

SECTION 321540 – STABILIZED STONE SCREENING PAVING

PART 1 – GENERAL

1.1 SUMMARY

- 1 Work included: The work required under this section consists of Stabilized Stone Screenings Paving Work and related items necessary to complete the work indicated on drawings and described in Specifications, including, in general, but not limited to the following.
 1. Supply and installation of sub-base material as specified
 2. Supply and installation of stabilized screenings paving
 3. Supply and installation of filter fabric

1.2 RELATED WORK

1. Earthwork - Section 313000
2. Aluminum Edging

1.3 REFERENCES

- 1 The following standards and definitions are applicable to the work of this Section to the extent referenced herein:
 1. Standard Specifications: Highway Department, Standard Specifications for Highways and Bridges, latest edition.
 2. ASTM: American Society for Testing and Materials.
 3. AASHTO: American Association of State Highway and Transportation Officials.

1.4 SUBMITTALS

- 1 Submittals shall conform to the provisions of the General Conditions and as specified herein. Do not order materials until submittals are approved.
- 2 Samples
 - 1 Submit samples of the following to the Architect or Engineer:
 - 1 Stabilizer;
 - 2 Crushed Aggregate for Stone Screenings top course; not less than four samples from approved sources.
 - 2 As directed by the Landscape Architect, submit a sample of not less than 3 lbs. of the Stone Screenings as approved by the Landscape Architect to local representative for Stabilizer Solutions Inc.: Ralph Crosby RLA, 54 Croton Terrace, Yonkers, NY 10701, tel. 914-476-8773, fax 914-476-

1625 for approval. If required submit an additional sample of not less than 3 lbs. of the Stone Screenings as approved by the Landscape Architect to stabilizer Solutions Inc. 205 South 28th Street, Phoenix, Arizona 85034, tel. 1-800-336- 2468., for testing. The test will provide information of the appropriate quantity of Stabilizer to be used per ton of aggregate.

3 Materials used in the work shall conform to approved samples.

3 Product data:

- 1 Submit certified sieve analysis of Crushed Aggregate for Stone Screenings.
- 2 Submit certified sieve analysis of Base Course
- 3 Provide manufacturer's data on Stabilizer
- 4 Provide manufacturer's data on Herbicide
- 5 Provide manufacturer's data for Filter Fabric

4 Test panels:

- A. Lay one test panel, not less than 5' x 5', of stabilized screening paving for Landscape Aggregate for strength and color. Architect's approval before commencing work. If required to meet Landscape Architect or Engineer's approval, lay additional panels as needed.

5 Mixes: Submit written proposals for Stabilized screening base and top course mixes.

6 Certification: Submit certification in writing that 'Stabilizer' materials and quantities used in mix are as specified.

1.5 GUARANTEES:

1. Contractor shall certify that the materials used and the installation of stabilized screenings are in accordance with 'Stabilizer' manufacturer's recommendations.
2. Guarantee the materials and workmanship against all defects for a period of one year, and further guarantee that pavement will have a solid foundation, will not settle unevenly, and that the pavement, when completed, will not show any noticeable stains or marks.
3. Product Data and Test Reports: Provide testing laboratory data to indicate that the materials delivered meet specifications.

1.6 PROJECT / SITE CONDITIONS:

1. Environmental Limitations: Do not install Stabilized Aggregate during rainy conditions or below 40 degrees Fahrenheit and falling.

1.7 QUALITY ASSURANCE:

1. Installer Qualifications: Installer to provide evidence to indicate successful experience in providing Stabilized Aggregate surface.
2. Compaction testing to be provided by contractor, one test per 2,000 square feet of base course.
3. Manufacturer's technical representative shall visit the site at the start of an installation to ensure the installer understands the correct installation methods to use.

1.8 WARRANTY:

A. Stone Screening Pavement:

1 General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

2 Special Warranty:

1 Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

2 Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

3 Special Warranty: Submit a written warranty executed by the installer agreeing to repair or replace components of Stabilized Aggregate that fail in materials or workmanship within the specified warranty period. Stabilizer Solutions, Inc. does not warranty "Stabilizer®" purchased from a non-approved Stabilizer Solutions, Inc. licensee. Failures include, but are not limited to, the following:

1. Premature wear and tear, provided the material is maintained in accordance with manufacturer's written maintenance instructions.

B. Aluminum Edging: (as manufactured by Permalok or equal)

A. 15-year limited material warranty for aluminum restraint edging from manufacturing defects in workmanship or material.

PART 2 – PRODUCTS

2.1 BASE COURSE

1 Base Course: Shall conform to the requirements for crushed stone as specified in Section 313000 - Earthwork

2.2 STONE SCREENINGS

1 Crushed Aggregate Cover Stone Screenings: Shall consist of inert materials that are hard, durable, sharp-edged fragments, free from surface coatings, dirt or other deleterious matter, graded within the following limits:

U.S. Sieve No. (Dry Analysis)	Percent Passing by Weight
# 1/2"	95 – 100
# 3/8"	90 – 100

# 4	65 – 80
# 8	48 – 63
# 16	40 – 49
# 30	30 – 40
# 50	20 – 27
# 100	10 – 18
# 200	10 - 12

Supplier to be Tilcon New York Inc., 162 Old Mill Road, West Nyack, New York 10994 or approved equal. Stone screenings to be locally sourced within 500 miles. Color of aggregate shall be gray selected by the Architect/Engineer from full range of available regional aggregates.

2.3 STABILIZER AGGREGATE BINDER

- 1 Stabilizer: The soil additive shall be "Stabilizer" as manufactured by Stabilizer Solutions, Inc., 4832 East Indian School, Phoenix, Arizona 85018, tel. 1-800-336-2468. LOCAL REPRESENTATIVE: Ralph Crosby, Yonkers, NY Tel. 914 476 8773.

IMPORTANT NOTE: The correct mixing, proportions and installation of the Stabilizer material is critical to ensure satisfactory installation. Unless the Contractor has prior experience with this material he should contact the manufacturer or manufacturer's local representative to determine correct procedures for this application.

2.4 FILTER FABRIC

Filter Fabric shall be Mirafi 500X, as manufactured by Mirafi Inc., P. O. Box 240967, Charlotte, NC 28224, tel. (800) 438-1855, or approved equal.

2.5 HERBICIDE

Herbicide shall be Treflan, as manufactured by Dow AgroSciences LLC, 9330 Zionsville Road Indianapolis, IN 46268, Telephone: +1 800-258-3033 or approved equal.

2.5 ASPHALT RESTRAINT EDGING

- A. Product: Permaloc AsphaltEdge or equal, with 0.210 inch (5.33 mm) thick exposed top lip x 3" (76mm) high x 8 feet (2.44 meters) long, extruded aluminum, alloy 6005, T-5 hardness as manufactured by Permaloc Corporation, Holland MI 49424, telephone (800) 356-9660 or (616) 399-9600. Horizontal base to have upward facing angle profile designed to integrate restraint and asphalt surfaces for straight-line and curvilinear applications. Section shall have holes in base spaced 4 inches (102 mm) apart along its length to receive anchors.
- B. Connection Method: Section ends shall splice together with horizontal 0.060 inch (1.52 mm) thick x 1 inch (25 mm) wide, or 0.530 inch (13.5 mm) wide for 1 inch (25 mm) high edging x 4 inches (102 mm) long aluminum sliding connector.
- C. 3/8 inch x 10 inches (9.5 mm x 254 mm) bright spiral steel spike, 3/16 inch x 1-1/2 inches (4.8 mm x 38 mm) or longer Ardox concrete nail, or drive pin fastener equal to Hilti DX 40 powder

actuated pin or Ramset Trakfast Automatic Fastening System pin.

- D. Finish: Mill Finish. Paint finish shall comply with AAMA 2603 for electrostatically baked on paint.

PART 3 – EXECUTION

3.1 PREPARATION OF PAVED AREAS:

- 1 Newly paved areas: Before any pavement is placed, the subgrade shall be prepared to line and grade and compacted with an approved self-propelled roller weighing not less than 10 tons. In places where the use of this roller is impracticable, a lighter roller may be substituted, or the area shall be compacted by mechanical tampers, all subject to the approval of the Architect/Engineer. Hollows and depressions which develop under rolling shall be filled with acceptable material and shall be repeated until no depressions develop.
- 3 The Contractor shall remove from the sub-grade all debris, foreign and other undesirable material which interferes with satisfactory construction. The fine grade shall not be muddy or otherwise unsatisfactory when the pavement is placed upon it. If the fine grade becomes rutted or displaced, due to any cause whatsoever, the Contractor shall regrade same without additional payment.
- 2 Lay geotextile fabric over compacted sub-grade as shown on the drawings. Roll out fabric over compacted subgrade overlapping new sheets by one and one-half (12) feet as per manufacturer's specifications. No equipment, materials or machinery shall be placed on or transported over exposed fabric. If the fabric is damaged during installation, the rupture shall be removed and the area covered with a new patch of fabric which shall overlap the undamaged fabric as stated above.

