SECTION 000110

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SECTION 024101

SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Disposal of removed material.

C. Obtaining of waste areas for disposal of material as required.

1.3 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312200 – Grading.

C. Section 312323 – Fill and Backfill.

D. Section 312500- Temporary Erosion and Sedimentation Control

E. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

C. PennDOT Publication 408, Section 491- Milling of Bituminous Pavement Surface

1.5 SUBMITTALS

A. Site Plan, showing:

1. Vegetation to be protected.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fill Material: As specified in Section 312323 - Fill and Backfill

PART 3 EXECUTION

3.1 SCOPE

A. Remove sidewalks, paving, walls and curbs as required to accomplish new work.

B. Remove fences and gates.

C. Remove other items indicated (playground equipment), for salvage, relocation, and recycling.

D. Remove or protect vegetation and tree(s) as shown on the drawings.

1. Tree Protection-Zone Fencing - Install protection zone fencing along edges of protection zones before materials or equipment are brought onto the site and construction operations begin in a manner that will prevent people and equipment from easily entering protected area. Install construction 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. Fence is to be wood slat snow fence, 48" high. Set or drive fence posts into ground one-third of the total height of the fence without concrete footings around the dripline of trees. Where a post is located on existing paving or concrete that is to remain, provide appropriate means of post support acceptable to the Architect.

2. Fence: Plastic snow fence - 48" height.

3. Posts: Set or drive posts into the ground one-third (1/3) the total height of the fence without concrete footings. Where a post is located on existing pavement or concrete that is to remain, provide appropriate means of post support acceptable to the Architect.

E. Maintain protection-zones free of weeds and trash.

F. Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner acceptable to the Architect.

G. Maintain protection-zone fencing in good condition as acceptable to the Architect and remove when construction operations are complete and equipment has been removed from the site.

H. Fill depressions caused by clearing, grubbing and demolition operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill consisting of materials as specified in Section 312323 of the specifications.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.

2. Provide, erect, and maintain temporary barriers and security devices.

3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.

4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.

5. Do not close or obstruct roadways or sidewalks without permit.

6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements that are not to be removed.

E. Partial Removal of Paving and Curbs: Neatly saw cut pavement and curbs at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies and Owner; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS OF UTILITIES IS THIS SECTION APPLICABLE TO THIS PROJECT?

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Architect before disturbing existing installation.

3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

C. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 4101

SECTION 032000 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Steel reinforcement bars for miscellaneous cast-in-place concrete site elements outside of Civil and Structural Engineering scope.

B. Related Sections:

1. Division 03 Section “Cast-in-Place Concrete”.
2. Division 07 Section “Sitework Joint Sealants”.
3. Division 32 Section “Concrete Paving”.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration,

insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Landscape Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to 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.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch (1.2908 mm) in diameter.

1. Finish: Galvanized.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

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

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch (25 mm), not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318 (ACI 318M).

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches (610 mm), whichever is greater.
2. Stagger splices in accordance with ACI 318 (ACI 318M).

H. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches (305 mm).

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches (50 mm) for plain wire and 8 inches (200 mm) for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

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

3.4 INSTALLATION TOLERANCES

A. Conform to ACI 117 (ACI 117M).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

B. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Philadelphia Parks and Recreation Standard Specifications

1.2 SUMMARY

A. Section Includes:

1. Miscellaneous cast-in-place concrete elements outside of Civil and Structural Engineering scope.

B. Related Sections:

1. Division 03 Section “Concrete Reinforcing”.
2. Division 07 Section “Site Joint Sealants”.
3 Division 32 Section “Concrete Paving”.
4. Division 32 Section “Protective Playground Surfacing”.
5. Division 32 Section “Playground Equipment”.

1.3 DEFINITIONS

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

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

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete 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 Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.

c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified slab flatness and levelness.
l. Slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

9. Color pigments.
10. Fiber reinforcement.
11. Vapor retarders.
12. Floor and slab treatments.
13. Liquid floor treatments.
14. Curing materials.
15. Joint fillers.
16. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.

8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
2. Location of construction joints is subject to approval of the Landscape Architect.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

    a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with specified requirements, including dosage rate used in test.

D. Field quality-control reports.

E. Minutes of preinstallation conference.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician [with experience installing and finishing concrete, incorporating permeability-reducing admixtures].

    1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed 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.

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

    1. Include the following information in each test report:

        a. Admixture dosage rates.
        b. Slump.
        c. Air content.
        d. Seven-day compressive strength.
        e. 28-day compressive strength.
        f. Permeability.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

1.11 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. For Concrete paving, refer to Section 32 “Concrete Paving”.

B. For site structures, refer to structural drawing.

C. Refer to this section for miscellaneous site concrete elements.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents.
1. ACI 117 – Specification for Tolerances for. Concrete Construction and Materials
2. ACI 301 – Specification for Structural Concrete
3. ACI 318 – Building Code Requirements for Structural Concrete

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I, Gray.
2. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag, Type IL, portland-limestone cement.

Commented [MB1]: Consider whether we can use Type 1L or 1S

C. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 3M

   a. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
   b. Fine Aggregate: ASTM C33/C33M.

2. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to appliable requirements for the class of concrete.

2.3 ADMIXTURES

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

B. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

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.

C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.

2.4 ACCESSORIES

1. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

2.5 REPAIR MATERIALS

A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

2.6 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

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

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.7 CONCRETE MIXTURES

A. Type A – Paving, Walls and Footings

1. Normal weight concrete
2. Strength - f'c = 4000 psi (at 28 days)
3. Shrinkage limit = 0.04%
4. Min SCM = 15 percent of cementitious
5. Slump = 5", or as required by Contractor

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of

Commented [MB2]: Review with NRMCA guidelines - recommends no min or max limitations

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batch is released.

2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.4 INSTALLATION OF CAST-IN-PLACE CONCRETE

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Landscape Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.5 INSTALLATION OF JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Landscape Architect.
2. Place joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and

girders and at the top of footings or floor slabs.

6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Landscape Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by formfacing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
    b. Remove projections larger than 1/4 inch (6 mm).
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 (ACI 117M) Class B.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.9 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

3.9 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month.
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Landscape Architect.
2. Remove and replace concrete that cannot be repaired and patched to Landscape Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch (19 mm).
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Landscape Architect.

D. Perform structural repairs of concrete, subject to Landscape Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Landscape Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency to immediately report to Landscape Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Landscape

Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

1) Project name.
2) Name of testing agency.
3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
4) Name of concrete manufacturer.
5) Date and time of inspection, sampling, and field testing.
6) Date and time of concrete placement.
7) Location in Work of concrete represented by samples.
8) Date and time sample was obtained.
9) Truck and batch ticket numbers.
10) Design compressive strength at 28 days.
11) Concrete mixture designation, proportions, and materials.
12) Field test results.
13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Batch Plant Inspections: On a random basis, as determined by Landscape Architect.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

a. When frequency of testing provides 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:

a. 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.
b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete:

a. 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:

   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two sets of two 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Landscape Architect but will not be used as sole basis for approval or rejection of concrete.
9. Additional Tests:

   a. Testing and inspecting agency to 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 Landscape Architect.
   b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Landscape Architect.

      1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.

10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

   1. Protect from petroleum stains.

2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 057310 –DECORATIVE SITE RAILINGS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Stainless-steel Handrails.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

F. Railing must comply with the 2010 Americans with Disabilities Act (ADA) Accessibility Guidelines.

G. Railing must comply with ASCE "Specification for the Design of Cold-Formed Stainless Steel Structural Members."

1.5 ACTION SUBMITTALS

A. Product Data for the Following:

1. Manufacturer's product lines of railings assembled from standard components
2. Grout, anchoring cement, and paint products.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For illuminated railings, include wiring diagrams and roughing-in details.

E. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Welded connections.
4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified delegated-design professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

C. Welding Certificates.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

E. Preconstruction Test Reports.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

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

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

1. AWS D1.6, "Structural Welding Code - Stainless Steel."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups as shown on Drawings.

2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.

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

F. Preinstallation Conference: Conduct conference at Project site.

1.9 PROJECT CONDITIONS

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

1. Provide allowance for trimming and fitting at site.

1.10 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering

products that may be incorporated into the Work:

1. Stainless-Steel Handrails

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.3 STAINLESS STEEL

A. Tubing: ASTM A 554, **Grade MT 304**.

B. Pipe: ASTM A 312/A 312M, **Grade TP 304**.

C. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, **Type 304**.

D. Bars and Shapes: ASTM A 276, **Type 304**.

2.4 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless-Steel Components: Type 304 stainless-steel fasteners.

2. Dissimilar Metals: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

1. Provide **tamper-resistant** flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy **Group 1 (A1)** stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Form work true to line and level with accurate angles and surfaces.

F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

H. Connections: Fabricate railings with welded connections unless otherwise indicated.

I. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

J. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

K. Form changes in direction as follows:

1. As detailed.

L. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

M. Close exposed ends of hollow railing members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

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

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 STAINLESS-STEEL FINISHES

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

C. Finish for Stainless Steel Tubing and Pipe (vertical posts, post brackets, handrails, toprails)

1. Bright, Directional Polish Finish: Match AISI No. 4.

PART 3 – EXECUTION

3.1 EXAMINATION

B. Examine step assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Payment for these services will be made from the testing and inspecting allowance, as authorized by Change Orders.

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Railings will be tested according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Landscape Architect and will comply with specified requirements.

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

3.7 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry

1. If necessary, re-polish affected areas to match adjacent finishes.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057310

SECTION 07 92 10 - SITEWORK JOINT SEALANTS

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes Elastomeric Joint Sealants:

1. Silicone joint sealants.
2. Related items including backing materials.

B. Related Sections:

1. Division 32 Section “Concrete Paving”.

1.3 PRECONSTRUCTION TESTING

A. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows.

1. Locate test joints where indicated on Project or, if not indicated, as directed by Landscape Architect.
2. Conduct field tests for each application indicated below.

a. Each kind of sealant and joint substrate indicated.

3. Field tests are to be performed on-site, either on field-constructed mock-ups or on actual construction, but far enough in advance of sealant work to allow curing of sealants and retesting if necessary.
4. Notify Landscape Architect seven days in advance of dates and times when test joints will be erected.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
7. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide up to eight Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants. Final colors shall be selected from actual field mock-ups only.

D. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

C. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

D. Field-Adhesion Test Reports: For each sealant application tested.

G. Qualification Data: For qualified Installer and testing agency.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

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

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section. Provide eight mockups of joints, each with different color sealant, as selected by Landscape Architect.

Final colors shall be selected from actual field mock-ups only.

E. Pre-installation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with General Conditions and Division 01 Section ‘Product Requirements’.

B. Products shall be delivered to the Project site in the original, unopened containers bearing the manufacturer’s name, product designation, batch number and applicable precaution labels, national standards with which the product complies and the application instructions.

1. Store in a cool, dry environment in a manner to prevent damage.

1.8 PROJECT 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 (5 deg C).
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.

1.9 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2- PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, 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.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Landscape Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. DOWSIL 795 Silicone Building Sealant (100 Percent Silicone; neutral cure ASTM C 920, Type S, Grade NS, Class 50, for Use Tor NT; suitable for exterior use; suitable to bond to joint surface materials indicated; with ASTM D 2240 or ASTM C661 Shore A Hardness of 35; or approved equal.

A. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Pecora; Product: 890FTS.
      b. Tremco; Product: Spectrem 800/900 SL.

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated 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: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

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

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support 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 sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet 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.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below 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 sealant from surfaces adjacent to joints.
2. Using tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.

3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform [5] tests for the first 500 feet of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint

Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following

a. Whether sealants filled joint cavities and are free of voids.
b. Whether sealant dimensions and configurations comply with specified requirements.
c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. 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 so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079210

SECTION 101110 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Philadelphia Parks and Recreation Signage Standards Manual

1.2 SUMMARY

A. Section Includes:

1. Signage materials and installation in accordance with the PPR Signage Standards Manual.

1.3 REFERENCE STANDARDS

A. The following materials reference standards will apply to the work materials (use most current version of reference standards):

1. ASTM A36 Structural Steel
2. ASTM A123 Zinc (Hot Galvanized) coatings on products fabricated from rodded, pressed, and forged steel shape, plates and bars.
3. ASTM B221 Aluminum-alloy extruded bars, rods, wire, shapes and tubes.
4. ASTM D822 Light and water exposure apparatus (carbon-arc type) for testing paint, varnish, lacquer, and related products.
5. ASTM E84 Surface-burning characteristics of building materials, lacquer and related products.
6. AWI Comply with applicable requirements of “Architectural Woodwork Quality Standards” published by the Architectural Woodwork Institute.
7. CDA Copper Development Association, Inc.
8. FS L-P-391 Plastic sheet, rods and tubing, rigid, cast materials
9. FS L-P-387 Plastic sheet, laminated, thermosetting
10. PS-1 Construction and industrial plywood
11. PEI Porcelain Enamel Institute
12. TM B135 QQ-B-613 (Fed Spec) Brass, Muntz 280
13. UL-943 Fluorescent lamp ballasts

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified fabricator**.**

1.6 QUALITY ASSURANCE

A. General

a. Site verification, fabrication, delivery, and installation of all sign types and quantities indicated in the final approved Copy List and Sign Location Plan. Fabricator to verify the sign quantities from the Copy List and Sign Location Plans and if discrepancies exist, notify the Designer of any such discrepancies.
b. Work shall include all support structures and fasteners required for installation.
c. Work shall include all design engineering needed to produce the project to comply with all applicable municipal, state and federal code, and structural soundness. Fabricator is responsible for submitting engineered drawings signed and sealed by structural engineer.
d. Fabricator to provide all services, subcontractors, labor, materials and equipment needed to complete the work described in this design drawings and specifications document.
e. It is the Fabricator's responsibility to have all drawings signed and sealed by a Structural Engineer.
f. Fabricator shall visit site before construction begins and inspect each proposed sign location. Any issues or concerns shall be communicated to the Designer in writing within twenty-four (24) hours.
g. Upon award of the bid, the selected Fabricator shall arrange a meeting with the Designer to review the scope of work.
h. Fabricator will be responsible for generating evacuation maps at all programmed locations based on template provided by Designer.
i. Fabricator will be responsible for providing the Designer and Owner a project schedule that outlines durations for all work including delivery dates for submittals and Designer and Owner review time. Sign Contractor shall update and reissue the schedule throughout the project and communicate all changes/impacts on the schedule to Designer and Owner.
j. Prior to installation, the Fabricator shall conduct a pre-install walk through with the Designer and Owner to address any potential issues/questions.
k. At the substantial completion of the project the Fabricator shall perform a walk-through with the Designer and Owner to inspect the installation and create a punch list of all unsatisfactory items. Fabricator is required to complete all punch list items within 3-4 weeks of receipt of punch list.

B. All work to be done in a professional manner and to the highest trade standards. Fabricator is responsible for ensuring the quality standards above for all related professional and trade subcontracted work including: general carpentry, masonry, electrical, landscaping, or utilities required for the installation of all sign types as described, unless otherwise agreed to by Owner. All subcontracted work must meet the general accepted professional standards.

B. Work done and materials furnished shall meet the highest industry standards in every respect and, unless otherwise specified, materials and equipment shall be new and of the latest design.

C. In the event of conflict or omission, the Fabricator shall consult the Designer for resolution. All clarifications are to be made in writing in the form of an RFI from the Fabricator to the Designer.

D. Use only personnel thoroughly skilled and experienced with the products and method for fabrication and installation of signage specified.

E. The Owner shall reserve the right to reject any shop drawings, samples or other submittals, as well as any finished product or installation, that cannot meet the standard of quality established. Any such decision will be considered final and not subject to recourse.

F. Materials and hardware not specified, but necessary to the complete functioning of the sign, shall conform to the quality level established.

G. Substitutions of items specifically indicated in this specifications package that serve the same function with equal performance will be considered upon submission of substitution.

H. Custom High Pressure Laminate

1. Quality of entire project must conform to specification and bid submittals as approved by the Designer.
2. Quality assurance to be provided by all printing, pressing, machining, finishing and crating of project products to be accomplished within a single stand alone manufacturing facility.
3. Manufacturer's craftsmen shall have a minimum of two years proven experience in this field of work and be approved by the Designer for this type of work.
4. Submit evidence of having successfully completed two projects of similar scope to this bid within the preceding two years.
5. Product to be assembled utilizing only FSC certified brown kraft paper.
6. Product to include a minimum of 5% Post Consumer Recycled Kraft Paper in product layup. Manufacturer to provide written confirmation and materials procurement back up of such recycled content inclusion.
7. Meets LC50 Pittsburgh Protocol Toxicity Test. Equal to and no more toxic than wood or paper.

J. Digitally Printed Media

1. Printer to have direct-to-substrate printing capabilities with CMYK and White ink options.
2. All media is to be opaque, with full even coverage, and free from dust bubbles, blemishes and other foreign matters.
3. Fabricator should seek to minimize visible banding over color fields and large graphics. Designer reserves the right to reject print samples that display excessive banding.

K. Finishes & Coatings

1. General

a. All exposed paint finishes shall be durable and resistant to scratching and chipping.
b. Finishes shall be spray painted according to manufacturer's specifications for environment, curing time, etc. All paints, inks, coatings and finishes, including primers and other sur-face preparations shall be of the highest quality, manufactured specifically for the surface materials to which they are applied, and shall be compatible with the materials to which they are applied.
c. Surfaces shall be smooth and free of flaws such as scratches, bumps or over-sprayed paint.
d. All paints, inks, and coatings shall be heavy-duty grade to withstand chalking, fading, discoloration, chipping, cracking, and peeling for a minimum of 7 years, or to the maximum manufacture warranty specifications.

2. Aluminum

a. Aluminum surfaces shall be spray painted with acrylic polyurethane enamel
b. Primer Coat: Matthews 74 760
c. Catalyst–43 270

d. Color Coat: Matthews Acrylic Polyurethane Nuance

L. Alternate Fabrication

1. The drawings show design intent only. The Fabricator is responsible for fabrication and overall level of quality. Any changes in design, materials, fabrication techniques or details necessary to the successful completion of this project should be communicated to the Designer in a timely fashion.
2. Further development and engineering of Designer's details (for fabrication and installation) is expected and should be shown in the shop drawings.
3. The Designer recognizes that manufacturers may have shop fabrication techniques that differ from details shown. Suggested changes in fabrication that do not alter the design intent nor reduce the quality will be considered by the De-signer, provided they are submitted in sketch form, as soon as possible, prior to shop drawing preparation.

1.7 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be their duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, will be done at the Contractor's risk.

1.8 WARRANTIES

A. Warrant all products (including, but not limited to: materials, hardware and finishes) against any and all defects based on manufacturers' supplied warranties from date of installation.

B. All manufacturer warranties should be submitted to the Designer and Owner for review.

C. Vinyl die-cut letters: warranted against delamination from substrate.

D. Paint finishes: warranted against fading or chalking, corrosion developing beneath paint surfaces of the support systems (except for obvious vandalism or other external damage to the paint surfaces).

E. Corrosion of the fastenings.

F. The signs not remaining true and plumb on their supports during normal wear.

G. Fading of the colors when matched against a sample of the original color and material.

H. Discoloration of metal finishes.

I. Adhesives, e.g. tape and epoxy

J. Paneling not remaining true and plumb on their supports during normal wear.

K. The Fabricator shall correct any and all material and/or workmanship defects which may appear during the warranty period by restoring defective work to the standard of the contract documents at no cost to the Owner and to the Owner's satisfaction. Corrections include, but are not limited to: disfiguring of any surface due to chalking, rusting, bubbling, or other disintegration of the sign face or of the messages or of the edge finish of the sign inserts or panel.

L. CHPL Samples

1. Manufacturer warrants that under normal wear and use the workmanship and materials used in the CHPL product purchased from the Manufacturer will meet the standards set forth on the applicable specification materials and that the product will not delaminate, peel, blister, crack or fade for a period ten (10) full years from the date of purchase.
2. In the event that the product does not perform as warranted:

    a. Manufacturer shall be allowed to conduct an on-site inspection and investigation, or be provided digital images of defects
    b. Manufacturer shall work directly with the end-user to resolve any warranty matter,
    c. The sole remedy will be the repair or replacement of the defective product at the sole discretion of the Manufacturer, and/or
    d. The repair or replacement by Manufacturer shall be limited to the re-manufacture and shipment of the replacement or repaired product to the site of the end-user's product.

3. This warranty only applies to the manufacture and material used in the manufacture of the product. Manufacturer shall not be liable for any other costs, including but not limited to installation, labor or other costs or expenses. Any repair or replacement shall be warranted for a period up to the remaining life of the original warranty. Further the repair or replacement costs incurred by Manufacturer shall not exceed the purchase price paid for the product.

1.9 DELIVERY, STORAGE AND HANDLING

A. Fabricator is responsible for storage of signs and assemblies and protection from damage at the shop, in transit and until erected in place, complete, inspected and accepted by Owner.

B. Fabricator is responsible for the replacement pilferage both prior to and until inspection and acceptance of installation by the Owner.

PART 2 - PRODUCTS

2.1 CUSTOM HIGH PRESSURE LAMINATE

A. Provide Custom High pressure laminate as manufacturer by iZone or an approved equal.

B. Custom High Pressure Laminate material composed of required layers of phenolic resin impregnated brown kraft filler paper to produce specified thicknesses, surfaced by a layers of melamine overlay, graphics imaged on saturation grade paper with UV resistant pigment based process color inks, and with an optically clear UV overlay that will resist no less that 99% of all sunlight and UV rays, as well as provide a graffiti resistant surface that allows for removal with

standard cleaners.

C. Layers of material are to be assembled, and heat / pressure consolidated at approximately 1200 PSI at temperatures exceeding 275° Fahrenheit at manufacturer's prescribed time frames.

D. All manufacturing processes of printing, pressing, machining, finishing and crating to be accomplished within a single standalone manufacturing facility to ensure consistent quality control and providing standard product delivery times of three weeks.

2.2 ALUMINUM

A. Aluminum shall be of best commercial quality and the various forms shall be straight and true.

B. There shall be no scratches, scars or buckles. Size thickness, and finish of aluminum shall be per NAAMM "Metal Finishes Manual". Comply with the following industry standards.

