

BLUE HOLE REGIONAL PARK

**City of Wimberley
12111 RR12
Wimberley, Texas 78676**

NOT FOR CONSTRUCTION

**SPECIFICATIONS
for
100% Design Development Set**

Issue Date: May 18, 2010

**TABLE OF CONTENTS
SPECIFICATIONS****Section Title****DIVISION 01 - GENERAL REQUIREMENTS**

Not Used at this Time

DIVISION 02 – EXISTING CONDITIONS

Not Used at this Time

DIVISION 03 – CONCRETE

Not Used at this Time

DIVISION 04 – MASONRY

042200	Concrete Unit Masonry
044200	Exterior Stone Cladding
044300	Landscape Boulders

DIVISION 05 – METALS

055000	Metal Fabrications
--------	--------------------

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

061000	Carpentry
--------	-----------

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

071400	Fluid-Applied Elastomeric Waterproofing
072100	Thermal Insulation
076113	Corrugated Metal Roof Systems
076200	Sheet Metal Flashing and Trim
079200	Joint Sealants

DIVISION 08 – DOORS AND WINDOWS

081113	Hollow Metal Doors and Frames
085113	Aluminum Windows
087100	Finish Hardware

DIVISION 09 – FINISHES

092116	Gypsum Board Assemblies
096513	Resilient Wall Base and Accessories
099100	Painting

DIVISION 10 – SPECIALTIES

102113	Stainless Steel Toilet Compartments
102813	Toilet Accessories
106050	Wire Mesh Panels

Section Title**DIVISION 11 – EQUIPMENT**

116800 Play Field Equipment and Structures

DIVISION 12 – FURNISHINGS

129300 Site Furnishings

DIVISION 22 – PLUMBING

221116 Domestic Water Piping

221316 Sanitary Waste and Vent Piping

DIVISION 23 –

230500 Common Work Results for Mechanical

230713 Mechanical Insulation

DIVISION 26 – ELECTRICAL

260500 Common Work Results for Electrical

262416 Panelboards

262726 Wiring Methods

262816 Enclosed Switches and Circuit Breakers

DIVISION 31 – EARTHWORK

Not Used at this Time

DIVISION 32 – EXTERIOR IMPROVEMENTS

323113 Chain Link Fences and Gates

323223 Dry-Stack Stone Walls

329200 Turf and Grasses

329300 Plants

321816.13 Playground Protective Surfacing

DIVISION 33 – UTILITIES

Not Used at this Time

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK:
- A. Extent and Types: Extent of each type of masonry work is indicated on drawings which includes load bearing and non-load bearing walls. Type of masonry work requires concrete masonry units (CMU). Work includes vertical and horizontal reinforcement, bond beams, anchorages and accessories.
- 1.03 QUALITY ASSURANCE:
- A. Codes and Standards: Comply with provisions of governing building codes, specifications and standards, except where more stringent requirements are shown or specified.
- B. References:
- 1] ASTM A-82: Cold-Drawn Steel Wire for Concrete Reinforcement.
 - 2] ASTM A-153: Zinc-Coating (Hot Dip) on Iron and Steel Hardware.
 - 3] ASTM A-641: Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 4] ASTM C-90: Hollow Load-Bearing Concrete Masonry Units.
 - 5] ACI 530.1/ASCE 6 - Specifications for Masonry Structures.
 - 6] ACI 531: Building Code Requirements for Concrete Masonry Structures.
 - 7] National Concrete Masonry Association Architectural and Engineering Concrete Masonry Details for Building Construction.
 - 8] ANSI/NBS Handbook H74, "Building Code Requirements for Reinforced Masonry".
- C. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- D. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.
- 1.04 SUBMITTALS:
- A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessories and other manufactured products, including certifications that each type complies with specified requirements.

- B. Samples for Verification Purposes: Submit unit masonry samples for each type of exposed masonry unit required. Include in each set the full range of exposed color and texture to be expected in completed work.
- C. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel required for project.
- D. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures". Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. General: Deliver masonry materials to project in undamaged condition. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, or other causes.
- B. Store cementitious materials off the ground and under cover in a dry location. Store aggregates where grading and other required characteristics can be maintained. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.06 PROJECT CONDITIONS:

- A. Protection of Work: During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
- C. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface. Protect sills, ledges, and projections from droppings of mortar.
- D. Cold Weather Protection: Do not lay masonry units which are wet or frozen. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch. Remove masonry damaged by freezing conditions.
- E. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10° F. Do not heat water for mortar and grout to above 160° F.

- 1] 40° F to 32° F:
Mortar: Heat mixing water to produce mortar temperature between 40° F and 120° F.
Grout: Follow normal masonry procedures.
- 2] 32° F to 25° F:
Mortar: Heat mixing water and sand to produce mortar temperatures between 40° F and 120°; maintain temperature of mortar on boards above freezing.

Grout: Heat grout materials to 90° F to produce in place grout temperature of 70° F at end of work day.

F. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

- 1] 40° F to 32° F:
Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
- 2] 32° F to 25° F:
Completely cover masonry with weather-resistive membrane for at least 24 hours.

G. Except as otherwise indicated, maintain masonry temperature above 32° F for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40° F for 48 hours.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
- B. Provide special shapes where required for lintels, bond beams, corners, jambs, sash, control joints, headers, bonding and other special conditions.
- C. Provide square-edged units for outside corners, except where indicated as bullnose.
- D. Concrete Block: Provide units complying with characteristics indicated below for grade, type, face size, exposed face and, under each form of block included, for weight classification.
 - 1] Hollow Loadbearing Block, ASTM C-90; Grade N-1; Type I; Normal weight classification.
 - 2] Size to manufacturer's standard size units with nominal face dimensions of 16" long x 8" high (15-5/8" x 7-5/8" actual) x thicknesses indicated, unless otherwise indicated.
 - 3] Type I moisture-controlled units. Cure units by autoclave treatment at a minimum temperature of 350° F and a minimum pressure of 125 psi.
 - 4] Compressive Strength: Minimum 2,000 psi based on net area.
 - 5] For units with exposed faces, use manufacturer's standard color and texture, unless otherwise indicated.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C-150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.
- B. Hydrated Lime: ASTM C-207, Type S.
- C. Aggregate for Mortar: ASTM C-144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16. sieve. For white mortar aggregates, use natural white sand or ground white stone.
- D. Aggregate for Grout: ASTM C-404.
- E. Water: Clean and potable.

2.03 DEFORMED BAR REINFORCEMENT:

- A. Reinforcement Bars: Provide deformed bars of following grades complying with ASTM A-615, except as otherwise indicated.
 - 1] Provide Grade 40 for bars No. 3 to No. 6, except as otherwise indicated.
 - 2] Provide Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.
- B. Shop-fabricate reinforcement bars which are to be bent or hooked.

2.04 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES

Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie, and anchor for size and other characteristics.

- A. Zinc-Coated (Galvanized) Steel Wire: ASTM A-82 for uncoated wire and with ASTM C-641 for zinc coating of class indicated:
 - 1] Class 1 (0.40 oz. per sq. ft. of wire surface).
 - 2] Application: Use for masonry not exposed to exterior or earth.
- B. Hot-Dipped Galvanized Steel Wire: ASTM A-82 for uncoated wire and with ASTM A-153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
- C. Austenitic Stainless Steel Wire: ASTM A-580 AISI Type 304 (UNS S30400) alloy.
 - 1] Application, use for masonry exposed to exterior and in contact with earth.
- D. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units and complying with requirements indicated below.
 - 1] Width: Fabricate joint reinforcement in units with widths of approximately 2" less than

- nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
- 2] Wire size for side rods to be 0.1875" diameter.
 - 3] Wire size for cross rods to be 0.1875" diameter.
 - 4] For single-wythe masonry, provide truss design with continuous diagonal cross rods spaced not more than 16" o.c. with single pair of side rods.
 - 5] For multi-wythe masonry provide tab design with single pair of side rods and rectangular box-type cross ties spaced not more than 16" o.c.; with side rods spaced for embedment within each face shell of backup wythe and ties extended to within 1" of exterior face of facing wythe. Use units with adjustable 2-piece rectangular ties where horizontal joints of facing wythe do not align with those of back-up.
- E. Anchor Bolts: Provide steel bolts with hex nuts and flat washers complying with ASTM A-307, Grade A, hot-dip galvanized to comply with ASTM C-153, Class C, in sizes and configurations indicated.
- F. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
- 1] AA Wire Products Co.
 - 2] Heckman Building Products, Inc.
 - 3] Dur-O-Wall, Inc.
 - 4] Hohmann & Barnard, Inc.
 - 5] Masonry Reinforcing Corp. of America
 - 6] National Wire Products Corp.

2.05 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire anchor section for welding to steel.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from [0.1875-inch- 0.25-inch diameter, hot-dip galvanized steel wire.

2.06 MASONRY CLEANERS:

- A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure) dissolved in one gallon of water.
- B. Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces include, but is not limited to the following:
Sure Klean, No. 600 Detergent (ProSoCo, Inc.), or equal.

2.06 MORTAR AND GROUT MIXES:

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds or other admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.

- B. Mixing: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.
- C. Mortar for Unit Masonry: Comply with ASTM C-270, Proportion Specification, for types of mortar required, unless otherwise indicated. Limit cementitious materials in mortar to Portland cement-lime.
 - 1] Use Type M mortar for masonry below grade and in contact with earth, and where indicated.
 - 2] Use Type S mortar for reinforced masonry and where indicated.
 - 3] Use Type N mortar for exterior, above-grade loadbearing and non-loadbearing walls; for interior loadbearing walls; and for other applications where another type is not indicated.
- D. Grout for Unit Masonry: Comply with ASTM C-476 for grout for use in construction of reinforced and nonreinforced unit masonry. Use grout of consistency indicated or if not otherwise indicated, of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout.
 - 1] Use fine grout in grout spaces less than 2" in horizontal direction, unless otherwise indicated.
 - 2] Use coarse grout in grout spaces 2" or more in least horizontal dimension, unless otherwise indicated.

2.07 MASONRY SEALERS:

- A. Silane/Siloxane Water-based Sealer: A high performance penetrative masonry water repellent, free of solvent and hazardous ingredients, which forms a hydrophobic barrier beneath the surface and seals out moisture while remaining highly vapor permeable. It should chemically bond with the substrate.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Surface Preparation of Foundation: Prepare surface contact area only on foundation concrete for initial mortar placement by one of the following methods.
 - 1] Sandblasting foundation and reinforcing dowels after concrete has fully cured to remove laitance and spillage and to expose sound aggregate.
 - 2] Water blasting foundation and reinforcing dowels after concrete has partially cured to remove laitance and spillage and to expose sound aggregate.
 - 3] Green cutting fresh concrete with high pressure water and hand tools to remove laitance and spillage from foundation and reinforcing dowels and to expose sound aggregate.
- B. Corners: Lay standard masonry bond for overlapping units and grout solid.
- C. Intersecting Walls: Bond with reinforcement as required by latest edition of the Uniform Building Code.

3.02 GENERAL INSTALLATION:

- A. Do not wet concrete masonry units.
- B. Cleaning Reinforcing: Before placing, remove loose rust, ice, and other coatings from reinforcing.
- C. Thickness: Build cavity and composite walls, floors, and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units using units of nominal thickness indicated.
- D. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.
- E. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- F. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible. Use dry cutting saws to cut concrete masonry units.

3.03 CONSTRUCTION TOLERANCES:

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises, do not exceed $\frac{1}{4}$ " in 10' or in a story-height not to exceed 20', nor $\frac{1}{2}$ " in 40' or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed $\frac{1}{4}$ " in any story or 20' maximum, nor $\frac{1}{2}$ " in 40' or more. For vertical alignment of head joints do not exceed plus or minus $\frac{1}{4}$ " in 10', $\frac{1}{2}$ " maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed $\frac{1}{4}$ " in any bay or 20' maximum, nor $\frac{1}{2}$ " in 40' or more. For top surface of bearing walls do not exceed $\frac{1}{4}$ " between adjacent floor elements in 10' or $\frac{1}{16}$ " within width of a single unit.
- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed $\frac{1}{2}$ " in any bay or 20' maximum, nor $\frac{3}{4}$ " in 40' or more.
- D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus $\frac{1}{4}$ " nor plus $\frac{1}{2}$ ".
- E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus $\frac{1}{16}$ " with a maximum thickness limited to $\frac{1}{2}$ ". Do not exceed head joint thickness indicated by more than plus or minus $\frac{1}{16}$ ".

3.04 LAYING MASONRY WALLS:

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs, and wherever possible at other locations. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

- B. Pattern Bond: Lay exposed masonry in the bond pattern shown, or if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Rack back 1/2-unit length in each course. Do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- D. Built-in Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
- E. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.05 INSTALLATION, REINFORCED CONCRETE UNIT MASONRY:

A. General:

- 1] Conform to requirements of latest edition of Uniform Building Code as supplemented by these Specifications.
- 2] Do not wet concrete masonry units.
- 3] Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

B. Walls:

- 1] Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
- 2] Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
- 3] Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of nonreinforced vertical cells, or provide units with solid bottoms.

- C. Grouting and Techniques: Use "Fine Grout" per ASTM C-476 for filling spaces less than 4" in one or both horizontal directions. Use "Course Grout" per ASTM C-476 for filling 4" spaces or larger in both horizontal directions. At the Contractor's option, use either low-lift or high-lift grouting techniques subject to requirements which follow.

D. Low-Lift Grouting:

- 1] Provide minimum clear dimension of 2" and clear area of 8 sq. in. in vertical cores to be grouted.
- 2] Place vertical reinforcement prior to laying of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters, nor 10 ft.
- 3] Lay CMU to maximum pour height. Do not exceed 5' height, or if bond beam occurs below 5' height, stop pour at course below bond beam.
- 4] Pour grout using chute or container with spout. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 1-1/2" below top course of pour.
- 5] Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

E. High-Lift Grouting:

- 1] Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3" and 10 sq. in., respectively.
- 2] Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.
- 3] Construct masonry to full height of maximum grout pour specified, prior to placing grout.
- 4] Limit grout lifts to a maximum height of 5' and grout pour to a maximum height of 24', for single wythe hollow concrete masonry walls, unless otherwise indicated.
- 5] Place vertical reinforcement before grouting; place before or after laying masonry units, as required by job conditions. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals not exceeding 192 bar diameters nor 10'. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcement bar, pull loops and bar to proper position and tie free ends.
- 6] Where reinforcement is prefabricated into cage units before placing, fabricate units with vertical reinforcement bars and lateral ties of the size and spacing indicated.
- 7] Place horizontal beam reinforcement as the masonry units are laid.

F. Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.

G. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

H. Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

I. Limit grout pours to sections which can be completed in one working day with not more than

one hour interruption of pouring operation. Place grout in lifts which do not exceed 5'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

- J. Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1" of vertically reinforced cavities, during construction of masonry. Where more than one pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if more pours are required.

3.06 MORTAR BEDDING AND JOINTING:

- A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- B. Set stone trim units (if any) in full bed of mortar with all vertical joints slushed full. Fill dowel, anchor and similar holes solid. Wet stone joint surface thoroughly before setting; for stone surfaces which are soiled, clean bedding and exposed surfaces with fiber brush and soap powder followed by thorough rinsing with clear water.
- C. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
- D. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- E. Collar Joints: After each course is laid, fill the vertical longitudinal joint between wythes solidly and with mortar for all exterior walls (except cavity walls) and non-loadbearing interior walls and partitions where metal ties or horizontal reinforcing are indicated for structural bonding and nominal thickness of wall or partition is required to meet code requirements for height-to-thickness ratio.

3.07 PLACING VERTICAL REINFORCEMENT:

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.
- B. Foundation Dowels:
 - 1] Size, number and location of foundation dowels shall match vertical wall reinforcing unless otherwise noted.

2] When foundation dowel does not line up as intended with vertical core, do not slope more than 1 horizontal to 6 vertical to bring it into alignment.

- C. Position reinforcement accurately at the spacing as required by Uniform Building Code. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (which ever is greater).
- D. Lap reinforcing bars 36 bar-diameters at foundation, 48 bar-diameter elsewhere minimum where spliced and wire tie together. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- E. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8" on exterior face of walls and 1/2" at other locations.

3.08 HORIZONTAL JOINT REINFORCEMENT:

- A. Provide continuous horizontal joint reinforcement in all CMU walls. Install longitudinal side rods in mortar for their entire length with a minimum cover of _" on exterior side of walls, ½" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
- C. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosure and other special conditions.
- D. For single-wythe walls, space reinforcement at 16" o.c. vertically, unless otherwise indicated.
- E. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.
- F. In addition to wall reinforcement, provide additional reinforcement at openings as required to comply with the above.

3.09 REINFORCED MASONRY BOND BEAMS AND LINTELS:

- A. Provide concrete masonry unit lintels and bond beams in locations indicated and over openings more than 15" wide (duct openings, etc.) where lintels are not indicated. Bond beams should be installed at top of all CMU walls and at mid-height locations to assure lateral stability and to meet building code requirements. Lintel and bond beams should be installed in accordance with recommendations of the National Concrete Masonry Association unless otherwise indicated.
- B. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

- C. All exposed lintels shall have joint to match the pattern of the adjacent masonry.
- D. Provide fine grout in accordance with ASTM C-476 for filling spaces less than 4" in one or both horizontal directions.
- E. Form lintels and bond beams of concrete masonry trough units; reinforced as indicated or in accordance with details of the National Concrete Masonry Association.

3.10 REPAIR, POINTING, AND CLEANING:

- A. Remove and replace exposed masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - 1] Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
 - 2] Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3] Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.
 - 4] Clean concrete unit masonry to comply with manufacturer's directions and applicable NCMA "Tek" bulletins.
- D. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

END OF SECTION

SECTION 04 42 00
EXTERIOR STONE CLADDING

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 SUMMARY:
- A. The work of this section consists of furnishing and constructing stonework in accordance with Drawings and as hereinafter specified.
 - B. Type of stonework specified in this section is stonework with mortar joints.
- 1.03 SYSTEM DESCRIPTION: Fabricate and install stonework to withstand normal loads from wind, gravity, movement of building structure and thermally induced movement, as well as to resist deterioration under conditions of normal use including exposure to weather, without failure.
- 1.04 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical data for each type of stone, stonework accessory and other manufactured product required.
 - B. Samples:
 - 1] Submit stone samples in form of sets for each color, grade, finish, type and variety of stone required and consisting of stones not less than 12" square. Include 2 or more stones in each set of samples showing the full range of variations in appearance characteristics to be expected in completed work.
 - 2] Colored pointing mortar and grout samples for color selection by Architect.
 - 3] Sealant samples for each type and color of joint sealant required.
- 1.05 QUALITY ASSURANCE:
- A. Comply with recommendations contained in Indiana Limestone Institute (ILI) Handbook.
 - B. Single Source Responsibility for Stone: Obtain each color, grade, finish, type and variety of stone from a single quarry with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to cut and finish material without delaying the progress of the work.
 - C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality and from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
 - D. Installer Qualifications: Engage an Installer who has successfully completed stonework similar in material, design and extent to that indicated for this project.

- E. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
- F. Field-Constructed Mock-Ups: Prepare mock-ups for the following types of stonework. Purpose of mock-ups is further verification of selections made for color and finish under sample submittals and establishing standard of quality for aesthetic effects expected in completed work. Mock-ups are to be partial area of actual construction where indicated by Architect. Do not proceed with construction of wall until mock-up approved.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle stone and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping or other causes.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly, to prevent breakage or cracking of stones, and to allow air to circulate around stones.
- D. Store cementitious materials off the ground, under cover and in dry location.

1.07 PROJECT CONDITIONS:

- A. Protect stonework during erection as follows:
 - 1] Cover top of walls with non-staining waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24" down both sides and hold securely in place.
 - 2] Prevent staining of stone from mortar, grout, sealants and other sources. Immediately remove such materials from stone without damage to latter.
 - 3] Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 4] Protect sills, ledges and projections from droppings of mortar and sealants.
- B. Do not lay masonry when temperature of outside air is below 40 degrees F; protect work from cold and frost; ensure mortar will harden without freezing. Do not place concrete footings on mud, disturbed soil, or frozen surfaces.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Comply with referenced standards and other requirements indicated applicable to each type of material required.

