

GENERAL NOTES

- Wire Mesh Reinforcing shall be incidental to Class "B" Concrete or Shotcrete.
- All existing structures and culverts shall be demolished unless noted otherwise (incidental to roadway excavation)
- Contractor shall verify all cutoff ditch profile and provide positive drain.
- Location of spillways and Bituminous gutter in cut and fill sections are approximate and shall be verified in the field.
- Offset distances and elev. @ top of new drainage structures are approximate and shall be verified in the field by the contractor before construction.
- Where circular structural plate culvert is used, the vertical diameter shall be elongated as described in Section 603-Culverts and Storm Drains of the Standard Specification for Road and Bridge Construction.
- Whenever gages for corrugated metal pipes or pipe-arches are called for on the plans, the equivalent thickness in inches shall be used. The equivalents are as follows:
 14 Ga. = 0.079 inch 10 Ga. = 0.138 inch
 12 Ga. = 0.109 inch 8 Ga. = 0.168 inch

By C.C.O. # 22

Sta. -3+91 Lt. to Sta. -0+67.21 Lt.

Construct 1'-0" Conc. Ditch with Steel Frame
 1'-0" x 1'-0" Lined Trapezoidal Ditch
 (For details see sht. no. 43)
 Install B-38 or Borden or Gary or Irving
 Grates w/ Steel Frame
 (For detail see sht. no. 43)

ESTIMATED QUANTITIES

Ditch & Channel Exc. = 75 C.Y.
 Cl. "A" Conc. = 15 C.Y.
 Cl. "B" Conc. or Shotcrete = 137 L.F.
 Reinf. Steel = 2710 lbs.
 B-38 or Borden or Gary or Irving
 Grates with Steel Frame = 187 L.F.
 Structure Exc. = C.Y.
 24" Pipe Culvert = L.F.
 Construct Modified Drop Intake
 Install 24" C.M.P., 14 Ga.

Sta. -0+62.5 Lt.

Construct S.D.M.H.
 Connect existing 48" RCP
 to S.D.M.H.
 (For detail see sht. no. 45)

ESTIMATED QUANTITIES

Struct. Exc. = 28 C.Y.
 Cl. "A" Conc. = 8 C.Y.
 Reinf. Steel = 924 lbs.
 Type "A" C.I. Frame
 Cover = 1 Ea.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	36	153

Sta. -0+25

Construct Type "B" C.B.
 Connect to 8'x4' box culvert 4' Lt.
 Install 48" RCP 12 Ga.
 42" C.M.P. 12 Ga.

ESTIMATED QUANTITIES

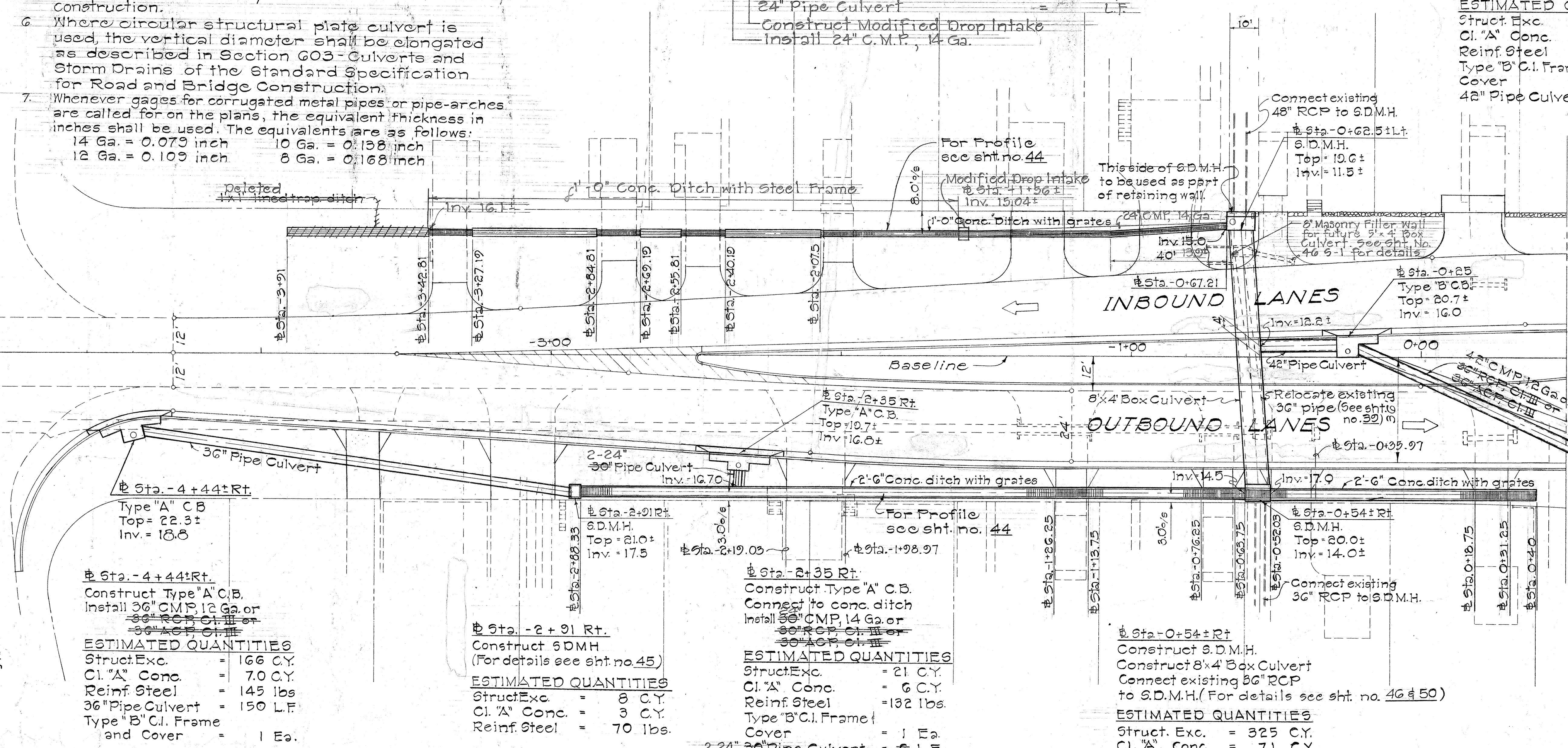
Struct. Exc. = 76 C.Y.
 Cl. "A" Conc. = 6 C.Y.
 Reinf. Steel = 108 lbs.
 Type "B" C.I. Frame
 Cover = 1 Ea.
 42" Pipe Culvert = 28 L.F.

BEGIN F.A.S. PROJECT NO. 5-0630 (10)
 BASELINE STA. -4+95.05

DRIVE

MIKIOLA

MATCH LINE @ STA. 0+50



Sta. -4+44 Rt.

Construct Type "A" C.B.
 Install 36" C.M.P. 12 Ga. or
 36" RCP 12 Ga. or
 36" ACP 12 Ga.

ESTIMATED QUANTITIES

Struct. Exc. = 166 C.Y.
 Cl. "A" Conc. = 7.0 C.Y.
 Reinf. Steel = 145 lbs.
 36" Pipe Culvert = 150 L.F.
 Type "B" C.I. Frame
 and Cover = 1 Ea.

Sta. -2+91 Rt.

Construct S.D.M.H.
 (For details see sht. no. 45)

ESTIMATED QUANTITIES

Struct. Exc. = 8 C.Y.
 Cl. "A" Conc. = 3 C.Y.
 Reinf. Steel = 70 lbs.

Sta. -2+88.33 Rt. to Sta. 0+40 Rt.

Construct 2'-6" Conc. Ditch w/ Steel Frame
 (For details see sht. no. 43)
 Install A-39 Grates
 Install Borden or Gary or Irving Grates
 (For details see sht. no. 43)

ESTIMATED QUANTITIES

Ditch & Channel Exc. = 373 C.Y.
 Cl. "A" Conc. = 93 C.Y.
 Reinf. Steel = 5403 lbs.
 Borden or Gary or Irving Grates
 with Steel Frame = 255 L.F.
 Type A-39 Steel Frame & Grates = 72 L.F.

Note: 2'-24" Pipe installed because
 of insufficient cover

Sta. -0+54 Rt.

Construct S.D.M.H.
 Construct 8'x4' Box Culvert
 Connect existing 36" RCP
 to S.D.M.H. (For details see sht. no. 46 & 50)

ESTIMATED QUANTITIES

Struct. Exc. = 325 C.Y.
 Cl. "A" Conc. = 71 C.Y.
 Reinf. Steel = 10,338 lbs.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

DETAIL PLAN OF DRAINAGE SYSTEM

Sta. -4+95.05 TO Sta. 0+50

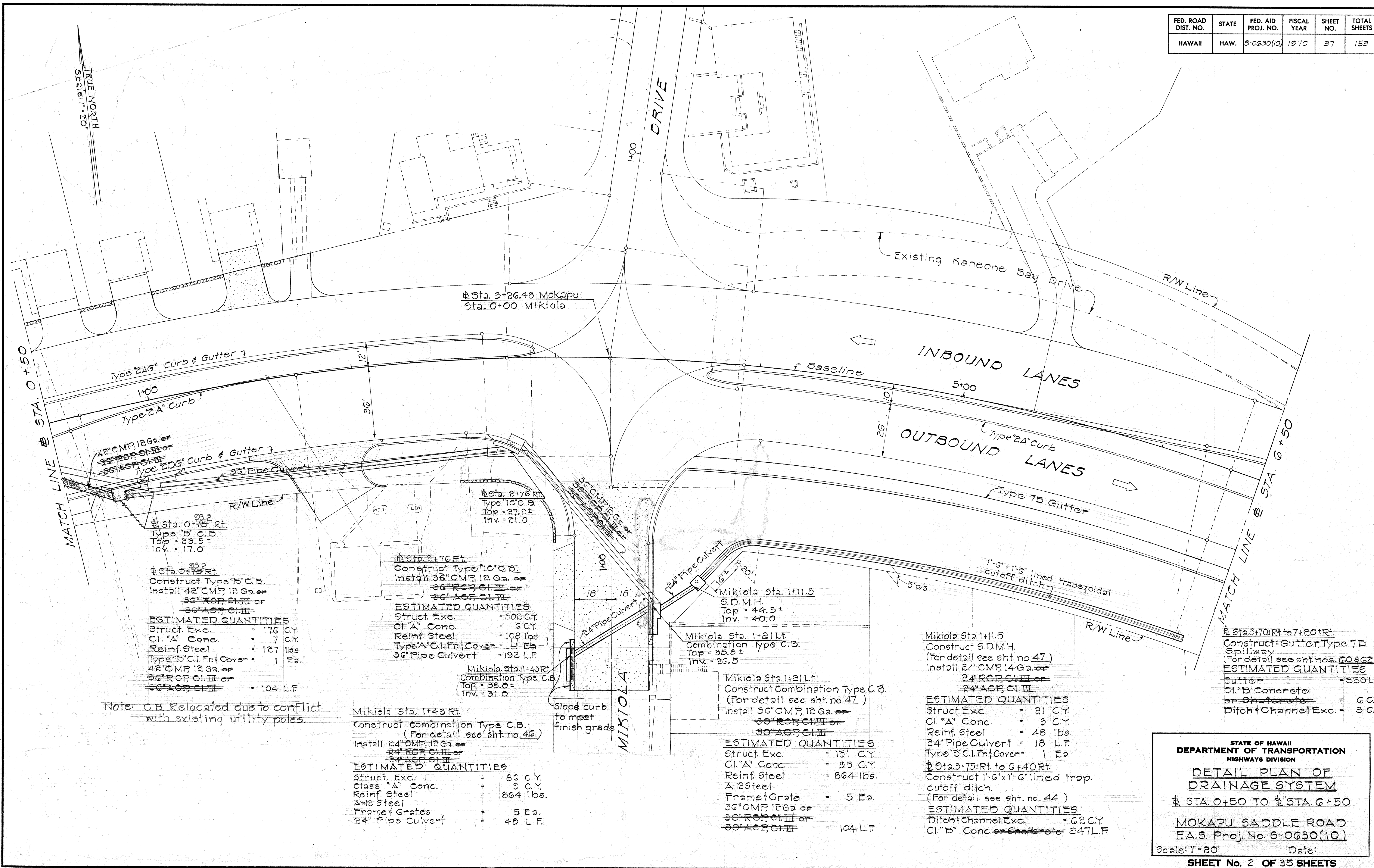
MOKAPU SADDLE ROAD
 F.A.S. Proj. No. 5-0630(10)

Scale: 1" = 20'

Date:

SHEET No. 1 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEET
HAWAII	HAW.	5-0630(10)	1970	37	153



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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETAIL PLAN OF
DRAINAGE SYSTEM

§ STA. 0+50 TO § STA. 6+50

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-OG30(10)

Scale: 1" = 20' Date:

SHEET No. 2 OF 35 SHEETS

\$62.7+25

Construct Type "C" C.B.

Install ~~24" CMP, 14 Ga. or~~
~~24" RCP, C.I. III or~~
~~24" ACP, C.I. III~~

ESTIMATED QUANTITIES

Struct. Exc.	= 116 C.Y.
C.I. "A" Conc.	= 6 C.Y.
Reinf. Steel	= 108 lbs.
Type "B" C.I. Frame	
Cover	= 1 Ea.
24" Pipe Culvert	= 86 L.F.

812.8+02 Lt.
Construct GIG14 Drop Intake
(For detail see sht. no. G8)
Install 24" CMP, 14 Ga.
ESTIMATED QUANTITIES
Struct. Exc. = 24 C.Y.
Cl. 'A' Conc. = 2 C.Y.
Reinf. Steel = 34 lbs
Type GIG14 Steel
Frame & Gate = 1 Ea.
24" Pipe Culvert = 22 L.F.

2 Sts. 10+43+95132 Lt
Construct S.D.M.H.
connect existing 18" RCP &
48" RCP to S.D.M.H.
Place ^{SOLE} GRP at opening of S.D.M.H.
(For details see sht. no. 49)

ESTIMATED QUANTITIES

Struct. Exc.	=	37 C.Y.
C.I. "A" Conc.	=	9 C.Y.
Reinf. Steel	=	1506 lbs.
Type "A" C.I. Frame		
Cover	=	1 Ea.
GRP	=	2 C.Y.
C.I. "B" Conc.	=	C.Y.

5+2.8±0.0L to Rd."A" Sta. 3+25
 Construct Gutter Type 7A
 (For detail see sht. no. 62)
ESTIMATED QUANTITIES
 Gutter = 527 L.F.

§ Sta. 7+75 Rt.
 Construct S.D.M.H.
 (For detail see sht.no.48)
 Install 42" CMP 12 Ga. or
~~42" RCP, C.I. III~~
ESTIMATED QUANTITIES
 Struct Exc = 94 CY.
 C.I."A" Conc. = 3 C.Y.
 Type "B" C.I. Frame &
 Cover = 1 Ea.
 42" Pipe Culvert = 60 L.F.

$R = 134 \text{ Mm}$
Nanamoena Sta. 1+16 Rt.
 Type "B" C. B.
 Top = 22.2±
 Inv = 17.0

Nanamoena Sta. 1+70 Rt.
 Combination Inlet C.B.
 Top = 24.8±
 Inv = 18.0

Station: 2+08.5% 118
 Inv. = 15.66
 44" Pipe Culvert
 S.Y.
 Name
 Cont
 Top
 Inv

St. 1
Sta. 9+66.75 St.
S.D.M.H.
Top = 20.0±
Inv. = 11.0±
moana Sta. 1+70 L±
pination Inlet C.B.
24.8±
15.0
Nanamoana Sta. 1+70 L±
Construct Combination Inlet C.B.

8 Sts. 0+66 to 9+91 R.T.
 Construct S.D.M.H. connect
 existing 36" RCF to S.D.M.H.
 (For details see sht. no. 49)
 Install 72" CMB 10 Ga. or
 72" Structural Plate Pipe 10
ESTIMATED QUANTITIES
 Struct. Exc. = 613 C.Y.
 Cl. "A" Conc. = 9.5 C.Y.
 Reinf. Steel = 1268 lbs.
 Type "A" C.I. Frame +
 Cover = 1 Ea.
 72" Pipe Culvert = 234 L.F.

Stn. 9+66 ± Rt. to Stn. 14+50 ± Rt.
Construct 2x2 lined trapezoidal
cutoff ditch (For detail see sht. no. 44)

ESTIMATED QUANTITIES

Ditch & Channel Exc. = 214 CY
Cl. "B" Conc. or Shotcrete = 40 GL. F.

Stn. 8+75 ± Rt. to Stn. 11+02 ± Rt.

1. 9' x 11' + 03'
 Construct Type 'A' C.B.
 Install 24" RCB Cl. III or
~~34" ACB Cl. III~~
ESTIMATED QUANTITIES
 Struct. Exc. = 119 C.Y.
 Cl. "A" Conc. = 6 C.Y.
 Reinf. Steel = 145 lbs.
 Type "B" C.I. Frame
 & Cover = 1 Ea.
 24" Pipe Culvert = 160 L.F.

Stn 6+90 Rt. to Stn 7+75 Rt.
Construct 1'-6" x 1'-6" lined
trapezoidal cutoff ditch
(For detail see sht. no. 44)
ESTIMATED QUANTITIES
Ditch & Channel Exc. = 20 C.Y.
Cl. "B" Conc. Shotcrete = 85 L.F.

ESTIMATED QUANTITIES

Struct. Exc.	=	84 C.Y.
C.I. "A" Conc.	=	4 C.Y.
Reinf. Steel	=	108 lbs.
Type "B" C.I. Frame		
Cover	=	1 Ea.
42" Pipe Culvert	=	56 L.F.

Nanamoana Sta. 1+70 Rt.
Construct Combination Inlet CB
(For details see sht. no. 46)
Install 42" CMP 12 Ga. or
~~42" RCP Cl. III~~
ESTIMATED QUANTITIES
Struct. Exc. = 88 C.Y.
Cl. "A" Conc. = 11 C.Y.

ESTIMATED QUANTITIES	
Struct. Exc.	= 341 C.Y.
Cl."A" Conc.	= 14 C.Y.
Reinf. Steel	= 1906 lbs.
12 Steel Frame Grates	= 6 Ea.
72" Pipe Culvert	= 108 L.F.
Bed Course Material for Culvert	= 35 C.Y.

8 St. 8:75 Rt.
 Construct GIG4 Drop Intake
 Make Connection to 72" Pipe Culvert
 (for detail see ent. no. 59)
 Install 24" CMP 14Ga.

ESTIMATED QUANTITIES
 Struct. Exc. = 103 C.Y.
 C.I. (A) Conc. = 2 C.Y.

Gutter 2827 LF
CHIEF Clerk, Birmingham City
Birmingham City

DETAIL PLAN
DRAINAGE SYSTEM
電 STA. 6+50 TO 電 STA.
MOKAPU SADDLE R.
 EAS Proj. No. S-0630

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETAIL PLAN OF
DRAINAGE SYSTEM

§ STA. 6+50 TO § STA. 12+75

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(10)

Scale: 1"=60' Date:

SHEET No. 3 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	39	153

Road 'A' Sta. 3+11 to Sta. 5+78
Construct 2'x2' unlined trapezoidal (For Detail see this sht.)
cutoff ditch, 6 Std CRM Headwalls
Remove clean and relay relocated 30" pipe culvert
Remove clean and relay relocated 36" pipe culvert

ESTIMATED QUANTITIES
Struct. Exc. = 80 C.Y.
Ditch & Channel Exc. = 135 C.Y.
CRM = 18 C.Y.
Relocated 30" Pipe Culvert = 44 L.F.
Relocated 36" Pipe Culvert = 48 L.F.

S.D. CURVE DATA
Δ = 18°02'00"
R = 315.00
T = 49.99
L = 99.16

Road 'A' Sta. 3+25
Construct 61614 Drop Intake
(For detail see sht. no. 68)
Install 24" CMP 14 Ga. or 24" RCP, Cl. III or
24" ACP, Cl. III
ESTIMATED QUANTITIES
Struct. Exc. = 64 C.Y.
Cl. 'A' Conc. = 2 C.Y.
Reinf. Steel = 34 lbs.
Type 61614 Steel
Frame & Grate = 1 Ea.
24" Pipe Culvert = 96 L.F.

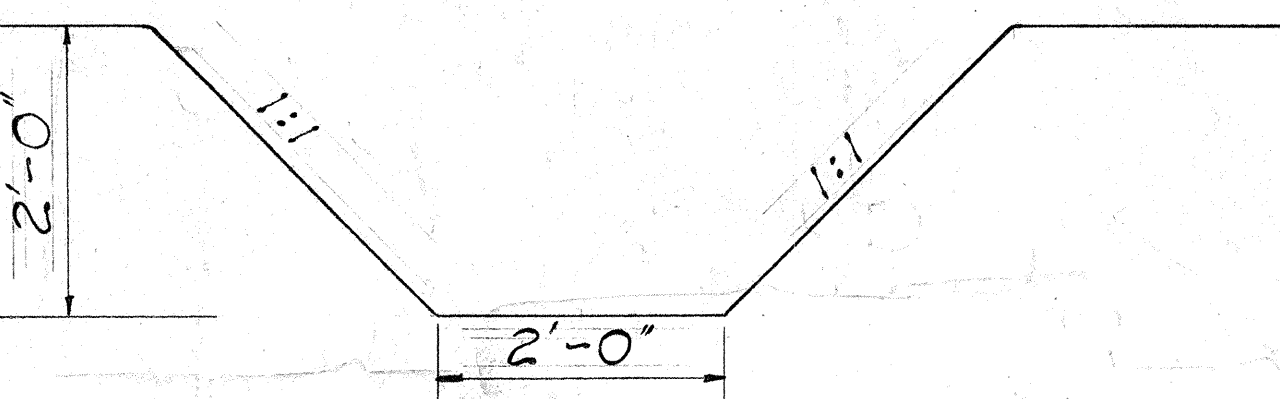
S.D. Sta. 3+08 to 4+68
Construct 8.0'x5.0' Box Culvert
(For details see sht. no. C.O.52)
ESTIMATED QUANTITIES
Struct. Exc. = 47 C.Y.
Cl. 'A' Conc. = 139 C.Y.
Reinf. Steel = 19,600 lbs.

S.D. Sta. 1+59 to 2+00
Construct 8'x4' Box Culvert
(For detail see sht. no. 50)
ESTIMATED QUANTITIES
Struct. Exc. = 12 C.Y.
Cl. 'A' Conc. = 31 C.Y.
Reinf. Steel = 4807 lbs.

Kaimalu Pl. Sta. 1+88.20 L+Rt
Construct 2 Grated C.D.I.
(For detail see sht. no. 50 & 51)
ESTIMATED QUANTITIES
Cl. 'A' Conc. = 1 C.Y.
Type A-12 Grate
with Frame = 2 Ea.

TRUE NORTH
Scale: 1" = 20'

Deleted Road 'A' Sta. 5+78
Std. CRM Headwall
Set invert to
existing ditch
Extended Re-
located 36" pipe
culvert to Sta. 5+50+



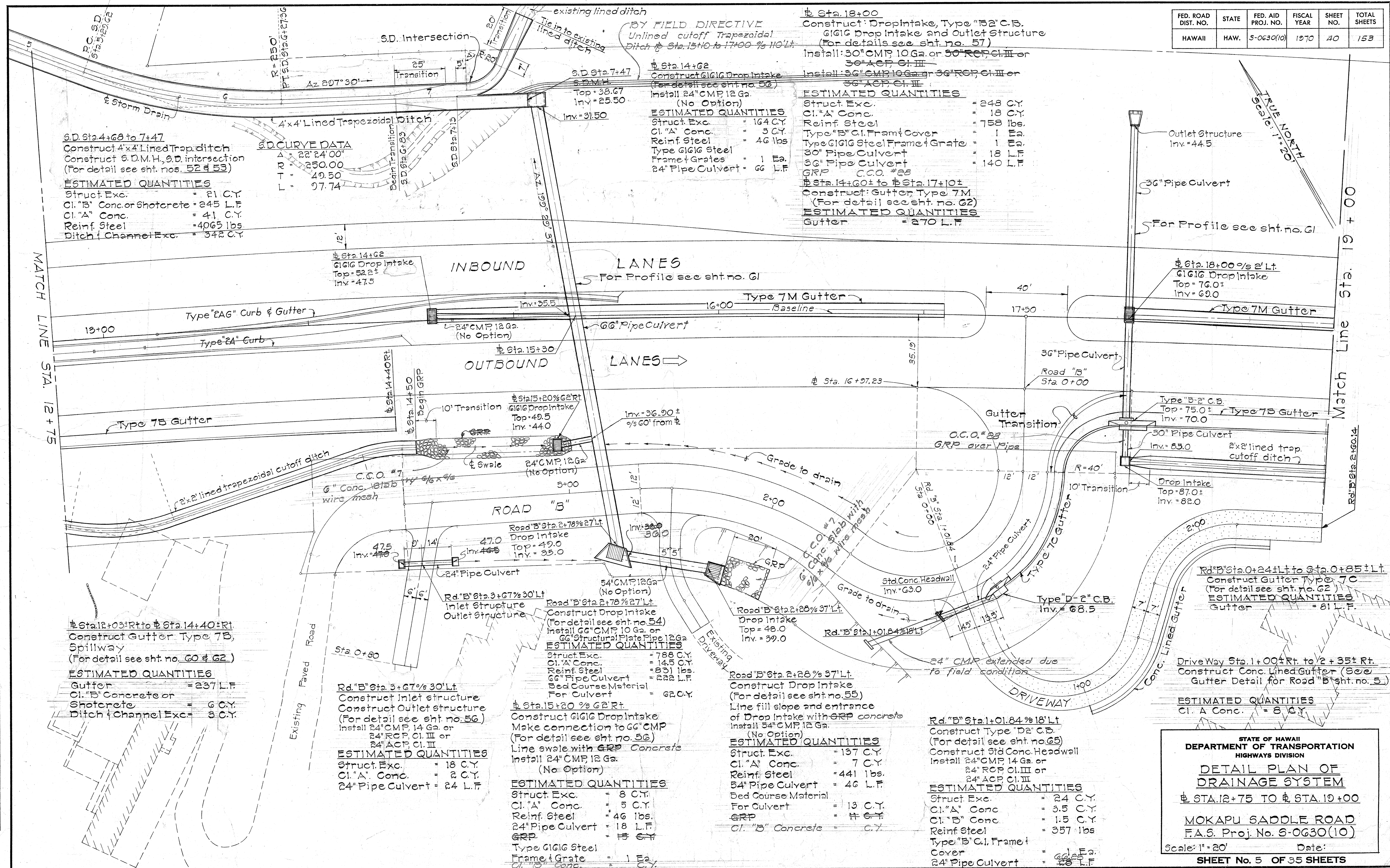
Typical 2'x2' Unlined Trap
Cutoff Ditch
Scale: 3/4" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
**DETAIL PLAN OF
DRAINAGE SYSTEM**
ROAD "A"

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)
Scale: 1" = 20' Date: June, 1972

SHEET No. 4 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	40	153



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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DETAIL PLAN OF
DRAINAGE SYSTEM

§ STA. 12+75 TO § STA. 10+00

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(10)

Scale: 1" = 20' Date:

SHEET No. 5 OF 35 SHEETS

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

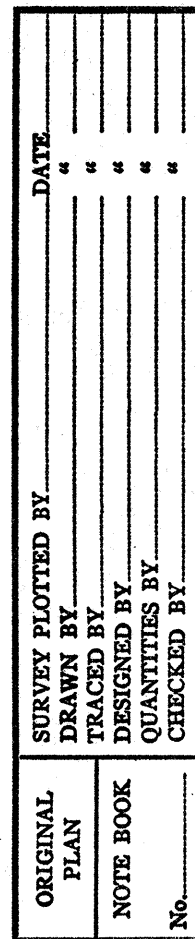
DETAIL PLAN OF
DRAINAGE SYSTEM

§ STA. 19+00 TO § STA. 24+00

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(10)

Scale: 1" = 20' Date: _____

SHEET NO. 6 OF 35 SHEETS



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	6-0630(10)	1970	42	153

TRUE NORTH
Scale: 1" = 50'

Sta. 17+00 to Sta. 31+75
Construct: Gutter Type 7M
(For detail see sht. no. 62)
ESTIMATED QUANTITIES
Gutter = 1385 L.F.

Sta. 26+75 Lt. to Sta. 31+75 Lt.
Construct: Gutter Type 7B
Spillway.
(For detail see sht. nos. 60 & 62)
ESTIMATED QUANTITIES
Gutter = 500 L.F.
Cl. "B" Concrete or Shotcrete = 6 C.Y.
Ditch Channel Exc. = 3 C.Y.

Sta. 25+60 % 52' Lt.
Type "X" Drop Intake
Top = 130.00 ±
Inv. = 124.0

Sta. 25+25.5 % 58' Lt.
Std. Conc. Headwall
Inv. = 123.4

36" Pipe Culvert

For Profile see sht. no. 61

Sta. 25+85 % 80' Rt.
Drop Intake
Top = 129.5 ±
Inv. = 123.0

GRP over pipe
by CCO #28
30" Pipe Culvert
Inv. = 126.0

Sta. 25+85 Rt.
Type "A-2" C.B.
Top = 130.8 ±
Inv. = 124.5

Existing 2x2 cutoff ditch
For Details see sht. no. 61

Sta. 24+75 Rt. to Sta. 25+80 Rt.
Construct 2x2 lined trapezoidal
cutoff ditch
(For details see sht. no. 44)

ESTIMATED QUANTITIES
Ditch Channel Exc. = 63 C.Y.
Cl. "B" Concrete or Shotcrete = 160
Shotcrete = 55 L.F.

Sta. 25+60
Construct: Type "A-2" C.B., Drop
Intake, Type "X" Drop Intake
Std. Concrete Headwall
2x2 lined trap. cutoff ditch
(For details see sht. nos. 44, 58 & 59)

Install 30" RCP, Cl. III or
30" ACP, Cl. III
Install 36" RCP, Cl. III or
36" ACP, Cl. III

ESTIMATED QUANTITIES
Struct. Exc. = 285 C.Y.
Cl. "A" Conc. = 135 C.Y.
Cl. "B" Conc. = 3 C.Y.
Cl. "B" Conc. or Shotcrete = 14 L.F.
Reinf. Steel = 449 lbs
30" Pipe Culvert = 56 L.F.
36" Pipe Culvert = 112 L.F.
Type "A" C.I. Frame
and Cover = 1 Ea.
Type "X" Steel Frame
and Grates = 1 Ea.
Ditch Channel Exc. = 3 C.Y.

Sta. 25+85 ± Rt.
G.R.P. CCO #28

END F.A.S. PROJECT NO. 5-0630(10)
BEGIN F.A.S. PROJECT NO. 5-0630(11)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

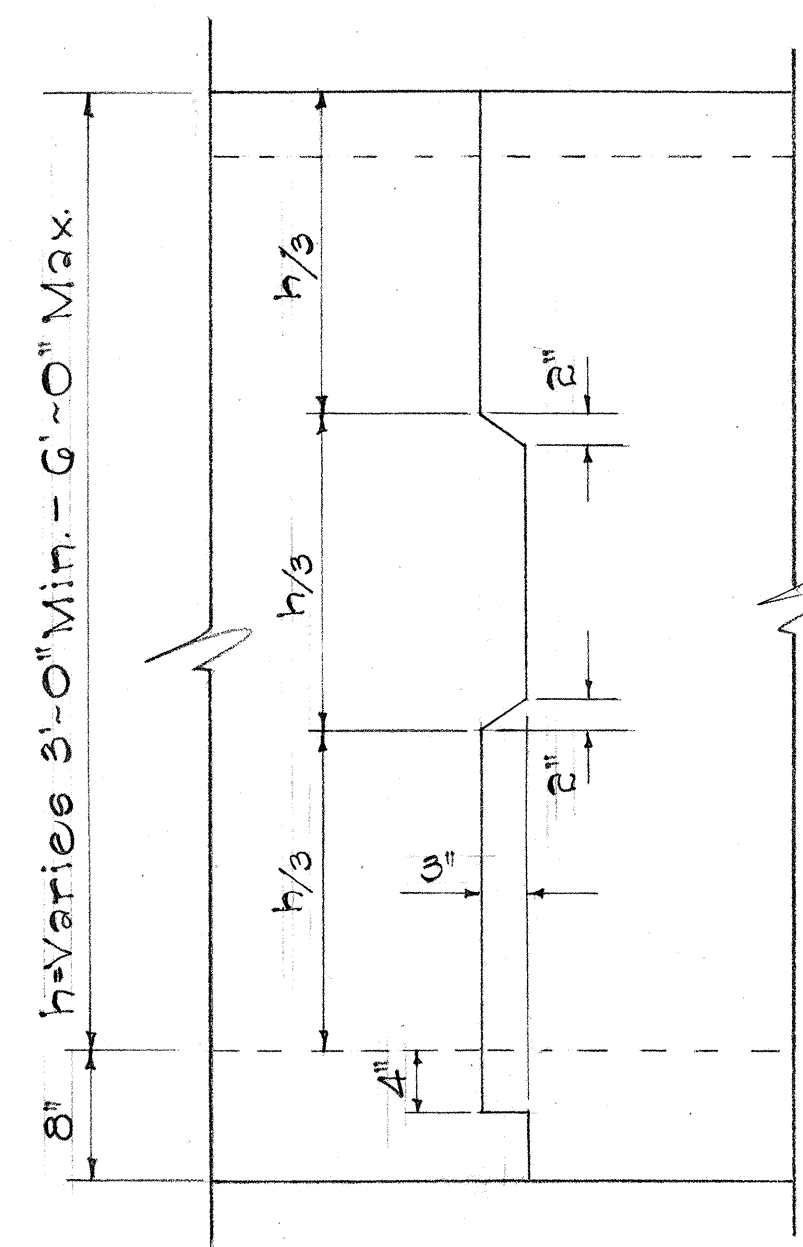
**DETAIL PLAN OF
DRAINAGE SYSTEM**

Sta. 24+00 TO Sta. 31+75

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)

Scale: 1" = 50' Date:

SHEET No. 7 OF 35 SHEETS

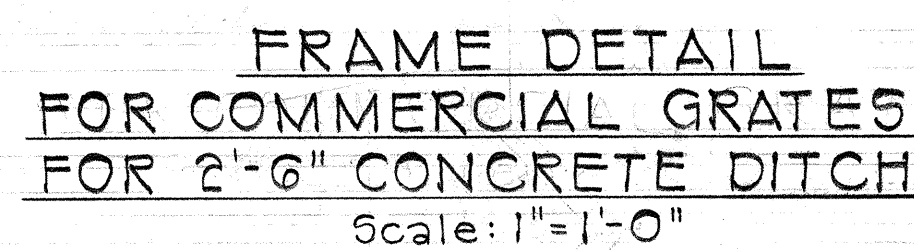


CONSTRUCTION JOINT
SPACED @ 30' o.c.
Scale: 1" = 1'-0"

2" x 1 1/2" x 1/4" L

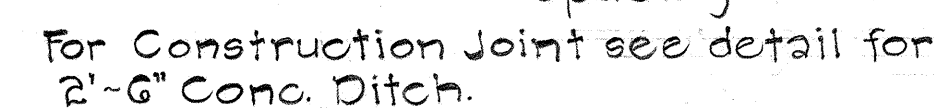
2"

1/2" ϕ Anchor
See Detail "A"



SPACING AND LOCATION TABLE

DETAIL OF 2'-6" CONC. DITCH AND STEEL FRAME & GRATE
AT STA. -2+88.33 RT. TO STA. 0+40 RT.



DETAIL OF 1'-0" CONC. DITCH
AT STA.-2+07± LT. TO STA.-0+67± LT.
Scale: 1" = 1'-0"

Technical drawing of a rectangular grate assembly. The drawing shows a rectangular frame with vertical bars. The top horizontal bar is labeled $1\frac{1}{2}" \times \frac{3}{16}"$ Banding Bar. The bottom horizontal bar is also labeled $1\frac{1}{2}" \times \frac{3}{16}"$ Banding Bar. The vertical bars are labeled $1\frac{1}{2}" \times \frac{3}{16}" \times 1'-2\frac{3}{4}"$ Grate Bars. The overall width is labeled "A" and the overall height is labeled $1'-2\frac{3}{4}"$. A detail view on the right shows a cross-section of a bar with a diameter of $\frac{3}{16}"$ and a spacing of $3"$.

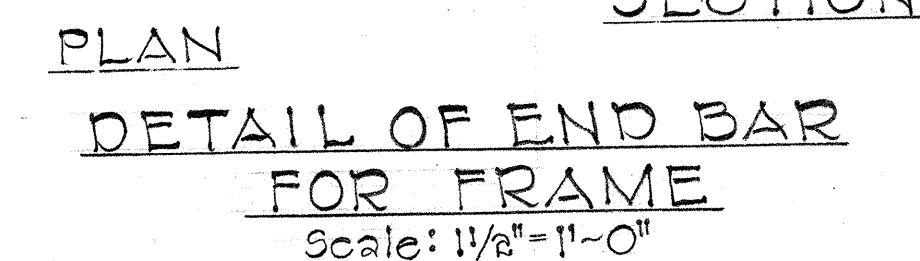
TYPE OF GRATE	NO. BARS	"A"-LENGTH OF GRATE	"B"-CLEAR BAR SPACING
B-38	38	3' ~ 1 3/16"	13/16"
Borden Type "B" Size no.8	32	3' ~ 1"	1"
Gary Type GW 150	32	3' ~ 1"	1"
Irvine Type A A	32	3' ~ 1"	1"

Hand-drawn plan view of a driveway area. The drawing includes a north arrow pointing towards the top right. A scale bar on the left indicates a distance of 8'-0". The plan shows a driveway area with a 1'x1' lined trap ditch and a 1'-0" conc. ditch. A steel grate is located in the center of the driveway area. The drawing is labeled 'PLAN' at the bottom.

SECTION "A ~ A"

SECTION "B-B"

DETAILS OF 1'-0" CONC DITCH IN DRIVEWAY AREAS
AND 1'-0" x 1'-0" LINED TRAPEZOIDAL DITCH
Scale: 1" = 1'-0"



Hand-drawn cross-section diagram of a concrete slab with a steel frame and grate. The diagram shows a central rectangular opening with a grate on top. The opening is 1' 0" wide and 1' 0" high. The concrete slab is 6" thick. The steel frame is 1' 3/4" wide and 6" high. The concrete slab is labeled "Cl. 1" Conc." and the steel frame is labeled "Steel Frame & Grate". The grate is labeled "#4 @ 18 both ways".

DETAIL "A"
Scale: 3" = 1'-0"

- ### GENERAL NOTES FOR GRATES
- | | |
|--|---|
| <ol style="list-style-type: none">1. Refer to Spacing and Location Table for Grate dimension.2. Grates and Frame shall be hot dip galvanized after fabrication, see specifications.3. The Grate/Frame materials shall conform to the specifications of ASTM Designation Structural Steel A283, Grade D and the Standard Specifications.4. Borden, Gary or Irving Grates with banding bars can be used as option in place of B-38 Grates between Sta.-2+07: Lt. to Sta.-0+67: Lt. (See Spacing Table)5. Borden, Gary or Irving Grates with banding bars to be used between driveways (See Spacing and Location Table) between Sta.-2+88.33 Rt. to Sta. 0+40 Rt. | <ol style="list-style-type: none">6. The banding bars shall be the same size as grate bars for A-38 and B-38 Steel Grate.7. The Contractor shall leave a maximum spacing of $\frac{1}{8}$" between grates.8. The quantity of grates required shall be paid for in linear feet. The estimated linear feet of grates required are approximate and shall be verified by the contractor. |
|--|---|

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

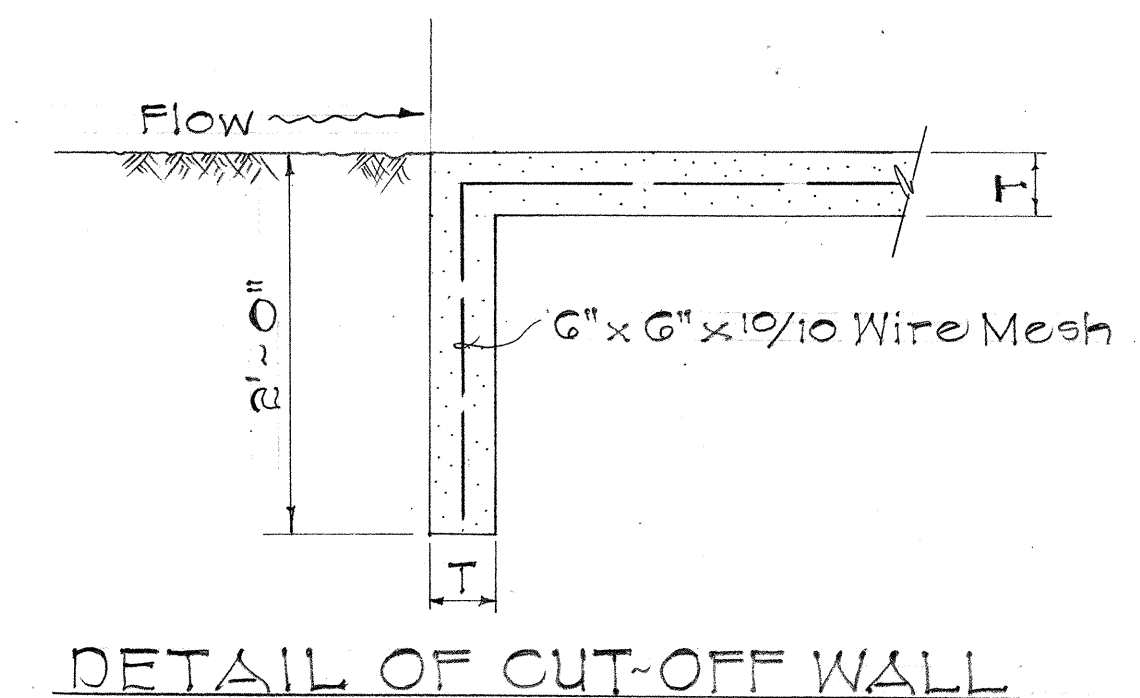
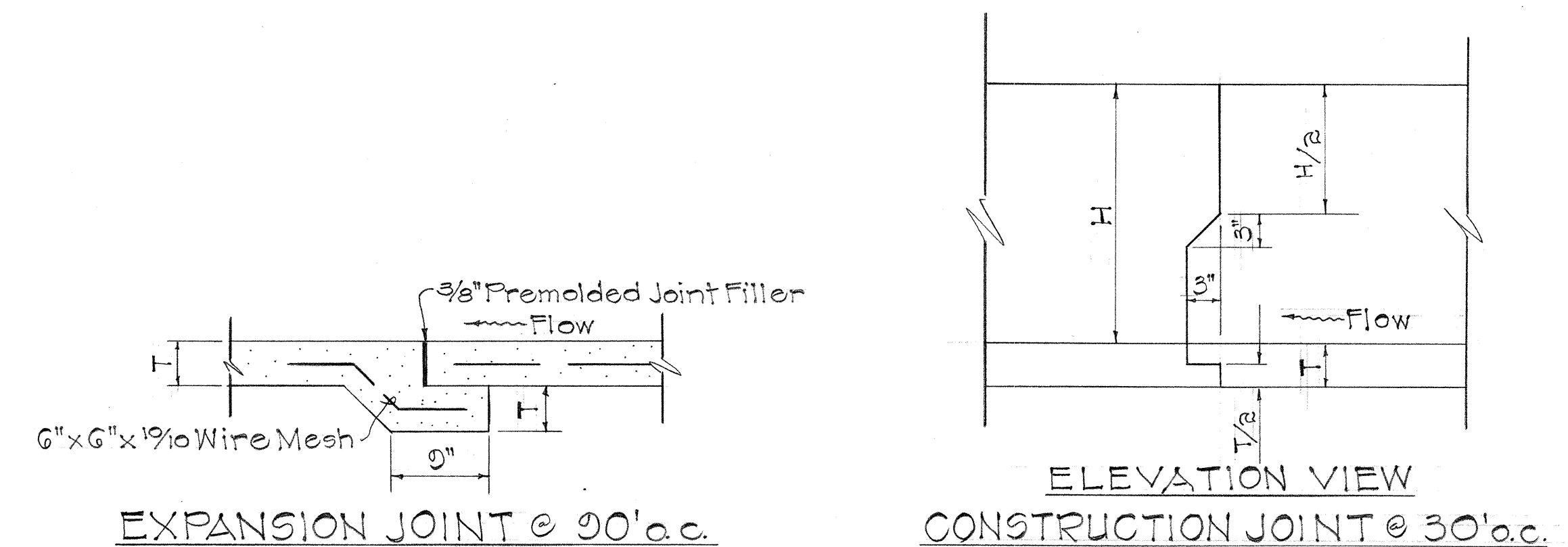
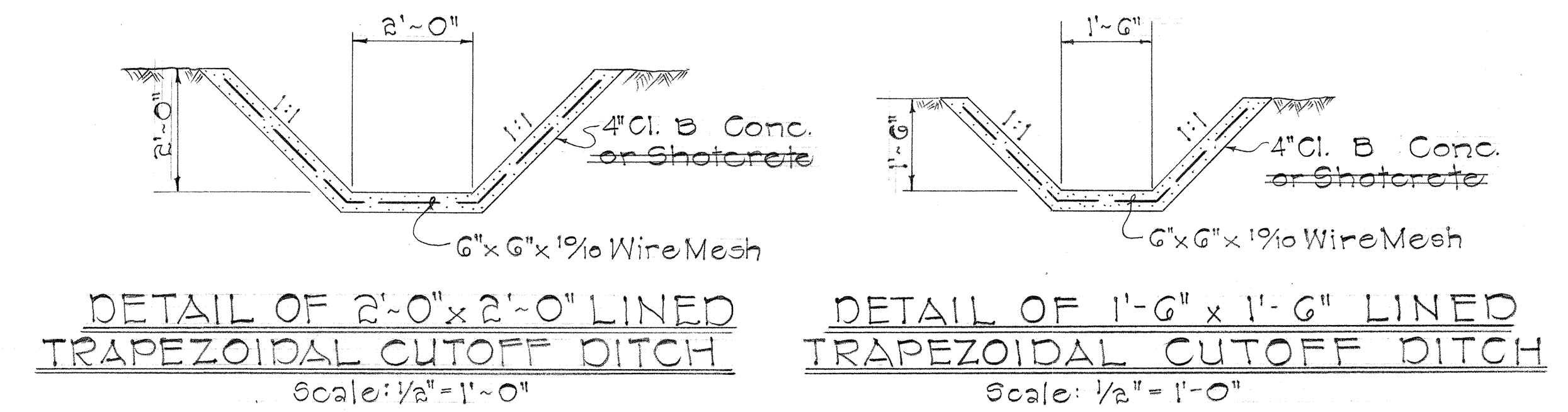
DETAILS OF 2'-6" & 1'-0" CONG. DITCH
AND STEEL FRAMES & GRATES

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-OG30 (10)

Scale: As Shown Date:

SHEET No. 8 OF 35 SHEETS

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



DETAIL OF CUT-OFF WALL
TYPICAL DETAILS FOR TRAPEZOIDAL LINED
DITCHES
Scale: 1" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

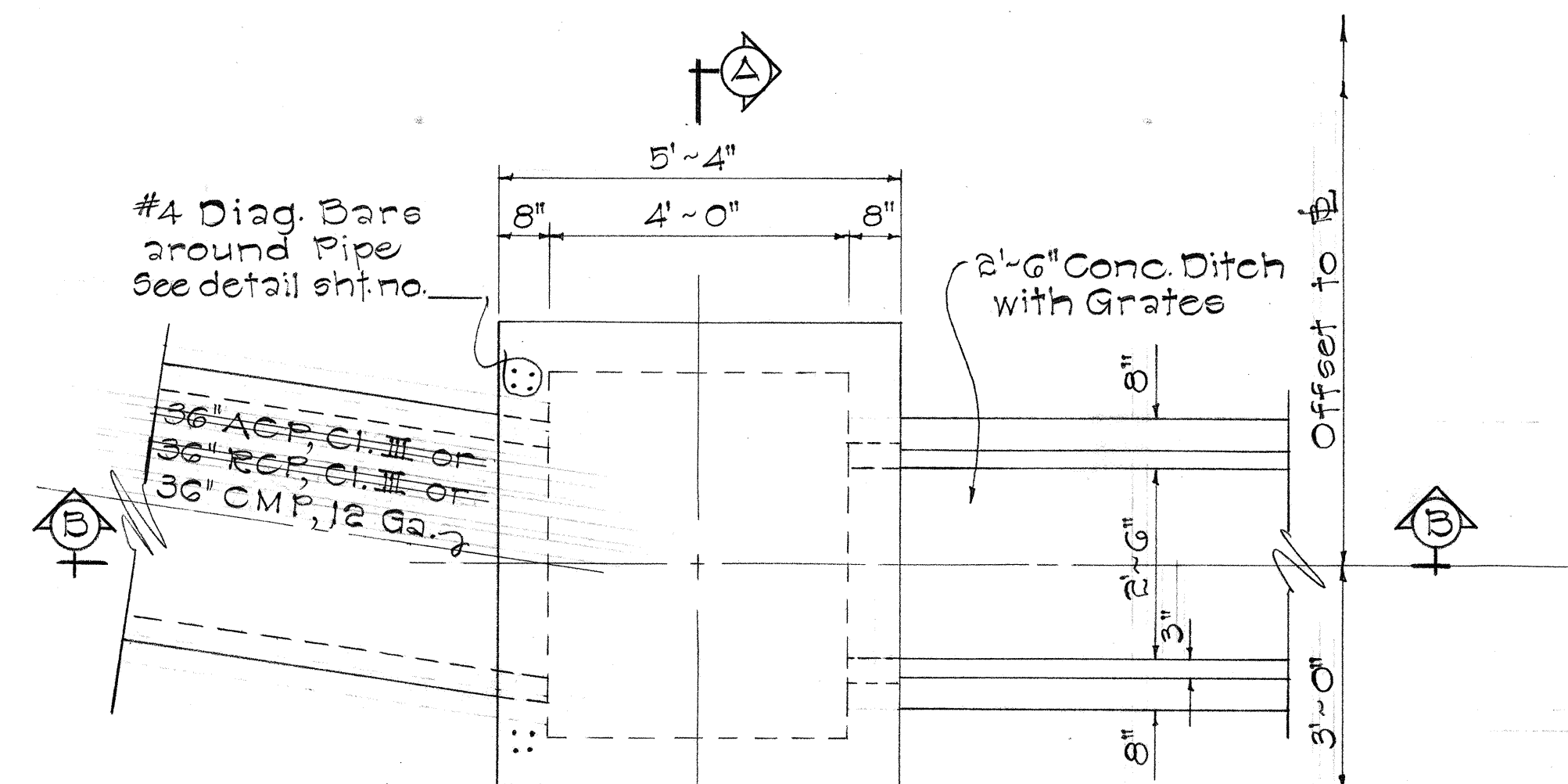
PROFILE OF 1'-0" & 2'-6" CONC. DITCHES,
DETAILS OF TRAPEZOIDAL LINED DITCHES

MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(10)

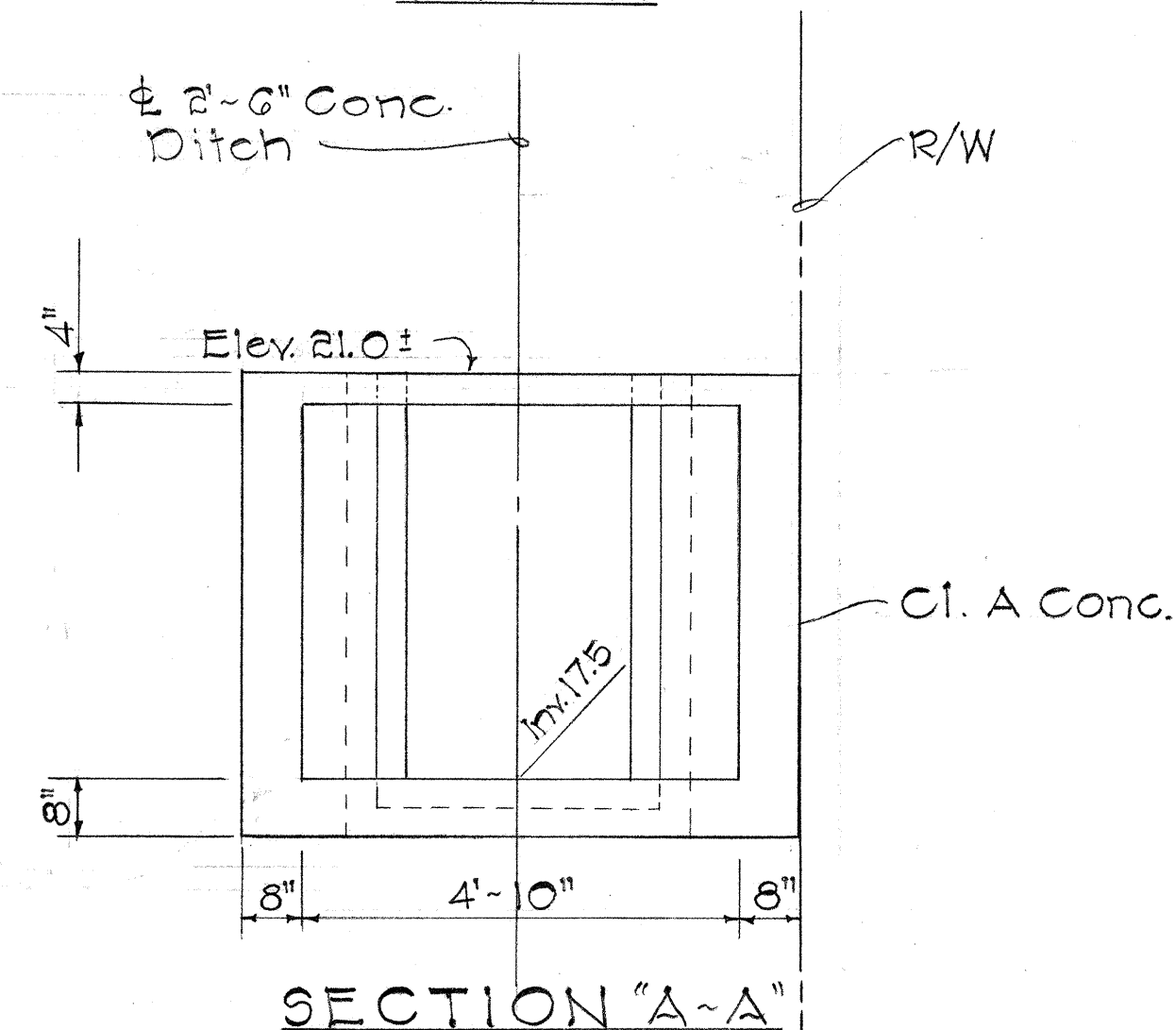
Scale: As Shown Date:

SHEET No. 9 OF 35 SHEETS

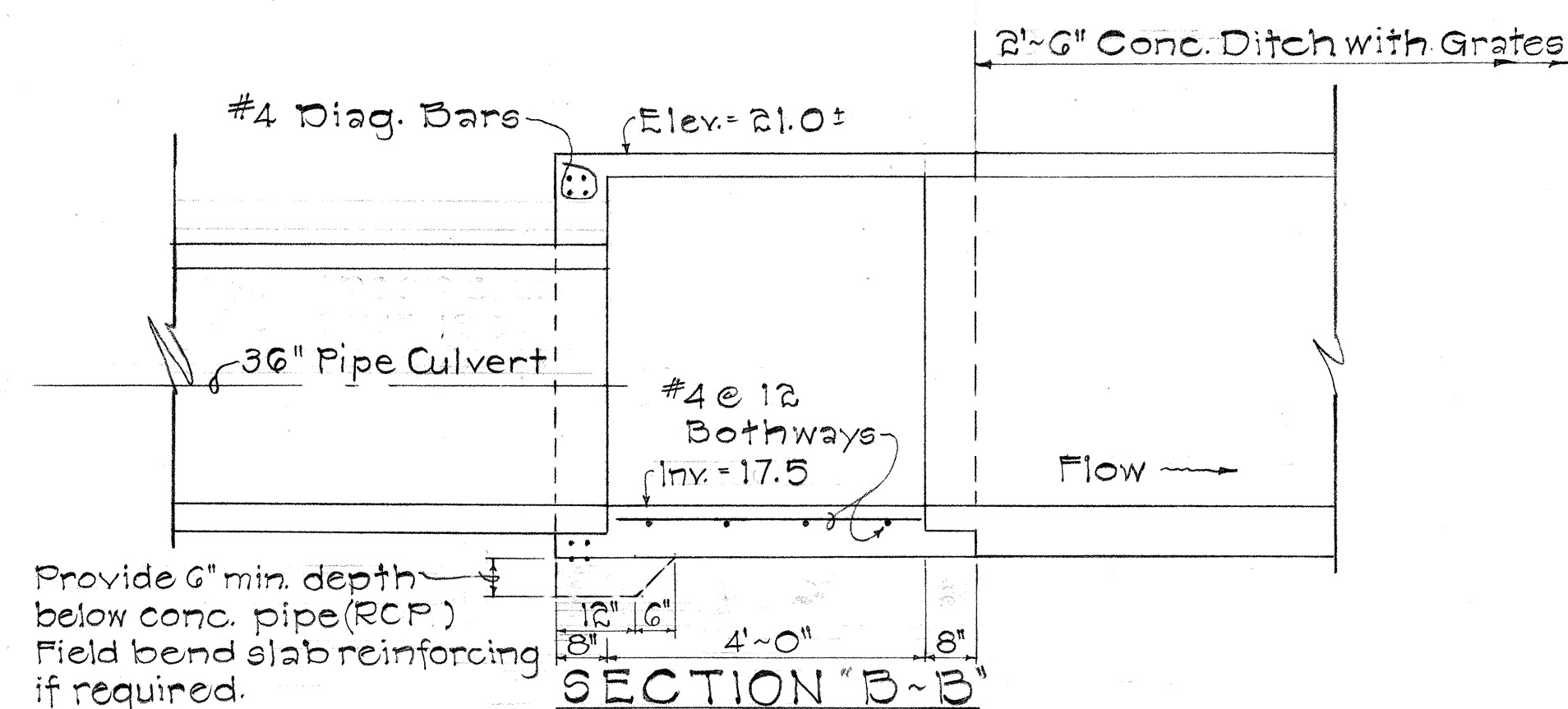
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	45	153



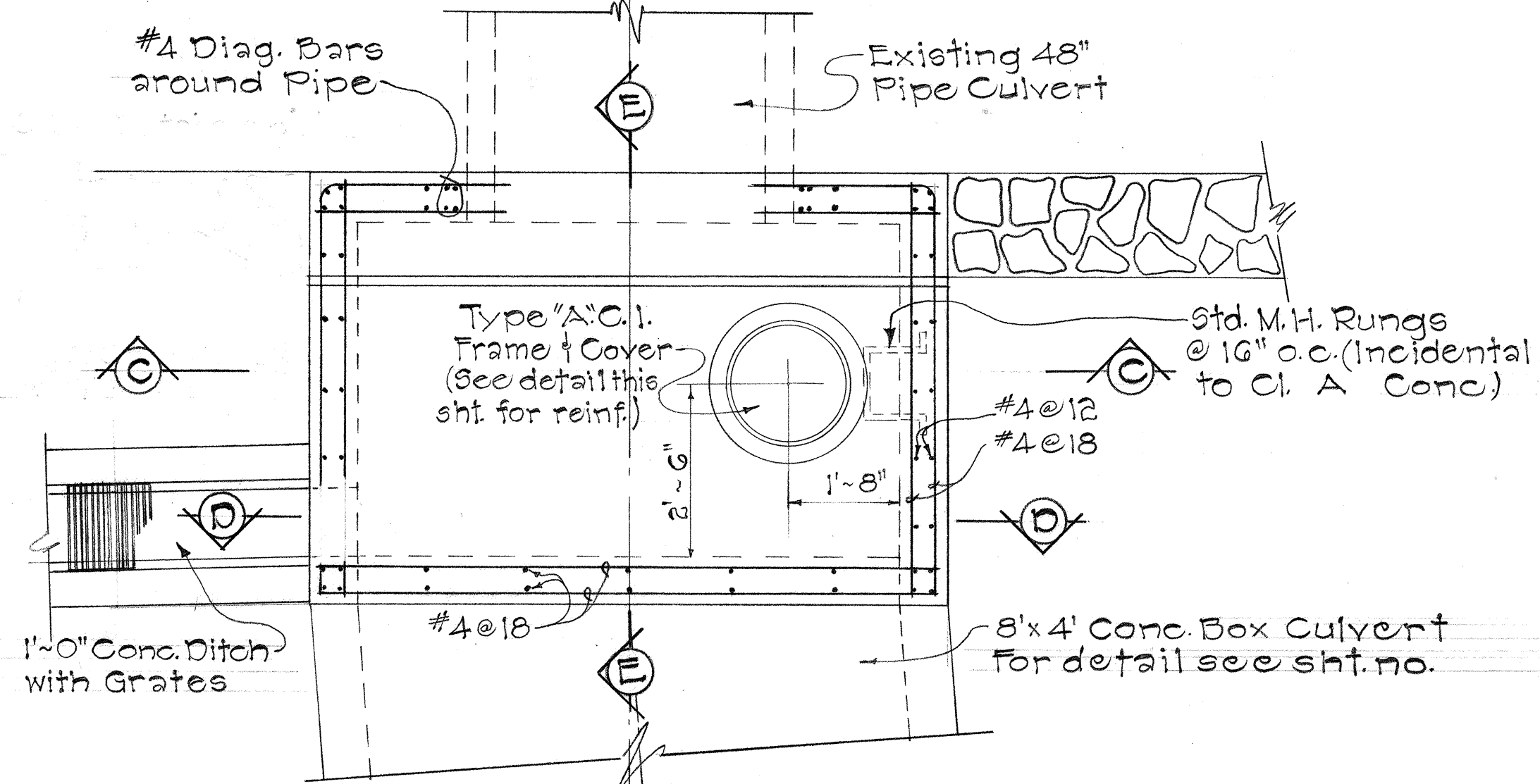
PLAN



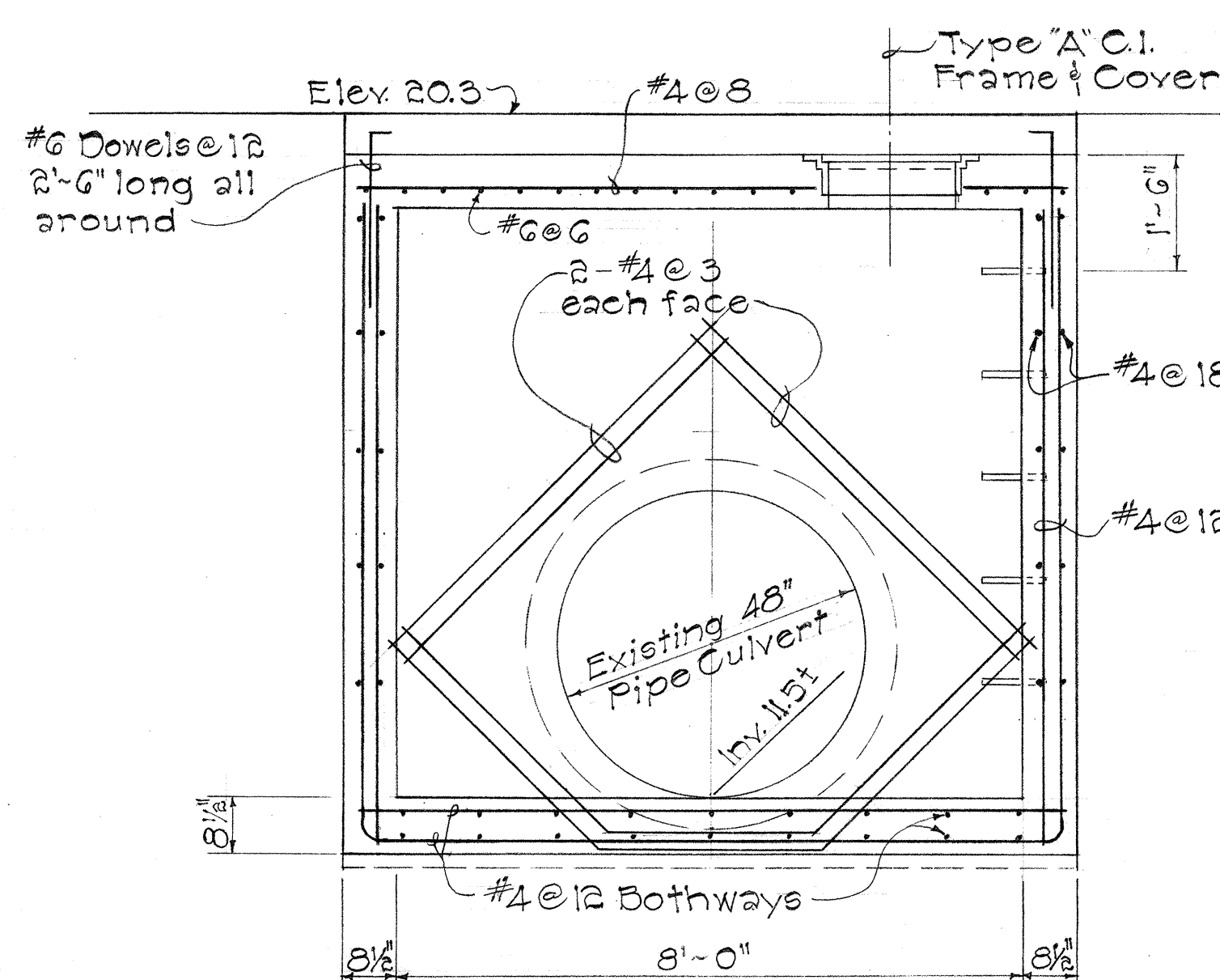
SECTION "A-A"



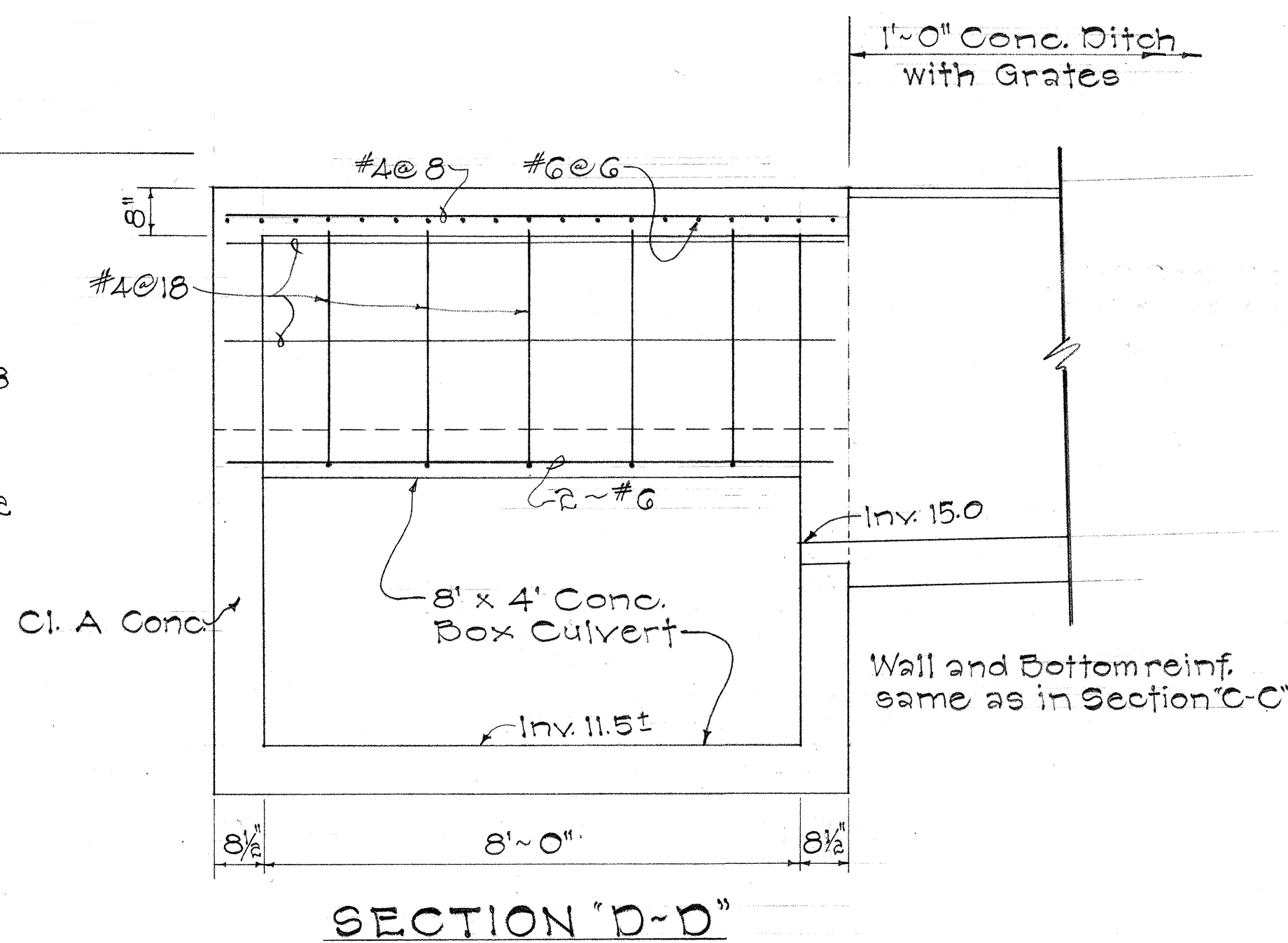
DETAILS OF S.D.M.H. @ STA. -2+01 RT.
Scale: 1/2" = 1'-0"



