Section 205. ROADWAY EARTHWORK

205.01. Description. This work consists of the following:

A. Constructing earth grades by excavating soil or rock and placing embankments or fills;
B. Salvaging and stockpiling selected materials;
C. Providing, placing, and compacting embankment materials;
D. Trimming the earth grade;
E. Disposing of surplus or unsuitable material; and
F. Maintaining the work in a finished condition until accepted by the Engineer.

Earth excavation consists of the work to excavate materials not otherwise addressed in the contract as separate work items. Rock excavation and subgrade undercutting are separate work items.

Investigate local conditions before bidding, in accordance with subsection 102.04. Soil series notations and boring logs, shown on the plans, are for information only. Refer to the Michigan Department of State Highways Field Manual of Soil Engineering, 5th edition for detailed data regarding soil series notations and soils descriptions.

Terminology.

CIP. A term, when used with an embankment item, that denotes Compacted in Place.

LM. A term, when used with an embankment item, that denotes Loose Measure.

Sound Earth. A natural, or otherwise Engineer-approved material, that can be compacted to the required density, contains no organic material, and has a maximum unit weight of at least 95 pounds per cubic foot.

Frost Heave Textured Material. A material with more than 50 percent silt particles by weight, and a plasticity index less than 10.

Silt. A material with a particle size from 0.002 mm to 0.075 mm.

205.02. Materials. Provide materials in accordance with the following:

Granular Material Class II, III.......................................................... 902
Open-Graded Aggregate................................................................. 902
Geosynthetics........................................................................... 910

Do not use foundry sand from metal casting for roadway earthwork.
Refer to the *Density Testing and Inspection Manual* for maximum unit weight and in-place density test methods.

**205.03. Construction.** Before beginning earth disturbing activities, install soil erosion and sedimentation control (SESC) measures, in accordance with section 208.

The Department considers buried rubbish and trash, not identified in the contract, a differing site condition in accordance with subsection 103.02.C.

A. **Preparing Roadway Foundation.** Remove material from the roadway foundation and salvage or dispose. Compact the roadway foundation to the depth and density required.

Perform removal, salvage, and disposal operations in accordance with the following:

1. **Removing and Salvaging Topsoil.** Before removing topsoil, reduce vegetation to a height of 6 inches. Remove and dispose of cut vegetation, brush, rocks, and other litter.

   Remove topsoil to the required depth from designated areas before excavating or placing embankment. Use equipment and methods that avoid lifting subsoil. Suspend topsoil removal if the Engineer determines soil or weather conditions are unsuitable.

   Use topsoil from the roadway on slopes, or stockpile unused topsoil within the right-of-way, and outside the limits of construction. Locate and shape topsoil stockpiles outside of the drip line of preserved trees and away from drainage courses and wetlands.

   If temporarily stockpiling topsoil outside the right-of-way, obtain written permission from the owner of the property designated for material placement and required permits in accordance with subsection 208.03.A. Provide documentation to the Engineer before stockpiling topsoil. Do not stockpile temporarily or permanently in wetlands or floodplains.

   Remove topsoil as follows:

   a. In peat and muck areas, do not remove topsoil;
   b. In borrow and clear vision areas, remove topsoil to the depth and width required;
   c. At inlet, outlet, and berm ditch areas, remove topsoil within the construction limits; and
   d. At roadway cut and embankment areas, remove topsoil within the limits of earth disturbance.
2. **Salvaging Materials.** Remove existing gravel, crushed stone, or selected excavated materials. The Contractor may salvage these materials. The Engineer may approve the use of salvaged materials to construct earth shoulders, approaches, temporary roadway surfacing, or other work the Engineer determines appropriate. Do not salvage foreign or undesirable material. Temporarily stockpile salvaged material outside the limits of Contractor's earth disturbance, and within the right-of-way limits, as approved by the Engineer.

Excess salvaged material is the property of the Contractor. Remove excess salvaged material before project completion. If the Engineer approves excess salvaged material stockpiles to remain on the project, trim excess stockpiles to a neat appearance.

