

Section 207 Embankment

207.1 Description

- (1) This section describes placing in embankments and in miscellaneous backfills, material obtained under the bid items in the roadway and drainage excavation, borrow, or excavation for structures sections.

207.2 Materials

- (1) For embankment, use engineer-approved material containing no logs, stumps, brush, or other perishable material. The contractor may place excess unstable topsoil and other unstable soil in embankments outside the roadway foundation as defined in [101.3](#). Do not place frozen soil in embankments within the roadway foundation.
- (2) For the top 8 inches of earth embankments, use materials free from large stone, rock, and broken concrete or other materials that significantly affect scarifying, compacting, and finishing the subgrade.
- (3) For those portions of embankments that the contractor proposes to bore holes for piling, or to drive piling through, use materials that do not contain stone or broken concrete retained on a 3-inch sieve and free from quantities of gravel, stone, or broken concrete passing a 3-inch sieve or other material that significantly affects boring the holes or driving the piling.

207.3 Construction

207.3.1 General

- (1) Before placing embankment materials, complete any required clearing and grubbing of the site and prepare the roadway foundation as specified in [205.3.2](#), unless the contract specifies otherwise.
- (2) Remove ice and snow from the ground surface before placing embankment on the ground. Do not place embankment on frozen subgrade.
- (3) Unless the contract specifies otherwise, discontinue constructing embankments in the fall or early winter if weather conditions prevail that cause substantial freezing of the materials during placement, except if using materials from rock excavation, or of a granular nature and that contain only minor quantities of silt, clay, loam, or similar materials.

207.3.2 Placing Layers

- (1) Construct an embankment starting at the lowest point of the fill, below the grade at the bottom of ravines. Construct the embankment in layers by spreading and leveling the material during placement. Spread individual layers evenly to uniform thickness throughout and approximately parallel with the finished grade for the full width of the embankment, unless directed otherwise. Place the material in layers generally no thicker than 8 inches, to secure the required compaction. On side hills too steep to operate hauling equipment, over low wet ground, in marshes, or if filling in water, provide a single layer, just thick enough to support the hauling equipment while placing subsequent layers.

207.3.3 Placing in Marsh

- (1) If constructing embankments in trenches excavated across wet marshes or swamps, end dump the fill material. Begin filling at one end of the marsh and proceed across the marsh, close enough to the excavating operations to allow the equipment to remove any displaced peat or muck as it accumulates ahead of the advancing embankment toe. Place fill material in a way that, and to a height that, effectively displaces unstable material from within the area of the proposed embankment. Build temporary surcharges, as required, to the height and horizontal dimensions the plans show. Progressively move temporary surcharges ahead as the embankment advances.
- (2) If excavating marsh areas in a dry condition, construct the embankment in the excavation area in layers and compact it to the extent practicable.

207.3.4 Placing Rock

- (1) If the material for embankment consists of rock, broken stone, or fragmented material of a size that makes placing in 8-inch layers impracticable, then place the embankment material in layers no thicker than the approximate average size of the larger rocks. Avoid nesting and fill the voids with smaller stones and satisfactory soil or rock fines.

207.3.5 Hydraulic Fills

- (1) If constructing embankments by the hydraulic method, obtain the engineer's written approval as specified in [208.3](#) and construct as the engineer directs.

207.3.6 Compaction

207.3.6.1 General

- (1) Except as specified otherwise for backfilling wet marshes, constructing rock fills, and hydraulic fills, compact embankments using standard compaction methods unless the contract specifies special compaction.
- (2) Do not compact embankment material if the moisture content causes excessive rutting by the hauling equipment, or excessive displacement or distortion under the compacting equipment. If these conditions exist, allow the materials to dry before compacting. If necessary, accelerate drying the materials by aerating or by using blade graders, harrows, discs, or other appropriate equipment to manipulate the material.
- (3) If the embankment material does not contain sufficient moisture to compact properly, add water in quantities the engineer deems necessary to aid, accelerate, and secure effective compaction.
- (4) Compact embankments, outside the roadway foundation, to the degree contemplated for standard compaction. The engineer may allow less compaction outside the roadway foundation if the contractor uses unstable soil.

207.3.6.2 Standard Compaction

- (1) Deposit, spread, and level, as specified above, the embankment material in layers generally no thicker than 8 inches before compaction. Compact each layer of the embankment until the compaction equipment achieves no further significant consolidation. Provide the required compaction for each layer before placing any material for a succeeding layer.
- (2) Route hauling and leveling equipment over the entire area of each layer of fill to compact to the extent practicable during placement. The engineer may require specialized compaction equipment to provide additional compaction if, in the engineer's opinion, adequate compaction is not achieved without it.
- (3) Specialized compaction equipment includes pad foot rollers, pneumatic-tire rollers, vibratory rollers, or other alternate compaction equipment that produces the required results. Obtain the engineer's approval before using alternate compaction equipment.

