

CHAPTER 5  
Earthwork Items

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Rev 11/09

## DOCUMENTATION REQUIREMENT SECTION A EARTHWORK ITEMS (PROFILE SHEET)

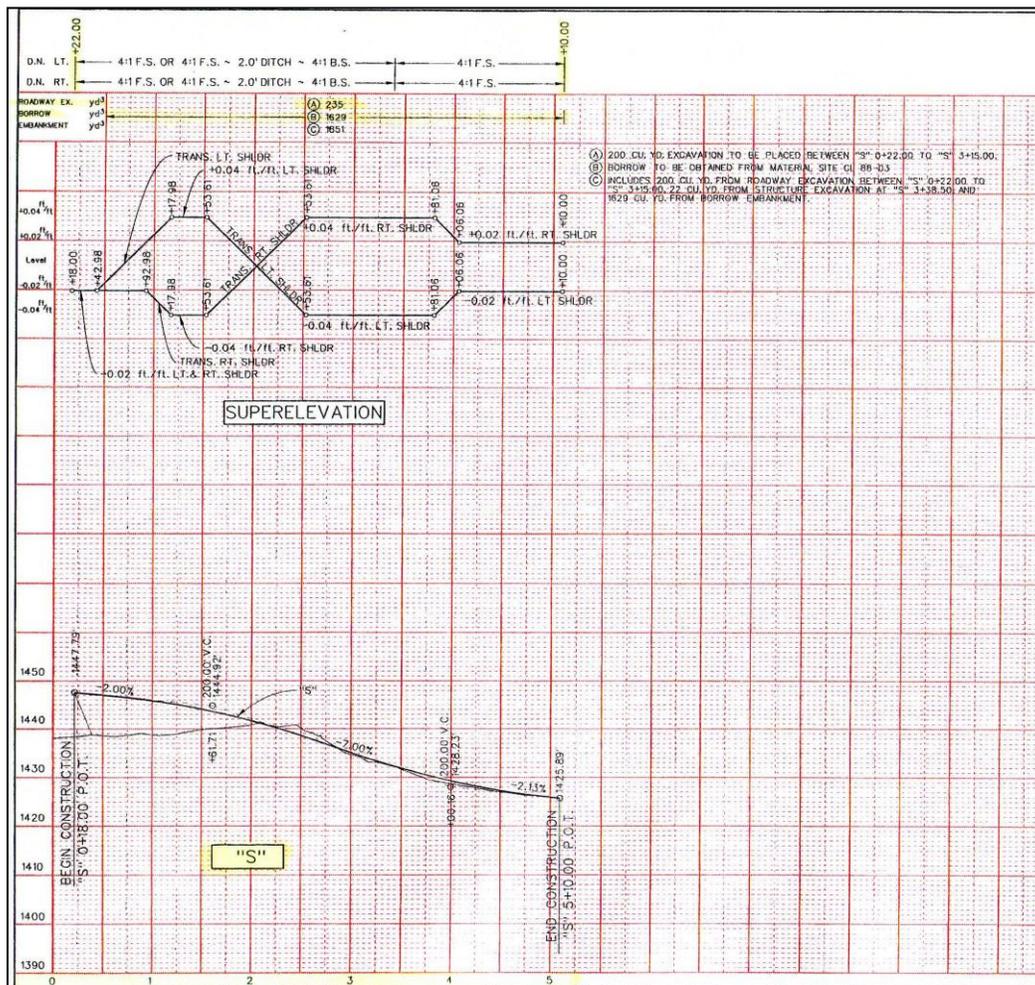
Earthwork items shall be documented in an EARTHWORK book. If only one type of earthwork item is being placed in a field book then the title will be the name of that item (example: if Roadway Excavation is placed in a field book by itself then the book will be named ROADWAY EXCAVATION.)

To setup the field books, the information on earthwork items shall be found in the Profile sheets and/or the Summary of Earthwork sheets.

A balance on a Profile sheet is from arrow to arrow, as illustrated below. Matching the ends of the arrows to the stations at the bottom of the plan sheet will give you the station to station for that balance.

Always use the Profile sheets to setup the earthwork books. Then compare the Profile sheets to the Summary of Earthwork to assure they match. An illustration of a Summary of Earthwork is shown on page 5-2. There might be areas that only appear on the Summary of Earthwork sheets. If this is the case then both the Profile sheets and the Summary of Earthwork sheets will be used in making out the field books for the earthwork items.

Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).



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**DOCUMENTATION REQUIREMENT  
SECTION B  
EARTHWORK ITEMS  
(SUMMARY OF EARTHWORK)**

To setup the field books, the information on earthwork items shall be found in the Profile sheets and/or the Summary of Earthwork sheets.

Always use the Profile sheets, as illustrated on page 5-1, to setup the earthwork books. Compare the Profile sheets to the Summary of Earthwork to assure all areas have been addressed. There may be areas that only appear on the Summary of Earthwork sheets. If this is the case then both the Profile sheets and the Summary of Earthwork sheets will be used in making out the field books for the earthwork items. An illustration of a Summary of Earthwork sheet is shown below.

