

Technical Release

Number 62

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PREFACE

This technical release contains the format for engineering field notes and related field staking in SCS. The instructions and sample notes represent the best practicable blending of the many existing note formats to fit the needs of the Soil Conservation Service.

Engineering surveys, staking, notekeeping, calculations and note interpretation are part of the daily activities of many Soil Conservation Service personnel, as well as contractors, consultants, district employees and others.

It is important, therefore, that we perform these operations with the greatest possible efficiency and in a manner that will result in maximum usefulness of the information obtained. This calls for uniformity in methods and procedures between states and between work locations within states.

GENERAL

Field Notebooks and Special Forms

Bound field notebooks and looseleaf field notebooks are both satisfactory for most SCS engineering surveys. However, the looseleaf notebooks should not be used for project or other contract work where the notes might be used as evidence or supporting data in court actions. Looseleaf notes are not generally acceptable to the courts.

The use of special forms is recommended for recording engineering notes and design data for such practices as terraces, diversions, waterways, small pond dams, and similar work. It is extremely important, however, that (1) the method be uniform and (2) the forms provide for at least the minimum construction check information shown in the sample notes.

Numbering, Identifying, Indexing, and Filing

Numbering Bound Notebooks

Number bound field notebooks consecutively for each broad activity. Use one series of numbers for Public Law 46 activities (including cost share programs) in each field office. The numbering may run consecutively from year to year or may start with number 1 at the beginning of each year. In the latter case, the year should precede the number such as 1977-1, 1977-2, etc.

Design and construction notebooks for project installation will be numbered in a separate series for each structure. Place the name of the project and the name (if there is one) and number of the structure site on each notebook. All notebooks used to record notes during the project planning stage may be numbered in one continuous series for the project area. A separate series of numbers will be used for each group project. Books containing notes of surveys made for other agencies should be numbered and identified as outlined for group or project type work. In all cases the identifying name should be lettered with India ink or its equivalent.

Identifying Notebooks

Identify all field notebooks, both bound and looseleaf, so that they can be returned to proper headquarters if lost. Place this identification on the inside on the front cover or on the flyleaf of bound notebooks. For most looseleaf notebook binders it will be necessary to paste a white tab to the inside front cover.

The following identification should be used:

U.S. GOVERNMENT PROPERTY

Finder please return to

SOIL CONSERVATION SERVICE

(Street or P.O. Box No.)

(City) (State) (Zip Code)

Indexing Bound Notebooks

The first 5 to 10 pages of each bound notebook should be reserved for indexing.

Note Identification

Each set of notes should have a title page. Printed title pages are available for use in looseleaf notebook binders (See Figure 1-1). Rubber stamps may be obtained for stamping the title page in bound notebooks.

Bound Notebooks

A single title page will suffice for all the surveys related to the same job if the notes are recorded on consecutive pages or clearly cross referenced by notations such as "continued on page _____," and "continued from page ____." If this is not feasible, use a separate title page for each set of notes.

Show the following information on the first page of notes following the title page:

Page number

Names of party members and assignments

Purpose of survey (design, construction layout, construction check, etc.)

Date

Show only the page number on subsequent pages unless there is a change in purpose of survey, party members, or date. Stamps may be used for recurring titles and other information.

Looseleaf Notebooks

Use a separate title page for each set of looseleaf notes (See Figure 1-1). The sample notes in Chapter 2 illustrate use of the title page.

Show the following information on the right-hand face of the first page of notes following the title page:

Page number

Individual, group or project name (may be abbreviated)

Practice or construction item (abbreviated if feasible)

Purpose of survey (design, construction layout, etc.)

Party members and their assignments

Date

Show the same information on the succeeding pages, except for party members and date which need not be listed unless they change.

Filing Notes

File all field notes in the office responsible for followup on the job. Fasten each set of looseleaf notes together and file in the plan folder or appropriate job file or folder. A large envelope stapled inside the folder makes a good repository.

Recording Survey Data

Record all numbers, figures, and explanatory notes clearly and legibly. Use pencils of a hardness equal to or exceeding No. 2-H. Do not erase numbers. If an error is made in recording a number, a line should be drawn through it and the correct number written above.

The recorded data should give a true picture of the precision of the survey. The decimal point should never be omitted when recording decimals. If measurements are made to the nearest 0.01 foot, 2 digits should always be recorded to the right of the decimal point even though the last one, or last two, may be zeros, for example 2.10 or 4.00.

Precision

The sample notes illustrate the precision required for ordinary SCS engineering surveys. A higher degree of precision may be required for project type work or special or unique jobs. The work outline for surveys should specify the degree of precision required. The Engineering Field Manual, Chapter 1, discusses survey precision and accuracy.

Sketches

Sketches are an important part of survey notes and should be made for all types of surveys. Sketches are of two general types: (1) those used on the title page

for general location of the job and (2) those used in the body of the notes to show data that cannot be readily shown in other ways. Normally, sketches are not drawn to scale but are proportioned by eye. The sample notes illustrate use of sketches. In sectioned country, the full legal description might replace the general location sketch.

Stationing

Normally the starting station for survey of streams, waterways, canals, ditches, and gullies is located at the upstream end and proceeds in the direction of flow. Stationing should be compatible with computer use. In some cases, however, the survey can be accomplished with less time and effort, and be related better with subsequent sections of the job, by locating the starting point at the downstream end. This is especially true of drainage surveys.

Negative stationing must not be used in surveys if water surface profiles are to be machine computed and positive stationing is always preferable. Negative stationing tends to be confusing and to cause errors. When the extent of the survey is not known at the beginning, a station value sufficiently greater than 0 + 00 should be assigned the starting station to insure all stationing will be positive.

Left and Right Designations

Banks of natural streams are conventionally designated left and right facing downstream. However, cross sections, slope stakes and notes should always be directed left and right as viewed in the direction of increasing stations.

Grade Rod

The notes for construction layout and check surveys illustrate the use of the grade rod. The grade rod is a timesaver and has wide application in SCS work. It eliminates the need for converting rod readings to elevations and facilitates computations since they may be made directly from the field notes. This eliminates copying time, reduces the time for checking and the chance for errors.

The grade rod is obtained by subtracting the planned elevation at each station from the height of instrument ($\text{Grade Rod} = \text{H.I.} - \text{Planned Elev.}$). When the height of instrument is above planned elevation, the grade rod has a plus value and is so marked in the notes, such as +5.2. If the height of instrument is below planned elevation, the grade rod has a minus value and is so marked, such as -8.3.

To find the cut or fill in construction layout surveys, subtract the actual rod reading from the grade rod. If the result has minus value, a fill is indicated. If the result has a plus value, it indicates a cut.

Example A

H.I. = 249.3
Planned Elev. = 243.0
Grade Rod = $249.3 - 243.0 = +6.3$
Foresight = 9.8
 $+6.3 - 9.8 = -3.5$ a fill

Example B

H.I. = 127.4
Planned Elev. = 132.6
Grade Rod = $127.4 - 132.6 = -5.2$
Foresight = 4.2
 $-5.2 - 4.2 = -9.4$ a fill

Example C

H.I. = 134.6
Planned Elev. = 128.4
Grade Rod = $134.6 - 128.4 = +6.2$
Foresight = 2.9
 $+6.2 - 2.9 = +3.3$ a cut

In construction check surveys, the grade rod for each station is computed as explained above. The foresight at each station is mentally compared with the grade rod for that station. Thus, the work can be checked rapidly without the necessity of converting rod readings to elevations.



4

5

6



7

8



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD		Date	
Field Office			
Name			
Individual	Group	Unit of Govt.	
(circle one)			
Job			
Design Sur.	Const. Layout		
Const. Check	Other		
Ident. No.	Field No.		



Scale

1" = _____

Legal Description

Sec T R

or

Location:

SCS-ENG-28 REV. 5-75

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD		Date	
Field Office			
Name			
Individual	Group	Unit of Govt.	
(circle one)			
Job			
Design Sur.	Const. Layout		
Const. Check	Other		
Ident. No.	Field No.		
Location			



SCS-ENG-28A REV. 5-75

Figure 1-1 Title Pages



STANDARD NOTE SAMPLES FOR ORDINARY ON-FARM WORK

The following sample notes illustrate the format for several types of surveys used for ordinary on-farm activities. The intent of these samples is to illustrate SCS notekeeping methods, format, identification, content, and completeness.

In a limited number of instances the sample notes include design information for the simpler projects. These design data were used only for illustration and do not establish design criteria.

Each set of notes is preceded by explanatory statements which should be studied carefully.

FIGURE 2-1

Engineering Notes for Pond Dam

Design and Construction Layout Survey

These notes are for a small pond dam that was designed and staked for construction during one trip to the field. The design survey and the construction layout survey were combined in one operation.

A reference hub was set at spillway elevation and the following information was given to the landowner for use by him and the contractor:

1. Total fill height (design height plus allowance for settlement) at each station as measured from the reference hub.
2. Spillway dimensions and its elevation in relation to the reference hub.
3. Top width of fill.
4. Side slopes of fill.
5. Standard specifications for site preparation and placement of fill.

Soil investigations and fill volume computations were made and recorded in accordance with State procedures.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <u>Clear River</u>	Date <u>2/26/74</u>
Field Office <u>Rayville</u>	
Name <u>W. F. Jones</u>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group <input type="radio"/> Unit of Govt. (circle one)	
Job <u>Pond</u>	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout <input checked="" type="checkbox"/>
Const. Check <input type="checkbox"/>	Other <input type="checkbox"/>
Ident. No. <u>42-010-718</u>	Field No. <u>3</u>
Location <u>3 mi. West of Beltsville</u>	

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Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Settlement % of H
BMI	2.80	102.80		100.00	
0+00			+0.8	102.0	
0+85			+0.8	102.0	0.5
1+00			+0.8	102.0	0.9
1+35			+0.8	102.0	0.8
2+00			+0.8	102.0	0.5
2+45			+0.8	102.0	0.2

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(5-70)

GPO : 1970 O-385-055

W.F. Jones Pond | J. Gibbs
Design & Const. Layout | K. Hill 2/26/74

Design Data

D.A. 8.0 ac. Q=18 (ES-1027)
 Elev. top dam = 102.0 top width = 8.0'
 Earth spillway 10.0' x 2.0' 2:1 SS.
 Spillway elev. 100.0
 Add 10% to $\frac{1}{2} H$ for settlement
 Left $\frac{1}{2}$ Right
 (downstream) (upstream)
 2:1 3:1

20^d nail in root of 12" maple in fence
 corner 200' E. of S. end of dam.

F=0.0 0.8 4.0	F=0.0 0.8 0.0	F=0.0 0.8 4.0
F=6.4 6.4 15.2	F=5.0 5.8 0.0	F=4.2 5.0 16.6
F=9.2 10.0 22.4	F=9.1 9.9 0.0	F=8.2 9.0 28.6
F=8.8 9.6 21.6	F=7.9 8.7 0.0	F=7.2 8.0 25.6
F=4.8 5.6 13.6	F=4.7 5.5 0.0	F=2.4 3.2 11.2
F=3.3 4.1 10.6	F=2.0 2.8 0.0	F=1.0 1.8 7.0

Figure 2-1 Sheet 2 of 6

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Settlement = 10% @ H.
		102.80			
2+50	End fill		0.8	102.0	0.0
2+61	Spillway \pm		2.8	100.0	
	Slope Stakes - Spillway				
0+00			2.8	100.0	
0+12			2.8	100.0	\pm Dam Sta. 2+61 @ 90°
0+25			2.8	100.0	
TBM1			2.81	99.99	OK.

1976-0-200-611

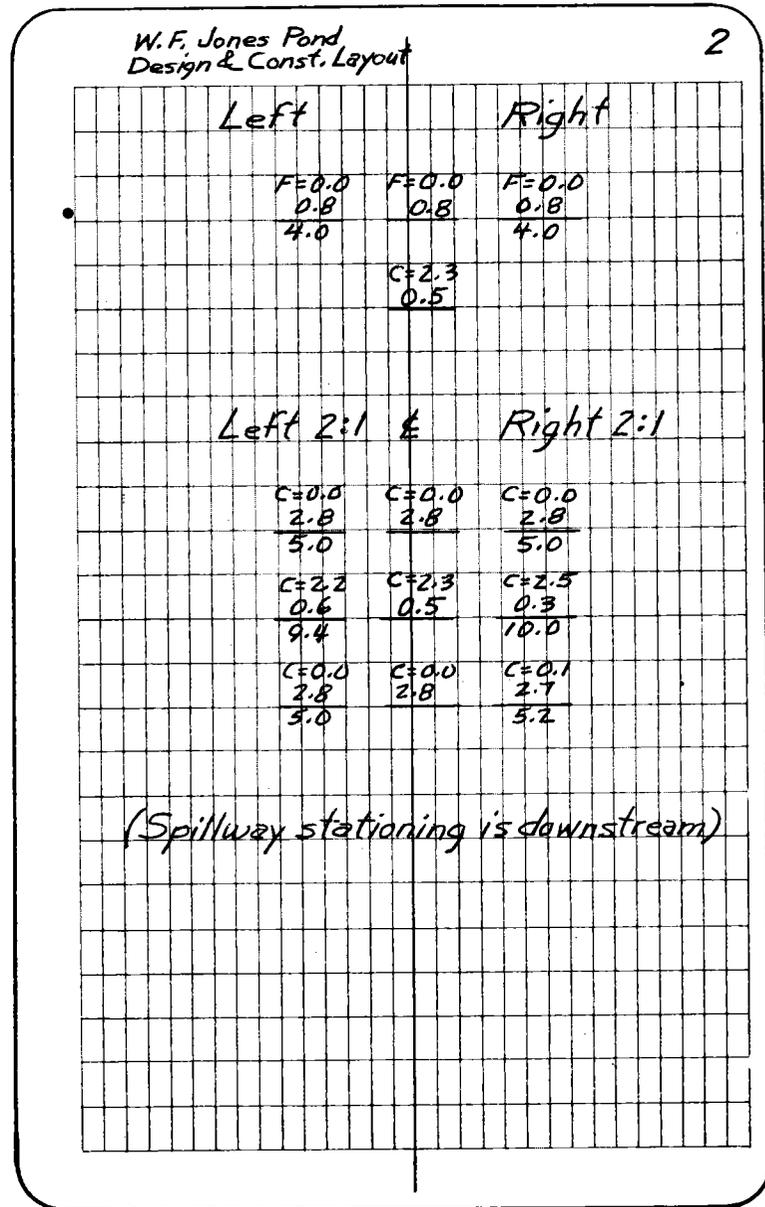


FIGURE 1

Engineering Notes for Pond Dam

Construction Check Survey

To expedite the construction check survey, the following information was taken from the plans and listed in the field notebook where it would be convenient for reference: (This was done before any survey work was started.)

<u>Sta.</u>	<u>Planned Elev.</u>	<u>Planned Elev. + 10% of C L Height</u>
0 + 00	102.0	
0 + 85	102.0	102.5
1 + 35	102.0	102.8
2 + 00	102.0	102.5
2 + 45	102.0	102.2
2 + 50	102.0	
2 + 51.6	102.2	
2 + 56	100.0	
2 + 61	100.0	
2 + 66	100.0	
2 + 71	102.5	

The constructed fill was uniform in appearance, therefore, only one cross section was taken.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <u>Clear River</u>	Date <u>3/5/74</u>
Field Office <u>Rayville</u>	
Name <u>W.F. Jones</u>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group <input type="radio"/> Unit of Govt. (circle one)	
Job <u>Pond</u>	
Design Sur.	Const. Layout
Const. Check <input checked="" type="checkbox"/>	Other
Ident. No. <u>42-010-718</u>	Field No. <u>3</u>
Location <u>3 mi. W. of Beltsville</u>	↑ N

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Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Planned Elev. + 10% ± H.
B.M.1	3.81	103.81		100.00	
0+00				+1.8	102.0
0+85				+1.3	102.5
1+35				+1.0	102.8
2+00				+1.3	102.5
2+45				+1.6	102.2
2+50	End Fill			+1.8	102.0
2+52	Edge Spillway Curt			+1.6	102.2
2+57	Bottom Spillway			+3.8	100.0
2+62	± Spillway			+3.8	100.0
2+67	Bottom Spillway			+3.8	100.0

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W.F. Jones Pond Const. Check

J. Jones
K. Hill 3/5/74

Left (downstream) 2:1				±	Right (upstream) 3:1			
				1.8				
				1.2				
9.8	9.6	6.4	0.9	0.9	1.0	4.2	8.6	9.0
25.0	20.0	14.0	4.0		4.0	13.0	25.0	30.0
				1.2				
				1.4				
				1.7				
				1.6				
				3.8				
				3.9				
				3.8				

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		103.81		
2+72	Edge Spillway cut.		+1.3	102.5
TP	3.87	104.42	3.26	100.55
BMI			4.42	100.00
	7.68		7.68	OK.
<p>Note: Normally rod readings are sufficient for checkout but complex or large dams may require a plotted section.</p>				

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(5-70)

GPO : 1970 O-385-053

W.F. Jones Pond
Const. Check

2

±

1.3

Pond has 0.1 acre area at elev. 90.1 as determined with hand level and tape.

