SECTION 31 23 00

GRADING, EXCAVATING AND BACKFILLING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies grading, excavating, constructing embankments, and backfilling for structures and utility facilities.

B. Related Work Specified Elsewhere: NOT APPLICABLE

C. Definitions:

1. Grading: Shaping earth and rock through the removal or filling of earth and rock materials.
2. Earth Excavation: Excavation of materials of whatever nature, except rock as defined below.
3. Rock Excavation: Excavation of material in place which cannot be loosened or broken down by ripping using earth excavating equipment and which requires blasting or rock excavating equipment for its removal.
4. Approved Material: Earth which meets specified measurable requirements for use as embankment, fill or backfill.
5. Surplus Excavated Material: Approved excavated material which is not used in embankments or as fill on site.
6. Unsuitable Material: Material which does not meet specified requirements for use in situ or as embankment, fill or backfill and is prohibited for use in the work.
7. Authorized Excavation: Excavating to neat lines and limits shown and specified; excavating unsuitable material.
8. Unauthorized Excavation: Excavating materials which would otherwise be left in place; excavation which is not specified as authorized excavation, such as excavation beyond neat lines and bottoms of footings as shown.
9. Excess Excavation: Excavating materials beyond or below cross section shown, as well as unavoidable over breakage in rock.
10. Controlled Low Strength Materials (CLSM): Fill.

D. Salvage:

1. Materials shown to be salvaged in accordance with the General Requirements.

1.02 SUBMITTALS:

A. Test Results: At least seven calendar days in advance of the desired date of approval, submit test results of material proposed for fill, backfill, controlled low strength material (flowable fill), and embankment material certifying that the material complies with the specifications.

B. Submit the following for approval in accordance with the General Requirements and the additional requirements as specified for each:

1. Samples:

a. Submit sample 21 days in advance of desired date of approval. Two one-cubic-foot samples are required of each material proposed for fill, backfill and embankments.

b. Obtain, identify and ship soil and aggregate samples in accordance with ASTM D75.

2. Documentation:

a. Permits for disposal of excavated material:

1) Obtain written permits and releases from owners of property where material will be deposited.

2) Each permit and release from each property owner will absolve the Authority from responsibility in connection with such disposal of the material.

b. Plan for tunneling or jacking of utility facilities:

1) Prior to tunneling, submit a tunneling plan.

a) Include in the plan the location of the facility, the method of construction, the types of equipment and the procedures proposed.

b) Procedure for field determination of soil bearing capacity, including description of the equipment to be used, and any calibration curves for the various soil types to be encountered, details of field test procedures, forms for reporting of test data/results and details of minimum number of tests required for each footing/base area.

3. Certification:

a. With samples of materials proposed for fill, backfill and embankment, submit certified test reports of tests performed by an approved Independent Testing Agency for all tests required to demonstrate compliance with specified requirements.

1.03 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:

1. Comply with codes and regulations of the jurisdictional authorities.

2. AASHTO: M147.

3. ASTM: C33, D75, D698, D2487, D2922, D3017 (both replaced by D 6930) D4318, D6930

1.04 JOB CONDITIONS:

A. Existing Drainage:

1. Preserve, protect and maintain existing operable drains and sewers during grading operations.

2. Keep excavations dry.

B. Blasting: NOT ALLOWED

C. Accident Prevention and Safety:

1. Perform work in accordance with specified safety requirements and PROTECTIVE DEVICES article of the General Requirements.

D. Location of Underground Facilities and Structures:

1. Locations shown for utility facilities are approximate.

2. Utility facility locations and site investigations are listed in the General Requirements.

3. Contact Miss Utility to have utilities located before beginning excavation.

E. Toxic and Combustible Substances:

1. During excavation, provide detection and testing equipment and carry out necessary tests to detect the presence of toxic and combustible substances.
2. Take action to safeguard persons and property in accordance with the rules and regulations of the jurisdictional agencies and utility owners.
3. Promptly notify utility owners when problems concerning their facilities become apparent.

F. Ramps:

1. Construct temporary ramps as necessary to provide access to work area.
2. Locate such access ramps in Contractor's storage, operations and access areas or within excavation for subway structure and maintain traffic as specified.
3. Support ramp excavation in accordance with WMATA requirements.
4. When ramps are in use, station flag persons equipped with red flags at ramp entrances to keep unauthorized vehicles or persons from entering work area.
5. When work necessitating entrance or exit of vehicles via ramps is not being performed, protect entrances and exits of ramps by warning signs, barricades and fences in accordance with the General Requirements.
6. Upon completion of the work needing ramps, remove the ramps and backfill excavated ramp areas, if necessary.