3.2 BASE COURSE

- 1 Placement of Base Course: Lay a course of base material as specified, at 8" thick or as shown on the drawings, over filter fabric over the compacted sub-grade. The broken stone for the base course shall be placed by a mechanical spreader or other approved means if placing by a mechanical spreader is impracticable, on well compacted sub-grade as specified herein.
- 2 Compacting Base Course: Before compaction begins, sprinkle the base course with water to dampen it but not drench it and roll it with a power-driven roller weighing not less than 10 tons. After final compaction, the base course shall have a density of not less than 95% and a depth not less than eight (8) inches (or as shown on the drawings).

3.3 HERBICIDE

- 1 Apply herbicide in the rate as recommended by the manufacturer to the base course.

3.4 INSTALLATION OF EDGING

1. Prior to installing the Stabilized Stone screening course install aluminum edge restraint as shown on the drawings and in the specification.

3.5 MIXING STABILIZED SCREENINGS PAVING

1. Mix Stabilizer thoroughly with aggregate cover screenings at the rate of 15-lbs of Stabilizer per 1-ton of approved crushed aggregate cover screenings. Verify with Stabilizer Solutions, Inc. for correct Stabilizer rate for project and climate conditions. Drop spreading of Stabilizer over pre-placed aggregate or mixing by rototilling is not acceptable for vehicular access. Stabilizer shall be mechanically pre-mixed per manufacturer's recommendations using an approved mechanical blending unit that will adequately mix and blend Stabilizer with aggregate (Bucket blending is not an approved blending apparatus). Always blend Stabilizer and aggregate DRY.

3.6 STABILIZED SCREENINGS PAVING

1. Installation of stabilized crushed aggregate cover screenings: Lay two lifts of 1-1/2" each (3" total compacted) course of stabilized crushed aggregate cover screenings as shown on the drawings. Spread by grading the stabilized crushed aggregate screenings onto the prepared base in a pushing mode and continue in this manner until entire area is covered. At no time shall any delivery or other vehicle travel directly onto the prepared base or filter fabric.

3.7 WATERING

1. Water heavily for full-depth moisture penetration of profile. Water activates Stabilizer, saturate to total depth. Apply 25 to 45-gallons of water per 1-ton. Application test moisture using a probing device reaching full depth.
2. Contractor shall wait a minimum of 24 –72 hours (depending on weather conditions) or until such time that the Stabilized Aggregate is able to accept compaction from a 2 to 5 ton roller without separation, plowing or any other physical compromise of the aggregate.
3. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction.

3.8 COMPACTION

1. Compact Stabilized Aggregate to 85% relative compaction by equipment such as; a 2 to 5-ton double drum roller making 3 to 4 passes. Do not begin compaction for 6 hours after placement and up to 72 hours. DO NOT use a vibratory plate compactor or vibration feature on roller, as vibration separates large aggregate particles. If pumping or pancaking of surface occurs, surface is still too wet to roll.
2. Take care in compacting Stabilized Aggregate when adjacent to planting and irrigation systems. Hand tamping with 8" or 10" hand tamp recommended.

3. Lightly spray surface area following compaction. Do not disturb aggregate surface with spray action.

3.9 INSPECTION

1. Finished surface shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted surface shall be firm throughout profile with no spongy areas. Loose material shall not be present on the surface after installation, but may appear after use and according to environmental conditions. Surface shall remain stable underneath the loose granite on top with a 'natural' look. Any significant irregularities in Stabilized Aggregate surface shall be repaired to the uniformity of entire installation.

3.10 PROTECTION DURING DRYING PERIOD

1. Contractor shall furnish and install construction fence around new surface to prevent public access. Maintain in place for a minimum of 12 - 72 hours after installation, or as directed by the Owner's Representative.
2. Contractor shall notify Owner's Representative to restrict landscape irrigation near surface until drying period is complete. Standing water on surface and adjacent to path shall be restricted at all times.

3.11 MAINTENANCE AND REPAIRS:

1. Maintenance and repairs: Contractor shall be responsible for maintaining and repairing the stabilized screening areas until final acceptance. Note that some rivuleting and depressions may appear shortly after construction.
2. Maintenance shall be carried out as follows:
 - 1 Debris, such as paper, grass, clippings, leaves or other organic material can be removed either by mechanically blowing or raking the surface.
 - 2 Low spots and some rivuleting will occur just after construction. These areas can be repaired as described below in Para. 3. Repairs.
 - 3 During the first year, a minor amount of loose aggregate will appear on the surface (1/6 to 1/8 inch). If this material exceeds an 1/3 of an inch, redistribute the material over the entire surface. Water thoroughly to the depth of the loose material and more. Let sit 2 hours up to 24 hours. Compact with power roller of no less than 1000 lbs. Depending on use and weather conditions, this process may be repeated 2 times over the course of the year.
 - 4 Some cracking may occur. Simply sweep fines into the cracks, water thoroughly and hand tamp with 8" hand tamp plate.
- 3 Repairs. If Stabilized areas have been damaged by means other than normal wear, repair of these areas can be achieved by the following steps.
 - 1 Excavate damaged area so that all sides are vertical and entire damaged area is clear of debris.

- 2 If area is dry, moisten damaged portion lightly.
- 3 Pre-blend the pre-determined amount of Stabilizer powder with the pre-determined amount of aggregate in a dry state. This can be blended with a concrete mixer (9 cubic ft.).
- 4 Add water to the pre-blended Stabilized Aggregate. Thoroughly moisten mix with 25 to 45 gallons per ton of preblended material or to approximately 10% moisture content.
- 5 Apply moistened pre-blended aggregate to excavated area to finish grade.
- 6 Compact with an 8" to 10" hand tamp or use a larger 1000 lb. roller. Keep traffic off areas for 12 to 48 hours after repair has been completed.

3.12 PROTECTION

- 1 Protect all work during the course of the contract until final acceptance. Repair or replace all work that is disturbed, damaged or destroyed at no cost to the Owner.
- 2 Protect stabilized stone screening areas from heavy wheeled traffic until final acceptance.

3.13 INSTALLATION OF RESTRAINT EDGING

A. Base Installation:

1. Extend base at least 6 inches (152 mm) beyond edge of restraint edging.
2. Level base beneath restraint edging.

B. Edging Installation:

1. Install edging leaving 3/8" (9.5 mm) between sections for expansion.
 - a. Drive spikes through edging holes in base of asphalt restraint edging (or drive nails through aluminum base when using powder actuated fastening system) at spaces for following applications:
 - a. Anchor each section end with anchor.
 - b. Aggregate Base: Spiral steel spikes at 4 inches (102 mm) to 12 inches (305 mm) on center.
 - c. Softer or Thinner Asphalt Base: 3/8 inch x 10 inches (9.5 mm x 254 mm) spiral steel spikes at 4 inches (102 mm) to 12 inches (305 mm) on center spacing.
 - d. Older, Harder, or Thicker Asphalt Base: Hilti DX A41 Fully Automatic Powder Actuated Tool is desirable where sufficient hold can be obtained. Provide 1-1/2 inches (38 mm) to 2-1/2 inches (64 mm) nail at 4 inches (102 mm) to 12 inches (305 mm) on center spacing with applicable charge recommended.
 - e. Concrete Base: Hilti DX A41 Fully Automatic Powder Actuated Tool is desirable where sufficient hold can be obtained. Provide 3/4 inches (19 mm) to 1 inches (25 mm) nail at 4 inches (102 mm) to 12 inches (305 mm) on center spacing with applicable charge recommended. Anchor into outer 1 inch (25 mm) of base of restraint edging and not less than 2.5 inches (63.5 mm) from edge of concrete.
2. Securely connect sections in accordance with manufacturer's instructions. Provide

additional anchors at closer spacing as necessary to firmly secure edging for permanent intended use.

B. Pavement Installation:

1. Lay pavement adjacent to and approximately 1/2 inch (12.7 mm) over top of restraint edging, depending on expected compaction results. Then, compact first pass with desired equipment within 6 inches (152 mm) of restraint edging. "Pinch roll" to create a hard joint. Subsequent passes may be directly against or over top of edging to ensure complete compaction of asphalt pavement.
2. Finish pavement shall be compacted and level with, but not to exceed 1/4 inch (6.4 mm) above top of restraint edging.

- C. Backfill side of edging on turf side and compact backfill material along edging to provide top of edging at 1/2 inch (13 mm) above finish grade on turf side.

END OF SECTION 321540

SECTION 321810 PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes provisions for the installation of protective surfacing (rubberized safety surfacing) restoration and repair of all disturbed surfaces, as shown on the Drawings, and as specified herein.

1.2 RELATED DOCUMENTS

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

1.3 SECTION INCLUDES

- A. Extent of work is shown on Drawings and includes but is not limited to:
 - 1. Rubberized safety surface.
 - 2. Clean up.

