

SECTION 31 00 00 – A

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Site clearing, grubbing stripping, and topsoil excavation and storage, including tree and stump removal.
 2. Construction and maintenance of soil-erosion protection.
 3. Construction of Contractor Laydown area.
 4. Reinstatement of Contractor Laydown and Staging areas to pre-construction conditions.
 5. Rough and finish grading for roads and parking areas.
 6. Excavating, filling, and compacting to attain required grades and densities.
 7. Trench excavation and backfill for underground utilities.
 8. Excavating for footings and foundations.
 9. Installation of fill under concrete slabs on grade and related site structures.
 10. Provide labor, materials, and equipment necessary to accomplish work specified in this Section.
- B. Related Sections:
1. Section 03 30 00 – Cast-in-Place Concrete.
- C. CAUTION: Use of this Section without including the above-listed items results in omission of basic requirements.
- D. In the event of conflict regarding earthwork requirements between this Section and another section, the provisions of this Section govern.

1.2 REFERENCES

- A. In addition to compliance with industry standards and Owner requirements, ensure that the following government acts and regulations (as applicable for any particular equipment or material) are complied with in design, fabrication, testing and shipment of equipment and materials.
- B. Meet or exceed the requirements of the latest edition of the following codes, regulations and standards.
- C. American Society for Testing and Materials (ASTM):
1. ASTM C33 – Standard Specification for Concrete Aggregates.
 2. ASTM C117 – Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 3. ASTM C150 – Standard Specification for Portland Cement.
 4. ASTM C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

5. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 6. ASTM D75 – Standard Practice for Sampling Aggregates.
 7. ASTM D448 – Standard Classification for Sizes of Aggregates for Road and Bridge Construction.
 8. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³)).
 9. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 10. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 11. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
 12. ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
 13. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 14. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 15. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 16. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 17. ASTM D4718 – Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles.
 18. ASTM D4832 – Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
 19. ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
 20. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- D. Occupational Safety and Health Administration: OSHA 29 CFR 1926, Safety And Health Regulations for Construction.
- E. New York State Department of Transportation Standard Specifications, 2025 edition

1.3 DEFINITIONS

- A. Relative Compaction: Ratio in percent of as-compacted field dry density to laboratory maximum dry density as determined by ASTM D1557 or ASTM D698 as noted in this Specification. Corrections for oversize material may be applied to either as-compacted field dry density or the maximum dry density as determined by A/E and as specified in ASTM D4718.
- B. Optimum Moisture Content: Determine by ASTM standard specified to determine the maximum dry density for relative compaction. Determine field moisture on basis of fraction passing 3/4-inch sieve.

- C. Prepared Ground Surface: Ground surface after clearing, grubbing, stripping, excavation, demolition, and scarification and/or compaction.
- D. Completed Course: A course or layer ready for next layer or next phase of work.
- E. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes. Well-graded does not define any numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters. Well-graded is used to define a material type that when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.
- F. Influence Area: Area within planes sloped downward and outward at an angle of 60 degrees from horizontal from 1 foot outside the outermost edge at base of foundations or slabs, 1 foot outside outermost edge at surface of roadways or shoulder, or 1/2 foot outside exterior edge at spring line of pipes and culverts.
- G. Unclassified Excavation: Nature of materials to be encountered has not been identified or described herein.
- H. Borrow: Material excavated on site or taken from designated borrow areas on or near site.
- I. Select Material: Materials available onsite that Geotechnical Engineer determines to be suitable for a specific use.
- J. Imported Material: Imported materials obtained by Contractor from sources off site.
- K. Structural Fill: Fill materials as required under structures, paving, etc.
- L. Embankment: Fill materials required to raise the existing grade in areas other than under structures.

1.4 SUSTAINABLE DESIGN REQUIREMENTS

- A. Comply with Section 01 81 13 – Sustainable Design Requirements.

1.5 SUBMITTALS

- A. Refer to Submittal Schedule at end of Part 3 for a list of submittal requirements for this Section.

1.6 QUALITY ASSURANCE

- A. Perform work in conformance, except as modified in this Section, with current edition of New York State Department of Transportation Standard Specifications, referred to here as Standard Specification.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Unclassified Excavation: Excavation is unclassified. Complete excavation regardless of type, nature, or condition of materials encountered including removal of existing asphalt and concrete pavements, curbs, curb and gutters, sidewalks, etc. Make own estimate of kind and extent of various materials to be excavated in order to accomplish work.
- B. Earthfill: Excavated material free from roots, organic matter, trash, debris, rocks larger than 3 inches, and other deleterious materials. Provide imported material of equivalent quality, if required to accomplish work.
- C. Subgrade Stabilization Fill and Drainage Materials: Crushed gravel, crushed bedrock, crushed gravel, or natural gravel meeting the requirements outlined below. Coarse aggregate materials shall be free of organics and other deleterious materials and shall be sounds, durable, and non-reactive. Coarse aggregate shall be tested for soundness in accordance with Standard Specification Method No.: 703-07P, G and shall demonstrate Magnesium Sulfate Soundness losses less than or equal to 10 percent by weight after 10 cycles.

