

SECTION 303—EARTHWORK

303.01—Description

This work shall consist of constructing roadway earthwork in accordance with these specifications and in conformity with the specified tolerances for the lines, grades, typical sections, and cross sections shown on the plans or as established by the Engineer. Earthwork shall include regular, borrow, undercut, and minor structure excavation; constructing embankments; disposing of surplus and unsuitable material; shaping; compaction; sloping; dressing; and temporary erosion and siltation control work.

303.02—Materials

- (a) **Borrow excavation** shall consist of approved material required for the construction of the roadway and shall be obtained from approved sources outside the project limits. Borrow excavation shall conform to the requirements of AASHTO M57 and the requirements herein.
- (b) **Materials for temporary silt fences, geotextile fabric silt barriers, and filter barriers** shall conform to the requirements of Sections 242.02(c) and 245.03(a).
- (c) **Geotextile materials used for embankment stabilization** shall conform to the requirements of Section 245.03(e).
- (d) **Mulch** shall conform to the requirements of Section 244.02(g).

303.03—Erosion and Siltation Control

Erosion and siltation shall be controlled through the use of the devices and methods specified herein or as is otherwise necessary. The Engineer reserves the right to require other temporary measures not specifically described herein to correct an erosion or siltation condition.

Erosion and siltation control devices and measures shall be maintained in a functional condition at all times. Temporary and permanent erosion and siltation control measures shall be inspected after each rainfall and at least daily during periods of prolonged rainfall. Deficiencies shall be immediately corrected. The Contractor shall make a daily review of the location of silt fences and filter barriers to ensure that they are properly located for effectiveness. Where deficiencies exist, corrections shall be made immediately as approved or directed by the Engineer.

When erosion and siltation control devices function by using wet storage, sediments shall be removed when the wet storage volume has been reduced by 50 percent. Sediments shall be removed from dewatering basins when the excavated volume has been reduced by 50 percent. Sediments shall be removed from all other erosion and siltation control devices when capacity, height, or depth has been reduced by 50 percent. Removed sediment shall be disposed of in accordance with the requirements of Section 106.04. Sediment deposits remaining in place after the device is no longer required shall be dressed to conform with the existing grade, prepared, and seeded in accordance with the requirements of Section 603.

Geotextile fabric that has decomposed or has become ineffective and is still needed shall be replaced. Temporary erosion and sediment control devices except brush silt barriers shall be removed within 30 days after final site stabilization or after the temporary devices are no longer needed as determined by the Engineer.

- (a) **Earth Berms and Slope Drains:** The top of earthwork shall be shaped to permit runoff of rainwater. Temporary earth berms shall be constructed and compacted along the top edges of embankments to intercept runoff water. Temporary Berms and temporary dikes are to be stabilized immediately following installation. Temporary slope drains shall be provided to intercept runoff and adequately secured to prevent movement. Slope drains may be flexible or rigid but shall be capable of being readily shortened or extended. A portable flume shall be provided at the entrance to temporary slope drains.
- (b) **Soil Stabilization:** Soil stabilization shall be applied within 7 days after attaining the appropriate grading increment for that stage of the construction operations, or upon suspension of grading operations for an anticipated duration of greater than 15 days, or upon completion of grading operation for a specific area. Areas excluded from this requirement include areas within 100 feet of the limits of ordinary high water or a delineated wetland which shall be continuously prosecuted until completed and stabilized immediately upon completion of the work in each impacted area. Soil stabilization includes: temporary and permanent seeding, riprap, aggregate, sod, mulching, and soil stabilization blankets and matting in conjunction with seeding. The

applicable type of soil stabilization shall depend upon the location of areas requiring stabilization, time of year (season), weather conditions and stage of construction operations.

Cut and fill slopes shall be shaped and topsoiled where specified. Seed and mulch shall be applied in accordance with the requirements of Section 603 as the work progresses in the following sequence:

- 1 Slopes whose vertical height is 20 feet or greater shall be seeded in three equal increments of height. Slopes whose vertical height is more than 75 feet shall be seeded in 25-foot increments.
- 2 Slopes whose vertical height is less than 20 but more than 5 feet shall be seeded in two equal increments.
- 3 Slopes whose vertical height is 5 feet or less may be seeded in one operation.

Areas that cannot be seeded because of seasonal or adverse weather conditions should be mulched to provide some protection against erosion to the soil surface. Organic mulch shall be used, and the area then seeded as soon as weather or seasonal conditions permit in accordance with the requirements of Section 303.03(e). Mulch shall be applied in accordance with the requirements of Section 603.04. Organic mulch includes: straw or hay, fiber mulch, wood cellulose, or wood chips conforming to the requirements of Section 244.02(g).

- (c) **Check Dams:** As an initial item of work, required check dams shall be constructed at 25-foot intervals, unless otherwise shown on the plans, below the outfall end of drainage structures.

Synthetic check dams recorded in the Department's Approved List may be substituted for Standard EC-4, Rock Check Dams, Type II, with the approval of the Engineer at no additional cost to the Department. Synthetic check dams shall be installed in accordance with the manufacturer's recommendation.

- (d) **Baled Straw Silt Barriers:** Baled straw silt barriers may be substituted for temporary filter barriers with the approval of the Engineer in noncritical areas, such as pavement areas and rock locations where filter barriers cannot be installed in accordance with the plans and specifications and locations where the Engineer determines that streams and water beds will not be affected.

- (e) **Temporary Silt Fences, Geotextile Fabric Silt Barriers, and Filter Barriers:**

- 1 **Temporary silt fences:** Fences shall be erected at locations shown on the plans or determined by the Engineer. Geotextile fabric used for silt fences shall be provided, and posts shall not be spaced more than 6 feet apart. Posts shall be uniformly installed with an inclination toward the potential silt load area of at least 2 degrees but not more than 20 degrees. Attaching fabric to existing trees will not be permitted.

Fabric shall be firmly secured to the post or wire fence. The bottom of the fabric shall be entrenched in the ground in a minimum 6-inch by 6-inch trench. Temporary silt fence may also be entrenched using a slicing method with a minimum of 8 inches sliced into the ground. Fabric may be spliced only at support posts and with an overlap of at least 6 inches. The top shall be installed with a 1-inch tuck or reinforced top end section. The height of the finished fence shall be a nominal 29 inches.

