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Project: Nolanville City Park, TPWD Grant Project #EABPRJB7000027

Phase: 100% CD Submittal

DIVISION 03 CONCRETE

- 033053 MISCELLANEOUS CAST-IN-PLACE CONCRETE
- Footings for fences, site furnishings, equipment

DIVISION 06 WOOD, PLASTICS, AND COMPOSITES

- 061063 EXTERIOR ROUGH CARPENTRY
- Wood fences, planters

DIVISION 12 FURNISHINGS

- 129300 SITE FURNISHINGS
- Rainwater barrels, picnic tables, signage

DIVISION 32 EXTERIOR IMPROVEMENTS

- 321316 DECORATIVE CONCRETE PAVING
- Splash Pad Spray Deck
- 321816.13 PLAYGROUND PROTECTIVE SURFACING
- Tiles
- 329113 SOIL PREPARATION
329300 PLANTS

SECTION 033053
MISC. CAST-IN-PLACE CONCRETE

SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete for:
 - 1. Fence footings
 - 2. Wall footings
 - 3. Play equipment footings
 - 4. Pavilion footings
 - 5. Splash pad footings

1.2 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. Comply with ACI 301.
- B. Comply with ACI 117.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type II.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
- B. Normal-Weight Aggregate: ASTM C 33/C 33M, 1-1/2-inch nominal maximum aggregate size.

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- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M.

2.4 RELATED MATERIALS

- A. Vapor Retarder: Plastic sheet, ASTM E 1745, Class A or B.
- B. Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick; or plastic sheet, ASTM E 1745, Class C.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 CONCRETE MIXTURES

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
 - 4. Slump Limit: 5 inches, plus or minus 1 inch.

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5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

- A. Install, protect, and repair vapor retarders according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
 1. Lap joints 6 inches and seal with manufacturer's recommended adhesive or joint tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

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- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

3.6 CONCRETE PLACEMENT

- A. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment according to ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.
 - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-rubbed finish.
 - 2. Grout-cleaned finish.
 - 3. Cork-floated finish.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

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1. Do not further disturb surfaces before starting finishing operations.
- C. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- E. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

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3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
 - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

END OF SECTION 033053

SECTION 061063
EXTERIOR ROUGH CARPENTRY

SECTION 061063 - EXTERIOR ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood fence posts.
2. Wood planters.

1.2 ACTION SUBMITTALS

A. Product Data: For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

B. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.

1. Factory mark each item with grade stamp of grading agency.
2. For items that are exposed to view in the completed Work, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: 19 percent.
2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness.
3. Timber. No limit.

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2.2 LUMBER

- A. Dimension Lumber: Construction or No. 2 grade and any of the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Redwood; RIS.
- B. Boards: Any of the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine; No. 2 grade; SPIB.
 3. Hem-fir or hem-fir (North); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 4. Northern white cedar, No. 2 Common; NeLMA or NLGA.
 5. Spruce-pine-fir (South) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

2.3 POSTS

- A. Dimension Lumber Posts: Construction or No. 2 grade and any of the following species:
1. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 2. Mixed southern pine; SPIB.
 3. Eastern softwoods; NeLMA.
 4. Western woods; WCLIB or WWPA.
 5. Salvaged cedar from site.

2.4 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWWA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWWA U1; Use Category UC4a.
1. Treatment with CCA shall include post-treatment fixation process.
- C. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
- D. Application: Treat all wood unless otherwise indicated.

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EXTERIOR ROUGH CARPENTRY

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, use stainless-steel fasteners.

- B. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors 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 according to ASTM E 488, conducted by a qualified independent testing and inspecting agency.
 - 1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. "Fastening Schedule" in ICC's International Building Code.

END OF SECTION 061063

**SECTION 129300
SITE FURNISHINGS**

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Rainwater barrels
 - 2. Picnic tables
 - 3. Interpretive signs

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 RAIN BARRELS

- A. 55-gallon, recycled plastic Rainwater Collection Barrels
 - 1. Installation Method: As per manufacturer's instructions.
 - 2. Barrels to be connected to raincatchment gutters on the pavilion, and to a drip irrigation system in the scent garden.
 - 3. Irrigation system to be designed and installed by contractor.

2.2 PICNIC TABLES

- A. Landscape Forms Gretchen Picnic Table, 58"x54"x30" in Polysite – Four (4) total

2.3 INTERPRETIVE SIGNS

- A. Custom 4"x 6" thin gauge signage
 - 1. Vandal resistant text in English, Spanish and braille
 - 2. Brushed aluminum with color background
 - 3. Color and text to be provided by Landscape Architect
 - 4. 1" x 1" x 2'-6" aluminum post for each sign. Posts to be bent at 45 degrees at the 6" mark on one end. Screw signs to bent piece. Install signs to allow for 18" of post above grade.