207.3.6.3 Special Compaction

- (1) Deposit, spread, and level the embankment material, as specified above, on the properly prepared ground surface in layers generally not exceeding 8 inches thick before compaction. If compacting granular material with equipment adaptable for this purpose, the contractor may increase layer thickness to 12 inches if obtaining the required dry density. Except as specified for construction methods in [207.3.2](#), [207.3.3](#), [207.3.4](#), and [207.3.5](#), compact each layer of spread and leveled material by suitable compaction equipment, to not less than the specified dry density before placing the succeeding layer.
- (2) Compact the roadway foundation to at least the dry density specified in [207.3.6.3\(3\)](#). Compact embankment areas outside the roadway foundation as specified in [207.3.6.1\(4\)](#).
- (3) For embankments of 6 feet or less high or for portions occurring within 200 feet of a bridge abutment, compact the full depth of the embankment to at least 95 percent of maximum dry density. For embankments over 6 feet in height, compact the material placed 6 feet below the finished subgrade to at least 90 percent of maximum dry density and backfill material placed within 6 feet of the finished subgrade to at least 95 percent of maximum dry density.
- (4) The engineer will determine the maximum dry density according to AASHTO T99, Method C except, replace the fraction of material retained on the 3/4-inch sieve with No. 4 to 3/4-inch material. The engineer will determine the in-place dry density of compacted embankment material according to AASHTO T310 or by other engineer-approved methods.
- (5) If the material in the in-place density sample differs in percentage of aggregate retained on a No. 4 sieve from the sample that the maximum dry density was determined from, the engineer will adjust the maximum dry density according to approved department procedure.
- (6) The engineer will not apply the foregoing density requirements to portions of embankments constructed of materials that, because of numerous large stones or high percentages of material retained on the No. 4 sieve, the engineer cannot accurately test according to the above procedures for determining maximum dry density or in-place dry density.

207.3.6.4 Subgrade Compaction in Cuts

- (1) Compact the finished earth subgrade in cut sections for a width equal to the width of the proposed pavement plus shoulders as specified for standard compaction in [207.3.6.2](#), unless the contract specifies using special compaction.

- (2) On grading projects that require special compaction, compact the finished earth subgrade in cut sections to the width described in [207.3.6.4\(1\)](#) and to a depth of at least 6 inches to at least 95 percent of maximum density. The engineer will determine the maximum density and attained density in the subgrade as specified for special compaction under [207.3.6.3](#).

207.3.7 Shrinkage and Surcharge

- (1) If the engineer considers it necessary, build embankments to an elevation above required grade to allow for settlement; or place sufficient surcharge above the required elevation of earth grade over deposits of unstable material to secure displacement or settlement.

207.3.8 Slopes

- (1) Build embankment slopes to the lines and section the plans show or as the engineer directs. For slopes of rock fill embankments, completely fill voids with rock fines or soils, and trim slopes to a smooth uniform appearance.
- (2) Construct embankments, whose slopes are receiving topsoil or salvaged topsoil, so that after placing the topsoil the finished embankment conforms to the required section.

207.3.9 Subgrade Intermediate Consolidation and Trimming

- (1) In addition to maintaining drainage during construction as specified in [205.3.3](#), at the end of each work day consolidate and trim the subgrade to aid drainage and to protect against erosion. Consolidate and trim those portions of the subgrade surface disturbed, operated over, or constructed during that workday. Consolidate and trim until float material is pressed firmly against the subgrade and produces a tight, smooth, well-drained surface. If rain is imminent during the workday, consolidate and trim the subgrade before the rain falls to avoid ponding and erosion.

207.3.10 Backfilling Structures

- (1) Place and compact required embankments over and adjacent to culverts, bridges, retaining walls, and other structures. This includes backfilling not performed incidental to the excavation of these structures.
- (2) Use materials and construction methods specified for backfill in [206.3.13](#).
- (3) If special compaction is specified, compact backfill material placed 6 feet or more below the finished subgrade to at least 90 percent of maximum density and backfill material placed within 6 feet of the finished subgrade to at least 95 percent of maximum density. For bridge approaches, compact as specified in [207.3.6.3](#).

207.3.11 Finish Grading

- (1) Trim, finish, and maintain earth grade as specified for finish grading under [205.3.14](#).
- (2) The engineer may require the removal and disposal of rock, stone, and boulders excavated by plowing and scarifying.

207.4 Measurement

- (1) The department will not directly measure work under this section.

207.5 Payment

- (1) The department will not pay directly for work specified under this section. This work is incidental to the roadway and drainage excavation, borrow, excavation for structures, granular backfill, structure backfill sections, and other contract bid items. The work includes forming, compacting, shaping, sloping, trimming, finishing, maintaining embankments, and other incidental work required under this section.
- (2) The department will not pay separately for removing and disposing of rock, stone, and boulders that the engineer rejects under [207.3.11](#).