- 2 **Geotextile fabric silt barriers:** Existing fences or brush barriers used along the downhill side of the toe of fills shall have geotextile fabric attached at specified locations as shown on the plans. The bottom of the fabric shall be entrenched in the ground in a minimum 6-inch by 6-inch trench, and the top shall be installed with a 1-inch tuck or reinforced top end section. Temporary fabric silt barriers may also be entrenched using a slicing method with a minimum of 8 inches sliced into the ground.

Brush barriers shall be installed prior to any major earth-disturbing activity and trimmed sufficiently to prevent tearing or puncturing fabric. Fabric shall be fastened securely to the brush barrier or existing fence. A 6-inch overlap of fabric for vertical and horizontal splicing shall be maintained and tightly sealed.

- 3 **Temporary filter barriers:** Barriers shall consist of geotextile fabric and shall be securely fastened to wood or metal supports that are spaced at not more than 3-foot intervals and driven at least 12 inches into the ground. At least three supports shall be used. The bottom of the fabric shall be entrenched in the existing ground in a minimum 4-inch by 4-inch trench.

Temporary filter barriers may also be entrenched using a slicing method with a minimum of 6

inches sliced into the ground. The top of the fabric shall be installed with a 1-inch tuck or reinforced top end section. The height of the finished temporary filter barrier shall be a nominal 15 inches.

Temporary filter barriers shall be installed at temporary locations where construction changes the earth contour and drainage runoff as directed or approved by the Engineer.

After removal and disposal of the temporary silt fence, geotextile fabric silt barrier, and temporary filter barrier, the area shall be dressed and stabilized with a permanent vegetative cover or other approved permanent stabilization practice approved by the Engineer.

- (f) **Sediment Traps and Sediment Basins:** Sediment traps are required if storm water runoff from less than 3 acres flows across a disturbed area of 10,000 square feet or more. Sediment basins are required if storm water runoff from 3 or more acres flows across a disturbed area of 10,000 square feet or more. Once a sediment trap or basin is constructed, the dam and all outfall areas shall be stabilized immediately.
- (g) **Erosion Control Mulch:** This work shall consist of furnishing and applying mulch as a temporary erosion control treatment on slopes exposed to the elements but not at final grade during the period from December 1 to March 1 for periods of up to 30 days prior to final grading or to areas to receive stabilization or paved surfaces within 6 months in accordance with this provision and as directed by the Engineer.

Mulch shall be applied to exposed slopes requiring mulch or to areas to be stabilized or paved, within 48 hours after performance of grading operations. Straw or hay mulch shall be applied on bare slope areas at the rate of approximately 3 tons per acre (1.24 pounds per square yard). Straw or hay mulch shall be applied at a uniform thickness in such a manner that not more than 10 percent of the soil surface will be exposed. Straw or hay mulch shall be anchored to the slope surface by one of the following methods: spraying with cellulose fiber mulch at the rate of 750 pounds per acre (0.15 pound per square yard); disking or punching the mulch partially into the soil; using approved netting; or using other materials or methods approved by the Engineer. The Contractor may use more than one method on the same project.

303.04—Procedures

Loose rock 3 inches or larger shall be removed from the surface of cut slopes.

When slides occur, the Contractor shall remove and dispose of material as directed by the Engineer.

Where required, surface ditches shall be placed at the top of cut slopes or at the foot of fill slopes and at such other points not necessarily confined to the right of way or shown on the plans and shall be of such dimensions and grades as directed by the Engineer.

Allaying dust, when specified, shall be performed in accordance with the requirements of Section 511.

Prior to the beginning of grading operations in the area, necessary clearing and grubbing shall be performed in accordance with the requirements of Section 301.02.

- (a) **Regular Excavation:** Existing foundations and slabs located within the construction limits shall be removed and disposed of in a location approved by the Engineer. In lieu of removal, foundations and slabs located 5 feet or more below the proposed subgrade may be broken into particles not more than 18 inches in any dimension and reoriented to break the shear plane and allow for drainage.

Cisterns, septic tanks, wells, and other such structures shall be cleared in accordance with the requirements of Section 516.

Balance points shown on the plans are theoretical and may vary because of actual field conditions.

When the material to be excavated necessitates the use of explosives, the requirements of Section 107.11 relating to the use of explosives shall apply. To prevent damage to newly constructed concrete, the Contractor shall schedule blasting operations in the proximity of proposed concrete structures so that work will be completed prior to placement of concrete.

Regular excavation shall consist of removing and disposing of material located within the project limits, including widening cuts and shaping slopes necessary for preparing the roadbed; removing root mat; stripping topsoil; cutting ditches, channels, waterways, and entrances; and performing other work incidental thereto. The Engineer may require materials in existing pavement structures to be salvaged for use in traffic maintenance.

Undrained areas shall not be left in the surface of the roadway. Grading operations shall be conducted so that material outside construction limits will not be disturbed.

Where rock or boulders are encountered, the Contractor shall excavate and backfill in accordance with the plans and contract documents.

When the presplitting method of excavation is specified for rock cuts, work shall be performed in a manner to produce a uniform plane of rupture in the rock and so that the resulting backslope face will be unaffected by subsequent blasting and excavation operations within the section. Rock shall be presplit along rock slopes at locations, lines, and inclinations shown on the plans or as determined by field conditions. A test section shall be provided to establish the spacing of drill holes and the proper blasting charge to be used in the presplitting operation. Drill holes shall be spaced not more than 3 feet apart and shall extend to the plan grade or in lifts of not more than 25 feet, whichever is less. If drilled in benches, an offset may accommodate the head of the drill, but no offset shall be more than 12 inches. Presplitting shall extend at least 20 feet ahead of the limits of fragmentation blasting within the section.

Where the project has been designed and slopes have been staked on the assumption that solid rock will be encountered and the Contractor fails to encounter solid rock at the depth indicated, he shall cease excavation in the area and immediately notify the Engineer. If it is necessary to redesign and restake slopes, any additional excavation necessary will be paid for at the contract unit price per cubic yard.

