Box Inlet - Cabe 17

Assume 3'x3.5' box inlet top elevation 468.69'
30" culvert
120' long.
Head = 0 to 1.81' 468.69 to 470.5'

3x3.5 box inlet weir length = 9.5'
$Q = C L h^{3/2}$ $C = 3.0$ $L = 9.5'$

3x3.5 L=9.5		4x4.5 L=13		5x5.5 L=16
h, ft.	Q cfs	h	Q	Q
0.5	10	0.5	14	17
1.0	28.5	1.0	39	48
1.5	52	1.5	72	88
1.81	69	1.81	95	117

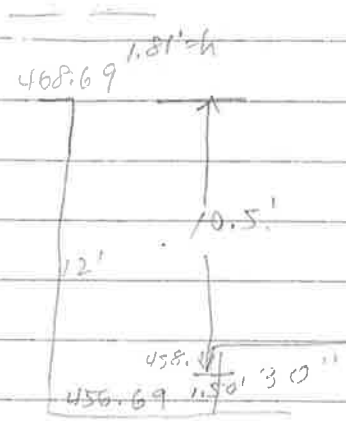
If D = 36" (see page 2)
Q = 95 cfs

$Q = 95 = 3 \cdot L \cdot 1.81^{3/2}$

$L = \frac{95}{3 \cdot 1.81^{3/2}}$

$= 13$

4x4.5 box



2/

$n = .025$

$L = 120'$ 30" corrugated culvert

$H = h + 10.5'$ $k_e = 0.05$ $r = 6"$

$k_c = .0341$

$$Q = \frac{a\sqrt{2gH}}{\sqrt{1 + k_e + k_c L}}$$

$$= \frac{4.91\sqrt{2g\,12.31}}{\sqrt{1 + .05 + .0341 \cdot 120}}$$

$= 61$ cfs

$$V = \frac{61}{4.91} = 12.4 \text{ fps}$$

$$h = \frac{k_c (V^2/2g)}{\sqrt{1 - [k_c (V^2/2g)]^2}}$$

$$= \frac{.0341 (2.388)}{\sqrt{1 - [.0341 \cdot 2.388]^2}} = .082$$

Try $d = 36"$

$k_c = .0267$

$H = h + 10.2$ $h = 1.81$

$a = 7.07$

$$Q = \frac{7.07\sqrt{2g\,12.01}}{\sqrt{1 + .05 + .0267 \cdot 120}}$$

$V = \frac{95}{7.07} = 13.44$

$= 95$ cfs

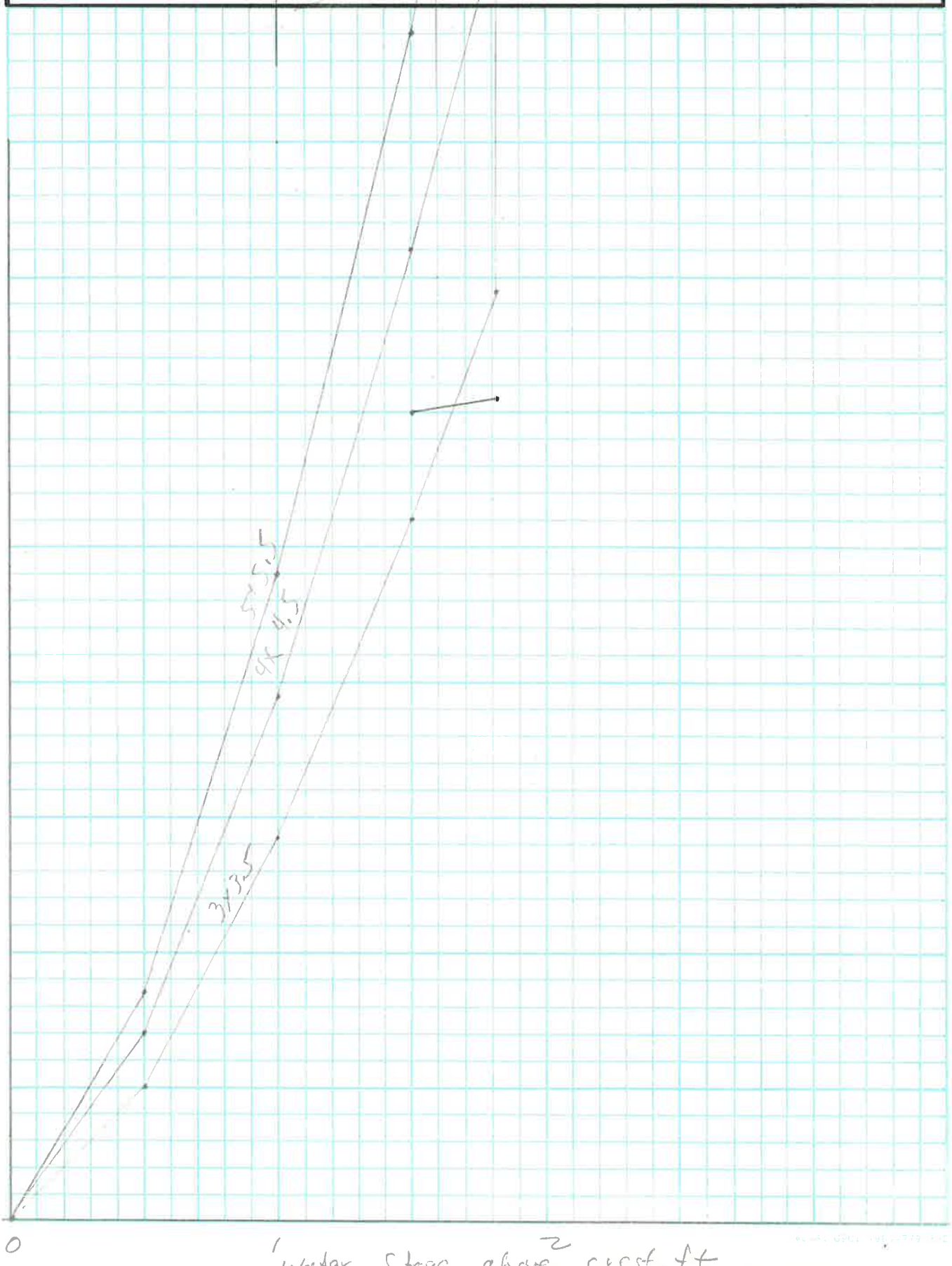
$$S_n = \frac{k_c (V^2/2g)}{\sqrt{1 - [k_c (V^2/2g)]^2}}$$