<b>SUMMARY OF EARTHWORK</b>					
ITEM AND LOCATION			TOTAL	UNIT	
<u>ROADWAY EXCAVATION</u>					
SR 170					
"X" 172+49.82	TO	"X" 205+34.99	8538	CUYDS	
SIDE ROAD					
"S" 0+22.00	TO	"S" 5+10.00	235	CUYDS	
FRONTAGE ROAD					
"FR" 0+18.00	TO	"FR" 5+20.98	41	CUYDS	
<b>TOTAL</b>			<b>8814</b>	<b>CUYDS</b>	
<b>USE TOTAL</b>			<b>8820</b>	<b>CUYDS</b>	
<u>STRUCTURE EXCAVATION</u>					
STRUCTURE B-85					
			108	CUYDS	
SIDE ROAD RT. CMP					
			30	CUYDS	
<b>TOTAL</b>			<b>138</b>	<b>CUYDS</b>	
<b>USE TOTAL</b>			<b>140</b>	<b>CUYDS</b>	
<u>* BORROW EMBANKMENT</u>					
SR 170					
"X" 172+49.82	TO	"X" 205+34.99	338	CUYDS	
SIDE ROAD/BERM					
"S" 0+22.00	TO	"S" 5+10.00	1629	CUYDS	
"S" 3+36.70			4	CUYDS	
FRONTAGE ROAD					
"FR" 0+18.00	TO	"FR" 5+20.98	234	CUYDS	
<b>TOTAL</b>			<b>2205</b>	<b>CUYDS</b>	
<b>USE TOTAL</b>			<b>2210</b>	<b>CUYDS</b>	
<u>SELECT BORROW</u>					
STRUCTURE B-85					
			2159	CUYDS	
<b>TOTAL</b>			<b>2159</b>	<b>CUYDS</b>	
<b>USE TOTAL</b>			<b>2160</b>	<b>CUYDS</b>	
* 15% SHRINKAGE FACTOR USED FOR ROADWAY EXCAVATION					

9	NEVADA	PROJECT NO.	CLARK	COUNTY	SHEET NO.
		STP-0180(016)			3A

**DOCUMENTATION REQUIREMENT  
SECTION C  
EARTHWORK ITEMS  
(INDEX AND INITIAL KEY)**

Below are illustrations of an index and an initial key. When setting up a field book at the beginning of a contract make sure each item in the book is listed on the index. During the contract if anything is added to the book make sure it is placed on the index. At job closeout make sure the index has the ending page for each item listed on more than one page. Make sure to list the book recap page(s) on the index. If room permits skip a line between entries on the index. Check the initial key each progress payment to assure that everyone who has made entries in the book has initialed and signed the initial key. If the signature is not legible, have the person print his/her name under the signature. Make sure the initials used throughout the book match the way the initials show on the initial key. If the initials change, add the new initials to the initial key next to the original initials.

**EARTHWORK  
book** →

**Use when  
multiple items  
are placed in a  
book.**

Index		Initial Key		
Page	Description	Initials	Signature	Title
4-16	Roadway Excavation	SB	Sheri Brown	Tech IV
18-34	Borrow Embankment	JD	Jack Dougherty	Tech III
36-50	Channel Excavation	TC	Teri Carson	Tech I
		Ⓢ	Shelly Jones	Tech II
75-76	Book recap			

**ROADWAY  
EXCAVATION  
book** →

**Use when  
only one item  
is placed in a  
book.**

INDEX		Initial Key		
Page	DESCRIPTION	Initials	Signature	Title
4-8	'X' 172+49.82 To 'X' 205+34.99 Lt to Rt	SB	Sheri Brown	Tech IV
10-14	'S' 0+22.00 To 'S' 5+10.00 Lt to Rt	JD	Jack Dougherty	Tech III
16-20	'FR' 0+18 To 'FR' 5+20.98 Lt	TC	Teri Carson	Tech I
		Ⓢ	Shelly Jones	Tech IV
75	Book Recap			

**DOCUMENTATION REQUIREMENT  
SECTION D  
ROADWAY EXCAVATION  
(WHEN PAID BY CUBIC YARD)**

To provide documentation for the above item, it will be necessary to prepare a field book labeled ROADWAY EXC. If there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.

When stakeout or planned quantities are to become final quantities, after the balance is 100% complete, the plan quantity total shall be reflected as the last entry in the accum. total column. No other documentation is required.

When quantities change and are re-computed for any reason, the change will be adjusted upward or downward accordingly from the plan quantities. **Any payment other than plan quantity must have documentation to support the new total.** When **Eaglepoint or other computer programs** are used to determine final quantities, hard copies are required for the CALCULATION book as illustrated in Chapter 2 (Setting up a Contract, Book Format, etc.). They must indicate station, end areas, etc., accompanied by an explanation of how quantities are arrived, so any individual unfamiliar with road construction or engineering can retrace the calculation of quantities.

**When quantities are recalculated at the request of the Contractor or Resident Engineer,** the new calculated quantity shall be used for payment. If the contractor requests final measurement and the quantities determined are equal to or less than the plan quantities plus authorized changes, the Contractor shall reimburse NDOT for NDOT's expenses incurred by the final measurement.

**Any change in planned quantities,** such as reworked balances, flattened back slopes, removal of soft spots, etc., must show calculations in the field book or on a CALCULATION sheet (Form No. 040-034). Be sure to cross reference the CALCULATION sheet to the field book(s) and page(s), rolls, CROSS SECTION book(s) and page(s) and the field book(s), rolls, CROSS SECTION book(s) and page(s) to the CALCULATION sheet.

