

DIVISION 200 EARTHWORK AND SITE PREPARATION

SECTION 201 CLEARING AND GRUBBING

201.01 GENERAL. All materials and debris from Clearing and Grubbing operations shall be disposed of in such manner and at such location(s) as approved by the Engineer. The Resident Engineer should pay particular attention to the requirements regarding Selective Clearing.

201.02 METHOD OF MEASUREMENT. Quantities for Clearing and Grubbing items as shown on the plans and in the contract will be considered as final quantities, and no further measurement is required, unless the Contractor notes a significant variation in the plan quantities (or a change order is approved altering the quantities). It is the intent of this specification to pay plan quantity if there is less actual clearing than noted on the plans and to pay additional clearing when there is more actual clearing than noted on the plans.

(a) Pre-Construction Review. A preconstruction review of clearing item quantities on the plans by the Resident Engineer is not necessary. It will be the contractor's responsibility to note any significant differences (i.e., additional clearing and grubbing), before beginning work in that area. If the Contractor notes differences, it will then be the Resident Engineer's responsibility to make appropriate sketches and measurements of any existing areas that are not shown on the plan schedule.

(b) Station (Metric Station) Measurement. When Station (Metric Station) measurement is specified, it includes all of the area within the R/W and easements. A full Station is measured whenever there is at least one tree (4" [100 mm] diameter at 1' [.3 m] above the ground) within that Station (Metric Station) which requires clearing and/or grubbing. For example:

	<u>Measurement</u>	
(1)	1 tree @ Sta. 4+90	1 Station
(2)	1 tree @ Sta. 4+90, 1 tree @ Sta. 5+12	2 Stations
(3)	1 tree @ Sta. 4+12, 1 tree @ Sta. 4+90	1 Station
(4)	1 tree @ 11+30, 1 @ 9+20, EQ 11+50 BK = 9+10 AH (11+00 to 10+00, greater than 100 feet)	2 Stations
(5)	1 tree @ 52+30, 1 @ 65+95, EQ 52+45 BK = 65+90 AH (52+00 to 66+00 less than (or equal) 100 feet)	1 Station

The same procedure shown in the example is applicable to metric projects.

(c) Acre (Hectare) Measurement. When Acre (Hectare) measurement is specified, the measurement is of a closed plane figure. The boundary of each tract shall be a line extending along the outside trunks of the outermost trees or stumps. The measurements and appropriate sketches of variances from plans must be made in the

field, since these documents are Original Source Documents (OSD's). When practical, calculation of the quantity should be performed using the AREA program on the microcomputer. A hard copy printout of these calculations is also a part of the OSD and both it and the document containing the sketches and measurements should be attached to the RWP marked "Final Document". (See 201.04 below.)

(d) Measurement by Each. When specified, isolated, individual trees or stumps are simply counted when variances from plan quantities are noted.

201.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified Station limits, approximate field measurement, etc. Current Estimate documentation for Clearing and Grubbing items must be recorded on the "Report of Work Performed" (RWP) form and marked "Current Estimate." Variations in plan quantities may be supported by reference to the appropriate final document or Change Order that contains the measurement and computations for the change.

Examples of properly completed RWP's for Current Estimate documentation of Clearing and Grubbing items are shown in *Figure 201-1*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

201.04 DOCUMENTATION - FINAL ESTIMATES. Final Estimate documentation for Clearing and Grubbing items is to be based on plan quantity and noted variations. The Original Source Document (OSD) that must accompany the Final Estimate is the RWP marked "Final Document."

If there are no variations in plan quantity on a Clearing and Grubbing item, plan quantity shall be shown on the "Final Document" RWP (OSD) with "Verified Plan Quantity" as the "Basis of Estimate".

When the final pay quantity differs from plan quantity, the "Final Document" RWP(s) should state "Verified Plan Quantity with Field Measured Additions/Deletions" (or similar notation) as the "Basis of Estimate". The variations in plan quantity should be documented by one or both of the following methods:

- (1) By field measurements, sketches, and computations entered on or attached to the "Report of Work Performed" forms (RWP's) and/or
- (2) By reporting the appropriate quantity and referring to the applicable approved Change Order number on an RWP marked "Final Document." In this case, the Change Order **MUST** contain the appropriate sketches, measurements, and computations.

Examples of properly completed RWP's for Final Estimate documentation of Clearing and Grubbing items are shown in *Figure 201-2*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual. RWP's marked "Current Estimate" should not be submitted with the Final Estimate.

SECTION 202

REMOVAL AND DISPOSAL OF STRUCTURES

202.01 GENERAL. All materials and debris shall be disposed of in such manner and at such location(s) as approved by the Engineer. Unless otherwise specified in the contract, all material removed under this item becomes the property of the Contractor.

When there are materials specified on the plans or in the contract to become the property of someone other than the Contractor, the procedures contained in *Subsection 104.04* of this Manual should be followed.

NOTE: Removal and Disposal of waterwells (including plugging same) must be performed in accordance with Arkansas Water Well Construction Commission policies. Resident Engineers should contact the Construction Office for guidance in this area when this item is on the plans.

202.02 METHOD OF MEASUREMENT. Quantities for "Removal and Disposal of _____" as shown on the plans and in the Bid Proposal will be considered as final quantities, and no further measurement is required, unless the Resident Engineer and/or the contractor notes significant exception(s) and/or a Change Order is approved altering the quantities.

The plan quantities must be verified and measurements for revisions (if any) must be made prior to the work in that area.

202.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation shall be RWP's completed in the same manner as those for Clearing and Grubbing items (See *Subsection 201.03* of this Manual).

An example of a properly completed RWP for Current Estimate documentation of this item is shown in *Figure 202-1*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

202.04 DOCUMENTATION - FINAL ESTIMATES. Final Estimate documentation shall be RWP's completed in the same manner as those for Clearing and Grubbing items.

An example of a properly completed RWP for Final Estimate documentation of this item is shown in *Figure 202-2*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

SECTION 203
REMOVAL AND DISPOSAL OF UNDERGROUND
STORAGE TANK SYSTEMS

203.01 GENERAL. This item consists of excavation, removal, and disposal of underground Storage Tank systems and their contents at locations specified. This also includes satisfactory backfill of same.

The Resident Engineer shall invite the Environmental Division Representative to the Preconstruction Conference on projects containing items specified under this Section. In addition, copies of all correspondence, etc., relating to these items shall be sent to

Environmental Division. The Resident Engineer may obtain details concerning the various testing procedures noted in this Specification from the Environmental Division.

Should the Contractor be allowed to dispose of contaminated material in a solid waste landfill, he must provide proof to the Resident Engineer that the material was so disposed.

The Resident Engineer should suspend operations and seek guidance from the Central Office Construction and Environmental Divisions:

- If extensive contamination is encountered,
- If "Free Product" is encountered, or
- If a tank system not shown on the plans is discovered.

203.02 METHOD OF MEASUREMENT. (a) "Removal and Disposal of Underground Storage Tank Systems" is measured by the Unit ("Each"), which includes removal and disposal of the tank, the lines connected to it, and their contents.

(b) "Backfilling Underground Storage Tank Systems" is measured by the Cubic Meter (Cubic Yard) of the hole from which the tank was removed. This may be measured by the cross section method with the volume computed by the average end area method, or by measuring all dimensions and computing the volume.

(c) "Excavation of Underground Storage Tank Systems" is measured by the Cubic Meter (Cubic Yard). (This is computed using the volume calculated for Backfilling Underground Storage Tank Systems less the volume of the tank.)

(d) "Treatment or Disposal of Excavated Material" is measured by the Cubic Meter (Cubic Yard). This is the portion of excavated material where hydrocarbon levels are in excess of 100 PPM. This may be measured using dimensions, in a windrow, in vehicles, by cross sections, etc.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CLEARING QUICK CODE 201011
 JOB NO. R12345 FAP NO. HEF-12(3) JOB NAME HWY 79-HWY 86
 (64 STRS)
 CURRENT ESTIMATE REPORT NO. 1
 FINAL DOCUMENT DATE 2-1-98

ITEM GRUBBING QUICK CODE 201101
 JOB NO. R61135 FAP NO. MM-9(17)-3 JOB NAME HWY 141-NORTH (64 STRS)
 CURRENT ESTIMATE REPORT NO. 2
 FINAL DOCUMENT DATE 2-1-98

Pay Quantity	Unit	Description, Location	Sub Item #	PLAN QUANTITY	PERCENT COMPLETE	TOTAL TO DATE	PREVIOUS ALLOWED	DUE THIS REPORT	REMARKS
40	STA	ENTIRE PROJECT - CLEARING COMPLETED		0.73	100%	0.73	0.50	0.23	
2	STA	STA. 26+00 - 27+53 ALIGNMENT CHANGE (C.O. # 2)		2.04	60%	1.22	0.60	0.62	
				0.97	25%	0.24	0	0.24	
42	STA	TOTAL TODAY							
0		PREVIOUS TOTAL							
42	STA	TOTAL TO DATE							

UNIT OF MEAS. ACRES

PLAN QUANTITY	PERCENT COMPLETE	TOTAL TO DATE	PREVIOUS ALLOWED	DUE THIS REPORT	REMARKS
0.73	100%	0.73	0.50	0.23	
2.04	60%	1.22	0.60	0.62	
0.97	25%	0.24	0	0.24	
Total Due This Report					1.09
Previous Total					1.10
Total To Date					2.19

BASIS OF ESTIMATE: % PLAN QUANTITY PLUS ADDITIONAL

REPORTED BY: Andrew Thomas CHECKED BY: SHARIS FREDERICK Rev. 6-8-94

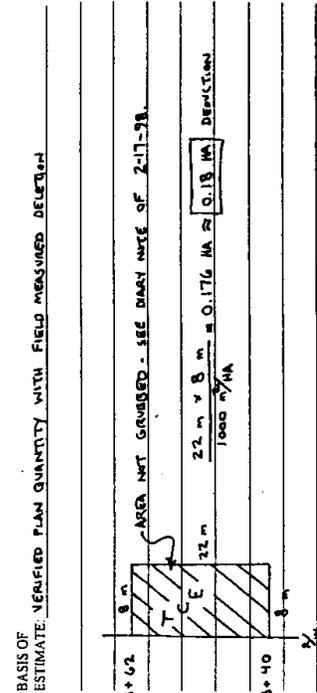
REPORTED BY: Arthur Murray CHECKED BY: Maxwell Coyle

