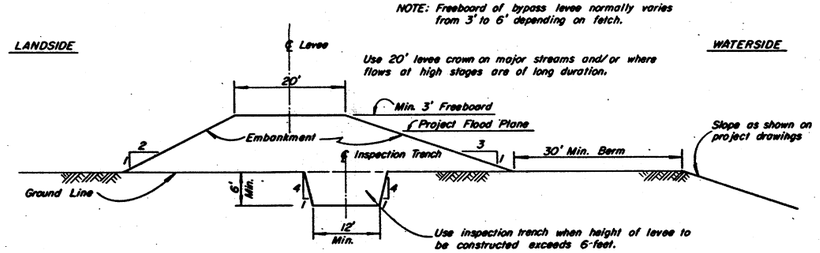
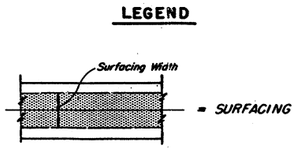


FIGURE 1
LEVEE SECTION WITH 20 FOOT CROWN
Scale: 1" = 10'-0"



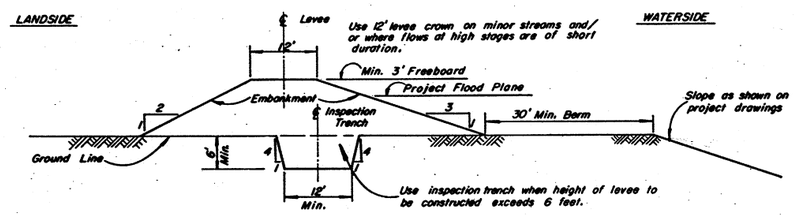


FIGURE 2
LEVEE SECTION WITH 12 FOOT CROWN
Scale: 1" = 10'-0"

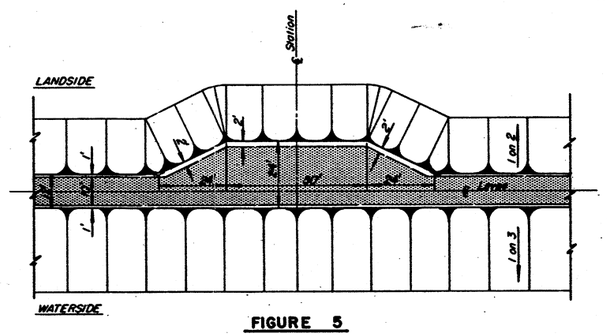


FIGURE 5
TURNOUT ON 12 FOOT LEVEE CROWN
Scale: 1" = 20'-0"

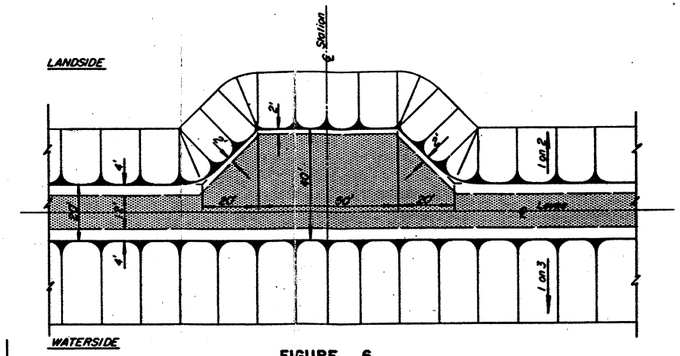


FIGURE 6
TURNAROUND ON 20 FOOT LEVEE CROWN
Scale: 1" = 20'-0"

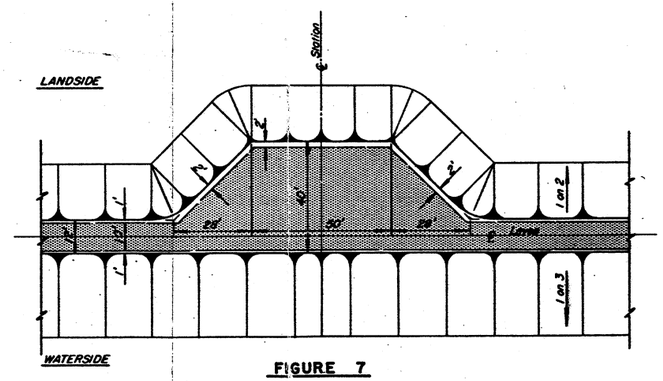


FIGURE 7
TURNAROUND ON 12 FOOT LEVEE CROWN
Scale: 1" = 20'-0"

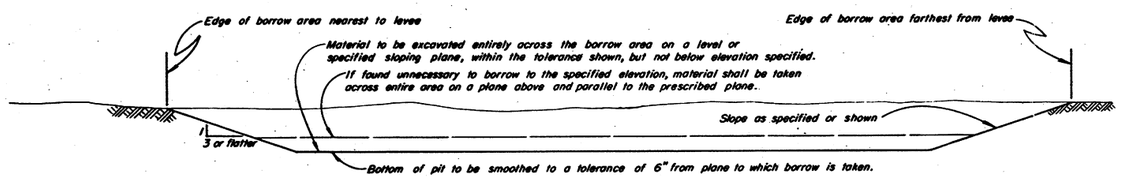


FIGURE 3
UNIFORM BORROW
Not To Scale

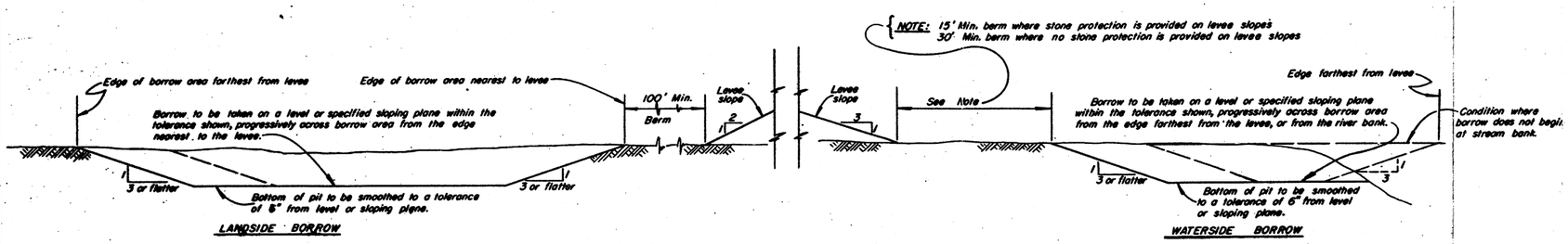
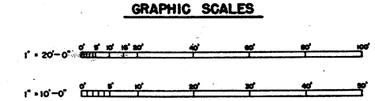


FIGURE 4
PROGRESSIVE BORROW
Not To Scale

GRAPHIC SCALES



NOTE: This sheet supersedes sheet numbers 3674/1 & 5, File No. 50-4-3674, Dtd. 29 Aug. 1960.

REVISION	DATE	DESCRIPTION	BY	BY

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

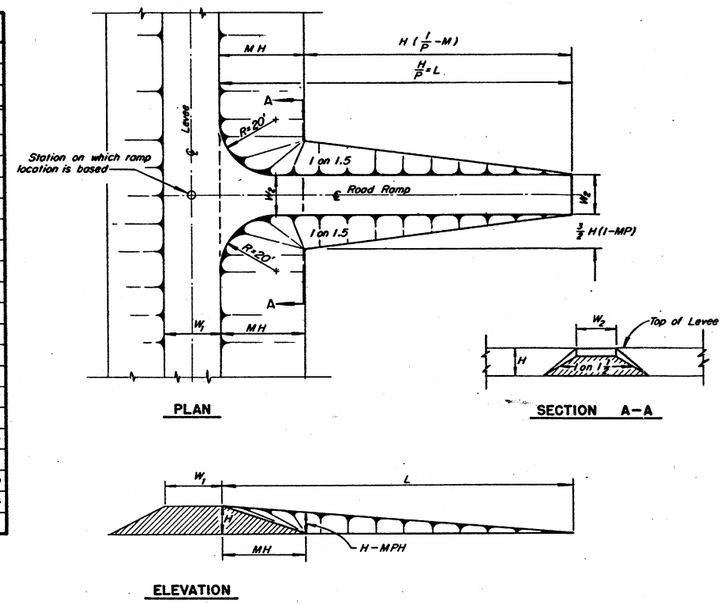
DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
PREPARED BY: R. CLARKE
SUBMITTED:
APPROVED: DATE: 25 September 1969
APPROVED UNDER THE DIRECTION OF
LT. COL., CORPS OF ENGINEERS, U.S.A.

STANDARD DRAWING
LEVEE SECTIONS
BORROW SECTIONS
TURNOUT & TURNAROUNDS

SCALE: AS SHOWN
DWG. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8
SHEET NO. 4488/1

EXHIBIT D

VOLUME IN CUBIC YARDS OF HEAD-ON RAMP								
HEIGHT OF LEVEE IN FEET	W_2 = 14'				W_2 = 22'			
	P = .08		P = .06		P = .08		P = .06	
	M = 3	M = 2	M = 3	M = 2	M = 3	M = 2	M = 3	M = 2
1	2	3	4	4	4	4	6	6
2	11	12	16	17	16	18	24	26
3	26	28	38	40	39	43	56	60
4	48	54	70	76	71	78	102	111
5	79	88	115	125	114	127	165	179
6	118	133	173	189	168	189	245	267
7	167	189	245	268	236	266	344	375
8	226	258	333	365	316	358	462	504
9	297	339	438	482	410	466	602	658
10	380	435	562	619	521	591	765	837
11	476	546	705	778	646	735	950	1041
12	586	674	869	960	788	898	1161	1273
13	710	819	1055	1168	948	1082	1397	1535
14	850	982	1263	1401	1126	1286	1660	1827
15	1005	1163	1497	1662	1322	1514	1953	2151
16	1179	1366	1757	1952	1539	1764	2275	2509
17	1369	1589	2043	2273	1775	2038	2628	2901
18	1578	1834	2358	2626	2034	2338	3014	3330
19	1806	2103	2702	3012	2314	2664	3433	3796
20	2055	2395	3077	3433	2618	3017	3887	4032



