Attachment 2.05.4(2)(e)-9

Flood and Sideroll Irrigation Designs - Irrigated Pasture

Note: In this attachment are the irrigation designs for both Lloyd and Benson fields to be replaced as irrigated pasture (IP) in the post-mine condition. Details of the irrigation layouts can be seen on Map 2.05.4-5

The irrigation design worksheets are from the Colorado Irrigation Guide and National Engineering Handbook Sec. 15, Chap. 11.

SIDEROLL SPRINKLER IRRIGATION DESIGN WORKSHEET
Project Name: BENSON - ENST - ZOSTARES Section 6
Designer: Reviewed by:
PRELIMINARY DATA:  Design Crop: GRASS  Neel Zo Shores of  WATER TO OPERATE This  5. de Roll
PRELIMINARY DATA: WATER TO OPERATE This
Design Crop: SRASS 5. de Rall
Soil Name:
Town:
Sprinkler Lateral Slope
Minimum Pressure psi available for sideroll (check Rainbird sprinkler model and gpm chart. Stay out of grayed out area because of insufficient pressure to mist the water stream properly)
FIELD DIMENSIONS
Length 900 FT (L) (manifold or mainline direction) basically: (8) x 60ft x (17) x(18)
WIDTH 1320 1400 ft (W) (sideroll direction)
Soil Information: Design Group
Max Sprinkler App. Rate inch/hr (1)
Root Depth: 3' grass & 5'Alfalfa Ft (2)
Moisture Extraction: 3' grass & 5'Alfalfa ft (3)

2 3	in feet inches  st  ond  th
TOTAL AVAILABLE WATER (TAW)	Recommendation from NRCS 4.0" (grass) & 7.6" on Morgan Prime Farmland soils (4)
Management Allowance Deficiency (Table CO 684.2)	_50%(5)
IRRIGATION NET APPLICATION:	
= % OF Total TAW	
(4) x (5) (Decimal) = $(4.0)$ x $(50\%)$	
Net. App. = () in. <b>Z.O</b> in.	(6)
DAILY PEAK CONSUMPTIVE USE RAT (CO683.52)	E:21 for grass & .25 for alfalfain/day (7)
IRRIGATION FREQUENCY:	
= (Net Application) (6) Daily Peak Consumptive Use (7)	
$= \underbrace{(7.0)}_{(.21)} $ (Round down to next whole n	umber
= 9.5	

= (rounded down) days return period 
$$9$$
 days (8)

# IRRIGATION GROSS APPLICATION

# GROSS APP.

$$= \underbrace{\text{NET App.}}_{\text{Field Eff. \%}} X 100 \quad (6) \qquad = \qquad \underbrace{(2,0) \times 100}_{(70) \%}$$

$$=$$
 **2**, **9** in. (10)

# **MAX HOURLY WATER APPLICATION RATE**:

MAX APP Rate w/cover
(CIG Table 6-D-1, CIG Sec 2-C) in/hr (10A)

SET TIME 10 HR (11)

Normally 11 or 23 hrs/set..... (11hr for flood & 23hr for sprinkler)

# CHECK POSSIBLE HOURLY APPLICATION RATES

$$= Gr. App. In. (10) = (2.9)$$
Set time (11) 
$$(60)$$

= Hourly App. Rate = 
$$\sqrt{29}$$
 in/hr\* (12)

USE \_\_\_\_\_ in. Gross App. On \_\_\_\_\_ hr. Sets

Cidan	_11	C.		-
Sider	110	2	Daci.	ug.

Sprinkler set spacing: 60 ft (Sm)

Spacing of Nozzle Along Lateral: 40 ft (s1)

Q = Total flow rate, gpm

Number of CCC ditch shares: What ever IT TO KES

Note: 1 share of CC water equals 450gpm/35 shares = 12.86gpm

 $Q = \# CCC \text{ ditch shares x } 12.86 \text{gpm} = \underline{\qquad} (13)$ 

# Required Sprinkler Head Capacity:

Flow at Nozzle = Hourly App. Rate (12) x (Sm) x (s1)96.3 (conversion factor)

Selection (see chart)

Make Rainbird Model 30 PSH
Size 13/4 + X O inch Flow 7,08 gpm (14)

PSI @ Nozzle 35 psi (DP)

Dia. Zx.5/ ft.

36 novele x 7.08 gem = 255 gem 255 gpmx 35 shores = 19,9 shores = US6 20 Shares

36 novele for 1400' System

Number of Nozzles (33nozzles for a full 1320ft side roll system)

Number of 1280ft sideroll systems = # of nozzles (15) /33 = ( )/33 = (15a)

Total area of system(s):  $= \underbrace{ [(15) \times 40 \text{ft}] \times [(8) \times 60 \text{ft}]}_{43560}$   $= \underbrace{ [(36) \times 40 \text{ft}] \times [(9) \times 60 \text{ft}]}_{43560}$   $= \underbrace{ 17, 9}_{5eF} \underbrace{ \text{acres (16)}}_{17, 9} \underbrace{ 29.6}_{17, 9} = 1.65$ 

NEED 29,6AC

SYSTEM EFFICIENCY (maintenance, cleaning head gate, checking water, farmer needed time off) ... = ?/(8) .....(n out of total potential /shifts-days of irrigation). (17)

NUMBER OF SETS PER DAY:

$$= 24/(11)$$

$$= \underline{\hspace{1cm}} (rounded down) = \underline{\hspace{1cm}} (18)$$

FT/100FT (18)

# NET EFFECTIVE ACREAGE WATERED.

= 
$$(16) \times (17)\% \times (18)$$
  
=  $(17.9) \times (\frac{15}{18}) \times (\frac{2}{18})$   
=  $\frac{29.8}{6000}$  ACRES

# NUMBER OF SIDE ROLL SYSTEMS (full or parcel)

SIDEROLL LENGTH SRL

= Nun	nber of Nozzles(15)/33	
=(	)/33	
=	(round up)	(19)

DETERMINE SIDEROLL HEADLOSS: This System is under a
DETERMINE SIDEROLL HEADLOSS: This System is under a Diesel Punp so side a Spec. Allows a variation of up to +/- 10% of the design pressure without special desing.
MULTIPLE OUTLET FACTOR =(F)  (Table CO685.72) use # outlets per sideroll
LATERAL SIZE = Use 5 in. Dia Aluminum Pipe (sideroll pipe)
FLOW PER SIDEROLL(s) = $\{\# \text{ HEADS (15)}\}\ X \{\text{NOZZLE FLOW (16)}\}$
= () X ()
=(20a)
SIDEROLL HEADLOSS PER 100LF = (Table CO685.73) for 40 ft pipe lengths

# TOTAL SIDEROLL HEADLOSS

WITH 5" LATERAL

# PRESSURE GAIN ( or LOSS) DUE TO FIELD SLOPE

Note" Look at most restrictive conditions in an entire field

= 
$$\frac{\text{(S)\% X (SRL)}}{2.31 \times 100} = \frac{\text{) x ()}}{2.31 \times 100}$$
  
=  $\frac{\text{+/- psi (20)}}{\text{pressure due to elevation change}}$ 

#### PRESSURE VARIATION:

\*PRESSURE VARIATION MUST NOT EXCEED +/-10% OF DP. If flow control nozzles are used, then +/-10% pressure limit can be dealt with easily.

# REQUIRED PRESSURE AT MAINLINE AT BEGINNING OF SIDEROLL (MPS)

NUMBER SETS 
$$= \underline{ML} + 1 \qquad = \qquad \underline{\qquad \qquad } + 1 = \underline{\qquad \qquad }$$
sets per field 
$$\underline{Sm} \qquad \qquad (\qquad 60 \qquad )$$

\* Use multiples of 60ft. Note this length may be shorter if 60 ft swing lines are used.

# MAINLINE CAPACITY

(Manifold)

# **TOTAL SIDEROLL PRESSURE REQURIED:**

# Main Line Head Loss per 100ft.

# siderolls (15a)=		
gpm per sideroll (20a) =	gpm	
	A7949.	
Mainline material & Diameter	(21)	
Length of Mainline Pipe	(L)	
Hazen Williams "C" factor		
Friction Loss ft/100 (chart)	(24)	

Total Main line Head Loss 
$$= \{(L) \times (24)\}/(2.31 \times 100)$$

Mainline pressure losses are found by using the pipeline computer program. Mainline losses should be checked at the beginning set and last set and any restrictive sets in between.

Total = 
$$(22) + (25)$$
 or  $(22) + (25)$   
=  $(22) + (25)$   
=  $(22) + (25)$   
=  $(22) + (25)$   
psi at beginning of system.