Figure 201-1A & Figure 201-1B
 Example RWP's for Current Estimates
 Fig. 201-1A Station Measurement-Clearing
 Figure 201-1B Acre Measurement-Grubbing

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM: GRUBBING ITEM CODE: 201011
 JOB NO. R61135 FAP NO. 1991-0(17)-3 JOB NAME HWY 161 - NORTH (66.149 167)
 QUICK CODE

CURRENT ESTIMATE
 FINAL DOCUMENT
 DATE 6-12-98 REPORT NO. 1

Pay Quantity	Unit	Description, Location	Sub Item #
3.74	HA	ENTIRE PROJECT - PLAN QUANTITY	
-0.18	HA	EASEMENT ON PLANS - NOT GRUBBED (SEE BELOW)	
3.56	HA	TOTAL TODAY	
		PREVIOUS TOTAL	
3.56	HA	TOTAL TO DATE	

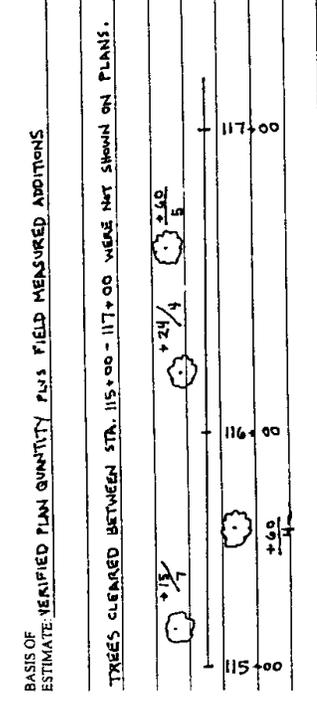


REPORTED BY: Autum Muey CHECKED BY: Sam Jackson III
 Rev 6894

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM: CLEANING ITEM CODE: 201011
 JOB NO. R12345 FAP NO. 11EF-12(3) JOB NAME HWY 19 - HWY 86 (66.4 STAS.)
 QUICK CODE

CURRENT ESTIMATE
 FINAL DOCUMENT
 DATE 7-12-78 REPORT NO. 1 FINAL

Pay Quantity	Unit	Description, Location	Sub Item #
40	STA	PLAN QTY - ENTIRE PROJECT	
2	STA	STA. 26+00 - 27+53 ALIGNMENT CHANGE - BY CO #2	
2	STA	STA. 115+00 - 117+00 (SEE BELOW)	
44	STA	TOTAL TODAY	
		PREVIOUS TOTAL	
44	STA	TOTAL TO DATE	



REPORTED BY: Andrew Brown CHECKED BY: C.E. Williams
 Rev 6894

Figure 201-2A & Figure 201-2B
 Example FINAL RWP for Clearing and Grubbing
 Fig. 201-2A Station Measurement-Clearing
 Figure 201-2B Acre Measurement-Grubbing

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 282053
 ITEM REMOVAL & DISPOSAL OF CONC CURB (GUTTER) QUICK CODE
 JOB NO. R11114 FAP NO. STATE J-6 JOB NAME MAIN ST. - HWY. 12
 REPORT NO. 2

DATE 2-1-98

Pay Quantity	Unit	Description . Location	Sub Item #
440	LF	STA. 202+50 - 208+00 LT	
TOTAL TODAY			
440	LF		
PREVIOUS TOTAL			
110	LF		
TOTAL TO DATE			
550	LF		

BASIS OF ESTIMATE: ROUGH FIELD MEASUREMENT
 CURB & GUTTER REMOVED FROM STA. 202+50 - 208+90 LT
 LEFT SIDE NOW COMPLETE
 REPORTED BY: Daniel Boone
 CHECKED BY: Stephen Austin

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 252011M
 ITEM REMOVAL & DISPOSAL OF FENCE QUICK CODE
 JOB NO. 60112 FAP NO. BAF-516 (2) JOB NAME BAYNE LICK, SR. & APPAS
 REPORT NO. 1

DATE 3-14-98

Pay Quantity	Unit	Description . Location	Sub Item #
781	M	APPAS - ADJUNCT FENCE QUANTITY	
92	M	STA. 250+00 - 250+70 RT (SEE BELOW)	
TOTAL TODAY			
863	M		
PREVIOUS TOTAL			
863	M		
TOTAL TO DATE			

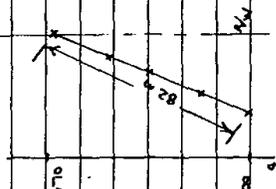
BASIS OF ESTIMATE: VERIFIED FENCE QUANTITY WITH FIELD MEASURED ADJUNCTION
 FENCE NOT SHOWN ON PLANS

 REPORTED BY: Douglas Johnson
 CHECKED BY: Andrew Thomas

Figure 202-1 & Figure 202-2

Example RWP for Removal and Disposal Items
 Fig. 202-1 Current RWP for R & D Conc. Curb
 Fig. 202-2 Final RWP for R & D Fence

203.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation for each of the items under this Specification may be based upon final quantity calculations, a percentage of plan quantity, approximate field measurements, etc. Current Estimate documentation must be recorded on the "Report of Work Performed" (RWP) form and marked current estimate.

An example of a properly completed RWP for Current Estimate documentation of this item is shown in *Figure 203-1A*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

203.04 DOCUMENTATION - FINAL ESTIMATE. Final Estimate documentation for "Removal and Disposal of Underground Storage Tank Systems" should be based on "Actual Field Count". The "Original Source Document" (OSD) that must accompany the Final Estimate is the "Report of Work Performed marked "Final Document". This should show "Actual Field Count" as the "Basis of Estimate".

An example of a properly completed RWP for Final Estimate documentation of this item is shown in *Figure 203-1B*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

(b) Final Estimate documentation for "Backfilling Underground Storage Tank Systems" is the same as noted in *Subsection 210.04 (a)* for other earthwork, if the cross section method is used. If the dimensions are used in lieu of cross sections, the sketch and volume computations obtained shall be placed on or attached to a properly completed RWP marked "Final Document".

(c) Final Estimate documentation for "Excavation for Underground Storage Tank Systems" shall consist of a properly completed RWP marked "Final Document". This RWP should contain a sketch of and volume calculations for the tank that was removed. It should also contain a reference to the appropriate "Final Document" RWP for "Backfilling Underground Storage Tank Systems" and the calculation of the final "Excavation for Underground Storage Tank Systems" quantity. (This is computed using the "Backfilling Underground Storage Tank Systems" amount and subtracting the volume of the tank.)

(d) Final Estimate Documentation for "Treatment or Disposal of Excavated Material" shall consist of a properly completed RWP marked "Final Document" (or "Daily Report of Volumetric Hauling" [Form 19-165M (19-165) if used]. This RWP should contain all applicable sketches, cross sections and volume calculations.

SECTION 204 VACANT

SECTION 205

REMOVAL OF EXISTING BRIDGE STRUCTURES

205.01 GENERAL. All materials and debris shall be disposed of in such manner and at such location(s) as approved by the Engineer. Unless otherwise specified in the contract, all salvageable material removed under this item remains the property of the Owner (normally the Department) and shall be handled as Salvage Material (See *Subsection 104.04* of this manual).

205.02 METHOD OF MEASUREMENT. "Removal of Existing Bridge Structure (Site No.____)" will be measured on the lump sum basis for each bridge.

205.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation for "Removal of Existing Bridge Structure (Site No.____)" may be based on a percent of the work completed on the item. This shall be recorded on a "Report of Work Performed" (RWP) marked "Current Estimate" when payment is made.

An example of a properly completed RWP for Current Estimate documentation of this item is shown in *Figure 205-1*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

205.04 DOCUMENTATION - FINAL ESTIMATES. Final Estimate documentation for "Removal of Existing Bridge Structure (Site No.____)" is to be based on "Observation of completed work". The Original Source Document (OSD) that must accompany the Final Estimate is the Report of Work Performed (RWP) marked "Final Document". This RWP should contain "Observation of Completed Work" as the "Basis of Estimate".

An example of a properly completed RWP for Final Estimate documentation of this item is shown in *Figure 205-2*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

SECTION 206 FLOWABLE SELECT MATERIAL

206.01 GENERAL. Flowable Select Material is generally used for backfilling RC Box Culverts or pipe culverts in areas with limited access to conventional compaction equipment. This item is also used where a fast installation is needed to minimize public inconvenience. The Contractor is responsible for preparing and submitting a mix design; however, the Department is responsible for all acceptance sampling and testing.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 295011
 ITEM REMOVAL OF EXISTING BRIDGE STRUCTURE (SITE NO. 1) QUICK CODE
 JOB NO. 30117 FAP NO. STATE JAS JOB NAME JUSTIN CREEK BR. 1
 APRK. REPORT NO. 1 \$ FINAL

CURRENT ESTIMATE DATE 4-11-98
 FINAL DOCUMENT

Pay Quantity	Unit	Description - Location	Sub Item #
1.0	L.S.	STA. 26+12.2 - 27+50.3 RT	
TOTAL TODAY			
1.0	L.S.		
PREVIOUS TOTAL			
1.0	L.S.		
TOTAL TO DATE			

BASIS OF ESTIMATE: OBSERVATION OF COMPLETED WORK

REPORTED BY William Clark CHECKED BY T. Jefferson
 REV 8-894

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 295011
 ITEM REMOVAL OF EXISTING BRIDGE STRUCTURE (SITE NO. 1) QUICK CODE
 JOB NO. 30117 FAP NO. STATE JAS JOB NAME JUSTIN CREEK BR. 1
 APRK. REPORT NO. 2

CURRENT ESTIMATE DATE 2-1-98
 FINAL DOCUMENT

Pay Quantity	Unit	Description - Location	Sub Item #
0.25	L.S.	STA. 26+12.2 - 27+50.3 RT	
TOTAL TODAY			
0.25	L.S.		
PREVIOUS TOTAL			
0.50	L.S.		
TOTAL TO DATE			

BASIS OF ESTIMATE: % PLAN QUANTITY

DECK REMOVED % COMPLETE TO DATE = 50%
 PREVIOUS PAID -25%
 DUE THIS ESTIMATE 25%

REPORTED BY William Clark CHECKED BY T. Jefferson
 REV 8-894

Figure 205-1 & Figure 205-2

Current and Final RWP for Removal of Existing Bridge Structure

206.02 METHOD OF MEASUREMENT. Flowable Select Material is measured by the cubic meter (cubic yard). The quantity shown on the plans will be considered as the final quantities. No further measurement is required, unless the Resident Engineer and/or the Contractor notes significant variations between plan quantities and actual quantities due to changes in alignment or dimensions or to apparent errors. Excavation carried beyond the limits shown on the plans (for the Contractor's convenience) should not be considered as a basis for increasing the plan quantity.

