

# S P E C I F I C A T I O N S

## ROMERO PARK SITE IMPROVEMENTS

**Santa Fe County**  
Santa Fe, New Mexico

December 20, 2019

Prepared by

**design office**  
1300 Luisa St. Suite 24  
Santa Fe, NM  
505.983.1415



The following specifications have been provided by the Landscape Architect:

Landscape Architect:     **DESIGN OFFICE**  
1300 Luisa Street, Suite 24  
Santa Fe, NM  
505.983.1415  
Contact: Claudia Horn



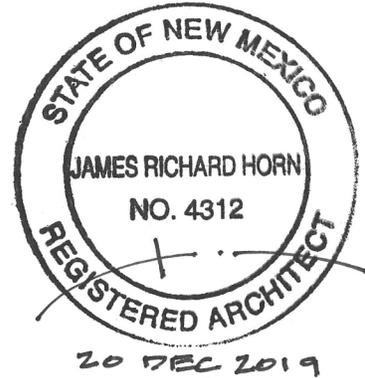
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32 92 23      Native Grass Lawn

The following specifications have been provided by the Architect:

Architect: SPEARS HORN ARCHITECTS  
1333 Pacheco St  
Santa Fe, NM  
505.983.6966  
Contact: James Horn

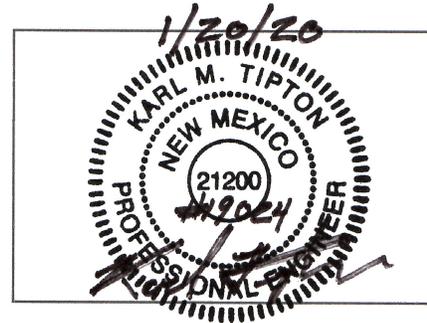


- |                                            |                                                                      |
|--------------------------------------------|----------------------------------------------------------------------|
| <b>DIVISION 4</b><br>04 22 00              | <b>MASONRY</b><br>Concrete Masonry Units                             |
| <b>DIVISION 6</b><br>06 10 00              | <b>WOOD, PLASTIC, AND COMPOSITES</b><br>Rough Carpentry              |
| <b>DIVISION 7</b><br>07 60 00              | <b>THERMAL AND MOISTURE PROTECTION</b><br>Flashing + Sheet Metal     |
| <b>DIVISION 8</b><br>08 10 00<br>08 71 00  | <b>WINDOWS AND DOORS</b><br>Metal Doors and Framing<br>Door Hardware |
| <b>DIVISION 9</b><br>09 90 00              | <b>FINISHES</b><br>Painting                                          |
| <b>DIVISION 10</b><br>10 21 00<br>10 80 00 | <b>SPECIALTIES</b><br>Toilet Partitions<br>Toilet Accessories        |



The following specifications have been provided by the MEP Engineer:

MEP Engineer: Tipton Engineering  
427 Luisa Place  
Santa Fe, NM  
505.310.3978  
Contact: Karl Tipton



**DIVISION 22 PLUMBING**  
22 05 53 Identification for Plumbing Piping and Equipment  
22 07 19 Plumbing Piping Insulation  
22 10 05 Plumbing Piping  
22 10 06 Plumbing Piping Specialties  
22 40 00 Plumbing Fixtures

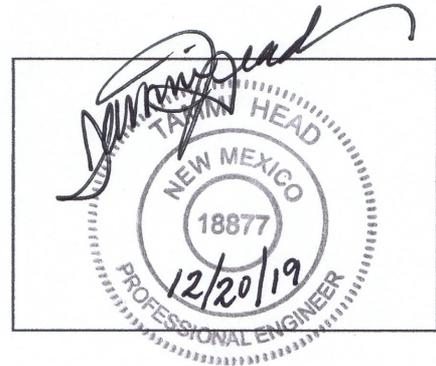
**DIVISION 26 ELECTRICAL**  
26 05 19 Low-Voltage Electrical Power Conductors and Cables  
26 05 26 Grounding and Bonding for Electrical Systems  
26 05 33.13 Conduit for Electrical Systems  
26 05 33.16 Boxes for Electrical Systems  
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26 09 23 Lighting Control Devices  
26 24 16 Panelboards  
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26 28 16.16 Enclosed Switches  
26 31 00 Photovoltaic Collectors  
26 51 00 Interior Lighting  
26 56 00 Exterior Lighting

**DIVISION 27 COMMUNICATIONS**  
27 10 00 Structured Cabling



The following specifications have been provided by the Slab Engineer:

Slab Engineer:           Unity Engineering  
                                  4 Snowcap Court  
                                  Cedar Crest, NM  
                                  505.270.5047  
                                  Contact: Tammi Head



**DIVISION 3           CONCRETE**  
03 38 16           Unbonded Post Tensioned Concrete



The following specifications have been provided by the Irrigation Consultant:

Irrigation Consultant: Hydrosystems-KDI  
860 Tabor St. Suite 200  
Lakewood, CO  
303.980.5327  
Contact: Amber Clark

Division 32 EXTERIOR IMPROVEMENTS  
32 84 00 Planting Irrigation



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END OF SECTION

Within the Drawings if inconsistencies are found, written directions/instructions/notes take precedence over graphic illustrations; written dimensions over scaled; and large-scale details over small scaled plans or sections. However, Contractor shall promptly bring to the Owner's and Landscape Architect's attention any discrepancies, inconsistencies, or ambiguities within the Drawings, or within the Contract Documents, prior to proceeding with the Work.

END OF SECTION

**PART I - CONTRACTS**

## 1.01 GENERAL

- A. Work to be done under this contract and in accordance with these Contract Documents consists of providing complete site improvements.
- B. The main features of the work include, but are not limited to, the following:
  - 1. Demolition
  - 2. Earthwork
  - 3. Concrete Paving
  - 4. Utilities
  - 5. Steel Shade Structures
  - 6. Building Renovations
  - 7. Playgrounds
  - 8. Site Furnishings
  - 9. Fencing and access control
  - 10. Signage
  - 11. Planting
  - 12. Seeding
  - 13. Irrigation

**PART 2 - OWNER OCCUPANCY**

## 2.01 GENERAL

- A. If a portion of the permanent construction has been satisfactorily completed and this portion will be immediately useful for the Owner to occupy, use, or gain access to other parts of the complex, the Owner may, by written notice, advise the Contractor that the Owner accepts such portion of work.
- B. Action by the Owner will in no way affect the obligation of the Contractor under the terms and provisions of the contract with respect to work not completed and accepted.

**PART 3 - CONTRACTOR USE OF PREMISES**

## 3.01 GENERAL

- A. Owner or his representative shall designate access areas to the project site, areas for construction personnel parking and for material and equipment storage as well as locations of temporary office and other construction building.
- B. Limit use of Project site to areas within the Limit of Work as designated on in the Contract Documents. Do not disturb portions of the Project site beyond areas in which the Work is indicated. Keep driveways, entrances, and parking areas serving the premises clear and available to the Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

- C. Carry out work in a manner which allows only a temporary lapse in operation of the dog park, and continuous operation of necessary functions of existing parking areas, buildings, and associated circulation areas for Nancy Rodriguez Community Center, the Sheriff's residence, Agua Fria Village Fire Station, and the Parks Maintenance building. Install temporary fencing to delineate construction zones from publicly accessible areas of the site. Maintain fencing, if necessary, for the duration of construction as required for user safety.
- D. Maintain portions of existing buildings affected by construction operations in a weathertight condition throughout the construction period. Repair damage caused by construction operations.

## **PART 4 - LABOR AND MATERIALS**

### **4.01 GENERAL**

- A. Provide complete materials and labor for proper execution and completion of work.
- B. Provide order and enforce strict discipline among employees and do not employ a person unskilled or unfit in task assigned to him.
- C. Provide completion of work items in proper sequence and order so that no items of construction or installation will be affected by the delay or premature application of another.
- D. Provide installation of work in accordance with manufacturer's specifications, when not otherwise specified.

## **PART 5 - PROJECT COORDINATION**

### **5.01 GENERAL**

- A. Comply with reasonable instructions of local public agencies and ordinances and codes of local government regarding sign, advertising, traffic, fires, explosives, danger signals, noise, and barricades. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Limit work on site to normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.
- C. Notices, demands, requests, instructions, approvals, proposals and claims must be in writing.
- D. Papers required to be delivered to Owner shall be delivered to Owner's authorized representative, unless otherwise specified in writing to the Contactor.
- E. Inform Owner when required samples and submittals are ready for approval. Owner will require a minimum of five days notice prior to approval trips.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA G703 - Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section.
- D. For each major line item list sub-values of major products or operations under the item.
- E. Revise schedule to list approved Change Orders with each Application for Payment.
- F. Upon request of the Landscape Architect, support the values with data which will substantiate their correctness.
  - 1. The Schedule of Values, unless objected to by the Landscape Architect, shall be used only as the basis for the Contractor's Applications for Payment.
- G. Form and Content of Schedule of Values:
  - 1. Type schedule on 8-1/2" x 11" white paper; Contractor's standard forms and automated printout will be considered for acceptance by Landscape Architect upon Contractor's request. Identify schedule with:
    - a. Title of Project and location
    - b. Landscape Architect and Project number
    - c. Name and Address of Contractor
    - d. Contract designation
    - e. Date of submission
  - 2. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
  - 3. For the various portions of the Work:
    - a. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
    - b. For items on which progress payments will be requested for stored materials not paid for, breakdown the value into:
      - 1) The cost of the materials, delivered and unloaded, with taxes paid.
      - 2) The total installed value.
  - 4. The sum of all values listed in the schedule shall equal the total contract sum.

## 1.02 APPLICATION FOR PAYMENT

- A. Submit three copies of each Application for Payment on AIA G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702. with all copies containing original signatures and notarization as required. The forms included at the end of this section must be used for pay requests. (See Samples)
- B. The Item and Description columns in the AIA G703 form must be filled out to follow the Contract bid sheets which may be abbreviated (use as many as required). A computer generated form may be substituted for the AIA forms.
- C. Content and Format: Use Schedule of Values for listing items in Application for Payment.

- D. Submit information in typewritten form
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.
- H. Submit three copies of each application for payment.
- I. Include three copies of the following with the application:
  - 1. Partial release of liens from all Subcontractors and vendors from previous payout.
  - 2. Partial release of lien from General Contractor for current pay request.
  - 3. Contractor's Sworn Statement for the Contract Price.
  - 4. Certified Payroll.
- J. When Landscape Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- K. Submit updated construction schedule with each Application for Payment.
- L. Payment Period: monthly.

#### 1.04 CONTRACT MODIFICATION PROCEDURES

- A. Upon the Owner's approval of a proposal from the Contractor, submitted either in response to a Proposal Request issued by the Landscape Architect or as a request for change from the Contractor, the Contractor will issue a Change Order on AIA Document G701 or on Owner-supplied forms, for all changes to the Contract Sum or Contract Time.
- B. When the Owner and Contractor disagree on the terms of a proposal, the Landscape Architect may issue a Construction Change Directive on AIA Document G714, instructing the Contractor to proceed with the change. The Construction Change Directive will contain a description of the change, and designate the method to be followed to determine changes to the Contract Sum or Contract Time.

#### 1.03 TAXES

- A. Provide sales and use taxes currently imposed by legislative action and as administered by the local jurisdiction agencies in this bid and contract price.
- B. If not required to bear the burden or if a refund is obtained from State sales or use tax, interest or penalty which was to be included in the bid and contract price shall be reduced by the amount. This reduction will be to the benefit of the Owner.
- C. Submit 3 copies of each Application for Payment on AIA Document G702/703, in accordance with the schedule established in the Agreement.

#### **PART 2 - PRODUCTS (Not Applicable)**

#### **PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

**PART 1 – GENERAL****1.01 SUMMARY**

- A. Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order. Overages and underages will be reconciled through Change Order.
- B. Types of allowances include the following:
  - 1. Lump Sum allowances.
  - 2. Unit Cost allowances.
  - 3. Quantity allowances.
  - 4. Contingency allowances.

**1.02 ACTION SUBMITTALS**

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

**1.03 INFORMATIONAL 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. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in the same manner as for other portions of the Work.

**1.04 COORDINATION**

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

**1.05 ALLOWANCES**

- A. The following Allowances are to be included in the Bid and Contract Sum:
  - 1. Miscellaneous Art Installation: \$ 25,000.00
  - 2. Miscellaneous Utilities: \$7,500.00
  - 3. Miscellaneous Irrigation: \$2,500.00

## 1.06 SCHEDULE OF ALLOWANCES

- A. The Allowance includes materials, labor, freight and delivery, installation, insurance, bonding, overhead and profit, and similar costs for the work provided by the subcontractor. In all cases, the Contractor shall be the responsible party for coordinating between the Contractor's work and the subcontractor. The Contractor shall also be responsible for protection and repair of any damage to the work of the subcontractor once installed within the project site.

The general description of the work provided by the subcontractor includes:

1. Allowance No. 1: Miscellaneous Art Installation (Lump Sum Allowance)  
Contractor shall provide all materials, labor, and installation services for new public art area(s). Work includes acquiring and installing unique artwork selected by the owner, providing a structural base / armature for the artwork, and landscaping the surrounding area per plans provided by the Landscape Architect. Materials shall be submitted to the Contractor for pricing prior to approval. Final installation locations, artwork selection, and landscape design to be provided by the Landscape Architect.
2. Allowance No. 2: Miscellaneous Utilities (Contingency Allowance)  
The purpose for this allowance is to reimburse the Contractor for the work of relocating, adjusting, or replacing any unforeseen required utilities as necessary to complete the construction of the project per the Contract Documents. In order to be eligible for payment under this item, the Contractor must submit a written proposal to the Owner Representative for approval for the required relocation or adjustments of existing utilities before work begins in these areas.
2. Allowance No. 3: Miscellaneous Irrigation (Contingency Allowance)  
The purpose for this allowance is to reimburse the Contractor for the work of relocating, adjusting, repairing, connecting, or replacing any unforeseen required work to the irrigation system as necessary to complete the construction of the project per the Contract Documents. In order to be eligible for payment under this item, the Contractor must submit a written proposal to the Owner Representative for approval for the required relocation or adjustments before work begins in these areas.

END OF SECTION

**PART 1 – GENERAL**

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

## 1.03 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

## 1.04 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

- B. Notification: Immediately following award of the Contract, each party involved shall be notified in writing of the status of each alternate, in particular whether alternates have been accepted, rejected, or deferred for later consideration. Notification shall include a complete description of negotiated revisions to alternates.

- C. Execute accepted alternates under the same conditions as other work of the Contract.

- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials necessary to achieve the work described under each alternate.

**PART 2 – PRODUCTS (Not Used)****PART 3 – EXECUTION**

### 3.01 SCHEDULE OF ALTERNATES

#### A. Deductive Alternate No. 1: Concessions

1. Deductive Alternate 1 consists of renovation work in the existing concessions room. Work includes selective demolition of existing countertop and concrete pad. New work includes the supply and installation of new plumbing + heating equipment / infrastructure, plumbing fixtures, electrical upgrades, lighting, and painting. See sheets A1-01, A1-02, E1-02, MP0-02, MP1-01 and associated details for further reference.

#### B. Deductive Alternate No. 2: Basketball Court

1. Deductive Alternate 2 consists of the east basketball court (57' x 94'). Work includes the supply, construction, and installation of a new concrete post-tensioned slab (integral color), subgrade preparation and earthwork, two salvaged posts, and court striping. See sheets L2-02, L2-05, and S1.3 along with associated details. This deduction assumes the contract includes reseeding this court area (ca 5,400 sf) and installing salvaged timber edging (57.5 lf).

#### C. Deductive Alternate No. 3: Tennis Court

1. Deductive Alternate 3 consists of the west tennis court (60' x 120'). Work includes the supply, construction, and installation of a new concrete post-tensioned slab court, court surfacing, post and net, and striping; perimeter fencing and gates set in concrete curb; and associated subgrade preparation and earthwork. See sheets L2-01, L2-05, and S1.2, along with associated details. This deduction assumes the contract includes reseeding the court area (ca 7,500 sf) and installing salvaged timber edging (62 lf).

#### D. Deductive Alternate No. 4: Building Upgrades

1. Deductive Alternate 4 consists of all building upgrades except those listed in Deductive Alternate 1 (concessions), mechanical room improvements associated with site electric improvements, and complete solar panel system installation. Architectural work consists of renovating the women's restrooms and reconfiguring/renovating the men's restroom to add a separate family restroom. Work includes upgrades to MEP systems, interior / exterior lighting, finish work, etc. as outlined in sheets A1-01, A1-02, E1-01, E1-02, MP0-02, and MP1-01. This deduction assumes no improvements in the above areas.

#### E. Deductive Alternate No. 5: Volleyball Court

1. Deductive Alternate 5 consists of the sand volleyball court area with perimeter seat wall north of the small picnic shelter. Work includes the supply, construction, and installation of the sand volleyball area; perimeter concrete (integral color) curb and seat walls; volleyball posts and net; and associated earthwork and subgrade preparation. See sheet L2-01, L2-05, and associated details. This deduction assumes the contract includes reseeding this area (ca. 7,300 sf) and installing salvaged timber edging (50 lf).

F. Deductive Alternate No. 6: Small Picnic Shelter

1. Deductive Alternate 6 consists of a steel frame picnic shelter (22' x 37') over a concrete surface with picnic tables (4). Work includes the supply, manufacture, and installation of a steel frame structure and roof; concrete paving, and picnic tables. See sheets L2-01 and A2-01 along with associated details. This deduction assumes the contract includes surfacing this area (ca. 940 sf) with crusher fines paving and installing salvaged timber edging (75 lf).

END OF SECTION

**PART I – GENERAL****1.01 SUBSTITUTIONS**

- A. Base bids upon providing the specific materials, processed products, persons or organizations, etc., identified in this Specification and/or indicated on the Drawings.
- B. For a period of thirty (30) consecutive calendar days after the signing of the Contract by the Owner, other fully equal materials will be considered by the Owner. No substitutions will be considered after thirty (30) days.
- C. The burden of proof of equality rests with the Contractor, and supporting technical literature, samples, drawings and performance data must be submitted with each request for substitutions.
- D. The Owner reserves the right to accept or reject proposed substitutions. Each request shall state the amount of savings to the Owner, if the substitution is approved.
- E. Cost of any testing required for analysis of proposed substitution shall be paid for by the Contractor at a testing agency selected and approved by the Owner.
- F. Should a substitution be accepted, the Contractor shall be responsible to make all necessary adjustments in the Work which may be affected as a result of the substitution at no additional cost.
- G. Should a substitution be accepted and this substitution prove to be defective within the one year guarantee period, the Contractor shall replace the substitute material with that specified and bear the costs incurred thereby.

**1.02 PRODUCT SUBSTITUTIONS**

- A. Contractor's Options
  - 1. For Products specified only by reference standard, select any product meeting that standard.
  - 2. For products specified by naming several products or manufacturer's select any one of the products or manufacturer's named, which complies with the specifications.
  - 3. For Products specified by naming only one Product or manufacturer, Contract must submit a request as for substitutions for any Product or manufacturer not specifically named.
  - 4. For products specified by naming only one Product and manufacturer and indicated as "no substitute", there is no option.
- B. Submit a separate request for each Product Substitution, supported with complete data, with drawings and samples as appropriate, including:
  - 1. Comparison of the qualities of the proposed substitution with that specified.
  - 2. Changes required in other elements of the work because of the substitution.
  - 3. Effect on the construction schedule.

4. Cost data comparing the proposed substitution with the Product specified.
  5. Any required license fees or royalties.
  6. Availability of maintenance service, and source of replacement materials.
- C. A request for substitution represents that the Contractor:
1. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
  2. Will provide the same warranties or bonds for the substitution as for the Product specified.
  3. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
  4. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.
- D. Owner will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

END OF SECTION

**PART 1 - PRECONSTRUCTION CONFERENCES**

## 1.01 GENERAL

- A. A preconstruction conference will be held prior to beginning of construction, notice of meeting will be sent by Owner to Contractor regarding time and place for the meeting.

**PART 2 - PROGRESS MEETINGS**

## 2.01 GENERAL

- A. Progress meetings shall be held as directed, with the Contractor, Construction Manager, Owner's Representative, Landscape Architect and Subcontractors whose presence is required, for the purpose of discussing, coordinating and expediting the work.
- B. Representatives at the meeting should be qualified to act on behalf of the Contractor or subcontractor they represent.
- C. Contractor will be responsible scheduling progress meetings, for keeping minutes of the meeting, and distribution of one typed copy of minutes to Owner, Landscape Architect, and subcontractors.

**PART 3 - JOB SITE ADMINISTRATION**

## 3.01 GENERAL

- A. The Owner, its authorized representatives and agents, will be allowed access to and be permitted to observe and review work, materials, equipment, payrolls, personnel records, employment conditions, and material invoices relevant to this Contract.
- B. Instructions and approval with respect to work will be given only by the Owner through its authorized agents.

END OF SECTION

**PART 1 - GENERAL****1.01 PROJECT MANAGEMENT AND COORDINATION**

- A. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.
- B. Progress meetings will be held at Project site at intervals agreed to by the Owner, Landscape Architect, and Contractor. The Owner, Landscape Architect, Contractor, and each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend.
  - 1. Minutes of each meeting will be prepared by Contractor and distributed to Owner, Landscape Architect and all other parties present.

**1.02 CONSTRUCTION SCHEDULE**

- A. Prepare a horizontal bar-chart-type, construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion.
  - 1. Submit within 10 calendar days of the date established for Commencement of the Work.
  - 2. Prepare the schedule on reproducible media, of width sufficient to show data for the entire construction period.
  - 3. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
  - 4. Indicate Substantial Completion and allow time for Landscape Architect's procedures necessary for certifying Substantial Completion.
  - 5. Schedule Distribution: Distribute copies to Owner, Landscape Architect, subcontractors, and parties required to comply with dates.
  - 6. Updating: Revise the schedule after each meeting or activity where revisions have been made.

**1.03 SUBMITTAL PROCEDURES**

- A. Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and other activities that require sequential operations.
  - 1. The Contractor shall submit two (2) sets of the items specified below to the Landscape Architect for review and approval at least seven (7) working days prior to ordering. No material shall be ordered, delivered or any work preceded in the field until the required submittals have been reviewed in its entirety and stamped approved. Delivered material shall match the approved samples in quantities as indicated on the drawings or in the specifications.
  - 2. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work.
  - 3. Landscape Architect will not accept submittals from sources other than Contractor.
- B. Prepare submittals by placing a permanent label on each for identification. Provide a space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:

1. Project name.
  2. Date.
  3. Name and address of Contractor.
  4. Name and address of subcontractor or supplier.
  5. Number and title of appropriate Specification Section.
  6. Contractor's certification that materials comply with specified requirements.
- C. Product Data: Mark each copy to show applicable choices and options. Include the following:
1. Data indicating compliance with specified standards and requirements.
  2. Notation of coordination requirements.
  3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.
- D. Shop Drawings: Submit newly prepared information drawn to scale as outlined in Section 6L. Shop Drawings and Samples of the General Conditions and as indicated herein. Indicate deviations from Contract Documents. Do not reproduce Contract Documents or copy standard information. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (762 by 1067 mm). Landscape Architect will return the reproducible print. Include the following:
1. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
  2. Identification of products and materials.
  3. Notation of coordination requirements.
  4. Notation of dimensions established by field measurement.
- E. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit at least 3 units that show limits of the variations. Include product name or name of the manufacturer.
- F. Mock-Ups:
1. Mock-ups shall be submitted for major systems and items as required on the Drawings and in the specifications.
  2. The mock-ups are to remain in place until the end of the project in an area where they will be protected from any damage, until otherwise directed by the Owner.
  3. Mock-up upon approval by the Owner will become the minimum construction quality standard for the system or item throughout the project.
  4. The Contractor shall provide corrections or resubmittals of the mock-up until approved by the Owner. Any corrections or resubmittals shall be at no additional cost to the Owner.
- G. Landscape Architect will review each submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

**PART 1 - GENERAL**

## 1.01 GENERAL

- A. Contractor to employ and pay for services of an independent Testing Laboratory to perform specified testing. Cooperate with laboratory to facilitate execution of required services.
- B. Employment of laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

## 1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Certification of Products: Respective sections of Specifications.
- C. Specific Materials / Products:
  - 1. Concrete Mixes: Section 03 30 00, Section 32 13 13
  - 2. Soil Compaction: Section 32 13 13
  - 3. Playground Protective Surfacing: Section 32 18 16
  - 4. Soil Mixes: Section 32 91 13

## 1.03 QUALIFICATIONS OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E-329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."
- C. Authorized to operate in the State in which the Project is located.
- D. Acceptable to Owner.
- E. Testing equipment at reasonable intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

## 1.04 AUTHORITY AND DUTIES OF LABORATORY

- A. Cooperate with Owner and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction.
- C. Promptly notify Owner and Contractor of observed irregularities or deficiencies of work or products.
- D. Laboratory is not authorized to:
  - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
  - 2. Approve or accept any portion of the Work.

3. Perform any duties of the Contractor.
- E. Promptly submit written report of each test and inspection; 4 copies each to Owner and Contractor. Each report shall include:
1. Date issued.
  2. Project title and number.
  3. Testing laboratory name, address, and telephone number.
  4. Name and signature of laboratory inspector.
  5. Date and time of sampling and inspection.
  6. Record of temperature and weather conditions.
  7. Date of test.
  8. Identification of product and Specification Section.
  9. Location of sample or test in the Project.
  10. Type of inspection or test.
  11. Results of tests and compliance with Contract Documents.
  12. Interpretation of test results that indicate unsatisfactory conditions.

#### 1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel and provide access to Work or to manufacturer's operations.
- B. Deliver to laboratory adequate quantities of representative samples of materials proposed for use and which require testing.
- C. Provide to laboratory preliminary design mix proposed to be used for concrete and other material mixes which require control by testing laboratory.
- D. Notify laboratory sufficiently in advance of operations (minimum of 2 days) to allow for laboratory assignment of personnel and scheduling of tests.
- E. Furnish incidental labor and facilities:
  1. To provide access to Work to be tested.
  2. To obtain and handle samples at Project site or at source of product to be tested.
  3. To facilitate inspections and tests.
  4. For storage and curing of test samples.
- F. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.
- G. Employ and pay for services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate Work does not comply with Contract Documents.

#### 1.06 REFERENCE STANDARDS

- A. American Concrete Institute (ACI): 301-73, Specifications for Structural Concrete for Buildings.
- B. American Society for Testing and Materials (ASTM) (latest editions):
  1. ASTM C31, Making and Curing Concrete Compressive and Flexural Strength Test Specimens in the Field.
  2. ASTM C39, Test for Compressive Strength of Cylindrical Concrete Specimens.
  3. ASTM C42, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

4. ASTM C143, Test for Slump of Portland Cement Concrete.
5. ASTM C172, Methods of Fresh Concrete, Sampling.
6. ASTM C231, Test for Air Content of Freshly Mixed Concrete by the Pressure Method.
7. ASTM F1292, Standard Specification for Impact Attenuation of a Playground Surface or Surfacing Materials.
8. ASTM F1951, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

## **PART 2 - NOT APPLICABLE**

## **PART 3 - EXECUTION**

### **3.01 CONCRETE CONTROL AND TESTING**

- A. Secure composite samples in accordance with ASTM C172.
- B. Mold and cure 3 specimens from each sample in accordance with ASTM C31.
- C. Test specimens in accordance with ASTM C39. Test two specimens at 28 days for acceptance and test one at 7 days for information.
- D. Make one set of strength tests (three cylinders) for each 100 cu. yd. or fraction thereof, or each mix design of concrete placed in any one day.
- E. Determine slump for each strength test and when consistency of concrete appears to vary in accordance with ASTM C143.
- F. Determine total air content of air entrained normal-weight concrete sample for each strength test in accordance with ASTM C231.
- G. Determine temperature of concrete sample for each strength test.
- H. Control addition of water to concrete at job site and length of time concrete is allowed to remain in truck during placement.
- I. Certify each concrete delivery ticket indicating class of concrete delivered, amount of water added and time at which cement and aggregate was discharged into truck, and time at which concrete was discharged from truck.
- J. Evaluation and Acceptance
  1. Strength level of concrete will be considered satisfactory if 90% of strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.
  2. Completed concrete work will be accepted when it conforms to requirements of ACI 301, Chapter 18.
  3. Where average strength of laboratory control cylinders, as shown by tests for portion of structure, falls below specified minimum ultimate compressive strength, Owner shall have right to require Contractor to provide improved curing, conditions of temperature and moisture to secure required strength.
  4. If average strength of laboratory control cylinders fall significantly below design strength and

Owner requires drilling concrete core specimens, test specimens in accordance with core procedure or ASTM C42. If results of core tests indicate that strength of structure is inadequate, such replacement, load testing, or strengthening as ordered by Owner shall be provided by Contractor without cost to Owner. If core tests are so ordered, and results of such tests indicate that strength of structure is as required by Contract Documents, cost of tests will be paid by Contractor.

- K. Concrete Test Reports
  - 1. Compile reports and distribute immediately after respective tests or inspections are completed.
  - 2. If reports indicate deviations from Contract Documents, include in report a determination or probable cause of deviation and, where applicable, a recommendation for corrective action.
  - 3. Where a trend of decreasing quality in concrete is determined due to changing seasons, conditions of curing or other cause, notify Owner and Contractor of conditions and submit a recommendation for corrective action to be taken before materials fall below specified quality requirements.

### 3.02 EARTHWORK

- A. Perform Plasticity Index Test on select fill material prior to use to determine compliance with the Contract Documents (ASTM D-424).
- B. Perform an in place density test on select fill for each 5,000 square feet of area or fraction thereof for each lift in place (ASTM D-2922).
- C. Perform a minimum of 4 density tests per lift under floor slabs on grade.

### 3.03 CONCRETE WALL AND COLUMN FOOTINGS EXCAVATION

- A. Soils testing laboratory shall inspect each concrete wall and column footing excavation to determine that proper bearing stratum is obtained and utilized for bearing and that excavations are properly clean and dry before concrete is placed.

### 3.04 PREWETTING SUBGRADE SOIL

- A. Soils Testing Laboratory shall conduct periodic auger borings to determine soil moisture contents at selected locations and depths (ASTM D-698 or D-1557).
- B. Surface construction shall not proceed over prewetted subgrade until desired moisture level is attained throughout the treated area.
- C. After moisture content is approved, construction shall proceed so as not to permit a loss in soil moisture content.

### 3.05 REINFORCING STEEL:

- A. If reinforcing steel is purchased direct from a United States mill, manufacturer's approved test sheet will suffice. Steel supplier shall furnish mail certificate reports.
- B. If steel is from dealer's stock, perform tension and bending test on three separate samples for each size of bar in every 5 tons of each type of steel as specified in the appropriate ASTM Specification. Contractor shall furnish all material for testing and pay for all such test.

- C. Tie-back cables shall be tested same as reinforcing steel.
- D. Perform visual inspection prior to placement for size, type and quality of materials.
- E. Observe the report on placement of reinforcement, including size, vertical location, horizontal spacing, correctness of bends, splices, clearance between bars and forms, firmness of installation, and security of supports and ties, immediately prior to concreting.
- F. Observe and report on placement of embedded items, including size, vertical location, horizontal spacing, correctness of fabrication, and firmness of installation immediately prior to concreting.

### 3.06 STRUCTURAL CONCRETE CONTROL AND TESTING

- A. Secure composite samples in accordance with C172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
- B. Concrete with a design strength of 6,000 psi or more shall be tested as follows:
  1. Mold and cure six specimens from each sample in accordance with ASTM C31.
  2. Two specimens shall be tested at 7 day for information, two shall be tested at 28 days for information, and two shall be tested at 56 days for acceptance. Acceptance tests results shall be the average of the strengths of the two specimens tested at 56 days. Minimum acceptable strength at 28 days for concrete with a design strength of 6,000 psi shall be 5,100 psi (85 percent of the 56 day requirement).
- C. Concrete with a design strength less than 6,000 psi shall be tested as follows:
  1. Mold and cure four specimens from each sample in accordance with ASTM C31.
  2. Two specimens shall be tested at seven days for information and two shall be tested at 28 days for acceptance. Acceptance test results shall be the average of the strengths of the two specimens at 28 days.
- D. Any deviations from the requirements of ASTM Specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C39.
- E. Make at least one strength test (six specimens for all 6,000 psi or above concrete, four specimens for other concrete) for each 100 cu. yd. of fraction thereof, of each mix design of concrete placed in any one day. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, in accordance with ASTM C143.
- F. Inspect each batch of concrete, adjust amounts of mixing in water to assure uniform consistency from truck to truck. Check mixing time of concrete in trucks.
- G. Should strength of concrete fall below the minimum, the additional tests may be required. These tests, if required, shall be made at the Contractor's expense and shall be in accordance with ASTM C42, and ACI 318. If core sample strength tests do not meet strength requirements, then the structure, or any part of the structure shall be removed and replaced at the Contractor's expense.
- H. Test reports shall show time test was made, truck ticket number, slump and time of batching, and location of each placement.

- I. Report promptly to Owner details of reasons for rejection of quantities of concrete. Give information concerning locations of the concrete pours, quantities, date of pours and other pertinent facts concerning concrete represented by the specimens.

### 3.7 STRUCTURAL CONCRETE MIX DESIGNS

- A. Trial mixtures having portions and consistencies suitable for the work shall be made based on ACI 211.1, using at least three different water-cement ratios which will produce a range of strengths encompassing those required for this Project.
- B. Trial mixes shall be designed to produce slump within 3/4 inch of the maximum permitted, and for air-entrained concrete, within .5 percent of maximum allowable air content. The temperature of concrete used in trial batches shall be the maximum temperature specified in the Structural Concrete Section.
- C. For each water-cement ratio, at least three compression test cylinders for each testage shall be made and cured in accordance with ASTM C192. Cylinders shall be tested at 7 and 28 days in accordance with ASTM C39. Where the required design strength is 6,000 psi, an additional set of cylinders shall be tested at 56 days in accordance with C39.
- D. From the results of the 28 days tests, a curve shall be plotted showing the relationship between the water-cement ratio and compressive strength. From this  
  
curve, the water-cement ratio to be used in the concrete shall be selected to produce the average strength required.
- E. The cement content and mixture proportions to be used shall be such that this water-cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement content, slump and air content.
- F. Mix designs furnished by the concrete supplier, accompanied by test data showing an acceptable strength history and certified by the testing laboratory, will be considered as an acceptable alternative to the procedure described in paragraphs A through D above.
  - 1. Temperature of concrete in test data shall be within 5 F. of maximum temperature specified or expected for this project.
  - 2. Strengths indicated in test data shall be in accordance with ACI 318, paragraph 4.3.
  - 3. The specified strength of concrete used in supporting test data shall vary no more than 500 psi plus or minus from that specified for this project.
- G. Where fly ash is used in the mix design, fly ash shall comprise no more than 20% by weight of the total cementitious material in the mix.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SECTION REQUIREMENTS

- A. Standards: Comply with NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations"; ANSI A10 Series standards for "Safety Requirements for Construction and Demolition"; and NECA Electrical Design Library's "Temporary Electrical Facilities."
  - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.
- B. At the earliest possible time, change over from use of temporary utility services to use of permanent utilities.
- C. Remove temporary facilities and controls before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

**PART 2 - PRODUCTS**

## 2.01 MATERIALS AND EQUIPMENT

- A. Provide new materials and equipment for construction of temporary facilities and controls.

**PART 3 - EXECUTION**

## 3.01 TEMPORARY UTILITIES

- A. Provide temporary lighting, fire-protection, and telephone services to project site for use during construction. Arrange for and coordinate service(s) with local utility companies.
  - 1. Contractor shall pay all use charges for temporary utilities.
- B. Provide temporary heat for curing or drying of work, and for protection of new construction from adverse effects of low temperatures. Use of gasoline-burning heaters and open-flame heaters is not permitted.
- C. Provide temporary sanitary facilities. Comply with regulations and health codes for type, number, location, and maintenance of facilities.
- D. Contractor shall have access to existing owner-provided electric power and water.

## 3.01 TEMPORARY CONSTRUCTION FACILITIES

- A. Provide field offices, storage trailers, and other support facilities as necessary for efficient prosecution of the Work.
  - 1. Temporary facilities located within the construction area or within 30 feet (9 m) of building lines shall be of noncombustible construction.

- B. Provide temporary enclosures for protection of construction and workers from exposure and inclement weather and for containment of heat.
- C. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- D. Collect waste daily and dispose of waste off-site according to local ordinances, when containers are full.
  - 1. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material according to applicable laws and regulations.
  - 2. Cost for removal and disposal of construction related waste materials and debris shall be paid by the Contractor.
- E. Costs for removal and disposal of construction related waste shall be paid by the Contractor.

### 3.02 TEMPORARY CONTROLS

- A. Provide temporary fire protection until permanent systems supply fire-protection needs.
  - 1. Provide adequate numbers and types of fire extinguishers.
  - 2. Store combustible materials in fire-safe containers in fire-safe locations.
  - 3. Prohibit smoking in hazardous fire-exposure areas.
  - 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. Provide temporary barricades, warning signs, and lights to protect the public and construction personnel from construction hazards.
  - 1. Enclose construction area(s) with fence(s) with lockable entrance gates, to prevent unauthorized access.
- C. Provide temporary environmental controls as required by authorities having jurisdiction including, but not limited to, erosion and sediment control, dust control, noise control, and pollution control, Environmental Protection Agency requirements. Contractor shall be responsible for arranging and paying for all activities related to providing temporary environmental controls.
- D. Contractor shall be responsible for and pay for all activities related to Environmental Protection Agency environmental control requirements.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SECTION REQUIREMENTS

- A. Provide products of same kind from a single source.
- B. Deliver, store, and handle products according to manufacturer's written instructions, using means and methods that will prevent damage, deterioration, and loss, including theft.
  - 1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces.
  - 2. Deliver in manufacturer's original sealed packaging with labels and written instructions for handling, storing, protecting, and installing.
  - 3. Inspect to ensure compliance with the Contract Documents and to ensure items are undamaged and properly protected.
  - 4. Store heavy items in a manner that will not endanger supporting construction.
  - 5. Store items subject to damage aboveground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required.

**PART 2 - PRODUCTS**

## 2.01 PRODUCT OPTIONS

- A. Provide items that comply with the Contract Documents, are undamaged, and are new at the time of installation.
  - 1. Provide products and equipment complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
- B. Do not attach manufacturer's labels or trademarks, except for required nameplates, on surfaces exposed to view in occupied spaces or on the exterior.
- C. Select products as follows:
  - 1. Where these Specifications name only a single product or manufacturer, provide the item indicated. No substitutions will be permitted.
  - 2. Where these Specifications name two (2) or more products or manufacturers, provide one (1) of the items indicated. No substitutions will be permitted.
  - 3. Where products or manufacturers are specified by name, accompanied by the term "or equal," comply with provisions concerning "product substitutions" to obtain approval for use of an unnamed product or manufacturer.
  - 4. Where these Specifications describe a product and list characteristics required, with or without naming a brand or trademark, provide a product that complies with the characteristics and other requirements.
  - 5. Where these Specifications require compliance with performance requirements, provide products that comply and are recommended in writing by the manufacturer for the application.
  - 6. Where these Specifications require compliance with codes, regulations, or reference standards, select a product that complies with the codes, regulations, or reference standards.

- D. Unless otherwise indicated, Landscape Architect will select color, pattern, and texture of any product from manufacturer's full range of options.

## 2.02 PRODUCT SUBSTITUTIONS

- A. Reasonable and timely requests for substitutions will be considered. Substitutions include changes proposed by the Contractor after award of the Contract, in products and methods of construction required by the Contract Documents.
  - 1. Do not submit unapproved substitutions on Shop drawings.
- B. Submit two (2) copies of each request for product substitution. Identify product to be replaced, provide complete documentation showing compliance of proposed substitution with all specified requirements, and include the following:
  - 1. A full comparison with the specified product.
  - 2. A list of changes to other Work required to accommodate the substitution.
  - 3. Any proposed changes in the Contract Sum or Contract Time should the substitution be accepted.
- C. Landscape Architect will review the proposed substitution and notify Contractor of its acceptance or rejection.

## **PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

**PART 1 - GENERAL**

## 1.01 CLOSEOUT SUBMITTALS

- A. Record Drawings: Maintain a set of Contract Drawings as Record Drawings. Mark to show installation that varies from the Work originally shown.
- B. Record Specifications: Maintain one (1) copy of the Project Manual, including addenda, as Record Specifications. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications.
- C. Operation and Maintenance Data: Organize data into 3-ring binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following:
  - 1. Emergency instructions.
  - 2. Spare parts list.
  - 3. Copies of warranties.
  - 4. Wiring diagrams.
  - 5. Irrigation zone diagrams.
  - 6. Shop Drawings and Product Data.
  - 7. Installation manuals.

**PART 2 - PRODUCTS (Not Applicable)****PART 3 - EXECUTION**

## 3.01 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with manufacturer's written requirements including, but not limited to, surfaces that are sound, level, and plumb; substrates within installation tolerances; surfaces that are smooth, clean, and free of deleterious substances; and application conditions within environmental limits. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Prepare substrates and adjoining surfaces according to manufacturer's written instructions, including, but not limited to, the application of fillers and primers.

## 3.02 CUTTING AND PATCHING

- A. Do not cut structural members without prior written approval of Landscape Architect.
- B. For patching, provide materials whose installed performance will equal or surpass that of existing materials. For exposed surfaces, provide or finish materials to visually match existing adjacent surfaces to the fullest extent possible.

## 3.03 INSTALLATION

- A. Comply with manufacturer's written instructions for installation. Anchor each product securely in place, accurately located and aligned. Clean exposed surfaces and protect from damage. If applicable, prepare surfaces for field finishing.

- B. Comply with NFPA 70 for installation of electrically operated equipment and electrical components and materials.

### 3.04 FINAL CLEANING

- A. Clean each surface or item as follows before requesting inspection for certification of Substantial Completion:
  - 1. Remove labels that are not permanent.
  - 2. Clean transparent materials, including mirrors. Remove excess glazing compounds. Replace chipped or broken glass.
  - 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean.
  - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
  - 5. Clean the site. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface. Remove weeds.

### 3.05 CLOSEOUT PROCEDURES

- A. Request Substantial Completion inspection once the following are complete:
  - 1. Advise Owner of pending insurance changeover requirements.
  - 2. Submit Record Drawings and Specifications, maintenance manuals, warranties, and similar record information.
  - 3. Deliver spare parts, extra stock, and similar items.
  - 4. Change over locks and transmit keys to Owner.
  - 5. Complete startup testing of systems and instructions of operation and maintenance to personnel.
  - 6. Remove temporary facilities and controls.
  - 7. Complete final cleanup.
  - 8. Touch up, repair, and restore marred, exposed finishes.
  - 9. Obtain final inspections from authorities having jurisdiction.
  - 10. Obtain certificate of occupancy.
- B. Upon receipt of a request for inspection, Landscape Architect will proceed with inspection or advise Contractor of unfilled requirements. Landscape Architect will prepare the Certificate of Substantial Completion after inspection or advise Contractor of items that must be completed or corrected before the certificate will be issued.
- C. Arrange for each installer of equipment that requires operation and maintenance to provide instruction to Owner's personnel. Include a detailed review of the following:
  - 1. Startup and shutdown.
  - 2. Emergency operations and safety procedures.
  - 3. Noise and vibration adjustments.
  - 4. Maintenance manuals.
  - 5. Spare parts, tools, and materials.
  - 6. Lubricants and fuels.
  - 7. Identification systems.

8. Control sequences.
  9. Hazards.
  10. Warranties and bonds.
- D. Request inspection for certification of final acceptance and final payment, once the following are complete:
1. Submit final payment request with releases of liens and supporting documentation. Include insurance certificates.
  2. Submit a copy of the Substantial Completion inspection list stating that each item has been completed or otherwise resolved for acceptance.
  3. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.
  4. Submit consent of surety to final payment.
- E. Landscape Architect will re-inspect the Work on receipt of notice that the Work has been completed.
1. On completion of re-inspection, Landscape Architect will prepare a certificate of final acceptance. If the Work is incomplete, Landscape Architect will advise Contractor of the Work that is incomplete or obligations that have not yet been fulfilled.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 INTRODUCTION

- A. This work shall consist of selective demolition, clearing and grubbing, earthwork, fine grading, utilities, irrigation pipe installation, concrete, base course, sub-grade preparation, testing, fencing, permanent signing and striping, planting, and overall project coordination and project scheduling required by the construction documents for this project.

**PART 2 – TECHNICAL SPECIFICATIONS**

## 2.01 GENERAL

- A. For all site work the “New Mexico APWA Standard Specifications”, Latest Edition, are hereby incorporated by reference, the same as if fully written herein and shall govern this project except where revised, amended, or supplemented by the construction plans, or superseded by the specifications and contract documents.
- B. All work shall be paid for by lump sum price for base bid and any selected alternative as outlined in the Contract with the Owner. All work as part of additions or deletions shall be paid for or deducted as per Contractor submitted unit cost per item.

**PART 3 – NPDES PERMITTING**

## 3.01 GENERAL

- A. This item will be paid on a Lump Sum basis for the entire project. This includes excavation for temporary sediment basins, straw bales, silt fence, temporary gravel construction entrance/exit installed prior to any construction and removed at completion of project, use of temporary earth swales, implementation of the Storm Water Pollution Prevention Plan (SWPPP) in accordance with Section 603 of the New Mexico Department of Transportation 2005 Interim Specifications and as amended by the Supplemental Technical Specifications Section 603 and all other materials and equipment required to complete erosion control plan and SWPPP.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Work Included: Perform all site demolition work complete, as shown, and as specified.

## 1.02 REFERENCES

- A. ASTM - American Society for Testing and Materials.

## 1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Demolish existing site improvements as indicated on the Drawings, in an orderly and careful manner. Comply with local codes and ordinances.
- B. Equipment: Use equipment specifically designed for the demolition of each type of material.
- C. Labor: Employ workmen skilled in the use of the equipment being utilized for demolition.

## 1.04 DELIVERY, STORAGE, AND DISPOSAL

- A. Delivery and Storage: Do not deliver to the job site nor store thereon demolition equipment and materials prior to receiving written notice to proceed. Confine storage to areas designated by Owner.
- B. Disposal: Legally dispose off site products of demolition during or at end of each day's work. Contractor to coordinate with Owner which site demolition items will be salvaged and disposed of or relocated. Contractor to pay all removal and disposal costs.

## 1.05 PROJECT / SITE CONDITIONS

- A. Existing Conditions: Inspect site prior to commencing work. Determine scope of applicable site conditions.
- B. Access and Testing: Make test excavations and borings required to determine existing conditions, subject to Owner's convenience.
- C. Acceptance: Commencing work constitutes Contractor's acceptance of site conditions, both surface and subsurface. No extra payment shall accrue to Contractor by virtue of unknown conditions or difficulties of performing this demolition work.

## 1.06 PROTECTION

- A. Protection of Existing Site Improvements:
  - 1. References: Verify and maintain benchmarks, monuments and other reference points. Replace if disturbed or destroyed.
  - 2. Protection: Protect existing improvements noted to remain within designated limits of work. Supply shoring, bracing, reinforcing and barricades required.
  - 3. Utilities: Keep in operation existing utility circuits and piping to remain including sprinkler irrigation except at the direction of the Owner's Representative. Provide 48 hour notice of

interruption of service. Notify Owner's Representative should utilities not shown on drawings can be found during demolition.