# FRICTION LOSS IN VARIOUS PIPE

Values in this table are Friction Loss Constants (C) for Various Pipe Materials - use these values to plug in to the next 11 pages of tables ("Des" in the column head below is for "Design or in-service.)

C Range C New, C

			C New,	
Pipe material or surface coating Acrylonite butadiene styrene (ABS)	High	Low	Clean	Des
Acrylonite butadiene styrene (ABS)	150	120 .	140	. 130
Aluminum	1011	150.		
Achastas coment	160	140 .	150	. 140
Acabalt lining	140	130 .		
Brass	150	120.	14U	. 130
D. C. I				1181
Contiron peoplet costed	140	90	130	. 100
Coot ivon hitumoetic anamai linga	1761	1411		
Coot iron hituminous lined	160	730	150	. 140
Cast iron cement lined	120	100.	140	. 120
Cast iron new unlined	150	110.	, 130	. 120
Cast iron old unlined	120	bD.		00
Cast iron sea-coated	140	100.	130	. 120
Com ant lining	7.4(1)	130		
Concrete	150	90.	120	.100
Concrete lined steel forms	140			
Congrete lined wooden forms	120			co-co-co
Concrete old	110	100		
Concrete steel forms	140			********
Congrate wooden forms	120			
A	360	17/11	1411	1.311
Ductile iron coment-lined	140	100		120
Tihar	141	140		
Calvanizad iron	150	120	140	100
Cloro	120	110		130
heal	150	120	140	. 130
Diactic	150	120	140	100
Polyethylene	150	140	150	140
Polyvinyl chloride (PVC)	150	120	140	100
Stool coal-for anomal lined	150	140		ummu
Steel, corrugated			60	60
Steel interior riveted no projecting rivets	140.	100	130	110
PALL THUS BUT	S		16V.	1.10
a sale of the might riverte			730	1181
Stant wolded and seamless	150.	100	140	IW
Tin	150 :	120	in 140	100
Vitritian day	140.	100		110
Wrought iron, plain	150	80	130	100
mought for paintenance		3 !		

Notes:

1. Values shown above are used in the Hazen-Williams equation for flow in pipes. Feet of Head Loss values shown on the next 11 pages were developed using the Hazen-Williams equation and the constants from the above table.

2. Feet of Head Loss values are subject to the following conditions:

a) Pipes carrying clear water at approximately 60° F (15.6°C).

b) Pipes are flowing full.

c) Velocities of water are generally less than 10 feet per second.

406	Water	
·····		

1 1 2 2 1 5 1	Head	088/100	Feet Pl	oe Due T	a Frictio	1: C=60	
Flow			Dameter			age 406	
(qpm)	1/2	3/4	15010	1-1/4	1-1/2	2	2-1/2
0.5	4.4	0.6	0.2	0.1	-	-	
1	15.9	2.2	0.5	0.2	0.1	-	-
2	57.2	7.9	2.0	0.7	0.3	0.1	-
3		16.8	4.1	1,4	0.6	0.1	
4		28.6	7.1	2.4	1.0	0.2	0.1
5		43.3	10.7	3.6	1.5	0.4	0.1
10			38.4	13.0	5.3	1.3	0.4
15			81.3	27.4	11.3	2.8	0.9
20				46.7	19.2	4.7	1.6
30				98.9	40.7	10.0	3.4
40					69.3	17.1	5.8
50						25.8	8.7
60						36.1	12.2
70						48.1	16.2
80						61.6	20.8
90						76.5	25.8
100						93.0	31.4
150							66.4
200							
250							
300							
400							
5000	3	4		6	8	10	12
5	0.1			1		1	
10	0.2			1			1
15	0.4	0.1					
20	0.7	0.2	0.1				1
30	1.4	0.3	0.1	1		1	
40	2.4	0.6	0.2	0.1	1	1	
50	3.6	0.9	0.3	0.1	1		
60	5.0	1.2	0.4	0.2	1	1	
70	6.7	1.6	0.6	0.2	0.1	1	
80	8.5	2.1	0.7	0.3	0.1		
90	10.6	2.6	0.9	0.4	0.1	1	
100	12.9	3.2	1.1	0.4	0.1	1	7 .
	27.3	6.7	2.3	0.9	0.2	0.1	1
150 200	46.5	11.5	3.9	1.6	0.4	0.1	0.1
250	70.3	17.3	5.8	2.4	0.6	0.2	0.1
	98.5	24.3	8.2	3.4	0.8	0.3	0.1
300	90.0	41.3	13.9	5.7	1.4	0.5	0.2
400	-		21.1	8.7	2.1	0.7	0.3
500	+	62.5	29.5	12.1	3.0	1.0	0.4
600	-	87.5		16.2	4.0	1.3	0.6
700	-	+	39.3	20.7	5.1	1.7	0.7
800	-	-	50,3		6.3	2.1	0.9
900	-	+	62.5	25.7	7.7	2.6	1.1
1000	+		76.0	31.3		3.6	1.5
1200	-	4	-	43.8	10.8		2.3
1500			-	66.2	16.3	5.5	3.9
2000	3	1	-	-	27.8	9.4	8.2
3000	-	-		-	58.8	19.8	
4000	-		-	+	+	33,8	13.9
5000						51.0	21.0

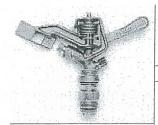
Water

407

1404	Head	Loss/10	0 Feet P	pe Due T	o Friction	1:0-1	0:5220	PART.	U <sub>n-d</sub> 1	man/HAA	Carl Di	e Due To	Coledia	. D. 140	e se
Flow		Pip	Diamete	r finchi	Coan	one the	00200000		Head			ie Due i ( (indh)		age 406	
(gpm 0.5	1.1	0.1	1	1-1/4	1-1/2	2	2-1/2		1/2	34	1	1-1/4	1-1/2	2	2-1/2
1	3.8	0.5	0.1	-	-	-		0.5	0.9	0.1				18	
2	13.7	1.9	0.5	0.2	0.1	-	-		3.3	0.5	0.1	101		-	
3	29.0	4.0	1.0	0.3	0.1		+	3	11.9	3.5	0.4	0.1	0,1	-	
4	49.3	6.8	1.7	0.6	0.2	0.1		4	43.0	6.0	1.5	0.5	0.2	0.1	
5 10	74.5	10.3 37.3	9.2	0.9	0.4	0.1			65.0	9.0	2.2	0.7	0.3	0.1	
15		79.0	19.5	3.1 6.6		0.3	0.1	10		32.5	8.0	2.7	1.1	0.3	0.1
20		1	33.1	11.2		0.7	0.2	15		68.9	17.0	5.7	2.4	0.6	0.2
30			70.1	23.7		2.4	0.8	20 30	-	-	28.9 61.2	9.7	4.0 8.5	1.0	0.3
40		-	-	40.3	16.6	4.1	1.4	40	-	-	101.2	35.1	14.5		1.2
50 60	-	-	-	60.9		6.2	2.1	50				53.1	21.8		1.8
70		+-		85.3		8.6	2.9	60				74.4	30.6	7.5	2.5
80			-			11.5	3.9	70				98.9	40.7		3.4
90						18.3	5.0	80				1	52.1		4.3
100					1	22.2	7.5	90		-		-	64.8 78.7	16.0	5.4 6.5
150	-	-	1			47.1	15.9	150		+	-	-	10.1	41.1	13.9
200 250	+	-	-	-		80.2	27.1	200						69.9	23.6
300	-	-	+	-			40,9	250							35.6
100		1	1	-			57.3 97.5	300						-	49.9
	3	4	5	6	8	10	12	400	3					46	85.0
	-						14.	5	3	4.	5	6	0	10	12
0	104	-	-					10		<del>                                     </del>		-			
5	0.1	-	-						0.1						
0	0.3	0.1	-					20	0.1						7
0.	0.6	0.1						30	0.3	0.1	-	-		-	
0	0.9	0.2	0.1						0.5	0.1	0.4	-	-		
0	1.2	0.3	0.1						1.0	0.2	0.1		-	-	
0	1,6	0.4	0.1	0.1					1.4	0.3	0.1	1		1	
***********	2.0	0.5	0.2	0.1					1.8	0.4	0.1	0.1			
	3.1	0.8	0.2	0.1				90	2.2	0.5	0.2	0.1			
	6.5	1.6	0.5		0.1				2.7	0.7	0.2	0.1			
00	11.1	2.7	0.9	-	0.1				5.7	1.4	0.5	0.2	-	-	
	16.8	4.1			0.1				9.7	2.4	1.2		0.1	-	
	23.6		2.0			).1			20.6	3.6	1.7	0.5	0.1	0.1	-
	40.1 60.7		3.3			).1			35.0	8.6	2.9		0.3	0.1	
·							0.1	500	52.9	13.0	4.4		0.4	0.2	0.1
00							0.1		74.1	18.3	6.2	2.5	0.6	0.2	0.1
00			************				0.1		98.5	24.3	8.2	3.4	0.8	0.3	0.1
00							0.2	800	-	31.1	10.5		1.1	0,4	0.1
000							0.3	900	-	47.0	15.8	6.5	1.6	0.5	0.2
00					2.6 0	.9	0.4	1200		65.8	22.2	9.1	2.3	0.8	0.3
00					1.9 1.		0.5	1500		99.4	33.5		3.4	1.1	0.5
00					1.6 2.		0.9	2000			57.1	23.5	5.8	2.0	0.8
00					4.1 4. 3.9 8.		2.0	3000				49.8	12.3	4.1	1.7
00							3.3	4000					20.9	7.0	2.9
					112			5000			<u></u>	1	31.5	10.6	4,4
4			117-	4											
7			Wa	ier .							W	ater			415
			***************************************												

