U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ID-ENG-40
Rev. 6
5/92

SPRINKLER SYSTEM DESIGN DATA

Instructions for ID-ENG-40:

PURPOSE: To provide a guide in the design of irrigation sprinkler systems.

USE: Sheet #2 is to be filled out by SCS personnel to provide basic data necessary for further design work. Sheets #3, #4, #5, and #6 may be completed by other than SCS personnel. These pages may be filled out directly or company forms may be substituted. In either case, please supply all information listed.

OTHER: SCS will provide a line tracing of the farm. If USGS quadrangle or other topographic coverage is available, elevation contours, not to exceed 20 ft. intervals will be provided by SCS. If this information is not available, the designer will need to provide suitable surveys. Non-SCS designers are welcome to stop in at the local SCS office and use topographic information available. The designer will then complete the location map by showing the completed sprinkler system layout as per sheet #5 of the ID-ENG-40.

Copies of the following standards will be supplied upon request from the local SCS office for use in designing as applicable, to a specific job.

NHCP Standard	Name of Standard
442	Irrigation System, Sprinkler Irrigation Water Conveyance
430-AA	Aluminum Tubing Pipeline
430-DD	Plastic, High Pressure Underground Pipeline
430-FF	Steel Pipeline
533	Pumping Plant for Water Control

The goal is to have a complete design to provide to the purchaser of the system.

SCS personnel are required to review and approve designs before the project is installed for ASCS cost share and some other cases. SCS would appreciate the opportunity to review all jobs.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ID-ENG-40
Rev. 6
5/92

SPRINKLER SYSTEM DESIGN DATA

NAME _____ DATE _____ PREPARED BY _____

SCD _____ COUNTY _____ JOB CLASS _____

I. INVENTORY

Total Acres _____ Crop Acres _____ Climatic Area _____
Water Source _____ Amt. Avail. _____ Seasonal Variation _____
Energy Source _____ _____ _____
(Electric) (Int. Comb-Fuel) (Gravity)

II. SOILS DATA

USDA Soils Class Majority	Total Available WHC (in/ft.)					Depth To		Maximum Intake Rate in/hr.
	0-1	1-2	2-3	3-4	4-5	Inhibiting Layer (ft)	Water Table	

III. DETERMINATION OF WEIGHTED CONSUMPTIVE USE (CU)

Crop	Acres (A)	June		July		August	
		CU	AxCU	CU	AxCU	CU	AxCU
Weighted Consumptive Use							

IV. WATER MANAGEMENT INFORMATION

Crop	Root Zone Depth (ft)	Total WHC (Inches)	Stress Point (%TWHC)	Max. Net Replacement (Inches)	Peak Daily C.U.	Max. Freq. @ Peak C.U. @ Max. Net.

V. DESIGN DATA -

Based on weighted consumptive use, ____% Eff., ____ MPH winds, ____ Wind Factor
(Ref: NHCP 442-2)

	Application		Peak Daily C.U. *	Frequency	System Requirements	
	Net (D)	Gross	(Weighted)	(F)(Days)	(Total gpm)(Q)	gpm/ac
Maximum						

$Q = \frac{453\ A\ D}{F\ H\ Eff.}$ = system capacity

H = Total operating hours/day

* Use controlling weighted monthly consumptive use and determine peak daily consumptive use from Table ID683-3, page ID683-22.

VI. SYSTEM DESIGN - BY COOPERATOR'S CHOICE

A. Sprinkler System Design Summary

Nozzle Spacing _____ (S_ℓ) Lateral Spacing on Mainline (S_m) _____

Minimum Wetted Dia. = _____ (S_m) ÷ _____ Wind Factor = _____ Ft.

Sprinkler Head _____ _____ _____ _____ _____ _____
(make) (model) (nozzle size) (gpm/nozz.) (pressure) (wetted dia. ≥$2S_\ell$)

Application Rate _____ in/hr Application Time _____ hours/set

Net Application = _____ (Application Rate (in/hr)) X _____ (Applic. Eff.) X _____ (hrs/set) = _____ in.