PLAN

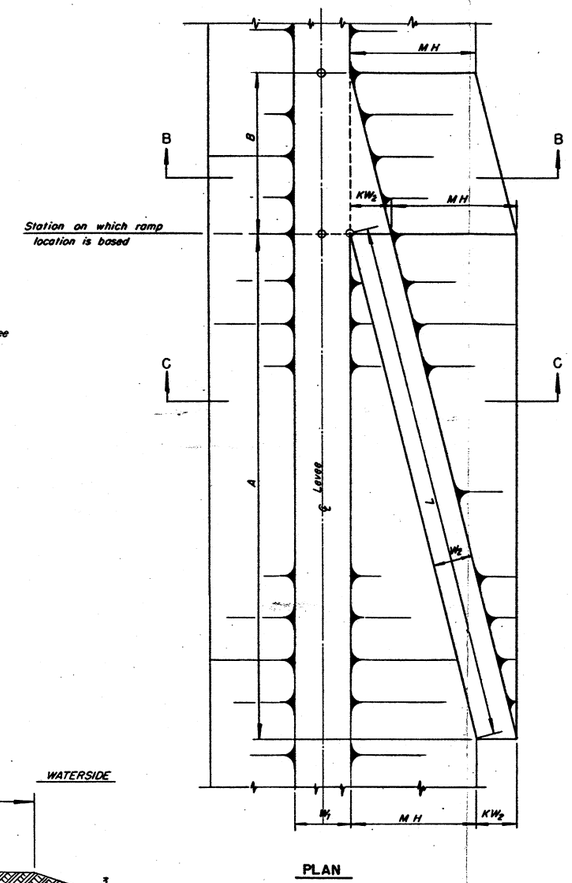
SECTION A-A

ELEVATION

FIGURE 1
HEAD-ON APPROACH ROAD RAMP
Scale: 1" = 20'-0"

VALUES OF "K" FOR KW_2

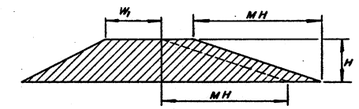
"M"	P = .08	P = .06
= 3	1.0301	1.0166
= 2	1.0131	1.0073



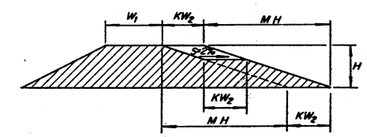
PLAN

FIGURE 2
SIDE APPROACH ROAD RAMP
Scale: 1" = 20'-0"

VOLUME IN CUBIC YARDS OF SIDE RAMP								
HEIGHT OF LEVEE IN FEET	W_2 = 14'				W_2 = 22'			
	P = .08		P = .06		P = .08		P = .06	
	M = 3	M = 2	M = 3	M = 2	M = 3	M = 2	M = 3	M = 2
1	19	26	25	35	44	62	57	82
2	44	59	58	78	97	134	128	178
3	76	98	100	130	161	216	213	287
4	114	144	151	191	235	308	311	410
5	159	196	211	260	320	411	423	546
6	210	255	279	338	414	524	548	696
7	268	320	355	425	519	647	687	859
8	332	391	441	520	634	780	840	1036
9	403	469	534	624	759	923	1006	1227
10	480	554	637	737	894	1077	1185	1431
11	564	645	748	858	1039	1241	1378	1649
12	654	742	868	988	1195	1414	1585	1881
13	750	846	997	1126	1361	1598	1806	2126
14	835	957	1134	1273	1537	1793	2040	2384
15	963	1074	1280	1429	1723	1997	2287	2656
16	1079	1197	1434	1594	1919	2212	2548	2942
17	1201	1327	1597	1767	2126	2437	2823	3241
18	1331	1464	1769	1948	2343	2672	3111	3554
19	1466	1607	1949	2139	2570	2917	3413	3881
20	1608	1756	2138	2332	2807	3172	3728	4221



SECTION B-B



SECTION C-C

FORMULAS

$L = H/P$

$K = 1/\sqrt{1-M^2P^2}$

$KW_2 = W_2/\sqrt{1-M^2P^2}$

$A = (H/P)\sqrt{1-M^2P^2}$

$B = W_2/PM$

Volume in cubic yards for head-on approach road ramp

$$V = \frac{H^2(1-PM)}{54P} \times \left[W_2 + H(1-PM)\right]$$

Volume in cubic yards for side approach road ramp

$$V = \frac{W_2 H^2}{54P} + \frac{W_2^2 H}{54PM\sqrt{1-M^2P^2}}$$

DEFINITIONS

W_1 = Crown width of levee

W_2 = Width of road ramp

L = Horizontal projection of road ramp length

H = Height of levee above natural ground

P = Grade of Ramp

M = Reciprocal of slope of levee, i.e., slope = 1 on 3, M = 3

A = Length of road ramp measured parallel to ℄ of levee

B = Length of road ramp platform measured parallel to ℄ of levee

KW_2 = Width of road ramp measured perpendicular to ℄ of levee

V = Volume of road ramp in cubic yards

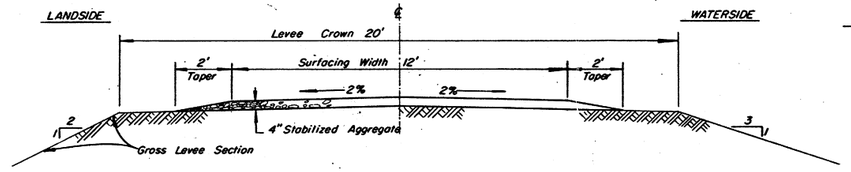


FIGURE 3
LEVEE SURFACING FOR 20' PATROL ROAD
Scale: 1" = 2'-0"

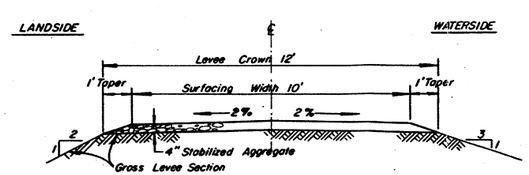
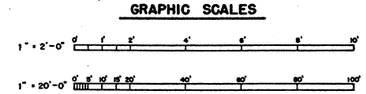


FIGURE 4
LEVEE SURFACING FOR 12' PATROL ROAD
Scale: 1" = 2'-0"

GRAPHIC SCALES



NOTE: This sheet supersedes sheet numbers 3674/1 & 2, File No. 50-4-3674, Dtd. 29 Aug. 1960

REVISION	DATE	DESCRIPTION	BY	BY

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
PREPARED BY: R. CLARKE
SUBMITTED:
APPROVED:
APPROVED:
DATE: 25 September 1969
PREPARED UNDER THE DIRECTION OF
SCALE: AS SHOWN
SPEC. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8
SHEET NO. 4488/2

STANDARD DRAWING
APPROACH ROAD RAMPS
&
LEVEE SURFACING

EXHIBIT D

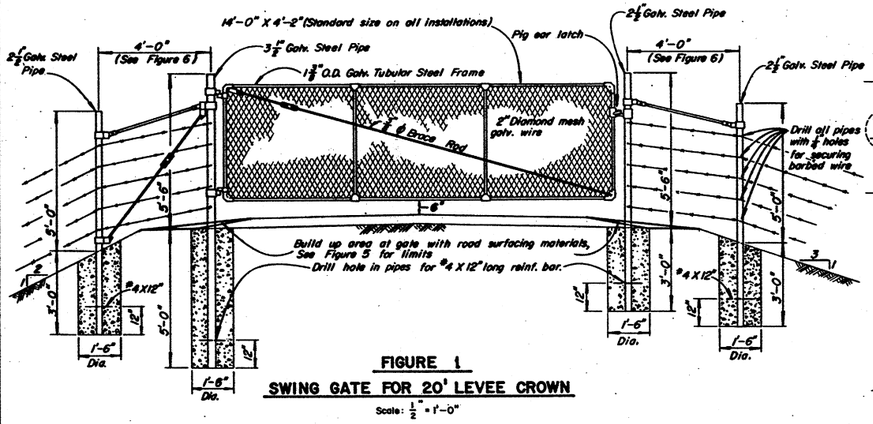


FIGURE 1
SWING GATE FOR 20' LEVEE CROWN
Scale: ½" = 1'-0"

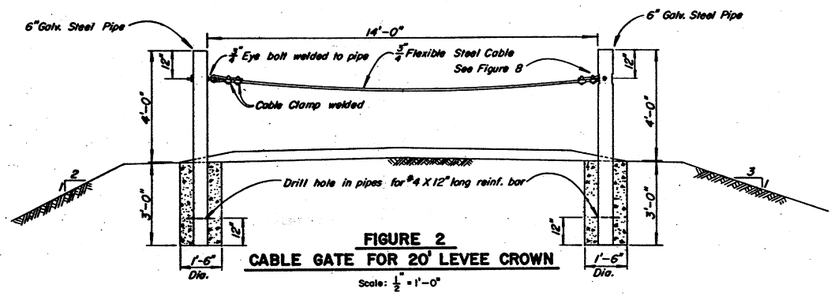


FIGURE 2
CABLE GATE FOR 20' LEVEE CROWN
Scale: ½" = 1'-0"

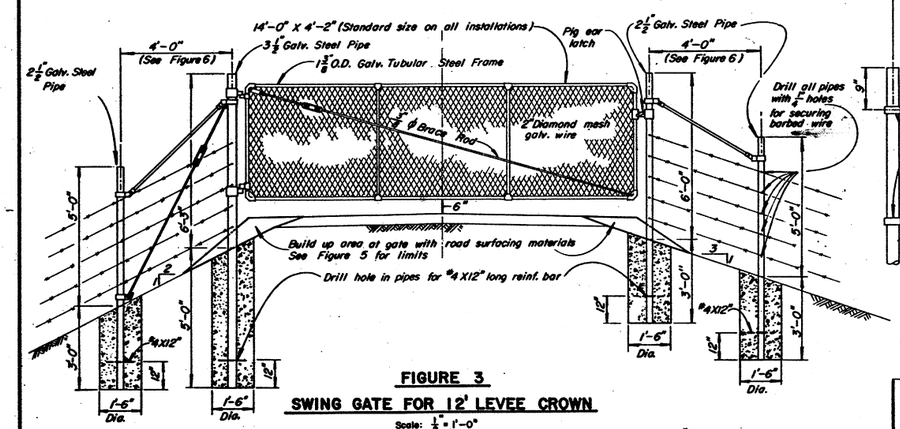


FIGURE 3
SWING GATE FOR 12' LEVEE CROWN
Scale: ½" = 1'-0"