1.4 REFERENCES

- A. The following apply to work in this Section:
 - 1. ASTM: Specifications of the American Society for Testing and Materials, Standard Consumer Safety Performance Specification for Playground Equipment for Public Use, latest edition.
 - 2. CPSC: "A Handbook for Public Playground Safety", latest edition, published by the U.S. Consumer Product Safety Commission.
 - 3. ADA: Americans with Disabilities Act, latest edition published by the U.S. Department of Justice, Civil Rights Division.
 - 4. Qualified testing laboratory: Qualified, experienced public or private testing laboratory, capable of providing test results as specified.

1.5 SUBMITTALS

- A. Submit under provisions of SECTION 016000 prior to delivery of materials to site.
- B. Certifications:

1. Safety surface installation: Written statement from Manufacturer's Representative observing installation and certifying that safety surface was installed according to manufacturer's specifications.
- C. Instructions: Submit safety surface installation/application instructions written by manufacturer.
- D. Product data: Submit safety surface product literature or tear sheets with name of product and manufacturer.
- E. Samples: Label with name of material and manufacturer.
 1. Safety surface: Nine (9) by nine (9) inch chips illustrating color and texture. Proposed color mixture to be based upon manufacturers color chart:
 2. Colors to be approved by owner.
- F. Shop drawings: Submit drawings clearly labeled with project name and product information.
 1. Safety surface: Indicate size, shape and pattern of each safety surface area.
- G. Test reports: Submit reports under provisions in SECTION 01400 clearly labeled with project name and material.

1.6 QUALITY ASSURANCE

- A. Contractor shall have had experience with at least two (2) other projects of similar scope and complexity and shall perform work with personnel totally familiar with playground, poured-in-place resilient safety surface installation and construction techniques under the supervision of an experienced foreperson.
- B. Manufacturer: Company specializing in the manufacture of poured-in-place resilient safety surface with minimum three (3) years experience.
- C. Cushioned course thickness must meet CPSC 200G guidance drop test, for heights up to eight (8') feet, and a HIC of no more than 1,000 when tested in accordance with ASTM F 1292.

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.
 1. Coordinate work with utility companies. Notify One Call System not less than three working days prior to beginning work.
- 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.
 1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

- C. Conform to applicable code for disposal of debris.
- D. Procure and pay for permits and licenses required for work.

1.8 DELIVERY STORAGE AND HANDLING

- A. Deliver, store, handle and protect all materials from damage.

1.9 PROJECT CONDITIONS

- A. Existing conditions:

1. Verify all existing conditions in the field.

- a. Should any work performed under this Section expose previously unknown conditions, immediately report the discovery to Owner. However, during this time use any measures necessary to maintain adequate safety conditions.
- b. Should Contractor, in the course of work, find any discrepancies between Drawings and physical conditions, inform Owner immediately in writing for clarification. Work done after such discovery, unless authorized by Owner, shall be at Contractor's risk.

- B. Protection of existing conditions adjacent to and within construction zone:

1. All necessary precautions for safety including barricades and other protection measures shall be taken during all work.
2. All heavy equipment shall be driven or parked on the site only where approved by Owner.
3. Existing pavements, lawns, structures, walls, etc. damaged or disturbed during construction shall be repaired or replaced to the satisfaction of the Owner at no additional cost.
4. Repair and replace all active utility lines, above and below grade, damaged in the course of construction operations at no additional cost to Owner.

- C. Environmental requirements:

1. Place safety surface during dry weather and when the temperature is 35 degrees F or above.

1.10 SEQUENCING AND SCHEDULING

- A. Coordinate work of this Section with work of all other Sections of Specification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Substitutions: Under provisions of SECTION 01600.
- B. Filter fabric: Reemay Inc., P.O. Box 511, 70 Old Hickory Blvd., Old Hickory, TN 37138, 1-800-321-6271, or approved equal.

- C. Color: refer to drawings
- D. Poured-in-placed resilient safety surface from one of the following:
 - 1. Sport Surface Specialties, 574 Main St., Suite 202, East Aurora, NY 14052, 716-652-2039 or sportsurface@verizon.net
 - 2. Safe Guard Surfacing Corp., PO Box 801, St. James, NY 11780, 800-899-8703.
 - 3. Safety Turf, Inc., 1307 Egypt Rd., Box 820, Oaks, PA, 19456, 610-666-1779.
 - 4. Child Safe Products, Inc.; Safety Surface.
 - 5. GameTime; GT Impax Poured.
 - 6. Surface America Incorporated; Poured-in-Place.
 - 7. Sure Play International Rubber Surfacing, 500 Hoiles Drive., Kenilworth, NJ 07033, 888-272-7393.

2.2 POURED-IN-PLACE SAFETY SURFACE MATERIALS

- A. Meet or exceed current: CPSC guidelines, ADA guidelines and ASTM F-1292-93, F-1487-93 requirements.
- B. Cushion course: Monolithic poured-in-place cushion pad made from a field mixed blend of select styrene butyrene rubber (SBR) fiber and a single component polyurethane binder (not containing toluene isocyanate (TDI) with a minimum weight of 8.5 lbs/gal.).
- C. Wearing course: Monolithic poured-in-place top surface made from a blend of ethylene propylene diene monomer (EPDM) colored rubber particles measuring one (1) to three (3) mm and a polyurethane binder with aliphatic binder for UV stabilization.
 - 1. Shore hardness 50-55.
 - 2. Tensile strength 200 PSI.
 - 3. Elongation at break 145%.
 - 4. Meet Class 1 fire rating.
 - 5. Meet Taper Abrasive Test of 0.1.
 - 6. Color: Colors to be selected and approved by the City of Elizabeth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that previously installed protection measures are in place.
- B. Verify that play equipment is in place.

1. Begin installation of safety surface immediately upon completion of play equipment installation.
 - C. Verify that existing crushed stone and drainage is ready to receive poured-in-place safety surface.
 1. Verify gradients and elevations are correct.
 - D. Beginning of installation means acceptance of existing conditions.
- 3.2 PREPARATION
- A. Remove all debris and other obstructions from area to receive safety surface.
- 3.3 INSTALLATION OF RUBBERIZED SAFETY SURFACE
- A. Secure manufacturer's representative to observe all phases of safety surface installation and provide Owner with a written statement certifying compliance with manufacturer's drawings and specifications.
 - B. Install safety surface according to manufacturer's instructions and specifications in locations shown on Drawings.
 1. Meet or exceed current: CPSC guidelines, ADA guidelines and ASTM F-1292-93 requirements.
 - a. Cushion course minimum depth of 2 1/2"
 - b. Wearing course minimum depth: 1/2".
 - c. Total thickness: 3"
- 3.4 TESTING OF POURED-IN-PLACE SAFETY SURFACE
- A. Owner reserves the right to have material used in construction of safety surface tested in accordance with ASTM F 1292-93, at Owner's expense. Test results will be used to determine if installed safety surface is acceptable to Owner.
 - B. Provide Owner with at least nine (9) samples of safety surface material to be tested.
 1. Provide a sturdy wood box form measuring 12 by 12 inches and of sufficient depth to hold the material at specified total thickness.
 2. Beginning with the second batch of mixed material, take samples of cushion and wearing course material at evenly distributed intervals to produce a representative sampling of all the batches.
 3. With Owner present, pour sample of cushion course material into form and finish to a level surface in accordance with manufacturer's specifications. Match thickness of finished sample with in-place material. Owner shall remove sample from construction site to cure.
 4. With Owner present pour sample of wearing course material into form on top of cured cushion course and finish to a level surface in accordance with manufacturer's specifications. Match thickness of finished sample with in-place material. Owner shall remove sample from construction site to cure.

5. Samples shall be tested for the appropriate crushed stone base by a qualified testing laboratory.
- C. If tested samples fail to pass the performance requirements of the test, Contractor shall reconstruct the safety surface so that when retested as specified herein the safety surface shall meet or exceed the performance requirements.
 1. Retesting, if required, shall be at Contractor's expense.

3.5 PROTECTION AND GUARANTEE

- A. Immediately after placement, protect safety surface under provisions of SECTION 01500 from all traffic.
 1. Provide watchman to guard safety surface until adequately cured, for a minimum of 24 hours. Installer shall be responsible for any damage until surface has been approved by Owner.
- B. All materials shall be guaranteed, by the manufacturer, for a period of TEN (10) years against peeling, cracking, ultraviolet fading, bacterial growth and mildew. The TEN (10) year guarantee shall also include that the cushion and wearing course shall perform in accordance with specifications and against material breakdown caused by failure of chemical bond under normal use.

3.6 CLEAN UP

- A. Maintain the site in an orderly condition during the progress of work. Promptly remove debris and trash. Leave the site in a neat, orderly condition, broom clean.
- B. Remove all items designated to be reset or reused in a manner to prevent damage. Replace all damaged items with an equal material as approved by the Engineer, at the Contractor's expense.
- C. All methods and materials are subject to the approval of the Engineer.
- D. Restore or repair to their original condition, or as otherwise specified herein, all surfaces damaged or removed in the Work.

