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I-70 WB CENTERVILLE WELCOME CENTER
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PROJECT MANUAL
For construction of:

I-70 WB Welcome Center
Centerville, Indiana

Public Works Project
89006007-23-034-C1

For

Department of Transportation

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CERTIFICATION PAGE

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SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ground-set flagpoles made from aluminum.

B. Flags 4 ft x6 ft size. Contractor to furnish.
1. Indiana state flag
2. U.S. flag

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For each flagpole.

1. Include the following

a. Plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
b. Section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Delegated Design Submittals: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Seismic Performance: Flagpole assemblies to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 95 mph.
2. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

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. Acme/Lingo Flagpoles, LLC.
b. American Flagpole.
c. Baartol Company.
d. Concord Industries, Inc.
e. Eder Flag Manufacturing Company, Inc.
f. Ewing Flagpoles.
g. Morgan-Francis Flagpoles and Accessories.
h. Pole-Tech Company Inc.
i. U.S. Flag & Flagpole Supply, LP.

B. Exposed Height: 35 feet.

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

D. Sleeve for Aluminum Flagpole: PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Flashing Collar: Same material and finish as flagpole.

2.4 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum[, finished to match flagpole][with gold anodic finish].

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.5 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.6 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

F. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.

G. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

H. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

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. Section includes playground equipment as follows:

1. Freestanding playground equipment.
2. Composite playground equipment.

1.3 DEFINITIONS

A. Definitions in ASTM F1487 apply to Work of this Section.

B. IPEMA: International Play Equipment Manufacturers Association.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of playground equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816.13 "Playground Protective Surfacing."

C. Samples for Initial Selection: For each type of exposed finish.

1. Manufacturer's color charts.
2. Include Samples of accessories involving color selection.

D. Samples for Verification: For each type of exposed finish on the following products:

1. Include Samples of accessories to verify color and finish selection.
2. Posts and Rails: Minimum 6 inches long.
3. Platforms: Minimum 6 inches square.
4. Molded Plastic: Minimum 3 inches square.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer and testing agency.

B. Product Certificates: For each type of playground equipment.

C. Material Certificates: For the following items:

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.

D. Field quality-control reports.

E. Sample Warranty: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground equipment and finishes to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

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

1.9 WARRANTY

A. Special Warranty: 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 and use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Provided either the named product or a comparable product approved in advance by Landscape Architect. Refer to front end specifications section 012500 Substitution Procedures for substitution process for additional comparable product approval process.

B. Playground equipment and components shall have the IPEMA Certification Seal.

2.2 PERFORMANCE REQUIREMENTS

A. Safety Standard: Provide playground equipment according to ASTM F1487.

2.3 PLAYGROUND EQUIPMENT

1. Refer to drawings for list of equipment and layout.

2. For foundation sizes and requirements reference Kompan standard details.

2.4 FABRICATION

A. Provide sizes, strengths, thicknesses, wall thickness, and weights of components as required to comply with requirements in ASTM F1487. Factory drill components for field assembly. Unnecessary holes in components, not required for field assembly, are not permitted. Provide complete play structures, including supporting members and connections, means of access and egress, designated play surfaces, barriers, guardrails, handrails, handholds, and other components indicated or required for equipment indicated.

B. Metal Frame: Fabricate main-frame upright support posts from metal pipe or tubing with cross-section profile and dimensions as required. Unless otherwise indicated, provide each pipe or tubing main-frame member with manufacturer's standard drainable bottom plate or support flange. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.

C. Wood Frame: Fabricate main-frame upright support posts from wood. Fabricate secondary frame members, bracing, and connections from wood, steel, or aluminum.

D. Composite Frame: Fabricate main-frame upright support posts from metal and plastic. Fabricate secondary frame members, bracing, and connections from either steel or aluminum.

E. Play Surfaces: Manufacturer's standard elevated drainable decks, platforms, landings, walkways, ramps, and similar transitional play surfaces, designed to withstand loads; fabricated from perforated or expanded metal molded plastic plastic panel or plank polyethylene panel or plank wood plank made into floor units with slip-resistant finish. Fabricate units in modular sizes and shapes to form assembled play surfaces indicated.

F. Protective Barriers: Fabricate according to ASTM F1487. Extend barriers to height above the protected elevated surface according to requirements for use by age group indicated. Fabricate from one or more of the following:

1. Welded-metal pipe or tubing with vertical bars.
2. Steel sheet with openings for vision and ventilation.
3. Metal-pipe or -tubing frame with wire-mesh infill panels.
4. Opaque plastic panels with openings.
5. Vertical wood balusters with metal pipe or tubing or wood frame.
6. Wood panels with openings for vision and ventilation.

G. Guardrails: Provide guardrails configured to completely surround the protected area, except for access openings. Fabricate from welded metal pipe or tubing. Extend guardrails according to requirements for use by age group indicated.

H. Handrails: Welded metal pipe or tubing, maximum OD between 0.95 and 1.55 inches (24 and 39 mm) of 0.125 inch (3.2 mm).

1. Provide handrails at heights to comply with requirements for use by age group indicated according to ASTM F1487.

I. Signs: Manufacturer's standard sign panels, fabricated from HDPE opaque plastic with graphics, attached to freestanding, upright support posts or directly to playground equipment.

1. Text: Minimum informational content according to ASTM F1487, safety requirements for equipment with heat concerns, general playground rules of safety.
2. Colors: Standard colors from manufacturer as selected by the Landscape Architect.

2.5 MATERIALS

A. Aluminum: Material, alloy, and temper recommended by manufacturer for type of use and finish indicated.

B. Steel: Material types, alloys, and forms recommended by manufacturer for type of use and finish indicated, hot-dip galvanized.

C. Stainless-Steel Sheet: Type 304; finished on exposed faces with No. 2B finish.

D. Wood: Manufacturer’s standard, surfaced smooth on all sides and all edges rounded.

E. Plywood: PS 1, Exterior grade; smooth surfaced with rounded edges; preservative treated after fabrication.

F. Opaque Plastics: Color impregnated, UV stabilized, and mold resistant.

G. Transparent Plastic: Abrasion-resistant, UV-stabilized polycarbonate sheet; clear, colorless; not less than 3/16 inch (5 mm) thick.

H. Suspension Chain and Fittings: ASTM A467/A467M, Class CS, 4/0 or 5/0, welded-straight-link coil chain; hot-dip galvanized zinc plated or PVC coated; with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and swing or ring hangers.

I. Suspension Cable: Manufacturer's standard hot-dip galvanized zinc-plated or PVC-coated cable; with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and swing or ring hangers.

J. Iron Castings and Hangers: Malleable iron, ASTM A47/A47M, Grade 32510, hot-dip galvanized.

K. Post Caps: Cast aluminum or color-impregnated, UV-stabilized, mold-resistant polyethylene or polypropylene; color to match posts.

L. Platform Clamps and Hangers: Cast aluminum or zinc-plated steel, not less than 0.105-inch- (2.7-mm-) nominal thickness.

M. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a vandal-resistant design.

N. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or zinc-plated steel and iron, or stainless steel; permanently capped; and theft resistant.

2.6 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment: Pressure-treat wood products according to AWPA U1 and the following:

1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

2.7 CAST-IN-PLACE CONCRETE

A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" ACI 301/ (ACI 301M) for normal-weight, air-entrained concrete with

minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (76-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

B. Concrete Materials and Properties: Dry-packaged concrete mix complying with ASTM C387/C387M and mixed at site with potable water, according to manufacturer's written instructions, for normal-weight concrete with minimum 28-day compressive strength of 3000 psi (20.7 MPa), 3-inch (76-mm) slump, and 1-inch- (25-mm-) maximum-size aggregate.

2.8 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 80 mils (2 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

2.9 IRON AND STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions for pretreatment, applying, and baking.

B. PVC Finish: UV-stabilized, mold-resistant, slip-resistant, matte-textured, dipped or sprayed-on PVC finish, with flame retardant added, and with minimum dry film thickness of 80 mils (2 mm). Comply with coating manufacturer's written instructions for pretreatment and application.

2.10 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written installation instructions for each equipment type unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values 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 Section 033000 "Cast-in-Place Concrete" ACI 301 (/ACI 301M) for measuring, batching, mixing, transporting, forming, and placing concrete.

1. Set equipment posts on concrete footing. 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: Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.
3. Finishing Footings: Smooth top, and shape to shed water.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contractor responsible for engaging a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Perform inspection and testing for each type of installed playground equipment according to ASTM F1487.

C. Playground equipment items will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

E. Notify Architect and Owner 72 hours in advance of date(s) and time(s) of testing and 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. Section Includes:
1. Benches, chairs, tables, bollards, and litter receptacles.
2. Signs

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.

C. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For site furnishings manufactured with preservative-treated wood.

1. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 CLOSEOUT SUBMITTALS

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

PART 2 - PRODUCTS

2.1 Basis-of-Design Product: Provided either the named product or a comparable product approved in advance by Landscape Architect. Refer to front end specifications section 012500 Substitution Procedures for substitution process for additional comparable product approval process.

2.2 BENCHES, TABLES, CHAIRS, BOLLARDS, AND LITTER RECEPTACLES

A. Refer to plans for product information.

B. Wood Bench identified on plans by Sitecraft to have integral led light strips installed by Sitecraft. Sitecraft to provide shop drawings showing segments of bench lengths and plans for contractor to install benches.

2.3 WAYFINDING SIGNS, INTERPERTIVE SIGNS, RULES SIGNS AND TRAIL MARKER

A. Refer to plans for product information on interpretive signs, rules sign, and trail marker.

B. Wayfinding signs to be custom fabricated, refer to details for design intent.

C. All sign graphics will be provided to contractor in digital format by landscape architect for contractor’s use. Submit shop drawings for each sign after receiving graphics for approval by landscape architect prior to fabrication.

2.4 MATERIALS

A. Steel and Iron: Free of surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A36/A36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A53/A53M, or electric-resistance-welded pipe complying with ASTM A135/A135M.
3. Tubing: Cold-formed steel tubing complying with ASTM A500/A500M.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A513/A513M, or steel tubing fabricated from steel complying with ASTM A1011/A1011M and complying with dimensional tolerances in ASTM A500/A500M; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A1011/A1011M.
6. Malleable-Iron Castings: ASTM A47/A47M, grade as recommended by fabricator for type of use intended.
7. Gray-Iron Castings: ASTM A48/A48M, Class 200.

B. Wood: Surfaced smooth on four sides with eased edges; kiln dried, free of knots, solid stock of species indicated by manufacturer.

C. Anchors, Fasteners, Fittings, and Hardware: Stainless steel; commercial quality, tamperproof, vandal and theft resistant.

1. Angle Anchors: For inconspicuously bolting legs of site furnishings to on-grade substrate; extent as indicated.
2. Antitheft Hold-Down Brackets: For securing site furnishings to substrate; two per unit.

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. 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.

E. Factory Assembly: Factory assemble components to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.6 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STEEL FINISHES

A. Powder-Coat Finish: Manufacturer's standard 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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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 321313 - CONCRETE PAVING

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 Concrete Paving Including the Following:

1. Concrete Aprons.
2. Walks.

B. Related Requirements:
1. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

a. Concrete mixture design.
b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete paving Subcontractor.
e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Laboratory Test Reports: For concrete paving mixtures, documentation indicating that cured concrete complies with Solar Reflectance Index requirements.

C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

1. Exposed Aggregate: 10-lb Sample of each mix.

E. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer of stamped detectable warnings, ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.7 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.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

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 full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.9 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

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.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from as-drawn galvanized-steel wire into flat sheets.

C. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

D. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

E. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

F. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

H. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 deformed bars; assembled with clips.

I. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn galvanized.

J. Deformed-Steel Wire: ASTM A 1064/A 1064M.

K. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated, plain and deformed.

L. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

M. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 plain-steel bars.

N. Tie Bars: ASTM A 615/A 615M, Grade 60; deformed.

O. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

P. 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:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

Q. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

R. Zinc Repair Material: ASTM A 780/A 780M.

2.4 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Regional Materials: Concrete shall be manufactured within 500 miles of Project site.

C. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, gray portland cement Type I/II.
2. Fly Ash: ASTM C 618, Class C or Class F.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4M, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. 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.

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.

G. Water: Potable and complying with ASTM C 94/C 94M.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

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. Euclid Chemical Company (The); an RPM company.
b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
c. Nycon, Inc.
d. Sika Corporation.

B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

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. Euclid Chemical Company (The); an RPM company.
b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
c. Nycon, Inc.
d. Sika Corporation.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

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. BASF Corp. - Construction Chemicals.
b. Brickform; a division of Solomon Colors.
c. Dayton Superior.
d. Euclid Chemical Company (The); an RPM company.
e. Kaufman Products, Inc.
f. Nox-Crete Products Group.
g. Sika Corporation.
h. SpecChem, LLC.
i. TK Products.
j. Vexcon Chemicals Inc.
k. W.R. Meadows, Inc.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

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. Dayton Superior.
b. Euclid Chemical Company (The); an RPM company.
c. Kaufman Products, Inc.
d. Nox-Crete Products Group.
e. Right Pointe.
f. SpecChem, LLC.
g. TK Products.
h. Unitex by Dayton Superior.
i. Vexcon Chemicals Inc.
j. W.R. Meadows, Inc.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

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. Dayton Superior.
b. Euclid Chemical Company (The); an RPM company.
c. Kaufman Products, Inc.
d. SpecChem, LLC.
e. Vexcon Chemicals Inc.
f. W.R. Meadows, Inc.

2.7 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, nonload bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.

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. Dayton Superior.
b. Euclid Chemical Company (The); an RPM company.
c. Kaufman Products, Inc.
d. Sika Corporation.
e. SpecChem, LLC.
f. TK Products.
g. Vexcon Chemicals Inc.
h. W.R. Meadows, Inc.

F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. 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. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

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. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 6-1/2 percent plus or minus 1-1/2 percent for 1-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

   1. Use water-reducing admixture in concrete as required for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

G. 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.

H. Concrete Mixtures: Normal-weight concrete.

   1. Compressive Strength (28 Days): 4000 psi.
   2. Maximum W/C Ratio at Point of Placement: 0.45.
   3. Slump Limit: 5 inches, plus or minus 1 inch.
   4. Solar Reflectance Index: Not less than 29.

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.

   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

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

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

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.

1. When joining existing paving, place transverse joints to align with previously placed joints 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.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

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, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

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. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. 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.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. 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.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

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.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line 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.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or 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.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-feet-long; unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd., 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect 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 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 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

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. Cold-applied joint sealants.
2. Joint-sealant backer materials.
3. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of joint sealant and accessory.

1.5 QUALITY ASSURANCE

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

B. Product Testing: Test joint sealants using a qualified testing agency.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

A. Multicomponent, Pourable, Urethane, Elastomeric Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T.

1. Basis of Design: Sika Corporation, Sikaflex-2C SL.

2.3 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

2.4 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.

3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete pavers.

B. Related Requirements:
   1. Section 033000 "Cast in Place Concrete" for concrete base under unit pavers

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.3 ACTION SUBMITTALS

A. Product Data:

   1. For materials other than water and aggregates.
   2. For the following:

      a. Pavers.
      b. Bituminous setting materials.
      c. Edge restraints.

B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

C. Samples for Initial Selection: For each type of unit paver indicated and the following:

   1. Joint materials involving color selection.
   2. Exposed edge restraints involving color selection.

D. Samples for Verification: For full-size units of each type of unit paver indicated. Assemble no fewer than five Samples of each type of unit on suitable backing and grout joints. Include Samples of the following:

   1. Joint materials.
   2. Exposed edge restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's field supervisor personnel assigned to the Work must have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with the following designations:
   1. Commercial Paver Technician Designation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store asphalt cement and other bituminous materials in tightly closed containers.

1.7 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Bituminous Setting Bed:

   1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.
   2. Apply asphalt adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Basis-of-Design Product: Basis of Design for pavers are Wausau tile for precast shapes and Techo Block for plank pavers. Provided either the named product or a comparable product approved in advance by Landscape Architect. Refer to front end specifications section 012500 Substitution Procedures for substitution process for additional comparable product approval process.

2.2 CONCRETE PAVERS

A. Concrete Pavers, Solid Paving Units, Normal-Weight Concrete: Solid paving units made from normal-weight concrete with a compressive strength not less than 5000 psi [water absorption not more than 5 percent according to ASTM C140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C67.

1. Thickness: Refer to paving plans
2. Face Size and Shape: Refer to paving plans

3. Color: Refer to paving plans

2.3 CURBS AND EDGE RESTRAINTS

a. Per details

2.4 BITUMINOUS SETTING-BED MATERIALS

A. Fine Aggregate for Setting Bed: ASTM D1073, No. 2 or No. 3.

B. Asphalt Cement: ASTM D3381/D3381M, Viscosity Grade AC-10 or Grade AC-20.

C. Neoprene-Modified Asphalt Adhesive: Paving manufacturer's standard adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos.

D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

1. Provide sand of color needed to produce required joint color. Submit sand color samples to Landscape Architect for approval prior to installation.

2.5 BITUMINOUS SETTING-BED MIX

A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate unless otherwise indicated. Heat mixture to 300 deg F (149 deg C).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Pattern: Refer to Paving Plans

F. Tolerances:

1. Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

G. Expansion and Control Joints:

H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch (25 mm) below top edge.

