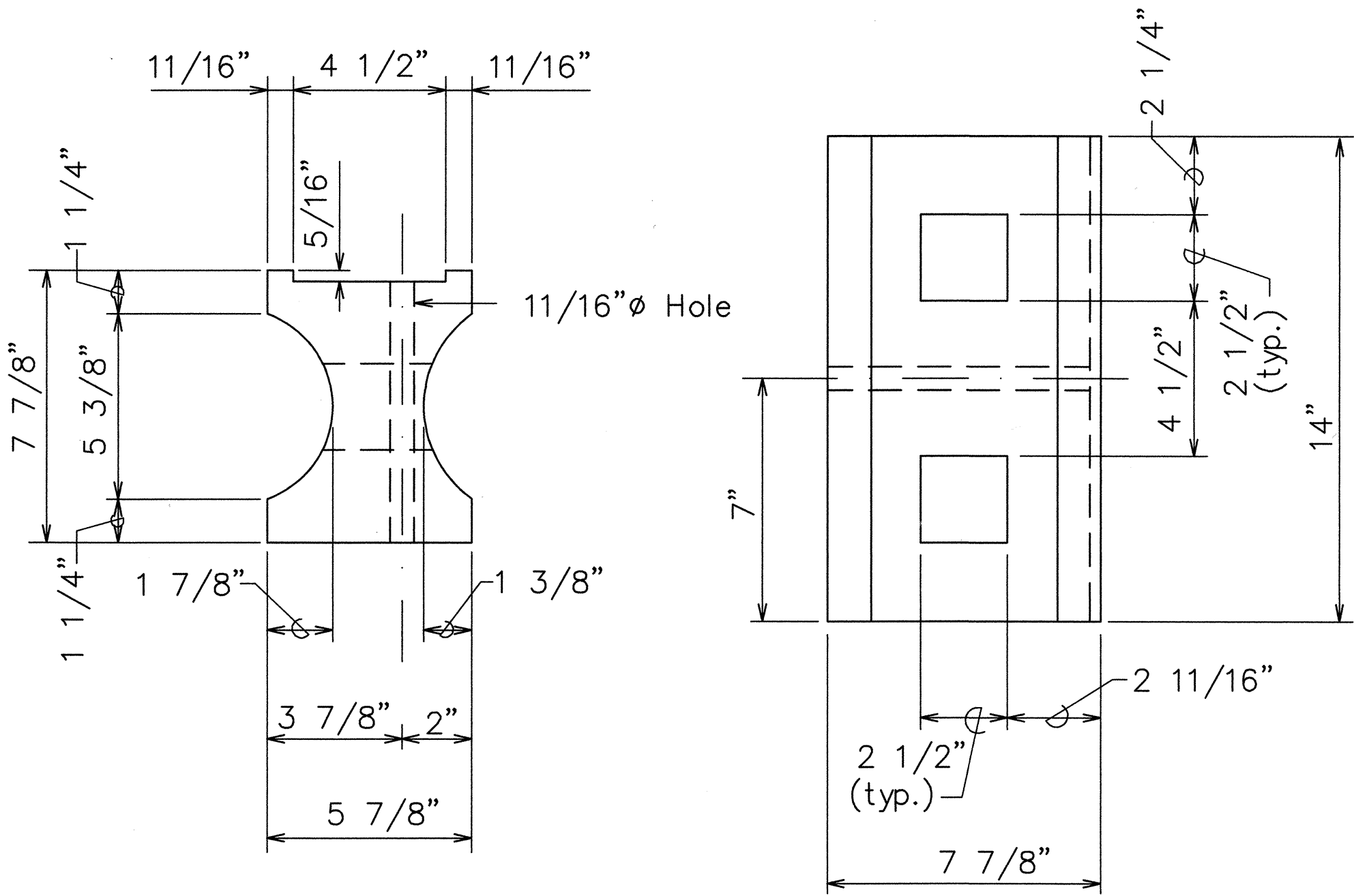
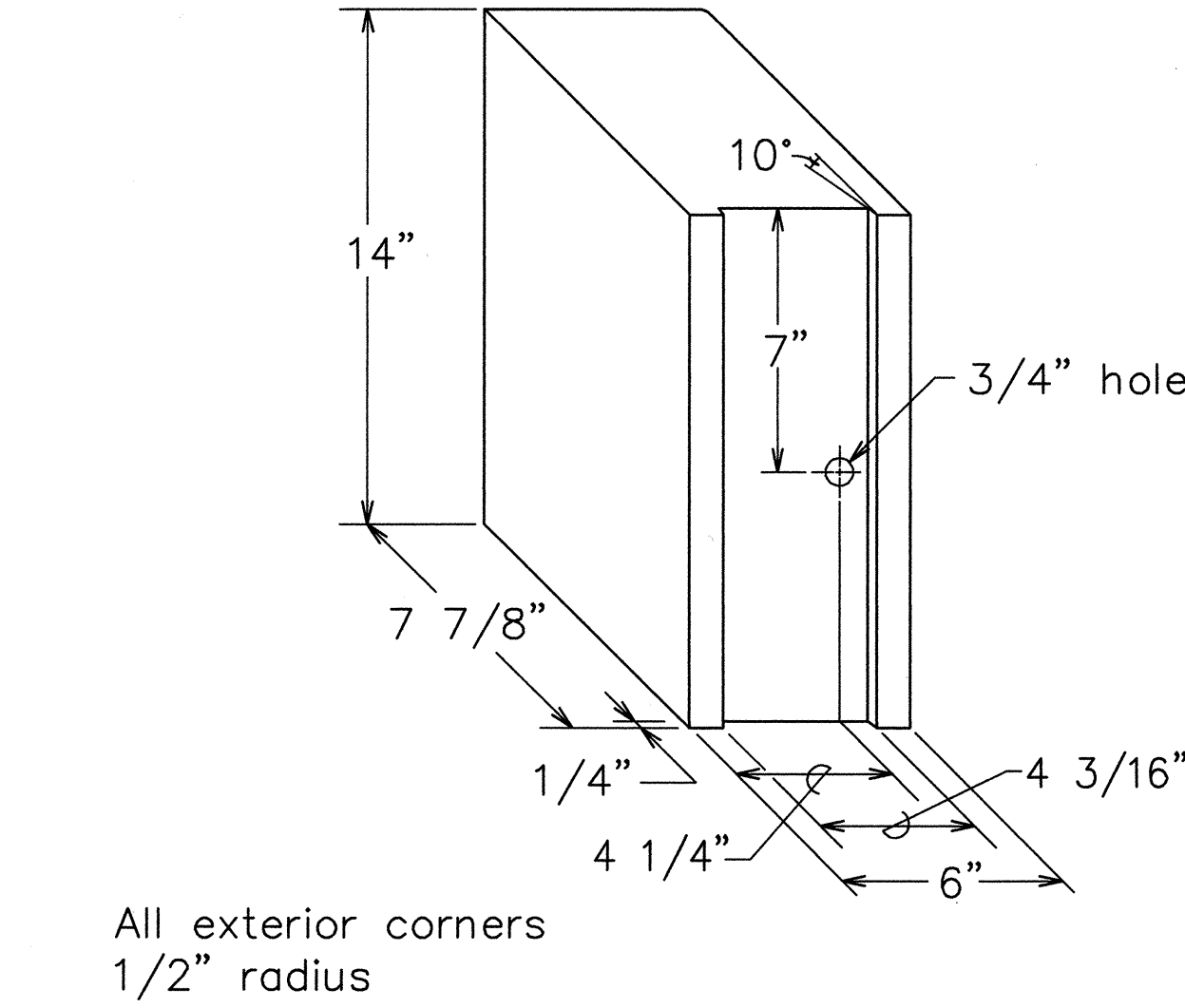


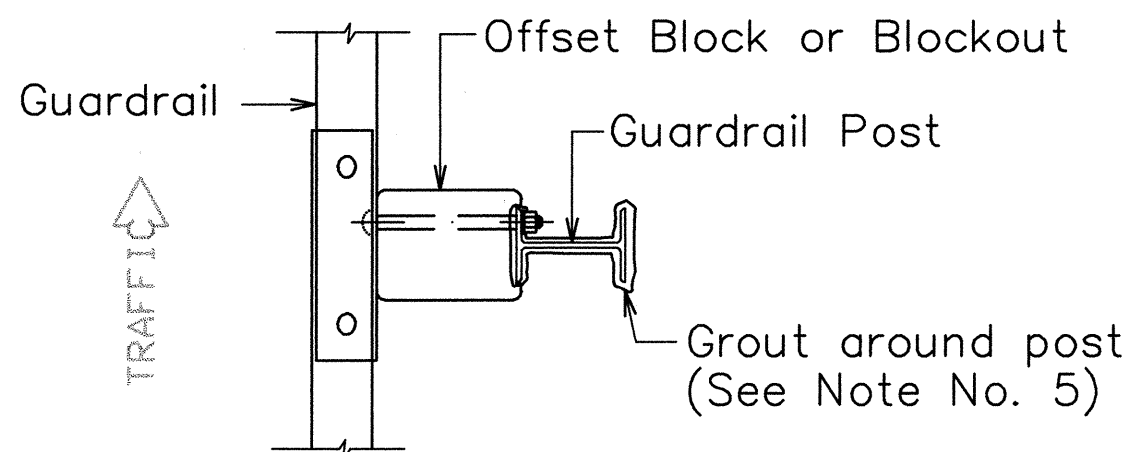
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	14	84



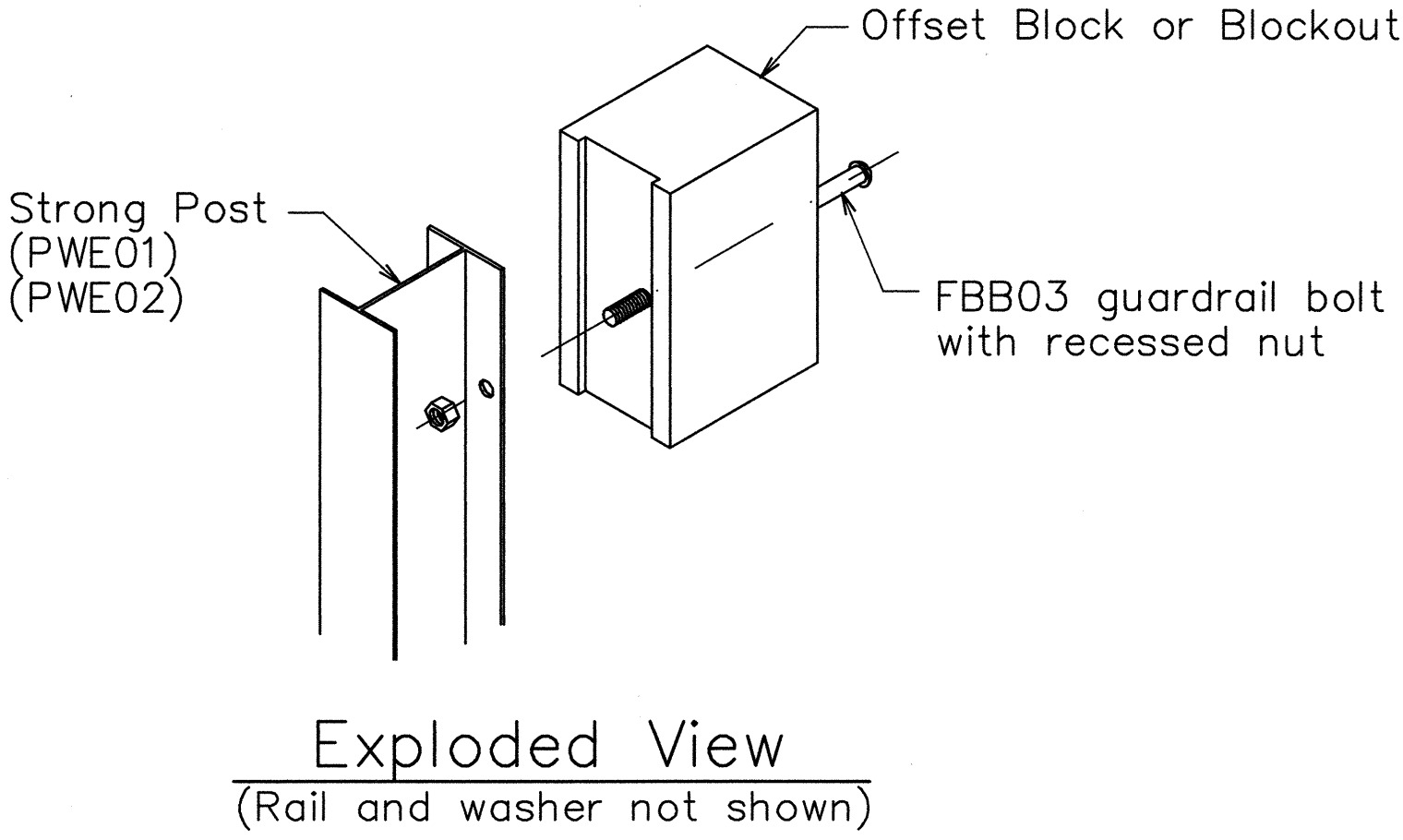
TOP
SIDE
RECYCLED PLASTIC BLOCKOUT (TYPE I)



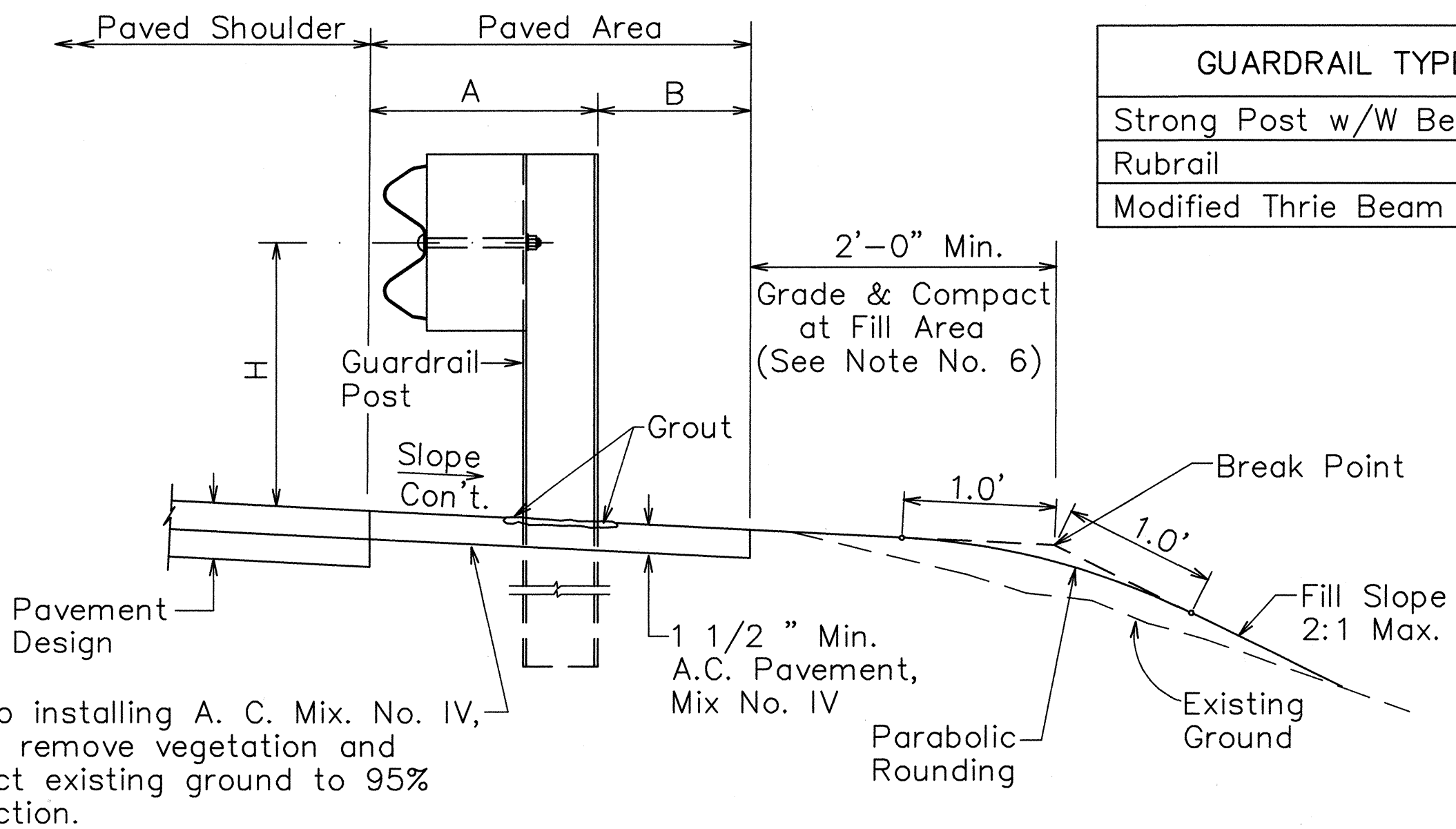
RECYCLED POLYETHELENE
OFFSET BLOCK (TYPE II)



PLAN



STEEL POST AND BLOCK DETAIL



ELEVATION

TYPICAL GUARDRAIL INSTALLATION

GENERAL NOTES

1. All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
2. Where conditions require, special post lengths in increments of 6 inches may be specified.
3. All fasteners, posts, and rail elements (i.e. FBB03, PWE01, RWM02b, etc.) shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, Subcommittee On New Highway Materials, Task Force 13 Report. Dimensions of fasteners, posts and rail elements have been converted from metric units into their present form.
4. The Recycled Plastic Block or Offset Block shall be approved by the State.
5. After the guardrail posts are installed in the paved area, the Contractor shall grout around the guardrail post and seal all cracks in the paved area that was caused during the guardrail post installation. If required by the inspector/engineer, the Contractor shall tamper the paved area around the guardrail post prior to grouting. The cost for this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
6. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.

GUARDRAIL TYPE	DIMENSION		
	H	A	B
Strong Post w/W Beam	1'-9 5/8"	1'-6"	1'-0"
Rubrail	2'-0"	1'-6"	2'-0"
Modified Thrie Beam	2'-0"	2'-0"	1'-0"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES

INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. B1 OF 10 SHEETS

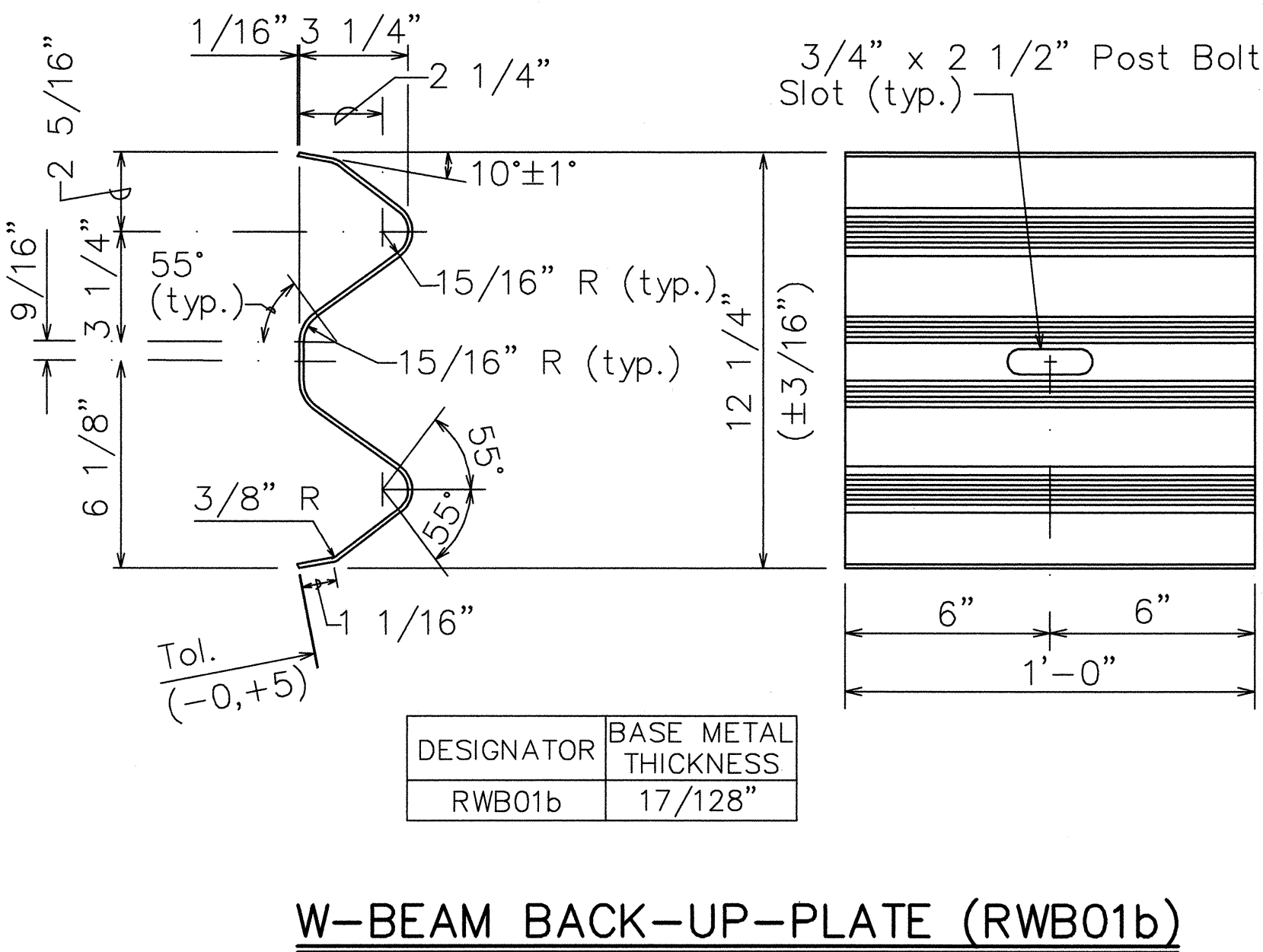
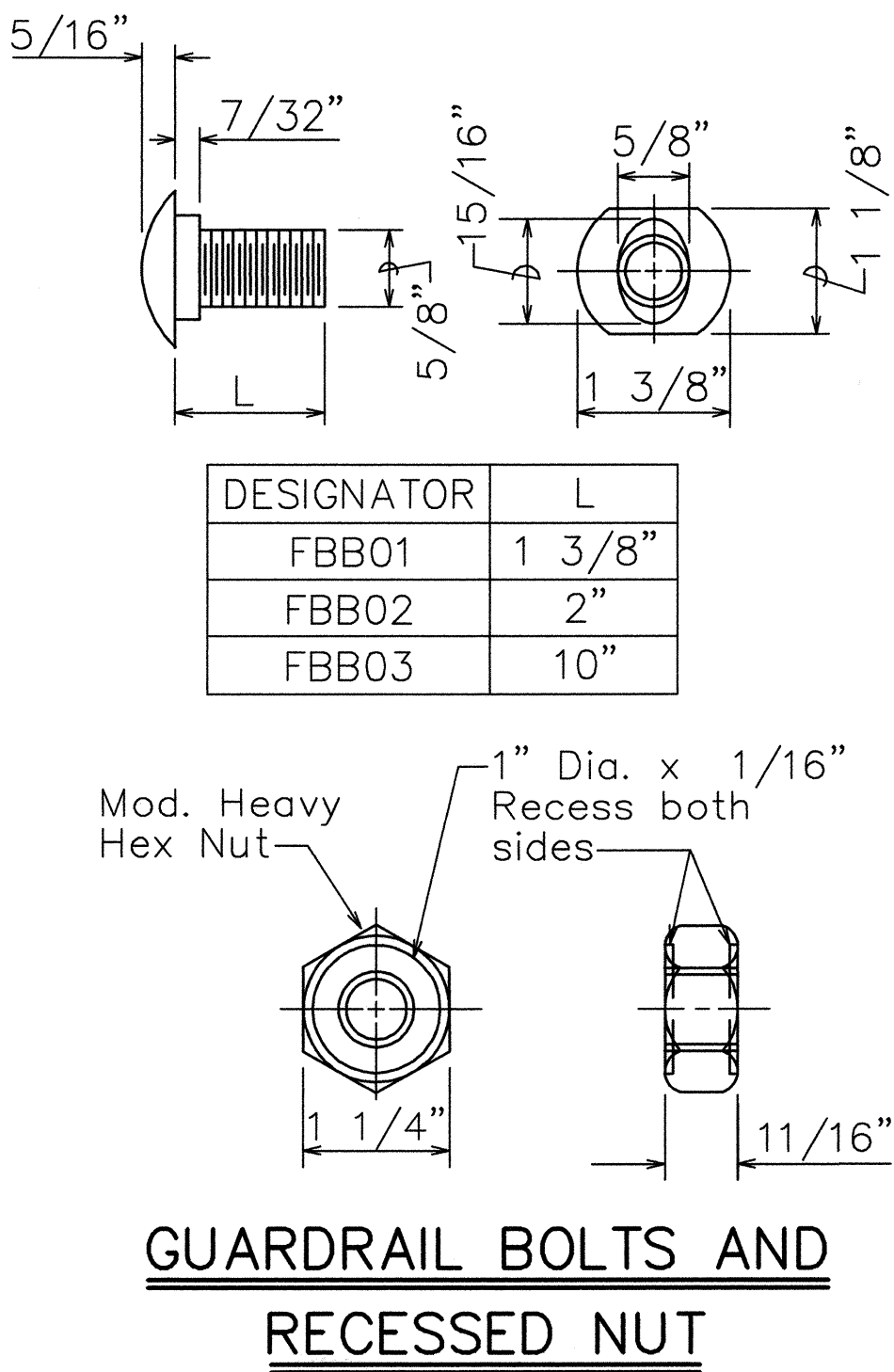
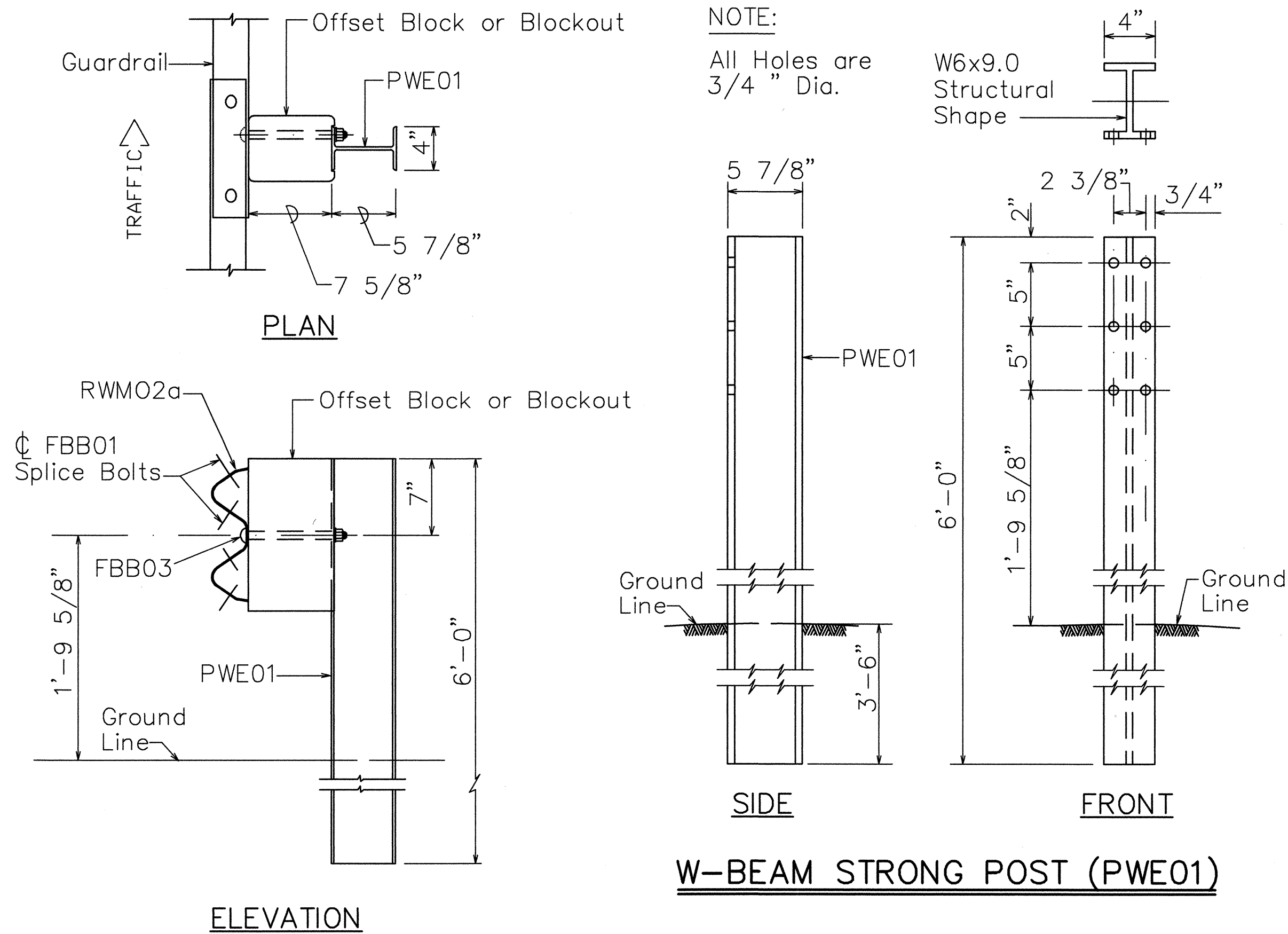
DATE: 04/28/99
SCALE: 1" = 1'
FILE: 9814-94

