§KS589.00 Design Criteria.

(a) This procedure applies only to dams where the product of the storage in acre-feet (cubic kilometers) times the effective height of the dam in feet (meters) is less than 3,000 (1,128). See item 2, page 378-1 of the Kansas Standard for Pond - 378 and § 520.20 of the National Engineering Manual (NEM). This procedure is not intended to dictate how the various phases of pond design, layout, inspection, and checkout are to be done. It presents a procedure for training purposes and reference. It does establish as policy, the minimum documentation requirements for certification of the pond conservation practice as required by GM 450-407.

(b) Designs will be in accordance with the guidelines in Chapter 6 of the Engineering Field Manual (EFM) and its supplements and the criteria listed in the Kansas Standard for Pond - 378.

(c) Additional documentation is needed on plans that require a DWR permit to construct. This documentation is detailed in GM-450 §KS405.13.

§KS589.01 Preliminary Design - The following information is needed:

(a) Hazard Classification - Refer to Form KS-ENG-12, for the guidelines to follow in making this determination. Hazard classification is the first priority item to consider before starting the design of the dam.

(b) Form KS-ENG-137 should be filled out in accordance with the instructions and procedures contained in the Engineering Field Manual, pages KS-2-1 to KS-2-18.

(c) Size - Determine the amount of reservoir storage available by topographic or other survey methods. Document how the reservoir capacity was developed when a topographic survey is not made. Make certain there is a sufficient amount available to satisfy the permanent and detention storage requirements for the site. List this information in the reservoir capacity table on Form KS-ENG-400(JS) found in the Kansas Supplement to Engineering Field Manual, Chapter 6.

(d) Use a loose leaf or a bound field notebook

(1) Record and describe the bench mark. (Bench mark description taken from topographic survey if same one was used.) Check and make certain that the elevation of the bench mark ties in with the elevations established when the topographic or other survey data was obtained.

(2) Survey a profile along the proposed centerline of dam including cross sections of the emergency spillway area and principal spillway profile as needed for design. On relatively small ponds or simple designs where the person doing the layout has the approval authority and a permit to construct is not required, it may be possible to set embankment slope stakes and stake out the emergency spillway at this time.

(e) An adequate geology investigation shall be made according to the requirements of NEM Part 531.

(f) Use standard engineering plans from the Kansas Supplement to the EFM, Chapter 6, as needed to complete the final plans.

§KS589.02 Final Design.

(a) On Form KS-ENG-4 complete the following:

(1) Compute the cubic yards (cubic meters) of embankment fill on the back side of the field sheet. The quantity section need not be filled out if printer output or photocopy from an approved programmable calculator or computer program is attached. Proper notation shall be made on the field sheet if this method is used.

(2) Design and other data on front side of sheet

(3) Signature and date by person doing the design

(4) Signature and date by person checking design

(b) On Form KS-ENG-400(JS) complete the following:

(1) Draw in drainage area, tributary pattern, and dam location.

(2) Fill in the Table of Quantities with the major items of work including excavation quantities of the cutoff trench and emergency spillway excavation.

(3) List any construction notes or instructions not covered by the specifications.

(4) Fill in Reservoir Capacity Table.

(c) On Form SCS-ENG-313A, Form KS-ENG-400(JS), or other suitable form complete the following:

(1) Plot plan view of dam and reservoir area. Locate centerline of the dam and show the stationing. Draw upstream and downstream toes. Locate centerline and limits of emergency spillway. Locate principal spillway. Plot location of test holes. Locate, describe, and show elevation of all permanent bench marks.

(d) On Form KS-ENG-401(JS) complete the following:

(1) Plot profile of the channel to approximately the top of dam elevation in the upstream direction and at least 100 feet (30.5 meters) downstream from the principal spillway outlet. If overfalls, bridges, etc., are within a distance downstream that will effect performance of the principal spillway outlet, the profile is to extend to such controls.