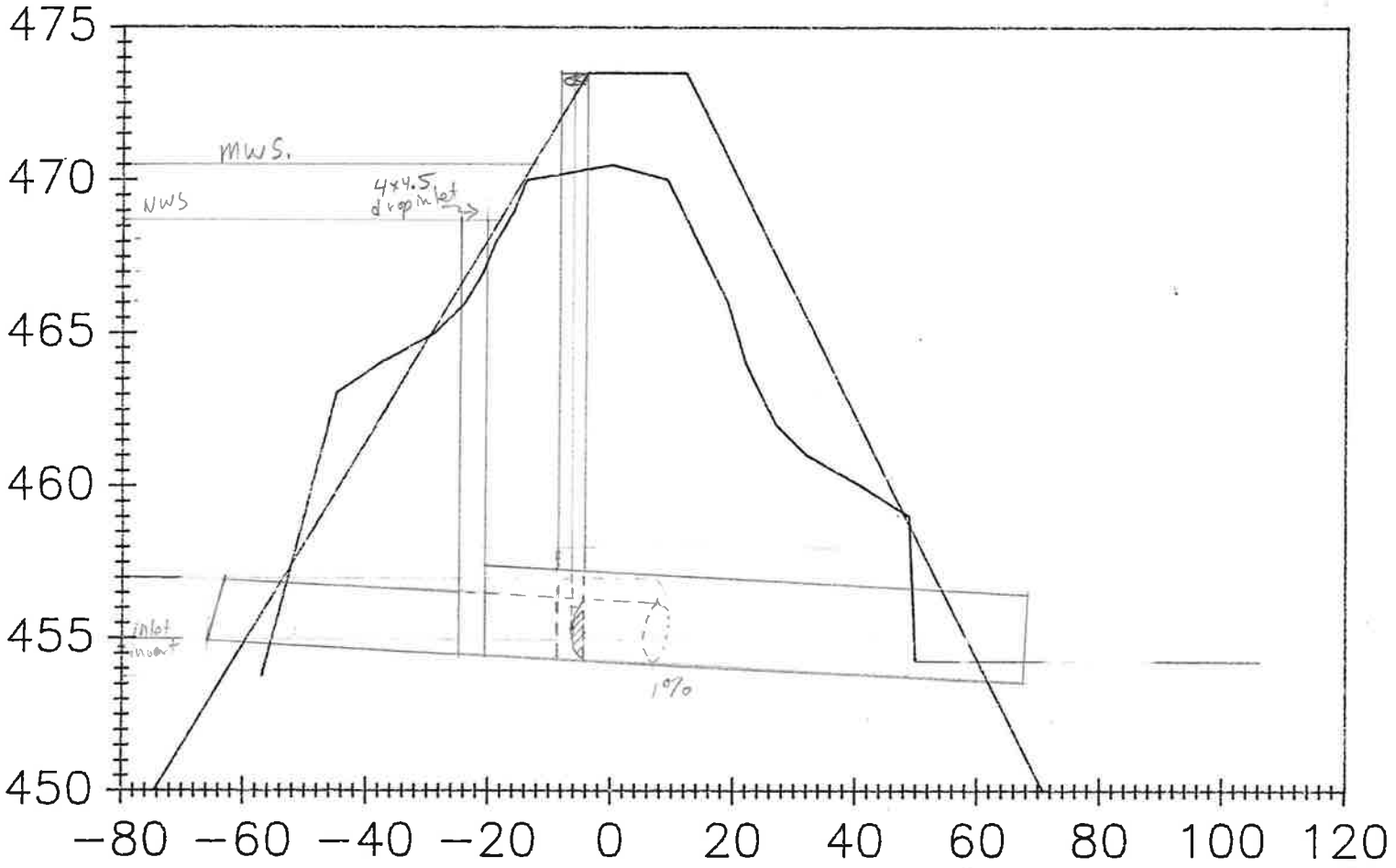
$= .07510$

7-1654 (7-73)
Bureau of Reclamation

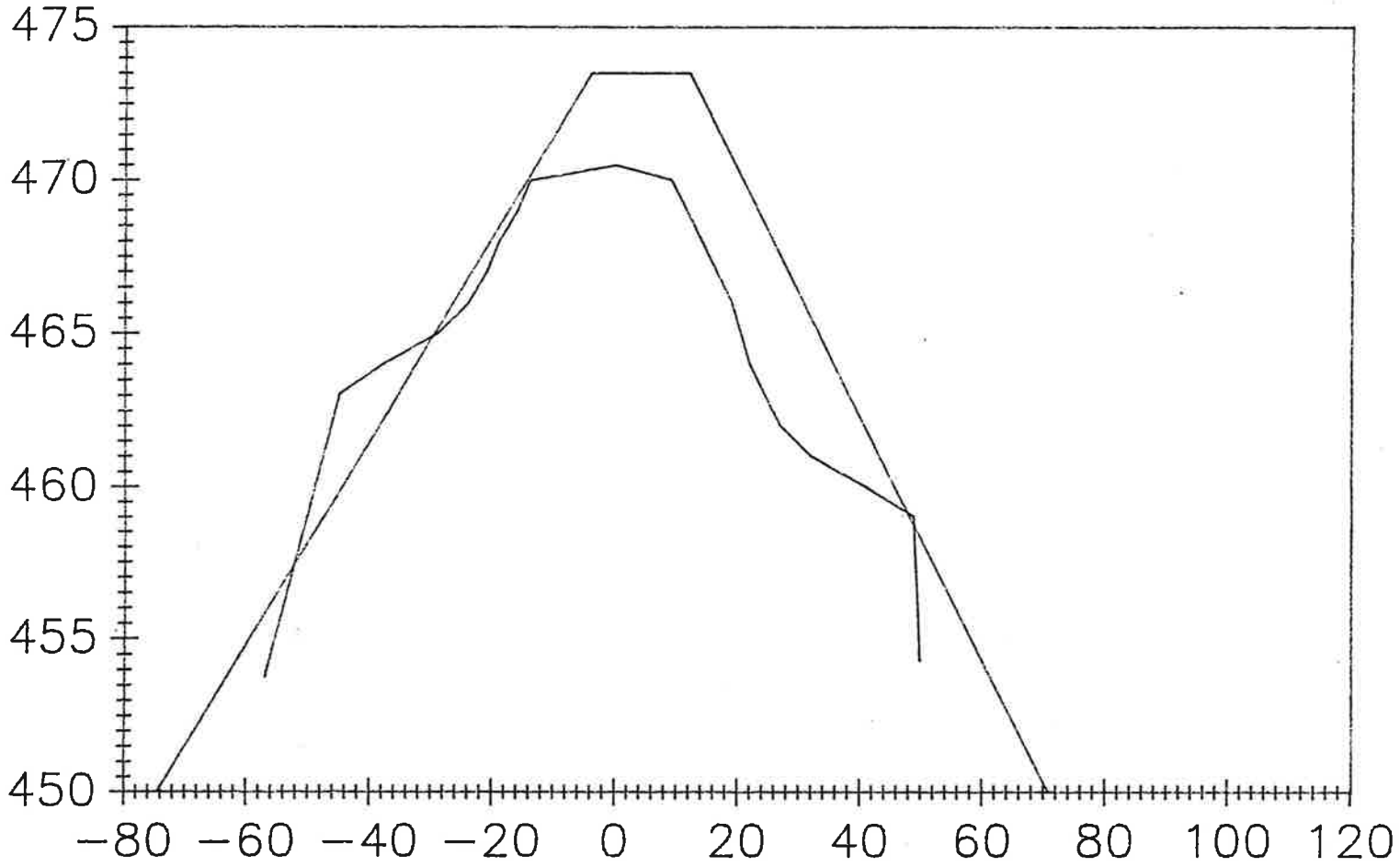
COMPUTATION SHEET

BY	DATE	PROJECT	SHEET ____ OF ____
CHKD BY	DATE	FEATURE	
