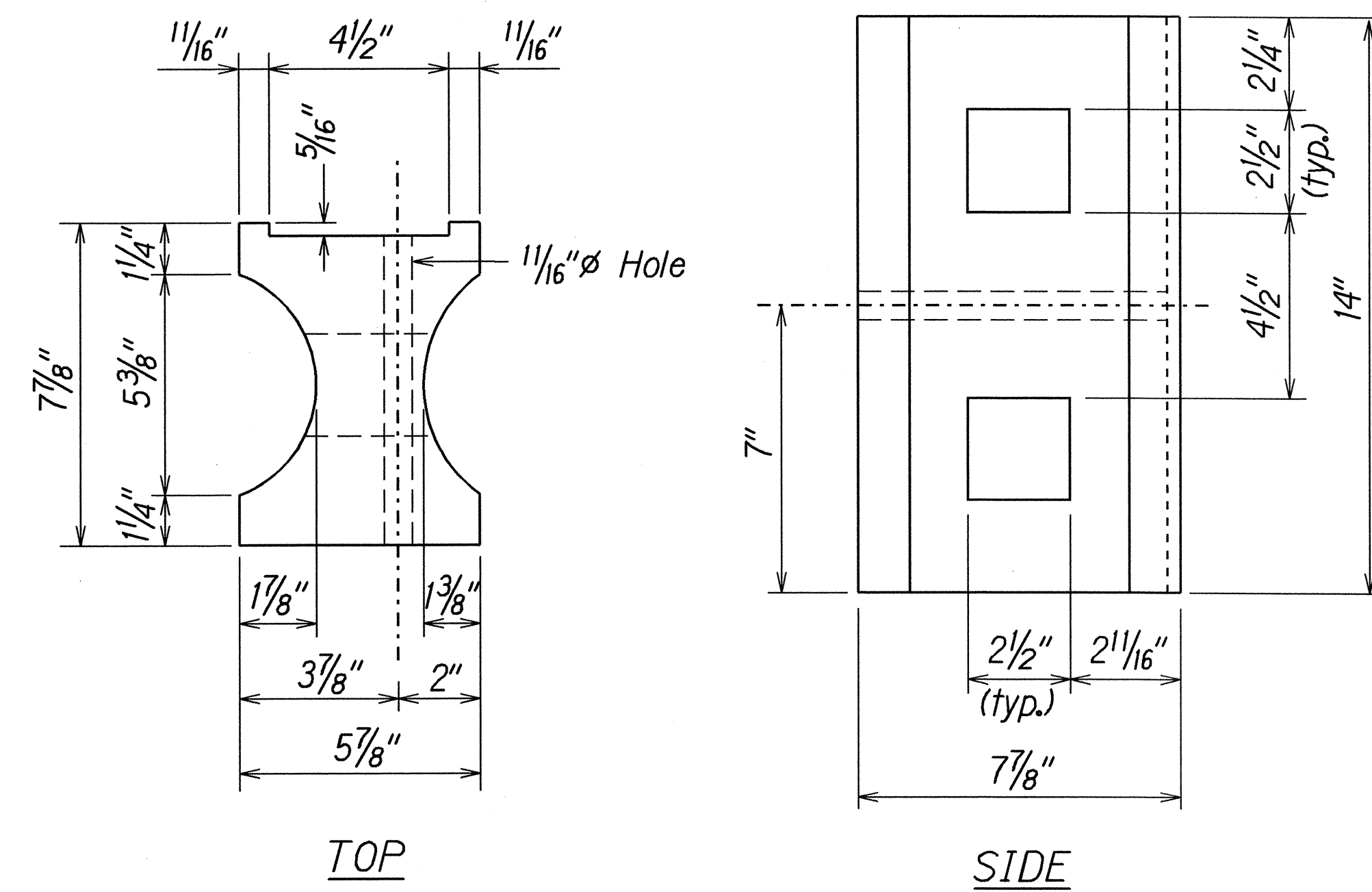
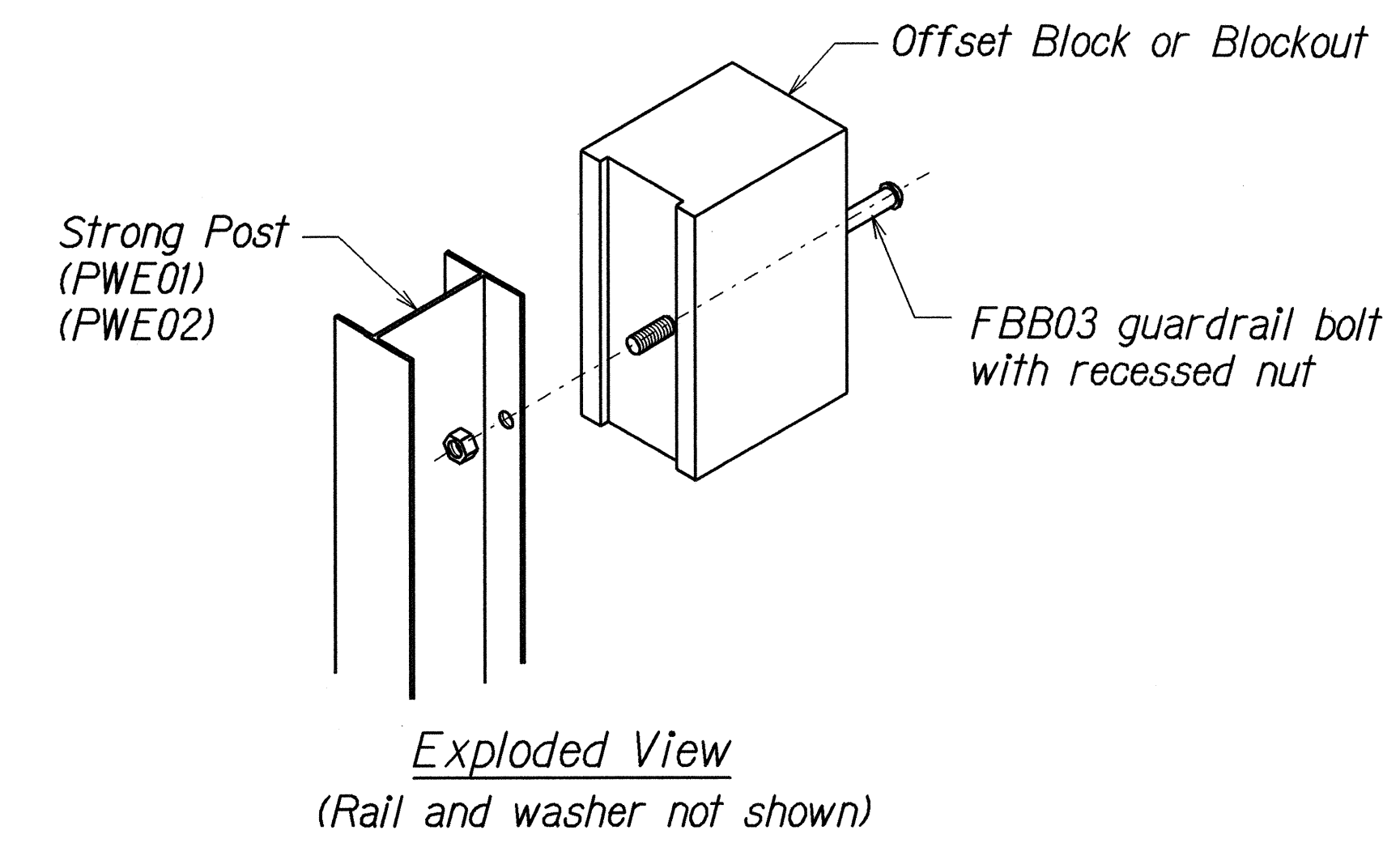


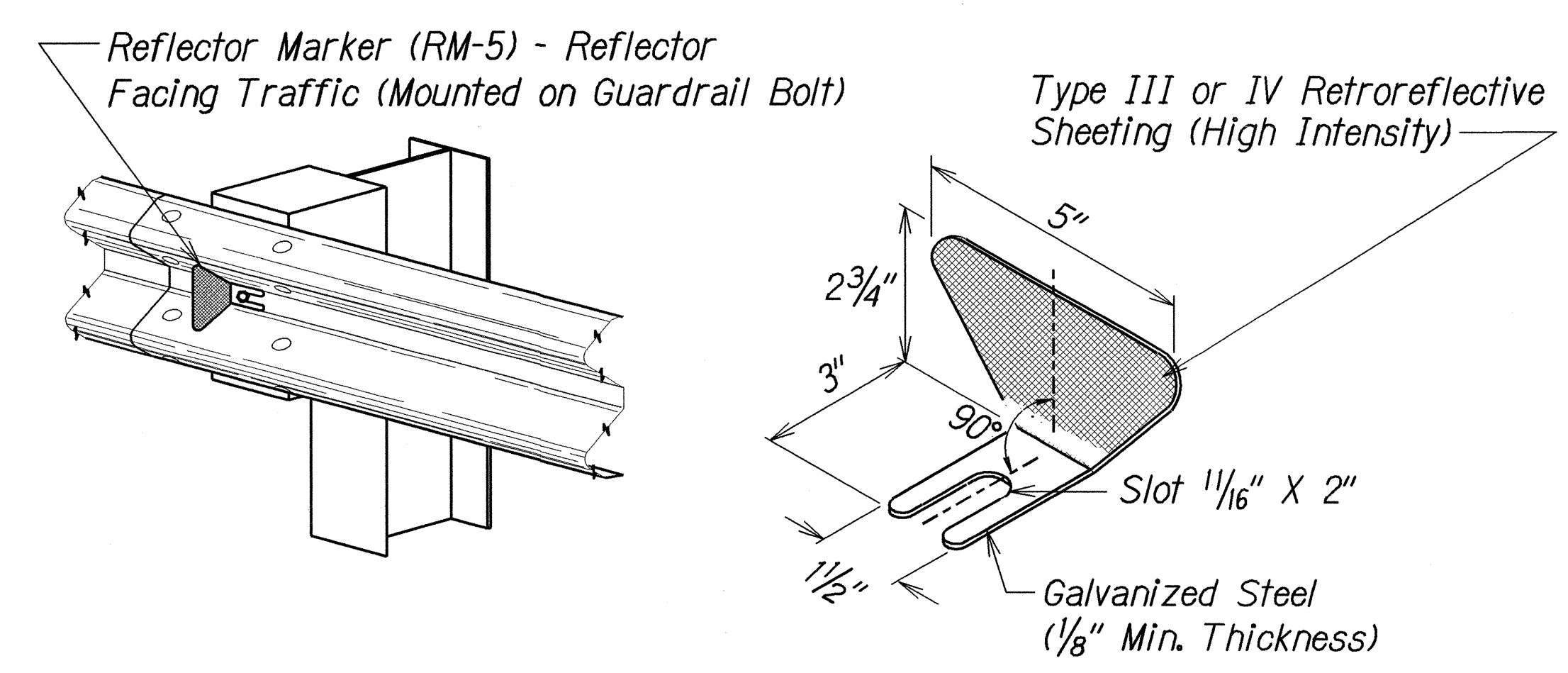
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-K(33)	2007	31	168



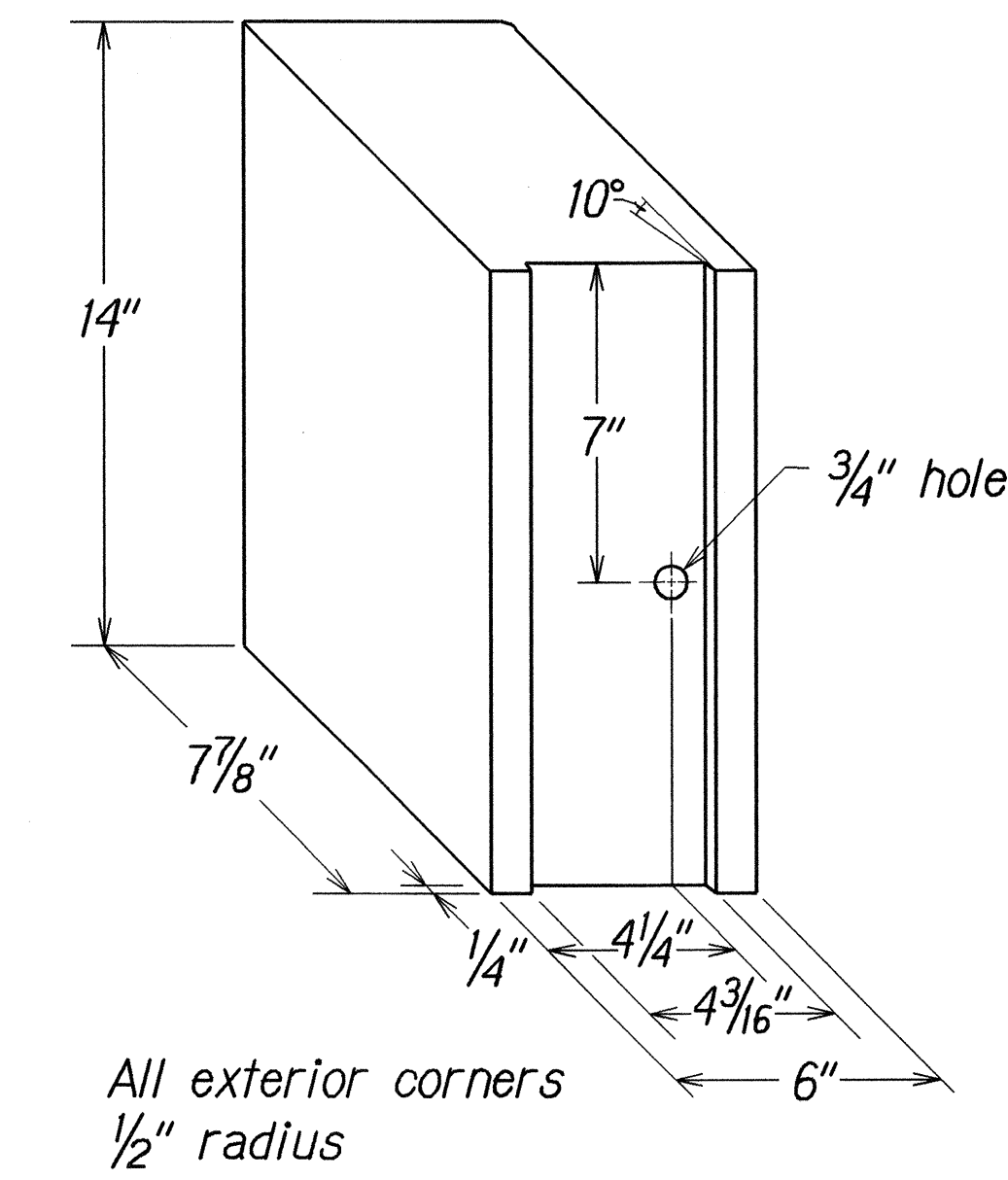
TOP
 SIDE
 RECYCLED PLASTIC BLOCKOUT (TYPE I)



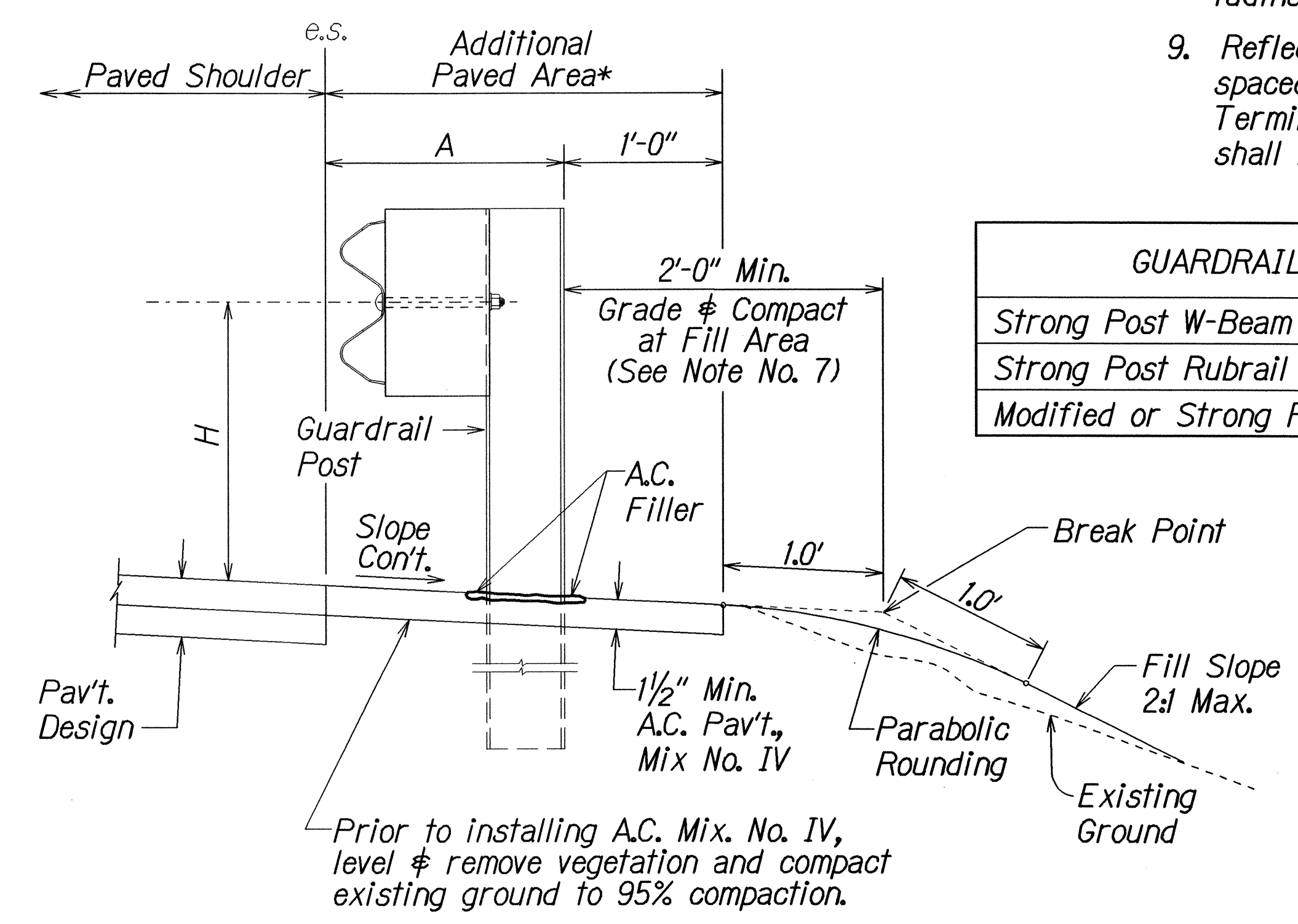
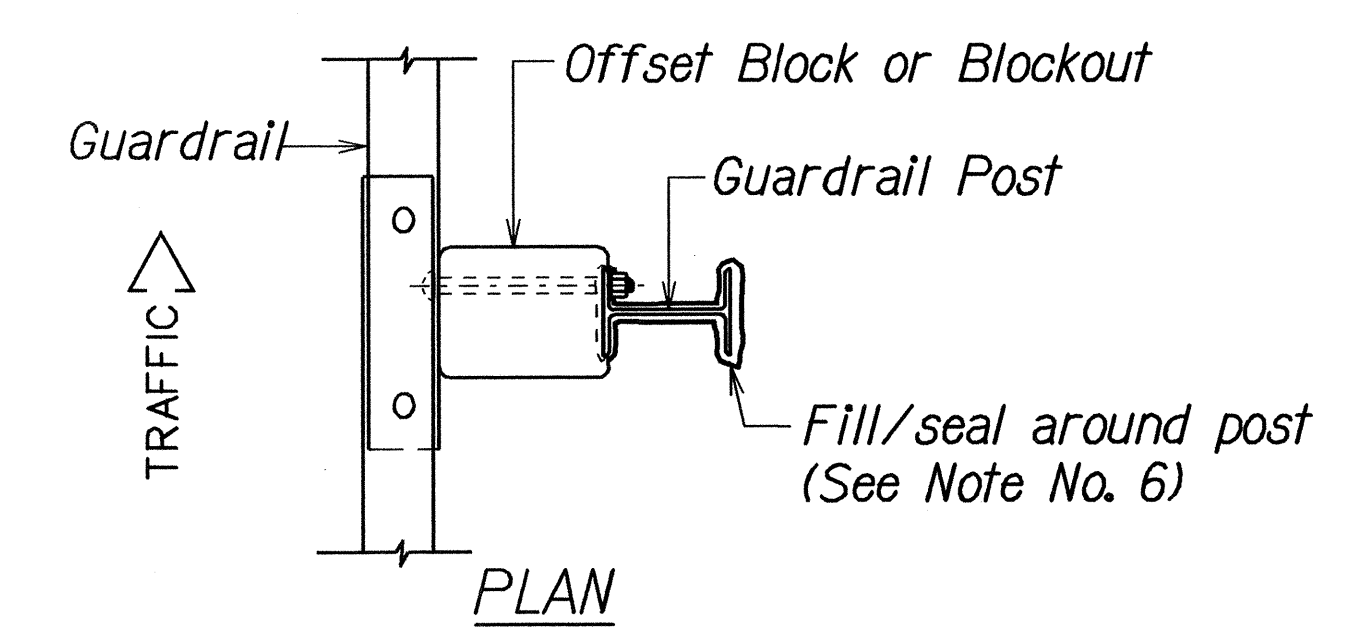
STEEL POST AND BLOCK DETAIL



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



RECYCLED POLYETHYLENE
 OFFSET BLOCK (TYPE II)



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 fastners, 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. All new guardrail systems (system consists of total length of guardrail including both end treatments) shall include the Additional Paved Area.
6. After the guardrail posts are installed in the paved area, the Contractor shall fill/seal around each guardrail post and all cracks in the paved area 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 filling/sealing. All costs associated with this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
7. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
8. New A.C. pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
9. Reflector Markers (RM-5) mounted on guardrails shall be spaced every 25 feet. RM-5's shall not be installed on Terminal Sections. Furnishing and installing of each RM-5 shall be considered incidental to the adjacent guardrail system.

