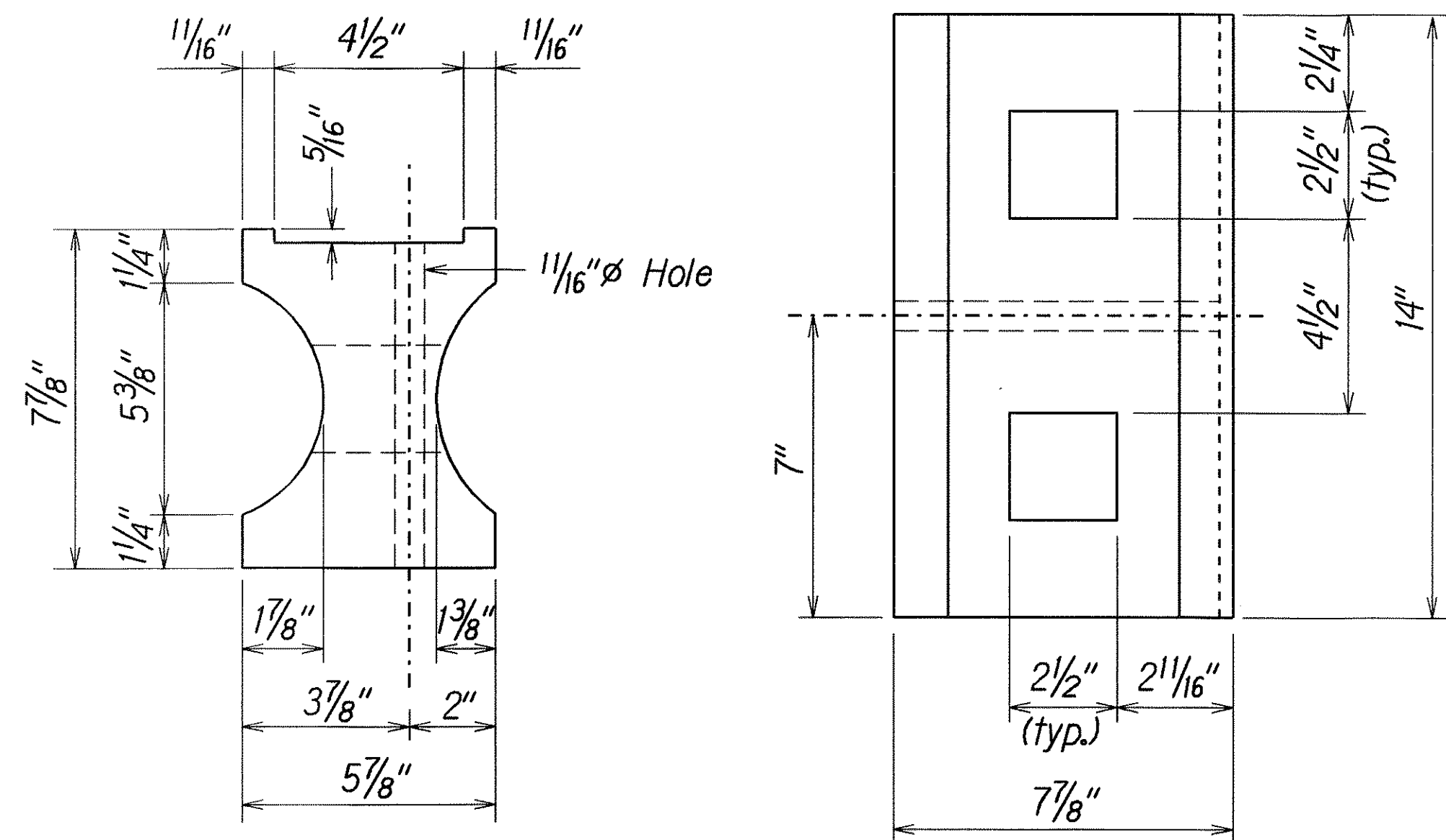


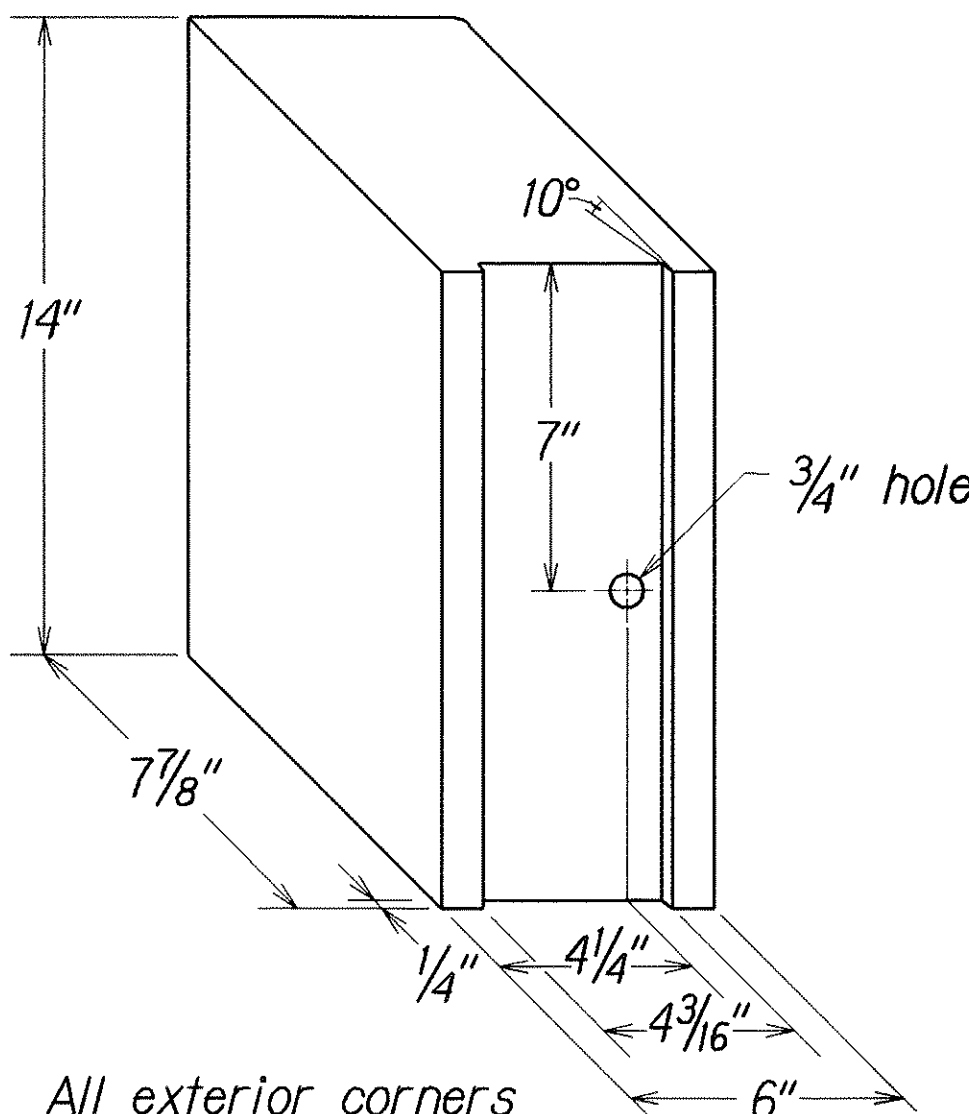
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	77	106

GENERAL NOTES

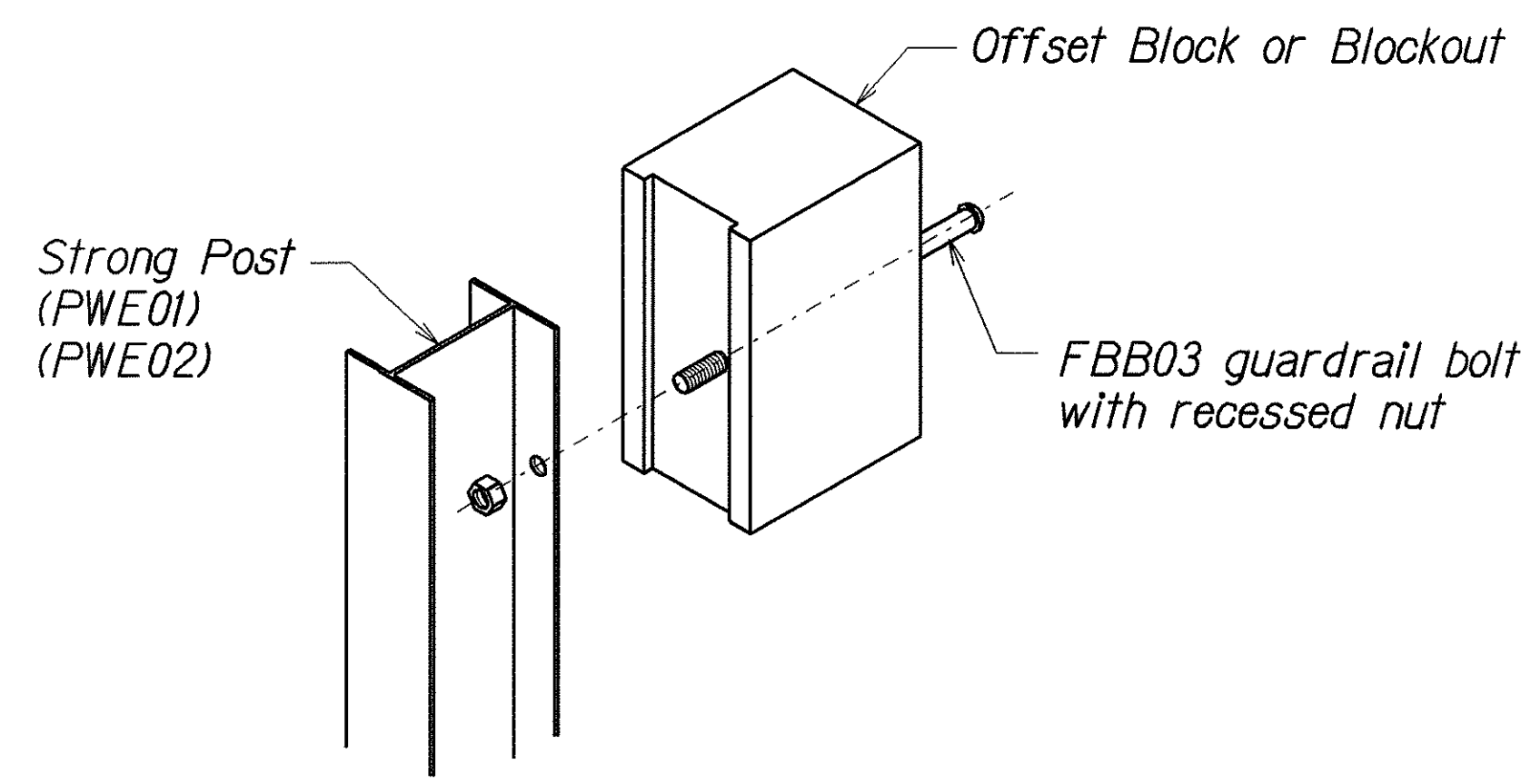
1. All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
2. Where conditions require, special post lengths in increments of 6 inches may be specified.
3. All fasteners, posts, and rail elements (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.



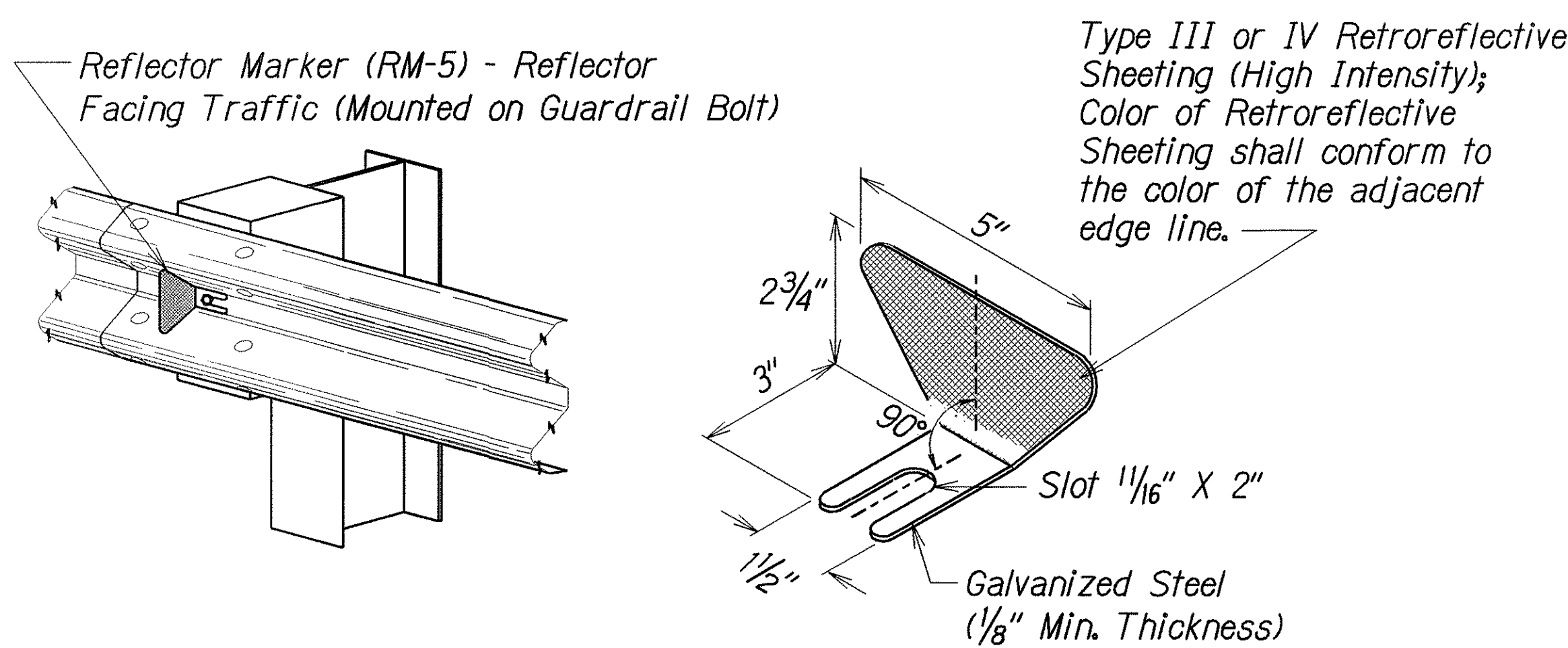
TOP  
RECYCLED PLASTIC BLOCKOUT (TYPE I)



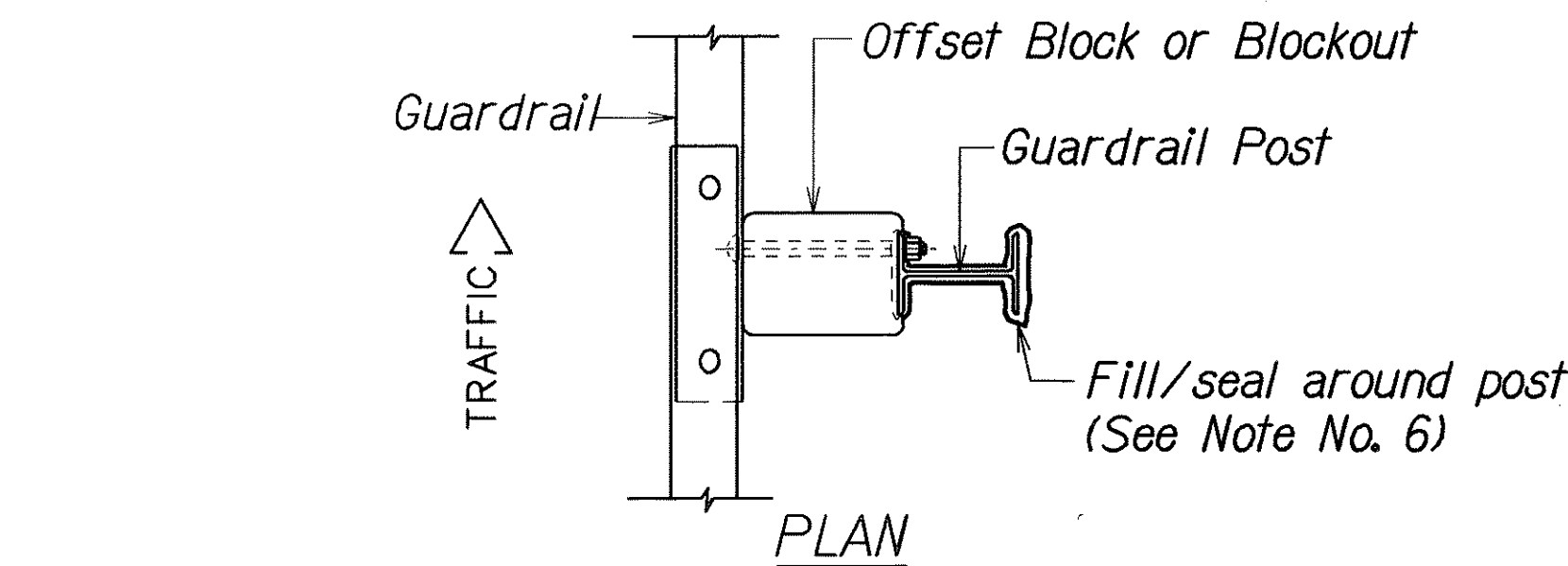
RECYCLED POLYETHYLENE  
OFFSET BLOCK (TYPE II)