As the job progresses and estimates of earthwork quantities are made, no payment in excess of plan quantities shall be allowed unless:

- OR      A.      It is based on quantities justified in a change order.
- OR      B.      It is substantiated by final cross sections and computerized sheets or other actual field measurements.
- OR      C.      It is based on quantities from a memo sent by Design, which must be referenced in the field book and attached to a CALCULATION sheet (complete top of form) and file in the CALCULATION book.

**Should the estimate be based on a change order, it will be necessary to make final computations to verify the actual quantity of the change order before the contract can be finalized.**

Roadway Excavation items shall be documented in a ROADWAY EXC. book or if there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.

The following is an illustration for an item with a UOM of Cuyd.

The **Officeperson** shall complete for each page the item number, item description, plan quantity, the significant figure on the top right-hand side of the page, the balance (stations this balance), this section (plan this balance), all column headings, and page total in the bottom left-hand corner of the page. **Each balance will be placed on a separate page. The balances for earthwork items shall be found in the contract plans on the Profile sheets and/or the Summary of Earthwork sheets.** Leave at least one blank page in the book between each balance. In some cases of very large balances that may require considerable time to complete, leave additional pages. The final total of a balance should equal the quantity shown in "This Section" for the balance. If it does not equal, then calculations or backup are required. The sum of all balances should equal the total plan quantity for that item. If a large discrepancy exists, an error has been made or an error exists on the plan quantity and must be investigated. **Skip at least one line between entries. A separate page shall be provided for each bid item. Make sure to leave enough pages between balances and items for any added or missed items. Calculations must be checked and initialed.**

As construction progresses throughout each balance, it will be the Resident Engineer's or his designated **Inspector's** responsibility at the end of each payment cycle, to estimate, to their best ability, the percent complete of each balance. The **Inspector** shall document the est qty, accum. total, date, initials, AEB#, and any calculations and remarks that are needed. **Skip at least one line between entries.**

**Note:** All entries must be entered as called out in the plans and document left, right, or centerline, where applicable.

**Payment for Cuyd items shall be based on planned quantity or if different than plan, calculations or backup are required. If calculations are too extensive to place in the book, then a CALCULATION sheet must be done (See Chapter 2).**

Item No: 2030508					
Item: Roadway Excavation					
Plan Qty: 8820.00 cuyd					
Balance: 5'0+22.00 To 5'5+10.00 LT+RT					
This Section: 235.00 cuyd					
Est Qty	Accum Total	Date	Insp	AEB#	PMT#
235.00	235.00	9-1-08	JD	2	
77.78	312.78	9-5-08	JD	2	
Page total:					

Sig fig = .01      10

LXWX'D = 27 = cuyd

0/0 Complete/Calcs/Remarks

Complete

800 X 7 X 1.5 / 27 = 77.78 ✓ 10  
additional qty to correct cross slope.

Complete

**Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).**

**Officeperson's Hint:** The length does not always equal the difference between the beginning and ending station. Sometimes there is a curve or an obstacle that will affect the distance. Always check with the **Inspector** before assuming the calculations are incorrect.

**DOCUMENTATION REQUIREMENT**  
**SECTION E**  
**UNSTABLE MATERIAL, BORROW, SELECTED BORROW,**  
**AND BORROW EMBANKMENT,**  
**(WHEN PAID BY CUBIC YARD)**

To provide documentation for the above items, it will be necessary to prepare a separate field book for each item labeled BORROW, SELECTED BORROW, etc. as outlined in this chapter. If there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.

These items shall be documented in the same manner as described under Roadway Excavation and the illustration on page 5-7.

For making progress payments, the Resident Engineer or **Inspector** shall base the estimate on the percent of embankment completed.

Estimated borrow quantities shown on the plans, plus or minus authorized changes, may be used for payment unless a final measurement is requested by the Contractor or Resident Engineer. Final measurements may be necessary when pits are used where a royalty must be paid to property owners. In any event, original cross sections must be taken of the pit area in case recalculation is later requested.

Whenever final measurements are taken and a recalculation is made, it is necessary to adjust the quantity in each AEB. This may be done by prorating and must be shown in the book recap.

An optional method of prorating the final quantities, is to calculate a prorating factor and apply the factor as illustrated in Chapter 25 (Calculations and Reports), to the borrow quantities in each roadway balance.

Selected borrow or selected borrow excavation with a UOM of ton, shall be measured and documented in the same manner as illustrated in Chapter 8, (Roadway Aggregates).

Any items requiring measurements, percentages, or final quantity calculations must be shown in the field book or on a CALCULATION sheet (Form No. 040-034) and filed in the CALCULATION book as illustrated in Chapter 2 (Setting up a Contract, Book Format, etc.). Be sure to cross reference the quantity in the field book to the CALCULATION sheet and the CALCULATION sheet to the field book(s) and page(s).

Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).