END OF SECTION

SECTION 323123 - EXTRUDED VINYL FENCING SYSTEMS

A. SECTION INCLUDES

- A. Rigid polyvinyl chloride (PVC) fencing sections, profiles and accessories, including pickets, rails, posts, caps and gates.

1.02 RELATED SECTIONS

- A. Section 31 00 00 Earthwork
- B. Section 32 00 00 Paving and Surfacing
- C. Section 03 30 00 Cast-In-Place Concrete
- D. Section 04 20 00 Unit Masonry

1.03 REFERENCES

- A. ASTM D4216 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Related Plastic Building Product Compounds
- B. ASTM F964-09 - Standard Specification for Rigid Poly (PVC) Exterior Profiles Used for Fencing and Railing.

1.04 SUBMITTALS

- A. Shop Drawings: Showing fence design, style and colors or woodgrains, layout of fence and gates with dimensions and specified options, including details and finishes of component accessories and post foundations.
- B. Product Data: Submit manufacturer's product data, including style, installation instructions and certification of compliance with material specifications.
- C. Samples: Submit manufacturer's wood grain (5) samples in form of actual product and in color selection.

1.05 WARRANTY

- A. Provide manufacturer's 20 year non-prorated warranty.

1.06 QUALITY INSURANCE

- A. Engage an experienced installer who has at least three years of experience and has completed at least five PVC fence projects with the same material and similar scope to that indicated for this project with a successful construction record of in-service performance.
- B. Obtain PVC fences and gates, including accessories, fittings and fastenings, from a single source.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation in a secure and dry place.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Approved Manufacturer: **Illusions Vinyl Fence**, 274 Middle Island Road, Medford, NY, 11763. Phone: 1-800-399-3362. Website: www.illusionsfence.com or approved equal. Model: V300-6W101. 6' Height. Color to be selected by Architect from manufacturer's full range.

2.02 MATERIALS

- A. Products from other qualified manufacturers having a minimum of 5 years experience manufacturing PVC fencing will be acceptable by the architect as equal, if approved in writing ten days prior to bidding, and if they meet the following specifications for design, fabrication, and color and/or woodgrain. PVC Profiles, lineals & extrusions used as components must "meet or exceed" the minimum performance guidelines laid out in ASTM F964-09.
- B. Pickets, rails, and posts prefabricated sections using Rigid Poly Vinyl Chloride (PVC) compounds for exterior-profile extrusions with cell classification of 1-32333-3 as defined by ASTM D4216, that meets or exceeds the following proprieties:
 - i. Color/Consistency Testing – The PVC compound in extruded section shall maintain uniform color and be free of any visual surface or structural changes, such as peeling, chipping, cracking, flaking, or pitting after weathering at intervals of six months and one year for white and for six months, one year, and two years for all other colors in a hot, dry climate such as Phoenix, AZ; a hot humid climate such as Miami, FL; and a temperate northern climate, when tested in accordance with ASTM Performance Weathering Requirements.
 - ii. Weathering Testing – The PVC compound shall have a minimum impact resistance of 0.6in.-lb/mil (2670 J/m) after weathering six months and one year in a hot, dry climate such as Phoenix, AZ; a hot, humid climate such as Miami, FL; and a temperate northern climate, when tested in accordance with ASTM Performance Weathering Requirements. The PVC compound shall have successfully met the weathering requirements prescribed for six months at each climatic testing site prior to use in production of exterior-profile extrusions, when tested in accordance with ASTM Performance Weathering Requirements.
 - iii. ASTM Specifications Met:
 - D256** – To determine Izod impact properties

- D618** – Practice for Conditioning Plastics for Testing
- D635** – Test Method for Rate of Burning and/or Extent and Time of Burning Plastics in a Horizontal Position
- D638** – To determine tensile properties
- D648** – To determine heat distortion temperature
- D696** – Test Method for Coefficient of Linear Thermal Expansion of Plastics between 0°C and 30°C with a Vitreous Silica Dilatometer
- D790** – To determine flexural properties
- D792** – To determine specific gravity
- D883** – Terminology Relating to Plastics
- D1435** – Practice for Outdoor Weathering of Plastics
- D1600** – Terminology for Abbreviated Terms Relating to Plastics
- D1784** – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- D1898** – Practice for Sampling of Plastics
- D2240** – To determine Shore hardness values
- D2244** – Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
- D2565** – Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications
- D4216** – Material Class Number 1-32333-3. To establish Cell Classification of PVC Material. Illusions compounds have a higher cell classification because one or more properties are superior to those used in standard acceptable compounds.
- D4226** – Test Methods for Impact Resistance of Rigid Poly (Vinyl Chloride) (PVC) Building Products
- D4726** – Specification for Rigid Poly (Vinyl Chloride)

2.03 PVC VINYL FENCE PREFABRICATED SECTIONS

1. Style: Privacy
2. Height: 6 feet
3. Width, Nominal Center to Center of Posts: 8 feet.
4. Bend: Straight
5. Base Vertical Color: Grand Illusions Vinyl WoodBond*: Color to be selected.
6. Post Options: Majestic™ 8 x 8 - .250 wall
7. Post Color: Grand Illusions Vinyl WoodBond*: Color to match fence sections.
8. Post Cap Style: New England V55NE
9. Post Cap Color: Grand Illusions Vinyl WoodBond*: Color to match fence post.
10. Top Horizontal Color: Grand Illusions Vinyl WoodBond*: Color to match fence sections.
11. Mid Horizontal Color: Grand Illusions Vinyl WoodBond*: Color to match fence sections.
12. Bottom Horizontal Color: Grand Illusions Vinyl WoodBond*: Color to match fence sections.
13. U-Channel Color: Grand Illusions Vinyl WoodBond*: Color to match fence sections.

2.04 GATE HARDWARE AND ACCESSORIES

- A. General: Provide hardware and accessories for each gate according to the following requirements:
- B. Hinges: Size and material to suit gate size, non lift-off type. Provide three hinges for each gate. Use Illusions (#IESH) extra strong hinges.
 - a. Color: Black
- C. Latch: Manufacturer's standard self-latching, stainless steel composition single or dual access gravity latch. Provide one latch per gate. (#HLSS)
 - a. Finish: Match gate hinge finish.
- D. Hardware: Stainless Steel. Provide sizes as recommended by fence manufacturer.
 - a. Finish: Match gate hinge finish.
- E. Accessory Items:
 - a. Use one drop rod set per gate leaf. (#DRA48)
 - b. Use one gate stop per gate set up. (#VGS)
 - c. Use one gate handle per gate. (#VHDL)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Consult local code officials for compliance to building code requirements.
- B. Verify areas to receive fencing are completed to final grades and elevations.
- C. Ensure property lines and legal boundaries of work are clearly established.

3.02 FENCE INSTALLATION

- A. Excavation: Drill or hand-excavate (using post hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
 - 1. If not on drawings, excavate holes for each post to a minimum diameter 12"
 - 2. Unless otherwise indicated, excavate hold depths not less than 30 inches or to frost line.
- B. Posts: Install posts in one piece per prefabricated section, plumb and in line. Installation method is one post and one section at a time for proper spacing.
 - 1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
 - a. Unless otherwise indicated, terminate top of concrete footings 3 inches below adjacent grade and trowel to a crown to shed water.
 - b. Secure posts in position with prefabricated section with manufacturer's recommendations until concrete sets.
 - c. Install post caps
 - d. Remove concrete splatters from PVC fence materials with care to avoid scratching.

- C. Fence Installation at Sloping Terrain: At sloping terrain, rails may be racked (sloped) or stepped to comply with manufacturer's recommendations.

3.03 GATE INSTALLATION

- A. Use heavy duty gate posts (.250 wall) 5" x 5" or 8" x 8" per manufacturer's recommendations. Bottom rail should include minimum (2) 1/4" drainage holes.
- B. Install gates plumb, level, and secure for full opening without interference according to manufacturer's instructions.
- C. Gate Latch Installation. Install gate latch according to manufacturer's instructions. Adjust for smooth, trouble-free operation. Use Illusions extra strength hinges. (#IESH)
- D. Allow minimum 72 hours to let concrete set-up before opening gates.

3.04 CLEANING

- A. Clean up all debris and unused material and remove from the site.

3.05 DEMONSTRATION

- A. Instruct the owner's personnel on proper operation and maintenance of fence components.

END OF SECTION 323123

SECTION 323300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. The work required under this Section consists of furnishing all labor, materials, equipment, services and related items necessary to furnish and install, all site furnishings, and all related work, including and not limited to associated concrete footings, concrete pad, and sub-base materials, complete, as indicated on the drawings or specified herein. Contractor shall install items per the contract drawings and in conformance with the manufacturer's recommendations. All fasteners and connectors on all furnishings and site amenities must have tamper resistant hardware as provided by the manufacturer. The contractor shall submit shop drawing for all site amenities for approval prior to purchase and installation.
- B. Contractor shall furnish and install items per the contract drawings and in conformance with the manufacturer's recommendations. Major items of work include, but are not limited to furnishing and installing the site amenities shown on the contract documents.