(2) Fill in the "Design Data" section

(3) Plot profile along centerline of the dam, draw in dam, and show elevations. Geology information when appropriate should be shown along the profile. Show log of test holes located in the borrow area in the blank space to the right side of the profile and cross-reference their location to the plan view of the dam on Form SCS-ENG-313A.

(4) Plot profile along centerline of the emergency spillway and draw in level section and any inlet or outlet channel. Show elevations and slope in outlet channel. Profile shall extend to the streambed below the dam.

(e) Fill out and complete any additional plan sheets needed: for example, a principal spillway with a 10-inch (25.4 centimeter) diameter CMP canopy inlet would require Forms KS-ENG-406(JS) and KS-ENG-409(JS). The need for a pipe support and trash rack would require Forms KS-ENG-405(JS) and KS-ENG-413(JS). If a water supply line is installed for stockwater, Form KS-ENG-408(JS) or KS-ENG-418(JS) should be included.

(f) Prepare construction specifications to supplement the drawings. The specifications will state the technical and workmanship requirements for the various operations of the work and state the quality of materials to be incorporated in the permanent works.

The specifications, pages S-378-1 through S-378-8, of the Kansas Standard and Specifications for Pond - 378, or Form KS-ENG-436(JS) may be used as the construction specification either as written or with non-applicable parts marked out. It may also be used as a guide to write a set of specifications. The Construction Detail section will contain the requirements for vegetation and fencing as well as other requirements not covered in the drawings or specifications.

(g) If there are more than five sheets of construction drawings, use Form KS-ENG-437(JS) for a cover sheet. Complete the following:

(1) Owner, practice, and all location blanks

(2) The index to drawings

(3) Signature and date of approving official.

§KS589.03 Layout - Use a loose leaf or a bound field notebook

(a) Set standard slope stakes for the embankment fill. Set offset stakes away from the toe stakes as needed. Set centerline alignment stakes as needed to insure location during construction.

(b) When an undisturbed berm is specified, set sufficient stakes off the front toe of the dam to delineate the undisturbed area.

(c) Layout the emergency spillway as designed. Set centerline, outside, and inside slope cut stakes. Adjust emergency spillway width accordingly to reflect any changes from the designed crest length. If this occurs, make the necessary changes on Forms KS-ENG-400(JS) and KS-ENG-401(JS). Note: Usual method is to make a preliminary design of the emergency spillway using the topographic survey and preliminary survey information.

(d) Stake inside and outside slope stakes for the wing dikes if required by design.

(e) Set alignment, survey the profile, and set excavation stakes, where needed, along the centerline of the principal spillway. Locate pipe support and set offset hub for flowline elevation of the principal spillway outlet. (On small ponds, set alignment stakes and offset hub only.)

§KS589.04 Approval of Plans.

(a) Approval of the plans (signature and date) by the person having approval authority for this size dam must be done prior to start of construction.

(b) If a permit to construct is required, it will be obtained prior to start of construction; and a copy will be placed in the design folder before SCS technical assistance is given on installation.

§KS589.05 Site and Construction Inspections.

(a) Prior to the start of construction, a site evaluation should be made to determine if sufficient moisture is available in the borrow material to insure adequate compaction of the embankment fill.

(b) Approximately 20 percent of the earth dam construction work of each contractor should be inspected during each year. This should be done throughout the year. Frequency of inspection should be the amount necessary to insure the contractor is doing quality work in all phases of construction.

(c) During construction there are several very important times when inspections should be made. These are in addition to the routine scheduled and non-scheduled visits during construction. They are as follows:

(1) Initial Inspection - Usually made during initial stripping operations of the base of the dam, the borrow area, and initial placement of the embankment fill. The core or cutoff trench and natural stream channel preparation should also be inspected during this visit.

(2) Pipe cr Conduit Inspection - Check that the materials are as specified by the plans and specifications. This includes the stockwater pipe and fixtures. Check pipe trench elevations, bedding under the pipe, alignment, compaction around and over the pipe, and connections. If cathodic protection is required, check for proper installation.

(3) Embankment Inspection - Check on compaction and quality of fill material. This is very important on zone fills. Also check for proper slopes and centerline alignment.

