

DRAINAGE SUMMARY

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5063011	1968	19	83

Revised: June 23, 1969
Revised: July 15, 1969

STRUCTURES			PIPE CULVERTS		ESTIMATED																QUANTITIES																REMARKS
NUMBER	TYPE	STATION	ITEM	NO.	14.01	15.01	20A.01	46.101	46.201	46.200A1	48.01	52.30	54A.03	54A.04	58B.050	59.172	59.182		59B.194	59B.178	59B.2420	59B.291	59B.388	59A.562	60.152	59B.180	62.01	65.01	98.01	98.02	98.30	19.00A2	128.01	61.02B2	58.120B2		
			FROM	TO	Structure Excavation other than at Bridges	Ditch And Channel Excavation	Untreated Base For Pipe Foundation	Class "A-1" Concrete other than in Bridges	Class "B-1" Concrete other than in Bridges	Class "B-1" Concrete For Ditches and Gutters	Reinforcing Steel other than in Bridges	Filter Materials For Underdrains	Type "G16" Steel Frame And Grates	Type A-12 Steel Frame And Grates	36" RCCP, CI, II or 36" ROCP, CI, II	24" CGMP, 12 Ga.	54" CGMP, 12 Ga.		24" CGMP, 10 Ga. or 24" RCCP, CI, II or 24" ACGR, CI, III	24" CGMP, 12 Ga. or 24" RCCP, CI, II or 24" ACGR, CI, III	30" CGMP, 10 Ga. or 24" RCCP, CI, II or 24" ACGR, CI, III	30" CGMP, 8 Ga. or 30" RCCP, CI, II or 30" ACGR, CI, III	36" CGMP, 8 Ga. or 36" RCCP, CI, II or 36" ACGR, CI, IV	48" CGMP, 10 Ga. or 48" RCCP, CI, III	72" Sectional Plate Pipe Culvert, 5 Ga.	24" CGMP, 12 Ga. or 24" RCCP, CI, II or 24" ACGR, CI, IV	Cement Rubble Masonry	Grouted Rubble Pavement	Type "A" C.I. Frame & Cover	Type "B" C.I. Frame & Cover	Installing Salvaged C.I. Frame And Covers	Shotcrete For Ditches and Gutters	6" Perforated Underdrain Pipe	Remove, clean and Relay Existing 30" Culvert Pipe	30" ROCP, CI, II		
			UNIT	USED	C.Y.	C.Y.	C.Y.	C.Y.	C.Y.	C.Y.	Lb.	C.Y.	Sq.	Sq.	L.F.	L.F.	L.F.		L.F.	L.F.	L.F.	L.F.	L.F.	L.F.	L.F.	C.Y.	C.Y.	Sq.	Sq.	Sq.	C.Y.	L.F.	L.F.	L.F.			
	Median C.D.I.	40+50			62			3			46		1						104																		
	Inlet & Outlet Structure	44+40±	44+80± Lt.	45+68± Rt.	5923 1060	185 185	1894 73																		5670 366	40.80 38	332 4										
	Spillway Inlet	45+50							1.0										16																		
	Median C.D.I., Spillway Inlet	46+00			42			2.0	3.5				1						192																		
	C.D.I., "A-2" C.B., Median C.D.I., Outlet Struct.	51+05±	51+00± Lt.	51+13± Rt.	280			18.0		2.0			1									22	132					1				2.0					
	Inlet & Outlet Structure	Kapaa Quarry Rd 6+11± 8+40±	6+11± 8+40±	6+11± 8+40±	111.7 164	8.62 10	10.19 10.0				1272.6 1100						556 64																				Kapaa Quarry Road Access
	Median C.D.I.	54+00 53+85			35			3.0					1						86																		
	C.D.I. & Headwall	Side Road 0+68	56+57± Lt.	57+07± Lt.	41				2.0		42															50											
	Median C.D.I.	57+20	57+20	57+89	37			3.0					1				66																				
	S.D.M.H., Outlet Structure	57+89	57+97± Lt.	57+80± Rt.	255	9	20	10.5		2.5	1087						122										7				1	2.5					
	"D" C.D.I., Spillway	59+50	59+50	59+50 Rt.	42			2.0					1						68										1								
	"D" C.D.I., St'd. Conc. Headwall	61+90	61+90	61+90 Rt.	47			2.0	1.5		42		1						66																		
	S.D.M.H., Outlet Structure	62+65	62+29± Lt.	63+00± Rt.	440	200		19.0		4.0	2015													300						1	4.0						
	"D" C.B.	Kalaheo Sch. 0+83± Rt.	0+83± Rt.	0+84± Lt.	25			4.5			77								28										1								
	"D" C.B.	Kalaheo Sch. 0+84± Lt.	0+84± Lt.	62+29± Lt.	25			5.0			77								16										1								
	"D" C.B.	65+00 Lt.	65+00 Lt.	67+50 Lt.	160			3.5			80								240										1								
	"D" C.B.	67+50 Lt.	67+50 Lt.	67+50	30			3.5	6.0		80								36										1								
	Median C.D.I.	67+50	67+50	71+42±	190			3.5			136		1																					230	162		
	"D" C.B.	71+48± Lt.			8			2.0	6.0		77																			1							Provide Connection To Existing Culvert
	Median C.D.I.	71+42±	71+42±	71+50± Rt.	80			3.5	8.0		136		1		70																					Provide Connection To Existing Culvert	
	St'd. Conc. Headwall	71+50± Rt.			6				3.0		60																										
	Transverse Underdrain		40+00 Lt.	45+50 Lt.	30							28																					192			50' o.c.	
	Conc. Lined Ditch		27+20	29+20± Lt.		50				22.0																					22.0					Transition Bench To 2x2' Cut-off Ditch	

1100. 19

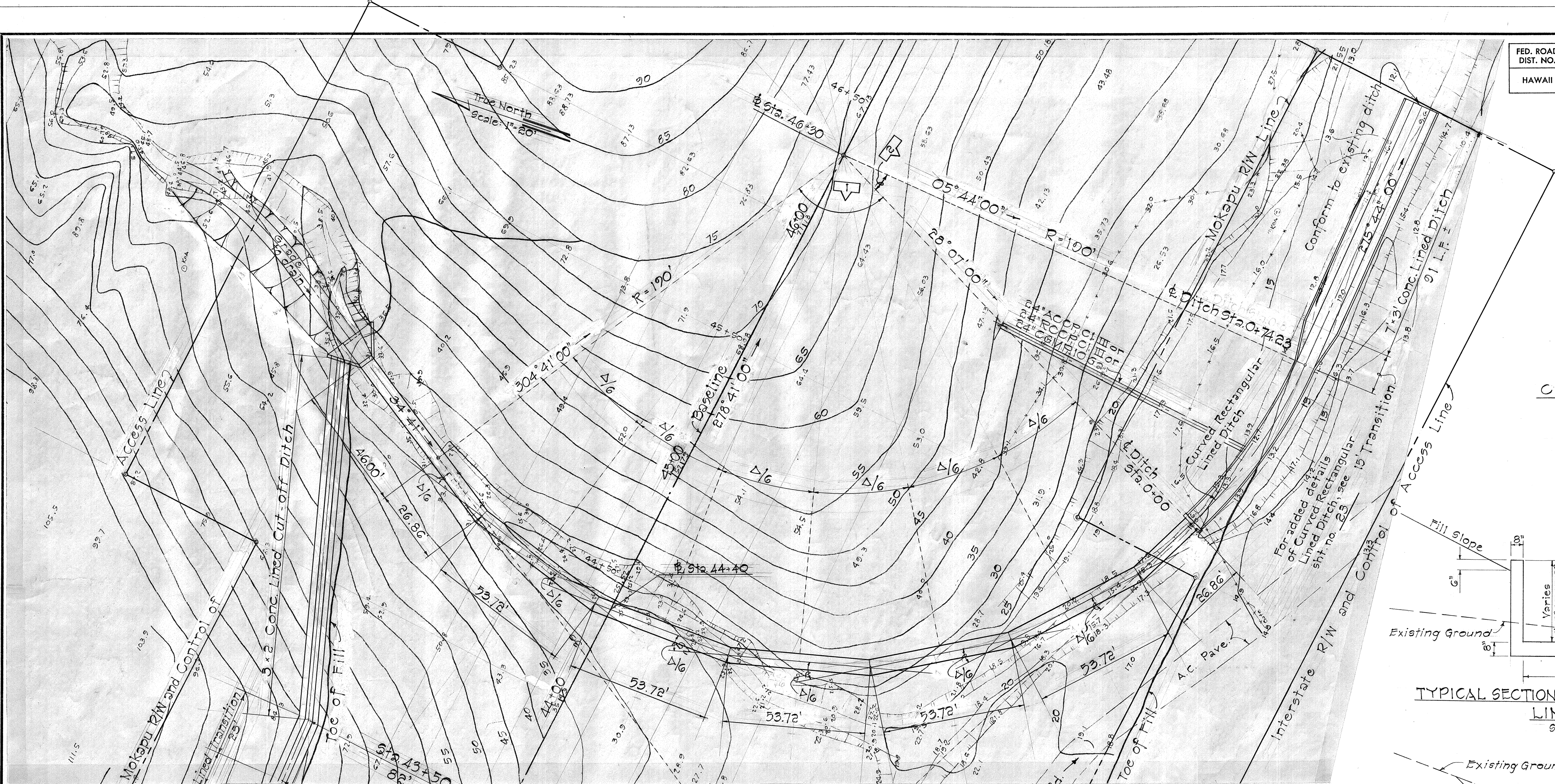
S U M M A R Y

Revised: June 23, 1969
Revised: July 15, 1969

SHEET NO. 2 OF 12 SH

ADD. 20

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	21	83



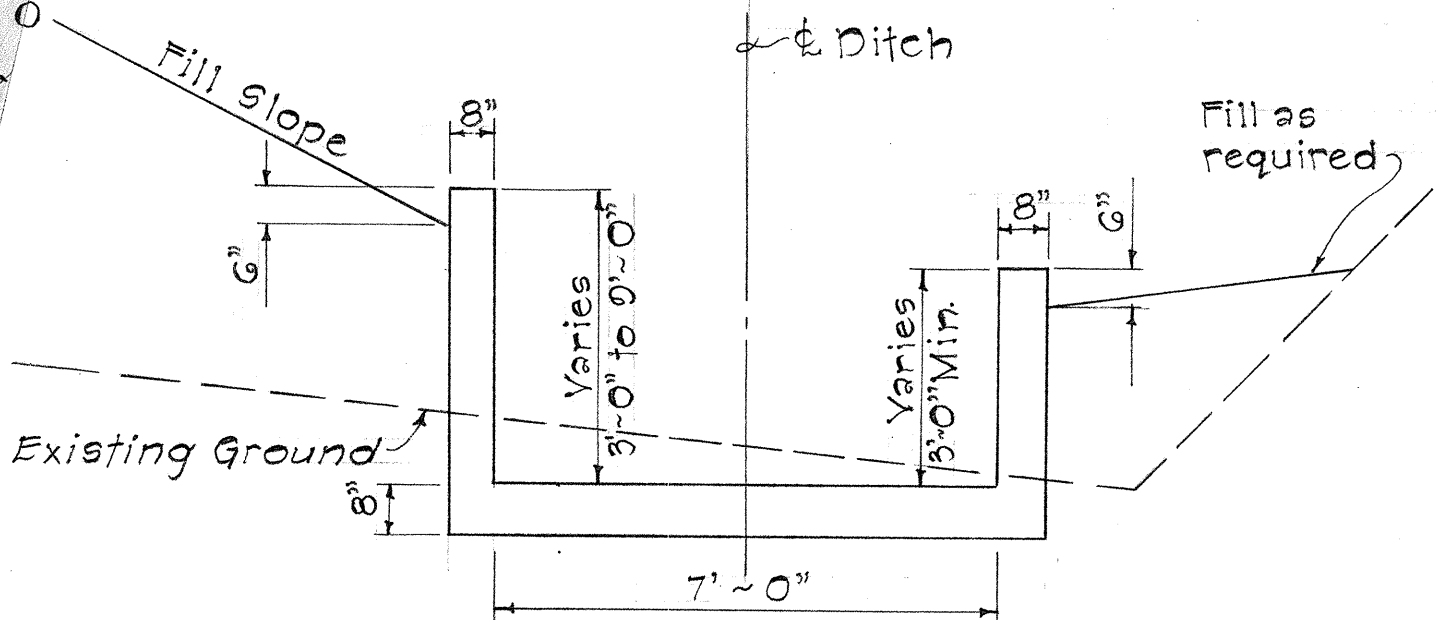
CURVE DATA

72" Sectional Plate Culvert

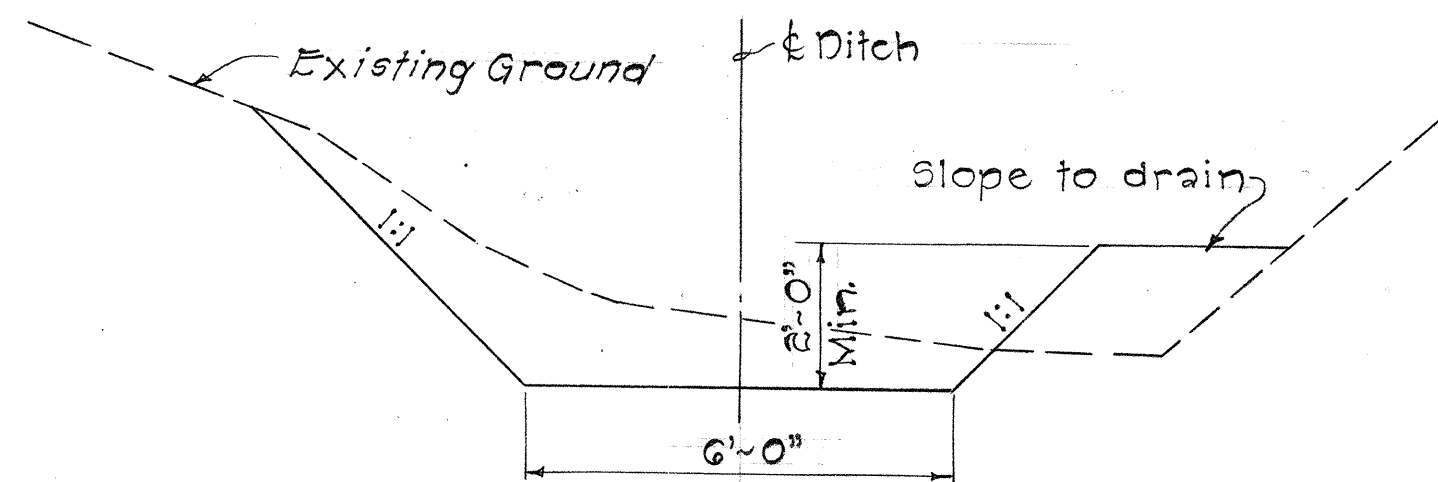
1
 $\Delta = 96^{\circ} 34' 00''$
 $\Delta\% = 16^{\circ} 05' 40''$
 $R = 190.00'$
 $T = 213.13'$
 $L = 26.86'$

Curved Rectangular Lined Ditch

2
 $\Delta = 28^{\circ} 23' 00''$
 $R = 190.00'$
 $T = 37.59'$
 $L = 74.83'$
 $C = 73.76'$



TYPICAL SECTION OF CURVED RECTANGULAR LINED DITCH
Scale: 3/8" = 1'-0"

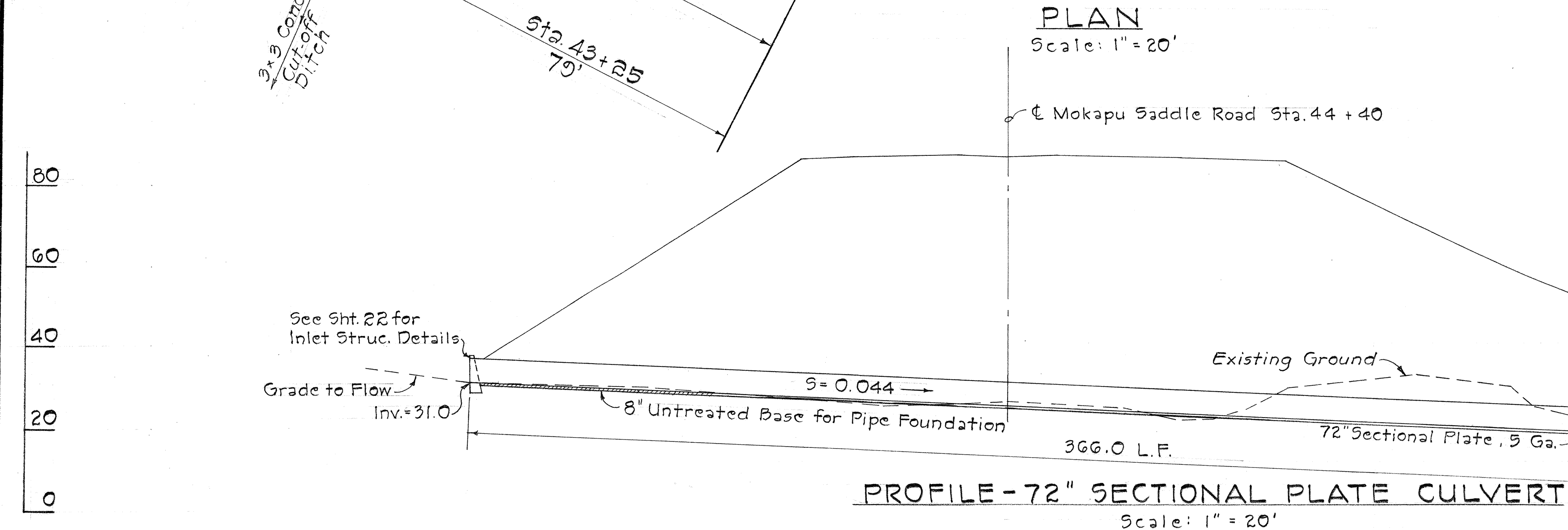


TYPICAL SECTION OF EARTH DITCH AT INLET TO 72" PIPE CULVERT
Scale: 3/8" = 1'-0"

ESTIMATED QUANTITIES

Struc. Exc.	= 1050 C.Y.
Ditch & Channel Exc.	= 185 C.Y.
Untreated Base	= 73 C.Y.
72" Sectional Plate	= 366 L.F.
Cement Rubble Masonry	= 38 C.Y.
Grouted Rubble Pavement	= 4 C.Y.

NOTE:
72" Sectional Plate Pipe Culvert shall be factory elongated



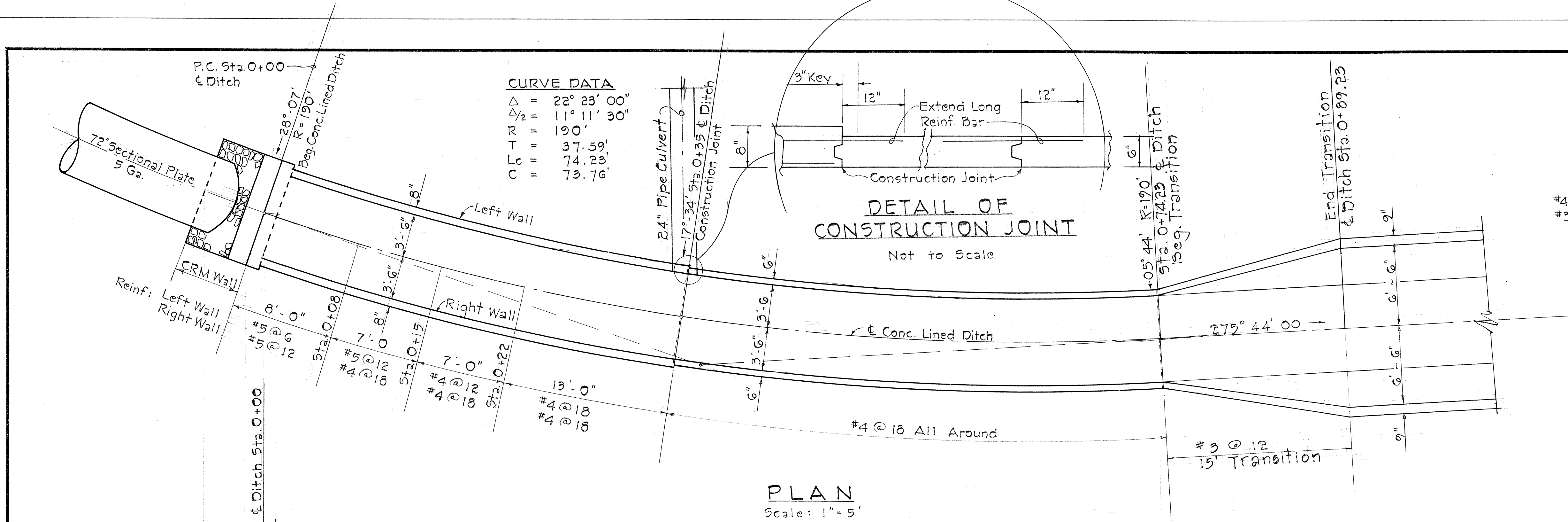
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS
72" SECTIONAL PLATE CULVERT
AT STA. 44 + 40

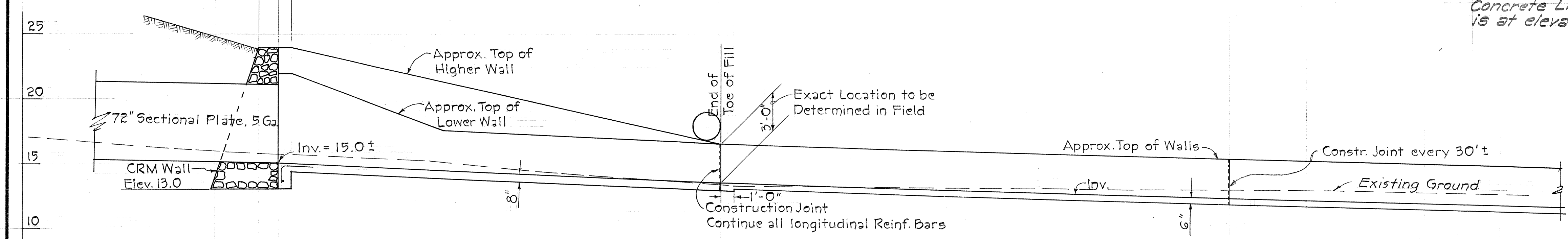
MOKAPU SADDLE ROAD
FAS Proj. No. 5-0630(11)
FAS Proj. No. 5-0630(7)
Scale: As Shown
Date: January, 1968

SHEET No. 3 OF 18 SHEETS

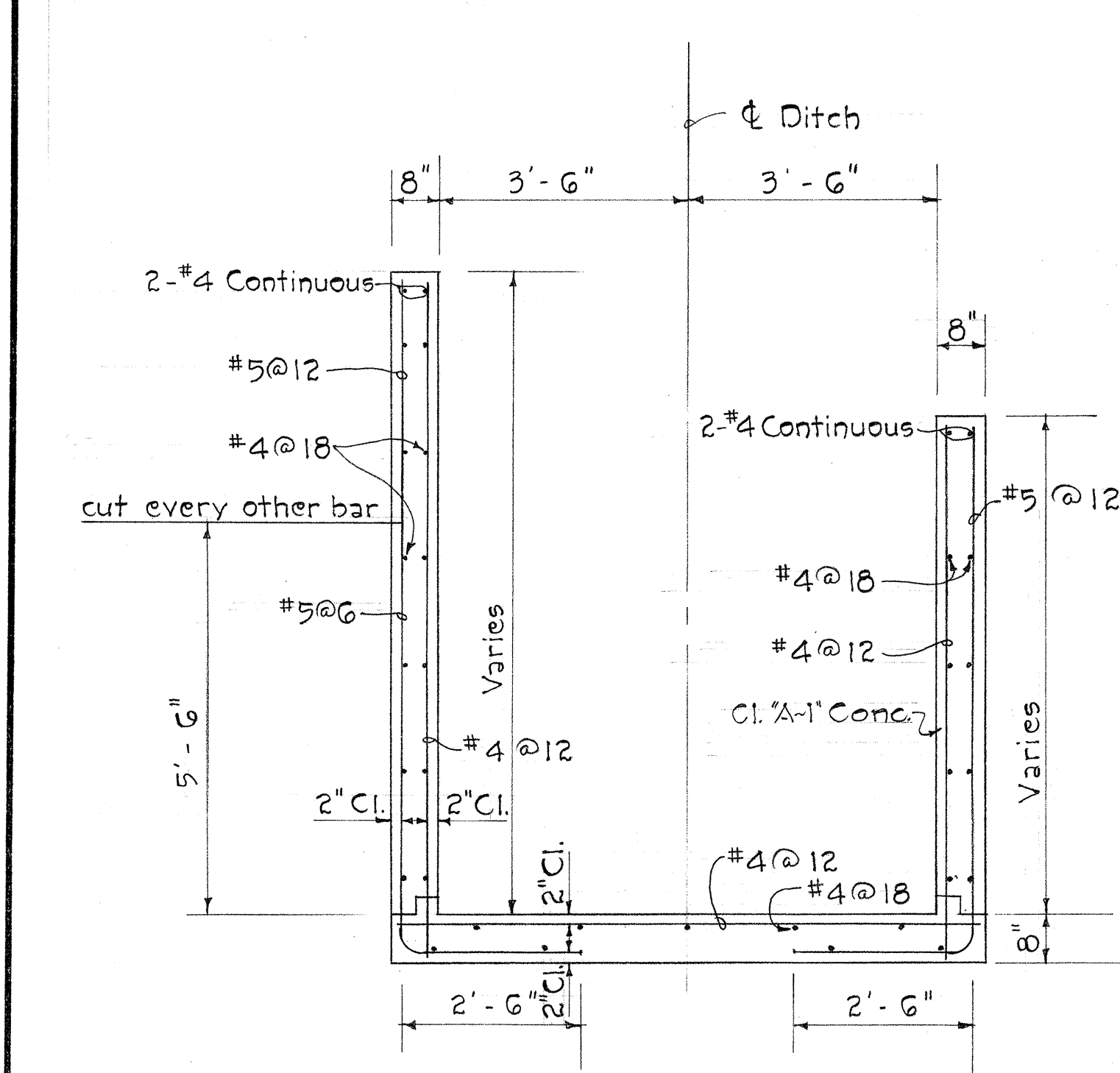
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	23	83



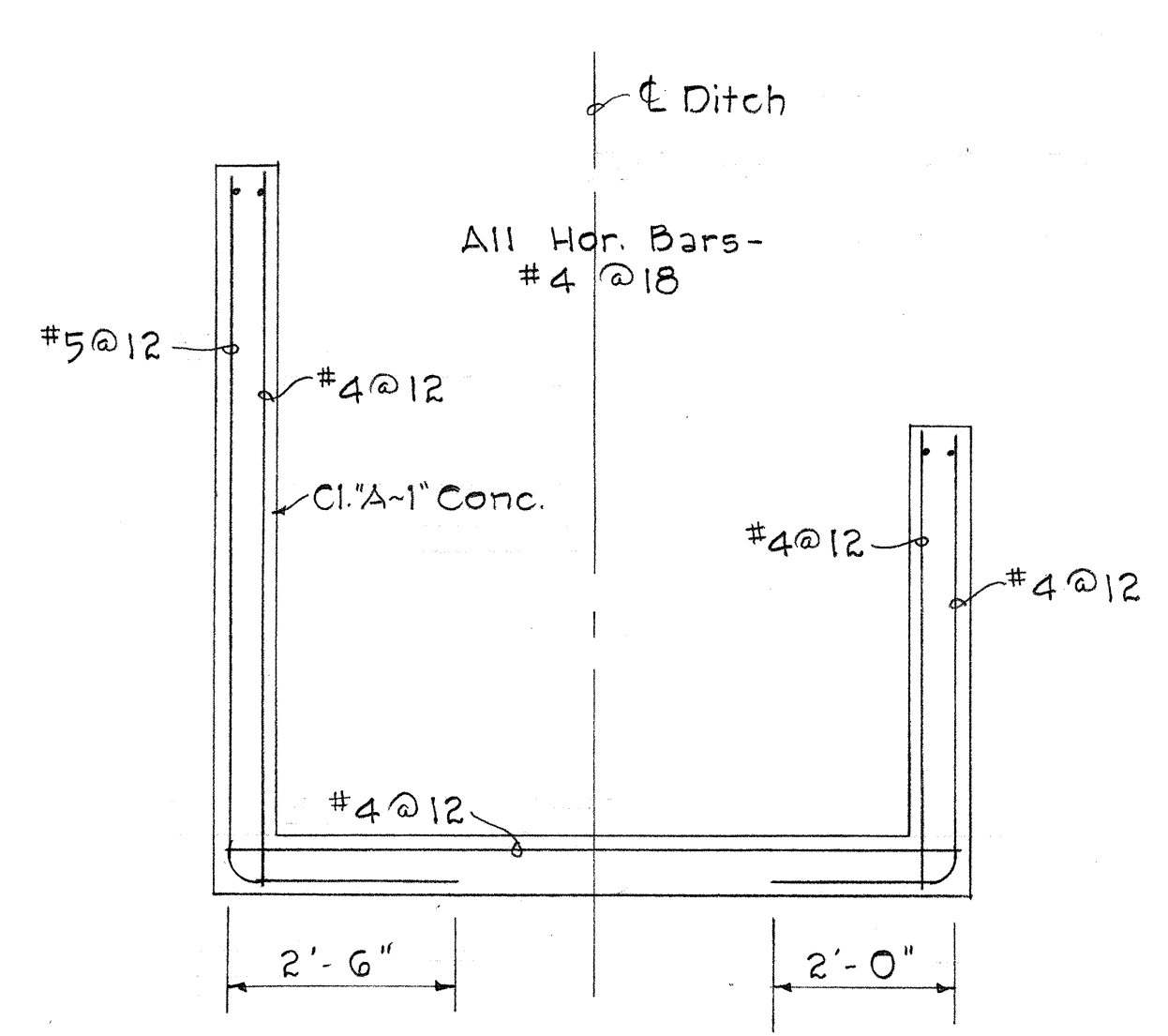
PLAN
Scale: 1" = 5'



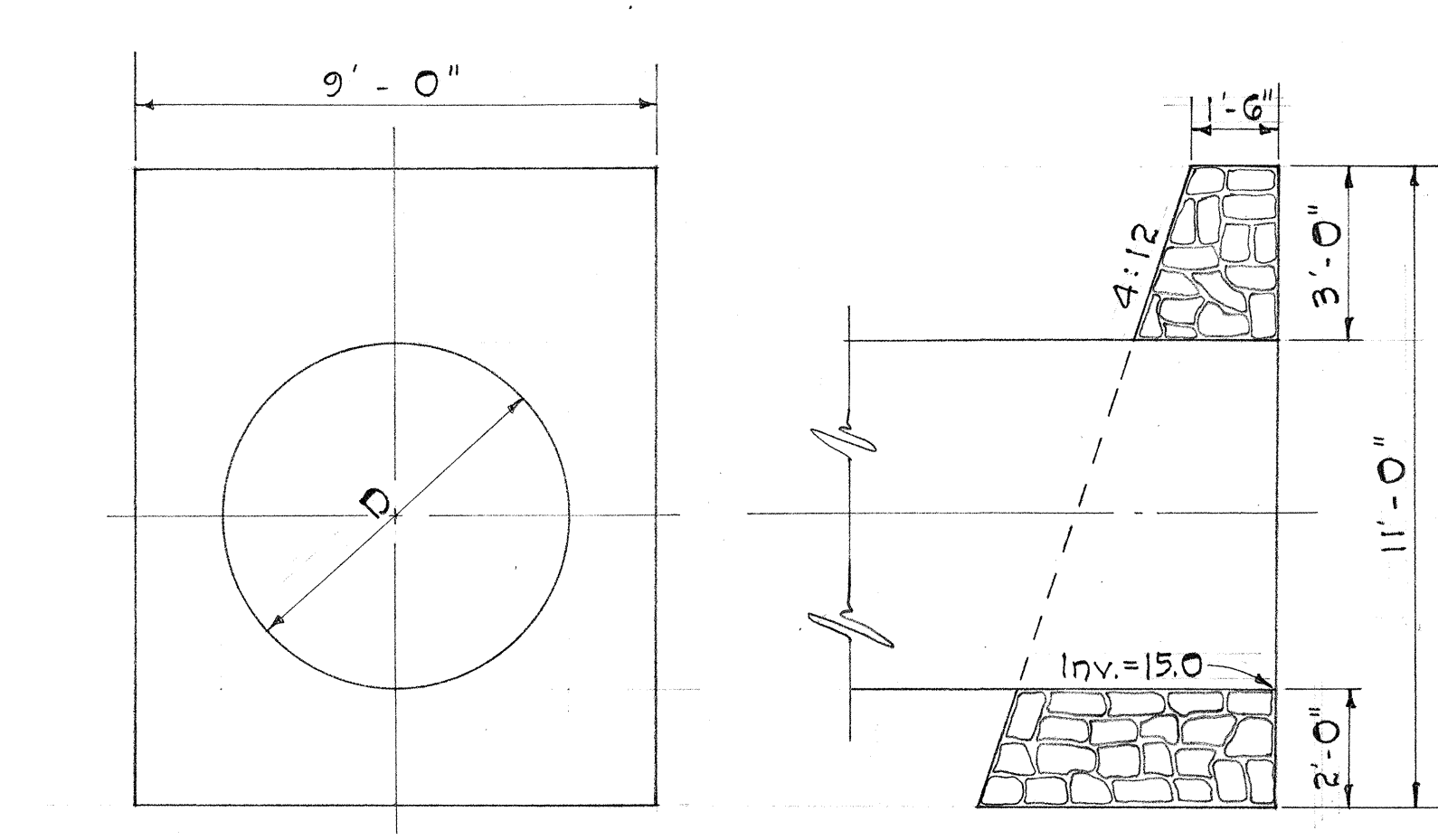
PROFILE OF CURVED RECTANGULAR LINED DITCH
Scale: 1" = 5'



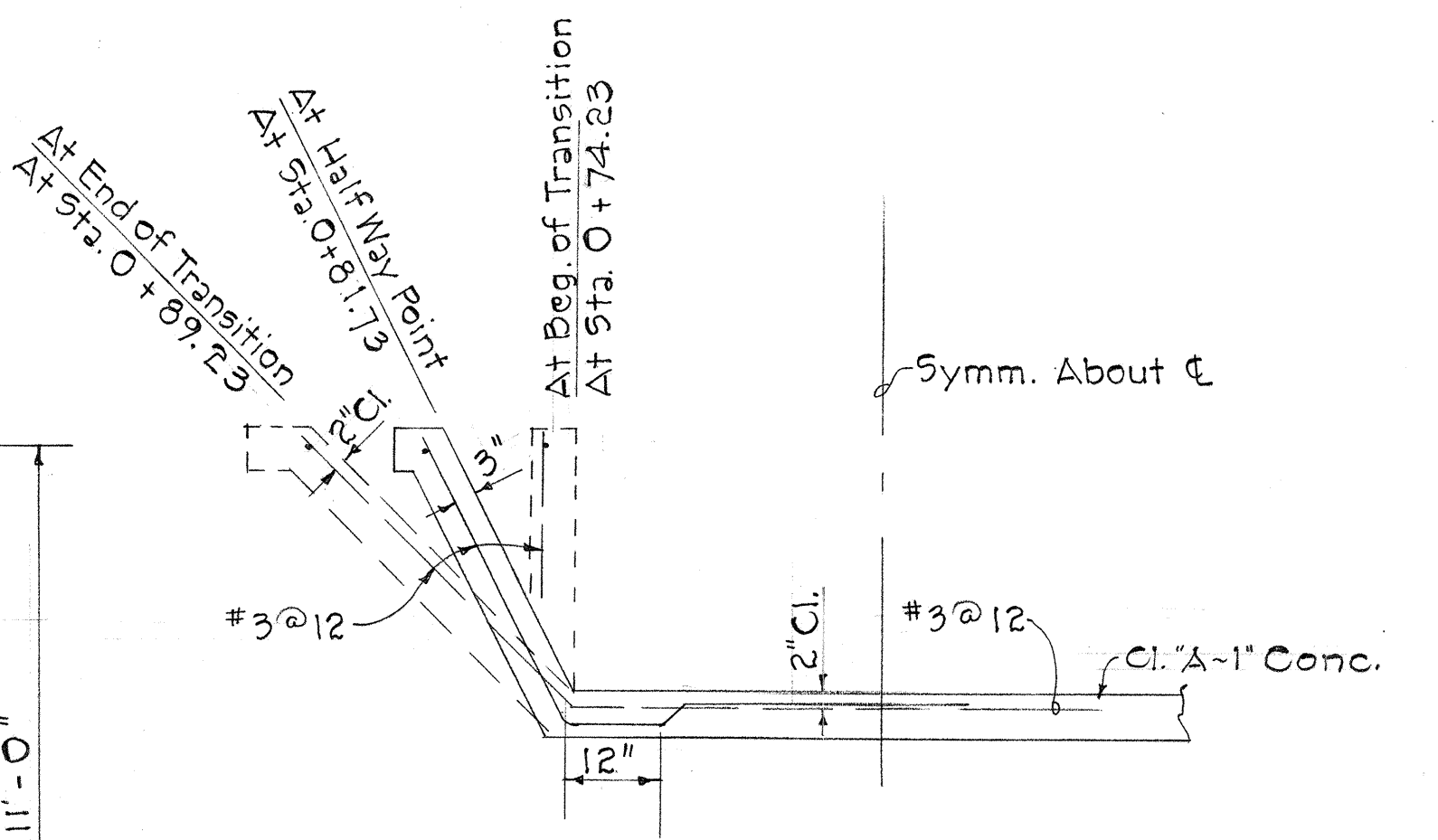
SECTION
AT STA. 0+00 TO STA. 0+08
Scale: 1/2" = 1'-0"



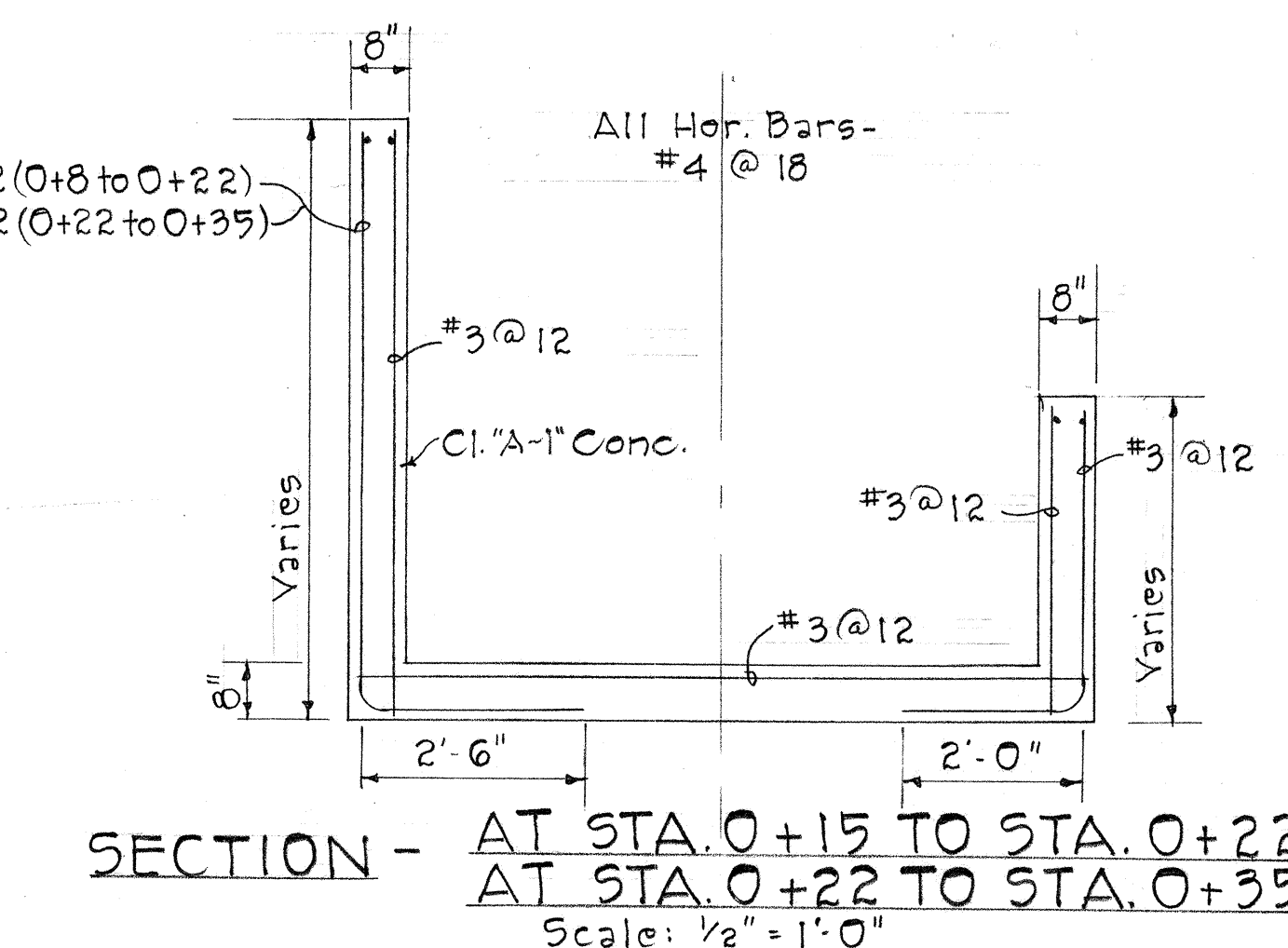
SECTION
AT STA. 0+08 TO STA. 0+15
Scale: 1/2" = 1'-0"



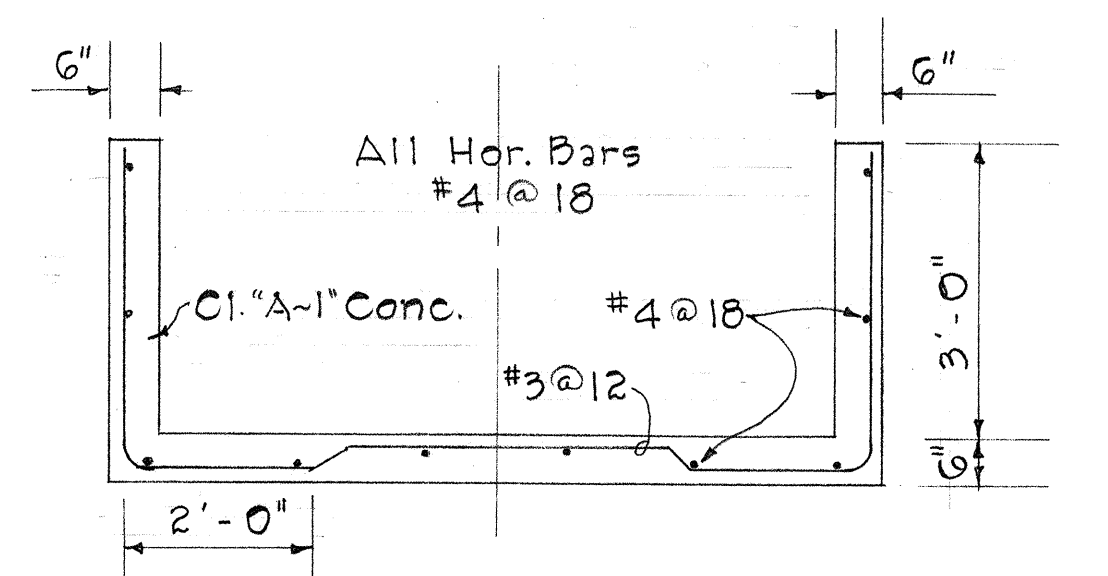
FRONT ELEVATION SIDE ELEVATION
CRM HEADWALL
Not to Scale



TRANSITION
AT STA. 0+74.23 TO STA. 0+89.23
Scale: 1/2" = 1'-0"



SECTION -
AT STA. 0+15 TO STA. 0+22
AT STA. 0+22 TO STA. 0+35
Scale: 1/2" = 1'-0"

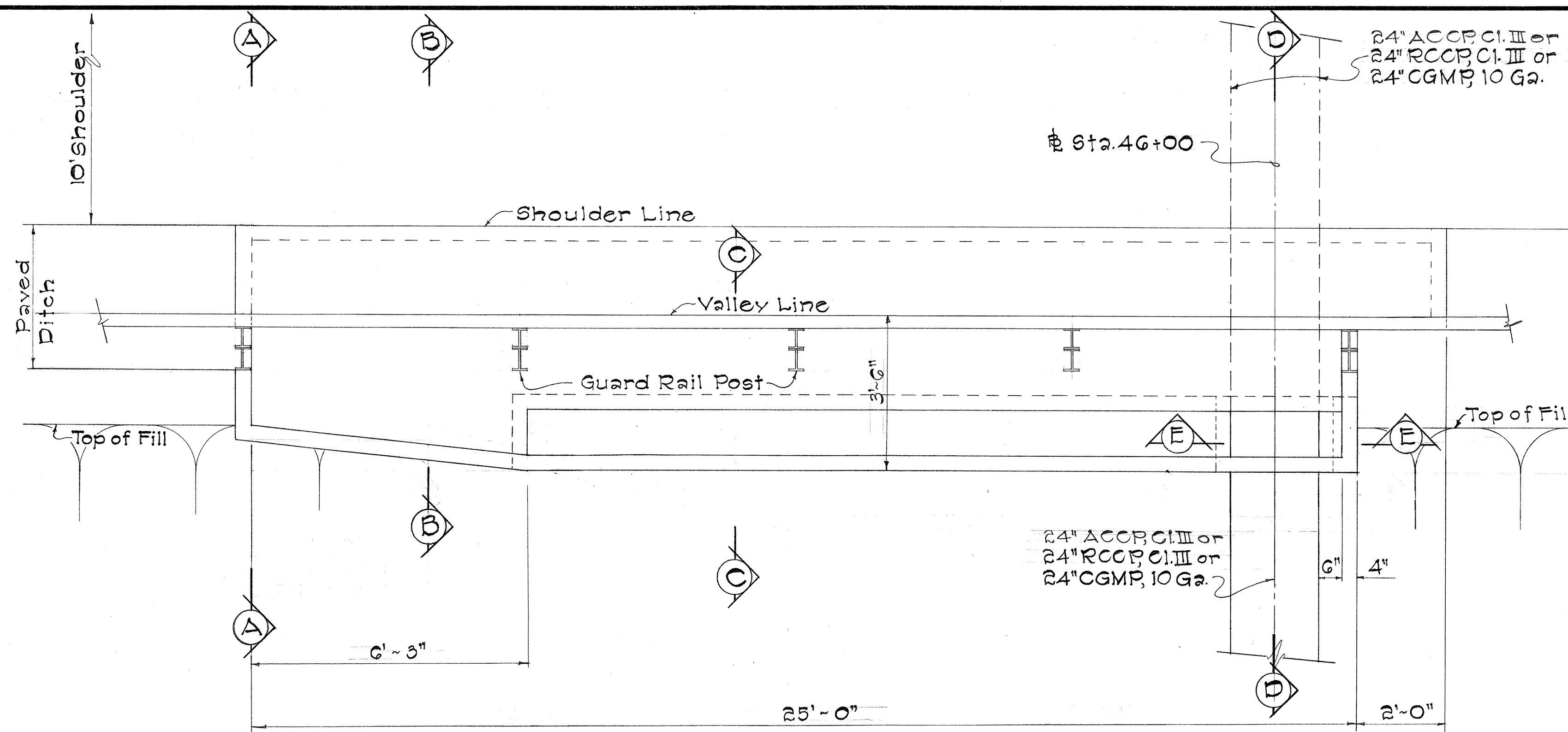


SECTION
AT STA. 0+35 TO STA. 0+74.23
Scale: 1/2" = 1'-0"

