

## SECTION 02210 - TOPSOIL

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. This item includes all work required to furnish and place topsoil to the depths and locations shown on the plans or as directed by the Engineer.

#### 1.2 SUBMITTALS

##### A. Action Submittals:

- 1. Shop Drawings: Product labels/data sheets.
- 2. Samples: Representative of stockpiled or imported topsoil.

##### B. Informational Submittals:

- 1. Certified Topsoil Analysis Reports:
  - a. Indicate quantities of materials necessary to bring topsoil into compliance with textural/gradation requirements.
  - b. Indicate quantity of lime, and quantity and analysis of fertilizer.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. The topsoil shall be the natural, fertile, friable surface layer of soil obtained from naturally drained areas and free from subsoil, clay lumps, stones, brush, stumps, roots, objectionable weeds or litter (glass, plastic, paper, etc.), excess acid or alkali, or other substances which may be harmful to plant growth or a hindrance to subsequent smooth grading, planting, or maintenance operations.

- B. Topsoil shall meet the following requirements unless otherwise specifically stated in the plans:

- 1) The pH of the material shall be between 5.5 and 7.6.
- 2) The organic content shall be not less than two (2) percent or more than twenty (20) percent.
- 3) The gradation shall be as follows:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
2 Inches	100
1 Inch	85-100
1/4 Inch	65-100
No. 200	20-80

## PART 3 – EXECUTION

### 3.1 TOPSOIL PLACEMENT

- A. As noted on the plans or as otherwise directed by the Engineer.
- B. The topsoil shall be placed to the line and grade shown on the plans or as directed by the Engineer.
- B. Topsoil shall be from one source, and shall be covered and protected, and used exclusively for the work under this contract. Once tested, no topsoil shall be added to the stockpile, and the stockpile shall be used until fully depleted.

### 3.2 FIELD QUALITY CONTROL AND TESTING

- A. Prior to use, the Engineer shall visually inspect and approve each topsoil stockpile for material compliance.
- B. The Contractor shall employ a qualified soils testing laboratory to perform the appropriate testing (sieve analysis, pH, and organic content). Three (3) different locations on each stockpile will be sampled and tested, as determined by the Engineer, to ensure compliance. Copies of these tests results shall be given to the Engineer and the cost of this testing shall be borne by the Contractor and included in the bid price. Should testing indicate that the topsoil does not meet the intent of this specification, the Contractor shall either amend the mix, or provide new material. In either case, retesting shall be completed and the cost borne by the Contractor. No topsoil shall be approved for use until the tested topsoil is approved in writing by the Engineer.

**END OF SECTION**

## SECTION 02220 – CU-SOIL STRUCTURAL SOIL

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. This item includes all work required to furnish and place CU-Soil (a structural soil) to the depths and locations shown on the plans or as directed by the Engineer. This structural soil is an aggregate/soil/tackifier hydrogel mixture designed to meet engineering requirements for proctor density and CBR values to support pavement, while allowing better drainage and increased soil volume, supportive of tree growth. Work shall cover all costs for spreading, rough grading, and fine grading of the structural soil.

#### 1.2 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Product labels/data sheets.
2. Proof of product license

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. The structural soil shall conform with “CU-Soil” as patented by Cornell University, Patent #5,849,069. CU-soil is a mixture of crushed stone, clay loam and Hydrogel which is a potassium propenoate-propenamide copolymer. Licensed producers include the following:

- Frank Paolangeli, Ithaca, New York; (607) 273-8139; Cell: (607) 279-0315
- Sultana Sand & Stone, Inc., Brooktondale, New York; (607) 539-7868; Contact: Mr. Kim Whetzel
- East Coast Mine, Quogue, NY
- Tully Environmental Co. d/b/a/ Evergreen Recycling of Corona, NY
- Ascape Landscape, New City, NY

