



**STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION**

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Chapter 2 Earthwork Update

Effective immediately, the Roadway Design Guidelines Chapter 2 has been revised to include updated earthwork information. The estimated grading tabulated block has been updated. Both balanced and unbalanced earthwork tab blocks have been added and will replace the requirement to add this information to the profile sheet. Projects that have already been submitted for final ROW should not remove the earthwork information from the profile sheet. A Grading Report template has been added to ensure consistent information is provided across the state. An [Earthwork Design Guide](#) has been developed to provide additional support for designers.

The following sections have been added or modified:

2-706.00 EARTHWORK BALANCES IN PLANS

Earthwork balances shall be computed using average end areas. Examples of how to calculate earthwork balances are as follows:

1. Calculation procedure for balanced Earthwork.

250,000 C.Y. Exc. (Common)
-13,000 C.Y. Topsoil from exc. Areas
- 5,000 C.Y. Topsoil from emb. Areas
232,000 C.Y. Exc. (Common) available for balance

Exc. (Com) + [Exc. (Rock) x 1.15] vs. Emb.

1.15

232,000 + (45,000 x 1.15) vs. 253,489 C.Y.

1.15

201,739 + 51,750 vs. 253,489 C.Y.

253,489 C.Y. = 253,489 C.Y.

2. Calculation procedure for unbalanced Earthwork.

350,000 C.Y. Exc. (Common)
 -13,000 C.Y. Topsoil from exc. Areas
 - 5,000 C.Y. Topsoil for emb. Area
 332,000 C.Y. Exc. (Common) available for balance

Exc. (Com) + [Exc. (Rock) x 1.15] vs. Emb.

1.15

332,000 + (45,000 x 1.15) vs. 253,489 C.Y.

1.15

340,446 C.Y. vs. 253,489 C.Y.

The 86,957 C.Y. of excess material has had the shrinkage factor applied to it (this assumes all excess material will be common). When this quantity is multiplied by the shrinkage factor (to "un-shrink" it), the excess then becomes 100,000 C.Y.

2-708.00 ESTIMATED GRADING QUANTITIES TABULATED BLOCK

The Estimated Grading Quantities tabulated block should be shown on Sheet 2E, Tabulated Quantities Sheet. An example of the tabulated block is shown in *Table 2-8, Estimated Grading Quantities – Balanced Example* and *Table 2-9, Estimated Grading Quantities – Unbalanced Example*.

On all projects using Item No. 203-01, Road and Drainage Excavation (Unclassified), it is to be referred to as unclassified excavation. When the Designer has received the Soils and Geology Report stating approximately what portion is common and what portion is solid rock, the Designer is to include the quantities in the block, even if the quantity is zero. If the Designer does not know the composition of the material being excavated, the Designer should use write 'UNKNOWN' in the Rock cell.

ESTIMATED GRADING QUANTITIES						
DESCRIPTION	UNADJUSTED VOLUMES (CY)		ADJUSTED VOLUMES (CY)	BALANCE SUMMARY		
	EXC.	EMB.	EXC.	SHRINK = 15 %	SWELL = 15 %	
MAINLINE	219500	243000	190870			
SIDE ROADS	12500	5490	10870			
PVT. DRIVES, BUSINESS AND FIELD ENTRANCES	0	0				
INDEPENDENT DITCHES	0	0				
TEMPORARY CONSTRUCTION EXITS	0	0				
OTHER	0	0				
PAVEMENT	0					
TOPSOIL (EMB.)	5000		4348			
TOPSOIL (EXC.)	13000		11305			
TOPSOIL (TO REPLACE STRIPPED TOPSOIL)		5000				
ROCK (C.Y.)	TOTALS (C.Y.)					
EXC.	EMB.	EXC. (UNCL.)	EMB. (UNCL.)	EXC (COMMON)	EXC. (AVAIL.)	EXC. (ADJ.)
45000	0	250000	253490	232000	201740	253490
				EXC.	EMB.	
				253490	-253490	
				AVAILABLE	=	0
				WASTE MATERIAL	=	0