3. **Disposing of Stones, Broken Rock, and Boulders.** The Engineer may allow placement of stones, broken rock, and boulders in the right-of-way in a safe and scenic manner. For material that cannot be incorporated in the work, bury between the roadway and right-of-way lines, or dispose outside the right-of-way. Bury stones, broken rock, and boulders below the natural ground level, with at least 12 inches of cover material. Dispose of materials in accordance with subsection 205.03.P.

B. **Rock Excavation.** Excavate boulders with a volume of at least ½ cubic yard. Excavate rock or cemented soils that do not soften when wet or that cannot be excavated without continuous drilling, blasting, or continuous use of a ripper or other special equipment.

Expose the surface of the rock to allow the Engineer to measure before starting rock excavation. Remove rock encountered in the excavation to the required cross section and in accordance with all of the following:

1. Excavate so no rock extends more than 6 inches above the lines of the required cross section.
2. Excavate backslopes to the neat line slopes shown on the plans, with no rock extending more than 12 inches from the true slope.
3. Excavate the rock surface to provide drainage. Do not leave undrained pockets in the rock surface.
4. Remove rock or boulders loosened in the excavation and overhanging ledges, on or outside the required cross section.

C. **Peat Excavation.** Remove peat, muck, marl, and underlying very soft clay. Coordinate removal with swamp backfill operations.

D. **Swamp Backfill.** Construct embankments across peat marshes as shown on the plans. Widen the embankment at culvert locations to
provide a stable foundation for the length of the culvert, including headwalls and end sections. Provide granular material Class III for swamp backfill.

If total excavation of peat results in a reasonably dry trench as determined by the Engineer, the Engineer may allow backfilling as a separate operation. Backfill the reasonably dry trench immediately after completing the excavation in accordance with the controlled density method in subsection 205.03.H.4.a. Perform excavation and backfill as separate operations in shallow peat areas only with the Engineer’s prior approval.

Coordinate the rate of advancement of the embankment and surcharge in deep swamps with the rate of excavation of the upheaved peat. If a trench of the required depth is not maintained full width ahead of the surcharge, use additional peat excavating equipment or stop construction of embankment and surcharge until the two operations are in balance.

Dispose of peat as shown on the plans or in accordance with subsection 205.03.P.

The Department will bore swamp backfill to determine if unsuitable material is completely excavated or displaced. If the borings show the presence of unsuitable material under the swamp backfill, the Department will determine the corrective action. The Department will complete borings and notify the Contractor of corrective actions within 60 days after completion of the swamp backfill.

Corrective action may consist of excavating, placing a surcharge, excavating relief trenches, or a combination of these actions.

If placing a surcharge over the swamp backfill, the Engineer will determine the width and elevation. Leave the surcharge in place until the Engineer determines that the swamp backfill is stable, or the required settlement has taken place. The Engineer may require that the surcharge remain in place for up to 90 days.

Material from the surcharge is the property of the Contractor.

Obtain the Engineer’s approval of swamp backfill and complete peat excavation and spreading before placing the pavement structure.

**E. Subgrade Undercutting.** Undercut the subgrade and backfill to replace material susceptible to frost heaving or differential frost action and to remedy unstable soil conditions.
Topsoil removal and peat excavation are not included in subgrade undercutting. Subgrade undercutting includes excavation below subgrade in cut sections, excavation at the transition from cut to fill sections, and excavation, other than peat excavation, as required below the topsoil in fill sections.

Excavated material from subgrade undercutting is the property of the Contractor.

1. **Limits of Subgrade Undercutting.** Excavate the subgrade to the approximate grade. The Engineer will promptly inspect the grade to decide the necessity of undercutting, and to determine the limits of undercutting.

   In shallow fill areas, the Engineer will inspect the fill area and determine the limits of the subgrade undercutting before the Contractor begins embankment placement.

   Remove deposits of frost heave textured material between lines 2 feet outside the proposed surface, including paved shoulders. For areas north of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 4 feet to 5 feet below the plan grade. For areas south of the north boundary of Township 12 North, remove the frost heave textured material to a depth of 3½ feet to 4 feet below the plan grade.

