

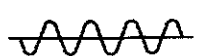
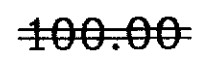
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	6	31

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 fastners, 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.
- All new guardrail systems (system consists of total length of guardrail including both end treatments) shall include the Additional Paved Area.
- 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.
- When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
- New A.C. pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
- 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 <sup>5</sup> / <sub>8</sub> "	1'-6"
Strong Post Rubrail (W-Beam)	2'-0"	1'-6"
Modified or Strong Post Thrie Beam	2'-0"	2'-0"

LEGEND FOR AS-BUILT POSTINGS

	Squiggly line for as-built deletion
	Double line for as-built deletion
Roadway	Text for as-built posting

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES

HAWAII BELT ROAD GUARDRAIL

& SHOULDER IMPROVEMENTS

Papalele Road to Kaunaloa Bridge

Federal Aid Project No. NH-019-1(39)

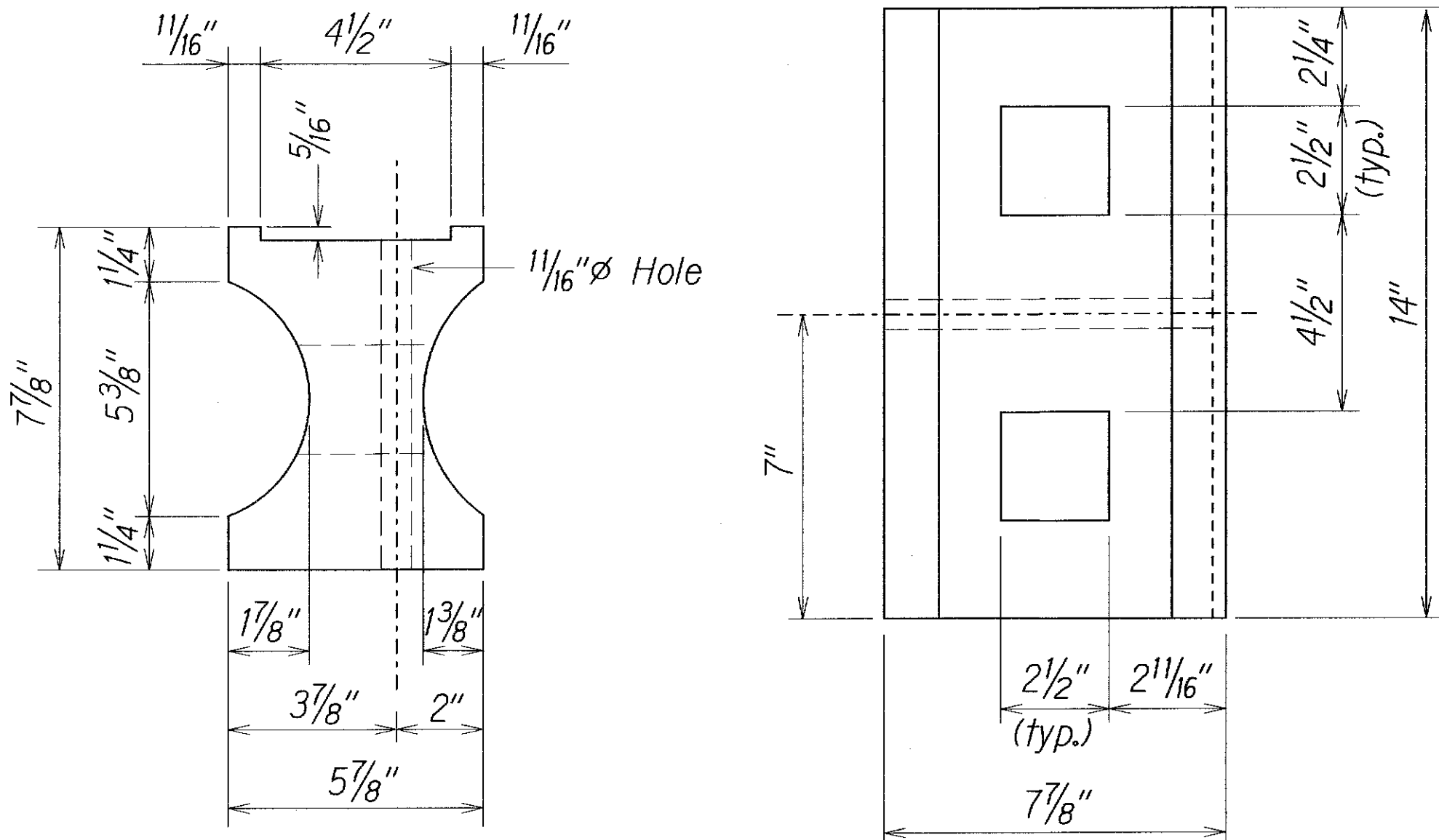
Scale: NTS

Date: Dec., 2011

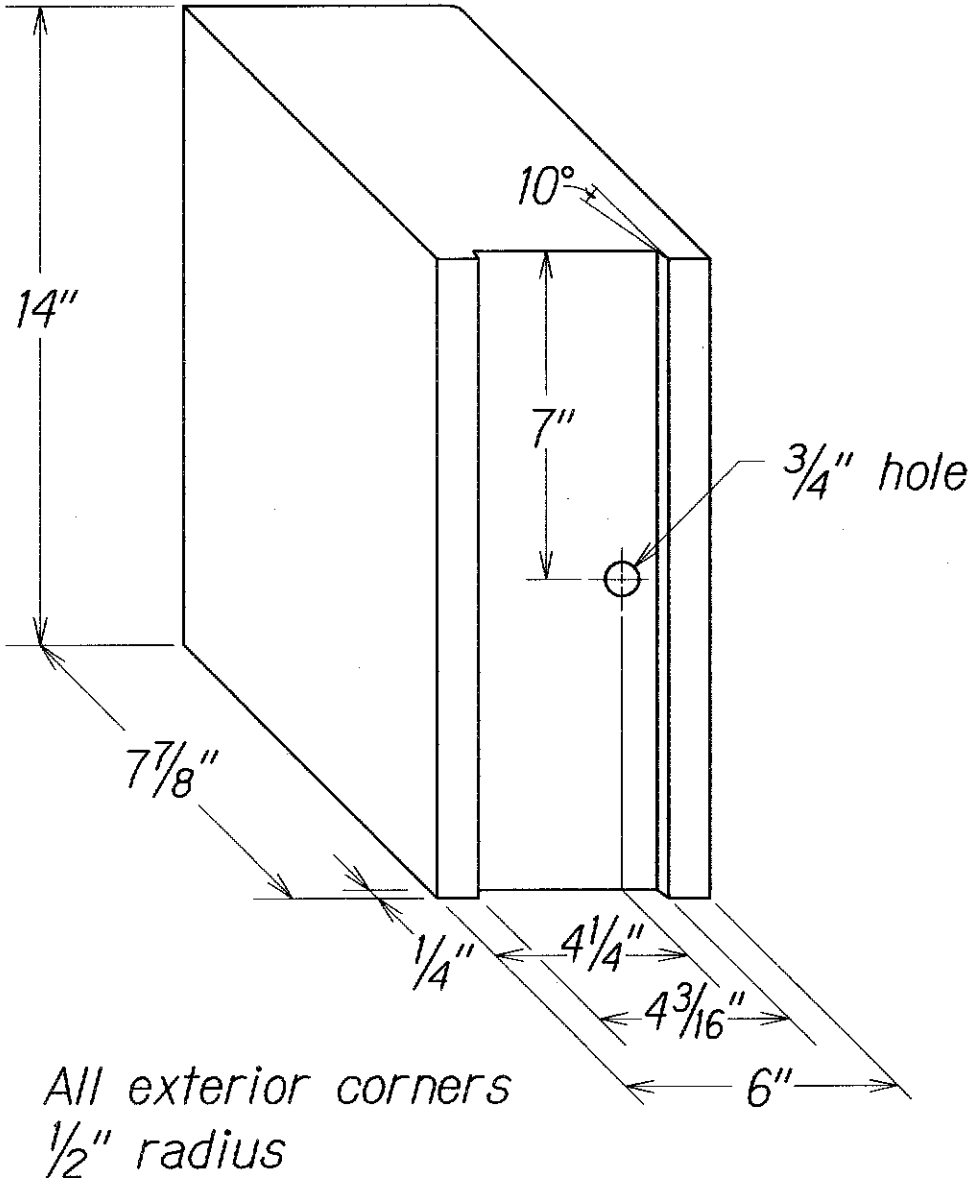
SHEET No. 1

OF 11

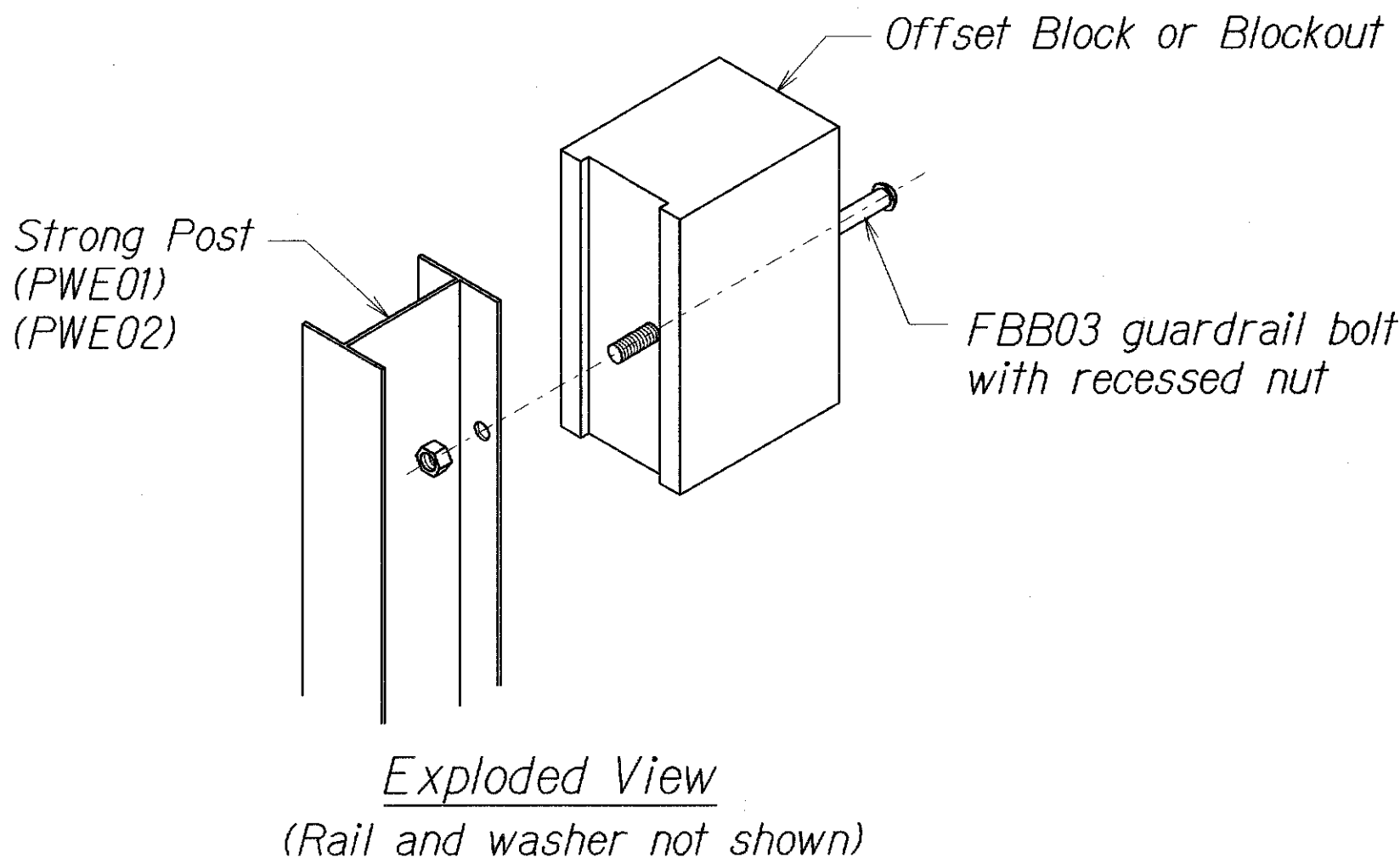
SHEETS



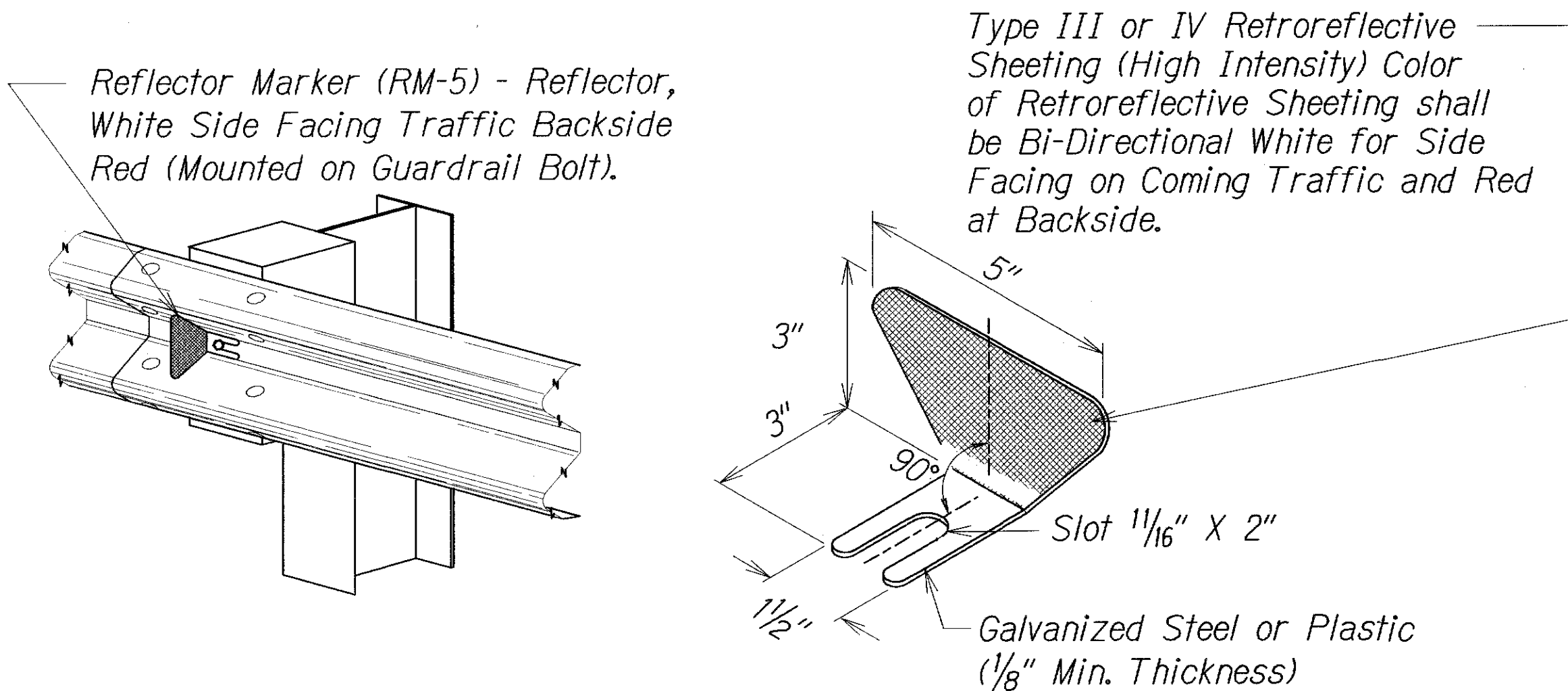
TOP  
SIDE  
RECYCLED PLASTIC BLOCKOUT (TYPE I)



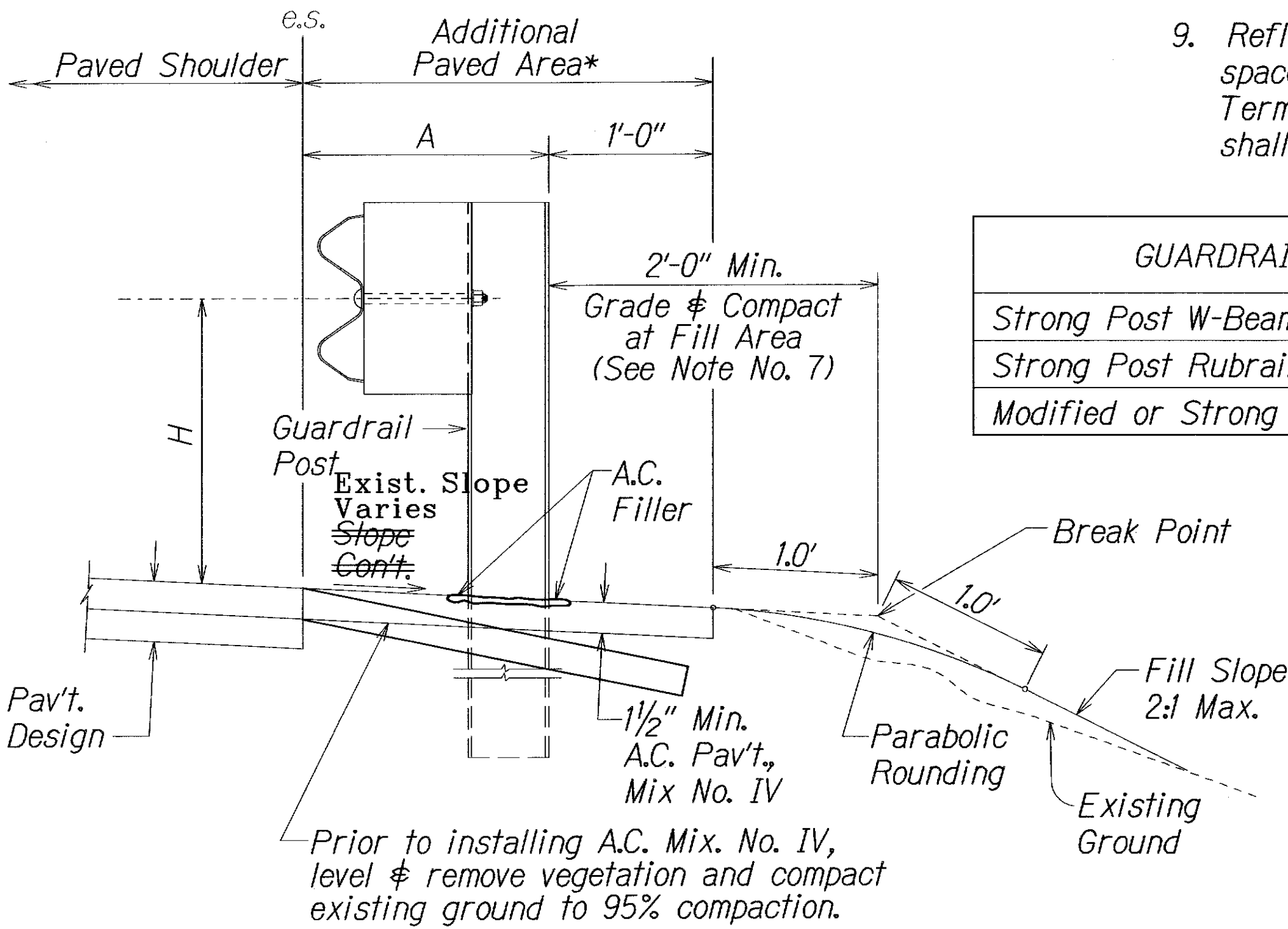
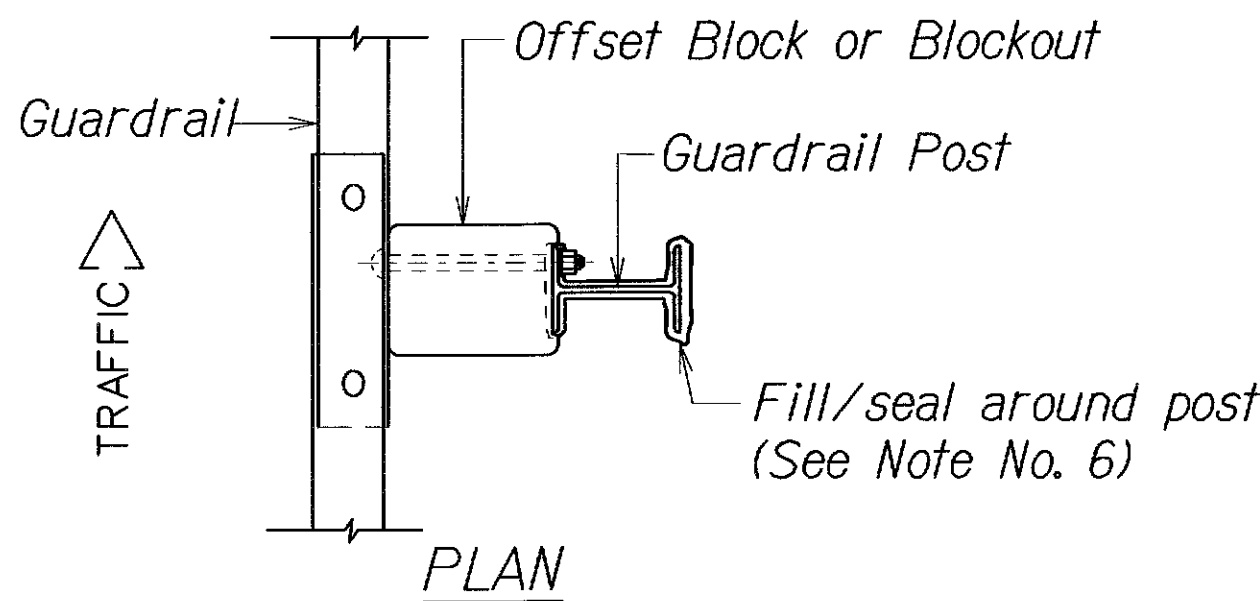
RECYCLED POLYETHYLENE  
OFFSET BLOCK (TYPE II)



