

Section 02330**EMBANKMENT****1.0 GENERAL****1.01 SECTION INCLUDES**

- A Construction of embankments with excess excavated material and borrow.
- B References to Technical Specifications:
 - 1. Section 01200 – Measurement and Payment Procedures
 - 2. Section 01350 – Submittals
 - 3. Section 01760 – Project Record Documents
 - 4. Section 01570 – Trench Safety System
 - 5. Section 01450 – Testing Laboratory Services
 - 6. Section 01500 – Temporary Facilities and Controls
 - 7. Section 02255 – Bedding, Backfill and Embankment Material
 - 8. Section 02910 – Topsoil
 - 9. Section 01564 – Control of Ground Water and Surface Water
 - 10. Section 01720 – Field Surveying
 - 11. Section 02220 – Site Demolition
 - 12. Section 02200 – Site Preparation
 - 13. Section 01140 – Contractor’s Use of Premises
- C Referenced Standards:
 - 1. American Society for Testing and Materials (ASTM)
 - a. ASTM D 698, “Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort”
 - b. ASTM D 1556, “Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method”
 - c. ASTM D 2922, “Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)”
 - d. ASTM D 3017, “Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)”

1.02 MEASUREMENT AND PAYMENT

- A Unless indicated as a Bid Item, no separate payment will be made for Embankment under this Section. Include cost in Bid Items for which this Work is a component.
- B If embankment is included as a Bid Item, measurement will be based on the Units shown in Section 00300 – Bid Proposal and in accordance with Section 01200 – Measurement and Payment Procedures.

1.03 SUBMITTALS

- A Make Submittals required by this Section under the provisions of Section 01350 – Submittals.
- B Submit product quality, material sources, and field quality information in accordance with this Section.
- C Submit field red lines documenting location of embankments as installed, referenced to survey Control Points, under the provisions of Section 01760 – Project Record Documents, 1.04C. Include location of utilities and structures encountered or rerouted. Give horizontal dimensions, elevations, inverts and gradients.
- D Submit a Trench Safety Plan under the provisions of Section 01570 – Trench Safety System that included measures that establish compliance with the standard interpretation of the General Duty Clause, Section 5.(a)(1), of the Occupational Safety and Health Act of 1970 – 20 USC 654 which states, “Employers must shore or otherwise protect employees who walk/work at the base of an embankment from possible collapse.”

1.04 TESTING

- A Testing and analysis of product quality, material sources, or field quality shall be performed by an independent testing laboratory provided by the Owner under the provisions of Section 01450 – Testing Laboratory Services and as specified in this Section.

1.05 PROTECTION OF PEOPLE AND PROPERTY

- A Contractor shall conduct all construction operations under this Contract in conformance with the practices described in Section 01500 – Temporary Facilities and Controls.

2.0 PRODUCTS**2.01 MATERIALS**

- A Contractor shall provide materials used as embedment, backfill, back-dressing, and embankment identified on the Plans in accordance with Section 02255 – Bedding, Backfill and Embankment Material.
- B Topsoil: Conform to requirements of Section 02910 – Topsoil.
- C Borrow Material: Conform to requirements of intended use. Take borrow material from sources approved by Engineer.

3.0 EXECUTION**3.01 EXAMINATION**

- A Verify borrow and excess excavated materials to be reused, are approved.
- B Verify removals, and clearing and grubbing operations, have been completed.
- C Verify backfill of new or relocated utilities and structures, below future grade, is complete.

3.02 PREPARATION

- A Employ a Trench Safety Plan as specified in Section 01570 – Trench Safety Systems.
- B Install and operate necessary dewatering and surface water control measures in accordance with requirements of Section 01564 – Control of Ground Water and Surface Water.
- C Identify required lines, levels, and datum. Coordinate with Section 01720 – Field Surveying.
- D Remove existing pavements and structures, including sidewalks and driveways, in conformance with requirements of Section 02220 – Site Demolition, as applicable.
- E Area shall be cleared and grubbed under the provisions of Section 02200 – Site Preparation prior to placing embankment or opening borrow source.
- F Strip and stockpile topsoil under the provisions of Section 02200 – Site Preparation.
- G Backfill test pits, or stump holes and other surface irregularities such as small swales with embankment materials and compact in proper lift depths according to the compaction requirements of this Section.
- H Areas of unsuitable material shall be removed, backfilled with embankment materials and compacted in proper lift depths according to the compaction requirements of this Section.
- I Upon discovery of unknown or badly deteriorated utilities, or concealed conditions, discontinue work. Notify Engineer and obtain instructions before proceeding in such areas.

3.03 PLACEMENT AND COMPACTION

- A Do not conduct placement operations during inclement weather or when existing ground or embankment materials exceed 3 percent of optimum moisture content. Contractor may manipulate wet material to facilitate drying, by disking or windrowing, at Contractor's expense.

- B Do not place embankment material until density and moisture content of previously placed material complies with specified requirements.
- C Scarify areas to receive embankment to a minimum depth of 4 inches to bond existing and new materials. Mix with first layer of embankment material.
- D Spread embankment material evenly, from dumped piles or windrows, into horizontal layers approximately parallel to finished grade. Place to meet specified compacted thickness. Break clods and lumps and mix materials by blading, harrowing, discing, or other approved method. Each layer shall extend across full width of embankment.
- E Each layer shall be homogeneous and contain uniform moisture content before compaction. Mix dissimilar abutting materials to prevent abrupt changes in composition of embankment.
- F Layers shall not exceed depth as indicated on the Plans.
- G Where shown on Plans for steep slopes, cut benches into slope and scarify before placing embankment. Place increasingly wide horizontal layers of specified depth, to the level of each bench.
- H Build embankment layers on back slopes, adjacent to existing roadbeds, to level of old roadbed. Scarify top of old roadbed to minimum depth of four inches and re-compact with next layer.
- I Construct to lines and grades shown on Plans.

3.04 COMPACTION REQUIREMENTS

- A Maintain moisture content of embankment materials to attain required compaction density.
- B Compact to minimum densities shown on the Plans with a moisture content of optimum to 3 percent above optimum as determined by ASTM D 698.

3.05 TOLERANCES

- A Top of compacted surface: Plus or minus $\frac{1}{2}$ inch in cross section, or in 16 foot length.

3.06 FIELD QUALITY CONTROL

- A Compaction testing will be performed in accordance with ASTM D 1556 or ASTM D 2922 and ASTM D 3017 under provisions of Section 01450 – Testing Laboratory Services.
- B A minimum of three tests will be taken for each 1,000 linear feet per lane of roadway or 500 square yards of embankment per lift.

- C If tests indicate work does not meet specified compaction requirements, recondition, re-compact, and retest at Contractor's expense.

3.07 CLEAN-UP AND RESTORATION

- A Perform clean-up and restoration in and around construction zone in accordance with Section 01140 – Contractor's Use of Premises.
- B In unpaved areas, grade surface as a uniform slope from installed appurtenances to natural grade and stabilize as indicated on Plans.

3.08 PROTECTION OF THE WORK

- A Maintain all embankment areas in good condition until completion of Work.
- B Repair and re-compact slides, washouts, settlements, areas with loss of density, or excavation damaged by Contractor's operations at no additional cost to Owner.
- C Distribute construction traffic evenly over compacted areas, where practical, to aid in obtaining uniform compaction. Protect exposed areas having high moisture content from wheel loads that cause rutting.

END OF SECTION