2. **Backfill of Subgrade Undercut.** Backfill subgrade undercutting Type I with selected clay or other Engineer-approved material.

   Backfill subgrade undercutting Type II with granular material Class II.

   Backfill subgrade undercutting Type III with the material excavated from subgrade undercut areas, after mixing the excavated material to break up the undesirable strata of soils, or with other Engineer-approved backfill material.

   Compact subgrade undercutting backfill to at least 95 percent of its maximum unit weight.

F. **Subgrade Manipulation.** Scarify, mix, and blend the roadbed subgrade to a depth of 12 inches below the top of subgrade. Compact to at least 95 percent of its maximum unit weight.

G. **Earth Excavation.** Excavated material, except as specified in subsection 205.03.A, is the property of the Contractor.

   Compact the subgrade to at least 95 percent of its maximum unit weight and to a depth of at least 10 inches. If the subgrade cannot be compacted to 95 percent of its maximum unit weight, using conventional
construction methods, the Engineer may authorize use of other methods to attain compaction.

In cut sections where the existing material appears to meet the requirements of subsection 301.02, excavate the grade to top of subbase rather than to the bottom of subbase. The Engineer will then determine whether the existing material meets subbase requirements. Shape material meeting subbase requirements to the top of subbase grade and compact to at least 95 percent of its maximum unit weight and to a depth of at least 12 inches. The Engineer will adjust earthwork quantities accordingly. Excavate material not meeting subbase requirements to the bottom of subbase. The Department will not consider claims for damage caused by the Contractor halting grading operations so the Engineer can make subbase determinations.

Maintain the roadbed and ditches and provide drainage at all times. Install and remove temporary drainage facilities at no additional cost to the Department.

Perform grading to avoid removing or loosening material outside the required slopes. Replace and compact material removed or loosened outside the slopes to the required density and cross section.

Dispose of surplus or waste material resulting from ditch construction in accordance with subsection 205.03.P. Remove roots, stumps, or other materials unacceptable to the Engineer in the slopes and bottom of the ditch and backfill the holes with suitable material. Maintain ditches until the Engineer's final acceptance.

H. Roadway Embankment.

1. Stepping Side Slope. Step embankments, constructed on existing side slopes of 1:6 or steeper, before placing embankment. Form steps with a horizontal dimension of at least 3 feet.

2. Borrow. Borrow consists of material, approved by the Engineer, from locations outside the roadway. Excavate, transport, and place borrow material in accordance with subsection 105.03. After removal of borrow, leave borrow areas free-formed without rigid geometric shapes. Make side slopes as flat as practical, but ensure slopes no steeper than 1:4. Round the tops and bottoms of slopes with vertical curves to blend into adjacent terrain. Grade overburden left in the borrow area, except topsoil, to eliminate unsightly mounds, as determined by the Engineer.

Where practical, shape borrow areas to drain, leaving usable land after completion. In granular soil, leave the area at least 12 inches
above the high ground water level. In cohesive soil, leave the area at least 12 inches above the high water elevation of the drainage outlet.

If the borrow area cannot be drained, create a pond or a wetland. Create ponds by excavating to a depth of at least 8 feet below normal ground water level in granular soil, or to 8 feet below the lowest drainage outlet in cohesive soil. Create wetlands by excavation to the elevation directed by the Engineer.

Restore borrow areas as shown on the plans, or in a manner that will leave the land in a useful condition and with a natural appearance. Restore borrow areas within the right-of-way as required by the contract. Fence ponded borrow areas, unless otherwise directed by the Engineer.

Restore borrow areas outside the right-of-way in accordance with permit requirements covered by 1994 PA 451, Part 91 Soil Erosion and Sedimentation Control. Topsoil, seed, and mulch borrow areas outside the right-of-way, not created as ponds or wetlands. Place topsoil, seed, fertilizer, and mulch above the normal water surface in borrow areas left as ponds or wetlands. Restore borrow areas without existing topsoil, as approved by the Engineer. Use materials and application rates specified in section 816 or as otherwise approved by the Engineer. Where the planting of pine seedlings is consistent with surrounding land uses, the Engineer may approve pine seedlings, spaced 6 feet apart, as an alternative for topsoil, fertilizer, seed, and mulch.