STEEL POST AND BLOCK DETAIL

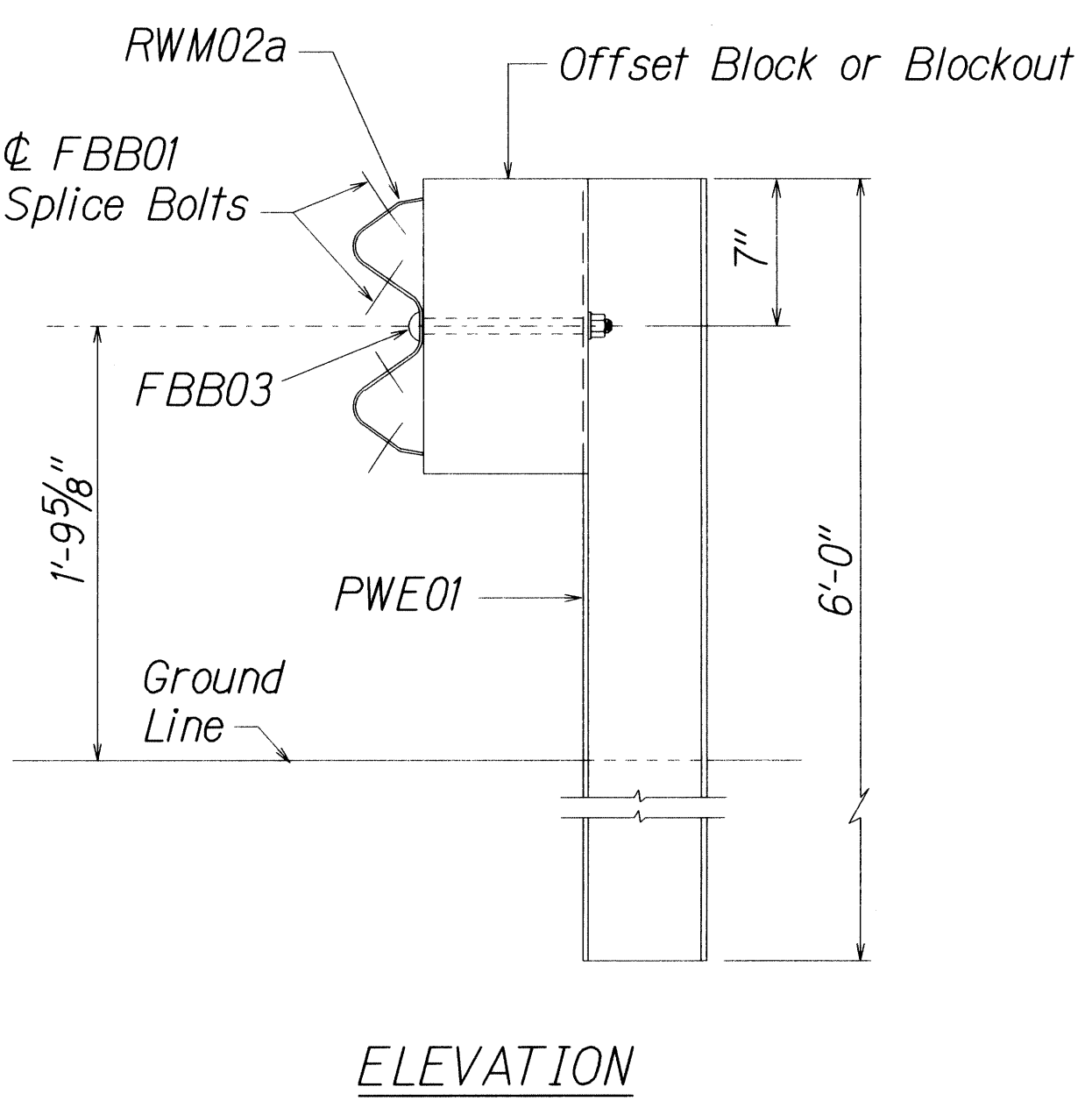
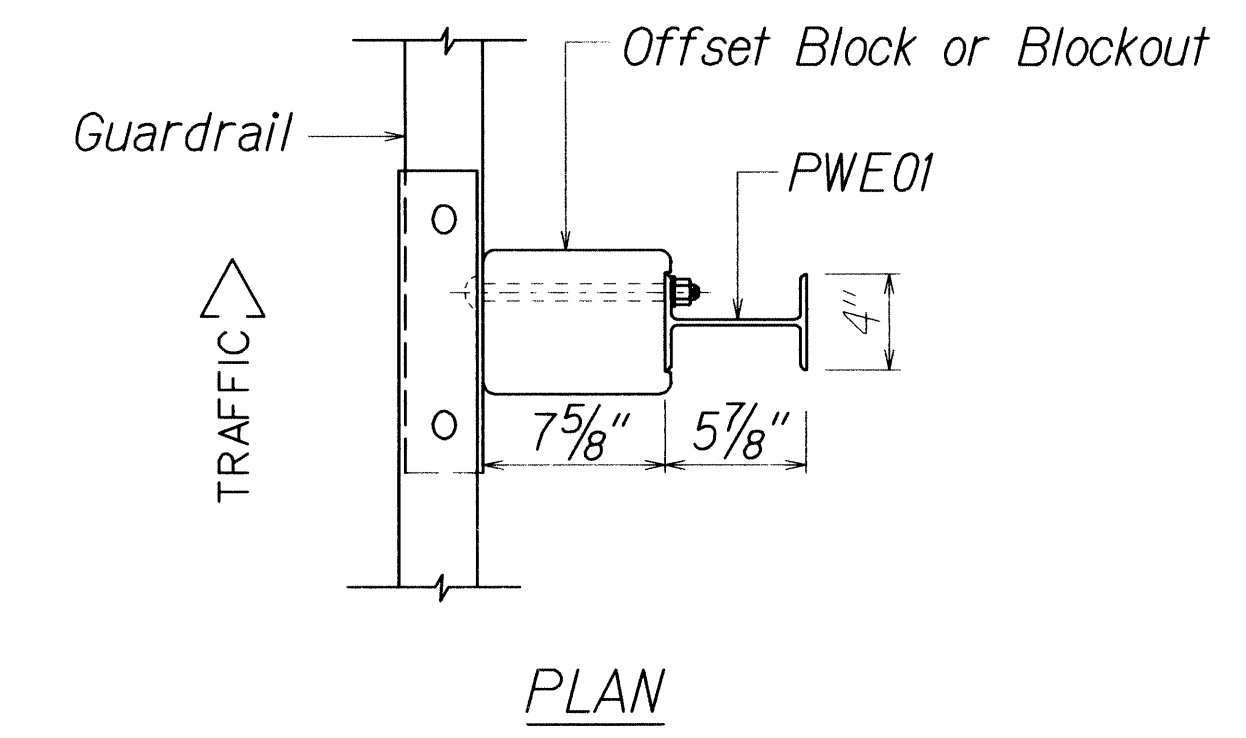


REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



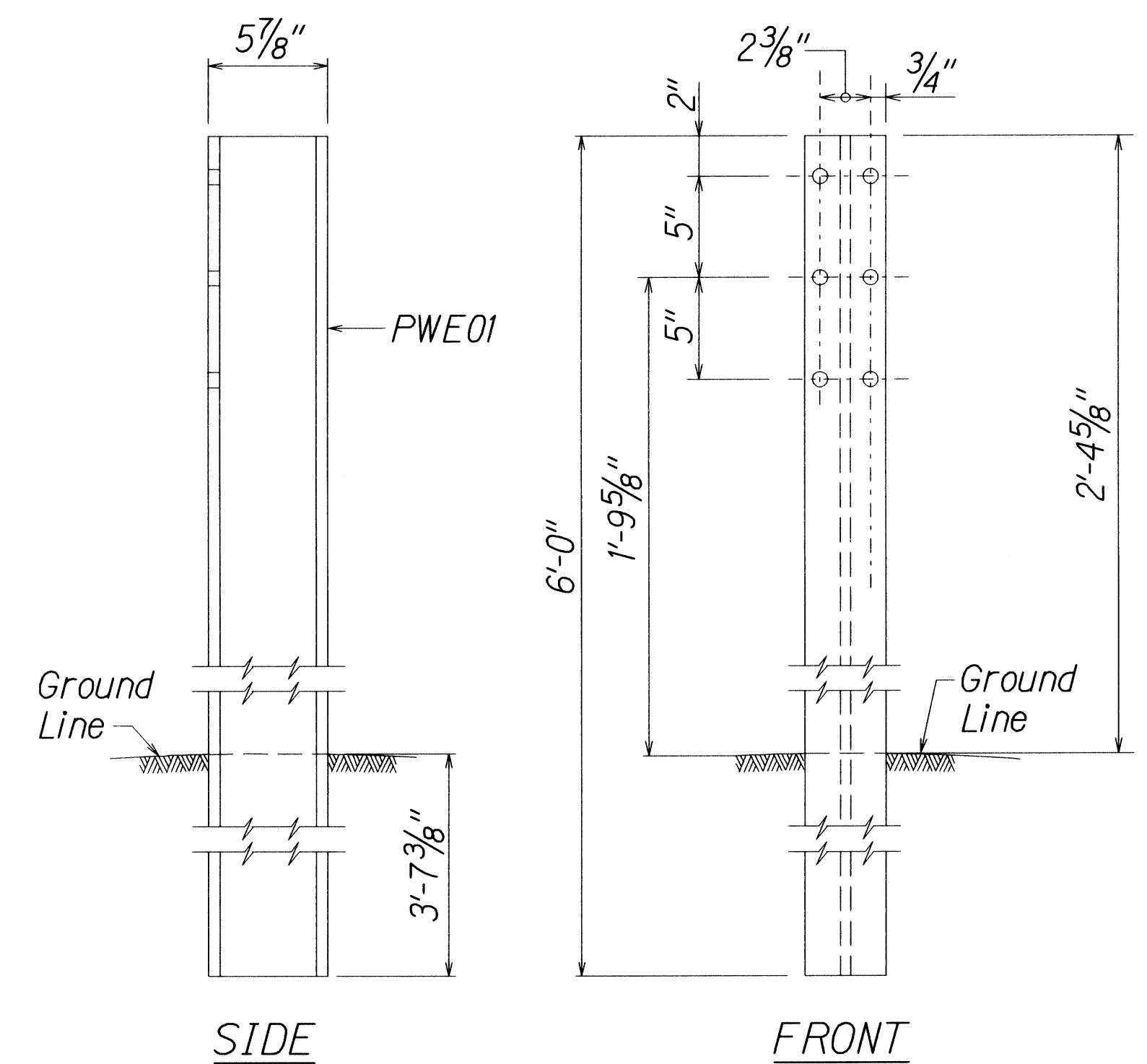
TYPICAL GUARDRAIL INSTALLATION

"AS-BUILT"

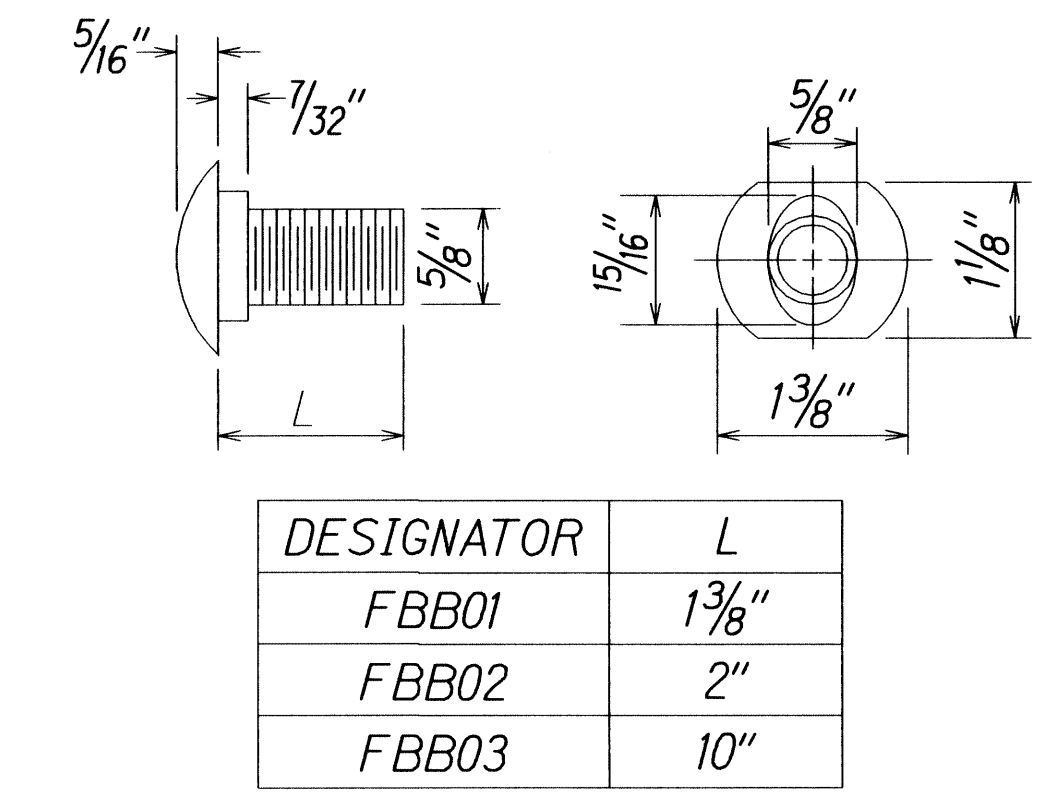


STRONG POST W-BEAM GUARDRAIL  
(SGR04a)

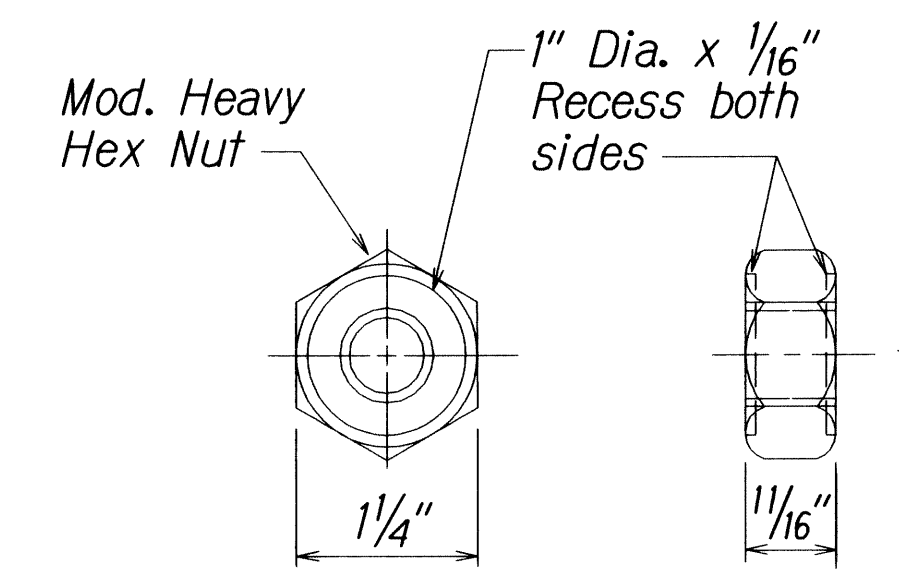
NOTE:  
All Holes are  
3/4" Dia.



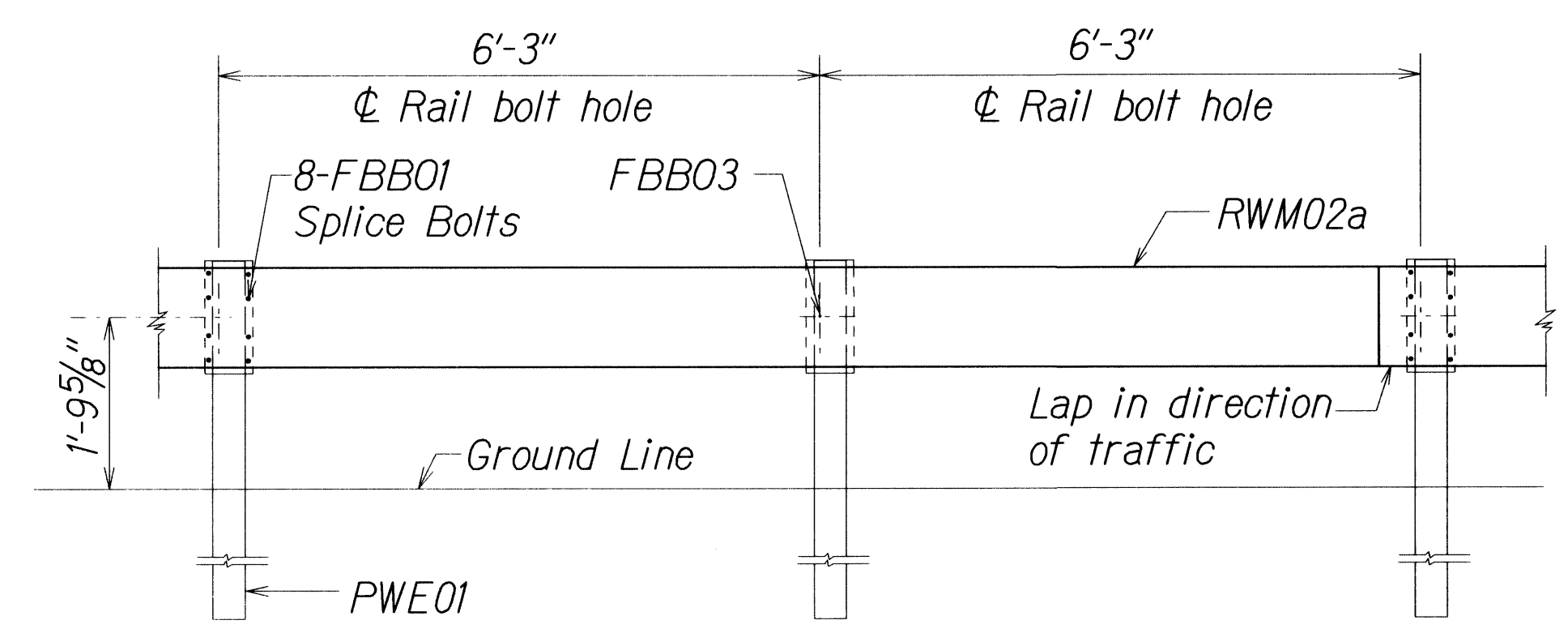
W-BEAM STRONG POST (PWE01)



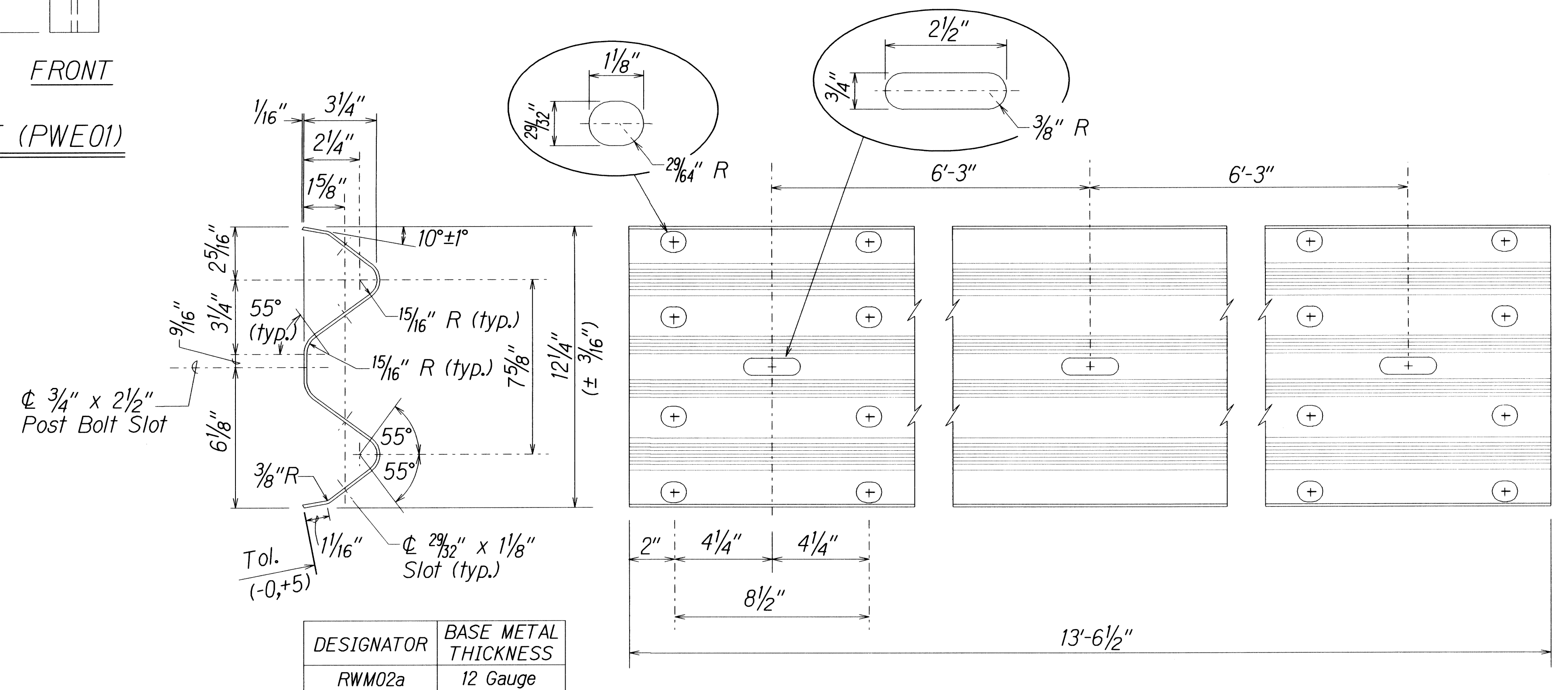
DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"