AASHTO Size No. 1

US Sieve Size	% Passing by Weight
4"	100
3 1/2"	90 – 100
2 1/2"	25 – 60
1 1/2"	0 – 15
3/4"	0 - 5

AASHTO Size No. 357

US Sieve Size	% Passing by Weight
2 1/2"	100
2"	95 – 100
1"	35 – 70
1/2"	10 – 30
No. 4	0 - 5

AASHTO Size No. 57

US Sieve Size	% Passing by Weight
1 1/2"	100
1"	95 – 100
1/2"	25 – 60
No. 4	0 – 10
No. 8	0 - 5

- D. Structural Fill: Also defined as Granular Fill in Geotechnical Report. Comprised of sand, gravel, crushed stone, or other approved recycled materials meeting the requirements outlined below. Granular fill shall be sound, durable, and non-plastic and, except as modified herein, shall comply with the requirements of Section 733-04 of the Standard Specification.

US Sieve Size	% Passing by Weight
4"	100
2"	90 – 100
¼"	30 – 65
No. 40	5 – 40
No. 200	0 - 15

- E. Embankment Material: On-site excavated material, not suitable for structural fill, as designated by Geotechnical Engineer.
- F. Embankment Fill and Cutoff Trench for dam embankments associated with stormwater ponds SMP-01, SMP-11, TEMP-SMP-01, and TEMP-SMP-02 (approximate limits of dam embankments as indicated on Drawings): On-site excavated material or imported fill that meets the following requirements.
1. Shall have a Unified Soil Classification (USCS Classification) of SM, SC, GM, GC, CL, or ML.
 2. Shall not have a USCS Classification of CH, MH, OL, OH, PT, SW-SM, SP-SC, or SW-SC.
 3. Shall have a minimum fines content (passing No. 200 sieve) greater than or equal to 20 percent.
 4. Shall have a maximum particle size of 4-inches.
 5. A list of required material approval testing for Embankment Fill is presented below. The tests shall be conducted by the Independent Testing Agency at the frequencies designated unless otherwise directed by the Engineer. These tests are for determining the suitability of the material for use as Embankment Fill.

Test	Test Method (Current Version)	Test Frequency
USCS Classification	ASTM D2487	Minimum 2 tests per classification
Gradation with No. 200 wash and hydrometer	ASTM D6913, D7928	
Moisture content	ASTM D2216	
Atterberg limits	ASTM D4318	
Laboratory Moisture-Density (Standard Proctor)	ASTM D698	Minimum 2 tests per material classification

- G. Dams Filter and Drainage Materials: See Specification 33_46_00-A Dam Subdrainage System for filter sand and drain stone associated with dam embankments associated with stormwater ponds SMP-01, SMP-11, TEMP-SMP-01, and TEMP-SMP-02.
- H. Sand: Natural sand or sand produced from crushed gravel or crushed rock, maximum size 1/4-inch, 95 percent passing a No. 4 sieve free from clay and organic material, with a maximum of 8 percent passing the No. 200 sieve when tested in accordance with ASTM C117.
- I. Non-Frost Susceptible Material: ASTM D448 No. 57 stone.
- J. Drain Rock: ASTM D448 No. 57 stone.
- K. Trench Stabilization Material: 3-inch minus river-run or pit-run gravel, crushed gravel, or crushed rock; free from clay balls, roots, and organic matter; well-graded from coarse to fine with less than 8 percent by weight passing the 1/4-inch sieve. Pipe Base: For concrete, ductile iron, steel, and galvanized and cast iron pipe, 3/4-inch minus gravel, crushed gravel, or crushed rock. For plastic pipe, copper tubing, and heating pipes use 1/4-inch minus granular material, 1/4-inch to 1/8-inch pea gravel or sand. For electrical duct banks use sand.
- L. Backfill Material for Pipe Zone: For concrete, cast iron, steel, and galvanized and cast iron pipe use 3/4-inch minus well-graded granular material. For plastic pipe use 1/4-inch minus well-graded granular material or sand. For electrical duct banks, use Thermal Fill..
- M. Thermal Fill: For use as backfill for utilities requiring improved heat dissipation. Comprised of clean quartz-rich sand, free of cinders, ash, organic matter, and other deleterious matter, meeting the grading requirements presented herein. Thermal sand shall have a minimum pH of 5.5, a dry unit weight equal to 11 pcf, and a maximum thermal resistivity equal to 90 °C·cm/Watt at dry-out conditions at 95 percent of the maximum dry density determined in accordance with ASTM D1557.

US Sieve Size	% Passing by Weight
3/8"	100
No. 4	70 – 90
No. 8	60 – 75
No. 30	35 – 50
No. 50	15 - 30
No. 200	3 - 8

- N. Rip Rap: Hard and durable quarry stone with not more than 35 percent wear when tested for resistance to abrasion in conformance to ASTM C535. The bulk density not less than 160 pounds per dry cubic foot. See Drawings for size and thickness.
- O. Controlled Low-Strength Material (CLSM) - For low strength fill select and proportion ingredients to obtain compressive strength between 50 and 150 psi at 28 days in

accordance with ASTM D4832. Use for telecommunications conduit in trench backfill.
Use the following materials:

1. Cement: ASTM C150, Type I or II.
2. Aggregate: ASTM C33, size 7.
3. Fly Ash (If Used): ASTM C618, Class C.
4. Water: clean, potable, containing less than 500 ppm of chlorides.