- B. Provide matched blocks from a single quarry for each type, variety, color and quality of stone required. Extract blocks from a single bed of quarry stratum, especially reserved for Project, unless stones from randomly selected blocks are acceptable to the Architect for aesthetic effect.

2.02 LIMESTONE (to be determined)

A. Limestone Building Stone Standard: ASTM C-568 for Category II (Medium Density) Classification.

B. Variety: Oolitic limestone.

C. Grade, Color, Finish, Cut and Masonry Pattern: Standard, buff, smooth, split face, random ashlar.

D. Available Source: Espinoza Stone, Jarrel, TX 512-930-1393 or Texas Stone Products Lometa, TX 325-628-3233.

2.03 MORTAR AND GROUT MATERIALS (ASTM C-270, Proportion Specification):

A. Portland Cement: ASTM C-150, Normal Type I, gray or white depending on mortar color required.

B. Hydrated Lime: ASTM C-207, Type S.

C. Aggregate: ASTM C-144, and as indicated below:

- 1] For joints narrower than 1/4" use aggregate graded with 100% passing the No. 8 sieve and 95% the No. 16 sieve.
- 2] For pointing mortar use aggregate graded with 100% passing the No. 16 sieve.
- 3] White Mortar Aggregates: Selected natural white sand or ground white stone sand.

D. Mortar Type: N.

E. Latex Additive for Setting Bed: Retarder-free formulation intended for use in thick-bed mortar applications, containing either Styrene Butadiene rubber or Acrylic, in concentrations recommended by manufacturer.

F. Water: Clean, non-alkaline and potable.

2.04 STONE ANCHORS, ATTACHMENTS & ACCESSORIES:

A. Anchors, Dowels, Ties: ASTM A-36 steel, galvanized after fabrication as per ASTM A-123. Type, size, configuration and load capacity as required.

B. Shelf angles and Supports: ASTM A-36 steel, galvanized after fabrication as per ASTM A-123. Size and configuration as required for load capacity.

C. Fasteners: Bolts, nuts and washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize to comply with ASTM A-153.

- D. Concealed Flashing: Type 302/304 stainless steel, 2D finish, fully annealed or dead soft temper, not less than 0.015" thickness.
- E. Setting Buttons: Lead or resilient plastic buttons, non-staining to stone, sized to suit joint thicknesses and bed depths of stonework involved without intruding into required depths of joint sealants or causing third-side adhesion between sealant and setting button.

2.05 MORTAR MIX:

- A. Provide Type N setting mortar (ASTM C-270 Proportion Specification) and Type I pointing mortar.
- B. Thoroughly mix mortar ingredients in quantities needed for immediate use.
- C. Do not use anti-freeze compounds in mortar.
- D. Use mortar within two hours after mixing.
- E. If necessary, retemper mortar within two hours of mixing to replace water lost by evaporation.

2-6 STONE FABRICATION:

- A. Fabricate stonework to produce pieces of thickness, size and shape indicated or required and within fabrication tolerances recommended by the Indiana Limestone Institute of America, Inc. for faces, edges, beds and backs.
- B. Thickness of Exterior Stone Veneer: Not less than 4".
- C. Dress joints (bed and vertical) straight and at 90 deg. angle to face, unless otherwise indicated.
- D. Quirk-miter corners, unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.
- E. Cut stones to produce joints of uniform width (3/8") and in locations indicated.
- F. Slope exposed top surfaces of stone and horizontal sill surfaces for natural wash.
- G. Cut and drill sinkages and holes in stones for anchors, fasteners and supports as indicated or needed to set stonework securely in place; shape beds to fit supports.
- H. Contiguous Work: Provide chases, reveals, reglets, openings and similar features as required to accommodate contiguous work.

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify that support work and site conditions are ready to receive work of this Section.
- B. Verify that items built-in under other Sections are properly located and sized.
- C. Beginning of installation confirms acceptance of existing conditions and support work.

3.02 PREPARATION:

- A. Advise Installers of other work about specific requirements relating to placement of inserts, flashing reglets and similar items which will be used by Stonework Installer for anchoring, supporting and flashing of stonework. Furnish Installers of other work with drawings and templates showing locations of these items.
- B. Clean stone surfaces which have become dirty or stained prior to setting to remove soil, stains and foreign materials. Clean stones by thoroughly scrubbing stones with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.
- C. Establish lines, levels and coursing. Protect from disturbance.

3.03 PROTECTION: Protect stone faces against staining. When work is not in progress, keep tops of walls covered with nonstaining waterproof coverings. When work resumes, clean top surface of stone of all mortar; thoroughly dampen in drying weather. Where new masonry joins partially or totally set masonry, remove loose mortar and dampen.

3.04 SETTING STONE (GENERAL):

- A. Execute stonework by skilled mechanics and employ skilled stone fitters at the site to do any necessary field cutting as stones are set. Use power saws to cut stones; for exposed edges, produce edges which are cut straight and true.
- B. Contiguous Work: Provide chases, reveals, reglets, openings and other spaces as indicated for accommodating contiguous work. Close-up openings in stonework after other work is in place with stonework which matches that already set.
- C. Set stones to comply with requirements indicated on drawings. Install anchors, supports, fasteners and other attachments indicated or necessary to secure stonework in place. Shim and adjust anchors, supports and accessories to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
- D. Construction Tolerances: Set stones to comply with the following tolerances:
 - 1] Variation from Plumb: For lines and surfaces of columns, walls and arrises, do not exceed 1/4" in 10', 3/8" in a story height or 20' maximum. For external corners, expansion joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum.

- 2] Variation from Level: For grades indicated for exposed lintels, sills, parapets, horizontal grooves and
- 3] Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum.
- 4] Variation in Cross-Sectional Dimensions: For columns and thickness of walls from dimensions indicated, do not exceed minus 1/4", nor plus 1/2".

E. Provide expansion joints, control joints and pressure relieving joints of widths and at locations indicated. Do not fill with mortar.

3.05 SETTING STONEWORK WITH MORTAR:

A. Wet stones which are dry at time of setting by drenching or sponging them with water.

B. Set stones in full mortar setting bed with vertical joints slushed full, unless otherwise indicated.

- 1] Place setting buttons of adequate size, in sufficient quantity and of same thickness as indicated joint width, to prevent mortar from squeezing out and to maintain uniform joint widths. Hold buttons at least one joint width back from face of stones.
- 2] Do not set heavy stones or projecting courses until mortar in courses below has hardened sufficiently to resist being squeezed out of joint.
- 3] Fill anchor holes with mortar.

C. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1/2" nor less than that required to expose sound mortar for joints pointed with mortar, or to provide sufficient depth for sealant and sealant backing for joints pointed with sealants.

D. Prepare stone joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply first layer of pointing mortar in layers not greater than 3/8" until a uniform depth is formed; compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

E. Point stone joints by placing pointing mortar in 3 layers with each of first and second layers filling approximately 2/5 of joint depth and third layer remaining 1/5. Fully compact each layer and allow to become thumbprint hard before applying next layer.

F. Tool joints with a round joiner having a diameter 1/8" larger than width of joint, when pointing mortar is thumbprint hard.

3.05 ADJUSTING AND CLEANING:

A. Remove and replace stonework of the following description:

- 1] Broken, chipped, stained or otherwise damaged stones.
- 2] Defective joints.
- 3] Stones and joints not matching approved samples and field-constructed mock-ups.
- 4] Stonework not complying with other requirements indicated.

- B. Replace in a manner which results in stonework matching adjacent completed areas, complying with other requirements and showing no evidence of replacement.
 - C. Not less than 6 days after placement, thoroughly clean and scrub with fiber brushes and mild alkaline abrasive cleaner containing no caustic or harsh fillers. Begin at top and work down. Leave stone clean and free of mortar stains or traces of cleaning compound.
- 3.06 PROTECTION: Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures stonework being without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 044400.10 - LANDSCAPE BOULDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Landscape Boulders.

- B. Related Sections:

- 1. Division 31 Section "Site Clearing" for salvaging existing landscape boulders.
 - 2. Division 31 Section "Earth Moving" for excavation for installation.
 - 3. Division 32 Section "Dry-Stack Stone Walls" for incorporation in and termination of dry-stack stone walls.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved for installation of units required for this Project.

- B. Source Limitations: Salvage and stockpile landscape boulders from on-site during site demolition. Ensure stockpiling does not damage, scar or break boulders.

- C. Preinstallation Conference: Conduct conference at Project site.

- 1. Review methods and procedures related to landscape boulders including, but not limited to, the following:
 - a. Landscape boulder salvaging.
 - b. Landscape boulder installation.
 - c. Landscape boulder termination of and incorporation in dry-stack stone walls.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle landscape boulders to prevent deterioration or damage due to contaminants, breaking, chipping, scarring or other causes.

1.5 PROJECT CONDITIONS

- A. Do not install landscape boulders that are damaged, scarred or broken.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Landscape Boulders: Provide sound, durable natural limestone boulders salvaged from the site. Should boulders not be available, contractor shall bring them to the site. Size range should include: Small (approximately 14"-20" diameter) Medium (approximately 24"-36" diameter) and Large (approximately 36"-54" diameter)
 - 1. Final selection and location of landscape boulders shall be determined in the field under the direction of the Landscape Architect.
 - a. Refer to Drawings for approximate quantity, size and locations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of landscape boulders.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 LANDSCAPE BOULDER INSTALLATION

- A. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
- B. Install boulders in locations as directed by Landscape Architect in the field. Bury boulders to a depth equal to 1/3 of the boulder's height.

3.3 PROTECTION

- A. Remove and replace landscape boulders that are damaged, scarred or broken during or after installation.

END OF SECTION 044400.10

**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of his section. See also Structural Engineering Specifications on Structural Contract Documents

1.02 DESCRIPTION OF WORK:

- A. Definition: Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes, and castings which are not a part of structural steel or other metal systems specified elsewhere.
- B. Extent of metal fabrications is indicated on drawings.
- C. Types of work in this section include metal fabrications for:
 - 1] Rough hardware.
 - 2] Miscellaneous framing and supports.

1.03 QUALITY ASSURANCE:

- A. Shop Assembly: Preassemble items in shops to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Tubing: Cold-formed, ASTM A-500, grade B.

- C. Steel Pipe: ASTM A53; standard weight (Schedule 40); unless another weight is indicated or required by structural loads. Refer to Structural Drawings.
- D. Steel Plates, Shapes and Bars: ASTM A-36; or A572, Grade 50.
- E. Structural Steel Sheet: Hot-rolled, ASTM A-570; or cold rolled ASTM A-611, Class 1; of grade required for design loading.
- F. Galvanized Structural Steel Sheet: ASTM A-446, of grade required for design loading. Coating designation as indicated, or if not indicated, G90.
- G. Non-Shrink, High Strength, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- H. Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 - 1] Bolts and Nuts: Regular hexagon head type, ASTM A-325, Grade A.
 - 2] Lag Bolts: Square head type, FS FF-B-561.
 - 3] Machine Screws: Cadmium plated steel, FS FF-S-92.
 - 4] Wood Screws: Flat head carbon steel, FS FF-S-111.
 - 5] Plain Washers: Round, carbon steel, FS FF-W-92.
 - 6] Lock Washers: Helical spring type carbon steel, FS FF-W-84.
- I. Paint:
 - 1] Shop Primer for Ferrous Metal: Primer as specified in Section 09 91 00 for ferrous metals.
 - 2] Galvanizing Repair Paint: High zinc dust content paint for regalanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

2.02 FABRICATION, GENERAL

- A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners whenever possible. Use exposed fasteners of type indicated, or if not indicated, Phillips flat-head (countersunk) screws or bolts.
- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized as follows:
 - 1] ASTM A-153 for galvanizing iron and steel hardware.
 - 2] ASTM A-123 for galvanized rolled, pressed and forged steel shapes, plates, bars and strips, 1/8" thick and heavier.
 - 3] ASTM A-386 for galvanizing assembled steel products.
- H. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- I. Shop Painting: Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 - 1] Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
 - Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.03 ROUGH HARDWARE:

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items as specified in Division-6 sections.
- B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.04 MISCELLANEOUS FRAMING AND SUPPORTS:

- A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

- B. Fabricate miscellaneous units to sizes, shapes, and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricated from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.
- D. Galvanize exterior miscellaneous frames and supports.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION:

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plus, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touchup shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal- arc welding, appearance and quality of welds made, and methods used in correcting welding work.

3.03 ADJUST AND CLEAN:

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with same material as used for shop painting.
 - 1] Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - 2] For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A-780.

END OF SECTION

SECTION 06 10 00
CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Framing with dimension lumber.
2. Framing with timber.
3. Solid (structural) wood decking.
4. Wood siding.
5. Wood blocking, cants, and nailers.
6. Plywood backing panels.

- B. Exposed Framing: Dimension lumber not concealed by other construction.

- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. SPIB - Southern Pine Inspection Bureau.
2. WCLIB - West Coast Lumber Inspection Bureau.
3. WWPA - Western Wood Products Association.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- C. Decking Standard: Comply with AITC 112, "Standard for Tongue-and-Groove Heavy Timber Roof Decking."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal Framing Anchors:
 - a. Alpine Engineered Products, Inc.
 - b. Cleveland Steel Specialty Co.
 - c. Simpson Strong-Tie Company, Inc.
 - d. United Steel Products Company, Inc.

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece[, or omit grade stamp and provide certificates of grade compliance issued by grading agency].
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
 - 5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
 - 6. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA C2 (lumber), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWPA C31 with inorganic boron (SBX).
 - 1. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry material after treatment to a maximum moisture content of [19 percent for lumber] [and] [15 percent for plywood]. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece[, or omit marking and provide certificates of treatment compliance issued by inspection agency].
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing members less than 18 inches (460 mm) above grade.
 - 4. Wood floor plates that are installed over concrete slabs directly in contact with earth.

2.4 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.
- B. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and any of the following species:
 - 1. Douglas fir-larch; WCLIB or WWPA.
 - 2. Douglas fir-south; WWPA.
 - 3. Southern pine; SPIB.
- C. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade and any of the following species:
 - 1. Douglas fir-larch; WCLIB or WWPA.
 - 2. Douglas fir-south; WWPA.
 - 3. Douglas fir-larch (north); NLGA.
 - 4. Southern pine; SPIB.

- D. Exposed Framing[Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics that would impair finish appearance.
1. Species and Grade: As indicated above for load-bearing construction of same type.
 2. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; No. 1 grade; NLGA, WCLIB, or WWPA.
 3. Species and Grade: Southern pine, No. 1 grade; SPIB.

2.5 SOLID WOOD DECKING

- A. Decking Species: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), hem-fir, hem-fir (North), southern pine, spruce pine-fir (North), western hemlock, or western hemlock (North).
- B. Decking Grade: Dense Standard Decking.
- C. Moisture Content: Provide wood decking with 15 percent maximum moisture content at time of dressing.
- D. Pattern and Dressing: Tongue and groove, edge vee 1 side, surfaced 2 sides.
- E. Fasteners: Provide fastener size and type complying with decking standard for thickness of deck used.
1. Use hot-dip galvanized nails and spikes.

2.6 WOOD SIDING

- A. For exposed boards (wood siding), provide lumber with 15 percent maximum moisture content and the following species and grades:
1. Cypress; D Select (Quality) grade; NELMA, NLGA, WCLIB, or WWPA.
 2. V-Edge, Tongue-and-Groove Siding: Smooth-faced tongue-and-groove pattern with eased edges, actual face width (coverage) and thickness as indicated on Drawings, measured at 15 percent moisture content.
- B. Siding Colors, Textures, and Patterns: Where manufacturer's standard products are indicated, provide siding with the following requirements:
1. Match Architect's samples.

2.7 TIMBER

- A. For timber of 5-inch nominal (117-mm actual) size and thicker, provide material complying with the following requirements:
1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; No. 1 grade; NLGA, WCLIB, or WWPA.
 2. Species and Grade: Southern pine, No. 1 grade; SPIB.
 3. Additional Restriction: Free of heart centers.

2.8 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Cants.
 - 3. Nailers.
 - 4. Furring.
 - 5. Grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:
 - 1. Mixed southern pine; SPIB.
- C. For furring strips for installing wood siding, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.9 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.10 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners[with hot-dip zinc coating complying with ASTM A 153/A 153M] [of Type 304 stainless steel].
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when

installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.11 METAL FRAMING ANCHORS

- A. General: Provide framing anchors made from metal indicated, of structural capacity, type, and size indicated, and as follows:
 1. Research/Evaluation Reports: Provide products acceptable to authorities having jurisdiction and for which model code research/evaluation reports exist that show compliance of metal framing anchors, for application indicated, with building code in effect for Project.
 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 1. Use for exterior locations and where indicated.
- C. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
 1. Thickness: 0.050 inch (1.3 mm).
- D. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.
- E. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- C. Apply field treatment complying with AWP4 M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. CABO NER-272 for power-driven fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in the Uniform Building Code.
 - 4. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.
 - 5. Table 2306.1, "Fastening Schedule," in the Standard Building Code.
 - 6. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in the International One- and Two-Family Dwelling Code.
- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- F. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Wood Siding: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 WOOD FRAMING INSTALLATION, GENERAL

- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- C. Do not splice structural members between supports.

- D. Where built-up beams or girders of 2-inch nominal- (38-mm actual-) dimension lumber on edge are required, fasten together with 2 rows of 20d (100-mm) nails spaced not less than 32 inches (812 mm) o.c. Locate one row near top edge and other near bottom edge.

3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and **[toe nail or]** use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- (19-by-140-mm actual-) size boards between every third pair of rafters, but not more than 48 inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.6 TIMBER FRAMING INSTALLATION

- A. Install timber with crown edge up and provide not less than 4 inches (102 mm) of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports if not continuous.
- B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch (13-mm) air space at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.7 SOLID WOOD DECKING INSTALLATION

- A. Install solid wood decking to comply with referenced decking standard and with end joints located according to lay-up indicated. Apply joint sealant between decking and supports and between tongues and grooves at outside wall supports.
 - 1. Nail each course of decking at each support with one nail slant nailed above the tongue and one straight nailed through the face.
 - a. Use 12d nails for 2-inch nominal (37-mm actual) decking.
 - 2. Slant nail each course to the tongue of the adjacent course at 30 inches (750 mm) o.c. and within 12 inches (300 mm) of the end of each unit. Stagger nailing in adjacent courses 15 inches (380 mm).
 - a. Use 6d nails for 2-inch nominal (37-mm actual) decking.

3.8 WOOD SIDING INSTALLATION

- A. Horizontal Lumber Siding: Apply starter strip along bottom edge of sheathing or sill. Install first course of siding with lower edge at least 1/8 inch (3 mm) below starter strip and subsequent courses lapped 1 inch (25 mm) over course below. Nail at each stud. Do not allow nails to penetrate more than one thickness of siding.
 - 1. Leave 1/8-inch (3-mm) gap at trim and corners, unless otherwise recommended by manufacturer, and apply sealant.
 - 2. Butt joints only over framing or blocking, nailing top and bottom on each side and staggering joints in subsequent courses.

END OF SECTION

SECTION 07 14 00
FLUID-APPLIED ELASTOMERIC WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

- 1] Provide a complete polyurethane waterproofing membrane system including all applicable sealants, elastomeric flashings and prefabricated drainage needed to prevent water penetration at locations indicated.

B. Related work:

- 1] Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 SUBMITTALS

A. Comply with pertinent provisions of Section 01330.

B. Product data:

1. Materials list of items proposed under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades;
4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
5. Written documentation of applicator's qualifications, including reference projects of similar scope and complexity, with current phone contacts of architects and owners for verification.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Applicator qualifications:

1. Applicator shall have at least three years experience in installing materials of types specified and shall have successfully completed at least three projects of similar scope and complexity.
2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

- C. Convene a pre-installation job-site conference three weeks prior to commencing work of this Section:
 - 1. Secure attendance by Architect, Contractor, applicator, and authorized representatives of the membrane system manufacturer and interfacing trades.
 - 2. Examine Drawings and Specifications affecting work of this Section, verify all conditions, review installation procedures, and coordinate scheduling with interfacing portions of the Work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.
- B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Comply with pertinent provisions of Section 01660.

