PROJECT MANUAL

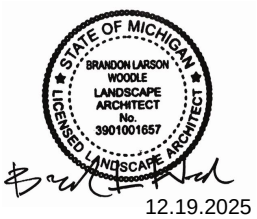
ROSE STREET PLAZA AND FARMERS ALLEY IMPROVEMENTS

Prepared for: City of Kalamazoo

BIDS AND PERMITS

Project No: 00014735

Issue date: December 19, 2025



12.19.2025

Prepared by:

SMITHGROUP

TABLE OF CONTENTS

DIVISION 11 - EQUIPMENT

NOT APPLICABLE

DIVISION 12 - FURNISHINGS

NOT APPLICABLE

DIVISION 13 - SPECIAL CONSTRUCTION

NOT APPLICABLE

DIVISION 14 - CONVEYING EQUIPMENT

NOT APPLICABLE

DIVISION 21 - FIRE SUPPRESSION

NOT APPLICABLE

DIVISION 22 - PLUMBING

NOT APPLICABLE

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

NOT APPLICABLE

DIVISION 25 - INTEGRATED AUTOMATION

NOT APPLICABLE

DIVISION 26 - ELECTRICAL

NOT APPLICABLE

DIVISION 27 - COMMUNICATIONS

NOT APPLICABLE

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

NOT APPLICABLE

DIVISION 31 - EARTHWORK

DIVISION 32 - EXTERIOR IMPROVEMENTS

DIVISION 33 - UTILITIES

NOT APPLICABLE

DIVISION 34 - TRANSPORTATION

NOT APPLICABLE

DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

NOT APPLICABLE

DIVISION 40 - PROCESS INTEGRATION

NOT APPLICABLE

DIVISION 41 - MATERIAL PROCESSING AND HANDLING EQUIPMENT

NOT APPLICABLE

DIVISION 42 - PROCESS HEATING, COOLING, AND DRYING EQUIPMENT

NOT APPLICABLE

DIVISION 43 - PROCESS GAS AND LIQUID HANDLING, PURIFICATION AND STORAGE EQUIPMENT

NOT APPLICABLE

DIVISION 44 - POLLUTION CONTROL EQUIPMENT

NOT APPLICABLE

DIVISION 45 - INDUSTRY-SPECIFIC MANUFACTURING EQUIPMENT

NOT APPLICABLE

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

NOT APPLICABLE

DIVISION 48 - ELECTRICAL POWER GENERATION

NOT APPLICABLE

SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:
   1. Section 311000 "Site Clearing" for removing existing trees and shrubs and for temporary erosion- and sedimentation-control measures if not specified in Section 015000 "Temporary Facilities and Controls."

1.2 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches above the ground for trees up to and including 4-inch size at this height and as measured at a height of 12 inches above the ground for trees larger than 4-inch size.

B. Caliper (DBH): Diameter breast height; diameter of a trunk as measured by a diameter tape at a height 54 inches above the ground line for trees with caliper of 8 inches or greater as measured at a height of 12 inches above the ground.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 ACTION SUBMITTALS

A. Product Data: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.4 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Moving or parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

D. Take precautions to protect plants from airborne contaminants, such as paint or fireproofing overspray.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
   1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- OD line posts, and 2-7/8-inch- OD corner and pull posts and 0.177-inch- diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
      a. Height: 54 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE PROTECTION

A. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
   1. Install temporary root protection matting over mulch to the extent indicated.

3.4 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
   1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
   2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Maintain protection zones free of weeds and trash.

C. Maintain hydration of plants to assure plant survival.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
   2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.5 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

3.6 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
   1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
   2. Cut Ends: Do not paint cut root ends.

3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.
1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees in accordance with ANSI A300.

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

3.8 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
1. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.9 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated 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 in accordance with arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

END OF SECTION

SECTION 310413 - COMMON SUBMITTAL REQUIREMENTS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes supplementary administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals specific to the work of this Division.

1.2 DEFINITIONS

A. Contractor: Refers to an entity in direct Contract with the Owner to furnish and/or perform any portion of the Work of the Contract, including but not limited to a Construction Manager.
   1. Contractor shall review and approve Product Submittals prior to forwarding them to the Architect.

B. Product Submittals: In general, Product Submittals show characteristics of the proposed construction in one of the following forms:
   1. Shop Drawings.
   2. Product Data.
   3. Samples.

C. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

D. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

E. Submittal Review Sheet: Specific form required to accompany each submittal. Obtain Submittal Review Sheet from the SmithGroup Project Manager.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Requirements specified for submittals are intended to provide efficient handling, while permitting review responsibilities to be carried out.

B. Avoidable Resubmittals: The first two reviews of each specified submittal will be processed without cost to the Contractor. After the second review, the Owner may charge the Contractor for the cost of such additional processing, unless the processing results from approved Change Orders causing revisions to previously approved submittals.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
   2. When a large volume of submittal materials is scheduled, additional review time may be required. Similarly, a particular submittal may require review completion in less than the agreed normal time. Due to variations in submittal volume and processing needs, agreed review time is not intended to apply to extreme conditions.
   3. Resubmittal Review: Allow 10 business days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.

E. Maintain at the Project Site ready access to the latest reviewed Shop Drawings and Product Data, and one set of samples.

1.4 DELEGATED-DESIGN SERVICES

A. Definitions:
1. Delegated Design: A portion or component of the Work identified by the Contract Documents to be designed by the Contractor, or an entity assigned by the Contractor, to satisfy performance and design criteria specified in the Contract Documents for that portion or component.
2. Registered Design Professional: Design professional, assigned by the Contractor, who is responsible for providing the delegated design work, and for certifying that the work is in compliance with the specified performance requirements and design criteria. Design professional shall be legally qualified to practice in jurisdiction where Project is located and shall be experienced in providing delegated design services of the kind indicated. Delegated design services are defined as those performed for installation of the system, assembly or product that are similar in material, design, and extent to those indicated for this Project.

B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Combine with Submittal Review Sheet before submitting to Architect .

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01.

C. Be responsible for quantities, weights, and dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes and to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of every trade, supplier, and subcontractor.

D. Be responsible for each submittal to be in conformance with information given and the design intent expressed in the Contract Documents.

E. Provide with each submittal specific written notice of any variation from the requirements of the Contract Documents by causing a specific notation to be made on the Submittal Review Sheet and Submittal Transmittal.

3.2 ARCHITECT'S AND GENERAL CONTRACTOR'S ACTION

A. General: Architect will not review submittals that do not include the Submittal Review Sheet.

B. Action Submittals: Architect's staff and consultants will review the submittal, and mark the Submittal Review Sheet with an action code. The code meanings are described below.

C. Additional codes may be provided within comments or as an electronic submittal review stamp and shall be used in help indicating return of partial submittals.

D. The Final Review Code on the Submittal Review Sheet prevails and governs the action of the overall submittal.

E. Review Code meanings are as follows:
   1. Action Codes Permitting Use:
      a. When an action code permitting use is assigned to a submittal, it does not authorize work that does not comply with the requirements of the Contract Documents. Acceptance of the Work will depend on compliance.
      b. Code AP - Approved: The Work covered by the submittal item may proceed, provided it complies with Contract Document requirements.
      c. Code AN - Approved as Noted: The Work covered by the submittal item may proceed, provided it complies with the Architect's notations and Contract Document requirements.
      d. Code AN-R - Approved as Noted - Resubmit: Do not deliver or install the related work until the resubmittal has received Code AP or AN. However, fabrication and other off-site work covered by the submittal item may proceed, at the Contractor's risk, provided it complies with the Architect's notations and Contract Document requirements.
   2. Action Code Prohibiting Use:
      a. Action Code REJ - Not Approved: The Work covered by the submittal item, including purchasing, fabrication, delivery, and other activity, shall not proceed. Revise the submittal item or prepare a new item in accordance with the Architect's notations. Resubmit the corrected or new item without delay; do not permit submittal items marked "Not Approved" to be used. Work incorporating such items will be rejected.
   3. Action Code for Items Not Required:
      a. Action Code X - Not Requested by Contract Documents: The submittal item is not called for by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.

F. Informational Submittals: For Architect's information only. Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
   1. Action Code for Information Only:
      a. Action Code INF - Information Only - Received: The submittal item is not called for a return with a reviewed action code by the Contract Documents and is being returned un-reviewed by the Architect except to the extent necessary to determine its status.

G. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

H. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.

I. Architect will return without review or discard submittals received from sources other than the Contractor.

J. Submittals not required by the Contract Documents may be returned by the Architect without action.
   1. Do not submit Material Safety Data Sheets. They will be returned without review.

3.3 SUBMITTAL TRANSMITTAL REQUIREMENTS

A. Submittal Transmittal shall be a PDF file in electronic format. It is recommended, to expedite the submittal review, the electronic form be emailed for review to the Architect as early as possible.
   1. Submittal Numbering: See below.
   2. Contact Information: Full Name, Phone Number and Email Address.

B. Submittal Definition
   1. Each submittal consists of items from only ONE Specifications section.
   2. Complete Submittal: If ALL the items required by the Specifications section are listed on one Submittal Form (including continuation sheet), it is a complete submittal.
   3. Partial Submittals: If it is necessary to divide the required items of a given Specifications section into two or more submittals to meet schedule or handling requirements, the separate submittals are partial submittals. All partial submittals have the same submittal number, and are differentiated by sequential P-numbers (see below).
   4. All items in each submittal, whether complete or partial, will be processed together: Individual items will not be 'broken out' for special handling. Arrange submittals accordingly.

C. Submittal Numbering
   1. Number submittals as described below to assist tracking.

2. Number each submittal in the format nnnnnn-nn.
   a. The 6-digit number is the number of the section that requires the submittal. For example, 044200.
   b. The 2-digit number is based on the numerical sequence of submittals from that section. In other words, for each section, the first submittal is 01, the second is 02, and so on. The 2-digit number does not change for partial or re-submittals, so that the submittal can be tracked.
   c. P-Number for Partial Submittals: Number each partial submittal in the pee space, beginning with P1, and increasing by one for each partial submittal of that submittal. If the submittal is a complete submittal, leave the P space blank.
   d. R-Number for Re-submittals: Number each re-submittal in the arr space, beginning with R1, and increasing by one for each re-submittal of that submittal. Do not include an R-Number for the initial submittal.
   e. Examples:
      1) Initial Complete Submittal: 044200-01. First Re-Submittal: 044200-01-R1.
      2) Initial Partial Submittal: 044200-01-P1. Second Partial Submittal: 044200-01-P2.
      3) First Re-submittal of Second Partial Submittal: 044200-R1-P2.

3.4 SUBMITTAL REVIEW SHEET REQUIREMENTS

A. Provide Submittal Review Sheet in PDF format. Submit as the page after the Submittal Transmittal.

B. When attached, the Submittal Review Sheet shall not obscure information contained in the submittal.

C. Do not edit any of the information contained within the Submittal Review Sheet except as follows:
   1. Submittal Number: See Submittal Numbering in Submittal Transmittal Requirements paragraph.

D. The Contractor shall submit the PDF file in a manner that will allow editing of the Submittal Review Sheet fields by SmithGroup and its consultants.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing, and abandoning site utilities in place.
6. Temporary erosion and sedimentation control.

1.2 DEFINITIONS

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

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

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
1. Use sufficiently detailed photographs or video recordings.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify IMiss Dig for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting 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 Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks pavements turf and grasses and plants.
3. Subbase course for concrete walks.

B. Related Requirements:
1. Section 311000 "Site Clearing" for site stripping, grubbing, and removal of above- and below-grade improvements and utilities.
2. Section 329300 "Exterior Plantings" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.2 DEFINITIONS

A. Base Course: Aggregate layer placed between the subgrade and concrete paving.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

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

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

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

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D 2487.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
   1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify Miss Dig for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 311000 "Site Clearing" are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

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

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294**/**D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

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

F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

G. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

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

I. Sand: ASTM C 33/C 33M; fine aggregate.

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

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability: Class 2; AASHTO M 288.
   2. Survivability: As follows:
      a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
      b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
      c. Tear Strength: 56 lbf; ASTM D 4533.
      d. Puncture Strength: 56 lbf; ASTM D 4833.
   3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
   4. Permittivity: 0.2 per second, minimum; ASTM D 4491.
   5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

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

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.
      b. 12 inches outside of concrete forms at footings.
      c. 6 inches outside of minimum required dimensions of concrete cast against grade.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.5 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

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

C. Proof-roll subgrade with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.

2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.6 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Removing concrete formwork.
2. Removing trash and debris.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.9 SOIL FILL

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

B. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.10 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

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

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
1. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

3.13 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:
   1. Shape base course to required crown elevations and cross-slope grades.
   2. Place base course 6 inches or less in compacted thickness in a single layer.
   3. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   4. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.14 FIELD QUALITY CONTROL

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

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

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

END OF SECTION

SECTION 320413 - COMMON SUBMITTAL REQUIREMENTS FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes supplementary administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals specific to the work of this Division.

1.2 DEFINITIONS

A. Contractor: Refers to an entity in direct Contract with the Owner to furnish and/or perform any portion of the Work of the Contract, including but not limited to a Construction Manager.
   1. Contractor shall review and approve Product Submittals prior to forwarding them to the Architect.

B. Product Submittals: In general, Product Submittals show characteristics of the proposed construction in one of the following forms:
   1. Shop Drawings.
   2. Product Data.
   3. Samples.

C. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

D. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

E. Submittal Review Sheet: Specific form required to accompany each submittal. Obtain Submittal Review Sheet from the SmithGroup Project Manager.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Requirements specified for submittals are intended to provide efficient handling, while permitting review responsibilities to be carried out.

B. Avoidable Resubmittals: The first two reviews of each specified submittal will be processed without cost to the Contractor. After the second review, the Owner may charge the Contractor for the cost of such additional processing, unless the processing results from approved Change Orders causing revisions to previously approved submittals.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
   2. When a large volume of submittal materials is scheduled, additional review time may be required. Similarly, a particular submittal may require review completion in less than the agreed normal time. Due to variations in submittal volume and processing needs, agreed review time is not intended to apply to extreme conditions.
   3. Resubmittal Review: Allow 10 business days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.