206.03 DOCUMENTATION - CURRENT ESTIMATE. Current estimate documentation for Flowable Select Material will be properly completed Reports of Work Performed (RWPs) marked "Current Estimate." The "Basis of Estimate" may be based on a percent of Plan Quantity, reference to the appropriate "Final Document" RWP, approximate field measurement, etc. The method used for "Basis of Payment" must be understandable, accurate, and clearly stated on the RWP.

An example of a properly completed RWP for Current Estimate documentation for Flowable Select Material is shown in *Figure 206-1*. Additional information on the completion of RWPs is found in *Subsection 109.02* of this Manual.

206.04 DOCUMENTATION - FINAL ESTIMATES. Final Estimate documentation for Flowable Select Material is to be based on plan quantity and noted variations. The Original Source Document (OSD) that must accompany the Final Estimate is the RWP marked "Final Document."

If there are no variations in plan quantity on a Flowable Select Material item, plan quantity shall be shown on the "Final Document" RWP (OSD) with "Verified Plan Quantity" as the "Basis of Estimate".

When the final pay quantity differs from plan quantity, the "Final Document" RWP(s) should state "Verified Plan Quantity with Field Measured Additions/Deletions" (or similar notation) as the "Basis of Estimate". The variations in plan quantity should be documented by one or both of the following methods:

- (1) By field measurements, sketches, and computations entered on or attached to the "Report of Work Performed" forms (RWP's) and/or
- (2) By reporting the appropriate quantity and referring to the applicable approved Change Order number on an RWP marked "Final Document." In this case, the Change Order MUST contain the appropriate sketches, measurements, and computations.

An example of a properly completed RWP for Final Estimate documentation of Flowable Select Material is shown in *Figure 206-2*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

**SECTION 207
STONE BACKFILL**

207.01 GENERAL. When this item is a bid item on a project, the Resident Engineer may designate unsuitable excavation areas for "Stone Backfill" in much the same manner as undercut is designated. (Refer to *Subsection 210.10* of this Manual.) Among the advantages to utilizing this item in lieu of undercut are:

- ☺ Fast Installation,
- ☺ Less Public inconvenience,
- ☺ Ease of Documentation, and
- ☺ less excavation and backfill than undercut due to Stone Backfill's ability to "bridge" unsuitable material.
- ☹ A common disadvantage is COST.

The Resident Engineer should include these in the consideration as to whether an unsuitable excavation area should be designated for undercut (Unclassified Excavation and Compacted Embankment) or Stone Backfill.

NOTE: Prior to authorizing significant use of Stone Backfill, the Resident Engineer should consult with others (District, Construction Office, Materials Division) to determine if other stabilization methods may be more appropriate and/or cost effective.

NOTE: Stone Backfill is paid only for locations "designated by the Engineer". Should a contractor utilize this material for his convenience without Resident Engineer authorization, it should be considered at his expense.

207.02 METHOD OF MEASUREMENT. Stone Backfill is measured by the ton (metric ton).

When backfilling with stone backfill to the subgrade elevation or to an elevation below subgrade when directed by the RE, the top 4" – 6" (100 mm - 150 mm) of the Stone Backfill must be made up of a material meeting the requirements of Class 7 Aggregate Base Course. This material is measured and paid for as Stone Backfill.

207.03 DOCUMENTATION - CURRENT AND FINAL ESTIMATES The computerized Daily Report System shall be used as OSD's for Stone Backfill. No further documentation is necessary for payment on Current and Final Estimates. Excavation is **NOT** measured for payment in conjunction with Stone Backfill.

NOTE: On projects with a very small amount of Stone Backfill, Form 19-213, "Daily Report of _____ Operations" may be utilized if the Resident Engineer feels that the total quantity for the project does not justify setting up the computer file and generating the computerized version.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 206001
 ITEM Flowable Select Material QUICK CODE
 JOB NO. 50117 FAP NO. AJ-104-1(18) JOB NAME MT. VERMONT - EAST
 CURRENT ESTIMATE DATE 3-11-98 REPORT NO. 1 FINAL
 FINAL DOCUMENT

Pay Quantity	Unit	Description, Location	Sub Item #
150.0	CY	STA. 71+50 10' x 10' RC BOX CURT	
150.0	CY	TOTAL TODAY	
		PREVIOUS TOTAL	
150.0	CY	TOTAL TO DATE	

BASIS OF ESTIMATE: VERIFIED PLAN QUANTITY

REPORTED BY: Washington Redding CHECKED BY: CA. Hamill

REV. 6-8-94

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 206001
 ITEM Flowable Select Material QUICK CODE
 JOB NO. 50117 FAP NO. AJ-104-1(18) JOB NAME MT. VERMONT - EAST
 CURRENT ESTIMATE DATE 2-1-98 REPORT NO. 1
 FINAL DOCUMENT

Pay Quantity	Unit	Description, Location	Sub Item #
75.0	CY	STA. 71+50 10' x 10' RC BOX CURT	
75.0	CY	TOTAL TODAY	
		PREVIOUS TOTAL	
75.0	CY	TOTAL TO DATE	

BASIS OF ESTIMATE: 50% PLAN QUANTITY AT ABOVE LOCATION

REPORTED BY: Washington Redding CHECKED BY: CA. Hamill

REV. 6-8-94

Figure 206-1 & Figure 206-2

Examples of Current and Final Documents for Flowable Select Material

SECTION 208
FENCE REMOVED AND RECONSTRUCTED

208.01 GENERAL. All materials and debris shall be disposed of in such manner and at such location(s) as approved by the Engineer. Unless otherwise specified, material removed and not used in the reconstruction becomes the property of the Contractor.

The Contractor is required to replace, at his expense, materials which are unusable and which are required for proper reconstruction.

208.02 METHOD OF MEASUREMENT. "Fence Removed and Reconstructed" will be measured by the linear foot (meter) of fence re-erected under this item. Measurement of the fence in its original position is **NOT** required as it has no bearing on the quantity for payment.

Gates removed and reconstructed as part of a fence will *not* be paid for separately. Gates will only be measured and paid for when shown separately on the plans. Such separate gates that are removed and reconstructed will be measured by the unit (Each) in the new location.

208.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation for Fence Removed and Reconstructed may be based on a percent of plan quantity, a percent of plan quantity within specified Station limits, approximate field measurement, etc. Current Estimate documentation for Gates Removed and Reconstructed may be based on a percent of plan quantity, or field count. Current Estimate documentation for "Fence Moved and Reconstructed" and "Gates Removed and Reconstructed" must be recorded on the "Report of Work Performed" (RWP) form and marked "Current Estimate" with the applicable "Basis of Payment" shown.

Examples of properly completed RWPs for Current Estimate documentation of these items are shown in *Figures 208-1A and 208-1B*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

208.04 DOCUMENTATION - FINAL ESTIMATES. Final Estimate documentation for Fence Removed and Reconstructed is to be based on "actual field measurement" of the fence **in its final position**. The Original Source Document (OSD) that must accompany the Final Estimate is the "Report of Work Performed" marked "Final Document". This should contain "Actual Field Measurement" as the "Basis of Estimate".

Final Estimate documentation for Gates Removed and Reconstructed is to be based on "actual field count" of the separate gates in the new locations. Gates removed and reconstructed as part of a fence are not to be included in this field count. The Original Source Document (OSD) that must accompany the Final Estimate is the "Report of Work Performed" marked "Final Document". This should contain "Actual Field Count" as the "Basis of Estimate".

Examples of properly completed RWPs for Final Estimate documentation of these items are shown in *Figures 208-2A & 208-2B*. Additional information on the completion of RWP's is found in *Subsection 109.02* of this Manual.

SECTION 209

REMOVING AND REPLACING BASE COURSE AND ASPHALT SURFACING

209.01 GENERAL. This pay item includes mixing, spreading, and compacting the material in accordance with Section 303.

The Contractor has two options in performing this work:

- scarify, break down, and mix all or part of the ACHM material with the base course and handle the material according to Section 209 of the Specifications, or
- remove and dispose of the ACHM by incorporating it into the embankment. In the event that the Contractor elects this option, the removal and disposal of the ACHM material will be measured and paid for as Unclassified Excavation.

209.02 METHOD OF MEASUREMENT. This item, when performed according to the first option above may be measured by either of two methods:

(a) **METHOD 1:** By cross section of the material in either its original position, in a windrow, or in a stockpile and computation of the volume (cubic yards [cubic meters]) **removed** using the average end area method. Cross sections are to be taken and volumes computed in the same manner as for earthwork. (See *Section 210* of this manual.) The quantity is reduced 30% for swell if windrow or stockpile X-sections are used.

(b) **METHOD 2:** Measured in trucks, using Form 19-165M (19-165) and Truck Measurement forms. The measured volume (cubic yards [cubic meters]) is reduced 30% for swell when this method is used. (See Appendix III for detailed instructions for this form.)