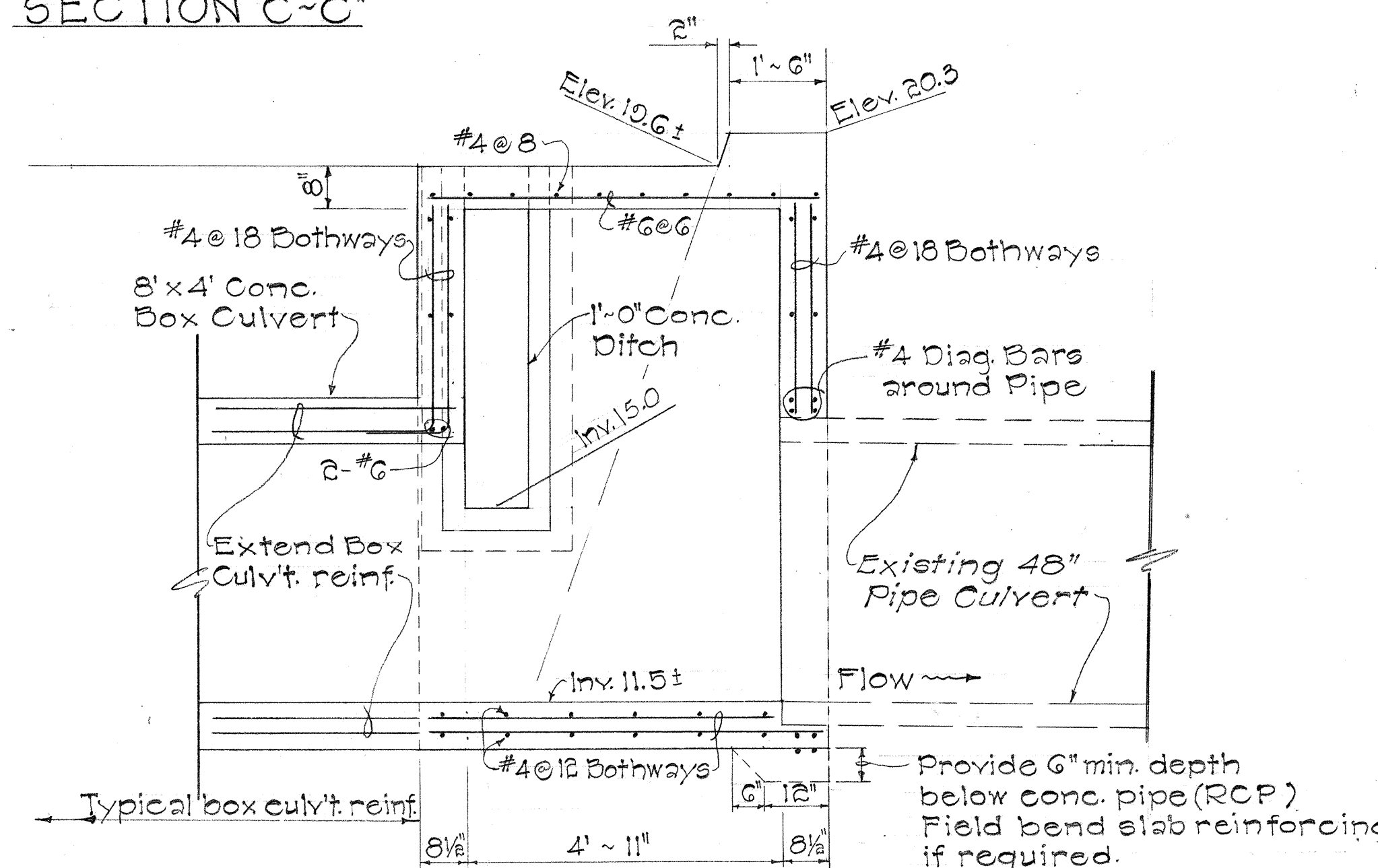
PLAN



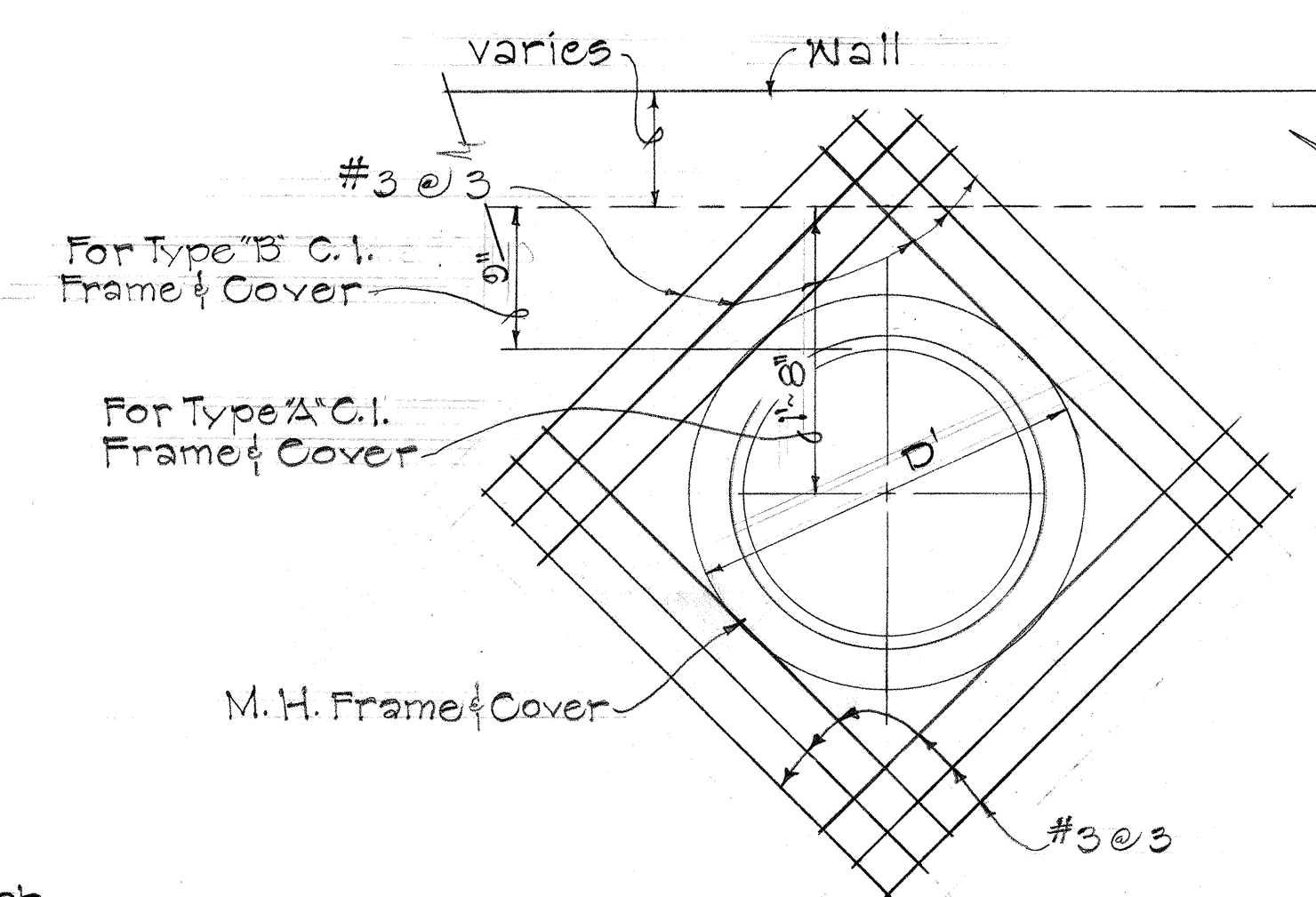
SECTION "C-C"



SECTION "D-D"



SECTION "E-E"
DETAILS OF S.D.M.H. @ STA. -0+62.5 LT.
Scale: 1/2" = 1'-0"

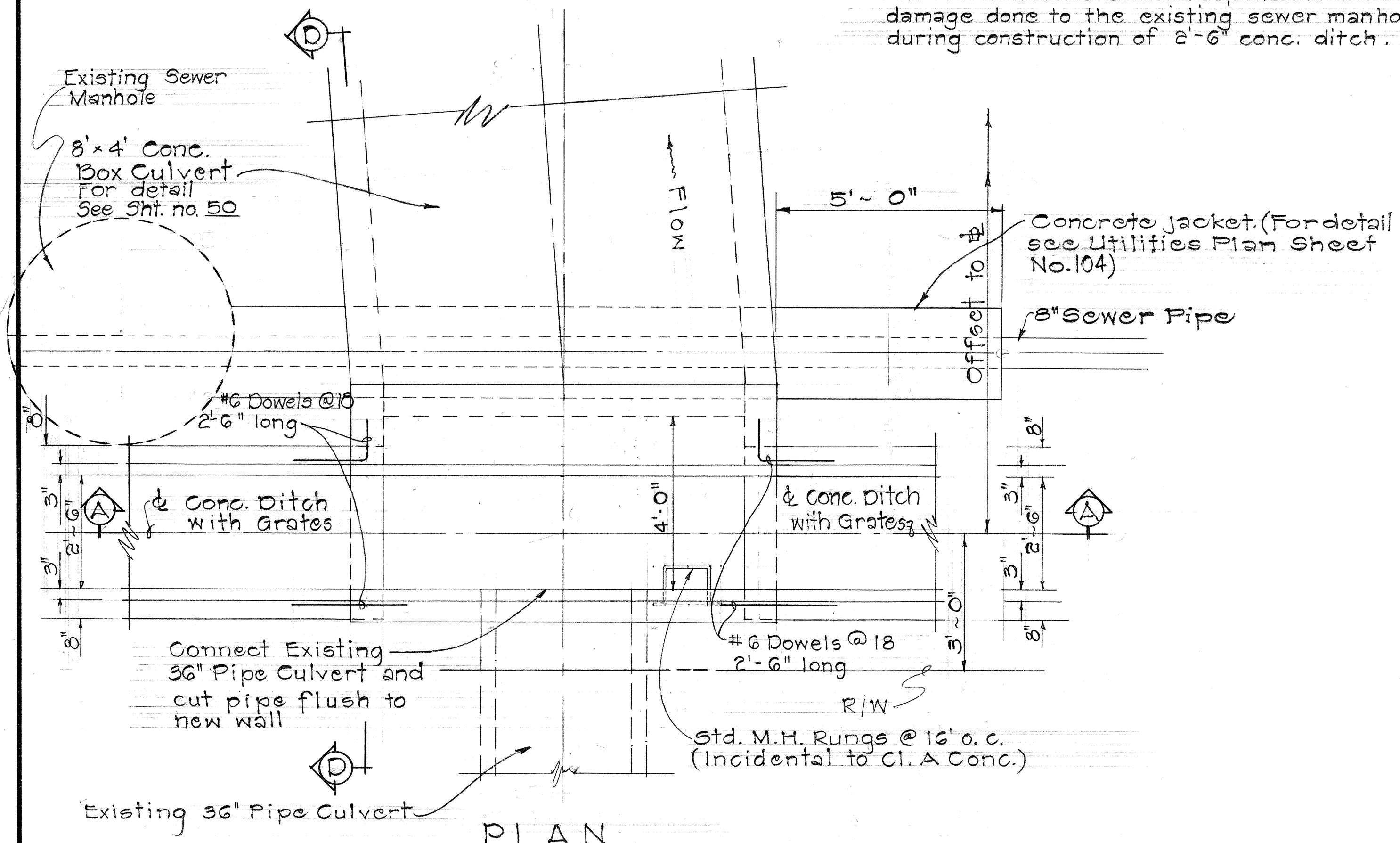


TYPICAL REIN. AROUND
M.H. FRAME & COVER
Scale: 1" = 1'-0"

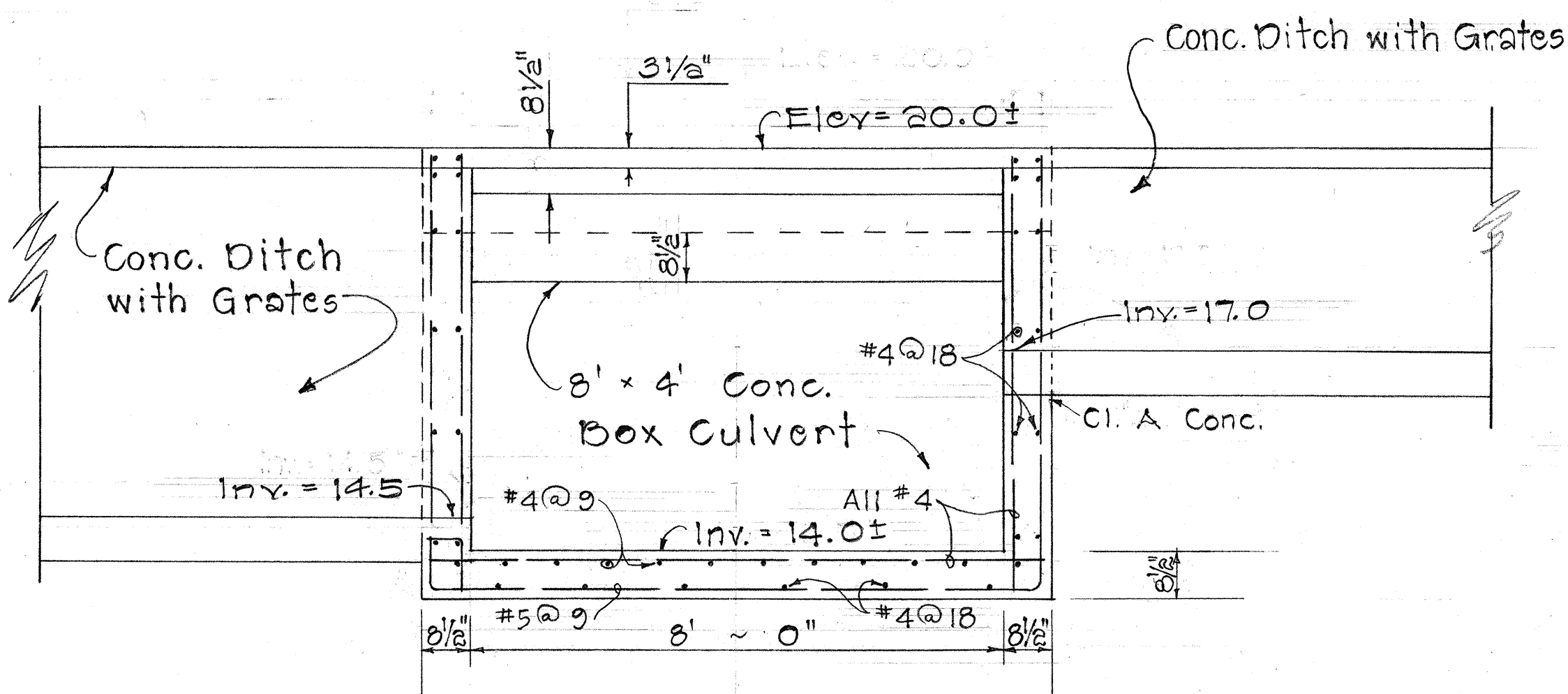
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
DETAILS OF S.D.M.H. AT STA.
-2+01 RT. AND -0+62.5 LT.
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)
Scale: 1/2" = 1'-0" Date:
SHEET No. 10 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	46	153

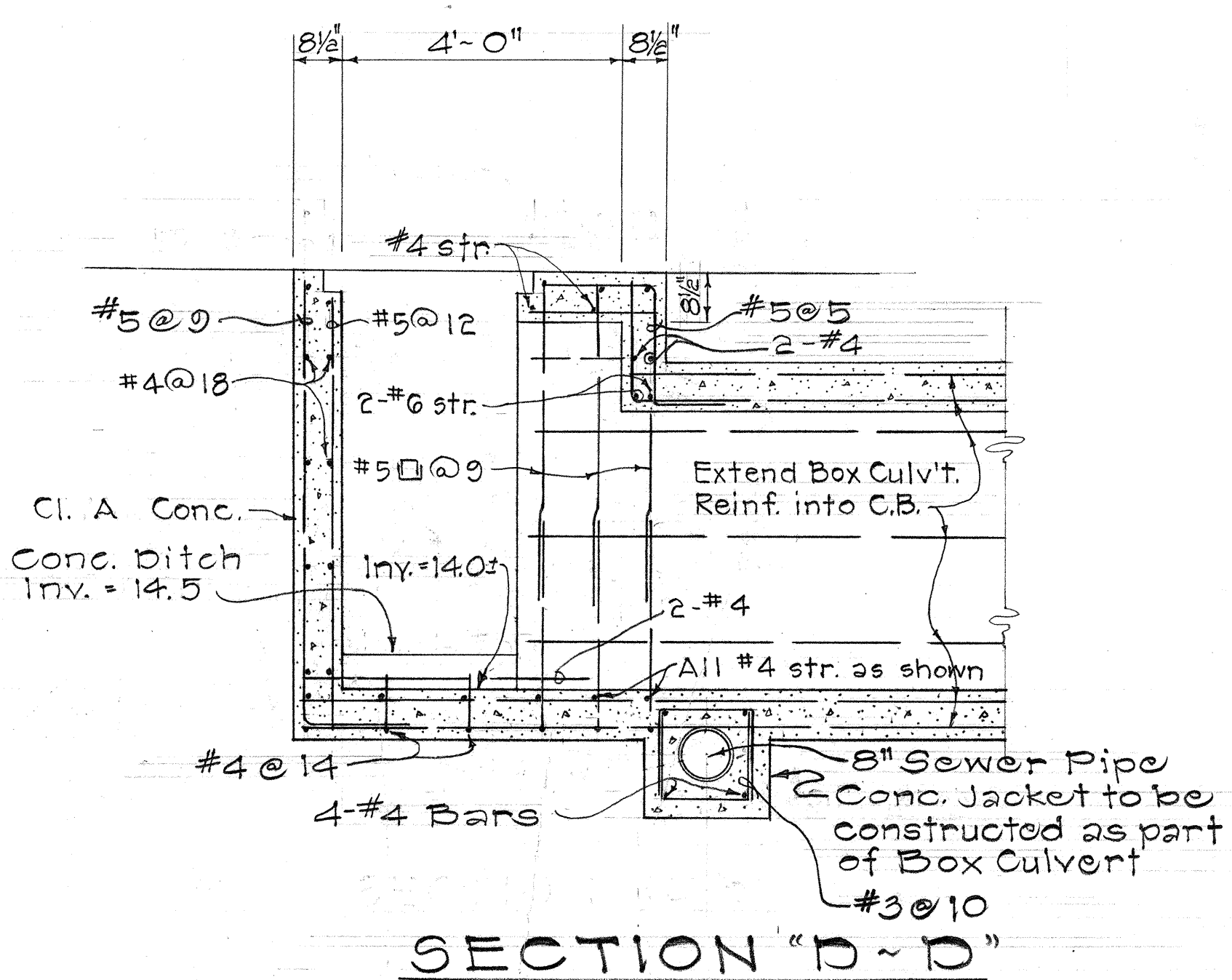
The Contractor shall be responsible for any damage done to the existing sewer manhole during construction of 2'-6" conc. ditch.



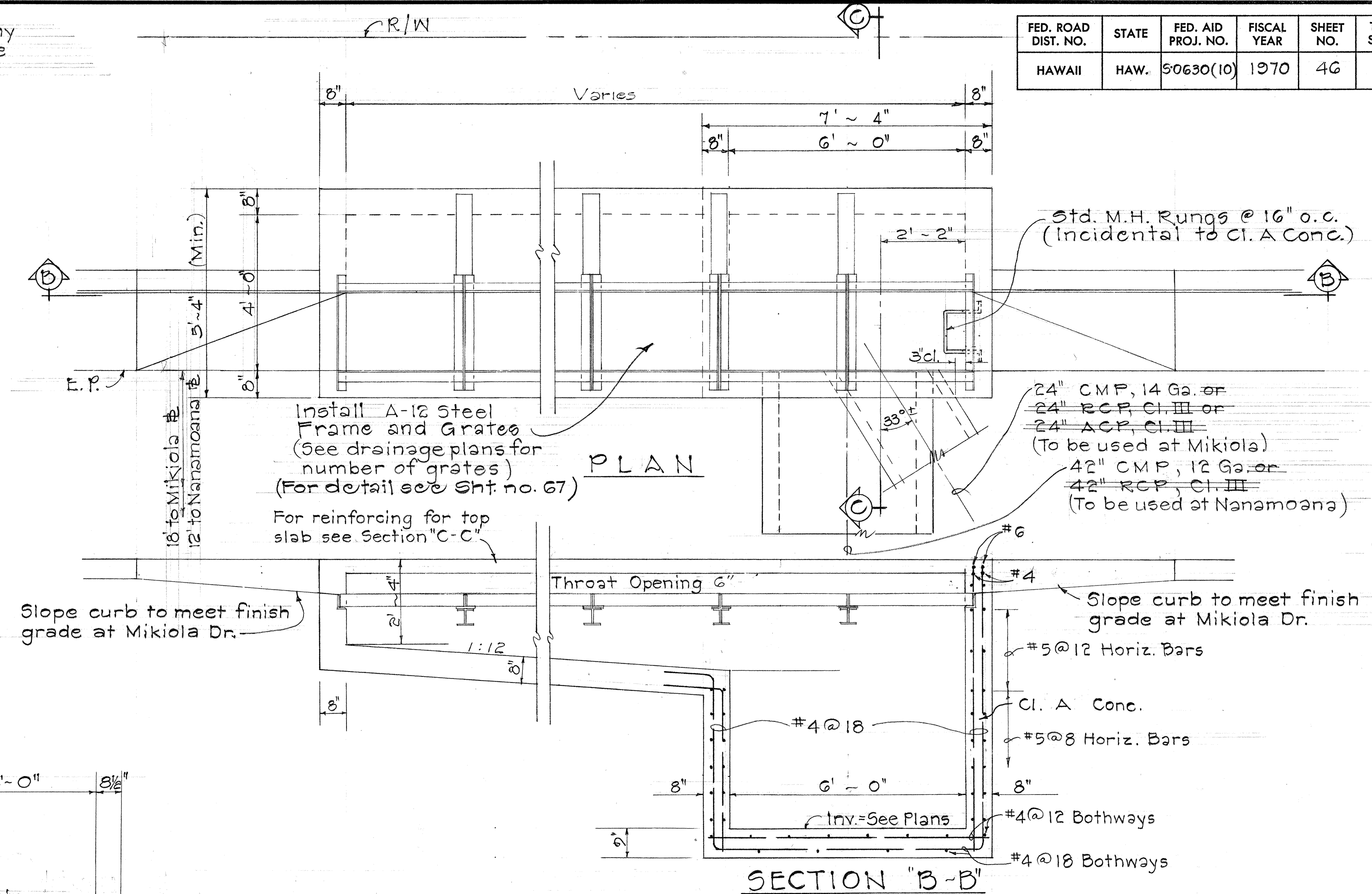
PLAN



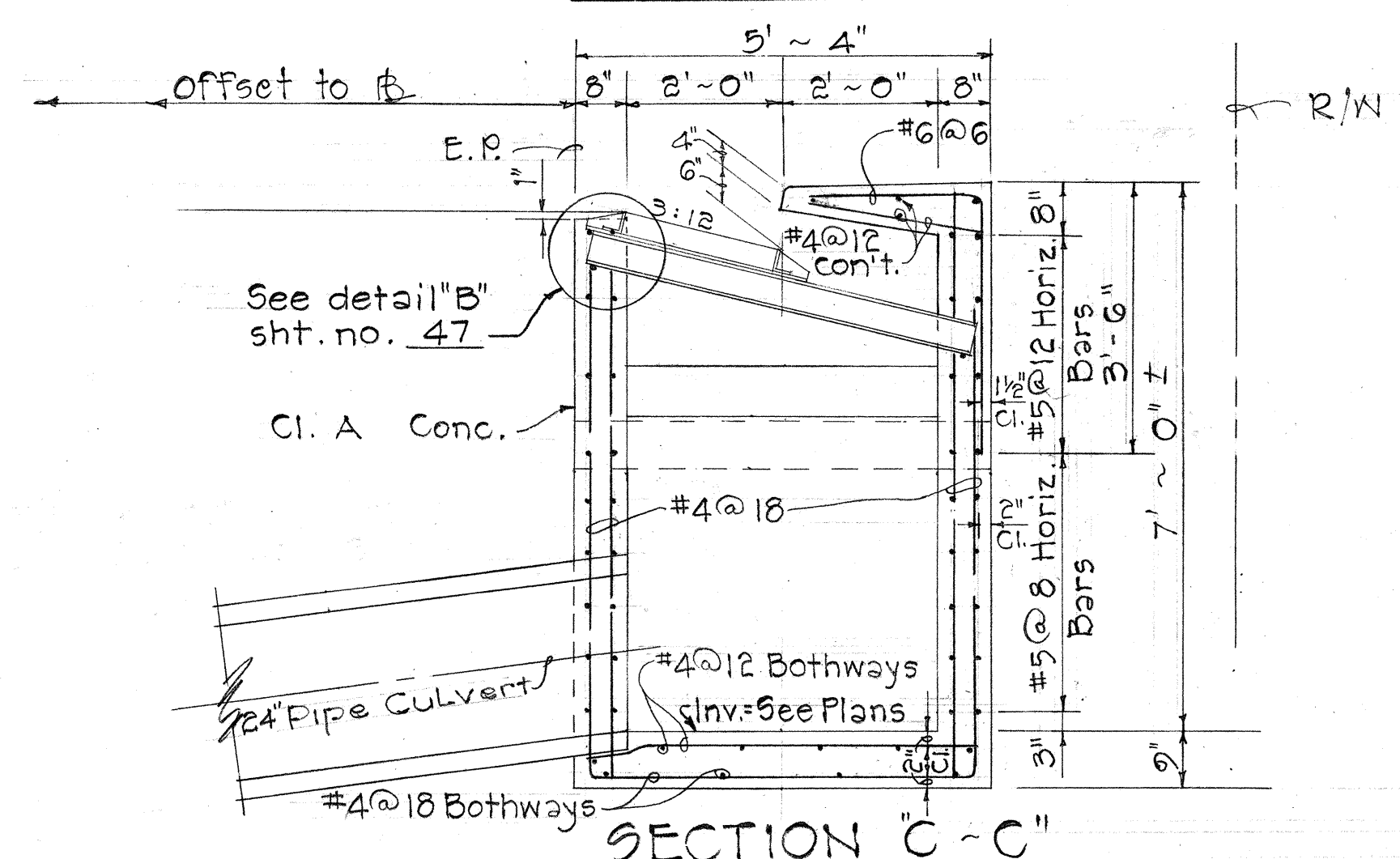
SECTION "A-A"



SECTION "D-D"



SECTION "B-B"



SECTION "C-C"

DETAILS OF COMBINATION C.B. @ MIKIOLA # STA. 1+43 RT.
AND NANAMOANA # STA. 1+70 RT.

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

DETAILS OF S.D.M.H. @ STA. -0+54 RT.
Scale: 1/2" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

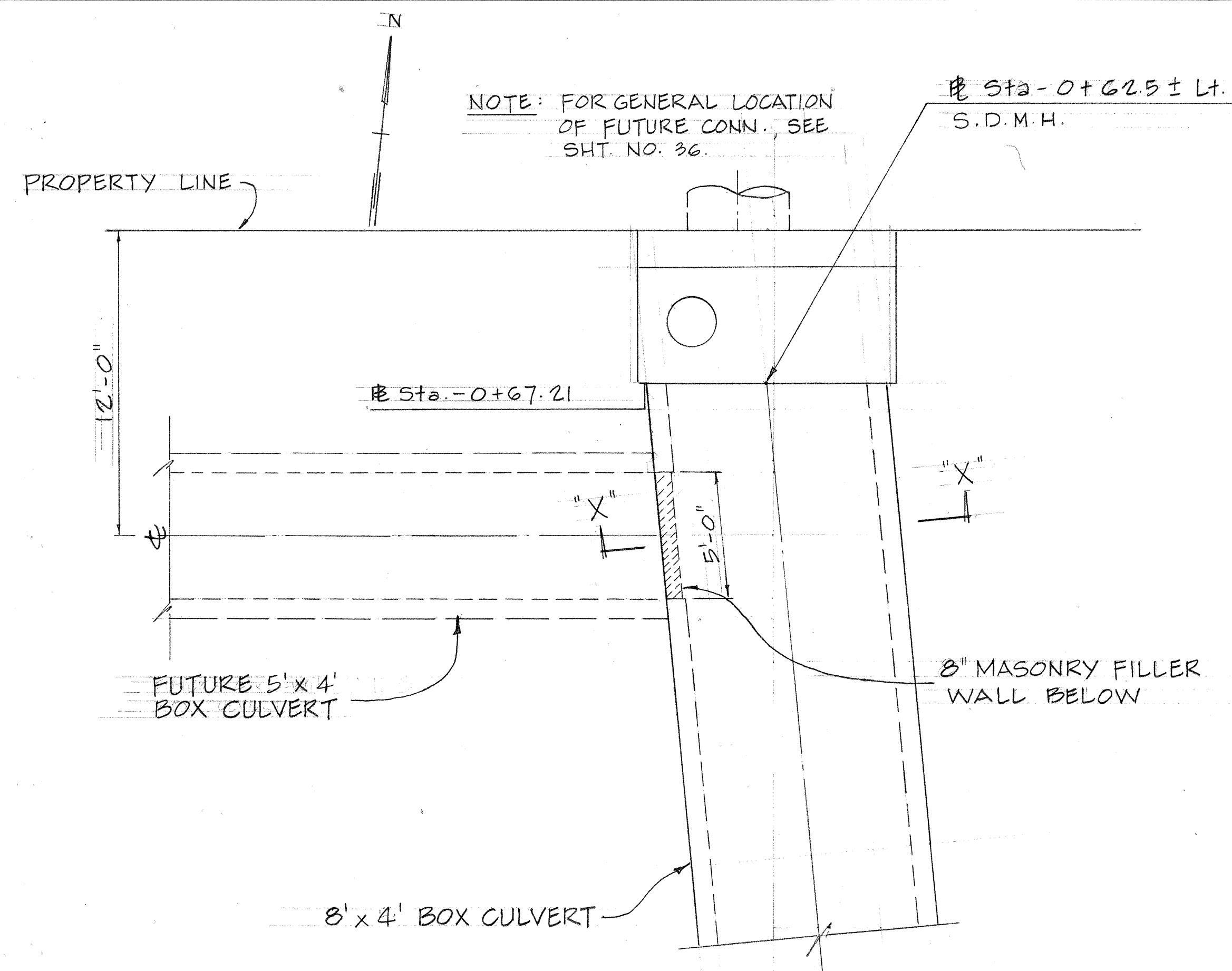
S.D.M.H. AT # STA. -0+54 RT.
COMBINATION C.B. @ MIKIOLA STA. 1+43 RT.
AND NANAMOANA STA. 1+70 RT.

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (10)

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

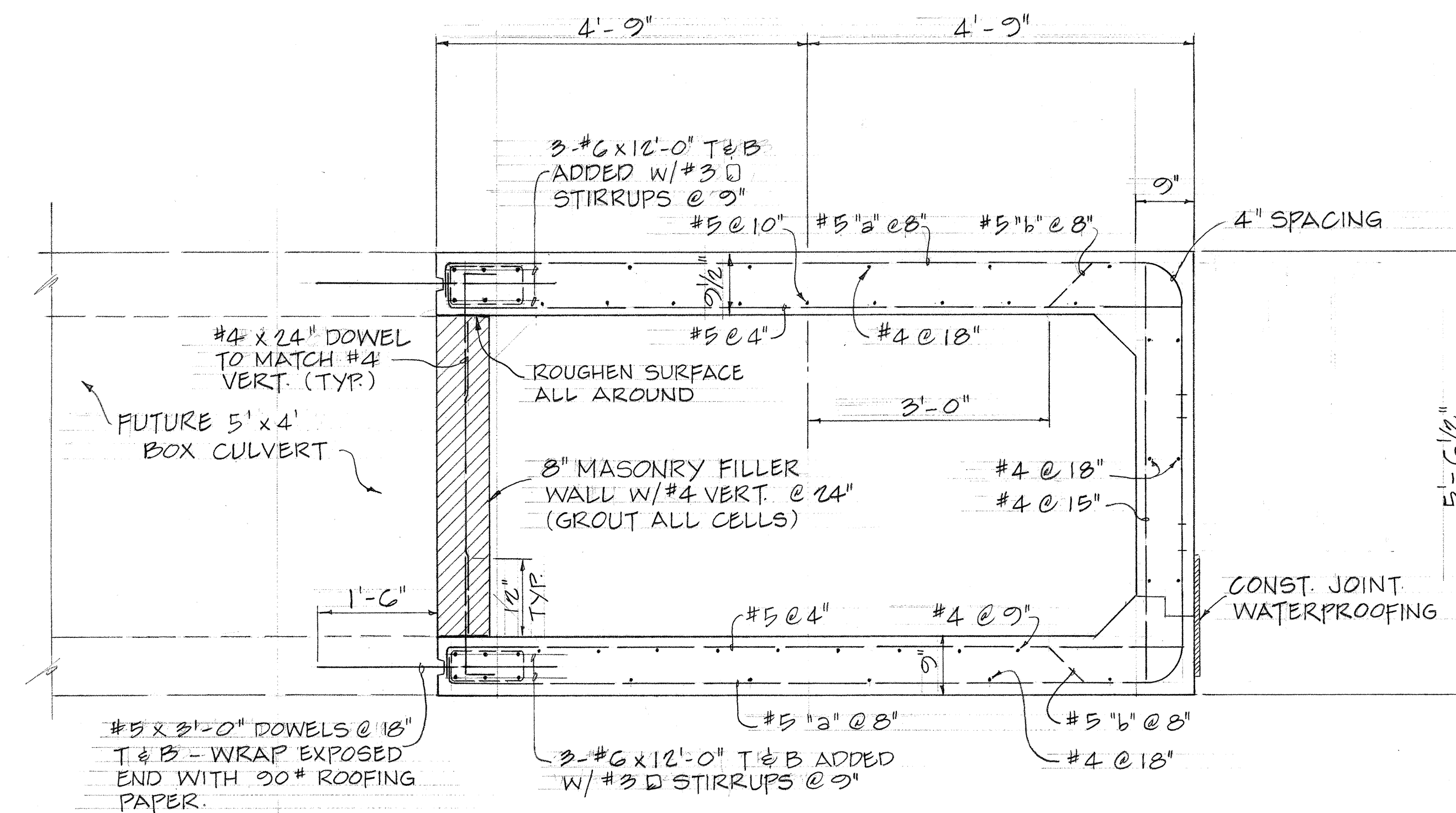
SHEET No. 11 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	465-1	153



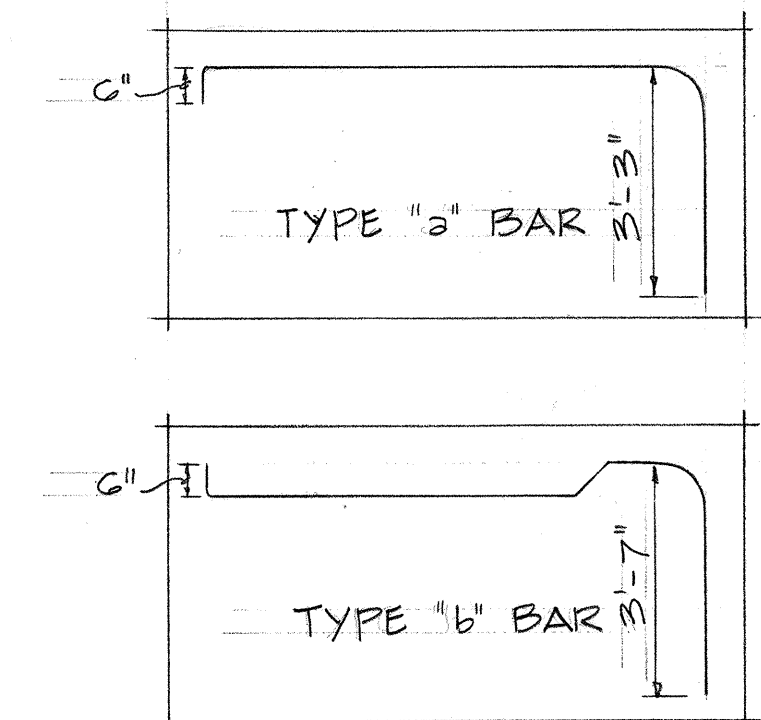
PARTIAL PLAN OF BOX CULVERT AT FUTURE CONN.

SCALE: $\frac{1}{4}" = 1'-0"$



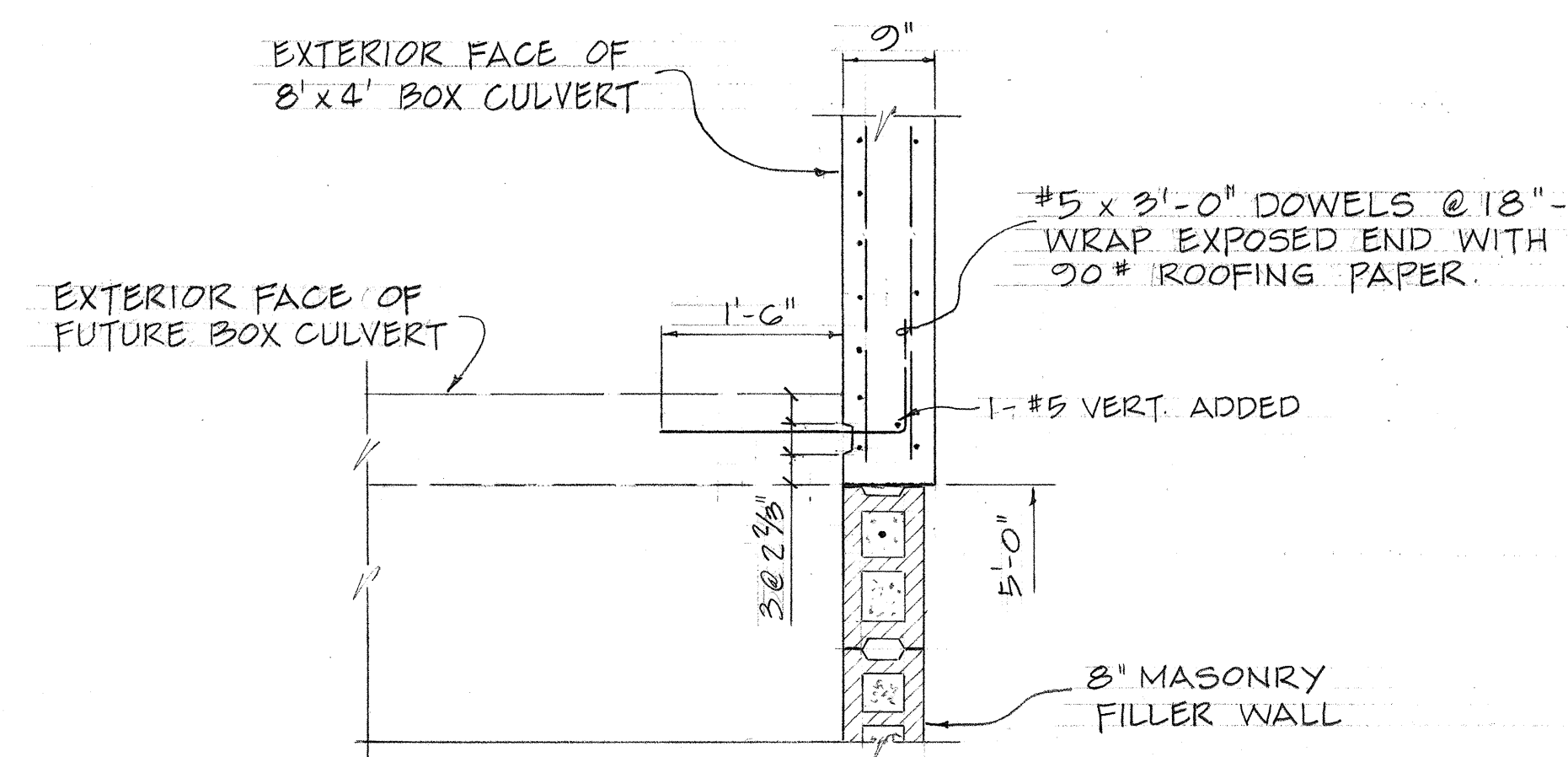
SECTION "X-X"

SCALE : $\frac{3}{4}" = 1' - 0"$



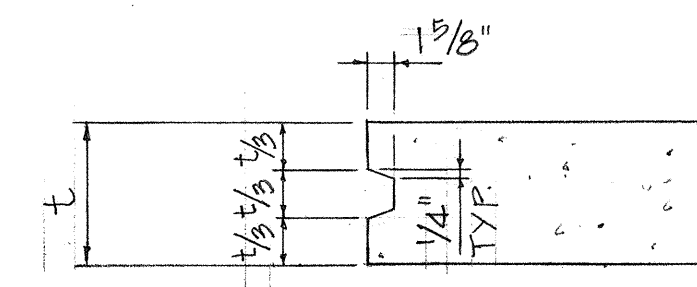
NOT TO SCALE

NOTE: REINF. SHOWN AT
4'-0" x 5'-0" OPENING ONLY.



TYP. CONN. DETAIL AT SIDE WALL

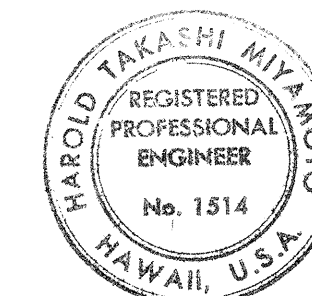
SCALE: $\frac{3}{4}" = 1'-0"$



TYP. CONST. JOINT DETAIL

NOT TO SCALE

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



THIS WORK WAS PREPARED BY ME
OR UNDER MY SUPERVISION

Harold D. Heymann

THIS SHEET IS AN
"AS-BUILT" ADDITION

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

NEW 4'-0" x 5'-0" OPENING IN
8'-0" x 4'-0" BOX CULVERT
AT STA - 0 + 66 ±

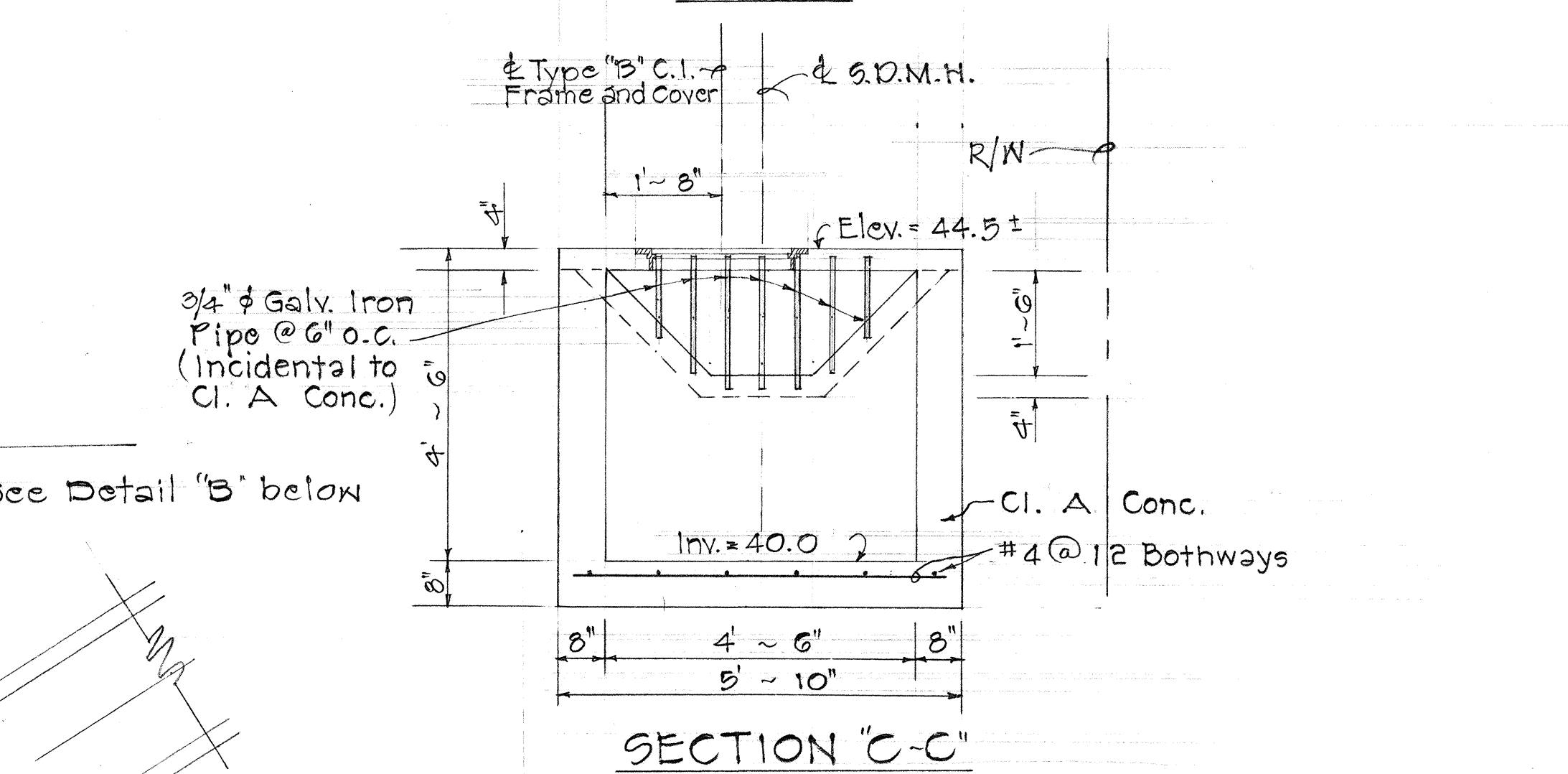
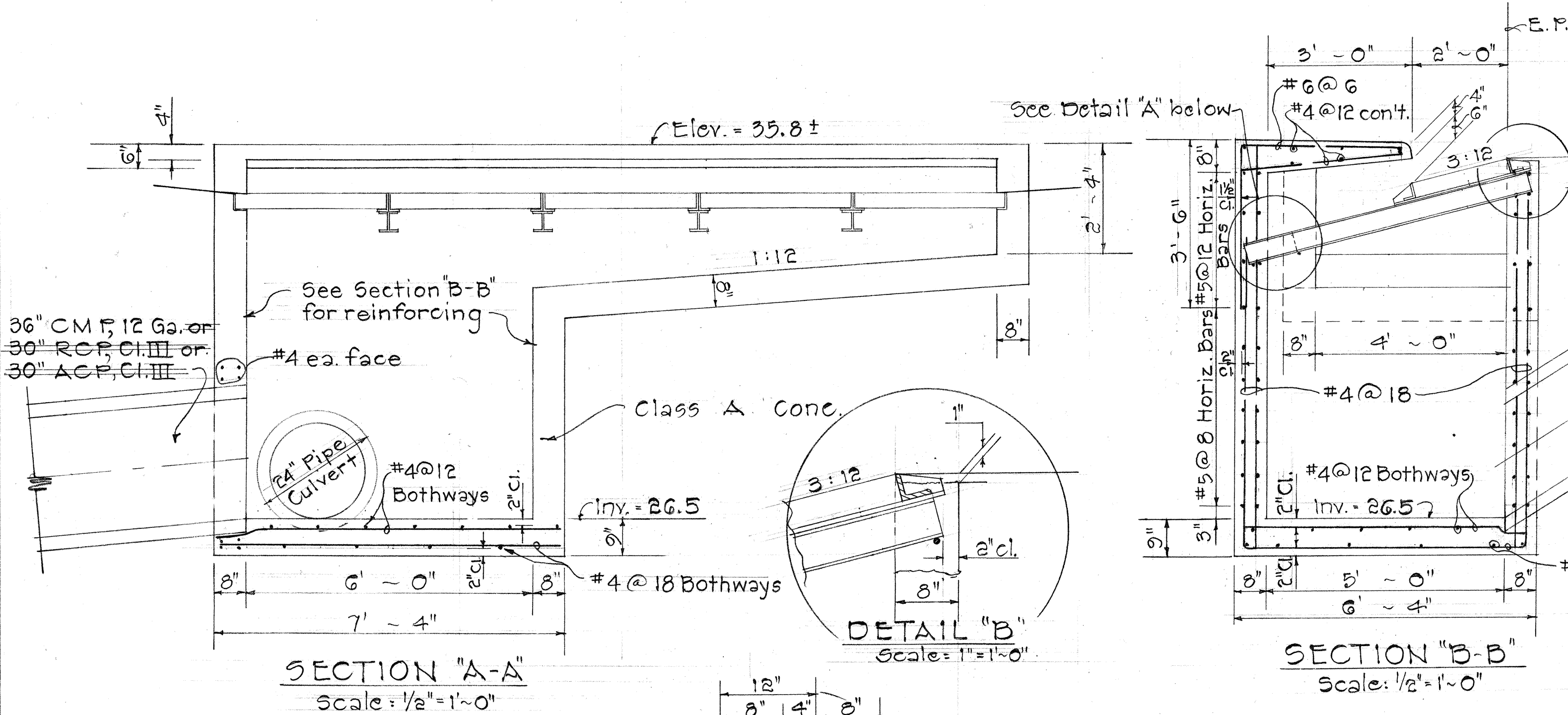
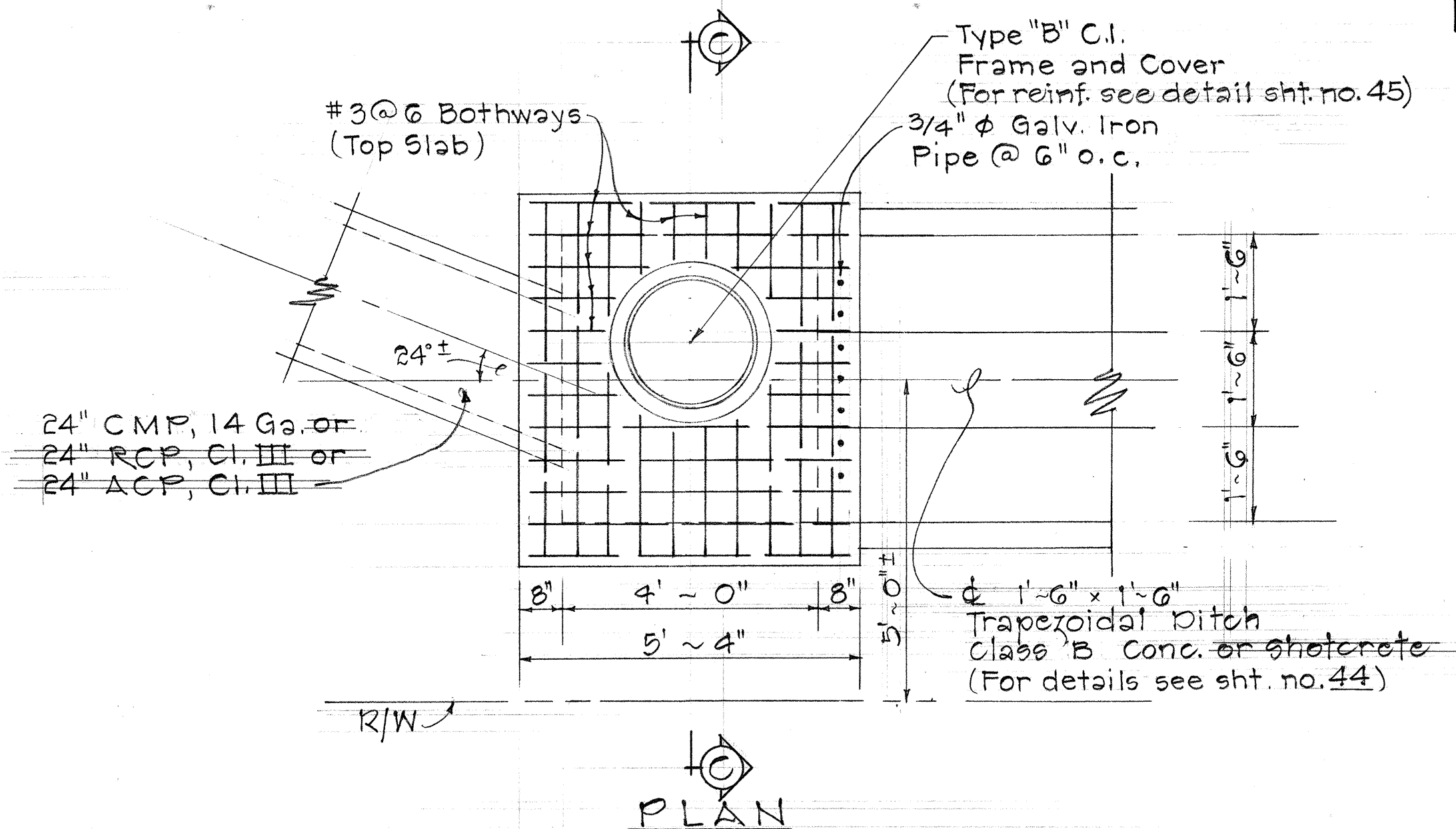
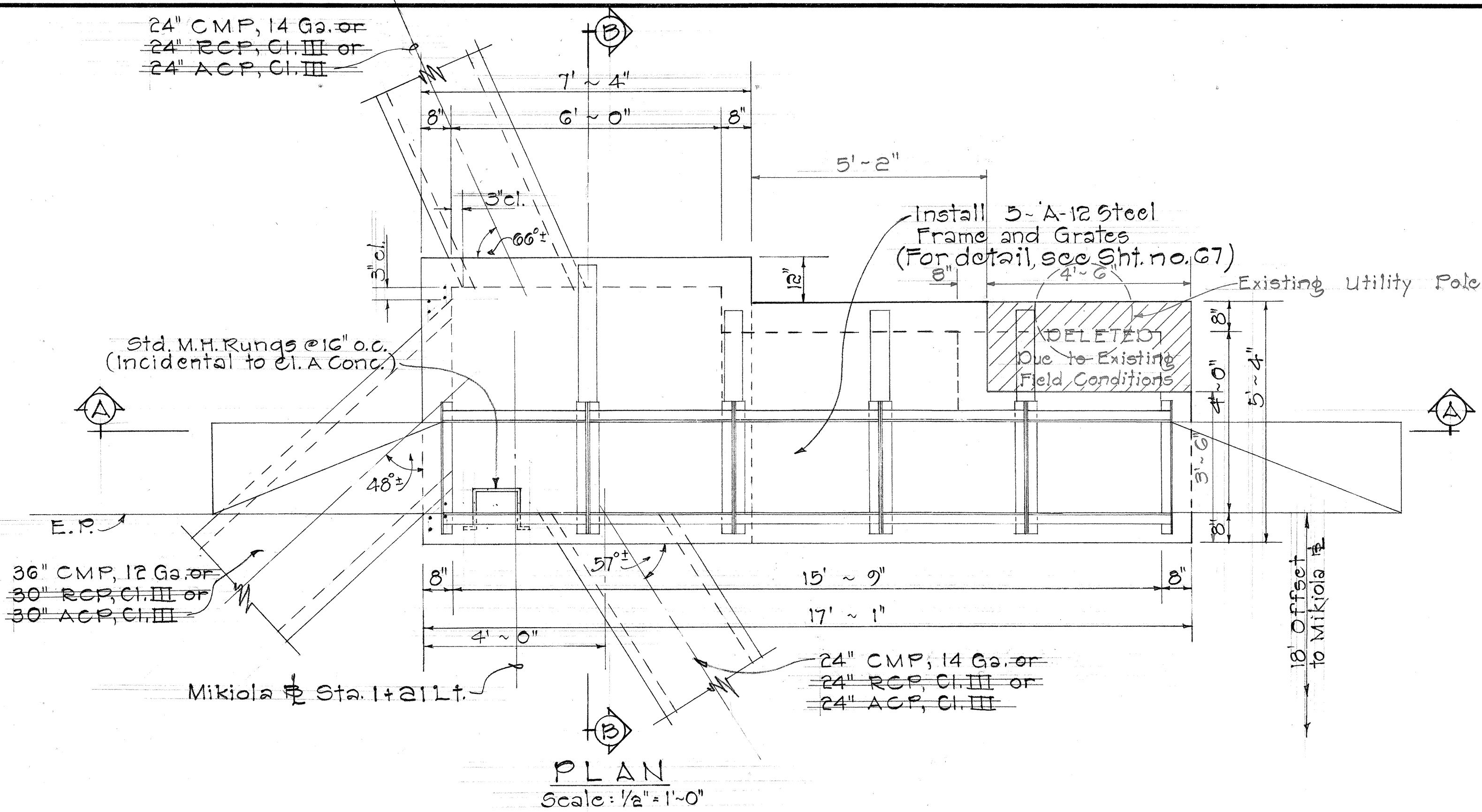
MOKAPU SADDLE ROAD
F.A.S. PROJECT No. S-0630(10)

SCALE: AS SHOWN DATE: JUNE 26, 1972

SHEET No. A | OF | SHEETS

46 S-1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	47	153



DETAILS OF C.D.I. @ MIKIOLA STA. 1+11.5
Scale: 1/2" = 1'-0"

DETAIL OF COMBINATION C.B. @ MIKIOLA # STA. 1+21 LT.
Scale: As Shown

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

DRAINAGE DETAILS

COMBINATION C.B. @ MIKIOLA STA. 1+21 LT.

C.D.I. @ MIKIOLA STA. 1+11.5

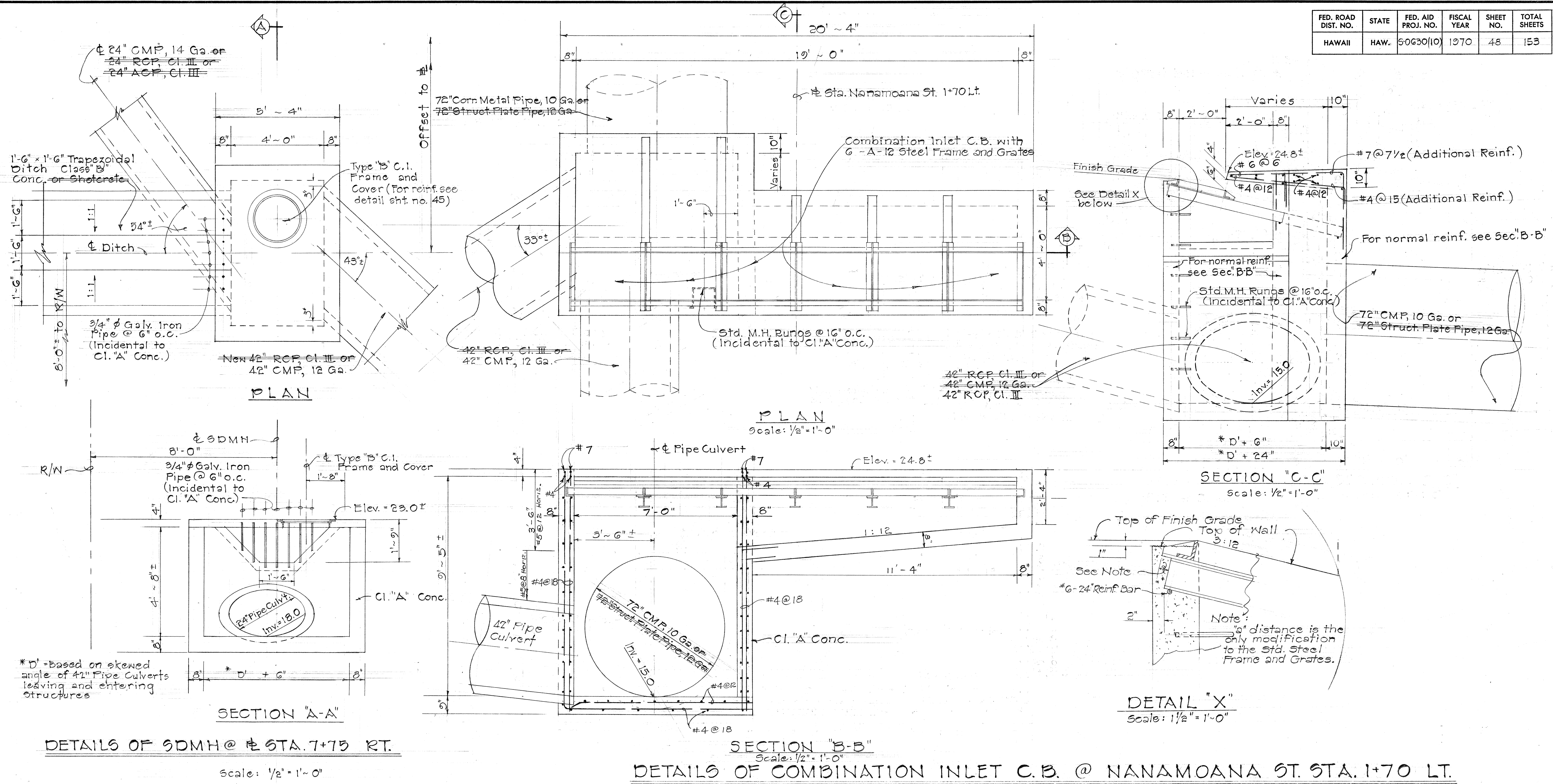
MOKAPU SADDLE ROAD

F.A.S. Proj. No. 5-0630(10)

Scale: As Shown Date:

SHEET No. 12 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	48	153

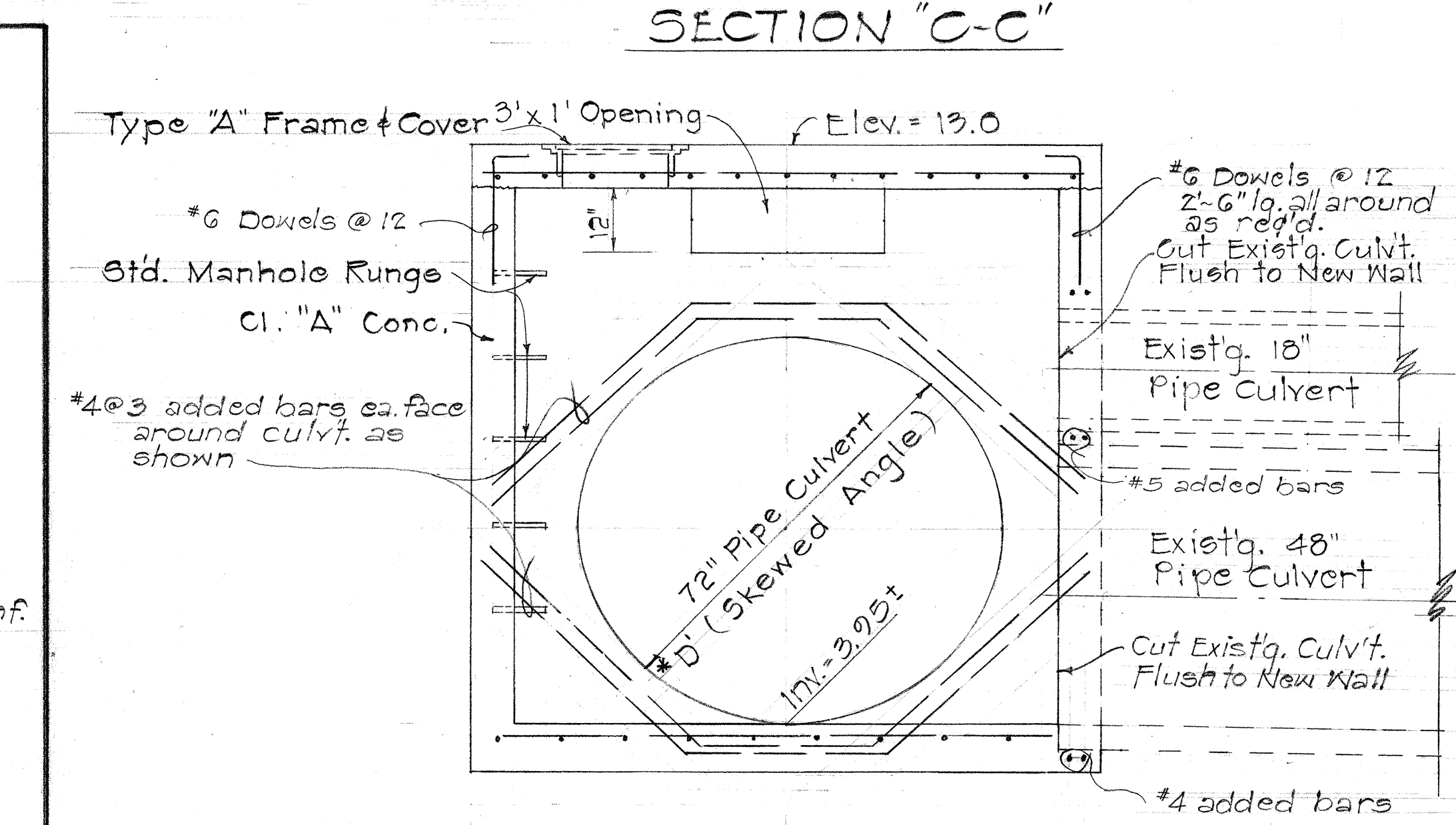
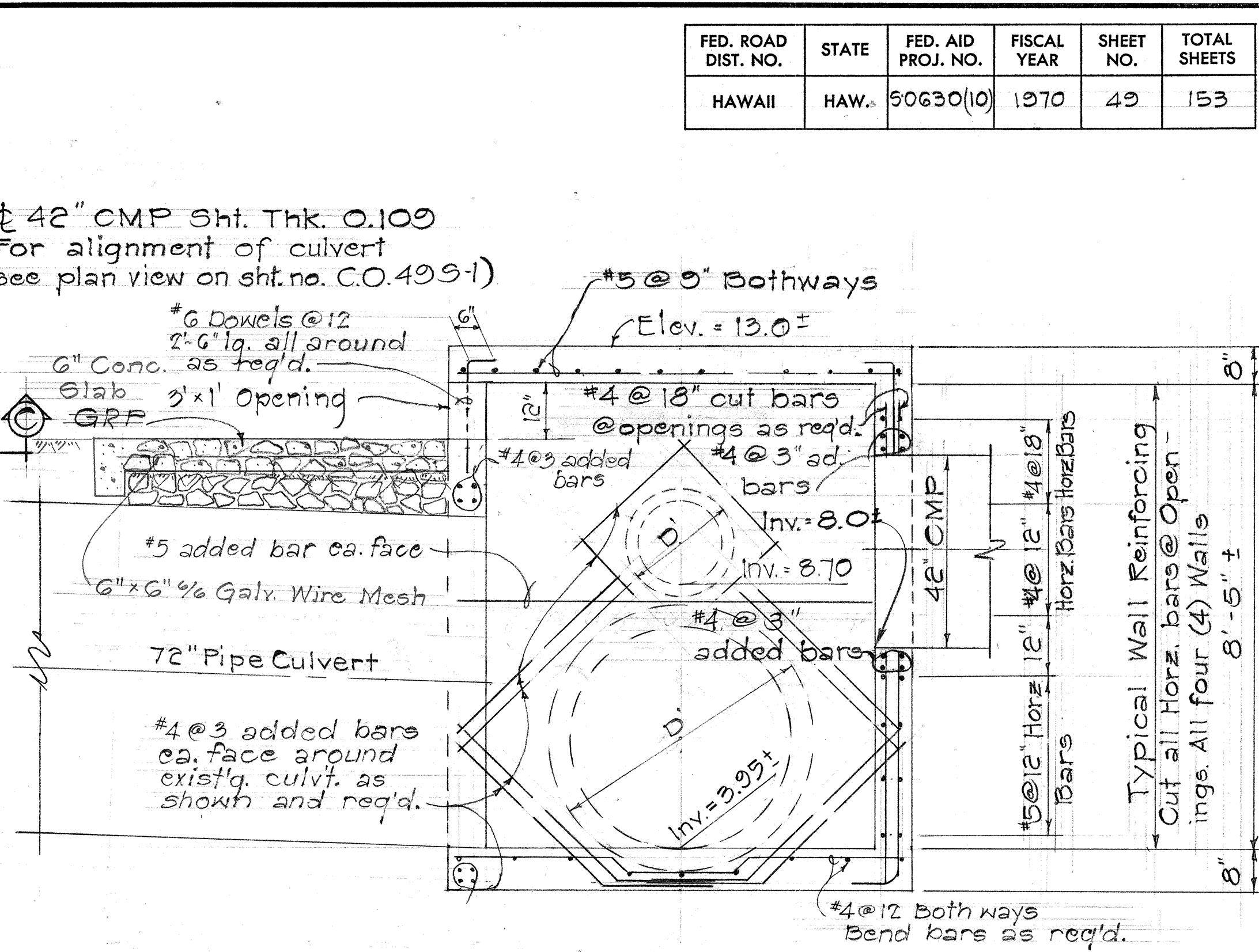
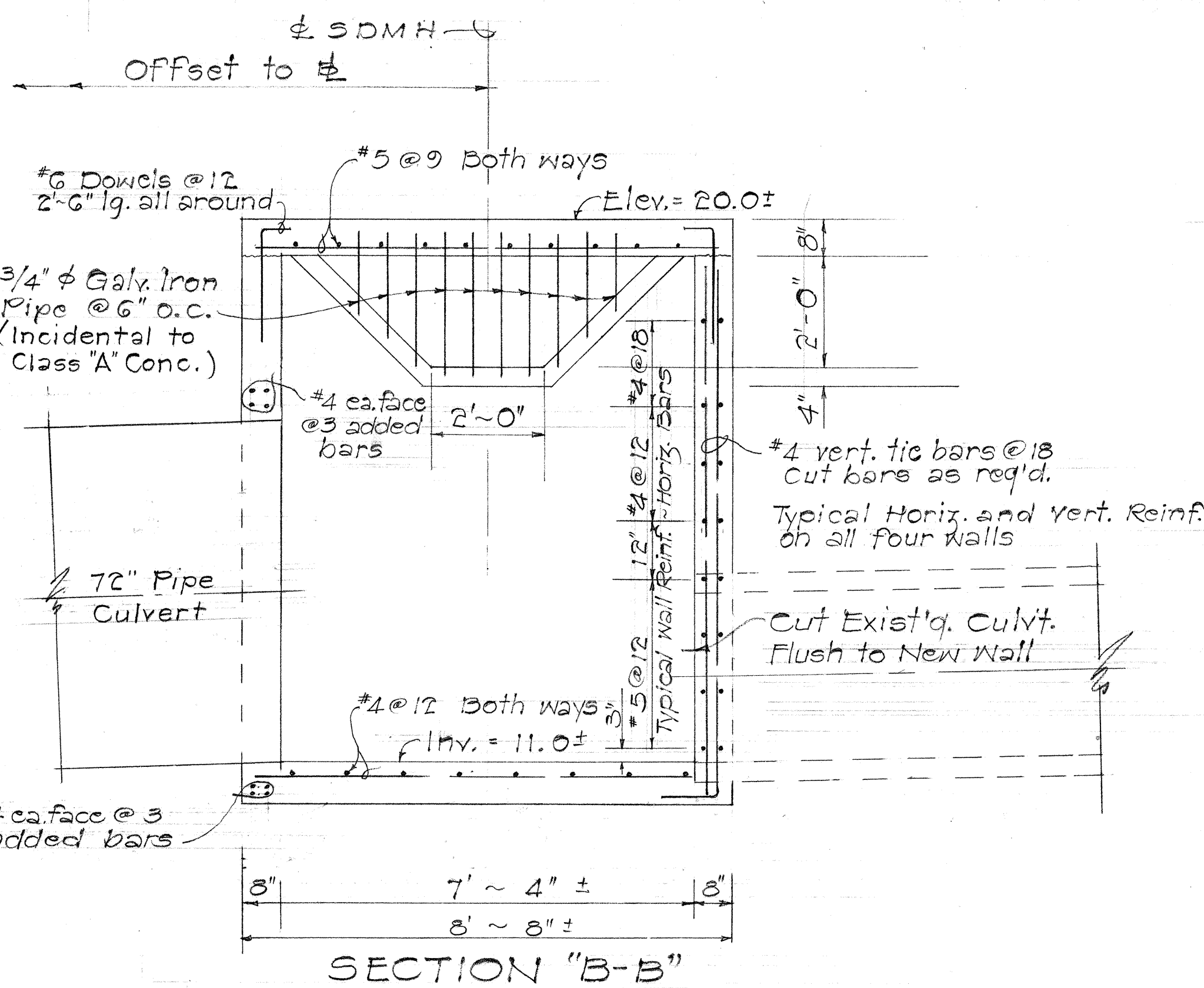
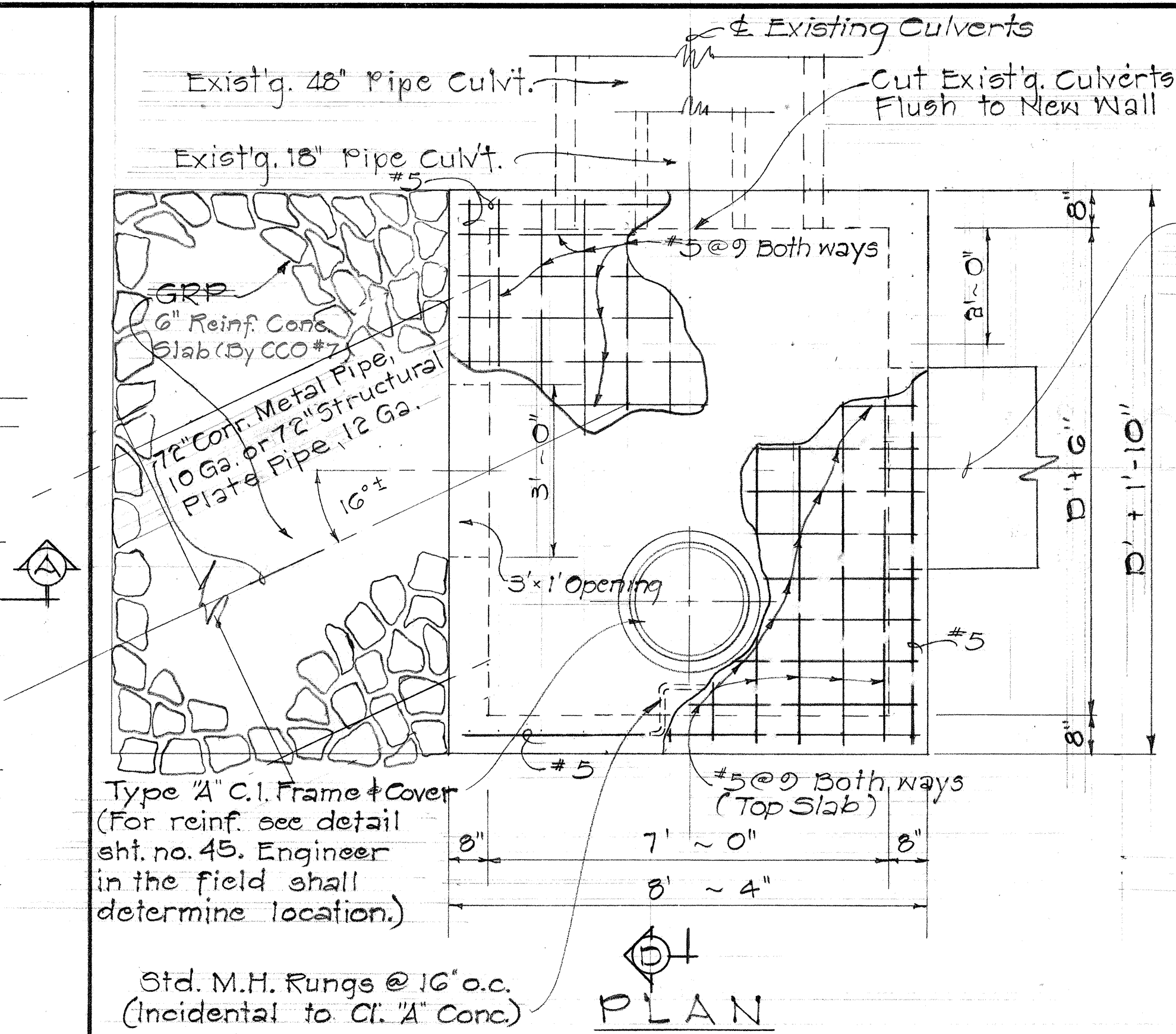
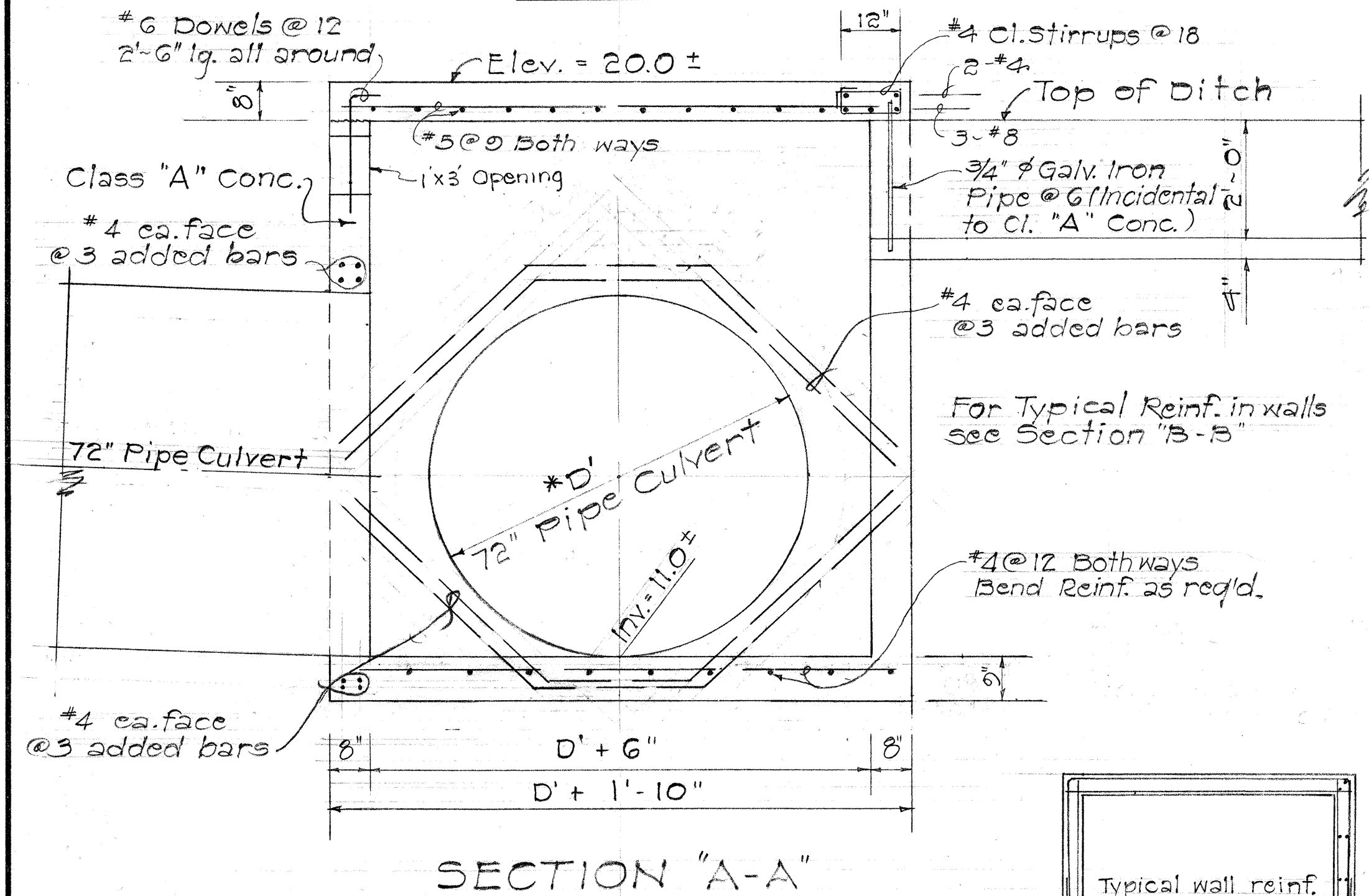
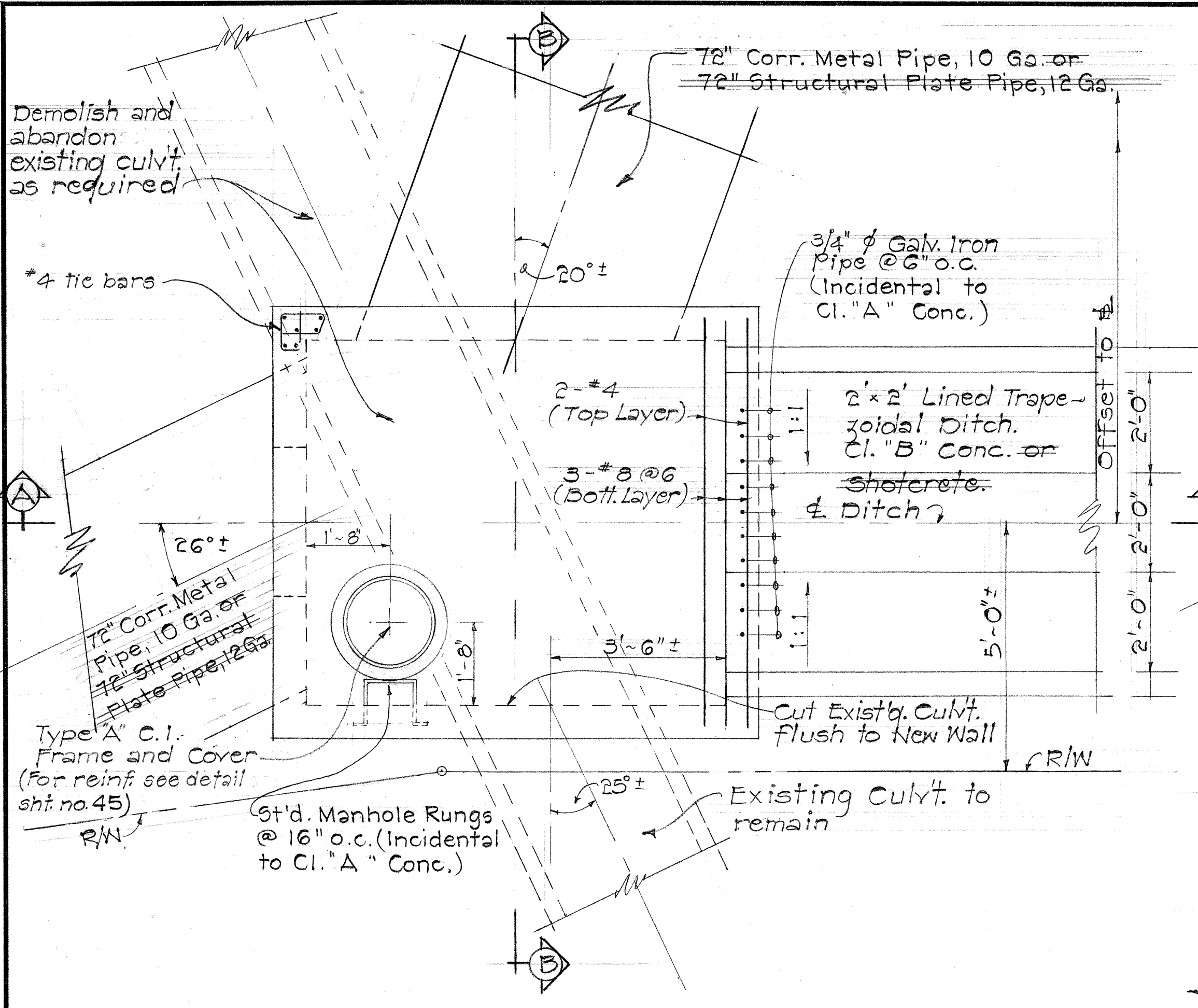


