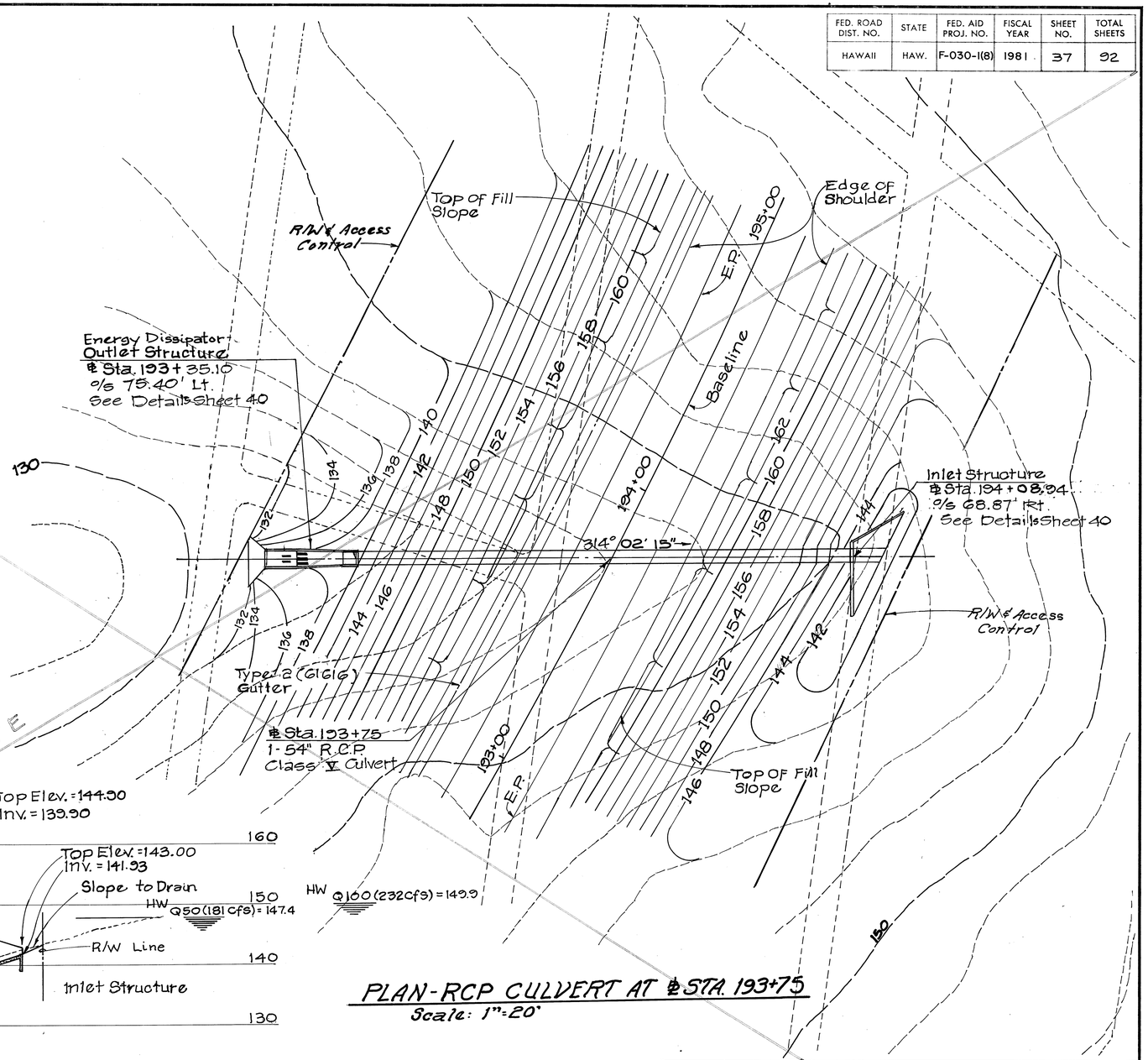
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	37	92

See Sheet #38



PROFILE

Scale: Horiz. 1" = 20'
Vert. 1" = 10'

PLAN-RCP CULVERT AT ℄ STA. 193+75

Scale: 1" = 20'

RCP CULVERT AT ℄ STA. 193+75

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

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HIGHWAYS DIVISION

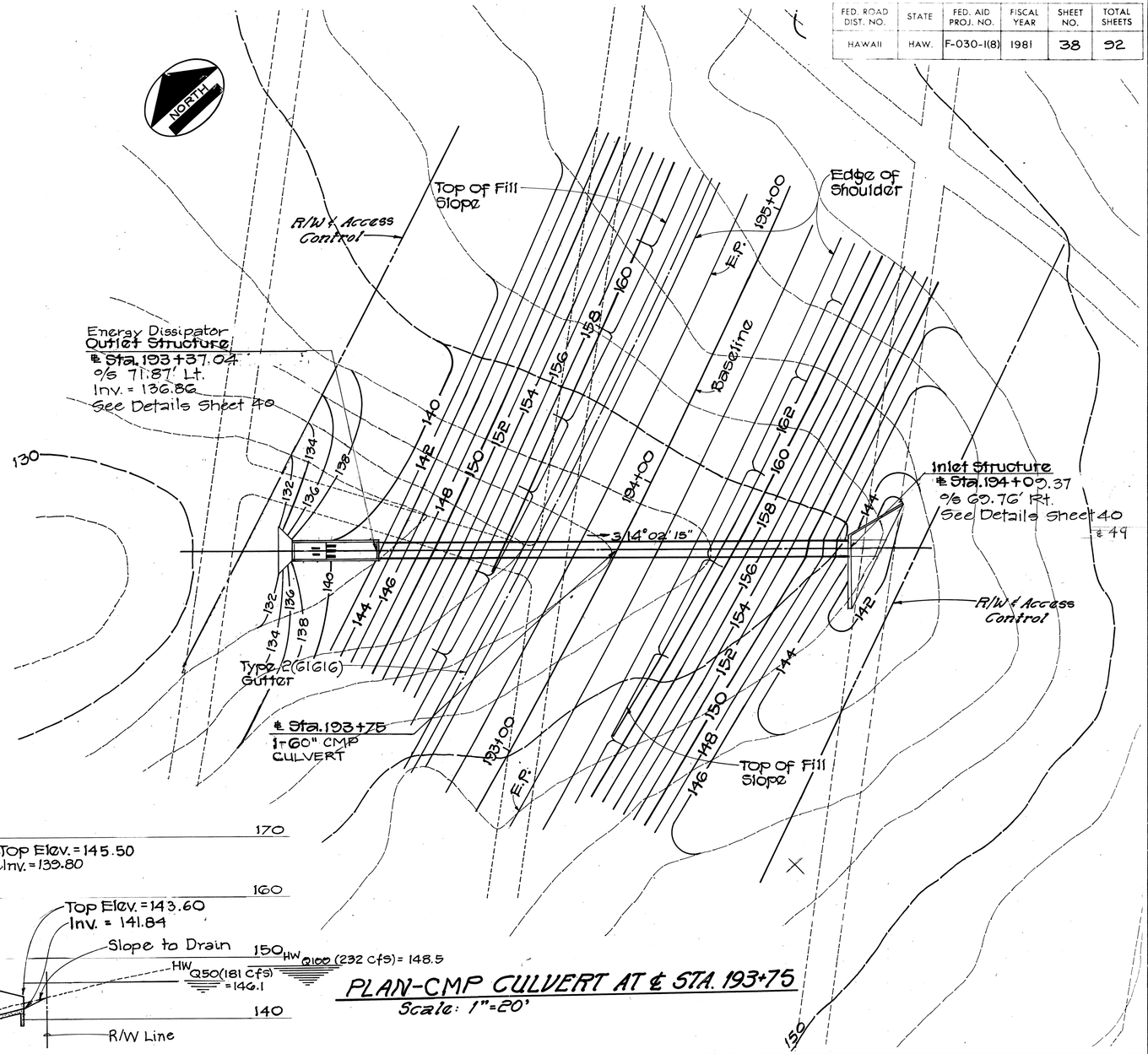
DRAINAGE DETAILS
RCP CULVERT AT ℄ STA. 193+75
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL

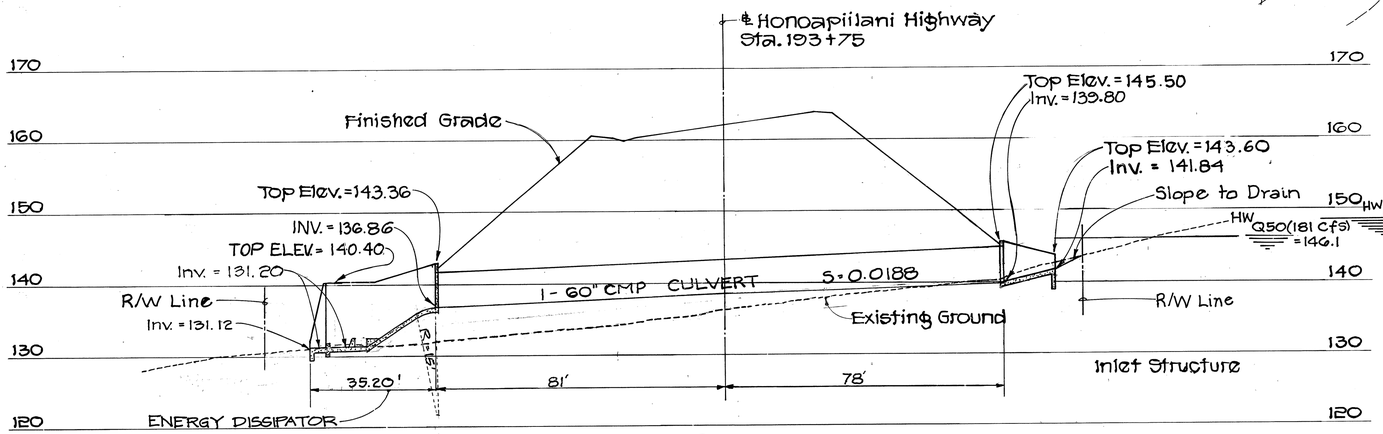
F.A. PROJECT NO. F-030-1(8)

DATE SEP 1981

SHEET No. 1 OF 16 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	38	92





PROFILE

Scale: Horiz. 1"=20'
Vert. 1"=10'

CMP CULVERT AT ℄ STA. 193+75

PLAN-CMP CULVERT AT ℄ STA. 193+75

Scale: 1"=20'

ORIGINAL PLAN
SURVEY PLOTTED BY
DRAWN BY
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DESIGNED BY
QUANTITIES BY
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DATE
NOTE BOOK
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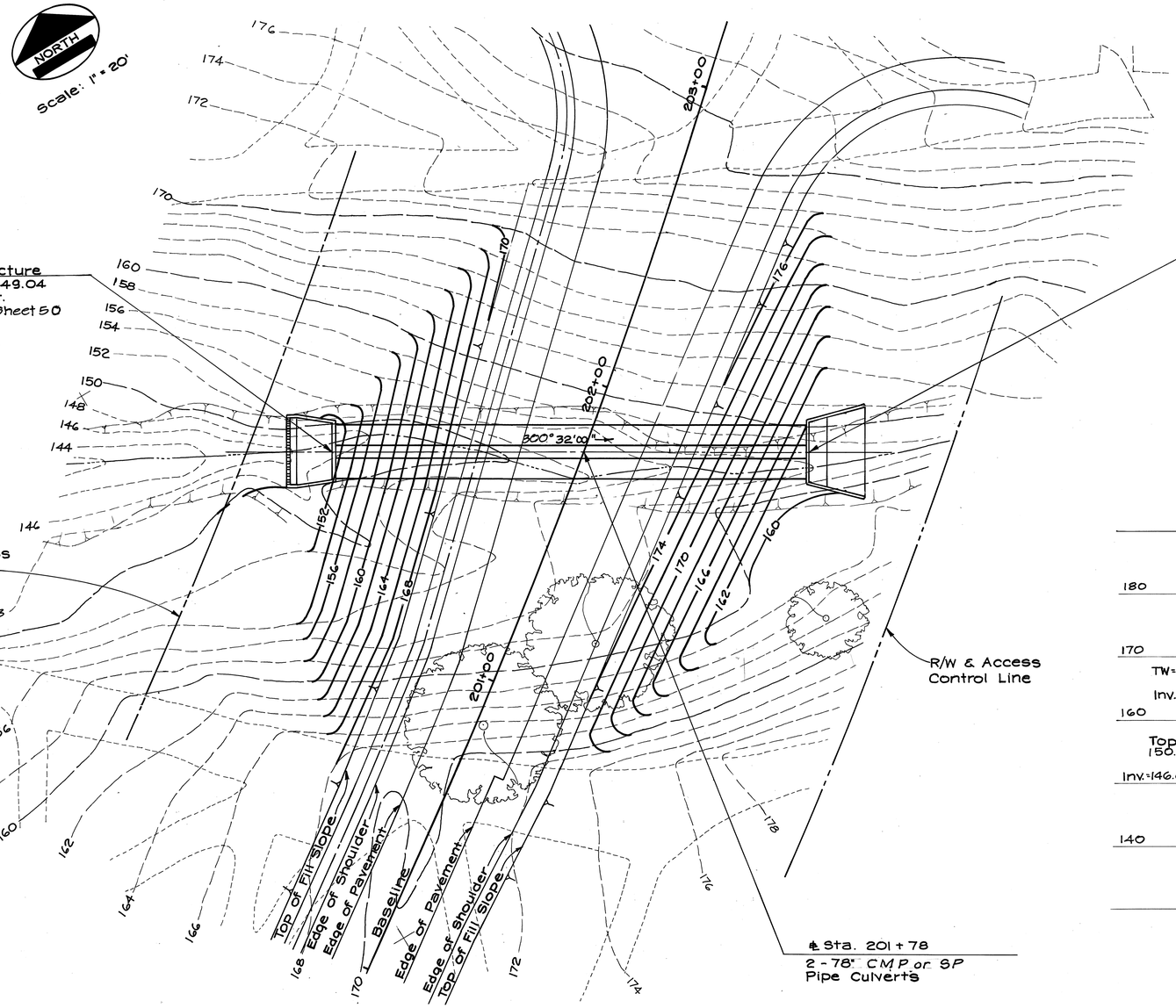
DRAINAGE DETAILS
CMP CULVERT AT ℄ STA. 193+75
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL

F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE SEP 1981

SHEET No. 2 OF 16 SHEETS

38

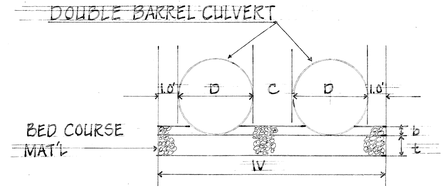
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	39	92



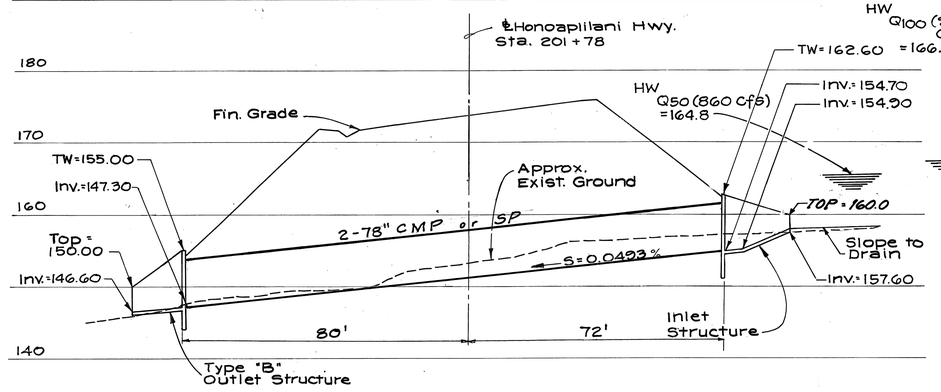
PLAN - CULVERT AT ℄ STA. 201 + 78

SCALE: 1" = 20'

DOUBLE BARREL CULVERT



CULVERT STATION	D (in)	C (ft)	t (ft)	W (ft)	b (in)	QUANTITY (c.y.)	L (ft)
201+78	78	4.01	1.0	19	8	451	152



PROFILE - CULVERT ℄ STA. 201 + 78

SCALE: HORIZ. 1" = 20'
VERT. 1" = 10'

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
	NOTE BOOK	DESIGNED BY
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HIGHWAYS DIVISION

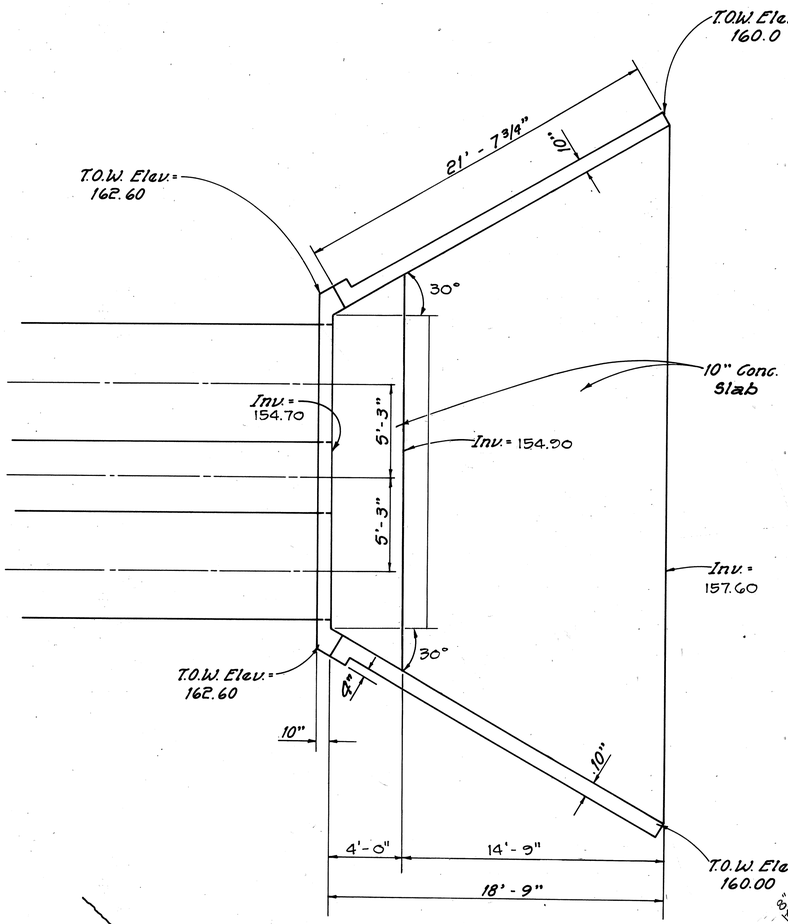
DRAINAGE DETAILS
CULVERT AT ℄ STA. 201+78
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL

F.A. PROJECT NO. F-030-1(8)

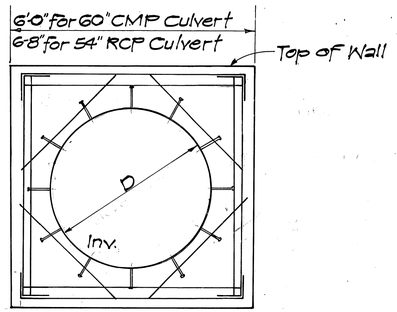
SCALE: 1" = 50' DATE MAR 1980

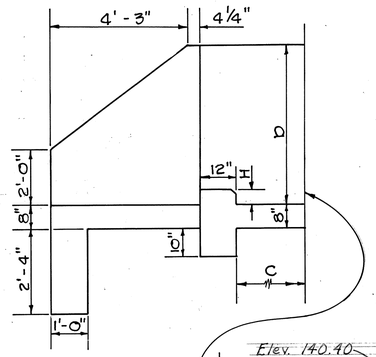
SHEET No. 3 OF 16 SHEETS

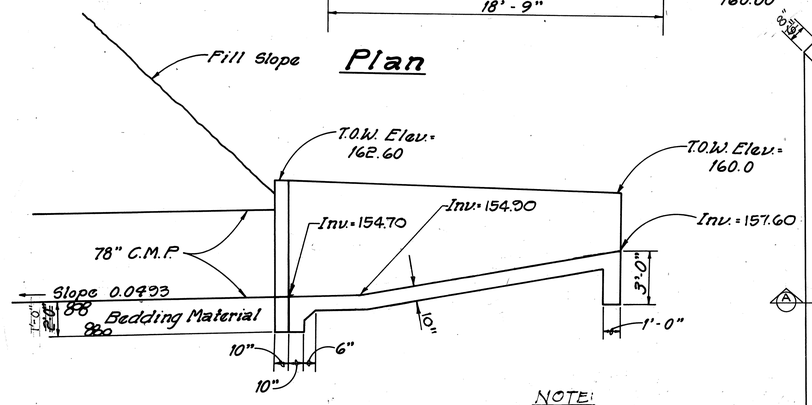
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	198i	40	92



Plan







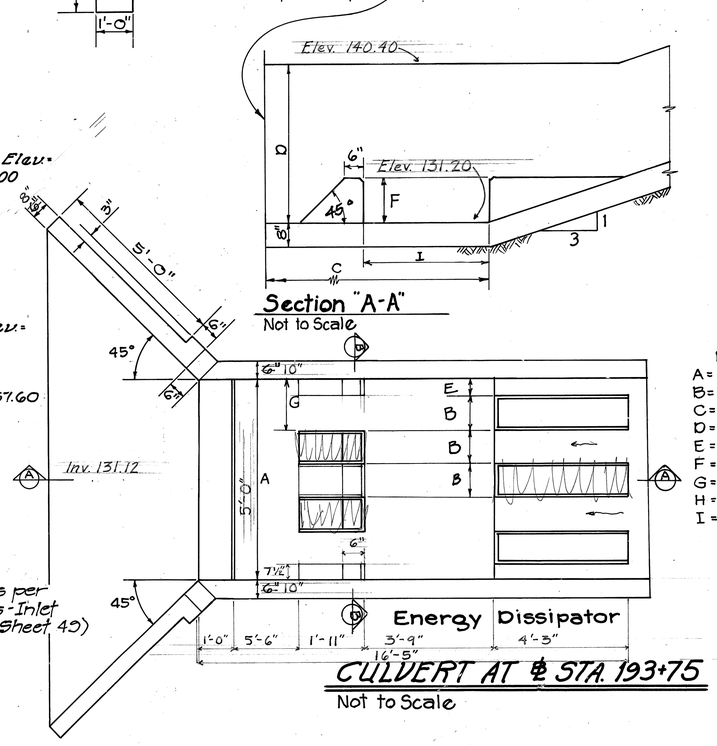
Section

Inlet Structure

CULVERT AT ℄ STA 201+78

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

NOTE:
Reinforcement as per Standard Details - Inlet Structures. (See Sheet 43)



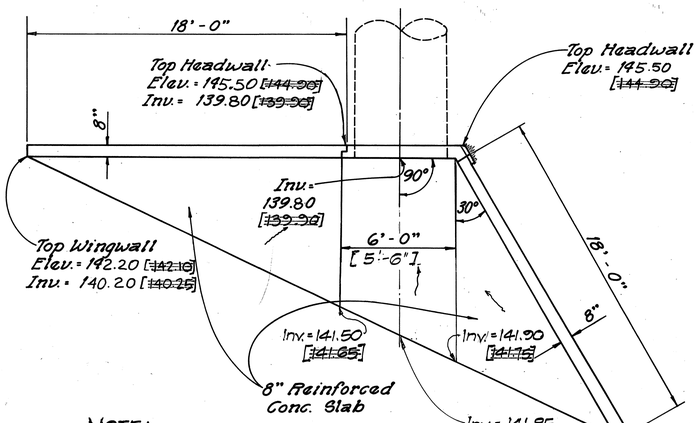
Section "A-A"
Not to Scale

Energy Dissipator

CULVERT AT ℄ STA. 193+75

Not to Scale

NOTE:
Reinforcement as per Standard Details - Inlet Structures. (See Sheet 43)

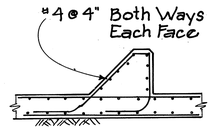


NOTE:
Bracket Figures are for 54" RCP Culvert

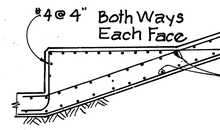
Inlet Structure

CULVERT AT ℄ STA. 193+75

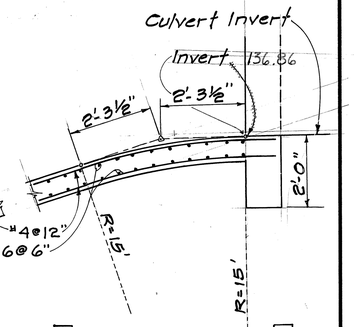
Scale: 1/4" = 1'-0"

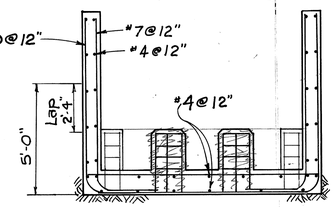


Basin Block
Not To Scale



Chute Block
Not To Scale





Section "B-B"
Not to Scale

Basin Dimensions

	For 60" CMP	For 54" RCP
A =	5'-0"	5'-8"
B =	1'-3"	1'-0"
C =	11'-2"	10'-2"
D =	9'-2"	8'-5"
E =	~~9'-8"~~ 7½"	0'-6½"
F =	1'-5"	1'-3"
G =	~~1'-10"~~ 1'-10½"	1'-5"
H =	0'-6"	0'-5½"
I =	3'-9"	3'-5"

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

INLET DETAILS FOR CULVERTS AT ℄STA. 193+75 & ℄STA. 201+78

HONOAPIILANI HIGHWAY

ALAELOA TO PINEAPPLE HILL

F.A. PROJECT NO. F-030-1(8)

SCALE: AS SHOWN DATE [illegible] 1987

SHEET No. 4 OF 16 SHEETS

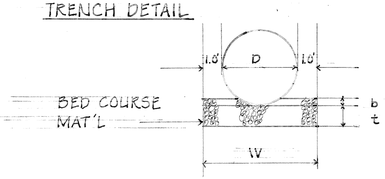
ORIGINAL PLANS
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
NOTE BOOK
No.

40(1)

40

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	41	92

TRENCH DETAIL



CULVERT STATION	D (in.)	t (ft.)	W (ft.)	b (in.)	QUANTITY (c.y.)	L (ft.)
193+75	60	1.0	7	6	15	42.5
209+37	120	1.5	12	12	210	220.4
221+19	108	2.5	11	11	451	357.7

PLAN - CULVERT AT ℄ STA. 209 + 37

SCALE : 1" = 20'