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

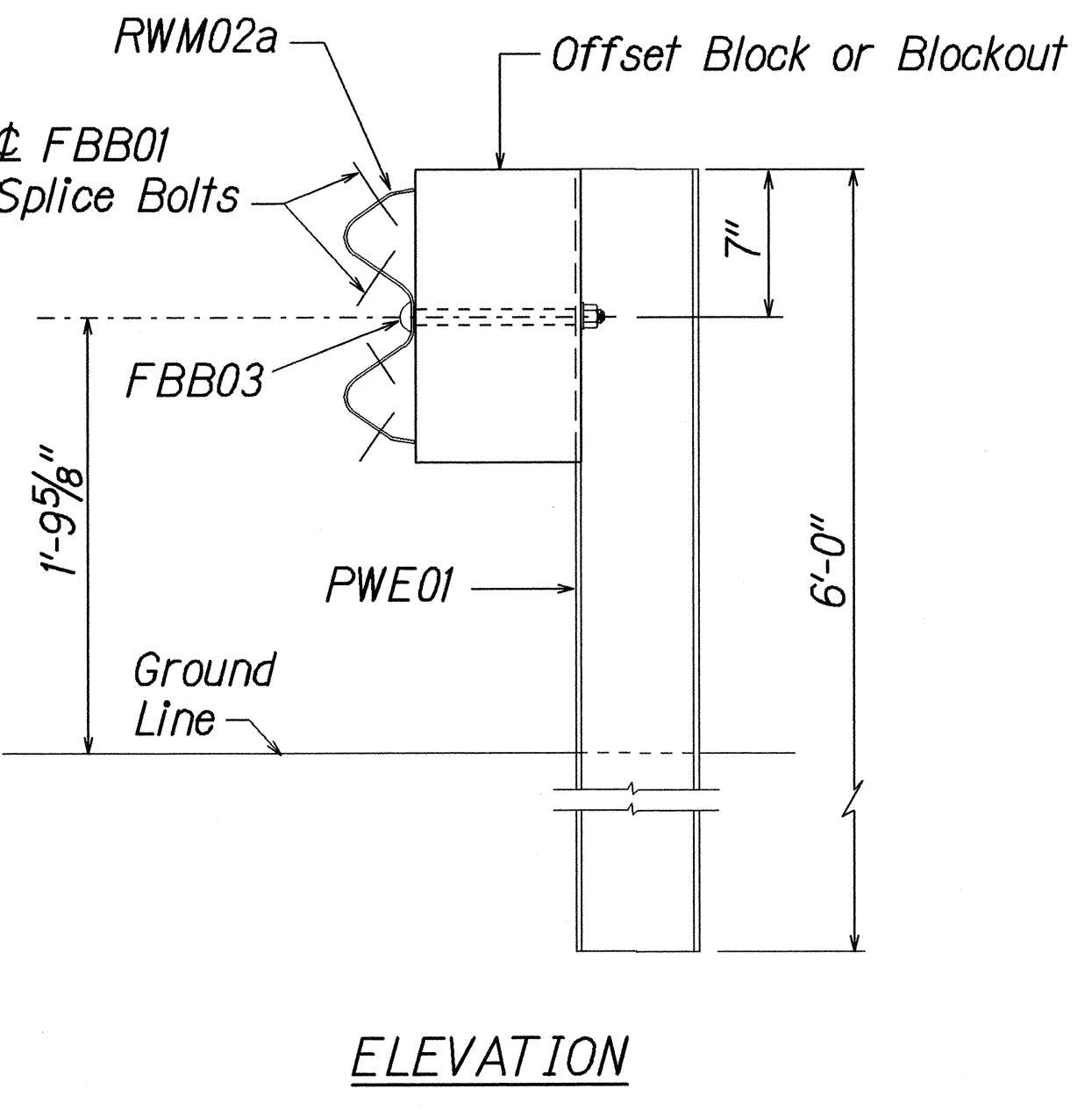
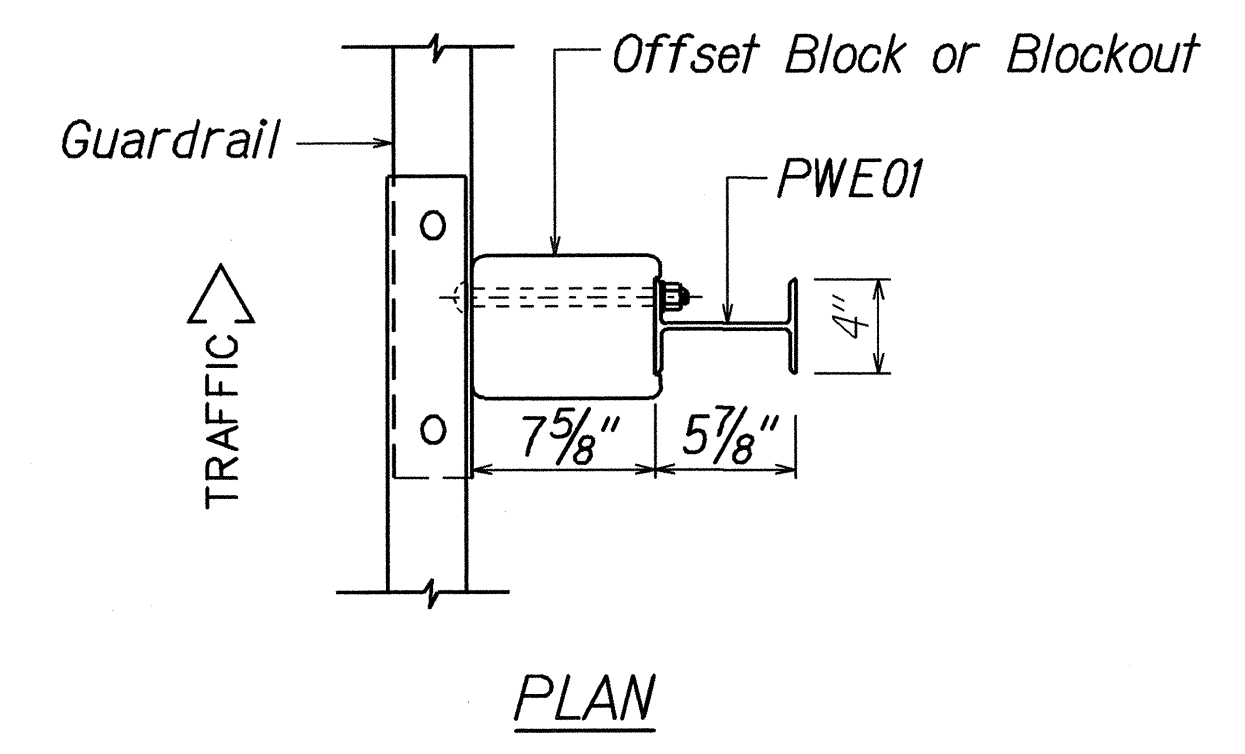
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES
INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-K(33)
Scale: NTS Date: December, 2005

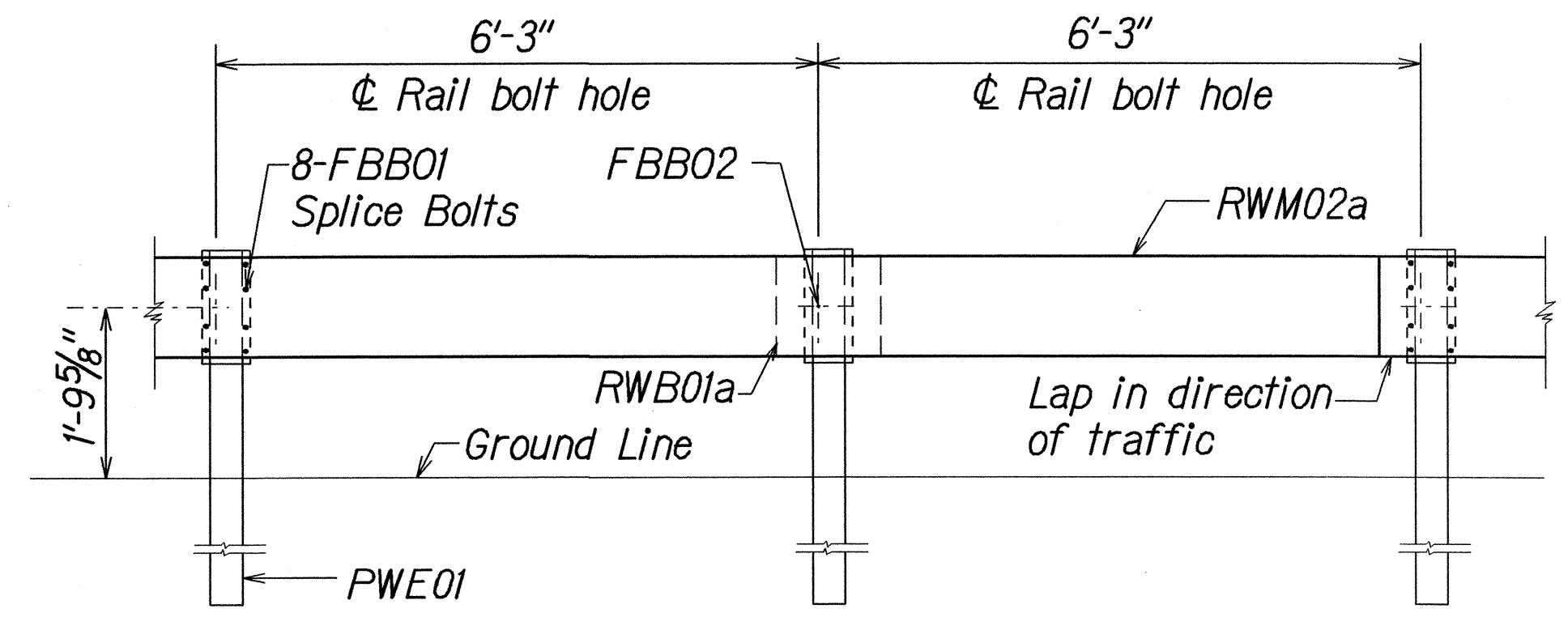
SHEET No. 1 OF 11 SHEETS

SURVEY PLOTTED BY	DATE
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	
ORIGINAL	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	32	168

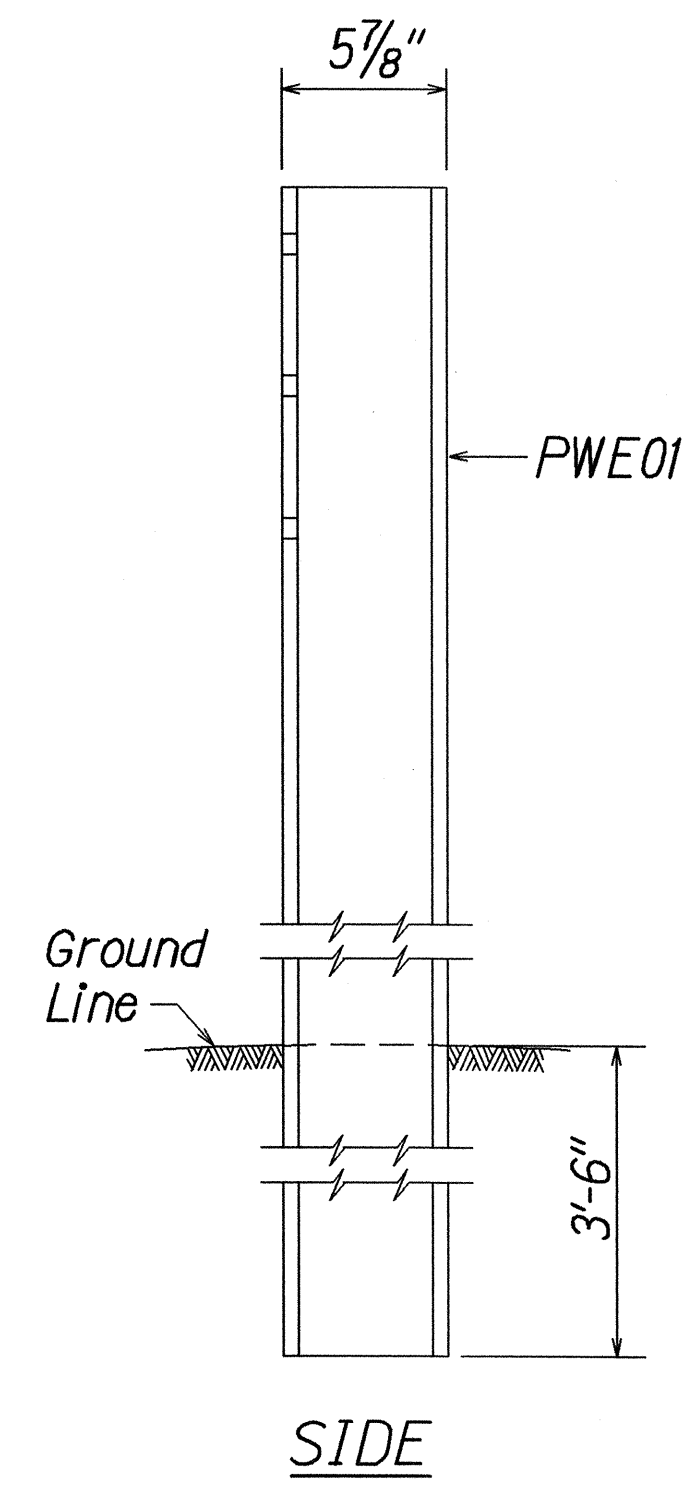


STRONG POST W-BEAM GUARDRAIL (SGR04a)

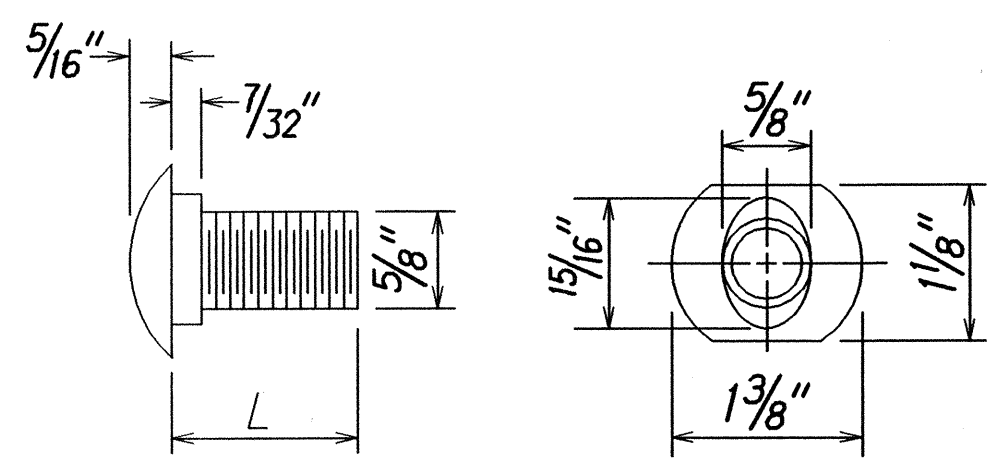
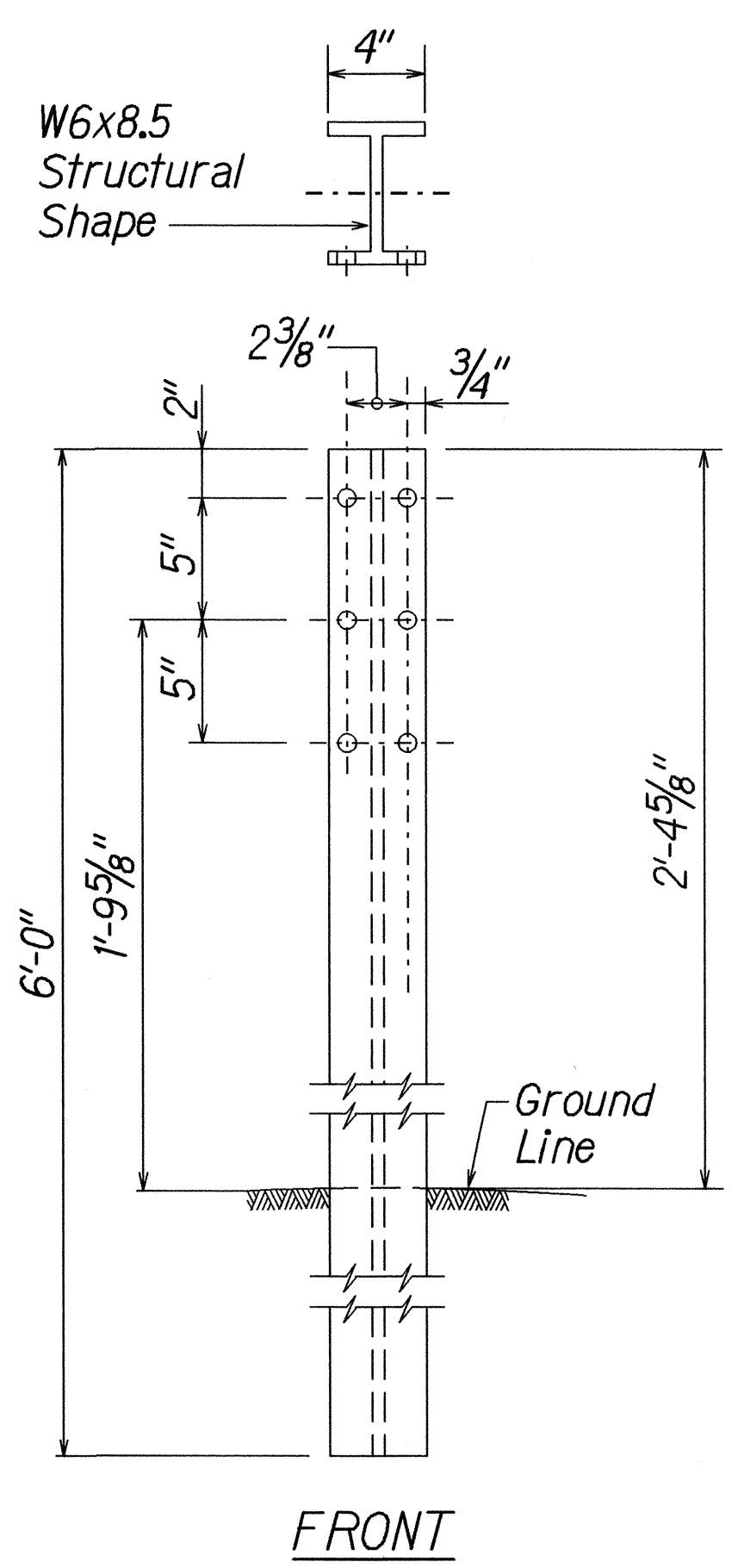


STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT

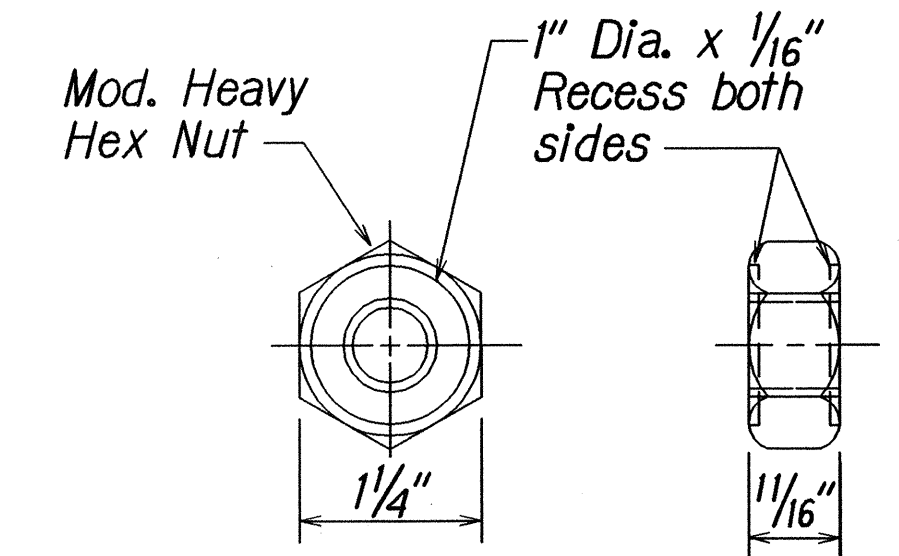
NOTE:
All Holes are 3/4" Dia.



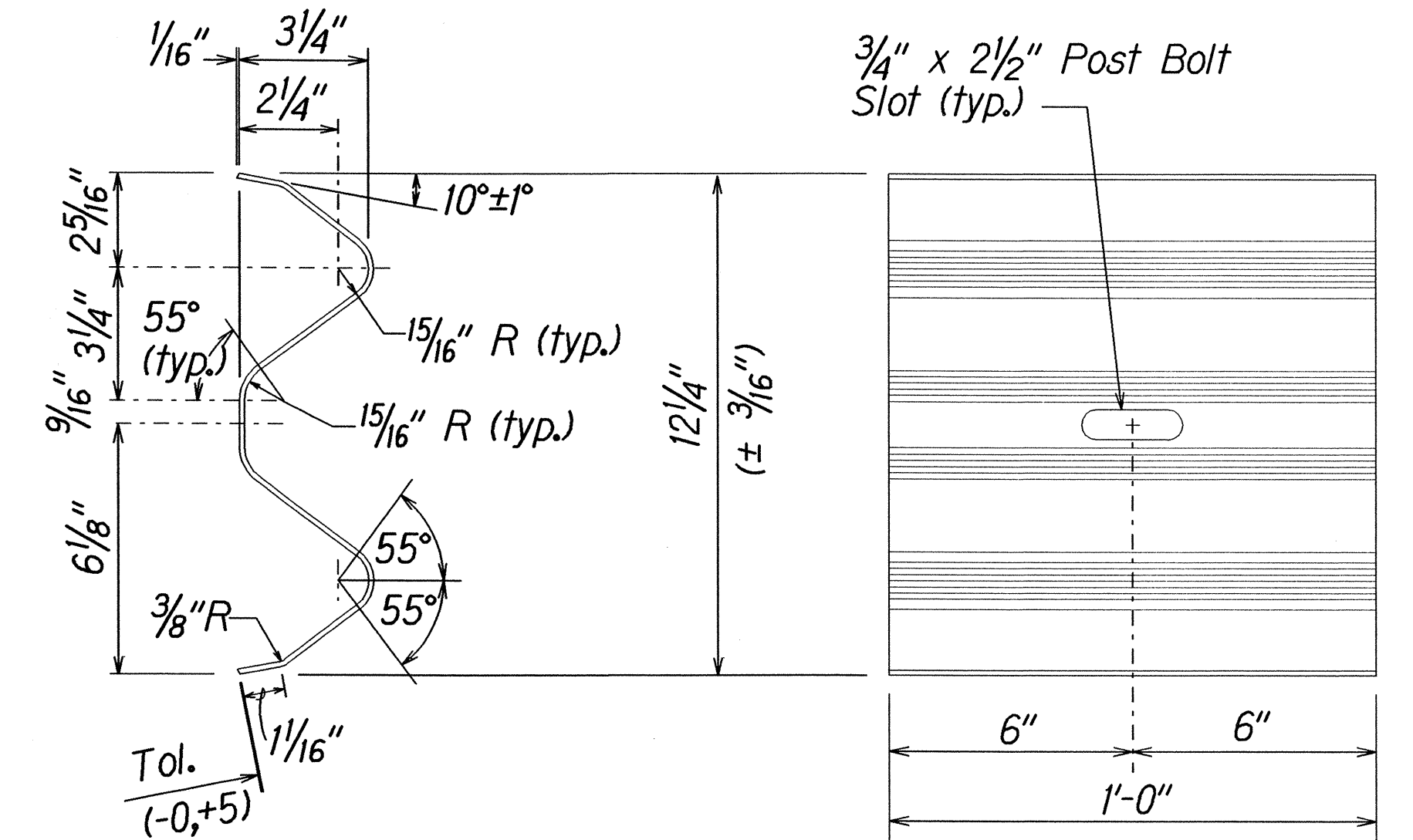
W-BEAM STRONG POST (PWE01)