E. Maintain at the Project Site ready access to the latest reviewed Shop Drawings and Product Data, and one set of samples.

1.4 DELEGATED-DESIGN SERVICES

A. Definitions:
1. Delegated Design: A portion or component of the Work identified by the Contract Documents to be designed by the Contractor, or an entity assigned by the Contractor, to satisfy performance and design criteria specified in the Contract Documents for that portion or component.
2. Registered Design Professional: Design professional, assigned by the Contractor, who is responsible for providing the delegated design work, and for certifying that the work is in compliance with the specified performance requirements and design criteria. Design professional shall be legally qualified to practice in jurisdiction where Project is located and shall be experienced in providing delegated design services of the kind indicated. Delegated design services are defined as those performed for installation of the system, assembly or product that are similar in material, design, and extent to those indicated for this Project.

B. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

C. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Combine with Submittal Review Sheet before submitting to Architect .

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01.

C. Be responsible for quantities, weights, and dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes and to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of every trade, supplier, and subcontractor.

D. Be responsible for each submittal to be in conformance with information given and the design intent expressed in the Contract Documents.

E. Provide with each submittal specific written notice of any variation from the requirements of the Contract Documents by causing a specific notation to be made on the Submittal Review Sheet and Submittal Transmittal.

3.2 ARCHITECT'S AND GENERAL CONTRACTOR'S ACTION

A. General: Architect will not review submittals that do not include the Submittal Review Sheet.

B. Action Submittals: Architect's staff and consultants will review the submittal, and mark the Submittal Review Sheet with an action code. The code meanings are described below.

C. Additional codes may be provided within comments or as an electronic submittal review stamp and shall be used in help indicating return of partial submittals.

D. The Final Review Code on the Submittal Review Sheet prevails and governs the action of the overall submittal.

E. Review Code meanings are as follows:
   1. Action Codes Permitting Use:
      a. When an action code permitting use is assigned to a submittal, it does not authorize work that does not comply with the requirements of the Contract Documents. Acceptance of the Work will depend on compliance.
      b. Code AP - Approved: The Work covered by the submittal item may proceed, provided it complies with Contract Document requirements.
      c. Code AN - Approved as Noted: The Work covered by the submittal item may proceed, provided it complies with the Architect's notations and Contract Document requirements.
      d. Code AN-R - Approved as Noted - Resubmit: Do not deliver or install the related work until the resubmittal has received Code AP or AN. However, fabrication and other off-site work covered by the submittal item may proceed, at the Contractor's risk, provided it complies with the Architect's notations and Contract Document requirements.
   2. Action Code Prohibiting Use:
      a. Action Code REJ - Not Approved: The Work covered by the submittal item, including purchasing, fabrication, delivery, and other activity, shall not proceed. Revise the submittal item or prepare a new item in accordance with the Architect's notations. Resubmit the corrected or new item without delay; do not permit submittal items marked "Not Approved" to be used. Work incorporating such items will be rejected.
   3. Action Code for Items Not Required:
      a. Action Code X - Not Requested by Contract Documents: The submittal item is not called for by the Contract Documents and is being returned unreviewed by the Architect except to the extent necessary to determine its status.

F. Informational Submittals: For Architect's information only. Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
   1. Action Code for Information Only:
      a. Action Code INF - Information Only - Received: The submittal item is not called for a return with a reviewed action code by the Contract Documents and is being returned un-reviewed by the Architect except to the extent necessary to determine its status.

G. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

H. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.

I. Architect will return without review or discard submittals received from sources other than the Contractor.

J. Submittals not required by the Contract Documents may be returned by the Architect without action.
   1. Do not submit Material Safety Data Sheets. They will be returned without review.

3.3 SUBMITTAL TRANSMITTAL REQUIREMENTS

A. Submittal Transmittal shall be a PDF file in electronic format. It is recommended, to expedite the submittal review, the electronic form be emailed for review to the Architect as early as possible.
   1. Submittal Numbering: See below.
   2. Contact Information: Full Name, Phone Number and Email Address.

B. Submittal Definition
   1. Each submittal consists of items from only ONE Specifications section.
   2. Complete Submittal: If ALL the items required by the Specifications section are listed on one Submittal Form (including continuation sheet), it is a complete submittal.
   3. Partial Submittals: If it is necessary to divide the required items of a given Specifications section into two or more submittals to meet schedule or handling requirements, the separate submittals are partial submittals. All partial submittals have the same submittal number, and are differentiated by sequential P-numbers (see below).
   4. All items in each submittal, whether complete or partial, will be processed together: Individual items will not be 'broken out' for special handling. Arrange submittals accordingly.

C. Submittal Numbering
   1. Number submittals as described below to assist tracking.

2. Number each submittal in the format nnnnnn-nn.
   a. The 6-digit number is the number of the section that requires the submittal. For example, 044200.
   b. The 2-digit number is based on the numerical sequence of submittals from that section. In other words, for each section, the first submittal is 01, the second is 02, and so on. The 2-digit number does not change for partial or re-submittals, so that the submittal can be tracked.
   c. P-Number for Partial Submittals: Number each partial submittal in the pee space, beginning with P1, and increasing by one for each partial submittal of that submittal. If the submittal is a complete submittal, leave the P space blank.
   d. R-Number for Re-submittals: Number each re-submittal in the arr space, beginning with R1, and increasing by one for each re-submittal of that submittal. Do not include an R-Number for the initial submittal.
   e. Examples:
      1) Initial Complete Submittal: 044200-01. First Re-Submittal: 044200-01-R1.
      2) Initial Partial Submittal: 044200-01-P1. Second Partial Submittal: 044200-01-P2.
      3) First Re-submittal of Second Partial Submittal: 044200-R1-P2.

3.4 SUBMITTAL REVIEW SHEET REQUIREMENTS

A. Provide Submittal Review Sheet in PDF format. Submit as the page after the Submittal Transmittal.

B. When attached, the Submittal Review Sheet shall not obscure information contained in the submittal.

C. Do not edit any of the information contained within the Submittal Review Sheet except as follows:
   1. Submittal Number: See Submittal Numbering in Submittal Transmittal Requirements paragraph.

D. The Contractor shall submit the PDF file in a manner that will allow editing of the Submittal Review Sheet fields by SmithGroup and its consultants.

END OF SECTION

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving including the following:
   1. Walks.

B. Related Documents:
   1. The basis for designing concrete mixtures and demonstrating compliance with carbon budget targets shall be in accordance with:
      a. National Ready Mixed Concrete Association (NRMCA) Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by NRMCA Members – Version 3 (or later).
      b. National Ready Mixed Concrete Association, NRMCA Member Industry Average EPD for Ready Mixed Concrete – Version 3 (or later).

C. Embodied Carbon Goals:
   1. This project has a goal of reducing the embodied carbon footprint for concrete relative to a benchmark established the NRCMA Cradle-to-Gate Life Cycle Assessment Version 3 (or later). The target maximum Global Warming Potential (GWP) and target for maximum portland cement content is provided in PART 2 PRODUCTS. The target carbon footprint reduction for concrete is a weighted average by volume. It shall be permitted to propose the use of innovative products and manufacturing processes for approval by the Engineer of Record. Proposed alternatives shall meet all performance criteria for strength, durability, and constructability, and achieve the required reduction in carbon footprint.
   2. CO2 mineralized concrete is permitted where available, pending concrete performance criteria is met.

1.2 DEFINITIONS

A. Carbon Dioxide Mineralization: Active carbonation treatment of concrete during mixing such that the carbon dioxide (CO2) that is injected during mixing is mineralized (I.E.chemically converted into a mineral) within the concrete. The concrete may undergo mix optimization whereby the strength enhancement property of the mineralized CO2 is utilized to adjust cementitious content, pending that the optimized concrete mix meets concrete performance requirements as outlined.

B. Carbonization Treatment: Active introduction of CO2 into the concrete pore fluid which reacts with calcium from calcium hydroxide and calcium silicate hydrate to form calcite (CaCO3).Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

C. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

D. Embodied Carbon Footprint: embodied carbon is the carbon dioxide equivalent (CO2e) footprint of a building or infrastructure project before it becomes operational. Embodied carbon is distinct from operational carbon – data the carbon that comes from energy, heat, lighting, etc. Embodied carbon is generally expressed as Global Warming Potential. Typically, the embodied carbon is the initial embodied carbon which only accounts for the cradle to gate impacts.

E. Environmental Product Declaration: An Environmental Product Declaration (EPD) quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function. EPDs are conducted in accordance with a Product Category Rule for the specific product being evaluated. (International Organization for Standardization 14025 as a Type III declaration).Global Warming Potential: Global warming potential (GWP) is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide. GWP is 1 for CO2. For other gases it depends on the gas and the time frame. GWP for concrete is expressed in kg of CO2e per unit of concrete (cubic yard or cubic meter).

F. Global Warming Potential: Global warming potential (GWP) is the heat absorbed by any greenhouse gas in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide. GWP is 1 for CO2. For other gases it depends on the gas and the time frame. GWP for concrete is expressed in kg of CO2e per unit of concrete (cubic yard or cubic meter).

G. Life Cycle Assessment: Life cycle assessment (LCA) is a methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service.

H. Product Category Rule: Product Category Rules (PCR) are a set of rules, requirements, and guidelines for developing Environmental Product Declarations (EPD) for one or more product categories. The PCR for concrete is published by NSF International.

I. Water to Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 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.
      c. Curing procedures.
      d. Cold and hot weather concreting procedures.
      e. Global warming potential (GWP) limits.
   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.

B. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Concrete finishes and finishing.
      c. Cold- and hot-weather concreting procedures.
      d. Curing procedures.
      e. Global warming potential (GWP) limits.
      f. Construction joints, movement joints, contraction/control joints, and isolation joints and joint-filler strips.
      g. Semirigid joint fillers.
      h. Steel reinforcement installation.
      i. Concrete repair procedures.
      j. Concrete protection.
      k. Initial curing and field curing of field test cylinders (ASTM C31/C31M).
      l. Protection of field cured test cylinders.

1.4 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, means of transportation, 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.
   4. Health Product Declaration (HPD): Provide documentation confirming product compliance with full disclosure of known hazards in compliance with the Health Product Declaration Open Standard.

C. Embodied Carbon Footprint Submittals:

1. Plant specific Environmental Product Declaration (EPD) for each concrete mixture proposed for the project accompanying each concrete mixture submittal.
    a. It shall be permitted to substitute plant-specific EPDs with those listed in NRMCA Member Industry Average EPD for Ready Mixed Concrete if the proposed mixtures are similar to those listed and the concrete producer participated in providing data for the NRMCA Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete.
2. Plant specific Environmental Product Declaration (EPD) for each steel and fiber reinforcement product proposed for the project.
3. A calculation showing that the Global Warming Potential (GWP) of all the concrete and reinforcing materials supplied for the project considered as a weighted average by volume shall be lower than the GWP target set in Section 2.

D. Design Mixtures: For each concrete mixture including the following:
1. Mixture identification.
2. Material data and mixture proportions.
3. Minimum compressive strength at specified time frame.
4. Durability exposure class.
5. Maximum w/cm ratio.
6. Mixture proportions.
7. Calculated equilibrium unit weight.
8. Slump limit.
9. Air content.
10. Nominal maximum aggregate size.
11. Steel fiber reinforcement content.
12. Synthetic fiber content.
13. Material data.
14. Supporting test data or preconstruction test results.
15. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
16. Intended placement method.
17. Submit alternate design mixtures when characteristics of materials, mixture proportions, Project conditions, weather, test data for materials and concrete mixtures, or other circumstances warrant adjustments.

E. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

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

G. 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.

H. Other Action Submittals:
1. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:
1. Cementitious materials.
2. Aggregates.
3. Admixtures.
4. Steel reinforcement and reinforcement accessories.
5. Epoxy-coated reinforcement: CRSI's "Epoxy Coating Plant Certification".
6. Fiber reinforcement.
7. Curing compounds.
8. Applied finish materials.
9. Bonding agents.
10. Adhesives.
11. Semi-rigid joint fillers.
12. Joint-filler strips.
13. Repair materials.

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.

E. Product Test Reports and Certificates: For each of the following, signed by manufacturers:
   1. Carbon dioxide mineralization: Provide concrete producers certificate verifying mineralization of carbon dioxide. Include quantity, location, and supplier of injected CO2.

1.6 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

B. Documentation that the concrete supplier participated in supplying data to the NRMCA Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
   1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. 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. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 PRECONSTRUCTION TESTING

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

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

B. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
   1. Store reinforcement to avoid contact with earth.
   2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
   3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
   4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

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: Recycled content not less than 90 percent, Provide documentation indicating postconsumer and preconsumer recycled content**.**

B. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars.

C. 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.

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

2.4 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 100 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Cementitious Materials: Materials conforming to the following are permitted:
   1. Portland Cement: ASTM C150/C150M, gray portland cement Type I/II.
   2. Fly ash or natural pozzolan: ASTM C618, Class C or Class F.
   3. Slag cement: ASTM C989/C989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, 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: 3/4 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
   1. Aggregate Sizes: 3/8 to 5/8 inch nominal.
   2. Aggregate Source, Shape, and Color.

E. Water and Water Used to Make Ice: Complying with ASTM C1602 including all limits listed in Table 2 and the requirements of paragraph 5.4.

F. Air-Entraining Admixture: ASTM C260/C260M.

G. 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 C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

H. Carbon Dioxide Mineralization: ASTM C494/C494M, Type S. Carbon dioxide in the mixture must be post-industrial.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CarbonCure Technologies.

2.5 CURING MATERIALS

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

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

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

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D1752, cork or self-expanding cork or ASTM D8139, semirigid, closed-cell polypropylene foam in preformed strips.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C881/C881M, 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 IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. 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.

2.7 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. Drying shrinkage limit is percentage in change in length after 28 days of drying when tested as per ASTM C157 with 3 inches x 3 inches x 11 inches specimen moist cured 7 days prior to drying.

C. Cementitious Materials: 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.

D. 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, 3/4-inch Nominal Maximum Aggregate Size: 6 percent plus or minus 1-1/2 percent.

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

F. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture high-range, water-reducing admixture high-range, water-reducing and retarding admixture plasticizing and retarding 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.

G. 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: 4 inches, plus or minus 1 inch.
4. Shrinkage Limit: 0.04 percent.