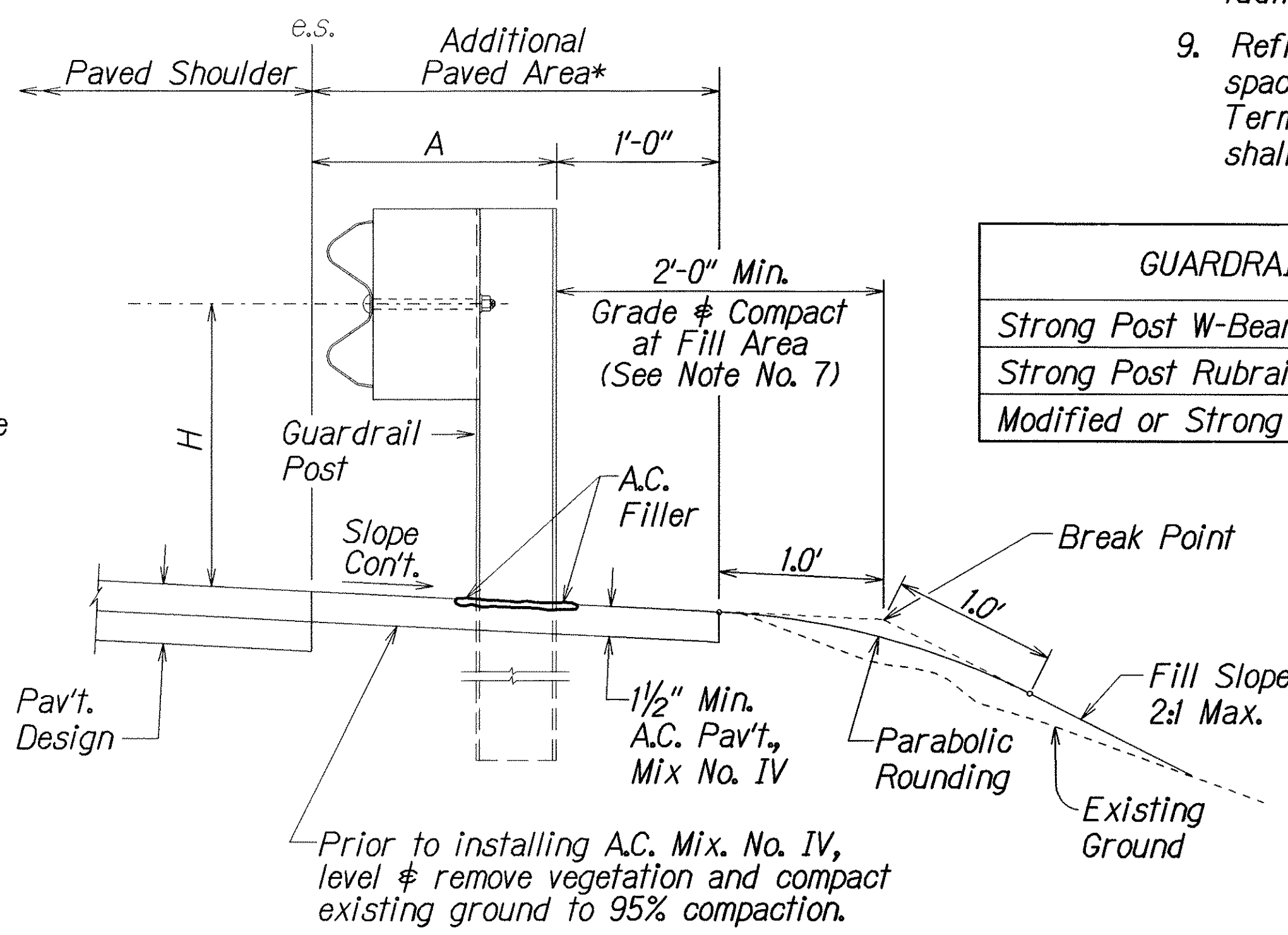
Exploded View  
(Rail and washer not shown)  
STEEL POST AND BLOCK DETAIL



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



PLAN



ELEVATION

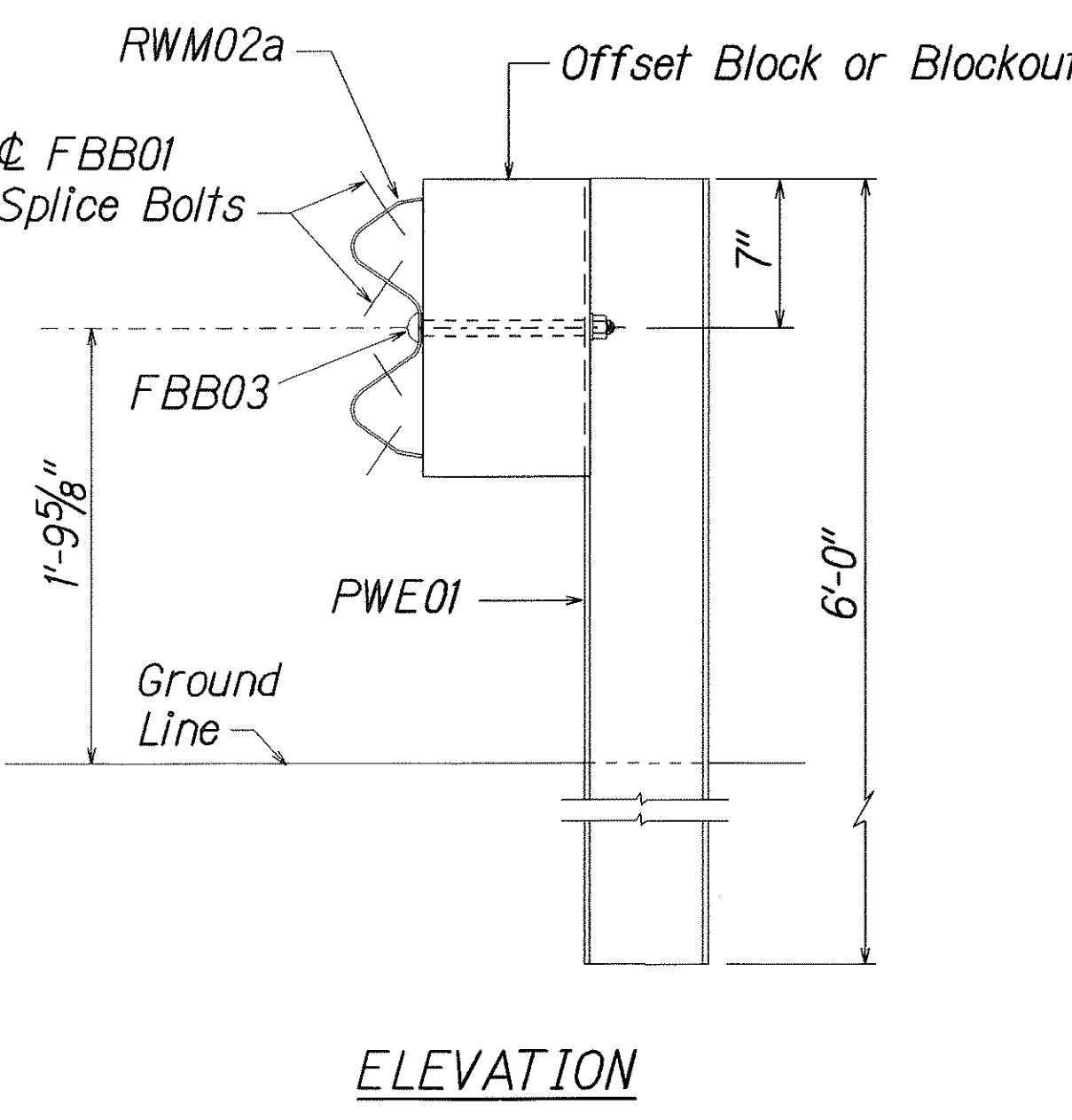
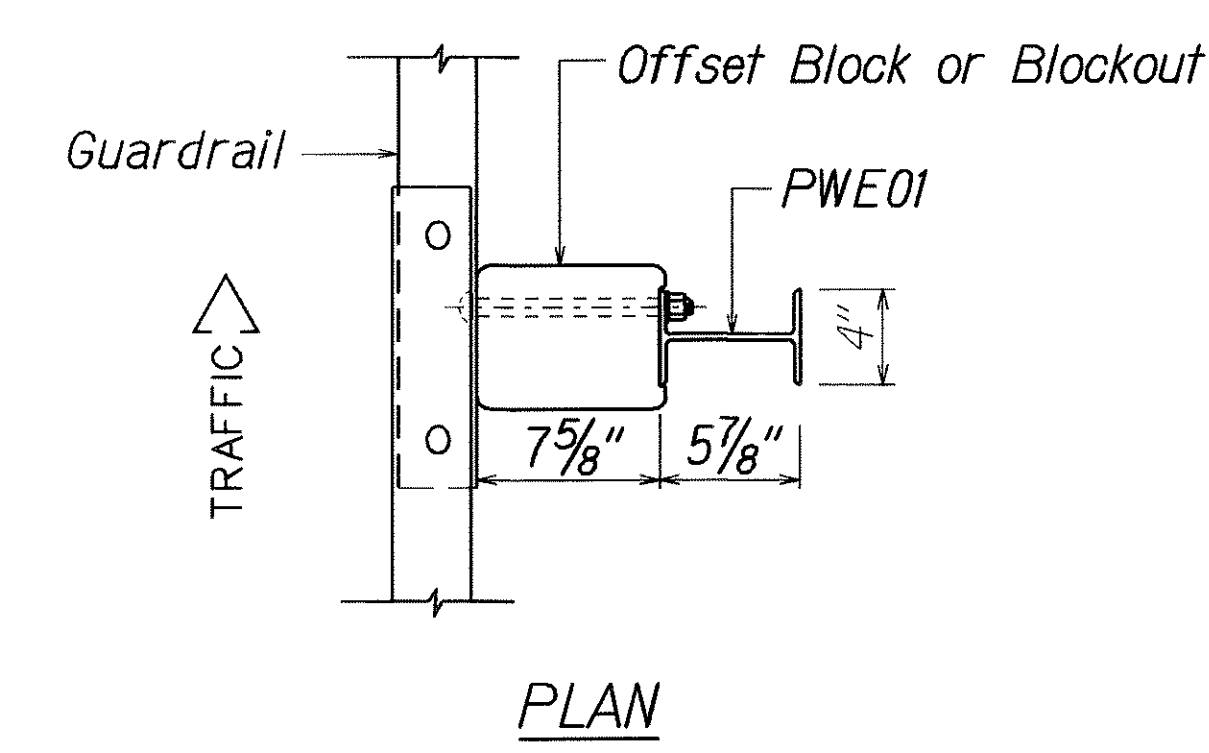
TYPICAL GUARDRAIL INSTALLATION

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"

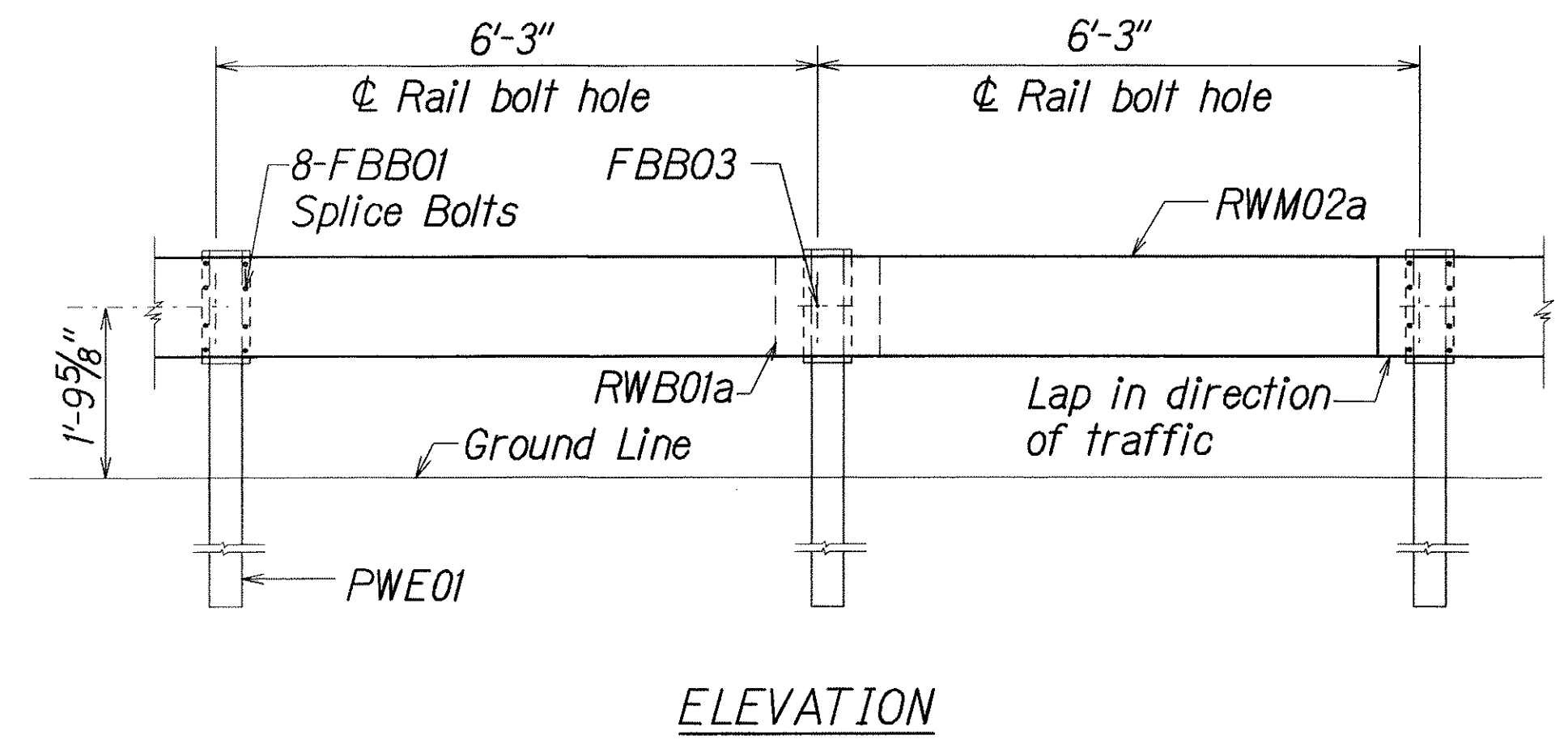
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS & NOTES**  
OLD KEAAU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M  
Scale: NTS  
Date: Nov., 2004

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	78	106

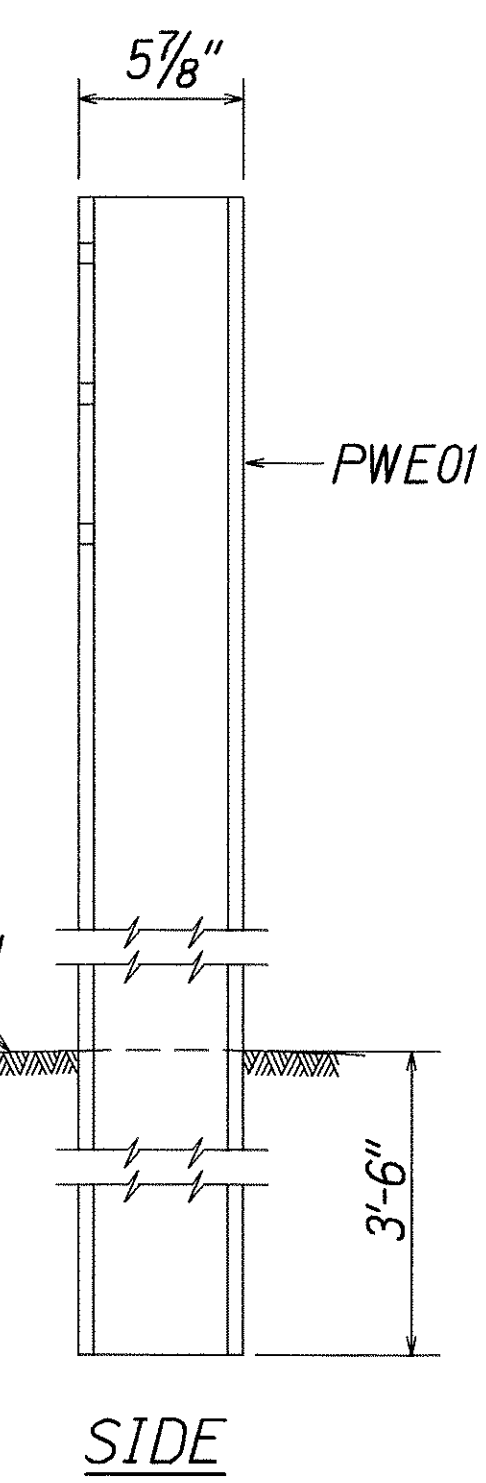


**STRONG POST W-BEAM GUARDRAIL (SGR04a)**

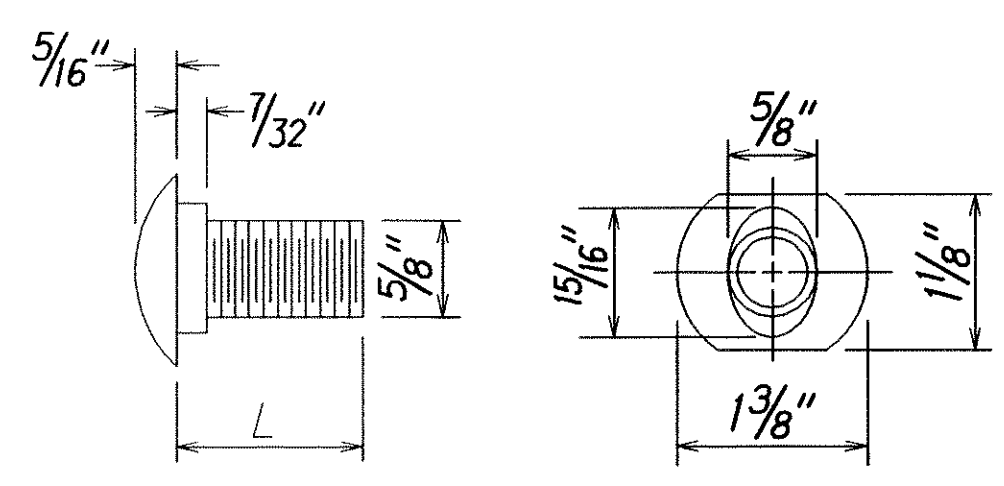
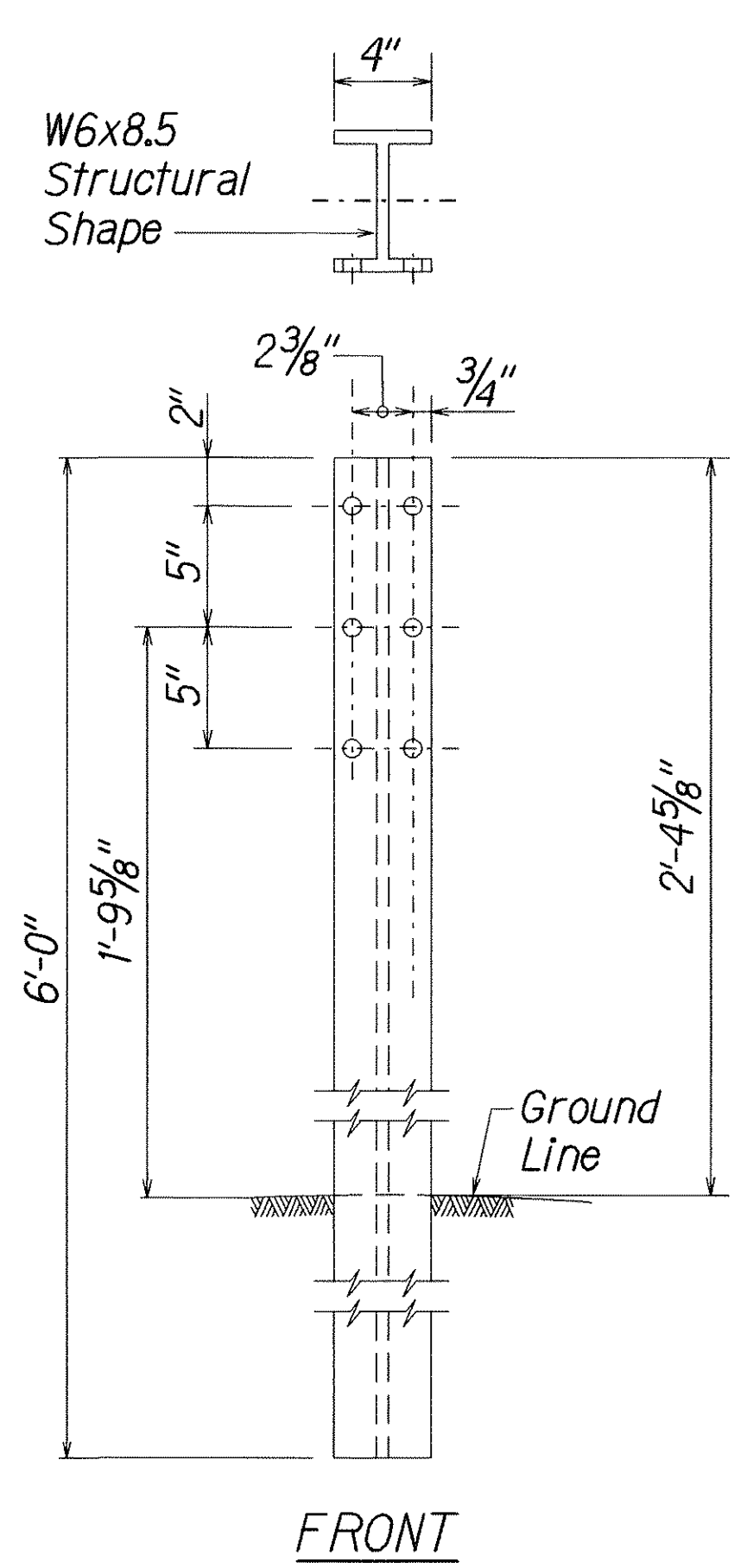


**STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT**

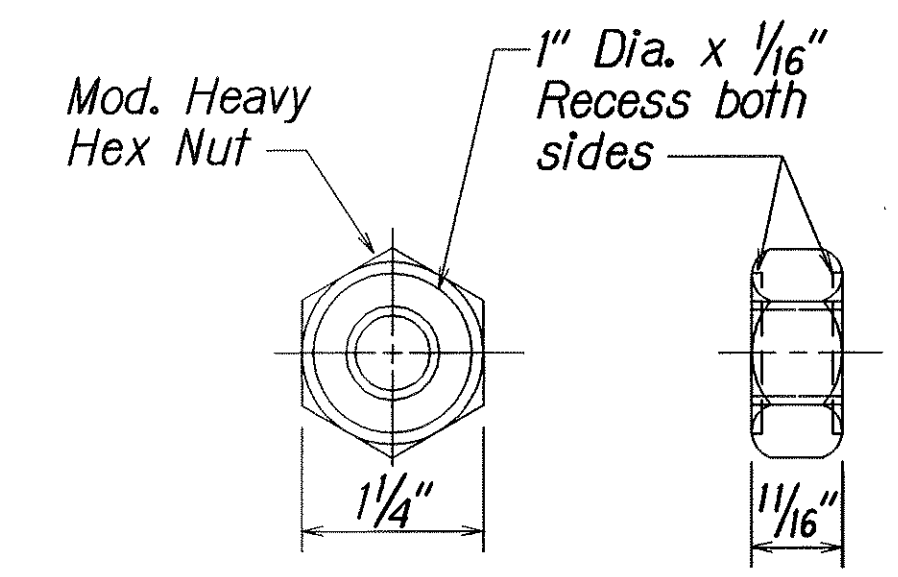
NOTE:  
All Holes are 3/4" Dia.



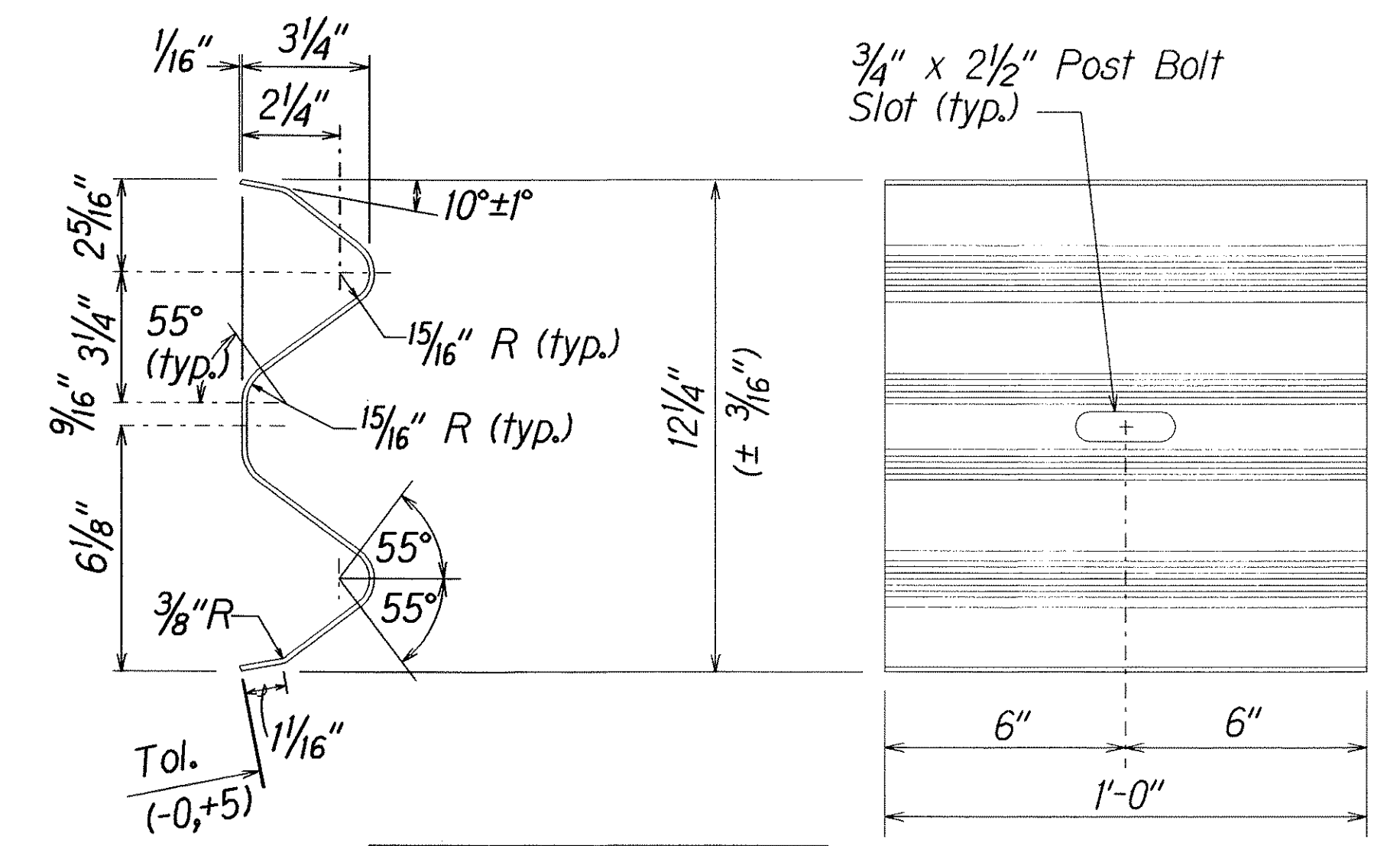
**W-BEAM STRONG POST (PWE01)**



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

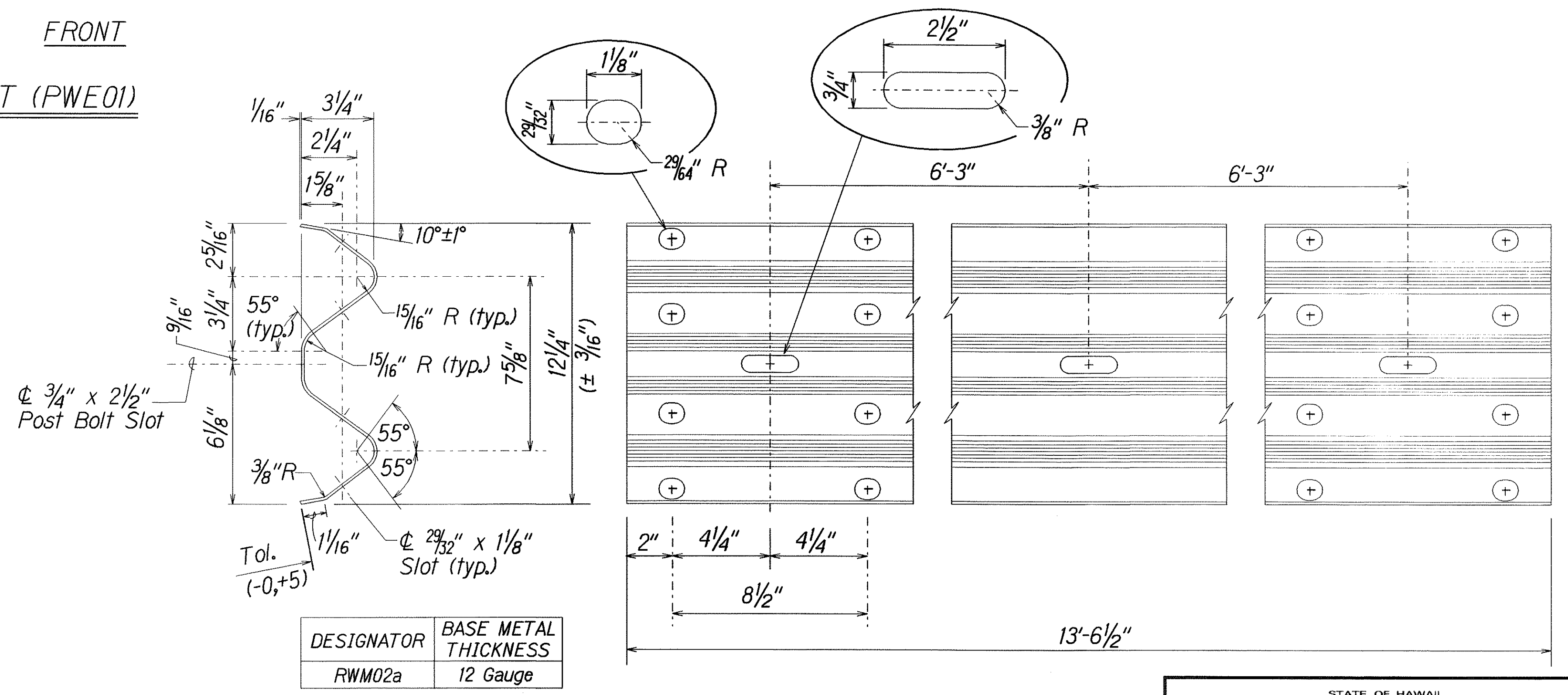


**GUARDRAIL BOLTS AND RECESSED NUT**



DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

**W-BEAM BACK-UP-PLATE (RWB01a)**



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

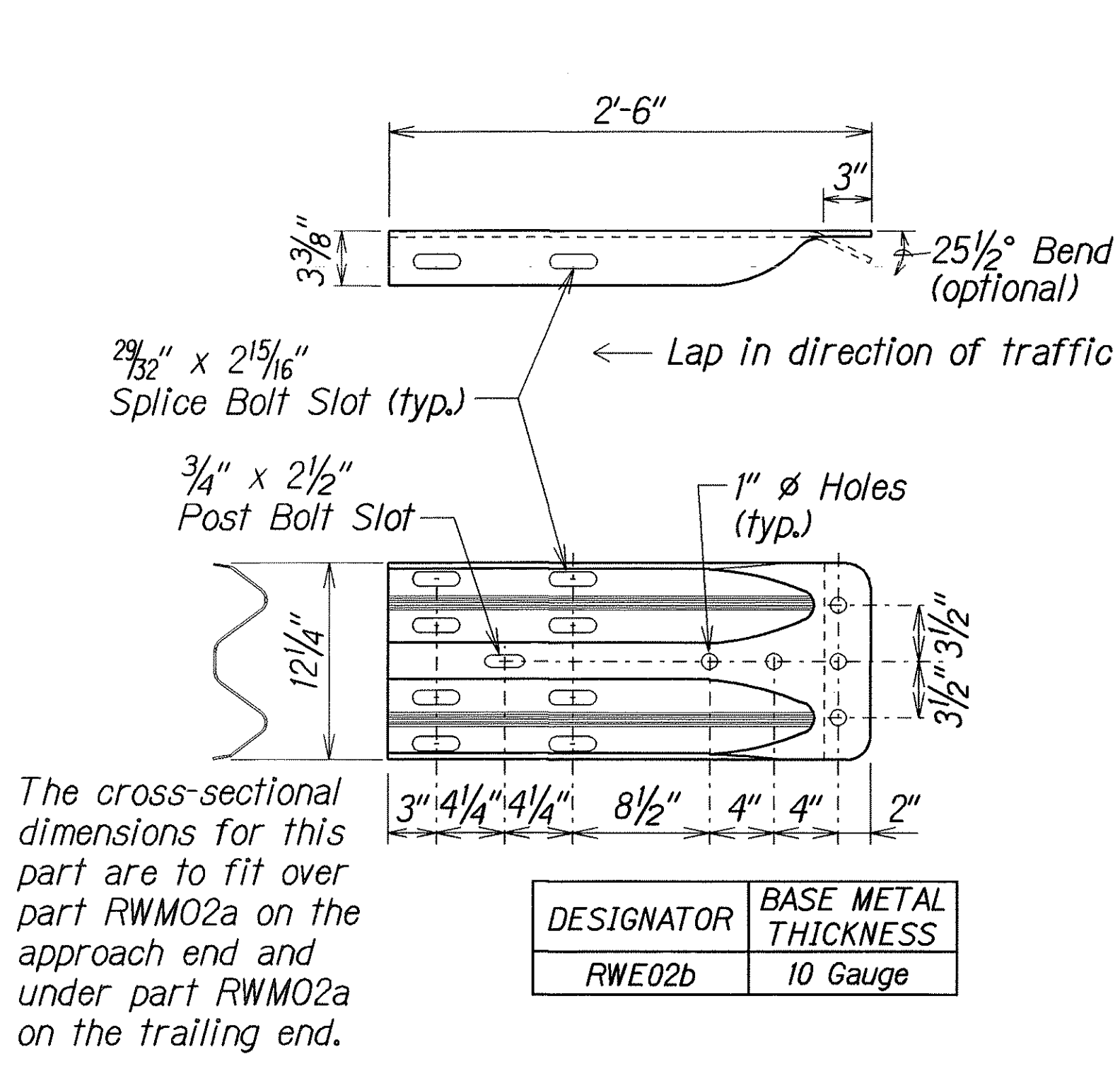
**2 SPACE W-BEAM GUARDRAIL (RWM02a)**

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

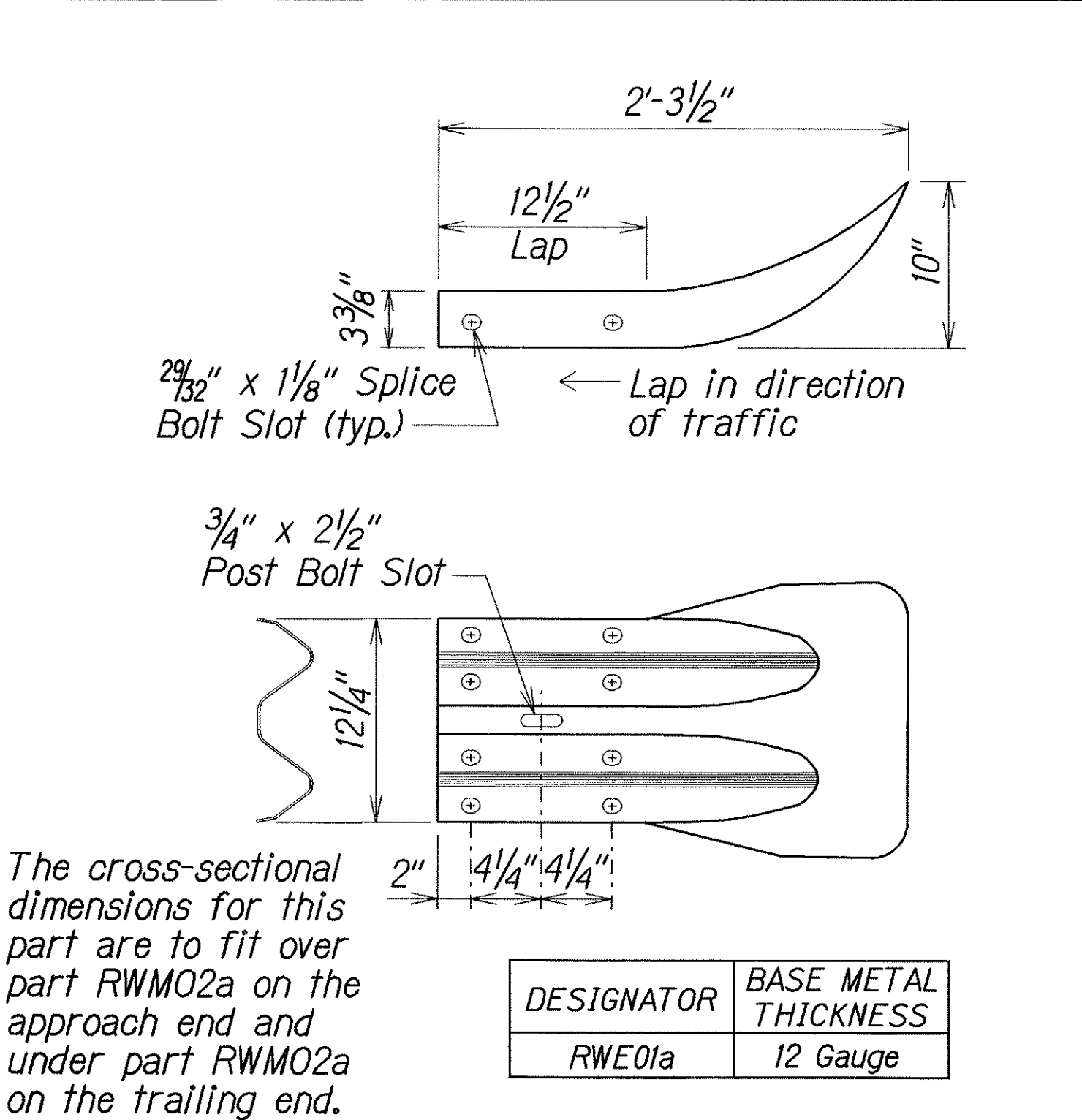
**STRONG POST W-BEAM GUARDRAIL**  
**OLD KEAAU-PAHOA ROAD RESURFACING**  
**KEA'AU TO KEAAU HIGH SCHOOL**  
**PROJECT NO. 139A-01-05M**  
Scale: NTS  
Date: Nov., 2004