1.05 SUBSTRATE CONDITIONS

- A. General:
 - 1. Provide applicator with surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing membrane system.
 - 2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete, masonry and ferrous metal surfaces to receive the work of this Section.
- B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth with finish equal to one that is light steel troweled followed by a fine hair broom.
- C. Drain:
 - 1. Slope deck surfaces to drains that have flanges at membrane level which are flush with deck surfaces.
 - 2. Rigidly install pipe, vents and other surface protrusions, properly flash them, and cover to prevent entry of membrane materials.
- D. Metal flashings: Where metal flashings are substrate to waterproofing membrane, set the flashings in continuous bedding bead of urethane sealant; install sealant S-bead between metal laps and mechanically fasten to substrate along leading edges at every 4" on center, staggered linearly, to lay flat without fishmouths.
- E. Joints: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents.

1.06 WARRANTY

- A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship for a period of two years following date of completion. Warrant that installed waterproofing membrane system shall be free of defects including adhesive failure, cohesive failure, and waterproofing failure resulting from substrate cracking up to 1/16 inch.
 - 1. Manufacturer's standard warranty covering materials;
 - 2. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide a complete fluid applied elastomeric waterproofing membrane system having the following minimum attributes:
 - 1. Acceptable products:
 - a. Tremproof 60; Tremco Inc.
 - b. Vulkem 201; Tremco Inc.
 - c. Vulkem 250 GC; Tremco Inc.
 - d. or prior approved equal
 - 2. Coal-tar free polyurethane designed for concealed building components subject to hydrostatic head;
 - 3. Complying with ASTM C836-89a.

2.02 ACCESSORIES

- A. Primer: As recommended by waterproofing membrane system manufacturer;
- B. Joint backing: Closed-cell, polyethylene rod as recommended by membrane manufacturer;
- C. Reinforcing fabric: Woven fiberglass scrim cloth;
- D. Elastomeric sheet flashing: 1/16 inch thick by 12 inch wide uncured neoprene sheeting;
- E. Joint Treatment:
 - 1. Acceptable products
 - a. Vulkem 921; Tremco Inc.
 - b. Vulkem 227; Tremco Inc.
 - c. or prior approved equal
- F. Primers (for sealants in total immersion):
 - 1. Acceptable product
 - a. Vulkem 171; Tremco Inc.

- G. Protection course: Inorganic asphalt composition hardboard with fiberglass reinforcing or other as approved by membrane manufacturer:
 - 1. Acceptable product
 - a. Powerply; Tremco Inc.

2.03 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the membrane system manufacturer as compatible, subject to review of the Architect.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
 - 1. Verify conformance with manufacturer's requirements;
 - 2. Report unsatisfactory conditions in writing to the Architect;
 - 3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Surface preparation and detailing procedures to be in accord with waterproof membrane system manufacturer's instructions and recommendations except where more stringent requirements are indicated.
- B. Clean all deck surfaces to receive membrane system in accord with manufacturer's instructions; vacuum clean or blow clean with oil-free compressed air all surfaces to receive sealants, detailing materials or membranes immediately prior to installation.
- C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.
- D. Clean metal surfaces to bright metal by wire brushing or mechanical etching; scuff-sand lead flashing and plastic surfaces.
- E. Prime surfaces in accord with manufacturer's instructions.
- F. Install 1/4" diameter backer rod into corner of all horizontal-to-vertical junctures subject to movement and cover with 1" detail cant of approved sealant; install 1" detail cants at projections, curbs and other horizontal-to-vertical junctures.
- G. Install detail coats, joint and crack treatments, and liquid flashings in accord with manufacturer's instructions.

- H. Allow detail applications to cure in accord with manufacturer's instructions prior to general application of membrane.

3.03 APPLICATION

- A. General: Install waterproofing system in accord with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated.
 - 1. Waterproofing membrane shall have a minimum of 60 mil dry-film thickness.
 - 2. Grid deck surfaces to assure proper coverage rates and verify membrane wet-film mil thickness with gauges as work progresses.
 - 3. Retain empty product containers during course of work to aid in determining whether completed membrane complies with required average dry-film thickness.
- B. Verify proper dry condition of substrate using method recommended by membrane system manufacturer; perform adhesion checks prior to general application of membrane system using field adhesion test method recommended by manufacturer.
- C. Mask off adjoining surfaces not to receive membrane system.
- D. Wipe clean all detail coats with white rags wetted with Xylene solvent; do not saturate detail coat.
- E. Apply membrane uniformly and allow to cure in accord with manufacturer's instructions.
- F. Feather terminating edge when entire area cannot be completed in one day; clean area 6" wide along terminating edge of membrane with Xylene solvent on clean white rags prior to startup on next working day; use interlaminary primer per manufacturer's instructions as needed; overlap existing work by 6" with new work.
- G. Flood test: Plug drains on deck surfaces and use sand bags or other means to restrict runoff. Flood deck with water to depth of 2" (50 mm) and allow to stand at least 48 hours; repair leaks if occurs and retest.
- H. Install drainage over cured membrane in accord with manufacturer's instructions.

3.04 PROTECTION AND CLEAN-UP

- A. Promptly remove primer or membrane system material from adjacent surfaces with MEK, Toluene or Xylene; leave work area in broom clean condition.
- B. Prohibit traffic over completed work and protect against work overhead until protection course is installed; protect from damage until protected beneath overlaying work.

END OF SECTION

**SECTION 07 21 00
THERMAL INSULATION**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

- A. Extent of insulation work is shown on drawings and indicated by provisions of this section.
- B. Applications of insulation specified in this section include lay-in blanket-type (batt) building insulation above Office ceiling and rigid insulation in Office exterior wall cavity..

1.03 QUALITY ASSURANCE:

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1] Surface Burning Characteristics: ASTM E-84.
 - 2] Fire Resistance Ratings: ASTM E-119.
 - 3] Combustion Characteristics: ASTM E-136.
- C. Maximum Allowable Asbestos Content of Inorganic Insulations: Provide insulations composed of mineral fibers or mineral ores which contain less than 0.25% by weight of asbestos of any type or mixture of types occurring naturally as impurities as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor retarder material required.
- B. Certified Test Results: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

- 1.05 DELIVERY, STORAGE, AND HANDLING: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

- 2.01 ACCEPTABLE MANUFACTURERS: Subject to compliance with requirements, provide products of one of the following:

- 1] Celotex Corp.
- 2] CertainTeed Corp.
- 3] Manville Corp.
- 4] Owens-Corning Fiberglas Corp.

- 2.02 INSULATING MATERIALS: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards and other characteristics. Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.

- A. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C-665 for Type III, Class A (blankets with reflective vaporretarder membrane facing with flame spread of 25 or less); foil-scrim-kraft vapor-retarder on one face, respectively; and as follows:

- 1] Mineral Fiber Type: Fibers manufactured from glass.
- 2] Combustion Characteristics: Unfaced blanket/batt passes ASTM E-136 test.
- 3] Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
- 4] R-24, 8-1/2" thick above ceiling.

- B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

- 1] Type VII, 2.20 lb/cu. ft. (35 kg/cu. m).

- 2.03 AUXILIARY INSULATING MATERIALS:

- A. Polyethylene Vapor Retarder: 6-mil polyethylene film, with laboratory-tested vapor transmission rating of 0.2 perms, natural color.
- B. Mechanical Anchors: Type and size indicated, or if not indicated, as recommended by insulation manufacturer fir type of application and condition of substrate.

PART 3 - EXECUTION

- 3.01 INSPECTION AND PREPARATION:

- A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- B. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections which might puncture vapor retarders.

3.02 INSTALLATION, GENERAL:

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.03 INSTALLATION OF GENERAL BUILDING INSULATION:

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except as firestopping.

3.04 INSTALLATION OF VAPOR RETARDERS: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as recommended by vapor retarder manufacturer. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.

3.05 PROTECTION: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

SECTION 07 61 13
CORRUGATED METAL ROOF SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Corrugated roof panels.
- B. Related Sections include the following:
 - 1. Refer to Structural Engineering Specification on Contract Documents.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide manufactured roof panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.
- B. Water Penetration: Provide manufactured roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).
- C. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.
- D. Structural Performance: Provide manufactured roof panel assemblies capable of safely supporting design loads indicated under in-service conditions with vertical deflection no greater than the following, based on testing manufacturer's standard units according to ASTM E 1592 by a qualified independent testing and inspecting agency.
 - 1. Maximum Deflection: 1/180 of the span.

1.4 SUBMITTALS

- A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.
- B. Shop Drawings: Show layouts of panels on roofs, details of edge conditions, joints, panel profiles, supports, anchorages, trim, flashings, underlayment, closures, snow guards, and special details. Distinguish between factory- and field-assembled work.

- C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of galvanized finish, textures, and patterns available for roof panels with factory-applied finishes.
- D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.
- E. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Product Test Reports: Indicate compliance of manufactured roof panel assemblies and materials with performance and other requirements based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed metal roof panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.
- B. Handling: Exercise care in unloading, storing, and erecting roof panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide panels by one of the following:
1. Steel Roof Panels: 2.67" x 7/8", 22 ga Sinewave Corrugated Steel by Corrugated Metals, Inc.

2.2 METALS AND FINISHES

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with **ASTM A 755 (ASTM A 755M)** and the following requirements:
1. Galvanized Steel Sheet: **ASTM A 653, G90 (ASTM A 653M, Z275)**; structural quality.
 2. Thickness: **0.034 inch (0.85 mm)**, unless otherwise indicated.
 3. Batten Caps: **0.028 inch (0.7 mm)** thick.
 4. Finish: Apply the following organic coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and accessories required for a complete roof panel assembly and as recommended by panel manufacturer, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.
1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
 2. Use aluminum or stainless-steel fasteners for exterior applications and aluminum or galvanized steel fasteners for interior applications.
 3. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
 4. Provide metal-backed neoprene washers under heads of exposed fasteners bearing on weather side of panels.
 5. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
- C. Accessories: Unless otherwise specified, provide components required for a complete roof panel assembly including trim, copings, fasciae, mullions, sills, corner units, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
1. Closure Strips: Galvanized metal closure strips. Cut to match configuration of panels. Provide closure strips where indicated or necessary to ensure bird blocking.

2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Elastomeric Joint Sealant: ASTM C 920, of base polymer, type, grade, class, and use classifications required to seal joints in panel roofing and remain weathertight. Provide sealant recommended by panel manufacturer.

2.4 FABRICATION

- A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2.5 PANEL SUPPORTS AND ANCHORAGE

- A. Secondary Framing: Provide components complying with the Light Gage Structural Institute's "Guide Specifications," Section 07410, "Manufactured Roof and Wall Panels."
 1. Roof Purlins: C- or Z-shaped sections fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel. Purlin spacers fabricated from 0.079-inch- (2.0-mm-) thick, cold-formed, galvanized steel sections.
 2. Eave Struts: Unequal flange, C-shaped sections formed to provide adequate back-up for roof panels. Fabricate from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.
 3. Flange and Sag Bracing: 1-5/8-by-1-5/8-inch (41-by-41-mm) angles, fabricated from 0.0598-inch- (1.5-mm-) thick, shop-painted, roll-formed steel.
 4. Base or Sill Angles: Fabricate from 0.079-inch- (2.0-mm-) thick, cold-formed, galvanized steel sections.
 5. Secondary structural members, except columns and beams, shall be manufacturer's standard sections fabricated from 0.079-inch- (2.0-mm-) thick, cold-formed galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel roofing.
 1. Panel Supports and Anchorage: Examine roof framing to verify that purlins, angles, channels, and other secondary structural panel support members and anchorage have been installed according to written instructions of panel manufacturer.
 2. Do not proceed with roof panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordinate metal panel roofing with rain drainage work; flashing; trim; and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
- B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.
- C. Secondary Structural Supports: Install purlins, bracing, and other secondary structural panel support members and anchorage according to the Light Gage Structural Institute's "Guide Specifications," Section 07410, "Manufactured Roof and Wall Panels."

3.3 PANEL INSTALLATION

- A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cutting exterior panels by torch is not permitted.
 - 2. Install panels with concealed fasteners, unless otherwise indicated.
- B. Accessories: Install components required for a complete roof panel assembly including trim, copings, fasciae, ridge closures, clips, seam covers, battens, flashings, gutters, sealants, gaskets, fillers, closure strips, and similar items.
- C. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized-asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- D. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not otherwise indicated, types recommended by panel manufacturer.
 - 1. Install weatherseal under ridge cap. Flash and seal panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
 - 2. Seal panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by panel manufacturer.
 - 3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
- F. Standing-Seam Roof Panel Assembly: Fasten panels to supports with concealed clip according to panel manufacturer's written instructions.
 - 1. Install clips at each support with self-drilling/self-tapping fasteners.
 - 2. At end laps of panels, install tape calk between panels.

3. Install factory-calked cleats at standing-seam joints. Apply snap-on batten to panels to provide a weathertight joint.
4. Seaming: Complete seaming of panel joints by operating portable power-driven equipment of type recommended by panel manufacturer to provide a weathertight joint.

3.4 CLEANING AND PROTECTING

- A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section. Refer to Structural Engineering specifications on Structural Contract Documents.
- 1.02 DESCRIPTION: Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.
- A. Types of work specified in this section include the following:
- 1] Metal counter flashing and base flashing.
 - 2] Exposed metal trim/fascia units.
 - 3] Miscellaneous sheet metal accessories.
- B. Roofing accessories which are installed integral with metal roofing are specified in Section 07410- Metal Roofing.
- 1.03 SUBMITTALS:
- A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- 1.04 JOB CONDITIONS: Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

- 2.01 FLASHING AND SHEET METAL MATERIALS:
- A. Sheet Metal Flashing/Trim: Zinc-Coated Steel- Commercial quality with 0.20% copper, ASTM A-525 except ASTM A-527 for lock-forming, G90 hot-dip galvanized, mill finish; 0.0359" thick (20 gage) except as otherwise indicated.
- B. Miscellaneous Materials and Accessories:
- 1] Solder: For use with steel provide 50 - 50 tin/lead solder (ASTM B-32), with rosin flux.
 - 2] Fasteners: Same metal as flashing/sheet metal or, other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
 - 3] Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- 4] Elastomeric Sealant: Generic type recommended by manufacturer of metal and

fabricator of components being sealed; comply with FS TT-S-0027, TT-S-00232, or TT-S-001543.

- 5] Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.

2.02 FABRICATED UNITS: General Metal Fabrication- Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

- A. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- B. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- C. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- D. Finish for Exposed Flashing and Sheet Metal: Paint finish as per "Painting" section of Division-9 in color to be selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS:

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

3.02 CLEANING AND PROTECTION:

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Installer shall advise Contractor of required procedures for surveillance and

protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION

SECTION 07920 JOINT SEALERS

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK: Extent of each form and type of joint sealer is scheduled at end of this section.
- 1.03 SYSTEM PERFORMANCES: Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.
- 1.04 QUALITY ASSURANCE:
- A. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.
 - B. Installer Qualifications: Engage an Installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.
- 1.05 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical data for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- 1.06 DELIVERY, STORAGE, AND HANDLING: Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- 1.07 PROJECT CONDITIONS:
- A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:
 - 1] When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturers.
 - 2] When joint substrates are wet due to rain, frost, condensation, or other causes.

- B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials, General:

- 1] Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.
- 2] Colors: Provide colors of exposed joint sealers as selected by Architect from manufacturer's standard colors.
- 3] Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealant of base polymer indicated which complies with ASTM C-920 requirements, including those for Type, Grade, Class, and Uses.

B. Elastomeric Joint Sealers:

- 1] ONE-COMPONENT, GUN GRADE, POLYURETHANE SEALANT:
Bostik Chem-Calk 900 or approved equal.
- 2] ONE-COMPONENT, SELF-LEVELING, TRAFFIC GRADE, POLYURETHANE SEALANT:
Bostik Chem-Calk 950 or approved equal.
- 3] ONE-COMPONENT, SILICONE SEALANT:
Bostik Chem-Calk 1200 or approved equal.

C. Joint Fillers:

- 1] Bituminous Fiber Joint Filler: Preformed strips of asphalt saturated fiberboard, complying with ASTM D-1751:

D. Joint Sealant Backing:

- 1] General: Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- 2] Plastic Foam Joint-Fillers: Preformed, compressible, resilient, nonwaxing, nonextruding strips of plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- 3] Either flexible, open-cell polyurethane foam or nongassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.
- 4] Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

E. Miscellaneous Materials:

- 1] Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate and field tests.
- 2] Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- 3] Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealant and to surfaces adjacent to joints.

PART 3 - EXECUTION

3.01 INSPECTION:

- A. General: Inspect all joints that should receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Repair any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

- A. Before proceeding with any joint sealer work, verify that such work is coordinated with all other trades.
- B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
- 1] Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellants; water; surface dirt and frost.
 - 2] Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean,

- sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
- 3] Remove laitance and form-release agent from concrete. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.
- C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- D. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALERS:

- A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C-962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
- 1] Install joint-fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
 - 2] Do not leave gaps between ends of joint-fillers. Do not stretch, twist, puncture or tear joint-fillers. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.
 - 3] Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.
 - 4] Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants

directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of concave configuration, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.04 PROTECTION AND CLEANING:

- A. General: Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion.
If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

PART 4 - JOINT SEALANT SCHEDULE

APPLICATIONS SEALANT TYPE

Perimeter Caulking Interior and Exterior Frames-Type A or B

Perimeter Caulking of Sanitary Fixtures-Type A

Sealing Around Entrances-Type A, B or D

Electrical & Mechanical Fixtures-Type A, B or C

Flashing-Type A, B or D

Lap Joints-Type A or C

END OF SECTION

SECTION 08111
STEEL DOORS AND FRAMES

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK
- A. Extent of standard steel doors and frames is indicated on drawings.
 - B. Finish hardware is specified elsewhere in Division- 8.
- 1.03 QUALITY ASSURANCE:
- A. Provide Doors and Frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- 1.04 SUBMITTALS
- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
 - B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements and details of joints and connections. Show anchorage and accessory items.
- 1.05 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver steel products cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory-finished doors.
 - B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
 - C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of nonvented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4" spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: Subject to compliance with requirements, provide products by one of the following:

A. Steel Doors and Frames:

- 1] Amweld Building Products, Inc.
- 2] Ceco Door Products; a United Dominion Company.
- 3] Copco Door Co.
- 4] Curries Company.
- 5] Kewanee Corporation (The).
- 6] Steelcraft; a division of Ingersoll-Rand.

2.02 MATERIALS:

- A. Hot-Rolled Steel Sheets and Strips: Commercial quality carbon steel, pickled and oiled, complying with ASTM A-569 and ASTM A-568.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A-366 and ASTM A-568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.
- D. Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
- F. Shop Applied Primer: For primer, use rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

2.03 FABRICATION:

- A. General: Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site. Comply with SDI-100 requirements as follows:
 - 1] All doors to be exterior, SDI-100, Grade III, extra heavy-duty, Model 2, minimum 16-gage faces.
 - 2] Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.
 - 3] Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).
 - 4] Fabricate doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gage inverted steel channels.
- B. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
- C. Thermal-Rated (Insulating) Assemblies: For all doors indicated provide doors which have

been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C-236. Unless otherwise indicated, provide thermal-rated assemblies with U factor of 0.24 BTU/(hr-ft²-°F) or better.

- D. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
- E. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
- F. Locate finish hardware as indicated on final shop drawings or if not indicated, in accordance with "Recommended Locations Builder's Hardware", published by Door and Hardware Institute.
- G. Shop Priming: Clean, treat, and prime exposed surfaces of steel door and frame units, including galvanized surfaces. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

2.04 STANDARD STEEL DOORS: Provide metal doors of types and styles indicated on drawings or schedules.

- A. All doors to be exterior, SDI-100-83, Grade III, heavy-duty, galvanized, Model 2, minimum 16-gage faces.
- B. Provide manufacturer's standard exterior, galvanized, sightproof, stationary louver where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24-gage cold-rolled steel set into 20-gage steel frame.