H. Global Warming Potential (GWP) or portland cement content shall be 20% lower than the baselines established below.
1. Baselines for 4000 psi
a. GWP: 236 kg CO2e/cubic yard
b. Cement Content: 475 pounds / cubic yard

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 INSTALLATION OF STEEL REINFORCEMENT

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. 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 D3963/D3963M.

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 epoxy-bonding adhesive 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 1/4-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. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
   2. 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. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:
   1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
   2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
   3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
   4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

3.9 INSTALLATION OF DETECTABLE WARNINGS

A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Section 321726 "Tactile Warning Surfacing."
   1. Tolerance for Opening Size: Plus 1/4 inch, no minus.

B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles specified in Section 321726 "Tactile Warning Surfacing." Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete to comply with Section 321726 "Tactile Warning Surfacing" immediately after screeding concrete surface.

3.10 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 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.

3.11 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.

3.12 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 C172/C172M will be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. 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 to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; 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 C231/C231M, 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 C1064/C1064M; 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 C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
   a. A compressive-strength test to 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 to be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to 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 will 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.

3.13 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

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Cold-applied joint sealants.
2. Joint-sealant backer materials.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

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

1.4 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. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Crafco Inc.; RoadSaver Silicone.
b. Dow Corning Corporation; 888.
c. Pecora Corporation; 301 NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Crafco Inc.; RoadSaver Silicone SL.
b. Dow Corning Corporation; 890-SL.
c. Pecora Corporation; 300 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.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

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 C 1193 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.

3.5 PAVING-JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Joints within concrete paving.
   1. Joint Location:
      a. Expansion and isolation joints in concrete paving.
      b. Contraction joints in concrete paving.
      c. Other joints as indicated.

END OF SECTION

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Painted markings applied to concrete surfaces.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to marking asphalt paving or concrete surfaces including, but not limited to, the following:
      a. Asphalt-paving or concrete-surface aging period before application of pavement markings.
      b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.3 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
   1. Pavement-marking paint, acrylic.
   2. Pavement-marking paint, polymer cement
   3. Glass beads.

B. Mock-Up
   1. A 5 foot by 10 foot mock-up is required and shall be constructed in the field using the same means and methods intended for the final installation. The mock-up shall include a representative sample of the mural lines, including a section demonstrating the crossing of two lines. The mock-up shall include 6 color options for the pavement pattern. The owner's representative will select the 3 colors for the mural prior to proceeding with full installation. The mock-up must be a stand-alone installation. It is to be constructed independently of any permanent work.

C. Shop Drawings:
   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.

D. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of of M DOT for pavement-marking work.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Acrylic: Acrylic, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952F, Type II, with drying time of less than 45 minutes.
   1. Color: White.

B. Pavement-Marking Paint, Polymer Cement: Polymer cement surface system
   1. Material: Endurablend or approved equal
   2. Color: As noted on drawings

C. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325D, Type 1, made of 100 percent recycled glass.
   1. Roundness: Minimum 75 percent true spheres by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
   2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place detectable warning tiles.

B. Related Requirements:
   1. Section 321313 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.4 PROJECT 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.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities for tactile warning surfaces.
   1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

B. Regional Materials: Products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

2.2 DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Metal Tiles: Accessible truncated-dome detectable warning metal tiles configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
   1. Material:
      a. Cast Iron: Gray iron, ASTM A 48/A 48M, CL 35.
      b. Finish and color: Manufacturer's standard powder coat, red brick color.
   2. Shapes and Sizes:
      a. Rectangular panel, 24 by 48 inches.
      b. Radius panel, nominal 24 inches deep by 6-footoutside radius .
   3. Mounting:
      a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

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

3.2 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles:
   1. Concrete Paving Installation: Comply with installation requirements in Section 321313 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
   2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
   3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch from flush.
   4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
   5. Clean tiles using methods recommended in writing by manufacturer.

3.4 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION

SECTION 323129 - WOOD FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. Wood screen fences.

B. Support framing for wood screen fences.

1.2 DEFINITIONS

A. Wood Terminology: ASTM D245

B. Commercial and common names for hardwood and softwood timer and lumber: ASTM D1165

C. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.

D. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

E. Timber: Lumber of 5 inches nominal or greater in least dimension.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:
1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
2. For preservative-treated wood products, indicate what wood preservative system was used, its target retention, the producer of the treated lumber, and the intended Use Category. Also indicate which AWPA standards and/or ICC-ES Evaluation Reports the treated lumber was manufactured according to, as well as which inspection agency was used.
3. All lumber. Indicate maximum moisture content prior to and after preservative treatment.

B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

1.4 QUALITY ASSURANCE

A. Lumber Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

B. Qualifications of Installer: Minimum 5 years' experience with design and installation of commercial boardwalk and patio systems.

C. Shop Drawings are not required unless deviations from the contract documents are proposed.

D. Mockups: Build a mockup of the Parking Lot Screen Fence for review and approval by the Landscape Architect prior to fabrication and installation. The mockup shall demonstrate materials, workmanship, finishes, and detailing as specified.
1. Include one panel (appx. eight-foot length) of fence complying with requirements.
2. Include the transition in height of pickets from elevation 2' -0• to 3' -0• , as shown on the drawings.
3. In-ground foundations are not required.
4. The mockup must be a stand-alone installation. It is to be constructed independently of any permanent work and must not be integrated into the final construction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. All lumber with damaged surfaces shall not be used.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
   1. Factory mark each item with grade stamp of grading agency.
   2. For items that are exposed to view in the completed Work, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
   4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Certified Wood: Wood products shall comply with requirements of ASTM D7612-10 (FSC, SFI, ATSM, CSA or PEFC certifications are acceptable).

C. Maximum Moisture Content Following Preservative Treatment:
   1. Boards and Dimension Lumber: 19 percent.

D. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide screws, in sufficient length, to penetrate not less than as shown on the drawings.
   1. Use stainless steel fasteners Type 304 or 316**.**

B. Power-Driven Fasteners: ICC-ES AC70.

C. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

D. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

2.3 METAL FRAMING PLATES & ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
   1. Cleveland Steel Specialty Co.
   2. KC Metals Products, Inc.
   3. Phoenix Metal Products, Inc.
   4. R. H. Tamlyn & Sons LP.
   5. Simpson Strong-Tie Co., Inc.
   6. USP Structural Connectors.

B. Stainless-Steel Sheet: ASTM A 666, Type 304 or Type 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Choose and arrange boards to minimize defects on the front face and corners of the pickets, such as knots, splits, checks, and chips.

C. Fence front face shall have a uniform appearance along its entire length. Choose and arrange boards for pickets to minimize visible sapwood on the front face and distribute natural variations in the color of the boards throughout the entire fence. Do not group boards with similar colors together.

D. Install metal framing anchors to comply with manufacturer's written instructions.

E. Do not splice structural members between supports unless otherwise indicated.

F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members.

G. Make tight connections between members. Install fasteners without splitting wood.

H. Arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced.

END OF SECTION

SECTION 329100 - TOPSOIL

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies all soil materials designated as "Topsoil" on the drawings or in the specifications. Supply topsoil for landscape work (seeding and planting) from **,** off-site sources .

B. Related Requirements:
1. Section 329200 "Lawns" for placing topsoil to meet seed bed soil requirements.
2. Section 329300 "Exterior Plantings" for placing soil mixtures that include topsoil.

1.2 REFERENCES

A. ASTM International, as referenced herein as ASTM.

B. US Department of Agriculture (USDA) Handbook No. 60 – Diagnosis and Improvement of Saline and Alkali Soils.

1.3 ACTION SUBMITTALS

A. Source Quality Control:
1. Material Test Reports: Conduct Topsoil testing for existing on-site surface topsoil imported topsoil from off-site sources.
2. Sample: Provide 1-quart samples for each topsoil test unit (including description of source).
3. Conduct all topsoil sampling and testing prior to delivery from off-site sources, .

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Soil-Testing Laboratory Qualifications: The contractor shall engage an independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
1. Topsoil for landscape work shall be a fertile, friable, sandy loam or loam surface soil without admixture of subsoil screened to be free of stones, stumps, root, trash, debris, and other materials deleterious to plant growth.
2. Particle Size Distribution of Topsoil:

Sieve Designation	Percent Passing
1 inch screen	100
1/4 inch screen	97-100
No. 10 U.S.S. mesh sieve	95-100
No. 140 U.S.S.	15-35

3. The pH range shall be 6.5 to 7.8. Topsoil that does not meet this pH range shall not be approved by the Landscape Architect.
4. Organic content shall not be less than 4 percent and not greater than 20 percent.
5. Clay content determined by Bouyoucous Hydrometer Test: between 5 percent and 15 percent.
6. Base percentages on dry weight of the sample.

2.2 SOURCE QUALITY CONTROL:

A. Laboratory Test Reports:
1. Conduct topsoil testing for each soil test unit as follows:
   a. Existing off-site location(s): 1 sample per acre of site to be excavated.
   b. Plant mixture: Plant mixture shall be tested twice. First - test topsoil as indicated above. Second - test plant mixture after integrating mixture ingredients as identified under Part 2 of "Exterior Plantings" specification Section 329300.

2. Submit all test reports for approval. Topsoil test report must not be more than 4 months old. Topsoil units that do not meet the soil requirements specified under this section will not be permitted for use as Topsoil without appropriate amendment to bring the soil into compliance.
3. Chemical Properties: For each unamended soil type, test topsoil for organic materials, pH, soluble salts, phosphate, potash content, calcium, magnesium, zinc, iron, and manganese.
4. Physical Properties: Determine percent sand, silt and clay and textural classification (USDA) by hydrometer method. Identify all foreign materials such as rock, roots, and vegetation.
5. Recommendations: Based on the test results, the independent testing laboratory shall state recommendations for soil treatments and soil amendments to be incorporated prior to landscape installation. Test report shall provide recommendations specific to the type of landscape plants used on the Project site, including lawns, native vegetation, trees, shrubs, and perennials. List recommendations in weight per 1000 square feet for lawn area and cubic yard of plant mixture. Recommendations shall include; nitrogen, phosphorus, and potash nutrients and all soil amendments required for the long-term growth of the specified plants and turf.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Sampling: Samples shall not be taken during winter months. Each soil test unit shall be a composite of five to seven subsamples taken the full depth of proposed source for each acre of surface area. For on-site stockpiles, discard upper 6 inches of soil before sampling. For large stockpiles, partial excavation will be required for collection of representative samples. Include a site plan verifying the locations of all topsoil sampling. Topsoil test reports shall be accompanied with each sample unit for review and approval by the Landscape Architect.

B. Testing methods and written recommendations when not references elsewhere, shall comply with USDA's Handbook No. 60. Nutrient data to be given in parts per million (ppm) dry soil.

C. Topsoil shall be as defined in ASTM D5268.

D. Soil pH shall be tested in accordance with ASTM D4972.

E. Test for organic material by using ASTM D2974.

END OF SECTION

SECTION 329200 - LAWNS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Seeding
2. Mulching
3. Erosion control blanket - slope stabilization
4. Jute Mesh
5. Turf renovation
6. Maintenance
7. Warranty

B. Related Requirements:
1. Section 311000 "Site Clearing" for stripping and using on-site topsoil.
2. Section 312000 "Earth Moving" for mass grading of the site.
3. Section 312500 "Soil Erosion and Sedimentation Control" for soil stabilization during construction.
4. Section 328400 "Planting Irrigation" for turf and planting irrigation systems.
5. Section 329100 " Topsoil" for lawns and plant mixture amendment.
6. Section 329300 "Exterior Plantings" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.2 REFERENCES AND REGULATORY REQUIREMENTS

A. United States Department of Agriculture (USDA), Federal Seed Act - labeling and purity standards and miscellaneous requirements.

B. State Seed Laws - where applicable.

C. Association of Official Seed Analysts (AOSA): "Rules for Testing Seed".

D. Turfgrass Producers International (TPI): Guidelines for Turfgrass Sod.

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 grasses, 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. Pure Live Seed (PLS): (percent germination x percent purity)/100 = Percent PLS

E. Topsoil: Imported soil that may have been modified with soil amendments and fertilizers to produce a soil mixture best for lawn growth. See Section 329100 " Topsoil" and drawing designations for topsoil.

F. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before topsoil is placed.

1.4 ACTION SUBMITTALS

A. Product Data:
1. Jute Mesh
2. Erosion control blanket and anchors.
3. Fertilizers - from manufacturer.
4. Mycorrhizal inoculum.
5. Herbicides: Product label, manufacturer's product data sheet, application instructions and application equipment.
6. Seeding and mulching equipment.
7. Straw Mulch tackifier - materials and equipment.
8. Lawn maintenance equipment.

B. Source Quality Control:
1. Samples:
a. Straw Mulch: one gallon bag.

2. Test Report:
   a. Topsoil: Test reports including soil amendments and fertilization rates for each seed mix. Refer to Section 329100 Topsoil.
3. Certifications/Licenses:
   a. Certification of Grass Seed 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 (PLS), germination, weed seed, year of production, and date of packaging. Include identification of source, name and telephone number of supplier.
   b. Certification of sod from proposed sod supplier that identifies quality standard, turf species stating the botanical and common names, proportions of each species or varieties in the sod, composition of the root zone soil in which the sod has been grown, and date the sod was planted. Include identification of source, name and telephone number of supplier.