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

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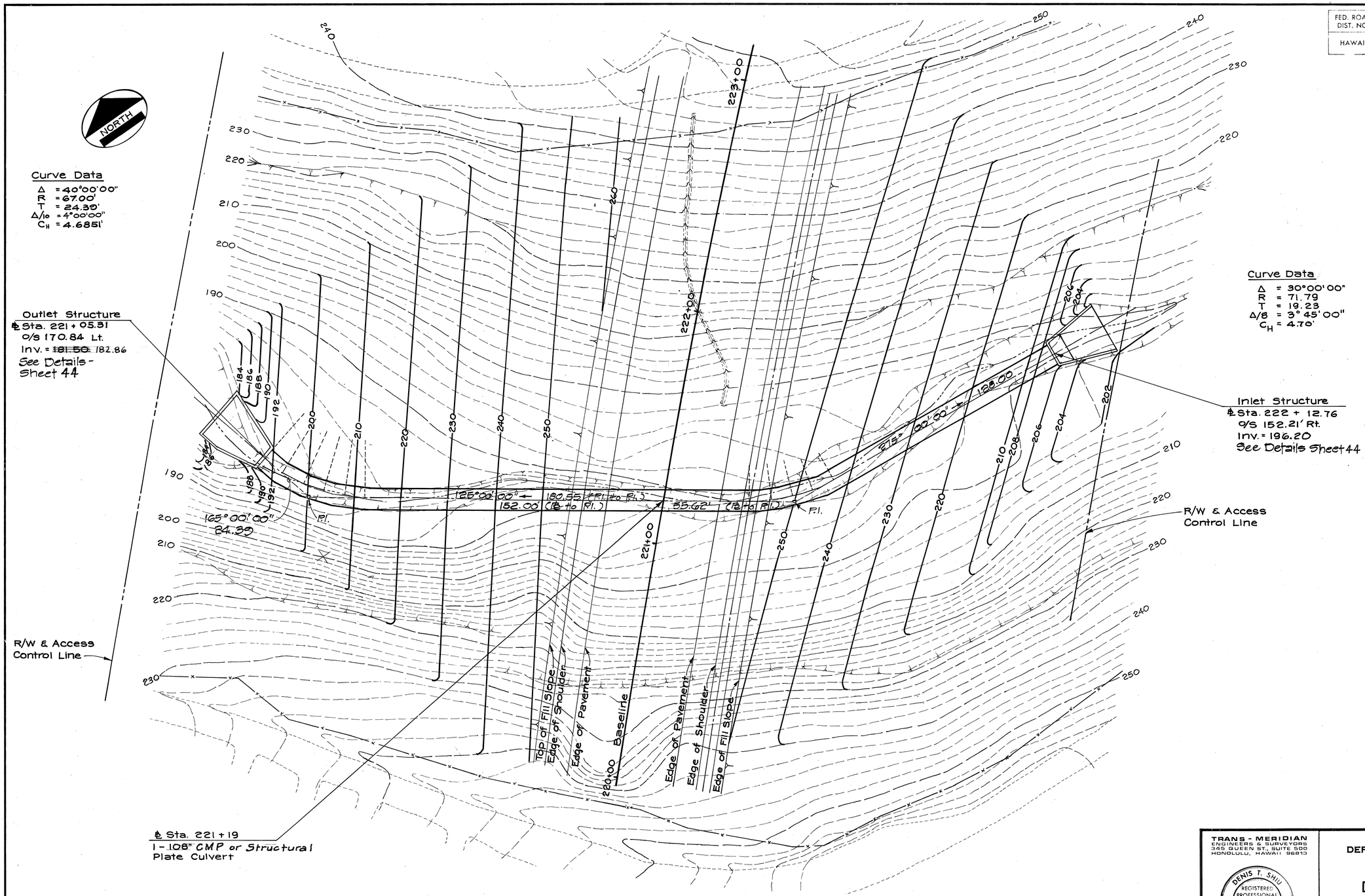
DRAINAGE DETAILS
CULVERT AT ℄ STA. 209+37
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)

SCALE : AS SHOWN DATE MAR 1982

SHEET No. 5 OF 16 SHEETS

41

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	42	92



PLAN - CULVERT AT ℄ STA. 221 + 19

SCALE: 1" = 20'

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

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HIGHWAYS DIVISION

DRAINAGE DETAILS

CULVERT AT ℄ STA. 221+19

HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE: MAR 1980

SHEET No. 6 OF 16 SHEETS

42
42

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	42A	96

Begin Wall
Sta. 0+16.43
o/s 14.05' Lt.
= Honoapiilani Hwy
℄ Sta. 243+97.75'
o/s 198.13' Lt.

Existing Dirt Road

To Honokahau

Honoapiilani Highway

241,000 N

CULVERT & CURVE NO.2 DATA
Δ = 48° 00' 00"
R = 191.01'
T = 85.04'
L = 160.02'
C = 156.39'

36" Inlet Pipe
Sta. 5+13.50
= Honoapiilani Hwy
℄ Sta. 240+21.13
o/s 104.36' Rt.
Top Elev. = 250.00

R/W & Access Control Line

Existing Dirt Road

Culvert Segment (Typ.)

351°00'00"

℄ Sta. 0+45.01

℄ Sta. 3+35.02
R = 191.01'

℄ Sta. 1+65.02
R = 191.01'

℄ Sta. 3+35.04

℄ R = 2650.00'

330°00'00"

504,000 E

Outlet Structure
w/ Cattle Guard
Sta. 0+35.01
= Honoapiilani Hwy
℄ Sta. 243+72.47
o/s 193.04' Lt.
Top = 197.50
Inv. = 191.50

CULVERT & CURVE NO.1 DATA
Δ = 36° 00' 00"
R = 191.01'
T = 62.06'
L = 120.01'
C = 118.05'

℄ CURVES NO.1 & NO.2
CULVERT SEGMENT DATA
Δ = 3° 00' 00"
R = 191.01'
T = 5.00'
L = 10.00'
C = 10.00'

℄ CURVE DATA
Δ = 43°-30'-00"
R = 2650.00'
L = 2011.93'
C = 1963.95'
P.C. = 238+23.62

R/W & Access Control Line

66" culvert, 10 Ga.
Sta. 4+00
= Honoapiilani Hwy
℄ Sta. 240+65

Type (6)(6)(6) Gutter

Top of Fill

Edge of Pavement

Edge of Shoulder

Back Tangent
230°35'22"

To Pineapple Hill

Inlet Structure
w/ Debris Rack
Sta. 5+35.27
= Honoapiilani Hwy
℄ Sta. 240+13.08
o/s 124.79' Rt.
Top = ~~242.70~~ 239.27
Inv. = ~~236.90~~ 233.27

Top of Fill

Edge of Shoulder

Edge of Pavement

Baseline

NOTE:

This culvert at ℄ Station 240+65 shall require no elongation.

PLAN - CMP CULVERT AT ℄ STA. 240+65

SCALE: 1" = 20'

241,000 N

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

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HIGHWAYS DIVISION

DRAINAGE DETAILS

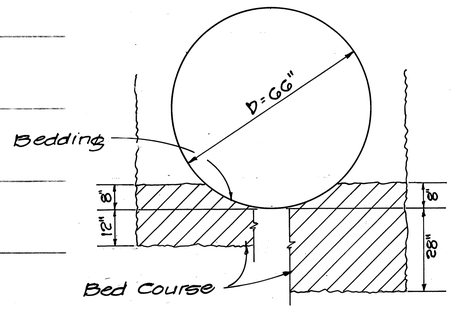
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)

SCALE: AS SHOWN DATE FEB. 1983

SHEET No. 7 A OF 20 SHEETS

C.O. 42 A1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	42B	96



BEDDING & BED COURSE
Not to Scale

PROFILE - CMP CULVERT AT ℄ STA. 240+65

SCALE: Horiz. 1" = 20'
Vert. 1" = 10'

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

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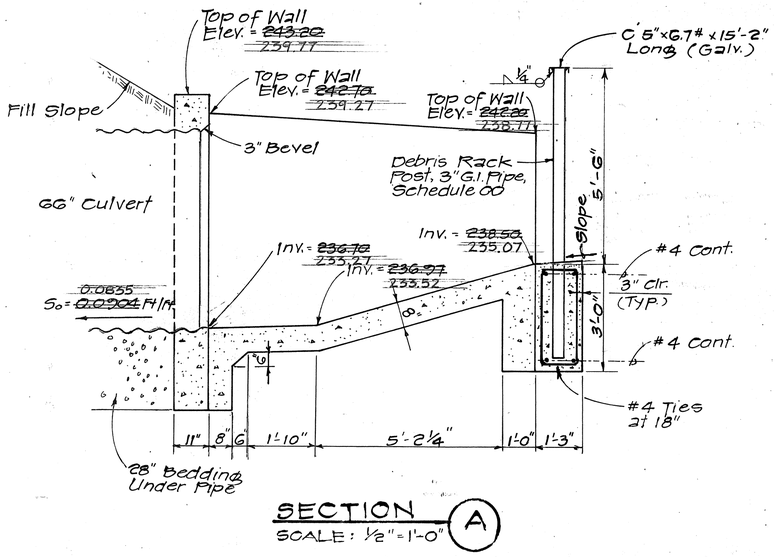
DRAINAGE DETAILS

HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE FEB. 1983

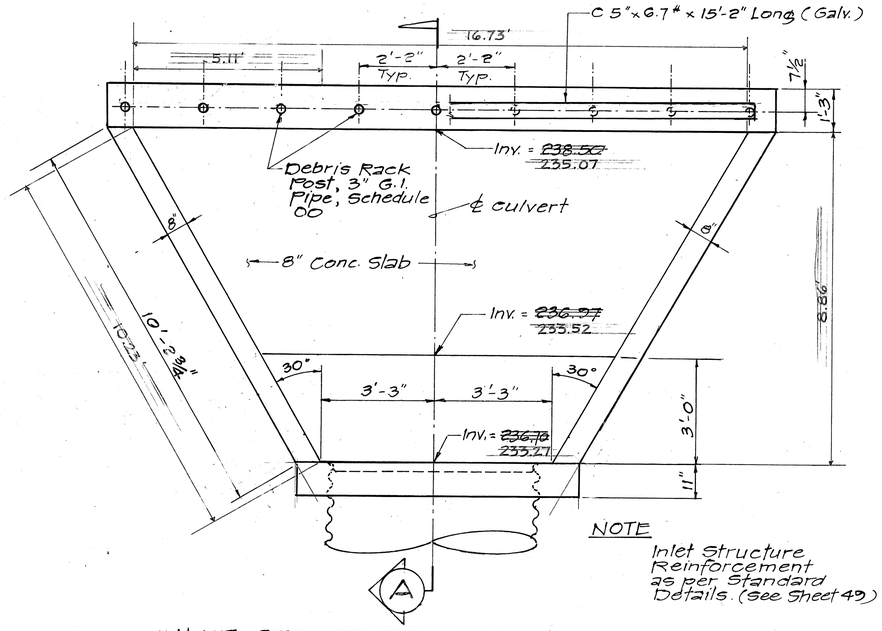
SHEET No. 78 OF 20 SHEETS

C.D. 42 B

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	42C	96



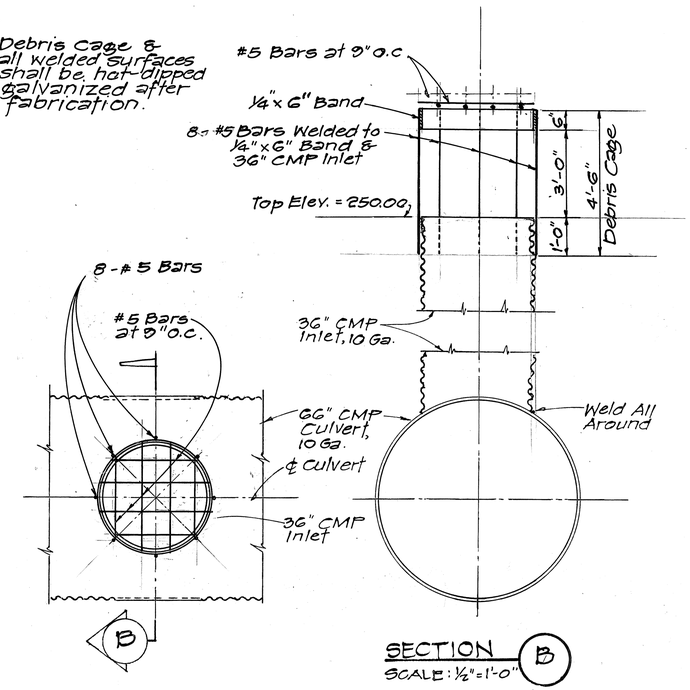
SECTION
SCALE: 1/2" = 1'-0" (A)



NOTE
Inlet Structure Reinforcement as per Standard Details. (See Sheet 49)

INLET STRUCTURE WITH DEBRIS RACK
SCALE: 1/2" = 1'-0"

NOTE:
Debris Cage & all welded surfaces shall be hot-dipped galvanized after fabrication.



SECTION
SCALE: 1/2" = 1'-0" (B)

36" INLET PIPE
SCALE: 1/2" = 1'-0"

