

SECTION 02350 - TREE/VEGETATION PROTECTION BARRIER

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes the protection and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.
- B. Related Sections:
 - 1. Section 02725 “Infiltration Bed” for building utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Tree Pruning Schedule: Written schedule from certified arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
- C. Qualification Data: For tree service firm and arborist, ISA certification required.
- D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly pruned and repaired when damaged.
- E. Maintenance Recommendations: From certified arborist, for care and protection of trees affected by construction during and after completion of the Work.
- F. Provide final log of work performed including any damage that occurred during construction and subsequent repairs.

1.3 QUALITY ASSURANCE

- A. Tree Service Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site on a full-time basis during execution of the Work.
- B. Arborist qualifications: An arborist certified by the International Society of Arboriculture.
- C. Tree Pruning Standards: Comply with ANSI A300 (Part 1), “Trees, Shrubs, and other Woody Plant Maintenance—Standard Practices (Pruning).”
- D. Pre-installation Conference: Before starting tree protection and trimming, meet with representatives of authorities having jurisdiction, Owner, Architect, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Unless otherwise noted on plans, materials for tree/vegetation protection barriers shall conform to the following requirements and AOB:
 - 1. Plastic barrier fence (orange or green color)
 - 2. Steel post (minimum length 6.0 feet)
 - 3. #14 gauge steel wire
- B. Temporary Signs: White or yellow weatherproof material, 8 inch by 40 inch minimum, with 3-inch black letter: text – “Tree Protection Area – Do Not Enter”.

PART 3 EXECUTION

3.1 PREPARATION

- A. Temporary Fencing: Install temporary fencing around the tree protection zones to protect remaining vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
- B. Temporary Signs: Install temporary signs 60 feet apart, or two per protected tree, whichever is greater, on posts of temporary fencing. Maintain temporary signs and remove when construction is complete.
- C. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
- E. Do not allow fires under or adjacent to remaining trees or other plants.

3.2 EXCAVATION

- A. Install shoring or other protective support systems to minimize shoring or benching of excavations.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
 - 1. Relocate roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical; cut roots approximately 3 inches (75 mm) back from new construction.
 - 2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect.
 - 3. Do not allow heavy equipment in tree protection areas. All excavation work is to be performed by hand.
- D. Root Pruning: Do not cut main lateral roots; cut only smaller roots that interfere with installation of utilities or construction. Cut roots with sharp pruning instruments; do not break or chop.

- E. When excavating, place excavated soil on opposite side of trench from tree.

3.3 REGRADING

- A. Do not fill within tree protection zones, unless otherwise indicated.
- B. Where filling for new construction is required within drip line of trees, perform work by hand to minimize damage to root systems
 - 1. Where existing grade is below elevation of finish grade, fill with topsoil. Place topsoil by hand in a single uncompacted layer and hand grade to required finish elevations.

3.4 TREE PRUNING

- A. Prune trees to remain that are affected by temporary and permanent construction.
- B. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
- C. Cut branches with sharp pruning instruments; do not break or chop.
 - 1. Clean all pruning instruments with antimicrobial solution between performing work on separate trees to avoid the potential spread of pathogens.
- D. Chip removed tree branches and use as organic mulch or dispose of off-site.

3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
- B. Remove and replace dead and damaged trees that arborist determines to be incapable of restoring to a normal growth pattern.
 - 1. Provide new trees of a 6-inch caliper size and of a species selected by Architect when damaged trees more than 6-inch caliper size, measured at breast height, are required to be replaced.
 - 2.
 - a. Planting New Trees: Comply with Columbia University standards.
 - b. Warranty and Maintenance Period: One year.
- C. Aerate surface soil, compacted during construction, 10 feet (3 m) beyond drip line. Drill 2-inch (50-mm) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.
- B. Disposal: Remove excess excavated material, displaced trees, and excess chips from Owner's property. Disposal shall be in a legal manner.

END OF SECTION

SECTION 02370 - TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 Description of Work

- A. The work of this section includes all temporary erosion and sediment control and related and incidental operations, including:
 - 1. Silt fence installation and maintenance
 - 2. Maintenance and repairs of erosion and sediment control measures
 - 3. Rock filters and sediment basins

1.2 Quality Assurance

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction. Construction operations shall be carried out in a manner such that soil erosion, air pollution, and water pollution is minimized. State, County, and Municipal laws concerning pollution abatement shall be followed.
- C. The recommendations and standards set forth in the New York State Department of Environmental Conservation, Standards and Specifications for Erosion and Sediment Control, August 2005 or latest edition.
- D. The Contractor shall take action to remedy unforeseen erosion conditions and to prevent damage to adjacent properties as a result of increased runoff and/or sediment displacement. Stockpiles of wood chips, hay bales, crushed stone, and other mulches shall be held in readiness to deal immediately with emergency problems of erosion. All erosion control checks and structures shall be inspected after heavy rainfalls, and if damaged, repaired or replaced.

PART 2 - PRODUCTS

- 2.1 All materials and products shall meet the approval of the engineer. Cut sheets for all items shall be submitted for review and approval prior to installation.
 - A. Silt Barrier Fence: Class 3 geotextile materials with 2"x2" anchoring pots
 - B. Flow Filter Bag (inlet protection): as specified in the New York State Department of Environmental Conservation, Standards and Specifications for Erosion and Sediment Control, August 2005 or latest edition.
 - C. Coarse Aggregate (inlet protection): AASHTO #57 or equivalent.
 - D. Sediment Filter Bag: as specified in the New York State Department of Environmental Conservation, Standards and Specifications for Erosion and Sediment Control, August 2005 or latest edition.
 - E. Hay or Straw Mulch

PART 3 - EXECUTION

3.1 General Requirements:

- A. All temporary erosion and sediment control measures indicated on the drawings and specified herein shall be in place before the beginning of any earthwork or site work phase. Refer to general plan notes and details for additional information.
- B. Erosion and sediment control measures shall be inspected weekly and after every precipitation event.
- C. Install erosion and sediment control products according to manufacturer's directions.
- D. Inspect silt barrier fence after every precipitation event.
- E. Remove sediment when it has reached ½ of the above ground height of the silt barrier fence.
- F. All graded or cleared areas shall receive temporary seeding if subject to erosion for a period of 72 hours or more.
- G. Provide adequate maintenance of erosion and sediment control measures conforming to requirements in the New York State Department of Environmental Conservation, Standards and Specifications for Erosion and Sediment Control, August 2005 or latest edition, and as indicated on the drawings.
- H. Remove sediment from inlet protections and asphalt roadways after each major storm event.

END OF SECTION

SECTION 02410 – AIR SPADING EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work includes hand and/or pneumatic excavation (air spading) in accordance with the plans, specifications, and directions of the Engineer. Air spading areas are defined on the plans, and include areas where trenching or other excavation is required within the drip line of existing trees.
- B. The purpose of air spading is to preserve the primary root structure of the trees, which is defined as preserving roots of 1-inch diameter and larger that do not conflict with proposed utilities or structures. Backfill of soil, granular materials, etc., around roots of 1-inch diameter and larger exposed by air spading may be required. Refer to Part 3 – Execution, below.

1.2 SUBMITTALS

- A. The Contractor shall submit in advance the proposed method of excavation for air spading areas. If a device other than the Air-Spade® is proposed, all product literature and/or description of excavation means and methods shall be submitted for review and approval by the Engineer.

1.3 QUALITY ASSURANCE

- A. Contractor shall notify the Engineer/Owner's Representative prior to air spading excavation and once air spading excavation is complete. Removal of tree roots 1-inch diameter and larger within air spading zones that do not conflict with directly location of stormwater utilities shall be approved by the Engineer/Owner's Representative.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION

3.1 METHODS

- A. Prior to beginning work, the area to be trenched/excavated shall be thoroughly wetted, 24 hours in advance, to minimize dust to the greatest extent possible.

- B. Trenching/Excavation shall be accomplished either by hand or with a pneumatic device. All hand excavation shall be completed carefully so as to not damage roots of 1-inch diameter and greater. Acceptable pneumatic equipment includes:
1. Air-Spade® CGP System – Manufacturer: Concept Engineering Group, Inc. Verona, PA,
 2. Or Approved Equal.
- C. The Contractor shall provide a compressor unit for operating the pneumatic excavator rated at one hundred fifty standard cubic feet per minute (150 scfm) at ninety pounds per square foot gauge (90 psfg). All pneumatic excavation shall be as minimal as possible in width and depth, thereby minimizing the impact on tree roots and other areas as noted on the plans. Different nozzles may be used on the air spade to expedite the work or minimize the amount of airborne material.
- D. Depth shall be as indicated on Contract Drawings or as directed by the Engineer. Depths greater than 18” shall require removal of soil by hand shovel, or other appropriate means. Where a pneumatic device is used, care shall be taken to avoid rocks being scattered and inadvertently damaging private or public property. In addition, operators must be equipped with adequate protective clothing and gear, in accordance with manufacturer’s recommendations.
- E. All tree roots exposed by the pneumatic or hand excavation operation must be kept constantly moist with burlap covered with white plastic and checked a minimum of two (2) times a day, once in the morning and once in the afternoon, for a maximum of forty-eight (48) hours, until backfill is complete as directed by the Engineer/Owner’s Representative. If directed, soaker hoses shall be installed to facilitate properly moist conditions.
- F. Necessary inspections of utilities, structures, and backfill shall be scheduled in advance to minimize the amount of time that roots and air spading areas are exposed.
- G. In cases where roots must be cut, the Contractor must receive written approval from the Engineer/Owner’s Representative prior to cutting any roots larger than one inch (1”) in diameter. Roots must be cut cleanly with pruning shears, loppers, or pruning saws. All root cuts must be approved by the Engineer prior to backfilling.

END OF SECTION

SECTION 02515 - STRAIGHT GRANITE CURB (5" x 12")

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Under this item the Contractor shall furnish and install granite curbing where shown on the plans or as directed by the Engineer. This item is intended for use at driveway and handicapped access ramp locations.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Curbing shall be from eleven (11") to thirteen (13") inches high, shall have a minimum width on top of five (5") inches and a minimum of four (4") inches at the bottom for not less than two-thirds (2/3) of the length of stone. The minimum length for all straight curb shall be five (5') feet. The use and payment for stone less than five (5') feet in length will be with the approval of the Engineer under this item.
- B. The curbstones shall have a top surface sawed to an approximately true plane. The front and back arris lines shall be pitched straight and true. There shall be no projection on the back surface for three (3") inches down from the top which would exceed a batter of four (4") inches in twelve (12") inches.
- C. The front face shall be at right angles to the plane of the top and shall be smooth quarry split, free from drill holes in the exposed face. There shall be no projections greater than one-half (1/2") inch measured from the vertical plane of the face through the top arris line for a distance of eight (8") inches down from the top. For the remaining distance there shall be no projections or depressions greater than one (1") inch measured in the same manner. The arris lines at the ends shall be pitched with no variation from the plane of the face greater than one-eighth (1/8") of an inch.
- D. The ends of all stones shall be squared with the planes of the top and face, and so finished that when the stones are placed butted end to end as closely as possible no space more than one-half (1/2") of an inch shall show in the joint for the full width of the top or down on the face for eight (8") inches. The remainder of the end may break back not over twelve (12") inches from the plane of the joint.
- E. The curbstones shall be thoroughly cleaned of any iron rust or iron particles.

PART 3 – EXECUTION

3.01 CONSTRUCTION DETAILS

- A. The curb shall be set in a trench, as shown on the plans, and in the following manner: The

trench for the curb shall be dug thirty (30") inches below the adjoining curb grade and eighteen (18) inches wide, with the back of the trench to be eleven (11") inches from the face of the curb. The subgrade shall be graded and tamped smooth prior to placement of the four (4") inch PE pipe drain. A line of four (4") inch perforated polyethylene pipe connected to catch basins so as to drain into the basins, will then be laid at the rear of the bottom of the trench in eight (8") inches of No. 2 stone. A six (6") inch layer of fairly dry concrete, mixed in the proportions of one and one-half (1.5) parts Portland Cement to three (3) parts of Concrete Sand and six (6) parts of coarse aggregates, shall be placed upon the stone foundation as specified above. The coarse aggregate shall be uniformly graded from particles passing a one and one-half (1 1/2) inch screen to those retained on a one-quarter (1/4") inch screen.

- B. In proportioning the materials for the concrete to be used in the curb trench batch boxes or the proper size shall be used. No shoveling of materials directly from stockpiles to the mixer will be allowed. Each mixer used for this type of work shall be fitted with a charging hopper or other approved device. Central plant batching and transit mixing are preferred methods of meeting this requirement.
- C. The curb shall be set carefully to line and grade, with close joints and even and contiguous surfaces, upon the concrete foundation. Wet concrete of the same mix proportions described above is to be placed back of the curb to within six (6") inches of the top of the curb, and in front of the asphalt binder for the pavement, or as ordered by the Engineer.
- D. Where stone curbing is used with any pavement not requiring a concrete foundation, the concrete in which the curb is set shall extend to within three (3") inches of the gutter grade on the front of the curbing.
- E. In cases where it becomes necessary to drain into a catch basin or manhole off the line of the curbing the connection between the curb trench and basin or manhole shall be made with four (4") inch perforated PE pipe, as directed by the Engineer. This four (4") inch perforated PE pipe shall be included in the price bid and shall be surrounded for its entire length, by concrete six (6") inches in thickness, mixed as specified for the curb trench.
- F. At all driveways, Straight Granite Curb (12") as specified in this Section shall be used. The concrete foundation and stone underdrain is to be maintained at the standard thickness described above. On each side of the lowered driveway, the end of the adjoining stones shall be beveled at a slope of one (1) to one (1), from the top of the adjoining curb to the top of the lowered curb. This beveling shall be done by a competent stone cutter. The use of Granite Transition Curb as specified in Section 02517, will eliminate the need for beveling of the curbstone. Curbing at driveway locations shall have reveal of one (1") to one and one-half (1 1/2") inches. Curbing at handicapped access ramps shall have a reveal of one-fourth (1/4") inch.

3.02 RESTORATION OF SURFACES

- A. Unless specified otherwise in the Contract Documents, the Contractor shall provide full restoration of surfaces in front of and behind the curb to their preconstruction conditions.

This work includes furnishing and placement of topsoil, permanent seeding, full restoration of pavements, resetting of sign posts standards, and any other work required to restore these areas to preconstruction conditions, unless specified otherwise in the Contract Documents.

END OF SECTION

SECTION 02516 - STRAIGHT GRANITE CURB (5" x 16")

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Under this item the Contractor shall furnish and install granite curbing where shown on the plans or as directed by the Engineer. Use of this item is only with the approval of the Engineer.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. This curbing shall be from fifteen (15) to seventeen (17) inches high, shall have a uniform width on top of five (5) inches and a minimum of four (4) inches at the bottom for not less than two-thirds (2/3) of the length of stone. The minimum length for all straight curb shall be five (5) feet. The use and payment for stone less than five (5) feet in length will be with the approval of the Engineer under this item.
- B. Except for the above-described dimensions, this curbing shall conform to the materials requirements specified in Section 02515 - Straight Granite Curb (5" x 12").

