SECTION 310001 - EARTHWORK MATERIALS

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
       2. SUMMARY
          1. Section Includes:

Soil/Aggregate Materials.

Geosynthetics.

Wastewater Materials.

* + - * 1. Related Requirements:

Section 310000 - Earthwork.

* + - 1. REFERENCE STANDARDS
         1. New York State Department of Transportation (NYS DOT)

NYSDOT 620 - Bank and Channel Protection

NYSDOT 703 - Aggregates

NYSDOT 733 - Earthwork Materials

* + - 1. SUBMITTALS
         1. Submittals for this Section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: Submit name of imported materials source.
         5. Qualification Data: For ASTM certified soils testing agency.

Retain "Material Test Reports" paragraph below for material test reports that are Contractor's responsibility.

* + - * 1. Material Test Reports: For each [**on-site**] [**and**] [**borrow**] soil material proposed for fill and backfill as follows:

Retain both subparagraphs below for borrow soil material. Delete if using only on-site soil material and geotechnical report is sufficient.

Classification according to ASTM D2487.

Laboratory compaction curve according to [**ASTM D698**] [**ASTM D1557**].

Retain one of two paragraphs below. Include the following paragraph ONLY if submission of physical samples is required. Retain the second paragraph if no physical samples are required.

* + - * 1. Samples: Submit, in airtight containers, samples of the following types to ASTM certified soil testing laboratory. Provide Director’s Representative with the laboratory test results for gradation, Proctors and soundness tests.

Include only materials that are used in the Project.

[**Select Granular Material: 50 - 60 lb. (Two Samples).**]

[**Subbase Course Type 2: 50 - 60 lb. (Two Samples).**]

[**Selected Fill: 40 - 50 lb.**]

[**Cushion Material: 30 lb.**]

[**Item B-12: 30lb, each gradation.**]

[**Crushed Stone: 30 lb.**]

[**Riprap: Submit sufficient sample size to confirm finish, color and texture**.]

[**Riprap Bedding Material: 30 lb.**]

[**Pea Gravel: 30 lb.**]

[**Topsoil: 30 lb.**]

Five subparagraphs below are for unit paving applications; delete if not required.

[**Sand Leveling Course: 30 lb**]

[**Sand for Joints: 30 lb**]

[**Soil Mix for Leveling Course: 30 lb**]

[**Graded Aggregate: 30 lb**]

Two subparagraphs below are for Environmental Engineering projects, when required. Delete if not required.

[**Crushed Stone, Crushed Gravel, or Screened Gravel (Wastewater): 30 lb., each layer gradation (if more than one).**]

[**Sand Filter Material (Wastewater): 30 lb**.]

* + - * 1. Source Quality-Control Submittals:

Subbase Materials: Provide name and location of source and the NYSDOT Source Number. If the material is not being taken from an approved NYSDOT source, the soil laboratory test results for gradation and soundness tests performed by an ASTM certified soils laboratory will be required.

Other Aggregates: Provide name and location of source and soil laboratory test results for gradation and soundness tests performed by an ASTM certified soils laboratory.

Topsoil: Topsoil used on this project shall be tested by a certified soils laboratory for organic matter, Ph value, and gradation, and must be approved before placement.

* + - * 1. Supplier’s Certificate: Certify that products meet or exceed specified requirements.
      1. QUALITY ASSURANCE
         1. Furnish each aggregate and/or topsoil material from a single source throughout the Work.

1. PRODUCTS
   * + 1. SOIL/STONE MATERIALS

Retain only the materials used in the Project.

* + - * 1. Select Granular Material.

Description: Stockpiled, sound, durable, sand, gravel, stone, or blends of these materials.

Quality: Free of organic and other deleterious materials.

Magnesium Sulfate Soundness Test: 20% maximum loss by weight after four test cycles.

Plasticity Index: The plasticity index of the material passing the No. 40 mesh sieve shall not exceed 5.0.

Elongated Particles: Not more than 30%, by weight, of the particles retained on a ½ inch sieve will consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than three times its least dimension.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 2 inch | 100 |
| 1/4 inch | 30-65 |
| No. 40 | 5-40 |
| No. 200 | 0-10 |

* + - * 1. Subbase Course Type 2.

Description: Stockpiled, crushed ledge rock or approved blast furnace slag.

Quality: Free of organic and other deleterious materials.

Magnesium Sulfate Soundness Test: 20% maximum loss by weight after four test cycles.