DATE	
SURVEY PLOTTED BY	
DRAWN BY	
TRACED BY	
CHECKED BY	
NOTE BOOK	
No.	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS
S.D.M.H. @ STA. 7+75 RT.
COMBINATION INLET C.B. @ NANAMOANA ST.
STA. 1+70 LT.
MOKAPU SADDLE ROAD
FAS. Proj. No. 5-0630 (10)
Scale: As Shown Date: _____
SHEET No. 13 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	49	153



DETAILS OF S.D.M.H. @ STA. 10+43 ± LT.
Scale: 1/2" = 1'-0"

DETAILS OF S.D.M.H. @ STA. 9+66 ± RT.
Scale: 1/2" = 1'-0"

ENLARGED DETAIL
Not to Scale

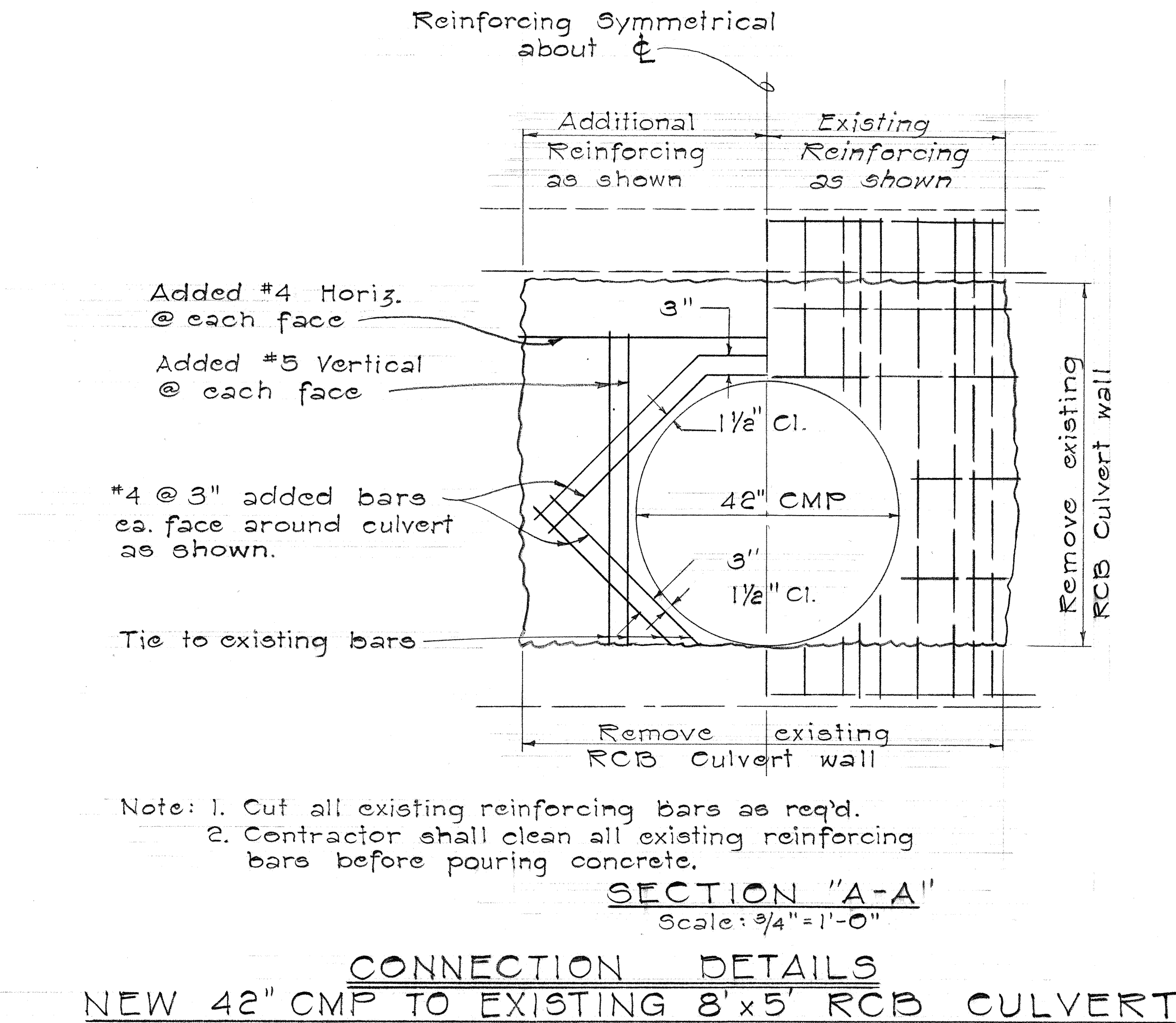
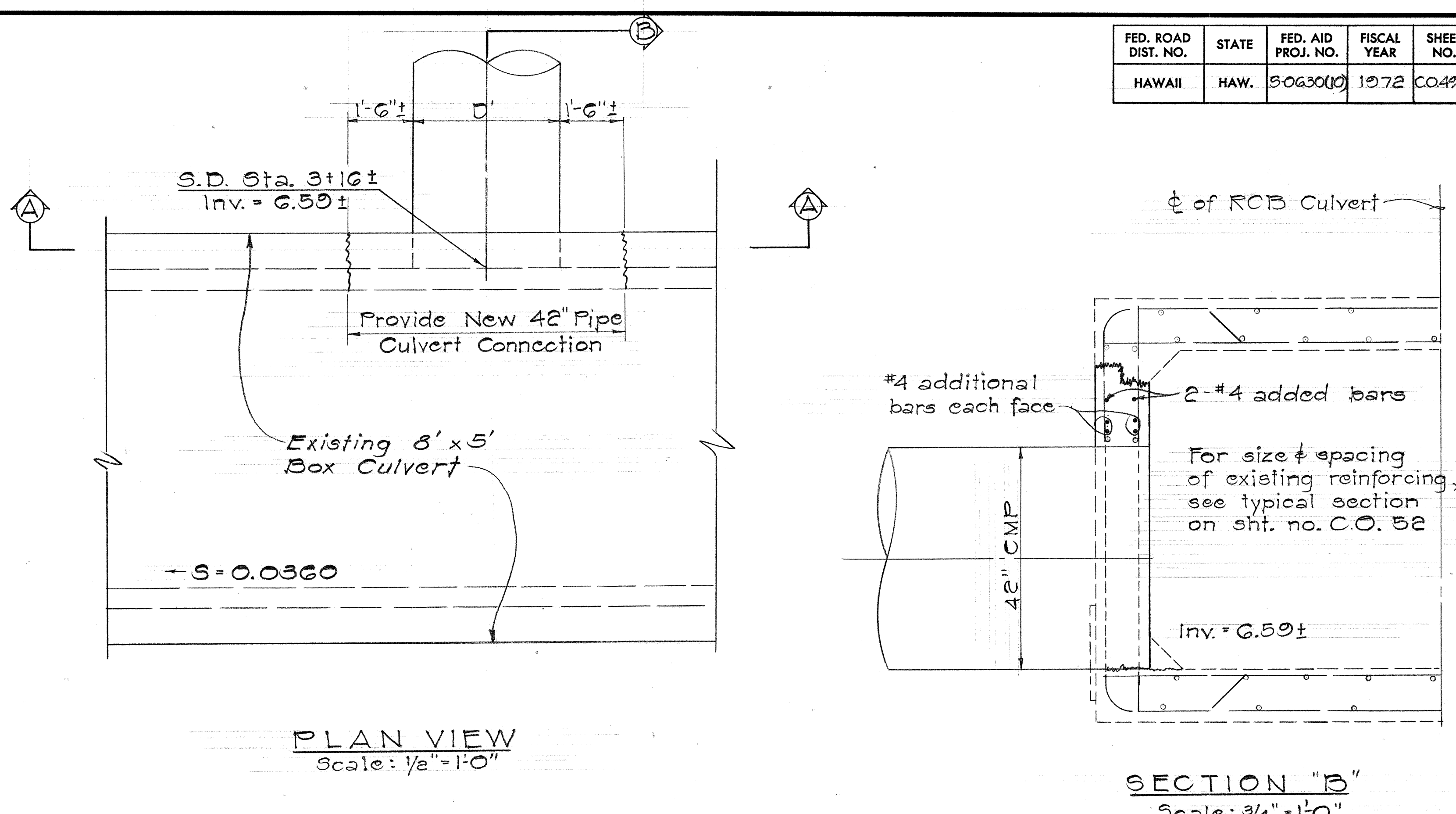
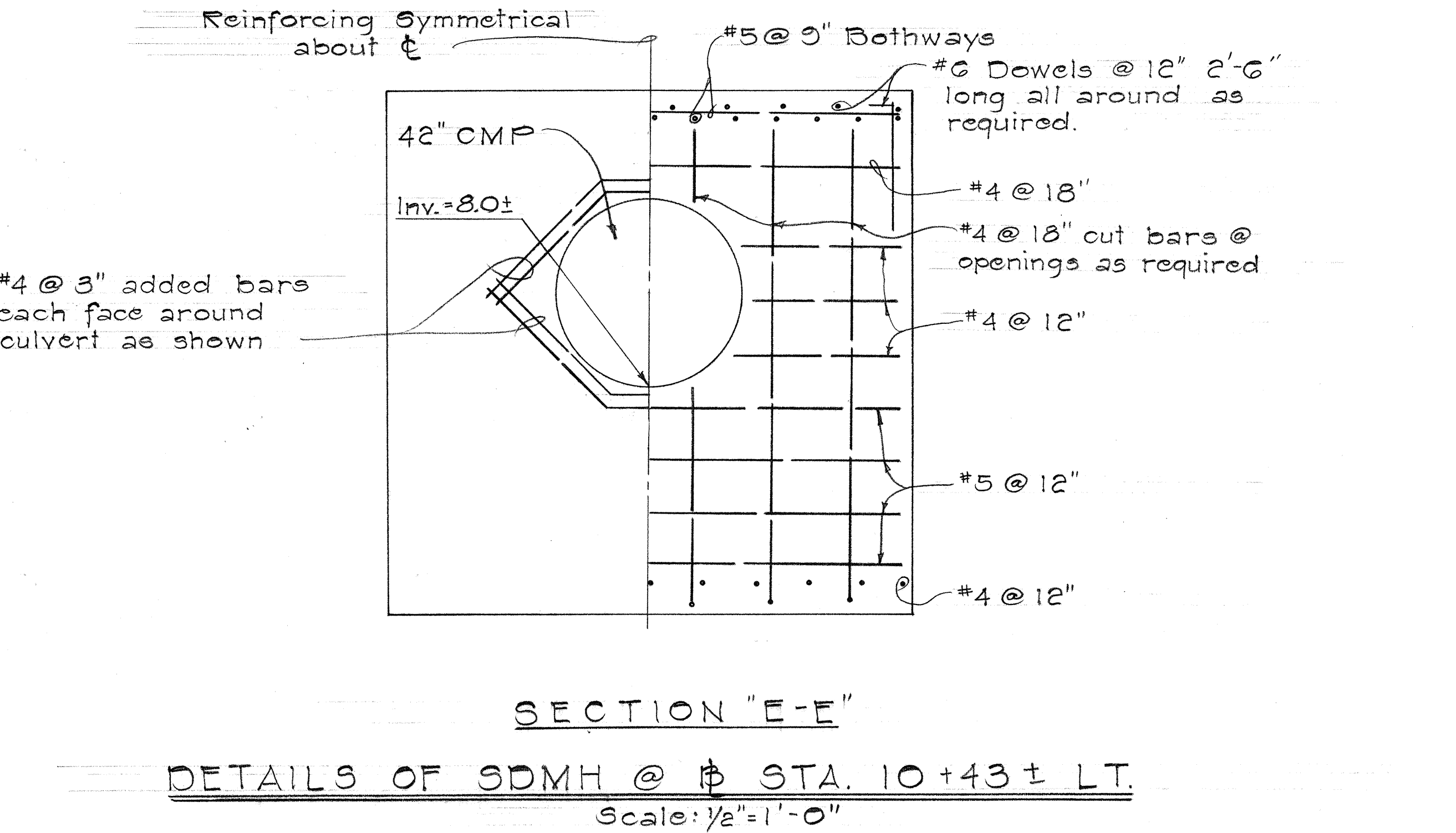
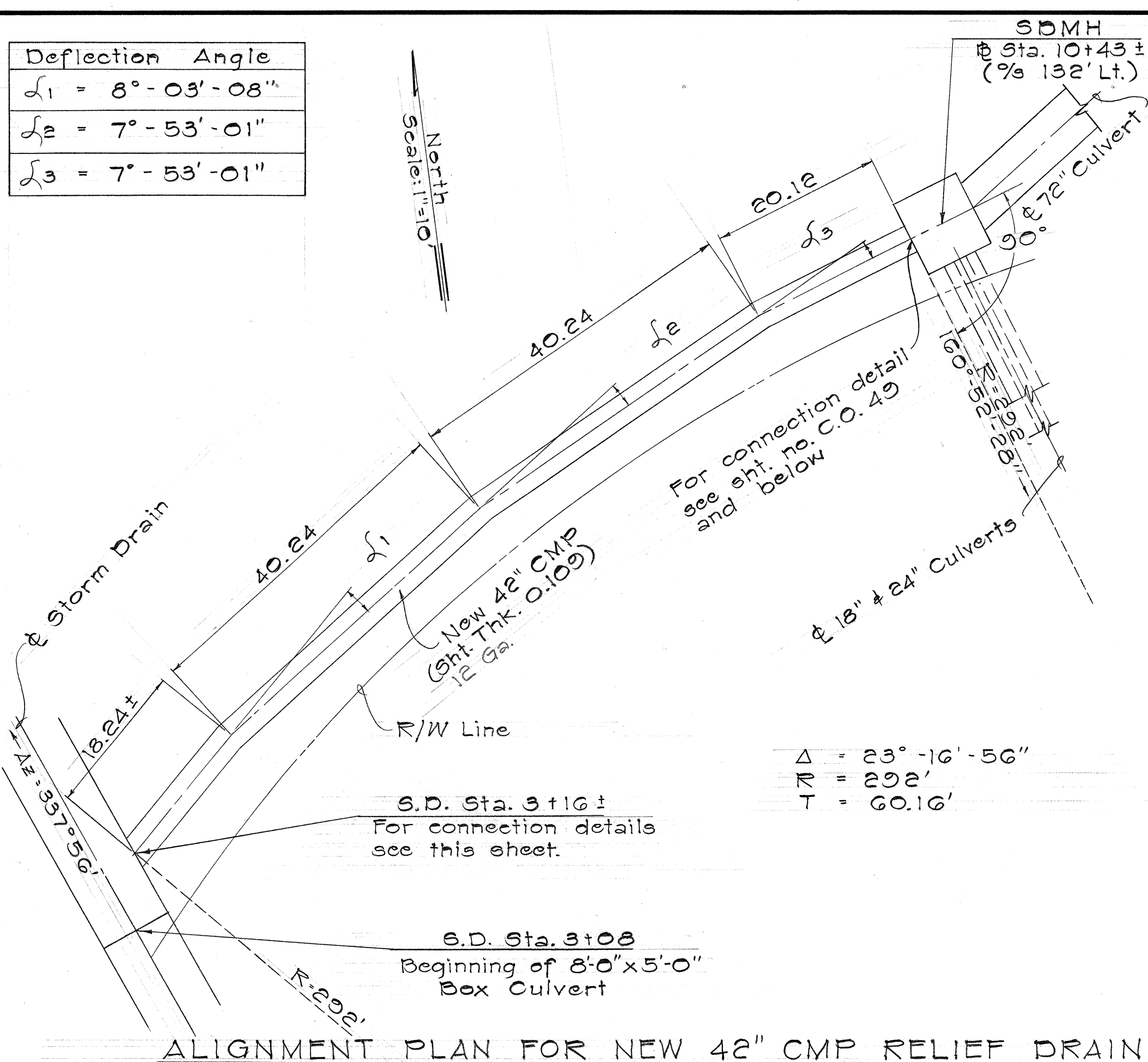
*D' ~ Based on skewed angle of
Pipe Culverts leaving and
entering structures

DATE	REVISION
6/23/72	42" Relief Drain Connection Details

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
S.D.M.H. @ STA. 9+66 ± RT.
S.D.M.H. @ STA. 10+43 ± LT.
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)
Scale: 1/2" = 1'-0" Date:

SHEET No. 14 OF 35 SHEETS

Deflection Angle	
$\angle_1$	$= 8^{\circ}-03'-08''$
$\angle_2$	$= 7^{\circ}-53'-01''$
$\angle_3$	$= 7^{\circ}-53'-01''$

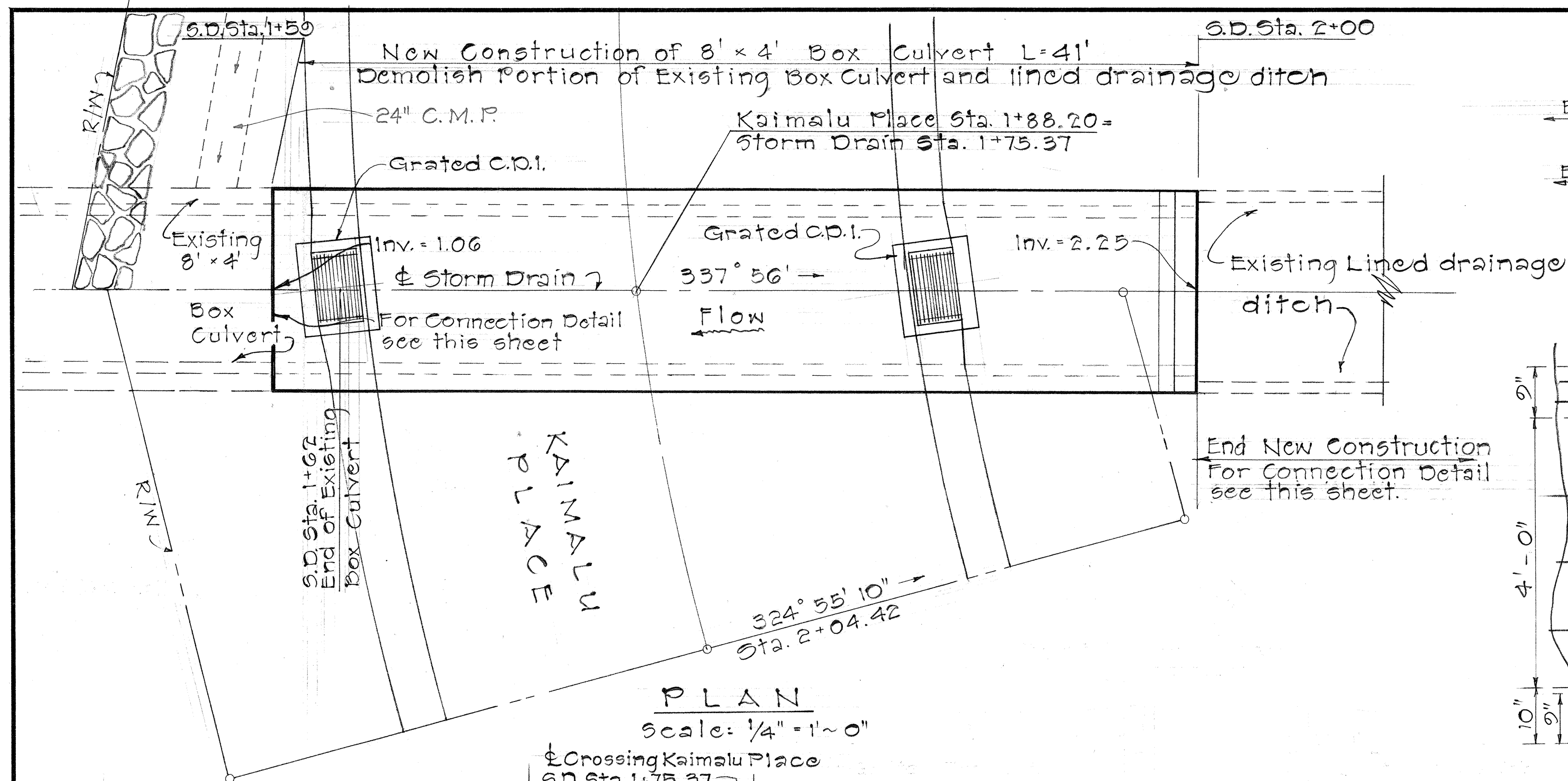


FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1972	CO.49S1	153

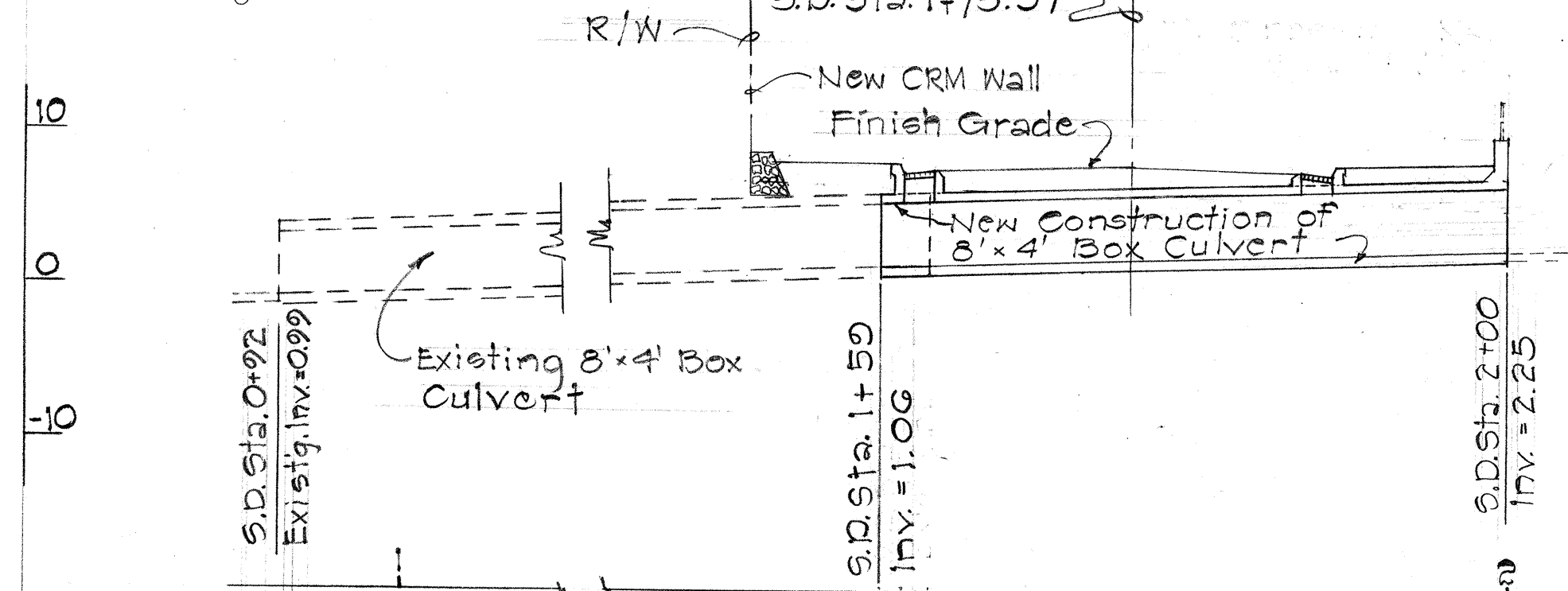
6/23/72 42" Relief Drain Connection Details	
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION DRAINAGE DETAILS FOR 42" CMP RELIEF DRAIN ALONG ROADWAY "A" MOKAPU SADDLE ROAD F.A.S. Proj. No. 5-0630(10) Scale: As Noted Date: June, 1972 SHEET No. 14A OF 35 SHEETS	

C.0.49S-1

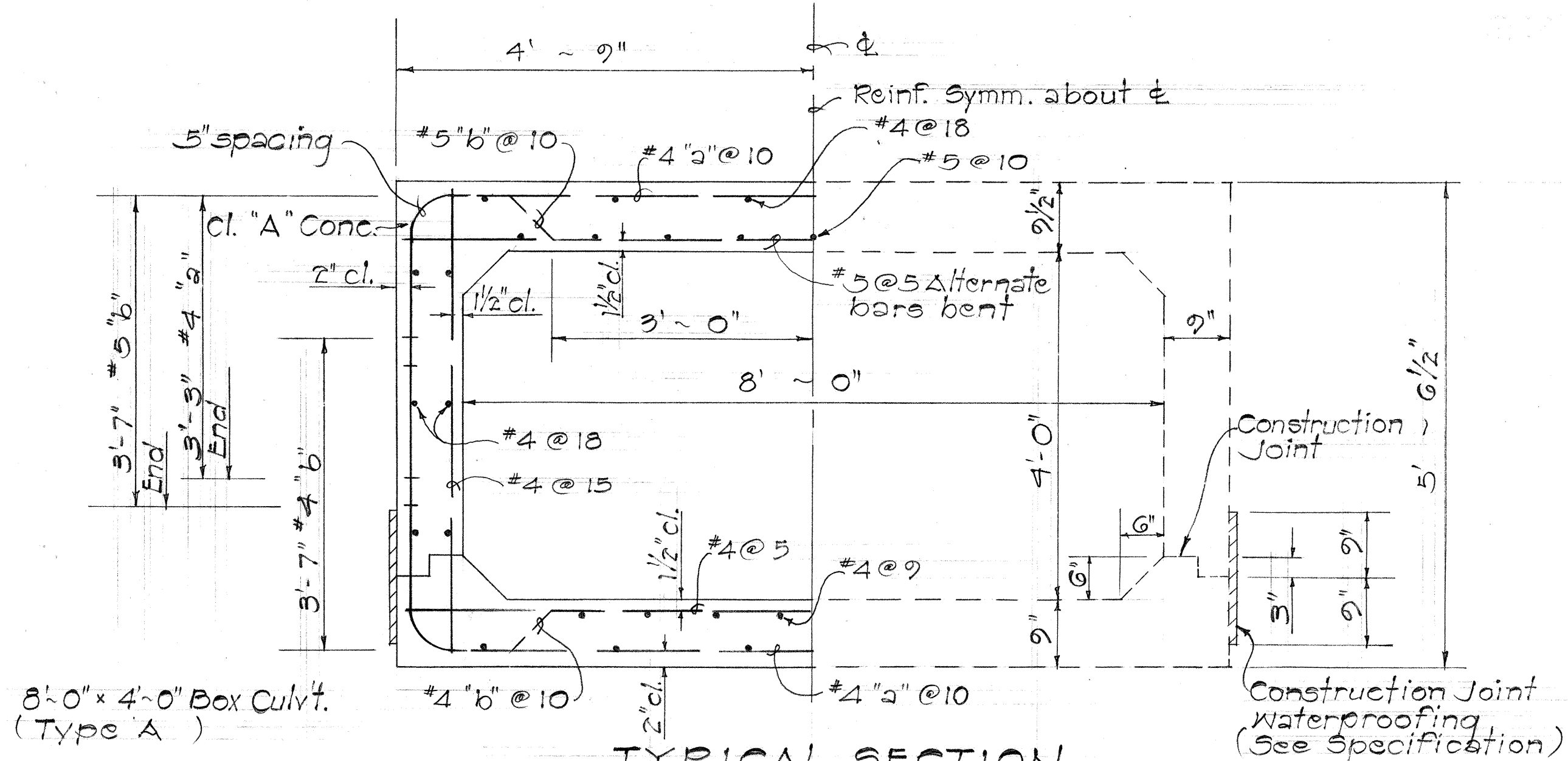
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	50	153



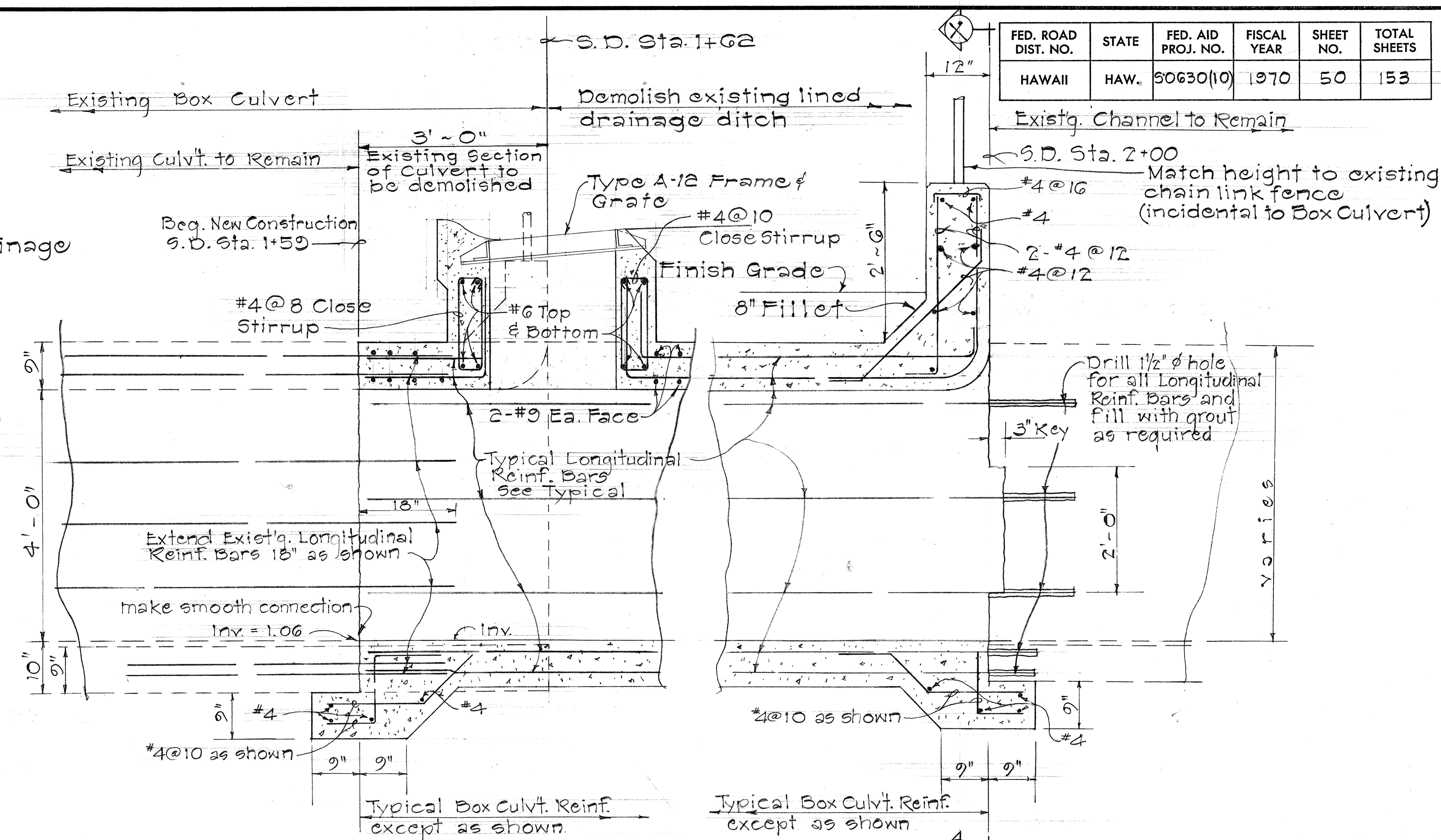
PLAN
Scale: 1/4" = 1'-0"



PROFILE - 8' x 4' BOX CULVERT
CROSSING KAIMALU PLACE
Scale: 1" = 10'

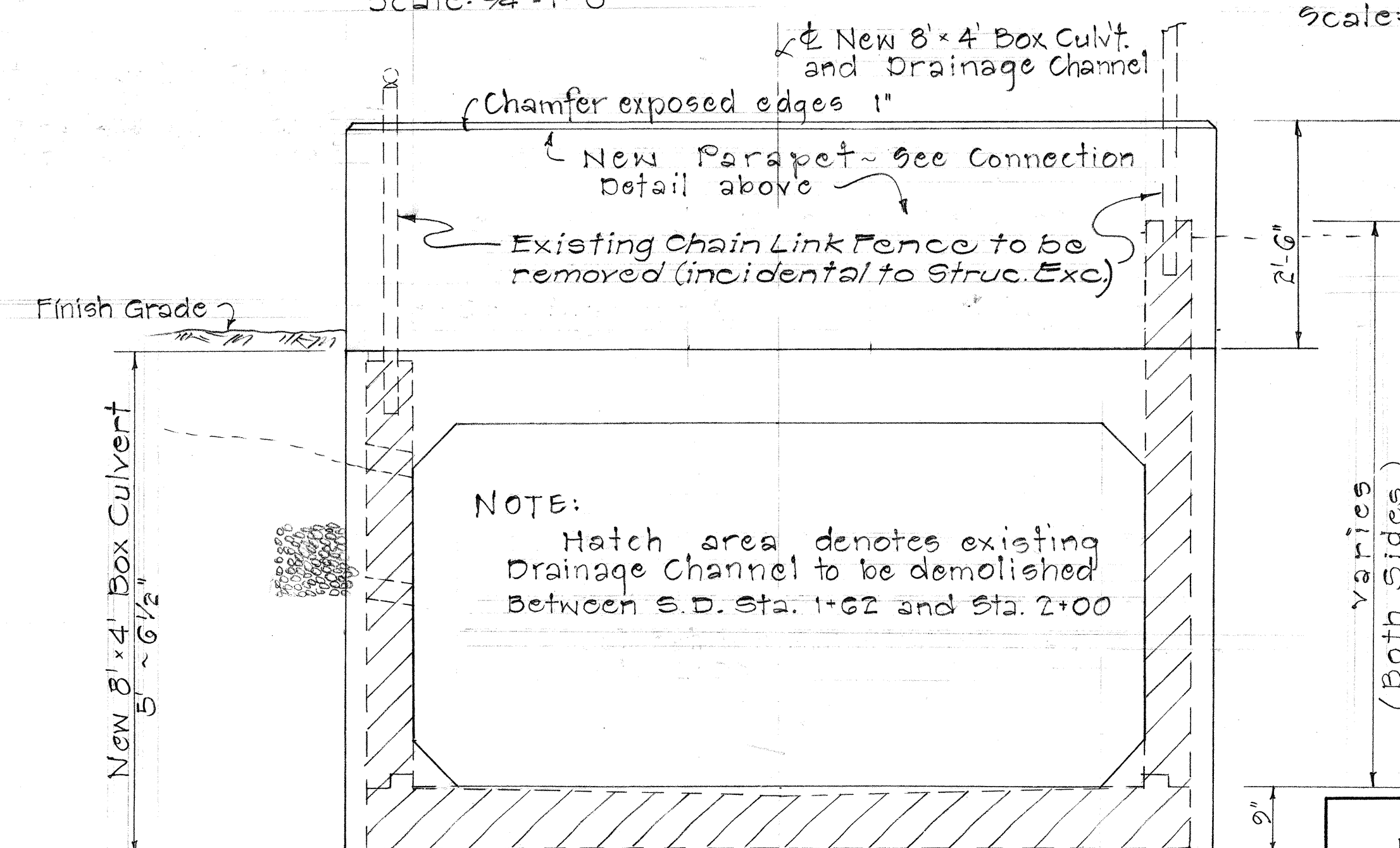


TYPICAL SECTION
Scale: 3/4" = 1'-0"
DETAILS OF NEW 8'-0" x 4'-0" BOX CULVERT

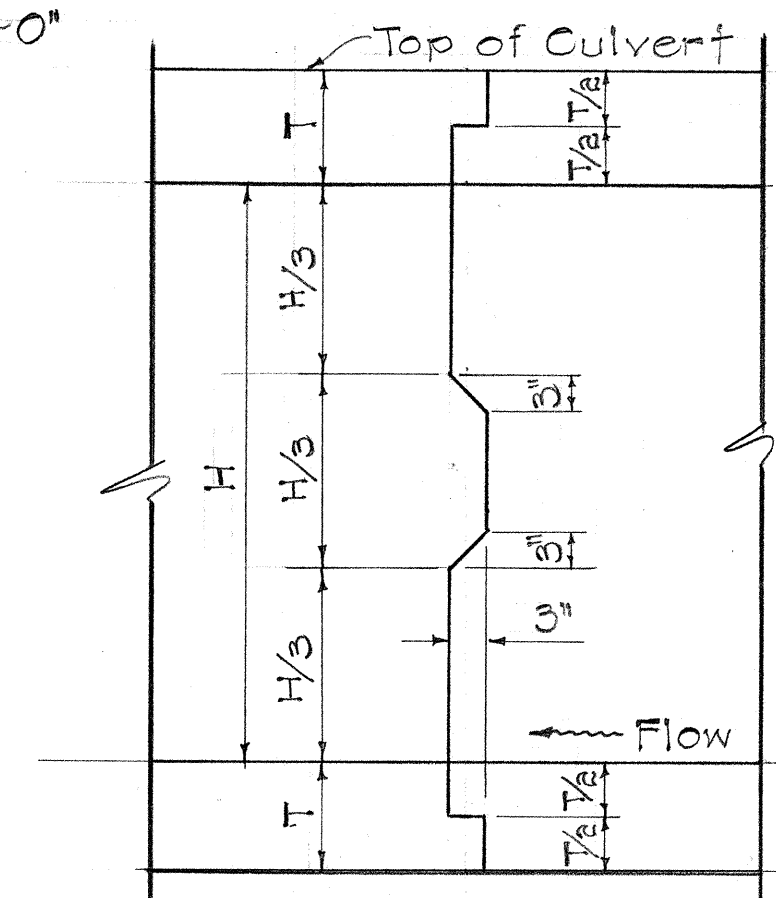


CONNECTION DETAIL
@ S.D. STA. 1+59
Scale: 3/4" = 1'-0"

CONNECTION DETAIL
@ S.D. STA. 2+00
Scale: 3/4" = 1'-0"



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



TYPICAL CONSTRUCTION
JOINT FOR BOX CULVERT
AT 30' O.C.
Scale: 3/4" = 1'-0"

STATE OF HAWAII	
DEPARTMENT OF TRANSPORTATION	
HIGHWAYS DIVISION	
DRAINAGE DETAILS	
8'-0" x 4'-0" BOX CULVERT	
CONNECTION DETAILS AT	
S.D. STA. 1+59 & S.D. STA. 2+00	
MOKAPU SADDLE ROAD	
E.A.S. Proj. No. 5-0630(10)	
Scale: As Shown	Date:
SHEET No. 15 OF 35 SHEETS	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

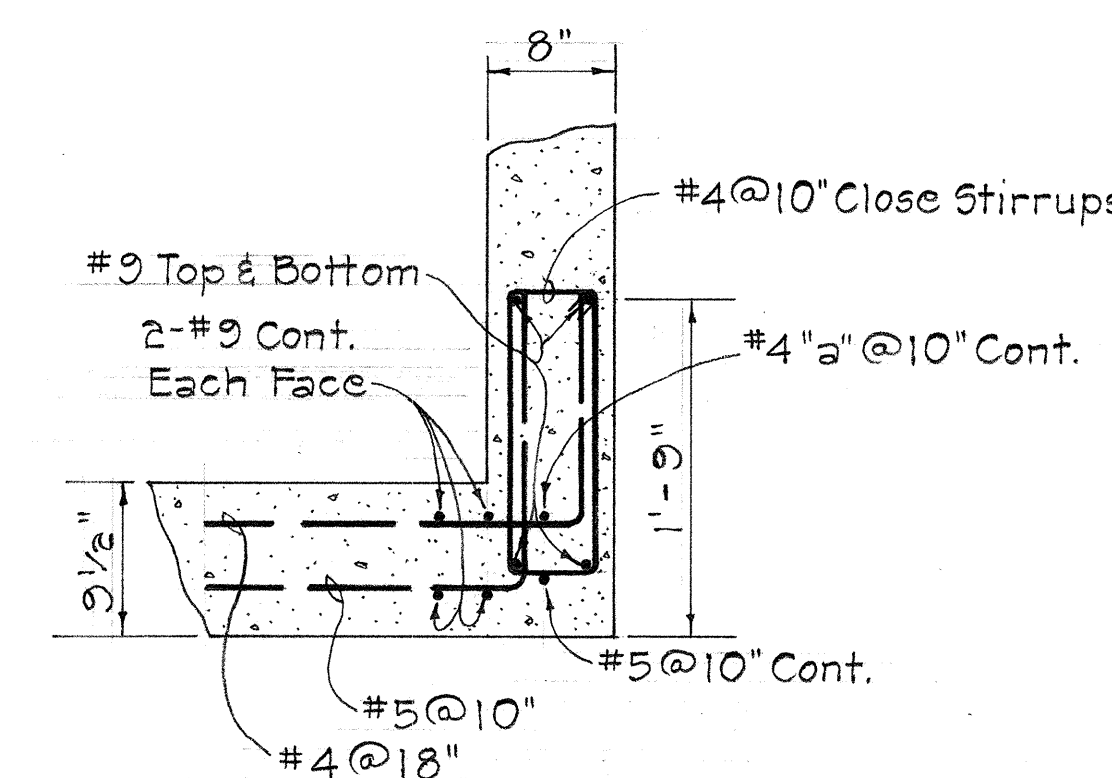
DRAINAGE DETAILS

GRATED DROP INTAKE AT
KAIMALU PLACE STA. 1+88.20 L&R

MOKAPU SADDLE ROAD
E.A.S. Proj. No. S-0630(10)

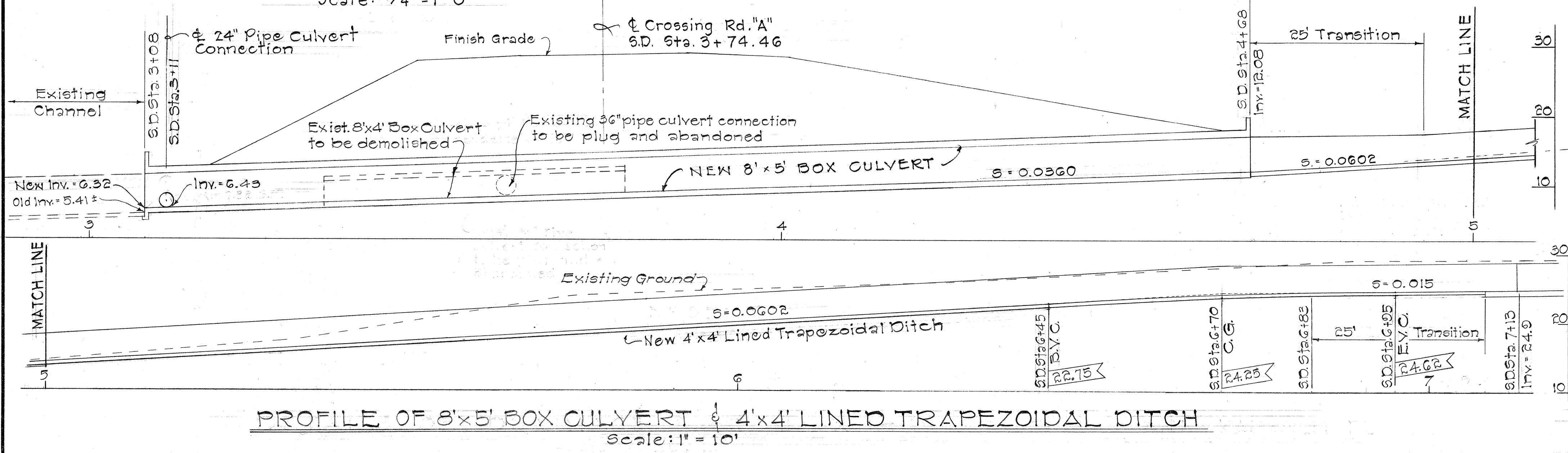
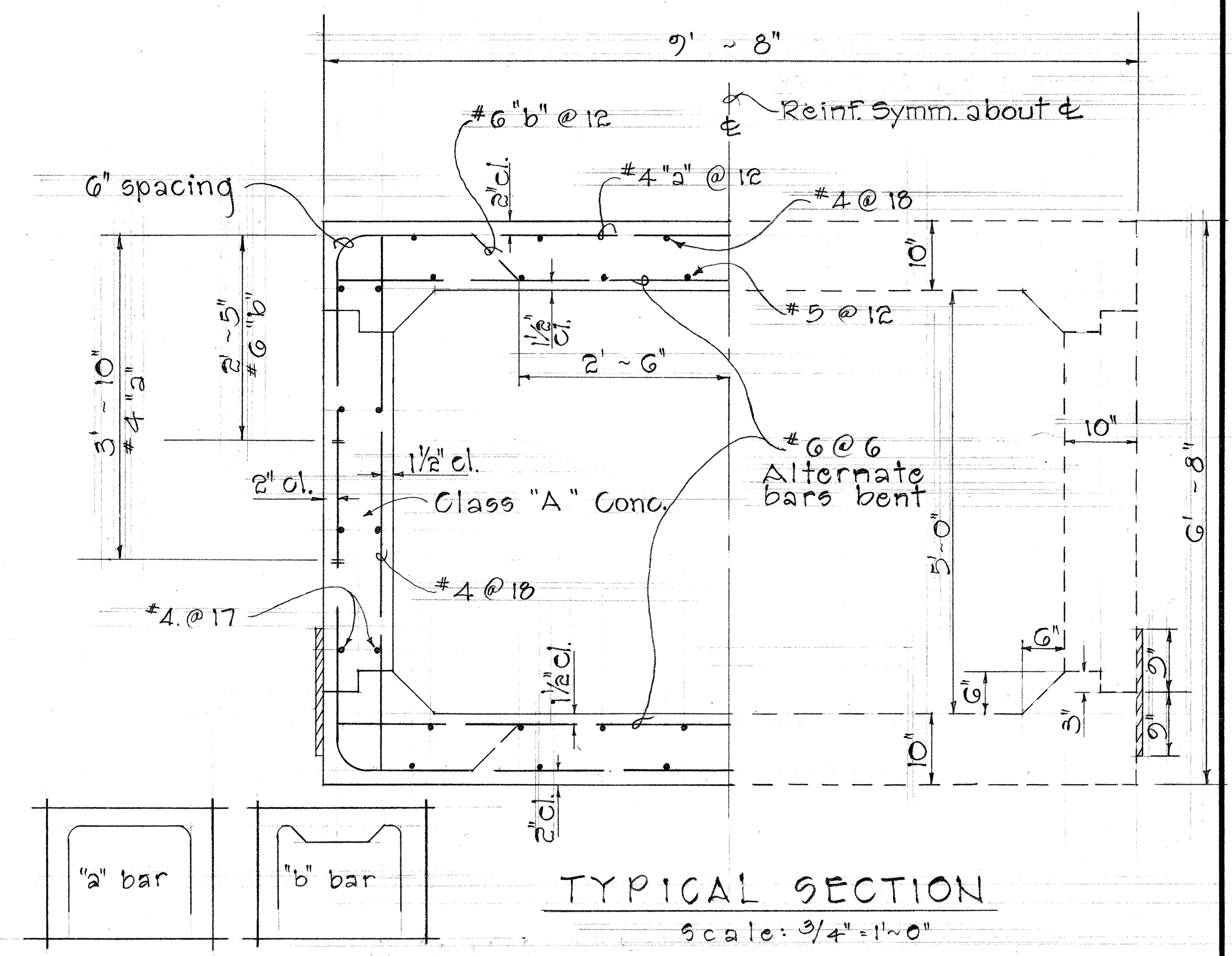
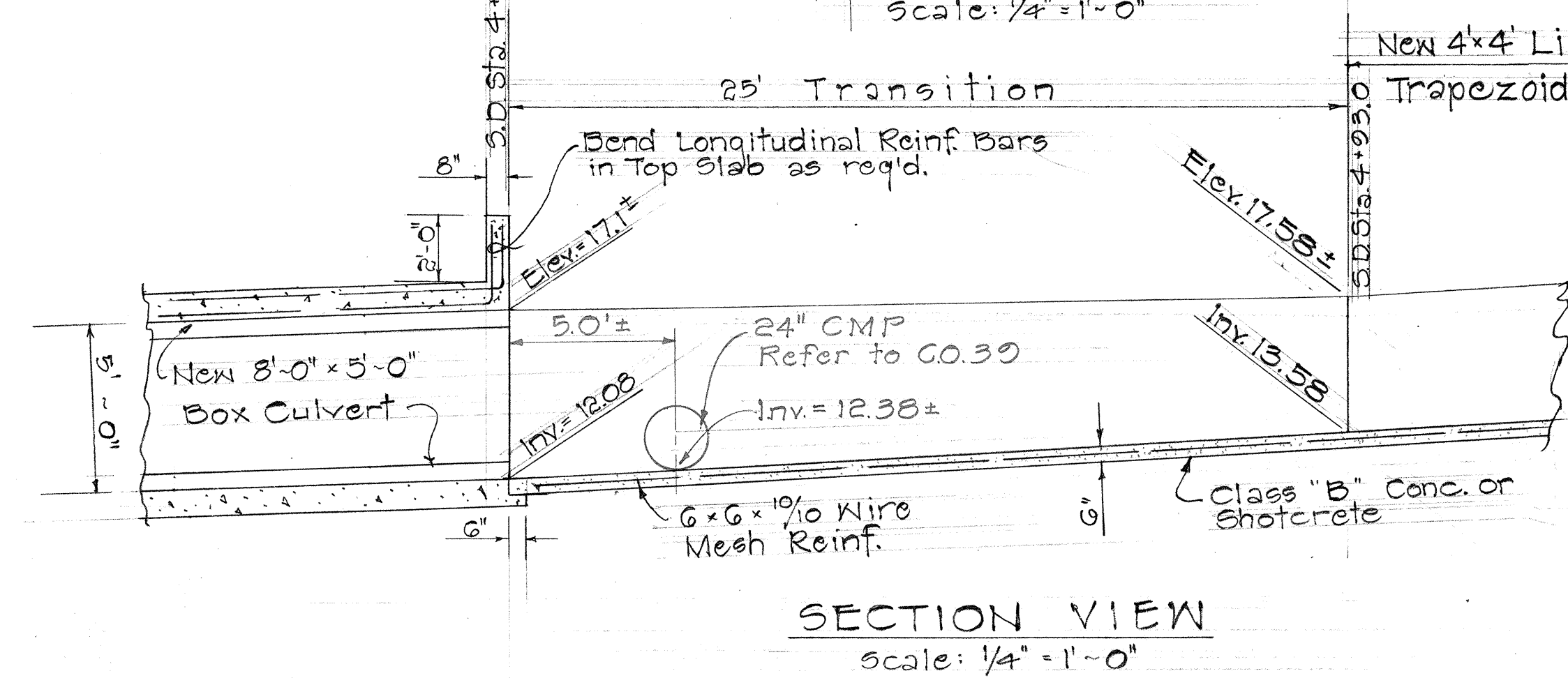
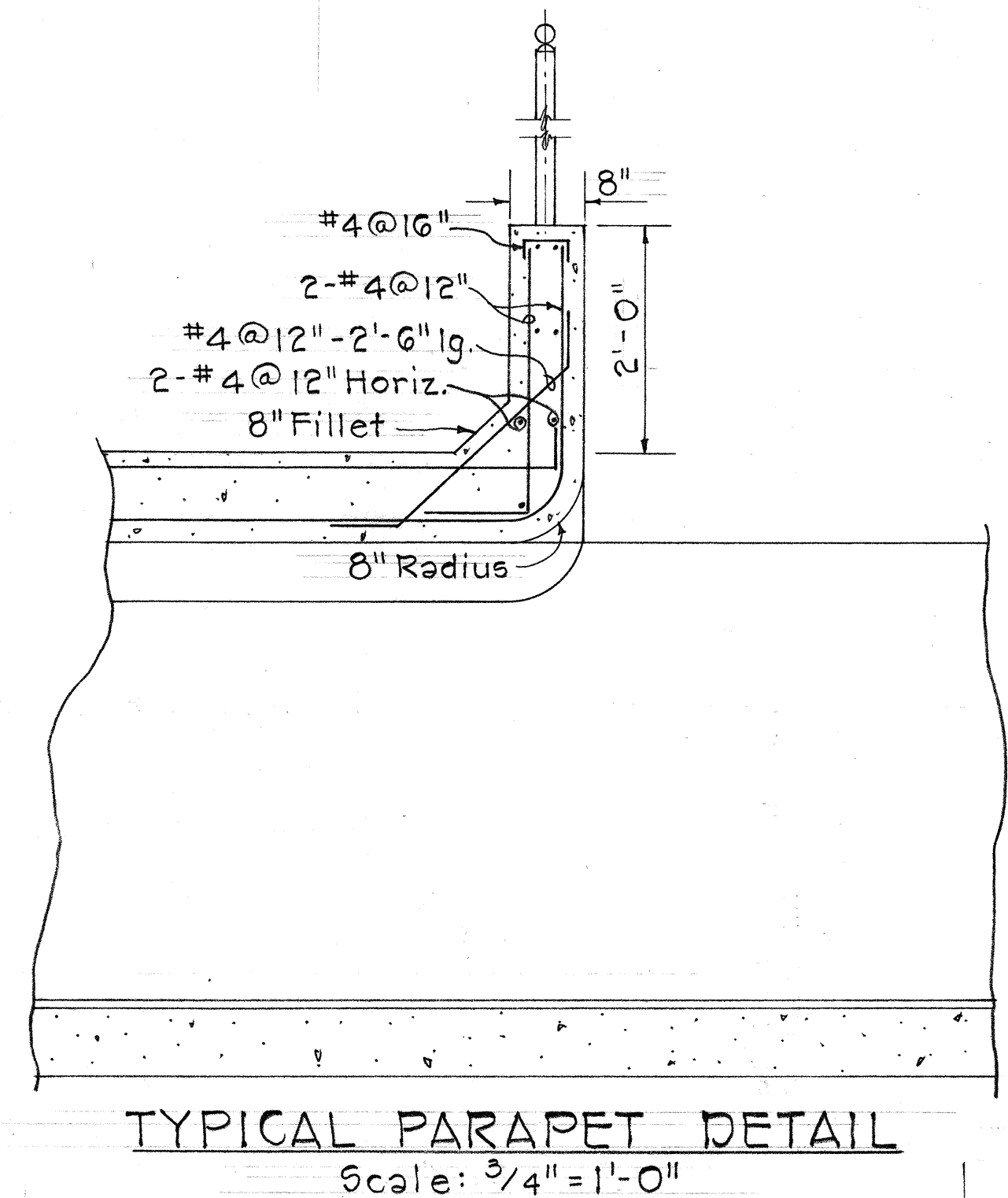
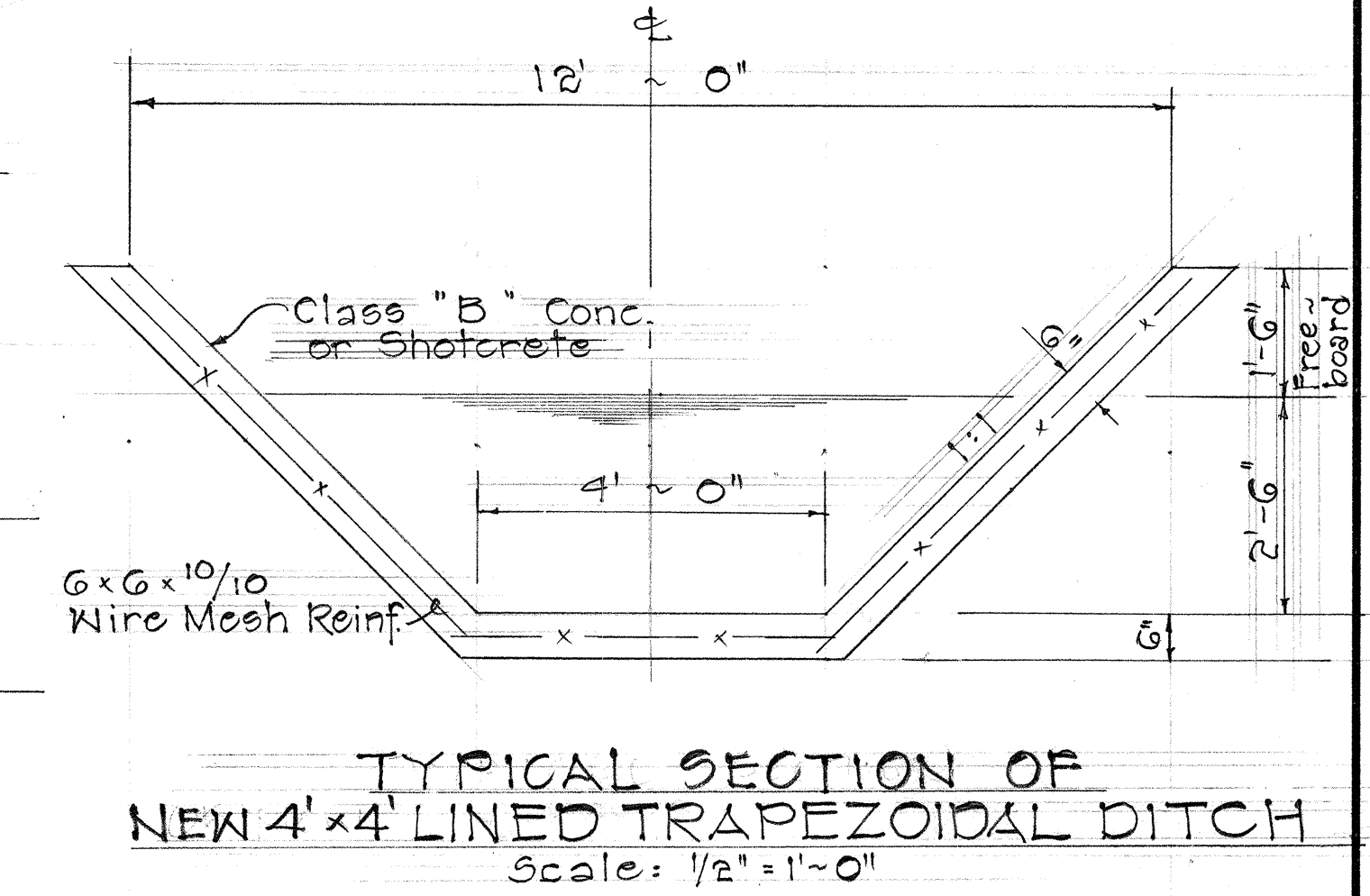
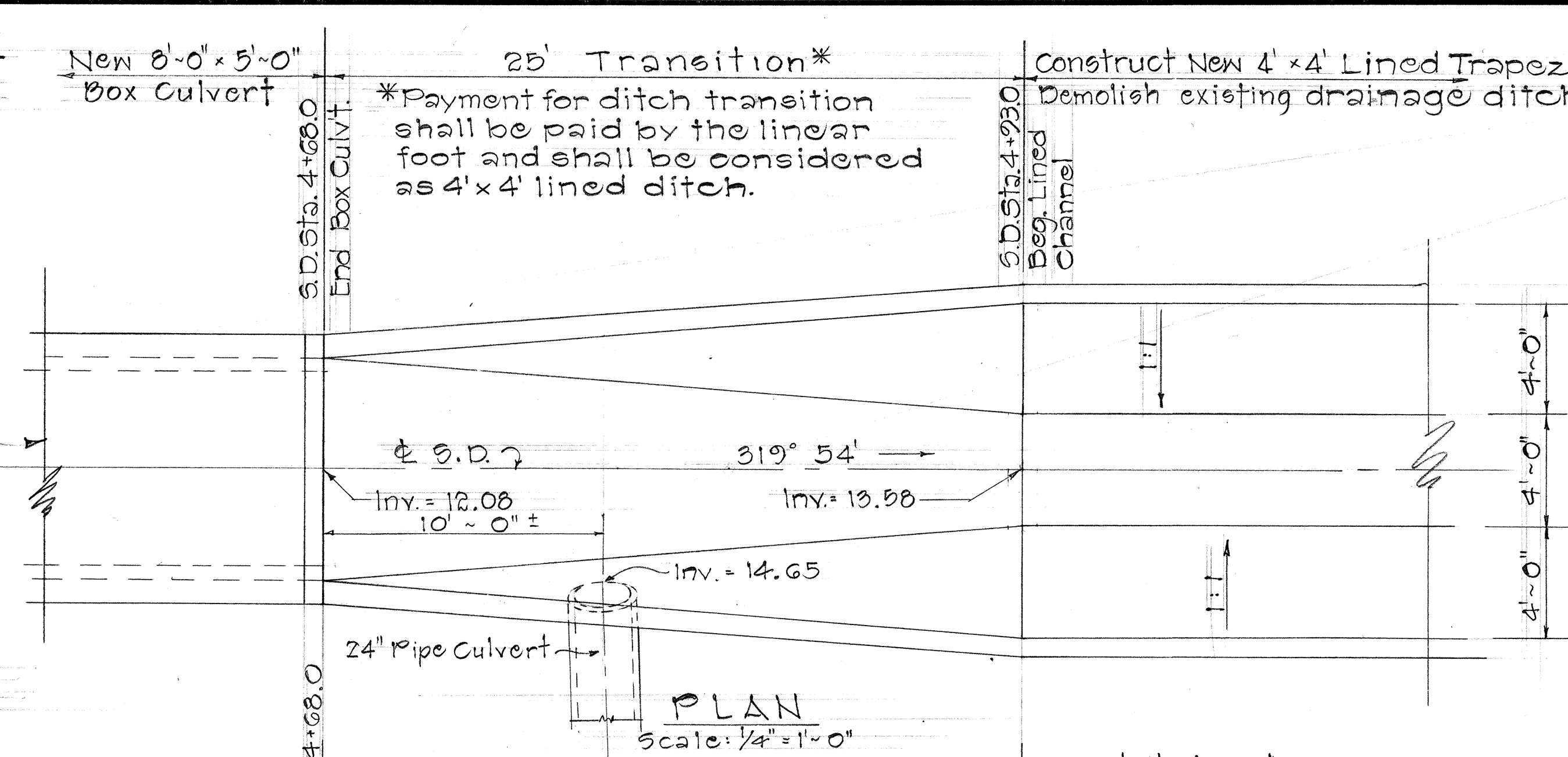
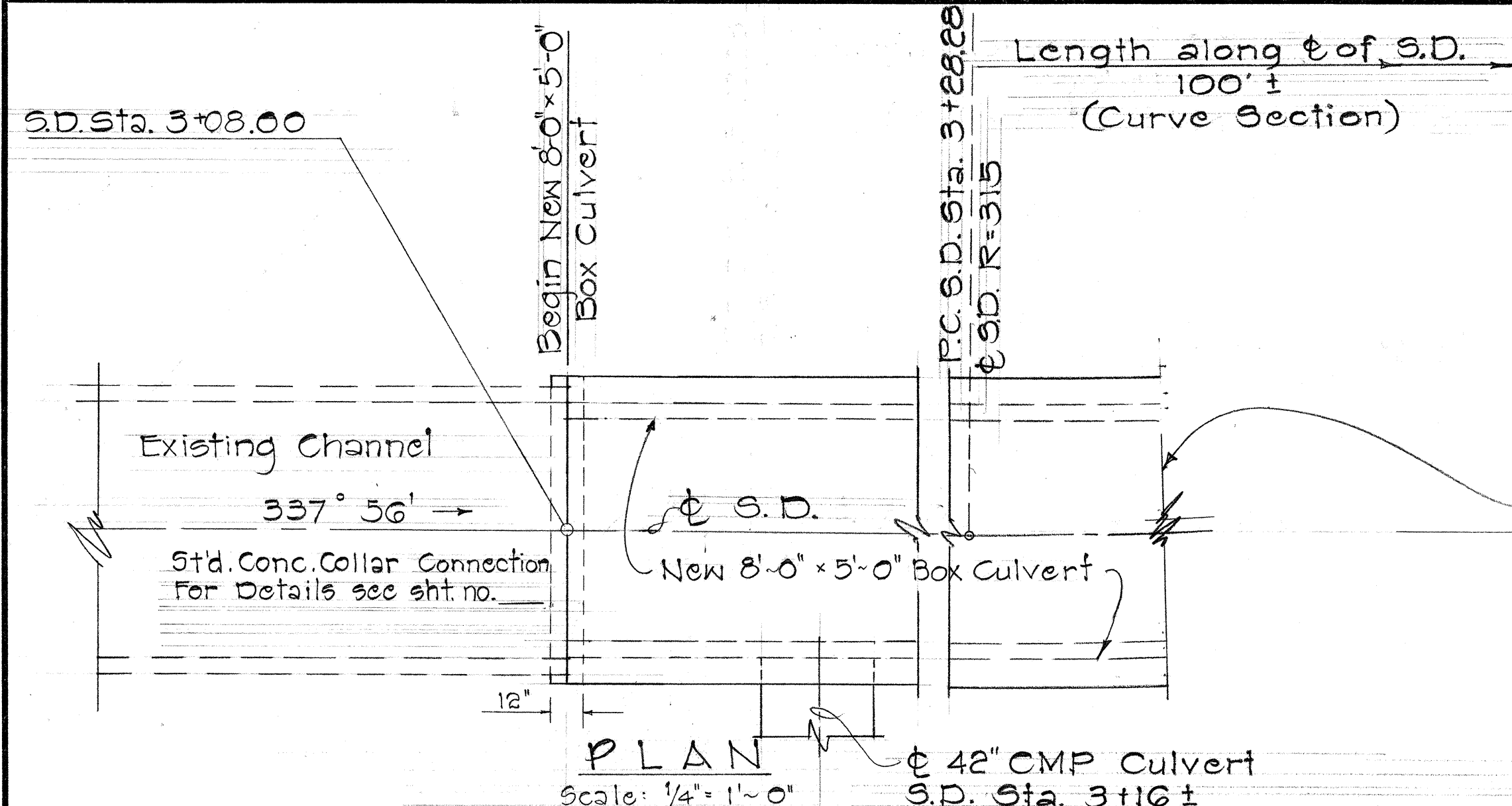
Scale: As Shown Date:

SHEET No. 16 OF 35 SHEETS



SECTION "C-C"

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	52	153

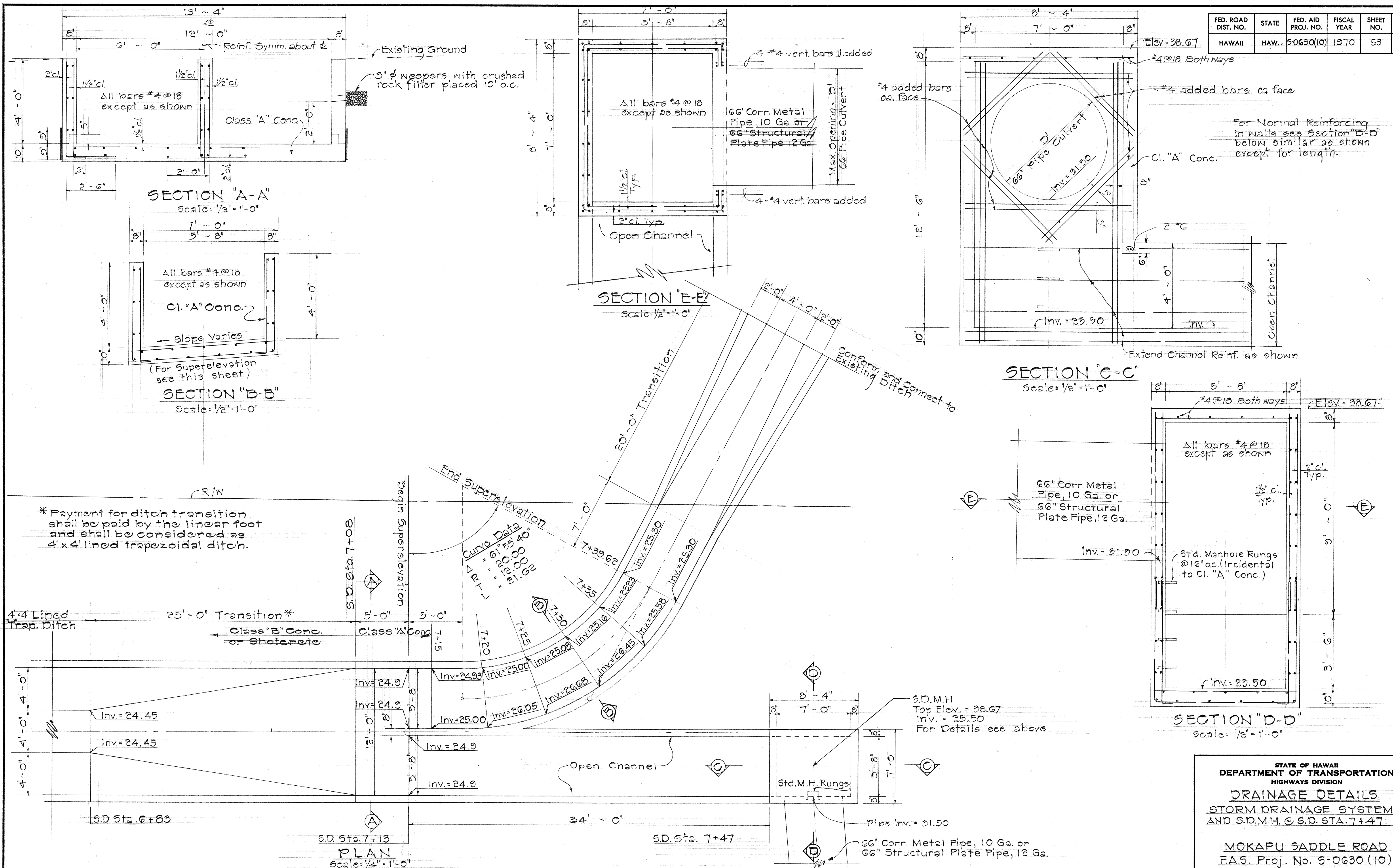


TYPICAL DETAILS OF 8'-0" x 5'-0" BOX CULVERT

6/23/72 42" Relief Drain Connection at existing RCB Culvert
DATE REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
8'-0" x 5'-0" BOX CULVERT
PROFILE OF 8' x 5' BOX CULVERT
AND 4' x 4' LINED TRAP. DITCH
MOKAPU SADDLE ROAD
F.A.5. Proj. No. 5-0630(10)
Scale: As Shown Date:
SHEET No. 17 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	53	153



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

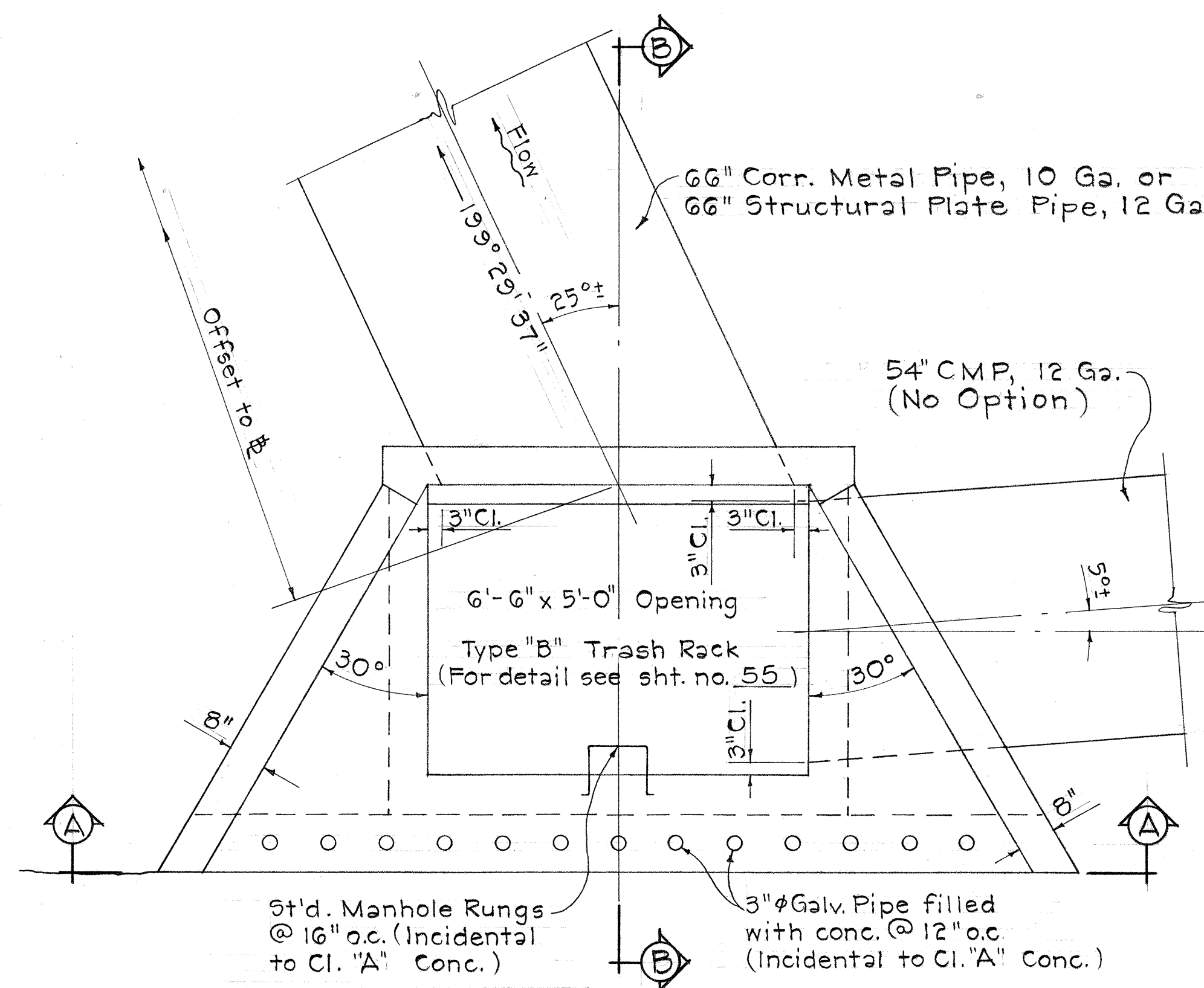
STORM DRAINAGE SYSTEM
AND S.D.M.H. @ S.D. STA. 7+47

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (10)

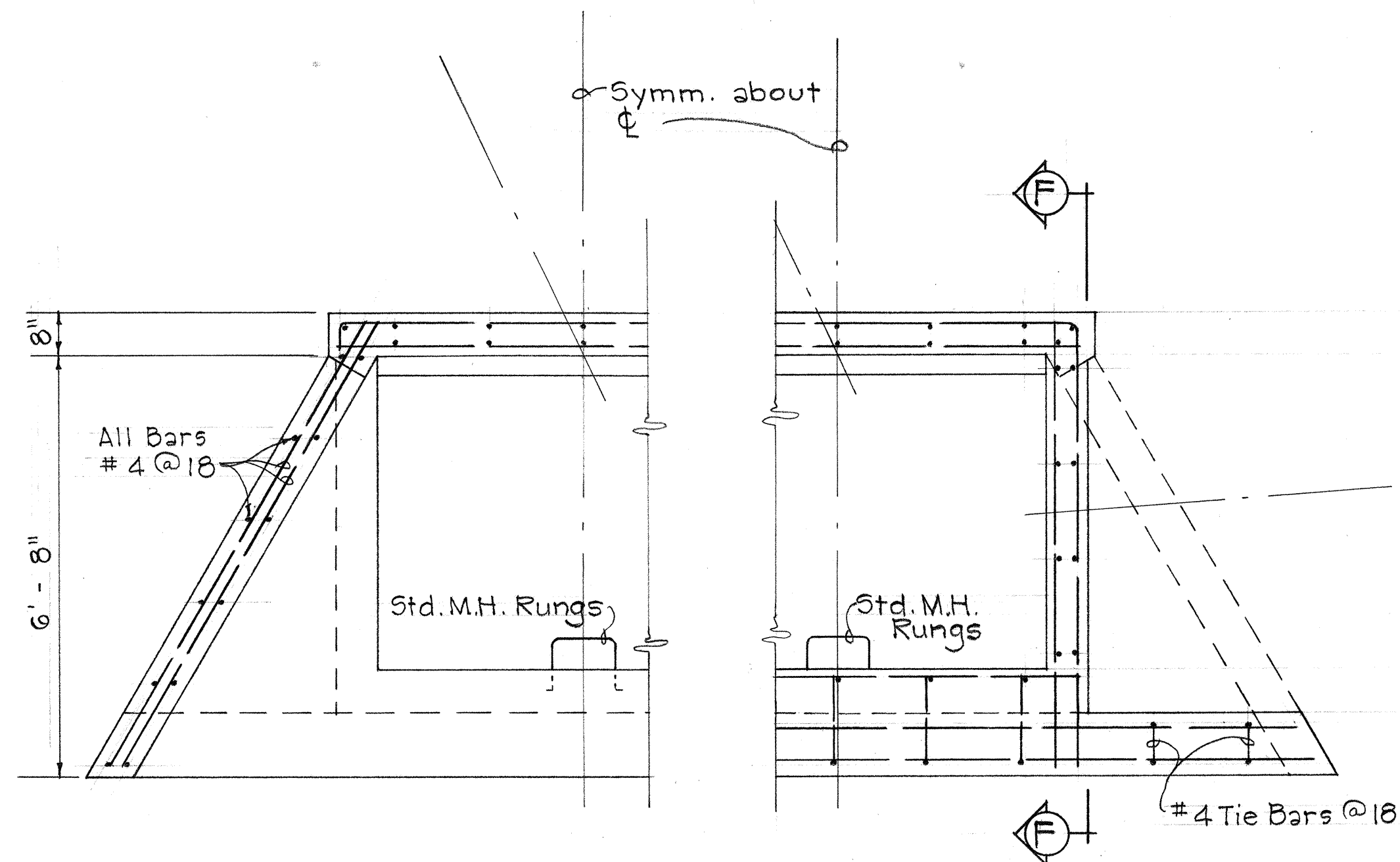
Scale: As Shown Date:

SHEET No. 18 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	54	153

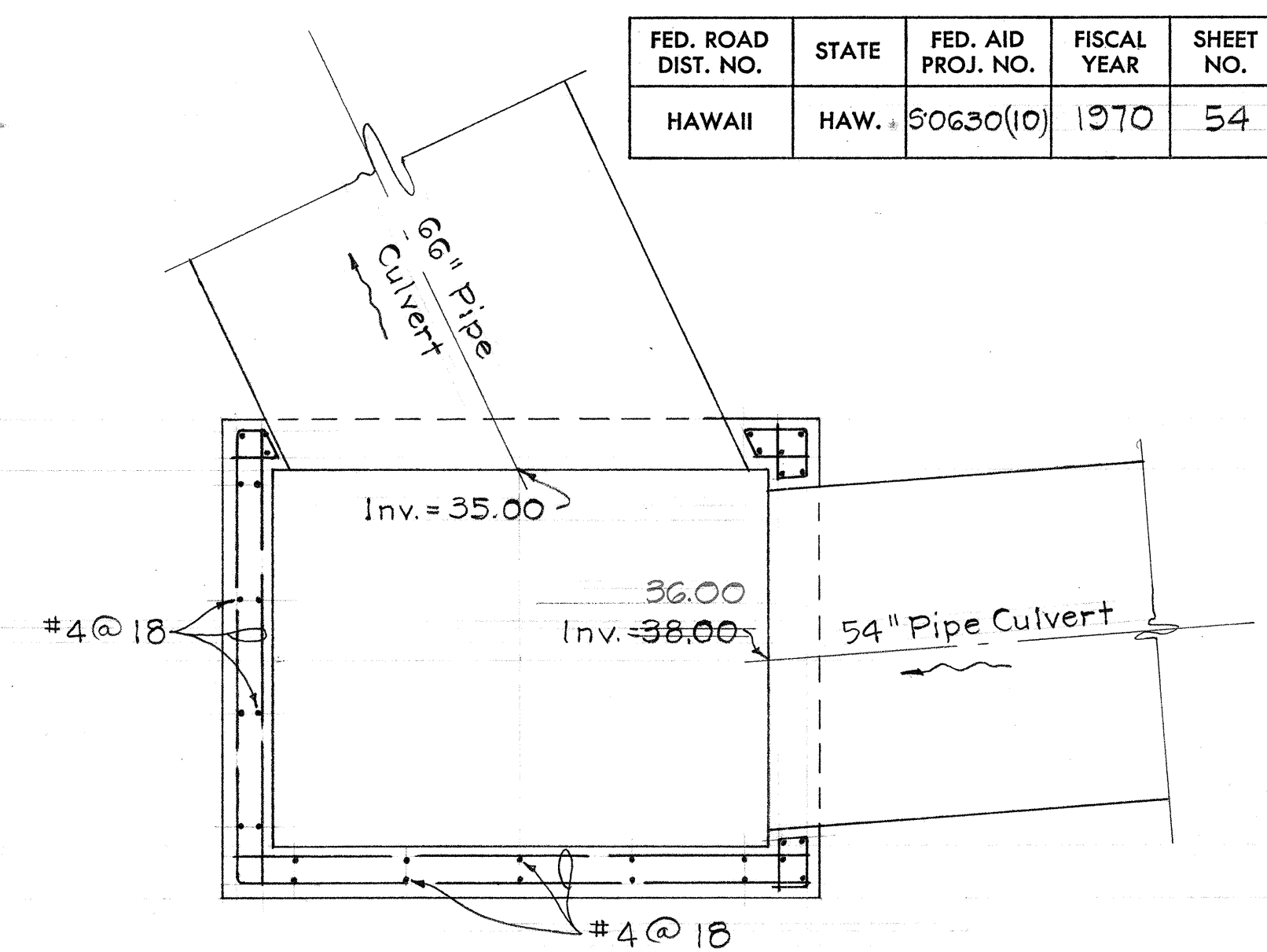


PLAN

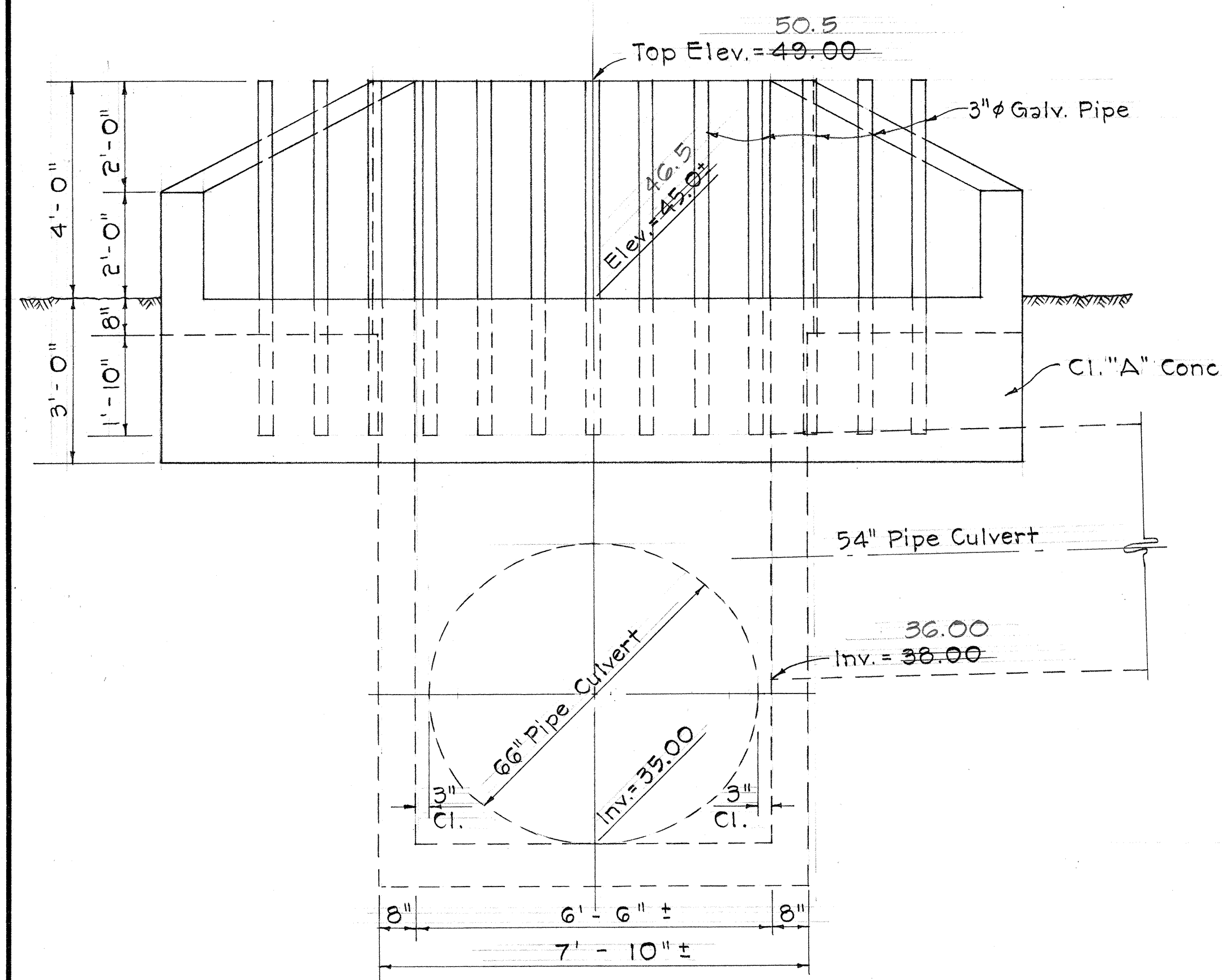


HALF PLAN OF
SECTION C

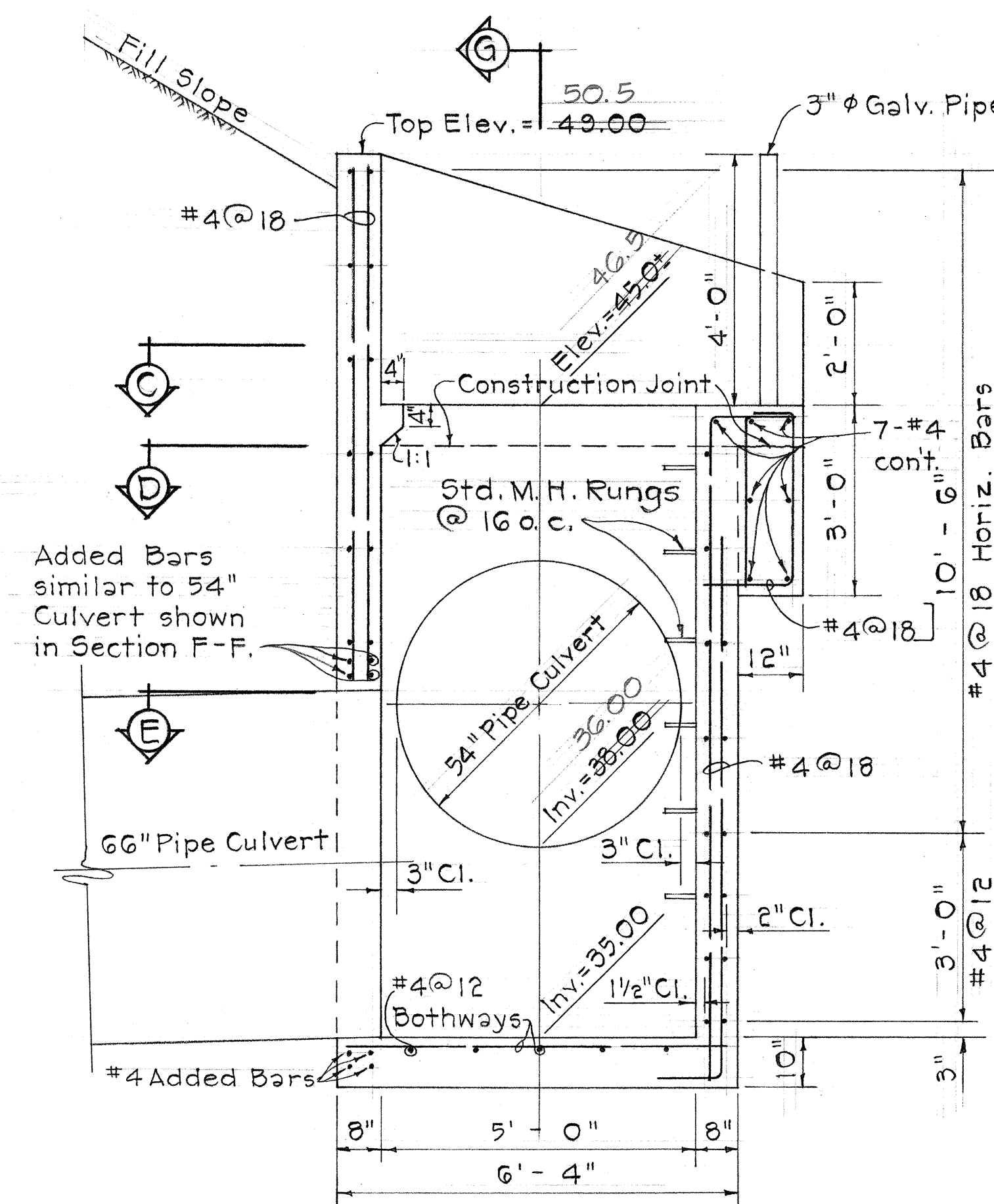
HALF PLAN OF SECTION D



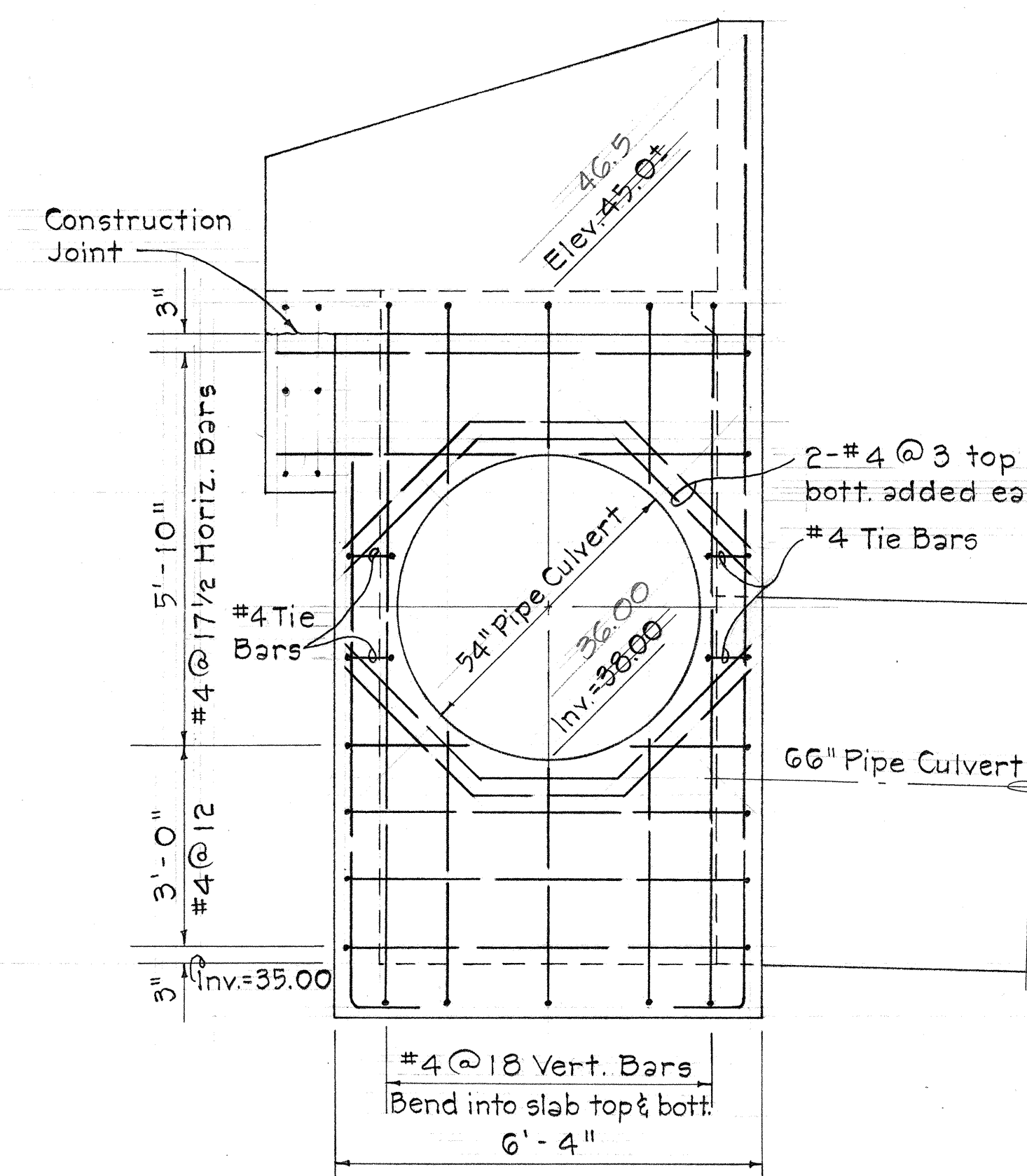
SECTION E



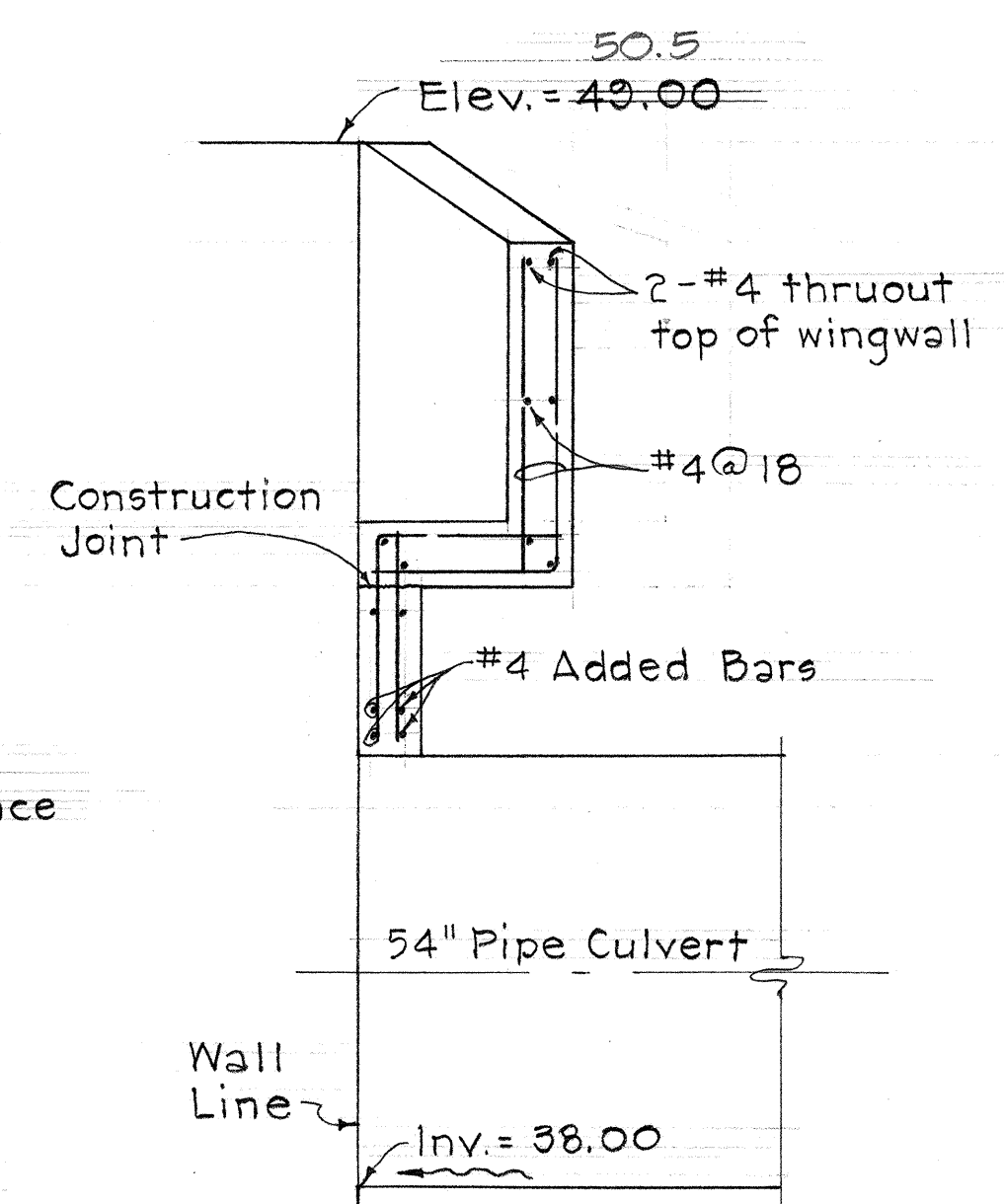
SECTION A-A



SECTION B-B



SECTION F-F



SECTION G

DETAILS OF DROP INTAKE AT ROAD "B" STA. 2 + 78 LT.

Scale: $\frac{1}{2}'' = 1'-0''$

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

DROP INTAKE @ RD."B" STA. 2+78 LT.

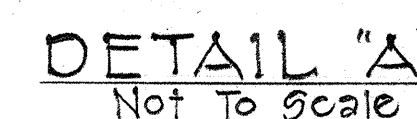
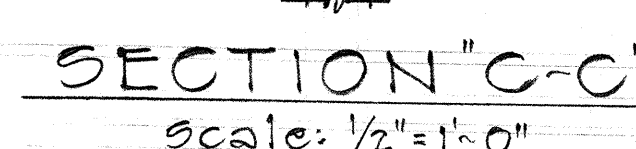
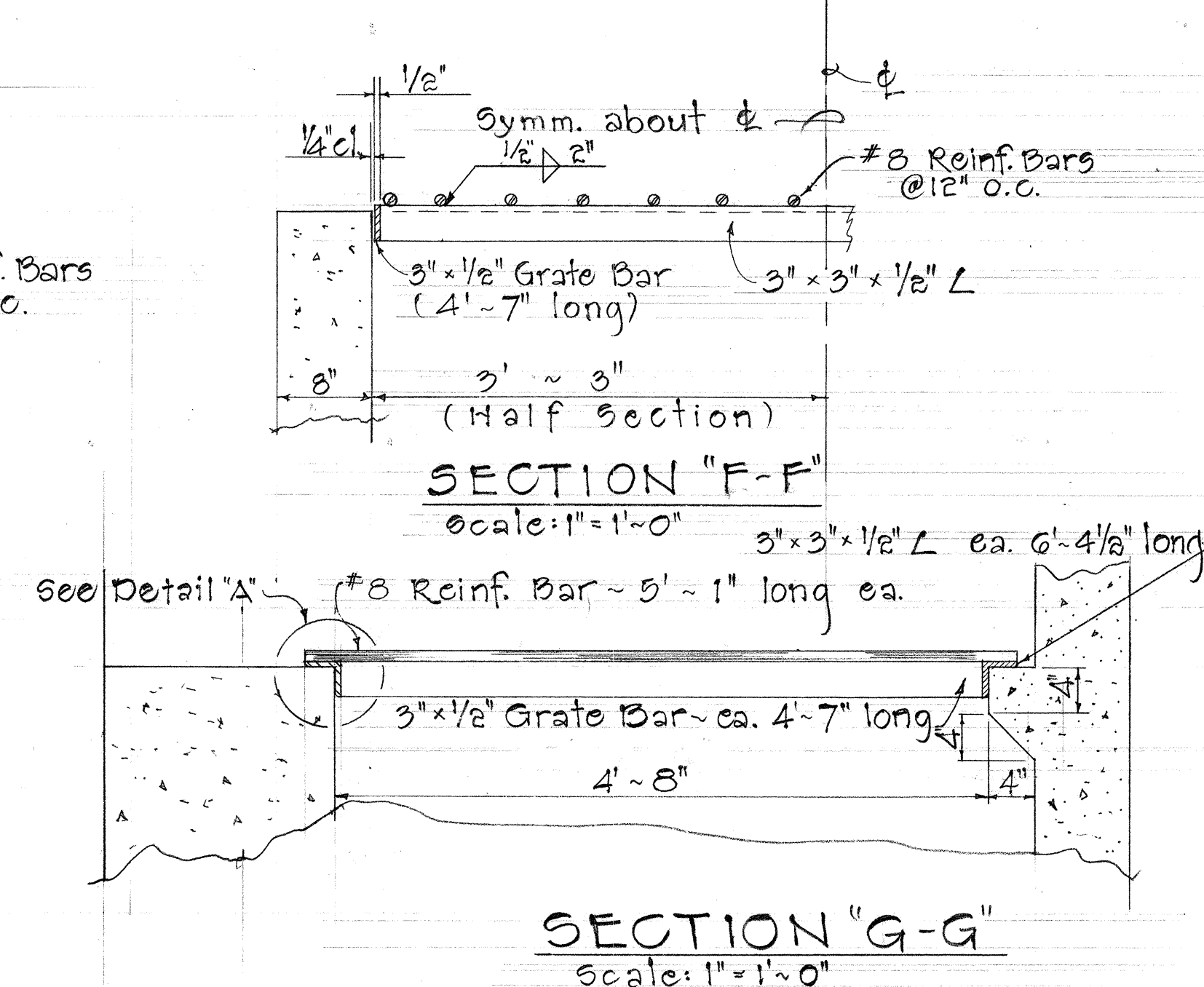
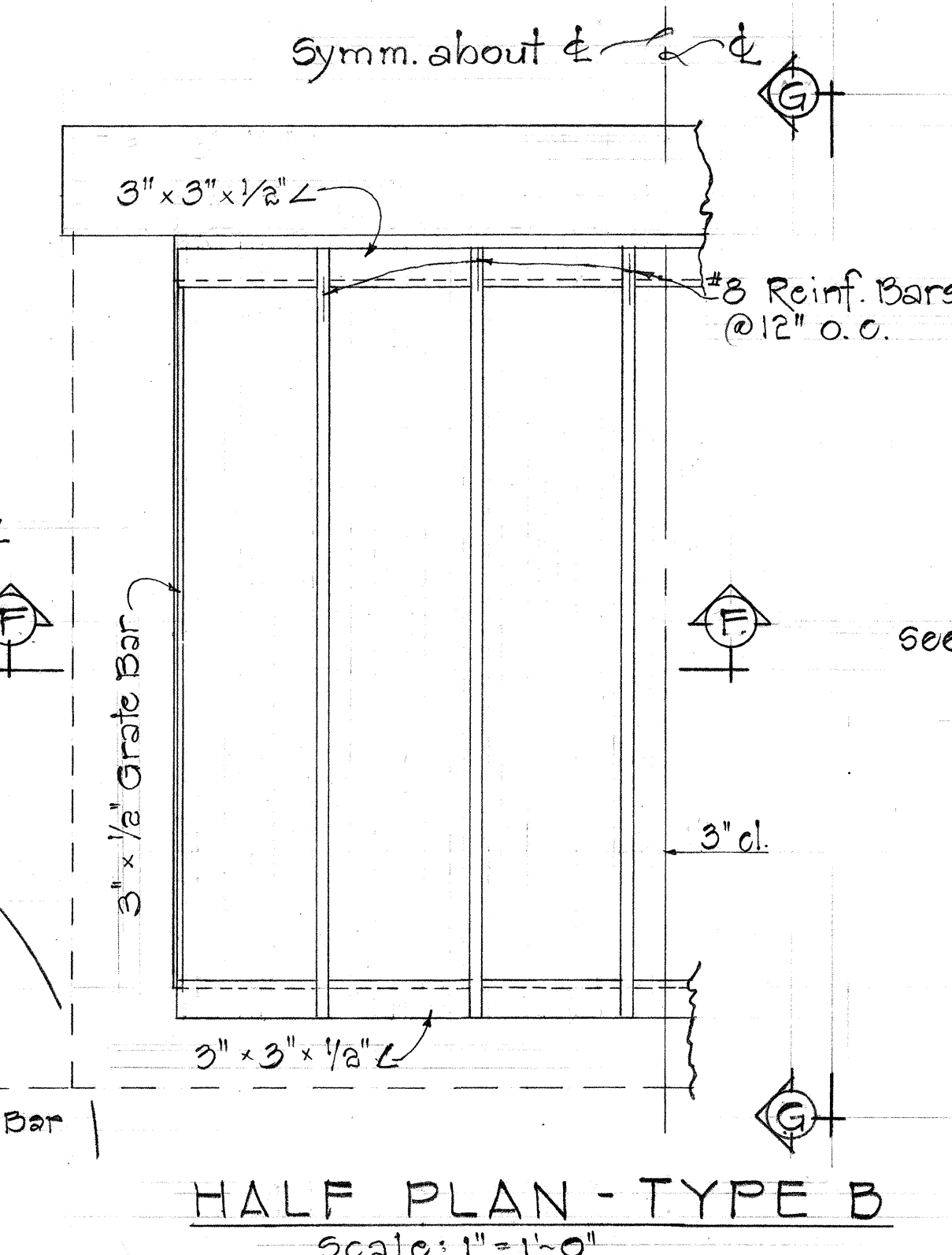
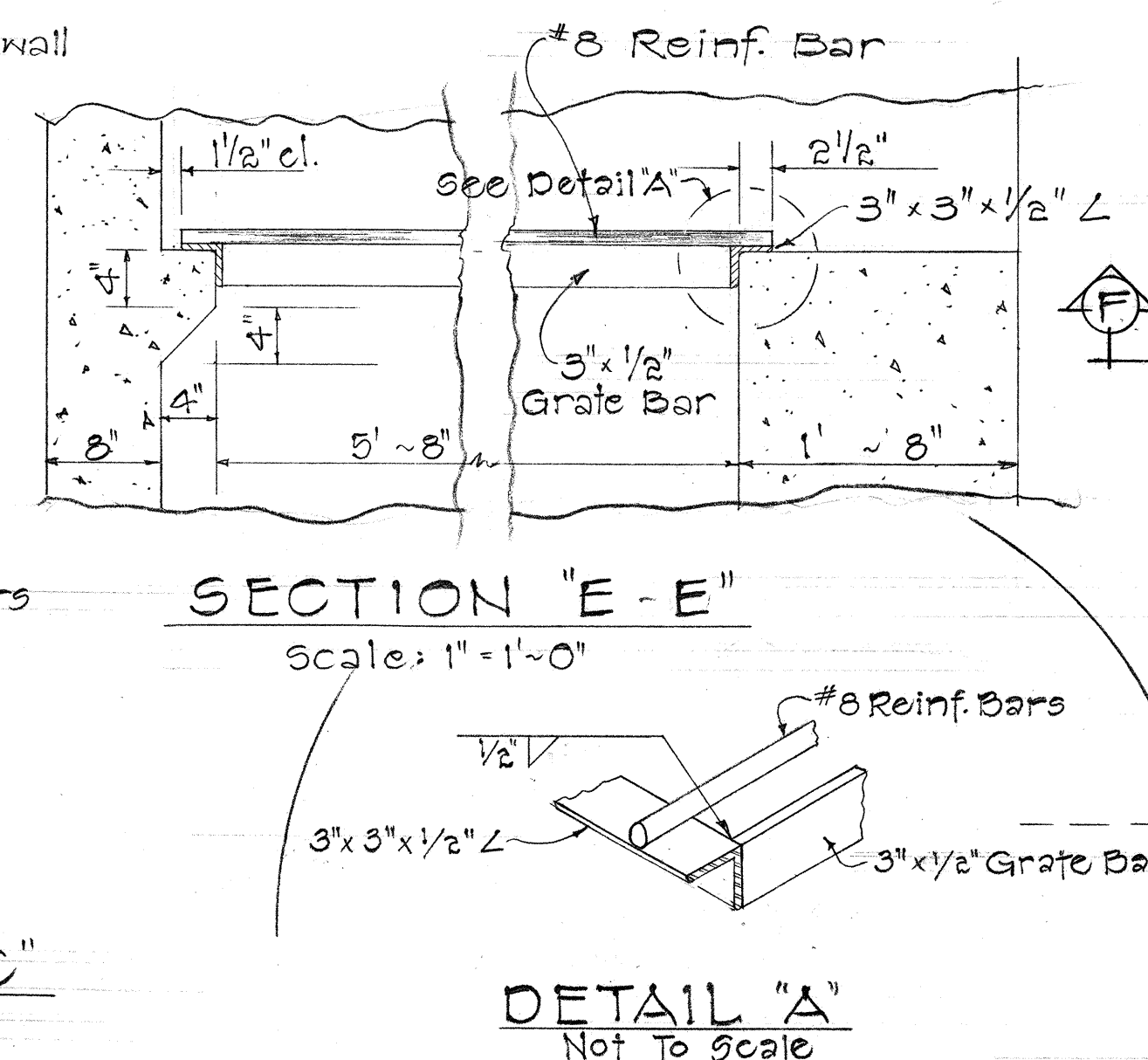
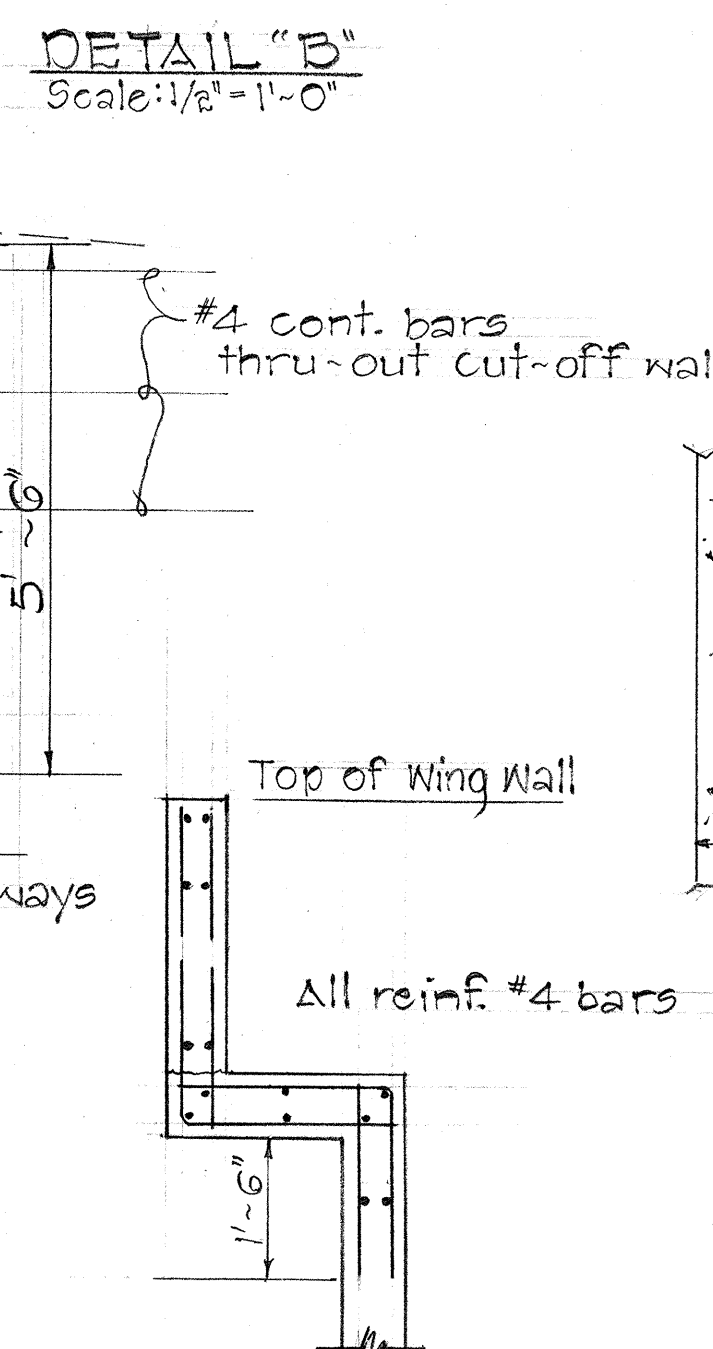
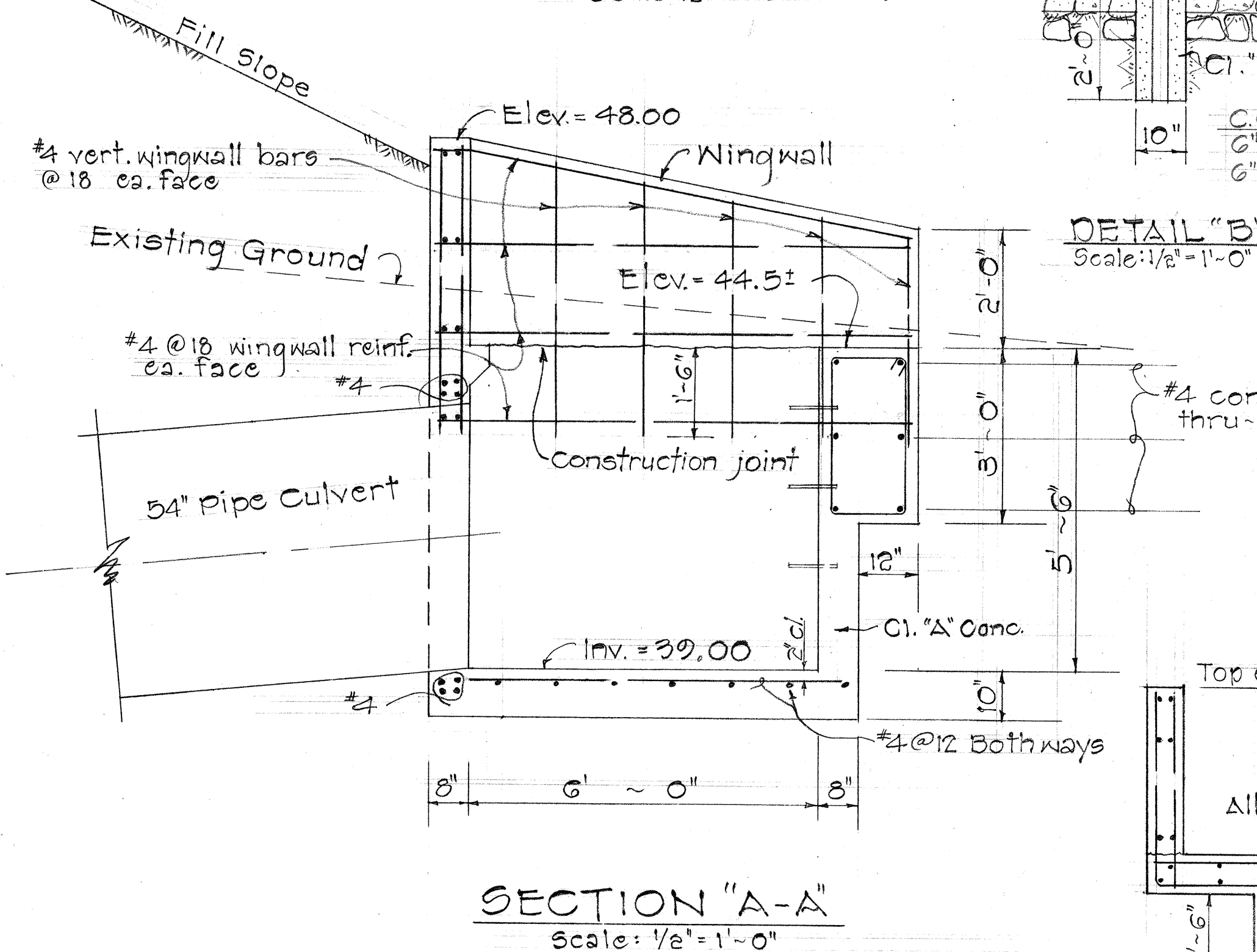
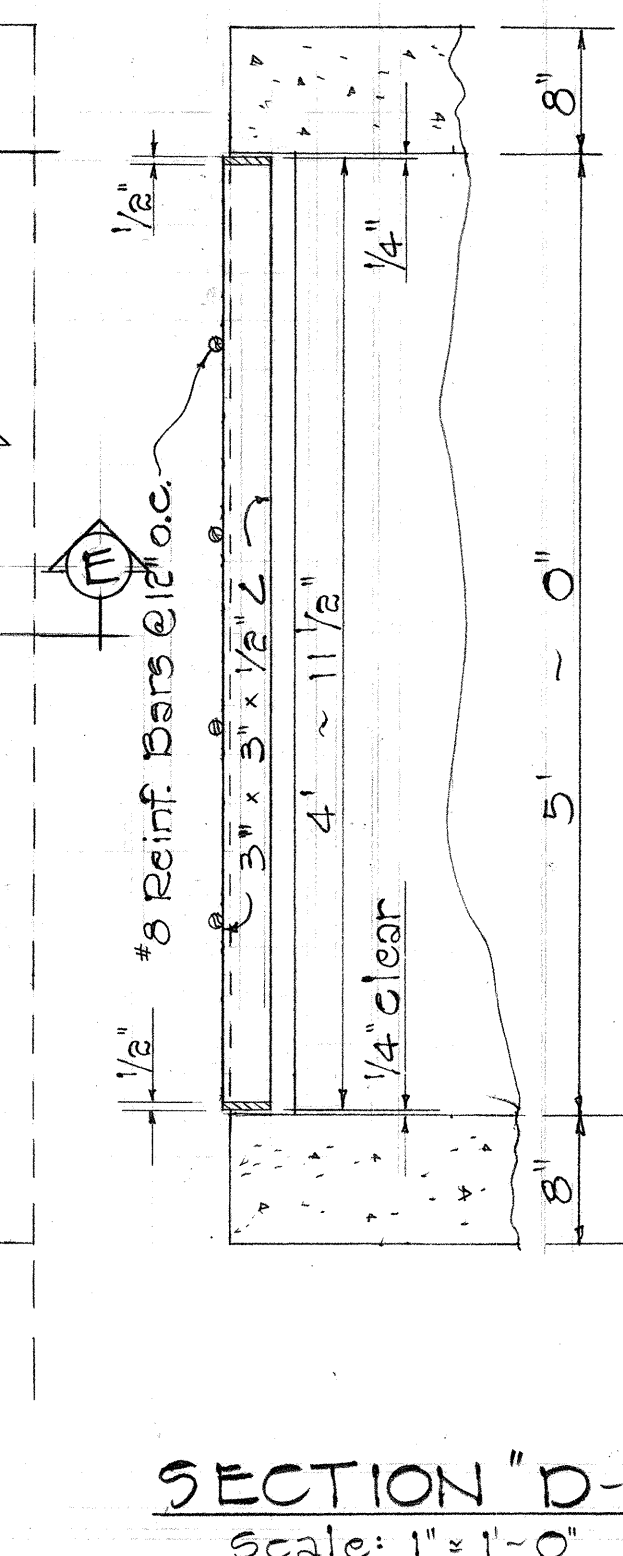
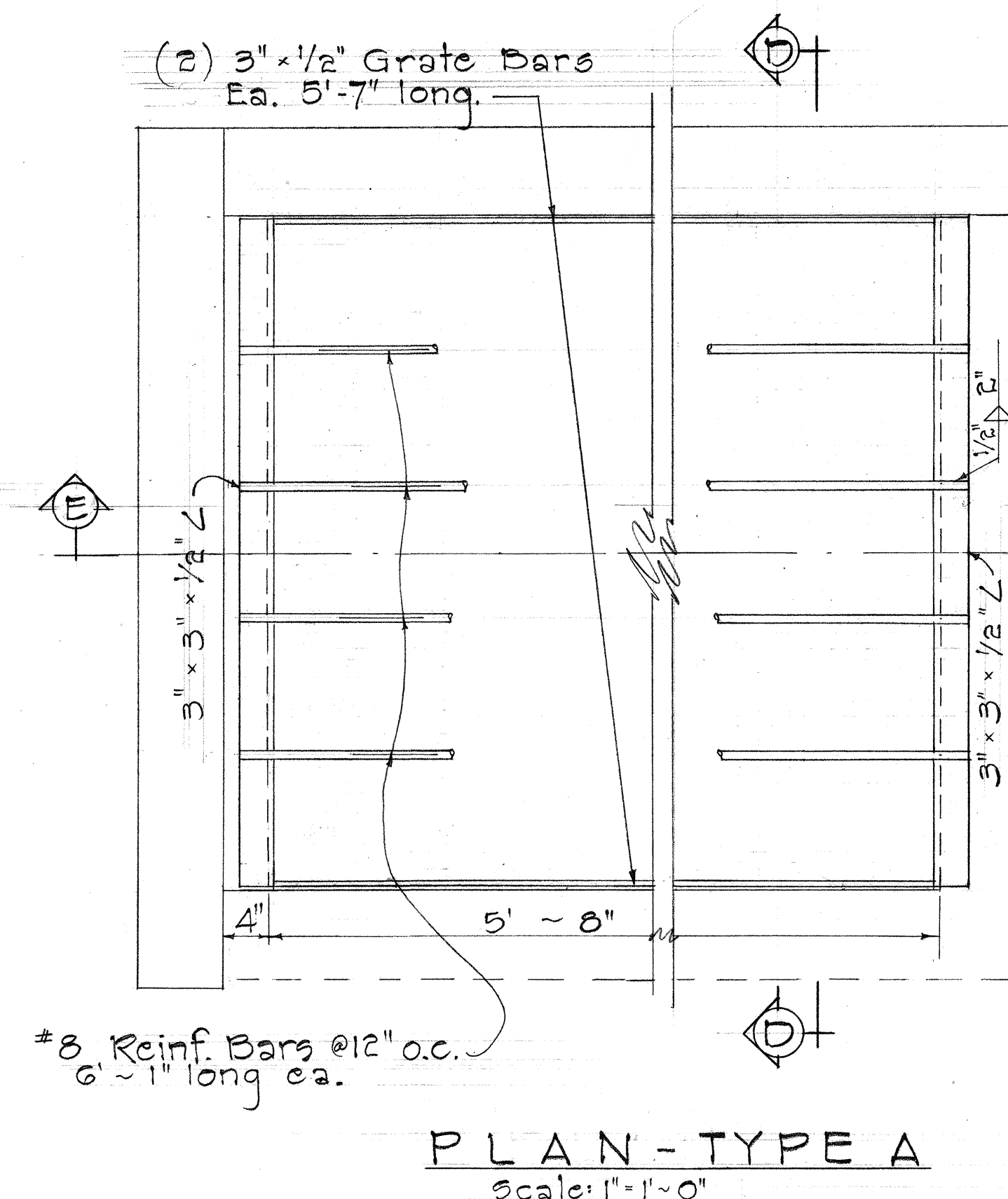
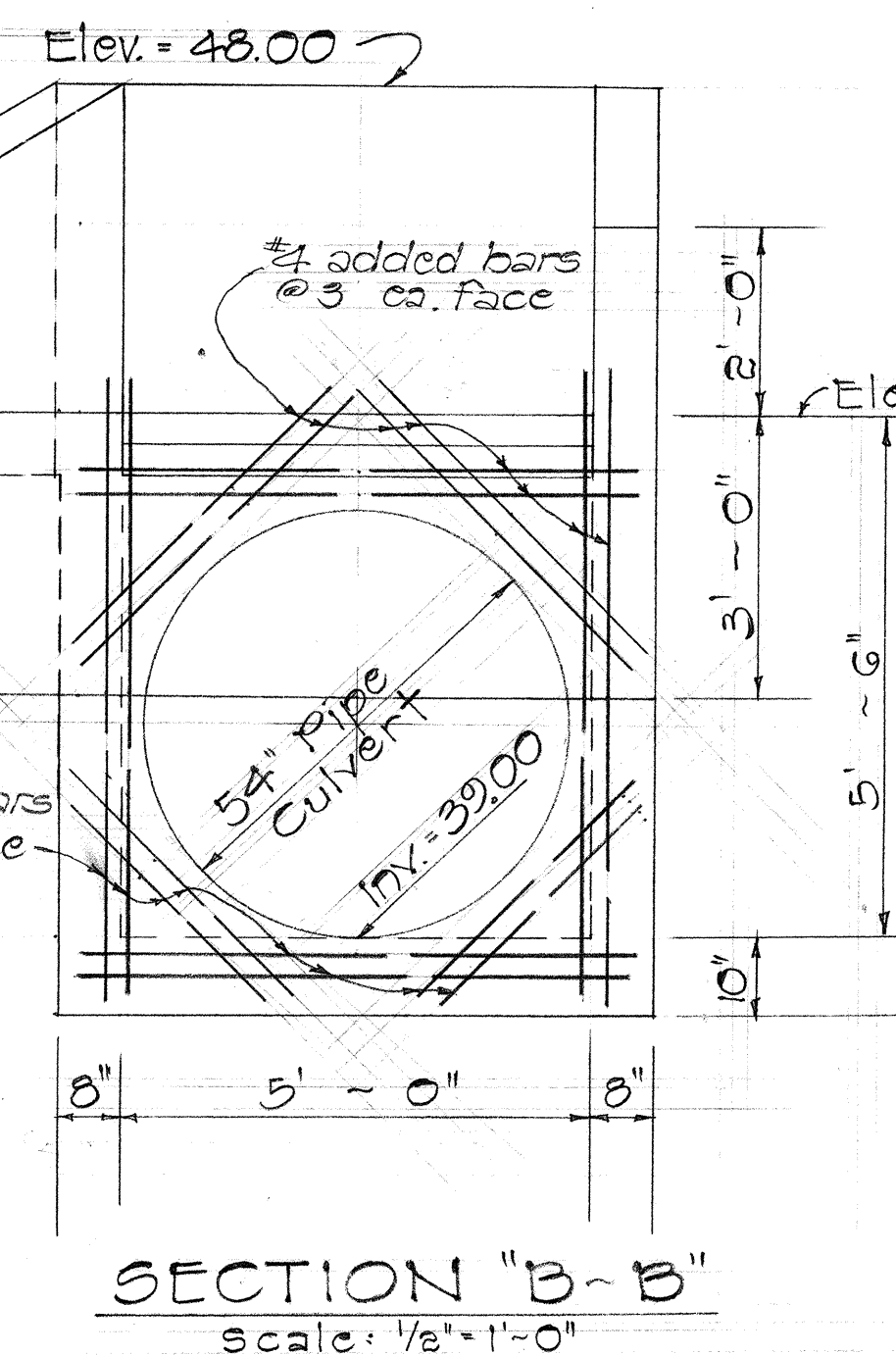
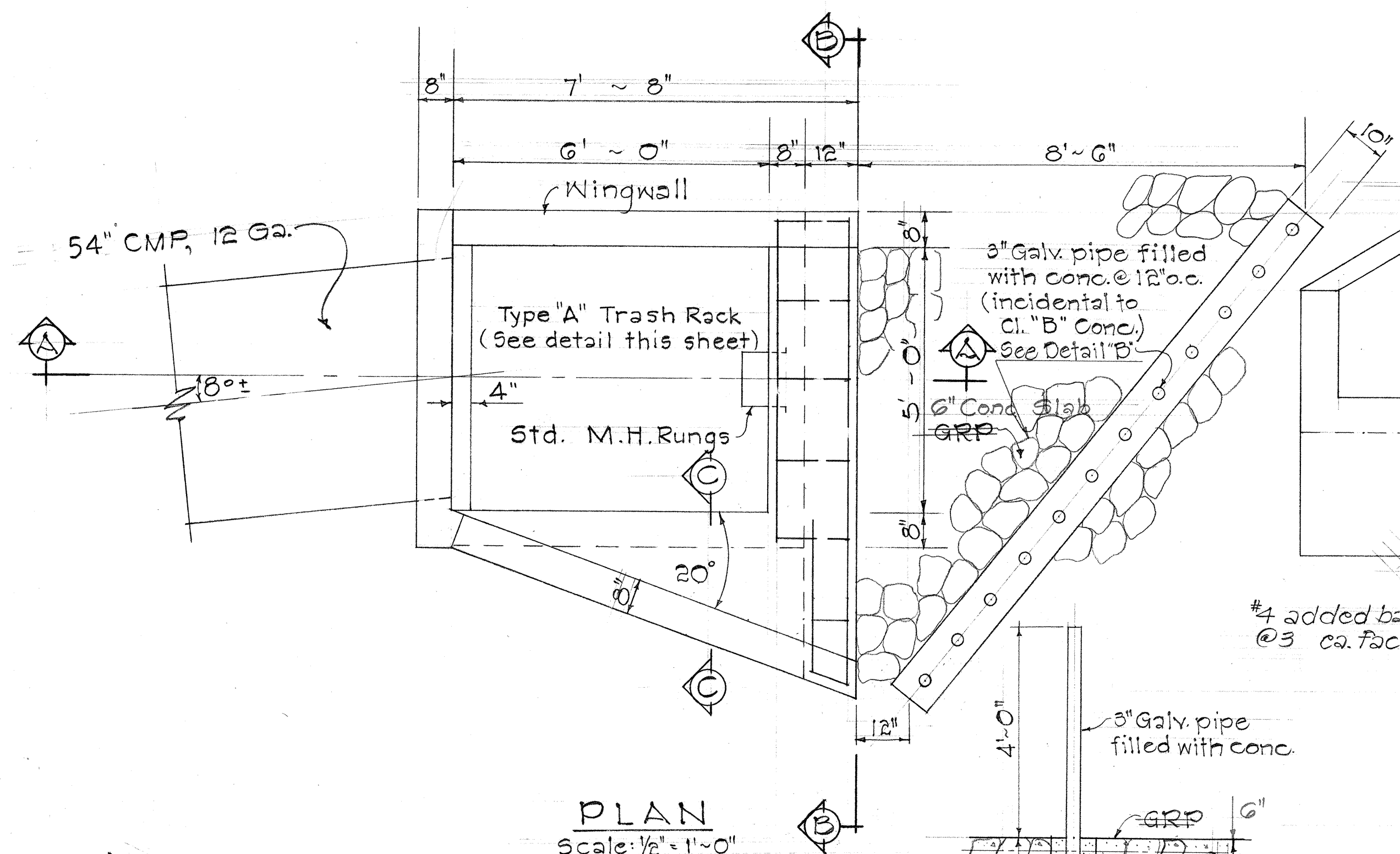
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (10)

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

SHEET No. 10 OF 35 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY _____	DATE _____
NOTE BOOK	DRAWN BY _____	_____
	TRACED BY _____	_____
	DESIGNED BY _____	_____
	QUANTITIES BY _____	_____
	CHECKED BY _____	_____
N ^o _____		