Fill and spillway not seeded. N.W. end of fill is rip-rapped with stone.

Construction meets plans and specifications except for seeding

W.F. Jones
Cons. Tech.

3/5/74

Figure 2-1 Sheet 6 of 6

FIGURE 2-2

Engineering Notes for Pond Dam and Spillway
Design Survey

These notes illustrate a job where the design survey was made by a survey party and the plans and specifications prepared from the notes by an engineer.

Soil investigations and hydrologic studies were made and recorded in accordance with Service standards and procedures for the State.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
SCD Blue Mountain	Date 2/26/74
Field Office Cavalier	
Name George Smith	
Individual Group Unit of Govt. (circle one)	
Job Pond #3	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout
Const. Check	Other
Ident. No. 81-008-26A	Field No. 11
Scale	1" =
Legal Description	
NE 1/4, NE 1/4 Sec 7 T 4N R 3W	
or	
Location:	
SCS-ENG-28 REV. 5-75	

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	6.71	106.71		100.00
1+00				
2+00				
2+39				
TP1	1.32	96.17 (96.2)	11.86	94.85
2+83				
3+00				
3+35				
4+00				
TP2	11.82	106.46 (106.5)	1.53	94.64
4+69				

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(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Design Survey
Dam

K J. Doe
R. Rowe 2/26/74

Left ϵ Right

1" steel axle in fence 200' N.W. of
N.W. end of dam ϵ

105.8 0.7 15	105.9 0.8 0	105.9 0.8 15			
105.5 1.2 15	105.5 1.2 0	105.6 1.1 15			
94.8 11.9 29	95.1 11.6 0	95.8 10.9 15	98.2 8.5 23	98.9 7.8 46	
92.2 4.0 36	91.4 4.8 9	93.5 3.7 0	95.3 0.9 15	94.6 1.6 27	94.4 1.8 49
87.7 8.5 68	85.3 10.9 31	88.0 8.2 0	87.7 8.5 17	88.6 7.6 40	88.9 7.3 80
84.3 11.9 60	86.2 10.0 20	85.0 11.2 0	87.4 8.8 20	85.9 10.3 42	86.7 9.5 80
93.5 2.7 45	95.9 2.3 15	94.3 1.9 0	94.6 1.6 15	96.0 2.2 46	95.4 2.8 70
95.3 11.2 40	95.8 10.7 30	96.0 10.3 0	96.3 10.2 35	96.7 9.8 50	

Figure 2-2 Sheet 2 of 15

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
5+00		106.46 (106.5)		
5+27				
5+50				
TP3	5.73	110.87 (110.9)	1.32	105.14
5+65				
5+72				
5+90				
6+00				
6+50				
BM2	0.33	110.34	0.86	110.01

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(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Design Surv.
Dam

2

Left			±	Right		
96.3 0.2 35	96.8 9.7 25	100.1 6.4 10.0	97.4 9.1 0	95.4 11.1 15	98.1 8.4 35	99.3 7.2 50
	100.4 9.1 25	101.0 5.5 15	101.3 5.2 0	101.5 5.0 20	101.9 4.6 35	
	104.7 11.8 25	104.8 11.7 15	105.0 1.5 0	105.1 1.4 15	105.4 1.1 30	
			106.4 4.5 0			
			104.6 6.3 0			
			105.2 6.7 0			
			105.9 5.0 0			
			109.2 11.1 0			

Spike in base of lone elm.

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		110.34		
TP1	4.87	105.00	10.21	100.13
1+00	Starting Sta.			
TP2	9.60	110.95 (110.9)	3.65	101.35
1+40				
1+52 =	Sta. 5+90 ± Dam			
2+00				
TP3	0.84	100.56 (100.6)	11.23	99.72
2+40				
2+56				
TP4	1.76	92.18	10.14	90.42

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(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Design Surv.
Emergency Spillway

3

Left	±	Right
	98.6 6.4 30	98.5 6.5 0
	98.7 6.3 25	
108.9 2.0 35	108.6 2.3 15	105.0 5.9 9.0
	104.0 6.9 0	104.7 6.2 9
	105.2 5.7 51	105.2 5.0 10
	107.8 3.1 25	
106.4 4.5 25	104.5 6.4 18	105.9 5.7 10
	101.0 10.6 0	101.0 9.9 15
	103.9 7.0 30	
96.5 4.1 30	95.4 5.2 20	94.4 6.2 0
	95.2 6.4 20	96.3 4.3 30
94.4 6.2 32	93.2 7.4 15	92.9 7.7 0
	93.1 7.5 15	94.2 6.4 30

Figure 2-2 Sheet 4 of 15

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
3+00		92.18 (92.2)		
3+42				
TP5	11.48	102.49	1.17	91.01
BMI	54.46		2.51 54.48	99.98
Correct elev. BMI = 100.00				
Diff. = .02 OK.				
Adjust elev. BM2 = 0.110.00 Adjusted				
<i>J. Doe</i>				

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(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Design Surv.
Emergency Spillway

4

Left			±	Right	
90.2	89.5	88.8		89.6	90.0
2.0	2.7	3.4		2.6	2.2
30	18	0		20	35
	85.5	85.0		85.3	
	6.7	7.2		6.9	
	32	0		30	

FIGURE 2-2

Engineering Notes for Pond Dam and Spillway

Construction Layout

To expedite the construction layout survey the following information was taken from the plans and listed in the field notebook.

1. Planned elevation of top of embankment at each station and the allowance for settlement. In this example, settled heights are shown. See Chapter 3 for an example using constructed heights.
2. Planned top width of embankment.
3. Planned elevation of bottom of excavation for the conduit at upper end, lower end, and intermediate points.
4. Planned elevation of emergency spillway at several points.
5. Dimensions of emergency spillway.

This information is also useful in construction check survey.

After the job was staked a reference hub was set at emergency spillway crest elevation so contractor could make preliminary checks for completion before calling on the Soil Conservation Service for final check-out.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <u>Blue Mountain</u>	Date <u>3/5/74</u>
Field Office <u>Cavalier</u>	
Name <u>George Smith</u>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group <input type="radio"/> Unit of Govt. (circle one)	
Job <u>Pond #3</u>	
Design Sur.	Const. Layout <input checked="" type="checkbox"/>
Const. Check	Other
Ident. No. <u>81-008-26A</u>	Field No. <u>11</u>
Location	N ↑

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Figure 2-2 Sheet 7 of 15

2-14

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Settlement ± 5% ± H.
BMI	7.42	107.42		100.00	
2+05	N.W. end dam	+2.4		105.0	0.0
2+39		+2.4		105.0	0.5
TP1	0.15	95.31	122.6	95.16	
2+83		-9.7		105.0	0.6
3+00		-9.7		105.0	0.9
3+35		-9.7		105.0	1.0
TP2	11.88	106.32	0.87	94.44	
4+00		+1.3		105.0	0.5
4+69		+1.3		105.0	0.5

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Const. Layout
Dam

J. Doe
R. Rowe 3/5/74

Left 2:1 Right 3:1

Top elev. 105.0 Top width 12'

1" steel axle in fence line 200' NW of NW end of dam.

Sta.	Left 2:1	Right 3:1
F=0.0	F=0.0	F=0.0
2.4	2.4	2.4
6.0	0.0	6.0
F=10.1	F=9.9	F=6.8
12.5	12.3	9.2
26.2	0.0	26.4
F=13.3	F=11.5	F=10.5
3.6	1.8	0.8
32.6	0.0	37.5
F=18.8	F=17.0	F=14.2
9.1	7.3	6.5
43.6	0.0	34.6
F=20.7	F=20.0	F=19.6
11.0	10.3	9.9
47.4	0.0	64.8
F=11.2	F=10.7	F=8.3
12.5	12.0	9.6
28.4	0.0	30.9
F=9.2	F=9.0	F=8.7
10.5	10.3	10.0
24.4	0.0	32.1

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Settlement = 5% E. H.
		106.32			
5+27			+1.3	105.0	0.2
5+50	S.E. end dam		+1.3	105.0	0.0
BM1			6.31	100.01	
	19.45		19.44		
Correct elev. TBM1 =				100.00	
Diff. =				0.01	OK.

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Geo. Smith Pond #3
Const. Layout
Dam 2

Left	±	Right
F=4.0	F=3.7	F=3.5
5.3	5.0	4.8
14.0	0.0	16.5
F=0.1	F=0.0	F=0.0
1.4	1.3	1.3
6.2	0.0	6.0

Note: See Figure 3-9 for stripping and core trench notes if they are to be measured.

Figure 2-2 Sheet 8 of 15

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	0.18	100.18		100.00
TP1	1.24	89.70	11.72	88.46
0+00	At riser		+4.2	85.5
0+23	£ dam		+4.0	85.7
0+48			+4.3	85.4
0+75			+4.7	85.0
TP2	11.87	101.10	0.47	89.23
BMI			1.09	100.01
	13.29		13.28	
	Correct elev. BMI =		100.00	
	Diff. =		0.01 OK.	

Geo. Smith Pond #3
Const. Layout
Principal Spwy. Excav. 3

Left	£	Right
See Page 1. (tube at right £ to £ Dam Sta. 3+00)		
	C+1.2	
	3.0	
	0	
	C+2.3	
	1.7	
	0	
	C+2.8	
	1.5	
	0	
	C+2.7	
	2.0	
	0	

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BM2	1.02	111.02		110.00
TP1	4.02	107.54 (107.5)	7.50	103.52
1+05	Starting Sta.		+8.4	99.1
1+40			+7.1	100.4
1+52			+7.1	100.4
2+00			+10.5	97.0
TP2	3.92	100.60	10.86	96.68
2+56			+7.7	92.9
TP3	11.03	111.01	0.62	99.98
BM2			1.03	109.98
	19.99		20.01	
	Correct elev. BM2 =			110.00
	Diff. =			0.02 OK.

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4

Geo. Smith Pond #3
Const. Layout
Emergency Spwy.

Left & Right

Spike in base of lone elm.
Bottom width = 20.0'
Side slopes = 2:1

C=0.1	C=0.0	C=0.0
8.3	8.4	8.4
10.2	0	10.0
C=4.7	C=3.6	C=4.3
2.4	3.5	2.8
19.4	0	18.6
C=5.5	C=4.8	C=5.1
1.6	2.3	2.0
21.0	0	20.2
C=4.6	C=3.3	C=4.0
5.9	7.2	6.5
19.2	0	18.0
C=0.0	C=0.0	C=0.1
7.7	7.7	7.6
10.0	0	10.2

Figure 2-2 Sheet 10 of 15

FIGURE 2-2

Engineering Notes for Pond Dam and Spillway
Construction Check Survey

These notes illustrate the standard Soil Conservation Service format for a fill that is too high to be checked from one instrument set up. To expedite the construction check survey necessary dimensions, stations and elevations are taken from the plans and entered in the field notebook for ready reference.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <i>Blue Maintain</i>	Date <i>3/21/74</i>
Field Office <i>Cavalier</i>	
Name <i>George Smith</i>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group <input type="radio"/> Unit of Govt. (circle one)	
Job <i>Farm Pond #3</i>	
Design Sur.	Const. Layout
Const. Check <input checked="" type="checkbox"/>	Other <i>Const. Recheck</i>
Ident. No. <i>81-008-26A</i>	Field No. <i>11</i>
Location	N ↑

SCS-FNC-28A REV. 5-75

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Planned Elev. + 3% S.H.
Upper portion of dam					
BMI	7.51	107.51		100.00	
2+05			+2.5		105.0
2+39			+2.0		105.5
2+83			+1.8		105.7
3+00			+1.5		106.0
3+35			+1.5		106.0
Side Shot			10.1	97.4	
4+00			+2.0		105.5
4+69			+2.0		105.5
5+27			+2.3		105.2
5+50			+2.5		105.0

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(5-70)

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Geo. Smith Pond #3
Const. Check
Dam

J. Doe
R. Rowe 3/21/74

Left (DS) Right (US)

1" steel axle fence line 200' NW of
NW end of dam.

2.4				
12.6	1.9	1.8	2.0	8.6
26	6		6	25
1.7				
11.7	1.3	1.4	1.4	11.6
26	6		6	35
11.8	1.3	1.3	1.4	11.7
26	6		6	35
Crest of Principal Spillway				
11.9	2.0	1.9	2.0	10.7
25	5		7	31
2.1				
6.3	2.2	2.1	2.0	5.4
14	6		6	17
2.4				

Figure 2-2 Sheet 12 of 15

Figure 2-2 Sheet 13 of 15

2-20

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
Lower portion of dam - downstream				
		107.51		
TP1	1.21	97.01	11.71	95.80
3+00				
Side Shot			12.0	85.0
3+35				
Lower portion of dam upstream				
TP2	11.66	107.59	1.08	95.93
TP3	1.29	97.10	11.78	95.81
3+00				
3+35				
TP4	11.31	107.31	1.10	96.00
BMI			7.29	100.02
	37.10		37.08	
<small>SCS-ENG-29 (5-70)</small> Correct elev. BMI = 100.00 <small>70 0-385-053</small> Diff. = 0.02 OK.				

Geo. Smith Pond #3
 Const. Check
 Dam

K.J. Doe
 R. Rowe 3/21/74

2

Left (ds) ≠ Right (us)

10.8 }
 4.4 }

Downstream invert of principal S.W.

12.7 }
 4.8 }

{ 8.3
 { 5.5

{ 12.7
 { 6.6

Sta.	B.S.	I.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BM2	0.80	110.80		110.00
TPI	2.02	101.11	11.71	99.09
1+80			+2.7	98.4
2+00			+4.1	97.0
2+20			+5.6	95.5
TP2	11.80	111.80	1.11	100.00
BM2			1.79	110.01
	14.62		14.61	
Correct elev. BM2 =				110.00
Diff =				0.01 OK.

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(5-70)

GPO : 1970 O-385-053

Geo. Smith Pond #3
Const. Recheck
Spillway

J. J. Doe
Geo. Smith 3/22/74

Left \neq Right
Spike in base of lone elm.

$\frac{2.6}{10}$	$\frac{2.7}{10}$	$\frac{2.6}{10}$
$\frac{4.1}{10}$	$\frac{4.1}{10}$	$\frac{4.1}{10}$
$\frac{5.5}{10}$	$\frac{5.6}{10}$	$\frac{5.5}{10}$

Construction meets plans and
specs.

J. J. Doe
Engr. Tech.
3/22/74

Figure 2-2 Sheet 14 of 15

FIGURE 2-3

Engineering Notes for a Diversion

The format and information illustrated by these notes are satisfactory for small diversions when drainage areas are small; topography is reasonably uniform; elevations with respect to other structures are not important and where approved design tables are available.