Topsoil stockpiled for later use in the work shall be stored within the right of way unless the working area is such that the presence of the material would interfere with orderly prosecution of the work. Stockpile areas outside the right of way shall be located by the Contractor at his expense. Topsoil used in the work shall be removed first from stockpiles located on private property. Surplus topsoil remaining on private property after completion of topsoiling operations shall be moved onto the right of way and stockpiled, shaped, and seeded as directed by the Engineer.

Stripping topsoil shall be confined to the area over which grading is to be actively prosecuted within 15 calendar days following the stripping operation. Grading operations shall be confined to the minimum area necessary to accommodate the Contractor's equipment and work force engaged in the earth moving work.

- (b) **Borrow Excavation:** The Contractor shall make his own arrangements for obtaining borrow and pay all costs involved in accordance with the provisions of Section 106.03.

If the Contractor places an excess of borrow and thereby causes a waste of regular excavation, the amount of such waste, unless authorized, will be deducted from the volume of borrow as measured at the source or computed by vehicle count as specified in Section 109.01.

When borrow is obtained from sources within the right of way and the excavation is performed simultaneously with regular excavation, borrow excavation will be designated as regular excavation. Material secured by widening cuts beyond slope stakes, when taken from previously excavated slopes, will be designated as borrow excavation. When such a procedure is approved, slopes shall be uniform and no steeper than shown on the plans.

Borrow excavation areas shall be bladed and left in a shape to permit accurate measurements after excavation has been completed.

CBR values, stipulated for borrow excavation, shall apply to the uppermost three feet of fill below the top of earthwork, as defined in Section 101 of the Specifications. Borrow excavation, installed below the top three feet shall consist of suitable fill material, available from regular excavation or borrow excavation, as defined and of a quality consistent with project requirements.

- (c) **Undercut Excavation:** Undercut excavation shall consist of removing and disposing of unsuitable material located within the construction limits in accordance with the requirements of Section 303.06(a)3.

Undercut excavation shall be disposed of in accordance with the requirements of Section 106.04.

- (d) **Minor Structure Excavation:** Minor structure excavation shall consist of removing material necessary to accommodate the structure, such as box or arch culverts, including pipe arches, structural plate arches, structural plate pipe, pipe culverts, and storm drains with a span(s) or opening(s) of 48 inches or greater. Minor structure excavation shall also include dewatering,

sheeting, bracing, removing existing structures, and backfilling. Removing existing structures shall also include foundations that might be necessary to clear the site.

- (e) **Removing Unsuitable Material:** Where excavation to the finished graded section results in a subgrade or slopes of unsuitable material, such material shall be excavated below the grade shown on the plans or as directed by the Engineer. Areas so excavated shall be backfilled with approved material in accordance with (f) herein.

Excavation for structures shall be carried to foundation materials satisfactory to the Engineer regardless of the elevation shown on the plans. If foundation material is rock, the Contractor shall expose solid rock and prepare it in horizontal beds for receiving the structure. Loose or disintegrated rock and thin strata shall be removed. Excavated material, if suitable, shall be used for backfilling around the structure or constructing embankments.

Material shown on the plans as unsuitable and during construction found to be suitable for use shall first be used in embankments where needed in lieu of borrow. However, the use of this material in lieu of borrow shall not alter the provisions of Section 104.02 regarding underruns.

Material shown on the plans as suitable material but found at time of construction to be unsuitable shall be disposed of as unsuitable material.

Unsuitable material shall be disposed of in accordance with Section 106.04.

- (f) **Backfill for Replacing Undercut Excavation:** Backfill shall be composed of regular excavation, borrow, select material, subbase material, or other material as directed by the Engineer. Backfilling operations shall be performed in accordance with (g) herein.
- (g) **Backfilling Openings Made for Structures:** Backfill shall be suitable material removed for the structure, although the Engineer may require that backfill material be obtained from a source within the construction limits entirely apart from the structure or other approved material. The opening to be backfilled shall be dewatered prior to backfilling. Backfill shall not be placed against or over cast-in-place box culverts or other structures until the top concrete slab section(s) has been in place 14 days, exclusive of days on which the average high-low ambient temperature is below 40 degrees F in the shade or until the concrete control cylinder(s) has attained a compressive strength equal to 93 percent of the 28-day design compressive strength.

Backfill shall be compacted in horizontal layers not more than 6 inches in thickness, loose measurement, and as specified in (h) herein. Backfill shall be placed in horizontal layers such that there will be a horizontal berm of compacted undisturbed material behind the structure for a distance at least equal to the remaining height of the structure or wall to be backfilled. Backfill shall be placed in a manner to deter impoundment of water and facilitate existing drainage. Backfill around piers in areas not included in the roadway prism shall be constructed in uniformly compacted layers. However, density requirements will be waived.

Box culverts shall not be opened to construction equipment traffic until concrete has attained 100 percent of the 28-day design compressive strength and has a backfill cover of at least 4.0 feet. The minimum height of backfill cover required to protect pipe culverts from construction equipment shall be in accordance with Standard Drawing PC-1 for the type and size specified.

Where only one side of abutments, wingwalls, piers, or culvert headwalls can be backfilled, care shall be taken that the area immediately adjacent to the structure is not compacted to the extent that it will cause overturning or excessive pressure against the structure. When both sides of a concrete wall or box structure is to be backfilled, operations shall be conducted so that the backfill is always at approximately the same elevation on both sides of the structure.

Openings subject to flooding shall be backfilled as soon as practicable or as directed by the Engineer.

- (h) **Embankments:** Work shall consist of constructing roadway embankments; placing and compacting approved material within roadway areas where unsuitable material has been removed; and placing and compacting approved material in holes, pits, utility trenches, basements, and other depressions within the roadway area.

Embankment shall be constructed with approved material and placed so as to be uniformly compacted throughout. Embankment shall be placed adjacent to structures in the same manner as for backfill as described in (g) herein. Embankment shall not contain muck, frozen material, roots, sod, or other deleterious material. Embankment shall not be placed on frozen ground or areas covered with ice or snow.

Unsuitable material used in widening embankments and flattening embankment slopes shall be placed in uniform layers not more than 18 inches in thickness before compaction. Each layer of material placed shall be compacted to the extent necessary to produce stable and reasonably even slopes.