1.2 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of site furnishing(s) through one source from a single manufacturer.
- B. Use an adequate number of skilled workmen approved and/or licensed by the manufacturer and with a minimum of 5 years experience, unless otherwise indicated, regularly engaged in installation procedures of product application similar to that required for this project.
- C. In addition to complying with pertinent regulations of governing agencies having jurisdiction, comply with pertinent provision of testing in accordance with trade practices and manufacturer's listed standards.
- D. Performance Guarantee: Contractor shall furnish a written guarantee, it shall be a certificate of product liability insurance, guaranteeing replacements (parts and labor) of any items or components found to be defective up to one year.
- E. Manufacturer's Warranty: 5 Year Warranty for structural failure.

1.3 SUBMITTALS

- A. Any and all substitutions (not limited to this section) must be submitted in accordance with Section 013300.
- B. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their applications and use. Include test reports and/or certifications substantiating that products comply with requirements.
- C. Shop Drawings: Contractor shall submit shop drawings in accordance with the requirements of Section 013300. They must include the following drawings as a minimum:
 - General layout.

- Dimensions.
- Materials.
- Finishes.
- Support (including any special footing or foundation requirements for same as required by manufacturer).
- Hardware.
- Fittings and accessories.

1.4 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect listed items before, during and after installation and to protect the installed work and materials of all other trades. Contractor is responsible for equipment until acceptance by Engineer.
- B. Replacement: In the event of damage, immediately make all repairs and replacement necessary to Engineers' approval and at no additional cost to the owner.
- C. The Contractor is to coordinate with Owner and Engineer to schedule the ordering of the items to be supplied by the Owner with the overall construction sequence to receive the site amenities during construction and properly time the delivery for immediate installation. If applicable the Contractor will be responsible to safely secure all site amenities prior to installation at no additional cost to the owner.

PART 1 - PRODUCTS

MANUFACTURERS

Site Furnishing as specified or approved equal.

MATERIALS

- A. All site furnishings shall be constructed with tamper resistant fasteners and connectors as provided by the Manufacturer. The location of all site furnishings are to be field verified by the Landscape Architect prior to installation. All foundations to be set below finish grade of pavement. All site amenities shall be as noted on the contract documents or approved equal.

PART 2 - EXECUTION

INSPECTION

- A. Examine the subgrade, finish surfaces and installation conditions. Do not commence work until all unsatisfactory conditions are corrected.

LAYING OUT THE WORK

- B. The trade performing the work of this section assumes full and sole responsibility for the accuracy and correctness of all layouts, lines, levels, grades and other aspects of the work under

this Section. Lay out all work in accordance with the requirements, therefore, as indicated in the drawings.

INSTALLATION

- C. Locate all site amenities where indicated on the drawings, and attach as detailed on the drawings and as elaborated upon in the Specifications and in conformance with manufacturer's recommendations. All equipment and furnishings specified to be installed as surface mounted shall be installed with stainless steel, tamper resistant hardware. Tack welding will not be acceptable as being tamper resistant.
- D. Any item locations not specifically detailed in the Contract Documents shall be located at the direction of the Owner.
- E. Clean and touch-up paint all abraded, welded, and scratched surfaces with matching paint provided by each manufacturer.
- F. Install all equipment straight and true, tight and secure, and complete with all fittings and accessories, in accordance with manufacturer's instructions.
- G. All threaded fittings shall be tamper resistant and peened, after being tightened, to prevent removal.

CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work.
- B. Remove from the project site all excess material and equipment at the completion of the work of this section.
- C. Repair damage resulting from site furnishings work.

END OF SECTION 323300

SECTION 329100 - SOIL MIXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This work includes but not is not limited to the following:
- 1 Supply of component materials and soil amendments for Soil Mixes as specified.
 - 2 Preparation and blending of Soil Mixes, as specified herein.
 - 3 Installation, placement, spreading, and fine grading of Soil Mixes, as specified herein.
 - 4 Testing of all soil component materials, soil amendment materials, and Soil Mixes, as specified herein.

1.2 RELATED WORK

- A. Section - Planting

1.3 SUBMITTALS

- A. All submittals shall be as specified in the General Conditions.

- B. Product Data:

Submit manufacturer's technical information, including application instructions where relevant, for the following items:

- 1 Fertilizers.
- 2 Herbicides.
- 3 Water-absorbent polymer.

- C. Test Results - Soil Mix Components:

Submit written reports, as specified herein, for each bulk component:

- 1 Topsoil.
- 2 Sand.
- 3 Compost.

- D. Test Results - Blended Soil Mixes: Submit written reports, as specified herein, for each blended soil mix. (These requirements include materials salvaged from on-site):

- 1 Lawn Mix.

1.4 TESTING

- A. Contractor shall submit written test reports as required under Submittals herein.

- 1 Each test shall be carried out using the categories and sieve sizes as specified herein. Failure to include any of the required criteria will be sufficient cause for rejection of the test.
- 2 Testing shall be carried out by an independent testing laboratory.
- 3 All testing required by this Section, or additionally required by Landscape Architect, shall be included in the Contract price.

- 4 Contractor shall be responsible for timely submittal of samples to the testing laboratory.

B. Each test report shall include the following information:

- 1 Project Title.
- 2 Name of Contractor.
- 3 Name of material supplier.
- 4 Testing Laboratory name, address and telephone number.
- 5 Type of test.
- 6 Date of test.
- 7 Test results, including identification of deviations from acceptable ranges.

C. Each sample shall be tested for the following:

- 1 Mechanical analysis:
Sieve method, using sieve sizes specified.
- 2 pH.
- 3 Organic matter content: Percentage of oven-dry weight of soil, determined by loss on ignition of moisture-free sample, dried in accordance with the methods of the Association of Official Agricultural Chemists.
- 4 Analysis of soluble salts: Sodium, calcium, magnesium, sulfates, chlorides and bicarbonates, in milimhos per centimeter.
- 5 Analysis of minerals: Nitrogen, phosphorus, and potassium, in parts per million.
- 6 Analysis of heavy metals: All elements specified herein, in parts per million.
- 7 Corrective recommendations for nutrients and pH.

D. The Landscape Architect may take and analyze at any time, such additional samples of materials as deemed necessary for verification of conformance to specification requirements.

1. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested at no additional cost to the Owner.

E. No component bulk material for Soil Mix shall be used or blended into a mix, until test reports have been received and approved by the Landscape Architect.

1. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments, until approved.

1.5 REFERENCES

A. Association of Official Agricultural Chemists.

ASTM: American Society for Testing and Materials.

1.6 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 for work to comply with such requirements at no additional cost to Owner.

B. Procure and pay for all permits and licenses required for the Work of this Section.

1.7 DELIVERY AND STORAGE

A. 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.

B. Packaged Materials:

1. Deliver packaged materials to the location where planting Soil Mixes are to be blended, in unopened bags or containers, each bearing the name and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.
2. All bags shall be protected from water and contamination with other materials.
3. Retain packages for inspection by Landscape Architect.
4. All packaged materials shall be stored, handled and applied in strict accordance with manufacturer's instructions.

C. Stockpiles:

- 1 Stockpiles of on-site or off-site bulk materials and Soil Mixes shall not exceed 50 cubic yards, and shall be no more than six (6) feet in height to prevent anaerobic conditions within the piles.
- 2 All stock piled materials shall be adequately covered with tarpaulins or otherwise protected to prevent excessive water absorption and blowing by winds, until time of actual use.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Perform all required tests and submit test reports. All Soil Mix components shall be tested and approved prior to incorporation into blended Soil Mixes.
- B. Provide adequate quantities of all Soil Mix materials to attain, after compaction and natural settlement, all design finished grades.

2.3 LAWN MIX

- A. Mix shall consist of the following proportions by volume:

60%	topsoil
20%	compost
20%	sand
5 pounds	bonemeal per cubic yard of soil mixture.
1 pound	commercial fertilizer per cubic yard of soil mixture.
1 pound	controlled release fertilizer per cubic yard of soil mixture.
2 pounds	water absorbent polymer per cubic yard of soil mixture, or as recommended by manufacturer.
Limestone	as required for specified pH.