209.03 DOCUMENTATION - CURRENT ESTIMATES. (a) **Method 1.**-If computation of the Final Pay Quantity **HAS** been made, prepare an RWP marked "Current Estimate" showing the Final Quantity and refer to the appropriate RWP marked "Final Document" as the "Basis of Estimate".

If computation of the Final Pay Quantity **HAS NOT** been completed (i.e., the stockpile is still being constructed or the material is still being removed from the roadway), the Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity within specified Station limits, or approximate field measurement, etc. Current Estimate documentation in this instance must be recorded on the "Report of Work Performed" (RWP) marked "Current Estimate" with the applicable "Basis of Payment" shown.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 219002
 ITEM: GATES REMOVED & RECONSTRUCTED
 JOB NO. 91173 FAP NO. ANJ-418-12(10) JOB NAME FOREST BOUNDARY - NORTH
 CURRENT ESTIMATE DATE 3-13-98 REPORT NO. 2
 FINAL DOCUMENT

Pay Quantity	Unit	Description . Location	Sub Item #
0.5	EACH	STA. 36+42 LT (GATE REMOVED)	
0.5	EACH	TOTAL TODAY	
7.0	EACH	PREVIOUS TOTAL	
1.5	EACH	TOTAL TO DATE	

BASIS OF ESTIMATE: 50% PLAN QUANTITY AT ABOVE LOCATION

REPORTED BY: H. Hanna CHECKED BY: Stephen Ramsey Rev. 4/84

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 208001M
 ITEM: FENCE REMOVED & RECONSTRUCTED
 JOB NO. 491176 FAP NO. STRE 308 JOB NAME SO. RD. 6 - HWY 23
 CURRENT ESTIMATE DATE 3-13-98 REPORT NO. 2
 FINAL DOCUMENT

Pay Quantity	Unit	Description . Location	Sub Item #
33.0	M	STA. 10+00 - 10+82 LT (REMOVAL COMPLETE) #	
33.0	M	TOTAL TODAY	
8.0	M	PREVIOUS TOTAL	
41.0	M	TOTAL TO DATE	

BASIS OF ESTIMATE: % PLAN QUANTITY

* STA. 10+00 - 10+82 LT PLAN QTY 82 m
 FENCE REMOVED - % COMPLETE = +50%
 TOTAL TO DATE 41 m
 PREVIOUSLY PAID 8 m
 DUE THIS EST. 33 m

REPORTED BY: Mark Shepard CHECKED BY: John Kennedy Rev. 4/84

Figure 208-1A & Figure 208-1B

Examples of CURRENT Documents
 Figure 208-1A Fence Removed and Reconstructed
 Figure 208-1B Gates Removed and Reconstructed

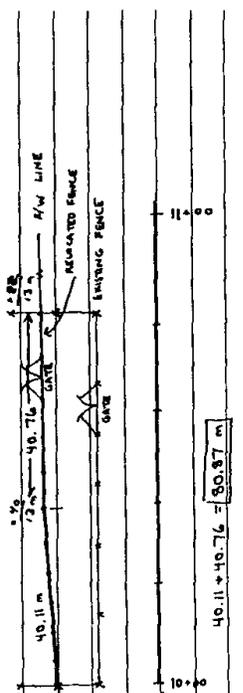
ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 208001M
 ITEM: GATES REMOVED & RECONSTRUCTED
 JOB NO. 91173 FAP NO. 418-12(17) JOB NAME: HART BARRON - NORTH
 REPORT NO. 2
 CURRENT ESTIMATE DATE: 4-12-98
 FINAL DOCUMENT

Pay Quantity	Unit	Description Location	Sub Item #
1	EACH	STA. 36+42 LT	
TOTAL TODAY			
TOTAL PREVIOUS			
TOTAL TO DATE			

BASIS OF ESTIMATE: ACTUAL FIELD COUNT
 REPORTED BY: H. Thomas CHECKED BY: Stephen Roney
 10-6-98

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM CODE: 208001M
 ITEM: FENCE REMOVED & RECONSTRUCTED
 JOB NO. 40176 FAP NO. 51773 JOB NAME: CO. RD. 6 - HWY 23
 REPORT NO. 1
 CURRENT ESTIMATE DATE: 4-21-98
 FINAL DOCUMENT

Pay Quantity	Unit	Description Location	Sub Item #
80.87	M	STA. 10+00 - 10+82 LT	
TOTAL TODAY			
TOTAL PREVIOUS			
TOTAL TO DATE			

BASIS OF ESTIMATE: ACTUAL FIELD MEASUREMENT


$$40.11 + 40.76 = 80.87 \text{ m}$$
 REPORTED BY: Andrew Richey CHECKED BY: Ben Ripton

Figure 208-2A & Figure 208-2B

Examples of FINAL Documents
 Figure 208-2A Fence Removed and Reconstructed
 Figure 208-2B Gates Removed and Reconstructed

The RWP's for Current Estimates are to be completed in the same manner as shown in *Section 210* for earthwork. The computations of the 30% reduction, when applicable, must be shown on the RWP.

(b) **Method 2.** When this item is measured in trucks, the applicable Forms 19-165 (19-165M), Daily Report of Volumetric Hauling, will be the documentation for Current Estimates. The computation of the 30% reduction must be shown on each form.

209.04 DOCUMENTATION - FINAL ESTIMATES. (a) **Method 1.** When this item is measured by X-section, the Original Source Document (OSD) that must accompany the Final Estimate will be an RWP marked "Final Document" showing the computed pay quantity. The "Basis of Estimate" is "Actual Field Measurement". In addition, the X-section books or SDMS file and computer-run computation sheets must accompany the Final Estimate. The computation of the 30% reduction, when required, should be shown on the volume sheets or on the RWP.

(b) **Method 2.** When this item is measured in trucks, the OSD will be the "Daily Report(s) of Volumetric Hauling" (Form 19-165 [19-165M]) completed for this item. No further documentation is necessary.

SECTION 210 EXCAVATION AND EMBANKMENT

210.01 GENERAL (a) **Quality Control and Acceptance Sampling and Testing.** Monitoring of Contractor acceptance testing is critical in embankment operations. Unlike other portions of the Specifications, only Contractor test results are used for acceptance of embankment construction. Therefore, the Department must make maximum use of verification tests in order to ensure that the test results reported by the Contractor are accurate. See *Subsection 106.04* of this Manual for additional information on verification testing. See the *Manual of Field Sampling and Testing Procedures* for specific test procedures and frequencies for verification testing.

As stated in Subsection 210.02(b) of the Specifications, in addition to the required acceptance tests, the Engineer may require the Contractor to test any location that appears defective. This tool should be used to ensure that no suspect areas are sweepingly accepted by the contractor's acceptance test. Remember that in-place density is not the only factor governing the acceptance of embankment material: stability is crucial to the final product.

(b) **Verification of Line and Grade.** It is the Resident Engineer's responsibility to compute planned grades. They may be computed by hand, or the microcomputer in the Resident Engineer's office can compute them.

ON ALL PROJECTS, and particularly on those which involve widening or matching an existing grade, the Resident Engineer shall take sufficient "on-ground" profiles, cross-sections, and other checks to verify the plan grades, typical sections, and/or plan original cross sections. This verification shall be accomplished prior to

performing any layout or other work which could be affected by the grades and/or typical sections.

(1) Projects WITHOUT Roadway Construction Control. When the pay item "Roadway Construction Control" is NOT included in the contract, the Resident Engineer is responsible for providing the Contractor with sufficient line and grade stakes to construct the work. Computation and documentation for these stakes should be performed using the manual method as described in the "Construction Survey Course". The microcomputer may be used to assist with the computations.

While the Contractor must satisfy themselves as to the correctness and meaning of all stakes, measurements and marks before commencing work, the Department and, ultimately, the Resident Engineer is responsible for the accuracy of the information given the Contractor. It is in the best interest of the Contractor and the Resident Engineer to ensure, prior to performing the work, that all the computations and stakeout information used to construct the project are accurate and in accordance with the plans and that the Contractor understands the meaning of the markings on the stakes. In addition, it is the Resident Engineer's obligation to check the Contractor's work during construction and ensure that the work is being constructed in accordance with the line and grade staked.

The Contractor is required by Subsection 105.09 of the Standard Specifications to preserve all stakes and marks. Occasional and inadvertent destruction of slope stakes, etc., is inherent in the nature of the work; however, if the stakes, etc., are willfully or carelessly destroyed or disturbed by the Contractor, the cost of replacing them will be charged to the Contractor and deducted from the payment for the work.

(2) Projects WITH Roadway Construction Control. When "Roadway Construction Control" IS included in the contract, the Contractor is responsible for computing all required grades and for setting (and replacing, if necessary) all slope stakes and/or grade stakes required. The Resident Engineer is still responsible for computing the centerline and shoulder elevations in order to check the Contractor's work. The Resident Engineer should randomly check the stakes and bluetops set by the Contractor in order to ensure substantial compliance with the plans.

(c) Location of Borrow Pits. The Department must approve the location of proposed borrow pits prior to their use. The Contractor is required to notify the Resident Engineer in writing of the location of the proposed pit. Refer to Subsection 107.10 of the Specifications and *Subsection 107.03(b)* of this Manual for the procedures to be followed in requesting clearance for a proposed pit. The physical requirements for borrow pits are contained in Subsection 106.02 of the Specifications.

NOTE: The specifications do not require the Resident Engineer to obtain a pit agreement or release from the Contractor.

210.02 METHOD OF MEASUREMENT. (a) Common Excavation, Rock Excavation, Unclassified Excavation, and Borrow. Each of these items is measured by the cubic yard in its original position by the cross section method, either by conventional, electronic, or photogrammetric methods, and the volume is computed by the average end area method. In unusual situations, other methods may be used, with the prior approval of the Construction Office.

NOTE: One of the two microcomputer programs in the Resident Engineer's Office, CAiCE or the AHTD Earthwork Program, **MUST** be used for these computations. Either the AHTD Earthwork Program or CAiCE can be used for conventional or photogrammetric cross-sections. CAiCE must be used for all data collected using the Survey Data Management System (SDMS).