4. Repair: If damage to site improvements to remain occurs during the course of the work, restore to the satisfaction of the Owner at no additional cost.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Verification: Verify with Owner items to be removed, salvaged or to remain prior to commencement of work.
- B. Compliance: Proceed with demolition in an orderly and careful manner, in compliance with local codes and ordinances.
- C. Utilities:
  1. Capping: Disconnecting and capping of utilities must be in accordance with the regulations of the utility company affected.
  2. Removal: Removal of buried pipes or conduits is not required if such pipes or conduits lay a minimum of 24 in. below the work required under other Sections of this contract.
- D. Paving and Walls:
  1. General: Remove completely concrete slabs and asphalt paving, foundations, metal supports, walks and paving including and connected equipment. Aggregate base may be reused or remain if it meets the subgrade specifications for the proposed finish, otherwise remove.
  2. Sawcutting: Accurately and cleanly sawcut existing concrete and asphalt paving as shown on Drawings. Confine cuts to areas shown. Avoid damage to adjacent improvements.
  3. Footings: Excavate as required to remove complete footing. Backfill excavation and compact to 95 percent density.
  4. Finishing: Rough grade excavated areas as necessary to achieve the final line and grade as called for in other Sections of this work. Compact to the density of the surrounding area. The final surface shall be smooth, even and tight, free from loose or soft areas.
- E. Subgrade: Fill depressions made by demolition and restore excavated areas to a smooth and even grade. Compact to the density of the surrounding soil or as needed to meet specification for proposed finish condition.

#### **3.02 DE-WATERING**

- A. General: Provide and operate equipment and do ditching and pumping necessary to keep the project area free from water.
- B. Storm Water: Pump off storm runoff or other water until such time as new work in other Sections shall effectively remove such water.
- C. Disposal of Water: Take measures required to dispose of surface and subsurface water in compliance with municipal requirements.

### 3.03 SALVAGE

- A. Contractor is to remove items “to be salvaged” in a manner that maintains the integrity of the item for reuse by the Owner.
- B. Contractor to clean items “to be salvaged” for future reuse to Owner’s satisfaction.
- C. All items marked as “to be salvaged” are to be delivered to a location as directed by Owner. Transport in safe, legal manner.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 DESCRIPTION:

- A. Provide formwork and accessories for construction of cast-in-place concrete work.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 03 30 00 - Cast-in-Place Concrete

## 1.03 QUALITY ASSURANCE:

- A. Design Criteria: Conform to ACI 347-68, Chapter I.
- B. Allowable Tolerances: Conform to ACI 347-68, 2.4.

## 1.04 STORAGE OF MATERIALS:

- A. Store materials on dunnage under protective sheeting.

## 1.05 COORDINATION:

- A. Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

**PART 2 - PRODUCTS**

## 2.01 MATERIALS:

- A. Forms:
  1. Concrete Walls and Stairs: Exterior grade Standard Douglas Fir (or equal plywood), minimum three ply, one smooth side sufficiently thick to sustain loads, or steel forms.
  2. Form Oil: Non staining, paraffin-base oil having a specific gravity of between 0.8 and 0.9.
  3. Form Ties: Bolts, rods, or patented devices having minimum tensile strength of 3000 lbs., adjustable length, free of lugs which would leave a hole larger than 5/8" diameter and having a full one-inch depth of break-back.

**PART 3 - EXECUTION**

## 3.01 CONSTRUCTION AND ERECTION:

- A. Design, erect, store, brace and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads. Design and engineering of formwork and shoring is the Contractor's responsibility.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117. Align all Horizontal and Vertical joints.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3 mm) for concrete surfaces exposed to view.
  2. Class C, 1/2 inch (13 mm) for other concrete surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms with care to produce concrete surfaces without unsightly or objectionable form marks in exposed concrete surfaces.
- F. Thoroughly clean surfaces of form material and remove nails before reuse. Do not reuse damaged or worn forms. Coat contact surfaces of forms with non-staining form oil prior to placing metal reinforcement.
- G. Immediately before placing concrete, clean forms of chips, sawdust, and other debris. Immediately after removal of forms, remove form ties, wires, and other defects and patch.
- H. Do not chamfer exterior corners and edges of permanently exposed concrete, unless otherwise noted.
- 3.02 INSERTS AND ACCESSORIES:
- A. Make provisions for required installation of accessories, bolts, hangers, sleeves, anchor slots and inserts cast in concrete. Obtain suitable templates or instructions for installation of items. Place expansion joints where detailed and required.
- 3.03 REMOVAL OF FORMS AND SHORING:
- A. Remove forms and shores in accordance with ACI 347-68.
- 3.04 CLEANUP:
- A. Remove debris and trash resulting from specified work.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 DESCRIPTION:

- A. Provide steel reinforcement for cast-in-place concrete.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 03 30 00 - Cast-in-Place Concrete

## 1.03 DELIVERY AND STORAGE:

- A. Stack reinforcing steel in tiers. Mark each length, size, shape and location. Maintain reinforcement free of dirt, mud, paint or rust.

## 1.04 REFERENCE STANDARDS:

- A. American Concrete Institute (ACI):
  - 1. ACI 315-80, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
  - 2. ACI 318-77, Building Code Requirements for Reinforced Concrete.
- B. American Society for Testing and Materials (ASTM - latest editions):
  - 1. ASTM A185, Welded Wire Fabric for Concrete Reinforcement.
  - 2. ASTM A233, Mild Steel Arc Welding Electrodes.
  - 3. ASTM A615, Deformed Billet-Steel Bars for Concrete Reinforcement.
  - 4. ASTM A706, Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice, latest edition.
- D. American Welding Society (AWS): Reinforcing Steel Welding Code, D12.1-75, including latest revisions.

## 1.05 SUBMITTALS:

- A. Shop Drawings: Submit in accordance with Section 01 33 00. Indicate complete reinforcing for each concrete member including materials, sizes, bends, dimensions, bar schedules, stirrup spacing, and placing details.
- B. Mill Test Certificates: Submit mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered. (Provide certified copies of ladle analysis for each lot of bars requiring welding).

**PART 2 - PRODUCTS**

## 2.01 MATERIALS:

- A. Steel Reinforcement: Deformed billet steel, ASTM A615, Grade 60.

- B. Welded Steel Reinforcement: Deformed low-alloy steel, ASTM A706, carbon content not exceeding 0.30% and manganese content not exceeding 0.60%. Identify and tag with manufacturer's heat identification number.
- C. Wire Mesh: ASTM A185.

2.02 FABRICATION:

- A. Fabricate to sizes, shapes, and lengths detailed in accordance with requirements of ACI 318-71 and ACI 315-65.

**PART 3 - EXECUTION**

3.01 INSTALLATION:

- A. Accurately place reinforcing steel in accordance with drawings. Thoroughly clean reinforcement of any coating which would reduce bonding. Do not heat, cut, or bend bars without Owner's approval. Do not splice reinforcement at points of maximum stress. Stagger splices in adjacent bars and provide a minimum overlap of 30-bar diameters at splices unless specifically noted otherwise on Drawings.
- B. Securely saddle tie intersections with No. 18 ga. black annealed wire. Rigidly secure reinforcement in place. Provide concrete coverage as shown on Drawings.

3.02 WELDING REINFORCEMENT:

- A. Weld deformed steel reinforcement bars in strict accordance with AWS 12.1, using recommended pre-heat temperature and electrode for type of steel being welded.
- B. Do not weld steel reinforcement bars without proper heat identification of bars.

3.03 CLEANUP:

- A. Remove debris and trash resulting from specified work.

END OF SECTION

**PART 1 - GENERAL****1.01 SUMMARY**

A. This Section specifies cast-in place concrete, including concrete materials, mix design, placement procedures, finishes, surface repair and curing for the following site elements, but not limited to:

1. Concrete Sidewalk
2. Concrete Paving
3. Concrete Curbs
4. Header Curbs
5. Concrete Turndown Edges
6. Mow Strips
7. Seat Walls
8. Concrete Bench
9. Retaining Wall

B. Related Sections include the following:

1. Section 03 11 00 - Concrete Formwork
2. Section 03 20 00 - Concrete Reinforcement
3. Section 03 39 00 - Concrete Curing

**1.02 SUBMITTALS**

A. Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures.

B. Installer's Qualifications. Submit installer's qualifications demonstrating ability to meet Quality Assurance requirements.

C. Manufacturer's Qualifications. Submit manufacturer's qualifications demonstrating ability to meet Quality Assurance requirements.

D. Mock-ups. Submit mock-ups for Owners approval as noted on drawings and as required by this specification.

E. Product Data: For each type of manufactured material and product indicated.

F. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.  
1. Indicate amounts of mix water to be withheld for later addition at Project site.

G. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

- H. 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:
1. Cementitious materials and aggregates.
  2. Fiber mesh
  3. Form materials and form-release agents.
  4. Steel reinforcement and reinforcement accessories.
  5. Admixtures.
  6. Curing materials.
  7. Bonding agents.
  8. Joint-filler strips.

### 1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced Installer with a minimum of five (5) years experience who has completed 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: A firm with minimum of five (5) years experience in manufacturing 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 Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Mock-ups: Cast one mockup each for type of paving to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
1. Build mockups at least 10 linear feet in location directed by Owner. Coordinate with mockup of gravel paving.
  2. Notify Owner seven days in advance of dates and times when mockups will be constructed.
  3. Obtain Owner's approval of mockups before starting construction.
  4. If Owner determines that mockups do not meet requirements, demolish and remove them from the site and cast another until the mockup is approved.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Avoid damaging coatings on steel reinforcement.

## **PART 2 - PRODUCTS**

### **2.01 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.
  1. Plywood, metal or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. 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.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. 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.
  1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- G. 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.
  1. Furnish units that will leave no corrodible metal closer than one (1) inch to the plane of the exposed concrete surface.
  2. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

### **2.02 STEEL REINFORCEMENT**

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

### **2.03 REINFORCEMENT ACCESSORIES**

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric 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. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

#### 2.04 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I, white.
  - 1. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
  - 1. Class: Severe weathering region, but not less than 5S.
  - 2. Nominal Maximum Aggregate Size: 1 inch.
- C. Water: Potable and complying with ASTM C 94.
- D. Color: Integral color concrete: Davis Color, " Omaha Tan #5084", for bidding purposes. See plans for locations of colored concrete components.

#### 2.05 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

#### 2.06 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. 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.
- F. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Evaporation Retarder:
    - a. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
    - b. Eucobar; Euclid Chemical Co.
    - c. E-Con; L&M Construction Chemicals, Inc.
    - d. Confilm; Master Builders, Inc.
    - e. Waterhold; Metalcrete Industries.
  - 2. Clear, Waterborne, Membrane-Forming Curing Compound:
    - a. High Seal; Conspec Marketing & Manufacturing Co., Inc.
    - b. Safe Cure and Seal; Dayton Superior Corporation.
    - c. Dress & Seal WB; L&M Construction Chemicals, Inc.
    - d. Vocomp-20; W. R. Meadows, Inc.
    - e. Metcure; Metalcrete Industries.

## 2.07 RELATED MATERIALS

- A. Joint-Filler Strips:
  - 1. Pre-molded Joint Filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant and backer rod.
  - 2. Sealant Backer Rod: Compressible polyethylene foam rod or other flexible, permanent, durable non-absorptive material as recommended by joint sealer manufacturer for compatibility with joint sealer.
  - 3. Joint Sealer:
    - a. Type: Multi-component polyurethane sealant, FS TT-S-00227, Class A, type as recommended by manufacturer for exterior locations
    - b. Product: ASTM C290 non-sag sealant, "Dynatred" by Pecora Corporation, (214) 278-8158, or "Sonolastic Two-Part" by Sonneborn Building Products, (612) 835-3434.
    - c. Color: To match adjacent paving/grout.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

## 2.08 REPAIR MATERIALS

- A. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.
  - 1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

## 2.09 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test databases, as follows:
  - 1. Per Fordyce Ownerural concrete. Match approved sample.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. All cast-in-place concrete structures except flush pavement bands: Proportion normal-weight concrete mix as follows:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Slump: 4 inches.
  - 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 3-inch slump.
  - 4. Integral color: None
- D. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements.
- E. Maximum Water-Cementitious Materials Ratio: 0.42 (air-entrained) for concrete exposed to deicers or subject to freezing and thawing while moist.
- F. Air Content: 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 1 or minus 1.5 percent, unless otherwise indicated:
  - 1. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
- G. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- H. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use slabs and concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

## 2.10 FABRICATING REINFORCEMENT

- A. See Section 03 20 00 Concrete Reinforcing.

## 2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1½ hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

### **PART 3 - EXECUTION**

#### **3.01 FORMWORK**

- A. See Section 03 11 00 Concrete Forming.

#### **3.02 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.

1. Install anchor bolts, accurately located, to elevations required.

#### **3.03 REMOVING AND REUSING FORMS**

- A. General: Formwork, for sides of beams, walls, 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 provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.

- C. 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.

- D. 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 Owner.

#### **3.04 STEEL REINFORCEMENT**

- A. Section 03 20 00 Concrete Reinforcing.

#### **3.05 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 Owner.

1. 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.
  2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1½ inches into concrete.
  3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in flush pavement bands: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
1. Sawn Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut ¾-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Expansion Joints in flush pavement bands: 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.
1. Terminate full-width joint-filler strips not less than ½ inch or more than 1 inch below finished concrete surface where joint sealants, are indicated.
  2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.
1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.06 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. Deposit concrete continuously or in 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 specified. Deposit concrete to avoid segregation.
- C. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators 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 mix constituents to segregate.
- D. Deposit and consolidate concrete for flush pavement bands in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or 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.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- F. 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 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.
  2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.07 FINISHING FORMED SURFACES

- A. Smooth-Formed Sub-Finish: Concrete texture imparted by form-facing material. Arrange form-facing materials in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 0.25 inch in height.

1. Apply to concrete surfaces exposed to view, or to be covered with a coating material applied directly to concrete, such as waterproofing, or dampproofing.
- B. Abrasive-Blast Finish: Apply the following to smooth-formed sub-finished concrete:
1. Sand blast finish: Using abrasive grit, equipment, application techniques, and cleaning procedures to smooth the surface of the concrete and remove heavy texture from form work.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent are to be struck off smooth and finished with a texture matching the adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.08 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 Work.

### 3.9 CONCRETE PROTECTION AND CURING

- A. See Section 03 39 00 Concrete Curing.

### 3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. 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.

### 3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Owner. Remove and replace concrete that cannot be repaired and patched to Owner'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.
1. Match Owner's mix color and texture.
  2. Test repair technique on a mock-up or surface to be concealed before repairing surfaces.
- 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.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than  $\frac{1}{2}$  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.
2. 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.
  3. Repair defects on concealed, formed surfaces that affect concrete's durability and structural performance as determined by Owner.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as flush pavement bands, 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.
1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, 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.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. 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.
  4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of ¼ 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.
  5. 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 ¾ inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  6. 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 Owner's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Owner's approval.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency approved by the Owner to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified below.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mix placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  4. Concrete Temperature: ASTM C 1064; 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.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
    - a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
    - a. Test two field-cured specimens at 7 days and two at 28 days.
    - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix 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.
- E. Test results shall be reported in writing to Owner, concrete manufacturer, 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 mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Owner but will not be used as sole basis for approval or rejection of concrete.
- G. 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 Owner. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Owner.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY:

- A. Section includes:
  - 1. Finish for architectural, exposed-to-view, smooth surface cast in place concrete walls including:
    - a. Surfaced plywood form boards.
    - b. Form ties.
    - c. Form release agent.
    - d. Wet sandblasting.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 03 30 00 - Cast-in-Place Concrete

## 1.03 QUALITY ASSURANCE:

- A. Design Criteria: Conform to ACI 347-68, Chapter I.
- B. Allowable Tolerances: Conform to ACI 347-68, 2.4.

## 1.04 STORAGE OF MATERIALS:

- A. Store materials on dunnage under protective sheeting.

## 1.05 COORDINATION:

- A. Notify responsible trades of schedules of concrete pours to allow time for installation and coordination.

## 1.06 SUBMITTALS:

- A. Provide in accordance with Section 01 33 00 – Submittal Procedures:
  - 1. Product data for forms, form ties, and form release agent.
  - 2. Formwork shop drawings for architectural exposed to view concrete indicating layout and cold joint and tie locations.
  - 3. Sample: Form tie.
  - 4. Manufacturer's application instructions for form ties, form release agent, and resurfacing coating.

## 1.07 FIELD SAMPLE:

- A. In accordance with Section 01 40 00 – Quality requirements, prepare field sample exposed cast-in-place concrete wall illustrating color, form tie, form board joints, and finish and to established standard of quality for completed work.
- B. Shape: Straight wall segment.
- C. Minimum size: 3 feet high by 8 feet long.
- D. Illustrate horizontal and vertical form board joints.
- E. Finish field sample as specified in this Section. Apply clear coating to form barrier to prevent rainwater penetration.
- F. Accepted field sample shall remain as part of Work and be used during construction as quality standard. Protect accepted field sample from damage. Unacceptable field samples shall be completely removed.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS:

- A. Form release agent: US Mix Products Company, Denver, Colorado; 303-778-7227; [www.usmix.com](http://www.usmix.com).
- B. Sealers:
  1. Degussa Building Systems, Shackopee, Minnesota; 800-243-6739; [www.degussabuildingsystems.com](http://www.degussabuildingsystems.com)
  2. L&M Construction Chemicals Inc., Omaha, Nebraska; 800-3362-3331.
  3. The Burke Company, San Mateo, California; 415-349-7600.
  4. US Mix Products Company, Denver, Colorado; 303-778-7227; [us.usmix.com](http://us.usmix.com).
- C. Requests to use equivalent products of other manufacturers shall be submitted in accordance with Section 01 25 00 – Product Substitution Procedures.

### 2.02 CONCRETE MATERIALS:

- A. Formwork: General requirements as specified in Section 03 11 00 – Concrete Formwork.
  1. Form surfaces: Plywood with high density overlay (HDO) to provide smooth cast finish.
  2. Fabricate forms with straight, ½ inch rounded or tooled edges.
- B. Form ties: Steel rod snap ties with truncated plastic cone and associated clamping hardware.
- C. Concrete: Cement, water, admixtures, and color as specified in Section 03 30 00 – Cast-in-Place Concrete.

1. Color: match concrete paving color, integral color concrete: Davis Color "Omaha Tan #5084".

D. Reinforcement: Bars and welded steel fabric as specified in Section 03 30 00 – Cast-in-Place Concrete.

#### 2.03 ACCESSORY MATERIALS:

A. Form release agent: Chemically reactive, non-staining form release in mineral oil carrier which reacts with alkali in concrete to form barrier inhibiting bonding of concrete to formwork; Slickote as manufactured by US Mix Products Company.

B. Concrete wall sealer: Clear acrylic, non-yellowing, non-chalking, gloss finish; Aggreglaze as manufactured by The Burke Company.

#### 2.04 CONCRETE MIX:

A. Mix concrete in accordance with Section 03 30 00 – Cast-in-Place Concrete.

### **PART 3 - EXECUTION**

#### 3.01 FORMING:

- A. Form cast concrete walls as located, dimensioned, and detailed on Drawings and reviewed shop drawings.
- B. Erect reinforcement as indicated on Drawings and reviewed shop drawings.
- C. Erect formwork in accordance with ACI 347. Properly brace and tie forms to maintain position and shape while concrete is placed. Assemble formwork to permit dismantling and stripping.
- D. Align form board joints and make watertight. Provide horizontal and vertical joints as located and dimensioned on Drawings and reviewed shop drawings.
- E. No chamfer strips on external vertical corners of walls.
- F. Place form ties at uniform spacing in straight, aligned, vertical and horizontal lines as indicated on reviewed shop drawings.
- G. Prior to casting concrete, spray apply form release agent in thin coating. Do not saturate. Remove runs and puddles with squeegee or soft rag. Ensure coverage is applied consistently to all forms to ensure uniform concrete finish.

#### 3.02 PLACING CONCRETE:

A. Form Removal:

1. Do not remove forms and bracing until concrete has gained sufficient strength to carry its own weight and imposed loads. Remove forms in a manner which will prevent damage to concrete.
  2. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.
  3. Snap form ties flush with concrete surface.
- B. Finish shall be as-cast concrete. Do not apply rubbed finish. Do not patch, repair, or fill voids without written approval from Architect.
- C. After concrete has fully cured, remove plastic form cones. Leave form tie depressions exposed.
- D. Remove efflorescence, oil, and other foreign materials from exposed surfaces of finished concrete.
- E. Sandblasting: Inspect exposed concrete surfaces and review with Architect. Ensure that color is uniform without noticeable variations in intensity and shade. Uneven surfaces shall be corrected by wet sandblasting.

END OF SECTION

**PART 1- GENERAL**

## 1.01 SUMMARY

- A. Section includes:
1. Furnishing post-tensioning reinforcement and accessories including non-encapsulated prestressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
  2. Installing post-tensioning tendons.
  3. Performing post-tensioning operations including stressing and finishing tendons.
  4. Recording tendon elongations and gage pressures.
  5. Finishing tendon ends and patching stressing pockets.
  6. Use of Santa Fe County Standard Specifications for Public Works Construction.

## 1.02 RELATED WORK

The following items of related work are specified and included in other sections of the specifications:

## 1.03 REFERENCES

The following standards will apply to the work of this Section:

- A. Post Tensioning Institute's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. ASTM: American Society for Testing and Materials

## 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Installation drawings including plans, elevations, sections, details, and notes prepared by or under the supervision of a registered professional engineer detailing tendon layout and installation procedures.
- C. Product certificates.
- D. Qualification Data: For Installer.
- E. Mill Test Reports: For prestressing strand.
- F. Field quality-control test reports.
- G. Calibration Certificates: For jacks and gages.
- H. Stressing Records: Filled out by testing agency during stressing operation with the following information recorded:
  1. Name of Project.
  2. Date of approved installation drawings used for installation and stressing.
  3. Concrete placement area.
  4. Date of stressing operation.

5. Weather conditions including temperature and rainfall.
6. Name and signature of inspector.
7. Name of individual in charge of stressing operation.
8. Serial or identification numbers of jack and gage.
9. Date of jack-and-gage calibration certificates.
10. Gage pressure to achieve required stressing force per supplied calibration chart.
11. Tendon identification mark.
12. Calculated tendon elongation.
13. Actual tendon elongation.
14. Actual gage pressure.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Landscape Architect.
  1. Superintendent must have received training from post-tensioning supplier in the operation of stressing equipment to be used on Project.
- B. Manufacturer Qualifications: Fabricating plant certified by PTI.
- C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
  1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 - Field Fundamentals course or shall have equivalent qualifications acceptable to Landscape Architect.
- D. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.
- E. Preinstallation Conference: Conduct conference at Project site.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

### PART 2 PRODUCTS

#### 2.01 PRESTRESSING TENDONS:

- A. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, 7-wire, low-relaxation, 0.5 diameter strand.
- B. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties specified in ACI 423.6; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.
- C. Tendon Sheathing: Comply with ACI 423.6.
- D. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements in ACI 423.6 and capable of developing 95 percent of actual breaking strength of strand.

## 2.02 NONPRESTRESSED STEEL BARS:

- A. Support Bars, Reinforcing Bars: ASTM A 615/A 615M, Grade 40. Minimum support bar size is 1/2 inch, above and below anchor.
- B. Low-Alloy-Steel Support Bars, Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

## 2.03 ACCESSORIES:

- A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.
- B. Anchorage Fasteners: Galvanized nails, wires, and screws used to attach anchorage devices to formwork.
- C. Sheathing Repair Tape: Elastic, self-adhesive, moisture proof tape with minimum width of 2 inches in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.

## 2.04 PATCHING MATERIAL:

- A. Patching Material: One component, polymer-modified, premixed patching material containing selected silica aggregates and Portland cement, suitable for vertical and overhead application. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

## PART 3 EXECUTION

### 3.01 FORMWORK

- A. Provide formwork for post-tensioned elements as specified in City of Santa Fe Standard Specification. Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.

### 3.02 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

- A. Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

### 3.03 TENDON INSTALLATION

- A. Install tendons according to approved installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.  
  
Support tendons as required to provide profiles shown on installation drawings.  
  
Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
- C. Maintain tendon profile within maximum allowable deviations from design profile according to ACI 423.6.

- D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 3 inches of separation between tendons at locations of curvature.
- E. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs unless changes are authorized in writing by Landscape Architect. Obtain Landscape Architect's approval before relocating tendons or tendon anchorages that interfere with one another.
- F. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
- G. Installation of Anchorage Devices:
  1. Place anchorage devices at locations shown on approved installation drawings.
  2. Switching fixed and stressing-end anchorages has no effect on the structural system but may affect the durability of the system or cause conflicts with work of other trades. Stressing-end anchorages are typically more vulnerable to corrosion and should not be located where there is potential for leakage, either during construction or in service. If there are tendons whose anchorages cannot be switched, this should be noted on the post-tensioning installation drawings.

Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.

Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches (300 mm) behind stressing-end and intermediate anchorages.

Embed intermediate anchorage devices at construction joints in first concrete placed at joint.

Minimum splice length in reinforcing bars at anchorages is 24 inches. Stagger splices a minimum of 60 inches.

Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.

Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.
- H. Maintain minimum concrete cover according to ACI 423.6.
- I. Maintain minimum clearance of 3 inches between tendons and openings.
- J. Paint markings on formwork will be transferred to concrete, allowing tendon locations to be determined by examination of slab soffit. Delete first paragraph below or use alternate method of marking tendon locations if soffit is to be exposed or such markings are not desired.
- K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
- L. Do not install sleeves within 36 inches of anchorages after tendon layout has been inspected unless authorized in writing by Landscape Architect.
- M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected unless authorized in writing by Landscape Architect.
- N. Do not use couplers unless location has been approved by Landscape Architect.

### 3.04 SHEATHING INSPECTION AND REPAIR

- A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.
- B. Ensure that sheathing is watertight and there are no air voids.
- C. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
- D. Cover exposed strand with sheathing repair tape to prevent contact with concrete.
- E. Immediately remove and replace tendons that have damaged strand.

### 3.05 CONCRETE PLACEMENT

- A. Place concrete as specified. Ensure compaction of concrete around anchorages.
- B. Ensure that position of tendon and nonprestressed steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed steel reinforcement moved during concrete placement.
- C. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete placing equipment on tendons.

### 3.06 TENDON STRESSING

- A. Calibrate stressing jacks and gages at start of job and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site and available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
- B. Stress tendons only under supervision of qualified post-tensioning superintendent.
- C. Coordinate concrete strength required with requirements of post-tensioning supplier.
- D. Do not begin stressing operations until concrete strength has reached a strength of 2000 psi as indicated by compression tests of field-cured cylinders.
- E. Complete stressing within 96 hours of concrete placement.
- F. If concrete has not reached required strength, obtain Landscape Architect's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
- G. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch.
- H. ACI 318 requires that the cause of any difference between the jacking force and the force corresponding to measured elongation that exceeds 7 percent be ascertained and corrected.
- I. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Landscape Architect.
- J. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
- K. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacement of affected elements may be required.

### 3.07 TENDON FINISHING

- A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Landscape Architect.
- B. Cut strand tails as soon as possible after approval of elongations according to ACI 423.6.
- C. Cut strand tails and install caps on stressing-end anchorages within one day of Landscape Architect's acceptance of elongations.
- D. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

### 3.08 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports. Cooperate with testing agency to facilitate the execution of its duties.
- B. Before concrete placement, testing agency will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
  - 1. Location and number of tendons.
  - 2. Tendon profiles and cover.
  - 3. Installation of backup bars and other nonprestressed reinforcement shown on post-tensioning installation drawings.
  - 4. Installation of pocket formers and anchorage devices.
  - 5. Repair of damaged sheathing.
- C. Testing agency will record tendon elongations during stressing.
- D. Testing agency will immediately report deviations from the Contract Documents to Landscape Architect.

### 3.09 PROTECTION

- A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade component.
- B. Retain first paragraph below, a requirement of ACI 423.6, if the Work will be exposed to an aggressive environment. See Evaluations for discussion of aggressive environments.
- C. Protect exposed components within one workday of their exposure during installation.
- D. Prevent water from entering tendons during installation and stressing.
- E. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

### 3.10 REPAIRS

- A. Submit repair procedure to Landscape Architect for evaluation and approval.
- B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Landscape Architect.

### 3.11 MEASUREMENT AND PAYMENT

Measurement and Payment for Unbonded Post Tension Concrete under this specification shall be by the square foot (SF) of post-tension concrete installed complete in place, including fully tensioned tendons, tendon anchors, admixtures, and all other appurtenances described in this specification.

END OF SECTION



**PART 1 - GENERAL**

## 1.01 DESCRIPTION:

Provide curing of cast-in-place concrete and flatwork.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 03 30 00 - Cast-in-Place Concrete
- B. Section 03 20 00 - Concrete Reinforcement

## 1.03 SUBMITTALS:

- A. Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures.
- B. Submit certification that materials meet specification requirements.

## 1.04 DELIVERY AND STORAGE:

Deliver materials in original sealed containers with seal and labels intact. Store in cool, dry place. Use materials out of original containers only.

**PART 2 - PRODUCTS**

## 2.01 MATERIALS:

- A. Curing Compound: Liquid, membrane-forming compound containing a fugitive dye, conforming to ASTM C309, Type I. Curing compound shall be designed as to wear off, or be easily removed by sweeping at 28 days.
- B. Curing Paper: Sisalkraft "Orange Label", "Seekure 896", American Sisalkraft Co., Division of St. Regis Paper Co., or equal conforming to ASTM C171, Type I or II.

**PART 3 - EXECUTION**

## 3.01 CURING:

- A. Protect concrete surfaces against frost and rapid drying. Keep moist for seven days after placing. At contractor's option, either curing paper or curing compound method may be used.
- B. Curing Compound Method: Begin curing concrete as soon as concrete surfaces begin to take initial set after finishing according to manufacturer's instructions and at rates specified by manufacturer. Spray compound on surfaces using two coats, applying second at right angle to first. Restrict traffic on surfaces during curing to prevent "tracking off" of protective film. Inspect treated surfaces daily for seven days for evidence of drying out. If premature loss of moisture occurs, rewet surfaces and apply a new application of curing compound.

- C. Curing Paper Method: Begin curing concrete surfaces begin to take initial set after finishing. Spread curing paper over surfaces, lapping ends and sides a minimum of four inches, and maintain in place by use of suitable weights for seven days, then remove.

3.02 CLEANUP:

- A. Remove debris and trash resulting from specified work.

END OF SECTION

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Related Documents:
  - 1. Drawings and general provisions of the Subcontract apply to this Section.
  - 2. Review these documents for coordination with additional requirements and information that apply to work under this Section.
- B. Section Includes:
  - 1. Concrete Masonry Units.
  - 2. Reinforcement, anchorages, embedments and accessories.
- C. Related Sections:
  - 1. Division 01 Section "General Requirements."
  - 2. Division 01 Section "Special Procedures."
  - 3. Division 04 Section "Masonry Mortar".
  - 4. Division 05 Section "Structural Steel Framing".
  - 5. Division 05 Section "Cold Formed Metal Framing".
  - 6. Division 07 Section "Thermoplastic Membrane Roofing".
  - 7. Division 07 Section "Sheet Flashing and Trim" for reglets for flashings.

## 1.2 REFERENCES

- A. General:
  - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
  - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
  - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
- B. ACI – American Concrete Institute:
  - 1. ACI 315            Details and Detailing of Concrete Reinforcement
- C. ASTM International:
  - 1. ASTM A615 / A615M    Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - 2. ASTM C 90            Standard Specification for Loadbearing Concrete Masonry Units
- D. AWS D12.1    Reinforcing Steel Welding Code

## 1.3 SUBMITTALS

- A. Submit under provisions of Division 01 Section "General Requirements."

- B. Submit Shop Drawings for reinforcement, anchorages and embedments . Indicate bar sizes, spacings, locations, and quantities of reinforcing steel bending and cutting schedules, supporting and spacing.
- C. Submit Manufacturer's certified mill test reports on each heat of reinforcing steel to be used in the work before placement.
- D. Submit two 12 inch (300 mm) long samples of expansion and control joint materials.
- E. Submit manufacturer's certificates.

#### 1.4 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to at least 50 deg F(10 deg C) prior to, during, and 48 hours after completion of masonry work.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Units: conforming to ["Utility Block Company" Standard 21-4, Grade N, or approved equal]<sup>1</sup>; light weight, plain smooth face in the manufacturer's standard color. Strength of units shall be [as indicated on the Drawings] [f m=[1500 psi (10.35 MPa)] [2000 psi (13.8 MPa)] [2500 psi (17.25 MPa)]].
- B. Masonry Units: Modular sized to 8x8x16 and 8x12x16 inch as shown on the Drawings; provide special units for 90° corners, open ended, double open ended, bond beams and lintels. The use of LCC blocks is not permitted.

#### 2.2 REINFORCEMENT AND ANCHORAGES

- A. Single Wythe Joint Reinforcement: Truss and Seismic Comb type, galvanized steel construction; as manufactured by Dur-o-wall, or equal.
- B. Reinforcing Steel: Type specified and grade as specified in Division 03 Section "Concrete Reinforcing".

#### 2.3 ACCESSORIES

- A. Control Joints: Preformed neoprene orpolyvinyl chloride material.
- B. Nailing Strips: Western softwood, preservative treated, sized to masonry joints.

#### 2.4 LINTELS

- A. Constructed from concrete masonry lintel blocks.

### PART 3 - EXECUTION

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**3.1 PREPARATION**

- A. Verify items provided by other sections of work are properly sized and located.
- B. Establish lines, levels, and coursing. Protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.

**3.2 COURSING**

- A. Place masonry to lines and levels indicated.
- B. Maintain masonry courses to uniform width. Vertical and horizontal mortar joints shall be installed between blocks, shall be equal and of uniform thickness. Exposed joints shall be tooled to a slightly concave profile; unexposed surfaces may be struck smooth. Walls and parapet surfaces which will receive membrane sheet flashing and counter-flashing, and shall be constructed to permit the installation of base flashing materials as specified in Division 07 Section "Thermoplastic Membrane Roofing".
- C. Lay concrete masonry units in running bond. Course one block unit and one mortar joint to equal eight (8") inches. Alternate open ended and double open ended blocks in each course. Bond beams shall consist of alternately placed open ended and double open ended bond beam block.

**3.3 PLACING AND BONDING**

- A. Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove the mortar and replace.
- D. Remove excess mortar.
- E. Perform jobsite cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

**3.4 REINFORCEMENT AND ANCHORAGES**

- A. Install horizontal joint reinforcement 16 inches on center and seismic comb reinforcement where indicated on the drawings.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend at least 16 inches on each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends at least 6 inches (150 mm). Extend at least 16 inches (400 mm) on each side of opening.

- E. Reinforce joint corners and intersections with strap anchors 16 inches (400 mm) on center.

### 3.5 REINFORCING STEEL

- A. Place reinforcement in accordance with ACI 315.
- B. Locate reinforcing splices at points of minimum stress. Splice locations shall be as shown on the Shop Drawings unless alternative locations of splices are approved by the Engineer-of-Record.
- C. Where welding is approved by the University, weld reinforcement in accordance with AWS D12.1.
- D. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2-inch (13 mm) of true dimension.
- E. Verify that reinforcement is clean, free of scale, dirt, or other foreign coatings that would reduce bond to grout.

### 3.6 TOLERANCES

- A. Alignment of Pilasters: Maximum 1/4-inch (7 mm) from true line.
- B. Variation from Unit to Adjacent Unit: 1/32-inch (1 mm) maximum.
- C. Variation from Plane of Wall: 1/4-inch (7mm) in 10 feet and 1/2-inch (13 mm) in 20 feet (6 m) or more.
- D. Variation from Plumb: 1/4-inch (7mm) per story noncumulative; 1/2-inch (13 mm) in two stories or more.
- E. Variation from Level Coursing: 1/8-inch (3 mm) in 3 feet; 1/4-inch (7 mm) in 10 feet (3 m); 1/2-inch (13mm) maximum.
- F. Variation of Joint Thickness: 1/8-inch (3 mm) in 3 feet.
- G. Maximum Variation from Cross Sectional Thickness of Walls: +/- 1/4-inch (7 mm).

### 3.7 MASONRY FLASHINGS

- A. Lap end joints at least [6 inches (150 mm)] <Insert option Here> inches and seal watertight.

### 3.8 LINTELS

- A. Construct lintels using grout fill and reinforcing specified. Place reinforcing bars as shown on the drawings.]
- B. Install reinforced unit masonry lintels over openings. Construct lintels using grout fill and reinforcing. Maintain at least 8-inch bearing on each side of opening.
- C. Use reinforcing bars of one-piece lengths only.
- D. Place and consolidate grout fill without disturbing reinforcing.
- E. Allow lintels constructed in place to reach strength before removing temporary supports.

**3.9 GROUTED COMPONENTS**

- A. Reinforce masonry units as shown on the drawings.
- B. Lap splices at least 24 bar diameters.
- C. Place and consolidate grout fill without disturbing reinforcing.
- D. Solid grout concrete masonry units in accordance with California Building Code section 2104A.6.1.2.2.

**3.10 CONTROL JOINTS**

- A. Do not continue horizontal joint reinforcing across control joints.
- B. Form control joint by use of sheet building paper bond breaker one side fitted to hollow contour of block unit end. Fill created core with grout fill. Rake joint at exposed faces for rod and sealant.
- C. Install resilient control joint in continuous lengths. Heat solvent weld butt and corner joints in accordance with manufacturer's instructions.
- D. Size joint in accordance with Division 07 Section "Joint Sealants" for sealant performance.

**3.11 BUILT-IN WORK**

- A. As work progresses, build-in [metal door frames,] [fabricated metal frames,] [window frames,] [wood nailing strips,] [anchor bolts,] [plates,] and other items to be built in the work supplied by other sections.
- B. Build-in items plumb and level.
- C. C. Bed anchors of metal door [and glazed] frames in mortar joints. Fill frame voids solid with mortar. [Fill masonry cores with grout at least [12 inches (300 mm)] <Insert option Here> from framed openings.]
- D. Do not build-in organic materials subject to deterioration.

**3.12 CUTTING AND FITTING**

- A. A. Cut and fit for [chases] [pipes] [conduit] [sleeves] [grounds] [and] <Insert option Here>. Cooperate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval from the University prior to cutting or fitting areas not indicated or where appearance or strength of masonry work may be impaired.

**3.13 CLEANING**

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with a nonacidic solution that will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners.

- D. Use nonmetallic tools in cleaning operations.

3.14 PROTECTION

- A. Protect finished installation under provisions of Division 01 Section "General Requirements".
- B. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- C. Provide protection without damaging completed work.
- D. At day's end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

**PART 1 - GENERAL****1.01 SUMMARY****A. Section Includes:**

Work to be done includes all labor, materials, equipment and services required to complete all metal fabricated elements, as indicated on the Construction Drawings, as specified herein, and in conformance with all applicable governing agency regulations. Work includes, but is not necessarily limited to the following items:

1. Handrails.

**1.02 RELATED WORK**

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

**1.03 REFERENCES**

1. ASTM – American Standard for Testing Materials.
2. AISC – American Institute for Steel Construction.

**1.04 SUBMITTALS**

- A. Installer's Qualifications. Submit installer's qualifications demonstrating ability to meet Quality Assurance requirements.
- B. Manufacturer's Qualifications. Submit manufacturer's qualifications demonstrating ability to meet Quality Assurance requirements.
- C. Product Data: For each product indicated. Include details of construction relative to materials, dimensions of individual components and profiles, and finishes.
- D. Mock-ups for Verification: Provide mock-up for verification of fabrication and finishes quality standard.
- E. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

**1.05 QUALITY ASSURANCE**

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Performance characteristics are indicated by criteria

subject to verification by one or more methods including structural analysis, preconstruction testing, field testing, and in-service performance.

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.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code – Steel."
2. AWS D1.2, "Structural Welding Code – Aluminum."
3. AWS D1.6, "Structural Welding Code – Stainless Steel."

#### 1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of steps and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Provide allowance for trimming and fitting at site.

#### 1.07 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for handrails. 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 concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

### **PART 2 - GENERAL**

#### 2.01 STRUCTURAL STEEL TUBING, PIPE, BAR AND PLATE

A. Product: As noted on drawings.

B. Sizes: As shown on drawings.

#### 2.02 FINISH

A. Type: Weathered Steel Finish

B. Product: White vinegar. Clear seal.

## **PART 3 - EXECUTION**

### **2.03 INSTALLATION**

- A. Fabricate metal elements as per the Construction Drawings and per the quality standards of the Owner approved mock-up.
- B. Finish the fabricated metal elements to obtain the finish and per the quality standards of the Owner approved mock-up.

END OF SECTION

PART 1 - GENERAL

1.01 Scope

- A. Provide labor, materials and equipment necessary for all rough carpentry including blocking, and sheathing as necessary for the Work.

1.02 Standards

- A. Follow IBC requirements for joining and nailing. Comply with National Design Specifications for Stress Grade Lumber for each intended use.

1.03 Inspection

- A. Obtain approval from the Architect of all wood framing before covering up the work.

1.04 Coordination

- A. Coordinate work with other trades to allow for correct installation of items passing between and attached to wood framing and blocking.

PART 2 - MATERIALS

2.01 Blocking and Bridging

- A. No. 2 pine, structurally sound.

2.02 Plywood

- A. Shall be grade and thicknesses shown on the Drawings, and shall bear the American Plywood Association seal and grade marking on every sheet. Allowable support spacing shall not exceed Identification Index numbers.

2.03 Delivery and Storage

- A. Keep materials dry at all times. Protect against exposure to weather and contact with damp surfaces. Stack lumber and plywood, and provide air circulation within stacks.

PART 3 - EXECUTION

3.01 Planar Surface

- A. New framing shall result in maximum plane variation of not more than 1/8" in 10' and without voids or bulges.

3.02 Connections

- A. All nailing, bolting and blocking shall conform to IBC requirements.

3.03 Notching

- A. Notching and cutting of structural framing members shall be done only with prior approval from and as directed by the Architect. Replace members cut without prior approval.

3.04 Blocking

- A. Install blocking as correct height and location for all wall-mounted items shown on the Drawings, including all accessories, cabinets, electrical, mechanical and plumbing equipment.

3.05 Decking

- A. Replace existing damaged roof decking with in-kind or greater strength material, match existing deck thickness.

END OF SECTION

**PART 1 – GENERAL**

**1.01 Scope**

- A. This section includes Flashings and other Sheet Metal items required to protect the building from moisture.

**1.02 Standards**

- A. All work under this section shall conform to applicable standards of the Sheet Metal and Air Conditioning Contractor's Association, Inc., as shown in their Architectural Sheet Metal Manual.

**1.03 Submittals**

- A. Submit shop drawings and 12" x 12" material samples of flashing if applicable, equipment curbs, brick flashing if applicable, roof and wall expansion joints, all other flashings and sheet metal details and all flashing indicated in the Drawings. Receive Architect's approval of submittals before proceeding with fabrication.

**PART 2 - PRODUCTS**

**2.01 Sheet Metal**

- A. All sheet metal which is not exposed, such as unexposed roof flashings, shall be standard galvanized metal. All other sheet metal shall be factory finished with the finish selected by the Architect at the time of materials approval submittal and as noted on the Drawings. If any rooftop flashings are visible from surrounding property, they shall be field primed and painted. Color to be selected by Architect.

**2.02 Flashings**

- A. Roof counter-flashings and all flashings at penetrations shall be 22-gauge sheet metal unless otherwise indicated.

**2.03 Gauges**

- A. All other sheet metal shall be fabricated in gauges recommended in the Architectural Sheet Metal Manual unless shown otherwise on the Drawings.

**2.04 Fasteners**

- A. Shall be of the same material as the sheets used.

**PART 3 - EXECUTION**

**3.01 Fabrication**

- A. Sheet metal items not covered specifically elsewhere in this section shall be as indicated on the Drawings, and as required to provide a water-tight installation. Formed sheet metal shall accurately reproduce the detail and design shown, and profiles, bends and intersections shall be sharp, even and true. Joints shall be locked, lapped, screwed, riveted or soldered as applicable and per SMACNA

standards. Flashings, and other exposed sheet metal to be painted as noted in Section 9900 PAINTING.

3.02 Projections and Extensions Through the Roof

- A. All roof penetrations shall be located where indicated on the Drawings and shall be installed by roofing subcontractor after coordinating work with all other applicable trades. If any roof equipment or penetrations are needed which are not specifically shown on the Drawings, or will be higher than the finished parapet height as shown on the Drawings, contact the Architect for approval prior to beginning the Work.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

- A. Sealants and joint backing.
- B. Precompressed foam sealers.

## 1.02 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2011a.

## 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with other sections referencing this section.

## 1.04 SUBMITTALS

- A. Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Product Schedule: Provide schedule indicating manufacturer's products matched to the same Sealant Types ( Type SIL-4, etc.) listed in Part 2 of this Section.
  - 1. Failure to provide product schedule will result in immediate rejection of the submittal.
- D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.
- E. Manufacturer's certification in accordance with Field Quality Control Article in Part 3 of this Section.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

## 1.06 MOCK-UP

- A. Construct mock-up with specified sealant types and with other components noted.
- B. Locate where directed.
  - 1. Requirements: Provide mock up, 5 feet minimum in length, of prepared joint, prior to sealant installation. Upon approval of preparation, install sealant in accordance with manufacturer's instructions.
- C. Mock-up may remain as part of the Work.
- D. In addition to sealant mock-ups required in this Section, provide required sealant in

assemblies of mock-ups in other Sections which may include, but may not be limited to, the following:

1. Section 04 27 31 - Reinforced Unit Masonry: Masonry expansion joints.

#### 1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

#### 1.08 COORDINATION

- A. Coordinate the work with all sections referencing this section.
- B. Do not apply concrete sealers until full sealant cure period recommended by manufacturers is attained.

#### 1.09 WARRANTY

- A. Correct defective work within a one year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
  1. Provide the following warranties for specific types of sealants indicated:
    - a. Exterior Building Silicones: 20 years.
    - b. Building Urethane Sealants: 5 years.

### **PART 2 - PRODUCTS**

#### 2.01 SEALANTS

- A. Type ES-1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses NT, M, G, A and O; multi-component.
  1. Manufacturers:
    - a. BASF Construction Chemicals, LLC: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
    - b. Sika Corporation: [www.sikausa.com](http://www.sikausa.com)
    - c. Tremco, Inc: [www.tremcosealants.com](http://www.tremcosealants.com)
    - d. Pecora Corporation: [www.pecora.com](http://www.pecora.com)
    - e. Sonneborn: [www.sonneborn.com](http://www.sonneborn.com)
  2. Volatile organic compound (VOC) content: 80 grams per liter, maximum.
  3. Product and Manufacturer: Sonolastic NP 2 manufactured by BASF Construction Chemicals, LLC: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com) or approved equal.
- B. Type ES-2: Self-leveling polyurethane; ASTM C 920, Grade P, Class 25, Uses T and M; multicomponent.
  1. Manufacturers:
    - a. BASF Construction Chemicals, LLC: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
    - b. Sika Corporation: [www.sikausa.com](http://www.sikausa.com)
    - c. Tremco, Inc: [www.tremcosealants.com](http://www.tremcosealants.com)
  2. Color: Standard colors matching finished surfaces.
  3. Volatile organic compound (VOC) content: 95 grams per liter, maximum.
  4. Product and Manufacturer: Sonolastic SL2 manufactured by BASF Construction

Chemicals, LLC: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com) or approved equal.

- C. Type SIL-4: Single component silicone sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT, G, A, and O.
  - 1. Tensile Strength: 45 psi.
  - 2. Volatile Organic Content: 43 g/liter.
  - 3. Product: Dow 795 Silicone Building Sealant manufactured by Dow Corning Corp: [www.dowcorning.com](http://www.dowcorning.com) or approved equal.
- D. Type SIL-8: Single component silicone sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT, M, A, and O.
  - 1. Tensile Strength: 100 psi.
  - 2. Volatile Organic Content: 35 g/liter.
  - 3. Product: Dow Contractors Weatherproofing Sealant manufactured by Dow Corning Corp: [www.dowcorning.com](http://www.dowcorning.com) or approved equal.
- E. Interior Sealant: Shall be acrylic latex caulk, Sonolac by Sonneborn or Architect-approved equal.
- F. Acoustical Sealant: Shall be non-drying, non-hardening, permanently flexible, synthetic rubber based, "Acoustical Sealant" as manufactured by "Tremco", Percora Corp", or Architect-approved equal.