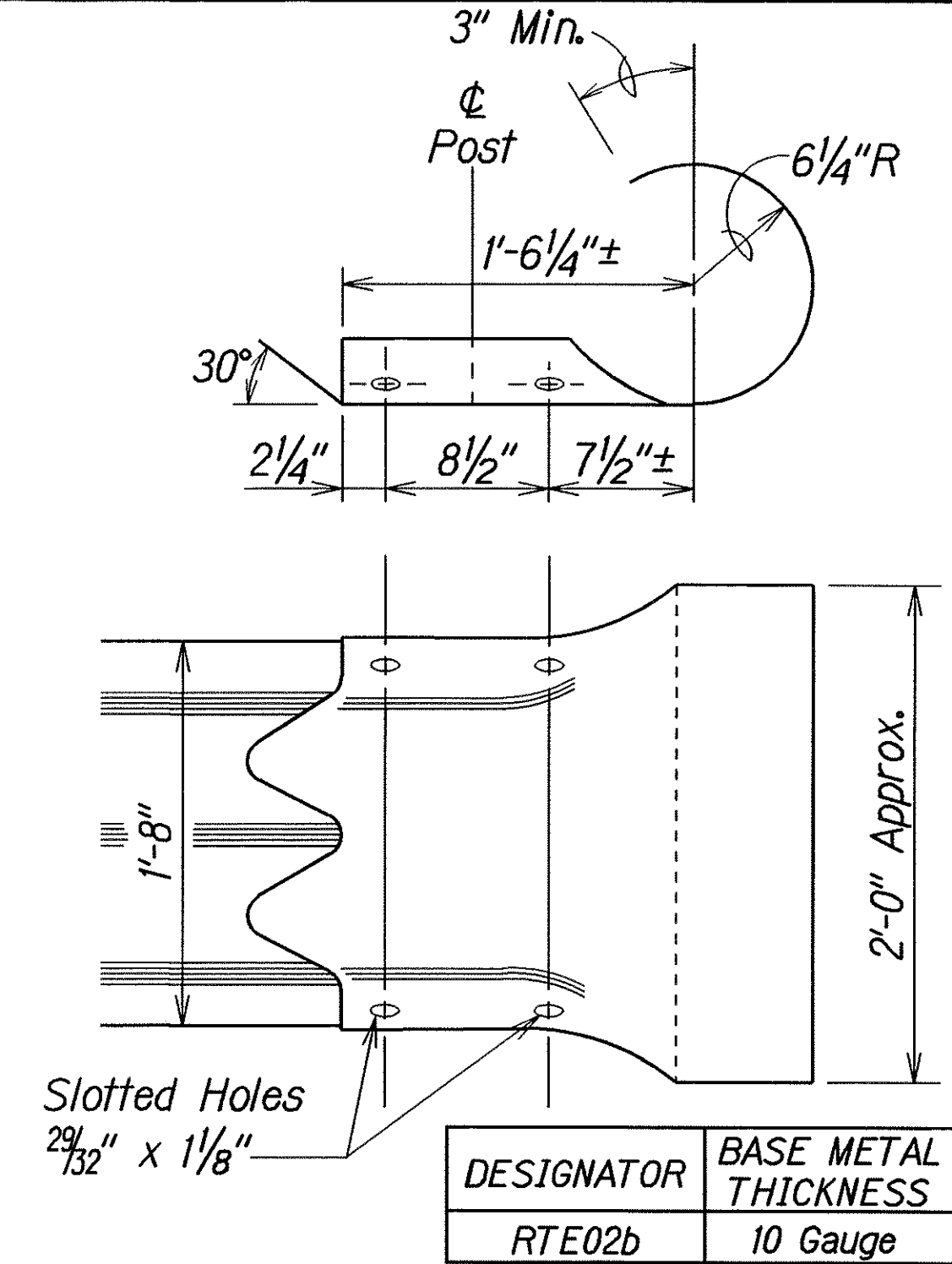
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	79	106



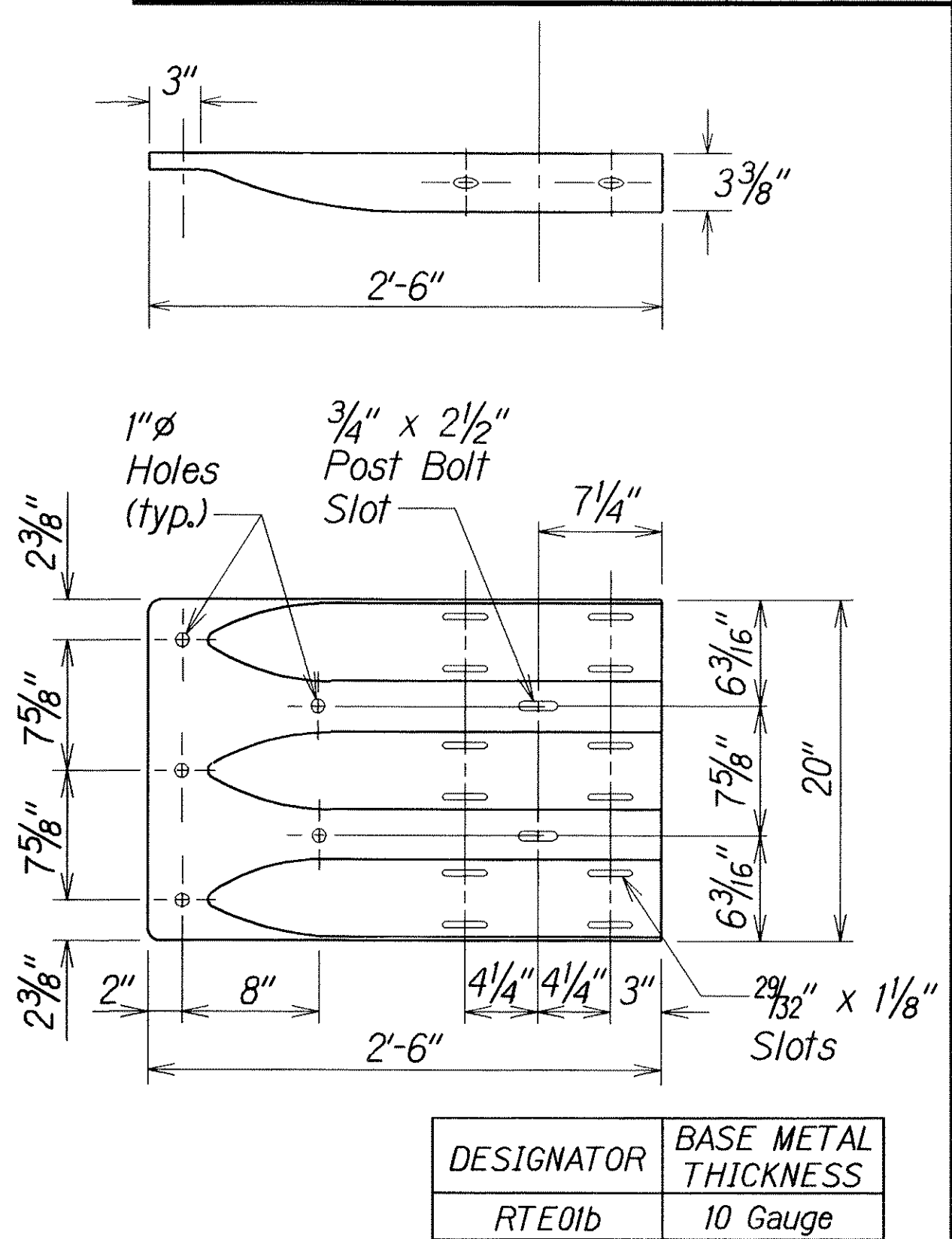
**W-BEAM TERMINAL CONNECTOR (RWE02b)**



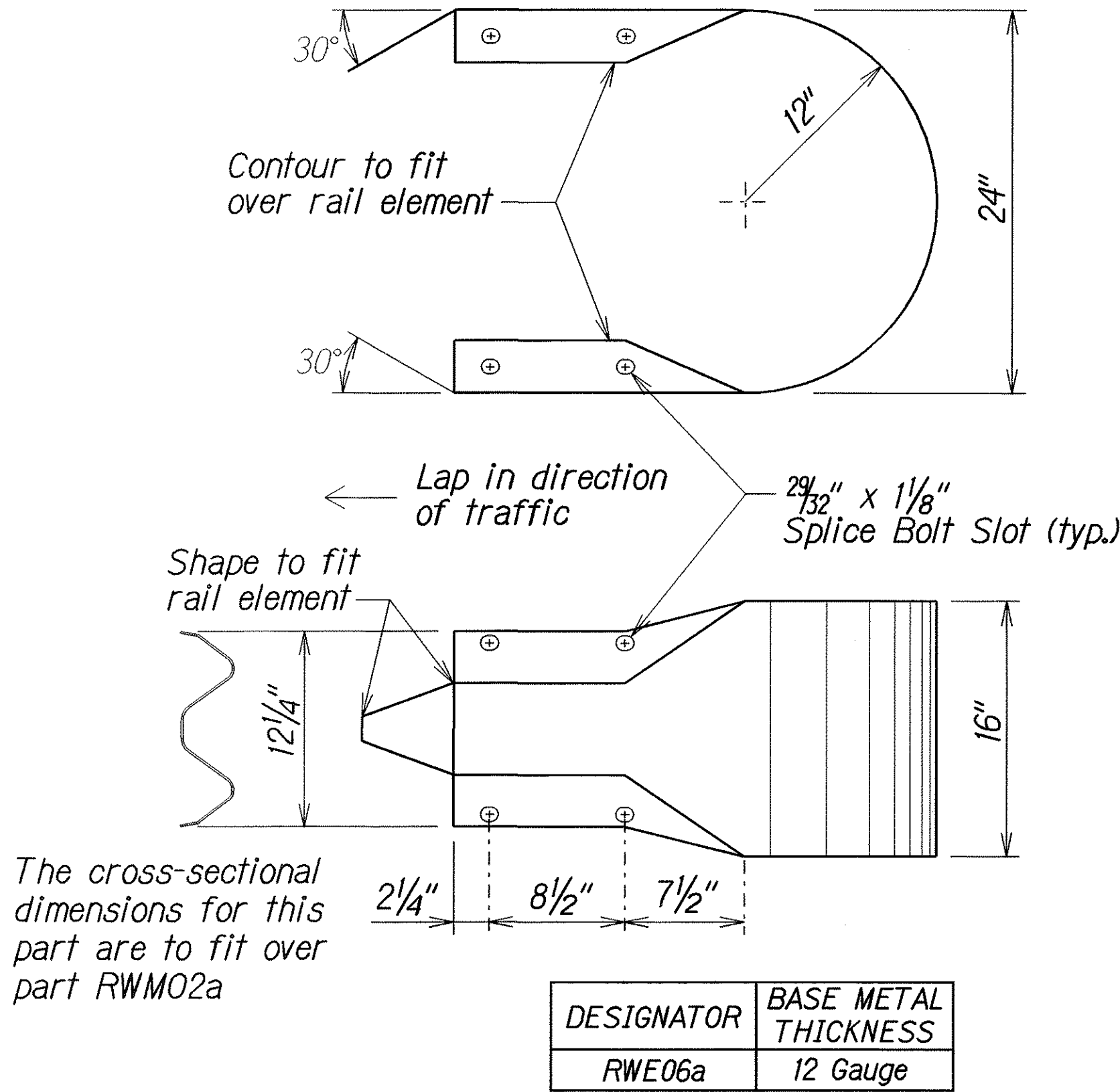
**W-BEAM END SECTION (FLARED RWE01a)**



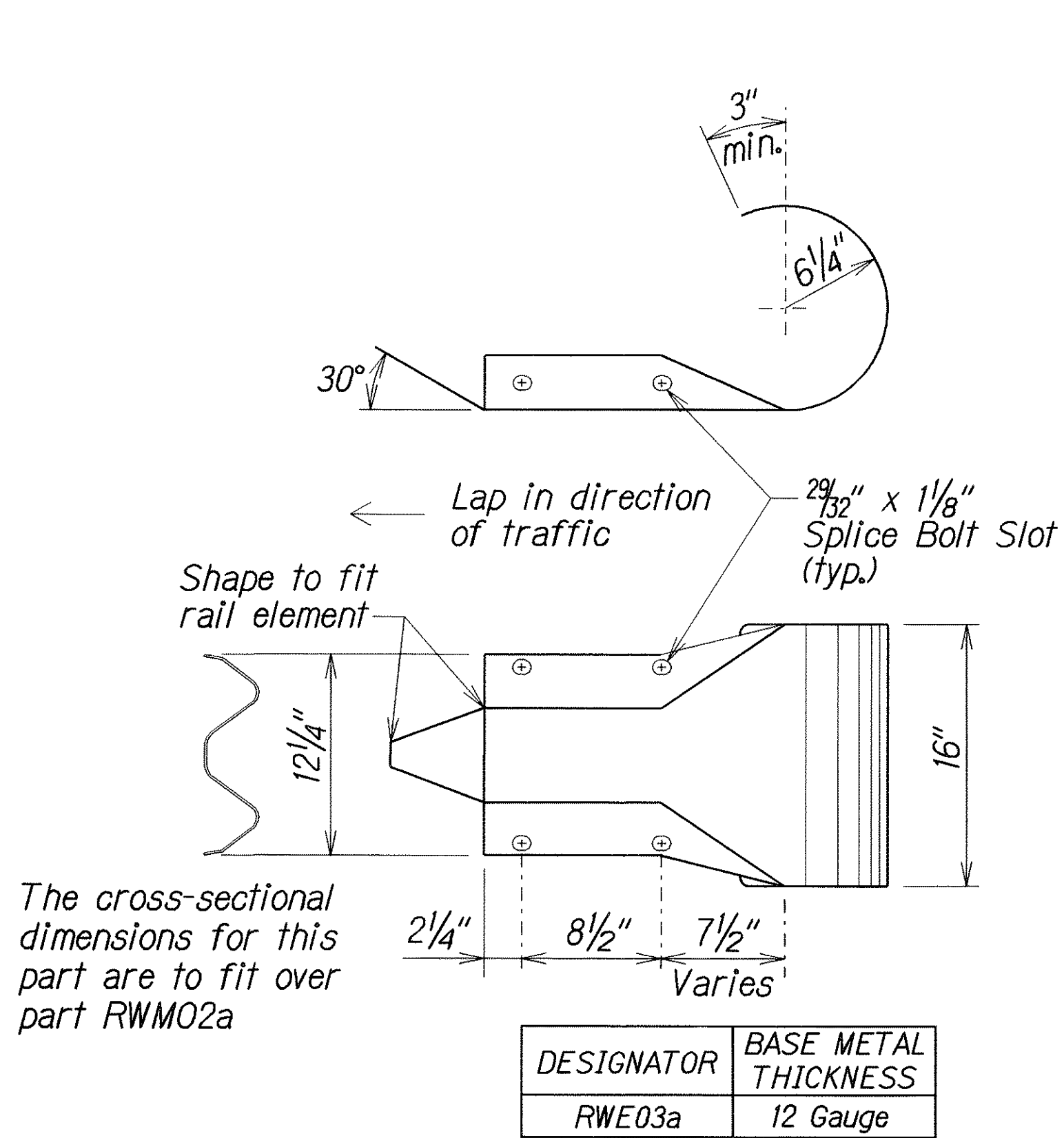
**THRIE-BEAM SECTION (ROUNDED) (RTE02b)**



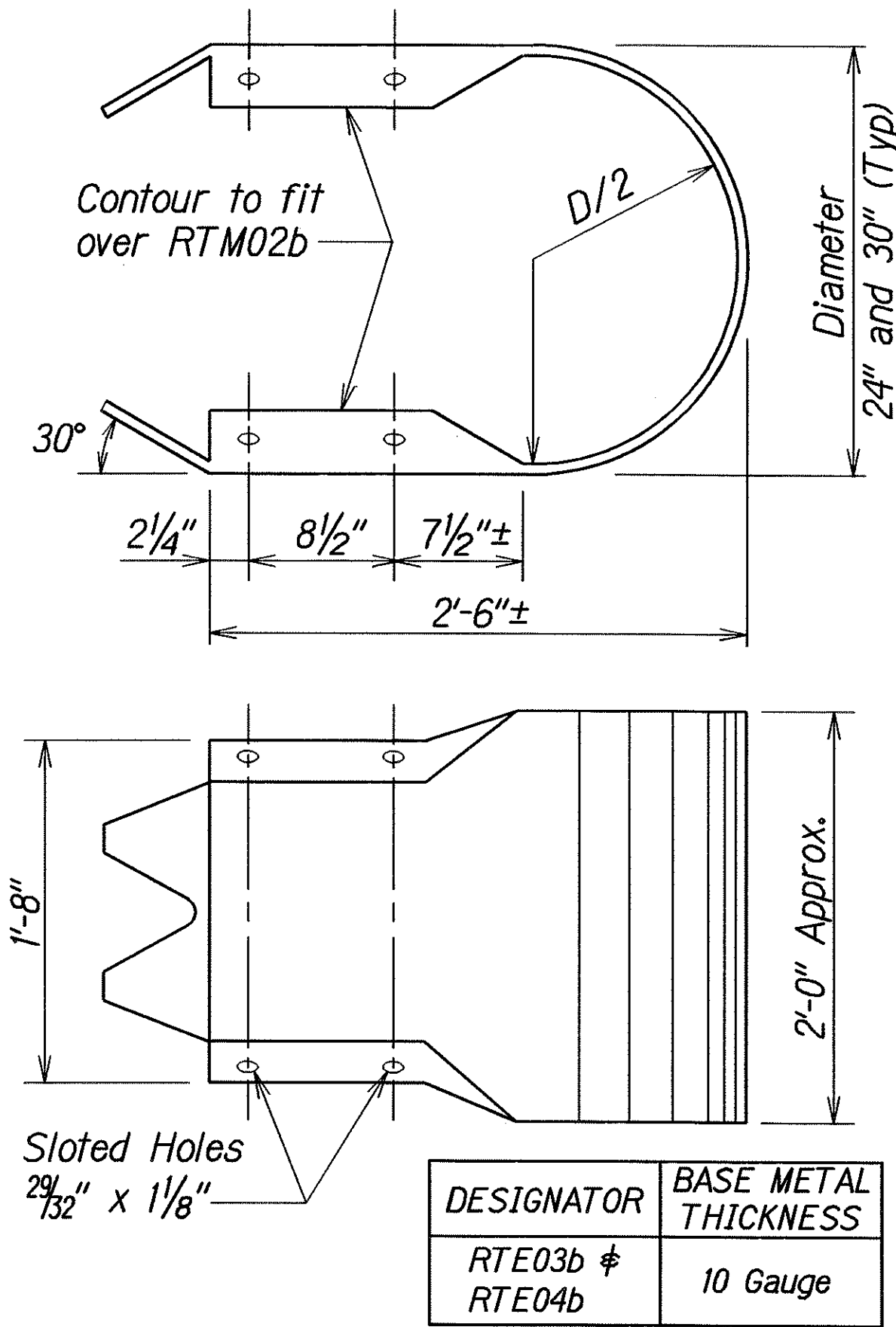
**THRIE-BEAM TERMINAL CONNECTOR (RTE01b)**



**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**  
OLD KEA'AU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO 139A-01-05M  
Scale: NTS Date: Nov., 2004