NOTE: The Specifications allow jobs with small quantities of Borrow to be measured in vehicles, using Method 2 of Subsection 209.02. As noted in *Section 209* of this Manual, this method requires the yardage measured in vehicles to be reduced by 30%. "Jobs with small quantities of borrow" is interpreted to be those with less than 2500 cubic meters (3000 cubic yards) in the contract. The Resident Engineer should contact the Construction Office for permission to use vehicular measurements in other instances. (The use of vehicular measurement must be documented. See *subsection 109.01(c)* of this manual.)

(b) **Presplitting** is measured by the square yard of plane surface of the final presplit cut face. Overbreakage due to excessive blasting is deducted from this measurement.

Measurements for presplitting should be taken at the same time final X-sections are taken. A measurement, parallel to the slope, shall be taken at each X-section and recorded on the "Report of Work Performed" sheet marked Final Document or on a separate sheet to be attached to the RWP.

(c) **Compacted Embankment** is measured by the cubic yard in its final position using the cross section method (conventional, electronic, or photogrammetric procedures) and computed using the average end area method. It includes all compacted fill volume within the right-of-way and easements.

NOTE: One of the two microcomputer programs in the Resident Engineer's Office, CAiCE or the AHTD Earthwork Program, is to be used for these computations. When the item "Compacted Embankment" is used, Special Compaction of Earthwork is a subsidiary item.

(d) **Earthwork Measurement Options.** Subsection 210.12(f) of the Standard Specifications provides four options for the measurement of earthwork items:

1. Obtaining original and/or final cross section in the field or by photogrammetric methods.
2. Use the preliminary (plan) cross sections used in the design of the project as the original cross sections.
3. Use templated final cross sections in lieu of cross sections taken in the field.
4. Use a computer program (CAiCE) to compute quantities from terrain models developed from field and/or photogrammetric data.

Options 1 and 4 can be used alone or in any combination with any of the other three options; however, **options 2 and 3 cannot be used together**. Before selecting option 2 or option 3, the RE must verify or check the plans to determine that the plan cross-

sections are substantially correct. In order to use option 3, the RE must verify that the subgrade was constructed to the elevations shown on the plans or subgrade calculations.

IF OPTION 2 OR 3 IS SELECTED FOR USE, CONCURRENCE MUST BE RECEIVED FROM BOTH THE CONSTRUCTION OFFICE AND THE CONTRACTOR. The earthwork measurement option selected should be discussed at the Preconstruction Conference and the discussion noted in the written documentation of the Preconstruction Conference. The Contractor must concur in writing to the measurement option proposed. If the Contractor does not concur with the proposed method, all measurements will be made by using Option 1 above, conventional cross sections.

210.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation on each of the above pay items may be based on a percent plan quantity, a percent of plan quantity within specified Station limits, approximate field measurement, etc. Normally “% of Plan Quantity” by balance point or, on smaller projects by the entire project, is the simplest Basis of Estimate and the most appropriate. This percentage should not be estimated closer than the nearest whole number. “Load Count” will not be used as the basis of Current Estimate.

The final decision as to the quantity (%) to pay rests with the Resident Engineer. Therefore, the Resident Engineer is responsible for estimating the quantity as accurately as possible. **DO NOT OVERPAY!!!** The Resident Engineer may utilize all of the information available to him to estimate the quantity (%) to pay. The information used to arrive at this estimate (%) may include visual observation of the work, approximate volume of material hauled, and/or estimate by approximate length, width, and depth.

When paying percent of plan quantity by balance point, care should be taken to pay only in the balance point in which the actual work occurs. If the actual work is taking place in more than one balance point, the RWP should reflect all of the balance points in which work is occurring. Again, **DO NOT OVERPAY**; the balance point should not be shown at 100% until all of the work in that balance point is complete.

Current Estimate documentation for each should be recorded on the "Report of Work Performed" (RWP) marked "Current Estimate" with the appropriate "Basis of Estimate" recorded.

NOTE: Prior to beginning work, the Resident Engineer should make whatever checks or comparisons necessary in order to satisfy himself that the plan quantities for Earthwork items are substantially correct. As the work progresses, the Resident Engineer should attempt to compare the actual shrinkage with the planned shrinkage and should remain cognizant of any modifications that would cause the final quantity to vary significantly from the plan quantity. In doing this, the Resident Engineer avoids overpayment to the Contractor on Current Estimates and is able to more easily explain overruns and underruns on the Final Estimate.

NOTE: Plan quantity (as revised by approved Change Orders) may not be exceeded without actual field measurements to support the overrun.

It is very important that the Resident Engineer utilize all of the above information in conjunction with the actual work performed in determining the volume of the earthwork to be submitted for payment. This volume should be reduced by an appropriate quantity until the slopes, ditches, and roadway are brought to final acceptable section, and any other required subsidiary work has been completed. Such reduction should reflect the extent of subsidiary work remaining in specific segments which can be determined readily (such as balance points, station limits, entire project, etc.). As that work is satisfactorily accomplished, payment will be made therefor. Acceptance of the work will not be made except as defined in Section 105.17 of the Standard Specification, and the contractor shall remain responsible as defined in Section 107.16.

Examples of properly completed RWP's for Current Estimate documentation of these items are shown in *Figures 210-1A & B and 210-2A*. Additional information on completion of RWP's is found in *Subsection 109.02* of this Manual.

In the case of Borrow measured in vehicles, Form 19-165M (19-165), "Daily Report of Volumetric Hauling" will be appropriate documentation for Current Estimates. The computation of the 30% reduction for swell must be shown on each completed form. The Truck Measurement Form (Form 19-507M or 19-507) must accompany the first daily report that the truck appears on.

210.04 DOCUMENTATION - FINAL ESTIMATES. (a) Common Excavation, Rock Excavation, Unclassified Excavation, and Borrow. The Original Source Documentation which must accompany the Final Estimate for each of the above items includes:

- (1) Cross section notes, including check level information.
- (2) Diskette containing the conventional cross-section data files or the SDMS data files. The SDMS data files are the unedited raw data files (.PRJ) and the edited data files (.EDI).
- (3) A hard copy of the microcomputer computations (INP and EWK files) or the (SOR and ERP files) when electronic data collection is used. Earthwork **MUST** be computed in the Resident Engineer's Office using the office's microcomputer. These must be entered into the computer by Resident Engineer personnel, proofread, and errors corrected.
- (4) Computer plots. The Resident Engineer shall review plots of all cross sections using the microcomputer screen. It is not necessary or desirable to routinely have the microcomputer print hard copies of all cross sections. However, any hard copies of plots printed should be included with the Final Estimate. If the Resident Engineer feels it necessary to obtain a hard copy plot of an entire project or a large portion of a project, an IOM to the State Construction Engineer (Attention: Final Estimates) should be sent requesting this, along with a diskette containing applicable data files.
- (5) "Report of Work Performed" (RWP). An RWP marked "Final Document" must be completed for each item and the computed quantity entered on it. "Actual Field Measurement" should be the "Basis of Estimate." This RWP should contain a

summary of quantities between major "breaks" (such as balance points, etc.) whenever possible. Since it is impractical to attach all of the above documentation to this, it should also refer to the other Original Source Documentation (noted in items 1 through 4 above) so that they may be readily found in the Final Estimate submission.

- (6) When CAiCE software is used to compute the earthwork quantities, the Resident Engineer must copy the archived CAiCE project file, including the raw SDMS data files and the edited data files (.EDI), on to the CONSTPRJ directory of the Construction Drive of the LAN (CSD4:\CONSTPRJ\RE\). Each Residency has an individual folder within the RE subdirectory. The entire archived CAiCE file for the project will be copied into the appropriate RE folder. A memo must be e-mailed to the Section Head of Contract Estimates Section notifying them that the files have been placed in the CONSTPRJ directory.

NOTE: When Borrow is measured in vehicles, the OSD will be the "Daily Report(s) of Volumetric Hauling", Form 19-165M (19-165) completed for this item. No further documentation is necessary.

(b) **Presplitting** is documented for the Final Estimate using an RWP marked "Final Document". Sketches, measurements, and computations for this item should either be entered on the RWP or attached to the RWP. See example RWP in *Figure 210-5*.

NOTE: The Resident Engineer's microcomputer should be utilized for the calculations and a hard copy attached to this RWP whenever possible. "Actual Field Measurement" is the "Basis of Estimate". A summary showing quantities between identifiable "breaks", such as that shown on the plans should also be entered on the "Final Document" RWP when possible.

(c) **Compacted Embankment** is documented in the same manner as the items in (a) above.

Examples of properly completed RWP's as Original Source Documents that are submitted with the Final Estimate on the above items are shown in *Figures 210-2B, 210-3, 210-4, and 210-5*.

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM COMPACTED EMBANKMENT ITEM CODE: 210601
 JOB NO. 89991 FAP NO. JEH-01(4)-93 JOB NAME BLACKWELL - WEST
 QUICK CODE

1) CURRENT ESTIMATE
 2) FINAL DOCUMENT
 DATE 12-1-98 REPORT NO. 4 FINAL

Pay Quantity	Unit	Description . Location	Sub Item #
83,717	CU YD.	ENTIRE PROJECT	
TOTAL TODAY			
PREVIOUS TOTAL			
83,717	CU YD.	TOTAL TO DATE	

BASIS OF ESTIMATE: ACTUAL FIELD MEASUREMENT - SEE SPMS DATA FILES & CALC EMBANKMENT REPORT

150+00 - 173+20	21,962
157+16 - 157+85	246
175+17 - 217+00	21,716
217+00 - 253+20	39,793
TOTAL	83,717

REPORTED BY: C. McCooly CHECKED BY: Ron McNeice
 REV. 6-8-94

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
 CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED
 ITEM COMPACTED EMBANKMENT ITEM CODE: 210601
 JOB NO. 89991 FAP NO. JEH-01(4)-93 JOB NAME BLACKWELL - WEST
 QUICK CODE

1) CURRENT ESTIMATE
 2) FINAL DOCUMENT
 DATE 3-14-98 REPORT NO. 3
 BASIS OF ESTIMATE: % PLAN QUANTITY UNIT OF MEAS. CU. YD.