C. Aluminum sheets shall conform to ASTM B209 6061-T6

D. Aluminum extrusions shall conform to ASTM B241 6063 T6. Wall thickness shall be a minimum of 1/8" thick unless otherwise shown.

E. Brushed Finishes—Brush with abrasive of increasing grit# in a linear directional pattern.

F. Final surface shall have visible grain pattern to match sample approved by Designer. Spray with clear protective finish.

G. Polished Finish—Brush with abrasive of increasing grit#. Buff to a mirror finish with no visible grain. Match sample approved by Designer. Spray with clear protective finish.

H. Non-Directional Finish—Brush with abrasive mounted in an random orbital sander. Match sample approved by Designer. Spray with clear protective finish.

2.3 WOOD

A. #1 grade black locust lumber. Sustainably harvested. Eased edges. Apply a UV clear coat to enhance the wood grain and provide additional protection.

2.4 CONCRETE

A. All concrete footers are to be poured in place.

B. All concrete footers are to be poured from thoroughly mixed and agitated concrete in order prevent unreasonable voids in the finished casting.

C. Concrete to meet specified "PSI Test" for strength: 3,500 psi minimum. Concrete to meet specified "Slump test" before pouring footing. All footings to extend past the frost line.

D. Any footers or posts for signs will be placed in wet concrete and allowed to fully cure in place before any signage is attached or mounted to it in any way. All exposed faces of concrete shall receive a finish to match existing, adjacent surfaces.

2.5 ADHESIVES AND TAPES

A. VHB Foam Tapes

1. Provide 3M Scotch VHB 4930
2. Adhesive shall be Acrylic VHB
3. Carrier shall be closed cell foam

2.6 ACCESSORIES

A. Anchors and Fastenings

1. Provide anchors and fasteners required to secure work in place. Do not expose fastenings on surface of sign panels unless specifically noted otherwise. Do not deform, distort or discolor sign face surfaces by attachment of concealed fastenings.
2. All fastenings shall be non-corrosive and resistant to oxidation or other corrosive action, of the same composition completely through their cross sections, particularly when used below grade. Use highest quality stainless steel hardware and fasteners.
3. Anchors, inserts or fasteners shall be compatible with sign materials, shall not result in galvanic action or chemical interaction of adhesives and shall have demonstrable and sufficient strength for intended use.
4. Steel anchors and fastenings for exterior use shall be galvanized in accordance with ASTM A153.
5. Fabricate and install signs with fastenings to withstand all actions imposed by use; 30 psf wind perpendicular to surfaces, water, ice, snow loads and similar forces.
6. Anchor bolts in concrete shall be cast in place. Fabricator shall furnish instructions for the setting of anchors and bearing plates. Fabricator shall ascertain that the items are properly set during the process of the work.
7. Secure work with fastenings of same color and finish as the components they secure where they are exposed to view, unless noted otherwise. All exposed fasteners must be vandal resistant and have vandal-proof “spanner” type slots to be removed only with a special driver head.

2.7 GRAPHIC STANDARDS

A. Signage Graphic shall be provided by Owner and provided to Contractor for procurement.

B. Typography

1. All type shall be computer typeset using typefaces specified in the Design Intent Package with letter spacing adjusted where needed to ensure optical spacing. Absolutely no letters are to touch. Only typefaces specified in the Design Intent Package are to be used.
2. Sign type drawings indicate which copy is uppercase and which is lowercase. These should be followed as much as possible. When the message on the Copy List differs from the drawing, the Copy List should be followed.

C. Graphics

1. All text, arrows and symbols shall be provided in the sizes, colors, typefaces and letter spacing specified in the Design Intent Package. All text shall be a true, clean photo-mechanically accurate reproduction of the typeface(s) specified as shown in the Graphic Standards section.
2. Text shown in drawings is for layout purposes only (unless message layouts are included

in the Design Intent Package); final text for all signs is shown in the Copy List.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspection: All production materials, color samples and paints, fabricated or partially fabricated items shall be available for inspection, on-site or in the shop, by the Owner or Designer during the manufacturing process and until final delivery, installation and acceptance, to determine compliance with the requirements of these specifications.

B. Shop inspection approvals do not guarantee final acceptance of installed work.

3.2 INSTALLATION

A. GENERAL

1. Fabricate signs to comply with the requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes and details of construction. Sign panel surfaces shall be smooth, even and fabricated to remain fat under installed conditions. Where specification calls for painted edges, they shall be routed and painted to match face color. For framed units, edges shall be painted or brushed to match finish of face of unit unless otherwise indicated on drawings.
2. This work may be produced by multiple contractors. Coordination with Designer and other contractors is required to provide for consistent signage across the entire project area, including color, material sizes and design intent.
3. Install sign units and components with concealed fasteners unless otherwise shown. Refer to drawings for general method of installation. Verify each surface in field to deter-mine appropriate mounting hardware. Fabricator is responsible for determining where below ground or in-wall structural tie-ins may be required.
4. All elements should be installed true and plumb in accordance with the design intent of this document.
5. Sign location drawings show approximate locations of signs. Fabricator, Designer and Owner shall conduct a pre-install markout walk through to confirm all locations and identify areas of conflict. Fabricator is responsible for determining the location of underground structures and utilities on ground-mounted signs. Any conflicts should be brought to the attention of the Owner and Designer.

3.3 REGULARTORY REQUIREMENTS

A. All installation work shall comply with applicable municipal, state and federal codes, sign ordinances and ADA guidelines for handicapped and fire/life safety signing.

B. All OSHA safety requirements will be implemented during fabrication and installation as needed or required to comply with safety regulations.

C. All field/site work shall be conducted in compliance with the Owner/Construction Manager’s requirements/regulations for the site, particularly areas open and accessible to the public. Work area protection shall be required as needed and all site-specific rules should be reviewed and outlined during the project kick-of meeting.

3.4 CLEANUP

A. Daily and upon completion of installation remove all waste, dirt, wrappings and excess materials, tools and equipment, and thoroughly clean all surfaces to the satisfaction of the Owner.

3.5 REORDERING

A. All items specified in this package shall be available to the Owner in additional quantities for a period of 10 years after completion of all work called for in this specification.

END OF SECTION 101110

SECTION 116813 – PLAYGROUND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

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

B. The following documents form part of the Specifications to the extent stated. Where differences exist between Codes, Standards, Authorities Having Jurisdiction, and the Documents, the one affording the greatest protection and/or more stringent condition shall apply.

C. Section Includes Playground Equipment as follows:

1. Embankment Slide

2. Three Bay Swing

3. Tipi Carousel

4. Spinner Bowl

4. Hamadryad Trail Climber

5. Pathfinder Climber

D. Related Sections:

1. Section 321816 Protective Playground Surfacing

2. Section 033000 Cast in Place Concrete

1.2 DEFINITIONS

A. Definitions in ASTM F 1487 and CPSC #325 apply to Work of this Section.

B. IPEMA: international Play Equipment Manufacturers Association.

1.3 ACTION SUBMITTALS

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

B. Samples: 3”x3” minimum sample of each custom color indicated

C. Shop Drawings:

1. Surfacing Include plans, elevations, sections, and attachment details.

2. Include fall heights and use zones for playground equipment, coordinated with the critical-height values of protective surfacing specified in Section 321816 Protective Playground Surfacing.

D. Qualification Data: For installer and testing agency.

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

F. Field quality-control reports.

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Qualification Data: For qualified installer and testing agency.

1.5 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to and ingress and egress at the site. Conform to all governmental regulations regarding the transportation of materials and secure, in advance, any necessary permits.

C. Procure and pay for permits and licenses required for Work.

1.6 QUALITY ASSURANCE

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

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

1.7 PROJECT CONDITIONS

A. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.

B. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be his duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect,

shall be done at the Contractor's risk.

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

1.8 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packages materials n clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration during delivery and during storage at site.

B. Deliver, store, and handle materials in accordance with manufacturer's instructions to prevent damage.

1.9 WARRANTY

A. Special Warranty: Play equipment manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures.
   2. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

B. Warranty Period as follows:
   1. 10 Years Warranty: Support posts of metal or wood.
   2. 8 Years Warranty: Support posts of concrete.
   3. 2 Years Warranty: Movable parts & ropes.
   4. 3 Years Warranty: All other parts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following:
   1. Kompan
      Scott Lean
      Territory Manager
      (M) 267.784.9791
      (E) ScoLea@kompan.com

   2. Landscape Structures Inc.
      Will Hemler
      General Recreation (local representative for Landscape Structures Inc.)
      (M) 800.726.4793
      (E) will@gen-rec.com

   3. Approved equal

2.2 PERFORMACE REQUIREMENTS

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

B. Field Quality Control: Playground equipment manufacturer's technical personnel or authorized representative shall be onsite during installation of equipment and inspect playground equipment at final completion.

2.3 PLAYGROUND EQUIPMENT

A. Products: Subject to compliance with requirements, provide the following:

1. Embankment Slide

2. Three Bay Swing

3. Tipi Carousel

4. Spinner Bowl

4. Hamadryad Trail Climber

5. Pathfinder Climber

1. Embankment Slide
   a. Manufacturer: Kompan
   b. Equipment: #KSL30303, 5' Height and 5' Width
   c. Color: Stainless Steel
   d. Or approved equal

2. Three Bay Swing
   a. Manufacturer: Landscape Structures Inc.
   b. Equipment: # CP001118, CP001117, Custom Anti-wrap hangars, Two Tot Bucket Swings, Three Belt Swings, One ADA Swing
   c. Color: Custom RAL6018 Steel, Green ADA Swing
   d. Or approved equal

3. Tipi Carousel
   a. Manufacturer: Kompan
   b. Equipment: #ELE400065
   c. Color: Lime Green Steel, Green Components
   d. Or approved equal

4. Spinner Bowl
   a. Manufacturer: Kompan
   b. Equipment: #ELE400024
   c. Color: Lime Green PE
   d. Or approved equal

5. Hamadryad Trail Climber

a. Manufacturer: Kompan
b. Equipment: #CRP252101
c. Color: Lime Green Steel, Green Membrane, Green Ropes
d. Or approved equal

6. Pathfinder Climber
a. Manufacturer: Kompan
b. Equipment: #CRP200302
c. Color: Lime Green Steel, Green Membrane, Green Ropes
d. Or approved equal

2.4 FABRICATION

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

2.5 CAST-IN-PLACE CONCRETE

A. Concrete Materials and Properties: Comply with requirements in Section 033000 - Cast-in-Place Concrete for normal-weight, air-entrained concrete with minimum 28-day compressive strength of 3000 PSI, 3 IN slump, and 1 IN maximum-size aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for earthwork, subgrade elevations, surface and subgrade drainage, and other conditions affecting performance of the Work. Do not begin installation before final grading required for placing playground equipment and protective surfacing is completed.

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

3.2 INSTALLATION

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

B. Maximum Equipment Height: Coordinate installed fall heights of equipment with finished elevations and critical-height values of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

C. Post and Footing Excavation: Excavate holes for posts and footings as indicated in firm, undisturbed or compacted subgrade soil. Set equipment posts in concrete footing. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at the correct angle, alignment, height, and spacing. Follow equipment manufacturer's written instructions and drawings to ensure correct installation of anchorages for equipment.

3.3 CLEANUP

A. Do NOT dispose of excess concrete and water-borne debris from cleaning out equipment in adjacent areas designated to be future planting beds.

B. Legally dispose of off-site all refuse and debris from these operations. Remove or neatly store material at the end of each day's work. Burning of material or dumping on the site is prohibited.

C. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Certified Playground Safety Inspector to perform tests and inspections.

B. Perform inspection and testing for each type of installed playground equipment according to ASTM F1487 and CPSC #325.

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

D. Prepare test and inspection reports.

END OF SECTION 116813

SECTION 265600 – EXTERIOR LED LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior LED light fixtures and poles.
2. Installation and connections
3. Tests
4. Spare parts.

B. Related Sections:

1. All work included in this section shall be coordinated with the requirements of the contract drawings, Division 0, Division 1, Division 3, and Division 26 specifications. Any discrepancies between sections shall be brought to the attention of the Owner.

1.3 GENERAL REQUIREMENTS

A. All materials and equipment furnished by this Contractor shall be new, the best in grade and quality, and manufactured in the United States of America with standards and ratings as specified herein. No substitution or deviation from the materials and equipment specified herein will be allowed except by written permission from the Landscape Architect and Engineer.

B. All materials and equipment shall be of the latest type and design and, where applicable, shall bear the label, stamp or seal of UL, NFPA, IEEE, NEMA, ASME, ASTM, ASA, IESNA, and other industry regulatory groups.

C. All items of the same kind shall be of the same make throughout the work.

D. All luminaires shall be controlled via photocell, however designer and contractor shall verify with Philadelphia Parks and Recreation (PPR) relative to lighting controls, lighting times, and security lighting. PPR may choose to have certain lights within a facility or site on a separate security circuit.

E. No ground lights or bollard lights are allowed.

1.4 CODES AND STANDARDS

A. The light fixtures shall comply with the latest applicable standards including, but not limited to the following:

1. ANSI/IEC 60529 - Degrees of Protection Provided by Enclosures
2. ANSI/IEEE C62.41.2 - IEEE Recommended Practice for Surge Voltages in Low-Voltage

AC Power Circuits.

3. IESNA LM-79-08 - Electrical and Photometric Measurements of Solid-State Lighting Products
4. NEMA SSL 1-2010: Electronic Drivers for LED Devices, Arrays, or Systems
5. UL 8750 - Outline of Investigation for LED Light Sources for Use in Lighting Products.
6. ANSI C136.31-2010 – Standard for Roadway and Area Lighting Equipment— Luminaire Vibration.
7. Codes and Standards referenced in Section 01410 shall also apply to this section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Completely detailed working drawings and descriptive literature for all lighting fixtures, wiring devices and appurtenances shall be submitted by the Contractor for approval in conformance with the requirements of Division 16 – Requirements for Electrical Installation.
2. Submittals shall be complete with catalog sheets, distribution curves, coefficients of utilization tables, and details of construction, assembly and installation. Electronic IES files of the fixture proposed if different from the fixture specified.
3. Prior to ordering all lighting fixtures, order one sample fixture for the Owner to inspect on site and approve. Upon approval of the fixtures, order the remaining fixtures.

B. Samples: For each exposed product and for each color and texture specified.

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

1.6 INFORMATIONAL SUBMITTALS

A. Guarantee: Obtain in the Owner’s name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. Guarantees must be in addition to, and not in lieu of, other liabilities, which the Contractor may have by law or other provisions of the Contract Documents.

B. Field Reports:

1. Manufacturer's field reports for field quality-control support.
2. Manufacturer's field reports for system startup support.

1.7 QUALITY ASSURANCE

A. General:

1. Experienced fabricator(s) or manufacturer(s) will fabricate and install site furnishings, and have prior experience in exterior site lighting work of equal scope and fabrication standards to Project requirements.
2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection must be in accordance with Project Contract Drawings and Specifications, approved shop drawings, and be of highest quality practices of the industry.

a. Include plans, elevations, sections, and mounting and attachment details.
b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
c. Include diagrams for power, signal, and control wiring.

3. Use new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.
4. Fabricate, assemble and neatly and accurately erect all work with smooth finished surfaces.
5. Field Measurements and Coordination: Verify dimensions with work specified in other sections which adjoins or to which this work will be attached.

    a. Effect coordination with related work of other sections, including work of other separate Contracts.
    b. Take measurements of adjoining work, so that work specified in this Section fits closely into the spaces and conditions provided.
    c. If any unusual conditions are encountered, the nature and location of conditions must be shown on shop drawings submitted to Landscape Architect for determination and approval prior to fabrication.

6. Coordination with other Trades: Coordinate with and furnish all necessary templates and patterns required by work of other sections. Furnish components of assemblies that are to be built into work specified as part of other sections. Supervise and be responsible for the correct location and installation of such built-in items.
7. This Specification Section does not define or establish the extent of work performed by sub-trades. Contractor will assign sub trade work as they deem appropriate for a complete, coordinated, cost effective and proper execution.

B. Product Testing:

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

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

D. Pre-installation Conference: Conduct conference at Project site.

1.8 SUBSTITUTIONS

A. Substitutions are not normally permitted. Substitutions must be approved by Philadelphia Parks and Recreation prior to bid.

B. The lighting design shown on the drawings is based on the fixtures selected on the fixtures schedule. If substitutions are approved by PPR, contractor shall provide complete design drawings and photometric using the design basis specified on contract drawings at no additional cost.

C. PPR will only approve substitutions if lighting design proves of equal or better design and the quality of product is equivalent to the products shown on the fixture schedule and meets all

requirements of the contract.

1.9 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Division 01 Section – PRODUCT REQUIREMENTS.

B. Finished Materials:

1. The Contractor will be responsible for timing delivery of all site improvement items, so as to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism. Damaged items must be repaired or replaced, as determined by the Landscape Architect.
2. Load and store primed and coated articles off the ground and under cover to prevent formation of wet storage film. Allow air between and around surfaces and allow for continuous drainage of units until installed and painted.
3. Protect finishes against soiling, staining, or damage from scratches and abrasion. Maintain protection during construction until project completion.

1.10 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be their duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, will be done at the Contractor's risk.

1.11 SEQUENCING AND SCHEDULING

A. Coordinate Work of this Section with Work of all other Sections of Specification.

1.12 CLOSEOUT REQUIREMENTS

A. Project Record Documents: Submit in accordance with Division 01 Section – EXECUTION REQUIREMENTS.

B. Operations and Maintenance Data:

1. Provide Maintenance and Cleaning instructions for Owner.

C. Provide manufacturer’s standard warranty.

PART 2 - PRODUCTS

2.1 LIGHT FIXTURES

A. All lighting fixtures shall be energy efficient solid-state LED as shown on the drawings.

B. All light fixtures shall operate at 120/240 volts and be furnished as described in the fixture schedule in the drawings.

C. All light fixtures shall be UL listed and manufactured in accordance with the latest applicable industry codes.

D. Where shown on drawings, provide accessories and mounting options.

E. All LED fixtures must appear on the Energy Star qualified product list or Design Lights Consortium products list to be eligible for rebates from PECO.

2.2 APPROVED FIXTURTES

A. Following are approved manufacturers and model for LED light fixtures, pole, and accessories:

1. DISCERA 4 by Selux or approvedequal.
2. Model A35 or AT535/64 by Selux or approved equal.
3. Suggested Light Pole model & type: LED Pole Kit with Three 80-watt LED Light; 15ft pole; 5000k; (120 → 277) Volt.

B. Pole and mounting accessories shall withstand the 114 mph wind load.

2.3 CONSTRUCTION AND MATERIALS

A. Luminaire housing shall be constructed of rugged cast aluminum with integral heat sink specifically designed for LED.

B. The finish shall be durable, colorfast with excellent resistance to corrosion, ultraviolet degradation and abrasion. The preferred finish color shall be black.

2.4 MOUNTING AND ACCESSORIES

A. Pole: Straight aluminum pole with powder coat finish. Mounting heights/pole lengths shall be the following:

1. Area E Playground: 20 feet from finished grade.
2. Area G Plaza: 14 feet from finished grade.

3. Diameter to correspond with pole height as per manufacture recommendation.
4. Regarding mounting a surveillance camera & surveillance recording equipment on top of a pole → The equipment should be mounted with a light pole length that is either 10-ft above finished grade, or 10-ft above the nearest/adjacent elevated platform.

B. Mounting Brackets: Single or double long arm mounts.

C. Photo Cell: Manufacturer’s provided photocell to be included on all fixtures.

D. Ground Fault Circuit Interrupter (GFCI) Receptacle: Where requested provide GFCI that is integrated into the pole by the manufacturer. Contractor/design shall confirm which poles

receive GFCI outlets. The GFCI outlet shall meet the following criteria:

1. GFCI shall be 120V 15A GFCI duplex receptacle with NEC approved weather-proof enclosure, self-closing cover; anything below 8’ from base of pole to be reviewed by PPR, in-line with handhole. For use with 120V applications only.
2. GFCI shall be wired on a separate circuit from the luminaire.

2.5 RATINGS

A. Electrical;

1. Voltage and Frequency. 120V – 277V,50/60Hz
2. System power factor shall be greater than0.9
3. Total Harmonic Distortion (THD) less than 20%
4. Class “A” Sound rating
5. Electromagnetic Interference (EMI) per Title 47 CFR 15 Class A
6. Surge protection of 10Kv IEEE C62.41.2-002 Scenario 1, Location Category C

B. Enclosure Ratings

1. UL/cUL Listed, suitable for wet locations per UL 1598 when pendant mount.
2. IP66 rated optical enclosure per ANSI C136.25-2009
3. Temperature rated at –40° to 40°C.

2.6 OPTICS

A. Structured LED array for optimized under canopy photometric distribution

B. Symmetric photometric distribution suitable for mounting at 14 or 20 feet (see plans).

C. Lenses produce Type III distribution per IESNA. See lighting schedule.

D. Reflective technology designed to optimize application efficiency and minimize glare.

E. Utilizes high brightness LEDs with color rendition index (CRI) of 70. Acceptable color temperature is 4000K. Standard LM-79 tests and reports shall be performed in accordance with IESNA standards

2.7 ACCESSORIES

A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant.

B. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.

2.8 WARRANTY

A. Provide Manufacturer’s warranty on all LED light fixtures and all its components for a period of 5 years based on fixture operation for 24 hours/ 7days or 50,000 hours.

B. Contractor shall include 1 year of labor for lighting repairs, etc.

C. The electrical contractor shall provide all warranty documents to the Owner along with original receipts.

D. In the event any fixture(s) are not functional due to sole failure of the fixture during the warranty period of 5 years, the manufacturer shall ship upon request a new equivalent replacement fixture at no additional cost to arrive within 6 weeks. These replacement fixtures shall be covered under the original warranty and shall continue the remaining warranty period.

PART 3- EXECUTION

3.1 EXAMINATION

A. Inspection: Verify the conditions, elevations, and measurements affecting the work of this Section prior to installation. Examine surfaces to receive site furnishings and do not proceed until any defects detrimental to the finished work are corrected. Take proper precautions so as not to disturb or damage subsurface elements of utilities, conduits, underdrainage systems, water proofing, insulation, or foam fill.