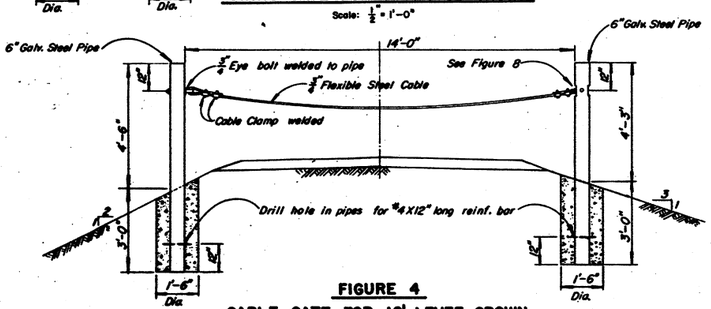


FIGURE 4
CABLE GATE FOR 12' LEVEE CROWN
Scale: ½" = 1'-0"

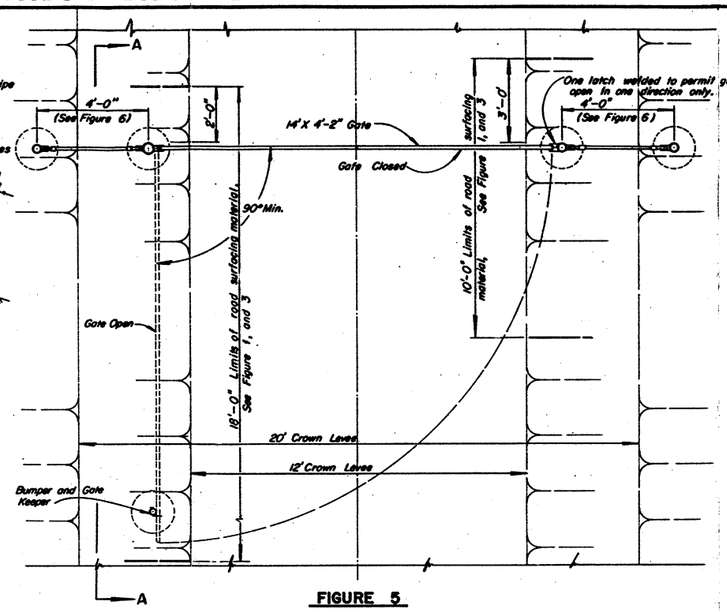


FIGURE 5
PLAN-SWING GATE INSTALLATION
Scale: ½" = 1'-0"

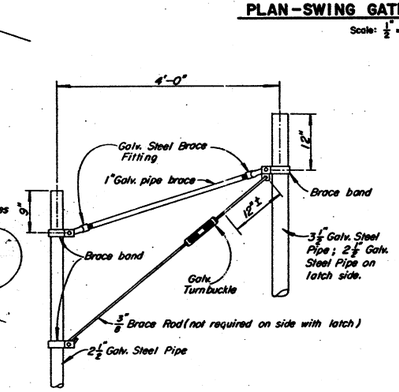


FIGURE 6
TENSION BRACING
Scale: 1" = 1'-0"

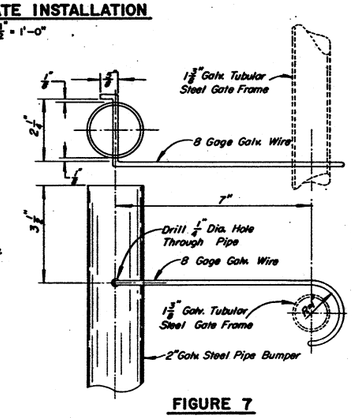


FIGURE 7
GATE KEEPER
Not To Scale

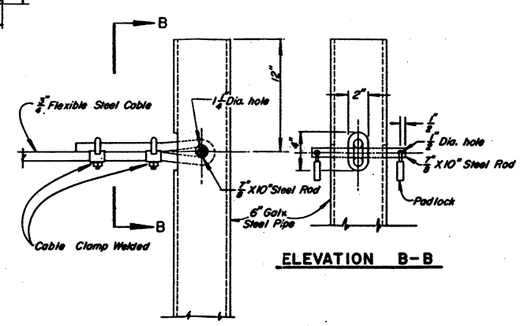


FIGURE 8
CABLE GATE LOCK
Scale: 2" = 1'-0"

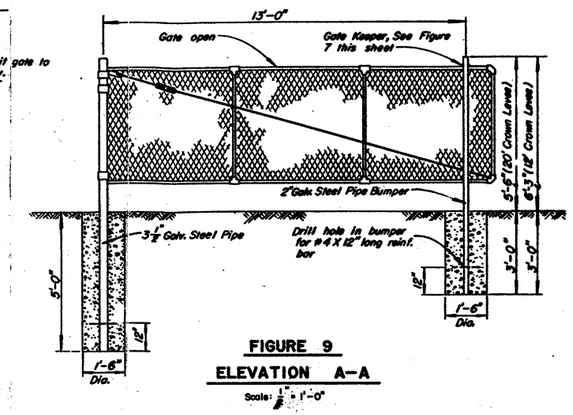


FIGURE 9
ELEVATION A-A
Scale: ½" = 1'-0"

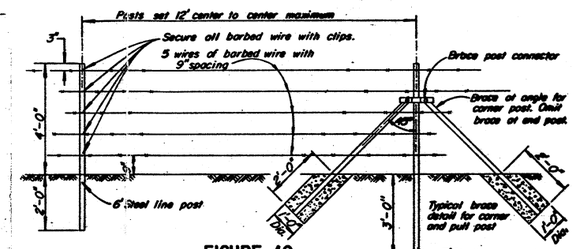


FIGURE 10
BARBED WIRE FENCING
Scale: ½" = 1'-0"

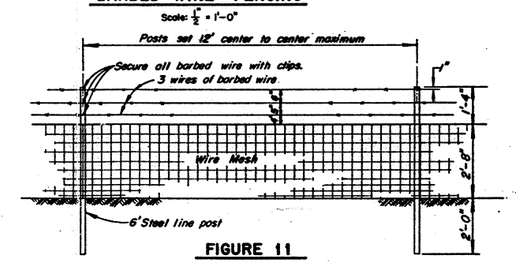


FIGURE 11
WIRE MESH & BARBED WIRE FENCING
Scale: ½" = 1'-0"

GRAPHIC SCALES

½" = 1'-0"
1" = 1'-0"
2" = 1'-0"

NOTE: This sheet supersedes sheet number 3674/3, File No. 50-4-3674, Dtd. 29 Aug. 1960.

REVISION	DATE	DESCRIPTION	BY	BY

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
PREPARED BY: R. CLARKE
SUBMITTED: Chief, Lab. & Tech. Services
APPROVED FOR CONSTRUCTION: Chief, Design Branch
APPROVED: Chief, Engineering Division
DATE: 25 September 1969
PREPARED UNDER THE DIRECTION OF: Lt. Col., Corps of Engineers, U.S.A.
For District Engineer
SCALE: AS SHOWN
SPEC. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8
SHEET NO. 4488/3

STANDARD DRAWING

GATES & FENCING FOR PATROL ROADS

EXHIBIT D

NOTE: Figs 1 & 2 used for dry channel construction

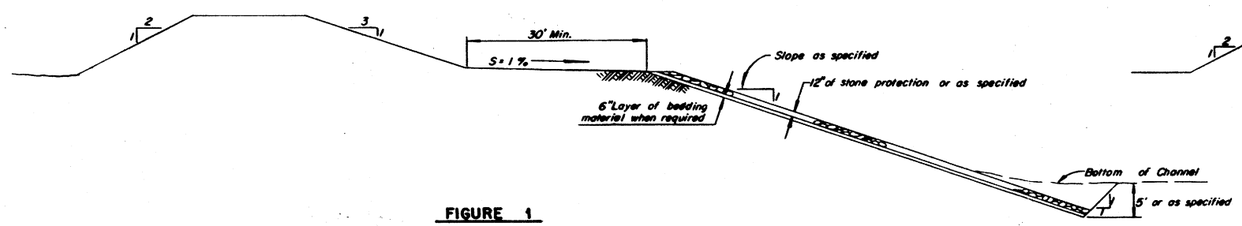


FIGURE 1
STONE PROTECTION WHEN BERM IS PROVIDED △2
Scale: 1" = 10'-0"

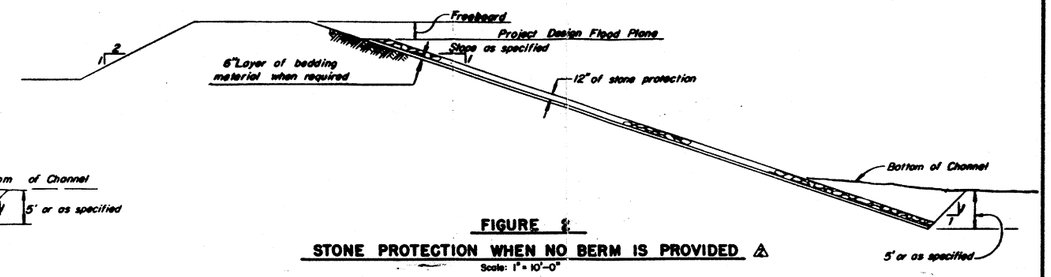
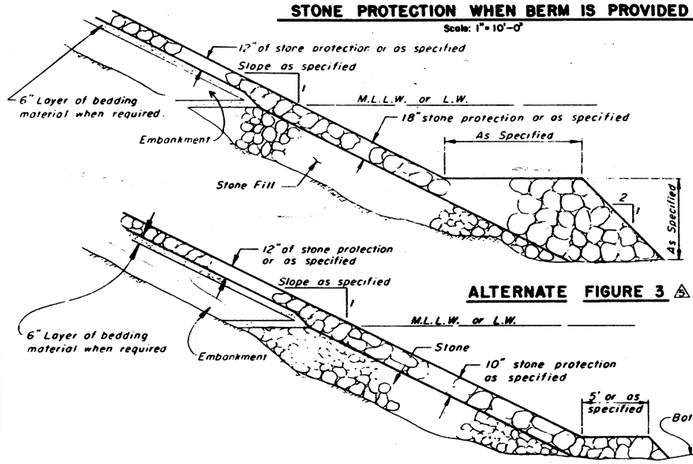
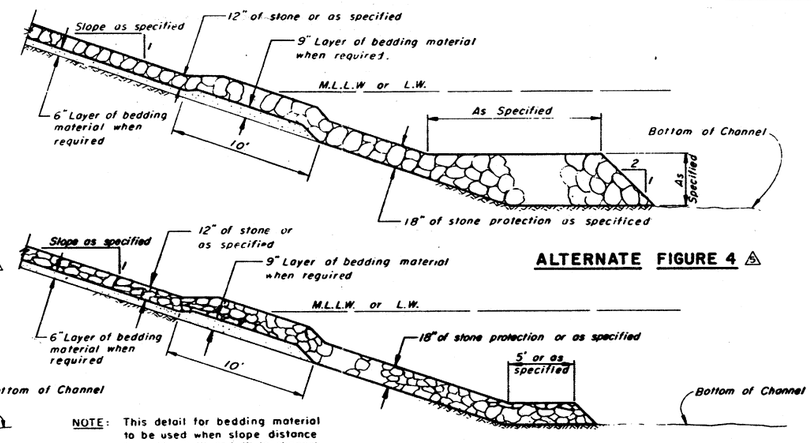


FIGURE 2
STONE PROTECTION WHEN NO BERM IS PROVIDED △2
Scale: 1" = 10'-0"



ALTERNATE FIGURE 3 △5

FIGURE 3
STONE PROTECTION WITH STONE FILL △3 △5 △6
Scale: 1" = 4'-0"



ALTERNATE FIGURE 4 △5

NOTE: This detail for bedding material to be used when slope distance from M.L.L.W. or L.W. to channel bottom is greater than 10 feet.