DETAILS			

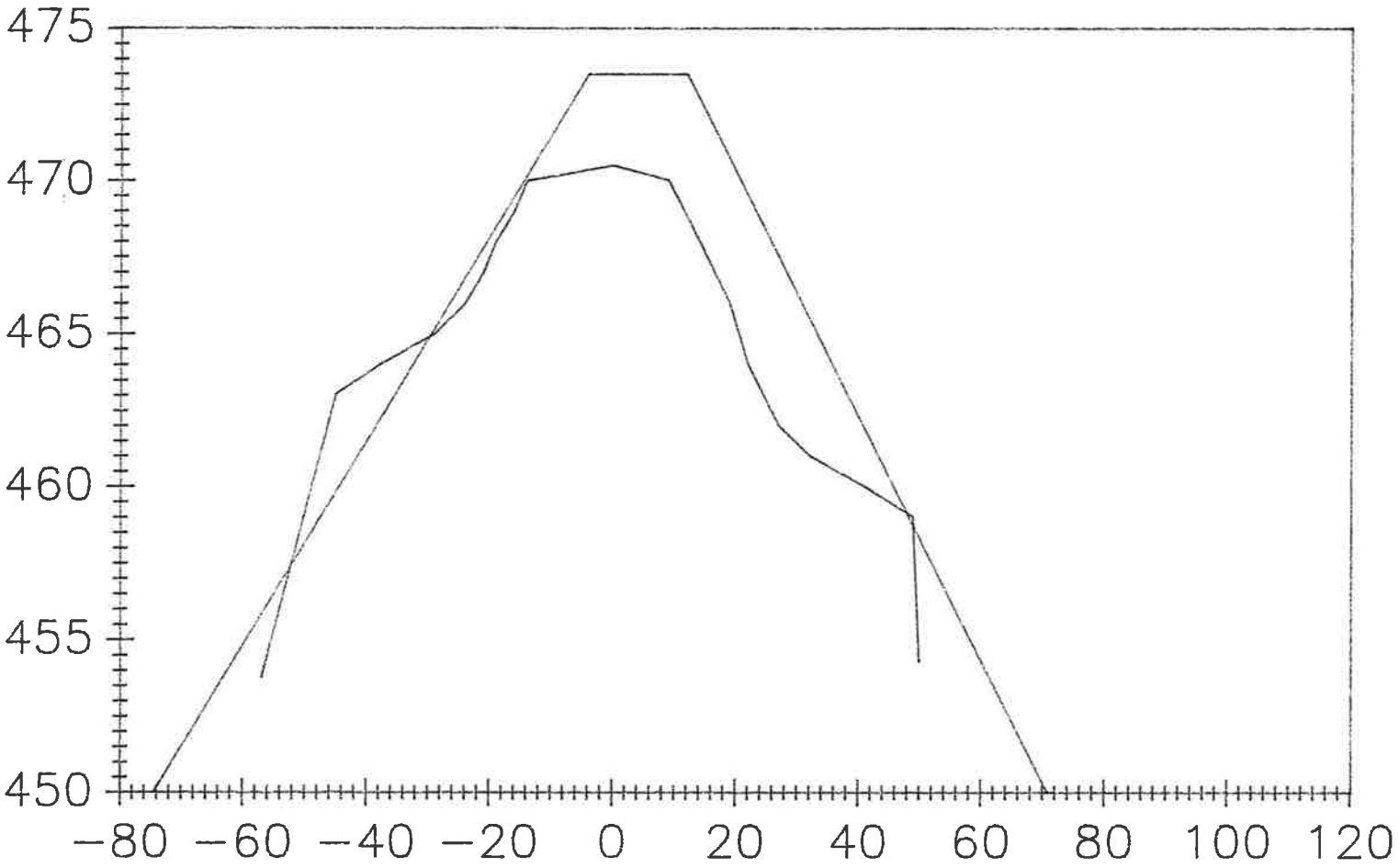


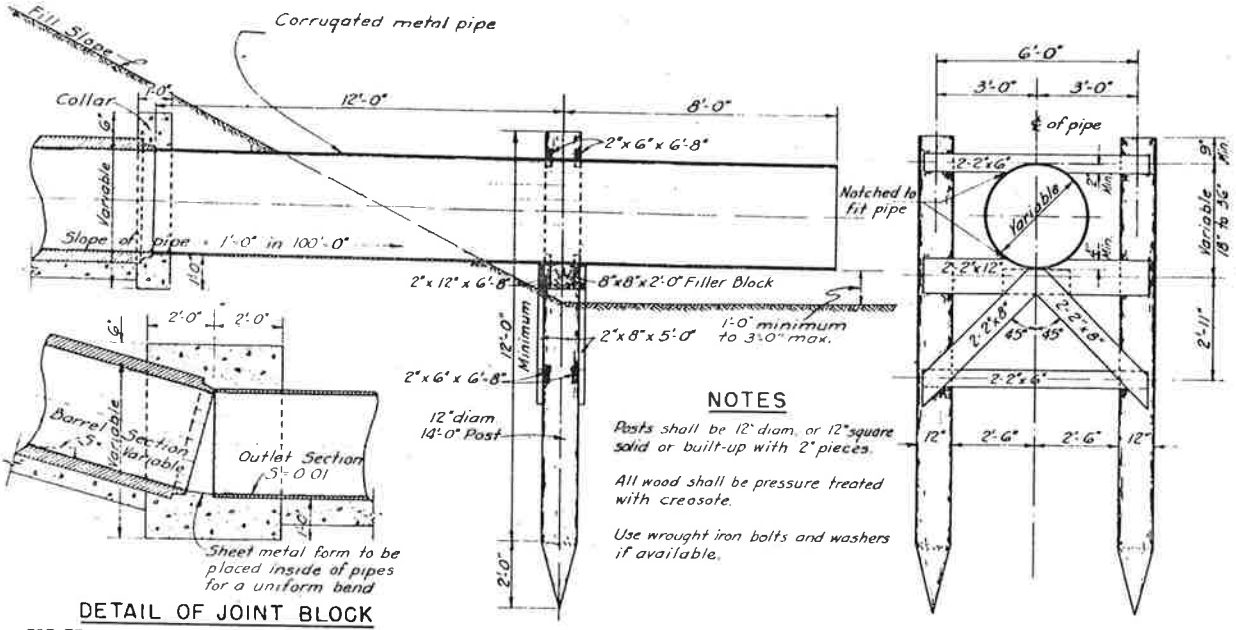

475
470
465
460
455
450
MWS.
NWS
4x4.5
drop inlet
inlet
invert
1%
−80 −60 −40 −20 0 20 40 60 80 100 120