## 2.02 JOINT BACKING

- A. Applications: Use for:
  - 1. Control, expansion, and soft joints in masonry.
  - 2. Joints between concrete and other materials.
  - 3. Joints between metal frames and other materials.
  - 4. Other exterior joints for which no other joint backing is indicated.
- B. Joint Backing: Non-gassing, round foam rod compatible and non-adhering with sealant; closed cell, polyethylene foam; non-gassing when punctured; oversized 30 to 50 percent larger than joint width.
- C. Volatile organic compound (VOC) content: 0 grams per liter.
- D. Color: As selected from manufacturer's standards.
- E. Product and Manufacturer: Sonolastic Closed Cell and Soft Backer Rod, BASF Construction Chemicals, LLC: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com) or equal.

## 2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; closed cell polyethylene; oversized 30 to 50 percent larger than joint width.

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

#### **3.02 PREPARATION**

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

#### **3.03 INSTALLATION**

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Completely seal joints indicated on Drawings and as required to render weathertightness, close openings, and allow movement of materials.
- C. Perform installation in accordance with ASTM C1193.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints in accordance with manufacturer's instructions.
- I. Do not lap or feather onto adjacent surfaces.

#### **3.04 FIELD QUALITY CONTROL**

- A. The Engineer reserves the right to test sealant products at any time and as often as the Engineer deems necessary during the period when sealant is being applied.

#### **3.05 CLEANING**

- A. Clean adjacent soiled surfaces.
- B. Repair or replace defaced or disfigured finishes caused by work of this Section.

#### **3.06 PROTECTION**

- A. Protect sealants until cured.

#### **3.07 SCHEDULE**

- A. Exterior Joint Sealants:

1. Provide Sealant Type ES-1 at the following locations:
    - a. Expansion joints in concrete paving sloped more than 1:50, where joints are indicated to receive sealant.
  2. Provide Sealant Type ES-2 at the following locations:
    - a. Expansion joints in concrete paving sloped 1:50 or less, where joints are indicated to receive sealant.
  3. Provide Sealant Type SIL-3 at the following locations:
  4. Provide Sealant Type SIL-4 at the following locations:
    - a. Exterior joints for which no other sealant type is indicated.
    - b. Joints at above-grade, horizontal penetrations in exterior walls.
    - c. Joints between metal frames and adjacent work.
    - d. Joints between masonry and adjacent work.
    - e. Joints between piping and masonry or concrete walls.
    - f. Joints between light fixtures and electrical boxes and walls.
    - g. Joints in sheet metal fascias, copings, drip edges, and gravel stops.
- B. Colors: Except as otherwise indicated and colors indicated below, provide colors that match adjacent surfaces.
1. Expansion and control joints in concrete paving and concrete slabs: Match concrete color.

END OF SECTION

## PART 1 - GENERAL

## 1.01 Scope

- A. Furnish all labor, materials and equipment necessary for a complete installation of the hollow metal doors and door frames with applicable ratings as shown on Drawings and as specified herein, including but not limited to hollow metal door, window and skylight frames, anchors, clips and hollow metal doors.

## 1.02 Shop Drawings

- A. Submit three (3) copies of Shop Drawings for the fabrication and erection of hollow metal work, anchorage and accessory items with schedule.

## 1.03 Standards

- A. All materials and installations shall comply with recommendations of the Steel Door Institute.

## PART 2 - PRODUCTS

## 2.01 Manufacturers

- A. Ceco Door Products**
- B. Curries**
- C. Southwestern Hollow Metal**
- D. Architect approved equal.

## 2.02 Doors

- A. 16-gauge, cold-rolled steel, flush, with invisible seams filled and ground smooth, with 1/8" bevel in 2" on hinge and lock edges. Glazed openings shall be as indicated on Drawings.
  - Doors shall be fully insulated with either mineral wool or polystyrene insulation.
  - The doors shall be factory prepped for all hardware. Doors shall be bonderized and receive one coat of baked-on primer. Doors shall be U.L. rated as required by Drawings and shall be so labeled.
  - Each door to receive door kick hardware at both sides of bottom of door.
  - Each door to receive door closer and panic hardware.

## 2.03 Frames

- A. Form from 16-gauge cold-rolled steel in profiles as shown on Drawings. Heads and jambs shall be accurately mitered, welded and ground smooth in accordance with Steel Door Institute's SDI-105 recommendations. Reinforce for butts and accessories. All frames shall be bonderized and shop primed with baked-on primer. See related section 08 80 00 Glazing.

## 2.04 Anchors

- A. Provided 6 jamb anchors and two base anchors per door frame of type as recommended by the Manufacturer and as noted on Drawings for new CMU, metal frame or existing masonry walls.

PART 3 - EXECUTION

3.01 Installation

- A. Set frames plumb and true in accordance with manufacturer's instructions. Paint as noted in Section 09 90 00 PAINTING.

3.02 Coordination

- A. Coordinate with other trades to see that anchors are set accurately and frames installed in the correct sequence of work.

3.03 Adjust and Clean

- A. Readjust operating hardware items prior to final inspection, replacing defective work, including warped or bowed doors and frames. Sand smooth any rusted or damaged areas of prime coat and touch up immediately after erection of hollow metal items.

END OF SECTION

## PART 1 - GENERAL

## 1.01 SCOPE

- A. Furnish all labor, materials and equipment necessary for a complete installation of all finish hardware and door accessories as intended by the Drawings and Schedules and as specified herein. This includes but is not limited to locksets, latchsets, hinges, thresholds, and miscellaneous hardware items and accessories required for smooth, secure operation and locking.

## 1.02 COORDINATION

- A. All hardware to be compatible with reinforcing and hardware preparation of doors. Verify compatibility.

## 1.03 SUBMITTALS

- A. Within fifteen working days of the Signing the Contract, a complete schedule of every Finish Hardware item furnished under this Section is to be submitted to the Architect for approval. Such schedule MUST contain finish samples, technical literature, with all pertinent information. Schedules are intended for coordination of the work. Submit sample of cabinet pulls and hinges for Architect approval. Drawing details MUST be submitted for hardware based on the products and manufacturers listed in the hardware schedule. Proposed substitutions must not change design intent.

## 1.04 KEYING

- A. All locks of this Section are to be Master Keyed with and match existing building hardware. Provide three keys per lock, properly labeled. Keying system is to be to the complete satisfaction of the Owner and shall be approved by the Owner before any hardware is installed.

## 1.05 QUALITY ASSURANCE

- A. Obtain each kind of hardware from one manufacturer with the exception of mag locks. In order to meet project requirements, Mag locks may be purchased from Securitron and Sargent. The supplier shall be recognized as builders' hardware supplier. The hardware supplier MUST be furnishing hardware in the project's vicinity for no less than two years. The hardware supplier MUST have in their employment an experienced hardware consultant who is and will be available for consultation to the Owner, Architect, and Consultant.
- B. Provide hardware for fire rated openings in compliance with NFPA Standard No. 80. Provide only hardware that has been tested and listed by U.L. for types and sizes of doors required and complies with requirements of door and door frame labels.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Packaging of hardware, on a set-by-set basis is the responsibility of the supplier. As material is received by hardware suppliers, sort and repackage in containers marked with hardware set numbers. Inventory hardware jointly with the hardware supplier and the installer. Provide secured area for hardware delivery to the project site. Control handling and installation of the hardware sets.

## 1.07 JOB CONDITIONS

- A. Coordinate hardware work with other work. Tag each item or package with basic information related to hardware schedule and installation requirements. Check shop drawings to confirm that hardware components will make an excellent fit. Coordinate all applicable door strike hardware with floor finishes so there will be a smooth transition. Make floor strikes flush with floor finishes.

**1.08 REFERENCES**

**A. Fire/Life Safety**

- 1. NFPA - National Fire Protection Association
  - a. NFPA 70 – National Electric Code
  - b. NFPA 80 - Standard for Fire Doors and Fire Windows
  - c. NFPA 101 - Life Safety Code
  - d. NFPA 105 - Smoke and Draft Control Door Assemblies

**B. UL - Underwriters Laboratories**

- 1. UL 10B - Fire Test of Door Assemblies
- 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
- 3. UL 1784 - Air Leakage Tests of Door Assemblies
- 4. UL 305 - Panic Hardware

**C. Accessibility**

- 1. ADA - Americans with Disabilities Act.
- 2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.

**D. DHI - Door and Hardware Institute**

- 1. Sequence and Format for the Hardware Schedule
- 2. Recommended Locations for Builders Hardware
- 3. Key Systems and Nomenclature

**E. ANSI - American National Standards Institute**

- 1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- |                      |                                    |
|----------------------|------------------------------------|
| <b>A. Schlage</b>    | <b>G. Glynn-Johnson</b>            |
| <b>B. Sargent</b>    | <b>H. Locknetics</b>               |
| <b>C. Von Duprin</b> | <b>I. NGP</b>                      |
| <b>D. Trimco</b>     | <b>J. Falcon</b>                   |
| <b>E. Bommer</b>     | <b>K. Markar</b>                   |
| <b>F. LCN</b>        | <b>L. Architect Approved Equal</b> |

**2.02 STEEL DOORS**

- A. All aluminum doors shall receive 1224 screws or larger with riv-nut type connection (minimum 8 per operator) in conjunction with the installation of all applicable hardware.

2.03 DOOR HARDWARE

- A. Provide a hardware schedule

2.04 THRESHOLDS

- A. Provide threshold anchors as approved by Architect at all doors to receive thresholds.

2.05 DOOR CLOSERS

- A. Provide door closers as approved by Architect**
- B. Adjust all door closers to ADA pressure standards (5lbs MAX)**

2.06 DOOR KICK PLATES

- A. Provide Door Kick Plates, typical @ each door. Architect approved brushed or satin finished stainless steel (ss) or nickel chrome finish.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install hardware items according to the manufacturer's recommendations and to the satisfaction of the Architect. Do not install surface mounted items until finishes are complete. Set units level, plumb and true to line.

3.02 ADJUSTMENTS

- A. Adjust and clean operating items before final inspection. Instruct Owner personnel as to proper maintenance. Operation shall be approved by the Architect.

3.03 MOUNTING HEIGHTS

- A. Mount hardware units at heights recommended by code requirements.

3.04 INSPECTION

- A. Doors shall be demonstrated to swing and close and hardware to operate to the satisfaction of the Architect.

PART 4 - SCHEDULE

- 4.01 See drawings for schedule information.

END OF SECTION



## PART 1 - GENERAL

## 1.01 SCOPE

- A. The Contractor shall provide all painting, staining and coatings as noted within provided Drawings and Schedules. As a general statement of scope, all materials such as wood, gypsum board and non-finish metal, which are not integrally or factory-finished, shall receive finish-protective coating under the scope of this section.

## 1.02 MATERIALS

- A. Provide the best quality of the various types of coatings in the best grades of **“Sherwin Williams”** or Architect approved equal. Provide finish coats, which are compatible with primers, or shop-applied undercoating. Provide barrier coats or remove incompatible primers. Provide undercoats by same manufacturer as finish coats and recommended for substrate encountered. Use only thinners recommended by the paint manufacturer.

## 1.03 SYSTEM STANDARDS

- A. The referenced manufacturer’s standard for all painting, staining and coatings material and methods for the Work shall be: **“Sherwin Williams”** Painting System for Specifiers and Applicators,” “PPG Specifications and Information for Architectural Coatings,” or other Architect approved printed system guide. Submit as noted herein.

## 1.04 SUBMITTALS

- A. The Contractor shall submit a list of proposed system products to be used, showing where they are to be applied and providing complete system data for preparation and finish materials, for approval of the Architect prior to initiating any Work.
- B. The Contractor shall furnish complete color charts for all approved paint materials from which the Architect shall prepare a complete paint color schedule.
- C. The Contractor shall provide **12” x 12” paint “draw-downs”**. The Contractor shall provide samples of each selected paint on a scrap of wood similar to that to be painted (on both new and restored window material) and shall obtain approval of sample before proceeding with painting, in order to obtain similar results for stains on adjacent wood products. Samples shall be allowed to dry one week before testing adhesion per ASTM D3359.

## 1.05 PRE-WORK MEETING

- A. The Contractor is to arrange a meeting between Contractor, painting Subcontractor, and Architect, prior to commencing any work, to discuss paint and finish colors and procedures.

## PART 2 - MATERIALS

## 2.01 PAINTS AND APPLIED FINISHES

- A. All paints and applied finishes shall be **“Sherwin Williams”** or Architect-approved equal. Provide complete systems in coatings and thicknesses recommended by manufacturer.

## PART 3 - EXECUTION

## 3.01 SURFACE PREPARATION

- A. The Painting Contractor shall be wholly responsible for his Work and shall not commence any part of it until the surfaces are properly prepared and in condition to receive finish. All surfaces are to be prepared according to the product manufacturer's recommendations for the system and its substrate, in addition to basic requirements noted in the Contract Documents. All scuffs and discoloration from other trades shall be removed and surfaces shall be clean and dry prior to application of all finishes.

## 3.02 REMOVE HARDWARE

- A. After initial in-place fitting, remove all hardware, accessories, plates, lighting fixtures and similar items, which are not scheduled for finish coating under this Section. After finish application re-install all items removed and adjust by workmen skilled in the trade.

## 3.03 DELIVERY AND STORAGE

- A. All painting materials shall be delivered in original containers in sufficient quantity for the complete job. Store materials in a single well-ventilated space designated for use of painters by the Contractor.

## 3.04 WORKMANSHIP

- A. All materials shall be applied in workmanlike manner, free from holidays, runs or sags. Application shall be to the satisfaction of the Owner and Architect.

## 3.05 THICKNESSES

- A. Apply paint at rates recommended by the manufacturer for full coverage. Total dry film thickness shall be specified herein, or if not specified, according to manufacturer's printed recommendations. Apply additional coats when undercoats, blemishes or other conditions show through final coat, until the final surface is of uniform finish, color and appearance. Cloudiness, spotting, laps, brush marks, runs or ropiness will not be acceptable and shall be refinished by the Contractor.

## 3.06 WEATHER

- A. No exterior finishing shall be done in rainy, damp (85% humidity), freezing or windy weather. Substrates for paint are to be thoroughly dry. Do not apply water base paints when air temperature is below 50 degrees F. Do not apply solvent-thinned paints if air is 45 degrees F. or below. Apply interior finishes only when space is adequately heated and ventilated.

## 3.07 MIXING MATERIALS

- A. Mix all materials according to the manufacturer's printed instructions. Do not stir film surface into materials and strain if necessary, before using.

## 3.08 APPLICATION

- A. Use techniques best suited for the type of material being covered, such as brush, roller or spray application. Review techniques with Architect prior to proceeding. Follow printed instructions.

**3.09 COMPLETED WORK**

- A. Remove, refinish or repaint Work rejected by the Architect, as required to achieve completed systems.
- B. Remove from the project daily all discarded cans, rubbish and rags. Upon completion of all painting Work, clean all paint-splattered surfaces by proper methods so as not to damage finish surfaces in any way. Remove all excess materials, wastes and temporary wrappings from the job site. Provide “Wet Paint” signs as required to protect new Work.

END OF SECTION



**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
1. Steel.
  2. Galvanized metal.
  3. Aluminum (not anodized or otherwise coated).

## 1.02 SUBMITTALS

- A. Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures
- B. Product Data: For each type of product indicated.
- C. Samples: For each finish and for each color and texture required.
- D. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

## 1.03 QUALITY ASSURANCE

- A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
  2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 1 sq. ft.
    - b. Other Items: Architect will designate items or areas required.
  2. Final approval of color selections will be based on benchmark samples.
    - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

#### 1.04 EXTRA MATERIALS

- C. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  - 1. Quantity: Furnish an additional 5%, but not less than 1 gal. (3.8 L) of each material and color applied.

### PART 2 - PRODUCTS

#### 2.01 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

#### 2.02 METAL PRIMERS

- A. Pro-Cryl Universal Primer: MPI #107.
  - 1. VOC Content: E3 (< 51 g/l).

#### 2.03 QUICK-DRYING ENAMELS

- A. Waterbased Alkyd Urethane Enamel (Semigloss): MPI #157 (Gloss Level 5).
  - 1. VOC Content: E0.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.
  - 3. Wood: 15 percent.
  - 4. Plaster: 12 percent.

5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
  1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

### 3.02 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
  1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.03 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  1. Quick-Drying Enamel System: MPI EXT 5.1D.
    - a. Prime Coat: Quick-drying alkyd metal primer.
    - b. Intermediate Coat: Quick-drying enamel matching topcoat.
    - c. Topcoat: Quick-drying alkyd urethane enamel (semigloss).

END OF SECTION

**PART 1- GENERAL****1.1 REQUIREMENTS**

- A. Signage Contractors / Sub-contractors must refer to the Romero Park – Site Improvements Design Intent Drawings for Signage Plans and Details prepared by the Landscape Architect. The design Intent documentation drawings and sign location plans are included as part of the Construction Documents.

**1.02 FORMAT**

- A. Signs illustrated in the drawing package are for design intent only, and therefore are not for construction. Selected Sign Fabricator is responsible for all final construction documents and engineering required for the fabrication and installation of the designs, subject to approval by Landscape Architect and Owner.
- B. If an alternate method of fabrication would result in reduction of the overall cost without compromising the Design Intent, it shall be included in the pricing in addition to the price per the drawing specifications. Otherwise, the signs will be made as specified in the Design Intent Documentation Drawings.

**1.03 CODES**

- A. It will be the responsibility of the successful bidder to meet any and all local, state and federal code requirements when fabricating and installing signs, to include ADAAG (Americans with Disabilities Accessibility Guidelines; ICC/ANSI (International Code Council and American National Standards Institute) requirements, as well as any supplementary items necessary to complete the installation, as applicable.

**1.04 EXAMINATIONS**

- A. Bidders shall carefully examine all documents including: Romero Park – Site Improvements Construction Document Drawings. Failure to do so shall in no way relieve the Bidder from any obligation with respect to his Bid.
- B. Product Specification. Bidders are responsible for a thorough evaluation of all products specified in the Design Intent Drawings to determine whether a specific product is fit for its particular purpose and suitable for the method of its application.
- C. It is the Bidder's responsibility to gather and dispense all information to its subcontractors regarding provisions of the Specification and any other information the subcontractor may require to prepare its proposal.
- D. Field Measurements: All architectural and field condition dimensions contained within the Design Intent Drawings reflect information available at the time of documentation preparation. It shall be the responsibility of the contracted fabricator to conduct a thorough survey of both existing and future conditions, to verify all as-built conditions/dimensions for fabrication and installation.

#### 1.05 FABRICATION AND INSTALLATION SPECIFICATIONS

Provide Architectural signage/graphics in accordance with requirements of the Contract Documents, i.e., Design Intent Documentation Drawings and Specifications, Sign Location Plans and Sign Message Schedule. It is intended that all finish work be of the highest quality in order to pass eye-level examination and scrutiny by the Owner.

All Work shall be free from burrs, dents, row edges and sharp corners. Finish all welds on exposed surfaces as required so they are not visible in the finished work. Finish all surfaces smooth, U.O.N., or specified. Surfaces that are intended to be flat, shall be free from bulges, oil canning, gaps or other physical deformities. Such surfaces shall be fabricated to remain flat under installed conditions. Fabricate all cabinets, panels or components with smooth, mechanically finished edges. All edges shall be true and corners shall be square. Where edges are specified to be painted, fill and sand smooth as required prior to painting. Cut routed letterforms and/or graphics clean and true to match adjacent surface-applied letterforms and/or graphics. Fabricate all internally illuminated sign cabinets as required to provide a weather tight housing for all lighting and electrical components. Exercise care to protect all polished and/or plated surfaces so that they remain unblemished in the finished work. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals as required to prevent corrosion.

All surfaces shall be flat to a tolerance of plus or minus 1/16" when measured at any point with a ten-foot straight edge. All visible sign surfaces of the same type shall have the same finish. Color and/or finish shall be consistent across the entire surface of a sign.

All reveals shall be uniform width; all butt joints shall be tight and closed along the entire length; all access panels shall have a nominal, uniform gap all around. All expansion joints, when required, shall be positioned so as not to interfere with the look or finish of any sign message or the overall appearance of the sign face. All gaps between milled components, when assembled, shall not exceed a tolerance of .005" Provide colors and/or finish textures as specified or indicated in the drawings or, as selected by Designer.

#### 1.06 SIGN ITEM NUMBERS AND CHARACTERISTICS

Refer to the Sign Message Schedule for precise definition and proposed message of each sign. Refer to the Sign Location Plan for general location of each sign.

#### 1.07 TIME OF COMPLETION

Time is of the essence. Sign Fabricator shall complete all work in accordance with the schedule milestones provided by General Contractor. All activities shall be sequenced to coordinate with field progress.

#### 1.08 REFERENCES

##### A. UBC

1. Uniform Building Code

##### B. NAAMM

1. National Association of Architectural Metal
2. Manufactures: "Metal Finishes Manual"

##### C. AWS

1. American Welding Society
2. AWS D1.1 "Structural Welding Code, Steel"

3. AWS D1.2 "Structural Welding Code, Aluminum"

D. UL

1. Underwriters Laboratories Inc.

2. Standards for Safety, UL Publication 48 "Electric Signs"

#### 1.09 SUBMITTALS BY SIGN FABRICATORS

- A. Artwork: One prototype artwork template per sign type (in Adobe Illustrator CS, Macintosh format) shall be provided to Fabricator to illustrate design intent. It is the responsibility of the Fabricator to generate proofs of all subsequent artwork for review and approval (submittals to be a full size representation of each layout, unless otherwise agreed upon in writing) to resolve any and all issues of compatibility pertaining to the provided artwork, prior to fabrication. Sign Fabricator to submit 'proof' of final artwork / graphics for approval prior to fabrication.
- B. Map Art: Fabricator shall be responsible for all technical production, i.e., color separation, registration and trapping as required, and for securing all necessary regulatory approvals from the Fire Department (including, but not limited to, the final locations of stairs, exit routes and symbols) for Fire & Life Safety maps. Vendor shall submit half size black and white laser prints of all map artwork approved by the Fire Department to Designer for final review and graphic layouts and obtain Designer's written approval of same, prior to fabrication.
- C. Shop Drawings: Shop Drawings provided by Sign Fabricator for review and approval by Architect. Structural signs must be signed and stamped by Licensed Structural Engineer in the State where the project is located. Otherwise, it must be reviewed by a Licensed Structural Engineer in the State of the project location at the Sign Fabricators Expense. Furnish elevations, details of fabrication and erection, including all materials, shapes, dimensions, finishes, wind load calculations, anchorage, and method of connections. Show proper letter spacing and dimensions of letter heights.
- D. Color and Material Samples: Submit per schedule, for approval. Provide 1 set of 12" x 12" non-returnable samples of all materials, colors, and finishes as specified.
- E. Full Size Patterns and Lettering: Submit for approval. Provide full-size patterns of each sign with solid black letter forms and graphic elements on a white background with sign face outlined. Typography and graphic elements must be represented in exact typeface with letter spacing and positioning as specified in digital artwork files.
- F. Text Verification: Provide a list of all text to be included on signage for approval, prior to fabrication. Text shown on Drawings is provided for the purpose of pricing only. Final wording on signage is subject to confirmation and possible revision by the Owner, after the start of the Contract, prior to fabrication.
- G. Extra Materials: Deliver to the Owner the following, in manufacturer's original packaging, and store at the project site where directed:
1. One (1) gallon of each finish paint color for touch-up purposes.
- H. Supplementary Product Literature: Submit for information. Furnish within seven (7) days of

completed installation, manufacturer's literature describing the general properties of each product used in the Work.

- I. Field Conditions: Sign Fabricator is responsible for thorough survey of existing and future conditions, as well as full coordination with the General Contractor. Field conditions may cause signs to be adjusted; and if necessary, exact modifications to each sign must be shown on shop drawings. Also, design and engineering of support systems required on the site will be the responsibility of the Fabricator.
- J. Structural Calculations: Provide exterior sign assemblies designed, tested, and installed, to withstand positive and negative wind loads per site requirements approved by a licensed Structural engineer, registered in the State of New Mexico. Furnish engineering calculations to show maximum stresses and deflections of signage, and signage support system; do not exceed specified performance requirements under full design loading. Calculations must be prepared and sealed by a Structural engineer licensed in the State of New Mexico and submitted to the Owner for review, prior to fabrication.

#### 1.10 QUALITY ASSURANCE

- A. Mock-ups, Prototypes, and Proofs  
Provide a mock-up / proof (complete mock-up for single panel signs, partial mock-up for multi-letter signs) of each sign type requested at the fabrication facility for review. The requested sign types are:

**Trail Sign – Header Panel (4/L3-04)**

**Trail Sign – Map Panel (6/L3-04)**

**Specialty Sign Panel (7/L3-04)**

**Trail Marker – Header Panel (8/L3-04)**

**Trail Marker – Directional Panel (9/L3-04)**

Refer to sign drawings for further information. Utilize the same materials and installation methods in the mock-up and/or prototypes as intended for the final Work. Schedule the installation so that the mock-up/prototype may be examined, and any necessary adjustments made, prior to commencing fabrication of the final Work. Replace unsatisfactory items as directed. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance for such Work throughout the project. Prototypes, once accepted may be used in final installation.

- B. Work-In-Progress Approvals: Provide work-in-progress sign elements for review. Scheduled or unscheduled viewing at the Shop or Factory may be initiated as deemed necessary to ensure continued quality control and to make any adjustments required during fabrication. Unsatisfactory items are to be corrected by the Sign Fabricator as directed at no additional cost to the Client.
- C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain necessary approvals and permits from all such authorities as required.
- D. Markings and Labels: Locate markings, labels, manufacturer names and other identifications so as to be concealed from public view and as acceptable to the Owner.
- E. Final Location of Signs: The location of signs as shown on the Layout Plans is for general reference only and in some cases is not representative of the exact final location. Final locations of

signs shall be field located in coordination with the Landscape Architect, Owner, General Contractor and Engineer at the site. Sign Fabricator shall arrange for meetings at the site to accommodate direction of final locations according to project schedule.

F. Lettering:

1. The Sign Fabricator shall be responsible for the quality control of all lettering. All letterforms shall be crisp, sharp, and free of nicks, ragged edges and discontinuous curves. All lettering shall conform to approved typeface, weight and letter spacing.
2. No substitutions of typeface foundry, brand or version or implementation technique will be accepted without prior approval. Unapproved letterforms shall be replaced at Fabricator's expense.
3. Vinyl Die Cut Graphics: All artwork shall be derived from computer artwork for cutting on a Gerber Sign Maker II or approved equal.
4. All cutting and routing shall be executed in such a manner that all edges and corners of finished letterforms are true and clean. Letterforms with rounded positive or negative corners, nicked, cut, or ragged edges, etc., will not be accepted. All letterforms shall be so aligned as to maintain a baseline parallel to the sign format. Margins must be maintained as specified on the Drawings.
5. All work under this contract shall be performed by skilled craftsmen under the supervision of trained foremen, experienced in the trade of craft required to accomplish the Work and produce product of high quality.

G. Quality of Workmanship: The Sign Fabricator shall be responsible for the quality of all materials and workmanship required for the execution of this contract including materials and workmanship of any firm or individual who act as Sign Fabricator's subcontractor. Sign Fabricator shall be responsible for providing up-to-date Drawings, Specifications, Message Schedule, etc., to all subcontractors.

H Dimensions: Written dimensions on drawings shall have precedence over scaled dimensions. Sign Fabricator shall verify and be responsible for all dimensions and conditions shown by these drawings. Shop details must be approved prior to fabrication.

I. Discrepancies: The General Contractor shall be notified by Sign Fabricator of any discrepancies in the Drawings, in field dimensions/conditions and/or changes required in construction details.

J. Rights to Designs: Sign Fabricator may not manufacture, reproduce, or exhibit these designs, or modify them for any other purpose outside of this current contract without written approval of the Landscape Architect and the Owner.

## 1.11 WARRANTY

A. Sign Warranty: Submit to Construction Manager for Owner's documentation, a 2-year written warranty (effective the date of final acceptance) covering all signs, signed by the Sign Fabricator and Installer, agreeing to repair or replace Work which has failed as a result of defects in materials, workmanship or installation. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner.

- B. Linear Polyurethane Paint Factory Finish Warranty. Submit to Construction Manager for Owner's documentation. Furnish 2 year written warranty, warranting that the factory-applied linear polyurethane finishes will not develop excessive fading or excessive non-uniformity of color or shade, and will not crack, peel, pit, corrode or otherwise fail as a result of defects in materials or workmanship within the following defined limits:
1. "Excessive Fading"  
A change in appearance which is perceptible and objectionable as determined when visually compared with the original color range standards
  2. "Excessive Non-Uniformity"  
Nonuniform fading to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
  3. "Will Not Pit or Otherwise Corrode"  
No pitting or other type of corrosion, discernable from a distance of 10' (3m), resulting from the natural elements in the atmosphere at the project site.

Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of the Owner.

#### 1.12 MAINTENANCE

- A. Maintenance and Operating Manuals: Submit 2 copies to Construction Manager for Owner's documentation. Furnish complete manuals describing the materials, devices and procedures to be followed in operating, cleaning and maintaining the Work. Include manufacturers' brochures and parts lists describing the actual materials used in the Work, including metal alloys, finishes, electrical components and other major components. Assemble manuals for component parts into single binders identified for each system.
- B. Instruction: Prior to acceptance, establish with the Owner an instruction and training program for Owner's personnel. Notify the Owner in writing at least 7 days prior to commencement of the program providing an outline of topics indexed to the Maintenance and Operating Manual. Provide a trained instructor. Provide 2 consecutive 4-hour periods of training scheduled during the normal 8-hour working day. Instruction and training shall include, but are not limited to, procedures to be followed in the normal day-to-day maintenance and operation of the Work.

### PART 2 - PRODUCTS

#### 2.01 SIGN MATERIALS

As previously noted, the sign fabricator is responsible for a thorough evaluation of all products specified in this drawing package and determining whether a specific product is fit for a particular purpose and suitable for the method of its application.

- A. Adhesives: Silicone adhesive used for installing signs shall be manufactured by Dow Corning or equal. Polyfoam or "Isotac" contact adhesive tape manufactured by 3-M, shall be used in conjunction with silicone adhesives for installation of wall signs, in minimum thicknesses available.
- B. All Specified Metals
1. Aluminum shall be suitable for ornamental, architectural work. Surface finish shall be smooth, free of extrusion marks or imperfections. Alloy shall be selected to meet the structural

requirements of the specific application.

2. Stainless steel shall be suitable for ornamental and architectural work. Provide stainless steel plate, sheet or strip AISI Type 302, complying with requirements of ASTM A 167. Surface finish shall be smooth, free of all extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of specific application.
  3. Structural metal for concealed framing shall be of galvanized rolled steel or equal, as required, to satisfy structural requirements.
  4. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
  5. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with no less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- C. Acrylic Sheet Plastic: Use Plexiglas II as manufactured by Rohm and Haas Co., Cyro-Acrylite or approved equal. Thickness shall be as indicated on drawings or not less than 1/8" thick. Sign Fabricator shall provide color and finish samples of all plastics for approval before fabrication; no substitution in color, thickness, or finish of plastics will be accepted without written approval. All plastics shall be of uniform color, translucence and illumination, as supplied by manufacturer. Any exposed edges of acrylic shall be finished with no visible saw marks. Colored Acrylics to have UV protective properties.
- D. Concrete Foundation: Sign Fabricator shall provide structurally engineered concrete footings/foundations and non-structural (mow-strip) pads at grade (in landscaped areas only) to meet local building code requirements.
- E. Decal or Transfer: Provide special printed paper or vinyl suitable for reproducing the design onto material indicated, as required. Submit samples for approval.
- F. Fasteners: Bolts, nuts, screws, washers, anchors and other devices required to complete the work. Same basic metal or alloy as the metal fastened and finished to match in color and texture. Stainless steel 300 series alloy where used to join dissimilar materials.
- G. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- H. Brackets: Fabricate brackets and fittings for bracket-mounted signs to suit sign panel construction and mounting conditions indicated. Factory-paint brackets as indicated.
- I. 3M VHB™: Tape Provide concealed 3M VHB™ tape that is fit for the intended use and the method of application, where indicated.
- J. Hardware/Hinges: Provide and install all incidental hardware necessary for the proper functioning of the signs, including but not restricted to materials and products covered in this section. Provide stainless steel hinges for all hinged access panels. Provide pin tumbler locks for all access panels requiring locks. Provide stainless steel fasteners for assembling ferrous and nonferrous metals.

Where brass finishes need to be matched, exposed stainless steel hinges need to be brass plated or dipped.

- K. Insulation: Separate all ferrous and nonferrous metals with nonconductive gaskets to prevent electrolysis. In addition to gaskets, provide stainless steel fasteners for some cases as required.
- L. Welding Electrodes and Filler Metal: Provide the alloy and type required for strength, workability, compatibility and color match after grinding smooth and finishing the fabricated product as required.

## 2.02 ELECTRICAL COMPONENTS

- A. Electrical Wiring and Equipment  
Provide and install electrical materials such as ballasts, transformers, lamps, sockets, neon units, connectors, and all other equipment, which shall be new, and U.L. approved.

## 2.03 FINISHING MATERIALS

- A. Linear Polyurethane Coatings: Provide the following, or other products as acceptable:
  1. Acrylic Linear Polyurethane enamel two components, acrylic aliphatic isocyanate/acrylic polyurethane having ultraviolet (UV) inhibitors and engineered for exterior application by Matthews Paint Company or approved equal.
  2. Primer for Aluminum Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or one-coat Matthews 74-793 Spray Bond at .15 to .25 mils dry film thickness or Wyandotte/AKZO Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal (primer) for the application of the pre-approved and pre-formulated paint system.
  3. Primer for Steel Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or Wyandotte/AKZO Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal for the application of the pre-approved and pre-formulated paint system.
  4. Clear Sealers Crystal-clear matte polyurethane sealers by Matthews Paint Co. or approved equal. Sealers are to resist rust and corrosion associated with exposure to salt air as required, and of highest quality available, applied per manufacturer's specifications.
- B. Silk Screening Materials: Provide photo processed screening, arranged to furnish sharp and solid images without edge buildup or bleeding of the coating. Screen mesh size to be 280 or finer. Pattern-cut screens may be used for non-repeat copy, provided that final image copy is equal to photo screen quality. Provide only weather-resistant coating materials, compatible with the intended substrates.
- C. Vinyl Die-Cut and Pattern Cut-out Graphics: Use 3M Scotchcal Opaque, Translucent or Scotchlite Reflective Sheeting as specified. Use pressure-sensitive, non-yellowing, non-peeling and weather resistant vinyl as specified. Use approved fonts and equipment as specified. For specific information contact Lee Butler (3M Commercial Graphics Division) at 1- 949-366-9919.

## 2.04 FABRICATION OF SIGNS AND SIGN SUPPORTS

- A. General: Provide custom-manufactured sign assemblies, components completely fabricated and finished at factory before delivery to site. Construct to accurate detail and dimensions as shown on shop drawings and as reviewed. Fit and assemble the Work at the shop to the greatest extent possible, and mark the components as required to facilitate assembly during installation. No site application or finishing will be permitted except for touch up. Exposed fasteners on finished faces will not be allowed, unless specifically indicated. Waviness and oil canning of surfaces is not acceptable. Minimum material thickness is to be 0.090 inches. Conceal wiring, conduct and other electrical items within sign enclosures.
- B. Seams and Joints: Added joints shall be ground filled and finished flush and smooth with adjacent work. Such seams shall be invisible after final finish has been applied. Spot welded joints shall not be visible on exterior of signs after final finish has been applied. No gaps, light leaks, waves, or oil canning will be permitted in the Work.
- C. Metal Signs and Supports: Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Permanently bond laminated metal components and honeycomb core with adhesive or sealant in accordance with product manufacturer's recommendations. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces.
  - 1. Welding: Make welds continuous. Comply with American Welding Society, Aluminum Association, and Copper Development Association standards for the type of metal. Welding to be performed by an AWS-certified welder.
  - 2. Fasteners: Use exposed fasteners only where indicated. Perform drilling and tapping at the shop.
  - 3. Dissimilar Materials: Where metal surfaces will be in contact with dissimilar materials, coat the surfaces with epoxy paint or plate with zinc chromate, or provide other means of dielectric separation as recommended by manufacturer to prevent galvanic corrosion.
- D. Hardware: Provide all hardware necessary for the proper functioning of signs. All hardware must conform to the external appearance of the sign. Where accessible to the public, provide vandal-resistant hardware.
- E. Supports and Backing in Walls: Sign Fabricator shall provide engineered sign supports anchored to building structure where required and to meet requirements of applicable building codes. Support or backing requiring installation within the building wall construction shall be immediately relayed to the General Contractor for field coordination.

## 2.05 SHOP APPLICATION OF SIGN FINISHES

- A. Sign Graphics: Provide the letters, numerals, symbols, and other graphics markings, using the finish materials as indicated on drawings. Apply the graphics neatly, uniformly proportioned and spaced, and accurate within the dimensions indicated. Prepare the substrate surfaces and apply finish materials in accordance with manufacturers' instructions.
- B. Metal Finishes: Remove scratches, abrasions, dents and other blemishes before applying finish. Apply the finish to the fabricated Work, with texture and reflectivity as required to match the approved sample.

- C. Linear Polyurethane Finishes: Clean the surfaces as required for proper adhesion of coatings. Use 3M "Scotch Brite" pads with cleanser and water, and/or chemically treat as recommended by paint manufacturer to remove deleterious film or residue.
  - 1. Linear Polyurethane Paint: Provide pretreatment and primer in accordance with manufacturer's recommendation. Add ultra violet inhibitors to paint subject to sunlight exposure.
  - 2. Clear Linear Polyurethane Finish: Provide pretreatment, primer, and matte or semi-gloss finish coatings in accordance with manufacturer's recommendations. Actual gloss level to be determined by S/P, based on samples. Apply 1.5 to 2.0 mils (0.0375 to 0.050 mm) dry film thickness.

## 2.06 GRAPHIC APPLICATION

- A. Preparation: Surfaces to receive the graphic markings shall be clean, dry, and otherwise made ready for application of the materials. Accurately measure and lay out the required marking configurations as indicated on drawings.
- B. Vinyl Graphics: Use pressure sensitive, non-yellowing, non-peeling and weather resistant vinyl adhesive letters or images, custom flood coated as required, die cut from ScotchCal or ScotchLite manufactured by 3M Company, as specified. Apply in strict accordance with manufacturer's instructions. Make uniformly smooth and free from bubbles, wrinkles, stretching and blemishes.
- C. Painted or Silk-screened Graphics: All graphics to be applied using photo-processed screens from camera-ready digital art, arranged to furnish sharp and solid images without edge buildup or bleeding of the coating. Comply with coating manufacturer's application instructions. Provide proper type of primer to suit each substrate and obtain a permanent bond. Verify compatibility of each substrate with the coatings to be used in the Work. Apply the markings with neat edges, minimum 3 mils (0.075 mm) dry film thickness and as required to obtain solid markings without voids or fading.

## 2.07 PRODUCTS (for bidding purposes only; substitutions may be submitted for consideration)

- A. PET WASTE SIGN  
Dogipot (or approved equal)  
5340 Young Pine Rd., Suite 8  
Orlando, FL 32829  
Phone (800) 364-7681  
Fax (407) 888-8526  
info@dogipot.com  
  
Product: Aluminum Dogipot On-leash Pet Sign  
Model: 1203  
Size: 18"h x 12"w  
Color: Green  
Quantity: 1

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Sign Fabricator must examine the areas to receive the Work and the conditions under which the Work would be performed. Contractor shall remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected or with approval from the Owner.
- B. A pre-installation meeting will be held with the Landscape Architect, the Owner and General Contractor to mutually agree on all installation details, placement, etc.

### 3.02 INSTALLATION OF SIGNS

- A. General: Complete installation shall be in accordance with manufacturers' printed instructions and accepted shop drawings, to produce Work complying with the Contract Documents. The Sign Fabricator will be responsible for daily cleanup of signs and their areas of work.
- B. Erection of Signs: Set and attach the Work accurately in location, alignment and elevation, plumb, level and true, as measured from established reference points and from other Work already in place. Fit components accurately together to form tight joints and secure connections. Coordinate, through the Construction Manager with other trades and make connections of illuminated signs to electrical service. Exterior wall penetrations and blocking are to be coordinated immediately upon award of contract. Test illuminated sign components and adjust operation for proper performance.
- C. Installation Method: Site conditions include installation of signs on sloped landscaped areas, sloped concrete, flat concrete, etc. Sign Fabricator is responsible for thorough survey of existing and future conditions. Exact modifications to each sign must be shown on shop drawings.
- D. Footings for Landscape Installation: Those signs that are freestanding in landscape will be mounted to concrete spread footings concealed below grade. Sign Fabricator shall verify location of existing sprinkler pipes, conduit and other conditions that might have to be modified to allow for sign foundations.
- E. Footings for Hardscape Installation: Those signs that are freestanding on hardscape will be mounted to sleeves that have been set into cored concrete. Sign Fabricator to verify location of slab below, post tension cables and other conditions that might affect the locations that concrete can be cored.

### 3.03 ADJUSTING

Neatly repair minor blemishes or marring on finished surfaces so that repairs are imperceptible. Completely replace components having permanent non-removable scratches, stains, or other defacement.

### 3.04 CLEANING

Upon completion of the Work, remove unused materials, debris, containers and equipment from the project site. Remove protective coverings and clean the exposed surfaces of the Work to remove dirt, stains and other substances, by methods as recommended by manufacturer.

### 3.05 PROTECTION

Protect the Work during the construction period so that it will be without any indication of use or damage. Leave the Work clean and free from defects at the time of acceptance.

### 3.06 FINAL WALK-THRU AND PUNCH-LIST

Final walk-through will be held with the Landscape Architect, the Owner and General Contractor to review the finished installation. Sign Fabricator will prepare a punch-list of all items requiring modification. Owner, General Contractor and Landscape Architect reserve the right to reject all or part of a sign that does not

correspond to the Design Development drawings and Specifications or the approved shop drawings, lettering patterns, color and material samples or prototypes, etc.

### 3.07 FABRICATION ERRORS

If the Sign Fabricator has made an error in copy (message), color, material, quality, etc. these items must be corrected within thirty (30) days of observation of error (at no additional cost to the Owner). Sign Fabricator will be notified with a written punch-list as errors are discovered.

### 3.08 REPAIRS AND REPLACEMENTS

Clean up, repair, or replace at no cost to Owner all property damaged by reason of the required Work, including restoring all disturbed areas, surfaced and un-surfaced, to the original condition on completion of the Work as approved. Work potentially impacted includes precast, brick, ornamental metal, gypsum board, millwork, windows, fixtures, etc. All patchwork or replacement shall match existing. Painted surfaces shall be painted to match the adjacent areas. Painting shall extend to include the entire plane of the surface subjected to a line where an inconspicuous break can occur, as directed by the Owner's Representative. Avoid damaging existing conditions and protect existing surfaces from impacts due to installation of the Work.

### 3.09 GUARANTEE

Contractors and Installer agrees to repair or replace Work, which has failed as a result of defective material, workmanship, or installation. Failure is defined if any of the following occurs within two (2) years of the acceptance of Work by the Owner or any other agreement period determined between the Owner and the Sign Fabricator:

1. Electrolytic decomposition of any metal.
2. Oxidation of any metal.
3. Dissociation of fasteners, anchors, welds, or any other connecting devices.
4. Delaminating of graphic materials and substrates.
5. Pitting or non-adhesion of finishes or coatings.
6. Sign panel warping or oil canning.
7. Fading and/or non-uniform fading of color.

Sign Fabricator shall replace/repair any defective work within thirty (30) days after notification by the Owner throughout the duration of this period, at no additional cost to the Owner.

END OF SECTION

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Toilet Compartments – Floor Supported.
- B. Urinal Screens – Floor Supported.
- C. See Accessory Schedule.

## 1.2 RELATED SECTIONS

- A. Section 05 40 00 - Cold-Formed Metal Framing.
- B. Section 10 51 00 - Lockers.
- C. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

## 1.3 REFERENCES

- A. ASTM A 65 3/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- B. ASTM A 24 0/A 240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
- C. Stainless Steel Industry of North America (SSINA): Stainless Steel Finishes.

## 1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Submit plan, section, elevation and perspective drawings showing layout, door swings, fixture clearance, hardware, and methods of anchoring.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of eighty-five (85) years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of one (1) year demonstrated experience in installing products of the same type and scope as specified.

- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver partitions, hardware, and headrail in manufacturer's original protective shipping containers or packaging with labels intact and legible.
- B. Store products in manufacturer's unopened packaging until ready for installation.

#### 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.8 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. **All American Metal Corp. "AAMCO"**. Which is located at: P.O. Box 108, 200 Buffalo Avenue, Freeport, NY 11520; Tel: 516-623-0222; Fax: 516-623-5809; Email: [info@allamericanmetal.com](mailto:info@allamericanmetal.com); Web: <http://www.allamericanmetal.com>
- B. **Finish: " Sky Blue – 22"**.
- C. Substitutions: Approved Equal.
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

#### 2.2 POWDER COATED BAKED ENAMEL TOILET PARTITIONS

- A. Partition Construction:
  - 1. Toilet Partition Type: BE-CS - Baked Enamel, Ceiling Stile.
  - 2. Toilet Partition Type: BE-FS - Baked Enamel, Floor Stile.
  - 3. Toilet Partition Type: BE-FF - Baked Enamel, Full Flush.
  - 4. Toilet Partition Type: BE-FC - Baked Enamel, Floor to Ceiling.
  - 5. Stiles, Panels and Doors: Galvanized Steel; Bonderized with a 0.00015 inch zinc coating, pressure laminated to a honeycomb core.
    - a. Stile Thickness: No less than 1 1/4 inches (32mm) thick.
    - b. Panel Thickness: No less than 1 inch (25mm) thick.
    - c. Door Thickness: No less than 1 inch (25mm) thick.
  - 6. Edges of stiles, panels and doors must be formed to interlock with each other to form a rigid,

- two-piece unit.
7. Corners are welded and ground smooth.
  8. All stile, panel and door units must be internally reinforced and pre-drilled for hardware and fittings.
  9. Panels are attached to pilasters with three (3) tension cleats.
  10. Panels are attached to walls with two (2) stirrup brackets.
- B. Shell Materials:
1. Panels: Galvanized Steel; Bonderized with a 0.00015 inch zinc coating.
    - a. Panel Thickness: 22 Gauge (Panels over 48 inches (1219mm)).
    - b. Panel Thickness: 20 Gauge (Panels less than 48 inches (1219mm)).
  2. Doors: Galvanized Steel; Bonderized with a 0.00015 inch zinc coating.
    - a. Door Thickness: 22 Gauge
  3. Stiles: Galvanized Steel; Bonderized with a 0.00015 inch zinc coating.
    - a. Stile Thickness: 20 Gauge.
  4. Headrail: 6063-T5 Aluminum; etched and anodized.
- C. Fittings:
1. Wall Brackets:
    - a. Zamac: Non-ferrous cast alloy, chrome plated and adjustable to keep panels and stiles clear from walls.
    - b. Stainless Steel: #304 with a #4 finish and adjustable to keep panels and stiles clear form walls.
    - c. Full Height Continuous Stainless Steel: #304 with a #4 finish and adjustable to keep panels and stile clear from walls.
    - d. Full Height Continuous Aluminum: 6063-T5 Aluminum; etched and anodized and adjustable to keep panels and stiles clear from walls.
  2. Stile Cover Bases: Stainless Steel, #304 with a #4 finish; 3 inches (76mm) high.
- D. Hardware:
1. Hinges:
    - a. "Trouble-Proof" Hinge Set: Top pivot is recessed into door 2 1/2 inches (64mm) below top edge. Heavy steel pins and Zytel nylon cams permit adjustment of door.
      - 1) Zamac: Non-ferrous cast alloy; chrome plated.
      - 2) Stainless Steel: #304 with a #4 finish.
    - b. Full Height Continuous Stainless Steel #304 with a #4 finish Piano Hinge; #304 stainless steel with a #4 finish, surface mounted, through bolted with screws of same material and finish.
  2. Slide Latch: Cast metal; chrome plated. Through bolted with theft proof "Torx" screws.
  3. Combination Bumper Coat Hook: Cast metal; chrome plated.
  4. Keepers: Cast metal; chrome plated. Through bolted with theft proof "Torx" screws.
  5. Coat Hooks: Cast metal; chrome plated.