1. The CU-Soil mix shall have a moisture content of 10% (AASHTO T-99 optimum moisture).
2. The pH of the material shall be between 5.5 and 6.0.
3. Gradation: The structural soil material shall consist of three components mixed in the following proportions by weight:
  - a. Crushed Stone: 100 parts
  - b. Clay Loam: 20 parts
  - c. Hydrogel: 0.03 parts
4. Crushed Stone shall be granite or sandstone (no limestone shall be used) and shall be narrowly graded from 19mm to 38mm, highly angular with no fines and in the following proportions:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
38mm	90 to 100
25mm	20 to 55
20mm	10

5. Clay loam shall meet the following requirements:
- a. Not less than 25% or more than 30% of the clay loam by weight shall be sand. 100% of the sand fraction shall pass the 2mm sieve and 100% shall be retained by the 50 um sieve.
  - b. Not less than 20% or more than 40% of the clay loam by weight shall be silt. The particle size distribution for the silt shall be 2um to 50um.
  - c. Not less than 25% or more than 40% of the clay loam by weight shall be clay. The particle size distribution for the clay shall include all particles smaller than 2um.
  - d. Not less than 2.75% or more than 5% of the clay loam by weight shall be decayed organic matter (humus) as determined by ASTM F-1647. If organic amendments are needed to obtain the specific organic matter content of the topsoil, the organic matter source shall be peat, composted leaves (leaf mold) or other approved organic amendments. Peat shall be sphagnum peat having ash content not exceeding 15%, as determined by ASTM D-2974. Leaf mold must be substantially free of sticks, stones, roots, plastic, glass, metal, and other debris. One-hundred (100%) percent of the leaf mold must pass a 0.5inch screen. The leaf mold chemical analysis shall conform to the following:
    - i. The soluble salt content (conductivity) must be less than 150 MHOS per cubic meter for a 1:5 leaf mold to water ratio.
    - ii. The pH shall not exceed 6.8.
    - iii. The carbon/nitrogen ratio shall fall between 12:1 and 25:1.
6. The Hydrogel/Wetting Agent shall be potassium propenoate-propenamide copolymer hydrogel such as:
- a. Gelscape, Amereq Corporation, NY
  - b. Soilmoist, JRM Chemical Inc., Cleveland, OH
  - c. Supersorb, Aquatrols Corporation, Cherry Hill, NY
  - d. Or Approved Equal

### PART 3 – EXECUTION

#### 3.1 SITE QUALITY CONTROL

- A. Do not proceed with the installation of the CU Soil material until all walls, curb footings and utility work in the area have been installed. Confirm that the sub-grade is at the proper elevation and compacted as required. Sub-grade elevations shall slope parallel to the finished grade.
- B. Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete, washout silts or other material harmful to plants have been spilled into the

sub-grade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required sub-grade compaction.

- C. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use ½" plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
- D. Do not deliver or place soils in frozen, wet, or muddy conditions. Material shall be delivered at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698). Protect soils and mixes from absorbing excess water and from erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter the site prior to compaction. If water is introduced into the material after grading, allow material to drain or aerate to optimum compaction moisture content.

### 3.2 PLACEMENT

- A. The structural soil shall be placed to the line and grade shown on the plans or as directed by the Engineer.
  - 1. Install CU-soil in 6-inch lifts and compact each lift. Compact all materials to 95% compaction from a standard AASHTO Compaction Curve (AASHTO T 99).
  - 2. No placement or compaction shall occur when moisture content exceeds 2 percent above the optimum compaction moisture content as determined by AASHTO T 99 (ASTM D698).
  - 3. Protect CU Soil during delays in compaction with plastic or plywood as directed by the Engineer.
  - 4. Field tested permeability shall be within 0.5 and 1.0 inches per hour.
- B. After the initial placement and rough grading of the CU Soil but prior to the start of the fine grading, the contractor shall request the review of the rough grading by the Engineer. The Engineer reserves the right to conduct infiltration/permeability testing prior to continuance of work.
- C. The Contractor shall set sufficient grade stakes for checking the final grades. Adjust the finish grades to meet field conditions as directed. Fill all dips and remove any bumps in the overall plane of the slope.
- D. All fine grading shall be inspected and approved by the Engineer prior to the installation of other items to be placed on the CU Soil.