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

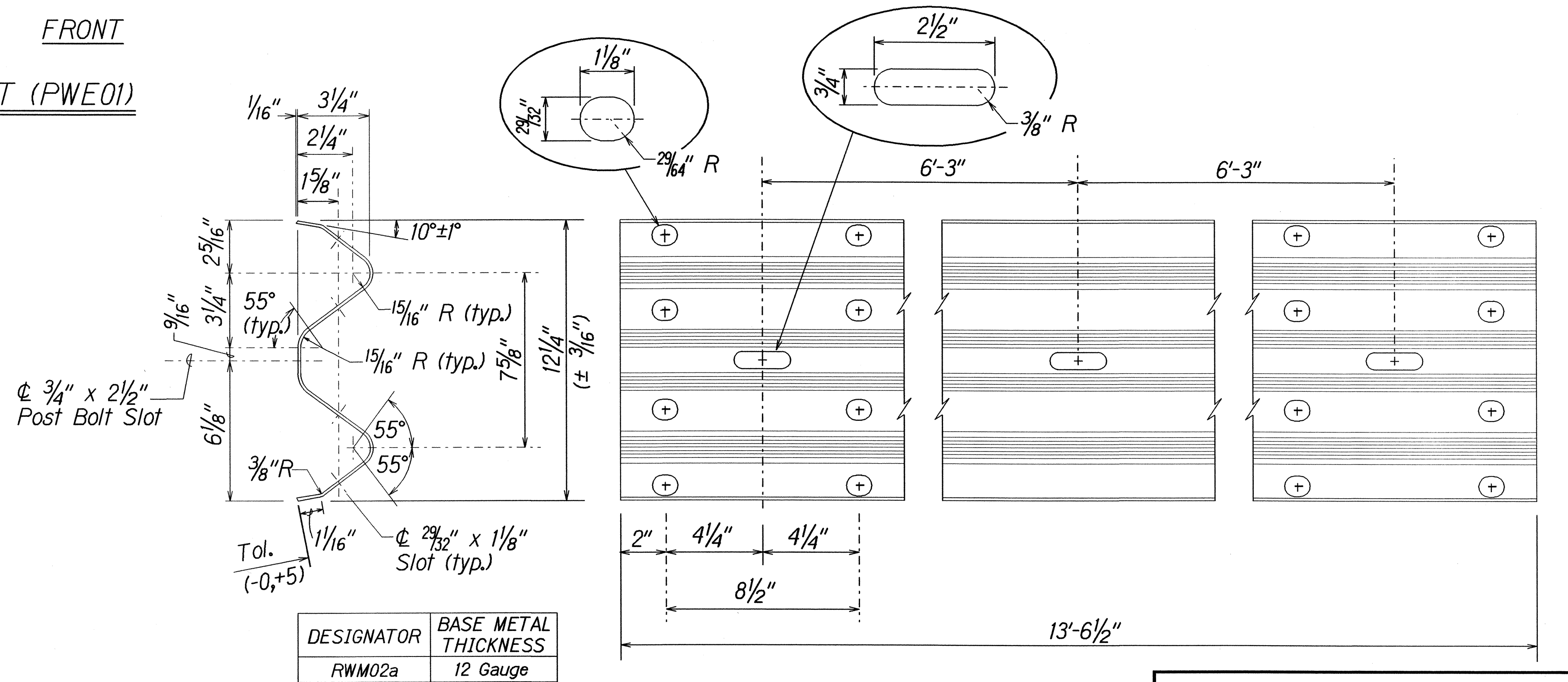


GUARDRAIL BOLTS AND RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

W-BEAM BACK-UP-PLATE (RWB01a)



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

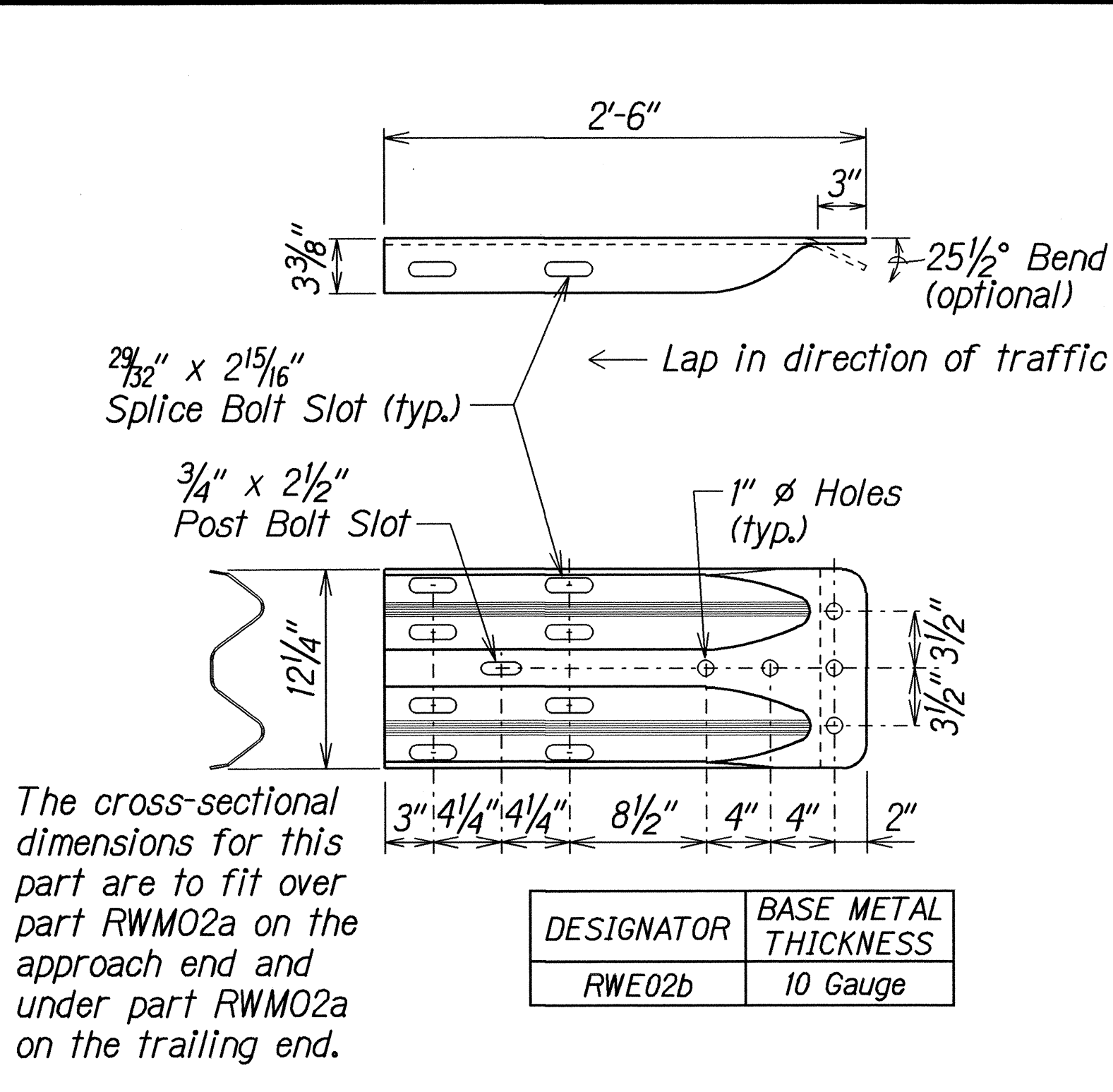
2 SPACE W-BEAM GUARDRAIL (RWM02a)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

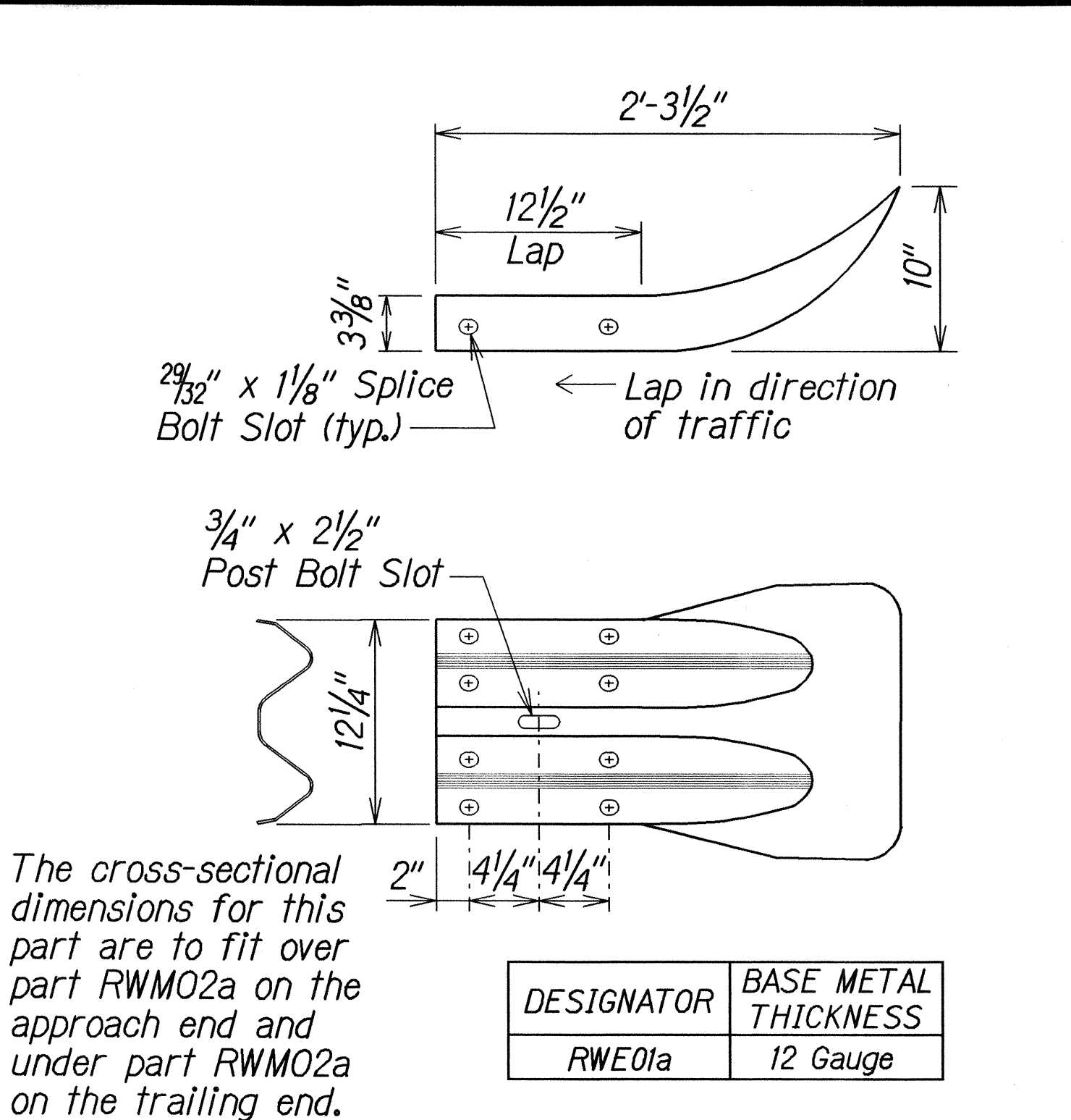
STRONG POST W-BEAM GUARDRAIL

INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-1(33)
Scale: NTS Date: December, 2006

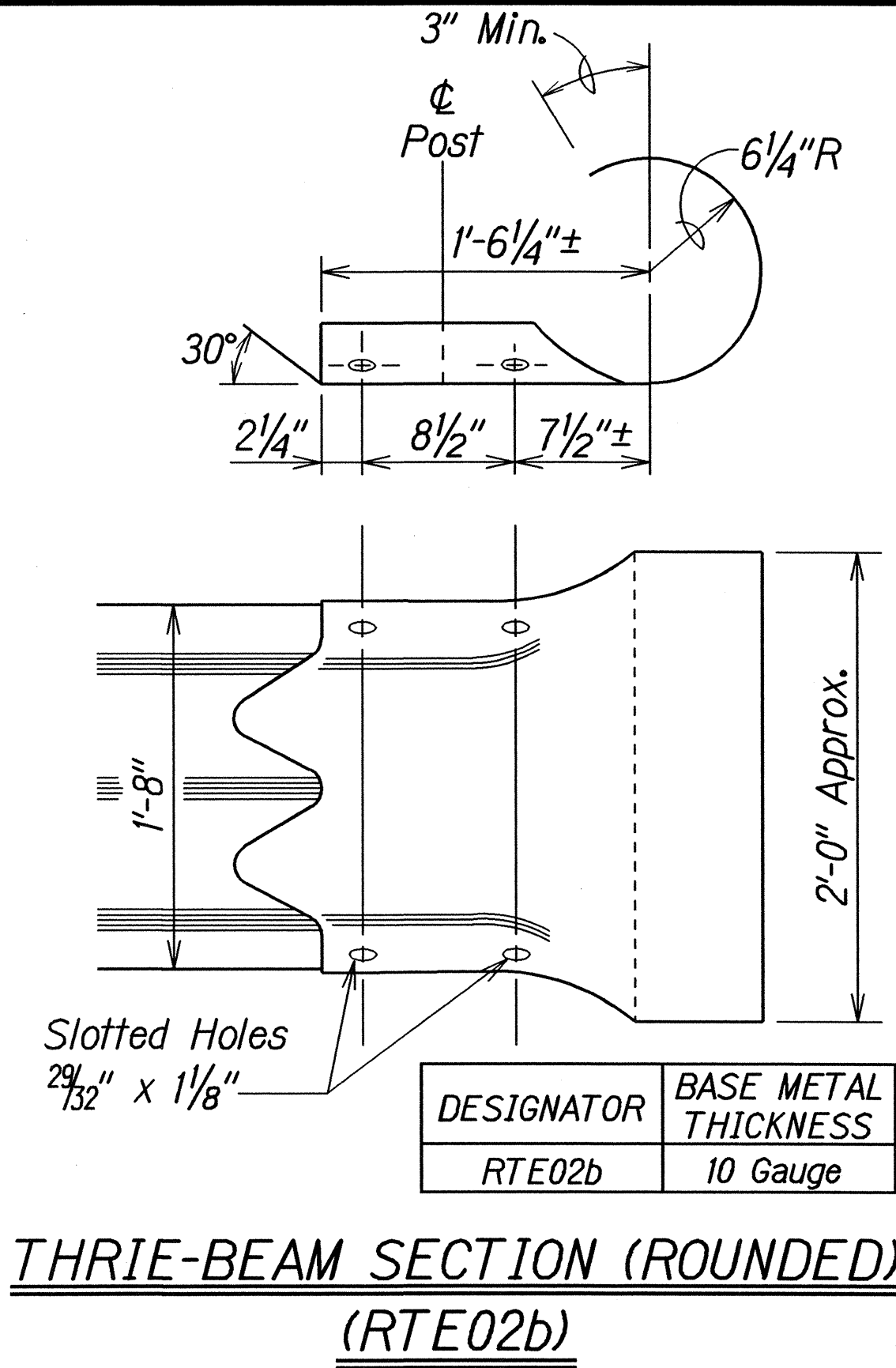
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	33	168



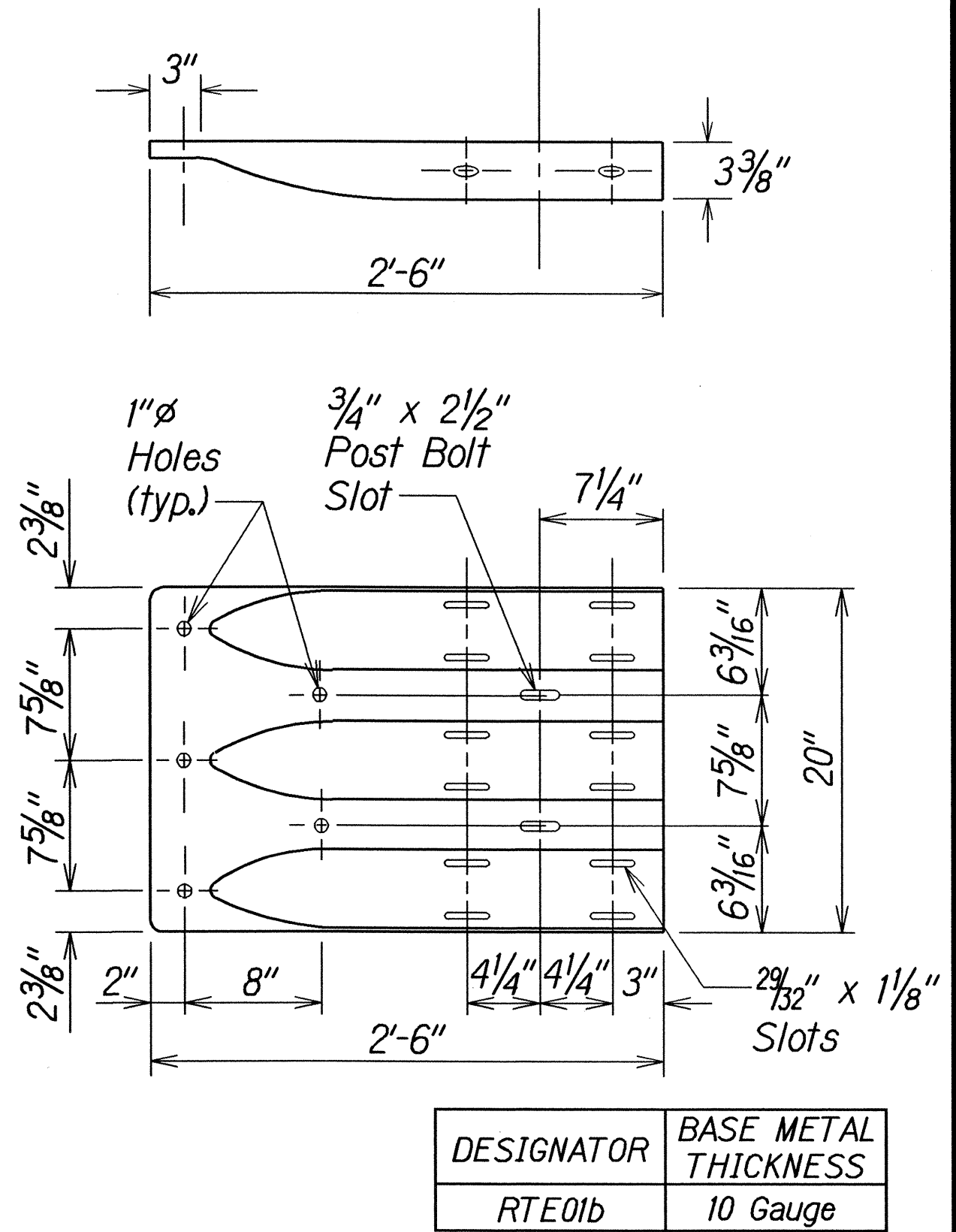
W-BEAM TERMINAL CONNECTOR (RWE02b)



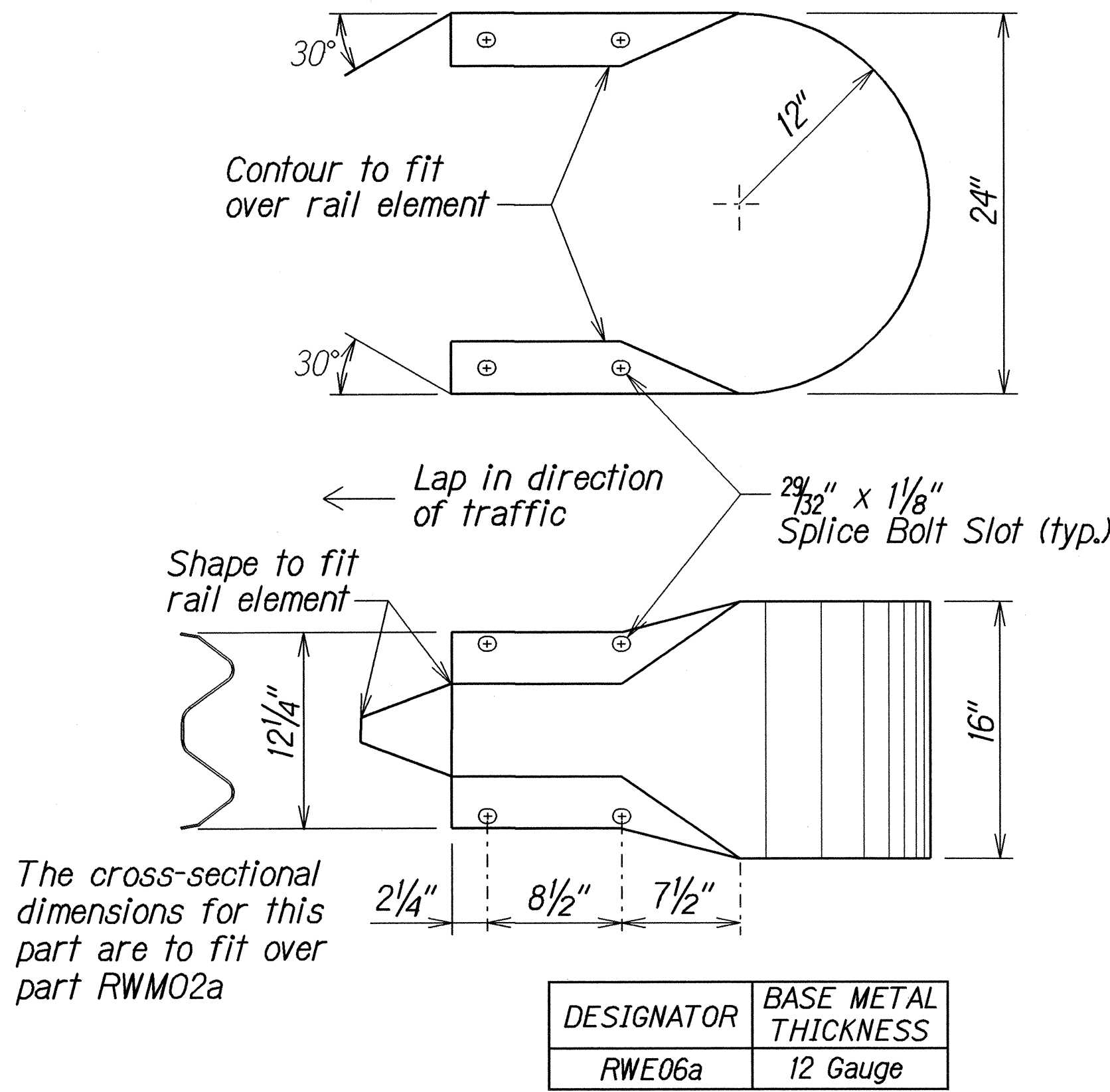
W-BEAM END SECTION (FLARED RWE01a)



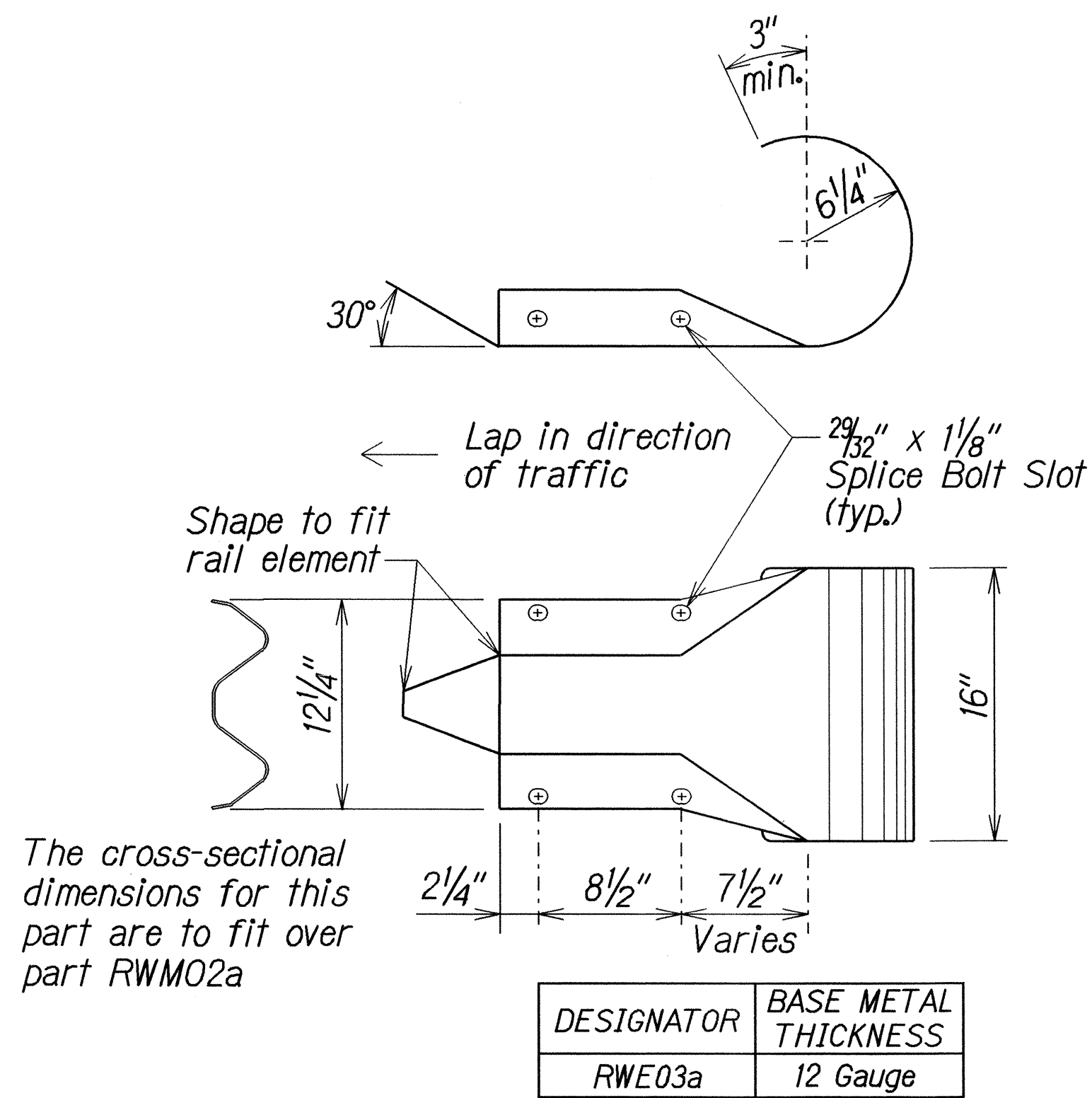
THRIE-BEAM SECTION (ROUNDED) (RTE02b)