Notes similar to the format shown in Figure 2-7 should be recorded for the larger diversions where considerable cut and fill are required and where vertical control is important.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
SCD	Boone	Date	2/26/74
Field Office	Boone		
Name	W. A. Jones		
<input checked="" type="checkbox"/> Individual	Group	Unit of Govt.	
	(circle one)		
Job	Diversion #1		
Design Sur.	<input checked="" type="checkbox"/>	Const. Layout	<input checked="" type="checkbox"/>
Const. Check	<input checked="" type="checkbox"/>	Other	Const. Recheck
Ident. No.	49-006-062	Field No.	3
Scale	1"		
Legal Description	Sec	T	R
	or		
Location:	5 Mi. West of Redwood		
SCS-ENG-28 REV. 5-75			

Figure 2-3 Sheet 2 of 3

2-24

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
0+00			9.3	
1+00			7.9	
2+00			7.5	
3+00			7.1	
4+00			6.7	
5+00			6.3	
6+00			5.9	
7+00			5.5	
7+62			5.2	

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(5-70)

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W.A. Jones
 Diversion #1
 Design + Const Layout
 T.V. Ray
 W.A. Jones
 2/26/74

Outlet - Veg. W.W.

Total length - 762 / in. ft.

Av. Fill / 100 ft = 48.2 yd.³

Total Fill = $48.2 \left(\frac{762}{100} \right) = 367 \text{ yd}^3$

Design

D.A. - 20 ac, Q = 30 cfs

Channel Grade - 0.4%

Velocity - 2 ft/sec.

FIGURE 2-4

Engineering Notes for Terraces

The layout notes illustrated here are considered appropriate for parallel terraces with underground outlet.

Terrace notes should be adequate to portray layout and checking in sufficient detail to insure proper functioning of the terrace.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
SCD <u>Podk</u>	Date <u>11/1/77</u>
Field Office <u>Podunk</u>	
Name <u>C.M. Tiller</u>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group <input type="radio"/> Unit of Govt. (circle one)	
Job <u>Terraces - Underground Outlet</u>	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout <input checked="" type="checkbox"/>
Const. Check <input checked="" type="checkbox"/>	Other
Ident. No. <u>32A</u>	Field No. <u>1</u>
Scale	
<u>1" = 1320'</u>	
Legal Description	
<u>SW 1/4</u>	<u>Sec 36 T 79N R 22W</u>
	or
Location:	
SCS-ENG-28 REV. 5-75	

FIGURE 2-5

Engineering Notes for Grassed Waterway

The format and content of this set of notes are suitable only for simple waterways where vertical controls and slope stakes are not necessary.

For the more complex types of waterways involving considerable cut and fill and requiring vertical control and slope stakes the general format illustrated in Figure 2-7 should be followed.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
SCD	Shelby	Date	2/26/74
Field Office	Carterville		
Name	A. C. Fuhr		
<input checked="" type="radio"/> Individual	Group	Unit of Govt.	
(circle one)			
Job	Grassed Waterway		
Design Sur.	<input checked="" type="checkbox"/>	Const. Layout	<input checked="" type="checkbox"/>
Const. Check	<input checked="" type="checkbox"/>	Other	
Ident. No.	49-007-58	Field No.	4
N ↑			
Scale			
Legal Description	SW 1/4, SE 1/4 Sec 6 T 4N R 3W		
Location:			
SCS-ENG-28 REV. 5-75			

Figure 2-5 Sheet 1 of 3

Sta.	St. E.	Ht.	St. or Grade Red.	St. or Planned Elev.
Design Data				
Drainage Area				
Sta. 8+00 = 20 ac.				
Sta. 13+00 = 40 ac.				
Runoff				
Q = 33 c.f.s. at Sta. 8+00				
= 56 c.f.s. at Sta. 13+00				
V = 4/Sec. Grade = 3.0%				
Dimensions				
Sta. 0+00 to 8+00				
Top width 22.0' Depth 1.3'				
Sta. 8+00 to 13+00				
Top width 32.0' Depth 1.3'				
(Runoff & dimensions taken from tables)				
Sta. 13+00 is intersection of E of waterway & E main draw.				
SCS-ENG-29 (5-70)				
GPO : 1970 O-385-053				

A.C. Fuhr. Grassed Waterway Design & Const. Layout		T J. Rowe A.C. Fuhr 2/26/74	
Typical existing x-sections (Call rod readings with hand level)			
Hub.	5.0	5.3	5.5
	0	10	15
		15	16
			18
			20
			35
			50
Sta. 3+00			
This section used in computing cut & fill in upper 800'			
Hub.	5.6	5.8	5.9
	0	10	18
			20
			24
			25
			35
			50
Sta. 10+50			
This section used in computing cut & fill in lower 500'			
Outside edges of waterway staked at 100' intervals. Increases from 22' W. to 32' W. between stations 7+50 & 10+50.			

Sta.	B.S.	I.I.	F.S. or Grade Rod	Elev. or Planned Elev.
Chained Length 1300'				
Min. Width				
Sta. 6+00 = 23'				
Sta. 11+20 = 32'				
Area				
Av. width upper 800' = 24'				
" " lower 500' = 33'				
$(800' \times 24') + (500' \times 33') = 35,700 \text{ sq}'$				
= 0.82 ac.				

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A.C. Fuhr
Veg. Waterways
Const. Check

K J. Roe
p R. Doe 3/5/74 ²

Typical constructed X-sections (hand level)									
H	5.2	5.2	6.0	6.5	6.7	6.5	5.2	5.0	H
0	6	12	15	17	20	29	35	50	
Sta. 3+00									
H	5.0	5.0	5.6	6.3	6.5	6.3	5.8	5.0	H
0	6	12	18	22	25	30	38	50	
Sta. 10+50									
Construction meets plans and specifications. Waterway seeded on this date.									
J. Roe Cons. Tech. 3/5/74									

Figure 2-5 Sheet 3 of 3

FIGURE 2-6

Engineering Notes for Small Drainage Ditch

These notes are for a small ditch that is to be cut with a motor patrol.

It was determined by taking a few random shots that a ditch with bottom elevation at outlet end one foot above bottom of the group ditch, and having a 0.05% bottom grade would give the desired drainage. With this information the planned bottom elevation and grade rod at each station were calculated.

Spoil is to be spread uniformly along each side of ditch during construction. For that reason, reference hubs showing cut from top of hub were offset 50' so they would not be disturbed during construction.

The topography was reasonably uniform, therefore, slope stakes were set at 200-foot intervals. Line stakes were set on the L at 100-foot intervals.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <i>Big Hill</i>	Date <i>2/26/74</i>
Field Office <i>Greyhill</i>	
Name <i>John Jones</i>	
<input checked="" type="radio"/> Individual <input type="radio"/> Group Unit of Govt. (circle one)	
Job <i>Drainage Ditch #1</i>	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout <input checked="" type="checkbox"/>
Const. Check <input checked="" type="checkbox"/>	Other <input type="checkbox"/>
Ident. No. <i>138-007-256</i>	Field No. <i>2</i>
Location <i>3 Mi. N.E. Greyhill on St. Hwy. 2</i>	

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Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	4.22	45.22		41.00
Side Shot			9.0	36.2
0+00			+8.0	37.2
2+00			+7.9	37.3
4+00			+7.8	37.4
6+00			+7.7	37.5
8+00			+7.6	37.6
TPI	3.94	44.34	4.82	40.40
BMI			3.34	41.00
	8.16	OK.	8.16	

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(5-70)

GPO : 1970 O-385-053

J. Jones Ditch #1 X T. Edwards
 Design + Const. Layout by R. Ray 2/26/74
 12" Ditch - 4: S.S.
 60° nail near ground in W. side 16"
 cottonwood in NE corner fence.
 Bottom of outlet ditch.

	Right Hubs
C=2.4	C=3.0
5.6	5.0
0.0	50.0
C=2.5	C=3.0
5.4	4.9
0.0	50.0
C=2.9	C=3.2
4.9	4.6
0.0	50.0
C=3.0	C=3.4
4.7	4.3
0.0	50.0
C=1.9	C=2.9
5.7	4.7
0.0	50.0

Note: Cut to be measured from
 top of hub.

Figure 2-6 Sheet 2 of 3

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	4.00	45.00		41.00
0+00			+7.8	37.2
2+00			+7.7	37.3
4+00			+7.6	37.4
6+00			+7.5	37.5
8+00			+7.4	37.6
BMI			4.00	41.00 OK.

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(5-70)

GPO : 1970 O-385-083

J. Jones
Dr. Ditch #1
Const. Check

J. Ryals
J. Jones 3/5/74

Left ← Right

See page 1

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Spoil

52	47	47	53	79	54	48	47	52
56	44	16	12		10	16	43	45

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49	44	43	46	77	47	41	42	45
45	43	16	12		12	16	44	48

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Construction meets plans and specifications.

J. Ryals
Engr. Tech.
3/5/74

FIGURE 2-7
Engineering Notes for Surface Drainage (Group Ditch)
Design Survey

These notes are for a proposed group ditch involving enlargement and extension of an existing ditch. However, the general format is applicable to all open ditches.

A series of temporary bench marks was set prior to the design survey.

In the design survey, sufficient cross sections were taken of the old ditch to determine how much of it was adequate and the volume of excavation required to enlarge other parts.

The center of the old ditch was used as centerline for taking cross sections. This may not be practicable where there is water in the old ditch. In such cases, it may be better to establish a base line along one side of the ditch and extend the cross sections from it.

The uniformity of the topography made it feasible to use an interval of 200 feet between profile shots and an average interval of 400 feet between cross sections. Each job will have its own conditions for spacing of profile shots and frequency of cross sections.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD	Lower E. Blue River	Date	2/26/74
Field Office	Carthage		
Name	Rabbit Creek Dr. Assoc.		
Individual	<u>Group</u>	Unit of Govt.	
	(circle one)		
Job	Main Ditch #1		
Design Sur.	✓	Const. Layout	
Const. Check		Other	
Ident. No.	Dr. G. 65	Field No.	
Location			
Legal Description Sec. 1 & 12, T12N, R26W			

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Figure 2-7 Sheet 2 of 17

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Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	1.67	50.77 (50.8)		49.10
0+00				
1+00				
2+00				
3+00				
TPI	5.01	53.90	1.88	48.89
4+00				
6+00				
8+00				

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(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc. T R. Ryals 1
Main Ditch #1 O. Brown 2/26/74
Design Surv.

Left € Right

20" nail in 8" pecan tree Δ 40' W &
75' N. Sta. 0+00 Main Ditch #1

	39.0	11.8	Outlet
	39.2	11.6	
	39.3	11.5	(Natural drain from Sta. 0+00 to Sta. 5+00 is adequate in size and well stabilized with vegetation)
	39.3	11.5	
48.8	49.4	48.9	46.6
5.1	4.5	5.0	7.3
50	25	12	7
			2
			42.4
			11.5
			Low area in field
48.8	43.7	45.0	43.9
5.1	10.2	10.9	10.0
14	3		4
			7
			14
			5.0
			5.8
			550

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		53.90		
TP2	4.61	54.23 (542)	4.28	49.62
10+00				
11+36				Outlet end 6'x6' R.C. Box Culvert
11+42				
11+54				
11+66				
11+72				Upper end culvert
12+00				
14+00				
16+00				

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GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Design Surv.

2

Left	±	Right
	44.7 9.5	
	44.2 10.0	Invert
	51.8 2.4	Road Shoulder
	52.4 1.8	± Hwy #26
	52.0 2.2	Road Shoulder
	44.3 9.9	Invert
49.6	48.9	46.6
4.6	5.3	7.6
17	8	
	46.7 7.5	
49.6	49.2	47.2
4.6	5.0	7.0
20	11	
	49.2	49.6
	5.0	4.6
	11	20

Figure 2-7 Sheet 3 of 17

Figure 2-7 Sheet 4 of 17

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		5423		
TP3	4.83	55.33	3.73	50.50
18+00				
20+00				
22+00				
24+00				
TP4	3.97	55.36 (55.4)	3.94	51.39
26+00				
28+00				
30+00				
32+00				
TP5	3.42	56.05	2.73	52.63

SCS-ENG-29
(5-70)

GPO : 1970 O-385-083

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Dep. Surv.

3

Left	€	Right
	47.2 8.1	
50.7 4.6 20	50.1 5.2 10	47.5 7.8 10
50.1 5.2 20	50.3 5.0 9	48.0 7.3 10
		48.3 7.1
51.4 4.0 14	50.7 4.7 8	48.5 6.9 8
		48.7 6.7
51.4 4.0 14	51.8 4.4 8	48.8 6.6 10
		51.1 4.3 10
		51.5 3.9 13
		51.7 3.7 16

Hood-Smith Prop.
E-W Fence

Low area in field

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		56.05		
34+00		(56.0)		
36+00				
36+72				
37+40				
BM2	2.99	55.61	3.43	52.62
	23.51		19.99	
	19.99			
	3.52			
	Correct elev. BM2 = 52.60			
	Diff. in elev. BM1 & BM2 = 3.50 OK.			
38+00				
40+00				
TP6	5.62	57.24	3.99	51.62

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Des. Surv. 4

Left	±	Right
	49.2	
	6.8	
51.9	51.6	49.3
4.1	4.4	6.7
13	8	10
		51.4
		4.6
		15
		52.0
		4.0
		15
Ditch curves left.		
Smith-Wiley E-W Boundary fence		
20" nail in S. side corn. post in S.W.		
corn. D.D. Wiley Tract El. 52.60		
	49.3	
	6.3	
52.1	51.7	49.5
3.5	3.9	6.1
14	7	7
		51.2
		4.4
		13
		51.9
		3.7
		13

Figure 2-7 Sheet 5 of 17

Figure 2-7 Sheet 6 of 17

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		57.24		
40+25	End old ditch.	5.3	51.9	
42+00				
44+00				
46+00				
48+00				
TP1	4.46	57.28 (57.3)	4.42	52.82
50+00				
52+00				
54+00				
56+00				
TP8	3.26	57.22	3.32	53.96

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Des. Surv.

5

Left	±	Right
51.9 5.3 10	51.9 5.3	51.8 5.4 10
51.7 5.5 12	51.7 5.5	51.7 5.5 12
Low area in field → 51.2 6.0 275	51.8 5.4	
52.1 5.1 15	52.1 5.1	52.2 5.0 15
	52.1 5.1	
52.6 4.7 15	52.5 4.8	52.4 4.9 15
	52.6 4.7	
52.9 4.4 15	52.8 4.5	52.9 4.4 15
	53.0 4.3	

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		57.22		
58+00				
60+00				
61+77				
BM3			4.19	53.03
	39.84		35.91	
	35.91			
	3.93			
Correct elev. BM3 = 53.00				
Diff. in elev. BM1 & BM3 = 3.90 OK.				
Allowable error = $0.1\sqrt{M}$				
= $0.1\sqrt{1.2}$				
= 0.11				

SCS-ENG-29
(5-70)

GPO : 1970 O-388-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Des. Surv.

6

Left	←	Right
53.2	53.2	53.1
4.0	4.0	4.1
15		15
	53.3	
	3.9	
	54.0	
	3.2	
		End of proposed ditch
20" nail in 12" pecan tree 50' W. Sta. 61+77.		

Figure 2-7 Sheet 7 of 17

FIGURE 2-7

Engineering Notes for Surface Drainage (Group Ditch)

Construction Layout

To expedite the construction layout survey, the planned elevation of the ditch bottom at each station was determined from the plans and entered on a sheet of paper so it could be referred to conveniently. This made it possible to calculate and record the grade rods rapidly after each instrument set-up.