(4) Use Form KS-ENG-15 to record the above inspections.

*

§KS589.06 Check Out - Use a looseleaf or a bound field book

(a) Take one or more cross sections of the embankment fill at maximum centerline fill locations. Take additional cross sections at apparent weak stations. Check enough points to insure an adequate cross section has been built.

(b) Take a profile along the centerline of the dam in conjunction with the cross sections outlined in paragraph (a) of this section.

(c) Take profile notes along the centerline of the completed emergency spillway. Begin the profile in the reservoir area at the elevation of the principal spillway inlet or two feet (0.6 meter) below the level section of the emergency spillway, whichever is lower, and run the profile through the level section to the end of the control section or the beginning of the exit channel. If the exit channel has been shaped, extend the profile on to the natural stream channel. Take a minimum of one cross section in the level section including both inside and outside slopes.

(d) Record survey shots on the flowline of the inlet and the outlet of the principal spillway to make certain they conform to design.

(e) Take a shot on the exit channel immediately below the outlet of the principal spillway or take survey shots and measure the dimensions of the plunge pool if one is installed as part of the design.

(f) If a stockwater pipe was installed, check inlet and outlet elevations and also check that the pipe and fixtures conform to the planned design as to proper elevations and alignment.

(g) Take survey shot to determine final pond depth in the reservoir.

(h) Have the person doing the checkout sign and date Form KS-ENG-4.

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§589.07 Sample of Form KS-ENG-4

USDA
SCS

FIELD SHEET: POND - 378

KS-ENG-4
Rev. 2/82

Owner Carl Mott Ident. No. _____

Legal Description SE^4 Sec. 34-T24S-R12E County Greenwood

Reservoir Data

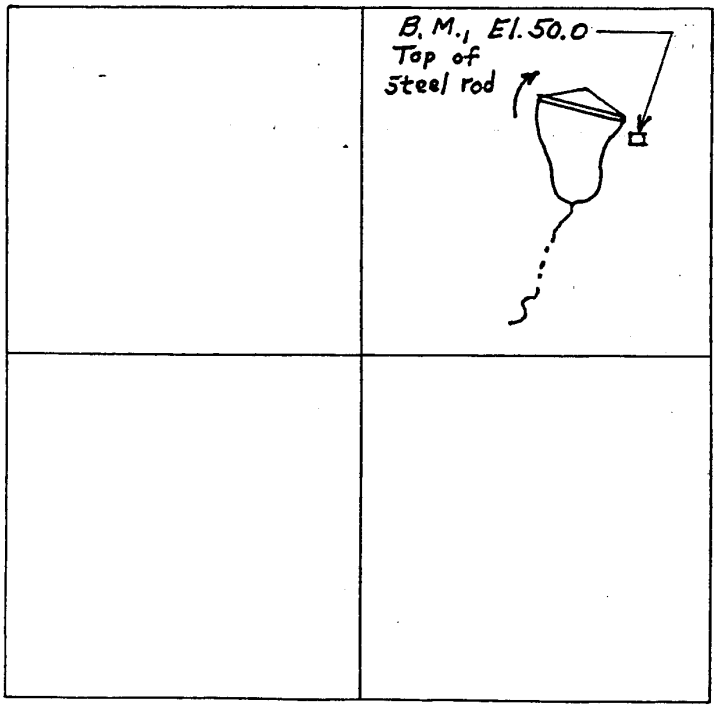
D.A. .40 ac., 0.06 sq. mi. Top of dam el. 100.0

Emerg. spwy. crest el. 97.0 Prin. spwy. crest el. 95.5

Pipe size: Riser – Barrel –

Canopy inlet 8"

Remarks: _____



J. T. Smith	8/6/81
Design by	Date
C. Jones	8/6/81
Design checked by	Date
H. Brown	8/6/81
Design approved by	Date
J. T. Smith	8/6/81
Layout by	Date
J. T. Smith	9/22/81
Checkout by	Date