P. Warning Tape:

1. Tape specifically manufactured for marking and locating underground utilities.
2. Polyethylene film 6 inches wide by 0.004 inches thick and a minimum strength of 1,750 psi and carries continuous inscription naming the specific utility.
3. Color of wire:
 - a. Irrigation and Water Lines: blue.
 - b. Sanitary and Storm Sewer: green.
 - c. Oil, Petroleum, and Natural Gas: yellow.
 - d. Electric: red.
 - e. Telecommunications and Cable: orange.
4. Place warning tape centered over top of the pipe, culvert, or other utility at a maximum depth of 5 feet and a minimum depth of 1 foot below finish grade.

Q. Tracer wire for nonmetallic pipe detection:

1. Wire: Use #12 AWG Copper Clad Steel, high strength, 30 mil HDPE insulation thickness, or 12 gauge single-strand copper. Wire to have insulating coating per APWA Uniform Color Code System.
2. Color of wire:
 - a. Water Lines: blue
 - b. Sewer Lines: green
 - c. Natural Gas: yellow
3. Connectors: Provide 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Use Connectors filled with dielectric silicon to seal out moisture and corrosion and install to prevent uninsulated wire exposure. Non locking friction fit, twist on or taped connectors are prohibited.
4. Termination: Utilize a trace wire access box at termination points for above ground access or grade level/in-ground access box. Provide products specifically manufactured for this purpose. Provide a minimum of 3 feet of excess/slack wire in trace wire access boxes after meeting final elevation.

R. Backfill Above the Pipe Zone: For trenches within influence area of existing or proposed structures and under roadways, parking lots, sidewalks, and concrete pads use specified structural fill above pipe zone. For other areas use earthfill material provided specified compaction can be obtained. If required compaction cannot be obtained use granular fill material as specified herein before.

S. Topsoil: Refer to Section 731-01 of the Standard Specifications.

T. Water for Compaction: Provide water for compaction as required.

U. Nonwoven Geotextile:

1. Pervious sheet of polyester, polyethylene, or polypropylene filaments, oriented to a stable network so that fibers retain their relative positions to each other.
2. Composed of continuous or discontinuous (staple) fibers held together by spun bonding, melt bonding, or needle paneling.
3. Minimum physical property values:

Mass per unit area (ounce/yard ²)	5
Grab tensile strength (pound), ASTM D4632	130
Puncture strength (pound), ASTM D4833	40
Trapezoidal tear strength (pound) ASTM D4533	40
Mullen burst strength (psi), ASTM D3786	210

4. Finish geotextile so that filaments will retain their relative position with respect to each other. Finish edges of woven fabric to prevent outer material from pulling away from fabric.
5. Provide manufacturer's certificate of compliance attesting that geotextile meets requirements of this Specification. Provide mill certificates stating length and width of fabric contained on each roll.

V. Woven Geotextile:

1. Composed of polymeric yarn interlaced to form a planar structure with a uniform weave pattern.
2. Calendered or finished so that yarns will retain their relative position with respect to each other.
3. Polymeric Yarn: Long-chain synthetic polymers (polyester or polypropylene) with stabilizers or inhibitors added to make filaments resistant to deterioration due to heat and ultraviolet light exposure.
4. Sheet Edges: salvaged or finished to prevent outer material from separating from sheet.
5. Unseamed Sheet Width: minimum 3 feet.
6. Minimum physical property values:

Water Permittivity (falling head), ASTM D4491	[0.01]
Grab tensile strength (pound), ASTM D4632	110
Puncture strength (psi), ASTM D4833	60
Mullen burst strength (psi), ASTM D3786	300

W. Silt Fence:

1. Acceptable filter fabric materials for silt fence:
 - a. T.C. Mirafi - Filterweave 402
 - b. Geo-Synthetics, LLC - Silt Tex
 - c. Approved equivalent
2. Material as specified for a woven geotextile above with ultraviolet radiation resistance of 70 percent strength retention after 500 hours measured in accordance with ASTM D4355.

X. Wire Mesh: 2-inch by 2-inch by 14-gauge wire fabric.

- Y. Straw Bales: Standard 40 to 60 pound rectangular bales of cereal grain or seed straw.
- Z. Erosion-Control filter bag: 45- to 90-pound mesh bag, filled weight and measure 18 by 8 by 30 inches or 18 by 8 by 60 inches. Fill with clean, 100 percent recycle log and stump waste encapsulated within a polyethylene mesh/plastic mesh material.

2.2 EQUIPMENT

- A. Compaction Equipment: Use suitable compaction equipment to obtain densities specified. Operate compaction equipment in strict accordance with manufacturer's instructions and recommendations. Maintain equipment in such condition that it will deliver manufacturer's rated compactive effort. If inadequate densities are obtained, provide larger and/or different types of additional equipment.
- B. Moisture Control Equipment: Use equipment for applying water of a type and quality adequate for work, that does not leak and is equipped with a distributor bar or other approved device to assure uniform application. Use equipment consisting of blades, discs, or other approved equipment for mixing and drying out material.
- C. Other Materials and Equipment: Select other materials and equipment not specifically described but required for a complete and proper installation subject to review by A/E prior to use.