PART 3 – EXECUTION

3.01 CONSTRUCTION DETAILS

- A. Construction details shall be identical to those specified in Section 02515 - Straight Granite Curb (5" x 12").

3.02 RESTORATION OF SURFACES

- A. Unless specified otherwise in the Contract Documents, the Contractor shall provide full restoration of surfaces in front of and behind the curb to their preconstruction conditions. This work includes furnishing and placement of topsoil, permanent seeding, full restoration of pavements, resetting of sign posts standards, and any other work required to restore these areas to preconstruction conditions, unless specified otherwise in the Contract Documents.

END OF SECTION

SECTION 02517 - GRANITE TRANSITION CURB (5")

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Under this item the Contractor shall furnish and install granite curb transition where shown on the plans or as directed by the Engineer. This item is intended for transition from sixteen inch (16") curb to twelve inch (12") curb at driveways and handicapped access ramps.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. The transition curb shall have an approximate depth of sixteen inches (16") at one end and taper to a depth of approximately twelve inches (12") at the other end. The length of the curbstone shall be a minimum of twenty-four inches (24") at driveways and a minimum of five feet (5') ± 3" at handicapped access ramps. It shall have a minimum width on top of five inches (5") and a minimum width on bottom of four inches (4") for not less than two-thirds (2/3) of the length of stone.
- B. Except for the above-described dimensions, this curbing shall conform to the materials requirements specified in Section 02515 - Straight Granite Curb (5" x 12").

PART 3 – EXECUTION

3.01 CONSTRUCTION DETAILS

- A. Construction details shall be identical to those specified in Section 02515 - Straight Granite Curb (5" x 12").

3.02 RESTORATION OF SURFACES

- A. Unless specified otherwise in the Contract Documents, the Contractor shall provide full restoration of surfaces in front of and behind the curb to their preconstruction conditions. This work includes furnishing and placement of topsoil, permanent seeding, full restoration of pavements, resetting of sign posts standards, and any other work required to restore these areas to preconstruction conditions, unless specified otherwise in the Contract Documents.

END OF SECTION

SECTION 02520 – PCC SIDEWALKS AND DRIVEWAYS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Under these items the Contractor shall construct or replace Portland Cement Concrete sidewalks and/or driveways as shown on the plans or as directed by the Engineer.
- B. The Contractor shall replace the entire PCC panel (concrete and topping courses) for any disturbed PCC area through adjacent panel expansion joint(s). Partial or piecemeal replacement will not be accepted.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. The requirements of the following sections of the current NYSDOT Standard Specifications, Construction and Materials, shall apply unless otherwise indicated in the contract documents:

| | |
|--------------------|--------|
| Portland Cement | 701-01 |
| Coarse Aggregates | 703-02 |
| Concrete Sand | 703-07 |
| Welded Wire Fabric | 709-02 |
| Admixtures | 711-08 |
| Water | 712-01 |

- B. Concrete for the lower course of two-course sidewalks and driveways shall comply with the requirements for Class A concrete, as defined in the aforementioned NYSDOT Standard Specifications, Table 501-3, "Concrete Mixtures". This concrete shall attain a minimum compressive strength of 3500 psi when tested at twenty-eight (28) days in accordance with ASTM C39-80. The air content of the freshly mixed concrete shall be six (6%), plus or minus one (1%) percent and the slump shall be three and one half (3 -1/2") inches plus or minus one half (1/2) inch.
- C. Non-woven geotextile (drainage filter fabric) shall conform to the following:
 - a. Minimum flow rate of 110 gal/min/ft² ASTM D-4491-99A
 - b. Grab tensile strength min 150 lb ASTM D-4632-91
 - c. Mullen Burst strength min 300 psi ASTM D-3786-87
 - d. Puncture strength min 90 lb ASTM D-4833-00
 - e. Apparent opening size 60-70 US Sieve ASTM D-4751-99A
 - f. Non-woven geotextile shall be Mirafi 160N, or approved equal.

PART 3 – EXECUTION

3.01 CONSTRUCTION DETAILS

A. ADA Compliance

1. Attention of Contractor is called to the following: The work in this contract shall comply with the requirements of the AMERICANS with DISABILITIES ACT of 1990 (ADA). The standard details included comply with the ADA. Sections of the ADA Accessibility Guidelines for Buildings and Facilities: Final Guidelines (ADA-AG), and ADA-AG Appendix should be consulted for further guidance.

B. Excavation

1. Existing deteriorated concrete shall be removed and disposed off the line of work to the satisfaction of the Engineer.

C. Subgrade

1. The subgrade shall be that portion of the ground surface directly beneath the sidewalk slab. Up to 3" of subgrade excavation shall be included in this payment item.
2. The subgrade shall be dressed to a plain surface containing no large stones, roots, sod or rubbish, and shall slope downward toward the roadway one-quarter (1/4") inch per foot laterally, and to such longitudinal grade as may be shown on the plans.
3. After the grading is completed, the surface shall be compacted and, if necessary, all soft or spongy areas shall be removed and replaced with suitable fill material. Fill material shall conform to the requirements of Granular Subbase, as specified in the NYSDOT Standard Specifications, Type 4 subbase or equal approved by the Engineer.

D. Formwork

1. Forms shall be of lumber with nominal thickness of two (2") inches, or of steel of equal rigidity and strength. No forms shall be less than five (5") inches in depth for sidewalks or seven (7") inches for driveways and corners. Flexible strips may be used on curves. The forms shall be staked or otherwise held to the established grade of walk. All forms shall be properly cleaned and wood forms shall be thoroughly wetted, and metal forms oiled, before depositing any material against them.
2. The total thickness of walks shall be five (5") inches and shall consist of a wearing surface course one (1") inch thick placed upon a base course four (4") inches thick. Driveways shall have a total depth of seven (7") inches and shall consist of a wearing course one (1") inch thick placed upon a base course six (6") inches thick.

3. Contraction (tooled) joints shall be placed between expansion joints at equal intervals not exceeding six (6') feet. These joints shall be formed either by the use of division plates (steel), one-eighth (1/8") inch thick, or by approved methods of cutting a groove in the surface of the finished concrete.
4. Where the sidewalk line intersects a building, walk, permanent structure or other location as designated by the Engineer, a one-half (1/2") inch, non-extruding pre-molded expansion joint shall be provided, and placed at intervals not exceeding twenty (20') feet in sidewalks.
5. Expansion joints shall be pre-molded strips of asphaltic felt of the required thickness, as wide as the thickness of the walk, and laid in one piece as long as the full length of the slab.
6. Expansion joints shall extend from the surface to the subgrade, be at right angles to the sidewalk surface and be constructed prior to placing the concrete.
7. Expansion joints shall be filled with a one-part, non-priming, self-leveling polyurethane sealant. Approved products include Sonneborn Sonolastic SL 1 or approved equal.

E. Placing

1. Concrete shall not be placed upon a dry or dusty subgrade. The subgrade shall be sprinkled or lightly wetted before placing the concrete. No concrete shall be placed on a frozen subgrade or when the temperature is or predicted to be within twenty-four (24) hours, less than forty (40°) degrees Fahrenheit, except with written permission of the Engineer.
2. After the concrete course has been brought to the established grade, it shall be struck off and worked with a float in a manner that will thoroughly consolidate it so that the surface has a true contour. The upper edges of the concrete shall be rounded to a radius of one-quarter (1/4") inch.
3. When wet spots occur, finishing operations should be delayed until the water either disappears or is removed with a squeegee. If a squeegee is used, cement should not be removed with the water. Under no conditions shall dry cement or sand be used to absorb this moisture or to hasten the hardening.

F. Curing

1. Concrete shall be allowed to cure for at least three (3) days before forms are removed. Forms shall be carefully removed from the sidewalk so no edge will be broken, and the area adjacent to the sidewalk shall be immediately refilled to the grade of the new sidewalk.
2. All walks shall be protected by suitable coverings and shielded from traffic and the

elements for at least three (3) days and shall not be open to traffic until the Engineer so directs.

3. All concrete walks, curbs, and driveways shall be sprayed with a white pigmented membrane curing compound immediately after finishing. Vapor-proof membranes used for curing will not require wetting. A list of approved membrane curing compounds is included in these contract documents.
4. The Contractor shall provide protection for all concrete placed in cold weather by covering with straw, tarpaulins, insulated blankets, or other approved material, and/or heated by salamanders, if needed to keep concrete temperatures above forty (40°) degrees Fahrenheit to obtain specified concrete strengths.

G. Testing

1. The Owner will employ a qualified third party testing laboratory to perform quality control testing of concrete and mortar used in the construction of sidewalks and driveways.
2. For each concrete placement of fifty (50) cubic yards or less, one series of compressive strength samples shall be fabricated. A series shall consist of three (3) test cylinders of base concrete and two (2) sets of test cubes of mortar topping. (Note that each set contains three (3) cubes.) One (1) concrete cylinder and one (1) set of mortar cubes shall be tested at seven (7) days, and two (2) cylinders and one (1) set of mortar cubes shall be tested at twenty-eight (28) days. Concrete cylinders shall be fabricated in accordance with ASTM C31-69 (1975), and tested in accordance with ASTM C39-80. Mortar cubes shall be fabricated and tested in accordance with ASTM C109-80. Copies of these tests results will be made available to the Engineer and Contractor.
3. Slump tests and air entrainment tests shall be taken on the concrete and mortar as directed by the Engineer in accordance with ACI and ASTM standards.
4. At the discretion of the Engineer, core samples may be taken for testing of thickness and compressive strength. The cost of coring and testing of cores shall be borne by the Owner, and copies of test results shall be made available to the Contractor.
5. If the average thickness of the concrete sidewalk as determined by the measurements of all cores taken on the work is deficient by more than one-quarter (1/4") inch, a deduction will be made from the contract price in the form of a change order. The amount of deduction shall be determined by the Engineer.
6. Any part of the concrete sidewalk or driveway which is deficient in depth by more than one-half (1/2") inch will not be accepted, and at the option of the Owner said sidewalk (or driveway) may be taken up and replaced according to the specification, at the Contractor's expense.

7. Sections of sidewalk for which core or cylinder or cube tests show the strength to be less than ninety (90%) percent of the compressive strength required will not be accepted and shall be replaced at the Contractor's expense.

3.02 NAME PLATE/CONTRACT NUMBER

- A. The Contractor, as required by City Ordinance, shall imprint the concrete work at the beginning, end, corners and every 250 feet, with the Contractor's (and sub-contractor's) name, year of construction, and the contract number under which the work is performed.
- B. The Contractor's imprint numbers shall not be less than two (2) inches nor more than three (3) inches tall. Letters shall be not less than one (1) inch nor more than two (2) inches tall.
- C. The Contractor shall be restricted from imprinting the Contractor's name promiscuously, and shall be guided as to the location of same by the Engineer or the Resident Engineer.

3.03 PROTECTION OF SURVEY MONUMENTS AND UTILITIES

- A. The Contractor shall comply with the requirements of the City's standard SUPPLEMENTAL CLAUSES OF GENERAL APPLICATION to protect City survey monuments and various utilities in or adjacent to the line of work.

3.04 PERIOD OF MAINTENANCE

- A. The Contractor shall remedy, without cost to the Owner, any defects which may occur during a period of two (2) years from the date of completion and acceptance of work performed under this contract, provided such defects are caused by defective or inferior material and/or workmanship.

END OF SECTION

SECTION 02521 - SIDEWALK/DRIVEWAY SEALANT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Under this payment item the Contractor shall install a one-part, non-priming, self-leveling polyurethane sealant to fill expansion joints in sidewalks, driveways or bus pads as directed by the Engineer.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. A one component, non-priming, urethane, self-leveling, (pour grade) sealant for use in contraction and expansion joints in sidewalks, pavements, decks or other concrete structures shall be used. Approved products include Sonneborn Sonolastic SL 1 or approved equal.
- B. The sealant material shall fully comply with:
 - 1. Federal Specification TT-S-00230C, Type 1 Class A
 - 2. ASTM C-920, Type S, Grade P, Class 25, Use T, M.
- C. The material used shall meet the following properties:

| <u>Property</u> | <u>Test Method</u> | <u>Value (average)</u> |
|--------------------------------|------------------------------|----------------------------------|
| Tensile Strength | ASTM D412 | 350 Al |
| Elongation | ASTM D412 | 800% |
| Hardness-Shore A | Shore Durometer | 43+/-2 |
| Shrinkage | | |
| Weatherability (1000 Hours) | Atlas 6500 Watt Xenon Arc | Excellent |
| Low Temperature Flexibility | ASTM D746 | -40 degrees Fahrenheit |
| Service Temperature Range | | -40 to 180 degrees Fahrenheit |

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

- A. Surfaces shall be prepared as directed by the Manufacturer's Instructions.

- B. Joints surfaces shall be structurally sound, clean, dry, and free of all loose aggregate, paint, oil, grease, asphalt, wax, mastic compounds, waterproofing compounds or form release materials prior to the application of the sealant.

3.02 APPLICATION PROCEDURE

- A. The joint sealant should be installed in accordance with Manufacturer's recommendations.
- B. Fresh concrete must be fully cured before installing the sealant material.
- C. Fill joints from the bottom; avoid bridging of the joint which may form air voids. Ideally, the temperature at the time of application should be the median between surface temperature extremes. Thus, the joint width would be at the mid-point of maximum and minimum opening, providing for maximum efficiency of sealant with subsequent joint movement.
- D. Protect joint from dirt and traffic until cured.

3.03 PERIOD OF MAINTENANCE

- A. The Contractor shall remedy, without cost to the Owner, any defects which may occur during a period of two (2) years from the date of completion and acceptance of work performed under this contract, provided such defects are caused by defective or inferior material and/or workmanship.

END OF SECTION

SECTION 02610 - ASPHALT MILLING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Under this item the Contractor shall perform cold-planing/milling and removal of asphalt pavements in accordance with the plans or as directed by the Engineer.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

1.1 EQUIPMENT

- A. The equipment for grinding and profiling pavement surface shall be a power-operated, planing machine or grinder capable of removing in one pass, a thickness of asphaltic concrete necessary to provide profile, cross-slope, and desired texture uniformly across the entire pavement surface up to seven (7) inches in one pass.
- B. The equipment shall be self-propelled with sufficient power, traction, and stability to maintain accurate depth of cut and slope.
- C. The equipment shall have be capable of controlling the chunk size to meet the following gradation:

| <u>Sieve Size</u> | <u>Chunk Size Gradation</u> | <u>Percent Passing</u> |
|-------------------|-----------------------------|------------------------|
| 3" | | 100 |
| 2" | | 95-100 |
| #200 | | 0-12 |

- D. In addition, the machine shall be so designed that the drum is capable of cutting with a zero side clearance on at least one side.
- E. The reclaimed material will be discharged to the rear of the machine onto a 24" pick-up conveyor belt. This conveyor will transfer material to a minimum of 24" wide truck loading conveyor.
- F. The equipment shall be capable of accurately and automatically establishing profile grades along each edge of the machine (within $\pm 1/8"$) by referencing from the exiting pavement by means of a ski matching shoe or from an independent grade control and shall be controlled by an automatic system for controlling grade elevation and cross slope at a given rate.
- G. The machine shall be equipped with means to control dust and other particulate matter created by the cutting action.
- H. Machine shall be variable in order to leave the desired grid pattern surface texture.