Wherever rock excavation is available on the project, an 8 to 15-inch layer of such materials shall be dump spread over the lower region of embankments in the immediate vicinity of stream crossings and used to cover ditches, channels, and other drainage ways leading away from cuts and fills. However, drainage ways shall be prepared to receive the rock excavation to the extent necessary to avoid reducing their cross section. If rock excavation is not available on the project, rip-rap, jute mesh or soil retention mats shall be used as the covering material and shall be installed in accordance with the requirements of Section 606.03(c). Limits of the area to be covered will be as noted on the plans or as directed by the Engineer.

Wherever sufficient right of way exists, surplus materials shall be used to widen embankments and flatten slopes as directed by the Engineer.

Rock excavation may be placed on slopes by uniform end dumping of the material from along the top of the embankment or as directed by the Engineer. Slopes that are covered with rock excavation shall not receive topsoil or seed.

When geotextile drainage fabric is required under rock fills, preparation shall be as specified in Section 245.

The Contractor shall schedule excavation and embankment work in a manner that will minimize the quantity of unsuitable material for which more than one handling is required prior to final placement. Therefore, the provisions for additional payment for each rehandling of material specified in Section 303.06(a) will not apply to placing unsuitable material for widening embankments and flattening embankment slopes.

The surface area directly beneath the pavement and shoulders on which embankments of less than 5 feet in depth are to be constructed shall be denuded of vegetation. These areas shall be scarified and compacted to a depth of 6 inches to the same degree as the material to be placed thereon.

Areas that contain material unsuitable as foundations for embankments shall be undercut and backfilled in accordance with (e) and (f) herein.

Embankments to be placed over saturated areas that will not support the weight of hauling equipment may be constructed by end dumping successive loads in a uniformly distributed layer of a thickness capable of supporting the hauling equipment while subsequent layers are placed. The nose, or leading edge, of the embankment shall be maintained in a wedge shape to facilitate mud displacement in a manner that will prevent its entrapment in the embankment. The front slope of the embankment shall be maintained steeper than 2:1. The use of compacting equipment will not be required on the original course. However, the remainder of the embankment shall be constructed in layers and compacted in accordance with these specifications.

When geotextile for embankment stabilization is required, it shall be placed as shown on the plans. Geotextile shall be spliced by sewing double-stitched seams with stitching spaced $\frac{1}{4}$ inch to $\frac{1}{2}$ inch apart or as shown on the plans.

Once geotextile for embankment stabilization is placed, the initial lift of material to be placed atop shall be free draining and shall be end dumped onto the geotextile and spread to the thickness as shown on the plans. Free-draining material shall be any material of which 15 percent or less passes the No. 200 sieve. If the geotextile becomes punctured or torn, the Contractor shall repair the area with geotextile lapped at least 3 feet all around the damaged area.

When embankment is to be placed and compacted on an existing road, the surface shall be scarified to such degree as will permit an ample bond between old and new material. Hydraulic cement concrete and asphalt concrete pavement structures within the proposed roadway prism shall be demolished in accordance with Section 508.02(a).

Existing slopes shall be continuously benched where embankments are constructed one-half width at a time; against slopes of existing embankments or hillsides; or across existing embankments, hillsides, and depressions at a skew angle of 30 degrees or more or the existing slopes are steeper than 4:1. For slopes steeper than 4:1 but not steeper than 1-1/2:1, the bench shall be at least 6 feet in width. For slopes steeper than 1-1/2:1 but less than 1/2:1, the bench shall be at least 4 feet in width. Benching shall consist of a series of horizontal cuts beginning at the intersection with the

original ground and continuing at each vertical intersection of the previous cut. Material removed during benching operations shall be placed and compacted as embankment material.

When excavated material consists predominantly of soil, embankment shall be placed in successive uniform layers not more than 8 inches in thickness before compaction over the entire roadbed area. Each layer shall be compacted within a tolerance of ± 20 percent of optimum moisture content to a density of at least 95 percent of the theoretical maximum density as defined in Section 101.02.

Material having a moisture content above optimum by more than 30 percent shall not be placed on a previously placed layer for drying unless it is shown that the layer will not become saturated by downward migration of moisture in the material.

Field density determinations will be performed in accordance with the requirements of AASHTO T191, modified to include material sizes used in the laboratory determination of density, with a portable nuclear field density testing device or by other approved methods. When a nuclear device is used, density determinations for embankment material will be related to the density of the same material tested in accordance with VTM-1 or VTM-12 and a control strip will not be required.

As the compaction of each layer progresses, continuous leveling and manipulating shall be performed to ensure uniform density. Prior to placement of subsequent layers, construction equipment shall be routed uniformly over the entire surface of each layer or the layer shall be scarified to its full depth in the area where the equipment is routed.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the thickness prescribed without crushing, pulverizing, or further breaking down the pieces resulting from excavation methods, such material may be placed in the embankment in layers that are not thicker than the approximate average size of the larger rocks. Rock not more than 4 feet in its greatest dimension may be placed in an embankment to within 10 feet of the subgrade. The remainder of the embankment to within 2 feet of the subgrade shall not contain rock more than 2 feet in its greatest dimension. Each layer shall be constructed so that rock voids are filled with rock spalls, rock fines, and earth. Rock shall be placed, manipulated, and compacted in uniform layers. However, density requirements may be waived. Rock, rock spalls, rock fines, and earth shall be distributed throughout each embankment layer and manipulated as specified herein so that the voids are filled. Rock shall not be end dumped over the edges of the layer being constructed but shall be deposited on the layer and moved ahead so as to advance the layer with a mixture of rock, rock spalls, rock fines, and earth. The 2 feet of the embankment immediately below the subgrade shall be composed of material that can be placed in layers of not more than 8 inches before compaction and compacted as specified herein for embankments. Rock more than 3 inches in its greatest dimension shall not be placed within 12 inches of the subgrade in any embankment.

Rock, broken concrete, or other solid materials shall not be placed in embankment areas where piling is to be placed or driven.

The best material shall be reserved for finishing and dressing the surface of embankments. Work necessary to ensure the reservation of such material shall be the responsibility of the Contractor. Section 303.06(a) will not apply to subsequent handling of capping material.

CBR values, stipulated for Embankment, shall apply to the uppermost three feet of fill below the top of earthwork, as defined in Section 101 of the Specifications. Embankment, installed below the top three feet shall consist of suitable fill material, available from regular excavation, borrow excavation or embankment, as defined and of a quality consistent with project requirements.