The Engineer may allow boulders to remain in borrow areas, if placement creates a natural appearance.

The Engineer may waive restoration requirements if the Contractor takes borrow from the working area of an existing commercial source, or the property owner holds a permit from a county or municipal enforcing agency, designated under 1994 PA 451, Part 91 Soil Erosion and Sedimentation Control. Provide the Engineer with a copy of the property owner’s permit.

3. **Winter Grading.** The Engineer will determine the winter grading limits. Remove ice and snow from the ground surface before placing embankment.

Remove frozen material if the original ground contains more than 4 inches of frost within the limits of 1:1 slopes extending away from the finished shoulders to points of intersection with the original ground.
Remove frozen material on a partially complete fill before placing more fill on the embankment. Stockpile frozen material in areas approved by the Engineer and outside the limits of earth disturbance until thawed. Use the thawed material in the embankment if it meets moisture requirements at the time of use.

4. **Placing and Compacting Embankment.** After preparing the ground area, construct embankments with sound earth or a mixture of sound earth and stones, broken rock, concrete, or masonry, except within the top 3 feet of embankment, or as allowed in the disposal of peat excavation material in accordance with subsection 205.03.D, and subsection 205.03.P. Do not place frost heave textured materials in the top 3 feet of embankment below subgrade surface. Use a uniformly textured material to construct the top 3 feet of embankment to a uniformly stable condition. Provide at least 50 feet longitudinal transition between two types of textured materials.

Deposit embankment materials and compact in accordance with the controlled density method. The Engineer may direct or approve the 12-inch layer method, rock embankment method, or methods for treatment of peat marshes.

Construct embankments using methods that do not create an unstable slope condition. Do not block the drainage of granular material by placing impervious material on the outside of embankments, or by placing a combination of pervious and impervious material in the embankment, creating potential pockets of saturated material. Do not place peat excavation material in upland areas between the 1:1 slope that extends down from the subgrade surface/front slope intercept point and the final plan fill slope, in fills greater than 14 feet high.

The Engineer may allow placement of stones uncovered within construction limits, broken concrete, and broken rock from rock cuts in embankments. Use stones, broken concrete, and broken rock with the largest dimension no greater than 12 inches. Place in layers. Fill voids with sound earth and compact to at least 95 percent maximum unit weight. Do not place stones, broken concrete, and broken rock layers within 3 feet of the subgrade surface.

Where placing embankment in layers of the required thickness is not feasible, such as filling in water or constructing on poorly drained soil, the Engineer may allow construction of the embankment in one layer of granular material Class III, and will determine the
minimum elevation for equipment operation. Thoroughly compact the fill material. Above the granular material Class III elevation, construct the embankment in accordance with the controlled density method.

Backfill and compact embankment adjacent to structures in accordance with subsection 205.03.I and subsection 206.03.B. Construct other embankment and backfill as follows:

a. **Controlled Density Method.** Deposit cohesive material for embankments and spread in layers no greater than 9 inches deep, loose measure, and extending to the full width of the fill area.

For granular material, attain the required density by depositing, spreading, and compacting in layers no greater than 15 inches deep.

Provide cohesive material with a moisture content no greater than 3 percent above optimum, at the time of compaction. Provide granular material with a moisture content below saturation, in accordance with the one point cone chart in the *Density Testing and Inspection Manual*.

Provide cohesive material in the top 3 feet of embankment with a moisture content not exceeding optimum. For material containing excess moisture, dry to the required moisture content before compacting. Ensure each layer of material meets moisture requirements and compact each layer to at least 95 percent of the maximum unit weight, before placing the succeeding layer.