									and the same of	HAAF.	et Pipe i	Due To F	riction :	C=160	
	Head	Loss/100	Feet Pi	e Due 1	o Frictio	n : C=15	0	H	ad Loss	y100 re	meter (in	21)	See pag	e 406	0.47
Flov	W	Pipe	Diameter	(inch)	Saa	nace 406	95952	#	1/2	9/4	meter (in	1-1/4	1-1/2	2	2.1/2
Ligan		3/4	1	1-1/4	1-1/2	2	2.173	0.		1					-
0.5	2.9	0.1	0.1	-	-	+	-	12	6 0		0.1	0.1	-		
2	10.5	1.5	0.4	0.1	-	+	+-1	9				0.2	0.1		
3	22.2	3.1	0.8	0.3	0.1	-	1		9.7 2	1		0.4	0.2	-	
4	37.9	5.3	1.3	0.4	0.2						1.7	0.0	9.14	0.1	0.1
<u>5</u>	57.2	7.9	2.0	0.7	0.3	0.1		- 10		5.4	0,0	Bat I			0.2
15	-	28.6 60.6	7.1	2.4	1.0	0.2	0.1	-		-	1010	7.0		0.8	0.3
20	-	100,0	14.9 25.4	5.0 8.6	3.5	0.5	0.2		- 19					1.6	0.6
30			53.8	18.2	7.5	1.8	0.6	_				27.4	11.3	410	0.9
40			91.7	30.9	12.7	3.1	1.1	-			01.0	41.5	1111	1110	2.0
50		-	-	46.7	19.2	4.7	1.6	-				58.1	P010		2.6
<u>60</u> 70	-	-	-	65.5	26.9	6.6	2.2	-				77.3	31.8	10.0	3.4
80	1	_	-	87.1	35.8 45.9	8.8	3.0					98.9	50.6	12.5	4.2
90			1	-	57.0	14.1	3.8 4.7				-	-	61.5	15.2	5.1
100					69.3	17.1	Iro S	0			-			Uhaii	10.8
150	-					36.1	12.2	0					-	54.6 82.5	27.8
200		-	-			61.6	20.8	0					-	1022	39:0
250 . 300 ·		-		-	-	93.0	31.4	00				-	-		66.4
400	38	+	1	-	┼──	+		00		10000000	C. C.	6	8	10	12
	3	6642	5	6	8	10	12		3	4	1				-
5		1			1		-			-				-	+
10								0	0.1	+				-	+
15	0.1				-		1 8	5	0.1				-	+	
20 30	0.1	0.1	-		-	-	- 3	0	0.2	0.1	-	-	+	1	
40	0.4	0.1	<del>                                     </del>		-	-	1 1	0	0.4	0.1	-	-	-	-	+-
50	0.7	0.2	0.1				1	0	0.6	0.1	0.1			-	+-
60	0.9	0.2	0.1					0	0.8	0.3	0.1		-	-	-
70 80	1.2	0.3	0.1	0.4	-	-		70 80	1.4	0.3	0,1	01	+-	-	
90	2.0	0.4	0.1	0.1	-	-	- 1	90	1.7	0.4	0.1	0.1	-	3	-
100	2.4	0.6		0.1		<del>                                     </del>	1	100	2.1	0.5	0.4	0.2			+-
150	5.0	1.2		0.2				150	4.5	1.1	0.6	0.3	0.1		+
200	8.5	2.1			0.1		1	200	7.6	2.8	1.0	0.4	0.1	-	+
250 300	12.9	3.2 4.5			0.1		13	250 300	16.1	4.0	1.3	0.5	0.1	0.1	
400	30.8	7.6	1.5		0.2	0.1	- 1	400	27.3	6.7	2.3	1.4	0.3	0.1	-
500	46.5	11.5	3.9			0.1	0.1	500	41.3	10.2		2.0	0.5	0.2	0.1
600	65.2	16.1	5.4			0.2	0.1	600	57.9	14,3		2.6	0.6	0.2	0.1
700	86.7		7.2	3.0	0.7	0.2	0.1	700	98.5	24.3	8.2	3,4	0.8	0.3	0.1
800	-				0.9		0.1	900	30.0	30.2	10.2		1.0	0.4	0.2
900	-	34.0 41.3			1.2	0.4	0.2	1000		36.7	12.4		1.8	1.0	0.2
1200	1	57.9	19.5			0.5	0.2	1200		51.4				0.9	0.4
1500			29.5				0.4	1500		77.7	44.6	-	4.5	1.5	
2000					5.1		0.7	2000		-	94.	4 38.	9.6		-
3000	-			43.8	10.8	3.6	1.5	3000		-		66.	2 16.		-
4000 5000	+	-	_			6.2	2.6	4000 5000		d 1 27	1	:	124.	0 .10.0	- 1
2000					27.8	9.4	3.9	1000							
CONTRACTOR CONTRACTOR															
$\overline{416}$			Wa					-				Wate	r		

no (806) 753-3591 Fax (806) 753-3144 Web: www.bosstriggston.com			Factory mude, new B2Xx 13 mex on hall bearing synedles. Trailer hich mounted for towing. Bide wheeks and all risers aches it using parable to most any type of crop. Existly dissurembed for whiping or starrage. List price does not include this Gom Sprinkler.  SIZE WEIGHT PRICE  725.50	UN CARTS
PSI   Nozzle 9/94	30WSH ST. Bore Nozzles  Stream Height 9'  Pan # Size List Price 100345001 30WSH \$ 18:30  (One Outlet with Nozzle)	Records 9847 x 187-200   Records 116x7x 187x20   Records 9847 x 187x20   Acquires 3027x 187x20   Acq	SPRINKLERS  30H/ST. Bore Drive Nozzle (1/8" Spreader)  Stream Height 9'  Part Size List Price 100345002 30H \$ 21.10  (Two Outlet with Nozzles)	



RAIN BIRD

#### PERFORMANCE DATA

30PSH

# 30PSH

# 3/4" Full Circle, Brass Impact Sprinkler

Bearing: 3/4" Male NPT, Brass Trajectory Angle: 27° Operating Range: 25-100 psi Flow Rate: 5.89-23.4 GPM Radius: 47-68 ft.

#### FEATURES

- · Heavy duty brass construction
- High pressure spoon
   High pressure spoon
   Stainless steel springs and fulcrum pin
   Chemically resistant washers
   Dual nozzle ports

- Two-year warranty

#### BENEFITS

- · High pressure spoon allows for larger nozzles and pressures
- Exceptionally wide range of flow rates
   Corrosion and grit resistant
- · Built to last

Straight Bore Nozzle (SBN-3) Brass Straight Bore Nozzle with Spreader (LAN-1-20) (Stream Height: 10 ft.) and Vane (SBN-3V) with Plug (Stream Height: 10 ft.)