Plasticity Index: The plasticity index of the material passing the No. 40 mesh sieve shall not exceed 5.0.

Elongated Particles: Not more than 30%, by weight, of the particles retained on a ½ inch sieve will consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than three times its least dimension.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 2 inch | 100 |
| 1/4 inch | 25-60 |
| No. 40 | 5-40 |
| No. 200 | 0-10 |

If excavated on-site soils meet the requirements of Selected Fill, select Excavated and Reused Material. If Selected Fill is to be imported, select Imported Borrow. Type of on-site material should be known prior to preparing this Section. Consult with soils engineer, if required.

* + - * 1. Selected Fill.

Source: [**Excavated and Reused Material**] [**Imported Borrow**]

Description: Sound, durable, sand, gravel, stone, or blends of these materials.

Quality: Free of organic and other deleterious materials.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 4 inch | 100 |
| No. 40 | 0-70 |
| No. 200 | 0-15 |

* + - * 1. Cushion Material.

Description: Clean, hard, durable, uncoated particles,

Quality: Free from lumps of clay and all deleterious substances.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1/4 inch | 100 |
| No. 60 | 0-35 |
| No. 100 | 0-10 |

* + - * 1. Item B-12.

Description: Equal blend of No.1 and No. 2 Crushed Aggregate that complies with material requirements of NYSDOT Article 703-02, crushed stone only.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1 1/2 inch | 100 |
| 1 inch | 95-100 |
| 1/2 inch | 45-60 |
| 1/4 inch | 0-15 |

* + - * 1. Blend of No.1 and No. 2 Crushed Stone that complies with material requirements of DOT Article 703-02, crushed stone only. No. 1 Coarse Aggregate.

Description: Crushed stone that complies with the material requirements of NYSDOT Article 703-02.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1 inch | 100 |
| 1/2 inch | 90-100 |
| 1/4 inch | 0-15 |

* + - * 1. No. 2 Coarse Aggregate.

Description: Crushed stone that complies with the material requirements of NYSDOT Article 703-02.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1 1/2 inch | 100 |
| 1 inch | 90-100 |
| 1/2 inch | 0-15 |

For paragraph below choose either fine, light, medium, or heavy. Also specify landscaping characteristics (color, shape, etc.), if required.

* + - * 1. Rip Rap.

Description: [**Fine**] [**Light**] [**Medium**] [**Heavy**] stone filling that complies with NYSDOT Article 620-2.02 for stone filling.

End Dumped: Conform to NYSDOT Table 733-21A, Stone Filling Gradation Requirements for stone filling.

| **Stone Filling Gradation** | | |
| --- | --- | --- |
| **Stone Filling Item** | **Stone Size** | **Percent of Total By Weight** |
| Fine | Smaller than 8 inches | 90-100 |
| Larger than 3 inches | 50-100 |
| Smaller than No. 10 Sieve | 0-10 |
| Light | Lighter than 100 lbs | 90-100 |
| Larger than 6 inches | 50-100 |
| Smaller than ½ inch | 0-10 |
| Medium | Heavier than 100 lbs | 50-100 |
| Smaller than 4 inches | 0-10 |
| Heavy | Heavier than 600 lbs | 50-100 |
| Smaller than 6 inches | 0-10 |

Delete subparagraph if not required.

Machine Placed: Stones shaped as nearly as practicable in the form of right rectangular prisms. Fifty percent, by weight, of the stones shall weigh in excess of 300 pounds each, and the remainder of the stones shall weigh from 100 to 300 pounds each. One dimension of each stone shall be at least equal to the thickness of the riprap.

* + - * 1. Riprap Bedding Material

Select gradation below to suit Project.

Stockpiled, crushed stone, crushed air-cooled blast furnace slag, or gravel, free from organic and other deleterious materials. Comply with the gradation and material requirements specified below:

| **TYPE 1 GRADATION** | |
| --- | --- |
| **Sieve Size Designation** | **Percent Passing by Weight** |
| 4 inches | 100 |
| 2 inches | 40-60 |
| ½ inch | 0-15 |
| No. 200 | 0-2 |

| **TYPE 2 GRADATION** | |
| --- | --- |
| **Sieve Size Designation** | **Percent Passing by Weight** |
| 1½ inches | 100 |
| 1 inches | 90-100 |
| ½ inch | 25-60 |
| ¼ inch | 0-10 |
| No. 200 | 0-2 |

* + - * 1. Pea Gravel:

Description: Comply with NYSDOT Article 703-02 for screened gravel.