10 ∓ 30



10 + 30





DETAIL OF JOINT BLOCK

FOR TRANSITION BETWEEN OUTLET AND BARREL

Note Joint block shall be used unless the conduit and outlet pipe are on the same slope.

NOTES

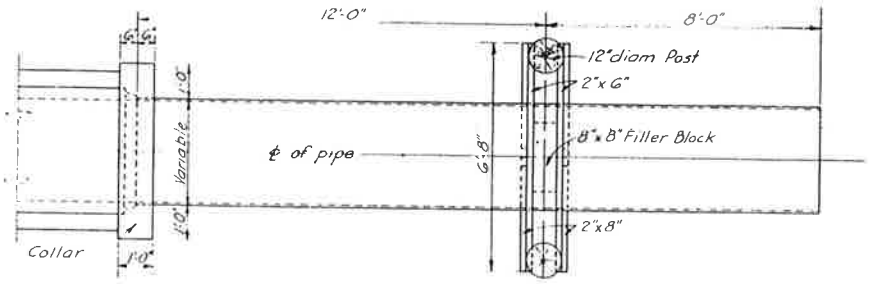
Posts shall be 12" diam. or 12" square solid or built-up with 2" pieces.

All wood shall be pressure treated with creosote.

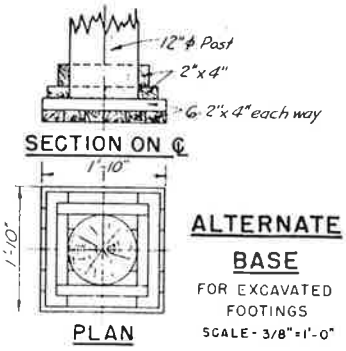
Use wrought iron bolts and washers if available.

ELEVATION OF BENT

SECTION THRU ℄ OF PIPE



PLAN

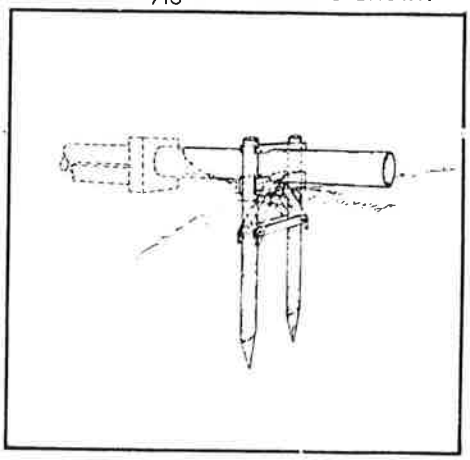


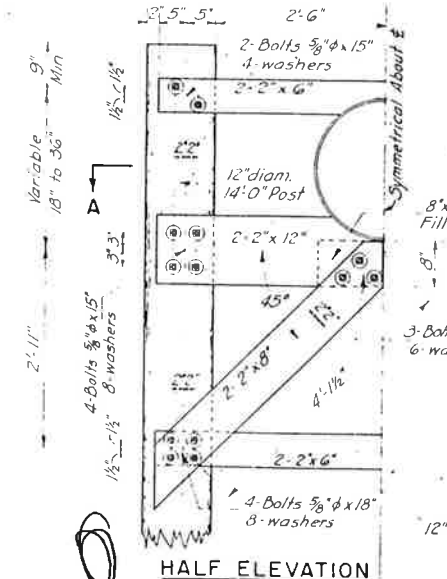
ALTERNATE BASE

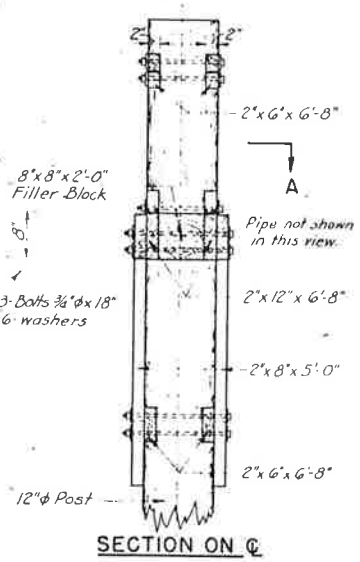
FOR EXCAVATED FOOTINGS

SCALE - 3/8" = 1'-0"

SCALE - 3/16" = 1'-0" UNLESS SHOWN







DETAILS OF BENT

SCALE - 3/8" = 1'-0"

REVISED 5-22-53

REFERENCE : 3-L-12524

FIGURE F-9

CANTILEVER OUTLET TIMBER BENT

EWP Unit Portland, Oregon

dimensionless parameter of $\frac{Q}{\sqrt{gD^5}}$. This is very convenient since Q and D are known prior to the plunge pool design.

