

SECTION 31 23 23
FILL AND BACKFILL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
 - b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - c. D75, Standard Practice for Sampling Aggregates.
 - d. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - e. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - f. D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - g. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

- A. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.
- B. Completed Course: A course or layer that is ready for next layer or next phase of Work.
- C. Embankment Material: Fill materials required to raise existing grade in areas other than under structures.
- D. Geosynthetics: Geotextiles, geogrids, or geomembranes.
- E. Imported Material: Materials obtained from sources offsite, suitable for specified use.

F. Influence Area:

1. Area within planes sloped downward and outward at 60-degree angle from horizontal measured from:
 - a. 1 foot outside outermost edge at base of foundations or slabs.
 - b. 1 foot outside outermost edge at surface of roadways or shoulder.
 - c. 0.5 foot outside exterior at spring line of pipes or culverts.

G. Lift: Loose (uncompacted) layer of material.

H. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

I. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

J. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D1557.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Contracting Officer.

K. Well-Graded:

1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

1.03 SUBMITTALS

A. Action Submittals:

1. Gradation Test Results for Imported Materials.
2. Gradation Test Results for Processed Earthfall material.
3. Samples: Imported material taken at source in accordance with ASTM D75.

B. Informational Submittals:

1. Manufacturer's data sheets for compaction equipment.
2. Certified test results from independent testing agency for all grain size analysis, relative compaction tests, and all other test results obtained by the testing laboratory.

1.04 QUALITY ASSURANCE

A. Notify Contracting Officer when:

1. Structure or tank is ready for backfilling, and whenever backfilling operations are resumed after a period of inactivity.
2. Access road is ready for backfilling and when backfilling operations are resumed after a period of inactivity.
3. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
4. Fill material appears to be deviating from Specifications.

1.05 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Section 02 41 00, Demolition; Section 31 10 00, Site Clearing; Section 31 23 16, Excavation; and Section 31 23 13, Subgrade Preparation, prior to placing fill or backfill.
- B. Backfill against concrete structures only after concrete has attained compressive strength, specified in Section 03 30 00, Cast-in-Place Concrete. Obtain Contracting Officer's acceptance of concrete work and attained strength prior to placing backfill.
- C. Backfill around water-holding structures only after completion of satisfactory leakage tests as specified in Section 03 30 00, Cast-in-Place Concrete.
- D. Do not place granular base, subbase, or surfacing until after subgrade has been prepared as specified in Section 31 23 13, Subgrade Preparation.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Gradation Tests: As necessary to locate acceptable sources of imported material.
- B. Samples: Collected in accordance with ASTM D75. Clearly mark to show source of material and intended use.

2.02 PROCESSED EARTHFILL

- A. As specified in Section 31 23 23.15, Trench Backfill.

2.03 GRANULAR FILL

- A. Physical Characteristics:

1. 1-inch minus crushed gravel or crushed rock.
2. Free from dirt, clay balls, debris, rock fragments larger than 3 inches, and organic material.

- B. Functional Characteristics: None.

- C. Performance Characteristics: Well-graded from coarse to fine and containing sufficient fines to bind material when compacted, but with maximum 8 percent by weight passing No. 200 sieve.

- D. Excavated bedrock, that has been crushed, processed to meet the above requirements, and approved by Contracting Office can be used as Granular Fill.

2.04 WATER FOR MOISTURE CONDITIONING

- A. Physical Characteristics: None.

- B. Functional Characteristics: Free of hazardous or toxic contaminants, or contaminants deleterious to proper compaction.

- C. Performance Characteristics: None.

2.05 BASE COURSE ROCK

- A. As specified in Section 32 11 23, Aggregate Base and Subbase Course(s).

2.06 FOUNDATION STABILIZATION ROCK

- A. Physical Characteristics:

1. Crushed rock or pit run rock.
2. Uniformly graded from coarse to fine.
3. Maximum 2-1/2-inch particle size.

- B. Functional Characteristics: Free from excessive dirt and other organic material.

- C. Performance Characteristics: None.