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1/2 inch | 100 |
| 1/4 inch | 90-100 |
| 1/8 inch | 0-15 |
| No. 200 | 0-1 |

* + - * 1. Topsoil:

Description: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for vegetation growth. Material shall be original loam topsoil, well drained homogeneous texture and of uniform grade, without the admixture of subsoil material and entirely free of dense material, hardpan, sod, or any other objectionable foreign material.

Organic Content: Containing not less than 4 percent nor more than 20 percent organic content in that portion of a sample passing a 1/4 inch sieve, when determined by the wet combustion method on a sample dried at 105 degrees C.

pH: Containing a Ph value within the range of 4.5 to 7 on that portion of the sample passing a 1/4 inch sieve.

Comply with the gradation requirement specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| 1 inch | 100 |
| 1/4 inch | 97 - 100 |
| No. 200 | 20 - 65 (of the 1/4 inch sieve) |

Five subparagraphs below are utilized in unit paver or porous unit paver applications. Delete if not used.

* + - * 1. Sand Leveling Course:

Description: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33 for fine aggregate.

* + - * 1. Sand for Joints:

Description: Fine, sharp, washed, natural sand or crushed stone

Comply with the gradation requirements specified below:

| **Sieve Size** | **Percent Passing** |
| --- | --- |
| No. 16 | 100 |
| No. 200 | 0-10 |

Retain subparagraph below if a particular color is required.

Provide sand of color needed to produce required joint color.

* + - * 1. Soil Mix for Leveling Course:

Description: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C33 for fine aggregate blended with planting soil. Use blend consisting of [**1/2 sand and 1/2 planting soil mix**] [**2/3 sand and 1/3 planting soil mix**] <**Insert proportions**>.

"Graded Aggregate " paragraph below is recommended instead of "Sand for Leveling Course" or "Soil Mix for Leveling Course" paragraph above for pavers used with aggregate fill. No. 8 stone is 1/2 inch and smaller; No. 9 is 3/8 inch and smaller.

* + - * 1. Graded Aggregate:

Description: Sound crushed stone or gravel complying with ASTM D448 for Size No. [**8**] [**9**].

Retain "Color" subparagraph below if a particular color is required.

Color: As indicated.

* + - 1. Geosynthetics
         1. Geotextile:

Drainage and Erosion Control:

Mirafi 140N & 160N

WINFAB 450N & 600N

US Fabrics US 120NW & US 160NW

Approved equivalent.

Separation for foundation drains, underdrains, undercuts:

GeoTex 601 and 801

Mirafi 160N & 180N

WINFAB 600N & 800N

Approved equivalent.

Designer shall note that although filter fabric does offer some additional strength to the existing subgrade the strength it offers is usually temporary and it is not the intended use of fabrics. If a subgrade soil is very soft, the designer shall incorporate a thicker subbase course or shall place a geogrid type material in addition to the fabric. Consult Soils Engineer if soft subgrade conditions exist.

Separation/Stabilization beneath pavements and riprap:

Geotex 4x4

Mirafi HP570

US Fabrics US 4800/30

Approved equivalent.

If segmental retaining walls are specified or if soft subgrades exist consult soils engineer to specify geogrid type.

* + - * 1. Geogrids:

Segmental Retaining Walls.

Subgrade Stabilization.

* + - 1. GEOFOAM

Retain one or more paragraphs in this article to suit Project.

Compressive strengths in "Extruded-Polystyrene Board Insulation" and "Molded-Polystyrene Board Insulation" paragraphs below are the compressive resistance at 10 percent deformation according to ASTM C578. Verify availability of type of insulation.

* + - * 1. Extruded-Polystyrene Board Insulation: ASTM C578, [**Type IV, 1.55-lb/cu. ft. density, 25-psi compressive strength**] [**Type X, 1.30-lb/cu. ft. density, 15-psi compressive strength**] [**Type VI, 1.80-lb/cu. ft. density, 40-psi compressive strength**] [**Type VII, 2.20-lb/cu. ft. density, 60-psi compressive strength**] [**Type V, 3.00-lb/cu. ft. density, 100-psi compressive strength**].
        2. Molded-Polystyrene Board Insulation: ASTM C578, [**Type I, 0.90-lb/cu. ft. density, 10-psi compressive strength**] [**Type VIII, 1.15-lb/cu. ft. density, 13-psi compressive strength**] [**Type II, 1.35-lb/cu. ft. density, 15-psi compressive strength**].