To save space, the layout notes have been recorded at 200-foot horizontal intervals. However, in actual practice, the slope stakes would be set at not more than 100-foot intervals.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD *Lower E. Blue River* Date *3/5/74*

Field Office *Carthage*

Name *Rabbit Creek Dr. Assoc.*

Individual *Group* Unit of Govt.
(circle one)

Job *Main Ditch #1*

Design Sur. _____ Const. Layout

Const. Check _____ Other _____

Ident. No. *Dr. G. 65* Field No. _____

Location _____

N ↑

SCS-ENG-28A REV. 5-75

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BMI	453	53.63		49.10
TPI	5.00	54.84	3.79	49.84
Old ditch adequate Sta 0+00 to 9+00 (54.8)				
9+00			+10.8	44.0
10+00			+10.7	44.1
12+00			+10.5	44.3
14+00			+10.3	44.5
16+00			+10.0	44.8
TP2	384	55.02	3.66	51.18
18+00			+10.0	45.0
20+00			+9.8	45.2

SCS-ENG-29
(5-70)

GPO: 1970 O-385-053

Rabbit Cr D. Assoc. R. Byals
CH. C. Smith 3/5/74
Main Ditch #
Const. Layout

Bottom Width 40' S.S. 2:1
Left ϵ Right
20' nail in 8" pecan tree blazed Δ 40'
W. & 75' N. Sta. 0+00

C=5.1 5.7 12.2	C=0 10.9 0.0	C=5.0 5.8 12.0
C=4.9 5.8 11.8	C=0.6 10.1 0.0	C=4.8 5.9 11.6
C=5.2 5.3 12.4	C=2.3 8.2 0.0	C=5.3 5.2 12.6
C=4.8 5.5 11.6	C=2.2 8.1 0.0	C=5.0 5.3 12.0
C=4.5 5.5 11.0	C=2.4 7.6 0.0	C=4.6 5.4 11.2
C=6.0 5.0 12.0	C=2.2 7.8 0.0	C=5.2 4.8 12.4
C=5.3 4.5 12.6	C=2.3 7.5 0.0	C=5.1 4.7 12.2

Figure 2-7 Sheet 9 of 17

Figure 2-7 Sheet 10 of 17

2-44

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		55.02		
22+00			+9.5	45.5
24+00			+9.2	45.8
TP3	4.57	55.47 (55.5)	4.12	50.90
26+00			+9.5	46.0
28+00			+9.2	46.3
30+00			+8.9	46.6
32+00			+8.6	46.9
TP4	6.38	56.42 (56.4)	5.43	50.04
34+00			+9.2	47.2
36+00			+9.0	47.4

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const. Layout

2

Left	±	Right
C=5.0 4.5 12.0	C=2.2 7.3 0.0	C=5.1 4.4 12.2
C=4.4 4.8 0.8	C=2.2 7.0 0.0	C=5.0 4.2 12.0
C=5.1 4.4 12.2	C=2.3 7.2 0.0	C=4.8 4.7 11.6
C=5.0 4.2 12.0	C=2.2 7.0 0.0	C=5.1 4.1 12.2
C=4.6 4.3 11.2	C=2.1 6.8 0.0	C=4.8 4.1 11.6
C=4.4 4.2 10.8	C=1.9 6.7 0.0	C=4.6 4.0 11.2
C=4.2 5.0 10.4	C=2.0 7.2 0.0	C=4.0 9.2 10.0
C=4.4 4.6 10.8	C=1.9 7.1 0.0	C=4.2 4.8 10.4

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		56.42		
BM2			3.84	52.58
	24.32			
	20.84		20.84	
	3.48			
Correct elev. BM2 = 52.60				
Diff. in elev. BM1 & BM2 = 3.50 Check OK				
38+00			+8.7	47.7
40+00			+8.4	48.0
TP5	5.19	56.50	5.11	51.31
40+30	old ditch ends		+8.5	48.0
42+00			+8.2	48.3
44+00			+8.0	48.5
46+00			+7.7	48.8
48+00			+7.4	49.1

SCS-ENG-29
(5-70)

GPO : 1970 O-388-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const. Layout

3

Left	±	Right
C=4.3 4.4 10.6	C=1.6 7.1 0.0	C=4.1 4.6 10.2
C=3.6 4.8 9.2	C=1.5 6.9 0.0	C=3.5 4.7 9.0
C=3.8 4.7 9.6	C=3.9 4.6 0.0	C=3.8 4.7 9.6
C=3.4 4.8 8.8	C=3.4 4.8 0.0	C=3.6 4.6 9.2
C=3.3 4.7 8.6	C=3.3 4.7 0.0	C=3.3 4.7 8.6
C=3.4 4.3 8.8	C=3.2 4.5 0.0	C=3.3 4.4 8.6
C=3.0 4.4 8.0	C=3.0 4.4 0.0	C=2.9 4.6 7.8

Figure 2-7 Sheet 11 of 17

Figure 2-7 Sheet 12 of 17

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		56.50		
TP6	5.03	57.32 (57.3)	4.21	52.29
50+00			+7.9	49.4
52+00			+7.6	49.7
54+00			+7.3	50.0
56+00			+7.0	50.3
TP7	5.08	57.30	5.10	52.22
58+00			+6.8	50.5
60+00			+6.5	50.8
61+82			+6.3	51.0
BM3			4.33	52.97
	39.62		35.75	
	36.75			
	3.87			
Correct elev. BM3 = 53.00				
+6.00 in elev. BM1 & BM3 = 3.90				
Check OK.				

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const. Layout

4

Left	Center	Right
C=3.1 4.8 8.2	C=3.1 4.8 0.0	C=3.1 4.8 8.2
C=2.9 4.7 7.8	C=2.8 4.8 0.0	C=2.9 4.7 7.8
C=2.8 4.5 7.6	C=2.8 4.5 0.0	C=2.7 4.6 7.4
C=2.7 4.3 7.4	C=2.8 4.2 0.0	C=2.8 4.2 7.6
C=2.7 4.1 7.4	C=2.7 4.1 0.0	C=2.7 4.1 7.4
C=2.4 4.1 6.8	C=2.5 4.0 0.0	C=2.6 3.9 7.2
C=2.6 3.7 7.2	C=2.6 3.7 0.0	C=2.5 3.8 7.0

FIGURE 2-7
 Engineering Notes for Surface Drainage (Group Ditch)
 Construction Check

The following check notes are for a ditch that was uniform in appearance. A small trickle of water along the ditch bottom indicated uniform grade except at one or two points. These facts were taken into consideration in deciding how intensively the work should be checked.

Design data from the plan such as bottom width, side slopes and the planned bottom elevation at each station was listed on a sheet of paper so it would be convenient for reference. This was done before starting the survey.

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

SCD *Lower E. Blue River* Date *4/30/74*
 Field Office *Carthage*
 Name *Rabbit Creek Dr. Assoc.*
 Individual *Group* Unit of Govt.
 (circle one)
 Job *Main Ditch #1*
 Design Sur. _____ Const. Layout _____
 Const. Check Other *Const. Recheck*
 Ident. No. *Dr. G. 65* Field No. _____
 Location _____

N
↑

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Figure 2-7 Sheet 14 of 17

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BM1	3.80	52.90		49.10
TP1	4.83	54.72	3.01	49.89
TP2	4.04	54.50	4.26	50.46
9+00			+10.5	44.0
12+00			+10.2	44.3
16+00			+9.7	44.8
TP3	4.28	54.77	4.01	50.49
		54.8		
22+00			+9.3	45.5
TP4	4.46	55.45	3.78	50.99
		(55.4)		
28+00			+9.1	46.3
TP5	4.26	55.69	4.02	51.43

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc. \nearrow R. Ryals 4/30/74
Main Ditch #1 \searrow O. Brown
Const. Check Ch. R. Jones (farmer)

Left \leftarrow Right

20' nail in 8' pecan tree blazed Δ
40' W. & 75' N. Sta. 0+00

Design: 4 ft BW, 2:1 SS, 10' Berm

(Berm)

5.3	5.4	10.6	10.6	10.5	5.5
24	13	2		2	12
			10.4		
5.1	5.2	9.7	9.7	9.7	5.1
22	11	2		2	12
4.0	4.2	9.5	9.3	9.4	4.2
22	12	2		2	13
			9.3		

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
		55.69			
34+00		(55.7)	+8.5	47.2	
BM2	4.12	56.73	3.08	52.61	OK
	Correct	elev. BM2 = 52.60			
		(56.7)			
40+00			+8.7	48.0	
42+00			+8.4	48.3	
TP7	4.32	58.04	3.01	53.72	
		(58.0)			
44+00			+9.5	48.5	
46+00			+9.2	48.8	
TP8	4.02	58.95	3.11	54.93	
		(58.9)			
52+00			+9.2	49.7	
54+00			+8.9	50.0	

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(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const. Check

2

Left	€	Right
(Berm)		
42 43 87 86 86 46		
23 11 2 2 11		
51 53 88 88 87 52		
24 11 2 2 10		
		84
		High 0.5'
62 89 90 91 62		Rework ditch
7.4 1.5 1.7 1.3		Sta. 42+50 to Sta. 45+50
		93
60 63 91 91 90 62		
1.4 8 2 2 8		
		90

Figure 2-7 Sheet 15 of 17

Figure 2-7 Sheet 16 of 17

2-50

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		58.95		
TP9	4.14	60.01	3.08	55.87
58+00			+9.5	50.5
60+00			+9.2	50.8
61+82			+9.0	51.0
BM3			6.97	53.04
	42.27		38.33	
	38.33			
	3.94			
	Correct elev. BM3 = 53.00			
	Diff. in elev. BM1 & BM3 = 3.90			
	Check OK			

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const Check

3

Left	Right
(Berm)	
6.5 1.9	6.7 0.8
9.6 2	9.5 2
	9.3
	8.9

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
BM 2	5.04	57.64 (57.6)		52.60
42+00			+9.3	48.3
43+00			+9.2	48.4
44+00			+9.1	48.5
45+50			+9.0	48.6
BM 2			5.04	52.60 OK

SCS-ENG-29
(5-70)

GPO: 1970 O-385-055

Rabbit Cr. Dr. Assoc.
Main Ditch #1
Const. Recheck

R. Ryals
O. Brown
Ch. R. Jones 5/2/74

4

Left £ Right

94

93

$\frac{5.8}{20}$ $\frac{5.9}{9}$ $\frac{9.3}{2}$ 92 $\frac{9.2}{2}$ $\frac{6.0}{9}$

91

Construction meets plans and specifications.

Robert Ryals
Engr. Tech.
5/2/74

Figure 2-7 Sheet 17 of 17

FIGURE 2-8

Engineering Notes for Subsurface Drain (Main Line)

Construction Layout and Construction Check

These notes illustrate the general format for subsurface drains. The design was prepared from a survey and soils investigations made during development of an overall plan for the district.

The construction check notes illustrate a simple method of checking from the reference hubs. It is simpler and faster than carrying elevations from bench marks and it is satisfactory for most jobs if reference hubs are offset a safe distance where they will not be disturbed during construction. In using this method, the person who is to do the checking must be given the following information:

1. Planned cut from top of reference hub to bottom of trench at each station.
2. Outside diameter of each size tile used in the line.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD <i>West Salt Lake</i>	Date <i>2/26/74</i>
Field Office <i>Murray</i>	
Name <i>East Riverton Dr. Dist.</i>	
Individual Group <u>Unit of Govt.</u> (circle one)	
Job <i>Subsurface Dr. #6</i>	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout <input checked="" type="checkbox"/>
Const. Check <input checked="" type="checkbox"/>	Other <input type="checkbox"/>
Ident. No. <i>ut-2-13</i>	Field No.
Location	

The diagram shows a plan view of a subsurface drain system. A horizontal 'Main' line runs across the center. Four vertical 'Lateral' lines (A, B, C, D) branch off from the main line. Lateral A is 6" from the main line, Lateral B is 7+00 6", Lateral C is 6" from the main line, and Lateral D is 11+02 6". Horizontal dimensions show 8" from the main line to Lateral C and 10" from the main line to Lateral B. A vertical line labeled 'Redwood Rd.' is 100+00 from the main line. A horizontal line labeled 'Riverton Rd.' is above the main line. A vertical line labeled 'Jordan River' is to the right of the main line. A benchmark 'PBM #453' is marked with an 'x' near Riverton Rd.

Legal Description Sec. 7 & 8, T12N, R2W

SCS-ENG-28A REV. 6-77

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Reference Hubs
BM	6.43	62.60		435617	
TP-1	3.32	58.81	7.11	55.49	
0+00					
0+10			+10.8	48.0	
					C-6.7
0+20			+10.8	48.0	4.1
					C-6.6
1+00			+10.7	48.1	4.0
					C-7.1
2+00			+10.6	48.2	3.5
2+54					
					C-7.4
3+04			+10.5	48.3	3.1
					C-7.2
4+00			+10.4	48.4	3.2

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

E. Riverton Dr. Dist. T. Scope
Main Drain #6 Pl. Road
Const. Layout Ch. H. Roy (farmer)

Left & Right 2/26/74

U.S.G.S. BM #453 SE. Corner Sec 6

& Jordan River 46.0 elev.
12.8

Begin 10" CMP 11.3
C=6.7 Drive piling at 0+12
4.5

Begin 10" conc. file
C=6.4
4.3

R.O.W. fence
C=6.6
4.0

& Redwood Rd. 55.5 elev.
3.3
C=6.8
3.7
C=6.7
3.7

Note: Cut to be measured from top of reference hubs.

Figure 2-8 Sheet 2 of 4

Figure 2-8 Sheet 3 of 4

2-54

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Reference Levels
		58.81			C=7.4
5+00			+10.3	48.50	2.9
					C=7.3
6+00			+10.2	48.60	2.9
					C=7.3
7+00			+10.1	48.70	2.8
					C=7.0
7+03			+9.8	49.0	2.8
					C=7.0
8+00			+9.7	49.1	2.7
TP2	3.19	59.70	2.30	56.51	
					C=6.9
9+00			+10.4	49.3	3.5
					C=6.8
10+00			+10.3	49.4	3.5
					C=6.6
11+02			+10.2	49.5	3.6
TP3	4.12	60.04	3.78	55.92	
BM			3.85	4356.9	
	17.06	OK.	17.04		

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

E. Riverton Dr. Dist Main Drain #16 Const. Layout		2	
Left	±	Right	
	C=6.8		
	3.5		
	C=6.8		
	3.4		
	C=6.8		
End 10" main	3.3		36" Manhole Sta. 7+00 to Sta. 7+03
	C=6.5		Junction laterals A&B.
Begin 8" main	3.3		
	C=6.5		
	3.2		
	C=6.4		
	4.0		
	C=6.4		
	3.9		
	C=6.4		
	3.8		36" dia. M.H. junction lat C&D.
U.S.G.S BM#453 Correct elev. 4356.17			

Sta.	B.S. <i>On Ref. Hub</i>	H.I.	F.S. or Grade Rod <i>to bottom of trench</i>	Elev. or Planned Elev.	<i>Planned cut from Ref. Hub to bottom of trench</i>
0+20	4.7		11.4		6.7
3+04	4.6		12.0		7.4
7+00	4.9		12.2		7.3
7+03	4.9		11.9		7.0
9+00	4.8		11.7		6.9
11+02	4.8		11.4		6.6

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976-0-200-611

E. Riverton Dr. Dist. Main Drain #6 Const. Check *T. J. Brown & R. Rush* *3/12/74* *3*

<i>Tile O.D. Ft.</i>	<i>Rod Reading Top of Tile</i>
1.0	10.4
1.0	11.0
1.0	11.2
0.8	11.1
0.8	11.0 <i>OK. within 0.1'</i>
0.8	10.6

Construction dimensions, elevations, and locations of manholes, outlet prop and filter noted on "As-built" plans. All construction meets plans and specs.

*T. J. Brown
Dr. Dist. Insp.
3/12/74*

Figure 2-8 Sheet 4 of 4

FIGURE 2-9

Engineering Notes for Bench Level Survey

These notes illustrate the general format for setting bench marks as vertical control points for subsequent surveys and construction work.