Crushed glass shall be limited within the boundaries of the embankment as follows. Crushed glass shall be a minimum of two feet inside the side slope and contain a minimum of two feet of soil embankment cap. For those areas where crushed glass is to be incorporated into the embankment, glass may constitute up to approximately ninety percent by weight of that portion of the embankment, except where 100 percent crushed glass is used for drainage purposes (including blankets).

Crushed glass shall be blended with soil and/or soil like materials as follows:

- 1 The embankment shall be constructed by placing alternate four-inch layers of waste glass and soil and mixing and blending by scarification or other approved methods during compaction. The thickness of uncompacted layers of soil/glass shall be a maximum of 8 inches (loose); or
- 2 Pugmilled in predetermined ratios to a visually consistent blend and placed in lifts of a maximum of 8 inches (loose); or

3 As directed by the Engineer.

Compaction of the soil/glass embankment shall be to the satisfaction of the Engineer and shall be accomplished with a vibratory compactor or other approved methods. Moisture and density requirements for the soil/glass embankments shall be the same as other conventional soil embankment in accordance with the requirements of Section 303 of the Specifications.

Normal compaction procedures and requirements are to be used for compaction of the soil embankment "cap" above the crushed glass/soil blends.

(i) **Settlement Plates and Surcharge:** The Contractor shall expedite construction of embankment to provide the maximum time possible for settlement prior to completing grading operations.

1 **Settlement plates:** The base of settlement plates shall be firmly seated into original ground for the full depth of the steel fins. The base shall be leveled. The Engineer shall be provided time to obtain the elevation of the seated base and the top elevation of the pipe extensions prior to placement of embankment material. Pipe extensions shall not be more than 4 feet in length and shall be vertically installed as the embankment is constructed such that the top of the pipe is not covered. As each extension is added, the Engineer shall be provided time to obtain the top elevation of the existing pipe and the top elevation of the new pipe extension. Pipe extensions shall be properly flagged at all times. Care shall be taken while placing and compacting embankment material around pipe extensions. Settlement plates shall be maintained until no longer required, as determined by the Engineer. Upon completion of the normal embankment plus 2 feet of the specified surcharge, the Contractor shall immediately commence placing the remaining surcharge to the limits shown on the plans or as directed by the Engineer. The remaining surcharge shall be placed in lifts of not more than 1 foot in depth and compacted uniformly with construction hauling and spreading equipment. Each lift shall be completed over the entire surcharge area before the next lift is begun.

If a settlement plate is damaged, the Contractor shall notify the Engineer immediately and promptly repair it under the observation of the Engineer to the nearest undamaged pipe. Excavation, backfill, compaction, and repair of settlement plates shall be at the Contractor's expense. The Engineer shall be provided time to obtain the top elevation of the undamaged connection and the top elevation of each subsequent pipe extension.

Settlement plates shall remain in place until settlement has been completed as indicated by elevation readings taken by the Engineer at approximately 2-week intervals. Evaluation of the readings by the Engineer will be the final and sole governing factor for releasing embankments for grading operations. Upon written release by the Engineer, extensions of settlement plate pipe shall be removed to at least 2 feet below the subgrade, the pipe capped, and the area backfilled and compacted.

2 **Surcharge:** When authorized by the Engineer, surcharge shall be removed to the subgrade and embankment slopes graded to the typical section. Removed surcharge shall be placed in roadway embankments not previously brought to grade or shall be disposed of in accordance with Section 106.04 or as directed by the Engineer.

(j) **Hydraulic Embankment:** Hydraulic embankment shall consist of dredging and pumping materials approved by the Engineer from designated areas, placing the material in embankments, and dressing and completing the embankment. Material shall be nonplastic and of such grading that not more than 7 percent will pass the No. 200 sieve.

Unless otherwise shown on the plans, material for the embankment shall not be obtained from sources closer than 300 feet from the toe of the slope of the embankment. The Engineer may reject materials considered to be unsatisfactory for use in the embankment, and such materials shall be stripped at the Contractor's expense before the embankment is built. Muck and unsuitable material shall be removed to the line, grade, and section shown on the plans. Unsatisfactory material brought to the top of the embankment shall be removed by the Contractor at his own expense, and satisfactory material shall be substituted.

In placing material in the embankment, the Contractor shall begin at the centerline and deposit material in either or both directions toward the toe of slopes. Discharge shall always be in the direction of and parallel with the centerline. The maximum distance from the bottom of the discharge pipe to the surface on which material is being deposited shall be 5 feet unless otherwise directed by the Engineer. Material shall be deposited in a manner that will maintain a higher elevation at the center of the roadway than on either side. The Contractor will not be permitted to

construct retaining levees along the roadway of such dimensions as to cause damage to the foundation of the roadway. The Contractor shall conduct operations so as to ensure the completion of an embankment that will conform to the cross section shown on the plans except that he will be permitted to flatten side slopes. However, if material is deposited on private property, the Contractor shall obtain permission in writing from the affected property owner(s). No payment will be made for material beyond the limits of the net pay section.

The embankment shall be placed so as to ensure a minimum relative density of 80 percent of the theoretical maximum density when tested in accordance with (h) herein. If the method of placing the embankment fails to produce the required density, the Contractor shall use approved methods to obtain the specified density.

The Contractor shall take all necessary precautions to prevent placing material in streams. The Contractor shall be responsible for all damage to or caused by the hydraulic embankment. The Contractor shall provide sufficient material to maintain the embankment in accordance with the typical cross section as shown on the plans or as directed by the Engineer until final acceptance.

The Contractor's plan for support of suction or discharge pipes shall be submitted to and approved by the Engineer. Traffic shall be protected by the display of warning devices both day and night. If dredging operations damage an existing traveled highway, the Contractor shall cease operations and repair damage to the highway.

- (k) **Surplus Material:** Surplus material shall not be wasted or sold by the Contractor unless authorized in writing by the Engineer. When authorization has been given for surplus material to be wasted, it shall be disposed of in accordance with the requirements of Section 106.04.

Material shown on the plans as surplus material will not be considered for overhaul payment.