PART 3 EXECUTION

3.1 INSPECTION

- A. Imported Material Acceptance: Imported materials specified in this Section are subject to the following requirements:
 - 1. Test acceptable sources for each imported material. Submit certification that material conforms to Specification requirements along with copies of test results from a qualified commercial testing laboratory as required by Submittals Schedule. Furnish material samples by Contract or at Contractor's sole expense. Clearly mark samples to show source of material and intended use on project. Perform sampling of material source in accordance with ASTM D75. Coordinate sampling schedule at least 24 hours in advance with A/E and Owner so they observe sampling procedures.
 - 2. Tentative acceptance of material source based on observation of source by Owner and/or certified test results submitted by Contractor to Owner at Owner's discretion.
 - 3. Deliver no imported materials to site until proposed source and material test submittal(s) has been reviewed by A/E and returned marked "No Exceptions Noted".
 - 4. Final acceptance will be based on tests made on samples of material taken from a completed and compacted course.
 - 5. Testing for final acceptance will be performed by Owner or Owner's representative.

6. If tests conducted by Contractor or Owner indicate that material does not meet Specification requirements, material placement will be terminated until corrective measures are taken.
7. Remove and replace material which does not conform to Specification requirements at the Contractor's sole expense.
8. Sampling and testing performed by Contractor at Contractor's sole expense.

3.2 FIELD PREPARATION

- A. Clearing and Grubbing: Clear site within areas required for access and execution of work. Remove existing trees, brush, stumps, and waste material on site which are noted for removal as shown on Drawings. Grub out stumps and roots. Prevent damage and disturbance to vegetation and topsoil in areas outside limits as shown on Drawings. Dispose of waste materials offsite in accordance with all federal, state, and local laws relating to such disposal. After completion of clearing and grubbing, get Geotechnical Engineer's acceptance before commencing stripping.
- B. Stripping: Prior to beginning any excavation or fill, strip existing ground to remove all vegetation, then strip topsoil to a depth of 18 inches and stockpile for future use. In general, remove topsoil where structures are to be built, trenches dug, and roads, parking lots, walks, equipment pads, staging areas, and similar improvements are constructed within area presently covered with topsoil. Extend the topsoil removal a minimum distance beyond the proposed structures and other improvements described above as directed by the Geotechnical Engineer. Store topsoil clear of construction area. Take care to prevent topsoil from becoming mixed with subsoil.

3.3 EXCAVATION

- A. General Excavation: Perform excavation of every description, regardless of type, nature, or condition of material encountered, as specified, shown, or required to accomplish construction.
- B. Unclassified Excavation: Excavation is unclassified. Complete excavation regardless of type, nature, or condition of materials encountered. Make own estimate of kind and extent of various materials to be excavated in order to accomplish work.
- C. Shoring, Sheet piling, Bracing, and Sloping: Design, install and maintain shoring, sheet piling, bracing, and sloping necessary to support sides of the excavation, and to prevent movement which may damage adjacent pavements, utilities, or structures, damage or delay work, or endanger life and health. Install and maintain shoring, sheet piling, bracing, and sloping as required by OSHA and other applicable governmental regulations and agencies. Comply with New York Department of Transportation (NYDOT) Excavation Safety Bulletin, November 11, 2016.
- D. Excavation for Roadways, Parking Area, Building Pad(s), and Miscellaneous Site Structures: Remove topsoil as aforementioned. Excavate to lines and grades shown taking into account thickness of finished surface material or structure. Bring rough excavation to within 0.1 foot of required grade. Method of excavation used is optional; however, do not operate equipment within 5 feet of existing structures or newly completed structures.

Perform with hand tools excavation that cannot be accomplished without endangering present or new structures.

- E. Structural Excavation for Footings, Retaining Walls, and Related Structures:
1. Excavation is unclassified. Excavate for structures to lines and grades shown or as required to accomplish construction. Perform all excavation regardless of type, nature, or condition of material encountered.
 2. Method of excavation used is optional; however, do not operate equipment within 5 feet of existing structures or newly completed structures without prior review by A/E. Perform with hand tools excavation that cannot be accomplished without endangering present or new structures.
- F. Limits of Excavation:
1. Allow for forms, working space, granular base, and finish topsoil as shown or required. Do not carry excavation for footings and slabs deeper than elevation shown.
 2. Replace excavations carried below grade lines shown with same fill material as specified for overlying fill or backfill, and compact as required for such overlying fill or backfill. Where overlying area is not to receive fill or backfill, replace overexcavated material and compact to a density not less than that of underlying ground. Fill excavations under footings with concrete of strength equal to that of footing. Correct cuts below grade by similarly cutting adjoining areas and creating a smooth transition.
 3. Correction of overexcavated areas at Contractor's sole expense.
- G. Removal of Water:
1. Provide and operate equipment adequate to keep all excavations and trenches free of water. Remove all water during periods when concrete is being deposited, when pipe is being laid, during placing of backfill, and as required for efficient and safe execution of work.
 2. Avoid settlement or damage to adjacent property. When dewatering open excavations, dewater from outside structural limits and from a point below bottom of excavation when possible. Design, install, and operate dewatering systems to prevent removal of fines from existing ground.
 3. For excavations associated with dam embankments for stormwater ponds SMP-01, SMP-11, TEMP-SMP-01, and TEMP-SMP-02, meet the following requirements:
 - a. Dewater by lowering and keeping the groundwater level at least 2 feet below the general bottom of excavations. The system shall have sufficient capacity to accomplish the desired result, allowing for normal variation in soil properties and foundation conditions. Use means necessary to lower the groundwater table and maintain dry excavation by means including, but not limited to, deep or shallow well points, wells, ditches, sumps, and pumps.
 - b. No upward, vertical, nor lateral flow of groundwater into a cut area will be permitted at any time. If groundwater is encountered in an excavation, the excavation shall be immediately backfilled, and dewatering measures put in place.