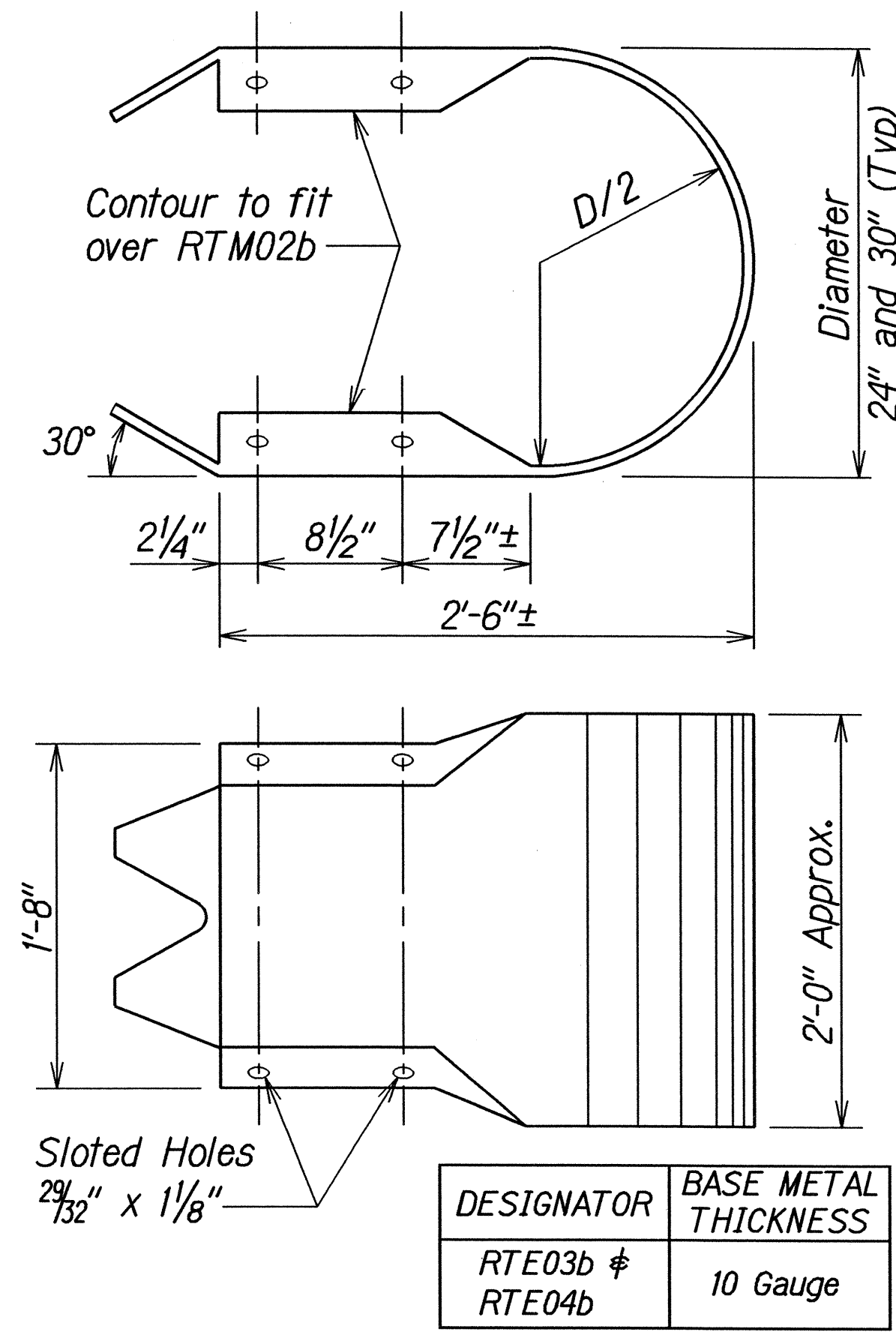
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



W-BEAM END SECTION (BUFFER RWE06a)



W-BEAM END SECTION (ROUNDED RWE03a)



THRIE-BEAM END SECTION (BUFFER RTE03b or RTE04b)

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

GUARDRAIL TERMINAL CONNECTORS AND END SECTIONS

INTERSTATE ROUTE H-2 REHABILITATION

Waipio Interchange & Milllani Interchange

On/Off Ramps, Ka Uka Blvd, Meheula Parkway

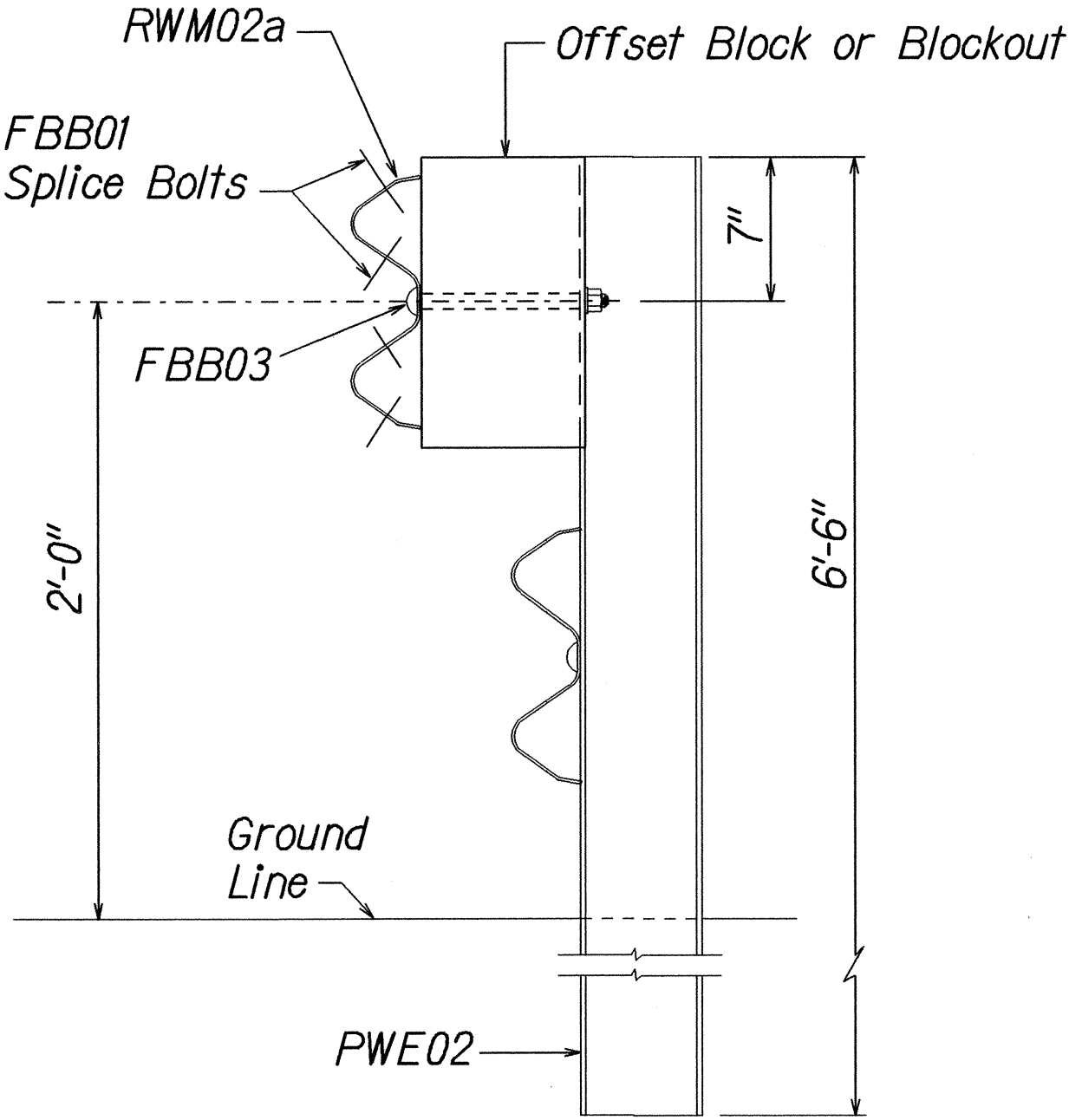
Overpass, & Kipapa Stream Bridge

Federal Aid Project No. IM-H2-1(33)

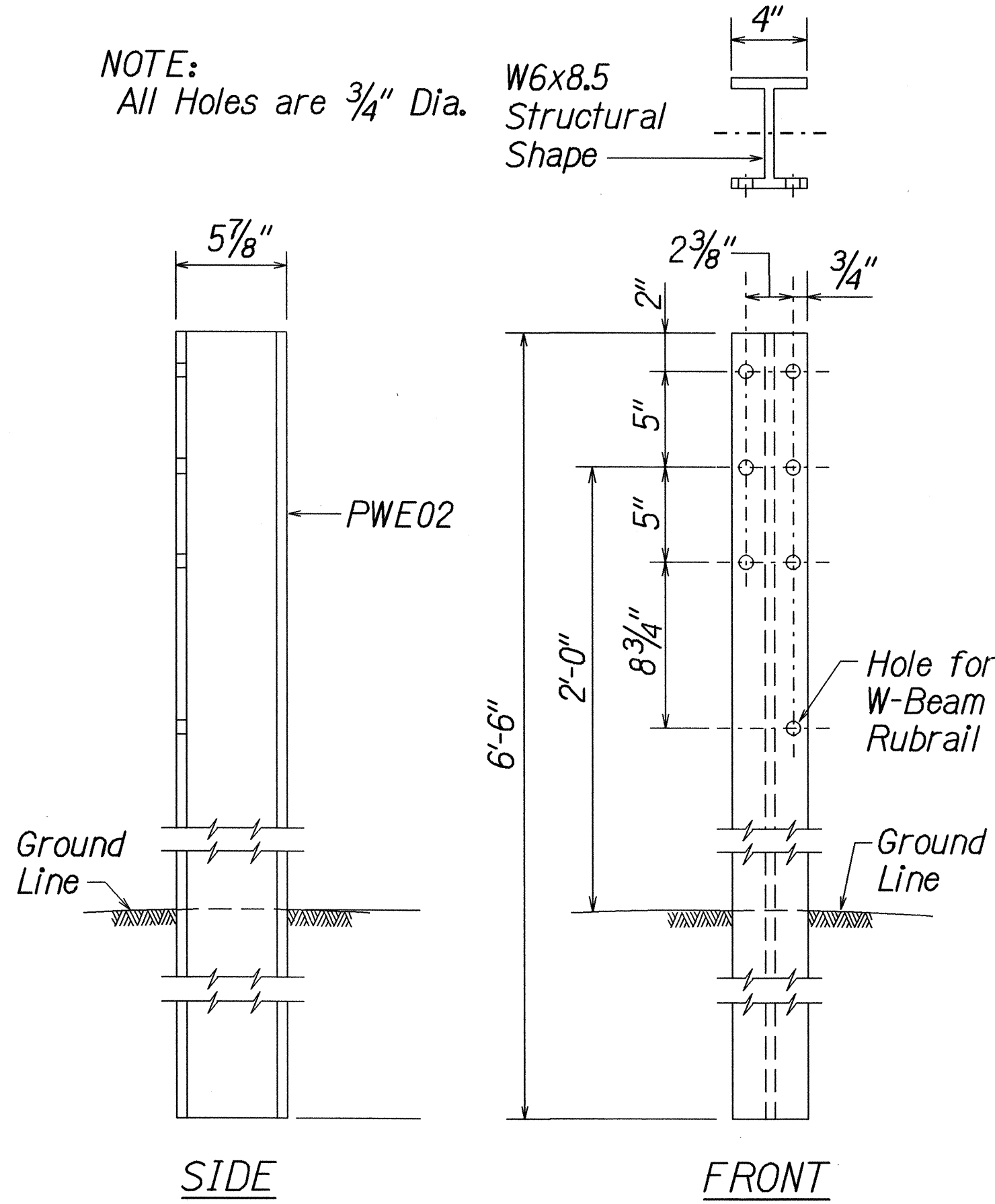
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Date: December, 2006

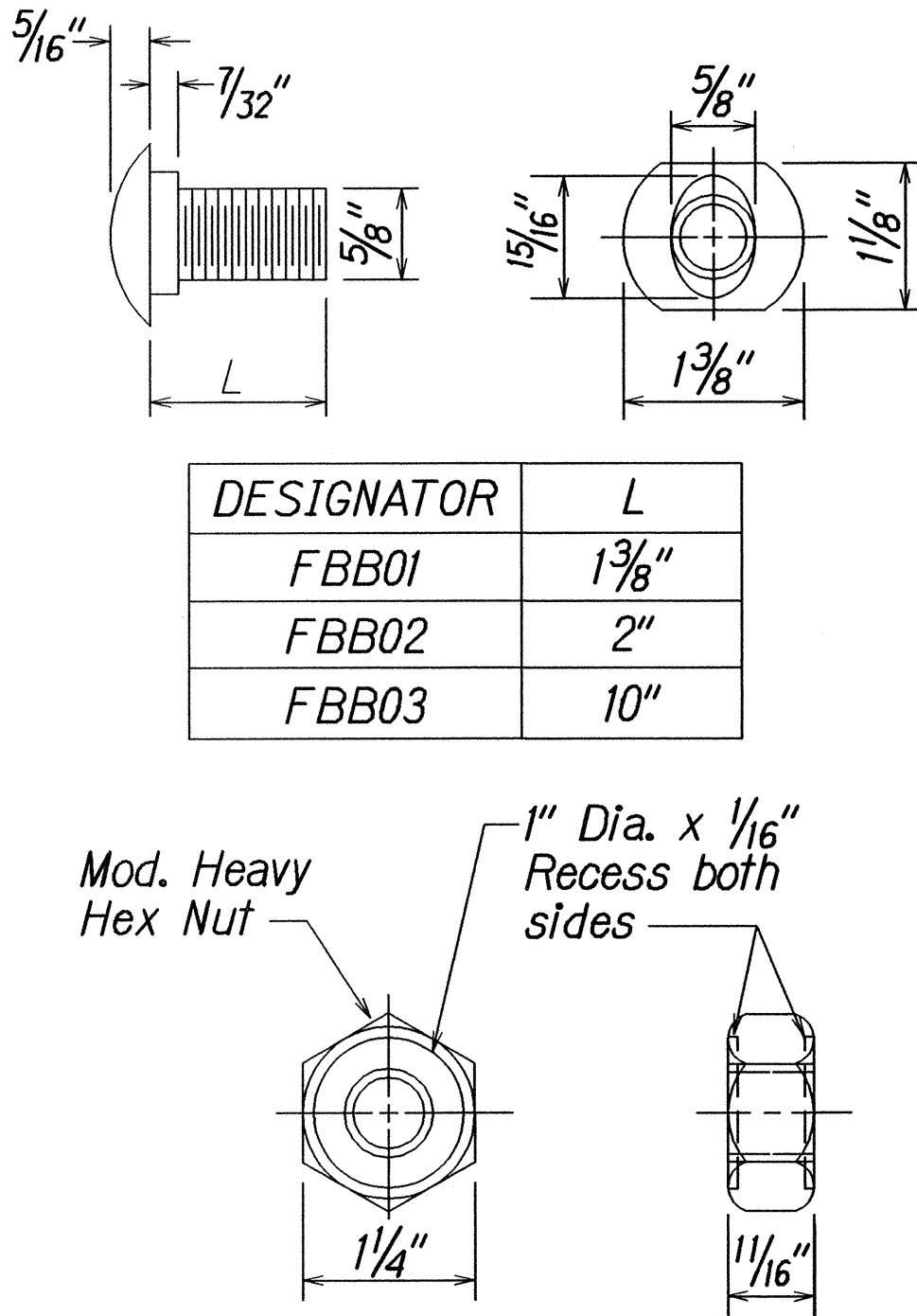
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H2-1(33)	2007	34	168



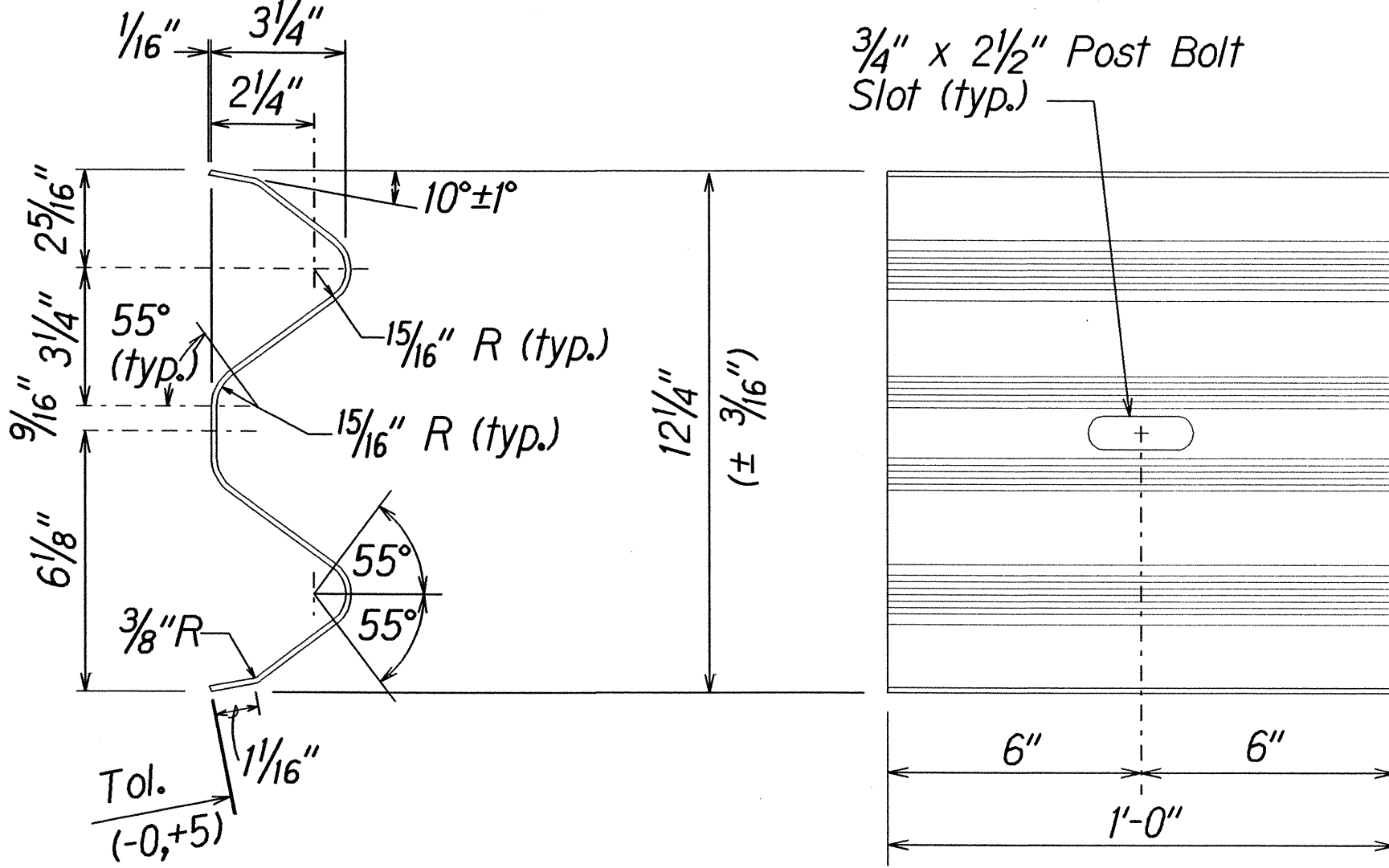
ELEVATION
STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL



SIDE
FRONT
W-BEAM STRONG POST (PWE02)