### 2.3 POWDER COATED BAKED ENAMEL URINAL SCREENS

- A. Urinal Screen Type: #1 - Wall Hung
1. Panel Shell: 22 gauge galvanized steel; Bonderized with a 0.00015 inch zinc coating.
  2. Panel Thickness: 1 inch (25mm).
  3. Panel Width: 12 inches (310mm).
  4. Panel Width: 18 inches (457mm).
  5. Panel Width: 24 inches (610mm).
  6. Panel Width: 30 inches (753mm).

7. Panel Height: 48 inches (1219mm).
  8. Wall Support:
    - a. Zamac: Non-ferrous cast alloy, chrome plated and attached with three (3) wall brackets.
    - b. Stainless Steel: #304 with a #4 finish and attached with two (2) wall brackets.
    - c. Full height continuous stainless steel bracket.
    - d. Full height continuous aluminum bracket.
- B. Urinal Screen Type: #2 - Floor Supported.
1. Panel Shell: 22 gauge galvanized steel; Bonderized with a 0.00015 inch zinc coating.
  2. Panel Thickness: 1 inch (25mm).
  3. Panel Width: 12 inches (310mm).
  4. Panel Width: 18 inches (457mm).
  5. Panel Width: 24 inches (610mm).
  6. Panel Width: 30 inches (753mm).
  7. Panel Height: 48 inches (1219mm).
  8. Wall Support:
    - a. Zamac: Non-ferrous cast alloy, chrome plated and attached with two (2) wall brackets.
    - b. Stainless Steel: #304 with a #4 finish and attached with two (2) wall brackets.
    - c. Full height continuous stainless steel bracket.
    - d. Full height continuous aluminum bracket.
  9. Floor Support: 1 1/4 inch (32mm) square aluminum post anchored to the floor with a floor shoe and fastened in two locations spaced 3 inches (76mm) apart.
- C. Urinal Screen Type: #3 - Wall Hung, Flange Supported.
1. Panel Shell: 22 gauge galvanized steel; Bonderized with a 0.00015 inch zinc coating.
  2. Panel Thickness: 1 inches (25mm).
  3. Panel Width: 18 inches (457mm).
  4. Panel Width: 24 inches (610mm).
  5. Continuous integral flanges and support plate attach panels to the wall.
- D. Urinal Screen Type: #4 - Wall Hung - Wedge.
1. Panel Shell: 18 gauge galvanized steel; Bonderized with a 0.00015 inch zinc coating. 20 gauge top and bottom.
  2. Panel Width: 18 inches (457mm).
  3. Concealed fastening.
  4. Sound deadening core.

## 2.4 FINISHES

- A. Powder Coated Baked Enamel Finishes: Power coated paint, baked at 350°F (177°C).
1. Color: AAMCO "Sky Blue- 22"

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 CLEANING

- A. Baked Enamel Partitions:
  - 1. Wash with a mild solution of automotive car wash.
  - 2. Wax with a non-abrasive spray automotive wax.
  - 3. Do not use acid solutions or products containing Metyl-Ethyl-Ketone (MEK).

END OF SECTION



PART 1 - GENERAL

1.01 Scope

A. Install Toilet accessories as indicated on Accessory Schedule – Restrooms Sheet A7.1 and supplemented by the following “or equal” product numbers:

<b>B</b>	<b>SOAP DISPENSER</b>	<b>ASI “0347” – or eq.</b>
<b>C</b>	<b>SANITARY NAPKIN DISPOSAL</b>	<b>ASI “0473-1A” – or eq.</b>
<b>D</b>	<b>TOILET PAPER DISPENSER</b>	<b>ASI “0042” – or equal</b>
<b>E / E2 / F</b>	<b>STAINLESS STEEL GRAB BARS</b>	<b>ASI “3500 SERIES” – or eq.</b>
<b>G</b>	<b>DIAPER CHANGING STATION</b>	<b>KOALA “KB200-01 - Grey” – or eq.</b>
<b>K</b>	<b>COAT HOOK</b>	<b>ASI “0714” – or eq.</b>
<b>L</b>	<b>WASTE DISPOSAL - 12 GAL.</b>	<b>ASI “0826” – or eq.</b>

1.02 Submittals

A. Submit product data and installation instructions for toilet accessories.

1.03 Standards

A. Comply with the following codes and standards including current editions, revisions and supplements:

- 01. ASTM A167, Stainless and Heat-Resisting Chromium – Nickel Steel Plate, Sheet and Strip.
- 02. ASTM A269, Seamless and Welded Stainless Steel Tubing for General Service.
- 03. ASTM B221, Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

PART 2 - PRODUCTS

2.01 Manufacturers

- 1. **American Specialties, Inc.**
- 2. **Bobrick Washroom Equipment, Inc.**
- 3. **Bradley Corp.**
- 4. Or architect approved equivalent

Changing Stations

- 1. **Koala Kare, Inc.**
- 2. Or architect approved equivalent

2.02 Deliveries, Storage and Handling

A. Deliver materials to job site in a timely manner to ensure uninterrupted progress. Major pre-assembled components if stored on site, shall have a protective wrapping such as polyethylene

or heavy kraft paper to protect factory or shop finish. Other components shall be packaged and identified for ease in assembly. Store materials off the ground and protect pre-finished surfaces from damage. Use necessary means to protect installed work and materials of other trades. In the event of damage make replacements at Contractor's expense. Promptly remove damaged materials from the job site.

**2.03 General**

- A. Toilet accessories shall be complete with required fastenings for a complete and proper installation. Fastenings shall harmonize with item being fastened, and shall have concealed anchorage whenever possible, include mounting kits for concealed anchorage.
- B. Stainless steel toilet accessories shall be constructed throughout of type 304 stainless steel with brushed satin finish. Plastic accessories shall be high-impact ABS.

**2.04 Toilet Accessories**

- A. Toilet Accessories include mirrors, paper towel dispensers, grab bars, grab bar mounting plates, toilet tissue dispensers and mop and broom racks. Provide and install these items per various manufacturer specifications. The extent and type of these items is indicated on the drawings. See drawings for locations.

**PART 3 - EXECUTION****3.01 Examination**

- A. Examine surfaces on which work of this Section is to be installed. Notify Architect of defects which may be detrimental to proper installation. Failure to call attention to defects or imperfections as may be discovered, shall be construed as acceptance and approval of the preparatory work. Contractor shall assume full responsibility for failures and defects of work resulting from the acceptance of defective surfaces.

**3.02 Installation**

- A. Install toilet accessories as indicated on Drawings and in full accordance with manufacturer's recommendations and approved Shop Drawings. Anchor components firmly in place for long life under hard use. All mounting heights to be taken from drawings. If not shown, request height from Architect.

**3.03 Field Quality Control**

- A. Upon completion of installation inspect it and verify that work is complete, properly installed and acceptable. Work found not acceptable shall be removed, replaced with new components or materials (as required) and reinstalled at Contractor's expense to the acceptance of the Architect.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Work Included: Provide exterior court athletic equipment and finish surfacing, and install complete, including footings, fittings and materials, as shown, and as specified.

## 1.02 RELATED SECTIONS

- A. Section 31 10 00 – Site Preparation
- B. Section 03 30 00 – Cast-in-Place Concrete
- C. Section 05 13 00 – Unbonded Post-Tensioned Concrete
- D. Section 32 18 23 – Athletic Surfacing

## 1.03 REFERENCES

- A. ACI - American Concrete Institute Manual of Concrete Practice.
- B. ASTM – American Society for Testing and Materials

## 1.04 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures
- B. Product Data: Submit product data and manufacturer's current printed specifications and catalog cutsheets of the following:
  - 1. Basketball Net
  - 2. Sand Volleyball Post / Net Assembly
  - 3. Tetherball Assembly
  - 4. Tennis Post / Net Assembly
  - 5. Pickleball Post / Net Assembly
  - 6. Player Bench
  - 7. Gagaball Court Assembly
  - 8. Windscreen
- C. Shop Drawings:
  - 1. Show plans, elevations, with dimensions, materials, details of inserts, joints and reinforcements and connections to all adjoining work.
- D. Samples:
  - 1. Color and finish for each type of furnishing.
- E. Contract Closeout Submittals:
  - 1. Operations and Maintenance Data:
    - a. Basketball Net
    - b. Sand Volleyball Post / Net Assembly
    - c. Tetherball Assembly

- d. Tennis Post / Net Assembly
- e. Pickleball Post / Net Assembly
- f. Player Bench
- g. Gagaball Court Assembly
- h. Windscreen

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Show not less than five (5) years successful and continuous experience in work of the type(s) shown on the Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description and name of manufacturer. Verify that materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.
- B. Storage: Damaged materials will be rejected. Remove damaged materials from the job site immediately, and pay cost of replacement. Determination of damage shall be the sole authority of the Owner.
- C. Handling: Lift materials using lifting inserts provided by manufacturer. Protect materials and finish from damage during handling and installation.
- D. Painted Finishes: Provide non-scratching, non-staining, firmly-bound covering for shop-painted finishes until installed and accepted.
- E. Wood and Precast Concrete: Protect from stains.

1.07 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install exterior athletic equipment prior to acceptance by Landscape Architect of area to receive such materials.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of construction.
  - 1. Athletic Equipment set in concrete slab or post-tensioned concrete slab: set frames, anchors or sleeves in place and pour footings prior to installation of adjacent finish paving. Coordinate joint layout with posts.
  - 2. Athletic Equipment set in graded surface: set frames, anchors or sleeves in place in coordination with final grades.

1.07 MAINTENANCE

- A. Maintenance Service:
  - 1. General: Immediately remove stains to materials or surrounding site improvements. Do not use cleaning solvents harmful to site materials. Do not permit cleaning agents to contaminate planted areas.
- B. Extra Materials:

1. General: Provide items necessary to re-tighten, clean up, restore or replace all items as required to ensure continued use of specified products.
2. Painted Finishes: Provide two (2) cans of each primer and finish coat for use in touch-up. Clearly label cans with batch mixture numbers required to duplicate painted finishes.

## **PART 2 - PRODUCTS**

### 2.01 MATERIALS (for bidding purposes only; substitutions may be submitted for consideration)

#### A. BASKETBALL NET

Jaypro Sports. (or approved equal)  
976 Hartford Turnpike  
Waterford, CT 06385  
Phone (800) 243-0533

Product: Anti-Whip Nylon Net  
Model: JNY-6JP  
Material: 120 threaded nylon  
Size: 12 loop  
Quantity: 4

#### B. SAND VOLLEYBALL POST / NET ASSEMBLY

VolleballUSA.com  
14615 NE 91<sup>st</sup> St. Bldg. B  
Redmond, WA 98052  
Phone (800) 494-3933

Product: Permanent Fixed Volleyball Poles  
Model: POP-FXD,  
Size: 3.5" O.D, 12' length  
Material: Galvanized steel posts, stainless steel hardware, UV resistant top cap  
Color: Galvanized  
Quantity: 1 (pair)

Product: 4" Professional Pro Beach Power Net  
Model: PBN4  
Size: 39" x 32'  
Material: 4" vinyl net tapes, #42 knotted nylon netting  
Top and bottom lines: Galvanized steel cables  
Side Tie Rope Tensioners: Braided tie ropes  
Color: Black  
Quantity: 2

#### C. TETHERBALL ASSEMBLY

Jaypro Sports (or approved equal)  
976 Hartford Turnpike  
Waterford, CT 06385  
Phone (800) 988-3363

Product: Heavy-Duty Permanent Tetherball Pole  
Model: TBP-250

Size: 2-3/8" OD pipe  
Material: Galvanized steel pole with top cap and eyebolt with leader chain  
Color: Galvanized  
Mounting: Embedded  
Quantity: 3

Product: Tetherball  
Model: TBP-BALL  
Weight: 3lbs  
Material: Sponge rubber with recessed rope holder and nylon rope  
Color: Yellow  
Mounting: Nylon rope  
Quantity: 6

D. TENNIS POST / NET ASSEMBLY  
Douglas Sports (or approved equal)  
3441 S. 11<sup>th</sup> Ave  
Eldridge, IA 52748  
Phone (800) 553-8907  
sales@douglas-sports.com

Product: Tennis Net Posts  
Model: Premier XS Posts  
Size: 2 7/8" OD round posts, 8-gauge steel  
Color: Black  
Mounting: Embedded, aluminum ground sleeves, 24" length  
Misc: Plated steel drive gears and continuous lacing rod  
Quantity: 3 (pair)

Product: TN-36-tapered Championship Net  
Model: 30036T  
Size: 42' x 3'-6"  
Headband: Vinyl Coated Polyester, 2-ply; 65 oz; 1/2" fiberglass side dowels  
Netting: 1-3/4" square mesh 3.5mm braided polyethylene  
Quantity: 5

Product: Classic Center Straps  
Model: 20603  
Size: 2" wide  
Material: Polyester webbing with adjustable buckle and a double-ended snap hook  
Color: White  
Quantity: 5

Product: Center Pipe Anchor  
Model: 63428  
Size: 1.9" OD  
Material: Galvanized steel (inside and out) with anchor pin  
Quantity: 3

E. PICKLEBALL POST / NET ASSEMBLY

Douglas Sports (or approved equal)  
3441 S. 11<sup>th</sup> Ave  
Eldridge, IA 52748  
Phone (800) 553-8907  
sales@douglas-sports.com

Product: Pickleball Net Posts  
Model: Pickleball Premier XS Posts  
Size: 2 7/8" OD round posts, 8 gauge steel  
Color: Black  
Mounting: Embedded, aluminum ground sleeves, 24" length  
Misc: Plated steel drive gears and continuous lacing rod  
Quantity: 5 (pair)

Product: Pickleball Net  
Model: JTN-30  
Size: 21' - 9" x 3'  
Headband: Vinyl Coated Polyester, 2-ply; 65 oz; 1/2" fiberglass side dowels  
Netting: 1-3/4" square mesh 3.5mm braided polyethylene  
Quantity: 8

Product: Classic Center Straps  
Model: 20603  
Size: 2" wide  
Material: Polyester webbing with adjustable buckle and a double-ended snap hook  
Color: White  
Quantity: 8

Product: Center Pipe Anchor  
Model: 63428  
Size: 1.9" OD  
Material: Galvanized steel (inside and out) with anchor pin  
Quantity: 5

F. PLAYER BENCH

Gared Holdings  
9200 E. 146<sup>th</sup> St. Bldg A  
Nobelsville, IN  
Phone (800) 757-2682

Product: Spectator 7'6" Inground Bench  
Model: BE08IG  
Size: 7'6" length x 10" width  
Material: Aluminum seat plank, steel frame  
Color: RAL 8014 Sepia Brown | Powder Coated  
Mounting: Embedded  
Quantity: 2

- G. GAGABALL COURT ASSEMBLY  
Coach Cliff's GaGa Ball Pits (or approved equal)  
95 Noll Street  
Waukegan, IL 60085  
Phone (877) 266-8426  
coachcliff@gagaballpits.com

Product: Bracket System  
Model: Octagon 30H  
Size: 30" height  
Material: Steel  
Color: Dark Brown  
Mounting: 5/16"-18 x 1.75" bolts, 5/16" acorn nut, 3/4" and 7/8" OD washers  
Quantity: 1 set of 8 brackets

Product: Wall Top Covers  
Size: 8' length  
Color: Brown (paint to match brackets)  
Quantity: 8

Product: ADA Doorway Kit  
Size: 4' width  
Material: Treated lumber and steel  
Color: Brown (paint steel to match brackets)  
Quantity: 1

Product: Wood Panels (sold separately)  
Size: 2"x10"  
Length: 8'  
Material: #2 Prime, Pressure Treated Lumber  
Color: Natural  
Quantity: 24

- H. WINDSCREEN  
Douglas Sports (or approved equal)  
3441 S. 11<sup>th</sup> Ave  
Eldridge, IA 52748  
Phone (800) 553-8907  
sales@douglas-sports.com

Product: Vinyl Coated Polyester Windscreen w/ Tabs  
Model: VCP-6  
Panel Size: 6' height x 48' length (confirm panel length in field prior to ordering)  
Material: Vinyl coated polyester  
Color: Brown  
Mounting: brass grommets  
Quantity: 2 sets of 1 panel  
Product: Vinyl Coated Polyester Windscreen w/ Tabs  
Model: VCP-9

Panel Size: 9' height x 120' length, 9' height x 180' length, 9' height x 120' length (confirm exact panel lengths in field prior to ordering)  
Material: Vinyl coated polyester  
Color: Brown  
Mounting: brass grommets  
Wind Reinforcing: AVR Air Vent Reinforced, 10" height x 8" width, spaced 10' on center.  
Quantity: 2 sets of 3 panels

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Locations: Verify that court athletic equipment can be installed at locations as shown on Drawings.
- B. Conditions: Verify that no defects or errors exist in the work of other sections which would lead to defective installation or latent defects in workmanship and function of items in this section. Notify architect of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions are corrected.
- C. Placement: Verify that rough-in frames, anchors, and supports are accurately placed.

#### **3.02 PREPARATION**

- A. Protection:
  - 1. Protect adjacent planting and site improvements to prevent damage during installation.
- B. Concrete Pads and Footings:
  - 1. Layout: Accurately lay out pads, poles and footings as called for in the Drawings.
  - 2. Installation: Excavate form as required and fill for pads, poles and footings as specified in Site Concrete - Section.

#### **3.03 INSTALLATION**

- A. Execution: Install as per manufacturer's specifications. Install elements level, plumb, square, accurately aligned, correctly located, and without warp unless otherwise directed by the Owner. Coordinate elevations of posts and sleeves set in footings with finish surface.
- B. Safeguarding: Secure equipment from vandalism and removal. Install equipment with tamperproof hardware, spot-weld bolts, or secure with other means acceptable to the Architect.
- C. Repair: Repair minor damages to finish in accordance with instructions and as approved by Architect. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

#### **3.04 CLEANING**

- A. Clean equipment in accordance with manufacturer's instructions. Do not use harsh cleaning materials that would damage finish.
- B. Remove temporary protective coverings.

#### **3.05 FIELD QUALITY CONTROL**

A. Test moving parts and controls for conformance to manufacturer's operating specifications.

3.06 DEMONSTRATION

A. Demonstrate the operation and maintenance of equipment to the Owner. Submit final copy of maintenance manuals at this time of demonstration. For manuals, see Submittals.

3.07 PROTECTION

A. Protect installed equipment from damage during construction.

B. Wrappings: Do not remove protective wrappings from furnishings until instructed by Landscape Architect. Remove trash and debris after completion.

END OF SECTION

**PART 1 GENERAL**

1.01 SECTION INCLUDES

1.01.A. Pipe markers.

1.02 REFERENCE STANDARDS

1.02.A. ASME A13.1 - Scheme for the Identification of Piping Systems .

1.03 SUBMITTALS

1.03.A. Product Data: Provide manufacturers catalog literature for each product required.

**PART 2 PRODUCTS**

2.01 IDENTIFICATION APPLICATIONS

2.01.A. Piping: Markers.

2.02 PIPE MARKERS

2.02.A. Comply with ASME A13.1.

2.02.B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.02.C. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.

2.02.D. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
2. Flammable Fluids/Gas: Yellow with black letters.

**PART 3 EXECUTION**

3.01 PREPARATION

3.01.A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

3.02.A. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

3.02.B. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

**END OF SECTION**



**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Piping insulation.
- 1.01.B. Jackets and accessories.

1.02 REFERENCE STANDARDS

- 1.02.A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus .
- 1.02.B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation .
- 1.02.C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel .
- 1.02.D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials .
- 1.02.E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials .
- 1.02.F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials .

1.03 SUBMITTALS

- 1.03.A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

- 1.04.A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- 1.04.B. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

- 1.06.A. Maintain ambient conditions required by manufacturers of each product.
- 1.06.B. Maintain temperature before, during, and after installation for minimum of 24 hours.

**PART 2 PRODUCTS**

2.01 REGULATORY REQUIREMENTS

- 2.01.A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- 2.02.A. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum Service Temperature: 650 degrees F (343 degrees C).

3. Maximum Moisture Absorption: 0.2 percent by volume.
  - 2.02.B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
  - 2.02.C. Vapor Barrier Lap Adhesive: Compatible with insulation.
  - 2.02.D. Indoor Vapor Barrier Finish:
    1. Vinyl emulsion type acrylic, compatible with insulation, white color.
- 2.03 JACKETS
- 2.03.A. PVC Plastic.
    1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
      - d. Thickness: 10 mil (0.25 mm).
      - e. Connections: Brush on welding adhesive.
    2. Covering Adhesive Mastic: Compatible with insulation.

**PART 3 EXECUTION**

## 3.01 EXAMINATION

- 3.01.A. Verify that piping has been tested before applying insulation materials.
- 3.01.B. Verify that surfaces are clean and dry, with foreign material removed.

## 3.02 INSTALLATION

- 3.02.A. Install in accordance with manufacturer's instructions.
- 3.02.B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- 3.02.C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- 3.02.D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- 3.02.E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- 3.02.F. Glass fiber insulated pipes conveying fluids above ambient temperature:

## **Plumbing Piping Insulation**

**22 07 19**

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

### 3.02.G. Inserts and Shields:

1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

3.02.H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

3.02.I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

## 3.03 SCHEDULES

### 3.03.A. Plumbing Systems:

1. Domestic Hot Water Supply: Per IECC

**END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Flanges, unions, and couplings.
  - 4. Pipe hangers and supports.
  - 5. Valves.

## 1.02 REFERENCE STANDARDS

- 1.02.A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 .
- 1.02.B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings .
- 1.02.C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings .
- 1.02.D. ASME B31.1 - Power Piping .
- 1.02.E. ASME B31.9 - Building Services Piping .
- 1.02.F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless .
- 1.02.G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products .
- 1.02.H. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service .
- 1.02.I. ASTM B32 - Standard Specification for Solder Metal .
- 1.02.J. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes .
- 1.02.K. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed .
- 1.02.L. ASTM B75/B75M - Standard Specification for Seamless Copper Tube .
- 1.02.M. ASTM B88 - Standard Specification for Seamless Copper Water Tube .
- 1.02.N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) .
- 1.02.O. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service .
- 1.02.P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube .
- 1.02.Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings .
- 1.02.R. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings .
- 1.02.S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems .

- 1.02.T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings .
  - 1.02.U. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing .
  - 1.02.V. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets .
  - 1.02.W. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings .
  - 1.02.X. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing .
  - 1.02.Y. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Polyethylene of Raised Temperature (PE-RT) Tubing .
  - 1.02.Z. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems .
  - 1.02.AA. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements .
  - 1.02.BB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation .
  - 1.02.CC. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends .
  - 1.02.DD. NSF 61 - Drinking Water System Components - Health Effects .
  - 1.02.EE. NSF 372 - Drinking Water System Components - Lead Content .
  - 1.02.FF. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe .
- 1.03 SUBMITTALS
- 1.03.A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
  - 1.03.B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
  - 1.03.C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- 1.04 QUALITY ASSURANCE
- 1.04.A. Perform work in accordance with applicable codes.
  - 1.04.B. Valves: Manufacturer's name and pressure rating marked on valve body.
  - 1.04.C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
  - 1.04.D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- 1.05 DELIVERY, STORAGE, AND HANDLING
- 1.05.A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
  - 1.05.B. Provide temporary protective coating on cast iron and steel valves.

- 1.05.C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- 1.05.D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**1.06 FIELD CONDITIONS**

- 1.06.A. Do not install underground piping when bedding is wet or frozen.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- 2.01.A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING**

- 2.02.A. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

**2.03 SANITARY SEWER PIPING, ABOVE GRADE**

- 2.03.A. PVC Pipe: ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

**2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING**

- 2.04.A. Copper Pipe: ASTM B42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
- 2.04.B. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.
  - 1. PPI TR-4 Pressure Design Basis:
    - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
    - b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
  - 2. Fittings: Brass and copper.
  - 3. Joints: Mechanical compression fittings.
  - 4. Joints: ASTM F1960 cold-expansion fittings.

**2.05 DOMESTIC WATER PIPING, ABOVE GRADE**

- 2.05.A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.

**2.06 NATURAL GAS PIPING, BURIED BEYOND 5 FEET (1500 mm) OF BUILDING**

- 2.06.A. Polyethylene Pipe: ASTM D2513, SDR 11.

1. Fittings: ASTM D2683 or ASTM D2513 socket type.
2. Joints: Fusion welded.

**2.07 NATURAL GAS PIPING, BURIED WITHIN 5 FEET (1500 mm) OF BUILDING****2.07.A. Steel Pipe: ASTM A53/A53M Schedule 40 black.**

1. Fittings: ASTM A234/A234M, wrought steel welding type.
2. Joints: ASME B31.1, welded.
3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

**2.08 NATURAL GAS PIPING, ABOVE GRADE****2.08.A. Steel Pipe: ASTM A53/A53M Schedule 40 black.**

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints: Threaded or welded to ASME B31.1.

**2.09 FLANGES, UNIONS, AND COUPLINGS****2.09.A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:**

1. Copper tube and pipe: Class 150 bronze unions with soldered joints.

**2.09.B. Flanges for Pipe Size Over 1 Inch (25 mm):**

1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

**2.09.C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.****2.10 PIPE HANGERS AND SUPPORTS****2.10.A. Provide hangers and supports that comply with MSS SP-58.**

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
  - a. Bases: High density polypropylene.
  - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
  - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.

- e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

**2.10.B. Plumbing Piping - Drain, Waste, and Vent:**

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.

**2.10.C. Plumbing Piping - Water:**

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.

**2.10.D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:**

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

**2.11 BALL VALVES**

- 2.11.A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

**2.12 PIPING SPECIALTIES****2.12.A. Flow Controls:**

1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

**PART 3 EXECUTION****3.01 PREPARATION**

- 3.01.A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- 3.01.B. Remove scale and dirt, on inside and outside, before assembly.
- 3.01.C. Prepare piping connections to equipment with flanges or unions.

**3.02 INSTALLATION**

- 3.02.A. Install in accordance with manufacturer's instructions.
- 3.02.B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- 3.02.C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- 3.02.D. Group piping whenever practical at common elevations.

- 3.02.E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- 3.02.F. Provide access where valves and fittings are not exposed.
- 3.02.G. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- 3.02.H. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- 3.02.I. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  - 3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  - 4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

### 3.03 APPLICATION

- 3.03.A. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- 3.03.B. Install flow control with shutoff valves for throttling, bypass, or manual flow control services.
- 3.03.C. Provide flow controls in water recirculating systems where indicated.

### 3.04 SCHEDULES

- 3.04.A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
      - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
      - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
    - b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
      - 1) Maximum Hanger Spacing: 10 ft (3 m).
      - 2) Hanger Rod Diameter: 3/8 inch (9 mm).
  - 2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft (1.8 m).
      - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

**END OF SECTION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Cleanouts.
- 1.01.B. Water hammer arrestors.
- 1.01.C. Mixing valves.

1.02 REFERENCE STANDARDS

- 1.02.A. NSF 61 - Drinking Water System Components - Health Effects .
- 1.02.B. NSF 372 - Drinking Water System Components - Lead Content .

1.03 SUBMITTALS

- 1.03.A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

1.04 QUALITY ASSURANCE

- 1.04.A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

**PART 2 PRODUCTS**

2.01 GENERAL REQUIREMENTS

- 2.01.A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 CLEANOUTS

- 2.02.A. Cleanouts at Exterior Surfaced Areas (DCO): See drawings for specification.
- 2.02.B. Cleanouts at Interior Finished Floor Areas (FCO): See drawings for specification.
- 2.02.C. Cleanouts at Interior Finished Wall Areas (WCO): See drawings for specification.

2.03 WATER HAMMER ARRESTORS

- 2.03.A. Water Hammer Arrestors: See drawings for specification.

2.04 MIXING VALVES

- 2.04.A. Thermostatic Mixing Valves:
  - 1. Accessories:
    - a. Check valve on inlets.
    - b. Volume control shut-off valve on outlet.
    - c. Stem thermometer on outlet.

**PART 3 EXECUTION**

3.01 INSTALLATION

- 3.01.A. Install in accordance with manufacturer's instructions.

- 3.01.B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- 3.01.C. Encase exterior cleanouts in concrete flush with grade.
- 3.01.D. Install floor cleanouts at elevation to accommodate finished floor.
- 3.01.E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- 3.01.F. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.
- 3.01.G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

**END OF SECTION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Water closets.
- 1.01.B. Sinks.
- 1.01.C. Service sinks.
- 1.01.D. Drinking fountains.

1.02 REFERENCE STANDARDS

- 1.02.A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design .
- 1.02.B. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping .
- 1.02.C. NSF 61 - Drinking Water System Components - Health Effects .
- 1.02.D. NSF 372 - Drinking Water System Components - Lead Content .

1.03 SUBMITTALS

- 1.03.A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.04 QUALITY ASSURANCE

- 1.04.A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. Accept fixtures on site in factory packaging. Inspect for damage.
- 1.05.B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

**PART 2 PRODUCTS**

2.01 GENERAL REQUIREMENTS

- 2.01.A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- 2.01.B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 REGULATORY REQUIREMENTS

- 2.02.A. Comply with applicable codes for installation of plumbing systems.

2.03 SINKS: SEE DRAWINGS FOR SPECIFICATIONS

2.04 DRINKING FOUNTAINS - BOTTLE FILLERS SEE DRAWINGS FOR SPECIFICATIONS

2.05 SERVICE SINKS: SEE DRAWINGS FOR SPECIFICATIONS

**PART 3 EXECUTION**

3.01 EXAMINATION

- 3.01.A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- 3.01.B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

**3.02 PREPARATION**

- 3.02.A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.03 INSTALLATION**

- 3.03.A. Install each fixture with trap, easily removable for servicing and cleaning.
- 3.03.B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- 3.03.C. Install components level and plumb.
- 3.03.D. Install and secure fixtures in place with wall supports and bolts.
- 3.03.E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

**3.04 ADJUSTING**

- 3.04.A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.05 CLEANING**

- 3.05.A. Clean plumbing fixtures and equipment.

**3.06 PROTECTION**

- 3.06.A. Protect installed products from damage due to subsequent construction operations.
- 3.06.B. Do not permit use of fixtures by construction personnel.
- 3.06.C. Repair or replace damaged products before Date of Substantial Completion.

**3.07 SCHEDULES**

- 3.07.A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches (380 mm) to top of bowl rim.
    - b. Accessible: 18 inches (455 mm) to top of seat.
  - 2. Urinal:
    - a. Standard: 22 inches (560 mm) to top of bowl rim.
    - b. Accessible: 17 inches (430 mm) to top of bowl rim.
  - 3. Lavatory:
    - a. Standard: 31 inches (785 mm) to top of basin rim.
    - b. Accessible: 34 inches (865 mm) to top of basin rim.
  - 4. Drinking Fountain:
    - a. Child: 30 inches (760 mm) to top of basin rim.
    - b. Standard Adult: 40 inches (1015 mm) to top of basin rim.

- c. Accessible: 36 inches (915 mm) to top of spout.
- 3.07.B. Fixture Rough-In
- 1. Water Closet (Tank Type):
    - a. Cold Water: 1/2 Inch (15 mm).
    - b. Waste: 4 Inch (100 mm).
    - c. Vent: 2 Inch (50 mm).
  - 2. Urinal (Flush Valve Type):
    - a. Cold Water: 3/4 Inch (20 mm).
    - b. Waste: 2 Inch (50 mm).
    - c. Vent: 1-1/2 Inch (40 mm).
  - 3. Lavatory:
    - a. Hot Water: 1/2 Inch (15 mm).
    - b. Cold Water: 1/2 Inch (15 mm).
    - c. Waste: 1-1/2 Inch (40 mm).
    - d. Vent: 1-1/4 Inch (32 mm).
  - 4. Sink:
    - a. Hot Water: 1/2 Inch (15 mm).
    - b. Cold Water: 1/2 Inch (15 mm).
    - c. Waste: 1-1/2 Inch (40 mm).
    - d. Vent: 1-1/4 Inch (32 mm).
  - 5. Service Sink:
    - a. Hot Water: 1/2 Inch (15 mm).
    - b. Cold Water: 1/2 Inch (15 mm).
    - c. Waste: 3 Inch (80 mm).
    - d. Vent: 1-1/2 Inch (40 mm).
  - 6. Drinking Fountain:
    - a. Cold Water: 1/2 Inch (15 mm).
    - b. Waste: 1-1/4 Inch (32 mm).
    - c. Vent: 1-1/4 Inch (32 mm).

**END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Single conductor building wire.
- 1.01.B. Metal-clad cable.
- 1.01.C. Wiring connectors.
- 1.01.D. Electrical tape.
- 1.01.E. Heat shrink tubing.
- 1.01.F. Oxide inhibiting compound.
- 1.01.G. Wire pulling lubricant.

## 1.02 REFERENCE STANDARDS

- 1.02.A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire .
- 1.02.B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft .
- 1.02.C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes .
- 1.02.D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation .
- 1.02.E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers .
- 1.02.F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation .
- 1.02.G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape .
- 1.02.H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes .
- 1.02.I. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable .
- 1.02.K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) .
- 1.02.L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy .
- 1.02.M. NFPA 70 - National Electrical Code .
- 1.02.N. UL 44 - Thermoset-Insulated Wires and Cables .
- 1.02.O. UL 83 - Thermoplastic-Insulated Wires and Cables .
- 1.02.P. UL 486A-486B - Wire Connectors .
- 1.02.Q. UL 486C - Splicing Wire Connectors .
- 1.02.R. UL 486D - Sealed Wire Connector Systems .

1.02.S. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape .

1.02.T. UL 1569 - Metal-Clad Cables .

### 1.03 SUBMITTALS

1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

### 1.04 QUALITY ASSURANCE

1.04.A. Comply with requirements of NFPA 70.

1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.05 DELIVERY, STORAGE, AND HANDLING

1.05.A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

### 1.06 FIELD CONDITIONS

1.06.A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

## **PART 2 PRODUCTS**

### 2.01 CONDUCTOR AND CABLE APPLICATIONS

2.01.A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

2.01.B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.01.C. Nonmetallic-sheathed cable is not permitted.

2.01.D. Underground feeder and branch-circuit cable is not permitted.

2.01.E. Armored cable is not permitted.

2.01.F. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:
  - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
  - b. Where concealed in hollow stud walls, above accessible ceilings, under raised floors and Exposed in warehouse areas for branch circuits up to 20 A.
    - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
2. In addition to other applicable restrictions, may not be used:
  - a. Unless approved by Owner.

- b. Where exposed to view.
- c. Where exposed to damage.
- d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
- e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.01.G. Manufactured wiring systems are not permitted.

## 2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

2.02.A. Provide products that comply with requirements of NFPA 70.

2.02.B. Provide products listed, classified, and labeled as suitable for the purpose intended.

2.02.C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

2.02.D. Comply with NEMA WC 70.

2.02.E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

2.02.F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

2.02.G. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

2.02.H. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

2.02.I. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
  - a. Exceptions:
    - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
    - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
    - 3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

2.02.J. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.
3. Color Code:
  - a. 240/120 V, 1 Phase, 3 Wire System:
    - 1) Phase A: Black.
    - 2) Phase B: Red.
    - 3) Neutral/Grounded: White.
  - b. Equipment Ground, All Systems: Green.
  - c. Travelers for 3-Way and 4-Way Switching: Pink.

### 2.03 SINGLE CONDUCTOR BUILDING WIRE

- 2.03.A. Description: Single conductor insulated wire.
- 2.03.B. Conductor Stranding:
  1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- 2.03.C. Insulation Voltage Rating: 600 V.
- 2.03.D. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

### 2.04 METAL-CLAD CABLE

- 2.04.A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- 2.04.B. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
- 2.04.C. Insulation Voltage Rating: 600 V.
- 2.04.D. Insulation: Type THHN, THHN/THWN or THHN/THWN-2.
- 2.04.E. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- 2.04.F. Grounding: Full-size integral equipment grounding conductor.
- 2.04.G. Armor: Steel, interlocked tape.
- 2.04.H. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

### 2.05 WIRING CONNECTORS

- 2.05.A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- 2.05.B. Wiring Connectors for Splices and Taps:
  1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

2.05.C. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
4. Aluminum Conductors: Use compression connectors for all connections.
5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
6. Conductors for Control Circuits: Use crimped terminals where connectors are required.

2.05.D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

2.05.E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

2.05.F. Mechanical Connectors: Provide bolted type or set-screw type.

2.05.G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.05.H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## 2.06 ACCESSORIES

2.06.A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- 2.06.B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- 2.06.C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- 2.06.D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

**PART 3 EXECUTION****3.01 EXAMINATION**

- 3.01.A. Verify that interior of building has been protected from weather.
- 3.01.B. Verify that work likely to damage wire and cable has been completed.
- 3.01.C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- 3.01.D. Verify that field measurements are as indicated.
- 3.01.E. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 PREPARATION**

- 3.02.A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

**3.03 INSTALLATION****3.03.A. Circuiting Requirements:**

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

3.03.B. Install products in accordance with manufacturer's instructions.

3.03.C. Perform work in accordance with NECA 1 (general workmanship).

3.03.D. Install aluminum conductors in accordance with NECA 104.

3.03.E. Install metal-clad cable (Type MC) in accordance with NECA 120.

**3.03.F. Installation in Raceway:**

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- 3.03.G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- 3.03.H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- 3.03.I. Terminate cables using suitable fittings.
  1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- 3.03.J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- 3.03.K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- 3.03.L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- 3.03.M. Make wiring connections using specified wiring connectors.
  1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.
  4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
  6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- 3.03.N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  1. Dry Locations: Use insulating covers specifically designed for the connectors or electrical tape.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape or heat shrink tubing.

- a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
  - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.
- 3.03.O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- 3.03.P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- 3.03.Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- 3.03.R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

**END OF SECTION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Grounding and bonding requirements.
- 1.01.B. Conductors for grounding and bonding.
- 1.01.C. Connectors for grounding and bonding.
- 1.01.D. Ground rod electrodes.

1.02 REFERENCE STANDARDS

- 1.02.A. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings .
- 1.02.C. NFPA 70 - National Electrical Code .
- 1.02.D. UL 467 - Grounding and Bonding Equipment .

1.03 ADMINISTRATIVE REQUIREMENTS

- 1.03.A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- 1.03.B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**PART 2 PRODUCTS**

2.01 GROUNDING AND BONDING REQUIREMENTS

- 2.01.A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- 2.01.B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- 2.01.C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- 2.01.D. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.

- b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  3. Metal In-Ground Support Structure:
    - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
  4. Ground Rod Electrode(s):
    - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
- 2.01.E. Bonding and Equipment Grounding:
  1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  3. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  4. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  5. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

## 2.02 GROUNDING AND BONDING COMPONENTS

### 2.02.A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

### 2.02.B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
  - a. Exceptions:

- 1) Use bare copper conductors where installed underground in direct contact with earth.
  - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- 2.02.C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors or exothermic welded connections for accessible connections.
- 2.02.D. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
  2. Material: Copper-bonded (copper-clad) steel.
  3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- 3.01.A. Verify that work likely to damage grounding and bonding system components has been completed.
- 3.01.B. Verify that field measurements are as indicated.
- 3.01.C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- 3.02.A. Install products in accordance with manufacturer's instructions.
- 3.02.B. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
- 3.02.D. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

### **END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Galvanized steel rigid metal conduit (RMC).
- 1.01.B. Intermediate metal conduit (IMC).
- 1.01.C. Flexible metal conduit (FMC).
- 1.01.D. Liquidtight flexible metal conduit (LFMC).
- 1.01.E. Electrical metallic tubing (EMT).
- 1.01.F. Conduit fittings.
- 1.01.G. Accessories.

## 1.02 REFERENCE STANDARDS

- 1.02.A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) .
- 1.02.B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) .
- 1.02.C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC) .
- 1.02.D. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) .
- 1.02.F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable .
- 1.02.G. NFPA 70 - National Electrical Code .
- 1.02.H. UL 1 - Flexible Metal Conduit .
- 1.02.I. UL 6 - Electrical Rigid Metal Conduit-Steel .
- 1.02.J. UL 360 - Liquid-Tight Flexible Steel Conduit .
- 1.02.K. UL 514B - Conduit, Tubing, and Cable Fittings .
- 1.02.L. UL 797 - Electrical Metallic Tubing-Steel .
- 1.02.M. UL 1242 - Electrical Intermediate Metal Conduit-Steel .

## 1.03 SUBMITTALS

- 1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- 1.03.B. Shop Drawings:
  - 1. Include proposed locations of roof penetrations and proposed methods for sealing.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- 1.05.A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

**PART 2 PRODUCTS****2.01 CONDUIT APPLICATIONS**

- 2.01.A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- 2.01.B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, EMT.
- 2.01.C. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
- 2.01.D. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
- 2.01.E. Interior, Damp or Wet Locations: Use electrical metallic tubing (EMT).
- 2.01.F. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
- 2.01.G. Exposed, Interior, Subject to Physical Damage: Use intermediate metal conduit (IMC).
1. Locations subject to physical damage include, but are not limited to:
    - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
- 2.01.H. Exposed, Exterior: Use intermediate metal conduit (IMC).
- 2.01.I. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet (1.8 m).

**2.02 CONDUIT REQUIREMENTS**

- 2.02.A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- 2.02.B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- 2.02.C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.02.D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4 inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  3. Control Circuits: 1/2 inch (16 mm) trade size.
  4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
- 2.02.E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

**2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

## **Conduit for Electrical Systems**

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2.03.A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

2.03.B. Fittings:

1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### 2.04 INTERMEDIATE METAL CONDUIT (IMC)

2.04.A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

2.04.B. Fittings:

1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### 2.05 FLEXIBLE METAL CONDUIT (FMC)

2.05.A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

2.05.B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

### 2.06 ELECTRICAL METALLIC TUBING (EMT)

2.06.A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

2.06.B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
  - a. Do not use indenter type connectors and couplings.
4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

### 2.07 ACCESSORIES

2.07.A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).

2.07.B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

2.07.C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

**PART 3 EXECUTION****3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that mounting surfaces are ready to receive conduits.
- 3.01.C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- 3.02.A. Install products in accordance with manufacturer's instructions.
- 3.02.B. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- 3.02.D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- 3.02.E. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.
  - 3. Conceal all conduits unless specifically indicated to be exposed.
  - 4. Arrange conduit to maintain adequate headroom, clearances, and access.
  - 5. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 6. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
  - 7. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
- 3.02.F. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
  - 4. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  - 5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  - 6. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
  - 7. Use of wire for support of conduits is not permitted.
- 3.02.G. Connections and Terminations:
  - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- 3.02.H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- 3.02.I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- 3.02.J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- 3.02.K. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

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3.03 PROTECTION

- 3.03.A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION**

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- 1.01.B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- 1.01.C. Boxes and enclosures for integrated power, data, and audio/video.
- 1.01.D. Underground boxes/enclosures.
- 1.01.E. Accessories.

## 1.02 REFERENCE STANDARDS

- 1.02.A. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.B. NECA 130 - Standard for Installing and Maintaining Wiring Devices .
- 1.02.C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable .
- 1.02.D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports .
- 1.02.E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) .
- 1.02.F. NFPA 70 - National Electrical Code .
- 1.02.G. SCTE 77 - Specification for Underground Enclosure Integrity .
- 1.02.H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations .
- 1.02.I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations .
- 1.02.J. UL 508A - UL Standard for Safety Industrial Control Panels .
- 1.02.K. UL 514A - Metallic Outlet Boxes .

## 1.03 SUBMITTALS

- 1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, cabinets and enclosures and underground boxes/enclosures.
- 1.03.B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Keys for Lockable Enclosures: Two of each different key.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- 1.05.A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

## 2.01 BOXES

## 2.01.A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

## 2.01.B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 27 26.

## 2.01.C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  - a. Indoor Clean, Dry Locations: Type 1, painted steel.
  - b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
  - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted 3/4 inch fire-retardant plywood.
  5. Finish for Painted Steel Enclosures: Coordinate with Landscape Architect unless otherwise indicated.
- 2.01.D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- 2.01.E. Underground Boxes/Enclosures:
1. Description: In-ground, solid bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
  2. Size: As indicated on drawings.
  3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
  4. Applications:
    - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
    - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
    - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
  5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    - a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.
- 2.02 ACCESSORIES
- 2.02.A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that mounting surfaces are ready to receive boxes.
- 3.01.C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- 3.02.A. Install products in accordance with manufacturer's instructions.
- 3.02.B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

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- 3.02.C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- 3.02.D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- 3.02.E. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- 3.02.F. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
  - 4. Locate boxes so that wall plates do not span different building finishes.
  - 5. Locate boxes so that wall plates do not cross masonry joints.
  - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
- 3.02.G. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- 3.02.H. Install boxes plumb and level.
- 3.02.I. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- 3.02.J. Install boxes as required to preserve insulation integrity.
- 3.02.K. Underground Boxes/Enclosures:
  - 1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
  - 2. Flush-mount enclosures located in concrete or paved areas.

## **Boxes for Electrical Systems**

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- 3. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.
  - 3.02.L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
  - 3.02.M. Close unused box openings.
  - 3.02.N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
  - 3.02.O. Provide grounding and bonding in accordance with Section 26 05 26.
- 3.03 PROTECTION
- 3.03.A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**



**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Electrical identification requirements.
- 1.01.B. Identification nameplates and labels.
- 1.01.C. Wire and cable markers.
- 1.01.D. Voltage markers.
- 1.01.E. Underground warning tape.

1.02 REFERENCE STANDARDS

- 1.02.A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels .
- 1.02.B. NFPA 70 - National Electrical Code .
- 1.02.C. UL 969 - Marking and Labeling Systems .

1.03 QUALITY ASSURANCE

- 1.03.A. Comply with requirements of NFPA 70.

**PART 2 PRODUCTS**

2.01 IDENTIFICATION REQUIREMENTS

- 2.01.A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- 2.01.B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify power source and circuit number. Include location when not within sight of equipment.
      - 2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Enclosed switches
      - 1) Identify power source and circuit number. Include location when not within sight of equipment.
      - 2) Identify load(s) served. Include location when not within sight of equipment.
  - 2. Service Equipment:
    - a. Use identification nameplate to identify each service disconnecting means.

3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
4. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
  - a. Service equipment.

**2.01.C. Identification for Conductors and Cables:**

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
  - a. At each source and load connection.

**2.01.D. Identification for Raceways:**

1. Use underground warning tape to identify underground raceways.

**2.01.E. Identification for Boxes:**

1. Use identification labels to identify circuits enclosed.

**2.01.F. Identification for Devices:**

1. Use identification label to identify serving branch circuit for all receptacles.
  - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

**2.01.G. Identification for Luminaires:**

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

**2.01.H. Identification for Photovoltaic Systems: Comply with Section 26 31 00****2.02 IDENTIFICATION NAMEPLATES AND LABELS****2.02.A. Identification Nameplates:**

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - b. Outdoor Locations: Use plastic nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

**2.02.B. Identification Labels:**

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

**2.02.C. Format for Equipment Identification:**

1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
  - a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
  - a. Equipment Designation: 1/2 inch (13 mm).
  - b. Other Information: 1/4 inch (6 mm).
5. Color:
  - a. Normal Power System: White text on black background.

