

# CHAPTER 8

## EARTHWORK ITEMS AND RELATED OPERATIONS REVIEW

### 8.1 PURPOSE

To detail the minimum checks to be applied by the District Final Estimates Office (DFEO) to earthwork items on the construction contracts. These procedures are specifically for the major items of excavation, embankment, and grading required in the construction of roadway, ditches, channel changes, and structures in accordance with the lines and grades shown on the plans or as directed, including the items of borrow material, as required. Although described herein are minimum requirements, each individual contract could have some other section, Plans, or Specifications govern a particular pay item differently.

### 8.2 PROCEDURE

#### 8.2.1 ROADWAY EXCAVATION, EMBANKMENT AND LATERAL DITCH EXCAVATION

- ~~o Roadway Excavation, Embankment, and Lateral Ditch Excavation.~~ These earthwork items are paid for on the basis of plan quantity, which may be subject to alterations as applicable edition per Article Section 9-3 of the Standard Specifications for Road and Bridge Construction.

Usually the reviewing involved in the above items occurs when plan revisions, Contractor's failure to build to template and/or plan error exceed the specification tolerances. These exceptions are to be verified or documented and computed by the Project Engineer Administrator (PEPA) as prescribed per Subarticle Section 9-3 of the Standard Specifications. Procedures for the PE-PA to follow in accomplishing this task are outlined in **Chapter 8** of the **Preparation and Documentation Manual (P&DM), Topic No. 700-050-010**. Should an error be found, the extent of that error shall be determined and the appropriate corrections shall be made by the DFEO reviewer<sub>[RM1]</sub>. With an item for subsoil excavation, along with a plan quantity embankment item, any overrun or underrun in subsoil will affect the embankment quantity. This adjustment to the embankment quantity is required and is not considered a plan tolerance. Backup computations in accordance with **Chapter 8, of the P&DM** must be submitted with quantity reductions made for deviations outside the limits.

## 8.2.2 BORROW EXCAVATION

This is material excavated and satisfactorily utilized from authorized borrow pit.

- (A) In borrow pits furnished by the ~~Department, Department~~; no material shall be excavated within 5 feet [~~1.5 meters~~] of the adjacent property lines. Authorization for exception to this general rule shall accompany the final estimate submittal.
- (B) If the item of borrow excavation is included in the contract, any stabilizing materials obtained from designated borrow areas shall be included in the pay quantity for borrow excavation.
- (C) See that remaining stockpiled material has been deducted. Shrinkage shall not be applied unless it is determined that excessive compaction has been applied.
- (D) If the Contractor furnished borrow material, from areas provided by the Contractor, the price for the item shall also include costs of furnishing these areas including **all necessary clearing and grubbing and the removal of unsuitable overburden above the borrow material.**
- (E) Flushed Slopes are defined as borrow material placed in fills outside the roadway template. Borrow material placed in flushed slopes shall not be paid for.
- (1) For truck measured borrow material, the flushed borrow material (placed in fills outside the roadway template) shall be measured by the cross section method and shall be converted to a truck measured quantity. This quantity shall be deducted from the total quantity of borrow material measured and documented with Tabulation Forms. To calculate the deduction, convert the flushed quantity measured by cross section to equivalent truck measured volume using the following formula: (Truck Measure. Quantity.) = (~~X~~Cross-Sectioned Quantity.) X (1 + Plan Shrinkage Factor) x (1 + Swell Factor).

**Example:** Where the flushed borrow volume is measured by cross section as 124 Cubic Yards (CY) ~~or M3~~, the shrinkage factor is 45% and the swell factor is 20%; then the equivalent Truck Measured Quantity is calculated as (124 CY ~~or M3~~ X (1+.45) X (1+.20) = 215.76 CY ~~OR M3~~ Truck Measured-Quantity.

~~Note: the same formula is used regardless whether the units are English or Metric.~~

### 8.2.3 SUBSOIL EXCAVATION

This item consists of the excavation and disposal of muck, clay, rock or any other material that is unsuitable in its original position and is excavated below the finished grading template, within authorized limits. All suitable material which must be removed in order to excavate underlying unsuitable material shall be included as subsoil excavation. If grading or embankment is a Plan Quantity pay item, then preconstruction original cross sections are not always required. The original terrain shown in the plan cross-sections should be used as original sections unless they are determined to be outside specification tolerance by the PEPA or the Contractor, in which case, preconstruction originals are required.