PM: BST
OPER: SHA*FAI
REVISED: 04/30/99

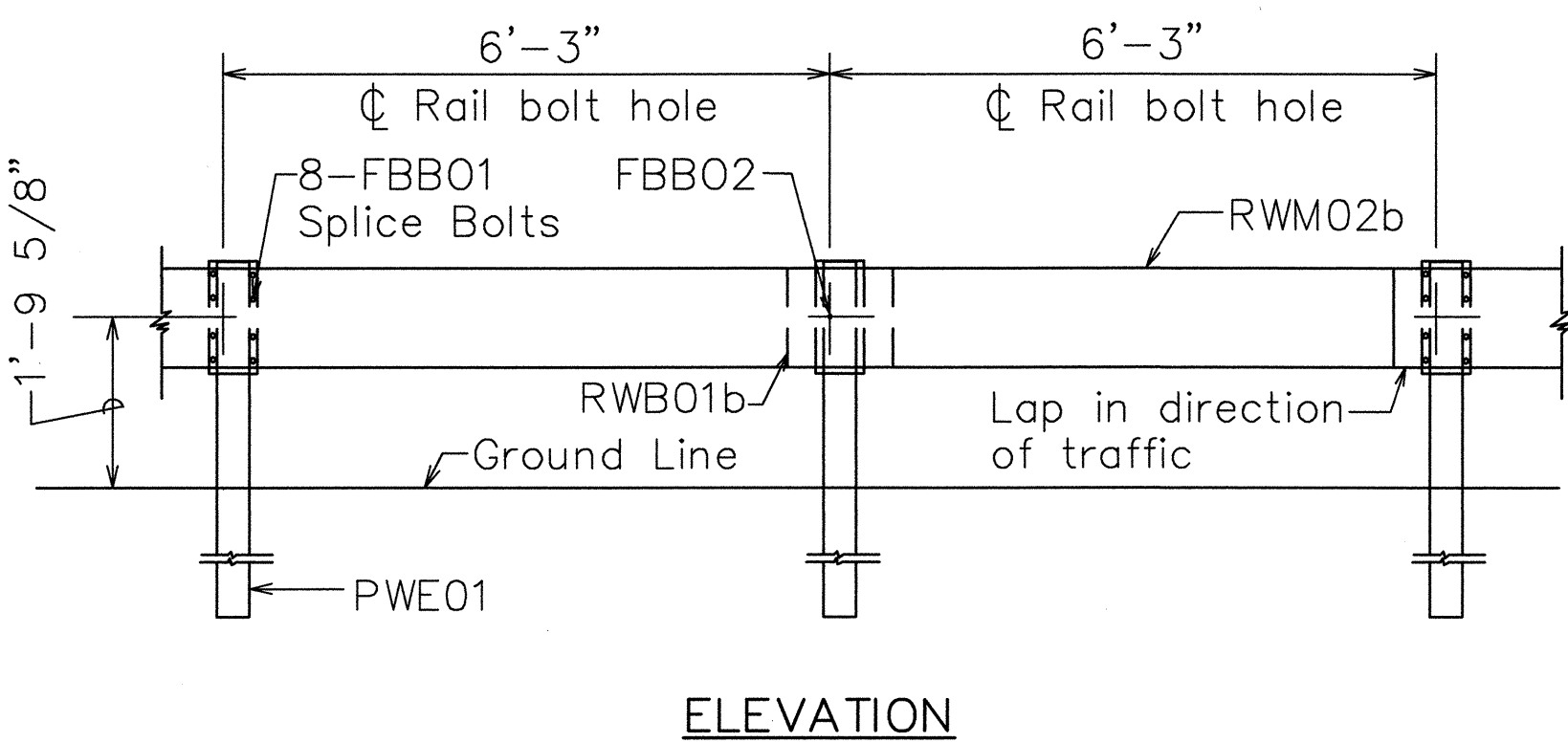
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DRAWN BY: _____
DESIGNED BY: _____
CHECKED BY: _____

ORIGINAL PLAN _____
NOTESBOOK _____
No. _____

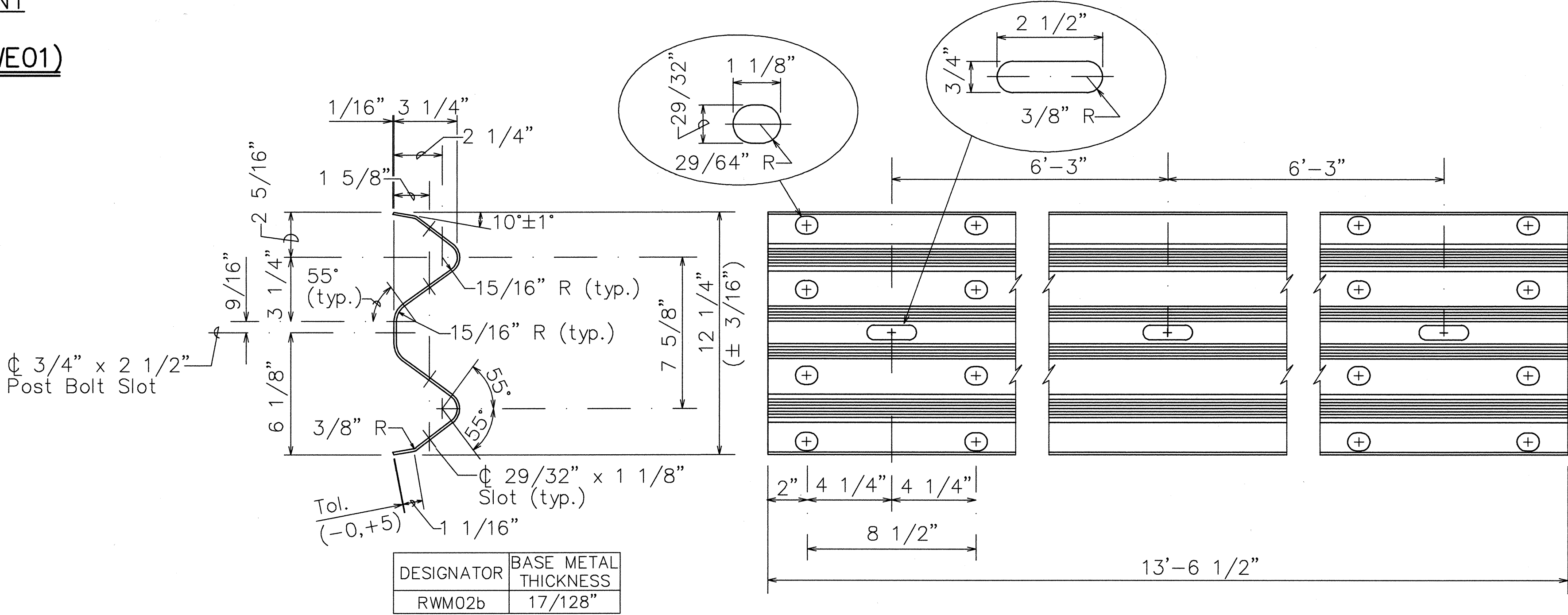
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	15	84



STRONG POST W-BEAM GUARDRAIL (SGR04a)



STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



2 SPACE W-BEAM GUARDRAIL (RRWM02b)

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

STRONG POST

W-BEAM GUARDRAIL

INTERSTATE ROUTE H-1 RESURFACING

Kunia IC to Waialeale Stream Bridge

F.A.I. Project No. NH-H1-1(235)

Scale: As Shown

Date: Apr. 30, 1999

SHEET NO. B2 OF 10 SHEETS

75

DATE: 04/28/99

SCALE: 1" = 1'

FILE: 9814-95

PM: BST

OPER: SHA CDK*FAI

REVISED: 4/29/99

SURVEY PLOTTED BY

DRAWN BY

DESIGNED BY

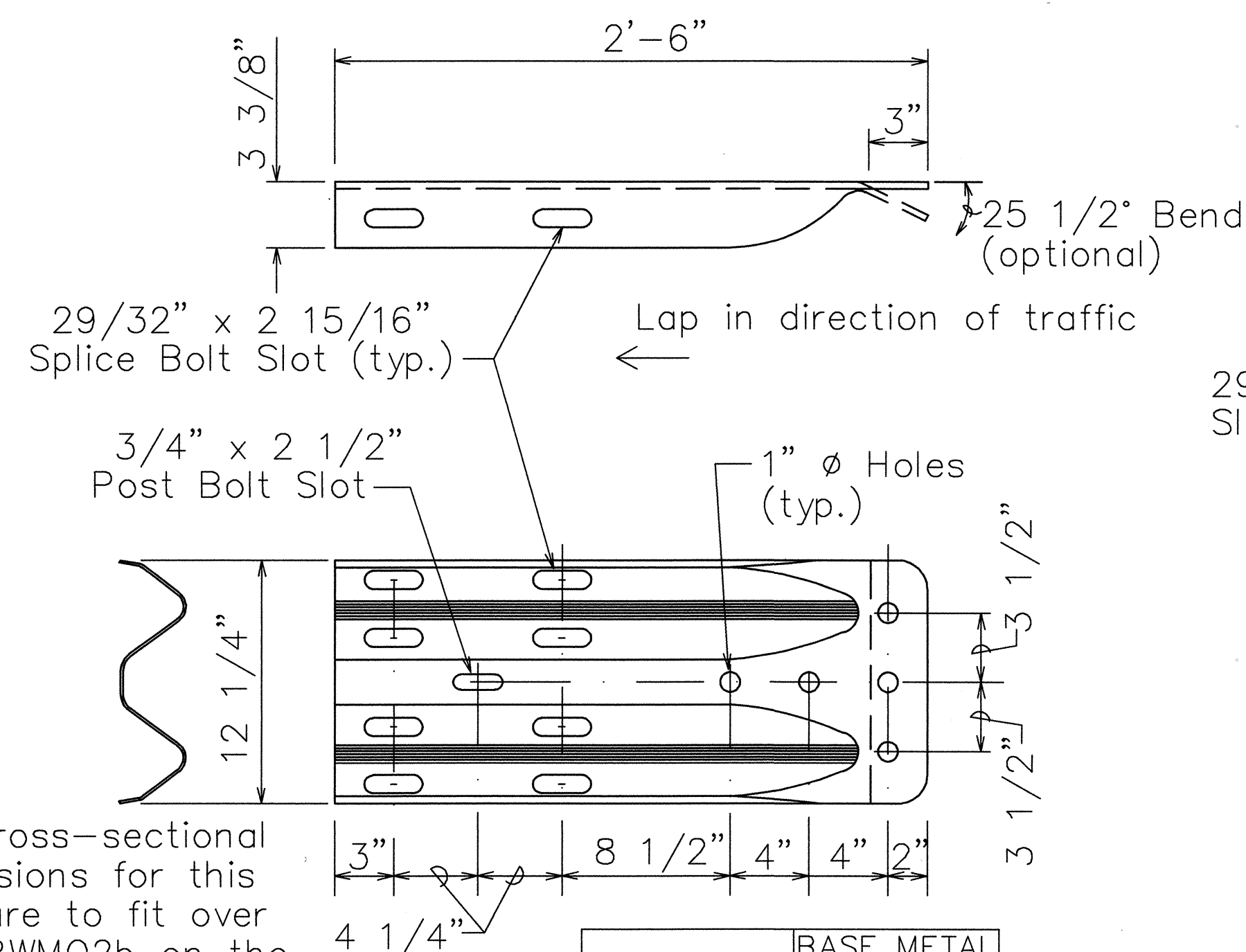
CHECKED BY

ORIGINAL PLAN

NOTEBOOK

No.

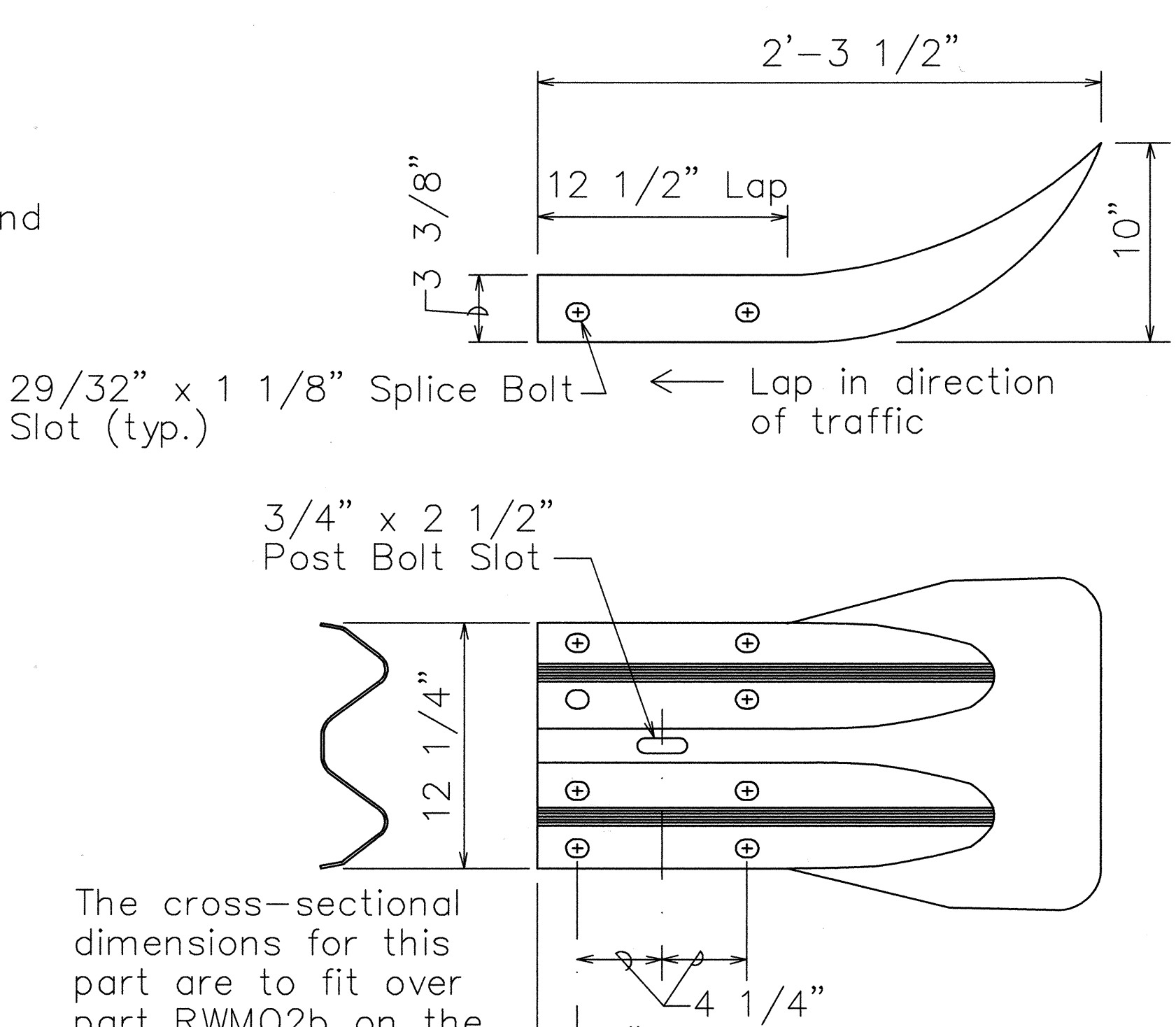
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	16	84



The cross-sectional dimensions for this part are to fit over part RWM02b on the approach end and under part RWM02b on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE02b	17/128"

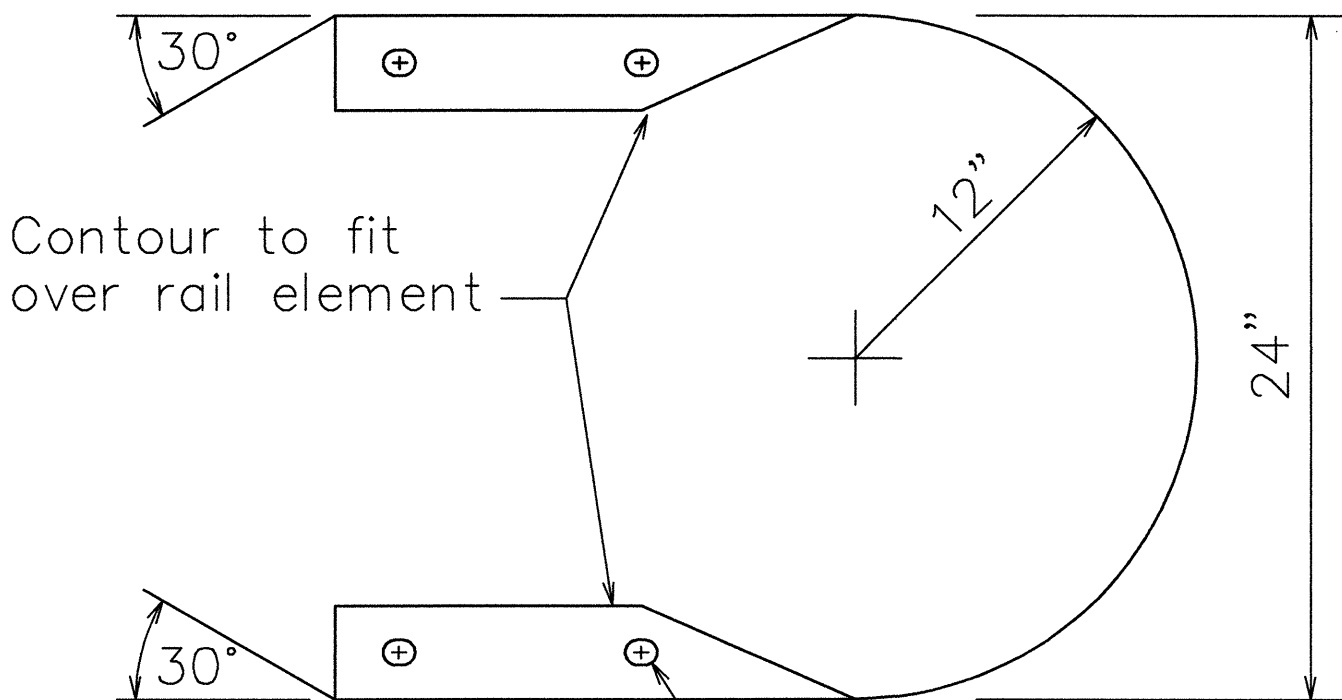
W-BEAM TERMINAL CONNECTOR (RWE02b)



The cross-sectional dimensions for this part are to fit over part RWM02b on the approach end and under part RWM02b on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE01b	17/128"