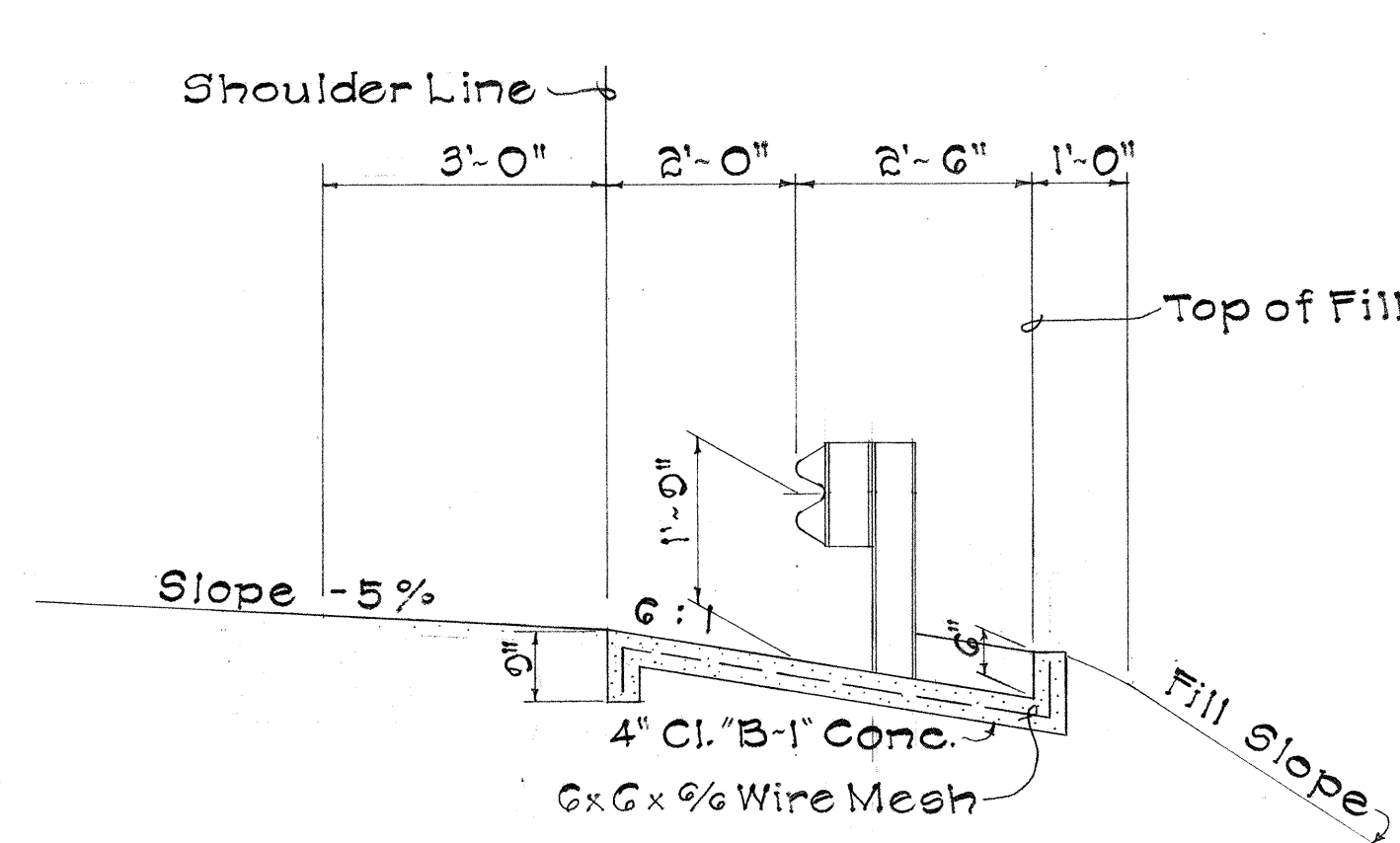
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
OF
CURVED RECTANGULAR
LINED DITCH
MOKAPU SADDLE ROAD
FAS. Proj. No. 5-0630(11)
FAS. Proj. No. 5-0630(7)
Scale: As Shown Date: January, 1968
SHEET No. 5 OF 18 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	S-0630(11) S-0630(7)	1968	24	83

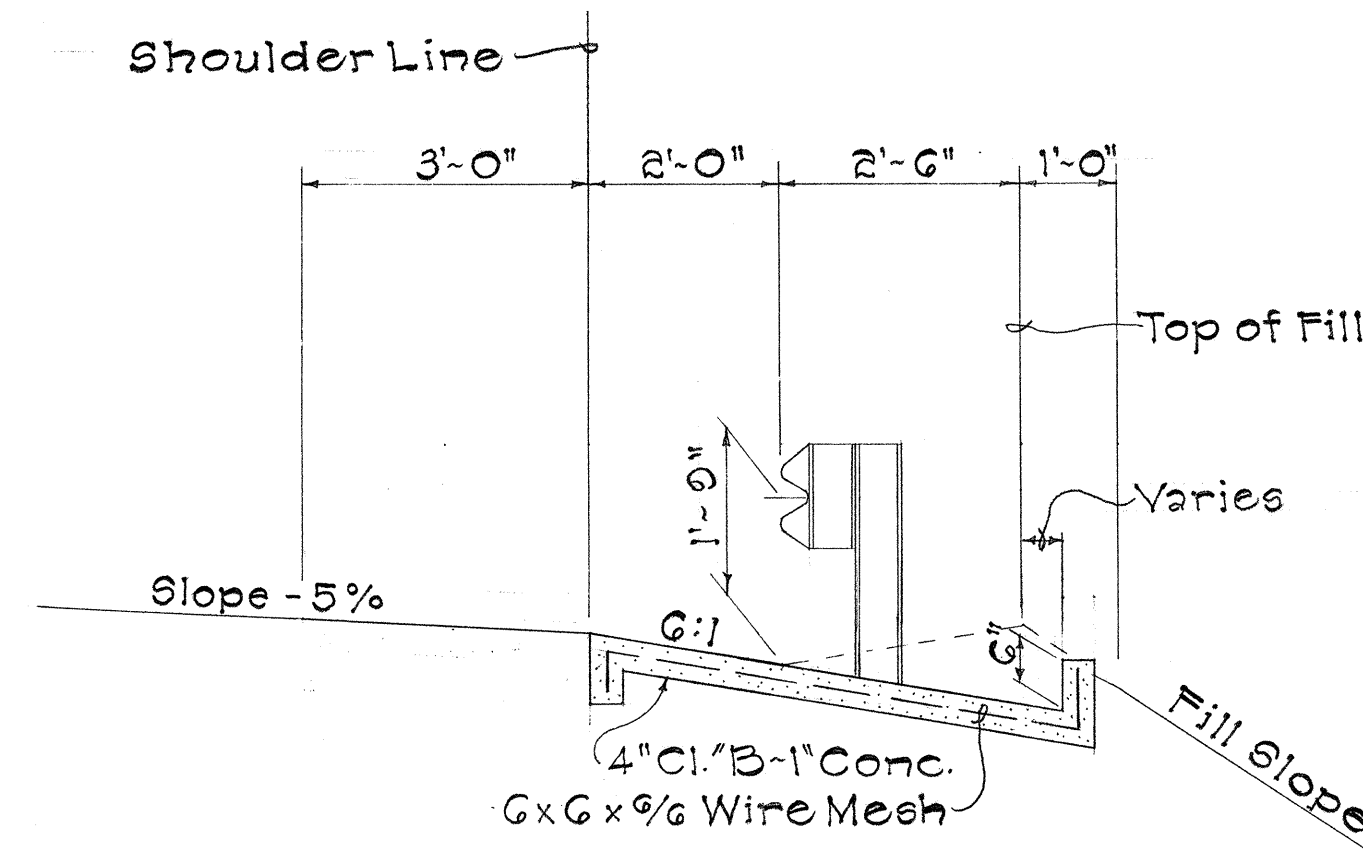
REVISED: June 23, 1968



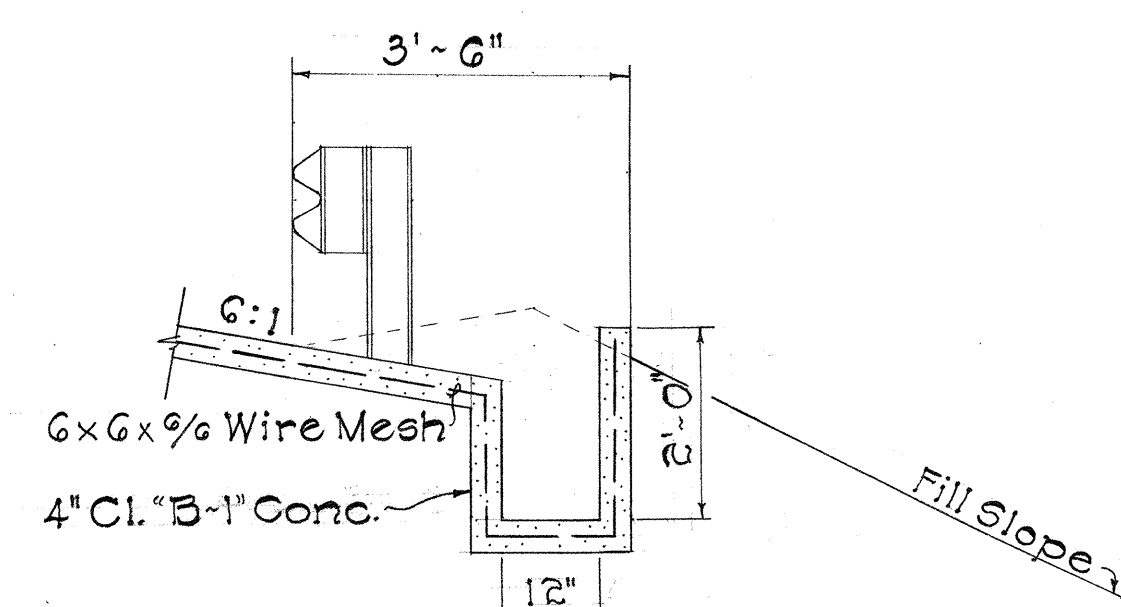
PLAN



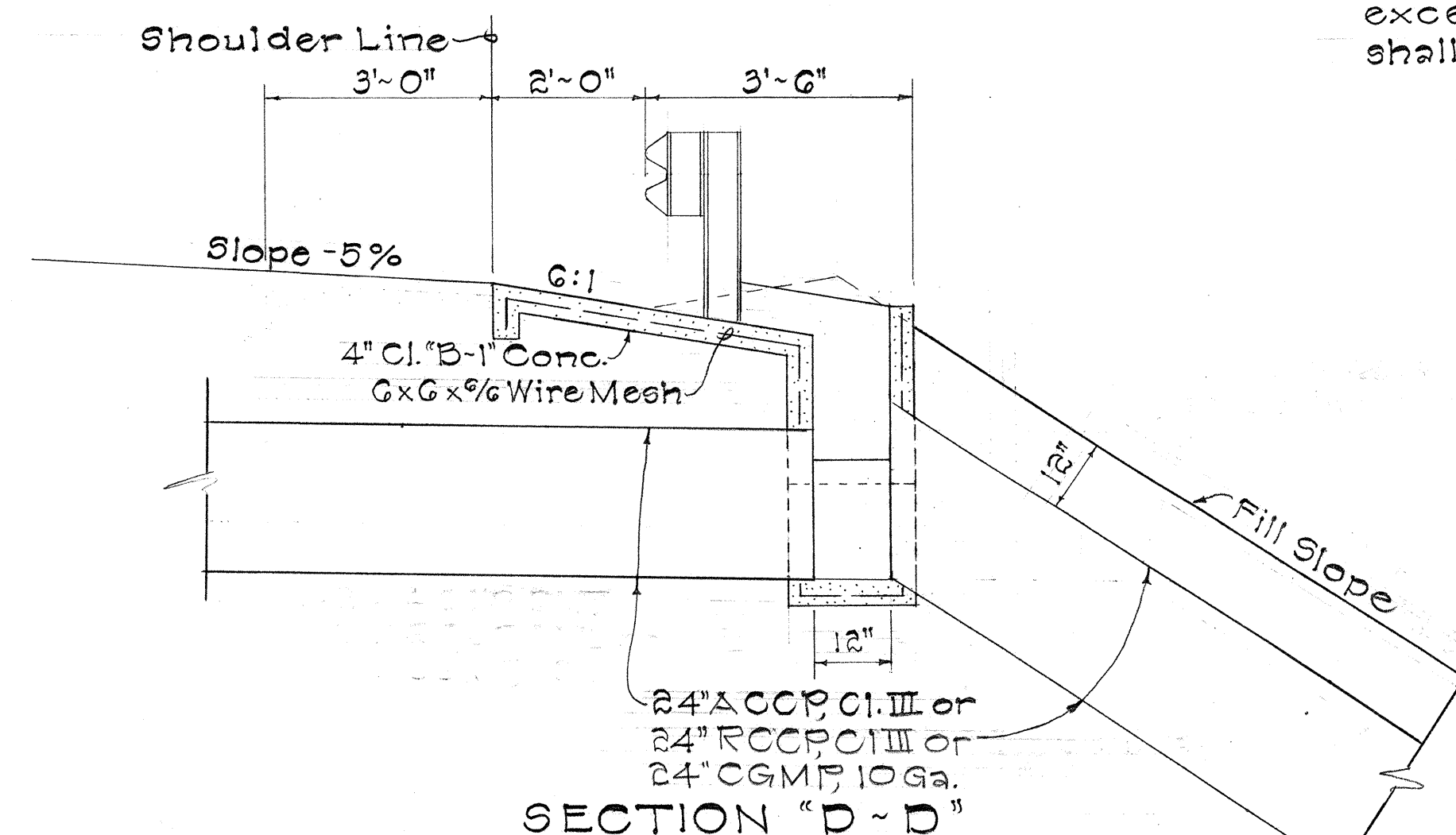
SECTION "A-A"



SECTION "B-B"



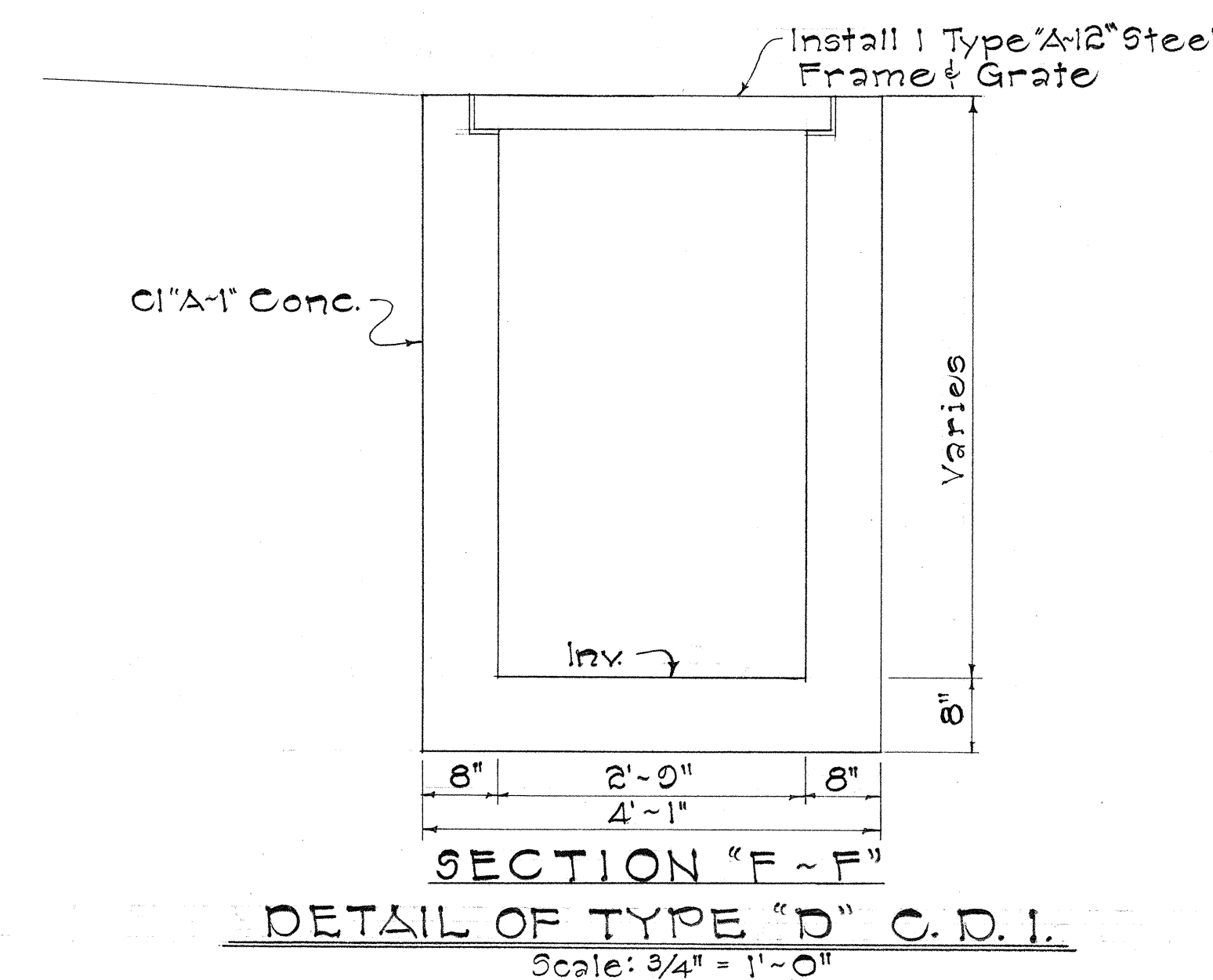
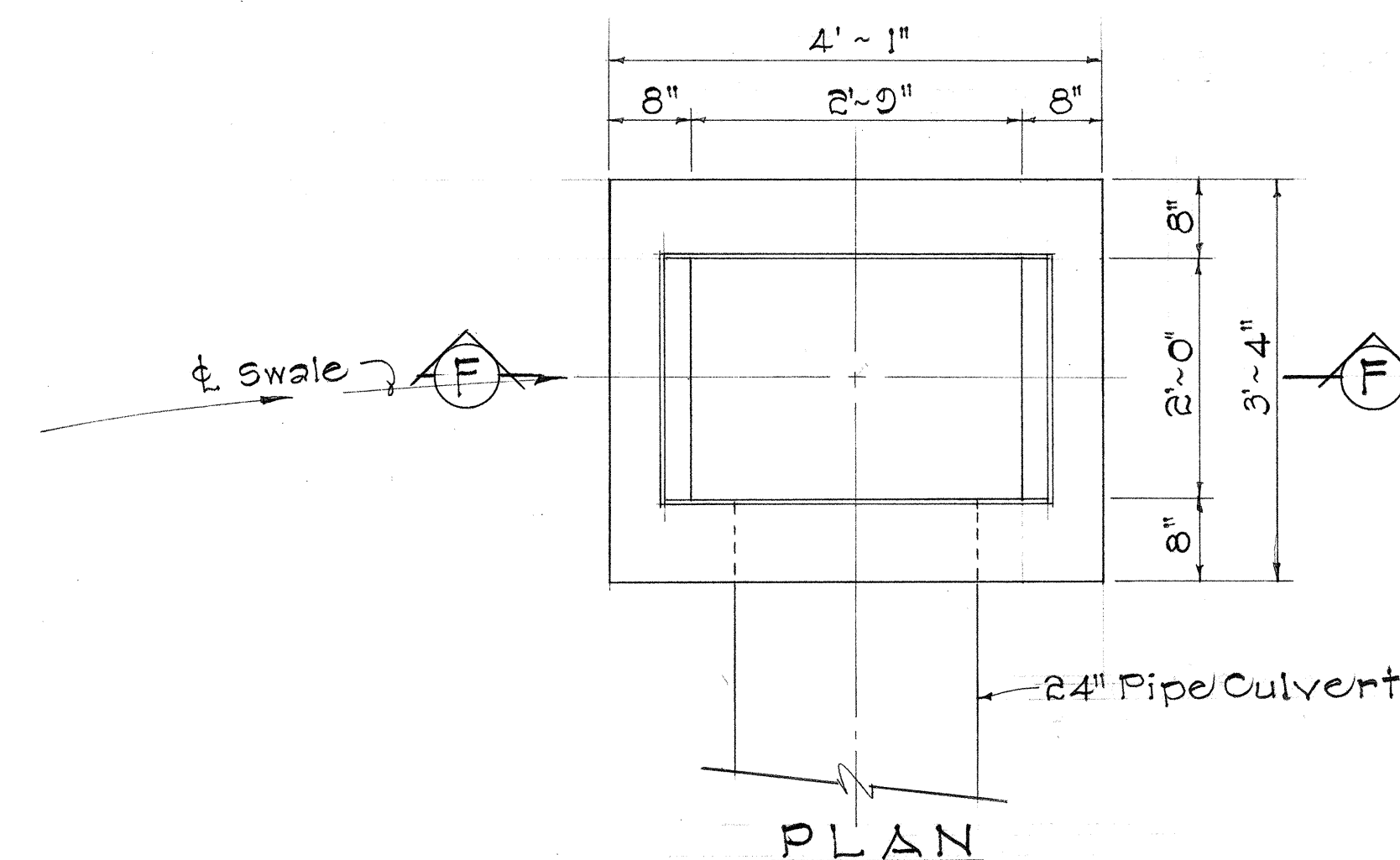
SECTION "C-C"



SECTION "D-D"

DETAIL OF SPILLWAY INLET AT STA. 46+00

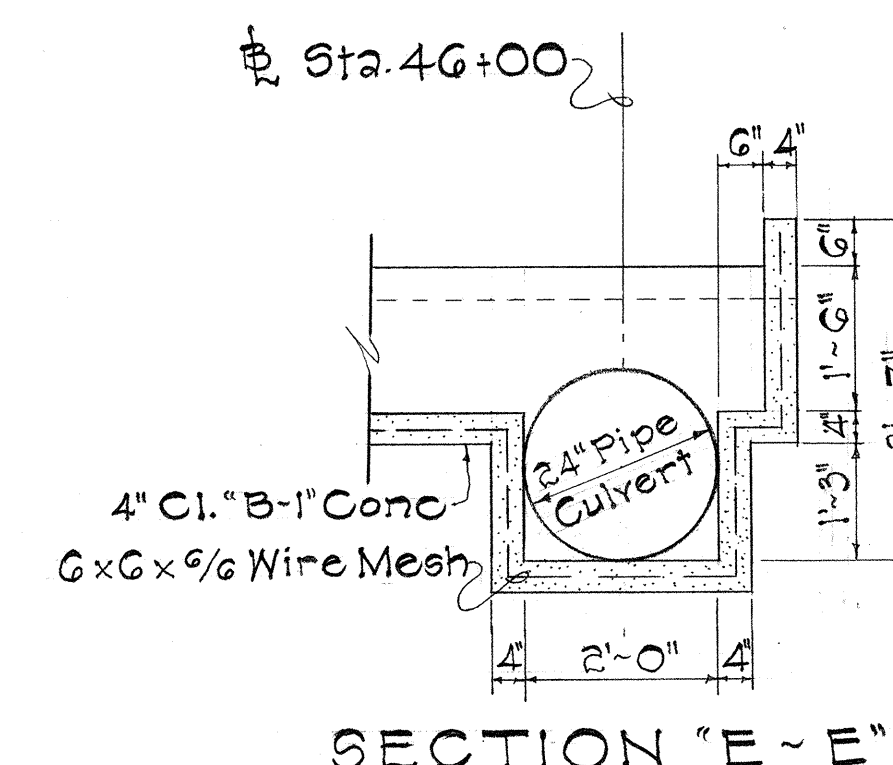
Scale: 1/2" = 1'-0"



DETAIL OF TYPE "D" C.D.I.

Scale: 3/4" = 1'-0"

Note:
Shoulders shall have a minimum slope of 5% except when the cross over crown between the pavement and the shoulder exceeds 6.5% then the pavement slope shall be continued through the shoulder.



SECTION "E-E"

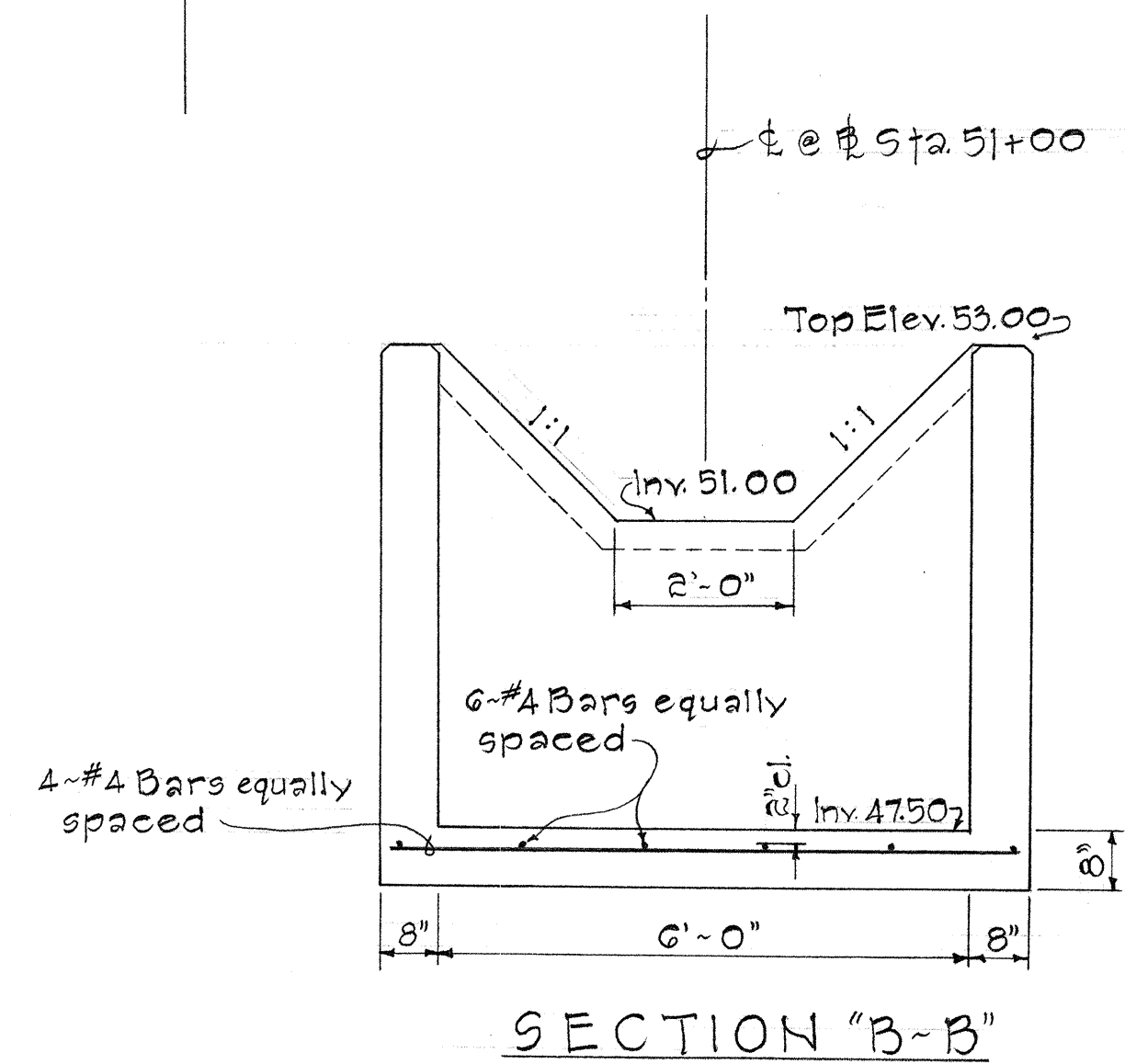
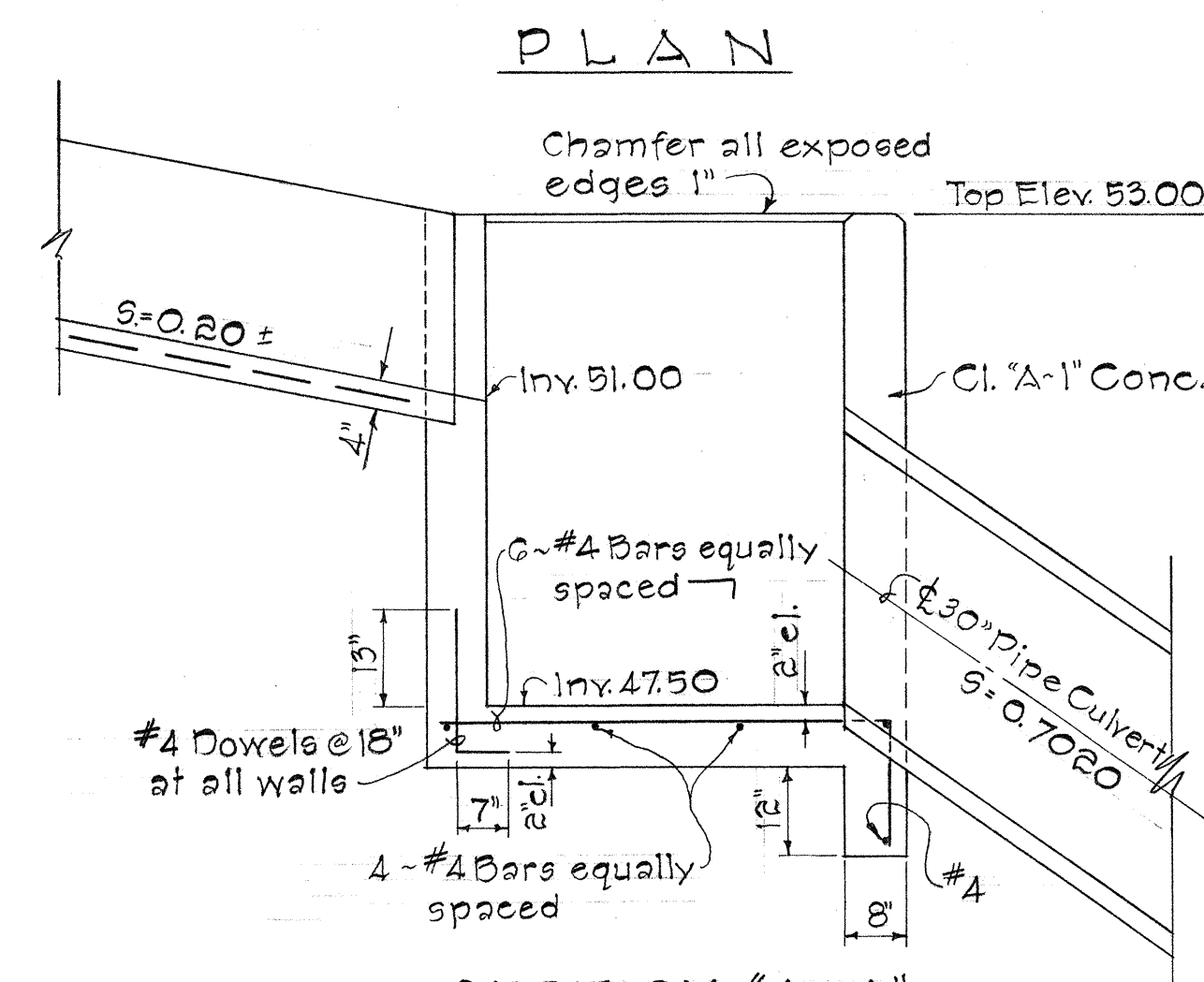
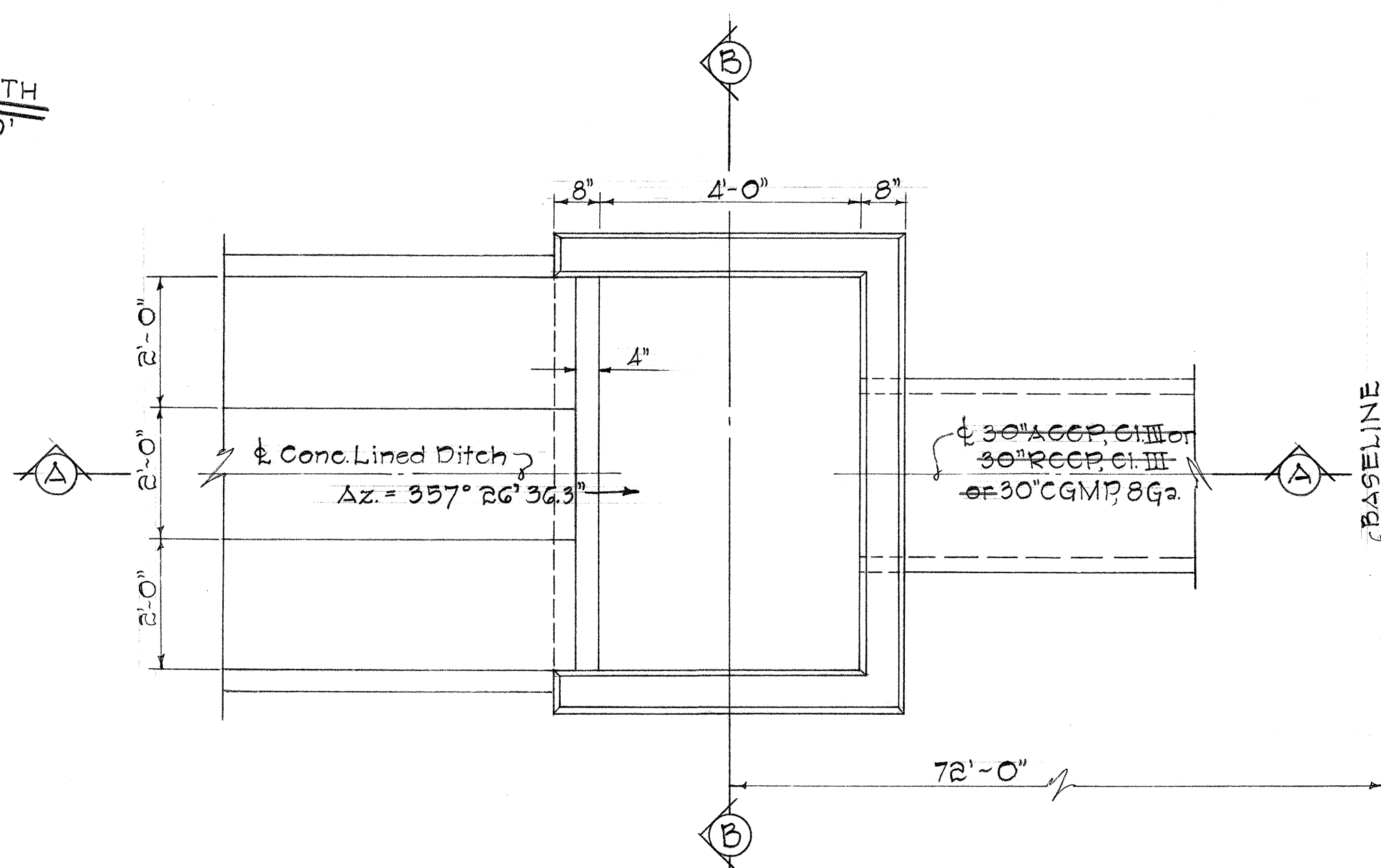
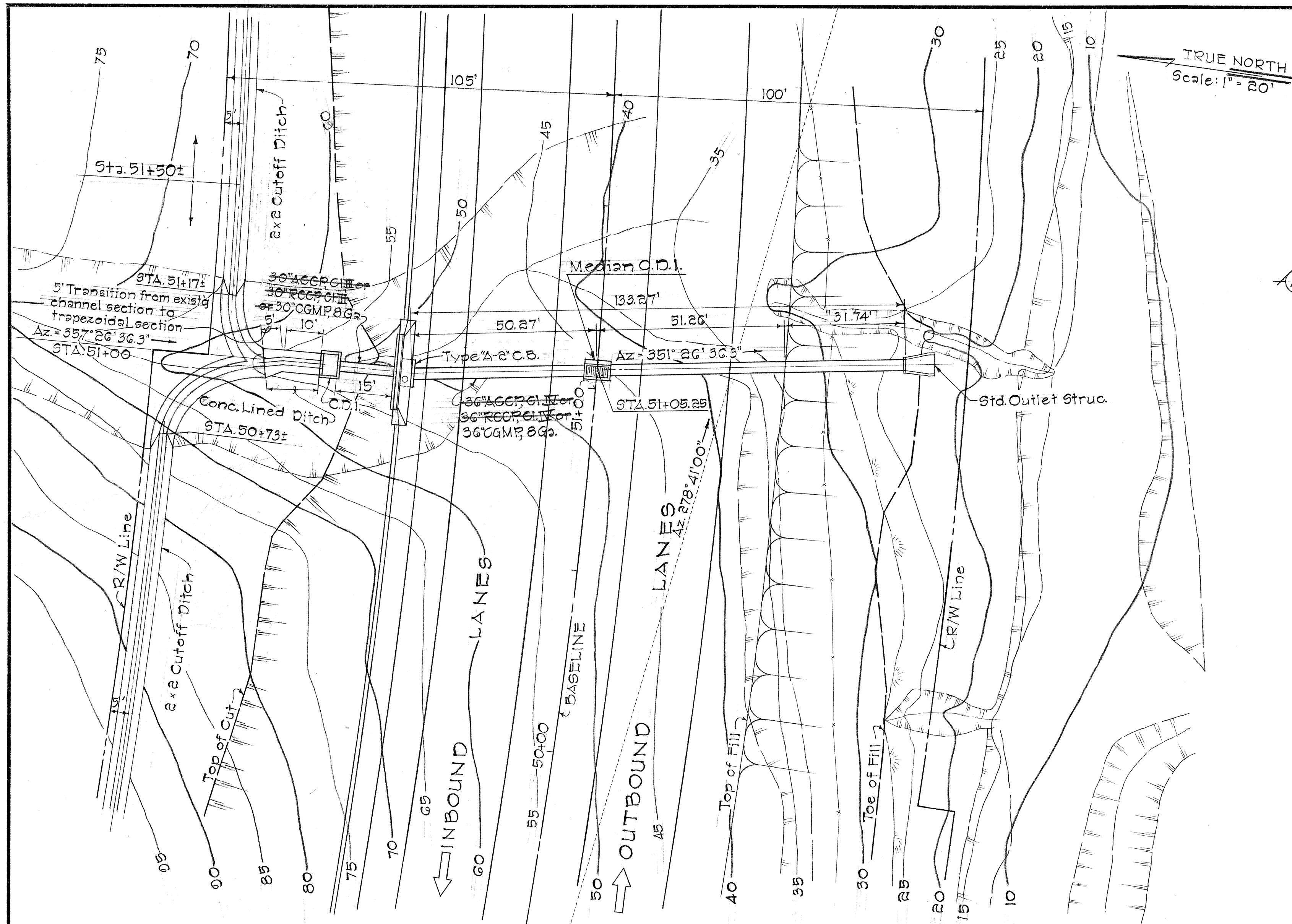
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS
SPILLWAY INLET
AT STA. 46+00

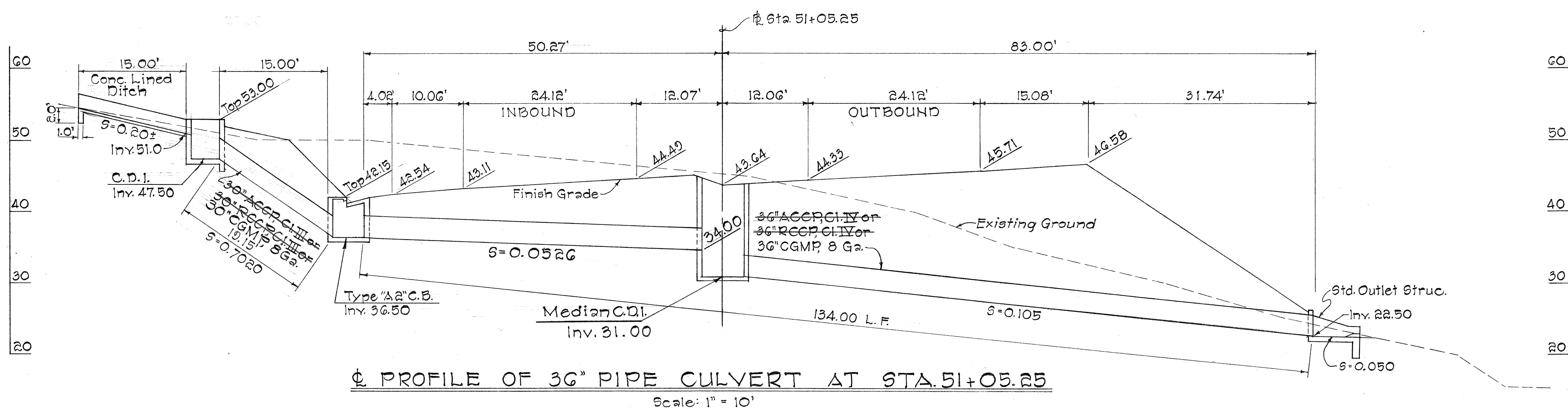
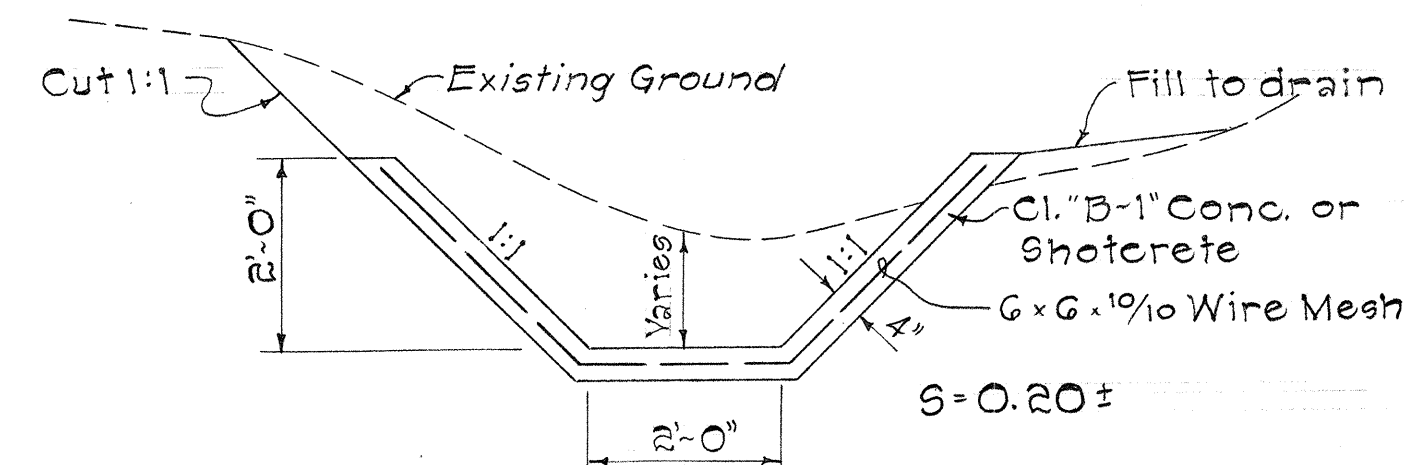
MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(11)
F.A.S. Proj. No. S-0630(7)
Scale: As Shown Date: Nov. 1968

SHEET No. 6 OF 18 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	25	83



DETAIL OF C.D.I. AT STA. 51+00 o/s 72' LT.
Scale: 1/2" = 1'-0"



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS
36" PIPE CULVERT
AT STA. 51+05.25

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (11)
F.A.S. Proj. No. 5-0630 (7)
Scale: As Shown Date: January, 1968