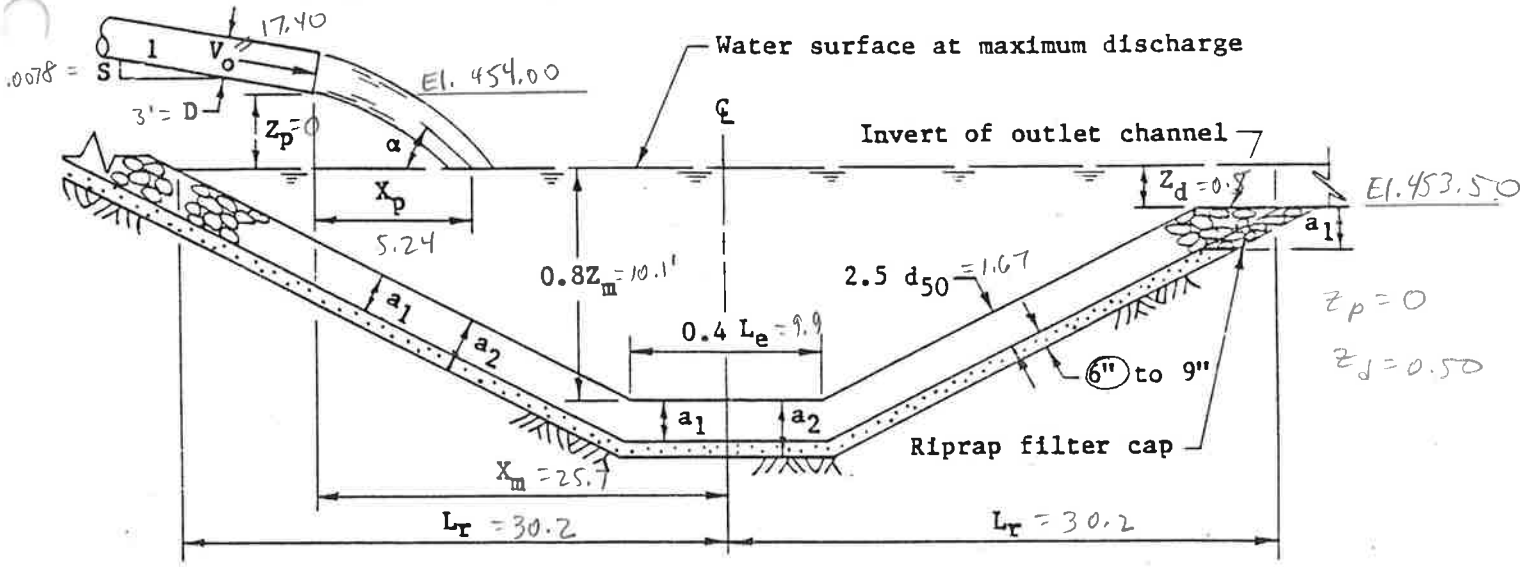
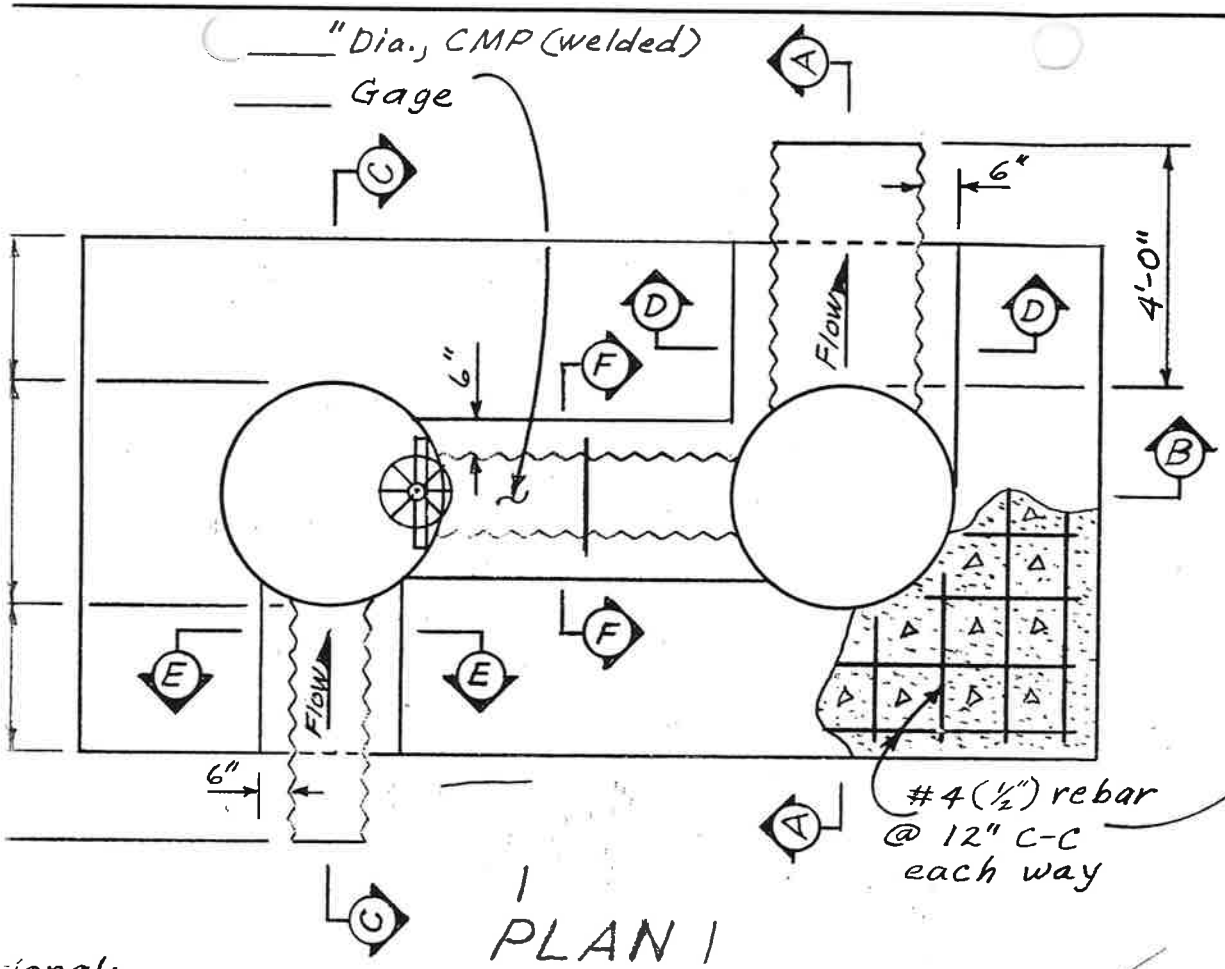


