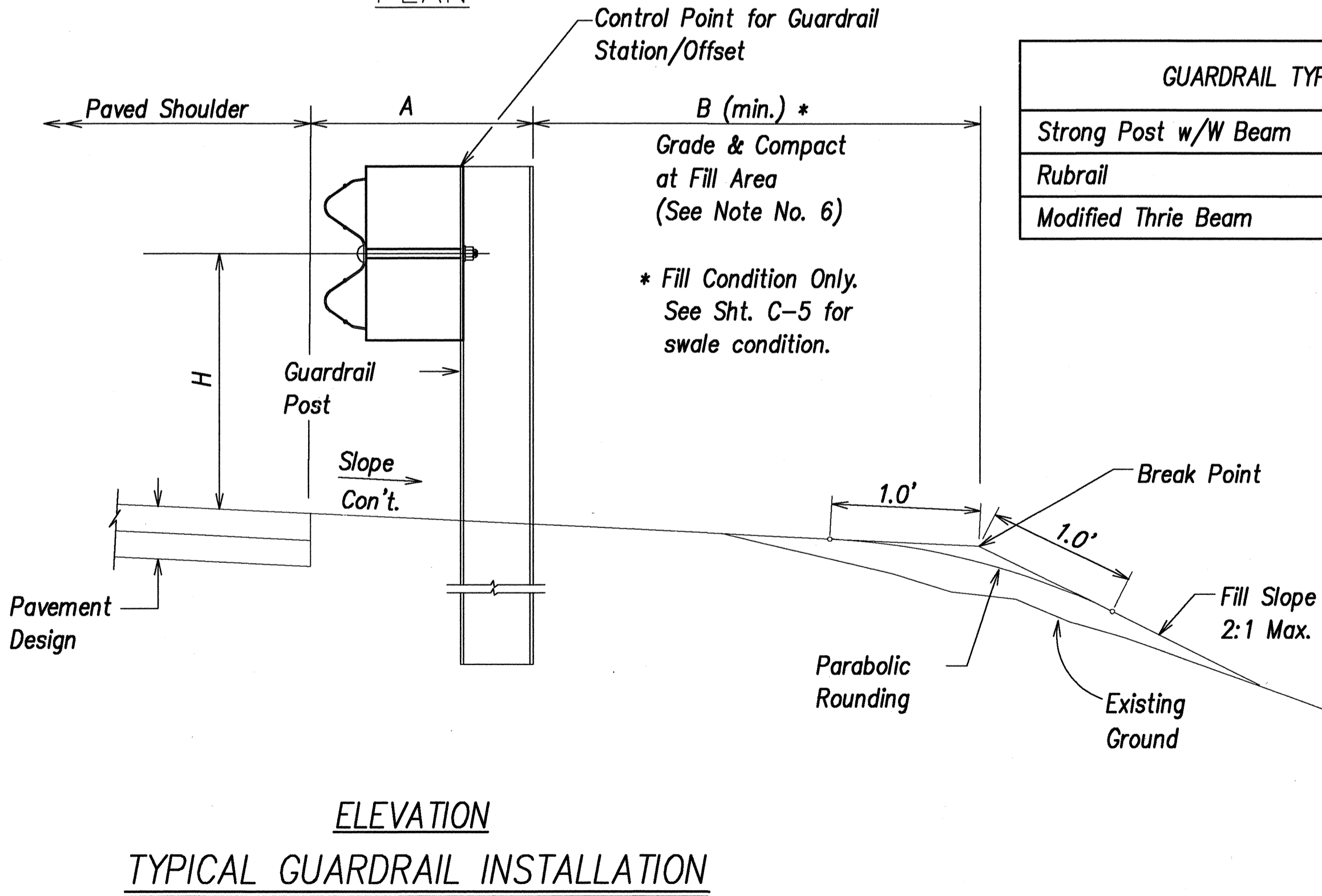
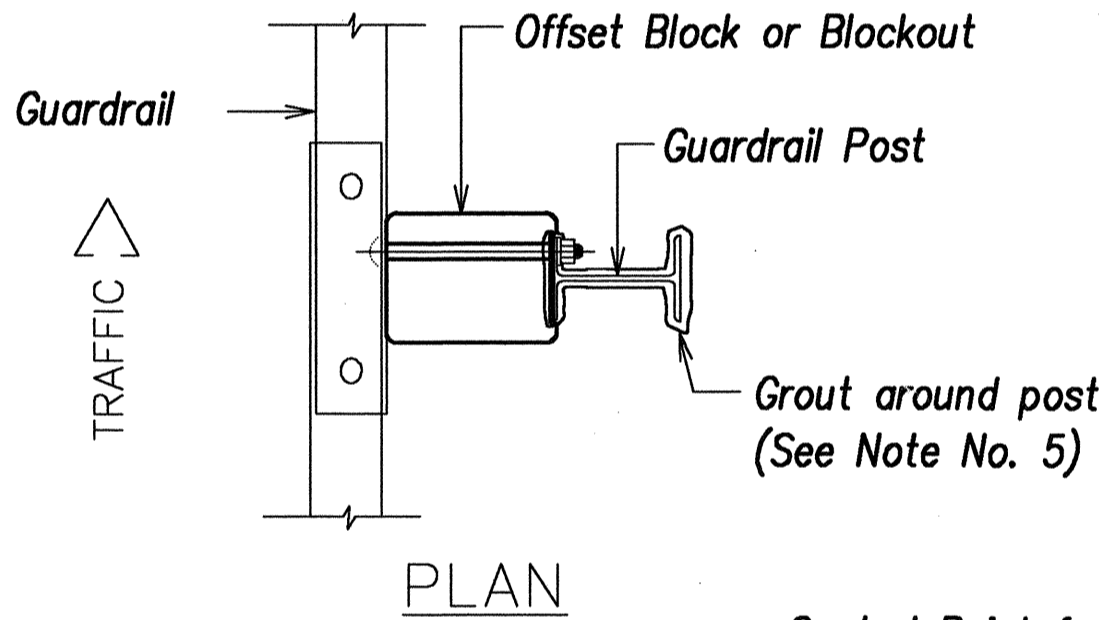
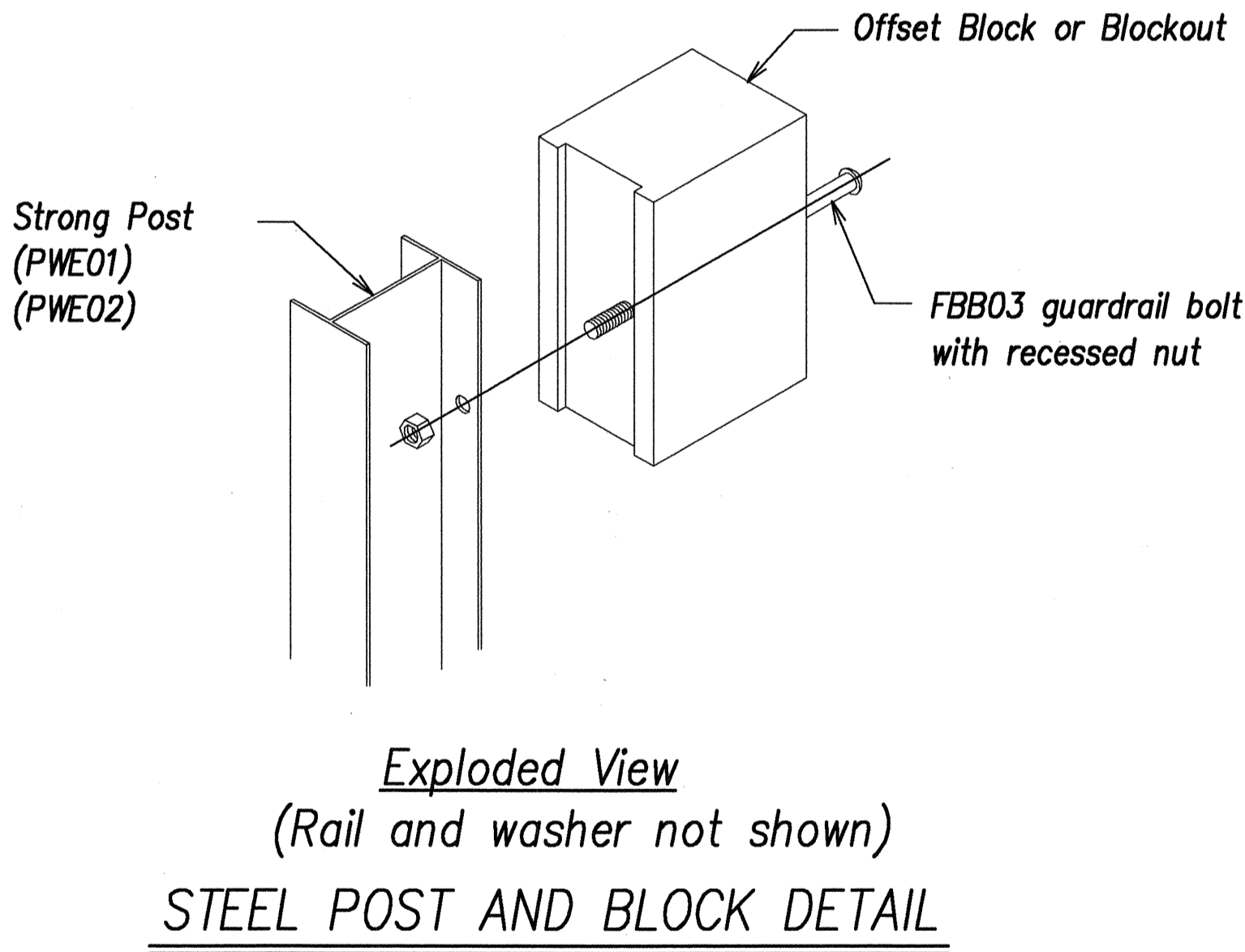
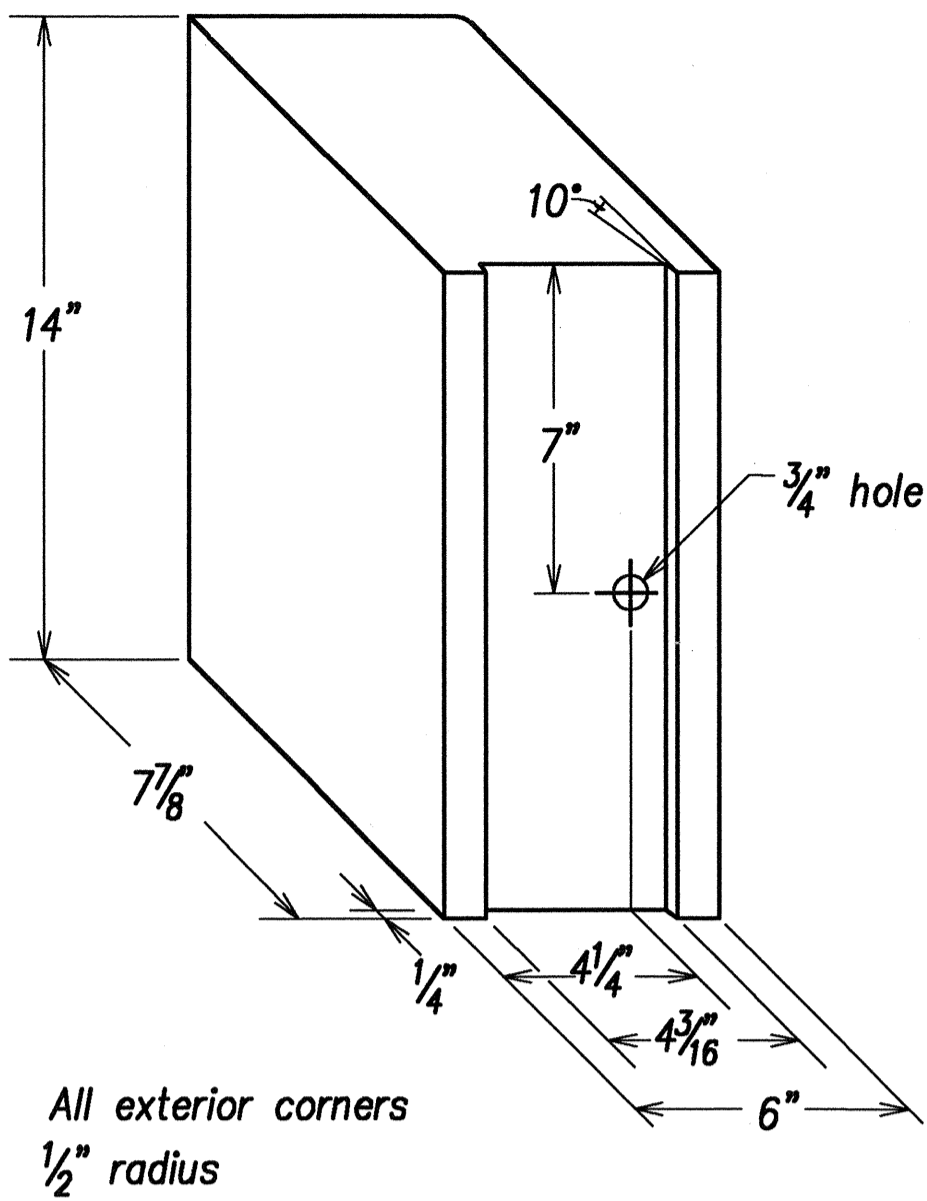
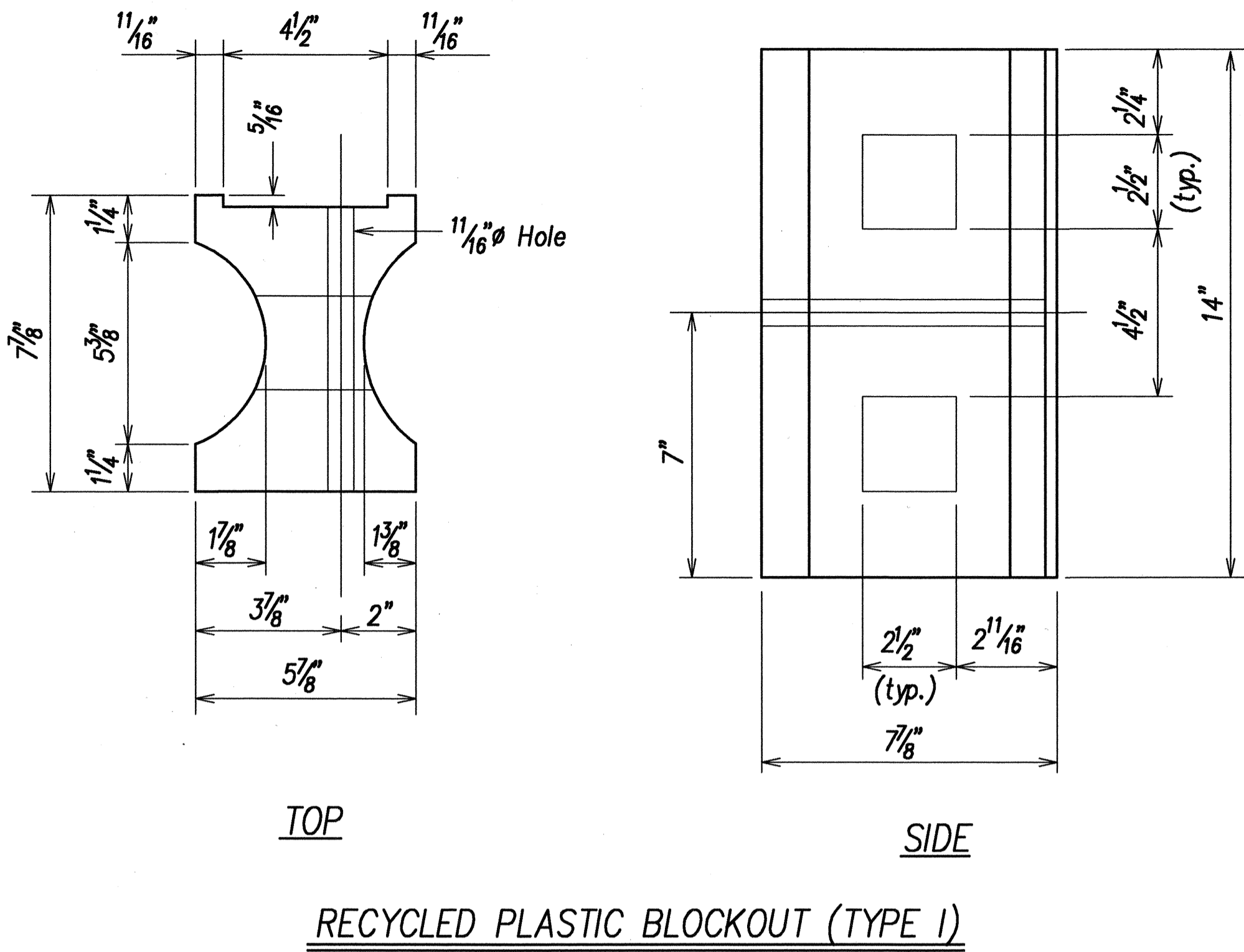


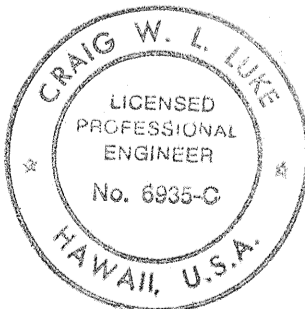
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	25	89

