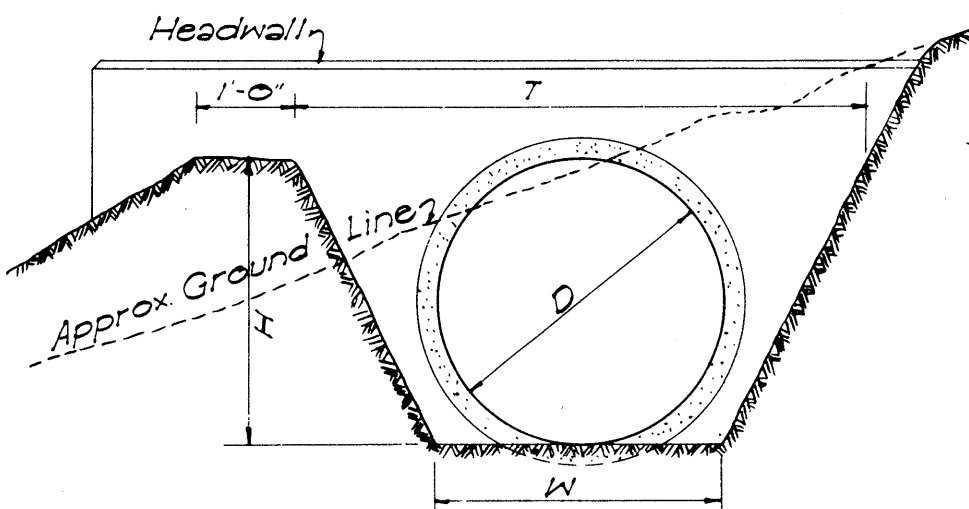


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW	930D-0142	1969	3	8

Revised: June 1965
Revised: August 1967

Note: To Resident Engineer
1) Consider economy of reinf. conc. for high retaining walls which did not originate on plan layout.
2) Elevation of weep holes to be determined by Resident Engineer. Holes to be placed as close to the existing ground line as local conditions permit.

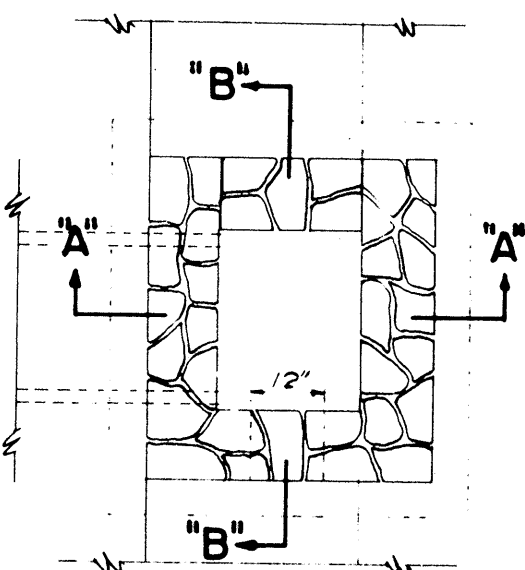
DATA FOR OUTLET DITCH			
D	W	H	T=H+H
18"	24"	2'-0"	4'-0"
24"	30"	2'-0"	4'-6"
30"	30"	2'-0"	5'-0"
36"	36"	3'-0"	6'-0"



DETAIL OF OUTLET DITCH
Scale: 1/2" = 1'-0"

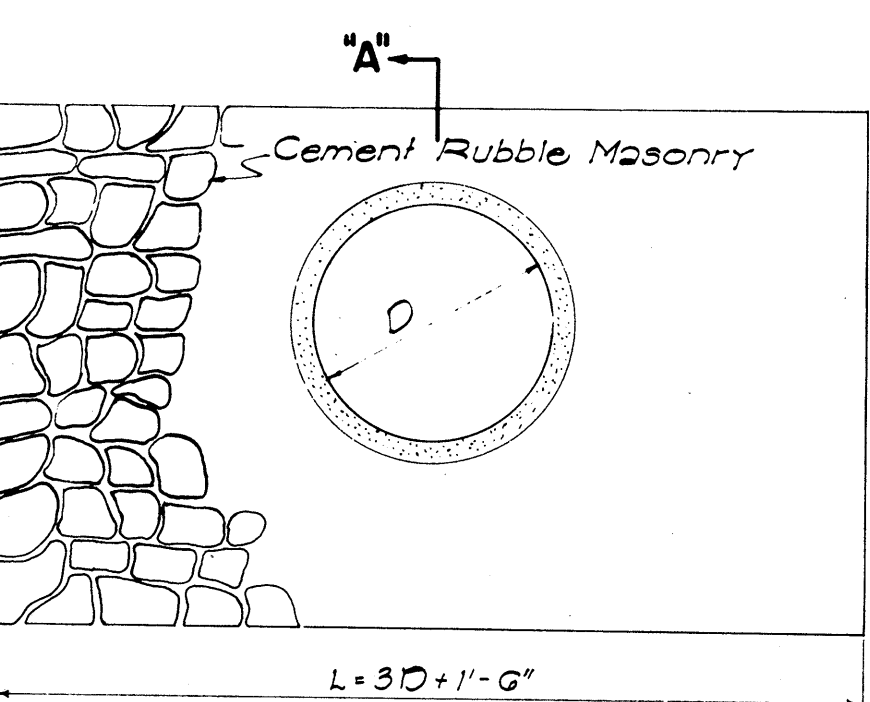
DATA FOR MASONRY DROP INTAKE				Where Variables Equal
D	H	L=D+G	Cu Yds.	
23"	18"	2'-5"	3.02	4'-6"
30"	24"	3'-0"	3.61	5'-0"
37"	30"	3'-7"	4.21	5'-6"
44"	36"	4'-2"	4.85	6'-0"

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

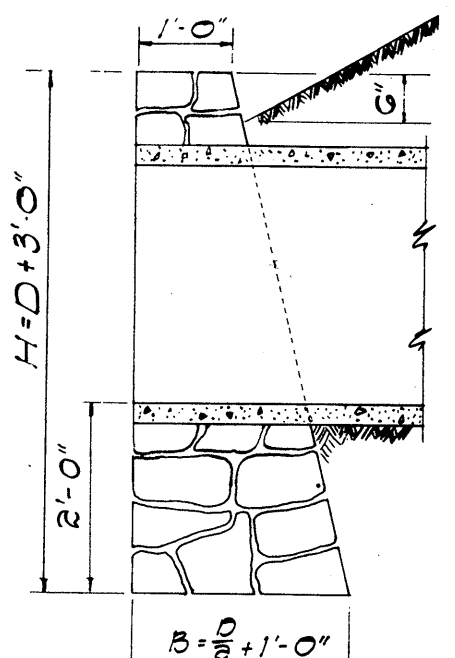


DETAIL OF MASONRY DROP INTAKE
Scale: 3/8" = 1'-0"

DATA - MASONRY HEADWALL		CRM For RCCP	CRM For CGMP
D	H	Cu Yds.	Cu Yds.
18"	4'-6"	1.24	1.20
24"	5'-0"	1.83	1.98
30"	5'-6"	2.56	2.70
36"	6'-0"	3.45	3.66

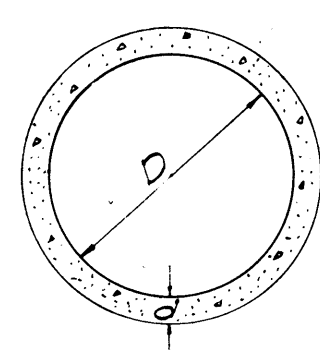


ELEVATION



SECT. "A-A"

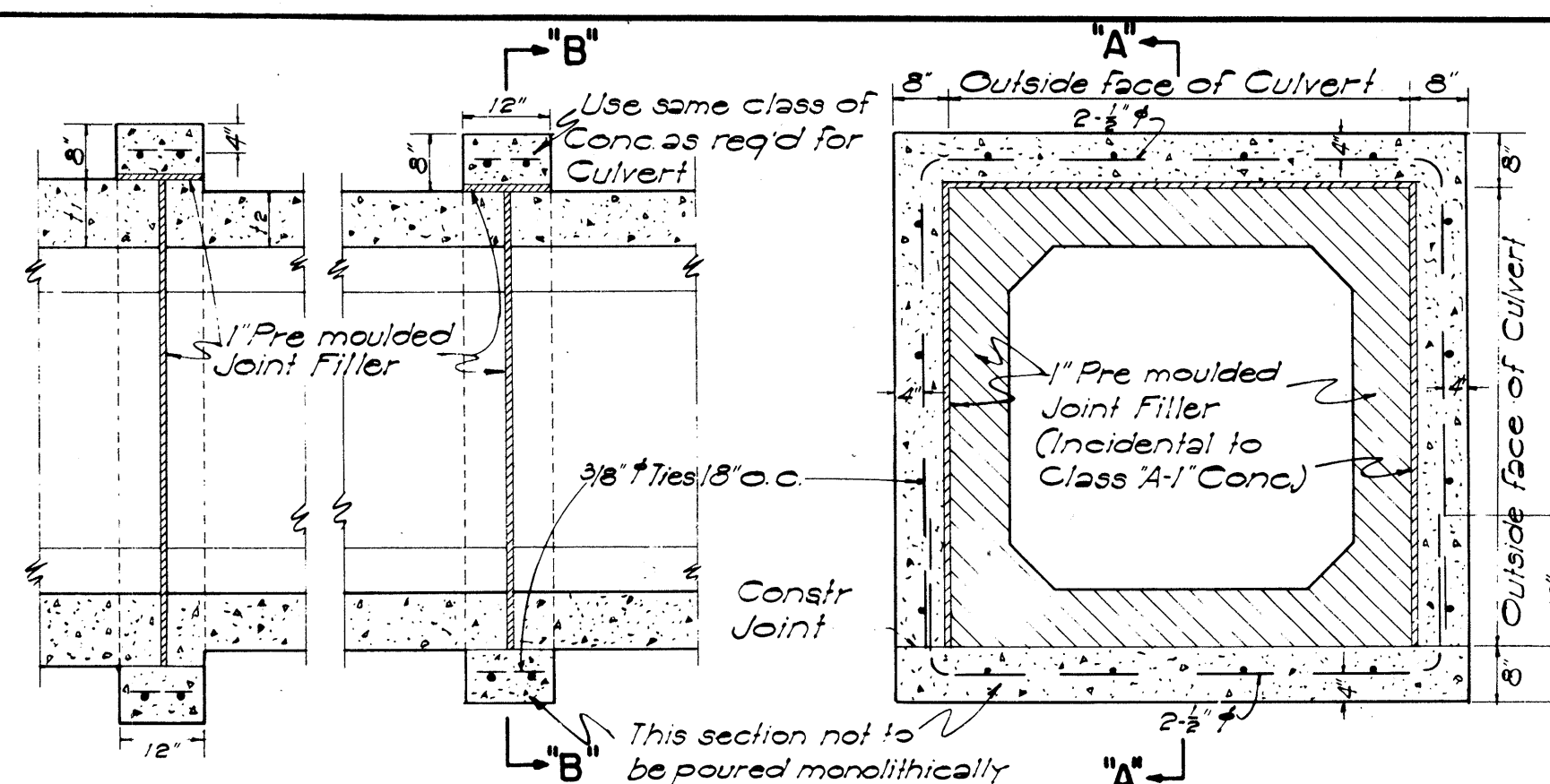
DETAIL OF MASONRY HEADWALL
Scale: 1/2" = 1'-0"



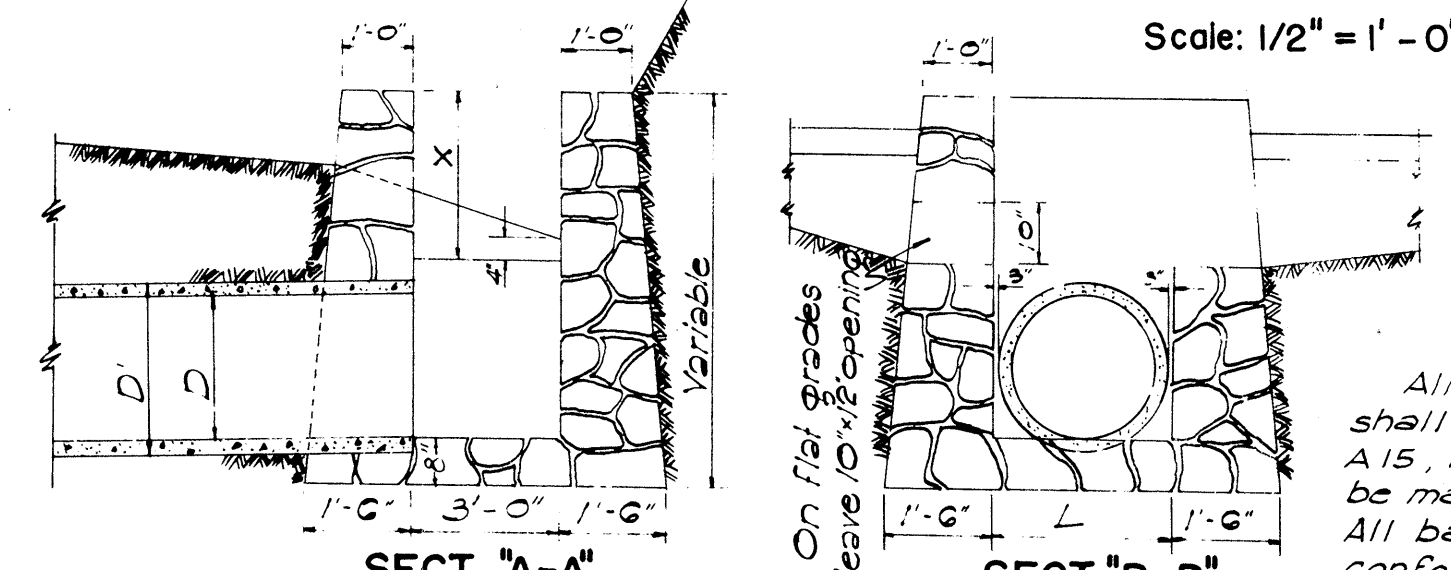
SECTION

CONC. PIPE CULVERT

NOTE:
Thickness of 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"