3.4 BITUMINOUS SETTING-BED APPLICATIONS

A. Prepare for setting-bed placement by locating 3/4-inch- (19-mm-) deep control bars approximately 11 feet (3.3 m) apart and parallel to one another, to serve as guides for striking board. Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.

B. Place bituminous setting bed where indicated, in panels, by spreading bituminous material between control bars. Spread mix at a minimum temperature of 250 deg F (121 deg C). Strike setting bed smooth, firm, even, and not less than 3/4 inch (19 mm) thick. Add fresh bituminous material to low, porous spots after each pass of striking board. After each panel is completed, advance first control bar to next position in readiness for striking adjacent panels. Carefully fill depressions that remain after removing depth-control bars.

C. Place pavers carefully by hand in straight courses, maintaining accurate alignment and uniform top surface. Protect newly laid pavers with plywood panels on which workers can stand. Advance protective panels as work progresses, but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.

D. Joint Treatment: Place unit pavers with hand-tight joints. Fill joints by sweeping sand over paved surface until joints are filled. Remove excess sand after joints are filled.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

END OF SECTION 321400

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 wheel stops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.

1. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
2. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter, 10-inch minimum length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.

B. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

PART I: GENERAL

1.1 DESCRIPTION:

A. Seamless, hand-troweled, unitary playground safety surface. Bidder shall provide all materials, installation details, labor, and equipment required to properly install the poured-in-place (PIP) system.

1.2 QUALITY ASSURANCE:

A. Qualifications
1. IPEMA Certification: Products must be IPEMA certified (go to www.ipema.org for certificate)
2. The PIP system shall be warranted by Fibar for any defects in materials and workmanship for five (5) years and for impact attenuation to ASTM F1292 (less than 1,000 HIC and 200G) for a period of three (3) years from the date of completion. See Limited Warranty for details and restrictions.
3. Test results showing compliance with various playground surfacing standards as per section 1.4 – Submittals together with other Bidder requirements.

B. Design and Detailing
C. The PIP system is utilized when an impact-absorbing surface is required within the Use Zone of playground equipment. Each system is engineered to meet CPSC Guidelines, ASTM F1292 Impact Attenuation, ASTM F1951 wheelchair mobility criteria, and complies with ASTM F2223 *Standard Guide for ASTM Standards on Playground Surfacing*.
D. Substrates over which PIP may be installed include concrete, asphalt, or compacted aggregate.

1.4 SUBMITTALS:
A. Product Data
B. Bidder must submit test results from an independent, qualified laboratory showing that PIP product passes:
1. ASTM F1292 Standard for Impact Attenuation
2. ASTM F1951 Standard for ADA compliance
3. ASTM D2859 Standard for Flammability
4. CPSC-CH-E1002-08.3 2012 – CPSIA Total Lead in Accessible Substrate Material: Non-Metal Children's Products

C. Independently Tested For:
1. Tear Strength (for durability) according to ASTM D624-00el Standard
2. Tensile Strength (for durability) according to ASTM D412-02

3. Coefficient of Friction (for slip resistance) according to ASTM D2047
4. Surface Friction (for slip resistance) according ASTM E303
5. Abrasion (for durability) according to ASTM C501 Taber Abrasion Test

D. Plus, additional benefits:
1. IPEMA Certification
2. Five-year Limited Warranty on Durability and 3-year Limited Warranty on impact attenuation to ASTM F1292
3. $10 million product liability insurance certificate with project owner named as certificate holder
4. Detailed Maintenance Instructions

1.5 INSTALLATION RECOMMENDATIONS:

A. It is recommended that the air temperature be greater than 45° F during the installation process. Lower temperatures may affect the polyurethane curing process. If the temperature is below 45°, professional judgment must be used to weigh the risk of installing the surface versus leaving the play equipment without safety surfacing.

PART 2: PRODUCTS

2.1 BASIS OF DESIGN

A. Basis-of-Design Product: Provided either the named product or a comparable product approved in advance by Landscape Architect. Refer to front end specifications section 012500 Substitution Procedures for substitution process for additional comparable product approval process.

2.2 PRODUCT:

A. FibarPIP Poured-In-Place is available from your local Representative

Or directly from The Fibar Group, LLC
80 Business Park Drive, Suite 300, Armonk, New York 10504-1705
Telephone: 800-342-2721 • 914-273-8770 • Fax: 914-273-8659 •
Email: Info@Fibar.com

B. **Top Surface Color:** FIELD 50% orange 50% black. BANDS 100% black. Submit sample to landscape architecture for approval prior to installation.

2.3 DEPTHS AND RECOMMENDED FALL HEIGHTS:

A. The depths of FibarPIP Poured-In-Place necessary for specified Fall Heights are as follows:

Critical Fall Height	Depth of Surfacing	Critical Fall Height	Depth of Surfacing
3 feet	1.75”	7 feet	3.50”
4 feet	2.00”	8 feet	3.75”
5 feet	2.50”	9 feet	4.25”
6 feet	3.00”	10 feet	5.00”

2.4 MATERIALS:

A. Primer: A single-component, moisture-cured polyurethane

B. Binder: Aliphatic - An MDI-based, free of solvent and TDI Monomers, elastomeric, polyurethane pre-polymer with low odor, clear in color and exceptional weathering and binding attributes. Aliphatic binder is a UV stabilized, non-yellowing moisture curing binder to preserve color fastness. The binder is specifically formulated for compatibility with SBR and EPDM/TPV granules.

C. SBR Black Base Layer:
1. Recycled SBR rubber buffings
2. 3/8” sieve with less than 4% dust (6-16 mesh)
3. Containment Bags shall provide ample moisture protection.

D. EPDM/TPV Wear Surface:
1. ½” EPDM/TPV cap thickness
2. Ultra-violet light-stabilized virgin EPDM/TPV rubber (excluding black)
3. EPDM/TPV shall be full color. No coated rubber is permitted.
4. Sieve sizes of 1.0 mm – 3.5 mm

2.5 MIXING AND PREPARATION:

A. Binder/SBR and binder/EPDM/TPV mix ratios shall be determined by the specified system.

PART 3 – EXECUTION

3.1 POURED-IN-PLACE SYSTEM:

A. Primer: When required, apply primer using a 3/8” napped roller at a rate of 300 square feet per gallon. Do not apply over crushed stone base. Prime all vertical interfaces of curbs, etc.

B. Owner/Operator understands that if FibarPIP Poured-In-Place is placed near a sand play area, impact attenuation of the FibarPIP Poured-In-Place may be adversely affected.

C. SBR Base Layer

1. Binder-to-rubber ratio shall be 15% by weight of rubber to achieve proper resiliency
2. Mix binder and SBR rubber in a paddle-type mixer for 1 to 2 minutes or until rubber particles are encapsulated.
3. Spread this mix to the desirable thickness using a screed bar.
4. Using a steel trowel, uniformly compact the mix. Periodically lubricate the trowel with mineral spirts as work progresses. Do not saturate the rubber surface with cutting agents.
5. Allow base layer to cure to the point of supporting foot traffic without deforming the base layer and before proceeding with the EPDM/TPV wear surface.

D. EPDM/TPV Wear Surface

1. Binder-to-rubber ratio shall be 20% by weight of rubber to achieve maximum durability
2. Mix EPDM/TPV and binder in paddle-type mixer for 1 to 2 minutes or until materials are thoroughly encapsulated. Using a screed bar, level the mix over the base layer.
3. Using a steel trowel, uniformly compact the mix. Periodically lubricate the trowel with soapy water as work progresses. Do not saturate the rubber surface with cutting agents.
4. Allow wear surface to cure 24 to 72 hours before opening the area for play. The surface must be tack-free before attempting to walk on the surface.

3.2 CLEAN-UP:

A. Clean all tools with mineral spirits.

3.3 GENERAL PRECAUTIONS:

A. Wear protective clothing and safety glasses when handling materials. Follow all safety precautions listed on packaging labels. Refer to Material Safety Data Sheets for safety

information.

3.4 VISUAL INSPECTION

A. Sand, mud, pea gravel, etc. will need to be removed to prevent loss of impact attenuation. These particles will require the use of a vacuum with sufficient strength to penetrate the depth of the surface. At no time should the surface be pressure-washed.

B. Remove debris such as stones, broken glass, contaminants, or other foreign objects. In heavily used parks, inspect daily.

C. The maintenance procedures and costs should be known and provided for prior to purchase to ensure the performance and longevity of the surfacing and the playground.

D. Cleaning – Surface may be cleaned with a broom, blower, or street-pressure hose.

E. Vandalism – Any acts of vandalism that alter the original surface must be repaired.

3.5 INSPECTION AFTER INSTALLATION

A. Contractor shall test installed product to verify it meets the required fall attenuation ASTM F1292. Contractor shall submit test data to landscape architect and owner for review. If installed product does not meet ASTM F 1292 the contractor shall remove and reinstall the product at no cost to the owner. The owner will only sign off on the project after it is demonstrated the product meets ASTM F1292.

3.6 CLOSE OUT SUBMITTALS

A. Inspector review from a Certified Playground Safety Inspector with a statement indicating approval utilizing an approved Playground Safety Compliance Audit Form from International Playground Safety Institute or equal.

END OF SECTION

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SECTION 323116 – WELDED WIRE FENCES AND GATES

PART I - GENERAL

1.01 SCOPE OF WORK

A. Work described in this section includes materials, equipment, labor costs, including shipping of fences, gates and accessories.

1.02 RELATED WORK

A. Division 03 – Concrete
B. Division 04 – Masonry
C. Division 31 – Earthwork
D. Division 32 – Exterior Improvements
E. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 REFERENCES

A. ASTM STANDARDS: American Society for Testing and Materials

1. A121 - 19 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
2. A123 / A123M - 17 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products A153 / A153M - 16a Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. A500 / A500M - 18 Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round Shapes.
4. A505 - 16 Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements A513/A513M - 19 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing A641/A641M - 09a (2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
5. A653/A653M - 19 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
6. A659/A659M - 18 Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled
7. A787/A787M - 15a Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing A853 - 24 (2017) Standard Specification for Steel Wire, Carbon, for General Use
8. A1008 / A1008M - 18 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High- Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
9. A1064 / A1064M - 18a Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
10. B6 - 18 Standard Specification for Zinc
11. B22 - 14 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars,

Rods, Wire, Shapes and Tubes. D2247 - 15 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

12. D2794 - 93 (2014) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact). D3359 - 17 Standard Test Methods for Measuring Adhesion by Tape.
13. F626 - 14 (2019) Standard Specification for Fence Fittings
14. F900 - 11 (2017) Standard Specification for industrial and commercial swing gates.
15. F934 - 96 (2017)Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials. F1043 – 18 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework.
16. F1184 - 16 Standard Specification for industrial and commercial horizontal slide gates.
17. F2919 / F2919M - 12 (2018) Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer Coated) with Variable Mesh Patterns or Meshes Greater than 6 in^2 in Panels
18. F2957 - 13(2019)e1 Standard Specification for Ornamental Aluminum Fence Systems

1.04 SUBMITTALS

A. Product Data: Material descriptions, dimension of individual components and profiles, and finishes for the following:

1. Fence, gate posts, brackets, rails and fittings.
2. Gates and hardware.

B. Shop Drawings: In accordance to Section 01 33 00

1. Show locations of fence, each gate, posts, rails, and details of gate swing direction, or other operation, hardware, and accessories.
2. Indicate materials, dimensions, sizes, weights, and finishes of components.
3. Include plans, elevations, sections, gate swing direction and other required installation and operational clearances, and details of post anchorage, attachment and bracing.
4. Installation recommendations and instructions by manufacturer describing all details for a typical fence and gates.

C. Verification Samples: For each finish product specified, two (2) samples, minimum size 6 in long, representing actual standard/optional color or color chips for custom color.

D. Qualification Data: For firms and persons specified in “Quality Assurance” article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Maintenance Data: Material Safety Data Sheet available upon request.

1.05 SUBSTITUTION OF PRODUCTS

A. Refer to front end specifications section 012500 Substitution Procedures for substitution process.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed installations of 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.

B. Source Limitations for Fences and Gates: Obtain each color, grade, finish, type, and variety of components for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

C. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

1. Coordinate with door hardware and site security requirements.
2. Coordinate direction of entering and exiting traffic with life safety plans.

1.07 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving 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 local utility making services before beginning work.
2. Unless otherwise indicated in the general provisions of the contract, notify the Architect no less than two (2) days in advance of proposed utility interruptions.
3. Do not proceed with utility interruptions without Architect's written permission.

B. Field Measurements: Verify layout information for fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Basis of Design: Provide either the named Product/Manufacturer or a comparable product approved in advance by Architect. Refer to section 1.05 substitution of products.

OMEGA II FENCE SYSTEMS
A division of Metaltech - Omega Inc.
1735, St-Elzéar west
Laval (Quebec), Canada H7L 3N6
Tel: 800-836-6342 / 450-686-9600
Fax: 450-681-5318
Email: customerservice@omegatwo.com
Web site: www.omegatwo.com

2.02 COATINGS

A. Zinc coating:

1. Wire meshes are coated with 0.5 oz/ft^2 (150 g/m^2) zinc in conformity with ASTM A641 Class 1.
2. Square fence posts, swing gate frame and posts:

    a. Thickness of 11GA (0.120 in or 3.0 mm) or less: Zinc coated (pre-galvanized process) with a minimum of 0.9 oz/ft2 (275 g/m2) as per ASTM A653 Grade 90.
    b. Thickness over 1/8 in (3.2 mm): Coated with a minimum of 2.3 oz/ft^2 (705 g/m^2) zinc (hot-dip galvanizing) in conformity with ASTM A123 Grade 100.

B. Polyester Coating:

Polyester coating to be minimum 4 mils applied by an electrostatic process. Coating shall cover all surfaces of the wire and post sections. Coating shall be capable of withstanding the following tests:

1. Mechanical adhesion test as per ASTM D3359 - Method B.
2. Shock resistance tests as per ASTM D2794.
3. Salt spray testing with a minimum of 1 000 hours without red rust appearance, as per ASTM B117.
4. Humidity resistance in a weather meter chamber as per ASTM D2247.
5. Exposure to ultraviolet light with exposure of 1 000 hours using apparatus Type E and 63°C as per ASTM D1499.

C. Polyester Surface Coating Colors:

1. Standard Coating: Black, RAL 9004 (30% Gloss).
2. Chocolate brown, RAL 8017 (55%-60% Gloss).
3. Corten Steel Look: Dark Rust (± 2 years).

2.03 MATERIALS

A. Panel Height:
1. 4-foot-high nominal panels: 49-1/8 in
2. 6-foot-high nominal panels: 70-1/8 in

B. Model “OMEGA ARCHITECTURAL” – Steel Mesh Fence Panels:

1. 92-11/16 in wide, welded by resistance using 6 gauge (0.192 in or 4.9 mm) pre-galvanized steel wire, welded at each crossing to form rectangles 1-15/16 in x 6 in (50.0 x 152.4 mm).
2. Cold rolled annealed wire made of AISI Grade 1018 steel with tensile strength of at least 75 000 psi (515 Mpa) in accordance with ASTM A853.
3. One end of the vertical wires of the panel shall extend 1 in (25.4 mm) from the last or the first horizontal wire to create a spiked top or bottom depending on installed position. The other end is cut flush.
4. Panels shall have the following number of folds based on the panel height:

    a. 4-foot-high nominal panels: 2 folds.
    b. 6-foot-high nominal panels: 3 folds.

5. Panel camber may not exceed 0.094 in (2.5 mm).

C. Square Posts:

D. Cold rolled 1008 grade steel to meet ASTM A500 and ASTM A787 and the following maximum horizontal loads, length as required for installation type:

E. The length of the posts is minimum 36 in (914 mm) more than the actual height of the fence for installation in the ground depending on local land code requirements (frost line).

1. Installation

   a. In ground, post length as required for local frost line requirements
   b. Surface mounted, flanged

2. Post Size
   a. For 4-foot-high nominal panels

Post Size	Gauge	Maximum horizontal load
3 in x 3 in 76.2 mm)	11	383 pounds

   b. For 6-foot-high nominal panels

Post Size	Gauge	Maximum horizontal load
3 in x 3 in	11	922 pounds

F. Post Brackets:

1. Universal Collar Bracket Kit: Universal bracket for standard use on line or end posts 2 in or 3 in (50.8 mm or 76.2 mm). Includes the following: 14 gauge (1.9 mm) steel collar and wire retaining plate 1/4 in x 1 in (6.4 mm x 25.4 mm), nut, washer and carriage bolt 5/16 in x 1-1/2 in (7.9 mm x 38.1 mm), all galvanized steel.
    a. For 90º turn, use the same bracket
    b. For different angles, used the “Universal collar angle brackets”.
    c. For 4-foot-high nominal panels: Provide 4 brackets per panel.
    d. For 6-foot-high nominal panels: Provide 6 brackets per panel.

2. Spider Universal Bracket Kit: Universal bracket for face-mount installation on straight run or internal 90º corner. Designed for installation on 2 in (50.8 mm) and larger studs and consists of the following components: bent steel (3.2 mm thick x 47.6 mm wide x 25.4 mm) and a self-piercing steel screw (Ø 5.5 mm x 38.1 mm length).

    a. For 4-foot-high nominal panels: Provide 4 brackets per post.

    b. For 6-foot-high nominal panels: Provide 6 brackets per post.