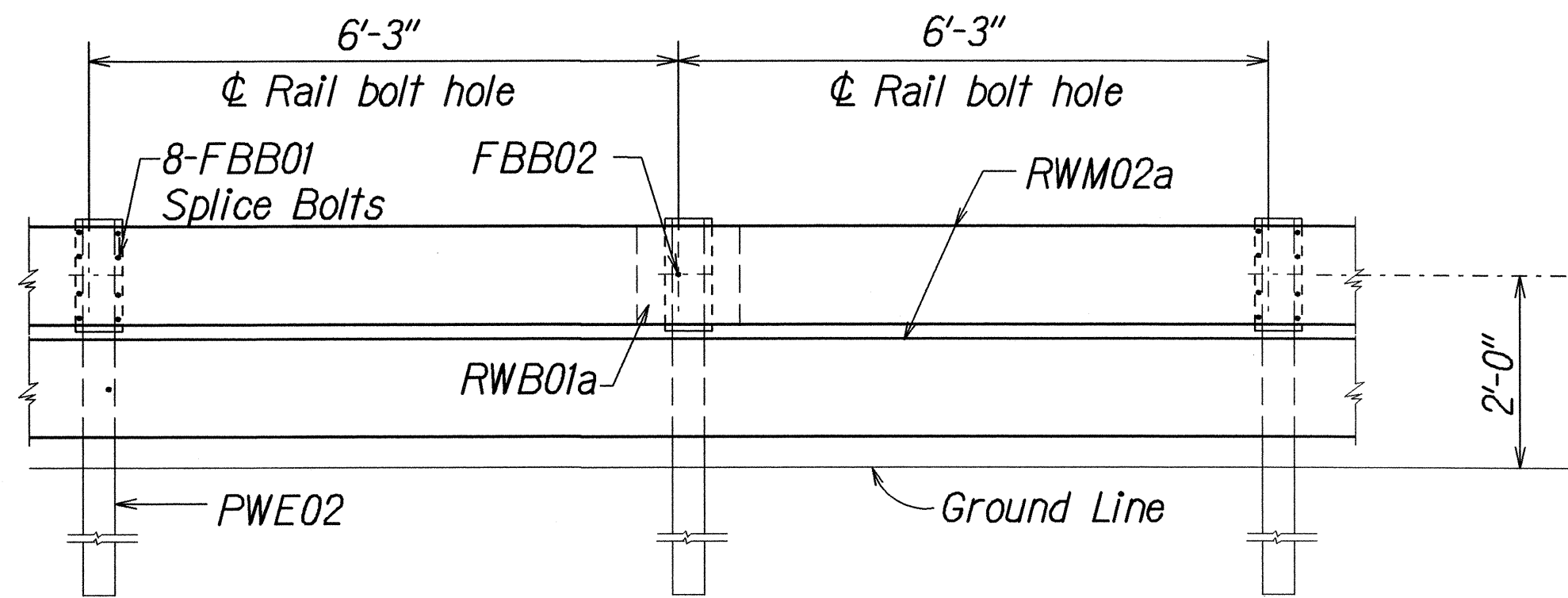


GUARDRAIL BOLTS AND
RECESSED NUT

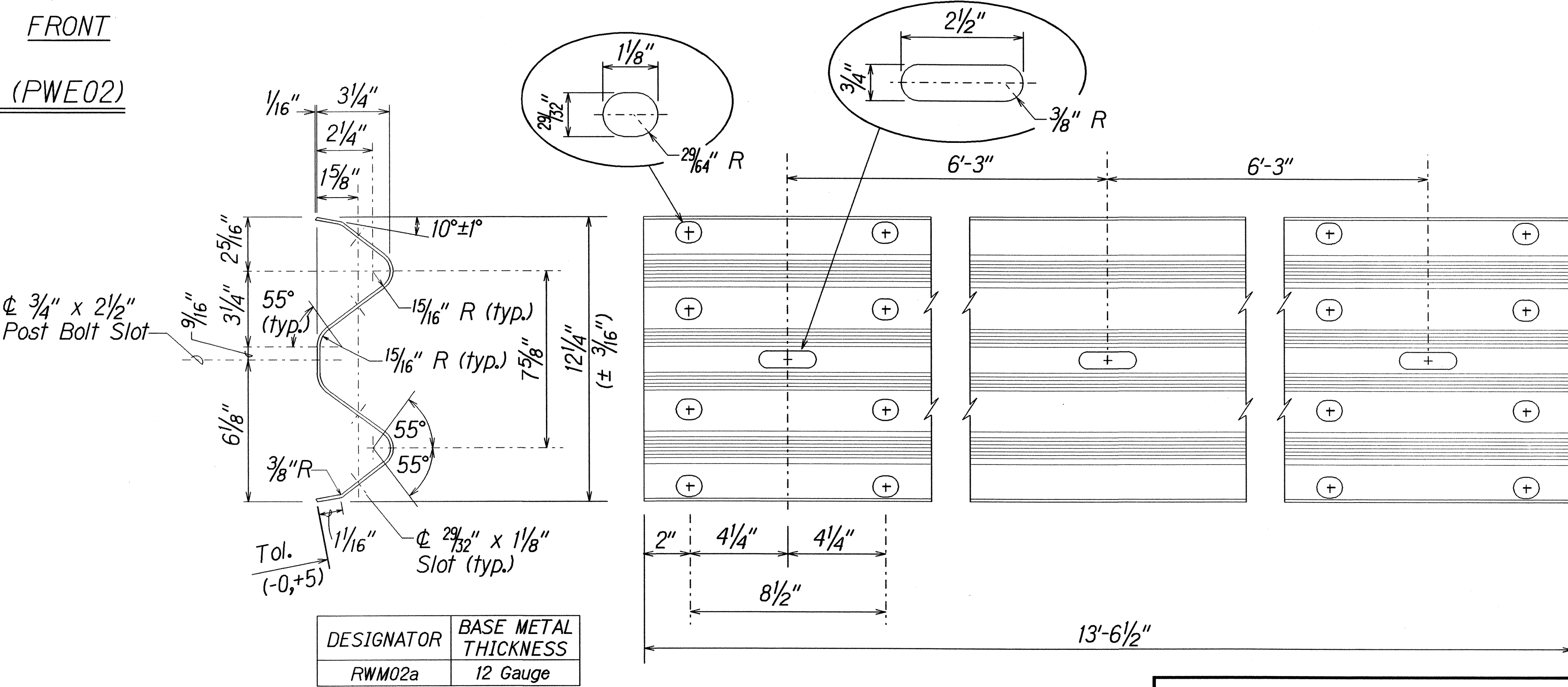


DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

W-BEAM BACK-UP-PLATE (RWB01a)

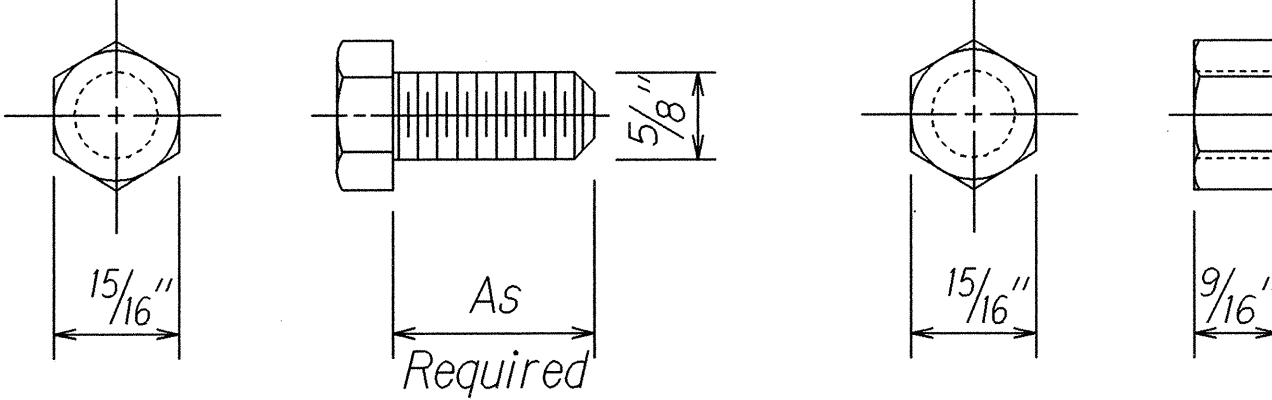


ELEVATION
STRONG POST RUBRAIL (W-BEAM) GUARDRAIL WITH
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

2 SPACE W-BEAM GUARDRAIL (RWM02a)



HEX BOLT & NUT (FBX16a)

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

STRONG POST RUBRAIL

(W-BEAM) GUARDRAIL

INTERSTATE ROUTE H-2 REHABILITATION

Waipio Interchange & Milliani Interchange

On/Off Ramps, Ka Uka Blvd. Meheula Parkway

Overpass, & Kipapa Stream Bridge

Federal Aid Project No. 1M-H2-1(33)

Not to Scale

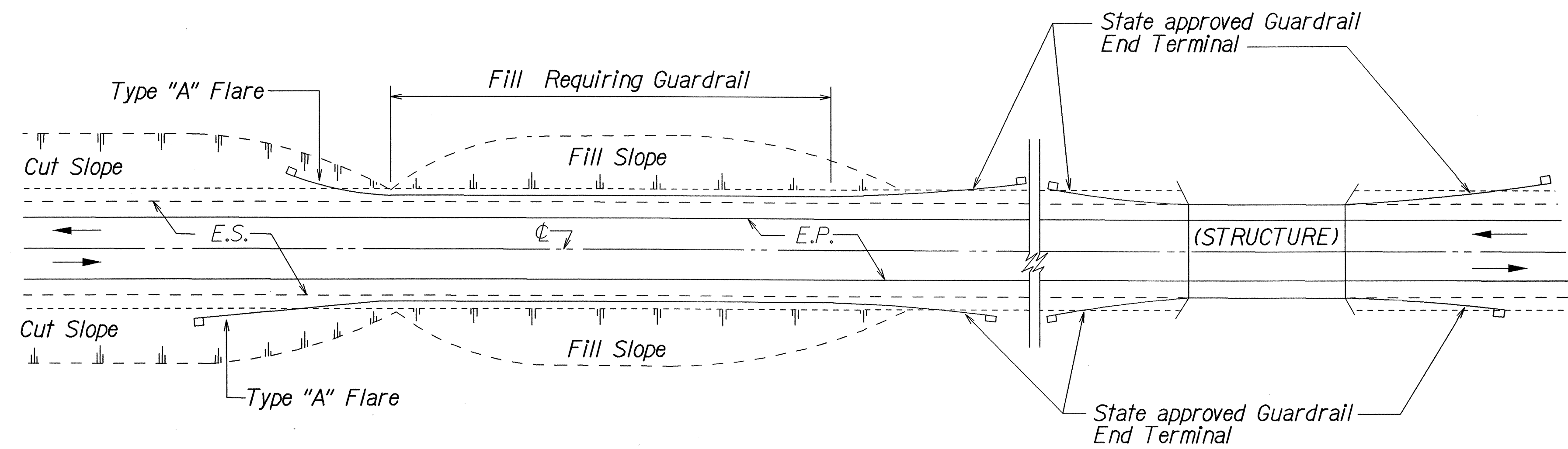
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SHEET No. 4 OF 11 SHEETS

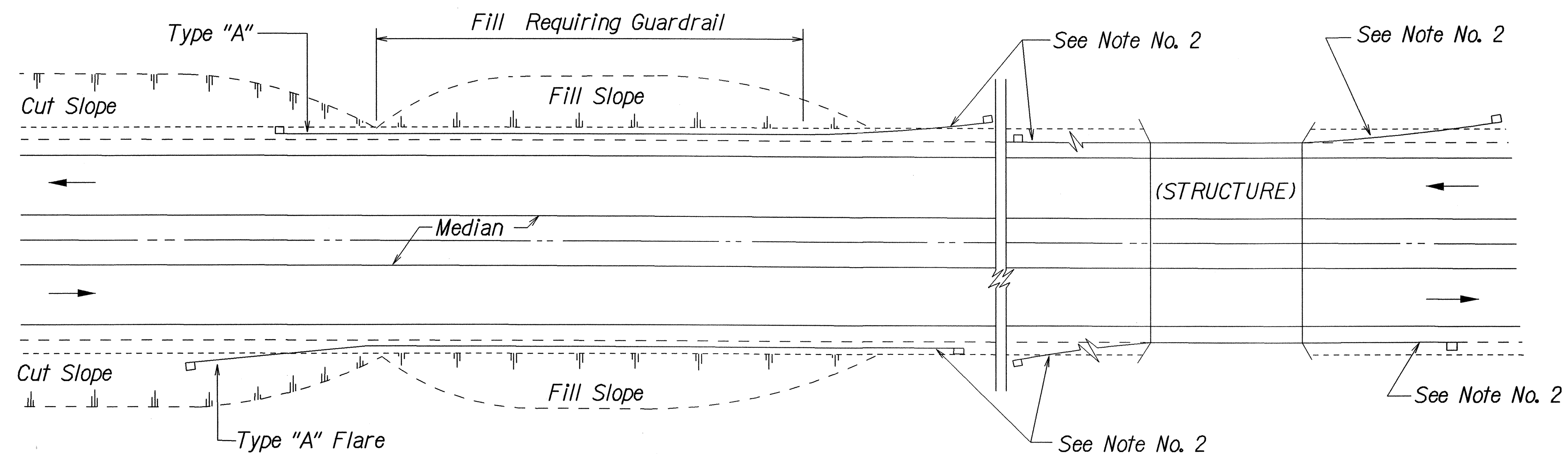
ORIGINAL PLAN	DATE
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	

4427 (rev) 4/11/2004.dgn

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	36	168



PLAN
TWO WAY ROADWAY



PLAN
ONE WAY ROADWAY (DIVIDED HIGHWAY)

NOTES:

1. Metal Guardrail connection to concrete structures requires End Post Connection. See Structure Plans.
2. Refer to State's most current approved Product List for NCHRP 350 approved Guardrail End Terminals.

ORIGINAL	SURVEY PLOTTED BY	DATE
PLAN	DESIGNED BY	
NOTE BOOK	QUANTITIES BY	
	CHECKED BY	

ddt/gwen/4/11/2006

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

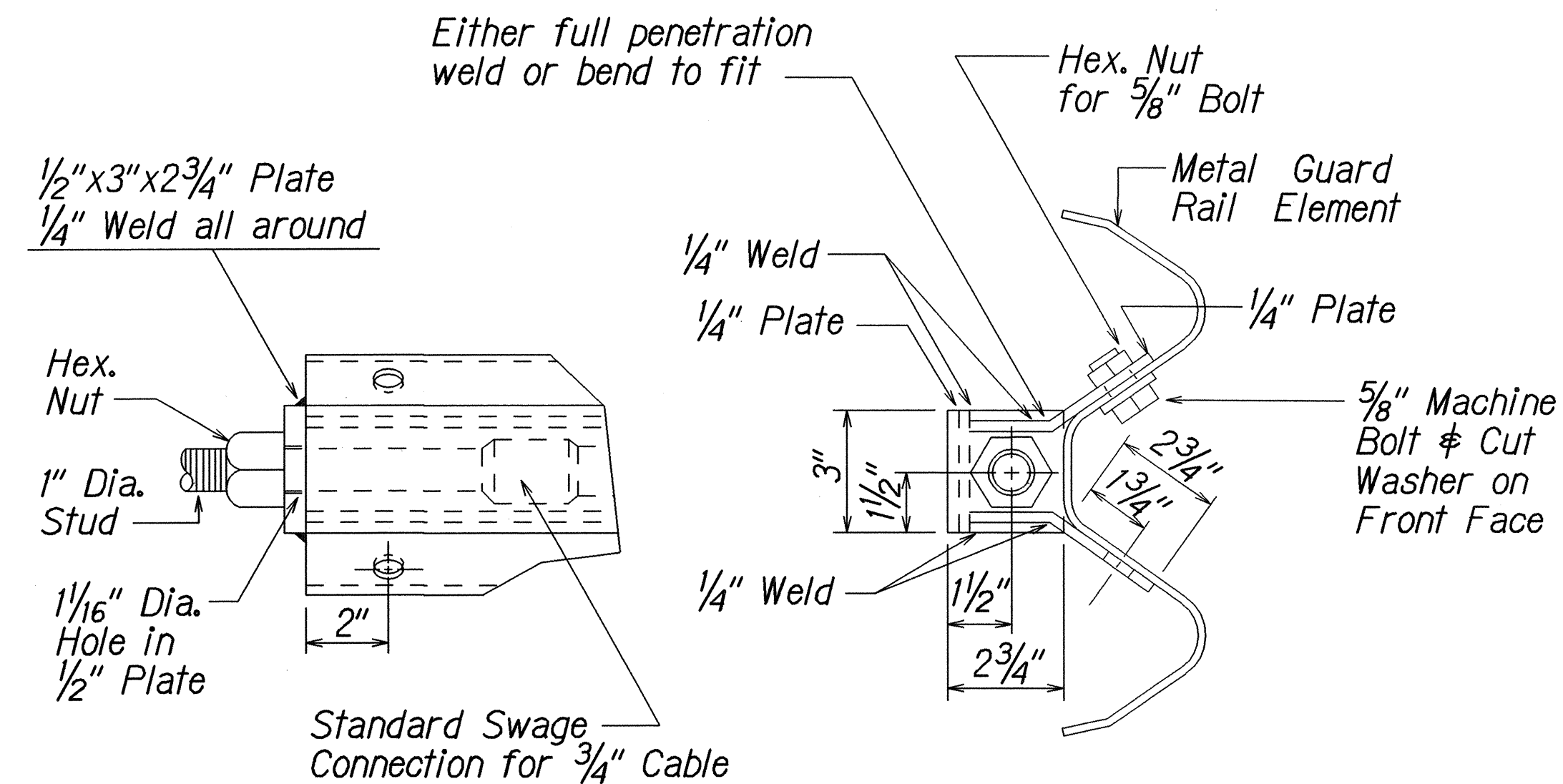
GUARDRAIL DETAILS

INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-1(33)

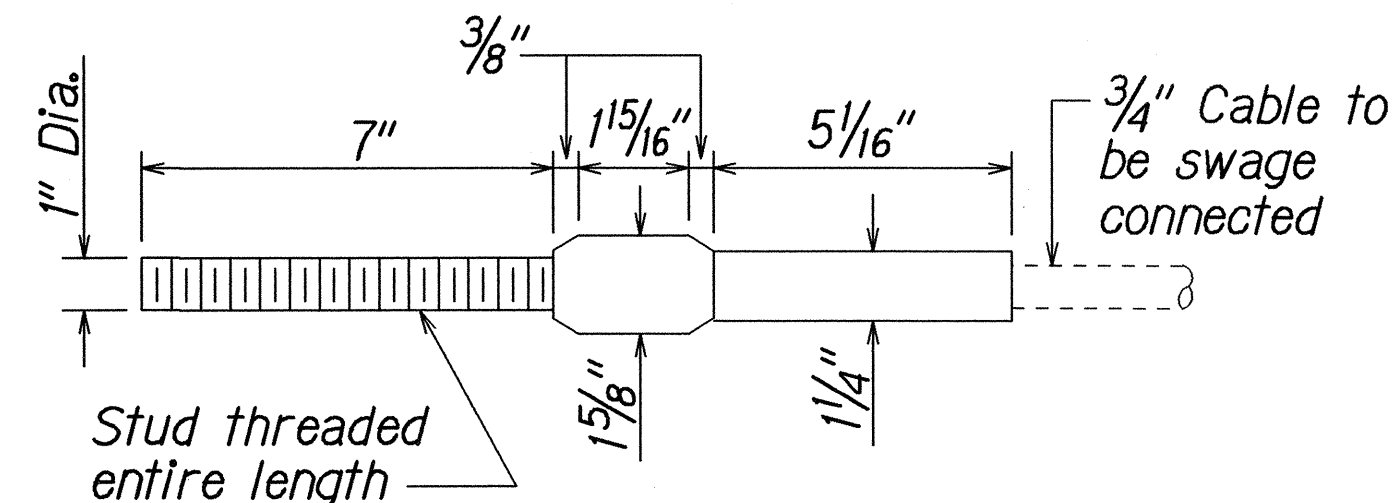
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SHEET No. 6 OF 11 SHEETS

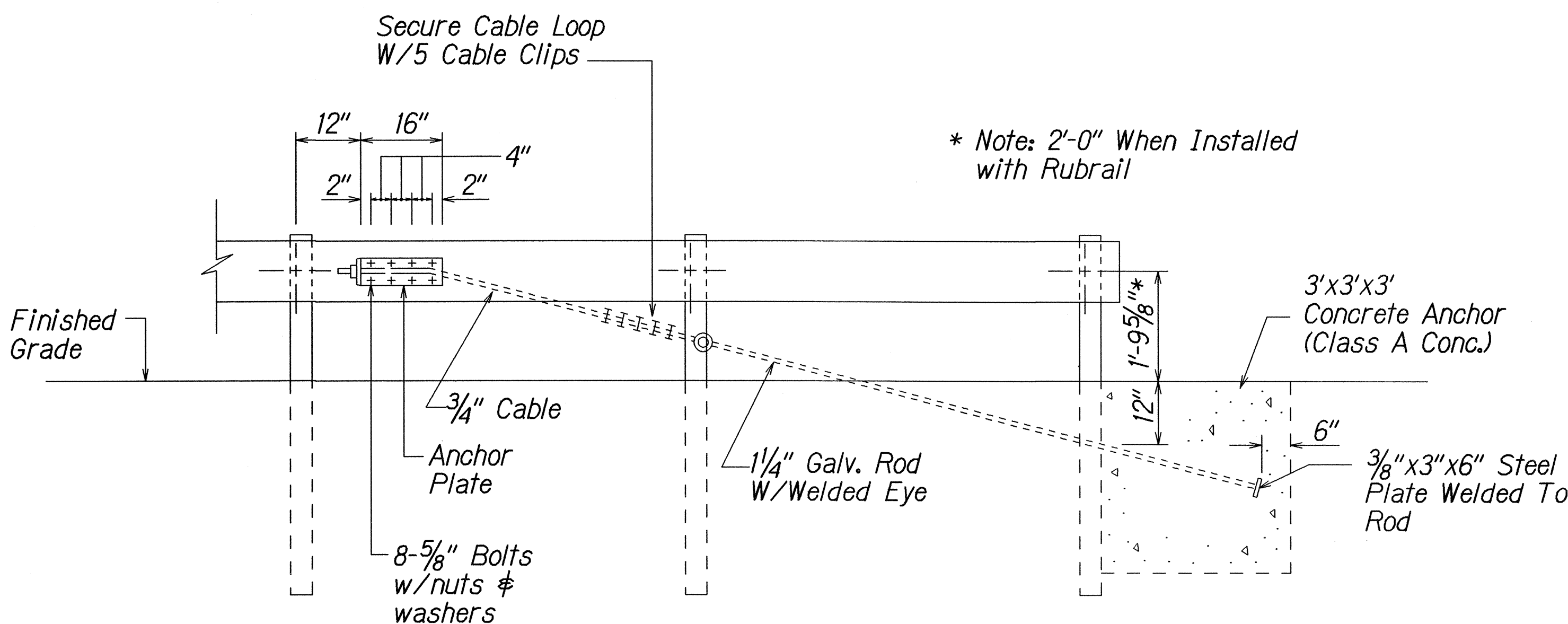
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	37	168



ANCHOR PLATE DETAILS

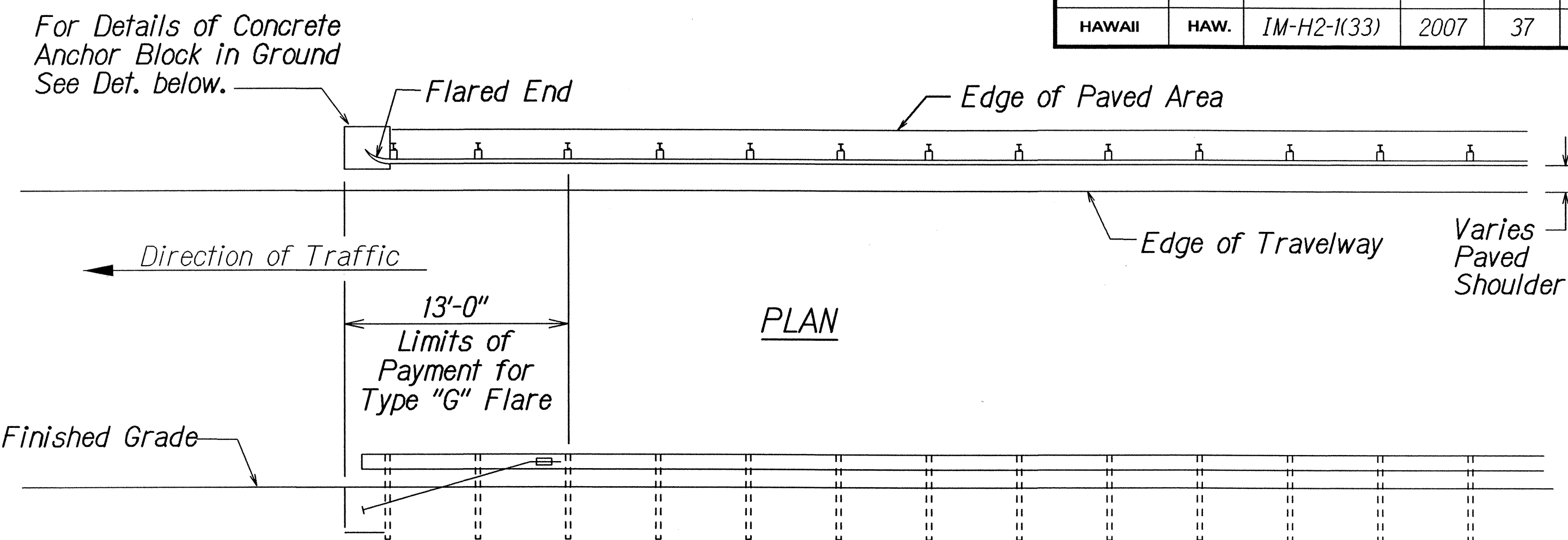


STANDARD SWAGED FITTING AND STUD



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.

SURVEY PLOTTED BY	DATE
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
NO.	

