SECTION 203 - EXCAVATION AND EMBANKMENT

Standard Specification Section 203, Excavation and Embankment, contains the contract requirements for excavating, disposing, placement and compaction of material. Excavation includes the disposal of all material encountered in the course of construction. Embankment is the placement of material situated between the embankment foundation and the subgrade surface.

Soils and soil related items account for a significant proportion of the work involved in the construction of transportation facilities. Therefore, control of these items by the earthwork inspectors under the supervision of the Engineer-in-Charge (EIC) is essential. Although the EIC is wholly responsible for the enforcement of all the requirements of the specifications and the control of these items on the project, he/she may convene a preconstruction meeting on projects involving particular geotechnical procedures or operations. Additionally, the EIC may request the advice and assistance of the Regional Geotechnical Engineer (RGE) on soil engineering problems that develop as the job progresses.

The requirements for the earthwork items are found in the 200 section of the specification book. However, the plans and proposal should be examined closely for special notes and special specifications. The General Provisions, given in Section 100 of the specifications, also contain requirements which affect excavation items.

§107-01 requires that the Contractor abide by all applicable laws and regulations:

A. Industrial Code Rule 753 (16 NYCRR 753) applies to all excavation work by the Contractor. This rule establishes the legal responsibilities for the operators of public or private underground facilities and excavators. In essence, Code Rule 753 includes the following major components:
1. All owners of underground facilities must be members of one of the two one call centers in the state (DigNet of New York City and Long Island and Dig Safely New York).
2. All New York contractors excavating on commercial or residential property must notify their local one call center two working days prior to the project’s excavation date.

The code also includes detailed information on fines, the tolerance zone, personal property and line marking color codes. Professional excavators are expected to know and obey this code. By law, excavators and contractors MUST contact DigNet at least two working days but no more than 10 days (excluding weekends and legal holidays) before beginning any excavation project. The operator is then required to stake out all of his underground facilities within the work area which the Contractor must verify as to the type, size, direction of run and depth and encasement before starting work. The work required to comply with Code Rule 753 is incidental to the contract and as such no separate contract payment is made for this work.

Suitable Material
Excavation items do not generally require testing of the excavated material. It is generally either suitable or unsuitable for embankment as defined in the specifications. In most cases, design investigations have determined whether suspect sites are contaminated and the proper handling and disposal methods are specified in accordance with Section 205 Contaminated Soil. If soil that is excavated appears to be contaminated, work should immediately be stopped and the Regional Environmental Specialist notified. The Regional Environmental Specialist would then give direction to the EIC on how to properly proceed with the work.

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**EXCAVATION AND EMBANKMENT**

**Benching**

Benching is the construction procedure of tying a new slope into an existing embankment (embankment widening) or construction a new embankment on or adjacent to an existing earth slope by cutting “steps” into the existing slope as the new material is placed. An interlock of the two materials is created, preventing the new fill from sliding down the existing embankment or slope.

**Transition Foundation**

The longitudinal transition embankment foundation condition is encountered where the alignment places the embankment alongside a hillside or where an existing embankment is to be widened. The newly placed fill tends to slide down the slope of the hillside or the existing embankment. The standard sheet entitled “Earthwork Transitions and Benching Details” – https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us-repository/203-02e1.pdf describes the preferred treatment for this condition. In effect, steps or benches are built into the existing slope to reduce the tendency of the new embankment to slide down the existing hillside or slope.

The same standard sheet (“Earthwork Transitions and Benching Details”) describes the proper treatment of the transverse transitional embankment foundation at the interface where the roadway changes from embankment to cut. When an embankment is placed against existing ground, such as occurs in a fill-cut situation, a bump may occur in the pavement at the interface. This occurs because the existing hillside is inherently different than the constructed embankment. The standard treatment provides a more gradual transition between the fill and the cut.

**Undercut**

Upon occasion, unstable soil conditions are encountered at the subgrade surface. In this situation, the soil is usually fine grained, inorganic and saturated. It is incapable of supporting normal construction operations and would result in poor pavement performance if the pavement could be constructed. Along with the ground water level that results in the saturate soil condition the instability may also be the result of liquefaction of the fine grained soils by the action of vibrating compaction equipment.

There are several methods of treating the unstable condition.