C. Field Quality Control:
1. Project Work Schedule: Within 4 weeks following the issuance of the Notice to Proceed, submit a project work schedule to the Landscape Architect indicating dates for delivery, installation, and Substantial Completion for all landscape work. The Schedule shall be comprehensive and address procurement, delivery, and installations of irrigation, planting and lawn areas of the site. For a large site, the schedule shall reflect a phased installation and shall include support graphics required to identify this phased approach. Refer to Part 1.10 below for a complete list of schedule requirements.
2. Maintenance Schedule: Within 4 weeks following the issuance of the Notice to Proceed, submit a detailed typewritten approach and schedule for the warranty maintenance of all landscape activities outlined under Part 3.13 of this section. Coordinate landscape maintenance with other applicable Sections (Exterior Plantings Irrigation) and combine all maintenance activities into one plan of action. The schedule shall be comprehensive and shall be the basis for monthly payment during the maintenance period.
3. Irrigation Plan: Prior to the issuance of Substantial Completion, submit a detailed typewritten approach and schedule that outlines watering requirements for maintaining the landscape as described herein. The Irrigation Plan shall be submitted in conjunction with the Maintenance Schedule The plan shall address how the irrigation system will be operated during the warranty period, frequencies and durations that will be established to provide the correct watering rates for plants and lawns, inspection protocols and winterization procedures. In locations where no automatic irrigation system has been installed, describe means, methods and frequencies for hand watering. If an automatic irrigation system is inoperative or not present, provide an approved temporary irrigation system approved by the Landscape Architect. The system shall have the ability to be operated without moving hoses or sprinklers around the site between seeded/planted areas (i.e., system can be set to water one area for the required maintenance period) and may be automated with a timer. Supply all water and equipment at the Contractor's expense from a source approved by the Landscape Architect. Reliance on natural precipitation will only be allowed with provision of recorded data from a rain gauge located within a 2-mile radius of the project site. The schedule shall be comprehensive and shall be the basis for monthly payment during the maintenance period.
4. Maintenance Report Forms: Using the approved Maintenance Schedule and Irrigation Plan as the framework for all maintenance activities (plant maintenance, and seed bed maintenance and irrigation operations). The Contractor shall provide detailed maintenance report forms for each site visit. The reports shall be completed by the on-site maintenance superintendent performing the work prior to leaving the site and shall be submitted monthly as back-up to each invoice. Office prepared reports will not be permitted and payment for this work will only be made by the Owner when proof of completed specified maintenance has been provided. Each report shall include the following:
   a. Date of activity.
   b. Length of time on site (start time and finish time).
   c. Name and signature of the maintenance superintendent.
   d. Number of personnel performing the work.
   e. Site climatic conditions (rain, wind, temperature, etc.)
   f. Detailed description of maintenance activities performed by area.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. Include list of at least three similar projects completed in the last 5 years by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
2. Provide resumes of field technician (foreman) responsible for managing the purchase and installation of all materials. Separate resumes shall be provided for the seeding, planting, irrigation, and maintenance technicians.
3. License certificates for pesticide applicator that includes "Turfgrass" category.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. The Contractor shall be a company specializing in seeding, sodding , exterior landscape, and irrigation installations and maintenance, having a minimum 5 years' experience in projects of the scope and scale being specified.
2. Installer's field technician: The installer shall provide a full-time supervisor on site when work is in progress.
3. Maintenance field technician: The maintenance activities for all turf areas shall be performed by skilled employees of the landscape installer. Subcontractors specializing in landscape and turf maintenance will not be permitted unless approved in writing by the Landscape Architect.
4. Pesticide applicator: State licensed, commercial.

1.7 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. During shipment and storage on site, protect materials from breakage, moisture, heat or other damage.

B. Straw Mulch: Straw mulch shall be stored off the ground under a cover that provides protection from moisture and humidity.

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.

1.8 SCHEDULING

A. Work Schedule:
1. Upon authorization to proceed with the work, submit a project work schedule indicating the dates of each of the following items:
   a. Submittal schedule.
   b. Delivery of materials to the site.
   c. Layout of seed bed locations on the site.
   d. Installation including; topsoil placement, fine grading , seeding , mulching.
   e. Substantial Completion of the work.
2. Update schedule monthly to reflect progress of the work.

B. Seasonal Limitations:
1. Seed mixes shall be installed during planting seasons normally recognized in the job locality.
2. Cool Season Grasses: Install during the spring and fall only when soil temperatures are between 50 and 65 degrees Fahrenheit and daytime air temperatures are 60 to 75 degrees Fahrenheit.
   a. Approximate spring installation: Between April 1 and May 15.
   b. Approximate fall installation: Between August 15 and September 30 but no later than 60 days before the first average annual frost date.
   c. Dormant seeding: Late fall/early winter or late winter. Daytime soil temperatures shall not exceed 50 degrees Fahrenheit.
3. If special circumstances warrant installation outside the normal installation season, submit a written request to the Landscape Architect describing conditions and stating the proposed variance. Seeding outside the specified seasons may extend warranty obligations and will be dependent upon the extent of the variance.

4. Weather limitations: Proceed with seeding only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
5. Coordination with Plantings: Plant trees, shrubs, and other plants after finish grades but prior to lawn installation unless otherwise indicated. When planting trees, shrubs, and other plants after lawn installation, protect completed areas, and promptly repair damage caused by planting operations.

1.9 WARRANTY, MAINTENANCE AND ACCEPTANCE

A. Substantial Completion:
1. The Substantial Completion inspection shall occur for the entire project and only one Notice of Substantial Completion will be issued. Phased approvals will not be permitted. Following the inspection, the Landscape Architect will issue a punch list identifying all work requiring completion or correction.
2. The Contractor shall complete all punch list items within 2 weeks of its issuance. All repairs shall occur at no additional cost to the Owner.
3. Substantial Completion will be provided for all lawn areas complying with the following:
   a. Landscape Architect approval of all specified submittals.
   b. The work shall be 100 percent complete (including all site preparation , earthwork , topsoil , seeding , mulching , erosion control blanket , planting , irrigation and clean-up), and ready for inspection.
4. After receiving a Notice of Substantial Completion, warrant and maintain all lawn areas (see Part 3.13) in a vigorous, well-kept condition until Final Acceptance.

B. Final Acceptance:
1. Approximately two weeks prior to the expiration of the warranty and maintenance period (or sooner if plantings are included in the inspection), the Landscape Architect will conduct an inspection of all lawn areas , plantings , irrigation system and review all previously submitted maintenance report forms to verify all completed maintenance activities. There shall be thorough documentation previously submitted by the contractor and field observations made by the Owner or Landscape Architect that the specified maintenance has occurred. Following the inspection, the Landscape Architect will issue a punch list identifying all work requiring completion, replacement, or correction.
2. Complete all punch list items within 2 weeks of its issuance. All repairs shall occur at no additional cost to the Owner.
3. Final Acceptance will be based upon Landscape Architect approval and the work having:
   a. Uniform finished grades conforming to the drawings and free of erosion.
   b. All maintenance items completed and documented by Contractor through maintenance report forms.
   c. Satisfactory Seeded Lawn: At end of warranty and maintenance period, a healthy, uniform well-rooted, even-colored, close stand of grass has been established, free of weeds, disease and insect problems, and surface irregularities, with 100 percent coverage of the specified species.
4. Areas which do not meet the contract requirements shall be regraded as needed and seeded , mulched,. Use specified materials and procedures to reestablish lawn that does not comply with requirements and continue maintenance at no cost to the Owner until lawn is satisfactory.
5. Final acceptance and the end of the warranty period for the lawns will occur only after all punch list items have been satisfactorily complated and the site is left in the condition specified under Clean and Protection.

C. Warranty and Maintenance Period:
1. The end of the warranty and maintenance period shall be:
   a. October 31 - one year following fall Substantial Completion.
2. When the initial warranty and maintenance period has not elapsed before end of growing season October 31, or if lawns are not fully established, continue maintenance during next growing season until all maintenance and warranty obligations have been met.
3. The Contractor will not be held responsible for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents beyond landscape installer's control which result from floods, hail storms, winds over 100 miles per hour, fires or vandalism, unless Contractor has not completed specified installation in a manner that could have protected the landscaping from these phenomena.

4. If, in the opinion of the Landscape Architect, it is advisable to extend the warranty and maintenance period for an additional growing season, the contractor will be notified of such requirement by the Owner. Improper execution of the installation and/or failure to perform and document the specified maintenance in accordance with contract requirement shall be the basis for extending the period of establishment for a second growing season. All specified maintenance and warranty requirements will be required during this extended period and all costs shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Other varieties that those specified may be submitted for approval to Landscape Architect, but they must be newer, more improved cultivars than what is listed.

C. Dormant seeding shall only be permitted if approved by Landscape Architect in writing. Apply seed at a rate that is 25 percent higher than the rates specified below.

D. Seed Species:
1. Quality: Seed of grass species as listed below for solar exposure, with not less than 90 percent germination, not less than 98 percent pure seed, and not more than 0.3 percent weed seed:
2. Sun and Partial Shade Blend: Proportioned by weight as follows:
   a. 60 percent Kentucky bluegrass (Poa pratensis), a minimum of two improved turf type varieties.
   b. 30 percent fine fescue (Festuca), a minimum two varieties; chewing and creeping red.
   c. 10 percent perennial ryegrass (Lolium perenne).

2.2 STRAW MULCH

A. Straw Mulch: Provide stalks from oats, wheat, rye, barley or rice that are free of weeds, air-dry, clean, mildew- and seed-free, threshed straw of wheat, rye, oats, or barley.

B. Straw shall be in an air-dry condition and suitable for placing with commercial mulch blowing equipment.

C. Tackifier:
1. Hydraulically applied tackifier shall be an organic based or anionic polymeric emulsion blend designed for use over long-fibered mulch (straw). Tackifier shall:
   a. Be powder or liquid based
   b. Achieve a drying time between 12 and 18 hours
   c. Minimum 4-month longevity after application

2.3 HYDRAULIC MULCH

A. Hydraulic mulch is not permitted.

B. Hydraulic Mulch Tackifier
1. Asphalt Emulsion tackifier is not permitted.

2.4 EROSION CONTROL BLANKET

A. Erosion Control Blanket : Intended for use on flat surfaces or slopes 4:1 (H:V) or greater where only sheet flow will be encountered.
1. Straw/jute blanket shall be constructed with a 100 percent agricultural straw matrix (0.5 lbs. per square yard), with jute or cotton netting on top and bottom, sewn together with biodegradable cloth thread. The blanket shall be 100 percent biodegradable and have a typical functional longevity of 12 months after installation. Plastic netting will not be permitted.

B. Jute Mesh: Uniform, open, plain-weave fabric of unbleached, single jute yarn having a width of 48 inches, plus or minus 1 inch and durability of 1-2 years. Yarn shall be loosely twisted jute fiber, having an average twist of not less than 1.6 turns per inch, varying in thickness by not more than 1/2 its normal diameter, and averaging 130 pounds per spindle of 14,400 yards. Polymer yarns are not acceptable.

C. Fasteners: Fasteners shall be natural based plastic that is 100 percent biodegradable from microbial activity in accordance with ASTM D5338 or D6400, formed in a T-shaped with barbed heads and shoulders, minimum six inches long, color green and installed per manufacturer's spacing and installation instructions.

2.5 EQUIPMENT

A. Tiller:
1. Equipment used for subsoiling or ripping compacted subsoils on slopes up to 2:1 (H:V): A minimum D-7 size tractor with a mounted ripper consisting of 3 to 5 tines spaced a maximum 24 inches apart. Tines shall be equipped with 12-inch-wide winged ripper points and shall be capable of penetrating subsoils up to 24 inches deep in one pass.
2. Equipment used for subsoiling or ripping compacted subsoils on slopes up to 4:1 (H:V): A tractor mounted disk harrow consisting of 6 to 12 offset disks weighing a minimum 1,800 pounds each. The harrow shall be capable of penetrating subsoils up to 18 inches deep in one pass.

B. Fine Grading: Hand rake, tractor mounted yoke rake or other similar equipment.

C. Drop Spreader with Cultipacker, as manufactured by Brillion or John Deere or equivalent.

D. Broadcast Seeding: A spinning-disc type broadcaster with a calibration gauge (handheld and tractor mounted) shall be used to broadcast the seed over the designated areas.

E. Seed Imprinting Equipment: Used with spinning-disc type broadcaster to lightly cover or press seed into the soil. A tractor or all-terrain vehicle mounted dragging device consisting of anchor chains, disk chains, cables, chain harrow or other similar equipment.

F. Straw Mulcher: A power mulcher that thrashes and separates, then evenly distributes the straw at a capacity between 2 and 20 tons per hour, with a discharge distance between 35 and 100 feet in still air.

G. Crimping Device: A mulch disc or other mechanical anchoring/crimping device for use in anchoring straw mulch into place, such as a Reinco Model MD-96 or equivalent, having flat discs with notched edges spaced 8" apart to impress mulch 1-3" down into soil.

2.6 WATER

A. Water for lawns shall be available from on-site sources. On-site sources of water may be available from City hydrant with metering and payment by Contractor or from PlazaCorp's irigation system . Confirm prior to commencing work.

B. Water shall be free of wastewater effluent or other hazardous chemicals.

2.7 TOPSOIL

A. Refer to Section 329100 "Topsoil".

2.8 SOIL AMENDMENTS

A. Compost shall be a heavily decomposed mature/stabilized, humus-like material derived from the aerobic decomposition of yard clippings or other compostable materials. Manure is not suitable for use. The compost shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have an objectionable odor. The compost shall be free of plastic, glass, metal and other physical contaminants, as well as viable weed seeds and other plant parts capable of reproducing (except airborne weed species). Composting facility shall be tested in accordance with the United States Composting Council, Seal of Testing Assurance (STA) following procedures as outlined in the Test Methods for the Examination of Composting and Compost protocols (TMECC).
1. pH: 5.5 to 8.
2. Moisture content: 35 to 55 percent by weight. No visible free water or dust is produced when handling it.
3. Sieve analysis: 100 percent passing 3/4 inch screen.
4. Soluble salt content: Less than 5 percent.
5. Organic matter content: Minimum 60 percent.

B. Sand shall be clean, coarse, ungraded, meeting the requirements of ASTM C33 for fine aggregates.
1. pH Adjusters:

a. Lime shall be finely ground agricultural grade dolomitic limestone containing not less than 85 percent calcium and magnesium carbonates conforming to ASTM C602, Class T or O.
b. Elemental sulfur shall be granular, biodegradable, horticultural grade material containing at least 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Mycorrhizal Inoculum:
1. Mycorrhizal fungi in the inoculant shall be available as propagules, i.e., spores, root fragments and hyphae. The inoculant shall contain highly selected strains of low host specificity endo- and ectomycorrhizal fungi combined with other beneficial fungi (Trichoderma), humic acids, bio stimulants, beneficial bacteria, soluble sea kelp, and yucca plant extracts, as manufactured by Horticultural Alliance or approved equal. The selection of inoculants shall be based upon fungal partners that are compatible with the specified turf grasses.