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

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HIGHWAYS DIVISION

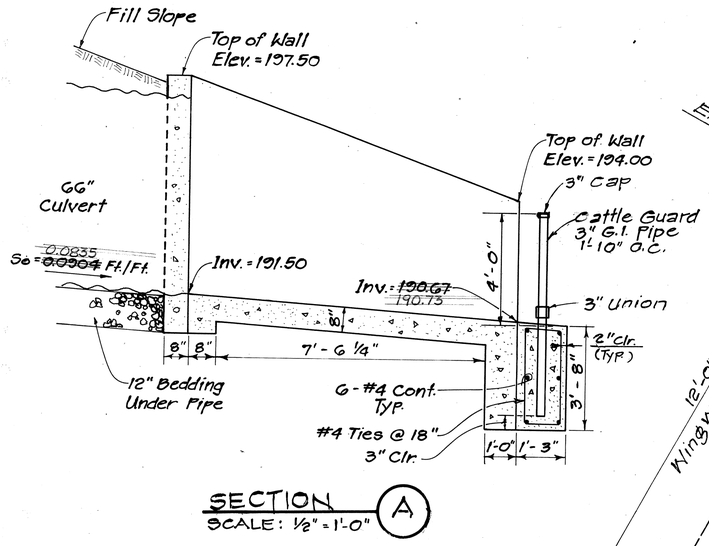
DRAINAGE PLAN

HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE FEB. 1983

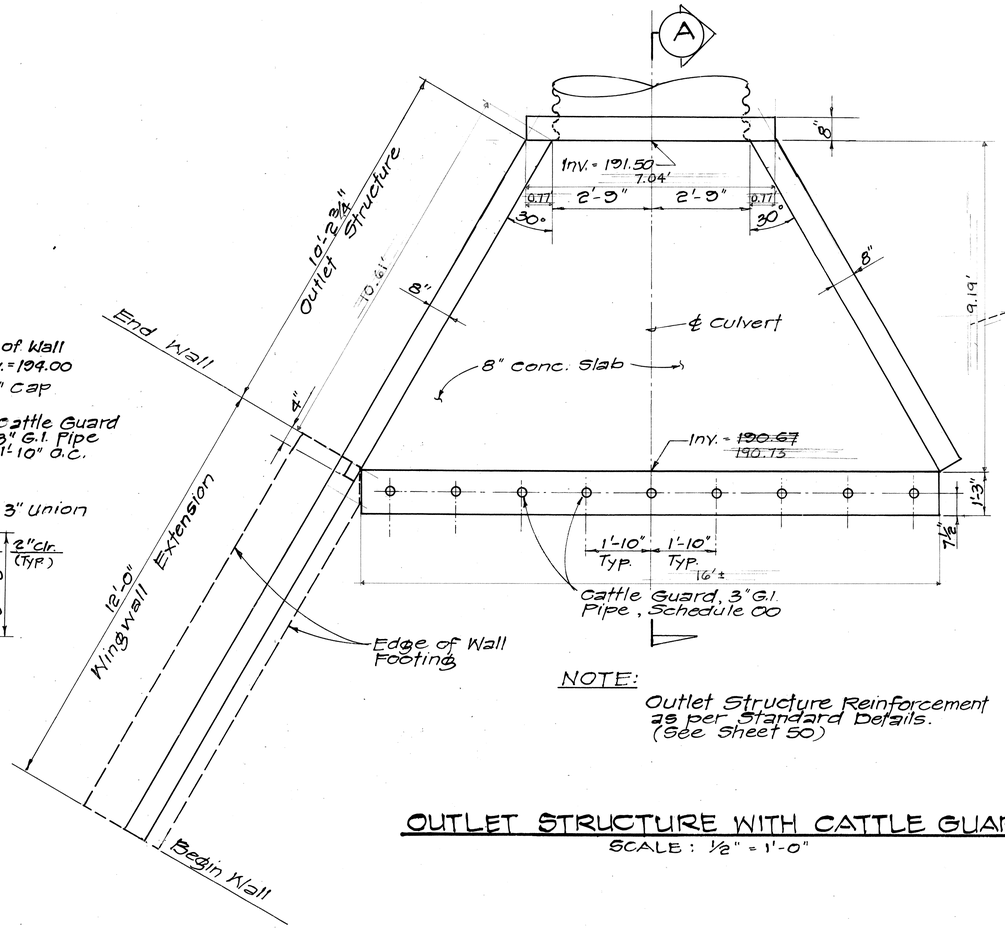
SHEET No. 76 OF 20 SHEETS

C.D. 42 C

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	42D	96

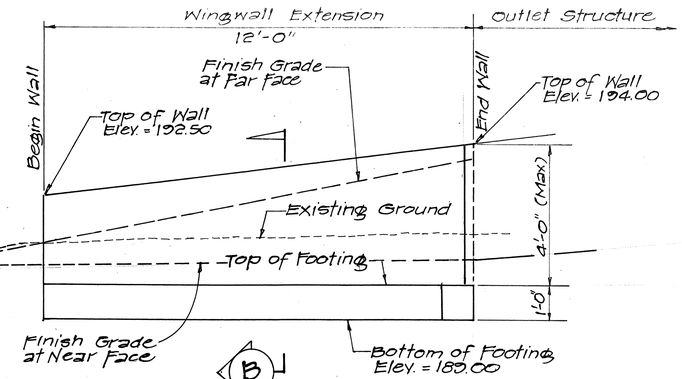


SECTION (A)
SCALE: 1/2" = 1'-0"

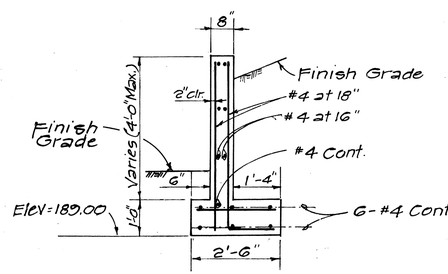


NOTE:
Outlet Structure Reinforcement as per Standard Details. (See Sheet 50)

OUTLET STRUCTURE WITH CATTLE GUARD
SCALE: 1/2" = 1'-0"



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



SECTION (B)
SCALE: 1/2" = 1'-0"

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

TRANS-MERIDIAN
ENGINEERS & SURVEYORS
345 QUEEN ST., SUITE 500
HONOLULU, HAWAII 96813

DENIS T. SHIU
REGISTERED PROFESSIONAL ENGINEER
No. 2447
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.
Denis T. Shiu

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

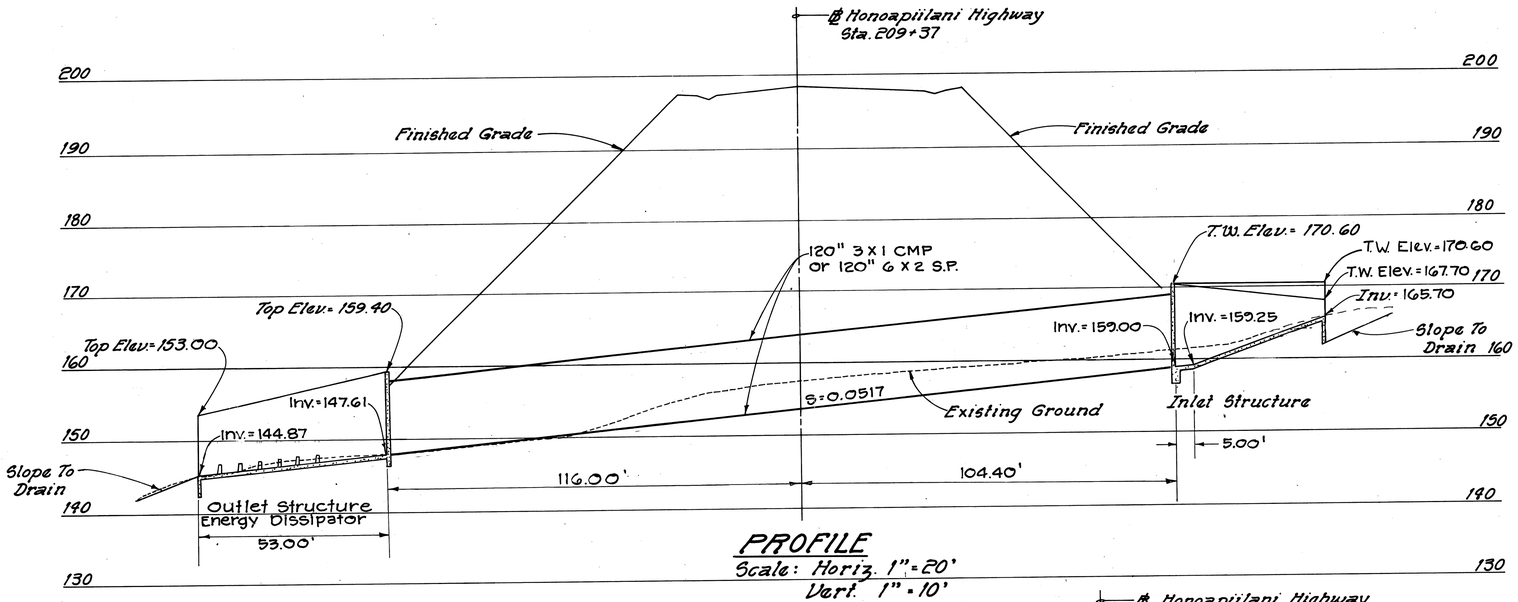
DRAINAGE PLAN

HONOAPIILANI HIGHWAY
ALAEOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE FEB. 1983

SHEET No. 7D OF 20 SHEETS

G.D. 42 D

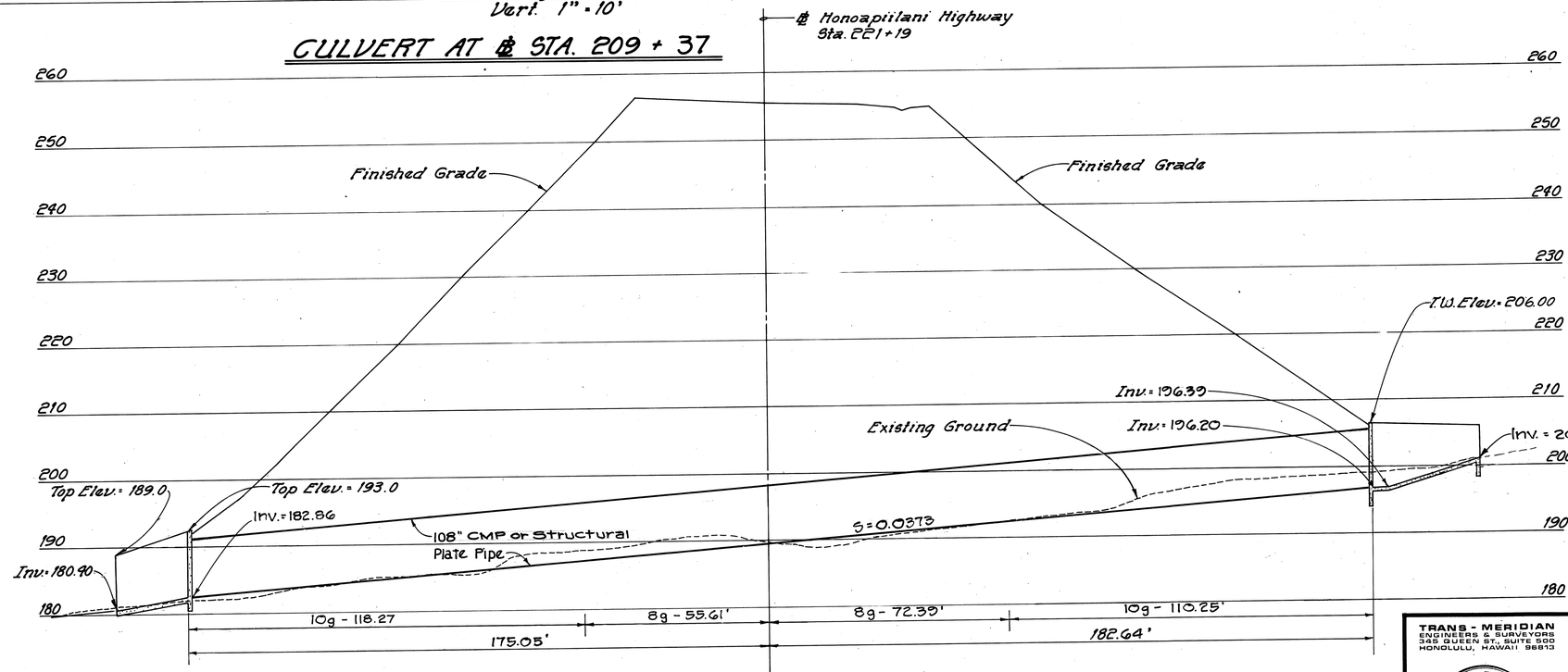
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	198	43	92



PROFILE

Scale: Horiz. 1"=20'
Vert. 1"=10'

CULVERT AT ℄ STA. 209 + 37



PROFILE

Scale: Horiz. 1"=20'
Vert. 1"=10'

CULVERT AT ℄ STA. 221 + 19

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

TRANS - MERIDIAN
ENGINEERS & SURVEYORS
345 QUEEN ST. SUITE 500
HONOLULU, HAWAII 96813

DENIS T. SHIU
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

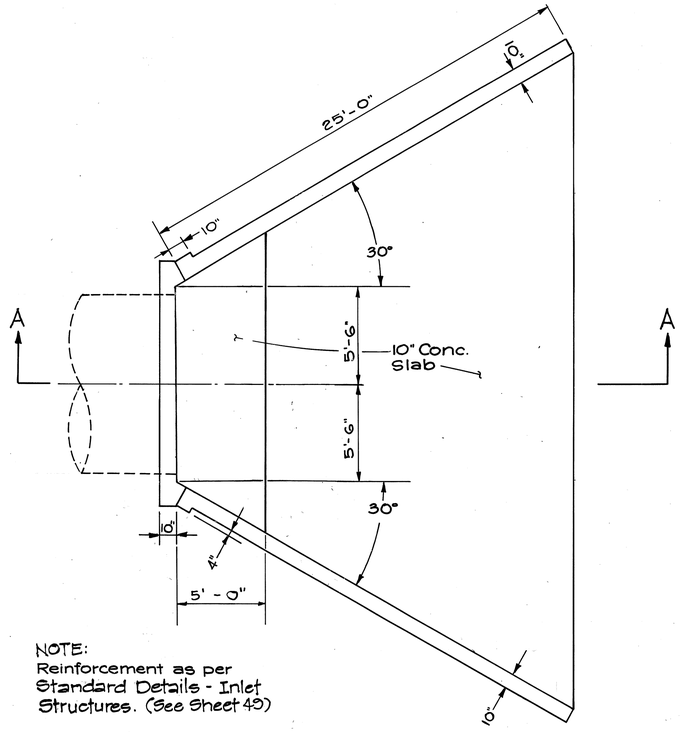
DRAINAGE DETAILS
PROFILES

CULVERTS AT ℄ STA 209+37 ℄ STA. 221+19
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE SEP 198?