3.2 INSTALLATION AND CONNECTIONS

A. The scheme of installation, connections, arrangement, and location of equipment and outline dimensions shall be as shown and specified. Contractor shall verify all locations with designer prior to installation.

B. All installations shall meet the requirements of the National Electric code and Philadelphia Code where applicable.

C. Lighting fixtures shall be installed as indicated on the drawings and as per manufacturer’s instructions.

D. Fixtures shall be clear of pipes, mechanical equipment, structural openings, and other obstructions.

E. The exact mounting of lighting fixtures shall be approved on the job before installation.

F. Pole based shall be installed relative to finish grade. Contractor shall verify top of footing elevations relative to finished grade elevation for conformance with the details and specifications prior to installation of concrete. Refer to pole base details for concrete and reinforcing information. Contractor shall use manufacturer’s anchor bolt template for proper positioning of light pole base anchor bolts. Anchor bolts are to be cast into the footing.

3.3 TESTS

A. The contractor shall test for continuity and balance after installation and prior to acceptance of the entire lighting system. All lighting shall be tested for proper operation.

B. The Contractor shall submit all foot-candle data along with a test report upon completion of all tests performed.

3.4 CLEANUP

A. Legally dispose of off-site all refuse and debris from these operations. Remove or neatly store material at the end of each day's work. Burning of material or dumping on the site is prohibited.

B. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION 265600

SECTION 311000

SITE CLEARING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of topsoil and organic material such as trees, brush, roots and other vegetation within the limits of grading,. Where indicated, perform tree trimming and selective tree removal outside of the limits of grading

C. Removal of objectionable material, rubbish and junk within the project limits.

D. Disposal of removed material.

E. Obtaining of waste areas for disposal of material.

F. Salvaging and temporarily storing, and delivering of material.

1.3 RELATED REQUIREMENTS

A. Section 024101 – Selective Site Demolition.

B. Section 312200 - Grading

C. Section 312323 – Fill and Backfill.

D. Section 312500 - Temporary Erosion and Sediment Control.

E. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 SUBMITTALS

A. Site Plan, showing:

1. Vegetation removal limits.

2. Mature trees to be maintained and protected during construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Acceptable friable loam that is reasonably free of subsoil, clay lumps, brush, roots, weeds, other objectionable vegetation, stones, other foreign material larger than 2 inches in any dimension, litter, and/or other material unsuitable or harmful to plant growth.

B. Topsoil Mixture. Designated top 8 inches to 12 inches of existing soil collected and combined with organic plant matter such as vegetative slashings consisting of crushed or shredded branches, stems, bark, leaves, seeds, and roots.

C. Fill Material: As specified in Section 312323 - Fill and Backfill

PART 3 EXECUTION

3.1 SITE CLEARING

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. Topsoil: After clearing and grubbing the area and before starting other construction operations, remove topsoil from areas, as indicated or directed. Adjust equipment and methods of operation to avoid mixing subsoil with topsoil. Separate the topsoil from other excavated material and stockpile at acceptable locations within the right of way. Do not compact and do not stockpile topsoil in a wet or frozen condition. Satisfactorily and uniformly grade stockpiled topsoil not required for the project. Apply seeding and soil supplements to these stockpiles, as specified in Section 312500 - Temporary Erosion and Sediment Control.

C. Topsoil Mixture. During clearing and grubbing operations and before other construction operations, shred all designated vegetation under 4 inches caliper in size using a crawler or loader mounted, self-powered, land clearing shredder capable of shredding vegetation to a desired maximum rough size of 12 inches long and 2 inches in diameter. Collect and mix the organic slashings with the top 8 inches to 12 inches of soil to be salvaged, as indicated or directed.

3.2 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.3 VEGETATION

A. Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.

B. Tree Protection Zone Fencing - Install protection zone fencing along edges of protection zones before materials or equipment are brought onto the site and construction operations begin in a manner that will prevent people and equipment from easily entering protected area. Install construction 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. Fence is to be wood slat snow fence, 48" high. Set or drive fence posts into ground one-third of the total height of the fence without concrete footings around the dripline of trees. Where a post is located on existing paving or concrete that is to remain, provide appropriate means of post support acceptable to the Architect.

C. Maintain protection zones free of weeds and trash.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Architect.

F. Maintain protection-zone fencing in good condition as acceptable to the Architect and remove when construction operations are complete and equipment has been removed from the site.

G. Tree Removal: Remove stumps, roots, and other debris protruding through the ground surface. Remove and dispose of shrubs, stumps and roots larger than 1-1/2" in diameter to a depth of 20". Fill depressions caused by clearing, grubbing and demolition operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill consisting of materials as specified in Section 31 23 23 of the specifications.

H. Tree Trimming: Trim living branches, dead and dying limbs and branches 1 inch or more in diameter growing within the legal Right of Way. Trim branches to the branch collar as shown on the PennDOT Standard Drawing RC-92M.

I. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.

2. Trees: Remove stumps and roots to depth of 20 inches.

3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 20 inches.

4. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

J. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.4 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

3.5 MATERIAL DISPOSAL

A. Dispose of removed material in an off-site an approved waste area.

1. Comply with the requirements of the Air Pollution Control Act (Act 245-1972, or as amended), the Solid Waste Management Act (Act 97-1980, or as amended)

2. Fill material that does not qualify as clean fill is regulated fill. Regulated fill is waste and must be managed in accordance with the regulations in Pennsylvania Code Title 25: Article VII (Hazardous Waste), Article VIII (Municipal Waste), Article IX (Residual Waste), and any other applicable articles or chapter.

END OF SECTION 31 1000

SECTION 312200

GRADING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Rough grading the site.

B. Finish grading.

C. Placing topsoil.

1.3 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312316 - Excavation.

C. Section 312323 – Fill and Backfill.

D. Section 312500 – Temporary Erosion and Sediment Control.

E. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 SUBMITTALS

A. Not used.

PART 2 PRODUCTS2.1MATERIALS

A. Topsoil and Other Fill Materials: See Section 312323 Fill and Backfill.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing water or ponding water.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Contact PA One Call at least three (3) working days in advance before excavation begins.

C. Stake and flag locations of known utilities.

D. Locate, identify, and protect from damage above- and below-grade utilities to remain.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; only hand excavation or air-spading will be permitted inside tree protection zones.

3.3 SOIL REMOVAL

A. In the case that topsoil or subsoil must be removed from the site, dispose of only at a designated and permitted landfill.

3.4 COMPACT SUBGRADE

A. Establish subgrade elevation and compact to specified density requirements.

B. Density Requirements:

1. Compaction Density Unless Otherwise Specified or Indicated:

   a. Under asphalt or concrete paving, slabs on grade or similar construction: 95 percent of maximum dry density, based on Modified Proctor or relative density.

   b. At other locations: 95 percent of maximum dry density based on Modified Proctor.

2. When material is too coarse (more than 20% retained on the 19 mm (3/4-inch) sieve and less than 35% passing the 75-micro-m (No. 200) sieve, or more than 30% retained on the 19 mm (3/4-inch) sieve) to use these methods, compaction will be determined based on non-movement of material under compaction equipment,

   a. Compact until embankment does not rut under a loaded triaxle (GVW 34 tonne (75,000 pounds)).

3. Maintain material to within 3% of the optimum moisture content at the time of compaction. For subgrades displaying pronounced elasticity or deformation under rolling, maintain a moisture content not greater than optimum at the time of compaction or at the time of placing the overlaying construction. When unable to obtain the specified stability, excavate material in the area to a depth that, when replaced and recompacted with a moisture content not exceeding optimum, the subgrade will have required stability.

3.5 FINISH GRADING

A. Before Finish Grading:

1. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil in areas where seeding or landscaping is indicated.

F. Place topsoil to the following compacted thicknesses:

1. Areas to be Seeded with Grass: 6 inches.

2. Shrub Beds: 18 inches.

3. Flower Beds: 12 inches.

G. Place topsoil during dry weather.

H. Remove roots, weeds, rocks, and foreign material while spreading.

I. Spread topsoil manually near plants to prevent damage.

J. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

K. Lightly compact placed topsoil.

L. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.6 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.7 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping or paving.

END OF SECTION 31 2200

SECTION 312316

EXCAVATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, paving, and site structures.

1.3 RELATED REQUIREMENTS

A. Section 024101 – Selective Site Demolition

B. Section 312200 - Grading.

C. Section 312323 – Fill and Backfill.

D. Section 312500 - Temporary Erosion and Sediment Control.

E. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.5 SUBMITTALS

A. See Division 01 for submittal procedures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 312200 Grading for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 EXCAVATING

A. Excavate to accommodate paving and site structures as shown on the Drawings.

a. Excavate to the specified elevations.

b. Should natural soils, as determined by the Foundation Consultant's Representative, be encountered at depths shallower than indicated on Drawings, consult the Professional.

c. Should embankment fill material, as determined by the Foundation Consultant's Representative, be present at the excavation elevations shown on Drawings, consult the Professional for additional excavation requirements.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Hand trim excavations. Remove loose matter.

D. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.

E. Correct areas that are overexcavated and load-bearing surfaces that are disturbed. See Section 312323 Fill.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation.

G. Remove excavated material that is unsuitable for re-use from site to an approved waste site.

H. Remove excess excavated material from site to an approved waste site.

3.4 SUBGRADE PREPARATION

A. See Section 312323 for subgrade preparation at general excavations.

B. Subgrades shall be protected from softening, undermining, washout, and damage by rain or water accumulation. In no case shall the site be left open and unsealed at the end of the work day.

3.5 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. See Section 312323 for fill, backfill, and compaction requirements at general excavations.

3.6 REMOVAL OF WATER

A. General Dewatering

1. Provide all materials, equipment, labor, and services necessary for care of water removal and erosion control.

    a. Implement the Erosion and Sedimentation Control Plan, do not begin excavation work until the Erosion and Sedimentation Controls are in place and operational.

    b. Dewater excavations, including seepage and precipitation.

2. Remove water which accumulates in excavations during the progress of work so that all work can be done in the dry. Keep excavated areas free from water while underground utilities or structures are constructed, while concrete is setting and until backfill or elements of the structure have been placed to a sufficient height to anchor the work against possible leakage or buoyant uplift forces.

B. Dewatering the construction site

1. Foundations, cutoff trenches, and all other parts of the construction site shall be dewatered and kept free of standing water and muddy conditions as necessary for the proper execution of the work.

    a. Provide all facilities required to divert, collect, control, and remove water from all construction work areas and excavations.

    b. Provide drainage features having sufficient capacity to avoid flooding of work areas.

    c. Arrange and alter drainage features as required to avoid degradation of the final excavated surface(s).

2. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation subgrade.

C. Disposal of Water

1. Discharge water through a sediment control device prior to it entering receiving water course.

2. Discharge does not endanger portions of work under construction or completed.

3.7 FIELD QUALITY CONTROL

A. Provide for visual inspection of load-bearing excavated surfaces before placement of paving or site structures.

3.8 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

END OF SECTION 31 2316

SECTION 312323

FILL AND BACKFILL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, site structures, and sidewalks.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.3 RELATED REQUIREMENTS

A. Section 312200 - Grading.

B. Section 312316 - Excavation.

C. Section 312316.13 - Trenching.

D. Section 312500 - Temporary Erosion and Sedimentation Control.

E. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.5 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2012).

B. ASTM C33 – Standard Specification for Concrete Aggregates.

C. ASTM C128 – Standard Test Method for Density, Relative Density (Specific Gravity, and Absorption of Fine Aggregate.

D. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

J. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

K. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.6 SUBMITTALS

A. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill. Reports must be submitted at least 48 hours prior to delivery of material to the site.

D. Compaction Density Test Reports.

E. Testing Agency Qualification Statement.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.8 DELIVERY, STORAGE, AND HANDLING

Not Used

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

1. Graded.

2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill: Coarse Aggregate - Type 2A

1. Per Pennsylvania Department of Transportation, Publication 408, Section 703 Aggregate.

2. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

C. Granular Fill: Coarse Aggregate - AASHTO #57

1. Per Pennsylvania Department of Transportation, Publication 408, Section 703 Aggregate.

2. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

D. Topsoil: Sandy loam, clay loam, silt loam, or other soil approved by the Owner's Representative. It shall not have a mixture of subsoil and shall contain no slag, cinder, stones, lumps of soil, sticks, roots, trash or other extraneous materials large than 1 inch in diameter. Topsoil must also be free of viable plants or plant parts of common nutsedge, poison ivy, Canada thistle, or others as may be specified. All topsoil shall be tested by a reputable laboratory for pH and soluble salts. If needed, pH correction material shall be applied at a rate sufficient to correct the pH to a range of 5.5 to 7.4. Soluble salts shall not be higher than 500 parts per million.

1. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

   a. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

2. Topsoil Source: Reuse surface soil stockpiled on the site if acceptable by the Owner's Representative. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, stones, clay lumps, and other extraneous materials harmful to plant growth.

3. If imported topsoil is necessary, the source of the topsoil must be approved by the Owner before delivering topsoil to the site. It shall be obtained from naturally well-drained sites where topsoil occurs at least 6 inches deep; do not obtain from lakes, ponds, bogs or marshes, river banks, dredgings or silt deposits.

E. Planting Bed Soil Mix: Soil mix for use in backfilling of plants, shall be fertile, medium-textured soils, of friable loam or clay loam typical of the Philadelphia Region and shall meet the following requirements:

1. Acidity range of pH 6.0 to 7.0 and a clay content of not more than 30%.

2. Must contain not less than 3% organic matter as determined by loss of ignition of moisture free samples dried at 100 degrees centigrade.

3. Must be without a mixture of sub-soil or slag and be free of all stones, lumps, plants, roots, sticks, brick, and other extraneous matter.

4. Must have been run through a soil shredder.

5. Must form a ball when squeezed with the hand, but shall crumble shortly after being released.

2.2 SOIL AMENDMENTS

A. Lime: In accordance with the soil test recommendations, lime shall be natural dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates; ground so that not less than 90% passes a 20-mesh sieve and not less than 50% passes a 100-mesh sieve. Application rates for liming materials shall be determined by soil tests or dolometric lime with Owner's Representative's approval.

B. Organic Matter: If required by the soil test, organic matter shall be polymer dewatered recycled composted leaf and/or bark mulch.

C. Peat Humus: Decomposed peat free of disease and fungus with no identifiable fibers and with pH range suitable for intended use.

D. Bonemeal: Commercial, raw, finely ground; 4% nitrogen and 20% phosphoric acid.

E. Superphosphate: Soluble mixture of treated minerals; 20% available phosphoric acid.

F. Sand: Clean, washed sand, free of toxic materials and in accordance with ASTM C33-81.

G. Manure: Well rotted, unbleached stable or cattle manure containing not more than 25% by volume of straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

H. Commercial Fertilizer: Complete high grade fertilizer of neutral character, with some elements derived from organic sources and conforming to the requirements of all federal, state, and local laws. Provide proper fertilizer to remedy deficiencies found in the soil tests. Provide nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.3 SOURCE QUALITY CONTROL

A. Where fill materials are specified by reference to a specific standard, testing of samples for compliance will be provided before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

A. Scarify subgrade to a depth of 6 inches and proof roll to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

E. Subgrade preparation shall be performed in the presence of the Foundation Consultant's Representative.

3.3 FILLING

A. Fill up to subgrade elevations unless otherwise indicated.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials within plus/minus two percent of optimum moisture content as determined by the Modified Proctor (ASTM-D1557) to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches (150 mm) compacted depth. Compact Granular Fill to a minimum of seventy-five percent relative density as determined by ASTM-D4253 and ASTM-D4254.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

G. Slope grade away from building and playground pads minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.

1. Other areas: Use structural fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density based on Modified Proctor.

I. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density, based on Modified Proctor or relative density.

2. At other locations: 95 percent of maximum dry density based on Modified Proctor.

J. Reshape and re-compact fills subjected to vehicular traffic.

K. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. At Lawn Areas:

1. Use general fill.

2. Compact to 95 percent of maximum dry density based on Modified Proctor.

3. See Section 31 22 00 for topsoil placement.

C. At Planting Areas Other Than Lawns :

1. Use general fill.

2. Compact to 95 percent of maximum dry density.

3. See Section 312200 for topsoil placement.

3.5 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.6 FIELD QUALITY CONTROL

A Perform compaction density testing on compacted fill in accordance with ASTM D6938.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: Perform a minimum of one in-place compaction density test per lift per 2500 square feet of compacted material, with a minimum of one test for any day that soil material is compacted.

E Proof roll compacted fill at surfaces that will be under slabs-on-grade.

END OF SECTION 31 2323

SECTION 312500

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Compost filter sock.

B. Inlet protection.

C. Pumped water filter bag.

D. Concrete Washout.

1.3 RELATED REQUIREMENTS

A. Section 312200 - Grading.

B. Section 312316 - Excavation.

C. Section 312316.13 - Trenching.

D. Section 312323 – Fill and Backfill

1.4 REFERENCE STANDARDS

A. Commonwealth of Pennsylvania Department of Transportation (PennDOT):

1. PA DOT Publication 408, latest edition.
   a. PennDOT Section 804 - Seeding and Soil Supplements
   b. PennDOT Section 855 - Pumped Water Filter Bag
   c. PennDOT Section 860 - Storm Inlet Protection
   d. PennDOT Section 867 - Compost Filter Sock

2. PennDOT Publication 35, Bulletin 15 – Approved Construction Materials

B. Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Soil and Water Conservation
   1. Technical Guidance Number 363-2134-008, Erosion and Sediment Pollution Control Program Manual, March 2012 edition.

C. The Pennsylvania State University, College of Agriculture
   1. "Erosion Control & Conservation Plantings on Noncropland", 1997 (PSU).

D. Erosion and Sedimentation Control Plan

PART 2 - PRODUCTS

2.1 INLET PROTECTION

A. Inlet Filter Bag:

a. Construct bag from woven polypropylene material with the properties listed below:

Property	Test Method	Units	Value
Grab Tensile Strength	ASTM D-4632	(lbs)	300
Grab Tensile Elongation	ASTM D-4632	%	20
Seam Strength	ASTM D-4632	%	90
Wide Width Tensile	ASTM D-4595	lbs/ft	2400
Puncture Resistance	ASTM D-4833	lbs	120
Mullen Burst Strength	ASTM D-3786	psi	800
Trapezoidal Tear Strength	ASTM D-4533	lbs	120
UV Resistance	ASTM D-4355	% @150 hrs	80
Apparent Opening Size	ASTM D-4751	Sieve No.	40
Flow Rate	ASTM D-4491	gal/min/sf	1630 (40)
Permitivity	ASTM D-4491	Sec -1	0.55

b. All seams to consist of double rows of 401 chain stitch, spaced evenly, 0.5 inch apart maximum.
c. The bag to have an expansion restraint inserted through the center of the bag consisting of a 0.25-inch cord and two 2-inch by 2-inch by 0.75-inch rubber blocks.
d. Provide No. 8 rebar for bag removal.

B. Inlet Filter Mat:
a. As specified on the contract drawings.
1) Manufacturer: MKB Company, www.mkbcompany.com; Triumph Geo-Synthetics, Inc, www.triumphgeo.com; Triangular Silt Dike Company, https://tri-siltdike.com; or equal as approved by the Professional.

2.2 WATER

A. Suitable clean water may be used without testing.

2.3 COMPOST FILTER SOCK

A. Filter Sock
a. As Specified on Contract Drawings:
1) Manufacturer: Filtrexx, www.FILTREXX.COM ; MKB Stormwater Innovation, www.mkbcompany.com; MVI Environmental, www.mwienv.com; or equal as approved by the Professional.
2) High density polyethylene (HDPE) expandable, tubular, biodegradable or photodegradable, 3 mil to 5 mil, 9.5 mm (3/8 inch) (nominal) mesh netting fabric sock of 300 mm (12 inches) and 450 mm (18 inches) diameters.

B. Compost
a. As Specified on Contract Drawings:
1) Manufacturer: Filtrexxwww.FILTREXX.COM ; MKB Stormwater Innovation, www.mkbcompany.com; MVI Environmental, www.mwienv.com; or equal as approved by the Professional.
2) Well-decomposed, stable, weed-free, organic compost meeting AASHTO MP-9, Standard Specification for Compost for Erosion/Sediment Control (Filter Berms) derived from a variety of feedstocks including agricultural, forestry, food, or industrial residuals; bio-solids (treated sewage sludge); leaf and yard trimmings; manure; or tree wood with no objectionable odors or substances toxic to plants. Material aerobically composted at a DEP, Bureau of Waste Management permitted site and conforming to CFR 503. Test in accordance with U.S. Composting Council's Test Methods for Examining of Composting and Compost (TMECC). Provide compost with the U.S. Composting Council's Seal of Testing Assurance Program (STA) certification and STA product label. Compost having the following physical properties:
TMECC Test Methodologies -
Organic Matter Content dry mass (weight) basis: 80% - 100%

Organic Portion: Fibrous and Elongated
Moisture content, dry mass (weight) basis < 60%
pH: 5.5 - 8.0
Soluble salt concentration (electrical conductivity): 5.0 dS/m
Max. Particle size, % passing mesh size, dry mass (weight) basis:
99% material passing 2 inch Screen

3) High density polyethylene (HDPE) expandable, tubular, biodegradable or photodegradable, 3 mil to 5 mil, 9.5 mm (3/8 inch) (nominal) mesh netting fabric sock or 300 mm (12 inches) and 450 mm (18 inches) diameters

2.4 PUMPED WATER FILTER BAG

A. Filter Bag
1. Construct bag from non-woven geotextile material with the properties listed below:

	Property:	Test Method	Units	Value
a.	Weight:	ASTM D-3776	g/m2 (oz/sy)	340 (10)
b.	Grab Tensile Strength:	ASTM D-4632	kg (lbs)	113 (250)
c.	Trapezoidal Tear Strength:	ASTM D-4533	kg (lbs)	45 (100)
d.	Puncture Resistance:	ASTM D-4833	kg (lbs)	69 (155)
e.	Mullen Burst Strength:	ASTM D-3786	kPa (psi)	2965 (430)
f.	UV Resistance:	ASTM D-4355 %	@ 500 hrs	70
g.	*Apparent Opening Size (max): ASTM D-4751 Sieve No.*	*100*		

2. Bag size: 15 feet by 15 feet ± 3 inches.
3. Provide bags with a double 401 chain lock stitch or double needle stitch with a minimum strength of 100 pounds per inch as per ASTM D-4884.
4. Provide an adjustable sewn in spout capable of handling a maximum hose size of 6 inches.