It will be noted that turning points have been numbered in these sample notes. This practice is optional.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
SCD <u>Sabine</u>	Date <u>2/26/74</u>
Field Office <u>Mary</u>	
Name <u>Sabine Drainage Group</u>	
Individual <input checked="" type="radio"/> (Group) Unit of Govt. (circle one)	
Job <u>Bench Level Survey</u>	
Design Sur.	Const. Layout
Const. Check	Other
Ident. No. <u>Dr. Gr. - A2</u>	Field No.
Scale	<u>9</u>
1" =	<u>10</u>
Legal Description	<u>BM6</u>
	<u>Sec 3 & 10 T 12N R 4W</u>
	or
Location:	

SCS-ENG-28 REV. 5-75

Sta.	B.S.	H.I.	F.S. or Grade-Rod	Elev. or Planned- Elev.
BM	6.82	151.44		144.62
TP1	4.92	151.19	5.17	146.27
TP2	5.69	148.63	8.25	142.94
BM1	1.90	148.58	1.95	146.68
TP3	3.02	148.36	3.24	145.34
TP4	5.57	148.48	5.45	142.91
BM2	5.16	148.13	5.51	142.97
TP5	4.93	149.28	3.78	144.35
TP6	4.42	149.58	4.12	145.16
BM3	4.65	149.22	5.01	144.57
TP7	3.72	148.56	4.38	144.84

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Sabine Dr. Group
Bench Levels

π S. Jones
φ R. Brown
Hot & Clear 2/26/74

USGS. BM#62 - Conc. Mon. 10'S. &
15'E. N.W. Corn. Sec. 3; T12N; R4W

60^d nail in S. side 18" cottonwood in
NE. Corn; NW¹/₄; NW¹/₄; Sec. 3

1" Steel axle in S.E. Corn; NW¹/₄; NW¹/₄;
Sec. 3

60^d nail in N. side 15" hickory tree in
S.E. Corn; SE¹/₄; NW¹/₄ Sec. 3

Figure 2-9 Sheet 2 of 5

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
		143.36		
TP 27	4.54	144.01	3.89	139.47
TP 28	4.64	144.87	3.78	140.23
TP 29	4.51	145.63	3.75	141.12
TP 30	4.44	146.54	3.53	142.10
TP 31	4.40	147.66	3.28	143.26
BM 62			3.09	144.57
ΣBS	171.75	ΣFS	171.80	
	171.80	Correct elev. BM 62 =		144.62
	-000.05	Diff. =		-0.05 OK.
Allowable error =				$.1\sqrt{M}$
				= $.1\sqrt{4.11}$
				= .203

Sabine Dr. Group
Bench Levels 4

Total circuit distance as scaled from
aerial photo = 4.11 miles.



FIGURE 2-10

Engineering Notes for Route Survey

These notes illustrate the format of a location or route survey by deflection angles.

The columns headed "Deflection Angle" and "Double Deflection Angle" are for the recording of observed values. One-half of the Double Deflection Angle is recorded in the column headed "Calculated Deflection Angle."

It will be noted that curves were calculated and staked as the survey progressed. This requires experienced personnel, but if it is not done, it is necessary to restation the line after the curves are staked.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCD Green River		Date 2/26/79
Field Office Brownsville		
Name Martin Dr Dist		
Individual (Group) Unit of Govt. (circle one)		
Job Route Survey - Main Ditch		
Design Sur.	Const. Layout	
Const. Check	Other	
Ident. No. Dr. G. 32	Field No.	
Scale	1" =	
Legal Description	Sec 8 T12N R4W	
Location:	or	

SCS-ENG-28 REV. 5-75

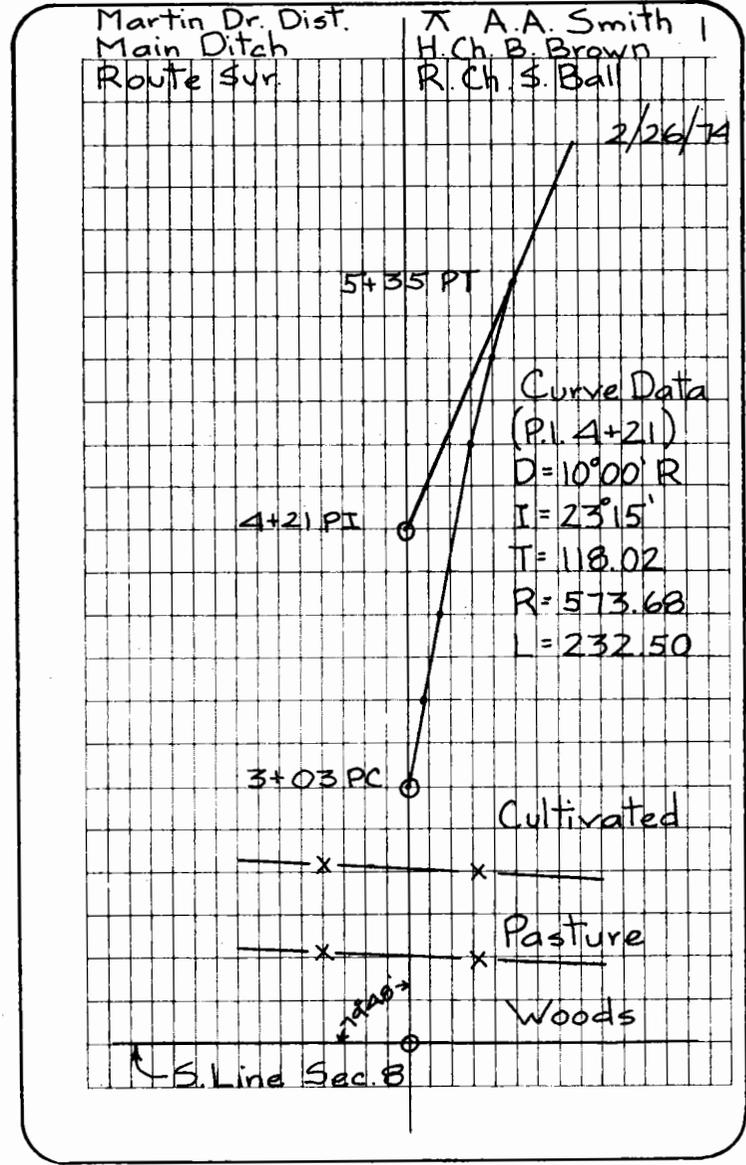
Figure 2-10 Sheet 2 of 3

2-62

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
	Def <	Dbl. Def. <	Cal. Def. <	Mag. Bearing	Point
6+00				N13°03'E	Line Stake P.O.T.
5+35.5	11°37.5'				PT
5+00	9°51'				P.O.C.
4+50	7°21'				P.O.C.
4+47					w. Line SE 1/4 Sec. B
4+21	23°14'R	46°30'R	23°15'R		P.I.
4+00	4°51'				P.O.C.
3+50	2°21'				P.O.C.
3+03					P.C.
2+00					Fence
1+00					Fence
0+00				N10°12'W	

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053



Sta.	-S-	++	f.S. or Grade Rod	Slew or Planned Slew	
	Def. <	Dbl. Def. <	Cal. Def. <	Mag. Bearing	Point
Continue Survey to End					
14+51					Pipeline
				N13°03'E	
14+02					P.O.T.
11+48					R.O.W. Fence S.H. 20
11+08					Edge Conc. Slab S.H. 20
10+88					Edge Conc. Slab S.H. 20
10+48					R.O.W. Fence S.H. 20
9+00					Line Stake
8+00					Line Stake
7+00					Line Stake
				N13°03'E	
SCS-ENG-29 (5-70)				GPO : 1970 O-385-053	

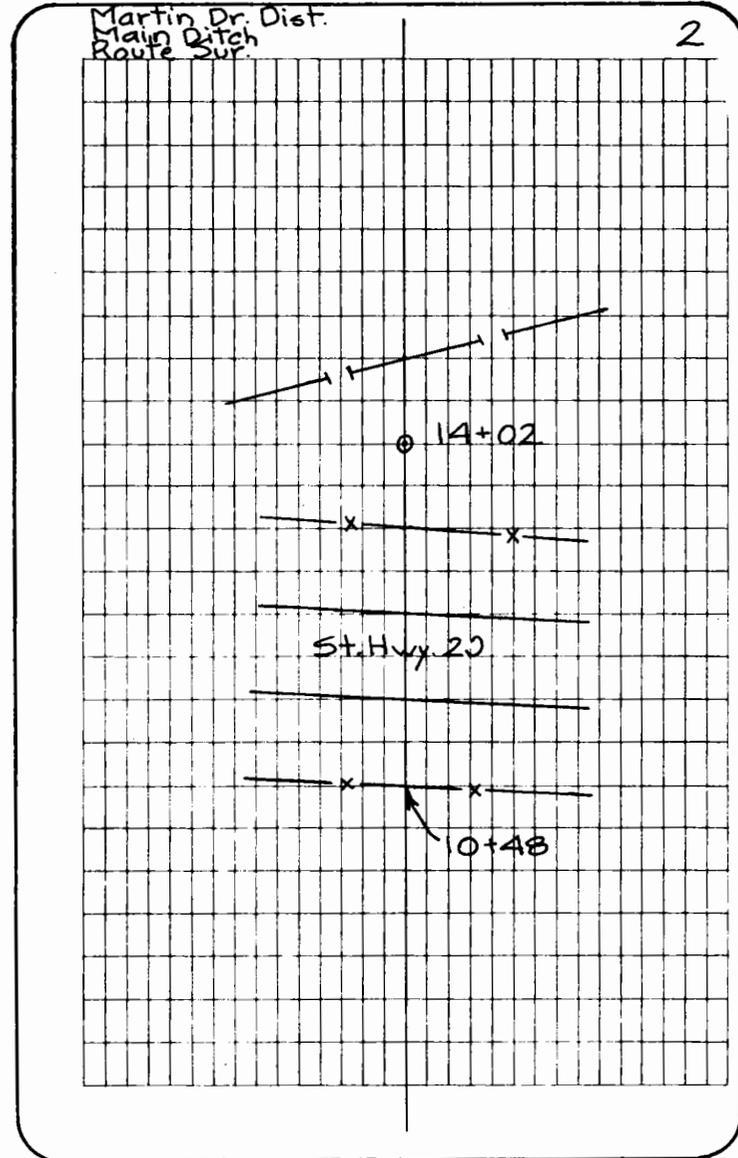


Figure 2-10 Sheet 3 of 3

FIGURE 2-11

Engineering Notes for Closed Traverse

These notes illustrate the format for a closed traverse by the deflection angle method. The traverse is to serve as horizontal control for a topographic survey of a reservoir site.

Transit station elevations will be established by a bench level survey from a permanent bench mark. Locations and elevations of pertinent topographic features will then be obtained with the transit by means of horizontal and vertical angles and stadia or chained distances.

See Figure 2-12 for a method of obtaining all needed information during one operation.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
SCD <u>N. Cache</u>	Date <u>2/26/74</u>
Field Office <u>Logan</u>	
Name <u>Blue River Watershed</u>	
Individual <input checked="" type="radio"/> Unit of Govt. (circle one)	
Job <u>Horizontal Control for Res. Topo.</u>	
Design Sur.	Const. Layout
Const. Check	Other
Ident. No.	Field No.
Scale	
1" =	
Legal Description	
<u>SE 1/4</u> Sec <u>6</u> T <u>12N</u> R <u>2E</u>	
or	
Location:	
SCS-ENG-28 REV. 5-75	

Sta.	B.S.	I.T.	F.S. or Grade Rod	Elev. or Planned Elev.	
	Def. <	Dbf. Def. <	Cal. Def. <	Hor. Dist.	Mag. Br.
A				588.08' South	
B	28°02'L	56°06'L	28°03'L	259.65'	528°03'E
C	119°02'L	238°04'L	119°02'L	711.78'	N32°54'E
D	68°41'L	137°24'L	68°42'L	336.15'	N35°47'W
E	63°51'L	127°40'L	63°50'L	316.75'	S80°23'W
A	80°24'L	160°46'L	80°23'L		South
B					

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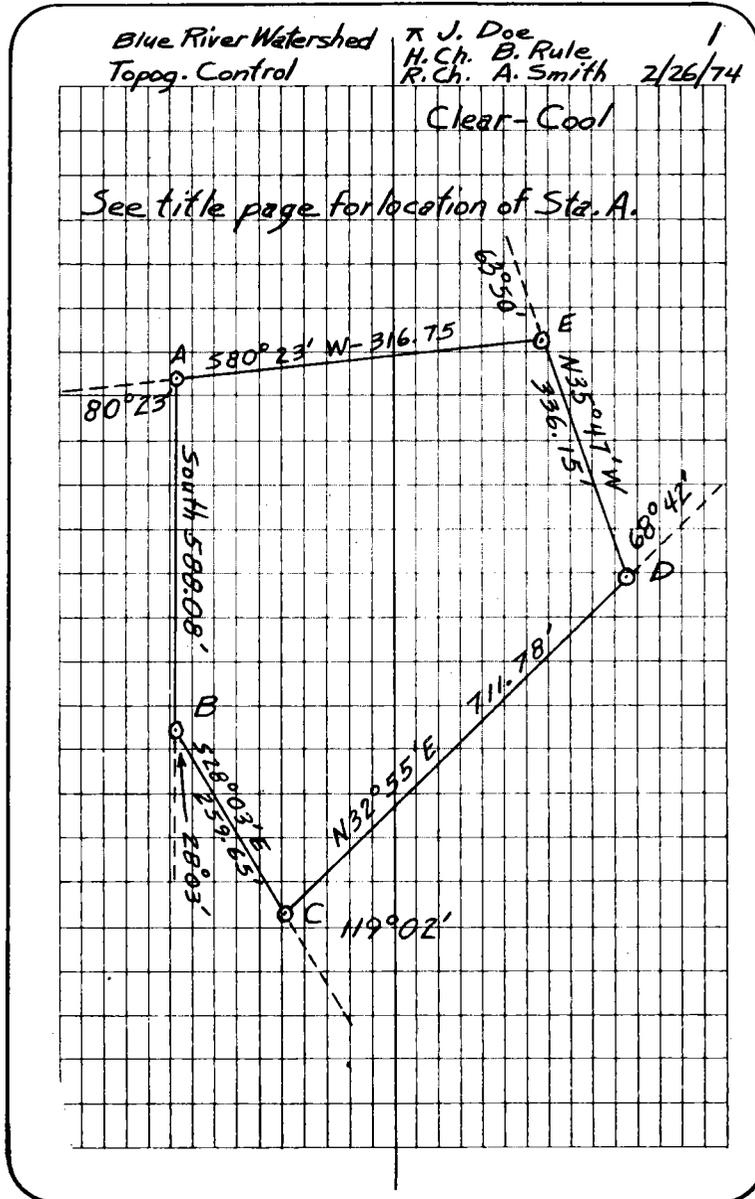


Figure 2-11 Sheet 2 of 3

Sta.	B.S.	I.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
Check for angular error					
EAB	=	99°37'			
ABC	=	151°57'	Σ int. angles = n-2(180°)		
BCD	=	60°58'	= 5-2(180°)		
CDE	=	111°18'	= 540°		
DEA	=	116°10'			
Σ	=	537°180'	= 540° OK.		
Check for horizontal closure.					
Latitude and departures.					
Course	A-B	B-C	C-D	D-E	E-A
Bearing	South	52°03'E	N32°55'E	N35°47'W	S80°23'W
Lat.	588.08	229.15	259.75	107.26	529.16
Cosine		.88254	.83946	.81123	.16706
Dist.	588.08	259.65	711.78	336.15	316.75
Sine		.47024	.54342	.58472	.98595
Dep.	0.0	122.09	386.79	196.55	312.300

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

Blue River Watershed
Topog. Control 2

Σ N
870.21

Σ S
870.15

Σ E
508.89

Σ W
508.85

$$AM = \sqrt{(0.06)^2 + (0.05)^2}$$

$$= 0.078$$

Traverse Perimeter = 2212.41

Error of closure = $\frac{0.08}{2212}$

$= \frac{1}{27,650} \pm$

OK.

Checked by
A. L. Jones
Engr. Tech.
2/26/74

FIGURE 2-12

Engineering Notes for Topographic Survey with Transit

These notes illustrate a method of running a closed traverse and obtaining topographic information in one operation. The traverse can be checked for closure as shown in Figure 2-11.