GUARDRAIL BOLTS AND RECESSED NUT



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



2 SPACE W-BEAM GUARDRAIL (RWM02a)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**STRONG POST W-BEAM GUARDRAIL**

HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papaleale Road to Kaumoali Bridge  
Federal Aid Project No. NH-019-1(39)

Scale: Not To Scale      Date: Dec., 2011

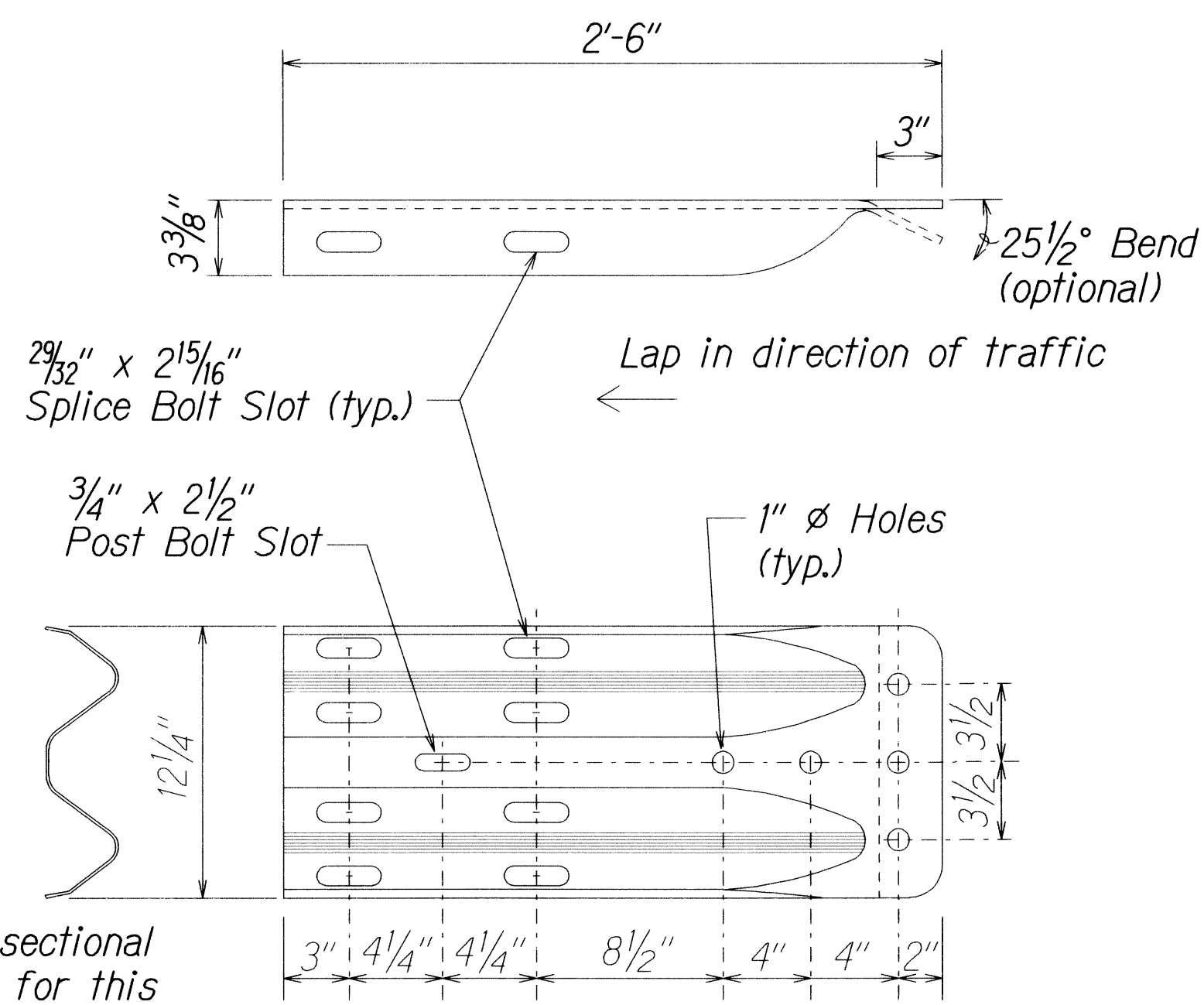
SHEET No. 2 OF 11 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	TRACED BY	
	REVIEWED BY	
	QUANTITIES BY	
	CHECKED BY	

11/01/05 rdrruby:guardrail/wbeamsp04gn (standard plan TE-50 r03/06/07)



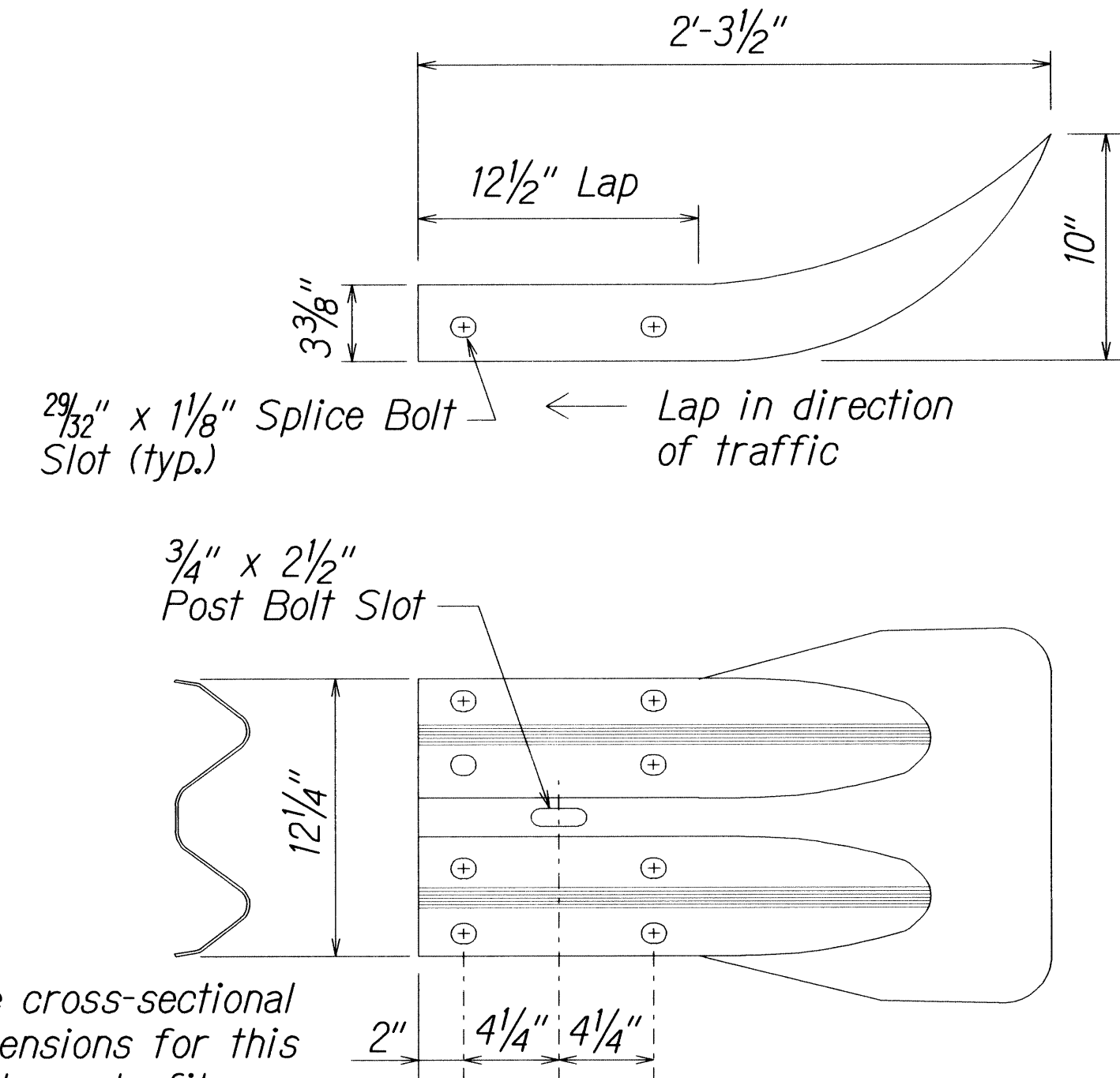
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	8	31



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 Gauge

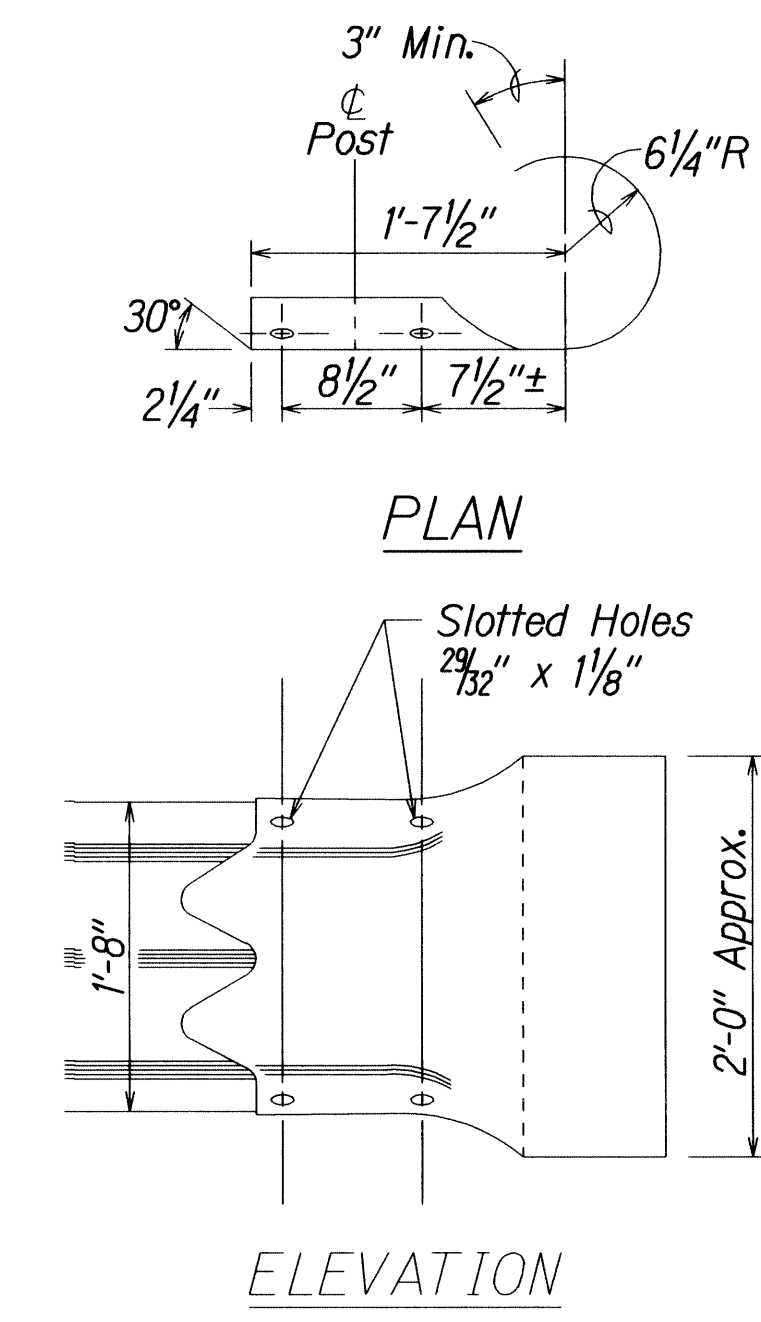
W-BEAM TERMINAL CONNECTOR (RWE02b)



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.

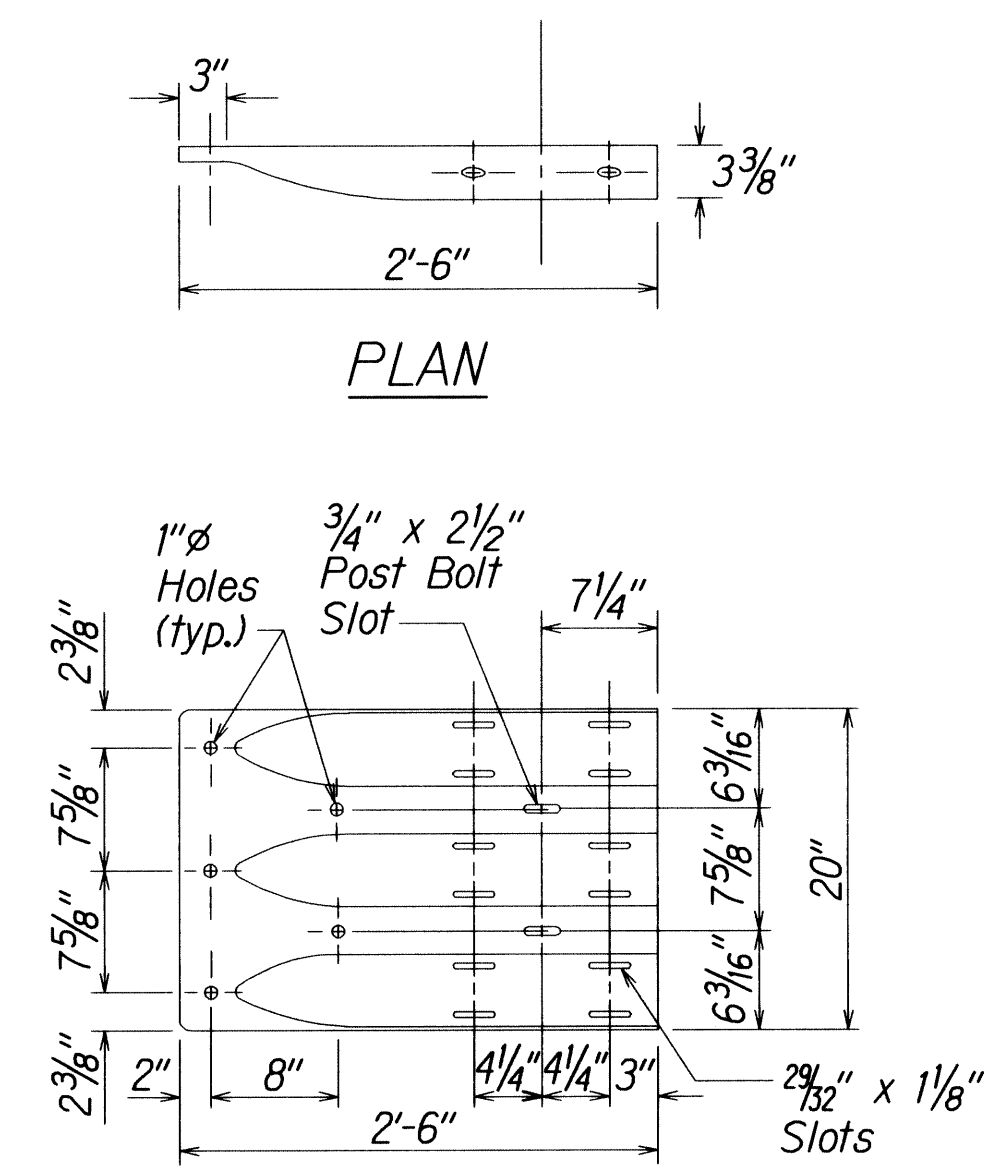
DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 Gauge

W-BEAM END SECTION (FLARED RWE01a)



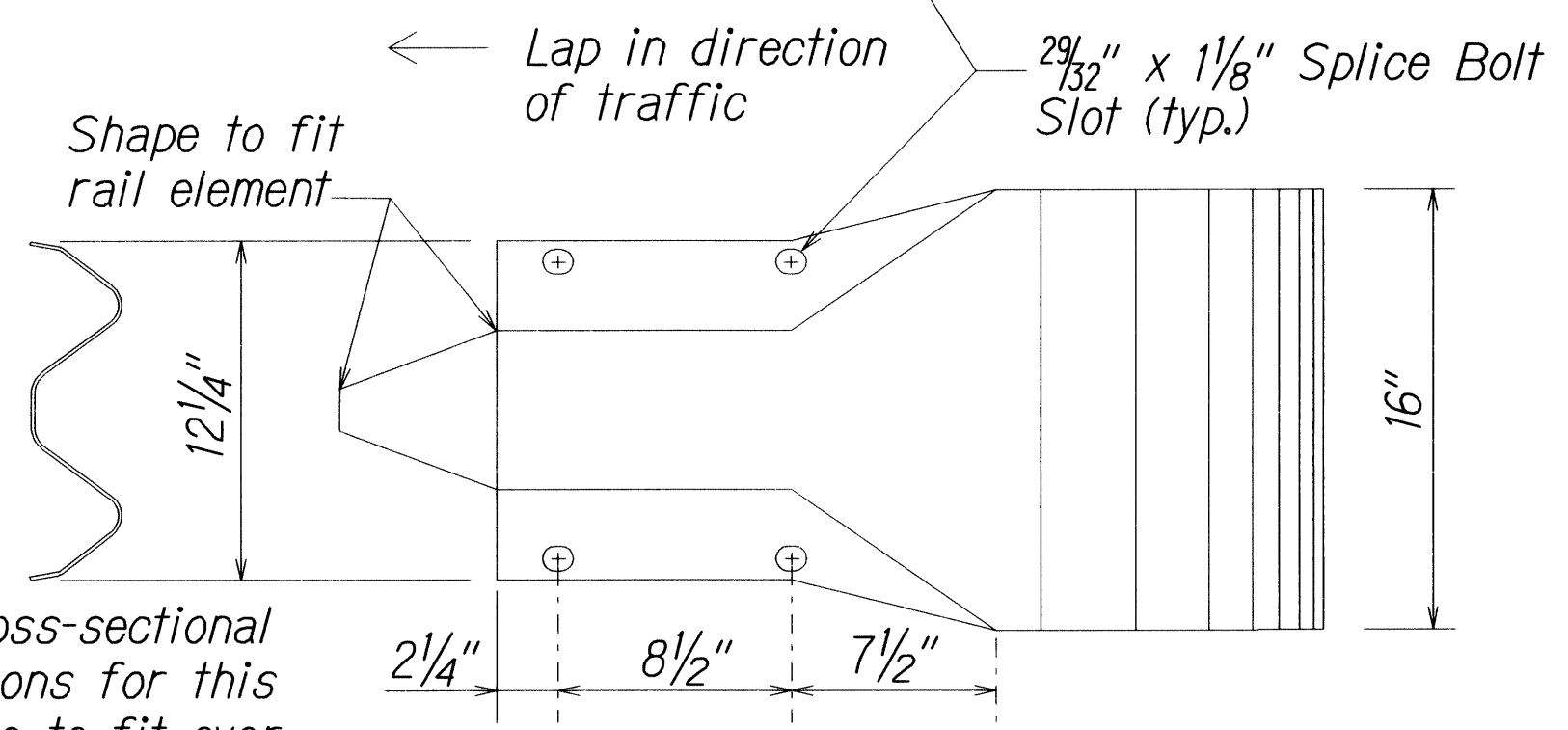
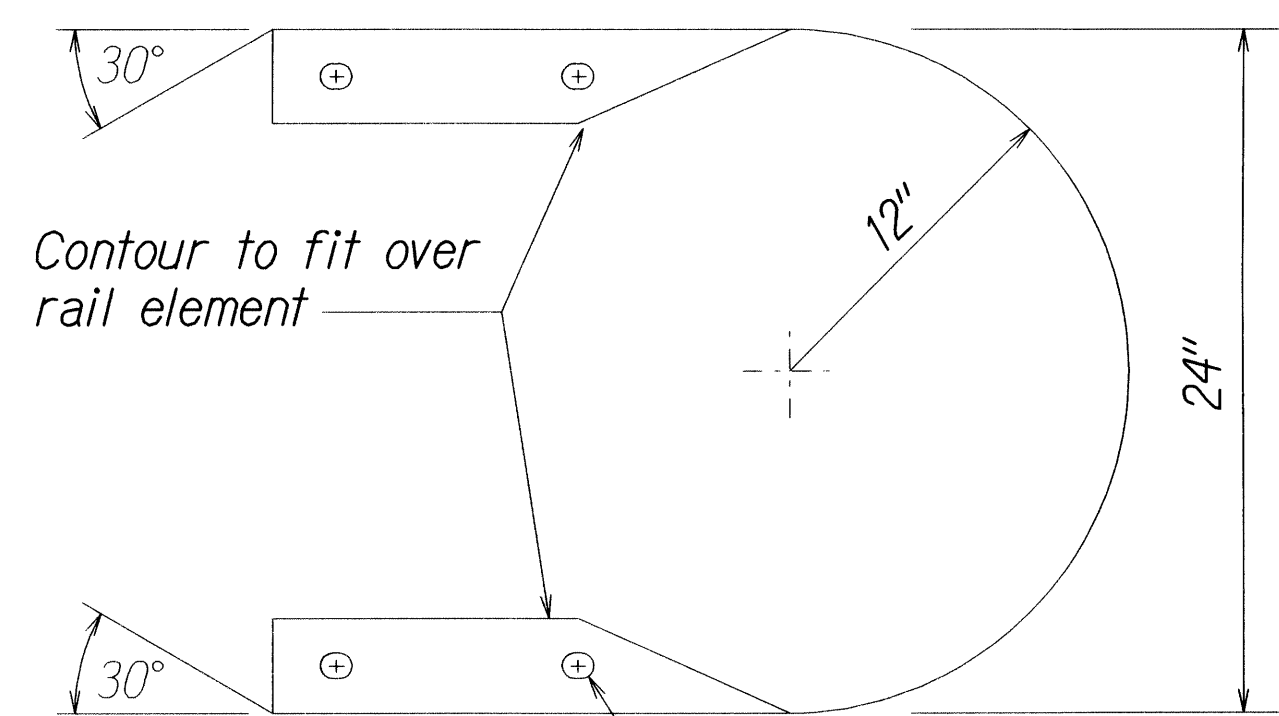
DESIGNATOR	BASE METAL THICKNESS
RTE02b	10 Gauge