FIGURE 4 △1 △3 △4
Scale: 1" = 4'-0"

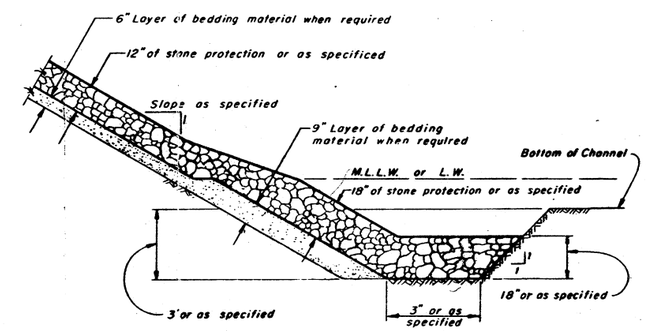
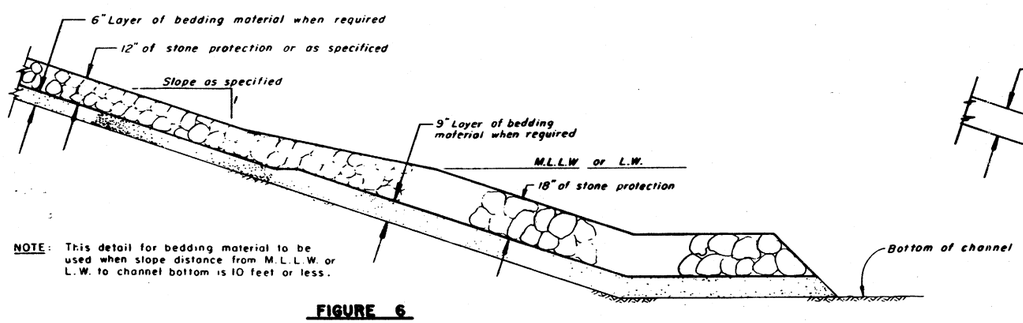


FIGURE 5 △1 △2 △3
Scale: 1" = 2'-0"

STONE PROTECTION AT BOTTOM OF CHANNEL



NOTE: This detail for bedding material to be used when slope distance from M.L.L.W. or L.W. to channel bottom is 10 feet or less.

FIGURE 6
STONE PROTECTION WITH BEDDING MATERIAL △3 △4
Scale: 1" = 2'-0"

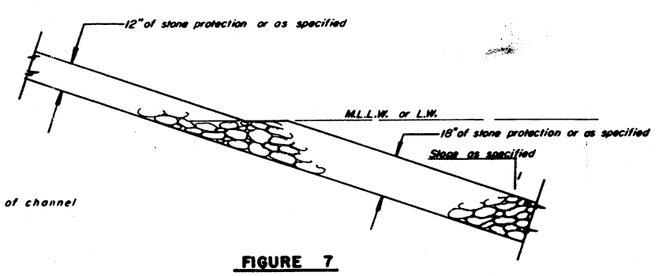


FIGURE 7
STONE PROTECTION WITHOUT BEDDING MATERIAL
Scale: 1" = 2'-0"

GRAPHIC SCALES

1" = 2'-0" 0' 1' 2' 4' 6' 8' 10'
1" = 4'-0" 0' 1' 2' 3' 4' 8' 12' 16' 20'
1" = 10'-0" 0' 5' 10' 20' 30' 40' 50'

REVISION	DATE	DESCRIPTION	BY	BY
△5	28 Aug 72	Change according to SPD comments (Unit 24)	[illegible]	[illegible]
△4	26 Aug 71	Change according to SPD comments (RD1602)	[illegible]	[illegible]
△3	18 Feb 71	Change according to SPD comments (Unit 21)	[illegible]	[illegible]
△2	26 Aug 70	Change according to SPD comments (Unit 20)	[illegible]	[illegible]
△1	16 Jan 70	Change according to SPD comments (Unit 19)	[illegible]	[illegible]

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
PREPARED BY: R. CLARKE
SUBMITTED:
APPROVED:
PREPARED UNDER THE DIRECTION OF
LT. COL., CORPS OF ENGINEERS, U.S.A.

STANDARD DRAWING

STONE PROTECTION

DATE: 26 September 1960
SCALE: AS SHOWN
SPEC. NO.
FILE NO. 50-4-4488
SHEETS: 4488/1 TO 4488/8
SHEET NO. 4488/4,6

△6	2 Nov 72	Change according to SPD comments (Unit 24)	[illegible]	[illegible]

NOTE: This sheet supersedes sheet number 3674/4, File No. 50-4-3674, Dtd. 29 Aug. 1960

EXHIBIT D

NOTE: If Berm is used for dry weather roadway extend encased pipe / or reinforced concrete conduit 12 Ft. waterward and provide embankment ramps over the extension for the passage of vehicles.

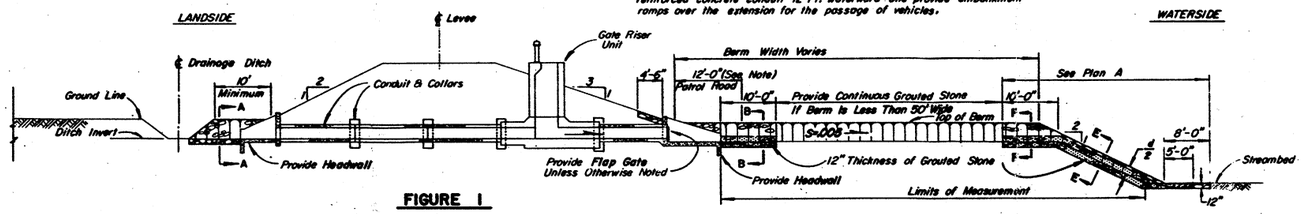


FIGURE 1

TYPICAL GRAVITY DRAINAGE STRUCTURE THROUGH LEVEE SECTION

Scale: 1" = 10'-0"

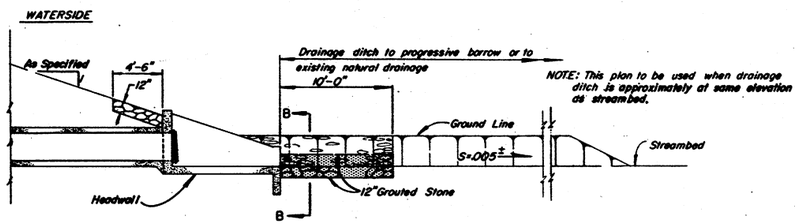
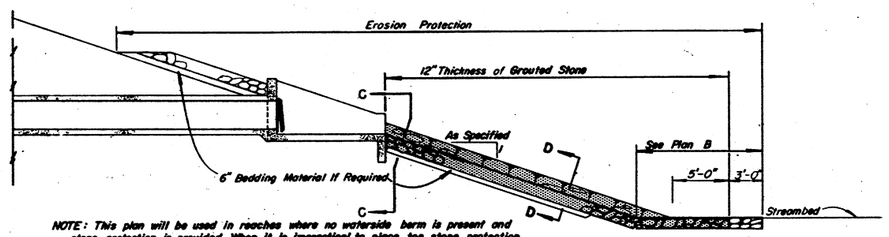


FIGURE 2

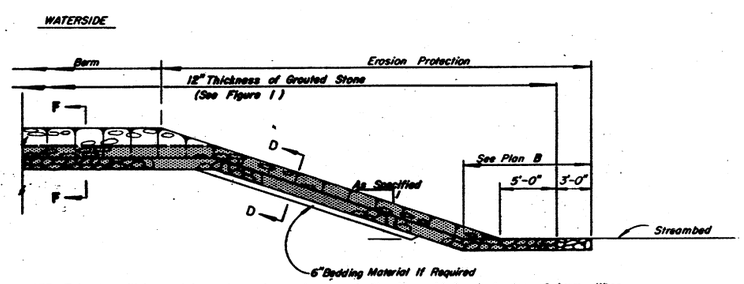
Scale: 1" = 5'-0"



NOTE: This plan will be used in reaches where no waterside berm is present and stone protection is provided. When it is impractical to place toe stone protection in the dry, grouted stone will be carried only to normal water surface.

FIGURE 3

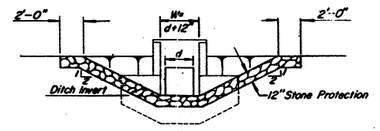
Scale: 1" = 5'-0"



NOTE: This plan will be used in reaches where stone protection is provided only to top of berm. When it is impractical to place toe stone protection in the dry, grouted stone will be carried to normal water surface.