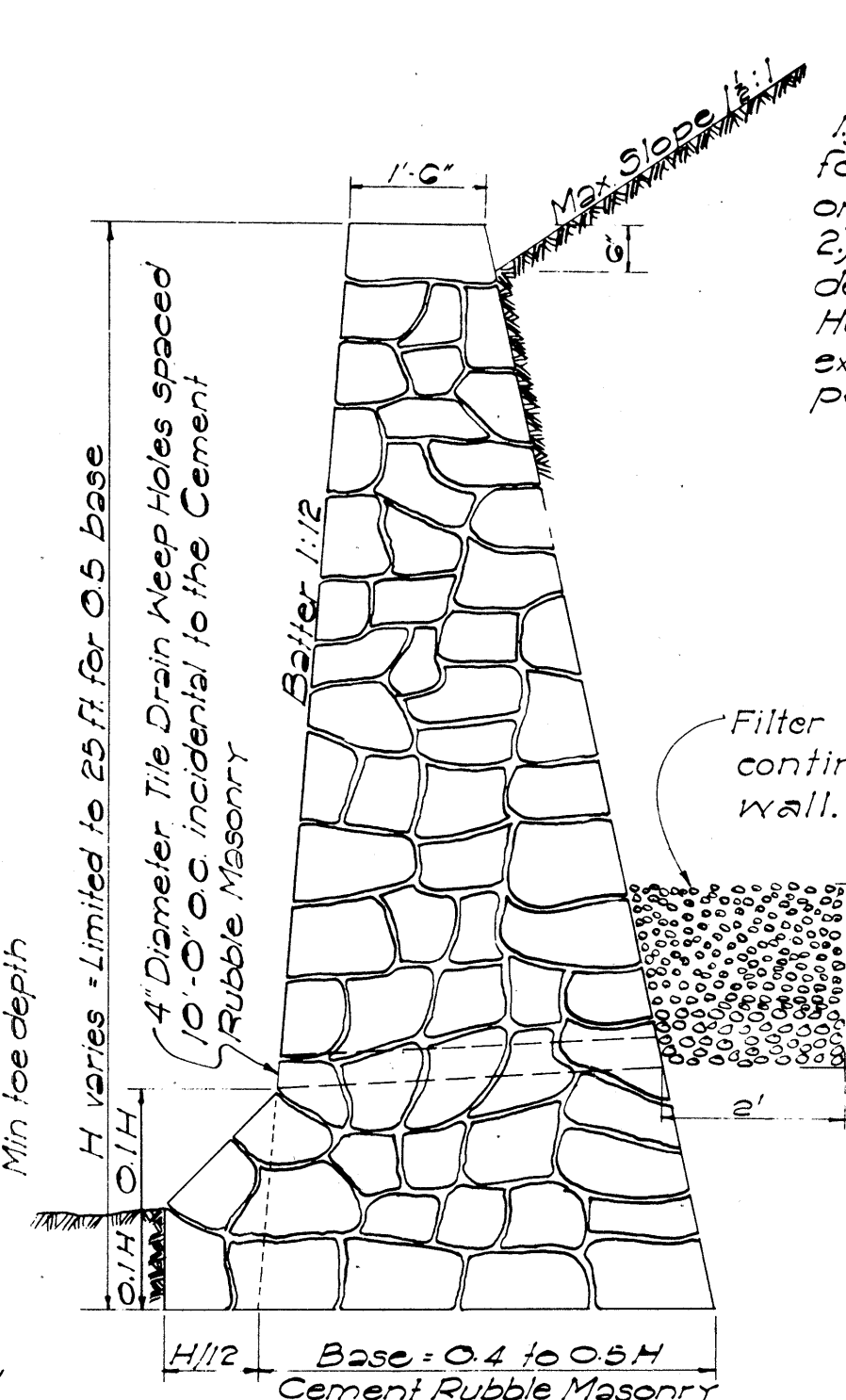
SECT. "A-A"

SECT. "B-B"

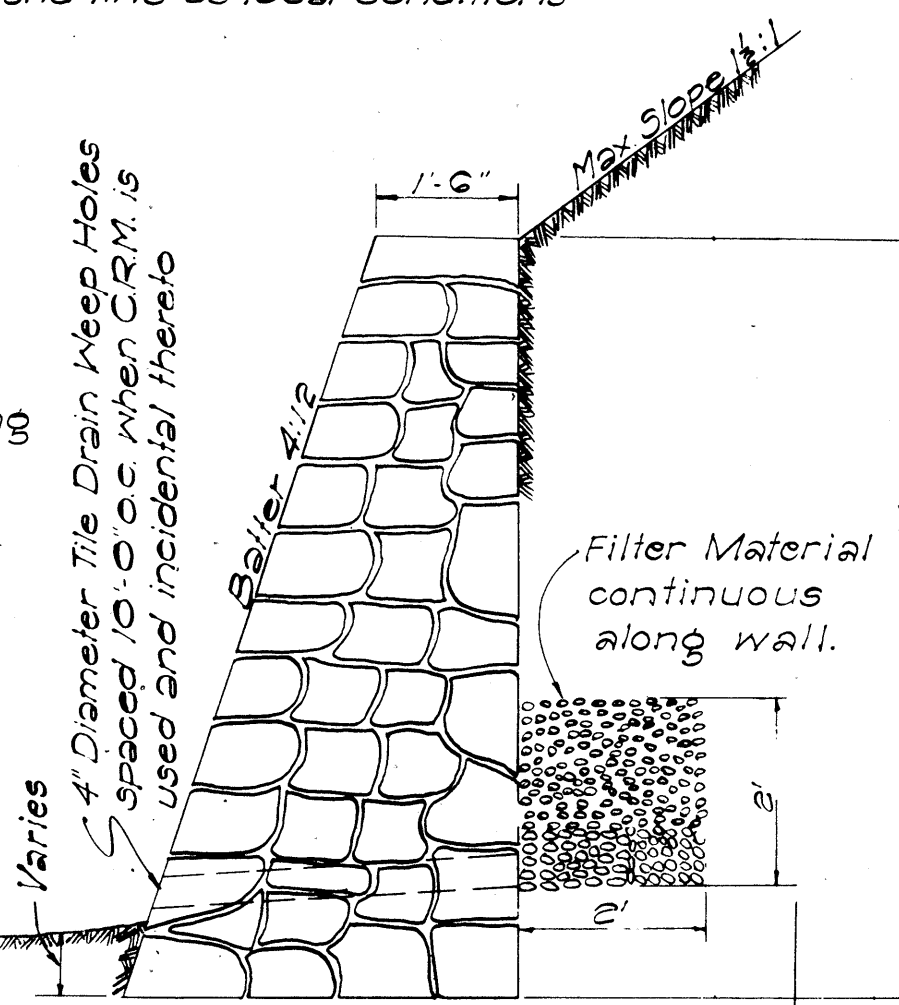
REINFORCING BARS

All reinforcing bars for concrete shall be Billet Steel bars, ASTM A15, intermediate grade. Steel shall be made by the open-hearth process. All bars shall be deformed type conforming to ASTM A-305.

SECTION OF HIGH CEMENT RUBBLE MASONRY RETAINING WALL OR SEAWALL



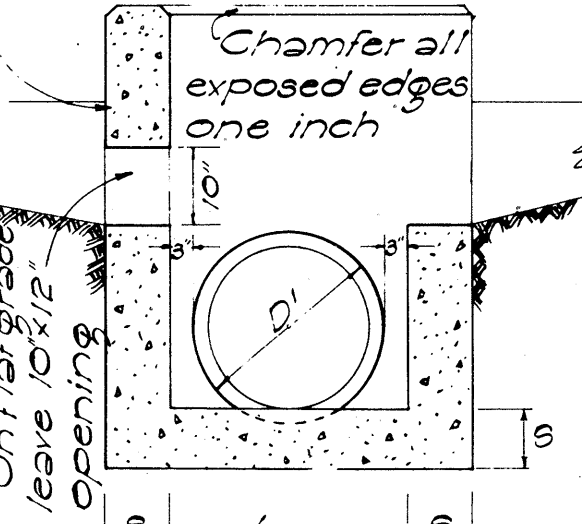
SECTION OF LOW MASONRY RETAINING WALL OR SEAWALL



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

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

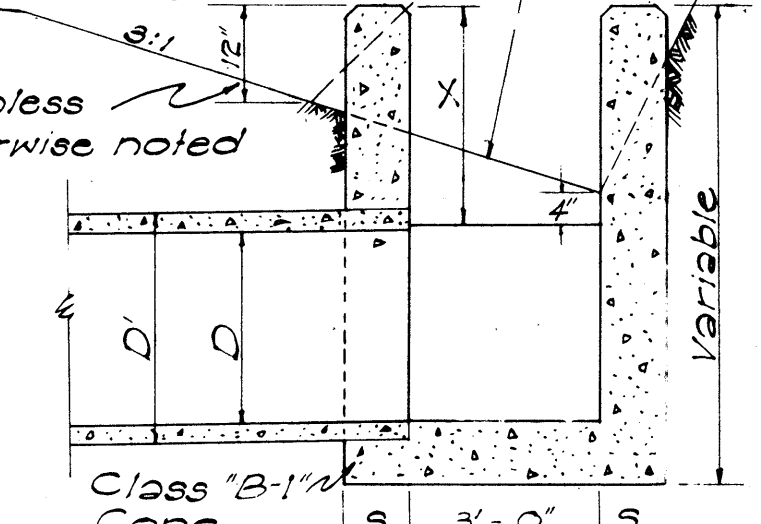
Note: This type of structure shall also be used for the Drop Intakes of Siphons connected with Irrigation Ditches or Flumes with appropriate changes to dimensions. In this case all joints must be made water tight.



SECTION "B-B"

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"

DETAIL OF CONCRETE DROP INTAKE
Scale: 1/2" = 1'-0"

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"

DATA FOR CONC. HEADWALL		CRM For RCCP	CRM For CGMP	Steel For One Headwall
D	H	Cu Yds.	Cu Yds.	No. of Bars Size Length Lbs.
18"	4'-6"	1.12	1.17	4 3/4" 7'-0" 33
24"	5'-0"	1.52	1.60	4 3/4" 7'-0" 42
30"	5'-6"	2.36	2.40	4 3/4" 8'-0" 51
36"	6'-0"	3.45	3.13	4 3/4" 10'-0" 60
42"	6'-6"	4.19	4.47	4 3/4" 11'-0" 60
48"	7'-0"	5.01	5.36	4 3/4" 13'-0" 78

DETAIL OF CONCRETE HEADWALL
Scale: 1/2" = 1'-0"

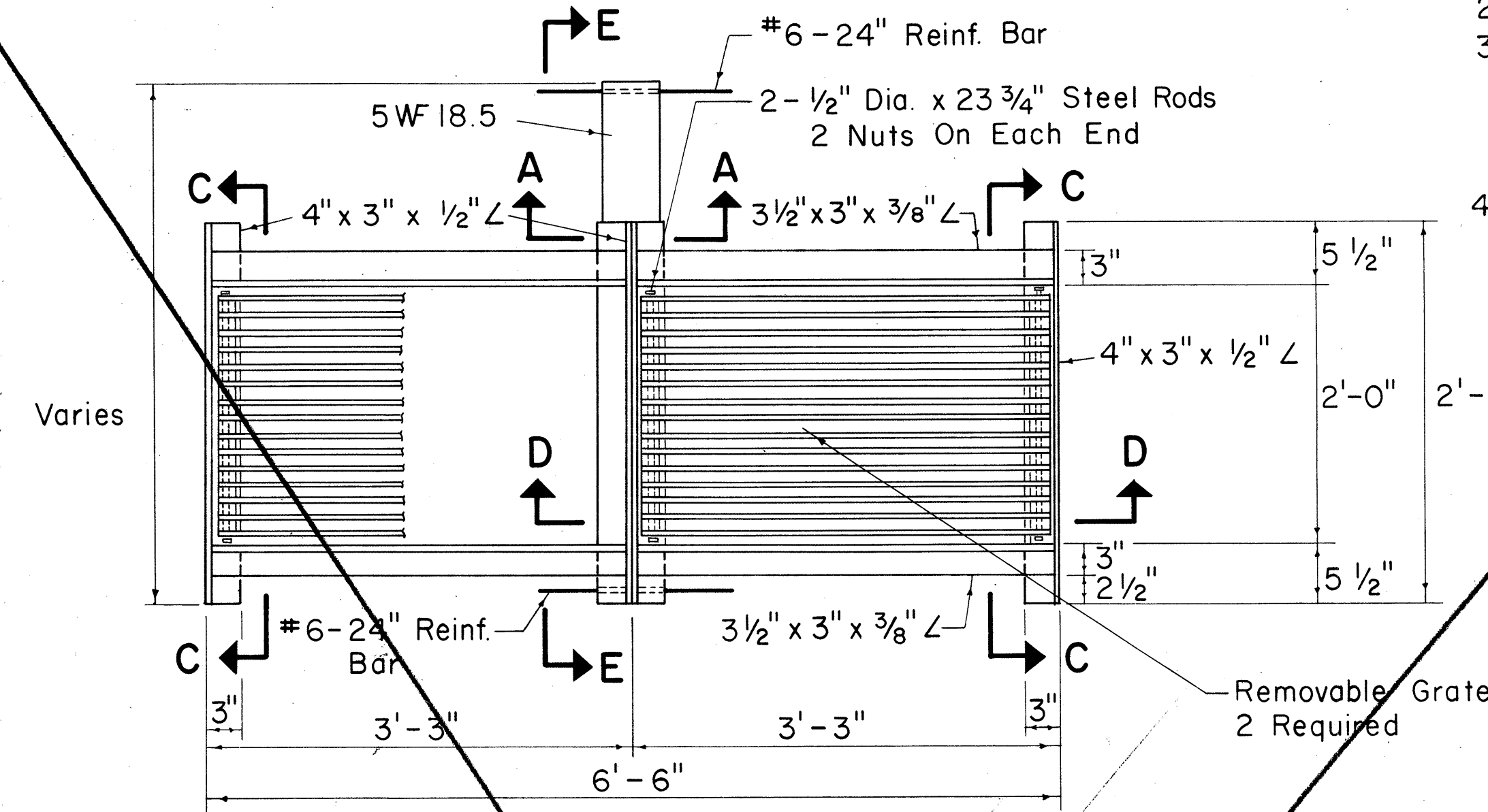
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
DROP INTAKES, RETAINING WALLS,
HEADWALLS, CONSTRUCTION JOINTS
SCALES AS NOTED
SHEET NO. 1 OF 5 SHEETS