				NOZZI	0° x1/8-20° x 1/8- PM Rad. 0PM Rad. 1,020 51 11.30 52 1 1,100 52 12.20 54 1 1,90 54 13.00 55 1 1,30 56 14.50 58 1 1,30 57 15.30 59 1 1,40 58 15.30 60 1 1,90 59 15.00 61 1				
PSI @		64" 8-20					1/4" x 1/8-20		
Nozzle	Rad.	GPM	20°         x 1/8-20°         x 1.8           8.30         cPM         Rad.           8.83         48         9.24         49           9.15         50         10.20         51           9.94         452         11.10         52           1.10         54         12.70         55           1.30         54         12.70         55           2.50         55         13.30         57           3.00         57         14.40         58           4.00         59         15.40         60           4.00         59         15.40         60	GPM	Rad.	GPM			
25	47	8.30	48	9.24	49	10.30	50	11.30	
30	49	9.15	50	10.20	51	11.30	52	12,40	
35	51	9.94	52	11.10	52	12.20	54	13.50	
40	52	10.70	53	11.90	54	13,00	56	14.50	
45	53	11.30	54	12.70	55	13.80	57	15,40	
50	53	11.90	55	13.30	56	14.50	5B	16.20	
55	54	12.50	56	13.90	57	15.30	59	17.00	
60	55	13.00	57	14.40	58	15.30	60	17.70	
65	56	13.50	5B	14.90	59	16.00	61	18.40	
70	57	14.00	59	15.40	60	17.20	52	19.10	
75	58	14.50	60	15.90	61	17.80	63	19.80	
80	59	15.00	61	16.40	62	18.40	64	20.50	
85	60	15.43	62	16.81	63	18.90	65	21.20	
90	61	15.87	63	17.25	64	19.30	56	22.00	
95	62	16.29	64	17.67	65	19.80	67	22.70	
100	53	16.71	55	18.08	66	20.20	68	23.40	

		NOZZLE SIZE													
	13/	64"	7/	32"	15	64"	1/4"								
SI @ ozzle			Rad.	GPM	Rad.	GPM	Rad.	GPM							
5	47	5.89	48	6.83	49	7.90	50	8.90							
0	48	6.51	50	7.58	51	8.70	52	9.80							
5	51 6	7.08	52	8.26	52	9.40	54	10.60							
0	52	7.60	53	8.87	54	10.00	56	11.40							
5	53	8.07	54	9.41	56	10.60	57	12.40							
D	53	8.49	55	9.88	56	11.10	58	12.80							
5	54	8.87	56	10.30	57	11.60	59	13.40							
D	55	9.20	57	10.60	58	12.10	60	14.00							
5	56	9.47	58	10.95	59	12.60	61	14.60							
9	57	9.78	59	11.29	60	13.10	62	15.10							
5	58	10.18	60	11.71	61	13.60	63	15.60							
)	59	10.52	61	12.10	62	14.00	64	16.10							
5	60	10.84	62	12.52	63	14.40	65	16.60							
)	61	11.17	63	12.94	64	14.80	66	17.10							
9	62	11.50	64	13.38	65	15.20	67	17.50							
10	63	11.83	65	13.83	66	15.60	68	18.00							

#### PART NUMBERS AND ORDERING INFORMATION

Ordering Example	MAKE YOUR SPRINKLER	CHOOSE NOZZLE SIZE(S)	ADD THEM TOGETHER TO
	CHOICE FROM CHART I	FROM CHART 2	CREATE THE PART NUMBER
To order a 30PSH sprinkler with a 13/64" Brass Straight Bore Nozzle and a 1/8" Brass 20° Low Angle Spreader Nozzle the part number would be:	A08714	- 13-08 =	= A08714-13-08

Chart 1	PART NUMBER: FIRST HALF
SPRINKLER ONLY/PLUG	APPROXIMENT OF
Sprinkler without Nozzle	A08713
SPRINKLER WITH COMBINATION NO	ZZLES INSTALLED
Sprinkler with SBN-3 and LAN-1-20	A08714-
Sprinkler with SBN-3V and LAN-1-20	A10803-

	PART N	UMBER: SECO	ND HALF	
1/8"	13/64"	7/32"	15/64"	1/4"
	13	14	15	16
	13	14	15	16
08				
		1/8" 13/64" - 13 - 13	1/8"         13/64"         7/52"           -         13         14           -         13         14	-     13     14     15       -     13     14     15

SIDEROLL SPRINKLER IRRIGATION DESIGN WORKSHEET
Project Name: Benson - South = 12 shores Section 6
Designer: Ross Gubka Reviewed by:
PRELIMINARY DATA:
Design Crop: GRASS
Soil Name:
Town: Nucla
Sprinkler Lateral Slope
Minimum Pressure psi available for sideroll (check Rainbird sprinkler model and gpm chart. Stay out of grayed out area because of insufficient pressure to mist the water stream properly)
FIELD DIMENSIONS
Length 1297 FT (L) (manifold or mainline direction) basically: (8) x 60ft x (17) x(18)
WIDTH 1320 800 ft (W) (sideroll direction)
Soil Information:
Design Group
Max Sprinkler App. Rate inch/hr (1)
Root Depth: 3' grass & 5'Alfalfa Ft (2)
Moisture Extraction: 3' grass & 5'Alfalfa ft (3)

12 Shares Of CCC WATER TO OPERATE a 800 × 1320
5 decoll

(CIG 2-C)	1 <sup>st</sup>	in feet		
	2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>			
TOTAL AVAILABLE WATER (TAW)			ation from NRCS <u>(</u> 5" on Morgan Pri oils (4)	The state of the s
Management Allowance Deficiency (Table CO 684.2)		50	_% (5)	
IRRIGATION NET APPLICATION:				
= % OF Total TAW				
(4) x (5) (Decimal) = $(4.0)$ x (50%)	(د			
Net. App. = ( ) in in	n. (6)			
DAILY PEAK CONSUMPTIVE USE RA (CO683.52)	ATE:	.21 for grass &	z .25 for alfalfa_	in/day (7)
IRRIGATION FREQUENCY:				
= (Net Application) (6) Daily Peak Consumptive Use (7)				
$= \underbrace{(2,0)}_{(,2/)} $ (Round down to next whole	numb	oer		
=9.5				

= (rounded down) days return period \_\_\_\_\_ days (8)

# **IRRIGATION GROSS APPLICATION**

DESIGN FIELD EFFICIENCY (70% FOR SIDE ROLL SPRINKLERIRRIGATION) (CO685.69) 70 % (9)

# GROSS APP.

$$= \underbrace{\text{NET App.}}_{\text{Field Eff. \%}} X 100 (6) = \underbrace{(Z,O) \times 100}_{(70) \%}$$

# **MAX HOURLY WATER APPLICATION RATE:**

MAX APP Rate w/cover
(CIG Table 6-D-1, CIG Sec 2-C) \_\_\_\_\_in/hr (10A)

<u>SET TIME</u> <u>/O</u> HR (11)

Normally 11 or 23 hrs/set..... (11hr for flood & 23hr for sprinkler)

# CHECK POSSIBLE HOURLY APPLICATION RATES

$$= \underline{Gr. App. In. (10)}$$
Set time (11) 
$$= \underline{(2.9)}$$

$$(10)$$

= Hourly App. Rate = 
$$.29$$
 in/hr\* (12)

USE \_\_\_\_\_ in. Gross App. On \_\_\_\_\_ hr. Sets

C' 1 11	$\alpha$	
Sideroll	In	acino.
Diucion	DP	acing.

Sprinkler set spacing: 60 ft (Sm)

Spacing of Nozzle Along Lateral: 40 ft (s1)

Q = Total flow rate, gpm

Number of CCC ditch shares: Whatever To Take 5

Note: 1 share of CC water equals 450gpm/35 shares = 12.86gpm

Q = # CCC ditch shares x 12.86gpm = \_\_\_\_ = (13)

# **Required Sprinkler Head Capacity:**

Flow at Nozzle = Hourly App. Rate (12) x (Sm) x (s1)96.3 (conversion factor)

Selection

(see chart)

Make\_Rainbird\_\_\_\_ Model 30 P5 H

Size

13/64 inch 7,08 gpm (14)

PSI @ Nozzle 35 psi (DP)

STOP HERE- WE ONLY MEED TO KNOW the quanty of water To operate A BOOFT Long Side Roll

Conclusion: 300 FT +1 = 21 NOZZILED

21 Horrle x 7.08 gpm = 149-9PM

149 50m x 355chine = 11.6 shores = USE 1.7 Shores

Number of Nozzles (33nozzles for	a full 1320ft side roll system)
=(13)/(14)	
= ( )/( )	
=	(Round down)
=	Use =(15)
Number of 1280ft sideroll systems	= # of nozzles (15) /33 = ( )/33 = (15a)
Total area of system(s): =	[(15) x 40ft] x [ (8) x 60ft] 43560 [( ) x 40ft] x [( ) x60ft]
=	43560acres (16)
	ance, cleaning head gate, checking water, farmer needed(n out of total potential /shifts-days of irrigation). (17)
NUMBER OF SETS PER DAY:	
= 24/(11)	
= 24/	