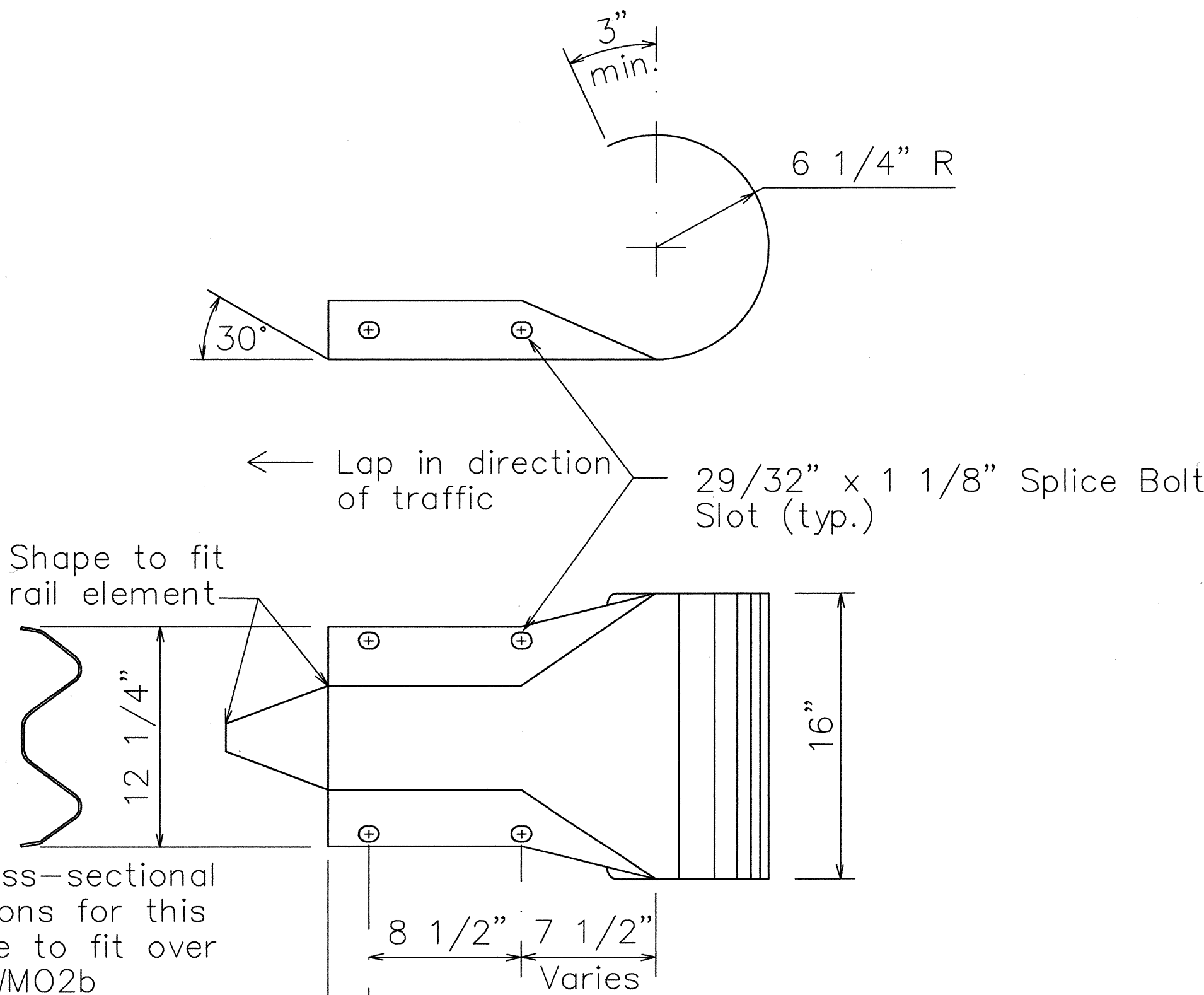
W-BEAM END SECTION (FLARED RWE01b)



The cross-sectional dimensions for this part are to fit over part RWM02b

DESIGNATOR	BASE METAL THICKNESS
RWE06b	17/128"

W-BEAM END SECTION (BUFFER RWE06b)



The cross-sectional dimensions for this part are to fit over part RWM02b

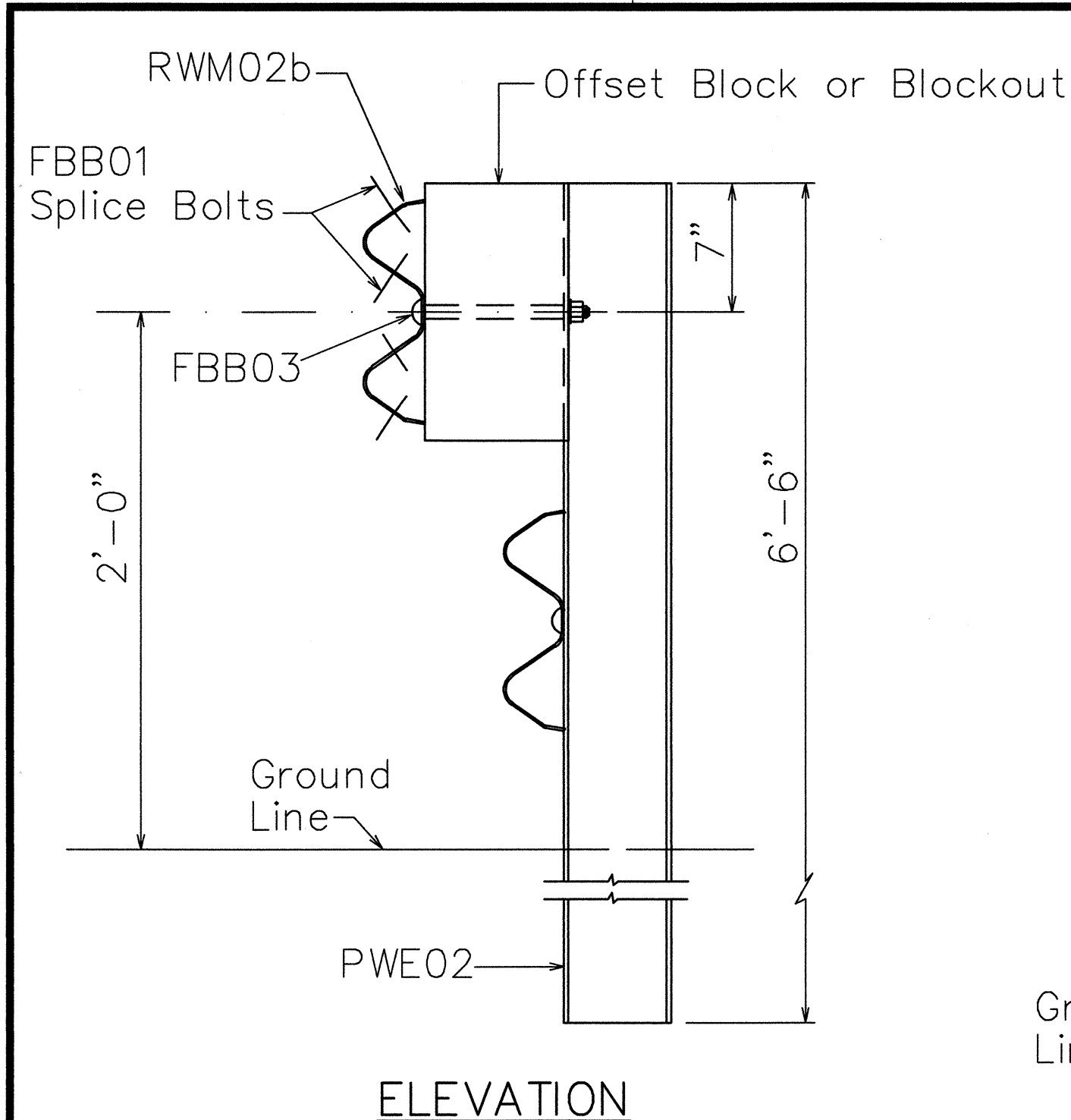
DESIGNATOR	BASE METAL THICKNESS
RWE03a	7/64 "

W-BEAM END SECTION (ROUNDED RWE03a)

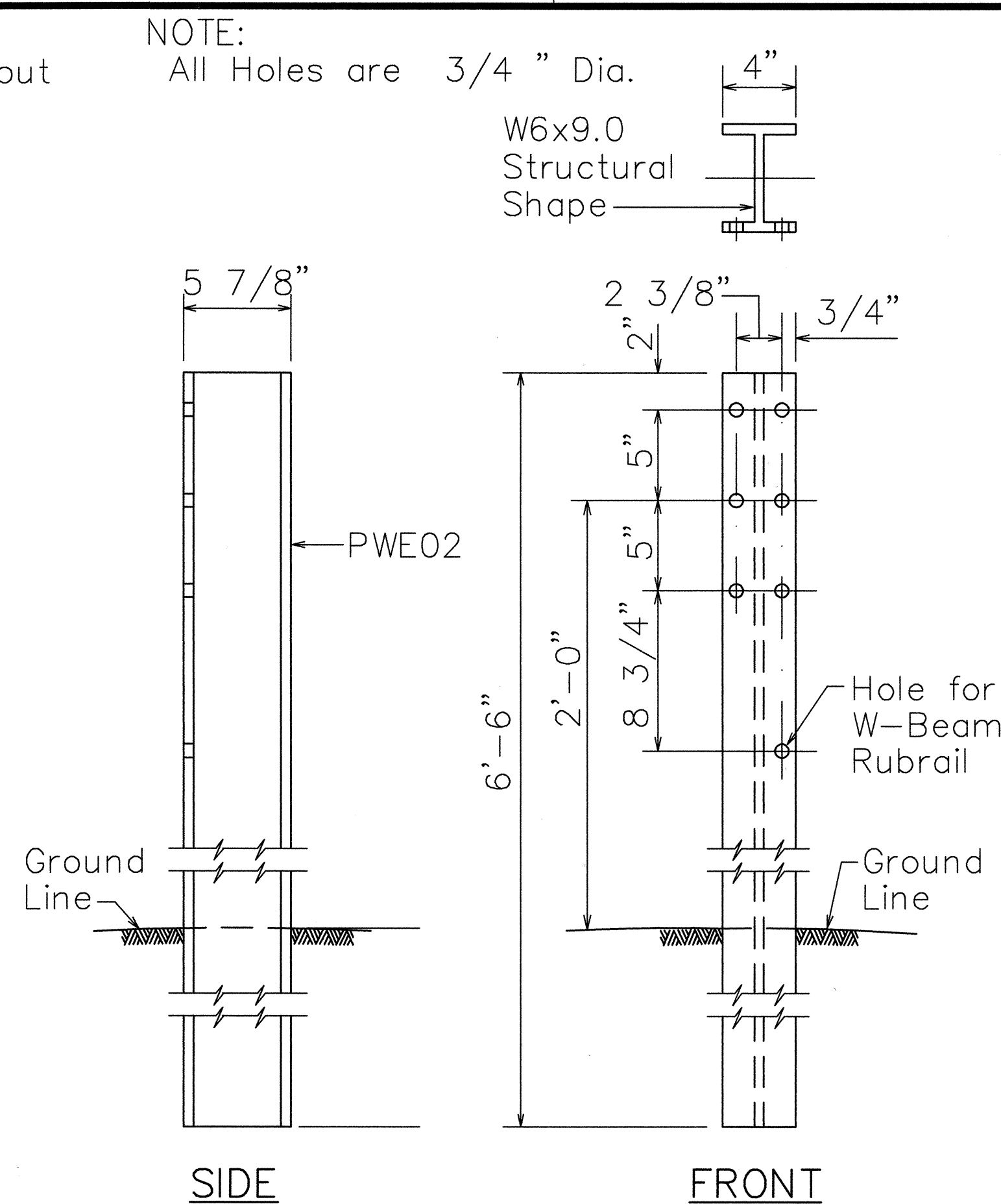
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRONG POST W-BEAM GUARDRAIL
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 83 OF 10 SHEETS

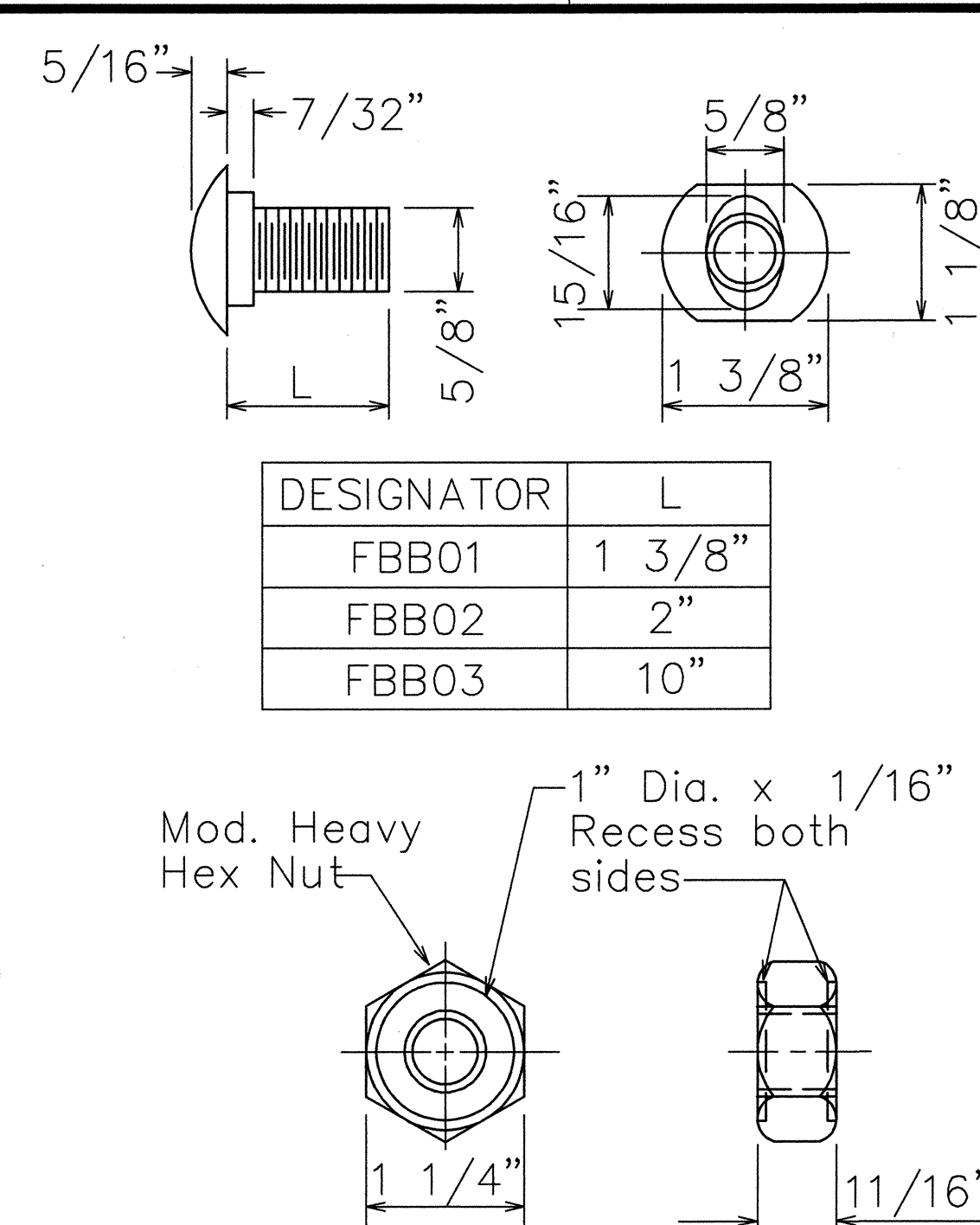
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	17	84



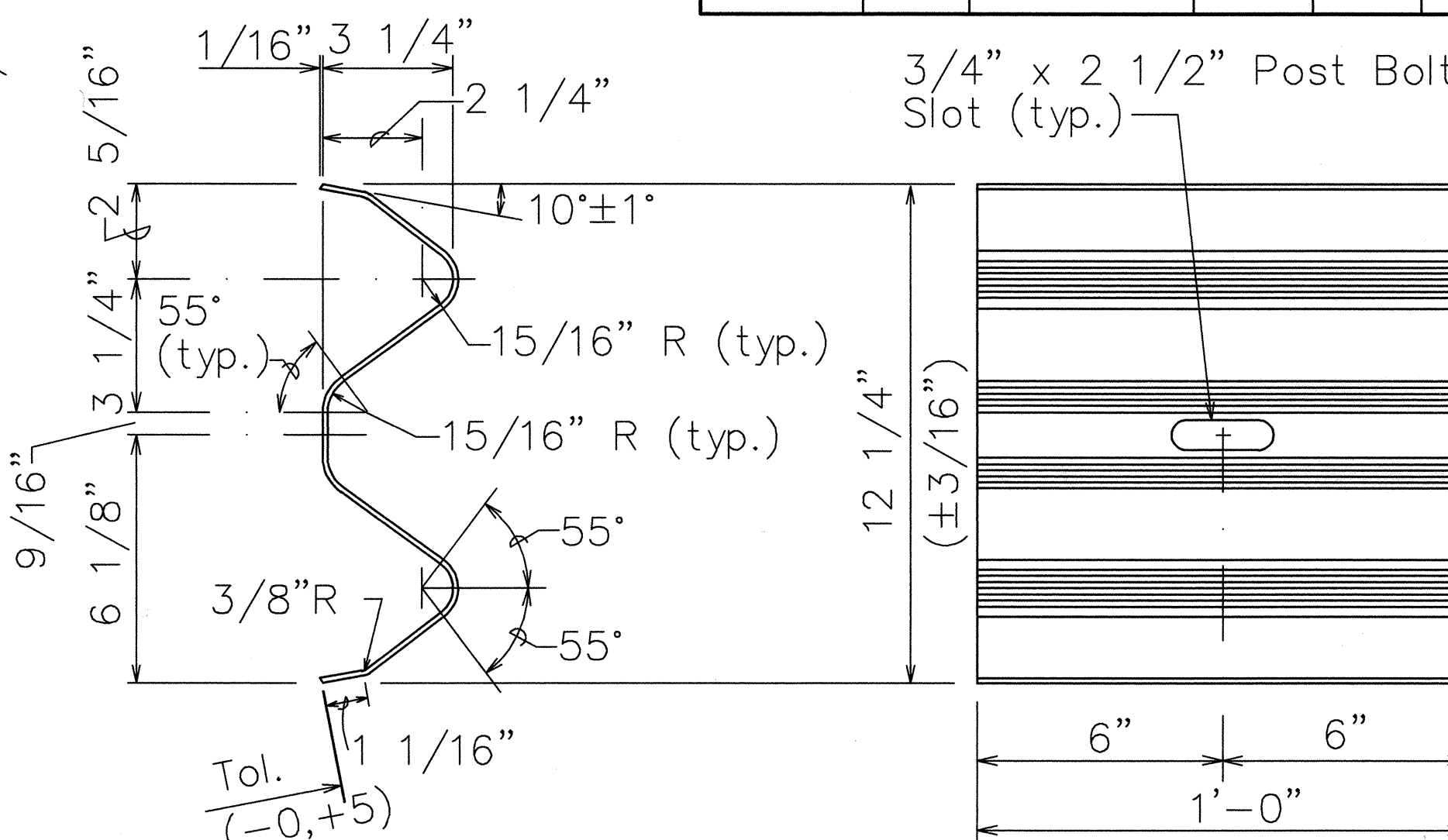
**STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL**



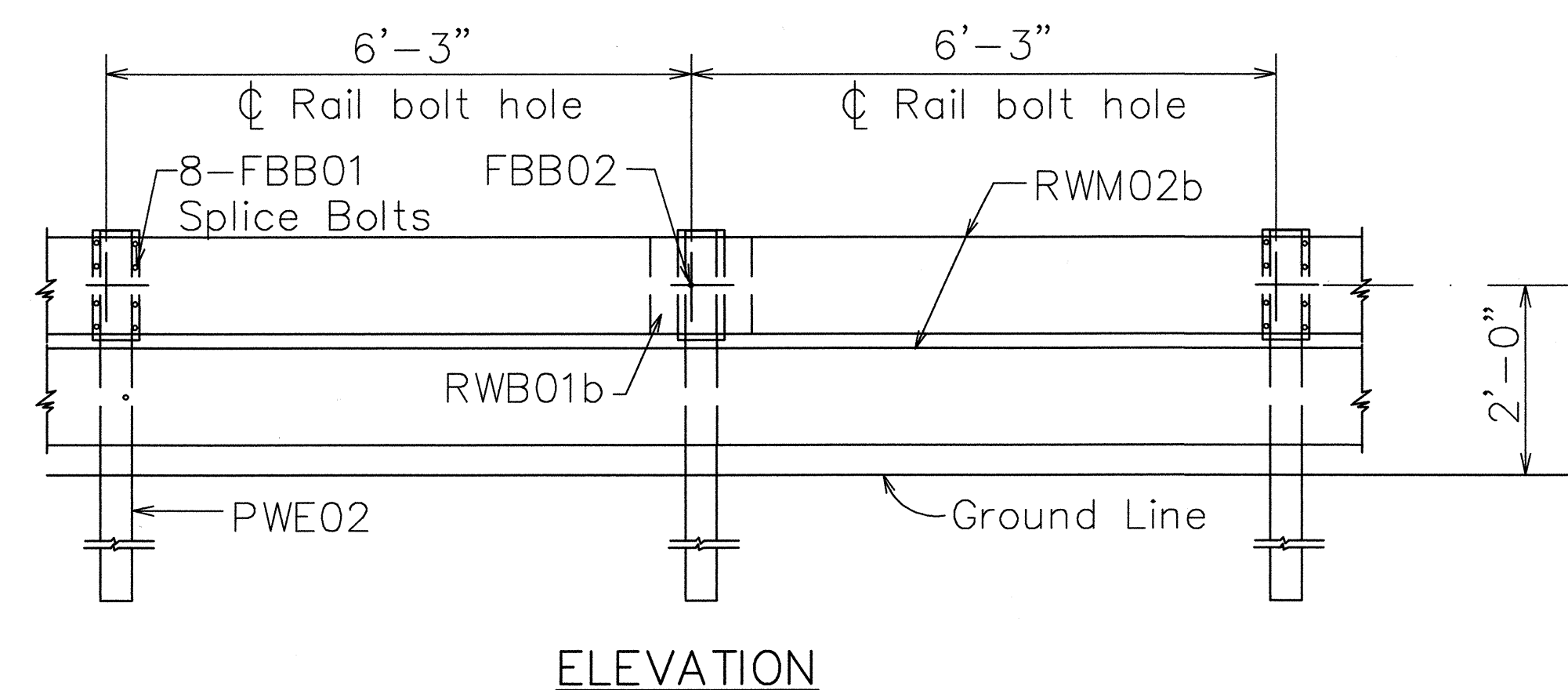
W-BEAM STRONG POST (PWE02)