- c. Dewater in a manner that will prevent loss of fines, will maintain stability of any excavated slopes and bottom excavations, and will allow the Work to be performed in dry conditions.
- d. Methods of dewatering and controlling groundwater, including designs and implementations, are the full responsibility of the Contractor.

3.4 FOUNDATION PREPARATION

- A. After completion of stripping and/or excavation in areas to provide support for foundations, floor slabs, dam embankments and structures, structural fill and pavement, inspect for soft surficial soils and proof-roll subgrade surface. Proof-roll with a fully loaded dump truck or similarly heavy-wheeled vehicle to detect soft or loose zones. Notify Geotechnical Engineer prior to commencement of proof-rolling.
- B. If soft or loose zones are found excavate soft or loose material to a depth of 12-inches and replaced with Subgrade Stabilization Fill. Gradation as dictated by Geotechnical Engineer. If soft or loose areas are encountered within the areas of the dam embankment foundations associated with stormwater ponds SMP-01, SMP-11, TEMP-SMP-01, and TEMP-SMP-02, notify the Geotechnical Engineer prior to any over excavation and backfilling operation. At the discretion of the Geotechnical Engineer, undercut identified soft zones a minimum of 2 feet and backfill with Embankment Fill. The Geotechnical Engineer must approve all dams embankment foundations prior to fill placement.

3.5 PLACING GEOTEXTILE

- A. Prevent exposure of geotextile to light until needed for construction. Place geotextile and subsequently cover with succeeding courses (granular, fill, for example) in such a manner as to limit exposure to light to a maximum period of 48 hours.
- B. Ensure surface to receive geotextile is smooth, free from obstructions, depressions, and sharp objects. Notify A/E prior to placing geotextile so that A/E may observe surface to receive geotextile. Lay geotextile so as to minimize number of joints and seams. Lay geotextile loosely, but without creases. Provide at least 2-foot overlap at joints.
- C. Do not operate machinery directly on geotextile. When placing material over joints, place in direction from overlying geotextile to underlying geotextile. Prevent puncture, tear, or displacement of geotextile and protect from damage. Replace torn areas and holes by placing an overlay of geotextile having dimensions at least 2 feet greater than tear or hole in all directions.
- D. Follow all manufacturers' recommendations for storage and placement of geotextile fabrics.

3.6 BACKFILL

- A. Preparations for Placing Backfill:
 - 1. Backfill around concrete structures only after concrete has attained specified compressive strength. Remove all form materials and trash from excavation

before placing backfill. Obtain A/E's written acceptance of concrete work and attained strength prior to backfilling.

2. Do not operate earth-moving equipment within 5 feet of walls of concrete structures for the purpose of depositing or compacting backfill material without prior review by A/E. Compact backfill adjacent to concrete walls with hand-operated tampers or similar equipment that will not damage structure.

3.7 COMPACTION OF FILL

- A. Compact all materials by mechanical means. Flooding or jetting will not be permitted. If compaction tests indicate that compaction or moisture content is not as specified, terminate material placement and take corrective action prior to continued placement.
- B. Do not place fill or backfill if material is frozen or if surface upon which fill or backfill is to be placed is frozen.
- C. Fill Under Pavements: Place fill in lifts not to exceed 12 inches of uncompacted thickness. Compact each lift of subgrade to not less than 95 percent relative compaction as determined by ASTM D1557.
- D. Fill Under Building Slabs and Building Foundations: Place in lifts not to exceed 6 inches of uncompacted thickness. Compact each lift of subgrade fill to not less than 95 percent relative compaction as determined by ASTM D1557.
- E. Fill Under Structures Other Than Under Building Slabs:
 1. Place hereinbefore specified structural fill in previously excavated areas under piping, slabs, walks, curbs, structures, facilities, and other areas as shown. Do not exceed loose lifts of 6 inches. Compact each lift to not less than 95 percent relative compaction as determined by ASTM D1557. Moisten material as required to aid compaction. Place material in horizontal lifts and in a manner which avoids segregation.
 2. Correct and repair subsequent damage to slabs, piping, concrete structures, facilities, or other structures caused by settlement of fill material by Contractor at Contractor's sole expense.
- F. Backfill Around Structures: Place hereinbefore specified structural fill in lifts not less than 6 inches uncompacted thickness prior to compaction and compact each lift to not less than 95 percent relative compaction as determined by ASTM D1557.
- G. Backfill around concrete structures only after concrete has attained compressive strength in Section 03 30 00 – Cast-in-Place Concrete.
- H. Structural Fill Beneath Footings: Place a minimum of 6 inches uncompacted thickness hereinbefore specified structural fill beneath footings and compact to not less than [95 percent relative compaction as determined by ASTM D1557.
- I. Earthfill Under Structures and Around Structures: Place hereinbefore specified earthfill in areas under facilities and around structures where structural fill or granular fill is not designated. Deposit material from excavation in horizontal lifts to maximum [6]-inch