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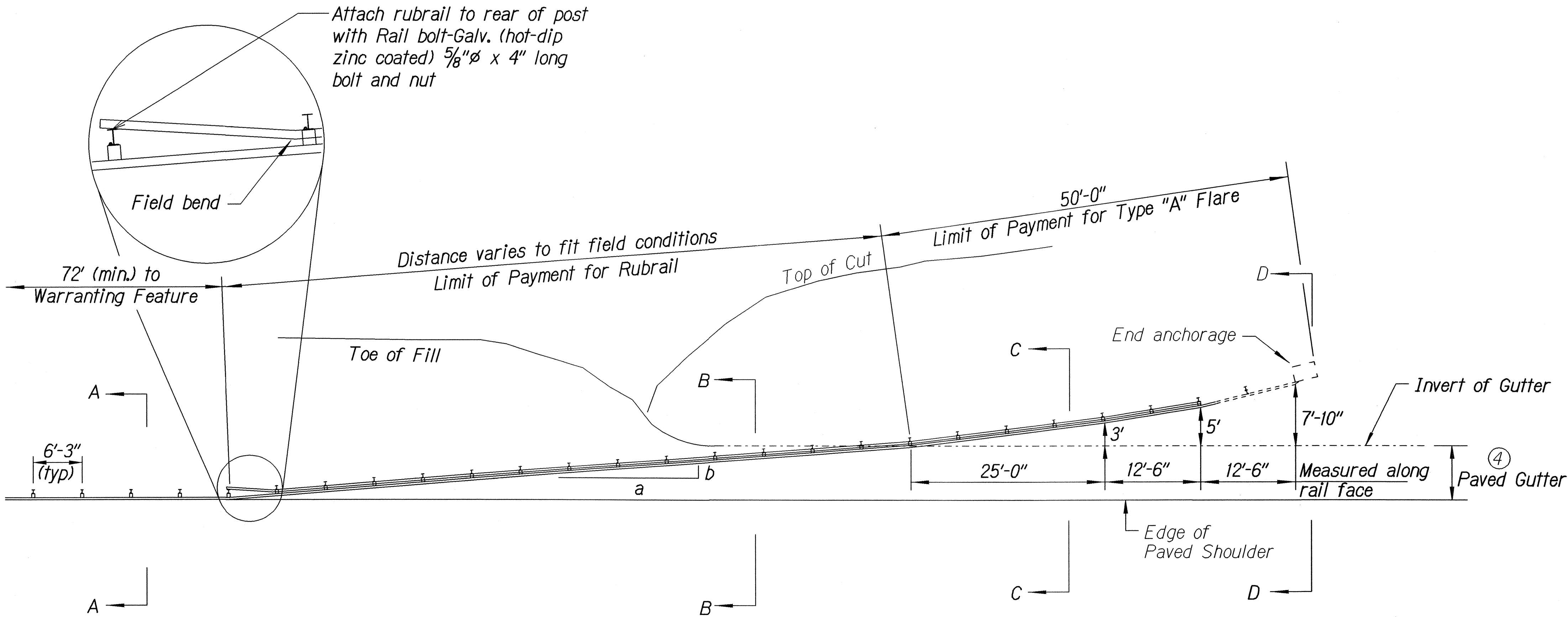
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS
INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
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HAWAII	HAW.	IM-H2-1(33)	2007	38	168

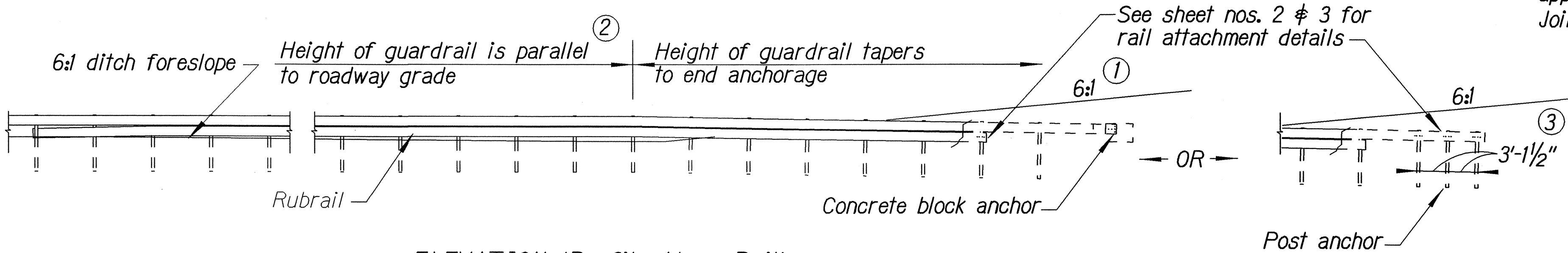
General Notes

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.

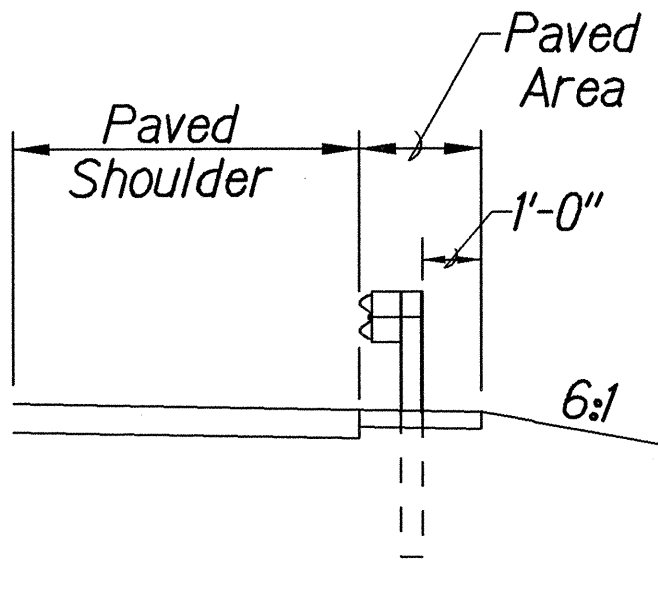


PLAN

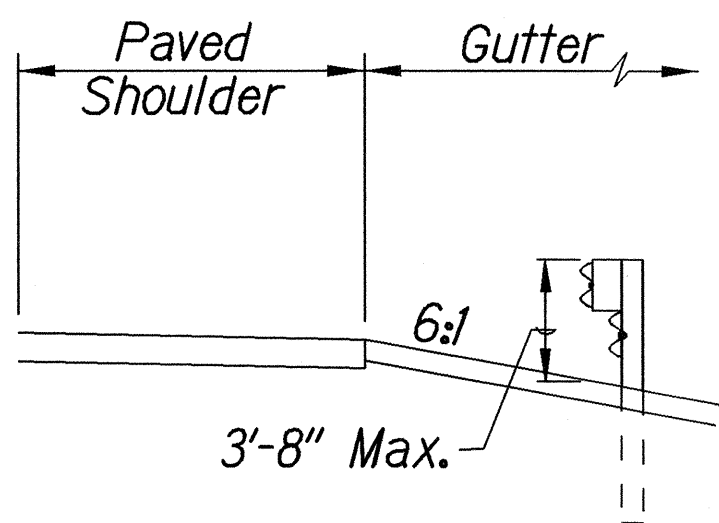
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



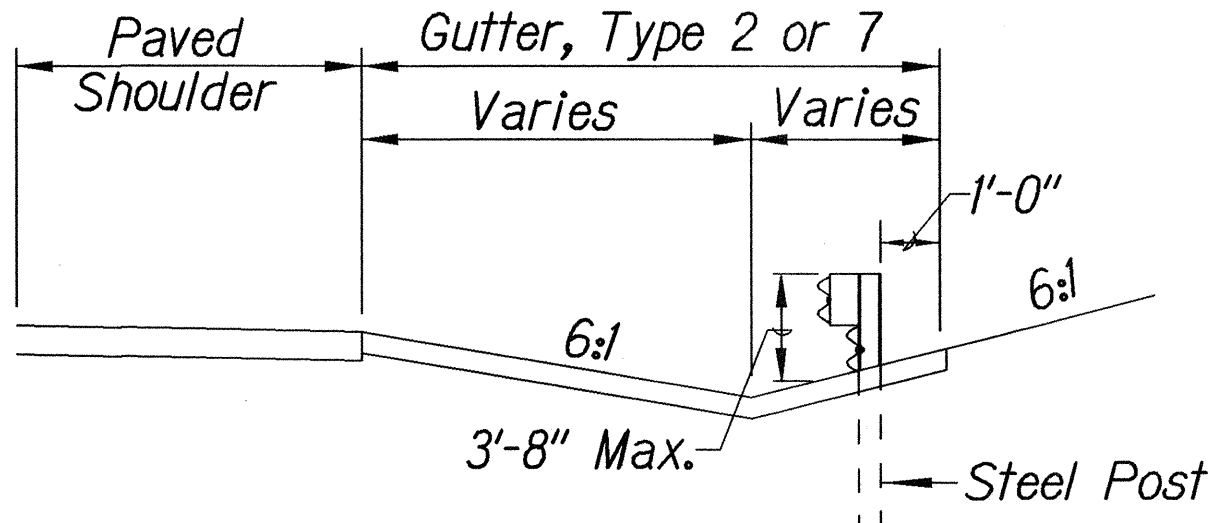
ELEVATION (Profile Along Rail)



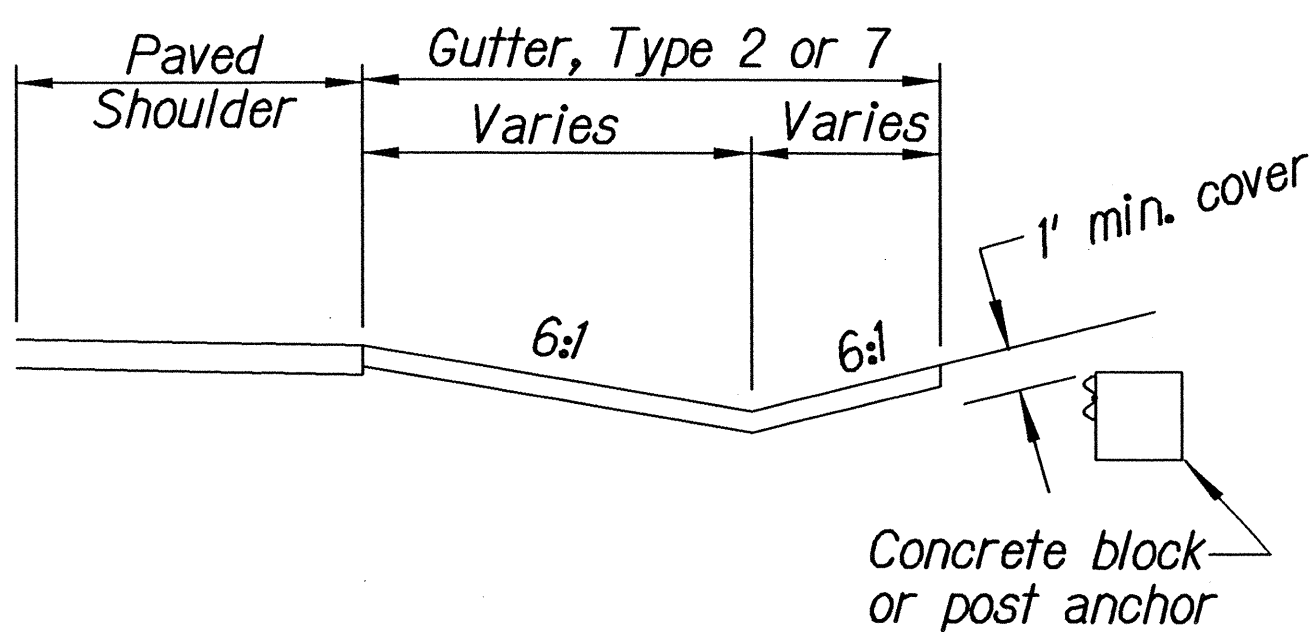
Section A-A



Section B-B
(With Rubrail)



Section C-C
(With Rubrail)

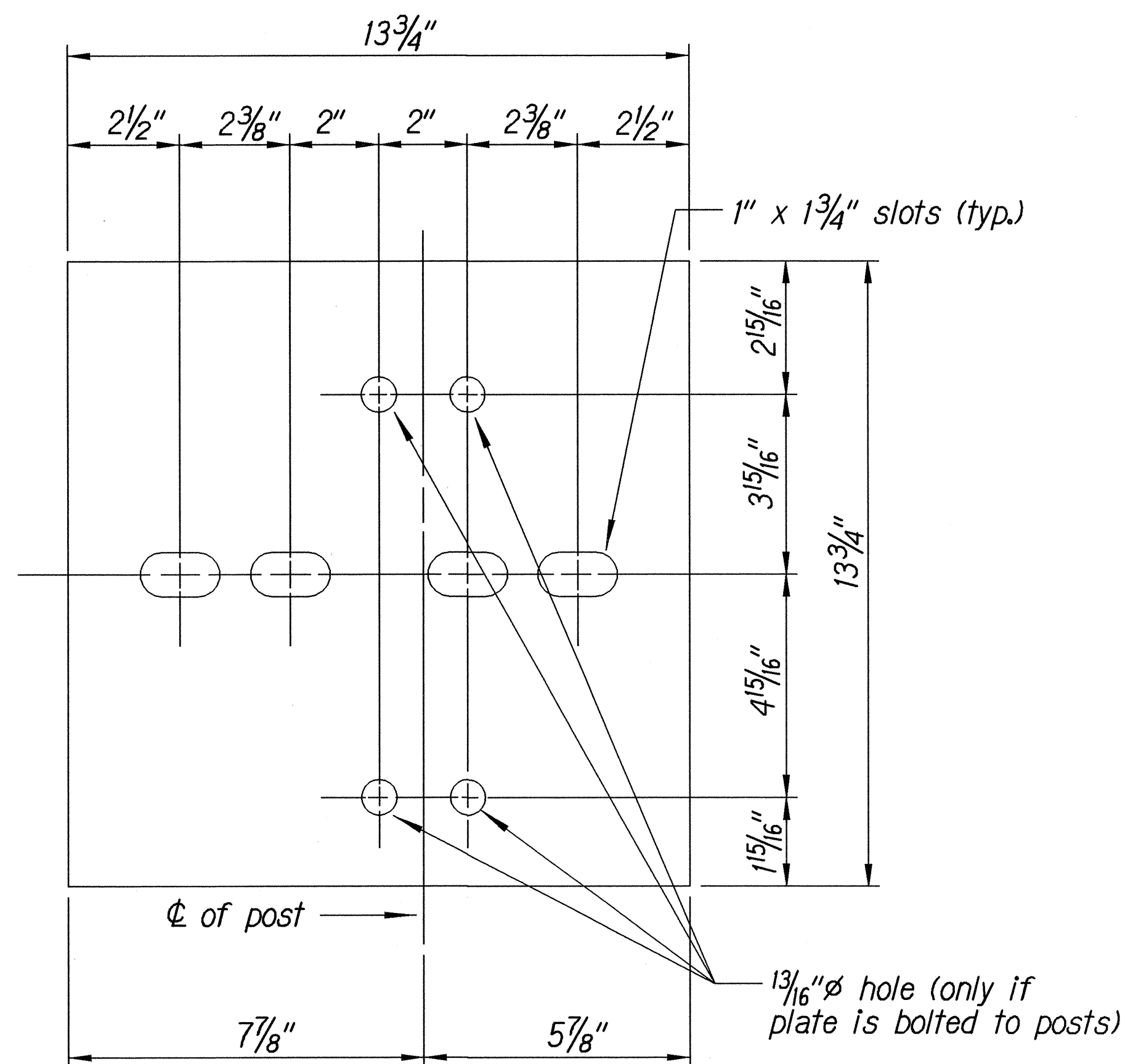


BACKSLOPE ANCHOR TERMINAL (WITH 6:1 PAVED GUTTER AND TYPE "A" FLARE)

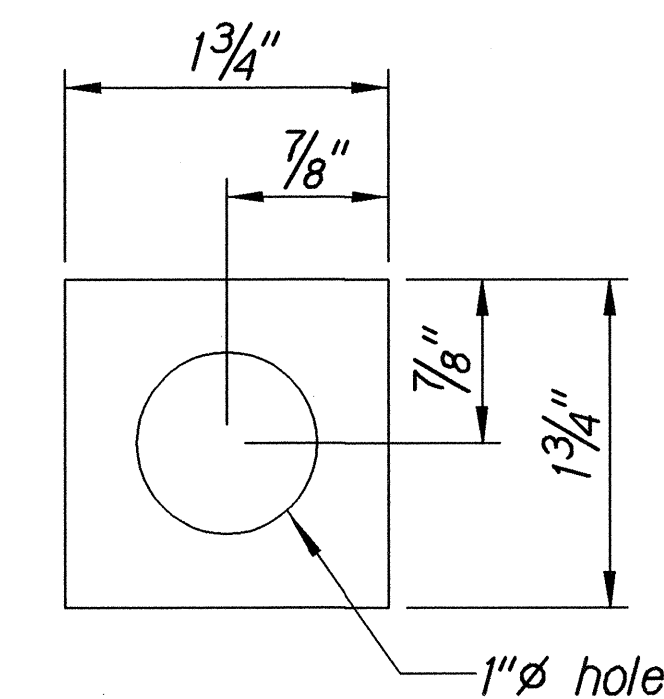
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE
INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-1(33)
Scale: NTS
Date: December, 2006

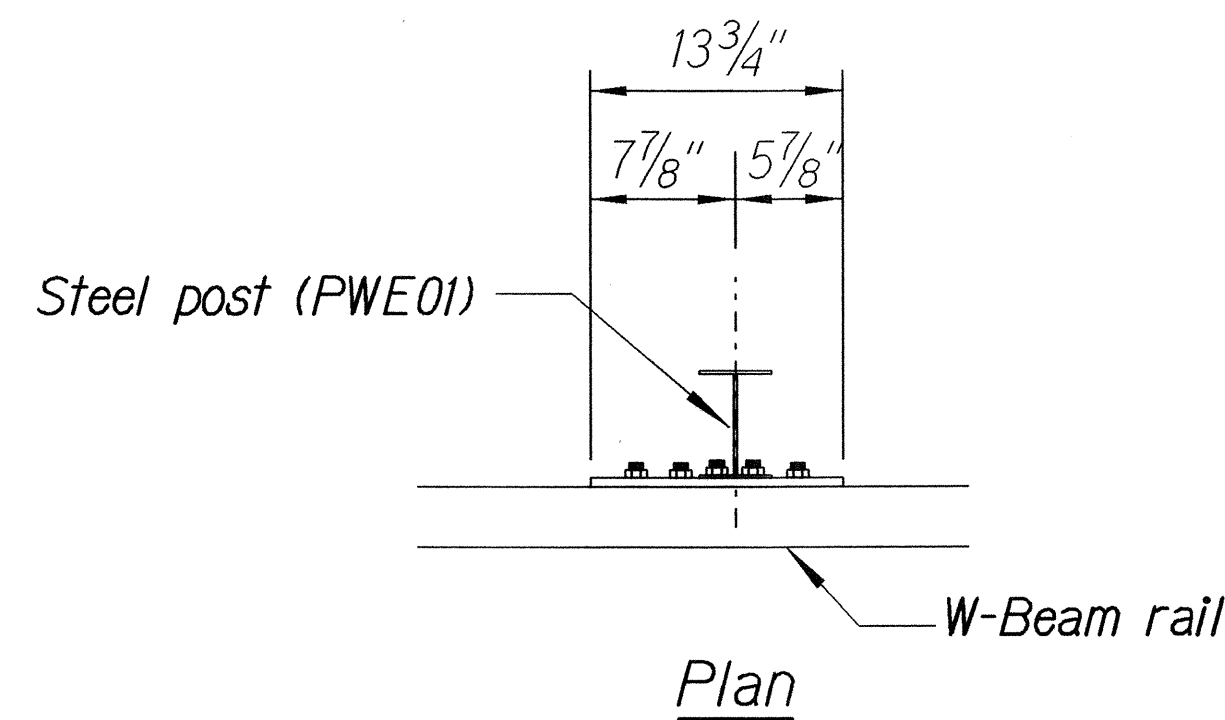
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	39	168



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

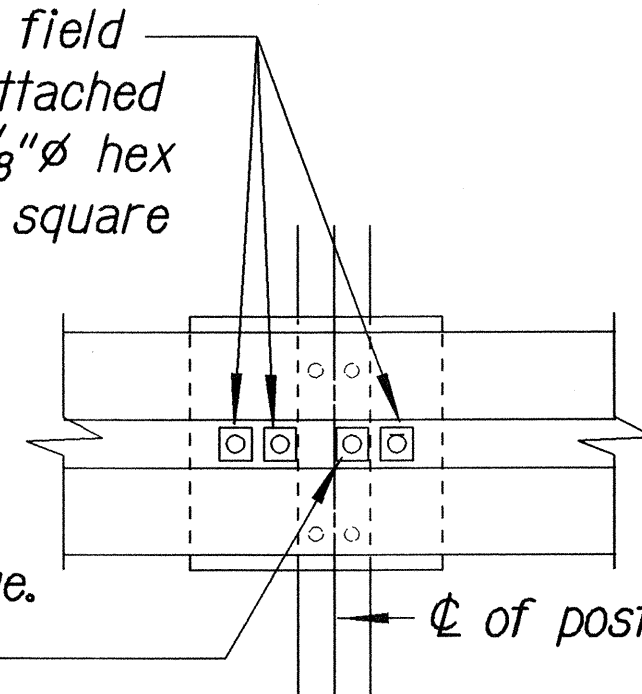


Square Washer
(3/16" Thick - Hot-dip
Zinc Coated Galvanized)

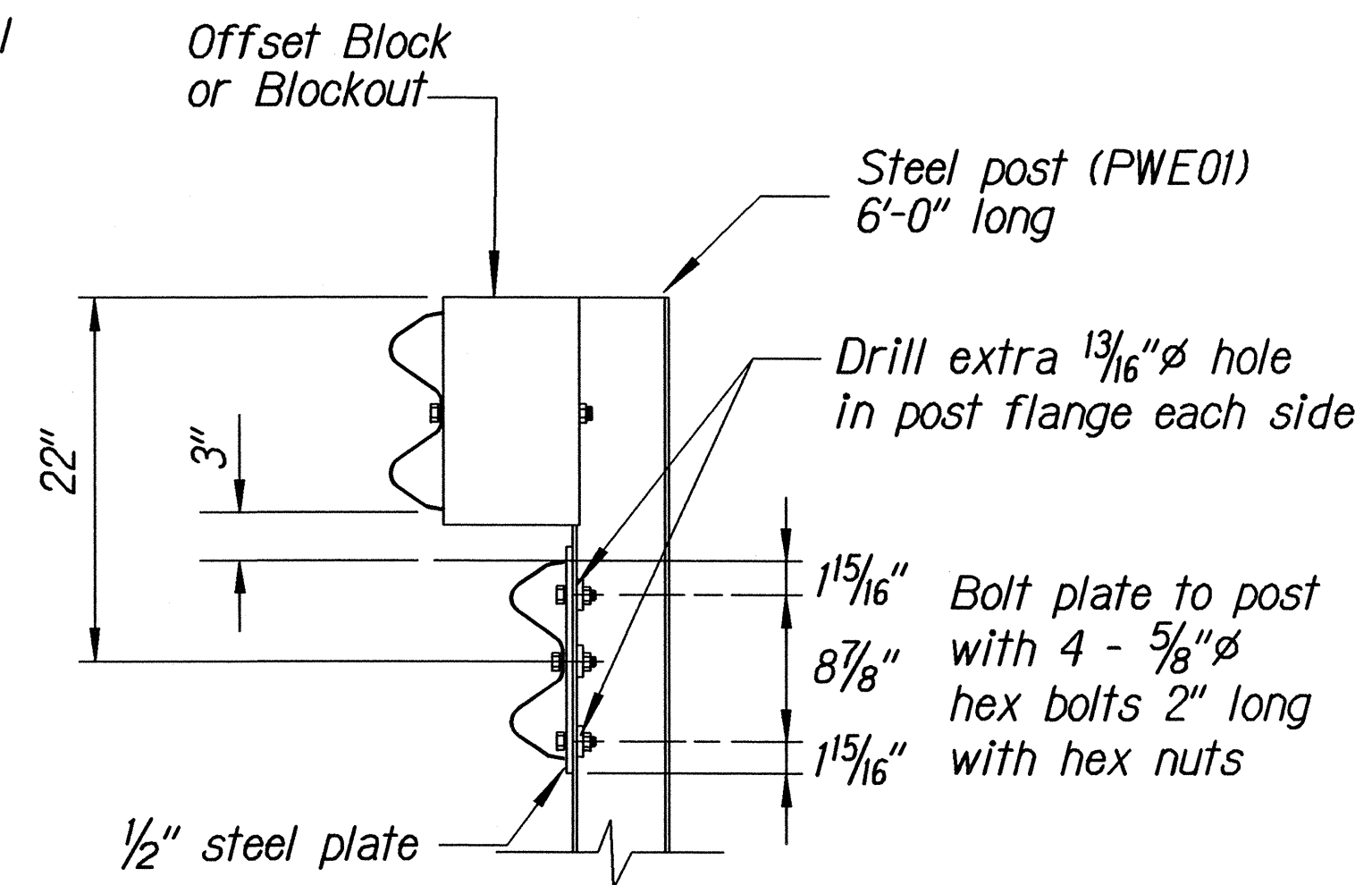


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 5/16" long with square washer