SHEET No. 3 OF 20 SHEETS

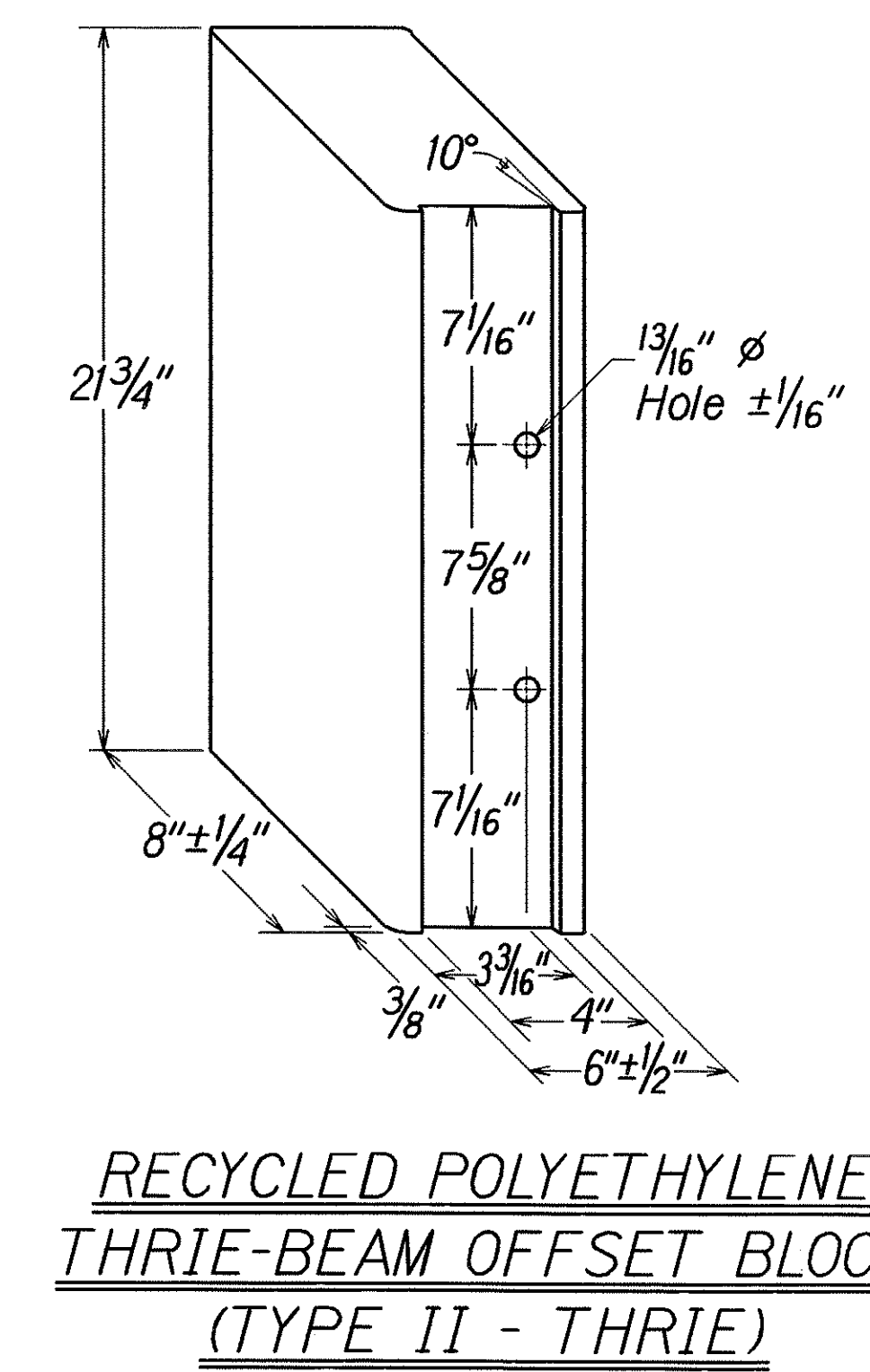
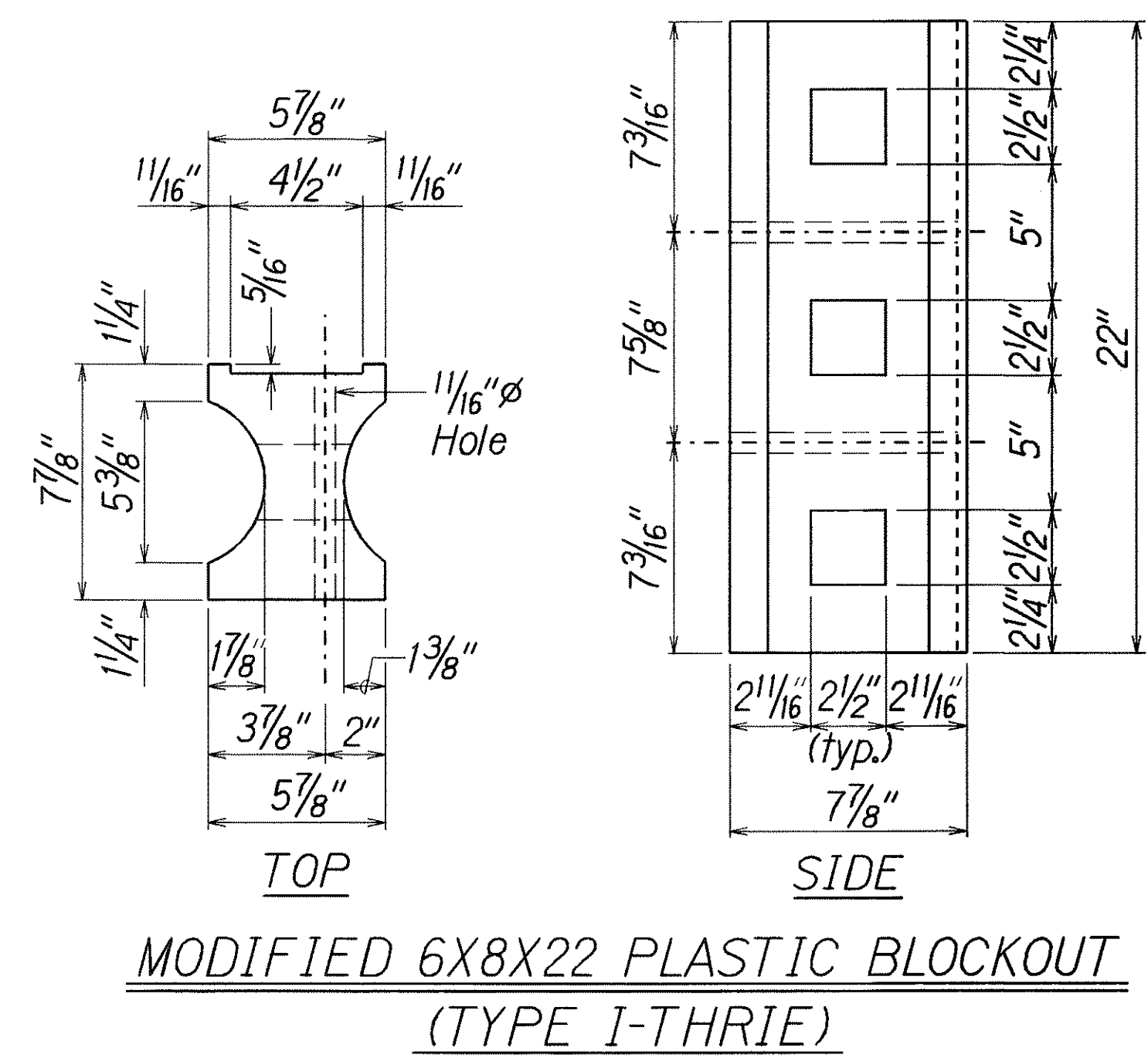
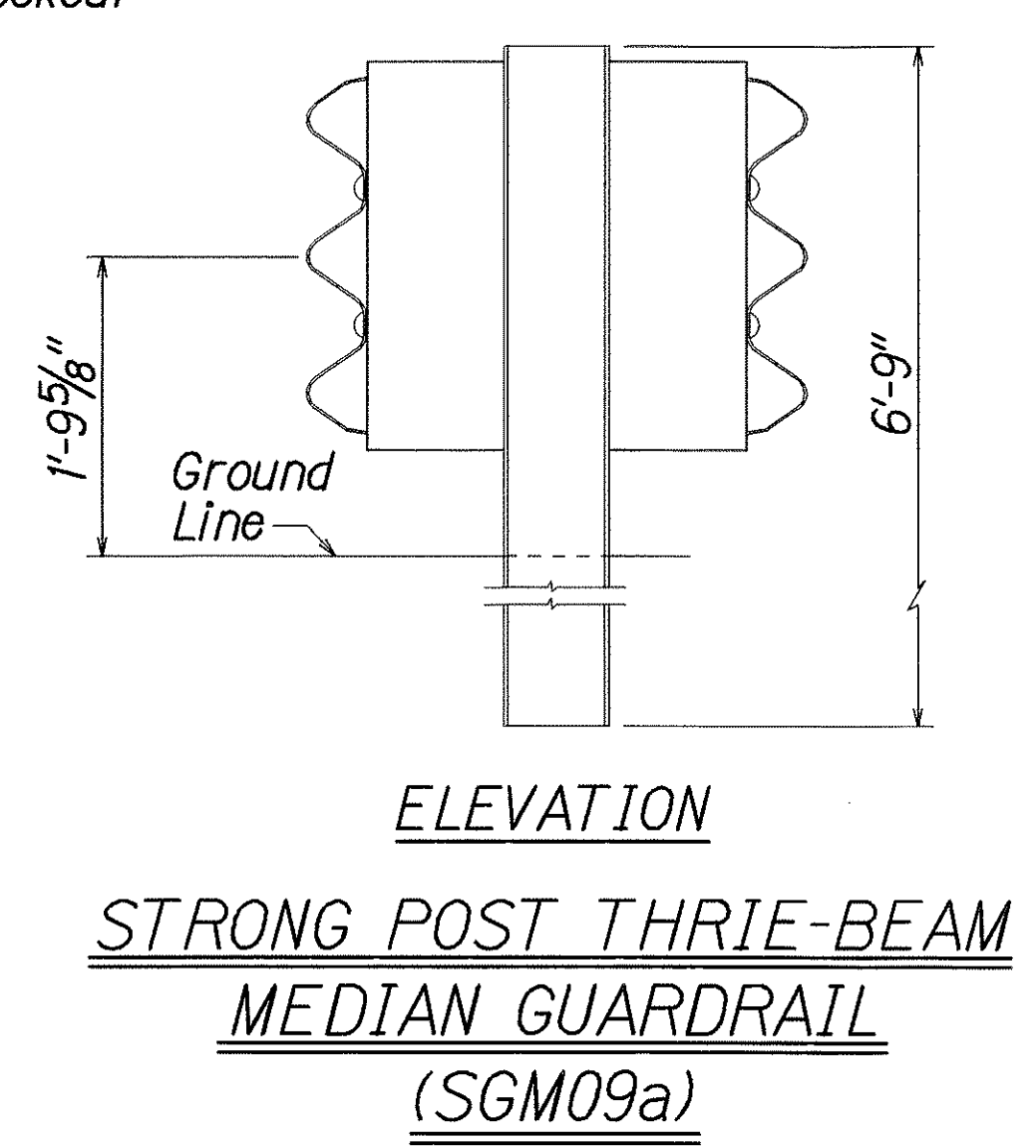
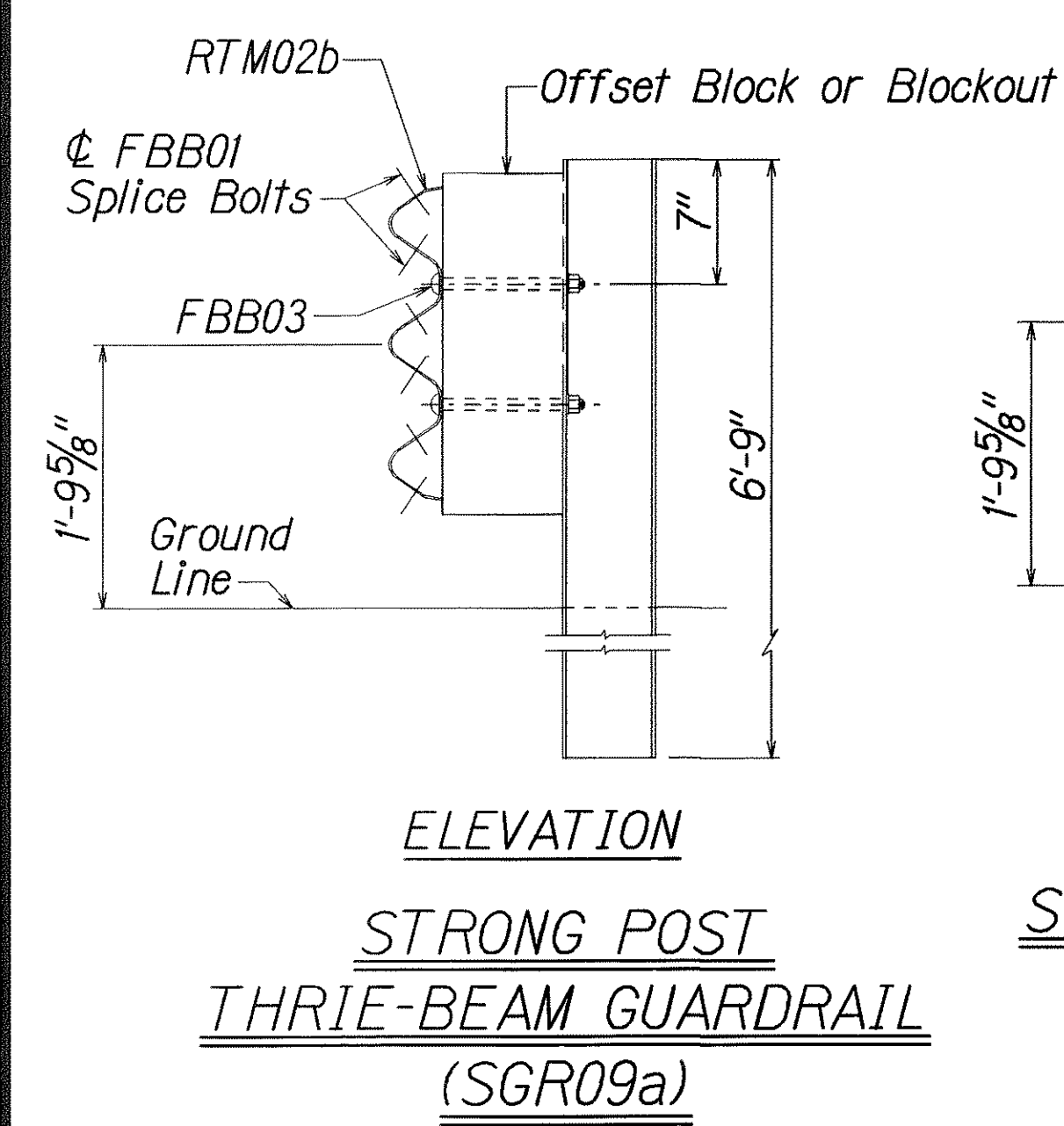
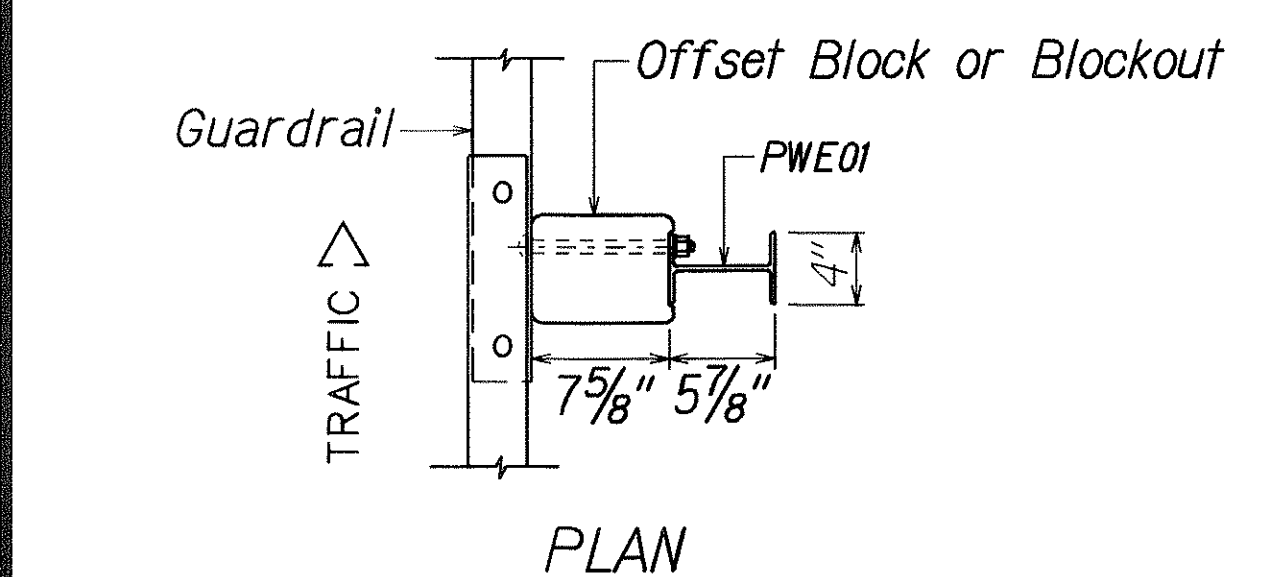
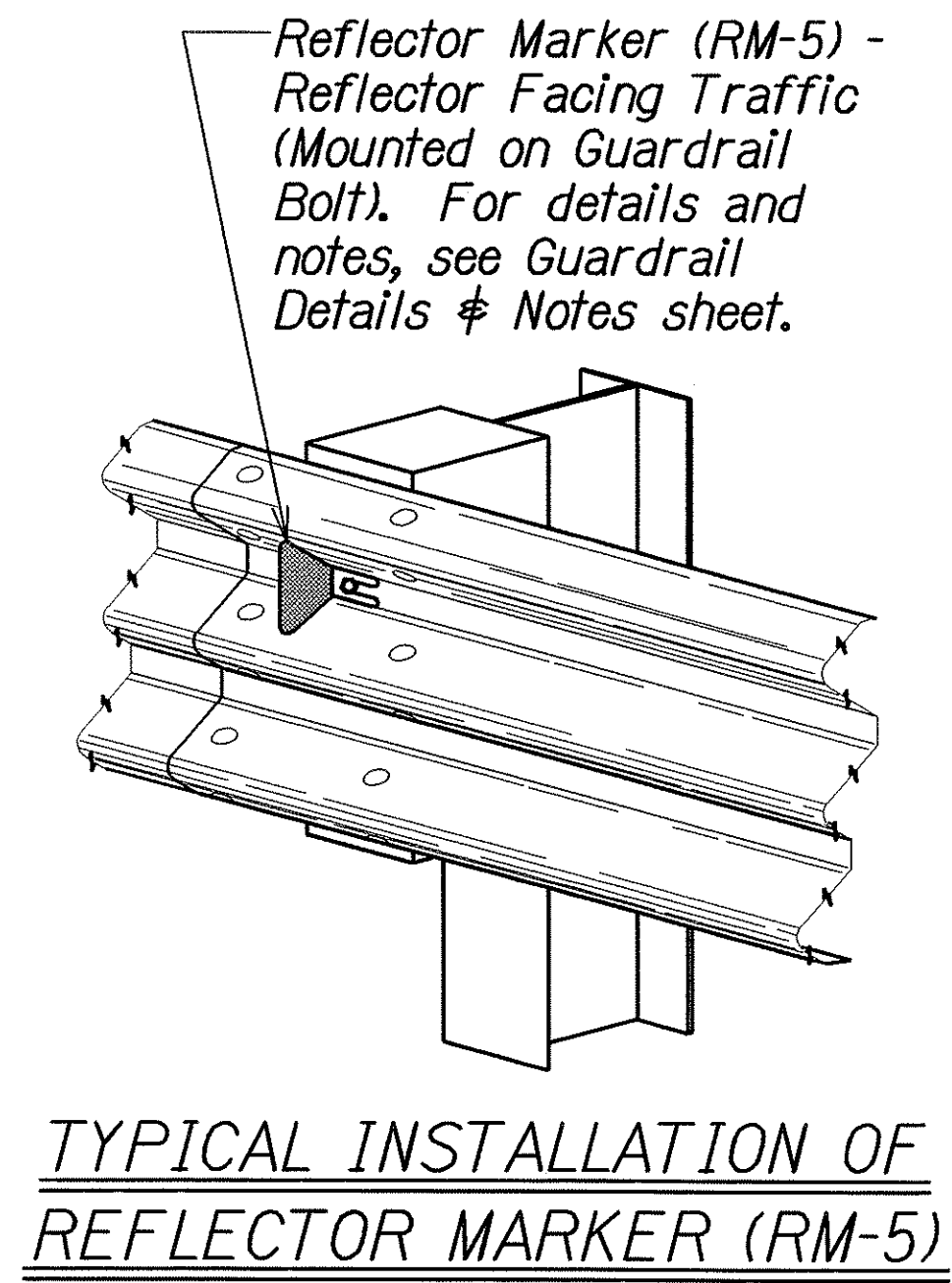
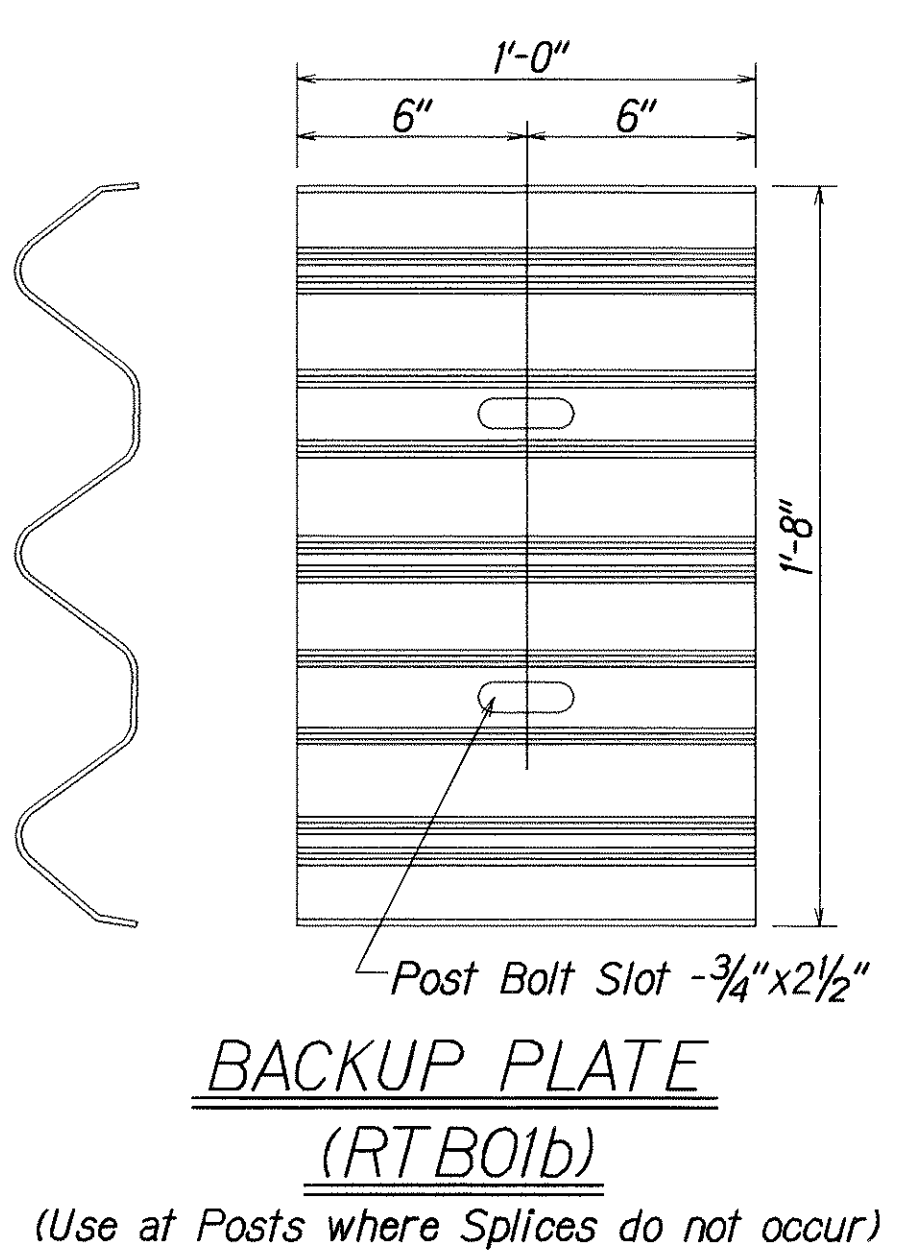