**Borrow, Selected Borrow, etc., if each item is placed in its own book, then the title will be the same as the item placed in the book or if there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.**

**The following is an illustration for an item with a UOM of Cuyd.**

The **Officeperson** shall complete for each page the item number, item description, plan quantity, the significant figure on the top right-hand side of the page, the balance (stations this balance), this section (plan this balance), all column headings, and page total in the bottom left-hand corner of the page. **Each balance will be placed on a separate page. The balances for earthwork items can be found in the contract plans on the Profile sheets and/or the Summary of Earthwork sheets.** Leave at least one blank page in the book between each balance. In some cases of very large balances that may require considerable time to move, leave additional pages. The final total of a balance should equal the quantity shown in "This Section" for the balance. If it does not equal, then calculations or backup are required. The sum of all balances should equal the total plan quantity for that item. If a large discrepancy exists, an error has been made or an error exists on the plans and must be investigated. **Skip at least one line between entries. A separate page shall be provided for each bid item. Make sure to leave enough pages between balances and items for any added or missed items. Calculations must be checked and initialed.**

As construction progresses throughout each balance, it will be the Resident Engineer's or his designated **Inspector's** responsibility at the end of each payment cycle, to estimate, to their best ability, the percent complete of each balance. The **Inspector** shall document the est qty, accum. total, date, initials, the AEB#, and any calculations and remarks that are needed. **Skip at least one line between entries.**

**Note:** All entries must be entered as called out in the plans and document left, right, or centerline, where applicable.

**Payment for Cuyd items shall be based on planned quantity or if different than plan, calculations or backup are required. If calculations are too extensive to place in the book, then a CALCULATION sheet must be done (See Chapter 2).**

Item No. 2030540 Item: Borrow Embankment Plan Qty: 2210.00 cuyd							Sig fig = .01      22
Balance: S' 0182.00 TO S' 5110.00 LT to RT This Section: 1629.00 cuyd							L X W X D = 27 = cuyd
EST Qty	Accum Total	Date	Insp	AEB#	PMT#		% complete / calcs / Remarks
244.35	244.35	8/18/08	TC	2			15% complete ✓SB
749.34	993.69	9/1/08	TC	2			61% complete ✓SB
635.31	1629.00	9/15/08	TC	2			100% complete 1629.00 - 993.69 = 635.31 ✓SB
Page total:							<b>Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).</b>

**Officeperson's Hint:** The length does not always equal the difference between the beginning and ending station. Sometimes there is a curve or an obstacle that will affect the distance. Always check with the **Inspector** before assuming the calculations are incorrect.

**DOCUMENTATION REQUIREMENT**  
**SECTION F**  
**CHANNEL EXCAVATION**  
**DRAINAGE EXCAVATION**  
**(WHEN PAID BY CUBIC YARD)**

To provide documentation for the above items, it will be necessary to prepare a separate field book for each item labeled CHANNEL or DRAINAGE as outlined in this chapter. If there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.

**Channel Excavation** may be listed three different ways in the contract plans:

1. If listed on the Summary of Earthwork sheets or on the Profile sheets, as illustration on page 5-9, the item will be placed in a CHANNEL EXCAVATION book or if there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.
2. If listed by itself on a line in a structure list, the item will be placed in a CHANNEL EXCAVATION book as illustration on page 5-10.
3. If listed on a line in a structure list with other items it will be placed in a book with those items as illustration on page 5-11.

**Drainage Excavation** may be listed two different ways in the contract plans:

1. If listed by itself on a line in a structure list, then it will go into a DRAINAGE EXCAVATION book as illustration on page 5-10.
2. If listed on a line in a structure list with other items it will be placed in a book with those items as illustration on page 5-11.

Planned quantities may be paid on channel or drainage excavation. If the Contractor or Resident Engineer requests a remeasurement and recalculation in writing, the revised quantities shall be referenced accordingly. The possibility of paying plan quantity does not eliminate taking original cross sections.

If the Contractor requests final measurement and such measurements are made, the survey or CALCULATION sheets must be referenced to the field book(s) and page(s), rolls, CROSS SECTION book(s) and page(s) or other pertinent sources and the field book must be referenced to the CALCULATION sheet (Form No. 040-034) as described and illustrated in Chapter 2 (Setting Up a Contract, Book Format, etc.).

The stationing shown in the field book shall coincide with the SURVEY or CALCULATION sheets for that area.

Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).

Channel or Drainage Excavation, if each item is placed in its own book, then the title will be the same as the item placed in the book or if there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK.

The following is an illustration for an item with a UOM of Cuyd.

The **Officeperson** shall complete for each page the item number, item description, plan quantity, the significant figure on the top right-hand side of the page, the balance (stations this balance), this section (plan this balance), all column headings, and page total in the bottom left-hand corner of the page. **Each balance will be placed on a separate page. The balances for earthwork items can be found in the contract plans on the Profile sheets and/or the Summary of Earthwork sheets.** Leave at least one blank page in the book between each balance. In some cases of very large balances that may require considerable time to complete, leave additional pages. The final total of a balance should equal the quantity shown in "This Section" for the balance. If it does not equal, then calculations or backup are required. The sum of all balances should equal the total plan quantity for that item. If a large discrepancy exists, an error has been made or an error exists on the plans and must be investigated. **Skip at least one line between entries. A separate page shall be provided for each bid item. Make sure to leave enough pages between balances and items for any added or missed items. Calculations must be checked and initialed.**

As construction progresses throughout each balance, it will be the Resident Engineer's or his designated **Inspector's** responsibility at the end of each payment cycle, to estimate, to their best ability, the percent complete of each balance. The **Inspector** shall document the est qty, accum. total, date, initials, the AEB#, and any calculations and remarks that are needed. **Skip at least one line between entries.**

**Note:** All entries must be entered as called out in the plans and document left, right, or centerline, where applicable.