1. Drain the area by means of ditches or underdrains to reduce the degree of saturation of the soil. Unfortunately, the terrain topography is frequently low and flat precluding this option which involves drainage by gravity.
2. Raise the profile to place the subgrade sufficiently above the unstable materials so that an adequate working platform can be constructed. Constraints such as design criteria and right of way may limit this option.
3. Horizontal realignment to avoid the site of the unstable soil is even more subject to the constraints of design criteria and right of way, and is rarely viable.
4. The most common treatment of an unstable subgrade is to undercut and replace some of the unstable material with granular material that will be stable in the wet environment. Undercuts of 2 ft. are common. This depth of removal and replacement (determined by experience) may be reduced substantially by the use of geosynthetics.

The EIC should request the opinion of the RGE concerning the need and depth of undercut.
**Weaving**
The moisture content has a very important impact on compaction operations. At any compactive effort, the maximum density will be obtained at a particular degree of moisture called the Optimum Moisture Content. When the actual moisture content exceeds the optimum moisture content, the strength of the soil decreases rapidly. With increased moisture content the material becomes slop. This phenomenon may be observed on the grade. At moisture contents slightly over optimum, weaving of the embankment surface may occur. That is, when a load such as a roller or heavy earthmoving equipment goes by, the embankment surfaces may depress. When the load has passed, the surface will spring back.

**Rutting**
At a greater moisture content then that which causes weaving, the embankment surface will not return to its original level and will leave ruts. These ruts are caused when the soil is too weak to support the roller and soil shears or the surface is punctured. Significant rutting under the action of the compactor on the final passes on a lift is not acceptable by the Specification. The degree of rutting that is significant is up to the discretion of the EIC. The RGE is available to advise the EIC on the significance of the rutting.

**Proof Rolling**
Once the embankment is completed and immediately prior to subbase placement (or immediately prior to final trimming of the subgrade surface and placement of subbase materials in cut sections), the subgrade surface must be proof rolled. The proof roller is a large box supported by four (4) pneumatic tires one axle. The weight of the roller is controlled by the load placed in the box and ranges from 30 to 50 tons. At 30 tons the box is empty, at 50 tons the box is filled to heaping. It is not the purpose of this proof rolling operation to cause rutting or failure of the embankment. If the roller is causing uniform excessive rutting, the stress level should be reduced as shown on Figure 203-3 *Guide for Selecting the Initial Stress Level for Proof Rolling Embankment Sections*. If individual areas of distress are exposed by the proof rolling operation, the distressed area must be repaired or removed and replaced to the satisfaction of the EIC. Repairs initiated due to the proof rolling operations in cut sections are identified and paid for, whereas repairs initiated due to the proof rolling operations in embankment sections are performed at no additional cost to the State.

**General Requirements**

**Winter Earthwork**
In general, all earthwork operations should cease between November 1st and April 1st. Temperatures below 32° F do not allow adequate compaction of most materials because frozen water inhibits consolidation of the individual soil particles. However, the Regional Director may grant exceptions by approving a Winter Earthwork submittal. A Winter Earthwork submittal outlines the modifications to the materials and/or methods including the following:

- **Material Requirements.** If either the air temperature, ground temperature, or material temperature is at or below 32° F at the time of placement, the material must meet the requirements of §733-16 *Winter Earthwork*.
- **Material Placement.** Proposed methods for controlling the weather effects on the material and existing ground conditions (i.e. insulation, enclosures, canvas and framework). The Contractor is to devise a plan such that all snow, ice, and frozen material shall be removed from the surface of the ground on which embankment or backfill material is to be placed, and from the surface under construction before succeeding lifts are added.
• **Procedures.** Procedures to ensure the existing ground is not frozen to any depth (e.g. test pits) and/or to address freeze-thaw action in earthwork that has remained idle during temperature fluctuations (e.g. re-roll and seal the surface prior to placement of succeeding lift).

• **Seasonal Adjustment Acceptance.** Standard earthwork materials may be used between November 1st and April 1st only under conditions where the air temperature, ground temperature and material temperature are all above 32° F at the time of placement. If the air temperature, ground temperature, or material temperature is at or below 32° F, earthwork will only proceed using material that meets the requirements of §733-16 *Winter Earthwork* and/or standard earthwork material placement utilizing the modified methods and procedures contained in the approved Winter Earthwork Submittal.

In all work incorporated into the final product, the Contractor shall not place material that is frozen, or place fill material on frozen ground regardless of the date. The material change to meet the requirements of §733-16 *Winter Earthwork*, is a component of the Winter Earthwork submittal and as such no additional contract payment is made for this change. The bid item and unit price remains the same.