Direct leveling was done wherever possible. Vertical angles were used only where the observed point was above the instrument, too far below it, or where the line of sight, with vertical arm at zero, was obscured by brush.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

S.C.D. Price River	Date 2/26/74
Field Office Price	
Name John Davis	
Individual <input checked="" type="radio"/> Unit of Govt. (circle one)	
Job Topographic Survey	
Design Sur. <input checked="" type="checkbox"/>	Const. Layout
Const. Check	Other
Ident. No.	Field No.

Scale			
1" =			
Legal Description	NW 1/4	Sec 8	T 12N R 13E
	or		
Location:			

SCS-ENG-28 REV. 5-75

Figure 2-12 Sheet 1 of 2

Sta.	Azi.	Horiz. Distance	Diff. in Elev.		Elev.
			F.S. or Grade Rod	Elev. or Planned Elev.	
N at A, Elev. 101.6, H.I. = 4.8					
BMI	301°00	281	0°/6.4	-1.6	100.00
1	323°30	388	0°/10.4	-5.6	96.0
2	269°45	307	0°/9.6	-4.8	96.8
3	269°50	453	-1°26'/4.8	-11.3	90.3
4	240°00	386	0°/9.5	-4.7	96.9
B	223°40	752	0°/10.9	-6.1	95.5
N at B, Elev. 95.5, H.I. = 4.4					
A	43°40	752	+0°28'/4.4	+6.1	101.6
5	24°50	83'	-4°26'/8.4	-6.4	85.1
6	161°10	445	+0°31'/4.4	+4.0	99.5
7	275°40	290	0°52'/4.4	+4.4	99.9
C	333°15	722	0°52'/4.4	+10.9	106.4
N at C, Elev. 106.4, H.I. = 4.5					
B	153°15	722	-0°52'/4.5	-10.9	95.5
8	92°25	228'	-4°50'/4.5	-19.0	87.4
9	45°40	190	-2°13'/4.5	-7.4	99.0
10	22°20	157	-2°44'/4.5	-7.5	98.9
A	96°48	850	0°/9.3	-4.8	101.6

SCS-ENG-29
(5-70)

GPO : 1970 O-385-053

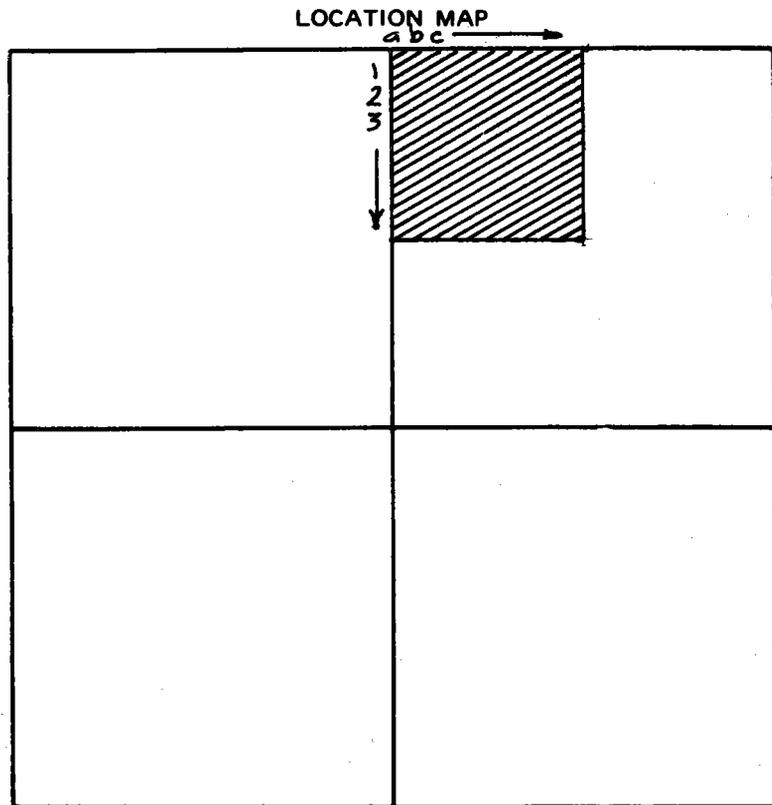
John Davis Topo. J. Gunn T. Smith 2/26/74

Azimuths From Magnetic North

Top of painted bolt head SE corner bridge
Elev. assumed.

Bottom of streambed.
Top of streambank.

SPECIAL DESIGN INSTRUCTIONS:



Scale: 4" = 1 mile
Legal Description: NW 1/4 of NE 1/4, Sec. 18, T. 21, R. 32
District Agreement No. _____; GPCP No. _____
Design Survey Construction Check

Date 8/30/77 John W. Branden, Civil Eng. Tech.
Technician and Title

The symbol * is a note to the computer for blank space or for information not used by the computer.

* DESIGN REQUIREMENTS

*

TITLE = RALPH KREY, RUN NO.1

*

HUNDREDTH = 1.

ORIGIN = UPPER LEFT

C/F RATIO = 1.50

SLOPE (X) = + 0.1, - 0.1

SLOPE (Y) = - 0.1, - 0.7 * Slope to South

BENCH = (A.1), (N.1), (N.14), (A.14)

BORROW = _____

WASTE = _____

MAXELEV (,) = _____

MINELEV (,) = _____

GO, DETAIL

*

TITLE = RALPH KREY, RUN NO.2

SLOPE (X) = + 0.1, - 0.1

SLOPE (Y) = + 0.1, + 0.7 * Slope to North

Bench (A.1), (N.1), (N.14), (A.14)

GO, DETAIL

*

TITLE = RALPH KREY, RUN NO.3

SLOPE (X) = 0.0, - 0.1

SLOPE (Y) = + 0.1, + 0.7 * Slope to West

Bench (A.1), (N.1), (N.14), (A.14)

GO, DETAIL

*

TITLE = _____

SLOPE (X) = _____

SLOPE (Y) = _____

GO, DETAIL

END JOB

*

CROSS OUT ALL FRINGE POINTS IN DATA GRID AFTER ENTERING IN FRINGE AREAS.

CROSS OUT ALL COMPUTER COMMAND LINES NOT USED.



STANDARDS FOR PROJECT AND LARGER GROUP JOBS

Standard staking and note keeping procedures are shown for representative type structures and portions of structures. They do not cover every situation. The illustrations show format and procedure in sufficient detail for the field engineer or survey party chief to apply them to the particular job. Construction staking must be consistent with contract provisions, and some of the illustrations may represent portions that are the responsibility of the contractor.

Unless otherwise specified basic staking for embankments and excavations includes centerline, slope (toe of slope or edge of cut) and offset reference stakes with hubs at each station and more frequently on curves along the axis of the embankment or excavation. It also includes stakes at significant breaks in topography or changes in section of the planned work. Basic staking for structures includes alignment and grade along the principal axis and may include offset stakes for long structures such as a principal spillway through a dam.

Computations are closely related to notekeeping. These samples can be used to compute quantities directly from the field notes. Placing the cut or fill above the distance from centerline or reference point facilitates direct computations. A sample plotted dam cross section and computation are shown.

Figures 3-1 through 3-4 show components of a typical floodwater retarding structure. These exhibits are referred to in the presentation of the sample field notes for layout and also for calculations. Although these figures and the field notes presented are for an earth dam, the content, procedures and completeness of note keeping are directly applicable to other major construction work.

Engineering Notes - Bench Mark Surveys

The engineering notes shown in Figure 3-5 illustrate the format for setting and checking bench marks (vertical control) for construction layout.

Note that B.M. No 81-1 and B.M. 81-6 are permanent monuments, and are so recorded on the drawings. Temporary benches should be run from the datum described in the contract drawings. All bench mark elevations should be thoroughly checked before other level work is started.

Engineering Notes - Construction Grades

Figures 3-6 through 3-8 show the planned grades for the embankment, cut-off trench, principal spillway, and emergency spillway.

Elevations and stationing or dimensions for all the major structure elements should be entered in the field notebook prior to layout. Spacing between entries should be sufficient for the field notes. Crowded notes are difficult to read and can cause errors. The inspector may find a condensed version of the same information helpful for a quick reference.

Elevations for earthwork are usually computed to the nearest one-tenth (0.1) foot. Where grades or control elevations are not shown on the drawings, sufficient information for rough grading may be established by scaled measurements taken from the drawings.

It is standard practice to set grades for the various elements of structures to the nearest one-hundredth (0.01) of a foot.

All construction stakes should be set and marked to show finish elevation. Additional information may be added to stakes and notes for subgrades or other specific construction datums as needed.

Engineering Notes -- Construction Stakeout

Figure 3-9 illustrates a format for stakeout notes for dams or other embankments. The elevations and structure dimensions illustrated are from plan data in Figures 3-1 through 3-4 and field notebook Figure 3-6.

The example shows the original cross section and embankment staking. The foundation was stripped and a second cross section was taken concurrently with setting the cutoff trench cut stakes. This is an optional procedure and in some cases one cross section will be sufficient. The (T) denotes the edge (toe) of fill or cut.

The computer program, STAKE, may be used to develop tables of horizontal distances from the toe of dam to the centerline for all expected fills. This can improve efficiency and accuracy of survey crews.

Figure 3-10 illustrates a format that may be used for recording the layout notes for the construction of principal spillways for flood control dams, and can also be readily adapted for use in laying out other types of closed conduits or culverts.

Figure 3-11 illustrates format that may be used for recording notes for the cross sections and the layout of the emergency spillway or other earth work. The work may consist of excavation, or sections which combine excavation and embankment.

The layout (including curve data) and the elevations for this example were taken from Figure 3-8. Simple curves are frequently required in the layout of embankments, excavations or elements of structures.

Stationing for the project should be continued along the centerline of the curve at the time of stakeout, and these stations should be used as control points for cross sections and the staking of the structure limits. Transverse measurements are made normal to the tangent to the curve at the point under consideration. This measurement line parallels an imaginary line that passes through the centerline station and the reference or radius point for the curve.

Plotting and Computations

Figure 3-12 shows the plotted cross section of dam centerline station 15 + 10. Fill height and distance from the centerline are the parameters used for plotting. Calculations should normally be made directly from field notes. It may be necessary in cases of complex geometry to plot cross sections to visualize the element. However, copying numbers and plotting cross sections should be kept to the minimum. There are computer programs available for computing quantities, some directly from rod readings. They may be used where appropriate. Figure 3-13 shows a convenient way of tabulating field notes for calculations where it is not convenient to compute directly from the fieldbook.

Setting and Marking Stakes

Figure 3-14 shows an example for staking embankments. This is the same cross section as recorded on Figure 3-9. Figure 3-15 shows an example for staking an open channel spillway. This is the same cross section as recorded for emergency spillway station 9 + 12 on Figure 3-11. The berm was added to the sketch to show the procedure (not in notes.) Stake location and markings must convey the necessary information. The examples show proven methods but may be varied to accomplish this objective.

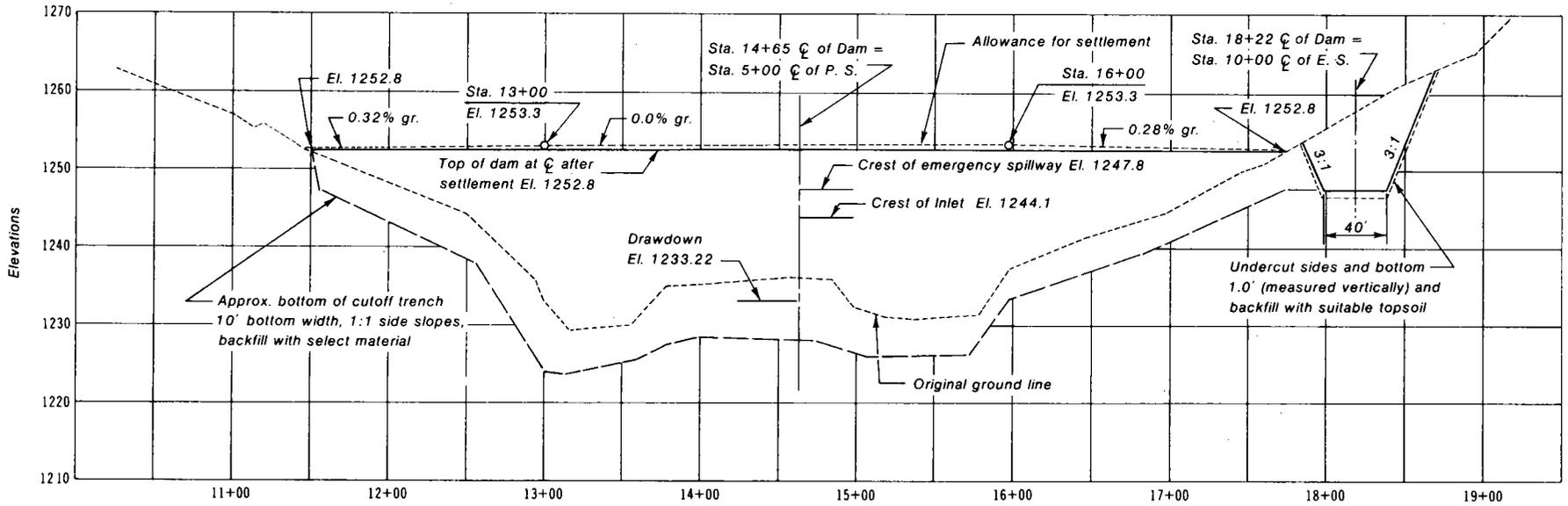
Figure 3-16 shows stake marking for various purposes applicable to construction.

Figures 3-17, 3-18 and 3-19 show methods of staking various other structures.

Engineering Notes - Checking Completed Work

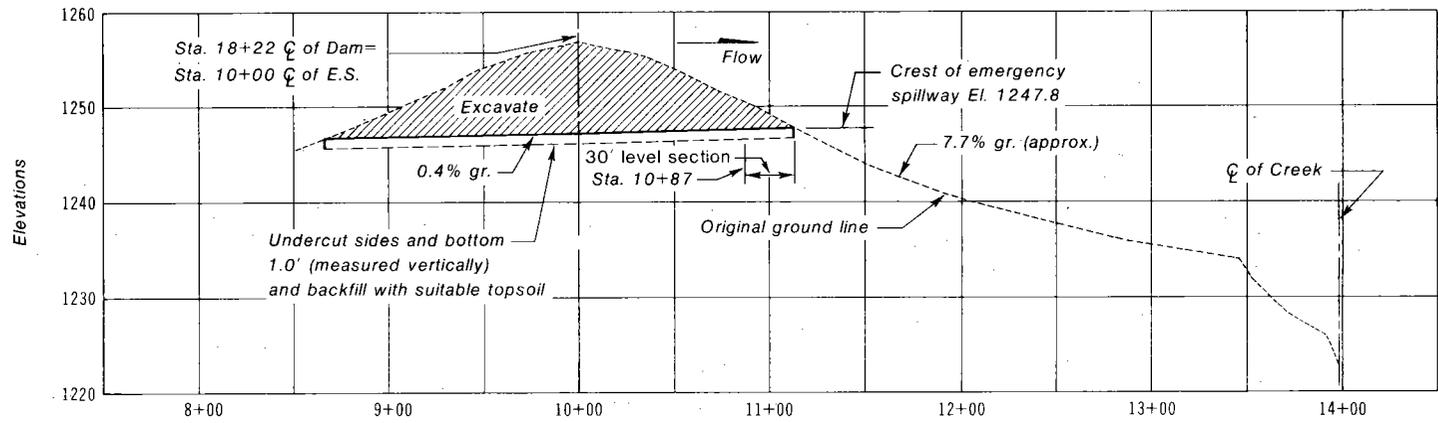
Figure 3-20 shows an example of recording a check of completed construction and although an embankment is shown, the principles are applicable for all construction work.

Some technicians develop a checkout schedule similar to the stakeout schedule based on constructed fill height to the dam centerline. Use of such schedules may be appropriate for large complex dams. The notes shown, along with good visual judgement should be sufficient for the ordinary dam. A plot of the planned embankment section overlain with the constructed cross section can also be made to visually compare the two.