PART 3 EXECUTION

3.01 GENERAL

- A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.
- B. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.
- C. During filling and backfilling, keep level of fill and backfill around each structure and buried tank even.
- D. Do not place fill or backfill, if fill or backfill material is frozen, or if surface upon which fill or backfill is to be placed is frozen.
- E. If pipe, conduit, duct bank, or cable is to be laid within fill or backfill:
 - 1. Fill or backfill to an elevation 2 feet above top of item to be laid.
 - 2. Excavate trench for installation of item.
 - 3. Install bedding, if applicable, as specified in Section 31 23 23.15, Trench Backfill.
 - 4. Install item.
 - 5. Backfill envelope zone and remaining trench, as specified in Section 31 23 23.15, Trench Backfill, before resuming filling or backfilling specified in this section.
- F. Tolerances:
 - 1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
 - 2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.
- G. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.02 QUALITY CONTROL TESTING

A. Gradation:

1. One sample from each 1,000 tons of finished product or more often as determined by Contracting Officer, if variation in gradation is occurring, or if material appears to depart from Specifications.
2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
3. Remove material placed in Work that does not meet Specification requirements.
4. Minimum Number of Tests: Three Tests per product.

B. Laboratory Moisture Density Test: Perform no less than two tests for each material with additional tests for each 100 in-place moisture density tests performed. Tests will also be conducted when noticeable material differences are observed.

C. In-Place Density Tests:

1. In accordance with ASTM D6938. During placement of materials, test as follows:
 - a. One test per 2,500 square feet for any lift covering areas greater than or equal to 2,500 square feet.
 - b. Minimum of one test for each structure having a footprint greater than 1,000 square feet.

3.03 BACKFILL UNDER AND AROUND STRUCTURES

- A. Under Facilities: Within influence area beneath structures, slabs, pavements, curbs, piping, conduits, duct banks, and other facilities, backfill with granular fill, unless otherwise shown. Place granular fill in lifts of 8-inch maximum thickness and compact each lift to minimum of 95 percent relative compaction as determined in accordance with ASTM D1557.
- B. Other Areas: Backfill with processed earthfill to lines and grades shown, with proper allowance for topsoil thickness where shown. Place in lifts of 12-inch maximum thickness and compact each lift to minimum 92 percent relative compaction as determined in accordance with ASTM D1557.

3.04 FILL

A. Outside Influence Areas Beneath Gravel Access Road, Structures, Tanks, Pavements, Curbs, Slabs, Piping, and Other Facilities:

1. Unless otherwise shown, place proceeded earthfill as follows:
 - a. Allow for 3-inch topsoil where seeding and 12-inch topsoil in shrub beds.
 - b. Maximum 8-inch thick lifts.
 - c. Place and compact fill across full width of embankment.
 - d. Compact to minimum 92 percent relative compaction as determined in accordance with ASTM D1557.
 - e. Dress completed embankment with allowance for topsoil, crest surfacing, and slope protection, where applicable.

3.05 GRANULAR BASE, SUBBASE, AND SURFACING

A. Place and Compact as specified in Section 32 11 23, Aggregate Base and Subbase Course(s).

3.06 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by Contracting Officer as follows:

1. Beneath Footings: Concrete of strength equal to that of respective footing, as specified in Section 03 30 00, Cast-in-Place Concrete.
2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.
3. Beneath Slabs-On-Grade: Granular fill.
4. Trenches:
 - a. Unauthorized Overexcavation: Either trench stabilization material or granular pipe bedding material or CLSM, as specified in Section 31 23 23.15, Trench Backfill.
 - b. Authorized Overexcavation: Trench stabilization material, as specified in Section 31 23 23.15, Trench Backfill.
5. Permanent Cut Slopes (Where Overlying Area is Not to Receive Fill or Backfill):
 - a. Flat to Moderate Steep Slopes (3:1, Horizontal Run: Vertical Rise or Flatter): Processed Earthfill.
 - b. Steep Slopes (Steeper than 3:1):
 - 1) Correct overexcavation by transitioning between overcut areas and designed slope adjoining areas, provided such cutting does not extend offsite or outside easements and right-of-ways, or adversely impacts existing facilities, adjacent property, or completed Work.

- 2) Backfilling overexcavated areas is prohibited, unless in Contracting Officer's opinion, backfill will remain stable, and overexcavated material is replaced as compacted earthfill.

6. Within Embankment Fill: Use embankment fill material.

3.07 ACCESS ROAD SURFACING

- A. Place and compact as specified in Section 32 11 23, Aggregate Base and Subbase Course(s).

3.08 EROSION AND DUST CONTROL

- A. Perform fill and backfill operations to minimize erosion and dust transport.
- B. Provide additional protective measures to prevent sediment and dust from being removed from site.
- C. Provide equipment or stabilize areas to prevent dust.

END OF SECTION