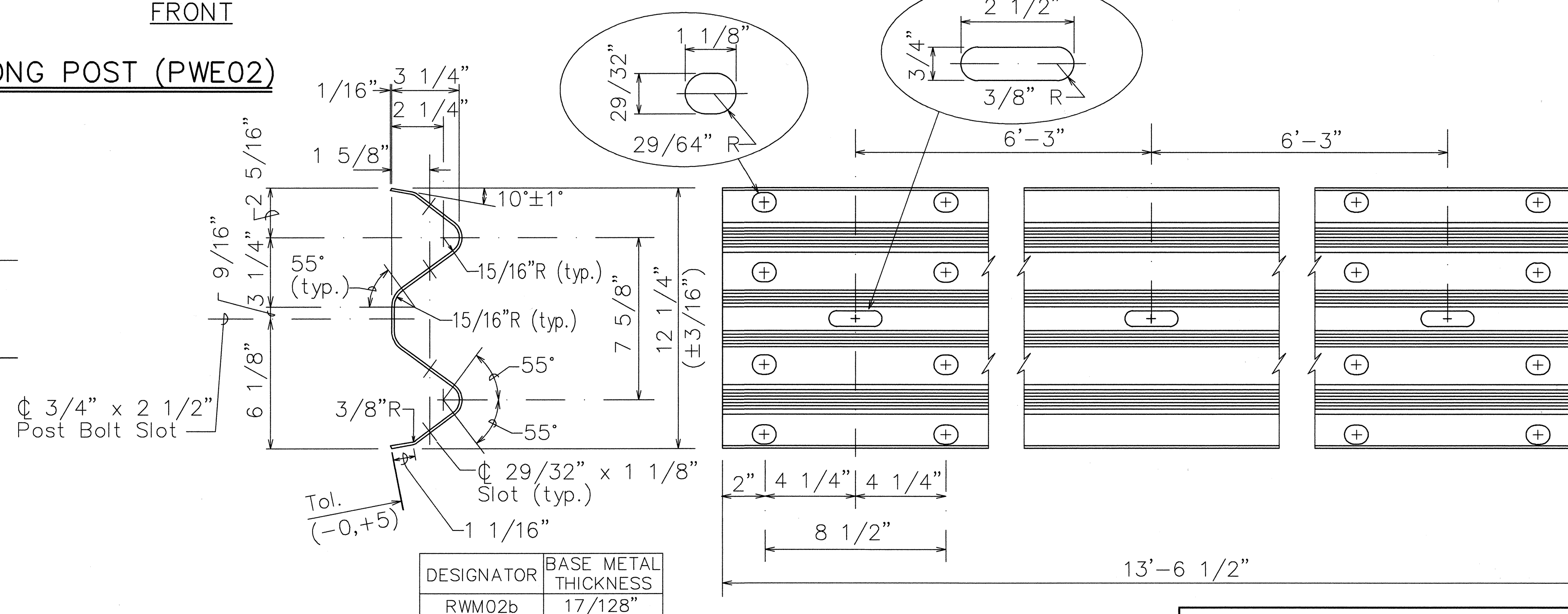
**GUARDRAIL BOLTS AND
RECESSED NUT**



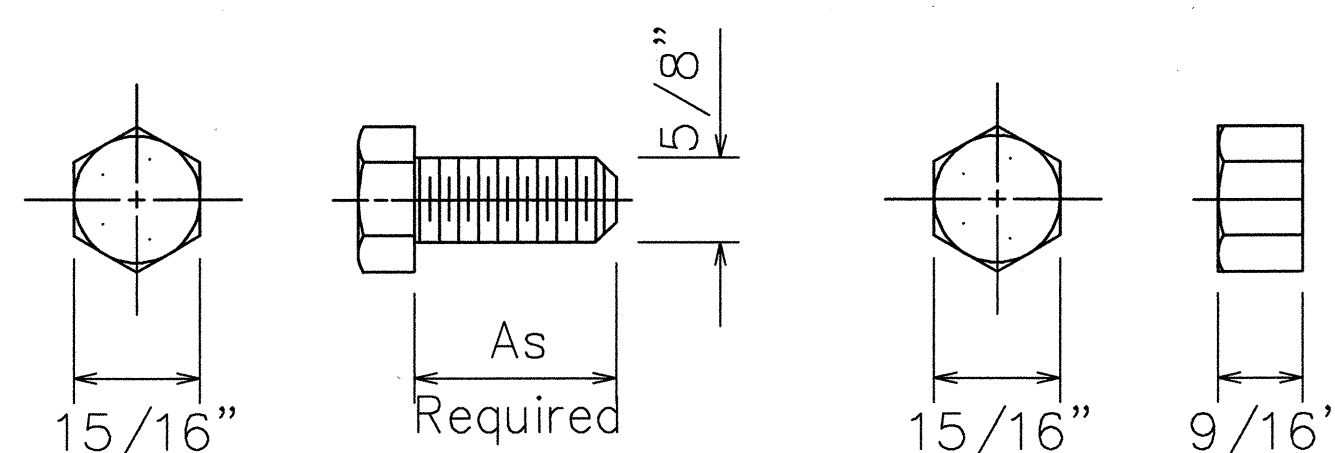
W-BEAM BACK-UP-PLATE (RWB01b)



**STRONG POST RUBRAIL (W-BEAM) GUARDRAIL WITH
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT**



2 SPACE W-BEAM GUARDRAIL (RWM02b)

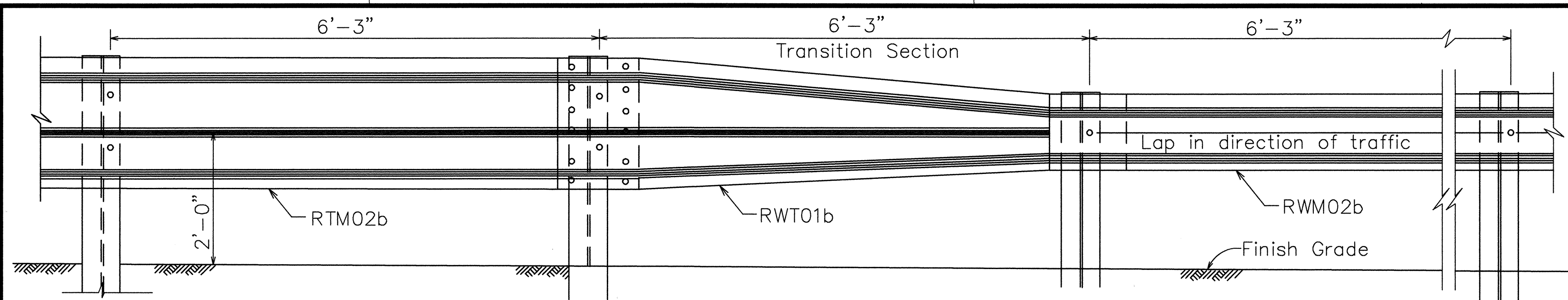


HEX BOLT & NUT (FBX16a)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
**STRONG POST RUBRAIL
W-BEAM GUARDRAIL**
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

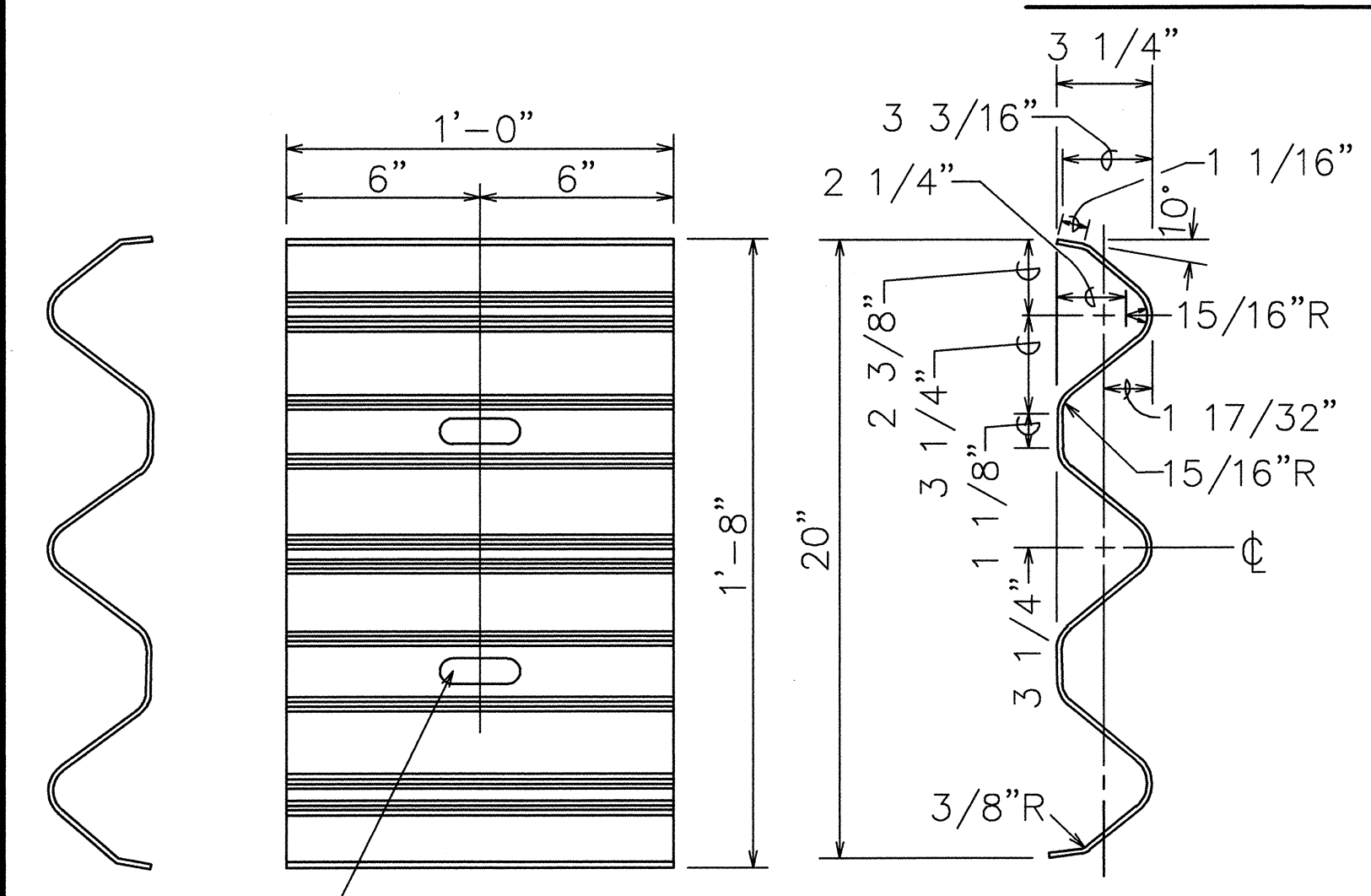
Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 84 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	78	84



TRANSITION SECTION *

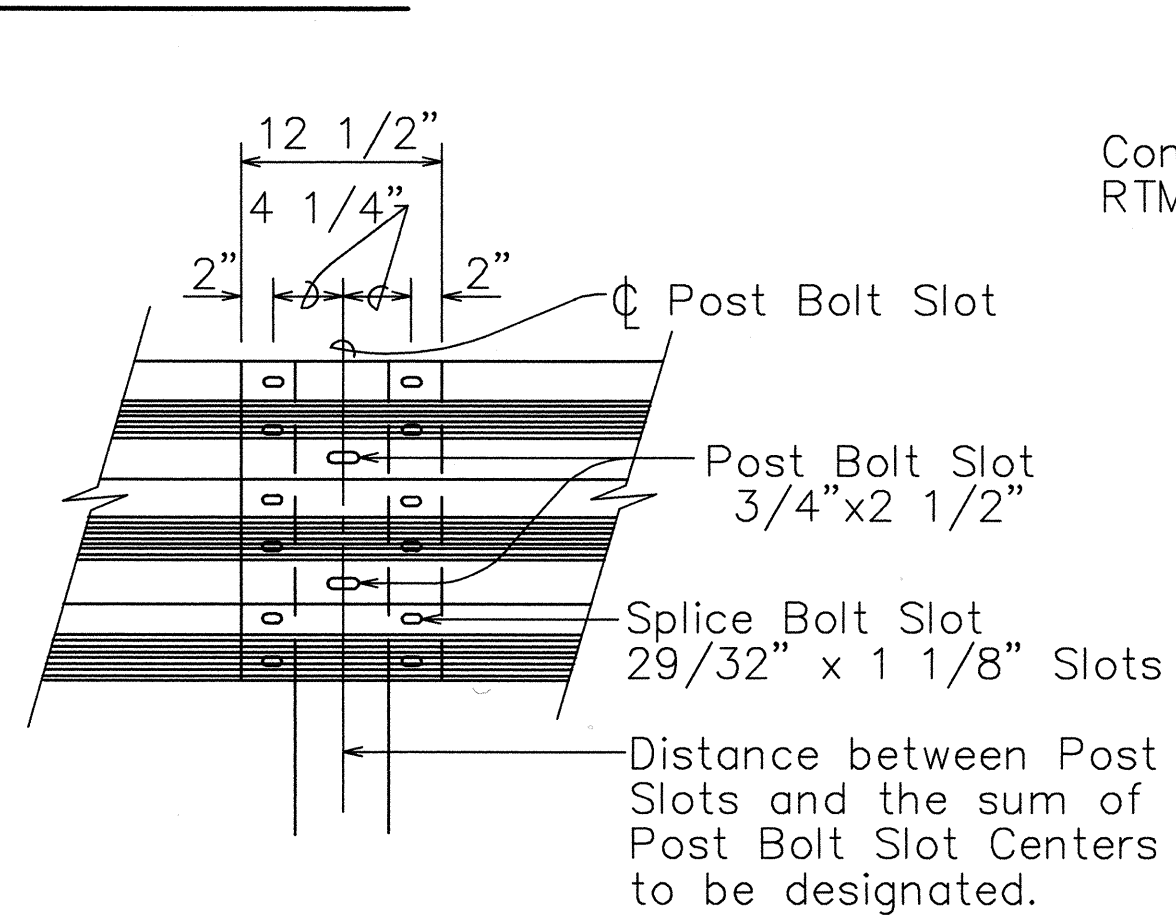
* Post spacing not to be used for Thrie Beam connection to structures.



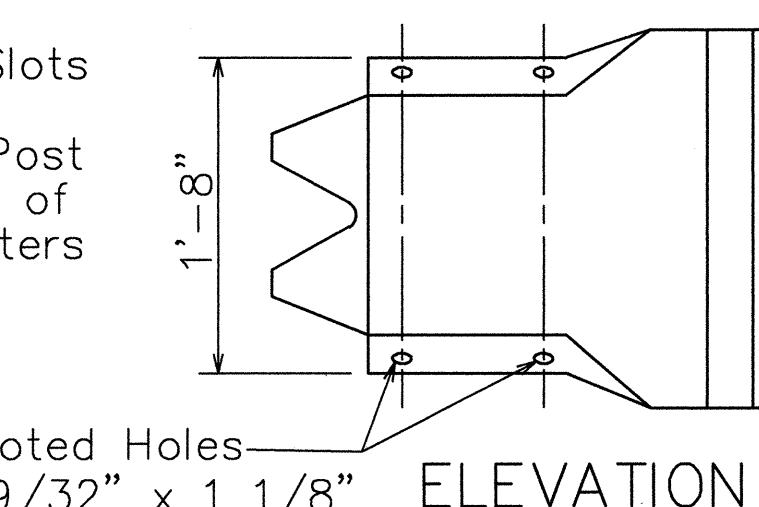
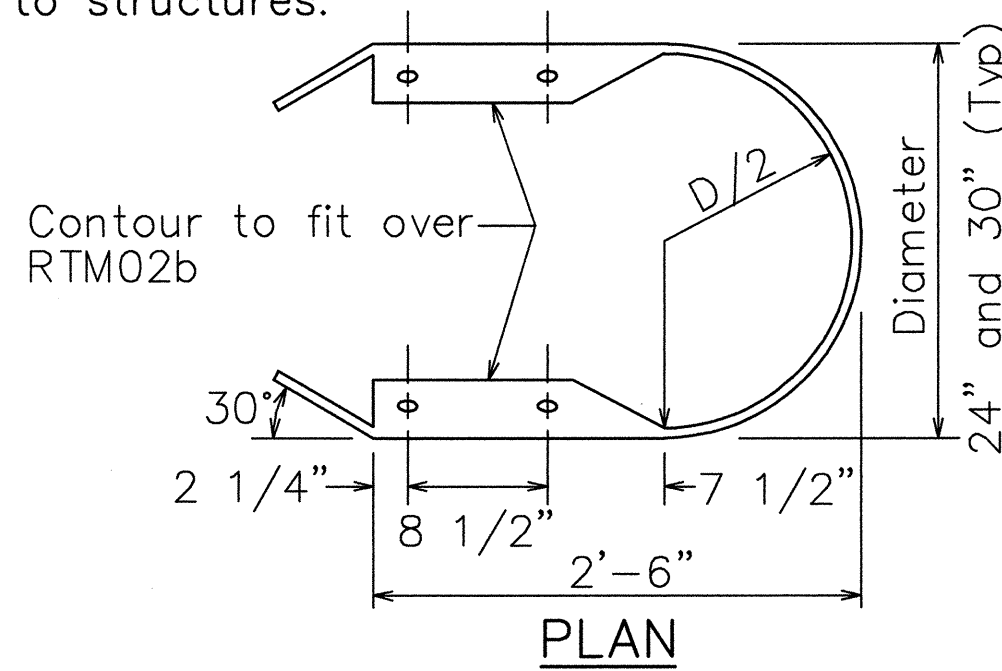
BACKUP PLATE (RTB01b)

(Use at Posts where Splices do not occur)

SECTION THRU RAIL ELEMENT (RTM02b)

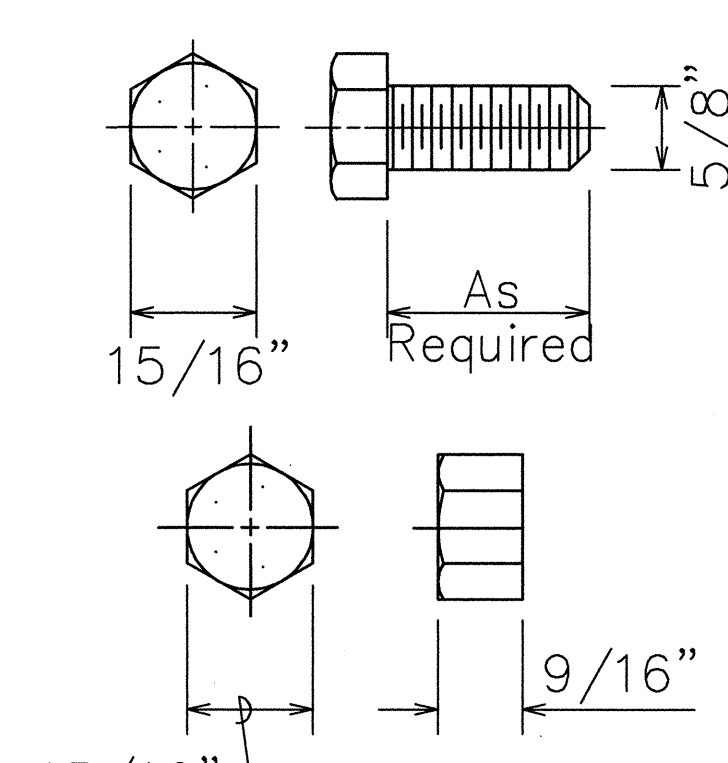


RAIL SPLICE

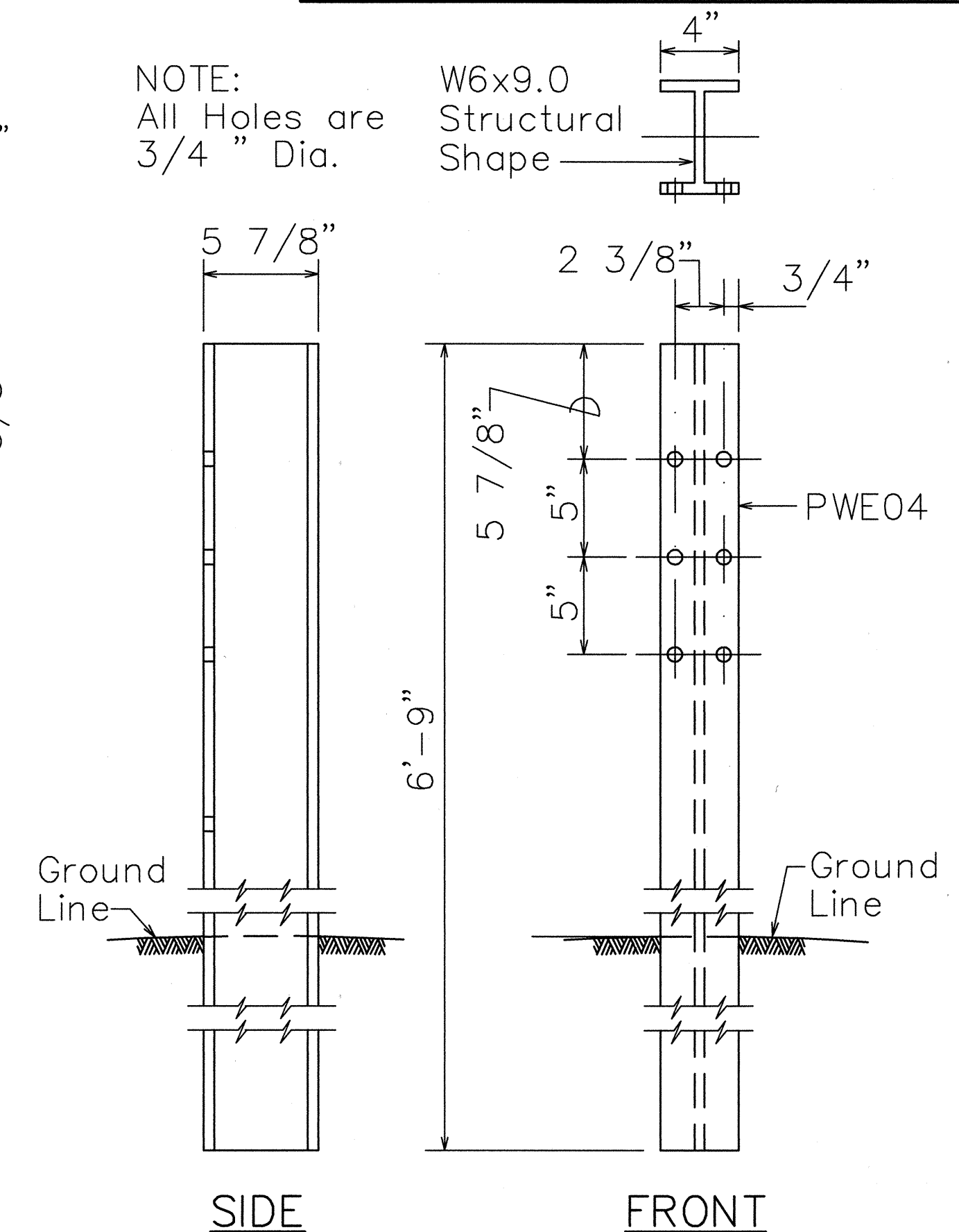


END SECTION (BUFFER RTE03b or RTE04b)

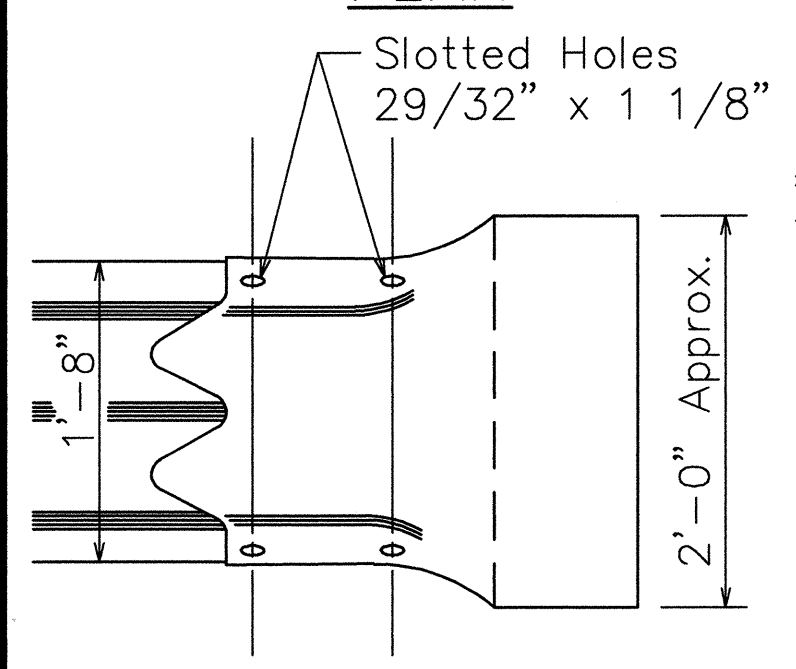
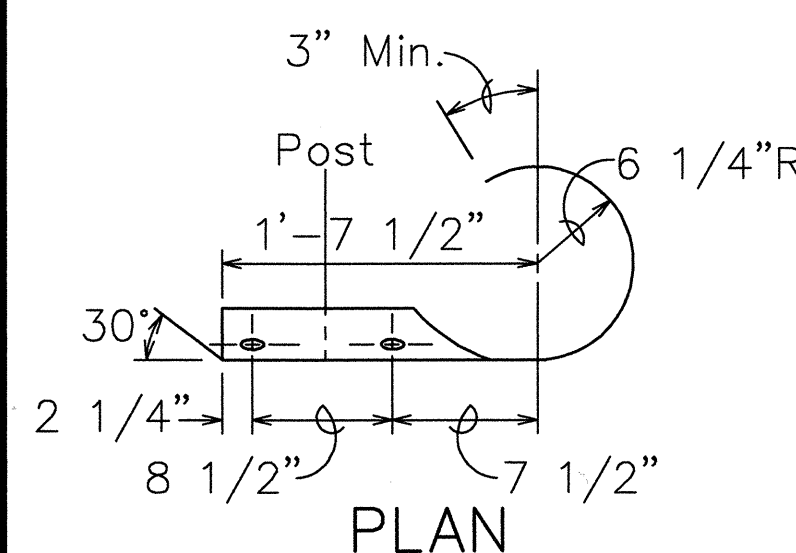
STEEL WASHER FOR 5/8" BOLT