**Soil Erosion and Water Pollution**
Section 203 *Excavation and Embankment* and Section 209 *Soil Erosion and Sediment Control* both require schedules to be submitted. Work should not be permitted until these schedules have been received and approved. These schedules should be compared to and should be consistent with the contract documents erosion and sediment control plan, or the modified plan approved by the EIC, to ensure that a logical sequence of excavation and control measures exist throughout the construction staging or until final site stabilization.

**Rock Blasting**
Departmental procedures for blasting can be found in the manual GEM-22, GEOTECHNICAL ENGINEERING MANUAL Procedures for Blasting.

Prior to drilling of any holes and blasting operations on projects involving rock and/or structural removal, the Contractor is required to submit a blast plan for approval and a project pre-blasting meeting is required. Those in attendance should include the EIC, Contractor, Blaster, representatives of all affected agencies, utility companies and an Engineering Geologist from the Geotechnical Engineering Bureau (GEB).

The Earthwork Inspector should document all aspects of the drilling and blasting operations on Form GE-469 (Exhibit 203B), "BLASTING REPORT," and attached to the Inspector's Daily Work Report (DWR). Consult an Engineering Geologist for assistance in completing these forms.

**Rock Slope Scaling**
Engineering Geologists from the Geotechnical Engineering Bureau (GEB) are available to provide assistance on rock slope scaling projects.

EIC's on projects involving rock scaling where weighing of scaled materials is required shall complete FORM SM-428 (Exhibit 203C), "DAILY RECORD OF SCALE WEIGHTS."

On projects with contractor-supplied scales, the Contractor may use Certified Public Scales or may furnish certified scales. Inspect the contractor-supplied scales. Record the certification and
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presence of an unexpired seal of the appropriate Sealer of Weights and Measures on DWR in SiteManager, documenting that only certified scales are used on the project. In the case of certified public scales, the EIC shall provide the Contractor with written authorization to use specific scales.

As indicated in the specification, the tare weight of each truck shall be furnished to the EIC prior to the start of work. After weighing and before reloading, a delivery ticket for each truck load shall be provided to the EIC (or his representative) with at least the following information: scale identification, date, time and loaded truck weight.

Disposal of Surplus Excavated Materials
Any surplus material generated in the course of a DOT construction project becomes the property of the Contractor to dispose of in accordance with all applicable laws and regulations. As per §107-10 Managing Surplus Material and Waste, the EIC must approve of the Contractor’s proposed spoil/waste site regardless of whether it is on DOT ROW or on private land. Also these approved spoil sites must be restored in a manner consistent with sections §107-08 Protection and Restoration of Property and Landscape. Disposal should not be approved in, or adjacent to, wetlands or flood plains.

- The Contractor may request to dispose of surplus material for the flattening of existing embankment slopes or filling of other areas within DOT’s ROW. The EIC should verify that this fill will not infringe on a wetland or flood plain. A wetland, depending on its size and location, is regulated by DEC, APA, and/or the Army Corps of Engineers. All of these agencies have strict regulating processes to follow before an approval is granted to place fill in a wetland. Filling wetlands outside of the ROW may affect the type and conditions of the wetland permits obtained during design for work within the project limits. Even if the wetland spoil area were approved, the Contractor or the Department may be required to mitigate the loss of the wetland by creating an equal sized wetland in another location. In summary, the widespread availability of non-wetland spoil sites, time for approval, and associated costs, should preclude the consideration of wetlands for spoil sites.

- Flood plains are regulated by DEC to ensure that construction activities do not increase the severity of flooding due to encroachment into the floodway or fringe areas. The floodway and fringe areas are the components of the flood plain. By definition, the flood plain is the land that is flooded by the 100 year flood. The elevation to which the flood will rise is termed the base of the flood elevation and is determined by the Federal Emergency Management Agency (FEMA). Because an outside agency has the responsibility to review and approve the disposal of material in these designated areas, the time for review and the decision itself are uncertain. Therefore, common sense would again dictate that flood plains should not be considered as a spoil area.

The only surplus demolition material that can be allowed in a waste site on or off DOT ROW is milled asphalt concrete or crushed portland cement concrete provided there is no exposed rebar. The EIC should refer to DEC’s waste regulations, 6NYCRR, Part 360 to ensure proper disposal for all other demolition material. The Contractor must supply the EIC with all the appropriate paperwork which will be filed with the appropriate documentation.