**Table 2-8
 Estimated Grading Quantities – Balanced Example**

ESTIMATED GRADING QUANTITIES					
DESCRIPTION	UNADJUSTED VOLUMES (CY)		ADJUSTED VOLUMES (CY)	BALANCE SUMMARY	
	EXC.	EMB.	EXC.	SHRINK = 15 %	SWELL = 15 %
MAINLINE	319500	243000	277827		
SIDE ROADS	12500	5490	10870		
PVT. DRIVES, BUSINESS AND FIELD ENTRANCES				EXC.	EMB.
INDEPENDENT DITCHES					
TEMPORARY CONSTRUCTION EXITS				340446	VS -253490
OTHER					
PAVEMENT					
TOPSOIL (EMB.)	5000		4348	AVAILABLE	= 86956
TOPSOIL (EXC.)	13000		11305		
TOPSOIL (TO REPLACE STRIPPED TOPSOIL)		5000		WASTE MATERIAL	= 100000
ROCK (C.Y.)	TOTALS (C.Y.)				
EXC.	EMB.	EXC. (UNCL.)	EMB. (UNCL.)	EXC. (COMMON)	EXC. (AVAIL.)
45000		350000	253490	332000	288696
					340446

**Table 2-9
Estimated Grading Quantities – Unbalanced Example**

2-709.00 GRADING REPORT

All grading report sheets shall show the federal and/or state project numbers, route numbers and/or street names and county on each sheet. The Designer should use the [Grading Report template](#). Each sheet shall be numbered to reflect both the individual sheet number as well as the total number of quantity sheets in the submission. See *Figure 2-22, Sample Grading Report*.

GRADING REPORT									
COMPUTED BY: AMY LORENTZ				SHEET 1 OF 1					
CHECKED BY: DAWN PRUETT				STATE NO.:83027-3221-94					
PIN: 124717.00				FEDERAL PROJECT NO: BR-STP-174(27)					
ROUTE NO. OR STREET: SR 174				COUNTY: SUMNER					
ESTIMATED GRADING QUANTITIES									
DESCRIPTION	UNADJUSTED VOLUME \$ (CY)		ADJUSTED VOLUME \$ (CY)		BALANCE SUMMARY				
	EXC.	EMB.	EXC.		SHRINK = 20 %	SWELL = 20 %			
MAINLINE	4236	6678	3529						
SIDE ROADS	2341	654	1951						
PVT. DRIVES, BUSINESS AND FIELD ENTRANCES					EXC.	EMB.			
PAVEMENT	542		452		16883	VS. -7232			
TOPSOIL (EMB.)					AVAILABLE =	9651			
TOPSOIL (EXC.)					WASTE MATERIAL =	11581			
TOPSOIL (TO REPLACE STRIPPED TOPSOIL)									
TOTALS (CY)									
ROCK	EXC. (UNCL.)	EMB. (UNCL.)	EXC (COMMON)	EXC. (AVAIL)	EXC. (ADJ.)				
543	718	7232	6676	5480	16883				

***** SR 174 *****									
Material Name	End Areas	Unadjusted	Adjusted	Mult	Mass	Accum	Accum	Accum	Adj Vol
Station		(sq. ft.)	(cu. yd.)	(cu. yd.)	Factor	Ordinate	Unadj Vol	(cu. yd.)	(cu. yd.)
100+43.56 EARTH									
Excavation		20	0	0	0.85		0	0	0
Fill		0	0	0	1.00	0	0	0	0
100+50.00 EARTH									
Excavation		22	5	4	0.85		5	4	4
Fill		0	0	0	1.00	4	0	0	0
100+75.00 EARTH									
Excavation		51	34	29	0.85		39	33	33
Fill		0	0	0	1.00	33	0	0	0
101+00.00 EARTH									
Excavation		117	78	66	0.85		117	99	99
Fill		0	0	0	1.00	99	0	0	0
101+25.00 EARTH									
Excavation		185	140	119	0.85		257	218	218
Fill		0	0	0	1.00	218	0	0	0

**Figure 2-22
Sample Grading Quantities Sheet**

This IB Voids RDG Section 4-203.45 and 4-203.55 due to an update and inclusion into RDG Chapter 2.

Chapter 2 has been not been updated on the Roadway Design Website. The [Estimated Roadway Quantities](#) file has been updated to include the new earthwork tab block. The [Earthwork Design Guide](#) can be found on the Roadway Design Training website.



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Roadway Design Division

KJL:JDK:ADP:LHC:NHP
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