**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
  - 4. Temporary seeding

#### **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. Seed Types: City of Syracuse Forestry Standards and Specifications, First Edition, May 2003, or approved equal.
- B. Silt Barrier Fence: Class 3 geotextile materials with 2"x2" anchoring pots
- C. 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.
- D. Coarse Aggregate (inlet protection): AASHTO #57 or equivalent.
- E. 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.

- F. 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. Prepare area to be seeded by hand raking and grading prior to seeding.
- H. Mulch newly seeded areas to prevent erosion prior to seed germination and stabilization. Seeding shall be as specified by the City of Syracuse Forestry Standards and Specifications, First Edition, May 2003, or approved equal.
- I. 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.
- J. Remove sediment from inlet protections and asphalt roadways after each major storm event.

**END OF SECTION**

**SECTION 02610 - ASPHALT MILLING (3'')**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Under this item the Contractor shall perform cold-planing 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 of 3” minimum or as shown on plans, and to a width, grade, and cross-section as shown on plans.
- 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.

## 1.3 MILLED MATERIAL HAULING AND DISPOSAL

- A. Milled material shall be hauled offsite to a location of the Contractor's choosing. If desired, 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), 19<sup>th</sup> 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.

3.6 FIELD QUALITY CONTROL

- A. The Engineer has the right to take core samples and test them as is deemed necessary. 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 02720 - DRAINAGE

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. This work includes the construction of catch basins, solid and perforated stormwater piping, and other structures as shown on plan, as well as any incidental or related operations.

#### 1.2 SUBMITTALS

- A. Submit three copies of catalogue cuts of all fabricated materials including pipes, inlet boxes, grates, etc. for approval by the Owner prior to ordering.
- B. Submit shop drawings as specified to Owner for approval prior to ordering.

#### 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 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), 19<sup>th</sup> 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.

#### 1.4 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. Pipe

1. High Density Polyethylene Pipe (HDPE) shall conform to AASHTO M252, ASTM F-405, and ASTM F-667 for materials and fabrication, shall be smooth lined, and shall be as manufactured by ADS or approved equal. Pipe joints shall be watertight joints.
2. Continuously Perforated High Density Polyethylene Pipe (HDPE) shall have perforations at least five-sixteenths (5/16") inch in diameter and provide an opening area not less than 3.31 square inches per square foot of pipe surface (i.e. 6.94 sq. in./LF for 8" DIA pipe and 10.40 sq. in./LF for 12" DIA pipe).
3. The joints of all precise structural units shall be sealed with a butyl-sealant system so that the joint will remain watertight under all conditions of service, including movement due to expansion, contraction and normal settlement. The bonder shall be the sole element depended upon to make the joint watertight.

#### B. Structures

1. Storm Drain Inlets and Structures:
  - a. Concrete Construction: Concrete construction shall be in accordance with PI 24 of Contract Documents and Specifications for 2010 Annual Street Structures and Rehabilitation at Various Locations within Onondaga County and the City of Syracuse, March 2010.
  - b. Precast Concrete Inlets and Manholes: Precast concrete inlets may be substituted for cast-in-place structures and shall be constructed as specified for cast-in-place. Precast structures may be used in only those areas where there is no conflict with existing underground structures which may necessitate revision of inverts. Precast structures shall be placed on an 8 inch bed of compacted coarse aggregate Size No. 2A. Reinforcement steel, if required for handling, shall have a minimum of 2 inch cover. Handling devices, if used, shall be removable and the holes filled with concrete. Where indicated on the plans, precast structures will be modified to provide sediment storage and bottom leaching basins, open to gravel sumps in sub-grade, when situated in an infiltration trench.
  - c. All cleanouts shall be PVC stand pipes with solid lid, 1/8<sup>th</sup> bend, and wye joint for connection to perforated HDPE, or as indicated on plans. Diameter of cleanout shall be as indicated on plans.
  - d. Observation well shall contain a PVC stand pipe sized as shown on the plans. Observation well pipe shall be capped, surrounded by six inches of NYSDOT No. 3 aggregate, and include a 12-inch sump (below the infiltration bed elevation) with a threaded end cap. Place a #4 reinforcing steel bar through the center of the PVC stand pipe as shown on plans.
  - e. Steel reinforcement, if required, shall comply with ACI 318-83, or latest edition thereof.
  - f. Inlet frame and lid (or grate, as indicated on plan) shall be Syracuse Casting No. 2916, or approved equal. Cement mortar all around frame inside and out. Inlet grates shall be bicycle-safe and conform to City of Syracuse standards.
  - g. Where indicated on plans, weir plate shall be 1/4" stainless steel, water tight, sealed, and bolted or notched 1/2" into walls of catch basin. Unless otherwise noted, install weir plate six inches from outlet side of catch basin.