G. Excavation Near Buildings:

1. Control excavation in areas near buildings or structures to maintain stability of buildings or structures. If underpinning is necessary, perform excavation work in accordance with WMATA requirements, so that condition of surrounding area remains unimpaired.

H. Excavation Near Surface and Underground Structures:

1. Control excavation in areas near all structures including buildings, underground and overhead utilities, bridges, pavement, and track to maintain stability and function of structures.

PART 2 - PRODUCTS:

2.01 MATERIALS:

A. Embankment, Fill or Backfill Materials:

1. Composition:
   a. Well-graded soil-aggregate mixture, as defined by ASTM D2487, comprised of stone, gravel, sand, silt, clay or combinations of such materials.
   b. Prohibited material: Organic matter, debris, cinders and frozen material.
2. Additional requirements:
   a. Particle size: Four inches maximum, but not exceeding one inch within one foot of finished grade.
   b. Liquid limit: Forty maximum, determined in accordance with ASTM D4318.

c. Plasticity index: Ten maximum, determined in accordance with ASTM D4318.
d. Maximum dry density: Not less than 100 pounds per cubic foot.

B. Select Material: AASHTO M147, with the following gradation requirements:

Sieve Designation	Percentage Passing By Weight
Two inch	100
One inch	70 - 95
3/8 inch	35 - 75
Size 4	25 - 60
Size 10	15 - 45
Size 40	10 - 30
Size 200	0 - 15

C. Pervious Material:

1. Natural, clean, free draining sand conforming to the requirements of ASTM C33 except the following:
   a. Material passing Size 100 sieve not to exceed eight percent.
   b. Material passing Size 200 sieve not to exceed five percent.
2. Drainage Material: Clean, crushed, rock, gravel, with 1-1/2 inch maximum particle size and maximum two percent by weight passing Size 4 sieve.
3. Below concrete walks and slabs: ASTM C33, Size No. 67, except maximum two percent by weight passing Size 4 sieve.

D. Impervious Material:

1. Silt-clay material minimum 35 percent by weight passing Size 200 sieve.
2. Plasticity index: 11 minimum, determined in accordance with ASTM D4318

2.02 SOURCE OF MATERIALS:

A. Use materials for embankment, fill or backfill from this Contract if they meet specified requirements. If sufficient material meeting these requirements is not available from this Contract, obtain material meeting specified requirements.

B. Use only material whose quality, source and zone of placement in the fill have been approved.

C. Dress and shape borrow areas provided by the Authority to ensure positive drainage when borrow operations are completed.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall use appropriate equipment in sufficient quantity and sizes to perform the work as specified and illustrated.

B. Storage of Excavated Material in Floodways: The Contractor shall not store or deposit surplus excavation or any other material in any area designated as a Flood Plain or along natural drainage ways. Materials so deposited shall be removed and the area restored to its natural condition at the sole expense of the Contractor.

3.02 EQUIPMENT:

A. Use appropriate equipment in sufficient quantity and sizes to perform the work as specified and shown.

3.03 EARTH EXCAVATION:

A. Excavate in sequences and stages as specified, and in a manner which will not impair permanent or temporary structures, installations or surfaces.

B. Excavate to neat lines or set back lines for mixed face conditions and grades shown. If approved, slopes may be flattened as a matter of expediency.

C. Support sides of excavation per WMATA requirements.

D. Protect, support and maintain utility facilities per WMATA requirements.

E. Proceed with caution in areas of utility facilities; expose them by hand excavation or other methods acceptable to the facility owner.

F. Control runoff so that water does not run through excavation area. Keep excavation free of water.

G. Remove excavated materials to fill, embankment, stockpile or disposal locations. Keep haul routes clean in accordance with the General Requirements.

H. Fill excess excavations with approved materials and compact as specified.

I. Unauthorized excavation for the purpose of obtaining materials for resale or for use at another job site is prohibited unless otherwise approved by the WMATA Engineer.

3.04 ROCK EXCAVATION:

A. Perform rock excavation to neat lines shown and so as to produce surfaces free of loose rock.

B. Install rock reinforcement in accordance with WMATA requirements.

C. Remove loose, semi-detached and unsound fragments from blasted surfaces. Remove standing water, debris, oil and other objectionable coatings from surfaces of rock upon or against which concrete or porous fill material is to be placed.

D. Repair shattered or loosened rock surfaces outside neat lines shown, which in the opinion of the Engineer would be detrimental to subway structure or would adversely affect subway drainage system.

E. Where directed, grout rock surfaces which have not been shattered but are naturally permeable.

F. Remove excavated rock to approved fill locations or disposal locations.

G. Fill excess excavation with concrete or other approved material.

H. If flowing or seeping water is encountered during excavation, install approved drainage system in accordance with WMATA requirements.