Retain subparagraph below if requiring molded polystyrene to deter termites.

Manufacture molded polystyrene with an inorganic mineral registered with the EPA and suitable for application as a termite deterrent.

AFM Corporation, and perhaps other manufacturers, offer products that meet requirements in first paragraph below. ASTM D6817 lists compressive resistances at 1, 5, and 10 percent deformation.

* + - * 1. Rigid Cellular Polystyrene Geofoam: ASTM D6817, [**Type EPS 19, 1.15-lb/cu. ft. density, 5.8-psi compressive strength at 1 percent deformation; 16-psi compressive strength at 10 percent deformation**] [**Type EPS 39, 2.40-lb/cu. ft. density, 15-psi compressive strength at 1 percent deformation; 40-psi compressive strength at 10 percent deformation**] <**Insert requirement**>.

To limit displacement of insulation or geofoam blocks, connectors may be used. Multibarbed, galvanized-steel sheet connectors in first option in "Connectors" paragraph below are manufactured by AFM Corporation and perhaps other manufacturers. Steel reinforcing bars in second option may also be used.

* + - * 1. Connectors: [**Geofoam manufacturer's multibarbed, galvanized-steel sheet connectors**] [**Deformed steel reinforcing bars, 3/4 inch in diameter**] <**Insert requirement**>.
      1. ACCESSORIES

Retain one or both of "Warning Tape" and "Detectable Warning Tape" paragraphs in this article to suit Project. Use of warning tapes may be mandatory for underground hazardous utilities.

* + - * 1. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

Revise colors below to comply with local practice or requirements of authorities having jurisdiction.

Red: Electric.

Yellow: Gas, oil, steam, and dangerous materials.

Orange: Telephone and other communications.

Blue: Water systems.

Green: Sewer systems.

* + - * 1. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

Revise colors below to comply with local practice or requirements of authorities having jurisdiction.

Red: Electric.

Yellow: Gas, oil, steam, and dangerous materials.

Orange: Telephone and other communications.

Blue: Water systems.

Green: Sewer systems.

If wastewater system is being constructed consult Environmental Engineer for modification of wastewater section. Delete article below if not required.

* + - 1. WASTEWATER MATERIAL
         1. Crushed Stone, Crushed Gravel, or Screened Gravel (Wastewater): Comply with applicable portions of NYSDOT Section 703-02, except as otherwise indicated.

Use only one Gradation subparagraph below for Wastewater Disposal System specified. Use subparagraph below for Intermittent Subsurface Sand Filters. Show on drawings.

Gradation: No. 6 Sieve to 1/4 inch and 3/4 to 1-1/2 inches.

Use below for intermittent open sand filters. Show on drawings.

Gradation:

Top Layer: No. 6 Sieve to 1/4 inch.

Middle Layer: 1/4 to 3/4 inch.

Bottom Layer: 3/4 to 1-1/2 inches.

Use subparagraph below for absorption trenches (tile fields). Show on drawings.

Gradation: 3/4 to 1-1/2 inches.

Use subparagraph below for seepage pits (leaching basins). Show on drawings.

Gradation: 1-1/2 to 2-1/2 inches.

* + - * 1. Sand Filter Material (Wastewater): Silica sand or other sound sand free from clay, loam, soft limestone or other impurities which may be disintegrated by sewage liquid.

Organic Content: Less than 1 percent; ASTM D2974 method and calculation.

Uniformity Coefficient: 4.0 or less.

Calcium Carbonate Content: Less than 3 percent by ASTM D4373.

Magnesium Sulfate Soundness Test: Less than 10 percent loss by weight after 5 test cycles by ASTM C88.

Shape: Rounded or oval. Do not use sharp sand, crushed flint or gravel.

Use only one effective size subparagraph below for wastewater disposal system specified. Use subparagraph below for intermittent subsurface sand filters where nitrification is not required. Show on drawings.

Effective Size: 0.50 to 1.0 mm.

Use subparagraph below for intermittent subsurface sand filters where nitrification is required. Show on drawings.

Effective Size: 0.25 to 1.0 mm.

Use subparagraph below for intermittent open sand filters where nitrification is not required. Show on drawings.

Effective Size: 0.50 to 1.0 mm.

Use subparagraph below for intermittent open sand filters where nitrification is required. Show on drawings.

Effective Size: 0.25 to 1.0 mm.

1. EXECUTION (NOT USED)

END OF SECTION 310001