- B. Lawn Mix for all sodded, seeded and hydroseeded lawn areas, shall conform to the following requirements:

- 1 Organic Matter: 4% minimum – 10% maximum.
- 2 pH: 6.0 - 7.0.
- 3 Soluble salts: Less than 2 milimhos per centimeter.
- 4 Macronutrients:

- Nitrogen: 20 – 100 ppm
- Phosphorus: 5 – 50 ppm
- Potassium: 10 – 200 ppm
- 5 Secondary nutrients:
 - Calcium: 100 – 200 ppm
 - Magnesium: 10 – 180 ppm
 - Sulphur: 10 – 20 ppm
- 6 Micronutrients:
 - 7 Boron: 0.05 – 0.5 ppm
 - 8 Chlorine: 5 – 50 ppm
 - 9 Copper: 0.001 – 0.5 ppm
 - 10 Iron: more than 0.5 ppm
 - 11 Manganese: more than 0.5 ppm
 - 12 Molybdenum: less than 10 ppm
 - 13 Zinc: 0.3 – 3 ppm

2.5 HEAVY METALS

A. Each soil mix shall be tested for heavy metal content. The total heavy metal concentration in all soil mixes shall not exceed the following:

Element Maximum concentration in parts per million

Arsenic	1
Boron	300
Cadmium	2
Chromium	100
Copper	100
Lead	150
Mercury	0.50
Molybdenum	10
Nickel	50
Selenium	25
Zinc	400

2.6 TOPSOIL

A. All topsoil shall consist of natural sandy loam, free from subsoil.

- 1 It shall be removed to a depth of 12", or less if subsoil is encountered.
- 2 Topsoil shall be of uniform quality, free from hard clods, stiff clay, hardpan, sods, roots, chips, sticks, partially disintegrated stone, cement, ashes, paper, boards, or any other undesirable material.
- 3 Topsoil shall be free of all materials harmful or toxic to plant growth.
- 4 Topsoil which has been stripped from the site may be used if it complies with the requirements specified herein.

B. Topsoil shall conform to the following requirements:

- 1 pH: 5.5 to 7.0.

- 2 Organic content: 3% minimum – 5% maximum.
- 3 Topsoil shall conform to the following mechanical analysis: Sieve Size Percent Passing by Weight
1" 100 1/4" 90 - 99 # 10 60 - 80 # 40 40 - 60 # 60 40 - 60 # 100 10 - 30 #
200 10 - 20

2.7 COMPOST

A. All compost shall conform to the following requirements:

- 1 Material shall be capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth.
- 2 Material shall be derived from organic wastes such as food and agriculture residues, composted cow or other animal manures, sewage sludge or other materials that meet the specified requirements.
- 3 Compost shall be screened, and shall be free of viable weed seed, stones, branches, roots or wood chips, and all debris such as plastic fragments, glass, and metal fragments.
- 4 Material shall be composted for a minimum of one year (12 months).
- 5 Acceptable manufacturers include: Allgro, Inc., Liberty Lane, Hampton, NH 03842, 800-662-2440. Milorganite. Sustane or approved equal .

B. Compost shall show conformance with the following requirements:

- 1 Organic content: 50% minimum.
- 2 pH: 6.0 to 7.5.
- 3 Carbon/nitrogen ratio: 25:1 to 35:1.
- 4 Passing 2" screen: 100%

C. Heavy metal content shall not to exceed the following indicated amounts: Element

Maximum concentrations in parts per million

Arsenic 1
Boron 300
Cadmium 2
Chromium 100
Copper 100
Lead 150
Mercury 0.50
Molybdenum 10
Nickel 50
Selenium 25
Zinc 400

2.8 SAND

A. Sand: Coarse grit. Mason' sand acceptable. Beach sand not acceptable.

2.9 SOIL AMENDMENT MATERIALS

A. Bonemeal:

Shall be finely ground and have the following N-P-K (Nitrogen-Phosphorus-Potassium) analysis: 4-12-0.

B. Commercial Fertilizer:

Shall have the following N-P-K analysis: 10-6-4.

- 1 A minimum of 50% of the nitrogen shall be derived from organic sources.
- 2 If soil tests indicate need for a different composition, Contractor shall submit proposed alternate fertilizer for approval.

C. Controlled-release Fertilizer: Shall be in granular form and shall have the following N-P-K analysis: 10-6-4.

- 1 Fertilizer shall be as manufactured by Osmocote, or Meister.
- 2 If soil tests indicate need for a different composition, Contractor shall submit proposed alternate fertilizer for approval.

D. Limestone: Shall be granular limestone, produced from Dolomitic limestone specifically for use in planting, with a minimum of 86% of calcium and magnesium carbonates, conforming to the following requirements: Sieve Size Percent Passing by Weight # 10 100 # 20 90 minimum # 100 60 minimum

E. Sulphur:

Lower pH if required, by use of horticultural elemental sulfur product.

- 1 Peat moss or copper sulfate may not be used to lower pH.

F. Herbicides:

Acceptable products:

- 1 Post-emergent herbicide, for lawn areas and plant beds:

Shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166.
- 2 Pre-emergent herbicide, not to be used at lawn areas or grasses: Shall be Treflan 5G.

G. Water-absorbent polymer:

Acceptable products:

- 1 'Supersorb', as manufactured by Aquatrols of America, Pennsauken, NJ 08110. Tel: (800) 257-7797 or approved equal.
- 2 'Terrasorb', as manufactured by Industrial Services International, Bradentown, FL 34282. Tel: (800) 277-6728 or approved equal .
- 3 'Agrosoke', as manufactured by Grosoke International Inc., Fort Worth, TX 76118. Tel: (800) 522-0696 or approved equal.
- 4

PART 3 – EXECUTION

3.1 INSPECTION AND COORDINATION

SOIL MIXES

- A. Contractor shall inspect the site before bidding to determine the characteristics of the site and the existing soil in areas to be planted.
- 1 Prior to construction and soil mix placement operations, the Contractor shall ascertain the location of all existing and proposed electric cables, conduits, irrigation, under-drainage systems and all other underground or at grade utilities, by contacting the appropriate utility company.
 - 2 Contractor shall take proper precautions so as not to disturb or damage any subsurface elements.
 - 3 Contractor shall be liable for and all damage to such utilities during the course of construction, and shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.
- B. Contractor shall be liable for any and all damage to surrounding areas caused by planting operations and shall be required to restore or replace damage areas to original conditions, to the satisfaction of the Landscape Architect.
- C. Coordination:
- The Contractor shall coordinate work of this Section with other work of the Project and with work of other Contractors. Such coordination shall include but not be limited to:
- 1 Location of all underground utility lines and structures.
 - 2 Scheduling of planting operations.
 - 3 Scheduling of maintenance operations.
 4. Verify that all work requiring access through or adjacent to areas where soil mixes are to be placed has been completed and no further access (other than Landscape installation) will be required. In the event that access will be required, this must be coordinated with the Landscape Architect.

3.2 EXECUTION –LAWN AREAS

A WEATHER LIMITATIONS

1. Perform both blending and site soil work only during suitable weather conditions. Do not handle, haul, place, work, disc or rototill soil when frozen, excessively wet, or in otherwise unsatisfactory condition.

B BLENDING OF SOIL MIXES

1. Uniformly blend all ingredients as required for each Soil Mix type, by wind rowing and/or tilling on a hard surfaced area.
 - 1 The components of all soil mixes shall be blended so that ingredients are thoroughly incorporated into the mixture to assure uniform distribution.
 - 2 Do not over-mix; mix shall remain friable and well aerated.
 - 3 Organic matter shall be maintained moist, not wet, during blending.
 - 4 Mineral soil material shall be saturated with clean water prior to blending.
 - 5 Crushed stone material shall be saturated with clean water prior to blending.
 - 6 Delay mixing of fertilizers if planting will not follow within a few days.

C PREPARATION OF SUB-GRADE

- 1 Verify as-constructed or existing sub-grade elevation and perform additional grading operations as necessary to bring the sub-grade to a true, smooth, slope parallel to the

- finished grade, at all areas to receive soil mixes.
2. Any sub-grades or soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render the material unsuitable for plant growth, shall be removed from the site, whether or not such pollution occurred or existed prior to or during the Contract period.
 1. In the event that such material is placed, this material shall be removed and replaced with approved material.
 2. All remedial operations associated with soil mixes shall be reviewed and approved by the Landscape Architect.
 3. Loosen sub-grade to a minimum depth of four inches (4").
 1. Remove all stones, large clods, lumps, brush, roots, stumps, litter, trash, and other foreign material one inch (1") or larger in any dimension.
 2. Dispose of all debris prior to placement of soil mixes, to legal off-site location.
 2. Spray all vegetation on sub-grade with a pre-emergent weed killer at the rate of application recommended by the manufacturer.
 3. Protect adjacent pavements, walls, utilities and other construction from damage or staining by any soil mix placement operations.

D PLACEMENT OF PLANTING SOIL MIXES

1. Do not place any muddy or wet Soil Mixes.
2. Place and spread Soil Mix over sub-grade, to a depth sufficiently greater than the depth required for planting areas so that after settlement the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.
3. Place and spread Soil Mix over the approved sub-grade, in six (6) inch maximum lifts, and settle to eliminate air pockets and minimize settlement. Lightly scarify previously placed surfaces prior to placing subsequent lifts.
4. Compact to not less than 90% Modified Proctor.
5. Provide compaction testing to conform compliance to specified compaction density.
6. Fills shall not be so compacted as to restrict the flow of air or water through the soil.
7. After completion of compaction operations, protect the installation from contamination by toxic materials or trash, and from water containing cement, clay, silt or any other materials.