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5. Manufacturer: Hightech Signs, 1707 Hydro Drive, Austin, TX 78728, 512-832-0000, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- 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 securely anchored at locations indicated on Drawings.

END OF SECTION 129300

**SECTION 321316
DECORATIVE CONCRETE PAVING**

SECTION 321316 - DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes spray deck concrete paving.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of exposed color, pattern, or texture indicated.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Landscape Architect and not less than 6'x6'.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

**SECTION 321316
DECORATIVE CONCRETE PAVING**

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, gray portland cement Type I/II.
 - 2. Fly Ash: ASTM C 618, Class C or F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 - 4. Blended Hydraulic Cement: ASTM C 595/C 595M, cement.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4S, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
- F. Water: Potable and complying with ASTM C 94/C 94M.

2.5 SURFACE COLORING MATERIALS

- 1. Spray-Deck by Increte

**SECTION 321316
DECORATIVE CONCRETE PAVING**

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
- B. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B, manufactured for colored concrete.
 - 1. For integrally colored concrete, curing compound shall be pigmented type approved by coloring admixture manufacturer.
 - 2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.
- C. Clear Acrylic Sealer: Manufacturer's standard, waterborne, nonyellowing and UV-resistant, membrane-forming, medium-gloss, acrylic copolymer emulsion solution, manufactured for colored concrete, containing not less than 15 percent solids by volume.
- D. Slip-Resistance-Enhancing Additive: Manufacturer's standard finely graded aggregate or polymer additive, designed to be added to clear acrylic sealer to enhance slip resistance of sealed paving surface.

2.7 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.
- B. Polyethylene Film: ASTM D 4397, 1 mil thick, clear.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M).
- B. Cementitious Materials:
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Slag Cement: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- C. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- D. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.
- F. Concrete Mixtures: Normal-weight concrete.
 - 1. Compressive Strength (28 Days): 3000 psi.
 - 2. Maximum W/C Ratio at Point of Placement: 0.50
 - 3. Slump Limit: 5 inches, plus or minus 1 inch.

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DECORATIVE CONCRETE PAVING**

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll prepared subbase surface below decorative concrete paving to identify soft pockets and areas of excess yielding.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.

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- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- B. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

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- E. Curing Compound: Apply immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 SEALER APPLICATION

- A. Clear Acrylic Sealer: Apply uniformly in two coats in continuous operations according to manufacturer's written instructions. Allow first coat to dry before applying second coat, at 90 degrees to the direction of the first coat, using same application methods and rates.
 - 1. Begin sealing dry surface no sooner than 14 days after concrete placement.
 - 2. Thoroughly mix slip-resistance-enhancing additive into sealer before applying sealer according to manufacturer's written instructions. Stir sealer occasionally during application to maintain even distribution of additive.

3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 (ACI 117M).

3.11 REPAIR AND PROTECTION

- A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.
- C. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321316

**SECTION 321816.13
PLAYGROUND PROTECTIVE SURFACING**

SECTION 321816.13 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Unitary, tile surfacing.

1.2 DEFINITIONS

- A. Critical Height: Standard measure of shock attenuation according to ASTM F 2223; same as "critical fall height" in ASTM F 1292.
- B. Unitary Surfacing: A protective surfacing of one or more material components bound together to form a continuous surface; same as "unitary system" in ASTM F 2223.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of protective surfacing.
 - 1. Include plans, sections, placement details, and attachment to substrates.
 - 2. Include accessories and edge terminations.
 - 3. Include fall heights and use zones for equipment and structures specified in Section 116800 "Play Field Equipment and Structures," coordinated with the critical heights for protective surfacing.
- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Product certificates.
- C. Field quality-control reports.
- D. Sample warranty.

**SECTION 321816.13
PLAYGROUND PROTECTIVE SURFACING**

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace components of protective surfacing that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: **Two** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Impact Attenuation: Critical fall height tested according to ASTM F 1292.
- B. Accessibility Standard: Minimum surfacing performance according to ASTM F 1951.