2.05 STANDARD STEEL FRAMES:

- A. Provide metal frames for doors of type and style as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage, cold-rolled furniture steel.
- B. Fabricate frames with mitered corners, welded construction for exterior applications.
- C. Fabricate exterior frames of hot-dip galvanized steel.
- D. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
- C. Except for frames located at in-place concrete, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.
- D. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels.
- E. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

3.02 ADJUST AND CLEAN

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.
- C. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

**SECTION 08 52 00
ALUMINUM WINDOWS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following types of aluminum-framed windows:
 - 1. Fixed
 - 2. Casement
 - 3. Awning
 - 4. Slider
- B. Related Sections include the following:
 - 1. Division 8 Section "Glazing" for glazing requirements for aluminum windows, including those specified to be factory glazed.

1.3 DEFINITIONS

- A. AW: Architectural.
- B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot (pascals) used to determine structural test pressure and water test pressure.
- C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.
- D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:
 - 1. Size indicated.
- B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2.
 - 1. Performance Class: AW.

2. Performance Grade: 40.
 3. Exception to AAMA/NWWDA 101/I.S.2: In addition to requirements for performance class and performance grade, design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length [or 3/4 inch, whichever is less, at design pressure based on the following:
 - a. Testing performed according to AAMA/NWWDA 101/I.S.2, Uniform Load Deflection Test.
- C. Structural Performance: Provide aluminum windows capable of withstanding the following, including wind loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind speed indicated:
1. Deflection: Based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Deflection Test.
 2. Basic Wind Speed: As indicated in miles per hour at 33 feet above grade. Determine wind loads and resulting design pressures applicable to Project according to the following, based on mean roof heights above grade as indicated on Drawings:
 - a. Appendix B in AAMA/NWWDA 101/I.S.2.
 3. Design Pressure: 30 lbf/sq. ft.
- D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.
1. Maximum Rate: 0.3 cfm/sq. ft. of area at an inward test pressure of 1.57 lbf/sq. ft..
- E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft.
- F. Forced-Entry Resistance: Comply with Performance Level 10 requirements when tested according to ASTM F 588.
- G. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45, where windows are indicated to be "thermally improved."
- H. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
1. U-Value: Btu/sq. ft. x h x deg F.
- I. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and

connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): [120 deg F, ambient; 180 deg F material surfaces.

J. Each Window Type: Comply with AAMA/NWWDA 101/I.S.2 for the following tests:

1. Operating Force.
2. Deglazing: When tested according to ASTM E 987.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Samples for Verification: For aluminum window components required, prepared on Samples of size indicated below.

1. Main Framing Member: 12-inch long, full-size sections of extrusions with factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.
3. Weather Stripping: 12-inch long sections.

D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Windows:
 - a. Rhino-Gerkin Windows
 - b. EFCO Corporation.
 - c. Peerless Products, Inc.
 - d. Alenco Windows

2.2 MATERIALS, GENERAL

- A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.
- B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components. Cadmium-plated steel anchors, clips, and accessories are not permitted.
 - 1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
 - 2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel anchors, clips, and accessories are not permitted.
- D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated. Cadmium-plated steel reinforcing members are not permitted.
- E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.
 - 1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
- F. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.

1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.

G. Replaceable Weather Seals: Comply with AAMA 701/702.

H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.3 GLAZING

A. Glass: Low-E, insulated double-pane.

B. Glazing System: Manufacturer's standard factory-glazing system that produces weather-tight seal.

2.4 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Cadmium-plated hardware is not permitted. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze.

B. Counterbalancing Mechanism: Comply with AAMA 902.

C. Casement, Awning and Slider Windows: Provide the following operating hardware:

1. Crank (on awning and casement) or Handle (slider)
2. Lock
3. Hinges (on awning and casement)

2.5 INSECT SCREENS

A. General: Design operable windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on outside of window and provide for each operable exterior sash or ventilator.

1. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.

1. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.040-inch wall thickness.
2. Finish: Match aluminum window members.

- C. Solar Screening Mesh Fabric: 17-by-15 (opening dimension) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.

2.6 FABRICATION

- A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.
 - 1. Fixed
 - 2. Casement
 - 3. Awning
 - 4. Slider
- B. Fabricate aluminum windows that are re-glazable without dismantling sash or ventilator framing.
- C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - 1. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
 - 2. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.
- E. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
- G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2.

2.7 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Color: Anodized

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.
 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
 2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
- C. Set sill members in bed of sealant or with gaskets, as indicated, for weather-tight construction.
- D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- E. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

3.3 ADJUSTING

- A. Adjust operating sashes and ventilators, screens, hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weather-tight closure. Lubricate hardware and moving parts.

3.4 PROTECTION AND CLEANING

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below

exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

- B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.
- D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION

**SECTION 087100
FINISH HARDWARE**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Definition: "Finish Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and nonmatching hardware specified in the same section as the door and door frame.

B. Extent of finish hardware required is indicated on drawings and in schedules.

C. Types of finish hardware required include the following:

- 1] Hinges
- 2] Lock cylinders and keys
- 3] Lock and latch sets
- 4] Door stops and silencers
- 5] Closers
- 6] Weatherstripping for exterior doors

D. Silencers included integral with hollow metal frames are specified with door frames elsewhere in Division 8.

E. Weatherstripping included integral with hollow metal frames are specified with door frames elsewhere in Division 8.

1.03 QUALITY ASSURANCE:

A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a manufacturer listed on hardware schedule of this section.

B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts and finish.

- B. Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
- C. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
 - 1] Type, style, function, size, and finish of each hardware item.
 - 2] Name and manufacturer of each item.
 - 3] Fastenings and other pertinent information.
 - 4] Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.
 - 5] Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
 - 6] Mounting locations for hardware.
 - 7] Door and frame sizes and materials.
 - 8] Keying information.
- D. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frame) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
- E. Templates: Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.05 PRODUCT HANDLING:

- A. Packaging of hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- B. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.
- D. Provide secure lockup for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable so that completion of the work will not be delayed by hardware losses, both before and after installation.

PART 2 - PRODUCTS

2.01 SCHEDULED HARDWARE:

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:
- B. Manufacturer's Product Designations: One manufacturer is listed for each hardware type required in the hardware schedule for purposes of establishing minimum requirements. Provide either the product designated, or the comparable product of another manufacturer which complies with requirements, including those specified elsewhere in this section.

2.02 MATERIALS AND FABRICATION:

- A. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- B. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to Architect. Manufacturer's identification will be permitted on rim of lock cylinders only.
- C. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- D. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.

- E. Tools and Maintenance Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware.

2.03 HINGES AND BUTTS:

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Screws: Furnish Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Provide stainless steel nonremovable hinge pins.

2.04 LOCK CYLINDERS AND KEYING:

- A. General: Supplier will meet with Owner's Representative to finalize keying requirements and obtain final instructions in writing.
- B. System: Provide new grandmasterkey system for project.
- C. Equip locks with manufacturer's standard 6-pin tumbler cylinder.
- D. Metals: Construct lock cylinder parts from brass/bronze, stainless steel, or nickel silver.
- E. Key Material: Provide keys of nickel silver only.
- F. Key Quantity: Furnish 3 change of keys for each lock; 3 master keys for each master system; and 3 grandmaster keys.
- G. Deliver keys to Owner's Representative.

2.05 LOCKS AND LATCHES:

- A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.
- B. Provide 1/2" minimum throw on other latch and deadlock bolts.

2.06 CLOSERS AND DOOR CONTROL DEVICES:

- A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
- B. Provide grey resilient parts for exposed bumpers.

2.07 WEATHERSTRIPPING:

- A. General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide type, sizes and profiles shown or scheduled. Provide noncorrosive fasteners as recommended by manufacturer for application indicated.
- B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is

easily replaceable and readily available from stocks maintained by manufacturer.

- C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semimortised, of following metal, finish, and resilient bumper material:

Extruded aluminum with natural anodized finish; 0.062" minimum thickness of main wall and flanges.

Closed-cell sponge neoprene insert, conforming to MIL R 6130A Type II, Grade C, 3/16" x 5/8".

2.08 HARDWARE FINISHES:

- A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.
- B. All finish hardware to be stainless steel unless otherwise indicated. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer".
- E. The designation used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A 156.18 "Materials and Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

3.02 ADJUST AND CLEAN:

- A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- D. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

PART 4 - FINISH HARDWARE SCHEDULE

MEN'S & WOMEN'S RESTROOMS (1 set each)

1-1/2 pair butts	TA-2314 4.5 x 4.5 NRP32D	Mc
1 closer	1231 UOEN	SA
1 privacy set	28-65U65 KL32D	SA
1 deadbolt	487732D	SA
1 stop	252F32D	HA
1 set weatherstrip	790AALUM	MAY
1 threshold	1050-AVALUM	MAY

STORAGE ROOMS

1-1/2 pair butts	TA-2314 4.5 x 4.5 NRP32D	Mc
1 lockset	23-8106 KL32D	SA
1 stop	252F32D	HA
1 set weatherstrip	790AALUM	MAY
1 threshold	1050-AVALUM	MAY

OFFICE

1-1/2 pair butts	TA-2314 4.5 x 4.5 NRP32D	Mc
1 lockset	23-8106 KL32D	SA
1 stop	252F32D	HA
1 set weatherstrip	790AALUM	MAY
1 threshold	1050-AVALUM	MAY

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.
 - 2. Steel suspended furrdown framing.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Framing and Furring:
 - a. Clark Steel Framing Systems.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc. - Dale/Incor.
 - d. Dietrich Industries, Inc.
 - e. National Gypsum Company.
 2. Gypsum Board and Related Products:
 - a. American Gypsum Co.
 - b. G-P Gypsum Corp.
 - c. National Gypsum Company.
 - d. United States Gypsum Co.

2.2 STEEL SUSPENDED FURRDOWN FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- C. Hanger Attachments to Concrete: As follows:
1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
- D. Hangers: As follows:
1. Rod Hangers: ASTM A 510 (ASTM A 510M), mild carbon steel.
 - a. Diameter: 1/4-inch.
 - b. Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with manufacturer's standard corrosion-resistant zinc coating.
1. Depth: 2 inches.
- F. Furring Channels (Furring Members): Commercial-steel sheet with manufacturer's standard corrosion-resistant zinc coating.
1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.
 - a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).

- G. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Subject to compliance with requirements, provide [one of] the following:
 - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - b. Chicago Metallic Corporation; Drywall Furring 660.
 - c. USG Interiors, Inc.; Drywall Suspension System.

2.3 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
 - 1. Type X:
 - a. Thickness: 5/8 inch.
 - b. Long Edges: Tapered.
 - c. Location: Vertical surfaces, unless otherwise indicated.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. American Gypsum Co.; FireBloc Type C.
 - b. G-P Gypsum Corp.; Firestop Type C.
 - c. National Gypsum Company; Gold Bond Fire-Shield G.
 - d. United States Gypsum Co.; SHEETROCK Brand Gypsum Panels, FIRECODE C Core.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc.
 - 2. Shapes:
 - a. Cornerbead: Use at outside corners, unless otherwise indicated.
 - b. Bullnose Bead: Use where indicated.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
 - d. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound; use at exposed panel edges.
 - f. Expansion (Control) Joint: Use where indicated.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.
 - h. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.

- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound].

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

2.7 TEXTURE FINISHES

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Aggregate Finish:
 - a. G-P Gypsum Corp.; GyProc Vermiculite Ceiling Texture.
 - b. United States Gypsum Co.; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).
- B. Primer: As recommended by textured finish manufacturer.
- C. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
 - 1. Texture: Light-spatter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Ceilings: Inspect existing overhead structure to ensure that it will accommodate new suspension system and report any problems to Owner before proceeding with work. Also confirm clearances with new MEP equipment before proceeding with work.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement.
 - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use deep-leg deflection track where indicated.

3.4 INSTALLING STEEL SUSPENDED FURRDOWN FRAMING

- A. Suspend ceiling hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 - 3. Secure rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - 4. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - 5. Do not attach hangers to steel deck tabs.

6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 10 feet measured lengthwise on each member and transversely between parallel members.
 - C. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
 - D. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
 1. Hangers: 48 inches (1219 mm) o.c.
 2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
 3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.
 - E. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

3.6 PANEL APPLICATION METHODS

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare

gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.9 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using sprayer or paint roller, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and unwanted texture to prevent damage according to texture finish manufacturer's written recommendations.

3.10 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
 - 1. Notify Owner seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.

END OF SECTION

SECTION 09 65 13
RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

- A. Extent of resilient base and accessories is shown on Drawings and in schedules and includes the following:

- 1) Rubber base

1.3 QUALITY ASSURANCE

- A. Manufacturer: Provide resilient base and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

1.4 SUBMITTALS

- A. Product Data: Submit two (2) copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.
- B. Samples: Submit samples of each type, color, and pattern of resilient base, including accessories, required, indicating full range of color and pattern variation. Provide full-size tile units and 2-1/2" long sections of resilient flooring accessories.
- C. Maintenance Instructions: Submit two (2) copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.5 JOB CONDITIONS

- A. Maintain minimum temperature of 65 degrees F (18 degrees) in spaces to receive resilient base for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55 degrees F (13 degrees C) in areas where work is completed.
- B. Install resilient base and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following or an acceptable substitute approved prior to bidding. For substitution request, refer to Section 01631.
 - 1) Wall Base: Provide vulcanized rubber base (SBR) complying with FS SS-W-40, Type I, with matching end stops and preformed, molded, or job fabricated corner units, and as follows:
 - a) Height: 4"
 - b) Thickness: 1/8" gage
 - c) Style: Standard cove style
 - d) Finish: High gloss
 - 2) Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Broom clean or vacuum surfaces to be covered, and inspect substrate. Start of wall base installation indicates acceptance of substrate conditions and full responsibility for completed work.
- B. Apply concrete primer, if recommended by resilient base manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.2 INSTALLATION

A. General

- 1) Install wall base using method indicated in strict compliance with manufacturer's recommendations. Extend into toe spaces, door reveals, and into closets and similar openings.
- 2) Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- 3) Tightly cement wall base to substrate without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

B. Wall Base

- 1. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

2. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
3. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.3 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring with heavy Kraft paper or other covering.
- B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.

END OF SECTION

SECTION 09910
PAINTING

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK:
- A. Extent of painting work is indicated on drawings and schedules and as herein specified.
 - B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop- priming and surface treatment specified under other sections of work.
 - C. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.
 - D. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect will select these from standard colors or finishes available.
 - E. Following categories of work are not included as part of field-applied finish work.
 - 1] Prefinished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) plastic toilet enclosures, acoustical materials and finished mechanical and electrical equipment, including light fixtures, switchgear and distribution cabinets.
 - 2] Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 - 3] Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require finish painting.
 - 4] Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor, and fan shafts will not require finish painting.
 - F. Following categories of work are included under other sections of these specifications.
 - 1] Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items. Unless otherwise specified, shop priming of fabricated

components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these specifications.

- 2] Mechanical and Electrical Work: Painting of mechanical and electrical work is specified in Divisions 15 and 16 respectively.

- G. Do not paint over any code-required labels, such as Underwriters Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.03 QUALITY ASSURANCE:

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. Coordination of Work: Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use. Include a full set of proposed manufacturer's color chips for selection by Architect.
- B. Samples: Prior to beginning work, Architect will furnish color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect's review of color and texture of all natural and stained wood finishes only.
 - 1] On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.
 - 2] Final acceptance of colors for natural and stained wood finishes will be from samples applied on the job.

1.05 DELIVERY AND STORAGE:

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
 - 1] Name or title of material.
 - 2] Fed. Spec. number, if applicable.
 - 3] Manufacturer's stock number and date of manufacturer.
 - 4] Manufacturer's name.
 - 5] Contents by volume, for major pigment and vehicle constituents.
 - 6] Thinning instructions.
 - 7] Application instructions.
 - 8] Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in

storage of paint in a clean condition, free of foreign materials and residue.

- C. Protect from freezing when necessary. Keep storage areas neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing, and application of paints.

1.06 JOB CONDITIONS:

- A. Apply water-based paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50°F (10°C) and 90°F (32°C), unless otherwise permitted by paint manufacturer's printed instructions.
- B. Apply Solvent-Thinned Paints: only when temperature of surfaces to be painted and surrounding air temperatures are between 45°F (7°C) and 95°F (35°C), unless otherwise permitted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying period.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Benjamin Moore and Co. (Moore)
PPG Industries, Pittsburgh Paints (Pittsburgh)
The Sherwin-Williams Company (S-W)

2.02 MATERIALS:

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard best-grade product will not be acceptable.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- C. Federal Specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.
- D. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect. Furnish material data and manufacturer's certificate of

performance to Architect for any proposed substitutions.

- E. Color Pigments: Pure, nonfading, applicable types to suit substrates and service indicated. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total nonvolatile (dry-film) of paint by weight. This limitation is extended to interior surfaces and those exterior surfaces such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

PART 3 - EXECUTION

3.01 INSPECTION

- A. General: Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
 - 1] Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
 - 2] Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 SURFACE PREPARATION:

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.
 - 1] Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
 - 2] Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finished-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
 - 3] Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.
- B. Cementitious Materials: Prepare cementitious surfaces of concrete, concrete block, cement plaster, and cement-asbestos board to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze.

Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

- C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with

scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

- D. Ferrous Metal: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch-up shop-applied prime coats wherever damaged or bare where required by other sections of these specifications. Clean and touch-up with same type shop primer.

- E. Galvanized Surfaces: Clean free of oil and surface contaminants with nonpetroleum based solvent.

3.03 MATERIALS PREPARATION:

- A. General: Mix and prepare painting materials in accordance with manufacturer's directions. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.04 APPLICATION:

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Paint colors, surface treatments, and finishes, are indicated in "schedules" of the contract documents.
- C. Provide finish coats which are compatible with prime paints used.
- D. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- E. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
- F. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
- G. Sand lightly between each succeeding enamel or varnish coat.

- H. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- I. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- J. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.
- K. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- L. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- M. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange, peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
- N. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.05 CLEANUP AND PROTECTION:

- A. Cleanup: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- D. Provide "WET PAINT" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- E. At completion of work of other trades, touchup and restore all damaged or defaced painted surfaces.

PART 4 - PAINT SCHEDULE

4.01 EXTERIOR PAINT SCHEDULE FOR FERROUS METAL:

Full Gloss Alkyd Resin: 1 finish coat over primer.

Prime Coat: Red Lead Pigmented Primer FS TT-P-86. Primer is not required on items delivered shop primed.

Pittsburgh: Speedhide Inhibitive Red Primer, 6-208. MWF 3.6 mils, MDF 1.6 mils per coat.

First Coat: High Gloss Alkyd Enamel FS TT-E-489.

Pittsburgh: Fast-Dry Alkyd Industrial Gloss Enamel, 97-600 Series. Spray Application: MWF 3.0 mils, MDF 1.0 mil per coat. Brush: MWF 3.5 mils, MDF 1.2 mils per coat.

4.02 EXTERIOR PAINT SCHEDULE FOR ZINC-COATED METAL:

High Gloss Alkyd Resin: 2 finish coats over primer.

Prime Coat: Zinc Dust-Zinc Oxide Primer FS TT-P-641.

Pittsburgh: Speedhide Galvanized Steel Primer 6-209. MWF 3.6 mils, MDF 2.0 mils per coat.

First and Second Finish Coats: High Gloss Alkyd Enamel FS TT-E-489.

Pittsburgh: Speedhide Quick-Dry Alkyd Gloss Enamel, 54 line. MWF 3.6 mils, MDF 1.5 mils per coat.

4.03 EXTERIOR/INTERIOR PAINT SCHEDULE FOR CONCRETE MASONRY UNITS (CMU):

Semi-Gloss Solvent Base Polyester-Epoxy: 2 finish coats over block filler.

Filler Coat: Acrylic-Epoxy Block Filler for Porous Surfaces.

Pittsburgh: Pitt-Glaze Acrylic-Epoxy Block Filler, 16-85/86. MWF 25.0 mils, MDF 12.5 mils per coat.

First and Second Finish Coats: Semi-Gloss Polyester-Epoxy.

Pittsburgh: Pitt-Glaze Polyester-Epoxy Semi-Gloss Coating, 16 line. MWF 6.0 mils, MDF 3.0 mils per coat.