2.9 FERTILIZER

A. Fertilizer shall be a complete fertilizer of neutral character, consisting of fast and slow-release nitrogen and shall be applied at the rates and formulations that release nutrients when new plants can effectively draw them from the soil.
1. The percentages of slow release and fast release nitrogen shall be adjusted based on the time of year fertilizers are being applied.
2. For fall seeding, the percentage of slow-release nitrogen shall be higher that spring seeding since a high percentage of fast-release nitrogen will be mostly lost by runoff or infiltration before plant uptake.

B. Composition: The percentages by weight shall be determined per recommendations of the soil testing reports for lawns.

2.10 PESTICIDES AND HERBICIDES

A. General: Pesticides and herbicides shall be 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 and herbicides unless authorized in writing by authorities having jurisdiction.
1. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within seeded areas at the soil level.
2. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.
3. Broadleaf Herbicide (Selective and Nonselective): A post-emergent herbicide effective for controlling annual and perennial broadleaf weeds within turf grasses.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:
1. The Contractor shall establish a quantifiable system to be employed in the field for measuring areas, weighing products and calibrating equipment on a daily basis to ensure all products are installed at the specified rates of application.
2. Prior to beginning work, examine and verify the acceptability of the project site and notify the Landscape Architect of unsatisfactory conditions or obstructions that do not appear on drawings. Do not proceed with the work until unsatisfactory conditions have been corrected or resolved.
3. Identify areas of subsoil compaction prior to placement of topsoil.
4. Verify that no foreign or deleterious material has been deposited in soil within a planting area.
5. Where lawn installation occurs in close proximity to other site improvements, provide adequate protection to all features prior to commencing work. Promptly repair any items damaged during installation operations to their original condition.
6. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
7. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
8. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.
9. If lawn areas die or are rejected due to non-conformity to contract requirements, they must be removed from the site immediately and replaced before Substantial Completion.

B. Utilities: Have all underground utilities located by servicing agencies. In the vicinity of utilities, hand-excavate to minimize possibility of damage.

C. Coordination with Other Work:
   1. The Contractor shall coordinate work with other contractors or trades to determine the appropriate sequence of landscape installation with respect to other work on the site.
   2. Completed work installed out of construction sequence which is subsequently disturbed by the completion of work by other trades shall be repaired by the landscape installer at no cost to the Owner.
   3. Maintain grade stakes and layout controls set by others until removal is mutually agreed upon by all parties concerned.

3.2 SUBGRADE PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by lawn installation operations.

B. Install erosion control measures, if necessary, to prevent erosion or displacement of soils and discharge of soil-bearing water run-off or airborne dust to adjacent properties, natural resources and walkways.

C. Vegetation Removal: Strip and dispose of organic debris and root mat.

D. Topsoil stripping, stockpiling: Refer to Section 311000 "Site Clearing."

E. Maintain subgrade in areas to be topsoiled in a uniform condition so as to prevent future depressions. Prior to placing topsoil;
   1. Till all subsoils to a minimum depth of 18-inches with approved equipment to remove all compacted subsoils. Tilling shall be complete, thoroughly fracturing subsoil. Perform tilling in two directions, one perpendicular to the other.
   2. Upon completion of tilling, the subsoils will require light compaction and leveling to prevent ponding of water and settlement after topsoil placement. As a final operation, a lightweight tracked dozer shall be employed that will remove surface irregularities and prevent excessive settlement. During this procedure, the surface of the subsoil on slopes greater than 4:1 (H:V) shall be imprinted with tracks from the dozer. Imprinting shall be perpendicular to the slope and shall be approximately one inch deep.
   3. .
   4. Repair disturbances to previously graded areas and remove surplus subgrade material associated with any landscape construction.

F. If the prepared subgrade is eroded or compacted by rainfall prior to topsoil placement, rework the surface as specified.

G. In locations where existing topsoil has not been removed, till entire area in accordance with Part 3.2 E above. Do not till within dripline of existing trees.

3.3 PLACING TOPSOIL, SOIL AMENDMENTS AND FERTILIZER

A. Topsoil, when placed, shall be dry enough so as not to puddle or bond. Do not place topsoil when the subgrade is frozen, excessively wet, extremely dry or in a condition otherwise detrimental to proper grading or lawn operation.

B. Following topsoil placement but prior to finish grading, broadcast all soil amendments and fertilizer and rototill into the topsoil. The coverage areas for soil amendments and fertilizer shall be carefully calculated by the installer and fully blended into the entire topsoil profile. Do not incorporate soil amendments and fertilizer more than 5 days in advance of seeding.

C. Mycorrhizal Inoculum: Rototill two granular pounds per 1,000 square feet of seed bed into the top four to six inches of topsoil or as recommended by supplier.

3.4 PRE-INSTALLATION PREPARATION

A. Finish Grading:
   1. Immediately before lawn installation scarify, loosen, float, and drag topsoil as necessary to bring it to the proper condition. Remove all foreign matter larger than 1" in diameter. There shall be no visible plants, roots, debris, or any foreign material present prior to installation.
   2. Finished grades shall slope to drain, be free of depressions or other irregularities, lightly compacted to prevent settlement, and shall be uniform in slope between grading controls and the elevations indicated.

3. Finished grade for seeded lawn areas shall meet existing grades at contract limits and be ½" below top of curbs, walk paving, and metal edging if used.

3.5 SEEDING AND MULCHING

A. Moisten prepared area before seeding if soil is dry. Water thoroughly and allow surface to partially dry before seeding. Do not create muddy soil.

B. Pay close attention to weather conditions. Ensure each area being seeded is fully completed in advance of weather conditions such as heavy rains and strong winds that will result in damage to the unfinished work. Fully completed shall mean seeding, dragging, mulching, crimping and tackifier.

C. Seeding Procedures:
1. Do not sow seed when weather conditions are unfavorable, such as during drought or high winds.
2. Perform seeding with only approved equipment. Do not broadcast or drop seed when wind velocity exceeds 10 mph.
3. Sow the seed uniformly at rates specified under Part 2.1 of this section. For dormant seeding, increase seeding rates by 25 percent.
4. Do not use wet seed or seed that is moldy or otherwise damaged.
5. Do not seed against existing trees and limit extent of seed to outside edge of planting saucers, plant beds and other seed beds. Mulch within plant beds and tree saucers which are contaminated by overseeding shall be removed and replaced.
6. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
7. Immediately following seeding, rake, drag or float all seed beds to provide a light covering of topsoil approximately 1/8 inch deep. When using equipment that lightly injects the seed into the soil, include equipment that lightly rolls the seed bed to provide good moisture contact between the seed and soil.
8. Maintain soil moisture in accordance with Part 3.11 below.

D. Straw Mulching Procedures:
1. Do not use any straw that contains weeds and other plants that will contaminate the seed beds with unspecified plants. Carefully inspect each bale of straw prior to spreading and any bales observed to be contaminated with weeds shall be removed from the site on a daily basis.
2. Do not mechanically blow straw when wind speeds exceed 10 mph.
3. Remove all straw that has been deposited outside the limits of seeding and on adjacent pavement, plant beds and tree saucers.
4. Spread straw mulch evenly at the rate of approximately 2 tons dry straw per acre. Place all mulch over all seeded areas within 24 hours after seeding. A mechanical blower or hand spreading shall be used to apply mulch material, provided the machine has been specifically designed and approved for this purpose. Mulch shall be uniform in thickness and cover resulting in a blanket of straw approximately 1 ½ inches loose thickness with little to no visible soil.
5. Slopes 4:1 or steeper and drainage swales shall be stabilized with erosion control blanket in accordance with Part 3.12 below.
6. For dormant seeding, straw mulch shall be replaced with erosion control blanket in accordance with Part 3.12 below at no additional cost to the Owner.

E. Anchoring Straw Mulch Procedures:
1. Mulch shall be crimped in all seed beds where slopes are less than 4:1 (H:V) and of sufficient width to allow equipment to perform crimping without damaging the finished seed bed. Crimp all locations in two directions. When finished, straw shall be anchored one to two inches deep into the seed bed in rows no more than eight inches apart.
2. Tackifier shall be applied at the rate recommended by the manufacturer and shall be applied uniformly to all mulch either simultaneously with mulching operation or in a separate application. Take precautionary measures to prevent materials from marking or defacing structures, pavements, utilities, or plantings. Immediately clean all stains and damaged areas.
3. Any seed and mulch displaced due to improper crimping and bonding with tackifier shall be immediately replaced to the specified condition at no additional cost to the Owner.

3.6 TURF RENOVATION

A. All preparation work shall be conducted in accordance with Part 3.1 through Part 3.4 above. Following surface preparation, lawn installation shall be completed in accordance with the applicable lawn installation methods specified above. Blend newly seeded areas into adjacent existing lawns.

B. Renovate existing lawns where indicated. In areas where diseased or contaminated lawns are identified, remove existing topsoil and dispose off site.

C. Renovate lawns damaged by Contractor's operations, such as storage of materials, haul roads or other areas outside the limits of work.

D. Renovate lawns where topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations has occurred. Remove existing topsoil and dispose off-site.

E. Maintain soil moisture in accordance with Part 3.11 below.

3.7 WATERING PROCEDURES

A. Immediately following lawn installation water all bed areas thoroughly and immediately with a fine mist until soil is soaked to a depth of at least 2-inches or as indicated above. Puddling of water or allowing the seedbed to dry is unacceptable.

B. For seeded areas, maintain soil in a moist condition (in hot dry weather irrigation may be required 2-4 times per day) until seeds have sprouted and reached a height of 1-inch. Water thereafter a minimum of once every 2-3 days unless natural rainfall has provided equivalent watering. Provide irrigation to moisten soil to a depth of 4" to encourage deeper rooting.

C. Watering at accelerated rates that dislodge seed and mulch materials, or cause erosion shall be immediately repaired at no cost to the Owner.

3.8 EROSION CONTROL BLANKET PROCEDURES

A. Install erosion control blanket as indicated in on the Plans, in all drainage swales, and all seed beds with slopes 4:1 (H:V) or steeper.

B. Immediately following seeding, erosion control blanket shall be rolled out in place in the direction of the slope fall line. The material shall be applied without stretching and shall lie smoothly but loosely on the soil surface. Installers shall minimize walking directly on the seed or topsoil bed either before or after the blanket is applied.

C. All ends shall be buried a minimum of 4 inches deep and the trench shall be firmly tamped after closing.

D. In cases where roll ends join, the up-slope piece shall overlap the down-slope piece by at least 18 inches.

E. Anchor edges prior to backfilling trench, all overlaps at 12-inch intervals, and the center of each panel on 3-foot intervals.

F. The upslope ends of the blanket shall be buried a minimum of 6 inches deep and anchored at 12-inch intervals prior to backfilling trench.

G. Reseed all disturbed edges immediately following erosion control blanket installation and work seed into blanket.

3.9 MAINTENANCE

A. General: Maintain and establish lawn areas by watering, fertilizing, pest and weed control, litter removal, mowing, trimming, repairs, and performing other operations as required to establish healthy, viable lawn. Maintenance shall also include grade repair, seeding and all associated soil amendments and fertilizers.

B. Provide all maintenance under the supervision of a skilled employee of the lawn installer. The skilled maintenance supervisor shall be: capable of operating the automatic irrigation system controller, conducting turf diagnostics to identify the presence of disease, insect and fertility problems, and directing a maintenance crew in the performance of horticultural maintenance practices identified below. Maintenance requirements identified below shall be the basis for information to be included in the Maintenance Schedule and Irrigation Plan identified under Part 1.5.C insert text of this section and thoroughly documented under the required Maintenance Report Forms to verify the work has been properly performed.

C. Failure to perform and submit factual Maintenance Report Forms could result in non-payment for said services and require the extension of the warranty and maintenance period an additional year at the Contractor's expense.

D. Provide all equipment, materials, labor and services to maintain the landscape beginning immediately after each area is installed and continuing until Final Acceptance and the end of the warranty period. During this period, perform the following:
   1. Inspect the entire landscape at least once per week during the growing season and perform needed maintenance promptly. Check for over- or under-watering using visible turf symptoms and checking soil moisture. Adjust the irrigation schedule as needed. If turf is not appearing healthy or if foliage color is atypical, Contractor must determine the cause and resolve the condition ASAP.
   2. Prior to each mowing, collect all debris, litter and miscellaneous materials accumulating on the site and remove from the site.
   3. Irrigation: Irrigate all turf areas to maintain optimum moisture within the root zone as specified under Part 3.11 above. When using an automatic sprinkler system, the lawn installer responsible for maintenance shall bear full responsibility to set each zone to the correct frequency and duration.
   4. Mow all lawns weekly during the growing season and as described below. Mowing frequencies shall be adjusted based on cutting requirements and may require more frequent visits during high growth periods. Use mulching mower only with sharpened blades and alternate direction of each mowing session to prevent rutting.
   5. Fertilize as described below in Part 3.14.
   6. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use Integrated Pest Management practices to minimize the use of chemical applications and reduce hazards. Apply herbicides and pesticides as described in Part 3.15 below.
   7. Remove leaves bi-weekly during the fall as they accumulate on the lawns. Bag and dispose off-site. Do not mow in advance of leaf removal.
   8. Repair bare, eroded or settled areas and restore to provide a uniformly smooth lawn with the specified grasses. Provide same materials and installation procedures as those used in the original installation.
   9. Reclaim/replace soil materials and turf damaged or lost in areas of subsidence. Roll, regrade, and replant bare or eroded areas to produce a uniformly smooth lawn.
   10. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.

E. Mowing: Mow turf as soon as top growth is tall enough to cut. Remove no more than one-third of grass-leaf growth in initial or subsequent mowing. At the time of each mowing, adjust mowing equipment to meet this requirement. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
   1. Mow kentucky bluegrass, annual ryegrass, fescue to a height of 2-1/2 to 3 1/2-inches.
   2. Mowing heights may increase during the hot summer months based on regional conditions.
   3. Collect all grass clippings if mowing is not sufficiently timed to allow for composting into the existing lawn and accumulations of clippings can be observed on the surface of the grass. Collection and off-site disposal shall be performed at no additional cost to the Owner.