**2.02.D. Format for Receptacle Identification:**

1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

**2.03 WIRE AND CABLE MARKERS**

- 2.03.A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- 2.03.B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- 2.03.C. Legend: Power source and circuit number or other designation indicated.
- 2.03.D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- 2.03.E. Minimum Text Height: 1/8 inch (3 mm).
- 2.03.F. Color: Black text on white background unless otherwise indicated.

**2.04 VOLTAGE MARKERS**

- 2.04.A. Minimum Size:
- 2.04.B. Legend:
- 2.04.C. Color: Black text on orange background unless otherwise indicated.

**2.05 UNDERGROUND WARNING TAPE**

- 2.05.A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- 2.05.B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
- 2.05.C. Legend: Type of service, continuously repeated over full length of tape.
- 2.05.D. Color:

**PART 3 EXECUTION****3.01 PREPARATION**

- 3.01.A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

**3.02 INSTALLATION**

- 3.02.A. Install products in accordance with manufacturer's instructions.
- 3.02.B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Conduits: Legible from the floor.
  - 8. Boxes: Outside face of cover.
  - 9. Conductors and Cables: Legible from the point of access.
  - 10. Devices: Outside face of cover.
- 3.02.C. Install identification products centered, level, and parallel with lines of item being identified.
- 3.02.D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- 3.02.E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- 3.02.F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.
- 3.02.G. Mark all handwritten text, where permitted, to be neat and legible.

**3.03 FIELD QUALITY CONTROL**

- 3.03.A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Occupancy sensors.
- 1.01.B. Outdoor motion sensors.
- 1.01.C. Outdoor photo controls.
- 1.01.D. Daylighting controls.

## 1.02 REFERENCE STANDARDS

- 1.02.A. 47 CFR 15 - Radio Frequency Devices .
- 1.02.B. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.C. NECA 130 - Standard for Installing and Maintaining Wiring Devices .
- 1.02.D. NFPA 70 - National Electrical Code .
- 1.02.E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control .
- 1.02.F. UL 1472 - Solid-State Dimming Controls .

## 1.03 SUBMITTALS

- 1.03.A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
  - 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- 1.03.B. Shop Drawings:
  - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
  - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- 1.03.C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**PART 2 PRODUCTS**

## 2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- 2.01.A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.01.B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

## 2.02 OCCUPANCY SENSORS

- 2.02.A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
    - b. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
  3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  6. Sensitivity: Field adjustable.
  7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
  8. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
  9. Wireless Sensors:
    - a. RF Range: 30 feet (9 m) through typical construction materials.
    - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
    - c. Power: Battery-operated with minimum ten-year battery life.
- 2.02.B. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - d. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- 2.02.C. Wall Dimmer Occupancy Sensors:
1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
    - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
- 2.02.D. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
  2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- 2.02.E. Power Packs for Wireless Occupancy Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
  2. Input Supply Voltage: Dual rated for 120/277 V ac.
  3. Load Rating: As required to control the load indicated on drawings.
- 2.03 OUTDOOR MOTION SENSORS
- 2.03.A. Description: Factory-assembled wet location listed device suitable for wall or ceiling/eave mounting, with integral swivel for field adjustment of coverage, capable of detecting motion for automatic control of load indicated.
  - 2.03.B. Sensor Technology: Passive Infrared (PIR) designed to detect occupancy by sensing movement of thermal energy between zones.
  - 2.03.C. Operation: Unless otherwise indicated, motion sensor to turn load on when motion is detected and to turn load off when no motion is detected during an adjustable turn-off delay time interval.
  - 2.03.D. Turn-Off Delay: Field adjustable, with time delay settings available up to 15 minutes.
  - 2.03.E. Integral Photocell: For dusk to dawn operation.
  - 2.03.F. Manual Override: Activated by switching power off to unit and then back on.
  - 2.03.G. Load Rating: 1,000 W incandescent and fluorescent load at 120 V ac.

2.03.H. Coverage: Capable of detecting motion within a distance of 50 feet (15 m) at a mounting height of 8 feet (2.4 m), with a field of view of 270 degrees.

2.03.I. Finish: Color to be selected.

## 2.04 OUTDOOR PHOTO CONTROLS

### 2.04.A. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.

## 2.05 DAYLIGHTING CONTROLS

2.05.A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

2.05.B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.

1. Sensor Type: Filtered silicon photo diode.
2. Sensor Range:
  - a. Outdoor Photo Sensors: 5 to 250 footcandles (53.8 to 2690 lx).
3. Wireless Daylighting Control Photo Sensors:
  - a. RF Range: 30 feet (9 m) through typical construction materials.
  - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
  - c. Power: Battery-operated with minimum ten-year battery life.

2.05.C. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.

2.05.D. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.

1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.

2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  3. Control Capability:
    - a. Single Zone Switching Modules: Capable of controlling one programmable channel.
- 2.05.E. Daylighting Control Switching Modules for Wireless Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
  2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  4. Control Capability: Capable of controlling one programmable channel.
  5. Input Supply Voltage: Dual rated for 120/277 V ac.
  6. Load Rating: As required to control the load indicated on drawings.
- 2.05.F. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
  2. Input Supply Voltage: Dual rated for 120/277 V ac.
  3. Load Ratings: As required to control the load indicated on drawings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- 3.01.C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- 3.01.D. Verify that final surface finishes are complete, including painting.
- 3.01.E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- 3.01.F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- 3.01.G. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- 3.02.A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise

indicated.

- 3.02.B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
  - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
- 3.02.C. Install lighting control devices in accordance with manufacturer's instructions.
- 3.02.D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- 3.02.E. Install lighting control devices plumb and level, and held securely in place.
- 3.02.F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.
- 3.02.G. Provide required supports in accordance with Section 26 05 29.
- 3.02.H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- 3.02.I. Occupancy Sensor Locations:
  - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
  - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- 3.02.J. Outdoor Photo Control Locations:
  - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
  - 2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
- 3.02.K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
- 3.02.L. Daylighting Control Photo Sensor Locations:
  - 1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize control and avoid conflicts or problems affecting proper detection of light levels.
  - 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

- 3.02.M. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

### 3.03 ADJUSTING

- 3.03.A. Adjust devices and wall plates to be flush and level.
- 3.03.B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- 3.03.C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- 3.03.D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- 3.03.E. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.
- 3.03.F. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

**END OF SECTION**



**PART 1 GENERAL**

1.01 SECTION INCLUDES

- 1.01.A. Power distribution panelboards.
- 1.01.B. Lighting and appliance panelboards.
- 1.01.C. Overcurrent protective devices for panelboards.

1.02 REFERENCE STANDARDS

- 1.02.A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service .
- 1.02.B. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.C. NECA 407 - Standard for Installing and Maintaining Panelboards .
- 1.02.D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) .
- 1.02.E. NEMA PB 1 - Panelboards .
- 1.02.F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less .
- 1.02.G. NFPA 70 - National Electrical Code .
- 1.02.H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations .
- 1.02.I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations .
- 1.02.J. UL 67 - Panelboards .
- 1.02.K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures .
- 1.02.L. UL 869A - Reference Standard for Service Equipment .
- 1.02.M. UL 943 - Ground-Fault Circuit-Interrupters .
- 1.02.N. UL 1053 - Ground-Fault Sensing and Relaying Equipment .
- 1.02.O. UL 1699 - Arc-Fault Circuit-Interrupters .

1.03 SUBMITTALS

- 1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**PART 2 PRODUCTS**

2.01 PANELBOARDS - GENERAL REQUIREMENTS

- 2.01.A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.01.B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).
  2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
  - 2.01.C. Short Circuit Current Rating:
    1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2.01.D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
  - 2.01.E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
  - 2.01.F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
  - 2.01.G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
    1. Provide fully rated neutral bus, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
    2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 2.01.H. Conductor Terminations: Suitable for use with the conductors to be installed.
  - 2.01.I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      - a. Indoor Clean, Dry Locations: Type 1.
      - b. Outdoor Locations: Type 3R.
    2. Boxes: Galvanized steel unless otherwise indicated.
      - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    3. Fronts:
      - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    4. Lockable Doors: All locks keyed alike unless otherwise indicated.
  - 2.01.J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
  - 2.01.K. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
    1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- 2.02 POWER DISTRIBUTION PANELBOARDS
- 2.02.A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as

indicated on the drawings.

2.02.B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

2.02.C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

2.02.D. Circuit Breakers:

1. Provide bolt-on type.
2. Provide thermal magnetic circuit breakers unless otherwise indicated.

2.02.E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.
2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

2.03.A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

2.03.B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

2.03.C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

2.03.D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

2.03.E. Enclosures:

1. Provide surface-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

2.04.A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable;

ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:
  - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - 2) 14,000 rms symmetrical amperes at 480 VAC.
  - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
  - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- 3.01.C. Verify that mounting surfaces are ready to receive panelboards.
- 3.01.D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- 3.02.A. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.B. Install products in accordance with manufacturer's instructions.
- 3.02.C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

## **Panelboards**

**26 24 16**

- 3.02.D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- 3.02.E. Provide required support and attachment in accordance with Section 26 05 29.
- 3.02.F. Install panelboards plumb.
- 3.02.G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- 3.02.H. Provide grounding and bonding in accordance with Section 26 05 26.
- 3.02.I. Install all field-installed branch devices, components, and accessories.
- 3.02.J. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- 3.02.K. Provide filler plates to cover unused spaces in panelboards.

### **3.03 ADJUSTING**

- 3.03.A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- 3.03.B. Adjust alignment of panelboard fronts.
- 3.03.C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Wall switches.
- 1.01.B. Wall dimmers.
- 1.01.C. Receptacles.
- 1.01.D. Wall plates.

## 1.02 REFERENCE STANDARDS

- 1.02.A. FS W-C-596 - Connector, Electrical, Power, General Specification for .
- 1.02.B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification) .
- 1.02.C. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.D. NECA 130 - Standard for Installing and Maintaining Wiring Devices .
- 1.02.E. NEMA WD 1 - General Color Requirements for Wiring Devices .
- 1.02.F. NEMA WD 6 - Wiring Devices - Dimensional Specifications .
- 1.02.G. NFPA 70 - National Electrical Code .
- 1.02.H. UL 20 - General-Use Snap Switches .
- 1.02.I. UL 498 - Attachment Plugs and Receptacles .
- 1.02.J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices .
- 1.02.K. UL 943 - Ground-Fault Circuit-Interrupters .
- 1.02.L. UL 1310 - Class 2 Power Units .
- 1.02.M. UL 1472 - Solid-State Dimming Controls .

## 1.03 SUBMITTALS

- 1.03.A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Products: Listed, classified, and labeled as suitable for the purpose intended.

## 1.05 DELIVERY, STORAGE, AND PROTECTION

- 1.05.A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

**PART 2 PRODUCTS**

## 2.01 WIRING DEVICE APPLICATIONS

- 2.01.A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- 2.01.B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

- 2.01.C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- 2.01.D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- 2.01.E. Provide GFCI protection for receptacles installed in kitchens.
- 2.01.F. Provide isolated ground receptacles for receptacles serving computers and electronic cash registers.
- 2.01.G. Unless noted otherwise, do not use combination switch/receptacle devices.

## 2.02 WIRING DEVICE FINISHES

- 2.02.A. Provide wiring device finishes as described below unless otherwise indicated.
- 2.02.B. Wiring Devices, Unless Otherwise Indicated: White with galvanized steel wall plate.
- 2.02.C. Wiring Devices Installed in Finished Spaces: White with galvanized steel wall plate.
- 2.02.D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- 2.02.E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

## 2.03 WALL SWITCHES

- 2.03.A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- 2.03.B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way or four way as indicated on the drawings.

## 2.04 RECEPTACLES

- 2.04.A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- 2.04.B. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- 2.04.C. GFCI Receptacles:
  - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class

A.

2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

## 2.05 WALL PLATES

2.05.A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

2.05.B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

2.05.C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

2.05.D. Weatherproof Covers for Damp Locations: Gasketed, thermoplastic, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

2.05.E. Weatherproof Covers for Wet Locations: Gasketed, thermoplastic, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- 3.01.C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- 3.01.D. Verify that final surface finishes are complete, including painting.
- 3.01.E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- 3.01.F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- 3.02.A. Provide extension rings to bring outlet boxes flush with finished surface.
- 3.02.B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- 3.03.A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- 3.03.B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
  1. Where multiple receptacles, wall switches or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
- 3.03.C. Install wiring devices in accordance with manufacturer's instructions.

- 3.03.D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
  - 3.03.E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
  - 3.03.F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
  - 3.03.G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  - 3.03.H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.
  - 3.03.I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
  - 3.03.J. Install wall switches with OFF position down.
  - 3.03.K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
  - 3.03.L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
  - 3.03.M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
  - 3.03.N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
  - 3.03.O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
  - 3.03.P. Identify wiring devices in accordance with Section 26 05 53.
- 3.04 ADJUSTING
- 3.04.A. Adjust devices and wall plates to be flush and level.

**END OF SECTION**

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

1.01.A. Enclosed safety switches.

## 1.02 REFERENCE STANDARDS

1.02.A. NECA 1 - Standard for Good Workmanship in Electrical Construction .

1.02.B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) .

1.02.C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) .

1.02.D. NFPA 70 - National Electrical Code .

1.02.E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations .

1.02.F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations .

1.02.G. UL 98 - Enclosed and Dead-Front Switches .

1.02.H. UL 869A - Reference Standard for Service Equipment .

## 1.03 SUBMITTALS

1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

## 1.04 QUALITY ASSURANCE

1.04.A. Comply with requirements of NFPA 70.

1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

## 1.05 DELIVERY, STORAGE, AND HANDLING

1.05.A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

1.05.B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**PART 2 PRODUCTS**

## 2.01 MANUFACTURERS

2.01.A. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## 2.02 ENCLOSED SAFETY SWITCHES

2.02.A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy or general duty as indicated; ratings, configurations, and features as indicated on the drawings.

2.02.B. Provide products listed, classified, and labeled as suitable for the purpose intended.

## **Enclosed Switches**

**26 28 16.16**

- 2.02.C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- 2.02.D. Horsepower Rating: Suitable for connected load.
- 2.02.E. Voltage Rating: Suitable for circuit voltage.
- 2.02.F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- 2.02.G. Provide with switch blade contact position that is visible when the cover is open.
- 2.02.H. Conductor Terminations: Suitable for use with the conductors to be installed.
- 2.02.I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- 2.02.J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- 2.02.K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
    - b. Outdoor Locations: Type 3R.
- 2.02.L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- 2.02.M. Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Provide mechanical lugs unless otherwise indicated.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
- 2.02.N. General Duty Switches:
  - 1. Conductor Terminations:
    - a. Provide mechanical lugs.
    - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

**PART 3 EXECUTION**

## 3.01 EXAMINATION

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- 3.01.C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- 3.01.D. Verify that conditions are satisfactory for installation prior to starting work.

## 3.02 INSTALLATION

- 3.02.A. Install products in accordance with manufacturer's instructions.
- 3.02.B. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- 3.02.D. Provide required support and attachment in accordance with Section 26 05 29.
- 3.02.E. Install enclosed switches plumb.
- 3.02.F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- 3.02.G. Identify enclosed switches in accordance with Section 26 05 53.

## 3.03 ADJUSTING

- 3.03.A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

## 3.04 CLEANING

- 3.04.A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- 3.04.B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Photovoltaic system requirements.
- 1.01.B. Photovoltaic modules.
- 1.01.C. Photovoltaic module mounting system.
- 1.01.D. Photovoltaic inverters.

## 1.02 REFERENCE STANDARDS

- 1.02.A. IEC 61215-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements .
- 1.02.B. IEC 61215-1-1 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-1: Special Requirements for Testing of Crystalline Silicon Photovoltaic (PV) Modules .
- 1.02.C. IEC 61215-1-2 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-2: Special Requirements for Testing of Thin-Film Cadmium Telluride (CDTE) Based Photovoltaic (PV) Modules .
- 1.02.D. IEC 61215-1-3 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-3: Special Requirements for Testing of Thin-Film Amorphous Silicon Based Photovoltaic (PV) Modules .
- 1.02.E. IEC 61215-1-4 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1-4: Special Requirements for Testing of Thin-Film Cu(In,Ga)(S,Se)<sub>2</sub> Based Photovoltaic (PV) Modules .
- 1.02.F. IEC 61215-2 - Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures .
- 1.02.G. IEEE 1547 - IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces .
- 1.02.H. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.I. NECA 412 - Standard for Installing and Maintaining Photovoltaic (PV) Power Systems .
- 1.02.J. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) .
- 1.02.K. NFPA 70 - National Electrical Code .
- 1.02.L. UL 1699B - Outline of Investigation for Photovoltaic (PV) DC Arc-Fault Circuit Protection; Current Edition .
- 1.02.M. UL 1703 - Flat Plate Photovoltaic Modules and Panels .
- 1.02.N. UL 1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources .
- 1.02.O. UL 869A - Reference Standard for Service Equipment .

## 1.03 SUBMITTALS

## **Photovoltaic Collectors**

**26 31 00**

- 1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
- 1.03.B. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, attachment locations and details, and proposed size, type, and routing of conduits and cables. Include system interconnection schematic diagrams showing all factory and field connections.
- 1.03.C. Manufacturer's detailed field testing procedures.
- 1.03.D. Field quality control test reports.
  - 1. Include manufacturer's field reports.
- 1.04 QUALITY ASSURANCE
  - 1.04.A. Comply with NFPA 70.
  - 1.04.B. Comply with Utility Company requirements for interconnection.
  - 1.04.C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
  - 1.04.D. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience with photovoltaic systems of similar size, type, and complexity.

## **PART 2 PRODUCTS**

### **2.01 PHOTOVOLTAIC SYSTEM REQUIREMENTS**

- 2.01.A. Provide complete photovoltaic system consisting of photovoltaic modules and associated balance of system components necessary for connection to facility electrical system.
- 2.01.B. System Description:
  - 1. Photovoltaic array is roof-mounted in location indicated on the drawings.
  - 2. System includes interconnection with utility grid (grid-tied system).
  - 3. System does not include battery storage system.
  - 4. System does not include engine generator.
- 2.01.C. Capacity:
  - 1. Total Nominal Rated Power Output of Array: Equal to or greater than the rated output of the basis of design array.
  - 2. Nominal Rated Power Output of Individual Modules: Equal to or greater than the rated output of the basis of design module.
- 2.01.D. Size:
  - 1. Array: Designed to fit within the area designated on the drawings.
- 2.01.E. Provide photovoltaic system and associated components suitable for wind loads, snow loads, seismic loads, and other structural design considerations of the installed location.
- 2.01.F. Provide photovoltaic system and associated components suitable for continuous operation under the service conditions at the installed location.

- 2.01.G. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.01.H. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system.
- 2.01.I. DC Arc Fault Circuit Protection: Provide DC photovoltaic arc-fault protection devices listed as complying with UL 1699B as required for compliance with NFPA 70.
- 2.01.J. Rapid Shutdown of Photovoltaic Systems on Buildings: Provide listed equipment arranged to provide rapid shutdown in accordance with NFPA 70.
- 2.01.K. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- 2.01.L. Arrange array to minimize shading during peak production periods.
- 2.01.M. Roof-Mounted Arrays:
  - 1. Arrange array such that normal roof drainage is not affected.
  - 2. Arrange array to maintain required safety clearances from edges of roof as indicated.
  - 3. Arrange array to maintain access and clearance requirements for other roof-mounted equipment.
  - 4. Arrange array to avoid spanning of expansion joints.

## 2.02 PHOTOVOLTAIC MODULES

- 2.02.A. Acceptable Module Types: Either crystalline silicon or thin film modules complying with specified requirements will be considered for this project.
- 2.02.B. General Requirements:
  - 1. Photovoltaic Modules: Factory assembled; consisting of photovoltaic cells, frame, junction box, cables for series connection, and bypass diodes for shade tolerance; rated for 600 V DC; complying with IEC 61215-1 and IEC 61215-2 and listed as complying with UL 1703.
  - 2. Crystalline Silicon Photovoltaic Modules: Comply with IEC 61215-1-1.
  - 3. Thin Film Photovoltaic Modules: Comply with IEC 61215-1-2, IEC 61215-1-3, or IEC 61215-1-4 as applicable.
  - 4. Frame: Anodized aluminum.
  - 5. Factory-Installed Junction Box: Weatherproof, with factory-installed terminals and bypass diodes.
  - 6. Factory-Installed Cables: Type USE-2 or listed photovoltaic (PV) wire with polarized locking connectors.
  - 7. Unless otherwise indicated, specified module performance characteristics are rated under Standard Test Conditions (STC).

## 2.03 BALANCE OF SYSTEM COMPONENTS

- 2.03.A. Photovoltaic Module Mounting System:
  - 1. Provide complete mounting system compatible with modules to be installed and suitable to properly install them in the location indicated, including all necessary hardware and accessories.

2. Support Structure and Associated Hardware Materials: Use aluminum, galvanized steel or stainless steel.
  3. Roof-Mounted Arrays:
    - a. Provide system compatible with the roof at the installed location.
    - b. Module Tilt Angle: As required to provide maximum energy production for installed location.
    - c. Provide minimum clearance of 3 inches (76 mm) between roof and module for air circulation and drainage.
- 2.03.B. Photovoltaic Inverters:
1. Provide inverter(s) as indicated or as required for connection of the photovoltaic array DC system to the AC system indicated.
  2. Inverters: Suitable for the requirements of the connected array; output configuration compatible with connected system; listed as complying with UL 1741; furnished with the following features:
    - a. Maximum power point tracking (MPPT).
    - b. LCD display.
    - c. Integral DC disconnect.
    - d. Integral DC ground fault detection and interruption (GFDI).
  3. Grid-Tied Inverters: Comply with IEEE 1547, including over/under grid voltage and frequency protection, and anti-islanding protection to automatically disconnect upon loss of utility power and to remain disconnected until utility power restoration has been maintained for five minutes.
  4. Total Harmonic Distortion: Less than five percent.
  5. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- 2.03.C. Enclosed Switches, in Addition to Requirements of Section 26 28 16.16:
1. Switches for DC System: Rated for 600 V DC.
  2. Switches Connected to Supply Side of Service Disconnecting Means: Listed and labeled as suitable for use as service equipment according to UL 869A.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- 3.01.C. Verify that mounting surfaces are ready to receive system components.
- 3.01.D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- 3.02.A. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.B. Install products in accordance with manufacturer's instructions.

- 3.02.C. Provide required support and attachment in accordance with Section 26 05 29.
- 3.02.D. Mount equipment such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor, ground, or working platform.
- 3.02.E. Circuiting Requirements, in Addition to Requirements of Section 26 05 19:
  - 1. Photovoltaic DC System Conductor Color Code:
    - a. Negative Grounded System:
      - 1) Positive: Red.
      - 2) Negative/Grounded: White.
    - b. Positive Grounded System:
      - 1) Positive/Grounded: White.
      - 2) Negative: Black.
  - 2. Maintain separation of photovoltaic and non-photovoltaic circuits in accordance with NFPA 70.
- 3.02.F. Grounding and Bonding Requirements, in Addition to Requirements of Section 26 05 26:
  - 1. Ensure that there is only one AC System bonding connection between grounding system and grounded/neutral conductor, including external connections and connections internal to equipment.
- 3.02.G. Identification Requirements, in Addition to Those Specified in Section 26 05 53:
  - 1. Use identification nameplate or means of identification acceptable to authority having jurisdiction to identify the presence of multiple power sources and the location of main service disconnecting means and each photovoltaic system disconnecting means. Locate at main service disconnecting means and at each photovoltaic system disconnecting means. Verify format and descriptions with authorities having jurisdiction.
  - 2. Use identification nameplate to identify each photovoltaic system disconnecting means with text "PV SYSTEM DISCONNECT".
  - 3. Use identification nameplate or identification label to identify systems equipped with rapid shutdown and associated rapid shutdown switch(es). Format, descriptions, and locations to comply with NFPA 70 and requirements of authorities having jurisdiction.
  - 4. Use identification nameplate or identification label to identify the information required by NFPA 70 for marking of direct-current photovoltaic power sources. Locate at each DC disconnect means requiring marking.
  - 5. Use identification nameplate or identification label to identify the interactive system point of interconnection at the disconnecting means as a power source and with the rated AC output current and the nominal operating AC voltage.
  - 6. Where the inverter output connection is located in a panelboard on the opposite (load) end from the input feeder location or main circuit location in order to meet requirements of NFPA 70, use identification nameplate or identification label to identify the overcurrent device with the word message "Warning; Inverter output connection; Do not relocate this overcurrent device".
  - 7. Use warning labels to identify electrical hazards for photovoltaic system disconnecting means. Include the word message "Warning - Electric Shock Hazard; Terminals on the line and load sides may be energized in the open position" or approved equivalent.

## **Photovoltaic Collectors**

**26 31 00**

8. Use warning labels, identification nameplates or identification labels to identify electrical hazards for photovoltaic systems equipped with DC ground-fault protection in accordance with NFPA 70. Include the word message "Warning - Electric Shock Hazard; If a ground fault is indicated, normally grounded conductors may be ungrounded and energized".
9. Use wire and cable markers to identify photovoltaic system source, output, and inverter circuit conductors at all points of termination, connection, and splices.
10. Use voltage markers, identification labels, stenciled text or suitable permanent marking approved by authority having jurisdiction to identify exposed raceways, cable trays, pull boxes, junction boxes, and conduit bodies with the text "Warning: Photovoltaic Power Source" at maximum intervals of 10 feet (3 m) in accordance with NFPA 70.

### 3.03 FIELD QUALITY CONTROL

- 3.03.A. See article "SYSTEM STARTUP" below for additional requirements related to testing and inspection.
- 3.03.B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
- 3.03.C. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- 3.03.D. Repair roof or adjacent roof-mounted items damaged as a result of work of this section.

### 3.04 SYSTEM STARTUP

- 3.04.A. Obtain Owner's approval prior to performing system startup.
- 3.04.B. Grid-Tied Systems: Obtain Utility Company's approval prior to performing system startup.
- 3.04.C. Prepare and start system in accordance with manufacturer's instructions.

### 3.05 CLEANING

- 3.05.A. Clean modules using only methods recommended by manufacturer to avoid scratches and other damage. Clean exposed surfaces on other components to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.06 PROTECTION

- 3.06.A. Protect installed products from subsequent construction operations.

**END OF SECTION**

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Interior luminaires.
- 1.01.B. Emergency lighting units.
- 1.01.C. Exit signs.
- 1.01.D. Ballasts and drivers.
- 1.01.E. Lamps.

## 1.02 REFERENCE STANDARDS

- 1.02.A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products .
- 1.02.B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules .
- 1.02.C. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems .
- 1.02.E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems .
- 1.02.F. NFPA 70 - National Electrical Code .
- 1.02.G. NFPA 101 - Life Safety Code .
- 1.02.H. UL 924 - Emergency Lighting and Power Equipment .
- 1.02.I. UL 1598 - Luminaires .
- 1.02.J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products .

## 1.03 SUBMITTALS

- 1.03.A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

- 1. LED Luminaires:
  - a. Include estimated useful life, calculated based on IES LM-80 test data.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.
- 1.04.B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- 1.04.C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.05 DELIVERY, STORAGE, AND PROTECTION

- 1.05.A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting) and manufacturer's written instructions.
- 1.05.B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

**PART 2 PRODUCTS****2.01 LUMINAIRE TYPES**

- 2.01.A. Furnish products as indicated in luminaire schedule included on the drawings.

**2.02 LUMINAIRES**

- 2.02.A. Provide products that comply with requirements of NFPA 70.
- 2.02.B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- 2.02.C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.02.D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- 2.02.E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- 2.02.F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- 2.02.G. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

**2.03 EMERGENCY LIGHTING UNITS**

- 2.03.A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- 2.03.B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- 2.03.C. Battery:
  - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- 2.03.D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- 2.03.E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

**2.04 BALLASTS AND DRIVERS**

- 2.04.A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.04.B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
  - a. Wall Dimmers: See Section 26 27 26.
  - b. Daylighting Controls: See Section 26 09 23.

2.05 LAMPS

2.05.A. Lamps - General Requirements:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

**PART 3 EXECUTION**

3.01 EXAMINATION

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- 3.01.C. Verify that suitable support frames are installed where required.
- 3.01.D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- 3.01.E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- 3.02.A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- 3.02.B. Perform work in accordance with NECA 1 (general workmanship).
- 3.02.C. Install products in accordance with manufacturer's instructions.
- 3.02.D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- 3.02.E. Provide required support and attachment in accordance with Section 26 05 29.
- 3.02.F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

**3.02.G. Suspended Ceiling Mounted Luminaires:**

1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure surface-mounted luminaires to ceiling support channels or framing members or to building structure.
4. Secure pendant-mounted luminaires to building structure.
5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

**3.02.H. Suspended Luminaires:**

1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

**3.02.I. Wall-Mounted Luminaires:** Unless otherwise indicated, specified mounting heights are to center of luminaire.**3.02.J. Install accessories furnished with each luminaire.****3.02.K. Bond products and metal accessories to branch circuit equipment grounding conductor.****3.02.L. Emergency Lighting Units:**

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

**3.02.M. Install lamps in each luminaire.****3.03 FIELD QUALITY CONTROL****3.03.A. Inspect each product for damage and defects.****3.03.B. Operate each luminaire after installation and connection to verify proper operation.****3.03.C. Test self-powered exit signs, emergency lighting units and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.****3.03.D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.****3.04 ADJUSTING****3.04.A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.****3.04.B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.****3.04.C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.****3.05 CLEANING**

## **Interior Lighting**

**26 51 00**

- 3.05.A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### 3.06 PROTECTION

- 3.06.A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**



**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Exterior luminaires.
- 1.01.B. Ballasts.
- 1.01.C. Poles and accessories.

## 1.02 REFERENCE STANDARDS

- 1.02.A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signal .
- 1.02.B. IEEE C2 - National Electrical Safety Code .
- 1.02.C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products .
- 1.02.D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules .
- 1.02.E. NECA 1 - Standard for Good Workmanship in Electrical Construction .
- 1.02.F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems .
- 1.02.G. NFPA 70 - National Electrical Code .
- 1.02.H. UL 1598 - Luminaires .
- 1.02.I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products .

## 1.03 SUBMITTALS

- 1.03.A. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- 1.03.B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.

## 1.04 QUALITY ASSURANCE

- 1.04.A. Comply with requirements of NFPA 70.

**PART 2 PRODUCTS**

## 2.01 LUMINAIRE TYPES

- 2.01.A. Furnish products as indicated in luminaire schedule included on the drawings.

**2.02 LUMINAIRES**

- 2.02.A. Provide products that comply with requirements of NFPA 70.
- 2.02.B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- 2.02.C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- 2.02.D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- 2.02.E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- 2.02.F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- 2.02.G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
- 2.02.H. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.
- 2.02.I. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

**2.03 BALLASTS AND DRIVERS**

- 2.03.A. Ballasts/Drivers - General Requirements:
  - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
  - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

**2.04 POLES**

- 2.04.A. All Poles:
  - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
  - 2. Structural Design Criteria:
    - a. Comply with AASHTO LTS.
  - 3. Material: Steel, unless otherwise indicated.
  - 4. Shape: Square straight, unless otherwise indicated.
  - 5. Finish: Match luminaire finish, unless otherwise indicated.

**PART 3 EXECUTION****3.01 EXAMINATION**

- 3.01.A. Verify that field measurements are as indicated.
- 3.01.B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- 3.01.C. Verify that suitable support frames are installed where required.
- 3.01.D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- 3.01.E. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- 3.02.A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- 3.02.B. Install products in accordance with manufacturer's instructions.
- 3.02.C. Install luminaires in accordance with NECA/IESNA 501.
- 3.02.D. Provide required support and attachment in accordance with Section 26 05 29.
- 3.02.E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- 3.02.F. Suspended Luminaires:
  - 1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  - 2. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet in length, with no more than 4 feet (1.2 m) between supports.
  - 3. Install canopies tight to mounting surface.
- 3.02.G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- 3.02.H. Pole-Mounted Luminaires:
  - 1. Maintain the following minimum clearances:
    - a. Comply with IEEE C2.
  - 2. Foundation-Mounted Poles:
    - a. Install foundations plumb.
    - b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
    - c. Tighten anchor bolt nuts to manufacturer's recommended torque.
    - d. Install anchor base covers or anchor bolt covers as indicated.
  - 3. Grounding:
    - a. Bond luminaires, metal accessories, metal poles and foundation reinforcement to branch circuit equipment grounding conductor.
  - 4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- 3.02.I. Install accessories furnished with each luminaire.

**Exterior Lighting**

**26 56 00**

3.02.J. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.02.K. Install lamps in each luminaire.

3.03 PROTECTION

3.03.A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**PART 1 GENERAL**

## 1.01 SECTION INCLUDES

- 1.01.A. Communications system design requirements.
- 1.01.B. Communications pathways.
- 1.01.C. Fiber optic cable and interconnecting devices.
- 1.01.D. Communications equipment room fittings.
- 1.01.E. Communications identification.

## 1.02 REFERENCE STANDARDS

- 1.02.A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment .
- 1.02.B. ICEA S-83-596 - Indoor Optical Fiber Cables .
- 1.02.C. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements .
- 1.02.D. NFPA 70 - National Electrical Code .
- 1.02.E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices .
- 1.02.F. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers .
- 1.02.G. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set .
- 1.02.H. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards .
- 1.02.I. TIA-568.3 - Optical Fiber Cabling and Components Standard .
- 1.02.J. TIA-598 - Optical Fiber Cable Color Coding .
- 1.02.K. TIA-606 - Administration Standard for Telecommunications Infrastructure .
- 1.02.L. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises .
- 1.02.M. UL 444 - Communications Cables .
- 1.02.N. UL 1651 - Fiber Optic Cable .

## 1.03 QUALITY ASSURANCE

- 1.03.A. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  - 2. Supervisors and installers factory certified by manufacturers of products to be installed.

**PART 2 PRODUCTS**

## 2.01 SYSTEM DESIGN

- 2.01.A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and

outlets.

1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

2.01.B. System Description:

1. Building Entrance Cable: Coordinate with provider..

2.02 PATHWAYS

2.02.A. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.03 COPPER CABLE AND TERMINATIONS

2.03.A. Copper Backbone Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
2. Cable Type: TIA-568.2 Category 5e UTP (unshielded twisted pair); 24 AWG.
3. Cable Capacity: Quantity of pairs as indicated on drawings.
4. Cable Applications:
  - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
  - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

2.03.B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

2.04.A. Fiber Optic Backbone Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
3. Cable Capacity: Quantity of fibers as indicated on drawings.
4. Cable Applications:
  - a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
5. Cable Jacket Color:

- a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.
- b. Multimode Fiber (OM1/OM2): Orange.
- c. Single-Mode Fiber (OS1/OS2): Yellow.

2.04.B. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

2.05 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

2.05.A. Copper Cross-Connection Equipment:

1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
  - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
  - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
  - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
  - d. Provide incoming cable strain relief and routing guides on back of panel.

2.05.B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.

1. Do not paint over UL label.

2.06 IDENTIFICATION PRODUCTS

2.06.A. Comply with TIA-606.

**PART 3 EXECUTION**

3.01 INSTALLATION - GENERAL

- 3.01.A. Comply with Communication Service Provider requirements.
- 3.01.B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF EQUIPMENT AND CABLING

3.02.A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

## **Structured Cabling**

**27 10 00**

- 3.02.B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
  2. At Outlets - Optical Fiber: 39 inches (1000 mm).
- 3.02.C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
  2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
  3. Use T568B wiring configuration.
- 3.02.D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
  2. Support vertical cable at intervals as recommended by manufacturer.
- 3.02.E. Identification:
1. Use wire and cable markers to identify cables at each end.
  2. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

### **3.03 FIELD QUALITY CONTROL**

- 3.03.A. Comply with inspection and testing requirements of specified installation standards.
- 3.03.B. Visual Inspection:
1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- 3.03.C. Testing - Fiber Optic Cabling:
- 3.03.D. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

**END OF SECTION**

**PART 1- GENERAL**

## 1.01 SUMMARY

Work to be done includes all labor, materials equipment and services required to complete the site's cement concrete paving as indicated on the construction documents, and as specified herein. Work includes, but is not necessarily limited to the following items:

- A. Work Included: Provide exterior cement concrete paving as shown and specified for the following:
  - 1. Walkways.
  - 2. Flatwork.

## 1.02 RELATED WORK

The following items of related work are specified and included in other sections of the specifications.

- A. Section 03 11 00 - Concrete Forming
- B. Section 03 20 00 - Concrete Reinforcing
- C. Section 03 30 00 - Cast-in-Place Concrete
- D. Section 03 35 10 - Concrete Finish
- E. Section 03 39 00 - Concrete Curing
- B. Section 32 22 16 - Landscape Fine Grading

## 1.03 REFERENCES

- A. Standard Specifications - Standard Specifications of the State of New Mexico Department of Transportation, NMDOT.
- B. ASTM - American Society for Testing and Materials
- C. ACI - American Concrete Institute, Manual of Concrete Practice.

## 1.04 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the blended hydraulic cement, expansive hydraulic cement, fly ash, and other pozzolans, ground granulated blast-furnace slag.
- B. Percent Compaction: ASTM D1557, percentage of the maximum in-place dry density of the same material as determined by Soils Engineer.

## 1.05 SUBMITTALS

- A. Product Data: Manufacturers' current printed specifications and catalogue cuts of the following:
  - 1. Expansion joint filler, backer rod and bond breaker.
  - 2. Glare-reducing agent.
  - 3. Air-entrainment.

- B. Design Mixtures: For each concrete pavement mixture. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustment.
- C. Samples: 10-lb. sample of exposed aggregate. Information from aggregate supplier indicating source, type, color, and gradation of aggregate shall accompany sample.
- D. Test Data: Tests for compressive strength of Portland cement concrete paving.

#### 1.06 QUALITY ASSURANCE

- A. Certification: Certified copies of concrete design mix including colorant, air entrainment, aggregates and glare-reducing agent used.
- B. Mock-Up: One 4 ft. x 4 ft. mockup for each type of concrete finish to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
- C. Design of Concrete Mix: Employ approved commercial testing laboratory, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated as documented according to ADTM E548. Design concrete mixes as follows:
  - 1. Minimum Compressive Strength at 28 Days:
    - a. Slabs: 4000 psi
  - 2. Concrete Slump:
    - a. Minimum: Two (2) inches
    - b. Maximum: Four (4) inches
  - 3. Exposed Aggregate Surface: Concrete to receive an exposed aggregate surface shall contain a minimum of 560 lb. of ASTM C150 Type II Portland cement per cubic yard of concrete.
  - 4. Aggregates: shall not be limestone. Aggregate size shall be a minimum of 3/8 inch and a maximum of 3/4 inch.
- D. Lines and Levels: To be established by a licensed Surveyor or registered Civil Engineer.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Cement Products:
  - 1. Mixed On Site: Protect packaged materials from dampness. Segregate all stockpiled accessories to prevent contamination or accidental mixing.
  - 2. Delivered Mixes: Coordinate delivery so that mixes may be immediately poured upon arrival at site.
- B. Components and Accessories:
  - 1. Fittings: Protect from rust, soil and oil contamination at all times. Store on pallets above ground.
  - 2. Templates: Protect from damage. Test accuracy prior to each use.

#### 1.08 PROJECT/SITE CONDITIONS

- A. Water and Dust Control: Maintain control of concrete dust and water. Do not permit adjacent planting areas to be contaminated. Clean up all debris resulting from this work at the end of each day's work.
- B. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

#### 1.09 SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate items of other trades to be furnished and set in place. Coordinate proper installation of accessories embedded in the concrete and for the provision of holes, and openings necessary to the execution of the work of the trades.
- B. Attachments: Insure that such portions of their work which are embedded, built-in, attached to, supported by or covered over by the concrete work are executed by them in ample time that progress of the work is not delayed.
- C. Cutting or Patching: Perform as necessary to comply with above injunction.
- D. Reinforcing Steel: Install progressively with work of other trades. Coordinate each other's schedules so as to avoid disturbing or moving work already installed by one trade to admit the work of another. Each trade shall be entirely responsible for proper installation and securing of their accessories and components during placing of concrete.

## PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. Cement: ASTM C150, Type V Portland Cement. Use only one brand and type for entire job.
- B. Aggregate Base Course for Exposed Aggregate: Shall consist of crushed stone or crushed gravel: free of clay, silt, organic matter or deleterious materials.
- C. Water: Clean, potable concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter. As available from Owner. Transport as required.
- D. Color Admixture: L.M. Socofield CO "Chromix" or Redwood Industries "Davis Colors." Color as selected by Landscape Architect.
- E. Air Entrainment: ASTM C260.
- F. Expansion Joint Materials:
  - 1. Premolded Joint Filler: "Sonoflex-F", a closed cell plastic joint filler by Sonneborn.
  - 2. Sealant Backer Rod:
    - a. Type: Compressible polyethylene foam rod or other flexible, permanent, durable non-absorptive material as recommended by joint sealer manufacturer for compatibility with joint sealer.

- b. Product: "Sonofoam Backer-Rod" as manufactured by Sonneborn Building Products, (612) 835-3434 or (415) 889-9899, or approved equal.
- 3. Joint Sealer:
  - a. Type: Multi-component polyurethane sealant, FS TT-S-00227, Class A, type as recommended by manufacturer for exterior locations subject to foot traffic.
  - b. Product: ASTM C290, non-slag sealant "Dynatred" by Pecora Corporation, (214) 278-8158, or "Sonolastic Sealant Two-Part" by Sonneborn, (612) 835-3434, or approved equal.
  - c. Color: to match concrete color.
- 4. Bond Breaker: Polyethylene tape as recommended by joint sealant manufacturer where bond to joint filler must be avoided for proper performance of joint sealer.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Verification of Conditions: Verify that subgrade has been rough graded for concrete paving and accepted under another Section prior to commencement of work.
- B. Surface Drainage:
  - 1. Report in writing conflicts discovered on the site or prior work done by others, which would prevent drainage.
  - 2. No "birdbaths" or other surface irregularities will be permitted. Properly correct irregularities.

### 3.02 PREPARATION

- A. Templates: Use templates for all anchor plates, bolts, inserts and other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.
- B. Aggregate Base Course: Compact base course to thicknesses shown on Drawings to 95% compaction.

### 3.03 INSTALLATION

- A. Formwork:
  - 1. Construct forms accurately to dimensions, plumb and true to line and grade. Use forms that are substantial, mortar tight and braced so as to maintain position and shape during placing of reinforcing and concrete. concrete work showing wavy slab surfaces will be rejected.
  - 2. Carefully verify and check all forms for alignment and level as the work proceeds. Promptly make all needed adjustments or additional bracing.
  - 3. Extend wood forms for all exposed concrete at least 6 in. below finish grade.
  - 4. Construct forms and assemble them in such a manner that joints occur at accepted locations.
- B. Edges: Except where tooled corners are indicated, provide all exposed concrete finish work with smooth, even surfaces of dense concrete with clean sharp arises and outside corners.
- C. Recesses and Openings: As shown on the Drawings or as directed at the site.

D. Reinforcements:

1. Supports: Hang footing bars from forms. Support with suitable metal cradles.
2. Placement: Clean, bend and place reinforcements per ACI Manual of Concrete Practice. Accurately and securely fasten to prevent displacement before or during pouring.
3. Reinforcement Splices: 24 bar diameters minimum, except as otherwise noted.

E. Tolerances: No more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes.

3.04 FINISHES

A. Finish:

1. As noted on plans.
2. Seeded Exposed Aggregate Finish: Immediately after floating, broadcast a single layer of aggregate uniformly onto the pavement surface. Tamp seeded aggregate into plastic concrete, and float to entirely embed aggregate with mortar cover of 1/16 inch.
  - a. Prior to the concrete placing operation, all select seeding aggregate shall be thoroughly washed so that it is free of all dust, dirt, and clay particles. The aggregate shall be in a damp condition but without free surface water at the time of seeding application. There shall be sufficient select aggregate on hand to complete the seeding once it has commenced.
  - b. The seeding operation shall start immediately after the placement of concrete as described above. The select aggregate shall be carefully and uniformly seeded by suitable means so that the entire surface is completely covered with one layer of stone. Stacked stones and flat and slivery particles shall be removed at this time. The aggregate shall be embedded by suitable means. Care shall be taken to not over-embed and deform the surface. Under no circumstances shall areas lacking sufficient mortar be filled with small quantities of the base concrete mix.
  - c. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom.
  - d. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
  - e. Work shall be planned so that the concrete placing and aggregate seeding procedures are coordinated with the capabilities of the washing and brushing crew.

3.05 JOINTS

A. Expansion Joints:

1. Locations: Provide joints at locations and intervals shown on the Drawings, and where concrete paving abuts buildings, curbs, or other structures and slabs, or at min. 30 ft on center. .
2. Placement: Place joint materials with top edge 1/2 in. below the paved surface. Securely hold in place to prevent movement.
3. Forming: Form joints and other edges in the fresh concrete using an edging tool to provide a smooth uniform impression. (Strike all edges before and after brooming.)

4. Sealing: After the curing period, carefully clean expansion joints and fill with joint compound to 1/4 in. below adjacent paved surface. Do not permit spillage on paved surfaces or overflow from joint.

B. Control Joints:

1. Form in fresh concrete using a jointer to cut the groove so that a smooth uniform impression is obtained. (Strike all joints before and after brooming.)
2. Perform in a continuous manner, avoiding misalignment. Redo all crooked or misaligned joints at no cost to Owner.

3.06 PROTECTION AND CURING

A. Protection:

1. Protect concrete against frost, rapid drying and damage by rain.
2. Keep moist for at least 7 days after installation. Secure approval of proposed method. During this period, maintain concrete above 70 degrees F. for at least 3 days or above 50 degrees F. for at least 5 days.

B. Spraying: Spray concrete during the curing period as frequently as drying conditions may require.

C. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice.

D. Damage and Defacement: Protect concrete work against damage and defacement during subsequent construction operations until Final Acceptance.

3.07 FIELD QUALITY CONTROL

A. Samples: Owner will select a qualified testing agency to take samples for testing during the course of the work as considered necessary.

B. Cost of Testing: Paid for by Contractor.

C. Notification: Notify the testing agency in sufficient time to allow taking of samples at time of pour.

D. Rejected Materials: Remove and legally dispose of off-site any concrete below specified strength.

E. Cost of Removal and Retesting: Pay for costs of removal of rejected concrete, and its replacement with concrete of specified strength and retesting.

3.08 CLEANING AND PATCHING

A. Cleaning:

1. Removal: Remove projecting fins, bolts, wire, nails, etc., not necessary for the work, or cut them back 1 in. from the surface and patch in an inconspicuous manner.
2. VOIDS: Fill holes with a 1:3 cement and sand mortar with the same color as the adjoining concrete. Mix and place the mortar as dry as possible and finish flush with the adjacent surface.

B. Patching:

1. Corrective Patching: Correct defects in concrete work. Chip voids to a depth of at least 1 in. with the edges perpendicular to the surface and parallel to form markings. Fill voids, surface irregularities, or honeycombing by patching or rubbing. Insure that concrete surfaces so repaired duplicate the appearance of the unpatched work.
2. Defective Work: Remove in its entirety and replace all defective concrete work which after corrective patching, rubbing, etc., fails to duplicate the appearance of unpatched work and/or conform to the standards set forth in these Specifications.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY:

## A. WORK INCLUDED:

1. The work of this section consists of constructing universally accessible crusher fines paving on a prepared subgrade.

## B. RELATED WORK:

1. Section 32 22 16 Fine Grading

## 1.02 DEFINITIONS:

## 1.03 SUBMITTALS:

A. SUBMITTAL PROCEDURE: Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures

B. PRODUCT DATA: Submit sieve analysis of proposed material to ensure it meets grading requirements. Sieve analysis and color of crushed aggregate screenings shall be approved in writing by the Landscape Architect before any material is delivered to the project site.