4.04 EXTERIOR PAINT SCHEDULE FOR PLYWOOD/HARDIPANEL:

Lo-Lustre Vinyl Acrylic Latex Finish: 2 finish coats over primer.

Prime Coat: Interior Latex Base Primer Coat FS TT-P-650.

Pittsburgh: Speedhide Quick-Drying Exterior Latex Primer-Sealer, 6-2. MWF 3.0 mils, MDF 1.0 mil per coat.

Second and Third Coats: Odorless Exterior Semigloss Alkyd Enamel FS TT-E-509.

Pittsburgh: Speedhide Semi-Gloss Enamel, 6-510. MWF 4.0 mils, MDF 1.4 mils per coat.

END OF SECTION

SECTION 10 21 13
STAINELSS STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Stainless steel.
 - 2. Compartment Style: Overhead braced and floor anchored.
 - 3. Compartment Style: Floor anchored.
 - 4. Screen Style: Wall hung.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Accurate Partitions Corporation.
 2. All American Metal Corp.
 3. Bobrick Washroom Equipment, Inc.
 4. Commercial and Architectural Products, Inc.; Marlite.
 5. Crane Plumbing; Sanymetal.
 6. General Partitions Mfg. Corp.
 7. Global Steel Products Corp.
 8. Hadrian Inc.
 9. MASCO; Flush-Metal Partition Corp.
 10. Metpar Corp.
 11. Partition Systems, Inc.; Columbia Partitions.
 12. Young Sales Corp.; DesignRite.

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, that is leveled to stretcher-leveled flatness, finished on exposed faces as indicated in the "Stainless-Steel Sheet Finishes" Article, and of the following minimum thicknesses:
1. Pilasters (Overhead Braced): 0.0375 inch (0.95 mm).
 2. Panels and Screens: 0.0375 inch (0.95 mm).
 3. Tapping Reinforcement: 0.0781 inch (2.0 mm).
- C. Core Material for Metal-Faced Units: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) minimum for doors, panels, and screens and 1-1/4 inches (32 mm) minimum for pilasters.
- D. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.
- E. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:
1. Material: Stainless steel.
- F. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:

1. Material: Stainless steel.
- G. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
1. Material: Stainless steel.
- H. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.
- I. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
1. Provide internal reinforcement in metal units for compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Metal-Faced Toilet Compartments and Screens: Pressure laminate seamless face sheets to core material and provide continuous, interlocking molding strip or lapped and formed edges. Seal corners by welding or clips. Grind exposed welds smooth.
- C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.
1. Provide metal-faced screens with integral full-height flanges for attachment to wall.
- E. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.
1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
 2. Latch and Keeper: Recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.

3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

2.4 STAINLESS-STEEL SHEET FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.
 1. Remove or blend tool and die marks and stretch lines into finish.
 2. Grind and polish surfaces to produce uniform, directional textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Finish: No. 3 directional polish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- D. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Screens: Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

**SECTION 10 28 13
TOILET ACCESSORIES**

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK: Extent of toilet accessories required include the following. All accessories must comply with Texas Accessibility Standards.
- A. Electric hand dryers.
 - B. Toilet tissue dispensers.
 - C. Soap dispensers.
 - D. Stainless steel mirrors.
 - E. Grab bars.
 - F. Diaper changing tables.
- 1.03 QUALITY ASSURANCE:
- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay. Provide all blocking required for adequate mounting of accessories.
 - B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
 - C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas.
- 1.04 SUBMITTALS: Submit manufacturer's technical product data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

- 2.01 TOILET ACCESSORY ITEMS: Provide one of each for each Restroom, unless otherwise indicated.
- A. Toilet Tissue Dispensers: Stainless steel, recessed, dual roll dispenser. American Specialties, Inc. #0030 or approved equal.
 - B. Electric Hand Dryers: Satin chrome finish, surface-mount, ¼ HP; 180 CFM at 7,500 RPM; 120Volt, 16 amp; 1,620 watts. American Specialties, Inc. #185-93 Profile Compact Dryer or approved equal.
 - C. Soap Dispensers: Stainless steel, surface-mount, liquid soap dispenser. American Specialties, Inc. #0351 or approved equal.

- D. Mirrors: Stainless steel frame and glazing, surface-mount, 18" wide x 36" high mirror. American Specialties, Inc. #0620 or approved equal.
- E. Grab Bars: Stainless steel, concealed-mount, safety grip, 1-1/4" o.d. grab bars. 30" length at back; 42" length at side. American Specialties, Inc. #3100 P Series or approved equal.
- F. Diaper Changing Tables:

2.02 FASTENERS AND MOUNTING DEVICES: Provide all hardware required to mount accessories to substrates indicated.

PART 3 - EXECUTION

3.01 INSTALLATION: Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated, to conform to Texas Accessibility Standards (TAS) requirements.

3.02 ADJUSTING AND CLEANING:

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION

**SECTION 10 60 50
WIRE MESH PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior wire mesh panels installed above perimeter CMU walls.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 05500- "Metal Fabrications".

1.3 DEFINITIONS

- A. The types of weaves for the wire mesh specified in this Section are as illustrated and defined in ASTM E 437 and its Appendix X4.2:
 - 1. Intercripped: Similar to plain weave with extra crimps between the intersections.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified, consisting of manufacturer's specification, technical data, and installation instructions.
- C. Shop Drawings showing fabrication and installation of wire mesh panels, including plans, elevations, and large-scale details showing anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.
- D. Samples of a 12-by-12-inch wire mesh panel constructed of specified frame members, wire mesh, and color charts.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Engage a firm experienced in manufacturing wire mesh panels similar to those indicated for this Project and that have a record of successful in-service performance.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations for wire mesh products by accurate field measurements before fabrication and show recorded measurements on Shop Drawings. Coordinate fabrication and delivery schedules with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Acorn Wire and Iron Works, Inc.
 - 2. G-S Company (The).
 - 3. King Wire Partitions, Inc.
 - 4. Lakeside Wire and Iron Co.
 - 5. McNichols Co.
 - 6. Wire and Iron Products, Inc.

2.2 MATERIALS

- A. Steel Wire: ASTM A 853.
- B. Steel Channels, Angles, Plates, and Bars: ASTM A 36 (ASTM A 36M).
- C. Steel Sheet: ASTM A 568 (ASTM A 568M).
- D. Cold-Rolled Steel Channels: Formed from steel sheet.
- E. Galvanized Steel Wire: ASTM A 641 (ASTM A 641M).
- F. Galvanized Steel Sheet: Commercial-quality, hot-dip-coated steel sheet, ASTM A 653, with G60 or A60 (ASTM A 653M, with Z180 or ZF180) coating.

2.3 RAILING INSERT PANELS

- A. Mesh: 0.135-inch- (3.4-mm-) diameter, plain-weave steel wire woven into a square pattern as indicated, inserted through frame holes and welded into frame. Vertical wires are plumb. Horizontal wires are perpendicular to vertical wires.
- B. Frames: 1-by-1/2-by-1/8-inch (25-by-13-by-3-mm) cold-rolled steel channels.

2.4 FABRICATION

- A. Shop fabricate wire mesh panels as much as possible.
- B. Do not use components less than sizes indicated. Use larger-size components as recommended by panel component manufacturer.

- C. Provide bolts, hardware, and accessories for complete installation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

- A. Erect panels plumb, rigid, properly aligned, and securely fastened in place, complying with Drawings and manufacturer's recommendations.
- B. Provide additional field bracing as shown or necessary for rigid, secure installation. Installer to provide additional clips and bracing as required.

3.3 ADJUSTING AND CLEANING

- A. Adjust moving components for smooth operation without binding.
- B. Touch up damaged finish after completing installation using field-applied paint to match color of shop-applied finish.

END OF SECTION

SECTION 116800 - PLAY FIELD EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Freestanding playground equipment and structures.
 - 2. Composite playground equipment and structures.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete footings.
 - 2. Division 32 Section "Playground Protective Surfacing" for protective surfacing under and around playground equipment.

1.3 DEFINITIONS

- A. Fall Height: According to ASTM F 1487, "the vertical distance between a designated play surface and the protective surfacing beneath it."
- B. HDPE: High-density polyethylene.
- C. IPEMA: International Play Equipment Manufacturers Association.
- D. LLDPE: Linear low-density polyethylene.
- E. MDPE: Medium-density polyethylene.
- F. Use Zone: According to ASTM F 1487, "the area beneath and immediately adjacent to a play structure that is designated for unrestricted circulation around the equipment and on whose surface it is predicted that a user would land when falling from or exiting the equipment."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for playground equipment and structures.

- C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Extent of surface systems and use zones for equipment.
 - 2. Critical heights for playground surface, or fall heights for equipment.
 - D. Samples for Initial Selection: For each type of playground equipment and structure indicated.
 - 1. Manufacturer's color charts.
 - 2. Include similar Samples of playground equipment and accessories involving color selection.
 - E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Posts and Rails: Not less than 6 inches (150 mm) long.
 - 2. Platforms: Not less than 6 inches (150 mm) square.
 - 3. Molded Plastic: Not less than 3 inches (75 mm) square.
 - F. Product Certificates: For each type of playground equipment, signed by product manufacturer.
 - G. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
 - H. Qualification Data: For manufacturer and testing agency.
 - I. Material Certificates: For the following items, signed by manufacturers:
 - 1. Shop finishes.
 - 2. Wood Preservative Treatment: Include certification by treating plant that states type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 3. Recycled plastic.
 - J. Field quality-control test reports.
 - K. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for playground equipment.
 - L. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.
 - M. Warranty: Special warranty specified in this Section.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
 - B. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

1. Provide playground equipment and play structure components bearing the IPEMA Certification Seal.
2. Provide the following playground equipment and play structure components bearing the IPEMA Certification Seal:
 - a. GAMETIME, INC. Primetime Fitness Track (part 11853)
- C. Testing Agency Qualifications: An independent agency qualified according to ANSI Z34.1 for testing indicated.
- D. Safety Standards: Provide playground equipment complying with or exceeding requirements in the following:
 1. ASTM F 1487.
 2. CPSC No. 325.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. GAMETIME, INC. Primetime Fitness Track (part 11853)
2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
3. Products: Subject to compliance with requirements, provide one of the products specified.
4. Basis-of-Design Product: The design for each piece of playground equipment is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PLAYGROUND EQUIPMENT FABRICATION

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as indicated. Form metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
 - 1. Fabricate secondary frame members, bracing, and connections from either steel or aluminum. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange.
 - 2. Form simple and compound curves in bars and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
 - 3. Cut, drill, and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.
 - 4. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
 - 5. Comply with AWS recommended practices for shop welding and brazing. Weld and braze behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
 - 6. Provide weep holes where water may accumulate.
- C. Provide necessary rebates, lugs, and brackets to assemble units and to attach to other work. Cut, reinforce, drill, and tap to receive finish hardware, screws, and similar items, unless otherwise indicated.
- D. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.
- E. Wood Frame: Fabricate main-frame upright support posts from wood species and with profile and dimensions as indicated.
 - 1. Surfaced members smooth on all sides and with all edges rounded.
- F. Composite Frame: Fabricate main-frame upright support posts from metal and plastic with profile and dimensions as indicated. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.
- G. Play Surfaces: GT Impax Engineered Wood Fiber Playing Surface
- H. Elevated Play Surfaces: Guardrails or protective barriers completely surround elevated play surface except for access openings, if play-surface heights above protective surfacing exceed the following for use by age group indicated:

1. Elevated surface greater than 20 inches (510 mm) intended for use by children aged 2 through 5.
 2. Elevated surface greater than 30 inches (760 mm) intended for use by children aged 5 through 12.
- I. Stepped Play Surfaces: Provide manufacturer's standard infill between stepped platforms where applicable.
- J. Protective Barriers and Guardrails: Fabricate according to ASTM F 1487 and as follows:
1. Welded metal pipe or tubing with vertical bars.
 2. Steel sheet with openings for vision and ventilation.
 3. Welded metal-pipe or -tubing frame with woven wire mesh infill panels.
 4. Transparent plastic panels with openings.
 5. Vertical wood balusters with metal pipe or tubing or wood frame.
- K. Handrails: Welded metal pipe or tubing, OD between 0.95 and 1.55 inches (24.1 and 39.4 mm)] [1.25 inches (32 mm) where applicable. Provide handrails at height for use by age group indicated below:
1. Ages: Between 2 and 5 and 5 and 12 years.
 2. Height of Top Surface: [29 inches (737 mm) intended for use by children aged 2 through 5 and 38 inches (965 mm) intended for use by children aged 5 through 12.
 3. Close exposed ends of handrails with returns with clearance of 1/4 inch (6 mm) or less.

2.3 FREESTANDING PLAYGROUND EQUIPMENT AND STRUCTURES

A. Playground:

1. Products:
 - a. GAMETIME, INC. Primetime Fitness Track (part 11853)

2.4 CAST-IN-PLACE CONCRETE

- A. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" to produce normal-weight, air-entrained]concrete with a minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (75-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.
- B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C 387 and mixed at site with potable water, according to manufacturer's written instructions, to produce normal-weight concrete with a minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (75-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

2.5 FINISHES, GENERAL

- A. Comply with Manufacturer's requirements

- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, site surface and subgrade drainage, and other conditions affecting performance.
 - 1. Do not begin installation before final grading required for placing protective surfacing is completed, unless otherwise permitted by Architect.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Verify locations of playground perimeter and pathways. Verify that playground layout and equipment locations comply with requirements for each type and component of equipment.

3.3 INSTALLATION, GENERAL

- A. General: Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.
 - 1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.
- B. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil.
- C. Post Set on Subgrade: Level bearing surfaces with drainage fill to required elevation.
- D. Post Set with Concrete Footing: Comply with ACI 301 for measuring, batching, mixing, transporting, forming, and placing concrete.
 - 1. Connect equipment posts to concrete footing per manufacturer requirements. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing.

- a. Place concrete around posts and vibrate or tamp for consolidation. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
2. Embedded Items: Use setting drawings and manufacturer's written instructions to ensure correct installation of anchorages for equipment.
3. Concrete Footings: Smooth top, and shape to shed water.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Arrange for playground equipment manufacturer's technical personnel to inspect playground and playground equipment and components at final completion and to certify compliance with the following:
 1. ASTM F 1487.
 2. CPSC No. 325.
- C. Notify Architect 48 hours in advance of date and time of final inspection.

END OF SECTION 116800

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Seating.
 - 2. Tables.
 - 3. Trash receptacles.
 - 4. Cedar Fencing.
 - 5. Cedar Bollards.
 - 6. Bicycle Racks.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete footings.
 - 2. Division 31 Section "Earth Moving" for excavation for installation of concrete footings.
- C. Products furnished, but not installed under this Section, include cast in concrete footings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For units with factory-applied color finishes.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Stone bench and stone table: 1'x1'x1' of limestone types
 - 2. Stone bench and concrete table: 1'x1'x1' of limestone bases and bench
 - 3. Aluminum trash bin with lid
 - 4. Cedar bollard 5' in height
- D. Product Schedule: For site furnishings. Use same designations indicated on Drawings.
- E. **Material Certificates: For site furnishings, signed by manufacturers.**
 - 1. **Wood Preservative Treatment: Include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.**

2. **Sustainably Harvested Wood:** Include certification by manufacturer and from sources that participate in sustained yield programs.
3. **Recycled plastic.**

F. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain stone site furnishing(s) through one source from a single manufacturer.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Trash Receptacle Inner Containers: 5 full-size units for each size indicated, but no fewer than 2 units.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wood: Reuse cedar on site for bollards and fencing. If cedar posts need to be imported on site, after existing cedar use is exhausted, match size, finish and style.

1. Wood Species: Cedar
 - a. Finish: with rough finish, bark intact as applicable.

B. Stone: Limestone (equal cream, nicotine and grey mix).

C. Concrete tops: Use existing concrete slabs found on site near Blue Hole parking lot.

D. 30 gallon aluminum trash bins with lids.

E. **Anchors, Fasteners, Fittings, and Hardware:** **[Stainless steel] [Brass] [Galvanized steel] [Zinc-plated steel] [Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials];** commercial quality[, **tamperproof, vandal and theft resistant**][, **concealed, recessed, and capped or plugged**].

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to **[on] [below]**-grade substrate; **[one per leg] [extent as indicated] <Insert extent>**.
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; **[two per unit] [extent as indicated on Drawings] <Insert extent>**.

- F. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107; recommended in writing by manufacturer, for exterior applications.
- G. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.
- H. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
 - 1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil (0.0076 mm) thick.
 - 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M.

2.2 BICYCLE RACKS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide American Bicycle Security Company, Rolling 4H:
 - 1. or approved equal.

2.3 TRASH RECEPTACLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. BCI Burke Company, LLC.
 - 2. BRP Enterprises, Inc.
 - 3. Canterbury International.
 - 4. Columbia Cascade Company.
 - 5. Country Casual.
 - 6. Creative Pipe, Inc.

7. DuMor Inc.
8. FairWeather Site Furnishings.
9. Fiberglass Engineering Company.
10. Fibrex Group Inc. (The).
11. Forms+Surfaces.
12. GameTime; a PlayCore, Inc. Company.
13. Gardenside Ltd.
14. Henderson Recreation Equipment Ltd.
15. Huntco Supply, LLC.
16. Kay Park Recreation.
17. Keystone Ridge Designs, Inc.
18. Landscape Forms.
19. Landscape Structures Inc.
20. L. A. Steelcraft.
21. Maglin Furniture Systems Ltd.
22. Miracle Recreation Equipment Co.; a division of PlayPower, Inc.
23. Playworld Systems, Inc.
24. Recreation Creations, Inc.
25. RPI Designs.
26. Sitecraft.
27. Smith & Hawken.
28. Urban Accessories, Inc.
29. Victor Stanley, Inc.
30. Wausau Tile, Inc.; Metal-Form Division.
31. Or approved equal.

D. **Trash** Receptacles:

1. Receptacle Shape and Form: **Round cylinder**, 30 gallon aluminum; with opening for depositing trash in **lid or top**.
2. Lids and Tops: **Aluminum** secured by cable
 - a. Description: **Solid**
 - b. Cut two 4" diameter openings as shown on plans for recycling container.
3. Receptacle Height: as indicated
4. Overall Height: as indicated
5. Overall Width: as indicated
6. Weight:
7. Inner Container: **Rigid plastic** container designed to be removable and reusable.
8. Capacity: Not less than **28 gal. (106 L)**
9. Service Access: **Removable lid or top**; inner container and disposable liner lift or slide out for emptying.

E. Installation Method: **Freestanding** but contained as shown on drawings

2.4 BOLLARDS

1. Cedar wood bollards. Reuse cedar trunks from on site clearance as shown in drawings.

B. Bollard Construction:

1. Rough finish cedar posts Not less than 4" diameter and not larger than 8" in diameter
2. Installation Method: as indicated on drawings

2.5 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
- D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.
- E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STEEL AND GALVANIZED STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and positioned at locations indicated on Drawings.
- D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

3.3 CLEANING

- A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 129300

SECTION 221116 – DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Service Piping: 125 psig.
 - 2. Domestic Water Distribution Piping: 125 psig.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in "Cleaning" Article in Part 3.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5.1 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

- C. Transition Couplings for Underground Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 COPPER TUBING

- A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

- B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.3 PVC PIPING

- A. PVC Schedule 40 Pipe: ASTM D 1785.

1. PVC Schedule 40 Fittings: ASTM D 2466, socket type.

- B. PVC AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket and spigot end.

1. Provide piping listed for fire-protection service where indicated.
2. PVC Fabricated Fittings: AWWA C900, Class 150 and Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.

- C. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- D. Underground Domestic Water Service Piping: Use the following piping material.:
 - 1. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.
- E. Aboveground Domestic Water Piping: Use the following piping material:
 - 1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
- F. Below Slab Domestic Water Piping: Use the following piping material:
 - 1. Hard copper tube, Type L; copper pressure fittings.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use bronze ball for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
 - 3. Drain Duty: Hose-end drain valves.
- B. PVC ball, butterfly, and check valves may be used with PVC piping.