3. The Special Panel Fitting – SPF: Enables a panel to be fastened to any vertical or horizontal surface, such as a steel, concrete beam or a wood post. All hot dip galvanized. When wanting to fasten the panel to something other than a post, [use one or more] of the (3) different models described below:

    a. The SPF-W Kit: For mounting on a vertical surface, consists of an L-shaped slotted plate, which accommodates a 1-3/4 in (44.5 mm) vertical adjustment and a retaining plate that hold two (2) vertical wires when bolted together.
    b. The SPF-C Kit: For horizontal surfaces, uses the same “L” shaped slotted plate and two (2) wire retaining plates.
    c. The SPF-P Kit: Connects two (2) panels together.
    d. The SPF-A Kit: For wall mount installation or posts 3 in (76.2 mm) and larger.

4. Eye-U-Shaped Bracket Kit: For use with existing round posts or new round posts installations of 2 in or 3 in (50.8 mm or 76.2 mm). Includes the following: Stainless steel U rod 5/16 in (8 mm) diameter, rear flange in PVC 1-1/2 in x 1-1/8 in (37.8 x 28.4 mm), forehead support in PVC 5/8 in x 1-1/16 (15.2 x 27.5 mm) cosmetic plastic caps and nuts (M8).

    a. For 4-foot-high nominal panels: Provide 2 brackets per post.
    b. For 6-foot-high nominal panels: Provide 3 brackets per post.

G. Post caps:

1. Aluminum alloy: For dimension posts 3 in x 3 in.

H. Polyester powder coating: (See article 2.02B).

2.04 SINGLE / DOUBLE SWING GATES

A. Configuration:

1. Single swing.
2. Double swing.
3. Swing as shown on Drawings.

B. Gate Frames:

1. Two (2) 1-1/2 in x 1-1/2 in (38.1 mm x 38.1 mm) horizontal tubes and two (2) 2 in x 2 in (50.8 x 50.8 mm) vertical tubes, all 16 gauge (1.6 mm) tubes, welded at intersections to create a rigid frame, in accordance with ASTM F900.

2. Installation:
   a. In ground, post length as required for local frost line requirements
   b. Surface mounted, flanged

3. Post size:

   a. For fences with 6-foot-high nominal panels:

Opening Dimension	Post Size
3 ft to 8 ft	3 in x 3 in 11 gauge
> 8 ft to 11 ft	4 in x 4 in 11 gauge
> 11 ft to 19 ft	6 in x 6 in 3/16 in

C. Gate Hardware:

1. Standard Hardware: Hot-dip galvanized steel in conformity with ASTM F900, sized to assure proper gate operation. Non- moving parts shall be powder coated.
   a. Hinge: Structurally designed to support all gates without deformation during opening and closing.
   b. Latch: Clamp-on gravity system that is self latching. Includes the following:
      - Self-locking Device: With padlock eyes as an integral part of latch.
2. Additional Hardware for Double Gates:
   a. Drop bar: Secure one gate in closed position, with stop pipe to engage the center drop rod.

b. Spring Hinge: For self-closing gate mechanism. [Replace Standard Hinge]
c. Panic Bar and Plate: (Dorex 8500). For quick unlocking during an emergency. [Replace Standard Latch]
d. Kick Plate: To prevent marring of the door by shoe marks.

D. Polyester Coating: (See article 2.02B)

E. Gate Single Openings:

1. Gates having 26 ft (7 925 mm) of opening or less include; two (2) truck assemblies with their support brackets, one (1) gate latch (if manually operated), one (1) gate catch, bottom stabilizing brackets and all hardware needed for installation.

Gate single opening	Overhang length	Overall length
4 ft (1 219 mm)	2 ft (609 mm)	6 ft (1 828 mm)
8 ft (2 438 mm)	4 ft (1 219 mm)	12 ft (3 657 mm)
16 ft (4 876 mm)	8 ft (2 438 mm)	24 ft (7 315 mm)
24 ft (7 315 mm)	12 ft (3 657 mm)	36 ft (10 972 mm)

F. Mesh section: Panels will be sized for the fence sections of the gate opening, put in place and secured using proper brackets and hardware (See article 2.03.1B).

G. Vertical Uprights are 2 in x 2 in (50.8 mm x 50.8 mm) 6061-T6 aluminum square extrusion. Their number and position will be determined by the opening.

H. Bracing will be done with 1 in x 2 in (25.4 mm x 50.8 mm) 6061-T6 aluminum rectangular extrusion. Their number and position will be determined by the opening.

I. Top Track is a 6061-T6 aluminum extrusion. It combines the necessary features for the gate to slide and to facilitate welding assembly. Track will resist a reaction load of 2 000 lb (907 kg).

J. Bottom Track is a 6061-T6 aluminum extrusion. It combines the necessary features for the gate to resist swaying and to facilitate welding assembly.

K. Truck Assembly: Swivel type, zinc plated body with four (4) sealed and lubricated ball bearings, 2 in (50.8 mm) in diameter by 9/16 in (14.3 mm) in width, and two (2) horizontal rolling wheels to ensure truck alignment in track. Trucks mount on post brackets using 3/4 in (19.1 mm) diameter machined stud with reduced shank. Truck assembly designed to withstand same reaction load as track.

L. Gate accessories and Hardware: Malleable iron or steel, galvanized after fabrication. Latches provide the possibility for padlocking.

M. Bottom Guide: Each assembly shall consist of one (1) 2 in (50.8 mm) diameter ball bearing hidden inside the bottom track, adjustable in height to maintain gate frame plumb and in proper alignment.

N. Coatings:

1. Paint primer:
    a. Epoxy-vinyl paint primer is applied to cantilever gate aluminum frame in 1 layer by spray paint process. Primer shall cover all visible surfaces.
2. Paint Frame coat:
    a. The acrylic surface coating color shall be standard black or any optional color, see Omega Web site – or color chart as per RAL code.
    b. Acrylic coating is applied in 1 layer by spray paint process.
3. Panel coat: (See article 2.02B)

PART III - EXECUTION

3.01 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.

B. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

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

3.03 IN-GROUND CONCRETE INSTALLATION

A. Install fencing on established boundary lines inside property line

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.

C. Post Setting: Set posts in concrete footing. Protect portion of posts above ground from concrete splatter. Place concrete around posts and consolidation. Using mechanical devices to set posts is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

1. Dimensions and Profile: As indicated on Drawings.
2. Space line posts uniformly at center to center.
3. Exposed Concrete Footings: Extend concrete 2 in (50.8 mm) above grade. Smooth and shape to shed water.
4. Concealed Concrete Footings: Stop footings [2 in (50.8 mm) <Insert dimension> below grade [as indicated on Drawings] to allow covering with surface material.
5. Posts Set into Concrete in Sleeves: Use steel pipe sleeves pre-set and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with [non shrink, non-metallic grout,] [anchoring cement,] mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
6. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 in (125 mm) deep and 3/4 in (19.1 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill granular space between post and concrete with [non- shrink, non-metallic grout,] [anchoring cement,] mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
7. Flange Post Installation: Bolt mounting plates attached to each post to slab or structure as indicated, using expansion bolts.

3.04 FENCE INSTALLATION – Model “OMEGA ARCHITECTURAL”

A. Install the fence along the specified layout according to the drawings. The fence panel shall be installed to maintain a clear minimum distance of 1-1/4 in (31.8 mm) and a maximum distance of 2 in (50.8 mm) from the ground surface. Holes for posts shall be at least 8 in (200 mm) in diameter and at least 42 in (1 070 mm) deep.

B. Posts shall be adequately supported within the concrete forms to maintain the required positioning and prescribed level until concrete has set. All necessary anchors and posts shall be at a minimum depth of 36 in (914 mm) into the ground.

C. Square Post Installation: Once the concrete is set, the fence sections are fastened to the posts with the desired bracket type.

1. Universal Collar Bracket Kit: Brackets slot allows for adjustments of ± 1-1/2 in (38.1 mm) on each side. Always install the brackets flush with horizontal wire of the panel (no gap).

Post Size	Post Spacing C/C
3 in x 3 in (76.2 mm x 76.2 mm)	98-11/16 in (2 507 mm)

D. For the fence to follow slopes, it is required to step the fence sections. The Universal bracket on square posts can be slid along the post at the desired height and should always be install flush with horizontal wire (no gap). When faced with a steep slope, it will be necessary to order longer posts and panels cut in half as to keep the gap under the panel to a minimum.

E. Upon cutting or trimming a post or a wire mesh section, apply a zinc rich primer to the exposed

ends and finish with the matching touch-up paint supplied by the manufacturer.

F. Panels must be installed as instructed by client:
   1. Spikes pointing up or down for safety
   2. Bents facing inwards or outwards the field

3.05 CAST-IN-PLACE CONCRETE

A. General: Comply with ACI 301 for cast-in-place concrete.

B. Materials: Portland cement complying with ASTM C150 <Insert type if required>, aggregates complying with ASTM C33, and potable water [for ready-mixed concrete complying with ASTM C94]. [Measure, batch, and mix Project-site-mixed concrete according to ASTM C94.]

C. Concrete Mixture: Normal-weight concrete with not less than 3 000 psi (20.7 Mpa) compressive strength (28 days), 3 in (76.2 mm) slump, and contain “coarse aggregate” of a minimum diameter of 1/5 in (5.1 mm) to a maximum of 3/4 in (19.1 mm) maximum size aggregate. A 5% to 7% air entrained or according to recommendation of section 03 00 00.

D. Materials: Dry-packaged concrete mix complying with ASTM C387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

3.06 GROUT AND ANCHORING CEMENT

A. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, 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.

3.07 GATE INSTALLATION AND ADJUSTMENT

A. Install gate posts in accordance with manufacturer's instructions.

B. Concrete Set Gate Posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have a diameter 4 times greater than outside dimension of post, and depths approximately 6 in (150 mm) deeper than frost level. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 in (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.

C. Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.

D. Attach hardware so to have the nuts inside the property thus making the assembly tamper-proof which will prevent unauthorized removal. Install ground-set items in concrete for anchorage.

E. Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from 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.

3.10 SITE CLEANING

A. Clean and adjust soil disturbed during work. Get of all surplus and waste materials and replace damaged turf in accordance with directives of Engineer and Consultant.

END OF SECTION 21045

SECTION 32 84 00.01 – IRRIGATION (Centerville)

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Install Irrigation System.

B. Modify existing irrigation systems.

1.2 RELATED WORK

A. Excavation, Soil Installation, Grading and seeding.

B. Fence removals

C. Water Meter

D. Roadway Augering

1.3 SUBMITTALS

A. Make submittals under provisions of Division 1.

B. Submit schedule of activities of sequence and time of work in this section.

C. Submit written itemized statement to Owner of work completed when requested during construction

D. Submit written itemized statement to Owner of work completed at the end of the construction period.

E. Submit Irrigation System Audit Report completed by irrigation consultant for all areas of installation completed.

1.4 QUALITY ASSURANCE

A. Work in this section shall be accomplished by a recognized Irrigation Contractor with a minimum of ten (10) years' experience.

B. Installation processes shall be applied to all local codes.

C. Irrigation contractor personnel shall provide documents demonstrating that he/she is a ***"Certified Irrigation Contractor"*** in accordance with the International Irrigation Association requirements and have passed all testing related to this. Submission of certificate is required with the bid documents.

D. Irrigation contractor personnel shall provide documents demonstrating that he/she is a ***"Certified Irrigation Auditor"*** in accordance with the International Irrigation Association requirements and have passed all testing related to this. Submission of certificate is required with the bid documents.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 1.

B. Deliver products in waterproof containers showing weight, chemical analysis, and name of manufacturer. Damaged containers are unacceptable.

C. Store and protect products under provisions of Division 1.

1.6 EXISTING CONDITIONS

A. Beginning work of this Section means acceptance of existing conditions.

B. Sprinkler installation shall not begin without a walk through provided with the irrigation consultant verifying conditions are truly ready for mainline, wire, valve and sprinkler installation

1.7 JOB CONDITIONS

A. Begin system management immediately upon substantial completion of work in each area completed and demonstrated to the irrigation Consultant

B. Sustain irrigation system management throughout the entire growing in period so landscape establishment will not be hindered from any workmanship issues related to irrigation system construction or other factors influencing the operation of the irrigation system.

1.8 PROTECTION

A. Protect landscaping and other features remaining as final work.

B. Protect existing structures, fences, roads, sidewalks, paving and curbs.

1.9 REGULATORY REQUIREMENTS

A. Comply with regulatory requirements related to construction process and water system connections.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not solvent weld piping when ambient temperatures are below 45 degrees F.

B. Do not perform final compaction of piping, sprinklers, valves, quick couplers and related valve boxes in muddy conditions.

1.11 SEQUENCING AND SCHEDULING

A. Coordinate all irrigation construction with other site contractors.

B. Irrigation contractor will be fully responsible for all installations, for their integrity and operations during all periods of construction by all trades assigned to this project.

1.12 DEFINITIONS

A. **Sprinklers**: Manufactured devices that distribute water to an assigned area of the landscape

B. **Drip Tubing**: Manufacturer tubing that is placed within the planting beds at 8” depth to provide water to the root systems as the controller is programmed

C. **Electric Valves**: Manufactured devices that release water to assigned sprinklers after receiving a signal from a controller

D. **Isolation Valves**: manufactured devices that isolate sections of piping or valves from piping

E. **Valve Boxes**: Manufactured devices that have a cover flush mounted with grade with a box or series of boxes that extend down to an electric valve, isolation valve, wire splice or Quick Coupler

F. **Controller**: Manufactured devices that control which electric valves operate and in what sequence

G. **Grounding**: the placement of required devices (grounding rod, grounding plate and bare #4 wire) for the purpose of protecting the control system and pumps

H. **Mainline Piping**: The piping system that carries the water supply form the city water source to designated electric valves throughout the site

I. **Lateral Piping**: The piping system that carries water from the electric valve to assigned sprinkler downstream of the electric valve to which it is attached

J. **24 Volt Wiring**: The wiring system from the Controller to the electric valves which is to be placed alongside and below the mainline

1.13 WARRANTY, MAINTENANCE, AS-BUILTS

A. Warranty:

1. TWO years from the date of final approvals. This final approval will only come after an Irrigation System Audit conducted by the Irrigation Consultant and the irrigation contractor follows up to correct noted irrigation system defects, related corrective measures and compliance is verified.
2. Two written Irrigation System Management Reviews (Spring and Fall) under the supervision of the Irrigation Consultant each year. Needed corrective measures will be outlined in the report and correction made by contractor with 48 hours from time of report distribution.
3. Any site system repairs that are necessary due to warranted equipment failure or other construction damage will be corrected within a 48 hour period after notification.
4. Fall of 2024 & 2025 Winterization and Spring of 2025 & 2026 system activation will be required as well as Site Reviews for June & September of each years (2025 & 2026)

B. Written Site Seasonal Management Process

1. **Irrigation Water Management Services:**

1) Qualified Water Management Technicians have the responsibility for two full seasons of irrigation system management services:

1) **Spring Turn On** - seasonal system activation in Spring (May)

2) **Irrigation System Operations Management Review** (OMR) – (Mid-June & Mid-September)
3) **Irrigation System Winterization--** seasonal system deactivation in Fall (November)
4) **T & M Irrigation System Service Requirements** - repairs related to corrections to system malfunctions (Non-Construction related)

2. **Spring Turn On**

1) Qualified Water Management personnel have the responsibility of:

1) Walking the irrigation mainline for any obvious items of concern,
2) Opening valve boxes to verify the quality of wire splices and valve condition, and
3) Reviewing the water source and related components for functionality.

2) Once those items are finished and documentation is completed, personnel will slowly start up the irrigation mainline, activate all zones, review mainline operations, test and tag backflow preventer, and flush all components necessary to ensure total system continuity.
3) All system elements will be reviewed for winter damage. A report outlining any and all immediate T&M repair needs will be forwarded to the client as a Work Order needing approval before proceeding with the repairs.
4) A minimum of 2 DATA sheets per Spring Turn On per year must be completed as part of the Spring Turn on requirements:

1) Water Source & Zones
2) Electric valves & Controller & Sensor
3) Mainline, Isolation Valves
4) Manual Outlets

3. **Irrigation System Operations Management Reviews**

1) Qualified Water Management personnel have responsibility for:

1) System operational management reviews related to:

a) Monthly Review of Controllers

- Rewriting & Updating Water Schedules
- Checking All Controller Operations

b) Seasonal Review of Irrigation Soils (2 Times)

- Moisture Levels to 6”
- Soil Profile Analysis to 6”

c) Seasonal Review of Turf Root Systems (2 Times)

- Density & Health Condition

d) Planned Grid Routes for:

- Correcting Sprinkler Compaction
- Correcting Sprinkler Adjustments
- Correcting Sprinkler Nozzle Misuse
- Valve Box Wire Splice Improvements
- Valve Box Cleaning

4. **Irrigation System Winterization**

1) Qualified Water Management personnel have responsibility for:

1) Shut downing the irrigation system using compressed air (365 CFM @ 40 PSI compressor settings required)
2) 1.5” Compressor hose, quick coupler key connection and pressure regulator required
3) Deactivation of in ground irrigation equipment to reduce the opportunity for winter damage to the system.