Figure 1 — Plunge pool definition sketch

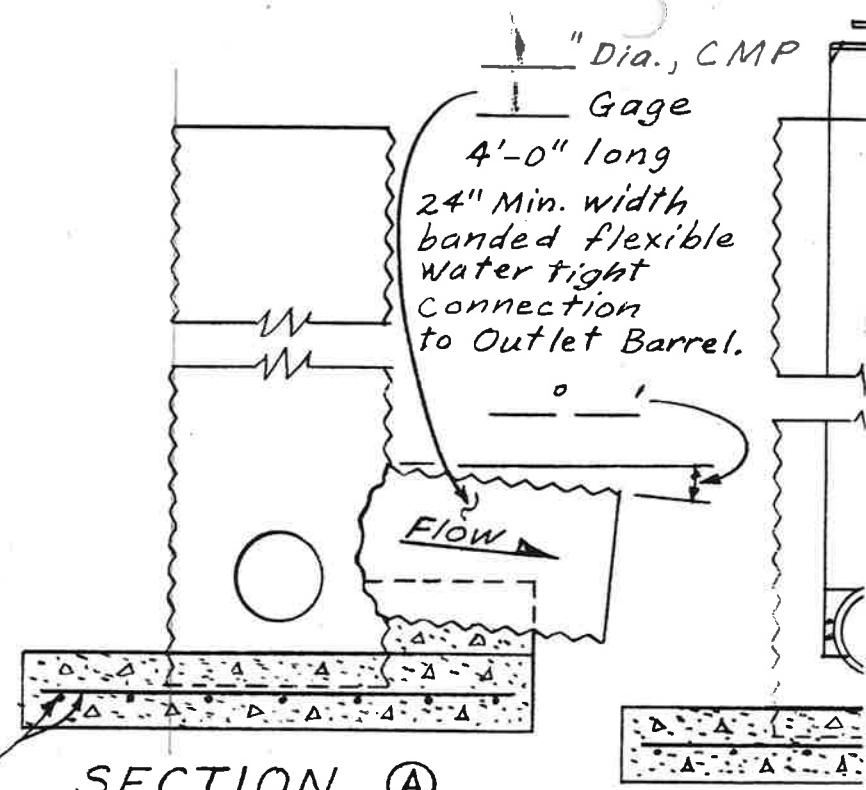
DISCHARGE JET TRAJECTORY

The plunge pool location is determined by the discharge jet trajectory. The location of the plunge pool centerline downstream from the discharge end of the pipe is dependent on the jet velocity and angle of impingement with the pool surface as well as the plunge pool depth.

The jet impingement velocity and angle of entry into the pool can be determined from the pipe exit slope, pipe discharge velocity, and height of pipe invert above the water surface. The height of pipe invert above the water surface, Z_p, should be measured from the tailwater elevation for the associated discharge used for the plunge pool design. The discharge should be the maximum prior to any secondary spillway flow. The pipe slope is $\frac{S}{\sqrt{1 - S^2}}$, where S is the sine of the angle whose tangent is the slope of the pipe. The discharge velocity, V_o, is computed based on the design discharge and the conduit cross-sectional area. The path of the free falling jet is a parabola between the pipe exit and tailwater surface where the jet enters the water with the impingement velocity, V_p, and the slope, tan α. The horizontal distance, X_p, from the pipe exit to where the jet plunges into the tailwater with horizontal velocity, V_h, and vertical velocity, V_v, is given in Eq. 5; where

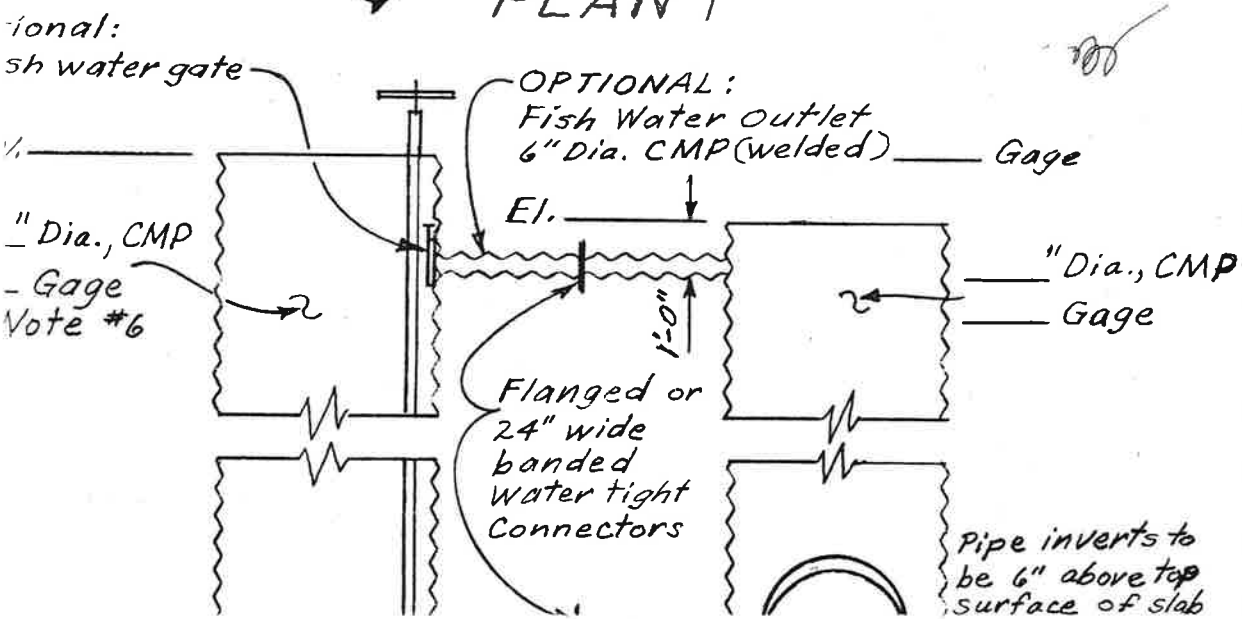


PLAN



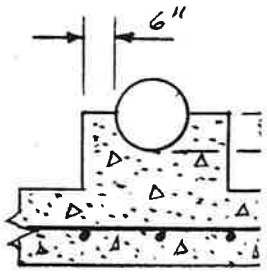
SECTION (A)

SECTI



NOTES:

1. All pipe will be water tight. Regular corrugated pipe will be close riveted.
2. All pipe to be used will be asphalt coated or polymer coated with water tight connectors.
3. The 4 ft. sections fabricated to the riser and wet well will have welded seams.
4. Fabricated pipe connections to be galvanized.
5. Gate will be Waterman Model C-20 or equivalent.
6. Gate well will be minimum 36" diameter.
7. Place outlet on berm.