- C. Water Quality Inserts
  - 1. Water Quality Inserts (or Inlet Filter Inserts) shall be frame mounted filter inserts conforming to Flogard+ by KriStar Enterprises, Inc., or approved equivalent.
- D. Anti-Seep Collars
  - 1. Anti-seep collars shall be two-piece HDPE collars by Lane Enterprises, or approved equal. Install anti-seep collars as indicated on the plan, approximately one foot from the edge (outside) of the infiltration bed.

### 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 – TRENCHES

- 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. 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.
- 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 reference density will be determined in the laboratory by the soils engineer in conformance with ASTM D-1557. The degree of compaction shall be checked by the soils engineer, and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the soils engineer. 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 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 ample 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

- 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 STRUCTURES (CONCRETE INLETS, CLEANOUTS, etc)

- 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 with the manufacturer's dispatch office in sufficient time to acquire the equipment.
- C. The completed installation shall be neat and watertight. Precast structures showing visible leakage due to groundwater or when subjected to an exfiltration test shall not be acceptable, and will be repaired or reconstructed by the Contractor.
- D. All precast sections shall be lifted and moved by use of suitable lifting slings and lugs to prevent damage to the precast joint edge. If minor damage occurs to the precast sections, such damage will be repaired in the presence of, and to the satisfaction of the Owner.
- E. All joints between sections shall receive a 1" equivalent diameter Butyl-Lock sealant. The Butyl-Lock sealant or approved equal shall contain a moisture insensitive epoxy resin, capable of bonding concrete and masonry surfaces down to 32 degrees F.
- F. One layer of tape shall be applied to both inside and outside flanges of the section groove before lowering the precast unit in place. This should be done in such a manner that when the modules are pressed together, a small amount of excess bonder is forced out of the joint area evenly. If no bonder is forced out of the joint area, immediately pull apart the top section and repress the unit together.
- G. The inside and outside faces of the joints shall be sealed with mortar, and troweled to a smooth finish.

- H. Pipes entering precast sections shall be set securely in the opening provided to the correct line and grade as shown on the plans. The pipe shall be set flush with the inside face of the structure. The connection shall be mortared in place to a smooth finish.
  - I. Where indicated on plan, install stainless steel weir plate six inches from outlet side of catch basin. Confirm placement of weir in catch basin prior to installation. Unless otherwise approved, weir shall be stainless steel, water tight, sealed, and bolted or notched ½” into walls of catch basin.
  - J. Each catch basin shall have one 1-inch diameter weep hole on each side of the basin, located twelve inches from the top of grate. In addition, each catch basin with a sediment sump (as indicated on plan) shall have eight 1-inch diameter weep holes installed at the bottom of the structure (five on the inlet side of the weir and three on the outlet side).
- 3.5 INSTALLATION OF WATER QUALITY INSERTS
- A. Conform to manufacturer’s specifications.

**END OF SECTION**

## SECTION 02725 – 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.
- C. Submit samples of coarse aggregates and non-woven geotextile for review and approval by the Engineer.