uncompacted depth and compact each lift to not less than 95 percent relative compaction as determined by ASTM D1557. Maintain material at optimum moisture content, plus or minus 2 percentage points. Place backfill material free of roots, organic matter, trash, and rocks larger than 4-inch diameter. Stop backfill at specified grade. Make allowance for topsoil where required.

- J. Fill for Earthen Berms and Other Uses Not Under Structures, Pavements or Facilities:
1. Place hereinbefore specified earthfill to lines and grades shown. Place fill material in lifts not greater than 12 inches compacted thickness prior to compaction and compact each lift to not less than 92 percent relative compaction as determined by ASTM D1557. Make proper allowance for topsoil where required.
 2. Compact full width of embankment. If pipelines are to be laid in embankment, construct embankment to an elevation 2 feet above top of proposed pipeline prior to trench excavation for pipeline. Moisten fill material as necessary to produce specified compaction. If material is too wet for proper compaction, aerate by blading, discing, or other methods. Dress completed embankment to elevations and slopes shown. Make proper allowance for topsoil where required.
- K. Earthfill and Granular Fill Under Roadways and Parking Areas: Place in lifts not to exceed 12 inches uncompacted thickness and compact each lift to not less than 95 percent relative compaction as determined by ASTM D1557.
- L. Fill for dam embankments and cutoff trenches:
1. Place hereinbefore specified Embankment Fill to lines and grades shown. Place fill material in lifts not greater than 8 inches in thickness prior to compaction and compact each lift to not less than 95 percent relative compaction as determined by ASTM D1557. The moisture content for materials, at the time of compaction, shall be between 2 percent below and 2 percent above the optimum moisture content.
 2. Perform one in-situ moisture/density test per 500 cy of material placed in a single day. At least one moisture/density test must be performed for each day of fill placement regardless of the quantity of material placed.
 3. Compact fill width of embankment and spread materials in horizontal lifts. Moisten fill material as necessary to produce specified compaction. If material is too wet for proper compaction, aerate by blading, discing, or other methods. Dress completed embankment to elevations and slopes shown. Make proper allowance for topsoil where required.
 4. The distribution and gradation of materials throughout the filling zone shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Perform placing operations so that the materials, when compacted, will be blended sufficiently to secure a high degree of compaction, uniformity, and stability. The surface of each fill lift should be roughened using the segmented pad/sheepsfoot roller prior to placing the next fill lift to promote bonding of the individual lifts and preclude formation of preferred seepage planes in the embankment.

5. In tight spaces and against structures where only small compaction equipment can be used, the maximum loose lift thickness shall be limited to 4-inches and the maximum particle size shall be limited to 2-inches.
6. Sheeting and shoring will not be permitted to be used within dams embankment or cutoff trench foundations without explicit approval in writing from the Geotechnical Engineer. All excavations shall be properly sloped.

3.8 CONTROLLED LOW-STRENGTH MATERIAL

- A. Discharge from truck-mounted, drum-type mixer into trench.
- B. Place in lifts as necessary to prevent uplift (flotation) of new and existing facilities.
- C. Fill the trench section as shown.

3.9 PROTECTON OF WORK

- A. Use all means necessary to prevent erosion of graded areas during construction and until such time as permanent drainage and erosion measures have been installed.
- B. Comply with all stipulations and regulations within NYSDEC SPDES General Permit and all other local, state, and federal agencies.]
- C. Excavation Safety: Perform excavations in a safe manner. Provide appropriate measures to retain excavation side slopes and prevent cave-ins and rock falls to ensure that persons working in or near the excavation are protected.
- D. For trench excavation exceeding 5 feet in depth, provide adequate safety system meeting requirements for applicable state and local codes, rules, regulations, construction safety orders, and federal requirements.
- E. A/E has not designed or reviewed, is not responsible for, and does not certify any aspect of trench safety systems and/or safety systems for trench excavation which may be described, shown, or depicted, directly or indirectly, in these plans and specifications.
- F. Protect trees, shrubs, lawns, walkways, curbs, vaults, manholes, valve boxes, and other features remaining as a portion of final facilities or landscaping.
- G. Protect benchmarks, existing structures, fences, utilities, sidewalks, paving, and curbs from equipment and vehicular traffic.
- H. Protect above and below grade utilities that are to remain.
- I. Notify A/E of unexpected subsurface conditions and discontinue work in affected area until notified to resume work.
- J. Grade top perimeter of excavations to prevent surface water runoff from flowing into excavation.

- K. Install erosion control materials or silt fence at toe of fill slopes and around catch basins so as to prevent soil particles from entering the existing adjacent area or the existing storm drain system in accordance with NYSDEC SPDES General Permit on file at Owner's field office.
- L. Identify significant landscape features from the Drawings on site with tags and appropriately protect.