FED. ROAD DIST. NO.	STATE	PROJECT	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAWAII	930D-01-60	1960	4	8

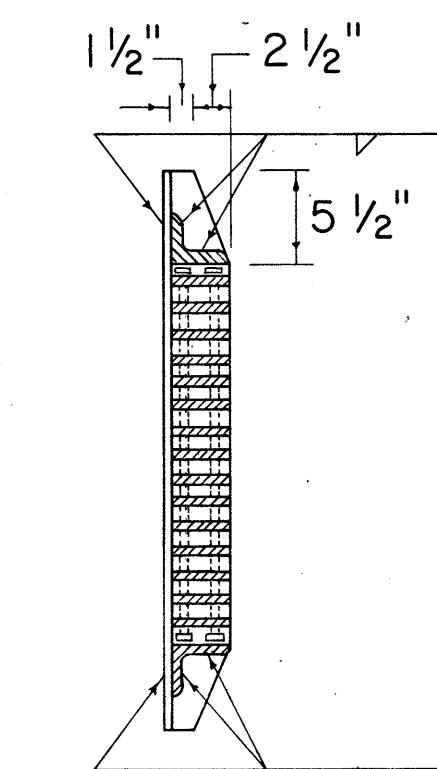
Revised: Jan. 25, 1967

NOTE:

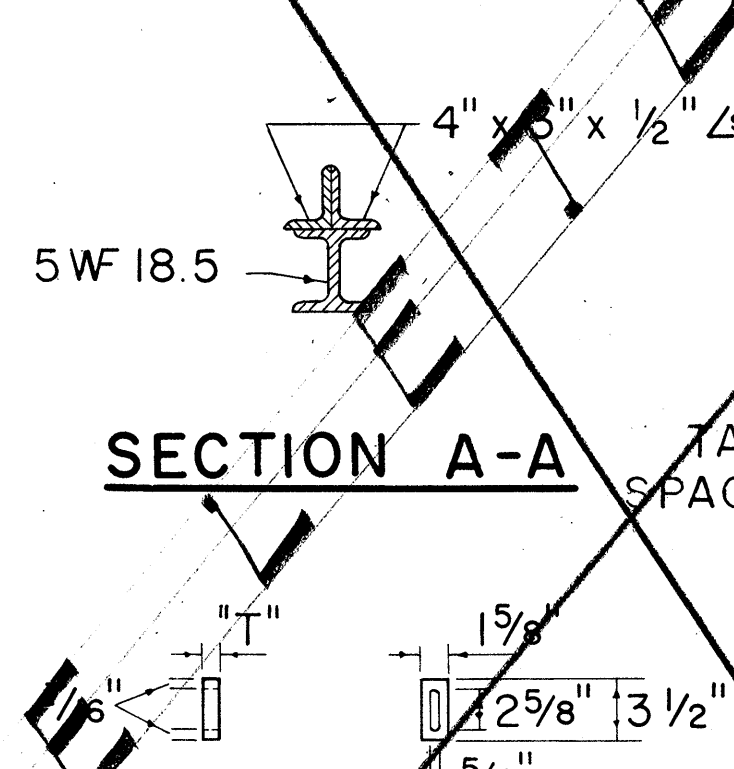
1. All welds $\frac{3}{8}$ " unless otherwise noted.
2. All steel shall be structural grade.
3. Grates and Frame shall be hot dip galvanized after fabrication in accordance with Section 44(H) of the Standard Specifications.
4. Detail of Types "A-1" and "A-2" Steel Frame and Grates are identical except for the thickness of end spacers and number of grate bars. See Table of End Spacer Thickness.