- I. Determination of the type carbide milling teeth shall be the sole discretion of the using agency if the intended milling is to be used as a serviceable riding texture for an indeterminate time.
- J. The Contractor shall provide sufficient equipment to remove the millings from the pavement at the same rate as the milling operation.

1.2 PLANING/MILLING AND REMOVAL

- A. The paving surface shall be removed to a depth as shown on plans, and to a width, grade, and cross-section as shown on plans, or as directed by the Engineer.
- B. The work involved corresponds to the Asphalt Recycling and Reclaiming Association's designation of Class II Cold Planing, in which pavement is removed to a specified uniform depth. Milling a wedge cut along the curb line to a specified cross slope will also be required.
- C. The surface resulting from the milling operation shall be in accordance with the plan and specification grades, and shall be characterized by uniform discontinuous longitudinal striations or other uniform pattern and shall not be gouged or torn.
- D. Before opening the milled surface to traffic, all loose material shall be removed from the milled surface and the surface swept with a power broom.
- E. In the event the entire pavement width along a section of highway has not been planed to a flush surface by the end of a work period, resulting in a vertical or near vertical longitudinal face exceeding 1-1/4" in height, this longitudinal face shall be sloped in a manner acceptable to the Engineer as not to create a hazard to traffic. If the road is to be open to traffic, vertical drop-offs in excess of two (2) inches at a lane line or at a centerline shall not be left overnight.
- F. Transverse faces existing at the end of a work period should be tapered in a manner approved by the Engineer to avoid a hazard for traffic.
- G. A reference elevation and string line shall be maintained by the Contractor to assure the proper subgrade. This shall be approved by the Engineer.
- H. Asphaltic concrete that cannot be removed by cold-planing equipment because of physical or geometrical restraints should be removed by other methods acceptable to the Engineer.
- I. Protect existing structures as indicated on the plans or as directed by the Engineer.
- J. Repair any pre-existing pavement base failures uncovered by the Contractor's milling operation, or as direct by the Engineer.

1.3 MILLED MATERIAL HAULING AND DISPOSAL

- A. Milled material shall be hauled offsite to a location of the Contractor's choosing. If desire, the Contractor may haul to the Department of Public Work's Asphalt Plant at 1200 Canal Street, Syracuse, and unload at the foot of the designated stockpile. DPW personnel will stack the milled material into the stockpile. The Engineer may order stockpiling at another site within city limits at no additional cost.

- B. If the Contractor chooses to haul milled material to the DPW, because the milled material is scheduled for recycling, it is imperative that it be free of any debris. The City reserves the right to reject any milled material that contains newspapers, paper bags, styrofoam, cans, wood, soil, or any other debris not found within the pavement structure. The City also reserves the right to reject any milled material that does not meet the gradation size specified above. Any material deemed unacceptable by the City shall be weighed on the truck scale located at the DPW asphalt plant and the weight applied toward a deduction to the Contractor's payment, based on a rate of 10 square yards of 3" milling material per 1.5 tons of rejected material. Weight tickets shall be given for all rejected material. The Contractor shall be responsible for the disposal of rejected milled material.

END OF SECTION

SECTION 02650 - ASPHALT CONCRETE TOP AND BINDER COURSES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This includes all work required to furnish and install Asphalt Concrete, Type 7 Top Course and Type 3 Binder course as per the current NYSDOT Standard Specifications, Section 403, Hot Mix Asphalt Concrete Pavement and Section 407, Tack Coat.
- B. The depth shall be as designated on the Contract Drawings.
- C. This Work also includes:
 - 1. All minor adjustments to City-owned valve boxes, drainage structure frames & grates and manhole rims (less than twelve (12) inches) necessary to finished grade prior to surface application.
 - 2. All necessary maintenance and control of traffic and public notification.
 - 3. The pavement surface area to be treated shall be cleaned by a rotary power broom.
 - 4. The application of tack coat to all structures, vertical edges and the binder course (or other subbase beneath).
 - 5. All incidental work related to this item.

1.2 SUBMITTALS

- A. Informational Submittals: Manufacturer's Certificate of Compliance with Section 400 of the NYSDOT Standard Specifications for the following materials:
 - 1. Aggregate: Gradation, source test results as defined in Section 400 of the NYSDOT Standard Specifications.
 - 2. Asphalt for Binder: Type, grade, and viscosity-temperature curve.
 - 3. Prime Coat: Type and grade of asphalt.
 - 4. Tack Coat: Type and grade of asphalt.
 - 5. Additives.
 - 6. Mix: Conforms to specified NYSDOT Standard Specification formula.

1.3 QUALITY ASSURANCE

- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- C. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction (such as NYSDOT and/or City of Syracuse).
- D. Materials and workmanship shall conform to applicable requirements of NYSDOT Specifications.

1.4 MAINTENANCE AND REPAIR

- A. The two (2) year guarantee for defective or inferior material and/or workmanship shall include the pavement base as well as the wearing surface placed thereon if both were constructed by the Contractors. The guarantee shall include also all structures built and paid for as part of the contract such as manholes, sewers, and basins, as well as Portland Cement concrete sidewalks and driveways, curbs, gutters, and headers.
- B. Where necessary, temporary repairs shall be made during the winter when it is impractical to make permanent repairs. Permanent repairs in such cases shall be made as soon as weather conditions permit.
- C. The guarantee covers all the work over trenches which existed previous to the letting of the contract for the pavement, as well as those which were made by the Contractor in the course of carrying out the provisions of this contract. If the pavement settles over such trenches, the Contractor shall lay and restore the pavement over these in a thorough and workmanlike manner to conform in grade and cross-section with the adjoining pavement.
- D. The right is reserved by the Engineer to allow one or more openings to be made in any portion and the paving done by other persons than this Contractor during the term of this guarantee. In this case, however, the Contractor will not be held responsible for any settlement or other defects in the portion of the pavement re-laid, which in the opinion of the Engineer are due to said opening and repaving. Nothing herein contained shall be construed as affecting the guarantee of the Contractor in any manner upon the remainder of the pavement, and only as aforesaid on the portion re-laid.
- E. Where cracks or subsidence of the wearing surface indicate defects in the pavement foundation, the pavement structure shall be excavated to its full depth and replaced with new material corresponding to the specifications under which the original pavement was laid.
- F. Whenever the repairs necessary to be made at the expiration of the guarantee period in accordance with these specifications shall amount to more than fifty (50) percent of the area of any one block, the entire pavement on the block shall be taken up and re-laid with new pavement, according to the specifications for the original pavement.
- G. At the close of the guarantee period, all defects as above described shall have been corrected, and the pavement left in a good serviceable condition substantially conforming in form to the grade and cross-section originally established.

1.5 REFERENCES

- 1. New York State Department of Transportation Specifications.
- 2. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 19th edition 1998 or latest edition.
- 3. Contract Documents and Specifications for 2010 Annual Street Structures and Rehabilitation at Various Locations within Onondaga County and the City of Syracuse, March 2010.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Concrete, Type 7 Top Course as per the current NYSDOT Standard Specifications, Section 403, Hot Mix Asphalt Concrete Pavement and Section 407, Tack Coat.

- B. Asphalt Concrete, Type 3 Binder Course as per the current NYSDOT Standard Specifications, Section 403, Hot Mix Asphalt Concrete Pavement and Section 407, Tack Coat.

PART 3 - EXECUTION

3.1 GENERAL

- A. Traffic Control:
 - 1. Minimize inconvenience to traffic, but keep vehicles off freshly treated or paved surfaces to avoid pickup and tracking of asphalt.

3.2 LINE AND GRADE

- A. Provide and maintain intermediate control of line and grade, independent of underlying base, to meet finish surface grades and minimum thickness.
- B. Shoulders: Construct to line, grade, and cross-section shown.

3.3 APPLICATION EQUIPMENT

- A. In accordance with Section 400 of the NYS DOT Standard Specifications.

3.4 PREPARATION

- A. Thoroughly coat edges of contact surfaces (curbs, manhole frames) with emulsified asphalt or asphalt cement prior to laying new pavement. Prevent staining of adjacent surfaces.

3.5 PAVEMENT APPLICATION

- A. General: Place asphalt concrete mixture on approved, prepared base in conformance with Section 400 of the NYS DOT Standard Specifications.
- B. Tack Coat:
 - 1. Prepare material, as specified in Section 400 of the Standard Specifications, prior to application.
 - 2. Apply uniformly to clean, dry surfaces avoiding overlapping of applications.
 - 3. Do not apply more tack coat than necessary for the day's paving operation.
 - 4. Touch up missed or lightly coated surfaces and remove excess material.
 - 5. Application Rate: Minimum 0.25 liter to maximum 0.70 liter of asphalt (residual if diluted emulsified asphalt) per square meter (0.05 to 0.15 gallon per square yard) of surface area.

C. Pavement Mix:

1. Prior to Paving:
 - a. Sweep primed surface free of dirt, dust, or other foreign matter.
 - b. Patch holes in primed surface with asphalt concrete pavement mix.
 - c. Blot excess prime material with sand.
2. Place asphalt concrete pavement mix in one single lift.
3. Compacted Lift Thickness:
 - a. Minimum: Twice maximum aggregate size, but in no case less than 25 millimeters (1 inch).
 - b. Maximum: 100 millimeters (4 inches).
4. Total Compacted Thickness: As shown.
5. Apply such that meet lines are straight and edges are vertical.
6. Collect and dispose of segregated aggregate from raking process. Do not scatter material over finished surface.
7. Joints:
 - a. Offset edge of each layer a minimum of 150 millimeters (6 inches) so joints are not directly over those in underlying layer.
 - b. Offset longitudinal joints in roadway pavements so longitudinal joints in wearing layer coincide with pavement centerlines and lane divider lines.
 - c. Form transverse joints by cutting back on previous day's run to expose full vertical depth of layer.
8. Succeeding Lifts: Apply tack coat to pavement surface between each lift.

D. Compaction:

1. Uniformly compact each course to target density arrived at in compaction control strip.
2. Joint Compaction:
 - a. Place top or wearing layer as continuously as possible.
 - b. Pass roller over unprotected end of freshly laid mixture only when placing of mix is discontinued long enough to permit mixture to become chilled.
 - c. Cut back previously compacted mixture when Work is resumed to produce slightly beveled edge for full thickness of layer.
 - d. Cut away waste material and lay new mix against fresh cut.

E. Tolerances:

1. General: Conduct measurements for conformity with crown and grade immediately after initial compression. Correct variations immediately by removal or addition of materials and by continuous rolling.
2. Completed Surface or Wearing Layer Smoothness:
 - a. Uniform texture, smooth, and uniform to crown and grade.
 - b. Maximum Deviation: 3 millimeters (1/8 inch) from lower edge of a 3.6-meter (12-foot) straightedge, measured continuously parallel and at right angle to centerline.
 - c. If surface of completed pavement deviates by more than twice specified tolerances, remove and replace wearing surface.
3. Transverse Slope Maximum Deviation: 6 millimeters (1/4 inch) in 3.6 meters (12 feet) from rate of slope shown.

- A. The Engineer has the right to take core samples and test them as is deemed necessary. Testing costs will be borne by the Owner and results will be made available to the Contractor. Determination of acceptance will be made by the Engineer. Full acceptance will be made if the average density of the cores taken at a location is between 92% and 97% of the mixture's average daily maximum theoretical density. If the average density fails to meet this limit, the quantity placed and the payment according to the Engineer's quantity calculation will be adjusted according to the table below:

Quantity Adjustment Factors:

| <u>Average Core Density</u> | <u>Quantity Adjustment Factors</u> |
|-----------------------------|------------------------------------|
| 90.0% < Density < 92.0% | 90% |
| 88.0% < Density < 90.0% | 85% |
| Density < 88% | Remove/Reinstall Pavement Section |

END OF SECTION

SECTION 02651 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this Section includes striping paint pavement markings to be applied at various locations as shown in the plans.

1.2 SUBMITTALS

- A. All submittals shall be submitted to Engineer for review and approval a minimum of two weeks prior to pavement construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Striping Paint

1. Striping paint shall be chlorinated rubber base, factory mixed, non-bleeding, fast drying, best quality, white traffic paint with a life expectancy of two years under normal traffic use.
2. Paint shall be latex, water-based emulsion, ready-mixed, complying with PS TT-P-1952.
3. Color: White
4. Color for Handicapped Markings, if required: Blue

PART 3 - EXECUTION

3.1.1 INSTALLATION

- A. Sweep and clean surface to eliminate loose material and dust.
- B. Paint traffic lane striping in accordance with layouts of plan. Striping width shall be as shown on the plans. Apply paint with mechanical equipment to produce uniform straight edges. Apply in two coats at manufacturer's recommended rates. Provide clear, sharp lines.

END OF SECTION

SECTION 02675 – POROUS BITUMINOUS ASPHALT PAVEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this Section includes asphalt treated permeable base course and porous bituminous (porous asphalt) top course.

B. Related Sections:

1. Section 02725 – Subsurface Infiltration Bed

1.2 SUBMITTALS

A. All submittals and testing results shall be submitted to Engineer for review and approval a minimum of two weeks prior to pavement construction.

B. Submit a list of materials proposed for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.

C. Submit certificates, signed by the materials producer and the paving subcontractor, stating that all materials meet or exceed the specified requirements.

D. Submit samples of coarse aggregates for review and approval by the Engineer prior to installation.

E. The Contractor shall provide results of all testing as required by this Section to Engineer, including, but not limited to:

1. Draindown Test (ASTM Method D6390)
2. Moisture Susceptibility Test using the modified Lottman Method (AASHTO T283) with the following:
 - a. Compact using 50 gyrations of Superpave gyratory compactor
 - b. Apply partial vacuum of 26 inches of Hg for 10 minutes to whatever saturation is achieved.
 - c. Keep specimens submerged in water during freeze cycle.
 - d. Required retained tensile strength (TSR) $\geq 80\%$
 - e. If the moisture susceptibility test cannot be successfully run on the porous asphalt mix, a comparable dense-graded mix (with the same top size stone and the same material sources) can be tested in accordance with AASHTO T283.
3. Air Voids Test (AASHTO T269/ASTM D3203)

F. The Contractor shall submit certification of all materials as required by this Section to Engineer, including:

1. Gradation of aggregate(s)
2. Certification letter from polymer modified asphalt laboratory (if applicable).
3. Test data, mix design, and Performance Grade classification of the neat asphalt.

4. Certification and mixing recommendations for all asphalt additives including fibers, hydrated lime, and additives
5. Recommended mixing and compaction temperatures based on testing results.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.
- B. Codes and Standards
 1. All materials, methods of construction and workmanship shall conform to applicable requirements of NYSDOT Standard Specifications and AASHTO Standards, unless otherwise specified.