THRIE-BEAM SECTION (ROUNDED) (RTE02b)



DESIGNATOR	BASE METAL THICKNESS
RTE01b	10 Gauge

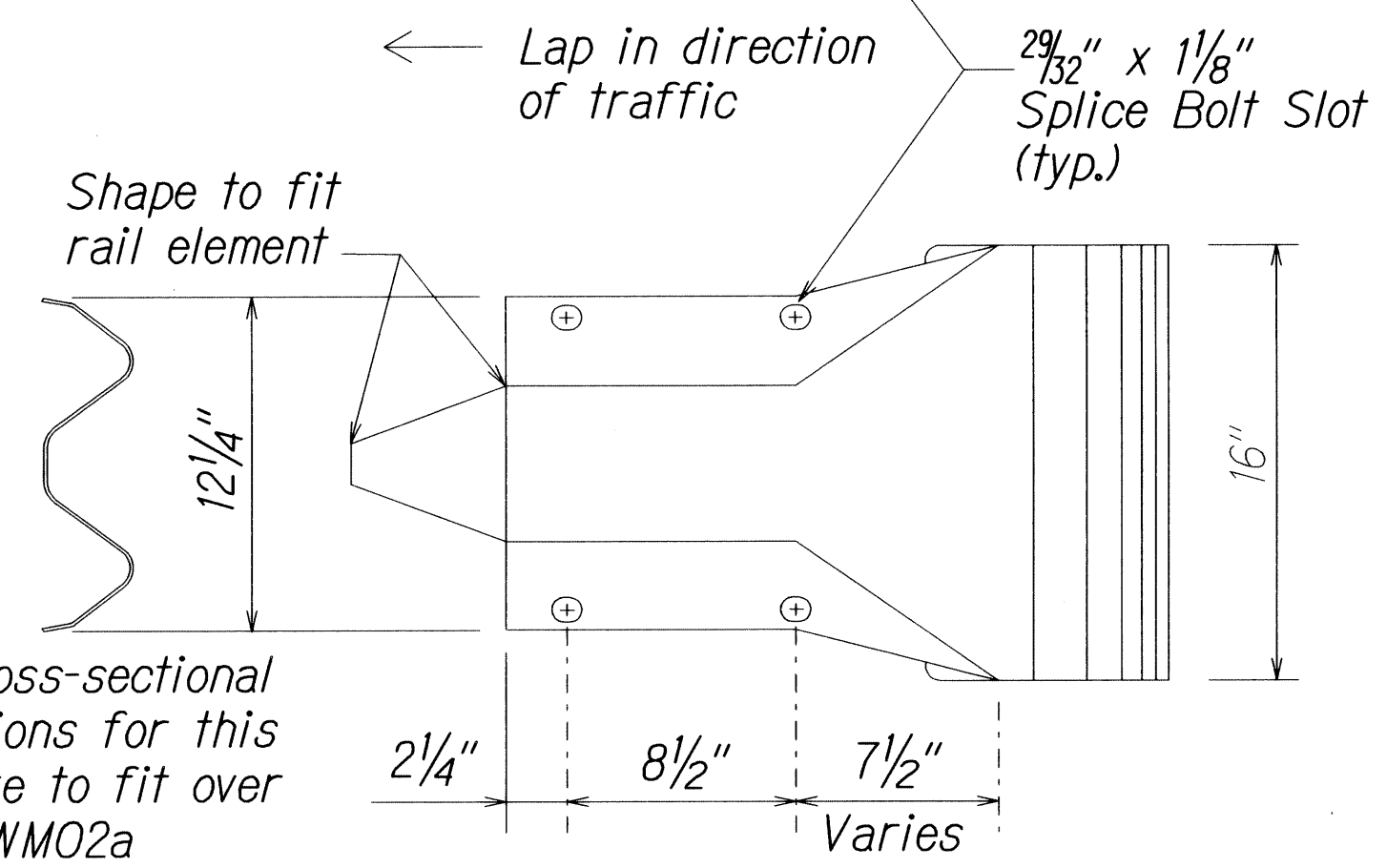
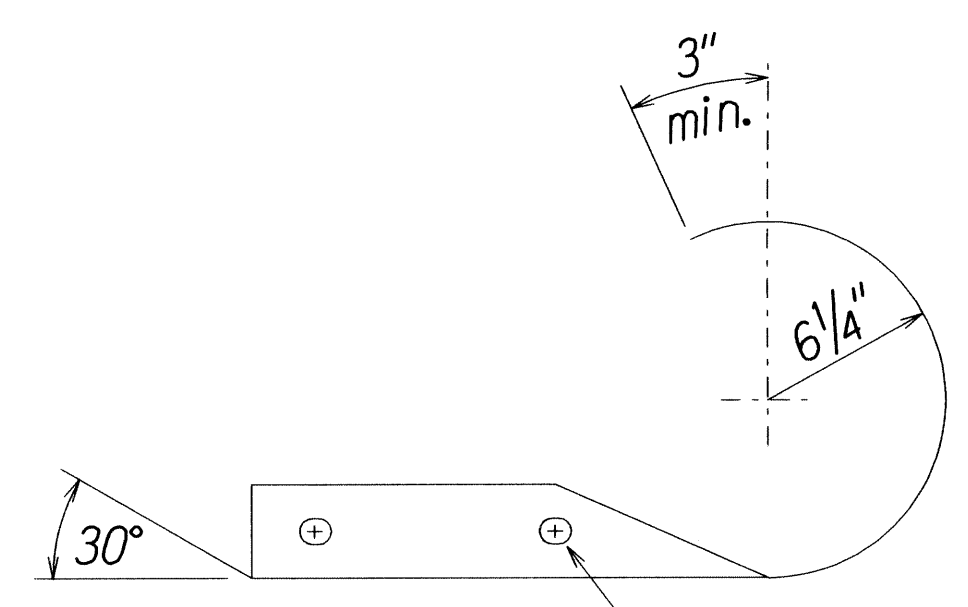
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



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

DESIGNATOR	BASE METAL THICKNESS
RWE06a	12 Gauge

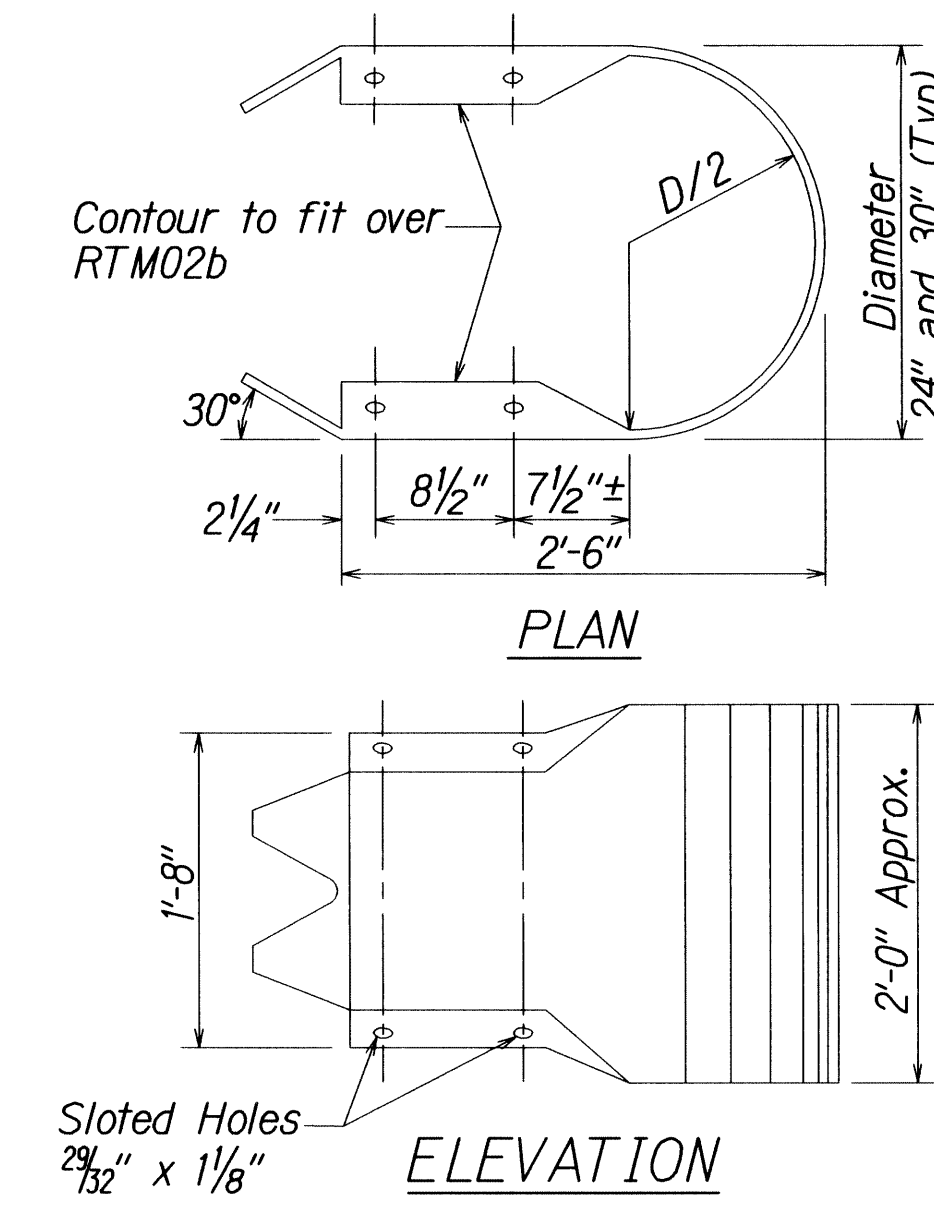
W-BEAM END SECTION (BUFFER RWE06a)



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

DESIGNATOR	BASE METAL THICKNESS
RWE03a	12 Gauge

W-BEAM END SECTION (ROUNDED RWE03a)



DESIGNATOR	BASE METAL THICKNESS
RTE03b & RTE04b	10 Gauge

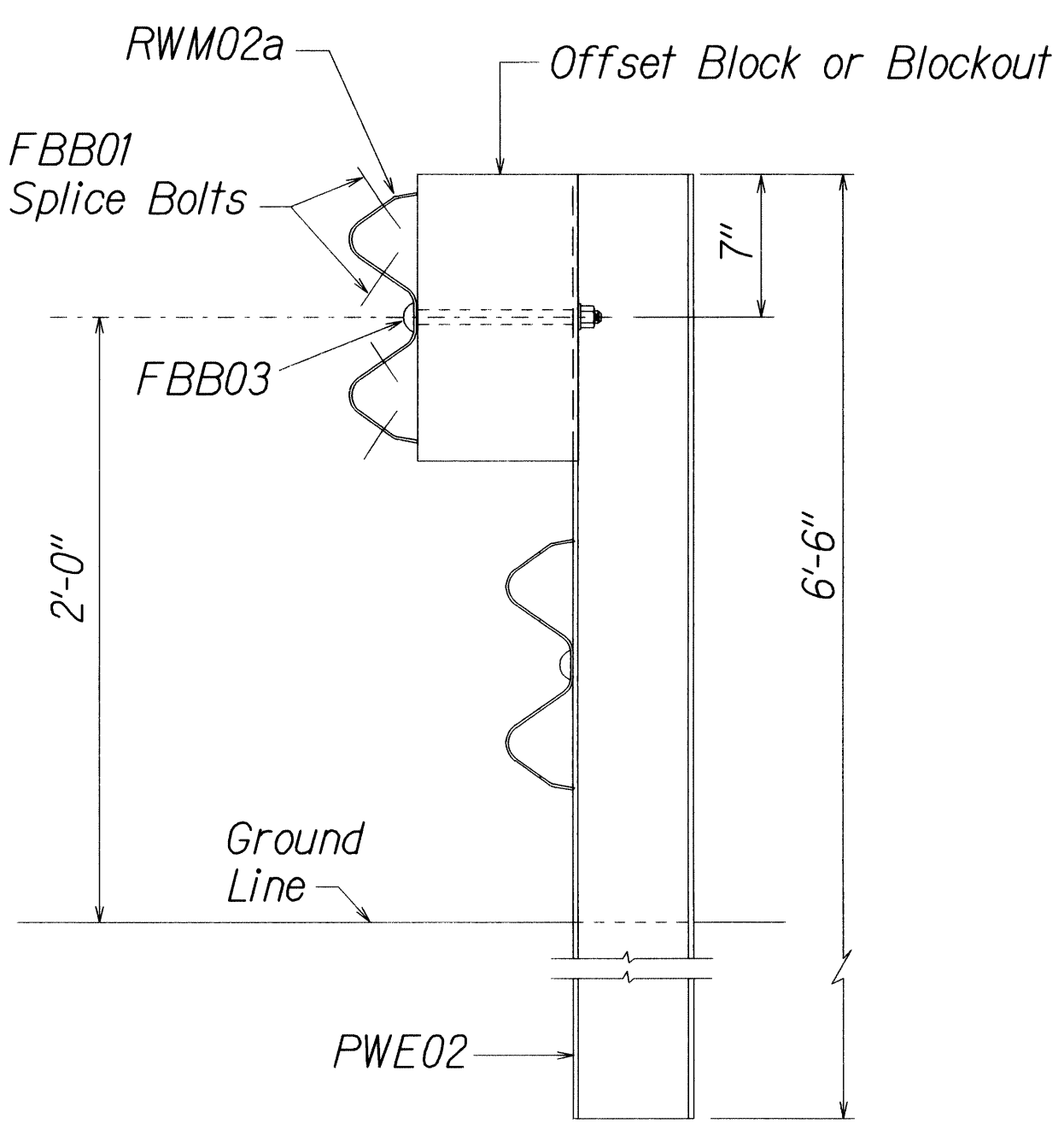
THRIE-BEAM END SECTION (BUFFER RTE03b or RTE04b)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**GUARDRAIL TERMINAL CONNECTORS  
AND END SECTIONS**  
HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papalele Road to Kaunaloa Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: Not To Scale      Date: Dec, 2011  
SHEET No. 3 OF 11 SHEETS

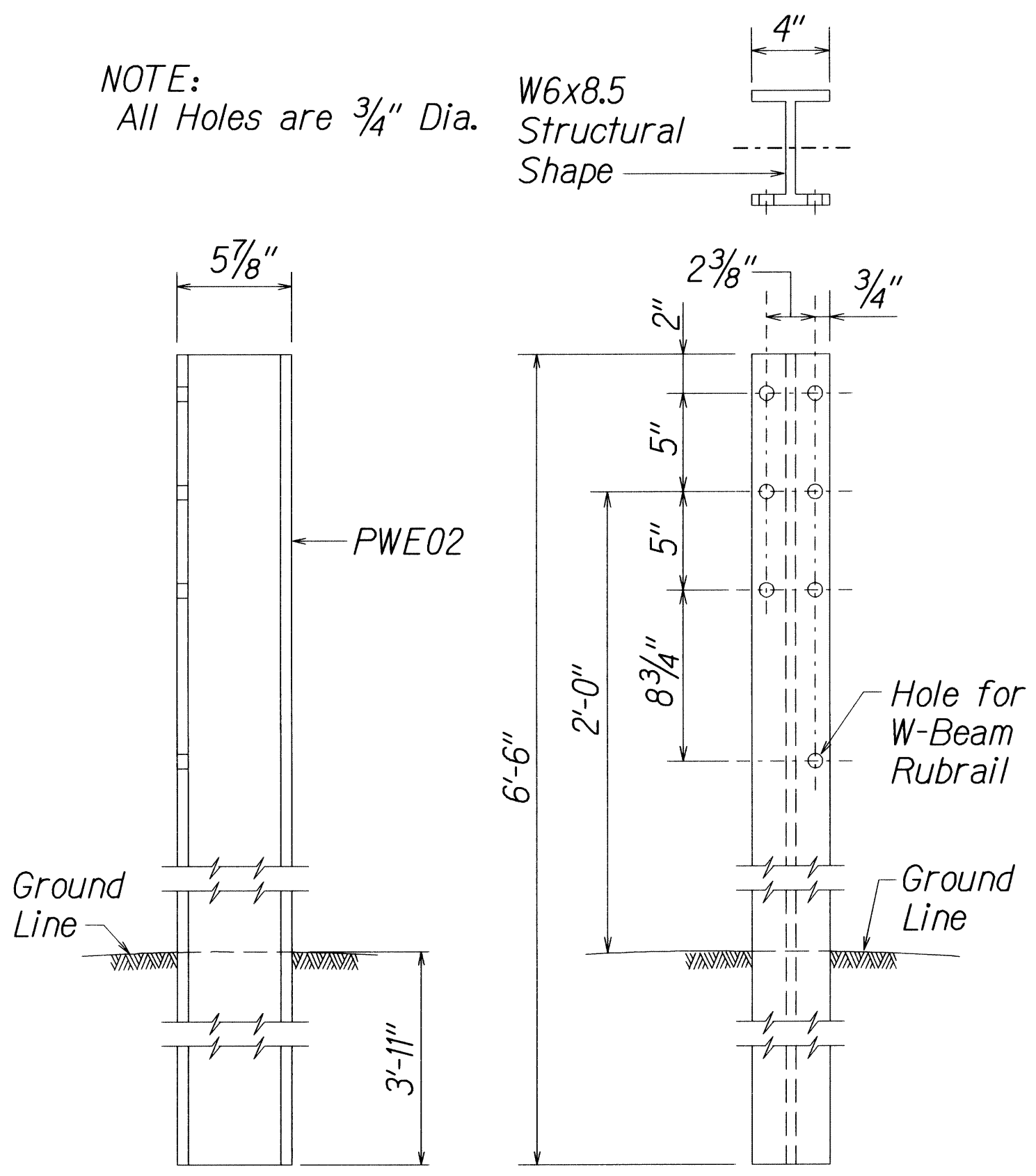
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	CHECKED BY	
	QUANTITIES BY	

16/13/01      rdtrubly/guardrail/tesdredgn      (standard plan TE-51 r09/01/87)

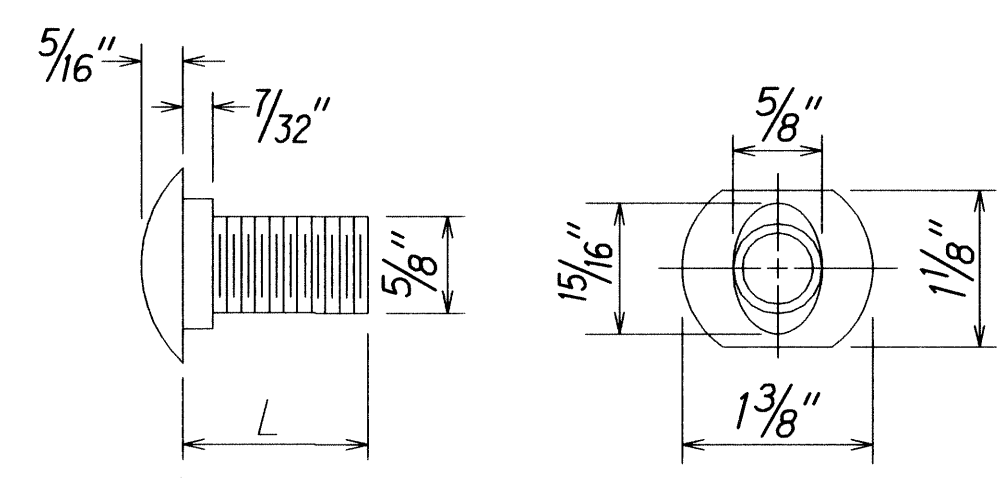
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	9	31