Embankment Construction
Embankment construction includes operations such as stripping, benching, and preparation of the embankment foundation, as well as the placement and compaction of suitable embankment materials. The major controls of embankment construction are the lift thickness, compactive effort, type of equipment and density requirements. Moisture content is controlled by the
Compaction
Lift thickness and compactive effort depend on the compaction equipment supplied by the Contractor. When a smooth drum is provided, a current list of the “Manufacturer’s Data for the Rating of Smooth Drum Vibratory Compactors for Earthwork Construction” is available on the GEB’s IntraDOT page at:
http://axim22.nysdot.private:7779/pls/portal/docs/PAGE/WCC_PG/TSD/TSD_BUREAUS_TAB/TSD_GEOTECHNICAL ENGINEERING_BUREAU_STAB/COMPACTDATA.PDF

The basic machine data for the various models required to determine loose lift thickness are unsprung drum weight, dynamic force, rated frequency, and drum width. Machines which do not meet the specifications are so noted. Machines which have had their specifications altered without changing the model number designations have been listed with the minimum acceptable parameters. The words low, medium, high, super, or the initials L, M, H, etc., appearing after the model number indicate a machine that has the capability of changing the dynamic force applied by varying the amplitude and/or rated frequency. The acceptable frequency range data provides limiting frequency values within which the compactor may operate (the acceptable frequency range is limited to 1100-1500 VPM by specification). The actual operating frequency must be verified by a tachometer supplied by the Contractor. For assistance in evaluating compaction equipment that is not on the current list, call the RGE. It is advisable to request assistance promptly to allow sufficient time to obtain the necessary data to rate the equipment.

Determination of loose lift thickness for the use of smooth wheel steel drum vibratory roller meeting the specifications and given in the “Manufacturer’s Data for the Rating of Smooth Drum Vibratory Compactors for Earthwork Construction” is as follows:
1. Given the manufacturer, model number, and anticipated operating frequency, enter the column headed “Frequency Range” to verify the operating frequency falls within the acceptable range.
2. Determine the operating dynamic force by converting the rated dynamic force to the planned operating frequency.
3. Using the operating dynamic force, unsprung drum weight, and drum width determine the minimum compactive force per unit length of drum.
4. Enter the graph (Figure 203-2) Vibratory Compactors, with the minimum compactive force and horizontally project to the intersection of the appropriate curve for soils and select granular material or blasted or broken rock then vertically down to determine the maximum loose lift thickness.
5. If the Contractor wishes to change the number of passes or operating speed of the roller, a new corresponding operating speed or number of passes would need to be established.

Example:
The Contractor wishes to use a Dynapac CA141D at an operating frequency of 1475/ V.P.M. and 4 passes to compact granular fill. What is the maximum loose lift thickness and operating speed?
1. The proposed operating frequency, 1475v.p.m. is within the listed frequency range of 1447-1500 v.p.m.
2. Conversion of manufacturer’s published ratings, at a given frequency (see the “Manufacturer’s Data for the Rating of Smooth Drum Vibratory Compactors for Earthwork Construction”), shall be made with the following equation:
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\[ F_2 = \frac{F_1(V_2)^2}{(V_1)^2} = \]

\[ 9,088 = \frac{15,833(1,475)^2}{(1,950)^2} \]

3. Determine the minimum effective compactive force per unit length of drum.

\[ \text{CFR} = \frac{\text{Unsprung Drum Weight (lbs)} + \text{Dynamic Force (lbs)}}{\text{Drum Width (in.)}} \]

\[ 210 = \frac{3,500 + 9,088}{60} \]

4. Determine maximum loose lift thickness.

From Figure 203-2 Vibratory Compactors (B): 8 inches

5. Determine new operating speed for 4 passes of the roller.

\[ \text{Speed } X = \frac{(\text{Specified Speed}) \times (\text{Min. Passes at Speed } X)}{(\text{Specified Min. Passes})} \]

\[ 3 \text{ ft/sec} = \frac{(4.5)(4)}{(6)} \]

Once determined, the compaction equipment, operating frequency, maximum and actual lift thickness, and number of passes shall be recorded on DWR in SiteManager.

For items which have density requirements, minimum densities shall be verified with compaction control tests performed on the job by the project’s earthwork inspection personnel. These tests shall be performed in conformance with the procedures contained in the appropriate Departmental publication in effect on the date of the advertisement for bids (References: GTM-6, 9 or 10). The RGE can specify the appropriate test(s).