3.10 POST-INSTALLATION FERTILIZATION

A. Apply fertilizers at the time of season, rate of application and grade of N-P-K that maximizes the health of the lawn and minimizes the potential run-off of fertilizers to adjacent waterways and groundwater. Avoid the use of phosphorus unless soil test results show that site soils are deficient of this nutrient.

3.11 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.
   1. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.
   2. For broadleaf herbicide:
      a. Apply during September in Zones 5 through 8
      b. Do not apply herbicides that contain Dicamba as they can harm adjacent woody plants.
   3. Apply, only as necessary, pre-emergent herbicide during early spring to prevent crabgrass and other annual weeds.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. 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. Protect newly seeded areas from stormwater flows discharging from paved surfaces until grass establishment. Additional water diversion and erosion control measures including but not limited to silt fence, sediment control tubes, wattles, and check dams may be utilized at Contractor's discretion and expense.

E. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION

SECTION 329300 – EXTERIOR PLANTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Tree and shrub plantings.
2. Plug plantings.
3. Bulb, corms, tuber and root stock plantings for upland and wetland sites.
4. Herbaceous perennials, ornamental grasses, groundcover and vine plantings.
5. Annual plantings.
6. Plant procurement.
7. Planting mixtures.
8. Plant mulch.
9. Aggregate maintenance edge.
10. Metal edging.
11. Staking and guying.
12. Jute mesh slope stabilization.
13. Maintenance.
14. Warranty replacements.

B. Related Requirements:
1. Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Section 312000 "Earth Moving" for mass grading of the site.
3. Section 329100 "Topsoil" for lawns and plant mixture amendment.
4. Section 329200 "Lawns" for lawn seeding and sodding.

1.2 REFERENCES AND REGULATORY REQUIREMENTS

A. Hortus Third, The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.

B. ASTM International, as referenced herein as ASTM.

C. American Standard for Nursery Stock, as referenced herein as ANSI Z60.1 (current edition). Where there is a conflict between the information in this Section and ANSI Z60.1, this Section shall govern.

D. United State Department of Agriculture (USDA), Plant disease and insect control Phytosanitary and Export Certifications.

E. United States Composting Council, Seal of Testing Assurance (STA), Procedures for sampling and testing as outlined in the Test Methods for the Examination of Composting and Compost (TMECC) protocols.

1.3 DEFINITIONS

A. 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.

B. 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.

C. 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.

D. Finish Grade: Elevation of finished surface of planting soil.

E. Mycorrhizal Inoculum: Fungi either introduced or naturally occurring in the soil that increase plant roots growth and ability to absorb nutrients and water.

F. 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.

G. 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.

H. 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.

I. 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.

J. Root Production Method (RPM): A trademark technology referred to as root production method for a variety of tree and shrub species resulting in a dense fibrous root system for smaller sized plants.

K. Single Central Leader: A single central dominant leader branch, free of secondary co-dominant stems that would compete with the central leader, either naturally occurring or professionally trained in the nursery with no stem deformities.

L. Specimen Plant: Exceptionally heavy, symmetrical, and tightly knit, growth, superior in form, with properly spaced branching.

M. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees at or below the soil surface.

N. 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.

O. Sheared Evergreen: Any evergreen tree or shrub that has been heavily trimmed or pruned to remove the natural shape of the plant. An evergreen tree grown at a "Christmas tree farm" is typically sheared.

P. Young Plants: Lining out stock, seedlings generally sold within the wholesale trade for continued cultivation.

1.4 ACTION SUBMITTALS

A. Product Data:
1. Plant procurement verification:
   a. Within 4 weeks following the execution of the Agreement between the Owner and Contractor, submit vendor purchase order, invoice or bill of lading for each plant species showing sizes, quantities and root treatment.
   b. Provide digital photos of all plant materials. Photos must depict the entire size and condition of the plant and include a scale rod or other measuring device to show scale. For species where more than 20 plants are required, include a minimum of three photos that show the average plant, the best quality plant, and the worst quality plant to be provided. Label each photograph with the plant name, plant size, and name of the growing nursery.
   c. The Contractor may request the Landscape Architect to provide nursery visits for the purpose of reviewing and tagging plant materials. The Contractor shall compensate the Landscape Architect for said services.
   d. Substitutions shall not be permitted without written approval from the Landscape Architect.
2. Metal edging and accessories.
3. Jute mesh.
4. Tree wrap.
5. Soil amendments: Provide information on composition and source of all soil amendments. Include test results for compost and peat.
6. Mycorrhizal inoculum.
7. Fertilizer.
8. Antidesiccants: Include product label and manufacturer's application instructions.
9. Maintenance edge aggregate gradation analysis.
10. Maintenance edge aggregate separation fabric.
11. Organic Mulch: Include product source and composition.
12. Predator barrier fencing and tree guard.
13. Staking and guying materials and ties.

B. Source Quality Control:
   1. Samples:
      a. Organic Mulch: 1 quart by volume in sealed plastic bag labeled with composition of materials and source of mulch. Provide an accurate representation of color, texture, size, and organic makeup.
      b. Mineral Mulch: 1 quart by volume in sealed plastic bag labeled with composition of materials and source / product name. Provide an accurate representation of color, texture, and size. Note, multiple samples of available products may be required for color selection by the Owner.
      c. Maintenance edge aggregate: 1 quart by volume in sealed plastic bag labeled with composition of materials and source / product name. Provide an accurate representation of color, texture and size. Note, multiple samples of available products may be required for color selection by Owner.
   2. Test Report:
      a. Topsoil: Test reports including fertilization recommendations for lawns and plant materials. Refer to Section 329100 "Topsoil".
   3. Certifications/Licenses:
      a. Phytosanitary Certification: Plant material Inspection Certificates required by Federal, State or other governing authority at the time of plant material verification identified above.
      b. License certificate(s) for pesticide applicator.
   4. Nursery Requirements:
      a. Plants shipped to the site as B&B must originate from a licensed plant nursery with a current Phytosanitary certification... Field collected plants will not be permitted.
      b. Plant digging shall comply with the following requirements:
         1) Digging shall not occur more than 4 months in advance of plant installation.
         2) Plants dug during the spring digging season must be planted in advance of the fall digging season of that same year.
         3) Plants dug during the fall season must be planted during the same season and will not be permitted for spring planting.
         4) No plants that have leafed out shall be dug.
         5) Plants with root systems that have grown through the original jute wrapping will not be permitted. This included all plants that have a second jute covering over the root ball.
         6) Jute wrapping that is heavily decayed or torn with exposed roots and loose root ball soil will not be permitted.
      c. Wrap tree trunks with protective material in advance of digging.

C. Field Quality Control:
   1. Project Work Schedule: Within 4 weeks following the issuance of the Notice to Proceed, submit a project work schedule to the Landscape Architect indicating dates for delivery, installation, and Substantial Completion for all landscape work. The Schedule shall be comprehensive and address procurement, delivery, and installation of irrigation, planting and seeding/sodding areas of the site. Refer to Part 1.10 below for a complete list of schedule requirements.
   2. Maintenance Schedule: Prior to the issuance of Substantial Completion, submit a detailed typewritten approach and schedule for the warranty maintenance of all landscape activities outlined under Part 3.13 of this section. Coordinate landscape maintenance with other applicable Sections (, Lawns , Irrigation) and combine all maintenance activities into one plan of action. The schedule shall be comprehensive and shall be the basis for monthly payment during the maintenance period.

3. Irrigation Plan: Within 4 weeks following the issuance of the Notice to Proceed, submit a detailed typewritten approach and schedule that outlines watering requirements for maintaining the landscape as described herein. The Irrigation Plans shall be submitted in conjunction with the Maintenance Schedule. The plan shall address how the irrigation system will be operated during the warranty period, frequencies and durations that will be established to provide the correct watering rates for plants and lawns, inspection protocols and frequencies and winterization procedures. In locations where no automatic irrigation system has been installed, describe means, methods and frequencies for hand watering. If the automatic irrigation system is inoperative or not present, provide an approved temporary irrigation system or hand water from a source approved by the Landscape Architect. The system shall have the ability to be operated without moving hoses or sprinklers around the site between seeded/planted areas (i.e. system can be set to water one area for the required maintenance period), and may be automated with a timer. Supply all water and equipment at the Contractor's expense from a source approved by the Landscape Architect . Reliance on natural precipitation will only be allowed with provision of recorded data from a rain gauge located within a 2-mile radius of the project site. The schedule shall be comprehensive and shall be the basis for monthly payment during the maintenance period.
4. Maintenance Report Forms: Using the approved Maintenance Schedule and Irrigation Plan as the framework for all maintenance activities (plant maintenance, and lawn maintenance and irrigation operations). The Contractor shall provide detailed maintenance report forms for each site visit. The reports shall be completed by the on-site maintenance superintendent performing the work prior to leaving the site and shall be submitted monthly as back-up to each invoice. Office prepared reports will not be permitted and payment for this work will only be made by the Owner when proof of completed specified maintenance has been provided. Each report shall include the following:
    a. Date of activity.
    b. Length of time on site (start time and finish time).
    c. Name and signature of the maintenance superintendent.
    d. Number of personnel performing the work.
    e. Site climatic conditions (rain, wind, temperature, etc.)
    f. Detailed description of maintenance activities performed by area.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:
1. Include list of at least three similar projects completed in the last 5 years by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
2. Provide resumes of field technician (foreman) responsible for managing the purchase and installation of all materials. Separate resumes shall be provided for the planting, seeding, irrigation and maintenance technicians.
3. ISA certification for arborist.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. The Contractor shall be a company specializing in exterior landscape, irrigation and turf installations and maintenance, having a minimum 5 years' experience in projects of the scope and scale being specified.
2. Installer's field technician: The installer shall provide a full-time supervisor on site when work is in progress.
3. Maintenance field technician: The maintenance activities for all landscape areas shall be performed by skilled employees of the landscape installer. Subcontractors specializing in landscape and turf maintenance will not be permitted unless approved in writing by the Landscape Architect.
4. Pesticide applicator: State licensed, commercial.
5. Tree and shrub pruning: ISA certified Arborist.

B. Substitutions:
1. It is the Contractor's responsibility to locate and secure all plant materials and to verify their availability well in advance of installation through the timely Action Submittal process identified above. Failure to comply with this requirement shall not be a reason for making substitutions. Furthermore, it may be necessary to purchase specified plants from multiple nurseries and from out-of-state sources providing said sources are within the same hardiness zone as the site.

2. Substitutions of plant materials will not be permitted unless authorized in writing by the Landscape Architect. If proof is submitted in writing that a plant specified is not obtainable, the Landscape Architect may assist in identifying alternate sources or substitutions.
3. Plants of larger size may be used if approved and if root balls meet ANSI Z60.1 for the increased size. Adjustments will be made at no additional cost to the Owner. Approval of smaller size plant materials shall require a corresponding credit to the contract price subject to Owner pre-approval.
4. Container plants may be substituted for those designated "B&B" if approved by the Landscape Architect.

C. Measurements: Measure plants according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for trees larger than 4-inch caliper.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
3. Plants pruned to compensate for transplanting shock will not be accepted if overall height and spread do not meet the specified dimensions after pruning.

D. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before, during or after planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General:
1. Packaged Materials: Deliver packaged materials in original unopened containers showing weight, analysis and name of manufacturer. During shipment and storage on site, protect materials from breakage, moisture, heat or other damage.
2. Store materials only in locations approved by the Owner. No storing or mixing of pesticides or herbicides is allowed on site.

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. Plant Materials:
1. Do not bend, stack or bind plants in a manner that damages bark, breaks branches or root systems, deforms root balls or destroys natural shape.
2. Transport plants in closed vehicles or with the entire load properly covered to protect from drying winds, heat, freezing or other exposure that may be harmful. Schedule shipping to minimize on-site storage of plants. Closed vehicles shall be adequately ventilated/refrigerated.
3. Labels: Prior to shipping, each plant or bundle of like variety and size shall be labeled with legible weatherproof tags indicating the correct name and size of plant.
4. Stock shall not be shipped until the planting preparations have been completed. If planting is delayed more than 24 hours after delivery, set plants and trees in filtered sun or shade, protect from weather and mechanical damage, and keep roots moist.
    a. Set balled stock on ground and cover ball with soil, or bark mulch.
    b. Do not remove container-grown stock from containers before time of planting.
    c. 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.
5. Store bulbs, corms, and tubers in a dry place at 60 – 65 degrees F until planting.
6. Handle plants at all times in accordance with the best horticultural practices. Lift B&B materials from the bottom of the ball only; do not roll the plants. Plants handled otherwise will be subject to rejection. Balled and burlapped plants which have cracked or broken balls are not acceptable and shall not be planted. Plants with mechanical damage, deformation or breakage will not be accepted and are to be replaced at the Contractor's expense.

1.8 SCHEDULING

A. Work Schedule:
1. Upon authorization to proceed with the work, submit a project work schedule indicating the dates of each of the following items:
   a. Submittal schedule.
   b. Tagging of plants in nurseries.
   c. Delivery of other materials to the site.
   d. Staking of plant locations on the site.
   e. Delivery of plant material to the site.
   f. Planting.
   g. Substantial Completion of the work.
   h. Maintenance period.
2. Update schedule monthly to reflect progress of the work.

B. Planting Season:
1. USDA Hardiness Zone 6:
   a. B&B and container grown deciduous trees and shrubs, planting season shall be from March 15 through May 15 and from October 1 through November 30.
   b. Containerized perennials, planting season shall be from March 15 through May 15 and from September 15 through October 30.
   c. Coniferous evergreen plants, planting season shall be from March 15 through May 15 and from October 1 through November 1.
   d. Broadleaf evergreen plants, planting season shall be from March 15 through May 15 and from September 1 through October 15.
   e. Bare root woody plants, planting season shall be in early spring dormant period, prior to April 1 but no later than full leaf-out of existing woody plants in project area.
   f. Aquatic plugs, tubers and root stock, planting season shall be only in spring from March 15 through May 15.
   g. Bare root woody plants and aquatic tuber and root stock only in spring from March 15 through approximately May 15 but no later than full leaf-out of existing woody and aquatic plants.
   h. Bulbs, corms and tubers from October 1 through November 15 and from March 15 through May 15. Spring vs. fall planting is species dependent and Contractor shall comply with seasonal limitations identified on the plant list included on the drawings.
2. If special circumstances warrant installation outside the normal planting season, submit a written request to the Landscape Architect describing conditions and stating the proposed variance. Planting outside the planting season could extend warranty obligations and will be dependent upon the extent of the variance.
3. Weather limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
4. Coordination with lawn installation: Plant trees, shrubs, and other plants after finish grades are established but before seeding/sodding unless otherwise indicated. When planting trees, shrubs, and other plants after seeding/sodding, protect completed areas, and promptly repair damage caused by planting operations.