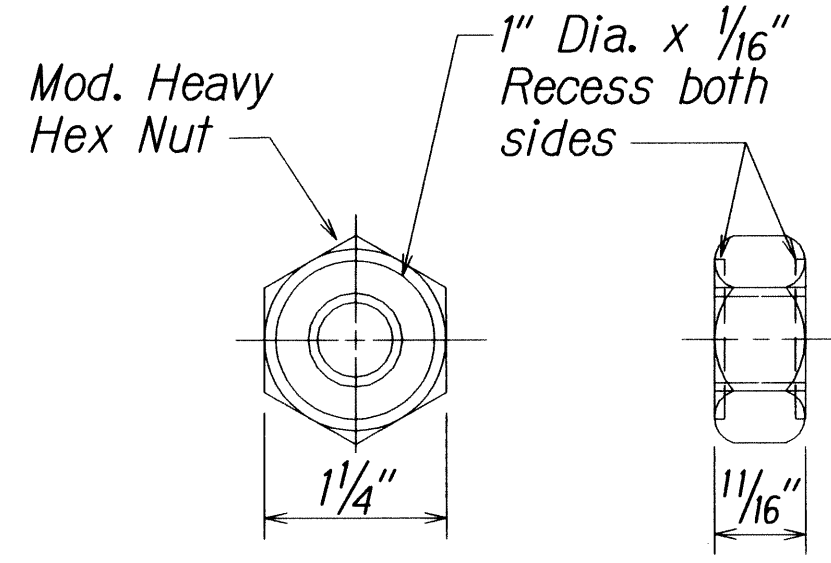
ELEVATION  
STRONG POST RUBRAIL  
(W-BEAM) GUARDRAIL



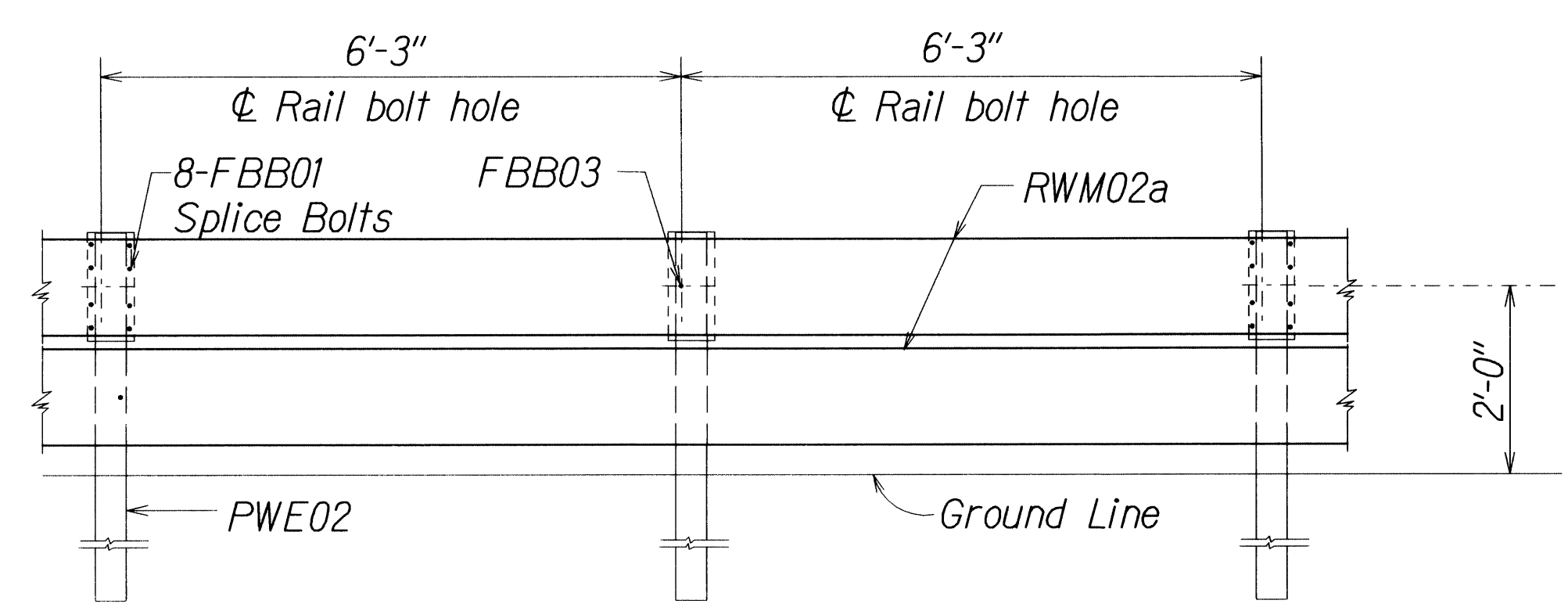
SIDE FRONT  
W-BEAM STRONG POST (PWE02)



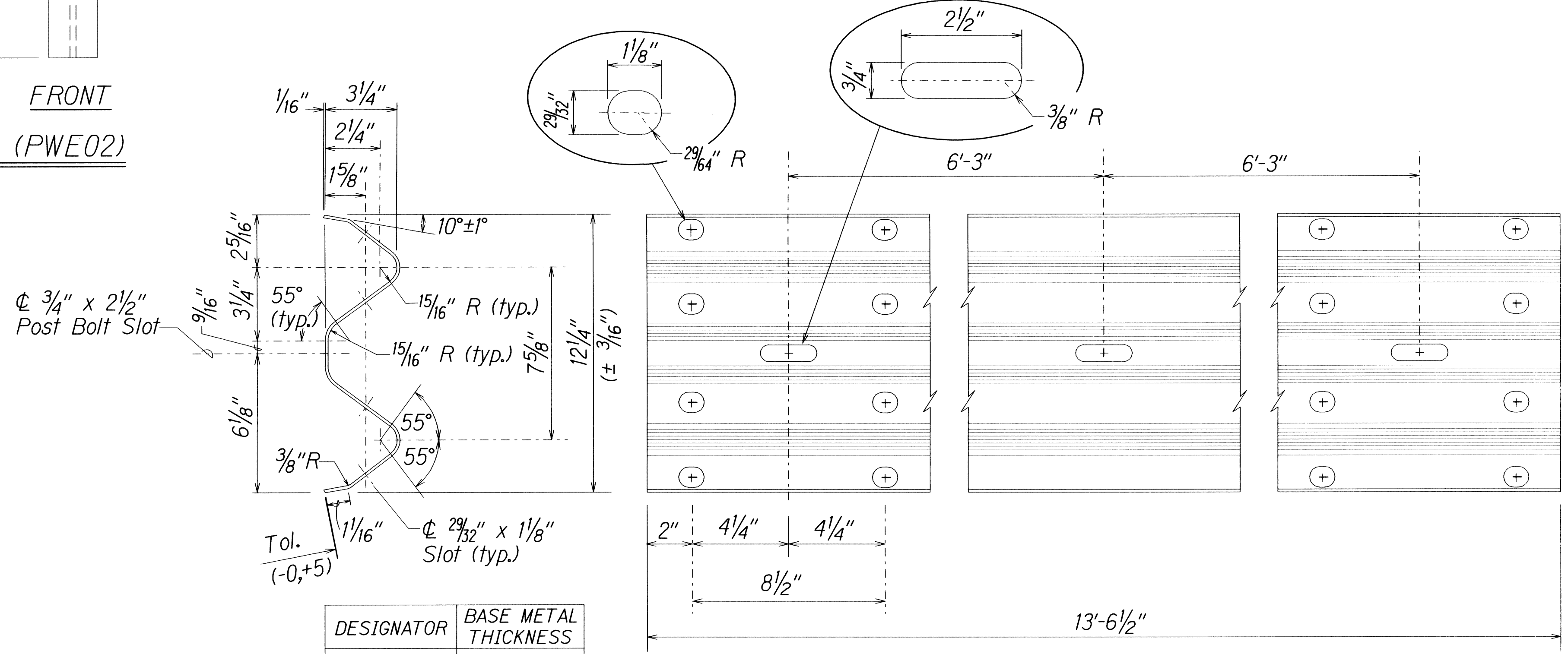
DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"



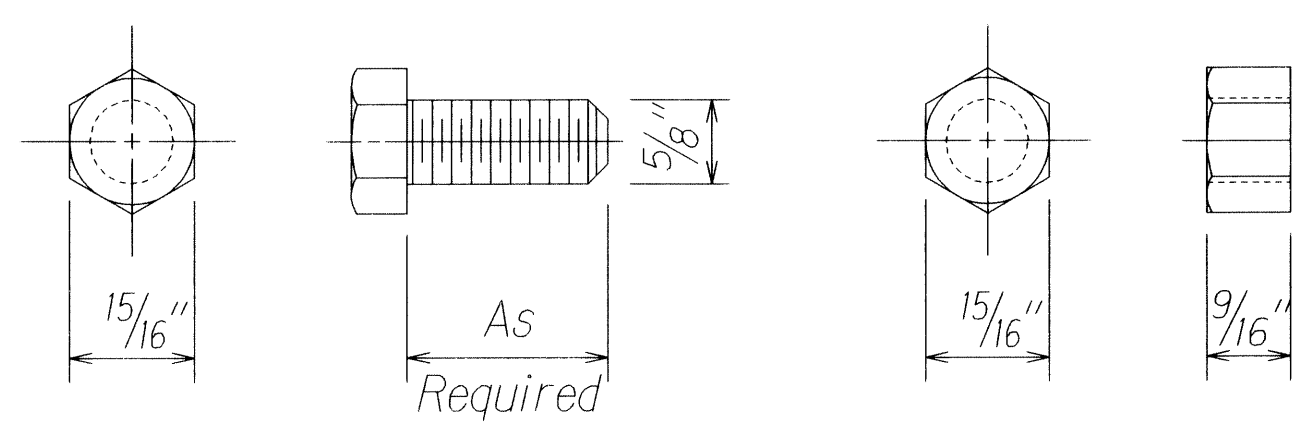
GUARDRAIL BOLTS AND RECESSED NUT



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



2 SPACE W-BEAM GUARDRAIL (RWM02a)



HEX BOLT & NUT (FBX16a)

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

STRONG POST RUBRAIL

(W-BEAM) GUARDRAIL

HAWAII BELT ROAD GUARDRAIL

& SHOULDER IMPROVEMENTS

Papalele Road to Kaumoali Bridge

Federal Aid Project No. NH-019-1(39)

Scale: Not To Scale

Date: Dec., 2011

SHEET No. 4

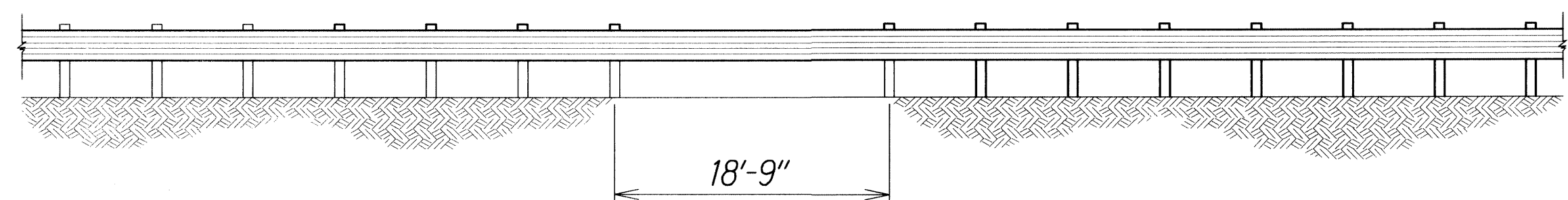
OF 11

SHEETS

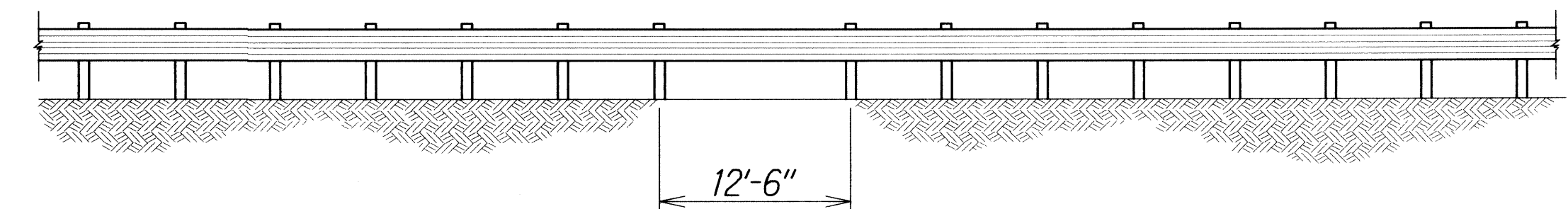
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
TRACED BY	DRAWN BY	
NOTE BOOK	CHECKED BY	
	QUANTITIES BY	

rt1/01/05 rdcruby/guardrail/rubrail.dgn (standard plan TE-52 rt1/03/09)

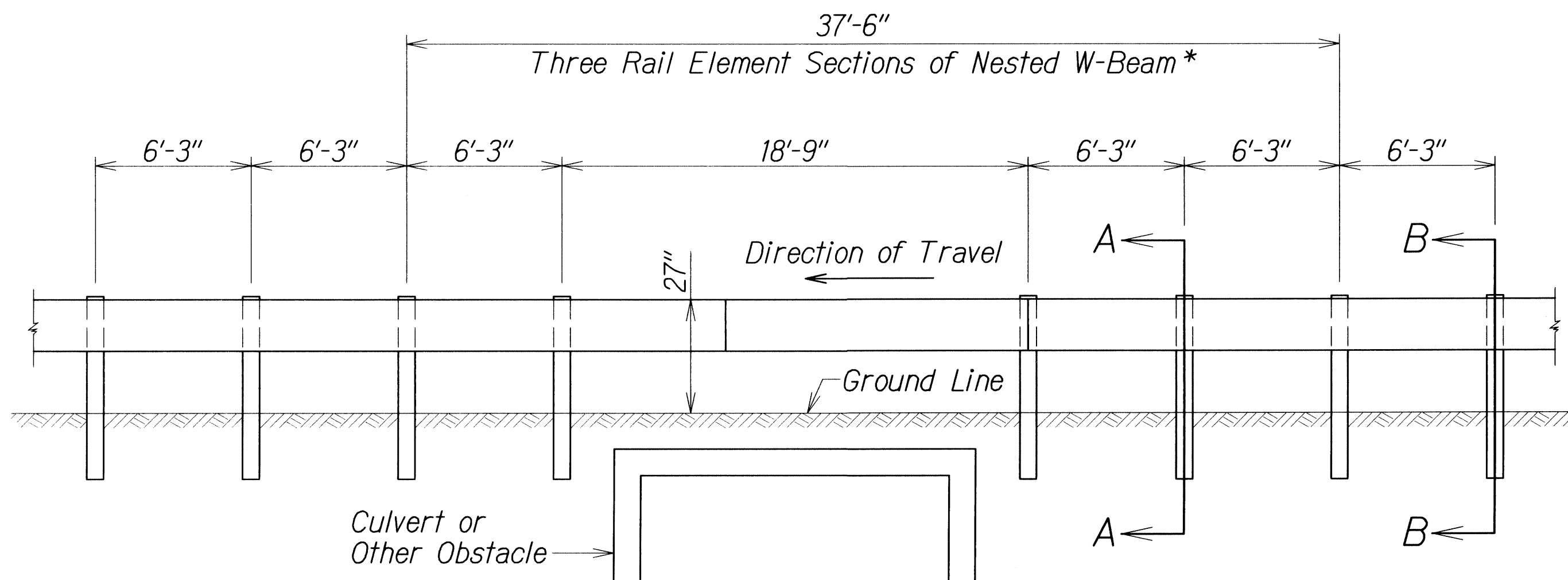
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	10	31



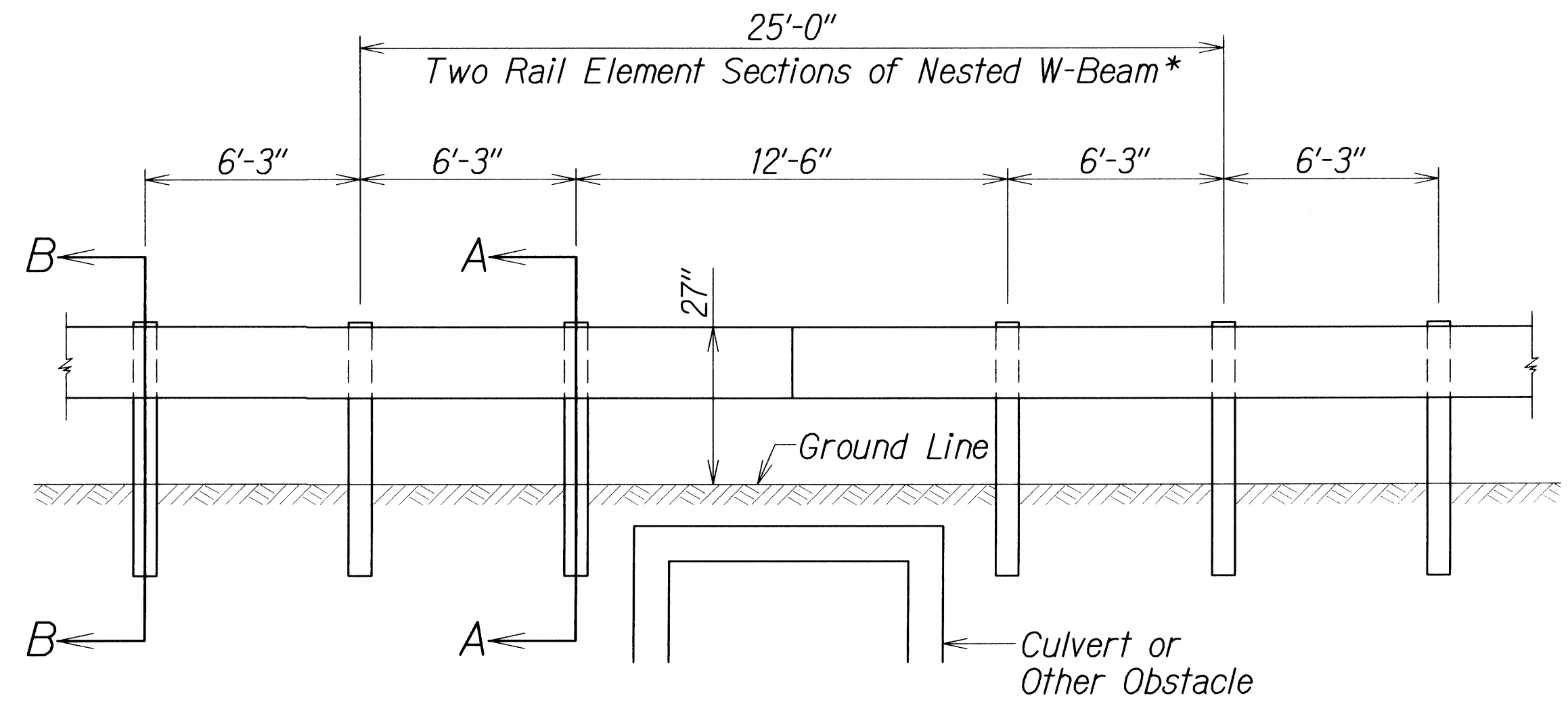
LONG SPAN OVER CULVERT



LONG SPAN OVER CULVERT

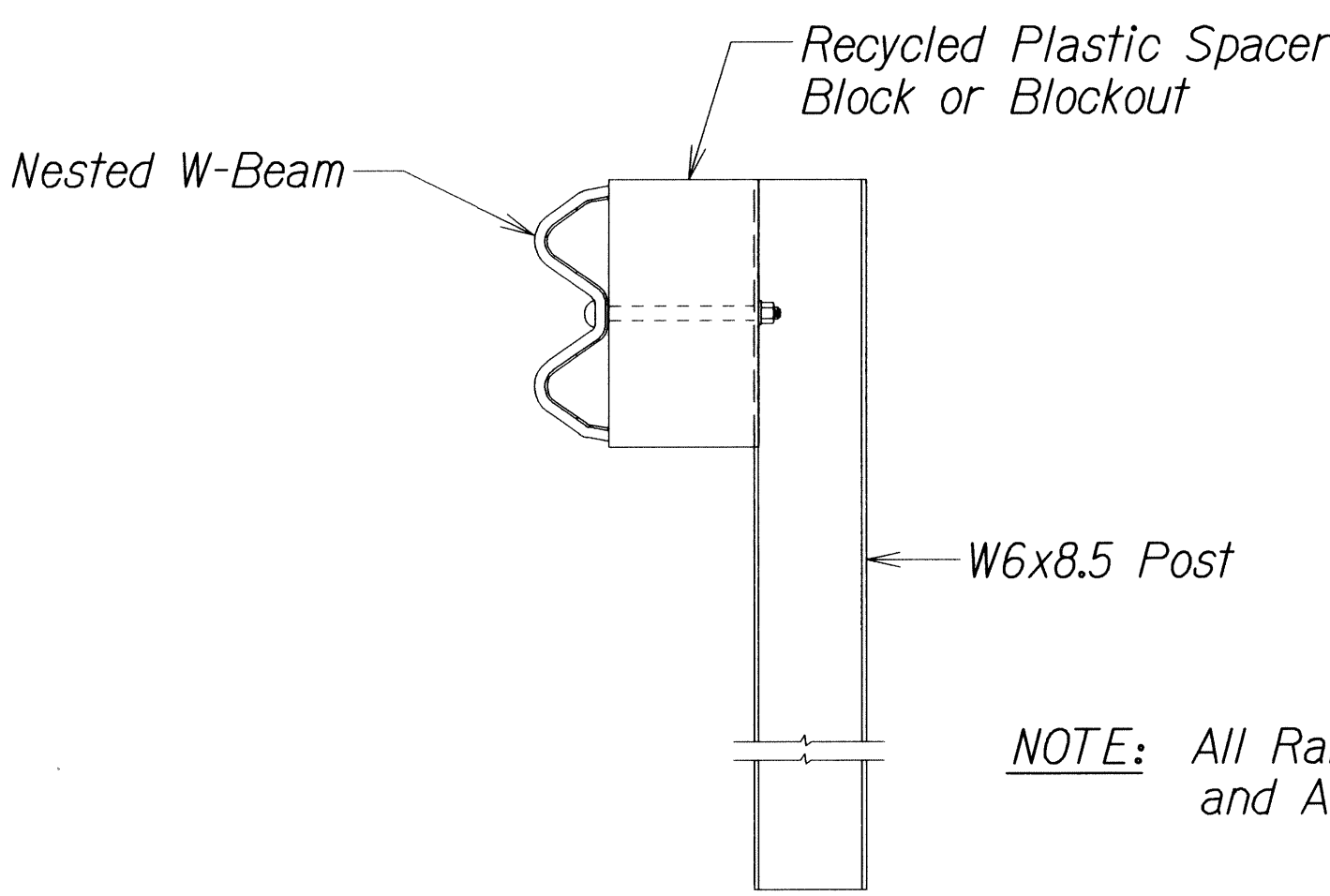


NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL OVER 18'-9" CULVERT  
(MAXIMUM DYNAMIC DEFLECTION OF 3.2 FT.)