Test results shall be documented on DWR in SiteManager, Retests of previously failing tests should be cross referenced to the original tests.

**Tests and Control Methods**

Attached is Exhibit 203-A, the GEB’s recommended frequency of sampling and testing of various earthwork items for quality control purposes. The number of samples and tests, as well as the distribution of locations from which they are taken, should be such as to adequately assure and verify that the materials incorporated in the work and resulting construction are acceptable and in accordance with the plans and specifications.

The sampling and testing should be augmented and coordinated by adequate visual inspection. It is important not only to assure that the methods and equipment used are in accordance with the specifications, but also to assure that the samples and tests are taken from material which is representative of the entire mass of materials. It is expected that inspection personnel on major
earthwork projects will continuously observe all earthwork operations at all times and that the sampling and testing will be done by other personnel, to preclude the necessity for earthwork inspectors to leave the scene during operations to perform a test.

Earthwork compaction control tests may only be waived if, in the judgment of the EIC, with the concurrence of the RGE (in writing), the material being placed and compacted contains a sufficient proportion of gravel, stones and cobbles, as to make the performance of compaction control tests impractical. However, compaction control tests shall not be waived on materials containing less than 30% by weight of particles retained on the \( \frac{3}{4} \) inch sieve. Waivers shall be properly noted in the project records, whenever compaction control tests are waived. The compaction control tests should reflect the in-place density of the entire lift thickness. The Contractor is required to provide adequate access to sources in order to perform these control tests.

All areas of failing tests should be retested after reworking the materials or applying additional compactive effort until a passing test is obtained. The DWR in SiteManager should cross-reference the failing test(s) and passing test(s).

**Fill and Backfill at Structures, Culverts, Pipes, Conduits and Direct Burial Cables**

Controlled Low Strength Material (CLSM) is often an acceptable alternative to compacted soil backfill. CLSM consists of cement, water and, at the contractor’s option, fly ash, aggregate or chemical admixtures in any proportions such that the final product meets the strength and flow consistency requirements included in the specification. The mix is proportioned to be self-leveling and does not require compaction. It is much lower in strength than concrete, making future excavation possible. CLSM should be thought of as “liquid dirt.” See Section 204 – Flowable Fill.

**Borrow**

As per the specification, any offsite borrow source must be approved by the EIC prior to its use. Permission to use construction and demolition (C&D) materials from off-site locations must be critically reviewed as existing NYSDEC regulations severely restrict the type of C&D material that can be allowed for embankment construction. Also, it may be necessary for a mining permit to be acquired by the contractor. The recognized danger is that crushed or shredded, and therefore, unrecognizable C&D material is an ideal medium to conceal the disposal of hazardous or toxic materials. Accordingly, only recognizable uncontaminated concrete, asphalt concrete pavement, brick, soil or stone can be legally placed in our embankments. The presence of any other material even in minute amounts should be cause for rejection and requires the disposal by DEC, of all the material in a DEC approved C&D landfill. If this material is contaminated, it may not be acceptable for disposal in a DEC approved C&D landfill. In those instances, the EIC should defer to DEC so that the waste is properly disposed and does not create a problem.

**Select Granular Materials**

The control and test requirements of granular materials used on a project is covered in GCP-17 *Procedure for the Control and Quality Assurance of Granular Materials*.

Material for items in the 203 series do not require stockpiling. However, a Contractor may choose to stockpile these items, and if so, that material will be sampled, tested and evaluated as a stockpiled item. If the Contractor elects to stockpile 203 item materials, the EIC should inform the RGE of the need to inspect the construction of the stockpile(s) to assure that it is constructed according to GCP-17 *Procedure for the Control and Quality Assurance of Granular Materials*. 

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Materials. Record the material source and stockpile construction features on the Inspector’s Daily Work Report (DWR). Final approval of the stockpile is requested and obtained from the RGE. The RGE will supervise the sampling and arrange for the testing of stockpiles. Test results will be reported on Form SM-454 (Exhibit 203H), "GRANULAR MATERIAL DOCUMENTATION FORM" and filed with project identification number and location of use with a copy to the RGE.

Note that if material from an approved stockpile is used for a 203 item, the Quality Assurance gradation testing (as shown in Exhibit 203-A) is not required, unless there is a visible change in the color or nature of the material. The State can also elect to sample and test at any time for any reason.