PLAN



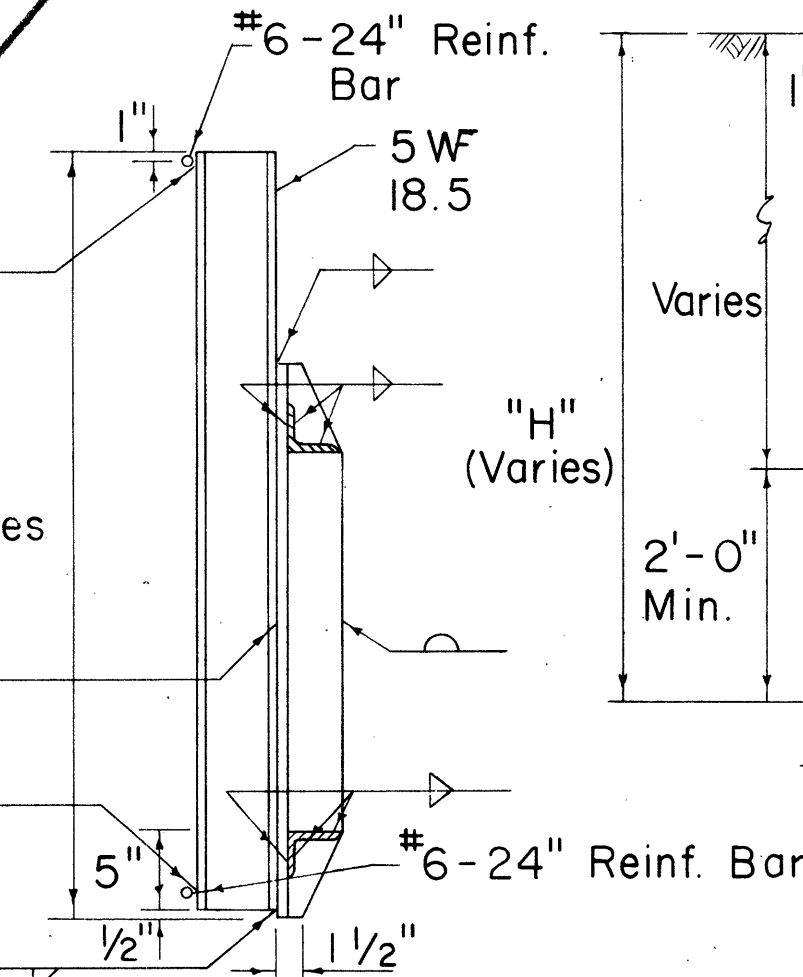
SECTION C-C



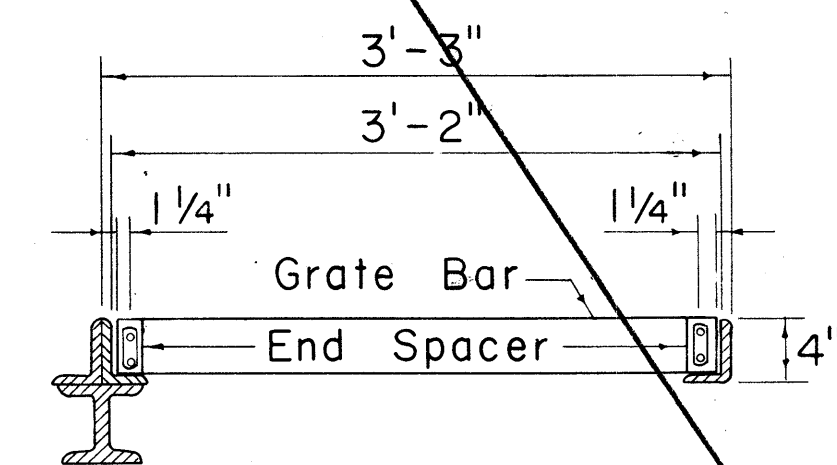
SECTION A-A

END SPACER

TYPE FRAME & GRATES	"T" SPACER THICKNESS (in.)
A-1	1
A-2	1 3/8



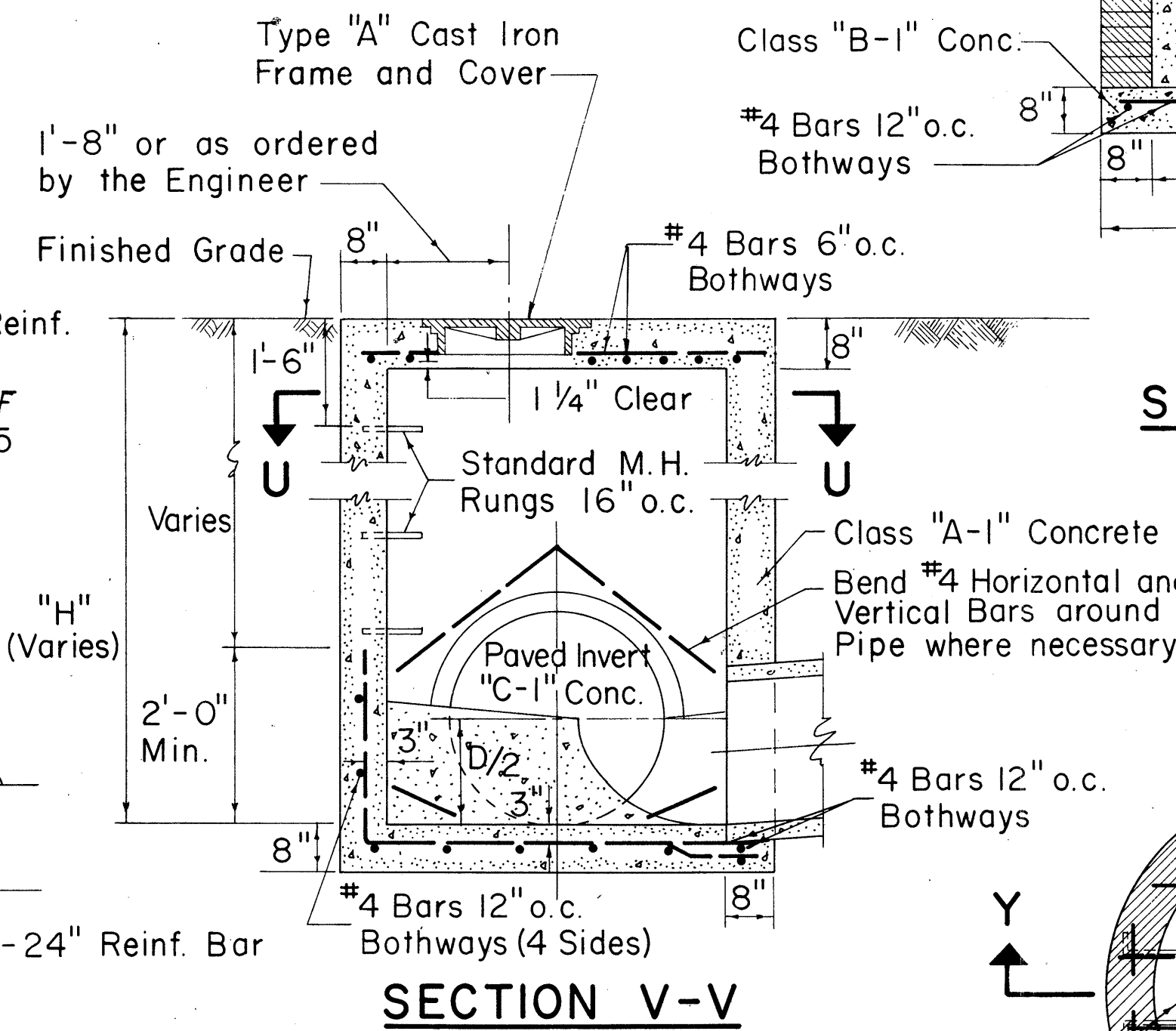
SECTION E-E



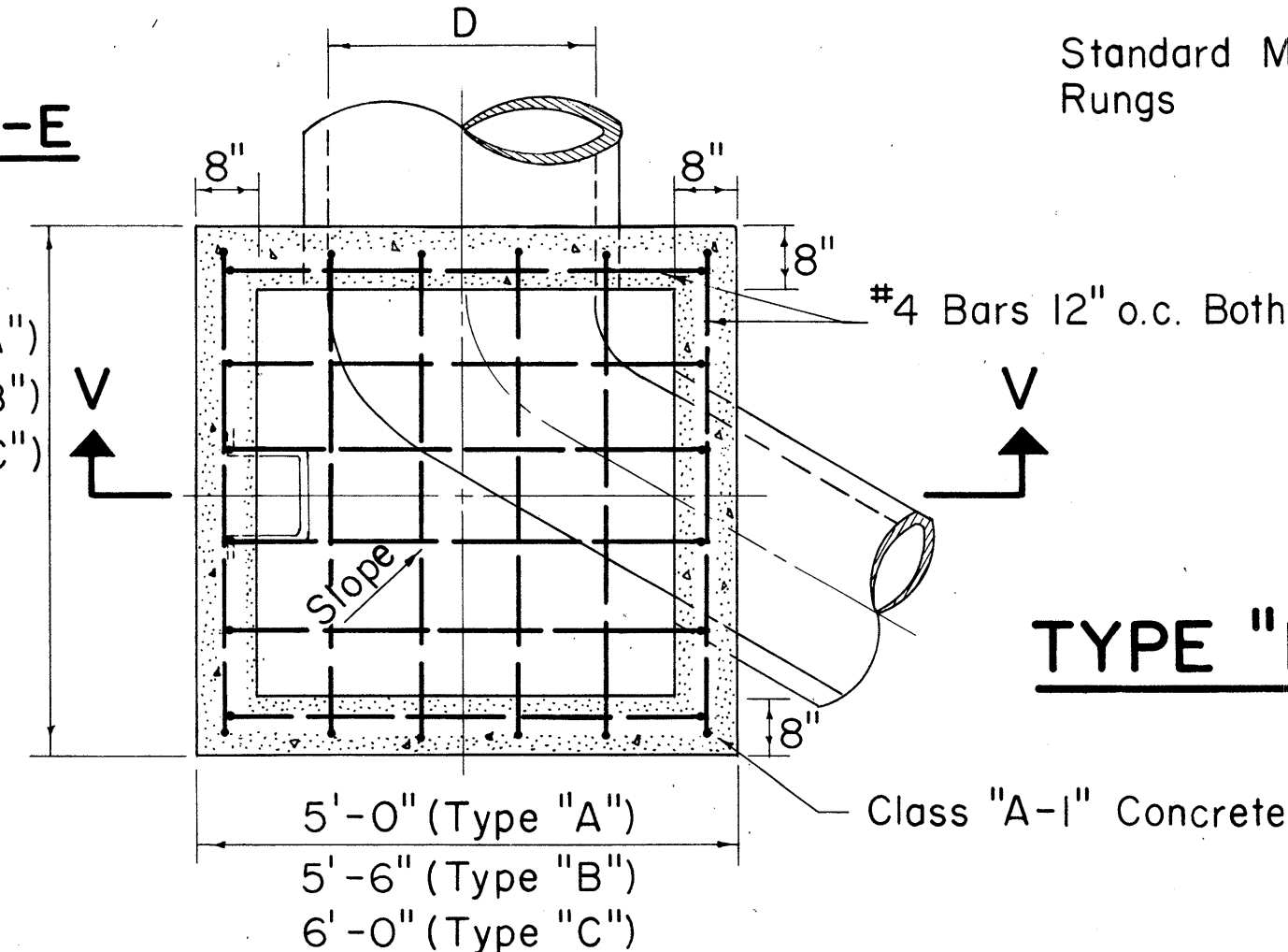
SECTION D-D

DETAIL OF TYPE "A-1" & "A-2" STEEL FRAME AND GRATES

Scale: 1" = 1'-0"



SECTION V-V

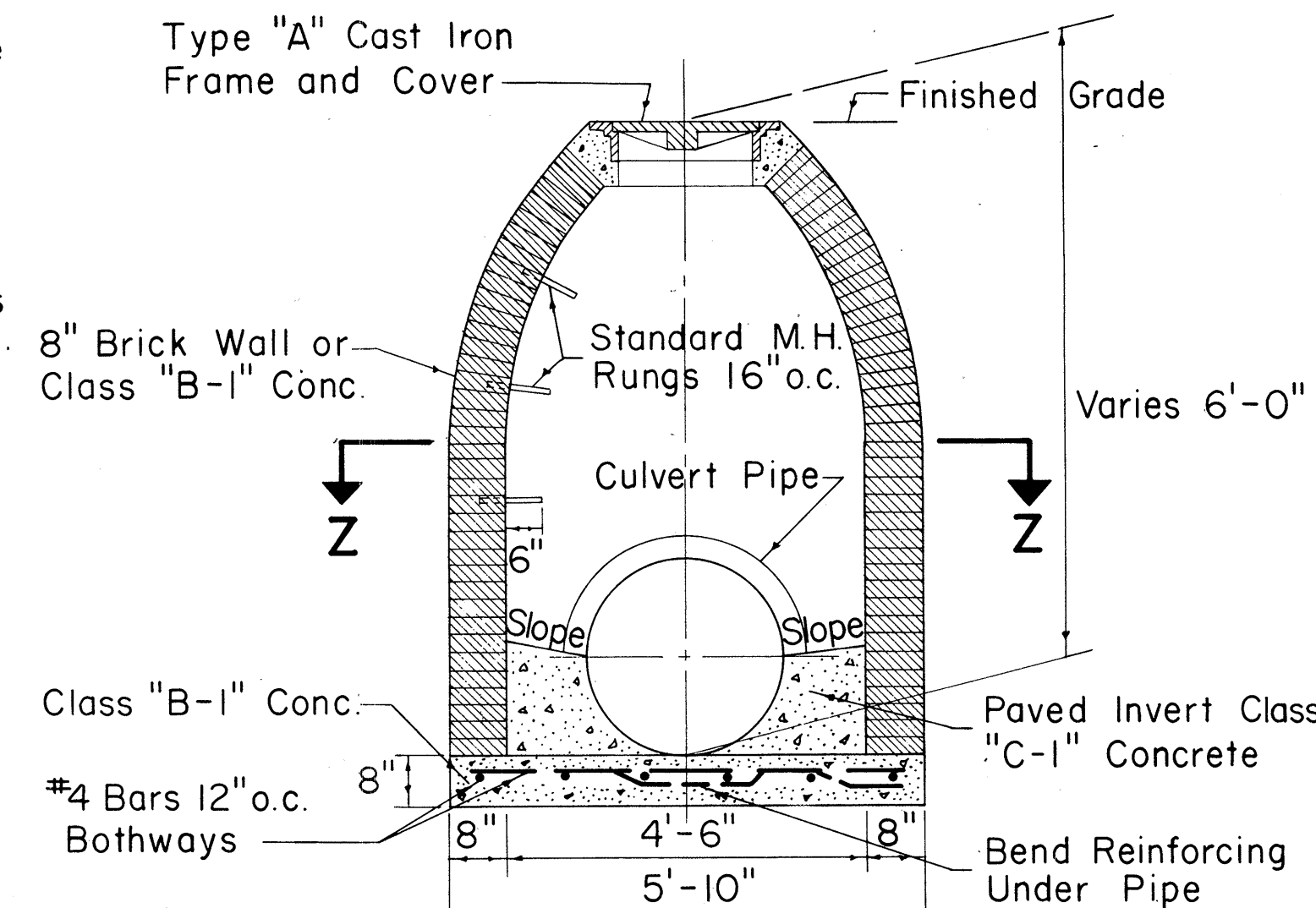


SECTION U-U

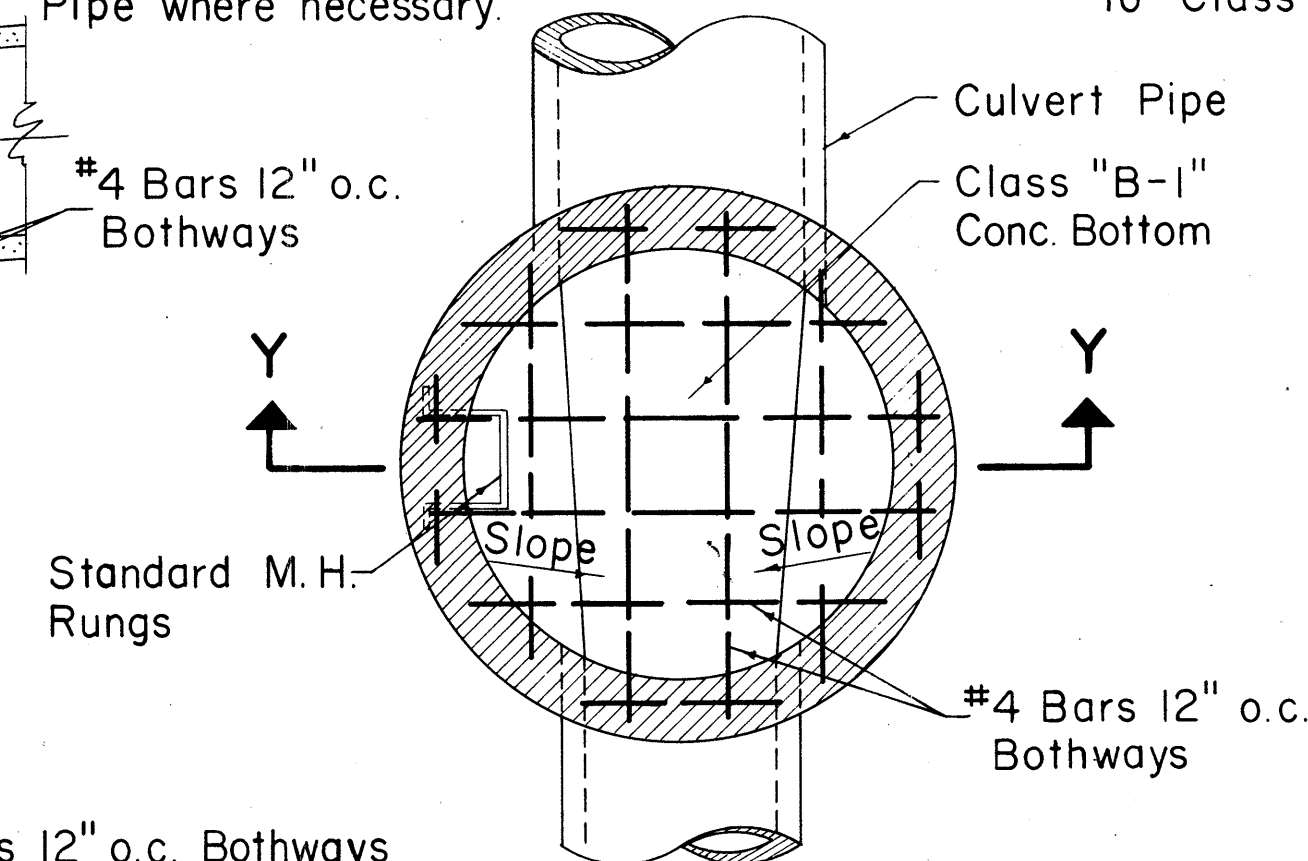
TYPE "A", "B", & "C"

S.D.M.H.