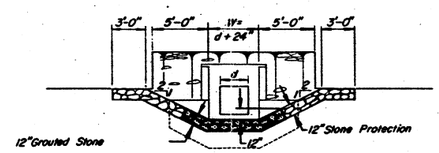
FIGURE 4

Scale: 1" = 5'-0"



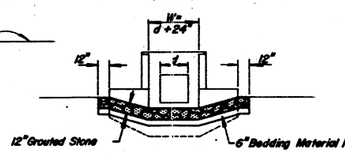
SECTION A-A

Scale: 1" = 5'-0"



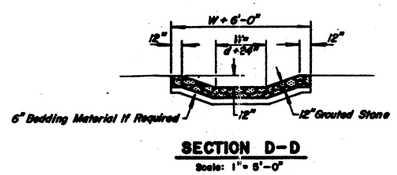
SECTION B-B

Scale: 1" = 5'-0"



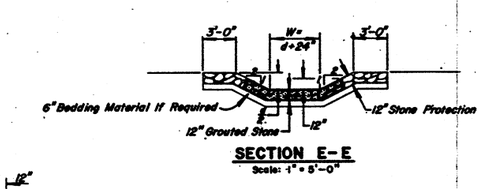
SECTION C-C

Scale: 1" = 5'-0"



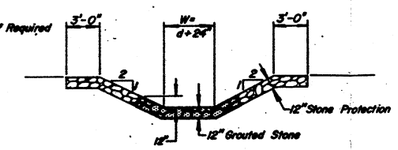
SECTION D-D

Scale: 1" = 5'-0"



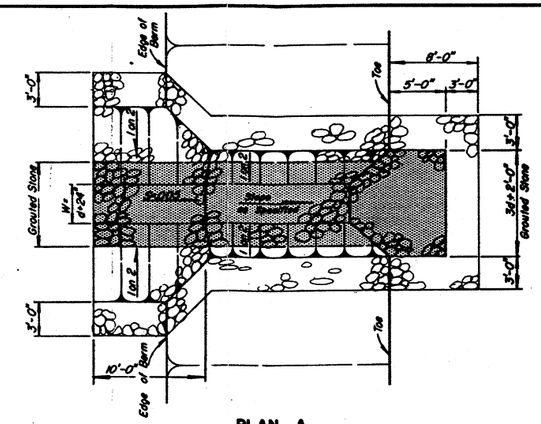
SECTION E-E

Scale: 1" = 5'-0"



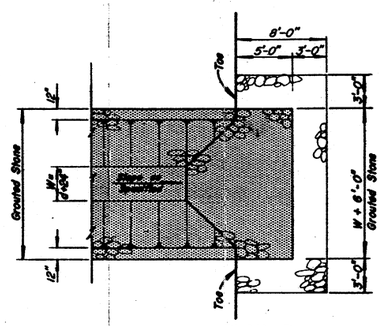
SECTION F-F

Scale: 1" = 5'-0"



PLAN A

Scale: 1" = 5'-0"



PLAN B

Scale: 1" = 5'-0"

GRAPHIC SCALES

1" = 5'-0"

1" = 10'-0"

REVISIONS	DATE	DESCRIPTION	BY	BY

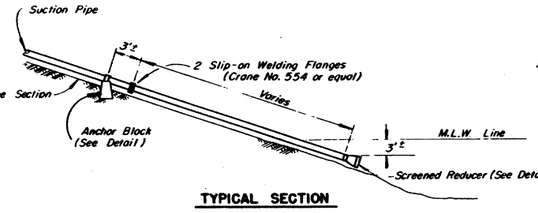
U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
ESTIMATED BY: R. CLARKE
SUBMITTED:
APPROVED:
APPROVED UNDER THE DIRECTION OF
APPROVED:
DATE: 23 September 1959
SCALE: AS SHOWN
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/9
SHEET NO. 4488/9

STANDARD DRAWING

IRRIGATION & DRAINAGE STRUCTURE EROSION PROTECTION DETAILS

NOTE: This sheet supersedes sheet number 3674/6, File No. 50-4-3674, Dtd. 13 Oct. 1960



TYPICAL SECTION

NOTES:
1. Air Relief Valve shall be installed at high point in line.
2. Provide pipe with minimum 2-foot cover through levee crown by humping levee if required.
3. Cut-off walls and drainage fill are required only in levees constructed of homogeneous impervious fill.

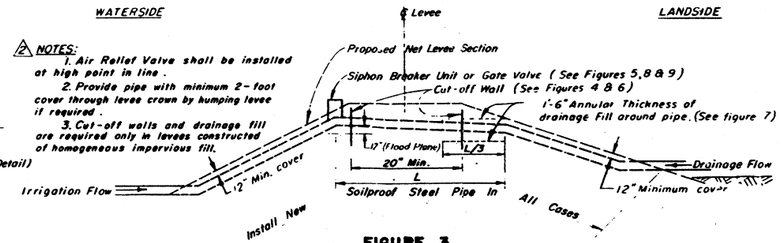
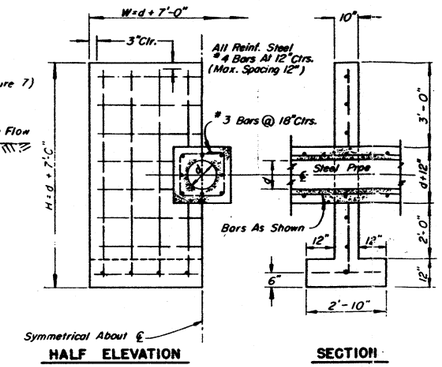


FIGURE 3
WELDED PIPE PRESSURE LINE INSTALLATION 2 3
Not To Scale

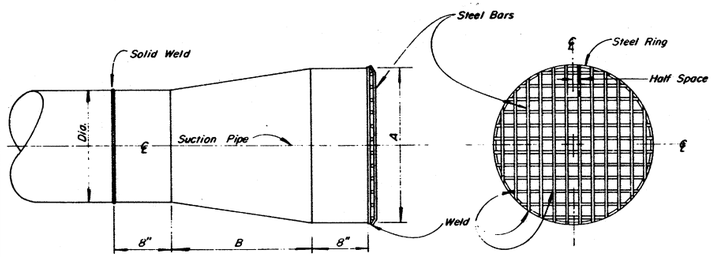


ENCASED STEEL PIPE QUANTITIES			
d	Bar No.	Conc. Per Lin. Ft.	Steel Lbs. Per Lin. Ft.
6"	3	.08 c.y.	4.9
8"	3	.09 c.y.	5.2
10"	3	.104 c.y.	5.5
12"	4	.119 c.y.	10.4
14"	4	.133 c.y.	10.9
16"	4	.148 c.y.	11.5
18"	4	.166 c.y.	12.0
20"	4	.185 c.y.	12.6
24"	4	.215 c.y.	13.7
30"	4	.270 c.y.	15.4

CUT-OFF WALL QUANTITIES		
d	Conc. C.Y.	Steel Lbs.
6"	2.20	94
8"	2.27	96
10"	2.34	98
12"	2.41	100
14"	2.48	102
16"	2.55	104
18"	2.62	107
20"	2.69	109
24"	2.82	114
30"	3.02	139

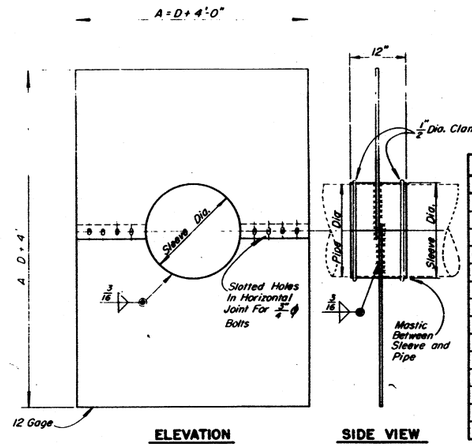
NOTES: 1. Concrete Encasement Shall Extend From Waterside Levee Toe To Landside Levee Toe.
2. For Pipes Below Flood Plane, A Cut-Off Wall Shall Be Placed At Each Levee Crown Line Or Min. 20' Apart
3. Encase Pipe With Concrete Below Flood Plane.
4. Detail Shown For Modification Of Existing Pipe Structures.

FIGURE 6
CONCRETE CUT-OFF WALL AND ENCASED STEEL PIPE 1 3
Not To Scale



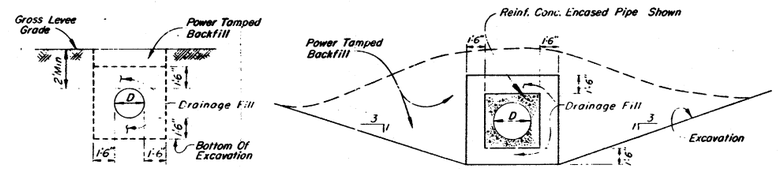
REDUCER AND SCREEN DATA				
Pipe Dia.	A	B	Bar No.	Spacing
4"	6"	18"	2	1 1/4" C. to C.
6"	8"	18"	"	"
8"	10"	18"	"	"
10"	12"	18"	"	1 1/4" C. to C.
12"	16"	18"	"	"
14"	18"	20"	"	"
16"	22"	20"	3	1 3/8" C. to C.
18"	24"	20"	"	"

FIGURE 1
SUCTION PIPE INSTALLATION AND SCREEN DETAILS
Not To Scale



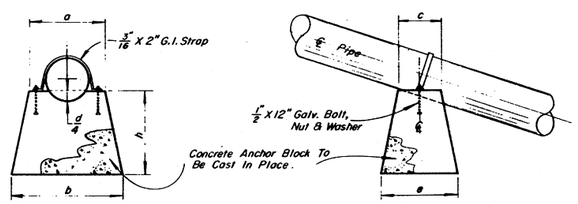
DIMENSION TABLE		
Dia.	A	
4"	4'-4"	
6"	4'-6"	
8"	4'-8"	
10"	4'-10"	
12"	5'-0"	
14"	5'-2"	
16"	5'-4"	
18"	5'-6"	
20"	5'-8"	
22"	5'-10"	
24"	6'-0"	
26"	6'-2"	
30"	6'-6"	
36"	7'-0"	

FIGURE 4
PLATE STEEL CUT-OFF WALL
FOR WELDED STEEL PIPE 1 3
Not To Scale



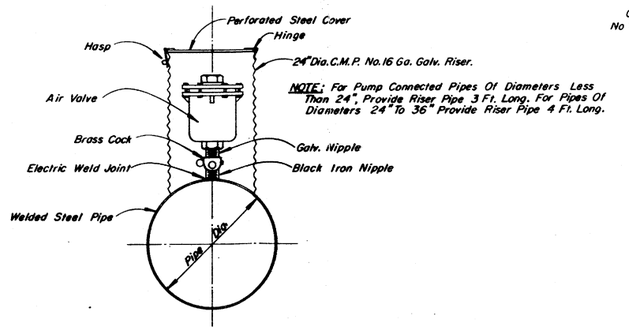
NOTES: 1. Typical Section in Landside 1/3 of Pipe below Flood Plane.
2. Detail Section for Modification of Existing Pipes only.