If the required percentage of maximum unit weight and the required moisture content are attained, but the compacted material does not provide support for the subbase, the Engineer may direct the Contractor to dry the material by aeration and re-compact. Aerate by disking or manipulating the material by other methods approved by the Engineer.

b. **Twelve Inch Layer Method.** Deposit the material and spread in layers no greater than 12 inches deep, loose measure, parallel to the finished grade, and extending to the full width of the embankment. Deposit the material by operating the hauling equipment over the layer being placed. Compact each layer to at least 95 percent of its maximum unit weight in accordance with the 12-inch layer method test in the *Density Testing and Inspection Manual*.
c. **Rock Embankment.** Use shattered rock from blasting or ripping, with the largest dimension no greater than 12 inches, to construct rock embankment. Deposit rock on the constructed fill and push over the leading edge to extend the fill. Do not deposit the shattered rock from the hauling equipment, directly over the end of the fill. Place the rock embankment in layers no greater than 3 feet thick. Fill the surface of the rock embankment with rock fragments and rock fines to prevent infiltration of the earth embankment. Use granular material Class III to supplement insufficient rock fines to fill the surface of the rock embankment.

Do not use this method in fills less than 4 feet deep. Do not place the stones and broken rock layers within 3 feet of the subgrade surface. For structures located under rock embankment, provide at least 24 inches of granular material Class III along the sides and the top of structures, before placing the rock embankment.

I. **Structure Embankment.**

1. **Compaction of Original Ground.** In fill areas on which a structure is required, remove the topsoil from the area within the toes of slope in accordance with subsection 205.03.A.1. Compact the area to at least 95 percent of the maximum unit weight, and at least 9 inches deep.

2. **Placing Structure Embankment.** Place and compact structure embankment to the limits shown on the plans before casting overlying footings. Protect structure embankments from freezing until placement of overlying footings.

   a. **Under Structure Footings Supported by Piling.** Construct structure embankment with Class III granular material within the limits shown on the plans. The Engineer may allow the use of sound earth as an alternate material when placed between April 1 and November 15. Use sound earth, as defined in subsection 205.01, except that for rocks or broken concrete, the greatest dimension must be less than 3 inches. Deposit and compact structure embankment in accordance with the controlled density method.

   b. **Under Structure Footings for Which Piling is Not Specified.** Construct structure embankment with Class III granular material within the limits shown on the plans and deposit and compact in accordance with the controlled density method. Compact structure embankment to 100 percent of the maximum unit weight.
weight within the limits of 1:1 slopes, extending outward and downward from the bottom edges of the structure footings.

3. **Winter Grading for Structure Embankment.** Construct embankment during winter weather in accordance with subsection 205.03.H.3, except, before placing embankment to support a structure, remove ground containing frost within the limits of 1:1 slopes spreading outward in every direction from the bottom edges of structure footings. Stockpile frozen material outside the limits of earth disturbance in areas, approved by the Engineer, until thawed.

J. **Machine Grading.** Machine grading consists of light grading, 12 inches deep, to develop the cross section shown on the plans and includes the following:

1. Scarifying,
2. Plowing,
3. Disking,
4. Moving,
5. Compacting, and
6. Shaping the earth.

Loading or hauling material is not required for machine grading.

Grade ditches to drain runoff water. Grade intersections, approaches, entrances, and driveways as shown on the plans or as directed by the Engineer. Obtain the Engineer's approval before using excavation from ditches and roadbeds for shaping shoulders and adjacent fills.

K. **Ditch Cleanout.** Perform ditch cleanout, to a depth no greater than 2 feet, based on a typical cross section shown on the plans, including the following work:

1. Removing cattails, brush and miscellaneous debris;
2. Removing trees with a diameter less than 6 inches; and
3. Blending ditch profiles to match the existing ditch.

L. **Temporary Railroad Crossing.** Construct temporary railroad crossings in accordance with subsection 107.20.

M. **Granular Blanket.** Excavate unstable soil in the slopes and backfill within the limits and to the depths shown on the plans, or as directed by the Engineer. Dispose of excavated material in accordance with subsection 205.03.P.