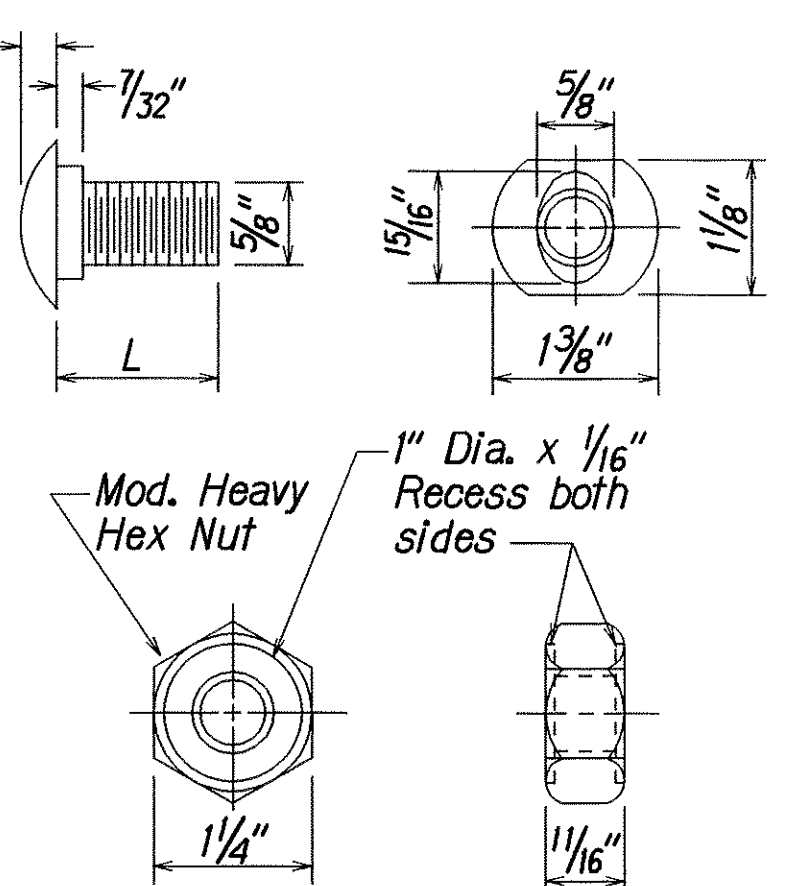
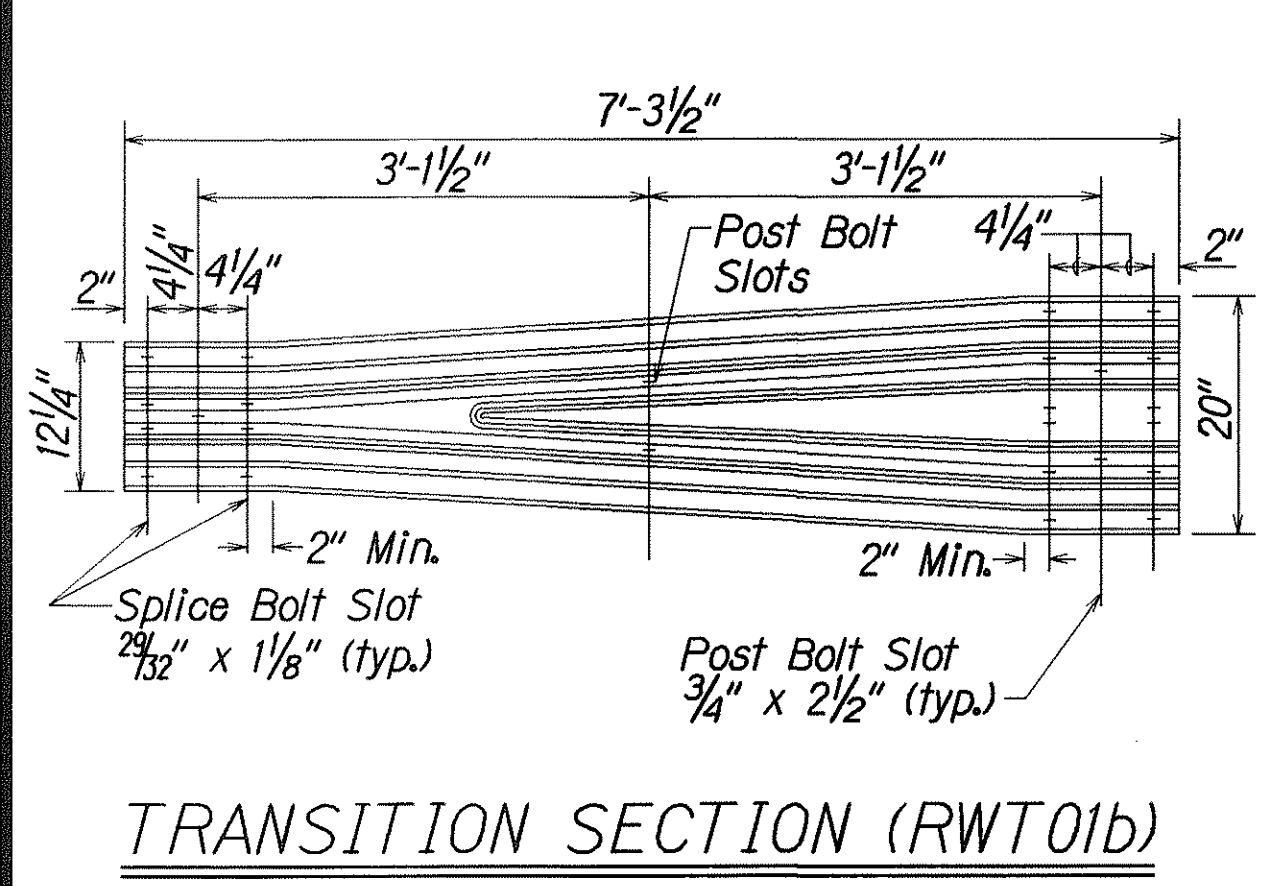
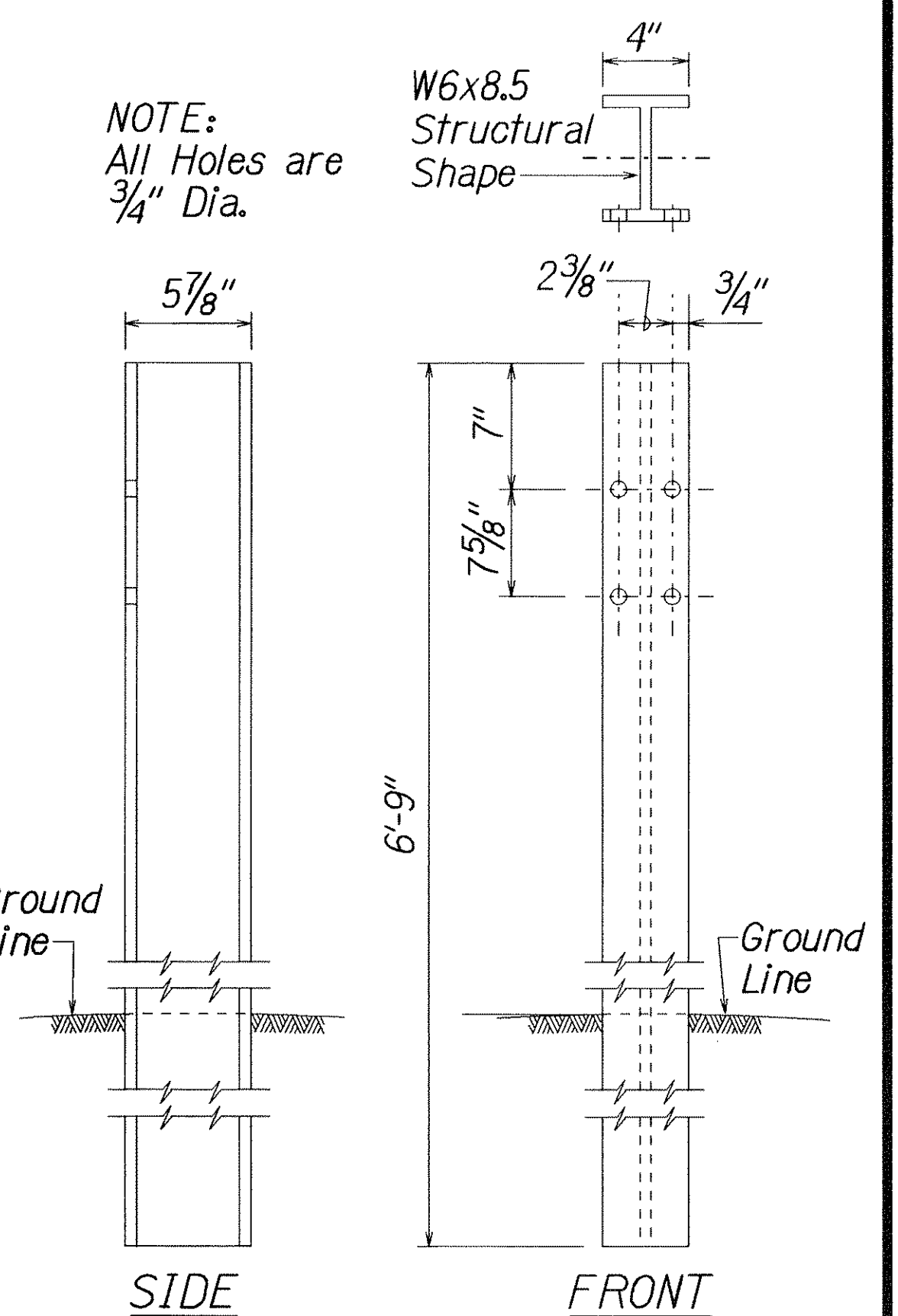
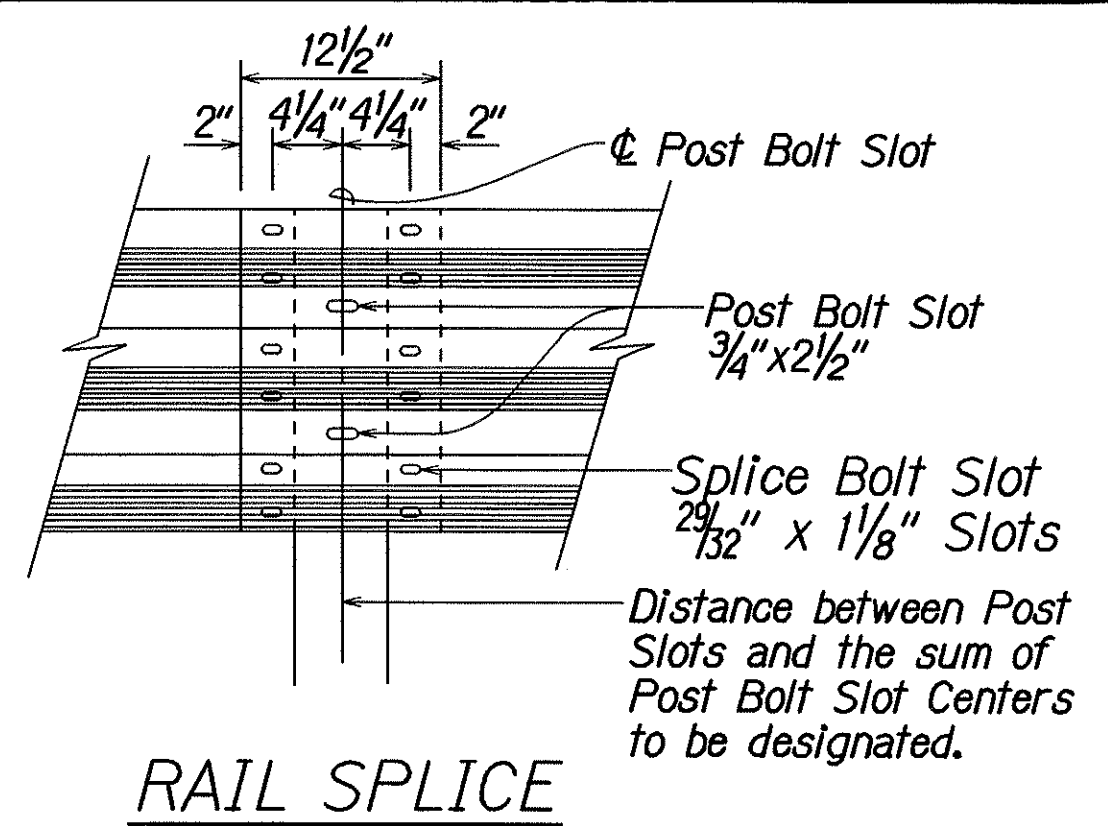
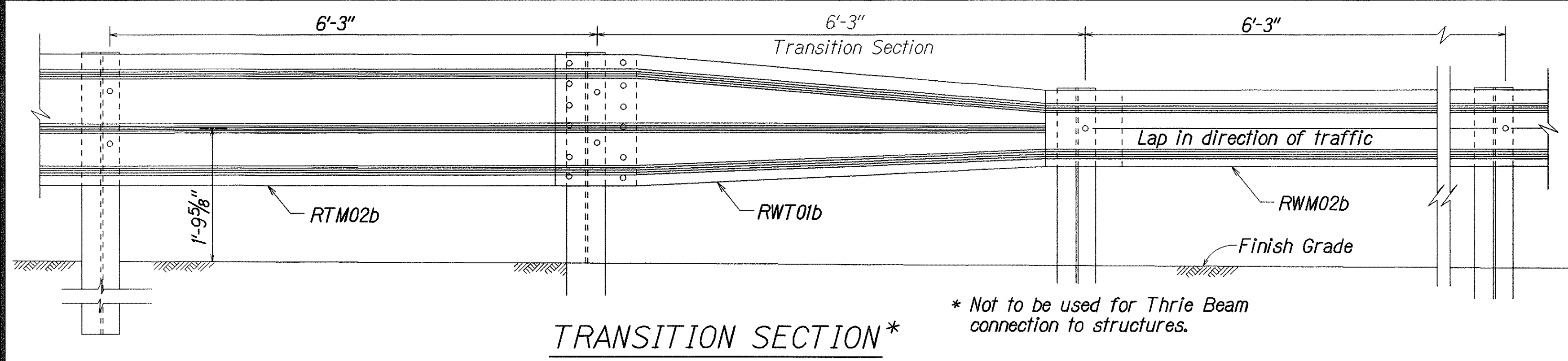
ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
DESIGNED BY	
NOTED BY	
CHECKED BY	
APPROVED BY	