B. Lifting Straps
a. Of sufficient strength to support load of bag.

C. Aggregate: AASHTO No. 57
a. Per PennDOT, Section 703 Aggregate

D. Geotextile: Class 4, Type A.
a. Per PennDOT, Section 735 Geotextiles

2.5 CONCRETE WASHOUT

A. As specified on the contract drawings, or approved equal.

PART 3 - EXECUTION

3.1 EROSION AND SEDIMENT POLLUTION CONTROL

A. Construction operations shall be carried out in such a manner so that erosion, air and water pollution will be minimized. State and local laws concerning pollution abatement shall be followed.

B. An Erosion and Sedimentation Control Plan has been completed by the Design Team. This plan contains a detailed staging of construction activities that the Contractor must follow throughout the period of its construction contract

3.2 INLET PROTECTION

A. Remove grate in catch basin/inlet, place sack in opening. Hold out approximately 6 inches outside the frame. Replace the grate to hold the sack in place.

B. Per Contract Drawings and Approved E&S Permit:

C. Install bag in accordance with manufacturer's recommendation.

D. Construct downstream earthen or sandbag berm as indicated and directed.

E. Replace or remove and clean bag when sediment has accumulated above the expansion restraint cord.

F. Upon final stabilization of tributary area, when directed, remove bag and downstream earthen or sandbag berm in a manner satisfactory to the Representative.

G. Dispose of bag and sediment in a manner satisfactory to the Representative.

H. Maintenance
   a. Per Contract Drawings

3.3 COMPOST FILTER SOCK

A. Per Contract Drawings and Approved E&S Permit:

B. Compost Filter Sock
   a. Fill sock with compost blend at the designated erosion control area or fill and transport to the project site.
   b. Fill sock with compost using pneumatic (blower) equipment.
   c. Tie off ends and fill socks to the lengths required.

C. Place Filter Socks
   a. On level contour or surface as indicated. Position the sock around the structure or surface to be protected to create a complete physical barrier to intercept any sheet flow of drainage water and allowing sediment to collect on the outside of the sock. Ensure a minimal overlap of at least 12 inches on either side of the area to be protected. Anchor sock with approved stakes or other devices capable of holding the sock in place.
   b. For bottom of slope installations, position sock parallel to the base of the slope to be protected in order to intercept sheet flow of drainage water. Place sock at least 5 feet distance from the toe of slope if possible. Do not place the sock where it will concentrate drainage runoff or channel water to another location. Position each closed end of the sock pointing upslope so that the ends are at a higher elevation than the overall sock body.

D. Maintenance
   a. Per Contract Drawings

3.4 PUMPED WATER FILTER BAG

A. Per Contract Drawings and Approved E&S Permit:

B. Location of Filter Bag:
   a. Place bag on a well vegetated (stabilized) area such that discharge from bag will not flow over any disturbed areas or back into project area.
   b. Locate bag on level area. When level area is not available, place AASHTO No. 57 Coarse Aggregate to level bag. Do not install bags in areas with slopes steeper than 5%.

C. Provide geotextile underlayment (Class 4, Type A) lined flow path if a stabilized flow path is not possible.

D. Do not exceed a pump rate of 750 gallons per minute or half the maximum specified by the manufacturer, whichever is less.

E. Insert hose into sewn-in spout and double clamp bag firmly to pump discharge hose. Do not install more than one pump hose into a single bag.

F. Monitor and evaluate entire pumping operation to assure that bag continues to function properly. Replace bag when contained silt reduces flow to approximately 50% of rate of initial bag discharge, or when directed.

G. Dispose of bag and sediment in a manner satisfactory to the Representative.
   a. Do not cut open bags and seed.

H. Maintenance
   a. Per Contract Drawings

3.4 CONCRETE WASHOUT

A. Per the contract drawings and the approved E&S Permit.

END OF SECTION 31 2500

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SECTION 321123

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.3 RELATED REQUIREMENTS

A. Section 312200 - Grading.

B. Section 312316.13 Trenching.

C. Section 312 23 – Fill and Backfill.

D. Section 321216 - Asphalt Paving.

E. Section 321313 - Concrete Paving.

F. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 1965 (2004).

B. ASTM C128 – Standard Test Method for Density, Relative Density (Specific Gravity, and Absorption of Fine Aggregate.

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.

F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.

H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

I. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

J. ASTM D3017 - Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2017

K. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2021.

1.5 SUBMITTALS

A. Materials Sources: Submit name of imported materials source.

1. Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

B. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

C. Compaction Density Test Reports.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coarse Aggregate: Type 2A:

a. Per Pennsylvania Department of Transportation, Publication 408, Section 703 Aggregate.

b. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

c. Depths:

1) For Asphalt Pavement: As shown on the Contract Drawings.

2) For Concrete Pavement: As shown on the Contract Drawings.

PART 3 EXECUTION

3.1 GENERAL

A. Pennsylvania Department of Transportation, Publication 408, Section 350 Subbase.

3.2 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.3 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.4 INSTALLATION

A. Under Bituminous Concrete Paving:

1. Compact to 95 percent of relative density.

B. Under Portland Cement Concrete Paving:

1. Compact to 95 percent of relative density.

C. Place aggregate in maximum 6 inch layers and compact to specified density.

D. Level and contour surfaces to elevations and gradients indicated.

E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.5 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.6 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D2167, ASTM D3017 or ASTM D6938.

   a. At each density test location and after completing the density test, carefully dig one test hole to the full depth of the completed subbase and measure the depth of the finished base course.

B. Results will be evaluated in relation to compaction curve determined by testing material in accordance with ASTM C128 (relative density).

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. If the subbase depth is deficient by 1/2 inch or more from the depth indicated, the base course is defective and may require additional test holes to determine the limits of the defective area.

   a. Scarify the base to a depth of 3 inches, blend in additional material, and recompact. After recompacting, retesting may be required to verify the base course depth is within 1/2 inch of the indicated depth.

E. Backfill the test holes with base course material and compact.

F. Proof roll compacted aggregate at surfaces that will be under asphalt or concrete paving. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D3017 and ASTM C6938.

3.7 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION 32 1123

SECTION 321313

CONCRETE PAVING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Concrete sidewalks, walls curbs and steps..

1.3 RELATED REQUIREMENTS

A. Section 312200 - Grading.

B. Section 312323 – Fill and Backfill.

C. Section 321123 - Aggregate Base Courses.

D. Philadelphia Parks and Recreation, Design Rebuild Specifications, General Earthwork Requirements: Regulated Fill Management.

1.4 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

C. ACI 305R - Hot Weather Concreting; 2010.

D. ACI 306R - Cold Weather Concreting; 2010.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

K. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

L. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

M. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

P. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

Q. PennDOT 408 – Construction Specifications

1.5 SUBMITTALS

A. Product Data: Provide data on joint filler, admixtures, and curing compound.

B. Design Mixes: For each concrete pavement mix.

   a. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Laboratory test reports for concrete mix design tests.

D. Material certificates signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

E. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

1.8 DELIVERY, STORAGE, AND HANDLING

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

a. Reinforcement shall be stored above the ground on platforms, skids or other supports and shall be protected from mechanical injury and surface deterioration caused by exposure to conditions producing rust.

1.9 WARRANTY

A. Special Warranty for Lifting/Cracking: Submit, for acceptance, a warranty document executed by authorized company official. Warranty is in addition to, and not a limitation of, other rights Client Agency may have under Contract Documents.

1. Special Warranty Period: Two (2) year limited warranty commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 CEMENT CONCRETE

A. Class AA Cement Concrete

1. Depth: As shown on the drawings

2. Per Pennsylvania Department of Transportation, Publication 408, Section 704 - Cement Concrete.

3. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

2.2 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

B. Pedestrian Walkways: Minimum 4 inches thick, no reinforcement, on 4 inches compacted crushed aggregate (PennDOT 2A Modified or 2B Clean Aggregate or AASHTO No. 57 Stone or equivalent).

C. Spraygrounds: 6 inches thick on 6 inches of compacted crushed aggregate (PennDOT 2A Modified or 2B Clean Aggregate or equivalent). Reinforcement shall be per sprayground equipment manufacturer's recommendations/specifications. Thickening of slabs and or foundations for sprayground features shall be per sprayground equipment manufacturer's recommendations/specifications.

2.3 FORM MATERIALS

A. Form Materials: Conform to ACI 310,

a. Forms for Exposed Finish Concrete: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects to provide continuous, straight, smooth, exposed surfaces.

1) Use flexible spring steel forms or laminated boards to form radius bends as required.
2) Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

b. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

c. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1) Formulate form-release agent with rust inhibitor for steel form-facing materials.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

a. Thickness: 1/2 inch (12 mm).

b. Provide removable plastic void cap strip that forms 1/2 inch deep joint for sealant installation.

C. Joint Devices: Combination keyed joint form and screed, galvanized steel slip dowel with minimum 1/2 inch diameter, holes for conduit or rebars to pass through at 12 inches on center; ribbed steel stakes for setting.

a. Height: To suit slab thickness.

b. Composition and Materials: Design is based on the use of Key-Loc Joint System manufactured by Form-A-Key Products Division, and the terminology used may include reference to proprietary products of that company. Construe such reference as establishing only the minimum quality of workmanship and materials to be provided under this Section, and not as limiting competition.

1) Provide removable plastic cap strip that forms wedge-shaped joint for sealant installation.
2) Construct keyed joint form from minimum 24 gauge galvanized steel with dowel knockouts and shaped to form a constant tongue and groove key between adjacent concrete slab sections.

a) Steel Stakes: Construct of minimum 13 gauge HRPO steel installed at 2 foot intervals.
b) Stake clip: Clip is used only when pour is on stake side first and as recommended by manufacturer.

2.4 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (60,000 psi) (420 MPa); deformed billet steel bars; unfinished finish.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.

C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi (280 MPa) yield strength; deformed billet steel bars; unfinished finish.

D. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use plastic or wire bar-type supports, such as chairs and bolsters, conforming to industry practice as described in the WRI "WWR-500, Manual of Standard Practice" (most current version) or "TF 702 - Supporting WWR" (most current version).

a. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

1) Properly size foot of bar supports or similar devices to prevent settlement on base materials and prevent puncture of geotextiles.

b. All metal bolsters or chairs which bear against the forms for exposed surfaces shall be equipped with snug fitting, high density, polyethylene tips which provide one half inch (1/2") minimum clearance between the metal and any exposed surface.

c. Do not use wood, clay brick, and other devices that can expand due to moisture gain.

E. Fabricate reinforcement according to Concrete Reinforcing Steel Institute's "Manual of Standard Practice."

2.5 JOINT MATERIAL

A. Expansion Joint Filler Material

1. Per Pennsylvania Department of Transportation, Publication 408, Section 705 - Joint Material.

2. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

B. Joint Sealing material

1. Silicone Joint Sealing Material

2. Color: As selected by Architect from full product range.

3. Per Pennsylvania Department of Transportation, Publication 408, Section 705 - Joint Material.

4. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

2.6 CONCRETE MATERIALS

A. Concrete Curing materials

1. Per Pennsylvania Department of Transportation, Publication 408, Section 711 - Concrete Curing Material and Admixtures.

2. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

B. Concrete Admixtures

1. Per Pennsylvania Department of Transportation, Publication 408, Section 711 - Concrete Curing Material and Admixtures.

2. Provided per Pennsylvania Department of Transportation, Publication 35, Bulletin 15.

3. Concrete Tint: As selected by Architect from full range of tints.

C. Water: Clean, and not detrimental to concrete.

2.7 ACCESSORIES

A. Liquid Surface Sealer: Euco-Guard 100 weatherproofing siloxane sealer by The Euclid Chemical Company, W.R. Meadows, Sonneborn, or equal as approved by the Professional.

B. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, I, M and A; single or two component.

1. Backup Material: As recommended by joint sealant manufacturer for compatibility and width to depth ratio for joint sealant.

2.8 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

a. The mixing agitation shall begin within 30 minutes, and shall be discharged from the truck within one hour after the water has been added to the concrete mix.

1) Provide batch ticket information including the following:

a) Name of project

b) Date of delivery

c) Supplier of concrete

d) Brand of cement

e) Truck identity & ticket serial

f) Cement content number

g) Strength classification

h) Batching time

i) Admixture content

j) Point of deposit

k) Name of Contractor

l) Total amount of water

m) Name of driver

n) Weight of aggregate

o) Time loaded

p) Daily temperature mixing of concrete

q) Number of cubic yards in load reading of revolution counter

2) Quantity of water used for each batch shall be accurately measured and recorded.

PART 3 EXECUTION

3.1 GENERAL

A. Pennsylvania Department of Transportation, Publication 408, Section 501 Reinforced or Plain Cement Concrete Pavements.

3.2 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.3 SUBBASE COURSE

A. See Section 321123 for construction of base course for work of this Section.

3.4 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, held securely and shall not cause difficulty in placing concrete.

3.5 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Form Preparation:

a. Clean formwork.

b. Remove rust from steel formwork.

C. Place and secure forms to correct location, dimension, profile, and gradient.

a. Provide slab side forms such that by placing a 10-foot straight edge, form does not exceed 1/8 inch variation.

1) Vertical face: Longitudinal axis not more than ¼" in 10 feet.

b. Do not use forms with dents, holes or patches.

c. Individual formwork elements shall be as large as possible.

d. Position individual formwork elements in regular, uniform pattern with joints aligned.

e. Butt joints and provide backup splice at joints to prevent faulting at form.

f. Do not tape formwork joints.

g. Just before placing concrete, clean forms and adjacent surfaces; remove wood, sawdust, chips, dirt and other debris.

D. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

a. Form Release Agent:

1) Before placing reinforcing steel, thoroughly coat contact surfaces of forms with form release agent.

2) Apply form release agent evenly without excess drip.

3) Do not allow form release agent to come in contact with concrete surfaces or any other surfaces that would be detrimental to the finish Work.

4) Comply with manufacturers recommendations and instructions.

b. Form Removal:

1) Do not remove forms until concrete has hardened sufficiently to support its own weight and imposed construction loads.

a) Formwork not supporting vertical load of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations but in no case sooner than 12 hours.

2) Removed forms in a manner to avoid damage to concrete.

3) Remove forms without hammering or prying against concrete.

E. Place joint devices and fillers vertical in position, in straight lines. Secure during concrete placement.

3.6 REINFORCEMENT

A. Place reinforcement in accordance with the most stringent requirements of ACI 301 and CRSI Manual of Standard Practice and Placing Reinforcing Bars.

B. Accurately place and secure reinforcement against displacement by firmly wiring at intersections and splices with not less than No. 18 U.S. Standard Gauge annealed wire.

C. Turn wire ends away from concrete exterior.

D. Ensure reinforcing is clean, free from defects and kinks, loose mill or rust scale or coatings that shall reduce bond.

E. Place welded wire reinforcement as follows unless noted otherwise.

a. Where one layer of reinforcement is indicated:

1) Place welded wire reinforcement such that the overall depth of the slab divided by four shall be the depth, in inches from the top of the slab, of the welded wire reinforcement; do not allow contraction joints to expose reinforcement. Where contraction joint depth would expose reinforcement, lower reinforcement depth to 1/3 the thickness of the slab.

a) As an example: Concrete sidewalk with a depth of four inches (4") shall have the welded wire reinforcing located one inch (1") below the top of the slab.

b) As an example: Parking area pavement with an overall depth of six inches (6") shall have the welded wire reinforcing located one and one half inches (1.5") below the top of the slab.

b. Where two layers of reinforcement are indicated:

1) Place the upper layer of welded wire reinforcement according to method outlined for one layer of reinforcement (above).

2) Place the lower layer of welded wire reinforcement such that there is one and one half inches (1.5") of clear cover below the welded wire reinforcement.

c. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1) Maximum welded wire reinforcement support spacings as follow unless more restrictive spacings are recommended by Wire Reinforcing Institute or Concrete Reinforcing Institute.

d. Clean reinforcement of loose rust and mill scale, earth, ice, mortar, paint, grease, oil, and other materials that reduce or destroy bond with concrete. Reinforcement shall be free from cracks and laminations. Bonded rust, surface irregularities, or mill scale shall not be cause for rejection, provided the minimum dimensions, cross sectional area, and tensile properties of the reinforcement meet the physical requirements for the size and grade of steel specified.

e. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, and spacers.

f. Place reinforcement to maintain minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement securely in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

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

1) Sheets at lap splices shall be placed in contact and tied together in such a manner as to maintain the minimum distance to the surface of the concrete.

h. Interrupt welded wire reinforcement at expansion and construction joints.

3.7 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

3.8 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. The General Contractor and concrete supplier shall have a quality control representative on site during placement of concrete.

C. Do not place concrete until subbase and forms have been checked for line and grade. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Conveying of concrete:

a. Handle concrete from mixer to place of final deposit as rapidly as practicable and in a manner which shall ensure obtaining specified quality of concrete.

b. Re-tempering: Discard concrete which has already begun to set. Do not re-temper with water.

c. Equipment: Provide mixing and conveying equipment of proper size and design to ensure continuous flow of concrete to delivery end. Do not use aluminum pipe or equipment in contact with concrete.

1) Mixers, agitators and non-agitating units: Conform to ASTM C94 and current certification requirements of Pennsylvania Department of Transportation.

3) Chutes: Metal or metal lined not to be installed at slopes greater than 1 vertical to 3 horizontal.

4) Runways:

a) Provide runways or other means above finished concrete level for wheeled conveying equipment.

b) Do not support runways on reinforcing.

c) Do not wheel equipment directly over reinforcing or metal deck.

E. Depositing of concrete:

a. Do not deposit concrete which has partially hardened or has been contaminated by foreign matter.

b. Deposit concrete continuously in layers of such thickness that no concrete shall be deposited on concrete which has hardened sufficiently to cause seams or planes of weakness.

c. Between construction joints, place concrete in a continuous operation such that concrete is plastic at all times and flows readily into spaces between reinforcement.

d. Use placement procedures to avoid segregation.

e. Deposit concrete as near as possible to its final position.

f. Do not place concrete over standing water, mud, frost, ice or snow.

g. Do not use wet screeds or garden style rakes.

F. Do not place concrete when base surface is wet.

G. Consolidation of concrete:

a. Consolidate concrete complying with ACI 301 by vibrating, spading or rodding so that concrete is thoroughly worked around reinforcing, embedded items and into the corners of forms.

b. Consolidate each layer of concrete with previously placed layers in a manner that will eliminate air or stone pockets which may cause honeycombing, pitting, or places of weakness.

c. Do not insert vibrator into portions of concrete that have begun to set.

d. Do not use vibrators to transport concrete.

e. Keep spare vibrator on job site during concrete operations.

f. Do not over-vibrate concrete.

g. Use internal vibrator for formed elements; do not use form vibrators.

h. Keep vibrator away from joint assemblies, reinforcement, or side forms.

H. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

I. Place concrete continuously over the full width and depth of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

a. If a section cannot be placed continuously or if interrupted for more than 1/2 hour, provide construction joints.

J. After concrete placement, adjust forms and bracing to maintain proper alignment and eliminate leakage of cement paste.

K. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.9 JOINTS

A. Place joints as indicated on contract drawings.

B.

C. Construct isolation, contraction (weakened-plane), and construction joints true to line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

D. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

E. Place joints to allow one continuous placement between bulkheads.

F. Unless otherwise shown on drawings or indicated, maximum spacing between contraction, construction or isolation joints in slabs on grade shall be lesser of the following:

a. 36 times the slab thickness in inches.

b. Panel length to width ratio of maximum 1-1/2:1.

G. Place construction joints at end of placements and at locations where placement operations are stopped for more than 1/2 hour, except where such placements terminate at isolation joints.

a. Construction joints shall be planned and installed in accordance with the overall joint plan where the construction joint shall also function as a contraction joint, maintaining the spacings indicated for contraction joints.

1) Where construction joints are located where a contraction joint was not planned or indicated, the associated concrete sections shall be removed and replaced in order to maintain a consistent joint pattern at no additional cost.

K. Place 1/2 inch wide isolation joints to separate paving from all vertical surface and other components.

a. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.

b. Secure to resist movement by wet concrete.

c. Protect top edge of joint filler during concrete placement with cap of temporary material. Remove protection after concrete has been placed on both sides of joint.

d. Provide joint sealer at all isolation joints and locations where joint filler is installed.

L. Provide contraction joints as follows unless noted otherwise:

a. Minimum depth of 1/4 the thickness of the slab, but not less than 1 inch.

1) Adjust the depth of welded wire reinforcing and other reinforcing in order not to expose reinforcement.

b. For paving up to and including eight feet in width, locate joints such that the distance between tooled contraction joints equals the width of the slab.

c. For paving greater than eight feet in width, locate joints such that he maximum joint spacing does not exceed 36 times the slab thickness in inches.

1) As an example, a four inch (4") thick pavement, joints would have joints located not to exceed twelve feet (12').

d. All panels should be square or nearly so with the length never to exceed 1.5 times the width.

e. Sawed Joints: Saw cut joints shall be made within 4 hours of concrete placement; excessive spalling or ravelling of concrete surface at saw cuts shall be reason for replacement of concrete as outlined herein at no additional cost.

1) Employ sufficient number of saws and skilled workers to complete cutting saw joints before shrinkage produces cracking.

2) Saw cut to minimum width of 1/8 inch; width shall be consistent throughout joint.

3) Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent ravelling or dislodging of aggregates.

4) Saw cut joints shall be made within 4 hours of concrete placement and after completing finishing of slab in that joint location.

5) Remove all saw debris, either loose or compacted, from slab surface and joints prior to curing installation.

3.10 FINISHING

A. General:

a. Do not add water to any slab surface during finishing operations.

b. Do not add cement to any slab surface during finishing operations.

c. Perform no finishing operations while water is present on slab surface.

B. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

C. After floating, test surface for trueness with a 10-ft. straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

D. Sidewalk. landing: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch (6 mm) radius.

a. Where new portland cement concrete paving abuts existing concrete paving, match existing concrete paving finishing.

b. Remove all tool and trowel marks.

E. Curbs: Light broom, texture parallel to pavement direction.

F. Curing General:

a. Cure concrete in accordance with ACI 301 and ACI 308R unless noted otherwise.

b. Start curing as soon as concrete surface shall not be damaged by curing operations.

c. Continuously cure concrete for at least 7 consecutive days.

d. During curing period, do not allow any part of the concrete to become dry.

G. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

a. Do not use liquid curing compound on surface against which additional concrete, other finishing materials, or coatings are to be bonded if the bond shall be affected by the curing compound.

b. Immediately recoat surfaces subjected to rainfall within 3 hours after compound has been applied or surfaces damaged by subsequent construction operations within the curing period.

c. Barricade concrete surfaces immediately after application of curing compound.

d. Do not allow traffic on concrete surfaces sooner than 3 days after placement or as recommended by curing compound manufacturer; comply with the more stringent requirement.

H. Concrete Sealer: Apply sealer uniformly to all new portland cement concrete paving in continuous operation according to manufacturer's written instructions.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch (6 mm) in 10 ft (3 m).

B. Maximum Variation From True Position: 1/4 inch (6 mm).

3.12 BACKFILLING

A. After curing, debris shall be removed and the areas adjoining shall be backfilled, graded and compacted to conform to the surrounding area in accordance with the lines and grades indicated.

3.13 FIELD QUALITY CONTROL

A. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd (76 cu m) or less of each class of concrete placed.

a. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

b. Perform one slump test for each set of test cylinders taken.

B. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.14 PROTECTION AND REPLACEMENT

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section. Defects include color and texture irregularities, crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

a. Area for removal and replacement shall be defined by a perimeter determined by isolation, contraction, and construction joints that completely contain within their prescribed border the break, damage, defect or otherwise unacceptable concrete paving. In no case shall additional joints, saw cuts, etc. be permitted without the express permission.

1) Remove defective areas with clean, square cuts.

2) Mix replacement concrete of same materials to provide concrete of same type or class as original concrete. Prepare, place, reinforce, consolidate, and finish to match adjacent finished concrete. Cure and seal in same manner as adjacent concrete.

3) Where possible, portions of the work cast or set integrally may be salvaged for re-use provided that each item be re-installed according to original Contract Documents requirements.

b. In the case of ramps and stairs, the entire run incorporating all intermediate landings of the ramp and/or stair shall be removed and replaced.

1) Remove defective areas with clean, square cuts.

2) Mix replacement concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to match adjacent finished concrete. Cure in same manner as adjacent concrete.

3) Where possible, portions of the work cast or set integrally may be salvaged for re-use provided that each item be re-installed according to original Contract Documents requirements.

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

D. Do not permit pedestrian or vehicular traffic over pavement for 28 days minimum after finishing.

a. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

b. Provide access ramps along exposed concrete edges to prevent equipment and machinery from impacting edges; barricade all other exposed edges to machinery and vehicular traffic which may damage edges.

E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.

END OF SECTION 32 1313

SECTION 321816 - PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

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

B. The following documents form part of the Specifications to the extent stated. Where differences exist between Codes, Standards, Authorities Having Jurisdiction, and the Documents, the one affording the greatest protection and/or more stringent condition shall apply.

C. Section includes:

1. Unitary, seamless surfacing.

D. Related Sections:

1. Section 312000 – Earth Moving

2. Section 116813 – Playground Equipment

1.2 DEFINITIONS

A. The following standards and definitions are applicable to the work of this Section to the extent referenced herein:

1. ASTM F 1292-22 – Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment

2. ASTM F 1487-21 – Standard Consumer Safety Performance Specification for Playground Equipment for Public Use

3. ASTM F 1951-21 – Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

4. ASTM F 2223-19a – Standard Guide for ASTM Standards on Playground Surfacing

5. ASTM F2479-17 – Standard guide for specification, purchase, installation, and maintenance of poured in place playground surfacing.

6. ASTM F3313-20 – Standard Test Method for Determining Impact Attenuation of Playground Surfaces Within the Use Zone of Playground Equipment as Tested in the Field

7. US Consumer Product Safety Commission (CPSC) Handbook for Playground Safety

8. IPEMA Certified

B. Critical Height: Standard measure of shock attenuation according to ASTM F 2223-19a; same as "critical fall height" in ASTM F 1292-22. According to ASTM F 1292-22, this approximates "the maximum fall height from which a life-threatening head injury would not be expected to occur."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of protective surfacing.

1. Include plans, sections, placement details, and attachment to substrates.

2. Include accessories and edge terminations.

3. Include pattern and colors as shown on drawings.

4. Include fall heights and use zones for equipment and structures specified in Section 116813 "Play Equipment and Structures," coordinated with the critical heights for protective surfacing.

C. Samples for Color Selection: For each color noted on drawings.

1. Provide Samples at min. 3”x3” square to verify color and finish selection.

2. Colors:

a. Color Blend 1 - Dark Blue:
50% Standard Blue RH20
50% Azure RH23

b. Color Blend 2 – Medium Blue:
50% Azure RH23
50% Light Blue RH22

c. Color Blend 3 - Light Teal:
50% Light Blue RH22
50% Turquoise RH26

d. Color Blend 4 - Dark Aqua:
50% Turquoise RH26
50% Dark Green RH12

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer.

B. Product Certificates: For each type of surfacing product.

C. Product Test Reports: For surfacing assembly at critical height specified.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For playground protective surfacing, including maintenance cleaning instructions, to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

1. Provide images of past construction work similar to work to be performed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials in location and manner to allow installation of surfacing without excess disturbance of granular base.

1.8 WARRANTY

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

1. Failures include, but are not limited to, the following:

a. Reduction in impact attenuation as measured by reduction of critical fall height.

b. Deterioration of protective surfacing and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Poured-In-Place (PIP) Rubber Safety Surfacing Manufacturers:

a. Safety Turf, Inc.
201 N. 4th Ave.
Royersford, PA 19468
Phone: (800) 804-4595
Web: www.safetyturf.com

b. ProPour™
154 N. Sheridan Road
Newmanstown, PA 17073
Phone: 610-589-1763
Web: www.theplaygroundpros.com/ProPour.php

c. Approved equal

2. Binder manufacturers:

a. VORAMER by DOW Chemical Company
STOBIELAST by Stockmeier Urethanes USA, Inc.
FLEXILON by Rosehill
Approved equal

2.2 PERFORMANCE REQUIREMENTS

A. Impact Attenuation: Critical fall height tested according to ASTM F 1292-22 for equipment as specified in Drawings.

1. Impact attenuation of 200 G's or less from the actual fall height and test results shall meet or exceed HIC (Head Injury Criteria) test results shall be less than 1000 at this fall height.

B. Accessibility Standard: Minimum surfacing performance according to ASTM F 1951-21, The Americans with Disabilities Act (ADA) and the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

C. Standard guide for playground surfacing, ASTM F2223-19a.

D. Standard guide for specification, purchase, installation, and maintenance of poured in place playground surfacing, ASTM F2479-17.

E. ASTM F 1487-21 – Standard Consumer Safety Performance Specification for Playground Equipment for Public Use

F. U.S. Consumer Product Safety Commission – Public Playground Safety Handbook No. 325.

2.3 POURED-IN-PLACE RUBBER SAFETY SURFACING

A. Description:

1. A two (2) layer surface system consisting of a Cushion Course and Surface/Wearing Course placed on a crushed aggregate or paved (asphalt or concrete).

2. Cushion Course: A layer of SBR (Styrene Butadiene Rubber) recycled crumb rubber granules bound with a solvent free MDI polyurethane prepolymer binder. SBR recycled crumb rubber shall be free of contaminates and metals.

a. All cushion course depths shall meet ASTM-F1487-11 for fall heights as dictated by the specified play and/or fitness equipment.

3. Wearing Course: A layer of TPV (Thermoplastic Vulcanised) rubber granules (1-4mm size) bound with a solvent free MDI polyurethane prepolymer binder.

a. Thickness: ½ inch minimum. Thicken to ¾ inch under swings, ends of slides, play equipment entrances/exits, and areas where there will be increased foot traffic such as around spinning play equipment. Provide a ¼" minimum radius on edges when abutting concrete.

4. MDI Polyurethane Prepolymer Binder: Binders shall be aromatic.

5. Base Requirements: Poured-In-Place (PIP) Rubber Safety Surfacing shall be installed on a stable and compacted crushed aggregate base or a paved (asphalt or concrete) base. The paved base may be existing pavement as long as it is in good condition.

    a. Compacted Crushed Aggregate Base: Minimum 6 inches thick of compacted crushed aggregate (PennDOT 2A modified, 2B Clean Aggregate, AASHTO No. 57 Stone, or equivalent) placed on a compacted un-yielding subgrade compacted to 95% minimum per ASTM D698 Standard Proctor.

    b. Asphalt Pavement Base (New): Minimum 3 inches thick ID-2 Binder Course placed on minimum 6 inches thick of compacted crushed aggregate (PennDOT 2A modified or equivalent) placed on a compacted un-yielding subgrade compacted to 95% minimum per ASTM D698 Standard Proctor.

    c. Concrete Pavement Base (New): Comply with Plain Cement Concrete Pedestrian Walkway requirements.

6. Joints between Colors: Joints shall be back-cut and receive a heavy coat of polyurethane to ensure firm connection between colored areas and joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

    1. Verify that substrates are sound and without high spots, ridges, holes, and depressions.

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

3.2 PREPARATION

A. Prepare substrates to receive surfacing products according to protective surfacing manufacturer's written instructions.

3.3 INSTALLATION

A. Mix and apply components of seamless surfacing according to manufacturer's written instructions to produce uniform, monolithic, and impact-attenuating protective surfacing of required overall thickness.

    1. Substrate Primer: Apply over prepared substrate at manufacturer's standard spreading rate for type of substrate.

2. Poured Cushioning Layer: Spread evenly over primed substrate to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation, with a minimum of cold joints.

3. Intercoat Primer: Over cured cushioning layer, apply primer at manufacturer's standard spreading rate.

4. Wearing Layer: Spread over primed base course to form a uniform layer applied at manufacturer's standard spreading rate in one continuous operation and with no cold joints. **Maintain continuous pour by modifying color mix at color transition areas to create a gradual, gradient effect.** Finish surface to produce manufacturer's standard wearing-surface texture.

5. Edge Treatment: Fully adhere edges to substrate with full coverage of substrate. Maintain fully cushioned thickness required to comply with performance requirements.

3.4 PROTECTION

A. Prevent traffic over seamless surfacing for not less than 72 hours after installation.

3.5 FIELD QUALITY CONTROL

A. Contractor is responsible for testing of surfacing post installation.

B. Report of field testing must comply with ASTM F3313-20 “Standard Test Method for Determining Impact Attenuation of Playground Surfaces Within the Use Zone of Playground Equipment as Tested in the Field” to ensure surfacing as installed meets:

1. ASTM F 1292-22 – Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment

   a. Ensure critical heights of surfacing meets or exceeds fall heights of structures as established by play equipment manufacturers and specified in Section 116813 "Play Equipment and Structures

   b. Impact attenuation of 200 G’s or less from the actual fall height and test results shall meet or exceed HIC (Head Injury Criteria) test results shall be less than 1000 at this fall height.

2. ASTM F 1951-21 – Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

END OF SECTION

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Philadelphia Parks and Recreation Signage Standards Manual

1.2 SUMMARY

A. Section Includes:

1. Chain-link fence framework.
2. Chain-link fittings.
3. Chain-link wires and ties.

B. Related Sections

1. Division 03 “Cast-in-Place Concrete” for post footing

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of gate operator.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS

A. Product Data:
1. For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
b. Fence posts, rails, and fittings.

B. Shop Drawings: For each type of fence assembly.

1. Include plans, elevations, sections, ground details, [mounting,] post spacing, and attachments to other work.
2. Include accessories, hardware, gate operation, and operational clearances.

C. Samples for Initial Selection: For each type of factory-applied finish.

D. Samples for Verification: For each type of component with factory-applied finish, prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch (150-mm) lengths for components and on full-sized units for accessories.

E. Delegated Design Submittal: For structural performance of chain-link fence and gate frameworks, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer, testing agency, or factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence.

C. Product Test Reports: For framework strength in accordance with ASTM F1043, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Build mockup for typical chain-link fence, including accessories.

a. Size: 8 ft. length of fence.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of fences that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to comply with performance requirements.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Chain-Link Fencing shall conform to the following minimum standards:

1. General Site Fencing Standards(Chain-link):

a. Height: All chain-link fencing will either measure 6’ tall (72”) or 8’ tall (96”) in height from the finished grade, unless otherwise requested or approved by Philadelphia Parks and Recreation.
b. Posts: Minimum 2” (outside diameter) galvanized steel, painted black. Posts should have a maximum spacing of 8’(96”) on center per section of chain-link fencing. All Terminal posts will have caps and tension bar. All line posts will have top and bottom connectors
c. Rails: Minimum 1-5/8” (outside diameter) galvanized steel, painted black. The bottom rail will be a 2” from finished grade.
d. Footings: Footings will be minimum 3500 PSI concrete at 36” depth below finished grade and have a 12” diameter, unless otherwise required. The new post will be set at a depth of 30” from finished grade within the new footing.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design chain-link fence and gate frameworks.

C. Structural Performance: Chain-link fence and gate frameworks are to withstand the design wind loads and stresses for fence height(s) and under exposure conditions indicated in accordance with ASCE/SEI 7.

1. Design Wind Load: 114mph.

a. Minimum Post Size: Determine in accordance with ASTM F1043 for post spacing not to exceed 8 feet for Material Group IA, ASTM F1043, Schedule 40 steel pipe.
b. Minimum Post Size and Maximum Spacing: Determine in accordance with CLFMI WLG 2445, based on mesh size and pattern specified.

D. Accessibility: Pedestrian gates to comply with the United States Access Board's ADA-ABA Accessibility Guidelines.\PART 3 – EXECUTION

2.2 CHAIN-LINK FENCES, GENERAL

A. CLFMI Publications: Comply with the CLFMI Product Manual unless modified by requirements in the Contract Documents.

B. Chain-Link Fence and Gate Assemblies: Include materials applicable for a complete assembly of application types, consisting of commercial, industrial, and security chain-link fences and gates.

1. Source Limitations: Obtain chain-link fence and gate components from single source or manufacturer.

2.3 CHAIN-LINK FENCE FRAMEWORK

A. Posts and Rails: ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thicknesses in accordance with ASTM F1043 or ASTM F1083 based on the following:

1. Height: All chain-link fencing will either measure 6’ tall (72”) or 8’ tall (96”) in height from the finished grade, unless otherwise requested or approved by Philadelphia Parks and Recreation. and as indicated in Drawings.

2. Fabric: All chain-link fabric will be vinyl coated and have a minimum weave of 2”x2” with 9GA tie wire, knuckled on both top and bottom. 2" mesh to be used for new climbing fence. Cut ends of fence fabric shall be turned or knuckled over in the field to sharp wire ends are not exposed. Tie wires will be 24” on center, unless otherwise approved by Philadelphia Parks and Recreation. The color will be black, unless otherwise stated/approved by Philadelphia Parks and Recreation.

3. Line Post: Minimum 2” (outside diameter) galvanized steel, painted black. Posts should have a maximum spacing of 8’ (96”) on center per section of chain-link fencing. All line posts will have top and bottom connectors.

4. End, Corner, and Pull Posts: Minimum 2-1/2” (outside diameter) galvanized steel, painted black. Posts should have a maximum spacing of 8’ (96”) on center per section of chain-link fencing. All Terminal posts will have caps and tension bar.

5. Horizontal Framework Members: Intermediate, top and bottom rails in accordance with ASTM F1043.

    a. Rails: Minimum 1-5/8” (outside diameter) Galvanized steel, painted black. The bottom rail will be a 2” from finished grade.

2.3 PPR APPROVED MANUFACTURERS:

A. Northeast Fence and Iron Works
8451 Hegerman Street, Philadelphia, Pennsylvania 19136,
Phone: (215) 335-1681,
Web: http://www.northeastfence.net/

B. Stephens Pipe and Steel, LLC
300 Streibeigh Lane, Montoursville, Pennsylvania 17754,
Phone: (888) 275-1638,
Web: http://www.spsfence.com

C. Master Halco
3010 Lyndon B Johnson Freeway, Suite 800, Dallas, Texas 75234,
Phone: (800) 883-8384,
Web: www.masterhalco.com

D. Equal approved Philadelphia Parks and Recreation.

2.4 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout

complying with ASTM C1107/C1107M. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

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

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

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION OF CHAIN-LINK FENCES

A. Install chain-link fencing in accordance with ASTM F567 and more stringent requirements specified.

1. Install fencing on established boundary lines inside property line.

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

C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend minimum 2 inches (50 mm) above grade; shape and smooth to shed water.

D. Terminal Posts: Install terminal end, corner, and gate posts in accordance with ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of as indicated on Drawings. For runs exceeding 500 feet (152 m), space pull posts an equal distance between corner or end posts.

E. Line Posts: Space line posts uniformly at 96 inches (2440 mm) o.c. unless otherwise indicated on Drawings.

F. Post Bracing and Intermediate Rails: Install in accordance with ASTM F567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. Locate horizontal braces at midheight of fabric 72 inches (1830 mm) or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

G. Tension Wire: Install in accordance with ASTM F567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches (152 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.

H. Top Rail: Install in accordance with ASTM F567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

I. Intermediate and Bottom Rails: Secure to posts with fittings.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests.

END OF SECTION 323113

SECTION 323300 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Benches.
2. Trash Receptacles
3. Tables and Chairs
4. Bike Racks
5. Removable Bollards

B. Related Sections:

1. Division 32 Section "Concrete Paving" installing site furnishings on concrete slab.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

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

1.4 INFORMATIONAL SUBMITTALS

A. Guarantee: Obtain in the Owner’s name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. Guarantees must be in addition to, and not in lieu of, other liabilities, which the Contractor may have by law or other provisions of the Contract Documents.

1.5 QUALITY ASSURANCE

A. General:

1. Experienced fabricator(s) or manufacturer(s) will fabricate and install site furnishings, and have prior experience in ornamental metal, or wood work of equal scope and fabrication standards to Project requirements.
2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection must be in accordance with Project Contract Drawings and Specifications, approved shop drawings, and be of highest quality practices of the industry.
3. Use new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be

subjected.

4. Fabricate, assemble and neatly and accurately erect all work with smooth finished surfaces.
5. Field Measurements and Coordination: Verify dimensions with work specified in other sections which adjoins or to which this work will be attached.

    a. Effect coordination with related work of other sections, including work of other separate Contracts.
    b. Take measurements of adjoining work, so that work specified in this Section fits closely into the spaces and conditions provided.
    c. If any unusual conditions are encountered, the nature and location of conditions must be shown on shop drawings submitted to Landscape Architect for determination and approval prior to fabrication.

6. Coordination with other Trades: Coordinate with and furnish all necessary templates and patterns required by work of other sections. Furnish components of assemblies that are to be built into work specified as part of other sections. Supervise and be responsible for the correct location and installation of such built-in items.
7. This Specification Section does not define or establish the extent of work performed by sub-trades. Contractor will assign sub trade work as they deem appropriate for a complete, coordinated, cost effective and proper execution.

B. Shop Assembly: Insofar as is practical, fitting and assembly of work must be done in shop in order to minimize field splicing and assembly.

1. Work that cannot be permanently shop-assembled must be completely assembled, marked for re-assembly and disassembled in shop before shipment to ensure correct assembly in field.
2. Shop assembles work in largest practical sizes to minimize field work.
3. Shop fabricated items must correctly fit the field condition. In event that shop- fabricated items do not fit the field condition, the item must be returned to the shop for correction, unless otherwise approved by Landscape Architect.

C. Product Testing:

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

E. Pre-installation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Division 01 Section – PRODUCT REQUIREMENTS.

B. Finished Materials:

1. The Contractor will be responsible for timing delivery of all site improvement items, so as to minimize on-site storage time prior to installation. All stored materials and items

must be protected from weather, careless handling and vandalism. Damaged items must be repaired or replaced, as determined by the Landscape Architect.

2. Load and store primed and coated articles off the ground and under cover to prevent formation of wet storage film. Allow air between and around surfaces and allow for continuous drainage of units until installed and painted.
3. Protect finishes against soiling, staining, or damage from scratches and abrasion. Maintain protection during construction until project completion.

1.7 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be their duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, will be done at the Contractor's risk.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate Work of this Section with Work of all other Sections of Specification.

1.9 CLOSEOUT REQUIREMENTS

A. Project Record Documents: Submit in accordance with Division 01 Section – EXECUTION REQUIREMENTS.

B. Operations and Maintenance Data:

1. Provide Maintenance and Cleaning instructions for Owner.

C. Provide manufacturer’s standard warranty.

PART 2 - PRODUCTS

2.1 BENCHES

A.

Manufacturer:	Dumor, Inc.
Address:	P.O. Box 142, Mifflintown, PA 17059
Other Contact Info:	Phone: (800) 598-4018
Web:	www.dumor.com.
Local Representative:	General Recreation P.O. Box 440, Newtown Square, PA 19073 Phone: (800) 726-4793 Web: www.generalrecreationinc.com
Product Name:	Dumor Series 160-60 Steel Bench (Backed), 6 foot length with

		center armrest with custom “Fairmount Park Panel” in center armrest.
	Color:	Black
	Note:	Bench shall be Philadelphia Parks and Recreation Department Standard Product. Coordinate required accessories and options with the manufacturer.

2.2 WASTE RECEPTACLES

A.	Manufacturer:	Dumor, Inc.
	Address:	P.O. Box 142, Mifflintown, PA 17059
	Other Contact Info:	Phone: (800) 598-4018
	Web:	www.dumor.com.
	Local Representative:	General Recreation P.O. Box 440, Newtown Square, PA 19073 Phone: (800) 726-4793 Web: www.generalrecreationinc.com
	Product Name:	Dumor Series 157-32-FTO Steel Waste Receptacle, Standard Top Opening.
	Color:	Black
	Note:	Receptacle shall be Philadelphia Parks and Recreation Department Standard Product. Coordinate required accessories and options with the manufacturer.