FIGURE 7
EXCAVATION AND BACKFILL FOR PIPE LINES 3
Not To Scale



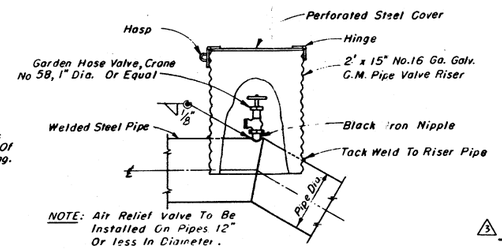
ANCHOR BLOCK DIMENSIONS & QUANTITIES						
Pipe Dia. d	a	b	c	e	h	Conc. C.Y.
4"	1'-4"	2'-0"	8"	12"	2'-4"	.12
6"	1'-4"	2'-0"	8"	12"	2'-4"	.12
8"	1'-6"	2'-3"	8"	1'-4"	2'-4"	.17
10"	1'-9"	2'-6"	10"	1'-8"	2'-6"	.26
12"	2'-0"	3'-0"	12"	2'-0"	2'-6"	.37
14"	2'-3"	3'-4"	1'-2"	2'-3"	2'-9"	.51
16"	2'-6"	3'-8"	1'-4"	2'-6"	3'-0"	.69
18"	2'-9"	4'-0"	1'-6"	2'-9"	3'-0"	.84

FIGURE 2
CONCRETE ANCHOR BLOCK
Not To Scale



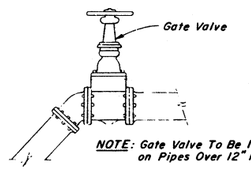
NOTE: For Pump Connected Pipes Of Diameters Less Than 24", Provide Riser Pipe 3 Ft. Long. For Pipes Of Diameters 24" To 36" Provide Riser Pipe 4 Ft. Long.

FIGURE 5
SIPHON BREAKER UNIT
FOR DRAINAGE LINE 2
Not To Scale



NOTE: Air Relief Valve To Be Installed On Pipes 12" Or less In Diameter.

FIGURE 8
STANDARD GARDEN HOSE
AIR RELIEF VALVE 2 3
FOR IRRIGATION LINES
Not To Scale



NOTE: Gate Valve To Be Installed on Pipes Over 12" In Dia.

FIGURE 9
3 GATE VALVE FOR IRRIGATION LINES

REVISION	DATE	DESCRIPTION	BY	BY
3	27 Jul. 72	Revised Drawing & Added Fig. 9		
2	8 Nov. 71	Modified Fig. 3 and added Fig. 8.		
1	12 Nov. 70	Revised cut off wall detail		

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY:
DRAWN BY: E. GARCIA
CHECKED BY: A. SMITH
PREPARED BY: R. CLARKE
SUBMITTED:
APPROVED FOR CONSTRUCTION:
APPROVED:
PREPARED UNDER THE DIRECTION OF
FOR DISTRICT ENGINEER

STANDARD DRAWING
IRRIGATION & DRAINAGE STRUCTURES
PIPE INSTALLATION, CUT-OFF WALLS, EXCAVATION & BACKFILL DETAILS

DATE: 25 September 1969
SCALE: AS SHOWN
SPEC. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8
SHEET NO. 4488/6.3

NOTE: This sheet supersedes sheet number 3674/7, File No. 50-4-3674, Dtd. 13 Oct. 1960

EXHIBIT D

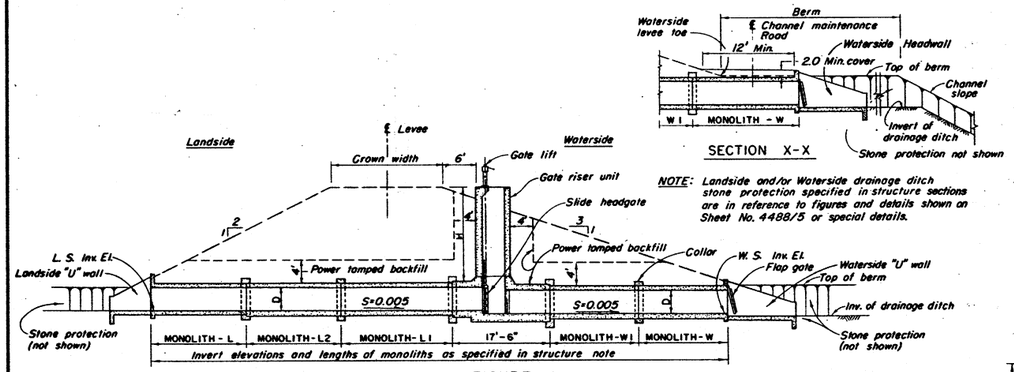


FIGURE 1

SECTION - TYPICAL GRAVITY DRAINAGE STRUCTURE
REINFORCED CONCRETE CONDUIT

SCALE: 1 IN. = 10'-0"

NOTE: Landside and/or Waterside drainage ditch stone protection specified in structure sections are in reference to figures and details shown on Sheet No. 4488/5 or special details.

NOTE: Section X-X to be used when necessary to traverse berm with vehicle.

SECTION X-X

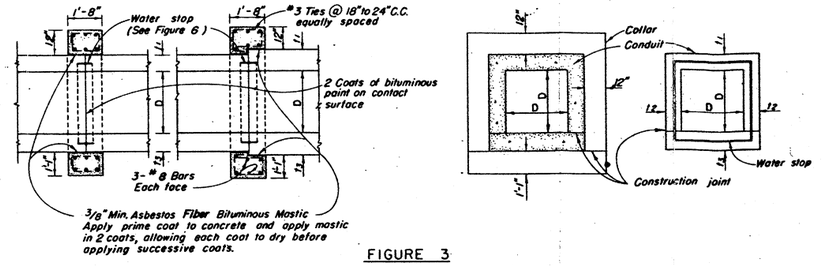


FIGURE 3

SECTIONS OF CONDUIT AND COLLARS

NOT TO SCALE

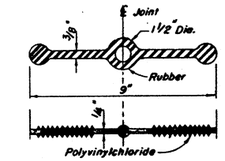


FIGURE 6

WATER STOP DETAILS

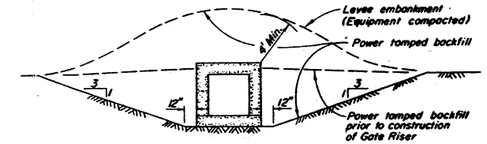
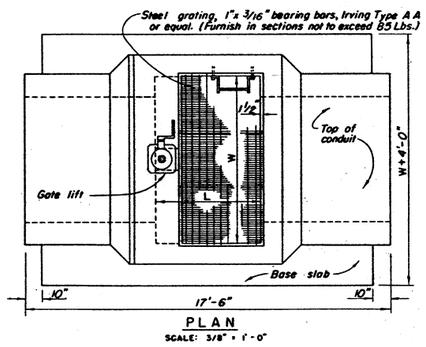


FIGURE 7

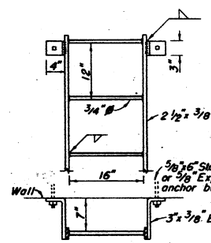
CONDUIT EXCAVATION AND BACKFILL

NOT TO SCALE



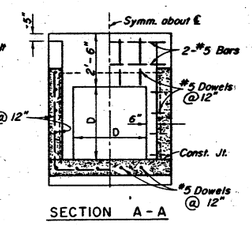
PLAN

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



PREFABRICATED
STEEL LADDER DETAIL

NOT TO SCALE



SECTION A-A

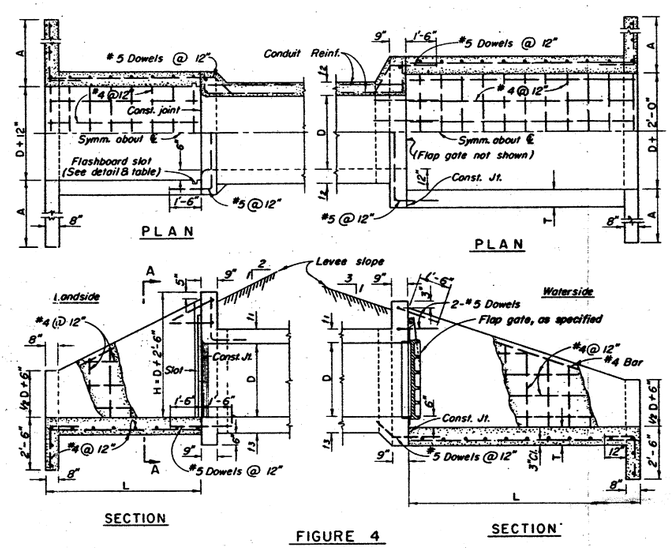
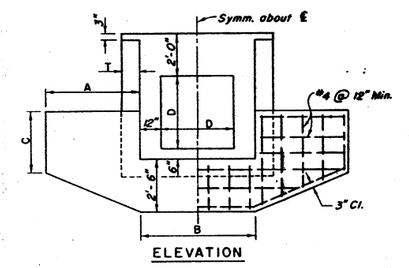
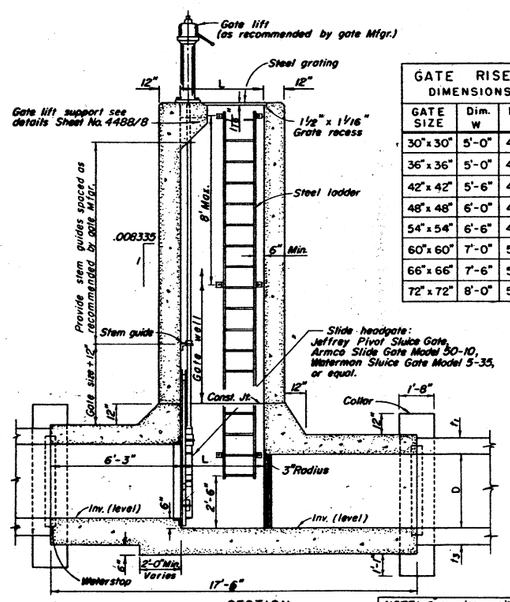


FIGURE 4

INLET AND OUTLET HEADWALLS

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





SECTION

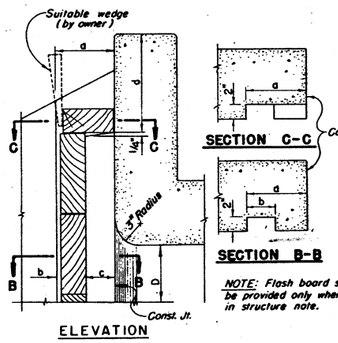
FIGURE 2

GATE RISER UNIT

SCALE 3/8" = 1'-0"

GATE RISER DIMENSIONS		
GATE SIZE	Dim. W	Dim. L
30" x 30"	5'-0"	4'-0"
36" x 36"	5'-0"	4'-0"
42" x 42"	5'-6"	4'-0"
48" x 48"	6'-0"	4'-0"
54" x 54"	6'-6"	4'-0"
60" x 60"	7'-0"	5'-0"
66" x 66"	7'-6"	5'-0"
72" x 72"	8'-0"	5'-0"

NOTE: Gate riser unit - Allowable foundation pressure 6000 Lbs. per Sq. Ft.