For granular blanket, Type 1, backfill with Class II granular material.
For granular blanket, Type 2, dress the excavated area with a nominal 3-inch layer of Class II granular material before placing the drainage layer. Construct the drainage layer using one of the following:

1. A 2-inch layer of open-graded aggregate with geotextile blanket above and below;
2. A three-dimensional mesh with geotextile blanket above and below; or
3. Other geocomposite section approved by the Engineer.

Place at least a 12-inch layer of Class II granular material on the drainage layer to bring the slope and ditch section to the required elevation and cross section.

Construct underdrains adjacent to, or as a part of the slope protection, in accordance with section 404.

N. Trimming and Finishing Earth Grade. Construct the earth grade to the required grade. Remove exposed stones and rocks with a diameter greater than 3 inches.

Trim the subgrade to the grade shown on the plans. If a subbase is required, trim the subgrade to within ±1 inch of the required grade. If a subbase is not required, trim the subgrade to within ±¾ inch of the required grade.

Trim and shape the earth grade outside the subgrade to the required lines, grades, and cross sections. Finish slopes to Class B tolerance unless Class A tolerance is required.

Finish Class A slopes to within ±1 inch of the average slopes shown on the plans. Make measurements at right angles to the slope.

Finish Class B backslopes to within ±6 inches of the average slopes shown on the plans. Make measurement at right angles to the slope. Do not leave abrupt variations in the finished surface. Remove debris and unsuitable material.

Finish Class B fill slopes to within ±2½ inches of the required grade and cross section, from the outside shoulder line for 3 feet down the slope. Measure at right angles to the slope. Finish the remainder of the fill slope the same as Class B backslope.

If trees or other obstacles do not interfere, round the tops of backslopes, bottoms of fill slopes, and other angles in the lines of the cross section, to form vertical curves as shown on the plans or as directed by the Engineer. Make vertical curve transitions gradual and present a uniform
and attractive appearance. The Contractor may omit vertical curves if constructing ditches in peat.

O. **Channel Excavation.** Trim, straighten, widen, deepen, or relocate the channel of a stream or watercourse. Remove and dispose of excavated material. Remove masonry and concrete structures in accordance with section 204. Complete work in the new channel before diverting the stream flow to the new channel. Maintain channels and keep free from debris until final acceptance of the channel.

P. **Disposing of Surplus and Unsuitable Material.** The Department assumes no legal obligation to ensure the Contractor responsibly disposes of surplus and unsuitable material in accordance with this section.

1. **Disposal Within the Right-of-Way.** Do not dispose of material, temporarily or permanently, beyond the normal plan fill slope across wetlands or floodplains. The Engineer may allow disposal of material within the right-of-way to fill low areas or flatten slopes, at no additional cost to the Department. The Engineer may allow burying, piling, or placing material in a safe and scenic manner in selected areas within the right-of-way, at no additional cost to the Department.

2. **Disposal Outside the Right-of-Way.** Do not dispose of material, temporarily or permanently, in wetlands or floodplains. Obtain and file, with the Department, written permission from the owner of the property for disposal outside the right-of-way. Dispose of material and restore areas in accordance with subsection 205.03.H.2, at no additional cost to the Department.

3. **Contractor Responsibility.** The Contractor is directly and solely responsible for disposal of surplus and unsuitable material.

Contact the appropriate regulatory agencies to determine if an area is a regulated wetland or floodplain, before disposing surplus or unsuitable material in areas outside the right-of-way, not shown on the plans as disposal sites.

Immediately move surplus or unsuitable material, disposed in portions of wetlands or floodplains not shown on the plans as disposal sites, to an upland site, at no additional cost to the Department. Restore the vacated area as directed by the regulatory agencies, at no additional cost to the Department.

The Engineer will not consider requests for contract time extensions without assessment of liquidated damages for delays associated with moving surplus or unsuitable material to an upland site.
4. Notification to Regulatory Agencies. The Department will notify the regulatory agencies if the Department becomes aware that the Contractor disposed of surplus or unsuitable material in portions of a wetland or floodplain not shown on the plans.