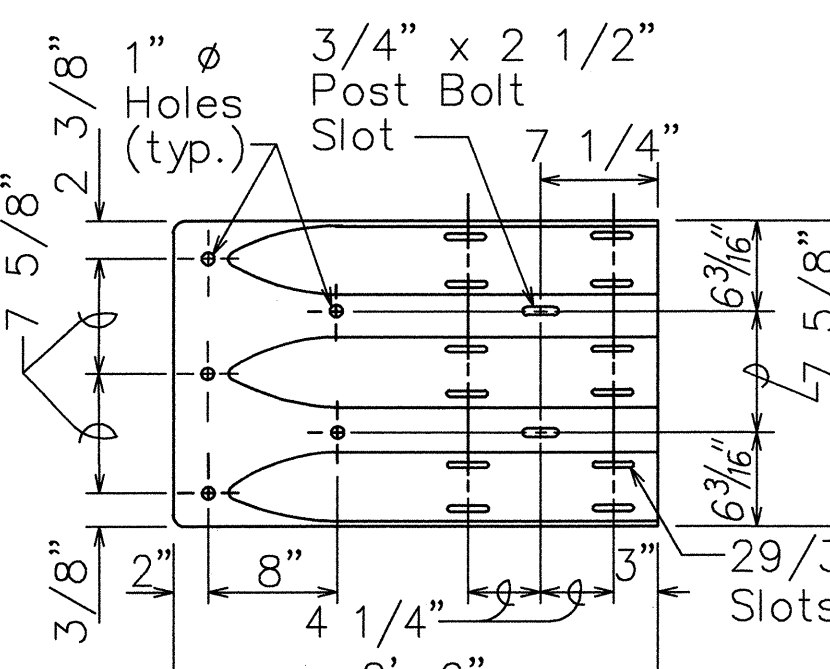
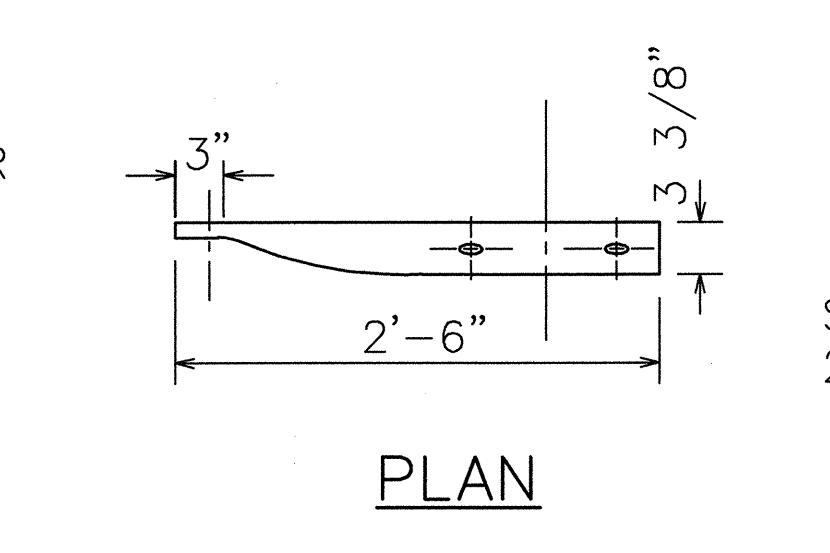
HEX BOLT & NUT (FBX16a)



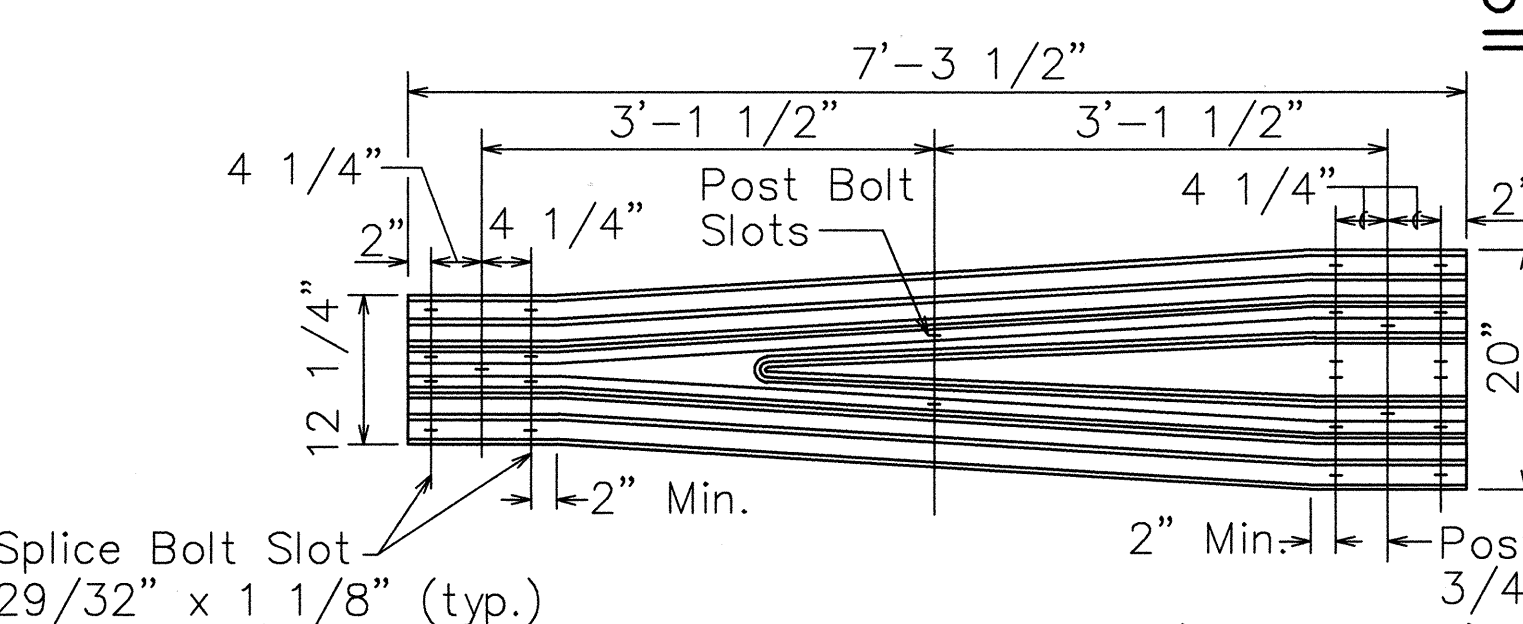
W-BEAM STRONG POST (PWE04)



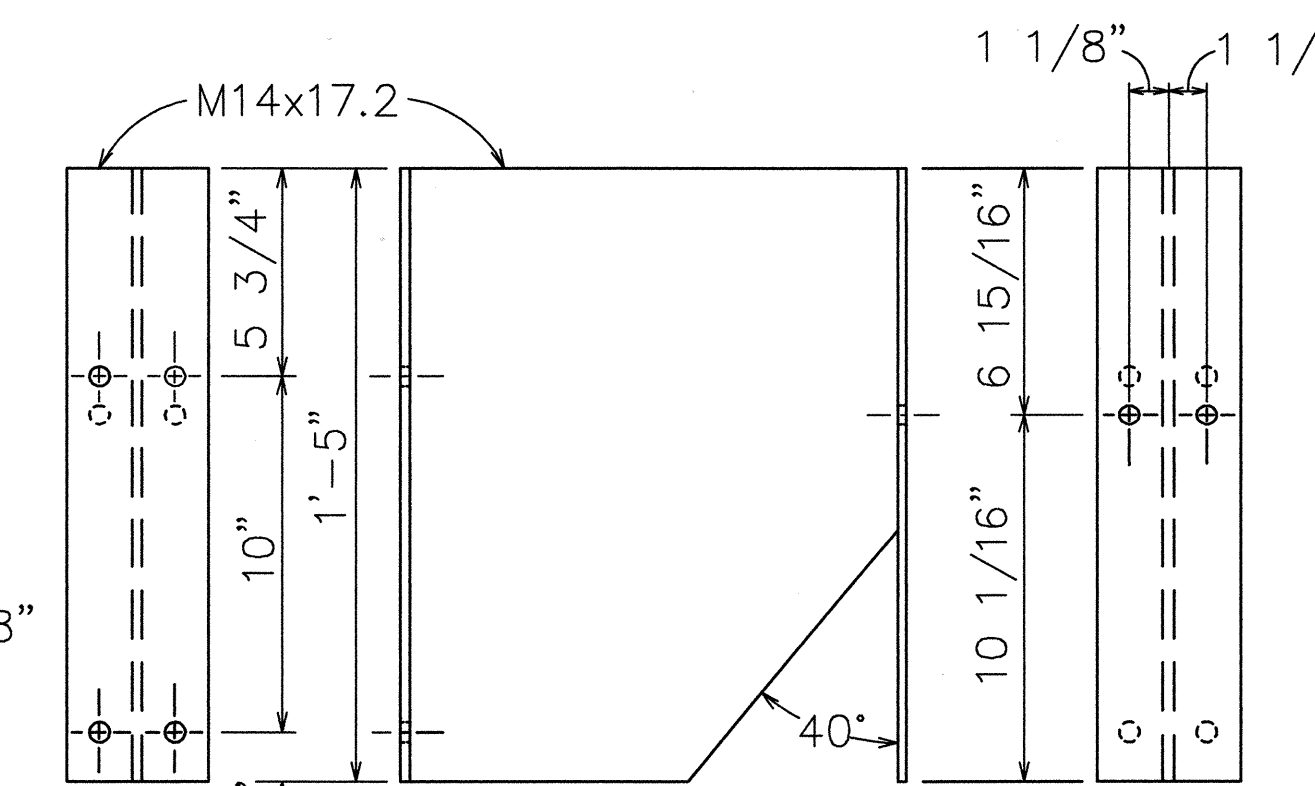
SECTION (ROUNDED) (RTE02b)



TERMINAL CONNECTOR (RTE01b)

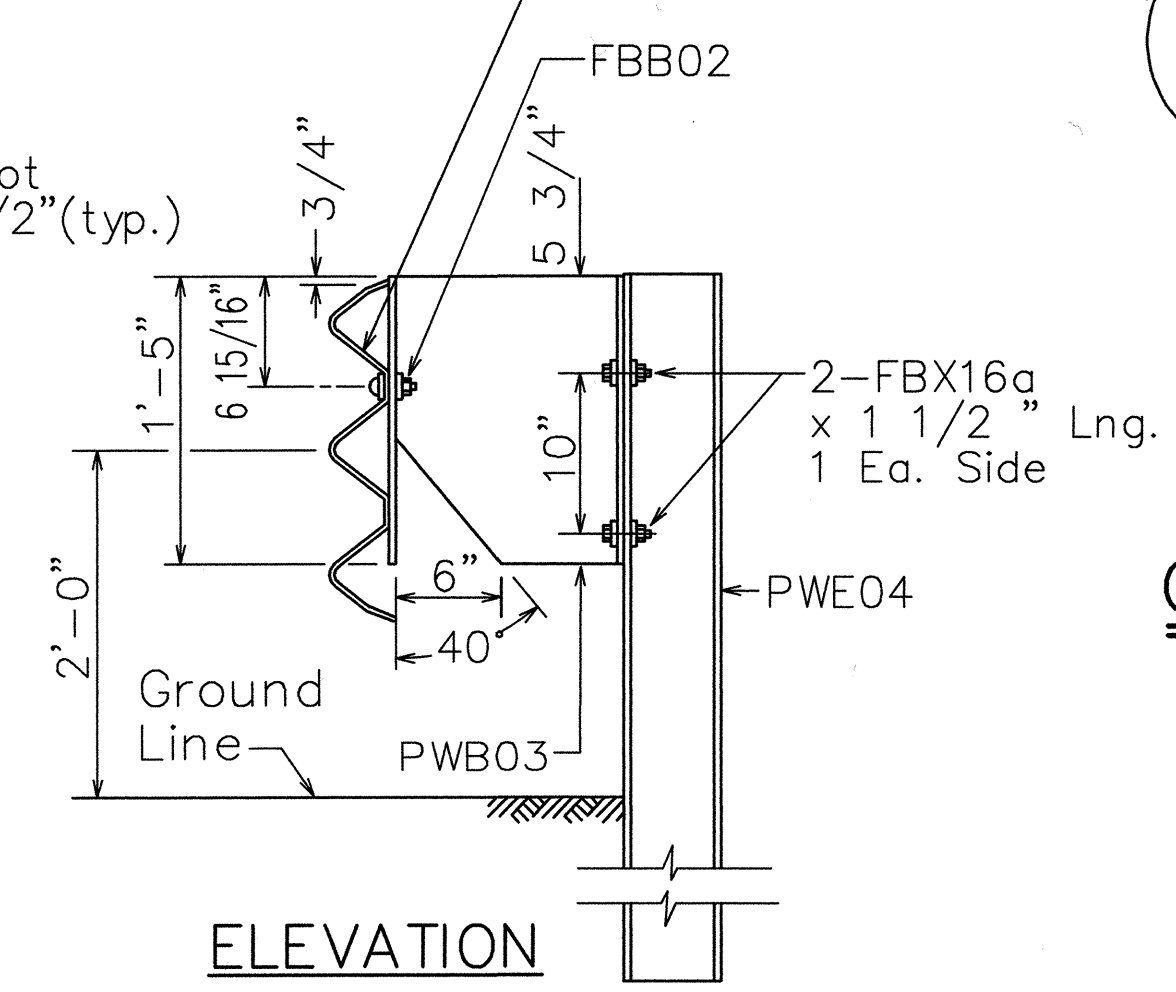


TRANSITION SECTION (RWT01b)

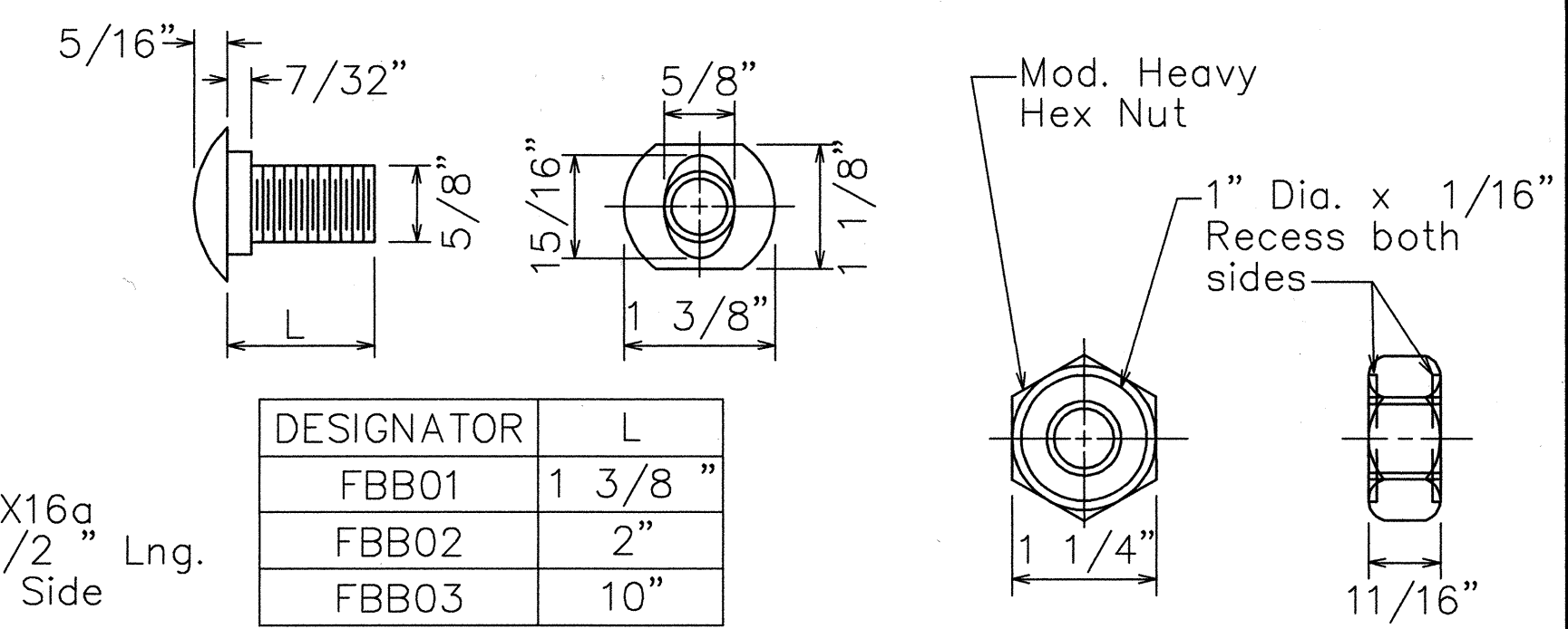


SPACER BLOCK PWB03

Thrie-Beam back-up Plate (At Posts where Splice does not occur)



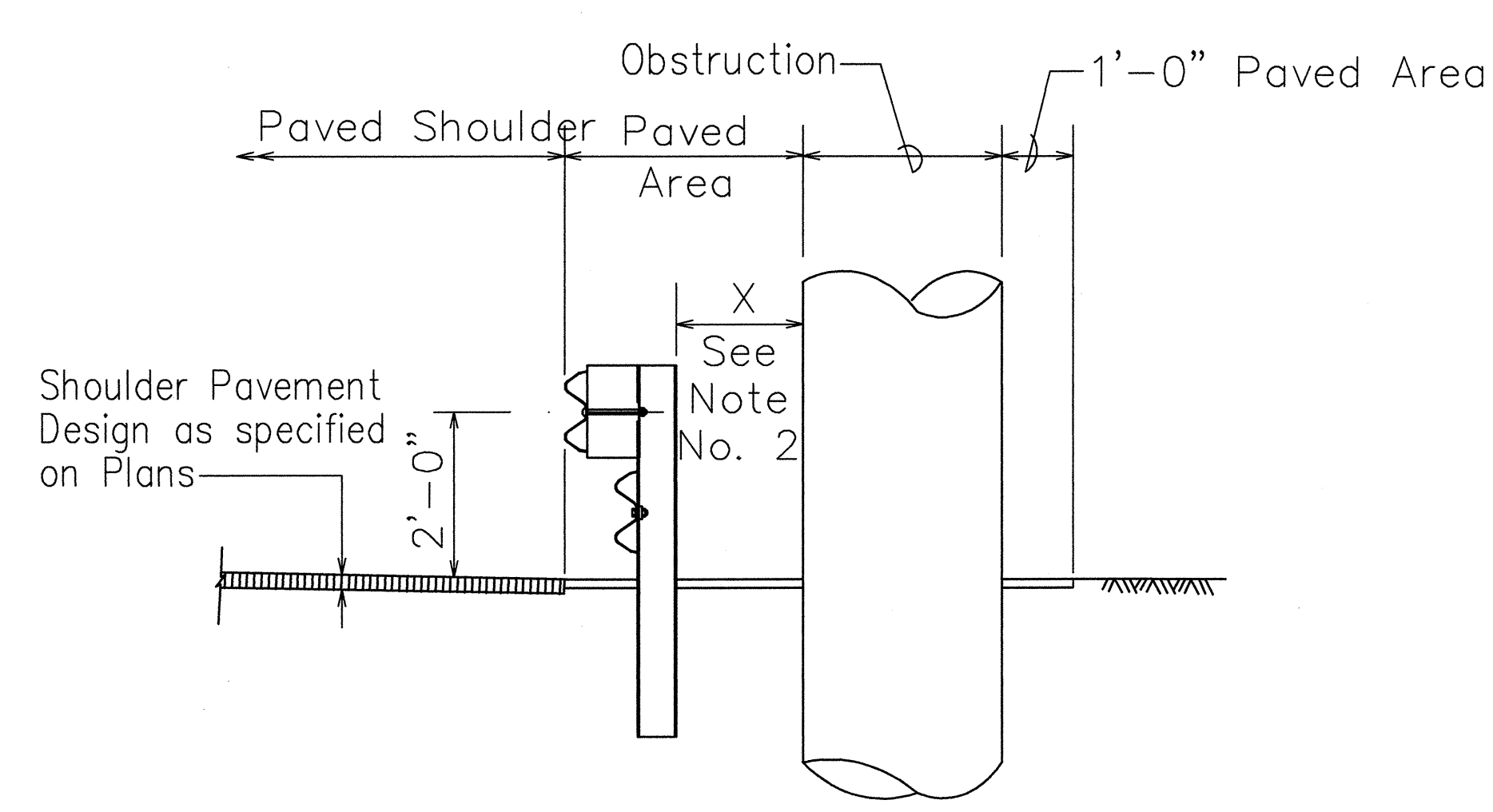
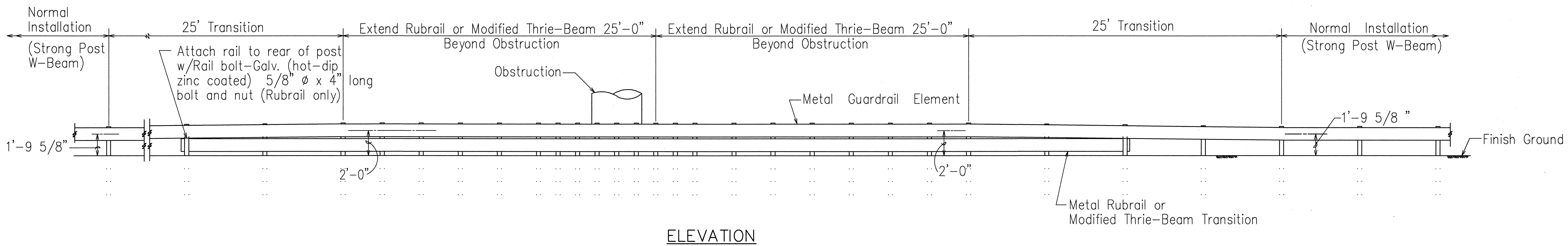
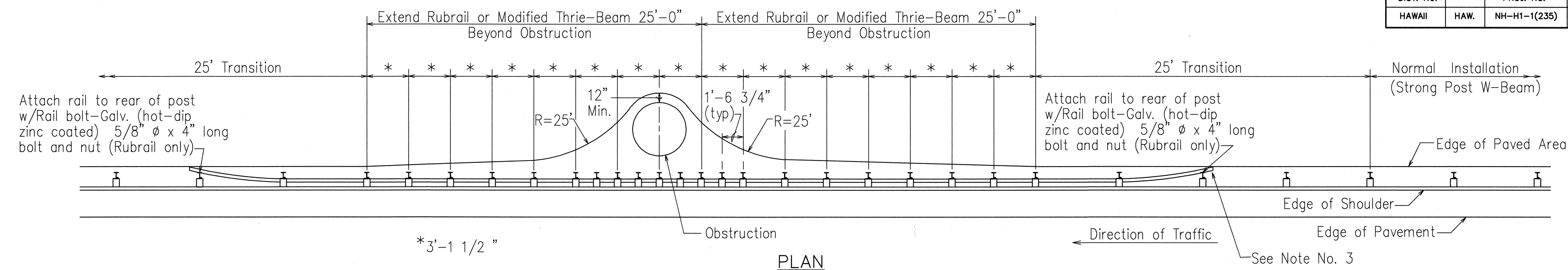
STRONG POST MODIFIED THRIE-BEAM GUARDRAIL (SGR09b)



GUARDRAIL BOLTS AND RECESSED NUT

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRONG POST MODIFIED THRIE-BEAM GUARDRAIL
INTERSTATE ROUTE H-1 RESURFACING
Kunua IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)
Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 85 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	79	84



- NOTES:
1. All Guardrail and Concrete Barrier Designs at Obstructions shall be approved by the Engineer.
 2. If $X < 2'-0"$, Concrete Barrier or special guardrail design.
 $2'-0" < X < 3'-0"$, Strong Post Rubrail or Modified Thrie-Beam with reduced post spacing.
 $3'-0" < X$, Strong Post W-Beam or Modified Thrie-Beam with 6'-3" post spacing. (Normal Installation)
 3. If a pedestrian walkway or bicycle route is located behind the guardrail, the Engineer should install the Modified Thrie-Beam System. The rubrail termini may become a hazard to pedestrians & bicyclists.