2) **S**ystematically:

1) Shut off water at its source
2) Remove or Winterize the Back-Flow Preventer (BFP)
3) Walk Mainline looking for obvious damage that would hinder the winterization process
4) Perform several activities related to mainline winterization:

a) Install Quick Coupler Keys in Mainline for air purging in the mainline-at ends also
b) Start Air Compressor and Fill mainline with air—Mainline ONLY
c) When mainline is completely purged—run each zone to purge of water (farthest away from water source first

5) Shut off controller
6) Tag BFP/Water Tap & Controller “Winterization Complete”

C. AS-BUILTS & Documentation:

1. As-Built drawings will be turned in on electronic format that includes all aspects of the irrigation system construction.
2. This includes but is not limited to sprinklers, lateral piping, electric valves, isolation valves, quick couplers, wire splice boxes, mainlines, boring locations, sleeve sizes and locations of all, controller locations, valve numbering, wire routes in existing areas, booster pump location, water tap location, connect points to existing systems, capped off areas from existing systems.
3. All product literature will be provided in four complete sets and will be complied to match every detail of the AS-BUILT drawings
4. As-Built drawings and system documentation will be provided to the irrigation consultant for review before final completion can be proclaimed. Irrigation consultant will provide notes for corrections which will need to be made by Irrigation Contractor prior to declaration of final completion.

PART 2 - PRODUCTS

2.1 REQUIRED USAGE

A. Products and installation configurations used will only be those listed and illustrated in this section:

1. Mid-Range Rotator Sprinklers

1) Hunter MP-Rotary Nozzle (Series 2000, 3000) installed with Rain Bird 1806 SAM PRS 45

1) *14' through 29' Radius*
2) *To be used in conjunction with Orbitz "Blu-Loc" Swing Pipe & fittings*
3) See Related Detail for full installation requirements.

2. ***Short Range Rotator Sprinklers***

1) Hunter MP-Rotary Nozzles (Series 1000 & Strip) installed with Rain Bird 1806 SAM PRS 45

1) *8' through 15' Radius*
2) *To be used in conjunction with Orbitz Blu-Loc Swing Pipe & fittings*
3) See Related Detail for full installation requirements.

3. ***Drip Tubing***

1) Netafim Techline TLCV4-1210 (12 O.C. .4 GPH, 8" burial)

- With 1" PVC Class 200 header from the control zone valve through the center of the drip zone assembly to the location attached directly to drip tubing
- Netafim Vacuum Relief Valve Guardian 65AR1A100 1" (1) Drip Zone
- Netafim TLFV-1 Insert Type Flushing Valves (2) Drip Zone
- Netafim TLCV001 Blank Drip Tubing

1) *Placed at 8" depth in planting beds*
2) *2' off turf edge or pavement*
3) *2.5' to 3' O.C. spacing between rows thereafter*

See Related Details for full installation requirements.

4. ***TRI-POD Sprinklers w Heavy Duty Hoses***

1) Irrigation Contractor is to provide to the landscape Contractor (fully Assembled):

		QTY.
1)	ORBIT 58308 N Tripod Sprinklers Stand	30
2)	HUNTER NODE 9V Battery Controller Single Station	30
3)	Hose FLEXOGEN (3/4" x 100')	30
4)	BUCKNER 261SDX ¾" Impact Sprinkler	30
5)	Brass Garden Hose Splitter, Heavy-Duty 2-Way Hose Connector Fitting	15

6) NOTE:

a) Each assembly is to include the HUNTER NODE 9V Battery Controller Single Station attached to a quick coupler key using a ¾" Brass Hose Swivel
b) Each assembly is to have the HUNTER NODE 9V Battery Controller Single Station with brass adaptors that will allow for ¾" Brass Hose Swivel attachment both to the quick coupler and the discharge hose

7) NOTE:

a) At the end of this project all TRI POD Sprinklers and associated hoses, timers, etc. will be given to the building mgmt. team for reuse as they deem necessary in future maintenance practices.

5. ***Electric Valves***

1) Rain Bird PESB 1"

1) In conjunction with Long, Mid/Short Range Sprinklers
2) See Related Detail for full installation requirements.

2) Rain Bird XCZ-100-PRB-MC Medium Commercial Control Zone Kit

(Includes Rain Bird 1" PEB Electric Valve & 200 Mesh Pressure Regulating Basket Filter)

1) *In conjunction with:*

- Netafim TLCV4-1210 Techline
- Netafim Vacuum Relief Valve Guardian 65AR1A100 1" (1) Drip Zone
- Netafim TLFV-1 Insert Type Flushing Valves (2) Drip Zone
- Netafim TLCV001 Blank Drip Tubing

See related detail for full installation requirements.

6. Electric Valve Decoders

    1) Utilize

        1) Baseline Decoder Bi-coder BL-5201 1 Valve Decoder
        2) Baseline Decoder Bi-coder BL 5202 2 Valve Decoder
        3) Baseline Decoder Bi-coder BL 5204 4 Valve Decoder
        4) *In conjunction with:*

            a) *Placing the decoder just below the top cover of the valve box*
            b) *Using S.S. Screws to mount the decoder in this required location*
            c) See Related Detail for full installation requirement

7. ***Isolation Valves***

    1) *In conjunction w Mainline Installation Requirements*

        1) SPEARS True Union Ball Valves - 2" is required
        2) NOTE: PVC Sch 80 Fittings (Ells/Tees) are required at each isolation valve box location.

            a) If a 1" outlet for a Quick Coupler installation is shown at same location PVC Sch 80 Service Fittings (Ells/Tees) with 1" FIPT outlets provided are required w Thrust Blocking on back side of tee/el

        3) NOTE: Place ONE Trynex Fiberglass Marking stake SP-15 at every isolation valve location

            a) At the end of the grow in period either cut this to 2'H or remove from the site per Certified Consultants Ltd.

        4) *In conjunction w Mainline Installation Requirements*

            a) See Related Detail for full installation requirements.

8. ***Valve Boxes***

    1) *In conjunction with Electric Valve installations*

        1) MacLean HIGHLINE Standard Valve Boxes

        2) Different Box Combinations will be used at each site location

            a) *1 valve—12" Rectangular Box with Multiple Extensions*
            b) *2 valves—12" Rectangular Box with Multiple Extensions*
            c) *3 valves—Jumbo Rectangular Box with Multiple Extensions*

        3) NOTE:

a) TURF Areas Require **GREEN** Valve Box Covers
b) PLANTING Areas Require Mulch **BROWN/BLACK** Covers
c) See Related Detail for full installation requirements.

See Related Detail for full installation requirements.

2) *In conjunction with Isolation Valve installations*

1) MacLean HIGHLINE Standard Valve Boxes

a) *1 valve—12" Rectangular Box with Multiple Extensions*

2) NOTE:

a) TURF Areas Require **GREEN** Valve Box Covers
b) PLANTING Areas Require Mulch **BROWN/BLACK** Covers
c) See Related Detail for full installation requirements.

3) *In conjunction with wire splice junction points*

1) MacLean HIGHLINE Standard Valve Boxes

a) *1 or more Splices—10" Round Box*

2) NOTE:

a) TURF Areas: Require **GREEN** Valve Box Covers
b) PLANTING Areas: Require Mulch **BROWN/BLACK** Covers
c) See Related Detail for full installation requirements.

3) NOTE: Valve box extensions will be required to maintain the required 3" of debris free areas below all the valve box assemblies (EV, IV, QC)
4) NOTE: All valve boxes placed within a planting bed will utilize a mulch brown valve box cover in all situations

a) All valve boxes placed within an area of mowed turf will utilize a dark green valve box cover in all situations.

9. ***Quick Couplers***

1) Rain Bird # 5 RC Quick Coupler

2) *Installed on 1" Lasco (Mipt x Mipt)* G13S-212 continuous pressure use rated.

a) *Install in 10" Round Valve box with Extensions.*
b) See Related Detail for full installation requirements.

2) NOTE:

a) TURF Areas Require **GREEN** Valve Box Covers
b) PLANTING Areas Require Mulch **BROWN/BLACK** Covers

3) See Related Detail for full installation requirements.

3) Rain Bird KEY # 55-K-1

1) 20 Keys are to be provided to Landscape Contractor by the irrigation contractor

4) Rain Bird HOSE SWIVEL FIPT x 3/4" Hose Connection

1) 20 Swivels are to be provide to the landscape contractor by the irrigation contractor.

2) NOTE: Place ONE Trynex Fiberglass Marking stake SP-15 at every quick coupler valve location

a) At the end of the grow in period either cut this to 2'H or remove from the site per Certified Consultants Ltd.

3) NOTE:

a) At the end of this project all RAIN Bird Keys and Swivels, etc will be given to the site/building mgmt. team for reuse as they deem necessary in future maintenance practices.

10. ***Swing Joints***

1) Lasco (Mipt x Mipt) Swing Joints –G13S-212 continuous pressure use rated

1) *Install in conjunction with 1" Quick Coupler valves*

2) Orbitz Blue Loc swing pipe & fittings

1) *Install in conjunction with all Long, Mid/short range Rotator Sprinklers*
2) See Related Detail for full installation requirements.

11. ***24 Volt Wiring***

1) PER EACH WIRE ROUTE (5 Total):

1) PAIGE WIRE # 180162 12/2 2-Wire **BLUE** Path with
PAIGE WIRE # 180117 14/2 2-Wire **GREEN** Path (Spare)
(See mainline/quick coupler/electric valve locations for routings)

a) 5 - **BLUE** Active Paths (Paige Wire # 180162) with assigned 5- **GREEN** Spare Wire Path (PAIGE # 180117) will be directly attached to the controller, and all assigned automated zones, moisture sensors and grounding on this Controller A as outlined in specifications.

- Place separate wire pathways (5 Wire Paths-w a BLUE & GREEN 2-Wire in each pathway) as noted below:

NOTE:

There are to be no 2-Wire in field end of pathway connected "Loops." Each 2-wire route BLUE & GREEN is to be directly from the controller through the pathways to an assigned "end of wire route" location with Grounding Grid on end of each route.

GREEN Path (Paige Wire 180117) will be directly placed alongside each BLUE Pathway (4 pathways) from the controller to identical assigned locations.

Made ready (SPARE) for additional future connection and utilization through leaving 3-5' wire loops within all electric valve, moisture sensor, and quick coupler boxes.

Wire Path -1 (12-2 BLUE & 14-2 Green Spare) – From Controller to assigned:

- Electric Valves -- Turf Based Along Wire Pathway 1
- Electric Valves -- Drip Based Along Wire Pathway 1
- Moisture Sensor – Along Wire Pathway 1
- Grounding Grid – Along Wire Pathway 1
- Manual Outlets – QC – 3' Loop in Valve Boxes

Wire Path - 2 (12-2 BLUE & 14-2 Green Spare) – From Controller to

- Electric Valves -- Turf Based Along Wire Pathway 2
- Electric Valves -- Drip Based Along Wire Pathway 2
- Moisture Sensor – Along Wire Pathway 2
- Grounding Grid – Along Wire Pathway 2
- Manual Outlets – QC – 3' Loop in Valve Boxes

Wire Path -3 (12-2 BLUE & 14-2 Green Spare) – From Controller to:

- Electric Valves -- Turf Based Along Wire Pathway 3
- Electric Valves -- Drip Based Along Wire Pathway 3
- Moisture Sensor – Along Wire Pathway 3
- Grounding Grid – Along Wire Pathway 3

- Manual Outlets – QC – 3’ Loop in Valve Boxes

Wire Path - 4 (12-2 BLUE & 14-2 Green Spare) – From Controller to

- Electric Valves -- Turf Based Along Wire Pathway 4
- Electric Valves -- Drip Based Along Wire Pathway 4
- Moisture Sensor – Along Wire Pathway 4
- Grounding Grid – Along Wire Pathway 4
- Manual Outlets – QC – 3’ Loop in Valve Boxes

Wire Path - 5 (12-2 BLUE & 14-2 Green Spare) – From Controller to

- Electric Valves -- Turf Based Along Wire Pathway 5
- Electric Valves -- Drip Based Along Wire Pathway 5
- Moisture Sensor – Along Wire Pathway 5
- Grounding Grid – Along Wire Pathway 5
- Manual Outlets – QC – 3’ Loop in Valve Boxes 5

See Related Detail for full installation requirements.

12. ***Wire Splices***

1) 3M DBYR-6 wire splices.

1) *Install 3M DBYR-6 splices in conjunction with ALL connection points (electric valves or at 24 Volt in field splice box locations)*

2) *Install 3M DBYR-6 splices in conjunction with all 14-2 connection points (electric valves or at 24 Volt in field splice box locations)*

3) *Install 3M DBRY-6 in ALL anticipated wire splice’s locations being in a submerged location.*

See Related Detail for full installation requirements.

13. Controllers & Related Equipment

Irrigation Contractor (through PLATT Industrial Pump Station Manufacturer) is to provide and install all equipment listed in this section.

This controller will be communicating within the PLATT Industrial Pump Station, w PLATT Industrial Pump Station Flow Meter/N.O. Master Valve which are part of the design package provided.

FIELD UNIT CONTROLLER A

Controller: Baseline BL-1000XS
Modem Based: (Baseline BL-CLOUD- LTE-AT-X) one cellular modem communication module (Baseline BL-CLOUD- LTE-AT-X),

Base Manager: BL-BMW2-PLUS-5Y *(Free 1st year))*

NOTE: Base Manager WEB Assess Outline Requirements:

- Create the account when the controller/booster pump station has been delivered to the contractor doing the install.
- Set Up with Property Mgmt. Organization as Account owner.
- Add Certified Consultants Ltd. As account user/administrator
- Add Irrigation Contractor (during warranty period) as an account user.

NOTE:

Follow the BASELINE requirement related to Grounding at this pedestal location and according to provided details (ASIC Grounding Grid Required) GRID # GC-*1*

Confirm full operations of cellular service shown above for communication purposes prior to the purchase of the modem.

See Related Detail for full installation requirements.

14. ***BASELINE BL-5315B Soil Moisture Sensor***

Locations for installation noted on the design provided.

Sensor locations include turf areas, parking lot areas, and planting areas.

Use 10” round valve boxes over connection along the 2-Wire pathway (BLUE & GREEN) for each moisture sensor to be installed along those pathways.

NOTE: Follow installation details related to the overall requirements.
Follow installation details related to overall depth.

- Turf 4-5” over top of sensor.
- Parking Lot 7-8” over top of sensor
- Prairie Area 5-6” over top of sensor
- Perennials 8-10” over top of sensor

- Trees 12-14” over top of sensor

NOTE:
Place ONE Trynex Fiberglass Marking stake SP-15 at every moisture sensor location.

NOTE:
Moisture Sensor locations are noted as shown in both turf and planting areas.

Moisture Sensors will be put in place to monitor water/air soil content in preparation for maintaining proper water/air/mineral balances:

At the end of the growth period either cut this to 2’H or remove from the site per Certified Consultants Ltd.

15. **Grounding Grids/Requirements- Baseline Controller A**

a) Baseline Controller Grounding Wire Entry/Connection Point is on power terminal strip within controller A.

- Grounding of controller and field wiring is required on ALL installations to have reading of 10 OHMS or LESS
- Grounding Grid for controller A is to be separate from the 2-wire pathways.
- Grounding Grid System that will include:
  - 4” x 96” CU Plate w 25’ of # 4 Green Coated Copper Wire to be routed into the Grounding Connection Point within the Controller A. Paige # 1821991C
  - 5/8” x 8’ Copper ROD (5/8” x 8’) with 15’ of 6 AWG to be routed into the Grounding Connection Point within the Controllers A. PAIGE # 1820001C6
  - Power Set Earth Backfill required as noted on details provided around CU Plate. 2 Bags of Paige Power Set Earth Contact Backfill Ground Enhancing Materials (50 lbs.) Paige # 1820058

16. **Grounding and Surge Protection Grids/Requirements-2 Wire Path**

a) Baseline Surge Arrestor BL-LA01 provided at each Grounding Grid location as noted on design

- Grounding of controller and field wiring is required on ALL installations to have reading of 10 OHMS or LESS
  - 4” x 96” CU Plate w 25’ of # 4 Green Coated Copper Wire. Paige # 1821991C

- 5/8” x 8’ Copper ROD (5/8” x 8’) with 15’ of 6 AWG. PAIGE # 1820001C6
- Power Set Earth Backfill required as noted on details provided around CU Plate. 2 Bags of Paige Power Set Earth Contact Backfill Ground Enhancing Materials (50 lbs.) Paige # 1820058
- 10” Round Valve Box required for each BL-LA01 arrestor location along.
- 10” Round Valve Box required for each Paige Re-Enterable Connector-3 Position. Paige # 270-RC3

b) Grounding Grids are locations that will be noted on the design.

c) Full Grounding Grid ARE required for:
- Ends of active BLUE 2 wire paths
- Every 390’-500’ along each active BLUE 2 wire path

NOTE: Grounding Grids are marked on design to match up with each BLUE & GREEN 2 Wire Path

NOTE: OHMS Resistance Testing and Reporting In writing/photos to Certified Consultants Ltd. REQUIRED

NOTE: SPARE GREEN 2- Wire Path is not to be grounded as outlined above.