Max. Irr. Cycle = $\frac{\text{Net Application}}{\text{Peak Daily C.U.*}} = \frac{(\quad)}{(\quad)}$ = _____ Days

Minimum Number Laterals = $\frac{\text{(No. Lateral Sets)}}{\text{(Max. Irr. Cycle)(Moves/day)}} = \frac{(\quad)}{(\quad)(\quad)}$ = _____

Designed Laterals: Number _____ Diameter _____ Type _____ Moves/day _____

System Capacity _____ (total nozz.) X _____ (gpm/nozz.) = _____ gpm (Total)

B. Lateral Friction 1/

Allowable Pressure Loss = 0.2 X _____ (Pa.) psi + 2/ _____ (elev) psi = _____ psi>0<0.6 Pa.

Actual Friction Loss (Pf) worst condition = _____ psi.

Pressure (Pm) required at the Mainline in psi.

	Standard Nozzle	Flow Control Nozzle
Nozzle Pressure (Pa)	_____ X 1.0 = _____	_____ X 1.0 = _____
Lateral Friction (Pf)	_____ X 0.75 = _____	_____ X 1.0 = _____
3/ Elevation Difference (Pe)	_____ X 0.50 = _____	_____ X 1.0 = _____
Nozzle Riser Height (Pr)	_____ X 1.0 = _____	_____ X 1.0 = _____
Flow Control Valve Loss (Pev)	N/A	_____ X 1.0 = _____
Total (Pm) ≥ Pa + Pr	_____	_____

1/ Reference NEH Section 15, Chapter 11, page 11-51.

2/ Positive when lateral is going downhill, negative when lateral is going uphill

3/ Add when lateral is going uphill, subtract when lateral is going downhill

C. Mainline Design

Mainline _____ _____ _____
(material) (pressure rating) (other description, such as SDR, PIP, IPS, Gage, Class)

Desirable mainline velocities are 5 fps or less (req. on PVC unless a surge analysis is performed).

Station From	To	Dia. of Pipe	Flow (gpm)	Velo-city (fps)	Distance	Friction Loss Per 1000'	Friction Loss This Section (Ft.)	Accum. Friction Loss	Remarks
	-								
	-								
	-								
	-								
	-								
	-								
	-								
	-								
	-								
	-								

*Mannings "n" factors:
Steel - 0.012
Aluminum - 0.012

*Hazen-Williams "C" factors:
PVC - 150

D. Determination of Total Dynamic Head

Pressure req'd @ Main	_____ psi	_____ ft.	
Friction loss in Main	_____	_____	
Elevation rise/fall	_____	_____	
Lift (water surface to pump)	_____	_____	
Column Loss	_____	_____	
Misc. Loss	_____	_____	
Total (TDH)	_____	_____	(TDH) must be in feet for horsepower equation.

E. Horse Power Requirements

$$BHP = \frac{(TDH)GPM}{(3960)\ \text{Pump Efficiency}} = \frac{(\quad)(\quad)}{3960\ (\quad)} = \_\_\_\_\_ HP$$