#### 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), 19<sup>th</sup> 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:

4. Maximum Wash Loss of 0.5% (ASTM C117)
5. Minimum Durability Index of 35 (ASTM D3744)
6. L.A. abrasion loss, 30% maximum. (ASTM C131 and C535)
7. Aggregate shall be 100% crushed material.
8. Fractured Faces, 1 side 95% minimum, 2 sides 90% minimum (ASTM D5821).

B. Unless otherwise approved by the Engineer, coarse aggregate for the infiltration bed shall be uniformly graded, crushed and washed No. 3 stone as specified in the NYSDOT Standard Specifications 703-02, size designation from Table 703-4.

C. Unless otherwise approved by the Engineer, choker base course aggregate for infiltration beds 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. Non-woven geotextile (drainage filter fabric) shall conform to the following:

1. Minimum flow rate of 110 gal/min/ft<sup>2</sup> 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.

E. The impervious liner between infiltration bed aggregate and adjacent pavement subbase shall be Solmax 230 (30 mil), or approved equal. Install per manufacturer's recommendations.

- F. The base bid for structural soils shall be as per Specification Section 02220 – CU-Soil. As indicated on the plans, bid alternates shall include Silva Cell by Deep Root and sand-based structural soil.
- G. Sand-based structural soil is based on Amsterdam Tree Soil and shall contain the following: 91-94% medium coarse sand, 44-5% organic matter, and 2-4% clay. The medium coarse sand shall be free of salts, have a median particle size of 220 µm, and have a relatively uniform distribution of particle sizes, which is specified by a D60/D10 ratio of > 2.5.
- H. The root barrier between structural soils shall also be bid as an alternate. Root barrier shall be as per Deep Root, or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Owner 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 aggregate. 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. Non-woven geotextile and bed aggregate 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 non-woven geotextile at no extra cost to the Owner.
  - 3. Place non-woven geotextile in accordance with manufacturer's standards and recommendations. Adjacent strips of non-woven geotextile shall overlap a minimum of sixteen inches (16"). Secure non-woven 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 non-woven geotextile along bed edges can be cut back to gravel edge.
  - 4. Install impervious liner as indicated between infiltration bed aggregate and adjacent pavement subbase.
  - 5. Install infiltration bed aggregate to grades indicated on the drawings. 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 perforated pipe, cleanouts, and observation well as indicated on plan.
- D. Structural Soil
  - 1. Install structural soil as per PI C613.0010 – Structural Soil for Street Trees.



2. Install Silva Cell and root barrier according to manufacturer's recommendations.
3. The components of sand-based structural soil shall be blended in a heavy-duty industrial mixer prior to installation. Install and compact sand-based structural soil in two layers. Compact sand-based structural soil to 70-80% Proctor density.

**END OF SECTION**

## SECTION 02730 – POROUS PAVERS

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. Permeable interlocking concrete pavers.
2. Crushed stone bedding material.
3. Open-graded base aggregate.
4. Bedding and joint/opening filler materials.
5. Edge restraints.

#### 1.02 REFERENCES

##### A. American Society for Testing and Materials (ASTM)

1. C 67, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
2. C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
3. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate.
4. C 140, Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8 – Freezing and Thawing.
5. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. C 936, Standard Specification for Solid Interlocking Concrete Pavers.
7. C 979, Specification for Pigments for Integrally Colored Concrete.
8. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) drop.
9. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop.
10. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
11. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

B. Interlocking Concrete Pavement Institute (ICPI)

1. Permeable Interlocking Concrete Pavement manual.

1.03 SUBMITTALS

A. Manufacturer's drawing and details: Indicate perimeter conditions, junction with other materials, expansion and control joints, paver layout, paver color, and installation and setting details. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.

B. Minimum 3 lb (2 kg) samples of base and bedding aggregate materials.

C. Sieve analysis of aggregates for base and bedding materials per ASTM C 136.

D. Permeable concrete pavers:

1. Manufacturer's product catalog sheets with specifications.
2. Four representative full-size samples of each paver type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation.
3. Accepted samples become the standard of acceptance for the work of this Section.
4. Laboratory test reports certifying compliance of the concrete pavers with ASTM C 936.
5. Manufacturer's material safety data sheets for the safe handling of the specified materials and products.
6. Manufacturer's written quality control procedures including representative samples of production record keeping that ensure conformance of paving products to the project specifications.