3.05 REMOVAL OF SUBSURFACE OBSTRUCTIONS:

A. Permanent Closure walls:

B. Prior to removal of parts of vaults or areaways which extend into Contract limits, build permanent closure walls where shown in such vaults or areaways to separate areas to be left intact from areas to be removed.

1. Obtain the WMATA Engineer's approval of permanent closure wall design prior to its installation.

C. Remove vaults, areaways and foundation walls as shown.

3.06 EMBANKMENT, FILL AND BACKFILL:

A. Place embankment, fill and backfill in eight-inch loose layers, unless otherwise shown, for entire width so that each layer can be uniformly and properly compacted.

B. Avoid accumulation of large pieces of material at one location. Fill voids and interstices with finer materials.

C. In confined areas, use approved power-actuated compactors to achieve required density.

D. Prior to compaction, adjust moisture content of material within required limits by drying or watering either at material source or on fill.

E. Leave struts, braces, lagging and timber sheathing in place as long as needed to support excavation and adjacent facilities and structures.

F. Where utility facilities and structures are supported in place, use special equipment and techniques as required to achieve specified compaction under and around them.

G. Do not place backfill on subway structures until requirements for curing and waterproofing have been complied with and, if required, until test cylinders for particular structure indicate that concrete has attained specified compressive strength.

H. When backfilling against structures, place material approximately simultaneously on both sides of structures to equalize opposing horizontal pressures.

I. When backfilling on tops of structures, place material in six-inch lifts over full area.

J. Under concrete floor and other slabs on grade, place drainage material directly on prepared subgrade which meets density and elevation requirements. Compact with hand-operated plate-type vibratory compactor.

K. Prior to placing embankment against slope greater than one vertical to four horizontal, cut benches into existing slope. Height of bench not to exceed two feet unless otherwise approved.

L. Maintain embankment, fill and backfill in stable, well-drained condition.

M. Where approved, dispose of surplus excavated material by widening embankments and flattening slopes.

N. Where pervious material will be exposed to erosion, cover it with 12-inch layer of approved impervious material compacted in place.

3.07 COMPACTION ADJACENT TO STRUCTURES:

A. Compact embankment, fill or backfill materials within five feet of retaining walls, abutments or other structures using lightweight compactors.

B. Do not overstress structures.

C. Backfilling against new structures without approval is prohibited.

3.08 EXCAVATION OF UNSUITABLE MATERIALS:

A. Remove unsuitable materials from the site.

B. Replace unsuitable material with approved material and compact as specified.

3.09 PREPARATION OF GROUND AS SUBGRADE:

A. Where the subgrade is on original ground or in cut or where embankment or fill is less than one foot, fulfill compaction requirement for 12 inches minimum below final subgrade.

B. If necessary, scarify original ground and adjust moisture content prior to compacting.

3.10 FIELD QUALITY CONTROL:

A. Allowable Tolerances:
   1. Construct finished subgrade to vary not more than 0.05-foot above or 0.10-foot below elevation shown.
   2. Complete embankment slopes to plus-or-minus 0.5 foot of slope line shown.
   3. Maintain moisture content of embankment, fill or backfill material within plus-or-minus three percent of optimum moisture content of material.
   4. Compact each layer of embankment, fill or backfill to 95 percent of maximum dry density as determined in accordance with ASTM D698, at moisture content within tolerance specified, except the following:
      a. From upper surface of fill or backfill to a plane 12 inches below subbase level of vehicular pavement, sidewalks, trackbeds and structural foundations to 100 percent of maximum dry density at moisture content within tolerance specified.

b. In areas of 95-percent compaction where utility facilities are located in fill and are not supported on concrete cradles, compact material for a depth of one foot directly below bottom of facility to 100 percent of maximum dry density at moisture content within tolerance specified.

B. Test Method:

1. Determine the maximum dry density and the optimum moisture content in accordance with ASTM D698.
2. Determine in-place density and moisture content in accordance with ASTMD2922 ASTM D 6938 and ASTM D3017 respectively, or other test methods acceptable to the WMATA Engineer.

3.11 TUNNELING FOR OR JACKING OF UTILITY FACILITIES:

A. Location of facility, method of construction, type of equipment and procedures: As approved.

3.12 FINISHING:

A. On completion of work, clean ditches and channels.

B. Slope and shape borrow areas to provide positive drainage.

C. Remove unsuitable and surplus excavated materials to locations outside the Authority's right-of-way.

D. Leave site in neat, presentable condition.

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. Measurement of work specified in this section will be made in the following manner:

1. No separate measurement.

4.02 PAYMENT

A. Compensation for work specified in this Section will be made in the following manner:

1. Included in the price of the work of which it is a part.

END OF SECTION