SECTION A-A
 PROFILE ALONG ζ OF DAM

Figure 3-2



SECTION B-B
PROFILE ALONG C OF EMERGENCY SPILLWAY

Figure 3-3

BM Level Circuit					X <input checked="" type="checkbox"/> McVicker φ Beason 7/1/70
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
BM 81-1	1.75	1267.26		1265.51	Top of 1/2" rebar set in concrete @ Sta. 10+00 E of dam guarded by R&W steel post.
TP	0.22	1255.33	12.15	1255.11	
TP	1.15	1243.70	12.78	1242.55	
TP	9.17	1240.51	12.36	1231.34	Top of south steel handle on well cap.
TP	11.61	1250.75	1.37	1239.14	
TP	12.60	1262.69	0.66	1250.09	
TP	8.51	1269.54	1.66	1261.03	
BM 81-6	1.29	1269.09	1.74	1267.80	Top of 1/2" rebar @ R&W steel post on E of dam Sta. 19+33.60.
TP	0.35	1257.34	12.10	1256.99	
TP	1.54	1246.88	12.00	1245.34	
TP	9.77	1247.73	8.92	1237.96	Top of steel post.
TP	11.11	1258.26	0.58	1247.15	

BM Level Circuit					7/1/70	
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.		
		1258.26				
BM 81-2	10.14	1266.77	1.63	1256.63		Top gate post downstream from north end of dam.
BM 81-1			1.25	1265.52	0.01 error	
						Checked: <i>J. J. J.</i> 7/24/70
<p>Note: If the error exceeds 0.01 but is within allowable error for the precision of the survey, the elevations should be adjusted.</p>						

Figure 3-5 Sheet 2 of 2

EMBANKMENT								
Stake Out Schedule								
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Settlement	Constructed Elev.	Constructed Core Trench Elev.	
	Elev.	BERM Settle- ment	Const. Elev.					
11+51				1252.8	0.0	1252.8	End of dam	
11+56					0.0	1252.8	1247.3	
12+56					0.3	1253.1	1240.0	Begin berm
13+00	1244.1	0.3	1244.4		0.5	1253.3	1224.0	
13+15		0.3	1244.4		0.5	1253.3	1224.0	
13+60		0.3	1244.4		0.5	1253.3	1226.0	Ground Core break
13+80		0.2	1244.3		0.5	1253.3	1227.5	Ground break
14+00		0.2	1244.3		0.5	1253.3	1229.0	
14+75		0.2	1244.3		0.5	1253.3	1228.6	
15+10		0.2	1244.3		0.5	1253.3	1226.5	
15+75	1244.1	0.2	1244.3	1252.8	0.5	1253.3	1226.5	

PRINCIPAL SPILLWAY					LT.	RT.
Stake Out Schedule					DIST. INCL. 50	DIST. INCL. 50 ₁₆
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev. <i>Trench Bottom</i>	SLOPE 1:1 <i>Pipe Invert Grades</i>	SLOPE 1:1 <i>Backfill Grades</i>
4+50				1237.0		
4+56				1231.0		(backfill) 1232.72 Riser Base
4+64				1230.2	1232.72	1232.97 Inlet
4+86				1229.2	1231.75	1232.0
5+00					Dam @ Sta. 14+65 @ 90°	
5+06				1228.5	1230.90	1231.15
5+26				1227.8	1230.05	1230.30
5+46				1227.0	1229.20	1229.45
5+66				1226.2	1228.35	1228.60
5+86				1225.3	1227.50	

EMERGENCY SPILLWAY					LT. DIST. INCL. 20	RT. DIST. INCL. 20
Stake Out Schedule						
Sta.	B.S. Defl.	H.I. Central	F.S. or Grade Rod	Elev. or Planned Elev.	Design	Subgrade
8+61				1246.8	1245.8	
9+08	0°00'	0°00'		1247.0	1246.0	
9+12	1°38'	3°17'		1247.1	1246.1	
9+37	11°53'	23°47'		1247.2	1246.2	
9+62	22°08'	44°17'		1247.3	1246.3	
9+87	32°23'	64°47'		1247.4	1246.4	
10+00		75°26'				
10+12	42°38'	85°17'		1247.5	1246.5	
	8	1	2			

SLOPE 3:1 SLOPE 3:1

Curve Data

RP. 17+52.1
R = 69.87'
D = 82°
Δ = 146°47'
L = 179'
T = 234.25
PC Sta. 9+08
PT Sta. 10+87

Sta. 10+00 ES = 18+22 E of Dam

Dam E

Figure 3-8 Sheet 1 of 2

EMBANKMENT AFTER STRIPPING and Core Trench Stakeout					LT DIST. INCL. 5.0	RT DIST. INCL. 5.0
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Slope 1:1	Slope 1:1
BM 81-7	0.15	1239.58 (1239.6)		1239.43	pg. 3 C-Book	9/15/70
15+10			-137	1253.3	(T) F-266 12.9 38.0	(T) F-249 11.2 32.0 F-242 10.5 26.76 C6.3-11.3 C7.0-16.3 19.0
		Core Trench				Core Trench Cut for stakes
					(T) F-202 6.5 57.0	(T) F-19.0 5.3 7.0 F-18.9 5.2 19.0
					(T) F-21.1 7.4 56.0	(T) F-17.2 3.5 33.0
					(T) F-24.6 10.9 48.0	(T) F-15.6 1.9 62.8
					(T) F-17.7 4.0 67.0	(T) F-14.6 0.9 63.8
			+13.1	1226.5	OK.	F-17.7 4.0 67.0
						F-14.2 0.5 73.8
TP	5.28	1242.13	2.73	1236.85	Note: Core checkout not shown - would be similar to other checkout notes.	Checked: 9/16/70 DB

PRINCIPAL SPILLWAY					LT.	RT.
Pipe Trench Stakeout Notes					DIST. INCL. 5.0	DIST. INCL. 5.0
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.		9/16/70
BM 81-7	0.95	1240.38 (1240.4)		1239.43	Slope 1:1	Slope 1:1
					pg 3	
					C-Book	
A+50			+3.4	1237.0	Begin Cut	34
						(10.0 05)
A+56			+9.4	1231.0	Cut	
				1231.72	Backfill	
						(10.0 05)
A+64			+10.2	1230.2		
				1233.0		

Figure 3-10 Sheet 1 of 2

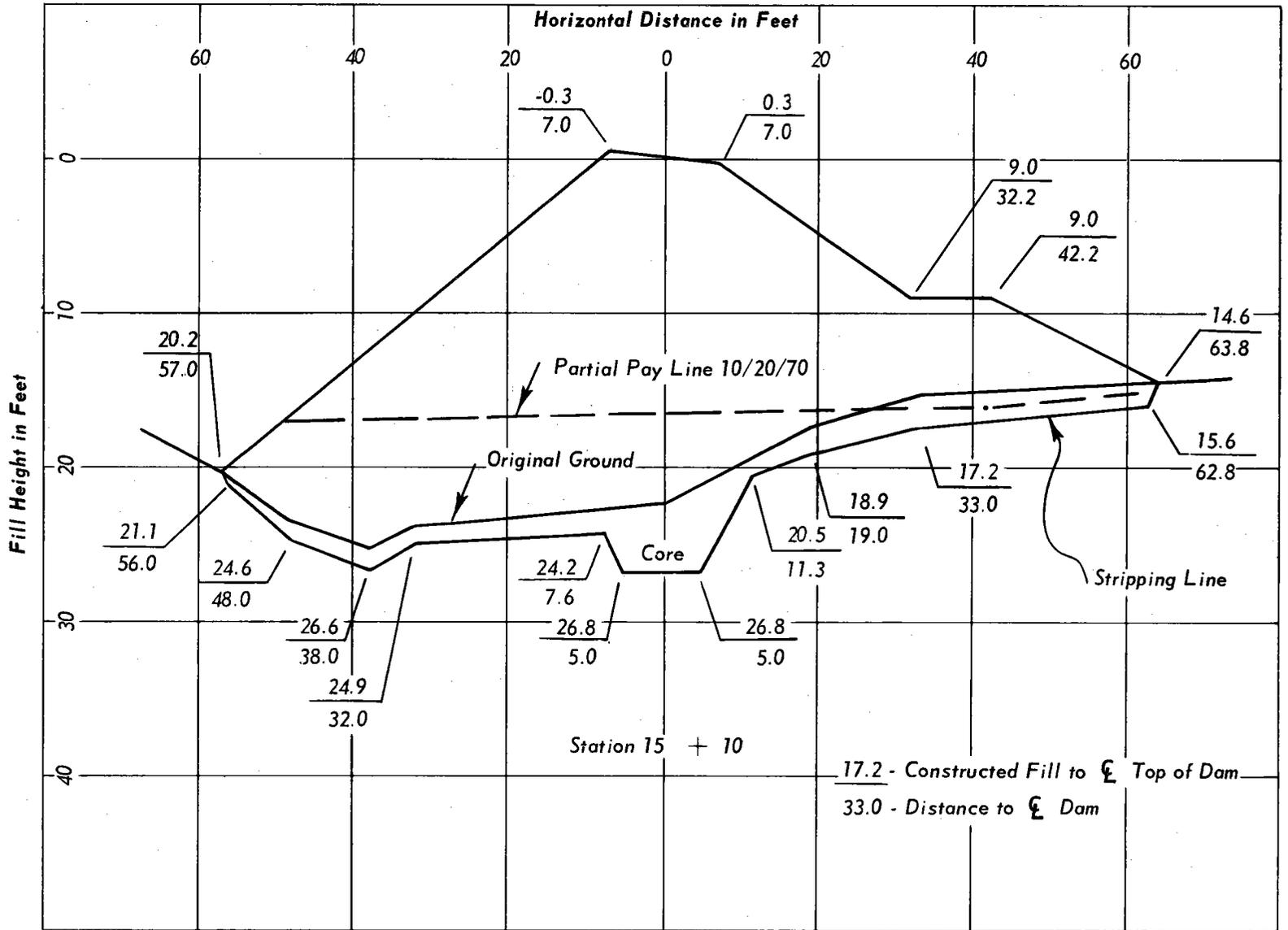
PRINCIPAL SPILLWAY				LT. DIST. INCL. 5.0	RT. DIST. INCL. 5.0
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	
Pipe Trench Stakeout Notes					9/16/70
		1240.38 (1240.4)			Slope 1:1
				pg. 27	Slope 1:1
					(+) 10.0' 03
5+06			+11.9	1228.5	C-6.4 C-6.0 C-5.5 C-5.2
				1231.2	5.5 5.9 6.4 6.7
					11.4 10.5 20.5
					(+) 10.0' 03
5+46			+13.4	1227.0	C-3.0 C-2.4 C-2.2 C-3.1
					10.4 11.0 11.2 10.3
			+10.9	1229.5	8.0 7.2 17.2
BM 81-7			0.95	1239.43	0.00 Closure
	BS & 0.95		FS & 0.95		
		0.95			
		-0.95			
		0.00			Error in closure
					Checked: J/CD 9/18/70

EMERGENCY SPILLWAY					LT.	RT.				
					DIST. INCL. 20	DIST. INCL. 20				
Stakeout Notes					31 7/19/70					
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	SLOPE 3:1		SLOPE 3:1			
				Design						
BM 81-6	0.38	1268.18 (1268.2)		1267.80	pg. 3	3/16/70	K D McVicker K T Deal & Beason			
					C-Book	(T) C-1.0	C-1.0	C-1.0	(T)	
8+61			21.4	1246.8	Backfill	Entrance 21.4	21.4	21.4		
			22.4	1245.8	Cut	20.0	0.0	20.0		
						(10' 05')			(10' 05')	
9+08 PC			21.2	1247.0		C-4.6	C-4.7 (T)	C-4.9	C-4.8 (T)	
			22.2	1246.0	Cut	17.6	17.5	17.3	17.4	
						44.1	34.1	0.0	34.4	
									44.4	
						(10' 05')			(10' 05')	
9+12			21.1	1247.1		C-4.7	C-4.8 (T)	C-5.0	C-5.3 (T)	
			22.1	1246.1	Cut	17.4	17.3	17.1	16.8	
						44.4	34.4	0.0	35.9	
									45.9	