C. SAMPLES: Submit sample of crushed aggregate screenings for approval to ensure color will be compatible with project site. Sample shall be sufficiently large to illustrate clearly the functional characteristics, and full range of color and texture of the material.

D. Sieve analysis and color of crushed aggregate screenings shall be approved in writing by the Landscape Architect before any material is delivered to the project site.

E. MOCK-UP: Construct a 6ft.x6ft mock-up of crusher fines paving section using all specified materials and edging. Mockup may be constructed as part of the work. Unapproved work will be removed and replaced at the Contractor's expense.

1.04 PROJECT CONDITIONS: Use lightweight hauling equipment. Exercise care in using equipment, avoiding damage to adjacent plant and tree growth, and adjacent site improvements.

**PART 2 - PRODUCTS**

## 2.01 CRUSHED AGGREGATE SCREENINGS:

A. Clean, hard, durable particles or fragments of 1/4" minus select crushed stone. Fines shall be evenly mixed throughout the aggregate. When produced from gravel, 50 percent, by weight, of the material retained on a No. 4 sieve shall have one fractured face. Color to be approved by Landscape Architect.

B. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77.

- C. The portion passing a No. 40 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89-81 and AASHTO T90-81, respectively.
- D. The crushed aggregate screenings shall be free from clay lumps, vegetable matter, and deleterious material.

2.02 GRADING REQUIREMENTS:

**Percentage of Weight Passing a Square Mesh Sieve  
AASHTO T11-82 and T27-82**

Sieve Designation	Percentage Passing	Sieve Designation	Passing
3/8-inch	100	No. 30	40-50
No. 4	95-100	No. 50	25-35
No. 8	75-80	No. 100	20-25
No. 16	55-65	No. 200	5-15

2.03 MISCELLANEOUS:

- A. Crusher fines material. Install as noted on the plans.
  1. Color: brown or to match Gravel A, Gravel B, Cobble (Section 32 90 00 Planting), and existing crusher fines. Acceptable product for bidding purposes: "Mountainair Brown Crusher Fines": Restoration Group, PO Box 27333, Albuquerque, NM 87125, (505)-294-1470; or approved equal.

**PART 3 – EXECUTION**

- 3.01 SITE CLEARING: Refer to Section 02 41 00
- 3.02 GROUND SURFACE PREPARATION: Strip existing soil as needed within the designated crusher fines paving areas as shown on drawings to allow 4" lay of crusher fines paving.
- 3.03 SUBGRADE PREPARATION: Prior to placing crushed aggregate screenings, shape, fill, grade, and compact the subgrade.
- 3.04 PLACING CRUSHED AGGREGATE SCREENINGS: After pre-blending, place the crusher fines paving on prepared subgrade and rake smooth to desired grade and cross section. Place to avoid segregation, in one layer of 4 inches minimum thickness. Do not apply crusher fines paving deeper than 4 inches in one lift. Ex: For a 6 inch thickness, apply crusher fines paving in two 3 inch lifts.
- 3.05 WATERING: Water heavily to achieve full depth moisture penetration of the crusher fines paving. Watering is best accomplished using a spray nozzle set to a coarse spray; pressure should not disturb the leveled surface. Apply to achieve full depth moisture penetration without causing over-saturation of the mix. Test for depth of water penetration by random inspection of paving cores. After inspection, fill core holes with material removed, smooth and hand tamp to match adjoining trail surface grade. Let watered mix stand 6-24 hours until surface water is no longer present; the mix should then be moist but not wet.
- 3.06 COMPACTION: While the crusher fines paving is still thoroughly moist, roll with a heavy lawn roller (minimum 225 pounds and maximum 30 inch width), to achieve finish grade and initial compaction. Hand tamp edges around curbs, benches, signposts, etc. Use a heavy (1 ton minimum) small rider, after having initially used the lawn roller, to obtain the desired final dense, smooth, uniform texture. Keep compacter 5 ft. away from newly planted trees. Do not use wackers or vibratory rollers.

3.07 INSPECTION:

- A. Finished surface shall be smooth, uniform and solid, with no evidence of chipping or cracking. Dried, compacted material shall be firm all the way through with no spongy areas. Loose material shall not be present on the surface initially. At the 11 month inspection, a minor amount of loose material is expected on the surface.
- B. Any significant irregularities shall be smoothed out prior to final acceptance of the work. Smoothing shall be accomplished by rewetting/saturating rough areas thoroughly, and then rolling the surface again with a heavy roller (1000-1500 lbs powered walk-behind or small rider). Wackers are not recommended.
- C. Final thickness of completed paving shall not vary more than 1/2 inch from dimension indicated. Measurements may be taken by means of test holes taken at random in finished surface. Correct any variations in the thickness beyond the allowable 1/2 inch by repeating the procedures listed under Sections 3.04-3.06 above.
- D. Final width of completed paving shall not vary more than 1/2 inch from typical dimensions indicated. Measurements may be taken at random cross sections in the finished surface.

END OF SECTION

**PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Contract 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. Unitary synthetic poured rubber seamless surface.
  - 2. Engineered Wood Fiber surface.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 45 23 – Testing and Inspection Services
  - 3. Section 01 60 00 – Product Requirements
  - 4. Section 03 30 00 – Cast-In-Place Concrete
  - 5. Section 02 10 00 – Earth Moving
  - 6. Section 32 15 00 – Crusher Fines Paving
  - 7. Section 32 13 13 – Concrete Paving

## 1.3 DEFINITIONS

- A. CPSC: U.S. Consumer Products Safety Commission
- B. Critical Height: Standard measure of shock attenuation. According to Consumer Products Safety Commission (CPSC) No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur." Maximum height of fall from play equipment to the ground.
- C. SBR: Styrene-butadiene rubber.
- D. EPDM: Ethylene propylene diene monomer (M-class) rubber.
- E. TPV: Thermoplastic Vulcanized Elastomer. Developed using resin and synthetic rubber with higher UV stabilization.
- F. EWF: Engineered Wood Fiber; natural processed wood product manufactured expressly for use as a playground surface.
- G. IPEMA: International Play Equipment Manufacturer's Association.

## 1.4 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation under and around Playground Equipment: According to ASTM F 1292.
- B. Accessibility of Surface Systems: According to ASTM F 1951.
- C. Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers: According to ASTM D 624.
- D. Flammability of Finished Textile Floor Covering Material: According to ASTM D 2859.
- E. Measuring Surface Frictional Properties: According to ASTM E 303.
- F. Minimum Characteristics for EWF Surfaces: According to ASTM F 2075.

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For each playground surface system, include materials, plans, cross sections, drainage, installation, penetration details, and edge termination including loose fill edgings. Include patterns made by varying colors of surfacing.
- C. Samples for Initial Selection: For each type of playground surface system indicated.
  - 1. Include similar samples of playground surface system and accessories involving color selection.
- D. Samples for Verification: For each type of playground surface system indicated.
  - 1. Minimum 1-quart loose-fill surface sealed in a container.
  - 2. Minimum four-inch (4") diameter sample of synthetic rubber seamless surface for each color.
- E. Product Schedule: For playground surface systems. Use same designations indicated on Contract Drawings.
- F. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
  - 1. Extent of surface systems and use zones for equipment.
  - 2. Critical heights for playground surfaces and fall heights for equipment.
- G. Qualification Data: For qualified Installer and testing agency.
- H. Material Certificates: For each type of playground surface system, from manufacturer.
- I. Material Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each playground surface system.
- J. Product Certificates: For each type of unitary synthetic playground surface system, from manufacturer, including IPEMA
- K. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each unitary synthetic playground surface system.
- L. Warranty: Sample of special warranty.
- M. Maintenance Data: Maintenance manuals to include manufacturer's data on maintenance of playground surface system.

## 1.6 QUALITY CONTROL

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer. Installer's Site Superintendent is to have a minimum of five (5) years of experience installing similar materials on similarly scaled projects and meet current ASTM F1292 Test Criteria.
- B. Source Limitations: Obtain playground surface system materials, including primers and binders, from single source from single manufacturer.
  - 1. Provide secondary materials including adhesives, primers, and geosynthetics, and repair materials of type and from source recommended by manufacturer of playground surface system materials.
- C. Standards and Guidelines: Comply with CPSC No. 325, "Handbook for Public Playground Safety"; IPEMA-certified product, ASTM F 1292; and ASTM F 1487.
- D. Color: All colors of surfacing shall be as specified in the Contract Documents. Colors shall be uniform in appearance and shall not be blended or mixed with other colors.

## 1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit playground surface system installation to be performed according to manufacturers' written instructions and warranty requirements.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground surface system that fail in materials or workmanship within the specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Reduction in impact attenuation.
    - b. Deterioration of surface and other materials beyond normal weathering.
    - c. Warranty Period: Five (5) years from date of Substantial Completion

## PART 2 - PRODUCTS

### 2.1 UNITARY SYNTHETIC DUAL-DENSITY SEAMLESS SURFACE

- A. Surface System: Poured-in-place, two-layer system with wearing course over cushion course. Provide manufacturer's standard thickness for each layer as required for overall thickness indicated, IPEMA- certified product or tested for impact attenuation according to ASTM F 1292 and for accessibility according to ASTM F 1951.
1. Products: Subject to compliance with requirements, provide the following or approved equal.
    - a. FlexGround: EnduraFlex
    - b. FlexGround: Xtreme Playground Surfacing (for area adjacent to carousel)
  2. Wearing Course: Formulation of 1-4mm Thermoplastic Vulcanized (TPV) virgin angular colored rubber granules and binder applied to a minimum thickness of ½" over cushion layer.
  3. Cushion Course: Manufacturer's standard formulation of 100% recycled SBR particles and binder, site mixed and applied.
  4. Binder:
    - a. Wearing Course: Aliphatic Urethane binder (110 pounds of TPV to 22 pounds of binder).
    - b. Cushion Course: Aromatic Urethane binder (100 pounds of SBR rubber buffings to 12 pounds of binder).
  5. Critical Height: As indicated on Contract Drawings or as per Play Equipment Manufacturer's Installation Manual for each piece of equipment.
  6. Overall Thickness: Not less than as indicated on Contract Drawings.
  7. Primer/Adhesive: Manufacturer's standard primer and weather-resistant, moisture-cured polyurethane adhesive suitable for unit, substrate, and location indicated.
  8. Sealant (adjacent to carousel): FlexGrout, thixotropic aliphatic thermoplastic paste applied at 1 gallon per 40 square feet over wear course layer rendering it nonporous. A water-based aliphatic composite color seal should be applied at 200 sq. ft. per gallon and spread evenly to cover entire surface. Acrylic and latex based coatings are not acceptable.
  8. Wearing Course Color(s): As indicated on Contract Drawings.
- B. Leveling and Patching Material for Use on Concrete Substrate Below Synthetic Play Surface: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by playground surface system manufacturer.

### 2.2 ENGINEERED WOOD FIBER SURFACE

- A. Engineered Wood Fiber:

1. Wood fibers containing no bark, leaves, twigs, or foreign or toxic materials according to ASTM F 2075-15.
2. Certified to be in conformance with IPEMA materials standards for EWF.
3. Products: Subject to compliance with requirements, provide one of the following or an approved equal.
  - a. Fibar Group LLC (The); Fibar Engineered Wood Fiber.
  - b. GameTime, a PlayCore, Inc. company; GT Impax Fiber.
  - c. SofSolutions Inc.; SofFall.
  - d. Zeager Bros., Inc.; Wood Carpet.
4. Product Sieve Analysis:

<u>Sieve Size</u>	<u>Percent Passing</u>
3/4 inch	100
3/8 inch	91.2
No. 16	7.8

5. Critical Height: As per Contract Drawings.
6. Uncompressed Material Depth: Not less than as indicated on the Contract Drawings.

## 2.3 ACCESSORIES

- A. Stabilizing Mats: Manufacturer's standard, water-permeable PVC or rubber mats tested for impact attenuation according to ASTM F 1292, and rated for use in the following locations, with anchoring system designed to anchor mat securely to subgrade through engineered wood:
  1. Under and in front of slide exits and under swings.
  2. Size: thirty-six-inches (36" by thirty-six-inches (36").

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content, subgrade and substrate conditions, drainage, and other conditions affecting performance of the Work.
- B. Surface Substrates: Verify that substrates are satisfactory for unitary playground surface system installation and that substrate surfaces are dry, cured, and uniformly level or sloped to drain within recommended tolerances according to playground surface system manufacturer's written requirements for cross-section profile.
  1. Concrete Substrates: Verify that substrates are dry, free from surface defects, and free of laitance, glaze, efflorescence, curing compounds, form-release agents, hardeners, dust, dirt, loose particles, grease, oil, and other contaminants incompatible with playground surface system or that may interfere with adhesive bond. Determine adhesion, dryness, and acidity characteristics by performing procedures recommended in writing by playground surface system manufacturer.
  2. Gravel Substrate: Three quarter-inch (3/4") angular gravel drainage stone, clean and washed, compacted to 95% Proctor density; depth as indicated on Contract Drawings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Prepare substrates to receive surfacing products according to playground surface system manufacturer's written instructions. Verify that substrates are sound and without high spots, ridges, holes, and depressions.
  
- B. Concrete Substrates: Provide sound supportive surface for playground surface system.
  - 1. Repair unsatisfactory surfaces and fill holes and depressions.
  - 2. Mechanically scarify or otherwise prepare concrete substrates to achieve recommended degree of roughness.
  - 3. Saw cut concrete for terminal edges of playground surface systems as indicated.
  - 4. Treat control joints and other nonmoving substrate cracks to prevent telegraphing through playground surface system.
  
- C. Gravel Substrates: Provide sound supportive surface for playground surface system.
  - 1. Gravel substrate is to be an approved substrate as stated by the manufacturer of the final play surface. Provide documentation from manufacturer prior to construction of play surface.
  - 2. Edge boundary structures and drainage systems are to be installed prior to placement of gravel substrate.
  - 3. Place and consolidate gravel substrate within edge boundary structures shown on Contract Drawings. Depth as shown on Contract Drawings.
  - 4. Smooth gravel surface by raking. Obtain Project Manager's approval prior to placing surface.
  - 5. Repair any damage to gravel surface from foot traffic prior to placing final surface.

### 3.3 INSTALLATION, GENERAL

- A. General: Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.

### 3.4 INSTALLATION OF SEAMLESS PLAYGROUND SURFACE SYSTEMS

- A. Seamless Surface: Mix and apply components of playground surface system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface and impact-attenuating system of total thickness indicated.
  - 1. Substrate Primer: Apply over prepared substrate at manufacturer's standard spreading rate for type of substrate.
  - 2. Poured Cushion Course: Spread evenly over primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.
  - 3. Wearing Course: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and, except where color changes, with minimal cold joints. Finish surface to produce manufacturer's standard wearing-surface texture.
    - a. Where colored patterns or graphics are indicated, place adjacent colored material as soon as placed colored material is sufficiently cured, using primer or adhesive if required by manufacturer's written instructions.
  - 4. Edge Treatment: Fully adhere surface system to edges and substrate while maintaining full thickness of surface system to comply with safety performance and accessibility requirements, as indicated on Contract Drawings.

### 3.5 INSTALLATION OF ENGINEERED WOOD FIBER PLAYGROUND SURFACE SYSTEMS

- A. Engineered Wood Fiber: Place playground surface system materials including manufacturer's standard amount of excess material for compacting naturally with time to required depths after installation of playground equipment support posts and foundations in conformance with ASTM F 1292.
  - 1. Stabilizing Mats: Coordinate installation of mats and mat anchoring system with placement of Engineered Wood Fiber. Under and in front of slide exits, and under swings.
- B. Finish Grading: Hand rake to a smooth finished surface and to required elevations, graded according to manufacturer's standard specification for material consistency for playground surfaces and for accessibility according to ASTM F 1951.

### 3.6 CLEANING

- A. Perform cleaning during installation of the Work and upon completion of the Work. Remove all excess materials, debris, and equipment from site. Repair any damage resulting from installation of surfacing.

### 3.7 PROTECTION

- A. Prevent vehicular traffic in total and pedestrian traffic over play surfacing for not less than forty-eight (48) hours after installation or per manufacturer's recommendations, whichever is longer.
- B. Protect play areas from construction debris, including dust, dirt, runoff, trash and equipment following installation for the duration of construction.

END OF SECTION

**PART I – GENERAL**

## 1.01 SUMMARY

Work to be performed under this section consists of furnishing all required labor, materials equipment, implements, parts, supplies and services necessary for the colored / texture surfacing and striping for the post-tensioned concrete courts (tennis, pickleball, basketball) and sand play surfaces (volleyball) as indicated on the construction documents, and as specified herein. This section is a part of the entire set of Contract Documents and shall be coordinated with the applicable provisions of the other parts. Work includes, but is not necessarily limited to the following items:

- A. Work Included: Provide acrylic color surfacing and striping for post-tensioned concrete courts as shown and specified. Provide sand surface for volleyball court and adjacent area as shown and specified

## 1.02 RELATED WORK

The following items of related work are specified and included in other sections of the specifications.

- A. Section 03 38 00 – Post-Tensioned Concrete
- B. Section 07 90 00 – Joint Sealants
- C. Section 11 68 23 – Exterior Court Athletic Equipment
- B. Section 32 31 13 – Chain Link Fences and Gates

## 1.03 QUALITY ASSURANCE

- A. Work is to be performed by contractor with a minimum of six (6) similar, successfully completed projects within the past two (2) years. Contractor will be a builder member of the American Sports Builders Association and will have a Certified Tennis Court Builder on staff. The color surfacing foreman will be a Certified Installer of the color coating manufacturer. All surface coatings shall be supplied from a single manufacturer.

## 1.04 REFERENCES

- A. Post Tensioning Institute (PTI)
- B. American Concrete Institute (ACI)
- C. American Society for Testing and Materials (ASTM)
- D. United States Basketball Association (USBA)
- E. United States Tennis Association (USTA)
- F. United States Pickleball Association (USAPA)
- G. American Sports Builders Association (ASBA)
- H. United States of America Volleyball (USAV)

## 1.05 SUBMITTALS

- A. Manufacturer specifications for components, color chart and installation instructions.
- B. Authorized Applicator Certificate from the surface system manufacturer.
- C. ITF Pace Classification Certificate for the system to be installed.

- D. Reference list from the installer of at least 6 projects of similar scope completed in the past 2 years.
- E. Current Material Data Safety Sheets (MSDS).
- F. Product Substitution: If other than the product specified, the contractor shall submit at least 7 days prior to bid date a complete type written list of proposed substitutions with enough data, drawings, samples and literature to demonstrate to the architect/engineer's satisfaction that the proposed substitution is of equal quality and utility to that originally specified. Information must include a QUV test of at least 1000 hours illustrating the UV stability of the system. Test method similar to ASTM G154. The color system shall have an ITF pace rating in Category 3 (medium). Under no circumstances will systems from multiple manufacturers be considered.

#### 1.06 LIMITATIONS FOR APPLICATION OF SURFACING

- A. Application temperatures as per manufacturer's recommendations. Application temperature shall be a minimum of 50°F in direct sunlight with no shade. Do not apply coatings if temperatures are at or below 50°F at night. The surface temperature shall not exceed 140°F. Do not apply when surface is wet or if rain is imminent or forecasted. Keep all coatings from freezing. Do not store in direct sunlight for an extended period. Containers shall be closed when not in use.

#### 1.07 WARRANTY

- A. Contractor shall guaranty that all materials and workmanship incorporated into the project will be of new quality and free from defects, and that all work will be installed as specified and drawn, and in conformance with the project documents. Any material or workmanship found to be defective or out of specification will be replaced, at the sole cost of the contractor, for a period of one (1) year from date of acceptance.

### PART 2 – PRODUCTS

#### 2.01 MANUFACTURER

- A. Court Color Surfacing: RSS Color Coatings - 775 Canosa Court, Denver, CO 80204 (800) 738-8106 or approved equal.

#### 2.02 ADHESIVE PRIMERS AND SEALERS

- A. Adhesion Primers - RSS Concrete Sealer and RSS Latex Concrete Primer- RSS Concrete Sealer is undiluted and RSS Latex Concrete Primer is mixed 1 gallon of RSS Latex to 4 gallons of clean potable water (1:4).

#### 2.03 PATCHING MIX

- A. Patching Mix - RSS Rhino Patch Binder- is mixed 3 gallons of RSS Latex Patch Binder, 1 gallon of Portland Cement Type 1 or 2 and 100 lbs. of Silica Sand.

#### 2.04 CRACK SEAL

- A. Crack Seal - RSS Epoxy Crack Seal or Rhino Crack Filler. The RSS Epoxy Crack Seal is mixed as a two (2) Parts Component A and one (1) Part Component B. Rhino Crack Filler is mixed 3 gallons of RSS Latex Patch Binder, 1 gallon of Portland Type 1 or 2 Cement and 100 lbs. of silica sand.

2.05 ACRYLIC RESURFACER

- A. Acrylic Resurfacer - RSS Acrylic Resurfacer. RSS Acrylic Resurfacer is mixed with 55 gallons of RSS Acrylic Resurfacer, 400 to 500 lbs. of Washed White Silica Sand and 20-28 gallons of clean potable water.

2.06 ACRYLIC COLOR PLAY SURFACE

- A. Acrylic Color Play Surface- The RSS Acrylic Color to provide an ITF Pace Rating Category 3 (medium) tennis surface which consists of the following mix - 55 gallons of RSS Acrylics Color Concentrate, 400 lbs. of Washed White Silica Sand (40-70 mesh) and 20 to 28 gallons of clean potable water.

2.07 TAPE SEALER AND TEXTURED LINE PAINT

- A. Play Lines- RSS Tape Sealer and RSS Textured Line Paint. Lines shall be accurately located and marked. Lines shall be primed first with (1) coat of RSS Tape Sealer to ensure crisp edges. Playing lines shall be (2") wide and painted using RSS Textured White Line Paint.

2.08 VOLLEYBALL SAND

- A. Sand Volleyball and Playground Sand shall be clean, washed, and screened for use in sand volleyball courts and children's playgrounds. Acceptable product for bidding purposes: "Playground Sand": Albert Montano Sand and Gravel and Septic Tanks, 4519 Agua Fria St. Santa Fe, NM, (505) 989-7921; or approved equal.
- B. Grading Requirements:

**Percentage of Weight Passing a Square Mesh Sieve**  
**ASTM C138 ASTM C 897**

Sieve Designation	Percentage Passing	Sieve Designation	Passing
No. 4	100	No. 50	10-30
No. 8	90-100	No. 100	0-5
No. 16	80-100	No. 200	0-3
No. 30	35-70		

PART 3 - EXECUTION

3.01 SURFACE PERPARATION

- A. Prior to the surfacing applications, the courts shall be thoroughly cleaned by pressure washing to remove all dirt and debris.
- B. Cracks and rock holes (if applicable) will be cleaned of debris and filled full depth and level with the playing surface using RSS Epoxy Crack Seal or RSS Rhino Crack Filler. RSS Rhino Crack Filler shall be ground smooth to court surface prior to the application of RSS Acrylic Resurfacer. RSS Epoxy Crack Seal shall have silica sand broadcast into wet mixture to provide texture.
- C. Flood the courts and after a (1) hour wait in direct sunlight with temperatures seventy (70) degrees and rising. Any areas of standing water remaining that cover a US Nickle shall be patched with RSS Rhino Patch Binder. Areas to receive patches shall be primed first with a mix of Water and RSS Latex Concrete Primer mixed at a 4:1 ratio. Reflood patches to ensure

compliance. Light misting with water on the edges to feather out is allowed as needed to maintain workability.

### 3.02 CONCRETE SEALER AND LATEX CONCRETE PRIMER

- A. One (1) coat of RSS Concrete Sealer shall be applied over the concrete with a sprayer. When the sealer coat has dried and cured apply one (1) coat of RSS Latex Concrete Primer using 1 gallon of Latex mixed with 4 gallons of clean potable water. Apply with a rubber bladed squeegee to aid in the mechanical bonding of the RSS Coating System to the concrete substrate. Apply the first coat of RSS Acrylic Resurfacer while Latex Primer Coat is tacky to the touch. Care should be taken not to leave any puddles of material.

### 3.03 ACRYLIC RESURFACER

- A. In order to provide a smooth underlayment for RSS Color Coating Systems one (1) coat of RSS Acrylic Resurfacer shall be applied over each court per the mix ratio stated in Section 2.05. The mixture will be agitated in a paddled mortar mixer or in drums to provide a consistent and homogeneous solution. The acrylic resurfacer coat shall provide a uniform surface with no ridges.

### 3.04 ACRYLIC COLOR

- A. Two (2) coats of color mixture (3 coats may be required depending on concrete texture) will be agitated in a paddled mortar mixer or drum to provide a consistent and homogeneous solution. The mixture will be applied over the entire court surface using a rubber-tipped squeegee in two separate applications with enough drying time allowed between coats per mix ratio stated in Section 2.06. The finished color surface is to be free of ridges and shall have a uniform appearance.

### 3.05 PLAYING LINES

- A. All lines will be painted first with (1) coat of RSS Tape Sealer to provide a uniform crisp line. Once the Tape Sealer has dried apply one (1) coat of RSS White Textured Line Paint two inches (2") wide which shall be accurately located and marked by snapping a chalk line and placing (1"+) masking tape using a line taper. For tennis courts, all lines shall conform to USTA Specifications for doubles play. For pickleball courts, all lines shall conform to USAPA Specifications for courts. For basketball courts, all lines shall conform to NFHS Specifications for high school courts (84' x 50').

### 3.06 PROTECTION

- A. Erect temporary barriers to protect coatings during drying and curing if needed.
- B. Lock gates to prevent use or entry until acceptance by the owner's representative.

### 3.07 CLEAN UP

- A. Remove all containers, surplus materials and debris. Dispose of materials in accordance with local, state and federal regulations.
- B. Leave site in a clean orderly condition.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Section Includes:
  - 1. Chain link fences, gates, and components as indicated.
  - 2. PVC-coated fence framing system and PVC-coated chain link fence fabric as indicated.
- B. Related Requirements:
  - 1. Division 01 - General Requirements.

## 1.02 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit plans and details indicating extent of fences, locations of gates, and details of attachment and footings. Indicate means and methods for surface preparation and finishing.
- B. Product Data: Submit catalog cutsheets and manufacturer's detail specifications for all materials and equipment to be incorporated into the work.
- C. Warranty: PVC coated chain link fence systems supplied with minimum fifteen (15) year factory warranty.

## 1.03 QUALITY ASSURANCE

- A. Chain Link Fence Manufacturers Institute: CLFMI Product Manual.
- B. ASTM A123: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A392: Specification for Zinc-Coated Steel Chain Link Fence Fabric. ASTM F567: Practice for Installation of Chain Link Fence.
- E. ASTM F626: Specification for Fence Fittings.
- F. ASTM F668: Specification for Poly (Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.
- G. ASTM F900: Specification for Industrial and Commercial Swing Gates.
- H. ASTM F969: Standard Practice for Construction of Chain-Link Tennis Court Fence
- I. ASTM F1083: Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- J. ASTM F1184: Specification for Industrial and Commercial Horizontal Slide Gates.
- K. ASTM F1553: Guide for Specifying Chain Link Fence.

**PART 2 - PRODUCTS**

## 2.01 MATERIALS

- A. Concrete Materials and Properties: Comply with requirements of Section 03 30 00 - Cast-in-Place Concrete to provide normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3,000 psi, 4-inch slump, and one inch maximum size aggregate.
- B. Chain Link Fence Fabric: Conforming to ASTM A 392, Class C2 zinc coating, 2.00 ounces minimum per square foot of uncoated wire surface, hot-dipped galvanized after weaving, and top and bottom edges knuckled.
  - 1. Fabric for perimeter fencing and interior fencing shall be 9 gauge woven wire with 2 inch mesh, unless otherwise specified.
  - 2. For perimeter fences 16 feet high, the upper 8 feet of fabric may be 11 gauge.
  - 3. Fences 12 feet high or less shall be furnished with single width fabric.

4. Installed fence fabric shall be free from barbs, icicles, or other projections and installed fence fabric with such defects will be deemed defective Work.
- C. PVC Coated Chain Link Fence Fabric: 6 mil (0.15 mm) to 10 mil (0.25 mm) thickness, thermally fused to zinc-coated steel core wire: Conforming to ASTM A 668 Class 2b, Core wire tensile strength 75,000 psi (517 MPa), and top and bottom edges knuckled.
  1. Fabric for fencing of tennis courts and pickleball courts shall be full height, single width, 8 gauge by 1-3/4 inches mesh chain link fabric, with a core wire diameter of 9 gauge and a break load of 1.290 lbf.
  2. Color: Brown, per ASTM F934.
  3. Selvage for fabric mesh is knuckle finish top and bottom, K & K.
  4. Fences 12 feet high or less shall be furnished with single width fabric.
  5. Installed fence fabric shall be free from barbs, icicles, or other projections and installed fence fabric with such defects will be deemed defective Work.
- D. Posts, Top Rails, Brace Rails, Intermediate Rails, Bottom Rails, and Gate Frames: Standard weight, galvanized, welded or seamless steel pipe conforming to ASTM F 1083, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings.
- E. PVC Coated Posts, Top Rails, Brace Rails, Intermediate Rails, Bottom Rails, and Gate Frames: Standard weight welded or seamless steel pipe conforming to ASTM F 1083, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings. PVC- coated finish to be applied in accordance with ASTM F1043, minimum 10 mils (0.253 – 0.38 mm) in Brown color to match PVC coated fabric.
- F. Post Caps: Malleable iron, ASTM F 626, , designed to fit snugly over posts with a minimum projection of 1-1/2 inches below top of posts. Post caps shall be manufactured with a curved top.
- G. Eye Tops: Malleable iron, ASTM F 626, , designed to fit over line posts, and for through passage of top rail.
- H. Expansion Sleeve Couplings for Top Rails: Steel, 6 inches long, designed to fit tightly on inside of rail, fitted with raised center.
- I. Rail Ends for Top Rails, Brace Rails, Intermediate Rails, and Bottom Rails: Malleable iron, ASTM F 626, , with holes to receive 3/8 inch bolts for securing to rail end bands.
- J. Tension Bands and Bands for Securing Rail Ends: Mild steel flats, at least 11 gauge x one inch, tension bands in gates shall be 11 gage by 1 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch by 1 1/2-inch.
- K. Tension Bars: Mild steel flats at least 3/16 inch by 3/4 inch.
- L. Tension Wire for Installation at Bottom of Fabric: 6 gage steel spring wire, conforming to requirements of AISI Steel Products Manual, Carbon Steel Wire, Section 16, merchant quality, galvanized, soft temper with Type I coating. Wavy type wire is not acceptable.
- M. Turnbuckles for installation with Tension Wires: Eye and hook type, drop forged steel, right and left hand threads, at least 3/8 inch screw diameter with at least 4 1/2-inches of take-up.
- N. Tie Wire: Aluminum ties 6 gauge for fastening fabric to posts, top rails and brace rails. At bottom tension wire 9 gauge galvanized hog rings shall be installed.
- O. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, rivets, bolts, and other metal parts and fittings shall match finish of adjacent fabric and fence framework.
  1. Galvanized finish: metal parts to be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform to ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, and ASTM F 626 Specification for Fence Fittings.
  2. PVC Coated Finish: Galvanize each ferrous metal item and finish to match framing. Nuts and bolts are to be galvanized but not PVC coated. Apply touchup paint to color coat nuts and bolts to match PVC Coated finish color.
- P. Paints for Refurbishing Existing Fence Posts, Rails, and Accessories: As required to match the finish color of a new installation.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install fences to heights indicated on Drawings.
- B. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 10 feet apart measured from center to center of posts. Post spacing for courts designed using wind screens may be less than 10 feet on center based on the wind load calculations. In curved fence sections having a radius of 50 feet or less, space posts not more than 5 feet - 6 inches apart. Install posts so that top of eye of post caps are level with top of fabric.
- C. Install angle or corner posts at each change in direction of 15 degrees or more, at change of 5 percent or more in grade of fencing, and at the beginning and end of curved fence sections.
- D. Install terminal posts at ends of runs of fencing. Install gateposts on both sides of vehicular and pedestrian gates. For double-leaf gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3 ½-inches; for single leaf gates, net opening shall be gate size plus 2 ½-inches.
- E. Where a fence is to be installed on a curb, construct footings with top of footing level with the lower finish grade. Align posts, set plumb and true before placing footings. Remove splattered concrete from exposed pipe surfaces while concrete is still soft. In bituminous surfaced areas, install seal coat on top of concrete footings.
- F. Install fences with top rail. Install rails parallel with curb. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.
- G. Install fences 6 feet and over in height, in addition to top rail, with a full length horizontal mid-rail set at mid-height of fence and rigidly secured to posts with rail end fittings and bands.
- H. In fences higher than 10 feet, install brace rails at angles, corners, and terminals at 1/4 and 3/4 of fence height. Provide one horizontal brace rail in panels adjacent to terminal, angle, corner, and gateposts, install at mid-height of fence and rigidly secured to posts with rail end fittings and bands. Provide horizontal brace rails, as specified, in panels of curved sections having a radius of 50 feet or less. Brace rails are not required in fencing 4 feet or less in height.
- I. Provide a transom rail and fabric at top of pedestrian gate openings in fences higher than 8 feet. Install transom rail 8 feet 0 inches above high point of grade at gate opening. Ends of transom rails shall be pinned or riveted to rail end fittings with 1/4 inch mild steel rivets. Pin or rivet must go through rail and peen. Welding on rail ends is not permitted.
- J. Install bottom tension wire a minimum of 3 inches from grade for fencing, and provide a turnbuckle for each 150 feet of wire or fractional part thereof. Turnbuckles are not required in runs of 15 feet or less. Install ends of tension wires to posts in a manner to prevent slipping or loss of tension. Wrap should start from fence side of post. Turn end of wire around post tightly twisted at least three times around wire. At turnbuckles, wire through eye and tightly twist end at least three times around wire. Cut tail of bottom wire flush.
- K. Provide a bottom rail on tennis court and pickleball court fences. Install bottom rail parallel with curb.
- L. Install fence fabric on outward facing side of posts, except for tennis courts and pickleball courts. Install fence fabric with top edge projecting above top rail of fence.
- M. Install bottom of fence fabric to clear finish grades, except on bituminous surface install 3/4 inch above such surface. Locally shape and trench ground surfaces where necessary to provide uniform top and bottom alignment of fence.
- N. Tightly stretch fabric and at terminal, pull corner, angle, and gateposts, secure with tension bars extending full height of fence. Secure tension bars to posts with bolted tension bands spaced not more than 14 inches apart.
- O. Bands and Ties: Install bands and ties in accordance with following schedule:

15 bands on 16 feet fence	16 ties on 16 feet fence
11 bands on 12 feet fence	12 ties on 12 feet fence
7 bands on 8 feet fence	7 ties on 8 feet fence

6 bands on 6 feet fence  
4 bands on 4 feet fence

6 ties on 6 feet fence  
4 ties on 4 feet fence

- P. Fasten fabric to line posts with wire ties spaced not more than 16 inches apart. Where 6 gauge aluminum ties are furnished, hook the tie at both ends. Installation of hooked ties with links is not permitted.
- Q. Fasten fabric to top rails, mid-rails, brace rails, with wire ties spaced not more than 18 inches apart. Bend back ends of tie wires so as not to be a hazard (knuckle selvage). At bottom tension wire, install hog rings spaced not more than 18 inches apart. Where 2 fabrics are furnished, lap the fabrics one mesh at mid-rail and tie both fabrics with 9 gauge wire or 6 gauge aluminum ties to midrails.
- R. Grind all field welds smooth, clean off flux and spatter, damaged galvanizing removed, burrs and projections ground off, properly prepared, then heavily coated with galvanizing repair coating as specified in Section 05 50 00; or equal product approved by Owner's Office of Environmental Health and Safety. Install coating in accordance with written recommendations of manufacturer.
- S. Fabrication of Gates:
  - 1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.
  - 2. Fabric: Install fence fabric to side members with tension bars and tension bands as specified, spaced not more than 14 inches apart. Tension bars shall extend full height of gate. Install fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inches apart.
  - 3. Latches: Weld gate latches and strikes to gate posts and frames. Welding shall be performed before gate frames are galvanized, or welds shall be finished as specified for field welds.
  - 4. Hinges: Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates more than 16 feet wide.
  - 5. Grind welds flush and smooth. Hot-dip galvanize fabricated parts after welding, or finish weld as specified for field welds.

### 3.02 TENNIS COURT PERIMETER FENCING

- A. Perimeter fences for tennis courts shall not be less than 10 feet in height. Instead of providing bottom tension wire, provide horizontal bottom rail. Install fabric on court side of posts.

### 3.03 FENCING ON TOP OF HANDBALL COURT WALLS

- A. Posts, rails, chain link fabric and accessories required for a complete installation shall be as specified, except that chain link fabric shall be 9 gage wire minimum by 1 inch mesh.

### 3.04 INSTALLATION ON TOP OF CONCRETE WALLS

- A. Posts for fences on top of new concrete or concrete masonry walls shall be installed in 24 gauge galvanized iron inserts one inch larger than the outside post diameter. Wall thickness for such installation shall be 8 inches minimum. Depth of embedment of post shall not be less than 15 inches for fence height not exceeding 4 feet. Install post plumb, true, and fill joint space with non-shrink grout as specified in Section 05 50 00, finished flush with top of wall. Remove excess grout and clean posts.
- B. Fencing on Gravity Walls: Post of fence not exceeding 8 feet high shall have a minimum of 15 inches embedment in gravity walls with a top width of 10 inches minimum and side of 1H: 4V. Where the height of gravity wall from top to bottom, within 5 feet from each side of a post, is less than 22 inches, provide concrete fence post footings and embed posts in accordance with the schedule of posts and footings as set forth in this section.
- C. Do not install footings on existing walls without the review of the Architect and DSA.

### 3.05 REINSTALLED FENCING

- A. Where existing fencing is indicated to be reset or relocated, remove existing concrete footings from posts and legally dispose of off the Project site. Construct new concrete footings, as specified, in their designated location. Replace parts of fencing broken or damaged during removal and re-installation with new parts as specified to complete reinstallation. New materials shall closely match design of existing installation. Top rail will be required in reinstalled fencing, which does not have top rail in its existing condition. Install as specified for new installations.
- B. Existing fences shall be reset where finish pavement is raised or lowered more than 6 inches from existing grade. Remove and reinstall entire fence assembly as specified.

### 3.06 FENCING ADJUSTMENTS

- A. Where the finish grade is raised 6 inches or less, cut and re-knuckle the existing fence fabric. Adjust tension wire and tie to fabric. Bottom of fence fabric shall be installed  $\frac{3}{4}$ " above finish grade.
- B. Where the finish pavement is lowered 6 inches or less, demolish the fence footing flush with the finish grade and adjust the fabric and its attachments. Bottom of fence fabric shall be installed  $\frac{3}{4}$  inches above finish grade.
- C. Post footings and fabrics that require readjustment after installation shall be entirely replaced.

### 3.07 INSTALLATION OF GATES

- A. Provide gates of the sizes indicated on Drawings. Allow clearance on gates of 1-1/2 inches at bottom and one inch at top. Construct gates installed in sloping areas to conform to the grade. Provide an opening in each gate for access to locking device or padlock. Knuckle ends of fabric cut for opening to eliminate hazards.
- B. Sliding Gates and Swing Barricade Gates: Fabricate and install as indicated on Drawings. Wheel housing must be designed to fit tightly to roll track and prevent gate from rolling over objects. Unsupported cantilever type roll gates are not acceptable. Install gate stops in accordance with the drawings. Both top and track stops are required.

### 3.08 RE-FENCING

- A. Hardware Removal: Disassemble existing fence and all attachment hardware (bands, pipe, and wire) prior to preparation of posts for painting
- B. Fabric Removal: Do not remove more than what can be replaced during one day unless a barricade, providing equal security, will be installed in its place. If freestanding temporary fence is used, it must be clamped and wrap tied.
- C. Post and Rails: Bent posts, rails and accessories shall be replaced. Cut bent portion of posts and weld new sections of equal diameter and thickness. Install splice to inside of all welded section prior to welding. Previously repaired or welded posts shall be replaced as necessary.
- D. Painting:
  1. Preparation: Prepare exposed steel posts, rails and accessories thoroughly cleaned of rust, oil and foreign materials. Painted galvanized metal shall be stripped to bare metal before applying prime coat.
  2. Priming: Spot prime areas from which the original surface coating had been removed with a metal primer to match adjoining surfaces. Subsequently, install a prime coat to the entire surface to be painted.
  3. First Coat: Install first coat as recommended by the paint manufacturer. Furnish a color that is 10 percent to 15 percent lighter or darker than the finish coat.
  4. Second or Finish Coat: Install finish coat after the first coat has cured.
  5. Install paint in accordance with manufacturer's written recommendations.
  6. Protect adjacent structures, walls, concrete or asphalt from paint.

3.09 COMPLETION

- A. Completed fencing shall form continuous units between points indicated with required parts, accessories, and fittings provided and installed. Clean exposed metal surfaces of cement, grout and other foreign substances.
- B. Fill in holes left by removal of existing fence footings, except in areas where grading Work is indicated or specified, to existing grade with clean earth thoroughly compacted to at least same density as adjoining soil.

3.10 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.11 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. This section shall consist of furnishing and installing new fence and/or removing and salvaging existing fence and restoring the same in conformance with the lines and grades and requirements shown on the drawings. Wherever the materials to be removed are not in good condition, as judged by the Architect, or wherever the Contractor has damaged the materials during the process of removal, equal or better quality fencing materials than the existing shall be furnished and installed by the Contractor.
- B. Section Includes:
  - 1. Single Leaf Steel Gate
  - 2. Pipe Fence
  - 3. Ranch Fence
  - 4. Ranch Fence Pedestrian Gate

## 1.02 SUBMITTALS

- A. Submittal Procedure: Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures
- B. Product Data: Submit manufacturer's data sheets for each product specified.
- C. Shop Drawings: Provide shop drawings for custom fabricated fence, gates, and gate hardware. Include plans, elevations, sections, details, and attachments to other work.
- D. Samples: For each material and color specified.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for decorative metallic-coated steel tubular gates, including finish, indicating compliance with referenced standard.

## 1.03 QUALITY ASSURANCE

- A. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for gates that must provide emergency access.
- B. Entrapment Protection Requirements: Comply with UL 325 Entrapment Protection Requirements for gate operator entrapment protection devices.
- C. Manufacturer: Provide products manufactured by a company with a minimum of 5 years successful experience manufacturing similar products.

## 1.04 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install fencing and gates prior to acceptance by Landscape Architect of area to receive such materials.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of construction.
  - 1. Fence and Gate Posts: Set anchors or sleeves in place and pour footings prior to installation of adjacent paving.
  - 2. Gate Operator: Provide conduit to gate operator footing; coordinate with electrical plans. Provide wireless connection to timer and operator for remote control.
  - 3. Shop Fabricated Items: Install anchors, bolts and fittings in appropriate formwork prior to installation of adjacent paving or walls.

## PART 2 – PRODUCTS

### 2.01 PRODUCTS

- A. Products are listed in this section to establish requirements for product type, characteristics, performance, and quality:

1. SINGLE LEAF STEEL GATE

Gate Depot  
17526 Highway 12  
Sonoma, CA 95476  
www.gatedepot.com  
phone: 1-888-818-4283

Model: DuraGate Steel Barrier Gate Kit with Pivot Post, Lock Post and Lock Assembly (or approved equal)

Model #: DGT-BR

Gate Size: 12ft. opening, 3.15" OD x 4mm round tubular steel

Post Size: 3.15" OD schedule 40 round tubular steel

Color: Galvanized

Miscellaneous: 180 degree swing

Lock: provided by owner

Quantity: 2

2. PIPE FENCE

440 Fence Company  
FM 455  
Pilot Point, TX 76258  
Phone (833)-440-5889  
www.440fence.com

Model: 440 Steel Fence, 8' x 3 Rail Section

Post: 440 Pipe 2-3/8" x 13 Ga x 7'-6" L

Rail: 440 Pipe 7'-6" L with Dome Cap

Brackets: 440 UNIV SGL Pipe Bracket for 2-3/8" pipe

Color: RAL 8014 Sepia Brown

Mounting: In-Ground Mount

Quantity: 72 LF

2. RANCH FENCE

See detail, or supply pre-manufactured fence for review and approval.

Gate Hardware: Raw steel or finish to match gate frame.

3. RANCH FENCE PEDESTRIAN GATE

See detail, or supply pre-manufactured fence for review and approval. Gate design to match fence.

Gate Hardware: Raw steel or finish to match gate frame.

Hinges: 5" Barrel Hinges, industrial weight, finish to match gate frame

Latch: Heavy Duty Drop Fork Latch Assembly; Post size: 2" x 2"; Gate frame size: 2" x 2"; Color:

Raw steel or finish to match gate frame.

## 2.02 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500, cold formed steel tubing.
- D. Bar Grating: NAAMM MBG 531.
- E. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
- F. Wire Rods: ASTM A 510 (ASTM A 510M).
- G. Galvanized-Steel Tubular Pickets: industrial and light-industrial (commercial) fences in ASTM F 2408.
- H. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50 (Grade 340)

## 2.03 COATING MATERIALS

- A. See plans; Raw steel or Galvanized finish.

## 2.04 MISCELLANEOUS MATERIALS

- A. Concrete: Normal-weight concrete complying with requirements in section 03 30 00 Cast-in-Place Concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.
- B. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

## 2.05 GROUNDING MATERIALS

- A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
  - 1. Material above Finished Grade: Aluminum.
  - 2. Material on or below Finished Grade: Copper.
- B. Grounding Connectors and Grounding Rods: Comply with UL 467.

## 2.06 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

## **PART 3 - EXECUTION**

### 3.01 FENCE INSTALLATION

- A. Install fence and fence components per manufacturer's specifications.

- B. Line, Corner and Gate Posts shall be set in 36-inch deep holes and backfilled with concrete. A minimum of six (6) inches of concrete shall be provided between the bottom of the hole and the bottom of the post being set.
- B. Steel posts shall be set true to line and grade in concrete bases. The distances between posts shall be 8 feet, typical, or as indicated on the drawings.
- C. Wire mesh panels shall be placed on the roadway side of posts unless otherwise specified. The mesh shall be placed approximately one inch above the ground, and on a straight grade between posts by excavating high points of the ground. Filling depressions will be permitted only upon approval by the Owner.
- D. Fasten wire panels to the steel frame by spot welding panel to frame. Butt joint panels together at intermediate line posts. Spot weld both panels at junction to steel frame.

### 3.02 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. 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.

END OF SECTION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. This section shall consist of furnishing and installing new fence and/or removing and salvaging existing fence and restoring the same in conformance with the lines and grades and requirements shown on the drawings. Wherever the materials to be removed are not in good condition, as judged by the Architect, or wherever the Contractor has damaged the materials during the process of removal, equal or better quality fencing materials than the existing shall be furnished and installed by the Contractor.
- B. Section Includes:
1. Post and Cable Fence
  2. Coyote Fence
  3. Coyote Fence Gate

## 1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Association of State Highway and Transportation Officials (AASHTO):
    - a. M111M/M111, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - b. M133, Standard Specification for Preservatives and Pressure Treatment Processes for Timber.
    - c. M181, Standard Specification for Chain-Link Fence.
    - d. M232M/M232, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - e. M281, Standard Specification for Steel Fence Posts and Assemblies, Hot- Wrought.
  2. ASTM International (ASTM):
    - a. A116, Standard Specification for Metallic-Coated, Steel-Woven Wire Fence Fabric.
    - b. A121, Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
    - c. A392, Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
    - d. A491, Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
    - e. B211, Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
    - f. F537, Standard Specification for Design, Fabrication, and Installation of Fences Constructed of Wood and Related Materials.
  3. Federal Specification (FED): FCGS-02-1, Fencing, Wire and Post, Metal (Chain-link Fence Posts, Top Rails and Braces).