1.5 PROJECT CONDITIONS

- A. Protection of Existing Site
 1. Protect adjacent work from splashing of paving materials. Remove all stains from exposed surfaces of paving, structures, and grounds. Remove all waste and spillage.
 2. Do not damage or disturb existing site features, utilities, or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.
 3. Restore damaged site features, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Owner, and authority having jurisdiction at no additional cost.
- B. Safety and Traffic Control
 1. Notify and cooperate with local authorities and other organizations having jurisdiction (such as NYSDOT and/or City of Syracuse) when construction work will interfere with existing roads and traffic.
 2. Provide temporary barriers, signs, warning lights, flaggers, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.
- C. Weather Limitations
 1. Do not place porous bituminous paving mixtures when surfaces are wet or when the ambient temperature is 55 degrees Fahrenheit or lower (measured in the shade and away from artificial sources of heat).
- D. Erosion and Sediment Measures

1. All erosion and sediment measures must be installed prior to infiltration bed construction and maintained throughout project construction.
2. It is the contractor's responsibility to maintain job conditions to prevent the deposition of sediment on infiltration beds by wind-borne deposition, tracking, stormwater runoff, etc.
3. If job conditions arise that adversely affect the infiltration bed, additional measures such as access control during construction, vacuuming of impervious and pervious surfaces, or additional site stabilization may be required.

1.6 REFERENCES

1. Annual Book of ASTM Standards, 2008 or latest edition; American Society for Testing and Materials, Philadelphia, PA.
2. New York State Department of Transportation Specifications.
3. Standard Specifications for Transportation and Methods of Sampling and Testing of the American Association of State Highway and Transportation Officials (AASHTO), 2007 or latest edition.
4. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 19th edition 1998 or latest edition.
5. Contract Documents and Specifications for 2010 Annual Street Structures and Rehabilitation at Various Locations within Onondaga County and the City of Syracuse, March 2010.

PART 2 - PRODUCTS

A. MATERIALS

A. Infiltration Beds

1. Per Section 02725.

B. Asphalt Treated Permeable Base Course

1. Shall meet the requirements of Type 1 Permeable Base as per Table 401-1 Composition of Hot Mix Asphalt Mixtures in Section 401 of New York State Department of Transportation Standard Specifications of May 1, 2008.
2. Shall contain a binder meeting the requirements of PG 70-22 as specified in AASHTO MP-1.

C. Porous Bituminous Asphalt Surface Course

1. All aggregates in the porous bituminous asphalt mix shall meet the following:
 - a. LA Abrasion loss, 30% maximum (ASTM C131).
 - b. At least one mechanically fractured face on 100 percent of the material retained on a 1/4-inch sieve.

- c. Flat and Elongated Particles, 5:1 – 10% maximum, 3:1 – 20% maximum (ASTM D4791)
2. Aggregate in the asphalt mix shall be 100% crushed and washed material and have a gradation of:

| U.S. Standard Sieve Size | Percent Passing |
|--------------------------|-----------------|
| ¾" (19.1mm) | 100 |
| ½" (12.7mm) | 85-100 |
| 3/8" (9.5mm) | 55-75 |
| 4 (4.75mm) | 15-25 |
| 8 (2.36mm) | 5-10 |
| 30 (600 µm) | 2-5 |
| 200 (75 µm) | 1-3 |

3. Fibers are recommended (but not required) if necessary to meet draindown requirements. Fibers minimize draindown, increase film thickness, and improve strength and durability. If used, they shall consist of either cellulose fibers or mineral fibers which are to be treated with a cationic sizing agent to enhance dispersement of the fiber as well as increase cohesion of the fiber to the bitumen. Fiber is to be added at a dosage rate between 0.2% and 0.4% by weight of total mix.
- a. Mineral fibers shall be from virgin, basalt, diabase, or slag with a maximum average fiber length of 6.35 mm and a maximum average fiber thickness of 0.005 mm.
 - b. Cellulose fiber – Fiber length shall be 6.35 mm (max), Ash Content 18% non-volatiles (±5%), pH 7.5 (±1), Oil absorption (times fiber weight) 5.0 (±1), Moisture Content 5.0% (max).
4. Hydrated lime, if required as an anti-stripping agent, shall meet the requirements of AASHTO M 303 Type 1 and shall be blended with the damp aggregate at a rate of 1.0% by weight of the total dry aggregate. The additive must be able to prevent the separation of the asphalt binder from the aggregate and achieve a required tensile strength ratio (TSR) of at least 80% on the asphalt mix. Other anti-stripping agents can also be used if approved in advance by the Engineer.
5. Asphalt binder shall meet the requirements of one of the following:
- a. Asphalt binder or modified asphalt binder with an elastomeric polymer meeting the requirements of PG 70-22 as specified in AASHTO MP-1.
 - b. Rubberized asphalt binder, if shown on plans: The base asphalt for the binder material to be used for asphalt-rubber mix shall be PG 64-22 (or other binder used locally for conventional mixes) and shall be blended with ground tire rubber to meet the requirements of 5.a. above. Rubber shall be free of wire and other contaminants. Follow local state specification for asphalt rubber binder, if available, or ASTM D 6114, "Standard Specification for Asphalt-Rubber Binder."

6. The asphalt binder content shall be between 5.75% and 6.75% by total weight as determined by testing in Part 3.
 7. The Contractor shall submit a certification letter for the asphalt or asphalt-rubber supplier to the Engineer before the mix is placed on the project. The certification letter from the supplier will include the following:
 - a. Type and amount of modifier, if any.
 - b. Information on the storage and stability of the asphalt binder.
 - c. Manufacturer recommended mixing and compaction temperatures.
- D. Riverstone (if used)
1. Clean, durable stone, free from slaty texture or cleavage planes. Crushed aggregate is not acceptable.
 2. Rounded and sub-rounded NYSDOT No. 2 stone.

PART 3 - MIX PRODUCTION

3.1 POROUS BITUMINOUS ASPHALT MIX DESIGN

- A. The asphalt content, use of fibers and/or anti-strip, and aggregate gradation should be adjusted within the ranges in this specification to produce a durable mix that meets the following criteria:
1. 18 to 22 percent air voids (compacted sample)
 2. Binder draindown (ASTM D 6390) not to exceed 0.3 percent
 3. The retained tensile strength (TSR) of the compacted specimens in the modified Lottman method must be 80 percent minimum (using ASTM D 7064 w/ 1 freeze-thaw cycle or a surrogate dense-graded mix according to AASHTO T283).

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Infiltration Beds
1. Install per Section 02725.
- B. Porous Bituminous Asphalt
1. A full job mix formula with all applicable test results must be submitted to the Engineer for review and approval at least 2 weeks before paving is scheduled.
 2. Transporting Material
 - a. Transporting of mix to the site shall be in vehicles with smooth, clean dump beds that have been sprayed with a non-petroleum release agent. Truck beds should be raised after spraying to drain any puddles of release agent.

- b. The mix shall be covered during transport to control cooling.
 - c. Haul distances shall be limited to 35 miles unless approved in advance by the Engineer.
- 3. Porous bituminous asphalt shall be placed within 90 minutes of being loaded.
- 4. Asphalt Placement
 - a. The porous bituminous surface course shall be laid with a track paver in one lift directly over the storage bed and stone base course to a 2.5 to 3-inch finished thickness.
 - b. The optimal laying temperature of the bituminous mix should be determined by the results of the Draindown Test (ASTM D6390). The typical range is between 275 degrees Fahrenheit and 325 degrees Fahrenheit (as determined by the testing and recommendations of the asphalt supplier).
 - c. Installation shall take place when ambient temperatures are 55 degrees Fahrenheit or above, when measured in the shade away from artificial heat.
 - d. The use of a remixing material transfer device between the trucks and the paver is recommended to eliminate cold lumps in the mix.
 - e. Modified asphalt, if used, can be very difficult to rake and work by hand; a well-heated screed and other techniques should be used to minimize the need for hand work.
 - f. Compaction of the surface course shall take place when the surface is cool enough to resist an 8 to 10-ton roller (typically between 210 and 260 degrees F). One or two passes is all that is required for proper compaction. More rolling could cause aggregate breakdown and/or a reduction in the surface porosity which is unacceptable. Additional rolling with a small roller to smooth seams and remove marks is acceptable.
- 5. After final rolling, no vehicular traffic of any kind shall be permitted on the surface until cooling and hardening has taken place, and in no case within the first 72 hours (7 days recommended). Provide barriers as necessary at no extra cost to the Owner to prevent vehicular use; remove at the discretion of the Owner.
- 6. Work shall be done expertly throughout, without staining or injury to other work. Transition to adjacent impervious bituminous paving shall be merged neatly with flush, clean line. Finished paving shall be even, without pockets, and graded to elevations shown on drawing.
- 7. Porous pavement beds shall not be used for equipment or materials storage during construction, and under no circumstances shall vehicles be allowed to deposit soil on paved porous surfaces.
- 8. Repair of Damaged Paving
 - a. Any existing paving on or adjacent to the site that has been damaged as a result of construction work shall be repaired to the satisfaction of the Owner without additional cost to the Owner.
- 9. Field Quality Control
 - a. The full permeability of the pavement surface shall be tested by application of clean water at the rate of at least 5 gpm, using a hose or other distribution devise.

Water used for the test shall be clean, free of suspended solids and deleterious liquids and will be provided at no extra cost to the Owner. All applied water shall infiltrate directly without ponding or surface runoff, and shall be observed by the Engineer/Owner. At least 3 random locations shall be tested, with at least 1 additional test per 10,000 SF of porous asphalt.

- b. Testing and Inspection: Employ at Contractor's expense an inspection firm acceptable to the Engineer and Owner to perform soil inspection services, staking and layout control, and testing and inspection of site grading and pavement work. Inspection and list of tests shall be reviewed and approved in writing by the Engineer prior to starting construction. All test reports must be signed by a licensed Engineer.
- c. Test in-place base and surface course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable work as directed by the Owner.
- d. Surface Smoothness: Test finished surface for smoothness and even drainage, using a ten-foot to centerline of paved area. Surface will not be accepted if gaps or ridges exceed 3/16 of an inch.
- e. Contractor shall vacuum-sweep porous asphalt pavement once site stabilization has occurred if materials have accumulated on the surface.

10. Grade Control

- a. Establish and maintain required lines and elevations. The Engineer shall be notified for review and approval of final stake lines for the work before construction work is to begin. Finished surfaces shall be true to grade and even, free of roller marks and free of low spots to form puddles. All areas must drain.
- b. If, in the opinion of the Owner, based upon reports of the testing service and inspection, the quality of the work is below the standards which have been specified, additional work and testing will be required until satisfactory results are obtained.

END OF SECTION

SECTION 02720 – DRAINAGE UTILITIES

- A. Pilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction (such as NYSDOT and/or City of Syracuse).
- C. Materials and workmanship shall conform to applicable requirements of NYSDOT Specifications.
- D. References
 - 1. Annual Book of ASTM Standards, 2005, or latest edition; American Society for Testing and Materials, Philadelphia PA.
 - 2. New York State Department of Transportation Specifications.
 - 3. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 19th edition 1998 or latest edition.
 - 4. Contract Documents and Specifications for 2010 Annual Street Structures and Rehabilitation at Various Locations within Onondaga County and the City of Syracuse, March 2010.

1.2 PROJECT CONDITIONS

- A. Conform to all conditions and restrictions included in other sections, including erosion and sediment control, protection of vegetation, existing improvements and utilities.
 - 1. All work shall be in accordance with the laws of New York State.
 - 2. The Contractor shall apply and pay for all necessary permits and fees required in the course of his work as required by the governing codes, including NYSDOT.
 - 3. The Contractor shall be responsible for coordinating his work with the work of other trades. Do no work that will damage, displace, or make unnecessarily difficult the installation of the work of other trades.
 - 4. The Contractor shall not cover any work until it has been inspected by the Engineer. Any work covered prior to inspection shall be opened to view by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. High Density Polyethylene (HDPE) Pipe and Fittings
 - 1. Solid and Perforated High Density Polyethylene Pipe (HDPE) shall conform to AASHTO M252, ASTM F-405, and ASTM F-667 for materials and fabrication, and shall be smooth lined (dual wall). Solid HDPE pipe joints shall be watertight joints.
 - 2. Continuously Perforated High Density Polyethylene Pipe (HDPE) shall have

Class II perforations per AASHTO M252 (pipe diameters 3 through 10-inches) and AASHTO 294 (pipe diameters 12 inches and greater). Class II perforations shall be located in the outside valleys of the corrugations, be circular and/or slotted, and evenly spaced around the circumference and length of the pipe. The opening area shall be no less than 0.945 square inches per linear foot (pipe diameters 4 through 10-inches), 1.42 square inches per linear foot (pipe diameters 12 through 18-inches), and 1.89 square inches per linear foot (pipe diameters 24-inches and larger).

3. Manufacturers:
 - a. ADS
 - b. Or Approved Equal.

B. Polyvinyl Chloride Pipe (PVC)

1. Shall be SDR 35 PVC in accordance with ASTM D3034.
 - a. Joints: Integral bell and spigot, in accordance with ASTM D3212.
 - b. Minimum SDR: 35.
 - c. Cell Classification: 12454-B or 12454-C, as defined by ASTM D1784.
 - d. Fittings: SDR 35 minimum wall thickness.
 - e. Gaskets: Factory fabricated rubber compression type with solid cross section in accordance with ASTM F477. Lubricant for joining pipe as approved by pipe manufacturer.
2. Color: White or Blue.
3. Labeling: Shall be labeled "STORM" and shall have flow arrows in direction as indicated on the Plans.
4. PVC pipe shall be manufactured with titanium dioxide for ultraviolet protection per ASTM standards.

C. PVC Catch Basins

1. PVC catch basins (risers) with domed ductile iron (DI) grates, heavy duty H-25 covers, or H-10 pedestrian grates as noted on plans.
2. PVC catch basins utilizing heavy duty H-25 covers shall be installed per manufacturer's specifications and backfill requirements.
3. Where applicable, PVC catch basin weirs shall be custom manufactured stainless steel. The weirs shall be fabricated and mounted by the PVC catch basin manufacturer to the catch basin, and anchored on the bottom and sides with stainless steel anchor bolts. All seams with the PVC catch basin shall be water tight.
4. Where applicable, PVC catch basin filter baskets shall be Nyloplast "Catch-It" filter baskets or approved equal.
5. Manufacturers:
 - a. Nyloplast
 - b. Or Approved Equal

D. Precast Concrete Structures, Curb Inlets, and Risers

1. Shall be per NYSDOT Standards and Specifications. Contractor shall submit shop drawings for Engineer's approval.
2. Where used, curb inlet filter inserts shall be Ultra Urban by Abtech Industries, or Approved Equal.