### GENERAL NOTES

- All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
- Where conditions require, special post lengths in increments of 6 inches may be specified.
- 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.
- The Recycled Plastic Block or Offset Block shall be approved by the State.
- 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.
- 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 <sup>5</sup> / <sub>8</sub> "	1'-6"	3'-0"
Rubrail	2'-0"	1'-6"	4'-0"
Modified Thrie Beam	2'-0"	2'-0"	3'-0"



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SIGNATURE DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS & NOTES**  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)

Scale: None
Date: June 30, 2000

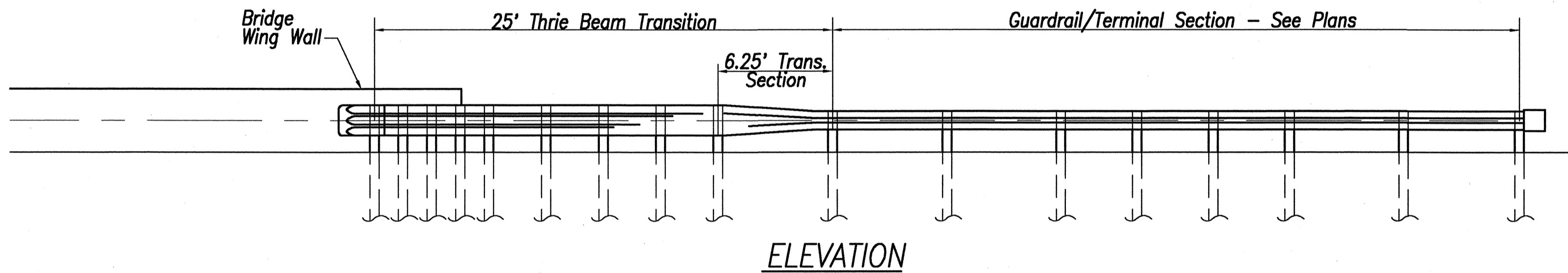
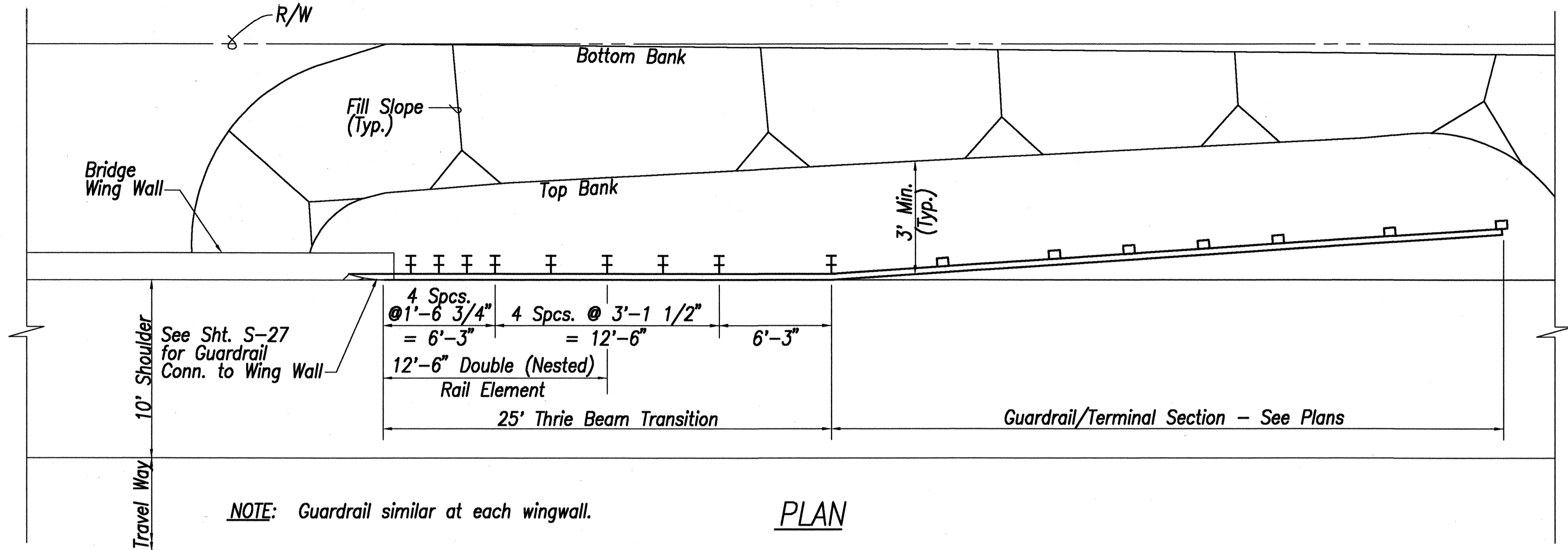
SHEET No. C-23 OF 89 SHEETS

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

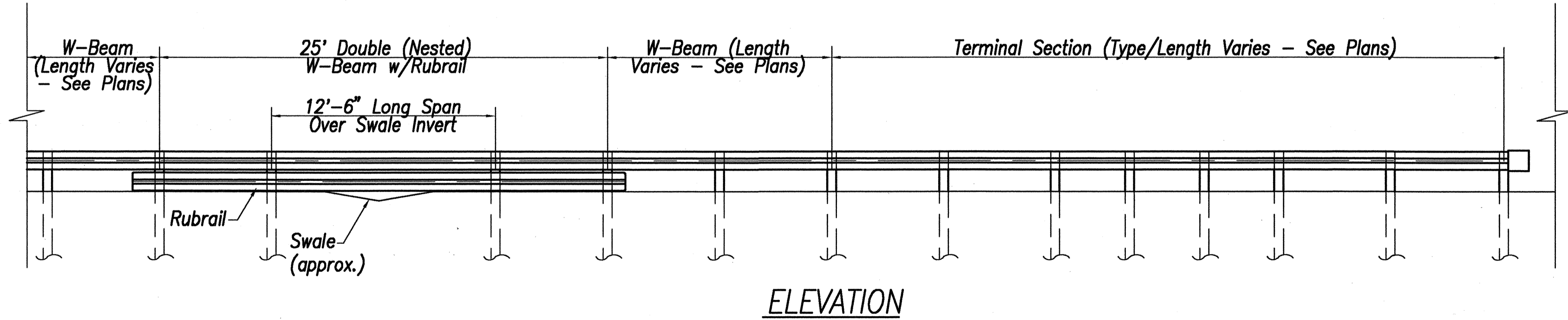
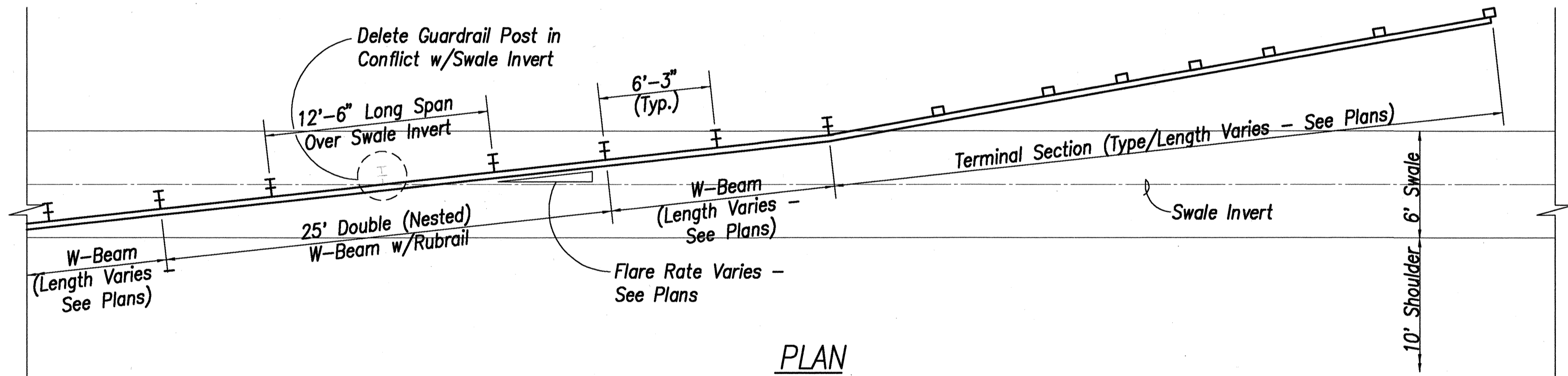
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	26	89

### THRIE BEAM NOTES

- The work necessary to connect guardrail to concrete end post or metal spacer block shall include all labor, materials, tools, equipment and incidentals necessary to complete the work, and shall be incidental to Item No. 606.8000 - Thrie Beam Transition Section and will not be paid for separately.
- Terminal connector, guardrail post, spacer block, transition section and all other associated hardware will not be paid for separately and shall be considered incidental to Item No. 606.8000 - Thrie Beam Transition Section.
- See "General Notes" on Sht. C-23 for additional guardrail and drilling information. other associated hardware will not be paid for separately and shall be considered incidental to Item No. 606.8000 - Thrie Beam Transition Section.
- All anchor bolts shall be high strength bolts conforming to the requirements of AASHTO M 164. See Special Provisions.
- Anchor bolt length shall be such that a snug fit of the elements and full thread engagement plus 1/4" (max.) is attained.
- Terminal Connector, Thrie Beam Metal Guardrail and Transition Section shall be fabricated from 10 gauge steel conforming to the requirements of AASHTO M 180 and shall be hot-dipped galvanized after fabrication.
- Guardrail posts, spacer blocks, "terminal connectors" and all anchor bolts, cap PL, bolts, nuts and washers, shall be hot-dip galvanized after fabrication. See Special Provisions.
- Cap PL shall be fabricated from ASTM A 36.
- First 25'-0" of guardrail adjoining "Terminal Connectors" shall be galvanized steel and supports spaced as shown on the detail drawings, unless indicated otherwise. This section of rail shall be placed on tangent to end post or parallel to roadway, unless conditions at site renders it impossible to do so. Flare point to be determined in field.
- Double (nest first panel) thrie beam elements at all end post connections.
- Where double (nested) beams occur, 12" "Back-Up Plate" not required.
- Heads of through anchor bolts shall be placed on the traffic side of the rail.
- Drilling of through holes shall be done in such a manner as to prevent cone puncturing of the daylighting end.
- For Strong Post Modified Thrie-Beam Guardrail details, see Sht. C-27.

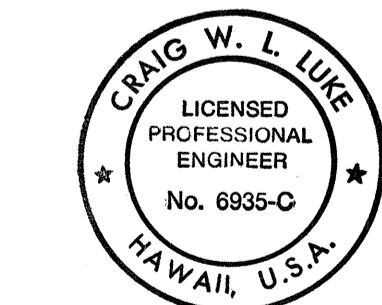
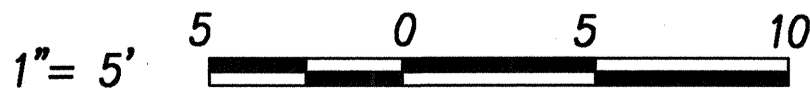


**TYPICAL METAL GUARDRAIL AT BRIDGE**  
SCALE: 1" = 5'



**TYPICAL GUARDRAIL CROSSING SWALE**  
SCALE: 1" = 5'

GRAPHIC SCALE:



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SIGNATURE: *[Signature]* DATE: 1/10/00

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

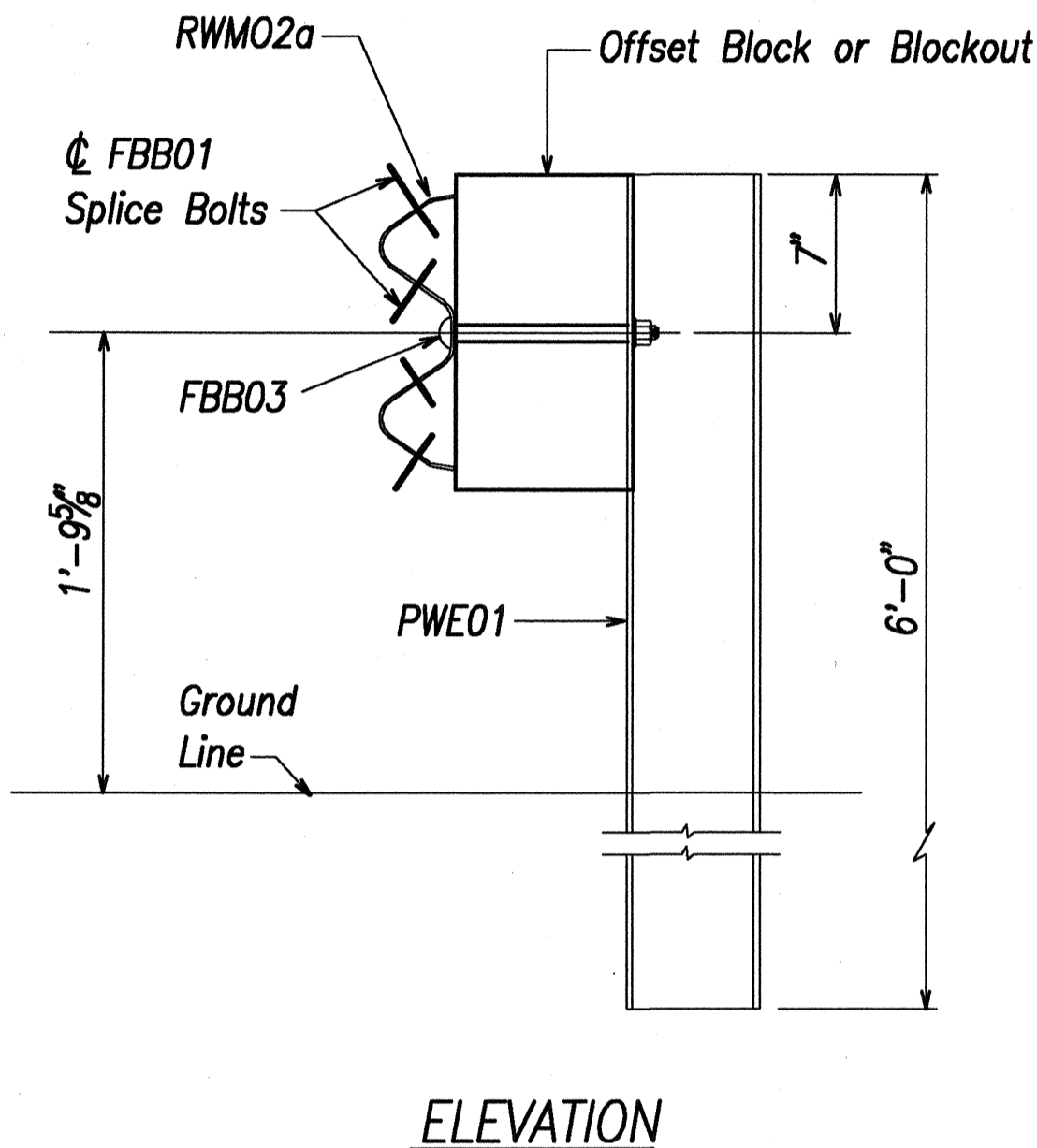
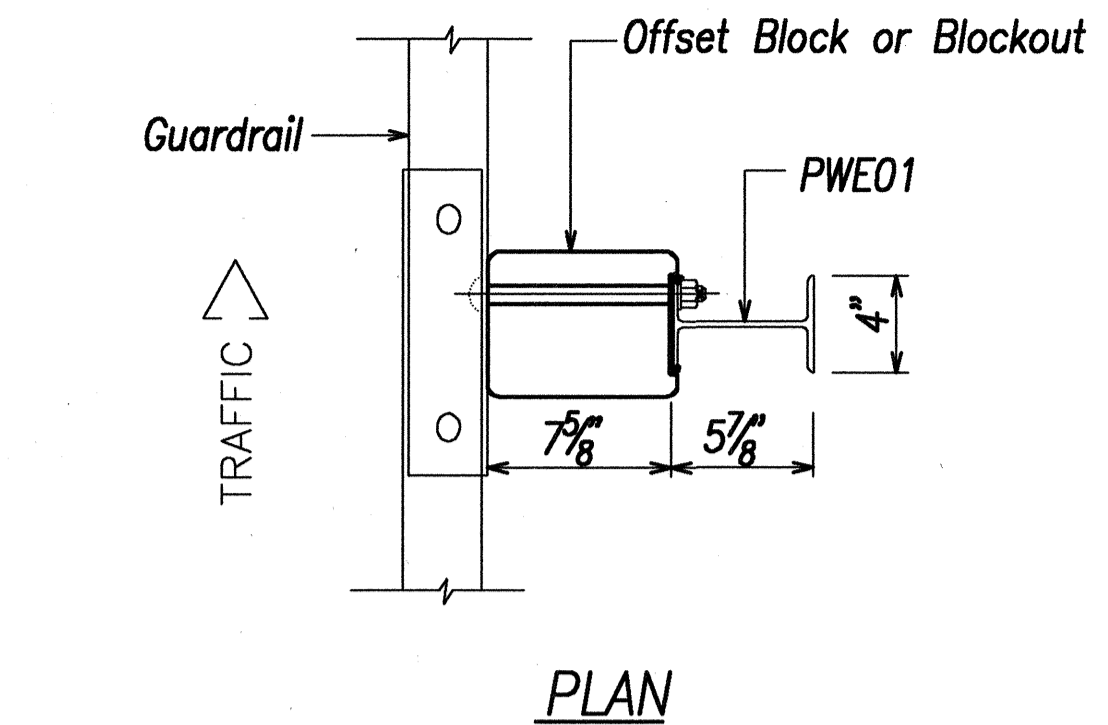
**GUARDRAIL DETAILS**  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)

