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| FOR CLIENT REVIEW May 20, 2009 |
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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Preparing subgrades for pavements, turf and plants.
 - 2. Subbase course and base course for asphalt paving.
 - 3. Excavating and backfilling trenches for utilities and pits for buried utility structures.
 - 4. Construction of boulder walls.

- B. Related Sections:

- 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
 - 3. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.
 - F. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 1.0 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586. Also, any parts of stone, brick, concrete pavements and parts of cemented or masonry structures measuring 1 cu. yd. or more that require blasting for removal, will be included as rock when encountered within the limits of excavation.
 - G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
 - H. Subbase Course: Aggregate layer placed between the subgrade and hot-mix asphalt pavement.
 - I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
 - J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 QUALITY ASSURANCE

- A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:
 1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
 2. Seismographic monitoring during blasting operations.

1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract. Do not proceed with work on adjoining property until directed by the Engineer.

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- C. Utility Locator Service: Notify "Dig Safely New York" (1-800-962-7962) for area where Project is located at least two full working days before beginning earth moving operations.
- D. Do not commence earth moving operations until temporary erosion and sedimentation control measures specified in Division 31 Section "Site Clearing" are in place.
- E. Do not commence earth moving operations until plant-protection measures specified in Division 31 Section "Site Clearing" are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations on site.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Fine Stone Filling: Conform to New York Department of Transportation Standard Specifications Section 620-2.01.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, natural or crushed sand, and (at the option of the Contractor) reclaimed miscellaneous aggregate with not more than 2 percent by mass of asphalt cement. The materials for this work are to meet the requirements of Section 304-1 of the New York Department Of Transportation Standard Specifications and conform to the following gradation.

| Gradation of Subbase | |
|----------------------|---------------------------|
| Square Mesh Sieves | Percent Passing by Weight |
| 2.00 inch | 100 |
| 0.25 inch | 25-60 |
| No. 40 | 5-40 |
| No. 200 | 0-10 |

- F. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; with 100 percent passing a 3/8-inch sieve and not more than 10 percent passing a No. 200 sieve.

- G. Sand: ASTM C 33; fine aggregate.

| Gradation of Sand | |
|--------------------|---------------------------|
| Square Mesh Sieves | Percent Passing by Weight |
| No. 4 | 95 to 100 |
| No. 8 | 80 to 100 |
| No. 16 | 50 to 85 |
| No. 30 | 25 to 60 |
| No. 50 | 5 to 30 |
| No. 100 | 0 to 10 |

- H. Boulders for boulder wall shall conform to New York Department of Transportation Standard Specifications Section 620-2.01 for Medium Stone Filling.
- I. Broken or Crushed Stone for construction entrance (anti-tracking pad) is to meet the gradation shown in the table below.

| Gradation Of Crushed Stone | |
|-----------------------------|---------------------------|
| Mesh Number Or Opening Size | Percent Passing By Weight |
| 4.00 inch | 100 |
| 2.50 inch | 75-100 |
| 2.00 inch | 50-75 |
| 1.25 inch | 0-25 |
| 1.00 inch | 0 |

2.2 ACCESSORIES

- A. 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:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
 - 1. Perform blasting without damaging adjacent structures, property, or site improvements.
 - 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Engineer. The Contract Sum will be adjusted for rock excavation according to the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.
 - 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 12 inches beneath pipe in trenches, and the greater of 36 inches wider than pipe or 42 inches wide.
 - b. 12 inches around and beneath concrete vaults, catch basins, manholes and other structures.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR PAVEMENTS

- A. Excavate surfaces under pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.
 1. Clearance: 12 inches each side of pipe or conduit or as shown on drawings, whichever is greater.
- C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
- D. Trenches in Tree- and Plant-Protection Zones:
 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Engineer when excavations have reached required subgrade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 2. Cover stockpile with porous geotextile. Do not use impervious cover materials.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Surveying locations of underground utilities for Record Documents.
 2. Testing and inspecting underground utilities.
 3. Removing trash and debris.
 4. Removing temporary shoring, bracing, and sheeting.
 5. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill voids with satisfactory soil while removing shoring and bracing.

- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under pavements, use satisfactory soil material.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

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2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 2. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBBASE UNDER PAVEMENTS

- A. General: Subbase courses shall be constructed in conformance with Section 304-1 (Option C) of the New York Department of Transportation Standard Specifications. Place subbase course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course under pavements as follows:
 1. Place subbase material over subgrade under hot-mix asphalt pavement.
 2. Shape subbase course to required crown elevations and cross-slope grades.
 3. Place subbase course 6 inches or less in compacted thickness in a single layer.
 4. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 5. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.17 BOULDER WALLS

- A. Description: This item shall consist of approved boulders (Medium Stone Fill) placed without the use of mortar to form a wall of the dimensions and details shown on the plans, constructed

where indicated on the plans or as ordered and in accordance with these specifications. Vertical and horizontal joints shall be broken.

- B. The earth along the lines of the proposed wall shall be prepared as necessary so that the boulders may be stably bedded. Sufficient chip boulders or spalls shall be used so that each stone is bedded securely and all interstices shall be firmly chinked. Spalls will not be allowed in the heart of the wall.

3.18 CHANNEL RESTORATION

- A. **General:** Place medium stone fill on bottom and side slopes of channel or as directed by the Engineer. The work shall be done in accordance with these specifications and in conformity with the lines, grades, thicknesses, and typical sections shown on the plans or established by the Engineer.
- B. Prepare the channel bed and side slopes so they are free of brush, trees, stumps, and other objectionable material have smooth surfaces. Remove all unsuitable material as directed by the Engineer and replace with satisfactory material.
- C. Place stone fill on channel bottom and side slopes to its full course thickness in one operation and in a manner that will produce a reasonable well-graded mass of stone. Fill spaces between large stones with smaller stones so that there will be no pockets of uniform size material. Shape the final section in conformance with the lines, grades, and thicknesses shown on the plans. Rearrange individual stones by mechanical equipment or by hand as required to secure the specified results.
- D. Place stone fill on channel bottom to form check dams in a manner that will produce NOT a reasonable well-graded mass of stone. Choose large, similar-size stones and do not fill spaces between large stones with smaller stones. Rearrange individual stones by mechanical equipment or by hand as required to secure the specified results.

3.19 PROTECTION

- A. **Protecting Graded Areas:** Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

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3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000