2.2 UNITARY, TILE SURFACING

- A. Description: Manufacturer's standard blend of rubber or PVC particles forming an integral wearing and cushioning material, with overall thickness as required, tested for impact attenuation according to ASTM F 1292 **and for accessibility according to ASTM F 1951.**
 - 1. Unit Size: **24 by 24 inches.**
 - 2. Base Profile: Integral ribbed or grid-patterned underside forming channels for water drainage between protective surfacing and substrate.
 - 3. Edging and Corner Units: Tapered, bevel-edged units that transition from top surface of protective surfacing to the adjacent, lower surface; size compatible with field units maintaining layout pattern continuity. Provide edging and corner units where protective surfacing does not abut vertical surfaces.
 - 4. Critical Height: As measured from top of highest play surface of existing play structure.
 - 5. Overall Thickness: Not less than **as required for critical height indicated.**
 - 6. Primer/Adhesive: Manufacturer's standard primer and weather-resistant, moisture-cured polyurethane adhesive suitable for unit, substrate, and location.
 - 7. Anchors: Manufacturer's standard for unit, substrate, and location.
 - 8. Tile Color(s): **As selected by Architect from manufacturer's full range.**
 - 9. Filler/Sealant: Manufacturer's standard clear silicone or polyurethane filler/sealant suitable for exterior use.

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- B. Leveling and Patching Material: Portland cement-based grout or epoxy- or polyurethane-based formulation suitable for exterior use and approved by protective surfacing manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.
 - 1. Repair: Fill holes and depressions in unsatisfactory surfaces with leveling and patching material.

3.2 INSTALLATION OF TILE SURFACING

- A. Apply components of tile surfacing according to manufacturer's written instructions to produce a uniform wearing surface with no unaligned units, raised edges (lipping), or other surface imperfections.
- B. Lay out units from center marks established between principal perimeter edges, discounting minor offsets, so units at opposite sides of installation are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half of a unit.
- C. Edging: Maintain fully cushioned thickness required to comply with performance requirements.
- D. Filler/Sealant: Mask area surrounding cutouts around playground equipment supports and other obstructions. Apply a full bead of filler/sealant, filling cutouts immediately after laying tile around cutout.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: **Owner will engage** a qualified testing agency to perform tests.
- B. Perform the following tests **with the assistance of a factory-authorized service representative**:
 - 1. Perform "Installed Surface Performance Test" according to ASTM F 1292 for each protective surfacing type and thickness in each playground area.
- C. Playground protective surfacing will be considered defective if it does not pass tests.
- D. Prepare test reports.

END OF SECTION 321816.13

SECTION 329113
SOIL PREPARATION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Soil preparation
 - 2. Mulching
 - 3. Planting Soil Mixing
 - 4. Planting Beds

- B. Related Requirements:
 - 1. Section 329300 "Plants"

1.2 DEFINITIONS

- A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

- B. Imported Soil: Soil that is transported to Project site for use.

- C. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

- E. 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.

- F. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

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

- H. USCC: U.S. Composting Council.

1.3 PREINSTALLATION MEETINGS

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

**SECTION 329113
SOIL PREPARATION**

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.
- C. Submit certified reports for each test required.

1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Sample warranty.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
- B. Soil testing shall be performed and reported for particle size, requiring percent of gravel (>2.0mm), very coarse sand (2.0-1.0mm), coarse sand (1.0-0.5mm), medium sand (0.5-0.25mm), fine sand (0.25-0.10 mm), very fine sand (0.10-0.05 mm), silt (0.05-0.002 mm), and clay (<0.002mm). Saturated conductivity, bulk density, pH, total porosity, salt content, ammonium content, and organic matter percentage on a dry weight basis shall also be tested.
- C. Test every soil mix batch made, or every 150 cu yd. of individual soil layers; if using less than 100 cu yd. per soil layer, just one QA test should be sufficient. Testing should include, but is not limited to, the following:
 - 1. Plasticity index
 - 2. Soil pH
 - 3. Particle size, percentage soil texture
 - 4. Percentage organic matter
 - 5. Nutrient level analysis
 - a. Macro, secondary, and micro nutrients
 - b. Nitrate
 - c. Potassium
 - d. Phosphorus
 - e. Calcium
 - f. Magnesium
 - g. Sodium
 - h. Percolation rate
 - i. Conductivity

**SECTION 329113
SOIL PREPARATION**

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Soil that is to be stockpiled longer than two weeks, whether on- or off- site, shall not be placed in mounds greater than 6 feet high. If soil stockpiles greater than 6 feet high are to be stored for more than two weeks, the contractor shall break down and disperse soil so that mounds do not exceed the 6-foot height restriction, or thoroughly mix the stockpile once a month.
- B. Soil materials shall be covered at least two weeks prior to installation, to prevent excess moisture from saturating the stockpile. Test for moisture content of the planting soil using the gravimetric over dry method, as described in Soil Science Society of America, *Methods of Soil Analysis*, Part 1, 1986, at least two days prior to soil installation.
- C. Soil materials shall not be handled or hauled, placed, or compacted when it is wet, as after a heavy rain, nor when frozen. Soil shall be handled only when the moisture content is between the specified ranges in percent water volume.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. Planting-Soil Type A: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with soil amendments and fertilizers to produce planting soil:
 - 1. Complies with ASTM D 5268-13.
 - 2. With a pH of 6 to 8.5.
 - 3. That is free of stones 2 inches (50 mm) or larger in any dimension and other extraneous material harmful to plant growth.
- B. Planting-Soil Type B: Imported, naturally formed soil from off-site sources and consisting of ½ by volume screened soil, ¼ by volume mineral sand, ¼ by volume compost material according to USDA textures; and modified to produce viable planting soil.
 - 1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
 - 2. Unacceptable Properties: Clean soil of the following:
 - a. Unacceptable Materials: 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 that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.