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	55	153

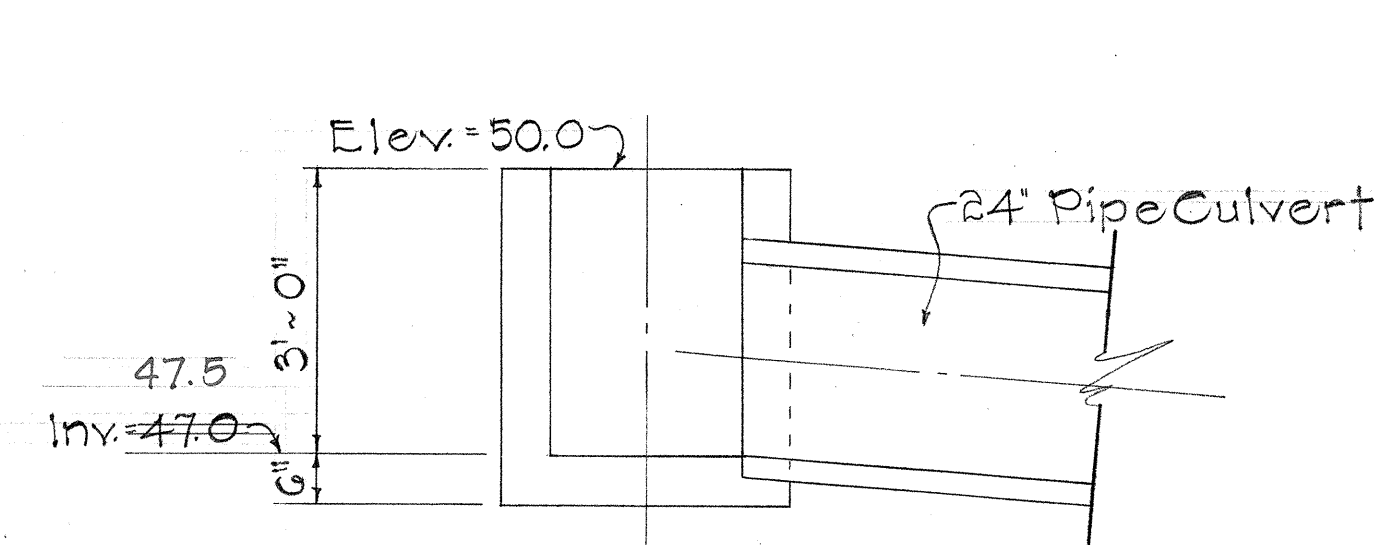
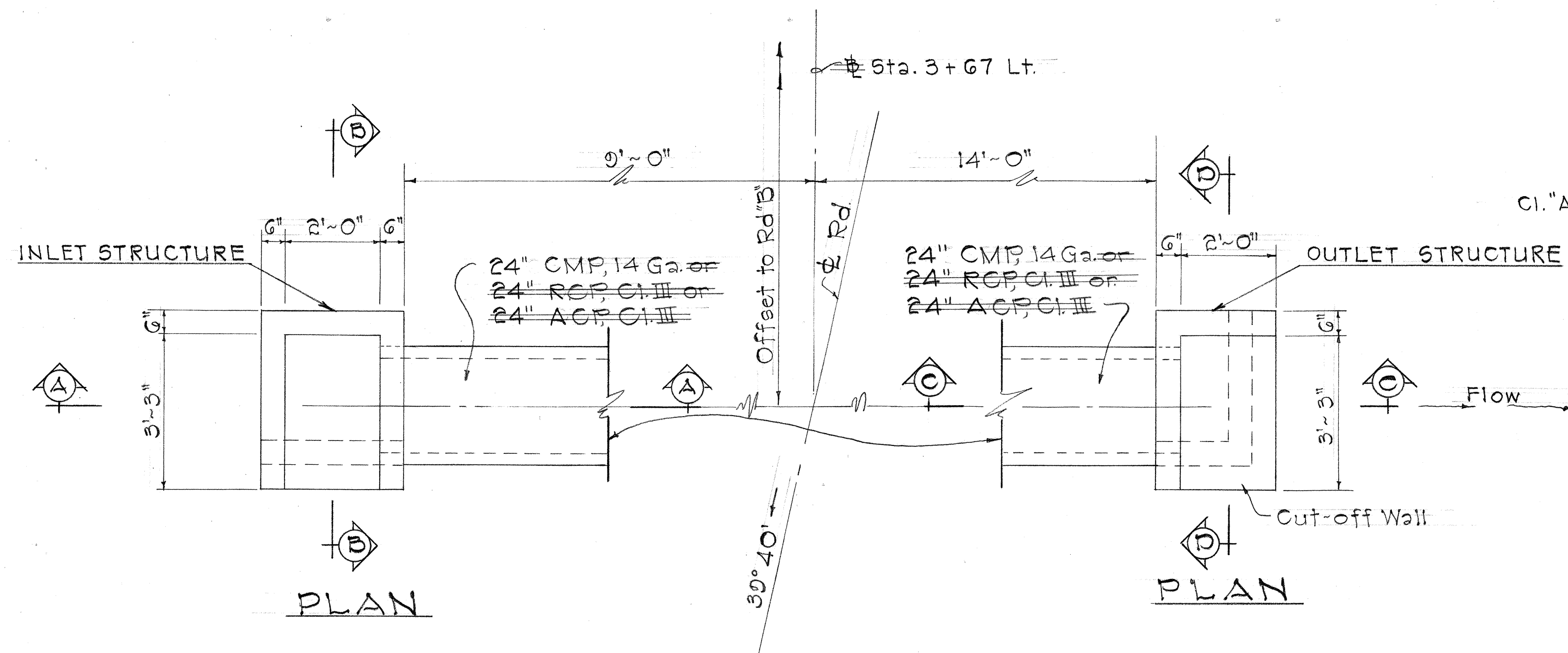


DETAILS OF DROP INTAKE @ RD. "B" STA. 2+28 LT.
Scale: As Shown

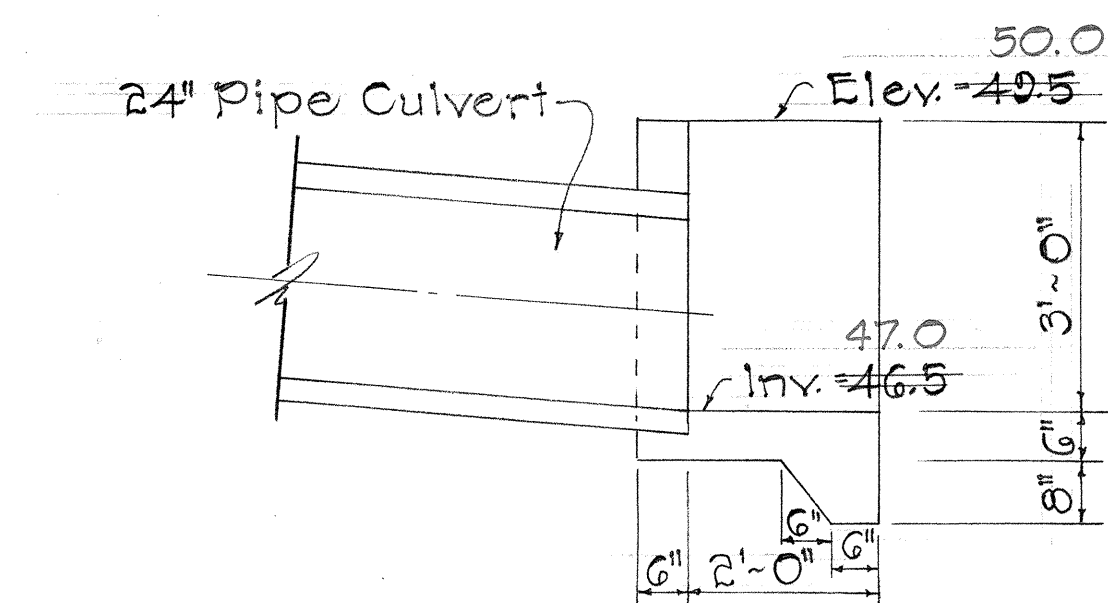
DETAILS OF TYPE "A" AND TYPE "B" TRASH RACK
Scale: As Shown

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
DROP INTAKE @ RD. "B" STA. 2+28 LT.
TYPE "A" & "B" TRASH RACK
MOKAPU SADDLE ROAD
FAS. Proj. No. 5-0630(10)
Scale: As Shown Date:
SHEET No. 20 OF 35 SHEETS

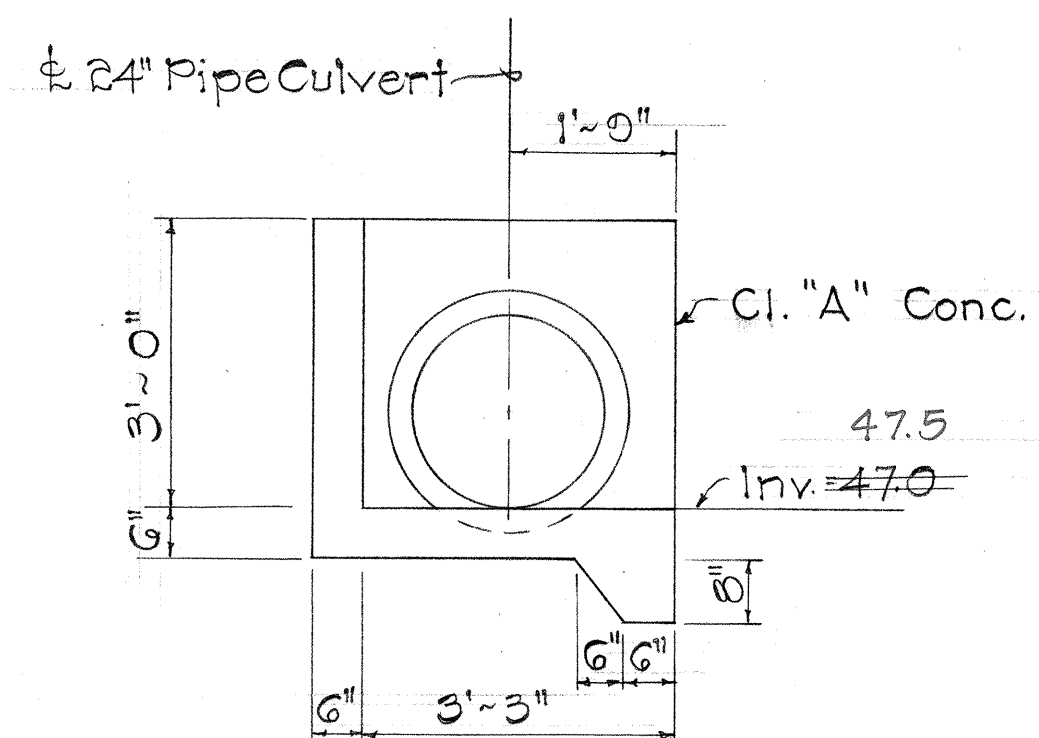
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	56	153



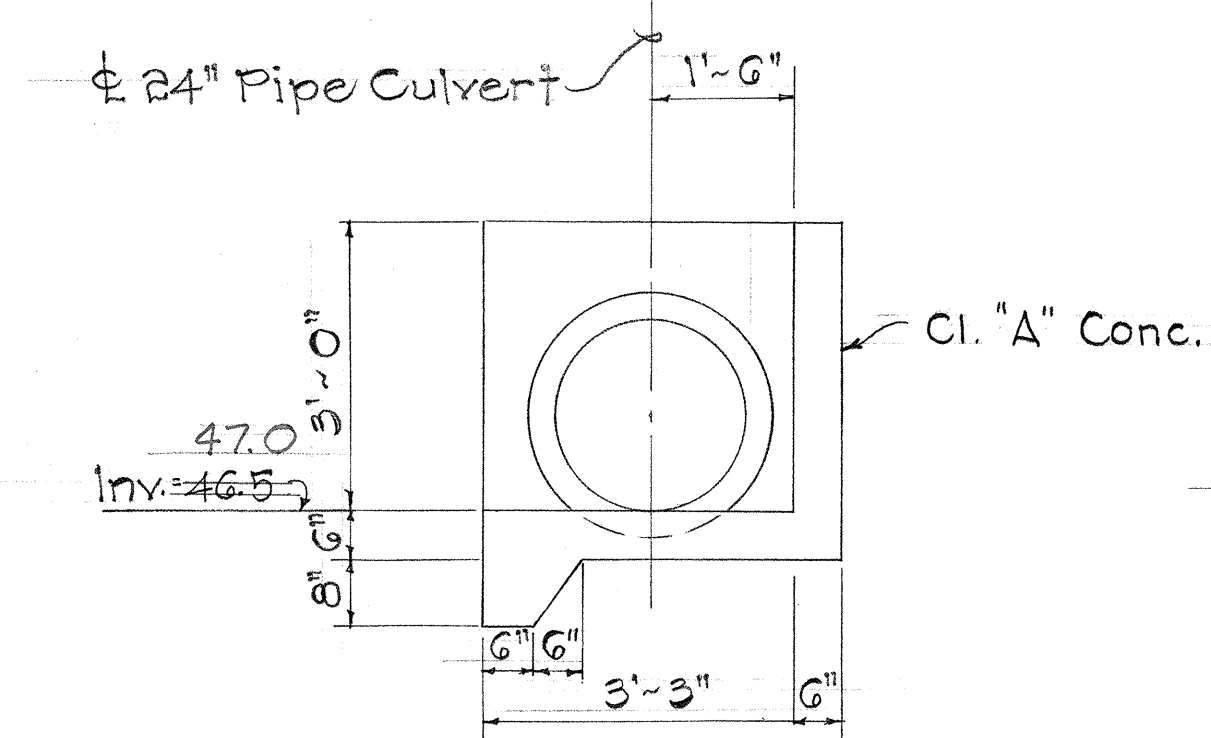
SECTION "A-A"



SECTION "C-C"

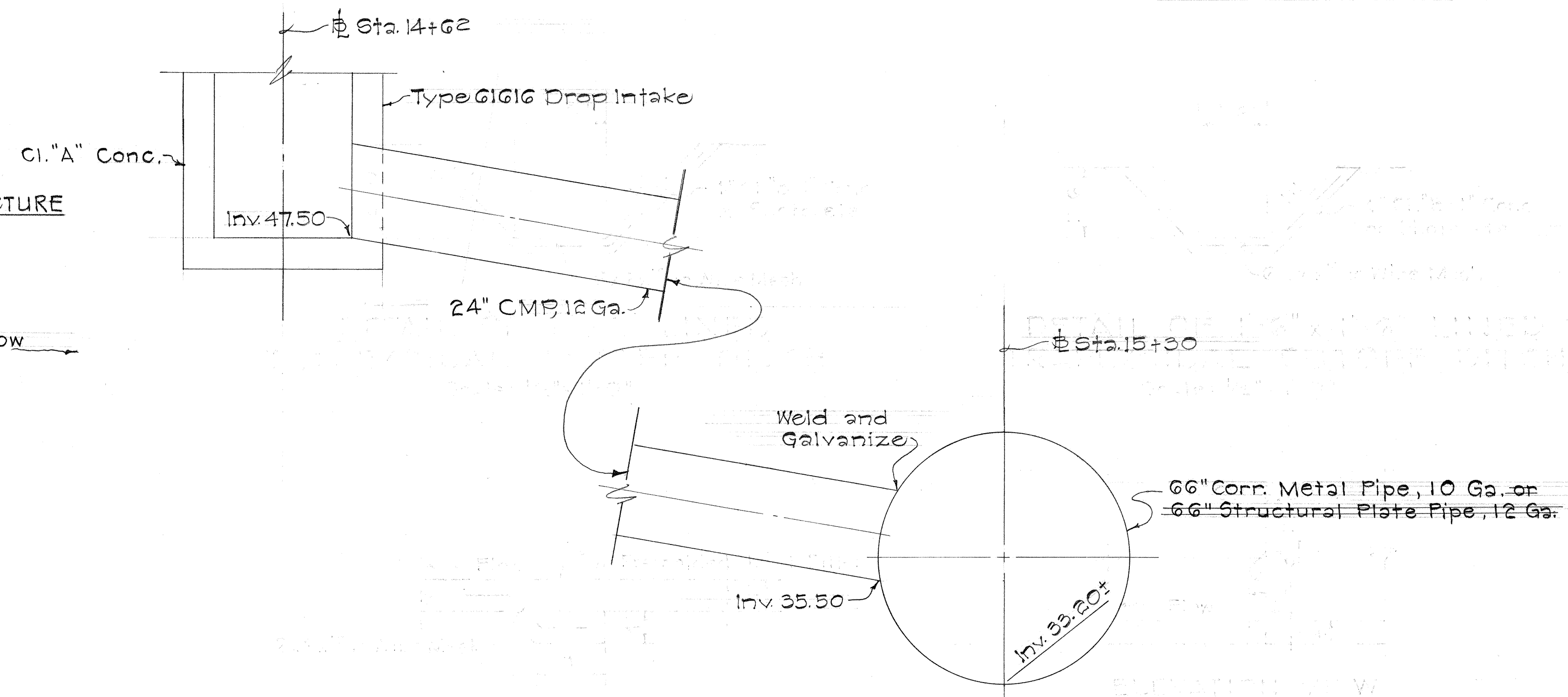


SECTION "B-B"

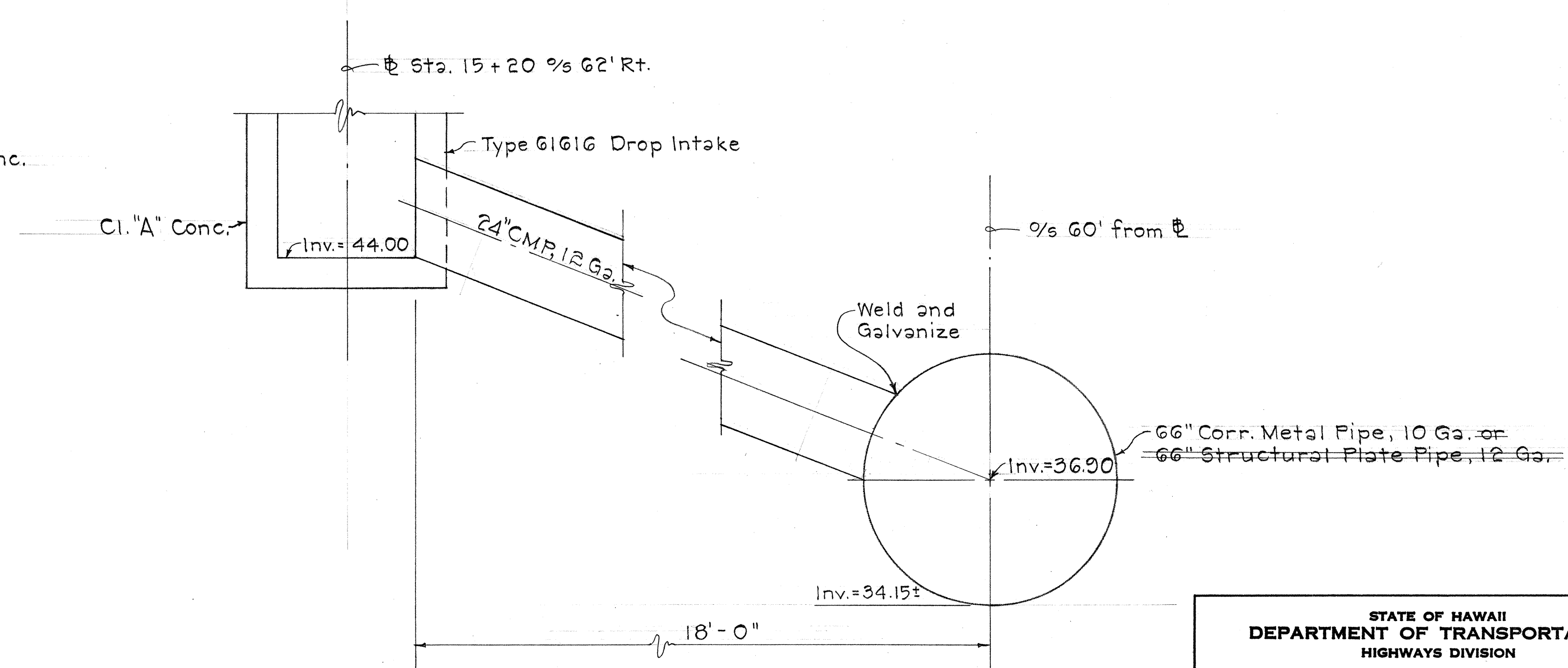


SECTION "D-D"

DETAILS OF INLET & OUTLET STRUCTURES @
RD. "B" STA. 3+67 LT.
Scale: 1/2" = 1'-0"



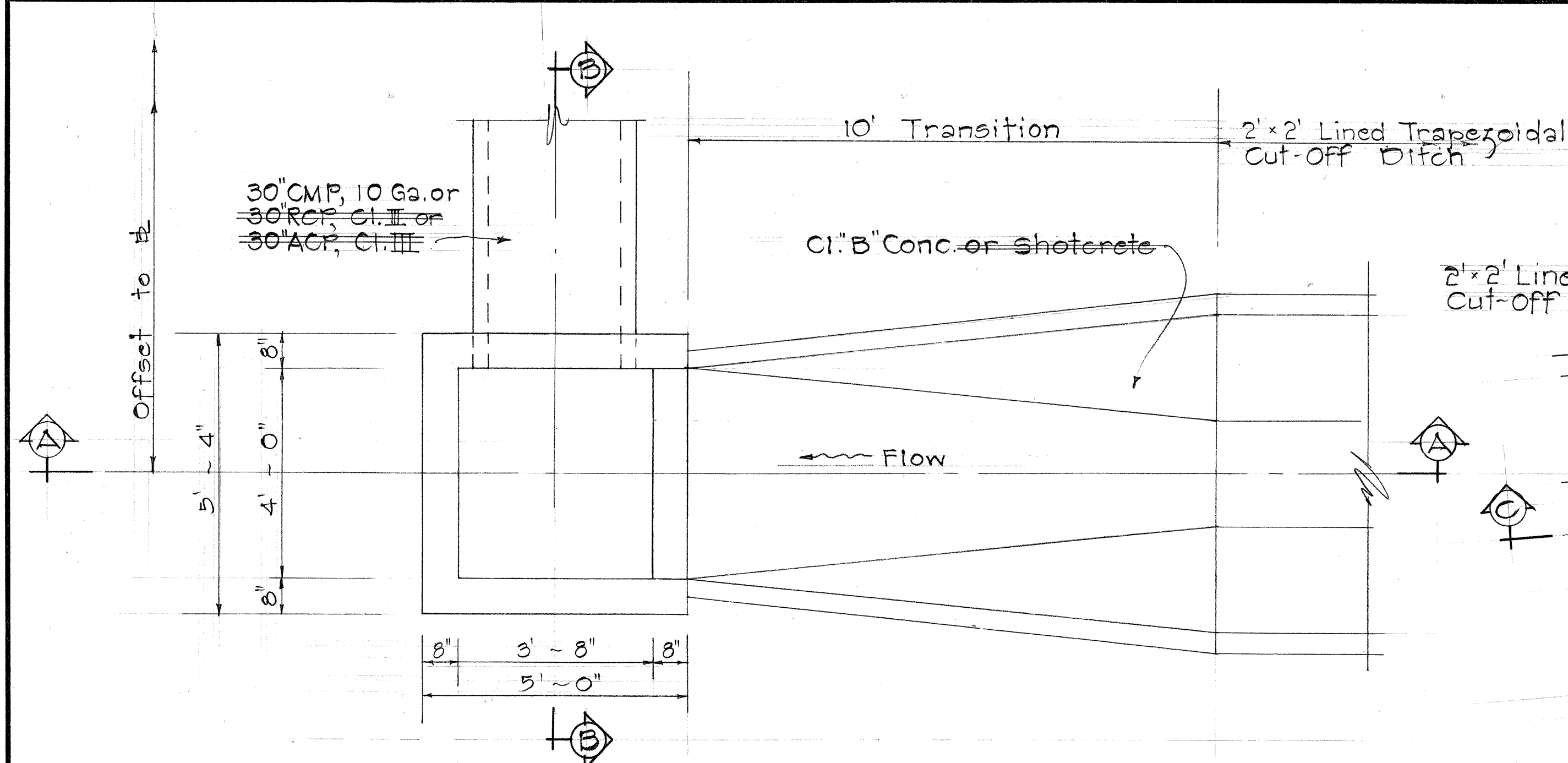
CONNECTION DETAIL FOR DROP INTAKE
AT STA. 14+62
Scale: 1/2" = 1'-0"



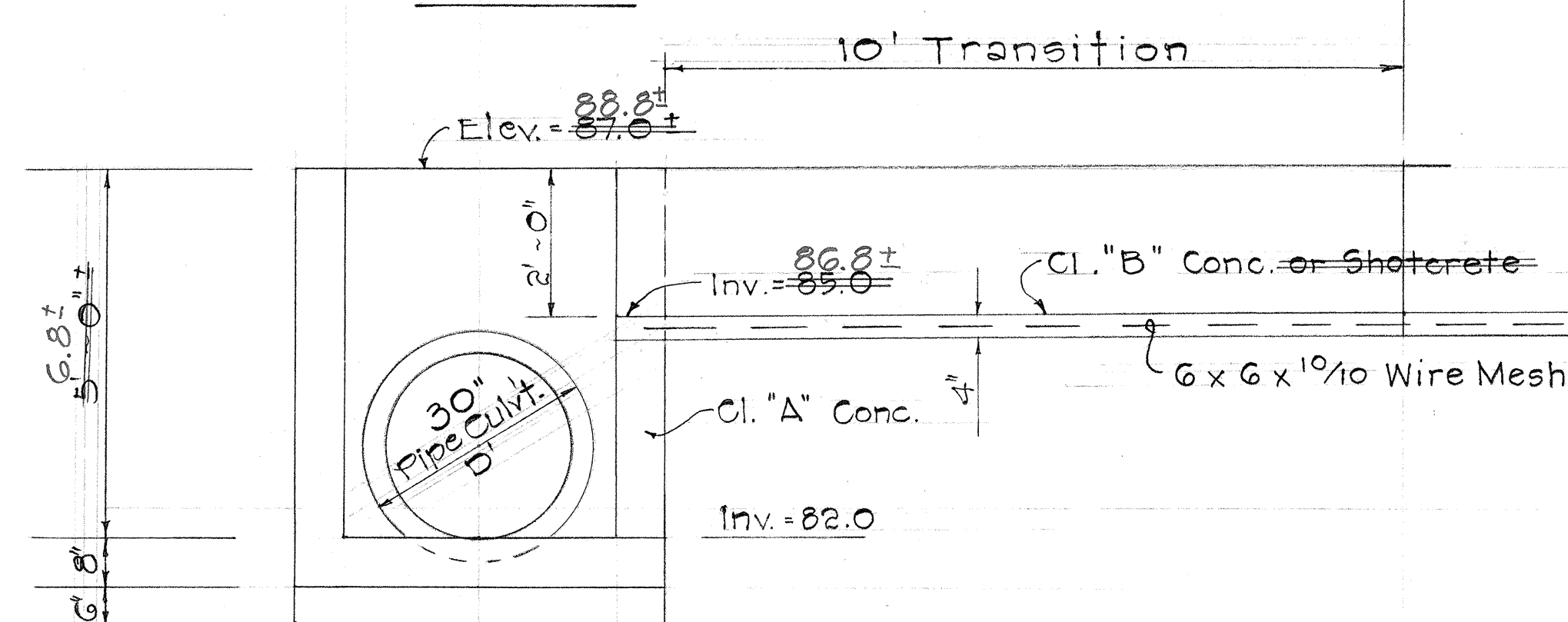
CONNECTION DETAIL FOR DROP INTAKE
AT STA. 15+20 1/2% G2' RT.
Scale: 1/2" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
INLET & OUTLET STRUCT. @ RD. "B" STA.
3+67 LT., CONNECTION DET. OF D.I.
@ STA. 15+20 1/2% G2' RT. & STA. 14+62
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (10)
Scale: 1/2" = 1'-0" Date:
SHEET No. 21 OF 35 SHEETS

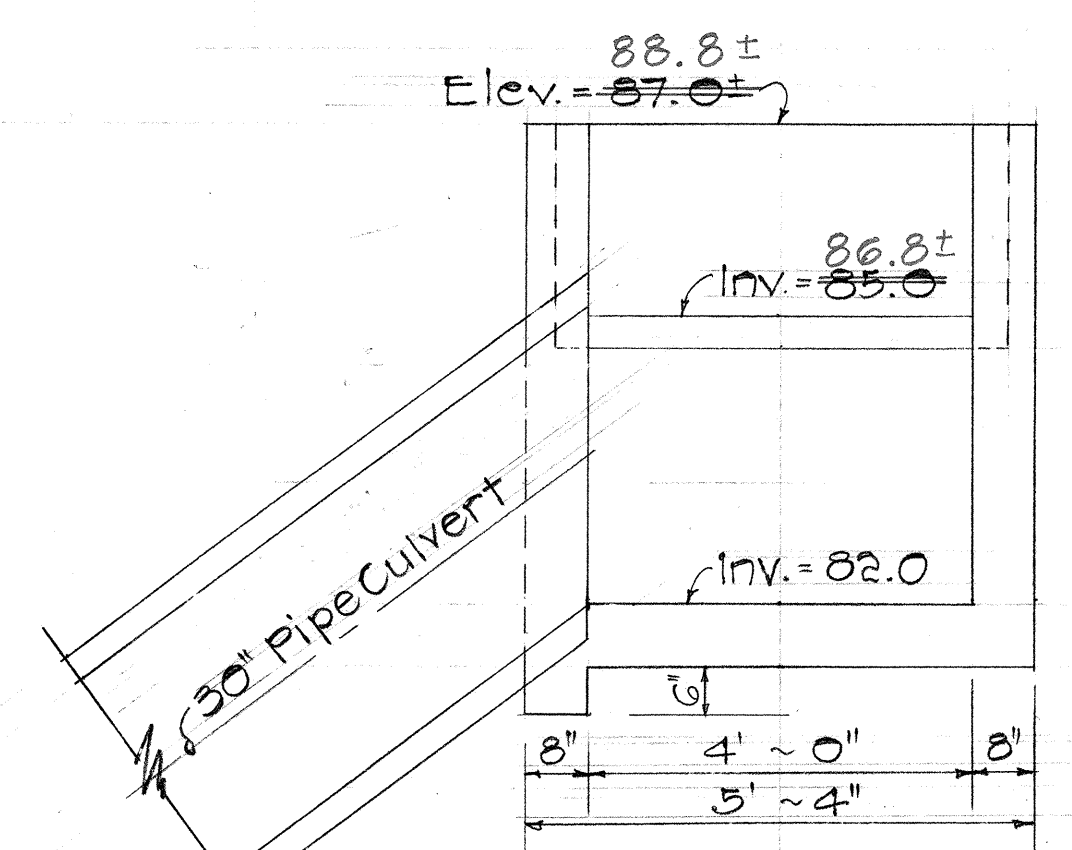
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	57	153



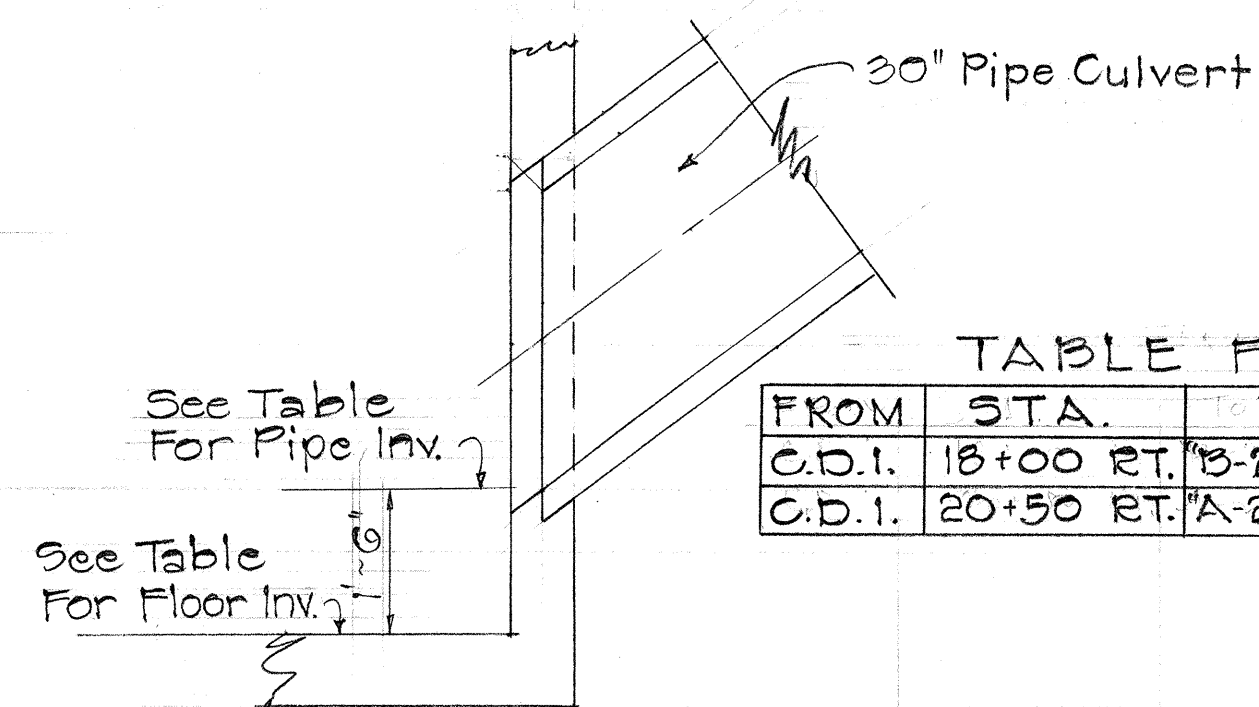
PLAN



SECTION "A-A"



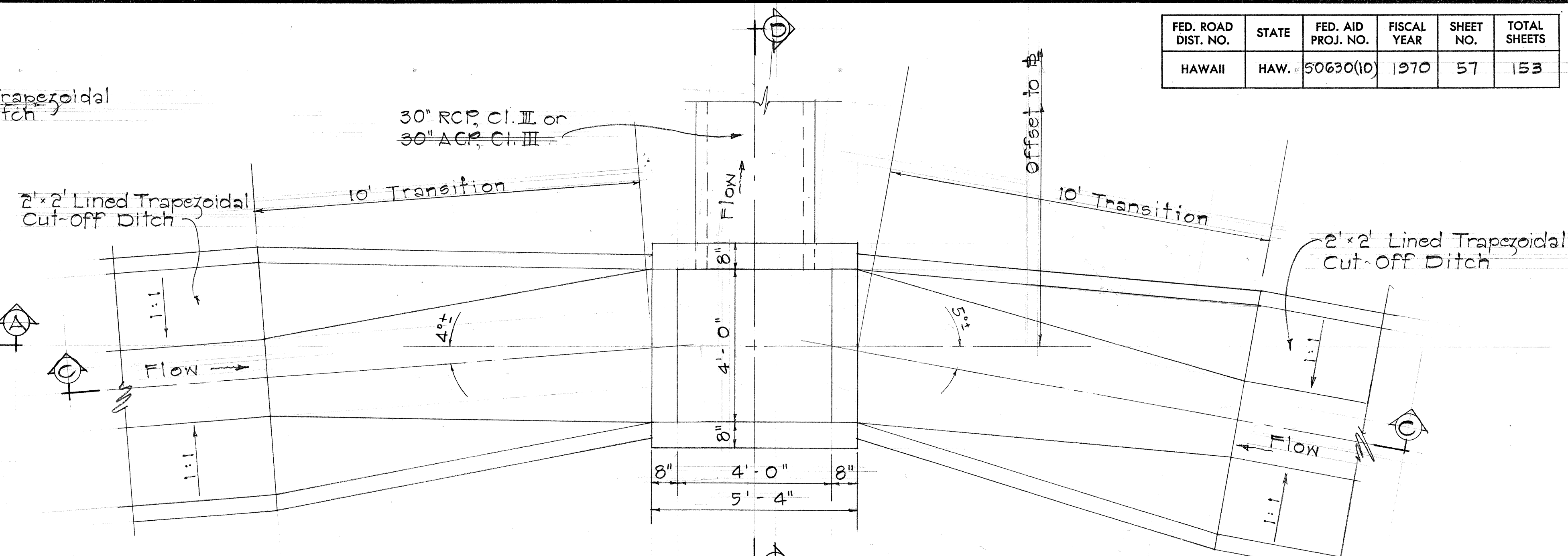
SECTION "B-B"



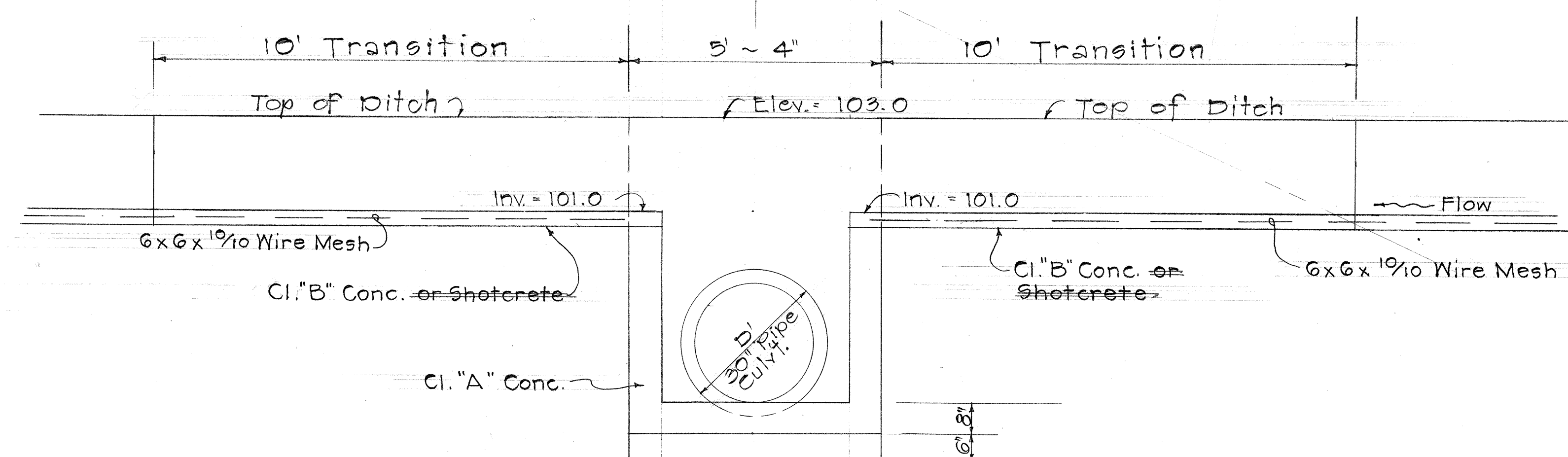
TYPICAL CONNECTION DETAIL FOR 30" PIPE CULVERTS AT 18+00 RT. AND 20+50 RT.

FROM	STA.	TO	FLOOR INV.	PIPE INV.
C.D.1.	18+00 RT.	"B-2" C.D.	70.0	71.50
C.D.1.	20+50 RT.	"A-2" C.D.	86.0	87.50

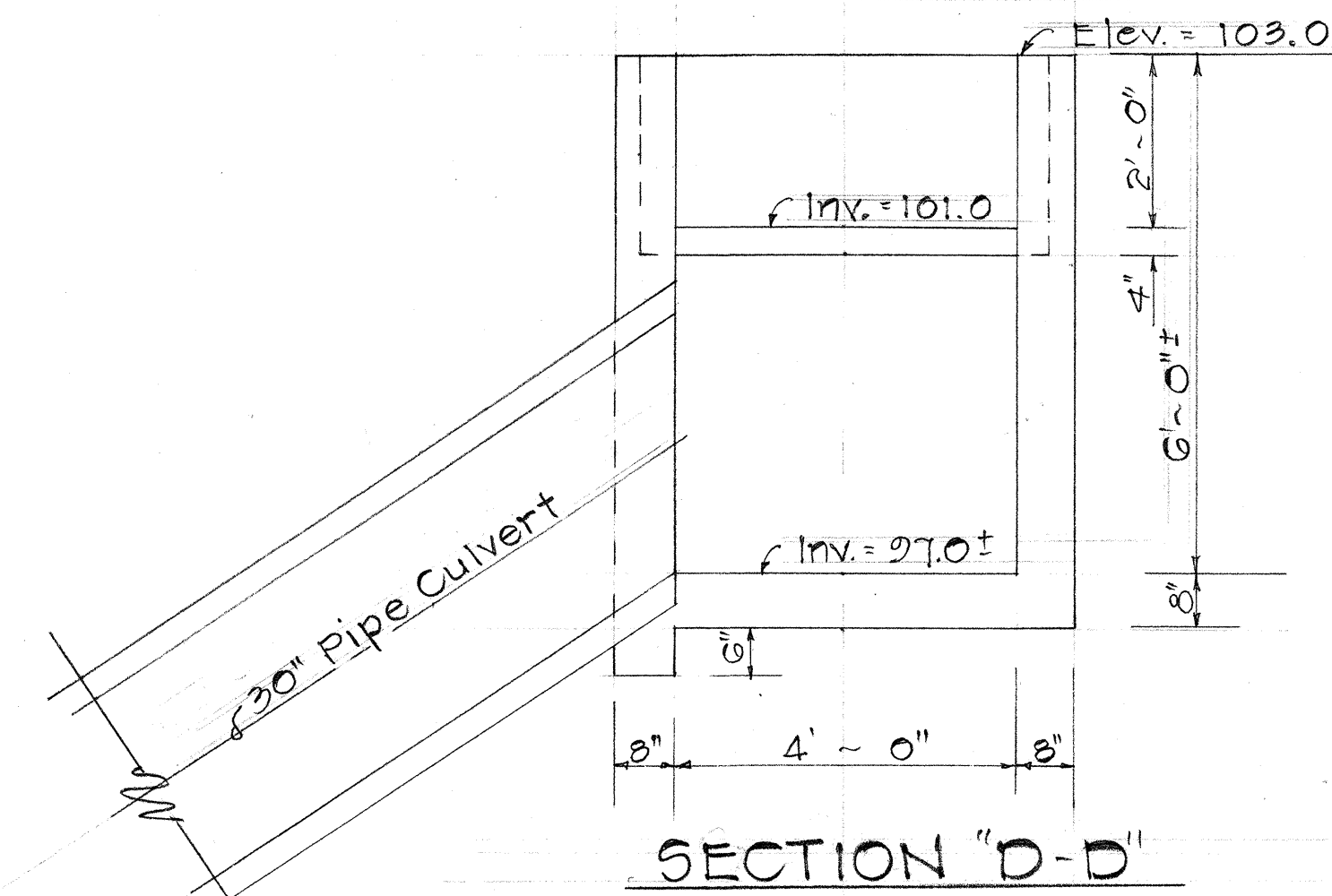
DETAILS OF C.D.1. @ STA. 18+00 RT.
Scale: 1/2" = 1'-0"



PLAN



SECTION "C-C"



SECTION "D-D"

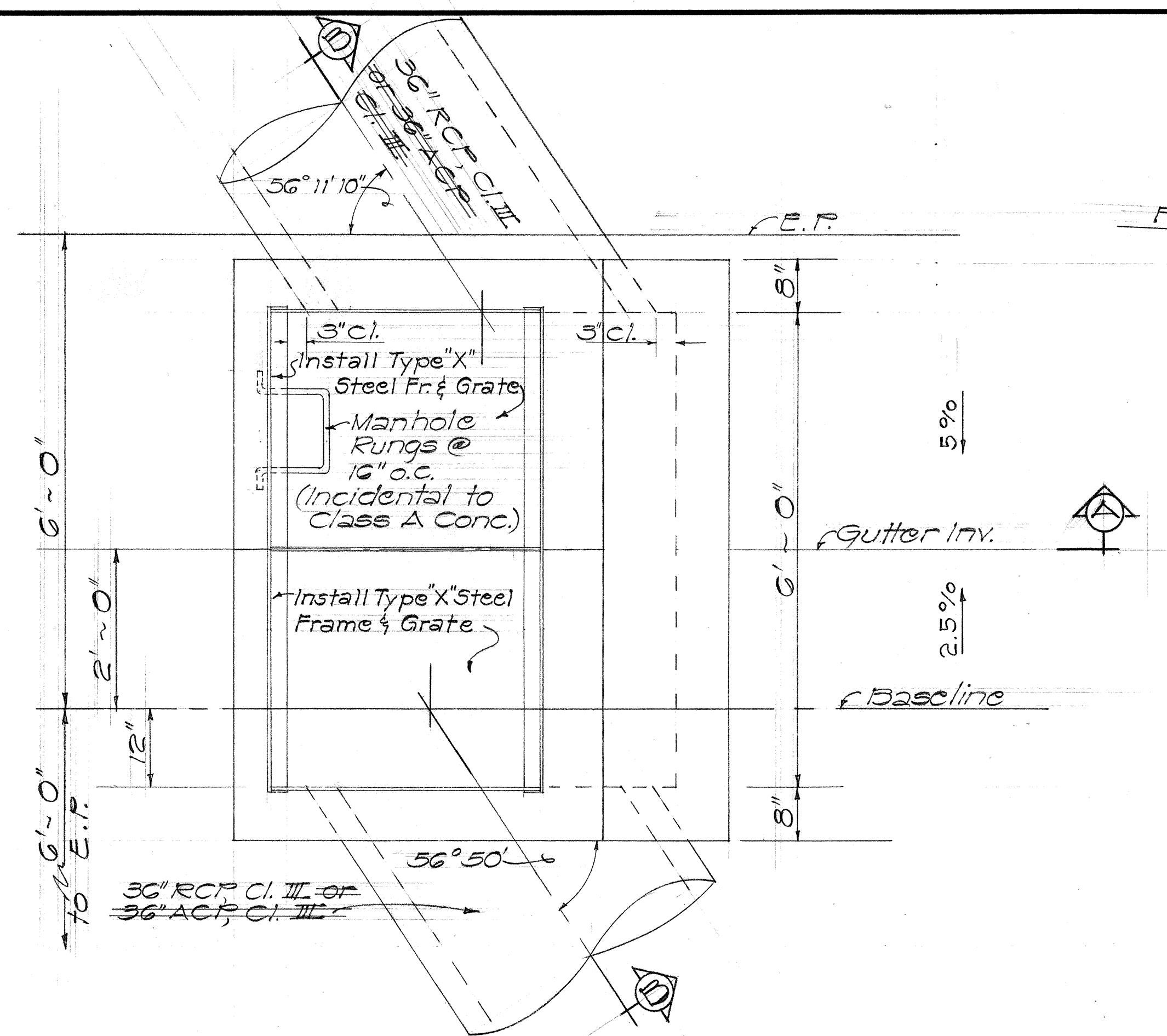
DETAILS OF C.D.1. @ STA. 20+50 RT.
Scale: 1/2" = 1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
CONCRETE DROP INTAKES @
STA. 18+00 RT. & STA. 20+50 RT.
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630 (10)
Scale: 1/2" = 1'-0" Date: _____
SHEET No. 22 OF 35 SHEETS

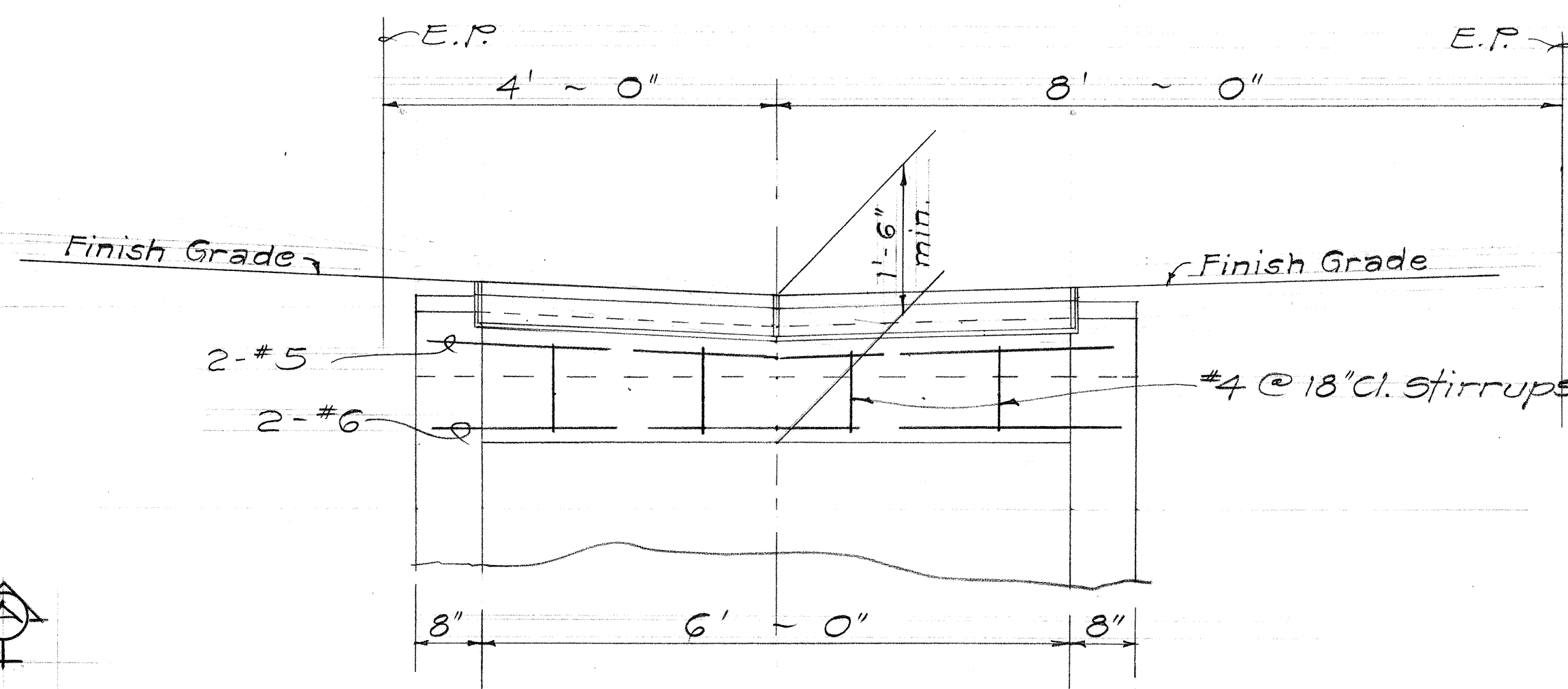
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	58	153

NOTE:

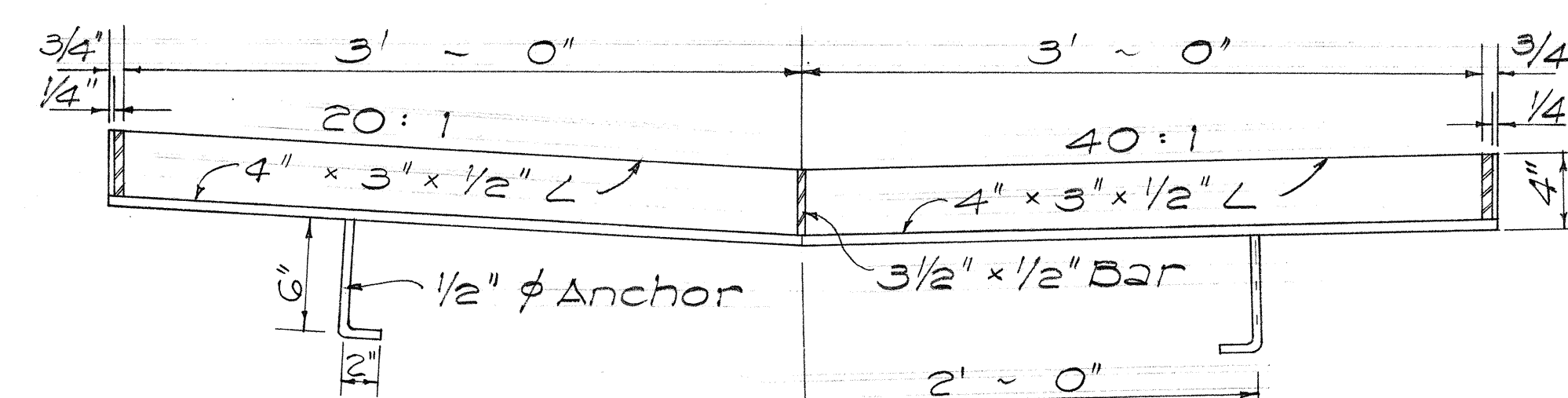
1. Grates and Frames shall have edges ground smooth.
2. Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
3. All welds $\frac{3}{8}$ " unless otherwise noted.
4. The Frame and Grate Materials shall conform to the specifications of ASTM: Designation Structural Steel A 238, Grade D and the Standard Specification.
5. Manhole Rungs may be placed at any location as ordered by the Engineer.



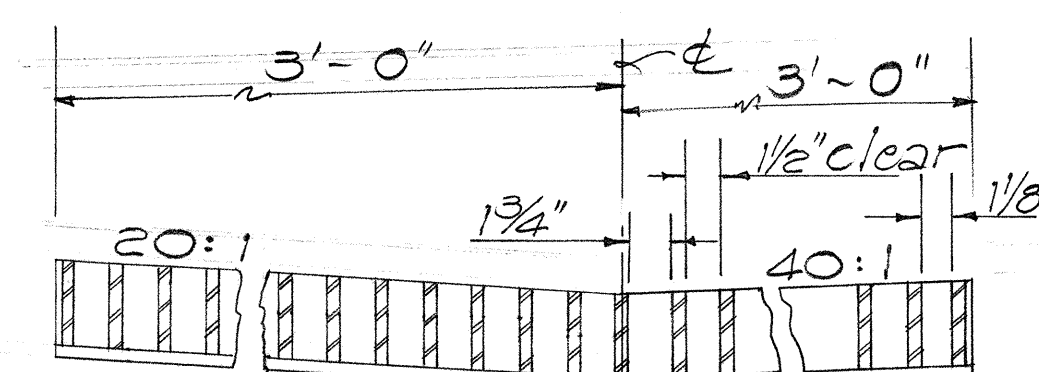
PLAN
Scale: $\frac{3}{4}'' = 1' - 0''$



SECTION B-B
Scale: $\frac{3}{4}'' = 1'-0''$



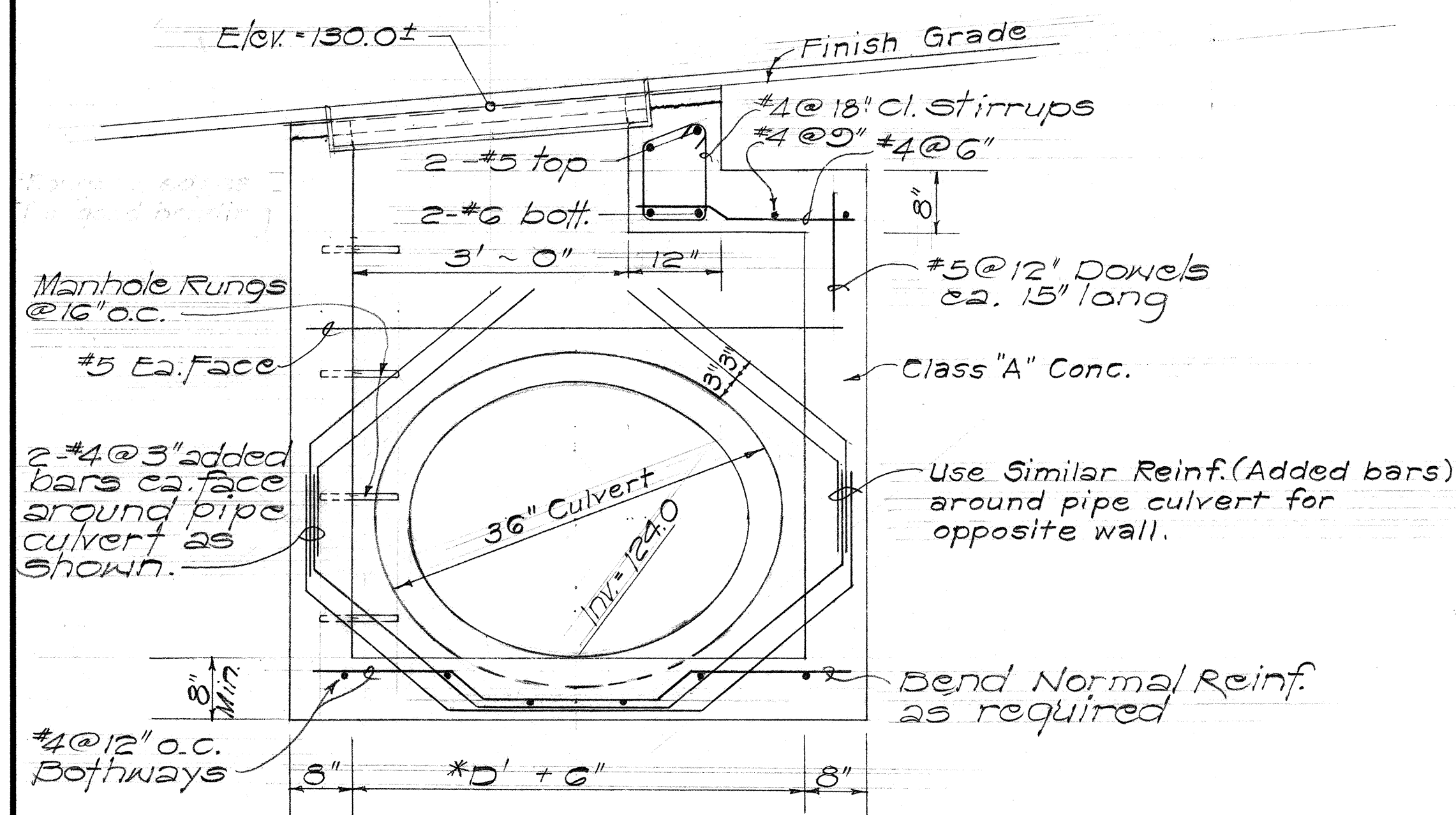
SECTION ~ FRAME
Scale: $1/2" = 1'-0"$



SECTION - FRAME AND GRATES
Scale: $1\frac{1}{2}" = 1' - 0"$

NOTE:

NOTE:
Except as shown on this sheet, all other details for Steel Frame and Grates and Drop Intake are similar to Standard 61616 Grated Drop Intake (For details see see sheet no. G8)



SECTION A-A
Scale: $\frac{3}{4}'' = 1' - 0''$

*D' based on skewed angle of pipe culverts leaving and entering structure.

DETAILS FOR TYPE "X" STEEL FRAME & GRATES
AND DROP INTAKE @ $\pm$ STA. 25 + 60

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

TYPE "X" GRATED DROP INTAKE
@ $\pm$ STA. 25 + 60

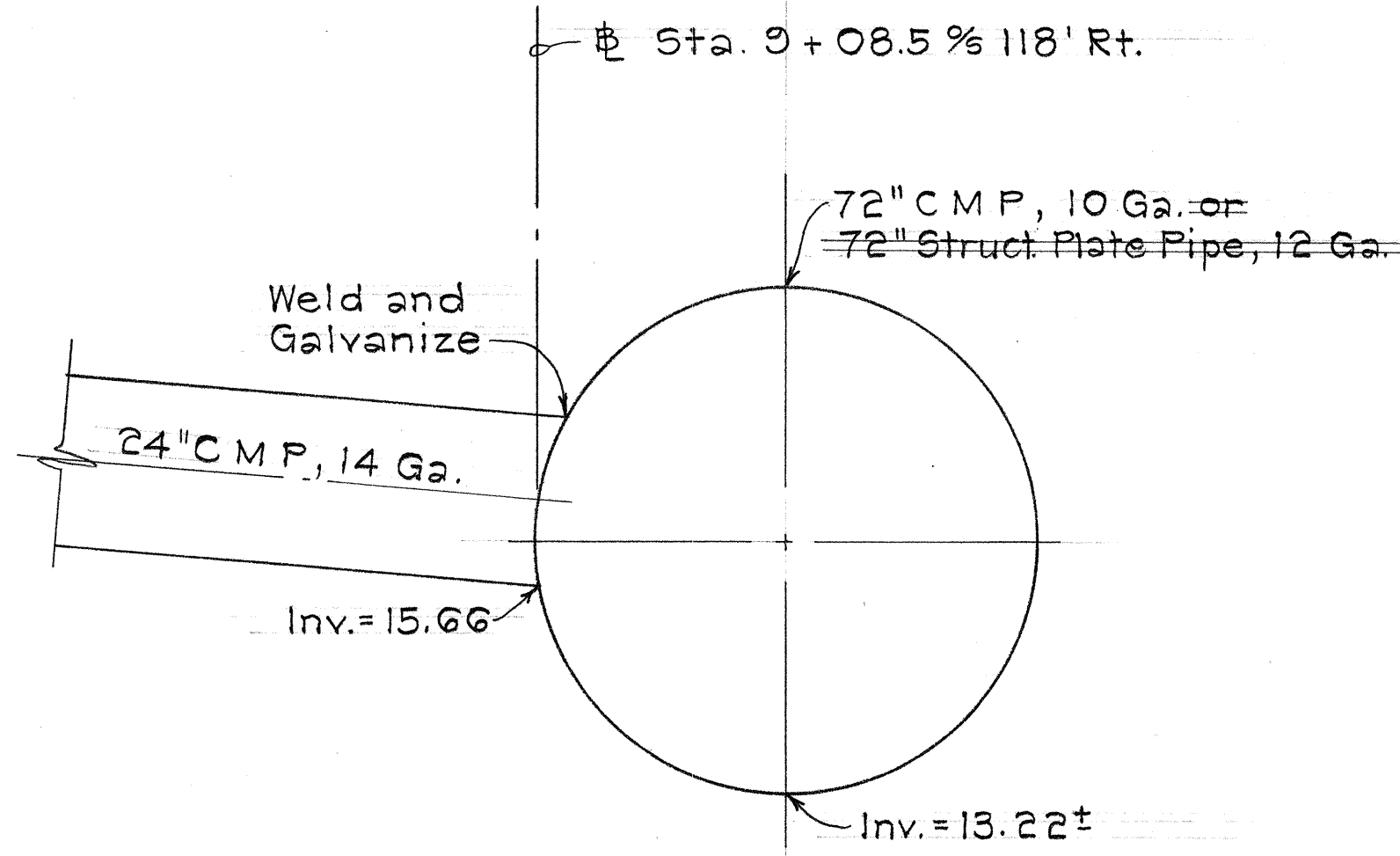
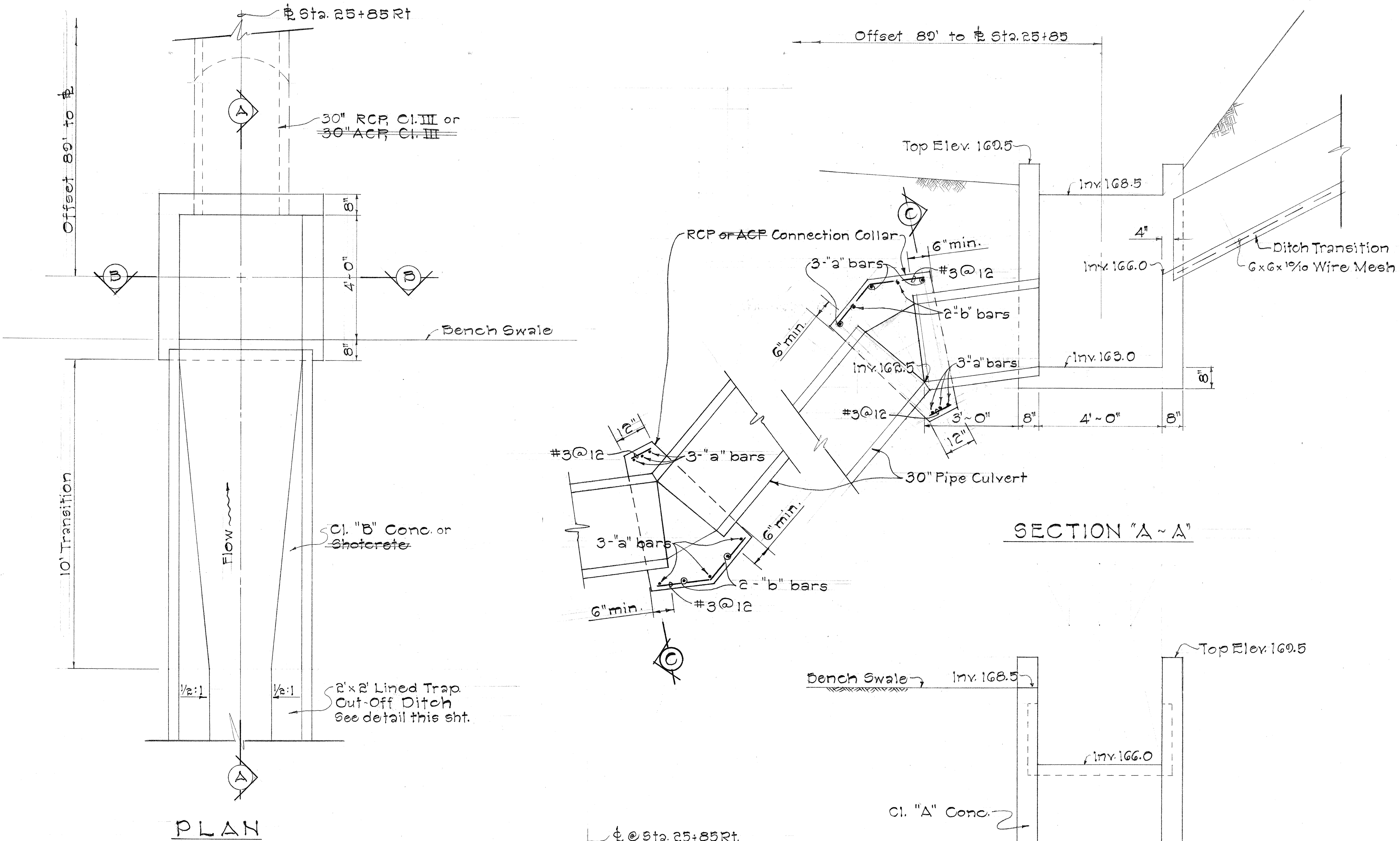
MOKAPU SADDLE ROAD

F.A.S. Proj. No. 5-0630(10)

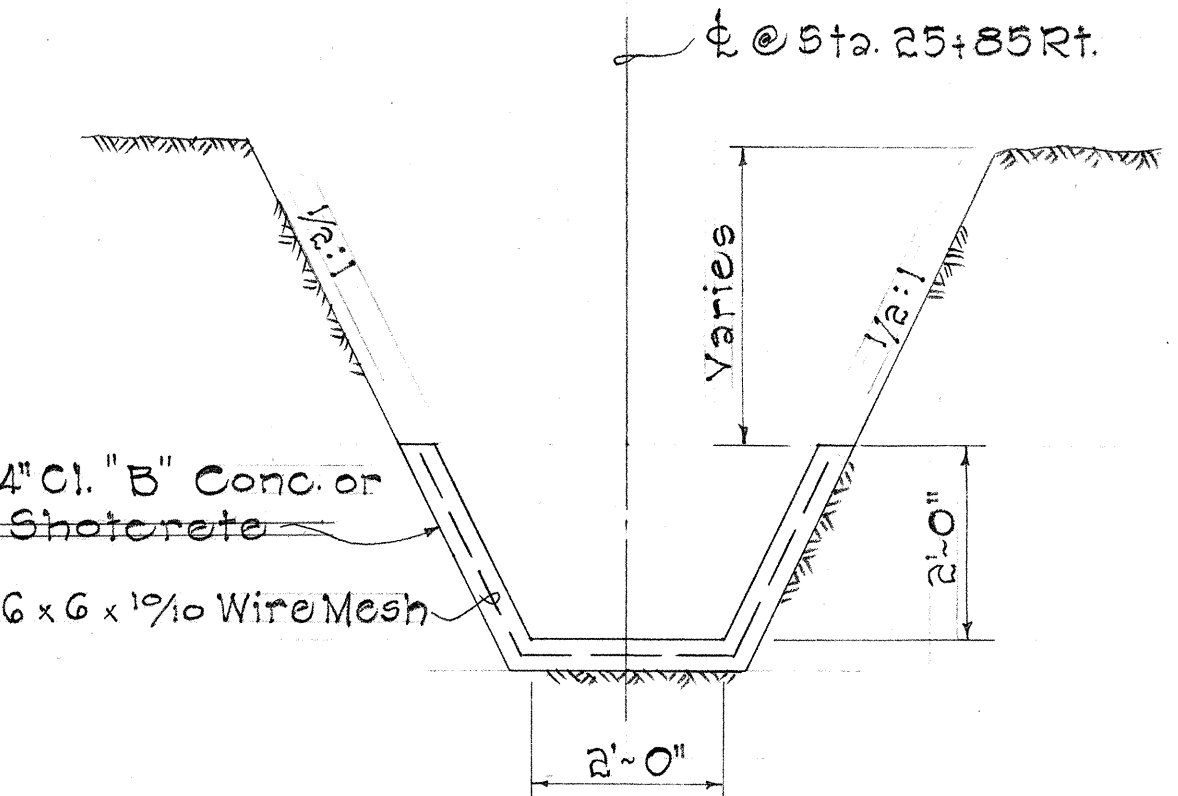
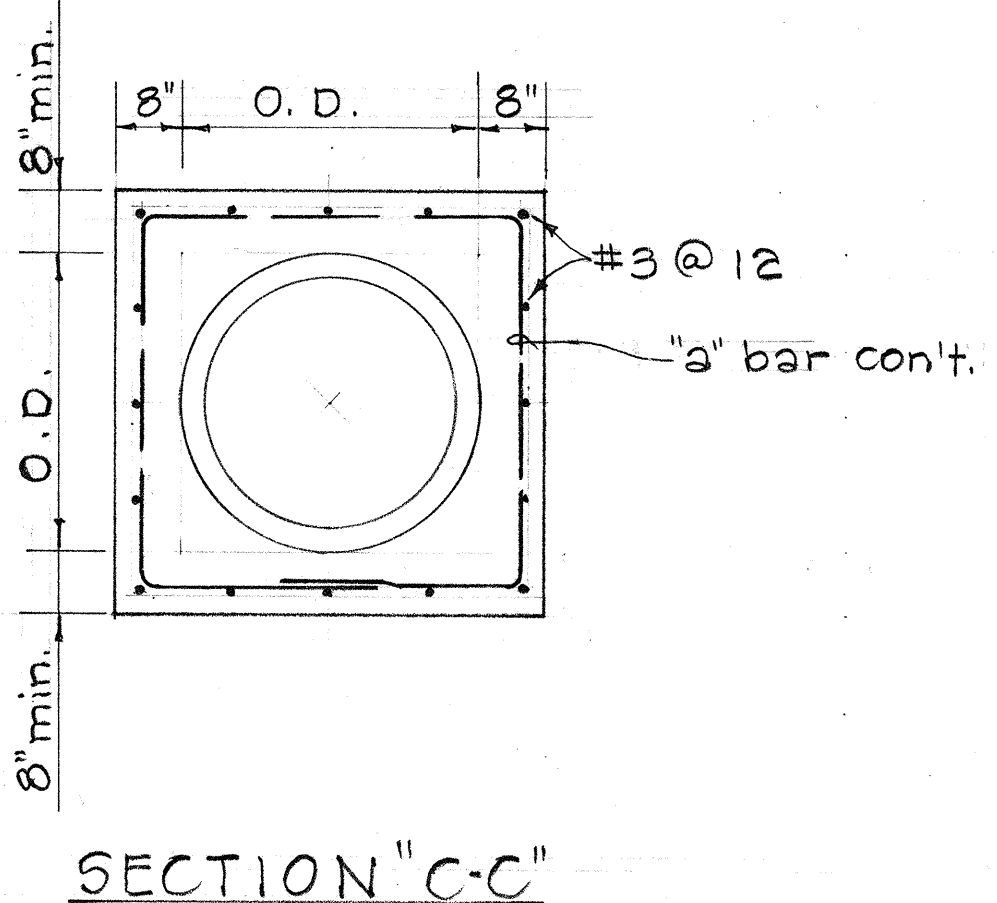
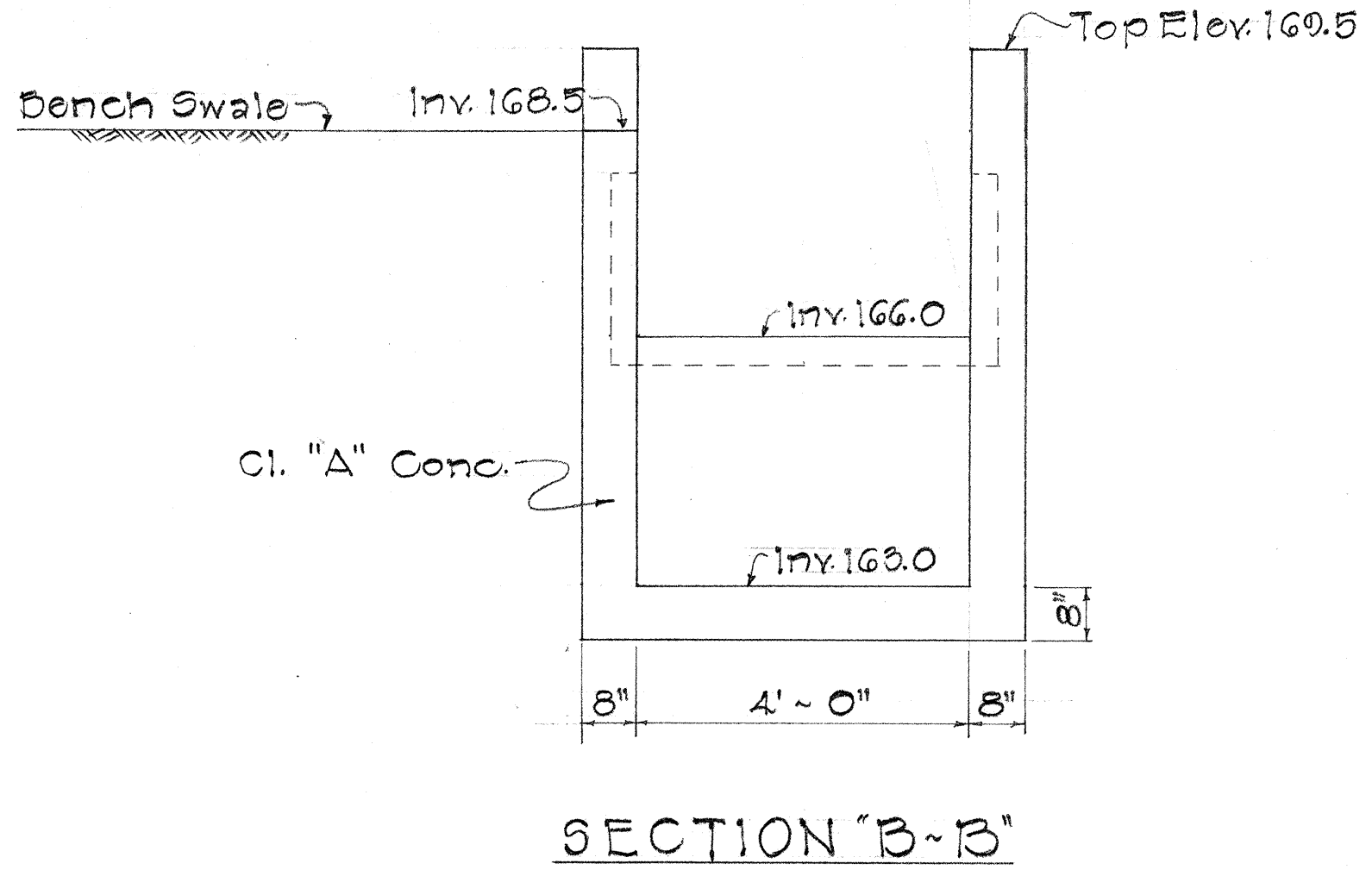
Scale: As Shown Date:

SHEET No. 23 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	59	153



**CONNECTION DETAIL FOR DROP INTAKE
AT STA. 8+75 RT.
Scale: 1/2" = 1'-0"**



**DETAIL OF 2' x 2' LINED TRAP
CUT-OFF DITCH @ STA. 25+85 RT.**

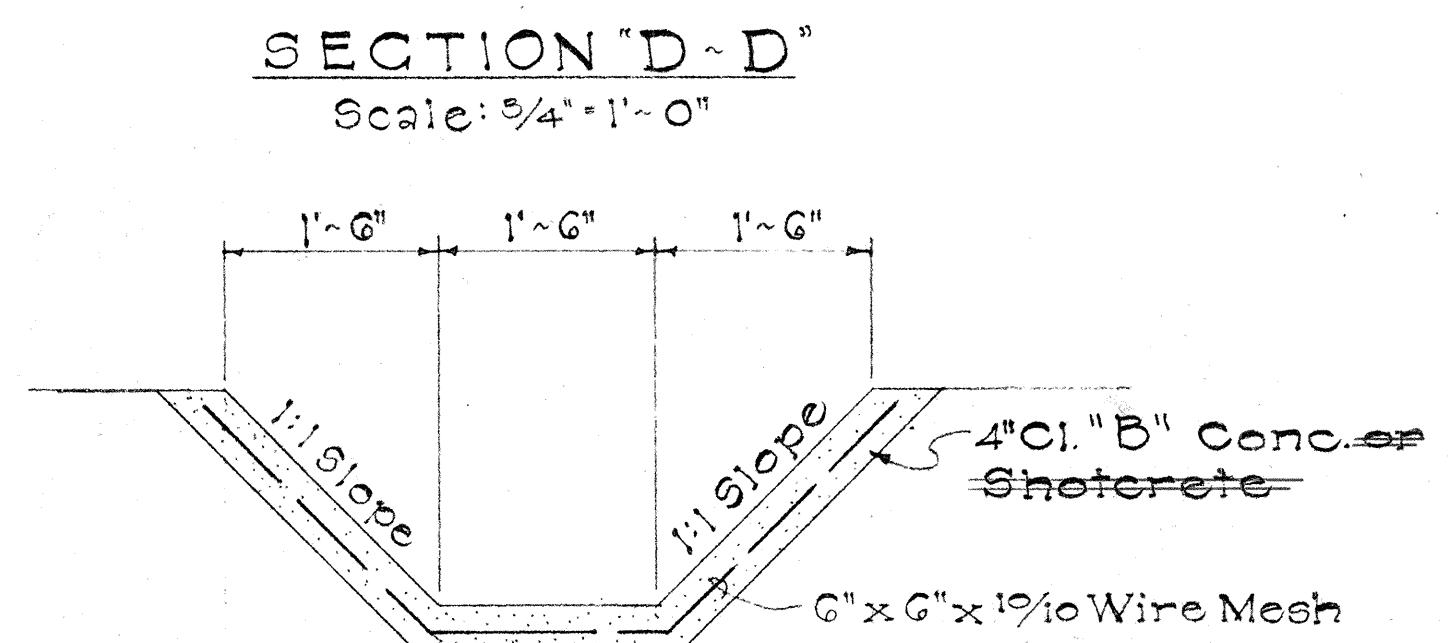
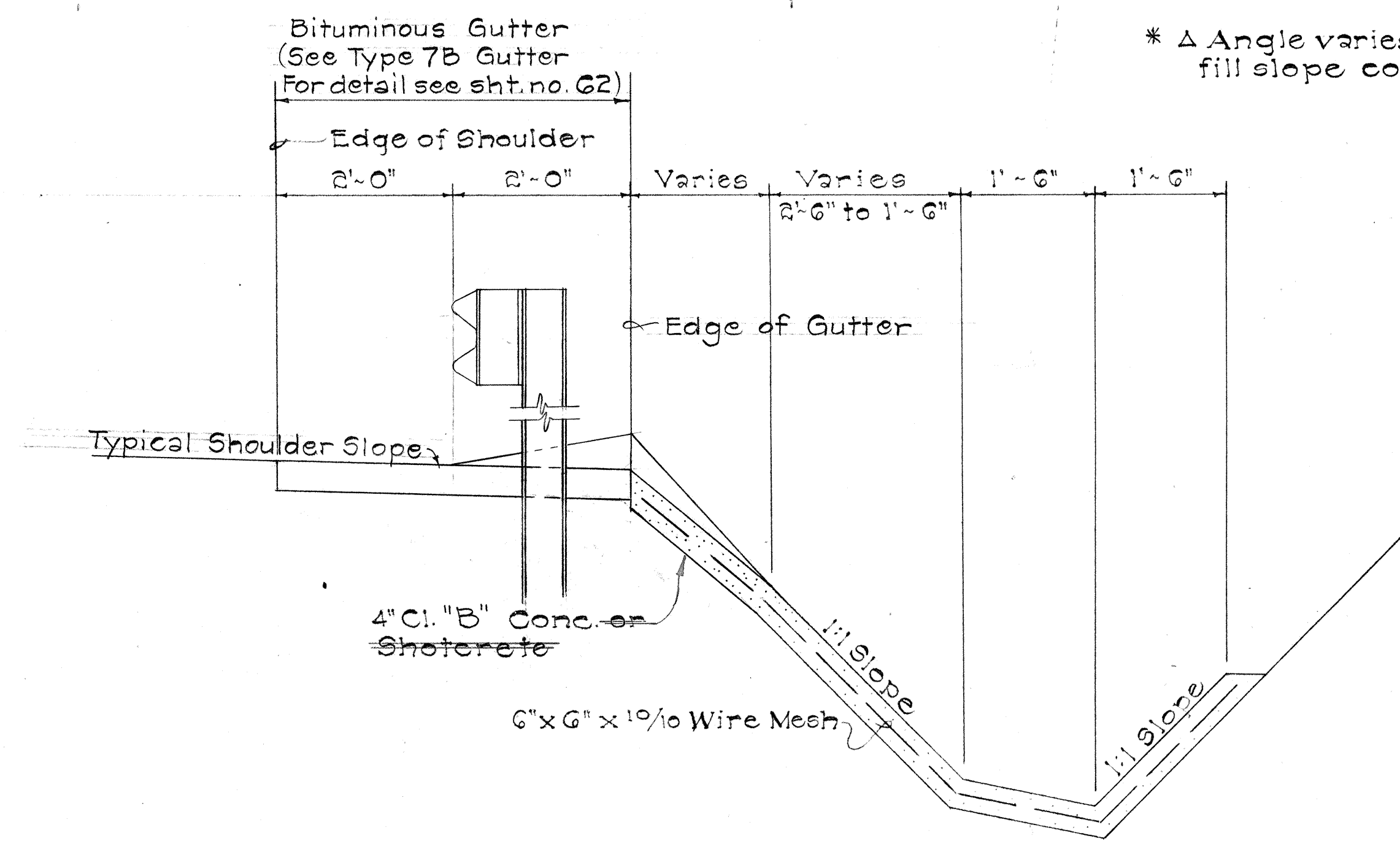
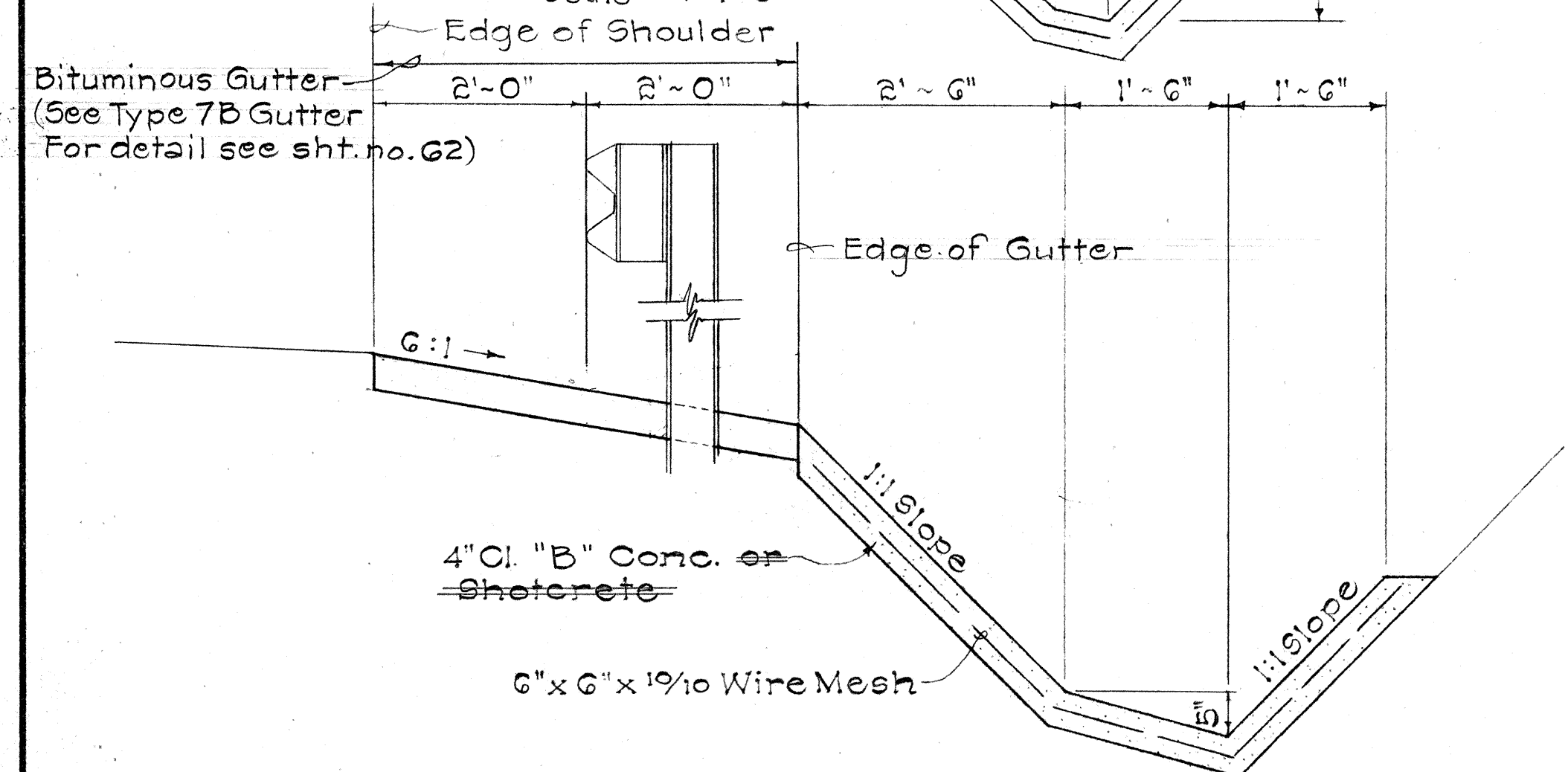
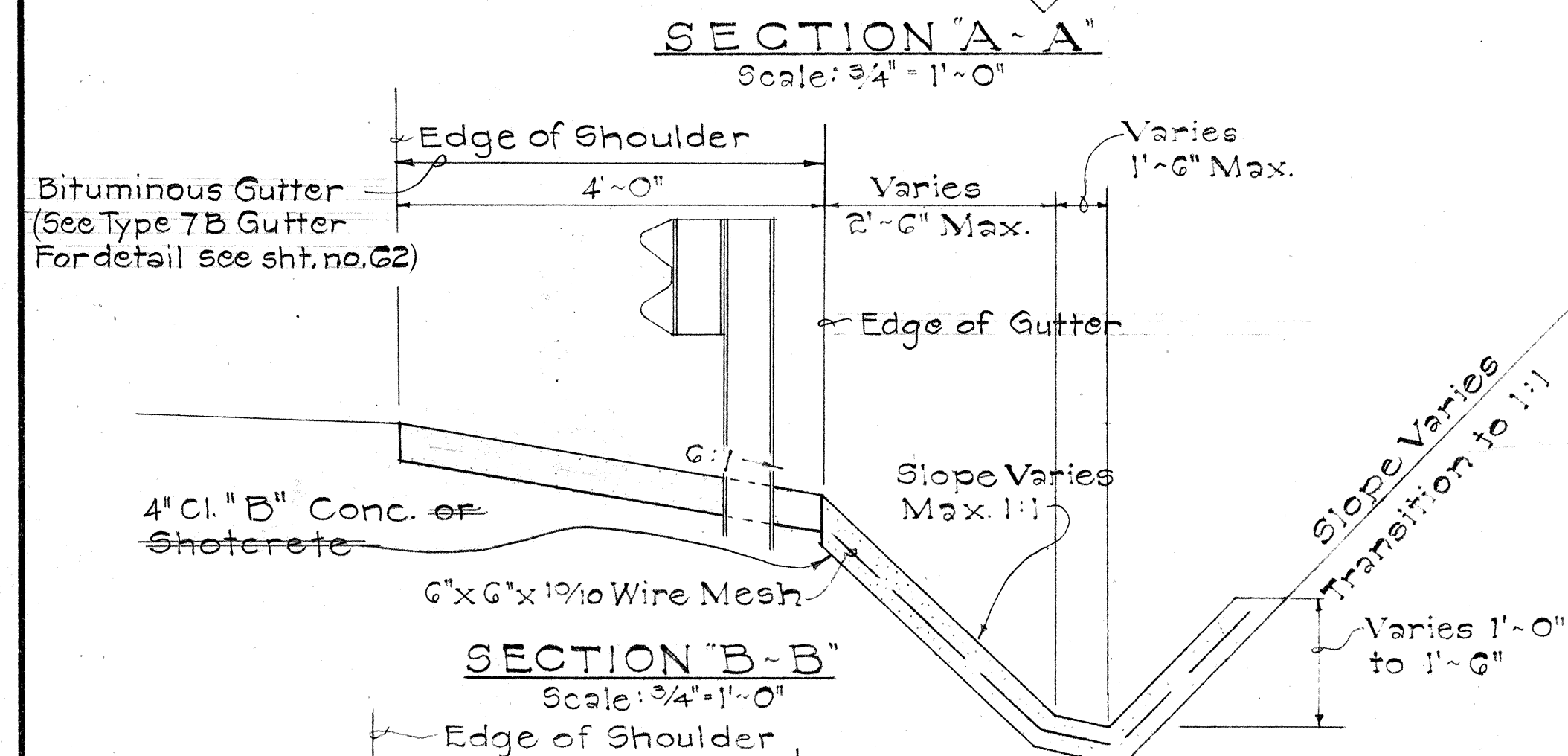
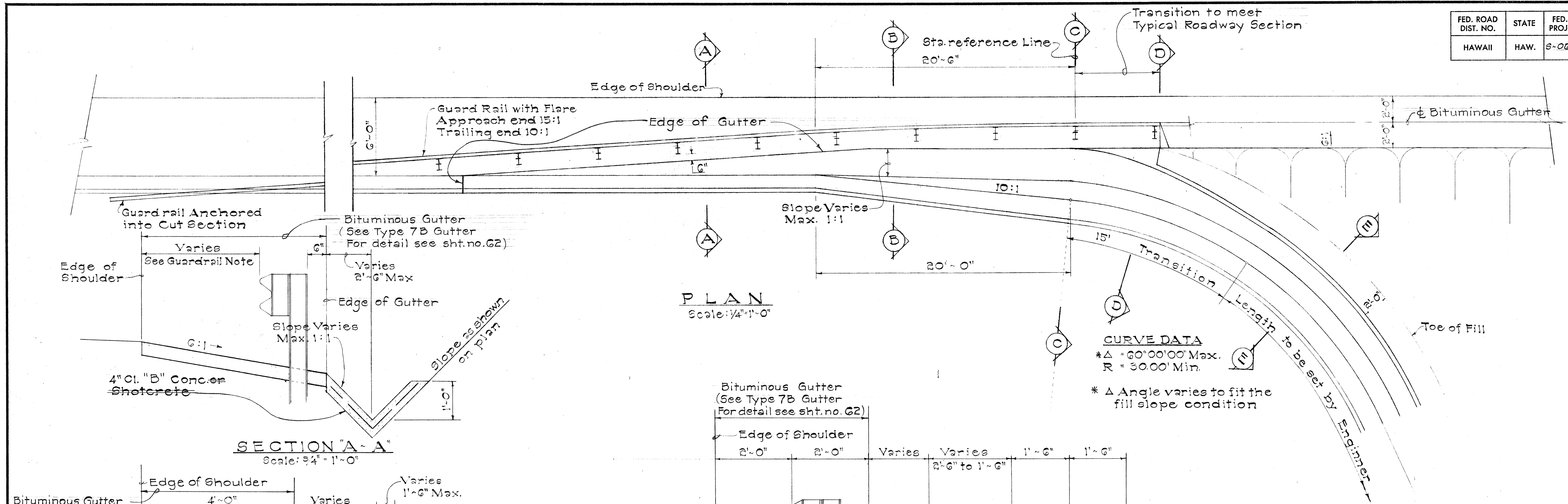
**DETAILS OF C.D.I. @ STA. 25+85 +/- 89' RT. & CONCRETE COLLAR CONNECTION
Scale: 1/2" = 1'-0"**

	SIZE OF BAR	DESCRIPTION
"a" bars	#4	OD + 11"
"b" bars	#4	OD + 11"

- NOTES:**
1. Connection Collars shall be Class "B" Concrete.
 2. Connection Collars shall be incidental to RCP or ACP.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
DRAINAGE DETAILS
C.D.I. @ STA. 25+85 +/- 89' RT. CONN.
DETAIL FOR D.I. @ STA. 8+75 RT.
CONCRETE COLLAR CONNECTION
MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)
Scale: 1/2" = 1'-0" Date:
SHEET No. 24 OF 35 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	S-0630(10)	1970	60	153



NOTE:
 Payment for Gutter Transitions shall be paid by the linear foot and shall be considered as Type 7B Gutter.

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

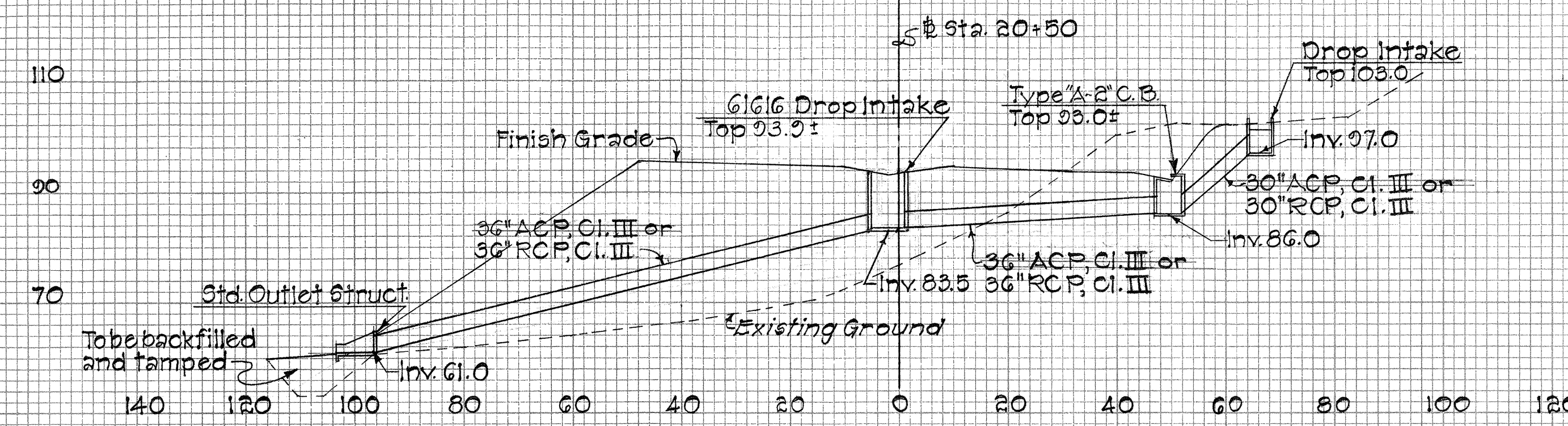
DRAINAGE DETAILS

CONCRETE SPILLWAY INLET

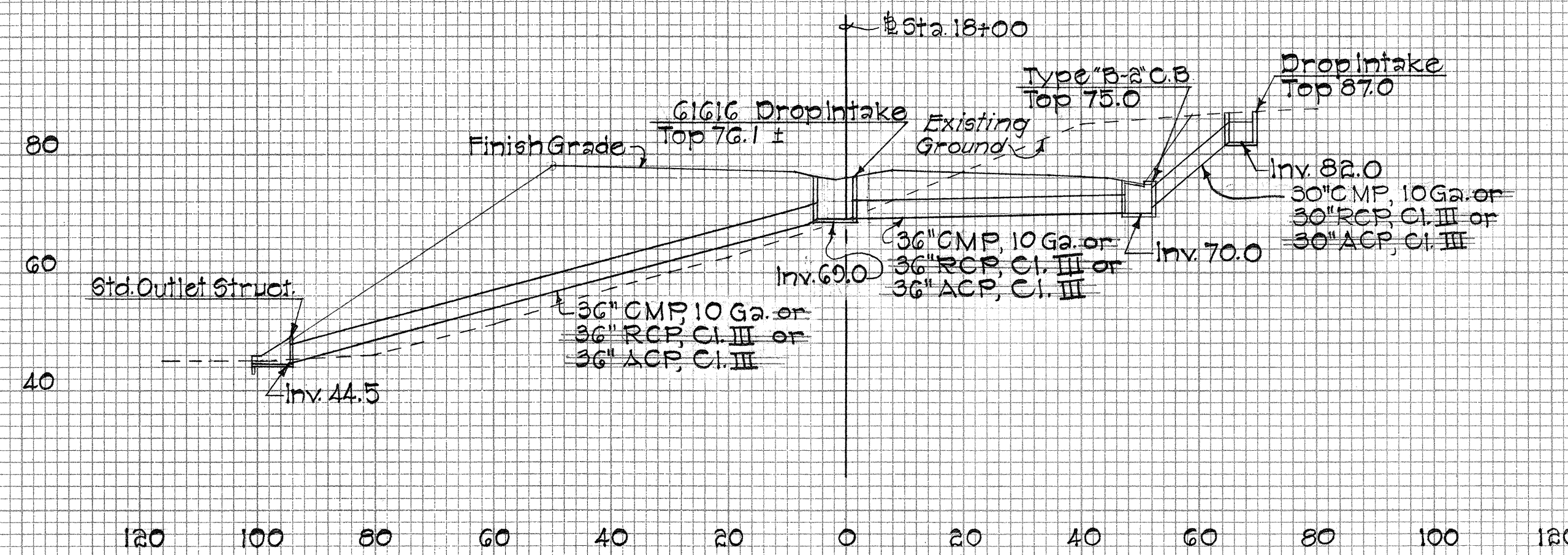
MOKAPU SADDLE ROAD
 F.A.S. Proj. No. S-0630(10)
 Scale: As Shown Date: April, 1969

SHEET No. 25 OF 35 SHEETS

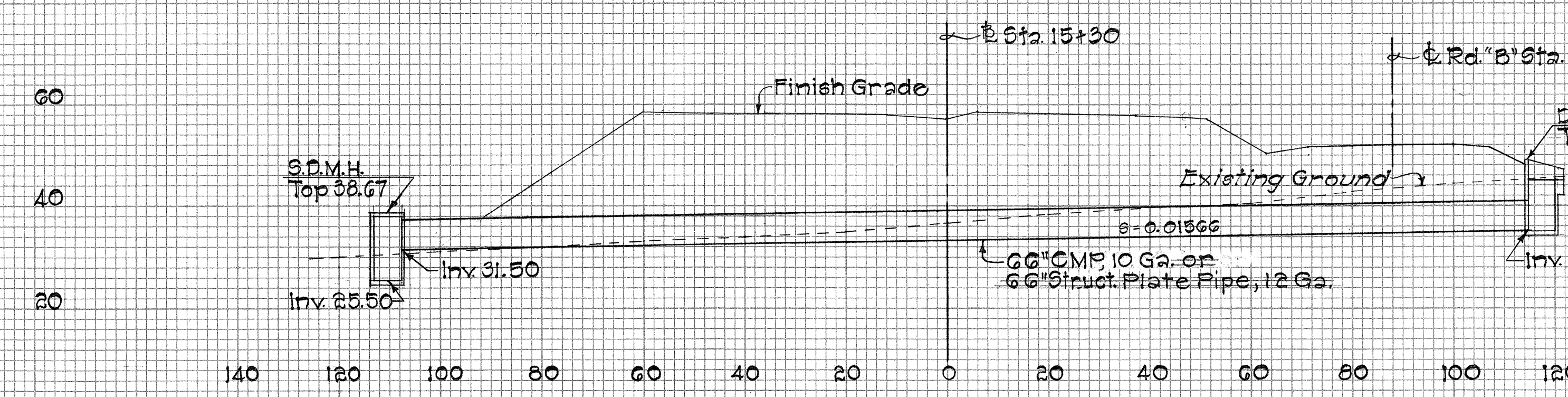
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	S-0630(10)	1970	G1	153



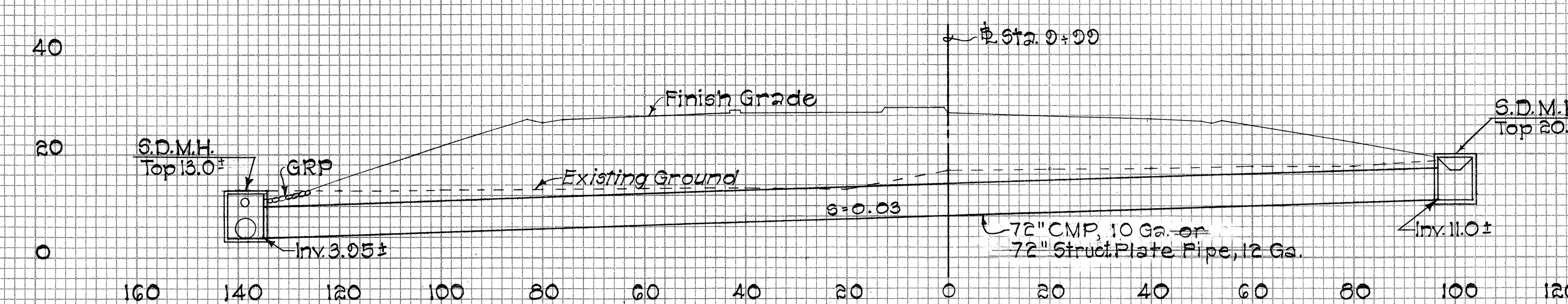
36" PIPE CULVERT @ STA. 20+50



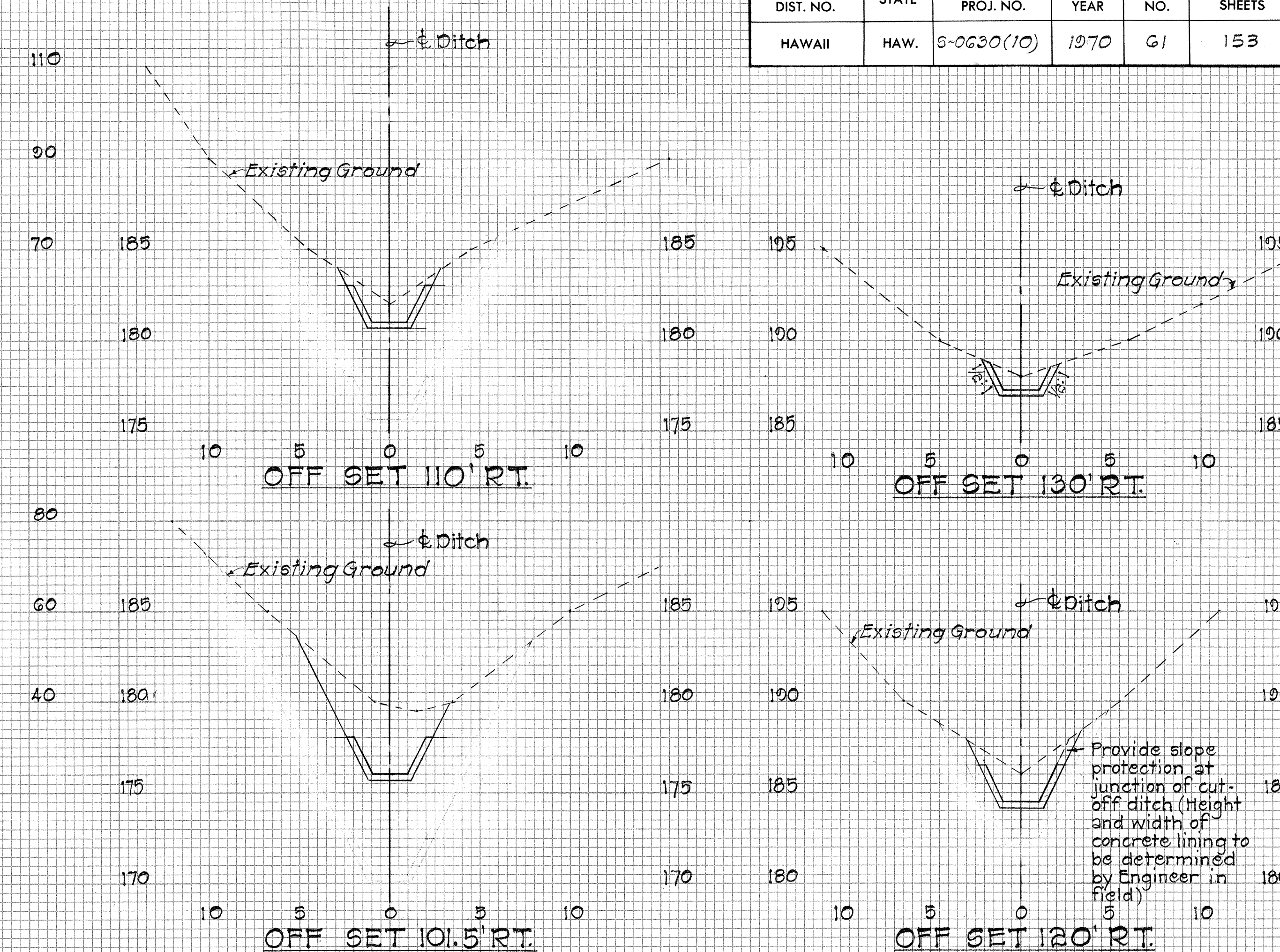
36" PIPE CULVERT @ STA. 18+00



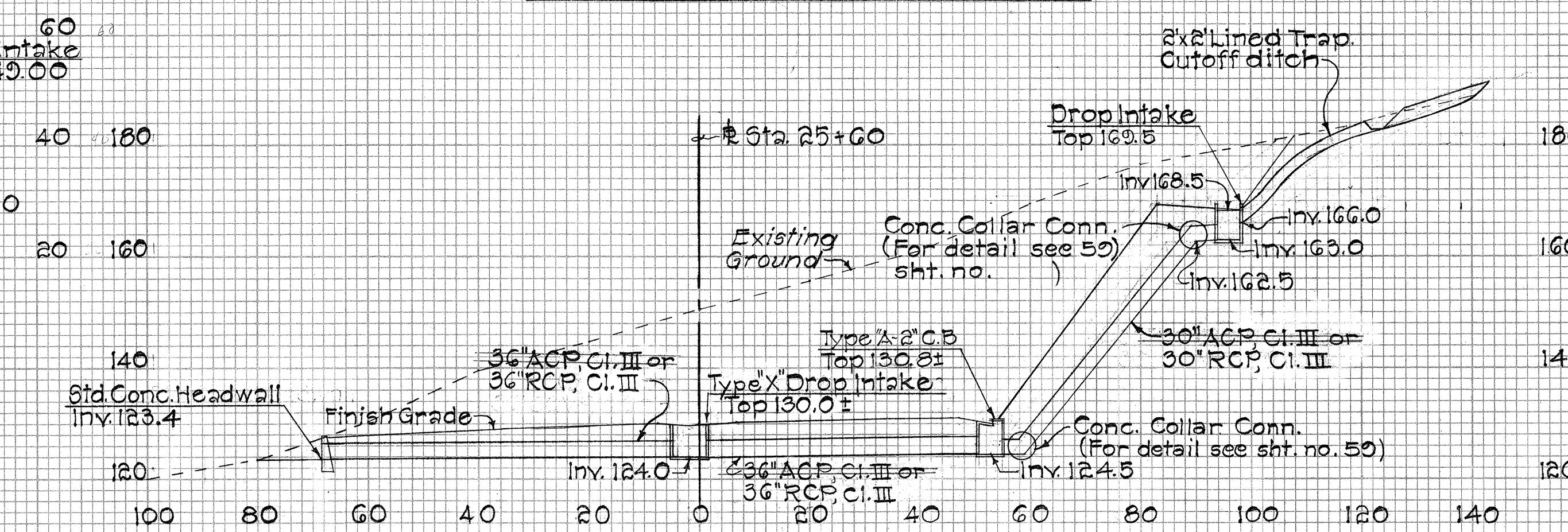
66" PIPE CULVERT @ STA. 15+30



72" PIPE CULVERT @ STA. 9+99



CROSS SECTION OF 2x2 LINED TRAP CUTOFF DITCH AT STA. 25+85 9/10 92' RT



36" PIPE CULVERT @ STA. 25+60

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**DRAINAGE PROFILES
OF CULVERT CROSSINGS**

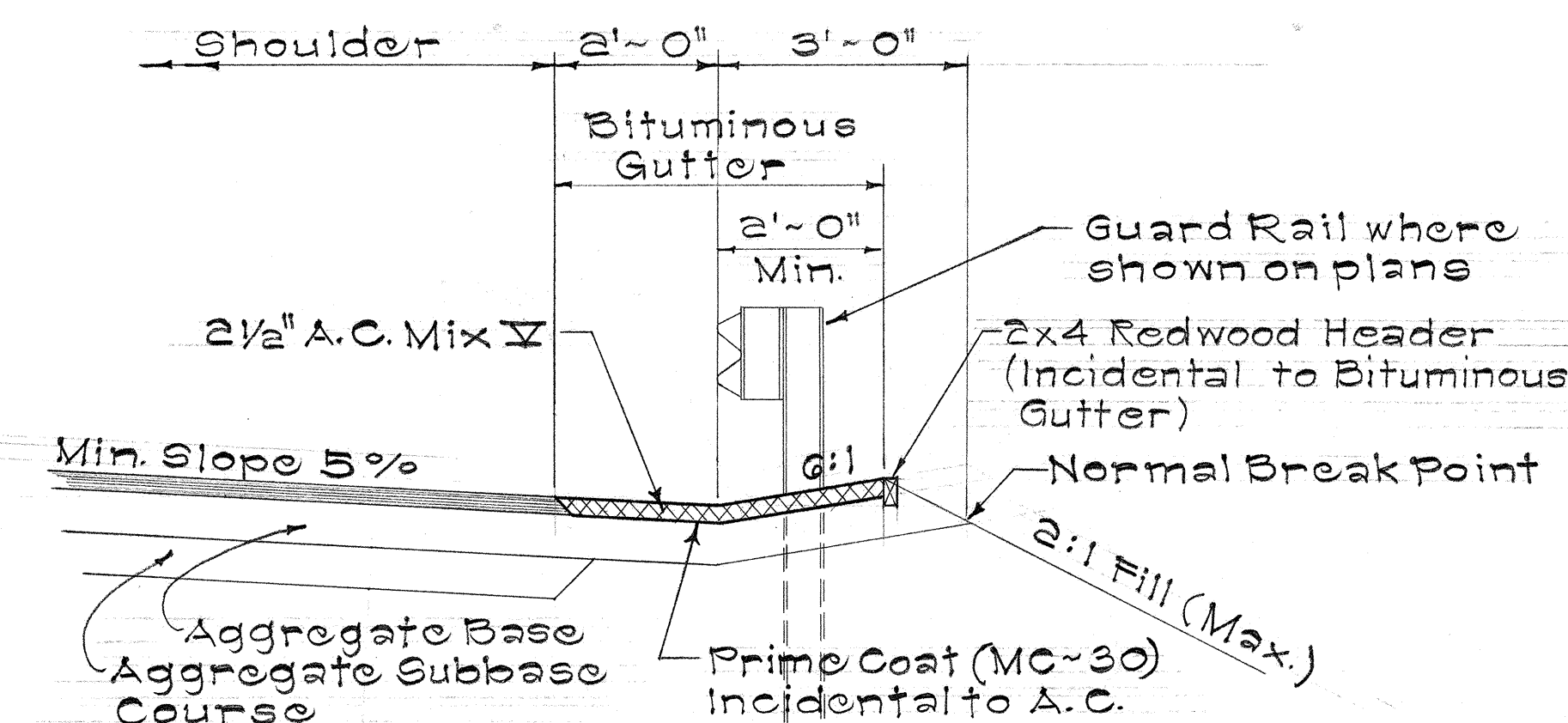
MOKAPU SADDLE ROAD
F.A.S. Proj. No. S-0630(10)

Scale: As Shown Date: Jan. 1969
SHEET No. 26 OF 35 SHEETS

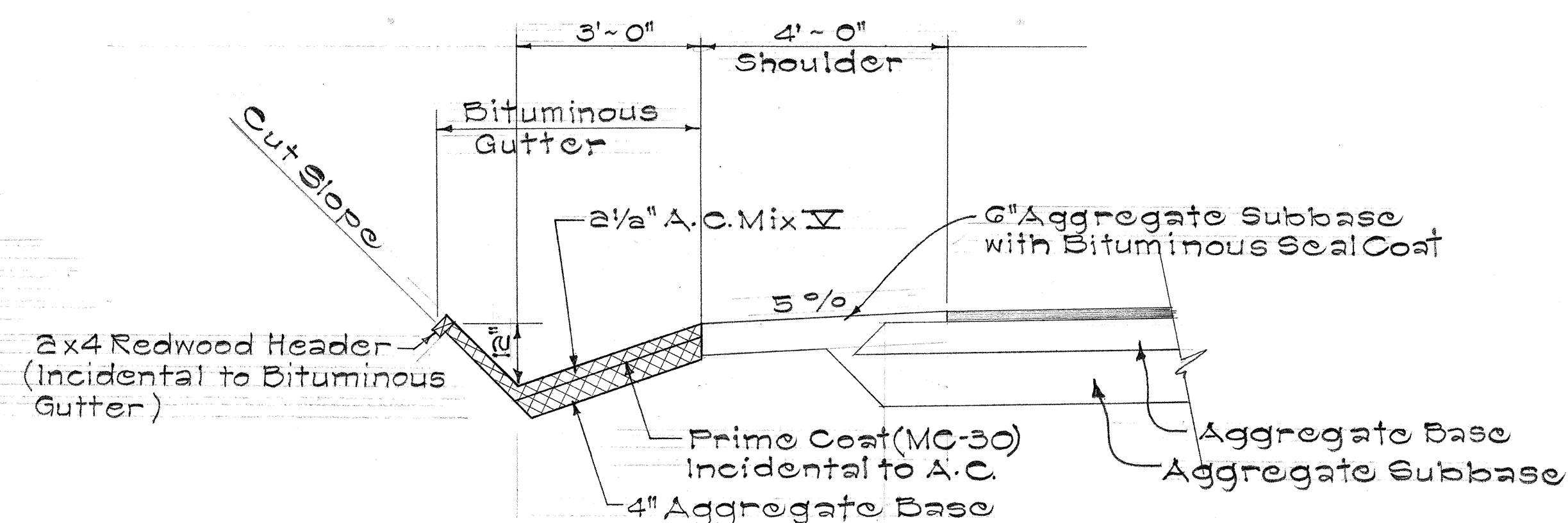
FINAL SURVEY PLOTTED TEMPLATE NO. DATE BY

ORIGINAL SURVEY PLOTTED TEMPLATE NO. DATE BY

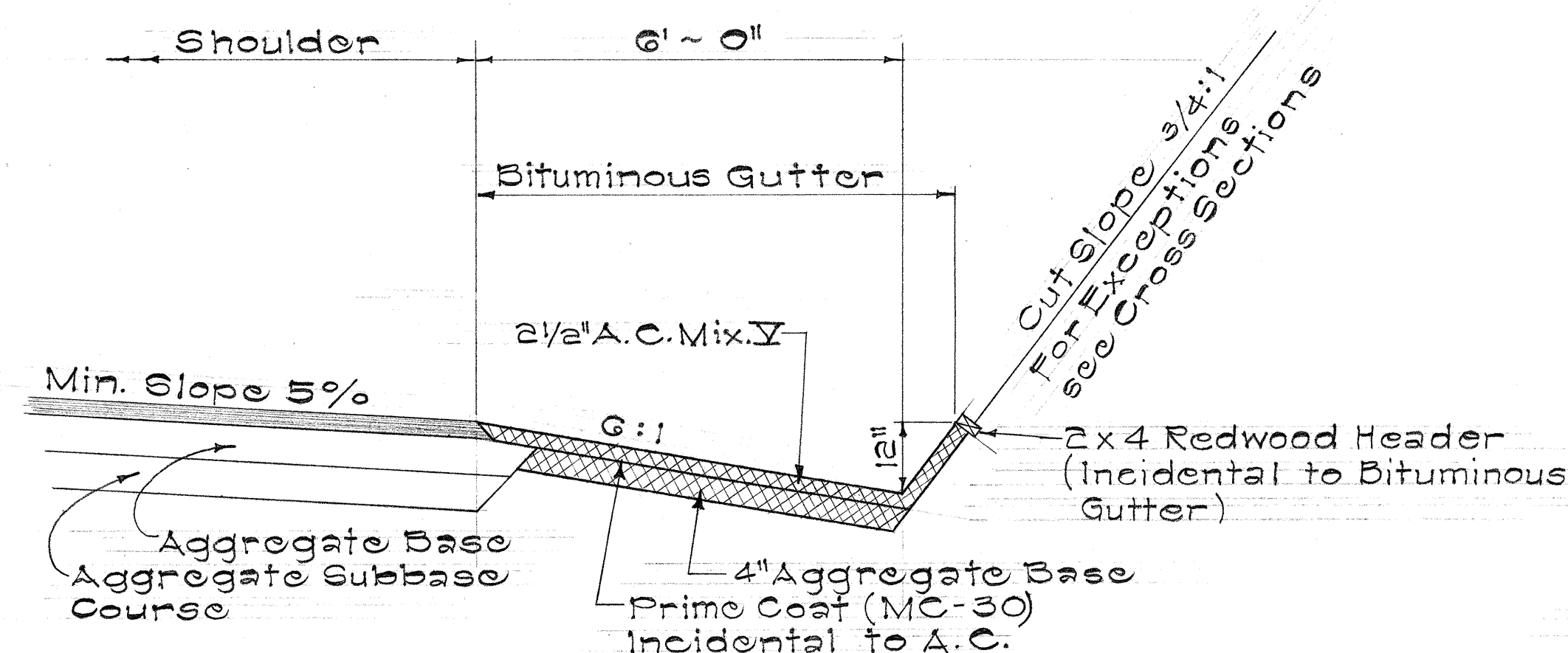
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	62	153



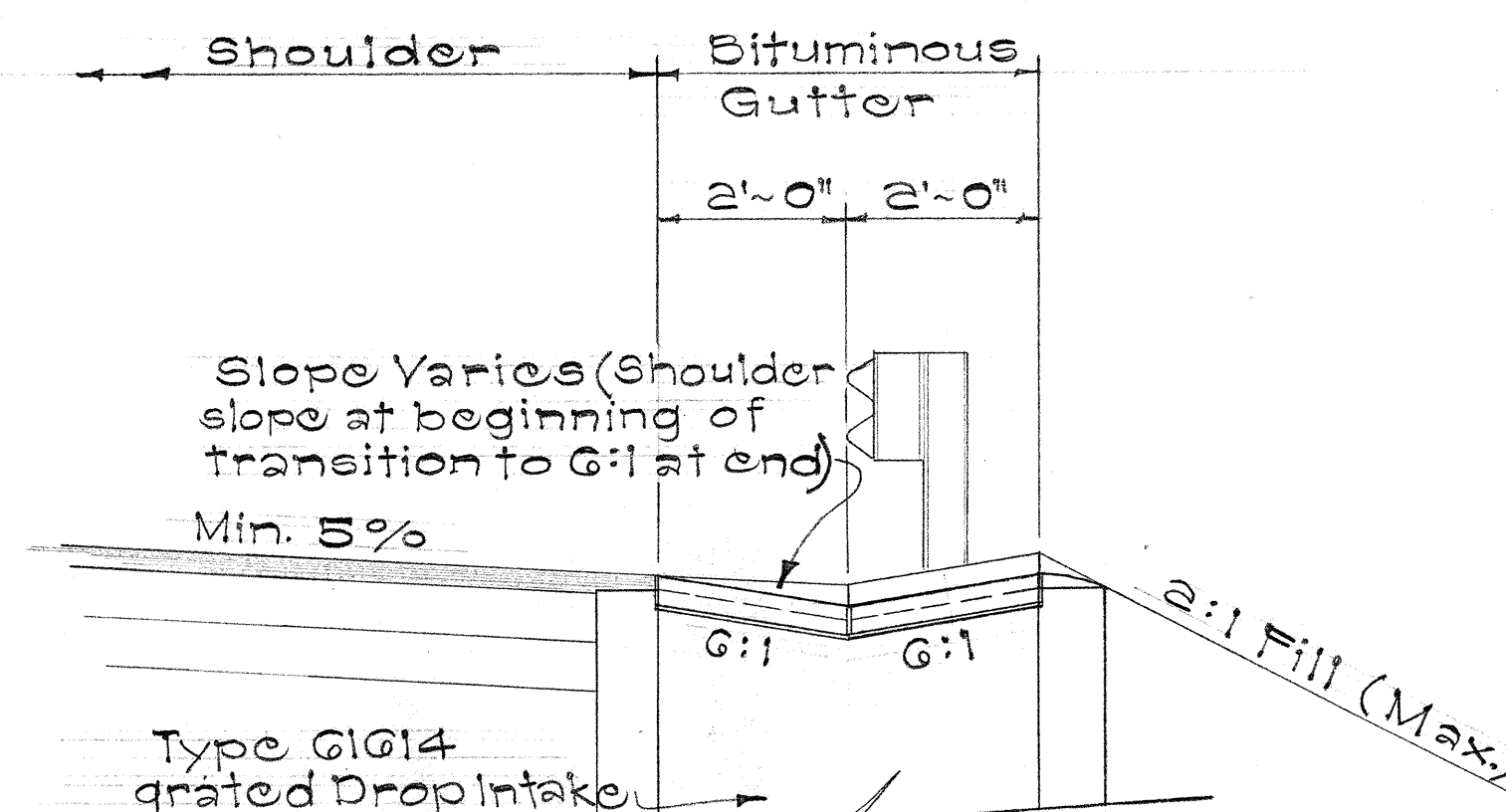
DETAIL OF TYPE 7A GUTTER



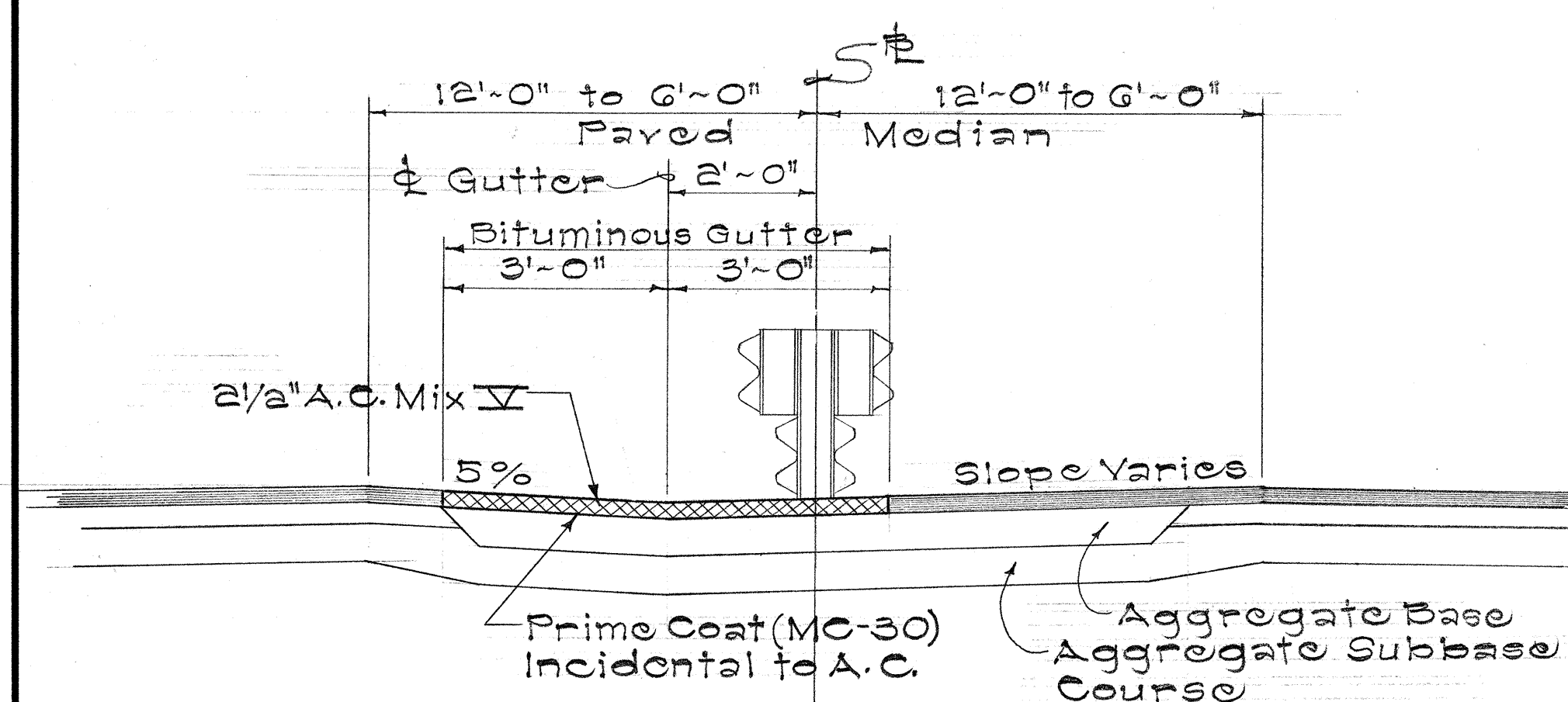
DETAIL OF TYPE 7C GUTTER



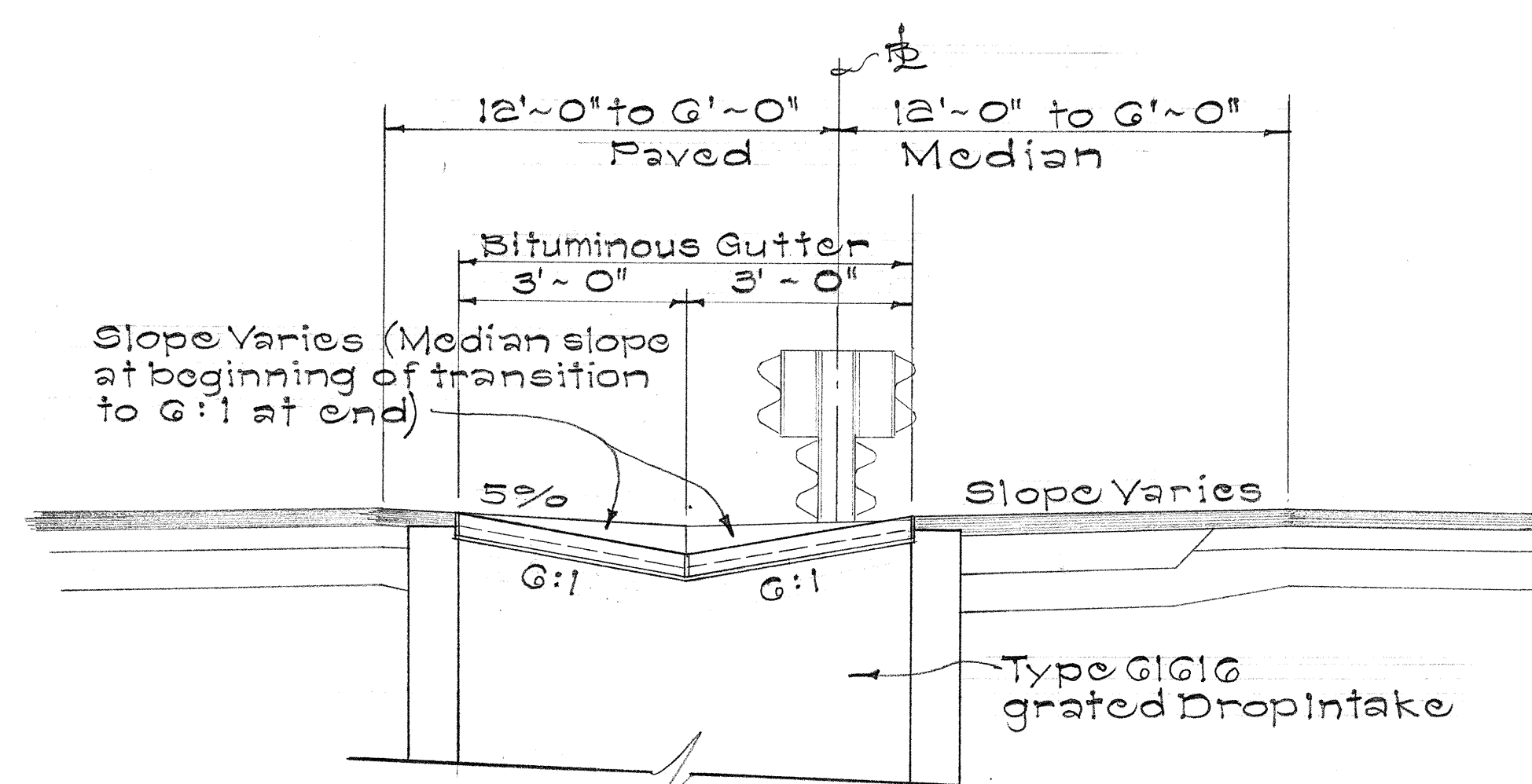
DETAIL OF TYPE 7B GUTTER



DETAIL 25' GUTTER TRANSITION FOR TYPE 7A GUTTER



DETAIL OF TYPE 7M GUTTER



DETAIL 25' GUTTER TRANSITION FOR TYPE 7M GUTTER

GENERAL NOTES

1. Cross Hatched Area indicates items to be covered under pay item for Type 7 Gutter per lin. ft.
2. Where Guardrail Post is to be installed in Bituminous Gutter Section the post shall be driven through the asphalt. Any damage done to the asphalt during this operation shall be repaired by the contractor at his expense.
3. Where 6/6/4 or 6/6/6 Drop Intakes are installed at Type 7A or 7M Gutter Sections, provide 25' minimum transition up and down stream of the structure.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

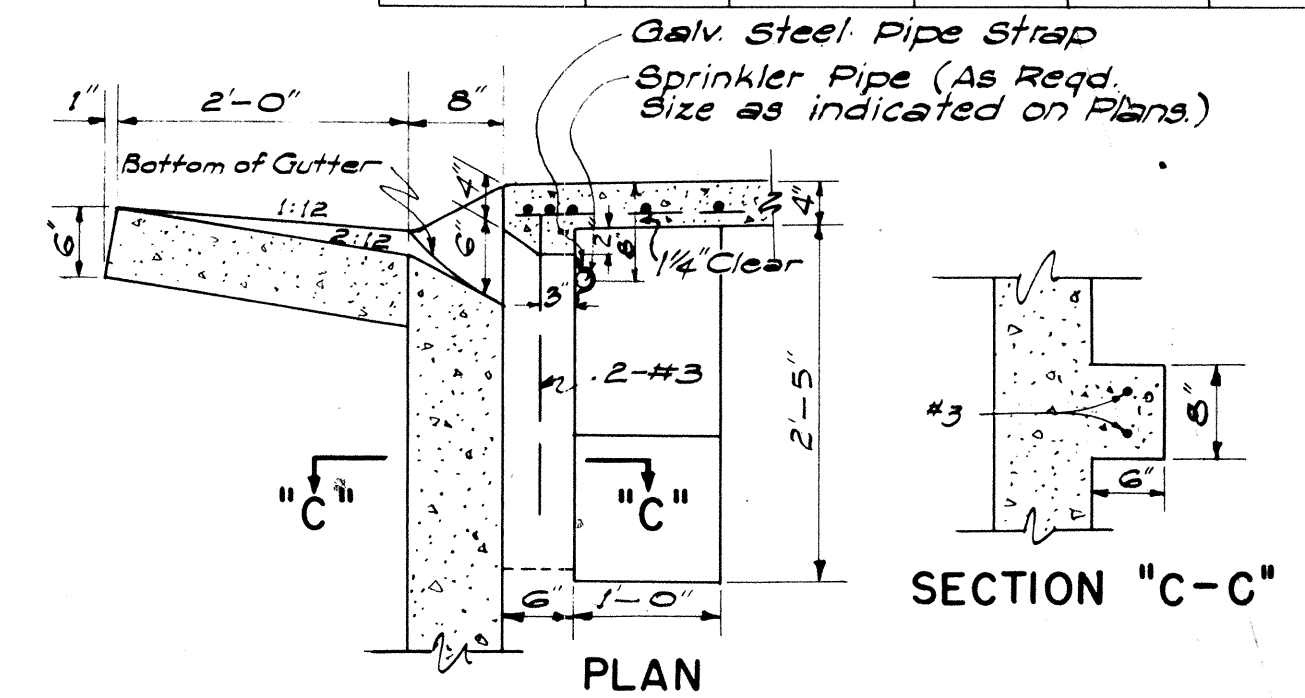
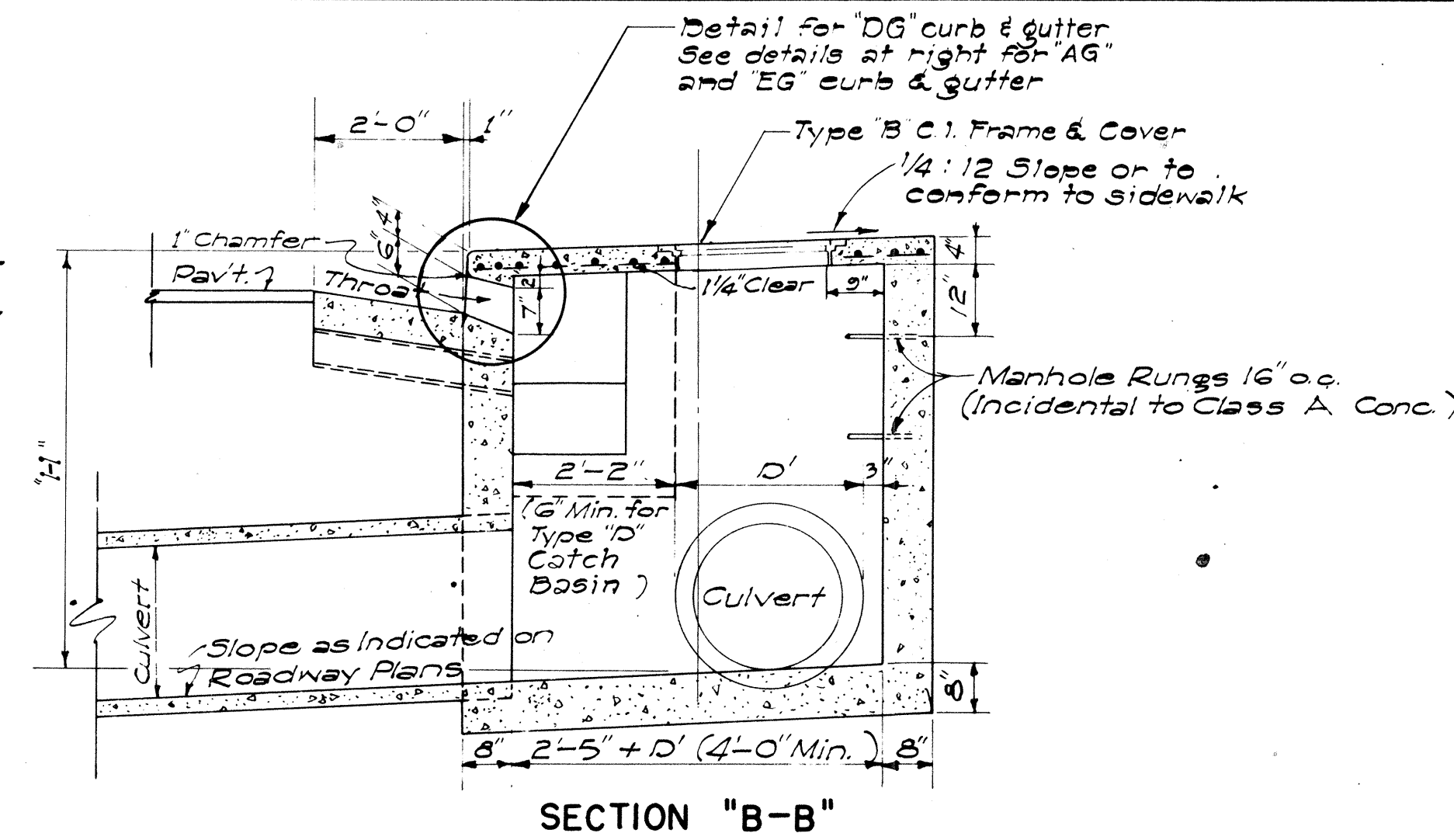
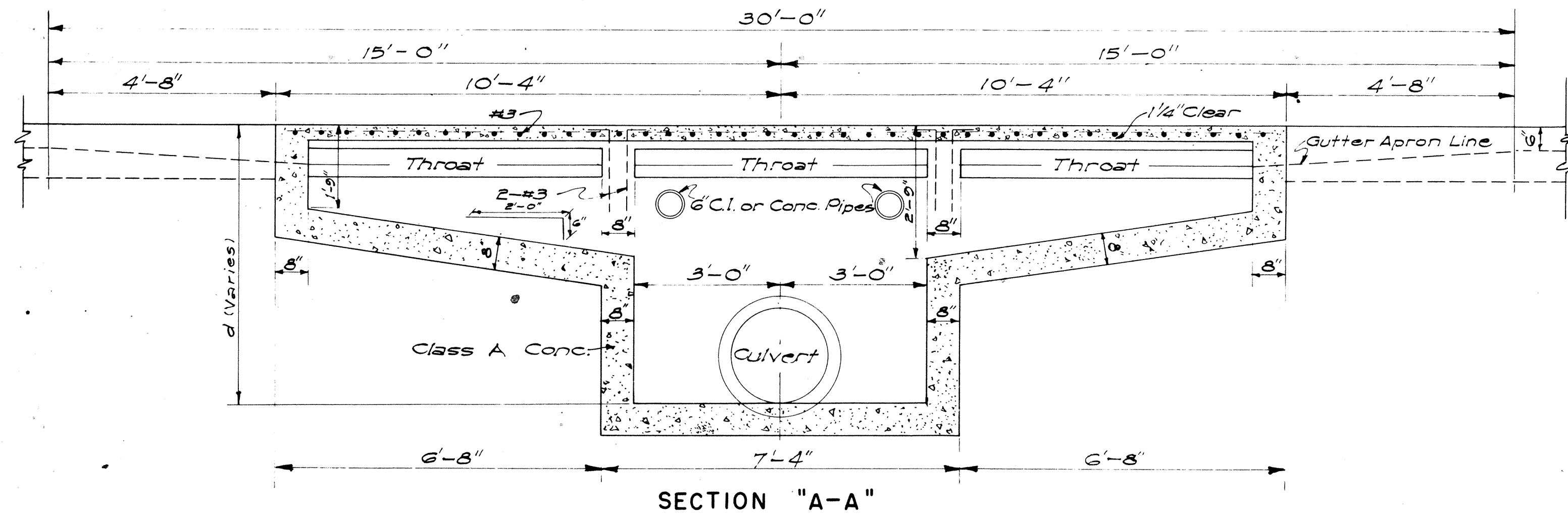
DRAINAGE DETAILS TYPE 7 GUTTERS

MOKAPU SADDLE ROAD
F.A.S. Proj. No. 5-0630(10)

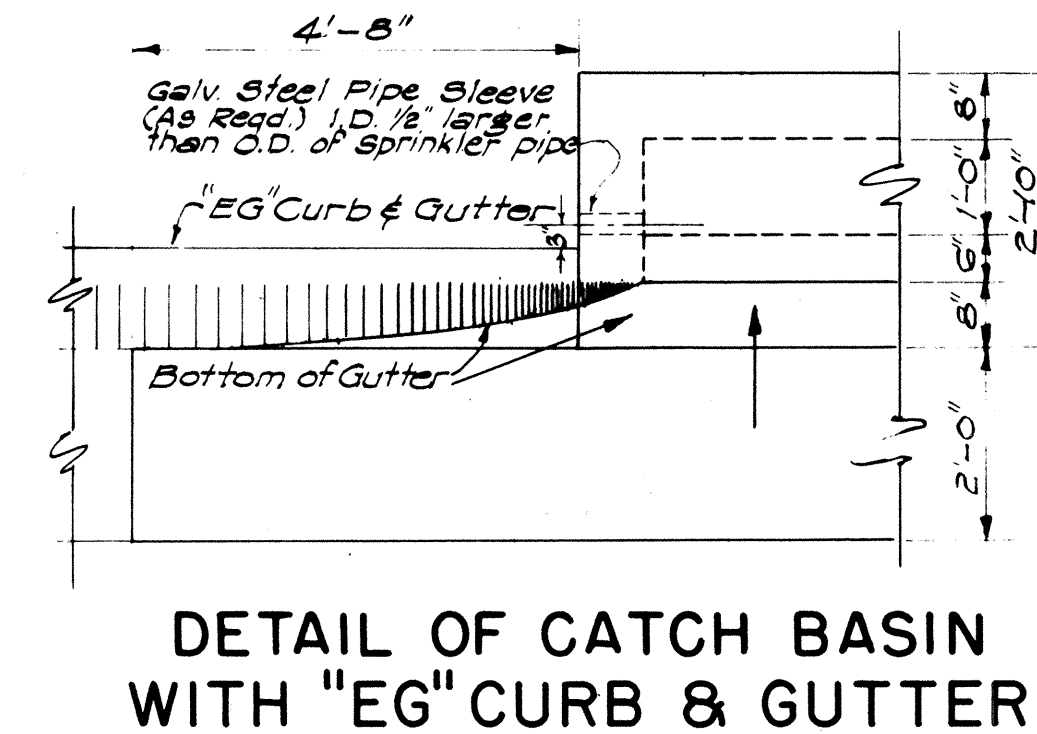
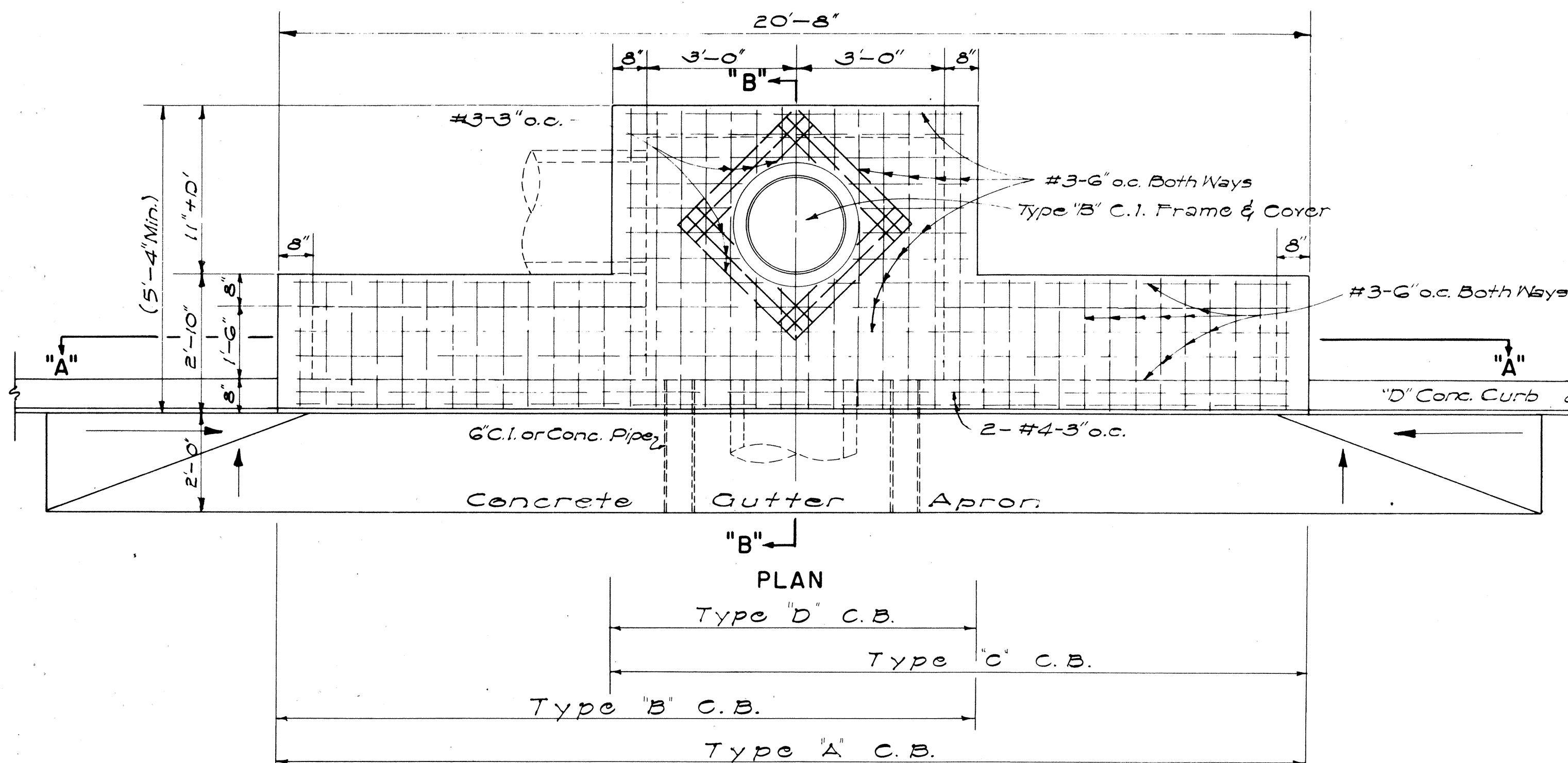
Scale: 1/2" = 1'-0" Date:

SHEET No. 27 OF 35 SHEETS

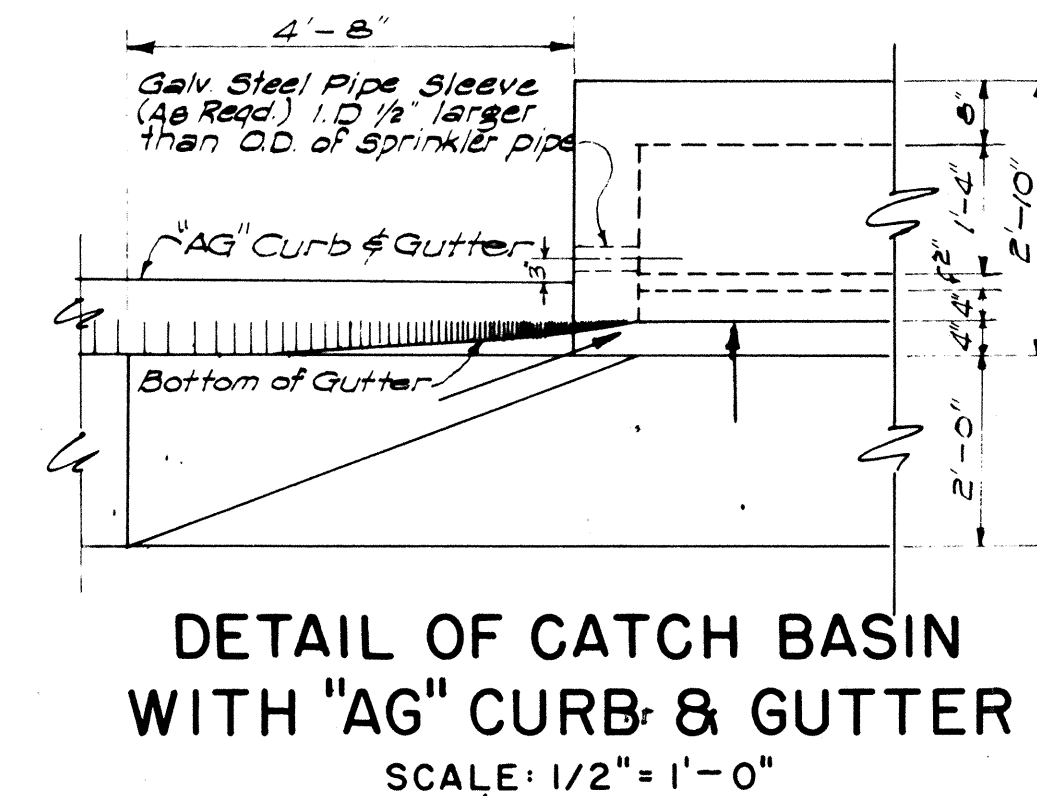
2/17/69



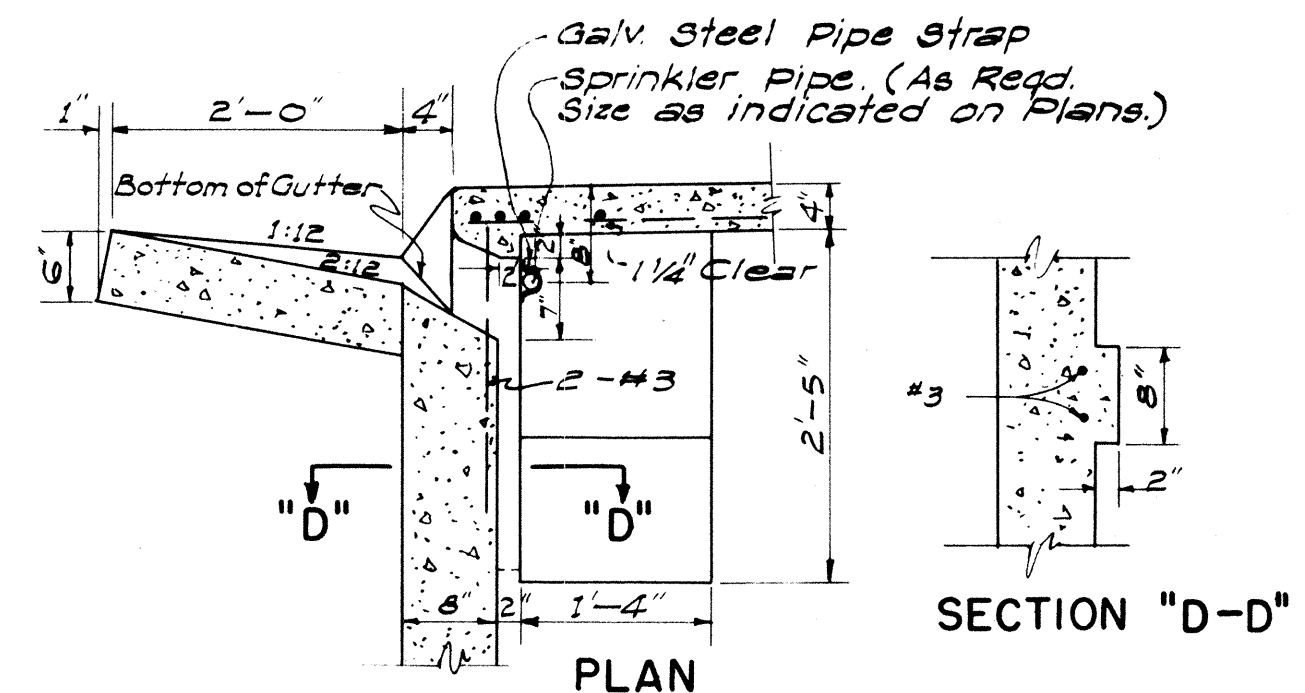
THROAT DETAIL FOR
"EG" CURB & GUTTER
SCALE: 3/4" = 1'-0"



DETAIL OF CATCH BASIN
WITH "EG" CURB & GUTTER



DETAIL OF CATCH BASIN
WITH "AG" CURB & GUTTER
SCALE: 1/2" = 1'-0"



THROAT DETAIL FOR
"AG" CURB & GUTTER
SCALE: 3/4" = 1'-0"

DETAILS OF TYPES "A", "B", "C" AND "D" CATCH BASINS

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

GENERAL 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 Concrete for Construction Drainage. The Engineer shall determine the exact location in the field.
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.
6. The type of curb and/or gutter (Type 1, 2, 3, etc.) shall conform to the type specified on the roadway plans.
7. Manhole Rungs (16" o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (12 inches from the bottom) is required if "H" is 4 feet 6 inches or less. Type "B" Cast Iron Frame and Cover and Manhole Rungs may be placed at any location as ordered by the Engineer.