LOCATION	PLAN QUANTITY	PERCENT COMPLETE	TOTAL TO DATE	PREVIOUS ALLOWED	DUE THIS REPORT	REMARKS
150+00 - 173+20	22,540	30%	6,762	1540	5222	
175+17 - 217+00	20,942	60%	12,565	8,964	3,601	
217+00 - 253+20	38,220	60%	22,932	15,100	7,832	
Total Due This Report						
					16,655	
Previous Total						
					25,604	
Total To Date						
					42,259	

REPORTED BY: Dick Decker CHECKED BY: E. Amey

Figure 210-2A & Figure 210-2B

Examples of Current & Final Documents for Compacted Embankment

**ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
CONSTRUCTION DIVISION - REPORT OF WORK PERFORMED**

ITEM PRESPLITTING

ITEM CODE: 210501
QUIK CODE _____

JOB NO. 90162

FAP NO. BMR-1-2(52)

JOB NAME LEAD HILL - Hwy. 281

CURRENT ESTIMATE
 FINAL DOCUMENT

DATE 3-1-98

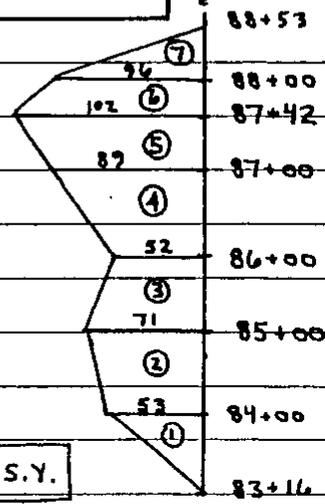
REPORT NO. 1

Pay Quantity	Unit	Description, Location	Sub Item #
3769	SY	STA. 83+16 - 88+53 LT - SEE BELOW	
3769	SY	TOTAL TODAY	
		PREVIOUS TOTAL	
3769	SY	TOTAL TO DATE	

NOTE: COMPUTATIONS & SKETCHES MAY BE SHOWN ON ATTACHED SHEETS. IF USING THE AREA PROGRAM ON THE PC FOR COMPUTATIONS, IT IS NOT NECESSARY TO SHOW THE COMPUTATIONS ON THE RWP. HOWEVER, THE PRINT OUT FROM THE AREA PROGRAM MUST BE ATTACHED TO THE RWP.

BASIS OF ESTIMATE: ACTUAL FIELD MEASUREMENT

AREA	L	WIDTH 1	WIDTH 2	AREA (SF)
1	84	0	53	2226
2	100	53	71	6200
3	100	71	52	6150
4	100	52	89	7050
5	42	89	102	4011
6	58	102	96	5742
7	53	96	0	2544



$33923 \text{ SF} \div 9 = 3769 \text{ S.Y.}$

REPORTED BY: Walter V. Braun

CHECKED BY: Robert L. Goddard

Rev. 6-8-94

Figure 210-5
Figure 210-6 Example of Final Document for Presplitting

210.05 PHOTOGRAMMETRY. Original and Final X-sections may be taken by conventional or photogrammetric procedures. There are numerous factors that determine the applicability of photogrammetric procedures to a particular project. Prior to requesting photogrammetry, the Resident Engineer should consider the availability of construction personnel, length of the project, and the type of terrain. Preferably, the project should be a minimum length of 1.6 kilometer (one mile) or an interchange or borrow pit area of at least 20 hectares (50 acres) before aerial photography is considered. If the Resident Engineer determines that aerial photography is desirable, he should make a request by memo to the District Engineer, who will in turn make the request to the Surveys Division.

Once the determination has been made to use aerial photography, the Resident Engineer will be responsible for:

1. Coordinating with the District Engineer to provide any clearing that is necessary around aerial photography targets.
2. Placing and maintaining the targets until the aerial photography is complete. (Target materials may be obtained from the Photogrammetry Section.)
3. Coordinating with the Contractor or District Engineer to remove vegetation to the extent that the aerial photography will be satisfactory.
4. Providing the vertical and horizontal control to the targets.
5. Providing the Surveys Division with any information relative to alignment changes.

The Photogrammetry Section will be responsible for:

1. Providing a map showing target size, shapes and locations of the targets.
2. Flying the aerial photography and providing the necessary X-sections to the Resident Engineer.

Other things to consider when using aerial photography are:

- Detours, channel changes and other minor earthwork most likely will have to be X-sectioned by conventional methods.
- If the aerial photography for final X-sections is not flown at the time the subgrade and slopes are completed, it may be necessary to make adjustments for base, paving, sod mulch, etc.

210.06 Original Cross Sections (Traditional). (a) Original X-sections become the basis for later calculations of earthwork quantities. They must be taken with great care and recorded in the format shown in Appendix 2 of the "Construction Survey Course".

Particular attention MUST be given to the following points:

- Ensure that level notes are arithmetically correct.
- Take **ALL** X-sections perpendicular to the Centerline or Base line. (Perpendicular to a curve is along a radial line). **NEVER TAKE A CROSS SECTION ON A SKEW!!** A right angle prism or a transit may be used, or stakes may be set at the R/W lines to assist in taking X-sections perpendicular to the Centerline.
- Take X-sections wide enough to cover **ALL** of the work. Normally, this will be from R/W line to R/W line (including permanent and temporary easements). It is better to take Original X-sections too wide than to extend those that were taken too narrow. Unless a change in design or alignment is involved, extending original X-sections can--and should--be avoided by taking them with sufficient width initially. If, due to an unforeseen change in design or alignment, work must be done beyond the limits of the original X-sections, they must be extended. The extended X-section notes **MUST** be taken before any work is done in the area. The extended X-section shots must be added to the original X-section notes and must be converted either to elevations or to the same H.I. to which the originals were referenced. The notes must be recorded in such manner that they can be checked by persons not familiar with the project.
- When there are separate roadways intersecting (such as ramps and loops at an interchange), match lines should be established and used for both the original and final X-sections. The best way to establish match lines is to use a plan layout drawing (to scale) of the interchange. Scale distances and stationing from the drawing and draw the match lines to verify that all of the area is covered. Be sure to take both the original and final X-sections **EXACTLY** to the established match line points.
- When establishing match lines, be sure that every X-section is perpendicular to the Centerline (or on a radial line in curves). Also, set the match lines so that when a section crosses a ditch line it is as nearly perpendicular to the ditch line as possible. Match lines should be referenced.
- Take intermediate sections so as to minimize interpolation after the finals have been taken. Suggestion: Review the profile and plan X-sections to anticipate locations for sections, i.e., equations, transition from cut to fill, etc. A list of these locations may be made in the back of the X-section book or on scratch paper for ready reference by the party chief. Determine from the profile sheets the stations where the profile line crosses the natural ground line and take a section at these stations. These will be as close to the cut-to-fill transition points as can be reasonably determined in advance.
- Take sections in increasing station order. Record stations in proper sequence, making notes clearly legible. Rarely will the project be cleared in such a manner that cross sectioning can begin at the beginning of the project and proceed with uninterrupted stationing to the end of the project.

- When it is necessary to take sections out of sequence, DO NOT recopy the notes in order to have consecutive stationing from the beginning at the book to the end. At the end of a series of sections, refer to the book and page number where the next consecutive station may be found.
- At the beginning of a series of stations, refer to the book and page number where the preceding station may be found.
- Refer **ALL** rod readings within a X-section to the "Height of Instrument" (H.I.) used in the level notes (the primary level). The Centerline (or Base Line) shot should normally be taken with the primary level. When the rod cannot be read with the instrument (either too high or too low) a hand level or another instrument setup **MUST** be used. DO NOT "BOOT" THE ROD OR ATTEMPT TO GUESS AT THE ROD READING.
 - a) Record the turn -- both foresight and backsight -- in the X-section notes and record the rod readings beyond the turn. Compute the adjusted rod readings and record the adjusted readings **IN RED** immediately above the regular readings. See the example in *Figure 210-6*.
 - b) If there are several consecutive stations in which a turn is required, considerable time can be saved by using two (or more) levels set up simultaneously.
- Measure distances from the Centerline (or Base Line) to the X-section shots **HORIZONTALLY**. Be particularly careful on steep slopes to ensure horizontal measurement.

NOTE: The microcomputer Earthwork program WILL accept two rod readings or elevations at the same horizontal distance, such as at the face of a curb or wall.

NOTE: If a Cross section is located entirely on one side of the centerline (or baseline), a centerline shot is NOT necessary.

- Take **ONE** X-section at each equation in stationing.
- Ensure that all Field and Level books are properly identified as to Job Number and are clearly indexed.
- Date all entries, list party members, and indicate weather conditions.

If the plans contain negative stationing, or if it is necessary for borrow pits to go back from 0+00, set up an equation that utilizes positive stationing. DO NOT USE NEGATIVE STATION NUMBERS.

SUGGESTION: For borrow pits, etc., begin stationing with 10+00 (or larger) instead of 0+00.

- If an error is made in recording the notes, draw a single line through the error and record the correction next to the error. **DO NOT ERASE!!!**

(b) When the contract includes the item "Removing and Replacing Topsoil" (Section 626 of the Specifications), the original X-sections for earthwork items shall not be taken until the stripping is complete.

(c) **ALL** original X-section notes should be entered in the Resident Engineer's microcomputer, using either the AHTD Earthwork program or CAiCE, as soon as they are completed and the following checks have been made:

- The notes are checked for legibility.
- The notes have been dated and the survey crew identified.
- All level circuits are shown and are arithmetically correct.

NOTE: When a turn is taken through a Bench Mark, show the actual foresight. The microcomputer program will accept a new bench mark at any point.

- All adjusted rod readings have been computed and recorded in **RED**.
- The segment, job, borrow pit, etc., is fully identified. Also note in the Cross section book the USR (PC) file name when it is punched.
- For borrow pits, etc., a sketch of the area must be included along with a written description. Include the location of the pit, etc., relative to the geometry of the roadway and the property owner's name and address.
- Line through errors and write the correction next to the error. **DO NOT ERASE!!**
- The books are marked with the Job number, Resident Engineer number, etc., and are properly indexed.