Location Map: Sale 1" = 660'

PART 589 - POND - 378

Standard Earthwork Computation Sheet

1	2	3	4	5	6
Station	Average Cut or Fill	End Area	Sum of End Areas	Distance Between Stations	Product Cols. 4 x 5
0+03	0.0	0.0			
			2.0	6	12.0
0+09	3.0	2.0			
			8.7	16	139.2
0+25	6.5	6.7			
			21.3	75	1,597.5
1+00	10.3	14.6			
			40.4	52	2,100.8
1+52	14.2	25.8			
			62.3	78	4,859.4
2+30	17.2	36.5			
			40.1	70	2,807.0
3+00	4.4	3.6			
			3.6	80	288.0
3+80	0.0	0.0			
Divide sum by: 2* 54***					11,803.9
Total cubic yards					5,902.

* If sum is in cubic yards
**To convert cubic feet to cubic yards

(KS210-KNKDM, Mar. 1982)

§ 589.08 Sample of Form KS-ENG-137 for use in stockwater pond design

USDA
SCS

HYDROLOGIC SUMMARY SHEET

KS-ENG-137
Rev. 5/79
(File Code EN-19)

Owner Carl Mott Legal Description SE¼ Sec. 34-T24S-R12E

Practice Pond-378 Computed by J. Smith Date 8-6-81

Soil Cover Complex Number

(1) Hydro. Soil Group	(2) Land Use	(3) Condition or Practice	(4) Soil Cover Complex No. (II AMC)	(5) Area (ac.)	(6) Product (4x5)
D	Cultiv.	Gradient Terraces	81	10	810
C	Grassland	Good Veg. Cover	74	30	2220
			Totals	40	3,030

Weighted Soil Cover Complex No. = Total Col. 6 ÷ Total Col. 5 = 76

Time of Concentration

Hydraulic flow length (L) _____ ft. Drainageway drop (H) = _____ ft.

Drainageway slope = (H ÷ L) (100) = _____ % Tc = _____ hrs.

Annual Yield

Annual precipitation = 37.0 in. Mean annual runoff = 7.7 in.

50 % chance runoff = 4.8 in. 90 % chance runoff = 0.9 in.

Minimum design storage = 0.9 in. 3.0 ac. ft.

Sediment Yield

50 yr. sediment yield = 0.57 in. 1.9 ac. ft.

Rainfall and Runoff

Design frequency 2 yrs. Rainfall(P) 3.7 in. Runoff(R) 1.49 in.

Design frequency 25 yrs. Rainfall(P) 6.4 in. Runoff(R) 3.7 in.

Design frequency _____ yrs. Rainfall(P) _____ in. Runoff(R) _____ in.

Peak Rate of Discharge

a. Hydraulic flow length 2000 ft. b. Average watershed slope 5 %

c. Equiv. drain. area 45 acres d. Equiv. peak disch. 35 cfs/in.

e. Slope adjust. factor 1.06 f. Other factors 0

Constant(C) = 35 (d) x 1.06 (e) x 0 (f) x 40 (actual acres) ÷ 45 (c) = 33.0 cfs/in.

Peak disch. 2 yr. = (C) 33.0 x (R) 1.49 = 49.2 cfs

Peak disch. 25 yr. = (C) 33.0 x (R) 3.7 = 122.1 cfs

Peak disch. _____ yr. = (C) _____ x (R) _____ = _____ cfs

(KS210-KNKDM, May 1981)

§ 589.08-2

HYDROLOGIC SUMMARY SHEET FOR WATERWAYS

Waterway Reach	A	B	C	D	E	Totals - Reach A	Totals - Reaches A & B	Totals - Reaches A, B, & C	Totals - Reaches A, B, C, & D	Totals - Reaches A, B, C, D, & E
1 Hydro. Soil Group										
2 Land Use										
3 Condition; Cover Treatment										
4 II Soil Cover Complex Number										
5 Area - acres										
6 Product (Col. 4 x 5)										
7 Weighted S.C.C. No. (Totals Col. 6 ÷ 5)										
8 Hydraulic Flow Length - Ft.										
9 Avg. Watershed Slope - %										
10 Equiv. Drainage Area - acres										
11 Equiv. Peak Disch. - cfs/in.										
12 Slope Adjustment Factor										
13 Rainfall - in. 10 yr. 24 hr.										
14 Runoff - in.										
15 Peak Disch. - cfs (Col. 11 x 12 x 14 x 5 ÷ 10)										