See Related Detail for full installation requirements.

17. ***PVC Pipe***

1) Class 200-SDR-21 Rated Pipe for all mainlines and laterals.
2) Lateral Piping- 1” Minimum Size

   1) *Solvent Weld Ends for 1” through 1.5”*
   2) Lateral Piping placed at a 12-18” trench depth (min/max)
   3) No 1.5” or 1” lateral pipe will be installed, or trenches placed within 5’ of any tree root system (existing or newly planted) without direct authorization from the landscape contractor/architect. Designs may not reflect this placement, but onsite placement will be required.

3) Mainline Piping- 2.0” Minimum Size

   1) *Solvent Weld Ends for 2.0”*
   2) Mainline Piping placed at an 18-24”” trench depth (min/max). except through sleeving
   3) No 2” mainline pipe will be installed, or trenches placed within 5’ of any tree root system (existing or newly planted) without direct authorization from the landscape contractor/architect. Designs may not reflect this placement, but onsite placement will be required.

See Related Detail for full installation requirements.

18. ***Pipe Fittings***

1) *1" through 1.5" Pipe Sizes will utilize:*

1) *Lasco, Spears and or Dura*
2) **PVC Sch 40** Fittings on piping systems from 1" through 1½"

2) 2" Pipe Sizes will utilize:

1) *Lasco, Spears and or Dura*
2) **PVC Sch 80** Fittings on mainline piping systems of 2"
3) In accordance with Pipe and Fitting Manufacturers recommendations
4) *Thrust Blocks as detailed below will also be used in conjunction with all mainline fitting installations*

See Related Detail for full installation requirements.

19. ***Thrust Blocks***

1) Concrete Blocks with 3' Rebar in each opening and Sakrete in each opening. Landscape Fabric required between concrete block and fitting or pipe for protection

See Related Detail for full installation requirements.

2.2 WATER SOURCE-BOOSTER PUMP STATION COMPLETE ASSEMBLY

A. WATER SOURCE

1. WATER CONNECTION POINT

1) Waterline connection will be in place and is provided by others with a 2" Copper FA just outside of building wall ready for connection to the Flanged Inlet Connection point on the PLATT Industrial Pump Station (about 18-30" above grade).

2) Place a 2" x 2" x 0.5" (SSFIPT) copper fitting just inside building wall for winter drainage of the upstream side of RPZ and building service line/isolation valve connection point. Provide a 0.5" FIPT threaded plug for use in this winter drainage fitting.

See Related Irrigation Design Detail for full installation requirements.

2. **COMPREHENSIVE BOOSTER PUMP STATION** and related irrigation system/pump controls are provided by:

PLATT INDUSTRIAL CONTROL, INC.
3N 301 Ellsworth Ave.

Addison, IL 60101
630-833-4388

Rain Boy II Irrigation Pump Station

PLATT Industrial Booster Pump Station (*Rain Boy II Irrigation Pump Station)* Includes:

BACKFLOW PREVENTER

RPZ/BACKFLOW PREVENTER FEBCO 825Y-2.0”
Provided as part of the PLATT Industrial Pump Station.

FLOW METER & N.O. MASTER VALVE

One irrigation flow meter (Baseline compatible), and one N.O., 2” discharge electric valve (Baseline compatible),

Baseline BiCoder that will then be wired (2-Wire Cable) back to the controller already mounted on the side of/part of the PLATT Industrial Pump Station.

Provided as part of the PLATT Industrial Pump Station

IRRIGATION CONTROLLER

Baseline Irrigation controller (Baseline BL-1000XS)

MODEM Based-(Baseline BL-CLOUD- LTE-AT-X) one cellular modem communication module (Baseline BL-CLOUD- LTE-AT-X),

INTERNAL BOOSTER PUMP STATION COMPONENTS

Rain Boy II Irrigation Pump Station

- One pad mount, aluminum enclosure (1/8" thick, 44"H x 60"W x 36"D estimated) with pad locking access cover,
- unpainted with 30-amp exterior mounted NEMA 3R main disconnect switch,
- one 600V surge arrester,
- one UL 508A control panel with drive line reactor,
- variable frequency drive,
- PLC and operator screen,
- one 2” RPZ,
- one close coupled pump (60GPM @ 50psi boost w/ suction of 30psi) & motor (5HP/460VAC/3phase/3450 RPM),
- one check valve,
- two isolation valves,
- 2” (suction & discharge),
- one pressure transmitter,

- one irrigation flow meter (Baseline compatible),
- one N.O., 2” discharge electric valve (Baseline compatible),
- one irrigation controller (Baseline BL-1000XS),
- one cellular modem communication module (Baseline BL-CLOUD- LTE-AT-X) one cellular modem communication module (Baseline BL-CLOUD- LTE-AT-X),
- one flanged painted steel drop pipe for suction piping,
- one flanged painted steel drop pipe for discharge piping,
- one flanged painted steel, 2”x 3ft. pipe spool,
- one set of discharge and suction pressure gauges,
- one ventilation fan with a shutter and thermostat.

Input power is 460VAC/3 phase/8 FLA.

.

NOTE:

Refer to Irrigation Water Delivery Details for full data and information (Irrigation pump Station, pump intakes, and associated pipe)

A concrete pad is required as well as related conduit work.

See Related Detail for full installation requirements.

BOOSTER PUMP STATION INPUT POWER

Input power is 480VAC/3 phase/8 FLA.

PLATT to provide start up and adjustments.

NOTE:

Refer to Irrigation Water Delivery Details for full data and information (Irrigation pump Station, pump intakes, and associated pipe)
120 Volt power will be provided through the PLATT Industrial Panel for the Baseline Controller units.

A concrete pad is required as well as related conduit work.

See Related Detail for full installation requirements.

2.3 SLEEVING LAYOUTS

A. SLEEVING- TYPE A:

1. 4” & 2” SCH 40 PVC Sleeves are to be in place and installed by the irrigation contractor under/across all sidewalks, pathways and roadways prior to the roadway & irrigation/landscape installation.

2. These TYPE A sleeves are intended to provide space for mainlines, lateral pipes, wiring and more.

B. SLEEVING- TYPE B:

1. 2” & 1” SCH 40 PVC Sleeves are to be in place and installed by the irrigation contractor across all sidewalks, pathways, and roadways prior to the irrigation/landscape installation.
2. These TYPE B sleeves are intended to provide space and routings for Drip Irrigation lateral piping and more.

See Related Detail for full installation requirements.

PART 3 - EXECUTION

3.1 EXCAVATION AND BACKFILLING

A. There shall be no irrigation installation in the new construction areas until all other construction trades are completed and verified.

B. Controller, Flow Meter, and related operational items are to be in place and fully operational before water is to be provided from this source.

3.2 ELECTRIC SOURCES

A. Electrical sources will be established and made functional outside of this contract.

B. Electrical sources will be established at Irrigation Controller location after excavation issues are cleared.

3.3 IRRIGATION MAINLINE

A. Irrigation Mainline installations can begin immediately only in areas agreed upon by the owner’s representative/project director.

3.4 CONTROLLER (A)

A. Irrigation Controller A can be installed with proper grounding when the areas assigned are completely free of construction issues.

B. Once Controller A is installed there will need to be a verification that communication with the Cellular Exchange is fully functional and operational

3.5 VALVES AND SPRINKLERS

A. Valves and sprinklers can not be installed in areas of construction until “final grade” has been established, Rock removal processes are completed, and no further soil additions or deletions are forth coming.

B. All sprinklers that are to be installed will only be attached to other sprinklers with similar elevations. Once the sprinklers are flagged by the irrigation contractor, the contractor will work with Certified Consultants LTD for proper piping combinations back to each electric valve.

3.6 SYSTEM TESTING AND FULL OPERATION

A. System testing can occur at any time during the construction process.

B. Full operation of the irrigation system is required prior to seeding processes are to take place.

3.7 AS-BUILT DEVELOPMENT

A. Irrigation Consultant will be requesting marked up irrigation drawings at various stages of construction development.

B. Electronic CAD based final AS-BUILT will be required upon project completion.

3.8 FINAL APPROVALS

A. The Final Approval Process includes final walk through, irrigation system Audits, completion of punch lists with verification of punch list completion, As-Built drawing verification and modifications and Control system operational verification.

END OF SECTION

SECTION 329113 – SOIL PREPARATION

SECTION 329113
SOIL PREPARATION

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Prepare area for planting turf or sod.

B. Prepare planting beds for perennial, shrub and annual plantings.

1.02 RELATED WORK

A. Earthwork.

B. Seeding & Sodding

C. Trees, Shrubs, and Ground Cover.

1.03 REFERENCES

A. ASTM D2607 – Classification of Peat, Moss, Humus, and Related Products.

B. ASTM D5268 – Topsoil used for Landscape Purposes.

C. FSO-F-241 – Fertilizers, Mixed, Commercial.

1.04 SUBMITTALS

A. Make submittals as required under general specifications and as required below..

B. Submit original labels when required.

C. Submit analysis from certified labs. Email submittal is acceptable.

1.05 QUALITY ASSURANCE

A. Work in this section shall be accomplished by a recognized Landscape Contractor with a minimum of five (5) years' experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver products in waterproof containers showing weight, chemical analysis, and name of manufacturer. Damaged containers are unacceptable.

B. Store and protect products until use to prevent damage from weather and other users of site. Storage for longer than two weeks on site is unacceptable unless written approval is granted.

1.07 EXISTING CONDITIONS

A. Beginning work of this Section means acceptance of existing conditions.

B. Contractor must notify owner if conditions are unacceptable prior to start of work.

1.08 JOB CONDITIONS

A. Proceed with and complete work rapidly as portions of site become available, working with seasonal and climatic limitations. Do not work topsoil, compost or existing soil in a wet or frozen condition.

B. Determine locations of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate as required. Maintain grade stakes set by others until removal is mutually agreed upon by partied concerned.

C. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions or obstructions, notify Landscape Architect before proceeding.

1.09 PROTECTION

A. Protect existing and new structures, fences, roads, sidewalks, paving, curbs, and landscaping and other features remaining as final work.

1.10 REGULATORY REQUIREMENTS

A. Comply with regulatory requirements related to fertilizer and amendment compositions.

B. Comply with regulatory requirements for licensing related to pesticide applications, general work & business licensing.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not work soil if muddy or frozen conditions exist.

1.12 SEQUENCING AND SCHEDULING

A. Coordinate the work of this section with installations of underground utilities, irrigation system and remainder of site work, including earth moving or grading.

B. Complete the work in this section prior to planting or seeding.

1.13 MAINTENANCE

A. Maintain surfaces and supply additional topsoil and amendments where necessary, including areas affected by erosion, until planting work begins. Planting shall not begin if eroded or improperly graded sections exist.

B. Maintain and protect stockpiles of bulk materials from erosion until stockpile is depleted or removed from site. Do not leave stockpiles uncovered during rainy or wet weather.

PART 2 – PRODUCTS

2.01.1 EXISTING SOIL

A. In areas where existing soil will be utilized, amendments shall be added per the recommendations of Certified Consultants Ltd. Each section of the site shall be amended per the recommendations for that site. Follow grading plan for this project. Apply and incorporate amendment materials prior to planting as outlined.

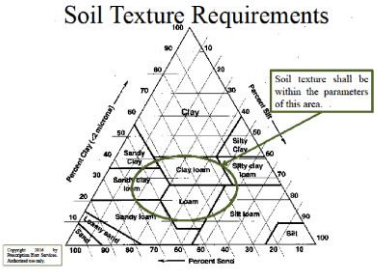
B. Follow recommendations found in Exhibit A at End of Section.

2.01.2 SOIL MATERIALS

C. In areas where stockpiled soil materials are being placed, existing soil in place shall be ripped to 10” deep prior to placement of the stockpiled soil materials. Soil materials shall be placed to a minimum depth of 12”. Follow grading plan for this project. Avoid ripping where utility lines, irrigation lines or other permanent or temporary underground lines or systems are installed.

D. Soil materials utilized shall be loose friable soil of loamy character, free from compacted subsoil, clay clods, vegetation, debris, rocks larger than one inch in any dimension and excessive amounts of smaller rocks or stones (no more than 2% of total volume), or other materials detrimental to proper vegetative growth. Soil materials shall NOT be from boggy locations on site.

E. Soil materials tested on site tests have the following conditions: Soil texture: Contains between 26%-32% clay, 28%-40% sand and 32%-44% silt. Soil pH: Shows to be between 7.9 & 8.4 CEC (Cation Exchange Capacity) between 17.9 – 26.1



F. In areas where stockpiled soil materials are being placed, the soil preparation contractor shall grade to final grade per engineer’s drawings. No additional compaction of topsoil shall be accomplished once topsoil is placed in all horticultural areas, landscape beds or turf areas and graded to final grade.

G. Once approved soil materials is placed and final graded, the biological stimulation and mineral balancing amendments outlined for placement are to be placed and the soil preparation contractor shall take soil samples and submit to Certified Consultants Ltd for testing.

Soil samples shall be obtained using approved procedures and at least one sample shall be submitted for turf areas, one for shrub/tree locations, one for perennial and non-woody shrub beds and one for annual beds. Submit additional samples for every 22,500sf of area to be tested.

Certified Consultants Ltd shall direct additional amendment requirements for imported topsoil based on soil test results. Additional amendments required shall be added prior to planting.

H. DISTRIBUTED SOIL AREAS – COMPACTION REQUIREMENTS

Except where more stringent requirements are defined in this specification. The following parameters shall define the general description of the threshold points of soil compaction in imported topsoil areas.

Soil prep contractor, in conjunction with Certified Consultants Ltd confirm that soil density/penetration resistance is not above or below these ranges of 100-175 psi.

Penetration Resistance Method-utilizing a qualified and approved device is required for the tracking of these readings.

Below 75 psi soil becomes increasingly unstable. Above 200 psi root growth development is limited with fewer and shorter and slower growing roots.

Penetration resistance shall be checked at least three locations for every 2,000 sf with a qualified soil penetrometer.

2.02 SOIL PREPARATION AMENDMENTS-GENERAL

AMENDMENTS TO EXISTING DISTRIBUTED SOIL-BIOLOGICAL STIMULATION

No plantings are to be incorporated until the Biological Stimulants and Mineral Balancers are in place and incorporated into the landscape-based soils for a minimum of 14 full days.

See Part 3 Execution section of this specification.

A. Biological Stimulation Process

Product 1: **Biochar Now w pH Reduction Elements-MEDIUM**

Engineered Bio-Carbon

Product description:

Biochar (Chip) shall be obtained from thermochemical conversion of biomass in an oxygen- limited environment (pyrolysis) containing at least 80% carbon. Feedstocks shall be composed of wood or clean forest waste. Feedstock materials transported in salt water, painted, or treated with preservatives are not permitted. Ash content shall be less than 5%. pH shall be near 6.5. Items listed in testing results per IBI standard testing shall not exceed standards for agricultural food production. Percent of carbon shall be listed on label or test results. The product shall be USDA certified Biobased.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
Biochar Now, LLC
19500 County Road 7
Berthoud, CO 80513
970-593-9100

NOTE:
Final determination of Biological Stimulation Product use, quantities, and placement will be determined by Certified Consultants Ltd.

Product 2: **CarbonPro-G** Granular Microbial & Carbon Plant Health Nutrient Optimizer

Product Description:

Granular Microbial & Carbon Plant Health Nutrient Optimizer that harnesses the power of carbon, plant-microbial interactions, and organic soil processes to maximize plant health and nutrition. Aids seed development and increases root mass and remediates high saline soils and salt toxicity.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

AMENDMENTS TO EXISTING DISTRIBUTED SOIL- MINERAL BALANCERS

No plantings are to be incorporated until the Biological Stimulants and Mineral Balancers are in place and incorporated into the landscape-based soils for a minimum of 14 full days.

See Part 3 Execution section of this specification.

B. Mineral Balancing Product Process

Product 1: **DISPER-SUL PASTILLE** Soil Sulfur Martin Midstream Partners

Product Description:

Water Degradable Sulfur that is a 90% Sulfur product. Martin Midstream Partners uses purest sulfur combined with a special formulation of bentonite clay and wetting agents. When applied to the soil DISPERSUL breaks down into micro sulfur that becomes available plant food during the growing season.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
Martin Midstream Partners
580 East Shipyard
Phone: 815-357-6954

Product-2: **Magnesium Sulfate** Sulfate of Potash 0-0-50 Seed Ranch

Product Description:

Strengthens the plant making it less susceptible to disease and adverse conditions. Soluble Potash @ 50%, Derived from Sulfate of Potash Chlorine (Cl) less than 2%,

This product is to be incorporated into the soil 14 days before prior to planting

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

Manufacturer:
SEED RANCH
6777 Lutz Lake Fern Rd.
Odessa, FL 33556

Product 3: **GRANULAR Iron Plus** LESCO Micronutrient Supplement

Product Description:

Use as a supplement to correct soil deficiencies and as a supplement to a well-developed soil fertility program.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

This product is to be incorporated into the soil 14 days before prior to planting

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

Product -4: **Ornamental Fertilizer** 14-20-4 LESCO

Product Description:

For use as a phosphorus supplement on existing lawns to correct a soil deficiency or as a starter fertilizer in lawn establishment.