DO NOT HOLD ORIGINALS WHILE WAITING FOR TIME TO TAKE FINALS!

The Resident Engineer should check the notes against the printouts and make all necessary corrections to the USR (data) file and the Cross section book. Be especially careful when proofreading the station numbers and the foresights and backsights.

(d) **Driveways.** It is usually easier and simpler to take the Original and Final roadway X-sections as though the driveways did not exist, then take separate X-sections for driveways, if necessary. If driveways are X-sectioned with the roadway, at least five (5) separate, complete sections are required to show each driveway.

210.07 Final Cross Sections (Traditional). (a) Final X-sections shall be taken and recorded in the same manner as that required for the original sections. The points to check on the finals include most of the points listed under the original sections. Prior to taking the Final X-sections, Resident Engineer personnel should:

- Make a list of the EXACT stationing of the originals in order that an entire Final section can be taken at each original location. A Final X-section is required at every Original X-section location except as follows:
 - ⇒ Do not take a Final X-section at a 0.0 section. Simply list the station number and "0.0 section".
 - ⇒ Between 0.0 sections where **NO** earthwork was done (such as beneath a bridge between the toes of the bridge end slopes), no Final X-

sections are needed. Draw a line through any Original X-sections taken in this location and note that they are deleted due to no work being done. Be sure to line out the originals both in the books and on the printouts. These sections should also be deleted from the USR microcomputer file.

- Instruct the survey party to take all Final sections completely across the work area from construction limit to construction limit. It is not necessary to take Final X-sections as wide as the Originals were taken when no work was done beyond a certain point; in fact, it is better to stop at the limits of construction. **THE ORIGINALS MUST BE AT LEAST AS WIDE AS THE FINALS.** When match lines are used, be sure that the Final X-sections are taken **EXACTLY** to the match line points.

(b) Final sections should be taken at those locations where a section is needed to accurately show the work even though no original section was taken there. The original sections required for computations are interpolated by the microcomputer program. **IT IS NOT DESIRABLE FOR RESIDENT ENGINEER PERSONNEL TO INTERPOLATE THESE ORIGINAL CROSS SECTIONS BY HAND.**

FINAL AND ORIGINAL CROSS SECTIONS MUST BE TAKEN FROM THE SAME BASE LINE, OR CENTERLINE, AND FROM THE SAME VERTICAL CONTROL DATUM.

(c) As soon as the Final X-sections have been taken, the same checks as are required for the originals should be made. The Resident Engineer must also make sure that 0.0 sections are properly identified and recorded. There should be **NO** rod readings at 0.0 sections on the final X-sections.

(d) After the printouts of the X-sections have been proofread, the Resident Engineer should review the plots on the microcomputer monitor and the volume sheets. Particular attention should be paid to tie shots. Note that the AHTD Earthwork program will mark a station number with an asterisk when the tie exceeds 0.3 m (1.0 foot) (or the closure specified) --unless the tie is at the Centerline or Base line. This is not available on CAiCE. The individual cross sections must be looked at to insure that the ties do not exceed 0.3 m (1.0 foot). **TAKE TIME TO LOOK AT THE PLOTS ON THE MICROCOMPUTER SCREEN!** If the plotted X-section does not look right, there is probably an error or an explanation is required. Note that **ALL** ties in excess of 1.0 foot **MUST** be corrected or explained. The plots are made from the punched data, so if there is an error in a plot, the printout must be corrected. The notes in the book may also require correction. Be sure to check both.

If any errors are found during the proofreading or review, make the appropriate corrections and rerun the program.

If there are no errors found during proofreading or review, (or after all corrections have been made), the first page of each separate run and any hard copies of plots should be stamped "CORRECT", dated and signed in the space provided.

(e) Quantities determined at this point are preliminary and are subject to verification during the Final Estimate review. Any notification or information provided to the Contractor concerning these quantities should state that the quantities are preliminary and subject to verification in accordance with Subsection 109.09 of the Standard Specifications.

210.08 Borrow Pits and Stockpiles. In general, all X-sections for borrow pits and stockpiles should be taken, checked, computed, and plotted in the same manner as roadway X-sections.

(a) **Borrow pits** normally should be laid out with the Base line along one side of the pit, rather than through the center. Always locate and reference the Base Line so that it can be re-established in the EXACT same location.

If the pit is located reasonably close to the roadway, check levels should be run and bench marks established for the pit from a roadway Bench Mark. If the Bench Marks for the pit are NOT established from a known elevation, at least two (2) BM's **MUST** be established for the pit (using an assumed elevation) and check levels run between them. Both BM's should be so located that they will not be disturbed by the borrow operations. **Always have at least two (2) BM's available for each Borrow Pit.** In addition, a sketch of the pit area must be made and recorded in the X-section book. Include a description of the location of the pit relative to the roadway.

The pit area should be stripped before Original X-sections are taken, and the Final X-sections should be taken before the topsoil is replaced. (See Subsection 106.02 of the Standard Specifications.)

Final X-sections should be taken as soon as possible after the pit is closed. The pit area should be dressed before taking Final X-sections so that accurate sections can be taken. After the Final X-sections have been taken, the Contractor can complete the final shaping of the pit area, replace the topsoil, and seed the area (if required). Once a pit is closed and Final X-sections have been taken, it shall NOT be reopened. If the Contractor wants to obtain more material from the pit, it must be opened as a new pit with new Original X-sections, sketches, etc. If the area covered by an existing, open pit is extended beyond the limits of the Original X-sections, the additional area may be opened as a new pit, or the Original X-sections may be extended. Match lines may be used to control the adjacent limits of the two pits. Match lines should be referenced.

After all corrections have been made and the quantities verified by the Resident Engineer, the Resident Engineer will notify the Contractor by letter of the quantity in each pit. Indicate in the letter that the quantity is preliminary and subject to verification during the Final Estimate review in accordance with Subsection 109.09 of the Standard Specifications.

(b) **Waste areas.** On many projects, there will be material excavated and/or generated that is unsuitable for use in embankments or is excess to the needs of the job. Such excess or unsuitable material may be spread on the slopes of nearby fills (see Subsection 210.08 of the Standard Specifications) or disposed of by the Contractor in a waste area. It is the Contractor's responsibility to obtain an agreement with the property owner, comply with NPDES requirements, etc.

(c) **Stockpiles.** Many projects contain pay items or otherwise require that certain material be excavated, stockpiled, and later replaced. (Topsoil Furnished and Placed, Removing and Replacing Base Course and Asphalt Surfacing, etc.) Such material is usually measured by X-section in the stockpile. The Original X-sections are to be taken immediately prior to the time the Contractor begins removing the material from the stockpile, or as near that time as possible. Original X-sections **MUST** be completed and the notes checked and ready for key-punching before removal operations begin. The Final X-sections should be taken as soon as possible after all material has been removed and the area dressed. Location sketches, descriptions, etc., must be made in the same manner as for borrow pits. The X-section notes are to be handled in the same manner as for borrow pits.

210.09 Channel Changes. Most projects will include one or more channel changes. This earthwork must be measured for payment by the X-section method. In many cases, match lines should be established between the limits of the channel change and the normal roadway to ensure that all of the work is covered, and that no overlap occurs. When match lines are not used, some of the work is usually measured twice resulting in an overpayment to the Contractor. Such overpayments are difficult to recover, and correcting the X-section notes to eliminate the excess measurement is difficult and time consuming.

Be very careful when taking X-sections for channel changes to avoid such problems. It may be helpful to hand-plot some of the X-sections and/or make a plan scale drawing of the area to verify that all work is covered **EXACTLY ONE TIME**. Hand plots made for this purpose **SHALL NOT** be used to support final pay quantities.

Sketches, X-section notes, etc., are to be completed and handled in the same way as all other X-sections.

210.10 Undercut. (a) Subsection 210.07 of the Standard Specifications states: "Where natural ground conditions or excavation to the finished grade section results in a subgrade or slopes of unsuitable soil, the Engineer may require the Contractor to undercut the unsuitable materials and backfill with approved materials to the elevation designated by the Engineer. The Engineer may designate as unsuitable those soils that cannot be stabilized in place through normal drying and compactive efforts when satisfactory weather and ground conditions exist. Normal drying and compactive effort is considered to be the work required in processing and compacting the natural ground (including the bottom of a cut section) to a maximum depth of 12" (300 mm) after the soil is brought to near optimum moisture content." Also, "Unless otherwise specified, rock shall be excavated to a minimum of 8" (200 mm) and not to exceed a maximum of 12" (300 mm) below subgrade within the limits of the roadbed, and the excavation backfilled with material designated on the plans or approved by the Engineer."

NOTE: Undercut is paid only for locations "designated by the Engineer". Should a contractor undercut an area for his convenience without Resident Engineer authorization, it should be considered at his expense.

(b) Undercut may be measured by the X-section method in its original position or by the "x, y, z" (length x width x height) method. The measurement is made from natural

ground down in fill areas (after stripping, if applicable) and from the finished subgrade down in cut areas. This method is especially useful for small areas with uniform dimensions.

At the time the undercut is measured, it may be difficult to determine in the field the exact location of the natural ground and finished subgrade or to determine which is the lower of the two. Therefore, the following procedure should be followed:

- (1) Take the Final undercut X-sections after the material is removed and before the backfill is placed.
- (2) Hand plot the Original roadway X-sections, Final roadway X-sections, and Final undercut X-sections. If the final roadway X-sections have not been taken (usually the case), plot the template plan finished subgrade section AS STAKED in lieu of the Final roadway X-sections.

NOTE: One of the two earthwork programs may be used to plot the Original and Final Roadway Cross sections.

- (3) From the plots, determine the natural ground and/or finished subgrade, whichever is lower, and compute elevations for Original undercut X-sections. Record these computed elevations in a X-section book. Note that these are elevations and not rod readings. These Original undercut X-section notes will often be a combination of Original roadway and Final roadway X-sections.
- (4) Look at the tie shots on the Final undercut X-sections and adjust them if necessary to ensure that all of the undercut is measured and nothing else is included.
- (5) The microcomputer shall be used to compute the undercut volumes. Once this is done, compare the microcomputer plots on the screen with the hand plots (2 above) to detect errors. This comparison is in addition to the normal proof reading and review.