1.9 WARRANTY AND ACCEPTANCE

A. Substantial Completion:
1. The Substantial Completion inspection shall occur for the entire project and only one Notice of Substantial Completion will be issued. Phased approvals will not be permitted. Following the inspection, the Landscape Architect will issue a punch list identifying all work requiring completion or correction.
2. The Contractor shall complete all punch list items within 2 weeks of its issuance. All repairs and plant replacements shall occur at no additional cost to the Owner.
3. Substantial Completion will be provided for all planting areas complying with the following:
4. Landscape Architect approval of all specified submittals.
5. The work shall be 100 percent complete (including all site preparation , earthwork , plant mixture installation , plantings , lawns, irrigation, and clean-up), and ready for inspection.
6. After receiving a Notice of Substantial Completion warrant and maintain all plantings in accordance with Part 3.13 of this Section in a vigorous, well-kept condition until Final Acceptance.

B. Final Acceptance:
1. Prior to plant dormancy and the expiration of the warranty and maintenance period, the Landscape Architect will conduct an inspection of all plantings lawns , irrigation system and review all previously submitted maintenance report forms to verify all completed maintenance activities. There shall be clear evidence through factual reporting by the Contractor and field observations made by the Owner or Landscape Architect that the specified maintenance has occurred. Following the inspection, the Landscape Architect will issue a punch list identifying all work requiring completion, replacement or correction.
2. The Contractor shall complete all punch list items within 2 weeks of its issuance. All repairs and plant replacements shall occur at no additional cost to the Owner.
3. Final Acceptance will be based upon Landscape Architect, approval and the work having:
   a. Been well maintained with all landscape plantings in a healthy growing condition free of disease and insect problems.
   b. All maintenance items completed and documented by Contractor through maintenance report forms.
4. Final Acceptance and the end of the warranty period for the landscape will occur only after all punch list items have been satisfactorily completed and the site is left in the condition specified under Cleanup and Protection.

C. Warranty and Maintenance Period:
1. The end of the warranty and maintenance period shall be:
   a. October 31 ÓÓ one year following fall Substantial Completion.
   b. June 30 ÓÓ one year following spring Substantial Completion.
   c. One year following Substantial Completion.
   d. Two years following Substantial Completion.
   e.
2. Prior to and during the warranty and maintenance period, replace any plants that are damaged, dead, or, in the opinion of the Landscape Architect, are unhealthy, or have lost more than 25 percent of their natural shape due to dead branches, excessive pruning or improper maintenance. Rejected plant materials shall be removed from the site immediately after being rejected and legally disposed off-site. Replacement plants shall be installed within 2 weeks following the inspection unless otherwise agreed to in writing by the Owner.
3. Only one replacement of any plant is required after Substantial Completion, except for losses due to failure to comply with specified installation and/or maintenance requirements. Failures include but are not limited to: infestation of crowns of perennials or ornamental grasses with invasive weeds due to failure to maintain beds, insufficient watering operations, herbicide damage, structural failures such as trees not remaining upright, and faulty performance of tree stabilization or watering devices.
4. Make replacements in accordance with the original specifications, plant list, planting details, and notes. Fully restore areas damaged by replacement operations to their original and specified condition.
5. The Contractor will not be held responsible for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents beyond landscape installer's control which result from floods, hail storms, winds over 100 miles per hour, fires or vandalism, unless Contractor has not completed specified installation or maintenance in a manner that could have protected the landscaping from these phenomena.
6. If, in the opinion of the Landscape Architect, it is advisable to extend the warranty and maintenance period for an additional growing season, the Contractor will be notified of such requirement by the Owner. Improper planting and/or failure to perform and document the specified maintenance in accordance with contract requirement shall be the basis for extending the period of establishment for an additional growing season. All specified maintenance and warranty requirements will be required during this extended period and all costs shall be the responsibility of the Contractor.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in the Plant List shown on Drawings and with the minimum quality conforming to ANSI Z60.1. Branching on all plants shall be characteristic of the species, well-shaped, full, sound, healthy, vigorous stock of uniform growth and densely foliated when in leaf. All plants shall be free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. 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.
2. Plants shall originate from the same USDA Hardiness Zone as project site, or lower (colder).
3. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Where plant height or spread is indicated with a tolerance, the smaller dimension is the minimum acceptable; the larger dimension represents the maximum permissible. The average dimension of all plants must, at least, equal the average of the tolerance figures shown on the drawings. Spread shall meet the minimum dimension specified in all directions and must be considered as pivoting on center of plant.
4. Canes on shrubs shall arise at or just below the root crown. Multi-stem and clump form trees shall have branches that arise at or just below the root crown except when approved by the Landscape Architect.
5. All plants shall have a waterproof legible label securely attached to each plant bearing designation of plant's common and scientific name, including genus, species, and cultivar or variety, when applicable.
6. Do not prune plants prior to delivery.
7. Stressed or damaged plants or those not conforming to the specifications shall be subject to rejection by the Landscape Architect at any time during the term of the contract.

B. Root treatments on all plants shall conform to the following requirements:
1. Balled and burlapped ("B&B") plants shall have healthy root systems developed by transplanting or root pruning with a firm, natural ball of earth securely wrapped with burlap, bound with cord and wire basket. Root flare shall be visible before planting. Plants with damaged or broken root balls or multiple layers of burlap will not be accepted.
2. Containers shall be finished landscape grade material having their roots well established in the soil mass. Plants over-established in the container, as evidenced by pot-bound root ends, will not be accepted.
3. Annuals , biennials , perennials , groundcover and ornamental grasses shall have well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery. .
4. Bulbs, Corms and Tubers: Provide healthy, disease free rot stock of the genus, species, variety and condition listed on the drawing. All plant sizes, grades and weights shall conform to ANSI Z60.1.

C. Trees: Evergreen and deciduous trees shall have straight single leaders. 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; or with stem girdling roots will not be accepted. Evergreens shall be unsheared.
1. Trees indicated as specimen shall be exceptionally heavy, symmetrical, and superior in form, branching, and symmetry.
2. Caliper is the trunk diameter taken at a specified distance above root collar as described in ANSI Z60.1.
3. Branching height is the distance above ground where balanced branching occurs.

2.2 MULCH

A. Organic Mulch: Well-composted, finely shredded processed hardwood bark, free from foreign material and fragments in excess of 2 inches in any dimension.
1. Dyed mulch or mulch that is predominantly wood chips will not be accepted.

2.3 STAKING AND GUYING

A. Staking (for deciduous trees less than or equal to 3.5-inch caliper, ornamental/understory trees, and evergreens less than or equal to 12-foot height):
1. Tree support stakes shall be a minimum actual size (not nominal) 2 inch x 2 inch hardwood posts free of bark or 3 inch diameter hardwood or cedar posts with bark intact. Posts shall be minimum 8 feet long. Metal fence posts are not permitted unless approved in advance by the Landscape Architect.
2. Tree support stakes for Root Production Method trees (RPM) shall be 1 inch x 1 inch hardwood posts free of bark.
3. Wire stays for tree stakes shall be No. 12 to 14 gauge galvanized wire. Polypropylene strapping will not be permitted.
4. Chafing guards shall be fiber-reinforced hose of not less than 1/2 inch inside diameter, color black. Multi-colored hose will not be permitted.

2.4 TREE WRAP, TRUNK PROTECTION, AND TREE GUARDS

A. Tree wrap for deciduous trees as noted in Plant List on Drawings shall be 4-inch wide, two-ply, waterproofed crepe Kraft paper with plies cemented together with asphalt. Twine used to secure wrap shall be natural fiber two-ply jute. Tape or plastic twine will not be permitted as a substitution for the jute twine.

B. Tree guards for Root Production Method trees (RPM) shall be vinyl, wraparound, 36 inch long, vented and UV stabilized.

C. Trunk Protection for deciduous shade trees: Corrugated PVC trunk protection, minimum 6" diameter, 5' height minimum.

2.5 WATER

A. Water shall be available from on-site sources.

B. Water shall be free of wastewater effluent or other hazardous chemicals. On-site sources of water may be available from City hydrant with metering and payment by Contractor or existing irrigation system. Confirm prior to commencing work.

2.6 TOPSOIL

A. Refer to Section 329100 "Toposil".

2.7 PLANTING MIXTURES

A. Standard planting backfill for individual tree and shrub pits shall be:approved off-site topsoil.

B. Plant bed mixture for beds comprising a mix of shrubs, perennials, annuals, ornamental grasses and groundcover shall be 3 parts approved off-site topsoil thoroughly blended with 1 part compost.

C. Plant bed mixtures for beds comprising a mix of shrubs, perennials, annuals, ornamental grasses and groundcover shall be twelve (12) inches deep approved off-site topsoil.

D. The pH range shall be 5.5 to 8.0.

E. Texture class shall be silt loam to loam, no less than 40% sand, and no greater than 20% clay considering only the mineral fraction of the soil.

F. Soluble salts: 500 ppm maximum.

G. Decomposed organic matter: 3-5% by weight (8-20% by volume)

2.8 SOIL AMENDMENTS

A. Peat shall be a product having at least 95 percent organic content consisting of sphagnum peat moss with a pH range of 3.0 “ 4.0 and Von Post decomposition value of H1 “ H3, or low-lime reed-sedge peat with a pH range of 4.0 to 5.0 and Von Post decomposition value of H4 “ H6. Product shall be free of sticks, wood or other debris.

B. Compost shall be a heavily decomposed mature/stabilized, humus-like material derived from the aerobic decomposition of leaf compost or standard commercial grade compost of sheep or cow manure. Raw manure is not suitable for use. The compost shall have a dark brown or black color, be capable of supporting plant growth without ongoing addition of fertilizers or other soil amendments and shall not have an objectionable odor. The compost shall be free of plastic, glass, metal, rocks, gravel, and other physical contaminants, as well as viable weed seeds and other plant parts capable of reproducing (except airborne weed species).
   1. pH: 6 to 8.
   2. Moisture content: 35 to 50 percent by weight. No visible free water or dust is produced when handling it.
   3. Sieve analysis: 100 percent passing 3/4 inch screen.
   4. Soluble salt content: Electrical conductivity below 10 dS m-1.
   5. Organic matter content: Minimum 40 to 60 percent.

C. Sand shall be clean, coarse, ungraded, meeting the requirements of ASTM C33 for fine aggregates.

D. pH Adjusters:

1. Lime shall be finely ground agricultural grade dolomitic limestone containing not less than 85 percent calcium and magnesium carbonates conforming to ASTM C602, Class T or O.
2. Elemental sulfur shall be granular, biodegradable, horticultural grade material containing at least 90 percent sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

2.9 FERTILIZER

A. Fertilizers are required at the time of installation and during the warranty/maintenance period. The fertilization program shall be based on soil testing and formulations and rates of application shall be based on test reports provided by the independent testing laboratory.

B. The independent testing laboratory shall also prepare a custom formulation and rate for each category of plants to be installed and maintained; i.e. trees, shrubs, perennials/ornamental grasses, annuals and bulbs.

C. Fertilizers shall include organic and inorganic, slow release and water-soluble nitrogen and the percentages shall be based on soil types and the time of year being applied. Fertilizers shall not be applied during the hot summer months unless specific to blooming plants or from mid-summer through the end of the growing season when new plant growth will not harden off prior to the first killing frost.

D. The fertilizer to be used to amend the soil before planting shall be granular fertilizer that conforms to applicable state and federal regulations, and contains no less than 60 percent slow-release nitrogen.

E. Fertilizer to be used during the warranty and maintenance period shall be a complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, not less than 30 percent of the nitrogen from a slow release source. Fifty percent of the nitrogen shall be derived from natural organic sources. The formulations shall be as provided by soil test of this Section.

2.10 PESTICIDES AND HERBICIDES

A. Pesticides and herbicides shall be 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-use pesticides and herbicides unless authorized in writing by authorities having jurisdiction.
1. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
2. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.11 METAL EDGING

A. Metal edging shall comply with ASTM A1011/A1011M, sized 3/16 inch thick x 4 inches wide x 16 feet length, made of steel, colored black, fabricated in sections with stake pockets stamped, punched, or welded to face of sections approximately 30 inches apart, with 3/16 inch x 16 inch stakes, as manufactured by J.D. Russell Co., or approved equal.
1. Accessories shall be from same product line and manufacturer.

2.12 MAINTENANCE EDGE AGGREGATE

A. Aggregate for maintenance edges shall be: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
1. Type: Rounded glacial gravel or smooth-faced stone.
2. Size Range: 3/4 inch maximum, 1/4 inch (minimum.
3. Color: Uniform tan-beige color range acceptable to Landscape Architect.

B. Filter Fabric: Synthetic, non-woven, needle-punched geotextile fabric weighing 2 to 4 oz per square yard with a minimum grab tensile strength of 35 pounds and permeability of 0.03 cm/second.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General:
1. Prior to beginning work, examine and verify the acceptability of the project site and notify the Landscape Architect of unsatisfactory conditions or obstructions that do not appear on the Drawings. Do not proceed with the work until unsatisfactory conditions have been corrected or resolved.

2. Verify that no foreign or deleterious material has been deposited in soil within a planting area.
3. Where planting occurs in close proximity to other site improvements, provide adequate protection to all features prior to commencing work. Promptly repair any items damaged during planting operations to their original condition.
4. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
5. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
6. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
7. If plants die or are rejected due to non-conformity to contract requirements, they must be removed from the site immediately and replaced before Substantial Completion.

B. Utilities: Have all underground utilities located by servicing agencies. In the vicinity of utilities, hand-excavate to minimize possibility of damage.