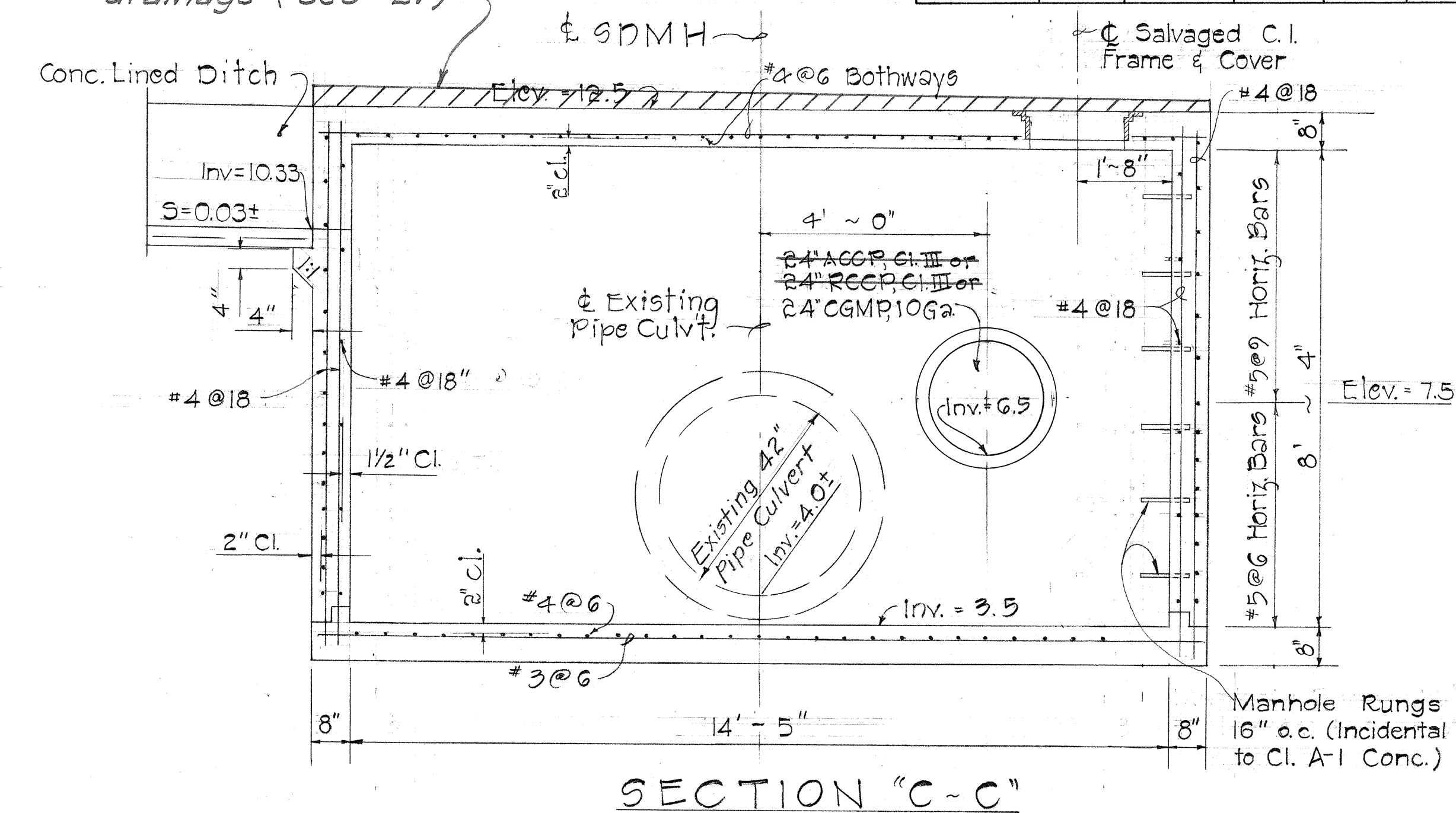
SHEET No. 7 OF 18 SHEETS

DATE	BY
DESIGNED BY	
DRAWN BY	
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	

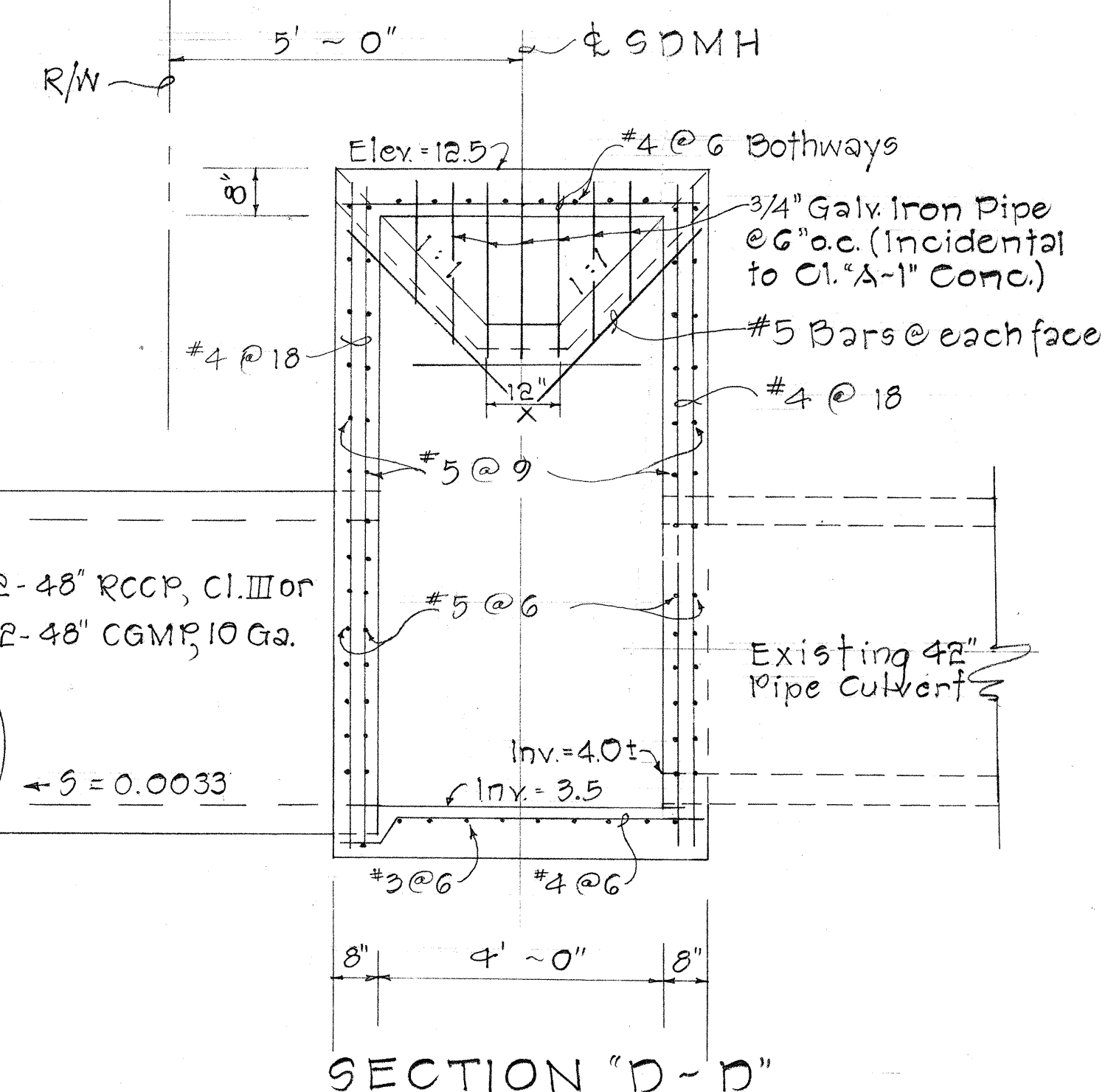
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	26	83

NOTE:

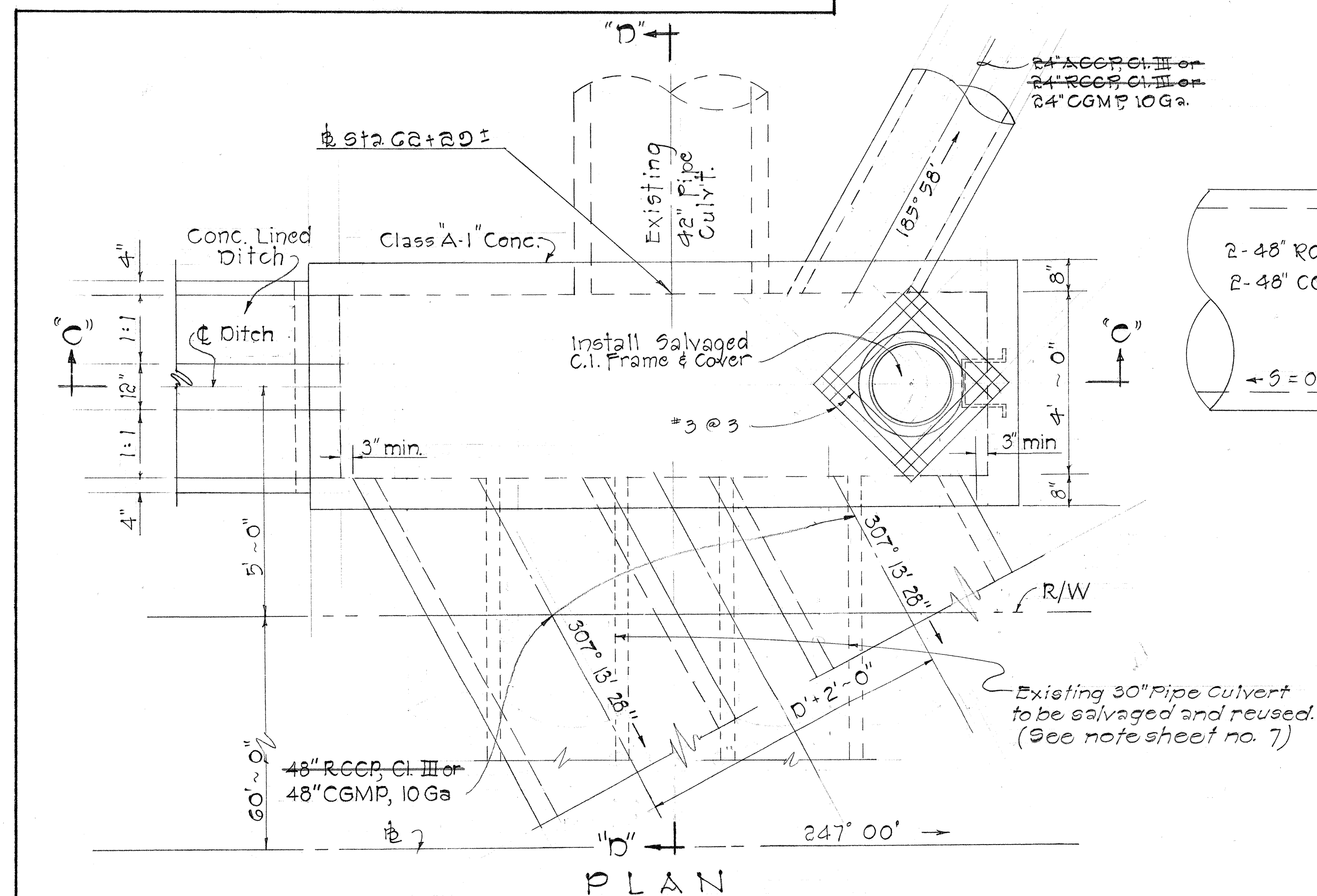
Second slab added to tie in with new
Curb & Gutter and to provide positive
drainage (CCO #21)



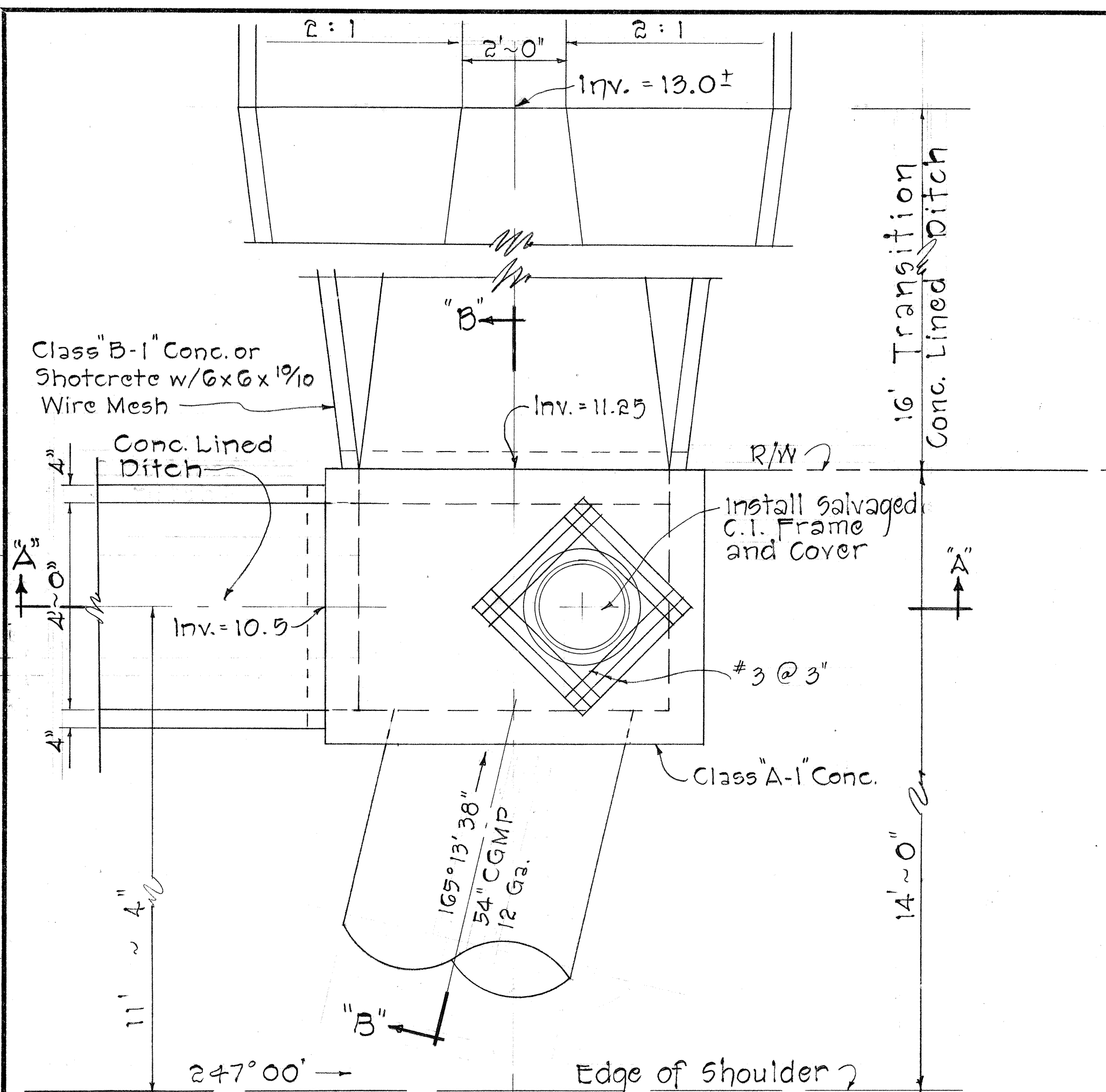
SECTION "C-C"



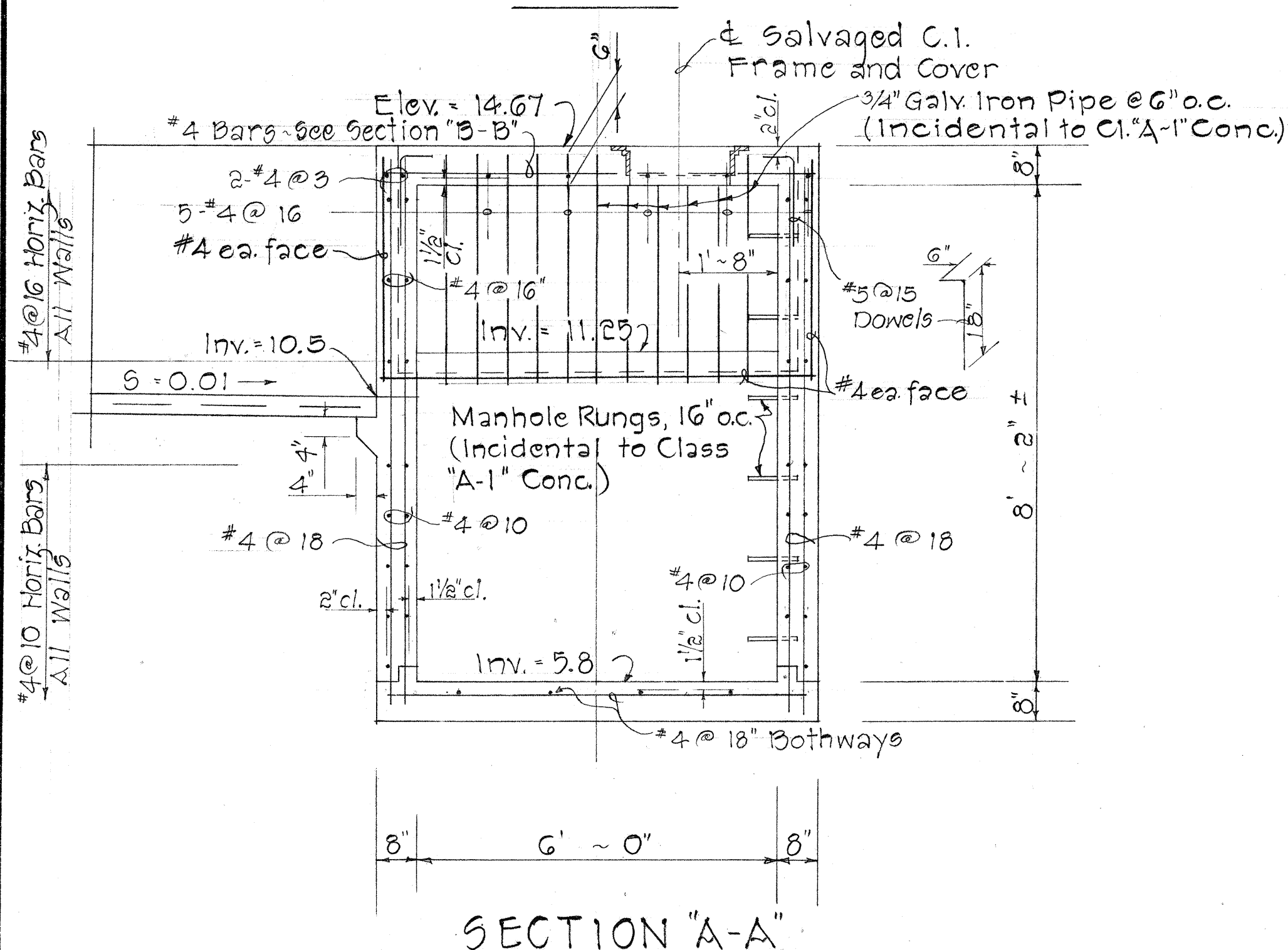
SECTION "D-D"



DETAILS OF SDMH AT STA. 62+29 ± LT.



PLAN



SECTION "A-A"

DETAILS OF SDMH AT STA. 57+97 LT.

**STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION**

DRAINAGE DETAILS

OF
SDMH AT STA.

57+97 LT. & 62+29±LT

MOKAPU SADDLE ROAD

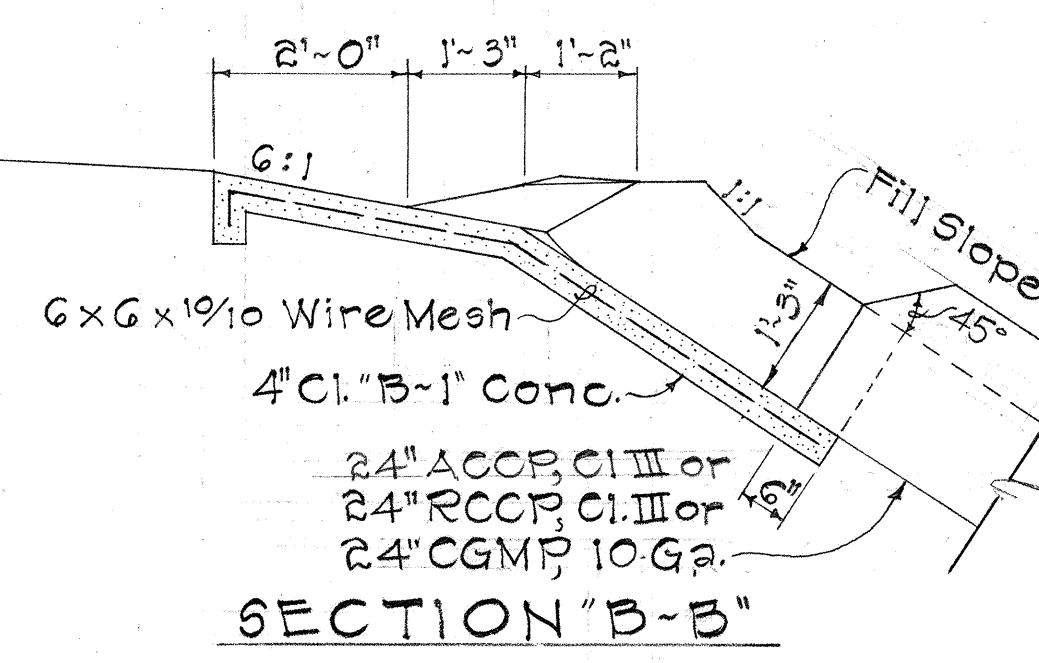
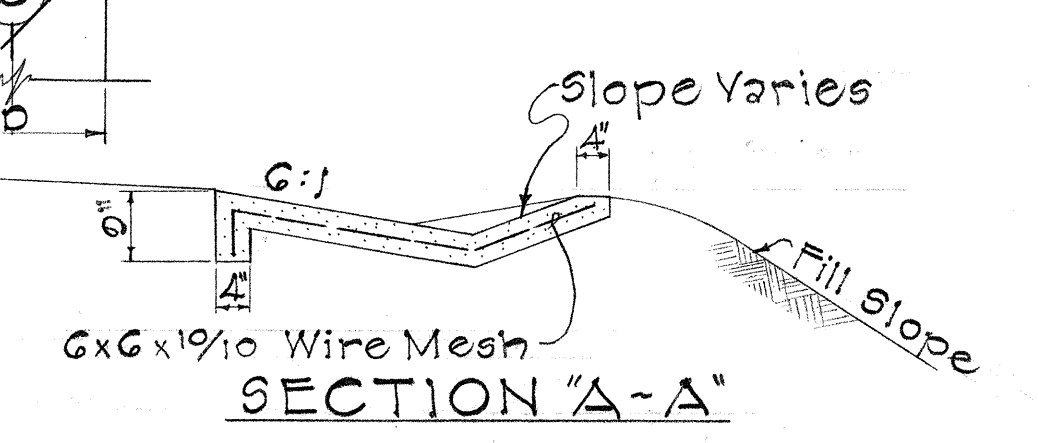
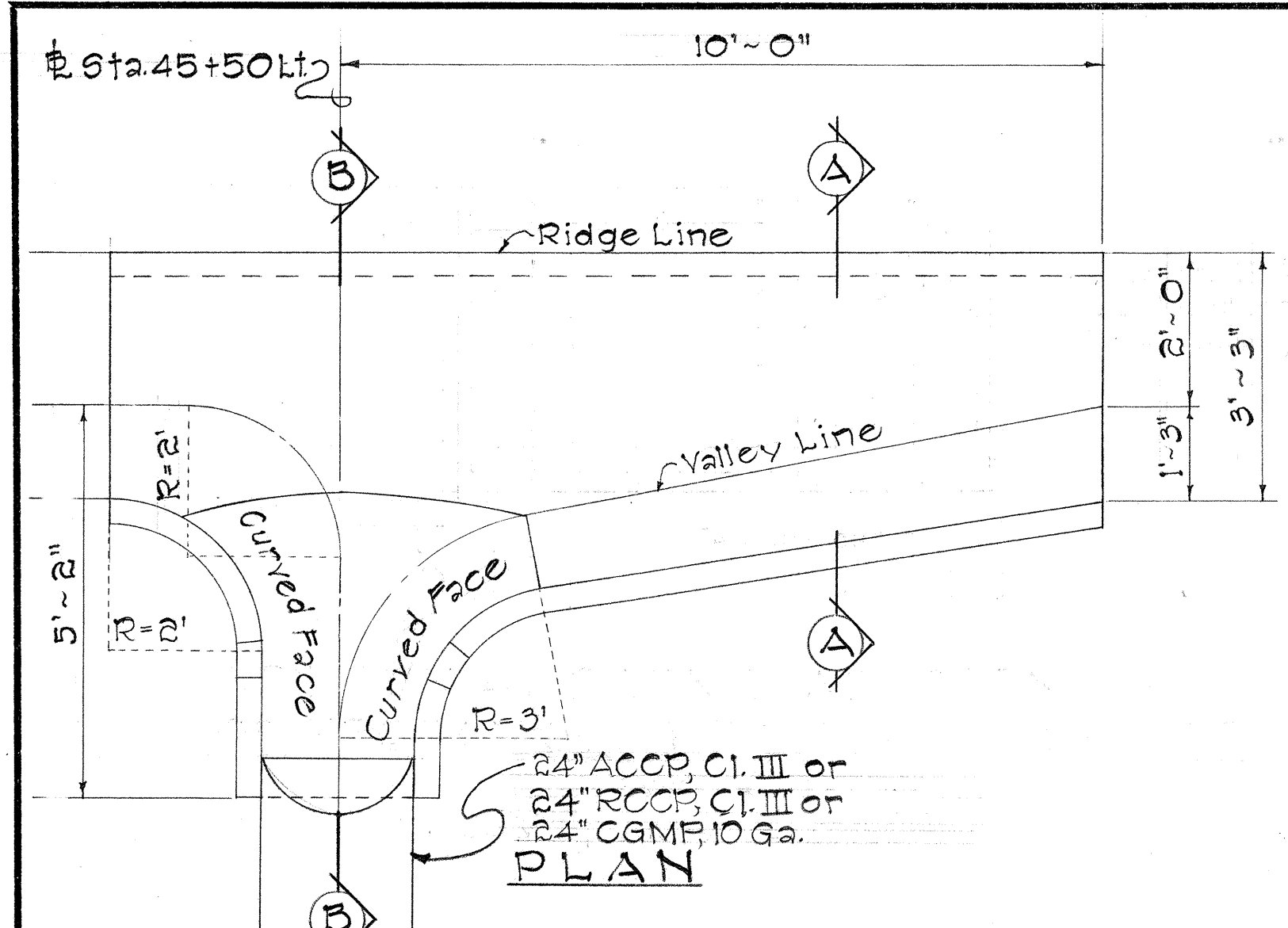
F.A.S. Proj. No. S-OG30 (11)
F.A.S. Proj. No. S-OG30 (7)
Scale: $\frac{1}{2}" = 1' - 0"$ Date: January, 1968

SHEET No. 8 OF 18 SHEETS

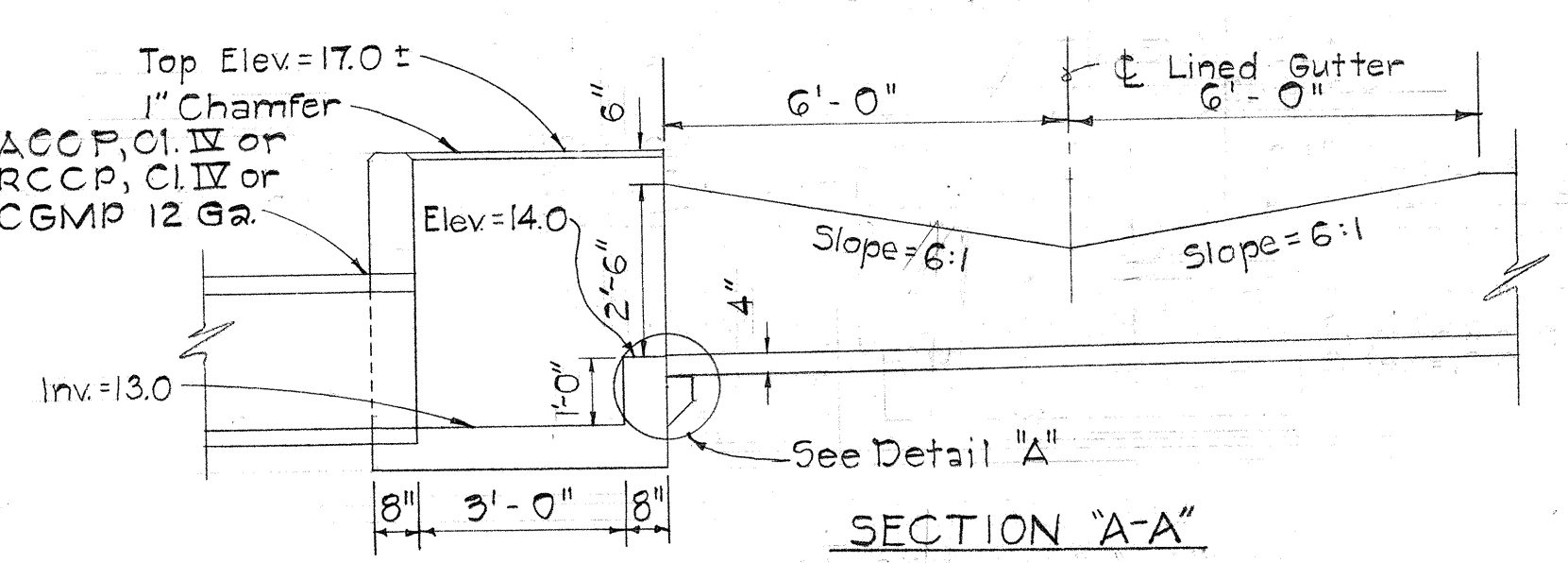
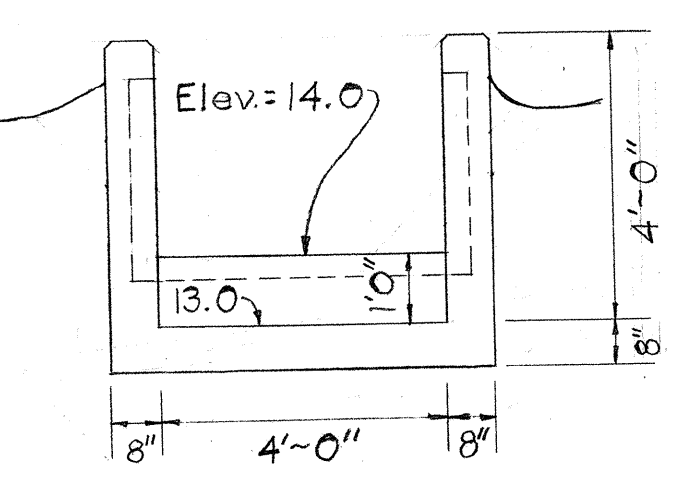
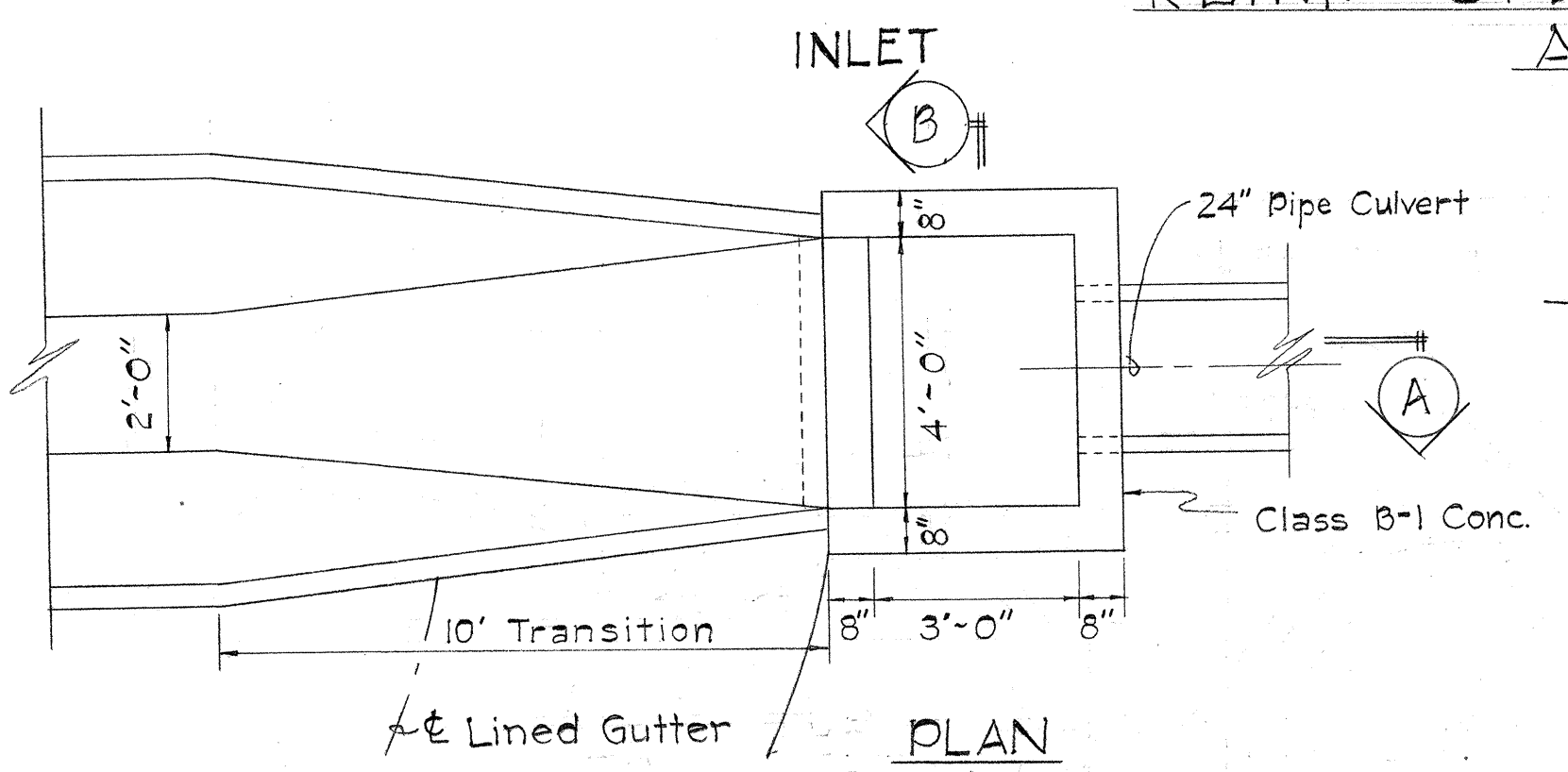
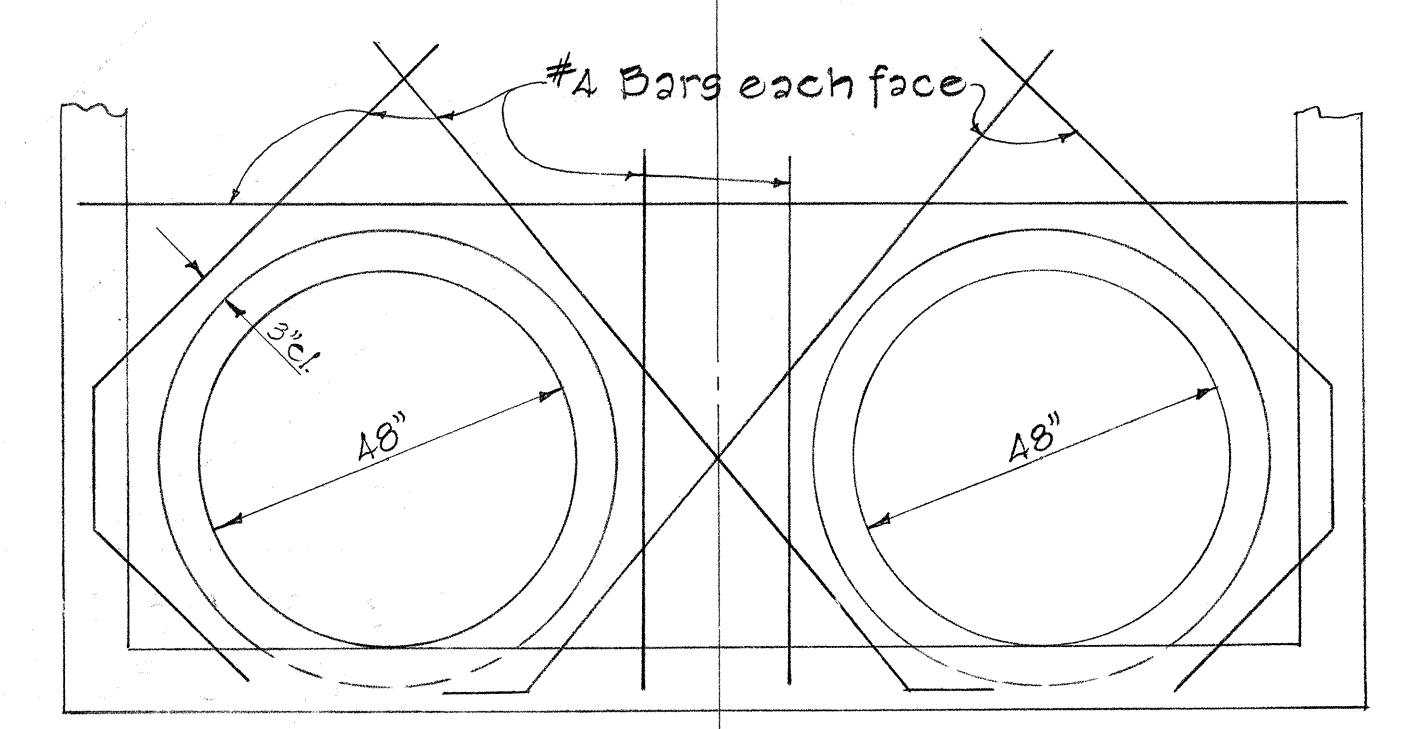
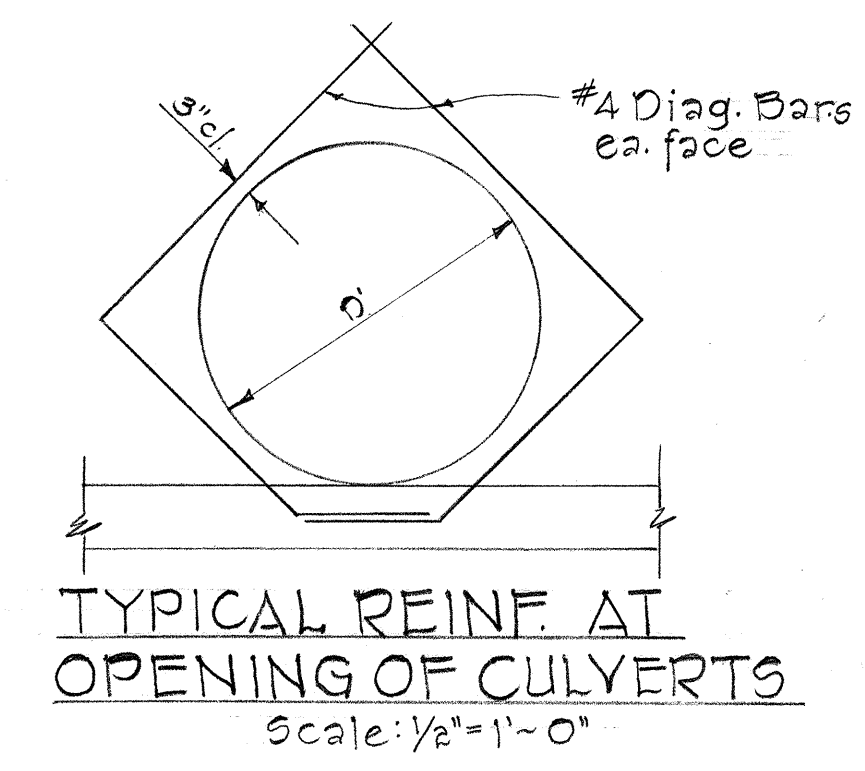
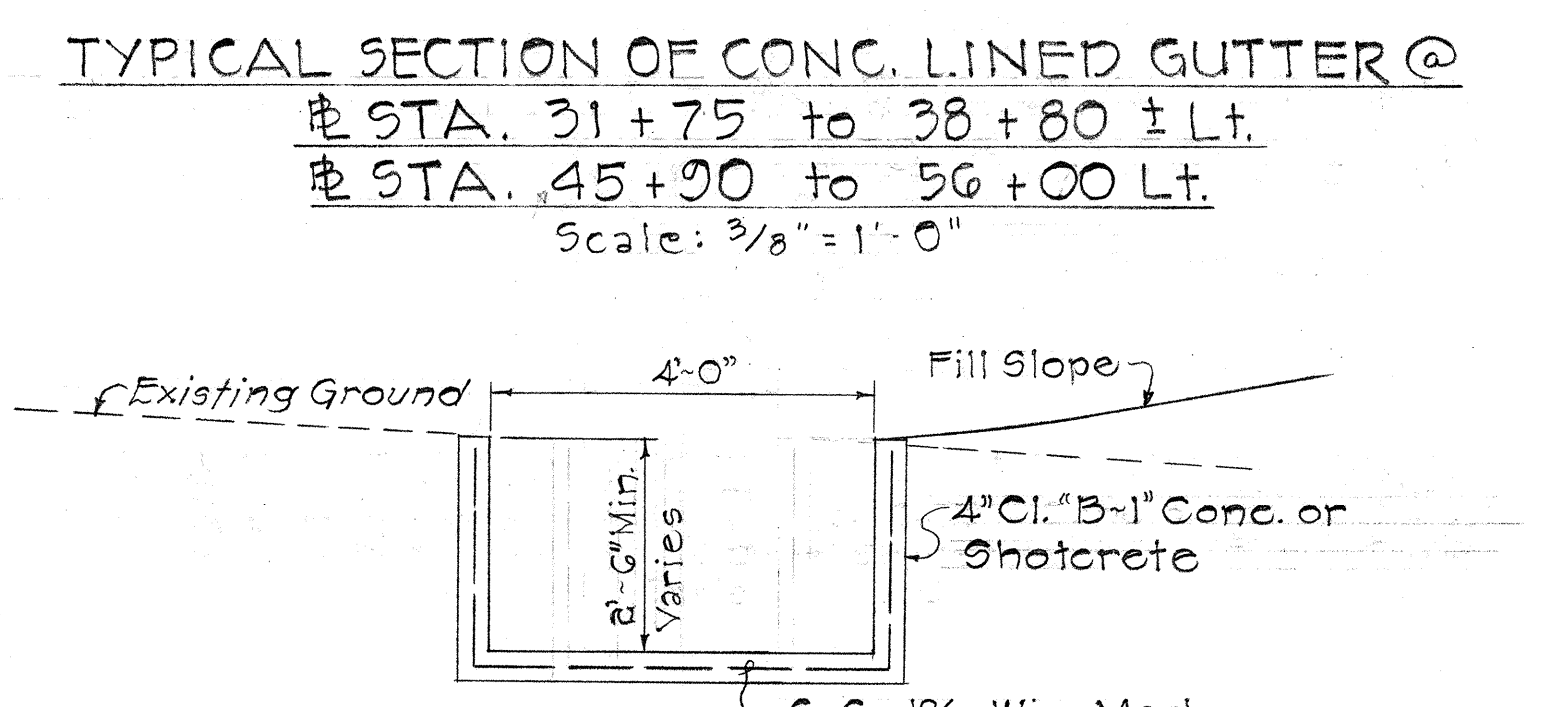
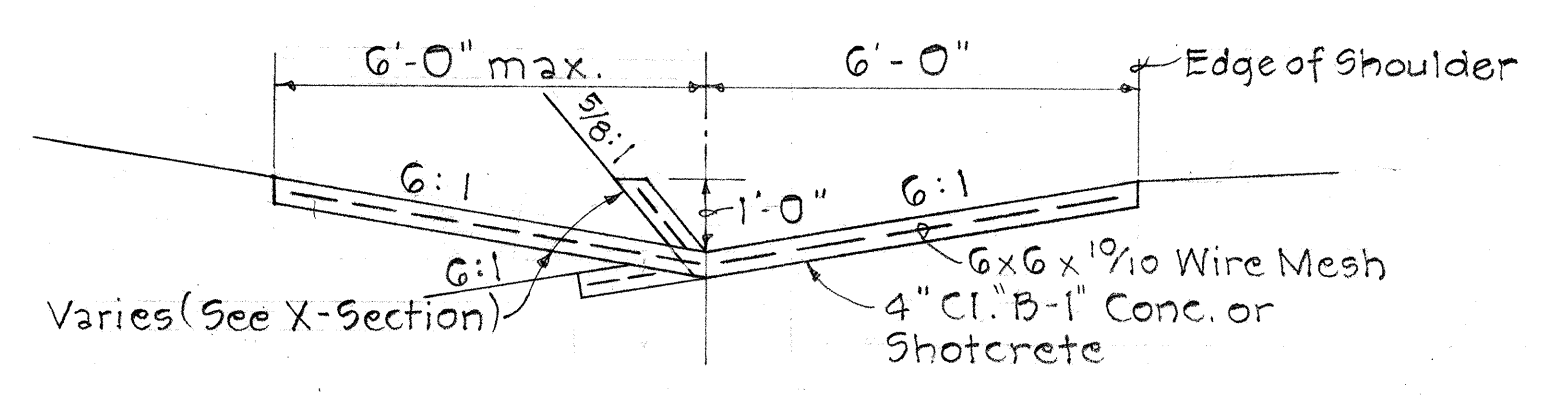
20