3.4 PIPING INSTALLATION

- A. Refer to Division 22 Section "Water Distribution" for site water distribution and service piping.
- B. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated and coordinate location with site requirements.
- C. Install underground copper tubing according to CDA's "Copper Tube Handbook."
- D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.
- E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.
- F. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service.
- G. Install water-pressure regulators downstream from shutoff valves.
- H. Install aboveground domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- I. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- J. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

K. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

L. Check plumbing specialties and verify proper settings, adjustments, and operation.

1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

3.5 JOINT CONSTRUCTION

A. Refer to Division 23 Section "Common Work Results" for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

3.6 VALVE INSTALLATION

A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

3.7 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 23 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

- b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 3. NPS 2: 10 feet with 3/8-inch rod.
 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
- E. Install supports for vertical steel piping every 15 feet.
- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
- G. Install supports for vertical copper tubing every 10 feet.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
 1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - Prepare reports for tests and required corrective action.

- CLEANING

C. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

D. Prepare and submit reports of purging and disinfecting activities.

E. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 221116 – SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For solvent drainage system, include plans, elevations, sections, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 SOIL PIPING

- A. Cast-Iron Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service class. **INSTALL UNDER BUILDING(S) SLAB TO LIFT STATION.**
 - 1. Gaskets: ASTM C 564, rubber.
- B. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
 - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
 - 2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
 - b. Heavy-Duty, FM-Approved Couplings: ASTM A 666, Type 304, stainless-steel housing; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4: 3-inch- wide housing with 2 bands.
 - 2) NPS 5 to NPS 10: 4-inch- wide housing with 2 bands.
 - c. Heavy-Duty, Cast-Iron Couplings: ASTM A 48, 2-piece, cast-iron housing; stainless-steel bolts and nuts; and sleeve.
 - d. Heavy-Duty, Type 301, Stainless-Steel Couplings: ASTM A 666, Type 301, stainless-steel shield; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4: 3-inch- wide shield with 4 bands.
 - 2) NPS 5 to NPS 10: 4-inch- wide shield with 6 bands.
 - e. Compact, Stainless-Steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4: 2-1/8-inch- wide shield with 2 bands.
 - 2) NPS 5 and NPS 6: 3-inch- wide shield with 4 bands.
 - 3) NPS 8 and NPS 10: 4-inch- wide shield with 4 bands.
 - 4) NPS 12 and NPS 15: 5-1/2-inch- wide shield with 6 bands.
 - 2. Solvent Fittings: ASME B16.45 or ASSE 1043, hubless, aerator and deaerator.

- C. PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
 - 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - 1. Up to 8 NPS: Service Weight cast iron No-Hub Piping system with neoprene gasket sleeves and stainless steel clamps. All materials shall conform to all appropriate ASTM and other standards and specifications.
 - 2. 10 NPS and larger: Service Weight cast iron bell and spigot pipe ASTM A-74 with TY-Seal neoprene gaskets and TY-Seal lubricant. All materials shall conform to all appropriate ASTM and other standards and specifications
- D. Below ground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - 1. Service Weight cast iron bell and spigot pipe ASTM A-74 with TY-Seal neoprene gaskets and TY-Seal lubricant. All materials shall conform to all appropriate ASTM and other standards and specifications
 - 2. PIP NPS 5 and NPS 6: Use NPS 6 PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

- A. Refer to site engineering plans Project-site sanitary sewer piping.
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

- D. Underground, Ductile-Iron, Force-Main Piping: Comply with AWWA C600. Install buried piping inside the building between wall and floor penetrations and connection to sanitary sewer piping outside the building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.
1. Encase piping with PE film according to ASTM A 674 or AWWA C105.
- E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- F. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 23 Section "Common Work Results" for wall penetration systems.
- G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
1. Building Sanitary Drain: 1/4" per lineal foot downward in direction of flow for piping NPS 3 and smaller; 1/8" percent downward in direction of flow for piping NPS 4 and larger.
 2. Vent Piping: 1/8" per lineal foot down toward vertical fixture vent or toward vent stack.
- K. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:
1. Cast-Iron, Sovent, Single Stack: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
 2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

- L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Hubless Joints: Make with neoprene gasket sleeves and stainless steel clamps.
 - 2. Bell and spigot: Make with TY-Seal neoprene gaskets and TY-Seal lubricant.

3.5 VALVE INSTALLATION

- A. Refer to Division 23 Section "Valves" for general-duty valves.
- B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.
 - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type, unless otherwise indicated.
 - 2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
 - 3. Install backwater valves in accessible locations.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Install supports according to Division 23 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 15150

SECTION 230500 – COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 23 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Concrete base construction requirements.
 - 3. Escutcheons.
 - 4. Dielectric fittings.
 - 5. Flexible connectors.
 - 6. Mechanical sleeve seals.
 - 7. Equipment nameplate data requirements.
 - 8. Nonshrink grout for equipment installations.
 - 9. Field-fabricated metal and wood equipment supports.
 - 10. Installation requirements common to equipment specification sections.
 - 11. Cutting and patching.
 - 12. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 22 piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 2. Clearances for installing and maintaining insulation.
 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 4. Equipment and accessory service connections and support details.
 5. Exterior wall and foundation penetrations.
 6. Sizes and location of required concrete pads and bases.
 7. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, hardware and piping specialties from moisture and dirt.
- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Dielectric Unions:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Eclipse, Inc.; Rockford-Eclipse Div.
 - d. Epco Sales Inc.
 - e. Hart Industries International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
 - 2. Dielectric Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Epco Sales Inc.
 - d. Watts Industries, Inc.; Water Products Div.
 - 3. Dielectric-Flange Insulating Kits:
 - a. Calpico, Inc.
 - b. Central Plastics Co.
 - 4. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
 - 5. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.

- b. Perfection Corp.
 - c. Victaulic Co. of America.
6. Metal, Flexible Connectors:
- a. ANAMET Industrial, Inc.
 - b. Central Sprink, Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.
 - f. Hyspan Precision Products, Inc.
 - g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
 - h. Mercer Rubber Co.
 - i. Metraflex Co.
 - j. Proco Products, Inc.
 - k. Uniflex, Inc.
7. Rubber, Flexible Connectors:
- a. General Rubber Corp.
 - b. Mercer Rubber Co.
 - c. Metraflex Co.
 - d. Proco Products, Inc.
 - e. Red Valve Co., Inc.
 - f. Uniflex, Inc.
8. Mechanical Sleeve Seals:
- a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
- D. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
 2. BAg1: Silver alloy.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Solvent Cements: Manufacturer's standard solvent cements for the following:
1. ABS Piping: ASTM D 2235.
 2. CPVC Piping: ASTM F 493.
 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 4. PVC to ABS Piping Transition: ASTM D 3138.
- G. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.
- H. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- I. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
1. Sleeve: ASTM A 126, Class B, gray iron.
 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
 3. Gaskets: Rubber.
 4. Bolts and Nuts: AWWA C111.
 5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
 5. PVC: Manufactured, permanent, with nailing flange for attaching to wooden forms.
 6. PVC Pipe: ASTM D 1785, Schedule 40.
 7. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 2. OD: Completely cover opening.
 3. Cast Brass: One piece, with set screw.
 - a. Finish: Polished chrome-plate.
 4. Cast Brass: Split casting, with concealed hinge and set screw.
 - a. Finish: Polished chrome-plate.

2.6 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.
- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 2. Location: Accessible and visible location.
- C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inch- high letters for ductwork and not less than 3/4-inch- high letters for access door signs and similar operational instructions.
1. Material: Fiberboard.
 2. Material: Brass.
 3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.

4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.
- D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- F. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
 1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Pump No. 1A or 1B," "Air Supply No. 2-1," or "Standpipe F12."

2.7 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psig, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install piping as code requires.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 2. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 3. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 4. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 3. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Section "Joint Sealants" for materials.
 - 4. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals. Verify sleeve and annular space requirement with mechanical sleeve seal specified.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- P. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals. Verify sleeve and annular space requirement with mechanical sleeve seal specified.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Section "Firestopping" for materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 5. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 6. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
 7. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. ABS Piping: ASTM D 2235 and ASTM D 2661.
 - c. CPVC Piping: ASTM D 2846 and ASTM F 493.
 - d. PVC Pressure Piping: ASTM D 2672.
 - e. PVC Nonpressure Piping: ASTM D 2855.
 - f. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.
- U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect/Engineer.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
 2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
 1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger

lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.

2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

- C. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.4 PAINTING AND FINISHING

- A. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

- B. Piping shall be painted with color coding as follows with direction arrows every 10 feet and at equipment and every wall:

- | | |
|------------------|---------------------------|
| • Domestic Water | White with Green Markings |
| • Drain Lines | Black |

- C. Do not paint piping specialties with factory-applied finish.

- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES (Coordinate with Swimming Pool Contractor)

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.8 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 230500

SECTION 230713 – MECHANICAL INSULATION

PART 1 - GENERAL

1.1 GENERAL

- A. Submittals: Product Data identifying thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.2 PRODUCTS

- A. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.
1. Performed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.
 2. Performed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.
- B. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
 2. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
 3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 5. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- C. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- D. Field-Applied Jackets: ASTM C 921, Type 1, unless otherwise indicated.
1. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
 2. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.
 - a. Adhesive: As recommended by insulation material manufacturer.
 3. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.

- a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 - b. Adhesive: As recommended by insulation material manufacturer.
- E. Glass Cloth and Tape: Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd..
- F. Tape Width: 4 inches.
- G. Bands: 3/4 inch wide in aluminum 0.007 inch thick.
- H. Vapor Retarders: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

1.3 EXECUTION

- A. Surface Preparation: Clean and dry surfaces. Remove materials that will adversely affect insulation application.
- B. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of ducts, equipment, and pipes, including fittings, valves, and specialties.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- E. Apply insulation with the least number of joints practical.
- F. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

G. CELLULAR-GLASS INSULATION APPLICATION

1. Apply insulation to straight pipes and tubes as follows:
 - a. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.
 - b. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply mastic or compatible glue to 100% of pipe and insulation at end joints, 2 inches on each joint of insulation and pipe.
 - c. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.
 - d. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
2. Apply insulation to flanges as follows:
 - a. Apply preformed pipe insulation to outer diameter of pipe flange.
 - b. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

- c. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.
 - d. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.
3. Apply insulation to fittings and elbows as follows:
 - a. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 - b. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.
 - c. Cover fittings with standard PVC fitting covers.
 4. Apply insulation to valves and specialties as follows:
 - a. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
- H. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
- I. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- J. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- K. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- L. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- M. Floor Penetrations: Apply insulation continuously through floor assembly.
- N. Piping Application Schedule.
1. Service: Domestic cold water.
 - a. Operating Temperature: 50 to 140 deg F.
 - b. Insulation Material: Mineral-Fiber Insulation, with jacket.
 - c. Insulation Thickness: Apply the following insulation thicknesses:
 - 1) Copper Pipe, ½ inch to 2 inch pipe: 1/2 inch insulation.
 - 2) Copper Pipe, 2-1/2 inch and larger pipe: 1 inch insulation
 - 3) Copper Pipe in Pavillion and Restrooms, all sizes shall be 1 inch insulation.
 - d. Heat tape applied prior to insulation
 - e. Field-Applied Jacket: Foil and Paper
 - f. Vapor Retarder Required: Yes.
 - g. Finish: Painted.
 2. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures.

- a. Operating Temperature: 35 to 120 deg F.
- b. Insulation Material: Mineral-fiber preformed pipe.
- c. Insulation Thickness: 1-inch thick
- d. Field-Applied Jacket: PVC P-trap and supply covers.
- e. Vapor Retarder Required: No.
- f. Finish: Painted

END OF SECTION

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**

- a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: **EPDM** interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 3. Pressure Plates: **Stainless steel**. Include two for each sealing element.
 4. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors **2 inches** above finished floor level.
- G. Size pipe sleeves to provide **1/2-inch** annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using **cast-iron** pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submit Product Data.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS

- A. Surface-mounted, NEMA PB 1, or NEMA Type 3R for all supplemental specifications on drawings.
 - 1. Front: Secured to box with concealed trim clamps.
 - 2. Bus: Hard drawn copper of 98 percent conductivity.
 - 3. Feed-through Lugs: Sized to accommodate feeders indicated.
- B. Molded-Case Circuit Breaker: NEMA AB 1; no tandem circuit breakers; single handle for multipole circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessory items according to NEMA PB 1.1. Indicate installed circuit loads on a circuit directory after balancing panelboard loads.
- B. Wiring in Panelboard Gutters: Arrange conductors into groups, bundle and wrap with wire ties.
- C. Perform visual and mechanical inspections and electrical tests stated in NETA ATS.

END OF SECTION

SECTION 262726 – WIRING METHODS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: Building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 V and less, and twisted-pair cable; and raceways and boxes.

PART 2 - PRODUCTS

2.1 WIRES AND CABLES

- A. Building Wires and Cables: Type THHN stranded copper conductor, #12 awg min size for power.
- B. Connectors and Splices: Wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.
- C. Single Conductor Plenum Coaxial: 75-ohm characteristic impedance, solid bare copper central conductor, foamed Teflon dielectric, 100 percent coverage tinned-copper, double-braid shield, Teflon jacket, suitable for installation in air-handling spaces.
- D. Four-Pair: No. 24 AWG, Data Max, UTP Lot 5, 7-strand, tinned-copper conductors; overall aluminum/polyester shield and No. 22 AWG tinned-copper drain wire.

2.2 RACEWAYS

- A. Conduit: Comply with the following:
 - 1. Rigid Steel Conduit: ANSI C80.1.
 - 2. Intermediate Metal Conduit: ANSI C80.6.
 - 3. Electrical metallic Tubing: ANSI C80.3.
 - 4. Rigid Nonmetallic Conduit: NEMA TC 2, Schedule 40.
- B. Outlet and Device Boxes: UL listed and labeled sheet metal boxes.
- C. Floor Boxes: Cast metal, fully adjustable, rectangular.
- D. Pull and Junction Boxes: Small sheet metal boxes.

2.3 ENCLOSURES

- A. Hinged-Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.
- B. Cabinets: NEMA 250, Type 1, except where another Type is indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wires and cables according to the NECA's "Standard of Installation."
- B. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.
- C. Outdoors Wiring Methods: As follows:
 - 1. Exposed: Rigid or intermediate metal conduit.
 - 2. Concealed: Rigid or intermediate metal conduit.
 - 3. Underground, Single Run: Rigid nonmetallic conduit.
 - 4. Underground, Grouped: Rigid nonmetallic conduit.
- D. Indoors Wiring Methods: As follows:
 - 1. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid or Motor-Driven Equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.
 - 2. Use armored cable and nonmetallic sheathed cable in applications allowed by NFPA 70.
 - 3. Damp or Wet Locations: Rigid steel conduit.
 - 4. Exposed: Electrical metallic tubing or rigid nonmetallic conduit.
 - 5. Concealed: Electrical metallic tubing, electrical nonmetallic tubing, or rigid nonmetallic conduit.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except in damp or wet locations use NEMA 250, Type 4, stainless steel.
 - 7. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
 - 8. Conceal conduit and electrical metallic tubing, unless otherwise indicated, within finished walls, ceilings, and floors.
- E. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- F. Raceways Embedded in Slabs: Install in middle third of the slab thickness where practical, and leave at least 1-inch concrete cover.
- G. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
- H. Join raceways with fittings designed and approved for the purpose and make joints tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight. Use insulating bushings to protect conductors.
- I. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

- J. Install raceway sealing fittings and locate at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings where required by the NEC.
- K. Stub-up Connections: Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor.
- L. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- M. Install a separate green ground conductor in surface metal raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.

END OF SECTION

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in closed position.

2.2 CIRCUIT BREAKERS

- A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.
 - 1. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.
 - 2. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
 - 3. Circuit Breakers, 400 A and Larger: Field-adjustable, short-time and continuous-current settings.
 - 4. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
 - 5. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

PART 3 - EXECUTION

3.1 TESTING

- A. Perform visual and mechanical inspections and electrical tests stated in NETA ATS.

END OF SECTION

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Engineered Wood Fiber Surface

- B. Related Sections include the following:

- 1. Division 31 Section "Earth Moving" for drainage course, drainage/separation geotextiles, and subbase courses.

1.3 DEFINITIONS

- A. Critical Height: Standard measure of shock attenuation. According to CPSC No. 325, this means "the fall height below which a life-threatening head injury would not be expected to occur."

1.4 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: According to ASTM F 1292.
- B. Accessibility of Surface Systems: According to ASTM F 1951.
- C. Minimum Characteristics for Organic Loose-Fill Surfaces: According to ASTM F 2075.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show the following:
 - 1. Installation details for concrete edge, and accessories.
 - 2. Location of drainage accessories.
- 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 (0.95-L) loose-fill surface sealed in a container.
- E. Qualification Data: For Installer.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 1. Inorganic loose-fill surface.
- G. Material Certificates: For each playground surface system product, signed by manufacturers.
- H. Field quality-control test reports.
- I. Maintenance Data: For playground surface system to include in maintenance manuals.
- J. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: An independent agency qualified according to ANSI Z34.1 for testing indicated.
- C. Source Limitations: Obtain playground surface system materials through one source from a single manufacturer.

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 COORDINATION

- A. Coordinate installation of playground surface systems with installation of playground equipment specified in Division 31 Section "Play Field Equipment and Structures."

1.9 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 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.
2. Warranty Period: Three years from date of Substantial Completion.

1.10 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Engineered Wood Fiber Playground Surfacing

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. GAMETIME IMPAX – Engineered Wood Fiber Playground Surfacing (12” Compacted)
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Basis-of-Design Product: The design for each product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 INORGANIC LOOSE-FILL SURFACE (For sand area as shown on drawings)

- A. Inorganic Aggregate Materials: Clean, washed, and free of loam, clay, organic matter, debris, and other foreign substances.
 1. Fine Sand: Complying with ASTM C 136 for the following sieve analysis test results; provide minimum depth of material with critical height indicated according to CPSC No. 325:
 - a. Sieve Sizes and Percent Passing through Screen: No. 16 passing 100 percent, No. 30 passing 98 percent, No. 50 passing 62 percent, No. 100 passing 17 percent, and No. 200 passing 0 to 1 percent.

2.3 LOOSE-FILL ACCESSORIES

- A. Edgings: As shown on drawings.

2.4 GEOSYNTHETICS

- A. Drainage/Separation Geotextile: Nonwoven, needle-punched geotextile, manufactured for subsurface drainage applications and made from polyolefins or polyesters; complying with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Weight: 4 oz./sq. yd. (136 g/sq. m) according to ASTM D 5261.
 2. Water Flow Rate: 100 gpm/sq. ft. (68 L/s per sq. m) according to ASTM D 4491.

PART 3 - EXECUTION

3.1 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.

3.2 INSTALLATION, GENERAL

- A. General: Comply with playground surface system manufacturer's written installation instructions. Install playground surface system over area and in thickness indicated.

3.3 INSTALLATION OF LOOSE-FILL PLAYGROUND SURFACE SYSTEMS

- A. Loose-Fill Edgings: Place as indicated, and permanently secure in place and attach to each other according to edging manufacturer's written instructions.
- B. Loose Fill: Place playground surface system materials including manufacturer's standard amount of excess material for compacting naturally with time or including manufacturer's standard amount of excess material for compacting mechanically to required depths after Installation of playground equipment support posts and foundations.
- C. Compacting and Grading: Uniformly compact and grade loose-fill according to manufacturer's written instructions to an even surface free from irregular surface changes as indicated.
- D. Finish Grading: Hand rake to a smooth finished surface and to required elevations.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing and inspecting of completed applications of playground surface system shall take place according to ASTM F 1292.

- C. Remove and replace applications of playground surface system where test results indicate that it does not comply with requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with requirements.

3.5 PROTECTION

- A. Prevent traffic over system for not less than 48 hours after installation.