=\_\_\_\_\_(rounded down) = \_\_\_\_\_(18)

	= (16) x	(17)% x (	18)		
	=(	) x (	) x (	)	
	=		ACRES		
NUMBER OF SIDE ROLL	L SYSTE	MS (full o	r parcel)		
= Number of Nozzle = ( )/33	s(15)/33				
= (rou	nd up)		(19)		
DETERMINE SIDEROLI	HEADL	OSS:			
Spec. Allows a variation of u	up to +/- 1	0% of the	design press	ure without special desing.	
MULTIPLE OUTLET FA (Table CO685.72) use # outlets per sideroll					
LATERAL SIZE = Use 5 (sideroll pipe)	5 in. Dia A	luminum 1	Pipe		
FLOW PER SIDEROLL(s)	= {# HE	ADS (15)	X {NOZZI	LE FLOW (16)}	
	= (	) X (	)		
	=			(20a)	
SIDEROLL HEADLOSS I (Table CO685.73)	PER 100I	_F =			
for 40 ft pipe lengths SIDEROLL LENGTH SRL		=_	-	FT/100FT (	18)

NET EFFECTIVE ACREAGE WATERED.

#### TOTAL SIDEROLL HEADLOSS

WITH 5" LATERAL

$$= \underbrace{\text{(Sideroll Lenght {SRL} x {Headloss {18}) x (F)}}_{\text{(2.31) x (100)}}$$

$$= \underbrace{\text{() x () ) x ()}_{\text{2.31 x 100}}$$

$$= \underbrace{\text{(19)}_{\text{(19)}}}$$

#### PRESSURE GAIN ( or LOSS) DUE TO FIELD SLOPE =

Note" Look at most restrictive conditions in an entire field

$$= \underbrace{\frac{\text{(S)\% X (SRL)}}{2.31 \times 100}} = \underbrace{\frac{\text{) x (}}{2.31 \times 100}}$$

$$= \underbrace{\frac{\text{+/- psi (20)}}{\text{pressure due to elevation change}}}$$

#### PRESSURE VARIATION:

\*PRESSURE VARIATION MUST NOT EXCEED  $\pm -10\%$  OF DP. If flow control nozzles are used, then  $\pm -10\%$  pressure limit can be dealt with easily.

# REQUIRED PRESSURE AT MAINLINE AT BEGINNING OF SIDEROLL (MPS)

For Level Laterals 
$$= (DP) + 0.75 (19) + 1$$
  
 $= ___ + 0.75 ( ) + 1 = __ (MPS) ____$   
MANIFOLD LENGTH (ML)\*  $=$ Field Length (L) - (1)(Sm)  
 $= ( ) - (1x 60 ) = ___ ft (ML)$ 

NUMBER SETS 
$$= \underline{ML} + 1 \qquad = \qquad \underbrace{ \qquad \qquad }_{\text{Sm}} + 1 = \underline{\qquad \qquad }_{\text{sets per field}}$$

\* Use multiples of 60ft. Note this length may be shorter if 60 ft swing lines are used.

#### **MAINLINE CAPACITY**

(Manifold)

# TOTAL SIDEROLL PRESSURE REQURIED:

# Main Line Head Loss per 100ft.

# siderolls (15a)= gpm per sideroll (20a) =	gpm	
Mainline material & Diameter	(21)	
Length of Mainline Pipe	(L)	
Hazen Williams "C" factor		
Friction Loss ft/100 (chart)	(24)	

Total Main line Head Loss 
$$= \{(L) \times (24)\}/(2.31 \times 100)$$

$$= \{( ) \times ( )\}/(2.31 \times 100)$$

$$= \sum_{n=1}^{\infty} psi(25) \sum_{n=1}^{\infty} (25) \sum_{n=1}^{\infty}$$

Mainline pressure losses are found by using the pipeline computer program. Mainline losses should be checked at the beginning set and last set and any restrictive sets in between.

Total = 
$$(22) + (25)$$
 or  $(22) + (25)$   
=  $(22) + (25)$   
=  $(22) + (25)$   
=  $(22) + (25)$   
psi at beginning of system.

#### FRICTION LOSS IN VARIOUS PIPE Head Loss/100 Feet Pipe Due To Friction : G=60 Pipe Diameter (inch) Values in this table are Friction Loss Constants (C) for Various Pipe 1-1/2 2 2-1/2 (CDETT) Materials - use these values to plug in to the next 11 pages of tables 4.4 0.6 0.2 0.1 ("Des" in the column head below is for "Design or In-service.) 2.2 0.5 0.2 57.2 7.9 2.0 0.7 0.3 C Range C New, C 16.8 4.1 11.4 0.6 0.1 High Low Clean Des Pipe material or surface coating 28.6 7.1 2,4 1.0 0.1 ..150 ..... 120 ..... 140 ..... 130 Acrylonite butadiene styrene (ABS).. 43.3 10.7 3.6 0.4 0.1 .150 .... 130 .... 38.4 13.0 5.3 1.3 0.4 ....160 ..... 140 ..... 150 ..... 140 0.9 Asbestos cement. 81.3 27.4 11.3 2.8 ..... 130 ..... Asphalt lining.... 46.7 19.2 4.7 ...150 ..... 120 ..... 140 ..... 130 Brass ..... 98.9 40.7 10.0 3.4 30 Brick sewer... 40 69.3 17.1 15.8 .140 ......90 ..... 130 ..... 100 Cast iron, asphalt coated ...... 50 25.8 8.7 ..150 .....140 ...... ...160 .....130 .....150 .....140 Cast iron, bitumastic enamel lined... 36.1 12.2 60 Cast iron, bituminous lined ...... 16.2 481 .150 ..... 100 ..... 140 ..... 120 Cast iron, cement lined .... 20.8 61.6 80 .150 ..... 110 ..... 130 ..... 120 Cast iron, new, unlined ... 76.5 25.8 120 ..... 60 ...... Cast iron, old, unlined ... 31.4 93.0 100 .140 ..... 100 ..... 130 ..... 120 Cast iron, sea-coated .... 66.4 150 ..... 130 ..... Cement lining ..... 200 150 ..... 90 .... 120 .... 100 Concrete... 250 Concrete lined, steel forms...... 300 Concrete lined, wooden forms...... 120 400 110 ..... 100 ...... Concrete, old..... 8 10 12 Concrete, steel forms...... 0.1 120 Concrete, wooden forms..... .150 ..... 120 ..... 140 ..... 130 0.2 Copper ..... .140 ..... 100 ....... 120 0.4 Ductile iron, cement-lined ... .150 ..... 140 ....... 0.7 Fiber ... 0.1 Galvanized iron..... .150 ..... 120 ..... 140 ..... 130 14 0.3 .120 ..... 110 ....... 130 .150 ..... 120 ..... 140 ..... 130 2.4 0.2 Glass 0.3 0.1 3.6 0.9 Lead ..... 150 120 140 130 150 140 150 140 150 120 140 150 140 0.4 60 1.2 0.2 5.0 Plastic. 0.2 6.7 1.6 10.6 Polyethylene.... Polyvinyl chloride (PVC). 80 Steel, coal-tar enamel lined ......150 ..... 140 ...... 2.6 0.9 0.4 10.6 90 0.1 0.4 100 12.9 0.9 0.2 6.7 150 27.3 46.5 11.5 1.6 0.4 0.1 200 2.4 0.6 0.2 0.1 70.3 5.8 250 0.8 0.1 300 98.5 Tin 150 120 140 130 Vitritied clay 140 100 110 Wrought iron, plain 150 80 130 100 13.9 5.7 1.4 0.5 400 21.1 2.1 500 600 29.5 12.1 3.0 1.0 0.4 16.2 4.0 1.3 0.6 700 800 20.7 5.1 Values shown above are used in the Hazen-Williams equation for flow in pipes. Feet of Head Loss values shown on the next 11 2.1 109 900 7.7 2.6 10.8 3.6 1000 76.0 31.3 11.1 pages were developed using the Hazen-Williams equation and the 1200 43.8 115 constants from the above table. 1500 66.2 16.3 5.5 Reet of Head Loss values are subject to the following conditions: A) Pipes carrying clear water at approximately 60° F (15.6°C). 9.4 2000 27.8 3.9 19.8 3000 58.8 b) Pipes are flowing full. 13.9 33,8 51.0 4000 c) Velocities of water are generally less than 10 feet per second. 5000 407 Water