(c) If the undercut is COMPLETELY within a fill section, it is not necessary to hand plot the final roadway X-sections as noted above. If the undercut lies COMPLETELY within a cut section, the original roadway X-sections need not be plotted. The hand plotting described above should still be done to verify that the tie shots are correct and to ensure that **all** of the undercut is measured and nothing else is included.

210.11 Plotting of Cross Sections. The Resident Engineer is responsible for reviewing ALL X-section plots and verifying that the X-sections they represent are correct. This can normally be performed using the microcomputer monitor. If, however, hard copies are made of some of the sections, they should accompany the final estimate.

The Resident Engineer may, however, hand plot and compute any X-sections in order to obtain information needed to make decisions about the work, to support change orders, or for any other reason deemed necessary. Such plots and/or computations will **NOT** be used to support or document the final pay quantities.

On projects run on the AHTD Earthwork Program, sections marked with an asterisk on the volume sheets are those which do not tie within 1.0 foot (0.3 m) (or the

parameters set). ALL ties in excess of one foot must be corrected or explained. Note that the computer will NOT mark ties in excess of 1.0 foot (0.3 m) if they are on the Centerline or Base line. On projects run on CAiCE, the Resident Engineer must review the individual cross sections on the computer screen to insure that no ties are in excess of 1.0 foot (0.3 m).

LOOK AT THE PLOTTED CROSS SECTIONS ON THE MICROCOMPUTER SCREEN. If the plotted section looks wrong, check the notes and the printout showing the data entered for each cross section. Either correct both the book and the printout, or explain why the vertical tie is correct. Write the explanation on the plotted X-section sheet and/or on the X-section printout sheet.

210.12 Notch Projects. A "Notch" project is one in which there is no earthwork between the edges of the existing pavement. The earthwork starts at each edge of the pavement with a "notch" down vertical cut. Widening projects are almost always "Notch" Projects.

The AHTD Earthwork program allows notch jobs to be X-sectioned in either of two ways:

1. Handle each side separately, as though they were separate jobs; or
2. X-section both sides at the same time.

(a) Method 1 (each side separately): If each side is X-sectioned separately, a centerline shot is not required on either the Original or Final X-sections. The distances should, however, be referenced to the centerline, and the notes should plainly show which side is being X-sectioned. Start the Original X-sections at the edge of the pavement, and start the Finals at the same distance at the bottom of the notch. The PC program will compute a vertical tie.

(b) Method 2 (Both sides together): If both sides are X-sectioned together, a centerline shot **IS REQUIRED** on the Original X-sections. For the Final X-sections, the X-section should begin at the bottom of the Notch on each side. Note that when punching the Final notes, a centerline shot must be entered; however, the value of this shot is ignored by the program when computing the volumes. When the program is told that this is a notch job, it computes a vertical tie at the **FIRST** shot on **EACH SIDE** of the centerline on the Final X-sections, then changes the shots between these two to match the Original X-sections. (Note that the INP file will not show these changes.) **METHOD 2 IS THE ONLY TIME THE "NOTCH" FEATURE OF THE MICROCOMPUTER EARTHWORK PROGRAM SHOULD BE USED.**

210.13 Digital Terrain Modeling. When digital terrain modeling is used to compute quantities, breakline processing is the preferred method of obtaining the surface data. A breakline is a line segment with a constant linear slope between two points. Random shots may be used to identify features not located on a breakline.

The control points, as listed on the control detail sheets in the construction plans, are the starting points for the construction survey. A control point is used to reestablish the coordinates for the different points and breaklines. The height of the instrument (IH:) and the staff height (SH:) are critical. These measurements are used to bring the

elevation of the control point up to the scope, then, with the vertical angle and slope distance, across to the prism; and then with the staff height down to the ground point. The Staff Height of the prism pole or cross section rod must be recorded on each shot. Do not “boot” the rod or attempt to guess at the rod reading. For ease, final and original breaklines should be taken from the same control points. Finals can be taken from any location as long as it is on the same coordinate system.

Breakline points are the same as the breaking points that were collected with conventional cross-sections. To enhance the digital terrain model being built, similar breakline points are tied together with the use of figure numbers. Breaklines can consist of both contour and elevation change points. A breakline would be the top backslope of a ditch, the bottom (flow line) of the ditch, the top front slope of the ditch, a shoulder edge, a pavement edge, center of the road, etc.

It is best to take shots and breaklines in a progressively forward manner. Breaklines in different segments can be added to the DTM model. If it is necessary to collect data in different segments due to the sequence of contractor’s operations, remember to use a different figure number for these skips. Always start the Final Breakline surface by collecting data at a 0-0 section.

For original surface breakline models, one can get shots from right-of-way to right-of-way. Breaklines and points should be wide enough to cover all of the work. Normally, this will be from R/W line to R/W line (including permanent and temporary easements). It is better to do the original surface breaklines too wide than to extend those that were taken too narrow. Extensions with breaklines can be easily added to existing surfaces. The original surface model must be at least as wide as the final surface.

While taking cross-sections or breakline topography, the survey crew should periodically take check shots (side shots) into other existing vertical and horizontal control points within the vicinity. These ties into other control points provide a check of position and elevation of the instrument set up.

SECTION 211 VACANT

SECTION 212 SUBGRADE

212.01 QUALITY CONTROL AND ACCEPTANCE SAMPLING AND TESTING. Quality control and acceptance sampling and testing is performed by the Contractor for this item in accordance with Section 210 of the Specifications. However, the frequency of testing is carried out as shown in Subsection 212.02 of the Specifications. Verification testing by the Department is conducted using the frequencies and procedures contained in the *Manual of Field Sampling and Testing Procedures*.

NOTE: The allowable tolerance from the required grade is ½" (13mm) per Subsection 212.02 of the Specifications.

212.02 METHOD OF MEASUREMENT / DOCUMENTATION. This is a subsidiary item and no documentation is necessary.

SECTION 213 SHAPING ROADWAY SECTION

213.01 GENERAL. This pay item includes compaction of the roadway section after it has been properly shaped. Compaction of the roadbed must comply with Subsection 210.10 of the Specifications. Quality control and acceptance sampling and testing is performed by the Contractor in accordance with Section 210 of the Specifications. Verification testing by the Department is conducted using the frequencies and procedures contained in the *Manual of Field Sampling and Testing Procedures*.

213.02 METHOD OF MEASUREMENT. This item is measured by the Station (Metric Station) along the centerline of the roadway to the nearest foot (meter).

213.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity between specified Station limits, approximate field measurement, etc. Current Estimate documentation for this item must be recorded on the "Report of Work Performed" (RWP) form and marked "Current Estimate".

213.04 DOCUMENTATION - FINAL ESTIMATE. Final Estimate documentation for this item is to be based on "actual field measurement". The OSD that must accompany the Final Estimate is the RWP marked Final Document". This shall contain "Actual Field Measurement" as the "Basis of Estimate".

SECTION 214 SUBGRADE PREPARATION

214.01 GENERAL. This item requires compaction and density tests. Quality control and acceptance sampling and testing are performed by the Contractor in accordance with subsection 212.02 of the Specifications. Verification testing by the

Department is conducted using the frequencies and procedures contained in the *Manual of Field Sampling and Testing Procedures*.

214.02 METHOD OF MEASUREMENT. This item is measured by the Station (Metric Station) along the centerline of each set of lanes and/or each ramp. Measurement will be made to the nearest foot (meter).

214.03 DOCUMENTATION - CURRENT AND FINAL ESTIMATE. Refer to *Section 213* above for payment documentation.

SECTION 215 TRENCHING AND SHOULDER PREPARATION

215.01 GENERAL. This item consists of trenching, scarifying, blading, etc., an existing shoulder for asphalt pavement widening in accordance with the plans and Specifications. Trenched material is to be spread on existing slopes. If unsuitable for this -- i.e., too rocky for mowing over, etc. -- it is to be disposed of. Quality control and acceptance sampling and testing are performed by the Contractor in accordance with subsection 212.02 of the Specifications. Verification testing by the Department is conducted using the frequencies and procedures contained in the *Manual of Field Sampling and Testing Procedures*.

215.02 METHOD OF MEASUREMENT AND DOCUMENTATION - CURRENT AND FINAL ESTIMATES. Refer to *Section 213* of this Manual. The Information in it is also applicable to this item.

SECTION 216 SCARIFYING AND RECOMPACTING SHOULDERS

216.01 GENERAL. This item consists of scarifying, blading, shaping, and recompacting existing base material; for preparation of existing shoulder for surfacing; and for stockpiling excess material at designated locations. This includes the breaking down and disposal of existing bituminous material as directed by the Engineer.

216.02 QUALITY CONTROL AND ACCEPTANCE SAMPLING AND TESTING. . Quality control and acceptance sampling and testing are performed by the Contractor in accordance with Section 306 of the Specifications. Verification testing by the Department is conducted using the frequencies and procedures contained in the *Manual of Field Sampling and Testing Procedures*.

216.02 METHOD OF MEASUREMENT. This item is measured by the Square Yard (Square Meter). Length will be measured to the nearest foot (meter) parallel to the centerline. The width for payment will be the width of the finished base course as shown on the plans or authorized by the Resident Engineer. Any areas wider than those shown on the plans or authorized by the Resident will not be measured for payment.

216.03 DOCUMENTATION - CURRENT ESTIMATES. Current Estimate documentation may be based on a percent of plan quantity, a percent of plan quantity between specified Station limits, approximate field measurement, etc. Current Estimate documentation for this item must be recorded on the "Report of Work Performed" (RWP) form and marked "Current Estimate".

216.04 DOCUMENTATION - FINAL ESTIMATE. Final Estimate documentation for this item is to be based on "actual field measurement". The OSD that must accompany the Final Estimate is the RWP marked Final Document". This shall contain "Actual Field Measurement" as the "Basis of Estimate".