NRCS Natural Resources Conservation Service

Instructions

Center Pivot Sprinkler Design Worksheet

Instructions for use of 442_NE_IR-59_Center_Pivot_Design_Worksheet (former NE-ENG-59)

FRONT PAGE: The front portion of this data sheet is to be filled out by NRCS personnel and provided to the vendor / supplier of the center pivot sprinkler and/or nozzle package.

Land Owner/Operator: Self explanatory

Field or Unit: Description of field

Designed by: NRCS Designer with date

Checked by: The person who checks this data sheet and the date

Approved by: NRCS employee or TSP with proper engineering JAA for NRCS Practice Standard 442 and the date of approval

Job Class - Engineering Job Class (I-V), See NEM NE501.09 for assigning proper job class

Support References

Nebraska Conservation Practice Standard 442, Sprinkler Irrigation, https://efotg.sc.egov.usda.gov/api/CPSFile/18789/___

National Engineering Handbook, Section 650: Engineering Field Handbook, Chapter 15, Irrigation, 07/01/1984 https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17552.wba

National Engineering Handbook, Section 652: Irrigation Guide, September, 1997 https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17837.wba

CENTER PIVOT SPRINKLER DESIGN WORKSHEET

LANDOWNER NAME _____ Field Or Unit _____

Designed by: _____ Date _____

Reviewed by: _____ Date _____

Approved by: _____ Date _____ NRCS Engr. Job Class 3

_____ Section _____ Township _____ Range _____ County: _____

☐ 442_NE_IR-28 - Irrigation System Inventory Worksheet attached

System Capacity

CROP(S)	Application[1] Efficiency (%)	Peak[2] ET (in/day)	GIR (in/day)	System requirements (Without Endgun or Cornering System)	
				Total Q (gpm)	Total Q_{ac} (gpm/ac)
	%				
	%				
	%				

[1] Use Application Efficiencies as follows:

85%, High Pressure

87%, Medium Pressure

90%, Low Pressure

95%, LEPA

[2] Peak Daily ET from - *Irrigation System Inventory Worksheet*

$$Q = \frac{453\,A\,(GIR)}{t}$$

- or -

$$Qac = \frac{453\,(GIR)}{t}$$

Q = system requirements (gpm) **– or –** Q_{ac} = system requirements (gpm/ac)

ET = Peak Daily ET (in)

GIR = Gross Irrigation Requirements (in/day) = ET/eff

eff = efficiency of system

t = Hours/day (hours of operation per day) = _____

A = area irrigated by the base sprinkler package (acres), without end gun or cornering system = _____

Does the system capacity (water supply) meet peak Crop ET? ☑ Yes or ☐ No. If you answered "No", then review the paragraph below with the landowner/operator and discuss the potential risks.

The system capacity provided is 830.0 gpm* -or- _____ gpm/ac* compared to the system capacity required of 0.0 gpm* -or- 0.00 gpm/ac* to meet the peak crop ET. If the capacity provided is less than the capacity required the center pivot may not provide the necessary water to keep ahead of the maximum crop water use ($ET_{c\,max}$). The difference will need to be made up by available water in storage in the soil profile or by rainfall. If either is inadequate, the crop(s) may experience yield reduction.

* System capacity for this comparison does not include flow for end guns or cornering systems. Nozzle vendor shall account for additional water needs for these appurtenances.

Potential Runoff Analysis:

CPNozzle computed weighted potential runoff _____ %

(Attach a hard copy of the *CPNozzle* printout or document runoff parameters below)

System Wetted Length _____ ft.	Soil Texture: _____
System Capacity _____ gpm (without endgun)	Intake Family: _____
Design Application Amount _____ in.	Total Surface Storage _____ in. (residue and slope combined)
Minimum design wetted diameter at last nozzle _____ ft.	Soil name _____ Symbol _____

Hydraulic Analysis, Pivot Lateral

Section # 1	Length: 1270.0 ft	I.D. 6.395 in
Section # _____	Length: _____ ft	I.D. _____ in
Base sprinkler package flow rate (gpm) Flow rate of system end gun (gpm)		830.0 130.0
Center Pivot Lateral Friction Loss[3] (ft) Select either option: (•) Computed ==========➔ -or- ( ) From Supplier Printout ===➔		33.401
Minimum sprinkler pressure (ft)		34.65
Topography Elevation Difference, measured from pivot to highest point along lateral (ft)		
Height of Pivot (ft)		15.0
Minor Losses (ft)		
Additional operating pressure[4] (ft)		

Hydraulic Analysis, Mainline

Mainline Option # _____	Length: _____ ft	I.D. _____ in
Mainline material, indicate type of material and/or pressure rating (IPS, PIP, SDR, Class) Other material (provide description)		
Flow (gpm)		960.0
Topography Elevation Difference, measured from well or pump to outlet location (ft)		
Velocity (fps)		
Mainline Friction Loss[3] (ft)		0.000
Minor Losses (ft)		
Total Mainline Losses (ft)		0.00

[3] Hazen-Williams friction factor "C" used for lateral 140 - or describe and attach computations of other method of center pivot lateral friction loss utilized.

[3] Hazen-Williams friction factor "C" used for mainline 150 - or describe and attach computations of other method of mainline friction loss utilized

Multiple Outlet Factor used: 0.555 (Typically 0.555 for center pivots)

[4] Applies where pressure regulators are required, typically 5 psi or 11.6 ft.

☐ Attach: Profile of irrigation system and/or plot of Hydraulic Grade Line (HGL). A plotted HGL is a required attachment. In lieu of completing the above "Hydraulic Analysis" show data in graphical form, with notes, and calculations shown on the plotted HGL

Minimum Pressure Head required at well discharge = 83.1 ft Design Q = 960.0 gpm

Pressure Head supplied at well discharge = _____ ft Supplied Q = _____ gpm

Does pump meet minimum system requirements? (Y/N) _____

☐ Attach: 533_NE-IR-85 - Pumping Plant Inventory and Evaluation Worksheet

Print a blank copy.