Water

406

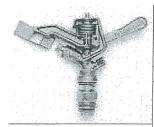
Flow	Head	Loss/10	) Feet P	pe Due T					Headl	.ose/100	Feet Pir	e Due T	o Friction	: C=140	
	1/2		Diamete	(inch)	See	age 406	2.1/2	Flow	9,6	Pipe I	Diameter	(inch)	See pa	age 406	
0.5	1.1	0.1		1-124	1-1/2	2	2.1/2	(gpm)			1	1-1/4	1-1/2	2	2-1/2
1	3.8	0.5	0.1					0.5	0.9	0.1	0.4		-	-	-
2	13.7	1.9	0.5	0.2	0.1			2	11.9	1.7	0.1	0.1	0.1	<del> </del>	-
4	29.0	4.0	1.0	0.3	0.1			3	25.3	3.5	0.9	0.3	0.1		
5	49.3 74.5	10,3	1.7	0.6	0.2	0.1		4	43,0	6.0	1.5	0.5		0.1	
10	174.5	37.3	9.2	3.1	1.3	0.1	-	5	65.0	9.0	2.2	0.7		0.1	
15		79.0	19.5	6.6	2.7	0.3	0.1	10		32.5	8.0	2.7			0.1
20		1	33.1		4.6	1.1	0.2	15		68.9	17.0	5.7			0.2
30			70.1		9.7	2.4	0.8	20	-	-	28.9	9.7	~~~~~~		0.3
40					16.6	4.1	1.4	30	-		61.2	20.6			1.2
50	-				25.1	6.2	2.1	40 50	-	-	-	35.1 53.1			1.8
60	-	-		85.3	35.1	8.6	2.9	60	1	1	+	74.4			2.5
70	-	-	-		46.7	11.5	3.9	70	<b> </b>	1	1	98.9			3.4
80 90	-	-			59.8	14.7	5.0	80	1	1	1	1		12.8	4.3
100	<del> </del>	-	-			18.3	6.2	90					64.8	16.0	5.4
150	1	-	-		90.3	22.2	7.5	100					78.7	19.4	6.5
200		1	-			47.1	15.9	150						41.1	13.9
250			-			80.2	27.1	200	ļ				-	69.9	23.6
300							40,9 57,3	250	-	-	-	-	-		35.6
400							97.5	300	<del> </del>	-	-	-			49.9
	3	4	5	6	8	10	12	400		4	207-00		8	44	***************************************
		-					16	5	3	4	0	1 6	1 0	10	12
0								10	-	-	-	-	-		
	0.1	-						15	0.1	+	1		<del>                                     </del>		
	0.2	0.1						20	0.1		1	1	1		
	0.3	0.1						30	0.3	0.1	Ì				
	0.9		0.1					40	0.5	0.1					
	1.2	1	0.1					50	0.7	0.2	0.1				
-	1.6			0.1				60	1.0	0.3	0.1				
		-		0.1	-			70	1.4	0.3	0.1	-	-		
0				0.1				80	1.8	0.4	0.1	0.1	-	-	
00 :	3.1			0.1				90 .	2.2	0.5	0.2	0.1	-		
	6.5				.1			100	2.7	0.7	0,2	0.1			
					.1			150	5.7 9.7	1.4	0.5	0.2	0.1	-	
				0.6	.1			200 250	14.7	3.6	1,2	0.5	0.1	-	
					.2	).1		300	20.6	5.1	1.7	0.7		0.1	-
						1.1		400	35.0	8.6	2.9	1.2	-	0.1	
							0.1	500	52.9	13.0	4.4	1.8			0.1
00							0,1	600	74.1	18.3	6.2	2.5			0.1
00			**************				0.1	700	98.5	24.3	8.2	3.4	0.8	0.3	0.1
00		-					0.2	800		31.1	10.5	4.3			0.1
000							0.2	900		38.6	13.0	5.4			0.2
200			-	7.5 1. 10.5 2.			0.3	1000		47.0	15.8	6.5			0.2
00				5.8 3.		****	0.4	1200		65.8	22.2	9.1			0.3
100				7.0 6.			0.5	1500	-	99.4	33.5	13.8			0.5
00			-		1 4		2.0	2000	-	-	57,1	23.5			0.8
00				7.2 2		-	3.3	3000		+		49.8			1.7
00				36		-	5.0	4000	-	-	-	84.7			4.4
								5000	<u> </u>		<u> </u>		(0.10	10.0	17,4
4			Wat	OM.											
7			well	er -							W	ater			415

H	lead Loss	s/100 Feet	Pine Dua	To Friedo	n : C=1¢		He	adioss	/100 Fe	et Pipe (	Oue To	riction : See pag	C=160 e 406	
Flow		Pice Diame	er (inch)	See	nace 406	650000	W	1/2	npe Dial	neter (in	1-1/4	1-1/2	2	2.1/2
	1/2	3/4	1-1/	1-1/2	2	2.1/3	0.	7 0.	1		-			
	9 0.		-	+	+	+	2.	6 0.		).3	0.1			
2 1	0,5 1.	5 0.4	0.1				9.	3 1.	-		0.2	0.1		
	2.2 3. 7.9 5.		0.3	0.1	-			3.6 4	7 1	-	0.,	0.2	0.1	
	7.2 7.		0.4	0.2	0.1	+-1		0.8 7	.0			0.9	0.2	0.1
10	28	3.6 7.1	2.4	1.0	0.1	0.1	-			13.3	4.5	110	0.5	0.2
15	60	0.6 14.9	5.0	2.1	0.5	0.2	$\dashv$		1.6	22.6	1.0	3.1 6.6	1.6	0.6
30	-	25.4 53.8	8.6	7.5	0.9	0.3	士			31.10		11.3	2.8	0.9
40		91.7	30.9	12.7	3.1	1.1					41.5	17.1	4.2	2.0
50			46.7	19.2	4.7	1.6	-				58.1	23.9	7.8	2.6
60 70			65.5	26.9	6.6	2.2	$-\dagger$				77.3 98.9	31.8	10.0	3.4
80			87.1	35.8 45.9	8.8	3.0					30.0	50.6	12.5	4.2
90				57.0	14.1	4.7						61.5	15.2	5.1
150	_		-	69.3	17.1	5.8					-	-	54.6	18.4
200	-	-	+	+	36.1 61.6	20.8	0				-		82.5	27.8
250 .					93.0	314	0					-	-	39.0
400			-	<del> </del>		44.0	0					80	10	-
	3.00	4 5	200	8	10			3	4	5	6	0		
5	- Marine		0	0	I IU	12				-	1			
10							)	0.1	-				-	+
15 0.1 20 0.1		_		-	-		0	0.1		-	+	+-	1	
30 0.3			+	-	-		0	0.2	0.1	+-	+		1	+
40 0.4	4 0.1						0	0.4	0.1					+
50 0.7 60 0.9			-				<u>0</u>	0.8	0.2	0.1		-	-	İ
70 1.2			-	-		3	70	1.1	0.3	0.1	-			-
80 1.6	6 0.4	0.1	0.1				80	1.7	0.3	0.1	0.1		-	+
90 2.0 100 2.4			0.1	-		ń	90 100	2.1	0.5	0.2	0.1	+-	-	1
150 5.0			0.1	1	-		150	4.5	1.1	0.4	0.2	0.1		1
200 8.5	5 2.1	0.7	0.2	0.1			200	7.6	1.9	1.0	0.4	0,1	-	-
250 12.			0.4	0.1		3	250	11.5	4.0	1.3	0.5	0.1	0.1	-
300 18. 400 30.			0.6	0.2	0.1	- 1	300 400	27.3	6.7	2.3	0.9	0.3	0.1	
500 46.			1.1		0.1	0.1	500	41.3	10.2	3.4	2.0	0.5	0.2	
600 65.	.2 16.	1 5,4	2.2	0.5		0.1	600	57.9 77.0	14.3	6.4	2.6	0.6	0.2	
700 86. 300			3.0	0.7	0.2	0.1	700 800	98.5	24.3	8.2	3.4	1.0	-	0
900	27.4		9.8 4.7			0.1	900		30.2			1.3	0.4	0
1000	41.3	3 . 13.9	5.7			0.2	1000		36.7 51.4			1.8	0.6	
1200	57.9	9 19.5	8.0	2.0	0.7	0.3	1200 1500	-	77.7	26.2	10.			-
1500 2000	87.5	5 29.5	12.1			0.4	2000	1		44.6			3.	
3000		150.3	43.8			0.7 · · · · · · · · · · · · · · · · · · ·	3000			94,4	66.	2 16	3 5.	5 4
4000	- 1		74.6			2.6	4000		2 1 25	-	1	24	6 8	3
5000						3.9	5000	1257						
							1				Wate	***		
416		~~~	ater	~~~			8				WALL	r		