Scale: 1" = 5'  
Date: June 30, 2000

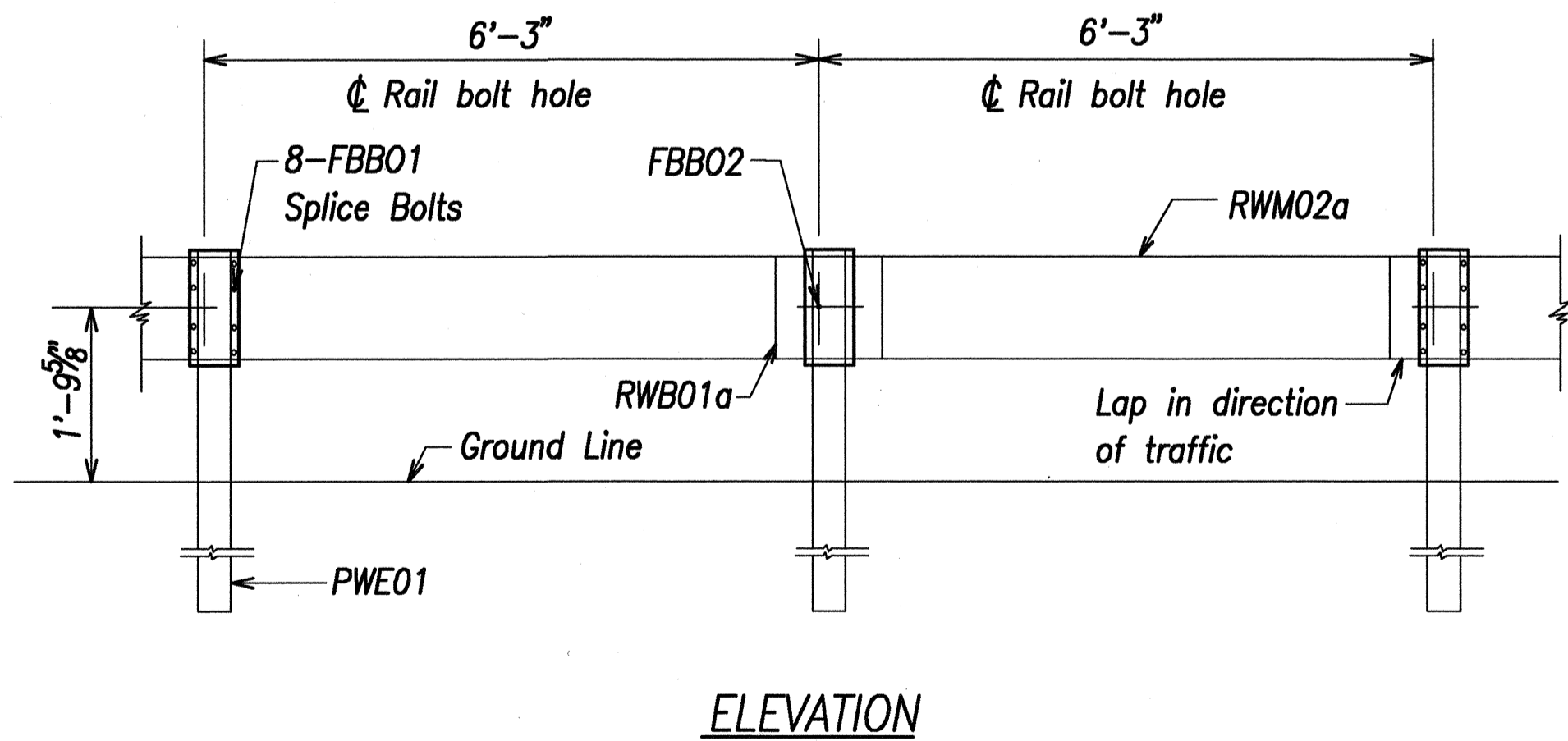
SHEET No. C-24 OF 89 SHEETS

ORIGINAL PLAN	DATE
DRAWN BY	
DESIGNED BY	
NOTED BY	
CHECKED BY	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	27	89

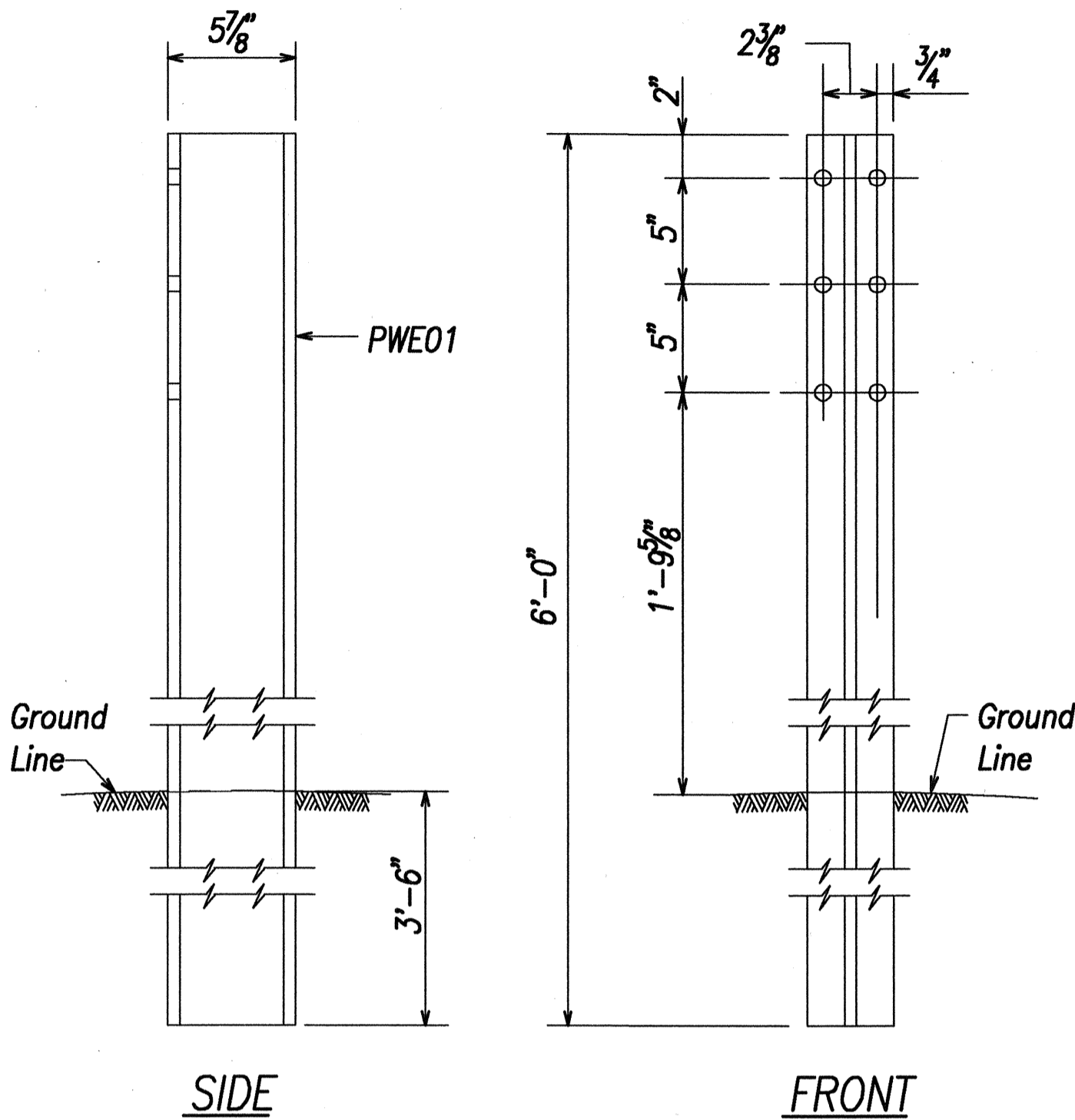


STRONG POST W-BEAM GUARDRAIL  
(SGR04a)

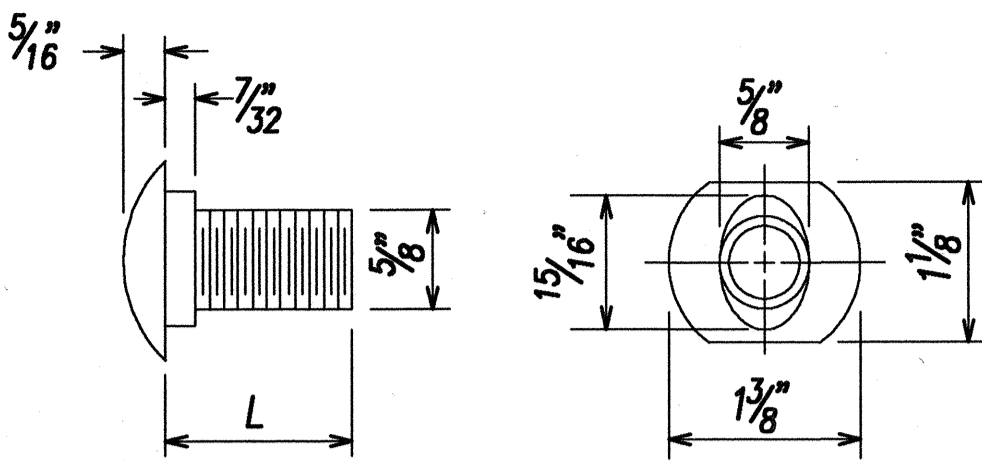


STRONG POST W-BEAM GUARDRAIL WITH  
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT

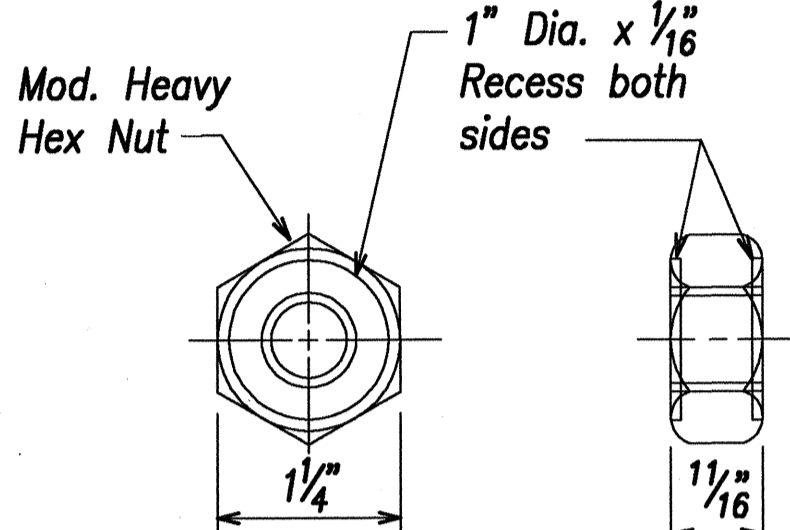
NOTE:  
All Holes Are  
3/4" Dia.



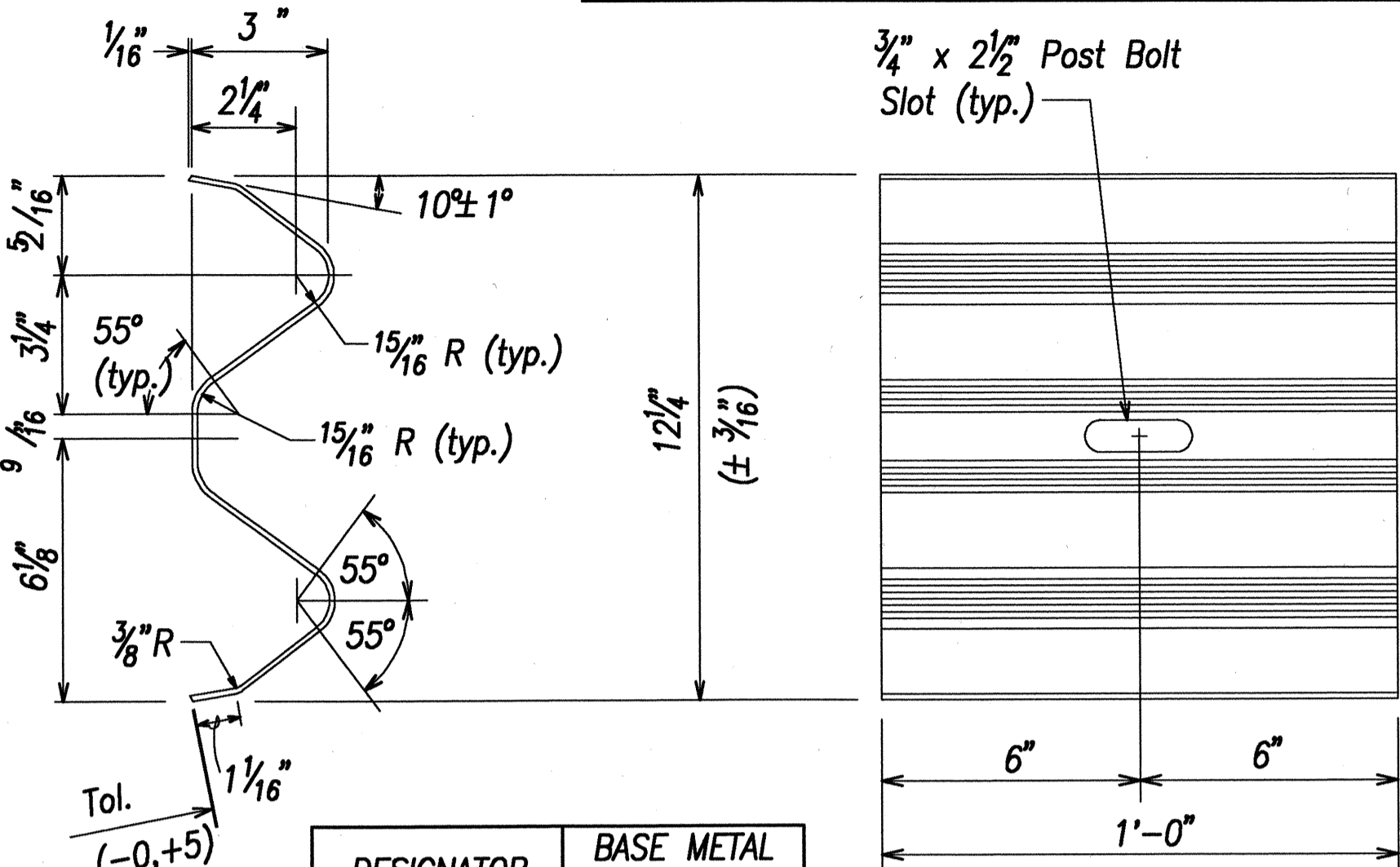
W-BEAM STRONG POST (PWE01)



DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"

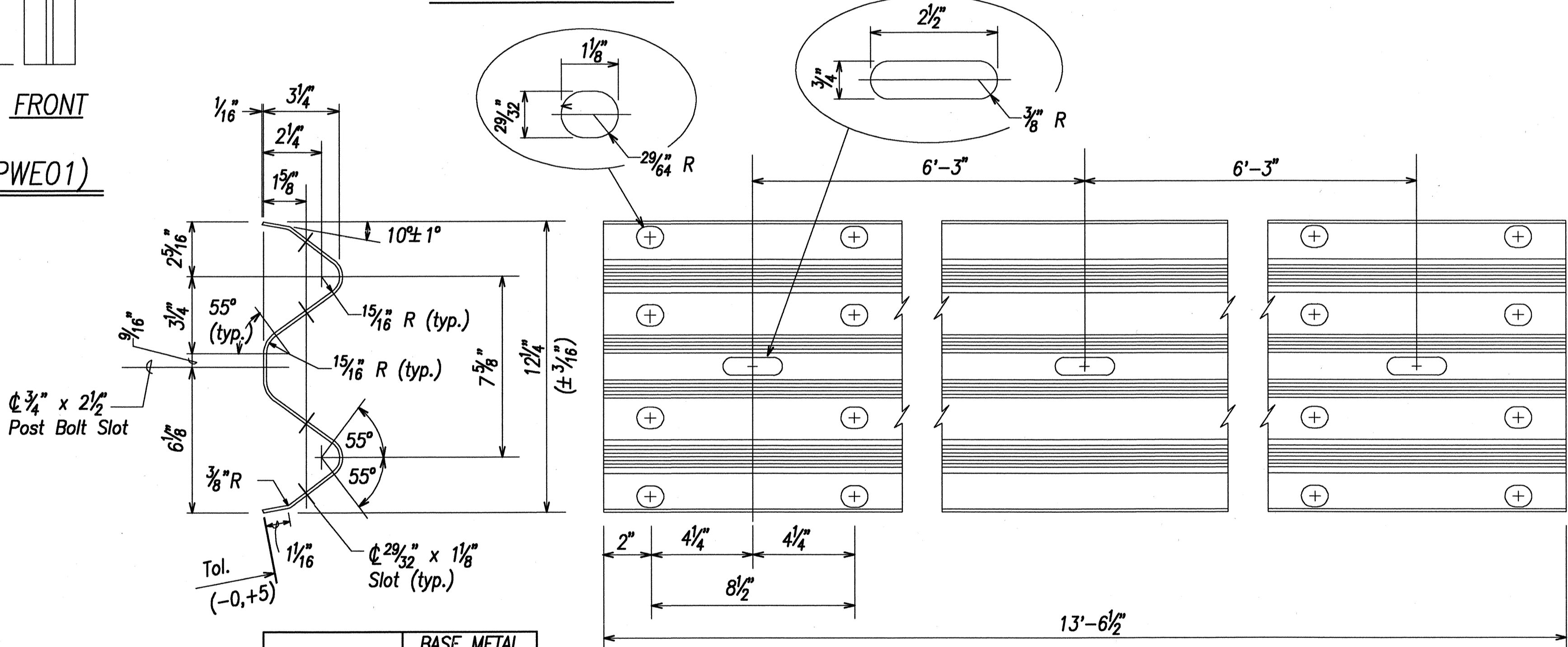


GUARDRAIL BOLTS AND  
RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 ga.

