

SECTION 235 EMBANKMENTS

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235-1 DESCRIPTION

Place suitable material excavated under Sections 225, 226, 230 and 240 in embankments, backfills and earth berms, to conform with the lines, grades and typical cross sections shown in the plans. Fill and compact holes, pits and other depressions when unsuitable material has been removed. Work includes preparation, formation, compaction and maintenance of the embankment area as well as the formation of benches in the existing ground with rises less than 60 inches.

Surcharges and waiting periods may be required for embankments and retaining walls to minimize and control the effects of settlement on structures, approach slabs, pavements, pipes, utilities, etc. Settlement gauges may be required to monitor settlement at approximate locations shown in the plans and as directed.

235-2 MATERIALS

Refer to Division 10.

Use soil consisting of loose, friable, sandy material free of subsoil admixtures, refuse, stumps, rocks, roots, root mats or other unsatisfactory material. Do not use material that meets AASHTO M 145 for soil classification A-2-5 and A-5 with a PI of less than 8 within 12 inches of the subgrade.

Wet, dry or frozen material may be suitable when dried, wetted or thawed, respectively. Aerate and dry material containing moisture content in excess of what is required to achieve embankment stability and specified density. Waste suitable material only with written authorization.

Provide Schedule 40 black steel pipes and couplers with steel or wood bases for settlement gauges. Use steel plates with yield strength of at least 36 ksi and pressure treated wood boards for bases of settlement gauges.

235-3 CONSTRUCTION METHODS

Coordinate work with excavation operations in accordance with Articles 107-12 and 225-2.

(A) Preparation for Embankment

Finish clearing and grubbing within an area before starting embankment in accordance with Section 200. Remove and waste organic or other unsuitable material unless otherwise directed.

Plow mowed sod and leave in place where the height of embankment to be constructed is greater than 6 feet measured under the roadbed. Plow or scarify and break up cleavage planes of all underlying road surfaces. Remove or break up existing pavement in accordance with Section 250.

Bench existing slopes steeper than 4:1 measured at right angles to the roadway. Provide rises of at least 12 inches and no more than 60 inches as embankment is brought up in layers. Provide sufficient width for the operation of placing and compaction equipment. Begin bench cut at the intersection of the original ground and the vertical side of the previous cut. Construct benches greater than 60 inches in height only when shown in the plans. Such benches will be paid in accordance with the contract.

Section 235

1 (B) Embankment Formation

2 Uniformly spread material in successive, approximately horizontal layers of not more
3 than 10 inches depth, loose measurement, for the full width of the cross section.
4 Compact each layer in accordance with Subarticle 235-3(C).

5 Shape embankment surface to properly drain at all times.

6 Route construction equipment uniformly over the full width of the embankment and
7 prevent deep rutting.

8 May construct the first layer of embankments across saturated or unstable material that
9 does not support the weight of hauling equipment, by successively dumping a uniformly
10 distributed layer of a thickness not greater than necessary to support hauling equipment
11 while placing subsequent layers.

12 When placing material in swamp or in water, keep unsuitable surge material in a fluid
13 state or remove to prevent trapping in or under embankment.

14 When shown in the plans or allowed by the contract, form a satisfactory base by end or
15 side dumping in valleys, ravines and at the foot of slopes on side hills.

16 Where embankments are being constructed principally of rock or broken pavement, place
17 in uniform layers with a maximum depth of 36 inches. Place rock or broken pavement so
18 larger pieces are evenly distributed and are no larger than 36 inches in any dimension.
19 Fill all voids. Place rock or broken pavement lifts at least 2 feet below finished subgrade
20 or finished grade whichever is lower.

21 Place select material where indicated in the contract. Construct the top 6 inches of
22 shoulder and fill slopes with material that meets Article 1019-2. Construct stabilized
23 embankment when required by the contract.

24 Install pipe culverts as specified in Section 300. Construct subsurface drains adjacent to
25 structures as required by Article 414-8 for box culverts, except for that portion of the
26 drain located below the elevation of the original ground. Do not disturb existing utilities
27 within the project construction limits until released by the Engineer.

28 Do not place rock or broken pavement in embankment areas where piles or drilled shaft
29 foundations are to be constructed or where underground utilities exist. This requirement
30 shall include, but not be limited to, piles and foundations for structures, metal signal
31 poles, overhead sign structures and high mount lighting.

32 (C) Embankment Compaction

33 Compact each layer for its full width to a density equal to at least 95% of that obtained by
34 compacting a sample of the material in accordance AASHTO T 99 as modified by the
35 Department. Copies of these modified procedures are available upon request from the
36 Department's Materials and Tests Unit.

37 Uniformly bond all layers to preceding layers. Compact all surfaces on embankment
38 slopes, principally constructed of soil, that are flatter than 1.5:1 using tracked equipment
39 or other approved methods.

40 Increase or decrease moisture content of the material before compacting to produce the
41 maximum density that will provide a stable grade. Exempt portions of rock
42 embankments that cannot be tested by approved methods, from density requirements.

(D) Maintenance

Maintain all embankments made under the contract until final acceptance. Construct and maintain adequate drainage of surface runoff to prevent soil erosion. Replace damaged or displaced embankment.