NOTE: Flash board slots shall be provided only when specified in structure note.

FIGURE 5

FLASHBOARD SLOT DETAILS

NOT TO SCALE

FLASH BOARD SLOT AND BOARD DIMENSIONS					
D	a	b	c	d	Furnish Boards	Length
30"	6 1/2	2 1/8	4 3/8	1'-2"	4-2" x 12" and 1-2" x 6"	3'-9 1/2"
36"	6 1/2	2 1/8	4 3/8	10 1/2"	4-2" x 12", 1-2" x 10" & 1-2" x 6"	4'-3 1/2"
42"	6 1/2	2 1/8	4 3/8	1'-2 1/2"	5-2" x 12" and 1-2" x 6"	4'-9 1/2"
48"	8 5/8	4 1/8	4 1/2"	1'-1"	5-4" x 12" and 2-4" x 8"	5'-3 1/2"
54"	8 5/8	4 1/8	4 1/2"	1'-3"	6-4" x 12" and 1-4" x 8"	5'-9 1/2"
60"	8 5/8	4 1/8	4 1/2"	1'-1 1/2"	6-4" x 12" and 2-4" x 8"	6'-3 1/2"
66"	8 5/8	4 1/8	4 1/2"	1'-3"	7-4" x 12" and 1-4" x 8"	6'-9 1/2"
72"	8 5/8	4 1/8	4 1/2"	1'-2"	7-4" x 12" and 2-4" x 8"	7'-3 1/2"

REINFORCED CONCRETE HEADWALL DIMENSIONS AND QUANTITIES																
SYMBOL	LANDSIDE HEADWALL				LEVEE SLOPE 1 ON 2				WATERSIDE HEADWALL - LEVEE SLOPE 1 ON 3							
CONDUIT SIZE D	30"x30"	36"x36"	42"x42"	48"x48"	54"x54"	60"x60"	66"x66"	72"x72"	30"x30"	36"x36"	42"x42"	48"x48"	54"x54"	60"x60"	66"x66"	72"x72"
H	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"
L	6'-4"	6'-0"	7'-6"	7'-10"	8'-4"	8'-10"	9'-4"	9'-10"	9'-8"	10'-5"	11'-2"	11'-11"	12'-8"	13'-5"	14'-2"	14'-11"
T	8"	8"	9"	9"	10"	10"	10"	10"	8"	8"	9"	9"	10"	10"	10"	10"
A	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"
B	3'-6"	4'-0"	6'-0"	6'-6"	7'-2"	7'-8"	8'-2"	8'-8"	4'-6"	5'-0"	7'-0"	7'-6"	8'-2"	8'-8"	9'-2"	9'-8"
C	2'-6"	2'-6"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	2'-6"	2'-6"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"
X *			1'-9"	2'-0"	2'-9"	3'-0"	3'-6"	4'-3"			1'-6"	2'-9"	4'-3"	5'-9"	7'-3"	8'-9"
Y *						1'-3"	1'-9"	2'-3"					1'-3"	2'-9"	4'-3"	5'-9"
Z *														0'-9"	1'-9"	3'-0"
CONCRETE CY.	2.36	2.83	3.80	4.34	5.41	6.24	6.94	7.78	3.56	4.33	5.61	6.46	8.11	9.23	10.33	11.53
CEMENT BBL.	3.24	3.89	5.23	5.97	7.74	8.58	9.54	10.70	4.90	5.95	7.71	8.33	11.15	12.69	14.20	15.85
REINF. STEEL LB.	158	190	244	268	315	378	437	480	226	272	326	406	472	590	655	759

* See Figure 4 Sheet No. 4488/8

NOTES:

All steel reinforcement to be deformed bars.

At splices, lap all bars a minimum distance of 24 diameters of smaller bar in splice unless noted otherwise.

All longitudinal steel in headwalls #4 bars unless noted, maximum spacing 12" on centers.

All exposed edges of concrete to be chamfered 3/4" unless noted.

For Gate Riser and Conduit reinforcement and details see Sheet No. 4488/8

In lieu of a square form for the inside of the conduit, a round smooth steel pipe, or other suitable round form, may be used and left in place. The round pipe or form will have a diameter equal to the inside dimension of the square conduit, but in no instance will it be less than 30 inches. When a square conduit is sized for a certain capacity, and a round section reduces the capacity to the extent that it is not adequate, the round pipe or form, as well as the entire conduit, will be enlarged to conform to the capacity requirement.

REVISION	DATE	DESCRIPTION	BY	BY

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY: G. SWARTZ
DRAWN BY: E. WARNER
CHECKED BY: A. SMITH
PREPARED BY: N. HACKEN
SUBMITTED BY: Alvin Smith
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: [signature]
CHIEF, DESIGN BRANCH
APPROVED: [signature]
CHIEF, ENGINEERING DIVISION
DATE: 25 September 1969
PREPARED UNDER THE DIRECTION OF: George B. Thomas
LT. COL., CORPS OF ENGINEERS, U.S.A. FOR DISTRICT ENGINEER

STANDARD DRAWING
IRRIGATION & DRAINAGE STRUCTURES
GATE RISER UNIT DETAILS AND HEADWALL REINFORCING DETAILS

SCALE: AS SHOWN SPEC. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8 SHEET NO. 4488/7

NOTE: This sheet supersedes sheet number 3674/9, File No. 50-4-3674, Dtd. 23 March 1965

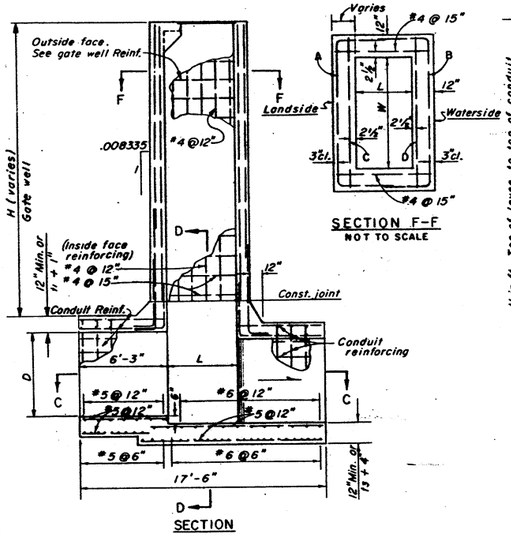
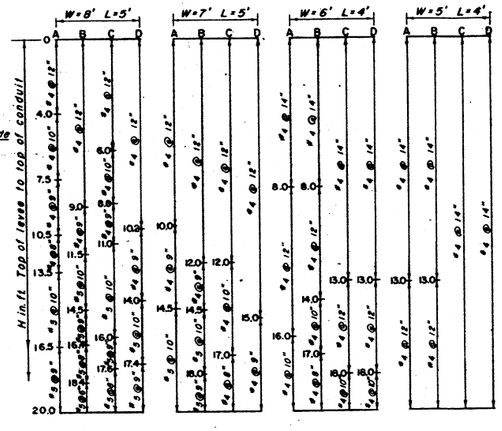


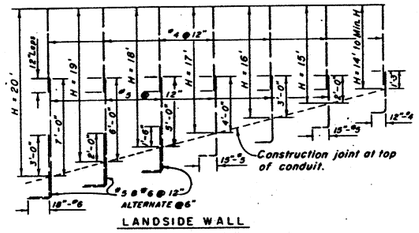
FIGURE 1

△ GATE RISER UNIT REINFORCEMENT

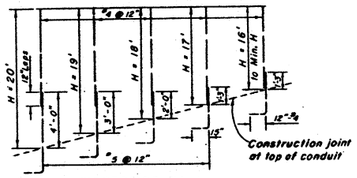
SCALE: 1/4" = 1'-0"



HORIZONTAL REINFORCEMENT



LANDSIDE WALL

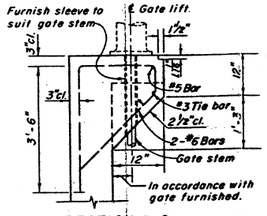


WATERSIDE WALL

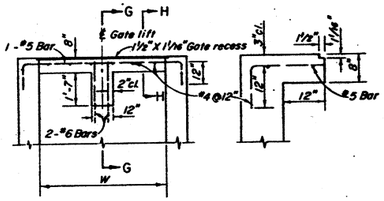
VERTICAL REINFORCEMENT

GATE WELL - REINFORCEMENTS

NOT TO SCALE



SECTION G-G



GATE LIFT SUPPORT DETAILS

NOT TO SCALE

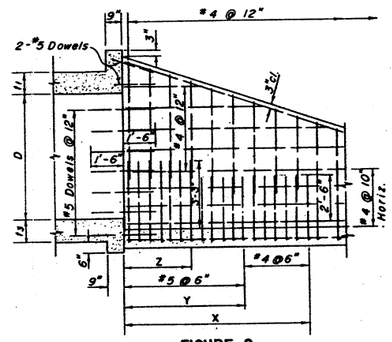


FIGURE 2

WATERSIDE HEADWALL REINFORCEMENT

NOT TO SCALE

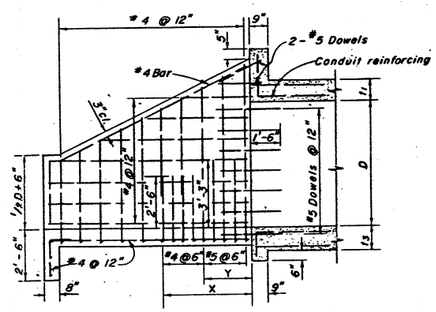
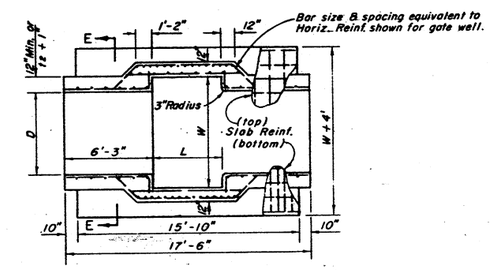


FIGURE 3

LANDSIDE HEADWALL REINFORCEMENT

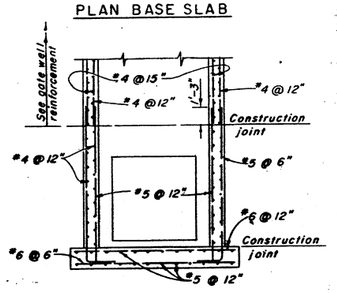
NOT TO SCALE

NOTE: See Table Reinforced Concrete Headwall, Sheet 4488/7 For The Dimensions Of X, Y, & Z.