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	27	83

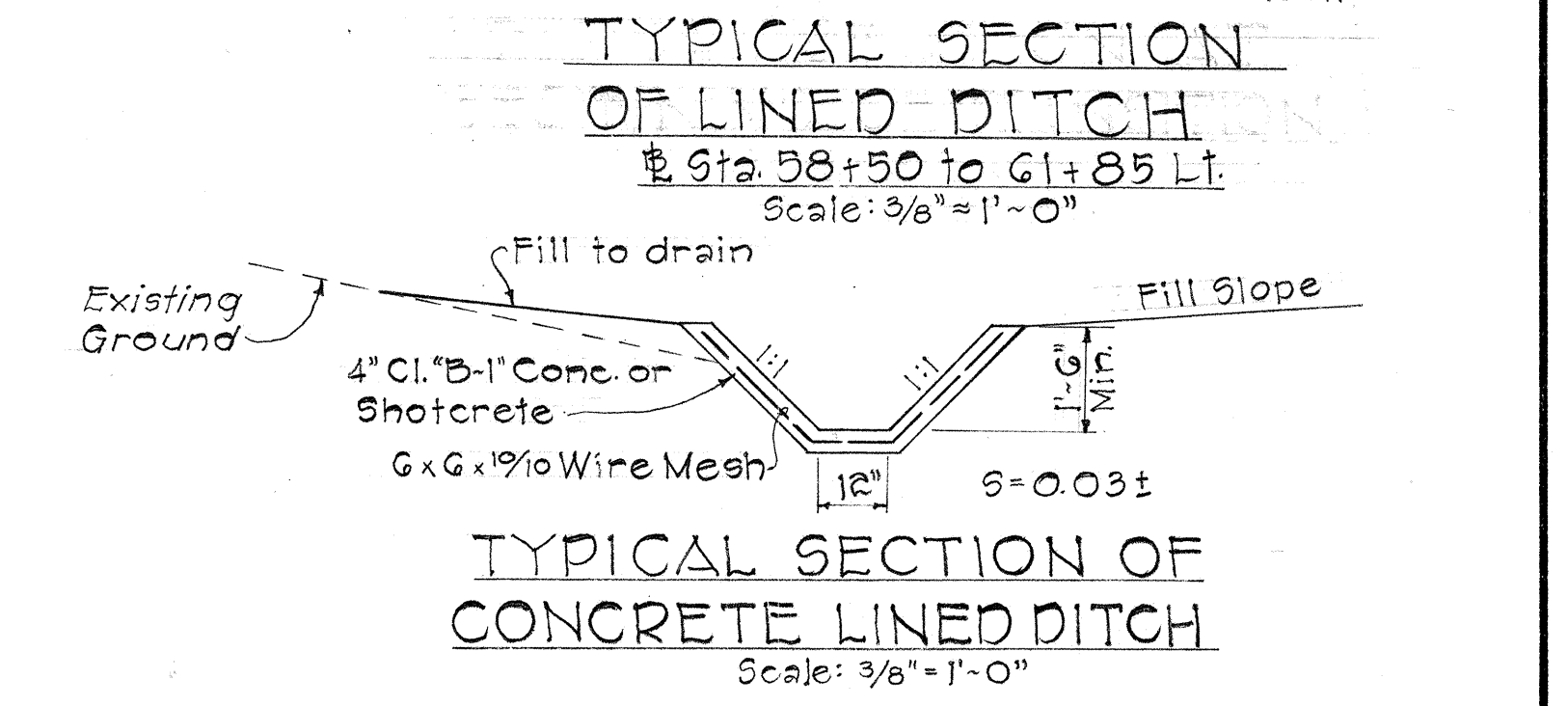
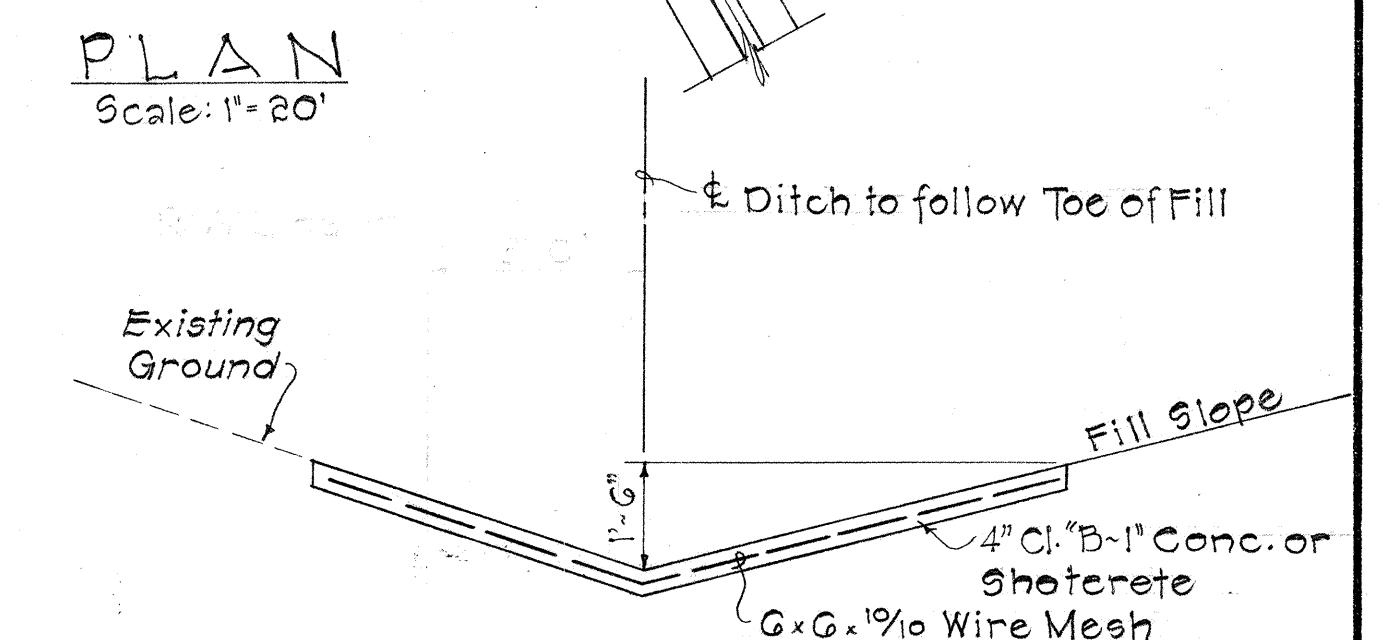
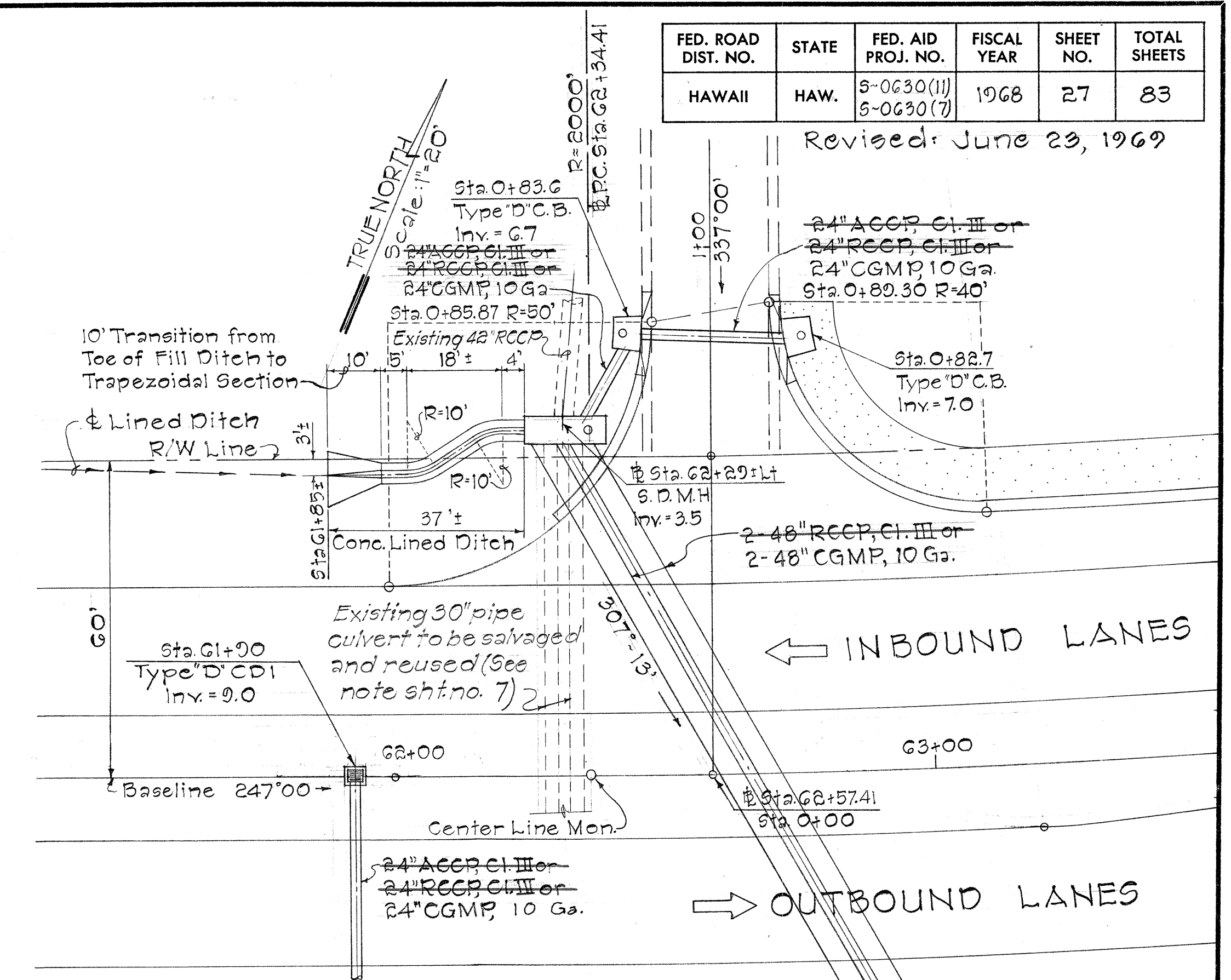
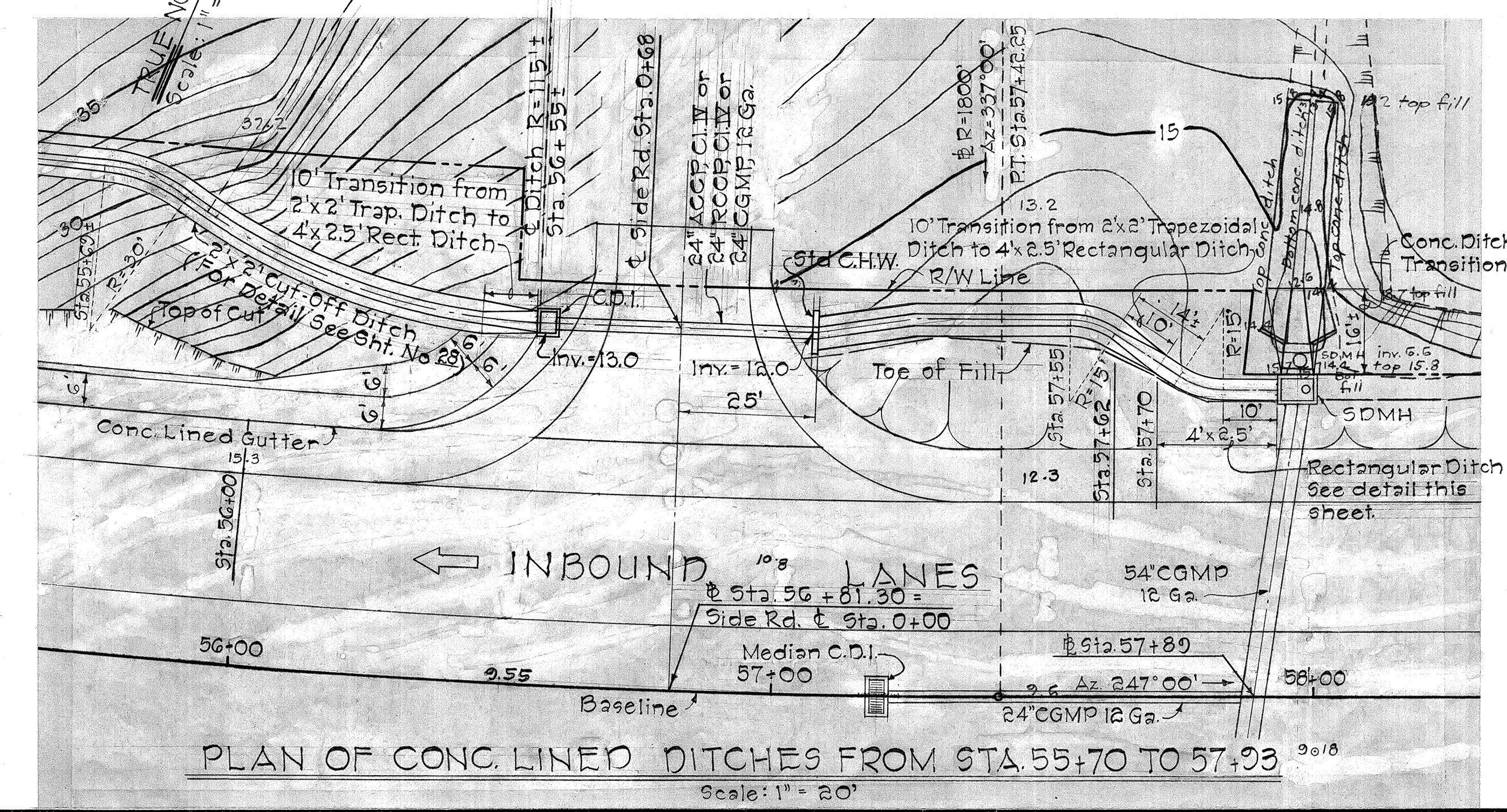
Revised: June 23, 1969



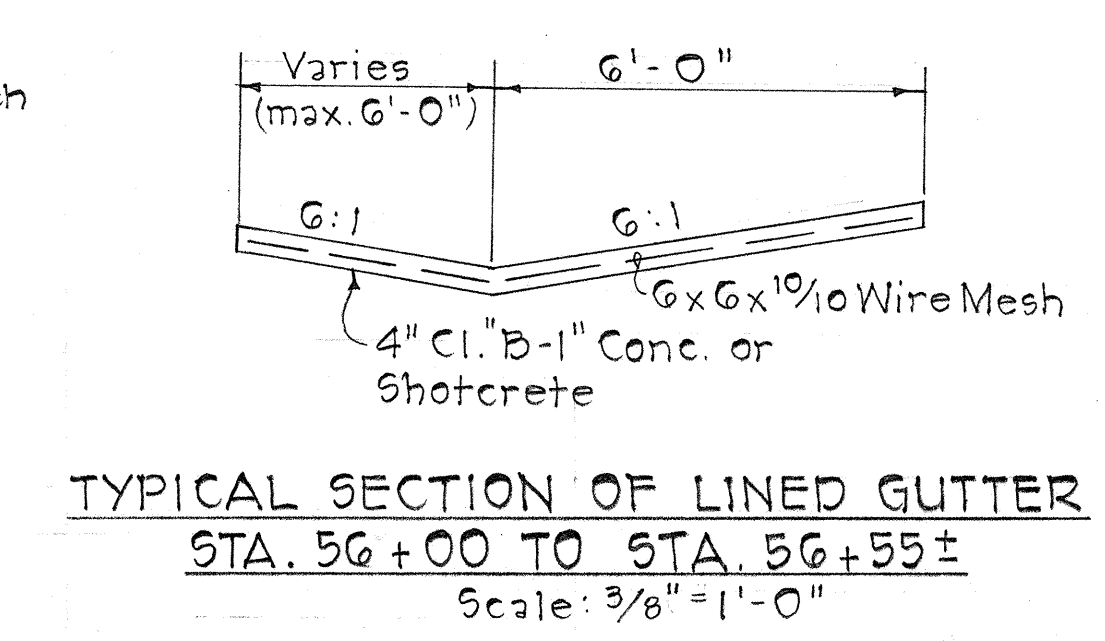
SPILLWAY INLET @ STA. 45+50 LT.
Scale: 1/2" = 1'-0"



**DETAIL OF CONCRETE DROP INTAKE
AT SIDE ROAD STA. 0+68 LT.**
Scale: 3/8" = 1'-0"



**DRAINAGE DETAILS OF INTERSECTION
AT STA. 62+57.41**



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

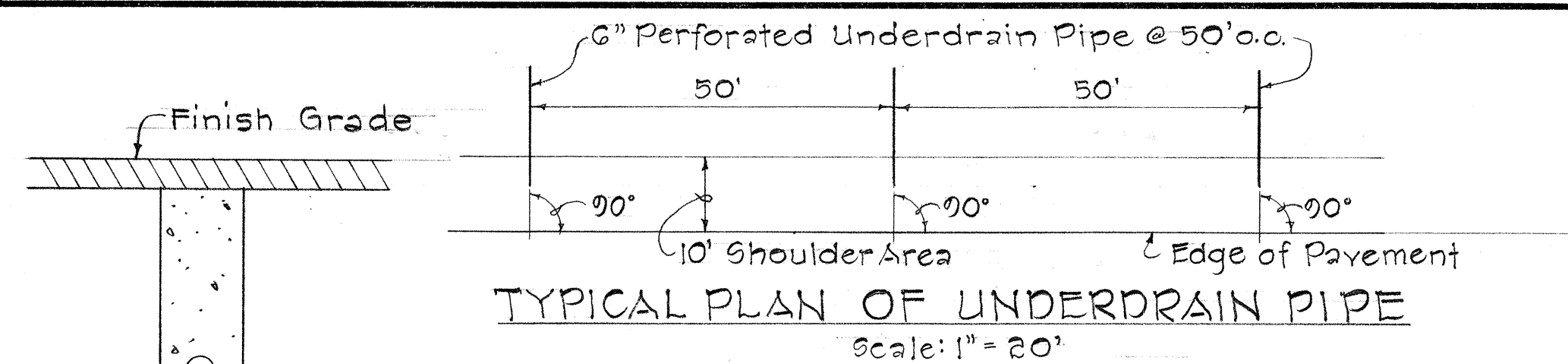
OF
INTERSECTION @ STA. 62+57.41, LINED
DITCHES FROM STA. 55+70 TO 57+93 AND
DETAILS OF SDMH @ STA. 57+93, 62+29
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (11)
F.A.S. Proj. No. 5-0630 (7)
Scale: As Shown Date: January, 1968

SHEET No. 9 OF 18 SHEETS

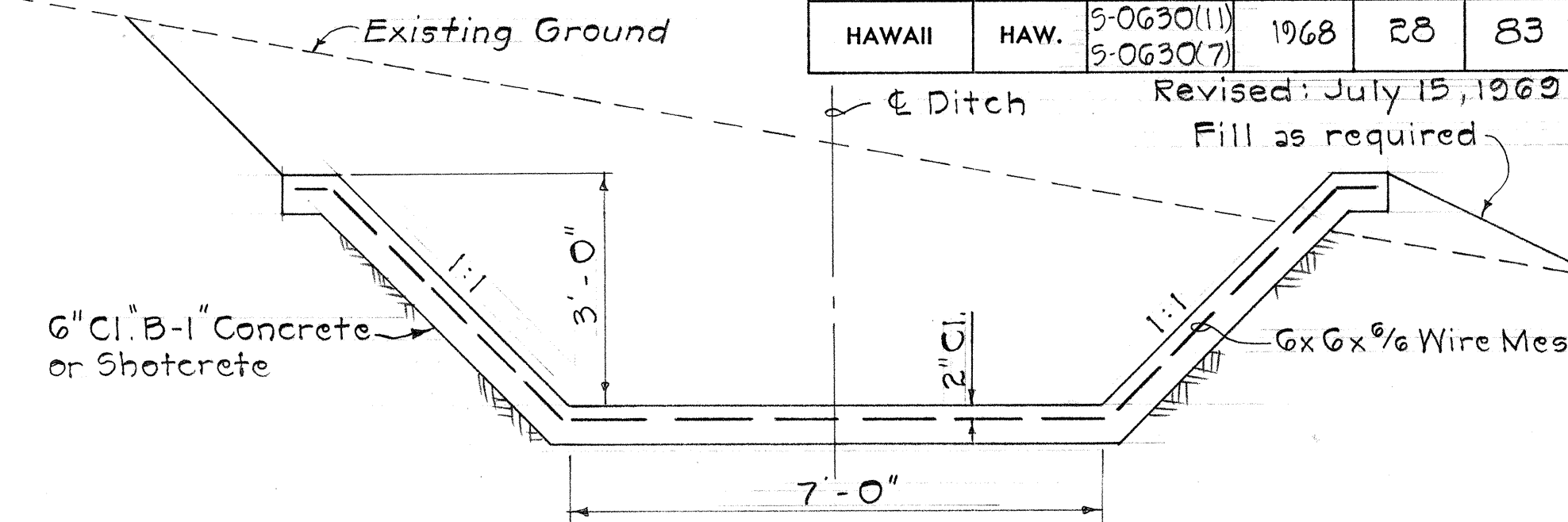
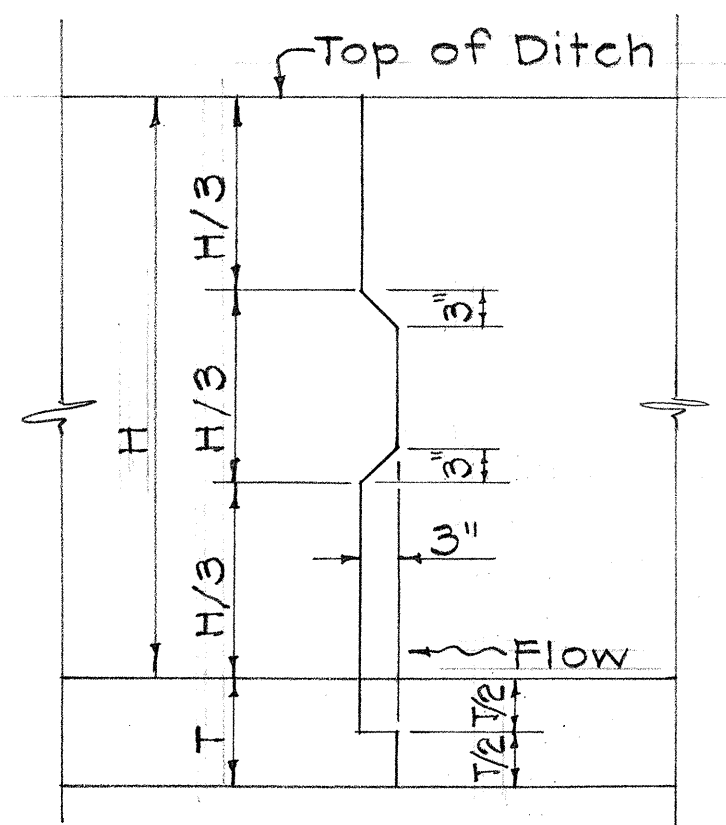
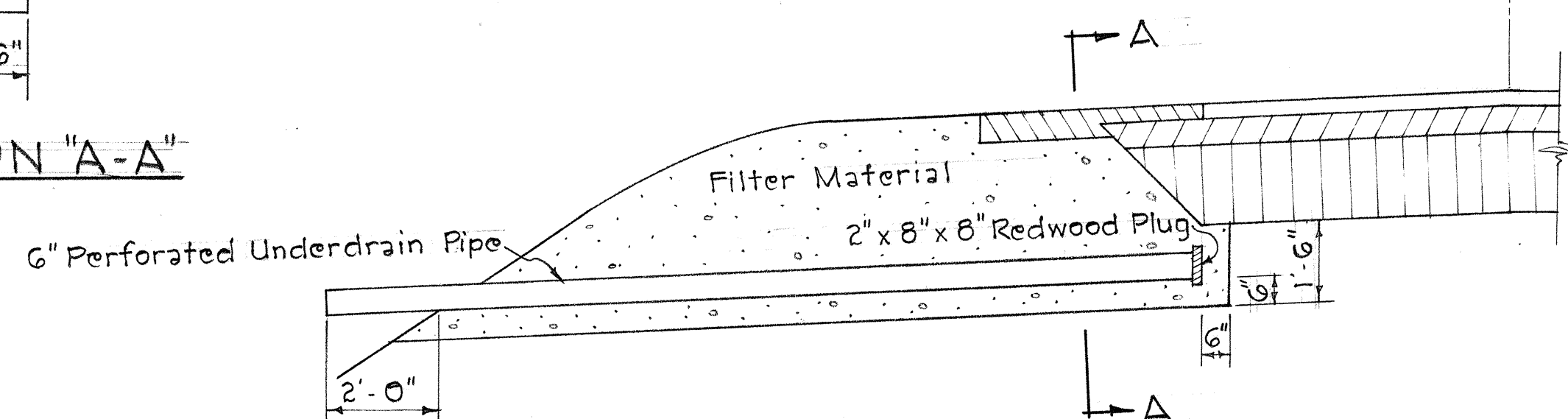
DATE	
DESIGNED BY	
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	
NO.	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	28	83

Revised: July 15, 1969
Fill as required



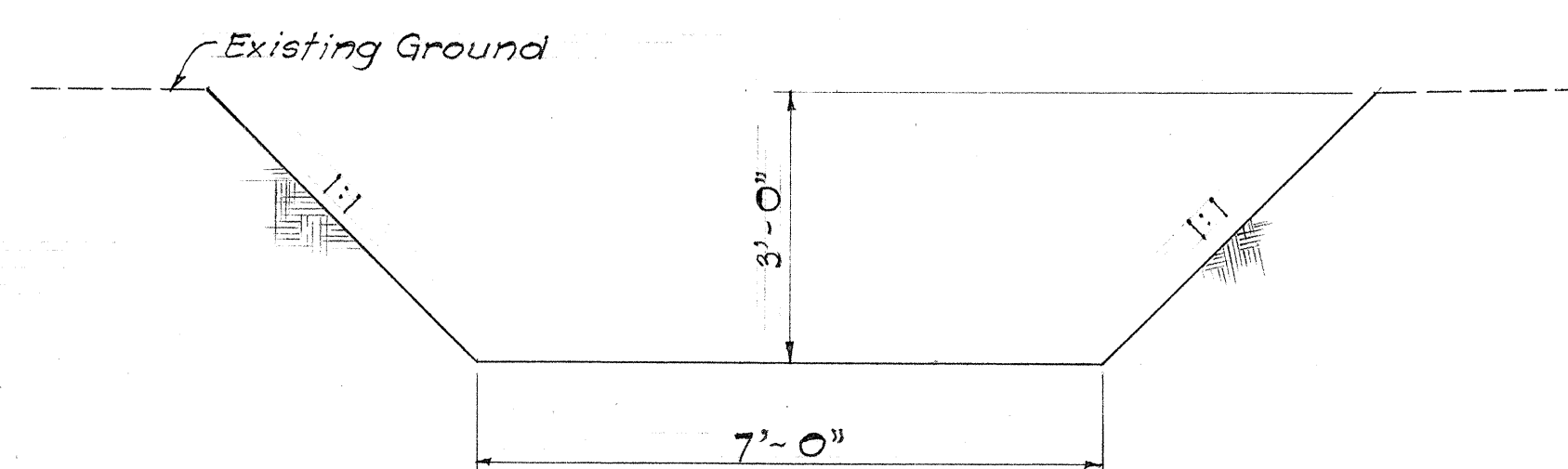
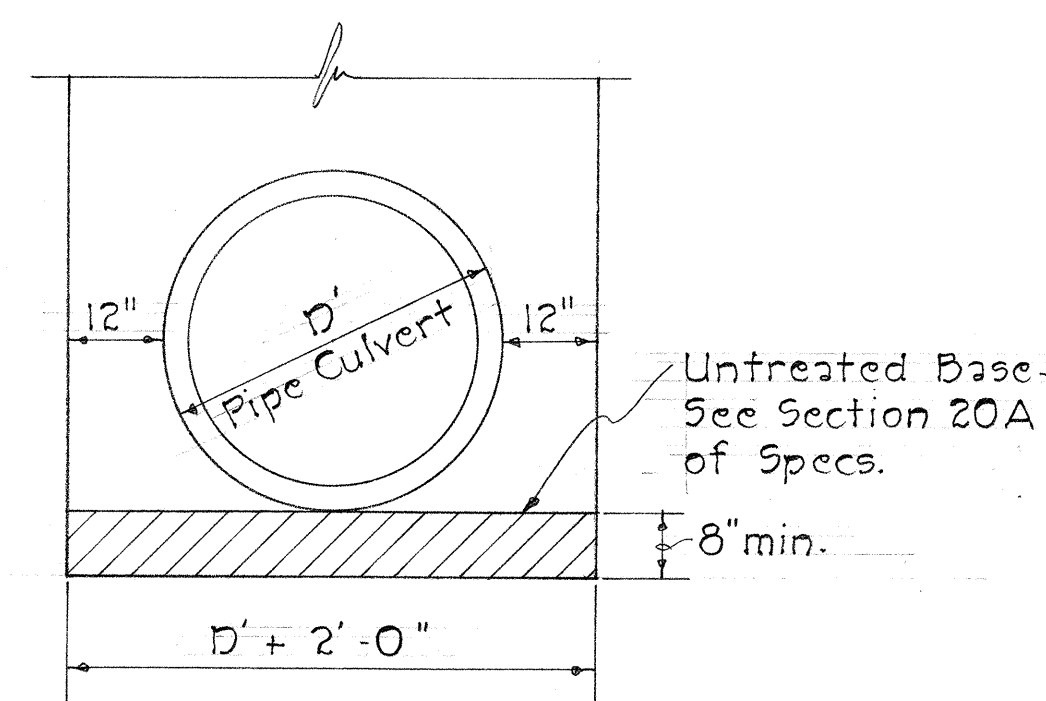
SECTION "A-A"



TRANSVERSE UNDERDRAIN

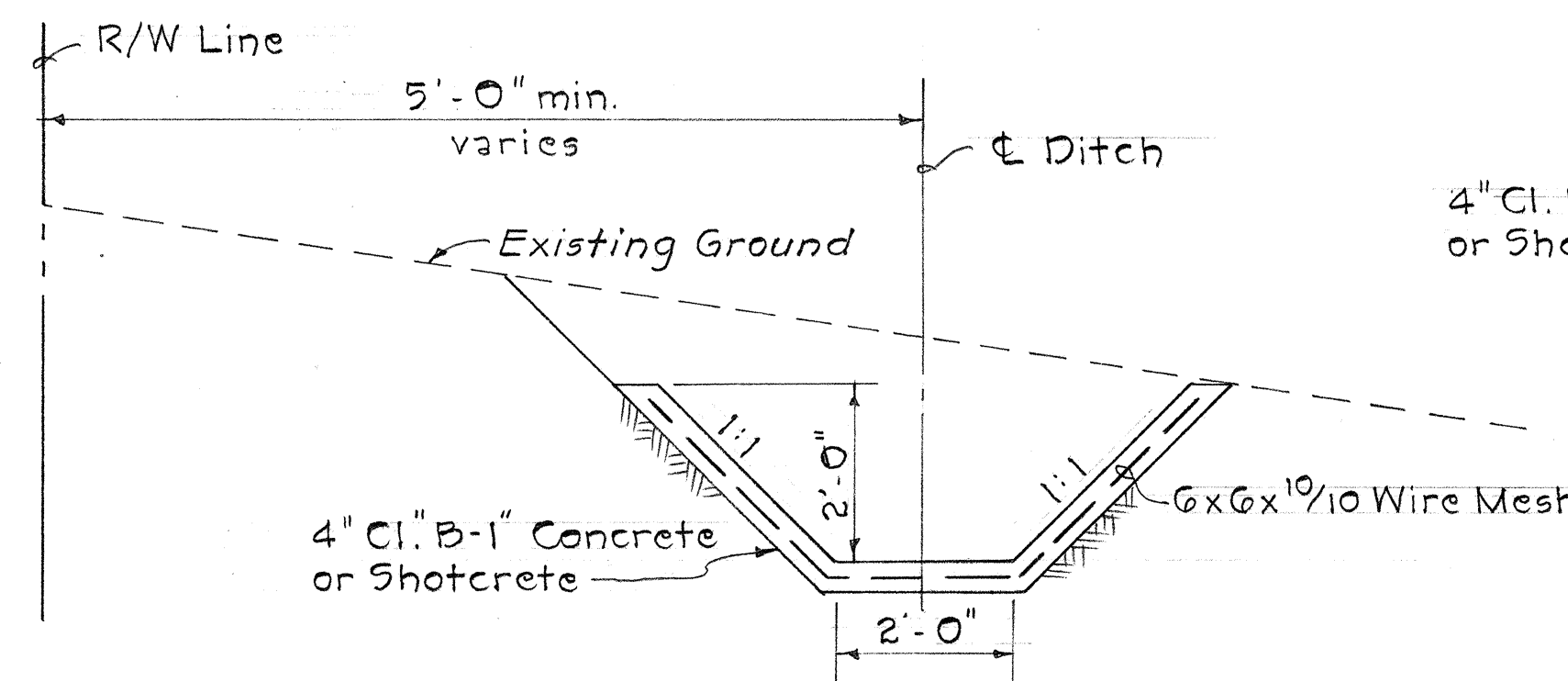
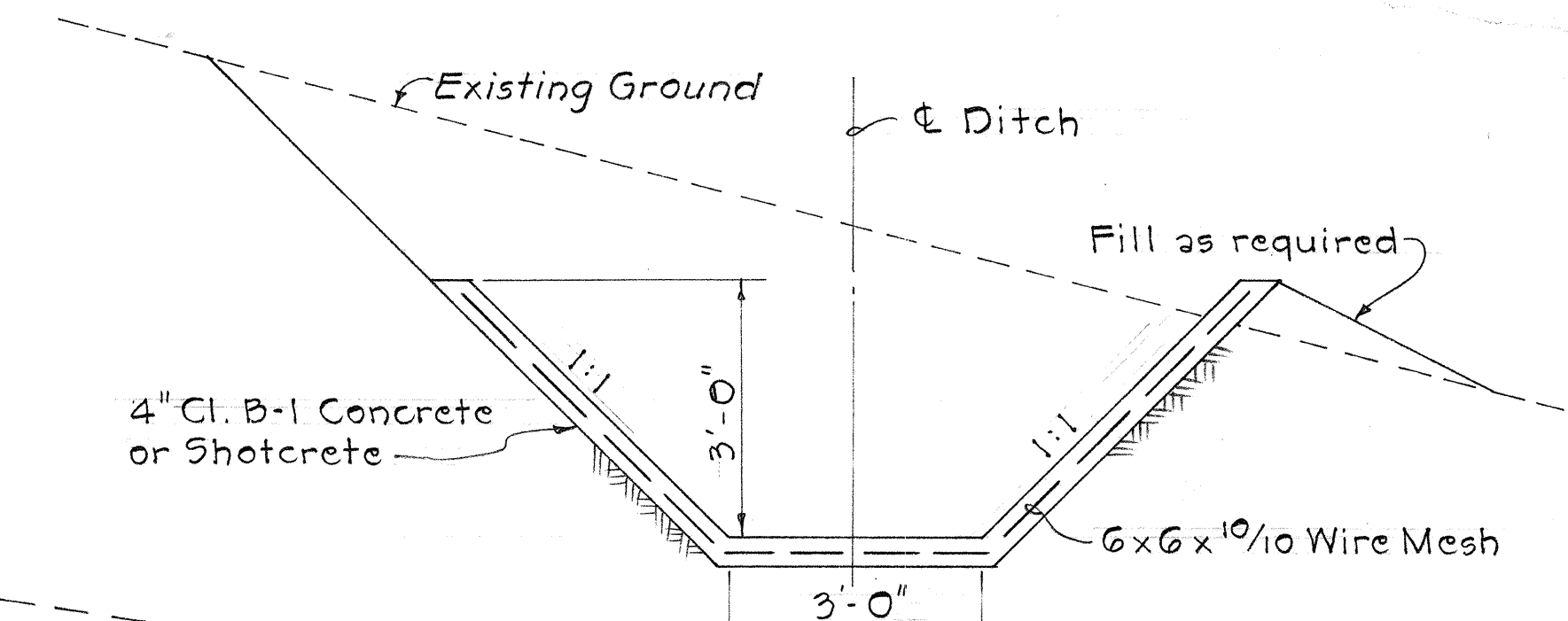
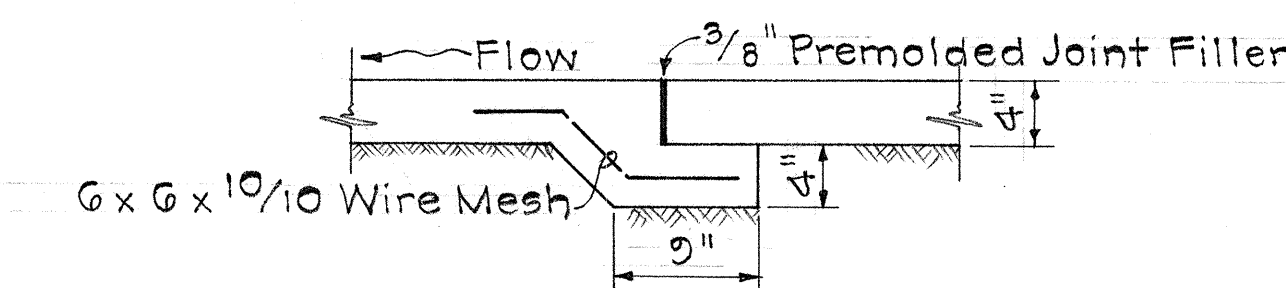
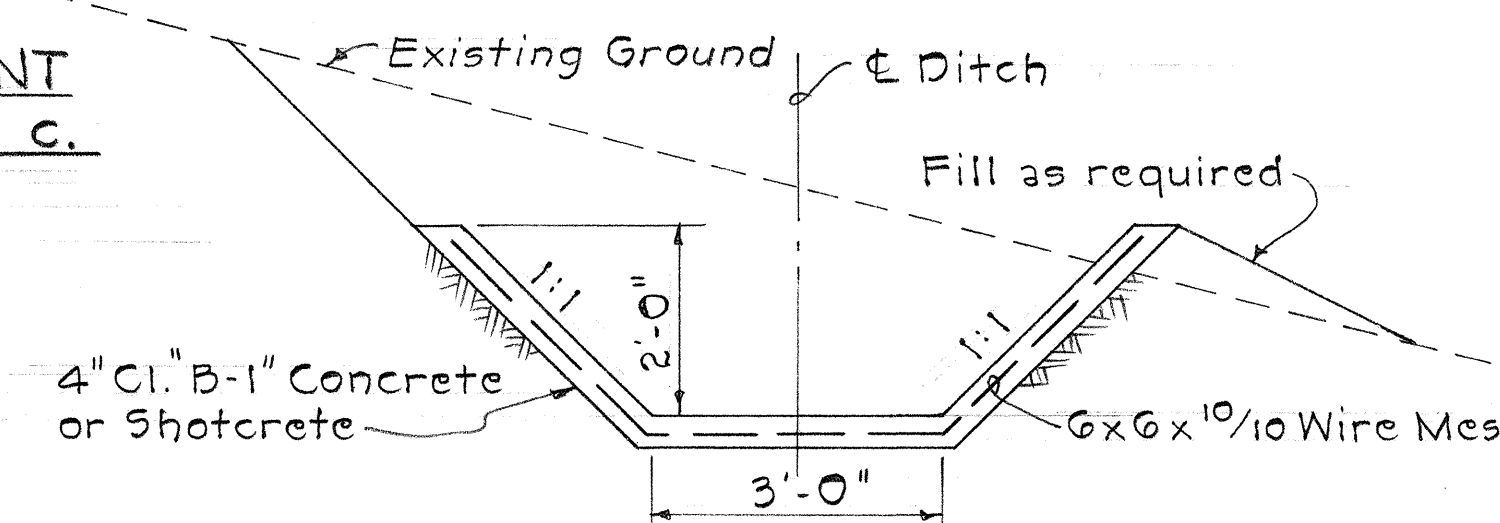
Scale: 3/8" = 1'-0"

See "Shoulder Detail" on sheet 3
for Actual Typical Cross Section

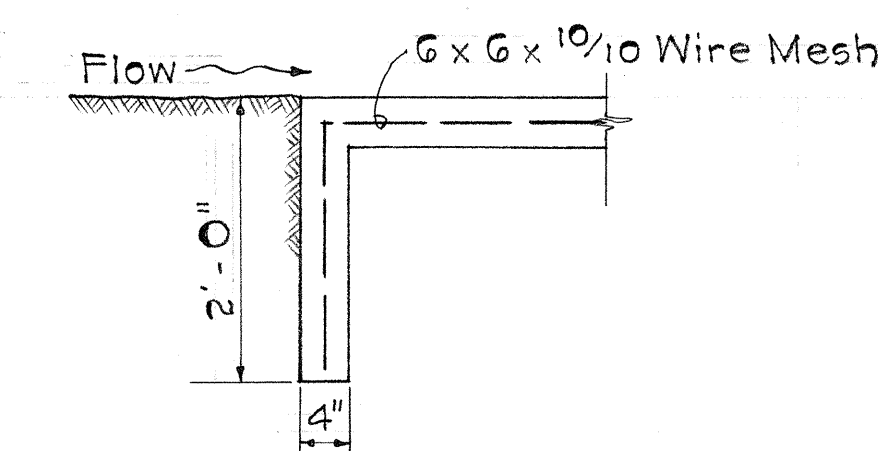
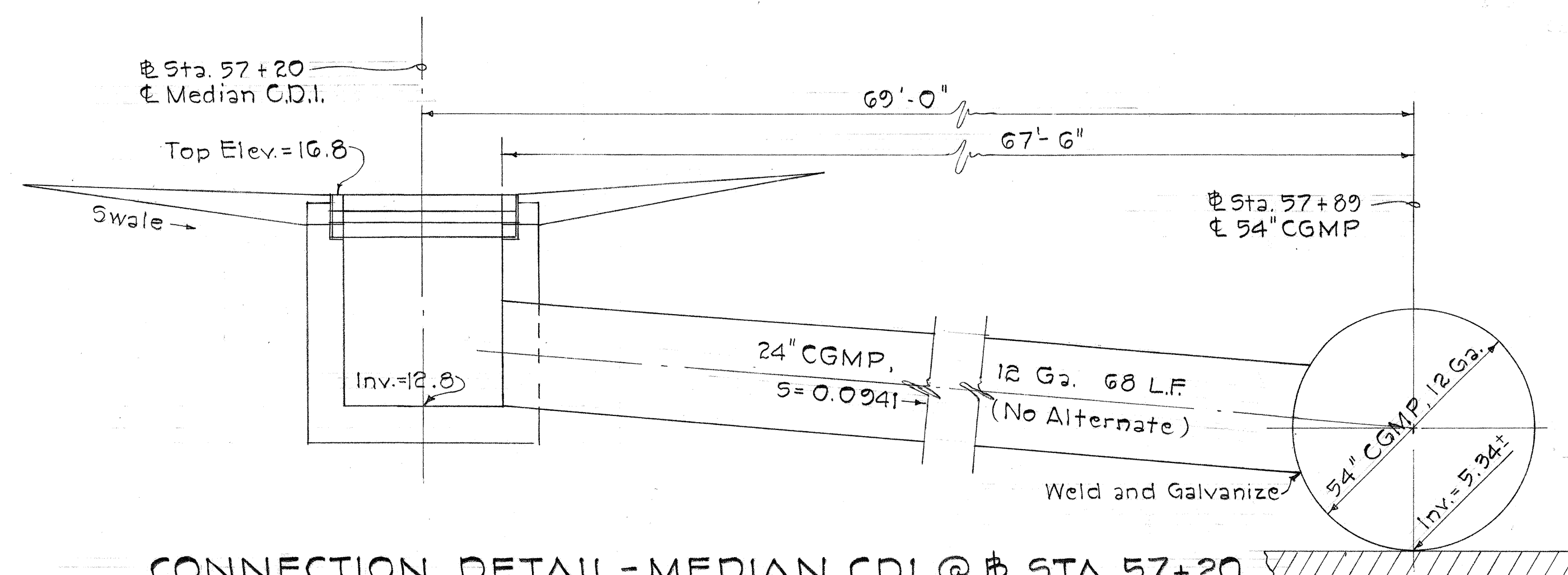


Note: Minimum Slope shall be 0.003

TYPICAL SECTION ~ EARTH DITCH
@ STA. 62+20 ± RT.



- NOTE:
1. Wire mesh reinforcing for channel lining shall be incidental to the concrete work.
 2. The minimum slope for channel lining shall be 0.003.