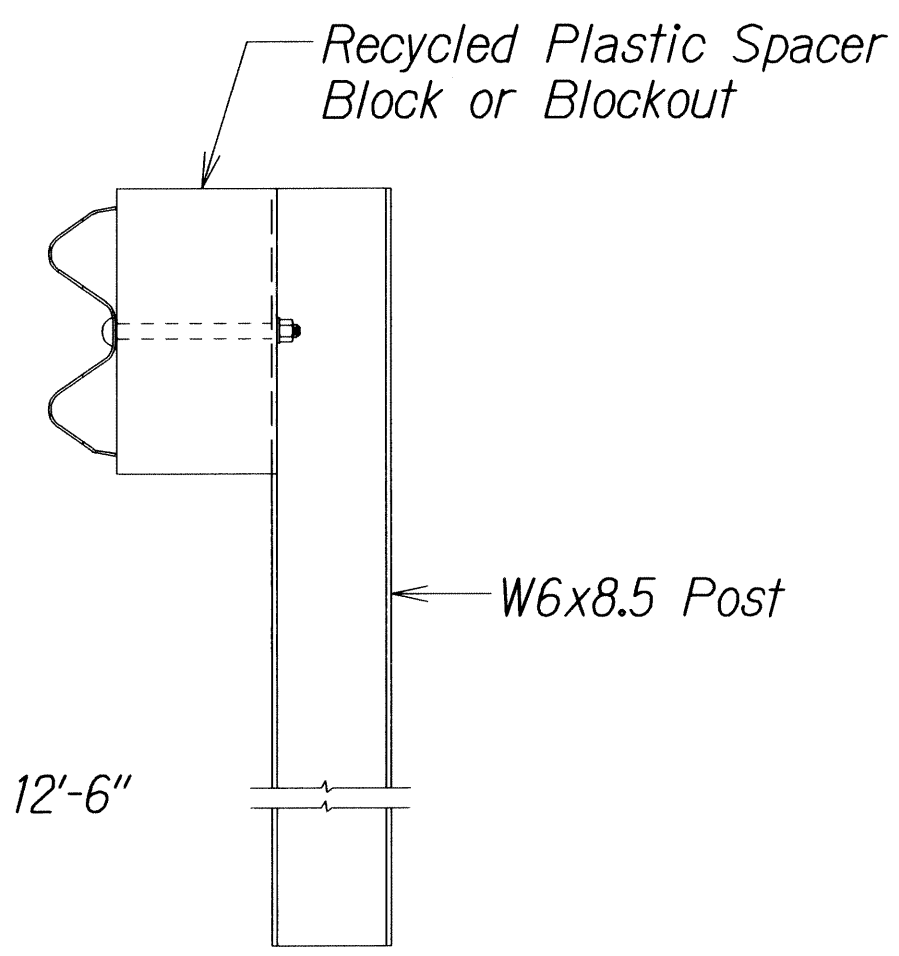


(SPlice IN CENTER OF 12'-6" SPACING)  
NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL OVER 12'-6" CULVERT  
(MAXIMUM DYNAMIC DEFLECTION OF 3.1 FT.)

\*Note: All nested W-Beam splices points shall be staggered.



SECTION A-A



SECTION B-B

NOTE: All Rail Elements Sections are 12'-6" and All Posts are 6' Long

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	TRACED BY	
	CHECKED BY	
	QUANTITIES BY	

4/22/04 tdruby.guardrail/nstdwbeams.dgn

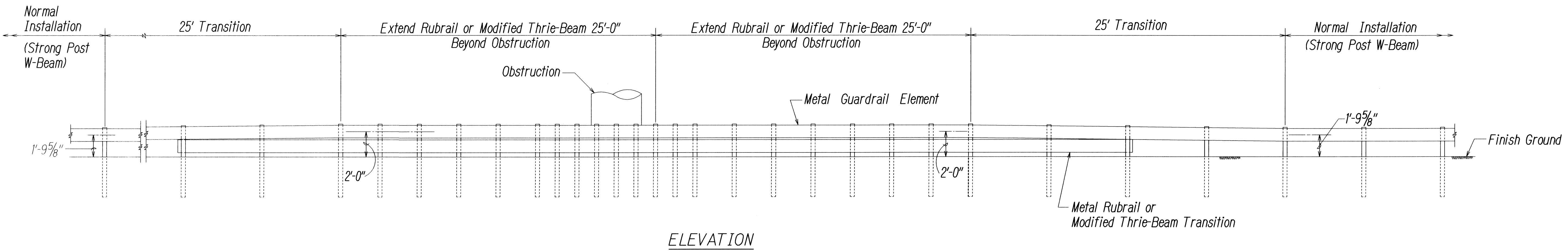
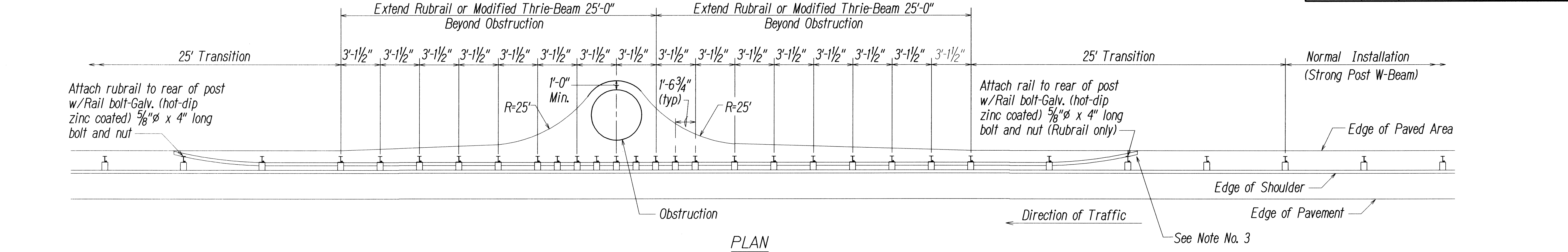
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL OVER CULVERT  
HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papalele Road to Kaumoali Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: Not To Scale      Date: Dec., 2011

SHEET No. 5 OF 11 SHEETS

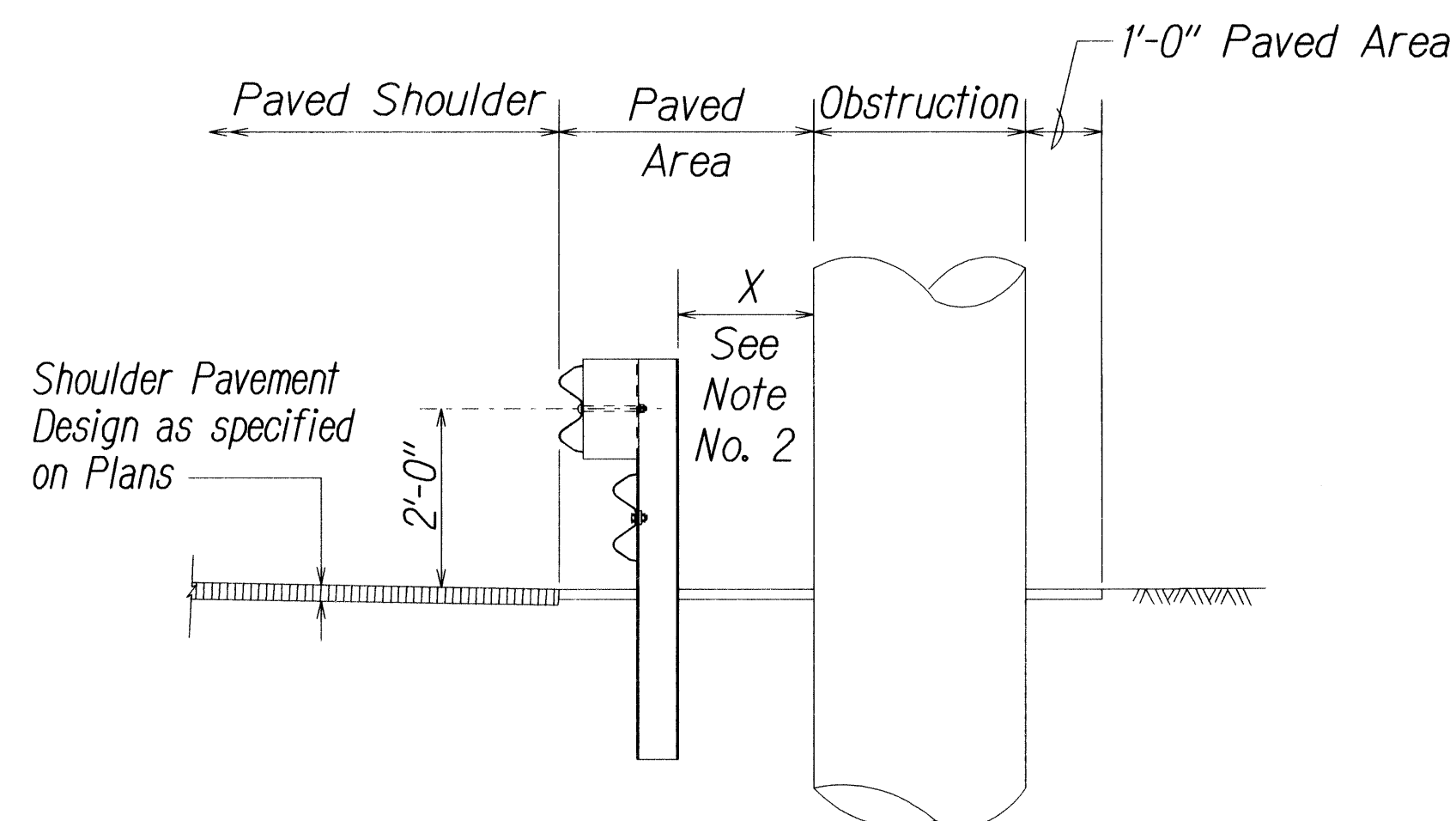


FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	11	31



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;  
 $2'-0" \leq X < 3'-0"$ , Strong Post Rubrail or Strong Post Thrie-Beam with reduced post spacing;  
 $3'-0" \leq X$ , Strong Post W-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

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

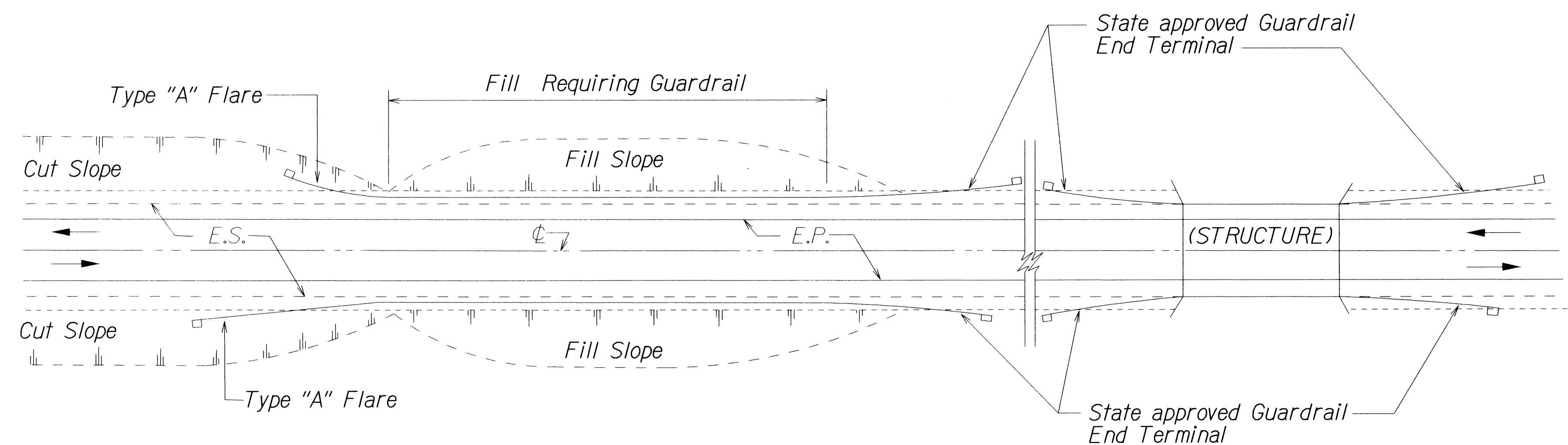
18/21/01 tdruby/guardrail/rev.dgn (Standard Plan TE-53 r09/01/87 # TE-54 r11/03/89)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

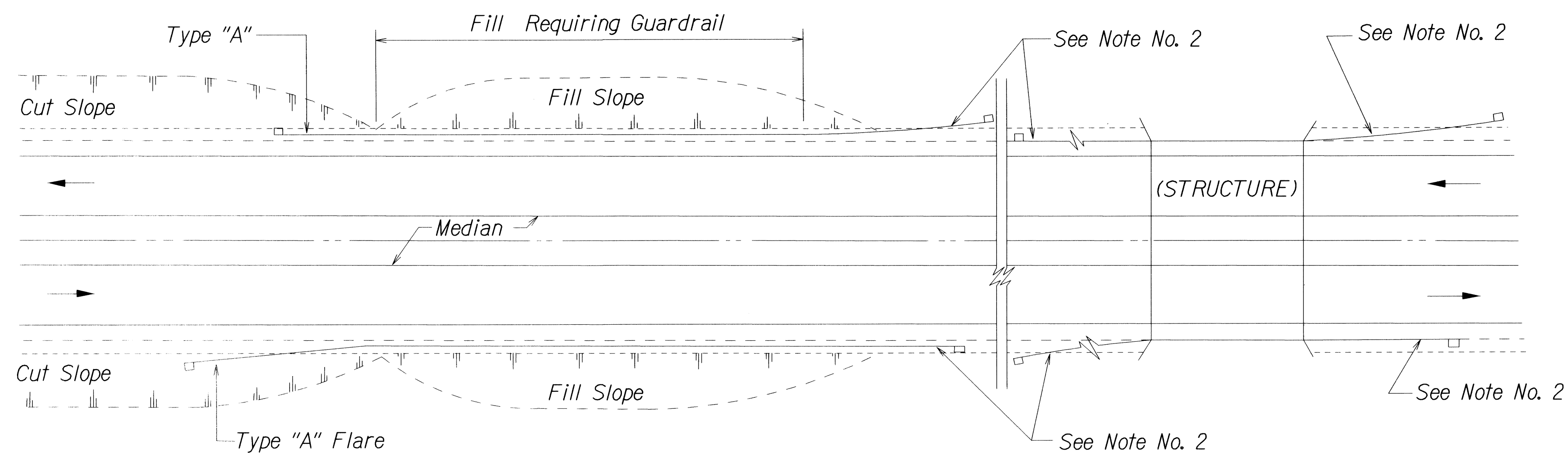
**GUARDRAIL DETAILS**  
(AT OBSTRUCTION)  
HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papalele Road to Kaumoali Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: Not To Scale      Date: Dec., 2011

SHEET No. 6 OF 11 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	12	31



PLAN  
TWO WAY ROADWAY



PLAN  
ONE WAY ROADWAY (DIVIDED HIGHWAY)

NOTES:

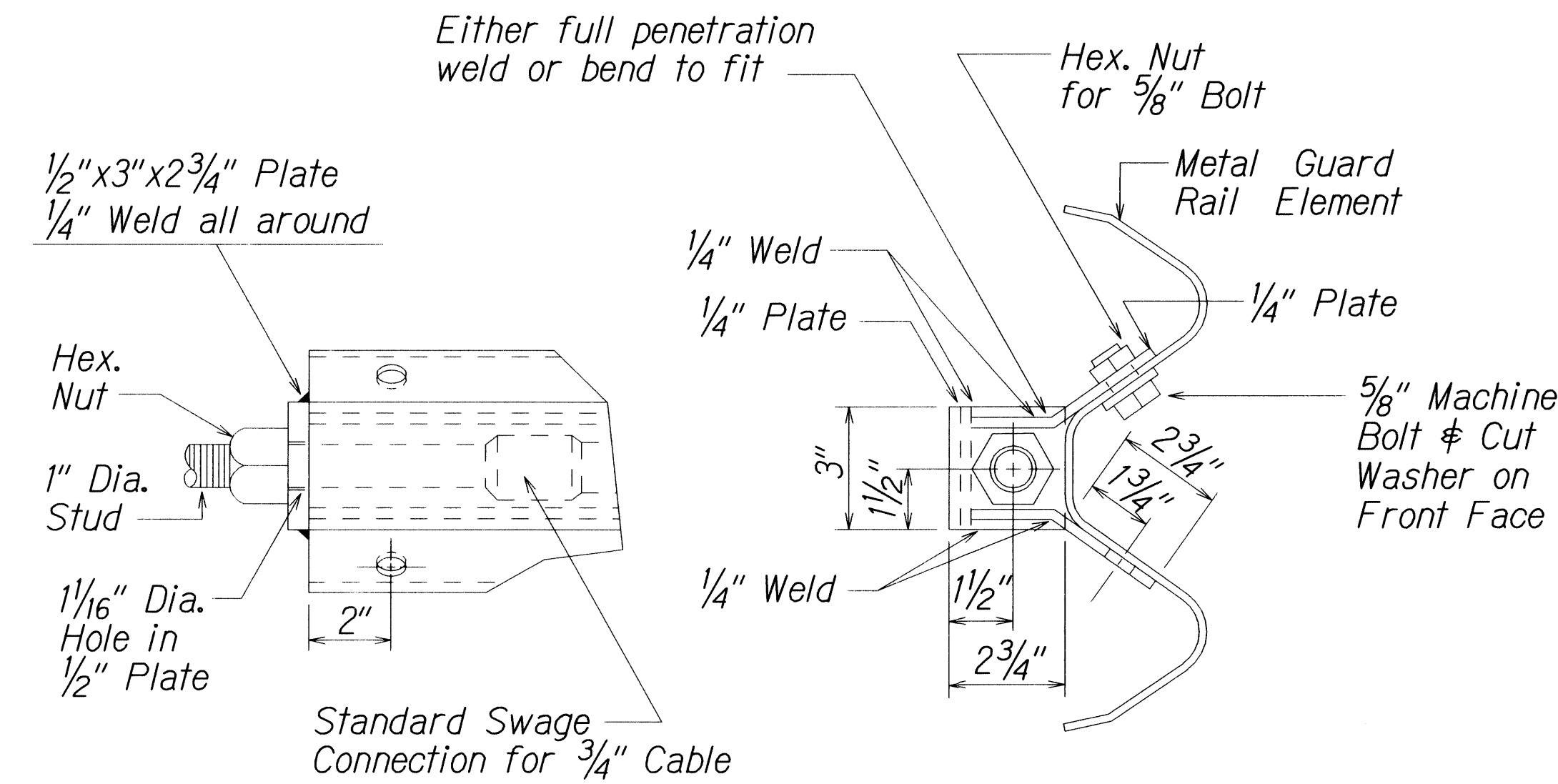
1. Metal Guardrail connection to concrete structures requires End Post Connection. See Structure Plans.
2. Depending on the existing field conditions, the Engineer shall determine which guardrail end terminal should be installed.
3. Refer to State's most current approved Product List for NCHRP 350 approved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

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	TRACED BY	
	CHECKED BY	
	QUANTITIES BY	

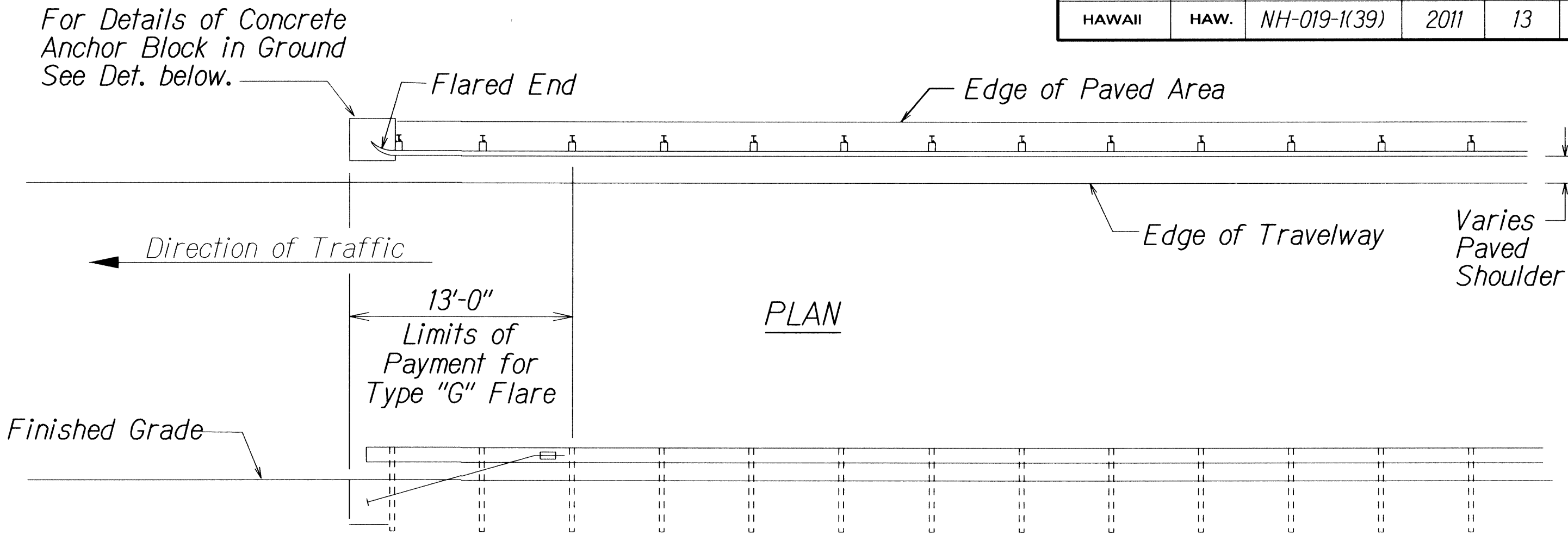
3/01/99 rdtruby/guardrail/tesBrev.dgn (standard plan TE-58-rd7/01/96)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**GUARDRAIL DETAILS**  
**HAWAII BELT ROAD GUARDRAIL**  
**& SHOULDER IMPROVEMENTS**  
**Papalele Road to Kaunaloa Bridge**  
**Federal Aid Project No. NH-019-1(39)**  
Scale: Not to Scale Date: Dec, 2011  
SHEET No. 7 OF 11 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	13	31