TOTAL NITROGEN (N).....14.00%
7.59% Ammoniacal Nitrogen
5.33% Urea Nitrogen*
1.08% Water Insoluble Nitrogen
AVAILABLE PHOSPHATE (P2O5).....20.00%
SOLUBLE POTASH (K2O) 4.00%
IRON (Fe) 0.36%
0.30% Water Soluble Iron (Fe)

DERIVED FROM: Polymer Coated Urea, Urea, Ammonium Phosphate, Muriate of Potash, Biosolids.
*2.52% Slowly Available Urea Nitrogen from Polymer Coated Urea.

This product is to be incorporated into the soil 14 days before prior to planting

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

B. GENERAL APPLICATION of Biological Stimulants and Mineral Balancing Elements Amendments

Follow amendment recommendations found in Exhibit A at End of Section, utilizing appropriate amounts based upon topsoil that is to be in place.

Amend the approved quantities of soil amendments into the soil and incorporate into the top 6 inches of soil materials, then rake to finish grade.

No plantings and nutritional development amendments are to be incorporated until the Biological Stimulants and Mineral Balancers are in place and incorporated into the landscape-based soils for a minimum of 14 full days.

C. Inspections

The Sustainability Consultant shall approve materials prior to use and shall ensure proper quantities of materials are incorporated per the above specifications.

Sustainability Consultant shall inspect amendments during amending operations and after all amendments are incorporated.

Provide 72-hour notice prior to commencing amending operations to arrange inspection time and location.

2.03 SOIL PREPARATION AMENDMENTS Process--NUTRITIONAL

A. Nutritional Development

Nutritional Development Product-1:
Landscape & Ornamental All-Purpose Fertilizer 14-14-14 LESCO

Product Description:

The sources of nitrogen, phosphorus, and potassium have been polymer coated to provide a longer release than uncoated, quick release fertilizers. Normal feeding with this product will last 3-4 months.

This product is specifically being utilized in:

- Dry Pond Soil Mix

This product is specifically to be incorporated into the soil just prior to planting.

Apply at rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

Nutritional Development Product -2:
Ornamental Fertilizer 8-10-10 LESCO

Product Description:

The sources of Nitrogen, Phosphorus, Potash, Magnesium, Sulfur, Copper, Iron, Manganese, and Zinc have been coated with LESCO Poly Plus OPTI Polymer Coated Urea.

Derived from Polymer Coated Urea, Urea, Ammonium Sulfate, Diammonium Phosphate, Sulfate of Potash, Muriate of Potash, Sulfate of Potash-Magnesia, Magnesium Sucrate, Copper Sucrate, Iron Sucrate, Manganese Sucrate, and Zinc Sucrate., Muriate of Potash.

Total Nitrogen 8% (4% Ammoniacal Nitrogen & 4% Urea Nitrogen), Available Phosphate 10%. Soluble Potash 10%, Magnesium 2.25%, Sulfur 5.5%, Copper .05%, Iron 3%, Manganese 2%, and Zinc .1%.

This product is specifically being utilized in:

- Ornamental Prairie Mix Soil,

- Shrub Soil Mix
- Turfgrass-Soil Mix

This product is specifically to be incorporated into the soil just prior to planting.

Apply at rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

Nutritional Development Product-3:

CarbonPro-G Granular Microbial & Carbon Plant Health Nutrient Optimizer LESCO

Product Description:

Granular Microbial & Carbon Plant Health Nutrient Optimizer that harnesses the power of carbon, plant-microbial interactions, and organic soil processes to maximize plant health and nutrition. Aids seed development and increases root mass and remediates high saline soils and salt toxicity.

This product is specifically being utilized in:

- Ornamental Prairie Mix Soil,
- Dry Pond Soil Mix
- Shrub Soil Mix
- Turfgrass-Soil Mix

This product is specifically to be incorporated into the soil just prior to planting.

Apply at rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

NUTRITIONAL DEVELOPMENT PRODUCT -4

GRANULAR Iron Plus LESCO Micronutrient Supplement

Product Description:

Use as a supplement to correct soil deficiencies and as a supplement to a well-developed soil fertility program.

This product is specifically being utilized in:

- Tree Drip Line Edge Amendment Incorporation

This product is specifically to be incorporated into the soil just prior to planting.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

Manufacturer:
LESCO
1385 East 36th Street
Cleveland, OH 44114-4114

NUTRITIONAL DEVELOPMENT PRODUCT -5

Biochar Now w pH Reduction Elements-MEDIUM Engineered Bio-Carbon

Product description:

Biochar (MEDIUM) shall be obtained from thermochemical conversion of biomass in an oxygen- limited environment (pyrolysis) containing at least 80% carbon. Feedstocks shall be composed of wood or clean forest waste. Feedstock materials transported in salt water, painted, or treated with preservatives are not permitted. Ash content shall be less than 5%. pH shall be near 6.5. Items listed in testing results per IBI standard testing shall not exceed standards for agricultural food production. Percent of carbon shall be listed on label or test results. The product shall be USDA certified Biobased.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
Biochar Now, LLC
19500 County Road 7
Berthoud, CO 80513
970-593-9100

This product is specifically being utilized in:

- Tree Drip Line Edge Amendment Incorporation

.

This product is specifically to be incorporated into the soil just prior to planting.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd.

Manufacturer:
Martin Midstream Partners
580 East Shipyard
Phone: 815-357-6954

NUTRITIONAL DEVELOPMENT PRODUCT -6

CarbonizPN PRO SOIL Enhancer LESCO

Product Description:

A professional blend of premium compost and USDA Certified Biobased Premium Biochar

This product is specifically being utilized in:

- Tree Drip Line Edge Amendment Incorporation

This product is specifically to be incorporated into the soil just prior to planting.

Application rate: See Appendix for the rates listed from soil test recommendations provided through Certified Consultants Ltd

Nutritional Development Product -7:

Ornamental Fertilizer 32-0-8 LESCO

Product Description:

Contains LESCO® Poly Plus® Polymer Coated Urea to provide
a uniform growth with extended nitrogen feeding.

TOTAL NITROGEN (N).....32.00%
32.00% Urea Nitrogen*
SOLUBLE POTASH (K2O) 8.00%
IRON (Fe) 2.00%
0.02% Water Soluble Iron (Fe)

DERIVED FROM: Polymer Coated Urea, Urea, Muriate of Potash,
Iron Sucrate. *8.64% Slowly Available Urea Nitrogen from Polymer Coated Urea.

This product is specifically being utilized in:

- Tree Drip Line Edge Amendment Incorporation

Manufacturer:
LESCO

1385 East 36th Street
Cleveland, OH 44114-4114

B. GENERAL APPLICATION of Nutritional Development Elements Amendments

Once:

- Site Soils are spread and installed according to specification with confirmation of adherence to specification.
- Soils have been amended with the Biological and Mineral Balancing Amendments
- 14-day waiting period is finished.
- And Plantings are on site and ready for placement (except turf and turf with tree areas),

Follow Nutritional Development amendment recommendations found in Exhibit A at End of Section, utilizing appropriate amounts based upon topsoil that is in place ready for each of Planting Area Types outlined below.

Planting Area Types

ORNAMENTAL PRAIRIE MIX SOIL ONLY-- Application of Amendments for *Ornamental Prairie Mix Soil Only.* Incorporate the approved quantities of Nutritional based soil amendments into the top 4" of the overall square footage for each "*Ornamental Prairie Mix Soil Only*" planting area.

DRY POND SOIL MIX ONLY--Application of Amendments for *Dry Pond Soil Mix Only areas.* Incorporate the approved quantities of Nutritional based soil amendments into the top 4" of the overall square footage for each *Dry Pond Soil Mix Only Planting areas*.

SHRUB SOIL MIX ONLY--Application of Amendments for *shrub only areas.* Incorporate the approved quantities of Nutritional based soil amendments uniformly into the top 4" (depth) in a 2' x 2' of the overall square footage for each "shrub Soil Mix only" planting area.

TURFGRASS SOIL MIX ONLY--Application of Amendments for *Turfgrass Soil Mix only areas.* Incorporate the approved quantities of Nutritional based soil amendments into the top 6" of the overall square footage for each *Turfgrass Soil Mix Only Planting areas*.

TREE BALL EDGE AMENDMENT INCORPORATION ONLY--Application of Amendments for *Tree Ball Edge Amendment Incorporation Only.* Incorporate the approved quantities of Nutritional based soil amendments into the top 4-6" of the overall square footage for each "Tree Ball Edge Amendment Incorporation Only" planting area.

C. Inspections

The Sustainability Consultant shall approve materials prior to use and shall ensure proper quantities of materials are incorporated per the above specifications.

Sustainability Consultant shall inspect amendments during amending operations and after all amendments are incorporated.

Provide 72-hour notice prior to commencing amending operations to arrange inspection time and location.

PART 3 – EXECUTION

3.01 TURF AND PLANTING BED AREA SOIL PREPARATION

A. Receive site at finish grade (+/-.10”). Ensure proper grading and drainage of site prior to acceptance.

B. Before the start of the project, spray all existing areas that are a part of construction or landscaping with 2% solution of glyphosate (Roundup or equal) to kill existing vegetation. Protect from erosion per other sections (NIC)

C. Upon completion of construction and prior to grading and soil work, remove all deleterious material – boulders, branches, construction debris. Remove all roots and stone over 2.5” diameter or length.

D. Remove all base stone, concrete, asphalt, etc from raised beds or newly constructed islands.

E. Rip all landscaped areas (including turf areas) to 12” deep. Ripping teeth shall be no further apart than 18” o.c.

F. Rip all raised beds or newly constructed islands to 12” deep. Ripping teeth shall be no further apart than 18” o.c.

G. Place approved soil materials and lightly compact until final grade per engineering drawings. Place no more than 8 inches per lift before compacting. Compaction shall be NO MORE than 150 psi. Grade by hand or equipment to finish grade, assuring proper drainage.

H. Till to 12” deep and grade to finish grade per engineer’s plans. Confirm in writing compaction is NO MORE than 150 psi

3.02 BIOLOGICAL STIMULANTS & MINERAL BALANCERS—

Incorporate the Soil Sulfur, BioChar Now-Medium Size, CarbonPro-G Granular Microbial, Sulfate of Potash, 14-20-4 Poly Plus, and Granular Iron Plus -- Biological Stimulants and Mineral balancers per rates on Soil Prep Quantities Chart.

Incorporation depth of all elements in the biological stimulants & mineral balancers is to be 6".

These amendments are to be in place 14 days prior to any plant or seeding incorporation.

3.03 NUTRITIONAL DEVELOPMENT—

Apply CarbonPro-G, per rates on "Nutritional Development" Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4" of soil as directed above.

Apply 8-10-10 Fertilizer per rates on "Nutritional Development" Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4" of soil as directed above.

Apply 14-14-14 Fertilizer per rates on "Nutritional Development" Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4" soil as directed above.

Apply "Granular Iron Plus Micronutrient Supplement per rates on "Nutritional Development" Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4" of soil as directed above.

Apply 32-0-8 Fertilizer per rates on "Nutritional Development" Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4" of soil as directed above.

Apply Bio Char Now w pH Reduction Elements CHIP per rates on “Nutritional Development” Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4” of soil as directed above.

Apply CarbonizPN Pro Soil Enhancer per rates on “Nutritional Development” Soil Prep Quantities Chart:

Incorporate these Nutritional Development Amendments, for the planting groups assigned before or while plantings are being completed, into top 4” of soil as directed above.

4 Once all planting is complete, restore all landscape beds to final grade and remove all excess soil from site.

Assure proper drainage and fill in all settled areas and riffs or gullies.

Remove all stone, roots, construction debris and deleterious material off site.

Repair ruts, gullies or disturbed areas in seed or sod, and rope or cordon off to prevent traffic during establishment period.

3.04 RESTORATION

A. Restore existing and new structures, fences, roads, sidewalks, paving, curbs, and landscaping damaged during execution of work of this Section, as approved by the Sustainability Consultant.

B. During work, keep surfaces clean and work area in an orderly condition.

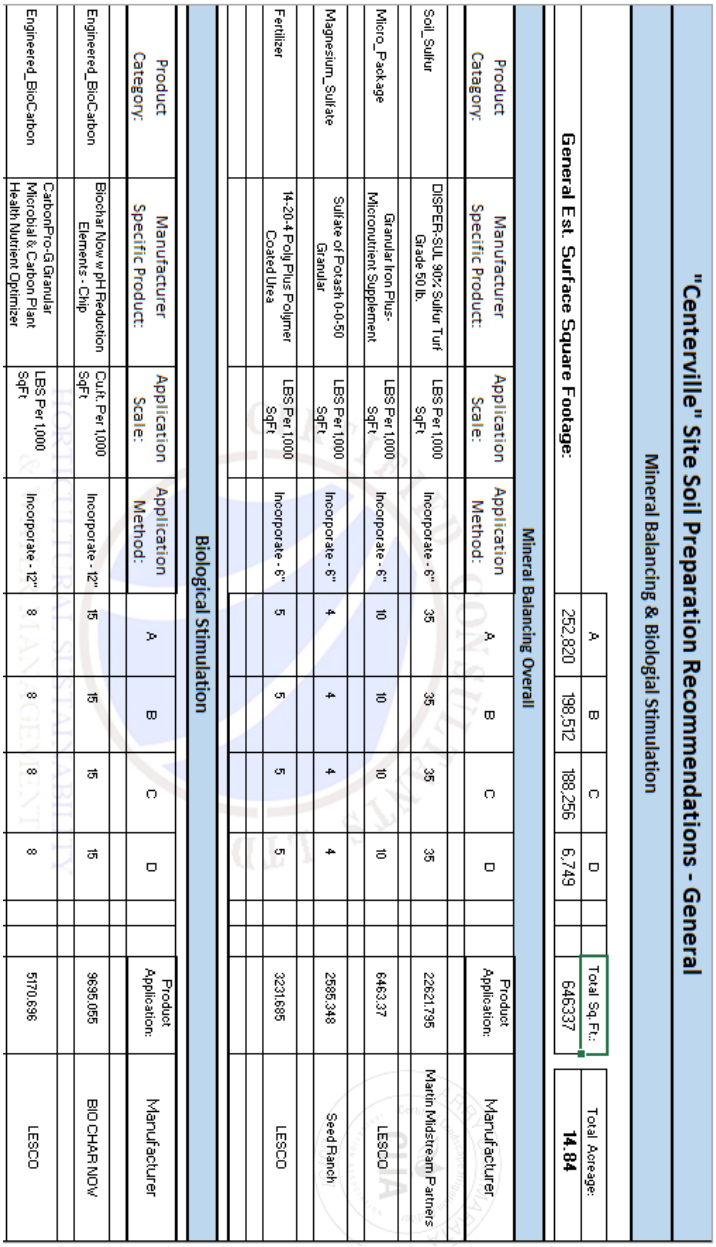
3.05 TOLERANCES

A. Hold finished grade adjacent walks, curbs, and pavement in planting beds to be mulched to 3 inches below top edge of pavement.