15/21/01 tdt/cub/guardrail/terdwg (standard plan, TE-51, R09/01/87)





FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	81	106



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**STRONG POST  
THRIE-BEAM GUARDRAIL**

OLD KEA'AU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO 139A-01-05M

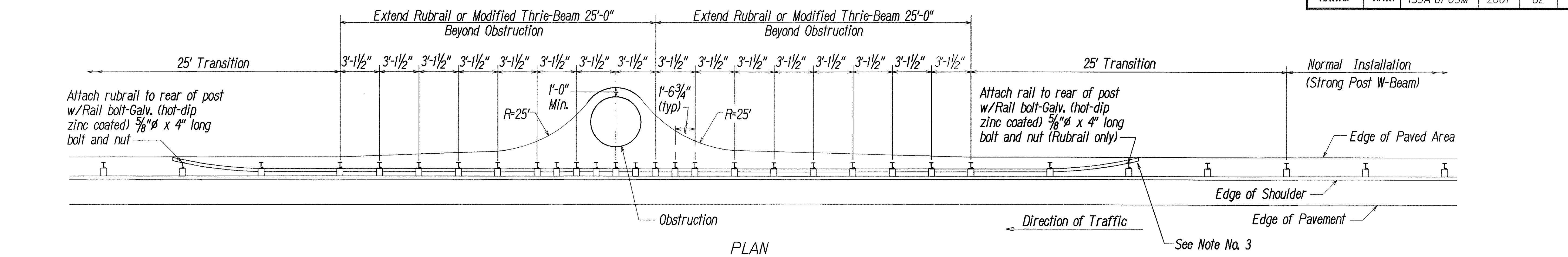
Scale: NTS Date: Nov., 2004

SHEET No. 5 OF 20 SHEETS

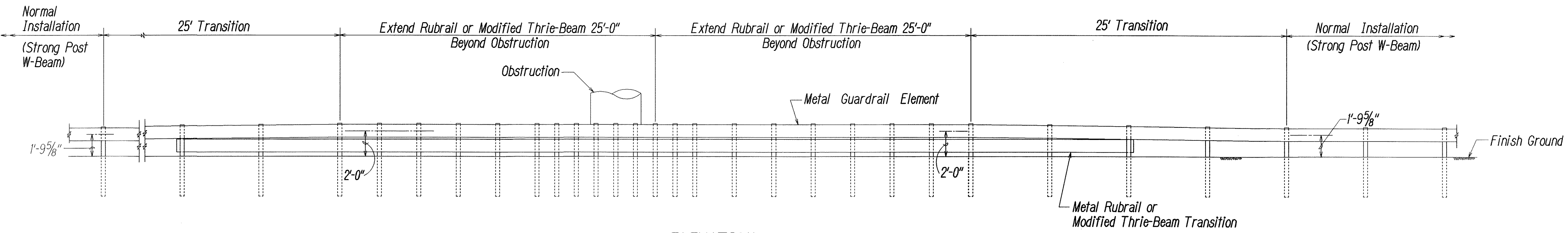
ORIGINAL PLAN	DATE
DESIGNED BY	
TRACED BY	
NOTED BY	
QUANTITIES BY	
CHECKED BY	

12/17/03 tdt:ubj:guardrail/thriebeam.dgn (standard plan TE-57 r1/03/03) # TE-57a r1/03/03 (89)

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	82	106



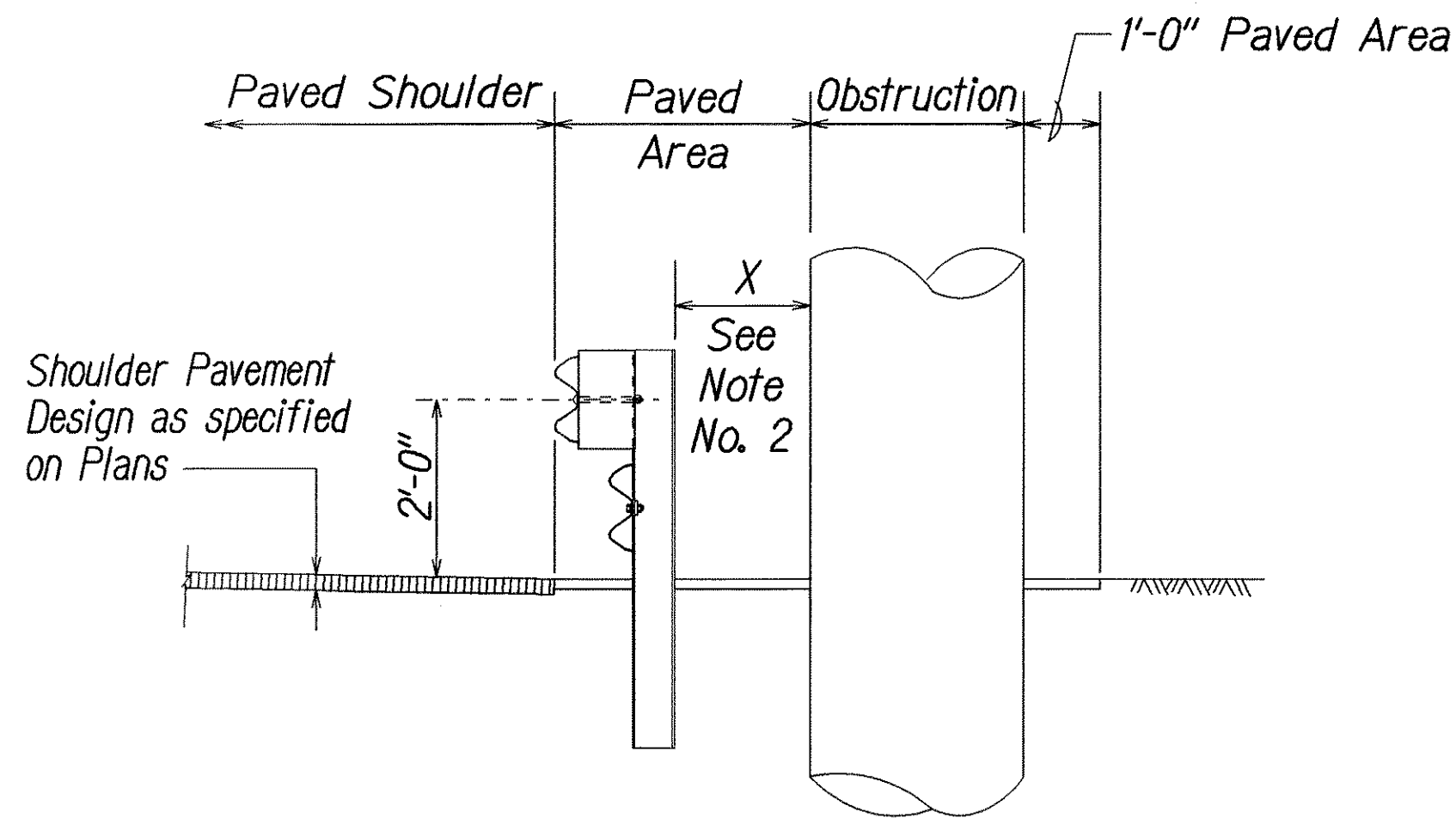
PLAN



ELEVATION

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

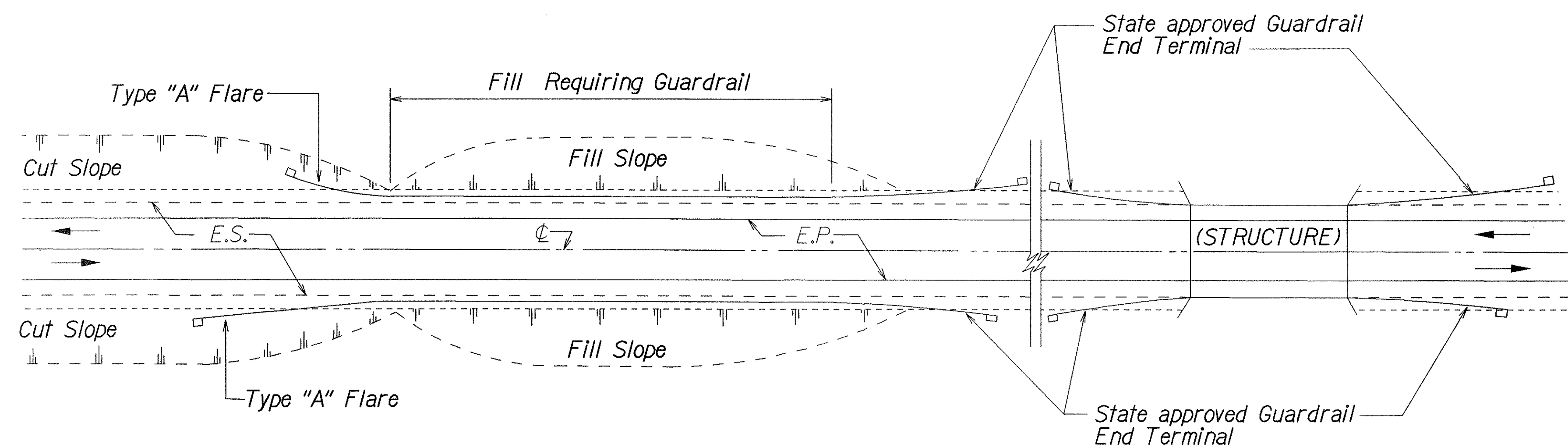
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS**  
(AT OBSTRUCTION)  
OLD KEAAU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M  
Scale: NTS  
Date: Nov., 2004

ORIGINAL PLAN	DATE
NOTED BY	DESIGNED BY
CHECKED BY	QUANTITIES BY
IN CHARGE	CHECKED BY

18/21/01 141rubyl/guardrail/1454guardign (Standard plan TE-53 108/01/87 & TE-54 11/03/89)

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	83	106

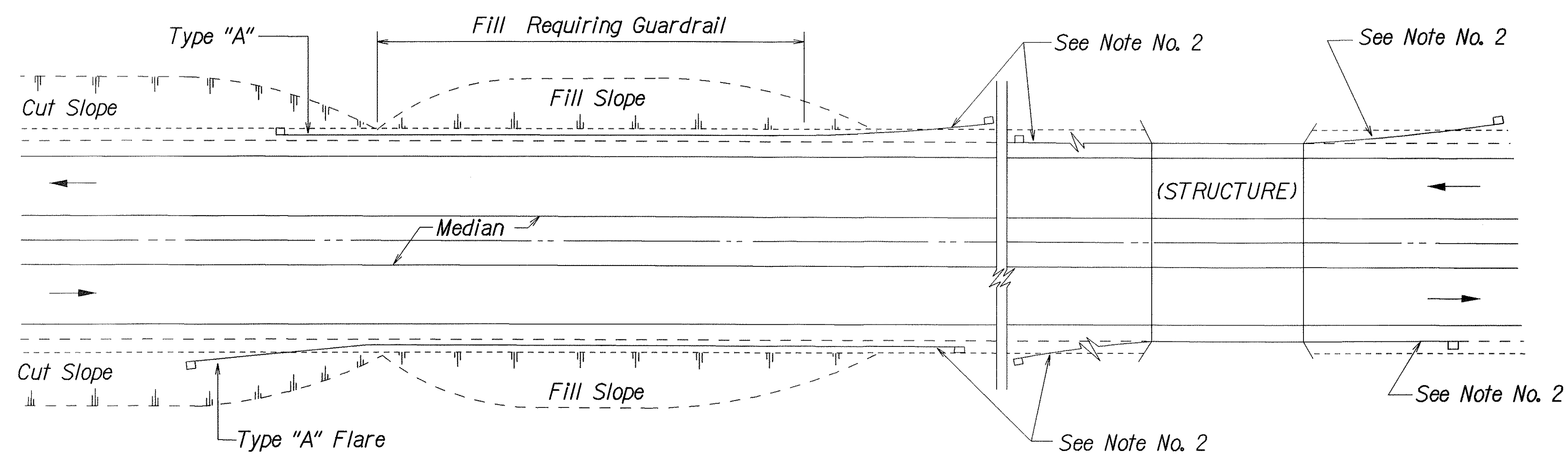


PLAN

TWO WAY ROADWAY

- 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

ONE WAY ROADWAY (DIVIDED HIGHWAY)

ORIGINAL PLAN	SURVEY PLOTTED BY _____	DATE _____
NOTE BOOK	DRAWN BY <u>X</u>	_____
	TRACED BY _____	_____
	DESIGNED BY <u>X</u>	_____
	QUANTITIES BY _____	_____
	CHECKED BY _____	_____

 td:ruby/quardrail/te58rev dan (standard plan TE-58 r07/01/86) |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS**

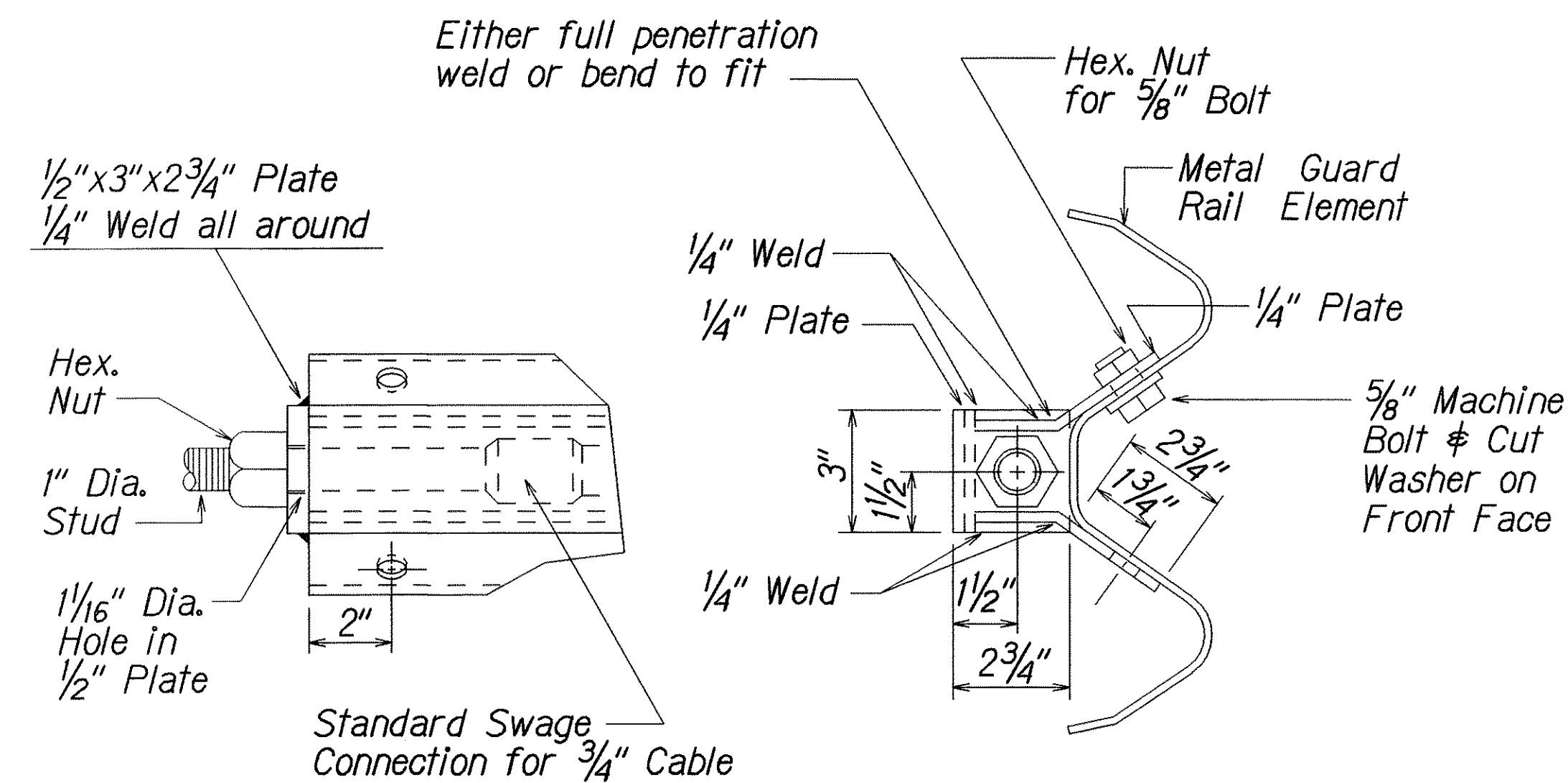
**OLD KEAAU-PAHOA ROAD RESURFACING**  
**KEA'AU TO KEAAU HIGH SCHOOL**  
**PROJECT NO. 139A-01-05M**