- 1 **Disposal of surplus material within the right of way where the haul distance is 2,000 feet or less:** Surplus material shall be used or disposed of where directed within a haul distance of 2,000 feet of its origin. Usage in this manner will not be considered a change in the character of the work.
- 2 **Disposal of surplus material within the right of way where the haul distance is more than 2,000 feet:** The Engineer reserves the right to require the Contractor to use surplus material in lieu of furnishing borrow, or as otherwise directed, where the haul distance from the origin of the material is more than 2,000 feet. Disposal of surplus material at locations requiring a haul of more than 2,000 feet will be considered a change in the character of work unless otherwise noted on the plans.

When material is declared surplus during construction and must be transported more than 2,000 feet from its origin, the Department will pay the Contractor \$0.03 per station per cubic yard for overhaul. The quantity of surplus excavation will be determined by vehicle measurement in accordance with the provisions of Section 109.01 or from cross-section measurements by the average end area method. The haul distance will be measured along a line parallel with the centerline of the roadway from the center of the excavated area to the center of the placement area. Overhaul will be the product of the quantity of surplus material in cubic yards and the haul distance in excess of 2,000 feet in 100-foot stations.

303.05—Tolerances

- (a) **Finished grade of subgrade** shall conform to the requirements of Section 305.03(c).
- (b) **Slopes** shall be graded in the following manner:
 - 1 Earth excavation slopes:
 - a. **Slopes steeper than 2:1** shall be grooved in accordance with the standard drawings and shall not deviate from the theoretical plane surface by more than 0.5 foot.
 - b. **Slopes steeper than 3:1 up to and including 2:1** shall be rough graded in a manner to provide horizontal ridges and grooves having no more than 0.5 foot deviation from the theoretical line of the typical cross section as is accomplished by the normal operation of heavy grading equipment.
 - c. **Slopes 3:1 or flatter** shall be uniformly finished and shall not deviate from the theoretical plane surface by more than 0.5 foot.

2 **Earth embankment slopes:**

Slopes steeper than 3:1 shall not deviate from the theoretical plane slope by more than 0.5 foot and shall be rough graded in a manner to provide horizontal ridges and grooves not more than 0.5 foot from the theoretical line of the typical cross section as is accomplished by the normal operation of heavy grading equipment.

- a. **Slopes 3:1 and flatter** shall be uniformly finished and shall not deviate from the theoretical plane surface by more than 0.5 foot.

3 **Rock slopes** shall not deviate from a plane surface by more than 2.0 feet and shall not deviate from their theoretical location by more than 2.0 feet measured along any line perpendicular to the theoretical slope line.

Finished excavation and embankment slopes shall not deviate from their theoretical location by more than 0.5 foot measured along any line perpendicular to the theoretical slope line.

303.06—Measurement and Payment

- (a) **Excavation:** Excavation will be paid for at the contract unit price per cubic yard unless otherwise specified.

Excavation requiring more than one handling prior to final placement will be paid for at the contract unit price for regular excavation for each handling approved by the Engineer unless there is a pay item for the second handling, in which case work will be paid for at the contract price for such handling.

Quantities of regular or borrow excavation used to backfill pipe, pipe culverts, and box culverts will not be deducted from quantities due the Contractor for payment.

- 1 **Regular excavation:** When payment is specified on a cubic yard basis, regular excavation will be measured in its original position by cross-sectioning the excavation area. This measurement will include overbreakage or slides not attributable to the carelessness of the Contractor and authorized excavation of rock, muck, root mat, or other unsuitable material except material included in undercut excavation. Volumes will be computed from cross-section measurements by the average end area method.

When it is impractical to measure material by the cross-section method, other acceptable methods involving three-dimensional measurements may be used.

Excavation for benching slopes to accommodate roadway embankments as specified in Section 303.04(h) will not be measured for separate payment. The cost thereof shall be included in the price for the related excavation or embankment item.

Excavation of existing roadways required to incorporate old roadway into new roadway or remove salvageable materials for use in traffic maintenance, other than those covered in Section 508, will be measured as regular excavation.

When “presplitting rock cuts” is shown on the plans, the work shall be considered incidental to the cost of excavation and will not be measured for separate payment.

In cut sections, excavation of topsoil and root mat and material down to a point 1 foot below the elevation of the top of earthwork or to the depth specified on the plans will be measured as regular excavation. When areas of unsuitable material are shown on the plans, excavation down to a point 1 foot below the elevation of such material shown on the plans will be measured as regular excavation.

In fill sections, excavation of topsoil and root mat and material down to an elevation of 1 foot below the bottom of topsoil and root mat will be measured as regular excavation. When areas of unsuitable material are shown on the plans, excavation down to a point 1 foot below the elevation of such material shown on the plans will be measured as regular excavation.

If slide material approved for measurement cannot be measured accurately, or if the removal of slide material will require different equipment than that being used in the regular excavation operations, payment therefor may be made on a force account basis when authorized by the Engineer.

Excavation of surface ditches specified on the plans or otherwise required by the Engineer will be paid for as regular excavation except that when required after the slopes have been completed and the work cannot be performed with mechanical equipment, the excavation will

be paid for as undercut excavation.

- 2 **Borrow excavation:** Borrow excavation will be measured in its original position by cross-sectioning the area excavated. The number of cubic yards will be computed from cross-section measurements by the average end area method. When it is impractical to measure the borrow excavation, vehicular measurement in accordance with Section 109.01 may be used.

Borrow excavation with a stipulated CBR value shall be measured and paid for as borrow excavation with the CBR value as specified.

Borrow excavation without a stipulated CBR value shall be measured and paid for as borrow excavation.

- 3 **Undercut excavation:** Measurement will be made by cross-sectioning the undercut area. The number of cubic yards will be computed by the average end area method. When it is impractical to measure material by the cross-section method because of erratic location of isolated deposits, acceptable methods involving three-dimensional measurements may be used.

When unsuitable material must be removed from an area of the project where undercut is not shown on the plans, unsuitable material removed after reaching the depth specified in (a)1. herein, or 1 foot below original ground in fill sections where topsoil and root mat are not required to be removed, will be measured as undercut excavation.

Excavation of rock or unsuitable material below the elevation of the bottom of the lower theoretical slab or culvert thickness or below the excavation limits shown on the plans or standard drawings for normal earth foundations, whichever is the greater depth, of minor structures having a span(s) or opening(s) of less than 48 inches will be measured for payment as undercut excavation. Such excavation for structures having a span(s) or opening(s) of 48 inches or greater will be measured as minor structure excavation in accordance with (a)4. herein.