E. Trench Drain

1. Trench drains shall be pre-engineered polymer concrete with heavy duty, ADA-compliant ductile iron frame and grate.
2. Manufacturer:
 - a. Polydrain by ABT, Inc.
 - b. Or Approved Equal
3. Where used, filter inserts for trench drains shall be Flogard Lopro by Kristar or Approved Equal.

F. Anti-Seep Collars

1. Anti-seep collars shall be two-piece HDPE collars. Install anti-seep collars on storm pipes approximately one foot from the edge (outside) of the infiltration bed, or as indicated on the plans.
2. Manufacturers:
 - a. Lane Enterprises
 - b. Or Approved Equal

G. Light Stone Fill (Rip Rap)

1. As specified in the NYSDOT Standard Specifications, Section 620, size and shape designations from Figure 620-1.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which work is to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 EXCAVATION, BACKFILLING, AND COMPACTION – DRAINAGE UTILITIES

- A. Grade trench bottom to a smooth, firm, stable and rock-free foundation. Remove unstable, soft, and unsuitable materials, as determined by the Engineer, and backfill with clean granular material to indicated level, per NYSDOT specifications.
- B. Backfilling includes all refilling of excavations and the tamping and rolling required for satisfactory compaction. Backfilling shall be done as promptly as possible without damage to pipe or structure in place. Backfilling will be done following inspection and approval of the work by the Engineer or Owner's representative, and only with permission of the Engineer or Owner's representative.
- C. No part of a pipe line or other structure that needs to be tested, located, or measured, shall be filled over or around until required tests and measurements have been made or witnessed by the Engineer or Owner's representative, and their permission so given to backfill. Any backfilling without authorization shall be uncovered by the Contractor at his own expense.

- D. All pipes shall be laid on an even and uniform bedding surface. The bedding shall be installed from a depth of six inches (6") below the pipe barrel unless otherwise shown. Bell holes and depressions for joints of the pipes shall be dug after the bedding materials have been properly graded. The pipe shall then be laid to its true grade and alignment. The bedding materials shall then be shovel placed and hand tamped to fill all spaces under and adjacent to the pipe to hold the pipe in its true grade and alignment during the test. The lines, grades, and joints of the pipes will be inspected before any further backfilling above the pipe is commenced. After the inspection is completed, the backfilling shall be continued in layers not exceeding six inches (6") to a height twelve inches (12") above the top of the pipe. The materials shall be placed with hand shovels and shall be solidly rammed down. Stones smaller than one inch (1") shall be used around the pipe. Note: Perforated pipes will be installed directly within the infiltration trench stone as shown; no additional bedding is required.
- E. From twelve inches (12") above the top of the pipe, suitable backfill material, conforming to the requirements of these specifications may be used. The compaction shall be done for the full length of the pipe, and in such a manner as not to disturb or damage the pipe. Hand-operated mechanical tampers may be used for compaction. Such mechanical tampers shall have a rating of at least 300 feet/lb. of energy per blow.
- F. From one foot (1') above the top of the pipe, machine backfilling and compaction may be used. Above this level, except for the last two feet (2'), small stones not larger than six inches (6") in their greatest dimension will be permitted, but this should not be in excess of 15% of the total volume of the backfill materials in the entire depth. Such stones shall be evenly distributed throughout the entire mass.
- G. The excavated material removed from the trenches can be used for backfilling purposes provided it meets the material classifications. In the areas where the conditions require the removal of the excavated materials, all the backfilling shall be done using crushed stone backfill. The backfilling materials should compact readily by the usual methods of tamping and puddling. Unsuitable materials, such as clay that will crumble under light pressure by hand, frozen materials, ashes, cinders, tree stumps and other organic and unsuitable materials shall not be used for backfilling. Organic soil will not be permitted as backfill.
- H. The materials backfilled in trenches shall be deposited in layers not exceeding six inches (6"). All backfill shall be properly moistened or dried to within 2% of the optimum moisture content as determined by ASTM D-1557. Each lift shall be compacted to 95% maximum density. The degree of compaction shall be checked by a state-certified testing agency, and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the Owner's Representative. The fill shall be compacted to elevations and limits indicated on the plans.
- I. The compaction shall be continued to the desired elevations. The trenches shall be molded to a height of one foot (1') after compaction with suitable materials. All the backfilling and compaction shall be continued without interruption to completion. The areas shall be properly cleaned and all the excess material shall be properly disposed of from the work area.

3.3 PIPE LAYING

- A. All pipes shall be unloaded, handled, and stored in conformance with the manufacturer's recommendations.
- B. Bedding and laying of pipe shall be in accordance with the pipe manufacturer's recommendations. Pipe joints shall be made in accordance with joint manufacturer's recommendations.
- C. All pipe shall be laid on a minimum six inch (6") thickness of NYSDOT No. 2 aggregate, unless otherwise noted on the plans or approved by Engineer.
- D. Pipe placement and alignment shall be accomplished only in the presence of the Owner or their authorized representative. Adequate and suitable equipment and appliances for safe and convenient handling and laying of pipes shall be used. The Contractor shall give two (2) days notice of the time scheduled for the pipe laying and inspection.
- E. Prior to being lowered into the trench, each pipe and fitting shall be carefully inspected, and those not meeting specifications or are otherwise defective shall be rejected and removed from the project.
- F. If, in the opinion of the Engineer or Owner's representative, the materials furnished or the methods of installation are not in accordance with the Specifications or generally accepted practices for that type of work, such work may be stopped by the Engineer.
- G. Pipes shall be laid true to the grades shown on the plans. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joints disturbed after laying shall be taken up and relaid. The pipe sections shall be inspected, and the interior and ends of all pipe will be cleaned before lowering into the trench. During construction, the Contractor shall use all precautions to keep the trench clean and clear of deposits and free from injury until finally inspected and accepted.
- H. Pipe shall be laid so that when completed, the interior bore will conform accurately to grades and alignment indicated by the contract documents or directed by the Engineer or Owner's representative.
- I. Before joints are made, each pipe shall be well bedded, and no pipe shall be brought into position until the preceding length has been thoroughly secured in place. Coupling or bell holes shall be dug sufficiently large to insure the making of a proper joint.
- J. The excavation into which the pipe is being laid shall be kept free from water, and no joints shall be made under water. Water shall not be allowed to rise in excavation until joint is complete. Care shall be used to secure water tightness and to prevent damage to joints during backfilling. All pipe joints shall be watertight within allowances established by these Specifications.
- K. No pipe shall be laid upon a foundation into which frost has penetrated, nor anytime when the Engineer or Owner's representative shall deem that there is a danger of formation of ice or penetration of frost at the bottom of excavation. Where the foundation is unstable or consists of rock, a stone or gravel foundation shall be placed and tamped to form an acceptable bed for the pipe.

3.4 INSTALLATION OF SDR 35 PVC DRAIN PIPE

- A. General:
 - 1. Install pipe sections in accordance with manufacturer's recommendations.
 - 2. Provide and use proper implements, tools, and facilities for safe and proper prosecution of Work.
 - 3. Position pipe, fittings, and appurtenances into place, using suitable tools and equipment, in such a manner as to prevent damage to pipe materials.

- A. Line and Grade:
 - 1. Establish line and grade for pipe by use of lasers.
 - 2. Measure for grade at pipe invert, not at top of pipe.
 - 3. Do not deviate from line or grade, as shown on Drawings.

- B. Jointing:
 - 1. Use gasket lubricant as recommended by gasket manufacturer.
 - 2. Lay pipe upgrade with bell ends pointing upgradient.
 - 3. When field cutting or machining pipe is necessary, use only tools and methods recommended by pipe manufacturer and approved by Engineer.
 - 4. Assemble joint in accordance with recommendations of manufacturer.
 - 5. Apply sufficient pressure in making joint to assure that joint is "home" as defined in standard installation instructions provided by pipe manufacturer. Inside joint space shall not exceed 50 percent of pipe manufacturer's recommended maximum allowance.
 - 6. Place pipe to specified line and grade to form smooth flow line.
 - 7. Ensure that bottom of pipe is in contact with supports and hangers.
 - 8. Check for alignment and grade after joint has been made.
 - 9. Connections between one pipe material and another shall be by means as noted on the plans.

- C. Hydrostatic Exfiltration Test:
 - 1. Notify Engineer/Owner's representative a minimum of 24 hours prior to testing for coordination and inspection purposes.
 - 2. Procedure:
 - a. Cap roof leader downspout at the outfall at end of the system.
 - b. Fill new PVC pipe from roof inlets. Verify that new pipe is filled prior to inspection.
 - c. Maintain full water level in new piping continuously for 2 hours minimum, adding additional make-up water only as necessary to restore volume.
 - d. Engineer/Owner's representative shall inspect all new pipe and fittings to determine if any leaks are present.
 - e. Determine leakage by measuring quantity of water necessary to maintain water level for duration of test.
 - f. Required Measurement Accuracy: Plus or minus 1/8-gallon of water leakage under specified conditions.
 - 3. Any observed leakage in new PVC pipe, fittings, joints, etc., shall be repaired per manufacturer's specification.

3.5 INSTALLATION OF STRUCTURES

- A. The Contractor shall provide an excavation of sufficient size to accommodate the outside dimensions of the structure as shown on the plans. Prior to setting the unit, the Contractor shall prepare a 6-inch minimum leveling course of compacted NYSDOT No. 1A aggregate suitable for receiving the structure. The base material shall be compacted and leveled to the elevations shown on the plans.
- B. The Contractor shall provide sufficient labor and equipment to unload and place the units. Should rental of a crane be required for unloading and setting the unit, it shall be coordinated by the Contractor with the manufacturer's dispatch office in sufficient time to acquire the equipment.
- C. The completed installation shall be neat and watertight.
- D. Install PVC catch basins, Nyloplast or approved equal, as per the manufacturer's specifications.

END OF SECTION

SECTION 02721 - PIPING SUPPORT SYSTEMS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope:
 - 1. Furnish all labor, materials, equipment, and incidentals required to design and provide hangers, supports, restraints, and appurtenances for the mechanical piping systems as shown and specified.
 - 2. Furnish standard and fabricated hangers and supports with necessary inserts, bolts, nuts, rods, washers, and other accessories.
- B. Applicable Systems: These specifications for hangers, supports, and restraints apply to all new and modified existing mechanical and process piping systems.
- C. Coordination: Review installation procedures under other Sections and coordinate the Work that must be installed with or attached to the hangers and supports.
- D. Sequencing: Obtain satisfactory review of Shop Drawings before installing any piping, supports, hangers or restraints.

1.02 SUBMITTALS

- A. Action Submittals:
 - 1. Catalog information and drawings of piping support system, locating each support, sway brace, seismic brace, hanger, guide, component, and anchor for piping 24 inches and smaller. Identify support, hanger, guide, and anchor type by catalog number and Shop Drawing detail number.
 - 2. Revisions to support systems resulting from changes in related piping system layout or addition of flexible joints.
- B. Informational Submittals: Maintenance information on piping support system.

1.03 QUALIFICATIONS

- A. Piping support systems shall be designed and Shop Drawings prepared and sealed by a Registered Professional Engineer in New York.

1.04 DESIGN REQUIREMENTS

A. General:

1. Design, size, and locate piping support systems throughout facility, whether shown or not.
2. Supports are shown only where specific types and locations are required; additional pipe supports may be required.
3. Meet requirements of standards and regulations as listed below in Part 1.05 – Quality Assurance.

B. Pipe Support Systems:

1. Pipe support systems shall be designed for gravity weight of pipes or internal pressures, including weight of fluid in pipes and insulation.
2. Seismic loads in accordance with governing codes.
3. Wind loads in accordance with governing codes.
4. Maximum support spacing and minimum rod size in accordance MSS SP-69 Table 3 and Table 4.

C. Anchoring Devices: Design, size, and space support anchoring devices, including anchor bolts, inserts, and other devices used to anchor support, to withstand shear and pullout loads imposed by loading and spacing on each particular support.

D. Vertical Sway Bracing: 10-foot maximum centers or as shown.

E. Existing Support Systems: Use existing supports systems to support new piping only if Contractor can show they are adequate for additional load, or if they are strengthened to support additional load.

1.05 QUALITY ASSURANCE

A. General:

1. Comply with all applicable governing codes.
2. Comply with trade accepted standards.

B. Reference Standards: Comply with all Federal and local laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

1. American National Standards Institute (ANSI):
 - a. B31.1, Code for Pressure Piping, Section 6, Chapter 1.
 - b. ANSI B1.1, Unified Inch Screw Threads.
2. American Society of Testing and Materials (ASTM):
 - a. ASTM A 36, Carbon Structural Steel.
 - b. ASTM A 47, Ferritic Malleable Iron Castings.
 - c. ASTM A 307, Carbon Steel Bolts and Studs, 60,000

- d. ASTM A 325, Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - e. ASTM A 575, Steel Bars, Carbon, Merchant Quality, M-Grades.
 - f. ASTM A 668, Steel Forgings, Carbon and Alloy, for General Industrial Use.
 - 3. Federal Specifications, FS WW-H-171D and FS WW-H-171c(1).
 - 4. Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) SP-58, Pipe Hangers and Supports, Materials and Design.
 - 5. National Fire Protection Association (NFPA):
 - a. NFPA-13.
 - b. NFPA-24.
 - 6. MSS SP-69, Pipe Hangers and Supports, Selection and Application.
 - 7. Underwriters Laboratories (UL):
 - a. UL-203, Pipe Hanger Equipment.
- B. Source Quality Control: Obtain each type of pipe hanger or support from only one manufacturer.

PART 2 PRODUCTS

2.01 GENERAL

- A. When specified items are not available, fabricate pipe supports of correct material and to general configuration indicated.
- B. Special support and hanger details may be required for cases where standard catalog supports are inapplicable.

2.02 HANGERS

- A. Clevis: MSS SP-58 and SP-69, Type 1.
 - 1. Anvil; Figure 260, sizes 1/2 inch through 30 inches.
 - 2. B-Line; Figure B3100, sizes 1/2 inch through 30 inches.

2.03 SADDLE TYPE SUPPORTS

- A. Pedestal Type: Pipe stanchion, saddle, and anchoring flange.
 - 1. Nonadjustable Saddle: MSS SP 58 and MSS SP 69, Type 37 with U-bolt.
 - a. Anvil; Figure 259, sizes 4 inches through 36 inches with Figure 63 base.

- b. B-Line; Figure B3090, sizes 3/4 inches through 36 inches with B3088 base.

2.04 WALL BRACKETS AND SUPPORTS

A. Offset Pipe Clamp:

- 1. B-Line; Figure B3148, sizes 1/2 inch through 12 inches.

2.05 PIPE CLAMPS

A. Riser Clamp: MSS SP 58 and MSS SP 69, Type 8.

- 1. Anvil; Figure 261, sizes 3/4 inch through 24 inches.
- 2. B-Line; Figure B3373, sizes 1/2 inch through 30 inches.