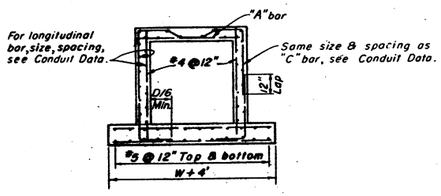


SECTION C-C

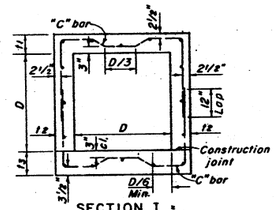
PLAN BASE SLAB



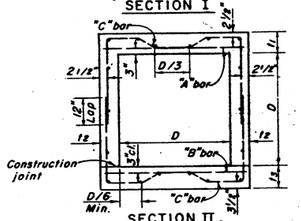
△ SECTION D-D



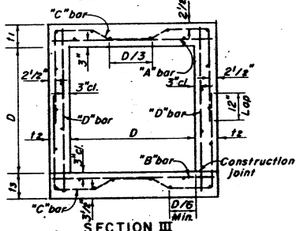
△ SECTION E-E



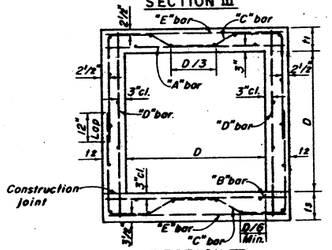
SECTION I



SECTION II



SECTION III



SECTION IV

TYPICAL CONDUIT SECTIONS

NOT TO SCALE

H = 4 Ft. to 10 Ft.				TRANSVERSE Bar Size – Spacing					Ref. to Sec.	LONGITUDINAL Bar Size-Spacing	QUANTITIES / Lin. Ft.		
CONDUIT SIZE	DIMENSIONS t_1	t_2	t_3	"A"	"B"	"C"	"D"	"E"			Conc. Cu. Yds.	Cement Bbls.	Reinf. Steel Lbs.
30"x 30"	7"	6"	8"			#4-9"			I	#4 @ 15"	.25	.34	22.5
36"x 36"	7"	6"	8"			#4-8"			I	#4 @ 15"	.30	.41	27.5
42"x 42"	7½"	6"	8"			#5-10"			I	#4 @ 15"	.34	.47	34.5
48"x 48"	8"	7"	9"	#4-12"	#4-12"	#5-12"			II	#4 @ 15"	.44	.60	41.8
54"x 54"	8½"	8"	10"	#4-12"	#4-12"	#5-12"			II	#4 @ 15"	.53	.72	46.3
60"x 60"	9½"	8"	10"	#4-11"	#4-11"	#5-11"	#4-12"		III	#4 @ 15"	.63	.86	70.0
66"x 66"	10"	9"	11"	#4-11"	#4-11"	#5-11"	#4-12"		III	#4 @ 12"	.76	1.04	77.6
72"x 72"	10"	10"	11"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 12"	.88	1.21	89.4
H = 10 Ft. to 12 Ft.													
30"x 30"	7"	6"	8"			#4-8"			I	#4 @ 15"	.25	.34	24.2
36"x 36"	7½"	7"	8"			#5-11"			I	#4 @ 15"	.33	.45	30.3
42"x 42"	8"	7"	9"			#5-10"			I	#4 @ 15"	.40	.54	35.2
48"x 48"	8½"	7"	9½"	#4-12"	#4-12"	#5-12"			II	#4 @ 15"	.46	.63	41.2
54"x 54"	9"	8"	10"	#4-11"	#4-11"	#5-11"			II	#4 @ 15"	.56	.77	50.5
60"x 60"	9½"	9"	10"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 15"	.67	.92	75.7
66"x 66"	10½"	10"	11"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 12"	.82	1.12	82.5
72"x 72"	11"	10"	12"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 12"	.91	1.25	89.6
H = 12 Ft. to 14 Ft.													
30"x 30"	7"	7"	8"			#5-12"			I	#4 @ 15"	.28	.38	26.0
36"x 36"	7½"	7"	8"			#5-11"			I	#4 @ 15"	.33	.45	30.9
42"x 42"	8"	8"	9"			#5-9"			I	#4 @ 15"	.43	.59	38.5
48"x 48"	9"	8"	10"	#4-12"	#4-12"	#5-12"			II	#4 @ 15"	.51	.70	43.3
54"x 54"	9½"	9"	10"	#4-10"	#4-10"	#5-10"			II	#4 @ 15"	.61	.84	53.3
60"x 60"	10"	9"	11"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 12"	.70	.96	76.4
66"x 66"	11"	10"	12"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 12"	.85	1.17	84.4
72"x 72"	11½"	11"	12"	#4-12"	#4-12"	#6-12"	#4-12"	#4-12"	IV	#4 @ 12"	.98	1.34	112.1
H = 14 Ft. to 16 Ft.													
30"x 30"	8"	8"	9"			#5-10"			I	#4 @ 15"	.32	.45	29.5
36"x 36"	8"	8"	9"			#5-9"			I	#4 @ 15"	.38	.52	35.7
42"x 42"	8½"	8"	9"			#5-9"			I	#4 @ 15"	.45	.62	37.1
48"x 48"	9"	8"	10"	#4-11"	#4-11"	#5-11"			II	#4 @ 15"	.51	.70	44.7
54"x 54"	10"	9"	11"	#4-11"	#4-11"	#5-11"			II	#4 @ 15"	.64	.88	51.4
60"x 60"	10½"	10"	11"	#4-11"	#4-11"	#6-11"	#4-12"		III	#4 @ 12"	.75	1.03	86.0
66"x 66"	11½"	11"	12"	#4-12"	#4-12"	#6-12"	#4-12"	#4-12"	IV	#4 @ 12"	.91	1.24	100.0
72"x 72"	12"	12"	13"	#4-11"	#4-11"	#6-11"	#4-12"	#4-11"	IV	#4 @ 12"	1.06	1.46	117.4
H = 16 Ft. to 18 Ft.													
30"x 30"	8½"	8"	9"			#5-10"			I	#4 @ 15"	.33	.45	29.2
36"x 36"	8½"	8"	9"			#5-9"			I	#4 @ 15"	.38	.53	35.0
42"x 42"	9"	8"	10"			#5-9"			I	#4 @ 15"	.44	.60	39.7
48"x 48"	9½"	9"	11"	#4-11"	#4-11"	#5-11"			II	#4 @ 15"	.57	.78	44.4
54"x 54"	10½"	10"	11"	#4-11"	#4-11"	#5-11"	#4-12"		III	#4 @ 12"	.69	.94	59.6
60"x 60"	11"	10"	12"	#5-12"	#5-12"	#5-12"	#4-12"	#4-12"	IV	#4 @ 12"	.78	1.07	82.1
66"x 66"	12"	11"	13"	#5-10"	#5-10"	#5-10"	#4-12"	#4-10"	IV	#4 @ 12"	.94	1.29	106.0
72"x 72"	12½"	12"	14"	#5-12"	#5-12"	#6-12"	#4-12"	#4-12"	IV	#4 @ 12"	1.10	1.51	116.1
H = 18 Ft. to 20 Ft.													
30"x 30"	8½"	8½"	9"			#5-9"			I	#4 @ 12"	.34	.47	31.7
36"x 36"	8½"	8½"	9"			#5-8"			I	#4 @ 12"	.40	.54	35.3
42"x 42"	9"	9"	10"	#4-10"	#4-10"	#5-10"			II	#4 @ 15"	.49	.67	46.8
48"x 48"	10"	9"	11"	#4-10"	#4-10"	#5-10"			II	#4 @ 15"	.58	.80	50.7
54"x 54"	11"	10"	11"	#4-10"	#4-10"	#5-10"	#4-12"		III	#4 @ 15"	.70	.96	63.9
60"x 60"	11½"	11"	12"	#4-11"	#4-11"	#6-11"	#4-12"	#4-11"	IV	#4 @ 12"	.84	1.15	95.6
66"x 66"	12½"	12"	13"	#4-11"	#4-11"	#6-11"	#4-12"	#4-11"	IV	#4 @ 12"	1.00	1.37	113.7
72"x 72"	13"	13"	14"	#5-12"	#5-12"	#6-12"	#4-12"	#4-12"	IV	#4 @ 12"	1.16	1.60	121.5

CONDUIT DATA

REVISION	DATE	DESCRIPTION	BY	
1	10 Mar'70	Revised Reinf. details		

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
SACRAMENTO, CALIFORNIA

DESIGNED BY: G. SWARTZ
DRAWN BY: J. KANENAGA
CHECKED BY: A. SMITH
PREPARED BY: N. HACKEN
SUBMITTED: CHIEF, LDV & CHM SECTION
APPROVAL RECOMMENDED: CHIEF DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE: 25 September 1969
PREPARED UNDER THE DIRECTION OF: LT. COL. CORPS OF ENGINEERS, U.S.A. FOR DISTRICT ENGINEER

STANDARD DRAWING
IRRIGATION & DRAINAGE STRUCTURES
REINFORCING DETAILS FOR
GATE RISER, CONDUIT SECTIONS
AND HEADWALLS

SCALE: AS SHOWN | SPEC. NO.
FILE NO. 50-4-4488
SHEETS 4488/1 TO 4488/8 | SHEET NO. 4488/8.1

NOTE: This sheet supersedes sheet number 3674/10, File No. 50-4-3674, Dtd. 23 March 1965