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

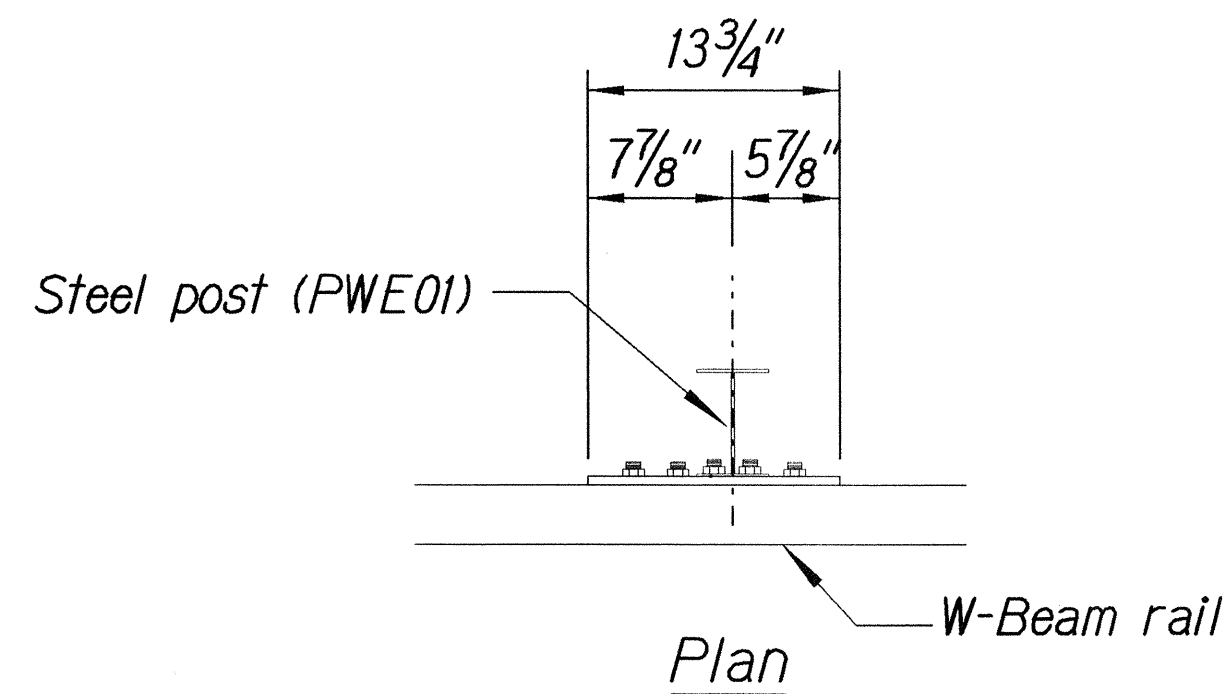


Front View



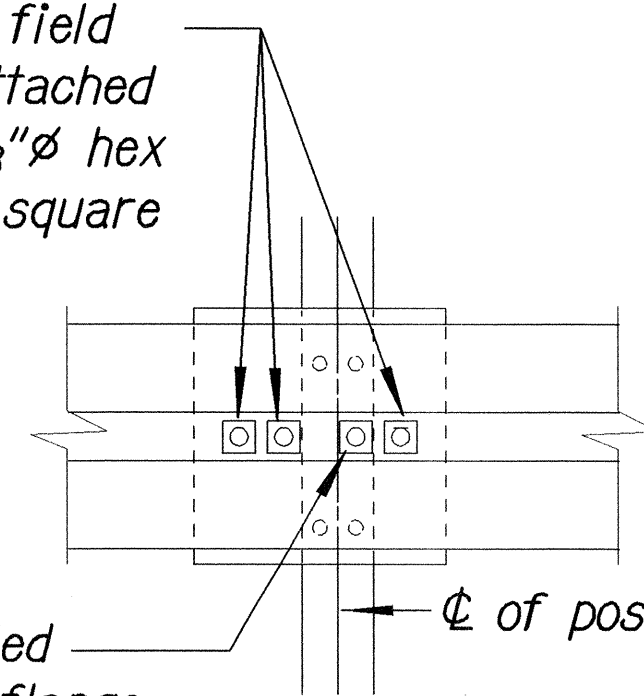
Elevation

RUBRAIL ANCHOR DETAILS

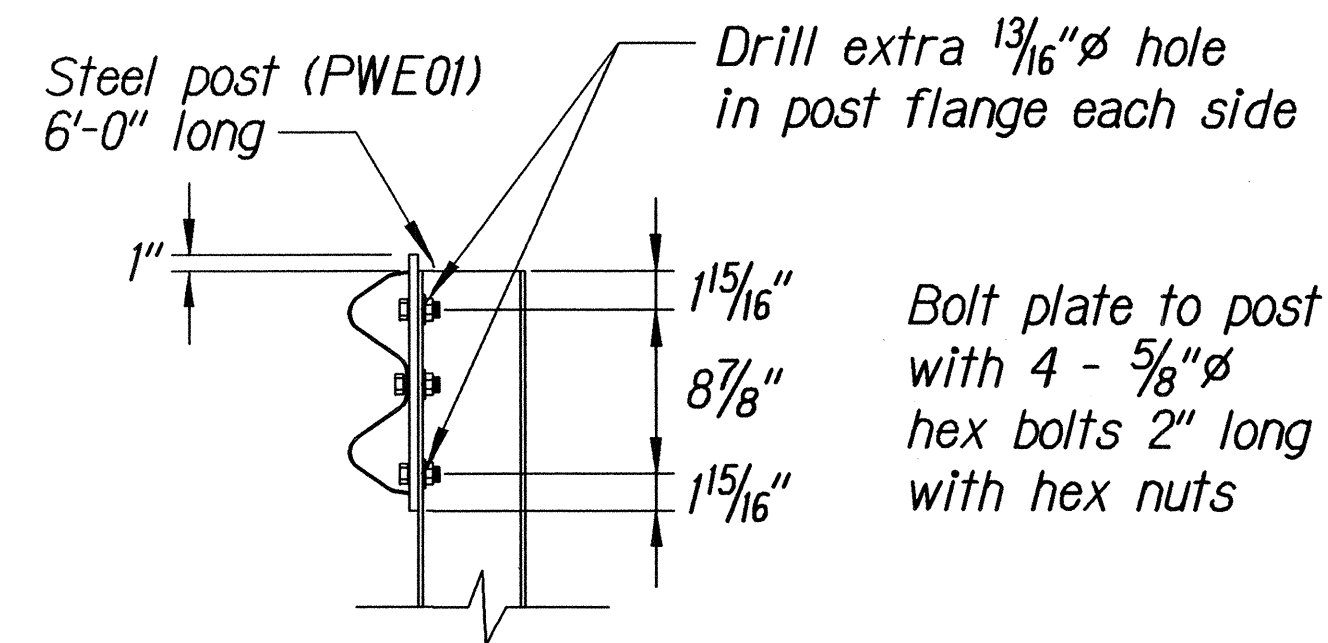


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 5/16" long with square washer

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



Front View



Elevation

POST ANCHOR DETAILS

BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS TYPE "A" FLARE

Note:

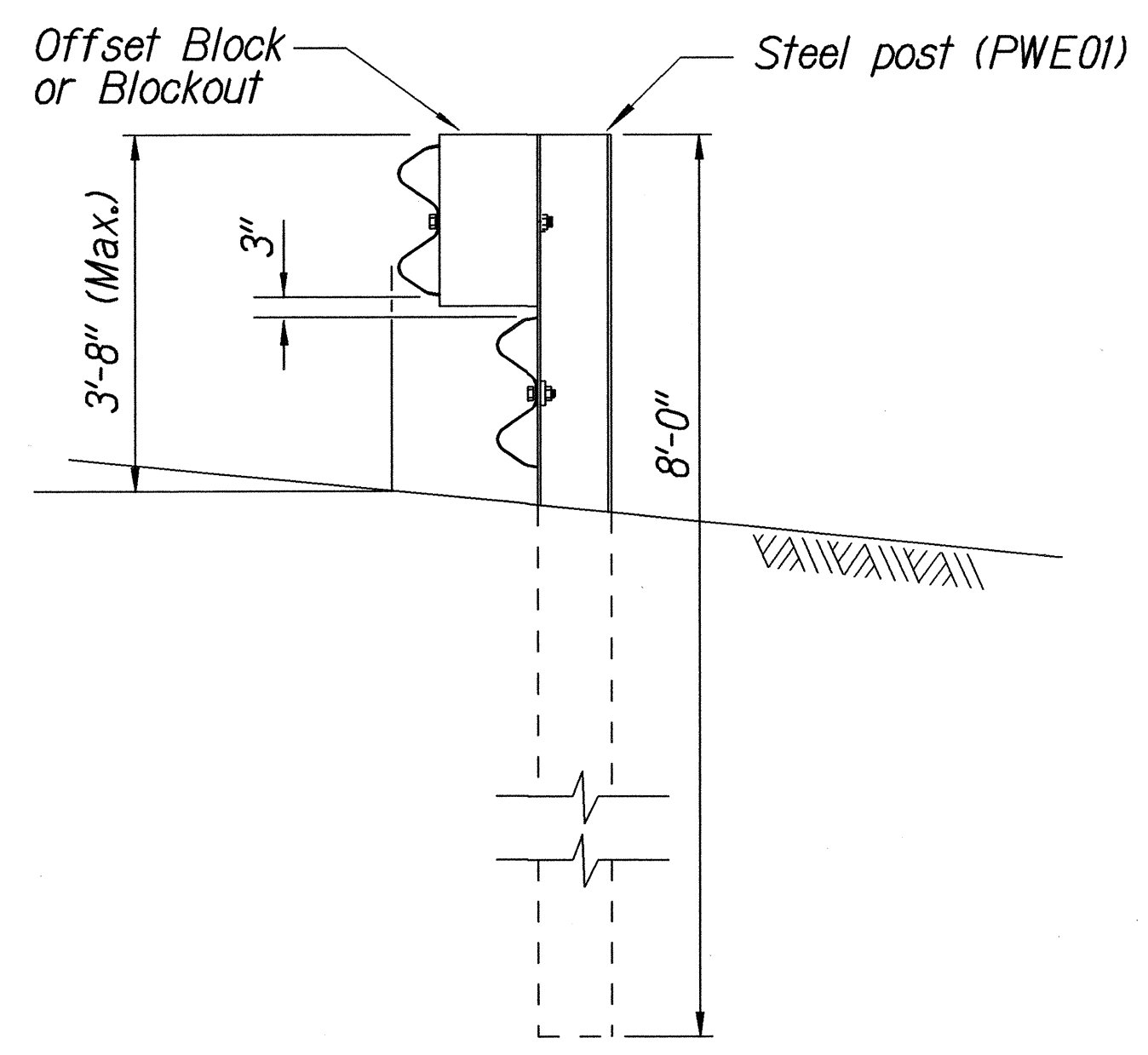
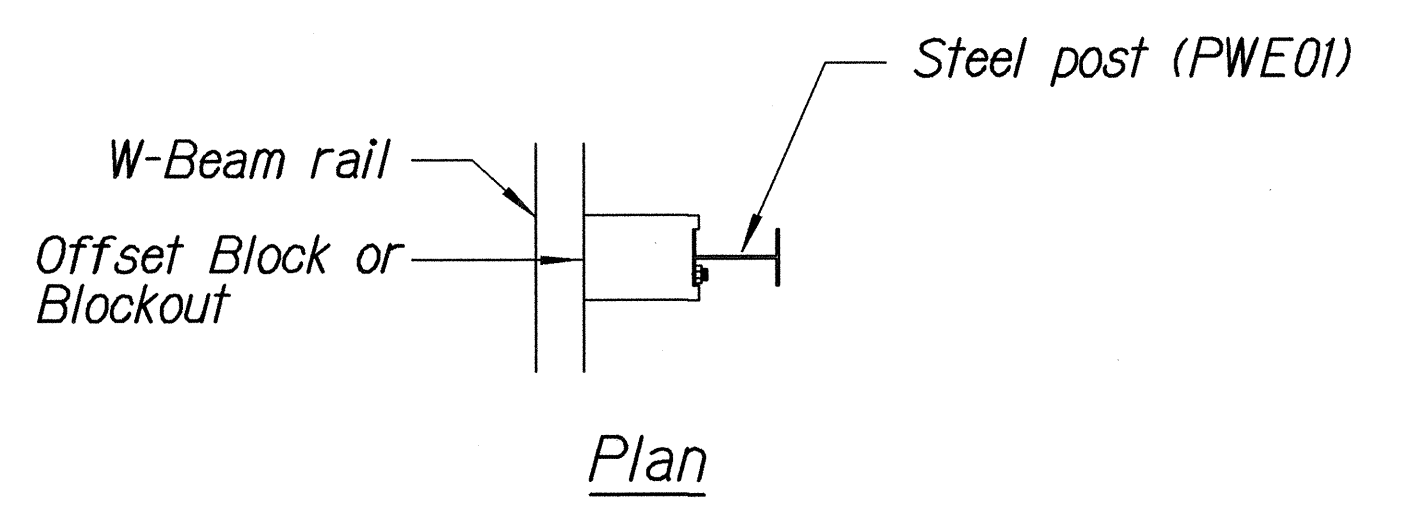
All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

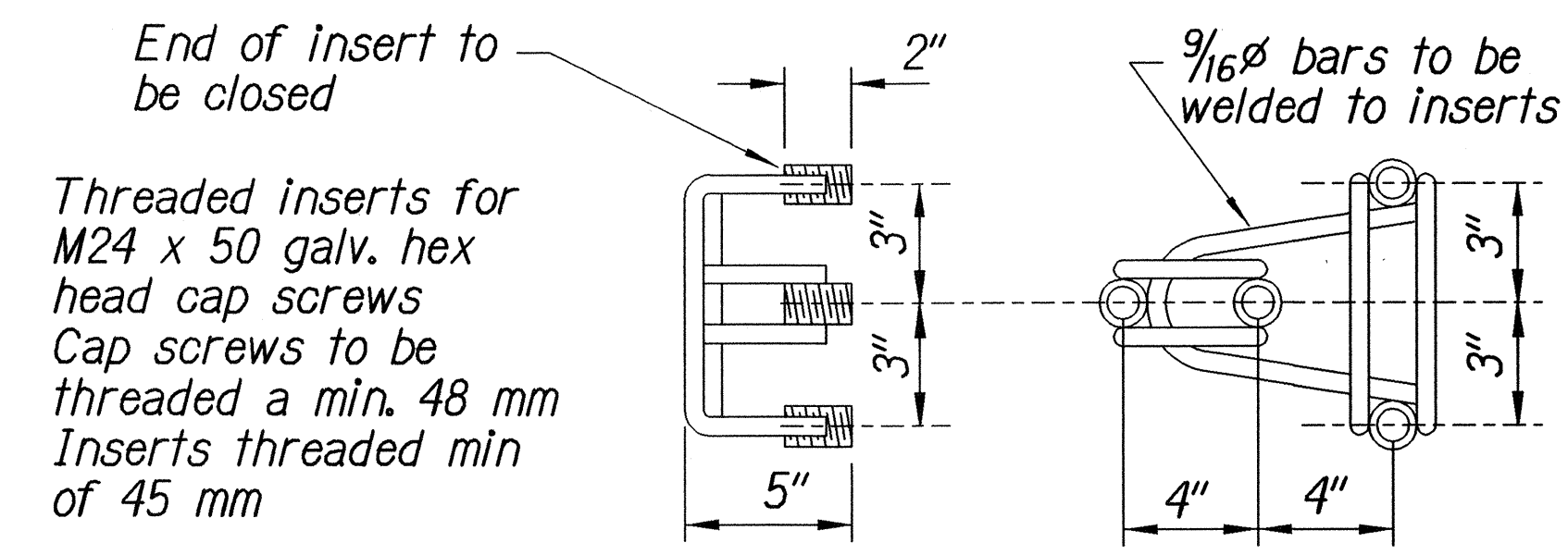
TYPE "A" FLARE
INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-1(33)
Scale: NTS Date: December, 2006

SHEET No. 9 OF 11 SHEETS

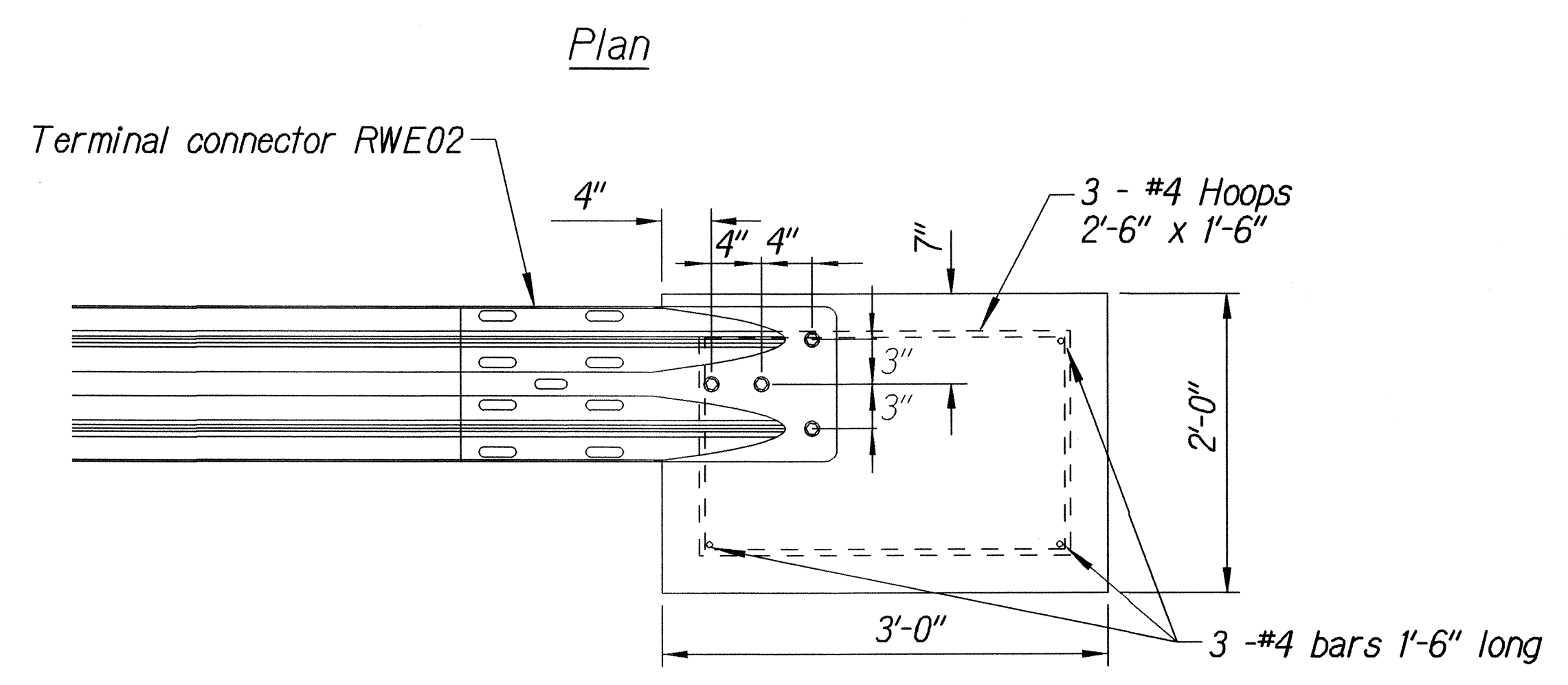
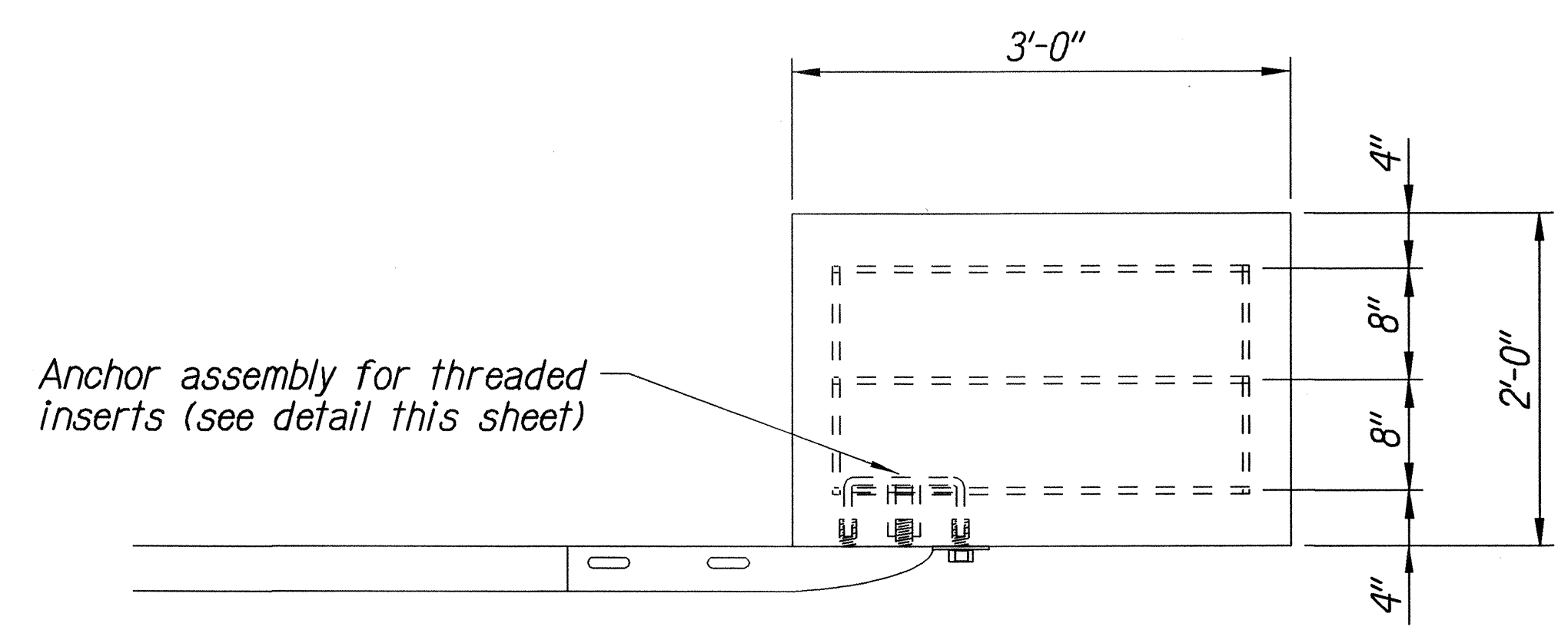
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-H2-1(33)	2007	40	168



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.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DESIGNED BY	
QUANTITIES BY	CHECKED BY	
IN. 1/2"=1'-0"		

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE
INTERSTATE ROUTE H-2 REHABILITATION
Waipio Interchange & Mililani Interchange
On/Off Ramps, Ka Uka Blvd. Meheula Parkway
Overpass, & Kipapa Stream Bridge
Federal Aid Project No. IM-H2-1(33)
Scale: NTS Date: December, 2006