TYPICAL SECTION AT OBSTRUCTION

DETAIL OF GUARDRAIL INSTALLATION AT OBSTRUCTION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS
(AT OBSTRUCTION)
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 86 OF 10 SHEETS

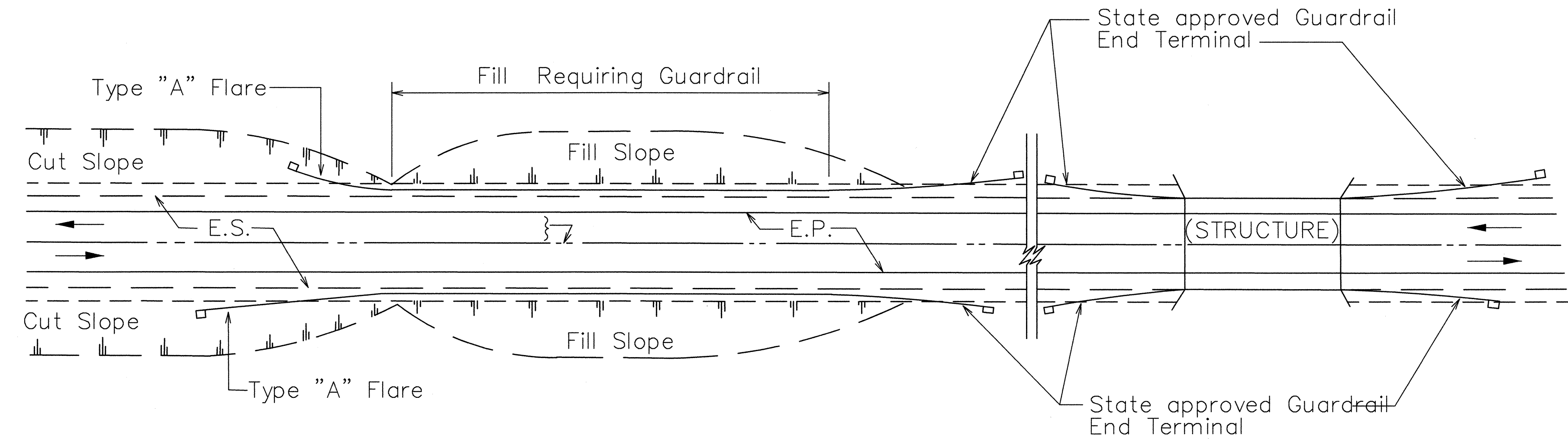
DATE: 04/28/99
SCALE: 1" = 1'
FILE: 9814-99

PM: BST
OPER: SHA,CDK,*FAI
REVISED: 4/29/99

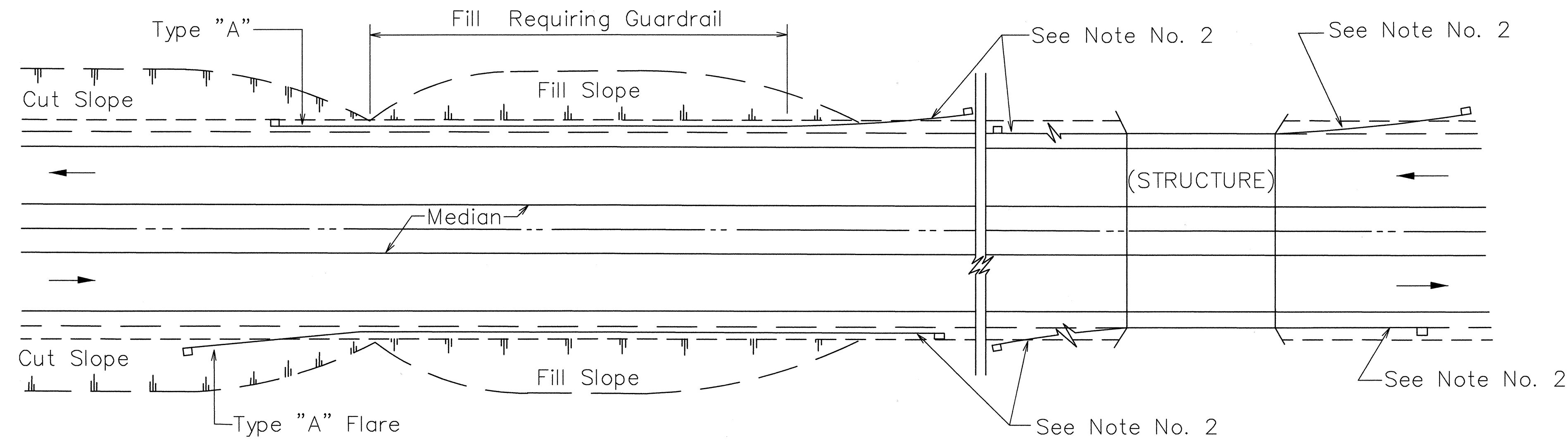
SURVEY PLOTTED BY: _____
DRAWN BY: _____
DESIGNED BY: _____
CHECKED BY: _____
ORIGINAL PLAN: _____
NOTEBOOK: _____
No. _____

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	80	84

- NOTES:
1. Metal Guardrail connection to concrete structures requires End Post Connection. See Structure Plans.
 2. Depending on the existing field conditions, the Engineer shall determine which guardrail end terminal should be installed.
 3. Refer to State's most current approved Product List for NCHRP 350 approved Guardrail End Terminals.



PLAN
TWO WAY ROADWAY



PLAN
ONE WAY ROADWAY (DIVIDED HIGHWAY)

DATE: 04/28/99	PM: BST	PM: SHA,CKK,FAI
SCALE: 1" = 1'	OPER: 4/29/99	REVIS: 4/29/99
FILE: 9814-100		
SURVEY PLOTTED BY		
DRAWN BY		
DESIGNED BY		
CHECKED BY		
ORIGINAL PLAN		
NOTEBOOK		
No.		

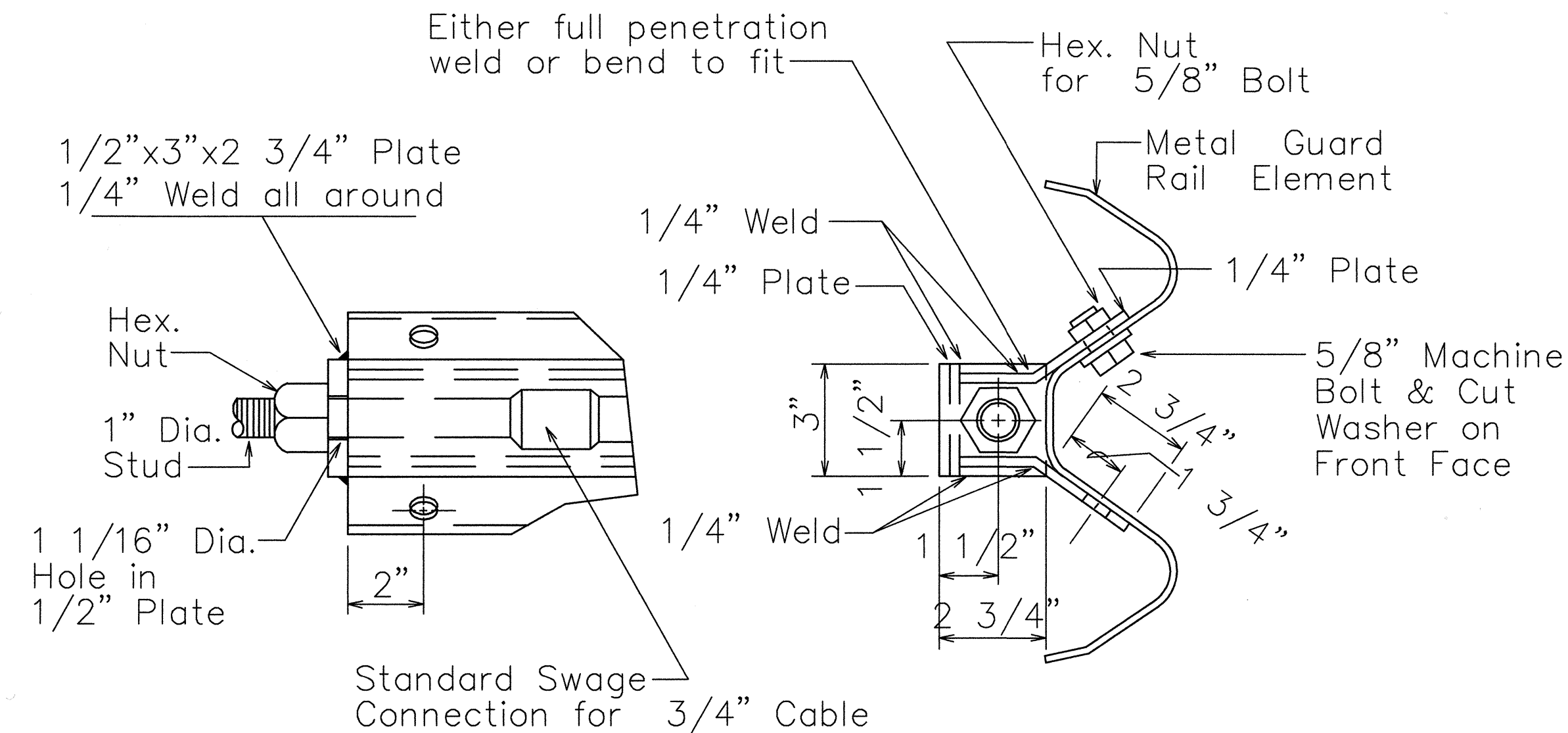
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS

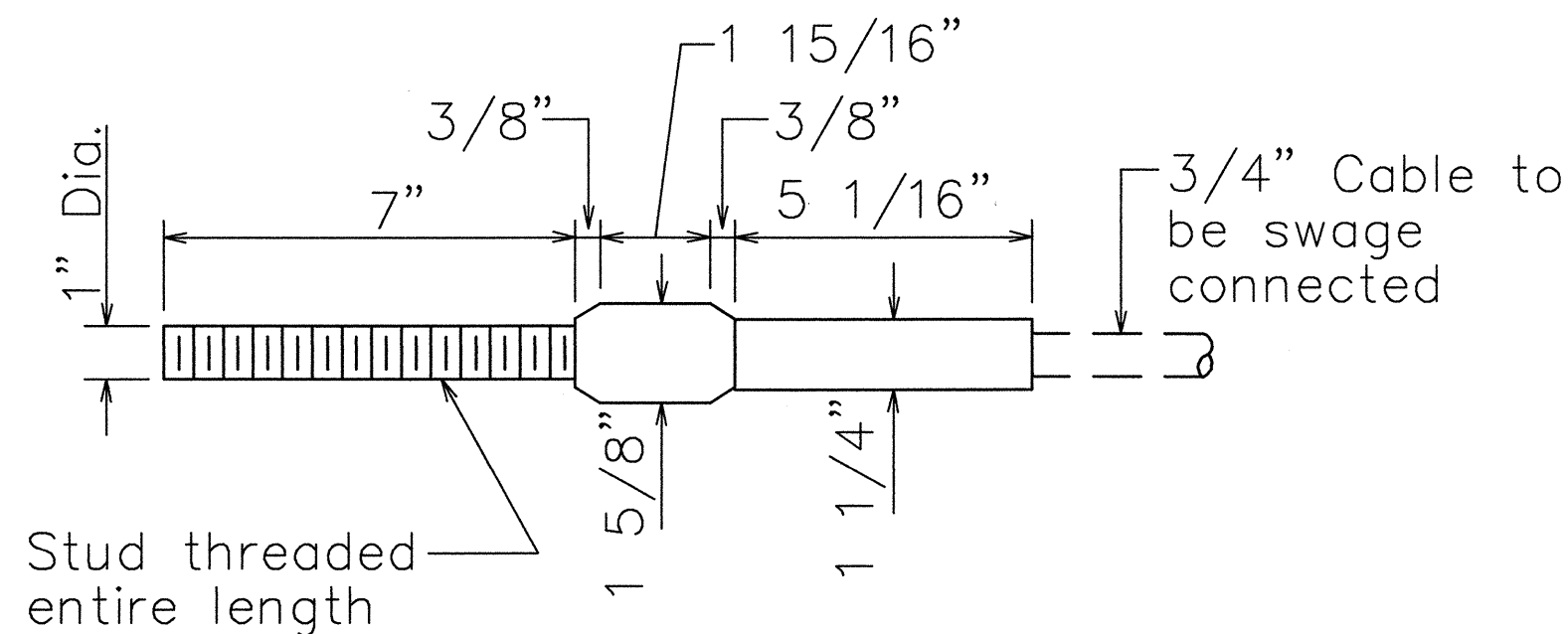
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waikole Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 87 OF 10 SHEETS

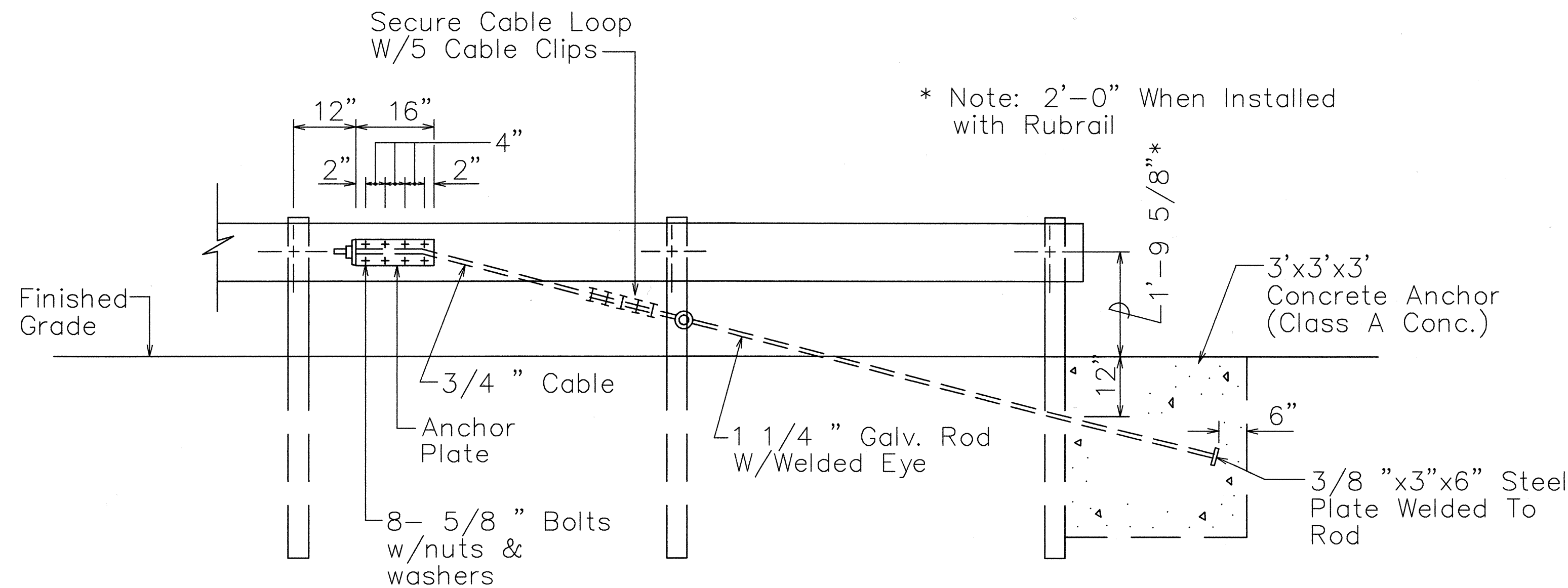
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	81	84



ANCHOR PLATE DETAILS

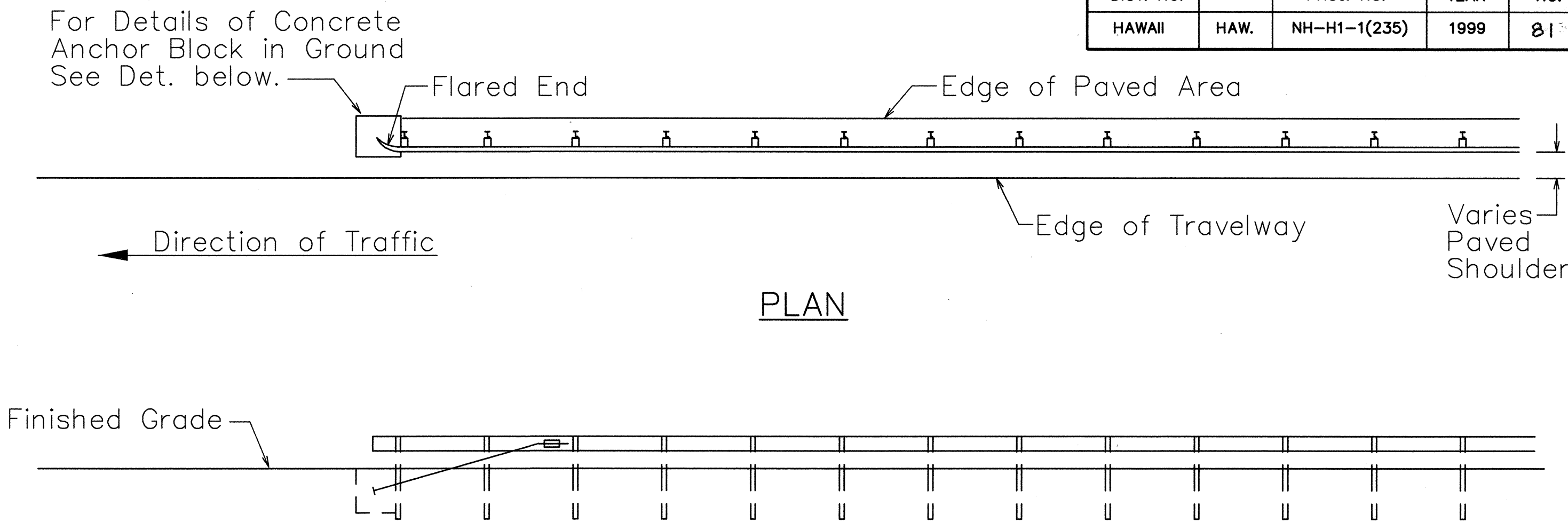


STANDARD SWAGED FITTING AND STUD



ANCHOR BLOCK DETAIL

- Concrete, G.R.P., excavation, anchor rod and miscellaneous appurtenances necessary to anchor the guardrail ends shall be incidental to metal guardrail.



PLAN

ELEVATION

TYPE "G" FLARE END TERMINAL

NOTE:

Type "G" Modified End Terminal is a site specific end terminal with a taper and radial termini. A site specific detailed drawing is required for all Type "G" Modified End Terminal and must receive Engineer's approval.

The taper (flare rate) of the guardrail shall follow the latest edition of AASHTO'S Roadside Design Guide (currently, Table 5.6 – Suggested Flare Rate for Barrier Design, page 5–21, Jan. 1996 edition).

The radius of the radial termini is an Engineer's judgement based on the site evaluation. The Engineer shall consider safety (minimize the spearing & blunt end situation); degree and potential seriousness of the hazard; bicycle and pedestrian accessibility; maintenance equipment accessibility; Right-of-Way availability; the smallest radii the metal w-beam/thrie-beam railing can be constructed (check with supplier/contractor); posted speed limit; angle of vehicle impact; and aesthetics when designing the Type "G" Modified End Terminal.

During construction, the Contractor shall layout the proposed Type "G" Modified End Terminal and receive approval from the Construction Engineer prior to installation.

DATE: 04/28/99	PM: BST	FILE: 9814-101
SCALE: 1" = 1'	OPER: SHA,CDK,*FAI	
	REVISED: 4/29/99	

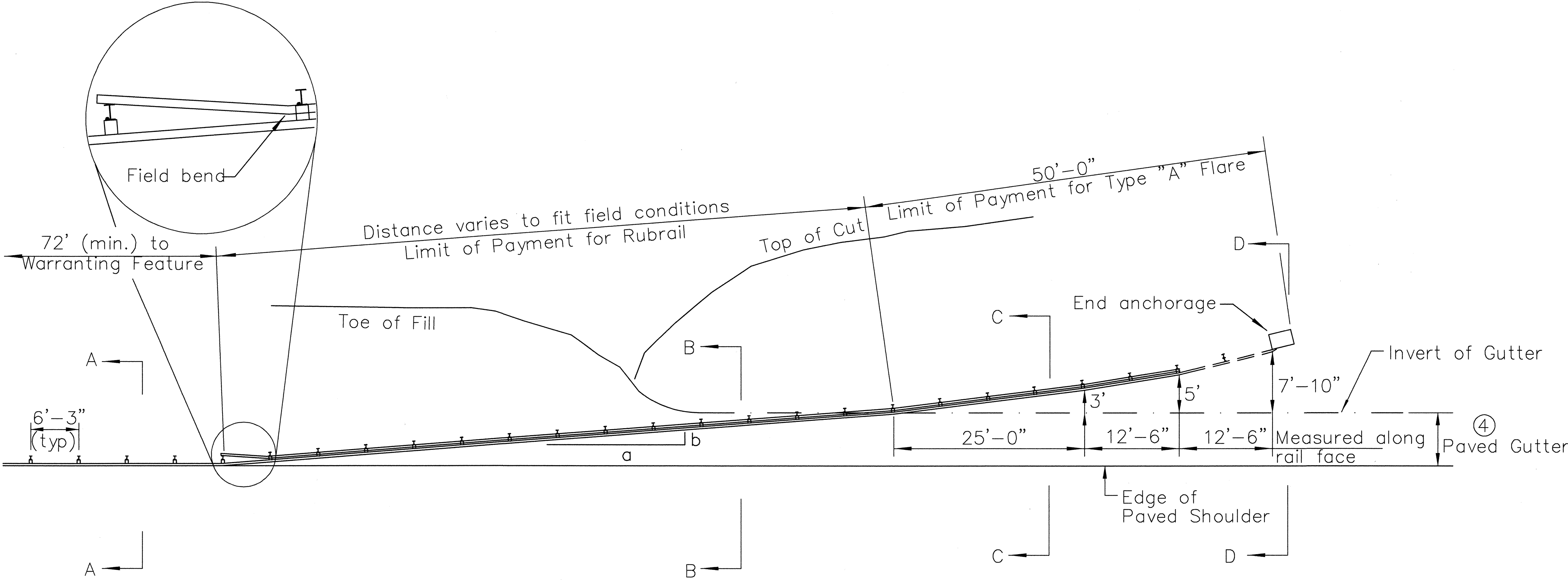
DATE: 04/28/99	PM: BST	FILE: 9814-101
SCALE: 1" = 1'	OPER: SHA,CDK,*FAI	
	REVISED: 4/29/99	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
GUARDRAIL DETAILS
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waikole Stream Bridge
F.A.I. Project No. NH-H1-1(235)
Scale: As Shown Date: Apr. 30, 1999
SHEET NO. 88 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	82	84

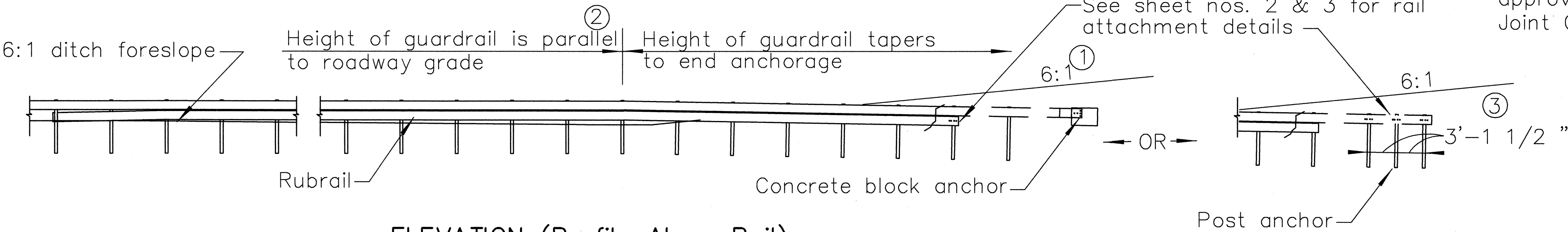
General Notes

1. A 6:1 or flatter slope is desirable. However, a steeper or flatter existing slope may be used.
2. Height of guardrail may be tapered down in elevation to maintain 3'-8" maximum height.
3. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the post anchor. Posts for the post anchor are 6'-0" long.
4. Variable Paved Gutter offsets may be used to fit field conditions.
5. The Guardrail Posts shall be located away from the gutter/swale invert.
6. All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