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



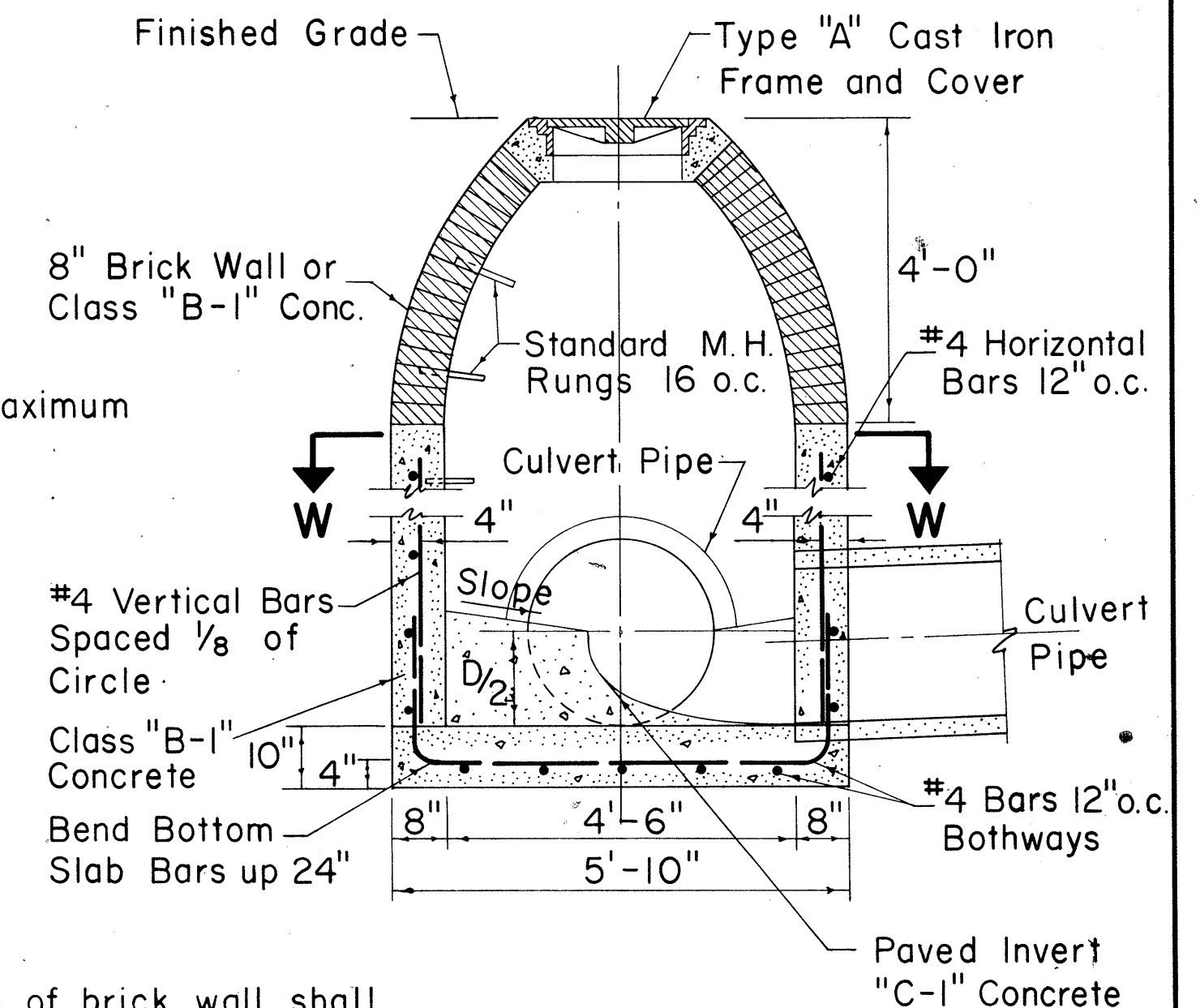
SECTION Y-Y



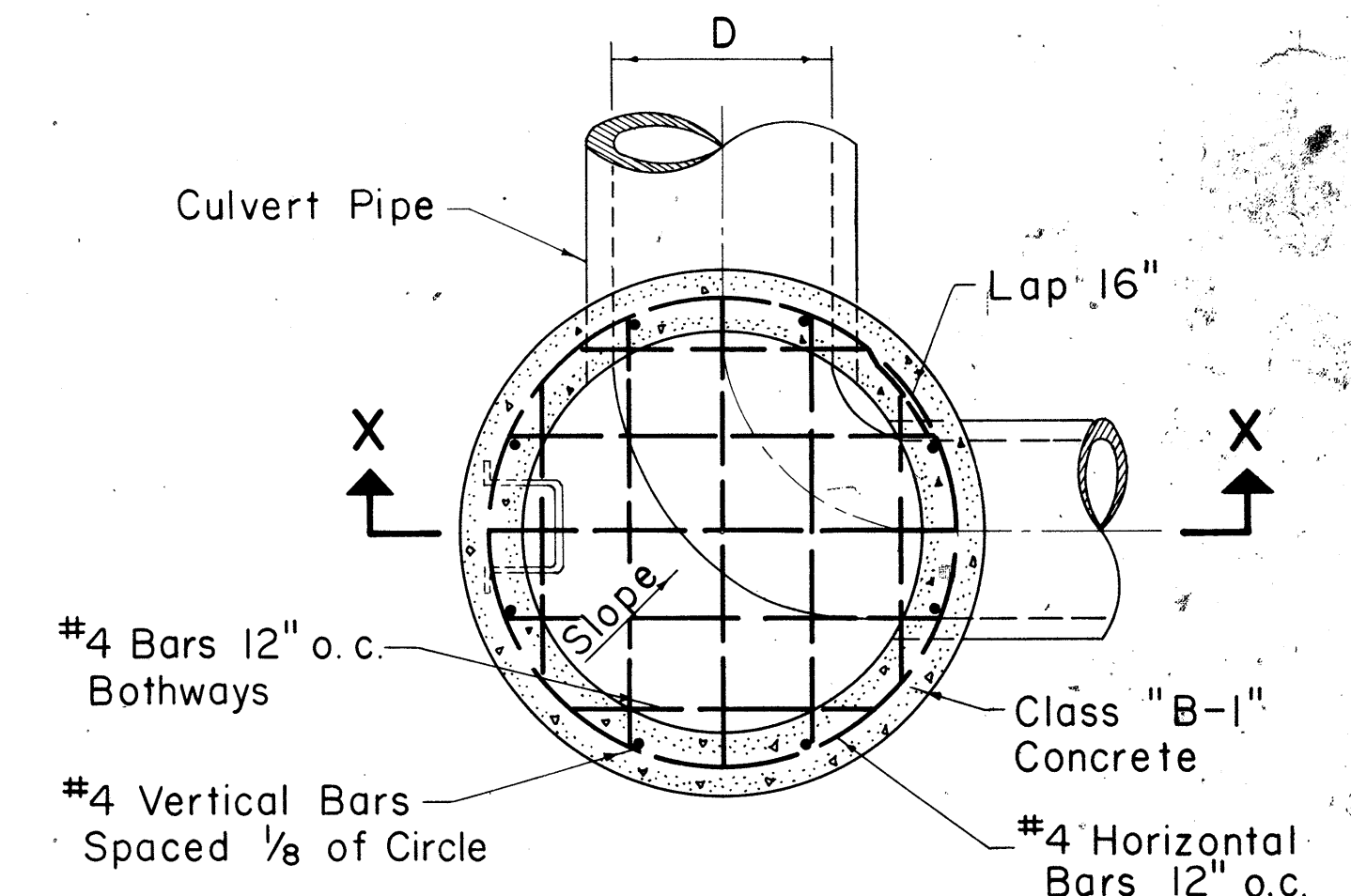
SECTION Z-Z

TYPE "D" STORM DRAIN MANHOLE

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



SECTION X-X



SECTION W-W

TYPE "E" STORM DRAIN MANHOLE

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

APPROVED:

DIRECTOR OF TRANSPORTATION DATE

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
STANDARD DETAILS	
STEEL FRAME AND GRATES AND STORM DRAIN MANHOLES	
Scales: As Noted	Date: May 1960
SHEET NO. 2 OF 5 SHEETS	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	030D-01-20	1969	5	8

GENERAL NOTES

- Contractor has the option of using cast malleable iron, cast steel, welded, bolted or cast steel end block grate.
- Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
- All welds $\frac{3}{8}$ " 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....	A 47, 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

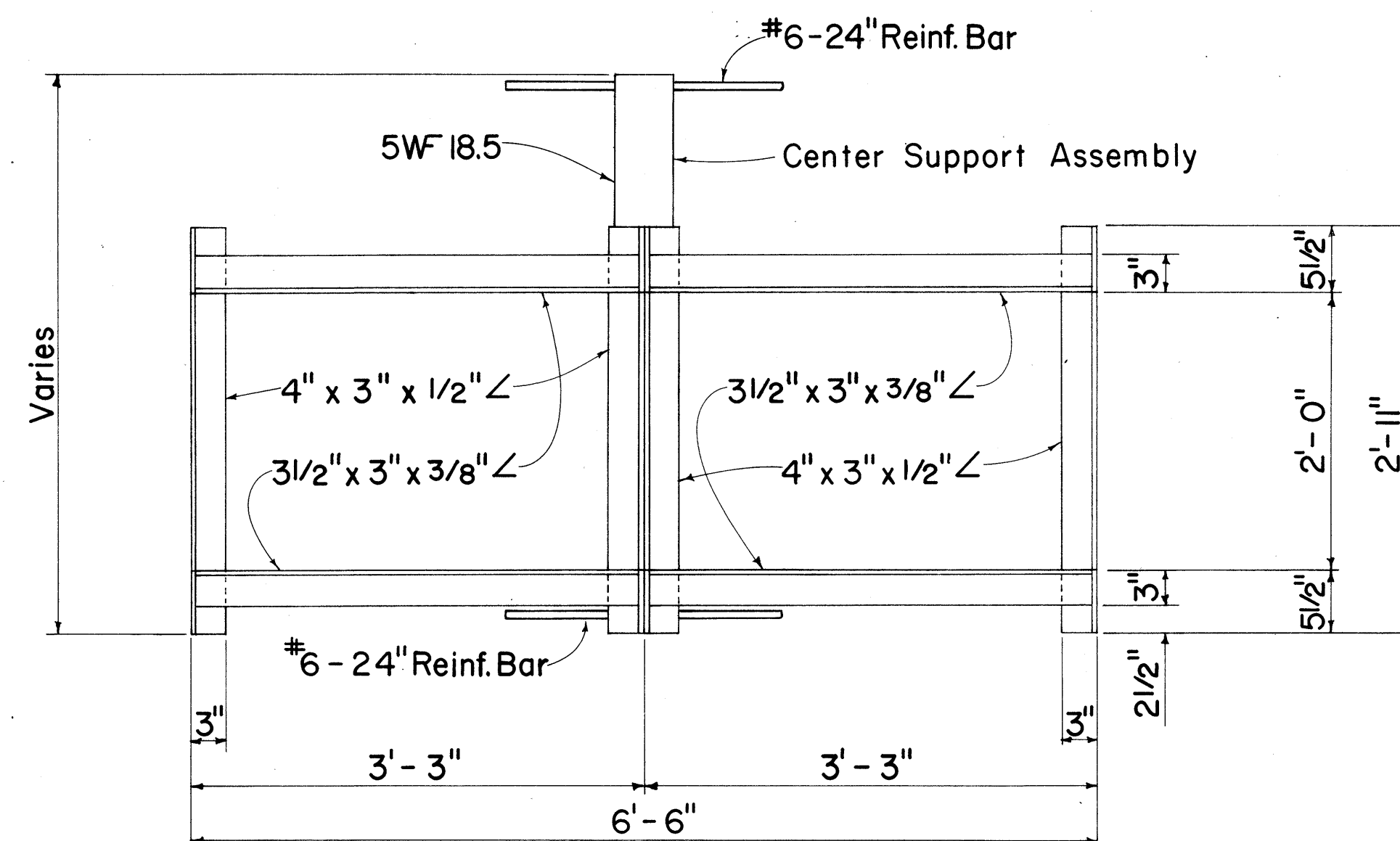
STANDARD DETAILS

TYPES A-9 AND A-12 FRAMES AND GRATES

Scales: As Noted

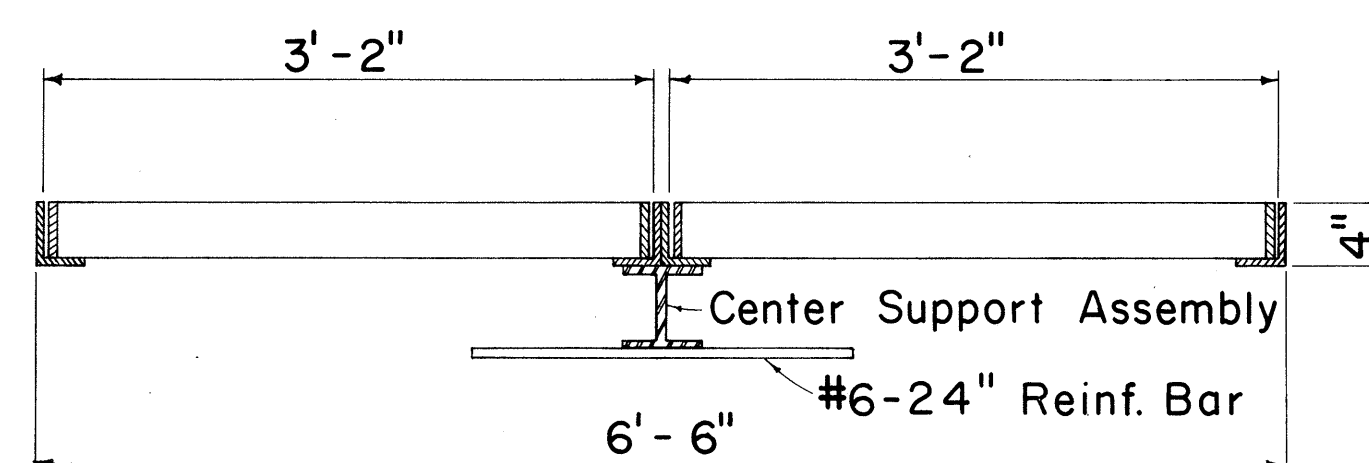
Date: Aug. 1968

SHEET No. 3 OF 5 SHEETS



PLAN

(Two or More Grates)

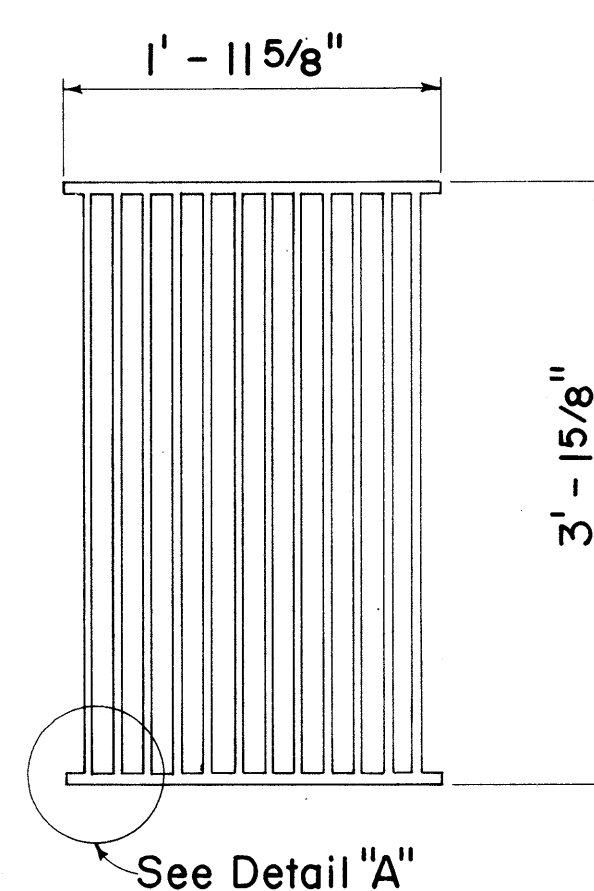


LONGITUDINAL SECTION

(Thru Frame & Grate)

FRAME DETAILS

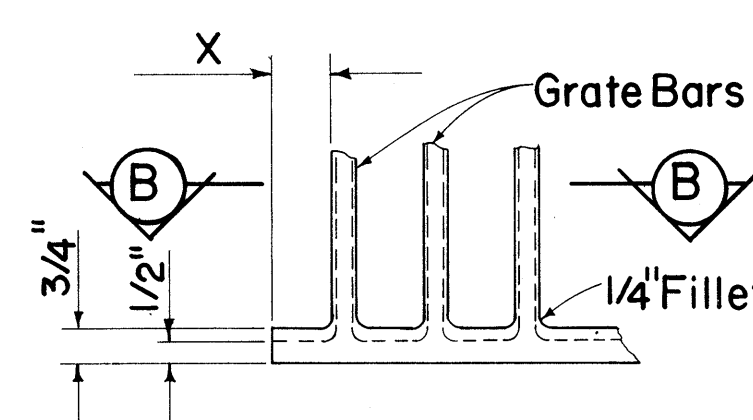
Scale: 1" = 1' - 0"