TYPICAL SECTION ~
CUT-OFF WALL FOR
LINED CHANNEL
Scale: 3/4" = 1'-0"

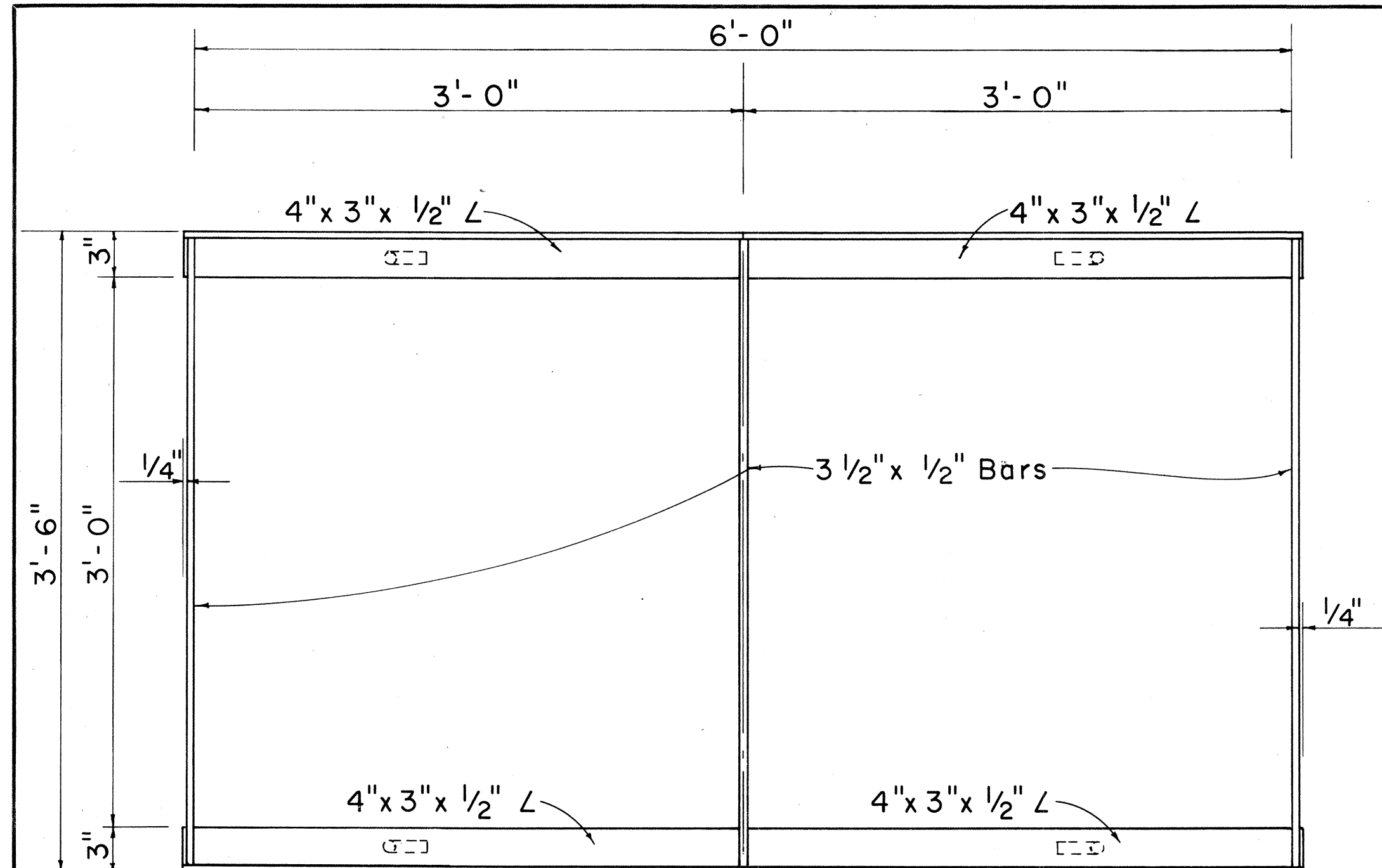
THIS SHEET SUPERSEDES
ORIGINAL SHEET NO. 28

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

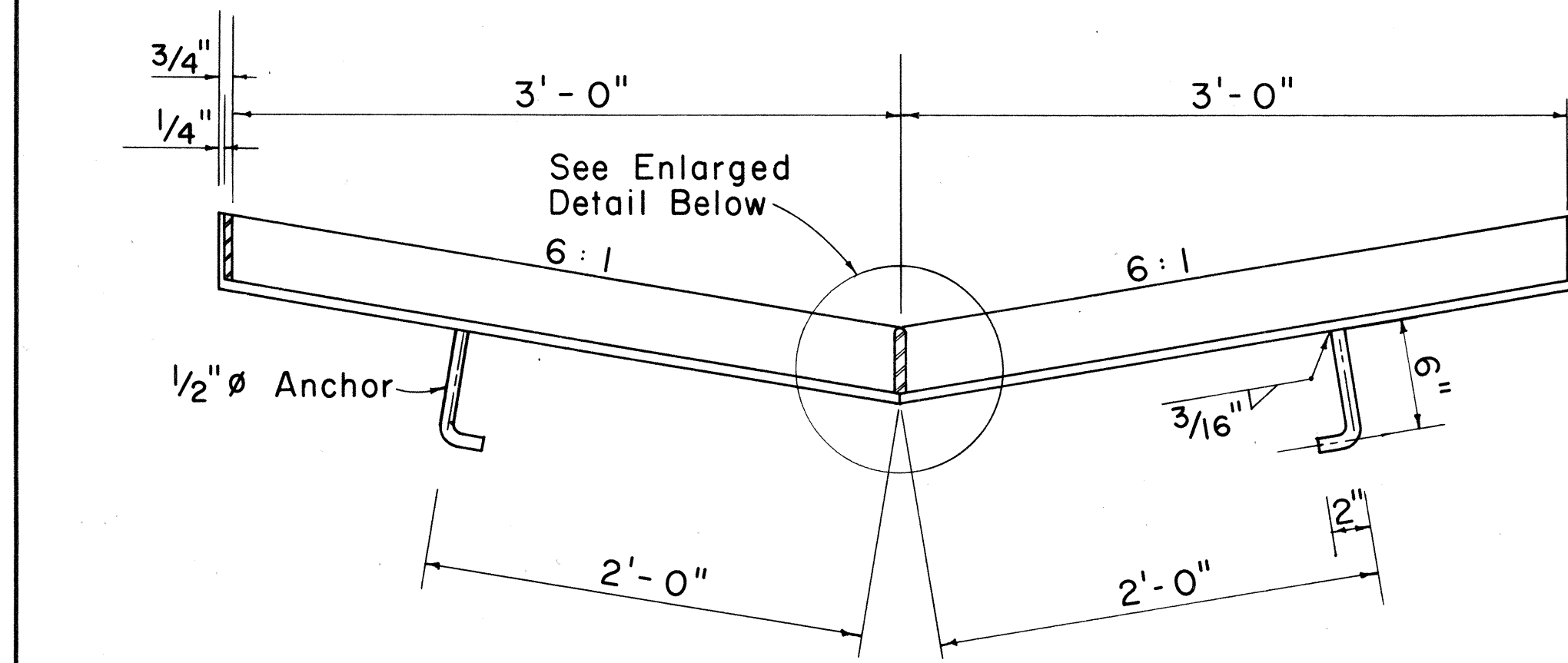
DRAINAGE DETAILS
OF
CONC. CUT-OFF DITCHES, TRANSVERSE
UNDERDRAIN AND UNTREATED
BASE FOR PIPE FOUNDATION
MOKAPU SADDLE ROAD
FAS Proj. No. 5-0630(11)
FAS Proj. No. 5-0630(7)
Scale: As Shown Date: January, 1969

SHEET No. 10 OF 18 SHEETS

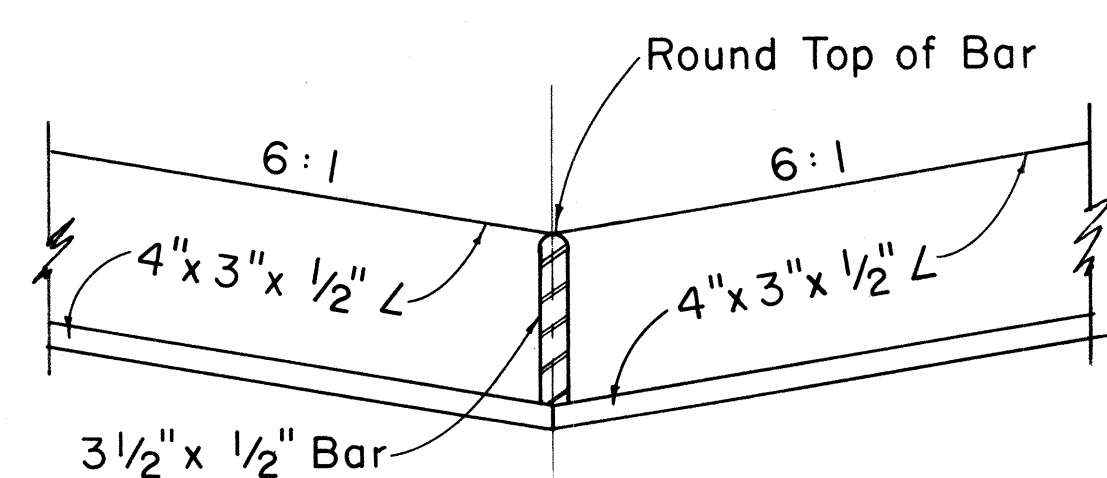
DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	
NOTE BOOK	
NO.	



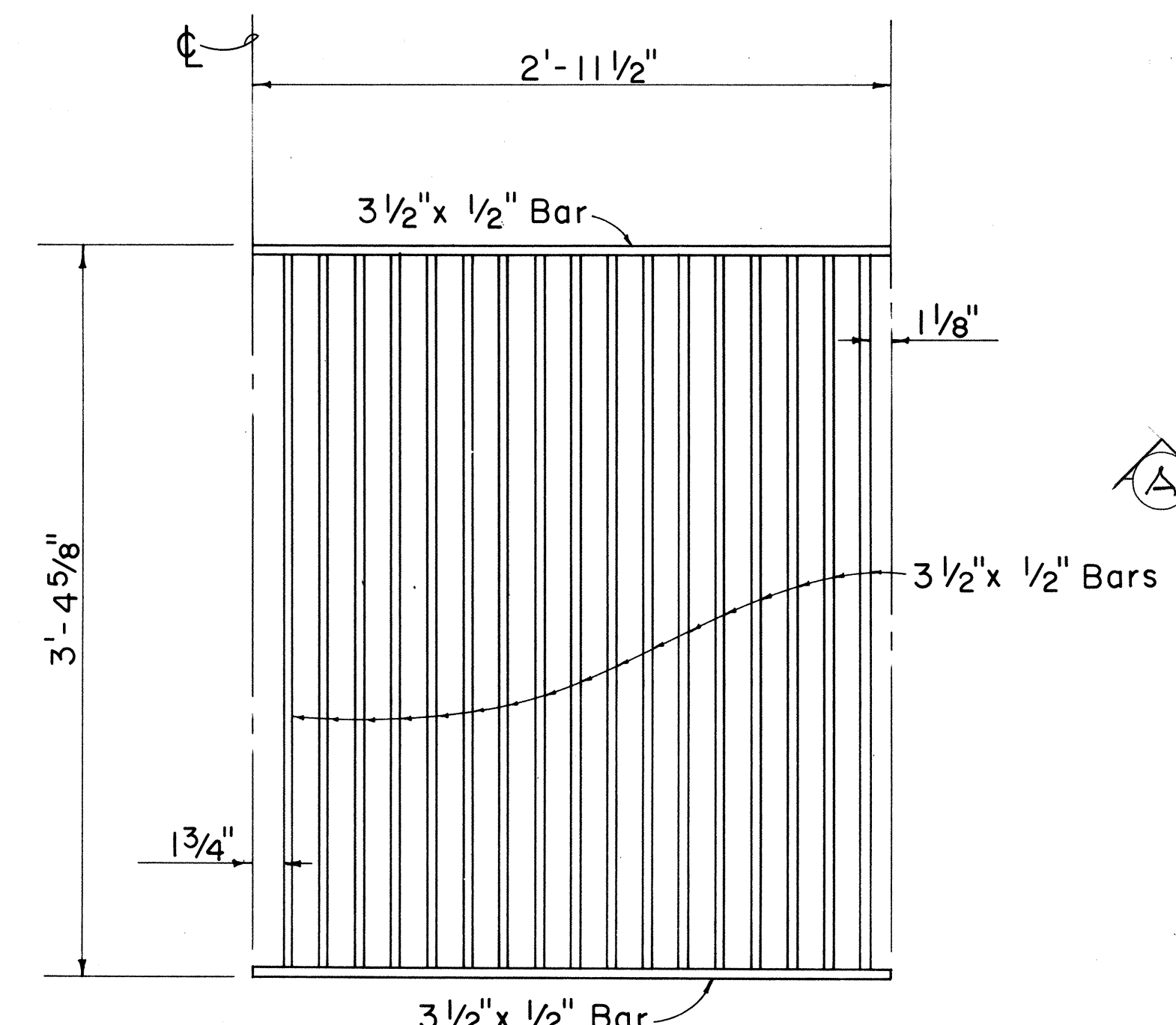
PLAN
Scale: 1 1/2" = 1'-0"



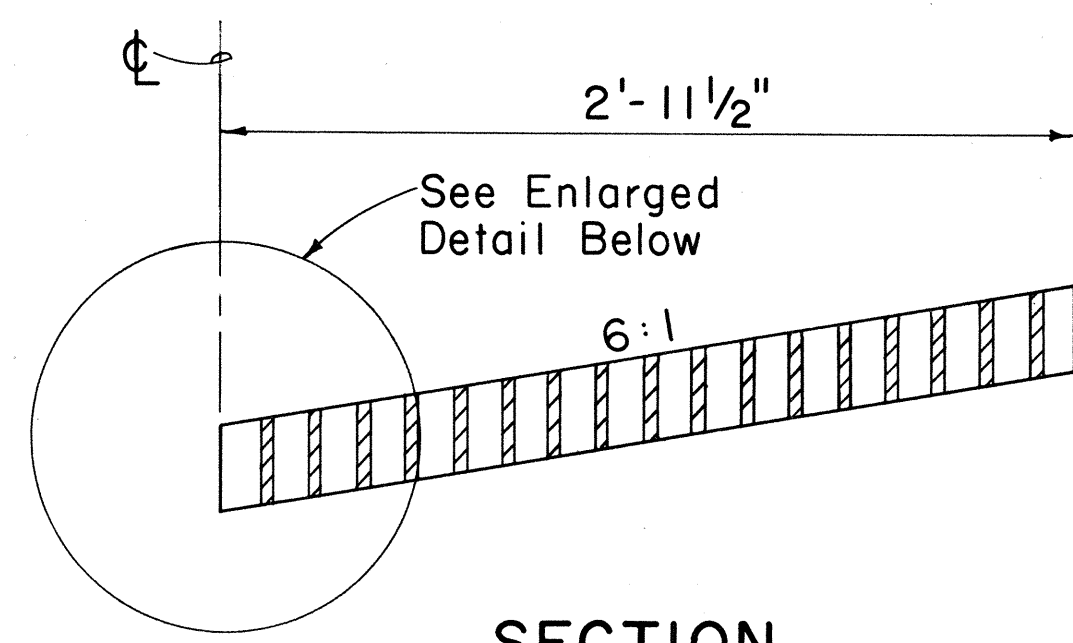
SECTION
Scale: 1 1/2" = 1'-0"



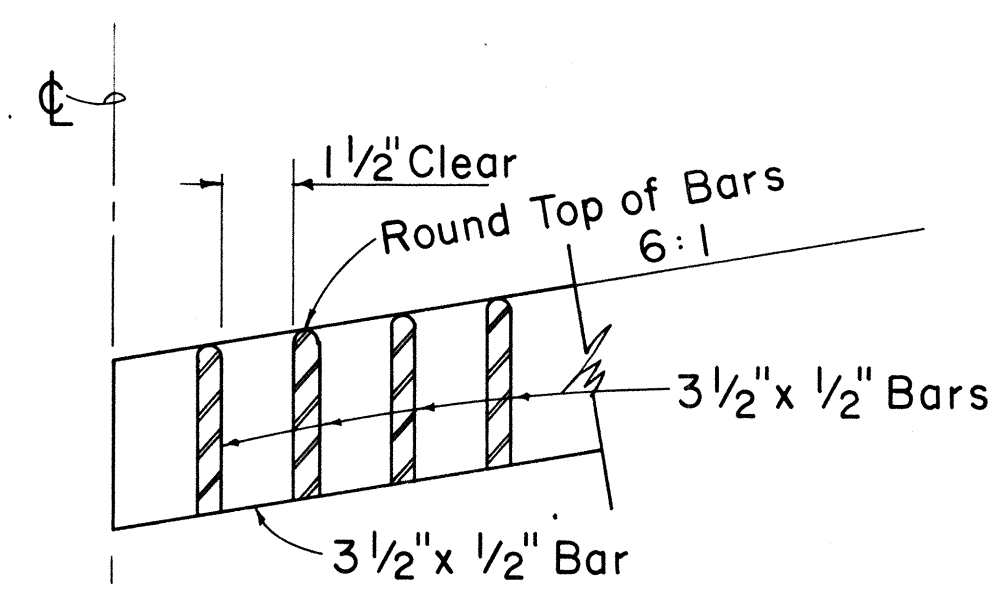
FRAME
Scale: 3" = 1'-0"



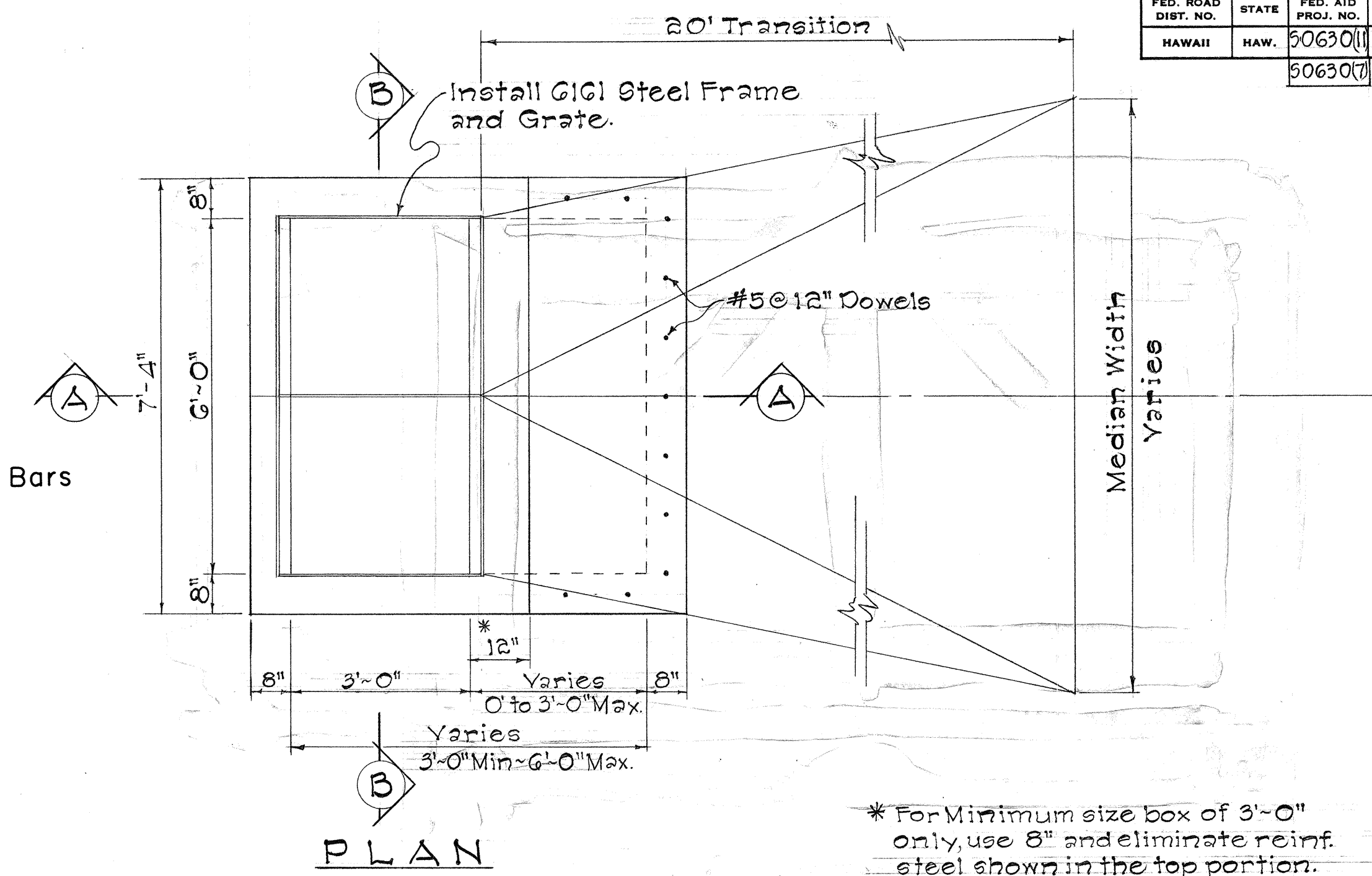
PLAN
Scale: 1 1/2" = 1'-0"



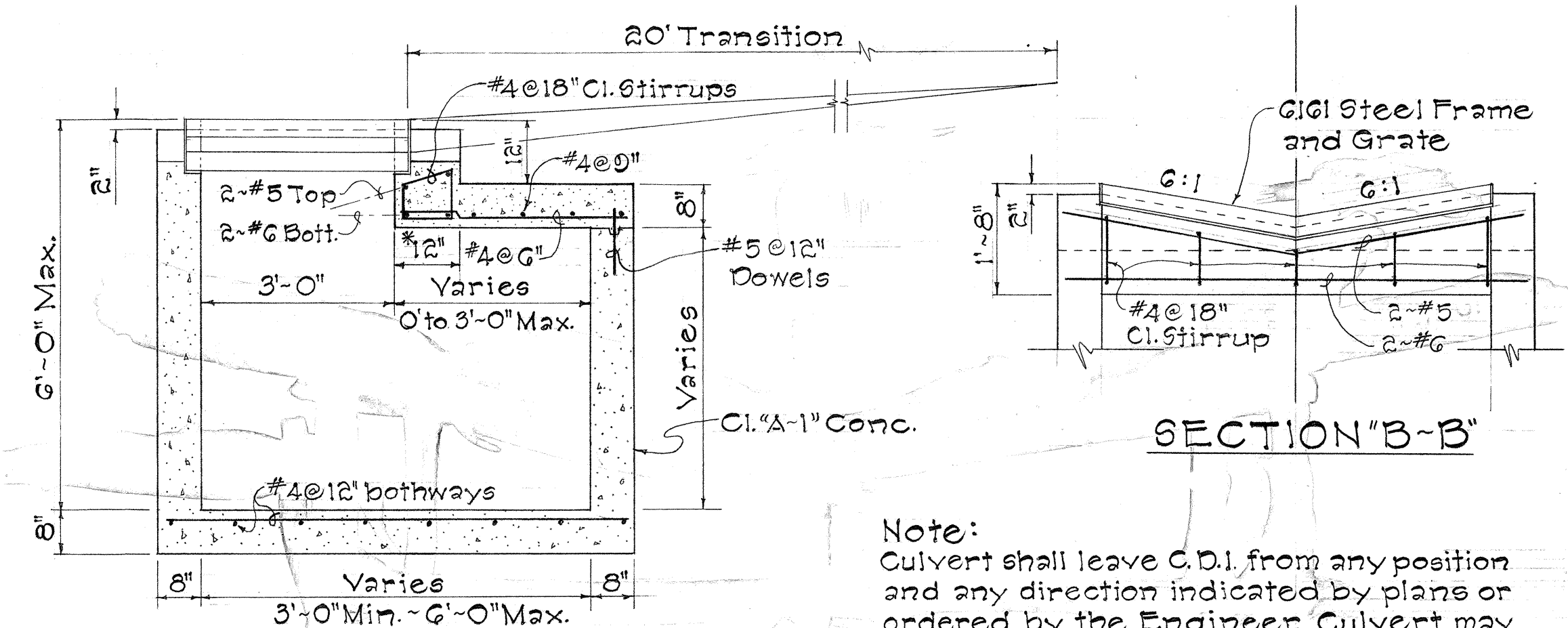
SECTION
Scale: 1 1/2" = 1'-0"



GRATE
Scale: 3" = 1'-0"



PLAN



SECTION "A-A"

MEDIAN CONCRETE DROP INTAKE

Scale: 1/2" = 1'-0"

Note: Culvert shall leave C.D.I. from any position and any direction indicated by plans or ordered by the Engineer. Culvert may both enter and leave C.D.I. so that C.D.I. will act as manhole.

GENERAL NOTES

1. Contractor has the option of using welded steel grate.
2. Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
3. All welds 3/8" unless otherwise noted.
4. The various materials shall conform to the specifications of ASTM as listed in the following tabulation and the Standard Specifications.

Material	ASTM Designation
Structural Steel	A283, Grade D
Cast Steel	A27, Grade 65-35
Malleable Iron Casting	A47, Gr. No. 35018

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

TYPE 6161 STEEL FRAME
AND GRATES FOR
MEDIAN CONC. DROP INTAKE

Scale: As Shown Date:

**DETAILS OF TYPE 6161 STEEL FRAME AND GRATES
FOR MEDIAN C.D.I.**

Technical drawing of a manhole structure, showing various components and dimensions:

- Overall Dimensions:**
 - Top: 28'-8" (Total width)
 - Bottom: 28'-0" (Total width)
 - Right side: 2'-0" (Total height)
- Structural Components:**
 - Type "A" 2" C.B. (Top horizontal reinforcement)
 - Type "B" 2" C.B. (Second horizontal reinforcement)
 - Type "C" 2" C.B. (Third horizontal reinforcement)
 - Type "D" 2" C.B. (Fourth horizontal reinforcement)
 - Standard M.H. Rungs @ 16" o.c. (incidental to Class "A-1" Concrete)
 - #3 @ 3" o.c. (Reinforcement for concrete lining)
 - 4" Concrete Lining (Inner lining)
 - 1'-8" (Bottom horizontal reinforcement)
 - Edge of Shoulder (Bottom edge)
- Dimensions and Spacing:**
 - Horizontal spacing: 4'-0", 6'-8", 8", 6'-0", 8", 6'-8", 4'-0"
 - Vertical spacing: 3' o.c., 5' o.c., 2'-0"
 - Right side vertical spacing: 1'-0", 1'-0"
- Other Labels:**
 - Top of Concrete Lining
 - Edge of Ditch
 - Edge of Shoulder
 - Varies 0" to 8" (Right side vertical dimension)

Technical drawing of a bridge structure showing a cross-section of a concrete lining over a pipe culvert. The drawing includes dimensions for the concrete lining, throat, and culvert. Labels include "Ditch Inv.", "4" Concrete Lining w/6x6x10 Wire Mesh Reinforcing", "Throat", "Top of Concrete Lining", "Type "A" C.I. Frame & Cover", "Class "A-1" Conc.", "See Plans for Inv. #4 @ 12" Bothways", and "Pipe Culvert". Dimensions are given in feet and inches, such as 4'-0", 6'-8", 7'-4", 6'-8", 4'-0", 12", 8", 6", 4", 1", 6", 8", 6", 1 1/2" C.I., 8", 6'-0", 8", and 8".

[illegible][illegible]

DETAILS OF TYPE "A2", "B2", "C2" AND "D2" CATCH BASIN

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	31	83

GENERAL NOTES

Concrete: All concrete shall be Class A-1.

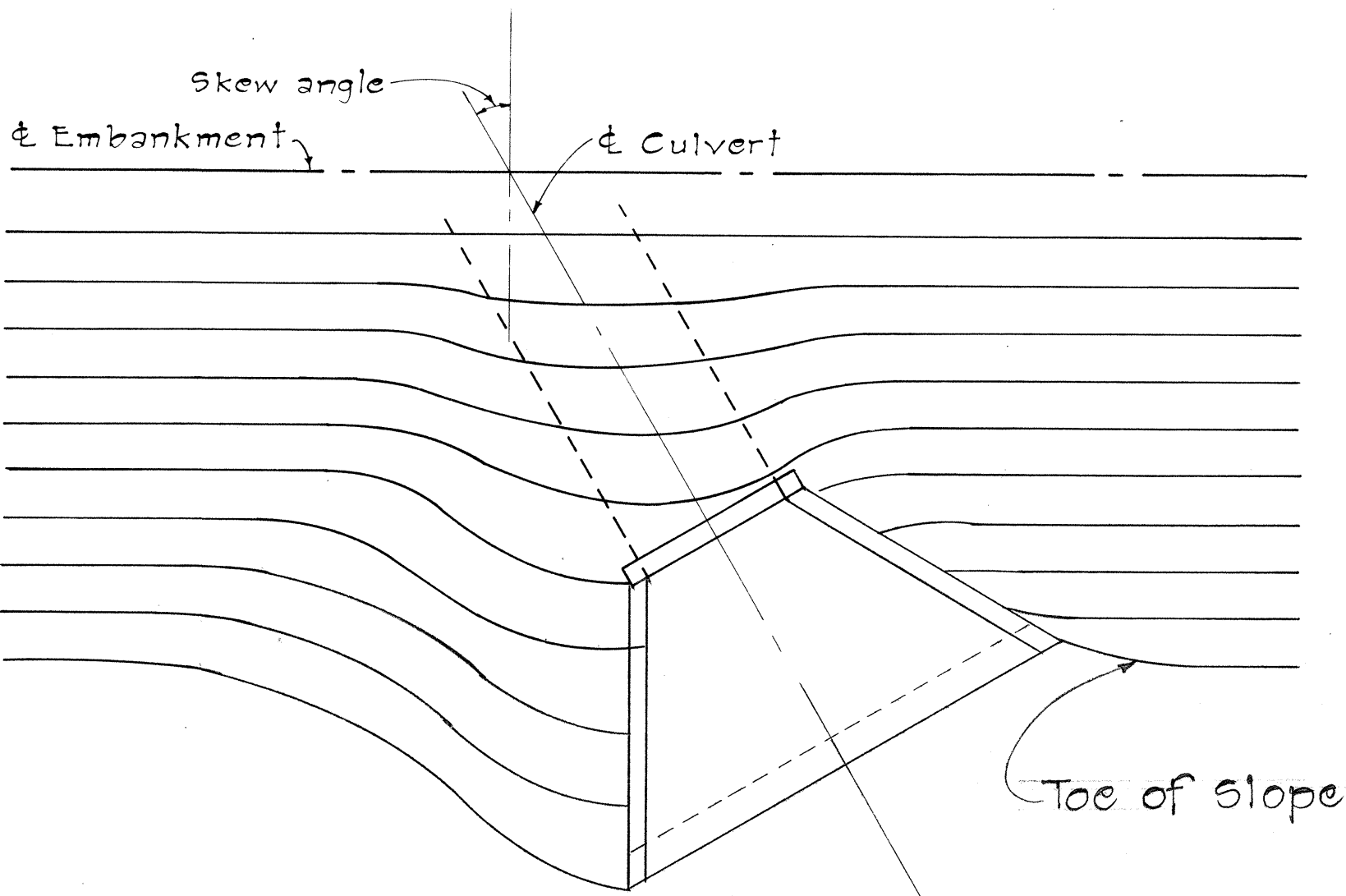
Cutoff Wall: The depth of wall shown on the plan may be reduced if rock is encountered at a higher elevation.

Multiple Pipe Installations: To permit careful placing and tamping of back fill material, clear spacing for multiple pipe installations shall be not less than one-half the diameter of the larger pipe between sides of adjacent pipes, but not required to exceed three feet.

Anchor Bolts: Anchor bolts are not required for concrete pipe.

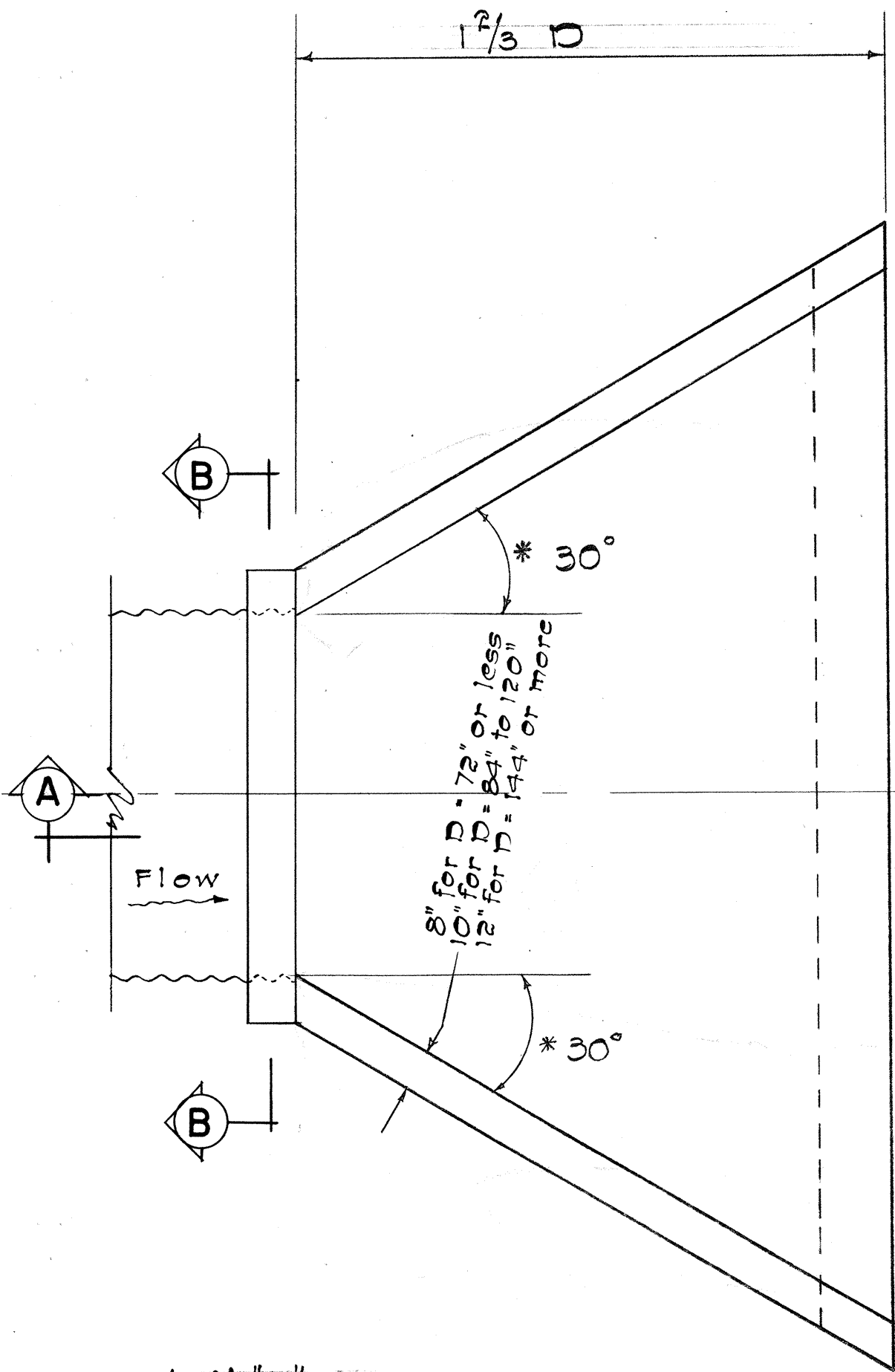
SUMMARY OF QUANTITIES

Culvert Dia.	Concrete	Reinf. Steel
inches	Cu. Yd.	Lbs.
48		
54		
60		
72		
84		
96		
108		
120		
144		
180		

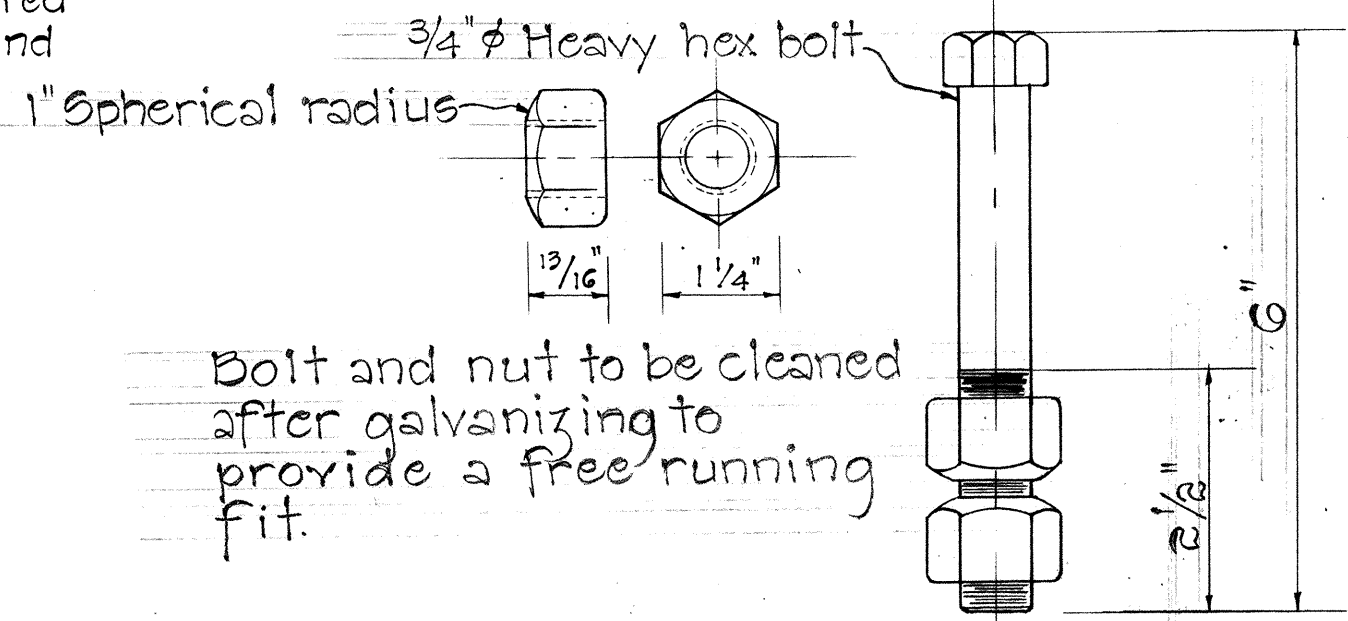


EMBANKMENT CONTOURS FOR SKEWED INLET

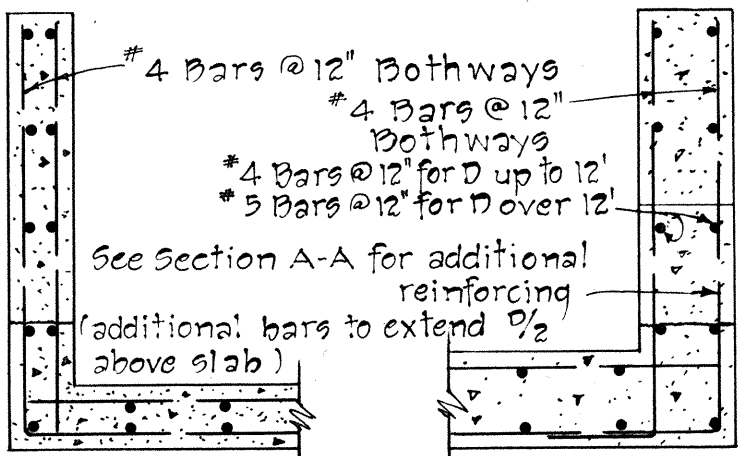
When inlet is skewed to embankment slope, the embankment may be contoured to cover the exposed section of wall and pipe.



* or indicated on plans

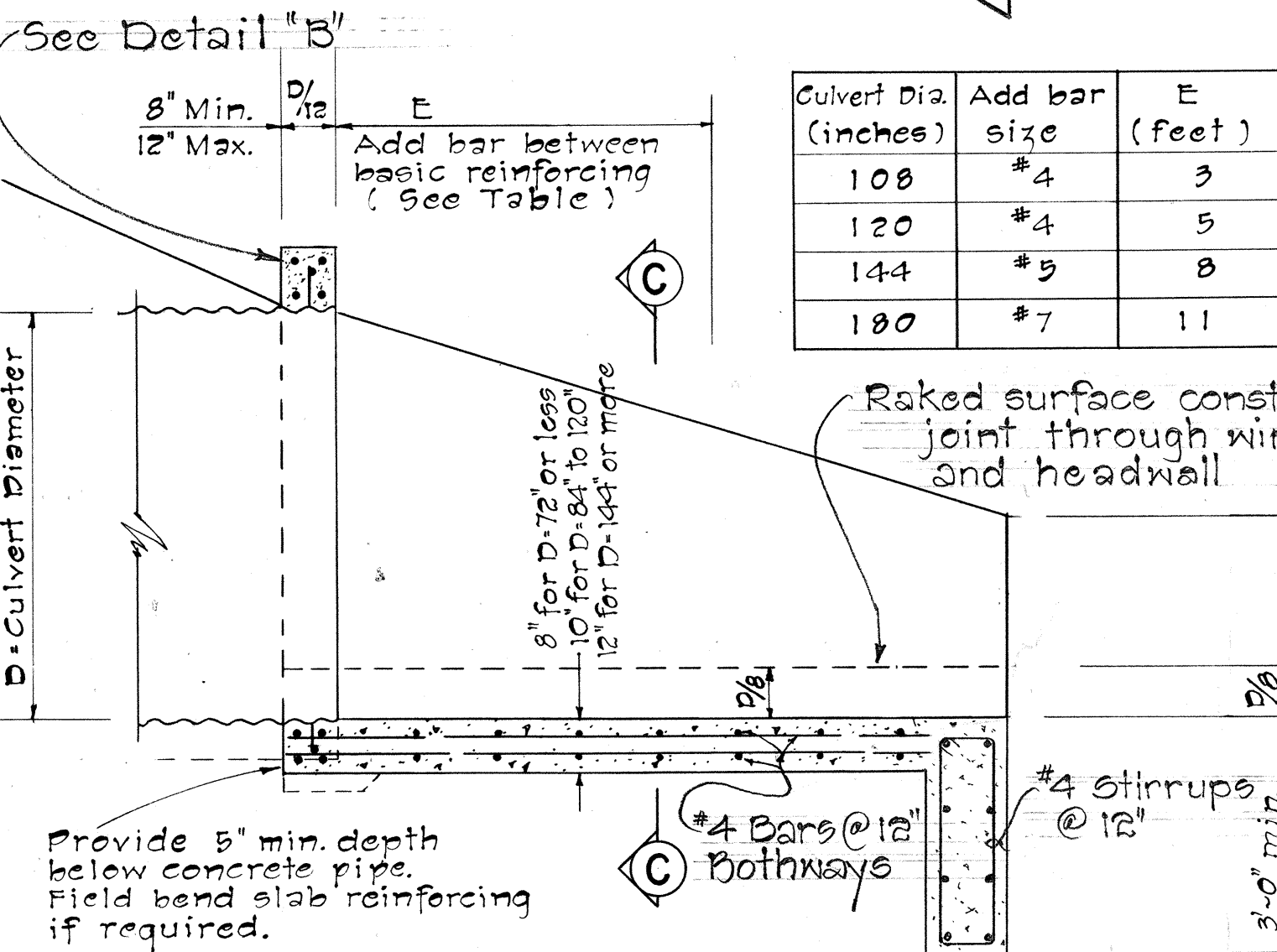


ANCHOR BOLT DETAIL



8" WING WALL 10" TO 12" WING WALLS

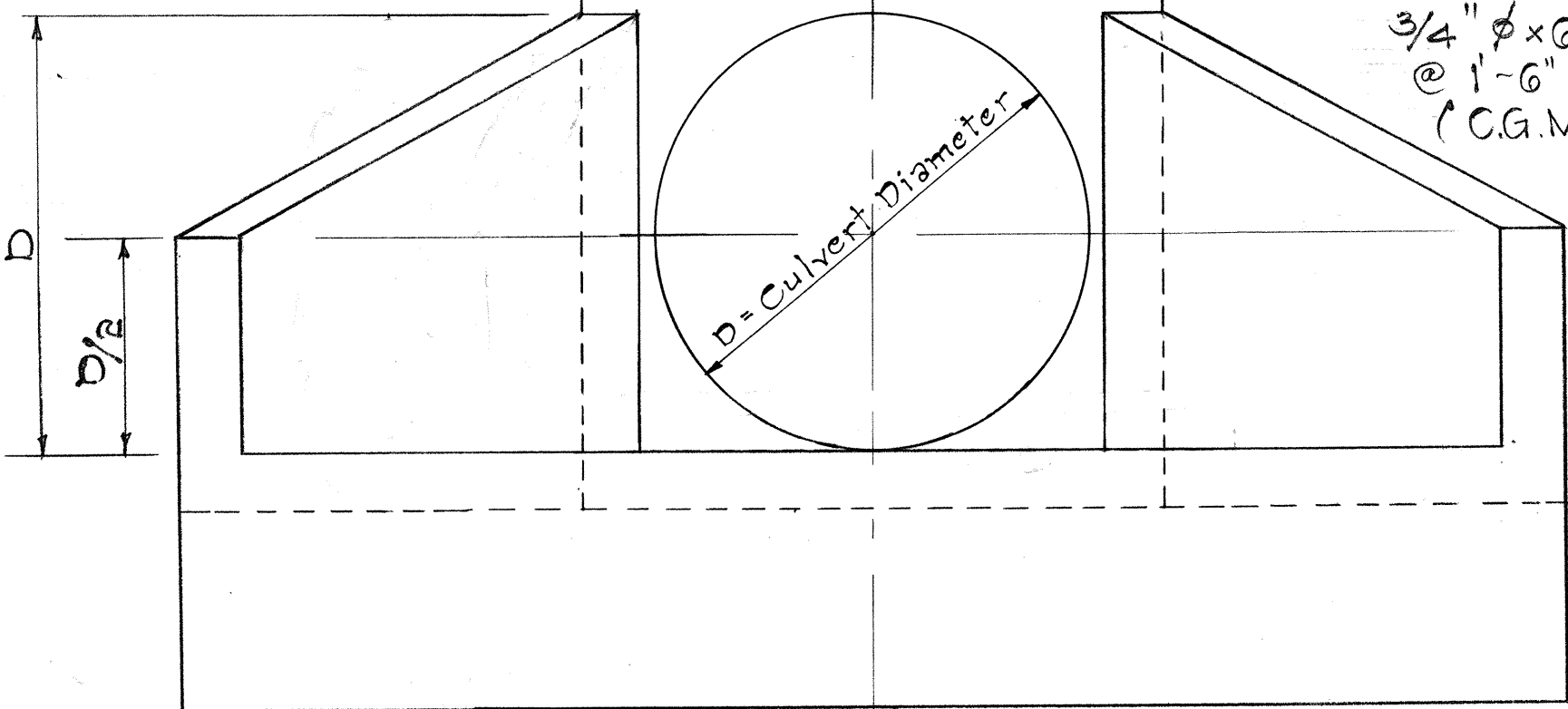
SECTION C-C



SECTION A-A

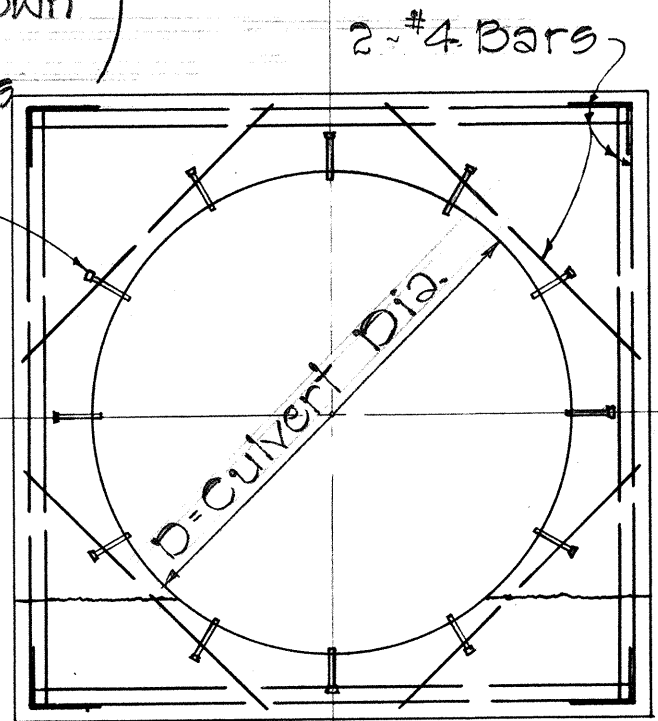
INLET STRUCTURE FOR CULVERT SIZES 48 IN. TO 180 IN. DIAMETER

10" min. for CGMP culvert
Pipe wall thickness
+ 8" for R.C.C.P.