205.04. Measurement and Payment.

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<td>Granular Material, Cl __</td>
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A. Roadway Earthwork Volumes. The Engineer will calculate roadway earthwork volumes using the average end areas, or the staked-section method, unless otherwise required.

The Engineer will determine the average end areas using the cross sections determined from the original and final elevation measurements.

For the staked-section method, the Engineer will calculate earthwork quantities using the original cross sections taken before construction, and slope stake and grade stake data from field notes.

The Engineer will take measurements during construction to ensure conformance to the required grade and cross sections. The Engineer will adjust quantities for changes in design or Engineer-authorized deviation from the established grade and cross section.

B. General. The cost to build, maintain, remove, and restore borrow haul routes is included in the unit prices for other pay items.

The Engineer will measure removing topsoil and other selected excavated materials from embankment areas as Excavation, Earth.

If the progress clause in the contract requires the Contractor to construct embankments during the winter, the Department will pay for the frozen material removed and the embankment required to replace it at the unit
price for **Excavation, Earth** and **Embankment**, of the type required. The Engineer will direct the winter grading limits.

The Department will not pay for removing topsoil and frozen material to facilitate the Contractor's operations.

The unit prices for other pay items include the cost of compacting existing material in embankment and cut sections after removing topsoil.

The Department will pay for removal of masonry and concrete structures in accordance with section 204.

The Engineer will measure **Granular Material, Cl II** and **Granular Material, Cl III** in place. The Engineer will measure **Granular Material, Cl III**, required for constructing fills in water or constructing fills on poorly drained soil, as **Backfill, Swamp**.

The Engineer will measure **Underdrains, Bank** in accordance with subsection 404.04.

The cost of trimming the subgrade and slopes, to the required tolerances is included in the unit prices for other pay items.

The cost of restoring borrow and disposal areas is included in the unit prices for other pay items.

C. **Excavation, Rock**. The Engineer will measure **Excavation, Rock** by the staked-section method with no allowance for overbreak. The Department considers overbreak the material removed outside the area shown on the plans or Engineer-approved cross section for rock excavation.

The Engineer will not make deductions for rock projecting inside the lines of the cross section, within the limits required.

The Engineer will measure boulders greater than ½ cubic yard individually and will calculate the volume from average dimensions taken in three directions. The Department will pay for boulders, greater than ½ cubic yard, as **Excavation, Rock**.

The Engineer will measure removal of overburden as **Excavation, Earth**.

D. **Peat Excavation and Swamp Backfill**. The Engineer will measure total **Excavation, Peat** in its original position.

For the measurement of partial **Excavation, Peat** and displacement, the Engineer will include the volume of the peat excavated to form the trench, and the excavation of the upheaved peat in the trench. The Engineer will estimate the volume of upheaved peat, required for
removal from the trench, at 100 percent of the actual peat displaced. The Department will not include peat, displaced outside the pay limits shown on the plans, in the pay quantity. The Engineer will take borings to determine the depth of displacement for calculating pay quantities.

The Department will pay for excavating peat, muck, marl, and underlying very soft clay as **Excavation, Peat**.

The unit price for **Excavation Peat**, includes the cost of re-handling waste material to facilitate displacement.

In the treatment of peat marshes, the Department will not allow claims for delays lasting less than 60 days caused by Department testing and determination of corrective methods. Perform corrective work in areas requiring the total excavation method at no additional cost to the Department.

The Department and the Contractor will share equally, the costs for corrective work in areas where the partial peat excavation and displacement method is required or directed by the Engineer. Payment for the corrective work includes excavation and relief trenches. If the Engineer recommends placement of a temporary surcharge, the Department will pay for half the swamp backfill quantity required for the surcharge. The Department will pay for half the quantity of swamp backfill removed as **Excavation, Earth**, after the backfill stabilizes or the required settlement occurs.

If shown on the plans, the Department will pay for placement of temporary surcharge at the unit price for **Embankment, CIP or Backfill, Swamp**. The Department will pay for the removal of temporary surcharge at the unit price for **Excavation, Earth**.