E. Paver Installation Subcontractor:

1. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
3. Written Method Statement and Quality Control Plan that describes material staging and flow, paving direction and installation procedures, including representative reporting forms that ensure conformance to the project specifications.

#### 1.04 QUALITY ASSURANCE

##### A. Paver Installation Subcontractor Qualifications:

1. Utilize an installer having successfully completed concrete paver installation similar in design, material and extent indicated on this project.
2. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.

B. Review the manufacturers' quality control plan, paver installation subcontractor's Method Statement and Quality Control Plan with pre-construction meeting of representatives from the manufacturer, paver installation subcontractor, general contractor, engineer and/or owner's representative.

##### C. Mock-Ups:

1. Install a 6 ft x 10 ft (2 x 3 m) paver area.
2. Use this area to determine surcharge of the bedding layer, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
3. This area will be used as the standard by which the work will be judged.
4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
5. If mock-up is not retained, remove and properly dispose of mock-up.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged container packaging with identification tags intact on each paver bundle.

1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift.
3. Unload pavers at job site in such a manner that no damage occurs to the product or existing construction

C. Storage and Protection: Store materials in protected area such that they are kept free from mud, dirt, and other foreign materials.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install in rain or snow.

B. Do not install frozen bedding materials.

1.07 MAINTENANCE

A. Extra materials: Provide 5% additional material for use by owner for maintenance and repair.

B. Pavers shall be from the same production run as installed materials.

PART 2 – PRODUCTS

2.01 PERMEABLE INTERLOCKING CONCRETE PAVERS

A. Manufacturer: Hanover Architectural Products, or approved equal.

1. Contact: Tom Piscitell, Paragon Supply, Inc.

B. Permeable Interlocking Concrete Paver Units:

1. Paver Type: 4" x 9" Permeable Paving Unit, or as approved by Owner.

a. Material Standard: Comply with ASTM C 936.

b. Color and finish: Quarry Red and Tutor finish, or as approved by Owner.

c. Color Pigment Material Standard: Comply with ASTM C 979.

d. Size: 4 5/8" inches x 9 1/4" inches x 3 inches thick.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: Substitutions must be approved by Owner and/or Engineer.

2.03 CRUSHED STONE FILLER, BEDDING, AND BASE

A. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131, minimum CBR of 80% per ASTM D 1883.

B. Do not use rounded river gravel.

C. All stone materials shall be washed with less than 0.5% passing the No. 200 sieve.

D. Joint/opening filler, bedding, and base: conforming to ASTM D 448 gradation as shown in Tables 1 and 2 below:

**Table 1**  
**Grading Requirements for ASTM No. 8 Bedding and Joint/Opening Filler**

Sieve Size	Percent Passing
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	85 to 100
4.75 mm (No. 4)	10 to 30
2.36 mm (No. 8)	0 to 10
1.16 mm (No. 16)	0 to 5

**Table 2**  
**Grading Requirements for ASTM No. 57 Base**

Sieve Size	Percent Passing
37.5 mm (1 1/2 in.)	100
25 mm (1 in.)	95 to 100
12.5 mm (1/2 in.)	25 to 60
4.75 mm (No. 4)	0 to 10
2.36 mm (No. 8)	0 to 5

E. Gradation criteria for the bedding and base:

1. D15 base stone /D50 bedding stone < 5.
2. D50 base stone/D50 bedding stone > 2.

2.04 ACCESSORIES

A. Provide accessory materials as follows:

1. Edge Restraints
  - a. Manufacturer: Permaloc, or approved equal.
  - b. Material: aluminum.
  - c. Material Standard: Asphalt Edge, or approved equal.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Paragon Supply, Inc. or approved equal.