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753-5551 Fax (809) 763-3144 Web: www.bossirrigation.com			on ball bearing syndises. Trader itich mounted for towing. Wale wheels and tall rosers makes it udapated for towing. Wale wheels and tall rosers makes it udapated to most any type of crop. Easily dissuscendibed for whipping or surrouge. List price does not metade By Gan Sprinkler.  WEIGHT PRICE inch 225s \$ 785.00		
BD 91 51 96 63 100 7.4 105  NOTE: Rainfold sprinker performance data represents ideal test conditions and may be adversely affected by wind a factors. The shaded area of the chart denotes rozzlebnessure communitions that result in marginal water distribution.  All privies subject to change without voice:  Consolidated Pipe & Tube Co. dha 8085 Infigation Phone (201) 743-8551 Fax (306) 743-3144 Web: www.bosslings.	PSI Nozzle 994" Nozzle 502" Nozzle 1764" al No	PSI	30H/ST. Bore Drive Nozzie (1/8" Spreader) Stream Height 9'  Part# Size List Price 100345002 30H S 21.10 (Two Outlet with Nozzies)	SPRINKLERS	

.



# RAINSBIRD

#### PERFORMANCE DATA

30PSH

# 30PSH

# 3/4" Full Circle, Brass Impact Sprinkler

Bearing: 3/4" Male NPT, Brass Trajectory Angle: 27° Operating Range: 25-100 psi Flow Rate: 5.89-23.4 GPM Radius: 47-68 ft.

#### FEATURES

- · Heavy duty brass construction
- High pressure spoonStainless steel springs and fulcrum pin

  Chemically resistant washers
- Dual nozzle ports
- Two-year warranty

#### BENEFITS

- · High pressure spoon allows for larger nozzles and pressures
- Exceptionally wide range
- of flow rates

  Corrosion and grit resistant

  Built to last

Straight Bore Nozzle (SBN-3) Brass Straight Bore Nozzle with Spreader (LAN-1-20) (Stream Height: 10 ft.) and Vane (SBN-3V) with Plug (Stream Height: 10 ft.)

		NOZZLE SIZE											
PSI@		64" 8-20		32" 8-20		64" 8-20"	1/4" x 1/8-20						
Nozzla	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM					
25	47	8.30	48	9.24	49	10.30	50	11.30					
30	49	9.15	50	10.20	51	11.30	52	12.40					
35	51	9.94	52	11.10	52	12.20	54	13.50					
40	52	10.70	53	11.90	54	13,00	56	14.50					
45	53	11.30	54	12.70	55	13.80	57	15.40					
50	53	11.90	55	13.30	56	14.50	58	16.20					
55	54	12.50	55	13.90	57	15.30	59	17.00					
60	55	13.00	57	14.40	58	15.30	60	17.70					
65	55	13.50	58	14.90	59	16.00	51	18.40					
70	57	14.00	59	15.40	60	17.20	52	19.10					
75	58	14.50	60	15.90	61	17.80	63	19.80					
80	59	15.00	61	16.40	62	18.40	64	20.50					
85	60	15.43	62	16.81	63	18.90	65	21.20					
90	61	15.87	63	17.25	64	19.30	56	22.00					
95	62	16.29	64	17.67	65	19.80	67	22.70					
100	53	16.71	65	18.08	66	20.20	68	23.40					

						_		
				NOZZI	E SIZE			
	13	/64" 7/32		7/32" 15/64"			1	/4"
PSI @ Nozzie	Rad.	GPM	Rad.	GPM	Rad.	GPM	Rad.	GPM
25	47	5.89	48	6.83	49	7.90	50	8.90
30	48	6.51	50	7.58	51	8.70	52	9.80
35	51	7.08	52	8.26	52	9.40	54	10.60
40	52	7.60	53	8.87	54	10.00	56	11.40
45	53	8.07	54	9.41	56	10.60	57	12.40
50	53	8.49	55	9.88	56	11.10	58	12.80
55	54	8.87	56	10.30	57	11.60	59	13.40
60	55	9.20	57	10.60	58	12.10	60	14.00
66	56	9.47	58	10.95	59	12.60	61	14.60
70	57	9.78	59	11.29	60	13.10	62	15.10
75	58	10.18	60	11.71	61	13.60	63	15.60
80	59	10.52	61	12.10	62	14.00	64	16.10
85	60	10.84	62	12.52	63	14.40	65	16.60
90	61	11.17	63	12.94	64	14.80	66	17.10
95	62	11.50	64	13.38	65	15.20	67	17.50
100	63	11.83	65	13.83	66	15.60	68	18.00

#### PART MUMRERS AND OPDEDING INFORMATION

Ordering Example	MAKE YOUR SPRINKLER	CHOOSE NOZZLE SIZE(S)	ADD THEM TOGETHER TO
	CHOICE FROM CHART I	FROM CHART 2	CREATE THE PART NUMBER
To order a 30PSH sprinkler with a 13/64" Brass Straight Bore Nozzle and a 1/8" Brass 20° Low Angle Spreader Nozzle the part number would be:	A08714	- 13-08 =	- A08714-13-08

Chart 1	PART NUMBER: FIRST HALF
SPRINKLER ONLY/PLUG	HEST SEALING THE STORY
Sprinkler without Nozzle	A08713
SPRINKLER WITH COMBINATION NO	ZZLES INSTALLED
Sprinkler with SBN-3 and LAN-1-20	A08714-
Sprinkler with SBN-3V and LAN-1-20	A10803-

Chart 2	PART NUMBER: SECOND HALF							
NOZZLE	1/8"	13/64"	7/32"	15/64"	1/4"			
Brass Straight Bore Nozzle (105842-) SBN-3	Point True	13	14	15	16			
Brass Straight Bore Nozzle with Vane (106131-) SBN-3V		13	14	15	16			
Brass 20' Low Angle Spreader Nozzle (100226-) LAN-1-20	08							

FLOOD IRRIGATION DESIGN WORKS	HEET GATED
Project Name: Benson - West -	Flood IRRIGATION SECTION 36
Designer: Ross Gubka	Reviewed by:
PRELIMINARY DATA:	43560 = 12.4AC
Design Crop: CRASS	43560 = 12.4Re
Soil Name:=	Z sets/du
Town:	1) Z sets/day  e) 15 out of 18 sets (6 days)  ft. (2) P) 155 gpm = 12 shares
Root Depth:3'	ft. (2) D) 155 gpm = 12 Shares
Moisture Extraction: 3	ft (3)
AVERAGE WATER HOLDING CAPACIT (CIG 2-C)	Soil Depth AWC in feet inches  1st 2nd 3rd 4th 4th
TOTAL AVAILABLE WATER (TAW)*	Recommendation from NRCS 4.0" (grass) &
total only to moisture extraction depth.	7.6" on Morgan Prime Farmland soils (4)
Management Allowance Deficiency (Table CO 684.2)	% (5)
IRRIGATION NET APPLICATION:	
= % OF Total TAW	
(4) $x$ (5) (Decimal) = (4.0) $x$ (50	
Net. App. = ( ) in. (6) 7.0	in.
DAILY PEAK CONSUMTIVE USE RA	<u>TE:</u> in/day

(CO683.52)

= (Net Application) (6) (7.0)
Daily Peak Consumptive Use) (.2.()

= days return period (7)

9.5 days (round down) = 9 (7)

# **IRRIGATION GROSS APPLICATION**

DESIGN FIELD EFFICIENCY (50-60% For Corrugate flood irrigation)

(CO685.69)

# **GROSS APPLACATION.**

(8)

$$= (7.0) \times 100$$
(.55) %

$$=$$
 3.6 in. (9)

# **MAX HOURLY WATER APPLICATION RATE:**

MAX APP Rate w/cover

(CIG Table 6-D-1, CIG Sec 2-C) , 50 in/hr (10)

**SET TIME:** 

(O HR (11)

Normally 11 or 23 hrs/set.... (11hr for flood irrigation is recommended by NRCS)

# **CHECK POSSIBLE HOURLY APPLICATION RATES**

= 
$$\frac{\text{Gr. App. In. } (9)}{\text{Set time } (11)} = \frac{(3, 6)}{(9)}$$