§ 589.09 Sample of Form SCS-ENG-28, field notes for stockwater pond

SCD Greenwood County Date 8-6-81

Field Office Eureka

Name Carl Mott

Individual Group Unit of Govt.

(circle one)

Job Stockwater Pond

Design Sur. Const. Layout ✓

Const. Check ✓ Other

Ident. No. Field No.

(See sketch on field sheet)

Scale

1" =

Legal Description

SE 1/4 Sec 34 T 24S R 12E

or

Location

SCS-ENG-28 REV. 5-78

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§ 589.10 Sample of Form SCS-ENG-29, field notes for layout of stockwater pond

Carl Mott
Stockwater Pond
Const. Layout

π J.T. Smith
φ C. Jones
8-6-81

Top of 5/8" steel rod 50' SE of Sta 3+80
Top of Dam - El. 100.0 Top Width = 10'-0"
Emerg. Spwy. El. 97.0, Prin. Spwy. El. 95.5

| | | |

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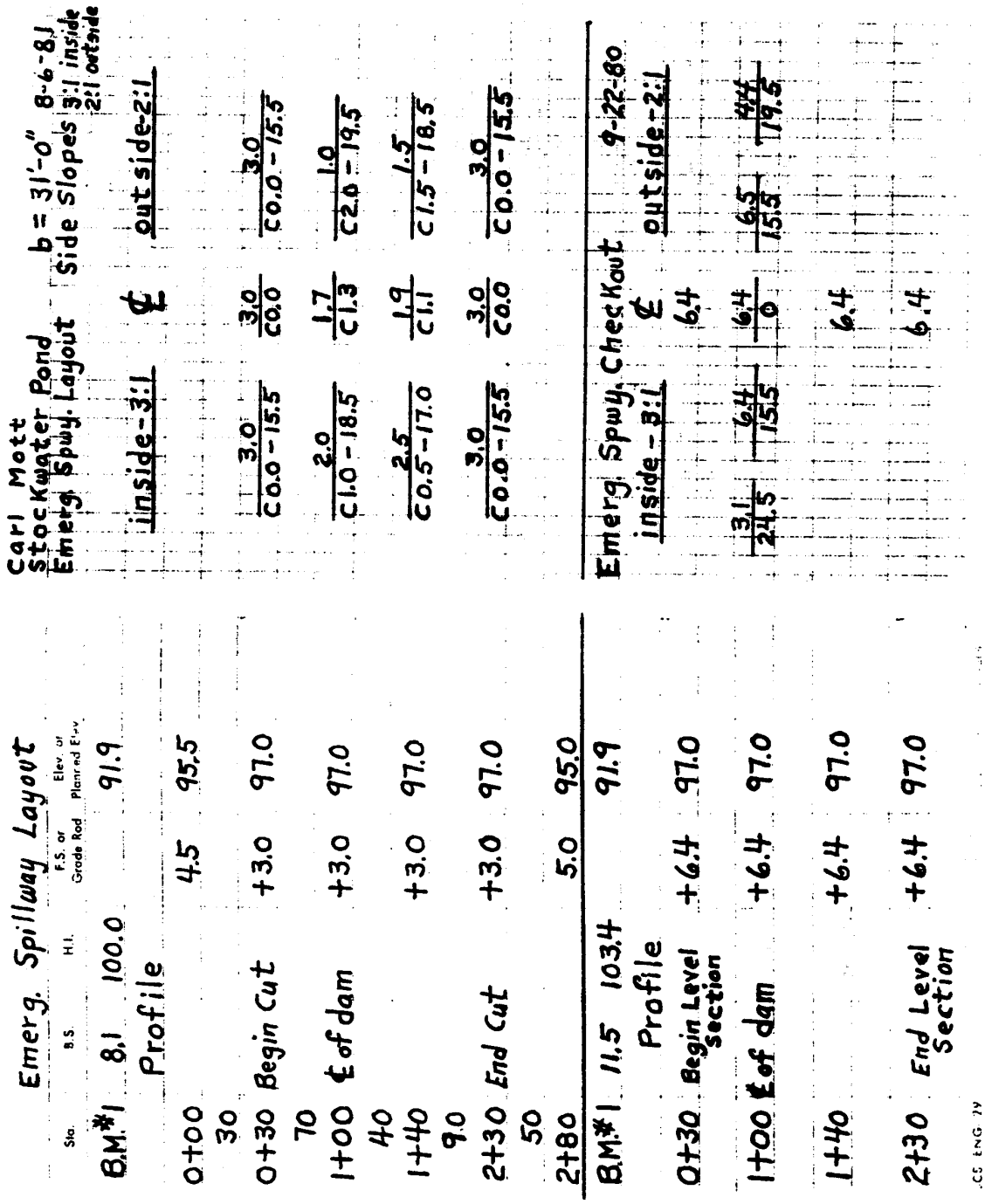
§ 589.11 Sample of Form SCS-ENG-29, sample of layout and check out of emergency spillway for stockwater ponds