ESTIMATED QUANTITIES

Type	Class A 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"

APPROVAL RECOMMENDED:

Hydraulic Design Engineer

12-17-69
DATE

APPROVED:

Assistant Chief, Engineering

12-17-69
DATE

NO.	REVISION	APPROVED BY	DATE

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

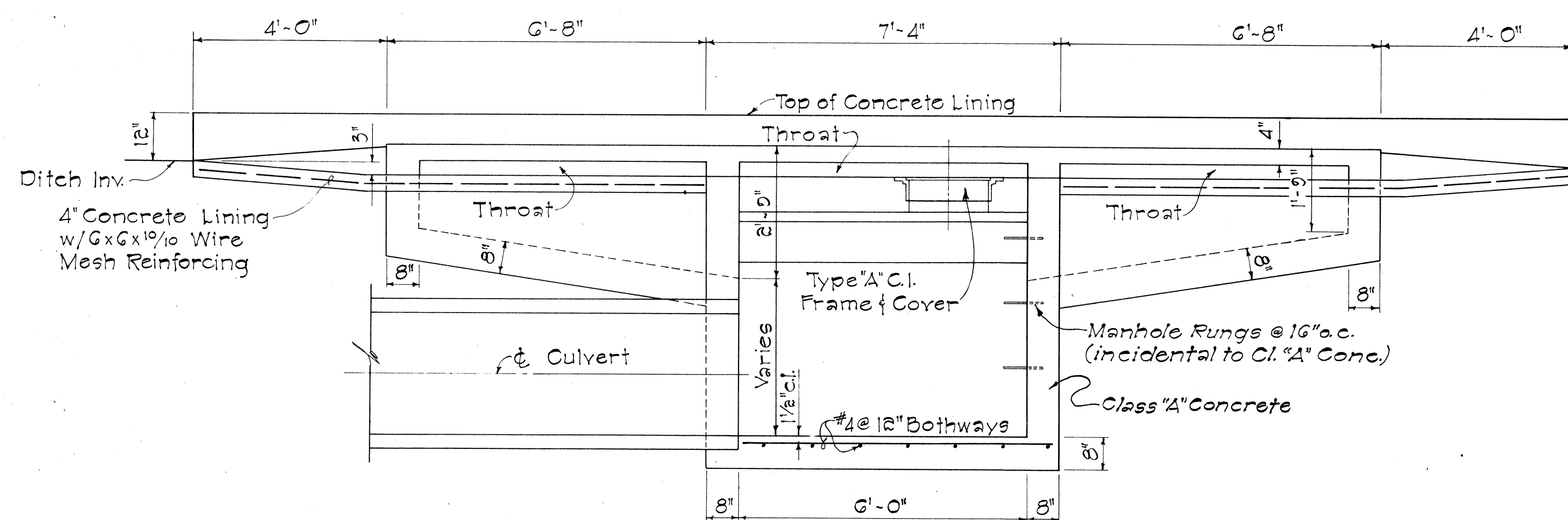
Scale: As Noted

Date: July, 1969

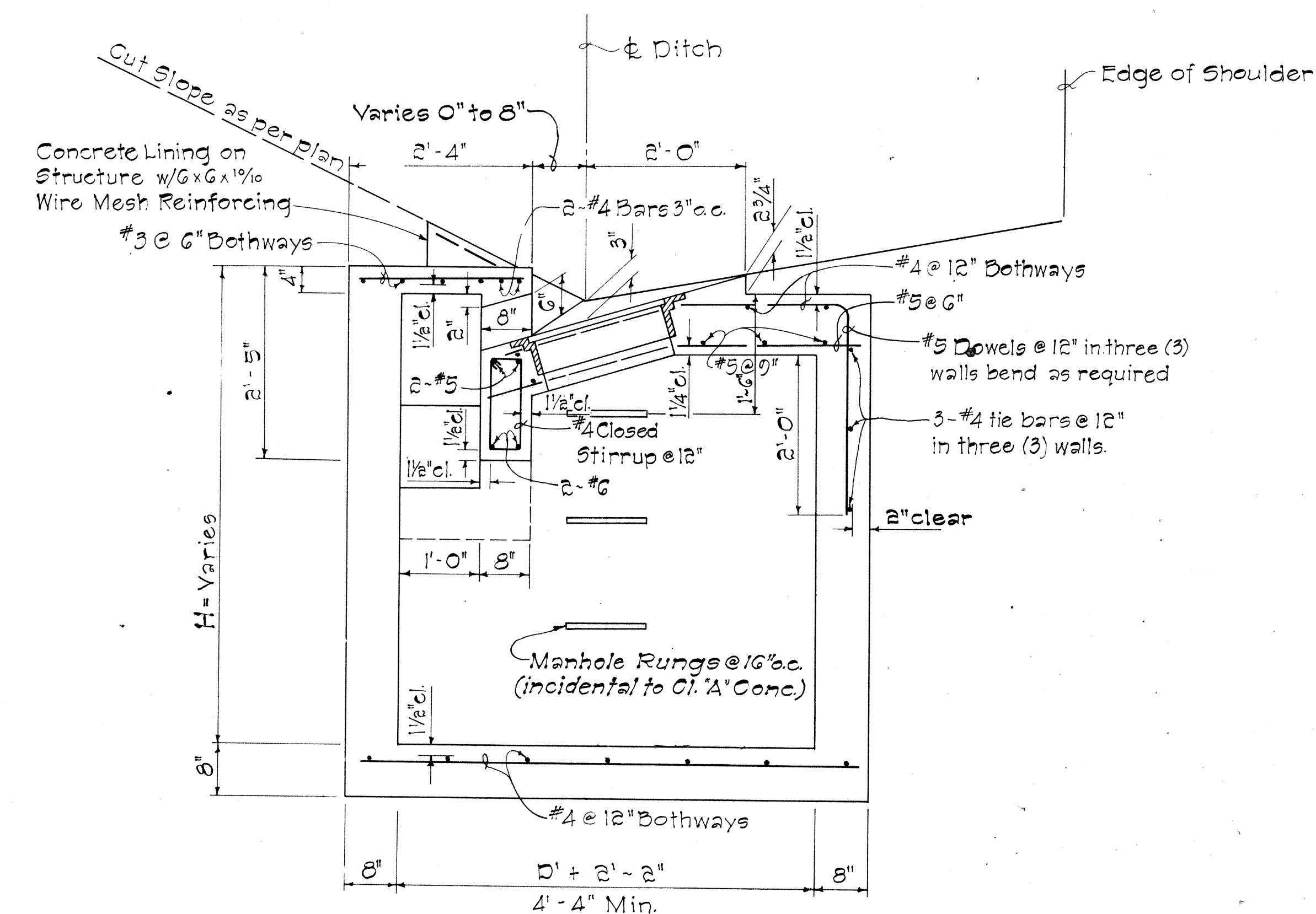
SHEET NO. 28 OF 35 SHEETS DH 1

[illegible]

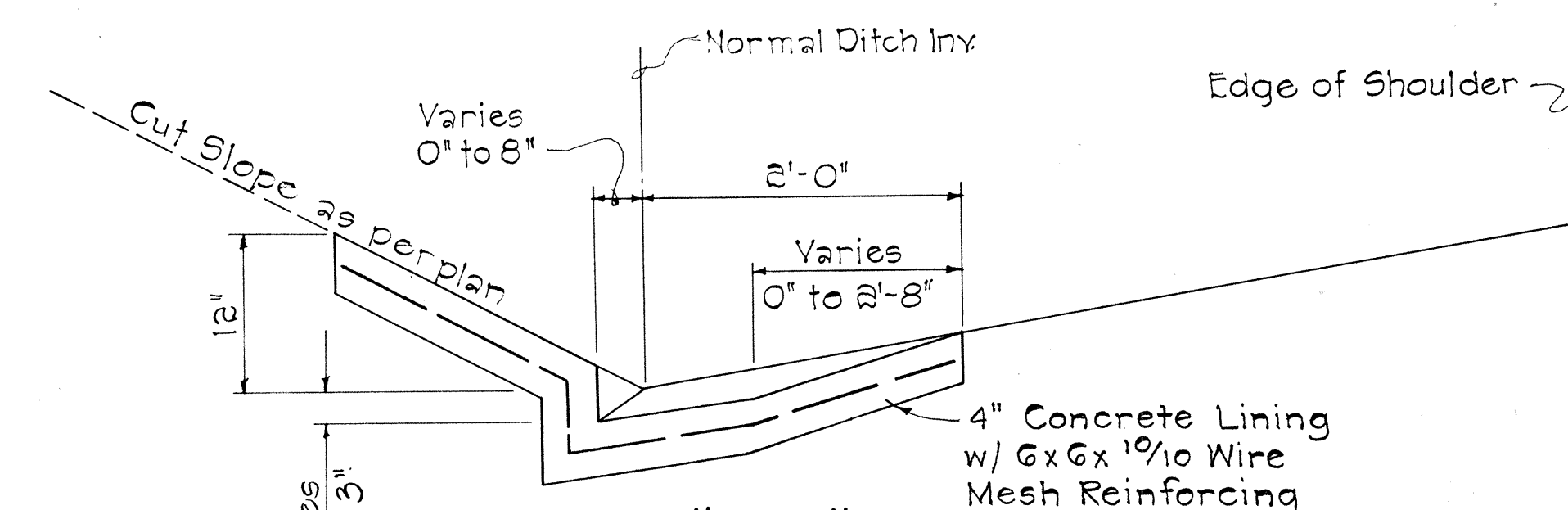
Scale: $1/2'' = 1' - 0''$



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



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



Scale: 1" = 1' - 0"

1. Culvert shall enter and leave C.B. from any position and in the direction indicated by the plans or ordered by the Engineer.
2. It shall be the maximum outside dimension of the culvert at the C.B. wall
3. Manhole Rungs (16" oc) are required when "H" is greater than 4 feet 6 inches. Only one rung (12 inches from the bottom) is required if "H" is 4 feet 6 inches or less.
4. Type "A" C.I. Frame (Cover and Manhole Rungs) may be placed at any location as ordered by the Engineer.

G. P. P. P.
HYDRAULIC DESIGN ENGINEER

APPROVED: 
ASSISTANT CHIEF, ENGINEERING

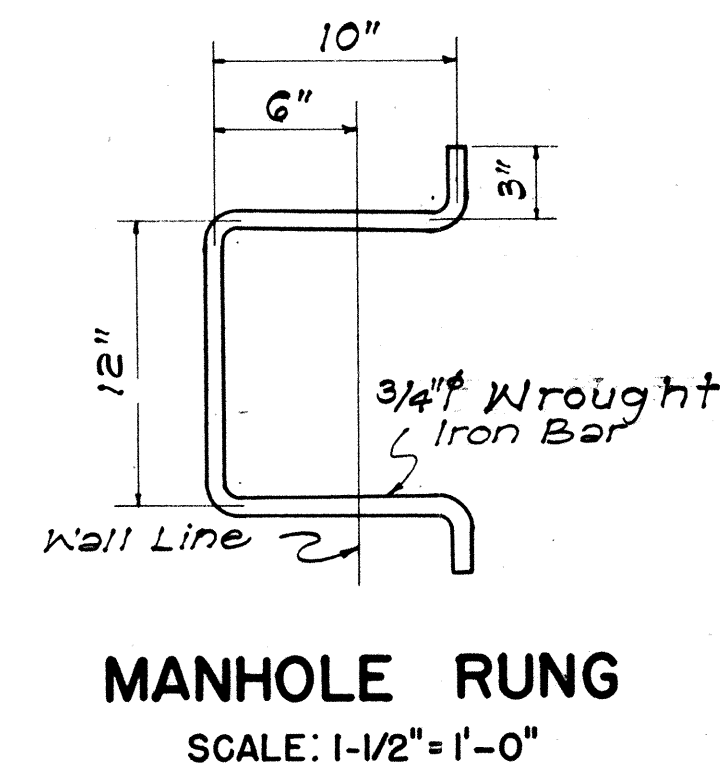
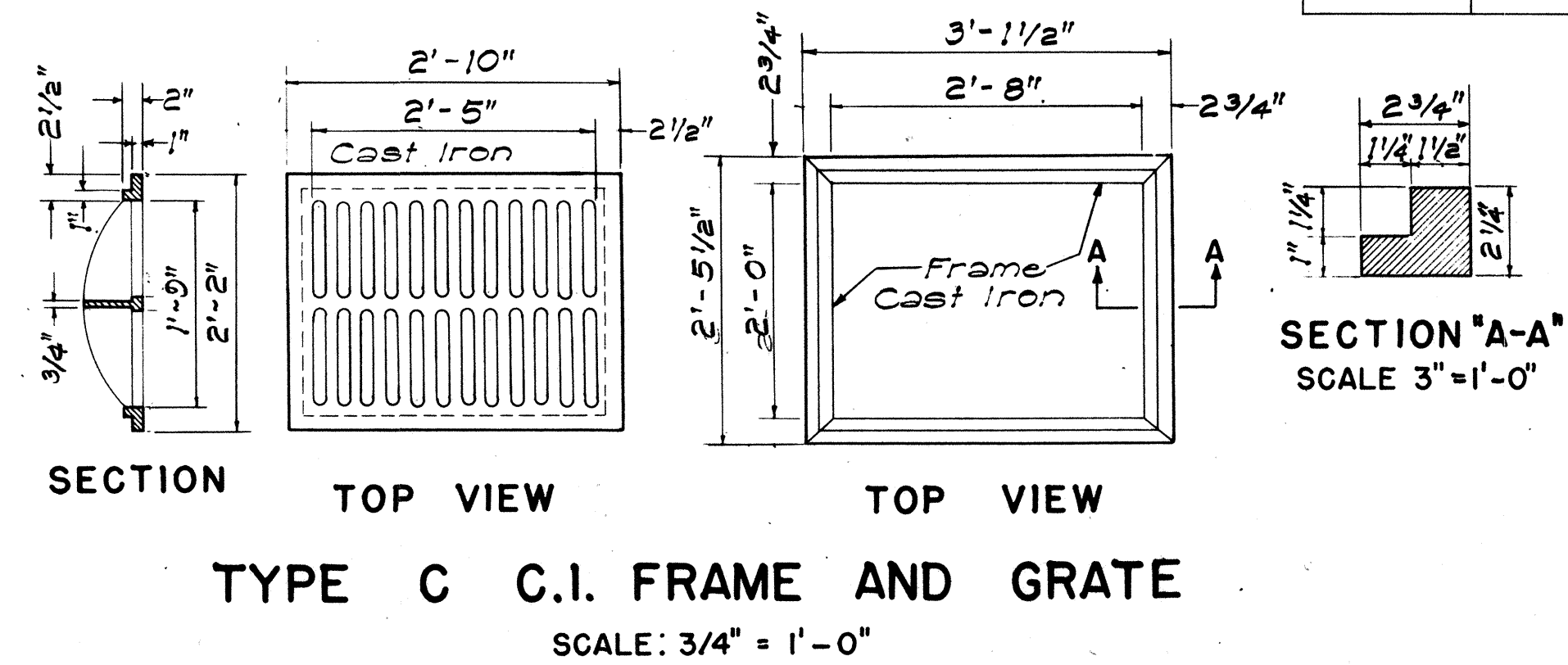
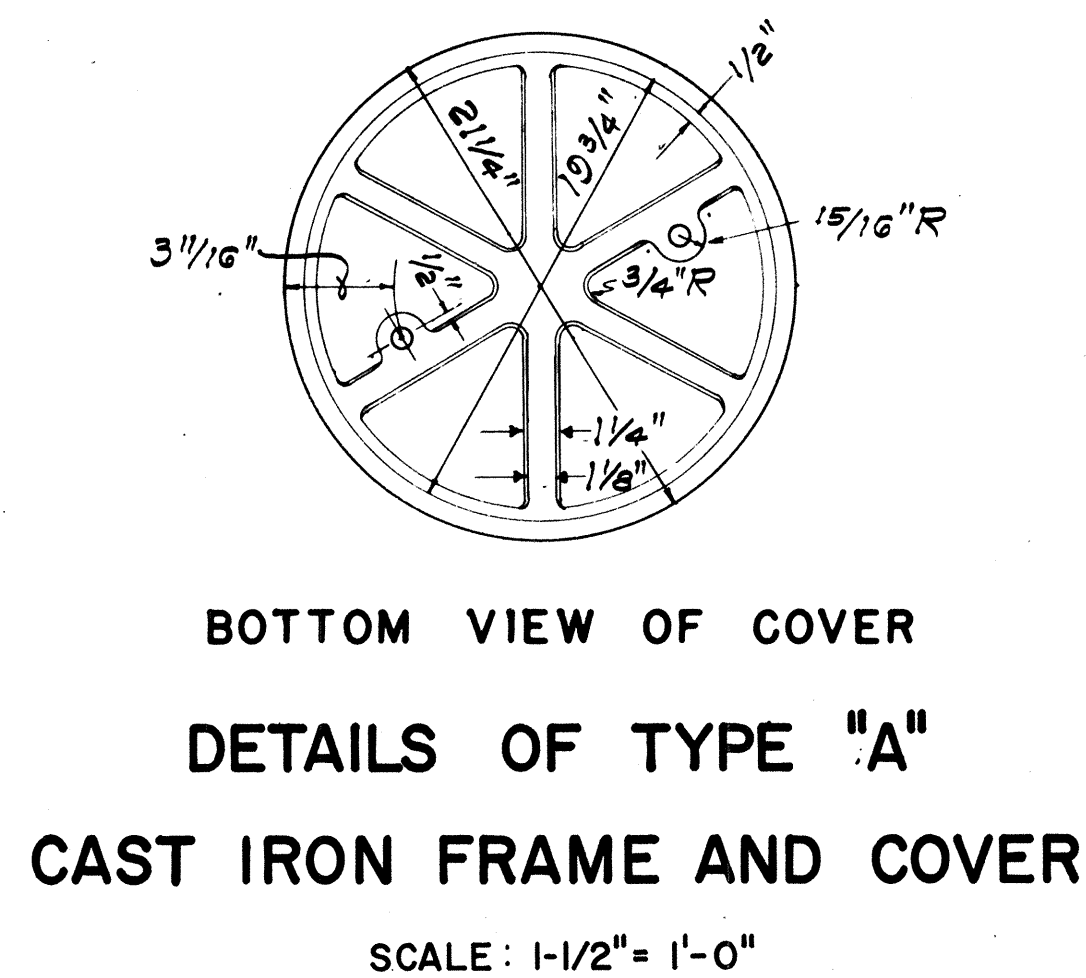
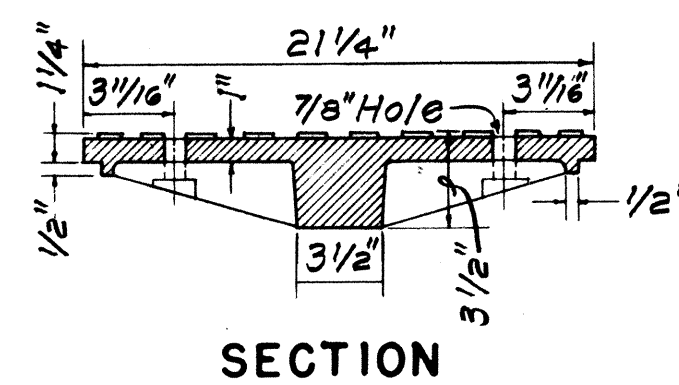
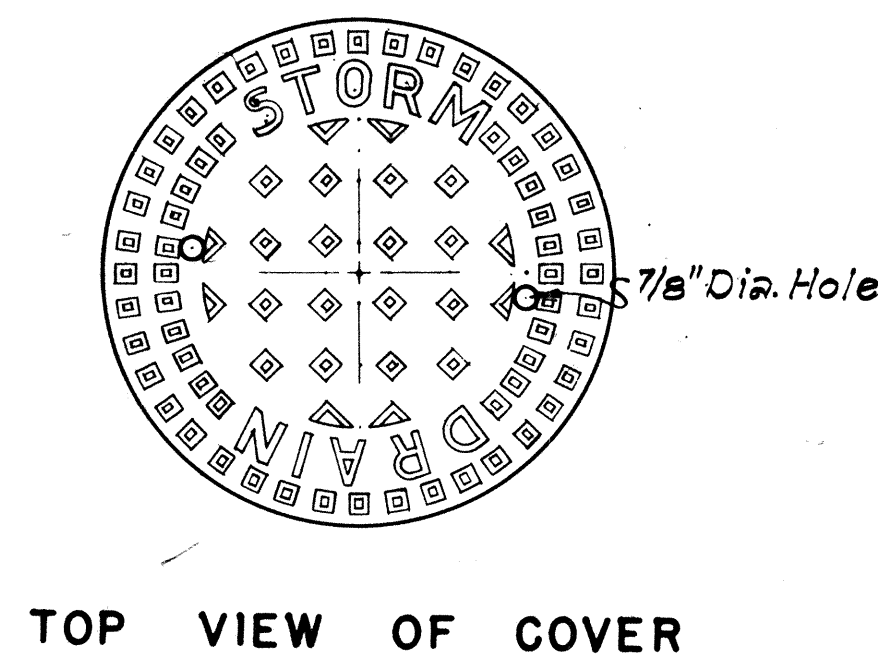
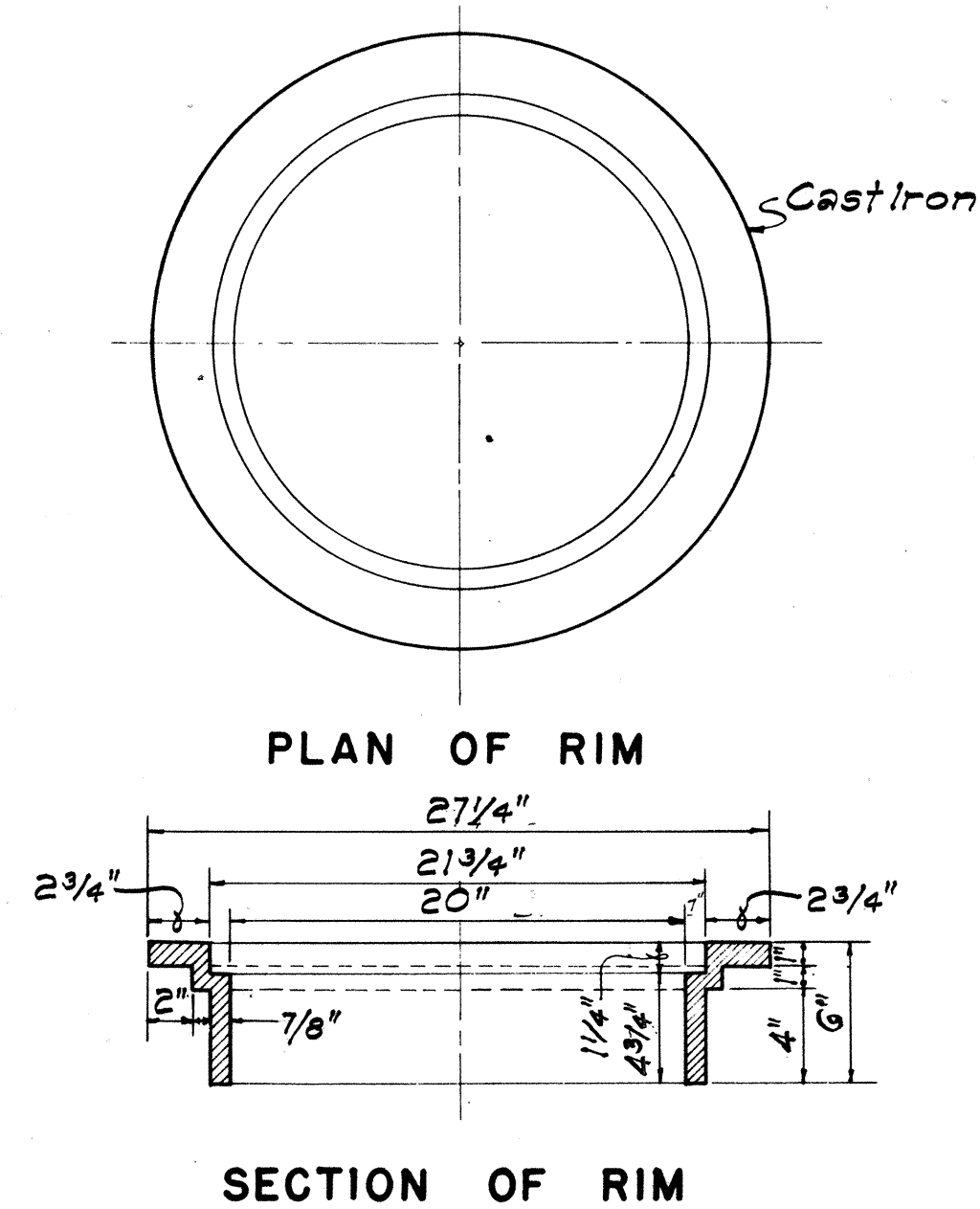
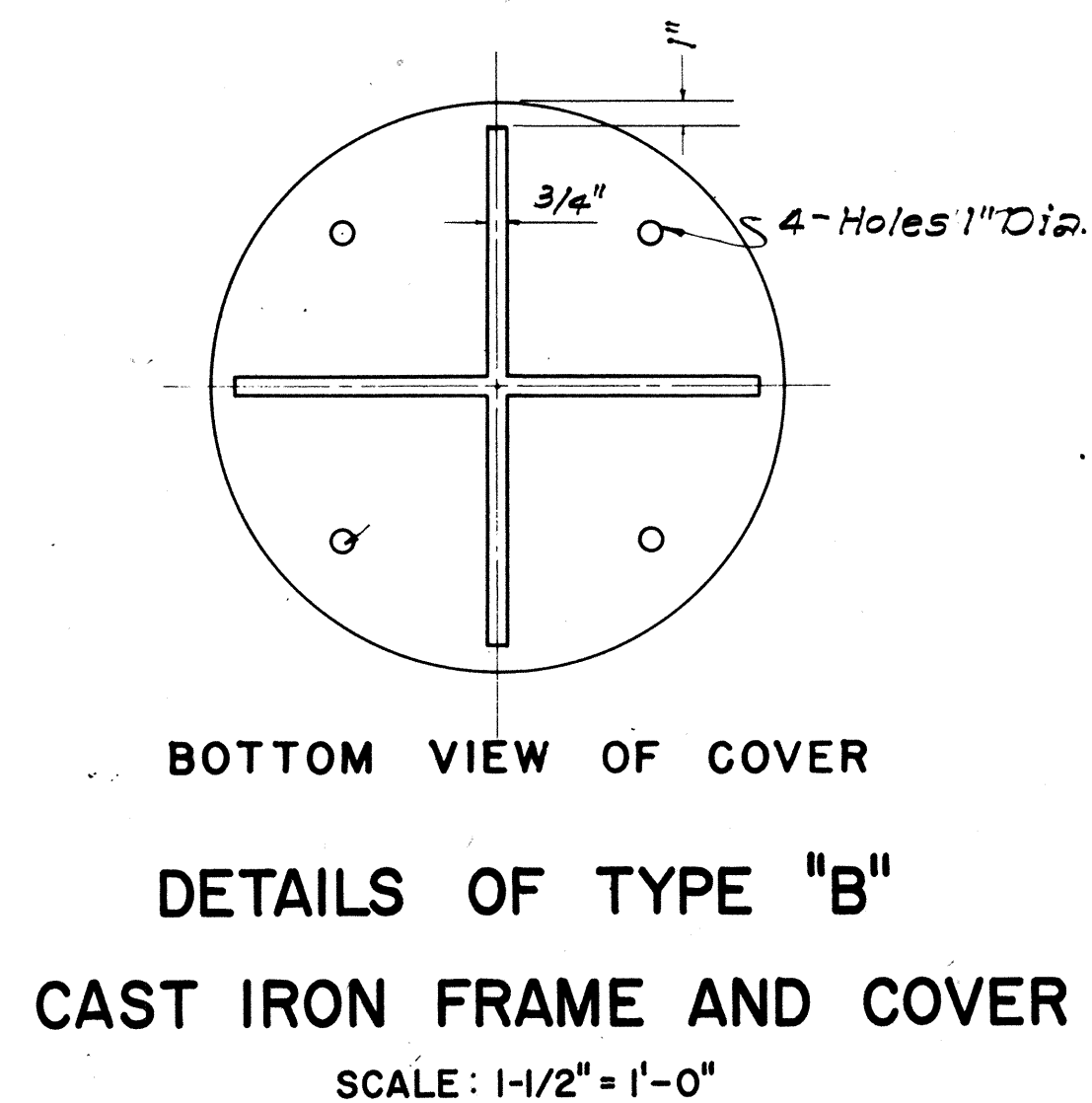
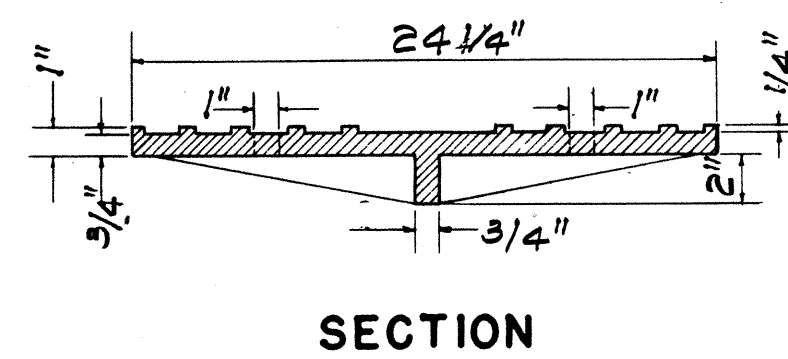
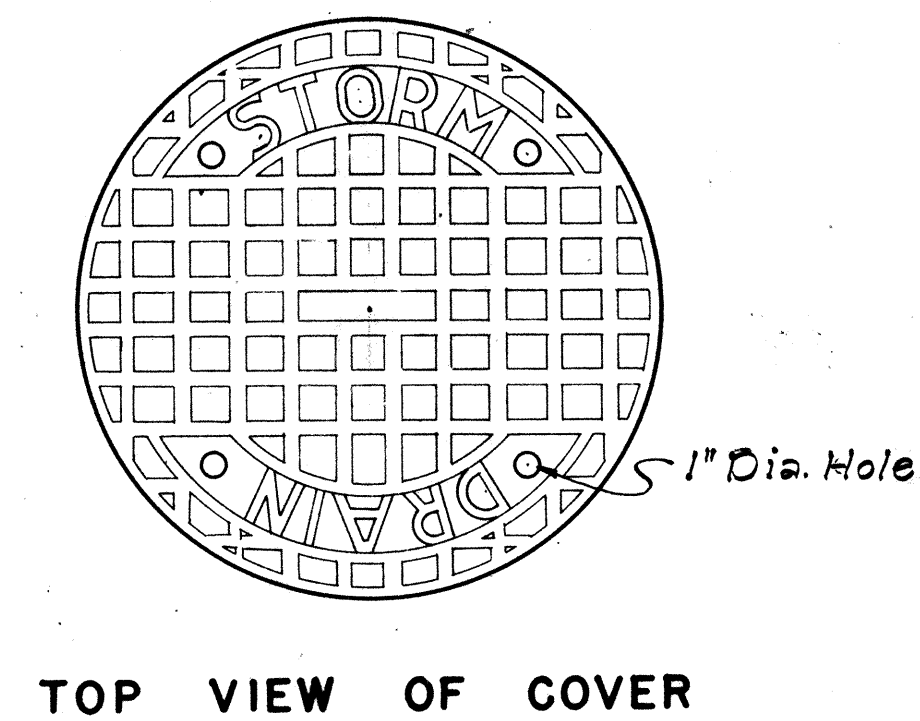
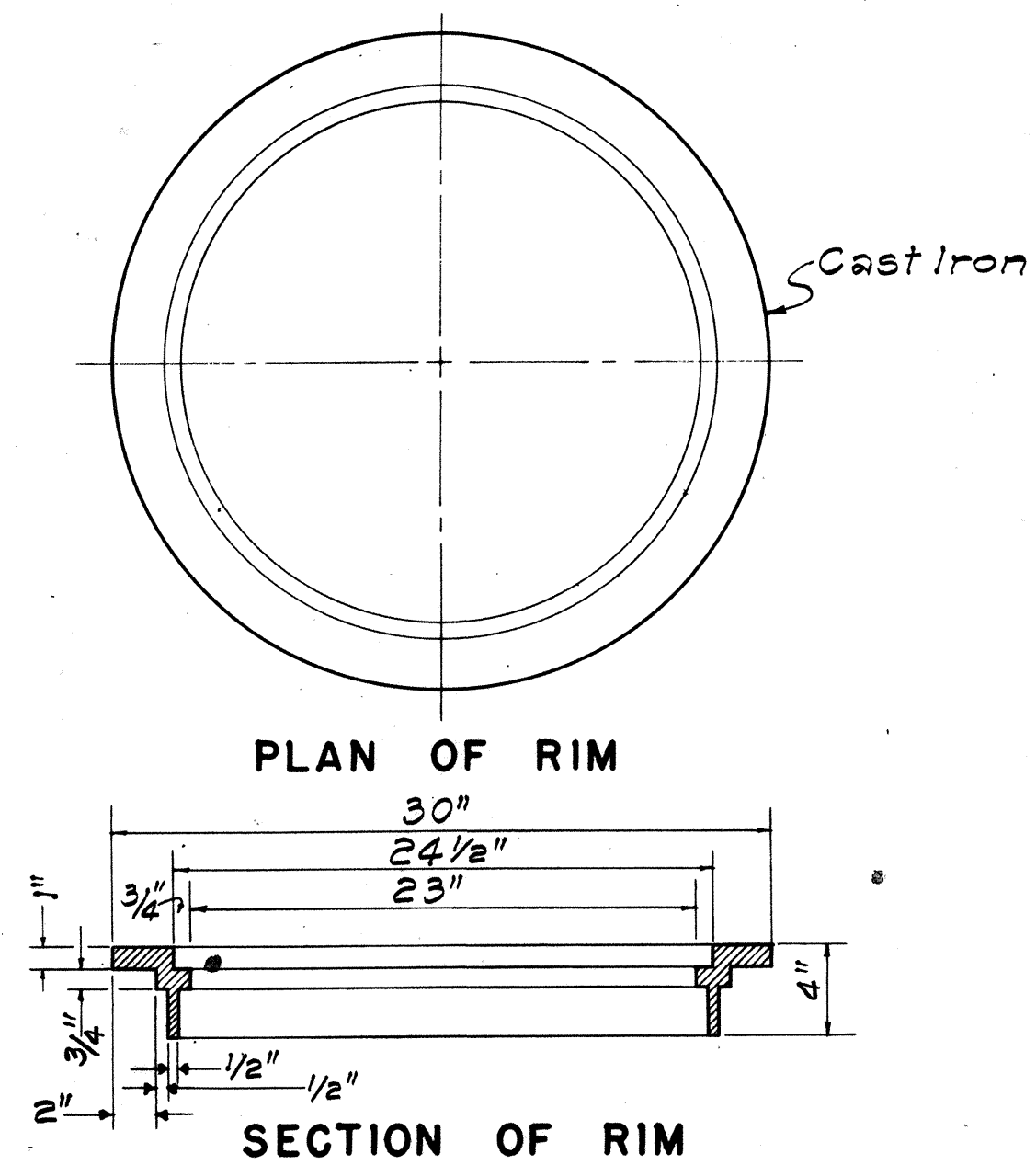
NO.	REVISION	APPROVED BY	DATE

STANDARD DETAILS TYPE "A2", "B2", "C2", AND "D2" CATCH BASINS

SHEET No. 30 OF 35 SHEETS

DH 4

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	66	153



APPROVAL RECOMMENDED:
P. Takano 12-17-67
 HYDRAULIC DESIGN ENGINEER DATE

APPROVED:
John S. Selig 12-17-67
 ASSISTANT CHIEF, ENGINEERING DATE

NO.	REVISION	APPROVED BY	DATE

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

STANDARD DETAILS
 CATCH BASIN AND
 MANHOLE CASTINGS

Scale: As Noted Date: July, 1969
 SHEET NO 31 OF 35 SHEETS DH 6

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50630(10)	1970	67	153

GENERAL NOTES

1. Contractor has the option of using cast malleable iron, cast steel, welded, bolted, cast malleable iron end block or cast steel end block grate.
2. Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
3. All welds 3/8" unless otherwise noted.
4. Center support assembly shall be used when two or more grates are specified. Incidental to Types A-9 or A-12 Frame and Grates.
5. Refer to "Grate Bar Spacing Table" for Types A-9 and A-12 Grate dimensions.
6. 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:
1. Type A-9 - Use in locations off the roadbed on all types of highways.
2. Type A-12 - Use within the roadbed on all types of highways.

APPROVAL RECOMMENDED:
[Signature] 12-17-69
HYDRAULIC DESIGN ENGINEER DATE

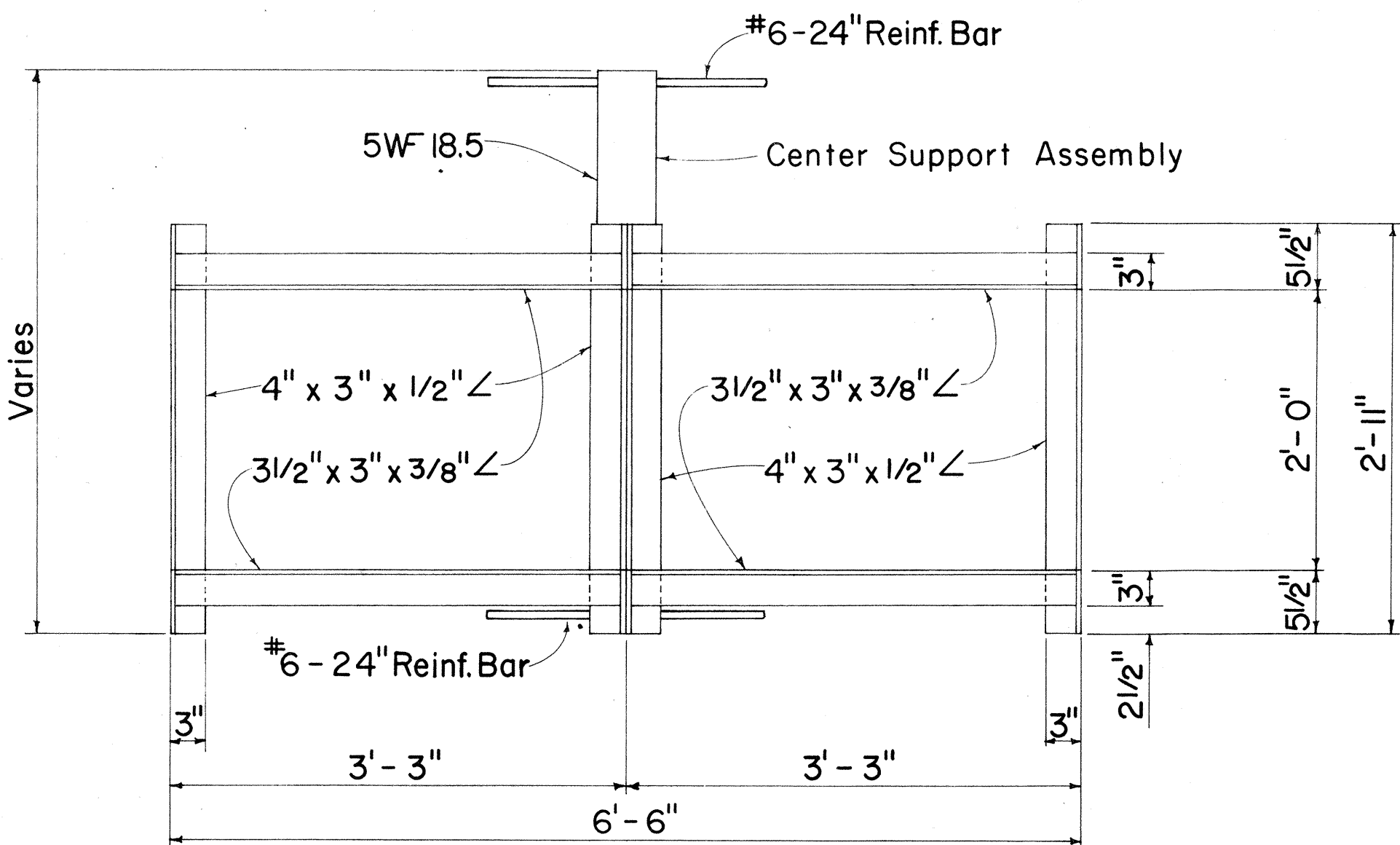
APPROVED:
[Signature] 12-11-69
ASSISTANT CHIEF, ENGINEERING DATE

NO.	REVISION	APPROVED BY	DATE

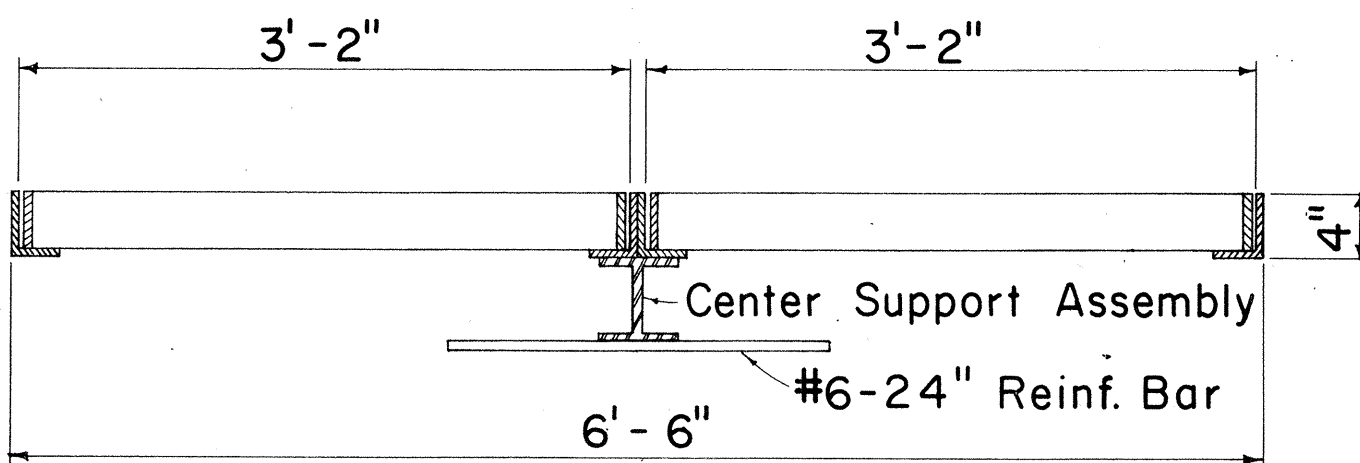
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS
TYPE A-9 AND A-12
FRAMES AND GRATES
Scales: As Noted Date: Aug. 1968

SHEET No. 32 OF 35 SHEETS DH 7



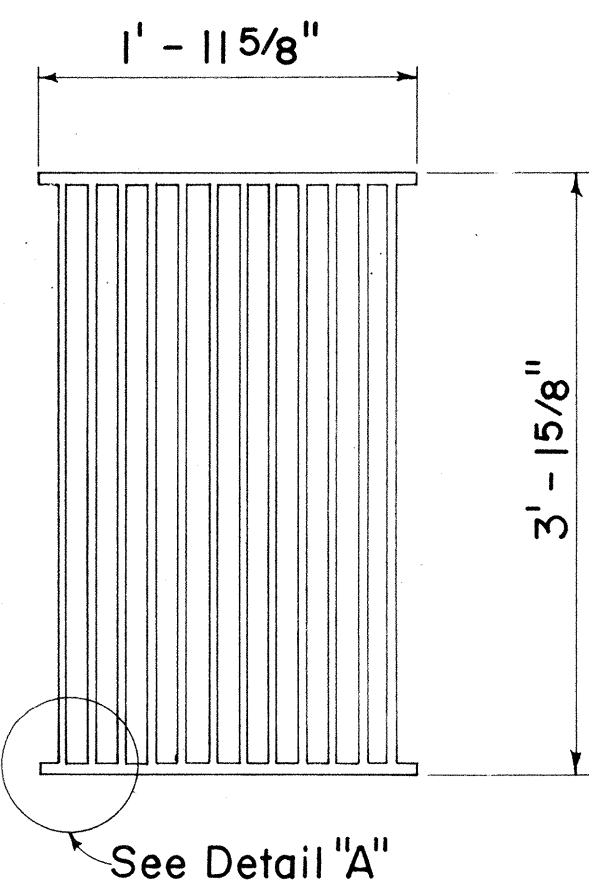
PLAN
(Two or More Grates)



LONGITUDINAL SECTION
(Thru Frame & Grate)

FRAME DETAILS

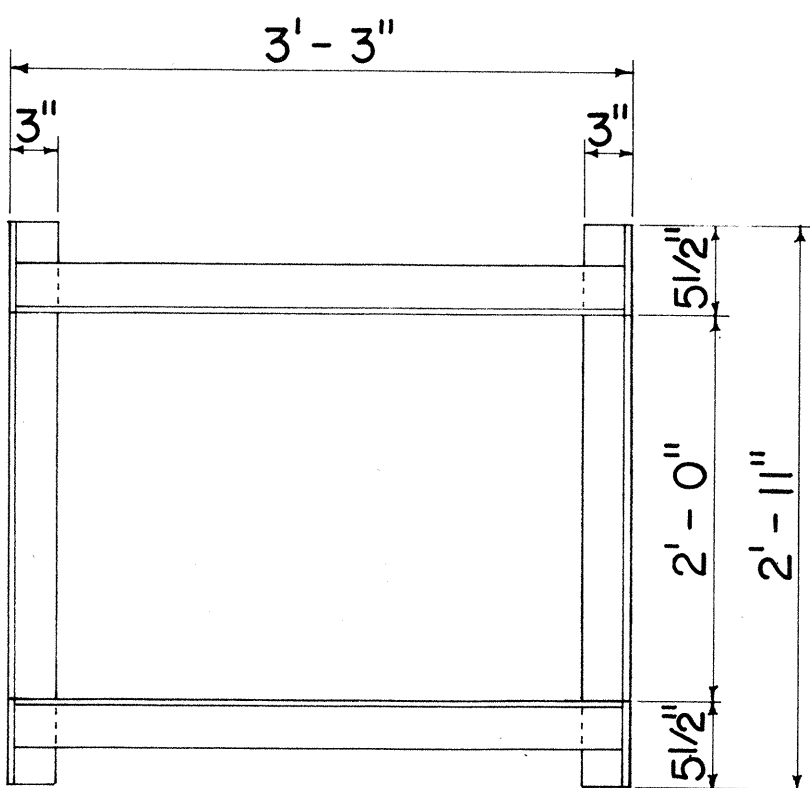
Scale: 1"= 1'- 0"



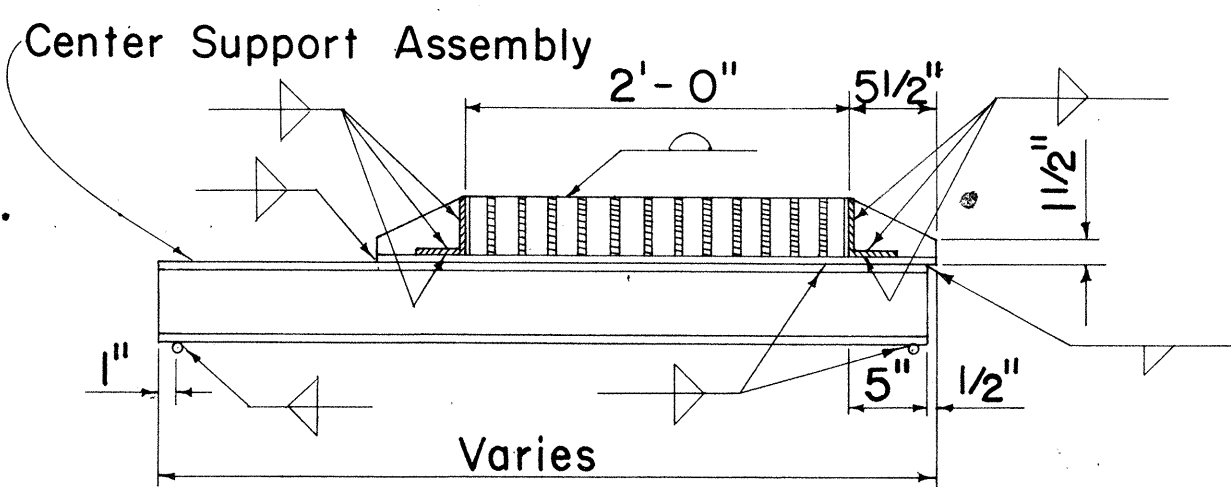
PLAN

Scale: 1"= 1'- 0"

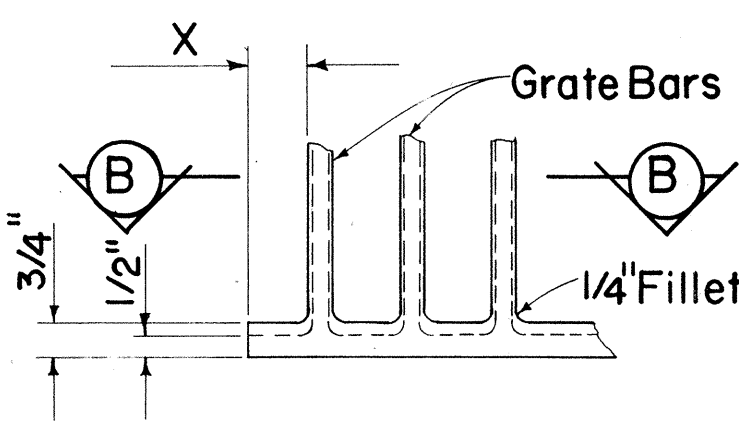
ALTERNATIVE CAST MALLEABLE IRON
OR CAST STEEL GRATE



PLAN
(Single Grate)

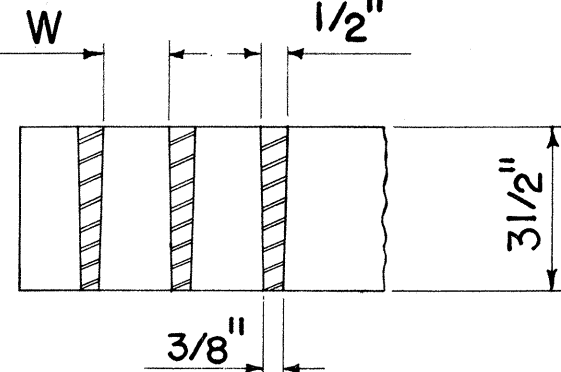


CROSS SECTION
(Thru Frame & Grate)



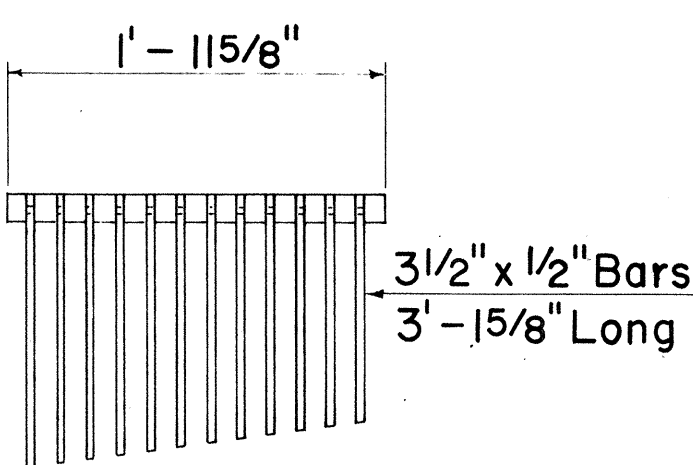
DETAIL "A"

Scale: 3"= 1'- 0"



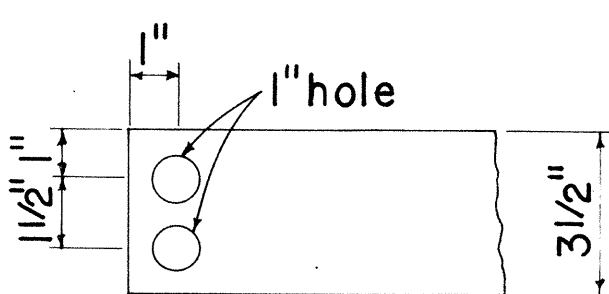
SECTION "B-B"

Scale: 3"= 1'- 0"



CAST END BLOCK

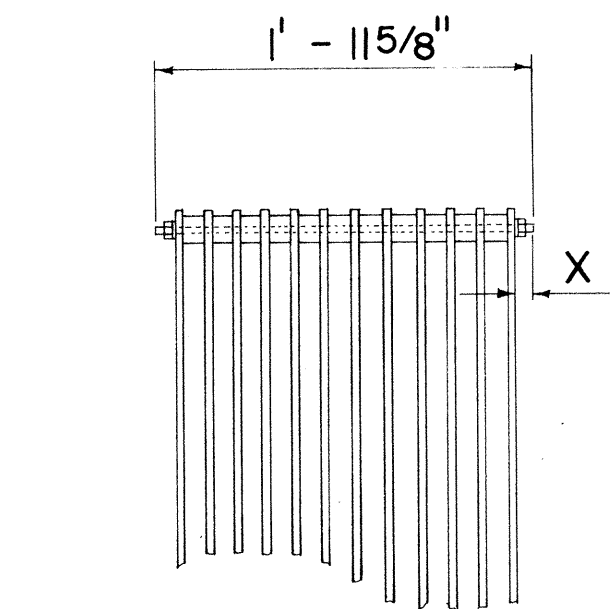
Scale: 1"= 1'- 0"



END OF BAR

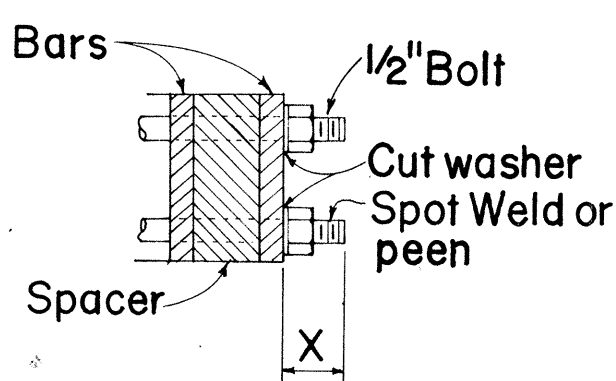
Scale: 3"= 1'- 0"

ALTERNATIVE CAST MALLEABLE IRON
OR CAST STEEL END BLOCK GRATE



BOLTED END BLOCK

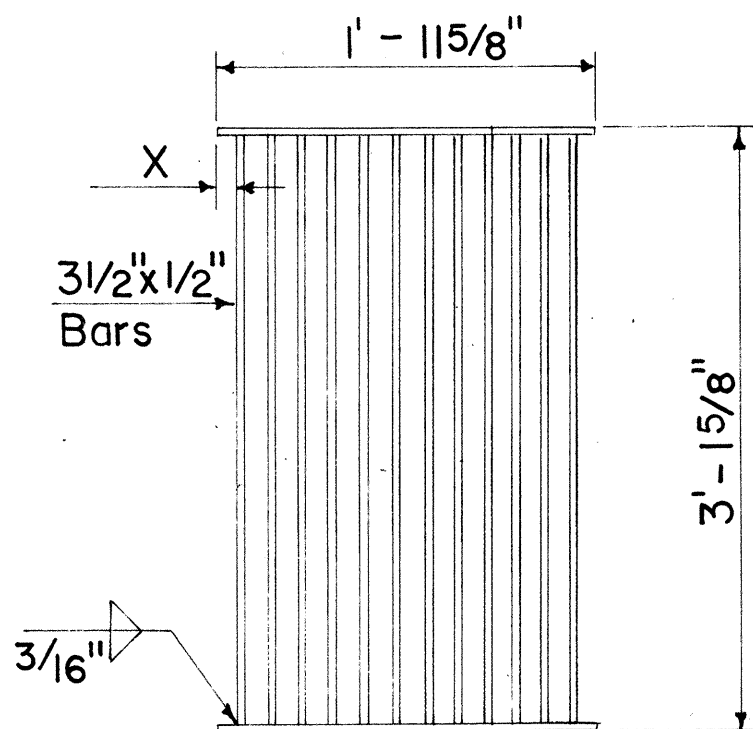
Scale: 1"= 1'- 0"



BOLTING DETAIL

Scale: 3"= 1'- 0"

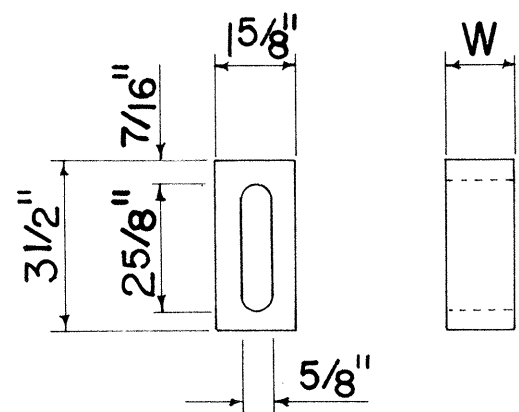
ALTERNATIVE BOLTED GRATE



PLAN

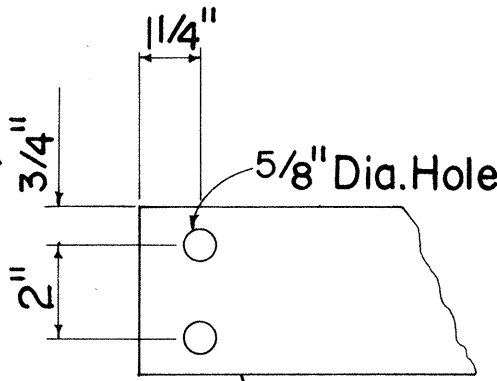
ALTERNATIVE WELDED GRATE

Scale: 1"= 1'- 0"



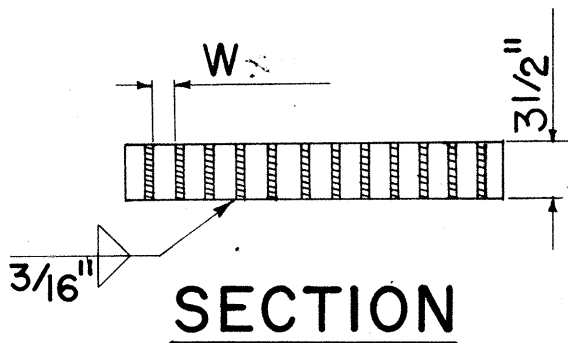
BAR SPACER

Scale: 3"= 1'- 0"



END OF BAR

Scale: 3"= 1'- 0"



SECTION

DATE	7/68
SURVEY PLOTTED BY	H.K.M.
DRAWN BY	H.K.M.
CHECKED BY	H.K.M.
NOTE BOOK	
ORIGINAL	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	68	153

GENERAL NOTES

- Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
- All welds $\frac{3}{8}$ " unless otherwise noted.
- Refer to "Spacing Table" for Types 61614 & 61616 Drop Intake and Frame & Grates dimensions.
- The Frame & Grate materials shall conform to the specifications of ASTM Designation Structural Steel A283, Grade D and the Standard Specifications.
- Culvert shall leave Drop Intake from any position and any direction indicated by plans or ordered by the Engineer. Culverts may both enter and leave Drop Intake so that Drop Intake will act as manhole.
- Manhole Rungs (16"o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (12 inches from the bottom) is required if "H" is 4 feet 6 inches or less. Manhole Rungs may be placed at any location as ordered by the Engineer.