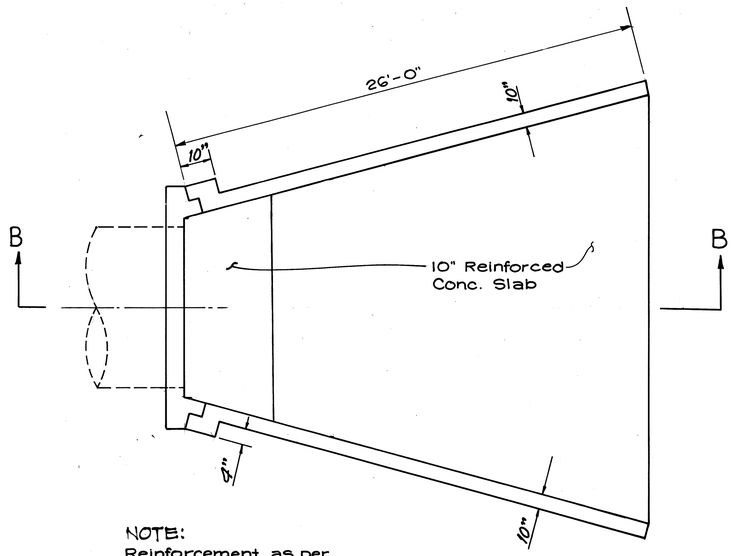
SHEET No. 7 OF 16 SHEETS

43

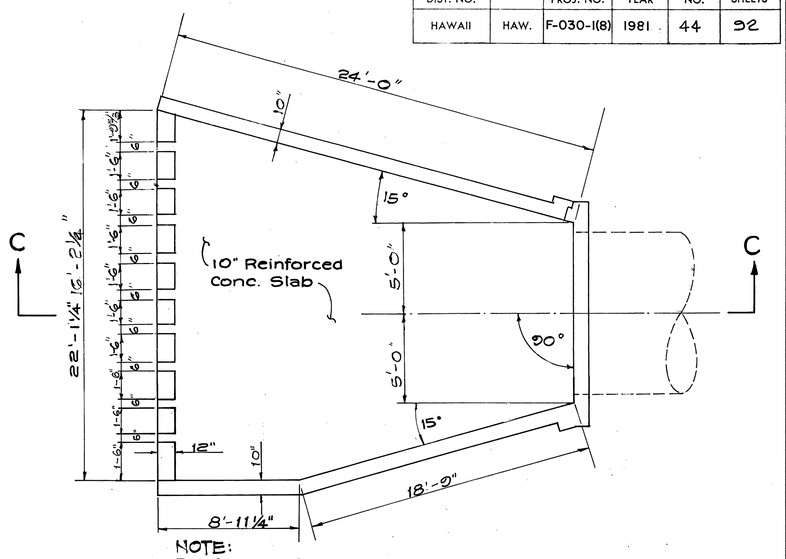
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	44	92



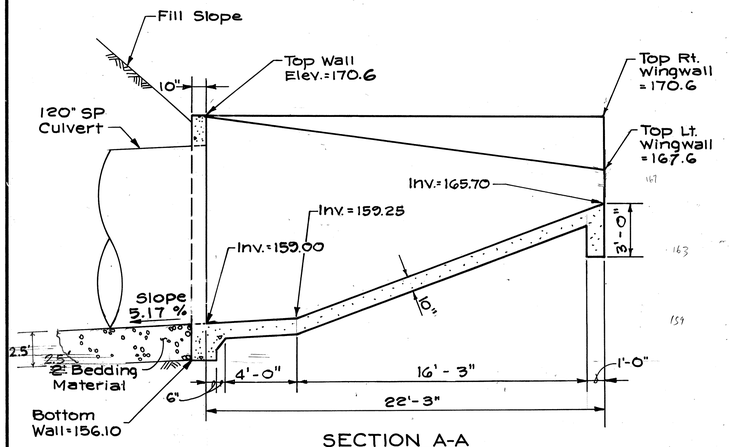
NOTE:
Reinforcement as per Standard Details - Inlet Structures. (See Sheet 45)



NOTE:
Reinforcement as per Standard Details - Inlet Structures. (See Sheet 49)

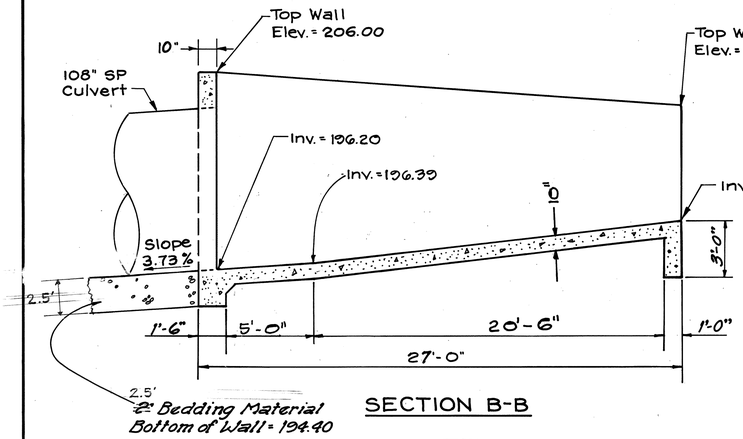


NOTE:
Reinforcement as per Standard Details - Outlet Structures. (See Sheet 50)



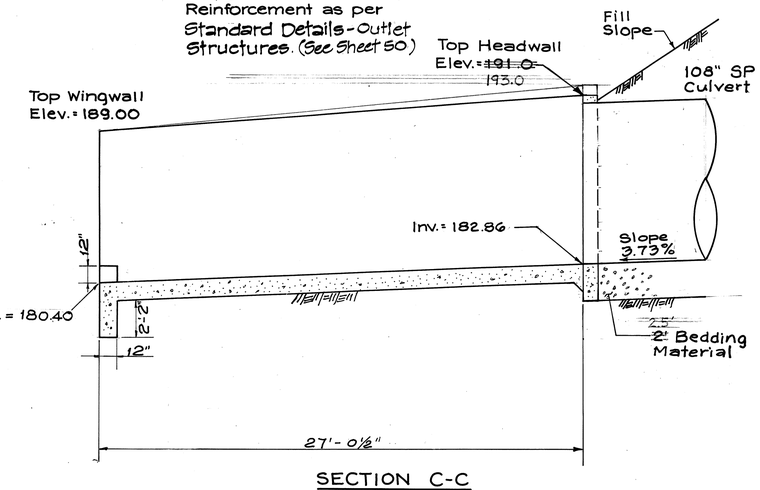
SECTION A-A

INLET



SECTION B-B

INLET



SECTION C-C

OUTLET

CULVERT AT STA. 209 + 37

NOT TO SCALE

CULVERT AT STA. 221 + 19

NOT TO SCALE

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

TRANS - MERIDIAN
ENGINEERS & SURVEYORS
345 QUEEN ST., SUITE 500
HONOLULU, HAWAII 96813

DENIS T. SHIU
REGISTERED PROFESSIONAL ENGINEER
No. 2447
HAWAII, U.S.A.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

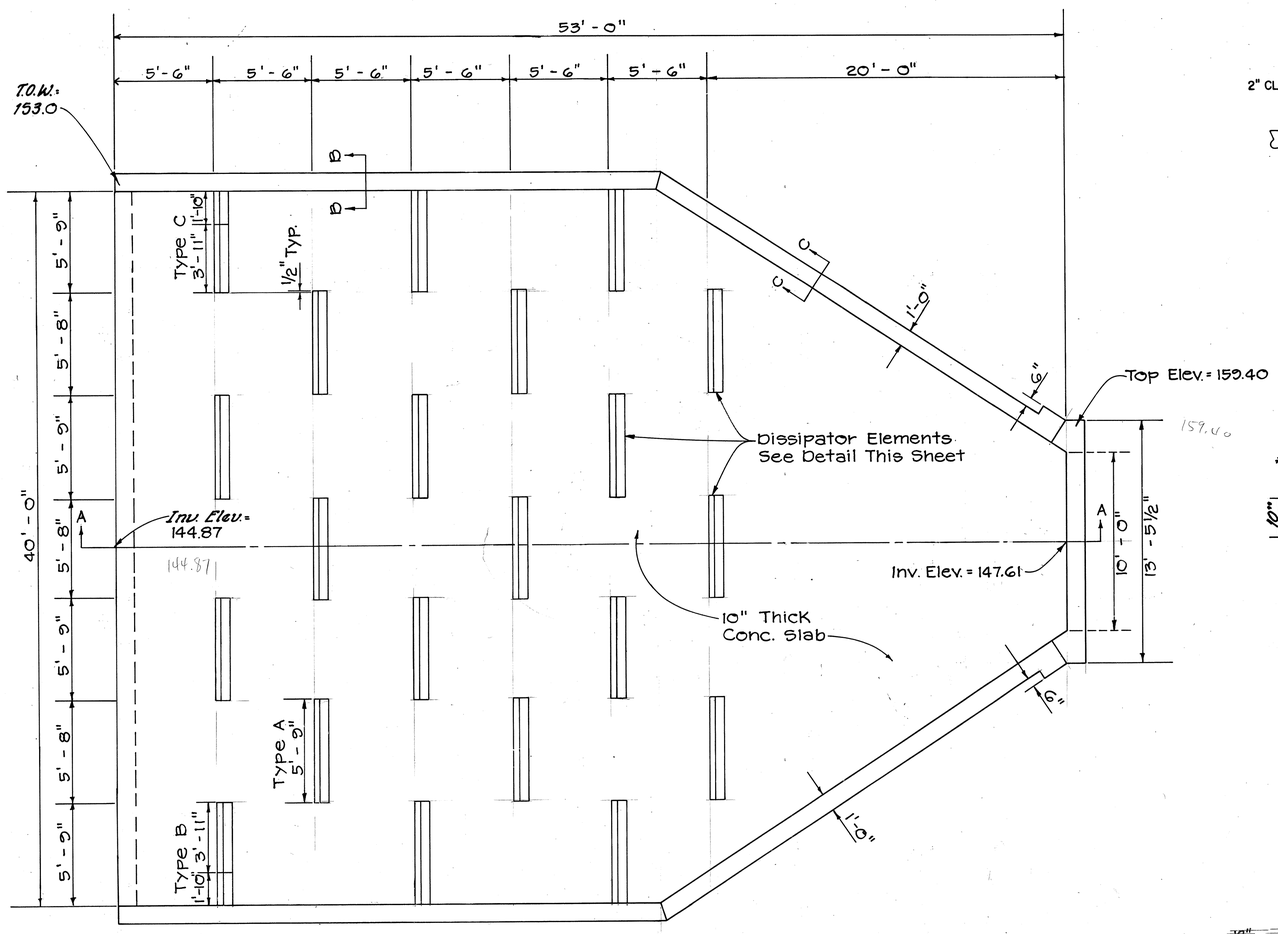
DRAINAGE DETAILS
CULVERT AT ℄ STA. 209+37
CULVERT AT ℄ STA. 221 + 19
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)

SCALE: AS SHOWN DATE Mar 1982

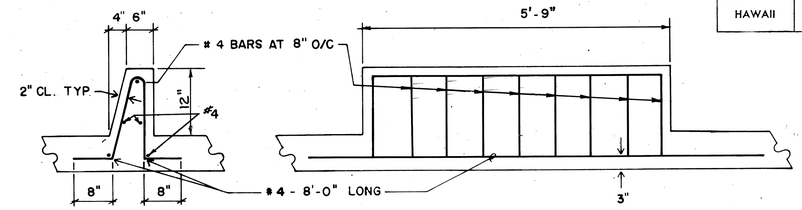
SHEET No. 8 OF 16 SHEETS

Rev 3.5.82

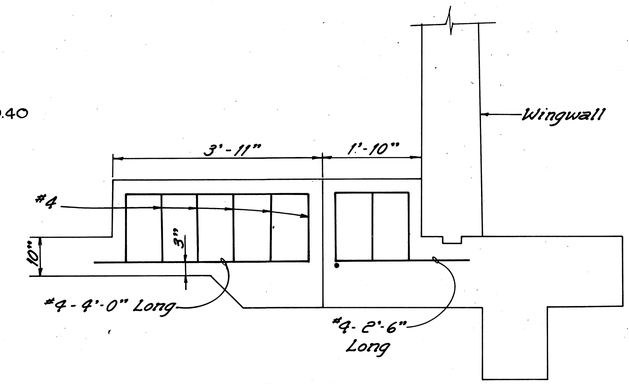
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	45	92



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

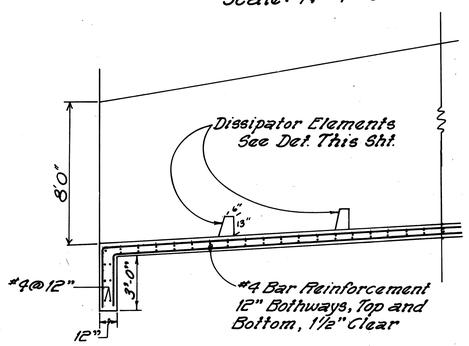


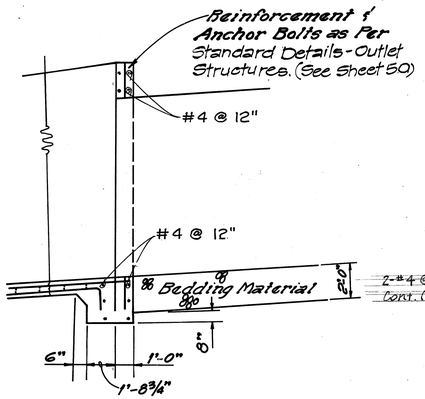
Type A



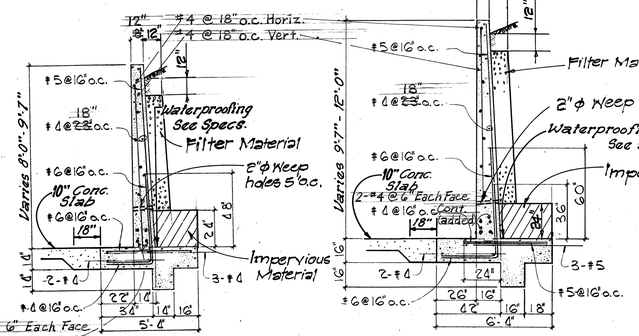
Type B
(Type C - Opposite View)

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





SECTION A-A
Scale: 1/4"=1'-0"



SECTION B-B
Scale: 1/4"=1'-0"

SECTION C-C
Scale: 1/4"=1'-0"

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

TRANS-MERIDIAN
ENGINEERS & SURVEYORS
345 QUEEN ST., SUITE 505
HONOLULU, HAWAII 96813

DENIS T. SHIU
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

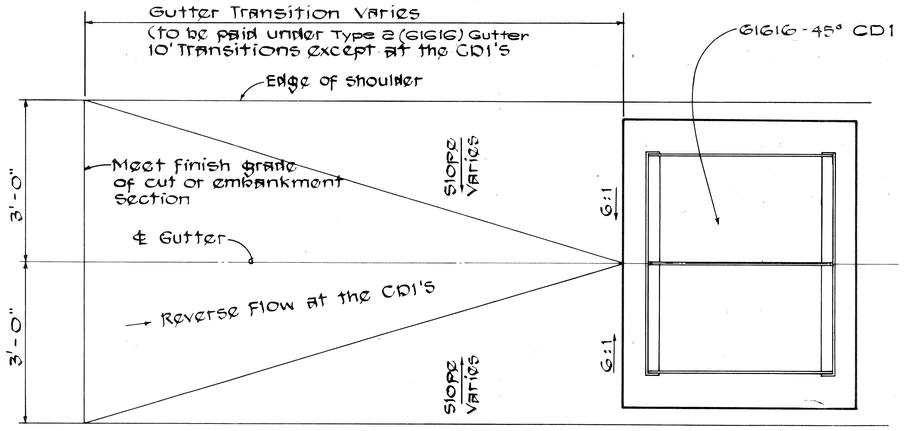
DRAINAGE DETAILS
ENERGY DISSIPATOR FOR CULVERT AT ℄ STA. 209+37
HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE MAR 1982