C. Pesticides and Herbicides:
1. General: All plants delivered to the site shall be free of disease, pests, eggs, and larvae. Promptly remove all plants that do not conform to this requirement.
   a. Insecticides should only be used to control pests when present in quantities that will be detrimental to plant vigor.
   b. Applying foliar herbicides to control weeds in plant beds after installation will not be permitted unless approved in advance by the Landscape Architect. Approval will only be granted if plants to be controlled cannot be effectively removed by hand pulling. Foliar herbiciding will only be permitted as part of the weed control program developed by the Contractor in advance of planting.
   c. All chemicals shall be stored and mixed off-site. No chemicals of any type shall remain on site at the end of each work day.
   d. Do not apply over water or dispose of used containers on-site.
   e. Post all pesticide and herbicide applications.

D. Coordination with Other Work:
1. The Contractor shall coordinate work with other contractors or trades to determine the appropriate sequence of landscape installation with respect to other work on the site.
2. Completed work installed out of construction sequence which is subsequently disturbed by the completion of work by other trades shall be repaired by the landscape installer at no cost to the Owner.
3. Maintain grade stakes and layout controls set by others until removal is mutually agreed upon by all parties concerned.

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, if necessary, to prevent erosion or displacement of soils and discharge of soil-bearing water run-off or airborne dust to adjacent properties, natural resources and all pavement surfaces.

C. Vegetation Removal: Strip and dispose of organic debris and root mat.

3.3 LAYOUT

A. Accurately lay out each plant location and planting bed edges according to the drawings, using clearly visible painted, labeled stakes or plastic flags. Spray paint continuous lines on bare soil delineating plant bed boundaries. When scaling locations on the drawings, use at least 2 known reference points as layout controls to determine plant locations. Do not proceed with planting operations until locations have been reviewed and approved in writing by the Landscape Architect.

B. Prior to installation, all plant locations and bed edges must be approved by the Landscape Architect, who may field adjust locations at no additional cost to Owner. Plants installed without layout approval are subject to relocation at Contractor's expense.

3.4 PLANT INSTALLATION

A. General: Complete all plantings, metal edging and mulching prior to fine grading adjacent seed beds. Keep excavations covered or otherwise protected after working hours and when unattended by Installer's personnel.

B. Planting Pit Excavation:
   1. For individual plant pits in seeded areas, spread seed bed topsoil to the uniform depth and rough grade prior to layout and planting pit excavation.
   2. Remove rocks and other unclassified underground obstructions to at least 6 inches below the finished planting depth of the root ball. Trim perimeter of planting pit leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Ensure that root ball will sit on undisturbed base soil to prevent settling. If plant pits are initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
   3. If underground utilities or other surface or subsurface obstructions are encountered that cannot be removed, do not proceed with planting operations until alternate planting locations have been selected and approved by the Landscape Architect.
   4. Size and configure planting pits in accordance with the planting details. If rotating augers or other mechanical diggers are used, scarify the side walls and bottom of the pit.
   5. Where poor soil percolation is probable, test drainage by filling planting pits with 12 inches of water. Record the drainage time for each pit and if, in the opinion of the Landscape Architect, the water does not adequately drain off within 24 hours, install drains or raise plant pits as directed.

C. Planting Bed Excavation:
   1. Refer to Section 311000 "Site Clearing" for vegetation removal.
   2. Refer to Section [312000 "Earth Moving" for earthwork requirements.
   3. In locations where plant beds are shown on the drawings and earth moving is not required other than achieving the specified plant bed subgrades, excavate plant beds to the depth shown on the planting details. Remove all existing vegetation.
   4. Grade subgrade smooth and uniform. Slope to perimeter of plant bed when underdrains are required to collect accumulated water within the bed.
   5. Transition from plant bed subgrade to adjacent seed bed subgrade outside the limits of the plant bed to ensure full depth plant bed mixture is provided.
   6. Where plant beds terminate next to pavement surfaces, subgrade transitions shall be 12 inches wide within the plant bed to protect pavement base material from being undermined.
   7. Obtain approval from the Landscape Architect for all subgrades prior to placing plant mixtures. Notify the Landscape Architect at least 48 hours in advance of placing plant mixture.

D. Mixing and Placing Planting Mixtures:
   1. Install planting bed and planting pit mixtures to the specified proportions and depths. On-site mixing of salvaged topsoil with off-site topsoil or amendments shall result in a homogenous blend of all ingredients. Screen all mixture to remove foreign debris and rocks greater than ½ inch diameter prior to placement.
   2. Place planting bed mixture in 6 inch lifts and lightly compact to prevent settlement after planting. Settlement that occurs after planting will require plant removal and the placement of additional plant mixture at the Contractor's expense. When placing mixture in raised planters, set finish grade elevations 2 inches low for mulch placement, if required on Drawings.
   3. Grade planting areas to a smooth, uniform surface plane. Roll and rake, remove ridges, and fill depressions to meet grade.
   4. Before planting, obtain Landscape Architect's approval of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

E. Fertilizing:
   1. Prior to or during planting, amend all planting pit and bed mixes by incorporating fertilizer at rates required by soil test reports as specified under Section 329100 "Soil Preparation (Topsoil)". Do not broadcast fertilize over the surface of the soil or onto any plant root ball.
   2. For individual plant pits, incorporate fertilizer into back fill during planting operations. For plant beds, pre-mix fertilizer prior to installation.

F. Planting and Backfill:
   1. Do not plant when the ground is frozen or saturated.

2. Balled and burlapped plants: Do not use planting stock if root ball is cracked or broken before or during planting operation. Set the plant in the center of planting pit with the crown set at 1 inch above adjacent soil for shrubs and 2 inches above adjacent soil for trees. Root flares shall not be set below adjacent finish grade. Face plant to give the best appearance or relationship to primary views. Cut away burlap, rope, wire or other wrapping materials from the top one-third of the root ball, and remove from pit. If plastic wrap or other non-degradable materials are used in lieu of burlap, completely remove them from the root ball before backfilling. Backfill planting pit approximately two-thirds full, add fertilizer, water and allow planting mixture to settle. After the water has been absorbed, complete backfilling and tamp lightly to grade to prevent future settlement and form a watering basin with plant mixture of the size indicated on Plans.
3. Container-grown plants: Remove containers and make at least four vertical cuts one-half to one inch deep around the root ball and thoroughly loosen the roots on the outside of the ball. Plant as specified above for balled and burlapped plantswith the additional requirement that container-grown stock shall be planted so that top of container soil is level with surrounding grade, unless the root flare is not at the surface of the container soil. If the root flare is buried, excavate to expose the flare and place as required above in relation to finish grade. Size of root ball must meet ANSI Z60.1 after removal of material. Do not plant higher to account for mulch, as mulch should not cover plant crown.

3.5 SPECIAL PLANTING CONSIDERATIONS:

A. Mycorrhizal Inoculum:
1. Rototill 2 granular pounds per 1000 square feet into the top 8 inches of soil for plant beds or as recommended by supplier. Incorporate 1 pound per cubic yard of plant pit backfill as backfill is being placed.

B. Sloped Plantings:
1. 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. Complete planting as specified under Part 3.4 F above.

C. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

D. Root Production Method (RPM) Trees:
1. Complete plantings as specified for container grown plants above. Install tree guard and staking in accordance with planting detail.

E. Mechanized Tree Spade Planting
1. 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 the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
2. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
3. Cut exposed roots cleanly during transplanting operations.
4. Use the same tree spade to excavate the planting pit as was used to extract and transport the tree.
5. Fill all voids between the plating pit and root ball with the specified planting mixture, tamping or watering soil in place until all voids are filled.
6. Deep root water and fertilize immediately following installation.
7. Where possible, orient the tree in the same direction as in its original location.

3.6 MULCHING

A. Uniformly install mulch on all trees and shrub beds to depth shown on Plans within 48 hours of planting.

B. Keep mulch out of the crowns of shrubs and perennials, at least 3 inches from all tree trunks, and off sidewalks and roadways.

3.7 PRUNING

A. After planting, prune trees and shrubs to remove all dead, dying, broken, or crossed limbs flush with the ground or main stem leaving no stubs. Do not prune to shape or to compensate for transplanting shock. Retain natural form of the plant type. Prune using standard professional horticultural and arboricultural practices. Remove trimmings from the site.

B. Employ workers experienced in this type of work.

3.8 WRAPPING

A. The trunks of deciduous trees as noted for particular species in Plant List shall be wrapped immediately after planting, but not before the condition of the trunks has been inspected and approved by the Landscape Architect. Trim the margins of any abrasions or cuts with a sharp, sterile knife prior to applying wrap.

B. Wrap trees beginning at the base and extending to the first branches in a spiral pattern with an overlap of half the width of the paper.

C. Secure the wrapping at the top, bottom and at 18 inch maximum intervals with twine.

3.9 STAKING AND GUYING

A. Install guying and staking as shown on the details immediately after planting.

B. Remove and dispose of stakes and guys at the end of the warranty period.

3.10 EDGING

A. Metal Edge:
1. Install edging as detailed and at all locations shown on Plans, keeping the alignment smooth and continuous without visible deviation from the line or arc being set.

B. Trench or Shovel-cut Bed Edge:
1. Install trench edge between all planting beds and lawn in the manner shown on the plans.

3.11 MAINTENANCE EDGE

A. Excavate areas receiving maintenance edge to the cross section shown on the details.

B. Level and compact subgrade and install metal edging and filter fabric as detailed, overlapping ends by 6 inches.

C. Install aggregate, leveling material with the top of edging.

3.12 CLEANUP AND PROTECTION

A. Remove excess and waste material daily. When planting has been completed, clear the site of all debris, stockpiles and materials.

B. Repair any damage to existing landscape, paving or other such features as a result of work related to this contract to its original condition.

C. Protect landscape work and materials from damage due to landscape operations, and operations by other Contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

D. Trunk protection shall be placed around all deciduous shade tree trunks at a minimum height of 5' immediately after planting.

3.13 MAINTENANCE

A. Provide all maintenance under the supervision of a skilled employee of the landscape installer. The skilled maintenance supervisor shall be: capable of **operating the automatic irrigation system controller,** conducting plant diagnostics to identify the presence of disease and insect problems and directing a maintenance crew in the performance of horticultural maintenance practices identified below. **Maintenance requirements identified below shall be the basis for information to be included in the Maintenance Schedule and Irrigation Plan identified under [Part 1.5**] of this section **and thoroughly documented under the required Maintenance Report Forms to verify the work has been properly performed**.
1. Failure to perform and submit factual Maintenance Report Forms could result in non-payment for said services and require the extension of the warranty and maintenance period an additional year at the Contractor's expense.

B. Provide all equipment, materials, labor and services to maintain the landscape beginning immediately after each plant is installed and continuing until Final Acceptance and the end of the warranty period. Perform all work under the direct supervision of a technician trained to recognize and treat conditions affecting the establishment and growth of the plants and perform the following:

1. Inspect the entire landscape at least once per week during the growing season and perform needed maintenance promptly.
2. Irrigation:
   a. Irrigate all plants to maintain optimum moisture within the root zone. Reoccurring overly dry or wet conditions shall be grounds for rejection of plant material. When using an automatic sprinkler system, the landscape installer responsible for maintenance shall bear full responsibility to set each zone to the correct frequency and duration.
   b. If the automatic irrigation system is inoperative or not present, provide an approved temporary irrigation system or hand water from a source approved by the Landscape Architect. The system shall have the ability to be operated without moving hoses or sprinklers around the site between seeded/planted areas (i.e. system can be set to water one area for the required maintenance period), and may be automated with a timer. Supply all water and equipment at the Contractor's expense from a source approved by the Landscape Architect.
3. All pruning shall be performed by or under the supervision of a certified arborist. Prune ly only dead wood and broken limbs as identified, in accordance with Part 3.7 - Pruning. Do not shear evergreens or any shrubs unless specifically required to be maintained as a sheared hedge. Maintain the natural shape of trees and shrubs. Plants sheared so that they no longer present their natural shape will be replaced at Contractor's expense.
4. Maintain stakes and guys taut and in the specified condition. Repair trees wraps if loose, torn or untied.
5. Maintain all plant beds and tree saucers weed free. Edge shrub and perennial beds and tree rings at least monthly during the growing season, keeping all tree rings to a uniform diameter. Hook mulch monthly and add mulch as needed.
6. In early spring – prior to the start of the growing season, cut all ornamental grasses , perennials , annuals and biennials flush with the ground and remove cuttings from the site.
7. Apply treatments as necessary to keep plants and planted areas free of insects, pests, and disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and herbicides. Treatments include utilizing physical and cultural controls.
8. All pesticides shall be applied by a licensed pesticide applicator. Apply pesticides and all other chemical products and biological control agents in accordance with the authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner at least 24 hours before each application is performed. No mixing or disposal of chemicals is allowed onsite.
9. Apply antidesiccant to upright conifers and broadleaf evergreens in December through February, at least once per month. In locations subject to high wind or salt spray, install burlap windscreens around spreading conifers and broadleaf evergreens but do not allow burlap to touch the plants.
10. Collect all litter and debris from plant beds and dispose off-site.
11. Fertilization:
    a. Fertilize plant material as recommended by the soil test report.
    b. Trees, shrubs and ornamental grasses: Fertilize once in the fall after the first hard freeze (usually October) but before the ground freezes; 1 pound of 4-1-2 (N-P-K) per 1,000 square feet of ground below the tree canopy or shrub bed.
    c. Perennials: Fertilize twice, once in the early spring and again 8 weeks later with 1 pound of 5-10-5 (N-P-K) per 100 square feet.
    d. Annuals and bulbs: For bed plantings, use high phosphorous granular fertilizer 10-20-10 (N-P-K) monthly during the growing season applied at a rate identify on the package label. For potted annuals, use high phosphorous water-soluble fertilizer 10-20-10 (N-P-K) every 2 weeks applied at a rate identified on the package label.
12. Remove dead and unacceptable plants as their condition becomes apparent. Make replacements during normal planting schedule season unless otherwise directed by Landscape Architect. Do not wait until end of the warranty period to replace plants unless directed to do so by Landscape Architect.
13. At the end of the warranty period, but prior to Final Inspection, remove all staking, guying, trunk wrap, protection fences, watering bags or saucers, and other accessories and top dress tree rings and beds 1 inch deep with the specified mulch product.

END OF SECTION