2.3 TABLES AND CHAIRS

A.	Manufacturer:	Dumor, Inc.
	Address:	P.O. Box 142, Mifflintown, PA 17059
	Other Contact Info:	Phone: (800) 598-4018
	Web:	www.dumor.com.
	Local Representative:	General Recreation P.O. Box 440, Newtown Square, PA 19073 Phone: (800) 726-4793 Web: www.generalrecreationinc.com
	Product Name:	Dumor Series 76-PL-3-S-1 (4 seat) and 76-PL-3-S-1 (3 seat-ADA Compliant)
	Color:	Black
	Note:	Table and chairs to be embedded in concrete paving or pad or PPR approved rigid paving with manufacturer’s recommended anchors or post anchored in a concrete footing cast below grade.

2.4 BIKE RACKS

A.	Manufacturer:	Dumor, Inc.
	Address:	P.O. Box 142, Mifflintown, PA 17059
	Other Contact Info:	Phone: (800) 598-4018
	Web:	www.dumor.com.
	Local Representative:	General Recreation P.O. Box 440, Newtown Square, PA 19073

Phone: (800) 726-4793
Web: www.generalrecreationinc.com

Product Name: Dumor Series 290
Color: Black
Note: Standard Philadelphia Parks and Recreation color is black. Designer may select another color from manufacturer's standard color palette; but color selection shall be approved by PPR. Bike rack to be embedded in concrete.

2.5 REMOVABLE BOLLARDS

A. Manufacturer: Dumor, Inc.
Address: P.O. Box 142, Mifflintown, PA 17059
Other Contact Info: Phone: (800) 598-4018
Web: www.dumor.com.
Local Representative: General Recreation
P.O. Box 440, Newtown Square, PA 19073
Phone: (800) 726-4793
Web: www.generalrecreationinc.com

Product Name: Dumor Series 400-42/ Ground Sleeve and Cap S-1SL

Materials:
Main Post:
Main post shall be manufactured from 4" (4 1/2" OD) ASTM A513 schedule 40 steel tubing.
Ground Sleeve and Cap S-1SL
Ground sleeve shall be manufactured from 5" OD x 3/16" wall ASTM A513 mechanical steel tubing and 1/4" thick ASTM A36 steel plate.
Color: Black
Note: Bollard to be removable and provided with corresponding sleeve cap plate.

2.6 ACCESSORIES

A. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, corrosion-resistant-coated or noncorrodible materials; commercial quality, tamperproof, vandal and theft resistant.

B. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.

PART 3- EXECUTION

3.1 EXAMINATION

A. Inspection: Verify the conditions, elevations, and measurements affecting the work of this Section prior to installation. Examine surfaces to receive site furnishings and do not proceed until any defects detrimental to the finished work are corrected. Take proper precautions so as not to disturb or damage subsurface elements of utilities, conduits, underdrainage systems,

water proofing, insulation, or foam fill.

3.2 INSTALLATION

A. GENERAL

1. Unless otherwise noted in specifications or shown on Drawings: Install all site furnishings according to manufacturer's instructions, plumb, straight, true to line or radius, accurately fitted and located, with flush tight joints, with provisions to allow for thermal movement, with provision to exclude water, and with attachment devices as required for secure and rigid installation. Make field assembly and connections with the same level of quality as shop fabricated work.
2. Install, or coordinate with other work as required to install bases, grouts, fillers, flashings, sealants, and other components as the work progresses.
3. Install work to provide items with capabilities to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.
4. Restore protective coverings which have been damaged during shipment or installation of work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.
5. Field Welding: Comply with the applicable AWS specification for procedures of manual shielded metal-arc welding, for appearance and quality of welds made.

B. ATTACHMENTS

1. All attachment devices must be of type, size and spacing to suit condition and as approved by Landscape Architect. When exposed to view, finish must match item attached.

    a. Provide shims, slotted holes, or other means necessary for leveling, plumbing, and other required adjustments.
    b. Mechanical Fastenings: Limit fasteners to concealed and inconspicuous locations as approved.

2. Do all necessary drilling, tapping, cutting or other preparation of surrounding construction in the field accurately, neatly, and as necessary for the attachment and support of work of this Section.
3. Do not cut or abrade finishes, which cannot be completely restored in the field, without the Landscape Architect's approval. Do not weld fabrications after shop priming.

3.3 CLEANUP

A. Legally dispose of off-site all refuse and debris from these operations. Remove or neatly store material at the end of each day's work. Burning of material or dumping on the site is prohibited.

B. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION 323300 – SITE FURNISHINGS

329115 – SOIL PREPARATION AND MIXES

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Furnishing and testing all soils and plant mix materials, including salvaged on-site topsoil, off site borrow materials, amendment materials, manufactured growing media and other component materials for approved use in planting mixes. These consist of:

    a. Various Planting Mixes comprised of Salvaged On-site Topsoil and additional soil amendment materials.

2. Preparing transition zone and subgrade at planting areas.

    a. Preparation shall include amending and mixing planting soil with existing on-site soil to the depths indicated for transition zones of each area.
    b. Preparation of subgrade shall include verification and scarification of the subgrade prior to placement of planting soil mixes.

3. Placing, spreading, and fine grading pre-mixed planting soil material of the type(s) indicated for plant areas.
4. Testing installed planting soil mixes and Growing Media to ensure compaction rates as specified.
5. Protecting all stock piles and plant mix installations with approved means until substantial completion.
6. Supplying and installing erosion control material.

B. Related Sections:

1. Division 31 “Site Clearing”
2. Division 31 “Grading”
3. Division 31 “Excavation”
4. Division 31 “Trenching”
5. Division 31 “Temporary Erosion and Sediment Control”
6. Division 31 “Fill and Backfill”
7. Division 32 Section “Turf and Grasses”
8. Division 32 Section “Exterior Planting”

1.3 REFERENCE STANDARDS

A. ASTM: American Society of Testing Materials

B. USDA: United States Department of Agriculture

C. AASHTO: American Association of State Highway and Transportation Officials

D. AOAC: Association of Official Agricultural Chemists

E. SSSA: Soil Science of America, Methods of Soil Analysis

F. TMECC: Test Methods for the Examination of Composting and Compost

G. NER493: Recommended Soil Testing Procedures for the Northeastern U.S.

1.4 DEFINITIONS

A. Base Mix Composite: Homogenously blended mix of sand and loam component materials which is then used for mixing with organic matter to create planting soils.

B. Debris: Elements including, but not limited to, concrete, concrete masonry, wood, excavated rock and rock fragments, rubble, overburden soils, abandoned utility structures, trash, refuse and litter.

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

D. Growing Medium: A manufactured mix of mineral materials, stabilizing organic amendments and stabilized aggregates to provide a mixture that promotes good growing conditions for the plants specified.

E. Salvaged On-site Topsoil: Stripped native loam removed within the limits of work, but outside of the “Tree Protection Areas”, to its entire natural depth.

F. Soil: A naturally occurring material of differing horizons, of which the uppermost is often used as a component in a soil mix or growing medium.

G. Subgrade: Surface or elevation of subsoil remaining after completing excavation or backfill immediately beneath planting soil, that is integrated with Specified Soil or Growing Media by tilling in a layer of Transition Mix.

H. Topsoil: Natural surface-soil or prepared planting mix layer containing organic matter and sand, silt and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil materials including, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other non-soil or non-specified materials.

I. Transition Mix: Imported topsoil / loam or manufactured soil, mixed with soil amendments as specified, such as sand that is homogeneously blended as specified to create a conversion layer between the existing native soil and imported planting soil.

1.5 ACTION SUBMITTALS

A. Product Data: Submit technical descriptive data for each manufactured or packaged product of this Section. Include manufacturer's product testing and analysis and installation instructions for manufactured or processed items and materials.

B. Submittal Requirements for Plant Mix or Amended Soil Suppliers:

1. Locations: Submit locations of material sources. Submit location of mixing sites,

including off site mixing of plant mix or soil amendment components.

2. Landscape Architect shall have the right to reject any soil supplier or salvaged on-site topsoil.
3. Soil Mix supplier shall have a minimum of five-year experience at supplying custom planting soil mixes.
4. Submit supplier name, address, email, telephone, and fax email numbers and contact name.
5. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project and within the limitations of the Project Schedule.
6. Statement(s) of Qualifications: Submit within 45 days of notice to proceed to confirm qualifications.

C. Certificates:

1. Submit certified analysis for each soil treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged materials.

D. Test reports – Soil, Soil Amendment and Plant Mix Component Analysis: The Contractor shall submit representative samples of salvaged on-site topsoil, all plant mix materials and organic material components which are intended to be used for planting soil mixes and final mixes, to an independent Soil and Plant Testing Laboratory acceptable to the Landscape Architect. All tests shall be performed in accordance with the current standards of the Association of Official Agriculture Chemists. All reports shall be sent to the Landscape Architect for approval. Samples of all soil materials to be brought to the site must be approved before delivery. Deficiencies in the soils shall be corrected by the Contractor, as directed by the Landscape Architect after review of the testing agency report. Testing reports shall include the following:

1. Date issued.
2. Project Title and names of Contractor and supplier.
3. Testing laboratory name, address and telephone number, and name(s), as applicable, of each field and laboratory inspector.
4. Date, place, and time of sampling or test, with record of temperature and weather conditions.
5. Location of material source.
6. Type of test.
7. Results of tests including identification of deviations from acceptable ranges.
8. Soil Amendment and Plant Mix analysis tests shall show recommendations for soil additives, including organic and inorganic soil amendments, necessary to accomplish particular planting objectives noted.
9. pH and Buffer pH.
10. Analysis for levels of toxic elements and compounds including arsenic, boron, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, zinc, and PCB. Test results shall be cited in milligrams per kilogram.
11. Particle size analysis to include sand sieve analysis shall be performed and compared to the USDA Soil Classification System per ASTM D422 hydrometer test) or ASTM F1632 (pipette test). The silt and clay content shall be determined on soil passing the #270 sieve and shall be reported separately.
12. Percent of organic matter shall be determined by an Ash Burn Test, ASTM D2974-14
13. Saturated hydraulic conductivity per ASTM F1815.
14. Analysis for nutrient levels by parts per millions including Nitrate nitrogen, Ammonium

nitrogen, Nitrite, Phosphorus, Potassium, Calcium, Magnesium, Iron, Manganese, Zinc, Copper, and Extractable Aluminum.

15. Soluable Salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
16. Cation Exchange Capacity (CEC) per NER493 or NCR221 using the pH 7 ammonium acetate method.
17. Carbon to Nitrogen Ratio (C:N Ratio).
18. Certified reports on analyses from producers of composted organic materials are required, additional tests are required when sources are changed. The analysis performed shall include pH, bulk density, salinity, total organic nitrogen, C:N Ratio, Solvita Maturity Index, moisture, sodium, potassium, calcium, magnesium, and phosphorus. Yard waste composts that may contain grass clippings shall be tested for chlopyralid and picloram.
19. Although the report(s) may contain the laboratory's comments or recommendations to the Landscape Architects regarding amendment requirements or procedures, the report shall not be interpreted to prescribe or dictate procedures or quantities of soil materials for the work of this Contract without the Landscape Architect’s written permission.

E. All samples to be submitted to the Landscape Architect for approval:

1. Organic Compost Material, each source, 5 lb. packaged.
2. Sand, each source, 5 lb packaged.
3. Loam, each source, 5 lb packaged.
4. Base Mix Composite, each source, 5 lb. packaged.
5. Planting Soil Mix, each specified, 5 lb. packaged.
7. Salvaged On-site Topsoil, each source, 5 lb packaged. (Screened & Shredded)F. Equipment Data: Submit descriptive information with wheel load data for each proposed item of equipment to be used for execution of earthwork of this Contract. Equipment Data will be evaluated for conformance to site restriction of use.

F. Schedule and Protection Plan: Submit a detailed plan for scheduling and sequencing of all contract work and for protection of soil mixes and other completed work including coordination with contractors requiring access through the site. Indicate with schedules and plans the utilization of soil mix and subsoil protection measures, over the surface area of plant bed installations, until Substantial Completion. Indicate with schedules and plans the utilization of finished work protection measures (wooden protection boards or other approved methods) over the work area of construction operations concurrent with all construction operations until substantial completion.

G. Settlement Methodology: Submit a plan with a schedule describing the proposed method intended for settling installed work.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Various Planting Mixes are comprised of Salvaged On-site Topsoil and additional soil amendment materials must meet the specification herein and be verified by testing as specified herein, prior to being delivered to the site.

B. No component or composite mix will be accepted unless it meets all submittal, testing and certification requirements including testing and certification report format specified herein.

C. Inspections and Testing

1. Sand, soil, compost, and other material testing and soil mix testing required in this Section or additionally required by the Landscape Architect shall be furnished and paid for by Contractor.

2. The Landscape Architect reserves the right to take and analyze at any time such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.

D. Qualifications

1. Installation and maintenance foreman on the job shall be competent supervisor(s), with experience in landscape installation and maintenance. Perform work with personnel totally familiar with planting soil preparation and lawn and planting installations under the supervision of a foreman experienced with landscape work.
2. Testing Laboratory: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified. The Testing Laboratory shall be as approved by the Landscape Architect.
3. It shall be the responsibility of the Contractor to see that the specifications are being adhered to. Failure of the Landscape Architect to immediately reject unsatisfactory workmanship or to notify the Contractor of his/her deviation from the specifications shall not relieve the Contractor of his/her responsibility to repair and/or replace unsatisfactory work.

E. Pre-Installation Conferences: Person(s) responsible for soil preparation and mixes of this Section shall attend Pre-Installation Conference(s) to coordinate with work of other sections.

1.8 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section.

1.9 PROJECT/SITE CONDITIONS

A. The Contractor shall be responsible for pedestrian and vehicular safety and control within the work site. He/she shall provide the necessary warning devices and ground personnel needed to give safety, warning and protection to persons and vehicular traffic within the area.

B. During site preparation, soil installation and protection, the Contractor shall be responsible for all damage to existing features above and below finished grade (structural decking, waterproofing, drainage, utility lines, irrigation pipes, paving surfaces, existing vegetation, site furnishings) incurred as a result of work operations. Repairs or replacements shall be made to the satisfaction of the Owner.

C. Investigate the conditions of site and public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.

D. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractor's duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

E. Environmental Requirements for Soil:

1. Perform both off-site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet (as defined by Landscape Architect), or in otherwise unsatisfactory condition.
2. Soil mixes shall not be handled, hauled or placed during rain or wet weather or when near or above the point where maximum compaction will occur (as defined by Landscape Architect).

F. Sequencing and Scheduling: Adjust, relate together and otherwise coordinate work of this Section with work or Project and all other Sections of Project Specifications.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials to the location where soils are to be mixed, in unopened bags or containers, each bearing the name, guarantee, and trademark or the producer, material composition, manufacturer’s certified analysis, and the weight of the material. Retain packages for the Landscape Architect.

B. Store and handle packaged materials in strict compliance with manufacturer’s instructions and recommendations. Protect all materials from weather, damage, and theft.

C. Soil or amendment materials stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. All temporary storage means and methods shall be approved by the Landscape Architect.

D. After mixing, soil mixtures shall be covered with a tarpaulin until time of actual use and protected from contamination or erosion.

PART 2 PRODUCTS

2.1 PLANTING SOIL PROFILE MATRIX

A. Provide planting soil profiles in locations and in accordance with details as indicated in the Drawings.

B. Use Amended salvaged soil as top-dress existing soil for existing trees and turf.

2.2 AMENDED ON-SITE PLANTING SOIL COMPONENTS

A. Planting Soil Components consist of:

1. Stockpiled Native Topsoil
2. Amended Salvaged On-site Soil
3. Imported Sand
4. Organic Material
5. Inorganic Soil Amendments
6. Surface-applied Nutrients

B. Stockpiled Native Topsoil

1. Salvaged surface soil stockpiled onsite.
2. Quantity: The approximate quantity of stockpiled native topsoil will not be known until demolition and rough grading have been completed. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Notify Landscape Architect of stockpile locations and quantities prior to importing supplemental topsoil.
3. Composition: Fertile, friable well-drained soil, of uniform quality, free of stones over two (2) inch in diameter, sticks and all construction debris and gravel less than twenty five percent (25%).
4. Test Results:

    a. Furnish soil samples for testing by Soil Testing Lab and correct deficiencies in the soils prior to plant installation, as directed by the Landscape Architect after review of the testing agency report.

C. Salvaged On-Site Soil Component

1. Salvaged soil shall be a friable mineral soil essentially free from heavy or stiff clay lumps, stones, cinders, roots, sticks brush, limit of one percent (1%). Content of concrete, brick, litter, plastics, metals refuse or other deleterious materials shall be zero percent (0%). The soil shall be free of herbicides, petroleum-based materials or other sub-stances of a hazardous or toxic nature which may inhibit plant growth. The soil shall be free of noxious weeds, seeds or vegetative parts of weedy plants that cannot be selectively controlled in the planting.

2. Salvaged On-site Soil for use in Planting Soil shall meet the following specifications.

    a. Texture: Salvaged Planting Topsoil shall be a salvaged Ap Horizon Topsoil; Subsoil layers are not acceptable.
    b. Salvaged Planting Topsoil shall be classified as a Loamy Sand or Sandy Loam.
    b. The pH shall be 5.5 to 7.5.
    c. The soluble salts shall be less than 3 millimho/cm, chloride shall be less than 150 parts per million in saturation extract

d. The organic matter content shall be lower than 1% on a dry weight basis. Blending may be used to achieve the required minimal organic content.
e. Free of noxious weeds, seeds, and rhizomes listed on invasive species list for local jurisdiction.
f. Clay content shall be under 30%. If clay content is greater than 30%, soils shall be amended with approved #20 sand in order to reduce clay content within acceptable levels.
g. Stone content shall be under 50%

3. Provide certification that soil does not contain any toxic substances harmful to plant growth.

4. Any off-site (imported or borrow) topsoils meeting the criteria shown above must be approved by the landscape architect through submittal testing and sampling prior to sourcing and delivery to the site.

5. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Methods No. 8020.

6. Percolation rate: one half inch per hour (1/2" / hr) minimum.

7. Compaction shall be 83-85% dry density per ASTM D 1775, or least level of compaction achievable as measured with neutron probe or other approved method, as approved by Landscape Architect, Civil Engineer and Geotechnical Engineer.

Table 2. General relationship of soil bulk density to root growth based on soil texture (NRCS Soil Quality Institute, 1999).

Soil texture	Ideal bulk densities (g/cm^3)	Bulk densities that may affect root growth (g/cm^3)	Bulk densities that restrict root growth (g/cm^3)
Sands, loamy sands	<1.60	1.69	>1.80
Sandy loams, loams	<1.40	1.63	>1.80
Sandy clay loams, loams, clay loams	<1.40	1.60	>1.75
Silts, silt loams	<1.30	1.60	>1.75
Silt loams, silty clay loams	<1.10	1.55	>1.65
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.10	1.49	>1.58
Clays (>45% clay)	<1.10	1.39	>1.47

D. Imported Sand Component

1. If imported sand must be added to existing salvaged on-site soil in order to meet specified texture: the sand shall be a clean, sharp, or natural silica not a limestone sand that has been suitably washed and classified (sieved). Suitable sands may be referred to in commerce as a uniform, or a coarse U.S.G.A. root zone sand. The selected sand must meet the following U.S.D.A. particle size distribution as well as the other gradation

characteristics listed in Part C when tested in accordance with the ASTM D-422 using U.S.D.A. particle size classifications.

E. Organic Material (Compost)

1. The organic amendment shall be stable, mature aerobically composted yard debris (green waste) compost. Leaf humus compost, manure composts, peat, peat-humus are not acceptable. Compost material must meet the requirements of all state and local Composting Regulations and have the following characteristics:

   a. The compost shall be a homogeneous material essentially free of soil clods, lumps, roots and stones.
   b. The compost shall have a foreign material (hard plastics, metal, glass, etc.) content less than 1.5% as material retained on a U.S. Std.No.5 (4 mm) sieve (TMECC 03.06).
   c. The compost shall be screened such that a minimum of 100% passes a U.S. Std. 3/4" sieve and that no more than 10% passes a U.S. Std. No.10 sieve on a dry weight basis. The compost shall have a pH of 5.5 to 7.5.
   d. The compost shall have a soluble salts content less than 10.0 millimhos per cm. when determined in saturation extract.
   e. The compost shall have an organic matter content of not less than 40% by weight determined by ASTM D2974-87 Method C on material passing a U.S. Std.1/4" sieve.
   f. The compost shall have a carbon to nitrogen (C:N) ratio less than 25:1.
   g. The compost shall have a Solvita® Maturity Index between 6 and 7.
   h. The compost shall have a moisture content of 45% to 65%.
   i. The compost shall have a dry bulk density of 0.17 to 0.35 grams per cubic centimeter (g/cc). (some compost have bulk density values of about 0.6.)
   j. The compost shall be tested for nitrate nitrogen, phosphorus, potassium, calcium, magnesium, iron, manganese, zinc, copper, boron and sodium using the AB-DTPA extraction method.
   k. The total digestible heavy metal content shall not exceed the following limits:

Element	Concentration Limits (mg/Kg d.w.)
Arsenic	20
Cadmium	15
Chromium	100
Copper	200
Lead	300
Mercury	10
Molybdenum	20
Nickel	100
Selenium	30
Zinc	200

   l. The compost shall meet all applicable state regulations based on the feedstock type.
   m. All compost testing shall be done in conformance with the U.S. Compost Council's publication "Test Methods for the Examination of Composting and Compost", USDA or SSSA methods.