SHEET No. 9 OF 16 SHEETS

45

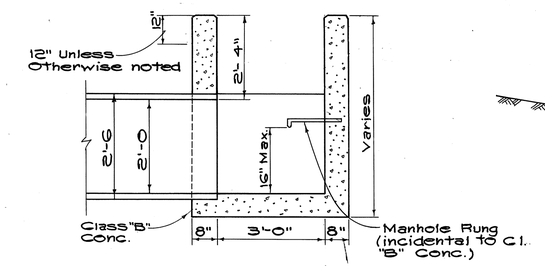
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	46	92

Begin Type 2-G1G1G Gutter or
End Type 2-G1G1G Gutter

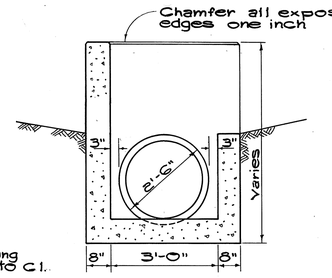


TYPICAL GUTTER TRANSITION AT TERMINATION OR BEGINNING OF TYPE 2(G1G1G) GUTTER

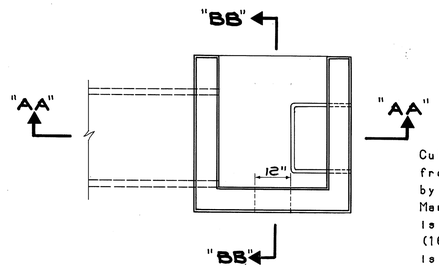
Scale: 3/4" = 1'-0"



SECTION "AA"



SECTION "BB"

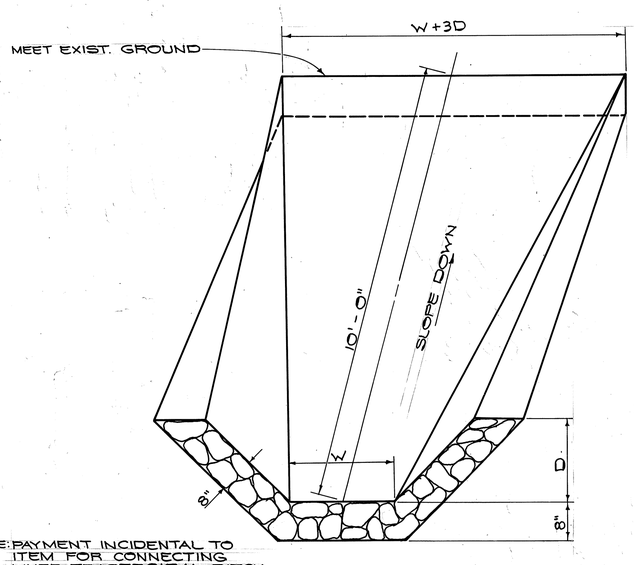


PLAN

TYPE A
CONC. DROP INTAKE DETAIL
NOT TO SCALE

GENERAL NOTES

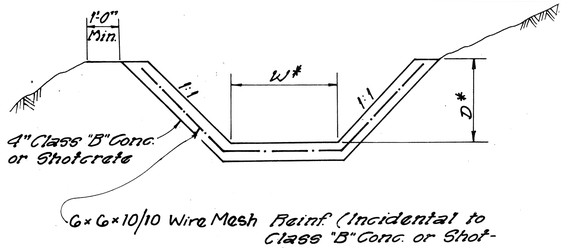
Culvert shall enter and leave Drop Intake from the position and the direction indicated by the plans or ordered by the Engineer. Manhole Rungs (12 o.c.) are required when H is greater than 4 feet 6 inches. Only one rung (16 inches from the bottom) is required if H is 4 feet 6 inches or less. Manhole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



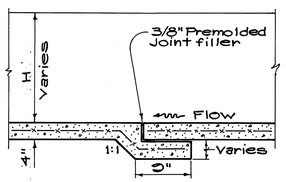
NOTE: PAYMENT INCIDENTAL TO ITEM FOR CONNECTING LINED TRAPEZOIDAL DITCH.

ISOMETRIC

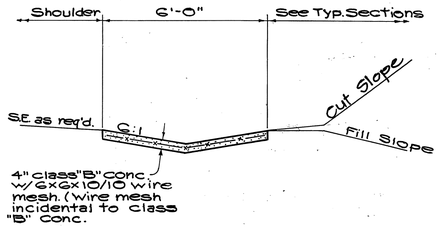
FLARED GRP DRAINAGE DITCH END SECTION
NOT TO SCALE



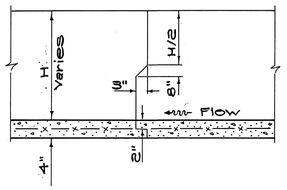
LINED TRAPEZOIDAL
DRAINAGE DITCH
* See Drainage Plans
NOT TO SCALE



EXPANSION JOINT @ 75' O.C.



TYPE 2 (G1G1G) CONC. GUTTER
NOT TO SCALE



CONSTRUCTION JOINT @ 25' O.C.

DRAINAGE DITCH DETAIL
NOT TO SCALE

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

TRANS-MERIDIAN
ENGINEERS & SURVEYORS
345 QUEEN ST. SUITE 500
HONOLULU, HAWAII 96813

DENNIS T. SHIN
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Dennis T. Shin

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

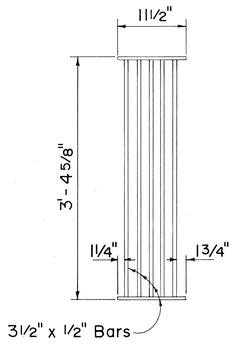
DRAINAGE DETAILS

HONOAPIILANI HIGHWAY
ALAELOA TO PINEAPPLE HILL
F.A. PROJECT NO. F-030-1(8)
SCALE: AS SHOWN DATE SEP. 1981

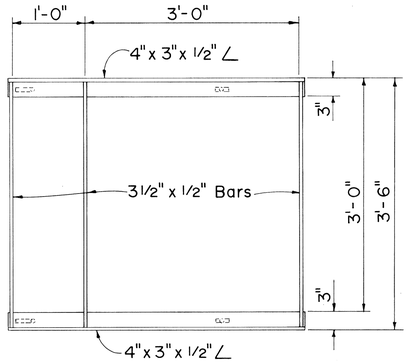
SHEET No. 10 OF 16 SHEETS

46
(46)

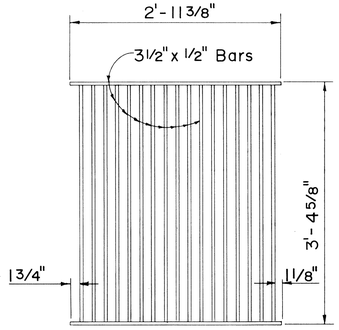
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.				



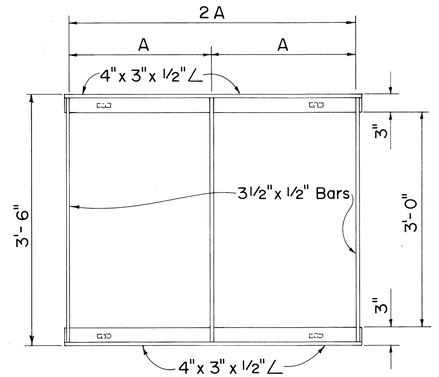
PLAN



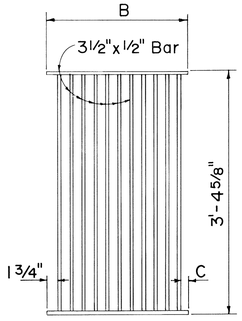
PLAN



PLAN



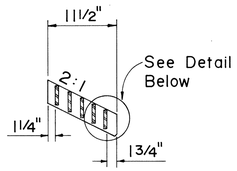
PLAN



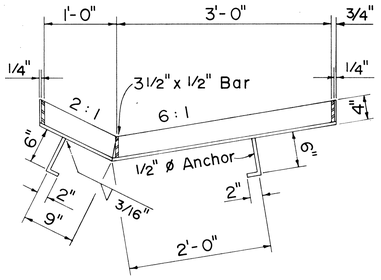
PLAN

GENERAL NOTE

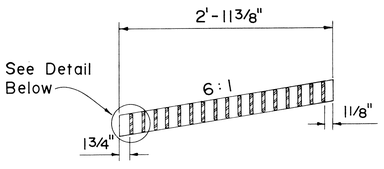
1. All welds 3/8" unless otherwise noted.



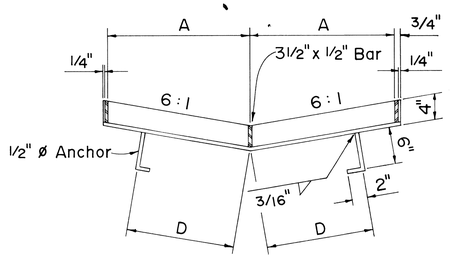
SECTION



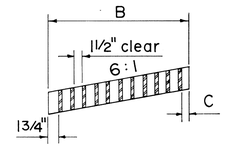
SECTION



SECTION

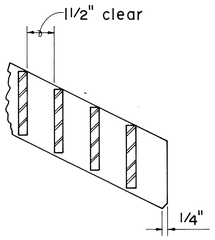


SECTION



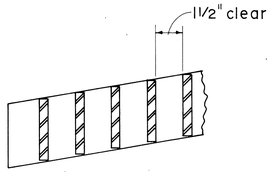
SECTION

GRATE



GRATE

FRAME



GRATE

FRAME

61614 OR 61616 STEEL FRAME AND GRATE

DIMENSIONS					
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"

APPROVAL RECOMMENDED:
T. Takano 6-19-79
HYDRAULIC DESIGN ENGINEER DATE

APPROVED:
Herbert Takeishi 6-22-79
ASSISTANT CHIEF, ENGINEERING DATE

NO.	REVISION	APPROVED BY	DATE
1.	Supersedes Sht. DH 8 & DH 9 approved 12-17-69	H.T.	6/22/79

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

61214, 61614 & 61616
STEEL FRAMES AND GRATES

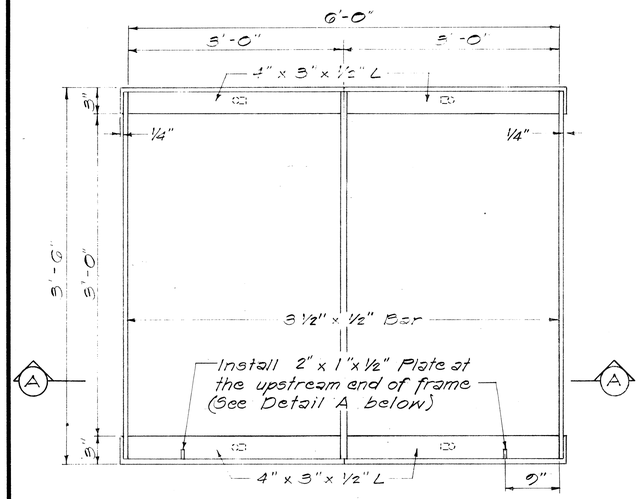
Not To Scale Date: Dec. 1977

SHEET No. OF SHEETS DH 8

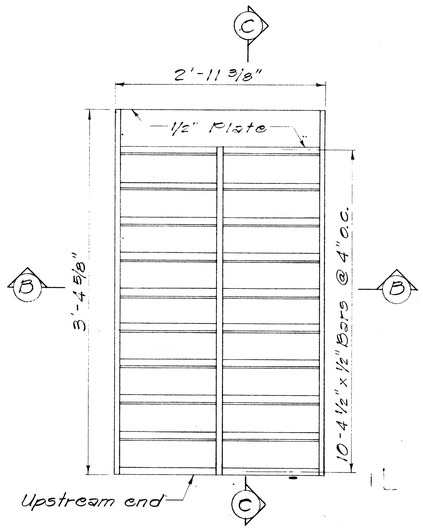
61214 STEEL FRAME AND GRATES

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

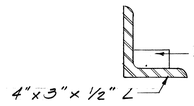
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F030-1(8)	1981	48	52



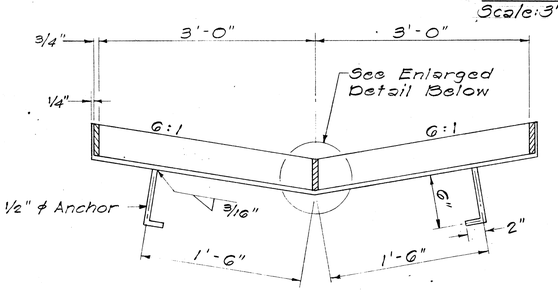
PLAN



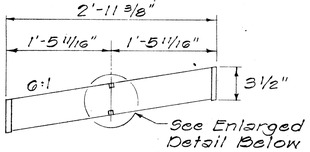
PLAN



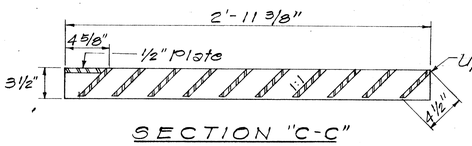
DETAIL A
Scale: 3"=1'-0"



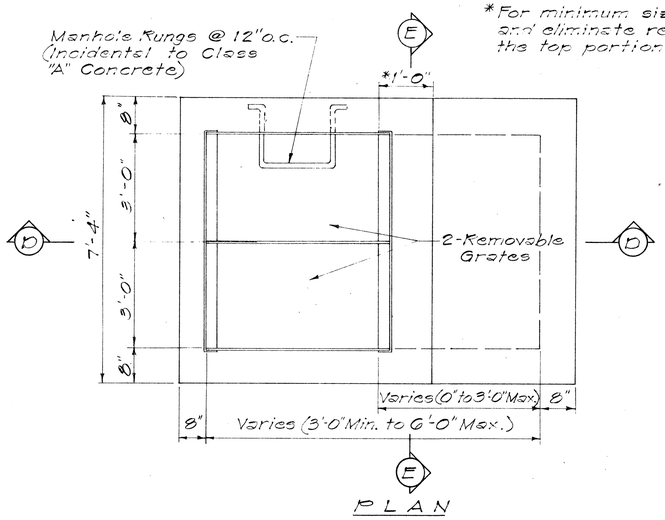
SECTION "A-A"



SECTION "B-B"

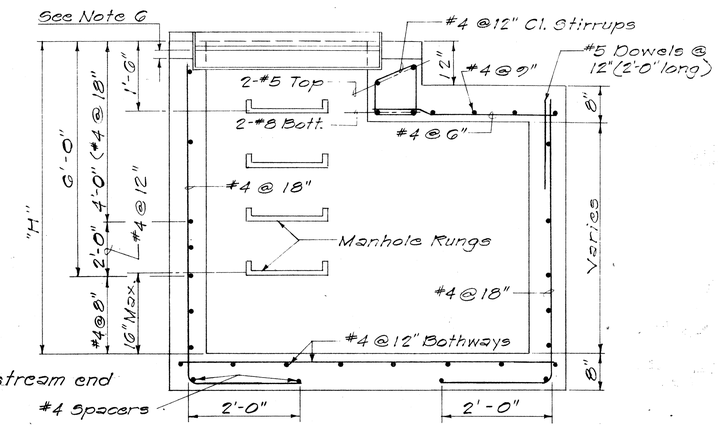


SECTION "C-C"

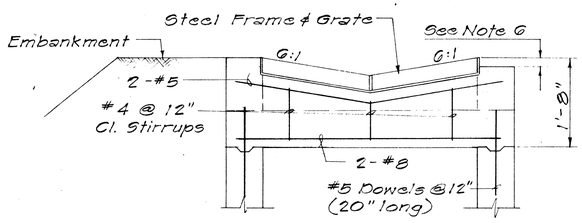


PLAN

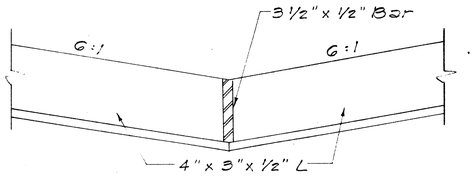
*For minimum size box of 3'-0", use 8" and eliminate reinforcing shown in the top portion.