Undercut excavation will be paid for at the contract unit price per cubic yard. This price shall include removal and disposal. When not a pay item, undercut excavation will be paid for at twice the unit price per cubic yard for regular excavation.

- 4 **Minor structure excavation:** Excavation of material above the elevation of the bottom of the lower theoretical slab or culvert thickness, or above the excavation limits shown on the plans for earth foundations, whichever is the greater depth, for culverts having a maximum span or opening of less than 48 inches will not be measured for payment.

Excavation of material for culverts having a span(s) or opening(s) of 48 inches or greater and excavation for minor structures not covered elsewhere in these specifications will be measured in cubic yards of minor structure excavation. The quantity allowed for payment will be the actual volume of material removed as bounded by the bottom of the lower theoretical slab or culvert thickness, or lower excavation limits shown on the plans for earth foundations, whichever is the greater depth; the original ground or regular excavation pay line, whichever is the lower elevation; and vertical planes 18 inches outside the neat lines of the structure (excluding wingwalls and other appurtenances) or bound by vertical planes coincident with the applicable bedding excavation limits shown on the plans. Payment for excavation for wingwalls and other appurtenances to structures will be based on the ratio of the plan area of the wingwalls or appurtenances to the plan area of the barrel. Once the ratio has been determined, the pay quantity for minor structure excavation will be increased accordingly.

If embankment is placed prior to installation of a minor structure, excavation of the embankment area will not be measured for payment unless the Contract requires placement of the embankment prior to the installation of the minor structure.

The volume of the interiors of culverts, drop inlets, and other existing minor structures that must be removed will not be deducted from the overall quantity of minor structure excavation allowed for payment.

The price of minor structure excavation shall include the cost of backfill above the horizontal planes of the neatlines of the Class I or Class II backfill areas to original ground. Class I and Class II backfill shall be measured and paid for in accordance with Section 302.04.

- 5 **Earthwork:** When a pay item, earthwork will be paid for at the contract lump sum price, wherein no measurement will be made. This price shall include regular excavation, minor structure excavation, and grading.

(b) **Embankments:**

- 1 **If embankment is not a pay item**, the cost of embankment construction will be considered incidental to other items of excavation.
- 2 **If embankment is a pay item and regular excavation is to be paid for on a plan quantity basis**, the quantity of embankment for which payment will be made will not be measured separately but will be computed in accordance with the following:
 - a. The regular excavation plan quantity will be adjusted in accordance with (C) Plan Quantities herein.
 - b. The quantity of unsuitable material will be measured and subtracted from the adjusted regular excavation quantity determined in 2.a. herein. Quantities of unsuitable material removed from fill areas or below the subgrade in cut areas will be determined by using plan dimensions and may be adjusted for deviations based on actual measurement. Actual dimensions will be used to determine the quantity of any other unsuitable material.
 - c. The total quantity shown on the plans will be adjusted for quantities not anticipated on the plans, such as changes in grade or undercut determined to be necessary during construction.
 - d. The quantity of suitable material determined in 2.b. herein will be subtracted from the adjusted total fill quantity determined in 2.c. herein. The resultant quantity will be the embankment quantity for which payment will be made.

The Contractor shall be responsible for determining the effect of the shrinkage or swell factor of the material, and no adjustment will be made in pay quantities for this factor.

Hydraulic embankment will be paid for as embankment.

- 3 **If embankment is a pay item and regular excavation is to be paid for on the basis of measured quantities**, the quantity of embankment will be measured in cubic yards computed by the average end area method from the dimensions of the embankment cross section.

Cross sections of the area to be covered by the embankment will be taken after the denuding or removal of unsuitable material and before any material is placed thereon. These cross sections shall extend laterally from the centerline to the toes of slopes as indicated on the typical cross section. The elevations as determined by these sections will be considered the original ground line. The pay quantity to be measured will be the volume of material included in the section above the original ground and below the upper limits of the typical cross section.

When regular excavation is a pay item, the embankment area to be cross-sectioned will exclude that portion of the fill constructed from regular excavation. Material outside the limits of typical cross sections as shown on the plans will not be measured or paid for.

- 4 **Extra embankment required for subsurface consolidation** will be determined by the use of settlement plates. The total settlement recorded at each settlement plate will be allowed across 75 percent of the lateral width of each section. Volumes will be computed using the average end area method. Embankment quantities will be adjusted as specified herein to include extra embankment for subsurface consolidation.

Settlement plates will be measured and paid for in units of each, complete-in-place. This price shall include furnishing, installing, maintaining, and removing when no longer required.

Surcharge placement and removal will be measured in cubic yards as determined by the plan quantity and will be paid for at the contract unit price per cubic yard. This price shall include furnishing, placing, and removing surcharge material and disposing of surplus and unsuitable materials.

- 5 **If geotextile drainage fabric is a pay item**, measurement and payment will be in accordance with the requirements of Section 504.

- 6 **Geotextile for embankment stabilization** will be measured in square yards complete-in-place. Overlaps and seams will not be measured for separate payment. The accepted quantity of geotextile will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing, placing, lapping, or seaming material and for all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Embankment with a stipulated CBR value shall be measured and paid for as embankment with the CBR value as specified.

Embankment without a stipulated CBR value shall be measured and paid for as embankment.

- (c) **Plan Quantities:** The quantity of regular excavation for which payment will be made when plan quantities are specified will be that specified in the Contract. However, borrow excavation; excavation for entrances; unsuitable material below the top of earthwork; undercut excavation; slide excavation; rock excavation that changes the slopes or causes undercut; and side, inlet, and outlet ditches not covered by plan cross sections will be measured in their original position by cross sections and computed in cubic yards by the average end area method.

Where there are authorized deviations from the lines, grades, or cross sections, measurements will be made and the volume computed in cubic yards by the average end area method for these deviations. The plan quantity will then be adjusted to include these quantities for payment.

When unauthorized deviations occur, allowances will not be made for overruns. However, if the deviation decreases the quantities specified in the Contract, only the actual yardage excavated will be allowed.