**Payment for Cuyd items shall be based on planned quantity or if different than plan, calculations or backup are required. If calculations are too extensive to place in the book, then a CALCULATION sheet must be done (See Chapter 2).**

Item No: 2030520					
Item: Channel Excavation					
Plan Qty: 3000.00 cuyd					
Balance: "PTRR" 33+79 LT					
This Section: 280.00 cuyd					
Est Qty	Accum TOTAL	Date	Insp	AEB#	PMT#
100.80	100.80	7-31-08	TC	1	
179.20	280.00	8-14-08	TC	1	
Page total:					

Signif = .01      36

$L \times W \times D = 27 = \text{cuyd}$

% Complete/calcs/Remarks

36% Complete ✓

100% Complete ✓

$280.00 - 100.80 = 179.20$

**Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).**

**Officeperson's Hint:**  
The length does not always equal the difference between the beginning and ending station. Sometimes there is a curve or an obstacle that will affect the distance. Always check with the **Inspector** before assuming the calculations are incorrect.

Channel Excavation as illustrated on this page shall be documented in a CHANNEL EXCAVATION book. If using this illustration for Drainage Excavation, then the book would be labeled DRAINAGE EXCAVATION. If there are few entries, the items mentioned in this chapter may be entered in separate sections of one book labeled EARTHWORK. The illustration on this page is used when earthwork items are located on a structure list with a plan quantity for each location.

The following is an illustration for an item with a UOM of Cuyd.

The **Officeperson** shall complete for each page the item number, item description, plan quantity, the significant figure on the top right-hand side of the page, all column headings, the AEB number, page total in the bottom left-hand corner of the page, station to station and plan for each location if indicated on a structure list. If an item with a UOM of Cuyd is not on a structure list omit the plan column. **Skip at least one line between entries. A separate page shall be provided for each item. Make sure to leave enough pages between items for any added or missed items. All Calculations must be checked and initialed.**

**Officeperson's Hint:** The length does not always equal the difference between the beginning and ending station. Sometimes there is a curve or an obstacle that will affect the distance. Always check with the **Inspector** before assuming the calculations are incorrect.

Daily, the **Inspector** shall document station to station and AEB# if not already entered, cuyd, date, initials, and any calculations and remarks that are needed. **Skip at least one line between entries.**

**Note:** All entries must be entered as called out in the plans and document left, right, or centerline, where applicable.

**Payment for Cuyd items shall be based on planned quantity or if different than plan, calculations or backup are required. If calculations are too extensive to place in the book, then a CALCULATION sheet must be done (See Chapter 2).**

Station to Station	Plan	cuyd	Date	Insp	AEB#	Pmr*	Calcs/Remarks
Item No: 2030520 Item: Channel Excavation Plan Qty: 3000.00 cuyd Sig Fig = .01 <span style="float: right;">18</span> $L \times W \times D \div 27 = \text{cuyd}$							
"BD" 65+90 To	100.00	106.40	8-27-08	JD	2		$280 \times 6.84 \times 1.5 \div 27 = 106.40$
"BD" 68+70 LT							
"BD" 18+96 To							
"BD" 27+86 LT	620.00	611.62	8-29-08	JD	2		$829 \times 8.3 \times 2.4 \div 27 = 611.62$
"Lne" 363+20.47	122.00						
"Lne" 350+19.50 LT							
Page total:							

Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).

When making out the field books if a required item of work is not illustrated in this chapter, use an illustration that has the same UOM.

Channel and Drainage Excavation listed on the same line with other items on a structure list shall be documented as illustrated on this page.

The following is an illustration for an item with a UOM of Cuyd.

The **Officperson** shall complete for each page the item number, item description, plan quantity this installation as shown on a structure list, the significant figure on the top right-hand side of the page, all column headings, and page total in the bottom left-hand corner of the page. **Skip at least one line between entries. A separate page shall be provided for each item. Make sure to leave enough pages between items for any added or missed items. All Calculations must be checked and initialed.**

**Officperson's Hint:** The length does not always equal the difference between the beginning and ending station. Sometimes there is a curve or an obstacle that will affect the distance. Always check with the **Inspector** before assuming the calculations are incorrect.

Daily, the **Inspector** shall document the location, cuyd, date, initials, AEB# and any calculations and remarks that are needed. **Skip at least one line between entries.**

**Note:** All entries must be entered as called out in the plans and document left, right, or centerline, where applicable.

**Payment for Cuyd items shall be based on planned quantity or if different than plan, calculations or backup are required. If calculations are too extensive to place in the book, then a CALCULATION sheet must be done (See Chapter 2).**

Item No: 2030520		Sig fig = .01		22
Item: Channel Excavation		$L \times W \times D \div 27 = \text{cuyd}$		
Plan Qty this installation: 45.00 cuyd				
Location	Cuyd	Date	Insp	AEB# Pmt#
X 300+10 RT	45.00	8-13-08	TC	4
				Calcs/Remarks
				Complete
<p><b>Each book shall be setup according to Chapter 2 (Setting up a Contract, Book Format, etc.) and recapped as illustrated in Chapter 24 ("Finaling Out" a Contract).</b></p>				
Page total:				

When making out the field books if a required item of work is not illustrated in this chapter, use an illustration that has the same UOM.

## **DOCUMENTATION REQUIREMENT SECTION G CROSS SECTION INFORMATION**

Cross sections may be required in some cases due to alignment change, insufficient cross sections taken during the original survey, or for various other reasons. When this is required, the same minimum requirement as set out for location surveys will be followed.