Compaction testing for material for 203 items from an approved stockpile should be performed as indicated. The exception would be if the material originated from a stockpile that was previously tested for use as a 304 item. In that case, a density test should be performed to determine if a meaningful result can be obtained. If a meaningful result cannot be obtained, which is typically the case for material constructed to meet 304 requirements, then compaction may be determined through a visual inspection by a qualified representative of the EIC, or the RGE.

For items not stockpiled, which require soundness and plasticity index determinations, samples shall be taken by the RGE for testing in accordance with established Departmental procedures. Test results will be returned on Form SM-454, "GRANULAR MATERIAL DOCUMENTATION FORM." A copy of this form shall be part of the project records. For projects that obtain material from sources which were tested under other projects, a copy of a letter approving transfer from the RGE, as well as a copy of the original SM-454, shall be placed in the project file.

For items not stockpiled, which required conformance to a particular gradation, sieve tests shall be performed by earthwork inspection personnel in accordance with GTM-20 Test Method for the Grain Size Analysis of Granular Soil Materials and reported in SiteManager. For a guide to sampling frequency, refer to Exhibit 203-A.

Embankment Construction Control Devices

Facilities constructed on soft and compressible foundations sometimes require the installation of devices to determine settlement. The construction details and procedural requirements for these devices are given in GCP-15 Settlement Gages and Settlement Rods. Forms GE-435, "SETTLEMENT REPORT - MANOMETER GAGE (Exhibit 203K)," GE-436 (Exhibit 203L), "SETTLEMENT REPORT - ROD GAGE," and/or GE-437 (Exhibit 203M), "SETTLEMENT REPORT - PIPE GAGE," shall be completed. Occasionally, piezometers are installed to monitor pore water pressures in embankments or slopes. Piezometer readings shall be recorded on Form GE-264 (Exhibit 203N), “PORE PRESSURE REPORT VIBRATING WIRE PIEZOMETER.”

To monitor potential slope movements, slope indicator installations may be required. Form GE-422, (Exhibit 203O) "SLOPE INDICATOR DATA SHEET," shall be completed to record these readings.

Method of Measurement

Interim Quantities

Interim earthwork quantities are almost always estimated. Back-up calculations must be kept on
file for all estimated quantities. Steps shall be taken to assure that progress estimates of such estimated quantities as earthwork are reasonably close to the actual quantities at the time of an estimate.

A number of methods can be used to check earthwork quantities as the job progresses. Because of the large number of variables, such as type of contract, operating procedure of the Contractor and size of the Inspection force, the choice of method employed for checking estimated earthwork quantities is left to each EIC. A few of these methods are:

1. Load count by our inspector. When using a load count method the vehicle volume should be documented. Volumes (both heaped and level) should be available from manufacturers’ literature for most earthmoving equipment. If not, the vehicle should be measured. This theoretical volume can be factored to compensate for void space and, thereby, arrive at an adjusted compacted or in-place volume to use for loose measure truck counts. Continued periodic surveys of excavation or embankment should be made and truck volume factors adjusted as necessary.

2. Periodic surveys of cut areas at each estimate period. However, in most cases, time and personnel preclude the use of this method.

3. Computations of cut areas based on design cross sections and a sampling by survey of the elevations of excavations and/or embankment.

4. Proportioning of design earthwork workups utilizing a few actual interim survey elevations in cuts.

Periodic checks must be made and documented to substantiate earthwork quantities for which payment is made in progress estimates. The EIC should select a method which best suits the particular job conditions, and, then, thoroughly document computations in the project records. Contractor’s load counts may be used as checks on the accuracy of volumes obtained by means of the methods described above, but never as the sole basis for payment. Estimates should be representative of the actual work accomplished by the Contractor during the estimate period and, at the same time, be within a reasonable degree of accuracy.

All the aforementioned difficulties in keeping track of interim quantities have been magnified by the composite item adjustment clause of §104-04 Significant Changes in the Character of Work. This clause allows adjusting the price for “major” unclassified excavation and embankment or unclassified excavation and embankment items if the rock quantity part of the item varies by more than 25% from the expected quantity stated in the earthwork summary. The only way to know when this event occurs is to have accurate tracking of quantities. Given the strain placed on field personnel, it is strongly suggested that each day either estimated or measured rock quantities be agreed by both the Inspector and Contractor. If a procedure is worked out between the two parties on quantity agreement, then cost adjustment, if warranted, will be subject to much less dispute.