## 1.03 SUBMITTALS

- A. Submittal Procedure: Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures
- B. Product Data: For each type of product indicated above.
- C. Samples: For each fence material and for each color specified.
- D. Hardware: Submit hardware list and cutsheets for each type for final approval.

- E. Shop Drawings: Submit shop drawings for post and cable fence, wood privacy fence and wood privacy fence double leaf vehicular gate with steel frame. Indicate plan layout, size and spacing of components, frame dimensions, bracing, accessories, fittings, anchorage, and post section.

#### 1.04 QUALITY ASSURANCE

- A. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for gates that must provide emergency access.

#### 1.05 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install fencing prior to acceptance by Landscape Architect of area to receive such materials.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of construction.
  1. Fence and Gate Posts: Set anchors or sleeves in place and pour footings prior to installation of adjacent paving.

### PART 2 – PRODUCTS

#### 2.01 GENERAL

- A. All wood materials shall be treated wood, western red cedar wood with a natural resistance to decay, or as specified in the drawings. Materials shall be free from loose knots, cracks and other imperfections which would weaken the material or otherwise cause them to be structurally unsuitable for the purpose intended.
- B. No additives, stains, paints or other chemicals may be used in manufacturing. Fencing shall not be sourced illegally or harvested without authorization from appropriate government agencies.
- C. All fasteners used for construction shall be stainless steel wood screws.
- D. Dual access (accessible and lockable from either side) latch and lock systems are required on all vehicular maintenance access gates.

#### 2.02 MATERIALS

- A. Post + Cable Fence:
  1. See detail
  2. Posts: match existing, assumed to be 8-inch x 8-inch x 5-foot post, ACQ Pressure Treated Douglas Fir Timber, Standard Grade or Better, S4S finish.
- B. Coyote Fence:
  1. See detail
  2. Latillas: match existing, assumed to be cedar.
- C. Coyote Fence Gate:
  1. See detail
  2. Latillas: match existing, assumed to be cedar.

#### 2.03 CEMENT:

- A. Concrete: Normal-weight concrete complying with requirements in Division 3 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.

## PART 3 - EXECUTION

### 3.01 REMOVAL OF EXISTING FENCE

- A. All broken, warped, or out of plumb posts, rails, pickets and other fence components shall be removed and disposed of or salvaged by the Contractor to allow construction of the project as described on the drawings..

### 3.02 FENCE INSTALLATION

- A. General:
  - 1. Contractor shall perform such clearing and grubbing as may be necessary to construct or replace the fence to the required grade and alignment as shown on the Drawings.
  - 2. Follow all applicable blue stakes procedures.
  - 3. Fence alignment shall be located on Owner's property, unless agreed to in writing by adjacent private property owner.
  - 4. At locations where breaks in a run of fencing are required, appropriate adjustments in fence alignment and/or post spacing shall be made to satisfy requirements or conditions encountered.
  - 5. Install as per plans, details, and manufacturer's specifications.
- B. Posts shall be set true to line and grade. Posts shall be securely embedded into the ground to meet the proper alignment and elevations.
- C. The maximum distance between posts in any section shall not exceed eight (8) feet, unless otherwise indicated on the drawings. The top and bottom railings shall be securely fastened to the posts with stainless steel nails or other acceptable means. Changes in line of 30 degrees or more shall be considered as corners.
- D. Fence corner posts, end posts, gate posts, and every sixth line post shall be placed in 1' diameter concrete footing. Posts and rails shall be held improper positions by secure bracing until such time as the concrete as set sufficiently to hold the posts. Materials shall not be installed on posts, or stress placed on bracing until the concrete has set sufficiently to withstand the stress. The complete fence shall be plumb and in straight alignment as shown on the drawings or as directed by the Landscape Architect.
- E. Fence slats shall be placed on the roadway side of posts unless otherwise specified. The slats shall be placed approximately 2" above the ground and on a straight grade between posts by excavating high points of the ground. Filling depressions will be permitted only upon approval of the Architect. The slats shall be sound and free from all major decay or defects which would weaken or otherwise cause them unsuitable for fence slats. Fastening to top, bottom, and other railings shall be done with two stainless steel wood screws at each juncture.

### 3.03 GATE INSTALLATION

- A. General:
  - 1. Gate location shall be approved by Landscape Architect prior to installation.
  - 2. Install gates plumb, level, and secure for full opening without interference.
  - 3. Install ground-set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation.
  - 4. Install as per plans, details, and manufacturer's specifications.

- B. Once gate is installed, coordinate with Owner's Representative on lock installation.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Work Included: Provide site furnishings, and install complete, including footings, fittings and materials, as shown, and as specified.

## 1.02 REFERENCES

- A. ACI - American Concrete Institute Manual of Concrete Practice.
- B. ASTM – American Society for Testing and Materials

## 1.03 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures
- B. Product Data: Submit product data and manufacturer's current printed specifications and catalog cutsheets of the following:
  - 1. Picnic Table Set
  - 2. Picnic Table Set - Accessible
  - 3. Trash / Recycling Receptacle
  - 4. Bike Rack
  - 5. Bench – Site
  - 6. Bollard – Fixed
  - 7. Reflective Tape
  - 8. Parking Bumper – Custom
  - 9. Dog Waste Bag Dispenser
- C. Shop Drawings:
  - 1. Show plans, elevations, with dimensions, materials, details of inserts, joints and reinforcements and connections to all adjoining work.
- D. Samples:
  - 1. Color and finish for each type of furnishing.
- E. Contract Closeout Submittals:
  - 1. Operations and Maintenance Data:
    - a. Picnic Table Set
    - b. Picnic Table Set - Accessible
    - c. Trash / Recycling Receptacle
    - d. Bike Rack
    - e. Bench – Site
    - f. Bollard – Fixed
    - g. Reflective Tape
    - h. Parking Bumper – Custom
    - i. Bag Waste Bag Dispenser

## 1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Show not less than five (5) years successful and continuous experience in work of the type(s) shown on the Drawings.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Furnish materials in manufacturer's unopened, original packaging, bearing original labels showing quantity, description and name of manufacturer. Verify that materials and components are adequately padded and securely bound in such a manner that no damage occurs to the product during delivery and unloading at the site.
- B. Storage: Damaged materials will be rejected. Remove damaged materials from the job site immediately, and pay cost of replacement. Determination of damage shall be the sole authority of the Owner.
- C. Handling: Lift materials using lifting inserts provided by manufacturer. Protect materials and finish from damage during handling and installation.
- D. Painted Finishes: Provide non-scratching, non-staining, firmly-bound covering for shop-painted finishes until installed and accepted.
- E. Wood and Precast Concrete: Protect from stains.

#### 1.06 SEQUENCING AND SCHEDULING

- A. Acceptance: Do not install site furnishings prior to acceptance by Landscape Architect of area to receive such materials.
- B. Coordination: Coordinate with the work of other sections to insure the following sequence of construction.
  - 1. Site Furnishings set over concrete slab: set frames, anchors or sleeves in place and pour footings prior to installation of adjacent finish paving. Coordinate joint layout with posts.
  - 2. Site Furnishings set in graded surface: set frames, anchors or sleeves in place in coordination with final grades.

#### 1.07 MAINTENANCE

- A. Maintenance Service:
  - 1. General: Immediately remove stains to materials or surrounding site improvements. Do not use cleaning solvents harmful to site materials. Do not permit cleaning agents to contaminate planted areas.
- B. Extra Materials:
  - 1. General: Provide items necessary to re-tighten, clean up, restore or replace all items as required to ensure continued use of specified products.
  - 2. Painted Finishes: Provide two (2) cans of each primer and finish coat for use in touch-up. Clearly label cans with batch mixture numbers required to duplicate painted finishes.

### **PART 2- PRODUCTS**

#### 2.01 MATERIALS (for bidding purposes only; substitutions may be submitted for consideration)

- A. PICNIC TABLE SET  
 Superior Recreation Products (or approved equal)  
 150 Adamson Industrial Blvd  
 Carrollton, GA 30117  
 Phone (866) 513-4241
- Model: T8RC4-4 (with Perforated Steel Surface)  
 Length: 8 ft.  
 Color: Brown | Polyethylene  
 Frame: Brown | Powder Coated  
 Material: Perforated metal surface coated with Polyethylene, steel frame  
 Mounting: In-Ground Mount  
 Quantity: 3
- B. PICNIC TABLE SET ACCESSIBLE  
 Superior Recreation Products (or approved equal)  
 150 Adamson Industrial Blvd  
 Carrollton, GA 30117  
 Phone (866) 513-4241
- Model: T8RCHDCP4-4 (with Perforated Steel Surface)  
 Length: 8 ft.  
 Color: Brown | Polyethylene  
 Frame: Brown | Powder Coated  
 Material: Perforated metal surface coated with Polyethylene, steel frame  
 Mounting: In-Ground Mount  
 Quantity: 1
- C. TRASH / RECYCLING RECEPTACLE  
 Superior Recreation Products (or approved equal)  
 150 Adamson Industrial Blvd  
 Carrollton, GA 30117  
 Phone (866) 513-4241
- Model: TR32PERF  
 Size: 30" H x 23-1/4" Dia.  
 Capacity: 32 gallons  
 Color: Brown | Polyethylene  
 Material: Perforated metal coated with Polyethylene  
 Mounting: TR-ING, In-Ground Post Mounting Kit, Black  
 Liner: LINER32, Heavy Duty Plastic, Black  
 Quantity: 8
- Lid: FLATTOP32, Flat Top Cover, 32 Gallon, 8" Opening  
 Lid Material: Steel  
 Lid Color: Brown | Powder-Coated Finish  
 Quantity: 8
- D. BIKE RACK  
 Superior Recreation Products (or approved equal)  
 150 Adamson Industrial Blvd

Carrollton, GA 30117  
Phone (866) 513-4241

Product: Bike Loop Rack  
Model: BIKELOOP  
Size: 2-3/8" O.D. Tubing  
Color: Brown | Powder-Coated Finish  
Mounting: In-Ground Mount  
Quantity: 6

E. BENCH - SITE

DuMor, Inc.  
Mifflintown, PA 17059-0142  
Phone (800) 598-4018  
sales@dumor.com

Model: Bench 500, 500-60HS  
Length: 6 ft.  
Seat Material: Steel  
Color: Sepia Brown RAL 8014 | Powder Coated  
Mounting: Embedded  
Quantity: 3

F. BOLLARD - FIXED

SCH Enterprises, LLC  
79405 Hwy 111  
Ste. 9, PMB 466  
La Quinta, CA 92253  
Phone (503) 364-1353  
operations@schenterprisesllc.org

Product: Bollard  
Model: BD 5001-6-E-P-DT  
Size: 6" Diameter, 36" height above finish grade  
Material: Steel  
Mounting: Embedded  
Color: Sepia Brown RAL 8014 | Powder Coated  
Cap: Dome  
Quantity: 7

G. REFLECTIVE TAPE

R.S. Hughes (or approved equal)  
6100-B Jefferson NE, Albuquerque, NM 87109  
Phone (505) 344-6310  
Fax (505) 344-8263  
Email: albuquerque@rshughes.com

Brand: 3M  
Model: 963-10  
Color: White  
Backing Material: Synthetic Resin  
Application: Vehicle

Width: 2 in  
Length: 50 yd  
Standards Met: DOT; FMVSS 108  
Quantity: 1

- H. PARKING BUMPER - CUSTOM  
Materials, Inc.  
318 South Hill Rd.  
Bernalillo, NM 87004  
Phone (866) 867-9035  
Fax (505) 867-4419  
klock.bryan@gmail.com

Model: Custom 6' Parking Bumper  
Size: see detail  
Color: Grey  
Finish: Smooth tops and sides as cast  
Sealer: Vocomp 20 Sealer  
Quantity: Refer to Drawings

- I. DOG WASTE BAG DISPENSER  
Dog Waste Depot.com (or approved equal)  
12316 World Trade Drive, Suite 102  
San Diego, CA 92128  
Phone (800) 678-1612  
customersupport@dogwastedepot.com

Product: Roll Bag Dispenser  
Model: Depot-003  
Size: 10"w x 18"h x 4"d  
Color: Green  
Quantity: 2

### **PART 3- EXECUTION**

#### **3.01 EXAMINATION**

- A. Locations: Verify that site furnishings can be installed at locations as shown on Drawings.
- B. Conditions: Verify that no defects or errors exist in the work of other sections which would lead to defective installation or latent defects in workmanship and function of items in this section. Notify architect of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions are corrected.

#### **3.02 PREPARATION**

- A. Protection:  
1. Protect adjacent planting and site improvements to prevent damage during installation.
- B. Concrete Pads and Footings:  
1. Layout: Accurately lay out pads and footings as called for in the Drawings.

2. Installation: Excavate forms as required and fill for pads and footings as specified in Site Concrete - Section.

### 3.03 INSTALLATION

- A. Execution: Install as per manufacturer's specifications. Install elements level, plumb, square, accurately aligned, correctly located, and without warp unless otherwise directed by the Owner. Pitch finish grade beneath items so as not to accumulate water.
- B. Safeguarding: Secure site elements from vandalism and removal. Install equipment with tamperproof hardware, spot-weld bolts, or secure with other means acceptable to the Architect.
- C. Repair: Repair minor damages to finish in accordance with instructions and as approved by Architect. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

### 3.04 CLEANING

- A. Clean site furnishings in accordance with manufacturer's instructions. Do not use harsh cleaning materials that would damage finish.
- B. Remove temporary protective coverings.

### 3.05 FIELD QUALITY CONTROL

- A. Test moving parts and controls for conformance to manufacturer's operating specifications.

### 3.06 DEMONSTRATION

- A. Demonstrate the operation and maintenance of equipment to the Owner. Submit final copy of maintenance manuals at this time of demonstration. For manuals, see Submittals.

### 3.07 PROTECTION

- A. Protect installed site furnishings from damage during construction.
- B. Wrappings: Do not remove protective wrappings from furnishings until instructed by Landscape Architect. Remove trash and debris after completion.

END OF SECTION

**PART 1 - GENERAL**

- 1.01 WORK INCLUDED - Work of this Section generally includes provisions for the installation of an underground landscape irrigation system including the following:
- A. Static pressure verification and coordination of irrigation system installation with landscape material installation.
  - B. Trenching, stockpiling excavation materials, refilling and compacting trenches.
  - C. Complete irrigation system including but not limited to piping, backflow preventer assemblies, valves, fittings, heads, controllers and wiring, and final adjustments to insure complete coverage.
  - D. Water connections.
  - E. Replacement of unsatisfactory materials.
  - F. Clean-up, Consultant Reviews, and Project Acceptance.
  - G. Tests.
- 1.02 REFERENCES
- A. Perform Work in accordance with requirements of Conditions of the Contract and Division 01 - General requirements as well as provisions of all applicable laws, codes, ordinances, rules, and regulations.
  - B. Conform to requirements of reference information listed below except where more stringent requirements are shown or specified in Contract Documents.
    - 1. American Society for Testing and Materials (ASTM) - Specifications and Test Methods specifically referenced in this Section.
    - 2. Underwriters Laboratories (UL) - UL Wires and Cables.
    - 3. National Sanitation Foundation (NSF) – Piping and Backflow prevention.
    - 4. American Water Works Association - Piping and Backflow prevention.
- 1.03 QUALITY ASSURANCE
- A. Installer Qualifications - Installer shall have had considerable experience and demonstrate ability in the installation of irrigation system(s) of specific type(s) in a neat, orderly, and responsible manner in accordance with recognized standards of workmanship. To demonstrate ability and experience necessary for this Project, and financial stability, submit if requested by Consultant, prior to contract award the following:
    - 1. List of 3 projects completed in the last 2 years of similar complexity to this Project. Description of projects shall include:
      - a. Name of project.
      - b. Location.
      - c. Owner.
      - d. Brief description of work and project budget.
  - B. Special Requirements:

1. Work involving substantial plumbing for installation of copper piping, backflow preventer(s), and related work shall be executed by licensed and bonded plumber(s). Secure a permit at least 48 hours prior to start of installation.
  2. Tolerances - Specified depths of mains and laterals and pitch of pipes are minimums. Settlement of trenches is cause for removal of finish grade treatment, refilling, compaction, and repair of finish grade treatment.
  3. Coordination with Other Contractors - Protect, maintain, and coordinate Work with Work under other Section.
  4. Damage To Other Improvements - Contractor shall replace or repair damage to grading, soil preparation, seeding, sodding, or planting done under other Sections during Work associated with installation of irrigation system at no additional cost to Owner.
- C. Pre-Construction Conference - Contractor shall schedule and conduct a conference to review in detail quality control and construction requirements for equipment, materials, and systems used to perform the Work. Conference shall be scheduled not less than 10 days prior to commencement of Work. All parties required to be in attendance shall be notified no later than 7 days prior to date of conference. Contractor shall notify qualified representatives of each party concerned with that portion of Work to attend conference, including but not limited to Architect, Consultant, Contractor's Superintendent, and Installer.
1. Minutes of conference shall be recorded and distributed by Contractor to all parties in attendance within five days of conference.
- 1.04 SUBMITTALS
- A. Prepare and make submittals in accordance with conditions of the Contract and Division 1 Specification Sections.
  - B. Materials List - Submit five copies if submitting in hard-copy format or one full electronic set of a complete materials list indicating manufacturer, model number, and description of all materials and equipment to be used. Show appropriate dimensions and adequate detail to accurately portray intent of construction via cut sheets and/or shop drawings, as appropriate based on plans, details, and specification information contained within.
  - C. Record Drawings (As-Builts):
    1. At onset of irrigation installation secure Autocadd files of original irrigation design from Owner. At the end of every day, revise as-built prints for work accomplished that day in red ink. As-built field prints shall be brought up-to-date at the close of the working day every Friday by a qualified draftsman. A print of record plan(s) shall be available at Project Site. Indicate zoning changes on weekly as-built drawings. Indicate non-pressure piping changes on as-built. Upon completion of Project, but prior to scheduling of substantial acceptance walk-through, submit for review a final set of as-built mylars and an Autocadd disk copy. Dimensions, from two permanent points of reference (building corners, sidewalk, road intersections or permanent structures), location of following items:
      - a. Connection to existing water lines.
      - b. Routing of sprinkler pressure lines (dimension maximum 100 feet along routing).
      - c. Sprinkler control valves.
      - d. Quick coupling valves.
      - e. Manual drains and stop and waste valves.
      - f. Drip line blow-out stubs.
      - g. Control wire routing if not with pressure mainline.
      - h. Gate valves.
      - i. Control wire and communication cable splices

- j. Water meters
    - k. Locations of all sleeving including size, quantity and depth of sleeve
    - l. Flow sensors
    - m. Pressure regulating valves
  - 2. Owner's Representative will not certify any pay request submitted by the Contractor if the as-built drawings are not current, and processing of pay request will not occur until as-builts are up-dated.
- D. Operation Instructions - Submit 3 written operating instructions including winterization procedures and start-up, with cut sheets of products, and coordinate controller/watering operation instruction with Owner maintenance personnel.
  - 1. Controller Charts:
    - a. Do not prepare charts until Consultant has reviewed record (as-built) drawings.
    - b. Provide one controller chart for each automatic controller installed.
      - i. Chart may be reproduction of record drawing, if scale permits fitting of controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.
      - ii. Chart shall be blue-line print of actual "as-built" system, showing area covered by that controller.
    - c. Identify area of coverage of each remote control valve, using a distinctly different pastel color drawing over entire area of coverage.
    - d. Following review of charts by Consultant, they shall be hermetically sealed between two layers of 20-mm thick plastic sheet
    - e. Charts shall be completed and reviewed prior to final review of irrigation system.
- E. Provide documentation of construction and demolition waste debris recycling / salvage rates. See Section 01 74 19 - Construction Waste Management and Disposal

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with General Conditions and Division 1 Section "Product Requirements".
- B. Deliver, unload, store, and handle materials, packaging, bundling, products in dry, weatherproof, condition in manner to prevent damage, breakage, deterioration, intrusion, ignition, and vandalism. Deliver in original unopened packaging containers prominently displaying manufacturer's name, volume, quantity, contents, instructions, and conformance to local, state, and federal law. Remove and replace cracked, broken, or contaminated items or elements prematurely exposed to moisture, inclement weather, snow, ice, temperature extremes, fire, or jobsite damage.
- C. Handling of PVC Pipe - Exercise care in handling, loading and storing, of PVC pipe. All PVC pipe shall be transported in a vehicle that allows length of pipe to lie flat so as not to subject it to undue bending or concentrated external loads. All sections of pipe that have been dented or damaged shall be discarded, and if installed, shall be replaced with new piping.

1.06 JOBSITE CONDITIONS

- A. Protection of Property:
  - 1. Preserve and protect all trees, plants, monuments, 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 Owner, and all injury to living plants shall be repaired by Owner. All costs of such repairs shall be charged to and paid by Contractor.

2. Protect buildings, walks, walls, and other property from damage. Flare and barricade open ditches. Damage caused to asphalt, concrete, or other building material surfaces shall be repaired or replaced at no cost to Owner. Restore disturbed areas to original condition.
3. Irrigation piping shall maintain a minimum distance from building foundations of 5 feet or as described in soils report, whichever is greater. No spray irrigation shall occur within 10 feet of the foundation. No drip irrigation shall occur within 5 feet of the foundation unless soil moisture sensors are installed on valves servicing these areas. All irrigation piping and emission devices located on top of or within building structure shall conform to Waterproofing Consultant requirements. Pipe routing may be shown within these distances for graphical clarity only.

B. Existing Trees:

1. All trenching or other Work under limb spread of any and all evergreens or low branching deciduous material shall be done by hand or by other methods so as to prevent damage to limbs or branches.
2. Where it is necessary to excavate adjacent to existing trees use all possible care to avoid injury to trees and tree roots. Excavation, in areas where 2 inch and larger roots occur, shall be done by hand. Roots 2 inches or larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a trenching machine is operated close to trees having roots smaller than 2 inches in diameter, wall of trench adjacent to tree shall be hand trimmed, making clean cuts through roots. Trenches adjacent to trees shall be closed within 24 hours, and when this is not possible, side of trench adjacent to tree shall be kept shaded with moistened burlap or canvas.

C. 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 lines from damage. If damage does occur, Utility Owner shall repair all damage. Contractor shall pay all costs of such repairs unless other arrangements have been made.
2. Request Owner, in writing, to locate all private utilities (i.e., electrical service to outside lighting) before proceeding with excavation. If, after such request and necessary staking, private utilities that were not staked are encountered and damaged by Installer, Owner shall repair them at no cost to Installer. If Contractor damages staked or located utilities, they shall be repaired by Utility Owner at Contractor's expense unless other arrangements have been made.

D. Replacement of Paving and Curbs - Where trenches and lines cross existing roadways, paths, curbing, etc., damage to these shall be kept to a minimum and shall be restored to original condition.

1.07 WARRANTY/GUARANTY

- A. Manufacturer shall warrant materials against defects for a period of one year from date of Substantial Completion. Installer(s) shall guaranty workmanship for similar period.
- B. Settling of backfilled trenches that may occur during guaranty period shall be repaired at no expense to Owner, including complete restoration of damaged property.
- C. Expenses due to vandalism before substantial completion shall be borne by Contractor.
- D. Owner will maintain turf and planting areas during warranty period, so as not to hamper proper operation of irrigation system.

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 sprinkler head and valve supplied on this Project.
  2. One eight foot valve key for operation of stop and waste valve.
  3. Two six foot valve keys for operation of gate valves.
  4. Two keys for each automatic controller.
  5. Two quick coupler keys and two matching hose swivels for each type of quick coupling valve installed.
  6. Two aluminum drain valve keys of sufficient length for operation of drain valves.
  7. Remote
- B. Winterization - include cost in bid for winterizing complete system at conclusion of sprinkling season (in which system received final acceptance) within 3 days notification by the Owner. System shall be voided of water using compressed air or similar method reviewed by Consultant. Reopen, operate, and adjust system malfunctions accordingly during April of following season within 3 days of notification by Owner.
- 1.09 EXTRA STOCK - In addition to installed system furnish the following items to Owner:
- A. 10 Pop-up spray heads with nozzles of each type used.
  - B. 4 Rotor heads of each type used.
  - C. 30 Drip emitters of each type used.
  - D. 100' roll in-line emitter tubing of each type used.

## **PART 2 - PRODUCTS**

### 2.01 MATERIALS

#### A. General Piping:

1. Pressure Supply Line (from tap on city mains to winterization tee or Stop and Drain valve prior to backflow prevention unit) – Type "K" Soft Copper (3/4" – 2 1/2"), Galvanized Steel (3/4" – 2 1/2"), and ductile iron (3" and larger).
2. Pressure Supply Line (from point of connection, winterization tee or Stop and Drain valve and through backflow prevention unit) - Type "K" Hard Copper (3/4" – 2 1/2"), and ductile iron (3" and larger).
3. Pressure Supply Lines (downstream of backflow prevention units) – Type "K" Hard Copper (3/4" – 2 1/2"), Class 200 PVC BE (1" - 2 1/2") and Class 200 PVC RT (3" and larger), Galvanized Steel (3/4" – 2 1/2"), as noted on plans and schedule.
4. Non-pressure Lines - Class 200 PVC BE, 1" minimum size, as noted on plans.
5. Sleeving - Class 160 PVC, as noted on plans and schedule.
6. Drip Tubing - Toro Dura-Pol EHD 1645 3/4" with .050 inch wall thickness.
7. Emitter Tubing - As recommended by emitter manufacturer.

#### B. Copper Pipe and Fittings:

1. Copper Pipe - Type K, hard tempered or annealed coil.
2. Fittings - Wrought copper, solder joint type.
3. Joints - Soldered with solder, 45% silver, 15% copper, 16% zinc, and 24% cadmium and solidus at 1125~F and liquids at 1145~F.

#### C. Brass Pipe and Fittings:

1. Brass Pipe - 85% red brass, ANSI Schedule 40 screwed pipe.
2. Fittings - Medium brass, screwed 125-pound class.

D. Ductile Iron Pipe and Fittings:

1. Ductile Iron Pipe – Centrifugal cast ductile iron in metal molds for water pipe in accordance with ANSI C151 and AWWA A21.51 with asphaltic exterior coating and interior lining and coating in accordance with ANSI C151 and AWWA A21.
2. Fittings – Mechanical joint as supplied by the pipe manufacturer and rated for working pressures of 350 psi.
3. Gaskets – Furnish in accordance with ANSI C111 and AWWA A21.11.

E. Plastic Pipe and Fittings:

1. Identification Markings:

a. Identify all pipe with following indelible markings:

- i. Manufacturer's name.
- ii. Nominal pipe size.
- iii. Schedule of class.
- iv. Pressure rating.
- v. NSF (National Sanitation Foundation) seal of approval.
- vi. Date of extrusion.

2. Solvent Weld Pipe - Manufactured from virgin polyvinyl chloride (PVC) compound in accordance with ASTM D2241 and ASTM D1784; cell classification 12454-B, Type 1, Grade 1.

a. Fittings - Standard Weight, Schedule 40, injection molded PVC; complying with ASTM D1784 and D2466, cell classification 12454-B.

- i. Threads - Injection molded type (where required).
- ii. Tees and ells - Side gated.

b. Threaded Nipples - ASTM D2464, Schedule 80 with molded threads.

c. Teflon Tape – All PVC male threaded fittings and nipples, excluding marlex fittings, shall receive wrapping of Teflon tape applied to threaded surfaces per pipe manufacturer's recommendations.

d. Joint Cement and Primer - Type as recommended by manufacturer of pipe and fittings.

3. Galvanized Pipe and Fittings:

- a. Galvanized Steel Pipe - Schedule 40, Hot Dip Galvanized.
- b. Fittings - Class 150 malleable cast iron.
- c. Joints – Install using Teflon tape.

F. Drip, Sub-Surface Irrigation Systems and Bubblers:

1. Drip Tubing - Manufactured of flexible vinyl chloride compound conforming to ASTM D1248, Type 1, Class C, Category 4, P14 and ASTM D3350 for PE 122111C.

2. Fittings - Type and diameter recommended by tubing manufacturer.

3. Drip Valve Assembly - Type and size shown on Drawings.

- a. Wye Strainer - Plastic construction with 150 mesh nylon screen and 1/2 inch blowout assembly.

- b. Control Valve - 2 way, solenoid pilot operated type made of synthetic, non-corrosive material; diaphragm activated and slow closing. Include freely pivoted seat seal; retained (mounted) without attachment to diaphragm.
  - c. Pressure Reducing Valve - Plastic construction as detailed.
- 4. Emitters - Single port, pressure compensating, press on type.
- 5. Sub-Surface tubing - Size and type shown on Drawings; installed as detailed.
  - a. Dripperline Tubing – Nominal sized one-half inch (1/2") low density, ultra-violet-resistant linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral drippers at specified intervals and with specified discharge rates. Emitter spacing and discharge specified on Drawings.
  - b. Headers and footers – polyethylene or PVC pipe as shown on Drawings.
  - c. Fittings - Type and diameter recommended by tubing manufacturer.
  - d. Drip Valve Assembly - Type and size shown on Drawings.
    - i. Wye Strainer - Plastic construction with 150 mesh nylon screen and 1/2 inch blowout assembly.
    - ii. Control Valve - 2 way, solenoid pilot operated type made of synthetic, non-corrosive material; diaphragm activated and slow closing. Include freely pivoted seat seal; retained (mounted) without attachment to diaphragm.
    - iii. Pressure Reducing Valve - Plastic construction as detailed.
  - e. Soil staples – install on all on-surface installations, spaced 3 feet on center for sandy soils, 4 feet on center for loam soils, and 5 feet on center for clay soils.
- G. Gate Valves:
  - 1. Gate Valves for 3/4 inch through 2-1/2 Inch Pipe - Brass construction; solid wedge, IPS threads, and non-rising stem with cross operating handle.
  - 2. Gate Valves for 3 Inch and Larger Pipe - Iron body, brass or bronze mounted AWWA gate valves with a clear waterway equal to full nominal diameter of valve; rubber gasket or mechanical joint-type only. Valves shall be able to withstand a continuous working pressure of 200 psi and be equipped with a square operating nut and resilient wedge. Provide pipe restraints on gate valves 3 inches or larger as detailed.
- H. Quick Coupling Valves - Brass two-piece body designed for working pressure of 125 PSI; operable with quick coupler. Equip quick coupler with locking rubber cover.
- I. Valve Boxes:
  - 1. Gate Valves, Quick Coupling Valves, Drain Valves, Drip Line Blow-out Stubs, and Wire Splice or Stub Box - Carson Brooks #910-10, box w/ Bolt Down Cover as detailed.
  - 2. 1 inch through 2 inch Control Valves, Master Valves, Pressure Regulating Valves and Communication Cable Splice box, Sub-meters - Carson Brooks #1419-12 box, w/ Bolt Down Cover as detailed.
  - 3. Drip Valve Assemblies and Flow Sensors - Carson Brooks #1220-12 box w/ Purple Bolt Down Cover, Carson Brooks #1730-12 box, as detailed.
- J. 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. Electrical Common Wire - AWG UFUL approved No. 14 direct burial copper wire or larger, if required to operate system as designed.
  - c. Wire Colors:
    - i. Control Wires - Red.
    - ii. Common Wires - White.
    - iii. Master Valve Wires - Blue.
    - iv. Drawing Spare Control Wires - Black.
    - v. Drawing Spare Common Wires - Yellow.
    - vi. Maintenance Spare Control Wires - Green.
    - vii. Maintenance Spare Common Wires - Brown.
  - d. If multiple controllers are utilized, and wire paths of different controllers cross each other, both common and control wires from each controller shall be different colors approved by Consultant.
  - e. Control Wire connections and splices shall be made with 3M DBY or King 600 DBY/R direct bury splice, or as required by the controller manufacturer.
2. High Voltage - Type required by local codes and ordinances, of proper size to accommodate needs of equipment serviced.
- K. Electric Control Valves - Size and type shown on Drawings having manual flow adjustment, and manual bleed nut.
  - L. Sprinkler Heads - As indicated on Drawings. Fabricated riser units in accordance with details on Drawings - with fittings and nipples of equal diameter as riser inlet in sprinkler body.

### **PART 3 - EXECUTION**

#### **3.01 SITE CONDITIONS, LANDSCAPE PLAN REVIEW AND COORDINATION**

- A. Contractor will be held responsible for coordination between landscape and irrigation system installation. Landscape material locations shown on the Landscape Plan shall take precedence over the irrigation system equipment locations. If irrigation equipment is installed in conflict with the landscape material locations shown on the Landscape Plan, the Contractor will be required to relocate the irrigation equipment, as necessary, at Contractor's expense.
- B. Contractor is responsible to notify Consultant of any field conditions that vary from the conditions shown on the Irrigation Construction Documents. If Contractor fails to notify Consultant of these conditions, Contractor will be held responsible for all costs associated with system adjustments required due to the change in field conditions.
- C. Comply with the requirements of Section 31 25 00, TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN for preparation and protection of the site.

#### **3.02 STATIC PRESSURE VERIFICATION**

- A. Contractor shall field verify the static pressure at the project site, prior to commencing work or ordering irrigation materials, and submit findings, in writing, to Consultant. If Contractor fails to verify static water pressure prior to commencing work or ordering irrigation materials, Contractor shall assume responsibility

for all costs required to make system operational and the costs required to replace any damaged landscape material. Damage shall include all required material costs, design costs and plant replacement costs.

### 3.03 INSPECTION

- A. 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.
- B. Grading operations, with the exception of final grading, shall be completed and approved by Owner before staking or installation of any irrigation system begins.
- C. Underground Utilities shall be installed prior to installation of irrigation system. If irrigation installation takes place prior to utility installation, Contractor shall notify Owner of this condition in writing prior to commencement of irrigation installation.

### 3.04 PREPARATION:

- A. Staking shall Occur as Follows:
  - 1. Mark, with powdered lime, routing of pressure supply line and flag heads for first few zones. Contact Consultant 48 hours in advance and request review of staking. Proposed locations of all trees shall be field staked by Contractor and approved by Owner/Landscape Architect prior to Consultant review of irrigation staking. Consultant will advise installer as to the amount of staking to be prepared. Consultant will review staking and direct changes if required. Review does not relieve installer from coverage problems due to improper placement of heads after staking.
  - 2. Contractor shall contact Consultant if field spacing varies by +/- 10% of the spacing shown on the irrigation plans. If Contractor fails to notify Consultant of variances exceeding 10%, Contractor assumes full responsibility for the costs associated with any required system modifications deemed necessary by the Consultant or Owner.
  - 3. If Project has significant topography, freeform planting beds, or other amenities, which could require alteration of irrigation equipment layout as deemed necessary by Consultant, do not install irrigation equipment in these areas until Consultant has reviewed equipment staking.
- B. Install sleeving under asphalt paving and concrete walks, prior to concreting and paving operations, to accommodate piping and wiring. Compact backfill around sleeves to 95% Modified Proctor Density within 2% of optimum moisture content in accordance with STM D1557.
- C. Trenching - Trench excavation shall follow, as much as possible, layout shown on Drawing. 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:
    - a. Piping 3 Inches and Larger - Make trenches of sufficient width (14 inches minimum) to properly assemble and position pipe in trench. Minimum clearance of piping 3 inches or larger shall be 5 inches horizontally on both sides of the trench.
    - b. Piping Smaller than 3 Inches - Trenches shall have a minimum width of 7 inches.
    - c. 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 – 24 inches from top of pipe minimum or as noted on plans.
    - b. PVC Sleeving – To match depth of sleeved material.
    - c. Non-pressure Piping (rotor) - 18 inches from top of pipe.

- d. Non-pressure Piping (pop-up) - 14 inches from top of pipe.
  - e. Control Wiring/Communication Cable - Side of pressure main or at 18 inch depth if installed in a separate trench with no mainline piping.
  - f. Drip Tubing - 12 inches from top of pipe.
  - g. Emitter Tubing (Micro-tubing) - 8 inches from top of pipe.
  - h. Subsurface – 2 inches from top of pipe or as noted on plans.
3. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed. In backfilling bore, final density of backfill shall match that of surrounding soil. It is acceptable to use sleeves of suitable diameter installed first by jacking or boring, and pipe laid through sleeves. Observe same precautions as though pipe were installed in open trench.
4. Vibratory Plow - Non-pressure piping may be installed through use of vibratory plow method if consultant determines soil conditions are satisfactory for this method of installation. Vibratory plowing does not relieve installer of minimum pipe depths.
- 3.05 INSTALLATION - Locate other equipment as near as possible to locations designated. Consultant shall review deviations prior to 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 degrees F. Place manual drain valves at low points and dead ends of pressure supply piping to insure complete drainage of system. When pipe installation 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. Drip Tubing:
- 1. Make all fitting connections as per manufacturer's recommendations.
  - 2. Use only manufacturer provided or recommended hole punch when making penetrations in drip tubing for insert fittings. Use of any other hole punch shall be cause for immediate removal and replacement of all installed drip tubing.
  - 3. Install drip line blow-out stubs at all dead ends of drip tubing.
- C. Control Wiring:
- 1. Low Voltage Wiring:
    - a. Install in conduit, as indicated on plans.
    - b. 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.
    - c. Bundle all 24 volt wires at 10 foot intervals and lay with pressure supply line pipe to one side of the trench.
    - d. 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.
    - e. Make all splices and E.C.V. connections using 3M DBY, King 600 DBY/R direct bury connectors, or similar dry splice method.
    - f. Install all control wire splices not occurring at control valve in a separate splice valve box.
    - g. Install one control wire for each control valve.

- h. Maintenance spare wires - In addition to spare wires labeled on drawings, extend two spare #14 AWG UFUL control wires and one spare #14 AWG UFUL common wire from controller pedestal to the end of each and every leg of mainline. Label maintenance spare wires at controller and wire stub box.
- D. Electric Control Valves - Install cross-handle four inches below finished grade where shown on Drawings as detailed. When grouped together, allow minimum of 12 inches between valve box sides. Install each remote control valve in a separate valve box. Install valve box flush with grade or when present flush with surfacing material (rock mulch). When parallel to roadway, sidewalk or other permanent element or structure, control valve and box to be installed perpendicular to element or structure, spaced equally.
- E. Quick Coupling Valves - Install quick couplers on swing-joint assemblies as indicated on construction details; plumb and flush to grade. Angled nipple relative to pressure supply line shall be no more than 45 degrees and no less than 10 degrees.
- F. Drip and Sub-Surface Valve Assemblies - Install valve assembly as detailed.
- G. Drip Emitters - Stake all surface emitters as detailed and staked with acceptable tubing stakes.
- H. Drain Valves - Install one manual drain valve on pressure supply line directly downstream of backflow preventer and at all low points in pressure supply line as detailed. Provide a three cubic foot drainage sump for drain valve as detailed.
- I. Valve Boxes:
  - 1. Install one valve box for each type of valve installed as detailed. Valve box extensions are not acceptable except for master valves and flow sensors. Install gravel sump after compaction of all trenches. Place final portion of gravel inside valve box after valve box is backfilled and compacted.
  - 2. Brand controller letter and station number on lid of each valve box. Letter and number size shall be no smaller than 1 inch and no greater in size than 1 1/2 inches. Depth of branding shall be no more than 1/8 inch into valve box lid.
  - 3. Concrete polymer boxes shall be labeled with branded inserts per manufacturer's recommendations.
- J. Gate Valves - Install where shown on Drawings as detailed.
- K. Sprinkler Heads - Install sprinkler heads where designated on Drawings or where staked. Set to finish as detailed. Spacing of heads shall not exceed the maximum indicated on Drawing unless re-staked as directed by Consultant. In no case shall the spacing exceed maximum recommended by manufacturer. Install heads on swing joints or riser assemblies as detailed. Adjust part circle heads for proper coverage. Adjust heads to correct height after sod is installed. Plant placement shall not interfere with intended sprinkler head coverage, piping, or other equipment. Consultant may request nozzle changes or adjustments without additional cost to the Owner.
- L. Backfilling - Do not begin backfilling operations until required system tests have been completed. Backfill shall not be done in freezing weather except with review by Consultant. Leave trenches slightly mounded to allow for settlement after backfilling is completed. Trenches shall be finish graded prior to walk-through of system by Consultant.
  - 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% maximum density, determined in accordance with ASTM D155-7 utilizing the following methods:
  - a. Mechanical tamping.
  - b. Puddling or ponding. Puddling or ponding and/or jetting is prohibited within 20'-0" of building or foundation walls.

M. Piping Under Paving:

1. Provide for a minimum cover of 18 inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete or concrete paving.
2. Piping located under areas where asphalt or concrete paving will be installed shall be bedded with sand (a layer 6" below pipe and 6" above pipe).
3. Compact backfill material in 6" lifts at 90% maximum density determined in accordance with ASTM D1557 using manual or mechanical tamping devices.
4. Set in place, cap, and pressure test all piping under paving, in presence of Owner prior to backfilling and paving operations.
5. Piping under existing walks or concrete pavement shall be done by jacking, boring, or hydraulic driving, but where cutting or breaking of walks and/or concrete is necessary, it shall be done and replaced at not cost to Owner. Obtain permission to cut or break walks and/or concrete from Owner.

N. Water Supply and Point of Connection - Water supply shall be extended as shown from water supply lines.

3.06 FIELD QUALITY CONTROL:

A. Flushing - After piping, risers, and valves are in place and connected, but prior to installation of sprinkler heads, quick coupler assemblies, and hose valves, thoroughly flush piping system under full head of water pressure from dead end fittings. Maintain flushing for 5 minutes through furthest valves. Cap risers after flushing.

B. Pressure Testing - Conduct test in presence of Consultant. Arrange for presence of Consultant 48 hours in advance of testing. Supply force pump and all other test equipment. Compressed air shall not be used for pressure testing system.

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 or 120 PSI, whichever is greater, for a period of 2 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.
6. Pressure test shall be scheduled and passed prior to scheduling of Substantial Completion Walk-through.

C. Walk-Through for Substantial Completion:

1. Arrange for Consultant's presence 48 hours in advance of walk-through.
2. Entire system shall be completely installed and operational prior to scheduling of walk-through.
3. Operate each zone in its entirety for Consultant at time of walk-through and additionally, open all valve boxes if directed.
4. Generate a list of items to be corrected prior to Final Completion.
5. Furnish all materials and perform all work required to correct all inadequacies of coverage due to deviations from Contract Documents.

6. During walk-through, expose all drip emitters under operations for observation by Consultant to demonstrate that they are performing and installed as designed, prior to placing of all mulch material. Schedule separate walk-through if necessary.
  7. Supply Consultant with prints of irrigation as-builts prior to scheduling substantial completion walk-through.
- D. Walk-Through for Final Completion:
1. Arrange for Consultant's presence 48 hours in advance of walk-through.
  2. Show evidence to Consultant that Owner 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 Consultant at time of walk-through to insure correction of all incomplete items.
  4. Items deemed not acceptable by Consultant shall be reworked to complete satisfaction of Consultant.
  5. If after request to Consultant for walk-through for Final Completion of irrigation system, Consultant finds items during walk-through which have not been properly adjusted, reworked, or replaced as indicated on list of incomplete items from previous walk-through, Contractor shall be charged for all subsequent walk-throughs. Funds will be withheld from final payment and/or retainage to Contractor, in amount equal to additional time and expenses required by Consultant to conduct and document further walk-throughs as deemed necessary to insure compliance with Contract Documents.
- 3.07 ADJUSTING - Upon completion of installation, fine-tune entire system by adjusting patterns and break-up pins, and setting pressure reducing valves at proper and similar pressure to provide optimum and efficient coverage. Flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible. Heads of same type shall be operating at same pressure +/- 10%.
- A. If it is determined that irrigation adjustments will provide proper coverage, and improved water distribution as determined by Consultant, contractor shall make such adjustments prior to Final Acceptance, as directed, at no additional cost to Owner. Adjustments may also include changes in nozzle sizes, degrees of arc, and control valve throttling.
  - B. All sprinkler heads shall be set perpendicular to finish grade unless otherwise noted on Construction Plans or directed by Consultant.
  - C. Areas which do not conform to designated operation requirements due to unauthorized changes or poor installation practices shall be immediately corrected at no additional cost to the Owner.
- 3.08 CLEANING - Maintain continuous cleaning operation throughout duration of work. Dispose of, off-site at no additional cost to Owner, all trash or debris generated by installation of irrigation system.
- A. Comply with the requirements of DIVISION 1, General Requirements, and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for recycling and salvage of debris and waste.
  - B. Comply with the requirements of Section 31 25 00, TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN for preparation and protection of the site.

**END OF SECTION**



**PART 1- GENERAL**

## 1.01 DESCRIPTION OF WORK

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications sections, apply to work of this section.
- B. Related Work Specified Elsewhere:
  - 1. Section 32 91 13 - Soil Preparation
- C. The work of this section includes furnishing all trees, shrubs and other materials necessary to complete the landscape planting in accordance with the specifications and drawings contained in the Contract Documents. This shall include all labor, equipment and performance of operations including planting, mulching, fertilizing, watering, cleanup of planting areas and other related work as specified herein.

## 1.02 REFERENCE STANDARDS

- A. American Standards for Nursery Stock (ANSI A 300,) American Association of Nurserymen, Washington, D.C.
- B. ANSI A 300, ANSI Z 133.1 and ANSI Z60.1 - 2012
- C. Hortus III, L.H. Bailey Hortorium and Staff, MacMillian Co., New York, 1976.
- D. Manual of Woody Landscape Plants, M.A. Dirr, Stipes Publishing Co., Champaign, Illinois, 1995.
- E. Standardized Plant Names, Second Edition
- F. MSMT603 New Mexico Standard Method of Tests (SHA).

## 1.03 QUALITY ASSURANCE

- A. Contractor Qualifications: All work specified herein shall be performed by a landscape contractor with a minimum of five (5) years of experienced with the type and scale of work required and having equipment and personnel adequate to perform the work satisfactorily.
- B. Source Quality Control:
  - 1. Compliance with Laws. All plant materials shall comply with State and Federal Laws, including the New Mexico Plant Protection Act, with respect to inspection for disease infestation.
  - 2. Plant Quality Standards: All plant material shall have been grown or dug and burlapped meet to standards set by American Association of Nurserymen and ANSI A 300.
  - 3. Tagging of Trees. The Contractor shall submit to the Owner, at least one week in advance of tagging date, an itemized list of trees along with a notice as to where and when the nursery inspection of trees shall may be made. The accepted trees will be tagged by the Owner for delivery to the site.
  - 4. Plant Inspection: Inspection of all plant materials will be made for size, vigor, representativeness of species and variety, injury, condition of ball and roots, or latent defects. Inspection at delivery does not preclude the possibility of rejection of material after installation.

5. Substitutions. Substitutions of any plant materials requires the written approval of the Owner prior to ordering plants. Requests for substitutions must be submitted with any cost or quantity adjustments for approval.
6. Analysis and Standards: All packaged standard products shall have manufacturer's certified analysis. For other materials, provide analysis if required in these specifications. Analysis is to be by recognized laboratory and made in accordance with methods established by the Association of Official Agricultural Chemists.
7. Tagging or Labeling of Plant Materials. All plant materials shall be true to species, variety and legibly tagged with origin, name and size of material. These tags shall be durable labels marked in weather resistant ink and securely attached to each plant of a single species, variety and size identification. They will remain on plants through final inspection.

#### 1.04 SUBMITTALS

- A. Submittal Procedure: Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures.
- B. Qualifications of Landscape Contractor. Submit Contractor's qualifications showing experience, quality, and capabilities as noted in Quality Assurance.
- C. Plant Sources. Submit for approval by the Owner the nursery or sources for the plant materials to be used in the project.
- D. Plant Photos. Submit photographic samples of representative trees from the plant sources. Photos shall include a scaled ruler or yardstick in the photo. The photos shall demonstrate the quality, size, and health of trees to be used in the project.
- E. Samples. Submit one (1) cubic foot sample of each type of mulch specified on the Drawings to the Owner for approval.
- F. Product Data/Sources: Submit two copies of product names, literature and application rates for fertilizer, antidessicant, and amendments.
- G. Maintenance Materials: Submit two copies of typewritten instructions bound in three-ring binder of recommended landscape maintenance procedures to be followed by the Owner for one full year. Submit prior to expiration of required maintenance periods.