ANCHOR PLATE DETAILS



TYPE "G" FLARE END TERMINAL

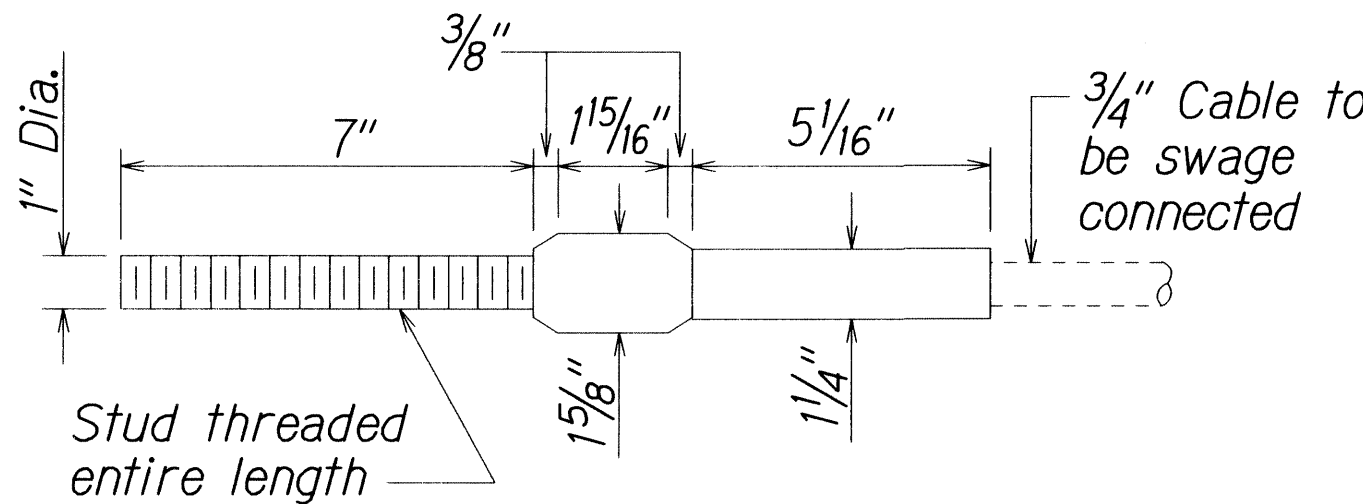
NOTE:

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.

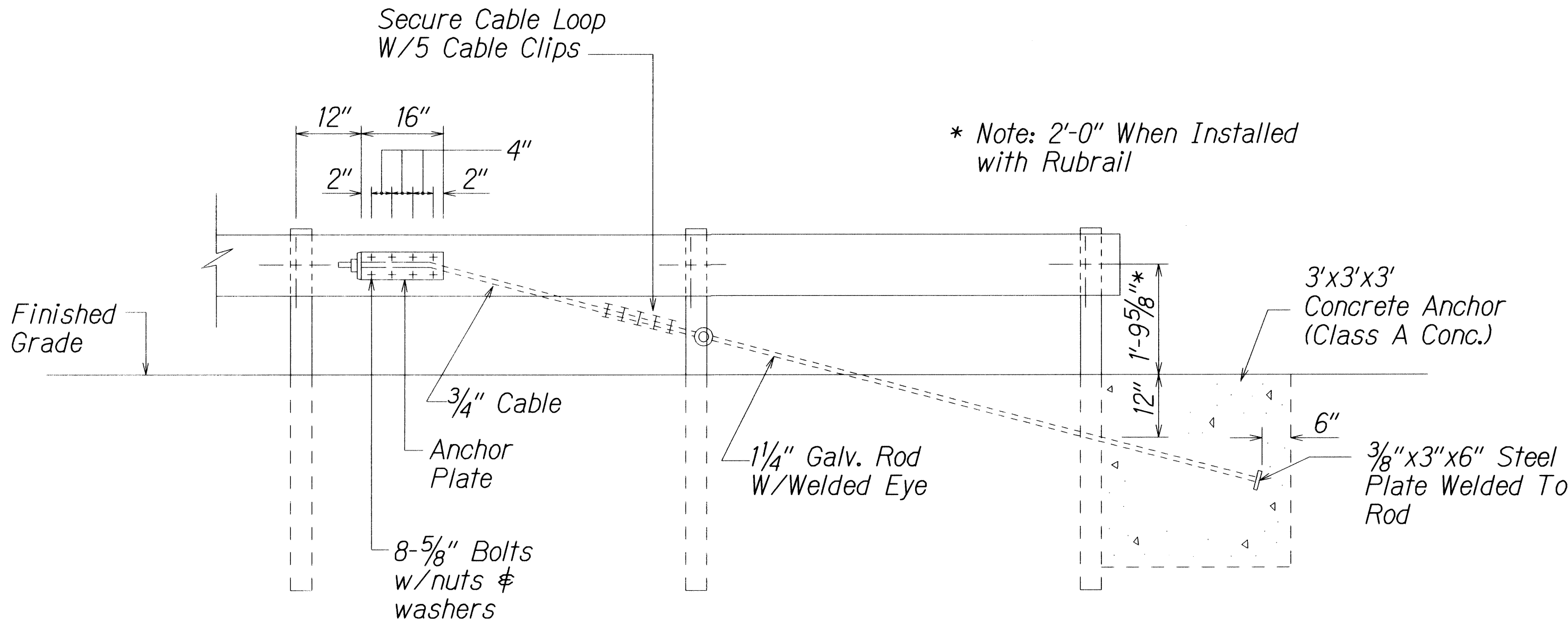
The taper (flare rate) of the guardrail shall follow the latest edition of AASHTO'S Roadside Design Guide (currently, Table 5.6 - Suggested Flare Rate for Barrier Design, page 5-21, Jan. 1996 edition).

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.



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.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
CHECKED BY	TRACED BY	
	QUANTITIES BY	

rs/13/02 tdruby:guardrail/tes9rev.dgn (standard plan TE-59 r11/03/89)

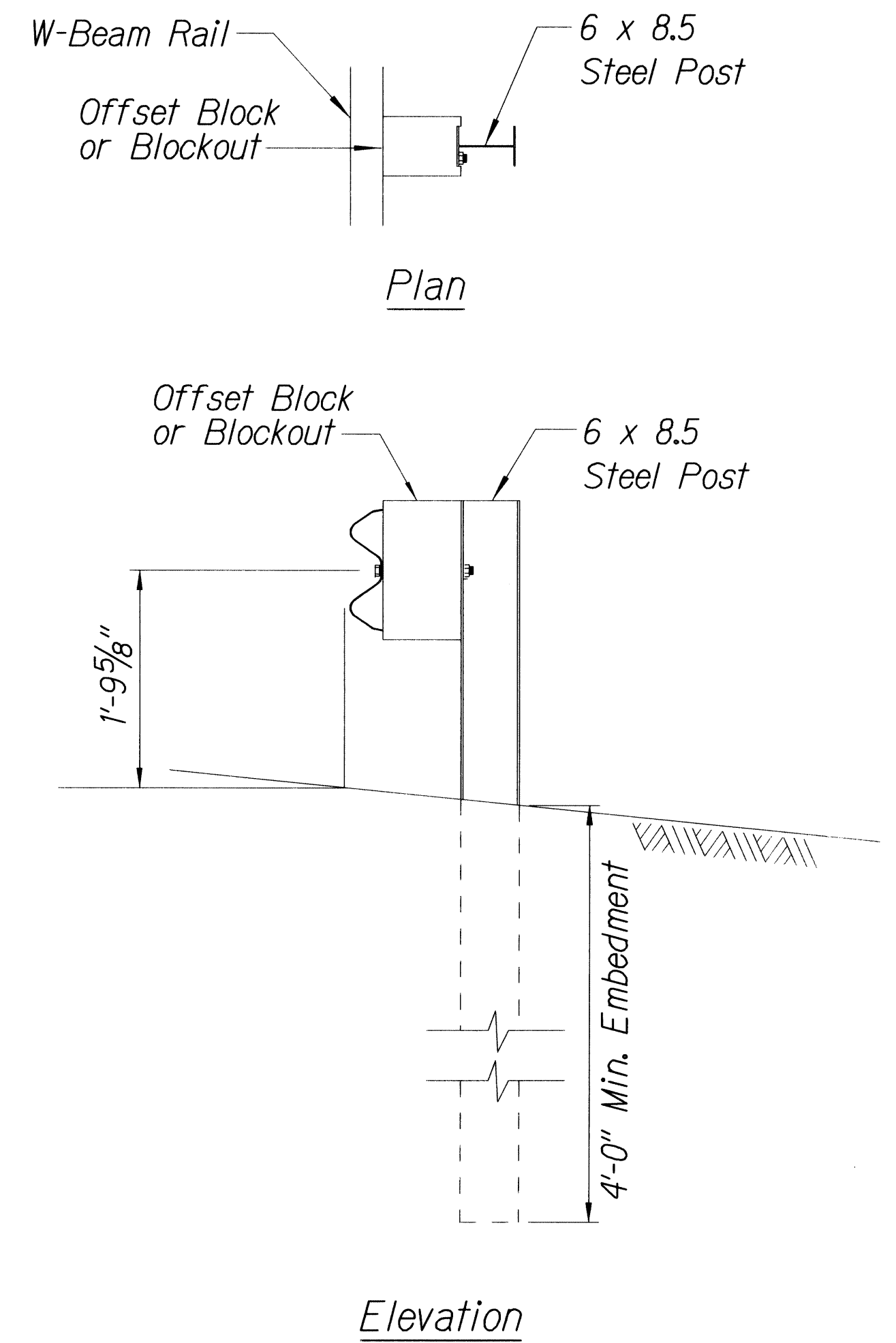
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS**  
HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papalele Road to Kaumuali Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: Not to Scale      Date: Dec., 2011  
SHEET No. 8 OF 11 SHEETS

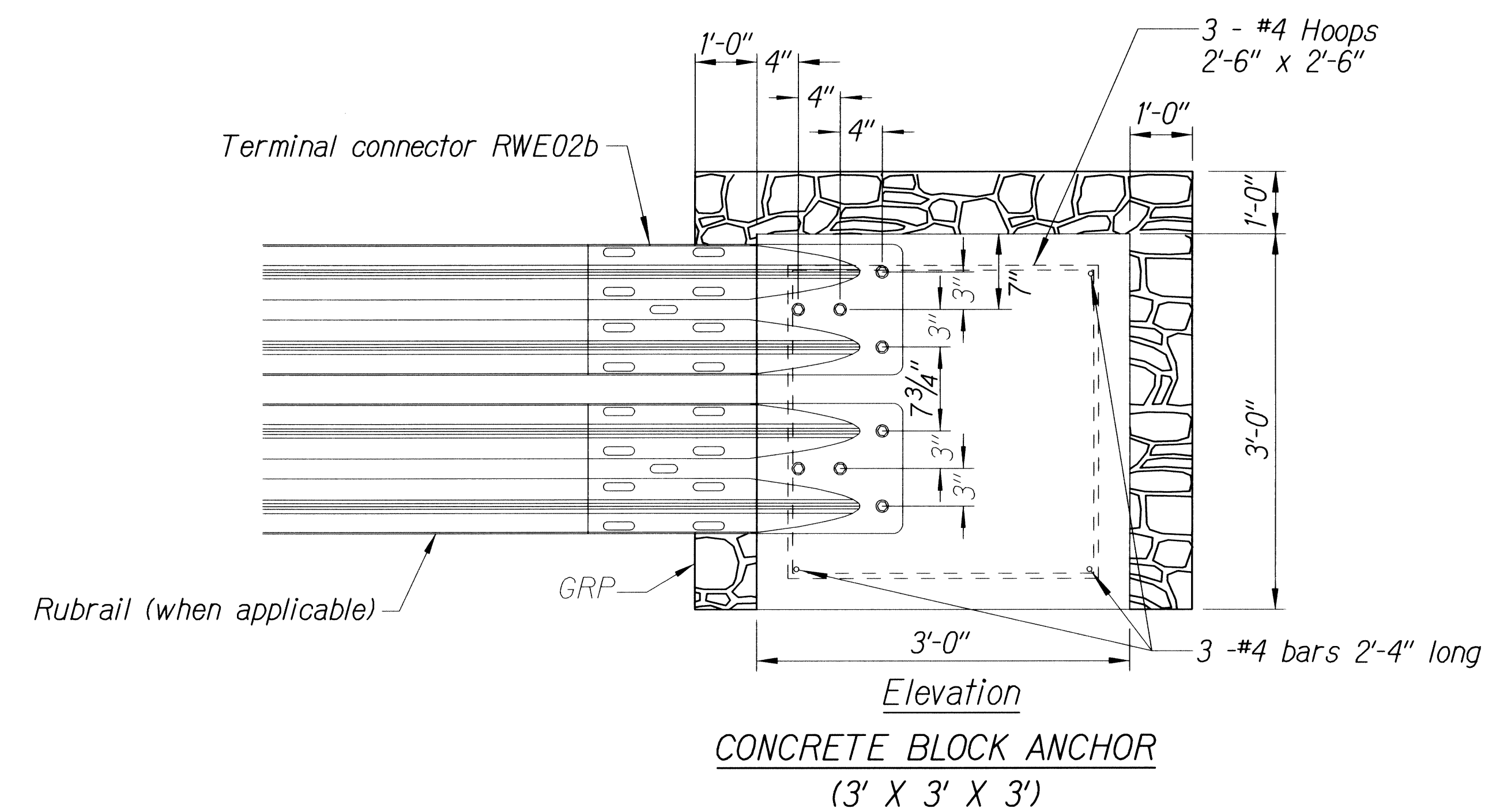
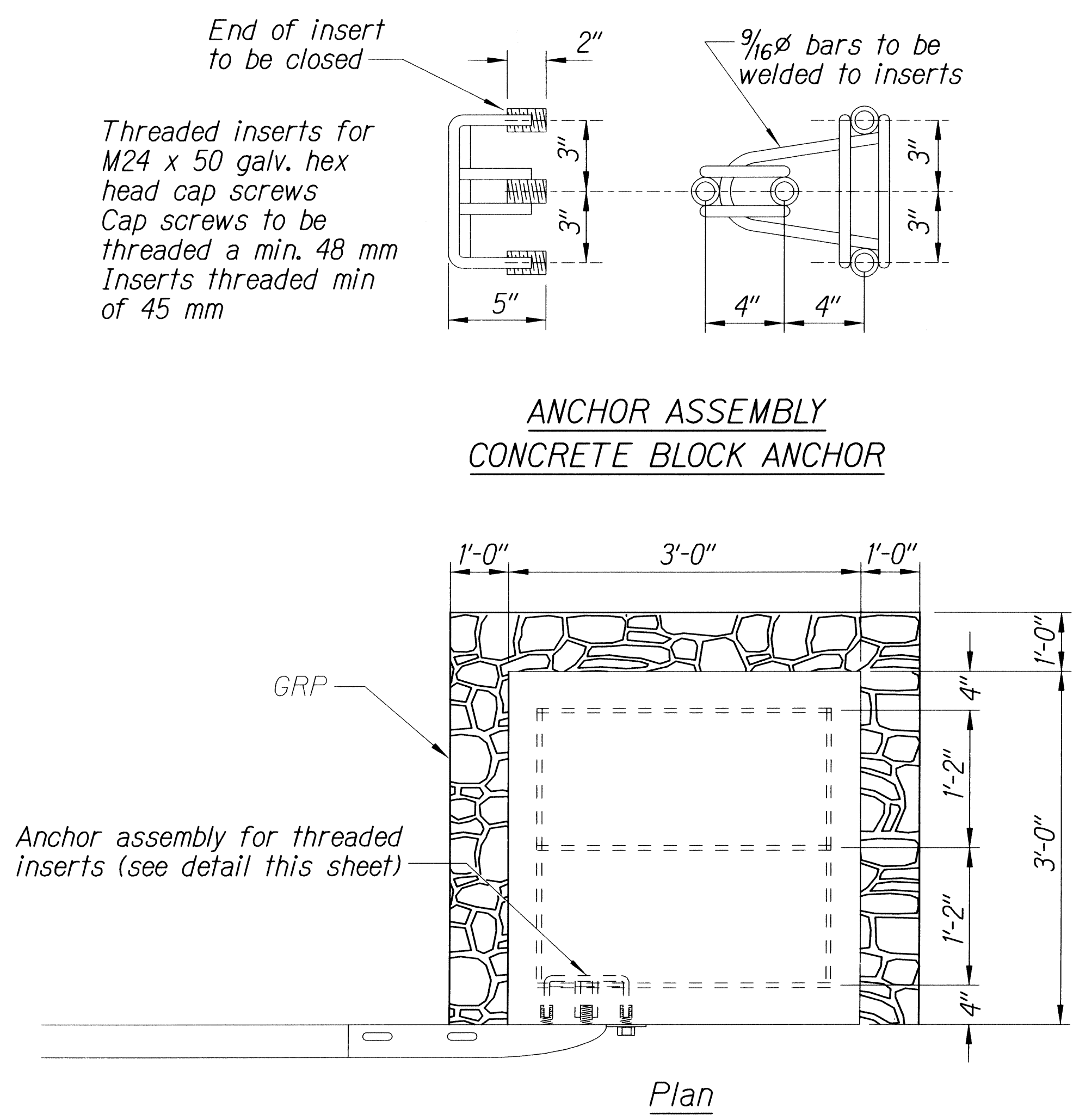




FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	15	31



**STRONG POST W-BEAM GUARDRAIL**



**BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS**  
**MODIFIED TYPE "A-1" 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 and HDOT's Statewide Guideline for Permanent Highway Safety Hardware.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
QUANTITIES BY	TRACED BY	
CHECKED BY	NOTED BY	

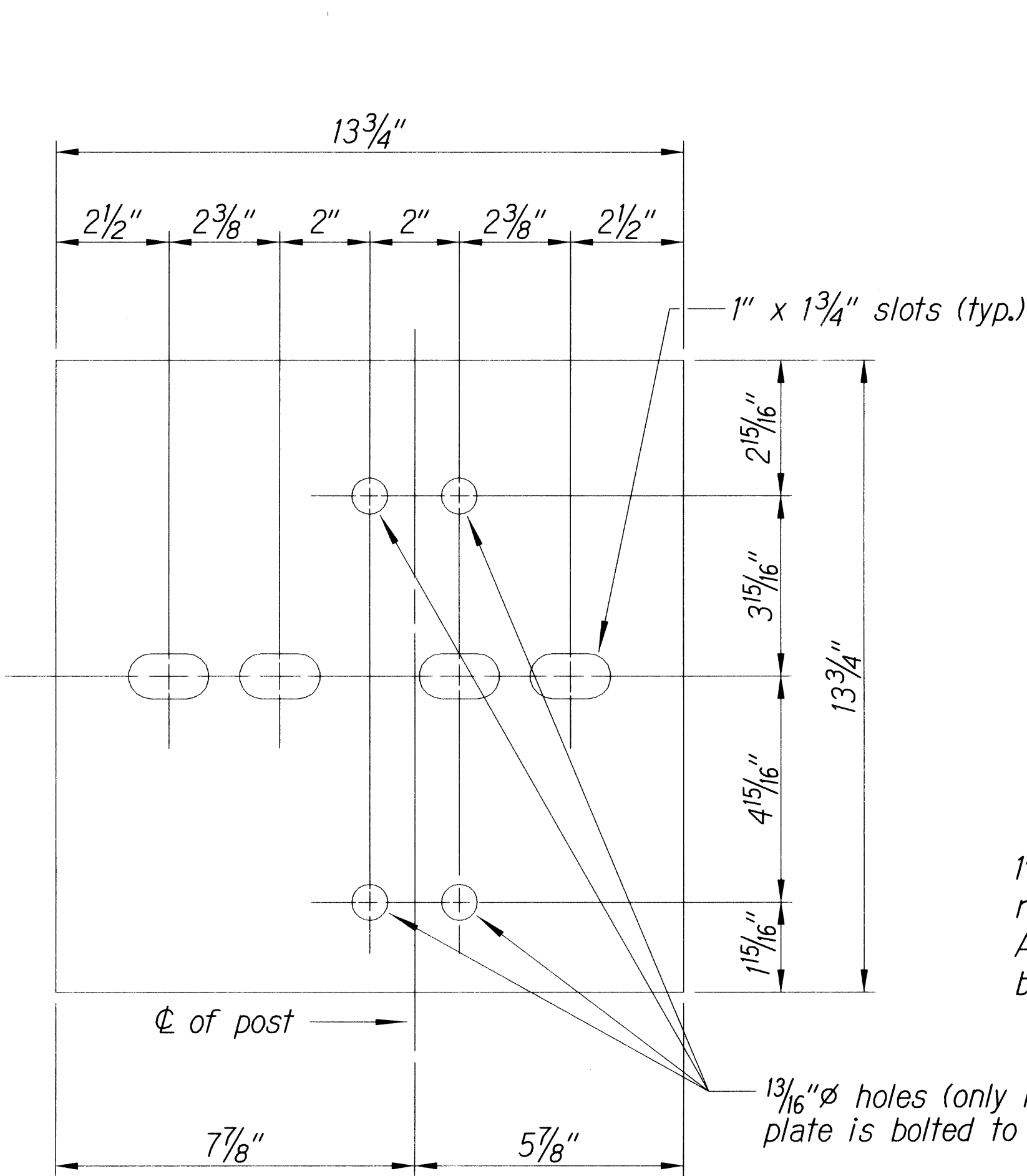
15/2/01 tdruby/guardrail/figs\_a1\_2dgn (standard plan TE-58 07/01/86, TE-59 r11/03/89 & TE-60 07/01/86)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