- (A) Check the level notes, cross sections, plots, templates, match lines, etc., as shown in **Chapter 8** of the-P&DM.
- (B) No material above the finished grading template is allowed for payment as subsoil excavation.
- (C) Fill material required to backfill unauthorized subsoil excavation shall be deducted from truck measured borrow to be paid for, unless the subsoil excavation replaces required borrow material elsewhere on the contract. The deduction would be the net- fill, plus fluffage and shrinkage allowance for truck measured borrow to determine the deductible quantity.
- (D) Check authorized limits (horizontal and depth) versus plan limits. Verify that authorized limits were used for computer runs. Check for grade changes that would influence the limits.
- (E) When using the Department's Multiline Earthwork Program, confirm that the pay cut column was transferred as the final pay quantity.
- (F) When subsoil excavation occurs and the baseline is on a curve, verify that a centroid correction was applied to the volume calculations. Also check the curve data, baseline reference and direction.
- (G) Check the plot output versus the end area output to ascertain that they represent the same run. It is possible to have a good plot and erroneous areas.
- (H) Check the field books for omissions of sections, notes concerning disposition of material, begin cut, end cut, and vertical cut.

- 1 | (I) ~~Run through any intermediate~~ Check computer outputs and notes to confirm  
2 | that all errors have been corrected. Check ties and irregular points.
- 3 | (J) Check extra depth subsoil excavation - calculated and paid for as described  
4 | in **Chapter 8** of the **P&DM**.
- 5 | (K) Check finished grading templates and sub\_design line for all plastic material  
6 | and/or rock excavation.
- 7 | (L) Refer to the **Design Standards** for the authorized limits and method of  
8 | developing sub\_design line.
- 9 | (M) The removal of slides and falls will not be paid for separately, but shall be  
10 | included in the contract unit price for the quantity of subsoil excavation within  
11 | the subsoil excavation limits.

#### 12 | **8.2.4 CHANNEL EXCAVATION**

13 | Channel excavation consists of excavation and disposal of material from the limits of  
14 | the channel shown in the plans. When this item is not shown, excavation shall be  
15 | included as lateral ditch excavation. The level notes, cross sections, templates, field  
16 | books, and volume calculation shall be checked according to the procedures already  
17 | outlined.

#### 18 | **8.2.5 EXCAVATION FOR STRUCTURES (Direct Pay)**

19 | Includes excavating for bridge foundations, box culverts, pipe culverts, storm  
20 | sewers, retaining walls, headwalls, catch basins, drop inlets, manholes and all  
21 | similar structures. This item does not include excavating for bases, pavement,  
22 | curbs, curb and gutter, ~~valley gutter, ditch pavement, or rubble gutter~~ and similar  
23 | items. An approved Quality Control Plan should be ~~de~~provided in accordance  
24 | with ~~article 6-8~~Section 105 of the Standard Specifications.

- 25 | (A) All bench mark elevations, level notes, and rod reductions shall be verified in  
26 | the Initial Reviewing operation.
- 27 | (B) Check the size and location of structures using plan dimension to establish  
28 | the authorized limits.
- 29 | (C) Excavation below plan grade may be authorized if unsuitable material is  
30 | encountered. Check the Daily Work Report ~~of Construction~~ forms or the

- 1 explanation of overruns and underruns.
- 2 (D) The cubic yards ~~or cubic meters~~ used as a basis of payment shall be the  
3 material actually removed below the original ground line or stream bed,  
4 excluding any material paid for as regular, subsoil, lateral ditch or channel  
5 excavation or any paid for in the item of grading. Check overlap of pay  
6 quantities.
- 7 (E) If payment for this item is at a lump sum price, all authorized material  
8 excavated below or outside the limits indicated on the plans will be paid for  
9 as extra work.
- 10 (F) Removal and replacement of material unsuitable for backfill shall be reviewed  
11 in accordance with the ~~Standard~~ Specifications requirement and Basis of  
12 Payment, as described per ~~Subarticle-Section 125-1214~~ of the Standard  
13 Specifications.
- 14 (G) Compute the average depth of excavation by the weighted rod elevation  
15 method (as in seal concrete), using a grid cross-section pattern.
- 16 (H) Wherever the existing site is disturbed *solely* for the purpose of constructing  
17 or removing box culverts, pipe culverts, storm sewers, inlets, manholes, etc.,  
18 completely replace and restore the site to the Engineer's satisfaction, without  
19 additional compensation per ~~Article-Section 125-1113~~ and ~~430-1211~~ of the  
20 Standard Specifications.

21 **8.2.6 ~~MUCK BLANKET AND TOPSOIL (Finish Soil Layer)~~ Prepared Soil Layer**

22 ~~The areas for these items are usually determined by latitude and departure. The~~  
23 ~~field measurements and calculations shall be checked using the original notes.~~  
24 The quantities to be paid for will be plan quantity meeting the requirements of  
25 Section 162-6 of the Standard Specifications, completed and accepted.  
26  
27

**8.3 LIST OF FIGURES FOLLOWING THIS CHAPTER**

Figure No. 8-1.....Volume of Seal Concrete Example

**Figure 8-1  
 EXAMPLE OF VOLUME OF SEAL CONCRETE**