- (d) **Backfill:** Furnishing and placing backfill material, including backfill for undercut, will be included in the price for excavation and will not be measured for separate payment unless specific material is a pay item for backfill or unless suitable material is not available within the construction limits. When a specific material is a pay item, the unit of measure of the material will be in accordance with the unit specified in the Contract. When suitable backfill is not available within the construction limits, the material furnished and placed by the Contractor will be paid for in accordance with the requirements of Section 109.05.

- (e) **Erosion Control Items:**

- 1 **Limiting the scope of construction operations, shaping the top of earthwork, and constructing temporary earth berms and brush silt barriers for temporary erosion and siltation control** will not be measured for payment but shall be included in the price for other appropriate pay items.

- 2 **Erosion control riprap** will be measured and paid for in accordance with the requirements of Section 414.04.

- 3 **Temporary protective covering** will be measured and paid for in accordance with the requirements of Section 606.04.

- 4 **Check dams** will be paid for at the contract unit price per each. This price shall include furnishing, excavating, constructing, maintaining, and removing check dams when no longer required.

Synthetic check dams may be substituted for Type II Rock Check Dams (Standard EC-4) at no additional cost to the Department.

- 5 **Temporary silt fences** will be measured in linear feet, complete-in-place, excluding laps, and will be paid for at the contract unit price per linear foot. Decomposed or ineffective geotextile fabric replaced after 6 months from the installation date will be measured in linear feet of temporary silt fence and paid for at 1/2 the contract unit price for temporary silt fence. Decomposed geotextile fabric required to be replaced prior to 6 months after installation will not be measured for payment. This price shall include furnishing, installing, and maintaining the silt fence, including wire reinforcement and posts; removing and disposing of these materials, and dressing and stabilizing the area.

- 6 **Geotextile fabric** attached to brush barriers or existing fence or used for another function specified on the plans and not included in other pay items will be measured in square yards, complete-in-place, excluding laps, and will be paid for at the contract unit price per square yard. The brush barrier will not be measured for payment. The cost thereof shall be included in the price for clearing and grubbing. This price shall include trimming the brush barrier; furnishing, installing, maintaining, and removing the fabric; and dressing and stabilizing the area.

- 7 **Temporary filter barriers** will be measured in linear feet, complete-in-place, excluding laps, and will be paid for at the contract unit price per linear foot. Decomposed or ineffective geotextile fabric replaced after 6 months from the installation date and decomposed or ineffective burlap fabric replaced after 3 months from the installation date will be measured in linear feet of temporary filter barrier and paid for at 1/2 the contract unit price for temporary filter barrier. Decomposed geotextile fabric required to be replaced prior to 6 months and decomposed burlap fabric required to be replaced prior to 3 months after installation will not be measured for payment. When permitted, baled straw silt barrier used in lieu of temporary filter barrier will be paid for in linear feet of temporary filter barrier, complete-in-place. This price shall include furnishing, installing, and maintaining the filter barrier, including filter barrier material and posts; removing and disposing of these materials; and dressing and stabilizing the area. If the Contractor is permitted to use baled straw silt barrier in lieu of temporary filter barrier, payment will be made at the price for temporary filter barrier.
- 8 **Silt cleanout**, when approved or directed by the Engineer, will be measured as siltation control excavation in cubic yards of vehicular measurement in accordance with the requirements of Section 109.01 for the full volume of the vehicle.

Silt removal and sediment cleanout will be paid in cubic yard of siltation control excavation. Payment shall be full compensation for removal of silt and sediment approved or directed by the Engineer and for transportation and disposal of the material.

If approved or directed by the Engineer, the installation of additional temporary silt fence and temporary filter barrier in lieu of silt cleanout will be measured in linear feet as specified in (e)5. and (e)7. herein.
- 9 **Seeding materials** will be measured and paid for in accordance with the requirements of Section 603.
- 10 **Temporary erosion and siltation measures required to correct conditions created because of the Contractor's negligence, carelessness, or failure to install permanent controls in accordance with the plans and sequence for performance of such work** will not be measured for payment.
- 11 **Slope drains** will be measured in units of each, per location regardless of size or length and will be paid for at the contract unit price per each. Raising of the slope drain and addition of pipe lengths will not be measured as a new location. This price shall include furnishing, installing, maintaining, and removing the drain and end section or portable flume.
- 12 **Sediment traps and basins** will be measured in cubic yards of sediment basin excavation and will be paid for at the contract unit price per cubic yard. This price shall include excavation, maintenance, and backfill or removing to original ground when no longer needed.
- 13 **Storm water management basin excavation** will be measured in cubic yards and will be paid for at the contract unit price per cubic yard. The price shall include excavation, maintenance, and shaping of basin.
- 14 **Temporary sediment basin excavation** will be measured in cubic yards and will be paid for at the contract unit price per cubic yard. The price shall include excavation, maintenance and when no longer required the removal of dam, pipe, riser pipe, trash rack, backfill and site restoration.
- 15 **Drop inlet silt trap** will be measured in units of each and paid for only one time during the life of the project.
- 16 **Dewatering basin** will be measured and paid for at the contract unit price per each. This price shall include furnishing, installing, maintaining, and when no longer required, removing the dewatering basin; backfill; and site restoration.
- 17 **Erosion control mulch** shall be paid for per square yard or acre. This includes all materials and equipment necessary for the application.

Payment will be made under:

Pay Item	Pay Unit
Regular excavation	Cubic yard
Borrow excavation	Cubic yard
Borrow excavation (CBR [value])	Cubic yard
Sediment basin excavation	Cubic yard
Siltation control excavation	Cubic yard
Undercut excavation	Cubic yard
Minor structure excavation (Item)	Cubic yard
Earthwork	Lump sum
Embankment	Cubic yard
Embankment (CBR [value])	Cubic yard
Settlement plate	Each
Surcharge placement and removal	Cubic yard
Geotextile (Embankment stabilization)	Square yard
Check dam (Type) (Log, rock, or straw)	Each
Temporary silt fence	Linear foot
Geotextile fabric	Square yard
Temporary filter barrier	Linear foot
Slope drain	Each
Storm water management basin excavation	Cubic yard
Temporary sediment basin excavation	Cubic yard
Drop inlet silt trap (Type)	Each
Dewatering basin	Each
Erosion control mulch	Square yard or acre