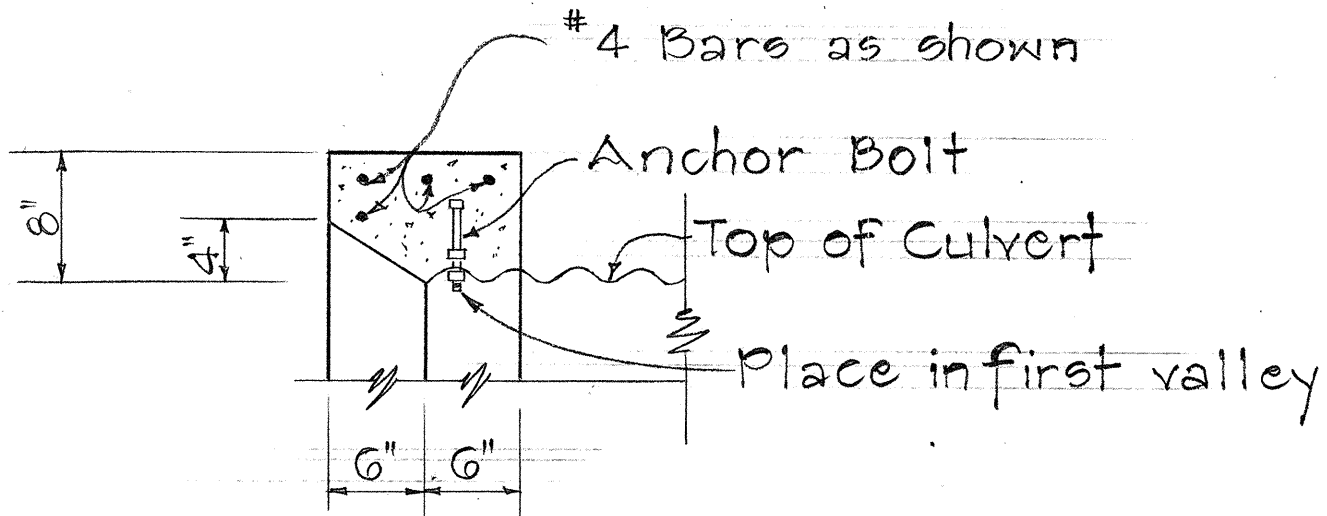


FRONT ELEVATION

For Multiple Pipe Installations: use Dimensions as shown plus clear spacings and outside diameters.
3/4" x 6" Anchor Bolts @ 1'-6" o.c. (CG.M.P. only)



SECTION B-B



DETAIL "B"

Scale: 1" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS
INLET STRUCTURES
FOR
CONCRETE AND CORRUGATED METAL
CULVERTS SIZES 48 IN. TO 180 IN.
Not to Scale May 1967
SHEET No. 13 OF 18 SHEETS

SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
DESIGNED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	

GENERAL NOTES

Concrete: All concrete shall be Class A-1.

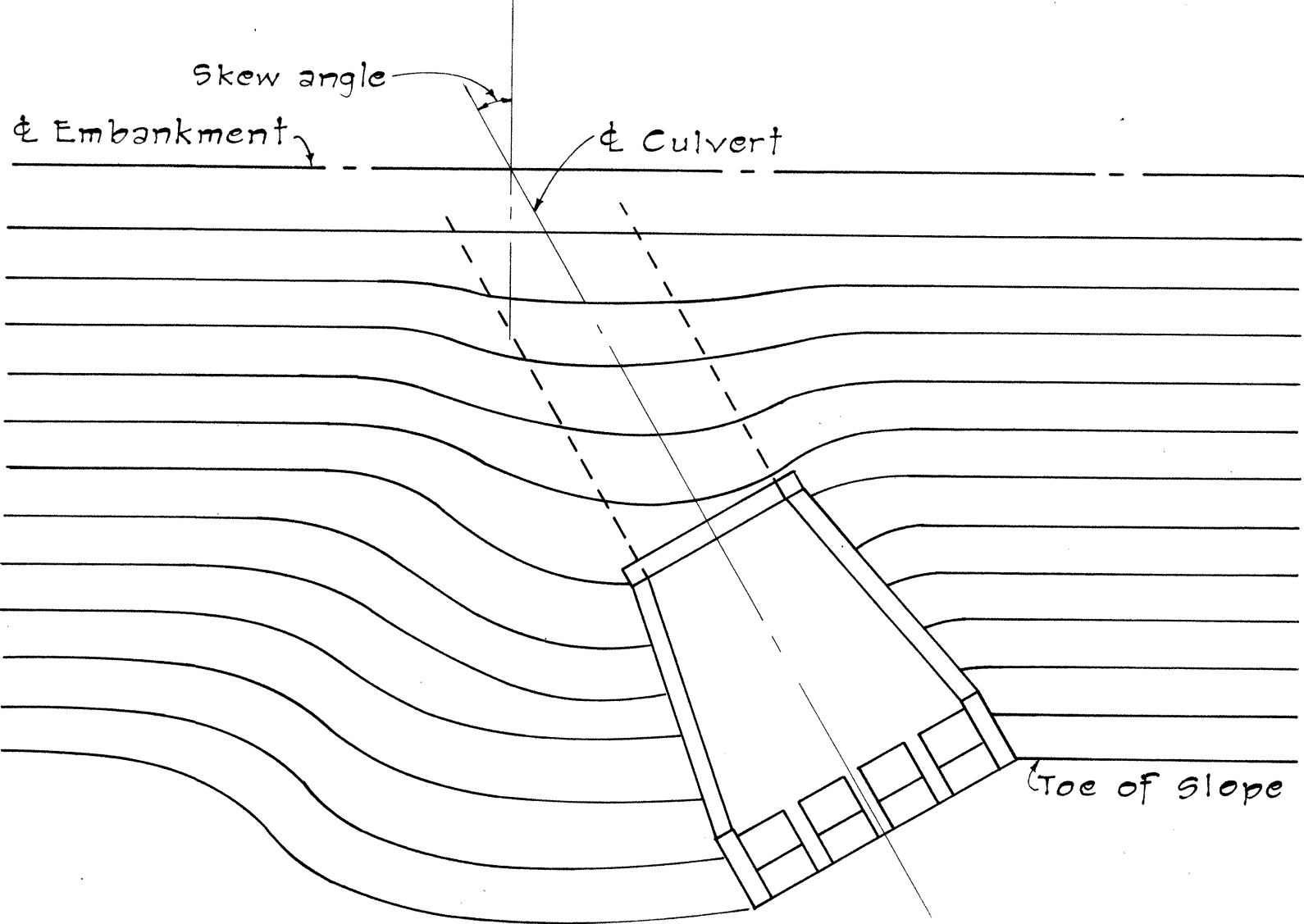
Cutoff Wall: The depth of wall shown on the plan may be reduced if rock is encountered at a higher elevation.

Multiple Pipe Installations: To permit careful placing and tamping of back fill material, clear spacing for multiple pipe installations shall be not less than one-half the diameter of the larger pipe between sides of adjacent pipes, but not required to exceed three feet.

Anchor Bolts: Anchor bolts are not required for concrete pipe.

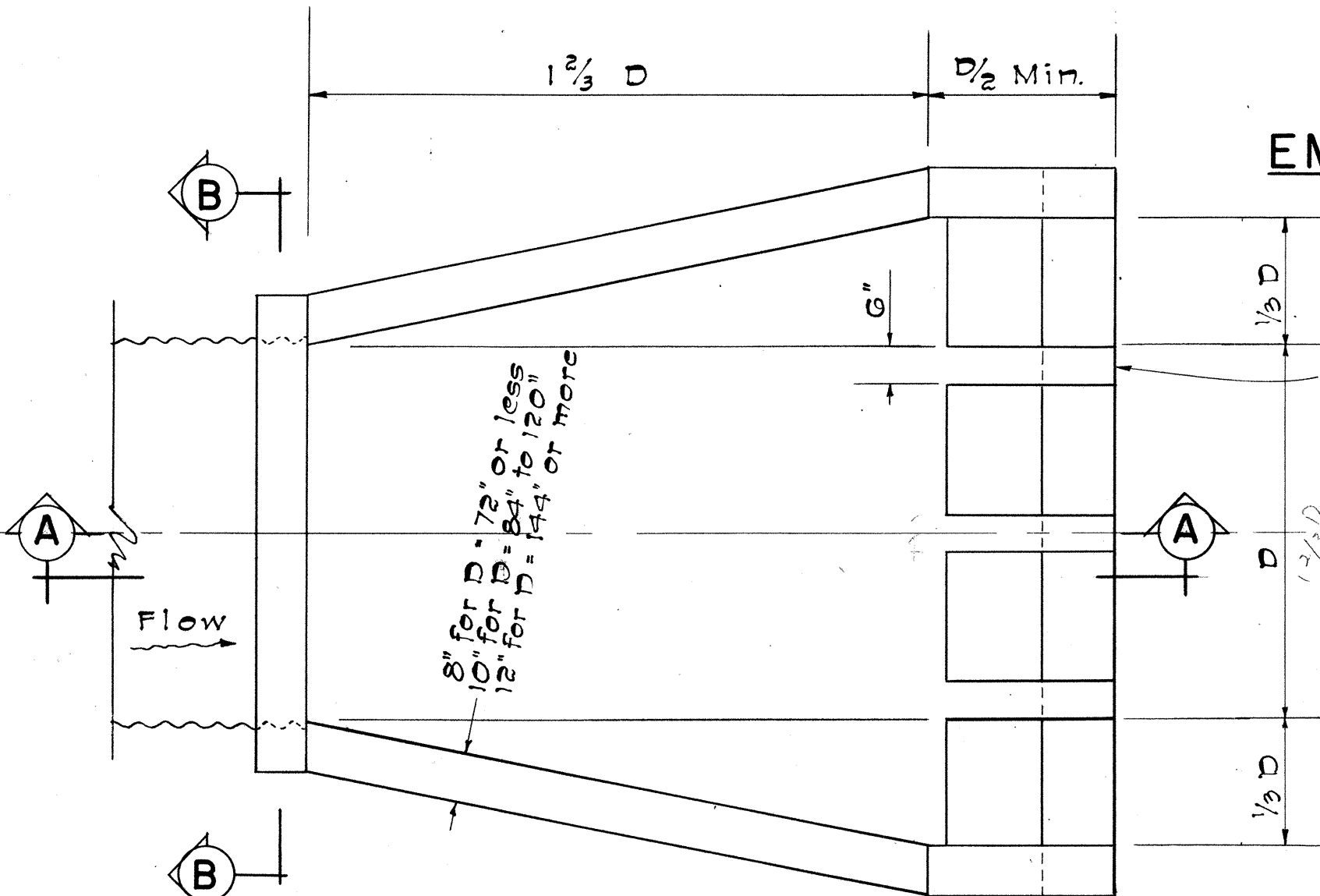
SUMMARY OF QUANTITIES		
Culvert Dia.	Concrete	Reinf. Steel
inches	Cu. Yd.	Lbs.
48		
54		
60		
72		
84	12.7	1270
96	16.2	1570
108	20.3	2010
120	24.8	2460
144	41.8	3610
180	63.8	7090

Note: Quantities shown are for C.G.M.P. culvert.

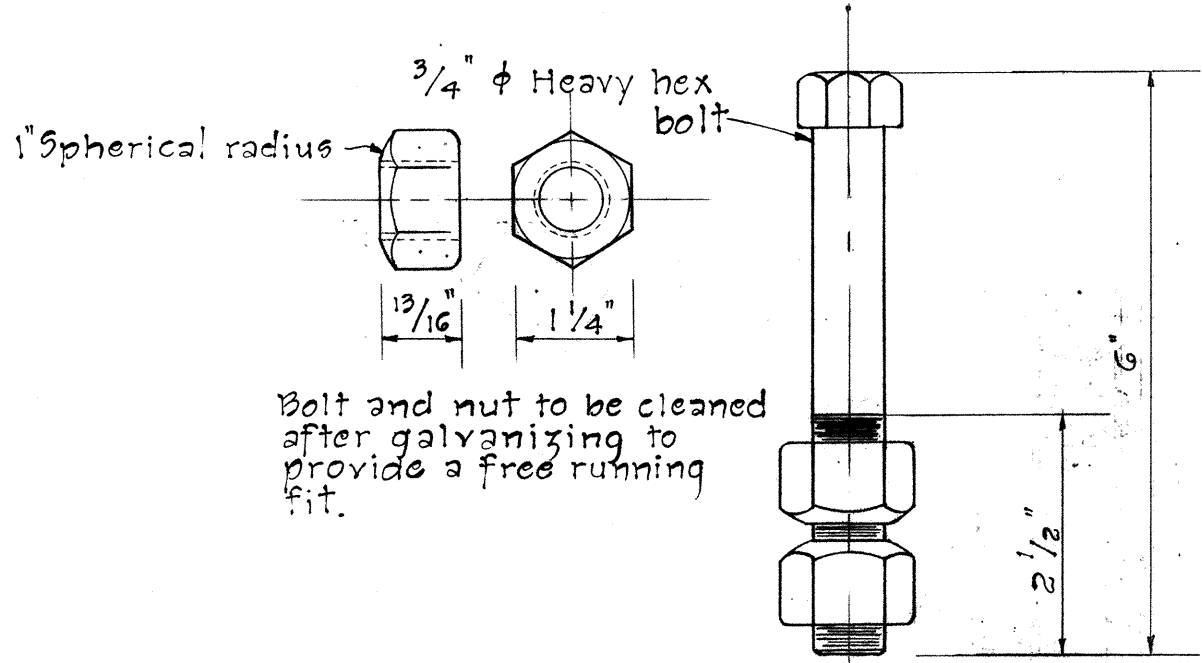


EMBANKMENT CONTOURS FOR SKEWED OUTLET

When outlet is skewed to embankment slope, the embankment may be contoured to cover the exposed section of wall and pipe.



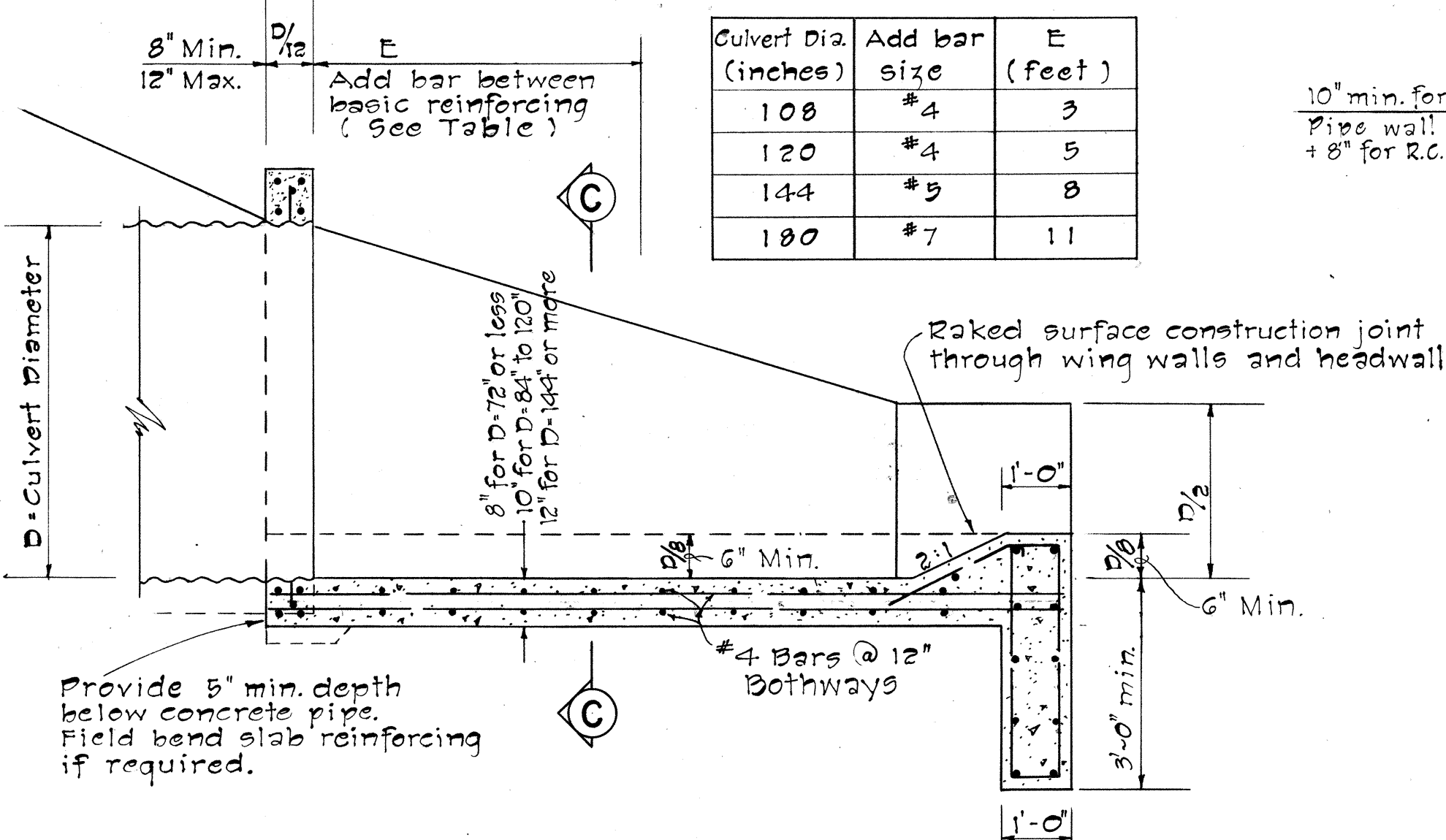
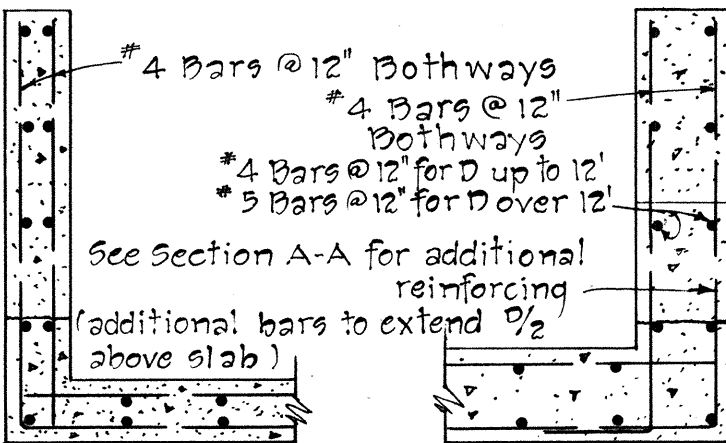
PLAN



ANCHOR BOLT DETAIL

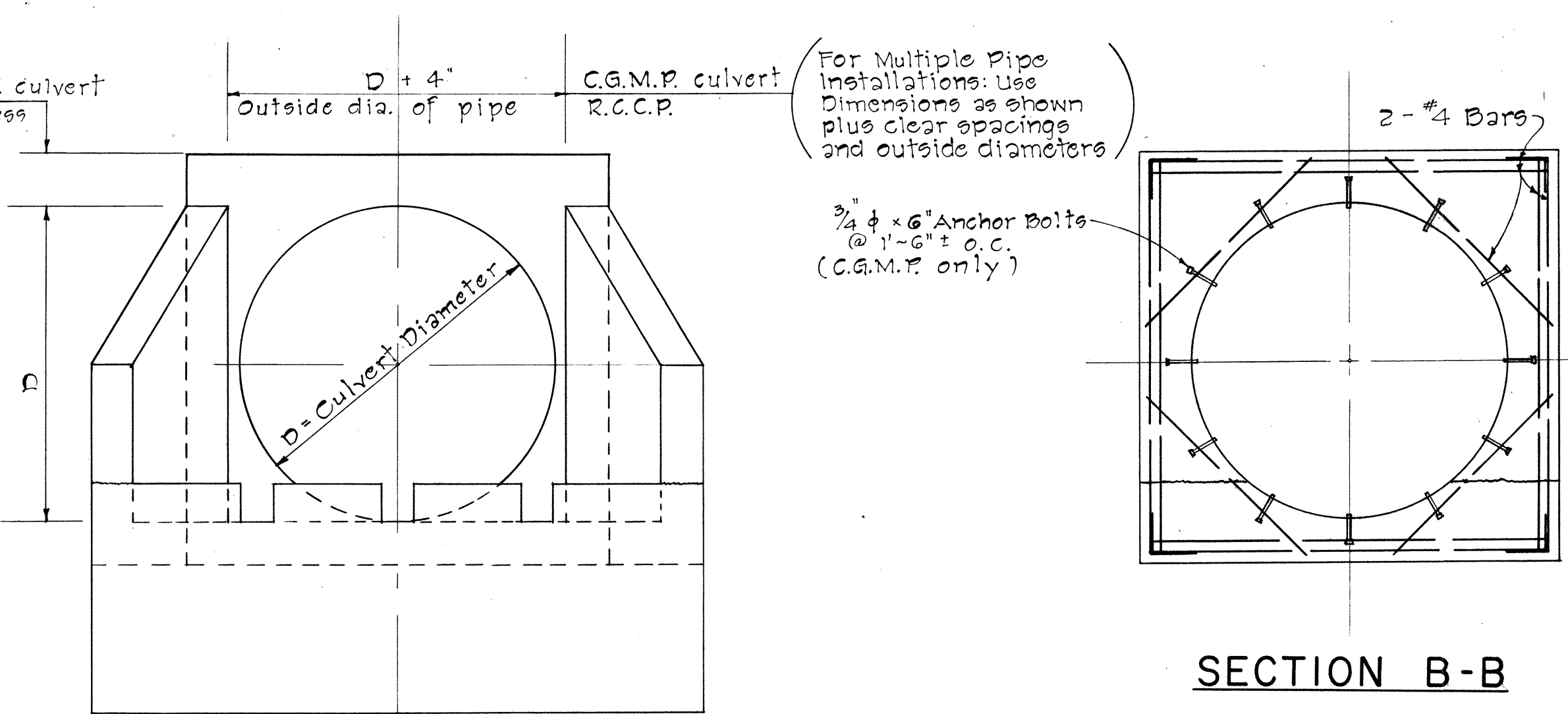
8" WING WALL 10" TO 12" WING WALLS

SECTION C-C



SECTION A-A

OUTLET STRUCTURE FOR CULVERT SIZES 36 IN. TO 180 IN. DIAMETER



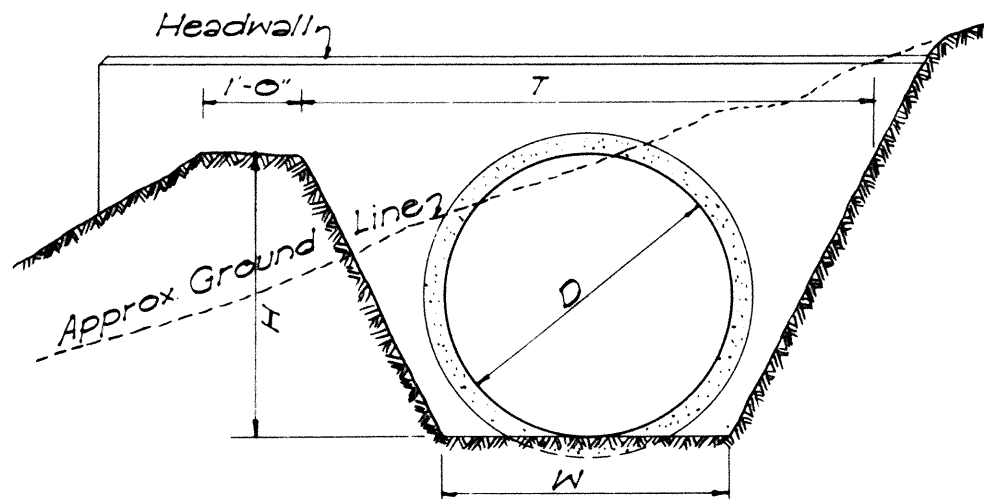
SECTION B-B

FRONT ELEVATION

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO	TOTAL SHEETS
HAWAII	HAW.	9-0630(11) 9-0630(7)	1968	33	83

Revised: June 1965
Revised: August 1967

DATA FOR OUTLET DITCH				
D	W	H	T=H+H	
18"	24"	2'-0"	4'-0"	
24"	30"	2'-0"	4'-6"	
30"	36"	2'-6"	5'-0"	
36"	36"	3'-0"	6'-0"	



DETAIL OF OUTLET DITCH

Scale: 1/2" = 1'-0"

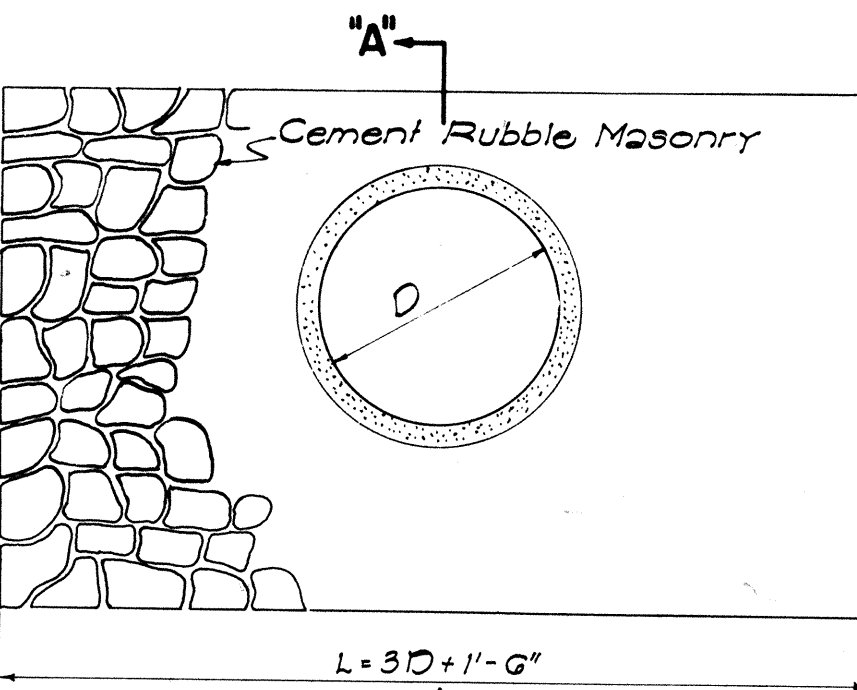
DATA FOR MASONRY DROP INTAKE				
D'	D	L=D+6"	Cu Yds.	Where Variables Equal
23"	18"	2'-5"	3.02	4'-6"
30"	24"	3'-0"	3.61	5'-0"
37"	30"	3'-7"	4.21	5'-6"
44"	36"	4'-2"	4.85	6'-0"

NOTE:

Dimension "X" is assumed as 2'-4" in figuring the above quantities.

DATA - MASONRY HEADWALL				
D	H	B	L	
18"	4'-6"	1'-0"	6'-0"	1.34
24"	5'-0"	2'-0"	7'-6"	1.83
30"	5'-6"	2'-3"	9'-0"	2.56
36"	6'-0"	2'-6"	10'-6"	3.45

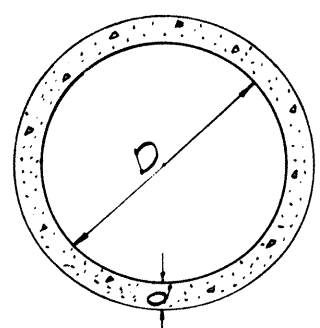
CRM For RCCP	CRM For CGMP
Cu Yds.	Cu Yds.
1.34	1.29
1.83	1.08
2.56	2.70
3.45	3.66



ELEVATION

DETAIL OF MASONRY HEADWALL

Scale: 1/2" = 1'-0"

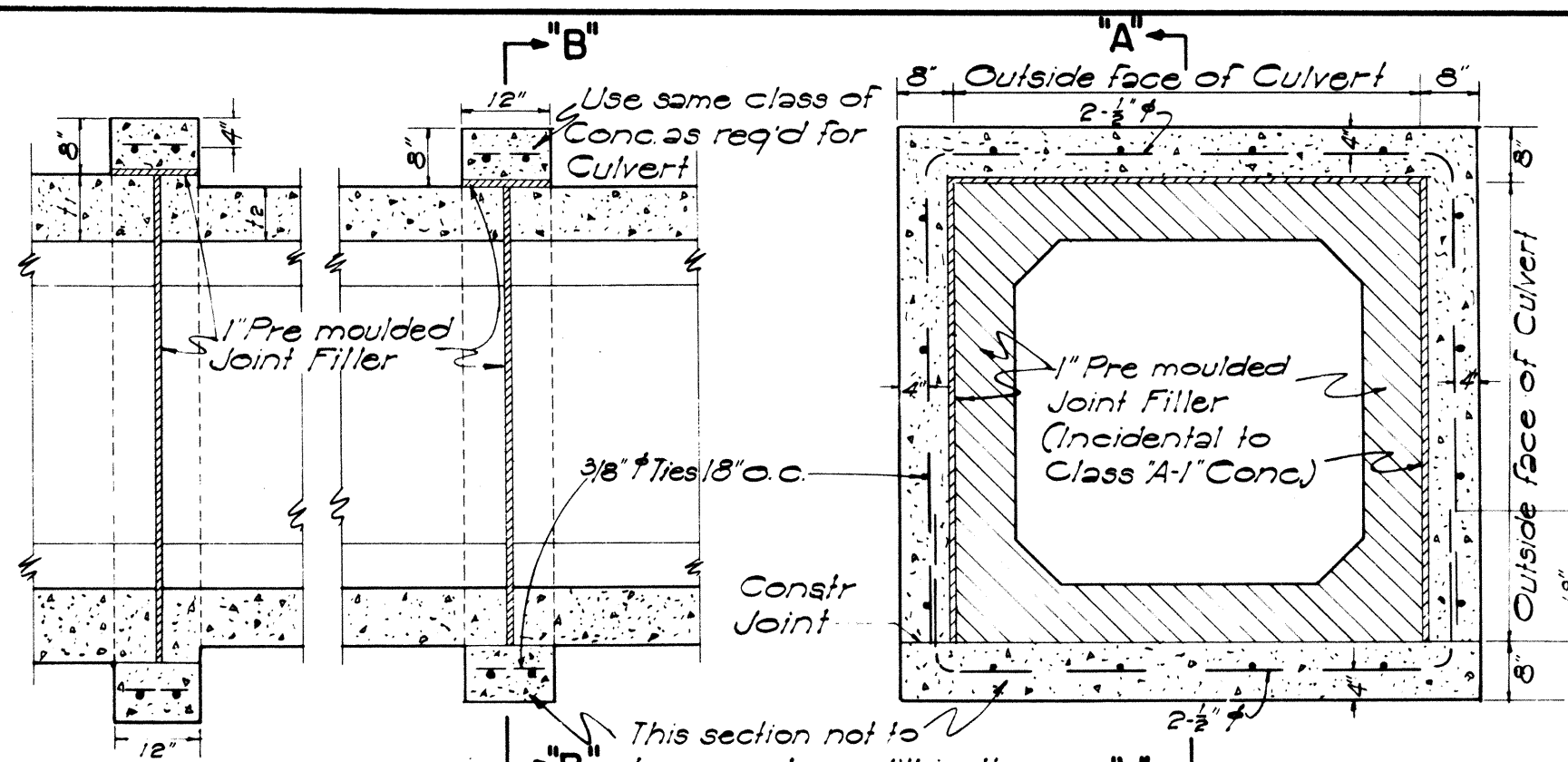


SECTION

CONC. PIPE CULVERT

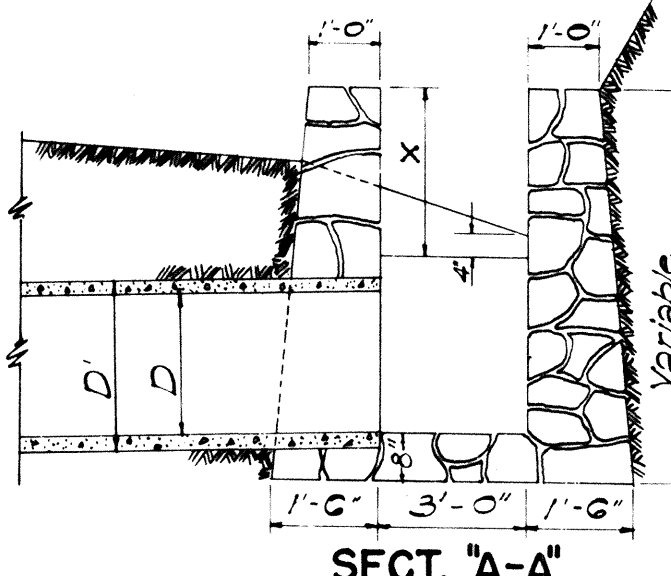
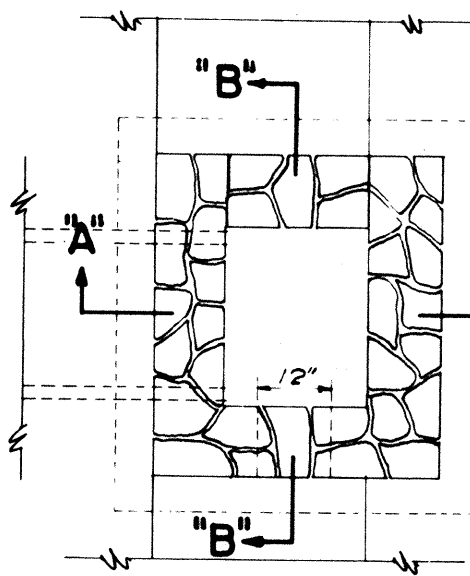
NOTE:

Thickness "d", reinforcing, and concrete used, are to conform with the approved design as provided by the Specifications.



SECTION "A-A" SECTION "B-B"
CONC. COLLAR FOR CONC. BOX CULVERT

Scale: 1/2" = 1'-0"

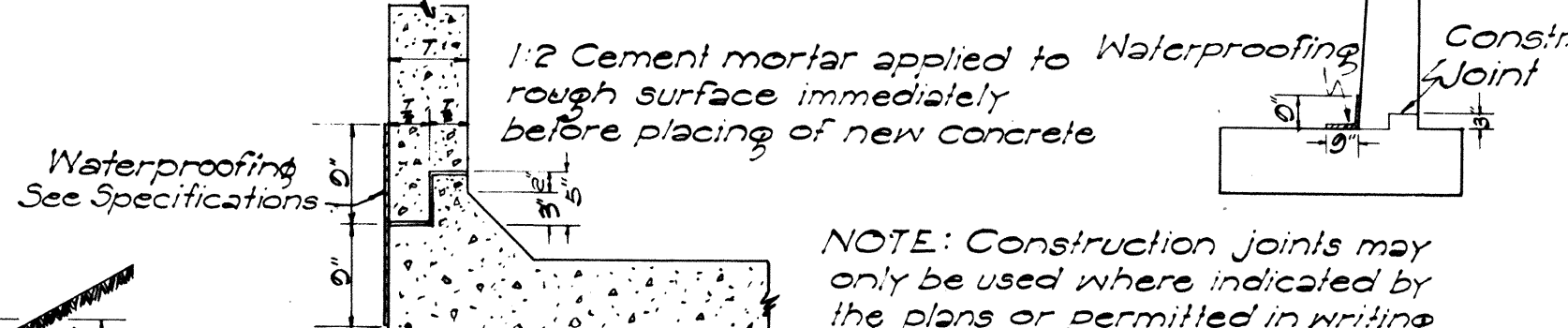


SECT. "A-A"

SECT. "B-B"

DETAIL OF MASONRY DROP INTAKE

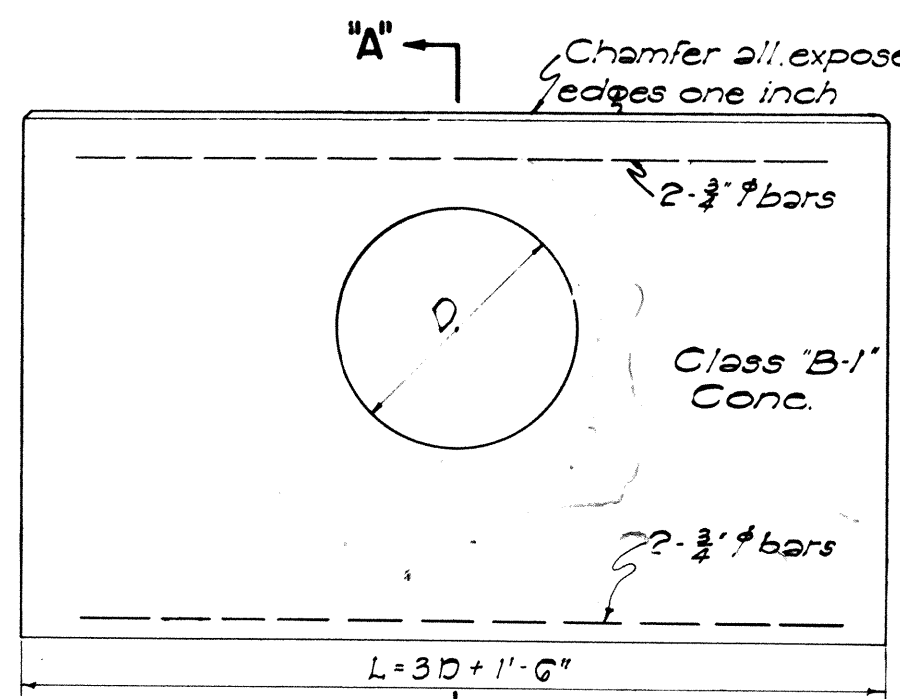
Scale: 3/8" = 1'-0"



CONSTR. JOINT DETAILS

NOTE: Construction joints may only be used where indicated by the plans or permitted in writing by the Engineer.

Note: When subgrade is below top of jacket, it shall be fully compacted to this line and then re-excavated (struck) to proper subgrade. This surface shall be rolled again.

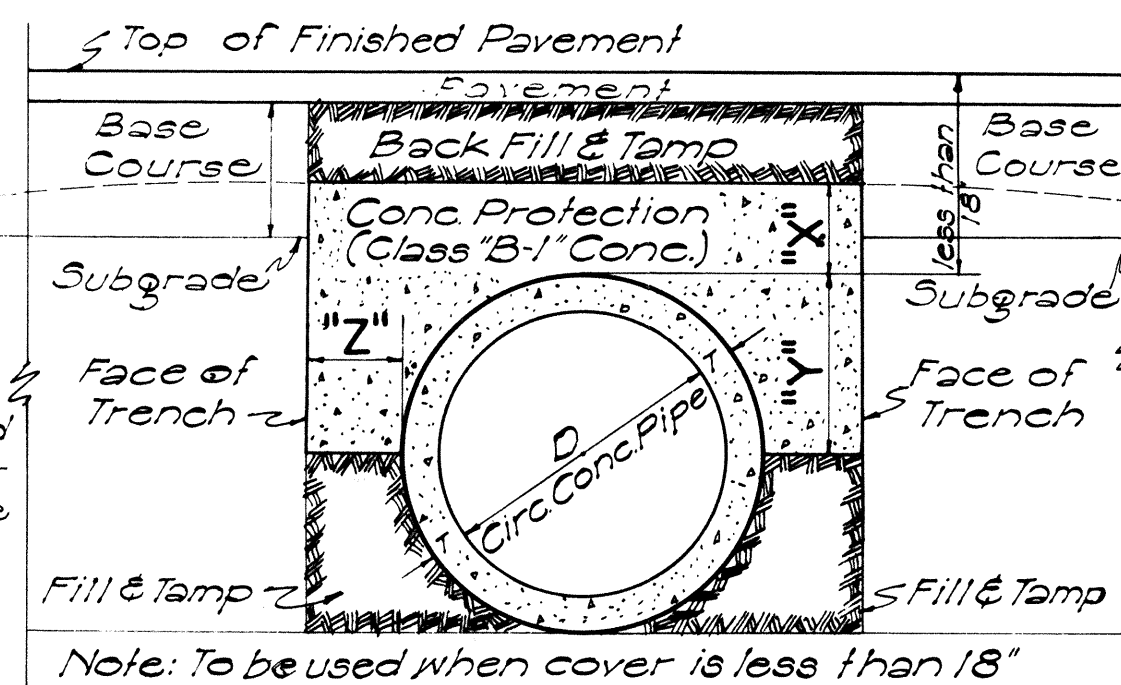


ELEVATION

DETAIL OF CONCRETE HEADWALL

Scale: 1/2" = 1'-0"

DATA FOR CONC. HEADWALL				
D	B	L	H	
18"	1'-6"	6'-0"	4'-6"	1.12
24"	1'-6"	7'-6"	5'-0"	1.52
30"	2'-0"	9'-0"	5'-6"	2.36
36"	2'-0"	10'-6"	6'-0"	2.94
42"	2'-6"	12'-0"	6'-6"	4.19
48"	2'-6"	13'-6"	7'-0"	5.01

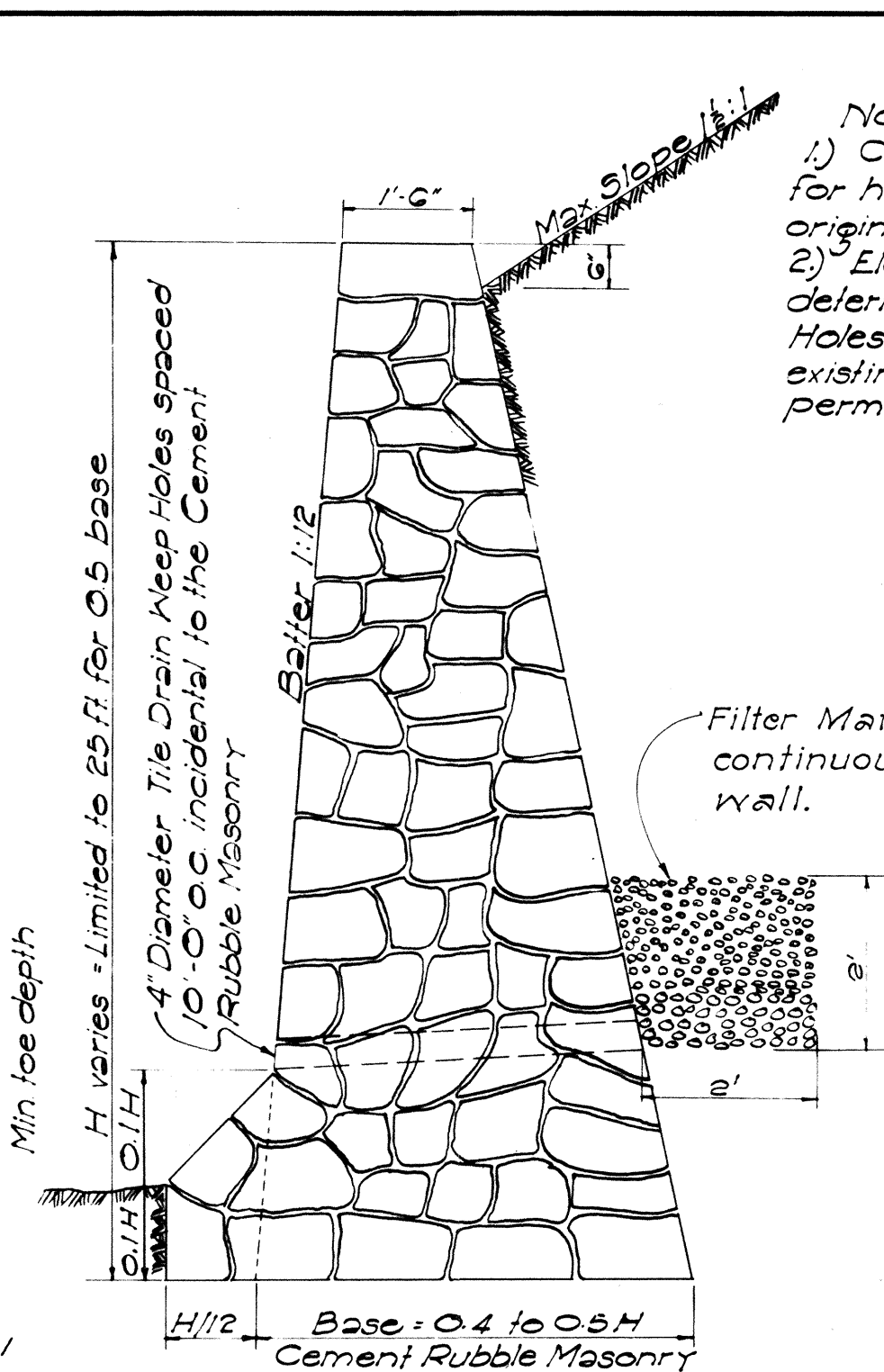


DATA FOR CONCRETE PROTECTION OVER CULVERTS		
X	Y	Z
6" for 18"D		Z must be from pipe to face of trench
7" " 24"D		
8" " 30"D		
9" " 36"D		
10" " 42"D		
11" " 48"D		
12" " 54"D		

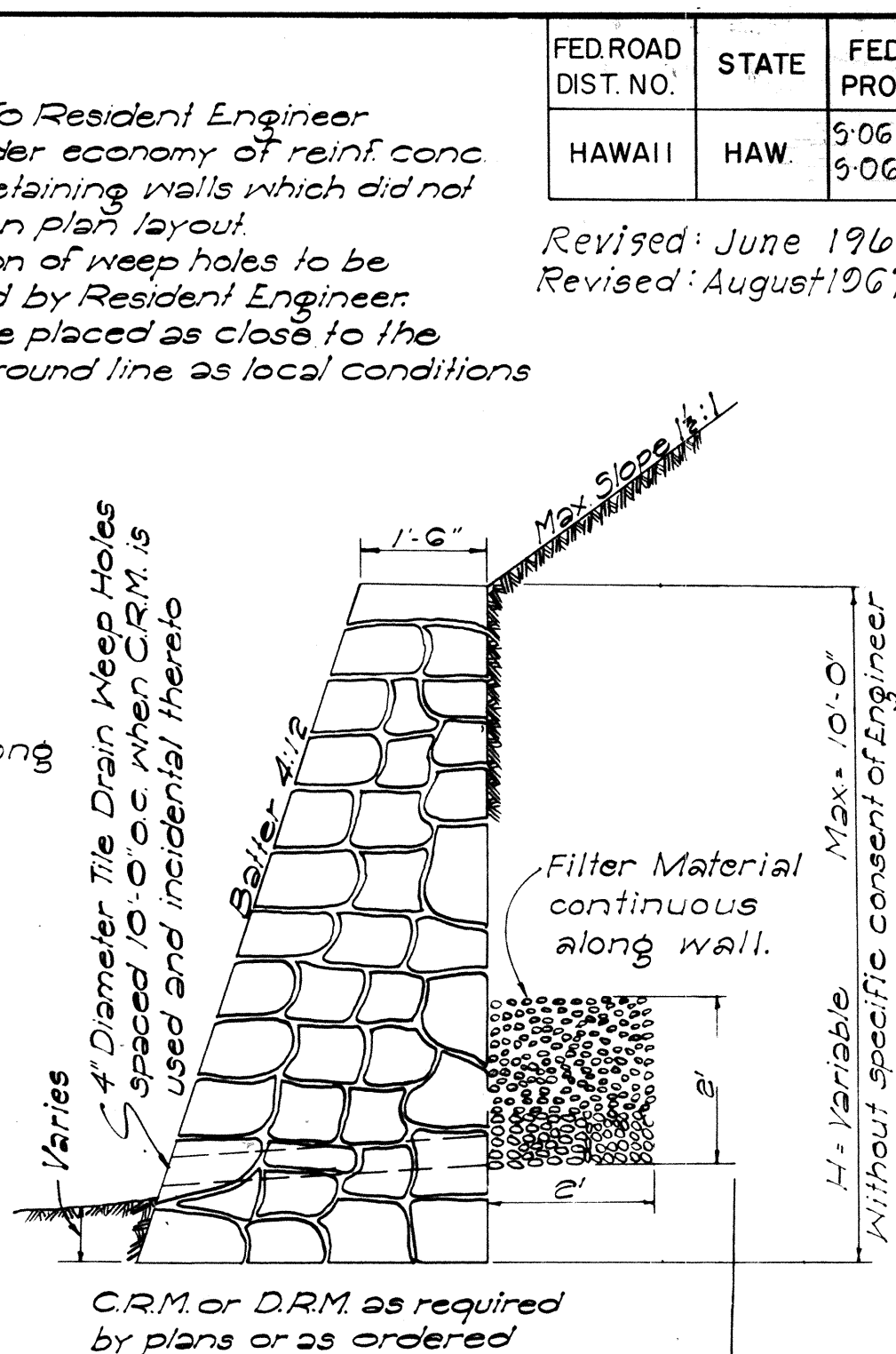
SECT. OF CULVERT WITH CONC. PROTECTION

Scale: 1" = 1'-0"

SECTION OF HIGH CEMENT RUBBLE MASONRY RETAINING WALL OR SEAWALL



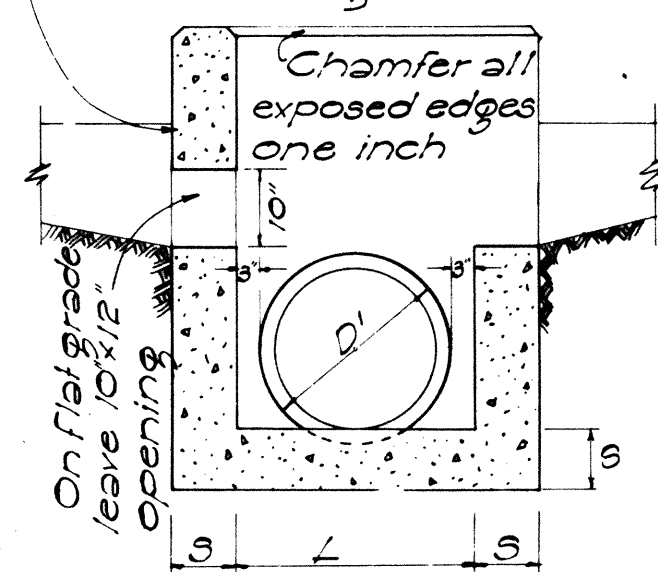
SECTION OF LOW MASONRY RETAINING WALL OR SEAWALL



DATA - CONC. DROP INTAKE				
D'	D	L=D+6"	S	Cu Yds.
23"	18"	2'-5"	8"	1.41
30"	24"	3'-0"	8"	1.72
37"	30"	3'-7"	9"	2.32
44"	36"	4'-2"	9"	2.73
51"	42"	4'-9"	10"	3.54
58"	48"	5'-4"	10"	4.01

Note: Dimension "X" is assumed as 2'-4" in figuring the above quantities.