SPACING TABLE					
TYPE	NO. BARS	A	B	C	D
61614	11	2'- 0"	1'- 11½"	1¼"	1'- 6"
61616	17	3'- 0"	2'- 11⅜"	1⅛"	2'- 0"

NO.	REVISION	APPROVED BY	DATE

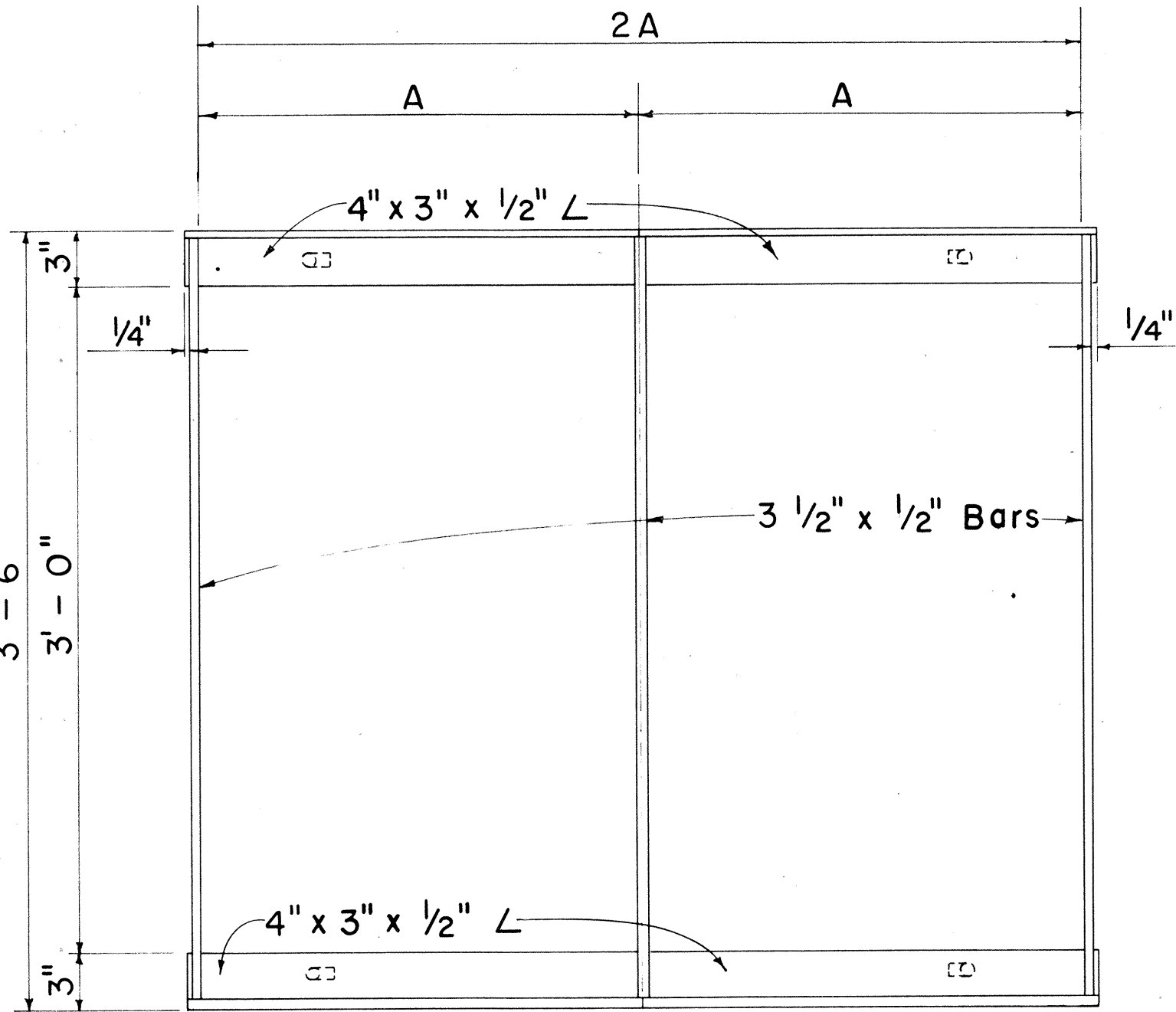
APPROVAL RECOMMENDED:
[Signature] 12-17-69
HYDRAULIC DESIGN ENGINEER DATE

APPROVED:
[Signature] 12-17-69
ASSISTANT CHIEF, ENGINEERING DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
TYPE 61614 & 61616
GRADED DROP INTAKES

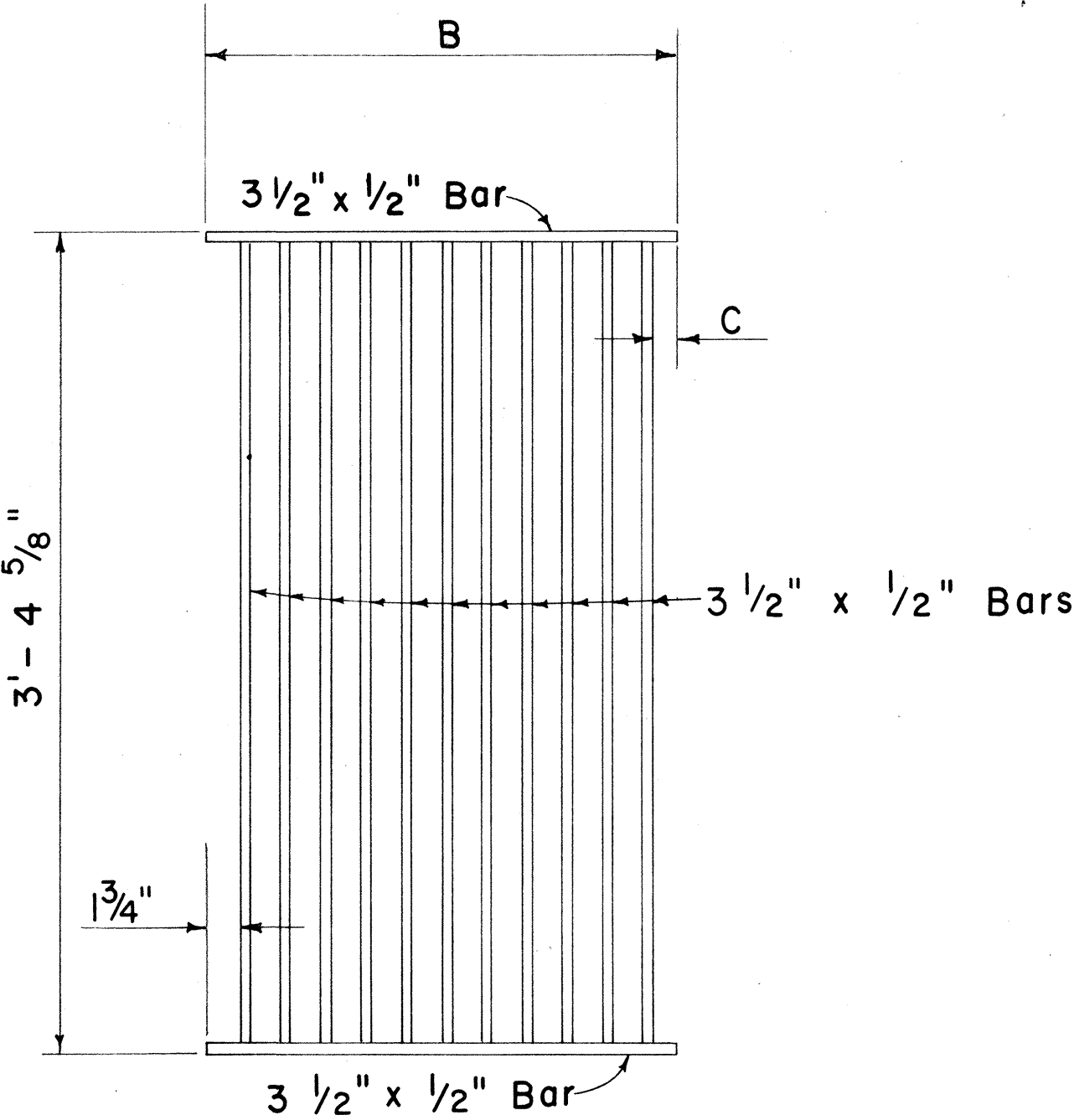
Scales: As Noted
Date: Feb. 1969

SHEET No. 33 OF 35 SHEETS DH 8



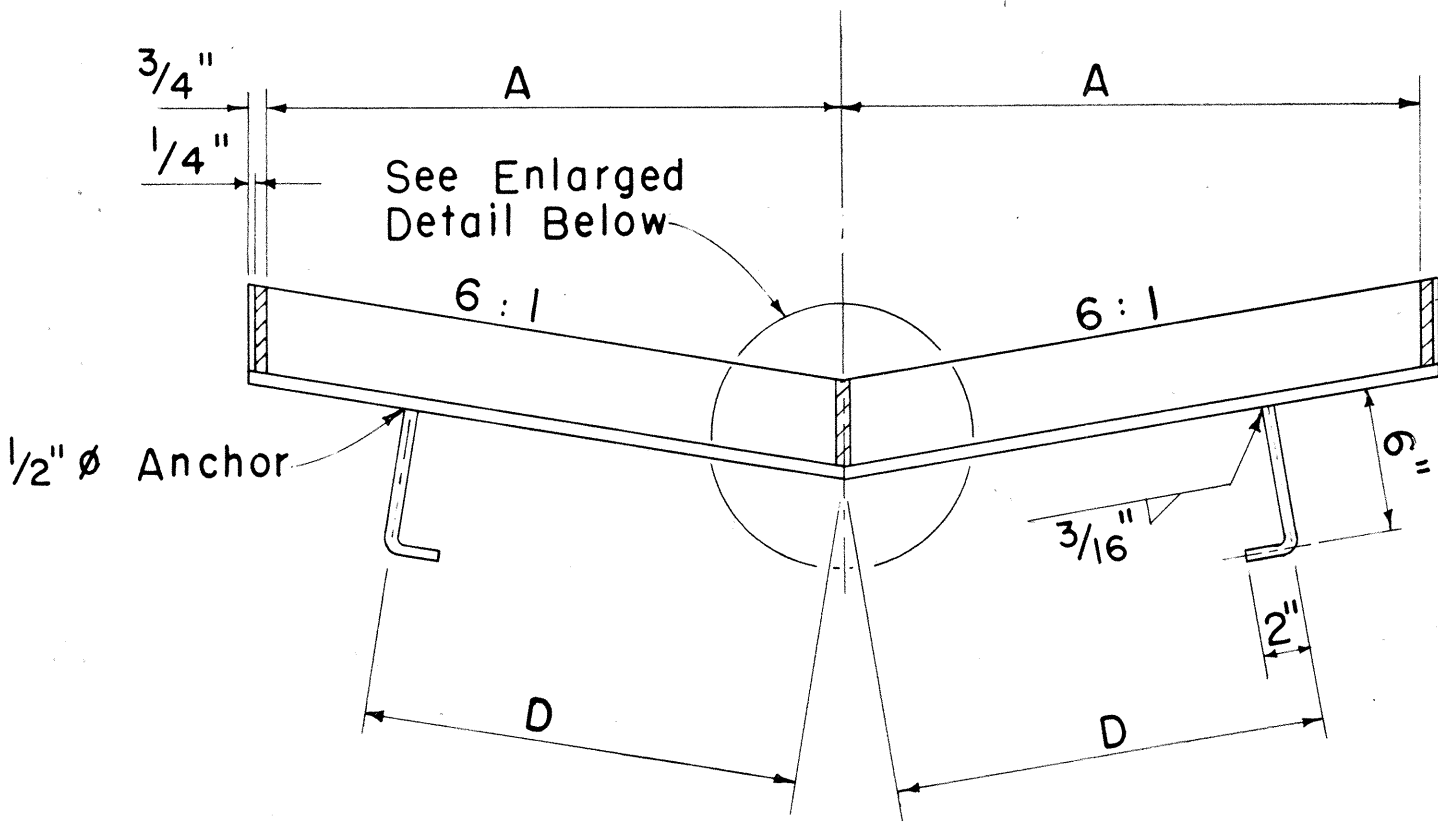
PLAN

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



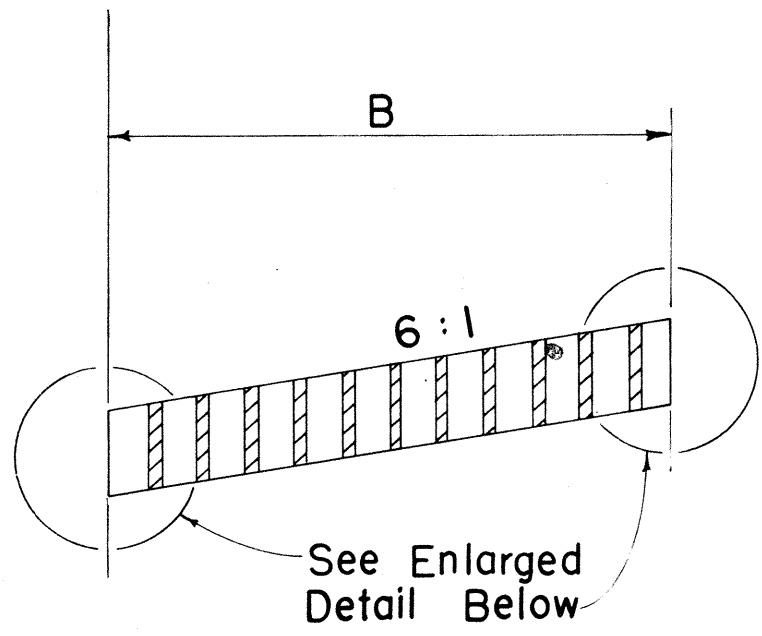
PLAN

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



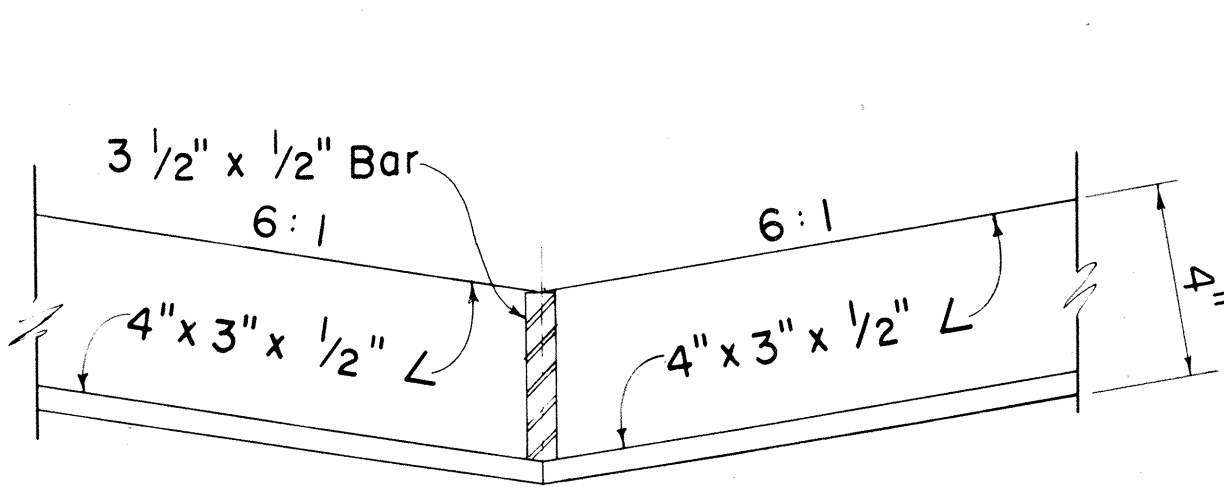
SECTION

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



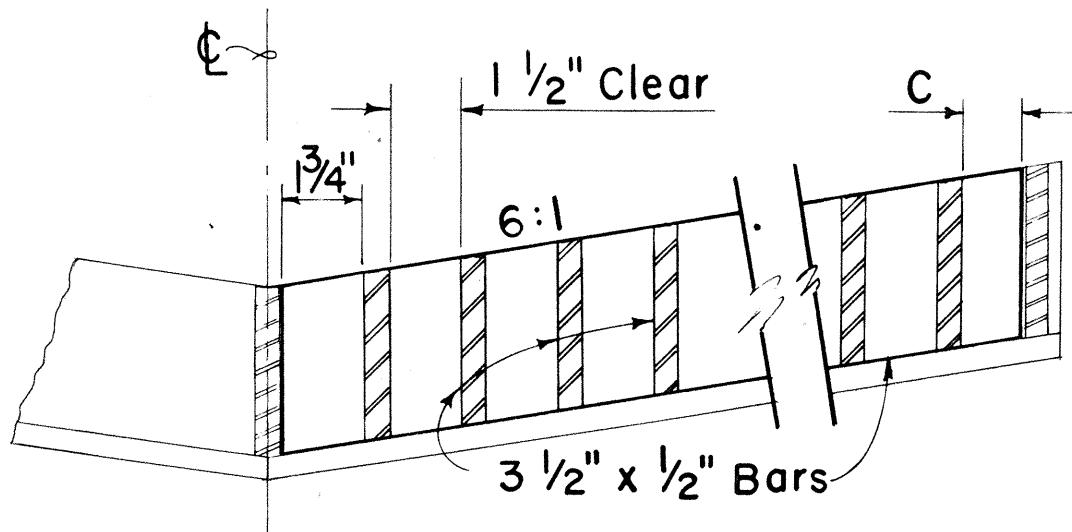
SECTION

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



FRAME

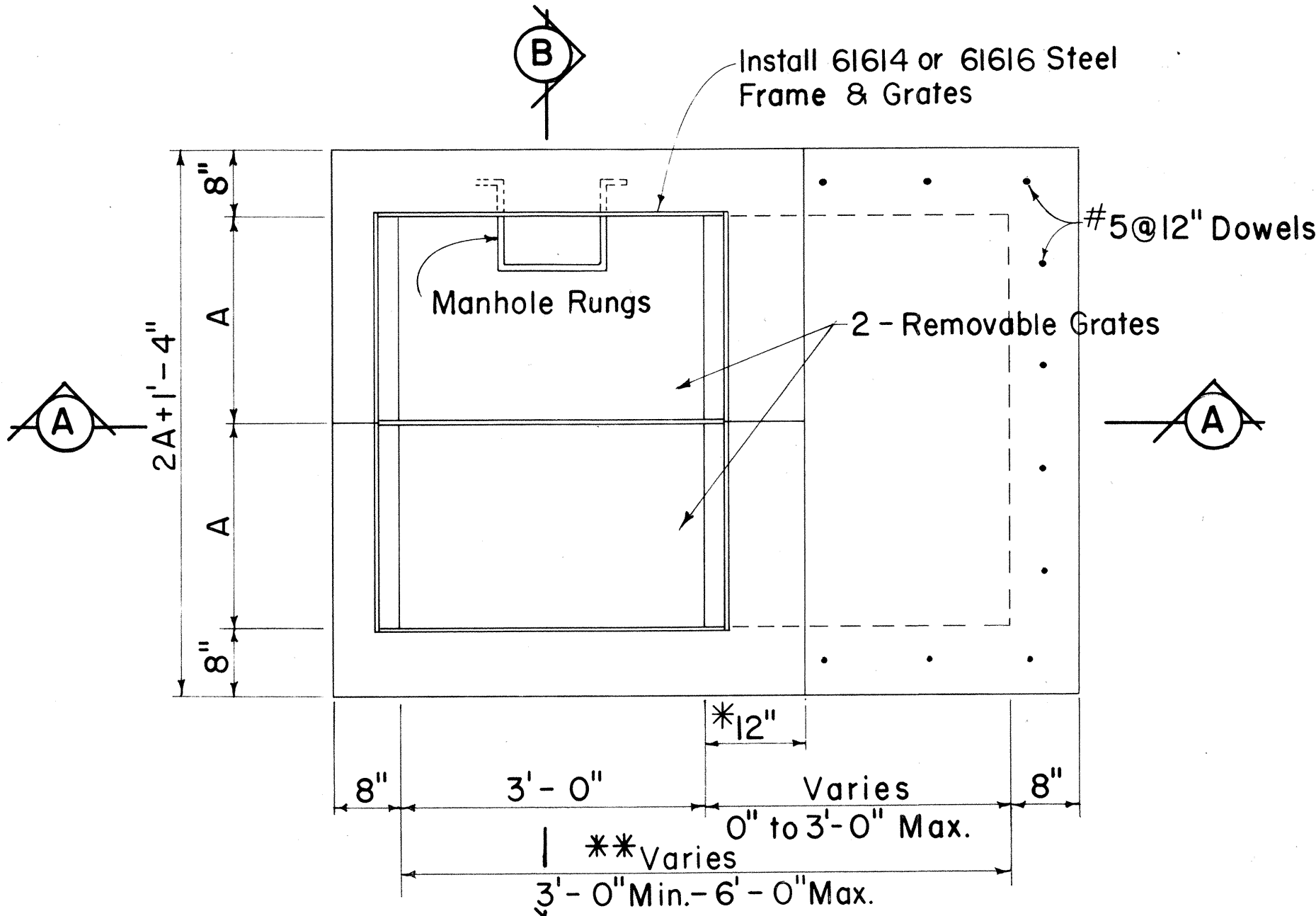
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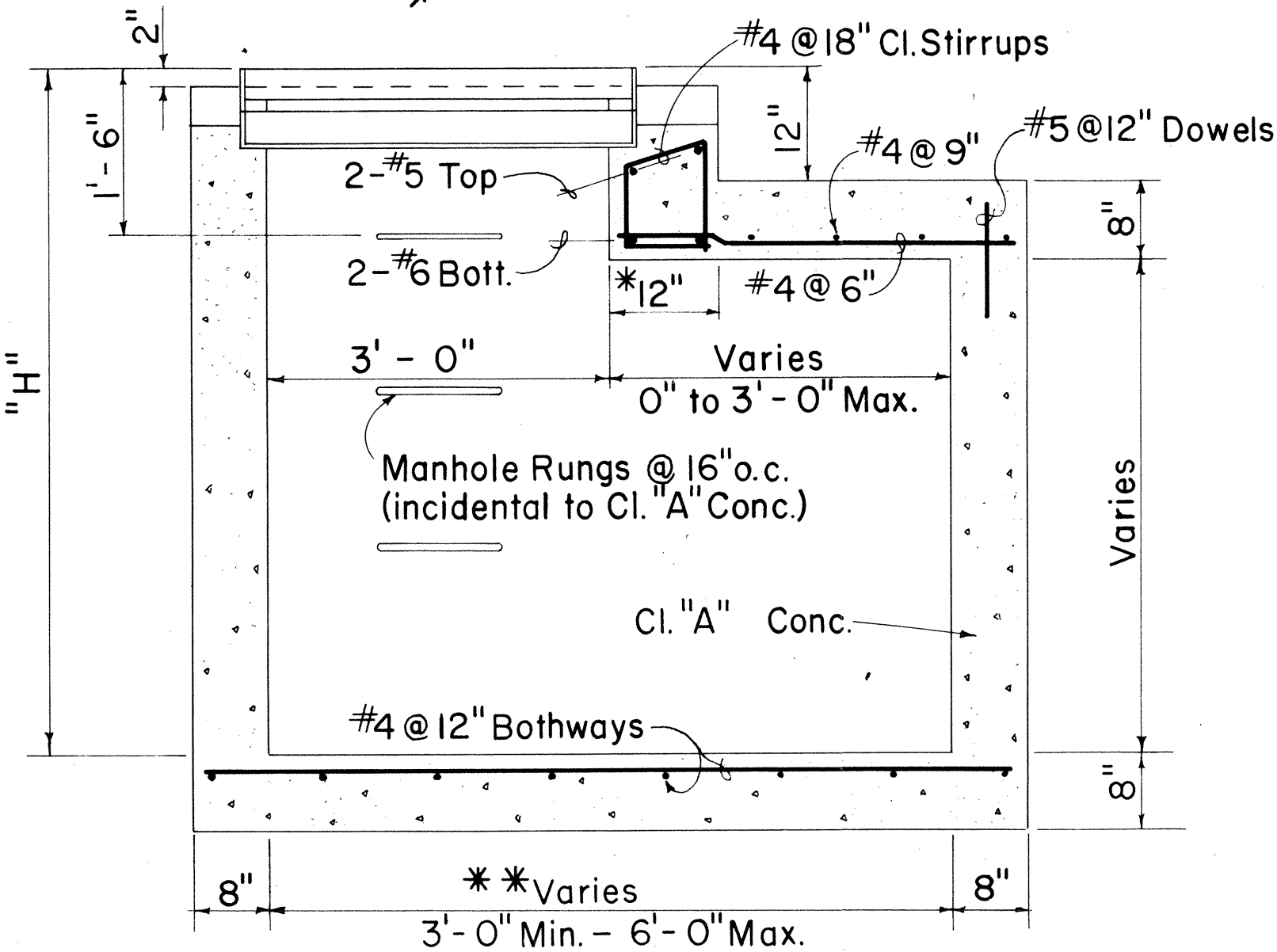
GRATE

Scale: 3" = 1'- 0"

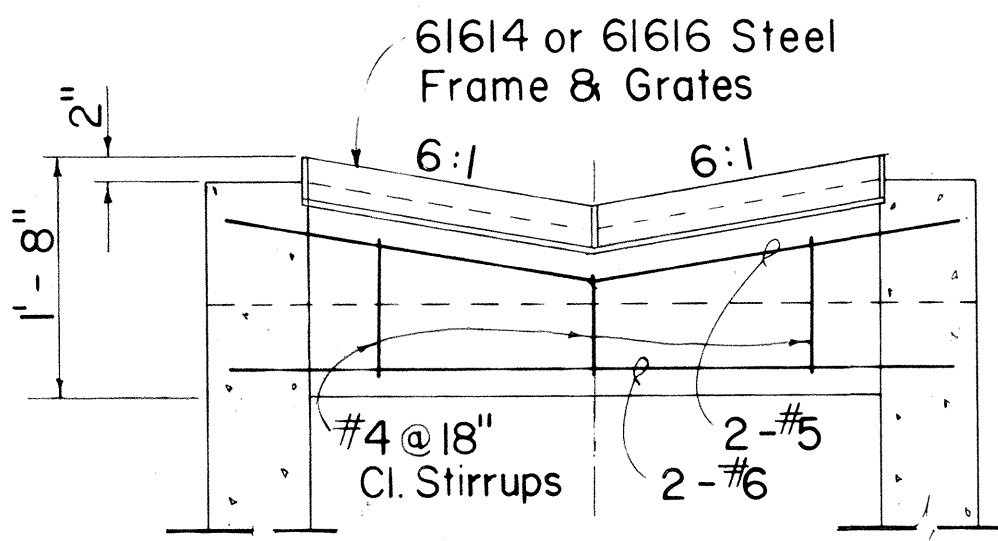
DETAILS OF TYPE 61614 OR 61616
STEEL FRAME AND GRATES



PLAN



SECTION A - A



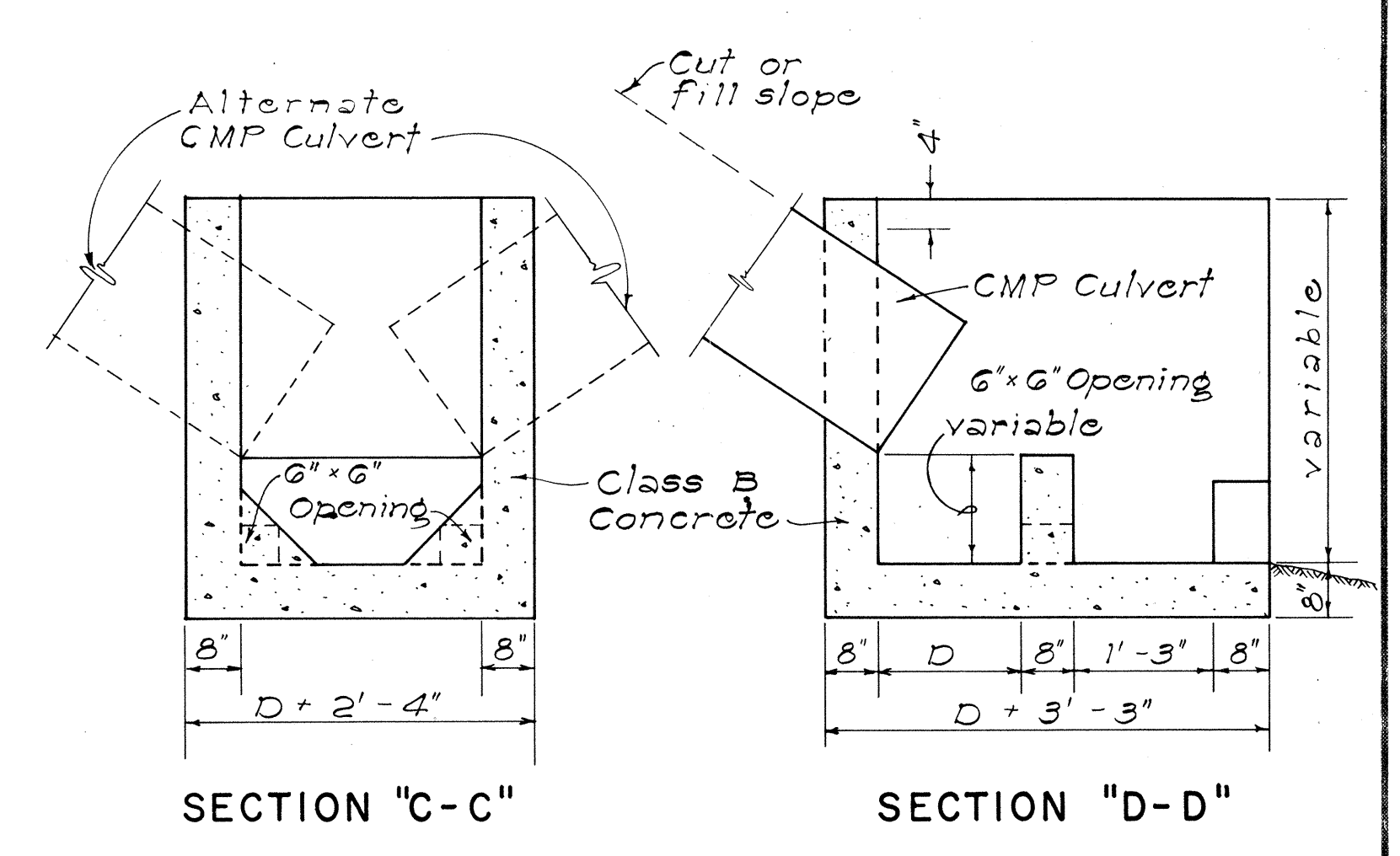
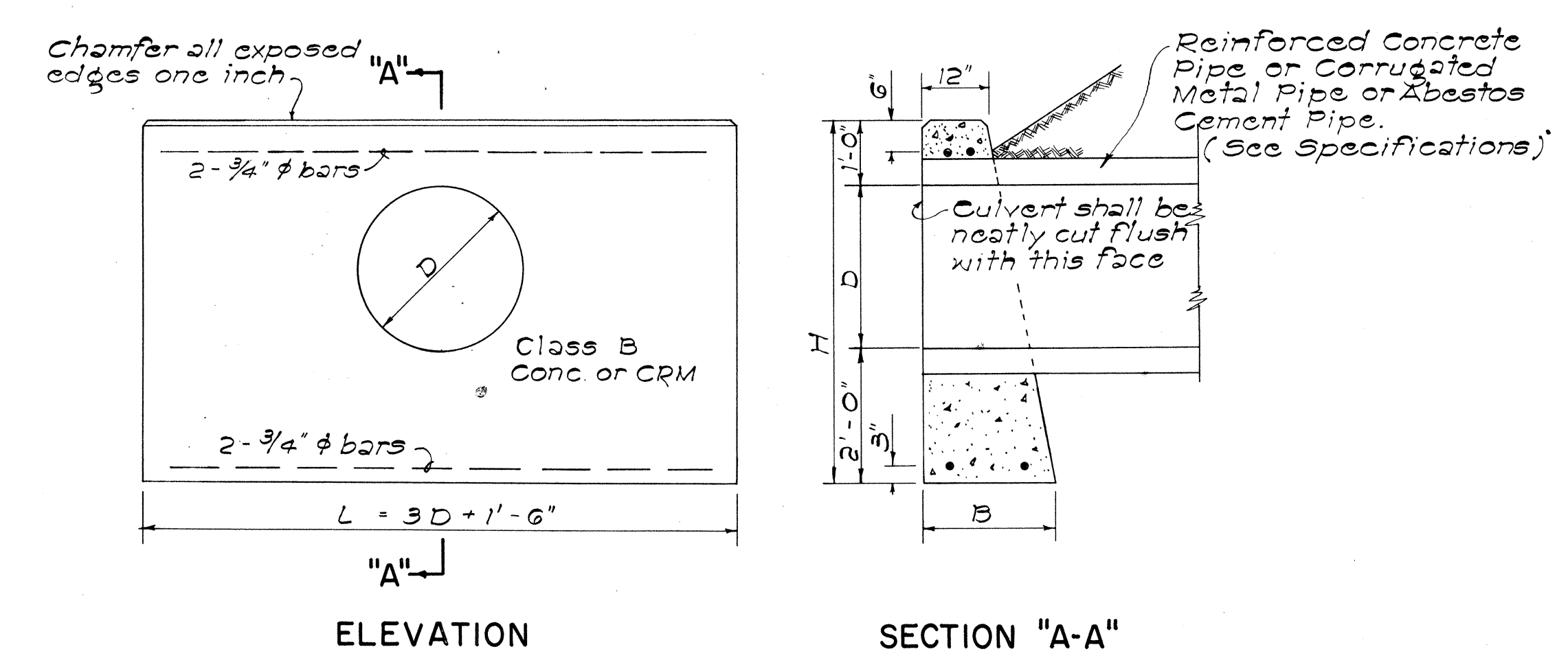
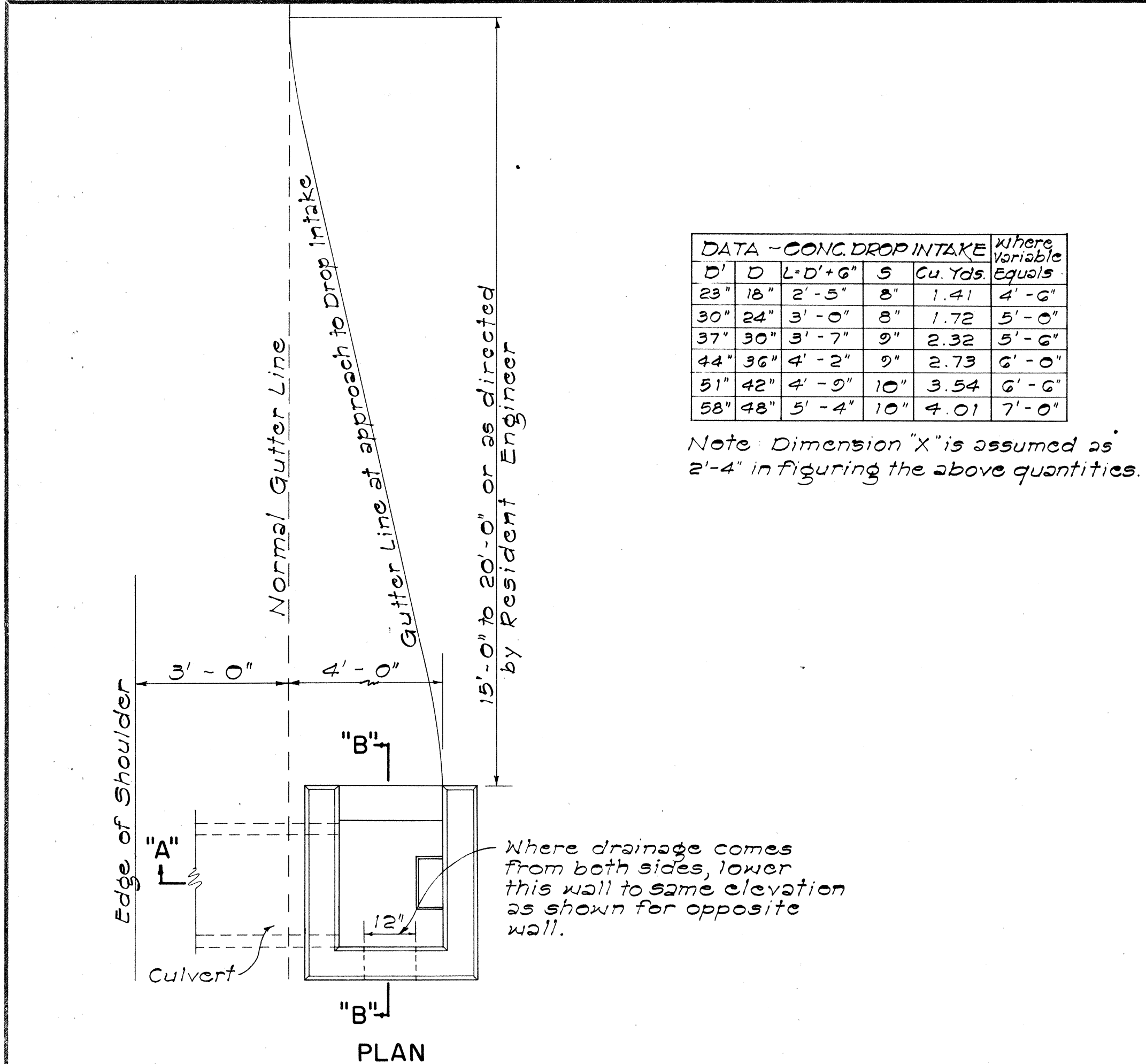
SECTION B - B

DETAILS OF 61614 OR 61616 DROP INTAKE

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

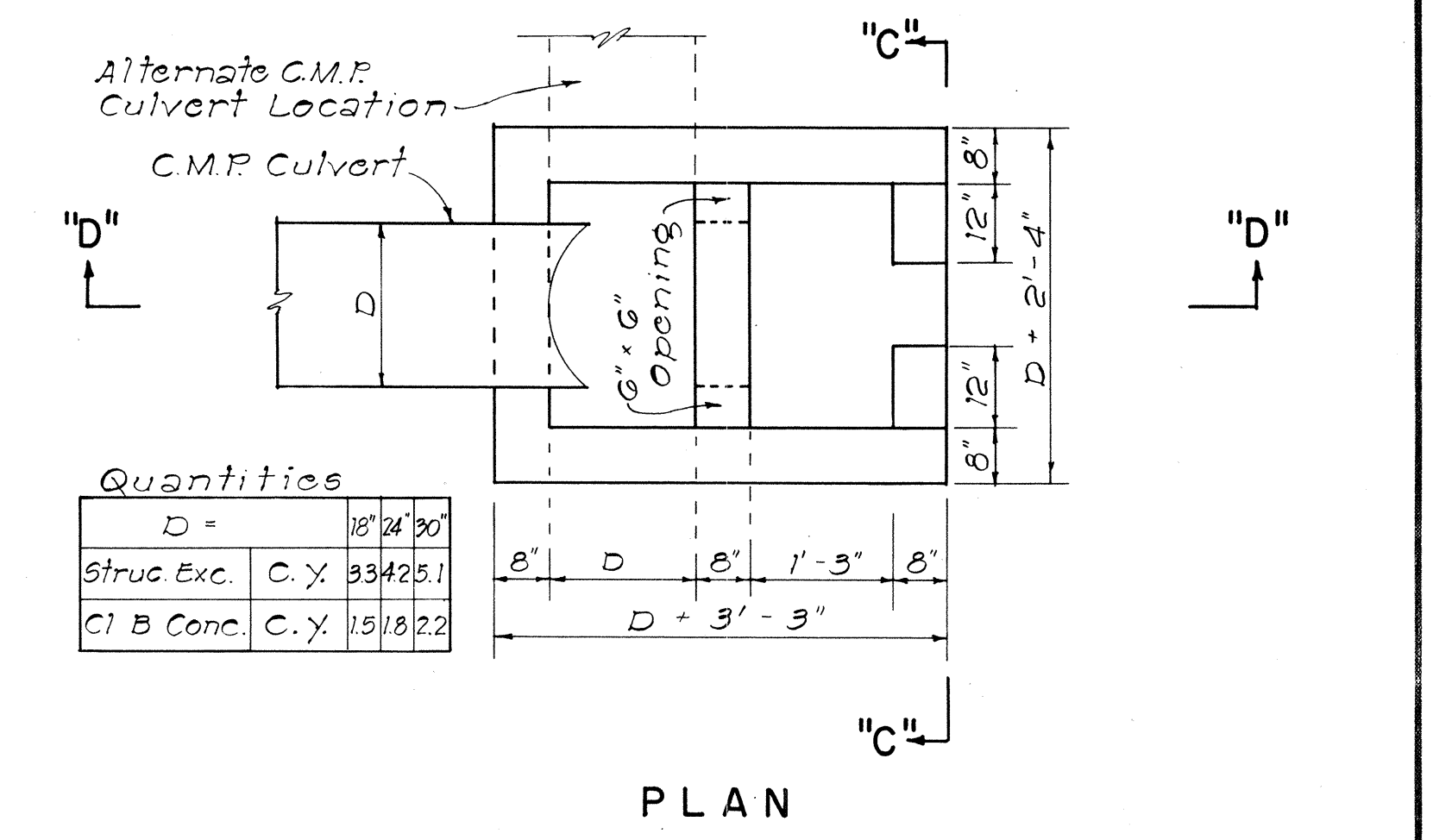
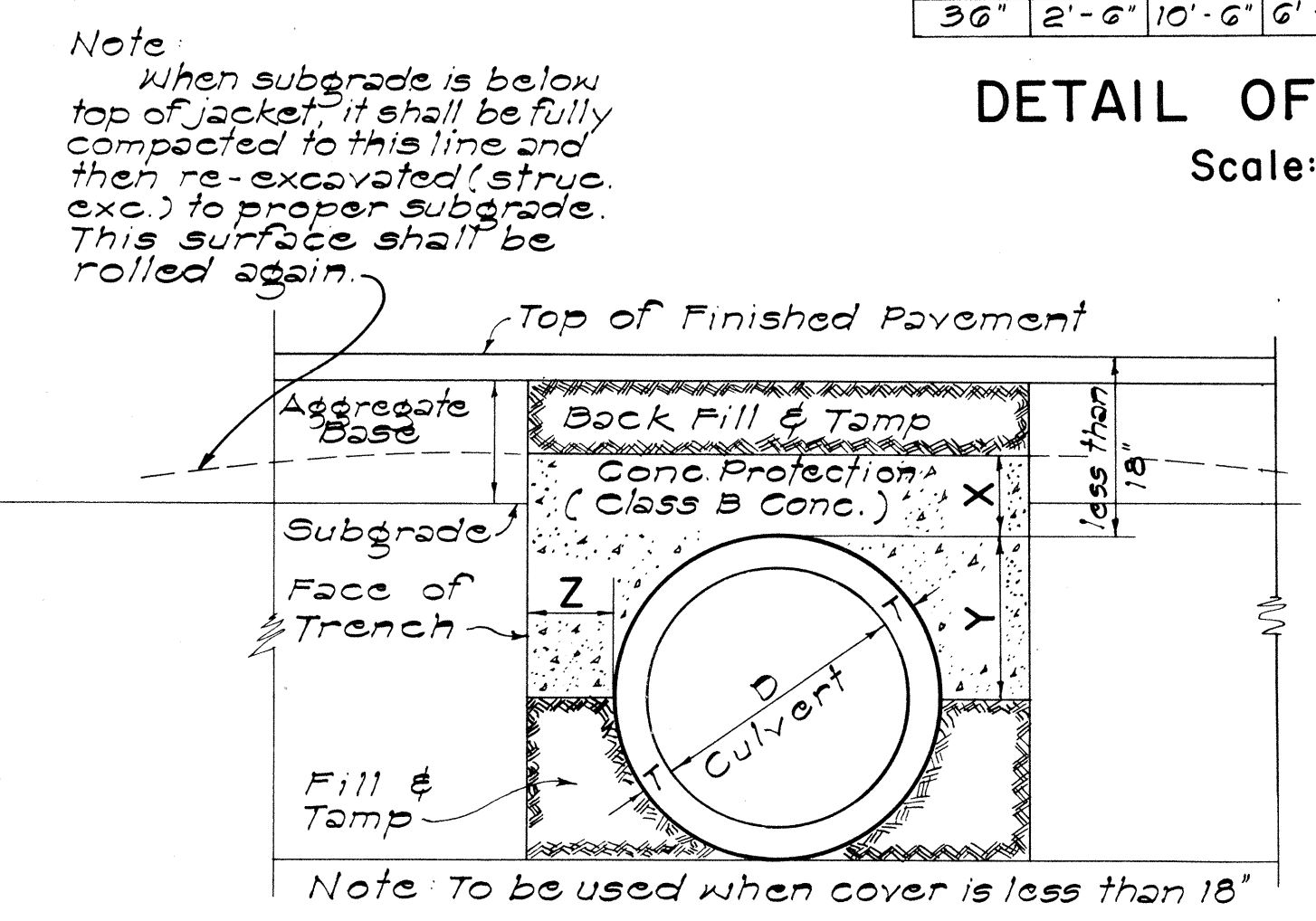
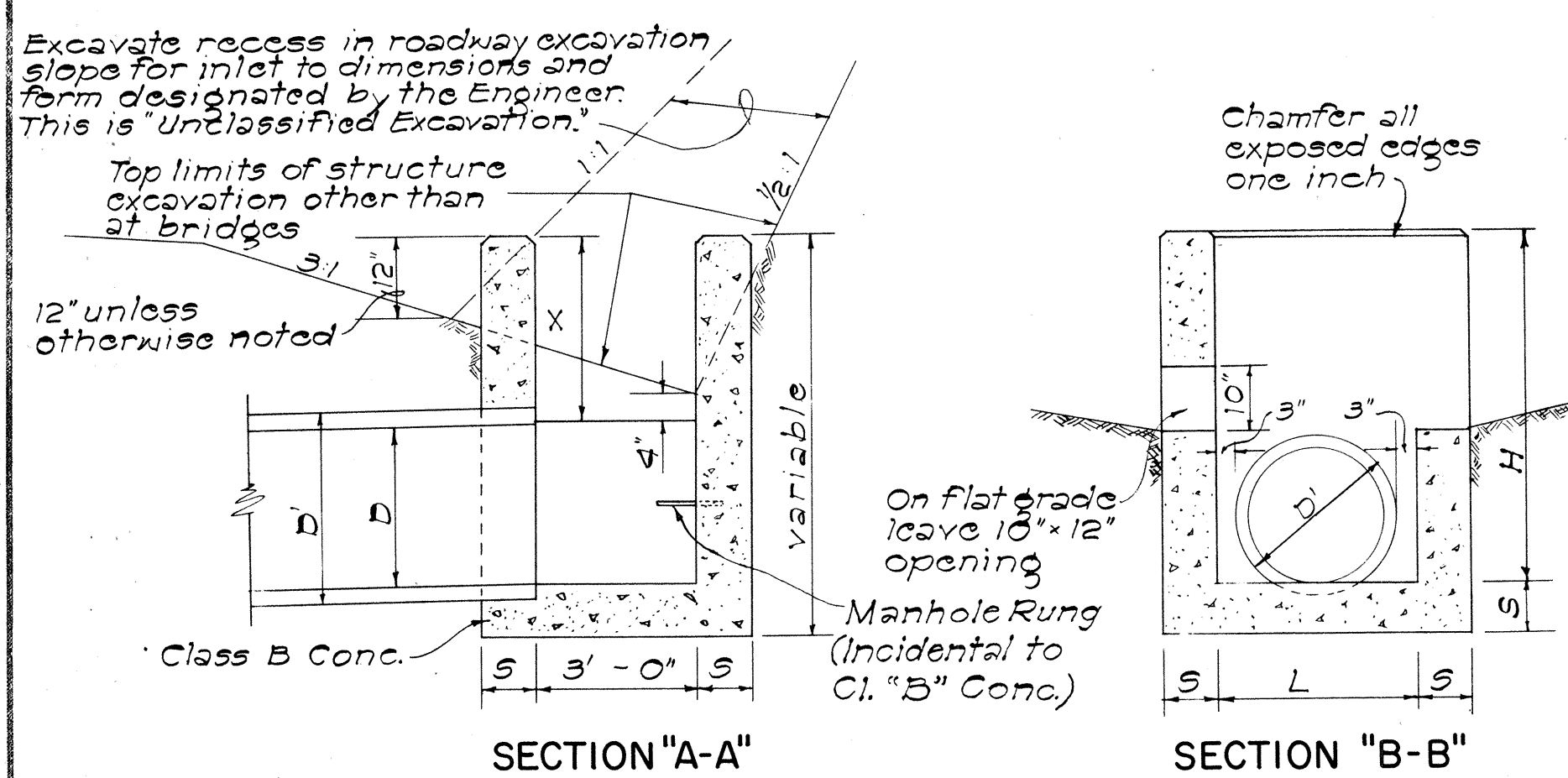
- * For Minimum size box of 3'- 0", use 8" and eliminate reinforcing steel shown in the top portion.
- ** For Culverts larger than 30", the minimum dimension shall be D.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	69	153



D	B	L	H	Cu. Yds.	Cu. Yds.	No. of Bars	Size	Length	Lbs.
18"	1'-0"	6'-0"	4'-6"	1.12	1.17	4	3/4"	5'-0"	33
24"	1'-0"	7'-0"	5'-0"	1.52	1.60	4	3/4"	7'-0"	42
30"	2'-0"	10'-0"	6'-0"	2.36	2.49	4	3/4"	8'-0"	51
36"	2'-0"	10'-0"	6'-0"	2.94	3.13	4	3/4"	10'-0"	60
42"	2'-0"	12'-0"	6'-0"	4.10	4.47	4	3/4"	11'-0"	69
48"	2'-0"	13'-0"	7'-0"	5.01	5.36	4	3/4"	13'-0"	78

D	B	L	H	Cu. Yds.	Cu. Yds.
18"	1'-0"	6'-0"	4'-6"	1.24	1.29
24"	2'-0"	7'-0"	5'-0"	1.83	1.92
30"	2'-0"	9'-0"	5'-0"	2.56	2.70
36"	2'-0"	10'-0"	6'-0"	3.45	3.66



DETAILS OF CONC. DROP BOX AT OUTLET OF CULVERT PIPE

NOT TO SCALE

DETAIL OF CONCRETE DROP INTAKE

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

GENERAL NOTES

- Culvert shall enter and leave Drop Intake from any position and in the direction indicated by the plans or ordered by the Engineer.
- D shall be the maximum outside dimension of the culvert at the Drop Intake wall.
- Manhole Rungs (16" o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (12 inches from the bottom) is required if "H" is 4 feet 6 inches or less. Manhole Rungs may be placed at any location as ordered by the Engineer.

X	Y	Z
6" for 18" D	$\frac{D}{2} + T$	Z must be from pipe to face of trench
7" for 24" D		Minimum = X
8" for 30" D		Maximum pay quantity will be Z = 12"
9" for 36" D		
10" for 42" D		
11" for 48" D		
12 for 54" D		

SECT. OF CULVERT WITH CONC. PROTECTION

Scale: 1" = 1'-0"

APPROVAL, RECOMMENDED:
 HYDRAULIC DESIGN ENGINEER
 12-17-69
 DATE

APPROVED:
 ASSISTANT CHIEF, ENGINEERING
 12-17-69
 DATE

NO.	REVISION	APPROVED BY	DATE

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

STANDARD DETAILS

DROP INTAKE, HEADWALL & CONCRETE PROTECTION

Scale: As Noted
 Date: Aug. 1967
 SHEET No. 34 OF 35 SHEETS DH 10

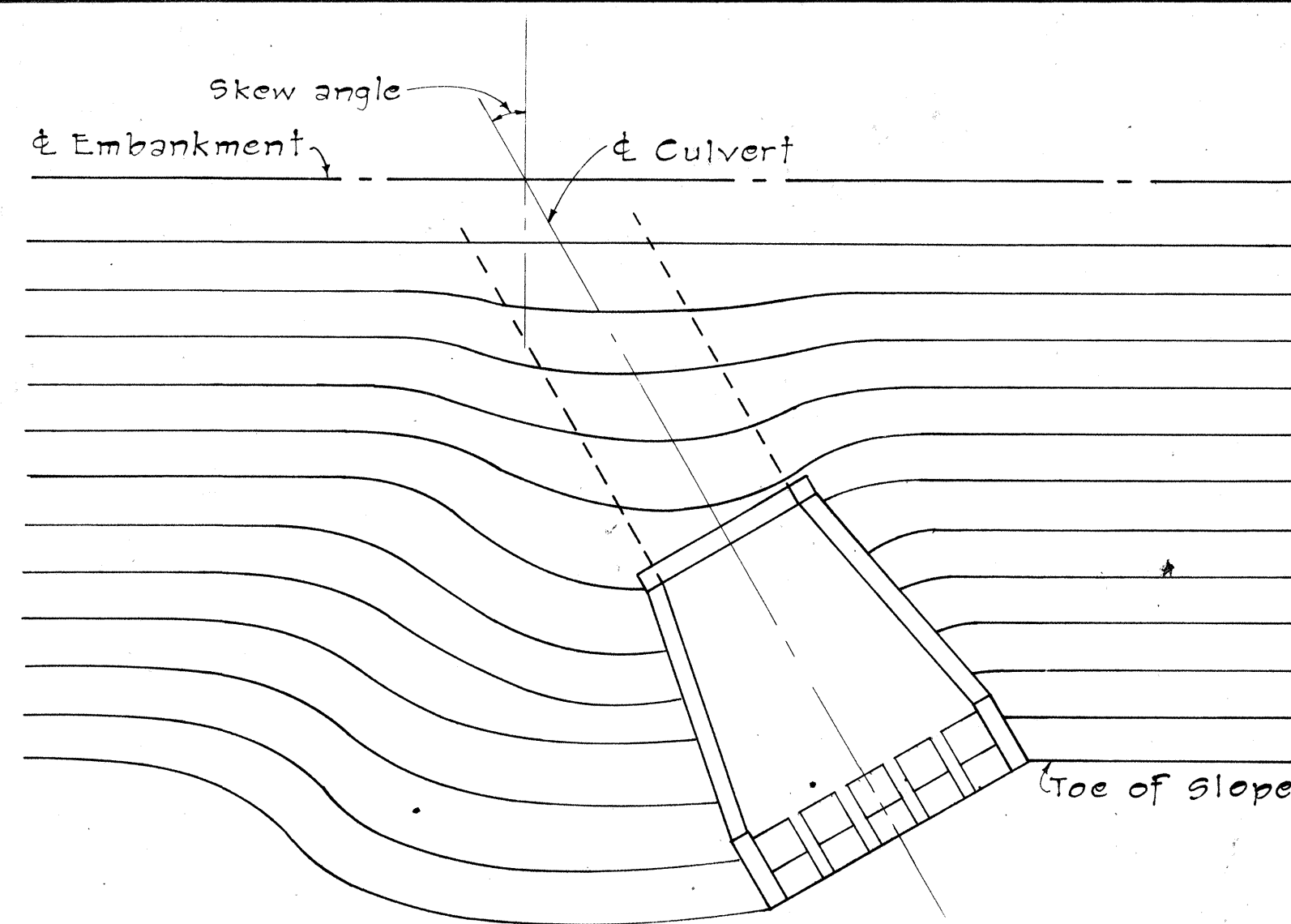
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	5-0630(10)	1970	70	153

GENERAL NOTES

- Concrete: All concrete shall be Class A.
- 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.

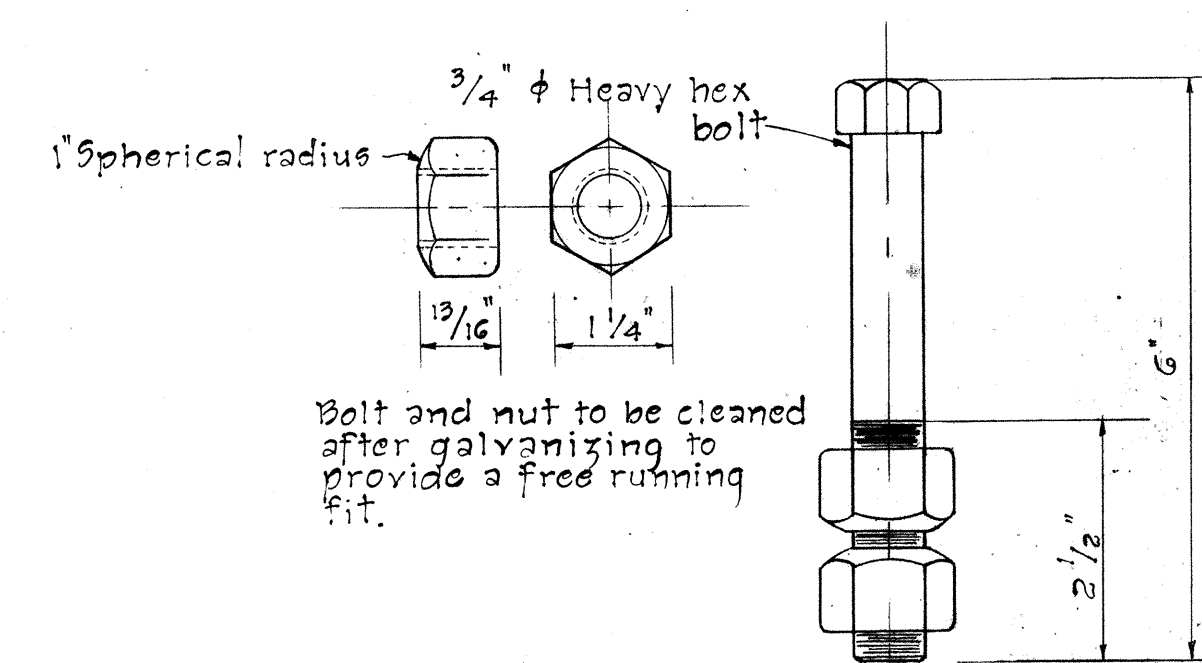
SUMMARY OF QUANTITIES		
Culvert Dia. (inches)	Concrete (Cu. Yd.)	Reinf. Steel (Lbs.)
48		
54		
60		
72		
84	12.7	1270
96	16.2	1570
108	20.3	2010
120	24.8	2460
144	41.8	3610
180	63.8	7090

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

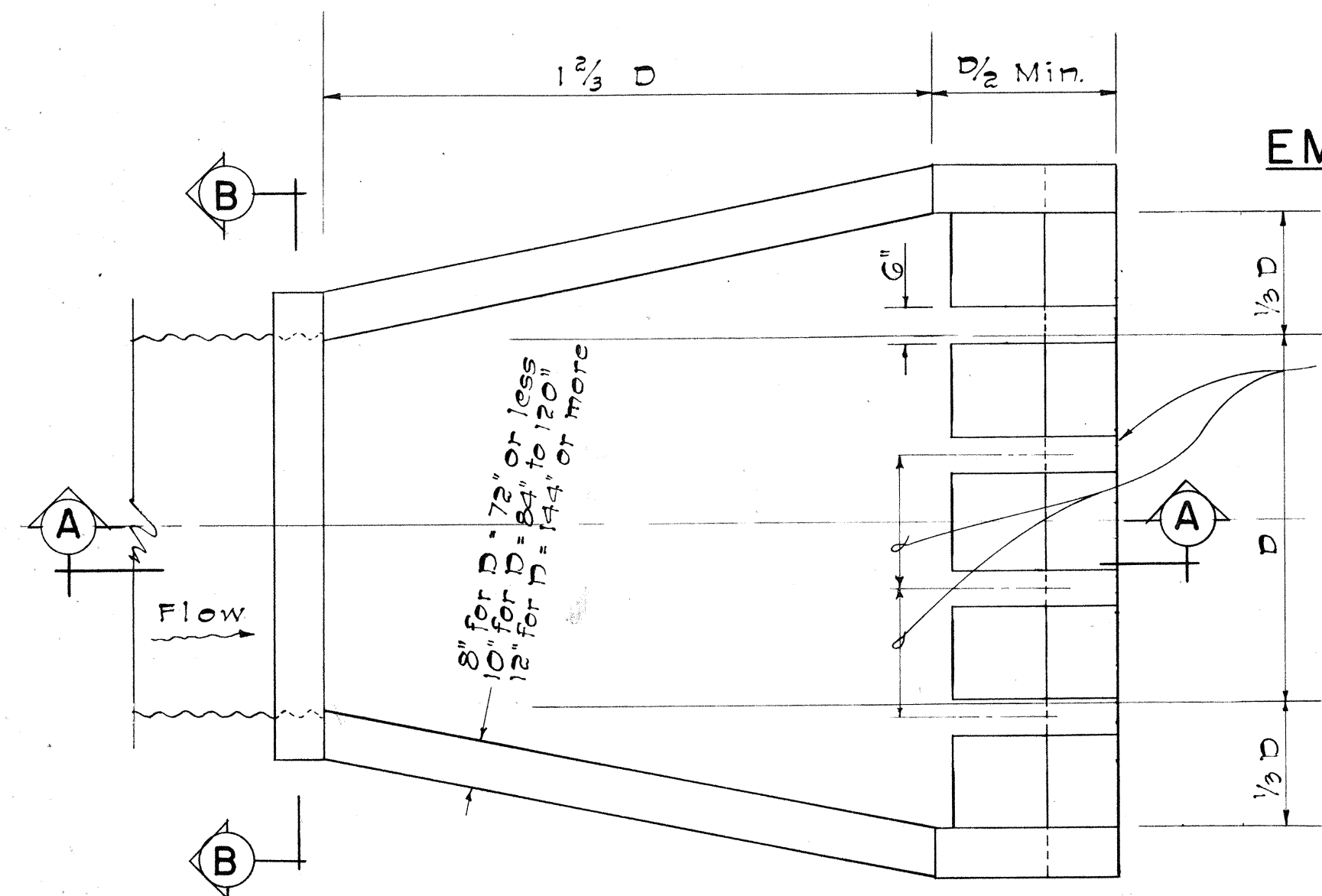


EMBANKMENT CONTOURS FOR SKEWED OUTLET

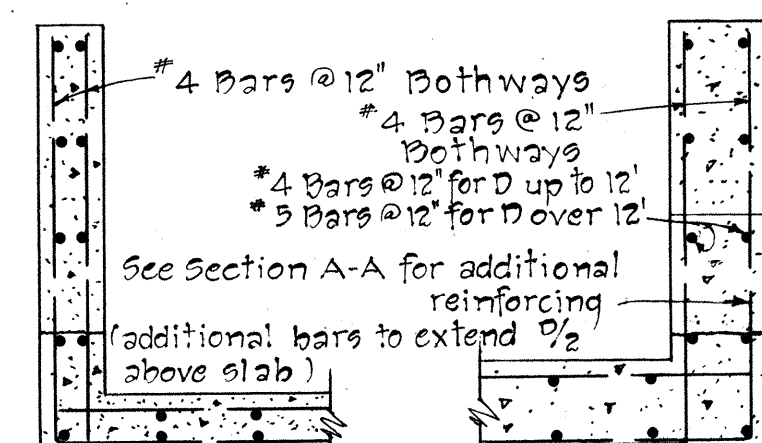
When outlet is skewed to embankment slope, the embankment may be contoured to cover the exposed section of wall and pipe.



ANCHOR BOLT DETAIL

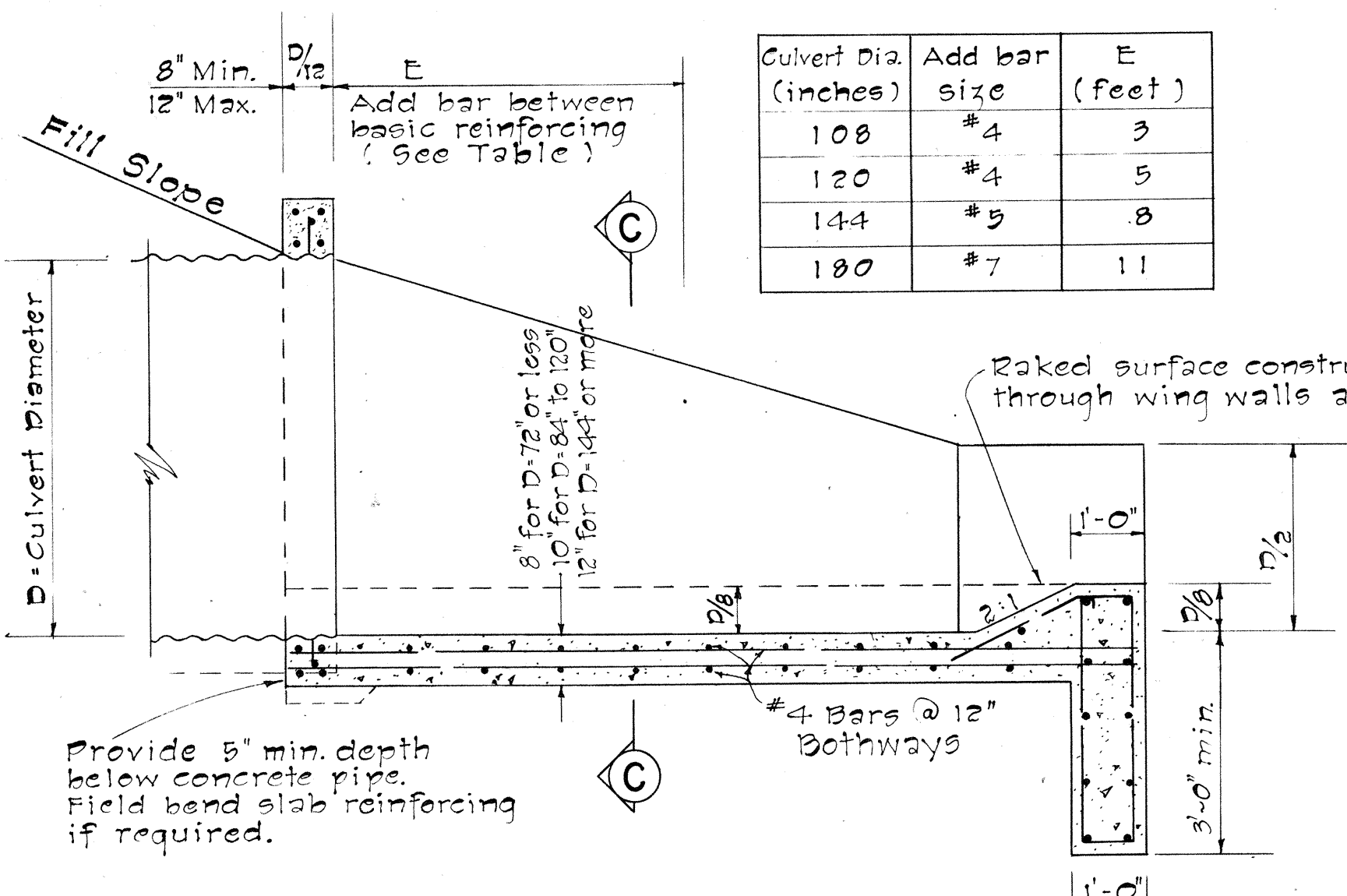


PLAN

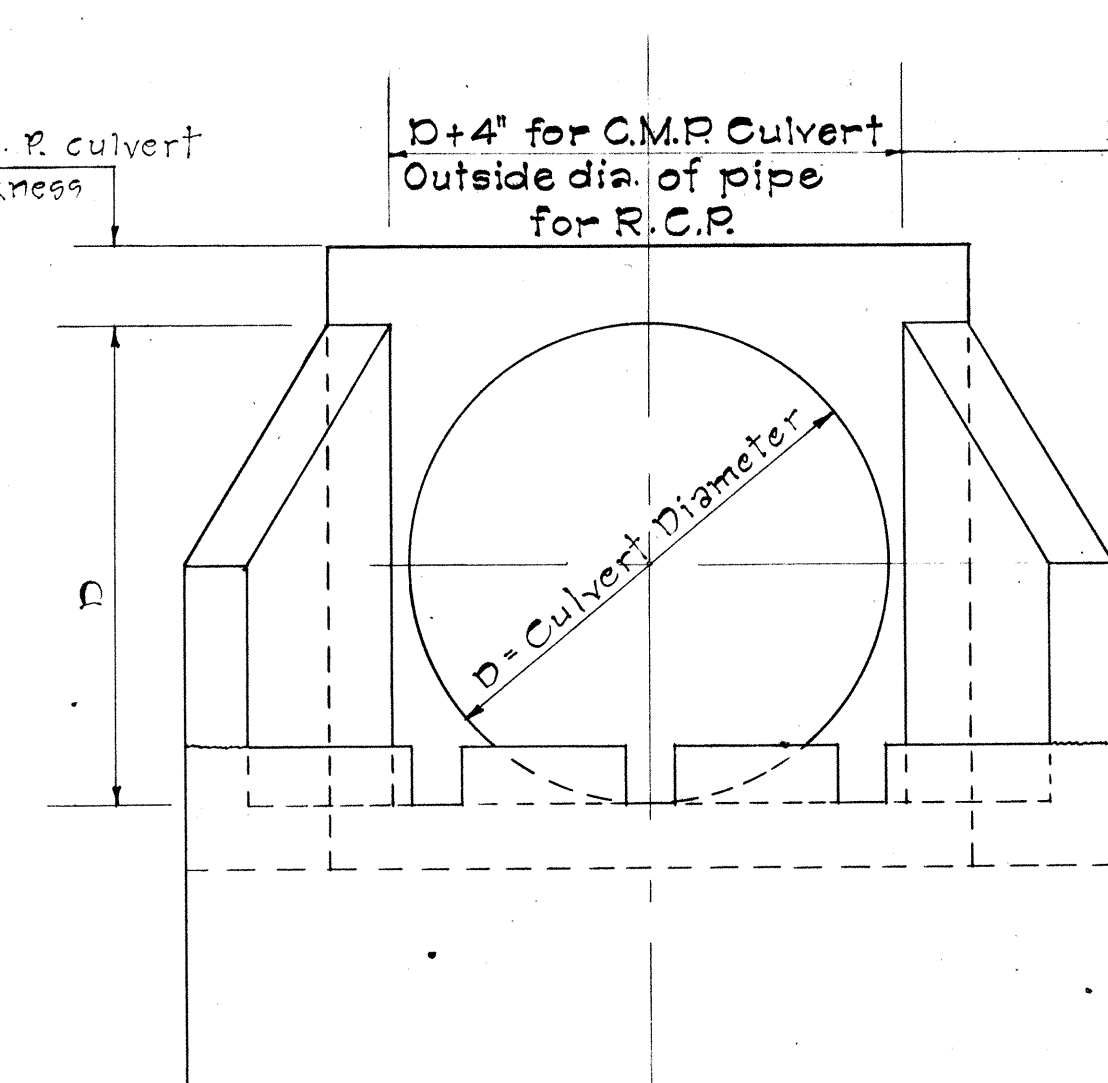


8" WING WALL 10" TO 12" WING WALLS

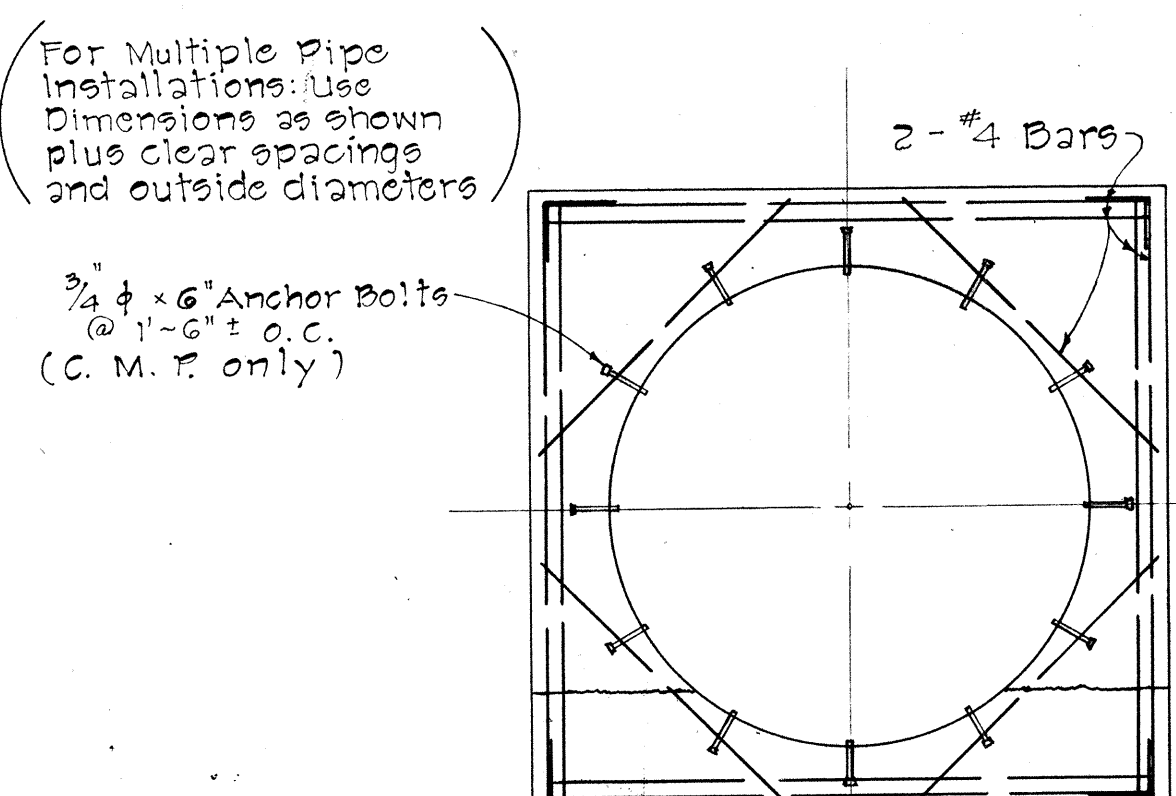
SECTION C-C



SECTION A-A



FRONT ELEVATION



SECTION B-B

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

APPROVAL RECOMMENDED:
[Signature] 12-17-69
HYDRAULIC DESIGN ENGINEER DATE

APPROVED:
[Signature] 12-17-69
ASSISTANT CHIEF, ENGINEERING DATE

NO.	REVISION	APPROVED BY	DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STANDARD DETAILS
OUTLET STRUCTURES

Not To Scale Date: July, 1969
SHEET No. 35 OF 35 SHEETS DH 15