F. Inorganic Soil Amendments

1. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   a. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
   b. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
   c. Form: Provide lime in form of ground dolomitic limestone.
2. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
3. Iron Sulfate: Granulated ferrous sulfate heptahydrate containing a minimum of 20 percent iron and 10 percent sulfur.
4. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

G. Surface-Applied Nutrients:

1. Chelated Iron: Commercial-grade FeEDDHA (Ethylenediamine-di (hydroxyphenylacetate without acid) for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.
2. Calcium Nitrate: 15.5% Nitrogen

2.3 SOIL COMPOSITIONS PROFILES

A. Provide the Planting Composition Profiles at the locations and depths as indicated on the Contract Drawings. Mix ratio volumes, will be established upon completion of the testing for the individual components of the Planting Mixes. The controlling factor will be the percent (%) organic matter by weight as specified for each Planting Mix. Note that volume ratios of the Base Mix and the Organic Amendment (compost) components will be, in large part, determined by the organic matter content of the compost. Follow the recommendations on mix design provided by the soil testing laboratory to achieve the target organic matter content.

B. Soil profiles and amendments will be uniformly mixed and blended.

1. Blending consistency shall match approved In Situ mock-up.
2. There shall be no discernable discreet pockets of organic matter, fertilizer components or other amendments.

C. Compaction: Final compaction rates in-place shall be a maximum of 85% dry density per ASTM D 1557.

D. Percolation rate: Hydraulic conductivity rate shall not be less than 2 inch per hour, nor more than 10 inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b, or other approved methods. Percolation rates to be confirmed using open pit percolation test as described in Part 1.

E. General planting soil testing and adjustment: Test as required to confirm specified conditions and remove soil or otherwise modify the condition as required to achieve specified requirements. Conduct additional testing as required to determine extent of any non-

conforming areas and confirm correction through testing of final condition prior to planting.

F. Weed

1. Noxious weeds and plants listed on the invasive species list of the Native Plant Association shall not be present on site.
2. The following shall not be present in either components or final planting soils, as a single plant, or plant part, such as roots, rhizomes, stolons or seeds: Bermuda grass, wild oats, bromus malus, guackgrass, johnsongrass, nutsedge, nutgrass, poison oak, star thistle, poa annua (annual bluegrass), cyperus rotundus, Lepidium (pepper weed).
3. Tolerances:

    a. not more than 1% undesirable grass species or clover. No more than 2 weeds per 500 square feet.
4. Eradicate and remove using means and extent as approved by Landscape Architect or Owner. Proposed removal methods may include flame in place, mowing and tilling, Round-Up, hand removal.
5. Remove weeds within 1 week, and do not allow them to produce seed prior to removal.

2.4 PLANTING MIXES

A. Adequate quantities of planting mix materials shall be provided to attain, after compaction and natural settlement, all design finish grades. Verify quantities for placement as specified to suit site conditions.

B. Uniformly mix components using a mechanical soil blender designed for such purpose as specified for each Planting Mix Type.

1. Mixing of Base Mix and Compost: Add compost as recommended by the testing laboratory to achieve the specified organic matter content by Planting Mix type. Other amendments shall not be added to Planting Mixes unless approved by the Landscape Architect and additional tests have been conducted to verify type and quantity of amendment.

C. Testing of Planting Mixes:

1. Perform initial tests to confirm compliance with the Planting Mix organic matter content specifications. These test results, when approved, will establish the standard to which all other test results must conform.

D. Planting Mix Types: Provide the following Planting Mix types at the locations and depths as indicated on the Contract Drawings. Mix ratio volumes, will be established upon completion of the testing for the individual components of the Planting Mixes. The controlling factor will be the percent (%) organic matter by weight as specified for each Planting Mix. Note that volume ratios of the Base Mix and the Organic Amendment (compost) components will be, in large part, determined by the organic matter content of the compost. Follow the recommendations on mix design provided by the soil testing laboratory to achieve the target organic matter content for Planting Mix Type A.

1. Planting Soil Mix A

a. Organic Matter Content by ASTM D2974-14 Method C on material passing a U.S. Std.1/4" sieve shall be within the range of following criteria:

i. If salvaged soil mix is a loam or sandy loam, add 5-8% organic amendment by volume, or 1" thick organic amendment per top 6-8" blended into topsoil.

ii. If salvaged soil mix is a clay or clay loam, add 15-20% organic amendment by volume, or 2" thick organic amendment per top 6-8" of topsoil.

2. Based upon salvaged soil testing and soil volume requirements, Contractor shall determine if additional soils are required. Contractor, at minimum, shall assume 10% borrow materials will be required. Additional borrow soils may be required if salvaged topsoils are unsuitable for planting use. Borrow soils shall comply with the requirements listed above.

E. Planting Mix Testing: Take one (1) composite sample upon arrival to the site from each 500 cubic yards or as required by the Landscape Architect for testing each type of Planting Mix and test the following:

1. Particle size analysis: Use sieve sizes as specified for the Base Mix.
2. Organic matter content ASTM D2974-14 Method C on material passing a U.S. Std.1/4" sieve.
3. Nutrient Analysis to include phosphorus, potassium, calcium, magnesium, iron, manganese, zinc, copper and boron. Request testing laboratory recommendations for fertilizer requirements for plant types being used.
4. Soil pH and Buffer pH.
5. Cation Exchange Capacity.
6. Soluble Salt Content.

F. Stockpiling

1. General: Stockpiling on-site, off-site, and at the source should be restricted to no more than the needs of what can be used in a 72-hr. period. Under no circumstances shall on-site or off-site stored material exceed 500 cubic yards. Stockpiles should be no more than 6 feet in height to prevent anaerobic conditions within the pile. Stockpiled composts should be turned every other week (unless otherwise instructed by the Landscape Architect) to prevent anaerobic conditions excessive water absorption and anaerobic conditions.

PART 3 EXECUTION

3.1 VERIFICATION

A. Prior to construction and soil placement operations at planting areas ascertain the location of all electric cables conduits under drainage systems and utility lines. Take proper precaution so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.

B. Verify that required underground utilities are available, located, and ready for use. Coordinate with other trades.

C. Verify that all work requiring access through or adjacent to areas where plant mixes are to be placed has been completed and no further access will be required. In the event that access will be required, this must be coordinated with the Contractor.

3.2 PREPARATION & PLACEMENT OF TRANSITION LAYER

A. Prior to preparation and placement of Transition Layer the Contractor shall verify as-constructed or existing elevations and do whatever additional grading is necessary to bring the subgrade to a true, smooth slope as indicated on Drawings.

1. Clean up subgrade and dispose of all debris and garbage prior to inspection.

B. Any soils polluted by gasoline, oil, mortar and grout debris, construction debris, unacceptable soils, or other substances which would render the soils unsuitable for a proper plant growth shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes shall be reviewed and approved by the Landscape Architect.

C. Transition Layer: After acceptance of grades for plant areas, the Transition Layer shall be formed by blending the specified Planting Soil Mix with the in situ rough graded subsoils (Existing Subgrade) to a depth per the drawings in plant beds to permit soil mixing and bonding of the native soil to the Planting Soil Mix.

1. Blend specified Planting Soil Mix with existing subsoil to the depths indicated and at the approximate rate of 50% existing subsoil to 50% Planting Soil Mix.
2. Transition Layer shall be blended in situ and shall be thoroughly mixed such that the components of the Transition Layer are not individually discernible.
3. Root systems of existing plants adjacent to soil work, particularly blending of Transition Layer with native soil adjoining existing trees, shall be protected from damage to the fullest extent possible and may not be conducted when existing roots are in the immediate vicinity. All work infringing on root systems of existing plant material shall be reviewed and approved by the Landscape Architect prior to beginning work. Blending of Transition Mix with native soils immediately adjacent to existing roots may be carefully conducted by amending the soil by hand with hand tools.

3.3 PLANTING MIXTURES

A. Planting mixture for planters and plant backfill shall be of the type(s) indicated in accordance with the planting details, and shall be pre-mixed and placed as specified.

1. Bring to pH levels as specified herein for non-ericaceous plants.
2. For ericaceous plants lower the pH by using elemental sulfur product. Peat moss or copper sulfate may not be used to lower pH.

B. All amendments shall be thoroughly incorporated into the mixture to assure uniform distribution. Delay mixing of fertilizers if planting will not follow within a few days.

C. Additional amendments shall be mixed into the soil as recommended by the testing laboratory and as approved by the Landscape Architect for each plant type and condition of installation.

3.4 SITE PREPARATION FOR PLANTING SOIL MIXES

A. Do not proceed with the installation of the Soil material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on Soil for foundation support, postpone installation until immediately after the installation of Soil.

B. Install subsurface drain lines as shown on the Drawings prior to installation of Soil material.

C. Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the Drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.

D. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the drawings.

E. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

F. All subsurface drainage systems shall be operational prior to installation of Soils.

G. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use ½" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.

1. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
2. Any damage to the paving or architectural work caused by the soils installation Contractor shall be repaired by the general contractor at the soils installation contractor's expense.

H. Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

3.5 PLACING PLANTING SOIL MIXES AND GROWING MEDIA

A. Remove all large clods, lumps, brush, roots, stumps, litter, and other foreign material and stones one-half inch (1/2") in diameter or larger. Dispose of removed material legally off-site.

B. Do not place a muddy or wet soil mix (as defined by the Landscape Architect).

C. Transition Layer Conditions: Refer to Article 3.2, herein.

D. Place and spread planting soil mix of the type specified over approved subgrade or transition zone areas to a depth sufficiently greater than the depth required for planting areas so that after settlement as previously approved by Landscape Architect, the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.

E. For Plant Bed Areas:

1. Required Transition Layer depth per drawings.
2. Required Planting Soil depths shall be as indicated on drawings with a total of Planting Soil Mix(es) to be a minimum per the drawings as measured in place in a settled position.
3. Place fills lightly in layers of a maximum of six to eight inch (6-8") lifts and very carefully settle soils to eliminate air pockets and to minimize future settling. Lightly scarify previously placed surfaces prior to placing subsequent lifts. Proposed method of settlement shall be as previously approved by the Landscape Architect. Method may include, but is not limited to, natural settlement over an approved period of time or light hand-tamp, light water misting of each layer and/or light rolling. Do not over-compact Planting Soil Mixes.
4. After settlement has occurred, add soil to maintain finished grades. If for any reason soil is left exposed for a long duration prior to planting, add soil and re-grade as required if erosion occurs. Fills shall not be so compacted as to in any way restrict the flow of water or air through the soil.

F. For Lawn Areas:

1. Required Transition Layer depth shall be per drawings.
2. Required Planting Soil depth shall be as indicated on drawings with a total of Planting Soil Mix(es) to be a minimum per the drawings as measured in place in a settled position.
3. Place fills lightly in layers of a maximum of six inch (6") lifts and very carefully settle soils to eliminate air pockets and to minimize future settling. Lightly scarify previously placed surfaces prior to placing subsequent lifts. Proposed method of settlement shall be as previously approved by the Landscape Architect. Method may include, but is not limited to, natural settlement over an approved period of time or light hand-tamp, light water misting of each layer and/or light rolling. Do not over-compact Planting Soil Mixes.
4. Roll the whole surface of lawn bed with a hand roller weighing approximately one hundred pounds (100 lb.) per foot (12") of roller width. During the rolling, fill all depressions caused by settlement with additional planting soil and then re-grade. Lightly roll and rake until the surface presents a smooth, even, and uniform finish that is at required grade.
5. Allow plant mix in lawn areas to remain undisturbed until fully settled in accordance with settlement methodology submitted as approved by the Landscape Architect. After any additional settlement has occurred, restore areas to finished grade prior to sodding.

    a. Protect plant mix against construction activity with site protection fence as specified and the eroding effects of wind and rain with filter fabric as approved for the protection plan.

    b. If soils are placed in the fall, the use of winter rye will be permitted. Where winter rye is used, the rye grass shall be roto-tilled into the soil in the spring and soil preparation and rolling shall be repeated as specified.

G. Backfilling for trees in this area shall use material specified in this section but be installed as specified in Section 329310 – "Exterior Planting". Removal or shoring is the responsibility of the Contractor for Soil Preparation and Mixes.

H. Grading Tolerances: Planting areas shall be fine graded within ±1/10 (0.10) feet of grades

indicated on drawings. Maintain all flat areas and slopes to allow free flow of surface drainage without ponding.

3.6 CLEANUP

A. Legally dispose of off-site all refuse and debris from these operations. Remove or neatly store material at the end of each day's work. Burning of material or dumping on the site is prohibited.

B. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION

SECTION 329210 – TURF AND GRASSES

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Sodding.
2. Preparing subgrade.
3. Soil amendments.
4. Mulching.
5. Protecting and maintaining all sodded areas until Substantial Completion.
6. Turf renovation.
7. Erosion-control material(s).
8. Final Clean-up.

B. Related Sections:

1. Division 31 Section "Site Clearing"
2. Division 32 Section "Exterior Planting"
3. Division 32 Section “Soil Preparation and Mixes”

1.3 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

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

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top sur-

face of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

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

1.4 ACTION SUBMITTALS

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

1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
2. Mulch(s)
3. Erosion control netting
4. Commercial fertilizer

B. Samples with product data:

1. Mulch: Two (2) pound bag of each type.
2. Erosion control netting: 12" x 12" piece.

C. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

E. Product Certificates: For soil amendments and fertilizers**,** from manufacturer.

1. Commercial Fertilizers: Include guaranteed analyses.
2. Ground Limestone: Include guaranteed analysis, and weight for packaged material.

F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

G. Schedule and Work Plan: Submit detailed schedule and Work plan, indicating location and installation dates for each area of lawn.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: **Five** years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:

    a. Certified Landscape Technician - Exterior, with installation specialty area(s), designated CLT-Exterior.
    b. Certified Turfgrass Professional, designated CTP.
    c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.

5. Maintenance Proximity: Not more than **two** hours' normal travel time from Installer's place of business to Project site.
6. Pesticide Applicator: State licensed, commercial.

B. Preinstallation Conference: Conduct conference at Project site.

C. Installer: Perform work with personnel totally familiar with lawn construction under the supervision of an experienced landscape foreman at all times during the construction. Notify the Landscape Architect of the name and phone number of the foreman five (5) business days in advance of the first day of lawn construction.

D. Arrange a preconstruction meeting between the Landscape Architect, General Contractor and Lawn Subcontractor. Such meeting shall seek to review the lawn construction schedule, phasing, review of specifications and construction procedures.

1.7 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to and ingress and egress at the site. Conform to all governmental regulations regarding the transportation of materials.

C. Procure and pay for permits and licenses required for Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

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 fertilizers and soil amendments with appropriate certificates.

1.9 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

1. Sodding

a. Spring: April 1 to June 15.

b. Fall: September 1 to October 15.

c. Sodding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted in writing by the Owner. Newly sodded areas, if sodded out of season, must be continuously watered according to good practice if sodding is done between June 15 and August 15. Contractor shall be responsible for providing an acceptable stand of grass as specified.

B. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.

2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or in layout as furnished by the Landscape Architect, inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

C. 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. Do not place sod when the ground is frozen, or the soil is otherwise in an unsatisfactory condition for lawn construction.

1.10 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following peri-

ods:

1. Sodded Turf: 30 days from date of Substantial Completion.

1.11 INSPECTION FOR SUBSTANTIAL COMPLETION

A. Refer to Division 01 Specification Sections for provisions regarding guarantees for the Work.

B. Maintain all lawn areas until Substantial Completion. Maintenance will be in accordance with requirements specified in Part 3 of this Section.

C. The Landscape Architect will make an inspection for Substantial Completion of the Work of this Section at the time of Substantial Completion of the entire Contract. The Contractor shall furnish a full and complete written program for maintenance of the lawns for review by the Landscape Architect at the time of the request for Substantial Completion.

1. Submit a written request for inspection at least two (2) weeks prior to the day on which the inspection is requested.

2. The Contractor shall prepare a list of items to be completed or corrected for review by the Landscape Architect, prior to inspection.

3. All lawns shall show a uniform, thick, well developed stand of grass. If the grass stand is unsatisfactory, as determined by the Landscape Architect, the Contractor's maintenance responsibility shall continue until an acceptable stand of grass is achieved.

D. Upon completion of the inspection, the Landscape Architect shall amend the list of items to be completed or corrected, and indicate the time period for their completion or correction.

E. Lawns will not be accepted until all items have been completed or corrected. The Landscape Architect, after an additional inspection, shall recommend in writing the Substantial Completion of the Work of this Section. The Contractor's responsibility for maintenance shall terminate, under issuance of a certificate of Substantial Completion for the entire Contract.

1.12 GUARANTEE

A. In addition to the specific guarantee requirements of the General Conditions and Supplementary General conditions, the Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Mixture: Sod of grass species as follows, majority of seed to be Turf Type Tall Fes-

cue (3 varieties min.) with remaining volume of seed to be Perennial Rye Grass, Kentucky Blue Grass, and/or Fine Fescue depending on sod farm.

Seed Type	*Proportion by Weight*	*Minimum Purity*	*Minimum Germination*
Turf-Type Tall Fescue (3 Varieties Min.)	***60%***	***95%***	***80%***
Perennial Rye Grass	***30%***	***95%***	***85%***
Kentucky Blue Grass	***10%***	***90%***	***80%***

C. Sod shall be thick, well developed, machine cut strips 3/4-inch thick, from an approved sod farm. Individual sod pieces shall be cut to a uniform size with square corners. Standard sections shall be strong enough to support their own weight when held vertically. Each piece shall be uniformly moist, and not excessively dry or wet.

D. Sod shall be free from noxious weeds, annual grasses, moss, large stones, tree roots, or other materials harmful to growth, or that will interfere with future mowing or other maintenance of the sodded areas.

E. Pegs where required for holding sod shall be of approved sound soft wood and be at least 3/4 inch in thickness, square or round, and at least 8 inches long.

F. Sod shall be harvested, delivered and installed within a period of 48 hours. Sod not installed within this period must be approved by the Landscape Architect prior to installation.

2.2 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil

reports from a qualified soil-testing laboratory.

2.3 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

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

1. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 6 inches (150 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.

a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

2. Spread planting soil to a depth of 8 inches (200 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately 3 inches of planting soil over loosened subgrade. Mix thoroughly into top 3 inches of subgrade. Spread remainder of planting soil.

b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

2. Loosen surface soil to a depth of at least 8 inches (200 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches (100 mm) of soil. Till soil to a homogeneous mixture of fine texture.

3. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

A. Sodding shall consist of soil preparation, sodding, weeding, watering and otherwise all labor and materials necessary to secure the establishment of acceptable turf.

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

C. After soil mix has been placed and grading is complete, irrigate the soil mix bed twelve to twenty-four (12-24) hours prior to sodding to a depth making the lawn mix evenly moist. Sod shall not be laid on soil that is powdery dry or excessively moist or slippery.

D. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

E. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Do Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.

2. Anchor sod on slopes exceeding 1:3 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

F. Tamp the sod lightly to ensure good contact with the soil surface. When laying is completed, dress top surface lightly with screened soil mix free of any material larger than one-half inch, which shall be worked into the seams between the pieces with a brush. When finished, the sod should present a smooth and uniform surface parallel to the finish grade.

G. Water all sod areas immediately following its installation so that the sod surface and lawn mix surface are thoroughly soaked. Cut and maintain established sod in accordance with the requirements contained herein.

3.5 TURF RENOVATION

A. Renovate existing turf as indicated on the Drawings.

B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.

2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as re-

quired. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

J. Apply sod as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.6 TURF MAINTENANCE

A. Maintenance shall begin immediately after each portion of lawn is installed. Maintenance is hereby defined as: re-sodding , repair of ruts and erosion, regarding, repair of protective devices, watering, weeding, fertilizing, cutting and the repeating of any or all phases of lawnwork construction as required to establish healthy, viable turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.

2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Lawnwork shall be maintained on daily basis, weekends and holidays excluded, except as otherwise required herein, until Substantial Completion.

D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow **turf-type tall fescue** to a height of 2 to 3 inches (50 to 75 mm).

E. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.7 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Landscape Architect:

1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Scattered bare or dead spots, none of which are larger than 36 square inches, will be allowed up to a maximum of two percent (2%) of any lawn area after initial installation. After the grass has been established, all areas which fail to show a uniformly thick and well developed stand of grass and all scattered base or dead spots, for any reason whatsoever, shall be resodded or re-seeded repeatedly until all areas are covered with a satisfactory growth of grass. Lawn areas shall show no joints or dead spots at Substantial Completion and shall be anchored to lawn mix bed with vigorous, healthy root growth. Prior to Substantial Completion, damage resulting from erosion, gulleys, washouts or other causes shall be repaired by filling with lawn mix, tamping, re-fertilizing and re-sodding.

C. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.8 PROTECTION OF LAWN AREAS

A. Protect all lawn areas continuously against damage with a fence as specified. Maintain continuously in a condition acceptable to the Landscape Architect. Remove fence and any protective devices remaining on site after Substantial Completion unless directed otherwise by the Landscape Architect.

B. Contractor shall pay cost of replacement of lawn areas except where it can be definitely shown that the loss resulted from vandalism or deleterious effects caused by maintenance procedures performed by the Owner without the concurrence of the Contractor. Fully restore all lawn areas, damaged or disturbed by replacement or repair operations to their original condition.

3.9 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.10 WATERING

A. The Contractor shall provide all labor and arrange for all watering necessary for establishment of lawn areas. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary and in sufficient quantities to maintain moist soil to a depth of at least four (4)

inches.

3.18 CLEANUP AND PROTECTION

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

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

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

D. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to inspection of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION 329210

SECTION 329310 - EXTERIOR PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Furnishing and installing trees
2. Tree stabilization
3. Mulching
4. Fertilizing
5. Guarantee
6. Maintenance
7. Clean-up

B. Related Sections:
1. Division 31 Section “Tree Protection and Arboriculture”.
2. Division 31 Section “Excavation”.
3. Division 31 Section “Fill and Backfill”.
4. Division 32 Section “Soil Preparation and Mixes”.
5. Division 32 Section “Turf and Grasses”.

1.3 DEFINITIONS

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

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than 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.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

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

I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

L. Planting Area: Areas to be planted.

M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

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

Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

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

1.4 REFERENCES

A. ASNS: "American Standard for Nursery Stock," ANSI Z60.1 latest edition, published by the American Association of Nurserymen, (AAN).