Note: This type of structure shall also be used for the Drop Intakes of Syphons connected with Irrigation Ditches or Flumes with appropriate changes to dimensions. In this case all joints must be made water tight.



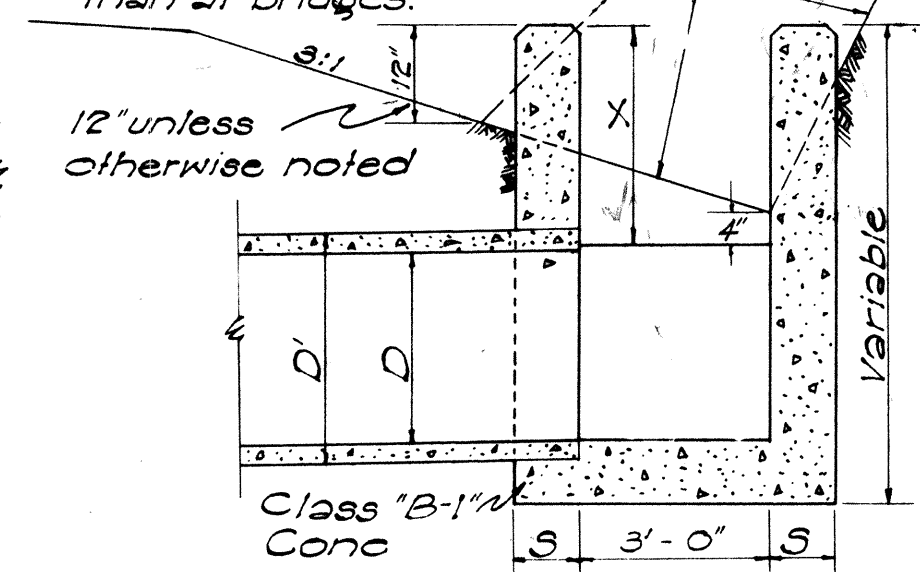
SECTION "B-B"

DETAIL OF CONCRETE DROP INTAKE

Scale: 1/2" = 1'-0"

Where drainage comes from both sides lower this wall to same elevation as shown for opposite wall.

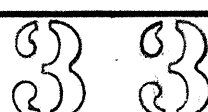
Excavate recess in roadway excavation slope for inlet to dimensions and form designated by Engineer. This is 'Unclassified' Excavation.



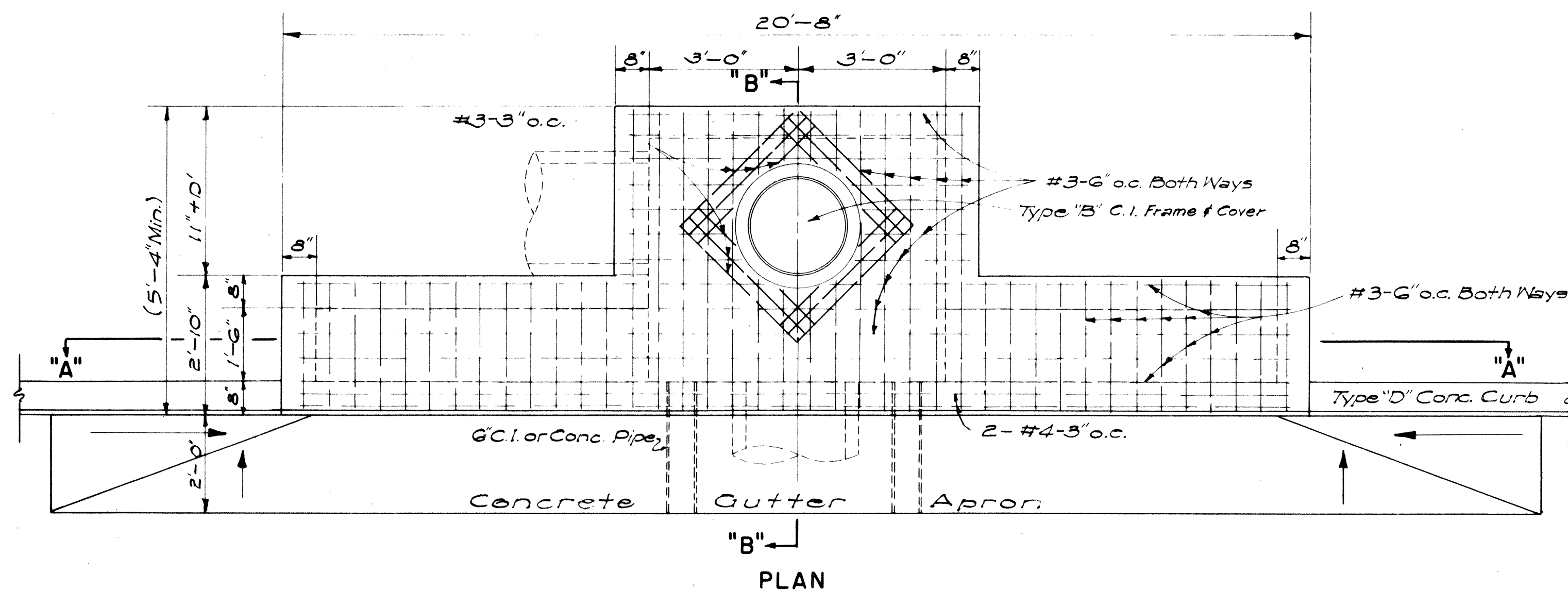
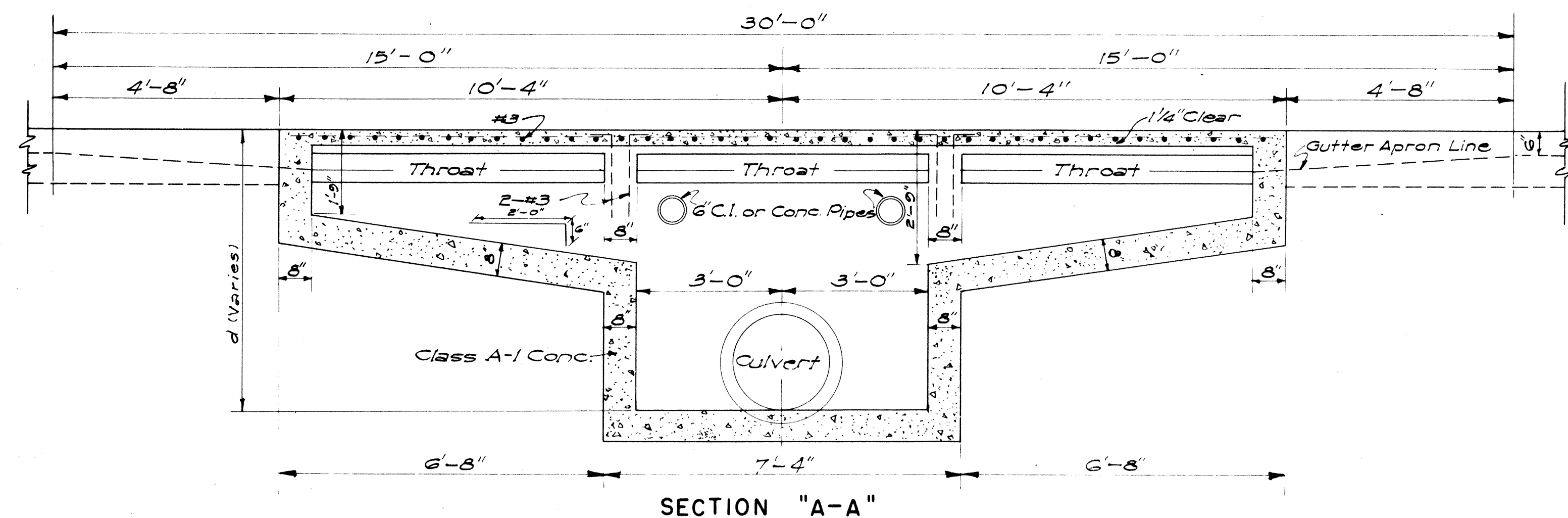
SECTION "A-A"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
DROP INTAKES, RETAINING WALLS,
HEADWALLS, CONSTRUCTION JOINTS
SCALES AS NOTED

SHEET No 15 OF 18 SHEETS

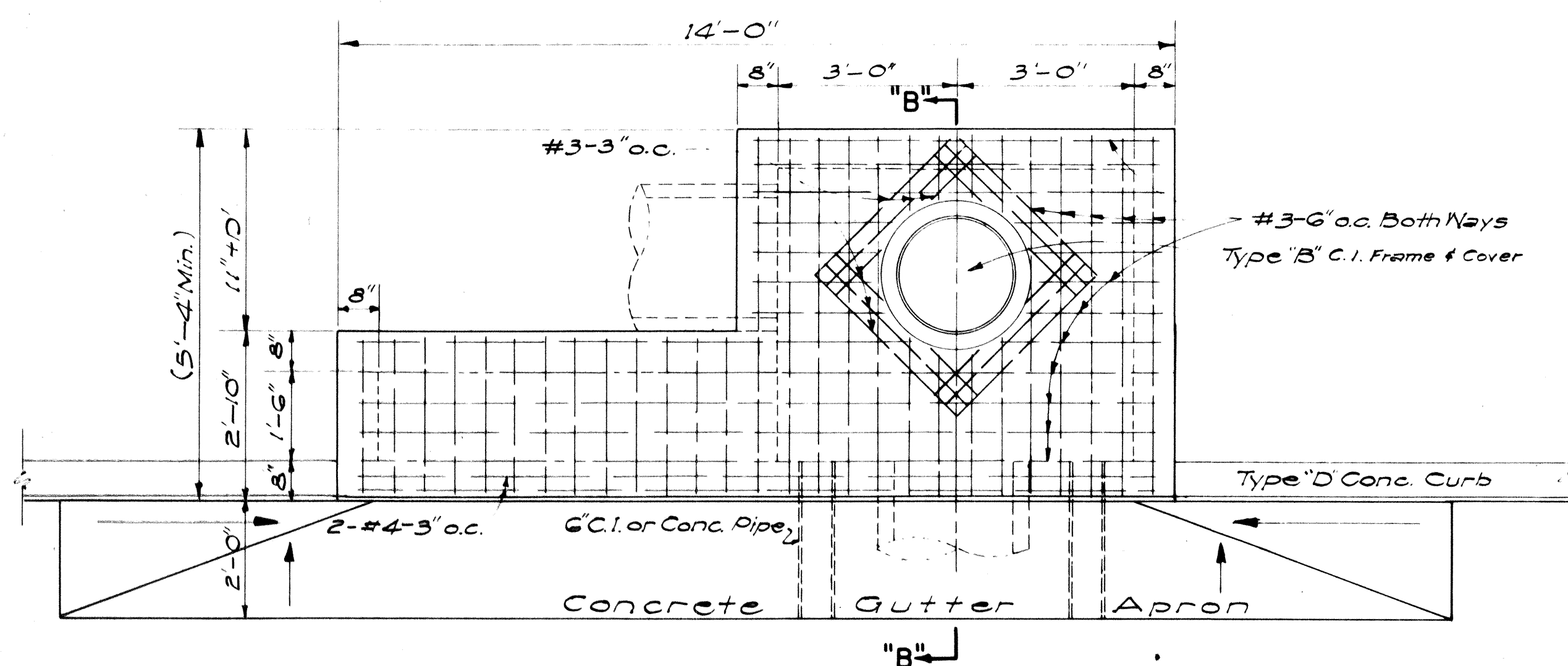


ORIGINAL PLAN	SURVEY PLOTTED BY _____	DATE _____
	DESIGNED BY <u>G. M.</u>	**
	DRAWN BY <u>J. Y.</u>	**
NOTE BOOK	TRACED BY _____	**
	QUANTITIES BY _____	**
No. _____	CHECKED BY _____	**



DETAIL OF TYPE "A" CATCH BASIN

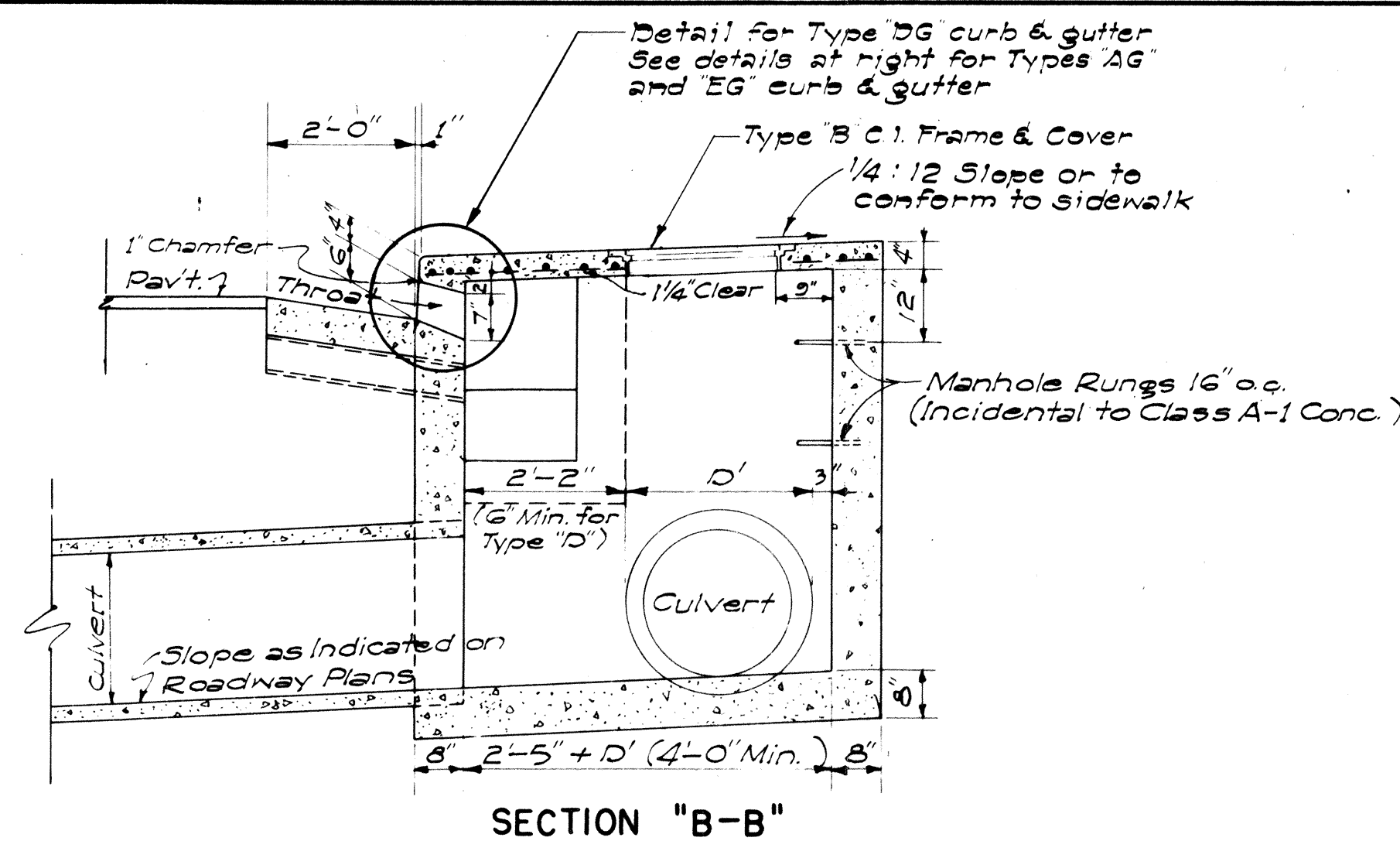
SCALE: 1/2" = 1'-0"



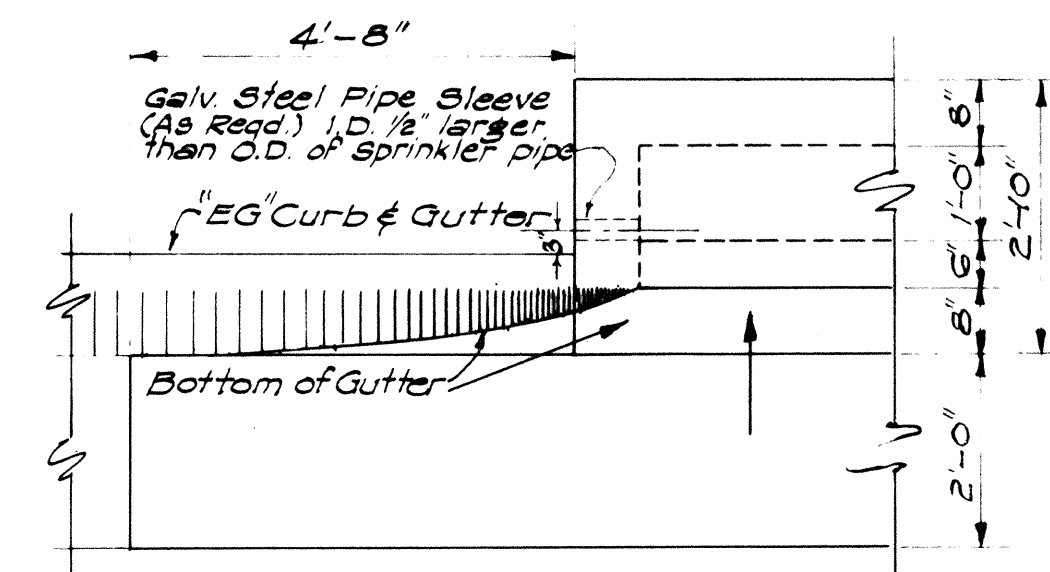
DETAIL OF TYPE "B" CATCH BASIN

SCALE: 1/2" = 1'-0"

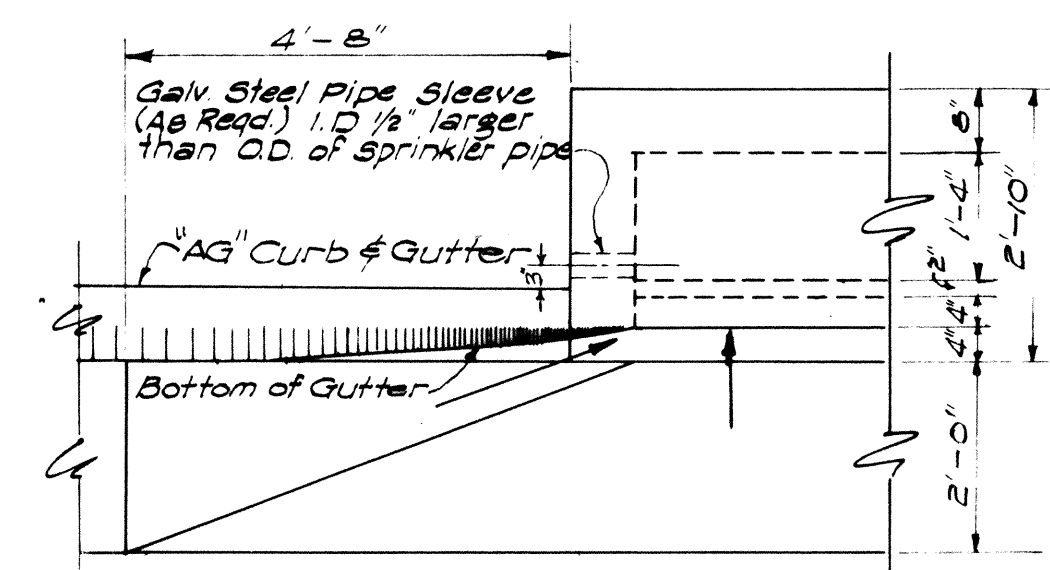
NOTE: TYPE "C" C.B. SIMILAR BUT OPPOSITE HAND



SECTION "B-B"

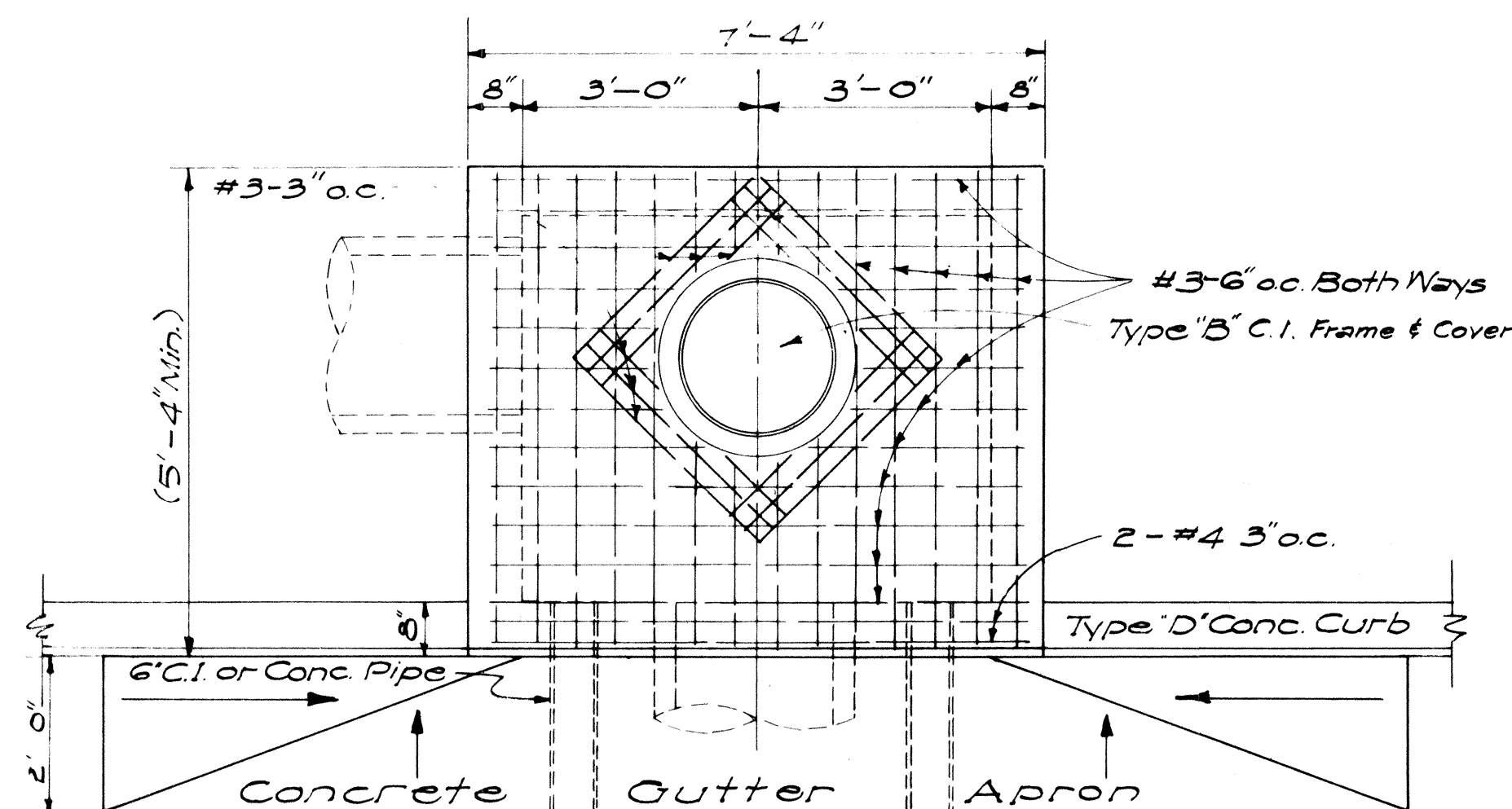


DETAIL OF CATCH BASIN
WITH TYPE "EG" CURB & GUTTER



DETAIL OF CATCH BASIN WITH TYPE "AG" CURB & GUTTER

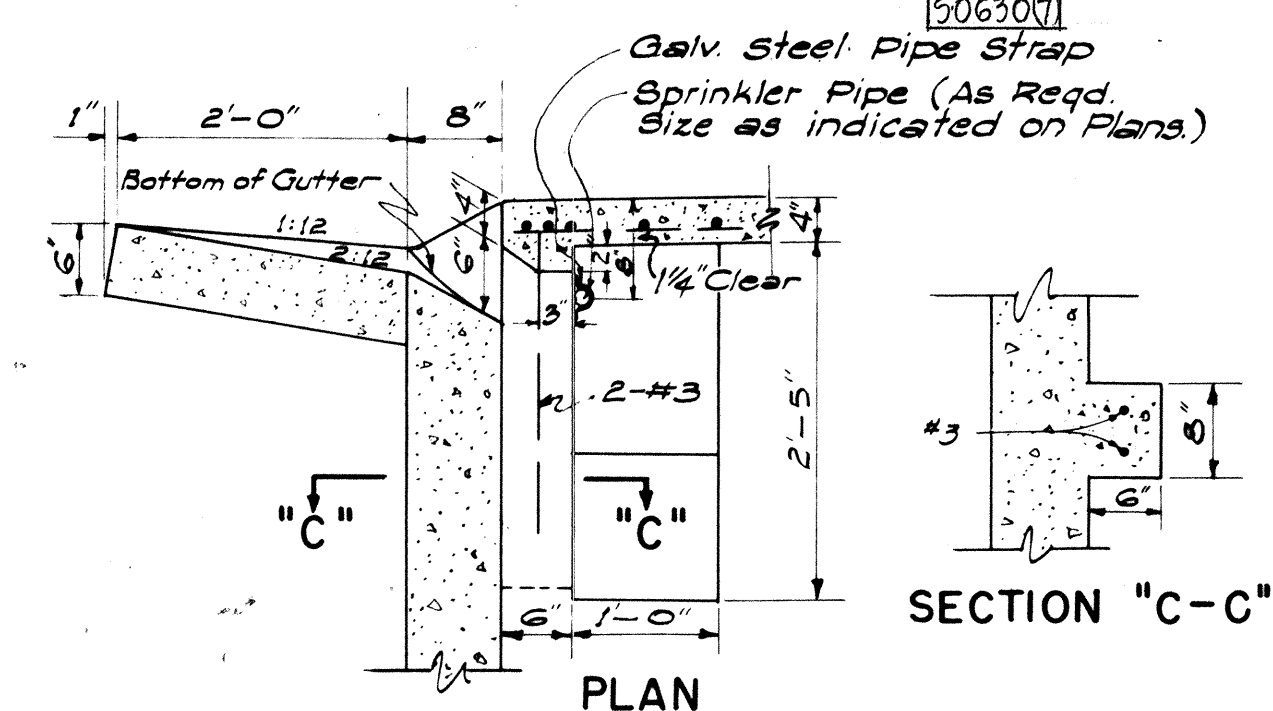
SCALE: 1/2" = 1'-0"



DETAIL OF TYPE "D" CATCH BASIN

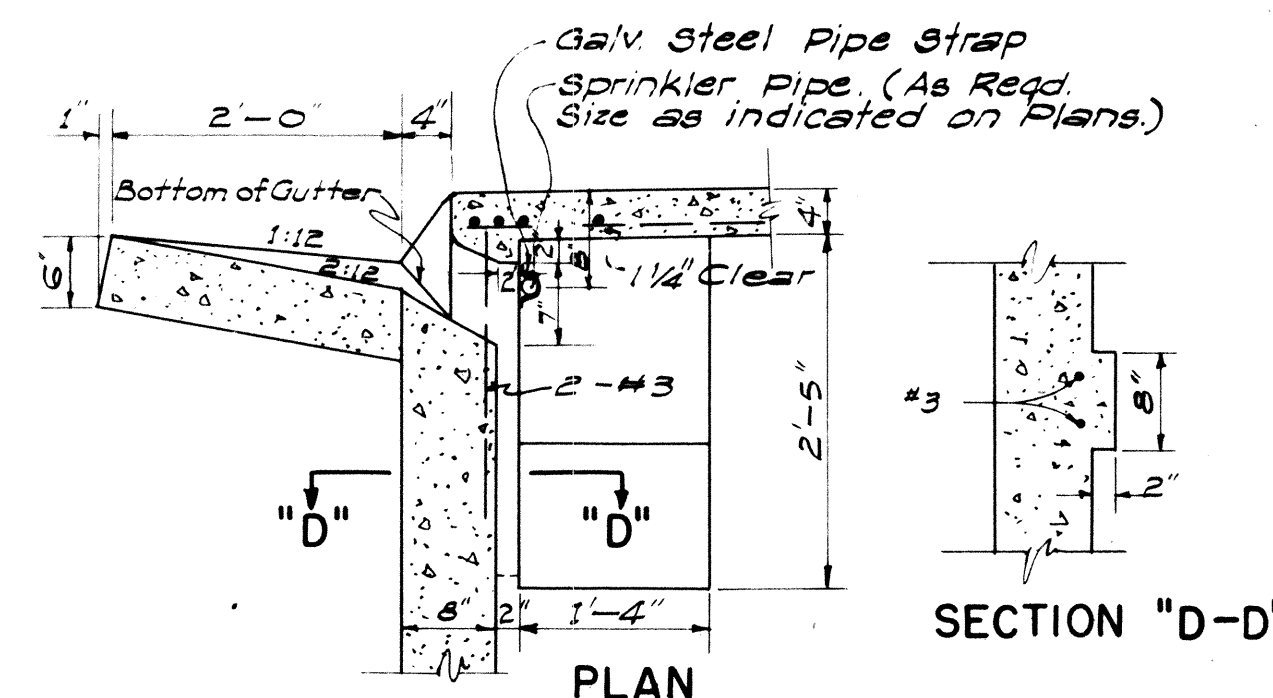
SCALE: 1/2" = 1'-0"

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW	5-0630(11)	1968	34	83



THROAT DETAIL FOR
TYPE "EG" CURB & GUTTER

SCALE: 3/4" = 1' - 0"



THROAT DETAIL FOR
TYPE "AG" CURB & GUTTER

SCALE: $3/4" = 1' - 0"$

ESTIMATED QUANTITIES

Type	Class A-I Conc.	Struct. Exc.	Reinf. Steel	Gutter Length
"A" 	7.5 c.y.	24.7 c.y.	145 lb.	30'-0"
"B" 	6.0 c.y.	21.5 c.y.	108 lb.	23'-4"
"C" 	6.0 c.y.	21.5 c.y.	108 lb.	23'-4"
"D" 	4.9 c.y.	16.5 c.y.	77 lb.	16'-8"

NOTES:

1. Quantities based on d = 5.75' and D = 30"
2. Quantities do not include concrete for Gutter Apron.
3. The Contractor shall install two 6" Cast Iron or Concrete Pipes as incidental to Class A-I Concrete for Construction Drainage.
4. Culvert shall leave C.B. from any position and any direction indicated by plans or ordered by the Engineer. Culvert may both enter and leave C.B. so that C.B. will also act as Manhole.
5. The Contractor shall install Galvanized Steel Pipe Sleeves and Straps as incidental to Sprinkler System.

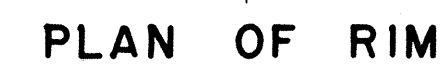
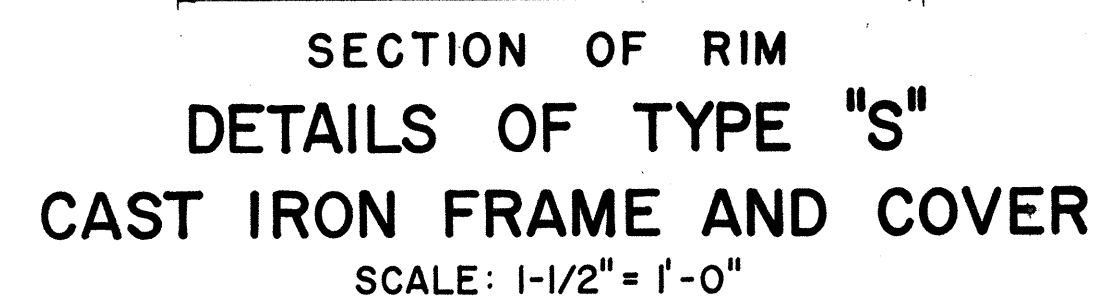
APPROVED:  DATE Aug 25, 1955
STATE HIGHWAY ENGINEER

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
CATCH BASINS

SCALES AS NOTED

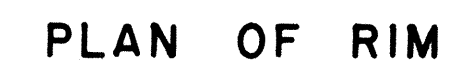
SHEET N° 16 OF 18 SHEETS

3 4



DETAILS OF TYPE "B"
CAST IRON FRAME AND COVER

SCALE: 1-1/2" = 1'-0"



DETAILS OF TYPE "A"

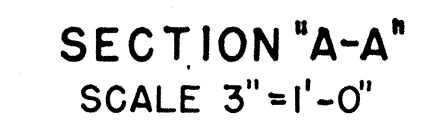
CAST IRON FRAME AND COVER

SCALE : 1-1/2" = 1'-0"

NOTE: Stock Pattern From Novelty Foundry ~ Honolulu



SCALE: 3/4" = 1'-0"



DETAILS OF TYPE "W" CAST IRON FRAME AND COVER

SCALE: 1-1/2" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS CATCH BASIN AND MANHOLE CASTINGS