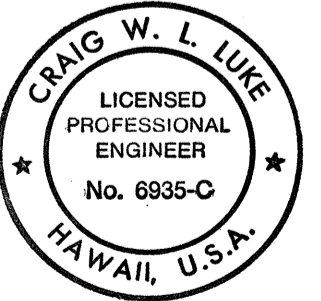
W-BEAM BACK-UP PLATE (RWB01a)



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 ga.

2 SPACE W-BEAM GUARDRAIL (RWM02a)

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



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MY SUPERVISION.  
SIGNATURE DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)

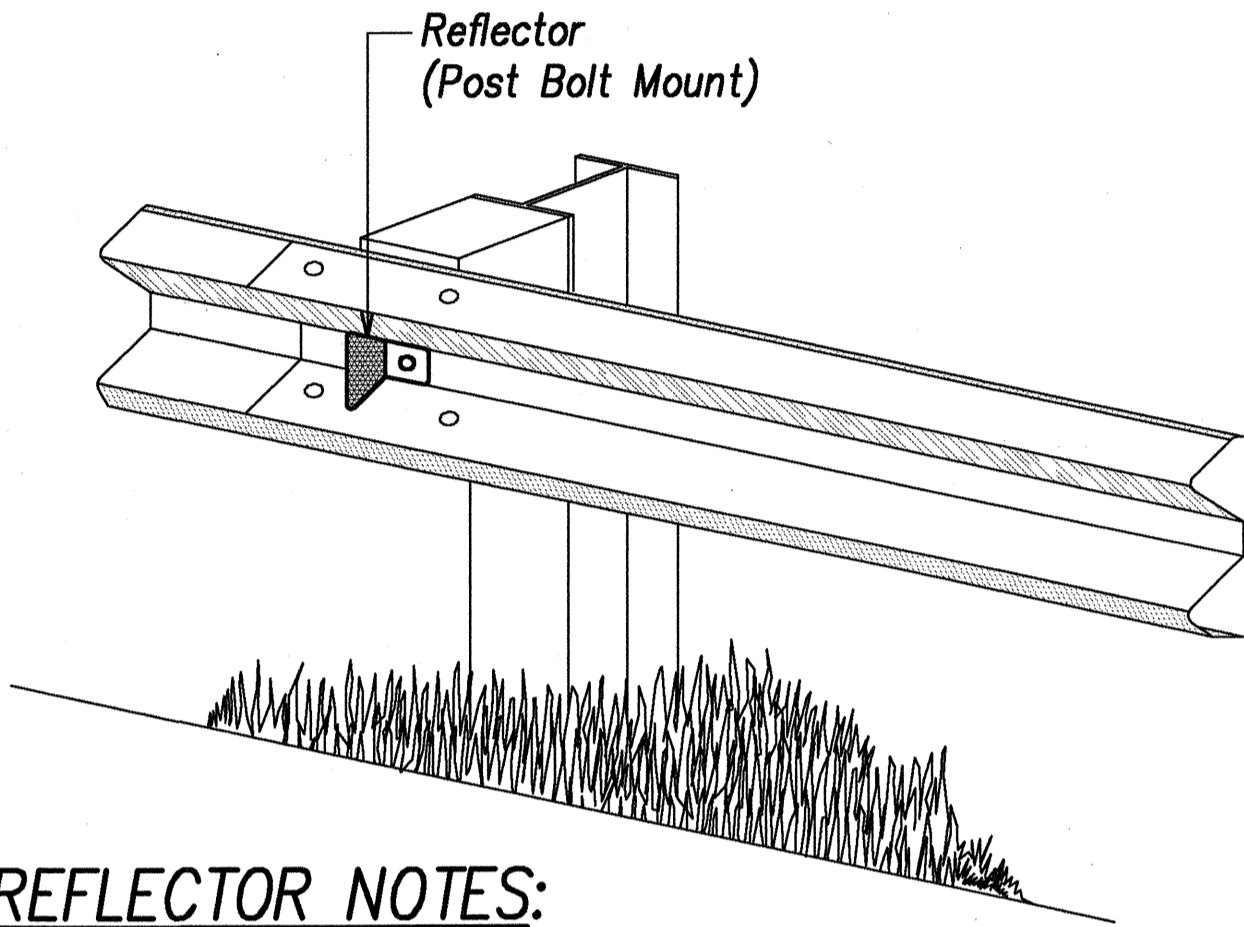
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Date: June 30, 2000

SHEET No. C-25 OF 89 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	28	89

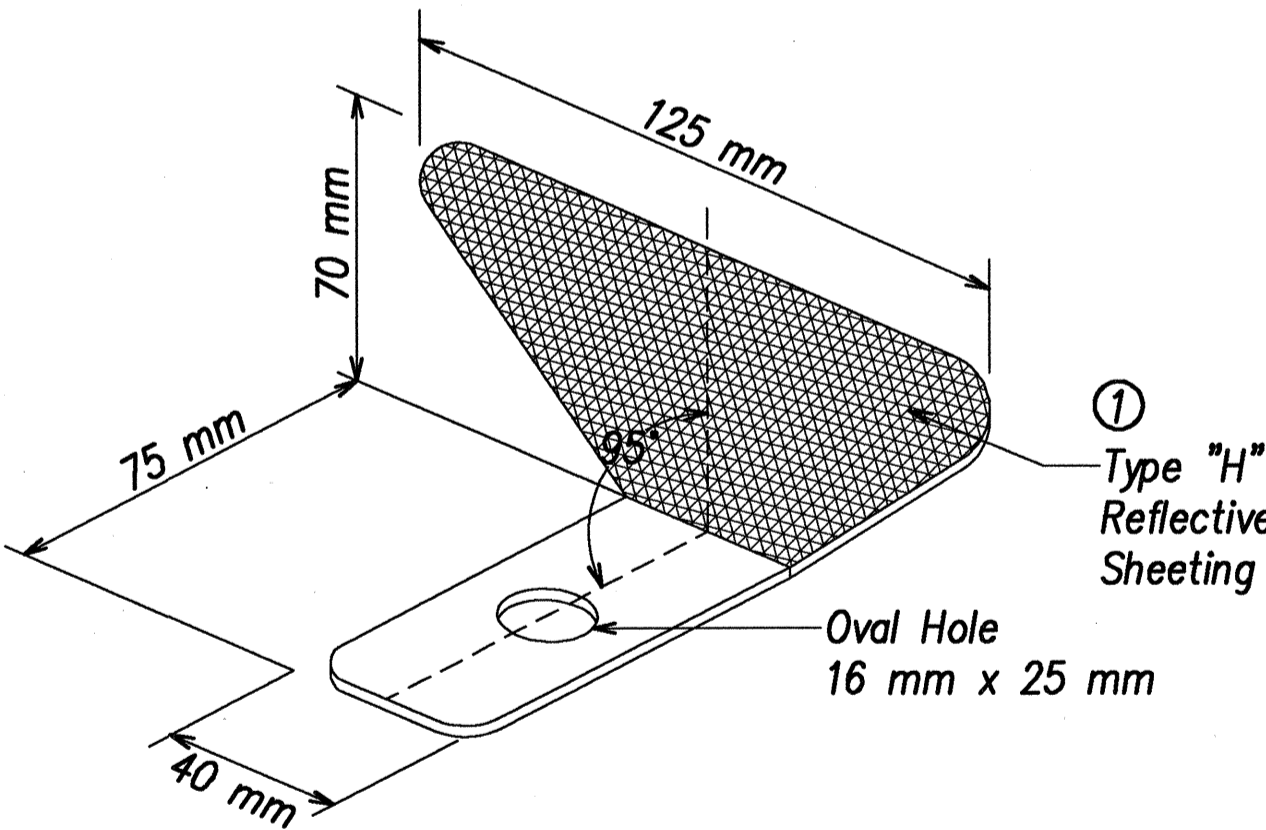
### REFLECTOR SPACING<sup>②</sup>

	BEAM GUARD LENGTH	REFLECTOR SPACING	NO. SURFACES REFLECTORIZED	MIN. NO. REFLECTORS
ONE WAY TRAFFIC	< 60 m	15 m C-C	1	3
	> 60 m	30 m C-C	1	
TWO WAY TRAFFIC	< 60 m	6 m C-C	1 <sup>③</sup>	6
	> 60 m	15 m C-C	1	
TWO WAY TRAFFIC	< 60 m	15 m C-C	2 <sup>④</sup>	3
	> 60 m	30 m C-C	2	

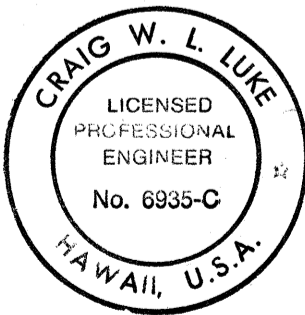


### REFLECTOR NOTES:

- ① Provide Type "H" silver reflective sheeting on all reflectors except those located along the left edge of one-way roadways, which shall be provided with Type "H" yellow reflective sheeting.
- ② Reflectors shall not be installed on the first 15.24 m of the approach end of the energy absorbing terminal.
- ③ Every other reflector shall be reversed for two-way visibility. Contractor may furnish two-sided reflectors in lieu of one-sided reflectors.
- ④ Angle of bend shall be 90° ± 1° for two-sided reflectors.



### REFLECTOR DETAIL AND TYPICAL INSTALLATION



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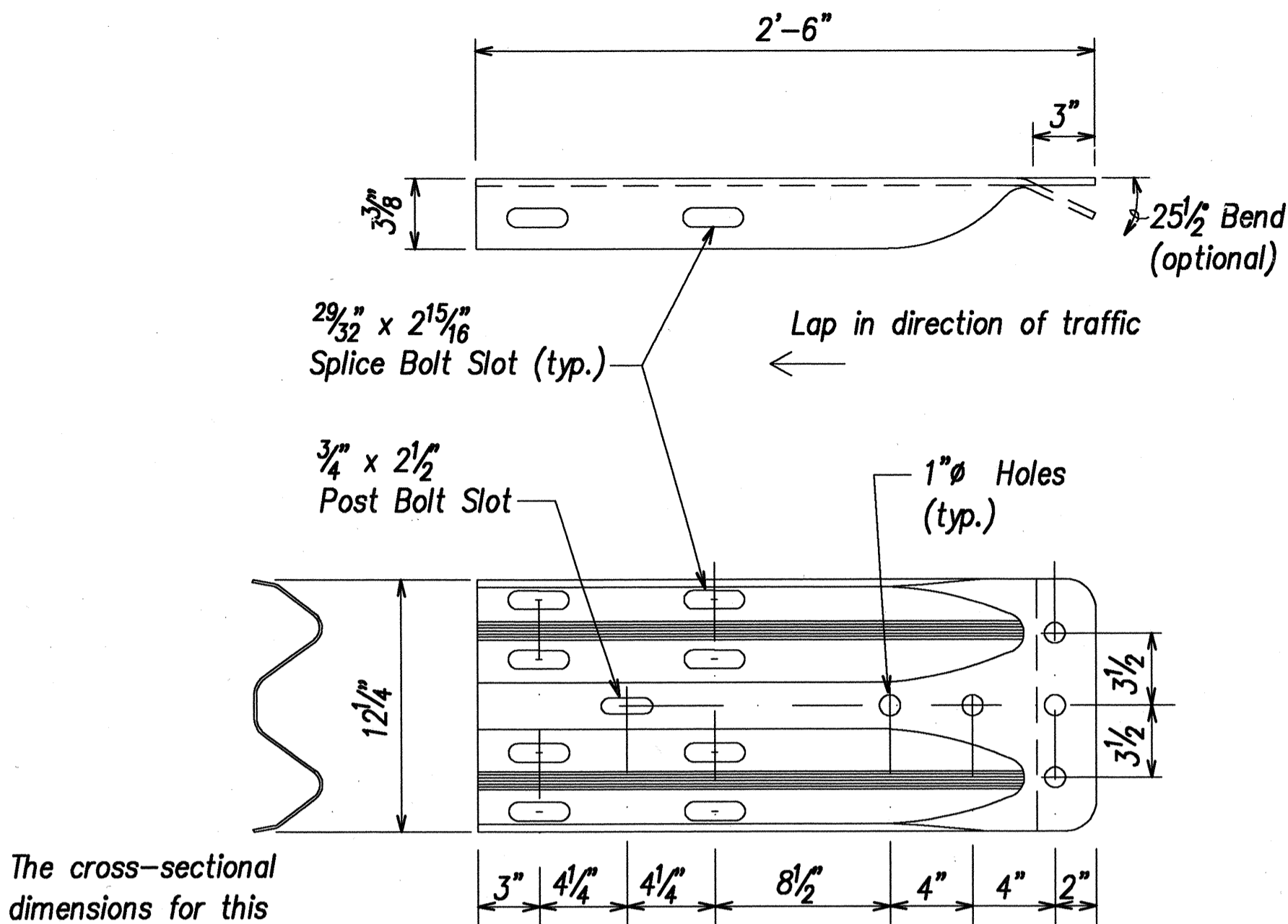
SIGNATURE DATE 9/16/00

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)

Scale: None
Date: June 30, 2000

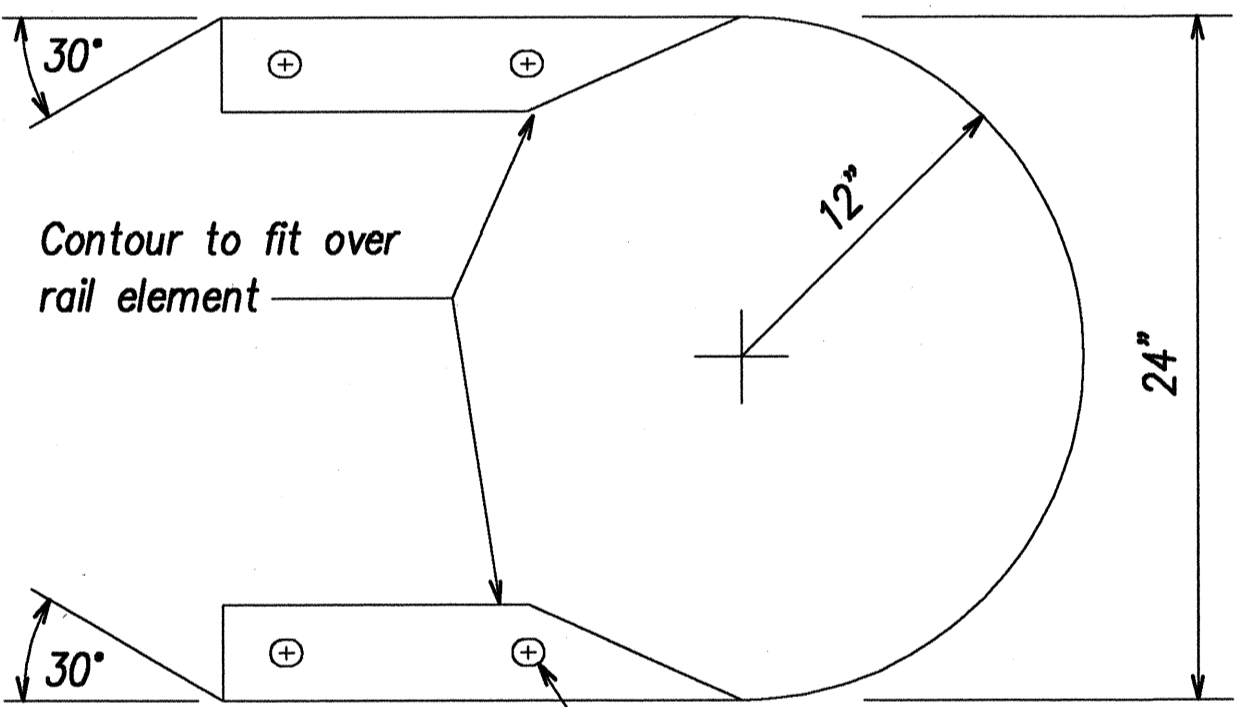
SHEET No. C-26 OF 89 SHEETS



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE02b	10 ga.