EXHIBIT ‘A”

A- 1.1 SOIL PREPARATION REQUIREMENTS – ENTIRE SOIL Sq. Ft. HORT NEEDS

BIOLOGICAL STIMULATION & MINERAL BALANCING



"Centerville" Site Soil Preparation Recommendations - General

Mineral Balancing & Biologial Stimulation

General Est. Surface Square Footage:	A	B	C	D		Total Sq. Ft.:	Total Acreage:
	252,820	198,512	188,256	6,749		646337	14.84

Mineral Balancing Overall

Product Catagory:	Manufacturer Specific Product:	Application Scale:	Application Method:	A	B	C	D		Product Application:	Manufacturer
Soil_Sulfur	DISPER-SUL 90%; Sulfur Turf Grade 50 lb.	LBS Per 1,000 SqFt	Incorporate - 6"	35	35	35	35		22621.795	Martin Midstream Partners
Micro_Package	Granular Iron Plus-Micronutrient Supplement	LBS Per 1,000 SqFt	Incorporate - 6"	10	10	10	10		6463.37	LESCO
Magnesium_Sulfate	Sulfate of Potash 0-0-50 Granular	LBS Per 1,000 SqFt	Incorporate - 6"	4	4	4	4		2585.348	Seed Ranch
Fertilizer	14-20-4 Poly Plus Polymer Coated Urea	LBS Per 1,000 SqFt	Incorporate - 6"	5	5	5	5		3231.685	LESCO

Biological Stimulation

Product Category:	Manufacturer Specific Product:	Application Scale:	Application Method:	A	B	C	D		Product Application:	Manufacturer
Engineered_BioCarbon	Biochar Now w pH Reduction Elements - Chip	Cu.ft. Per 1,000 SqFt	Incorporate - 12"	15	15	15	15		9696.055	BIO CHAR NOW
Engineered_BioCarbon	CarbonPro-G Granular Microbial & Carbon Plant Health Nutrient Optimizer	LBS Per 1,000 SqFt	Incorporate - 12"	8	8	8	8		5170.696	LESCO

A-1.2 SOIL PREPARATION REQUIREMENTS – NUTRITIONAL DEVELOPMENT

"Centerville" Site Soil Preparation Recommendations

Nutritional Development

	A	B	C	D	E		
Sq. Ft. Estimate Per Planting Type Area	252820	198512	188256	6749	6,120	**Total Sq. Ft. Coverage Area:**	**652457**

Nutritional Feeding Recommendations

Product Catagory:	Manufacturer Specific Product:	Application Scale:	Application Method:	A	B	C	D	E	Total Product Application:	Manufacturer
Engineered_BioCarbon	CarbonPro-G Granular Microbial & Carbon Plant Health Nutrient Optimizer	LBS Per 1,000 SqFt	Incorporate - 4"	6	8	8			3672.496	LESCO
Fertilizer	14-14-14 Poly Plus Polymer Coated Urea w 4% S, .5% Fe, .5% Mn	LBS Per 1,000 SqFt	Incorporate - 4"	3	4				794.048	LESCO
Fertilizer	8-10-10 Poly Plus Polymer Coated Urea w 2.25% Mg, 5.5% S, .05% Cu, 3% Fe, 2% Mn, .1% Zn	LBS Per 1,000 SqFt	Incorporate - 4"	7	10	10			3719.79	LESCO
Fertilizer	32-0-8 Poly Plus Polymer Coated Urea w 2%Fe	LBS Per 1,000 SqFt	Incorporate - 4"				9		55.08	LESCO
Engineered_BioCarbon	Biochar Now w pH Reduction Elements - Med	Cu.yd. Per 1,000 SqFt	Incorporate - 4"				10		61.2	BIO CHAR NOW
Engineered_BioCarbon	CarbonizPN™ PRO SOIL ENHANCER 40 lbs (CARBONIZPN-SOIL)	LBS Per 1,000 SqFt	Incorporate - 4"				20		122.4	MIRIMICHI GREEN
Micro_Package	Granular Iron Plus-Micronutrient Supplement	LBS Per 1,000 SqFt	Incorporate - 4"					10	61.2	LESCO

PLANTING AREA TYPE	DESCRIPTION
A	Ornamental Prairie Mix Soil
B	Dry Pond Soil Mix
C	Turfgrass Soil Mix
D	Shrub Soil Mix
E	Tree Planting Ball Edge Amendment Incorp.

NOTES: TREE BALL EDGE AMENDMENT INCORPORATION PROCESS OUTLINE
All products are to be applied/incorporated just prior to planting of tree material outlined below
PLANT AREA A (Trees-Ex.-10) are to incorporate required amendments outside the Existing Drip line Area & then 3' beyond
PLANT AREA A (Trees 34)are to incorporate required amendments outside the Existing Drip line Area & then 3' beyond
PLANT AREA B (Trees 10)are to incorporate required amendments outside the Existing Drip line Area & then 3' beyond
PLANT AREA C (Trees 68) are to incorporate required amendments outside the Existing Drip line Area & then 3' beyond
PLANT AREA D (Trees 7) are to incorporate required amendments outside the Existing Drip line Area & then 3' beyond

A-1.3 EXISTING SITE SOIL CONDITIONS

Centerville Site/Soil Conditions:							
Lab Results							
Site Information:	**Quantity:**	**A-1**	**A-2**	**A-3**	**A-4**	**A-5**	**A-6**
Soil Analysis Report							
Nitrate - N	LBS/A	2	2	2	10	2	2
Sub-Soil							
Sub-Soil							
P1 Phosphorus (Weak Bra	PPM	5VL	6VL	9L	2VL	5VL	7VL
P2 Phosphorus (Strong Bi	PPM	11L	17L	14L	3VL	11L	14L
Olsen Bicarb - P	PPM	17H	10L	11M	7L	10L	8L
Potassium - K	PPM	127M	99L	123L	94VL	83L	146M
Magnesium - Mg	PPM	382VH	416VH	563VH	386M	410VH	359VH
Sulfur - S	PPM	9L	6VL	5VL	222VH	12L	7L
Zinc - Zn	PPM	1.1M	.9L	1.0L	0.7L	0.8L	1.1M
Manganese - Mn	PPM	6L	4VL	5L	2VL	5L	5L
Iron - Fe	PPM	17H	21H	20H	4VL	14M	31VH
Copper - Cu	PPM	.8L	.7L	.8L	1.1M	.7L	.9M
Boron - B	PPM	.3VL	.3VL	.2VL	.9M	.2VL	.3VL
Calcium - Ca	PPM	2928H	2816H	2657H	8227VH	3082H	3383VH
Sodium - Na	PPM	18	16	16	114	24	12
Soluble Salts	MMHOS/CM	.3L	.3L	.3L	.8L	.2L	.3L
Excess Lime Rate		M	L	L	M	M	M
Nutrient Availability - Profile							
Orthophosphate - P		9.6VH	9.5VH	9.7VH	3.2L	6.9 O	10.1VH
Phosphorus		14 O	14 O	14 O	6L	10M	16VH
Potassium - K		75 O	59	68 O	41L	35	75 O
Magnesium - Mg		382VH	390VH	349VH	371VH	324VH	342VH
Calcium - Ca		1329VH	1175VH	771VH	2549VH	853VH	1591VH
Sodium - Na		23	19	18	115	22	14
Iron - Fe		57VH	67VH	83VH	69VH	52VH	45VH
Aluminum		137	144	166	145	140	113
Microbial Health Indicator	*(CO2 Burst)*	195.00VH	146.00VH	227.00VH	2.00VL	77.0H	179.00VH
ORGANIC CONVATIO		24.6	26	25.4	26	28.1	26.8
Organic Matter	%	2.5L	2.7M	2.9M	1.5VL	2.0L	2.5L
C.E.C.	MEQ/100G	18.2	17.9	18.4	45.1	19.1	20.3
pH		8	8	7.9	9.8	8	8.1

Soil Textural Composition							
Type:	**Rate:**	**A-1**	**A-2**	**A-3**	**A-4**	**A-5**	**A-6**
Sand	%	32%	34%	28%	40%	30%	36%
Silt	%	40%	40%	40%	32%	44%	34%
Clay	%	28%	26%	32%	28%	26%	30%
Soil Texture:		CLAY LOAM	LOAM	CLAY LOAM	CLAY LOAM	LOAM	CLAY LOAM
Soil Compaction Test Results Per Quad: (psi)		324	236	197	214	233	203
Gravel							

General Soil Conditions						
	A-1	**A-2**	**A-3**	**A-4**	**A-5**	**A-6**
Textural	Average	Good	Average	Average	Good	Average
Biological Readiness	Poor	Poor	Poor	Poor	Poor	Good

Centerville Site/Soil Conditions:

Lab Results

Site Information:	Quantity:	A-7	A-8	AA1	AA2	AA3	AA4
Soil Analysis Report							
Nitrate - N	LBS/A	10L	11L	7L	29VH	2	2
Sub-Soil							
Sub-Soil							
P1 Phosphorus (Weak Bra	PPM	3VL	6VL	6VL	2VL	4VL	3VL
P2 Phosphorus (Strong Bi	PPM	8L	8L	11L	5VL	7VL	9L
Olsen Bicarb - P	PPM	8L	18H	9L	7L	12M	7L
Potassium - K	PPM	165M	142M	96L	83L	111L	130M
Magnesium - Mg	PPM	337VH	361VH	412VH	415VH	351VH	319VH
Sulfur - S	PPM	10L	11L	7L	29VH	7L	12L
Zinc - Zn	PPM	1.5M	1.4M	.8L	.5VL	0.9L	1.0L
Manganese - Mn	PPM	6L	5L	4VL	4VL	4VL	6L
Iron - Fe	PPM	27VH	32VH	21H	18H	19H	24H
Copper - Cu	PPM	1.4H	1.0M	.8L	1.2M	.9M	1.4H
Boron - B	PPM	.3VL	.2VL	.2VL	.3VL	.2VL	.3VL
Calcium - Ca	PPM	3621VH	3210H	3148H	3366H	3517VH	3308VH
Sodium - Na	PPM	50	57	21	199VH	20	59
Soluble Salts	MMHOS/CM	.3L	.3L	.3L	.4L	.3L	.3L
Excess Lime Rate		M	M	M	M	M	L
Nutrient Availability - Profile							
Orthophosphate - P		3.9L	8.0VH	6.5 O	3.9L	5.8M	5.6M
Phosphorus		7L	12 O	10M	7L	10M	9M
Potassium - K		74 O	69 O	47M	32L	51	60 O
Magnesium - Mg		303VH	387VH	442VH	412VH	335VH	294VH
Calcium - Ca		2118VH	1431VH	1727VH	1625VH	1803	1536
Sodium - Na		48	56	20	176	16	59
Iron - Fe		59VH	79	51VH	49VH	46	60VH
Aluminum		111	141	132	139	124	120
Microbial Health Indicator	*(CO2 Burst)*	105	128.00VH	65.00 O	32.00M	94.00VH	80.00H
ORGANIC C/N RATIO		27.1	21.6	25.4	25.4	29.3	30.5
Organic Matter	%	2.1L	2.2L	2.0L	1.4VL	2.1L	2.3L
C.E.C.	MEQ/100G	21.6	19.7	19.5	21.4	20.9	19.8
pH		8.2	8.2	8.1	8.4	8.2	8.3

Soil Textural Composition

Type:	Rate:	A-7	A-8	AA1	AA2	AA3	AA4
Sand	%	36%	34%				
Silt	%	34%	38%				
Clay	%	30%	28%				
Soil Texture:		CLAY LOAM	CLAY LOAM				
Soil Compaction Test Results Per Quad: (psi)		284	293	276	245	312	234
Gravel							

General Soil Conditions

	A-7	A-8	AA1	AA2	AA3	AA4
Textural	Good	Good	Average	Good	Good	Average
Biological Readiness	Poor	Poor	Poor	Poor	Poor	Poor

END OF SECTION

SECTION 329200 – TURF, GRASSES, AND SEEDING

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 (native meadow seed mixes).
2. Seeding (turfgrass).
3. Hydroseeding (turfgrass).
4. Sodding (turfgrass).
5. Turf renovation.
6. Erosion-control material(s).

B. Related Requirements:

1. Section 329113 “Soil Preparation.”

2. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

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.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. 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” and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Schedule conference to coordinate with Planting Preinstallation Conference, and conduct conference at project site, unless otherwise arranged.

1.5 SUBMITTALS

A. Qualification Data: For landscape Installer.

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. Include identification of source and name and telephone number of supplier.
   2. Certification of each specified native meadow seed mixture. Include identification of source and name and telephone number of supplier.

C. Indication of seeding method(s) and equipment to be used and intended depth of seed cover.

D. Product Data: For each type of product indicated.
   1. Mycorrhizal Fungi Inoculant: Product literature and manufacturer's recommended application rates and practices for turfgrass seed mix installations and native meadow seed mix installations.

E. Product Certificates: For fertilizers, from manufacturer (turfgrass only; do not use fertilizer on native meadow seed mix installations).

F. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

G. Schedules: Planting Schedule indicating anticipated seeding and sodding dates; Maintenance Schedule indicating anticipated maintenance activities, hours associated with the activities, and their frequencies.

H. Maintenance Log: Written record of actual maintenance activities performed during the maintenance period including description of activities, dates, list of personnel and products applied.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf and native meadow areas during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "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 National Association of Landscape Professionals:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawn Care Manager.
    c. Landscape Industry Certified Lawn Care Technician.

5. Pesticide Applicator: State licensed, commercial.

1.8 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 compliance 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" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. 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 materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Planting Restrictions - Seed (Native Meadow Seed Mixes): Native meadow grasses and wildflowers are warm season grasses and require 70-degree soil temperature to germinate.
   1. Fall Planting: Dormant seeding from November 1 to December 31 is preferred (ground can be frozen).
   2. Spring Planting: Sowing seed from April 1 to July 1 is also acceptable.
   3. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

B. Planting Restrictions - Seed (Turfgrass): Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Fall Planting: August 15 to October 15 (fall planting is preferred).
   2. Spring Planting: April 1 to May 1

C. Planting Restrictions - Sod: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
   1. Fall Planting: September 15 to October 15
   2. Spring Planting: April 15 to May 15

D. 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.

1.10 COORDINATION

A. Coordinate Work of the Section with installation of underground utilities, topsoil/planting soils and plants.

PART 2 - PRODUCTS

2.1 SEED (NATIVE MEADOW SEED MIXES)

A. Native Meadow Seed: Fresh, clean, dry, new-crop seed.

B. Seed Mix: Proprietary seed mixes as follows:

   1. Products: Subject to compliance with requirements, provide the following mixes distributed by Spence Restoration Nursery, 2220 East Fuson Road, Muncie, IN 47302, ph. (765) 286-7154:

      a. Bioretention Mix 1: ‘Wet Mesic Prairie Mix’
      b. Bioretention Mix 2: ‘Basic Prairie Mix’

C. Cover Crop: Avena sativa (seed oats) and Lolium multiflorum (annual ryegrass) based on rate recommended by Spence Restoration Nursery.

2.2 SITE STABILIZATION SEED MIX

A. If the site is prepared at a time that does not allow the sowing of the specified native meadow seed mix within the specified time window, the following seed mix is to be sown:
   1. Avena sativa (seed oats) @ 64 pounds per acre
   2. Lolium multiflorum (annual ryegrass) @ 25 pounds per acre

B. Under no circumstances are the following species to be used:
   1. Winter rye
   2. Winter wheat

2.3 TURFGRASS SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows with not less than 85 percent germination, not less than 98 percent pure seed, and not more than 0.5 percent weed seed:
   1. Seed Species: Turf type tall fescue and Kentucky bluegrass blend as follows:
      a. Three of the following varieties, balancing advantageous characteristics and distributed @ 30% each of total seed mix: Avenger III, Dynamite G-LS, Firecracker G-LS, Raceway, Raptor LS, Spyder 2LS, Stealth, Titanium G-LS, Xanadu, Zion.
      b. United or Yellowstone Kentucky Bluegrass @ 10% of total seed mix.

2.4 TURFGRASS SOD

A. Turfgrass Sod: Certified complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
   1. Minimum Age: 24 months
   2. Select sod grown in soils similar to those present on the project site.
   3. Turfgrass Species: a minimum of three cultivars of turf type tall fescue with up to one cultivar of Kentucky Bluegrass comprising a maximum of 10% of the mix.

C. Harvesting Sod: Machine-cut sod not exceeding one (1) sq. yd. in area with a minimum of 3/4 inch and a maximum of 1-1/4 inch topsoil base. Minimum width shall be eighteen (18) inches. Broken pads or pads with uneven ends shall not be acceptable.

2.5 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: 1 lb/1000 sq. ft. 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.

B. 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.

2.6 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley. Hay or chopped corn stalks are not acceptable.

B. 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.

2.7 PLANTING SUPPLEMENTS

A. Pesticide(s): 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.

B. Pre-Emergent Herbicide (Selective and Nonselective): 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 Nonselective): Effective for controlling weed growth that has already germinated.

D. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

2.8 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 long.
   1. Product: North American Green DS75 Single Net Straw Blanket

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

   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; verify that prepared topsoil is otherwise ready to receive Work of this Section.
   2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   3. Confirm that required utilities are available and ready for use.

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 TURF AREA / NATIVE MEADOW SEED MIX AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 “Soil Preparation.”

B. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect grade stakes set by others until directed to remove them.

C. Placing Planting Soil: Place specified planting soil over exposed subgrade.

   1. Reduce elevation of planting soil at sodded areas to allow for soil thickness of sod.

2. Verify that planting soil is lightly compacted and firm. If walking compacts the planting soil more than ½", planting site shall be Culti-packed.

D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.3 PREPARATION OF NATIVE MEADOW SEEDBED

A. Mark edges of areas to be seeded, taking care to ensure areas to be seeded with differing seed mixes are defined in a craftsman-like manner with true geometric boundaries as delineated on the Drawings.

B. Water area to encourage germination of weed seeds near the surface. Most weed seeds will germinate within two weeks of application of moisture. Do not till the soil again as this will bring even more seeds up to the surface.

C. Spray any new weed growth with specified herbicide in accordance with manufacturer's instructions. Provide waiting period for soil to recover, as recommended by manufacturer, prior to seeding.

D. Do not till soil unless otherwise directed. Do not apply fertilizer. Culti-pack soil if it is in a tilled or otherwise un-firm condition.

E. Apply mycorrhizal fungi inoculant prior to sowing of seed. Apply at a rate of one pound per 1000 square feet.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area / Native Meadow Seed Mix Area Preparation" Article.

B. For erosion-control blanket, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. 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 SEEDING (NATIVE MEADOW SEED MIXES)

A. DO NOT APPLY FERTILIZER TO AREAS RECEIVING NATIVE MEADOW SEED MIXES.

B. Apply seed mix with appropriate rangeland seed drill with packing wheels designed for installation of native grass and wildflower seed. Rolling is not necessary if appropriate drill is used with packing wheels. Seeding depth: confirm and follow recommendation of native seed supplier.

C. Protect seeded slopes exceeding 1:6 against erosion with Erosion-Control Blankets installed and stapled according to manufacturer's recommendations.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a rate of 1 ton/acre to form a thin continuous blanket 3/4 inch in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Use air-dry, clean, mildew- and seed-free threshed straw of wheat or oats. Hay or chopped corn stalks are not acceptable.

2. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.6 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 8-10 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:6 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches 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.

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. Spray-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 dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-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 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.

3.8 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. 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 soil or sod during installation. Tamp and roll lightly to ensure contact with soil, 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 slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two 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 below sod.

3.9 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.

I. Apply initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades. Apply Mushroom Compost to surface to surface of turf renovation area.

1. Soil Amendment(s): Mushroom Compost, according to requirements of Section 329113 "Soil Preparation." Apply Mushroom Compost to ¼ inch depth.
2. Initial Fertilizer: Slow-release fertilizer applied according to manufacturer's recommendations.

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.10 TURF MAINTENANCE

A. General: 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 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 one-third of grass height. Remove no more than one-third 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 turf type tall fescue to a height of 3 to 4 inches.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.11 NATIVE MEADOW SEED MIX AREA MAINTENANCE

A. Maintain a satisfactory meadow area by weeding, mowing and replanting.

B. Provide a monthly program of weed control. Large weed patches shall be eliminated by either spot-spraying with a general herbicide, or selective cutting with a string trimmer. Apply herbicides in accordance with manufacturers' written instructions. Correct damage resulting from improper use of herbicides.

C. Provide first year mowing as follows:
1. First mowing to be 4-6 inches height before oats set seed heads.
2. Mow to 4-6 inches height on a monthly interval or whenever weeds reach a height of 10" for remainder of first season.

D. Roll, re-grade, and immediately replant bare or eroded areas and re-mulch to produce a uniformly smooth grade. Provide material and installation the same as those used in the original installation.
1. Repair eroded areas by filling with topsoil, re-grading, and replanting.

E. Provide a log of maintenance activities including dates, hours, equipment used, and personnel involved.

3.12 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. 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.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.13 SATISFACTORY STAND OF NATIVE MEADOW

A. Installation shall meet the following criteria as determined by Architect during final inspection and at acceptance:
   1. Satisfactory Stand of Native Meadow (at the beginning of the second growing season):
      a. A healthy, uniform stand of grasses and wildflowers with 75% of the plant community being covered with the intended plant material.
      b. 50% of the specified species shall be present.
      c. 25% of the plant material shall be the permanent species.
   2. Use specified materials to reestablish native meadow stands that do not comply with requirements and continue maintenance until conditions are satisfactory. In areas where native meadow stands require over-seeding to meet specification, over-seeding will be performed using a slit seeder. No other over-seeding method will be acceptable.
   3. If satisfactory stand of native meadow has not been established at final inspection, another inspection shall be made upon written Contractor request.

3.14 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to 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 Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.15 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf and native meadow work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. 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.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.16 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following period:

1. Seeded Turf: 60 days from date of site planting completion.

2. Sodded Turf: 30 days from date of site planting completion.

B. Native Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape installer. Maintain as required in "Native Meadow Seed Mix Area Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable native meadow stand is established, but for not less than the following period:

1. Seeded Native Meadows: 12 months from date of site planting completion, including one full growing season.

END OF SECTION 329200

SECTION 329300 PLANTS, ORNAMENTAL

PART 1 - DESCRIPTION

1.1 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section SOIL PREPARATION GENERAL 329113

2. Section TURF, GRASSES, SEEDING 329200

1.2 DEFINITIONS

A. General Note: this article defines terms that may appear in the Contract Documents.

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

C. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; 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.

D. 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 diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

E. 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 the minimum root spread according to ANSI Z60.1 for type and size of plant required.

F. 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.

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. 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.

J. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

K. Planting Area: Areas to be planted.

L. 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 LANDSCAPE FILL SOIL AND TOPSOIL and drawing for planting soils.

M. 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.

N. 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.

O. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

P. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.3 COORDINATION

A. 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.

1.4 PREINSTALLATION MEETINGS

A. Plant Material Confirmation Conference: **Schedule conference for a date within 60 days of Contract award and not less than 15 months prior to projected commencement of planting installation;** conduct conference at project site, unless otherwise arranged.

B. Preinstallation Conference: **Schedule conference for a date not less than 60 days prior to commencement of planting installation,** and conduct conference at project site, unless otherwise arranged.

1.5 SUBMITTALS

A. Qualification Data: For landscape Installer

B. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials; reserved or contract-grown.
2. Plant Photographs: Include color photographs in digital format, min. 150 dpi of each required species and size of plant material as it will be furnished to 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.

C. Samples for Verification: For each of the following:

1. Organic Mulch: 1-quart 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.
2. Mineral Mulch: 1-quart volume of each mineral mulch required; in sealed plastic bags labeled with composition and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color and size.
3. Slow-Release, Tree-Watering Device: One unit of each size required.

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. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

F. Schedules: Planting Schedule indicating anticipated planting dates; Maintenance Schedule indicating anticipated maintenance activities, hours associated with activities, and their frequencies.

G. Maintenance Log: Written record of actual maintenance activities performed during the maintenance period including description of activities, dates, list of personnel and products applied.

H. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.7 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 in addition to requirements in Section 014000 "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. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Interior.
    c. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure 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 above the root flare for trees up to and including 4-inch caliper size, and 12 inches above the root flare for larger sizes.

2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth, or at site before or after planting for compliance with requirements for genus, species, variety, cultivar, size, size and condition of root balls and root systems, overall health, and quality, including form. Architect may also observe plant material further for the aforementioned requirements, and for pests, disease symptoms, injuries, and latent defects and may 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 and anticipated delivery dates seven days in advance of (each) delivery to site or to Contractor's storage facility.

1.8 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 compliance 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 materials with appropriate certificates.

C. 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.

D. **Handle balled and burlapped planting stock by root ball**.

E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.

F. 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.

G. 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.

H. 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 balled and burlapped trees and shrubs. Set stock on ground and cover balls with soil, peat moss, sawdust, organic mulch or other acceptable material.
2. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours prior to heeling-in. Reject plants with dry roots.
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.

I. Fertilizer: Deliver fertilizer in original sealed, waterproof containers labeled with weight, chemical analysis and manufacturer. Retain all labels and/or containers in an on-site location through planting completion date.

1.9 FIELD 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. Planting Restrictions: Install all plant material during a calendar time frame that is consistent with good horticultural practice. Install woody plant material between March 15 and December 1; install herbaceous plants of #1 container (one (1) gallon) or smaller size between March 15 and August 15. Coordinate planting periods with maintenance periods to provide required maintenance from date of planting completion.

C. Weather Limitations:

1. Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Do not install plants:
   a. When ambient temperatures are forecast to drop below 30 degrees F or rise above 90 degrees F;
   b. When wind velocity exceeds, or is forecast to exceed, 30 mph;
   c. When ground is frozen, snow-covered, muddy or in an otherwise unsuitable condition;
   d. During periods of extreme drought.

2. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Architect.

E. Coordinate work of this Section with installation of underground utilities, irrigation system, and seeding.

1.10 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.
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 planting completion and acceptance by Architect, including one continuous growing season:

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

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 10 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is 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.

PART 2 - MATERIALS

2.1 PLANT MATERIAL

A. No Substitutions: Furnish only plants true to genus, species, variety and cultivar indicated in the Plant List, Plant Schedule, or Plant Legend on Drawings. No substitutions will be approved.

1. Reserved plants: Reserve trees and shrubs through approved growers to ensure required plants at required sizes are available for scheduled installation.
2. Contract-grown plants: Contract-grow herbaceous perennials to ensure required plants at required sizes are available for scheduled installation.

B. 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.

1. Unacceptable are 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 in diameter; stem-girdling roots.
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.

C. 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.

D. 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.

E. 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.

F. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

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: 10-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: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Finely ground native hardwood bark.

a. AAA Hardwood Fines, Tiffany Lawn and Garden Supply, Inc., (317) 228-4900
b. Forrest Fines® Hardwood Bark Mulch, Greendell Landscape Solutions, Mooresville, IN (317) 996-2826
c. Hardwood Fines, Indiana Mulch, Indianapolis, IN (317) 638-8334
d. Approved equal.

B. Mushroom Compost: Spent Mushroom Substrate as defined by the American Mushroom Institute and consisting of well-composted, stable, and weed- and pesticide-free mixture of wheat straw, hay, corn cobs, cottonseed hulls, gypsum, sphagnum peat, ground limestone, chicken litter, and /or horse stable bedding and free of substances toxic to plantings. Reference 329113 “Soil Preparation” for analysis.

C. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, or following type, size range, and color:

1. Granite as supplied by Green Stone Company, 4455 E. Conner St.; Noblesville, IN 46060.

a. Maintenance Strip
Size Range: 3/4" to 1”; no fines.
Color: Maylen Black.
b. TYPE 2 @ Splash pad:
Size and Color: Weathered sandstone Creek 4”-8”

2.4 PLANTING SUPPLEMENTS

A. Pesticide(s): 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.

B. Pre-Emergent Herbicide (Selective and Nonselective): 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 Nonselective): Effective for controlling weed growth that has already germinated.

2.5 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal, by length indicated, pointed at one end.
2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or compression springs.
3. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
5. Guy Cables: (for trees of 3” caliper and/or 14’ in height and larger) Five-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated compression springs, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
6. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.
7. Padding: Burlap.
8. Manufactured tree-stabilization systems (subject to compliance with requirements):
    a. Border Concepts, Inc.: Tomahawk Tree Stabilizers
    b. Foresight Products, LLC: Duckbill Rootball Fixing System
    c. Tree Staple, Inc.: Tree Staples

2.6 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents across the total at-grade surface extents of the root ball over an extended time period manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.

1. Color: green

2.7 MISCELLANEOUS PRODUCTS

A. 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.

B. Burlap: Non-synthetic, biodegradable.

C. Mycorrhizal Fungi Inoculant: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

D. 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. Subject to compliance with requirements, provide products by one of the following: Colmet; Sure-Loc Edging Corporation; Border Concepts, Inc.; Collier Metal Specialties, Inc.; Russell, J.D. Company (The). Edging size min. 3/16 inch wide by min. 4 inches deep. Stakes min. 12 inches long of tapered steel. Standard tapered ends, corners and splicers. Unpainted raw steel or standard black paint - color/finish by Architect.

PART 3 - CONSTRUCTION REQUIREMENTS

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that specified fill soil and topsoil requirements have been met prior to commencement of planting installation.

2. 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.
3. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
4. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
5. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil according to Section LANDSCAPE FILL SOIL AND TOPSOIL

B. Placing Planting Soil: Place manufactured planting soil over exposed subgrade and lightly compact to minimize settling.

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 Inoculant: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations

3.4 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 for balled and burlapped or container-grown stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
    a. For planting pits that will receive Structural Soil, excavate to the depth specified in the Drawings.
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 angles of repose of adjacent materials to ensure stability. 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 when unattended by Installer's personnel.
8. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Soil removed from excavations is to be used as backfill soil unless otherwise indicated. Cross-reference 329113 Soil Preparation.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, 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 AND SHRUB

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. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 to 2 inches above adjacent finish grades.

1. Backfill: For trees, use excavated soil mixed with one shovel-full of Mushroom Compost per 3’ of tree height. For shrubs and vines, use planting soil.
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 lifts, 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 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. Quantity: Three for each caliper inch of plant

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above finish grades.

1. Backfill: Planting soil
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 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. Quantity: Two per plant

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. 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.

3.6 MECHANIZED TREE-SPADE PLANTING

A. Trees 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 manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.

B. Use the same tree spade to excavate the planting hole as will be used to extract and transport the tree.

C. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.

D. Cut exposed roots cleanly during transplanting operations.

E. Plant trees 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 AND SHRUB

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines only as directed by Architect.

C. Prune, thin, and shape trees, shrubs, 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 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, unless otherwise noted.

B. Use planting soil 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 minimally disturbs 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.

3.9 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 2-inch average thickness, with 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.

3.10 EDGING INSTALLATION

A. Shovel-Cut Edging (“Spade Edge”): Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch-deep, shovel-cut edge as indicated on Drawings.

B. Steel Edging: Install per manufacturer’s written instructions to match graphic representation(s) on Drawings, creating true arcs and straight lines as depicted.

3.11 INSTALLING SLOW-RELEASE WATERING DEVICE

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

3.12 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.

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.

3.13 PESTICIDE APPLICATION

A. 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.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.14 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. **Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.**

3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 10 percent dead, or in an unhealthy condition before the end of the corrections period, or are damaged during construction operations, and that Architect determines are incapable of restoring to normal growth pattern.

3.15 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. 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.

D. After installation and before planting completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of planting completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.16 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: 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: 12 months from date of planting completion and acceptance

B. Maintenance Service for Herbaceous Perennials, Bulbs and other plants: 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: 12 months from date of planting completion and acceptance

PART 4 - METHOD OF MEASUREMENT

A. Work under this item will be measured for payment on a lump sum basis.

PART 5 - BASIS OF PAYMENT

A. This work will be paid for at the contract lump sum (L SUM) price for **PLANTS, ORNEMNTAL AND TREES (SPECIAL)**, which price shall price include all materials, equipment, and labor to furnish and install per contract documents.

END OF SECTION 329300

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Trench drain grates and frames as shown on drawings and as specified herein.

1.2 SUBMITTALS

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

B. Shop Drawings: Show the following:

1. Layout, profiles, anchorages, accessories and installation details.

C. Samples for Verification: For each type of product indicated.

D. Qualification Data: For Installer and Manufacturer.

E. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Two years minimum experience installing tree, drain, or trench grates and support frames.

B. Manufacturer's Qualifications: Fifteen years minimum experience in cast grate manufacturing.

C. Source Limitations: Obtain trench drain grate and frame materials through one source from a single manufacturer.

D. Mock-up

1. Provide two trench drain grates to test cathodic rust arrestor application for finish technique and quality control.

2. Grates used for mock-up may not become a part of the finish installation.

1.4 PROJECT CONDITIONS

A. Delivery, Storage and Handling: Store product in manufacturer's packaging until ready to install.

1.5 COORDINATION

A. Coordinate installation of trench drain grate support frames with installation of concrete substrate specified in Division 3 Section "Cast-in-Place Concrete."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of trench drain grates and frames that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TRENCH DRAIN GRATES AND FRAMES

A. Basis-of-Design Product: Provided either the named product or a comparable product approved in advance by Landscape Architect. Refer to front end specifications section 012500 Substitution Procedures for substitution process for additional comparable product approval process.

B. Basis of Design Manufacturer:

   1. IRONSMITH (Palm Desert, CA, (800) 338-4766)

C. Products:

   1. 8-inch Infill Trench Drain Grate (straight): Custom model based on standard model GRID 8 x 24 with special castings as required to fit out non-standard lengths as shown on Drawings.

   2. 8-inch Corner Trench Drain Grate (corner): Standard model GRID 8 x 18 x 18.

D. Trench drain grate material shall be cast ductile iron from 100% recycled materials. All trench grate castings shall be manufactured true to pattern and component parts, and shall fit together in a satisfactory manner. The castings shall be of uniform pattern quality, free from blowholes, hard spots, shrinkage, distortion or other defects. Castings shall be cleaned by shot blasting.

E. Trench Drain Grate Finish: Unfinished natural state.

F. Trench drain grate frames shall be supplied by grate manufacturer with installation details as shown on Drawings.

G. Trench drain grate frames shall be supplied unfinished.

2.2 ACCESSORIES

A. Pilfer-proof Bolts/Screws: Provide pilfer-proof bolts/screws per manufacturer’s standard.

B. Cathodic Rust Arrestor

1. Products: Rhomar Industries; Black-Max.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Do not begin installation until site is properly prepared.

B. Concrete Substrate: Provide sound surface free of laitance, efflorescence, curing compounds, and other contaminants incompatible with area drains and frames.

C. Clean surfaces thoroughly prior to installation.

D. Prepare the surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.2 INSTALLATION, GENERAL

A. General: Comply with trench drain grate manufacturer's written installation instructions.

3.3 INSTALLATION

A. Frame: Install steel angle frame in accordance with details specified on Drawings and manufacturer’s recommendations. Maintain flush and leveled condition with surrounding paving surface at all times. Provide gap in frames at adjoining pavement expansion joints where applicable.

B. Install trench drain grates after danger or damage from construction traffic is past.

C. If needed, grind pads on underside of trench drain grates to level and to prevent grate rattle or rocking.

3.4 PILFER-PROOF BOLTING

A. Position trench drain grates to meet in the center of the trench and have uniform spacing around outside edges of castings. Drill through counter bored holes in the grates and install pilfer-proof bolts per manufacturer’s instructions.

B. Use wood or foam block out under frames per manufacturer’s instructions to allow pilfer-proof screw to extend below angle.

3.5 FINISH

A. Apply cathodic rust arrestor evenly to all surfaces of pre-rusted trench drain grates and frames in strict accordance with manufacturer’s installation instructions to achieve an even appearance and black polymer surface after curing. Cathodic rust arrestor may be applied by brush or roller directly to the surface of the substrate.

3.6 CLEAN-UP AND PROTECTION

A. Protect installed product until completion of project.

B. DO NOT ALLOW water from new concrete to run off or wash onto grates to prevent damage from concrete exudates, lime, and efflorescence. Protect or remove grates if surrounding surface is to be acid washed.

C. Touch up, repair or replace damaged products.

END OF SECTION 334416

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