**General**

Payment lines for all items of work with payment units in cubic yards encompassed by Section 203 shall be computed from payment lines shown in the contract documents.

**Unsuitable Excavation**

Excavation of unsuitable material shall be permitted by the EIC to the payment lines establishing the lateral and depth extent of the excavation as shown on the applicable cross sections. If such payment lines are not indicated on the cross sections, the RGE should be requested to acquire and furnish sufficient subsurface information that will permit the establishment of payment lines. Such payment lines shall be established and approved by the
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RGE before any excavation is done. The depth, extent and payment for unsuitable material excavation shall be based on predetermined payment lines and not on such criteria as the color of the water, the color of the muck in the bucket, or the color of the waste pile. Just prior to backfilling, the EIC shall verify that the excavation has been completed to the payment lines. Payment shall not be made for excavation or backfill in excess of such predetermined payment lines.

Basis of Payment

The composite item adjustment clause of §104-04 Significant Changes in the Character of Work pertains to the unclassified excavation item. If the requirements of the major item definition (a 25% change in the rock quantity from what is shown in the earthwork summary sheet) and proper notification and recordkeeping are satisfied, the unit price can be adjusted.

References


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GEM-12, GEOTECHNICAL ENGINEERING MANUAL Guidelines for Embankment Construction.
https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/GEM-12b.pdf

GEM-22, GEOTECHNICAL ENGINEERING MANUAL Procedures for Blasting.

Standard Sheets:
203-01 CONSTRUCTION DETAILS UNSUITABLE MATERIAL EXCAVATION AND BACKFILL
203-02 EARTHWORK TRANSITION AND BENCHING DETAILS
203-03 INSTALLATION DETAILS FOR GRANULAR FILL-SLOPE PROTECTION
203-04 INSTALLATION DETAILS FOR REINFORCED CONCRETE PIPES
203-05 INSTALLATION DETAILS FOR CORRUGATED AND STRUCTURAL PLATE PIPE AND PIPE ARCHES

Contract Administration Manual (CAM)

Related Contract Provisions
§102-02 C. Subsurface Information
§104-03 Differing Site Conditions
§104-04 Significant Changes in the Character of Work
§105-03 Methods and Equipment (Winter Earthwork Submittal)
§106-01 Sources of Supply
§106-02 Quality Requirements
§106-05 Recycled Materials
§107-07 Protection of Underground Facilities
§107-08 Protection and Restoration of Property and Landscape
§107-10 Managing Surplus Material and Waste
§107-12 Water Quality Protection

Section 205 Contaminated Soil
Section 209 Soil Erosion and Sediment Control
## GUIDE TO FREQUENCY OF JOB CONTROL SAMPLING AND TESTING

<table>
<thead>
<tr>
<th>Material Description &amp; Placement</th>
<th>FREQUENCY COMPACTION</th>
<th>FREQUENCY GRADUATION**</th>
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<td>One/day/source or One/500 cy *</td>
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<td>Slope Protection Material</td>
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</tr>
<tr>
<td>Underdrain Filter Material</td>
<td>NR</td>
<td>See GCP</td>
</tr>
<tr>
<td>Structure Backfill</td>
<td>One/day/abutment, pier, wall, etc. or One/500 cy *</td>
<td>One/day/source or One/1,000 cy *</td>
</tr>
<tr>
<td>Subbase Course (Non-Stockpiled)</td>
<td>NR</td>
<td>GCP or 2/day/source or One/1,500 cy *</td>
</tr>
<tr>
<td>Subbase Course (Stockpiled)</td>
<td>NR</td>
<td>See GCP</td>
</tr>
<tr>
<td>Trench &amp; Culvert and Structure Excavation Backfill (Material backfilled under these items)</td>
<td>One/day/trench, abutment, pier or wall or One/500 cy *</td>
<td>NR</td>
</tr>
</tbody>
</table>

* = Whichever results in the greater frequency

** = Gradation testing is not required for material that is stockpiled. Turn the requirement for gradation testing off in SiteManager by going to the Contract Sampling and Testing Requirements screen, Sampling and Testing Tab and changing the Rate to 0.0. Leave the Frequency whatever number it is, just change the Rate. Also, leave the Compaction Rate/Frequency whatever number it is, since the Stockpile testing only pertains to Gradation testing – Compactions on grade must still be done at the prescribed Rate/Frequency

NR = Not required

GCP = Geotechnical Control Procedure