B. SPN: "Standardized Plant Names," latest edition, by the American Joint Committee on Horticultural Nomenclature.

C. Agricultural chemist: Qualified, experienced public or private soils testing laboratory, capable of providing test results as specified, and approved by the Landscape Architect.

1.5 ACTION SUBMITTALS

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

1. Approval by the Landscape Architect of submitted product data, samples, test reports, and certificates, or plants inspected at source of supply, does not constitute final acceptance.
2. Plant sources: Submit proposed sources for all plants within 60 days of award of contract. Provide name and location of nursery, contact person, and telephone number.
3. Commercial fertilizer: include guarantee analysis, and weight for packaged materials.
4. Herbicides, pesticides and fungicides: include safety information.
5. Anti-dessicant

B. Samples for Verification: For each of the following:

1. Organic Mulch: 1-pint (0.5-liter) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
2. Root Barrier: Width of panel by 12 inches (300 mm).

C. Test Reports: Submit certified reports by an agricultural chemist. Make submittals at least three (3) weeks prior to delivery of materials to site.

D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Plants: Furnish certificates of inspection as may be required by Federal, State or other authorities that plants are free of disease or hazardous insects.

E. Schedule and Work Plan: Submit detailed schedule and Work plan, indicating start and finish dates of planting activities, including layout, soil preparation, delivery of plants from nursery sources, excavation, and installation. If planting work is being installed in phases, submit plan with definable areas outlined and keyed, and provide schedule for planting work within each area.

F. Maintenance Program: Submit full and complete written program for maintenance of the planting. Submit prior to inspection for substantial completion.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: **Five** years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's shall have certification in one of the following categories from the National Association of Landscape Professionals:

    a. Certified Landscape Technician - Exterior, with installation specialty area(s), designated CLT-Exterior.
    b. Certified Ornamental Landscape Professional, designated COLP.

5. Pesticide Applicator: State licensed, commercial.

B. Plants: Meet or exceed applicable ANSI Z60.1 standards.

1. Plant List: Investigate sources of supply prior to submitting bid. Confirm that size, variety and quantity of plants specified on Plant List can be supplied. Failure to take this precaution will not relieve the successful bidder from his responsibility for furnishing and installing all plants in strict accordance with the Contract requirements and without additional expense to the Owner.

    a. Substitutions will not be permitted unless substantiated written proof is supplied that a specified plant is not obtainable. In this situation a proposal to use the nearest equivalent size or variety with an equitable adjustment of Contract Price will be considered.

2. Trees and Shrubs: Measure according to ANSI Z60.1. Do not prune to obtain required sizes. Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.

3. Other Plants: Measure with stems, petioles, and foliage in their normal position.

C. Landscape plantings will conform to the following standards:

1. General standards for Landscape Plantings:
    a. Trees:
        1) Canopy Trees:
            i. Sizes: All canopy trees will be a minimum 2-1/2” caliper size, unless otherwise requested or authorized by Philadelphia Parks and Recreation. All trees must conform to ANSI Z60 standards for nursery stock, latest edition.

            ii. Condition: The central leader and branches will be free of breakage or damage. Trees that are suckering before installation will be rejected.

iii. Mulch: All canopy trees should be covered with 3-4” of brown, doubled ground hardwood mulch, where applicable.

iiii. Planting Procedure: Comply with the latest International Society of Arboriculture recommendations.

2) Ornamental Trees:

i. Sizes: All understory/ornamental trees will be installed at a minimum of size of 6’ tall, unless otherwise requested or authorized by Philadelphia Parks and Recreation. All trees must conform to ANSI Z60, latest edition.

ii. Condition: The central leader (crown in the case of multi-stem trees) will be free of breakage or damage. Trees that are suckering before installation will be rejected.

iii. Mulch: All canopy trees should be covered with 3-4” of brown, doubled ground hardwood mulch, where applicable.

iiii. Planting Procedure: Comply with the latest International Society of Arboriculture recommendations.

D. Arrange a preconstruction meeting between the Landscape Architect, General Contractor and Planting Subcontractor. Such meeting shall seek to review the proposed plant schedule, source of plants, consideration of substitutions, general review of specifications and planting procedures.

1. Notify the Landscape Architect of the name and phone number of the foreman five (5) business days in advance of the first day of planting operations.

1.8 PLANT SELECTION AND INSPECTION

A. Landscape Architect will inspect and select all plants at the source of supply for compliance with requirements for genus, species, variety, cultivar, size, and quality. Locate all plants and be present for inspection of plants at the source. Make all pre-selection arrangements at the source of supply to insure a ready supply of materials, equipment and man power required for an efficient selection procedure. Request the visit a least fourteen (14) days in advance of the desired inspection date.

B. Plants will be inspected and approval given by the Landscape Architect at the source for conformity to Specification requirements. 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 delivery and installation. Remove rejected trees or shrubs immediately from Project site.

C. All plants specified as ball and burlap (B&B) must be in the ground at the growing source at the time of inspection. Pre-dug material will not be accepted.

D. Arrange for adequate manpower and equipment on site at the time of plant inspection and installation to provide a complete staked layout and to unload, open and handle plants during inspection.

1.9 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened clearly marked containers showing net weight, guaranteed analysis and name of manufacturer. Specified requirements for packaged materials apply to bulk shipments. Protect materials from deterioration during delivery and during storage at site. Upon delivery to the site, request, in writing, inspection of materials by Owner's representative and by Landscape Architect.

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 fertilizers and soil amendments with appropriate certificates.

C. Plants:

1. Notify the Landscape Architect seven (7) days in advance of any delivery of plants to the site.
2. Immediately before moving plants from its source, spray all deciduous plants with an anti-dessicant, applying an adequate film over trunks, branches, twigs and foliage. Plants may be resprayed after planting.
3. Dig and handle plants with care to prevent injury to trunks, branches and roots. Handle planting stock by root ball.
4. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
5. Do not prune prior to delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Pack and ship to insure arrival at site in good condition. Provide protective covering during delivery. No plants will be accepted if ball is cracked or broken.
6. Deliver trees and shrubs after preparations of planting areas have been completed and approved and plant immediately.

    a) If planting is delayed more than twenty-four (24) hours after delivery, set balled and burlapped plants in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage and keep roots moist, on the ground well protected with soil, straw, hay or other acceptable material. Adequately cover all roots of bare root material with soil, wet straw, hay or other acceptable material. Protect balls and roots and container grown material from freezing, sun, drying winds, and/or mechanical damage. Water as necessary until planted.
    b) Heeling in of plants shall not be allowed for more than two (2) days without approval of the Landscape Architect.

7. Immediately remove rejected plants from the site.
8. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.
9. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other

acceptable material.

10. Do not remove container-grown stock from containers before time of planting.
11. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.10 PROJECT CONDITIONS

A. Existing Conditions

1. Carefully examine the site before submitting a bid. Be informed as to the nature and location of the Work, general and local conditions including climate, adjacent properties and utilities, conformation of the ground, the nature of subsurface conditions, the character of equipment and facilities needed prior to and during execution of the Work.
2. Should the Contractor, in the course of Work, find any discrepancies between Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Landscape Architect, it will be his duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

B. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Landscape Architect and Owner no fewer than two days in advance of proposed interruption of each service or utility.
2. Do not proceed with interruption of services or utilities without Owner's written permission.

D. Planting Restrictions: Plant only within the following dates, weather permitting. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion. Do not plant when the ground is frozen, or the soil is otherwise in an unsatisfactory condition for planting.

1. Plant ground covers and balled and burlapped broadleaf evergreens in the spring only, between April 1 and June 30.
2. Plant balled and burlapped deciduous trees and needled evergreen trees and shrubs and container grown trees and shrubs between April 1 and June 15 and September 1 and November 15.
3. The following plants are listed in three groups according to lessening degrees of risk for fall planting. The list is not based on controlled experiments, but on years of observation by nursery men. Planting at times other than spring shall be done at Contractor's risk, and shall not relieve him of the obligation of Guarantee.

    a. Plants with significant risk of loss. Best to postpone planting the following plants until spring:
        1). Carpinus spp., hornbeams
        2). Cercis Canadensis, eastern redbud
        3). Chamaecyparis nootkatensis, nootka cypress

4). Koelreuteria paniculata, golden-rain tree
5). Liriodendron tulipifera, tulip tree
6). Magnolia spp., magnolias
7). Nyssa sylvatica, black gum
8). Populus spp., poplars
9). Quercus alba, white oak
10). Quercus coccinea, scarlet oak
11). Quercus macrocarpa, bur oak
12). Quercus phellos, willow oak
13). Quercus robur, English oak
14). Quercus rubra, red oak
15). Zelkova serrata, Japanese zelkova

b. Plants with some degree of risk. The following plants can be transplanted if stock is freshly dug and moved quickly and carefully. Stake, wrap, and provide extra care.
1). Acer rubrum, red maple
2). Betula spp., birches
3). Cornus florida, flowering dogwood
4). Crataegus spp., hawthorns
5). Prunus spp., stone fruits (peach, cherry, etc.)
6). Pyrus calleryana, Callery pear
7). Salix spp., willows (tree forms)
8). Tilia tomentosa, silver linden

c. Plants not at great risk, but avoid late planting. These are best planted in late August or September: they may have trouble if planted later.
1). Berberis julianae, wintergreen barberry
2). Cotoneaster salicifolius, willowleaf cotoneaster
3). Hedera helix, English ivy
4). Ilex crenata, Japanese holly
5). Pinus thunbergiana, Japanese black pine
6). Rhododendron spp., rhododendrons and azaleas, evergreen types
7). Tsuga canadensis, Canada hemlock
8). Viburnum rhytidophyllum, leatherleaf viburnum

4. Plant shrubs in the spring only, when dormant, as close to April 1 as possible.
5. Plant perennials as soon as the ground is workable in spring until November 15.

E. 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.

F. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.11 INSPECTION FOR SUBSTANTIAL COMPLETION

A. Maintain all plants until Substantial Completion.

B. The Landscape Architect, with the Contractor and the Owner's Representative, will make an inspection for Substantial Completion of the Work of this Section. Furnish full and complete written program for maintenance of the planting for review by the Landscape Architect at the time of the request for Substantial Completion.

1. Submit a written request for inspection at least **two (2)** weeks prior to the day on which the inspection is requested.
2. All planting shall be alive, healthy and installed as specified to be accepted.
3. Prepare a list of items to be completed or corrected for review by the Landscape Architect.

C. Upon completion of the inspection, the Landscape Architect shall amend the list of items to be completed or corrected, and indicate the time period for their completion or correction.

D. The Landscape Architect will make another inspection after notification from the Contractor that all items have been completed and corrected. If the work is complete and acceptable, the Landscape Architect will certify in writing to the Owner the Substantial Completion of the Work. The guarantee period will not begin until certification is received from the Owner.

1.12 GUARANTEE

A. Contractor is not responsible for acts of vandalism occurring after the beginning of Guarantee Period, nor shall Contractor be held responsible for deleterious effects caused by maintenance procedures performed by the Owner without the concurrence of the Contractor or caused by Owner's failure to follow maintenance program.

B. During this time the Owner shall maintain all plants; however, during the Guarantee Period it shall be the Contractor's responsibility to inspect the plants to satisfy himself that the areas are receiving proper care.

1. If the Contractor is of the opinion that the care being given the plants by the Owner is insufficient or may cause them to die prematurely, he shall immediately, and in sufficient time to permit the condition to be satisfactorily rectified, notify the Landscape Architect in writing; otherwise no consideration will be given to his claim at a later date.

C. Guarantee for plants other than herbaceous material:

1. Replace at no additional cost for a period of one (1) year after the establishment of the beginning date of Guarantee Period, any trees, shrubs, or ground covers that have died or that are, in the opinion of the Landscape Architect, in unhealthy or unsightly condition, or that have lost their natural shape due to dead branches, excessive pruning, excessive defoliation, or inadequate or improper maintenance.

    a. Replace unacceptable plants no later than the next succeeding planting season.
    b. Replace unacceptable plants in accordance with original Specification. Cost is considered to be included in the Bid and Contract price. Guarantee all replaced material for a period of one (1) year from date of replacement.

D. Guarantee for herbaceous plants

1. Perennials, Bulbs and Aquatics

    a. Guarantee to show signs of healthy growth in the succeeding blooming season.

1.13 FINAL ACCEPTANCE

A. The Owner's Representative will make an inspection for Final Acceptance of the Work of this Section at the end of the Guarantee Period.

1. Submit a written request for inspection at least two (2) weeks prior to the day on which the inspection is requested.
2. All planting shall be alive, healthy and maintained as specified to be accepted.

B. Upon completion of the inspection, the Owner's Representative will submit to the Owner a list of items to be completed or corrected, and indicate the time period for their completion or correction.

C. The Final Acceptance will not occur until all items have been completed or corrected. The Owner's Representative after additional inspection, will recommend in writing to the Owner Final Acceptance of the Work. Final Acceptance will be certified in writing by the Owner.

1.14 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: **12** months from date of **Substantial Completion**.

B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: **Six** months from date of **Substantial Completion**.

C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 PLANTING PIT MATERIALS

A. Soil and Soil Mixes: See Division 32 Section – "Soil Preparation and Plant Mixes".

2.2 COMMERCIAL FERTILIZER (for maintenance period)

A. Soluble fertilizer, with analysis of 20-20-20 or 23-29-27, such as Ra-Pid-Gro or an approved equal for non-ericaceous plants, unless otherwise recommended by soil test results.

B. Miracid, or an approved equal, for ericaceous and other evergreen plants, unless otherwise recommended by soil test results.

2.3 WATER

A. Potable, clean, fresh and free from harmful materials. Water shall be furnished by the Owner. All hoses and other irrigation equipment required for the Work shall be furnished by the Contractor.

2.4 PLANTS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
3. Nomenclature: Agree with SPN or as accepted in the nursery trade for varieties not listed therein.

a) Clonal types shall be true.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

2.5 MULCH MATERIALS

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Double Ground Hardwood Mulch.
2. Color: Natural.

2.6 ROOT BARRIERS

A. Root Barrier: Black, molded, modular panels 18 inches (457 mm) high (deep); manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.

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. DeepRoot UB 18-2
b. NDS EP-1850

2.8 PLANT TREATMENT MATERIALS

A. Herbicides, Fungicides, Pesticides: Approved before use for type and rate of application by Landscape Architect and local, state and/or federal agencies with jurisdiction.

B. Anti-dessicant: "Wiltproof" as manufactured by Wiltproof Products, Inc., P.O. Box 4280, Greenwich, Ct. 06830, 203-531-4740.

PART 3 - EXECUTION

3.1 EXAMINATION OF SITE

A. Prior to excavation of planting areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines. Take proper precautions so as not to disturb or damage sub-surface elements. If sub-surface elements are uncovered, promptly notify the Landscape Architect, who will relocate the plants. If Contractor fails to follow this procedure he is responsible for making requisite repairs to damaged utilities at his own expense.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAYOUT

A. Stake out locations for new plants and outlines of planting areas for approval by the Landscape Architect where shown on Drawings except where obstructions exist below ground, overhead, or where changes have been made during construction. Adjustments shall be approved by the Landscape Architect. Completely layout of planting beds and pits before seeking approval by the Landscape Architect.

3.4 INSTALLATION

A. Excavation: All plant pits and trenches shall be excavated in accordance with the Planting Details after approval of staked locations by the Landscape Architect. Excavation of plant pits shall be done after soil testing, and analysis and approval by the Landscape Architect.

B. Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate as indicated on the Drawings for balled and burlapped stock.
2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
8. When compacted soil is encountered, sides and bottoms shall be loosened by scarifying.
9. Exercise extreme caution during excavation to avoid damaging or interrupting existing underground utilities. Use appropriate detection equipment to locate utilities during excavation of pits to the required depth.
10. Erect barricades, warning signs, or other protective devices as is required by local, state or federal laws and regulations to protect open excavation.
11. Excavated material shall be removed and disposed off-site, unless approval, in writing, has been obtained from the Landscape Architect.

C. Subsoil and topsoil removed from excavations may be used as planting soil.

D. Drainage of Pits

1. Verify by testing that pits are free draining. If pits are not free draining notify Landscape Architect and Owner and submit alternative method of drainage for approval.

    a. Check planting drainage system to insure it is functioning correctly prior to planting. Refer to Drawings for layout and design of planting drainage system.
    b. Do not put plants in pits until the pits have been approved by the Landscape Architect.

E. Obstructions Below Ground

1. In the event that rock, underground construction work, utilities or obstructions are encountered in any plant pit excavation work under this Contract, alternate locations may be selected by the Landscape Architect.
2. Where locations cannot be changed, the obstruction shall be removed, subject to the Landscape Architect's approval, to a depth of not less than three (3) feet below grade and no less than six (6) inches below bottom of ball or roots when plant is properly set at the required grade. Payment shall be made in accordance with the Contract.

F. Placement of Plants

1. Plants shall be set in center of pits plumb and straight, in accordance with the planting details, and faced to give best appearance and relationship to adjacent plants and structures.
2. Do not plant until plants has been approved by the Landscape Architect at site.
3. Plant to such depth that the finished grade level of the plant, after settlement, will be the same as that at which the plant was grown, and so that the root flair is at finish grade.
4. Do not pull burlap out from under balls. Remove platforms, wire and surplus binding

from top and sides of ball. Cleanly cut off all broken or frayed roots.

5. Remove plants from containers by cutting or inverting the container.
6. Set the bare root plants in the pit so that all roots, when fully extended, will not touch the walls of the planting pit and the uppermost roots are just below the original grade. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

G. Set **balled and potted** stock plumb and in center of planting pit or trench with root flare 2 inches (50 mm) above adjacent finish grades.

1. Use planting soil Mix A for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

H. Backfilling

1. Use planting soil Mix A for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Spread out the roots of bare root plants properly and work backfill mix among them. Prune off broken roots in a natural position. Water thoroughly while backfilling.
5. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.

    a) Continue backfilling process. Water again after placing and tamping final layer of soil.

I. Installation Inspection

1. The Landscape Architect will inspect trees for injury to trunks, evidence of insect infestation and improper pruning before wrapping. Treat injuries of infestation by accepted methods. Remove and replace plants determined by the Landscape Architect to have injuries or infestations which cannot be treated or which have caused unacceptable damage to the plant.
2. Trees shall stand plumb after staking or guying.

3.5 TREE PRUNING

A. Prune, thin, and shape trees as directed by Landscape Architect.

1. Remove broken or badly bruised branches with a clean cut. Perform pruning with clean, sharp tools.
2. Accidental damage to trees and shrubs occurring during the course of planting operations which is not so great as to require removal of a branch or the replacement of the plant shall be promptly traced and treated in accordance with recognized horticultural practices as directed by the Landscape Architect.

D. Do not apply pruning paint to wounds.

3.6 TREE STABILIZATION

A. Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Use two stakes for trees up to 12 feet (3.6 m) high and 2-1/2 inches (63 mm) or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches (100 mm) in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.7 ROOT-BARRIER INSTALLATION

A. Install root barrier where trees are planted within 48 inches (1200 mm) of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.

B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of 60 inches (1500 mm) in each direction from the tree trunk, for a total distance of 10 feet (3 m) per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier flush with finish grade.
2. Overlap root barrier a minimum of 12 inches (300 mm) at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.8 GROUND COVER AND HERBACEOUS PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.

B. Use planting soil Mix A for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb

the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

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

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 3-inch to 4-inch average thickness, with 24-inch (600-mm) radius around trunks or stems. Do not place mulch within 6 inches (150 mm) of trunks or stems.
2. Organic Mulch in Planting Areas: Apply 3-inch to 4-inch average thickness of organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place within 6 inches (150 mm) of trunks or stems.

B. Shovel-Cut Edging: Separate mulched areas from turf areas and paving with a 45-degree, 4- to 6-inch- (100- to 150-mm-) deep, shovel-cut edge.

3.10 MAINTENANCE PRIOR TO SUBSTANTIAL COMPLETION

A. Immediately begin maintenance after each plant is planted. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected until Substantial Completion. Tree turnbuckles and stakes shall be tightened and repaired as required. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed.

B. Upon completion of planting, and prior to Substantial Completion, remove from site excess soil and debris and repair all damage resulting from planting operations.

C. As part of maintenance, provide protection and extermination measures against gophers, rabbits, or other rodents, and repair damage caused by their activities.

D. Adjust irrigation systems as required.

E. Do no pruning without approval of the Landscape Architect.

F. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

3.14 MAINTENANCE DURING GUARANTEE PERIOD

A. Perform procedures set forth in the submitted and approved maintenance program for the duration of the Guarantee Period. The program based on the requirements of the Specification must be approved by the Landscape Architect and Owner.

B. Herbaceous Plants

1. Perennials

a. After initial installation:

1) If a time-released, high-phosphate fertilizer has been incorporated during plant installation, no more fertilizer need be applied the first growing season.

b. The following year:

1) Fertilize 3 times (May 1, May 21, June 15) using one of the following methods: Apply liquid fertilizations of 20:20:20 water soluble fertilizer (not to exceed 1 lb. of 20:20:20 per 100 gal. of water). Or, apply 1-1/2 lbs. of 10:10:10 or 5:10:10 granular fertilizer per 100 sq. ft. Or, apply fish emulsion as a liquid spray following manufacturer's recommendations.
2) Cut spent leaves and stems of deciduous perennials flush to ground by March 1 (if not done previous fall) to allow new growth to develop freely.
3) Mulch once in early spring (1 inch deep) and again in fall (1 inch deep).
4) Inspect for insect or disease problems.
5) Weed perennial bed.
6) Prune to make bushier plants, as needed. Cut back after flowering if approved by Landscape Architect.

c. The following fall:

1) Cut back deteriorating plant parts.

3.15 CLEAN UP AND DISPOSAL

A. Legally dispose of off-site all refuse and debris from these operations. Remove or neatly store material at the end of each day's work. Burning of material or dumping on the site is prohibited.

1. Maintain segregation of man-made materials, debris, organic matter, and soil material as may be required for conditions of disposal.
2. Transport materials over legal haul routes and obtain necessary permits for transporting and disposal as required by Federal, State and local regulations.
3. Removals at Completion: Remove all temporary preparation and protection measures installed on Project site at completion of Work and at a time approved by Landscape Architect.

B. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, "broom clean".

END OF SECTION