3.10 MOISTURE CONTROL

- A. During all compacting operations, maintain optimum practicable moisture content required for compaction purposes in each lift or fill. Maintain moisture content uniform throughout lift. Supplement, if required, by sprinkling fill. Achieve optimum moisture content of fill, plus or minus 2 percentage points, at time of compaction.
- B. Do not attempt to compact fill material that contains excessive moisture. Aerate material by blading, discing, harrowing, or other methods to hasten drying process.

3.11 TRENCH EXCAVATION AND BACKFILL

- A. General:
 - 1. Process excavated material to meet specified gradation requirements.
 - 2. Adjust moisture content as necessary to obtain specified compaction.
 - 3. Do not allow backfill to freefall into trench or allow heavy, sharp pieces of material to be placed as backfill until after at least 2 feet of backfill has been provided over top of pipe or other utilities.
 - 4. Do not use power-driven impact-type compactors for compaction until at least 4 feet of backfill is placed over top of pipe or other utilities.
 - 5. Backfill to grade with proper allowances for topsoil, crushed-rock surfacing, and pavement thickness, wherever applicable.
 - 6. Backfill around structures with same class backfill as specified for adjacent trench unless otherwise shown or specified.
- B. Excavation: Excavate for installation of piping, utilities, and appurtenances. Remove obstructions, such as tree roots, stumps, and other material of any type.
- C. Trench Excavation: Trench excavation is unclassified. Remove all material regardless of nature, type, or condition of material encountered.
- D. Trench Width: Provide minimum width of unsheeted trenches or minimum clear width of sheeted trenches in which pipe is to be laid 18 inches greater than outside diameter of pipe. Sheet piling requirements are independent of trench width. The maximum clear width at top of pipe or above pipe will not be limited except in cases where excess width of excavation would cause damage to adjacent structures, utilities or other improvements.
- E. Grade: Carry bottom of trench to line and grade shown. Allow for pipe thickness and for pipe base or special bedding when specified. Backfill any part of the trench excavated below grade with pipe base material and compact to not less than 95 percent relative compaction as determined by ASTM D1557.

- F. Shoring, Sheet piling, and Backing of Trenches: Design, install, maintain, and remove shoring, sheet piling, and bracing as required by federal, state, and local laws, codes, and ordinances.
- G. Removal of Water: Remove water as specified hereinbefore.
- H. Trench Stabilization: If in the opinion of the Geotechnical Engineer, material in bottom of trench is unsuitable for supporting pipe, excavate to remove unsuitable material and backfill to required grade with trench stabilization material as specified. Compact as required by geotechnical engineer. Removal of unsuitable material and replacement fill as specified in this paragraph and as reviewed by the Owner is paid for by an adjustment of the Contract price in accordance with the provisions of additional work.
- I. Pipe Base: Place a minimum 4-inch thickness of pipe base material of type hereinbefore specified. Bed pipe in base material so that flow line is at required grade and elevation. Place and finish base material to grade ahead of pipe laying operation.
- J. Pipe Zone Backfill:
1. Backfill pipe zone to 6 inches above outside of pipe for full width of trench with backfill material conforming to backfill material for pipe zone as specified hereinbefore. Place in horizontal lifts not exceeding 6 inches in uncompacted thickness on both sides of pipe. Thoroughly tamp and supplement by "walking in" material. Use particular attention in placing material on the underside of pipe to provide a solid backing and to prevent lateral movement during final backfilling procedure.
 2. Backfill at pipe zone for plastic pipe must receive particular attention and care to prevent damage to pipe. After placing material as specified herein to a point of 12 inches above top outside surface of barrel of pipe, material so placed will be compacted by at least three passes of a vibratory compactor over area generally above sides of pipe. Impact compactors will not be used for compaction of backfill at pipe zone. Impact compactors will not be used until 3 feet of cover has been placed over top of pipe.
- K. Trench Backfill Above the Pipe Zone:
1. In trenches under all structures, sidewalks, roads, parking areas, and similar facilities, except where specifically shown, deposit fill material as specified hereinbefore in horizontal lifts not exceeding 6 inches in uncompacted thickness. Compact as specified for fill in paragraph 3.7, Compaction of Fill, above. Repair subsequent damage caused by settlement of trenches at Contractor's sole expense.
 2. In other areas, excavated trench material may be used for backfill. Push by mechanical means, first onto slope of backfill previously placed and allow to roll down into trench. Neatly windrow material over trench to provide for future settlement. Correct excess or deficient backfill material after settlement within warranty period by regrading and adding or removing material.

- a. Compact backfill in suitable lifts with mechanical vibratory or impact tampers. Determine type of compaction equipment and amount of compaction required to prevent subsequent settlement. Remove boulders and stones 4 inches in diameter and larger from material used for backfill in upper 12 inches of backfilled trenches. In areas where topsoil conditions exist, replace topsoil in top 6 inches of trench. Compact and rake to match ground surface adjacent to trench. Maintain surface of backfilled trench level with existing grade until entire project is accepted by the Owner. Repair promptly, at no cost to Owner, subsequent settlement of finished surface during warranty period which is considered to be a result of improper or insufficient compaction.
- b. Warning Tape: Place warning tape centered over top of the pipe, culvert, or other utility at a maximum depth of 5 feet and a minimum depth of 1 foot below finish grade.