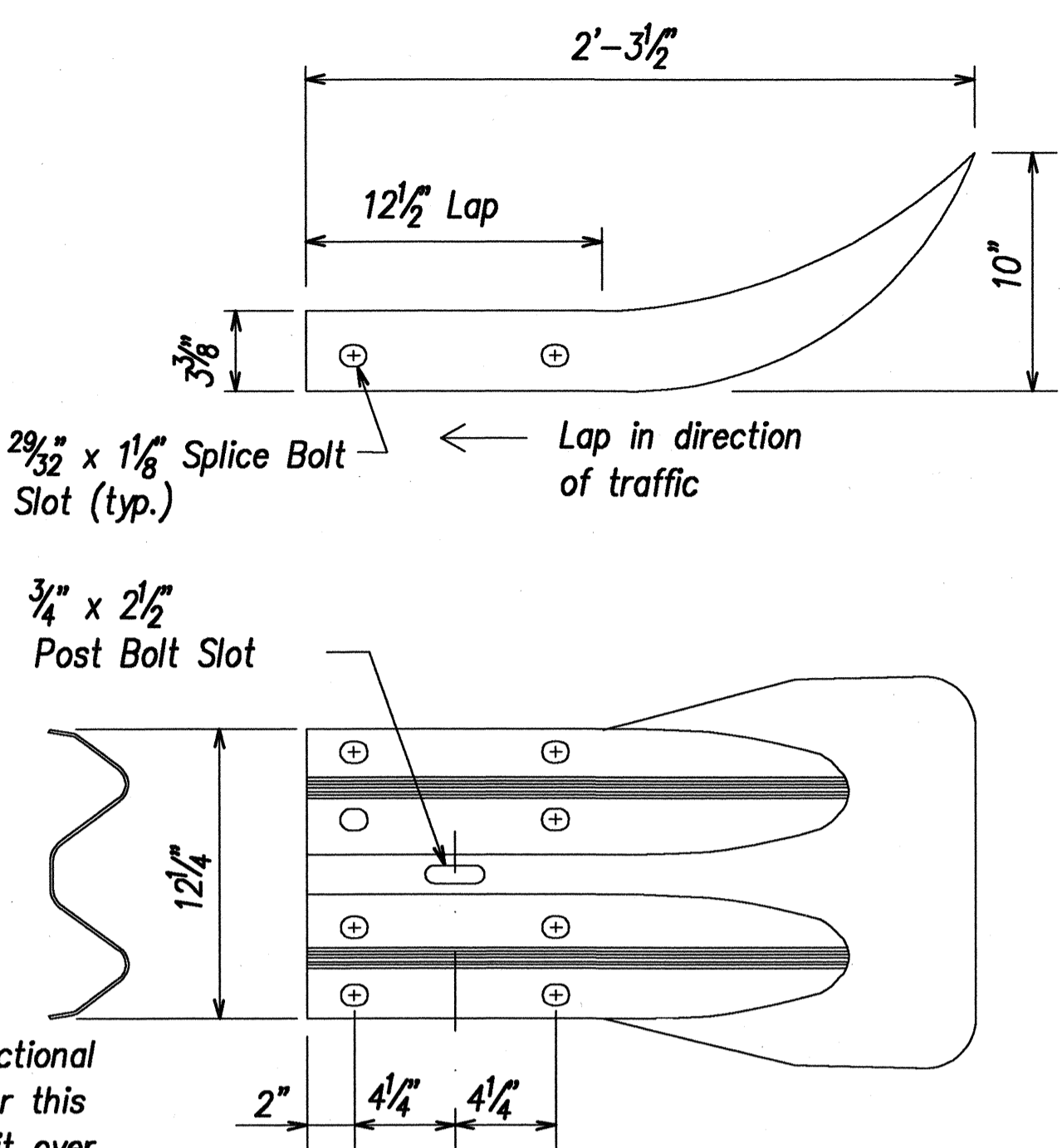
### W-BEAM TERMINAL CONNECTOR (RWE02b)



The cross-sectional dimensions for this part are to fit over part RWM02a

DESIGNATOR	BASE METAL THICKNESS
RWE06a	12 ga.

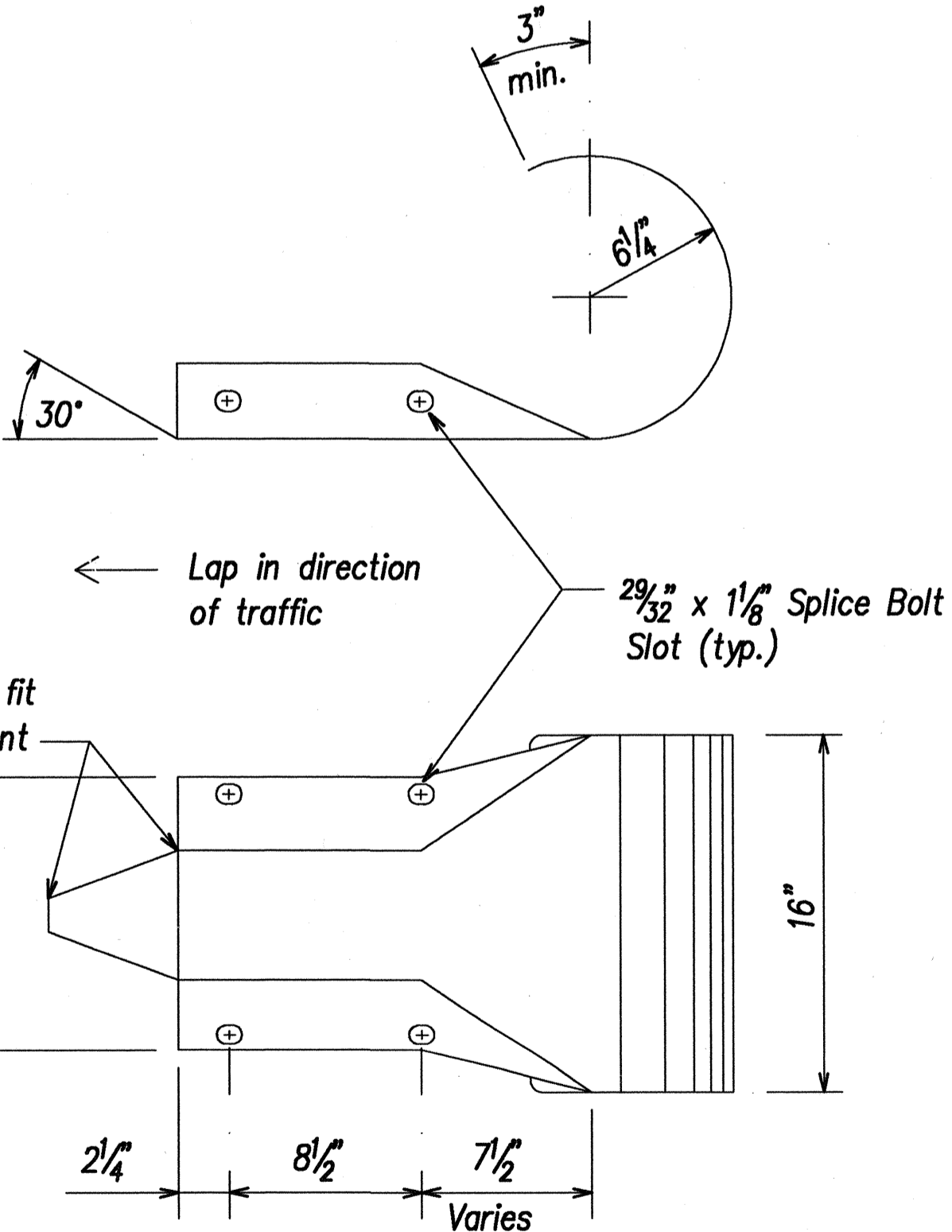
### W-BEAM END SECTION (BUFFER RWE06a)



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 ga.

### W-BEAM END SECTION (FLARED RWE01a)



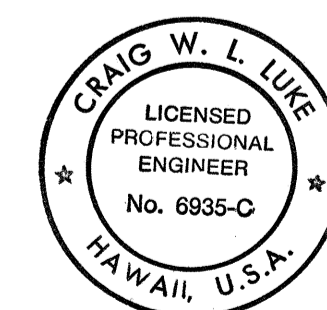
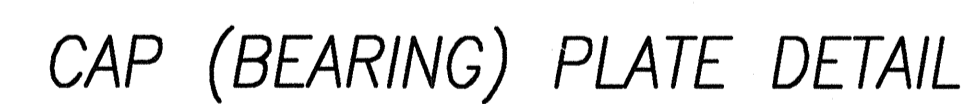
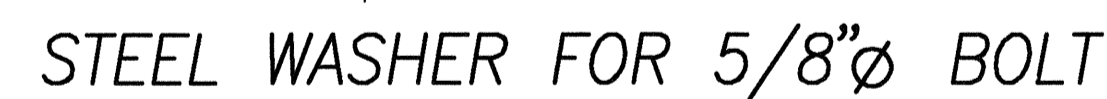
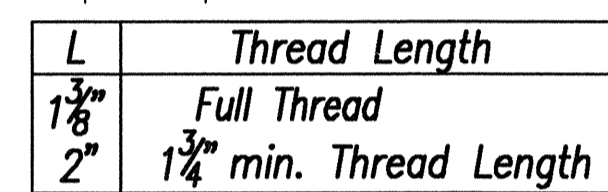
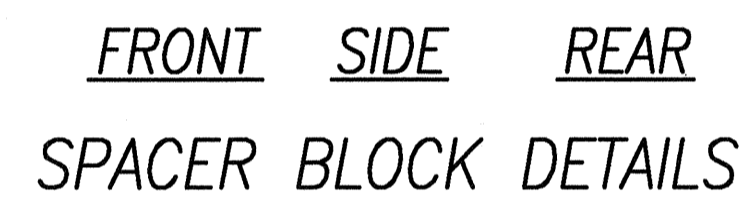
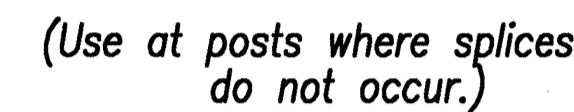
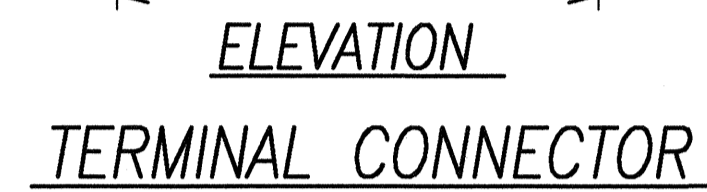
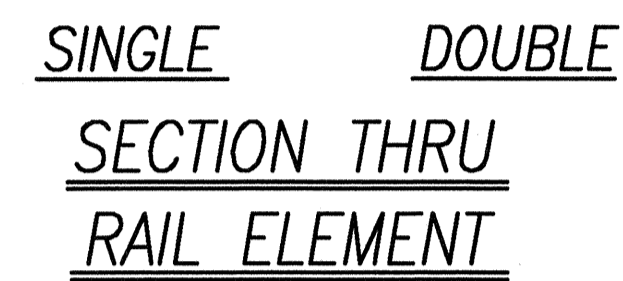
The cross-sectional dimensions for this part are to fit over part RWM02a

DESIGNATOR	BASE METAL THICKNESS
RWE03a	12 ga.

### W-BEAM END SECTION (ROUNDED RWE03a)

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

Technical drawing of a mechanical part showing dimensions:  $3\frac{1}{4}$ ,  $3$ ,  $2'-6"$ , and  $\frac{3}{4}$ .



1

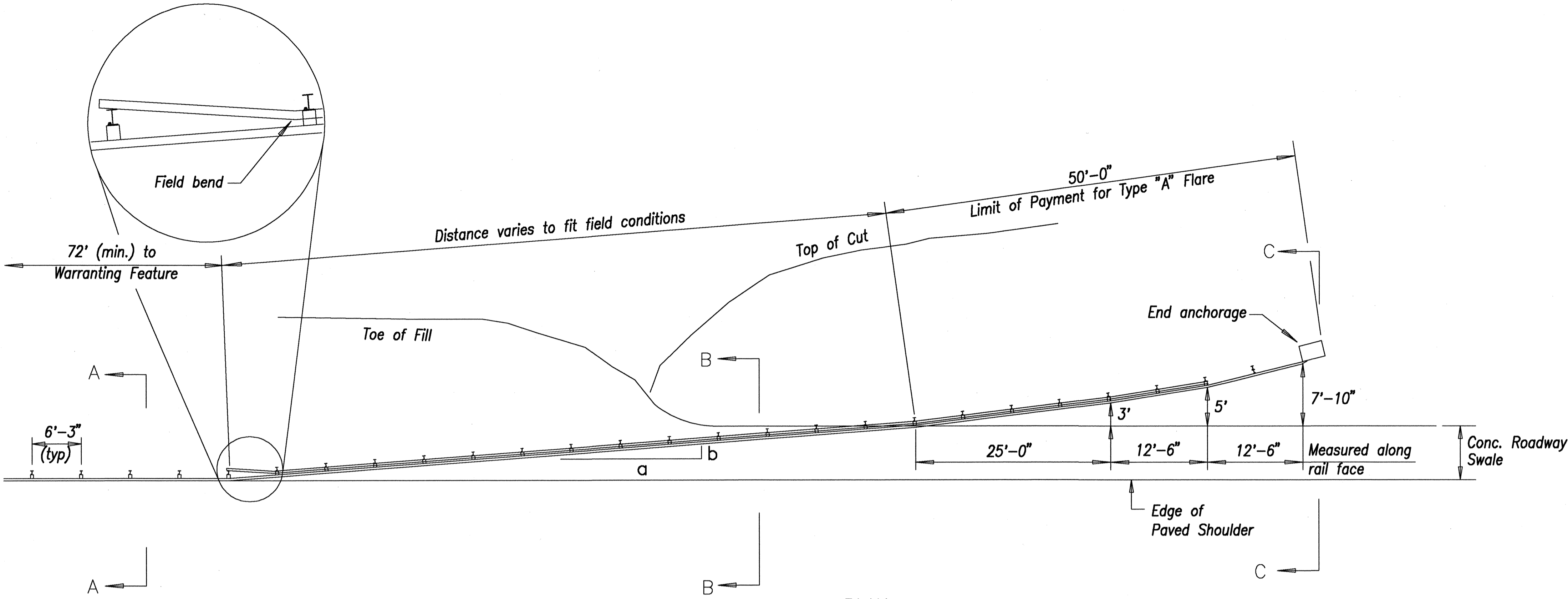
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**STRONG POST MODIFIED**  
**THREE-BEAM GUARDRAIL**  
**HANA HIGHWAY**  
**REPLACEMENT OF KAUPAKULUA BRIDGE**  
**AND APPROACHES**  
**F.A.P. Proj. No. BR-036-1(15)**  
Scale: None Date: June 30, 2000

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

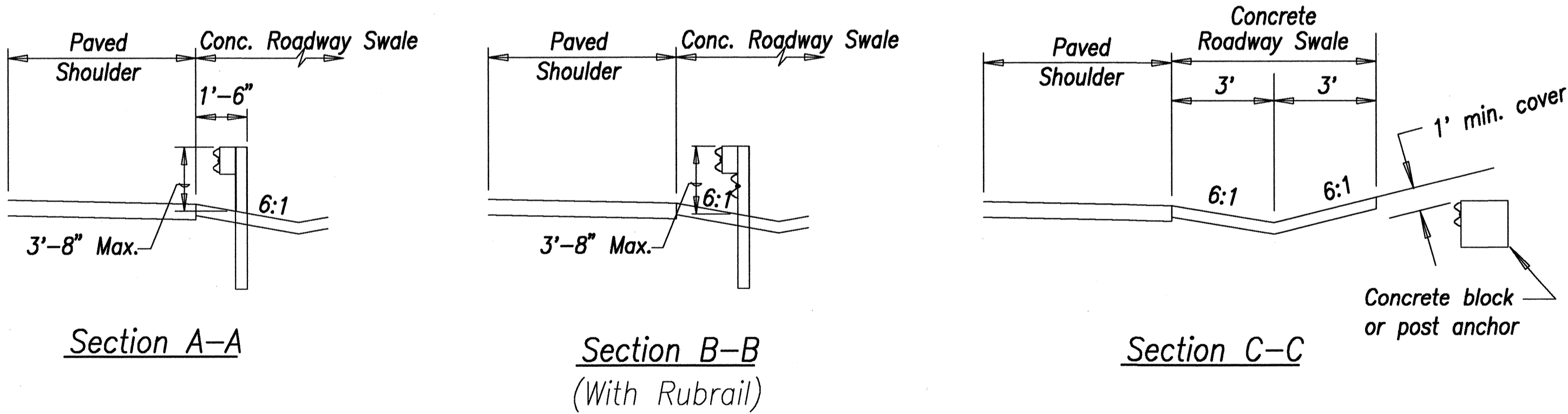
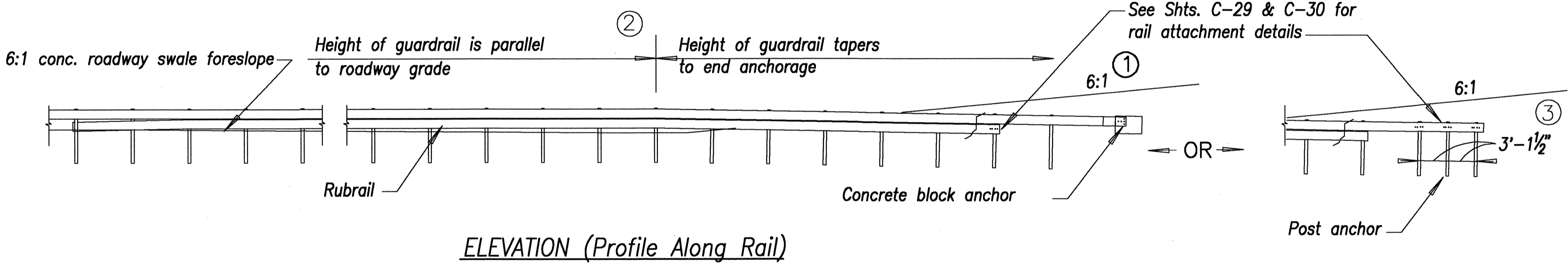
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	30	89

General Notes

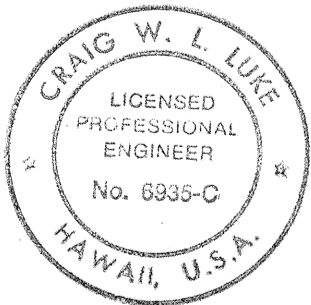
1. A 6:1 or flatter slope is desirable. However, a steeper or flatter existing slope may be used.
2. Height of guardrail may be tapered down in elevation to maintain 3'-8" maximum height.
3. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the post anchor. Posts for the post anchor are 6'-0" long.
4. The Guardrail Posts shall be located away from the roadway swale invert.
5. 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.