Pump Curve Data Attached yes no If not supplied, SCS will assume 70% efficiency

Bill of Materials yes no

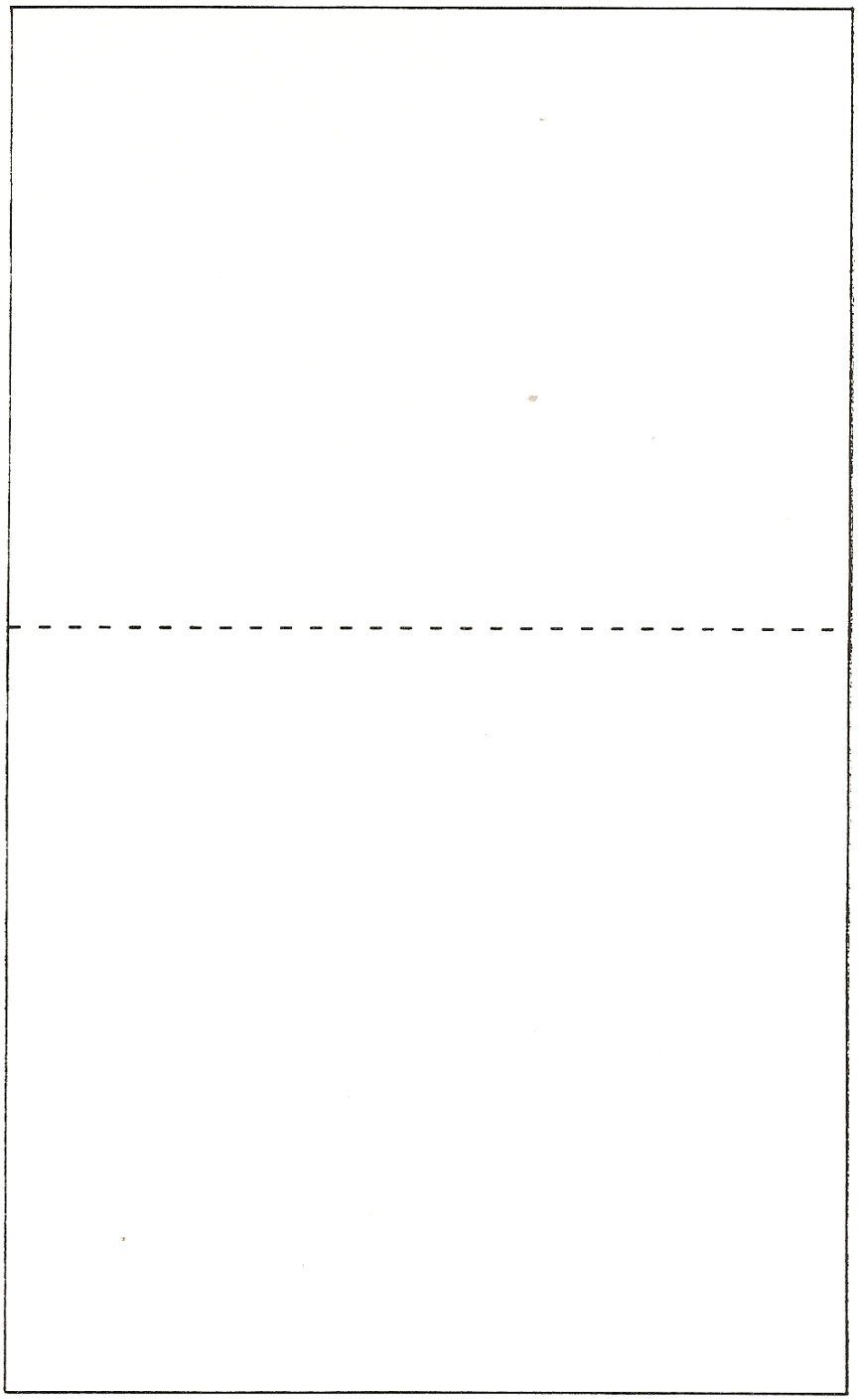
F. Location and Layout Map

TWP _____
Range _____

Show:

Location of acres not sprinkled - (out)
Direction of prevailing wind
Elevations (contours preferable)
Stations on mainline in feet or alphabetical notation
Pump location X
Mainline Location

Lateral layout
W - if wheel line
H - if hand move
S - if solid set
W. H. S.
Direction of lateral move
North Arrow
Location of nearest section corner



Scale:

G. Appurtenances*	DESIGN Needed	Not Needed	Location	Size	Const. Check Installed
Expansion Couplers					
Reducers					
Anchors					
Thrustblocks					
Bends					
Tees					
Gate Valve					
Drain Valves					
Check Valves					
Pressure Relief Valves					
Air-Vacuum Release Valves					
Pipe Supports					
Corrosion Protection					
Other:					

* Check off if applicable and fillin columns. Provide any special additional drawings of the above as needed.

SYSTEM DESIGNED BY: _____ _____ _____
(Company Name) (Individual's Signature) (Date)

(FOR SCS ONLY) Reviewed by: _____ Date: _____ ☐ Design ☐ As Built

Approved by: _____ Date: _____

COMMENTS: _____

I have reviewed the plans and specifications and agree to construct this project to the best of my ability in accordance with them.

_____ _____
(Cooperator) (Date)

I certify that I have completed this project according to the plans and specifications.

_____ _____
(Cooperator) (Date)