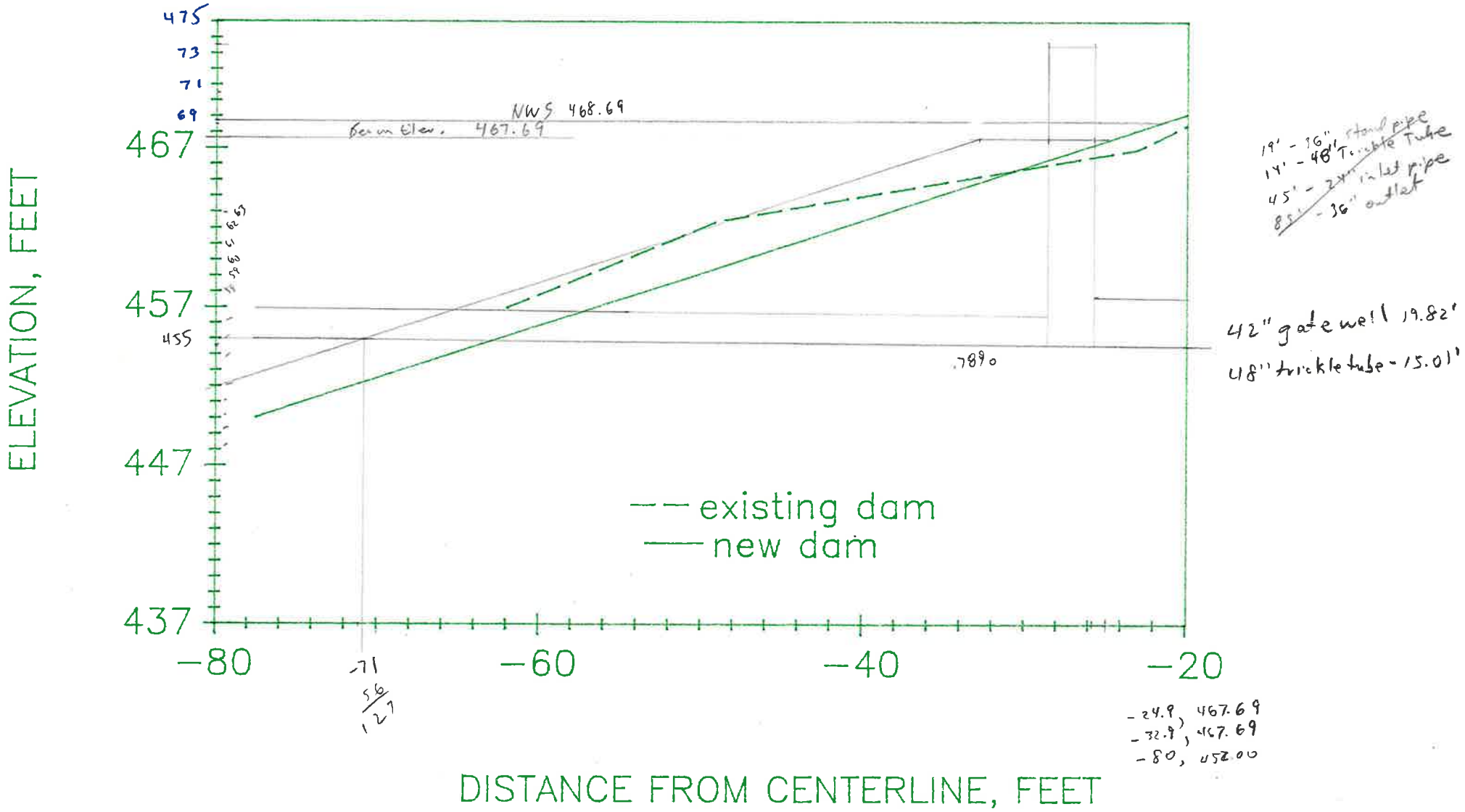


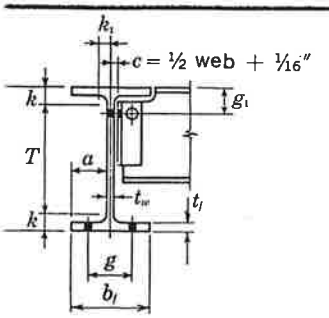
SECTION (E) AND (F)

Job Clas

OUTLET

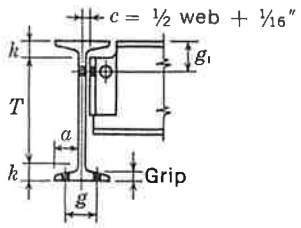
10 + 16


ELEVATION, FEET
475
73
71
69
467
457
455
447
437
NWS 468.69
Berm Elev. 467.69
59.63
58.63
.789o
19' - 36" stand pipe
14' - 48" Trickle Tube
45' - 24" inlet pipe
85' - 36" outlet
42" gate well 19.82'
48" trickle tube - 15.01'
existing dam
new dam
-80
-71
56
127
-60
-40
-20
-24.9, 467.69
-32.9, 467.69
-80, 452.00
DISTANCE FROM CENTERLINE, FEET



nce			Grip	Max. Flange Fastener	Usual Flange Gage g
k_1	g_1	c			
In.	In.	In.	In.	In.	In.
3/8	2¼	3/16	¼	¾	2¼
3/8	2¼	⅛	¼	—	—
½	2½	¼	7/16	⅞	2¾
7/16	2½	3/16	3/8	⅞	2¾
5/16		⅛	3/16	—	—
½	2½	¼	½	⅞	5½
5/8	2½	¼	7/16	⅞	5½
5/8	2½	¼	7/16	⅞	5½
½	2¼	¼	3/8	⅞	2¾
7/16	2¼	3/16	3/8	⅞	2¾
¼	2	⅛	3/16	—	—
¼	2	⅛	3/16	—	—
9/16	2½	5/16	5/8	⅞	3½
½	2¼	¼	3/8	⅞	3½
7/16	2¼	3/16	3/8	⅞	3½
¼	2	⅛	3/16	—	—
½	2½	¼	7/16	⅞	2¾
½	2	3/16	7/16	¾	2¼
½	2	¼	3/8	¾	2¼
7/16	2	3/16	3/8	¾	2¼