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- c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.

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 a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Perlite: Horticultural perlite, soil amendment grade.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
 - 1. Reaction: pH of 5.5 to 8.
 - 2. Soluble-Salt Concentration: Less than 4 dS/m.
 - 3. Moisture Content: 35 to 55 percent by weight.
 - 4. Organic-Matter Content: 30 to 40 percent of dry weight.
 - 5. Particle Size: Minimum of 98 percent passing through a 4-inch sieve.
- B. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- C. 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. 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: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

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- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. 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 planting soil.
- C. Verify that underdrainage and/or irrigation systems have been installed and accepted, if applicable.
- D. Verify that the subgrade passes the minimum water infiltration requirement.
- E. Determine that the subgrade is free of debris.
- F. Verify that the soil mix and topsoil are below 10 percent moisture at least two days prior to placement.
- G. Notify the Landscape Architect of soil placement operations at least 10 calendar days prior to the beginning of work.

3.2 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Amendments: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - a. Mix lime and sulfur, if required, with dry soil before mixing fertilizer.
 - b. Mix fertilizer with planting soil no more than seven days before planting.

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2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 12 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Application: Spread planting soil to total depth indicated on Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Lifts: Apply planting soil in lifts not exceeding 12 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.

1. Mix lime and sulfur, if required, with dry soil before mixing fertilizer.

2. Mix fertilizer with planting soil no more than seven days before planting.

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- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Soil will be considered defective if it does not pass tests and inspections.

3.7 PROTECTION AND CLEANING

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

SECTION 329300
PLANTS

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plants.
2. Tree-watering devices.
3. Landscape edgings.

B. Related Requirements:

1. Section 329113 "Soil Preparation."

1.2 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

C. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.

D. 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.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples of each type of mulch.

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PLANTS**

1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.7 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver bare-root stock plants within 24 hours of digging. 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. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- B. 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.
- C. Handle planting stock by root ball.
- D. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- E. 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.

1.9 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

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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.
 - b. Structural failures including plantings falling or blowing over.
2. Warranty Periods: From date of planting completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 - c. Annuals: Three months.

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 List, Plant Schedule, or Plant Legend indicated 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.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- C. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

- A. 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.

2.3 MULCHES

- A. Organic Mulch: Texas shredded hardwood.
- B. Mineral Mulch: Rounded riverbed gravel or smooth-faced stone.
 1. Size Range: 3/4 inch maximum, 1/4 inch minimum.

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PLANTS**

2. Color: Uniform tan-beige color range acceptable to Landscape Architect.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. 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..

2.5 PESTICIDES

- A. General: Pesticide registered and approved by the 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.

2.6 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
 1. Edging Size: 1/8 inch thick by 6 inches deep minimum.
 2. Finish: Unfinished.

2.7 TREE-WATERING DEVICES

- A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

PART 3 - EXECUTION

3.1 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.
- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

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PLANTS**

3.2 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. 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.
 - 2. Excavate approximately three times as wide as ball diameter.
 - 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 - 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

3.3 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of 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. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Backfill: Planting soil.
 - 2. Balled and Burlapped Stock: 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. Balled and Potted and Container-Grown Stock: Carefully remove root ball from container without damaging root ball or plant.
 - 4. Fabric Bag-Grown Stock: 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.
 - 5. Bare-Root Stock: Support stem of each plant and spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working. Carefully work backfill around roots by hand. Bring roots into close contact with the soil.
 - 6. 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.

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7. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Bare-Root Stock: Place tablets beside soil-covered roots; do not place tablets touching the roots.
 8. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Slopes: 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.

3.4 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Do not apply pruning paint to wounds.

3.5 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.6 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

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3.7 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.
- B. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch-deep, shovel-cut edge.

3.8 INSTALLING SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree.

3.9 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- 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 when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. Apply pesticides and other chemical products and biological control agents according to 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.
- E. 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.
- F. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.10 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. 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 for Trees and Shrubs: 12 months from date of planting completion.
 - 2. Maintenance Period for Ground Cover and Other Plants: Six months from date of planting completion.

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END OF SECTION 329300