#### 1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery/ Storage of Materials
  1. Delivery of Shipment to Site. The Contractor shall promptly notify the Owner in advance of the time and manner of delivery of plant materials. The Contractor shall furnish, at the time of notice, an itemized list, in duplicate, of the actual quantities of plant materials in each delivery, in order to expedite the required inspection at the point of delivery. Plants rejected at this inspection any time prior to planting shall be removed immediately from the planting area. When shipment is made, all plant materials shall be packed to provide made in a closed vehicle or plants shall be completely covered to prevent drying or other wind damage. Particular care should be exercised in digging, wrapping and binding of plants to insure safe loading and shipment. Mushroomed or cracked rootballs shall be unacceptable for planting.

2. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
- B. Handling Materials:
1. Trunks, branches, and root balls shall not be damaged during lifting and planting operations.
  2. Handle container-grown stock only in containers.

## 1.06 JOB CONDITIONS

- A. Existing Conditions:
1. General: Proceed with and complete landscape work as rapidly as portions of site become available.
  2. Determine the acceptability of each planting site and subgrade prior to the start of planting work.
  3. Utilities: Locate all existing underground utilities in the construction area as accurately as is possible. Perform work in a manner which will avoid damage to underground utilities. Hand excavate as required. Any damage to the utilities shall be repaired by the Contractor at his own expense to the satisfaction of the Owner.
  4. Grade Stakes: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
  5. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions or obstructions, notify the Owner before planting.
- B. Protection/ Sequencing/ Scheduling:
1. Protect all existing items to remain.
  2. Ensure proper timing of each phase of work in relationship to the normal planting season for each type of planting work.
  3. Coordinate planting with the required maintenance period.
  4. Coordination with seeding and sodding: Plant trees and shrubs after final grades are established and prior to seeding and sodding, unless otherwise accepted by the Owner. If planting of trees and shrubs occurs after seeding and sodding work, protect such areas and promptly repair damage resulting from planting operations.

## 1.07 GUARANTEE/WARRANTY

- A. Warranty trees, shrubs and ground covers through maintenance period and until final acceptance.
- B. Replace dead or unhealthy trees and shrubs at the end of warranty period.
- C. Only one replacement per plant will be required during the warranty period, except for losses of original or replacement material due to failure to comply with the specification requirements.

## PART 2 - PRODUCTS

### 2.01 PLANT MATERIALS

- A. Plant Materials. All plants shall be as specified on the Planting Plans and shall be healthy, vigorous and representative of the species and variety. They shall have normal, well developed branch and root systems. All plants shall be free of mechanical injury, free of sun or frost damage, free from

insects, insect eggs and without disfiguring knots or other objectionable defects. All plant materials shall be selected for quality of the specimen. Plant material shall be nursery-grown.

- B. Growing Conditions. Plants shall have been grown under climatic conditions similar to project locality for at least two (2) years.
- C. Pruning. Plants shall not be pruned prior to or after delivery unless authorized by the Owner and must be done under the supervision of a qualified arborist or horticulturist.
- D. Size. All plants shall equal or exceed minimum measurements specified on the plans. Grading of plant material shall be in accordance with the codes and standards of AAN. Any undergrade plants shall be removed and replaced prior to provisional acceptance.
- E. Measurement. Caliper measurements shall be taken six (6) inches above natural ground line on the trunk.
- F. Tree Orientation Marking. All trees prior to digging in the field shall be marked to indicate the north side of tree trunk. Mark is to be temporary and done in manner not deleterious to the long term health and growth of the tree.
- G. Nomenclature. Nomenclature shall conform with Standardized Plant Names, Second Edition. Names not present in this listing shall conform to accepted botanical nomenclature in the nursery trade.

## 2.02 TREES

- A. Deciduous Trees: All deciduous trees, except aspen, and New Mexican privet, shall have been container or nursery grown (not collected or plantation grown) from an approved nursery. Trees noted to be boxed shall be grown in box for a period of one year minimum and two years maximum. Any rootbound material shall not be accepted. Boxed or containerized trees shall be handled by container only. All trees shall be first-class representatives of their species; well-shaped and full. Tree trunks shall be straight and plumb unless otherwise specified. The Owner reserves the right to reject any trees not meeting these criteria. Balled and burlapped material will be rejected if wrapped with plastic burlap or plastic twine. All balled & burlapped material shall have been properly root pruned.
- B. Evergreen Trees. Evergreen trees, except for locally native pines, shall be grade XX or better and nursery grown. Evergreen trees shall be straight, evenly canopied, full and shapely for the species, unless specified as a character tree. Balled and burlapped material shall be tightly and neatly wrapped around the rootball. Field dug material shall have rootballs one size larger than that required for nursery grown stock of the same size. AAN standards shall be used for ball sizes. Nursery grown material shall have been root pruned prior to digging.

## 2.03 SHRUBS AND GROUND COVERS

- A. Container Stock: Plants designated as "Container" grown in various sizes and type containers in the plant list shall be of a size and stage of development normal in the nursery industry for the size container in which they are specified. They shall have been grown in their containers long enough to have developed good, round root systems capable of holding the soil intact after removal from

the container, but not so long as to have become root bound. Any root-bound material will not be accepted.

- B. Ground Cover: Provide well rooted, established ground cover in removable containers or integral peat pots, with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size specified.

## 2.04 SOIL AMENDMENTS

- A. Fertilizer. Standard products manufactured and complying with state and U.S. federal fertilizing laws. Exact fertilizer to be used shall be adjusted based upon the soils test analysis on the existing and imported soils, but for bidding purposes Grow Power Plus at manufacturer's recommended rates shall be applied to all plants.
- B. Soil Additives/ Plant Stimulants. Soil additives such as Ironite and Super Phosphate shall be applied if needed as a result of the soils test analysis. The plant stimulant, Superthrive, shall be applied to all plants at five (5) times the rate recommended by the manufacture.
- C. Compost. Compost material shall be as noted in Section 32 91 13 Soil Preparation.

## 2.05 MISCELLANEOUS MATERIALS

- A. Gravel Mulch/Cobble Stones. Install in areas as noted on the plans per detail (for bidding purposes only).
  - 1. Cobble shall be 2"- 4", angular cobble. Color: brown or to match Gravel A, Gravel B, Crusher Fines (Section 32 20 00 Crusher Fines Paving), and existing cobble. Acceptable product for bidding purposes: "Mountainair Brown Cobble 2"- 4": Restoration Group, PO Box 27333, Albuquerque, NM 87125, (505)-294-1470; or approved equal.
  - 2. Gravel A shall be 1" diameter, washed angular gravel. Color: brown or to match Gravel B, Cobble, Crusher Fines (Section 32 20 00 Crusher Fines Paving), and existing gravel. Acceptable product for bidding purposes: "Mountainair Brown 1" gravel": Restoration Group, PO Box 27333, Albuquerque, NM 87125, (505)-294-1470; or approved equal.
  - 3. Gravel B shall be 7/16" diameter, washed angular gravel. Color: brown or to match Gravel A, Cobble, Crusher Fines (Section 32 20 00 Crusher Fines Paving), and existing gravel. Acceptable product for bidding purposes: "Mountainair Brown 7/16" gravel": Restoration Group, PO Box 27333, Albuquerque, NM 87125, (505)-294-1470; or approved equal.
- B. Boulders: Install as noted on the plans. See plan for quantity.
  - 1. Site boulders. Size: 3'- 5'. Color: brown or to match Gravel A, Gravel B, Cobble, Crusher Fines (Section 32 20 00 Crusher Fines Paving), and existing site boulders. Acceptable product for bidding purposes: "Mountainair Brown boulder": Restoration Group, PO Box 27333, Albuquerque, NM 87125, (505)-294-1470; or approved equal.
  - 2. Playground boulder seat / retaining wall. Size: 18"-24" wide, 12"-20" height, length TBD. Quarry stoned, to be uniform in size, rough hewn on at least 3 sides (top and 2 sides). Approximately 275 LF. Color: Oakwood. Acceptable product for bidding purposes: "Oakwood Sandstone": Rock Mountain Stone Co., 4741 Pan American Freeway NE, Albuquerque, NM 87109, (505) 345-8518; or approved equal.

- C. Check Dam Stone: Install as noted on the plans. See plan for quantity.
  - 1. 1'- 2' stone. Color: match existing. Acceptable product for bidding purposes: "Stacking rock": Oscar's Tree Services, 6151 Airport Rd., Santa Fe, NM 87507, (505)-577-8337; or approved equal.
- D. Rootbarrier: Install in areas as noted on the plans.
  - 1. Root barrier shall be recycled, extruded plastic panels. Size: 24" wide x 24" high, 0.80" thick panels. Color: black. Acceptable product for bidding purposes: "UB 24-2": DeepRoot Green Infrastructure, LLC, 101 Montgomery St., Suite 2850, San Francisco, CA 94104, (800) 458.7668; or approved equal.
- E. Anti-Desiccant: Emulsion-type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's containers and mix in accordance with manufacturer's instructions. Acceptable Product: "Wilt-Pruf."
- F. Staking Materials: Required only when indicated on the Drawings. Staking material shall be as specified on the Drawings.
- G. Wood Stump / Log: Required only when indicated on the Drawings. Stump and logs shall be as specified on the Drawings. Owner supplied.

## 2.06 WATER

- A. Water for maintaining plants shall be clean and free from pollutants that would be harmful to plant growth or contaminate the environment.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Plant Material Locations: Tree and shrub locations as shown on the planting plan are approximate only. Contractor is to place all plant material locations as shown on the planting plan, and under the direction of the Owner adjust the position and orientation of trees and shrubs as required. Final positions of all plant material are subject to the approval of the Owner.
- B. Preparation Ground Surface: Areas to be planted or mulched are to be free of rock/stones greater than one inch across, trash and other debris prior to beginning planting or mulching. Subgrades for planted and mulched areas are to be approved by the Owner prior to beginning planting or mulching.

### 3.02 INSTALLATION

- A. Planting General.
  - 1. Soil amendments shall be as noted in Section 32 91 13 Soil Preparation.
  - 2. Plants shall not be planted deeper than the original ground line.
- B. Trees/ Individual Locations: Excavate tree pits so that top of rootball will be above adjacent soil grade.

1. Tree pit excavations shall be three times as wide as the rootball in diameter and shall be no deeper than the maximum depth of the rootball.
  2. Prior to setting the tree flood the tree pit and allow all water to percolate in to soil.
  3. Set rootball plumb in center of pit and orient tree north marking to face site north.
  4. Remove burlap and wire from top half of root ball.
  5. Unless otherwise directed on the Drawings, backfill with excavated soil in 6" tamped layers. Do not add compost to tree backfill.
  6. Apply fertilizer tablets and other soil additives evenly around the perimeter of each tree rootball at a depth half way between the top and middle of the rootball.
  7. Flood with water after two-thirds backfilled. After water is absorbed, continue backfilling and tamping to grade, leaving no voids or air pockets. Water again after placing final layer of backfill.
  8. Form a water well around each tree if noted on the Drawings as specified at each type of tree. Fill the watering well with mulch as specified.
- C. Shrub planting/ Individual Locations:
1. Shrub pit excavation shall be three times larger than width of rootball and shall only be as deep as the maximum depth of the rootball.
  2. Prior to setting the plant, flood the pit and allow all water to percolate in to soil.
  3. Set shrub rootball plumb in center of pit.
  4. Backfill with two parts native soil and one part compost, unless other wise noted in Section 32 91 13 Soil Preparation.
  5. Apply fertilizer tablets and other soil additives when shrub pit is two-thirds backfilled.
  6. Continue backfilling to finish grade, create watering well, and thoroughly water.
- D. Planting Beds/ Mass Planting Areas:
1. Grade existing soil to proper depth to meet finish grades for area. Grading shall allow for compost, soil additives, and mulch depths.
  2. Spread compost at rates noted Section 32 91 13 Soil Preparation.
  3. Till compost to a minimum depth of twelve inches (12) throughout the planting bed. Till in two directions each at right angles to each other.
  4. Spread soil additives and fertilizer as noted on the plans, and till 6" into compost amended soils. Till in two directions each at right angles to each other.
  5. Rake and remove all rocks over 1 inch size, trash, debris or other deleterious material from the top three inches of the prepared bed.
  6. Soak the amended area with water. Let the area dry. Fill any large depressions or settlement.
  7. Set out plant materials designated for the planting area. If a formal arrangement is shown on the plan, align and measure plants in a uniform triangular pattern; or as shown on the Drawings; or as directed by the Owner.
  8. Excavate pits large enough to set each plant. Backfill with excavated planter soil.
  9. Water area thoroughly after planting. Fill depressions and level high spots. Fine rake bed.
- E. Apply anti-desiccant to leafed out deciduous trees and shrubs, and broadleaf evergreens.
- F. Mulch: Spread a uniform layer of specified mulch as noted on the Drawings. If not indicated on drawings, for bid purposes, assume four (4) inch layer of tan gravel. Any watering wells and planting areas to receive mulch shall be raked smooth, firm, and graded as required. Planted areas shall be approved by the Owner prior to mulch installation.
- G. Staking and Guying: If required on the Drawing, plants shall be guyed and staked as shown on the Drawings. If a manufactured tree staking system is shown in the drawings, install the system as per the manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

- A. Pruning: Pruning shall only be done under direct supervision of the Owner and in accordance with ANSI Z 133.1 and ANSI Z60.1 - 2004. Remove dead and broken branches. Prune deciduous trees and shrubs as approved by the Owner Retain typical growth habit of individual plants. Make cuts with sharp instruments to branch collar. Do not pole or remove the leader from the trees. Remove trimmings from site.

3.04 PROTECTION AND CLEANING

- A. During the installation and maintenance periods, protect planted areas against erosion and trespass. Any damaged planting shall be replaced by the Contractor at no cost to the Owner.
- B. All walks and pavements shall be swept or washed clean upon completion of work in each section. Upon completion of all planting work, clean the portion of the project site used for storing planting materials and equipment of all debris, extra materials and equipment. All such materials and equipment shall be entirely removed from the project site.

3.05 MAINTENANCE PERIOD

- A. Begin maintenance of all plants immediately after planting.
- B. Maintain trees, shrubs and other plants until final acceptance of all contract work.
- C. Maintenance Activities: Maintenance shall include measures necessary to establish and maintain plants in vigorous and healthy growing condition:
  - 1. Plants shall be watered, fertilized, and maintained by the Contractor until physical completion of all the contract work.
  - 2. Water shall be applied to all plants by hand until the underground irrigation system is in place and operational.
  - 3. Cultivate and weed beds every week during maintenance period. If herbicides are used for weed control, apply in accordance with the manufacturer's instructions. Remedy any damage resulting from use of herbicides.
  - 4. Pruning including removal of dead or broken branches and treatment of prune wounds.
  - 5. Maintain all trees in vertically plumb position
  - 6. Disease and insect control.
  - 7. Maintenance of turn buckles and stakes.
  - 8. Maintain watering wells.
  - 9. Replace dead or dying plant material with plants of the same kind and size as specified in the plant list.

The Owner shall inspect maintenance work to verify that maintenance work has been satisfactorily undertaken and continued. The Contractor shall make all corrective measures, as directed by the Owner, prior to release of maintenance responsibilities. All maintenance work as outlined herein is incidental to each planting item, and no additional payment will be made for maintenance operations.

Final inspection and acceptance of landscape work will be made by the Owner upon notice by the Contractor of physical completion of all the contract work.

NOTE:

Maintenance Manual Submittal: Prior to Final Inspection, the Contractor shall submit a plant maintenance manual which is acceptable to the Owner.

END OF SECTION

**PART 1 - GENERAL**

## 1.01 SUMMARY

Work to be done includes all labor, materials, transportation, equipment and services required to complete the soil preparation. Execute labor to achieve soil preparation, complete, as shown and as specified planting as indicated on the Construction Drawings, and as specified herein. Work includes, but is not necessarily limited to the following items: soil amendments, and mulches.

## 1.02 RELATED WORK

The following items of related work are specified and included in other sections of the specifications:

A. Section 32 90 00 - Planting

## 1.03 REFERENCES

The following standards will apply to the work of this Section:

A. MSA: Methods of Soil Analysis

B. ASTM: American Society for Testing and Materials

## 1.04 SUBMITTALS

A. Submit samples and detailed technical data of products proposed for use for Owner's approval according to Section 01 33 00 Submittal Procedures

B. Product data: Manufacturers' catalog cuts and current printed specifications of the following:

1. Back-to-Earth  
Composted cotton burr  
Back to Earth Resources  
3071 Hwy 86  
Tulia TX 79088  
800/441-2498  
Fax: 806/627-4277

C. Samples:

1. Compost, one (1) cubic foot
2. Mulches, one (1) cubic foot each
3. Imported soil, one (1) cubic foot

D. Testing Results:

1. Existing native soils: samples to be taken in two locations approved by Landscape Architect.
2. Imported Soils

E. Soil Amendments:

1. Proposed soil amendments, for each type of plant material within each type of soil, adjusted to the results of the soils tests.

F. Certifications:

1. Certify strict compliance with accepted soil mixes and amendments, including rate of application

#### 1.05 QUALITY ASSURANCE

- A. Soil Testing Laboratory: Approved by the Owner and paid for by the Contractor.
  1. Servi-Tech Laboratories  
1816 E. Wyatt Earp  
PO Box 1397  
Dodge City, KS 67801  
Tel. 620.227.7123  
www.servitechlabs.com
  2. A & L Plains Agricultural Laboratories, Inc.  
301 34<sup>th</sup> St.  
PO Box 1590  
Lubbock, TX 79408  
Tel. 806.763.4278  
www.al-labs-plains.com
- B. General: Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting.
- C. The work of this Section shall be performed by a Contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five (5) years experience.
- D. The Contractor shall examine all areas of work and surfaces before proceeding with any work of this section. Any defects such as incorrect grading and inadequate drainage shall be reported to the Owner prior to beginning work.
- E. The Contractor shall secure Blue Stakes permit number for the project to certify notification of all utilities. The Contractor shall not commence work until Blue Stakes has responded.
- F. It is the intent of this specification that all material herein specified and shown on the construction documents shall be of the highest quality available and meeting the requirements specified.
- G. All work shall be performed in accordance with the best standards of practice relating to the trade.
- H. The Contractor shall comply with all rules, licensing, regulations, laws and ordinance of the City, County and State, and other authorities having jurisdiction over this project site.

#### 1.06 DEFINITIONS

- A. Existing soil: Area of undisturbed native soil where no rough grading is to be done. No soil is to be placed. Only surface cultivation and soil amending are included in this Section.
- B. Subgrade: Soil level resulting from the rough grading work under another Section. Cultivation of subgrade areas prior to amending is included in this section.

- C. Imported Soil: Imported soil stockpiled for spreading over prepared subgrade. Soil imported and stockpiled under this Section, shall be spread and amended as work under this Section.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

#### **A. Imported Soil:**

1. Quantity: The approximate quantity of imported soil will not be known until demolition and rough grading have been completed under earthwork. It is assumed no imported soil will be needed for areas receiving planting.
2. Composition: Fertile, friable, well-drained soil, of uniform quality, free of stones over 1 in. diameter, sticks, oils, chemicals, plaster, concrete and any other materials deleterious to healthy plant growth.
3. Analysis: Obtain an agricultural suitability analysis of the proposed soil from an accepted, accredited Testing Agency at Contractor's cost.
4. Test Results: Request Testing Agency to send one (1) copy of test results direct to the Owner and one (1) copy to the Owner. Imported soil shall be amended per soils analysis report.

### **2.02 SOIL MIXES**

- A. Typical plant backfill mix: Shall consist of four (4) inch depth of compost tilled in twelve (12) inches into the soil. To be administered to all planting areas and areas adjacent to contiguous planting areas.

### **2.03 ACCESSORIES**

- A. Water: Contractor to supply as available until turn over of project to Owner. Transport may be required.

## **PART 3 – EXECUTION**

### **3.01 SOIL MOISTURE CONTENT**

- A. General: Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting.
- B. Range: Maintain within 2 percent above or below optimum moisture content during the work.

### **3.02 CLEARING AND CULTIVATION**

- A. Clearing: Clear planting areas of stones 2 in. diameter and larger, weeds, debris and other extraneous materials prior to soil preparation work.
- B. Cultivation of Imported Soil:
  1. Cultivation: Till or loosen soil to receive planting to a depth of twelve (12) inches immediately prior to applying soil amendments.

- C. Cultivation of Subgrade:
  - 1. Verification:
    - a. Verify that subgrades for installation of soil have been established under rough grading. Do not spread soil prior to acceptance of subgrade work.
    - b. Depth: Verify that subgrades are within required subgrade tolerances.
  - 2. Cultivation: Rip or cultivate subgrade in planting areas to a depth of twelve (12) inches immediately prior to spreading imported amended soils.

### 3.03 SPREADING OF AMENDED IMPORTED SOIL

- A. General: Spread amended imported soil over accepted subgrade prior to incorporating amendments.
- B. Restrictions: Do not commence spreading of amended imported soil prior to acceptance of subsoil cultivation above. Do not place soil under muddy or frozen conditions.
- C. Soil Depth: Refer to finish grade and planting details per the Drawings.

### 3.04 SOIL AMENDMENT

- A. Amending of Soil: Follow recommendations of soil tests
  - 1. Preparation: Do not commence amending of imported soil prior to acceptance of final subgrades. Do not work soils under muddy or frozen conditions.
  - 2. Soil Amendments: Incorporate by tilling amendment into the top (12) inches of imported soil in all planting areas.

### 3.05 FIELD QUALITY CONTROL

- A. Tests: Right is reserved to take samples of soil mixes prepared soil for testing for conformity to Specifications.
- B. Rejected Materials: Remove off site at Contractor's cost. Pay cost of testing of materials, not meeting Specifications.

### 3.06 CLEAN-UP

- A. After completion of all soil preparation operations and before acceptance of the work, the Contractor shall remove all debris, rubbish, etc. from the site in a legal manner. The premises shall be left clean, presentable, and satisfactory.

END OF SECTION

**1.01 SUMMARY**

Work to be done includes all labor, materials, transportation, equipment and services required to complete reseeding operations. Execute labor to achieve soil preparation, complete, as shown and as specified mechanical seeding as indicated.

**PART 1 - GENERAL****1.01 DESCRIPTION**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Related Work Specified Elsewhere:
  - 1. Section 32 90 00 Planting
- C. Scope: Prepare all areas indicated on the Drawings for grass seeding according to the specifications and drawings contained in the Contract Documents, including: furnishing and installing all seed, fertilizer, organic soil amendments and related maintenance.

**1.02 QUALITY ASSURANCE**

- A. Contractor Qualifications: All work specified herein shall be performed by a licensed landscape contractor experienced with the type and scale of work required and having equipment and personnel adequate to perform the work satisfactorily.

**1.03 APPLICABLE STANDARDS**

- A. All grass seed shall be certified by state of origin. The certification authority for the state of New Mexico is the New Mexico Crop Improvement Association.

**1.04 SUBMITTALS**

- A. Product Data:
  - 1. Proposed source of all native grass seed which shall indicate the location from which the seed was harvested, prior to ordering seed.
  - 2. Submit type and source of soil amendment and fertilizer for approval prior to ordering soil amendment.
- B. Seed Tags: Seed bag tags and weights per bag and copies of invoices identified by project name.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Keep fertilizer and seeds in dry storage away from contaminants.

1.06 JOB CONDITIONS

- A. Sequencing, Scheduling: Schedule to seed after installation and approval of the complete irrigation system in the area.

1.07 WARRANTY

- A. Warranty seeded areas through specified maintenance period, as outlined in Paragraph 3.04, Maintenance.
- B. Where native grass is installed in areas without an irrigation system, no warranty shall be required after the date of final acceptance of all the contract work.

**PART 2 - MATERIALS**

2.00 SEED MIX

- A. All native grass seed shall be obtained from sources in New Mexico unless proof is provided that a particular seed is unavailable within the state. Fescue seed shall be obtained from approved producers.
- B. Contractor shall furnish certification showing origin of all seed and pure live seed (P.L.S.) content as determined by a certified authority. Pure live seed shall be the product of percent purity time's percent germination. Each bag of seed shall be tagged and sealed by the seed dealer in accordance with the State Department of Agriculture or other local certification authority within the state of origin. The tag or label shall indicate analysis of seed and date of analysis, which shall not be more than 9 months prior to delivery date. Seed may be premixed by the seed dealer and appropriate data indicated on the bag label for each variety.
- C. Native Grass Seeding: The seed mixes shall be as follows:

a. Santa Fe Trail - Seed Mix (Irrigated / Non-Irrigated):

Seed mix by Curtis and Curtis Seed and Supply 4500 N. Prince St, Clovis, NM 88101.  
Phone: (877) -907-1806, or approved equal. Seed mix rate: 1.5 lbs/1000 SF.

**Common Name**

*Western Wheatgrass*  
*Sideoats Grama*  
*Galleta*  
*Little Bluestem*  
*Blue Grama*  
*Indian Ricegrass*  
*Buffalograss*

**Botanical Name**

*Agropyron smithii*  
*Bouteloua curtipendula*  
*Hilaria jamesii*  
*Agropyron scoparium*  
*Boutelua gracilis*  
*Achnatherum hymenoides*  
*Buchloe dactyloides*

Alkali Sacaton  
Sheep Fescue

*Sporobolus airoides*  
*Festuca ovina*

Quantity: 4.5 AC (approx.)

D. Native Grass / Wildflower Seeding: The seed mix shall be a combination of the following:

a. Santa Fe Trail Seed Mix:

Seed mix by Curtis and Curtis Seed and Supply 4500 N. Prince St, Clovis, NM 88101.  
Phone: (877) -907-1806, or approved equal. Seed mix rate: 1.0 lbs/1500 SF.

<b>Common Name</b>	<b>Botanical Name</b>
Western Wheatgrass	<i>Agropyron smithii</i>
Sideoats Grama	<i>Bouteloua curtipendula</i>
Galleta	<i>Hilaria jamesii</i>
Little Bluestem	<i>Agropyron scoparium</i>
Blue Grama	<i>Boutelua gracilis</i>
Indian Ricegrass	<i>Achnatherum hymenoides</i>
Buffalograss	<i>Buchloe dactyloides</i>
Alkali Sacaton	<i>Sporobolus airoides</i>
Sheep Fescue	<i>Festuca ovina</i>

Quantity: 32,400 SF (approx.)

b. High Plains Seed Mix: Distribute by hand prior to installing tackifier.

Seed mix by Plants of the Southwest 3095 Agua Fria St. Santa Fe, NM 87507  
Phone: (505) 438-8888, or approved equal. Seed mix rate: 1.0 lbs/6400 SF.

<b>Common Name</b>	<b>Botanical Name</b>
Spotted Gayfeather	<i>Liatris punctata</i>
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>
California Poppy	<i>Eschsholzia californica</i>
Firewheel	<i>Gaillardia pulchella</i>
Skyrocket	<i>Ipomopsis aggregata</i>
Western Blue Flag	<i>Iris missouriensis</i>
Blue Flax	<i>Linum lewisii</i>
Desert 7 O'Clock	<i>Mirabilis multiflora</i>
Pink Wild Snapdragon	<i>Antirrhinum majus</i>
Rocky Mt. Penstemon	<i>Penstemon strictus</i>
Mexican Hat	<i>Ratibida columnifera</i>
Yellow Prairie Coneflower	<i>Ratibida pinnata</i>
Chocolate Flower	<i>Berlandiera lyrata</i>
Rocky Mountain Beeplant	<i>Cleome serrulata</i>

Quantity: 32,400 SF (approx.)

## 2.01 COMPOST MATERIAL

A. Compost material shall be as noted in 32 91 13 Soil Preparation or approved equal. Rate of application shall be as noted on the Drawings.

## 2.02 FERTILIZER

- A. Fertilizer shall be manufactured from quality materials, be free from impurities, uniform in composition, meet recognized standards for effectiveness and be free flowing and suitable for application with approved equipment.
- B. Fertilizer shall be delivered to the site in bags or other containers, each clearly labeled, conforming to applicable state laws, bearing the grade and trade name of the producer.
- C. Application: Care shall be taken when spreading fertilizer that there are no gaps during application. The fertilizer shall be applied under favorable conditions and by such approved methods as will ensure maximum uniformity of distribution.
- D. Fertilizer: Exact fertilizer mix may be altered to reflect results of soil analysis, but for purposes of bidding the following fertilizer shall be used in the following applications:

### Seed Mix Microrhyza:

Mix the following with seed mix at a rate of 1 lb / 5 acres (best done at facility):

- Endomaxia (or approved equal)  
Soil Secrets LLC & Soil Secrets Worldwide LLC  
9 Gilcrease Road, Los Lunas, New Mexico 87031  
Phone: 505-866-7645; email: [info@soilsecrets.com](mailto:info@soilsecrets.com); web: [www.soilsecrets.com](http://www.soilsecrets.com)

### Seed Mix Fertilizer:

Mix the following with mulch / tackifier at a rate of 22 bags / 1 acres:

- Protein Crumbles (or approved equal)  
Soil Secrets LLC & Soil Secrets Worldwide LLC  
9 Gilcrease Road, Los Lunas, New Mexico 87031  
Phone: 505-866-7645; email: [info@soilsecrets.com](mailto:info@soilsecrets.com); web: [www.soilsecrets.com](http://www.soilsecrets.com)

### Seed Mix Soil Conditioner:

Mix the following with mulch / tackifier at a rate of 44 bags / 1 acres:

- TerraPro (or approved equal)  
Soil Secrets LLC & Soil Secrets Worldwide LLC  
9 Gilcrease Road, Los Lunas, New Mexico 87031  
Phone: 505-866-7645; email: [info@soilsecrets.com](mailto:info@soilsecrets.com); web: [www.soilsecrets.com](http://www.soilsecrets.com)

## 2.03 MULCH AND TACKIFIER

- A. The tackifier shall be a colloidal polysaccharide or wood fiber tackifier. The tackifier shall be homogeneous within the unit package. It shall have no growth or germination inhibiting factors and be nontoxic. It shall be dry mixed with the fertilizer and soil conditioner at a rate of 1 bale per 1,000 sf.
- B. Apply mulch and tackifier at a rate of ½" layer evenly across seeded areas.

## PART 3 - EXECUTION

### 3.00 PREPARATION

- A. Preparation of Subgrade: Clear existing soil free of roots, plants, sod, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.
- B. Preparation for Seeding:
1. The extent of seed bed preparation shall not exceed the area on which the entire seeding operation can be accomplished to such prepared seed bed within a 24 hour period, unless otherwise directed by the Landscape Architect.
  2. All areas to be seeded shall be brought to an even grade and shaped to drain. Areas to be seeded shall be graded to meet finished grades, and be uniformly compacted to prevent uneven settlement after seed installation and watering.
  3. Rototill to the following depths:  
  
Native Grass: top four (4) inches.  
Rototill area twice in cross directions. Rototilling shall not occur when the wind is over 10 mph and creates a dust problem to adjoining areas.
  4. Fine rake and remove stones over 1/2" in any dimension, sticks, roots, rubbish and any other extraneous matter brought to surface by the rototilling process. Drag to even grade, and compact to ninety (90) percent modified proctor.
  5. Water area to be seeded thoroughly. Apply a minimum of two inches of water throughout area. Allow area to dry.
  6. Regrade as necessary to insure drainage and to meet proposed grades. Correct any differential settlement.
- C. Harvested Topsoil Reapplication:
1. Before spreading topsoil ensure that all necessary erosion and sediment control practices are in place and functioning properly. These practices must be maintained until the site is permanently stabilized.
  2. Maintain grades on the areas to receive topsoil according to the approved plan and do not alter them by adding topsoil.
  3. Immediately prior to spreading the topsoil, loosen the subgrade by disking or scarifying to a depth of at least 4 inches to ensure bonding of the topsoil and the subsoil. If no amendments have been incorporated, loosen the soil to a depth of at least 6 inches before spreading the topsoil.
  4. Uniformly distribute topsoil to a minimum compacted depth of 2 inches on 3:1 slopes and 4 inches on flatter slopes. Topsoil shall not be spread while it is frozen or muddy or when the subsoil is frozen or muddy. Do not apply topsoil to slopes greater than 2:1 to prevent slippage.

5. If topsoil is stockpiled prior to final placement, the top 1 foot of the stockpile material should be mixed with the remainder of the stockpile to ensure that living organisms are distributed throughout the topsoil material at the time of final placement.
- D. Moisten prepared areas before seeding if soil is dry. Do not create muddy soil conditions.
- E. Approval of Seed Bed Preparation: Seed bed preparation is to be approved by the Landscape Architect immediately prior to the seeding operations, and after all seed bed preparation is complete.

### 3.01 SEEDING

- A. General:
  1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
  2. Sow not less than the quantity of seed specified or scheduled.
- B. Seeding Dates: Shall be accomplished between June 15th and September 1st unless specific permission in writing is issued by the Landscape Architect to allow seeding before or after these dates.
- C. Seeding Rate and Mix: As per Paragraph 2.00.C.
- D. Drill Seeding:
  1. Where indicated on the plans, the seed shall be mechanically broadcast by use of a range drill seeder. Seed should be drilled to a depth of 1/4".
  2. Contractor's vehicles and other equipment are prohibited from traveling over the seeded areas.

### 3.02 MULCH / TACKIFER

- A. Immediately following the drill seeding operation, seeded areas on slopes less than 2:1 shall receive mulch/tackifier at the even rate of 1/2" depth throughout the seeded area.
- B. Spread mulch to achieve an even coverage.
- C. All areas receiving insufficient coverage in the opinion of the Architect shall receive additional mulch/tackifier.

### 3.03 RESEEDING

- A. Void areas greater than one square foot, or repetitive voids smaller than one square foot which amount to more than 10% of any area that occur within 60 days after installation shall be reseeded.

### 3.04 MAINTENANCE

- A. Begin maintenance immediately after planting.
- B. Maintain seeded grass for not less than the period stated below, and longer as required to establish an acceptable grass stand.
  - 1. Maintenance shall continue through the first mowing, or until the entire landscape project is accepted, and until the end of the maintenance period. Maintenance period shall be not less than sixty (60) days after substantial completion, unless otherwise approved by the Landscape Architect.
  - 2. Maintain seeded areas by watering fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading and replanting as required to establish an acceptable grass stands, free of weeds and eroded or bare areas. Irrigate by means of the underground automatic irrigation system where irrigation is available, as often as necessary to promote healthy grass growth, and until a thick, even stand of grass has been obtained.

### 3.05 CLEANUP AND PROTECTION

- A. During the work, keep all pavements clean and work area in an orderly condition.
- B. Protect existing elements from damage due to seeding operations, operations by other contractors, other trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged work to the satisfaction of the Owner at no cost to the Owner.
- C. Preservation of Existing Vegetation: The Contractor shall preserve and protect all existing vegetation adjacent to areas being seeded and which do not unreasonably interfere with construction procedures. The contractor shall replace or restore, at his own expense, all vegetation that may be destroyed or damaged which has not been protected or preserved as specified herein.

### 3.06 OBSERVATION AND ACCEPTANCE

- A. When work is completed, including maintenance, the Landscape Architect will, upon request, make an observation to determine acceptability.
- B. All seed must be well-rooted into sub grade and any bare spots, low areas or dead native grass must be repaired or reseeded to the satisfaction of the Owner prior to acceptance. Final acceptance of all grass areas shall be when a minimum of 80% germination is evidenced and approved by the Landscape Architect and all areas have been seeded for a minimum of twenty eight (28) days.
- C. When observed work does not comply with requirements, reseed rejected work and continue specified maintenance until re-observed by Landscape Architect and found to be acceptable.
- D. The owner shall begin grass establishment operations upon acceptance of grassing operations by the Landscape Architect.

END OF SECTION

**SUMMARY**

Work to be done includes all labor, materials, transportation, equipment and services required to complete native grass lawn installation. Execute labor to achieve lawn installation complete, as shown and as specified planting as indicated

**PART 1 - GENERAL**

## 1.01 DESCRIPTION

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Work Specified Elsewhere:
  - 1. Section 32 90 13 - Soil Preparation
- C. Scope: Prepare all areas indicated on the Drawings for turfgrass installation according to the specifications and drawings contained in the Contract Documents, including: furnishing and installing all seed, sod, fertilizer, organic soil amendments and related maintenance.

## 1.02 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Planting Soil: Native or imported topsoil, manufactured topsoil, 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.
- D. Anywhere in this section use of the term "Architect" shall mean "Landscape Architect."

## 1.03 APPLICABLE STANDARDS

- A. All grass seed shall be certified by state of origin. The certification authority for the state of New Mexico is the New Mexico Crop Improvement Association.

## 1.04 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Proposed source of all native grass seed which shall indicate the location from which the seed was harvested, prior to ordering seed.
  - 2. Submit type and source of soil amendment and fertilizer for approval prior to ordering soil amendment.

- B. Seed Tags: Seed bag tags and weights per bag and copies of invoices identified by project name.
- C. 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 and name and telephone of supplier.
- D. Qualification Data: For landscape installer.
- E. Soils Test Reports: For relocated existing surface soil and imported topsoil.
- F. Fertilizer: Recommended fertilizer based on soils test results for each type of planting.
- G. Product Certificates: For soil amendments and fertilizers signed by product manufacturer.
- H. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- I. Maintenance Instructions: Recommend procedures to be established by Owner for maintenance and irrigation of lawns during both the first calendar year and a typical post-establishment calendar year. Submit before expiration of required maintenance periods.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
  - 1. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on Project Site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
  - 1. Servi-Tech Laboratories  
 1816 E. Wyatt Earp  
 PO Box 1397  
 Dodge City, KS 67801  
 Tel. 620.227.7123  
 www.servitechlabs.com
- C. Topsoil Analysis: Contractor shall provide soil samples to a certified soil testing lab for testing and lab reports and recommendations for amendments and soil modifications. Testing shall include percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
  - 1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Keep fertilizer and seeds in dry storage away from contaminants.

1.06 SCHEDULING

- B. Planting Restrictions: Plant during the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  - 1. Seeding Shall be accomplished between June 1st and August 15th unless specific permission in writing is issued by the Landscape Architect to allow seeding before or after these dates. Install warm season grasses when average daily soil temperature is above 55 degrees Fahrenheit. Do not plant within 75 days of average first frost.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.07 WARRANTY

- A. Warranty lawn through first calendar year after acceptance of Substantial Completion.

**PART 2 - PRODUCTS**

2.01 SEED MIX

- A. All native grass seed shall be obtained from sources in New Mexico unless proof is provided that a particular seed is unavailable within the state. Fescue seed shall be obtained from approved producers.
- B. Contractor shall furnish certification showing origin of all seed and pure live seed (P.L.S.) content as determined by a certified authority. Pure live seed shall be the product of percent purity time's percent germination. Each bag of seed shall be tagged and sealed by the seed dealer in accordance with the State Department of Agriculture or other local certification authority within the state of origin. The tag or label shall indicate analysis of seed and date of analysis, which shall not be more than 9 months prior to delivery date. Seed may be premixed by the seed dealer and appropriate data indicated on the bag label for each variety.
- C. Native Grass Lawn: The seed mix shall be as follows:

a. Sundancer Buffalograss – Seed (Irrigated):

Seed mix by Curtis and Curtis Seed and Supply 4500 N. Prince St, Clovis, NM 88101. Phone: (877) -907-1806, or approved equal. Seed mix rate: 4 lbs/1000 SF.

<b>Common Name</b>	<b>Botanical Name</b>
<i>Sundancer Buffalograss</i>	<i>Buchloe Dactyloides</i>

Quantity: 10,600 SF (approx.)

## 2.02 TOPSOIL

- A. Topsoil: Topsoil shall be a loamy sand, clay loam, loam, silt loam, sandy clay loam, and other soil approved by the architect. All topsoil shall be tested by a reputable laboratory for pH and soluble salts. pH range to be 6 to 7. Soluble salts shall not be higher than 500 parts per million.

## 2.03 ORGANIC SOIL AMENDMENTS

- A. Compost: Apply compost, pH range of 6 to 8, mixed at a rate of 3 CY per 100 SF of lawn area with existing topsoil. Topsoil to be free of stones 1 inch or larger in any dimension and other extraneous material harmful to plant growth.

## 2.01 FERTILIZER

- A. Fertilizer: Soil tests shall be made to determine the exact requirements for any soil amendments. Slow-release nitrogen fertilizers shall be used to prevent rapid lush growth and weed pressure. Phosphorous and potassium shall be maintained at adequate levels to ensure root growth and overall turf quality.
- B. Fertilizer shall be manufactured from quality materials, be free from impurities, uniform in composition, meet recognized standards for effectiveness and be free flowing and suitable for application with approved equipment.
- C. Fertilizer shall be delivered to the site in bags or other containers, each clearly labeled, conforming to applicable state laws, bearing the grade and trade name of the producer.
- D. Application: Care shall be taken when spreading fertilizer that there are no gaps during application. The fertilizer shall be applied under favorable conditions and by such approved methods as will ensure maximum uniformity of distribution.
- E. Fertilizer: Soil tests shall be made to determine the exact requirements for any soil amendments.

## 2.05 MULCH AND TACKIFIER

- A. The tackifier shall be a colloidal polysaccharide or wood fiber tackifier. The tackifier shall be homogeneous within the unit package. It shall have no growth or germination inhibiting factors and be nontoxic. It shall be dry mixed with the fertilizer and soil conditioner at a rate of 1 bale per 1,000 sf.
- B. Apply mulch and tackifier at a rate of ½" layer evenly across seeded areas.

## 2.06 FENCING

- A. Temporary Fencing: 4' height orange plastic fencing (Safety Fence) with 6' length steel fence posts set a minimum of 10' on center.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 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. Preparation of Subgrade: Clear existing soil free of roots, plants, sod, stones, clay lumps and other extraneous materials harmful or toxic to plant growth.
- D. Preparation for Seeding:
  - 1. The extent of seed bed preparation shall not exceed the area on which the entire seeding operation can be accomplished to such prepared seed bed within a 24 hour period, unless otherwise directed by the Landscape Architect.
  - 2. All areas to be seeded shall be brought to an even grade and shaped to drain. Areas to be seeded shall be graded to meet finished grades, and be uniformly compacted to prevent uneven settlement after seed installation and watering.
  - 3. Rototill to the following depths:
    - Native Grass: top four (4) inches.
    - Rototill area twice in cross directions. Apply compost and after first Rototill to work into soil. Rototilling shall not occur when the wind is over 10 mph and creates a dust problem to adjoining areas.
  - 4. Apply soil amendments according to manufacturer's specifications.
  - 5. Fine rake and remove stones over 1/2" in any dimension, sticks, roots, rubbish and any other extraneous matter brought to surface by the rotilling process. Drag to even grade, and compact to ninety (90) percent modified proctor.
  - 6. Water area to be seeded thoroughly. Apply a minimum of two inches of water throughout area. Allow area to dry.
  - 7. Regrade as necessary to insure drainage and to meet proposed grades. Correct any differential settlement.
- E. Moisten prepared areas before seeding if soil is dry. Do not create muddy soil conditions.
- F. Approval of Seed Bed Preparation: Seed bed preparation is to be approved by the Landscape Architect immediately prior to the seeding operations, and after all seed bed preparation is complete.

### 3.03 SEEDING

#### A. General:

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
2. Sow not less than the quantity of seed specified or scheduled.

#### B. Seeding Dates: As per Paragraph 1.06.A.

#### C. Seeding Rate and Mix: As per Paragraph 2.01.C.

#### D. Drill Seeding:

1. The seed shall be mechanically broadcast by use of a range drill seeder. Seed should be drilled to a depth of 1/4".
2. Contractor's vehicles and other equipment are prohibited from traveling over the seeded areas.

### 3.04 MULCH / TACKIFER

#### A. Immediately following the drill seeding operation, seeded areas on slopes less than 2:1 shall receive mulch/tackifier at the even rate of 1/2" depth throughout the seeded area.

#### B. Spread mulch to achieve an even coverage.

#### C. All areas receiving insufficient coverage in the opinion of the Architect shall receive additional mulch/tackifer.

### 3.05 RESEEDING

#### A. Void areas greater than one square foot, or repetitive voids smaller than one square foot which amount to more than 10% of any area that occur within 60 days after installation shall be reseeded.

### 3.06 SATISFACTORY LAWN

#### A. Satisfactory Lawn: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

### 3.07 CLEANUP AND PROTECTION

#### A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

#### B. Erect protection fencing along perimeter of seeded area and install warning signs as required to protect newly planted areas from traffic. Maintain barricades for 365 days after seeding is installed and remove after lawn is established.

### 3.08 LAWN MAINTENANCE

- A. Maintain seeded grass and sod for not less than the period stated below, and longer as required to establish an acceptable grass stand.
1. Maintenance shall continue through the first mowing, or until the entire landscape project is accepted, and until the end of the maintenance period. Maintenance period shall be not less than sixty (60) days after substantial completion, unless otherwise approved by the Landscape Architect.
  2. It shall be the Contractor's responsibility to show adequate germination of all seeded areas, as well as maintain proper health of seeded areas, prior to acceptance by the Landscape Architect. The Contractor's responsibilities during the germination process may include, but not limited to, adjustment of the irrigation system including heads, unclogging heads and station programming, erosion control, erosion damage repair, reseeding damaged areas, fixing and improving installed drainage.
- B. Maintain seeded areas by watering fertilizing, weeding, mowing, trimming and other operations such as rolling, regrading and replanting as required to establish an acceptable grass stands, free of weeds and eroded or bare areas. Roll, regrade, and replant bare or eroded areas and mulch to produce a uniformly smooth lawn.
1. Implement mowing schedule 4 weeks after seeding.
  2. Weed area by hand to prevent weed competition.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist until permanent irrigation system is operational. Irrigate by means of the underground automatic irrigation system where irrigation is available, as often as necessary to promote healthy grass growth, and until a thick, even stand of grass has been obtained.
1. Water seeding application multiple times per day with a short sprinkler run to keep the top 1 to 2 inches of soil constantly moist. Prevent areas of standing / pooling water from accumulating. After most seed has germinated, cut back frequency of irrigation, increase run time. Adjust to long-term maintenance routine.
  2. 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.
- D. Satisfactory survival of the lawn will be evidenced when a solid stand of seedlings are produced, free of all foreign materials and erosion. Any areas greater than 100 square feet that do not produce sufficient growth as determined by the Landscape Architect within twenty eight (28) calendar days of planting shall be replanted to the specification outlined above. All areas of erosion shall be patched and re-seeded by the Contractor. In areas where the Contractor is unable to establish complete coverage, such as swale drainage, the Landscape Architect may chose to have the unsatisfactory areas sodded. The sod used shall match the type of seed used for turf grass seeding.

### 3.09 OBSERVATION AND ACCEPTANCE

- A. When work is completed, including maintenance, the Landscape Architect will, upon request, make an observation to determine acceptability.
  - 1. Seeding shall be considered completed when germination is evident or sodding has been completed over the entire area. No bare patches shall remain. The Landscape Architect shall be the sole judge of complete germination or sodding
- B. All seed must be well-rooted into sub grade and any bare spots, low areas or dead native grass must be repaired or reseeded to the satisfaction of the Owner prior to acceptance. Final acceptance of all grass areas shall be when a minimum of 80% germination is evidenced and approved by the Landscape Architect and all areas have been seeded for a minimum of twenty eight (28) days.
- C. When observed work does not comply with requirements, reseed rejected work and continue specified maintenance until re-observed by Landscape Architect and found to be acceptable.
- D. The owner shall begin grass establishment operations upon acceptance of grassing operations by the Landscape Architect.

END OF SECTION