2.06 SEISMIC RESTRAINTS

A. Solid pipe bracing attachment to pipe clevis with clevis cross brace and angle rod reinforcement.

B. Manufacturer: Mason Industries.

2.07 ACCESSORIES

A. Pipe Guard

- 1. Custom prefabricated 1/2" galvanized steel plate, size and dimensions as shown on the plans.
- 2. Paint/Coatings:
 - a. Shop prime with epoxy primer (2 mils).
 - b. Field coat with 2 coats of epoxy epoxy paint, total 6 mils.
Coating Color: ANSI 73, Safety Yellow.
- 3. Mount as shown on the plants.

B. Link Seal

- 1. Thunderline
- 2. Or Approved Equal.

C. Hanger Rods, Clevises, Nuts, Sockets, and Turnbuckles: In accordance with MSS SP 58.

D. Attachments:

1. I-Beam Clamp: Concentric loading type, MSS SP 58 and MSS SP 69, Type 21, Type 28, Type 29, or Type 30 which engage both sides of flange.
2. Concrete Insert: MSS SP 58 and MSS SP 69, Type 18, continuous channel insert with load rating not less than that of hanger rod it supports.
3. Welded Beam Attachment: MSS SP 58 and MSS SP 69, Type 22.
 - a. Anvil; Figure 66.
 - b. B-Line; Figure B3083.
4. U-Channel Concrete Inserts: As specified in Section 05 50 00, Metal Fabrications.
5. Concrete Attachment Plates:
 - a. Anvil; Figure 47, Figure 49 or Figure 52.
 - b. B-Line; Figure B3084, Figure B3085 or Figure B3086.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

1. Install support systems in accordance with MSS SP 69 and MSS SP 89, unless shown otherwise.
2. Install pipe hanger rods plumb, within 4 degrees of vertical during shut down, start up or operations.
3. Support piping connections to equipment by pipe support and not by equipment.
4. Support large or heavy valves, fittings, and appurtenances independently of connected piping.
5. Support no pipe from pipe above it.
6. Support pipe at changes in direction or in elevation, adjacent to flexible joints and couplings, and where shown.
7. Do not install pipe supports and hangers in equipment access areas or bridge crane runs.
8. Brace hanging pipes against horizontal movement by both longitudinal and lateral sway bracing and to reduce movement after startup.
9. Install lateral supports for seismic loads at changes in direction.
10. Install pipe anchors where required to withstand expansion thrust loads and to direct and control thermal expansion.
11. Repair mounting surfaces to original condition after attachments are made.

B. Standard Pipe Supports:

1. Horizontal Suspended Piping:

- a. Single Pipes: Adjustable swivel-ring, split-ring, or clevis hangers.
- 2. Horizontal Piping Supported from Walls:
 - a. Single Pipes: Wall brackets or wall clips attached to wall with anchors. Clips attached to wall mounted framing also acceptable.
 - b. Piping clamps that resist axial movement of pipe through support are not acceptable. Use cast iron hanging rolls supported from wall bracket.
- 3. Horizontal Piping Supported from Floors:
 - a. Stanchion Type:
 - 1) Pedestal type; adjustable with stanchion, saddle, and anchoring flange.
 - 2) Use yoked saddles for piping whose centerline elevation is 18 inches or greater above floor and for exterior installations.
 - 3) Provide minimum 1-1/2-inch grout beneath base plate.
- 4. Vertical Pipe: Support with wall brackets and base elbow or riser clamps on floor penetrations.

END OF SECTION

SECTION 02725 – SUBSURFACE INFILTRATION BED

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work of this Section includes subgrade preparation and installation of a subsurface infiltration bed.

1.2 SUBMITTALS

- A. Submit a list of materials proposed to be provided for work under this Section including the name and address of the materials producer and the location from which the materials are to be obtained.
- B. Submit certificates, signed by the materials producer, stating that materials meet or exceed the specified requirements.

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.
- B. Codes and Standards
 - 1. All materials, methods of construction and workmanship shall conform to applicable requirements of NYSDOT Standard Specifications and AASHTO Standards, unless otherwise specified.

1.4 PROJECT CONDITIONS

- A. Protection of Existing Site
 - 1. Do not damage or disturb existing site features, utilities, or vegetation. Provide suitable protection where required before starting work and maintain protection throughout the course of the work.
 - 2. Restore damaged site features, including existing paving on or adjacent to the site that has been damaged as a result of construction work, to their original condition or repair as directed to the satisfaction of the Owner, and authority having jurisdiction at no additional cost.
- B. Safety and Traffic Control
 - 1. Notify and cooperate with local authorities and other organizations having jurisdiction (such as NYSDOT and/or City of Syracuse) when construction work will interfere with existing roads and traffic.
 - 2. Provide temporary barriers, signs, warning lights, flagmen, and other protections as required to assure the safety of persons and vehicles around the construction area and to organize the smooth flow of traffic.
- C. Erosion and Sediment Control Measures

1. All erosion and sediment measures must be installed prior to infiltration bed construction and maintained throughout project construction.
2. It is the contractor's responsibility to maintain job conditions to prevent the deposition of sediment on infiltration beds by wind-borne deposition, tracking, stormwater runoff, etc.
3. If job conditions arise that adversely affect the infiltration bed, additional measures such as access control during construction, vacuuming of impervious and pervious surfaces, or additional site stabilization may be required.

D. REFERENCES

1. Annual Book of ASTM Standards, 2005, or latest edition; American Society for Testing and Materials, Philadelphia PA.
2. New York State Department of Transportation Specifications.
3. Standards of the American Association of State Highway and Transportation Officials (AASHTO), 19th edition 1998 or latest edition.
4. Contract Documents and Specifications for 2010 Annual Street Structures and Rehabilitation at Various Locations within Onondaga County and the City of Syracuse, March 2010.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregates within infiltration bed shall be clean and thoroughly washed and shall meet the following:
1. Maximum Wash Loss of 0.5% (ASTM C117)
 2. Minimum Durability Index of 35 (ASTM D3744)
 3. L.A. abrasion loss, 30% maximum. (ASTM C131 and C535)
 4. Aggregate shall be 100% crushed material.
 5. Fractured Faces, 1 side 95% minimum, 2 sides 90% minimum (ASTM D5821).
- B. Unless otherwise noted on the plans or approved by the Engineer, coarse aggregate for the infiltration bed shall be uniformly graded, crushed and washed No. 3A stone as specified in the NYSDOT Standard Specifications 703-02, size designation from Table 703-4.
- C. Unless otherwise noted on the plans or approved by the Engineer, choker base course aggregate for infiltration beds beneath pavements shall be a uniformly graded, crushed blend of 40 percent No.1 and 60 percent No.2 stone as specified in the NYSDOT Standard Specifications 703-02, size designations from Table 703-4.
- D. Unless otherwise noted on the plans or approved by the Engineer, NYSDOT Select Granular Subgrade for infiltration beds shall be as specified in the NYSDOT Standard Specifications 203-2, size designations from Part 203-2.02.C.1.
- E. Non-woven geotextile (drainage filter fabric) shall conform to the following:
1. Minimum flow rate of 110 gal/min/ft² ASTM D-4491-99A
 2. Grab tensile strength min 150 lb ASTM D-4632-91
 3. Mullen Burst strength min 300 psi ASTM D-3786-87
 4. Puncture strength min 90 lb ASTM D-4833-00
 5. Apparent opening size 60-70 US Sieve ASTM D-4751-99A
 6. Non-woven geotextile shall be Mirafi 160N, or approved equal.
- F. Where noted on the plans, impervious liners between infiltration bed and adjacent surfaces shall

be Solmax 230 (30 mil), or approved equal. Install per manufacturer's recommendations.

G. Modular Storage System

1. Modular storage system shall consist of rigid, fully-open or open-grid bottom, synthetic structures, specifically designed, manufactured, and prefabricated for subsurface stormwater storage and infiltration.
2. Minimum effective stormwater storage volume shall be as shown on the plans. Calculation of storage volume shall only include volume provided by modular storage units and shall not include storage from surface storage or planting soil voids. Granular material voids shall only be included in the calculation if granular material meets the requirements of Part 2.1.A above.
3. Modular storage system footprint, depth, and stormwater utility layout shall not vary from that shown on the plans unless approved by the Engineer.
4. Install per manufacturer's recommendations.
5. Manufacturer and Availability:
 - a. Stormtank
 - i. Manufacturer – Brentwood Industries.
 - ii. Distributor – Vari-Tech, LLC.
 - b. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Owner's Representative and Engineer shall be notified at least 24 hours prior to all infiltration bed work.
- B. Subgrade preparation
 1. Existing subgrade under bed area shall NOT be compacted or subject to excessive construction equipment traffic prior to installation of geotextile and aggregate.
 2. Where erosion of subgrade has caused accumulation of fine materials and/or surface ponding, this material shall be removed with light equipment and the underlying soils scarified to a minimum depth of 6 inches with a York rake or equivalent and light tractor.
 3. Bring subgrade of bed to line, grade, and elevations indicated on plan. Fill and lightly regrade any areas damaged by erosion, ponding, or traffic compaction before the placing infiltration bed media. Infiltration bed bottom to be kept at level grade, unless otherwise noted on plans.
- C. Infiltration Bed Installation
 1. Upon completion of subgrade work, the Engineer shall be notified and shall inspect at his discretion before proceeding with infiltration bed installation.
 2. Geotextile and bed media shall be placed immediately after approval of subgrade preparation. Any accumulation of debris or sediment which has taken place after approval of subgrade shall be removed prior to installation of geotextile at no extra cost to the Owner.
 3. Place geotextile in accordance with manufacturer's standards and recommendations. Adjacent strips of geotextile shall overlap a minimum of sixteen inches (16"). Secure geotextile at least four feet (4') outside of bed and take steps necessary to prevent any runoff or sediment from entering the bed. This geotextile edge strip shall remain in place

until all bare soils contiguous to infiltration bed have been stabilized. When the site is fully stabilized, excess geotextile along bed edges can be cut back to gravel edge.

4. Where noted, install impervious liner as indicated between infiltration bed and adjacent pavement subbase.
5. Install infiltration bed media to grades indicated on the drawings. If used, install modular storage system per manufacturer's recommendations. Install coarse aggregate in 8 inch maximum lifts. Lightly compact each layer with equipment, keeping equipment movement over storage bed subgrades to a minimum. Install stormwater utilities as indicated in Section 02720 and as indicated on plan.

D. Work in Related Sections

1. Where applicable install planting soils and plantings as indicated on the plans and as specified in Section 02941 - Planting Soils and Section 02930 - Exterior Plants.
2. Where applicable install pavement courses and porous bituminous asphalt courses as noted in Section 02725 – Porous Bituminous Asphalt Pavement.

END OF SECTION 02725

SECTION 02930 - EXTERIOR PLANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Landscape Work
 - a. Plants
 - b. Mulch
 - c. Initial maintenance of landscape materials
2. Provisions for rototilling, placing, grading, decompacting and amending soil and plant materials to construct the soil profiles as showing in Section 02940 Planting.

B. Related Sections:

Section 02941 – Planting Soils

1.2 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.

- I. **Manufactured Topsoil:** Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- J. **Pesticide:** A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- K. **Pests:** Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- L. **Planting Area:** Areas to be planted.
- M. **Planting Soil:** Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- N. **Plant; Plants; Plant Material:** These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- O. **Root Flare:** Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. **Stem Girdling Roots:** Roots that encircle the stems (trunks) of trees or shrubs below the soil surface.
- Q. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- R. **Subsoil:** All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- S. **Surface Soil:** Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3 SUBMITTALS

- A. **Product Data:** For each type of product indicated.
 - 1. **Plant Materials:** Include quantities, sizes, quality, and sources for plant materials.
 - 2. **Pesticides and Herbicides:** Include product label and manufacturer's application instructions specific to the Project.
- B. **Samples for Verification:** For each of the following:
 - 1. **Shrubs, and Plugs:** 3 samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
 - 2. **Organic Mulch:** 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each

Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.

- C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- D. Planting Schedule: Submit proposed planting schedule, indicating dates for plant tagging with Landscape Architect, digging of woody material, and installation of each type of landscape work during normal season for such work in area of site.
- E. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 3. Inspection Certificate: The Contractor shall be responsible for all certificates of inspection of shrubs which may be required by Federal, State or other authority to accompany shipments of plants.
- F. Material Test Reports: For existing native surface topsoil, existing in-place surface soil, and imported or manufactured topsoil.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.
- H. Contractor shall submit letter notifying Landscape Architect of completion of planting work, including maintenance, and requesting inspection to determine acceptability for Substantial Completion and beginning of Warranty Period.
- I. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the New York State Nursery Landscape Association or the American Nursery and Landscape Association.
 - 2. Experience: 5 years experience in landscape installation in addition to requirements in Division 1 Section "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Qualification of Foreman or Crew Leader: All work shall be supervised by a foreman or crew leader who is a certified landscape professional.
 - a. Landscape professional shall be a New Your State Certified Horticulturist or a Landscape Technician certified by the New York State Nursery Landscape Association.

- b. Certification shall be current.
- 5. Qualification of Pesticide/Herbicide Applicator: All work of pesticide/herbicide application shall be done by a person licensed by the State of New York to apply pesticides/herbicides as specified in this section.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- C. Selection of shrubs will be made by Landscape Architect, who will tag stock at their place of growth before they are prepared for transplanting. Submit schedule for tagging to Landscape Architect for approval.
- D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of shrub for height and spread; do not measure branches or roots tip to tip.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- E. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected shrubs immediately from Project site.
- F. Substitutions: Submit request for substitutions in writing to Landscape Architect before selection of plants by Landscape Architect. Substitutions will only be considered after review of plant availability with Landscape Architect.
- G. Preinstallation Conference: Conduct conference at Project site.

1.5 PRODUCT HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

- D. Do not prune shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
 - 1. Notify Owner no fewer than 3 days in advance of proposed interruption of each service or utility.
 - 2. Do not proceed with interruption of services or utilities without Owner's written permission.
- C. Planting Restrictions: Plant during one of the following periods for each planting type indicated. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Shrubs and Herbaceous Perennials:
 - a. Spring Planting: 15 April - 15 May.
 - b. Fall Planting: 1 September - 15 November.
 - 2. Bulbs:
 - a. Fall Planting: 1 September – 15 October.
 - 3. Contractor shall schedule selection and digging operations so as to comply with nursery industry recognition of 'Spring Dig Only' or 'Fall Hazard' plant materials. No

substitutions of plant materials will be allowed for fall planting based on unavailability due to 'Spring Dig Only' or 'Fall Hazard' restrictions.

- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - 2. Warranty Period from Date of Substantial Completion: 12 months.
 - 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.8 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 12 months from date of Substantial Completion.
- B. Initial Maintenance Service for Ground Cover, Plugs, and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 12 months from date of Substantial Completion.
- C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 PRODUCTS

2.1 PLANT MATERIAL SOURCES

- A. Plant Sources, General: Acquire plant materials from the following nurseries, unless otherwise indicated, and confirm availability with Architect. The Contractor shall inform the architect of the source of origin of all plant materials which are to be used in this contract. Unless otherwise noted or approved in writing, plant material must be grown in locations no warmer than Zone 6a and within 300 miles of Syracuse. As shipments of plant materials arrive at the Temporary Storage Area, a copy of the invoice for plant materials to be used in this contract shall be forwarded to the architect. Due to the increased incidence of specific diseases and insects in certain regions of the State and County, the County of Onondaga reserves the right to eliminate certain species or to request the Contractor to select an alternate Nursery Source, when evidence or research furnished by New York State College of Environmental Science and Forestry, New York State Department of Agriculture and Markets, or Onondaga County, Co-operative Extension indicates that plant materials from a specific region of the State or County might adversely affect plant materials. The Contractor shall furnish the Nursery Source supplier with a copy of the specifications. The Contractor shall be entirely responsible to see that acceptable plant materials conforming to all specifications are supplied and delivered to the Temporary Storage Area. Schedule tagging visits at nurseries with Architect. Obtain Architect's approval for substitutions and sources other than those listed below.
1. Aspinalls Tree Nursery Chittenango 687-5282
 2. Anthony De Marco & Sons Elbridge 689-9577
 3. Cayuga Landscape Ithaca 257-3000
 4. Hoadley Wholesale Nursery Auburn 253-4510
 5. Manlius Shade Tree Farm Manlius 682-0653
 6. Red Oak Nurseries Camillus 672-3055
- B. Plant Plugs: Acquire plant plugs from the following nurseries:
1. North Creek Nurseries, Landenberg PA (610-255-0100).
www.northcreeknurseries.com
 2. Catskill Native Plant Nursery, Kerhonkson NY (845-626-2758).
www.catskillnativenursery.com
- C. Bulbs: Acquire bulbs from the following nursery:
1. Colorblends, Greenwich CT (888-847-8637).
- D. Groundcovers and Perennials: Acquire groundcovers and perennials from the following nurseries:
1. Anthony De Marco & Sons Elbridge 689-9577
 2. Dickman Farms Auburn 253-3030

3. Hoadley Wholesale Nursery Auburn 253-4510
4. Lan's Flower Farm Clay 688-8584
5. Marcellus Nursery & Farm Syracuse/Marcellus 488-2632
6. Maple Hill Nursery Manlius 682-8835
7. North Creek Nurseries, Landenberg PA (610-255-0100).
8. Catskill Native Plant Nursery, Kerhonkson NY (845-626-2758)

2.2 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Shrubs with stem girdling roots will be rejected.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Plant Plugs: Furnish plugs (also known as liners or cell packs) fully rooted in containers, ranging in sizes indicated and as follows:
 1. 72 per Tray: 1.5 inches long by 1.5 inches wide by 2.5 inches deep.
 2. 50 per Tray: 2 inches long by 2 inches wide by 2.5 inches deep.
 3. 32 per Tray: 2.25 inches long by 2.25 inches wide by 3 inches deep.
 4. 38 per Tray: 2.25 inches long by 2.25 inches wide by 5 inches deep.
 5. 18 per Tray: 3.25 inches long by 3.25 inches wide by 3.5 inches deep.
- E. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

2.3 SOIL AMENDMENTS

- A. Soils Test: As determined by Engineer and Owner's Representative to meet requirements shown on drawings.

2.4 FERTILIZER

- A. Fertilizer: Provide the following:

1. Basis-of-Design Product: Reforestation Technologies International, Salinas CA (800-784-4769); Bio-Paks 16-6-8 "Time of Planting Fertilization".
2. Application Rates: 1 Bio-Pak per one gal. container plant; 2 Bio-Paks per foot of plant height for balled and burlapped plantings.

2.5 MULCHES

- A. Organic Mulch: Shredded hardwood bark and wood fibers free from foreign materials and suitable as a top dressing of trees and shrubs ranging in size from ½” to 3”.

2.6 WATER

- A. The Contractor shall be responsible for watering all planted areas during the maintenance period. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor’s responsibility to correct. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner’s water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. Water provided by Contractor shall be free from impurities injurious to vegetation.
- B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- C. Temporary Watering Equipment: Hoses and sprinklers. Equipment may be owned by the Contractor and removed from the site when no longer required.

2.7 PESTICIDES/HERBICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.8 MISCELLANEOUS PRODUCTS

- A. Burlap: Non-synthetic, biodegradable.
- B. Root Gel: Product of organic-based ingredients formulated to enhance root growth and increase stress tolerance for bare root planting; containing 18 species of mycorrhizal spores to increase nutrient uptake, and water-holding gel.
 1. Basis-of-Design Product: Novozymes Biologicals, Inc., Salem VA (800-342-6173, www.novozymes.com/roots); ROOTS Root Dip Gel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation of aeration piping systems, and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Apply antidesiccant to shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- E. Wrap shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Refer to planting soils specification for areas of bioretention, for all other areas loosen subgrade of planting areas to a minimum depth of 12 inches, unless otherwise indicated. 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 superphosphate fertilizer directly to subgrade before loosening.
 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 3. Spread planting soil to depths of 12 inches 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 over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, container-grown, and fabric bag-grown stock.
 2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision of excavations during working hours.
 7. Keep excavations covered or otherwise protected overnight, after working hours, or when unattended by Installer's personnel.
- B. Subsoil and topsoil removed from excavations may be used as planting soil, subject to compliance with requirements specified for planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.

- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning shrubs.

3.5 SHRUB PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare bearing same relationship to adjacent finish grades as it had to grade in nursery.
 - 1. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set balled and potted and container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
 - 1. Carefully remove root ball from container without damaging root ball or plant.
 - 2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Set fabric bag-grown stock plumb and in center of planting pit or trench with root flare 2 inches 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. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

3. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
4. Continue backfilling process. Water again after placing and tamping final layer of soil.

- F. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape shrubs as directed by Architect.
- C. Prune, thin, and shape shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, remove only injured, dying, or dead branches from shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than shrubs, and plugs as indicated.
- B. Dig holes large enough to allow spreading of roots.
- C. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 1. Organic Mulch in Planting Areas: Apply 3-inch average settled thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 6 inches of trunks or stems.

3.9 PESTICIDE/HERBICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate

applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.11 DISPOSAL

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

END OF SECTION

SECTION 02941 - PLANTING SOILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section and are hereby made a part of this Section.

1.2 SCOPE OF WORK

- A. The work of this Section consists of all site preparation work and related items as indicated on the Drawings and/or as specified herein and includes, but are not limited to the following:
 - 1. Evaluation of rough subgrade water infiltration.
 - 2. Planting soil material acquisition.
 - 3. Testing and analysis for specification conformance.
 - 4. Inspection and testing of subgrade for preparation of subgrade.
 - 5. Preparation of mixes and testing for conformance.
 - 6. Installation and placement of soils.
 - 7. Decompaction of soils.
 - 8. Mock-up of planting soil profiles.
 - 9. Final in-place testing of soils.
 - 10. Coordination with other contractors.
 - 11. Clean-up.

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. Carefully examine all of the Contract Documents for the requirements that affect the work of this Section. Other specification Sections that directly relate to the work of this Section include, but are not limited to, the following:
 - 1. Section 02720 – Drainage Utilities
 - 2. Section 02725 – Subsurface Infiltration Bed
 - 3. Section 02920 – Lawns and Grasses

1.4 QUALITY ASSURANCES / DEFINITIONS

A. DEFINITIONS:

- 1. *Compaction*: Compaction of the soil fabric is any force applied to the soil that reduces porosity and where 90 percent of all compaction can be accomplished with only three applications of force under optimum soil moisture conditions.

2. *Dry Soil*: The condition of the soil at or below the wilting point of plant available water in which the soil is powdery and subject to blowing.
 3. *Frozen Soil*: The point at which the soil water has frozen and the soil has become very hard and cloddy. Ice crystals can be seen in the pore spaces of the soil.
 4. *Field Capacity*: The percentage of water remaining in a soil two or three days after having been saturated and after free gravimetric drainage has ceased.
 5. *Moist Soil*: The condition of the soil in where it can be formed into a ball and maintain its shape. Deformation of the soil is difficult with hand pressure. Free water is not visible and is usually considered the point between the wilting point and field capacity of the soil.
 6. *Saturated*: meaning that all the pore space within a soil is filled with water and the remaining water is under gravitational forces to drain through the profile.
 7. *Scarification*: The loosening of the surface of a soil lift by mechanical or manual means to alleviate compaction of the soil surface. Depth of scarification is dependent on material and extent of compaction. Depths are noted within the specifications.
 8. *Subsoil*: The soil horizon directly below topsoil that provides water holding and structural support to plants. Source of the majority of micro-nutrients.
 9. *Subgrade*: The in-situ soil material that the planting soil will be installed upon.
 10. *Topsoil*: The uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils and ranging in depth from 7 to 25 cm. Frequently designated as the plow layer, the *surface layer*, the *Ap layer*, or the *Ap horizon*. Typically, has more organic matter and biologic activity than lower horizons of the soil profile.
 11. *Wet Soils*: Soils that are considered wet will easily be deformed by hand pressure, maintain their shape, and free water will be visible within the pore spaces. The water content at this soil condition is considered at field capacity or wetter.
- B. *Analysis and Testing of Materials*: For each type of packaged material required for the work of this Section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards and procedures of the following:
1. American Society of Testing Materials (ASTM)
 2. American Society of Agronomy
 3. Soil Science Society of America
 4. Association of Official Agricultural Chemists.
- C. *Quality Assurance*: Work and materials shall meet the standards of the following references:
1. International Society of Arboriculture
 2. American Society for Testing Materials (ASTM)
 3. Environmental Protection Agency (EPA)
- D. *Installer Qualifications*: A qualified Contractor whose work has resulted in successful establishment of landscape plants.
1. *Installer's Field Supervision*: Contractor shall maintain an experienced full-time supervisor on Project site when soil is placed and landscape planting is in progress.
 2. The Contractor shall have experience in the proper and safe transportation and installation of soil material.

3. The Contractor shall prepare and present to the Owner's representative required soil submittals and their associated specified test results prior to the scheduled soil and plant installation.
4. The Contractor shall have a minimum of 3 to 5 years experience in installing designed soil mixes.

E. *Soil Mixing Contractor Qualifications:*

1. Shall be able to provide soil mixes that meet the specifications within tolerances assigned.
2. Shall be able to produce enough consistently uniform soil material for the project to meet the scheduled demands.

F. *Testing Laboratory Qualifications:* An independent laboratory, recognized by the State Department of Agriculture, with experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

1. The Owner will employ a qualified independent testing and inspection laboratory to perform tests and certifications indicated.
2. It is the responsibility of Contractor to coordinate submittal of material for the soil and compost tests.
3. Tests shall be made in strict compliance with the standards of the Association of Official Analytical Chemists and follow standards from ASTM, EPA, and/or Methods of Soil Analysis, Soil Science Society of America.

1.5 SUBMITTALS AND TESTING

- A. *Certificates:* Provide certificates required by authorities having jurisdiction. Approval as EPA Type 1 "exceptional quality" is required as well standards for application of composted organic material by the State of New York.
- B. *Testing Intervals for Organic Amendments, Planting Soil Mixes and Subgrade:* Testing is required at the following intervals:
1. Testing of the organic compost material: Test certificates required for producers of composts or biosolids are described within this Section 02941 Part 1.0 and shall follow criteria listed in Part 2.1.D.
 2. After test results for the composted organic material have been accepted the Contractor shall create sample soil mixes for each of the soil layers for the planting soil mix and perform tests described in this Section, Part 1.5.C.
 3. During the placement of planting soils, test every 250 cubic yards (or one test for every planting area) of planting soil mix delivered to the job site. Tests shall be for soil mix quality assurance to maintain adherence to particle size distribution, pH, organic matter, salts, permeability, and Ammonium. Report organic matter content on a percent by weight basis.

Testing applies to all soil layers. Testing procedures are described in Part 1.5.C of this Section.

C. *Test Procedures and Reporting:* Submit certified report for each test required.

1. *Compost:* Analyses of composted organic materials are required prior to initial soil mix acceptance. Analyses shall include all tests for criteria specified in Part 2.1.D of this section.
 - a. Compost Test 3A from Penn State's Agricultural Analytical Services Laboratory fulfills this requirement and meets strict U.S. Compost Council standard.
2. *Soil Mixes:* Testing shall be performed and reported for particle size requiring percent of gravel (>2.0 mm), very coarse sand (2.0 – 1.0 mm), coarse sand (1.0 – 0.5 mm), medium sand (0.5 – 0.25 mm), fine sand (0.25 – 0.10 mm), very fine sand (0.10 – 0.05 mm), silt (0.05 – 0.002 mm) and clay (< 0.002 mm). Saturated conductivity, bulk density, pH, total porosity, salt content, Ammonium content and organic matter percentage on a dry weight basis shall also be tested.
 - a. Particle size distribution by ASTM F1632-03 for all soil layers. Fines passing the #270 sieve are to be measured using the hydrometer method as outlined in ASTM F1632. If any alternate method is used, the results still must be reported at the specified particle size breaks listed below or by plotting as a particle size distribution curve on a three cycle semi-log graph.
 - b. Organic content test results of S2 layer. Organic content test shall be performed in accordance with Testing Methods of the Examination of Compost and Composting (TMECC), 05.07A, "Loss-On-Ignition Organic Matter Method";
 - c. Modified Proctor compaction testing of S2 Layer, performed in accordance with ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort;
 - d. Permeability or hydraulic conductivity testing of the S2 Layer performed in accordance with ASTM D 2434, Standard Test Method for Permeability of Granular Soils. For the S2 Layer assume a relative compaction of 85 percent of modified maximum dry density (ASTM D 1557).
 - e. Salts and Ammonium test using a 1:2 soil/water extract test as specified in *Methods of Soil Analysis, Part 3* or similar and must be tested and made available to the Engineer within two weeks of planned soil installation.
 - f. Soil moisture testing by gravimetric oven dry method as described in Soil Science Society of America, *Methods of Soil Analysis*, Part 1, 1986.
3. *In-place Designed Soil Testing:*
 - a. General planting soil installation for planting beds and lawns shall be tested using a cone penetrometer or equivalent for approximately one point every 100 ft² at an interval after S2 layer installation and again after complete soil profile installation. The planting soil

penetration resistance shall be uniformly increasing in density with depth, not exceeding 250 lbs/in². There shall not be any compacted dense layers within the soil profile.

Specific penetration resistance rates are given in Part 2 of this section for each soil layer.