Checked: DB
7/20/70

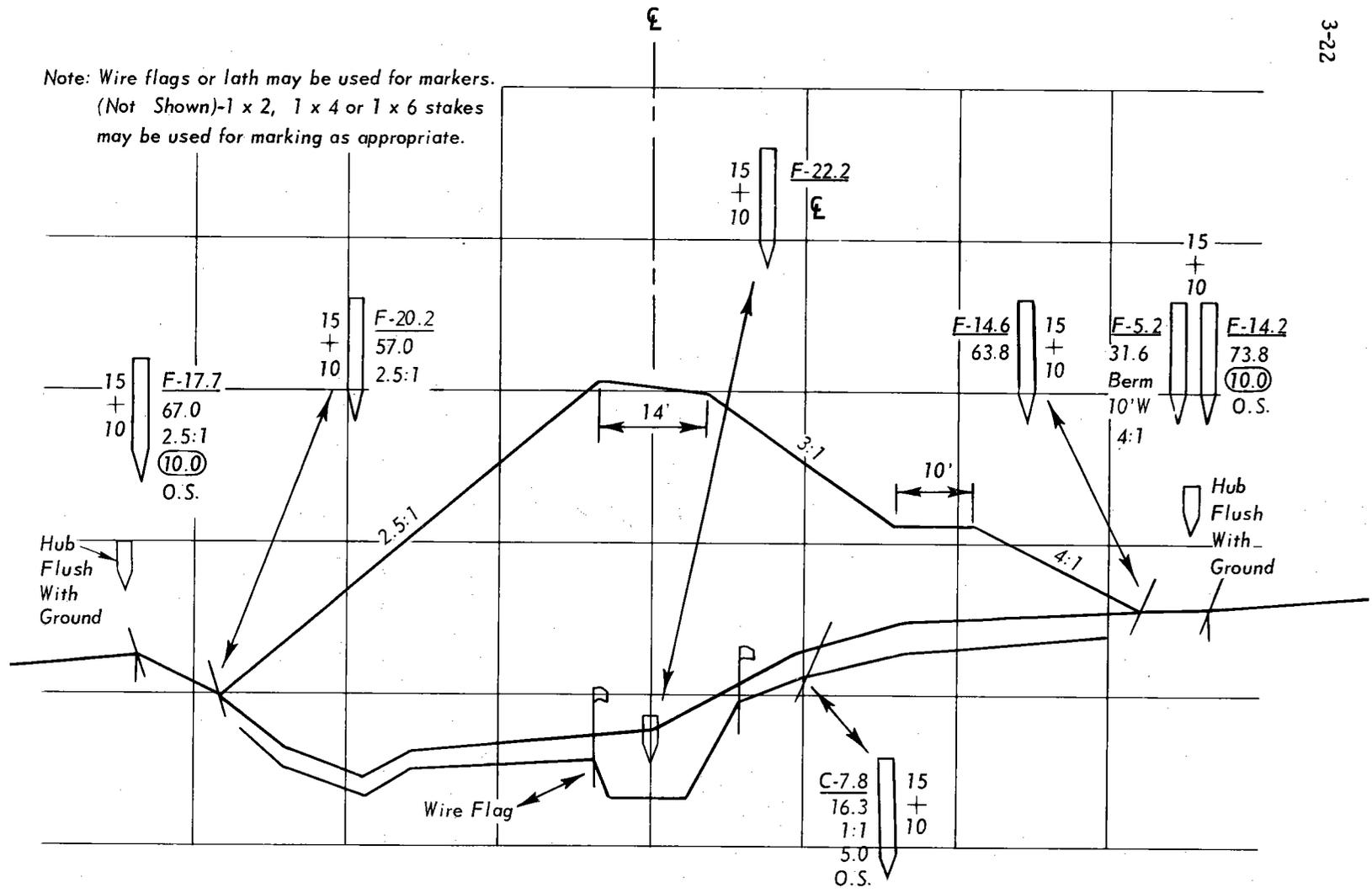
Figure 3-11 Sheet 1 of 1

Figure 3-12 Sheet 1 of 1

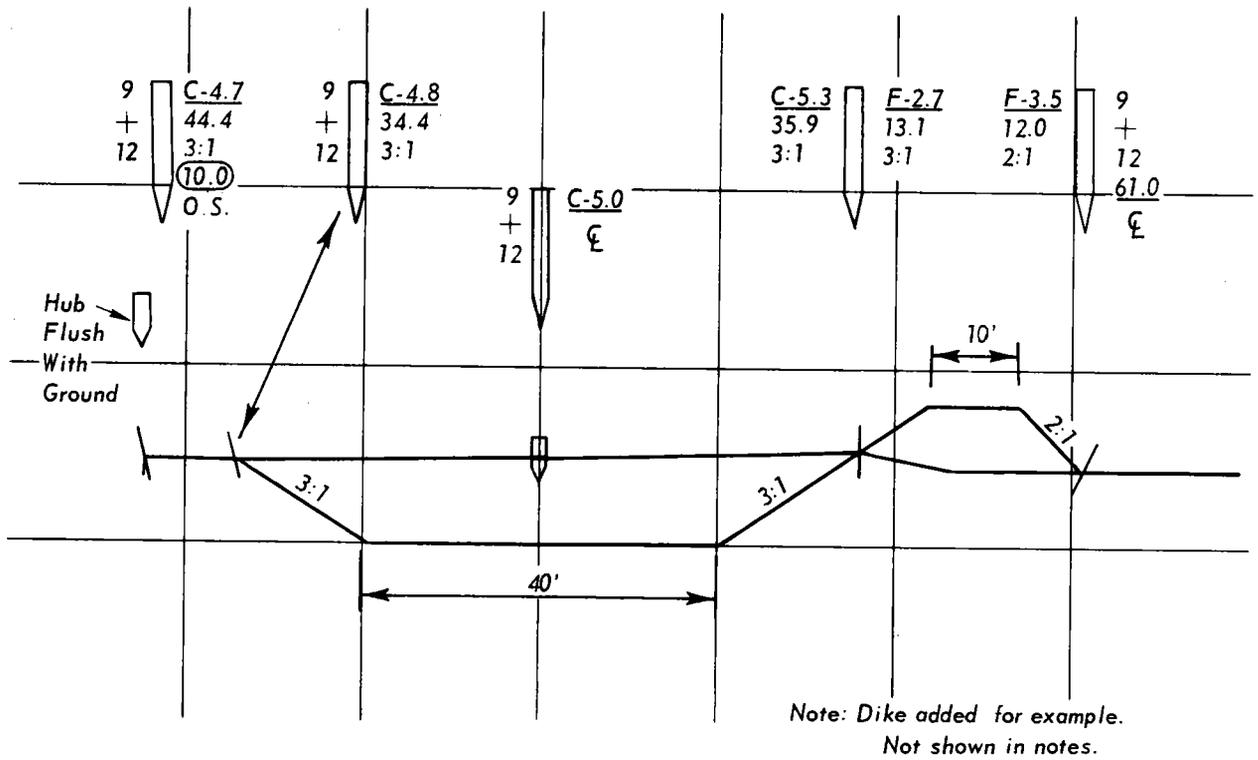


PLOTTED DAM CROSS SECTION

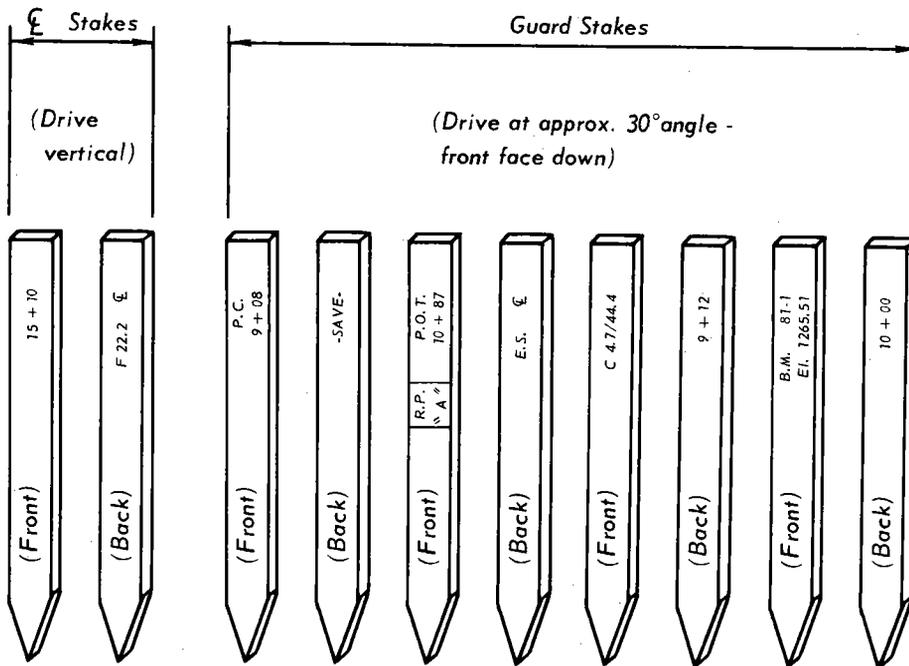
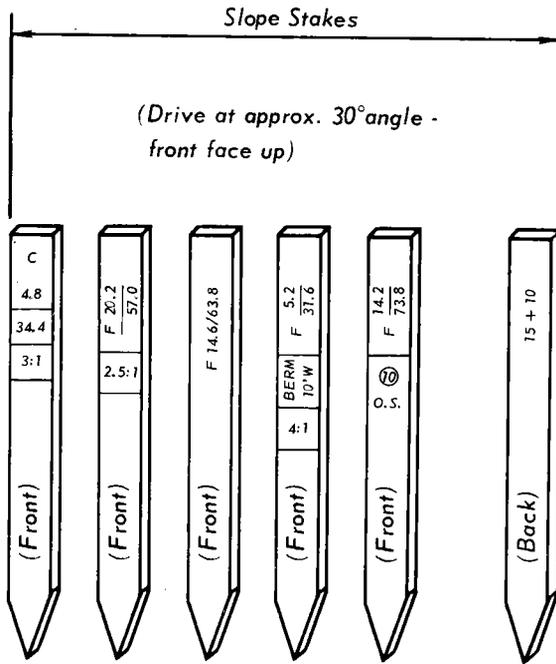
Note: Wire flags or lath may be used for markers.
 (Not Shown)-1 x 2, 1 x 4 or 1 x 6 stakes
 may be used for marking as appropriate.



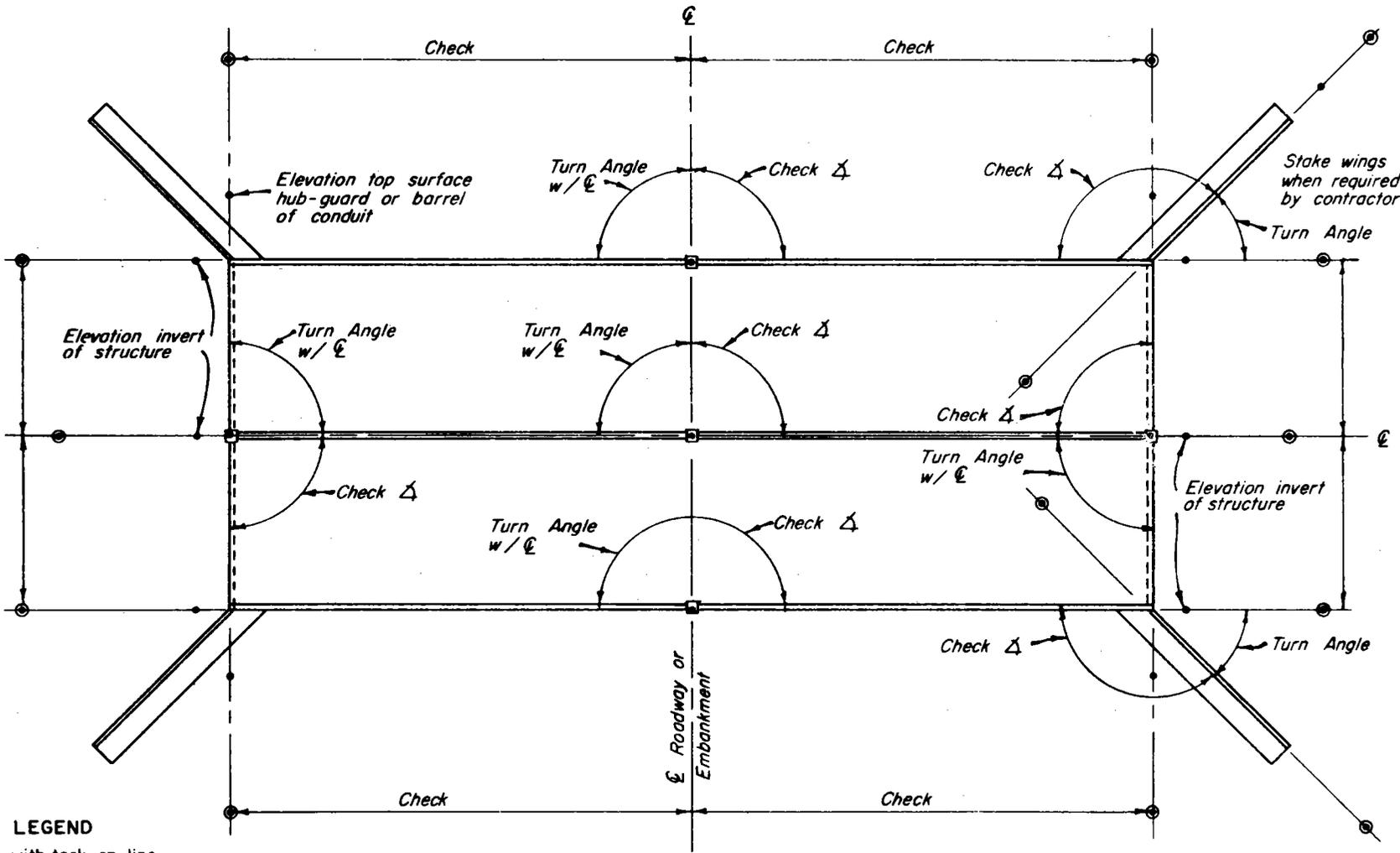
EXAMPLE FOR STAKING EMBANKMENTS



EXAMPLE FOR STAKING EXCAVATIONS.
 Figure 3-15 Sheet 1 of 1



EXAMPLES FOR MARKING CONSTRUCTION STAKES



- LEGEND**
- ⊙ Stake with tack on line
 - Elevation stake tacked for line
 - ▣ Temporary hub tacked line

FIGURE 3-18 EXAMPLE FOR STAKING MULTIPLE BOX CONDUITS

LEGEND

- ⊙ Stake with tack on line
- Elevation stake tacked for line
- ▣ Temporary hub tacked line

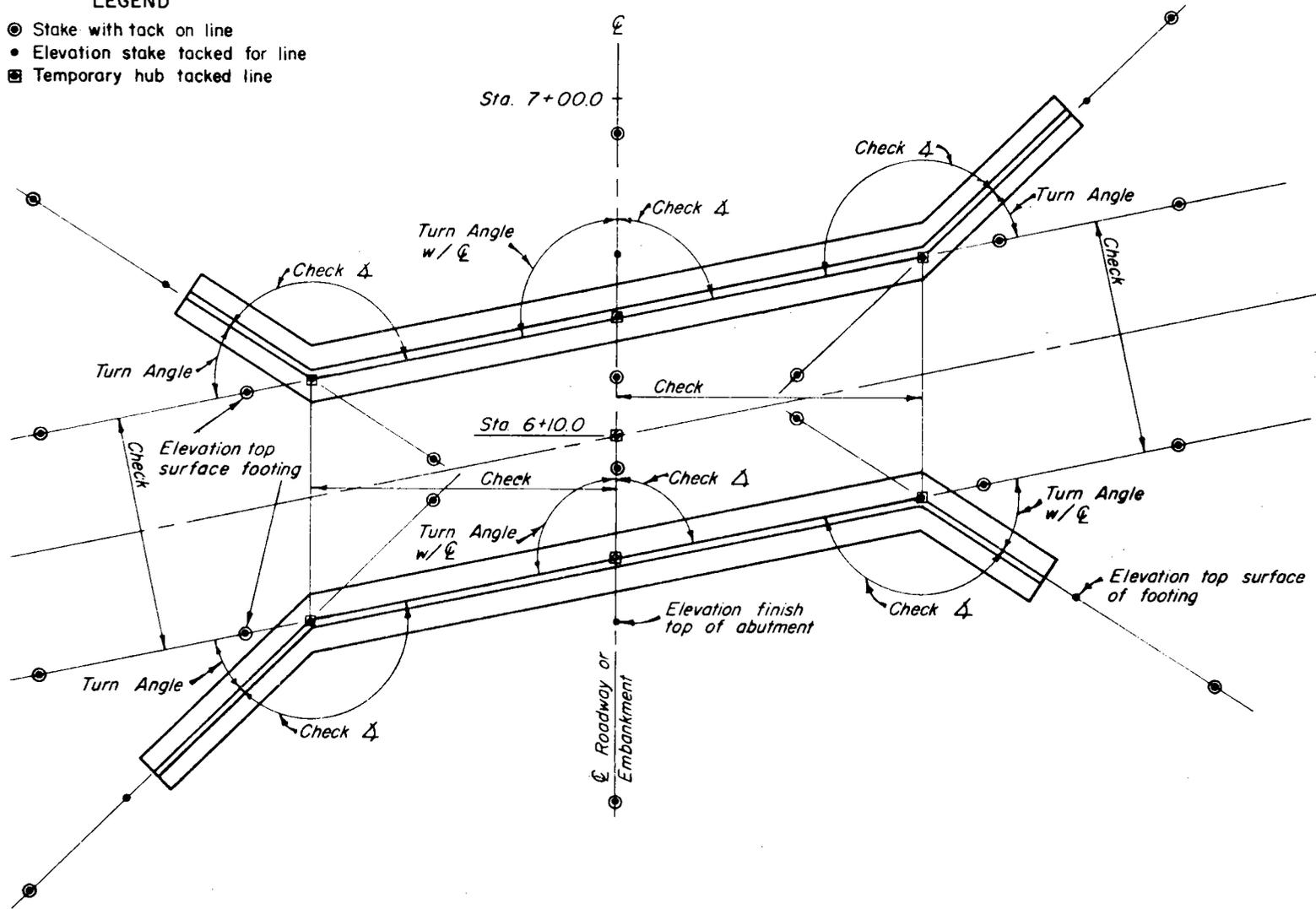


FIGURE 3-19 EXAMPLE FOR STAKING CANTILEVER ABUTMENTS ON SKEW ANGLE

Final Dam Checkout (Cont'd)					T & McVicker φ Beason 58 4/19/71				
Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Crown T'D.S.	Check T'D.S.	Need FS	Need FS	
		1256.66 (1256.7)							
					-0.3			(Crown tilt)	
14+75			+3.4	1253.3	3.1	3.0	3.7	3.7	
15+10			+3.4	1253.3	11.6 21.7 See Page 40-63	3.1	3.1	3.7	3.7
								8.3 21.1	12.2 32.2
								12.4 42.2	15.5 54.2
15+75			+3.4	1253.3	3.1	3.1	3.7	3.6	
16+00			+3.4	1253.3	3.1	3.1	3.7	3.6	
16+90			+3.7	1253.0	3.4	3.4	4.0	4.0	
17+78			+3.9	1252.8	3.6	3.6	4.2	4.0	
BM 81-3			7.27	1249.39					
				1249.39					

Note: Crown was checked at most stations.
Slopes were checked at representative locations.

Corr. Elev.
No Error