3.12 PLACING TOPSOIL

- A. Refer to Section 713-01 of the Standard Specifications for requirements for placing topsoil.

3.13 FINISH SITE GRADING

- A. Perform earthwork to lines and grades as shown on Drawings and/or established by A/E, with proper allowance for topsoil where specified or shown. Shape, trim, and finish slopes of channels to conform to lines, grades, and cross section shown. Make slopes free of exposed roots and stones exceeding 3-inch diameter. Round tops of banks to circular curves, in general, not less than a 6-foot radius unless otherwise shown on the Drawings. Trim rounded surfaces neatly and smoothly. Neatly blend new grading into surrounding existing terrain. Finished site grading will be reviewed by A/E.
- B. Planters in parking areas and adjacent to the building shall be graded to 6-inches below finish grade, top of well or top of curb.

3.14 REINSTATEMENT OF TEMPORARY SITE CONSTRUCTION AREAS

- A. Reinstate temporary laydown, stockpile, storage, and other areas disturbed by construction activities to pre-construction condition, by removing ground coverings, gravel, fabric, construction barriers, fencing, and/or any site appurtenances related to construction activities. Match final groundcover and condition of laydown and temporary construction staging areas to pre-construction condition with plantings fully established, where applicable.

3.15 INSTALLATION OF RIPRAP

- A. Foundation Preparation for Riprap:
 - 1. Place riprap to lines and grades as shown on Drawings.
 - 2. Trim surfaces above grade to neat line. Fill areas below grade by increasing thickness of riprap.
 - 3. Place no material until foundation has been reviewed by A/E.

- B. Place geotextile as specified hereinbefore or 6-inch minimum thickness of granular filter material.
- C. Placing Riprap:
 - 1. Place riprap to a depth as shown on Drawings.
 - 2. Intermix the sizes of riprap material to provide uniform gradation between small and large material. Prevent damage to pipe or other facilities.
 - 3. Repair damage to pipe or coating at Contractor's sole expense.

3.16 TOLERANCES

- A. Construct material limits within a tolerance of 0.1 foot except where dimensions or grades are shown or specified as minimum. Perform grading to maintain slopes and drainage as shown on Drawings. No reverse slopes will be permitted.
- B. Maintain constant uniform slopes between finish grade contour lines and spot elevations shown on the Drawings.

3.17 FIELD QUALITY CONTROL

- A. Field Density and Moisture Tests: The independent testing laboratory representative will determine in-place density and moisture content by any one or combination of the following methods ASTM D2922, D1556, D2216, or other methods selected by A/E. Cooperate with this testing work by leveling small test areas designated by Owner's testing representative. Backfill test areas at Contractor's sole expense. Frequency and location of testing determined solely by the Independent Testing Agency.

3.18 INSTALLATION OF SILT FENCE

- A. Minimize number of joints in fence. When joints are necessary, locate at support posts and overlap fabric a minimum of 6 inches.
- B. Install silt fence to follow contours where feasible. Space fence posts a maximum of 6 feet apart and drive securely into ground as shown on Drawings.
- C. Fasten wire mesh securely to upslope side of posts using heavy-duty wire staples at least 1 inch long, tie wire or hog rings.
- D. Inspect silt fence immediately after each rainfall and at least daily during prolonged rainfall. Immediately repair as required.

3.19 INSTALLATION OF STRAW BALES

- A. Install straw bales in accordance with detail shown on Drawings. Install bales to follow contours where feasible.

3.20 INSTALLATION OF EROSION CONTROL FILTER BAG

- A. Install bags end-to-end perpendicular to gully or ditch flow. Install around perimeter of inlets and catch basins. Use wood laths or other means for holding in place. Install filter bags in accordance with details shown on Drawings.

3.21 ADJUSTING AND CLEANING

- A. Disposal of Excess Excavation: Dispose of all excess excavated materials not suitable for site berms, backfill, or fills offsite. Make arrangements for disposal of excavated material. Dispose in accordance with applicable federal, state, and local requirements.
- B. Removal of Erosion Control Measures: Remove temporary erosion control measures at completion of construction activities, and when permitted to do so by authority having jurisdiction. Dispose in accordance with applicable federal, state and local requirements.

3.22 SUBMITTAL SCHEDULE

ITEM NO.	SUBMITTAL REQUIREMENT	WITH BID	NO. OF WEEKS AFTER AWARD	AS INDICATED
31 00 00-01	Certification, sieve analysis, other test results, source, for all imported materials.			Provide the following information 10 calendar days prior to first use.
31 00 00-02	Certification and mill certificates for geotextile.			Provide the following information 10 calendar days prior to shipment.
31 00 00-03	Catalog and manufacturer's data sheets warning tape.			Provide the following information 10 calendar days prior to first use.
31 00 00-04	Copies of permits obtained for excavation, dewatering, etc., that are required by state and local governing authorities prior to start of work.			Provide the following within 4 weeks after award or upon receipt from local jurisdiction.

END OF SECTION