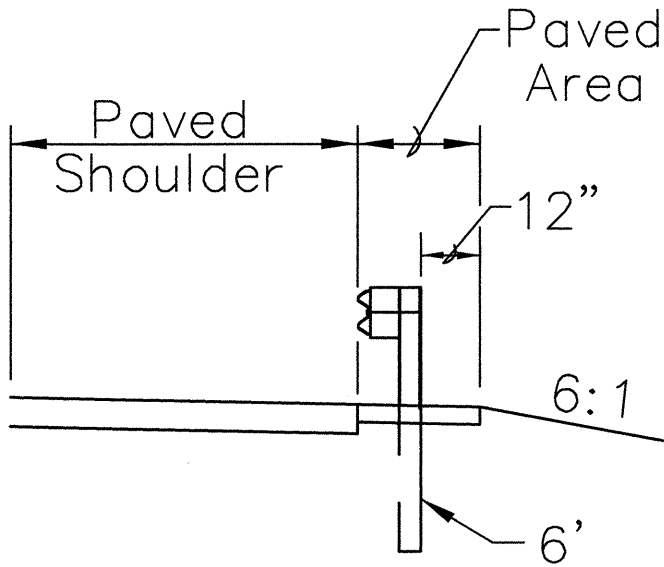


PLAN

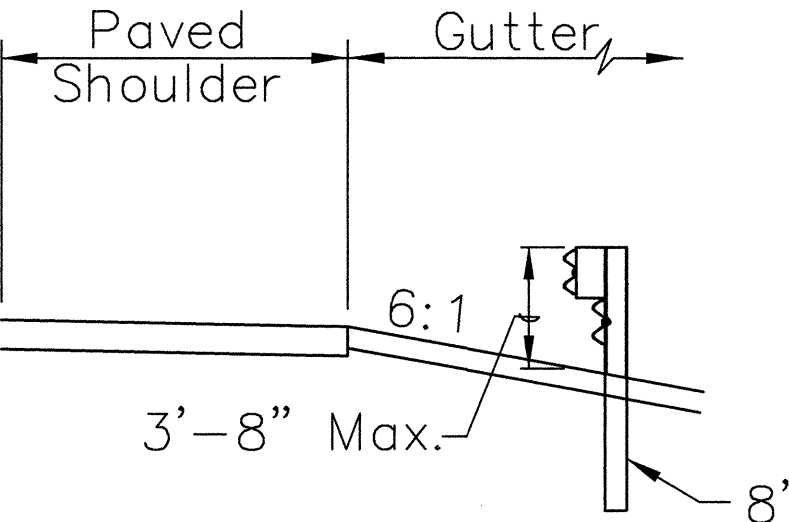
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



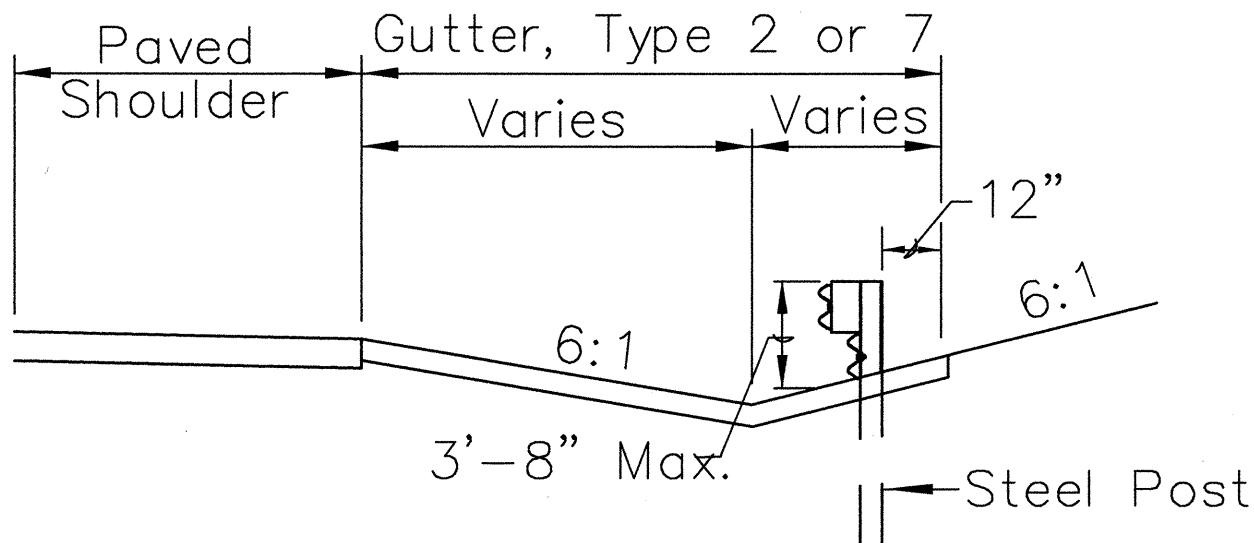
ELEVATION (Profile Along Rail)



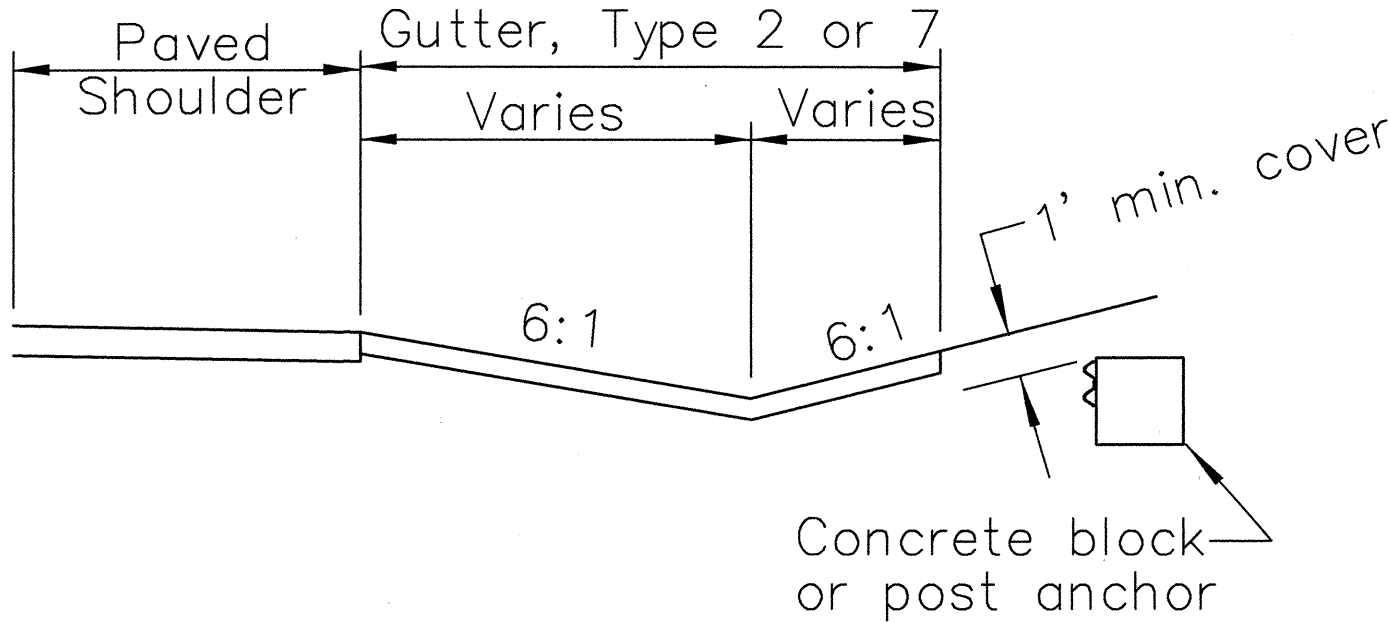
Section A-A



Section B-B
(With Rubrail)



Section C-C
(With Rubrail)



Concrete block
or post anchor

BACKSLOPE ANCHOR TERMINAL (WITH 6:1 PAVED GUTTER AND TYPE "A" FLARE)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. B9A OF 10 SHEETS

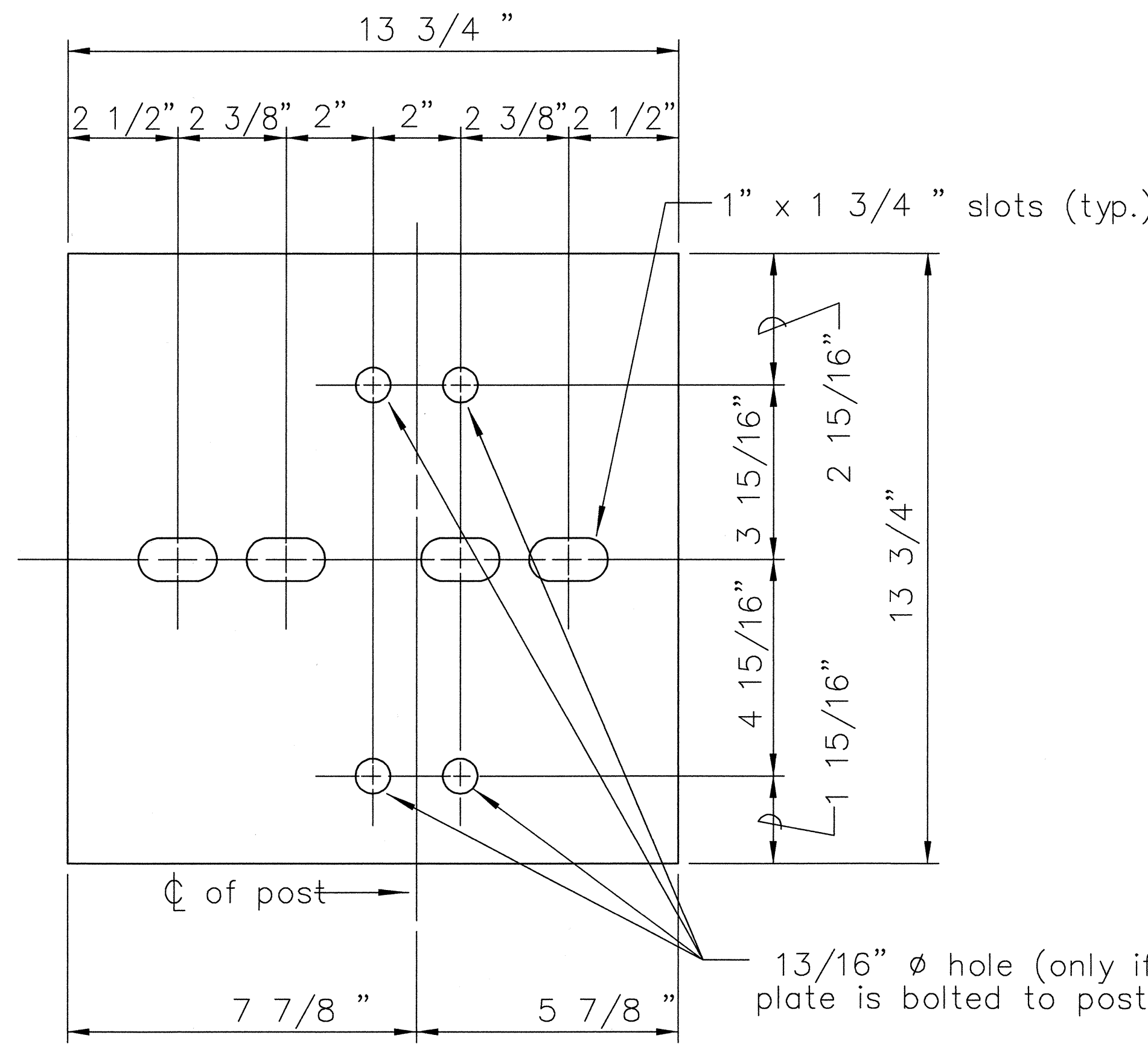
DATE: 04/28/99
SCALE: 1" = 1'
FILE: 9814-102

PM: BST
OPER: SHA,CDK,*foi
REVISED: 4/29/99

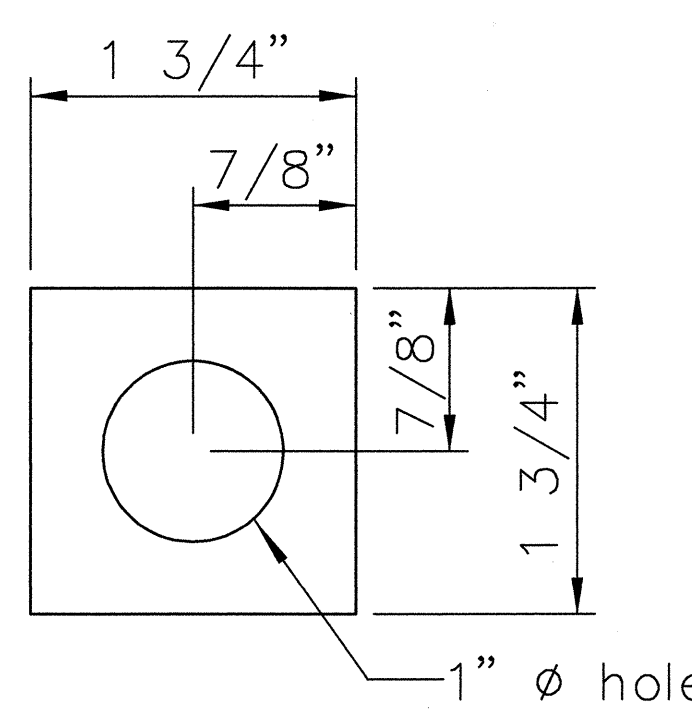
SURVEY PLOTTED BY: _____
DRAWN BY: _____
DESIGNED BY: _____
CHECKED BY: _____
No. _____

ORIGINAL PLAN
NOTEBOOK
No. _____

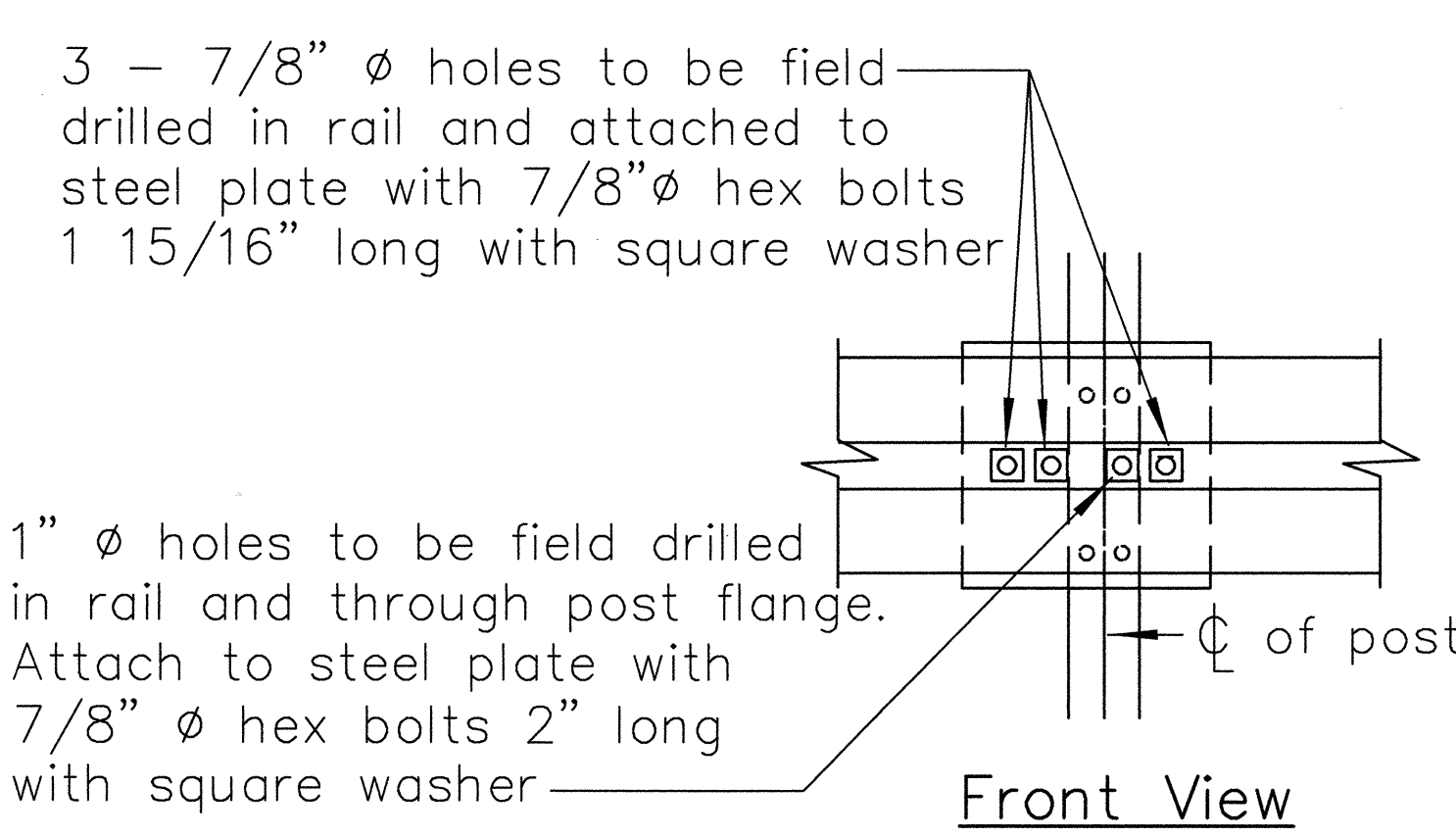
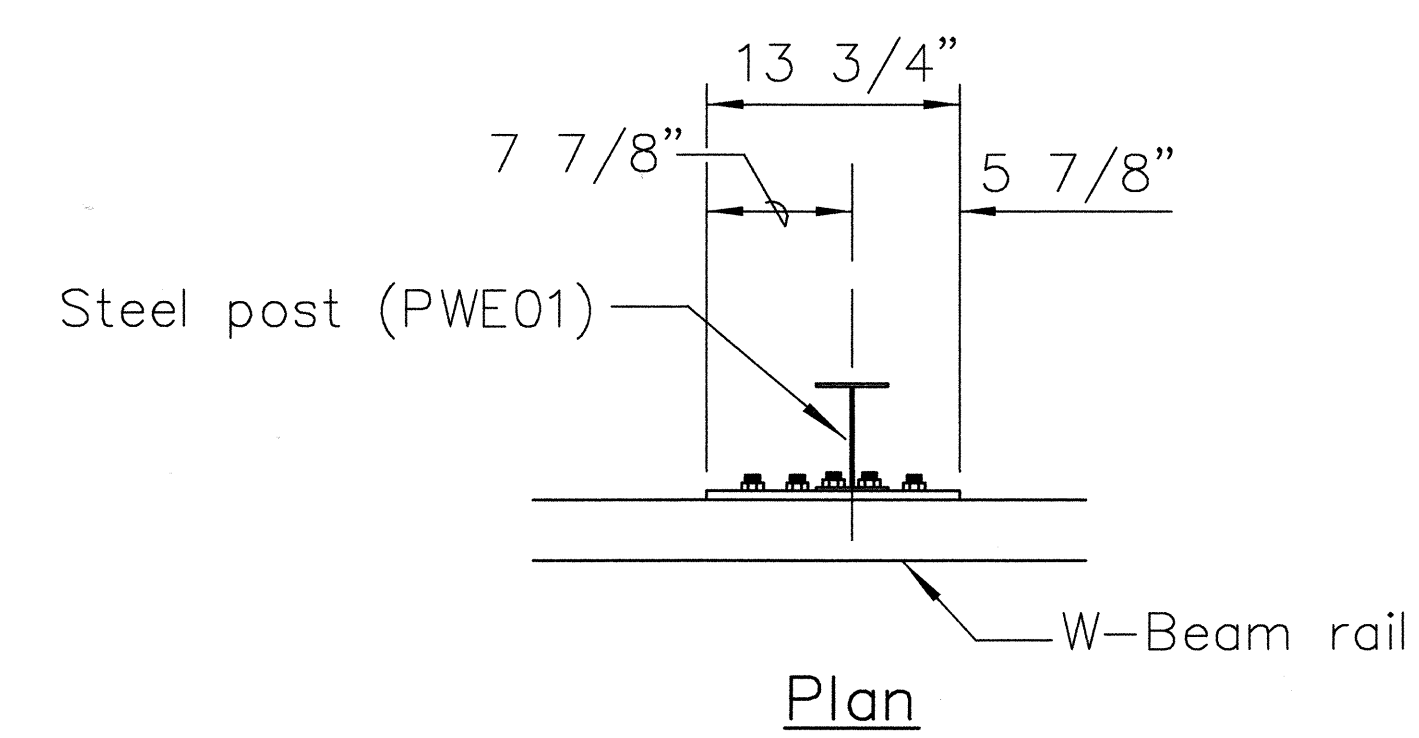
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	83	84



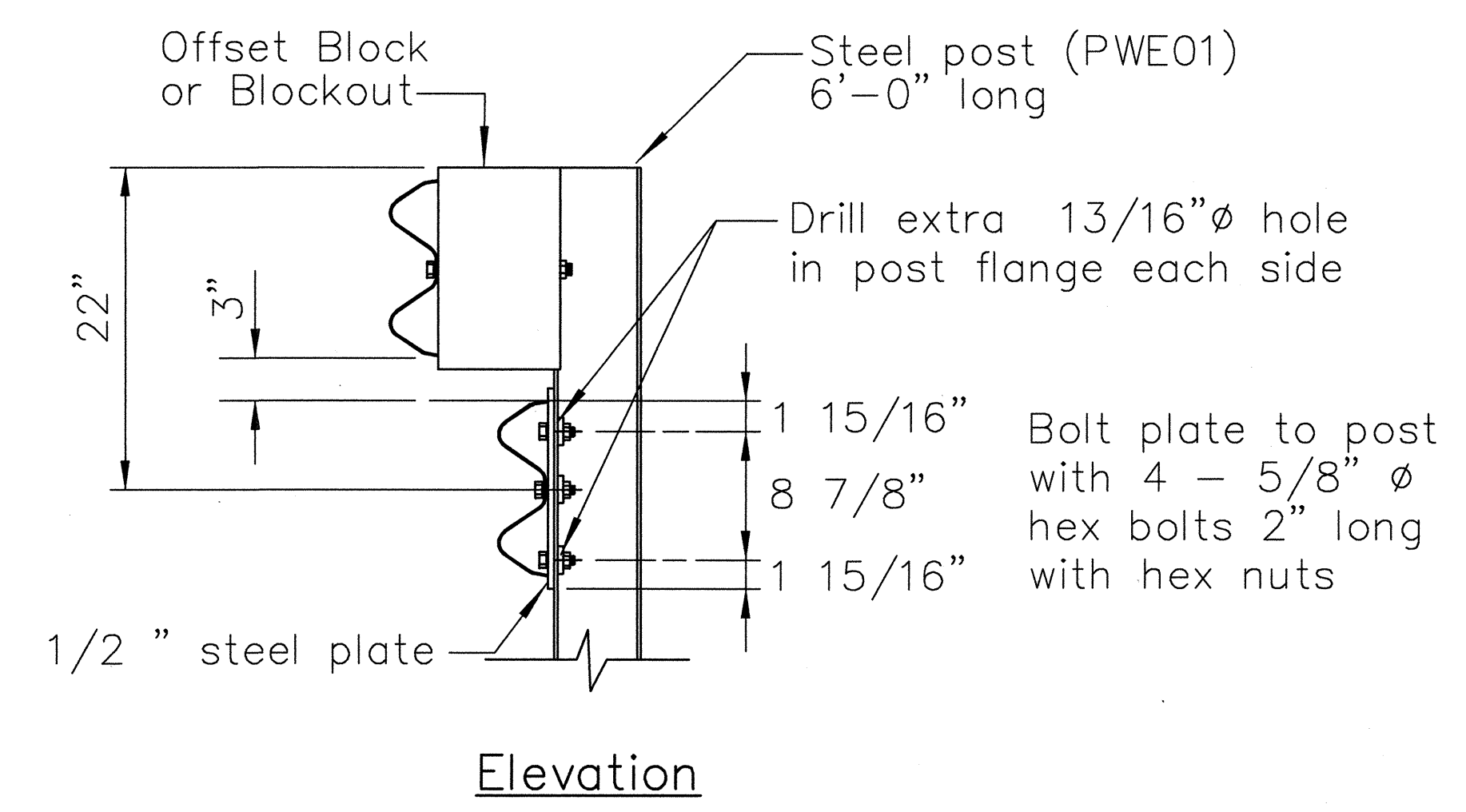
Steel Plate - 1/2"
(Hot-dip Zinc Coated Galvanized
Welded or Bolted to Post)