PLAN

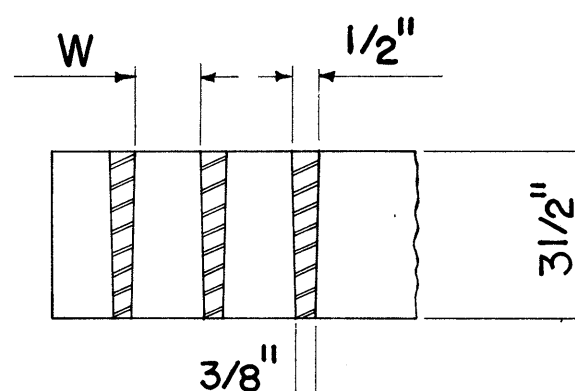
Scale: 1" = 1' - 0"

ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL GRATE



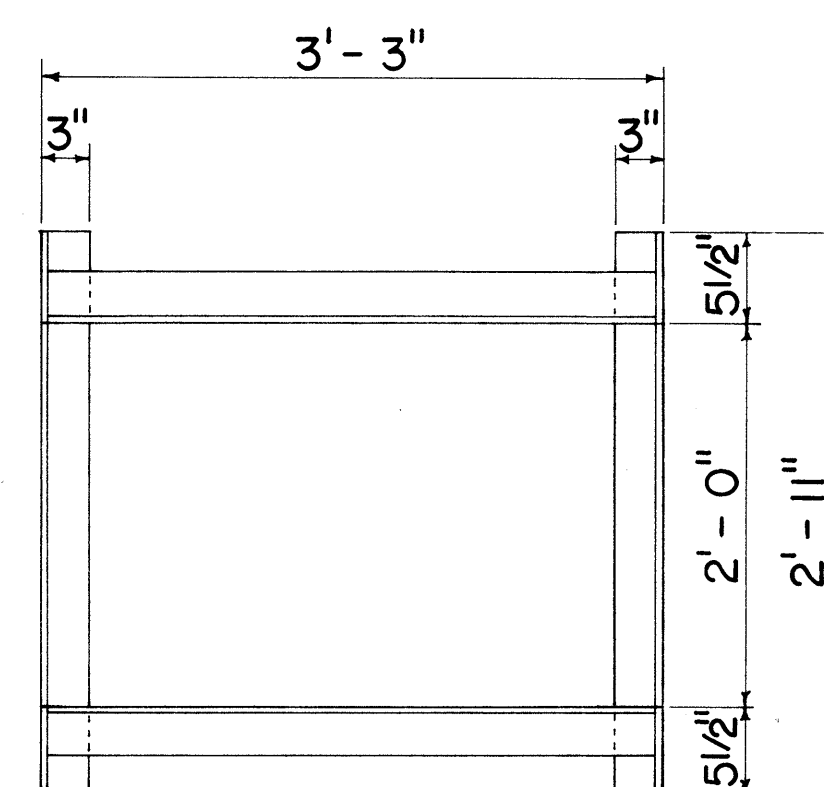
DETAIL "A"

Scale: 3" = 1' - 0"



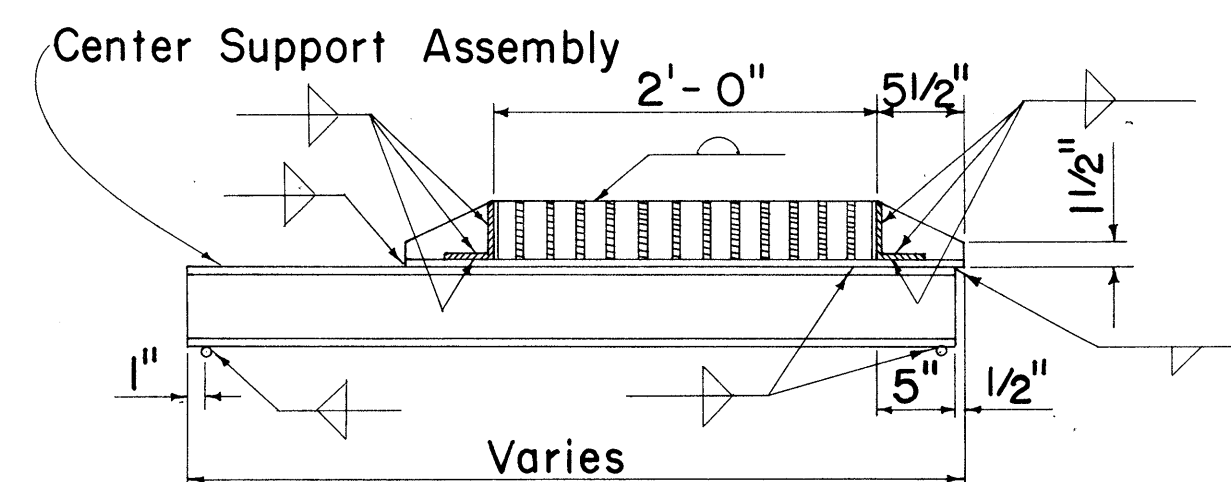
SECTION "B-B"

Scale: 3" = 1' - 0"



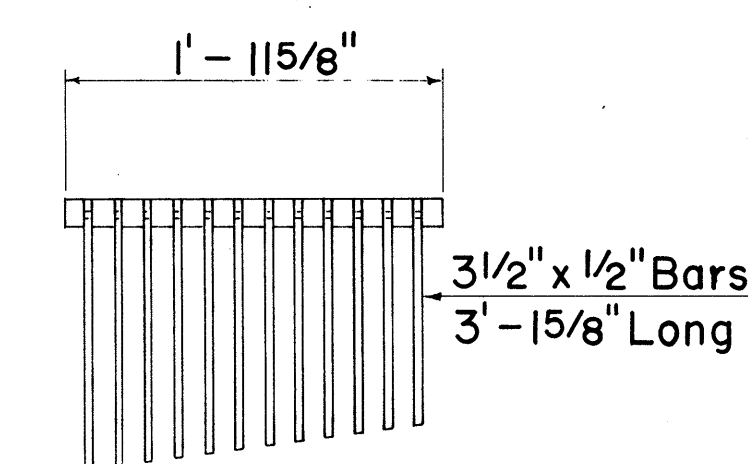
PLAN

(Single Grate)



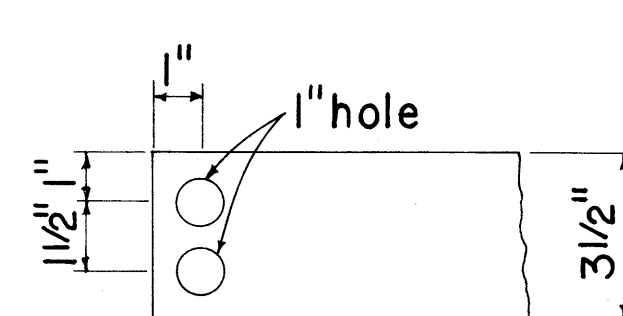
CROSS SECTION

(Thru Frame & Grate)



CAST END BLOCK

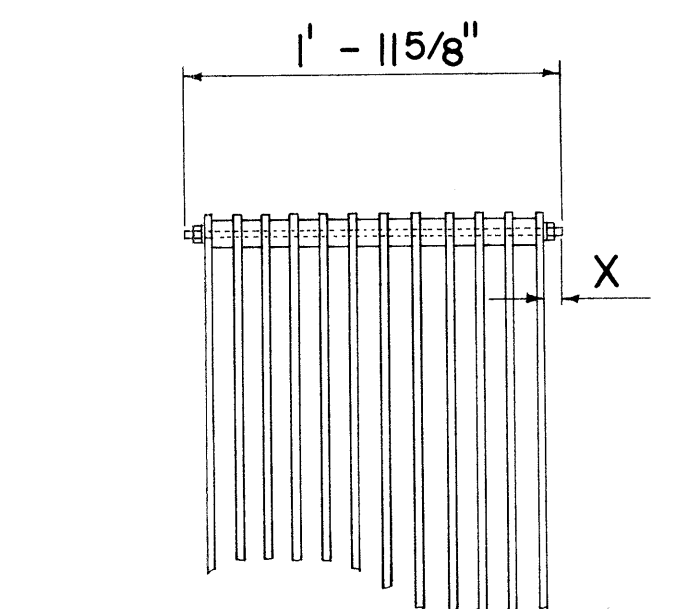
Scale: 1" = 1' - 0"



END OF BAR

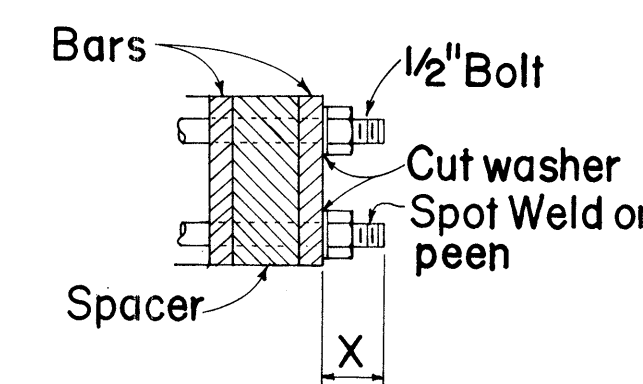
Scale: 3" = 1' - 0"

ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL END BLOCK GRATE



BOLTED END BLOCK

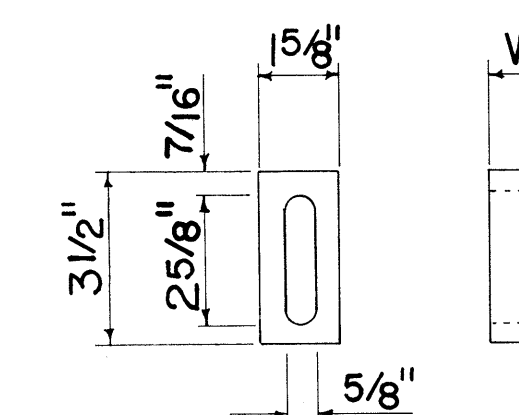
Scale: 1" = 1' - 0"



BOLTING DETAIL

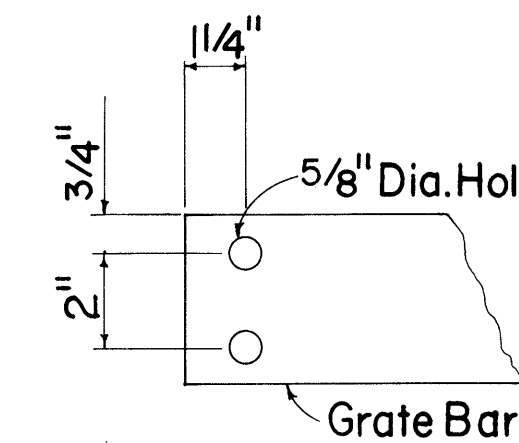
Scale: 3" = 1' - 0"

ALTERNATIVE BOLTED GRATE



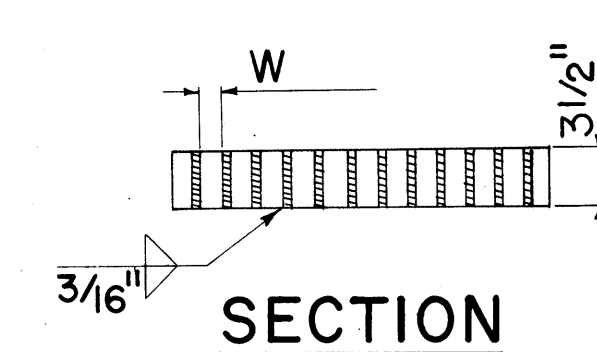
BAR SPACER

Scale: 3" = 1' - 0"

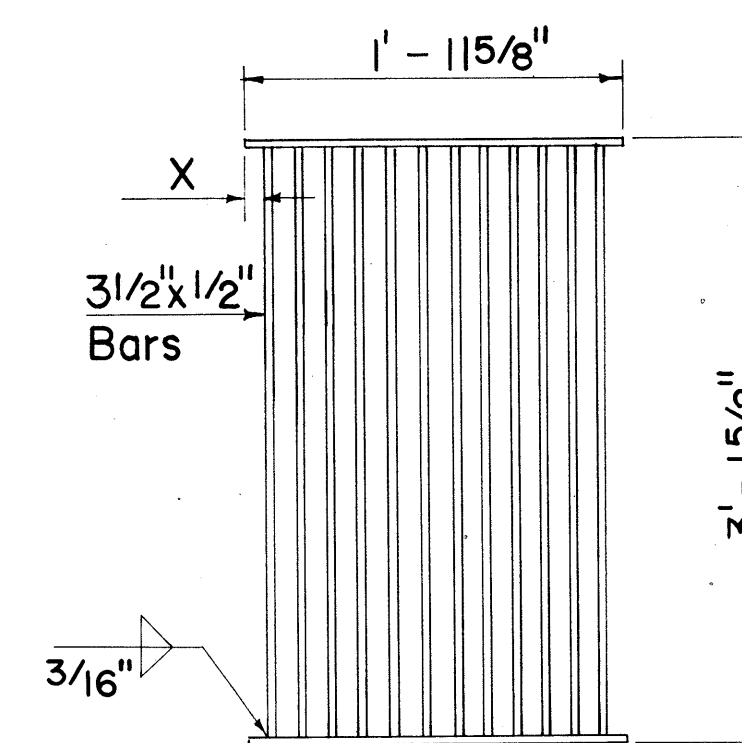


END OF BAR

Scale: 3" = 1' - 0"