Cross sections shall normally be taken on stations, plus 50's and equations. Additional pluses shall be added as necessary to show such things as drainages, slipouts, dropoffs, etc. Cross sections shall be taken at right angles to the centerline on tangents and on radial lines of curves. If for some reason this is not possible, the reason for deviating, and the angle that it was taken on, shall be entered in the CROSS SECTION Book.

The CROSS SECTION book shall be setup like the CALCULATION book as described in Chapter 2 (Setting up a Contract, Book Format, etc.) and filed in a loose-leaf binder labeled CROSS SECTION book. This book shall be kept in the field office. **The CROSS SECTION sheets shall be attached to a CALCULATION sheet. The top portion of the CALCULATION sheet will be completed and numbered consecutively and referenced to the field book(s) and page(s) and the field book (s) must be referenced to the CALCULATION sheet.**

### **THE FOLLOWING METHODS ARE BRIEFLY DISCUSSED:**

1. The use of level, level rod and cloth tape.  
This method is generally best suited to relatively flat terrain where it is possible to cross section the profile of centerline while at the same level setup.
2. The use of a hand level, level rod and cloth tape.  
This method should only be used to catch an occasional "plus" rod reading.
3. Use of a transit (total station, etc.), level rod and tape or electronic measuring instrument. This method is only to be employed in mountainous country where it is more expedient to transfer elevations and distances by means of slope measuring, rather than by hand level and tape.

In addition to the CROSS SECTION Book, Computer Aided Design (CAD) software can create calculation sheets or reports that display station-to-station data. This triangulation based software calculates a volumetric difference between an existing surface and excavated or designed surface. These reports accumulate the earthwork by stations and show quantities that are acceptable for payment.

To produce the Accumulated Quantities report as illustrated on page 5-13 and 5-14, the software user will input two sources of data in the computer. Source one is a roadway section encompassing the alignment, profiles, and typical sections that the instrument man will input from the contract plans. Source two is a surface model or DTM, which is collected in the field during an existing or excavated surface cross section.

Using Trimble Geomatics Office software and their "Roadlink" tool, you can display the inputted roadway horizontal alignment, insert an overlay of the collected cross sectioned surface, and then create a report based on the volumetric difference between the roadway design dimensions and the cross sectioned existing surface.

The Supervisor I is the primary source of this report, as they have the training and knowledge base to manipulate the survey equipment and software to create this type of payment document.

The illustration below and on page 5-14 will be attached to a CALCULATION sheet (Form No. 040-034). Be sure to cross reference the CALCULATION sheet to the field book(s) and page(s), rolls, CROSS SECTION book(s) and page(s) and the field book(s), rolls, CROSS SECTION book(s) and page(s) to the CALCULATION sheet.

# Volume Report

## Project Pahrump Adjusted

**Project name** Pahrump Adjusted  
**Road** P1-1  
**Units** US survey feet  
**Date** 9/14/2007 12:58 PM

Station: 711+00.000 to: 735+50.000  
 Road : P1-1

Statn US feet	----- XS area -----		----- Volume -----		----- Accumulated -----	
	Cut Sq ft	Fill Sq ft	Cut Cu ft	Fill Cu ft	Cut Cu ft	Fill Cu ft
711+50.000	0.00	24.58	0.00	0.00	0.00	0.00
712+00.000	0.00	27.40	0.00	1299.53	0.00	1299.53
712+50.000	0.00	26.65	0.00	1351.23	0.00	2650.76
713+00.000	0.00	27.41	0.00	1351.60	0.00	4002.36
713+50.000	0.00	27.24	0.00	1366.31	0.00	5368.67
714+00.000	0.00	26.56	0.00	1344.91	0.00	6713.59
714+50.000	0.00	23.66	0.00	1255.37	0.00	7968.96
715+00.000	0.00	25.66	0.00	1232.97	0.00	9201.92
715+50.000	0.00	31.53	0.00	1429.82	0.00	10631.74
716+00.000	0.00	31.88	0.00	1585.35	0.00	12217.09
716+50.000	0.00	21.77	0.00	1341.20	0.00	13558.29
717+00.000	0.00	13.48	0.00	881.04	0.00	14439.34
717+33.650	0.00	8.91	0.00	376.73	0.00	14816.07
717+50.000	0.00	8.87	0.00	145.57	0.00	14961.63
718+00.000	0.00	5.23	0.00	352.84	0.00	15314.48
718+50.000	0.00	1.47	0.00	167.78	0.00	15482.26
719+00.000	0.00	2.23	0.00	92.51	0.00	15574.77
719+50.000	0.00	3.23	0.00	136.28	0.00	15711.05
720+00.000	0.10	1.70	2.50	123.10	2.50	15834.16
720+50.000	0.00	7.69	2.50	234.75	5.00	16068.91
721+00.000	0.00	4.70	0.00	310.05	5.00	16378.95
721+50.000	0.43	0.92	10.73	140.53	15.73	16519.48
722+00.000	0.01	1.93	10.88	71.28	26.61	16590.76
722+50.000	0.19	0.99	4.79	73.04	31.39	16663.80
723+00.000	0.08	1.12	6.58	52.64	37.97	16716.44
723+50.000	0.00	6.11	1.94	180.68	39.91	16897.11
724+00.000	0.00	21.63	0.00	694.37	39.91	17591.49
724+50.000	0.00	14.69	0.00	908.92	39.91	18500.40
725+00.000	0.00	2.79	0.00	437.01	39.91	18937.41
725+50.000	0.00	2.76	0.00	138.75	39.91	19076.16
726+00.000	0.00	1.94	0.00	117.56	39.91	19193.73
726+50.000	0.08	0.51	2.06	61.32	41.97	19255.04
727+00.000	0.62	0.21	17.54	18.06	59.52	19273.11
727+50.000	0.24	0.44	21.47	16.35	80.98	19289.45
728+00.000	0.00	1.89	5.97	58.29	86.95	19347.74
728+50.000	0.27	1.21	6.84	77.34	93.79	19425.08
728+81.000	1.08	0.31	20.97	23.53	114.77	19448.61
729+00.000	0.42	0.54	14.29	8.04	129.05	19456.65