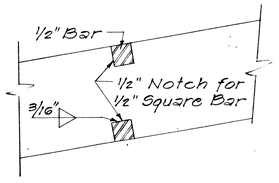
SECTION "D-D"



SECTION "E-E"
CONCRETE DROP INTAKE



DETAIL
FRAME



DETAIL
GRATE

GENERAL NOTES.

1. Frames and grates shall be hot-dip galvanized after fabrication, see specifications.
2. All welds 3/8" unless otherwise noted.
3. The Frame and Grate materials shall conform to the specifications of ASTM Designation Structural Steel A283, Grade D and Standard Specifications.
4. 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 a manhole.
5. Manhole Rungs (12" o.c.) are required when "H" is greater than 4 feet 6 inches. Only one rung (16 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.
6. Concrete - Gutter Type 2 (G1G1G) Top of concrete wall for Drop Intake shall be flush with top of steel frame for grate as directed by the Engineer in the field.

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DRAINAGE DETAILS

HONOAPIILANI HIGHWAY
Alaeloa to Pineapple Hill
F.A. Proj. No. F-030-1(8)

Scale: Not to Scale Date: SEP 1981

SHEET NO. 12 OF 16 SHEETS

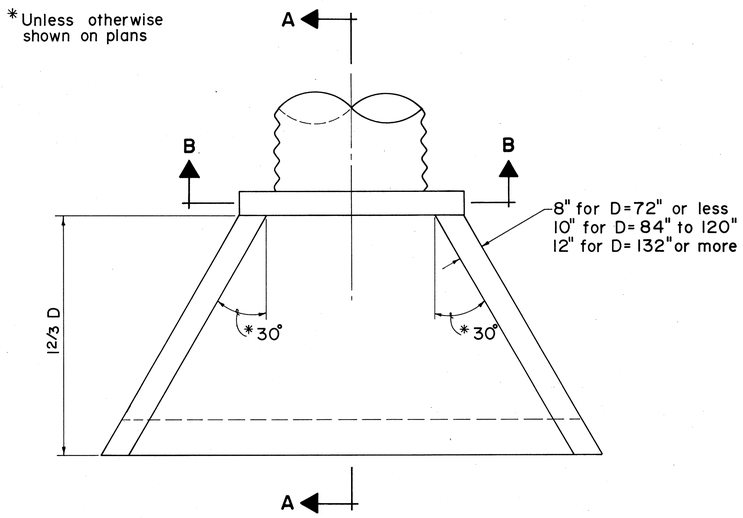
TYPE G1G1G-45° STEEL FRAME AND GRATE AND DROP INTAKE

A-2-4

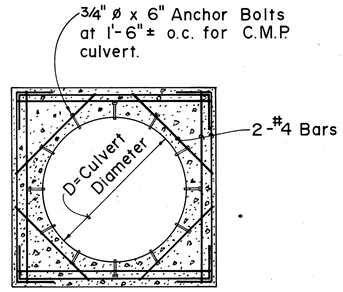
K+E TRACING PAPER

4183

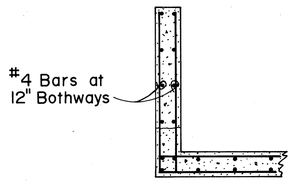
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	49	92



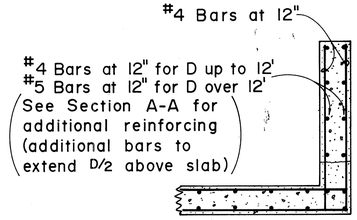
PLAN



SECTION B-B

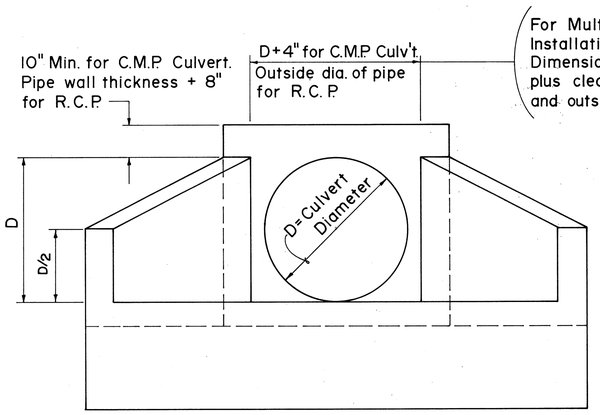


8" WING WALL

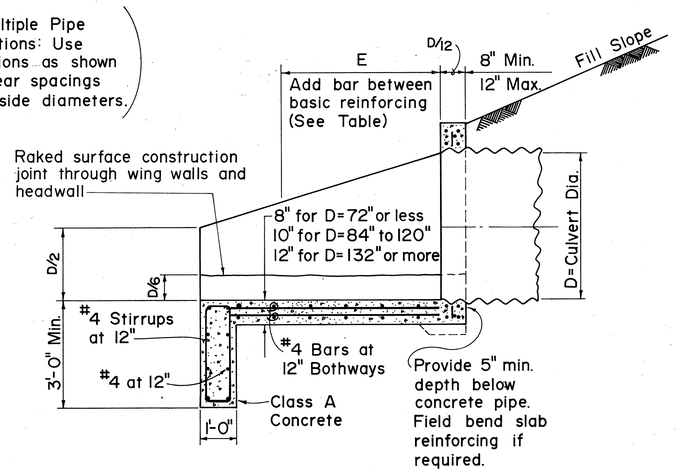


10" TO 12" WING WALLS

TYPICAL WING WALL REINFORCING



FRONT ELEVATION



SECTION A-A

CULVERT DIA. (INCHES)	ADD BAR SIZE	E (FEET)
108	#4	3
120	#4	5
144	#5	8
180	#7	11

ADDITIONAL REINFORCING

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

APPROVAL RECOMMENDED:
T. Takano — HYDRAULIC DESIGN ENGINEER — 6-19-79 DATE

APPROVED:
Herbert Zaleski — ASSISTANT CHIEF, ENGINEERING — 6-22-79 DATE

NO.	REVISION	APPROVED BY	DATE
1.	Supersedes Sht. DH 13 approved 12-17-69	H.F.	6/22/79

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

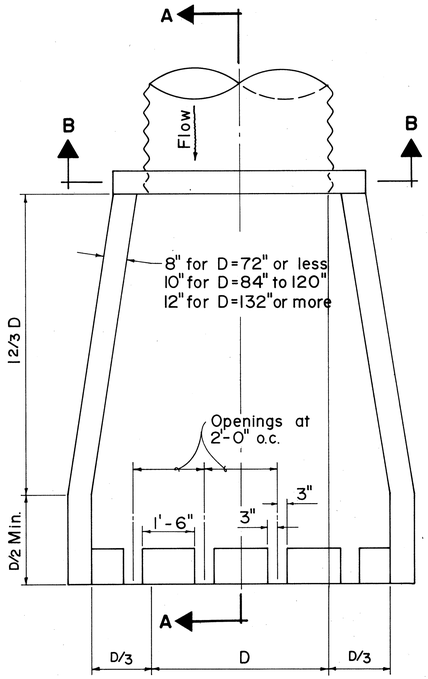
INLET STRUCTURES

Not To Scale — Date: Dec. 1977

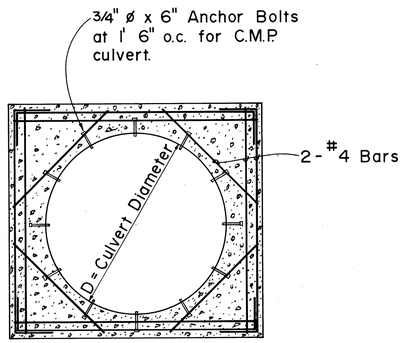
SHEET NO. 13 OF 16 SHEETS DH 13

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

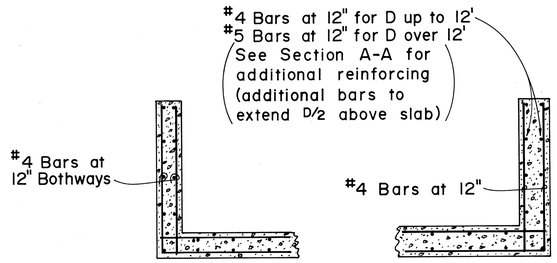
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	50	92



PLAN

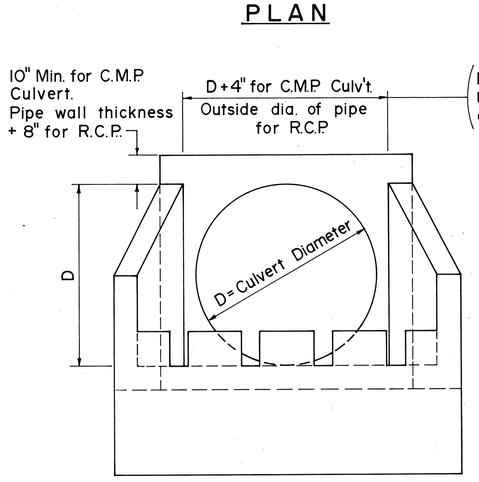


SECTION B-B

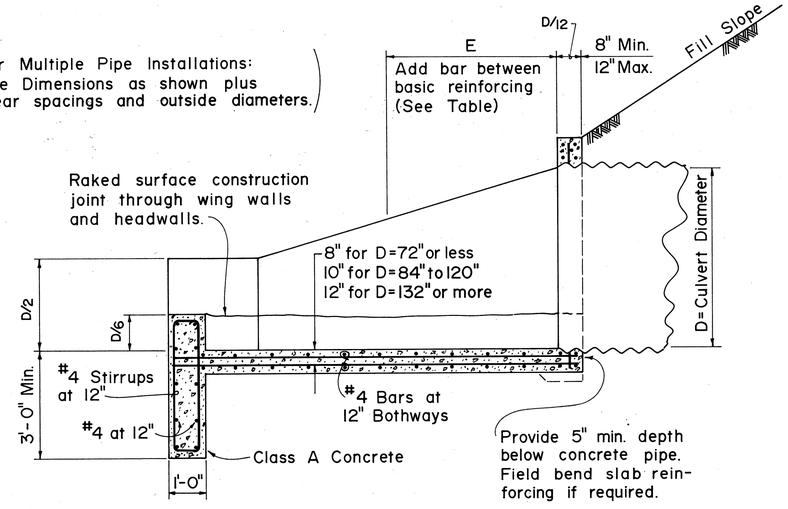


8" WING WALL 10" TO 12" WING WALLS

TYPICAL WING WALL REINFORCING



FRONT ELEVATION



SECTION A-A

CULVERT DIA. (INCHES)	ADD BAR SIZE	E (FEET)
108	#4	3
120	#4	5
144	#5	8
180	#7	11

ADDITIONAL REINFORCING

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

APPROVAL RECOMMENDED:
T. Takano
HYDRAULIC DESIGN ENGINEER 6-19-79 DATE

APPROVED:
Herbert Takeishi
ASSISTANT CHIEF, ENGINEERING 6-22-79 DATE

NO.	REVISION	APPROVED BY	DATE
1.	Supersedes Sht. DH 15 approved 12-17-69	H.T.	6/22/79

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

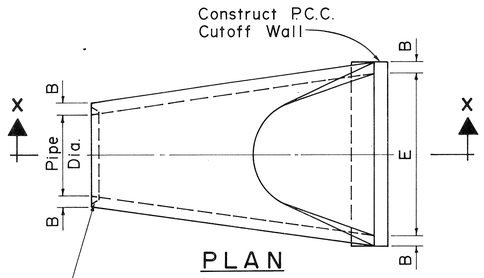
OUTLET STRUCTURE

Not To Scale Date: Dec. 1977

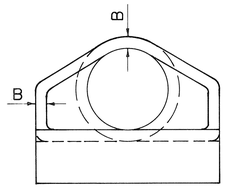
SHEET No. 14 OF 16 SHEETS DH 15

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

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(9)	1981	51	92



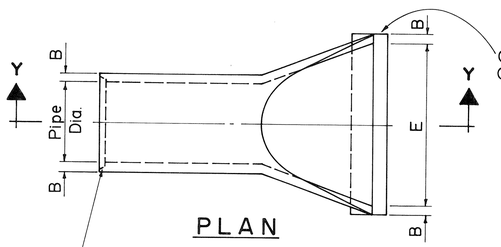
SECTION X-X



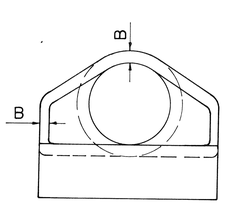
*C dimension shall be as desired by manufacturer and will be paid for at the price paid for concrete pipe.

MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	SLOPE
12"	4"	2"		2'-0"	2'-0"	2:1 or Flatter
18"	9"	2½"		2'-3"	3'-0"	
24"	9½"	3"		3'-7½"	4'-0"	
30"	1'-0"	3½"		4'-6"	5'-0"	
36"	1'-3"	4"		5'-3"	6'-0"	
42"	1'-9"	4½"		5'-3"	6'-6"	
48"	2'-0"	5"		6'-0"	7'-0"	
54"	2'-3"	5½"		5'-5"	7'-6"	

PRECAST CONCRETE FLARED END SECTION TYPE A



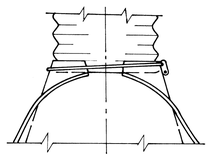
SECTION Y-Y

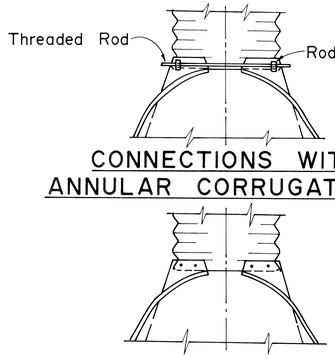


*C dimension shall be as desired by manufacturer and will be paid for at the price paid for concrete pipe.

MINIMUM DIMENSIONS						
PIPE DIA.	A	B	C*	D	E	SLOPE
12"	4"	1¾"		1'-10"	2'-0"	2:1 or Flatter
18"	9"	2"		2'-1"	3'-0"	
24"	9½"	2½"		3'-6"	4'-0"	
30"	1'-0"	3"		4'-5"	5'-0"	
36"	1'-3"	3⅜"		5'-2"	6'-0"	
42"	1'-9"	3¾"		5'-3"	6'-6"	
48"	2'-0"	4¼"		6'-0"	7'-0"	
54"	2'-3"	4⅝"		5'-6"	6'-10"	

PRECAST CONCRETE FLARED END SECTION TYPE B

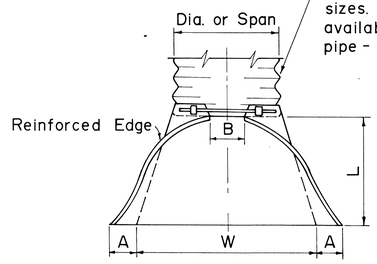




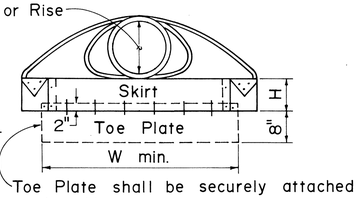
CONNECTIONS WITH ANNULAR CORRUGATIONS

ALTERNATIVE CONNECTIONS

12" Connector Section available for all sizes. This is the only connection available for 64" x 43" thru 83" x 57" pipe - arch.

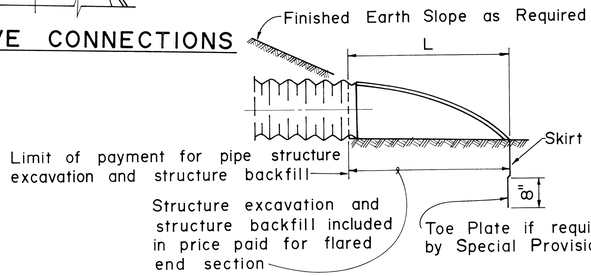


PLAN



Toe Plate shall be securely attached to the skirt

ELEVATION



TYPICAL CROSS-SECTION

GENERAL NOTES

1. All 3pc. bodies to have 0.109" thick sides and 0.138" thick center panels. Width of center panels to be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams which are to be tightly joint by 3/8" galvanized rivets or bolts.
2. Reinforced edges to be supplemented with galvanized stiffener angles for the 60" thru 84" round, 77" x 52" and 83" x 57" pipe - arch sizes. The angles will be 2" x 2" x 1/4" for the 60" thru 72" round, 77" x 52" and 83" x 57" pipe - arch sizes and 2½" x 2½" x 1/4" for 78" and 84" round. The angles to be attached by 3/8" galvanized nuts and bolts.
3. Angle reinforcement will be placed under the center panel seams on the 77" x 52" and 83" x 57" pipe - arch sizes.
4. Galvanized toe plate to be available as an accessory when specified.
5. End of pipe to be finished with annular corrugations to conform to flared end section so that no leakage results from the connection. Other designs may be used with approval of the Engineer.
6. Contractor has the option of using either Type A or B "Precast Concrete Flared End Section".

CIRCULAR PIPES							
PIPE DIA.	THICKNESS	DIMENSIONS-INCHES A 1±	B MAX.	H 1±	L 1½±	W 2±
12"	0.064"	6	6	6	21	24
15"	0.064"	7	8	6	26	30
18"	0.064"	8	10	6	31	36
21"	0.064"	9	12	6	36	42
24"	0.064"	10	13	6	41	48
30"	0.079"	12	16	8	51	60
36"	0.079"	14	19	9	60	72
42"	0.109"	16	22	11	69	84
48"	0.109"	18	27	12	78	90
54"	0.109"	18	30	12	84	102
60"	0.109"	18	33	12	87	114
66"	0.109"	18	36	12	87	120
72"	0.109"	18	39	12	87	126
78"	0.109"	18	42	12	87	132
84"	0.109"	18	45	12	87	138

PIPE - ARCHES								
INCHES SPAN	INCHES RISE	THICKNESS	DIMENSIONS-INCHES A 1±	B MAX.	H 1±	L 1½±	W 2±
21	15	0.064"	7	10	6	23	36
24	18	0.064"	8	12	6	28	42
28	20	0.064"	9	14	6	32	48
35	24	0.079"	10	16	6	39	60
42	29	0.079"	12	18	8	46	75
49	33	0.102"	13	21	9	53	85
57	38	0.102"	18	26	12	63	90
64	43	0.102"	18	30	12	70	102
71	47	0.102"	18	33	12	77	114
77	52	0.102"	18	36	12	77	126
83	57	0.102"	18	39	12	77	138

NO.	REVISION	APPROVED BY	DATE
1.	Replaces Sht. DH 14 approved 12-17-69	H.T.	6/22/79

APPROVAL RECOMMENDED:
T. Takane — 6-14-79
HYDRAULIC DESIGN ENGINEER — DATE

APPROVED:
Herbert Zakahashi — 6-22-79
ASSISTANT CHIEF, ENGINEERING — DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

FLARED END SECTION FOR CULVERTS

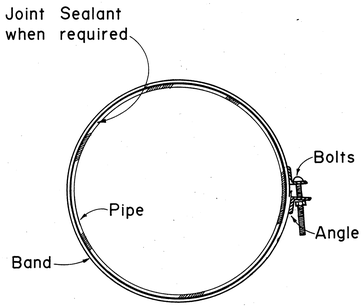
Not To Scale — Date June 1979

SHEET No. 15 OF 16 SHEETS DH 14

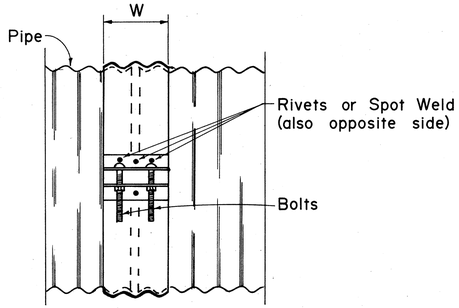
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

FLARED END SECTIONS FOR C.M.P. CULVERTS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	F-030-1(8)	1981	52	52

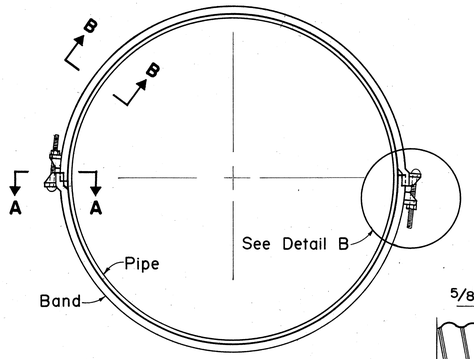


END VIEW

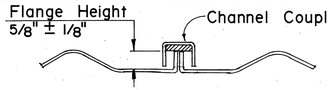


SIDE VIEW

ANNULAR COUPLING BAND

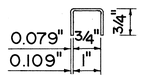


END VIEW

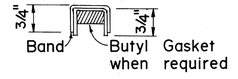


SECTION B-B

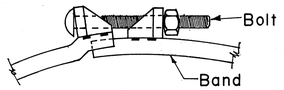
BOX END LUG CONNECTOR



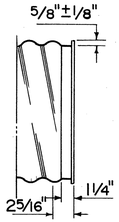
CHANNEL BAND



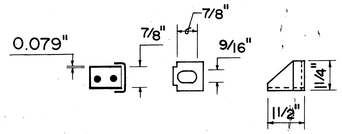
SECTION A-A



DETAIL B



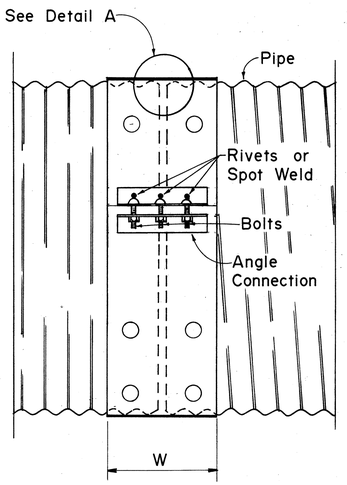
REFORMED END



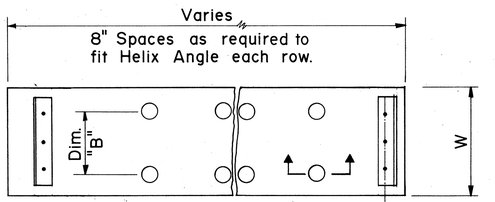
DETAIL LUG

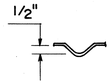
GENERAL NOTES

1. All coupling band connection hardware shall be galvanized or electro plated in accordance with Standard Specifications.
2. For pipe arches use same width band as for round pipe of same periphery.
3. Two pieces band required for pipe greater than 48" diameter.
4. Fillet welds of equivalent strengths may be substituted for spot welds or rivets.
5. Dimensions and thickness shown are in inches and are nominal.
6. Band thickness shall be not more than 2 standard thicknesses lighter than the thickness of the pipe; and, in no case shall be lighter than 0.079 inch.



DETAIL A



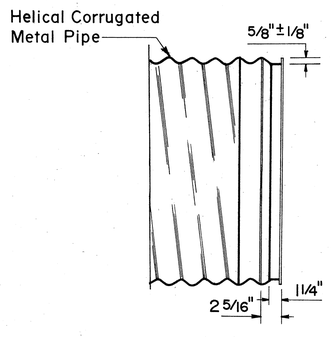


SECTION THRU DIMPLES

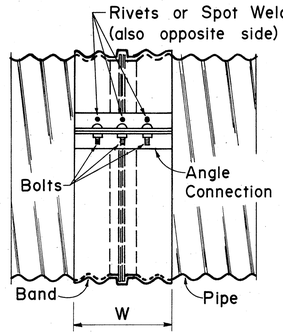
UNIVERSAL COUPLING BAND ANGLE CONNECTION

COUPLING TYPE	CORRUGATION	PIPE SIZE	W	PIPE WALL THICKNESS	ANGLE CONNECTIONS-QUANTITIES PER CONNECTION DIMENSIONS	BOLTS	RIVETS	SPOT WELD
UNIVERSAL	2 2/3 x 1/2	12 - 36	10 1/2	0.079-0.138	2 ea 2 x 2 x 3/16 x 7	2 ea 1/2 x 6	3 ea 3/8	3 ea 1/2
		42- 60	16 1/2	0.168	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	5 ea 1/2
		66-84	16 1/2	0.168	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	
	3 x 1	36 - 72	10 1/2	0.079-0.138	2 ea 2 x 2 x 3/16 x 7	2 ea 1/2 x 6	3 ea 3/8	
		78-120	16 1/2	0.079-0.138	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	
ANNULAR	2 2/3 x 1/2	12 - 36	7	0.079-0.138	2 ea 2 x 2 x 3/16 x 7	2 ea 1/2 x 6	3 ea 3/8	3 ea 1/2
		42 - 72	12	0.079-0.168	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	5 ea 1/2
		78 - 84	12	0.168	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	5 ea 1/2
	3 x 1	36 - 42	14	0.079-0.109	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	
		48-84	14	0.079-0.109	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	5 ea 1/2
		90-120	14	0.079-0.109	2 ea 2 x 2 x 3/16 x 12	3 ea 1/2 x 6	4 ea 3/8	

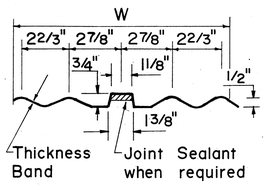
CHANNEL COUPLING BAND FOR USE ON REFORMED END C.M.P.



REFORMED END



SIDE VIEW



SECTION

WING CHANNEL COUPLING BAND FOR REFORMED END H.C.M.P.

COUPLING TYPE	CORRUGATION	PIPE SIZE	W	PIPE WALL THICKNESS	LUG TYPE CONNECTORS-QUANTITIES PER CONNECTION DIMENSIONS	BOLTS	SPOT WELD
CHANNEL	2 2/3 x 1/2	12 - 72		0.079-0.138	2 ea Lugs	1 ea 1/2 x 6	4 ea 1/2
	3 x 1	36 - 72		0.079-0.138	2 ea Lugs	1 ea 1/2 x 6	4 ea 1/2
WING	2 2/3 x 1/2	12 - 72	12	0.079-0.138	6 ea Lugs	3 ea 1/2 x 6	12 ea 1/2
		78-84	12	0.168	6 ea Lugs	3 ea 1/2 x 6	12 ea 1/2
	3 x 1	36-120	12	0.079-0.109	6 ea Lugs	3 ea 1/2 x 6	12 ea 1/2

APPROVAL RECOMMENDED:
R. Takano
HYDRAULIC DESIGN ENGINEER — 9-7-79 DATE

APPROVED:
Hubert S. Sakioka
ASSISTANT CHIEF, ENGINEERING — 9-14-79 DATE

NO.	REVISION	APPROVED BY	DATE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STANDARD DETAILS

C.M.P. COUPLING DETAILS
STANDARD JOINT

Not To Scale — Date: Sept. 1979

SHEET No. 16 OF 16 SHEETS DH 18

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