END OF SECTION 321816.13

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Gates: swing
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete" for concrete
 - 2. Division 31 Section "Earth Moving" for site excavation, fill, and backfill where chain-link fences and gates are located.
- C. Alternates: Refer to Division 01 Section "Alternates" for description of Work in this Section affected by alternates.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal gate capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
 - a. Wind Speed: 60 mph
 - b. Fence Height: 4 feet
 - c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe
 - d. Wind Exposure Category: B
 - 2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 4 feet high, and post spacing not to exceed 10 feet.
- B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
 - 1. Gate posts, rails, and fittings.
 - 2. Gates and hardware including male hinge lock system

- B. Shop Drawings: Show locations of cedar fence on 5' on each side of gate, gate, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

- C. Samples for Verification: For each type of gate indicated.
 - 1. Galvanized finish

- D. Product Certificates: For each type of gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1043.

- E. Qualification Data: For Installer.

- F. Field quality-control test reports.

- G. Maintenance Data:

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
 - 1. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified according to NETA ETT, or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. UL Standard: Provide gate operators that comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.
- F. Mockups: NA

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Interruption of Existing Utility Service: Do not interrupt utility services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility services.
 - 2. Do not proceed with interruption of utility services without Architect's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Galvanized Pipe Ranch Gate, Posts and Accesories:
American Fence and Supply Company 4'amerTUBEgateCATTLE PART#030TG4
 - a. American Fence and Supply Company or approved equal.

Gate: 4'amerTUBEgateCattle Part#030TG4

Provide mail lock and post system to match

2.2 GATE FRAMING

- A. Posts and Rails: Round cold-formed, electric-resistance-welded, steel pipe or tubing, with minimum yield strength of 45,000 psi (310 MPa) and with outside dimension, minimum wall thickness, and weight complying with ASTM F 761 or ASTM F 654 for the following fence height and strength and stiffness requirements:
 - 1. Fence Height: shown on drawings
 - 2. Duty Rating: Medium.
 - 3. Tube or Pipe Diameter and Thickness: According to ASTM F 761.
 - 4. Tube Size and Thickness: According to ASTM F 654.
 - 5. Hardware: Latches permitting operation from both sides of gate and hinges. Provide male hatch system for locking.
 - 6. Metallic-Coated Steel: Posts, rails, and frames protected with an external coating of not less than 0.6 oz. of zinc/sq. ft. (183 g of zinc/sq. m), or galvanized.

2.3 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Post and Line Caps: Provide for each post.
 - 1. Line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

2.4 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94/C 94M.
 - 1. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7-MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.
- B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.5 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create

pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.6 FENCE GROUNDING

- A. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
 - 1. Material above Finished Grade:
 - 2. Material on or below Finished Grade: Copper.
 - 3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- B. Connectors and Grounding Rods: Comply with UL 467.
 - 1. Connectors for Below-Grade Use: Exothermic welded type.
 - 2. Grounding Rods: Copper-clad steel.
 - a. Size: 5/8 by 96 inches (16 by 2440 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for Support Posts: Hand-excavate holes for bases/pads, in firm, undisturbed soil to dimensions and depths and at locations as required by gate-operator component manufacturer's written instructions and as indicated.
- C. Concrete Bases/Pads: Cast-in-place, or detail on Drawings, dimensioned and reinforced according to gate-operator component manufacturer's written instructions and as indicated on Drawings.

3.6 GROUNDING AND BONDING

- A. Fence Grounding: Install at gate
- B. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is **6 inches (150 mm)** below finished grade. Connect rod to gate with No. 6 AWG conductor. Connect conductor to each gate component at the grounding location per manufacturer.
- C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
- D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- E. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.7 FIELD QUALITY CONTROL

- A. Grounding-Resistance Testing: Engage a qualified independent testing and inspecting agency to perform field quality-control testing.
 - 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
 - 2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
 - 3. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.8 ADJUSTING

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
 - 1.
- B. Lubricate hardware and other moving parts.

3.9 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates. Refer to Division 01 Section "Closeout Procedures"

END OF SECTION 323113

SECTION 323223.10 – DRY-STACK STONE WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes dry-stack stone gravity retaining walls.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for excavation for walls.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Dry-stack stone walls shall be considered a gravity wall system and based on its mass and geometry to resist earth pressure forces acting on it. Weight, depth, wall batter and inter-unit shear strength shall achieve stability. Comply with the recommendations set forth in the Geotechnical Report for the compaction of foundation soils and setting beds/leveling pads.

1.4 SUBMITTALS

- A. Samples for Verification: For each color and texture of stone required. Submit stone samples not less than 3 inches square indicating full range.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build mockup of dry-stack stone wall approximately 72 inches long by not less than 36 inches high above finished grade at front of wall.
 - a. Include typical soil reinforcement.
 - b. Include typical pattern, texture, color, joints, and standard of workmanship.
 - c. Include typical cap.
 - d. Include backfill to typical finished grades at both sides of wall.
 - e. Include typical end construction at one end of mockup.
 - f. Include typical boulder integration in mockup.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to dry-stack stone walls including, but not limited to, the following:
 - a. Structural load limitations.
 - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Field quality-control procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and accessories to prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.

PART 2 - PRODUCTS

2.1 DRY-STACK STONE WALLS

- A. Provide sound natural stone as follows:

1. Limestone boulders and dry stack stone sizes that match wall veneer.

- B. Color: Cream, Nicotine and Grey

- C. Shape and Texture: Provide stone wall units with 40% natural stain face and 60% broken face with a full range of rectangular dimensions, minimum size of 2 inches x 4 inches x 5 inches thick and a maximum size of 8 inches x 24 inches x 8 inches thick. Jumper (Boulder) stones shall be used to meet grade requirements as shown on drawings. Minimize small, chinking and plug pieces.

- D. Batter: Provide at minimum a 1:12 batter.

2.2 INSTALLATION MATERIALS

- A. Cap Adhesive: Product supplied or recommended by stone supplier for adhering cap units to stone wall units below.
- B. Leveling Base: Comply with requirements in Division 31 Section "Earth Moving" for base material and Division 33 Section "Subdrainage" for drainage fill.
- C. Drainage Fill: Comply with requirements in Division 33 Section "Subdrainage."
- D. Reinforced-Soil Fill: Comply with requirements in Division 31 Section "Earth Moving" for satisfactory soils.

- E. Non-reinforced-Soil Fill: Comply with requirements in Division 31 Section "Earth Moving" for satisfactory soils.
- F. Filter Fabric: Comply with requirements in Division 33 Section "Subdrainage."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of segmental retaining walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DRY-STACK STONE WALL INSTALLATION

- A. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
- B. First Course: Place first course of stone units for full length of wall. Place units in firm contact with each other, properly aligned and level.
 - 1. Use large, wide, long, flat and stable stones.
 - 2. Tamp units into leveling base as necessary to bring tops of units into a level plane.
- C. Subsequent Courses: Remove excess fill and debris from tops of stone units in course below. Place units in firm contact, properly aligned, and directly on course below.
 - 1. Stone coursing pattern to be random-range ashlar with random course heights and random lengths, including interrupted courses with jumper (boulder) stones. Use small, chinking or plug pieces with mortar to level and secure courses.
 - 2. Landscape boulders to be incorporated into wall and used for termination of wall as indicated on Drawings. Stone coursing and units to be cut to fit in the field.

3.3 FILL PLACEMENT

- A. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.
- B. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of stone units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall and place and spread fills toward embankment.
 - 1. Use only hand-operated compaction equipment within 48 inches of wall, or one-half of height above bottom of wall, whichever is greater.

2. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - a. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 90 percent maximum dry unit weight according to ASTM D 698.
 3. Compact nonreinforced-soil fill to comply with Division 31 Section "Earth Moving."
- C. Place a layer of drainage fill at least 6 inches wide behind wall to within 12 inches of finished grade. Place a layer of drainage geotextile between drainage fill and soil fill.
 - D. Place impervious fill over top edge of drainage fill layer.
 - E. Slope grade at top of wall away from wall unless otherwise indicated. Slope grade at base of wall away from wall. Provide uniform slopes that will prevent ponding.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Level: For bed-joint lines along walls, do not exceed 3 inches in 10 feet.
- B. Variation from Indicated Batter: For slope of wall face, do not vary from indicated slope by more than 1-1/4 inches in 10 feet.
- C. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet.

3.5 FIELD QUALITY CONTROL

- A. Comply with requirements in Division 31 Section "Earth Moving" for field quality control.

3.6 ADJUSTING

- A. Remove and replace dry-stack stone wall construction of the following descriptions:
 1. Broken, chipped, stained, or otherwise damaged stone units. Stone units may be repaired if Landscape Architect approves methods and results.
 2. Dry-stack stone walls that do not match approved Samples and mockups.
 3. Dry-stack stone walls that do not comply with other requirements indicated.
- B. Replace stone units so dry-stack stone wall matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

END OF SECTION 323223.10

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Plugging.
5. Sprigging.
6. Meadow grasses and wildflowers.
7. Erosion-control material(s).

B. Related Sections:

1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
3. Division 32 Section "Planting Irrigation " for turf irrigation.
4. Division 32 Section "Plants" for border edgings.
5. Division 33 Section "Subdrainage" for subsurface drainage.

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments from manufacturer.
- E. Material Test Reports: For standardized ASTM D 5268 topsoil, existing native surface topsoil, existing in-place surface soil, and imported or manufactured topsoil.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and meadows during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf **and meadow** establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's **field supervisor** shall have certification in **one of** the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with **installation, maintenance** and **irrigation** specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
 5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
 6. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university 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.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per **1000 sq. ft. (92.9 sq. m)** or volume per **cu. yd. (0.76 cu. m)** for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Preinstallation Conference: Conduct conference at Project Site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion
 - 1. Spring Planting: before July 15
 - 2. Fall Planting: after September 15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1. Seeded Turf: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
 - 2. Sodded Turf: 60 days from date of Substantial Completion.

- B. Initial Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 40 days after Substantial Completion.
- C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:
- C. Seed Species: Seed of grass species as follows, with not less than 90 percent germination, not less than 90 percent pure seed, and not more than .5 percent weed seed:
 - 1. Full Sun: **Bermudagrass (*Cynodon dactylon*) at recreation soccer fields. St. Augustinegrass (*Stenotaphrum secundatum*) at the Blue Hole area.**

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Zoysiagrass (*Zoysia matrella*) in the soccer fields

2.3 MEADOW GRASSES AND WILDFLOWERS

- A. Wildflower Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 - 1. **<Insert mix of wildflower species>.**
- B. Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 - 1. **LIST THE NATIVE SEED MIXES**
- C. Wildflower and Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 - 1. **LIST THE NATIVE SEED MIXES**

- D. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

2.4 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through **No. 8 (2.36-mm)** sieve and a minimum of 75 percent passing through **No. 60 (0.25-mm)** sieve.
 - 2. Class: O, with a minimum of 95 percent passing through **No. 8 (2.36-mm)** sieve and a minimum of 55 percent passing through **No. 60 (0.25-mm)** sieve.
 - 3. Provide lime in form of ground [**dolomitic limestone**] [**calcitic limestone**] [**mollusk shells**] <**Insert material**>.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through **No. 6 (3.35-mm)** sieve and a maximum of 10 percent passing through **No. 40 (0.425-mm)** sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through **No. 50 (0.30-mm)** sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.5 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through **1/2-inch (12.5-mm)** sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.6 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.7 PLANTING SOILS

- A. Planting Soil ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments in the following quantities to produce planting soil:
 - 1. Ratio of Loose Compost to Topsoil by Volume: 1:4

2. Ratio of Loose [**Sphagnum**] [**Muck**] Peat to Topsoil by Volume: <Insert ratio>.
3. Ratio of Loose Wood Derivatives to Topsoil by Volume: <Insert ratio>.
4. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
5. Weight of [**Sulfur**] [**Iron Sulfate**] [**Aluminum Sulfate**] per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
6. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
7. Volume of Sand Plus 10 Percent [**Diatomaceous Earth**] [**Zeolites**] per 1000 Sq. Ft. (92.9 Sq. m): <Insert volume>.
8. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
9. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
10. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
11. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.

B. Planting Soil <Insert drawing designation>: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process[**and stockpiled on-site**]. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

1. Supplement with [**another specified**] <Insert drawing designation> planting soil when quantities are insufficient.
2. Mix existing, native surface topsoil with the following soil amendments[**and fertilizers**] in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: [**1:4**] [**1:3**] [**1:2**] <Insert ratio>.
 - b. Ratio of Loose [**Sphagnum**] [**Muck**] Peat to Topsoil by Volume: <Insert ratio>.
 - c. Ratio of Loose Wood Derivatives to Topsoil by Volume: <Insert ratio>.
 - d. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - e. Weight of [**Sulfur**] [**Iron Sulfate**] [**Aluminum Sulfate**] per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - f. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - g. Volume of Sand Plus 10 Percent [**Diatomaceous Earth**] [**Zeolites**] per 1000 Sq. Ft. (92.9 Sq. m): <Insert volume>.
 - h. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - i. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - j. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - k. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.

C. Planting Soil <Insert drawing designation>: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments[**and fertilizers**] in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Surface Soil by Volume: [**1:4**] [**1:3**] [**1:2**] <Insert ratio>.
2. Ratio of Loose [**Sphagnum**] [**Muck**] Peat to Surface Soil by Volume: <Insert ratio>.
3. Ratio of Loose Wood Derivatives to Surface Soil by Volume: <Insert ratio>.
4. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
5. Weight of [**Sulfur**] [**Iron Sulfate**] [**Aluminum Sulfate**] per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.

6. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 7. Volume of Sand Plus 10 Percent [Diatomaceous Earth] [Zeolites] per 1000 Sq. Ft. (92.9 Sq. m): <Insert volume>.
 8. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 9. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 10. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 11. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
- D. Planting Soil <Insert drawing designation>: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from [agricultural land,]bogs or marshes.
1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
 2. Mix imported topsoil or manufactured topsoil with the following soil amendments[and fertilizers] in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: [1:4] [1:3] [1:2] <Insert ratio>.
 - b. Ratio of Loose [Sphagnum] [Muck] Peat to Topsoil by Volume: <Insert ratio>.
 - c. Ratio of Loose Wood Derivatives to Topsoil by Volume: <Insert ratio>.
 - d. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - e. Weight of [Sulfur] [Iron Sulfate] [Aluminum Sulfate] per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - f. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - g. Volume of Sand Plus 10 Percent [Diatomaceous Earth] [Zeolites] per 1000 Sq. Ft. (92.9 Sq. m): <Insert volume>.
 - h. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - i. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - j. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
 - k. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
- E. Lightweight On-Structure Planting Soil <Insert drawing designation>: Mix produced by modifying planting soil as follows:
1. Planting Soil <Insert drawing designation>: [One] <Insert number> part(s), except replace [all] [half] <Insert amount> of sand content with perlite.
 2. Additional Perlite: [One] <Insert number> part(s).
 3. Additional [Sphagnum] [Muck] Peat: [One] <Insert number> part(s).

4. Additional Lime: Ground [dolomitic limestone] [calcitic limestone] [mollusk shells] <Insert material> applied at the rate of [3 lb per cu. yd. (1.36 kg per cu. m)] <Insert rate>.
5. <Insert material and quantity>.

2.8 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.9 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.10 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of **3-inch (75-mm)** nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - 1. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - a. Invisible Structures, Inc.; Slopetame 2.
 - b. Presto Products Company, a business of Alcoa; Geoweb.
 - c. Tenax Corporation - USA; Tenweb.
 - d. **<Insert manufacturer's name; product name or designation>..**

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
1. Apply superphosphate fertilizer directly to subgrade before loosening.
 2. Thoroughly spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 3. Spread planting soil to a depth of 6 inches (150 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 2. Loosen surface soil to a depth of at least 6 inches (150 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches (100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 3. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, trash, and other extraneous matter.
 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 PREPARATION FOR GRASS-PAVING MATERIALS

- A. Reduce subgrade elevation soil to allow for thickness of grass-paving system. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade so that installed paving is within plus or minus **1/2 inch (13 mm)** of finish elevation. Roll and rake, remove ridges, and fill depressions.
- B. Install **[base course] [and] [sand course] and [sandy loam soil mix] [proprietary growing mix] [soil for paving fill]** as recommended by paving-material manufacturer for site conditions; comply with details shown on Drawings. Compact according to paving-material manufacturer's written instructions.
- C. Install paving mat and fasten according to paving-material manufacturer's written instructions.
- D. Before planting, fill cells of paving mat with **[planting soil] [sandy loam soil mix] [proprietary growing mix] [sand half full]** and compact according to manufacturer's written instructions.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.6 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds **5 mph (8 km/h)**. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate as required in mix.
- C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft. (38 to 49 L/92.9 sq. m). Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.

3.7 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre (10.4 kg/92.9 sq. m).

3.8 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.9 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow [bermudagrass to a height of 1/2 to 1 inch (13 to 25 mm).
 - 2. Mow zoysiagrass to a height of 1 to 2 inches (25 to 50 mm).
 - 3. Mow St. Augustinegrass > to a height of 2 to 3 inches (50 to 75 mm).
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) only to zoysiagrass and bermudagrass area. No fertilizers should be used on St. Augustinegrass.

3.10 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m).
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
 3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
 4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 MEADOW

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at a total rate of 4 oz./1000 sq. ft. (113 g/92.9 sq. m)
- C. Brush seed into top 1/16 inch (1.6 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.
- E. Water newly planted areas and keep moist until meadow is established.

3.12 MEADOW MAINTENANCE

- A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water meadow with fine spray at a minimum rate of **1/2 inch (13 mm)** per week for six weeks after planting unless rainfall precipitation is adequate.

3.13 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.14 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting soils.
3. Tree stabilization.
4. Landscape edgings.
5. Tree grates.

B. Related Sections:

1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Division 31 Section "Site Clearing" for protection of existing trees and plantings, topsoil stripping and stockpiling, and site clearing.
3. Division 31 Section "Earth Moving" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
4. Division 32 Section "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
5. Division 33 Section "Subdrainage" for below-grade drainage of landscaped areas, paved areas, and wall perimeters.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.
- I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- L. Planting Area: Areas to be planted.
- M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
 3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
1. Trees and Shrubs: Three samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 2. Cedar Mulch: 1-pint (0.5-liter) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 3. Decomposed Granite Mulch: 1 lb of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
 4. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).
 5. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- E. Material Test Reports: For **standardized ASTM D 5268 topsoil, existing native surface topsoil, existing in-place surface soil with compost and imported or manufactured topsoil.**

- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- G. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Five years' experience in landscape installation specific to native revegetation and wetland restoration in addition to requirements in Division 01 Section "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's **field supervisor** shall have certification in **one of** the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, designated CLT-Exterior.
 - b. Certified Ornamental Landscape Professional, designated COLP.
 - 5. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university 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.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 - 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 - 3. Report suitability of tested soil for plant growth.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per **1000 sq. ft. (92.9 sq. m)** or volume per **cu. yd. (0.76 cu. m)** for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such

problem materials are present, provide additional recommendations for corrective action.

- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
 - 1. Selection of plants purchased under allowances will be made by Architect, who will tag plants at their place of growth before they are prepared for transplanting.
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements **6 inches (150 mm)** above the root flare for trees up to **4-inch (100-mm)** caliper size, and **12 inches (300 mm)** above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- F. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1. Notify Architect of sources of planting materials ten days in advance of delivery to site.
- G. Preinstallation Conference: Conduct conference at Project Site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk organic fertilizers, lime and soil amendments with appropriate certificates.
- C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 - 1. Notify **Construction Manager** and **Owner** no fewer than three days in advance of proposed interruption of each service or utility.
 - 2. Do not proceed with interruption of services or utilities without **[Construction Manager's or Owner's]** written permission.
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: Until June 15
 - 2. Fall Planting: After September 15
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of **tree stabilization**.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods from Date of **Substantial Completion**
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Seedmix: 12 months after 90% germination.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 12 months from date of substantial completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance

immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 12 months from date of substantial completion.
- C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than **3/4 inch (19 mm)** in diameter; or with stem girdling roots will be rejected.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through **No. 8 (2.36-mm)** sieve and a minimum of 75 percent passing through **No. 60 (0.25-mm)** sieve.
 2. Class: O, with a minimum of 95 percent passing through **No. 8 (2.36-mm)** sieve and a minimum of 55 percent passing through **No. 60 (0.25-mm)** sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through **No. 6 (3.35-mm)** sieve and a maximum of 10 percent passing through **No. 40 (0.425-mm)** sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through **No. 50 (0.30-mm)** sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through **1/2-inch (13-mm)** sieve; soluble salt content of **5 to 10** decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of **0.15 lb/cu. ft. (2.4 kg/cu. m)** of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of **0.25 lb/cu. ft. (4 kg/cu. m)** of loose sawdust or ground bark.

- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 - 1. Size: 5-gram tablets.
 - 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.
- F. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.5 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of six percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments **of Dillo Dirt**.
- B. Planting Soil Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process **and stockpiled on-site**. Verify suitability of native surface

topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

1. Supplement with organic Dillo Dirt planting soil when quantities are insufficient.
2. Mix existing, native surface topsoil with the following soil amendments
3. Retain first paragraph below if existing surface soil is not of topsoil quality or is of unknown quality and will be amended and used.

C. Planting Soil <Insert drawing designation>: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments[**and fertilizers**] in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Surface Soil by Volume: [1:4] [1:3] [1:2] <Insert ratio>.
2. Ratio of Loose [Sphagnum] [Muck] Peat to Surface Soil by Volume: <Insert ratio>.
3. Ratio of Loose Wood Derivatives to Surface Soil by Volume: <Insert ratio>.
4. Weight of Lime per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
5. Weight of [Sulfur] [Iron Sulfate] [Aluminum Sulfate] per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
6. Weight of Agricultural Gypsum per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
7. Volume of Sand Plus 10 Percent [Diatomaceous Earth] [Zeolites] per 1000 Sq. Ft. (92.9 Sq. m): <Insert volume>.
8. Weight of Bonemeal per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
9. Weight of Superphosphate per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
10. Weight of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.
11. Weight of Slow-Release Fertilizer per 1000 Sq. Ft. (92.9 Sq. m): <Insert weight>.

D. Planting Soil <Insert drawing designation>: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from [agricultural land,]bogs, or marshes.

1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch (25 mm) or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
2. Mix imported topsoil or manufactured topsoil with the following soil amendments[**and fertilizers**] in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: [1:4] [1:3] [1:2] <Insert ratio>.

- b. Ratio of Loose [**Sphagnum**] [**Muck**] Peat to Topsoil by Volume: <Insert ratio>.
 - c. Ratio of Loose Wood Derivatives to Topsoil by Volume: <Insert ratio>.
 - d. Weight of Lime per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - e. Weight of [**Sulfur**] [**Iron Sulfate**] [**Aluminum Sulfate**] per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - f. Weight of Agricultural Gypsum per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - g. Volume of Sand Plus 10 Percent [**Diatomaceous Earth**] [**Zeolites**] per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert volume>.
 - h. Weight of Bonemeal per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - i. Weight of Superphosphate per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - j. Weight of Commercial Fertilizer per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
 - k. Weight of Slow-Release Fertilizer per **1000 Sq. Ft. (92.9 Sq. m)**: <Insert weight>.
- E. Lightweight On-Structure Planting Soil <Insert drawing designation>: Mix produced by modifying planting soil as follows:
- 1. Planting Soil <Insert drawing designation>: [**One**] <Insert number> part(s), except replace [**all**] [**half**] <Insert amount> of sand content with perlite.
 - 2. Additional Perlite: [**One**] <Insert number> part(s).
 - 3. Additional [**Sphagnum**] [**Muck**] Peat: [**One**] <Insert number> part(s).
 - 4. Additional Lime: Ground [**dolomitic limestone**] [**calcitic limestone**] [**mollusk shells**] <Insert material> applied at the rate of [**3 lb per cu. yd. (1.36 kg per cu. m)**] <Insert rate>.
 - 5. <Insert material and quantity>.

2.6 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
- 1. Type: Shredded cedar from cedar trees removed from site and locally attained cedar mulch.
 - 2. Size Range: 3" maximum
 - 3. Color: Natural.
- B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
- 1. Type: Decomposed granite
 - 2. Size Range: **3/4 inch (19 mm) maximum, 1/4 inch (6.4 mm) minimum**
 - 3. Color: **Uniform tan-beige color range acceptable to Architect**

2.7 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, **3 oz./sq. yd. (101g/sq. m)** minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

- B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd. (162 g/sq. m).

2.8 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 TREE STABILIZATION MATERIALS

A. Stakes and Guys:

1. Upright and Guy Stakes: Rough-sawn, sound, new **hardwood** or metal stakes, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.
8. Proprietary Staking-and-Guying Devices: Proprietary stake and adjustable tie systems to secure each new planting by plant stem; sized as indicated and per manufacturer's written recommendations.
 - a. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following:**
 - 1) Arborbrace; ArborBrace Tree Guying System.
 - 2) Decorations for Generations, Inc.; Megga System.
 - 3) Or approved equal

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, **2-by-2-inch nominal (38-by-38-mm actual)** by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.
3. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball; sized per manufacturer's written recommendations unless otherwise indicated.
 - a. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) Border Concepts, Inc.; Tomahawk Tree Stabilizers.
 - 2) Foresight Products, LLC; Duckbill Rootball Fixing System.
 - 3) Tree Staple, Inc.; Tree Staples.
 - 4) **<Insert manufacturer's name; product name or designation>**.

C. Palm Bracing: Battens or blocks, struts, straps, and protective padding as indicated.

1. Battens or Blocks and Struts: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, **2-by-4-inch nominal (38-by-89-mm actual)** by lengths indicated.
2. Straps: Adjustable steel or plastic package banding straps.
3. Padding: Burlap.
4. Proprietary Palm-Bracing Devices: Proprietary systems to secure each new planting by trunk; sized per manufacturer's written recommendations unless otherwise indicated.
 - a. Products: Subject to compliance with requirements, **[provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) Arborbrace; ArborBrace Palm Bracing.
 - 2) Horticultural Consultants, Inc.; Oasis Palm Tree Anchoring System.
 - 3) **<Insert manufacturer's name; product name or designation>**.

2.10 LANDSCAPE EDGINGS

A. Wood Edging: Of sizes shown on Drawings, and wood stakes as follows:

1. Species: **[Western red cedar, all heart] [Southern pine with specified wood pressure-preservative treatment]**.
2. Stakes: Same species as edging, **1-by-2-inch nominal (19-by-38-mm actual)** by **18 inches (450 mm)** long, with galvanized nails for anchoring edging.

B. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. Russell, J. D. Company (The).
 - d. Sure-Loc Edging Corporation.
 - e. <Insert manufacturer's name>.
 3. Edging Size: [**3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep**] [**1/4 inch (6.4 mm) wide by 5 inches (125 mm) deep**] [**1/4 inch (6.4 mm) wide by 4 inches (100 mm) deep**] [**1/8 inch (3.2 mm) wide by 4 inches (100 mm) deep**] [**1/8 inch (3.2 mm) wide by 6 inches (150 mm) deep**] [**0.1 inch (2.5 mm) wide by 4 inches (100 mm) deep**] <Insert dimensions>.
 4. Stakes: Tapered steel, a minimum of [**12 inches (300 mm)**] [**15 inches (380 mm)**] <Insert length> long.
 5. Accessories: Standard tapered ends, corners, and splicers.
 6. Finish: [**Standard paint**] [**Zinc coated**] [**Unfinished**].
 7. Paint Color: [**Black**] [**Green**] [**Brown**].
- C. Aluminum Edging: Standard-profile extruded-aluminum edging, **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.
1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. Curv-Rite, Inc.
 - b. Permaloc Corporation.
 - c. Russell, J. D. Company (The).
 - d. Sure-Loc Edging Corporation.
 - e. <Insert manufacturer's name>.
 3. Edging Size: [**3/16 inch (4.8 mm) wide by 5-1/2 inches (140 mm) deep**] [**3/16 inch (4.8 mm) wide by 4 inches (100 mm) deep**] [**1/8 inch (3.2 mm) wide by 5-1/2 inches (140 mm) deep**] [**1/8 inch (3.2 mm) wide by 4 inches (100 mm) deep**] <Insert dimensions>.
 4. Stakes: Aluminum, **ASTM B 221 (ASTM B 221M)**, Alloy 6061-T6, approximately **1-1/2 inches (38 mm)** wide by **12 inches (300 mm)** long.
 5. Finish: [**Manufacturer's standard paint**] [**Powder-coat paint**] [**Mill (natural aluminum)**] [**Black anodized**].
 6. Paint Color: [**Black**] [**Green**] [**Brown**].
- D. Plastic Edging: Standard black polyethylene or vinyl edging, [**V-lipped bottom**] [**horizontally grooved**] <Insert configuration>, extruded in standard lengths, with **9-inch (225-mm)** [**steel angle**] [**plastic**] stakes.

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following]** **[available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
2. Basis-of-Design Product: Subject to compliance with requirements, provide **[product indicated on Drawings]** **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. Oly-Ola Edgings, Inc.
 - b. Valley View Industries.
 - c. **<Insert manufacturer's name>**.
3. Edging Size: **[0.1 inch (2.5 mm) wide by 5 inches (125 mm) deep]** **[0.07 inch (1.8 mm) wide by 5 inches (125 mm) deep]** **<Insert dimensions>**.
4. Top Profile: Straight, with top **2 inches (50 mm)** being **1/4 inch (6.4 mm)** thick.
5. Top Profile: Round top, **[1/2 inch (13 mm)]** **[1 inch (25 mm)]** in diameter.
6. Accessories: Manufacturer's standard alignment clips or plugs.

2.11 TREE GRATES

- A. Tree Grates **[and Frames]**: ASTM A 48/A 48M, **Class 35 (Class 250)** or better, gray-iron castings of shape, pattern, and size indicated.
- B. Tree Grates and Frames: ASTM A 48/A 48M, **Class 35 (Class 250)** or better, gray-iron castings and ASTM A 36/A 36M steel-angle frames of shape, pattern, and size indicated; steel frames hot-dip galvanized.
- C. Shape and Size: **[As indicated]** **[Round, 36 inches (914 mm) in diameter]** **[Round, 72 inches (1828 mm) in diameter]** **[48 inches (1219 mm) square]** **[60 inches (1524 mm) square]** **[Rectangular, 36 by 60 inches (914 by 1524 mm)]** **[Rectangular, 48 by 72 inches (1219 by 1828 mm)]** **<Insert shape and dimensions>**.
- D. Finish: **[As fabricated]** **[Powder-coat finish]** **<Insert finish>**.
 1. Color: Low-gloss **[black]** **[dark brown]** **[dark green]** **[dark gray]** **<Insert color>**.

2.12 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.
- B. Root Barrier: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, **85 mils (2.2 mm)** thick, with vertical root deflecting ribs protruding **3/4 inch (19 mm)** out from panel, and each panel **[18 inches (457 mm)]** **[24 inches (610 mm)]** **<Insert measurement>** wide.

- C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- D. Burlap: Non-synthetic, biodegradable.
- E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with [ASTM D 448 for Size No. 8] <Insert requirements>.
- F. Planter Filter Fabric: [Woven] [Nonwoven] geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of **[4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] [12 inches (300 mm)]** <Insert depth>. Remove stones larger than **[1 inch (25 mm)] [1-1/2 inches (38 mm)] [2 inches (50 mm)]** <Insert size> in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply **[superphosphate]** <Insert type> fertilizer directly to subgrade before loosening.
 - 2. **[Thoroughly blend planting soil off-site before spreading] [or] [spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil]**.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of **[4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] [12 inches (300 mm)]** <Insert depth> but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top **[2 inches (50 mm)] [4 inches (100 mm)]** of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at **[application rate indicated on Drawings]** <Insert application rate>.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately three times as wide as ball diameter for **[balled and burlapped]** **[balled and potted]** **[container-grown]** **[fabric bag-grown]** stock.
 2. Excavate at least **12 inches (300 mm)** wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision of excavations during working hours.
 7. Keep excavations covered or otherwise protected **[overnight]** **[after working hours]** **[when unattended by Installer's personnel]**.
 8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subsoil and topsoil removed from excavations **[may]** **[may not]** be used as planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill **6-inch- (150-mm-)** diameter holes, **24 inches (600 mm)** apart, into free-draining strata or to a depth of **10 feet (3 m)**, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare [**1 inch (25 mm) above**] [**2 inches (50 mm) above**] <Insert dimension> adjacent finish grades.
1. Use planting soil <Insert drawing designation> for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about **1 inch (25 mm)** from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set [**balled and potted**] [**container-grown**] stock plumb and in center of planting pit or trench with root flare [**1 inch (25 mm) above**] [**2 inches (50 mm) above**] <Insert dimension> adjacent finish grades.
1. Use planting soil <Insert drawing designation> for backfill.
 2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about **1 inch (25 mm)** from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare [**1 inch (25 mm) above**] [**2 inches (50 mm) above**] <Insert dimension> adjacent finish grades.
1. Use planting soil <Insert drawing designation> for backfill.
 2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about **1 inch (25 mm)** from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Set and support bare-root stock in center of planting pit or trench with root flare [**1 inch (25 mm) above**] [**2 inches (50 mm) above**] <Insert dimension> adjacent finish grade.
1. Use planting soil <Insert drawing designation> for backfill.

2. Spread roots without tangling or turning toward surface, and carefully work backfill around roots by hand. Puddle with water until backfill layers are completely saturated. Plumb before backfilling, and maintain plumb while working backfill around roots and placing layers above roots.
 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about **1 inch (25 mm)** from root tips; do not place tablets in bottom of the hole or touching the roots.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 MECHANIZED TREE SPADE PLANTING

- A. Trees **[shall]** **[may]** be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
- C. Cut exposed roots cleanly during transplanting operations.
- D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.
- E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in the same direction as in its original location.

3.7 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.8 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend [to the dimension shown on Drawings] [at least 72 inches (1830 mm)] [one-third of trunk height] <Insert dimension or requirement> above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Staking and Guying: Stake and guy trees more than 14 feet (4.2 m) in height and more than 3 inches (75 mm) in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches (760 mm) long, driven to grade.
1. Site-Fabricated Staking-and-Guying Method:
 - a. For trees more than 6 inches (150 mm) in caliper, anchor guys to wood deadmen buried at least 36 inches (900 mm) below grade. Provide [turnbuckle] [compression spring] for each guy wire and tighten securely.
 - b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to [turnbuckle] [compression spring]. Allow enough slack to avoid rigid restraint of tree.
 - c. Support trees with strands of cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to [turnbuckle] [compression spring]. Allow enough slack to avoid rigid restraint of tree.
 - d. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.
 - e. Paint [turnbuckles] [compression springs] with luminescent white paint.
 2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.

- a. Install stakes of length required to penetrate at least [**to the dimension shown on Drawings**] [**18 inches (450 mm)**] <Insert dimension> below bottom of backfilled excavation. Saw stakes off at horizontal stake.
 - b. Install screws through horizontal hold-down and penetrating at least **1 inch (25 mm)** into stakes. Pre-drill holes if necessary to prevent splitting wood.
 - c. Install second set of stakes on other side of root trunk for larger trees as indicated.
2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- D. Palm Bracing: Install bracing system at three or more places equally spaced around perimeter of trunk to secure each palm until established unless otherwise indicated.
1. Site-Fabricated Palm-Bracing Method:
 - a. Place battens over padding and secure battens in place around trunk perimeter with at least two straps, tightened to prevent displacement. Ensure that straps do not contact trunk.
 - b. Place diagonal braces and cut to length. Secure upper ends of diagonal braces with galvanized nails into battens or into nail-attached blocks on battens. Do not drive nails, screws, or other securing devices into palm trunk; do not penetrate palm trunk in any fashion. Secure lower ends of diagonal braces with stakes driven into ground to prevent outward slippage of braces.
 2. Proprietary Palm-Bracing Device: Install palm-bracing system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.9 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within [**60 inches (1500 mm)**] [**48 inches (1200 mm)**] <Insert dimension> of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.
- B. Align root barrier [**vertically**] [**with bottom edge angled at 20 degrees away from the paving or other hardscape element**] and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of [**60 inches (1500 mm)**] <Insert distance> in each direction from the tree trunk, for a total distance of [**10 feet (3 m)**] <Insert distance> per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 1. Position top of root barrier [**flush with finish grade**] [**1/2 inch (13 mm) above finish grade**] [**per manufacturer's recommendations**].
 2. Overlap root barrier a minimum of **12 inches (300 mm)** at joints.
 3. Do not distort or bend root barrier during construction activities.
 4. Do not install root barrier surrounding the root ball of tree.

3.10 PLANTING IN PLANTERS

- A. Place a layer of drainage gravel at least **4 inches (100 mm)** thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric [**4 inches (100 mm)**] [**6 inches (150 mm)**] **<Insert measurement>** up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.
- B. Fill planter with [**lightweight on-structure**] planting soil **<Insert drawing designation>**. Place soil in lightly compacted layers to an elevation of **1-1/2 inches (38 mm)** below top of planter, allowing natural settlement.

3.11 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines [**9 inches (225 mm) apart**] [**12 inches (300 mm) apart**] [**18 inches (450 mm) apart**] [**24 inches (600 mm) apart**] [**as indicated**] in even rows with triangular spacing.
- B. Use planting soil **<Insert drawing designation>** for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.12 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of [**6 inches (150 mm)**] [**12 inches (300mm)**] and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 1. Trees [**and Tree-like Shrubs**] in Turf Areas: Apply [**organic**] [**mineral**] mulch ring of [**2-inch (50-mm)**] [**3-inch (75-mm)**] **<Insert dimension>** average thickness, with [**12-inch (300-mm)**] [**24-inch (600-mm)**] [**36-inch (900-mm)**] **<Insert dimension>** radius around trunks or stems. Do not place mulch within [**3 inches (75 mm)**] [**6 inches (150 mm)**] **<Insert distance>** of trunks or stems.
 2. Organic Mulch in Planting Areas: Apply [**2-inch (50-mm)**] [**3-inch (75-mm)**] **<Insert dimension>** average thickness of organic mulch [**extending 12 inches (300 mm) beyond edge of individual planting pit or trench**] [**and**] [**over whole surface of planting area**], and finish level with adjacent finish grades. Do not place mulch within [**3 inches (75 mm)**] [**6 inches (150 mm)**] **<Insert distance>** of trunks or stems.

3. Mineral Mulch in Planting Areas: Apply [**2-inch (50-mm)**] [**3-inch (75-mm)**] <Insert dimension> average thickness of mineral mulch [**extending 12 inches (300 mm) beyond edge of individual planting pit or trench**] [**and**] [**over whole surface of planting area**], and finish level with adjacent finish grades. Do not place mulch within [**3 inches (75 mm)**] [**6 inches (150 mm)**] <Insert distance> of trunks or stems.

3.13 EDGING INSTALLATION

- A. Wood Edging: Install edging where indicated.[**Mitre cut joints and connections at a 45 degree angle.**] Fasten each cut joint or connection with two galvanized nails. Anchor with wood stakes spaced up to **36 inches (900 mm)** apart, driven at least **1 inch (25 mm)** below top elevation of edging. Use two galvanized nails per stake to fasten edging, of length as needed to penetrate both edging and stake and provide **1/2-inch (13-mm)** clinch at point. Pre-drill stakes if needed to avoid splitting. Replace stakes that crack or split during installation process.
- B. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately **30 inches (760 mm)** apart, driven below top elevation of edging.
- C. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately [**36 inches (900 mm)**] [**48 inches (1200 mm)**] apart, driven below top elevation of edging.
- D. Plastic Edging: Install plastic edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately [**36 inches (900 mm)**] [**48 inches (1200 mm)**] apart, driven through upper base grooves or V-lip of edging.
- E. Shovel-Cut Edging: Separate mulched areas from turf areas[, **curbs, and paving**] with a 45-degree, **4- to 6-inch- (100- to 150-mm-)** deep, shovel-cut edge[**as shown on Drawings**].

3.14 TREE GRATE INSTALLATION

- A. Tree Grates: Set grate segments flush with adjoining surfaces as shown on Drawings. Shim from supporting substrate with soil-resistant plastic. Maintain a **3-inch- (75-mm-)** minimum growth radius around base of tree; break away units of casting, if necessary, according to manufacturer's written instructions.

3.15 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.16 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.17 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before [**Substantial Completion**] <Insert time>, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.18 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 329300