729+50.000	0.00	13.65	10.60	354.90	139.65	19811.56
730+00.000	0.00	13.27	0.00	673.92	139.65	20485.48
730+50.000	2.84	0.14	71.04	335.80	210.69	20821.28
731+00.000	5.23	0.00	201.94	3.48	412.63	20824.76
731+50.000	6.77	0.00	300.21	0.00	712.84	20824.76
732+00.000	6.96	0.00	343.39	0.00	1056.23	20824.76
732+50.000	7.29	0.00	356.53	0.00	1412.76	20824.76
733+00.000	4.43	0.07	293.51	1.84	1706.27	20826.61
733+50.000	3.13	0.05	189.27	3.08	1895.54	20829.69
734+00.000	0.00	2.06	78.22	52.64	1973.76	20882.33
734+50.000	0.16	2.67	3.99	117.95	1977.75	21000.28
735+00.000	0.48	2.40	16.03	126.48	1993.78	21126.75

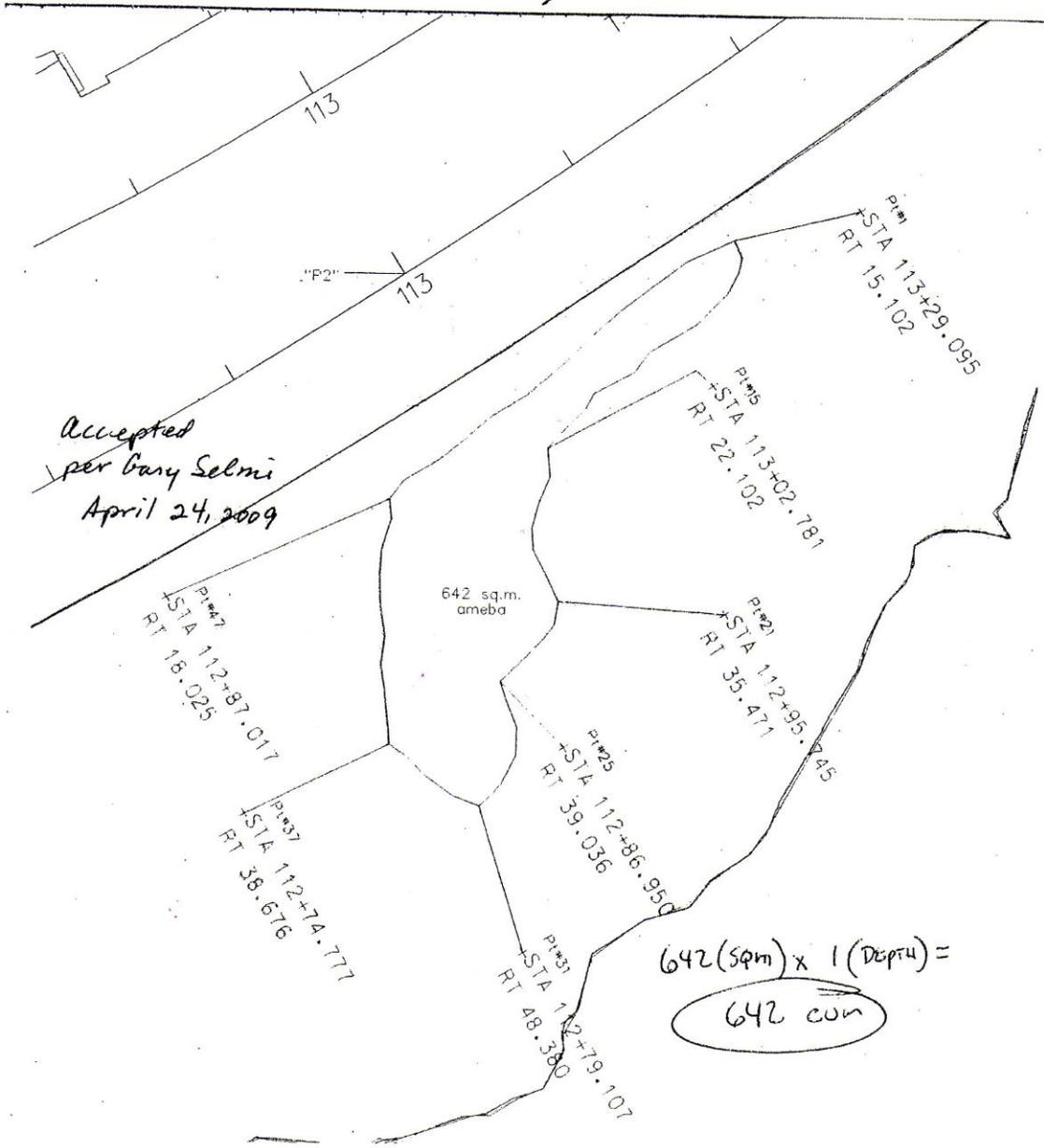
**Back to top**

Survey information may be printed out on CALCULATION sheets (Form No. 040-034).  
Make sure to complete the top portion of the sheet.