= Hourly App. Rate = 
$$40$$
 in/hr\* (12)

USE \_\_\_\_\_ in. Gross App. On \_\_\_\_\_ hr. Sets

Gross Irrigation Application (inches) = 
$$\frac{Q \times T}{450 \times A}$$

$$= \frac{(14) \times (11)}{450 \times (15)}$$

$$= \frac{(153 \times (9))}{450 \times (93)}$$

$$=$$
 3.7 (13)

Gross Application (9): 3,6 INCh

Q = Total flow rate, gpm

Number of CCC ditch shares: 
$$44 - (20+12) = 12$$
 Shores

Note: 1 share of CC water equals 450gpm/35 shares = 12.86gpm

$$Q = \# CCC \text{ ditch shares } x \text{ 12.86gpm} = \frac{|Z_X|/Z_2}{|Z_1|} = 155 \text{ geV} \qquad (14)$$

T = length of application, hours (NRCS recommends 11 hr sets for flood irrigation) (11)

A = area being irrigated, acres

450 is a conversion constant:

$$450 \text{ gpm} = 1 \text{ acre-inch/hr}$$

the area being irrigated, A, is determined using the following formula:

$$= \underbrace{\frac{\text{N x R x L}}{43560}}$$

$$= \frac{(\mathbf{Z4}) \times (\mathbf{Z.5}) \times (600)}{43560}$$

$$=$$
 .83 (15)

N = number of wetting furrows = Q (total gpm) /corrugate flood rate (start with 7gpm per gate, then round up to the next even number of sections of pipe) flow per gate: $\frac{7}{249}$ (7gpm 1st try) (16) $\frac{55}{249}$ (45 gPm/6ate
*gated pipe comes in 30ft lengths @ 2.5ft spacings per gate = 12 gates per pipe section
N= 1st Estimated number of gates = $(14)/(16)$ (Not final number) = $\frac{155}{7} = 22$ (17) $\Rightarrow$ USE 24 gates = $Z_{p,pes} e$ 12 $\frac{3e}{p_{pe}}$
Estimated Number of 30ft gated pipe: $= (17)/12 = \frac{2}{100} \frac{8}{100}$ Rounded up to whole number = $\frac{2}{100}$ (18)
Net number of Gates
$N = (18) \times 12$ = $2 \times / 2 = 24$ (19)
$\mathbf{R}$ = width between wetting furrows, feet (30inch or <b>2.5ft</b> ) (20)
L = row length, feet (NRCS recommends 400-600ft) use: (21)
NUMBER OF SETS PER DAY:
= 24/(11)
= 24/_9
= 2, 7  (rounded down) = 2  (22)
SYSTEM EFFICIENCY (maintenance, cleaning head gate, checking water, farmer needed time off) = (23) $\frac{15}{18} = 83\%$ basically 6 days = NET EFFECTIVE ACREAGE WATERED.
$= (15) \times (22) \times (7) \times (23)$
$= (.83) \times (2) \times (9) \times (\frac{15}{18})$
$= (.83) \times (Z) \times (9) \times (\frac{15}{18})$ $= 12.5 C \frac{15}{18} ACRES$



FLOOD IRRIGATION DESIGN WORKS	HEET 25.51
Project Name: LLOYD Z	4 Share
Designer: Ross Gubka	
	24 Share Water
PRELIMINARY DATA:	24 Share Water 25ets - 6 day dog week
Design Crop: GRASS	75,5Ae
Soil Name:	1960 ETX 600 FT = 25.5 AC
Town: Nucle	1960 ETX 600 FT = 25.5 AC
Root Depth:	
Moisture Extraction:	ft (3)
AVERAGE WATER HOLDING CAPACITY (CIG 2-C)	Soil Depth AWC in feet inches  1 <sup>st</sup> 2 <sup>nd</sup> 3 <sup>rd</sup> 4 <sup>th</sup>
TOTAL AVAILABLE WATER (TAW)* total only to moisture extraction depth.	Recommendation from NRCS 4.0" (grass) & 7.6" on Morgan Prime Farmland soils (4)
Management Allowance Deficiency (Table CO 684.2)	% (5)
IRRIGATION NET APPLICATION:	
= % OF Total TAW	
(4) x (5) (Decimal) = $(4.0)$ x ( $50^{4/3}$	9)
Net. App. = () in. (6) 2.0	in.

DAILY PEAK CONSUMTIVE USE RATE: .21 for grass & .25 for alfalfa in/day (CO683.52)
IRRIGATION FREQUENCY:
= (Net Application) (6) (7.6) Daily Peak Consumptive Use) (.2)
= days return period (7)
IRRIGATION GROSS APPLICATION
DESIGN FIELD EFFICIENCY (50-60% FOR CORRUGATE FLOOD IRRIGATION) (CO685.69)
GROSS APPLACATION.
$= \underbrace{\text{NET App.}}_{\text{Field Eff. \%}} X 100  (6) \qquad = \qquad \underbrace{(2.0) \times 100}_{(55) \%}$
= <u>364</u> in. (9)
MAX HOURLY WATER APPLICATION RATE:
MAX APP Rate w/cover (CIG Table 6-D-1, CIG Sec 2-C)in/hr (10)
<u>SET TIME:</u>
Normally 11 or 23 hrs/set (11hr for flood irrigation is recommended by NRCS)
CHECK POSSIBLE HOURLY APPLICATION RATES
$= \underline{Gr. App. In. (9)} = \underline{(3.64)}$ Set time (11) $(9)$
= Hourly App. Rate = $0$ 40 in/hr* (12)
USE <u>0.40</u> in. Gross App. On <u>9</u> hr. Sets

Gross Irrigation Application (inches) = 
$$\frac{Q \times T}{450 \times A}$$
 =  $\frac{(14) \times (11)}{450 \times (15)}$  =  $\frac{(13) \times (13)}{450 \times (1.65)}$  =  $\frac{(13) \times (13)}{450 \times (1.65)}$  =  $\frac{(13) \times (13)}{450 \times (13)}$  Gross Application (9):  $\frac{(13) \times (13)}{(13)}$  Gross Application (9):  $\frac{(13) \times (13)}{(13)}$  Note: 1 share of CC water equals 450gpm/35 shares = 12.86gpm Q = # CCC ditch shares x 12.86gpm =  $\frac{24 \times (2.9)}{(14)}$  =  $\frac{30990}{(14)}$  (11) A = area being irrigated, acres 450 is a conversion constant: 450 gpm = 1 acre-inch/hr the area being irrigated, A, is determined using the following formula: A = Set size or area (acres) =  $\frac{N \times R \times L}{43560}$  =  $\frac{(19) \times (20) \times (21)}{43560}$   $\frac{49 \times (2.5 \times 60)}{43560}$  =  $\frac{(19) \times (20) \times (21)}{43560}$   $\frac{49 \times (2.5 \times 60)}{43560}$  =  $\frac{(19) \times (20) \times (21)}{43560}$   $\frac{49 \times (2.5 \times 60)}{43560}$  =  $\frac{(1.65)}{43560}$ 

N = number of wetting furrows = Q (total gpm) / corrugate flood rate (start with 7gpm per gate, then round up to the next even number of sections of pipe)
flow per gate: 7 (7gpm 1<sup>st</sup> try) (16) 3/03pm 44 GATES Round up to \*gated pipe comes in 30ft lengths @ 2.5ft spacings per gate = 12 gates per pipe section

N= 1<sup>st</sup> Estimated number of gates = 
$$(14)/(16)$$
 (Not final number)  
=  $\frac{310}{7} = 444$  (17)

Estimated Number of 30ft gated pipe:

= 
$$(17)/12 = \frac{44}{72} = 3.67$$
Rounded up to whole number =  $\frac{4}{7}$  (18)

### **Net number of Gates**

$$N = (18) \times 12$$
= 4 \( 12 \) 48 \( 26 \) (19)

 $\mathbf{R}$  = width between wetting furrows, feet (30inch or **2.5ft**) (20)

L = row length, feet (NRCS recommends 400-600ft)... use: 600 (21)

# NUMBER OF SETS PER DAY:

= 
$$24/(11)$$
  
=  $24/9$   
=  $2.67$  (rounded down) =  $2.565$  (22)

SYSTEM EFFICIENCY (maintenance, cleaning head gate, checking water, farmer needed time off)  $\dots =$ 

# NET EFFECTIVE ACREAGE WATERED.

= 
$$(15) \times (22) \times (7) \times (23)$$
  
=  $(1,65) \times (7) \times (9) \times$