Emerg. Spillway Layout

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.
B.M.#1	8.1	100.0		91.9
Profile				
0+00			4.5	95.5
30				
0+30 Begin Cut			+3.0	97.0
70				
1+00 ℄ of dam			+3.0	97.0
40				
1+40			+3.0	97.0
90				
2+30 End Cut			+3.0	97.0
50				
2+80			5.0	95.0
B.M.#1	11.5	103.4		91.9
Profile				
0+30 Begin Level Section			+6.4	97.0
1+00 ℄ of dam			+6.4	97.0
1+40			+6.4	97.0
2+30 End Level Section			+6.4	97.0

Carl Mott
Stockwater Pond
Emerg. Spwy. Layout

b = 31'-0" 8-6-81
Side Slopes 3:1 inside
2:1 outside

inside-3:1	℄	outside-2:1
3.0 / C0.0-15.5	3.0 / C0.0	3.0 / C0.0-15.5
2.0 / C1.0-18.5	1.7 / C1.3	1.0 / C2.0-19.5
2.5 / C0.5-17.0	1.9 / C1.1	1.5 / C1.5-18.5
3.0 / C0.0-15.5	3.0 / C0.0	3.0 / C0.0-15.5

Emerg. Spwy. Check Out 9-22-80

inside-3:1	℄	outside-2:1
	6.4	
3.1 / 21.5 — 6.4 / 15.5	6.4 / 0	6.5 / 15.5 — 4.4 / 19.5
	6.4	
	6.4	