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



BACKSLOPE ANCHOR TERMINAL (WITH 6:1 ROADWAY SWALE AND TYPE "A" FLARE)



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SIGNATURE DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

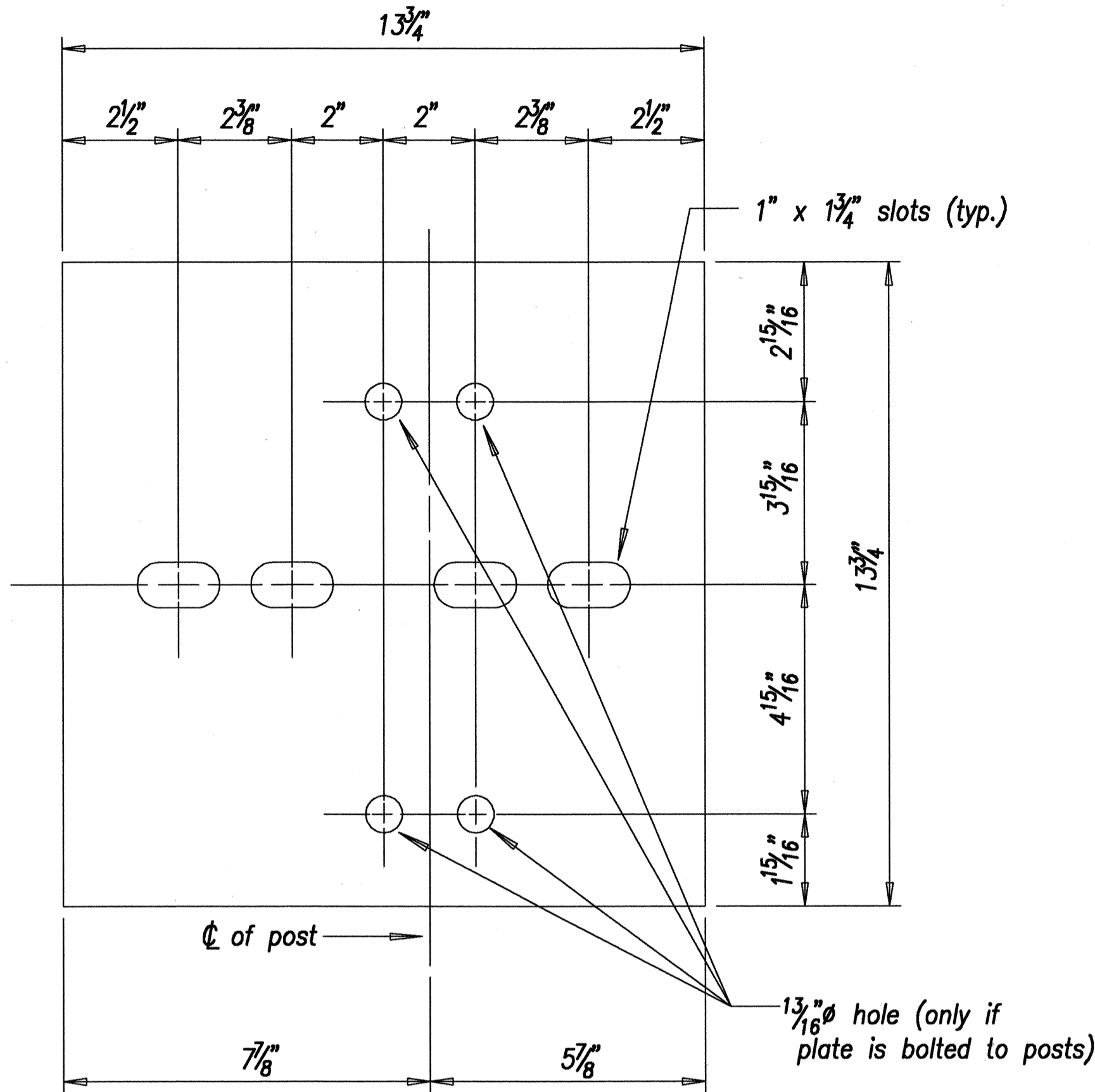
TYPE "A" FLARE  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)

Scale: None
Date: June 30, 2000

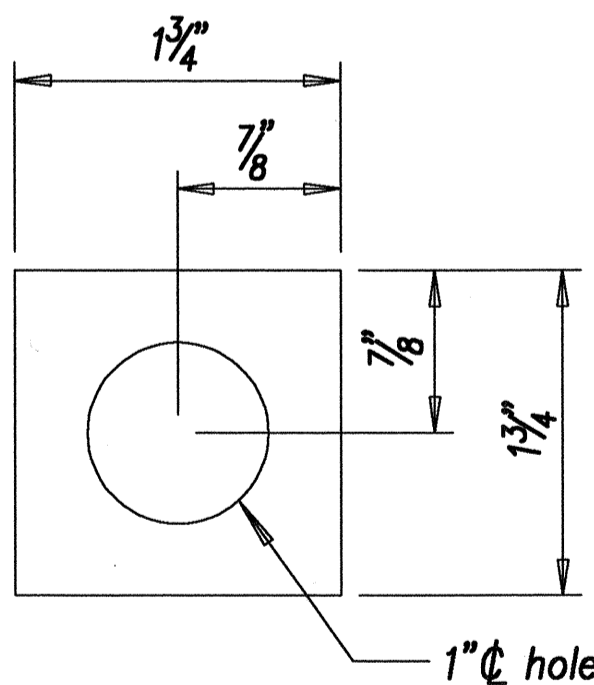
SHEET No. C-28 OF 89 SHEETS

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NO.	

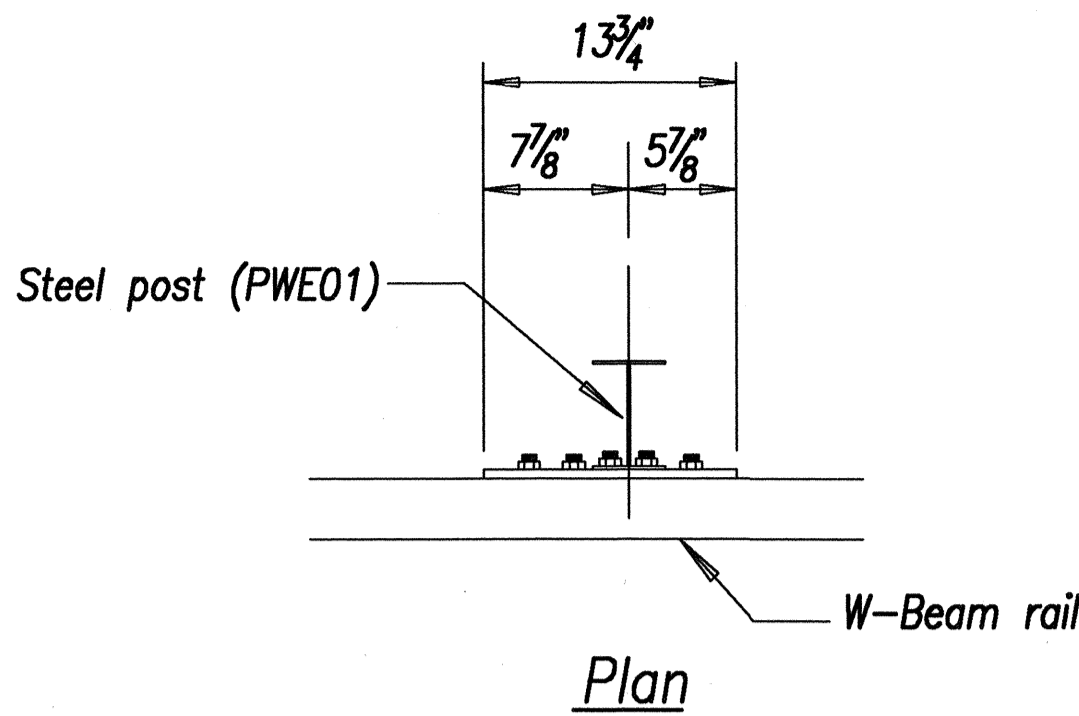
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	31	89



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

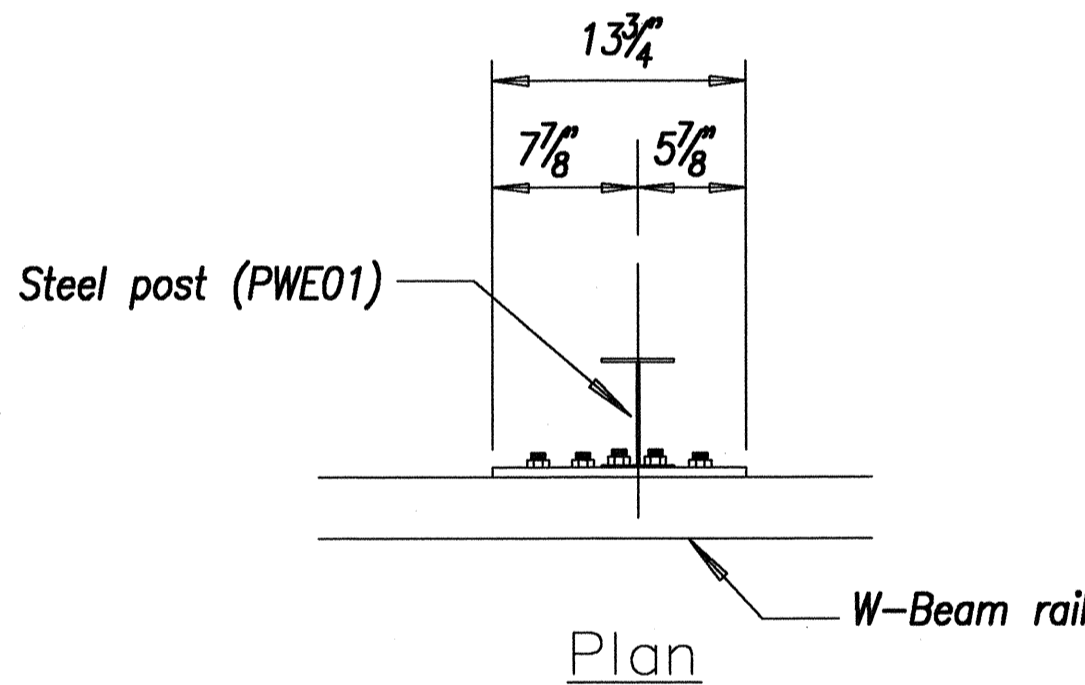


Square Washer  
(3/16" Thick - Hot-dip  
Zinc Coated Galvanized)



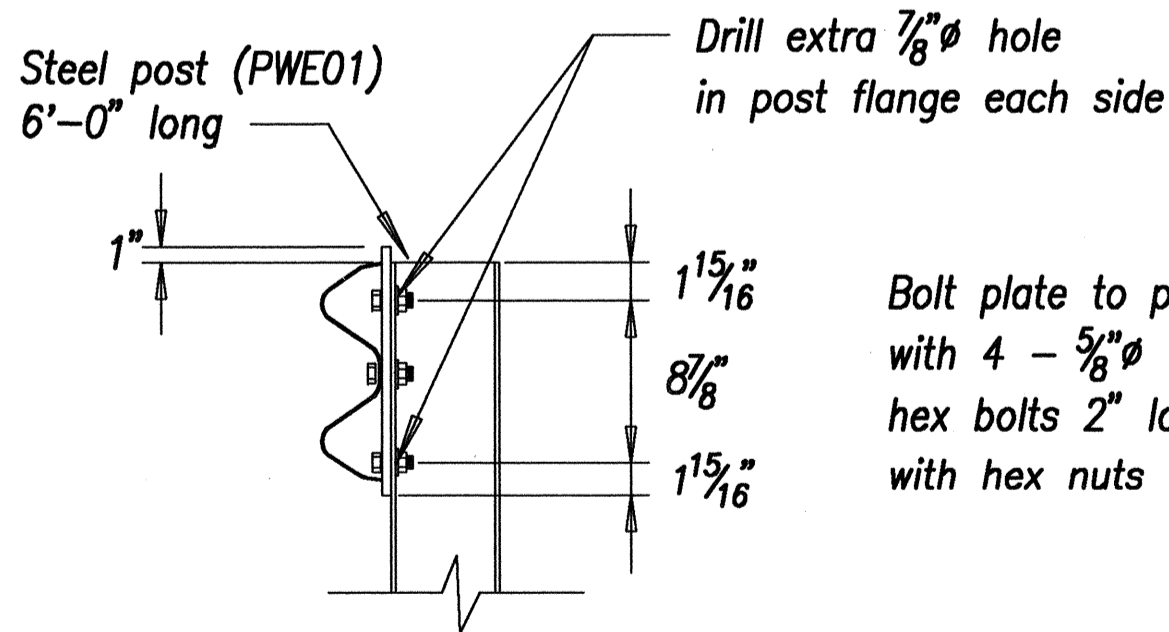
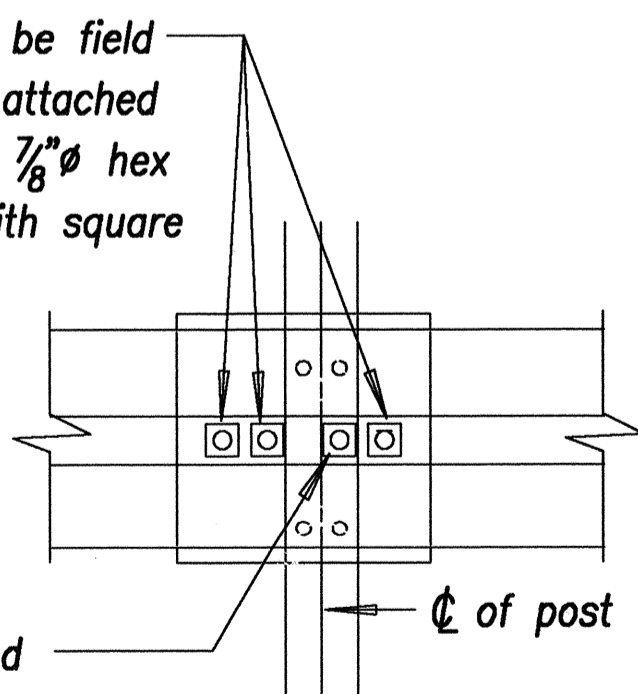
3 - 7/8" holes to be field drilled in rail and attached to steel plate with 7/8" hex bolts 1 5/16" long with square washer

1" holes to be field drilled in rail and through post flange. Attach to steel plate with 7/8" hex bolts 2" long with square washer



3 - 7/8" holes to be field drilled in rail and attached to steel plate with 7/8" hex bolts 1 5/16" long with square washer

1" holes to be field drilled in rail and through post flange. Attach to steel plate with 7/8" hex bolts 2" long with square washer



Bolt plate to post with 4 - 5/8" hex bolts 2" long with hex nuts

### RUBRAIL ANCHOR DETAILS

Elevation

Front View

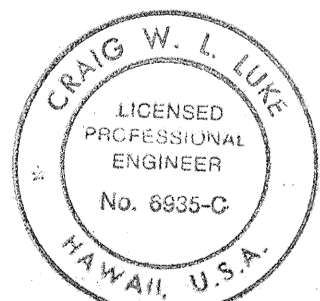
### POST ANCHOR DETAILS

### TYPE "A" FLARE

### BACKSLOPE ANCHOR TERMINAL END ANCHORAGE 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.



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Signature: [Signature] Date: 7/10/00