3.02 EXAMINATION

A. Acceptance of Site Verification of Conditions:

1. General Contractor shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.

a. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.

b. Provide written density test results for soil subgrade to the Owner, General Contractor and paver installation subcontractor.

c. Verify location, type, and elevations of edge restraints, utility structures, drainage pipes, and inlets.

2. Do not proceed with installation of bedding and interlocking concrete pavers until subgrade soil conditions are corrected by the General Contractor or designated subcontractor.

### 3.03 PREPARATION

A. Verify that the soil subgrade is free from standing water.

B. Stockpile joint/opening filler, bedding, and base materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.

C. Edge Restraint Preparation:

1. Install edge restraints per the drawings and manufacturer guidelines.

### 3.04 INSTALLATION

A. General

1. Any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities shall be removed before application of the geotextile and base materials.

2. Keep area where pavement is to be constructed free from sediment during entire job. Geotextiles, base, and bedding materials contaminated with sediment shall be removed and replaced with clean materials.

3. Do not damage drainpipes, overflow pipes, observation wells, or any inlets and other drainage appurtenances during installation. Report any damage immediately to the project engineer.

B. Geotextiles

1. Place on bottom and sides of soil subgrade. Secure in place to prevent wrinkling from vehicle tires and tracks.

2. See Section 02725 – Infiltration Bed for more information on geotextile installation.

C. Open-graded base

1. Moisten, spread and compact No. 57 base in 76 mm (3 in.) lift over the compacted subgrade with a minimum 10 T (10 t) vibratory roller until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller.
2. The surface tolerance the compacted No. 57 base should not deviate more than.  $\pm 25$  mm ( $\pm 1$  in.) over a 3 m (10 ft.) straightedge.

D. Bedding layer

1. Moisten, spread and screed the No. 8 stone bedding material.
2. Fill voids left by removed screed rails with No. 8 stone.
3. The surface tolerance of the screeded No. 8 bedding layer shall be  $\pm 10$  mm ( $3/8$  in.) over a 3 m (10ft) straight-edge.
4. Do not subject screeded bedding material to any pedestrian or vehicular traffic before paving unit installation begins.

E. Permeable interlocking concrete pavers and joint/opening fill material

1. Lay the pavers in the desired pattern and maintain straight pattern lines.
2. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to tire traffic shall be no smaller than 1/3 of a whole unit.
3. Cut pavers and place along the edges with a double-bladed splitter or masonry saw.
4. Fill the openings and joints with No. 8 stone.
5. Remove excess aggregate on the surface by sweeping pavers clean.
6. Compact and seat the pavers into the bedding material using a low-amplitude, 75-90 Hz plate compactor capable of at least 18 kN (4,000 lbs.) centrifugal compaction force. This will require at least two passes with the plate compactor.
7. Do not compact within 2 m (6 ft) of the unrestrained edges of the paving units, if applicable.
8. Apply additional aggregate to the openings and joints, filling them completely. Remove excess aggregate by sweeping then compacting the pavers. This will require at least two passes with the plate compactor.
9. All pavers within 2 m (6 ft) of the laying face must be left fully compacted at the completion of each day.



10. The final surface tolerance of compacted pavers shall not deviate more than  $\pm 10$  mm ( $\pm 3/8$  in.) under a 3 m (10 ft) long straightedge.

11. The surface elevation of pavers shall be 3 to 6 mm (1/8 to 1/4 in.) above adjacent drainage inlets, concrete collars or channels.

### 3.05 FIELD QUALITY CONTROL

A. After sweeping the surface clean, check final elevations for conformance to the drawings.

B. Lippage: No greater than 3 mm (1/8 in.) difference in height between adjacent pavers.  
Note: The minimum slope of the finished pavement surface should be 1%. The surface of the pavers may be 3 to 6 mm (1/8 to 1/4 in.) above the final elevations after compaction. This helps compensate for possible minor settling normal to pavements.

### 3.06 PROTECTION

A. After work in this section is complete, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent construction activity on the site.

**END OF SECTION**