The cost of maintaining a temporary surcharge, moved forward as the fill progresses, is included in the unit prices for other relevant pay items.

The Engineer will measure **Backfill, Swamp** in its original position. To facilitate measurement, isolate an area in the borrow pit or roadway cut as the exclusive source of material for **Backfill, Swamp**. If the Engineer requires more than initial and final cross sections to measure and calculate the volume of material removed, pay the Department for additional cross sections and calculations.

If not practical to calculate the volume of **Backfill, Swamp** in its original position, the Engineer will calculate the volume within the limits shown on the plans, or from fill borings, and increase the volume by 15 percent. The Engineer will not increase the **Backfill, Swamp** volume by 15 percent if the peat excavation results in a dry hole.
The Engineer will not increase the volume of Backfill, Swamp by 15 percent if the material is used to construct sand core fills regardless of whether sand core fills are shown on the plans or directed by the Engineer.

E. Subgrade Undercutting and Subgrade Manipulation.

1. **Subgrade Undercutting.** The Engineer will measure Subgrade Undercutting in its original position. The Department will not make deductions in subgrade undercut quantities for areas where underdrain is installed.

   The Department will not adjust the unit price for changes to the quantity of the type of Subgrade Undercutting required.

   The unit price for Subgrade Undercutting of the type required includes the cost of removal and disposal of unsuitable material, and replacement with required material.

2. **Subgrade Manipulation.** The Engineer will measure Subgrade Manipulation only in designated areas shown on the plans or directed by the Engineer.

F. Earth Excavation and Embankment. The cost of stepping side slopes is included in the unit prices for the related roadway embankment pay items.

1. **Embankment, LM.** The Engineer will measure Embankment, LM by volume, loose measure. The unit price for Embankment, LM includes the cost of providing, hauling, placing, and compacting material at the required locations.

2. **Excavation, Earth and Embankment, CIP.** The Engineer will determine if payment for Excavation, Earth and Embankment, CIP will be based on plan quantities.

   If use of plan quantities is not feasible, the Engineer will measure Excavation, Earth and Embankment, CIP in accordance with all of the following:

   a. The Engineer will measure Excavation, Earth using the staked-section method unless the Contractor performs excavation without predetermined excavation limits.

   b. The Engineer will measure Embankment, CIP based on the grade and cross section shown on the plans or approved by the Engineer, using the staked-section method. The Engineer will not make allowance for increases in quantities of fill material
required due to normal consolidation of the natural ground under the embankment. If the Contractor disposes of surplus or unsuitable material outside the plan cross sections, the Engineer will not measure it as Embankment, CIP.

If material is removed in embankment areas to a greater depth than required, the Department will only pay for the quantities of Excavation, Earth; Embankment, CIP; and Embankment, Structure, CIP as shown on the plans, or as directed by the Engineer.

3. Embankment, Structure, CIP. The Engineer will measure Embankment, Structure, CIP based on the grade and cross section shown in the plans, using the staked-section method. The Engineer will not make allowance for increases in quantities of fill material required due to normal consolidation of the natural ground under the embankment.

The Engineer will measure sound earth, if used as structure embankment under pile-supported footings, as Embankment, CIP.

G. Machine Grading. The Engineer will measure Machine Grading along the surface edge. The Engineer will measure each side of the road, where work is performed, separately.

H. Ditch Cleanout. The Engineer will measure Ditch Cleanout along the center line of the ditch. The Engineer will measure, and the Department will pay for the cost of restoring the ditch in accordance with section 816.

I. Granular Blanket.

1. Granular Blanket, Type 1. The Engineer will measure Granular Blanket, Type 1, including the volume of granular material Class II, within the limits and to the depth shown on the plans or approved by the Engineer.

2. Granular Blanket, Type 2. The Engineer will measure Granular Blanket, Type 2 in place, and include the volumes of the drainage layer and granular material Class II, within the limits and to the depth shown on the plans or approved by the Engineer.

J. Channel Excavation. The Engineer will measure Excavation, Channel by volume in its original position.