SHEET No. 10 OF 11 SHEETS

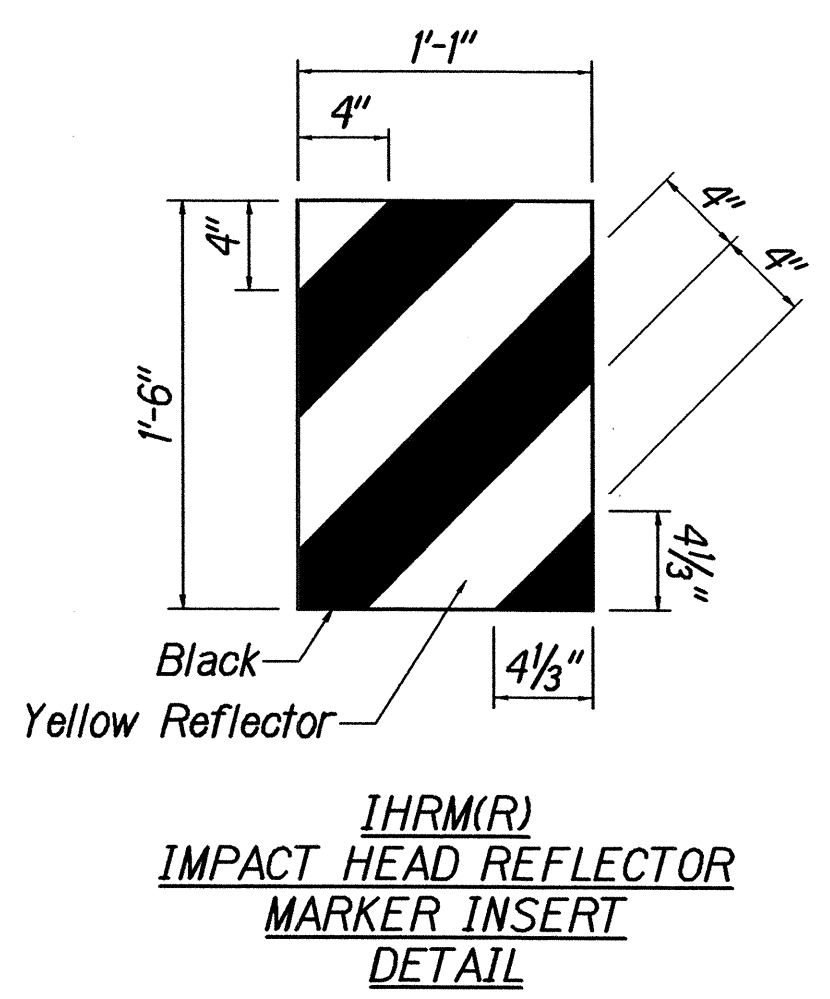
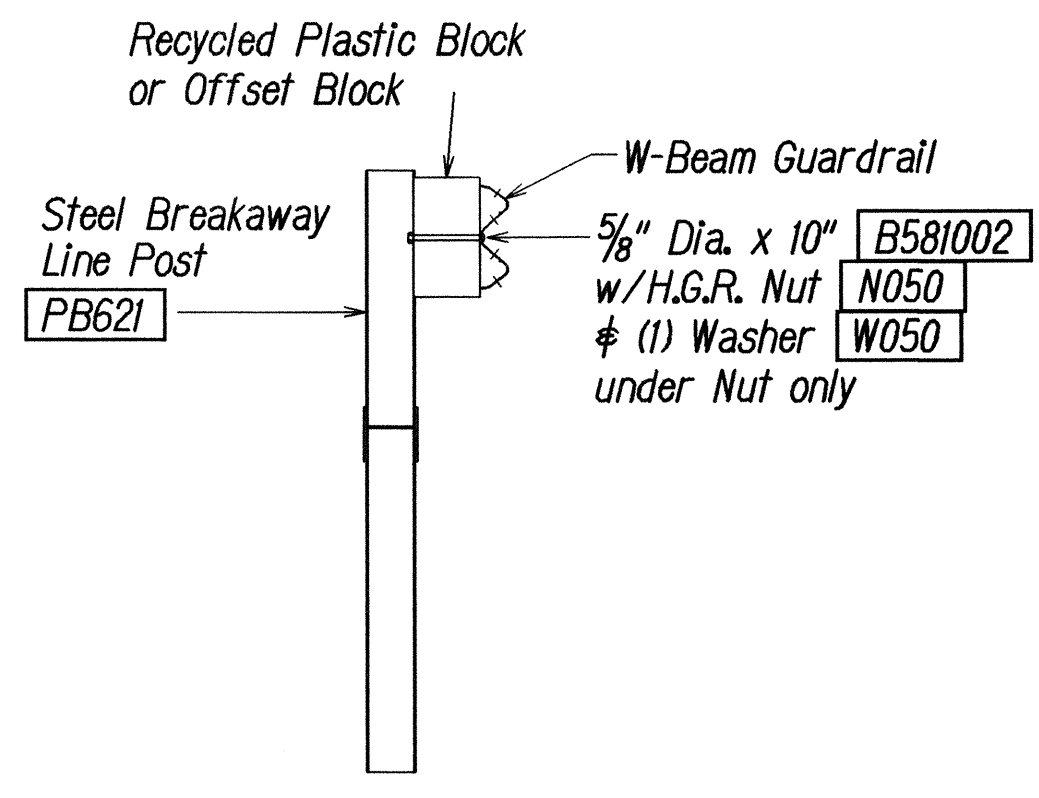
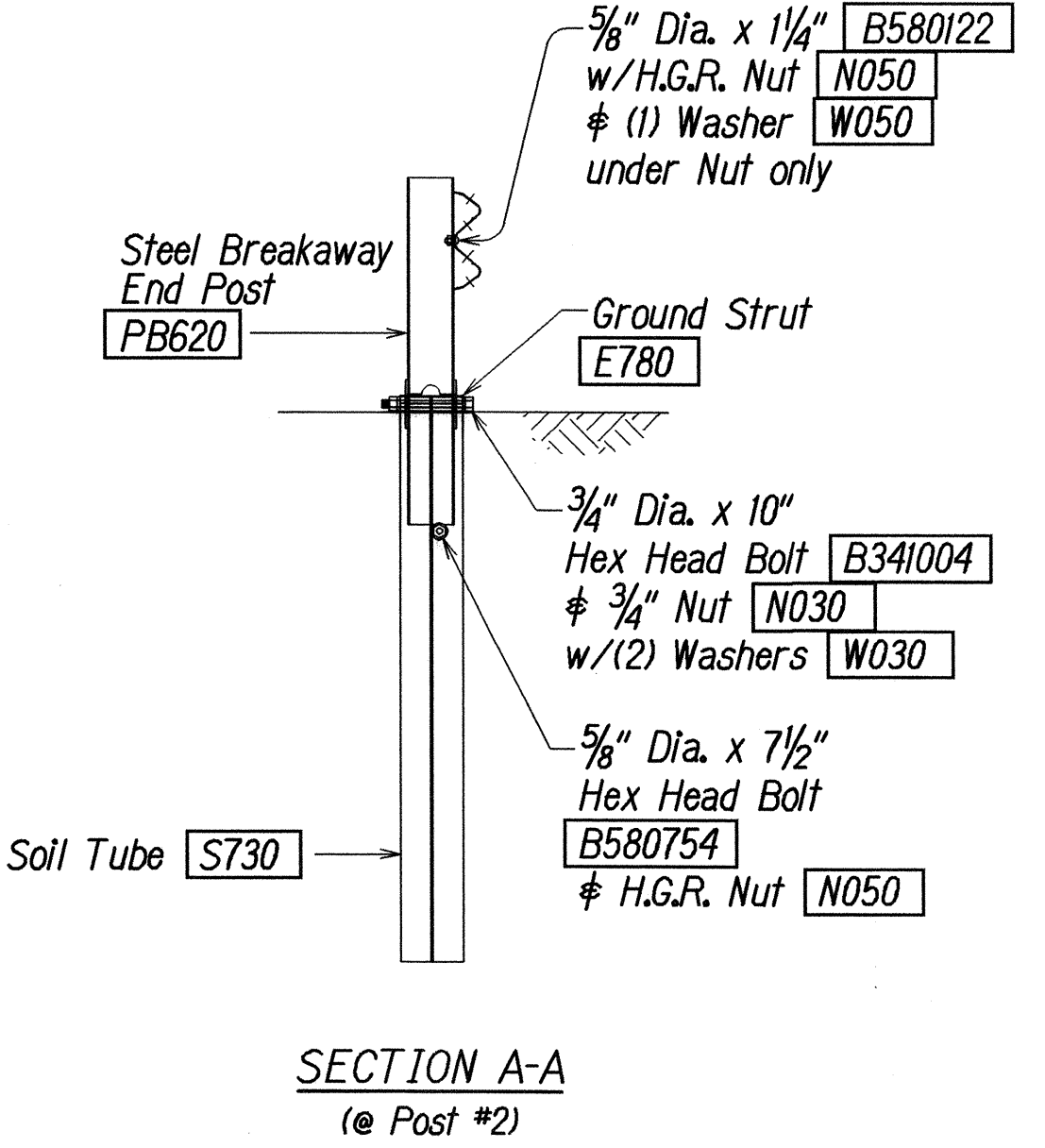
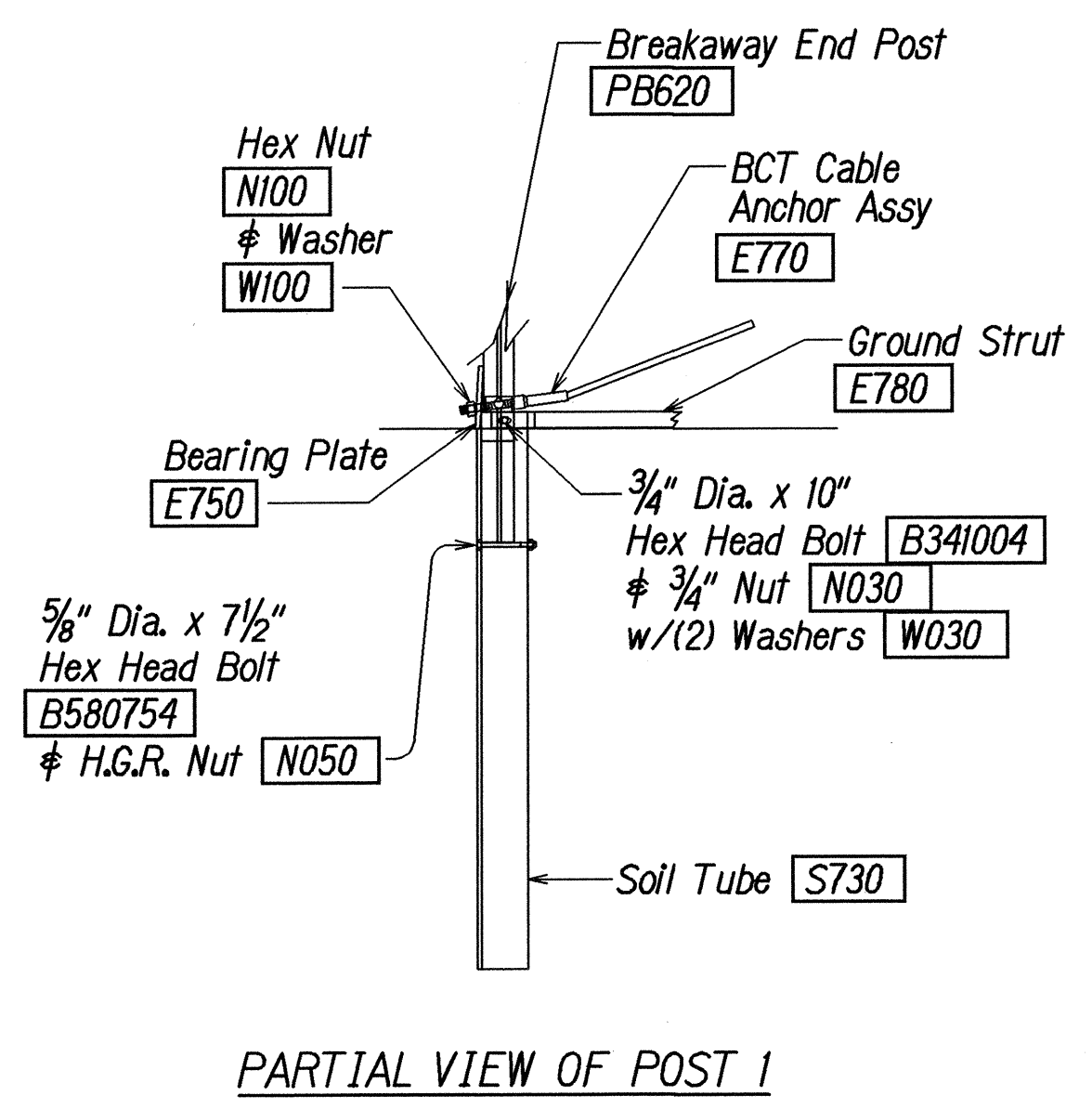
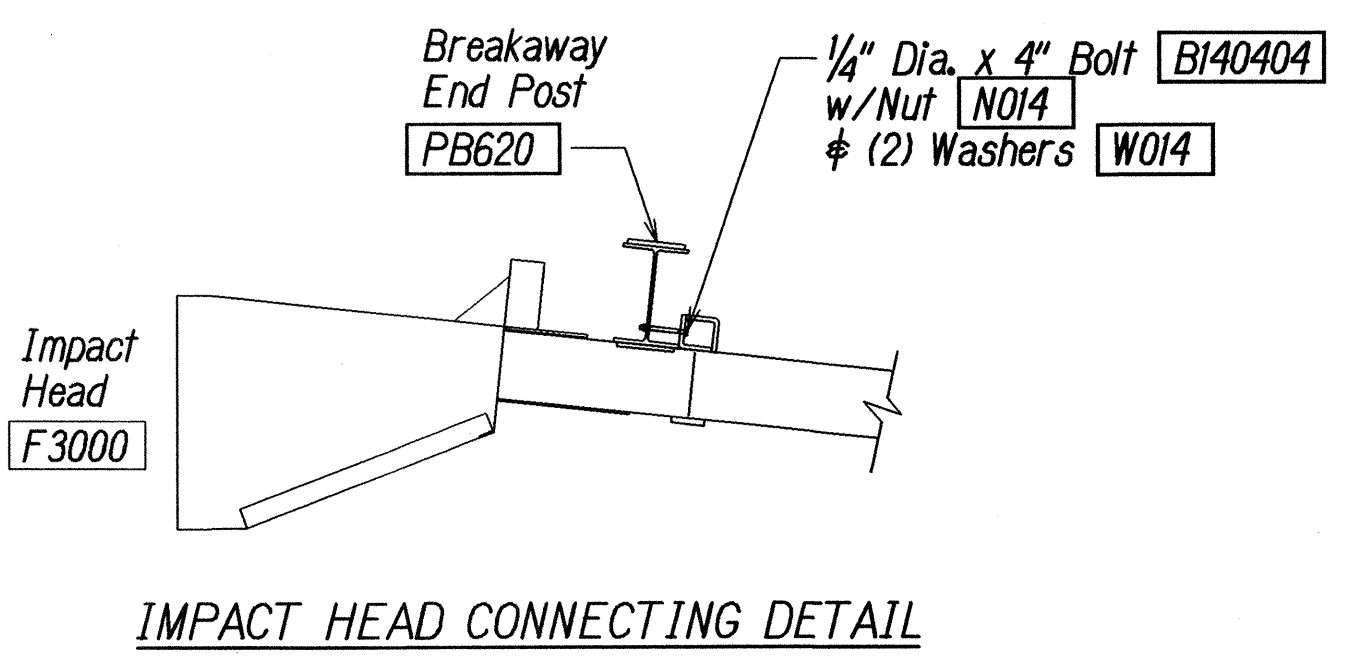
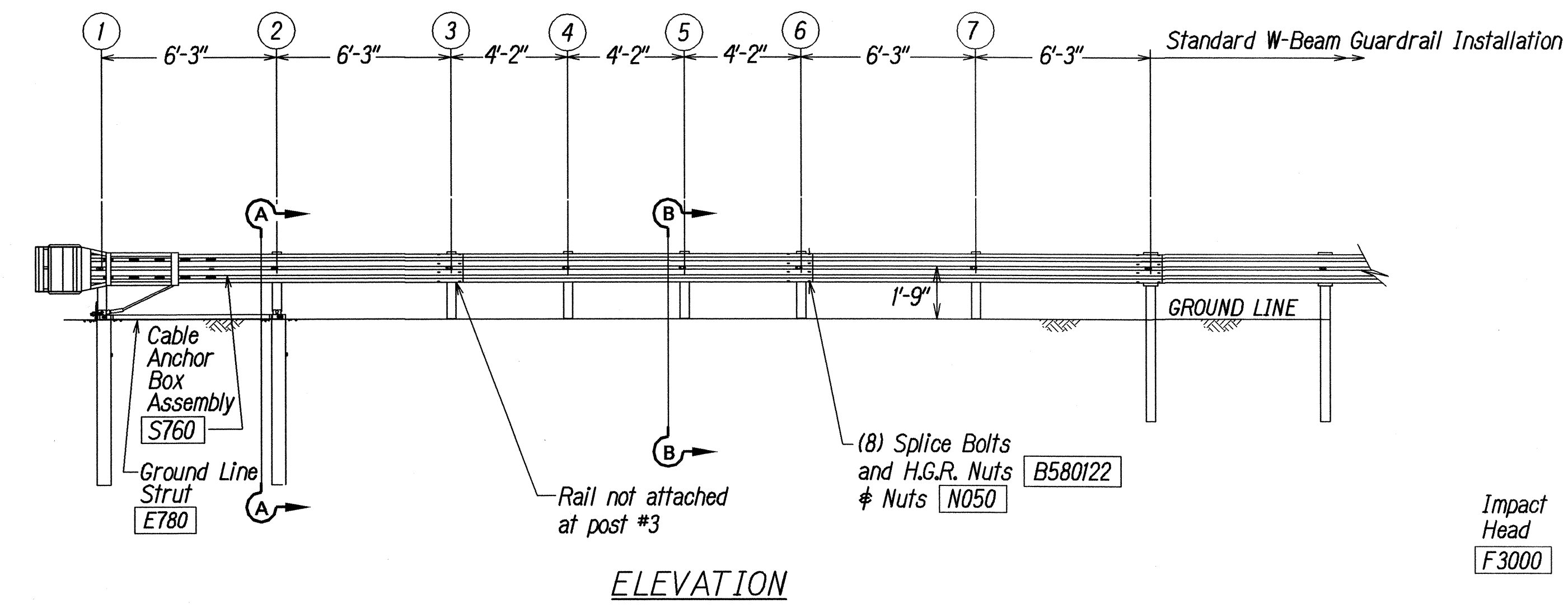
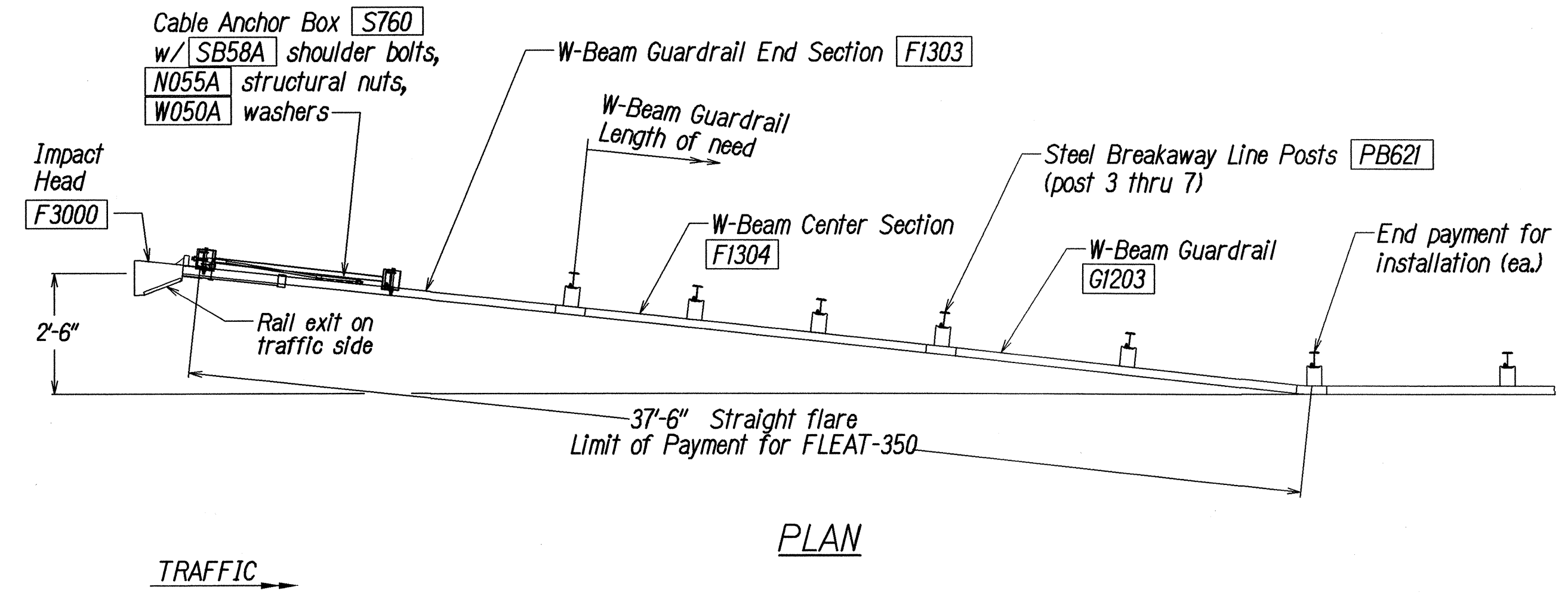
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H2-1(33)	2007	41	168

ITEM NO.	QTY.	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SECTION, 12 GA.
G1203	1	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 72"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
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
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
HARDWARE		
B580122	25	5/8" Dia. x 1 1/4" SPLICE BOLT, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLT
B341004	2	3/4" Dia. x 10" HEX BOLT
B581002	5	5/8" Dia. x 10" H.G.R. BOLT (POST 3 THRU 7)
N050	32	5/8" Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, POST 2 THRU 7, 6)
N030	2	3/4" Dia. HEX NUT
W050	6	H.G.R. WASHER
W030	4	3/4" ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	1/4" x 4" HEX BOLT
N014	2	1/4" HEX NUT
W014	4	1/4" WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" A325 STRUCTURAL NUT
W050A	16	1 1/16" OD x 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

GENERAL NOTES

- Breakaway steel posts are required with the FLEAT Terminal.
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The soil tubes shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The soil tubes may be driven with an approved driving head. Soil tubes shall not be driven with the post in the tube. If the tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
- 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 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.
- 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.
- (R) or (L) indicates right or left Impact Head Reflector Marker (IHRM). Providing and installing of IHRM shall be considered incidental to end treatment.
- The stripes for IHRM shall slope downward at an angle of 45° towards the side of the end treatment that traffic is to pass.



SURVEY PLANNED BY	DATE	X
DESIGNED BY		
QUANTITIES BY		
CHECKED BY		
ORIGINAL PLAN		
NOTE BOOK		

dd2/usc2/4/12/2007/11/12/07

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
FLEAT-350
FLARED ENERGY ABSORBING TERMINAL
INTERSTATE ROUTE H-2 REHABILITATION
 Waipio Interchange & Milliani Interchange
 On/Off Ramps, Ka Uka Blvd. Meheula Parkway
 Overpass, & Kipapa Stream Bridge
 Federal Aid Project No. 1M-H2-1(33)
 Not to Scale Date: December, 2006
 SHEET No. 11 OF 11 SHEETS