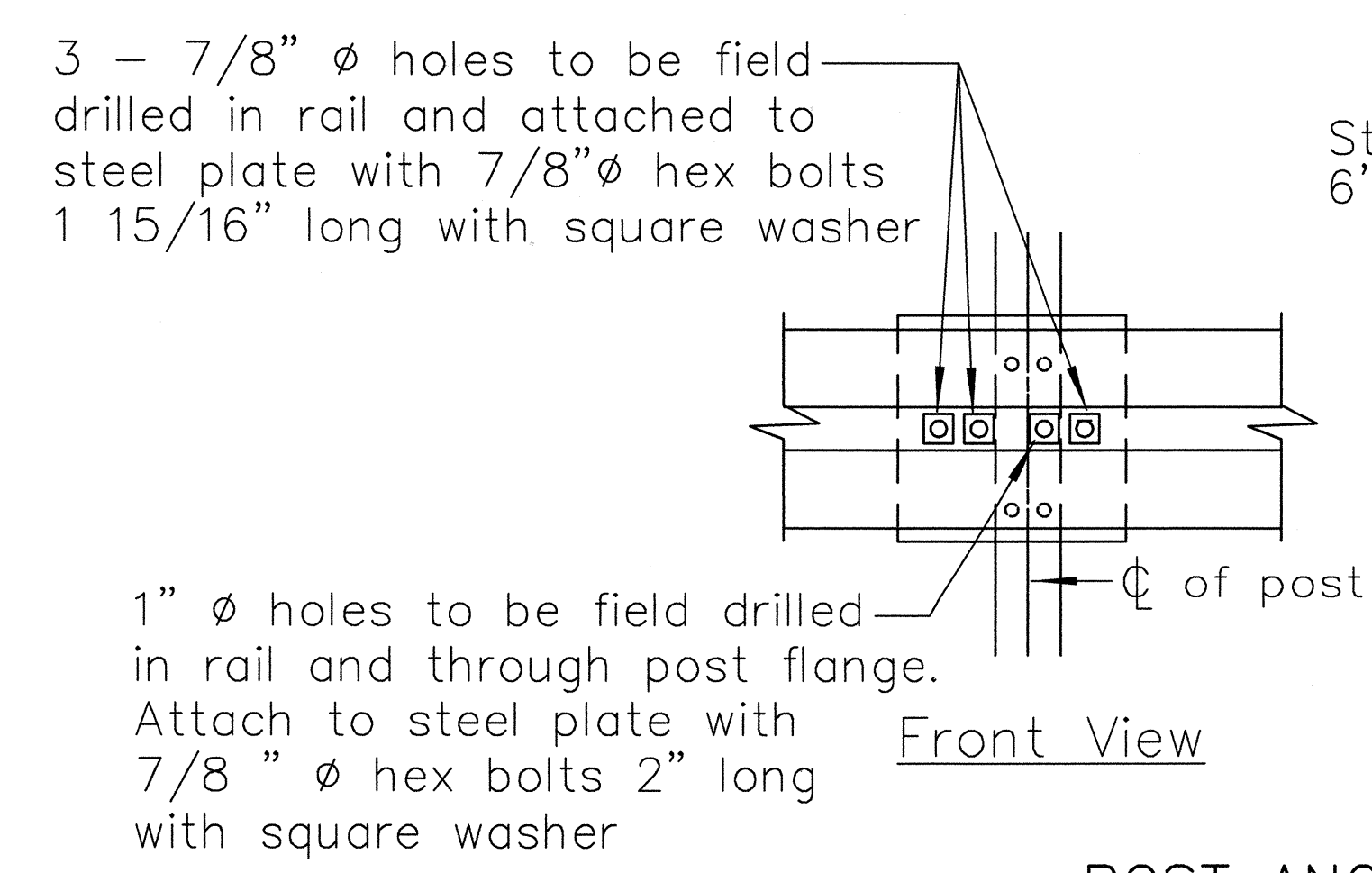
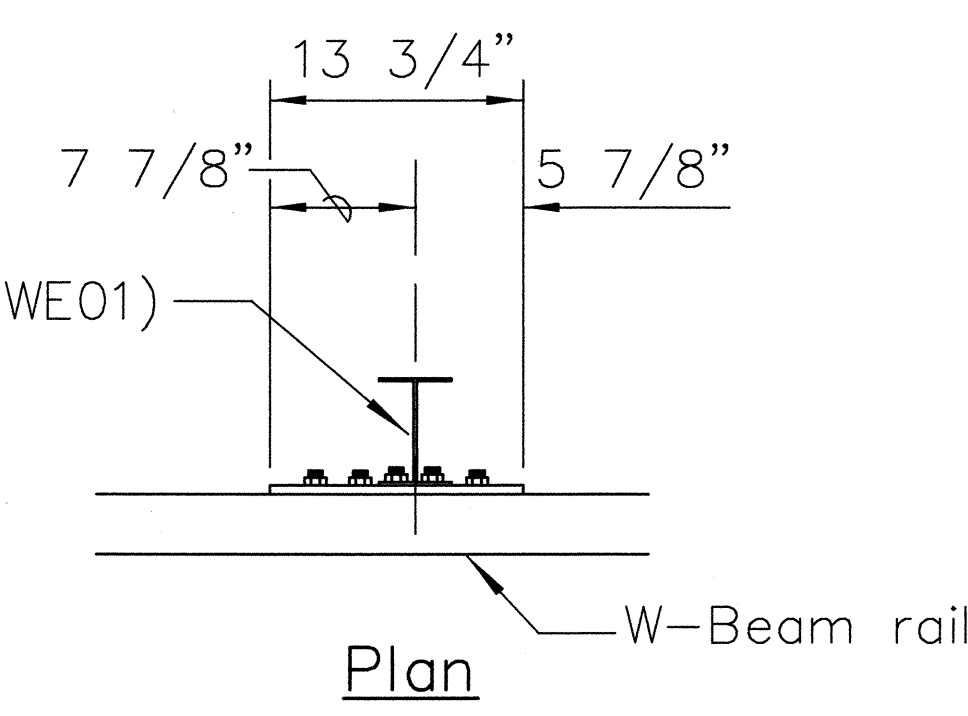
Square Washer
(3/16" Thick - Hot-dip
Zinc Coated Galvanized)



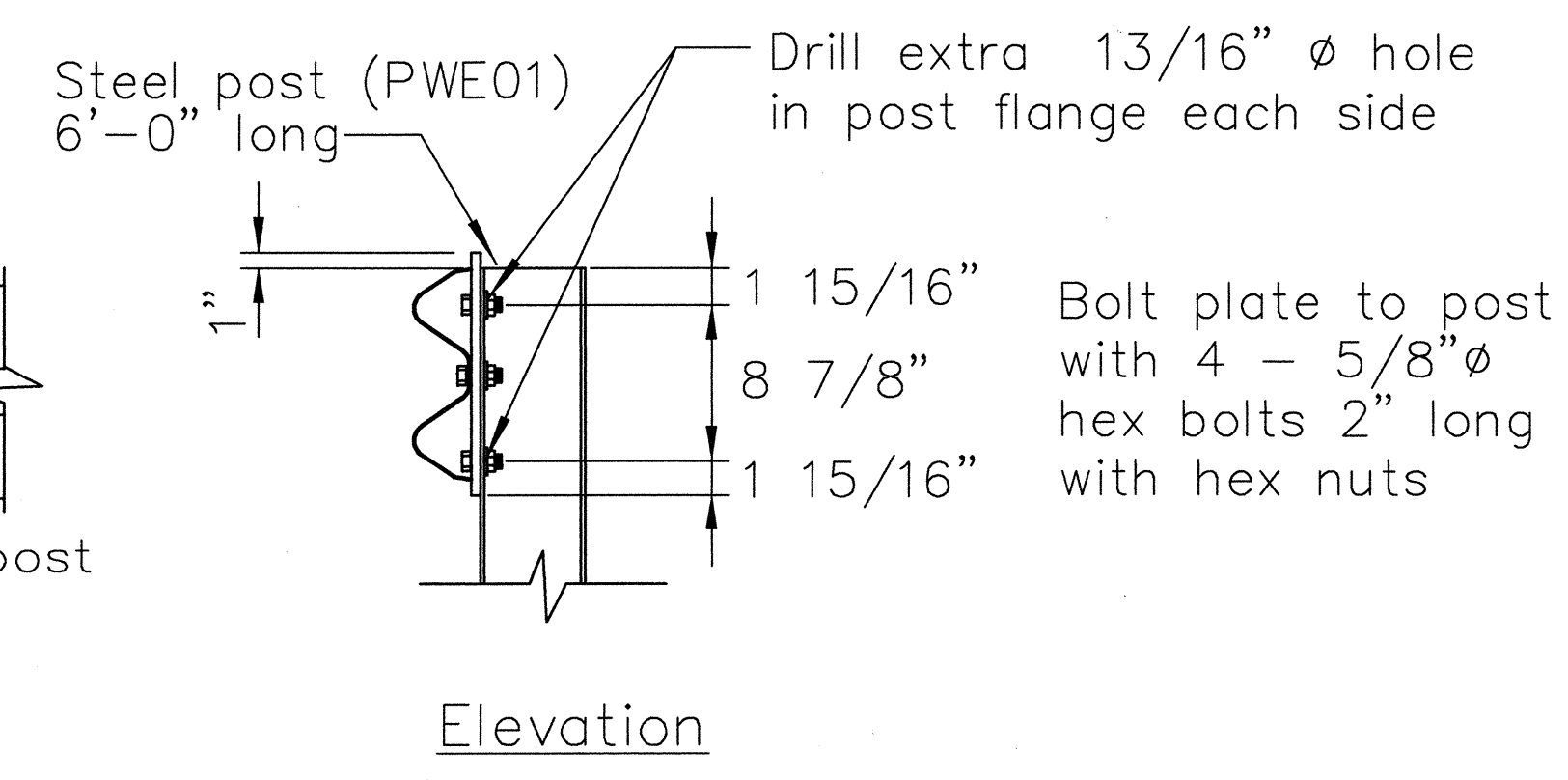
RUBRAIL ANCHOR DETAILS



Note:
All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.



POST ANCHOR DETAILS



BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
TYPE "A" FLARE)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

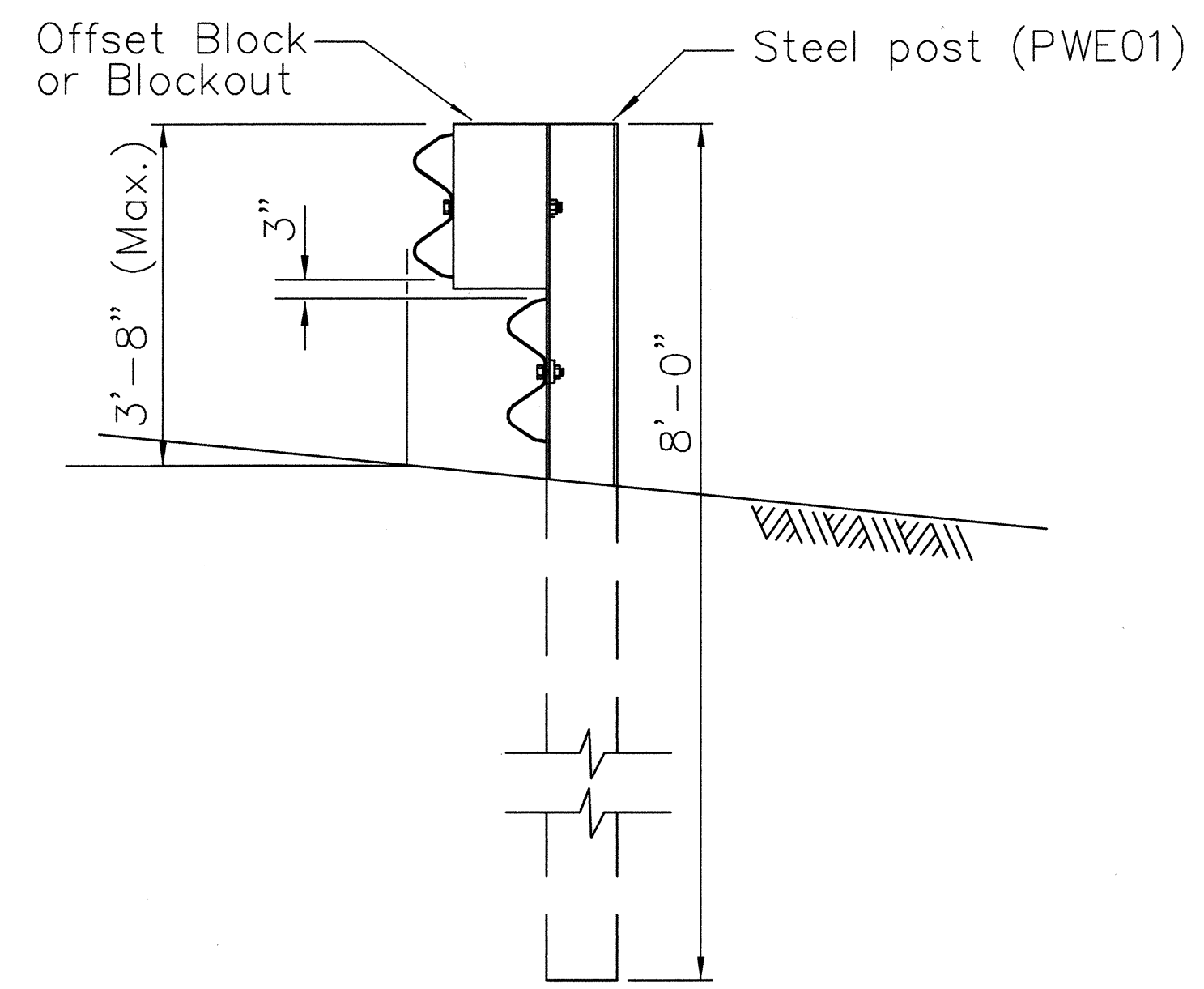
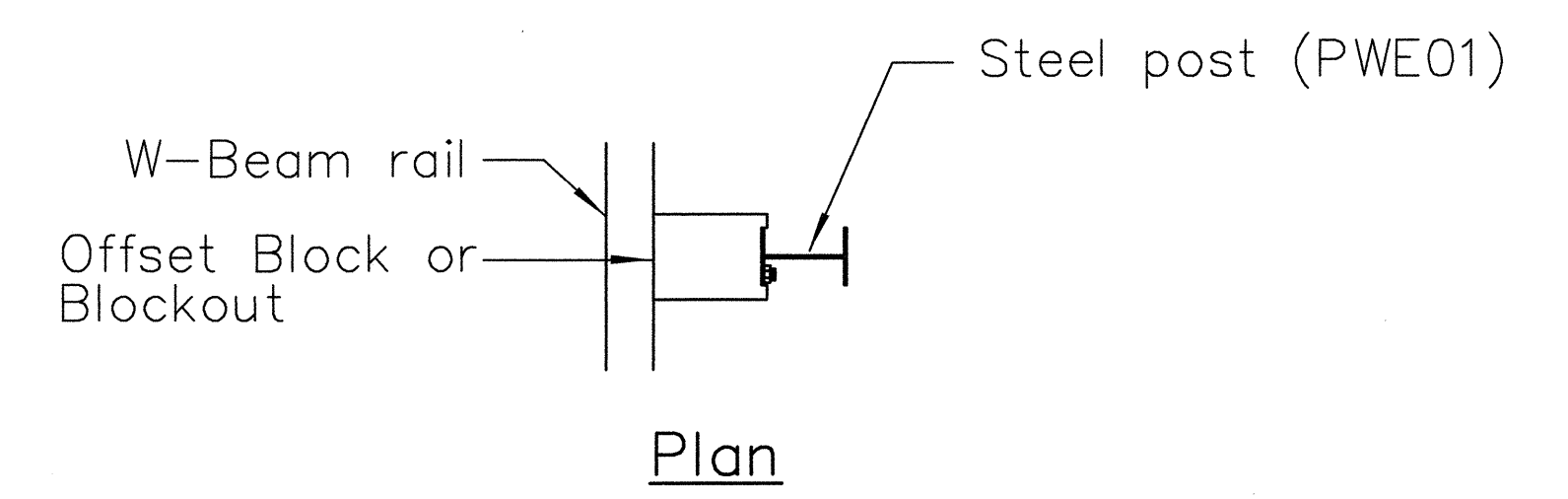
INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999
SHEET NO. B9B OF 10 SHEETS

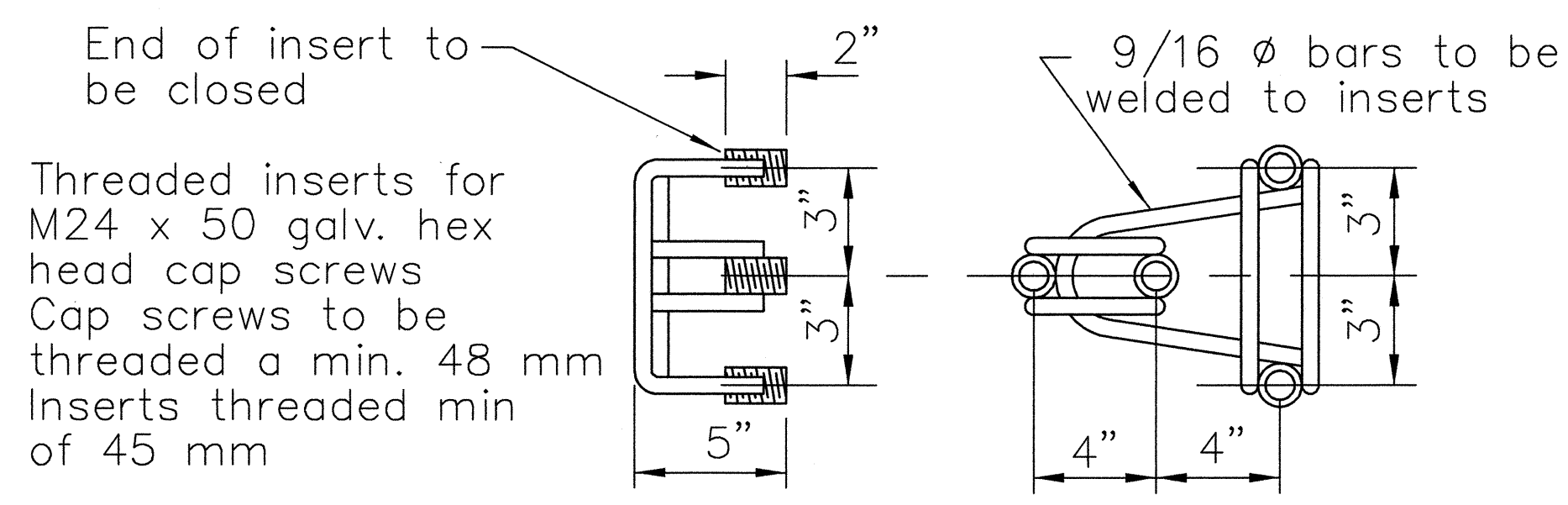
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-H1-1(235)	1999	84	84

Note:

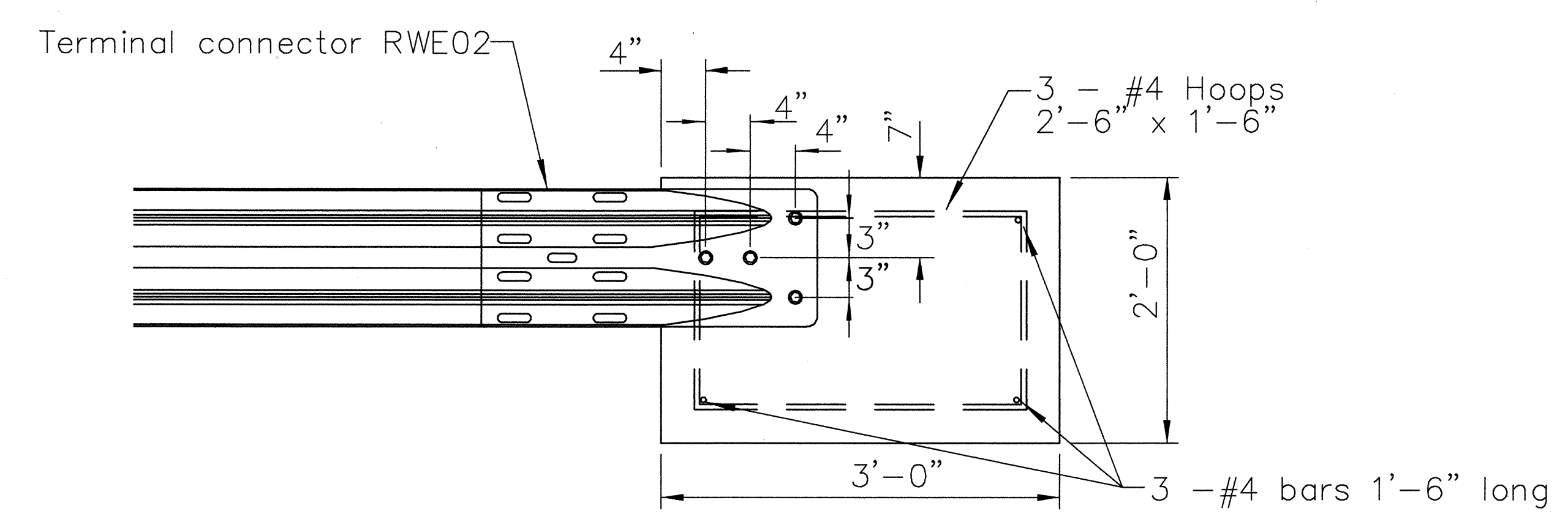
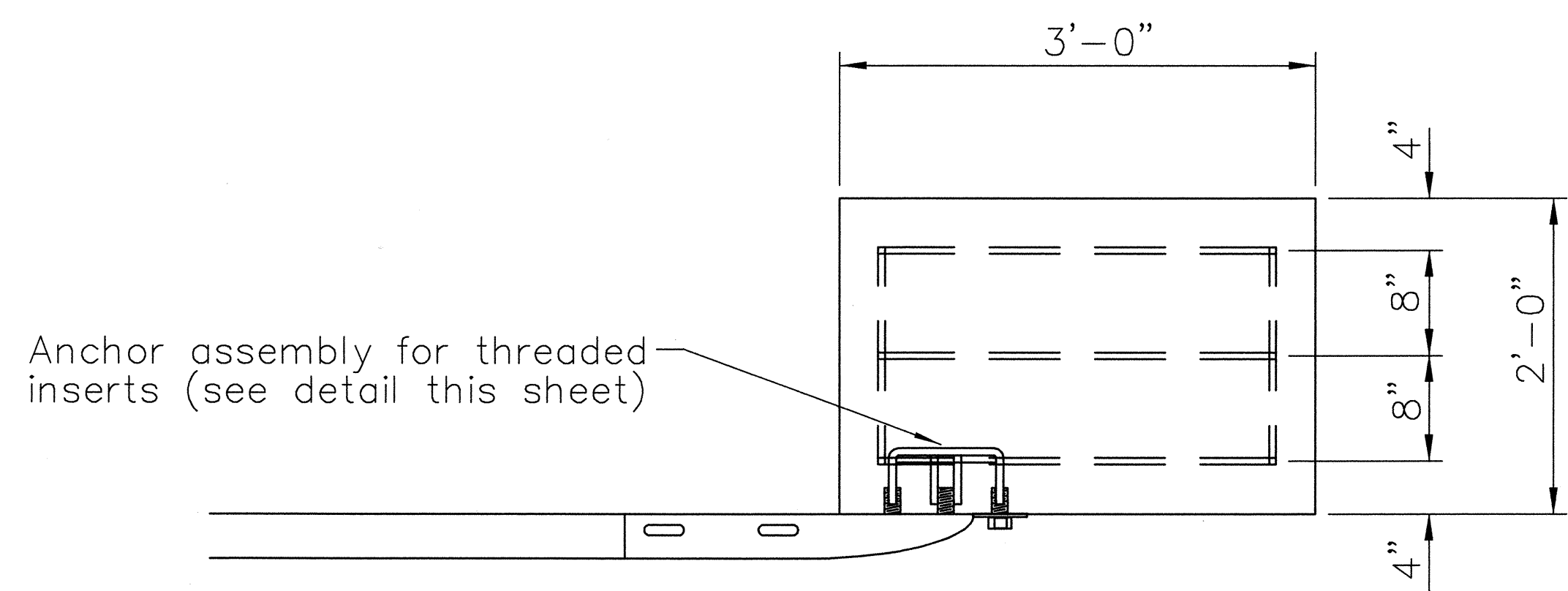
All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.



STEEL POST GUARDRAIL WITH RUBRAIL



ANCHOR ASSEMBLY
CONCRETE BLOCK ANCHOR



CONCRETE BLOCK ANCHOR
(2' X 2' X 3')

BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
TYPE "A" FLARE

SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTEBOOK	
No.	

DATE: 04/28/99
SCALE: 1 = 1
FILE: 9814-104

PM: BST
OPER: SHA,CDK,*FAI
REVISED: 4/29/99

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

INTERSTATE ROUTE H-1 RESURFACING
Kunia IC to Waialeale Stream Bridge
F.A.I. Project No. NH-H1-1(235)

Scale: As Shown Date: Apr. 30, 1999

SHEET NO. B9C OF 10 SHEETS