(E) Surcharges and Waiting Periods

Place surcharges at locations shown in the plans. Unless required otherwise in the contract, surcharge embankments after embankments are constructed to the grade and cross section shown in the plans. Construct surcharges with side slopes as directed, 2:1 (H:V) end slopes outside of surcharge limits and surcharge heights shown in the plans. Place and compact surcharge material in accordance with Subarticles 235-3(B) and 235-3(C). Construct and maintain adequate drainage of surface runoff to prevent erosion of surcharge material.

Waiting period durations are in accordance with the contract and as directed. Surcharge waiting periods apply to surcharge locations shown in the plans and begin after surcharges are constructed to the height shown in the plans.

Unless required otherwise in the contract, bridge waiting periods are required in accordance with the following:

- (1) Apply to bridge embankments and retaining walls within 100 feet of end bent and bent locations shown in the plans and
- (2) Begin after bridge embankments and retaining walls are constructed to the elevations noted in the plans. Department's Materials and Tests Unit.

Unless required otherwise in the contract, embankment waiting periods are required in accordance with the following:

- (1) Apply to embankment locations shown in the plans and retaining walls for embankments with waiting periods and
- (2) Begin after embankments and retaining walls are constructed to the elevations, grade and cross section shown in the plans. Department's Materials and Tests Unit.

Except for maintaining embankments, do not perform any work on embankments or structures with waiting periods until waiting periods end unless otherwise approved. Place and compact additional material in accordance with Subarticles 235-3(B) and 235-3(C) to maintain embankment grade elevations during waiting periods. Remove surcharges to the grade and cross section shown in the plans after surcharge waiting periods end.

(F) Embankment Monitoring

Fabricate and install settlement gauges in accordance with the contract and the *Roadway Standard Drawings*. Make settlement gauges highly visible so gauges are not disturbed while monitoring settlement. Use only hand operated compaction equipment to compact fill material around gauges.

Do not damage settlement gauges. Damaged settlement gauges may require replacement or additional gauges and waiting period extensions as determined by the Engineer.

Bring all embankments to the grade and cross section shown in the plans before final inspection and acceptance.

235-4 TOLERANCES

Finish subgrade surface within ± 0.10 feet from the established grade after it has been graded to a uniform surface.

Section 240

1 **235-5 MEASUREMENT AND PAYMENT**

2 Payment will not be made for embankment construction. Payment at the contract unit prices
3 for the various items covered by Sections 225, 226, 230 and 240 will be full compensation for
4 all work covered by this section. Repairs to embankments caused by Contractor carelessness
5 or negligence will be incidental to the work of Sections 225, 226, 230 and 240. Repairs to
6 embankments as a result of natural causes will be at the contract unit price for the excavated
7 material required to make the necessary repairs.

8 *Borrow Excavation* for surcharge material and additional material for maintaining
9 embankment grade elevations will be measured and paid in accordance with Article 230-5.

10 *Unclassified Excavation* for surcharge material, additional material for maintaining
11 embankment grade elevations and removing surcharges will be measured and paid in
12 accordance with Article 225-7. When there is no pay item for *Borrow Excavation* or
13 *Unclassified Excavation* in the contract, surcharge material and removing surcharges will be
14 included in the lump sum payment for *Grading*. Additional material for maintaining
15 embankment grade elevations will be paid as extra work in accordance with Article 104-7.

16 *Embankment Settlement Gauges* will be measured and paid in units of each. Settlement
17 gauges will be measured as one per gauge location. The contract unit price for *Embankment*
18 *Settlement Gauges* will be full compensation for fabricating and installing settlement gauges
19 including placing and compacting fill material around gauges, adding pipes and couplers until
20 embankment monitoring ends and any incidentals necessary to monitor settlement. No
21 payment will be made for interfering with the Contractor’s operations due to embankment
22 monitoring or damaged settlement gauges as determined by the Engineer.

23 Payment will be made under:

Pay Item	Pay Unit
Embankment Settlement Gauges	Each

24 **SECTION 240**
25 **DITCH EXCAVATION**

26 **240-1 DESCRIPTION**

27 Excavate and satisfactorily dispose of all materials excavated in the construction of ditches
28 except silt ditches.

29 **(A) Drainage Ditches**

30 Define “drainage ditches” as inlet and outlet ditches for pipe culverts and structures,
31 changes in channels of streams, ditches draining borrow and material sources and parallel
32 or lateral ditches when such ditches are separated from the roadway slope by an area of
33 natural ground or berm.

34 Unless otherwise classified in the plans, parallel or lateral ditches constructed as
35 an integral part of the graded roadbed, having a continuous slope from the outer limit of
36 the shoulder to the bottom of the ditch, will be considered to be within the roadway
37 grading limits and will be part of the work covered by Section 225.

38 **(B) Berm Ditches**

39 Define “berm ditches” as ditches constructed by either excavation or the construction of
40 earth berms along the top of cut slopes. The location of berm ditches will be as shown in
41 the plans or as directed.

42 **240-2 GENERAL**

43 Excavate to the lines, grades, typical sections and details shown in the plans or established.
44 Coordinate all work covered by this section with the grading, construction of drainage