STATE OF NEVADA  
DEPARTMENT OF TRANSPORTATION  
CALCULATION SHEET

PAGE NO. 10

CONTRACT NO. 3292 CALCS BY SL CHECKED BY (SD) DATE 3-24-09  
DESCRIPTION SELECTED ROCK SLOPE  
LOCATION 'P2' 112+75 TO 'P2' 113+29 RT  
EVENT  
REFERENCE FIELD BOOK NO. TSA0504I 46002209324 PAGE(S)



STATE OF NEVADA  
DEPARTMENT OF TRANSPORTATION  
CALCULATION SHEET

PAGE NO. 11

CONTRACT NO. 3292 CALCS BY SL CHECKED BY GD DATE 3-24-09  
DESCRIPTION SELECTED ROCK SLOPE  
LOCATION 'P2' 112+75 TO 'P2' 113+29 RT

REFERENCE FIELD BOOK NO. ISPL&WI 4602009 324 PAGE(S)         

LINE NO.	STATION	ELEVATION	RTAMEBA	113+00P2.txt
*1	4514088.648	698912.076	1528.630	AMEBA PERIMETER
2	4514086.931	698912.820	1528.391	AMEBA PERIMETER
3	4514085.442	698912.483	1527.787	AMEBA PERIMETER
4	4514083.386	698911.431	1527.597	AMEBA PERIMETER
5	4514081.912	698909.642	1527.236	AMEBA PERIMETER
6	4514080.236	698908.256	1527.107	AMEBA PERIMETER
7	4514078.836	698905.880	1527.260	AMEBA PERIMETER
8	4514077.552	698903.732	1527.087	AMEBA PERIMETER
9	4514075.540	698902.250	1527.033	AMEBA PERIMETER
10	4514075.708	698899.759	1526.751	AMEBA PERIMETER
11	4514074.762	698898.670	1526.762	AMEBA PERIMETER
12	4514073.398	698898.306	1526.480	AMEBA PERIMETER
13	4514071.795	698897.408	1526.284	AMEBA PERIMETER
14	4514069.562	698895.154	1526.202	AMEBA PERIMETER
*15	4514067.922	698893.659	1526.215	AMEBA PERIMETER
16	4514065.121	698893.907	1525.515	AMEBA PERIMETER
17	4514062.448	698892.742	1523.925	AMEBA PERIMETER
18	4514060.045	698892.080	1523.347	AMEBA PERIMETER
19	4514057.835	698892.241	1522.451	AMEBA PERIMETER
20	4514055.340	698893.574	1520.974	AMEBA PERIMETER
*21	4514052.757	698894.795	1519.581	AMEBA PERIMETER
22	4514050.463	698894.422	1518.824	AMEBA PERIMETER
23	4514048.852	698893.163	1518.521	AMEBA PERIMETER
24	4514046.740	698890.969	1518.586	AMEBA PERIMETER
*25	4514044.862	698888.970	1518.010	AMEBA PERIMETER
26	4514042.921	698889.621	1517.057	AMEBA PERIMETER
27	4514040.412	698890.655	1515.588	AMEBA PERIMETER
28	4514037.582	698890.588	1514.911	AMEBA PERIMETER
29	4514034.762	698889.109	1514.203	AMEBA PERIMETER
30	4514033.591	698888.111	1513.986	AMEBA PERIMETER
*31	4514032.599	698886.915	1513.843	AMEBA PERIMETER
32	4514033.277	698885.521	1514.641	AMEBA PERIMETER
33	4514033.553	698884.295	1515.166	AMEBA PERIMETER
34	4514034.789	698882.859	1515.878	AMEBA PERIMETER
35	4514035.502	698881.524	1516.797	AMEBA PERIMETER
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*37	4514038.522	698877.994	1519.043	AMEBA PERIMETER
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41	4514046.350	698877.100	1522.648	AMEBA PERIMETER
42	4514049.100	698877.510	1523.467	AMEBA PERIMETER
43	4514052.265	698877.017	1524.855	AMEBA PERIMETER
44	4514055.125	698876.956	1526.162	AMEBA PERIMETER
45	4514057.614	698877.099	1527.019	AMEBA PERIMETER
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*47	4514062.715	698877.892	1528.515	AMEBA PERIMETER
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50	4514068.741	698885.372	1528.330	AMEBA PERIMETER
51	4514071.085	698888.059	1528.523	AMEBA PERIMETER
52	4514073.245	698891.594	1528.430	AMEBA PERIMETER
53	4514076.229	698895.137	1528.577	AMEBA PERIMETER
54	4514079.085	698898.082	1528.917	AMEBA PERIMETER
55	4514081.558	698900.903	1528.688	AMEBA PERIMETER
56	4514084.051	698904.116	1528.751	AMEBA PERIMETER
57	4514086.513	698907.433	1528.671	AMEBA PERIMETER
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