- b. Bio-filtration in-place testing. Using ASTM D3385 determine the saturated hydraulic conductivity of the Bio-filtration basins. For each linear Bio-filtration Swale, one conductivity test at the lowest collection point for each swale. Bio-retention soil penetration resistance shall be probed at least 5 individual places within each basin. The overall resistance shall be uniformly increasing in density with depth, not exceeding 250 lbs/in². The surface layer (S1) shall not exceed 100 lbs/in². There shall not be any layer within the profile denser than 50 lbs from the background resistance.
4. Testing Laboratories: These are some examples of testing facilities that can accomplish part of, or complete testing of all soil mixes.

| | | |
|-------------------------------|---|--------------|
| Atlantic Testing Laboratories | 6085 Court St., Syracuse, NY | 315-699-5281 |
| Norm Hummel (Hummel & Co.) | 35 King Street, PO Box 606 Trumansburg, NY | 607-387-5694 |
| CME Associates, Inc. | PO Box 1824, 8560 Brewerton Rd., Cicero, NY | 315-698-9315 |
| PW Laboratories, Inc. | 6544 Fremont Road, East Syracuse, NY | 315-437-1420 |

- D. *Sources for Soil Components and Planting Soil Mixes:* Submit information identifying sources for all soil components and the contractor responsible for mixing of planting soil mixes.
- 1. To the extent feasible, on-site soils shall be retained and modified to meet the requirements of this specification. Outside material sources can be used to modify and amend available on-site soil materials as needed. Topsoil is not to be removed from the site without the Owner's written permission. If on-site soil materials are insufficient in quantity or quality, outside soil materials may be used.
 - 2. Owner's representative shall have the right to reject any soil supplier.
 - 3. Soil mix supplier shall have a minimum of five years experience at supplying custom planting soil mixes.
 - 4. Soil shall be provided from single source.
 - 5. Submit supplier name, contact person, address, telephone and fax number. The Owner's representative can assist in locating acceptable suppliers within the area.
 - 6. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project. Indicate quantity and type of material from supplier.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle packaged materials in strict compliance with manufacturer's instructions and recommendations. Protect all materials from weather, damage, injury and theft.
- B. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Owner. Deliver soil materials only after preparations for placement of planting soil have been completed.
- C. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.
- D. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than six feet high. If soil stockpiles greater than six feet high are to be stored for more than two weeks, the contractor shall break down and disperse soil so that mounds do not exceed the six-foot height restriction or thoroughly mix the stockpile once a month.
- E. Vehicular access to the site is restricted. Prior to construction the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access which shall include, but not be limited to equipment movements and staging locations
- F. Soil materials shall be covered at least two weeks prior to installation to prevent excess moisture from saturating the soil stockpile. Test for the moisture content of the soil mix using the gravimetric oven dry method as described in Soil Science Society of America, *Methods of Soil Analysis*, Part 1, 1986 at least two days prior to soil installation.
- G. Soil materials shall not be handled or hauled, placed or compacted when it is wet, as after a heavy rain, nor when frozen. Soil shall be handled only when the moisture content is less than 10 percent by volume.
- H. The planting soil shall be mixed in a ball mill or tub mill fitted with proper screening and paddles. Windrowing the materials is not acceptable, as it does not produce uniform mixing of the components.

1.7 ACCEPTANCE AND MAINTENANCE

- A. *Soil Installation Acceptance:* Notify the Engineer at least 5 days in advance of date of soil placement. Inspection of the soil installation shall take place while the subgrade is visible and prior to placement of additional layers. Notify the Engineer 72 hours prior to inspection. Another inspection shall occur during the placement of the S2 layer before placement of the S1 layer installation.
- B. *Partial Acceptance:* Acceptance of partial areas or portions of the total work may be granted at the option of the Engineer only if the area to be inspected for acceptance is large, well defined and easily described. The Engineer is not obligated to provide partial acceptance of the work.
- C. *Final Acceptance:* Final acceptance shall be defined as the date after which the Engineer determines that all work, including Soil submittals and Punch List items has been satisfactorily completed.

PART 2 – PRODUCTS

2.1 SOIL LAYERS (HORIZONS):

A. General

1. All plant mix material shall fulfill the requirements as specified and be tested to confirm the specified characteristics.
2. Samples of individual components of plant mixes in addition to blended plant mixes including mulch materials shall be submitted by the Owner for testing and analysis to a testing laboratory. Include verification testing of on-site sub soils. Comply with specific materials requirements specified.
 - a. No base component material or soil components for plant mixes shall be used until certified test reports by an approved agricultural chemist have been received and approved by the Owner's representative.
 - b. If necessary, testing of the soil material components may be requested by the Owner's representative to facilitate approval of the planting soil mix.
 - c. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.
 - d. Layers consisting of stone storage/infiltration beds are specified in Section 02720 – Drainage Utilities.
 - e. Non-woven geotextiles are specified in Section 02720 Drainage Utilities.
3. The Owner's representative may request additional testing for confirmation of mix quality and/or soil mix amendments at any time until completion.

B. Suppliers:

1. In the event that any of the soil materials are not available from the supplier or are not in compliance with specifications herein, the Contractor shall obtain material from other suppliers to provide materials in compliance with these specifications.
2. The Owner's representative shall be notified of all soil mix substitutions or problems with the planting soil supply in order to assist with a smooth delivery and installation.

C. Planting Soils:

The following particle size distributions are for the planting soil materials. To achieve the particle size ranges listed in the products, follow the *Soil Mix Matrix* noted in section below.

1. *Soil layer (S2):* Planting Soil Drainage Layer consisting of material with a USDA Texture of coarse sand.
 - a. *Soil reaction* with a pH between 4.5 – 7.0.

- b. An estimated permeability of 10 - 25 cm/hour.
- c. The S2 layer within the bio-retention swale shall have a, uniformly increasing with depth, penetration resistance of < 250 lbs/in² after installation. No dense layers (+ 50 lbs/in² from background rate) are allowed.
- d. There shall be no visible organic material present in this layer.
- e. Material can be a natural sand or finely ground recycled glass meeting the following particle size distribution

S2 Soil Layer Particle Size Distribution

| Particle Size Class | Passing Sieve No | Range in Percent Passing ASTM F 1632-03 |
|---------------------|------------------|--|
| fine gravel | 10 | 95 – 100 |
| very coarse sand | 18 | 80 – 95 |
| coarse sand | 35 | 60 - 80 |
| medium sand | 60 | 10 – 40 |
| fine sand | 140 | 8 – 15 |
| very fine sand | 270 | 1 – 10 |
| silt* | | 1 – 6 |
| clay* | | 0 – 4 |
| Chemical | | |
| Organic Matter % | ASTM F 1647-02a | <0.25 |
| pH | 1:1 Water | 4.5 – 7.0 |

*determined by hydrometer method in ASTM F1632-03.

- 2. *Soil layer (S1):* Planting Soil Surface layer. Consisting of a layer of sand to loamy sand (S2) amended with organic matter. (must be tested to meet specs after compost is approved and added). See drawings for appropriate layer thicknesses.
 - a. The soil specifications shall be that the minimum infiltration rate for planting soil areas stays above 1 in/hour after installation.
 - b. For S1 layers within Bio-retention basins the saturated conductivity shall be greater than 6in/hr and not more than 60 in/hr directly after installation. After a few rain events the range shall be between 3 to 10 in/hr.
 - c. The soil shall have soil moisture content less than 10% by weight for installation.
 - d. The S1 layer shall have a penetration resistance of < 100 lbs/in² after installation before final acceptance.
 - e. The particle size distribution shall be:

S1 Soil Layer Particle Size Distribution

| Particle Size Class | Passing Sieve No | Range in Percent Passing ASTM F 1632-03 |
|---------------------|------------------|--|
| fine gravel | 10 | 95 – 100 |
| very coarse sand | 18 | 90 – 100 |
| coarse sand | 35 | 65 – 85 |
| medium sand | 60 | 30 – 40 |
| fine sand | 140 | 15 – 25 |
| very fine sand | 270 | 12 – 22 |
| silt* | | 6 – 12 |

| | | |
|------------------|-----------------|----------------------|
| clay* | | 6 – 10 |
| Organic Matter % | ASTM F 1647-02a | 2-4% |
| pH | 1:1 water | 5.5 – 7.0 |
| EC | 1:1 paste | 1.5 dS/m |
| Phosphorous (P) | extract | 20 – 100 ppm |
| Potassium (K) | extract | 200 – 600 ppm |

*determined by hydrometer method in ASTM F1632-03.

D. *Organic Amendment*: Compost. Compost shall be Leaf Compost and shall conform to the following specifications:

1. Organic matter for amending existing soils shall be a stable, humus-like material produced from the aerobic decomposition and curing of leaf compost, composted for a minimum of one year (12 months). The leaf compost shall be free of debris such as plastics, metal, concrete or other debris. The leaf compost shall be free of stones larger than 1/2", larger branches and roots. Wood chips over 1 inch in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests. Prior to its initial use, submit certified reports documenting the source and properties of the leaf compost.

- a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 22:1. Stability shall be assessed by the Solvita procedure (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale or by <2.0 percent Carbon/day using CO₂ evolution
- b. Pathogens/Metals/Vector Attraction reduction shall meet 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32, and applicable New York State requirements for applications to soils with human activity.
- c. Organic content shall be between 20 and 75 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve.
- d. pH: The pH shall be between 6.5 to 8.0 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy *Methods of Soil Analysis*, Part 2, 1986.
- e. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 3.0 mmhos/cm (dS/m).
- f. The compost shall be screened to 3/8 inch maximum particle size and shall contain no more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.

2.2 SOIL PROFILES

Planting Soil Profile: The S2 layer thickness is as specified on the Plans and is lightly placed [$<250 \text{ lbs/ft}^2$ after installation]. The surface layer is 6-8 inches of specified S1 material lightly placed [$<100 \text{ lbs/ft}^2$ after installation]. (See Drawings for project-specific layer thicknesses).

PART 3 – EXECUTION

3.1 COORDINATION

- A. *Pre-Installation Examination Required:* The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify the Owner in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means the Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by the Owner.
- B. *Planting Soil Preparation:* Examine soil and remove foreign materials, stones over 1", and organic debris over 2" in length. Mix-in amendments as required by tests and as approved by the Owner. All preparation and mixing shall be accomplished when the soil moisture content is less than 10 percent by volume.
- C. Coordinate activities with other project contractors so that there is no soil disturbance from vehicle or foot traffic or other construction activities subsequent to placement.

3.2 EXCAVATION AND SCARIFICATION

- A. Excavation of the soils shall be accomplished to depths noted for each soil profile area. All construction debris shall be removed from the planting areas prior to placement of the soil layers. Care shall be taken to avoid working the soil when it has 10 percent moisture content or above.
 - 1. *Excavation Depths:*
 - a. Planting Areas shall be excavated or loosened at least 12 inches below final grade. (See Drawings for locations).
 - b. Infiltration areas shall be excavated to elevations shown on the drawings. All bed bottoms are level and scarified as indicated on plans.
- B. Scarification of the Subgrade: After excavation of the subgrade is complete, notify the Engineer for inspection of the subgrade prior to backfill or subgrade preparation of any kind. Scarification may be required to loosen the compacted surface of the subgrade following final rough grade to a depth of 4 to 6 inches prior to the designed soil placement.

3.3 MIXING OF SOIL

- A. The planting soil shall be mixed in a ball mill or tub mill fitted with proper screening and paddles. Windrowing the materials is not acceptable, as it does not produce uniform mixing of the components.

- B. Mixing of the compost for the S1 layer (topsoil) shall be accomplished in the same manner as the other mixing procedures. The compost shall be moist, but not overly wet so as water can be squeezed out by hand or so dry as to be easily blown by wind.

3.4 PLACEMENT OF SOIL LAYERS (HORIZONS)

- A. *Examination of Subgrade:* The subgrade shall be examined by the Engineer prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner in writing prior to acceptance of the subgrade.
- B. *Planting Soil Placement:*
 - 1. Where required as noted in Section 3.2.B above, scarify the subgrade after engineered compaction to a depth of 3 to 4 inches. Scarify parallel to the contour of the slope when possible, especially on slopes greater than 4:1. This is to provide teeth to stabilize the sandier soil above.
 - 2. Place the S2 layers following planned locations and specific planting situation details (See Drawings). The soil installation shall not to exceed 6 inches lifts and shall only compacted by foot traffic. A light scarification for the surface of each lift with hand tools is required to break up any compacted surface and eliminate any compaction interface. Additional compaction is prohibited.
 - 3. In areas where utilities or other underground structures prevent the full soil profile, the S2 layer shall be thickened or thinned to maintain final grade. All soil profiles shall have a 6-8 inch S1 layer.
 - 4. Care shall be taken to maintain the separation between the designed soil layers. Do not mix individual layers with preceding layers.
 - 5. Correctly pitch the final grade to allow smooth surface runoff as noted on the grading plan. Plant after installation of the S1 layers has been final graded.
 - 6. Reducing the amount of compaction to the soils can be accomplished by beginning the work in corners, against walls, or at the center of isolated beds, and progressing outwards. This limits the amount of traffic needed for installation on the placed soil.
 - 7. Planting soils shall not be moved or worked when wet or frozen. The optimal soil moisture content shall be between 5 and 10 percent by weight.
 - 8. Bio-filtration shall be tested using ASTM D3385 determine the saturated hydraulic conductivity of the Bio-filtration basins. For each linear Bio-filtration Swale, one test at the lowest collection point for each swale. Penetration resistance testing using a cone penetrometer shall be conducted after completion of the basin installation. Testing will be performed by the Owner's 3rd party testing agency and shall be scheduled by the Owner's Representative and coordinated with the Contractor.

NOTE: If any utility boxes or other structures will be placed within the designed soil, structures shall have compacted pedestals of S2 material of 90 percent of standard proctor to support them.

- D. Bio-Remediation Basin Area Protections: To ensure proper long-term functionality of the Bio-Retention Basins, several procedures and scheduling will need to be followed while handling planting soil installation around these areas.
1. Install protective mulch socks and erosion controls after excavation and installation of the underdrainage, gravel and filter fabric to restrict sedimentation of the Bio-filtration areas. Filter fences alone are not sufficient.
 2. Do not install the filter sand prior to planting soil installation. Failure to comply will allow excessive sediment to contaminate the filter sand causing decreased functionality.
 3. Install the S2 layer. Install the S1 layer. Install 3 inches of coarse wood chip mulch to the final surface (S1) of the Bio-retention swale to help trap sediment and prevent infiltration of sediment into the basin until vegetation establishment. It is highly recommended to install the complete Bio-retention swales in the summer or during several weeks of dry weather to ensure that erosion is kept to minimum.
 4. Maintain effective erosion and sediment controls throughout the vegetation establishment period
 5. Vegetate the surrounding catchment areas as quickly as possible.
 6. All other maintenance and warranty items as noted elsewhere in the Contract Documents.

3.5 PROTECTION AND REPAIRS

A. General:

1. Protect newly graded areas from vehicle and foot traffic, freezing and erosion. Keep free of trash, debris or construction materials.
2. Within the installation warranty period repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or compacted due to subsequent construction operations or weather conditions.
3. Scarify or remove and replace material to a depth as directed by the Owner; reshape and re-compact by only hand tamping at the prescribed moisture content.
4. Where settling occurs, before sidewalk construction and final soil installation acceptance, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.

3.6 POST INSTALLATION MAINTENANCE

- A. Where settling occurs, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.
1. Any post installation changes or amendments to previously approved soils without the Owner's representative's consent are the responsibility of the owner.
- B. Fertilization of planting areas shall be handled after establishment as noted in within the planting section.

END OF SECTION