E GRADING OF SOIL MIXES

1. 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 regrade as required.
2. Protect placed Soil Mixes against construction activity with snow fencing or by other acceptable methods.
 1. Protect from the eroding effects of wind and rain with filter fabric, as necessary.

3.4 CLEAN UP

- A. At the end of each work day the Contractor shall broom-clean the site, to remove all trash, debris, and loose soil materials.
- B. Immediately following the completion of soil mix installation operations, the Contractor shall remove all excess materials, stock piles, waste material, tools and equipment, and

leave the site in a clear and clean condition.

- C. All waste materials shall become the property of the Contractor, who shall legally dispose of same off-site.

END OF SECTION 329100

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Turf and Grasses shall be performed in accordance with Sections 804, 806, 809 and 810 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Seeding.
 - 2. Topsoil.
 - 3. Straw Mulch.
 - 4. Mowing.
- B. Related Sections include the following:
 - 1. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Division 2 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
- C. All areas disturbed and all areas within the property boundaries are to be restored with topsoil, fertilizer and seed if no other material is defined. The Contractor shall topsoil, fertilize and seed and straw mulch grass areas disturbed during construction.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety,

and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture, identifying source, including name and telephone number of supplier.
- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. 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; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
1. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
1. Spring Planting: 3/1-4/30
 2. Fall Planting: 8/15-11/15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Lawns: 3 months from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
 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 lawn at a minimum rate of 1 inch per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent 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 grass 1 to 2 inches high.
- E. Lawn 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. to lawn area.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
 1. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - a. Seed shall be NJDOT type A as per section 917.05 of the NJDOT Standard Specifications.

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 5 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained

construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2. Topsoil Source: Import topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.
3. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 50 to 60 percent of dry weight.

2.5 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.6 STRAW MULCH

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydro seeding overspray.
- B. Provide 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 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil mix to a depth of 6 inches 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.
- C. 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 of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

- E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 3 to 4 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Bond straw mulch by spraying with asphalt emulsion at the rate of 10 to 13 gal./1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

3.5 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches.

3.6 CLEANUP AND PROTECTION

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

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants, including ferns and herbs
 - 5. Planting Accessories.
 - 6. Planting Soil Mixes
 - 7. Mulch.
 - 8. Maintenance and Warranty of Exterior Plants.

1.2 DEFINITIONS

- A. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than [diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.
- B. Balled and Potted Stock: Exterior 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 exterior plant required.
- C. Bare-Root Stock: Exterior 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 kind and size of exterior plant required.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with 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 kind, type, and size of exterior plant required.
- E. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted exterior 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 exterior plant.

1.3 SUBMITTALS

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

- B. Samples for Verification: For each of the following:
1. 5 lb (2.2 kg) of mineral mulch for each color and texture of stone required, in labeled plastic bags.
 2. Edging materials and accessories, of manufacturer's standard size, to verify color selected.
- C. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:
1. Manufacturer's certified analysis for 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.
- D. Qualification Data: For landscape Installer.
- E. Planting Schedule: Indicating anticipated planting dates for exterior plants.
- F. Photographs: Submit photographs of plants, as requested by the Engineer, prior to Observation, as listed under Quality Assurance, below. Photographs shall include a person holding a clearly-marked measuring rod next to plants. Photographs shall exhibit the size, growth habit, and general visual quality of plants. Photographs of dense clusters of plants, in which one plant is not distinguishable from another, are not acceptable. Digital photographs submitted via email are acceptable.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of exterior plants on similar forest regeneration projects.
1. Installer's Field Supervision: Require Installer to maintain an experienced full-time, English-speaking, supervisor on Project site when exterior planting and regular maintenance is in progress.
 2. Installer must have a minimum of three (3) years experience in this type of landscaping.
 3. Installers to provide a minimum of three (3) references where this same type of landscaping.
 4. Installer must have installed previous projects in similar size and scope as this project and provide a listing of projects including name and contact person with phone number or email address.

- B. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
 - 1. Substitutions of plants will not be permitted unless authorized in writing by the Engineer, prior to purchase for this Project.
- C. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- D. Observation: Engineer may observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Engineer retains right to observe trees and shrubs further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site. Notify Engineer of sources of planting materials seven days in advance of delivery to site.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- F. Planting Schedule: Indicating anticipated planting dates for exterior plants.
- G. Maintenance Instructions: Recommended procedures to be established by owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store, irrigate, maintain, and otherwise protect balled and burlapped trees in a manner that prevents mechanical injury and physiological stress between the time of digging and delivery.
- B. Deliver exterior 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.
- C. Do not prune trees and shrubs before delivery, except as approved by Engineer. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Irrigate balled and burlapped plants thoroughly immediately prior to transport. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
- D. Handle planting stock by root ball. Planting stock with cracked or broken root balls will not be accepted.

- E. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots in water for two hours if dried out.
 - 2. Set balled stock on ground and cover ball with woodchip mulch or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of exterior plants stored on-site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 COORDINATION

- A. Contractor is responsible for determining plant quantities per planting plan. Contractor is responsible for filling all areas on plans shown to be planted on planting plan. Contractor shall prepare his or her own quantity list from the plan(s). All ground cover, perennial, and annual beds are to be filled at the specified spacing.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 15 to June 15
 - a. Quercus species
 - b. Deciduous material
 - c. Herbaceous material
 - 2. Fall Planting: September 15 to November 30
 - a. Evergreen material
 - b. Deciduous material other than Quercus spp.
 - c. Herbaceous material
 - 3. No Planting shall occur between June 15 and September 14, inclusive, except annuals, or as authorized by the Engineer.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.
- D. Coordination with Other Work: Coordinate planting with all other work of the project, including the following:
 - 1. Site Lighting and Electrical Equipment: Coordinate planting with site lighting to ensure that plantings do not impair site lighting from illuminating the site as designed. Following planting installation, coordinate aiming of site lighting that is intended to illuminate plants.

- E. Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns, unless otherwise acceptable to Engineer. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.

1.7 WARRANTY

- A. Special Warranty: Warrant all exterior plants covered by this Section, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
 - 1. Warranty Period for Exterior Plants:
 - a. From date of Installation to Substantial Completion.
 - b. Two years from date of Substantial Completion.
 - 2. Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
 - 3. Replace without cost to Owner, as soon as weather and soil conditions permit, exterior plants that are more than 25 percent dead or in an unhealthy condition as determined by the Engineer at end of warranty period.

1.8 MAINTENANCE

- A. Maintenance Period for all exterior plants covered by this Section: Concurrent with Warranty Period and same duration as Warranty Period. Maintenance requirements are itemized in Part 3 of this Section. Begin maintenance immediately after each area is planted and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below.
- B. Owner will assume maintenance following completion of Maintenance Period.
- C. Maintenance Period: 1 year (12 months) from the date of planting completion and acceptance and approval by the Owner.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs in accordance with good horticultural practices under climatic conditions similar to those of the Project for at least two years, unless specifically noted otherwise. Trees and shrubs shall comply with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Trees and shrubs shall exceed AAN standards for quality by being exceptionally heavy, uniform, so trained or favored in development and appearance as to be superior in form, density and spread of branches, compactness, and symmetry. Determination of quality shall be made by the Engineer. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs,

larvae, and defects such as knots, sun scald, leaf spotting, injuries, abrasions, and disfigurement.

- B. Trees shall be planted such that the root flare is 1" above adjacent grade, unless the drawings indicate otherwise. Tree planting height shall be dictated by the actual root flare rather than the top of rootball as received from growers or nurseries.
1. Tops of tree rootballs shall be no higher than 2" above the tops of main order tree roots.
 2. If main order roots are buried greater than 2" but less than 4" below the top of tree rootballs, contractor must trim rootballs by carefully removing soil from the top of the rootballs so that main order roots are within 2" of the top of rootball.
 3. If main order roots are buried greater than 4" below the top of rootball, the tree will be rejected and the contractor must remove the tree from the jobsite.
 4. The contractor is responsible for ensuring that trees received on site and planted on site meet the aforementioned specifications regarding tree root flare and rootball. The contractor is responsible for ensuring that the Engineer has an opportunity to review the tree root flares of trees in the grower's field or nursery yard. If tree root flares are obscured (due to trunk wrap or burlap or other obstructions), Engineer's acceptance of trees in the grower's yard or nursery shall constitute acceptance of trees WITH THE EXCEPTION of trees whose root flare is buried greater than 4" below top of rootball. In the event that contractor does not allow Engineer to visually observe tree root flares during tree selection at grower's yard or nursery, Engineer reserves the right to reject any tree delivered to the site if tree's root flare is buried greater than 4" below top of rootball, even if Engineer previously accepted said trees at the grower's yard or nursery.
- C. Grade: Provide trees and shrubs of sizes and grades complying with ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Engineer, with a proportionate increase in size of roots or balls.
- D. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.
- E. Label at least one tree and one shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.
- F. If formal arrangements or consecutive order of trees or shrubs is shown, select stock for uniform height, branching height, and spread, and number label to assure symmetry in planting.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required. Provide

balled and burlapped, balled and potted, or container-grown trees. Branching Height: One-third to one-half of tree height. For street trees branching height shall be one half of tree height.