SECTION



PLAN

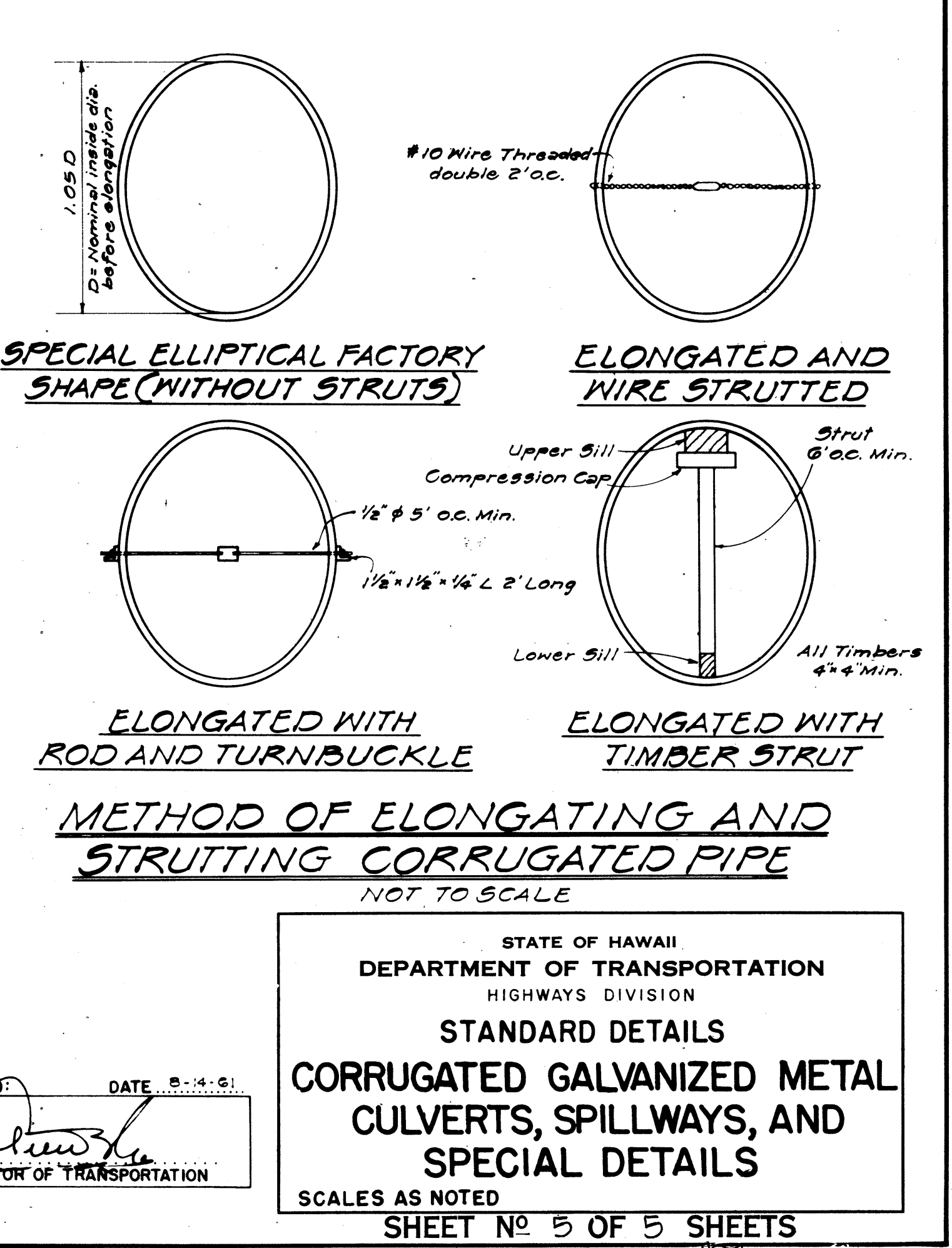
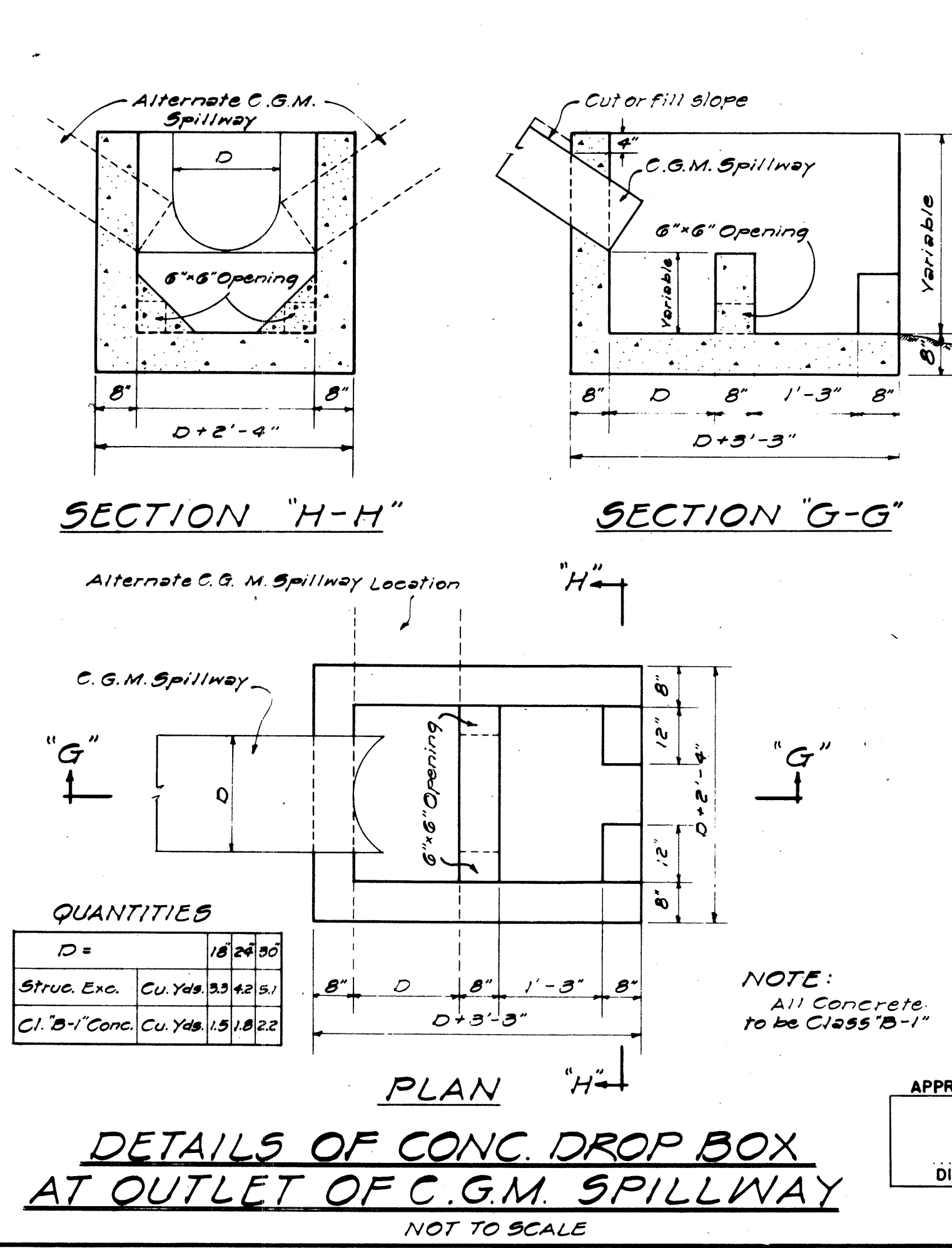
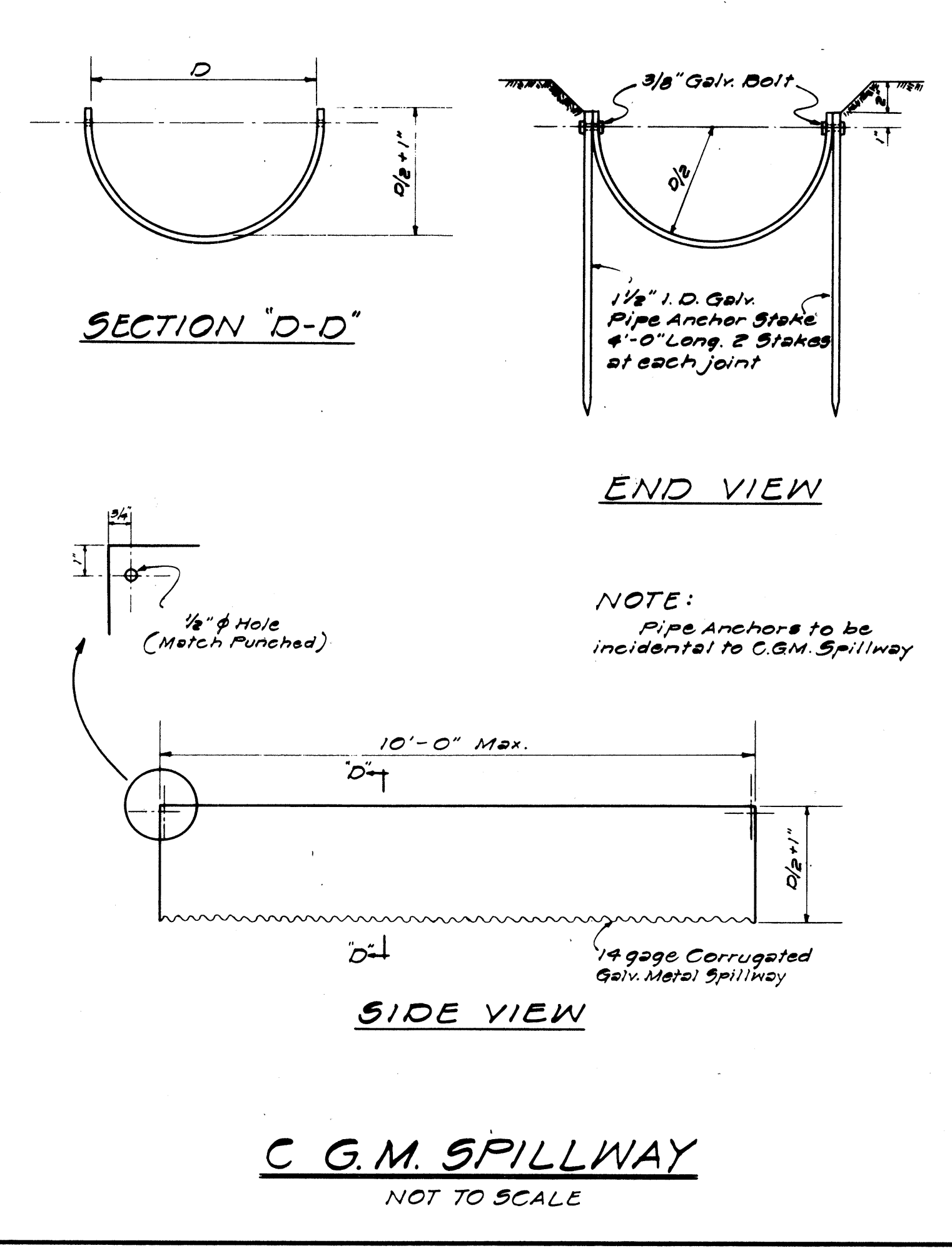
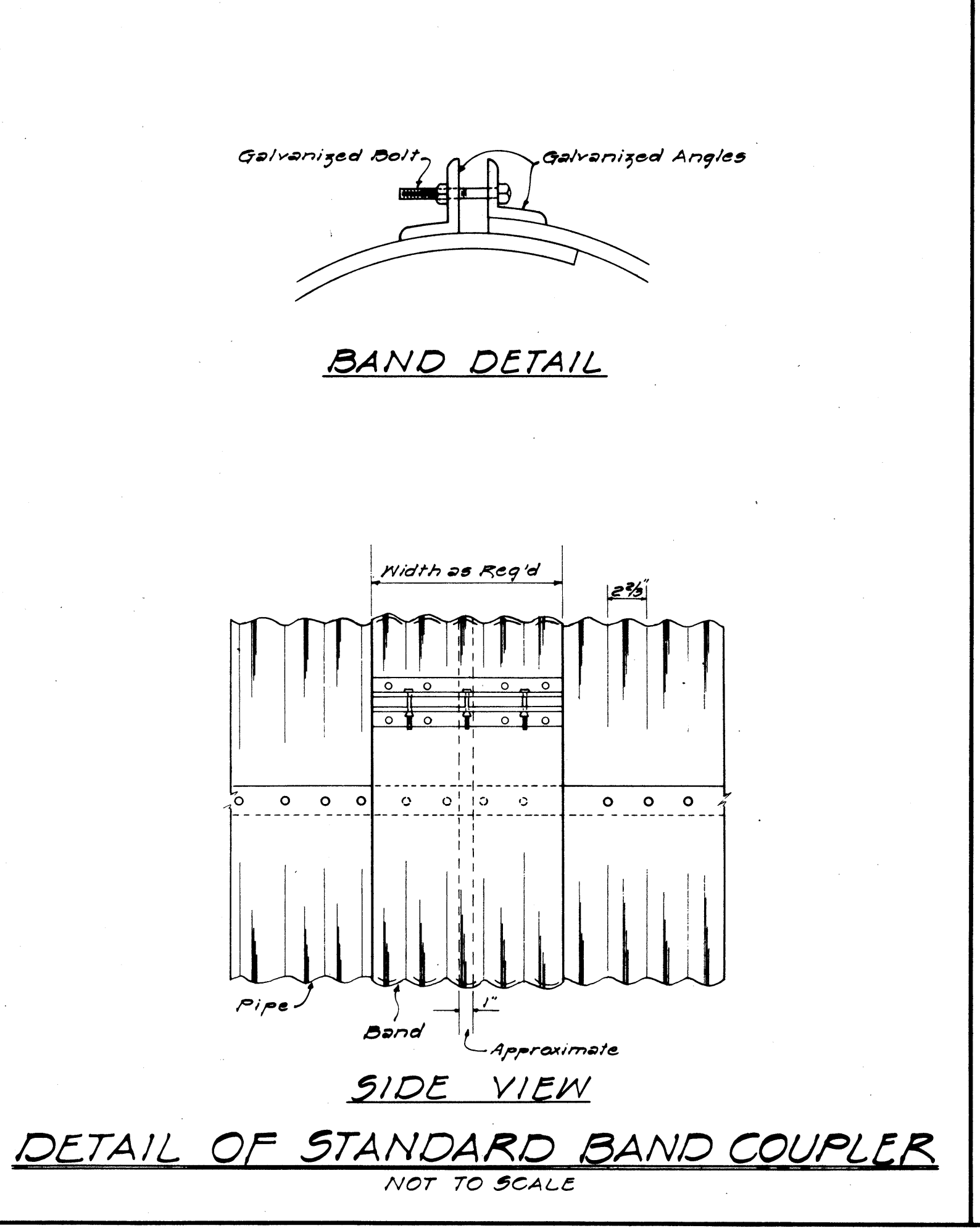
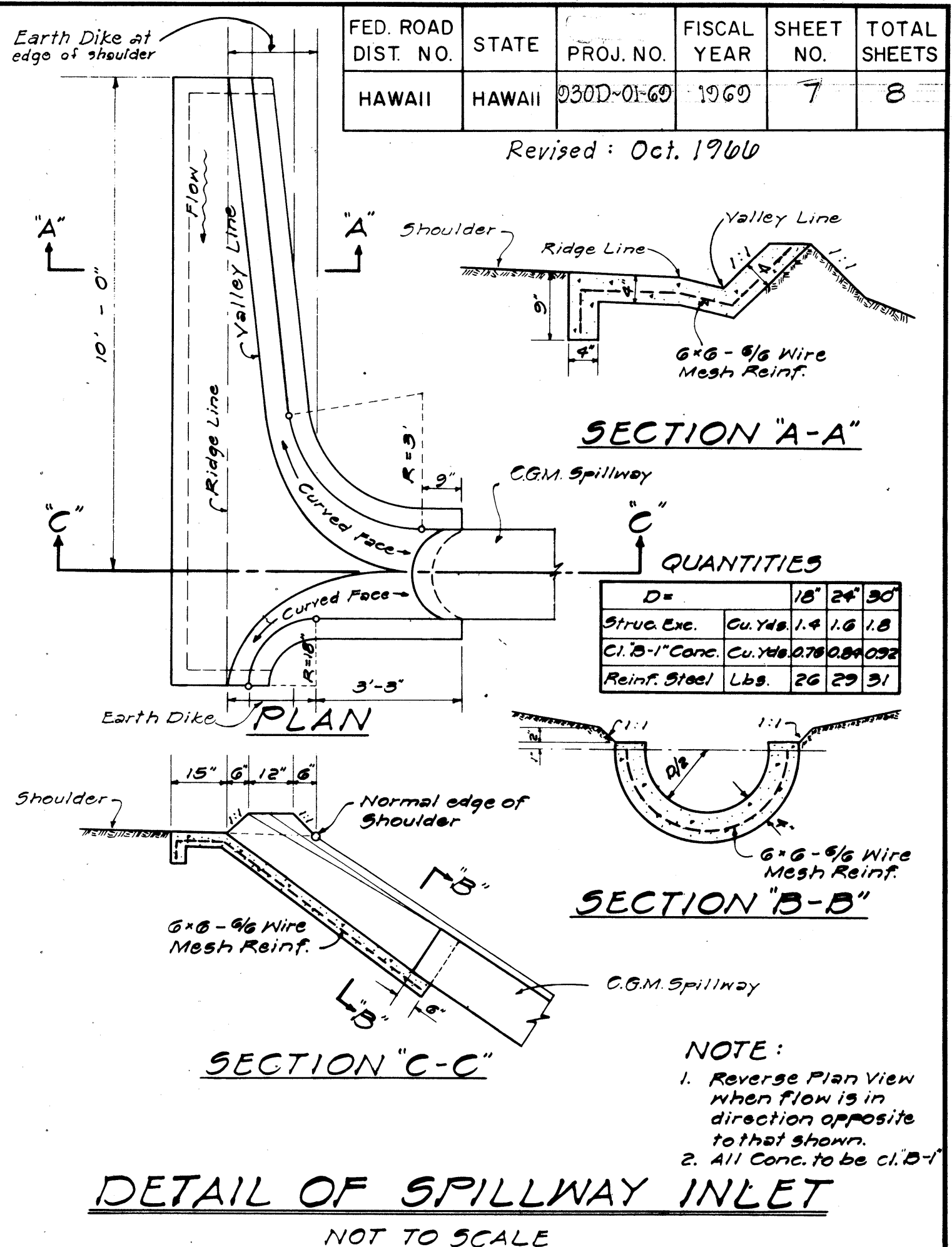
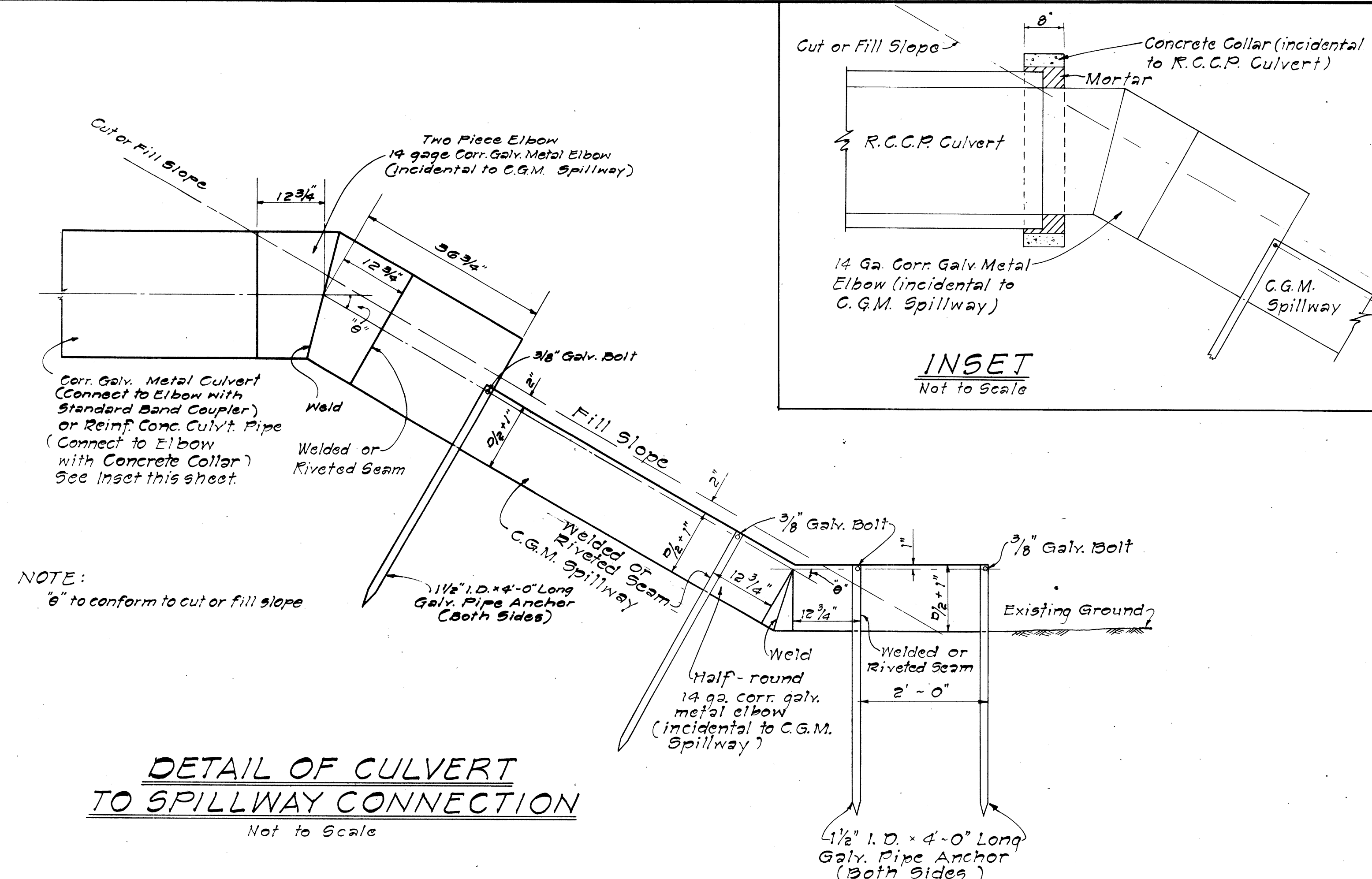
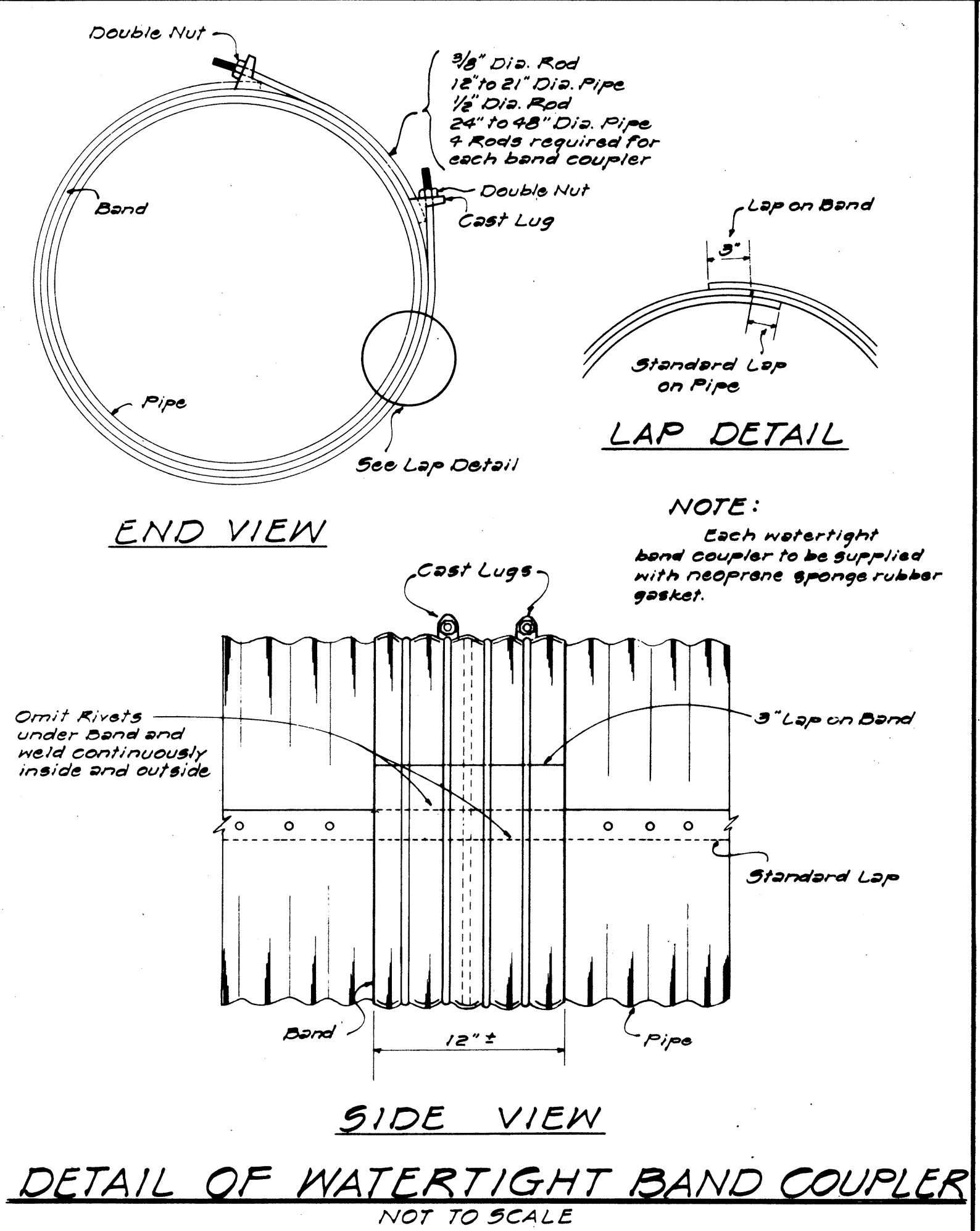
ALTERNATIVE WELDED GRATE

Scale: 1" = 1' - 0"

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
APPROVED BY	
NOTED BY	
NO.	

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

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.



DATE	BY	REVISION
5-24-64	Y	1
5-24-64	Y	2
5-24-64	Y	3
5-24-64	Y	4
5-24-64	Y	5
5-24-64	Y	6
5-24-64	Y	7
5-24-64	Y	8
5-24-64	Y	9
5-24-64	Y	10
5-24-64	Y	11
5-24-64	Y	12
5-24-64	Y	13
5-24-64	Y	14
5-24-64	Y	15
5-24-64	Y	16
5-24-64	Y	17
5-24-64	Y	18
5-24-64	Y	19
5-24-64	Y	20

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
CORRUGATED GALVANIZED METAL
CULVERTS, SPILLWAYS, AND
SPECIAL DETAILS
SCALES AS NOTED
SHEET NO 5 OF 5 SHEETS

APPROVED: *[Signature]*
DIRECTOR OF TRANSPORTATION