CS ENG 29
7-71

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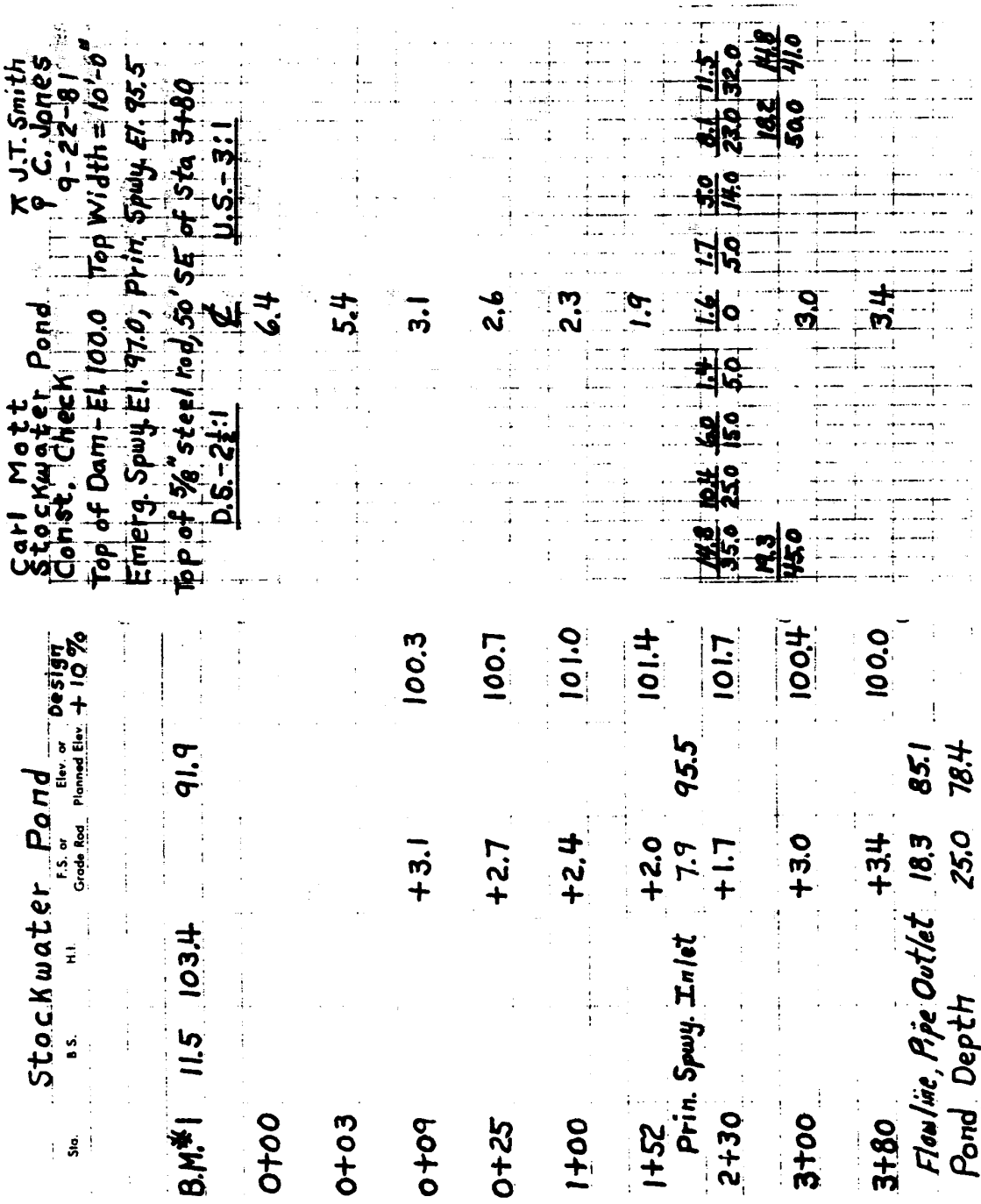
§ 589.12 Sample of Form SCS-ENG-29, field notes for embankment check out of stockwater ponds



Carl Mott
Stockwater Pond
Const. Check
Top of Dam - El. 100.0
Emerg. Spwy. El. 97.0, Prin. Spwy. El. 95.5
Top of 5/8" steel rod, 50' SE of Sta. 3+80
D.S. - 2½:1
℄
U.S. - 3:1
Top Width = 10'-0"
J.T. Smith
C. Jones
9-22-81

Stockwater Pond

Sta.	B.S.	H.I.	F.S. or Grade Rod	Elev. or Planned Elev.	Design + 10%
B.M.#1	11.5	103.4		91.9	
0+00					
0+03					
0+09			+3.1	100.3	
0+25			+2.7	100.7	
1+00			+2.4	101.0	
1+52			+2.0	101.4	
Prin. Spwy. Inlet			7.9	95.5	
2+30			+1.7	101.7	
3+00			+3.0	100.4	
3+80			+3.4	100.0	
Flowline, Pipe Outlet			18.3	85.1	
Pond Depth			25.0	78.4	

| | | | | |