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

### TYPE "A" FLARE

HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES

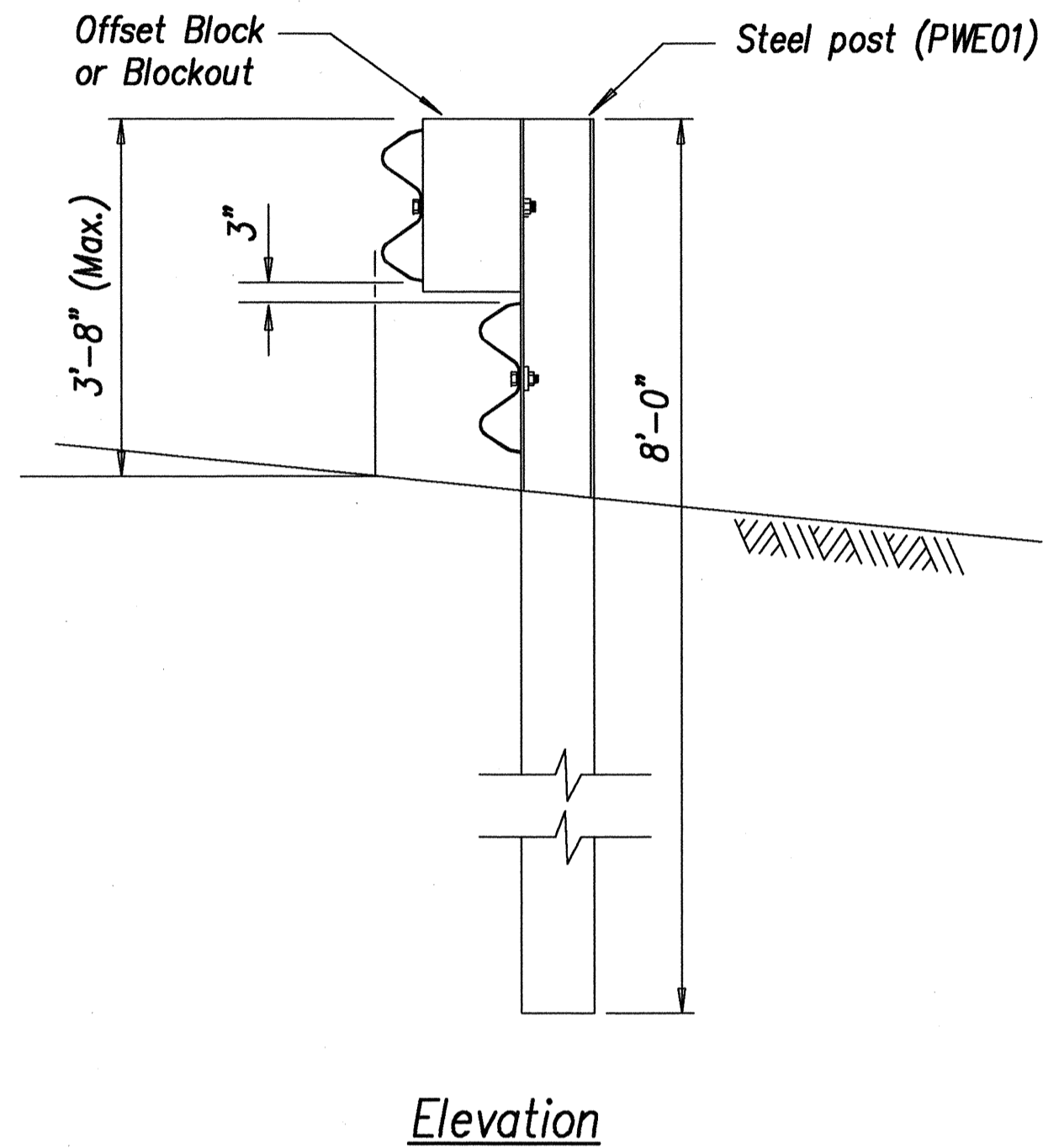
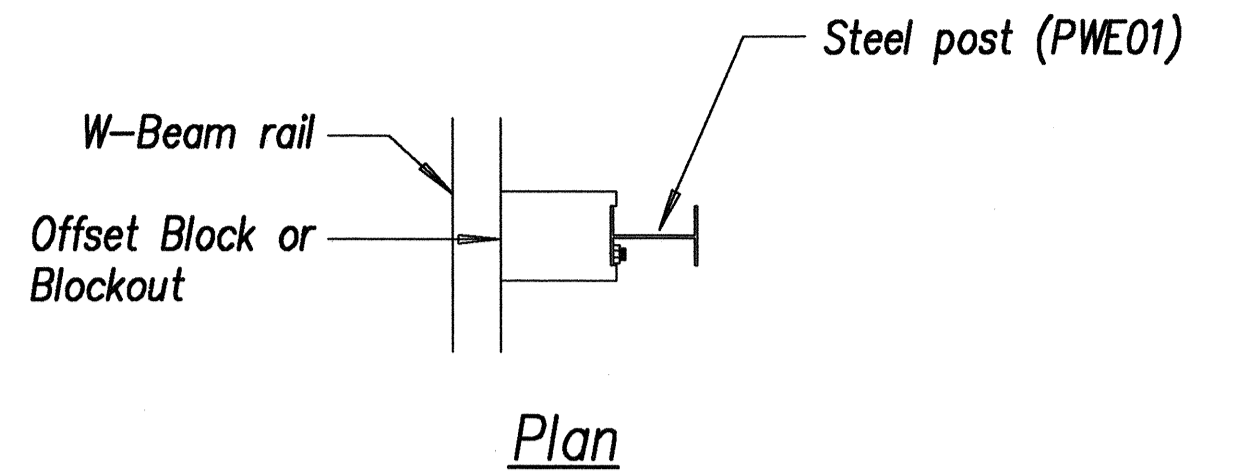
F.A.P. Proj. No. BR-036-1(15)

Scale: None Date: June 30, 2000

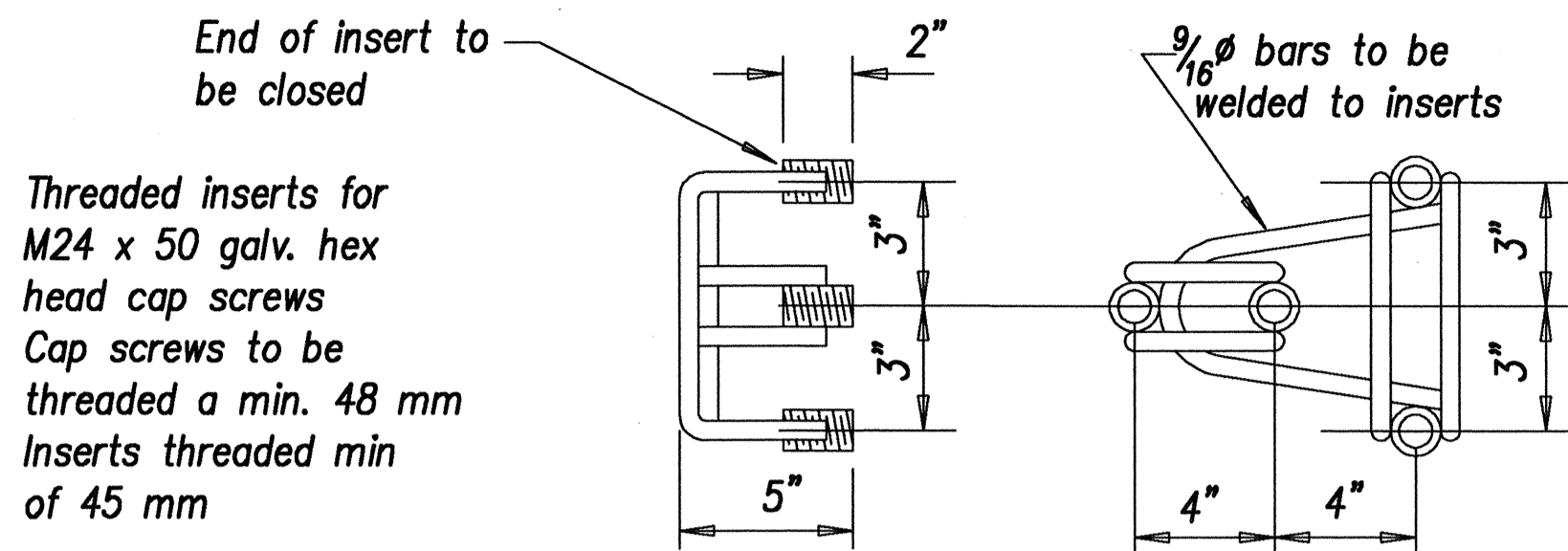
SHEET No. C-29 OF 89 SHEETS

DESIGNED BY	DATE
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	
NO. X-1001	

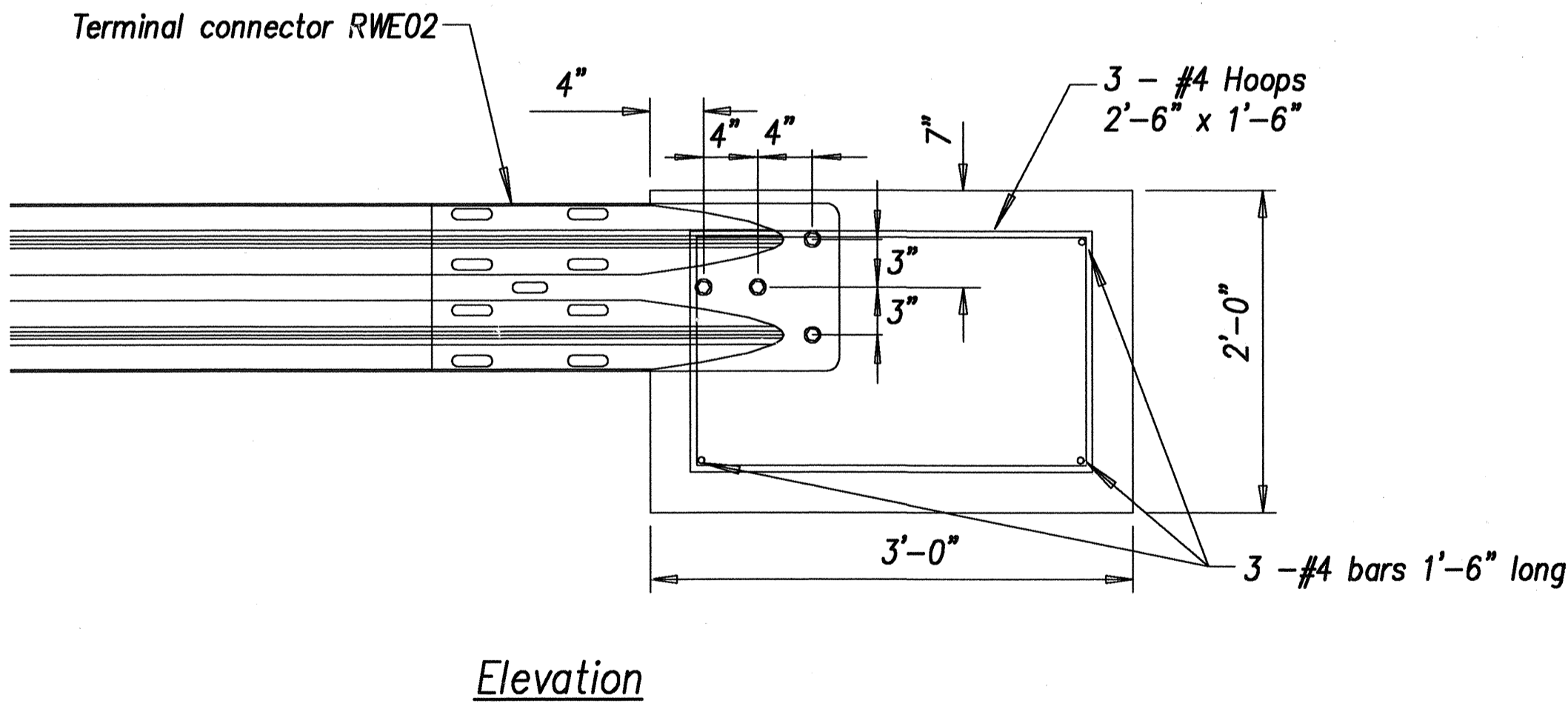
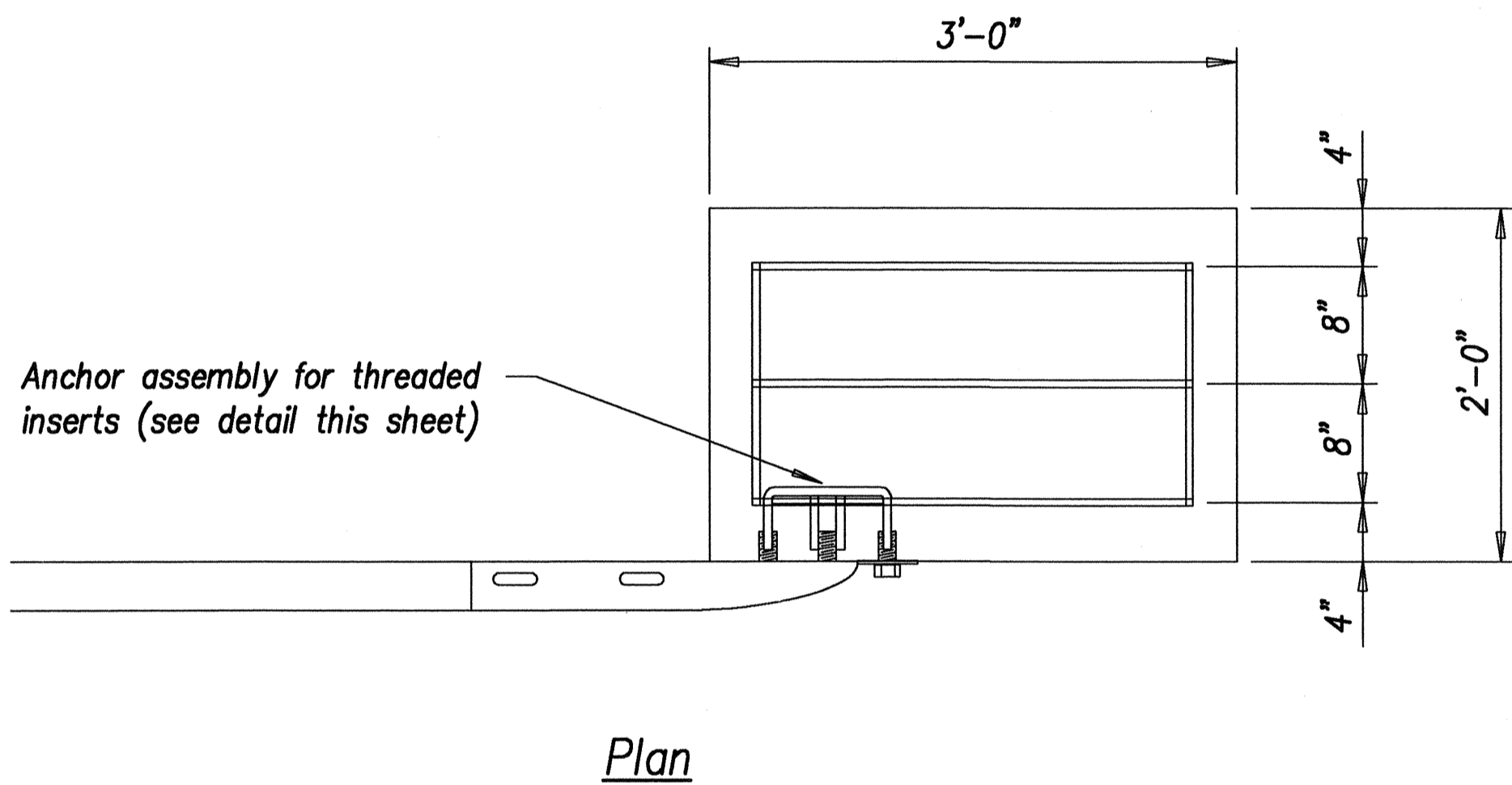
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	32	89



STEEL POST GUARDRAIL  
WITH RUBRAIL



ANCHOR ASSEMBLY  
CONCRETE BLOCK ANCHOR



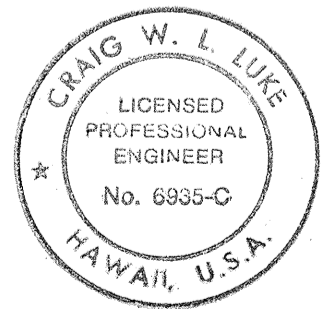
CONCRETE BLOCK ANCHOR  
(2' X 2' X 3')

BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS  
TYPE "A" FLARE

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.

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
APPROVED BY	
DATE	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

SIGNATURE DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**TYPE "A" FLARE**