- B. Small Upright or Spreading Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows: Stem Form: Multistem, clump, with two or more main stems. Provide balled and burlapped trees.
- C. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows: Stem Form: Clump. Provide balled and burlapped trees.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub. Provide balled and burlapped, balled and potted, or container-grown shrubs.

2.4 CONIFEROUS EVERGREENS

- A. Form and Size: Specimen-quality, exceptionally heavy, densely branched, symmetrically shaped coniferous evergreens and the following grade: Heavy Grade: "XXX." Provide balled and burlapped trees.

2.5 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1. Provide balled and burlapped, balled and potted, container-grown, or fabric bag-grown trees.

2.6 GROUND COVER PLANTS

- A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1:
- B. Herbs / Ferns: Provide herbs and ferns of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1:

2.7 PLANTS

- A. Annuals: Provide healthy, disease-free plants of species and variety shown or listed. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.
- B. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

- C. Woody Vines: Provide vines of species indicated, and size indicated, complying with requirements of ANSI 12.1.3 and 12.6.
- D. Fast-Growing Vines: Provide vines of species indicated complying with requirements in ANSI Z60.1 as follows:
 - 1. Two-year plants with heavy, well-branched tops, with not less than 3 runners 18 inches or more in length, and with a vigorous well-developed root system.
 - 2. Provide field-grown vines. Vines grown in pots or other containers of adequate size and acclimated to outside conditions will also be acceptable.
- E. Bulbs: Top Size, including corresponding designation of "Jumbo", "Giant" or "Extra Large", per ANSI 11.

2.8 PLANTING SOIL MIX

- A. Planting Soil Mix:
 - 1. Quantities per cubic yard:
 - a. 3/4 cubic yard existing soil from plant pits or on-site stockpiles.
 - b. 1/4 cubic yard organic matter. Use organic matter compatible with plant materials specified. Include sand as needed
 - 2. Transplant inoculant plus chemical additives and/or soil amendments as specified and recommended by soil tests and as approved by the Engineer.

2.9 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of Shredded hardwood, Ground or shredded bark, or Wood and bark chips.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.10 STAKES AND GUYS

- A. Install Stakes and Guys per methods and locations as shown on the Drawings.

- B. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.
- C. Guy Ties and Guards:
 - 1. Guy and Tie Wire: ASTM A 641/A 641M, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.
 - 2. Guy Cable: For large trees: 5-strand, 3/16-inch- (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.
 - 3. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.
 - 4. Woven Fabric Guy Ties: Flat, woven, non-fraying, polypropylene material, 3/4" wide, white. Arbor Tie or approved equivalent.
- D. Guy and Anchoring System: ArborGuy 40E (www.stakingsystems.com), or approved equivalent. ArborGuy guylines, arrowhead anchors, tool-free tensioners.
- E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.11 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs, designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions. Dowax by Dow Chemical Co., or Wilt-Proof by Nursery Specialty Products, Inc. or approved equal
- B. Root Barrier: Root Barrier to be installed in locations shown on the plans. Refer to detail.
- C. Install "Gator Bags" as manufactured by Tree Gator Spectrum Products, Inc. Youngsville, NC USA on all Trees. or approved equal

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive exterior plants for compliance with requirements and conditions affecting installation and performance. Notify Engineer, in writing, of any conditions that might prevent satisfactory completion. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Test drainage of pits and planting beds. Notify Engineer of potential poor drainage of tree and shrub pits and planting beds. Recommend a program for correction of poor drainage

conditions and submit proposal to Engineer. Do not proceed with planting operations in areas of poor drainage until conditions are corrected, or direction is given by the Engineer.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.
- B. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Engineer's acceptance of layout before planting. Make minor adjustments as required.
- C. Lay out exterior plants at locations directed by Engineer. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING BED ESTABLISHMENT

- A. Loosen subgrade of planting beds to a minimum depth of 8 inches (200 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply fertilizer directly to subgrade before loosening in accordance with "Planting Soil Mix" Article in Part 2, and in accordance with soil laboratory test recommendations per Section "Soil Preparation."
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil mix to a depth of [8 inches (200 mm)] [12 inches (300 mm)] [18 inches (450 mm)] [as indicated on the drawings] but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil mix.

- B. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Restore planting beds if eroded or otherwise disturbed after finish grading and before planting.

3.4 TREE AND SHRUB EXCAVATION

- A. Pits and Trenches: Excavate circular pits with sides sloped inward, so that top of pit is larger than bottom of pit. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation.
 - 1. Excavate approximately three times as wide as ball diameter for planting 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. If drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.
- B. Subsoil removed from excavations may be used as backfill.
- C. Obstructions: Notify Engineer if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Engineer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

- A. Set balled and burlapped stock plumb and in center of pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
 - 1. Cut burlap and wire baskets from top half of root balls, but do not remove from under root balls. Discard removed burlap and wire baskets; do not turn down baskets and leave in tree or shrub pits. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, install transplant inoculants per manufacturer's directions and water thoroughly before

- placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
3. Prepare surface of planting bed as shown on drawings.
- B. Set balled and potted or container-grown stock plumb and in center of pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
1. Carefully remove root ball from container without damaging root ball or plant.
 2. Make four (4) evenly spaced vertical cuts in the sides of the root ball with a clean, sharp utility knife. Cuts are to be one inch (1") deep and are to extend the full height of the rootball.
 3. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, install transplant inoculants per manufacturer's directions and water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
 4. Prepare surface of planting bed as shown on drawings.
- C. Set fabric bag-grown stock plumb and in center of pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
1. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 2. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, install transplant inoculants per manufacturer's directions and water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
 3. Prepare surface of planting bed as shown on drawings.
- D. Organic Mulching: Apply 2-inch (50-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.
- E. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape if requested by Engineer. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation; take corrective measures required before wrapping.

3.6 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as directed by Engineer.
- B. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Engineer, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

3.7 GUYING AND STAKING

- A. Guy and Stake trees as indicated on the drawings. Installation of tree support systems shall be completed within 48 hours of planting, utilizing applicable methods as indicated.

3.8 GROUND COVER AND PLANT PLANTING

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

3.9 PLANTING BED MULCHING

- A. Mulch backfilled surfaces of planting beds and other areas indicated.
 - 1. Organic Mulch: Apply 2-inch (50-mm) average thickness of organic mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.
 - 2. Mineral Mulch: Apply [2-inch (50-mm)] [3-inch (75-mm)] average thickness of mineral mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.

3.10 TREE WATERING BAGS

- A. Install a minimum of one tree watering bag per tree. Install multiple bags for trees as recommended by the tree watering bag manufacturer. Fill water bags for each tree.

3.11 INITIAL ACCEPTANCE

- A. When all work except maintenance and guarantee program of this contract has been completed, Engineer will perform a Substantial Completion inspection. Provide notification

at least ten (10) working days before inspection date. If required a "punch list" of items to be completed by an agreed upon date will be issued by the Engineer after the Substantial Completion inspection.

- B. Work will be considered Substantially Complete after all "punch list" items are complete. Notify the Engineer at least five (5) working days before re-inspection date, to verify completion of the "punch list" items.
- C. Substantial Completion certificate will be issued and dated by the Engineer following the "punch list" verification inspection.

3.12 MAINTENANCE

- A. Maintain all exterior plants covered by this Section, as required to establish healthy, viable plantings, including the following maintenance requirements during the maintenance period indicated in Part 1 of this Section:

1. Mowing;
2. Edging;
3. Pruning;
4. Cultivating;
5. Watering, including filling tree water bags, do not allow plants to wilt at any time;
6. Weeding;
7. Fertilizing;
8. Mulching;
9. Restoring plant saucers for trees;
10. Maintaining trees support systems at correct tension;
11. Resetting plants to proper grade and vertical position;
12. Insect and Pest Control as required to keep plants free of insects and disease;
13. Restoring or replacing damaged tree wrappings;
14. Removal of trash and debris; and
15. Replacing dead or dying plants.

3.13 FINAL ACCEPTANCE

- A. Inspection to determine Final Acceptance of planted areas will be made by the Engineer upon Contractor's request at completion of the two-year Warranty Period. Provide notification at least fifteen (15) working days before requested inspection date.
 1. Planted areas will be acceptable provided all requirements, including plant replacements and maintenance, have been complied with and healthy, thriving, and growing plants are established.
 2. Remove all Tree Staking and Guying materials prior to Final Acceptance inspection.
 3. Knock down, regrade, and remulch all tree pit saucers prior to Final Acceptance inspection.

3.14 CLEANUP AND PROTECTION

- A. During exterior planting, keep adjacent pavings and construction clean and work area in an orderly condition.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.

3.15 DISPOSAL

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of off Owner's property.

END OF SECTION 329300