SCALES AS NOTED

SHEET N° 17 OF 18 SHEETS

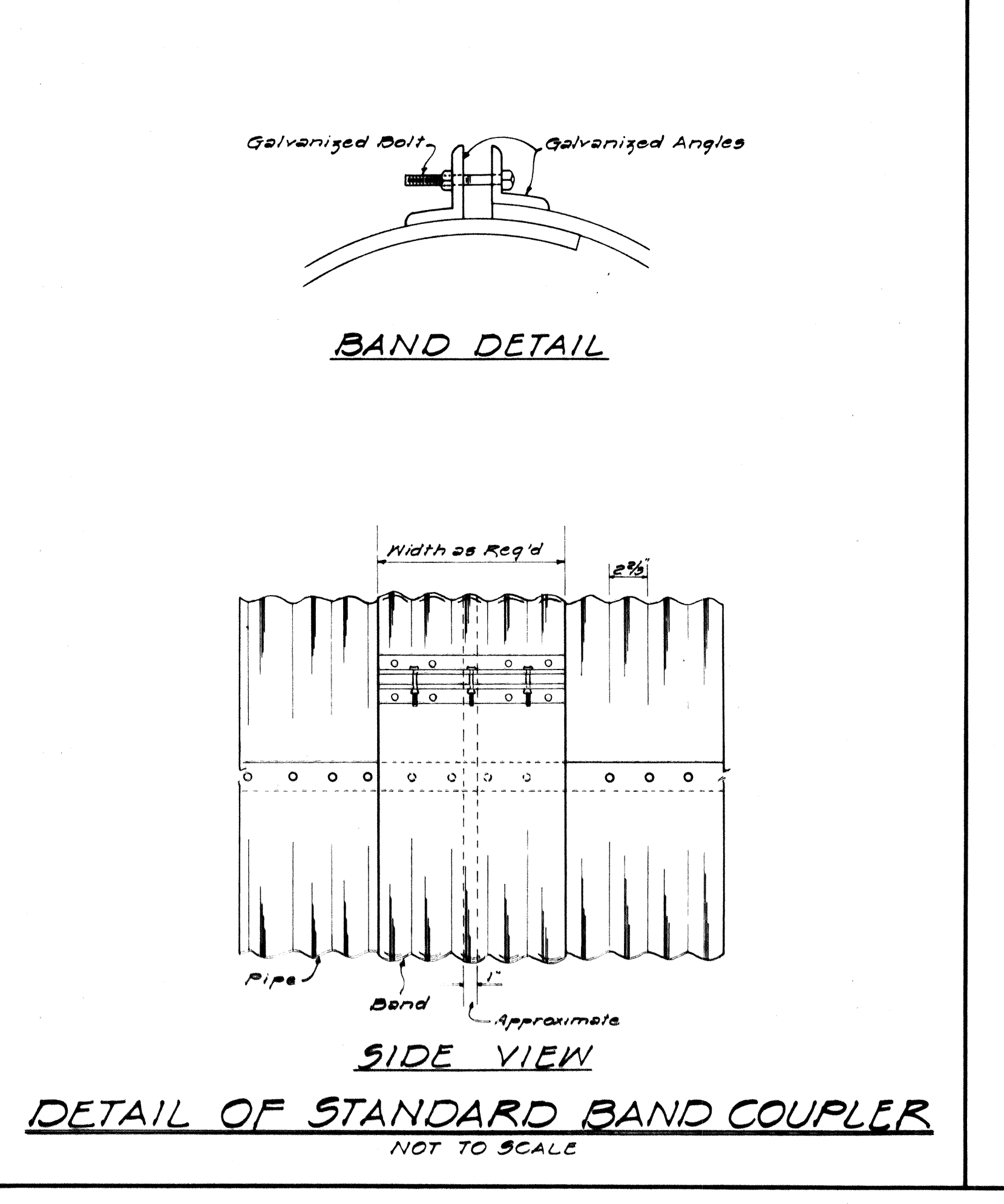
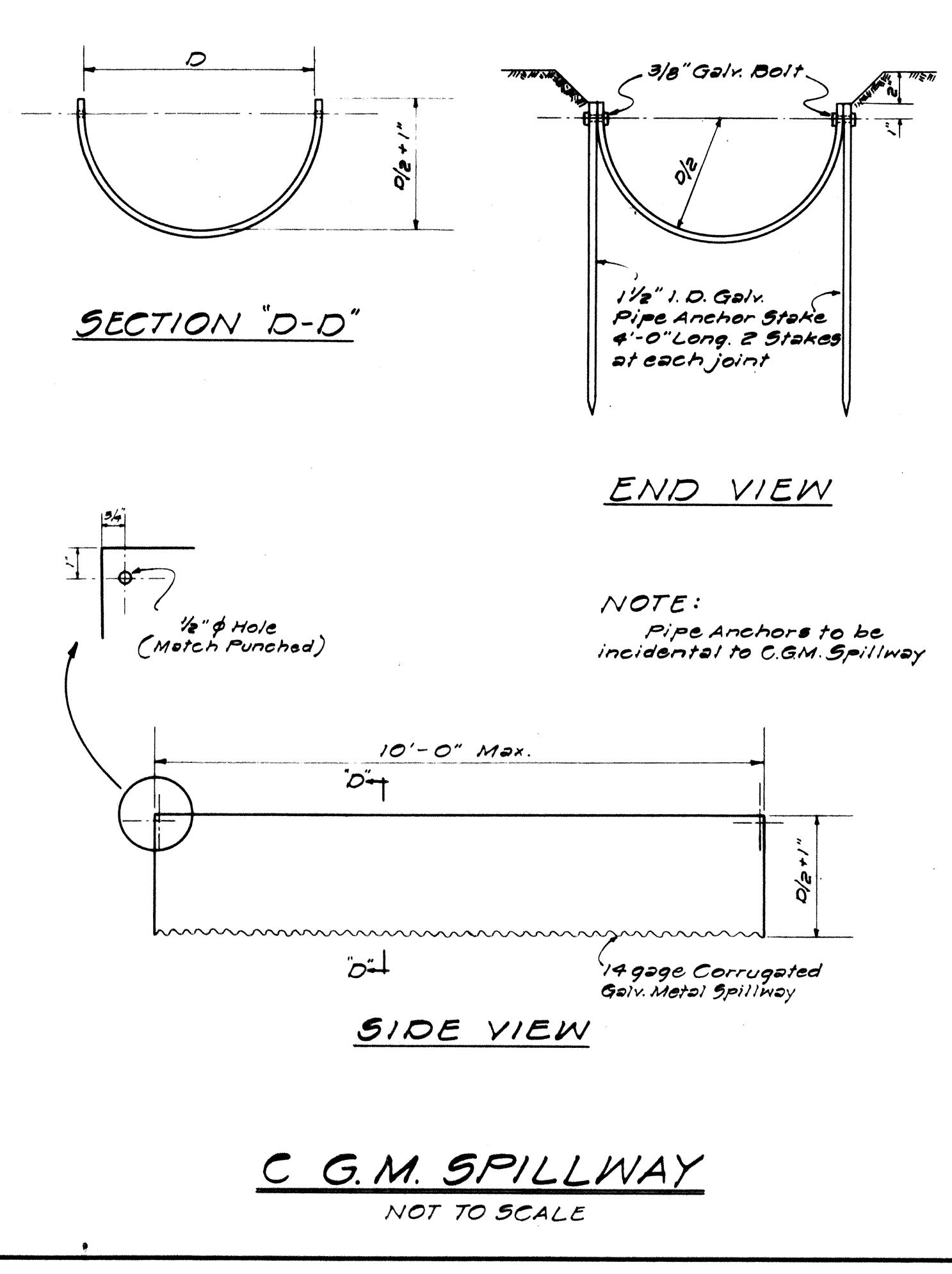
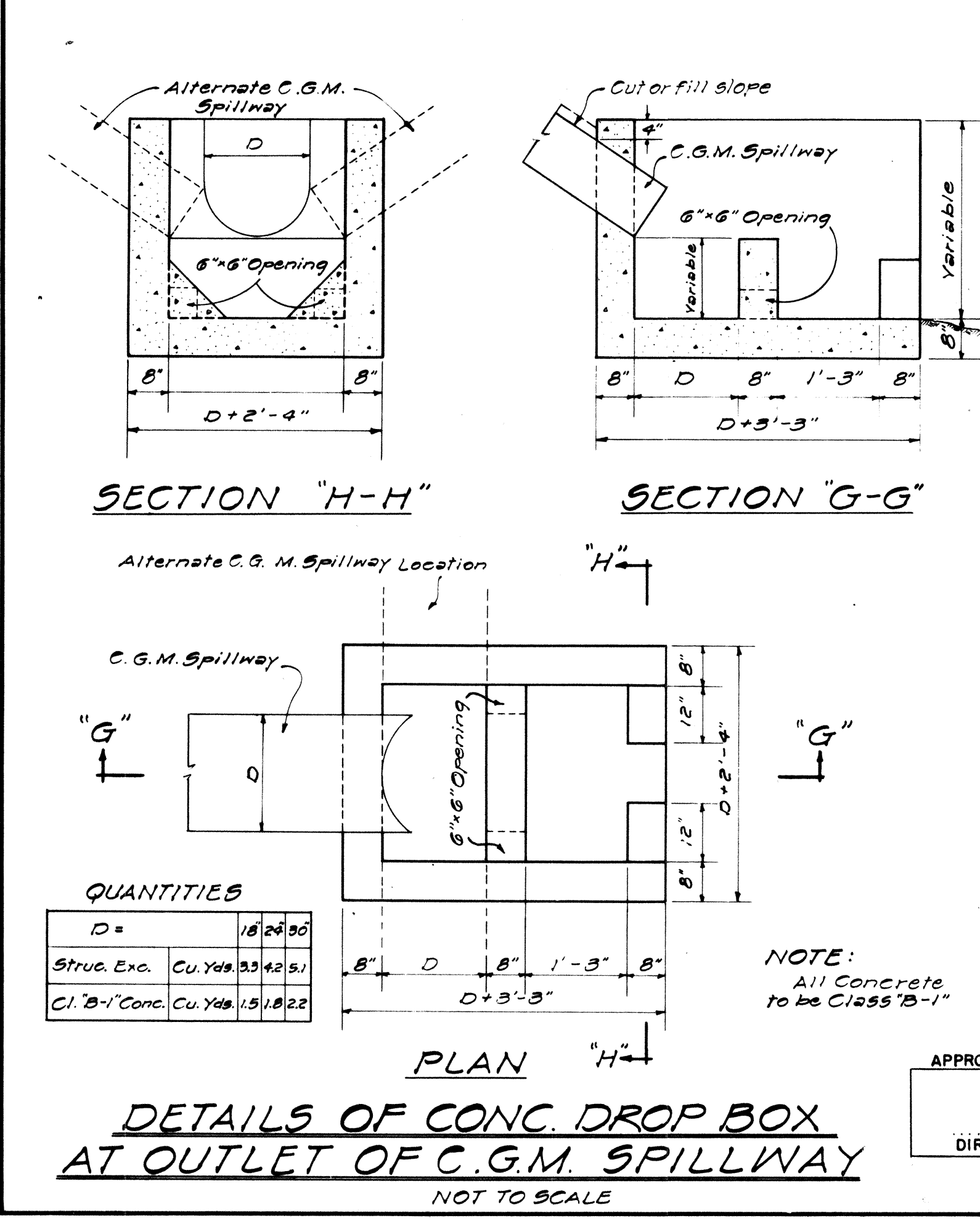
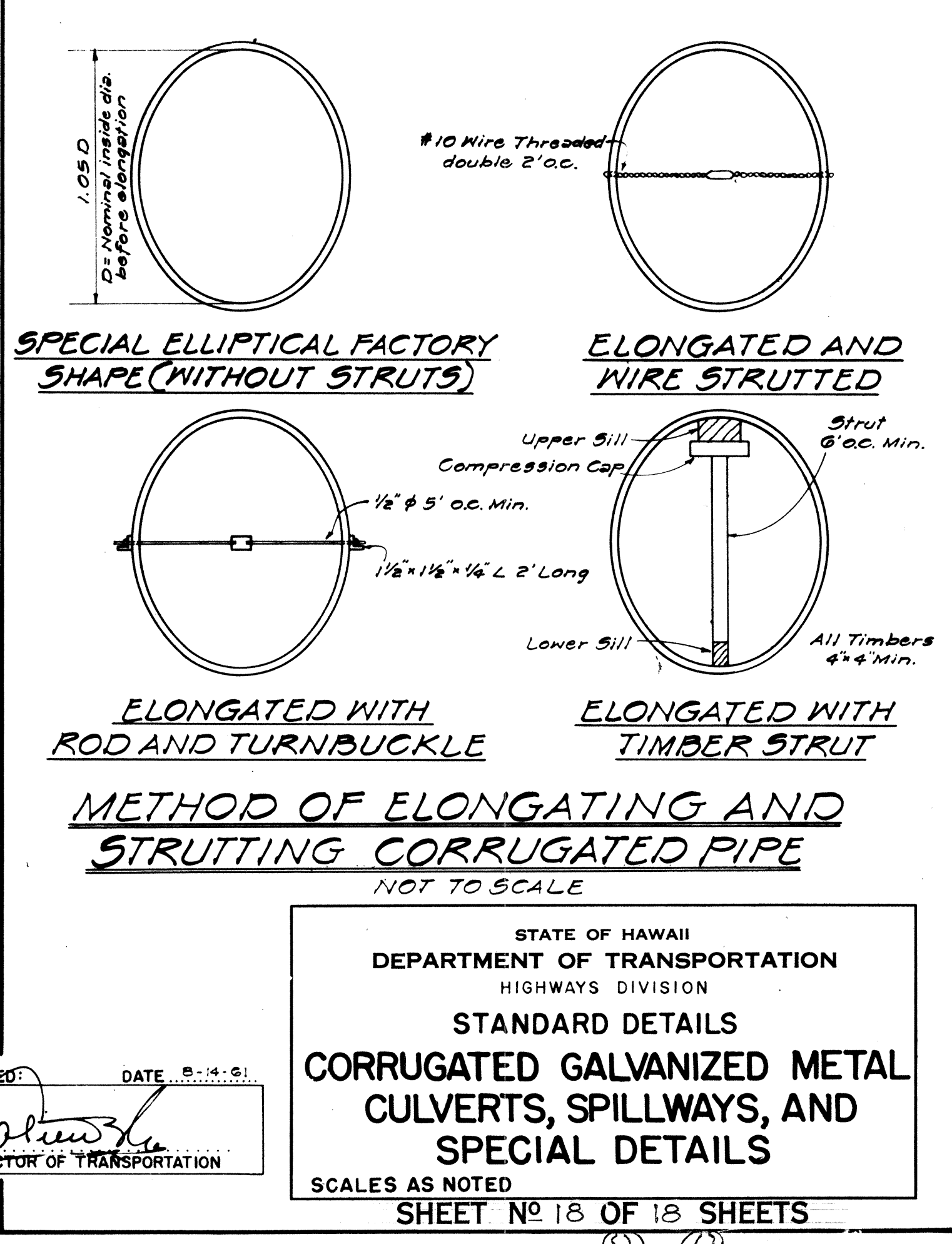
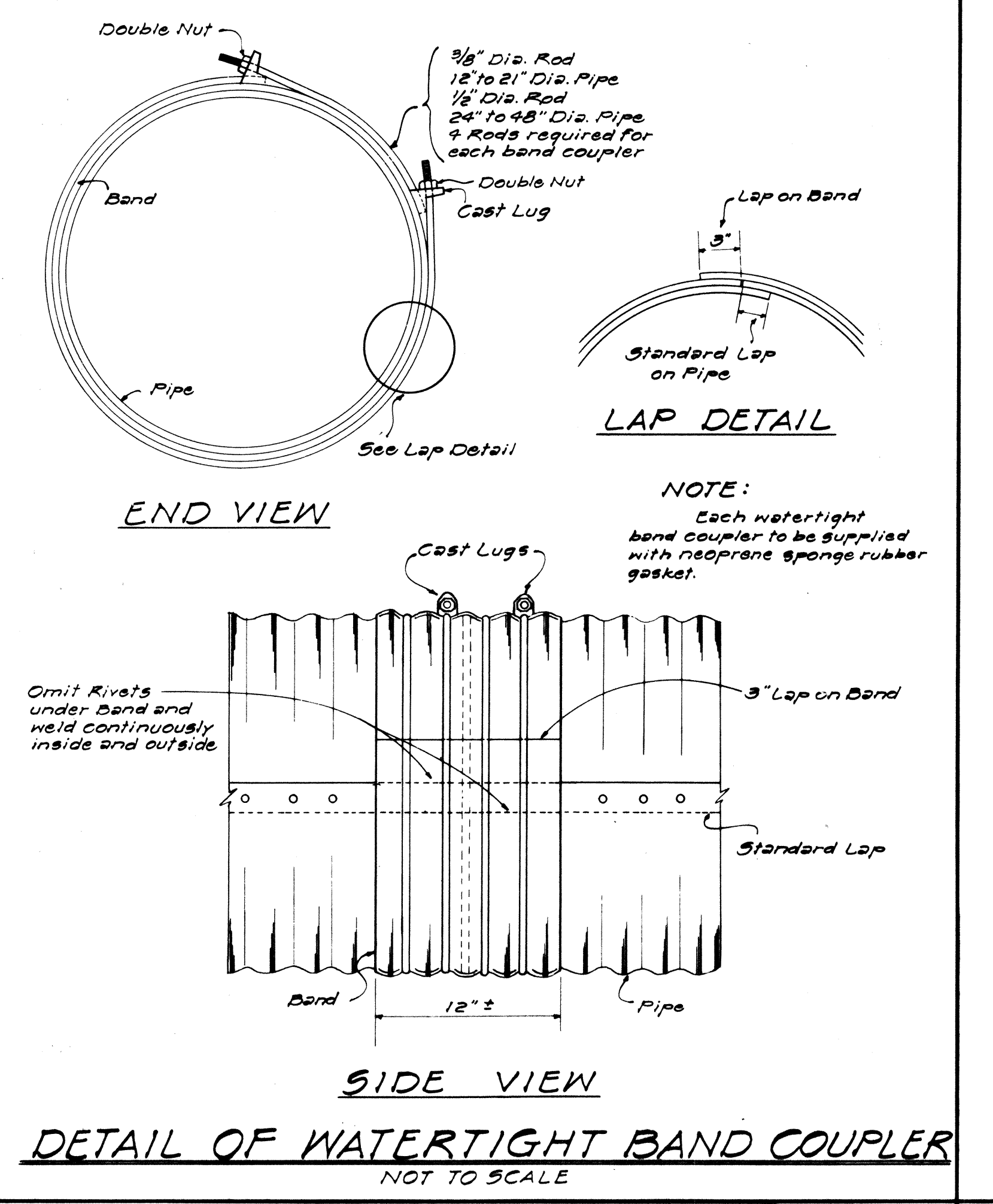
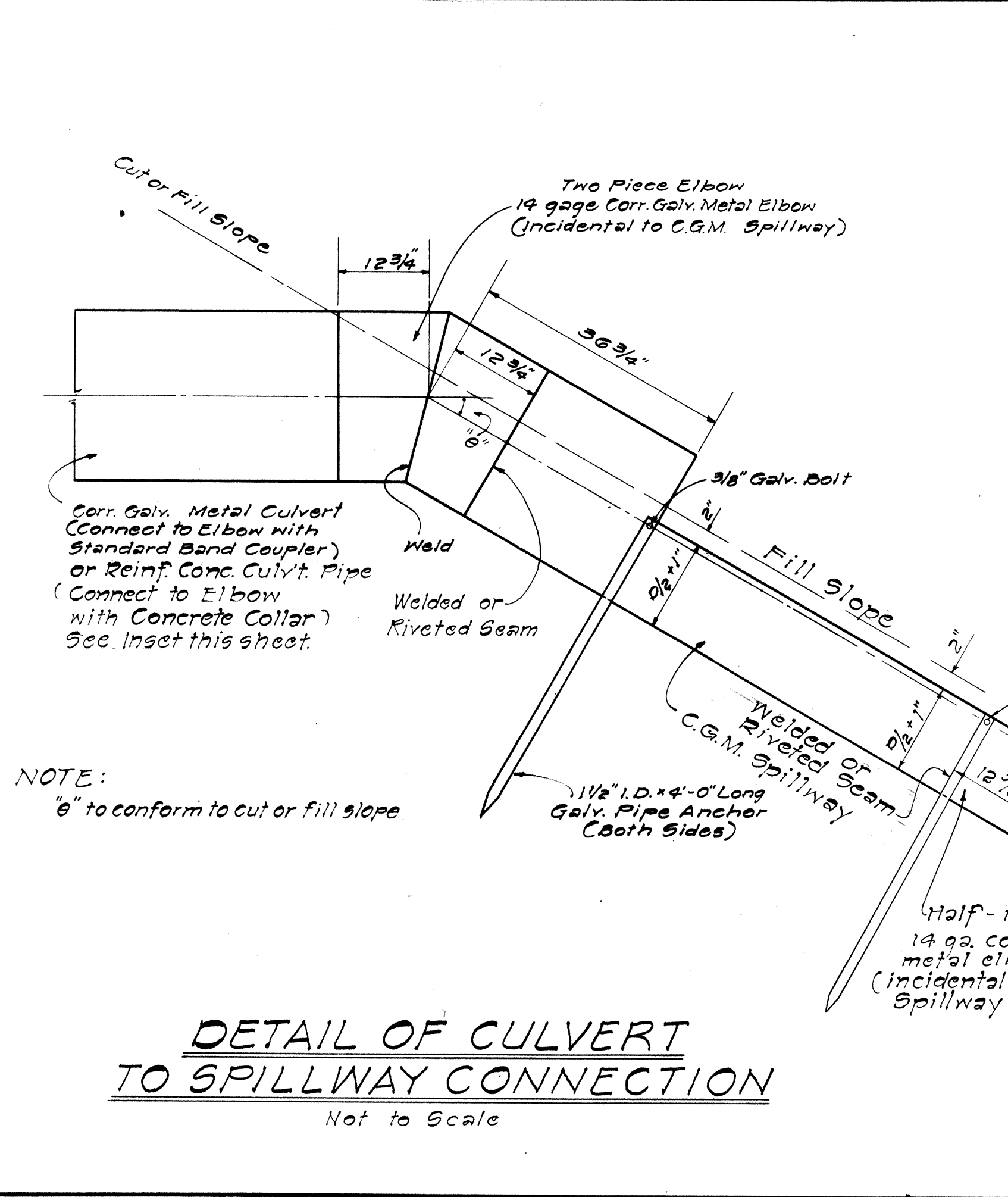
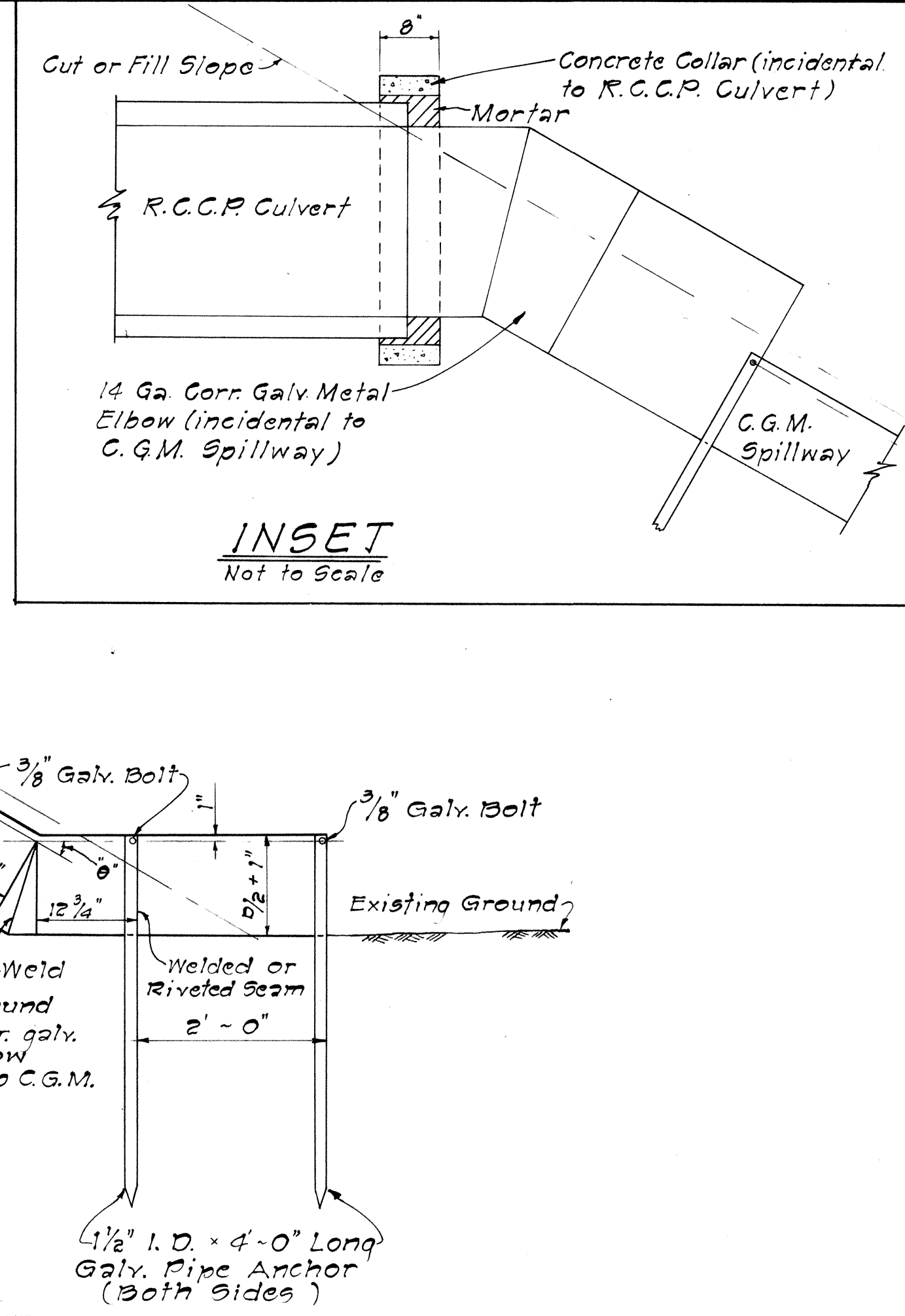
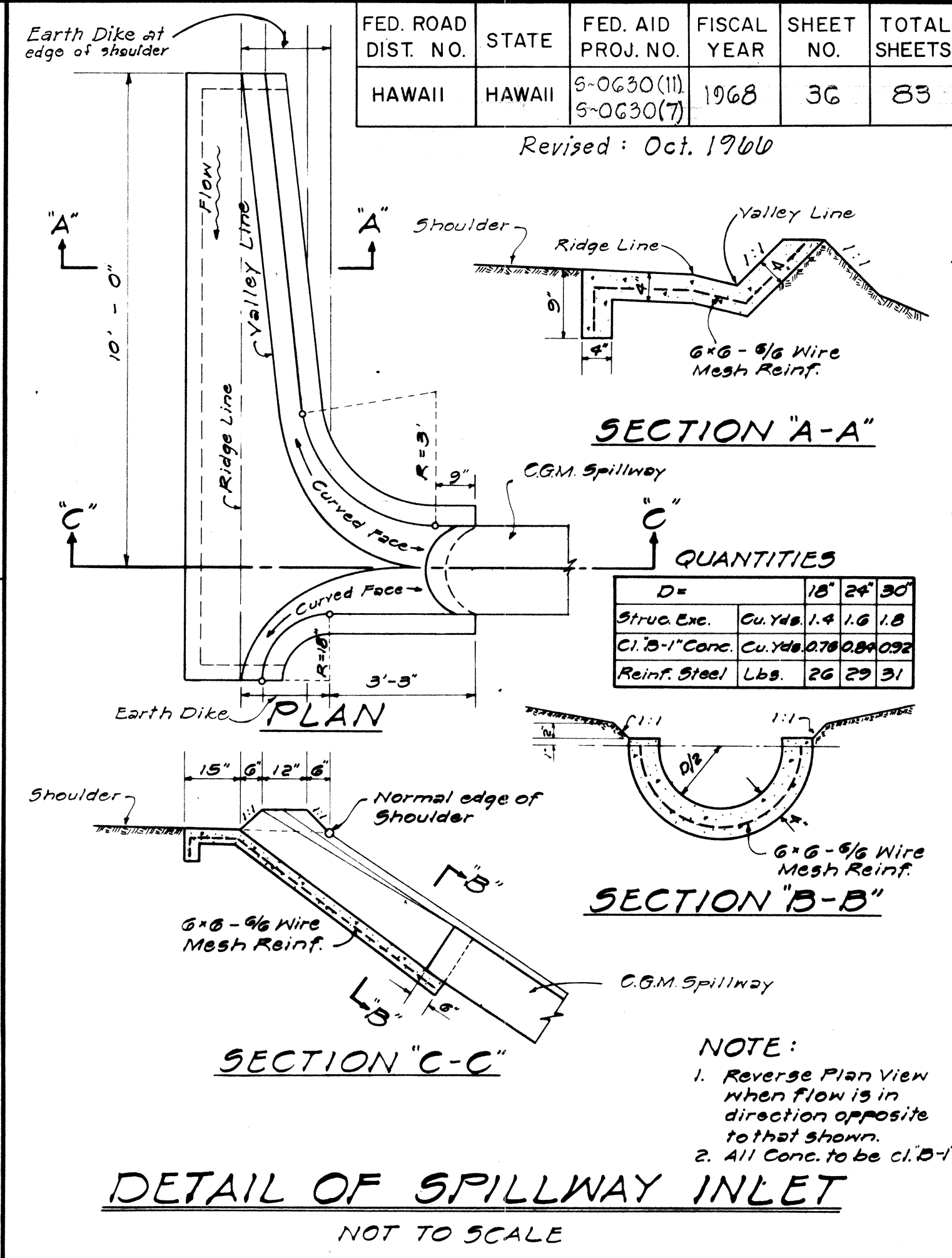
NOTE:

THE TYPE "S" CAST IRON FRAME AND COVER SHOWN ON THIS SHEET IS EQUIVALENT TO THE CITY AND COUNTY OF HONOLULU, DIVISION OF SEWERS' TYPE "A" CAST IRON MANHOLE FRAME AND COVER.

THE TYPE "W" CAST IRON FRAME AND COVER
SHOWN ON THIS SHEET IS EQUIVALENT TO THE
CITY AND COUNTY OF HONOLULU, BOARD OF
WATER SUPPLY'S CAST IRON MANHOLE FRAME
AND COVER, 20" SIZE.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	6-0630(11) 6-0630(7)	1968	36	83

Revised: Oct. 1960

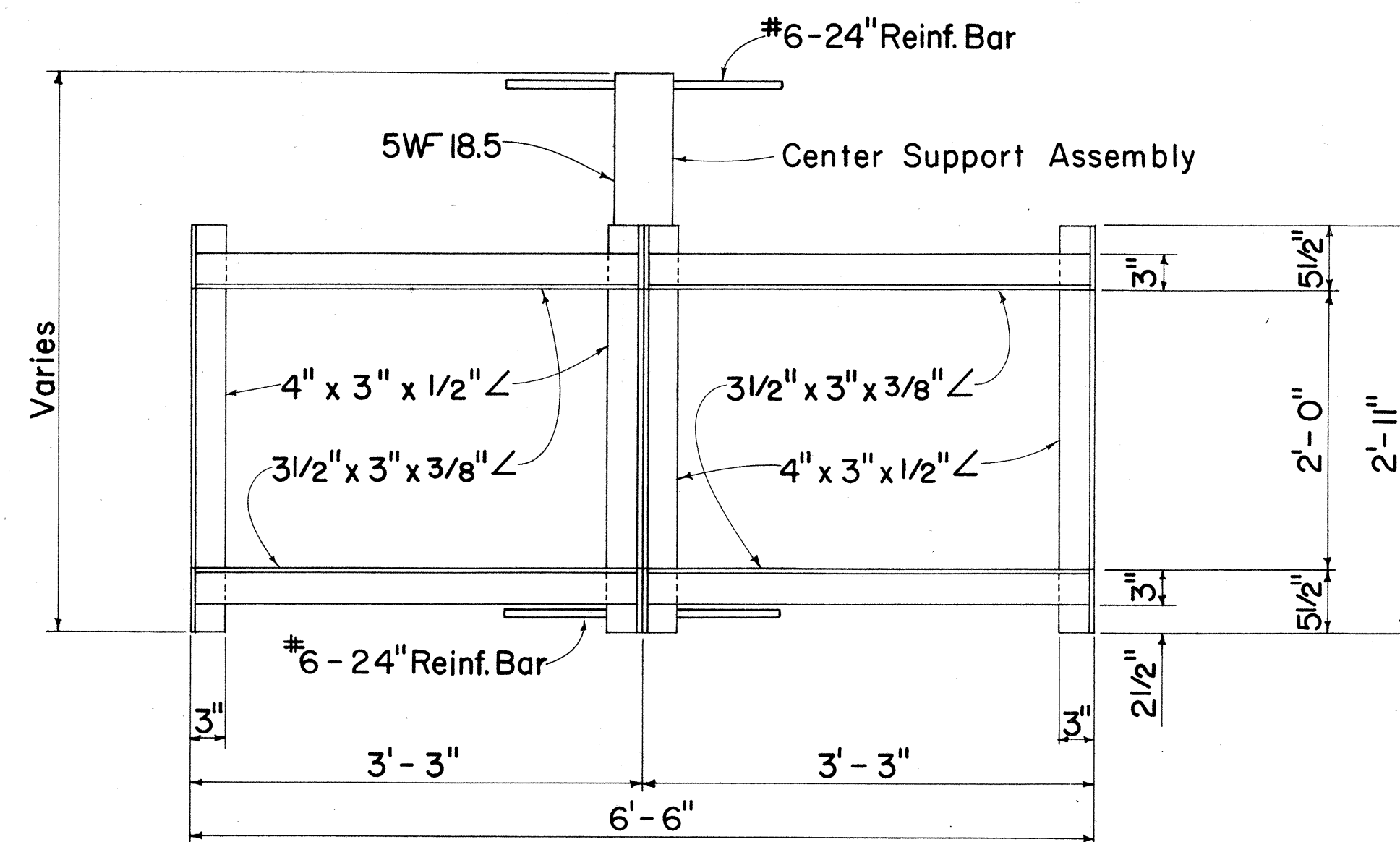


STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
CORRUGATED GALVANIZED METAL
CULVERTS, SPILLWAYS, AND
SPECIAL DETAILS
SCALES AS NOTED
SHEET NO 18 OF 18 SHEETS

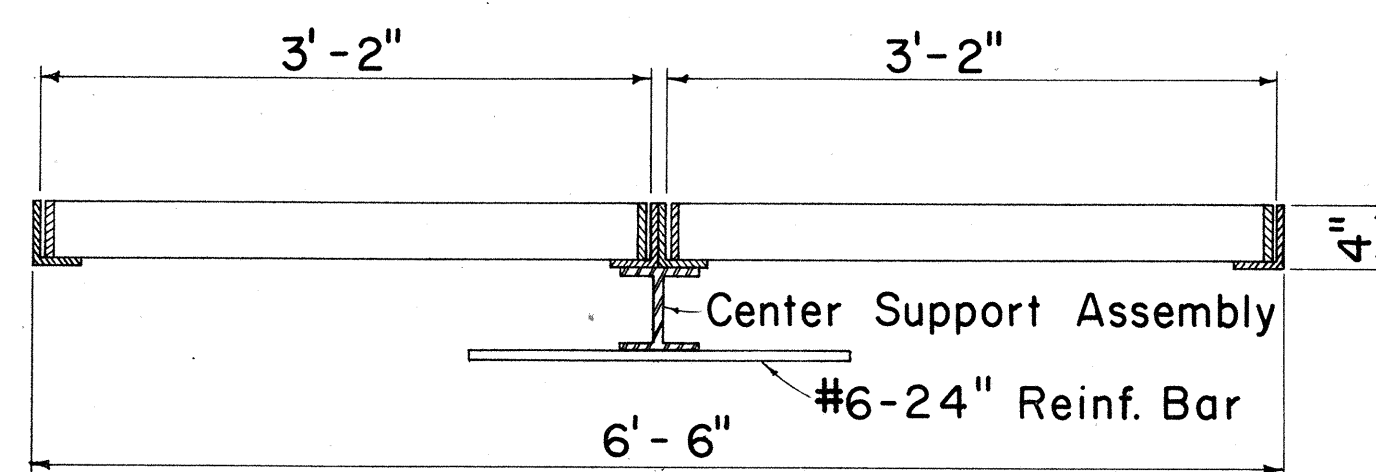
APPROVED: DATE: 5-14-61
DIRECTOR OF TRANSPORTATION

DESIGNED BY	DATE
TRACED BY	5-24-61
NOTED BY	5-24-61
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
1/2"	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(11) 5-0630(7)	1968	18A	83

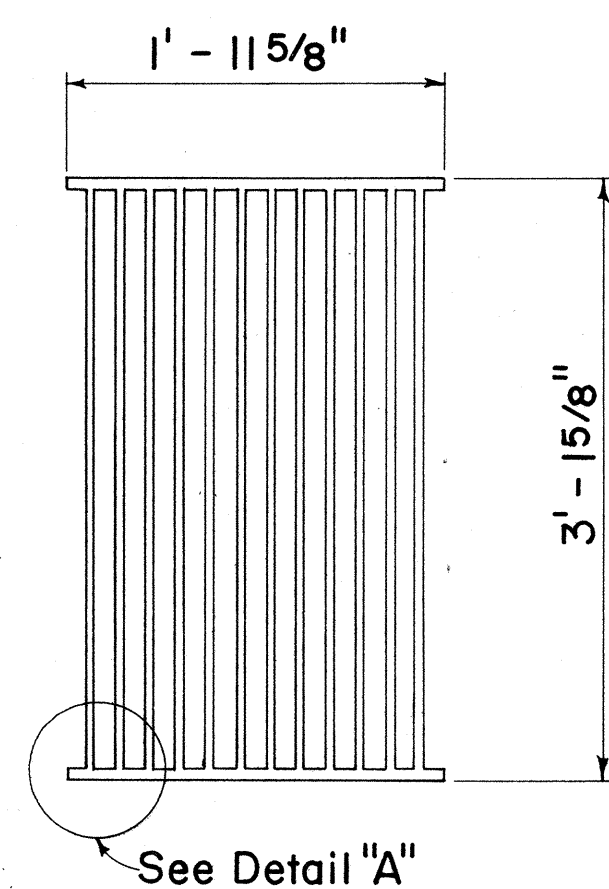


PLAN
(Two or More Grates)



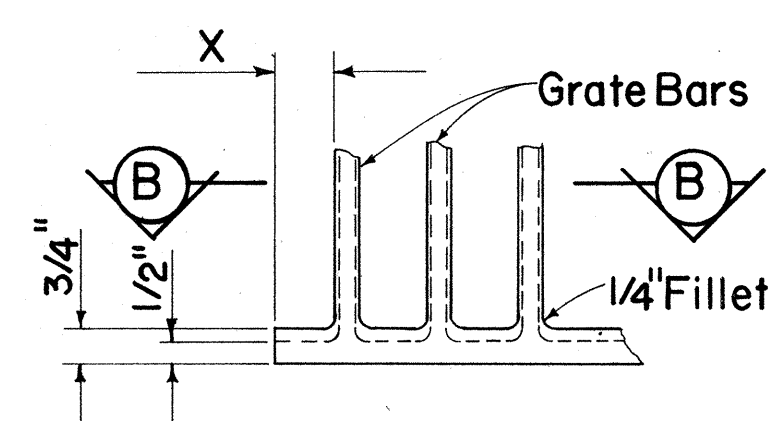
LONGITUDINAL SECTION
(Thru Frame & Gate)

FRAME DETAILS
Scale: 1" = 1' - 0"



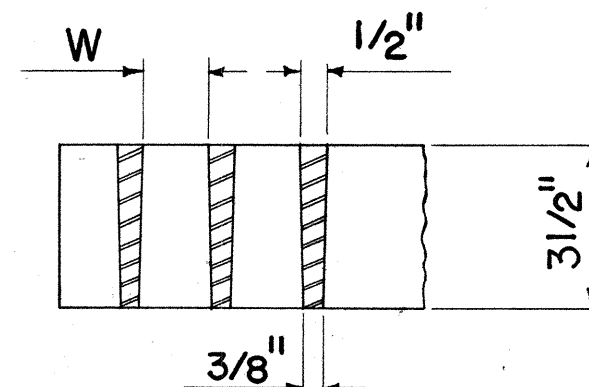
PLAN
Scale: 1" = 1' - 0"

**ALTERNATIVE CAST MALLEABLE IRON
OR CAST STEEL GATE**



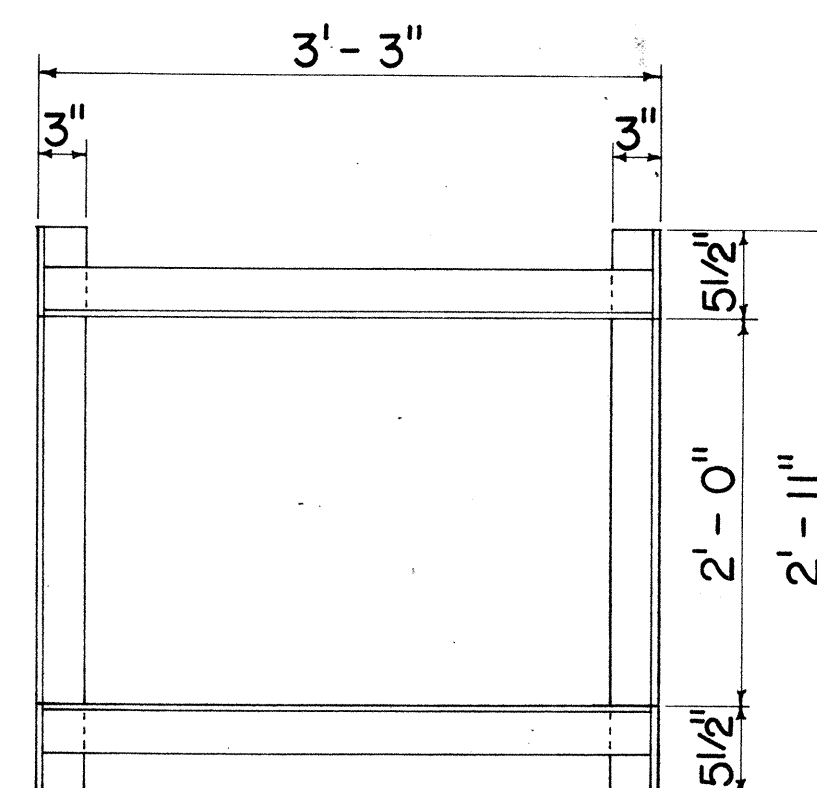
DETAIL "A"

Scale: 3" = 1' - 0"

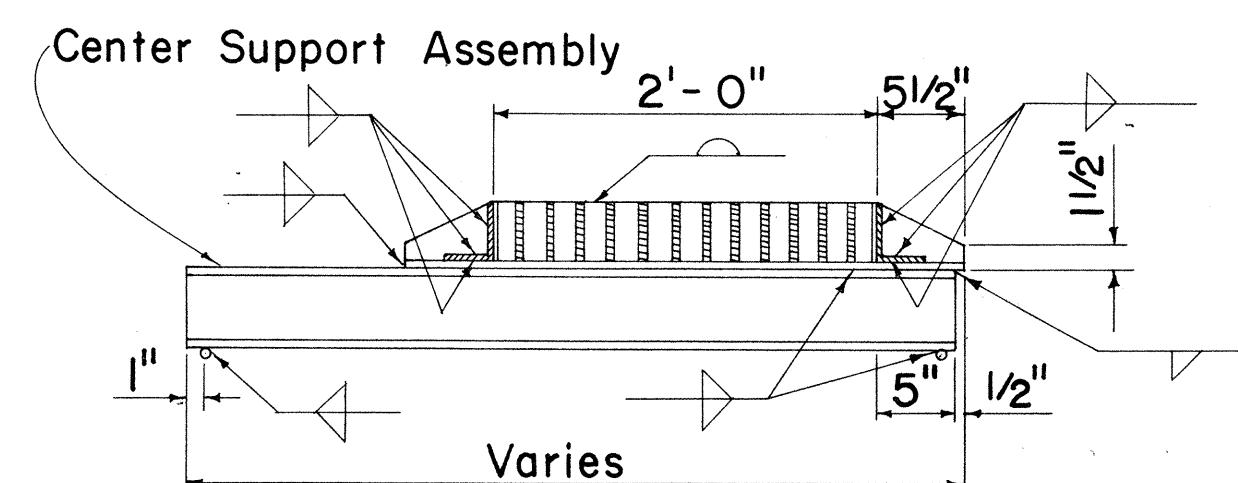


SECTION "B-B"

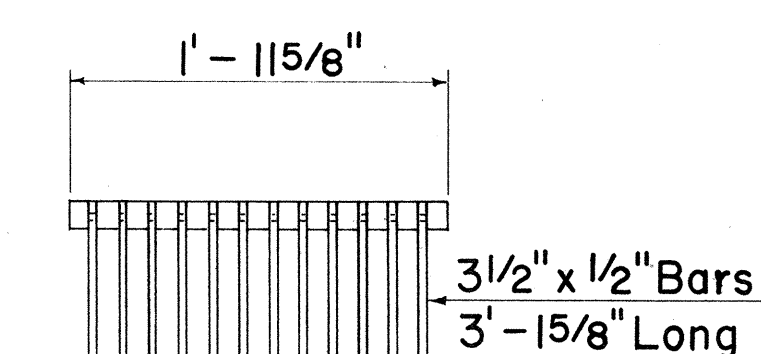
Scale: 3" = 1' - 0"



PLAN
(Single Gate)

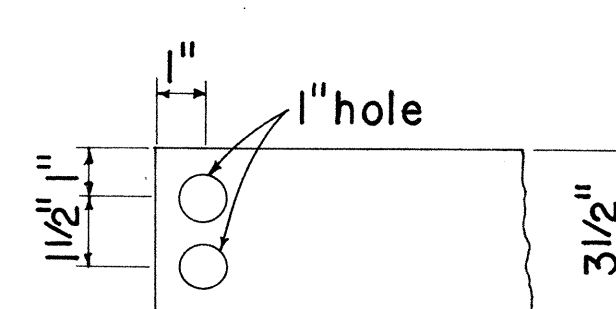


CROSS SECTION
(Thru Frame & Gate)



CAST END BLOCK

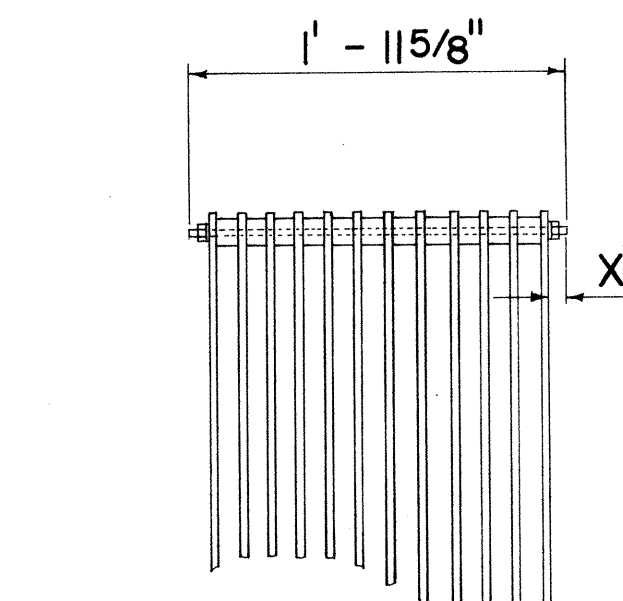
Scale: 1" = 1' - 0"



END OF BAR

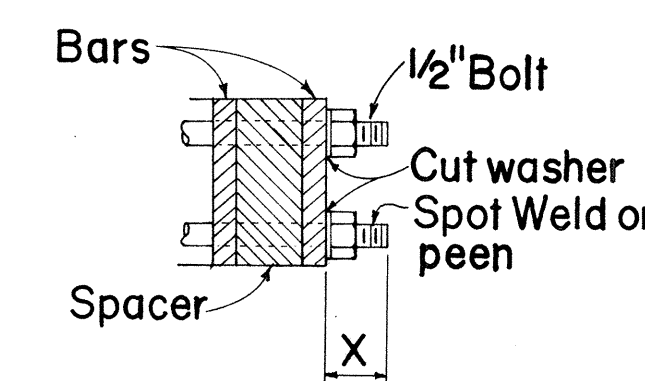
Scale: 3" = 1' - 0"

**ALTERNATIVE CAST MALLEABLE IRON
OR CAST STEEL END BLOCK GATE**



BOLTED END BLOCK

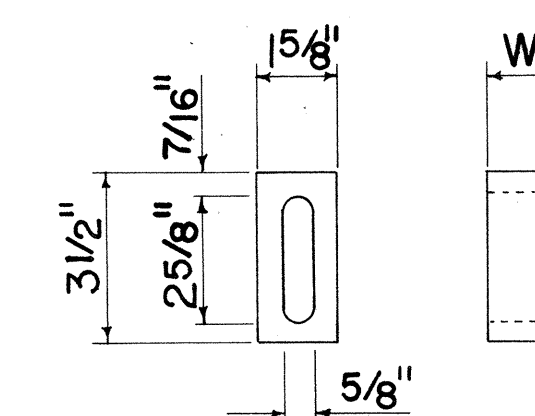
Scale: 1" = 1' - 0"



BOLTING DETAIL

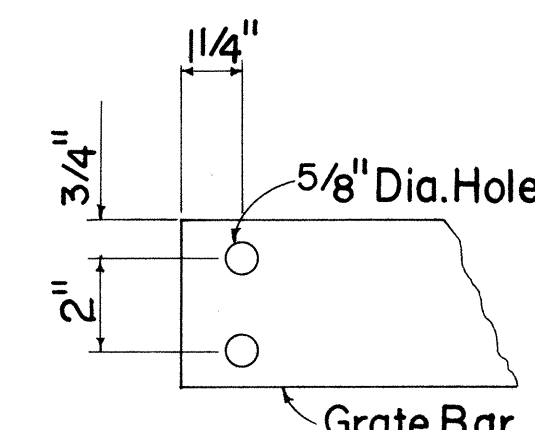
Scale: 3" = 1' - 0"

ALTERNATIVE BOLTED GATE



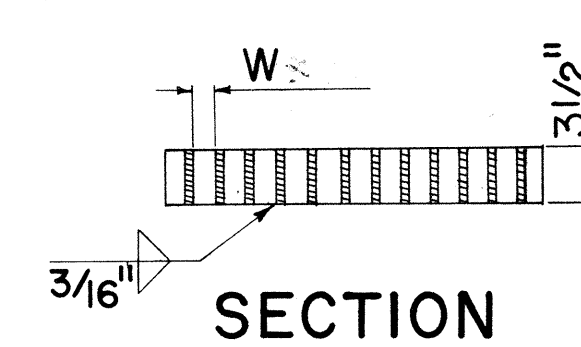
BAR SPACER

Scale: 3" = 1' - 0"

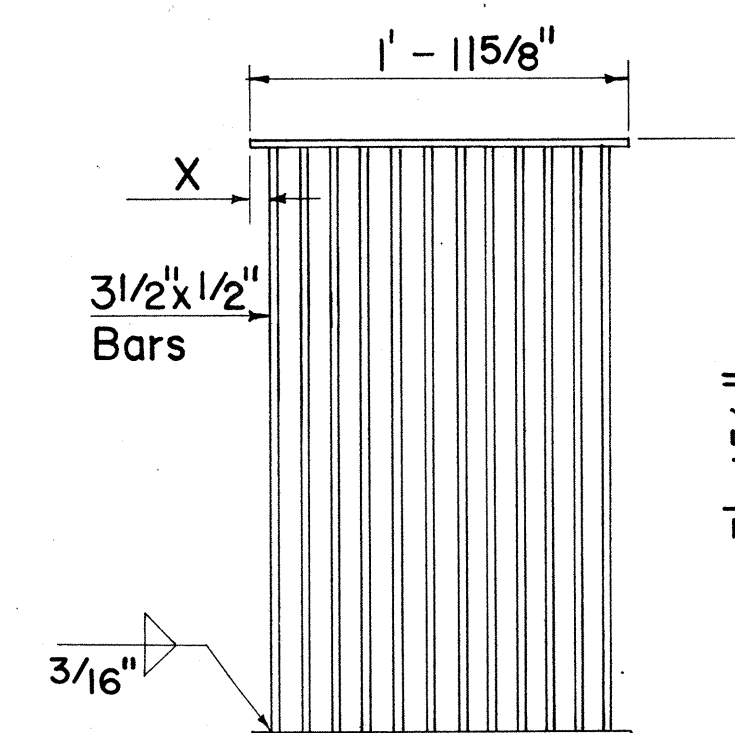


END OF BAR

Scale: 3" = 1' - 0"



SECTION



PLAN

**ALTERNATIVE
WELDED GATE**

Scale: 1" = 1' - 0"

GENERAL NOTES

- Contractor has the option of using cast malleable iron, cast steel, welded, bolted or cast steel end block gate.
- Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
- All welds 3/8" unless otherwise noted.
- Center support assembly shall be used when two or more grates are specified. Incidental to Types A-9 or A-12 Frame and Grates.
- Refer to "Grate Bar Spacing Table" for Types A-9 and A-12 Grate dimensions.
- The various materials shall conform to the specifications of ASTM as listed in the following tabulation and the Std. Specifications.

Material	ASTM Designation
Structural Steel	A283, Grade D
Cast Steel	A27, Grade 65-35
Malleable Iron Casting	A47, Gr. No. 35018

GRATE BAR SPACING TABLE

TYPE	NO. BARS	CLEAR BAR SPACING - W	X
A-9	9	2"	1 9/16"
A-12	12	1 3/8"	1 1/4"

NOTE:

- Type A-9 - Use in locations off the roadbed on all types of highways.
- Type A-12 - Use within the roadbed on all types of highways.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

TYPES A-9 AND A-12
FRAMES AND GRATES

Scales: As Noted

Date: Aug. 1968

SHEET No. 18A OF 18 SHEETS

36A

ORIGINAL	DATE
PLAN	7/68
DESIGNED BY	H.A.M.
CHECKED BY	H.K.M.
NOTED BY	H.K.M.
QUANTITIES BY	H.K.M.
NO.	8/68