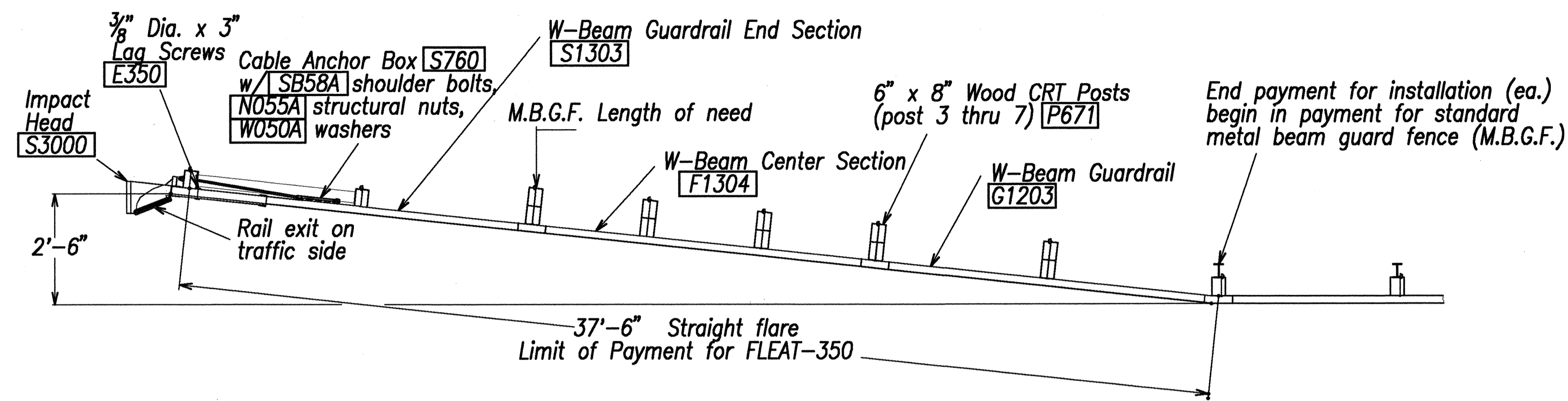
HANA HIGHWAY

REPLACEMENT OF KAUPAKULUA BRIDGE AND APPROACHES

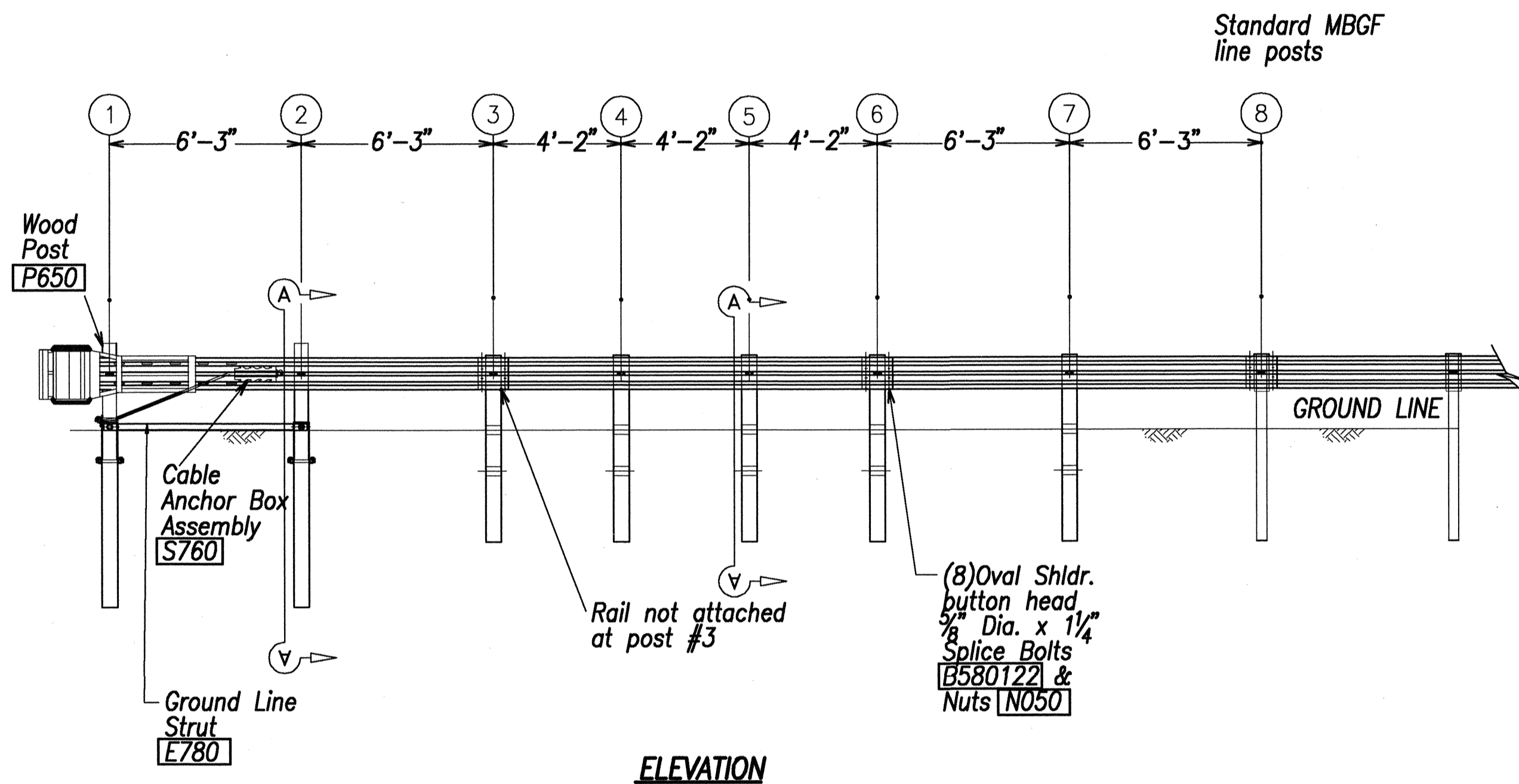
F.A.P. Proj. No. BR-036-1(15)

Scale: None Date: June 30, 2000

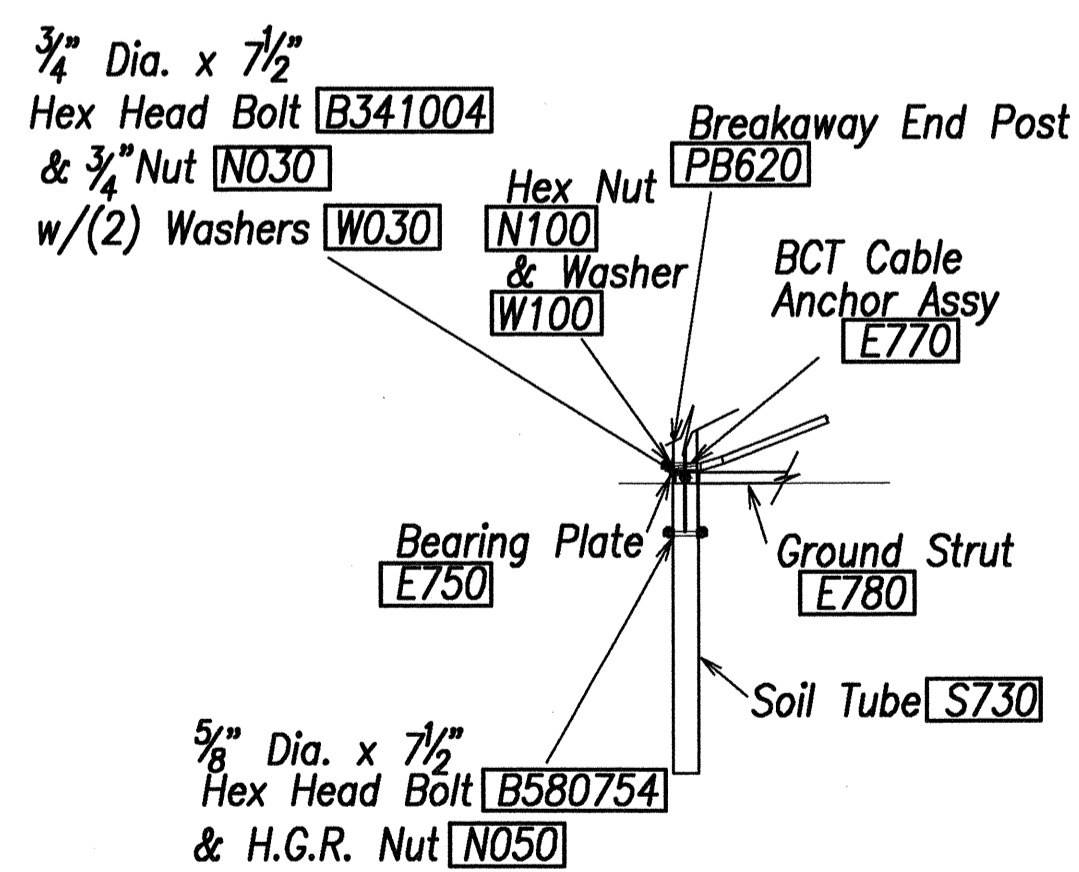
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-036-1(15)	2000	33	89



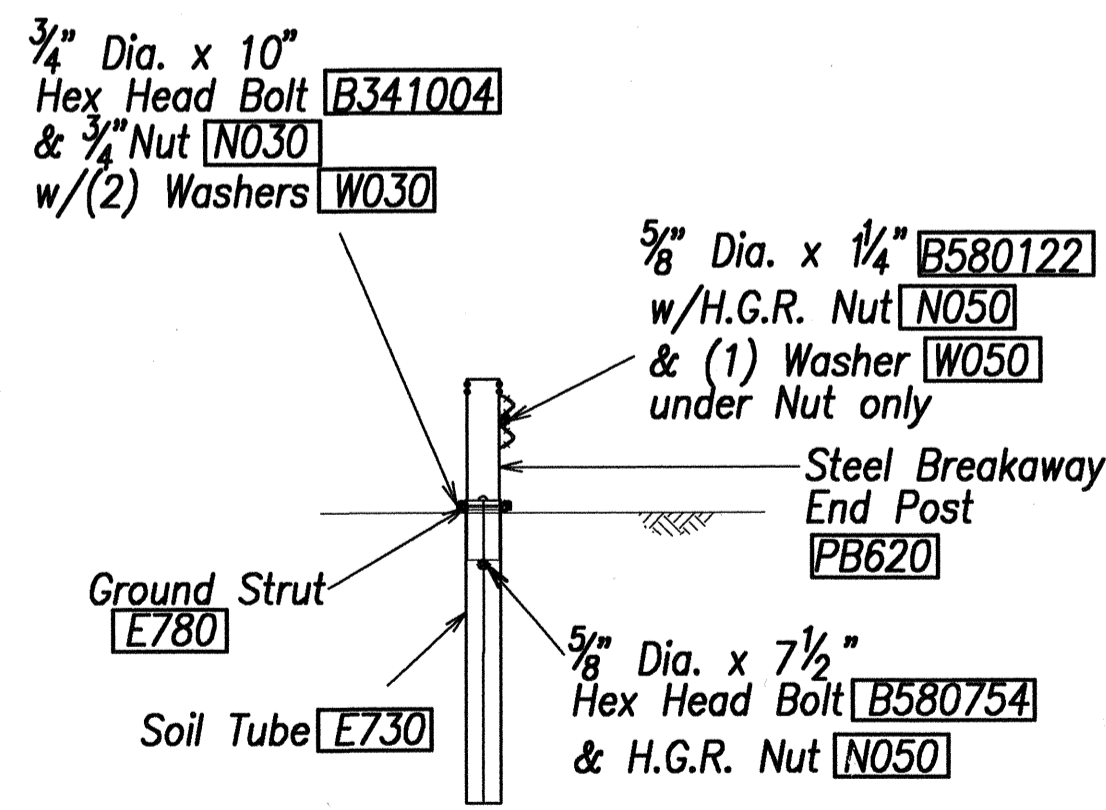
PLAN



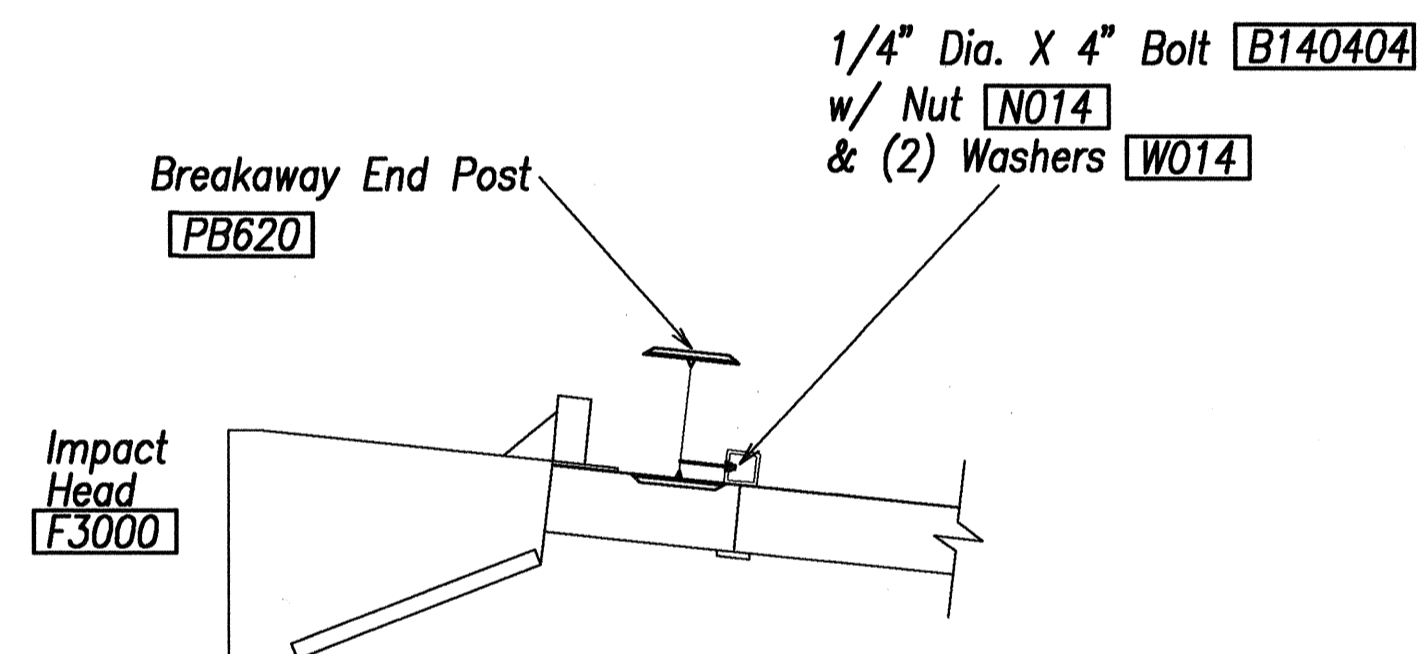
ELEVATION



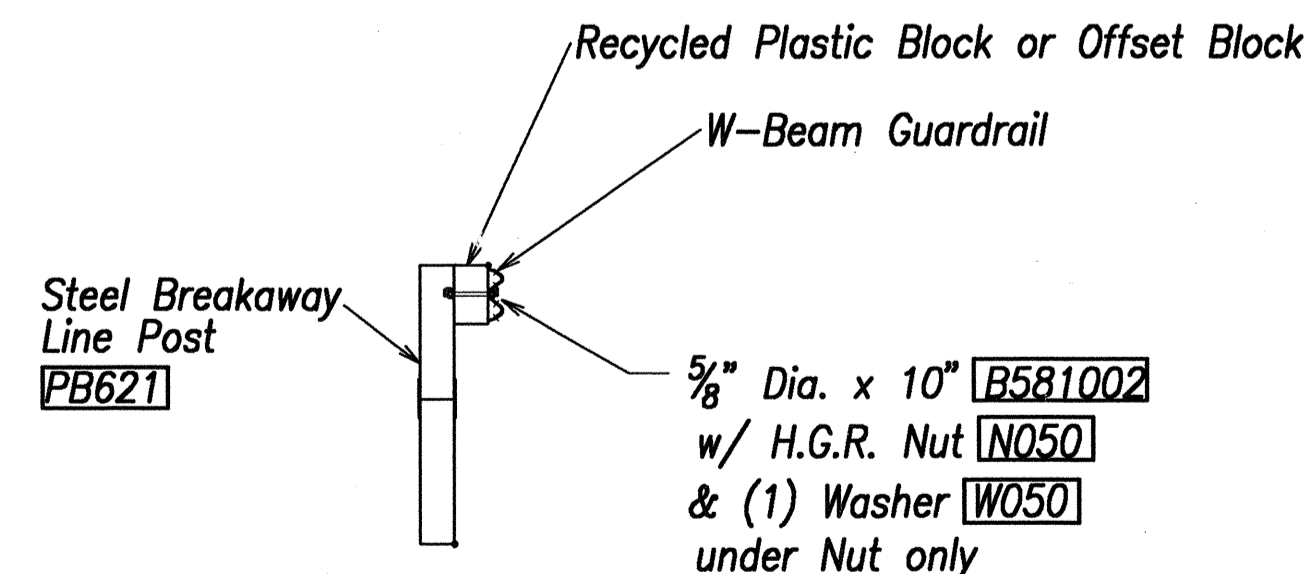
PARTIAL VIEW OF POST 1



SECTION A-A  
@ Post #2



IMPACT HEAD CONNECTING DETAIL



SECTION B-B

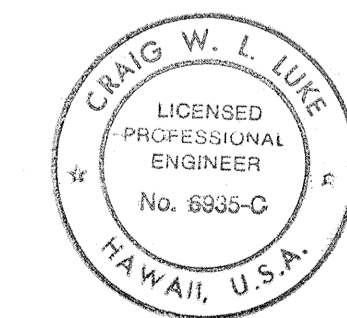
(Typical @ Post 3 - 7)

NOTE: RAIL NOT BOLTED @ POST #3

# GENERAL NOTES

1. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
2. The soil tube shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
3. The soil tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the soil tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
4. When rock is encountered during excavation, a 12" Dia. post hole, 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approx. 2  $\frac{1}{2}$ " deep to provide drainage. The soil tubes will be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
5. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

ITEM NO.	QTY	BILL OF MATERIALS
S3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SEC., 12 GA.
G1203	1	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 6'
E750	1	BEARING PLATE, 8" x 8" x "
S760	1	CABLE ANCHOR BOX $\frac{5}{8}$ "
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	STEEL BREAKAWAY END POST
PB621	5	STEEL BREAKAWAY LINE POST
	5	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
HARDWARE		
B580122	25	$\frac{5}{8}$ " Dia. x $1\frac{1}{4}$ " SPLICE BOLT, POST #2
B580754	2	$\frac{5}{8}$ " Dia. x $7\frac{1}{2}$ " HEX BOLT
B341004	2	$\frac{3}{4}$ " Dia. x 10" HEX BOLT
B581002	5	$\frac{5}{8}$ " Dia. x 10" H.G.R. BOLT (POST 3-7)
N050	32	$\frac{5}{8}$ " Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, POST 2 THRU 7, 8)
N030	2	$\frac{3}{4}$ " Dia HEX NUT
W050	6	H.G.R. WASHER
W030	4	$\frac{3}{4}$ " ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	$1\frac{1}{4}$ " x 4" HEX BOLT
N104	2	$1\frac{1}{4}$ " HEX NUT
W104	4	$1\frac{1}{4}$ " WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	$\frac{1}{2}$ " A325 STRUCTURAL NUT
W050A	16	$1\frac{1}{16}$ " OD X $\frac{9}{16}$ " ID A325 STR. WASHER
Foundation Tube Options For Posts 1 & 2		
*6'-0" Split Foundation Tubes S730		
*6'-0" Solid Foundation Tubes E731		
*5'-0" Foundation Tubes S735 W/Soil Plates SP600		
*4'-6" Foundation Tubes E735 W/Soil Plates SP600		



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

SIGNATURE DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**FLEAT-350**  
**FLARED ENERGY ABSORBING TERMINAL**  
HANA HIGHWAY  
REPLACEMENT OF KAUPAKULUA BRIDGE  
AND APPROACHES  
F.A.P. Proj. No. BR-036-1(15)  
Scale: None Date: June 30, 2000  
SHEET No. C-31 OF 89 SHEETS