ication Sect. 1.16.5 may require

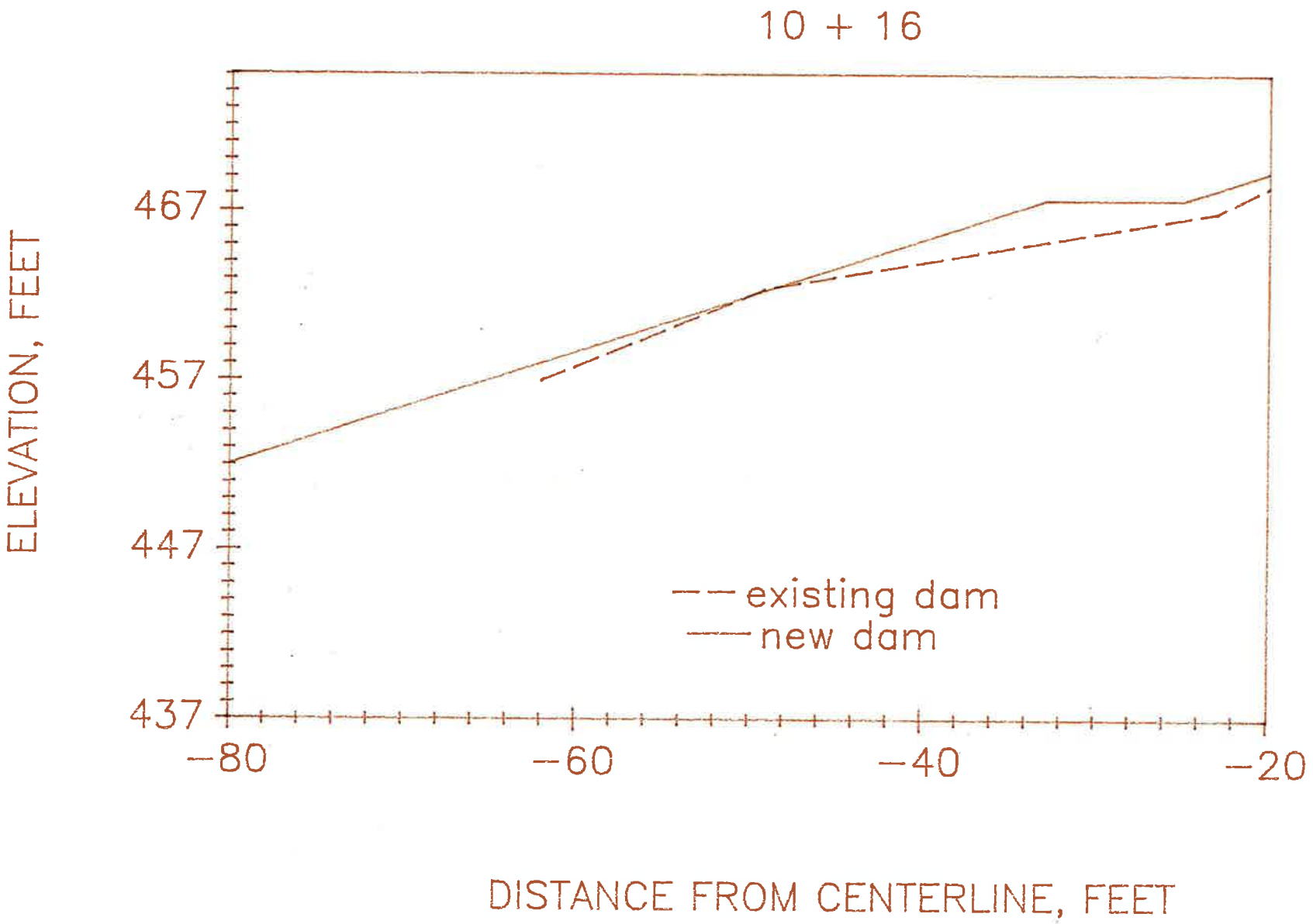


S SHAPES
Dimensions for detailing

I

Designation	Depth d	Flange		Web Thickness t_w	$\frac{t_w}{2}$	Distance					Grip	Max. Flange Fastener	Usual Flange Gage g
		Width b_f	Thickness t_f			a	T	k	g_1	c			
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
S 24×120	24	8	1⅛	13/16	3/8	3⅝	20	2	3¼	7/16	1⅛	1	4
×105.9	24	7⅞	1⅛	⅝	5/16	3⅝	20	2	3¼	3/8	1⅛	1	4
S 24×100	24	7¼	⅞	¾	3/8	3¼	20½	1¾	3	7/16	⅞	1	4
× 90	24	7⅛	⅞	⅝	5/16	3¼	20½	1¾	3	3/8	⅞	1	4
× 79.9	24	7	⅞	½	¼	3¼	20½	1¾	3	5/16	⅞	1	4
S 20× 95	20	7¼	15/16	13/16	3/8	3¼	16¼	1⅞	3	7/16	15/16	1	4
× 85	20	7	15/16	⅝	5/16	3¼	16¼	1⅞	3	3/8	⅞	1	4
S 20× 75	20	6⅜	13/16	⅝	5/16	2⅞	16¾	1⅝	3	3/8	13/16	⅞	3½
× 65.4	20	6¼	13/16	½	¼	2⅞	16¾	1⅝	3	5/16	¾	⅞	3½
S 18× 70	18	6¼	11/16	11/16	3/8	2¾	15	1½	2¾	7/16	11/16	⅞	3½
× 54.7	18	6	11/16	7/16	¼	2¾	15	1½	2¾	5/16	11/16	⅞	3½
S 15× 50	15	5⅝	⅝	9/16	¼	2½	12¼	1⅜	2¾	5/16	9/16	¾	3½
× 42.9	15	5½	⅝	7/16	3/16	2½	12¼	1⅜	2¾	¼	9/16	¾	3½
S 12× 50	12	5½	11/16	11/16	5/16	2⅜	9⅛	1 7/16	2¾	3/8	11/16	¾	3
× 40.8	12	5¼	11/16	7/16	¼	2⅜	9⅛	1 7/16	2¾	5/16	⅝	¾	3
S 12× 35	12	5⅛	9/16	7/16	3/16	2⅜	9⅝	1 3/16	2½	¼	½	¾	3
× 31.8	12	5	9/16	3/8	3/16	2⅜	9⅝	1 3/16	2½	¼	½	¾	3
S 10× 35	10	5	½	⅝	5/16	2⅛	7¾	1⅛	2½	3/8	½	¾	2¾
× 25.4	10	4⅝	½	5/16	⅛	2⅛	7¾	1⅛	2½	3/16	½	¾	2¾
S 8× 23	8	4⅛	7/16	7/16	¼	1⅞	6	1	2½	5/16	7/16	¾	2¼
× 18.4	8	4	7/16	¼	⅛	1⅞	6	1	2½	3/16	7/16	¾	2¼
S 7× 20	7	3⅞	3/8	7/16	¼	1¾	5¼	⅞	2½	5/16	3/8	⅝	2¼
× 15.3	7	3⅝	3/8	¼	⅛	1¾	5¼	⅞	2½	3/16	3/8	⅝	2¼
S 6× 17.25	6	3⅝	3/8	7/16	¼	1½	4⅜	13/16	2¼	5/16	3/8	⅝	2
× 12.5	6	3⅜	3/8	¼	⅛	1½	4⅜	13/16	2¼	3/16	5/16	—	—
S 5× 14.75	5	3¼	5/16	½	¼	1⅜	3½	¾	2¼	5/16	5/16	—	—
× 10	5	3	5/16	3/16	⅛	1⅜	3½	¾	2¼	3/16	5/16	—	—
S 4× 9.5	4	2¾	5/16	5/16	3/16	1¼	2⅝	11/16	2	¼	5/16	—	—
× 7.7	4	2⅝	5/16	3/16	⅛	1¼	2⅝	11/16	2	3/16	5/16	—	—
S 3× 7.5	3	2½	¼	3/8	3/16	1⅛	1¾	⅝	—	¼	¼	—	—
× 5.7	3	2⅜	¼	3/16	1/16	1⅛	1¾	⅝	—	⅛	¼	—	—

Gage g permissible near beam ends; elsewhere Specification Sect. 1.16.5 may require reduction in fastener size.


10 + 16
467
457
447
437
ELEVATION, FEET
existing dam
new dam
-80
-60
-40
-20
DISTANCE FROM CENTERLINE, FEET