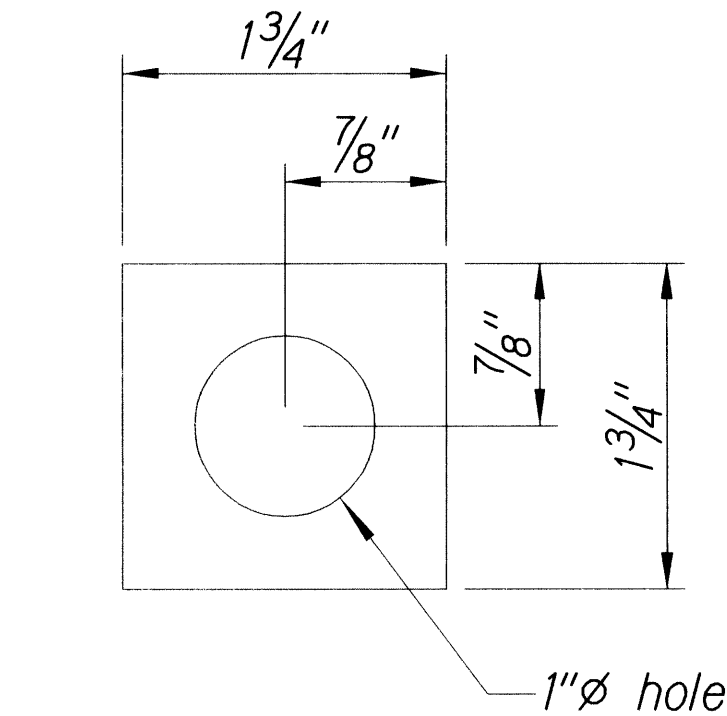
**MODIFIED TYPE "A-1" FLARE**  
HAWAII BELT ROAD GUARDRAIL  
SHOULDER IMPROVEMENTS  
Papalele Road to Kaunaloa Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: Not To Scale Date: Dec., 2011

SHEET No. 10 OF 11 SHEETS

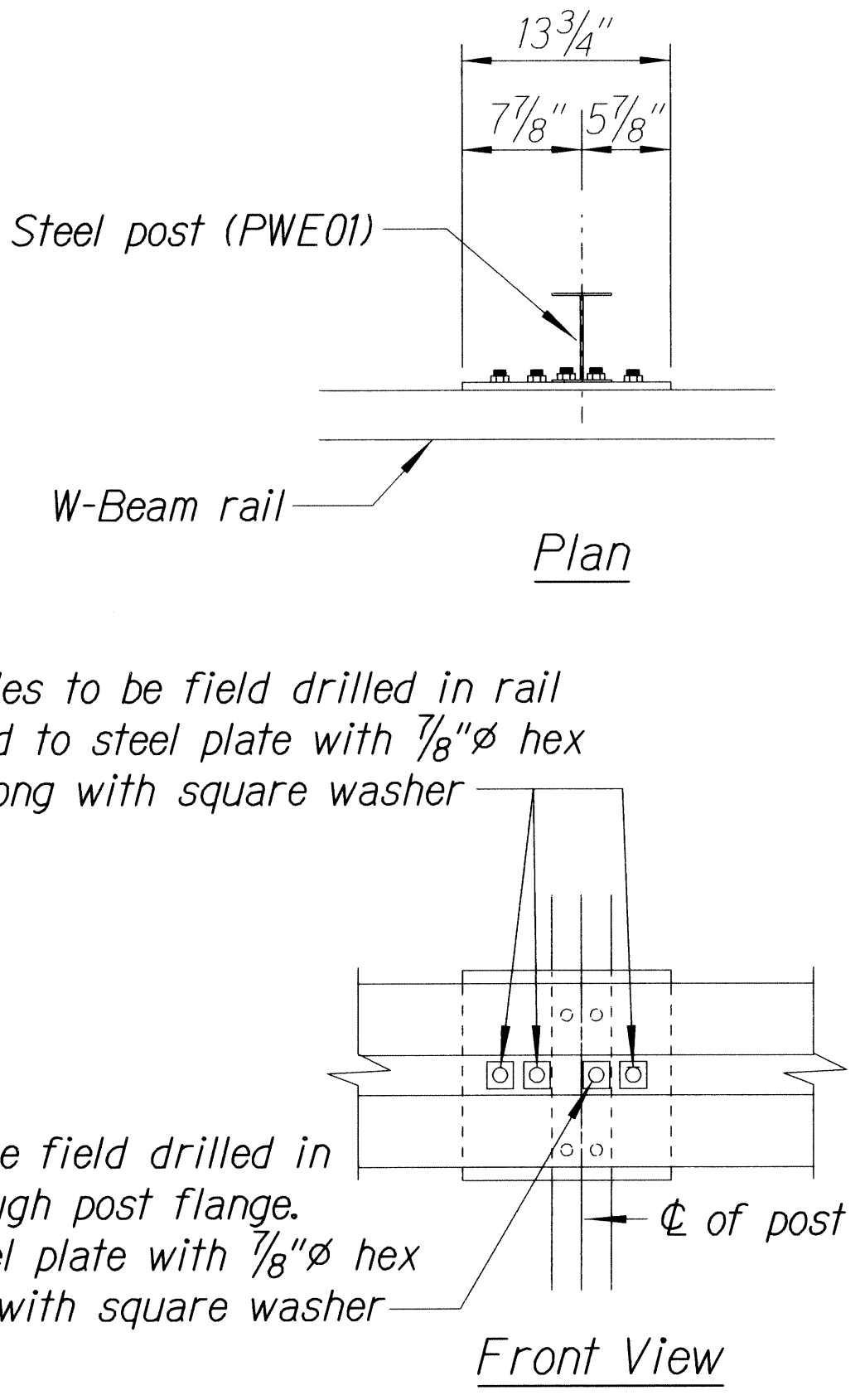
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(39)	2011	16	31



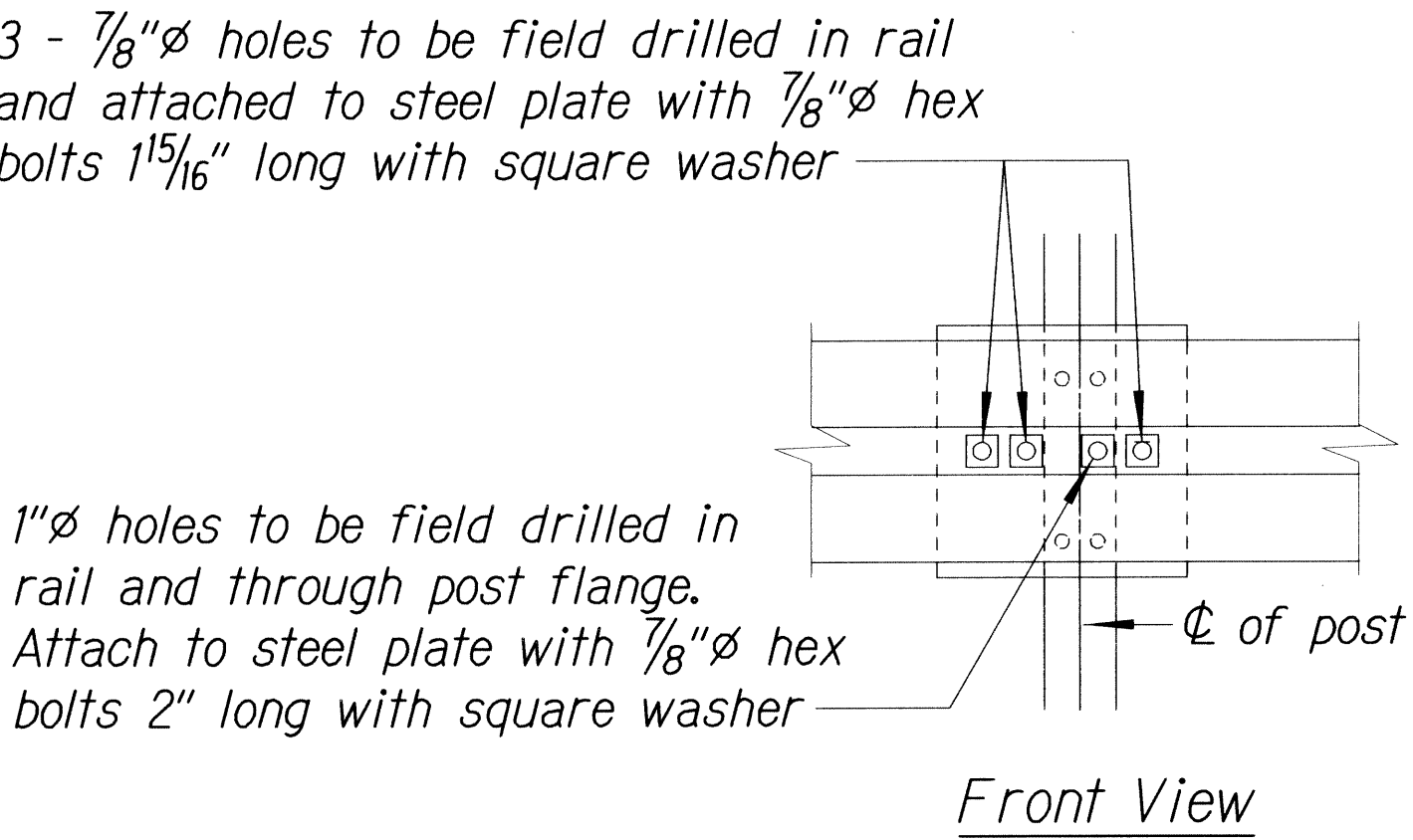
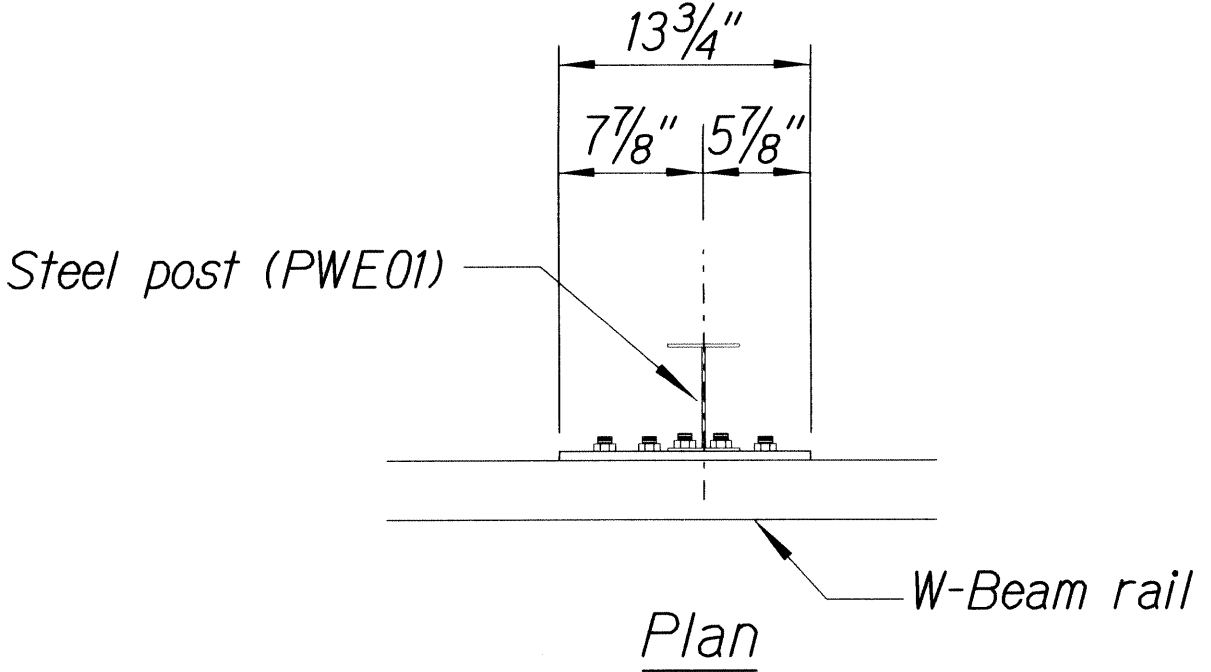
**Steel Plate - 1/2"**  
(Hot-dip Zinc Coated Galvanized-  
Welded or Bolted to Post)



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

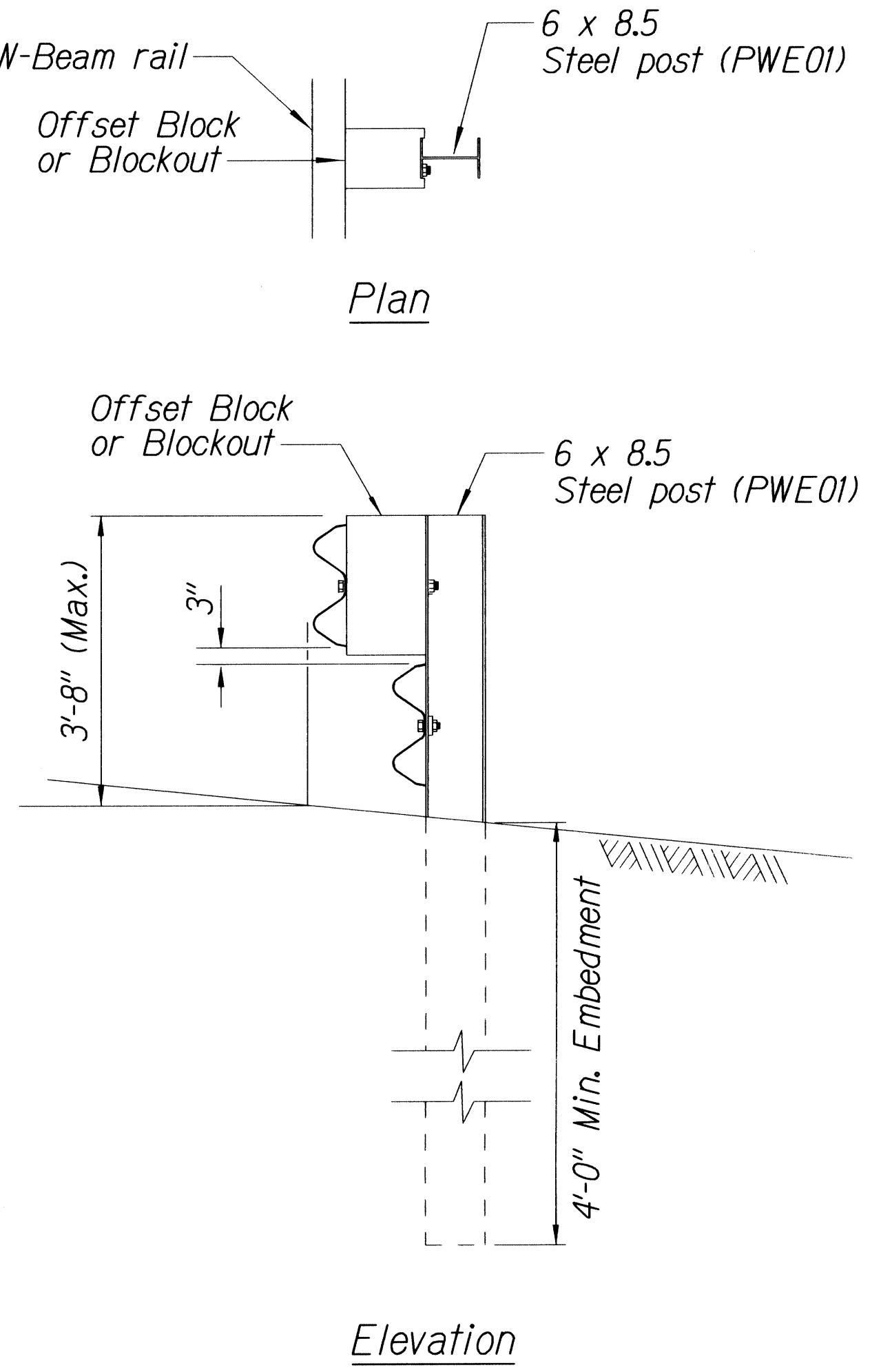
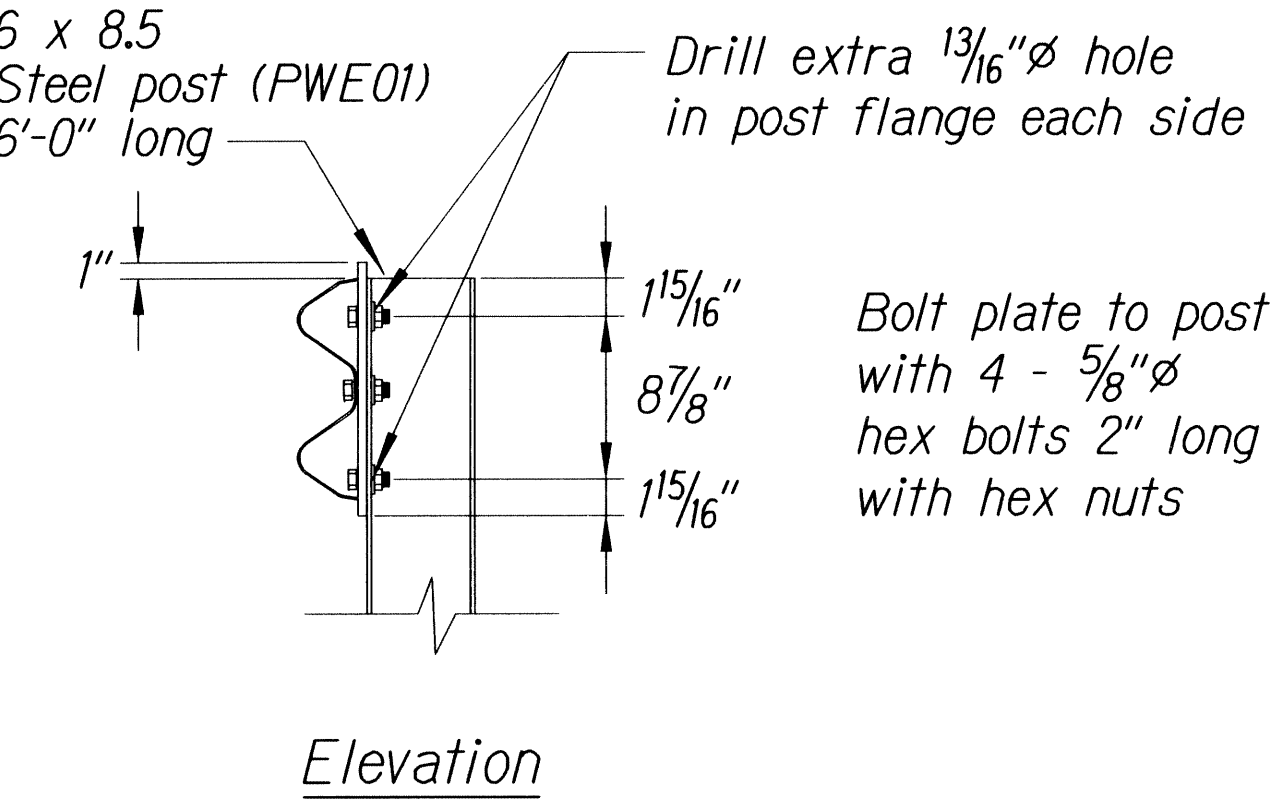


**RUBRAIL ANCHOR DETAILS**



**POST ANCHOR DETAILS**

**RUBRAIL DETAIL FOR MODIFIED TYPE "A-1" FLARE  
(WHEN CALLED FOR IN PLANS)**



**STEEL POST GUARDRAIL  
WITH RUBRAIL**

**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

**MODIFIED TYPE "A-1" FLARE**  
**RUBRAIL DETAILS**  
HAWAII BELT ROAD GUARDRAIL  
& SHOULDER IMPROVEMENTS  
Papalele Road to Kaunaloa Bridge  
Federal Aid Project No. NH-019-1(39)  
Scale: As Noted Date: Dec., 2011

SHEET No. 11 OF 11 SHEETS

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

15/12/01 10:00 AM guardrail/flare.al\_3dgn