Scale: NTS Date: Nov., 2004

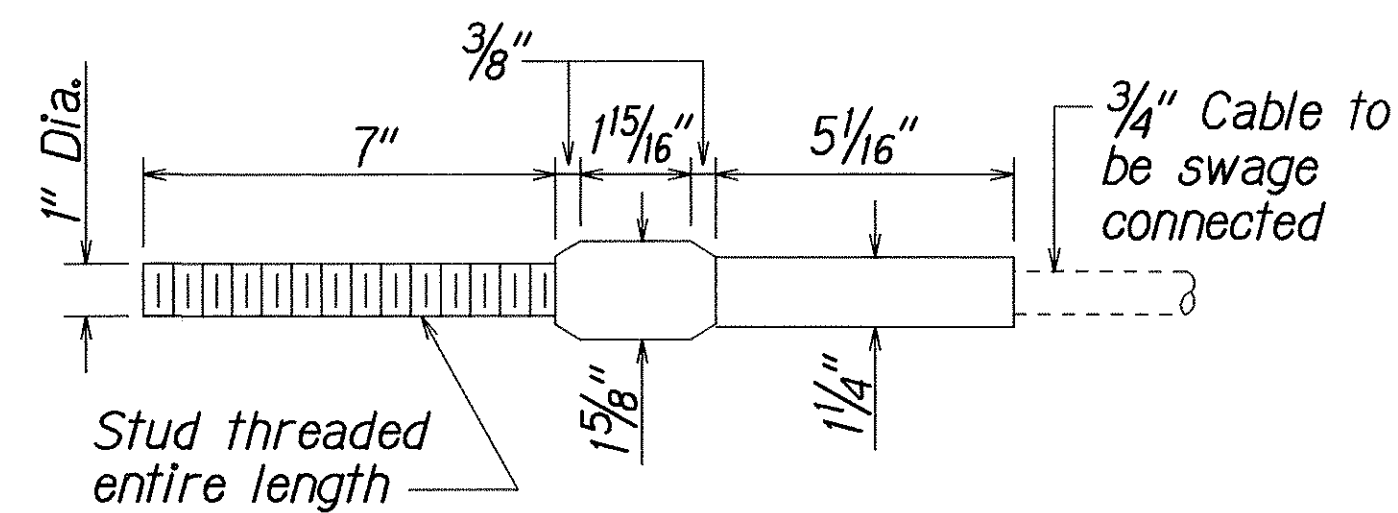
SHEET No. 7 OF 20 SHEETS



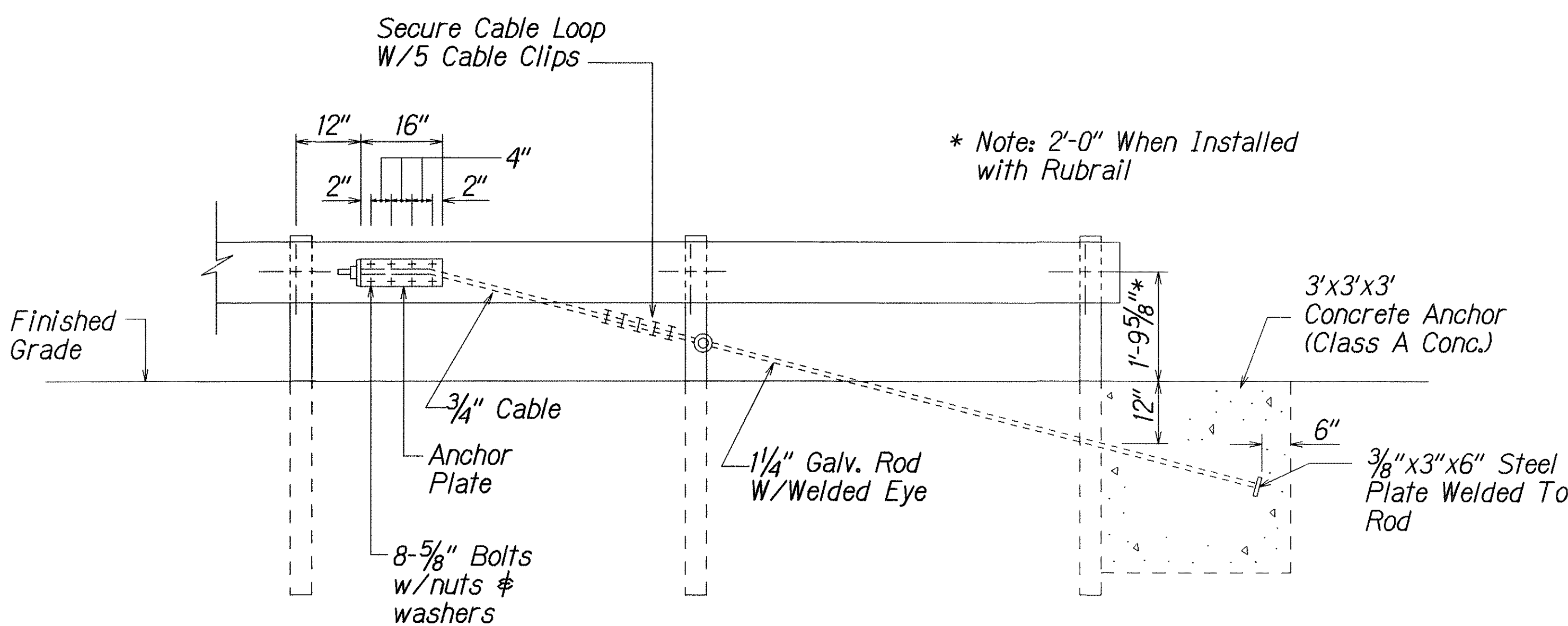
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	84	106



ANCHOR PLATE DETAILS

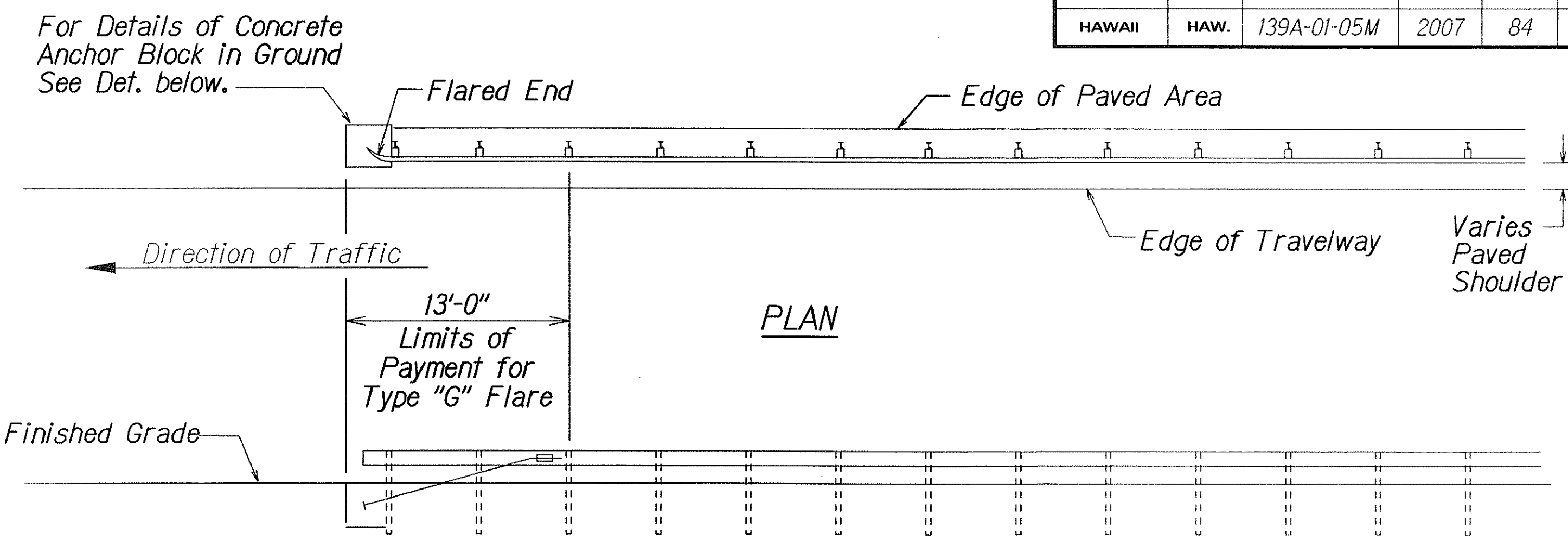


STANDARD SWAGED FITTING AND STUD



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.

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

r3/13/02 tdr:cub/guardrail/16509w.dgn (Standard plan TE-59 R1/03/89)

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**GUARDRAIL DETAILS**  
OLD KEAAU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M  
Scale: NTS  
Date: Nov., 2004

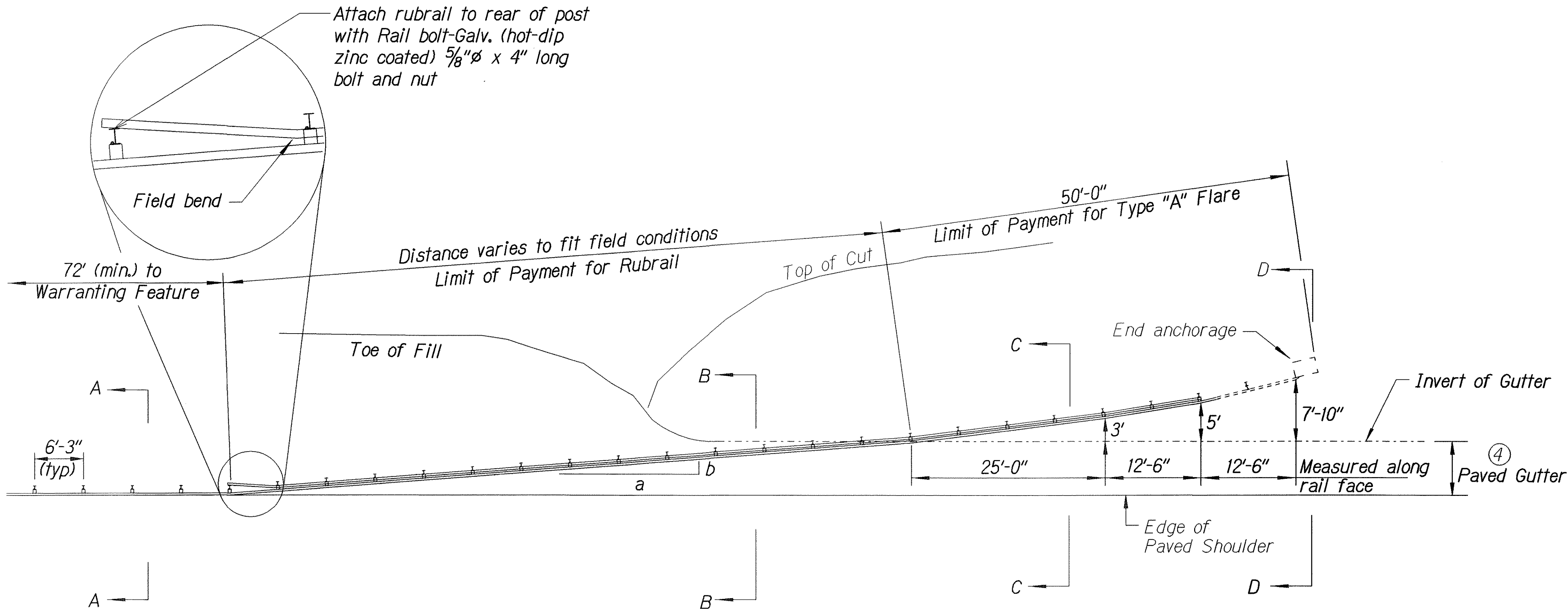
SHEET No. 8 OF 20 SHEETS



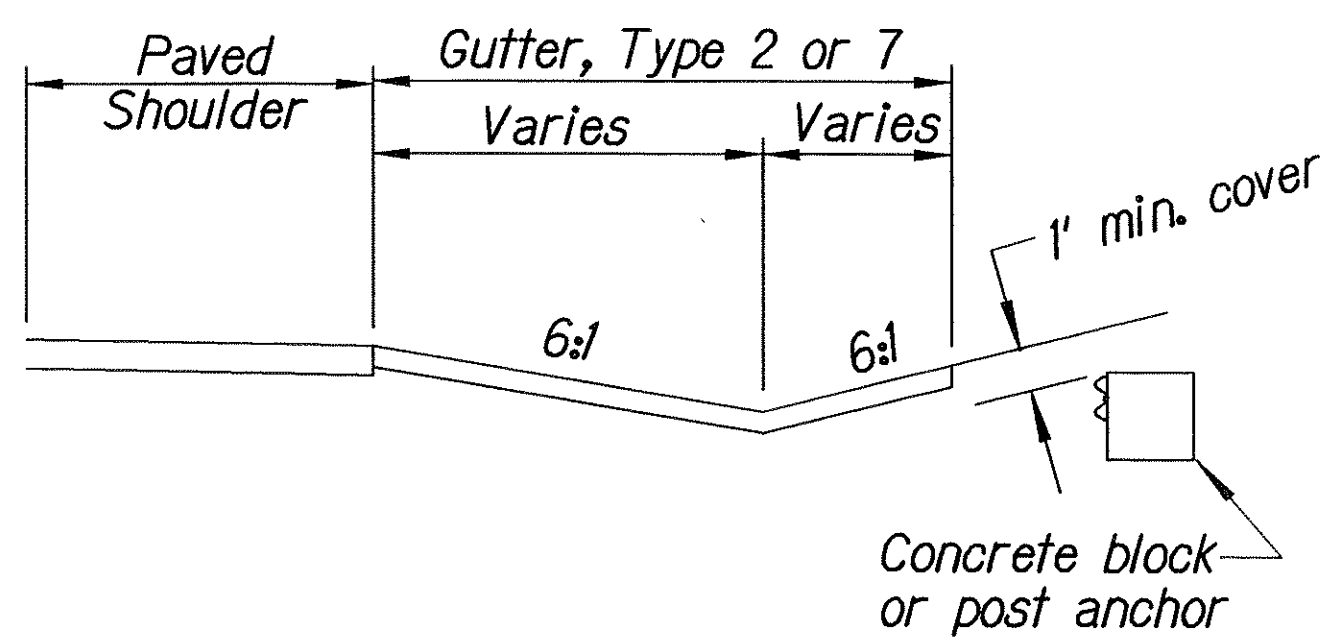
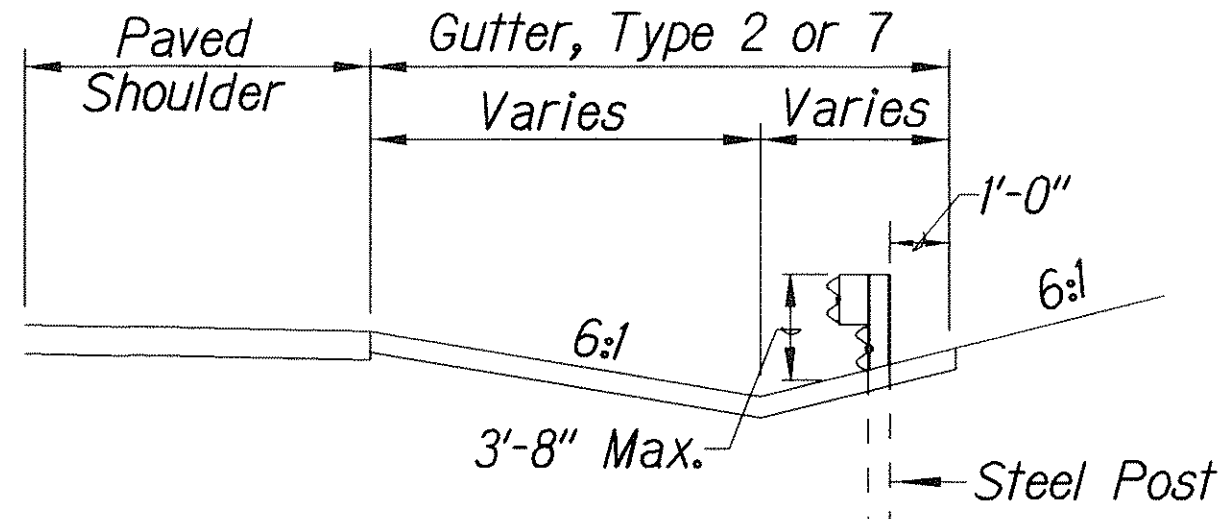
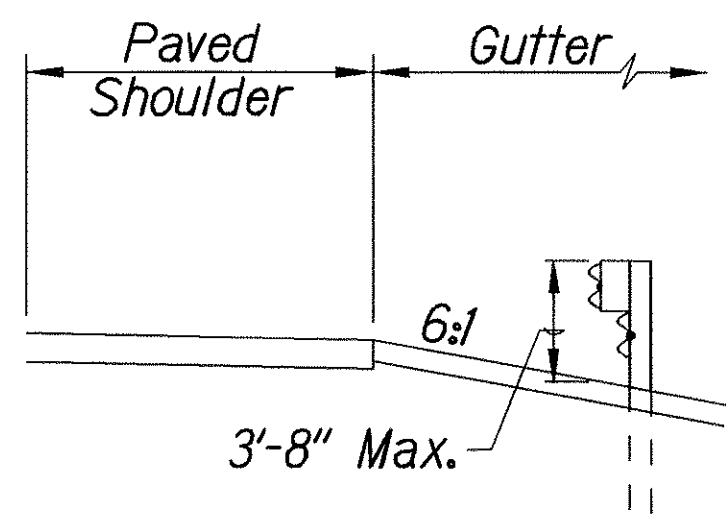
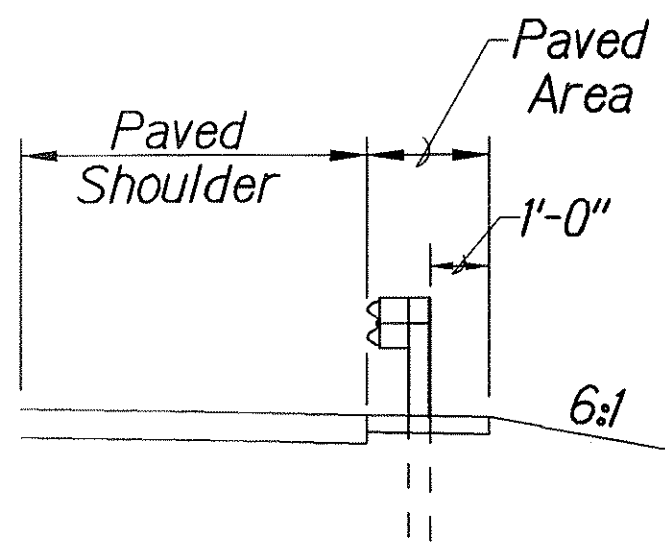
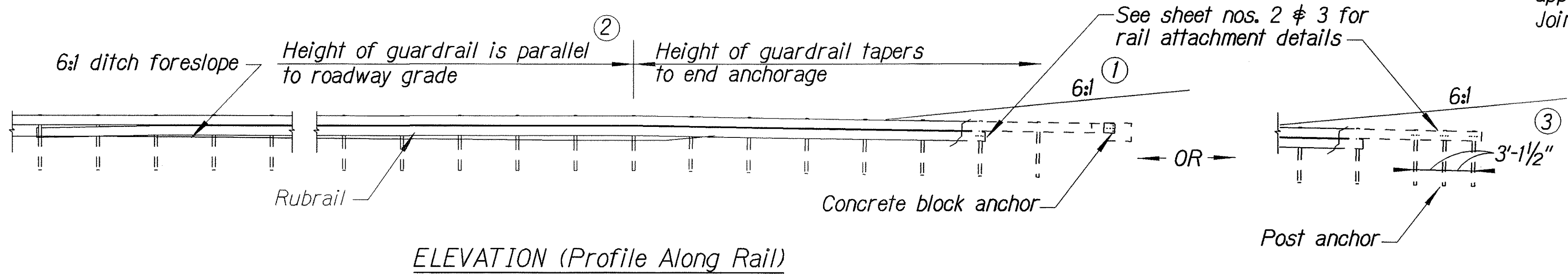
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	85	106

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.



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

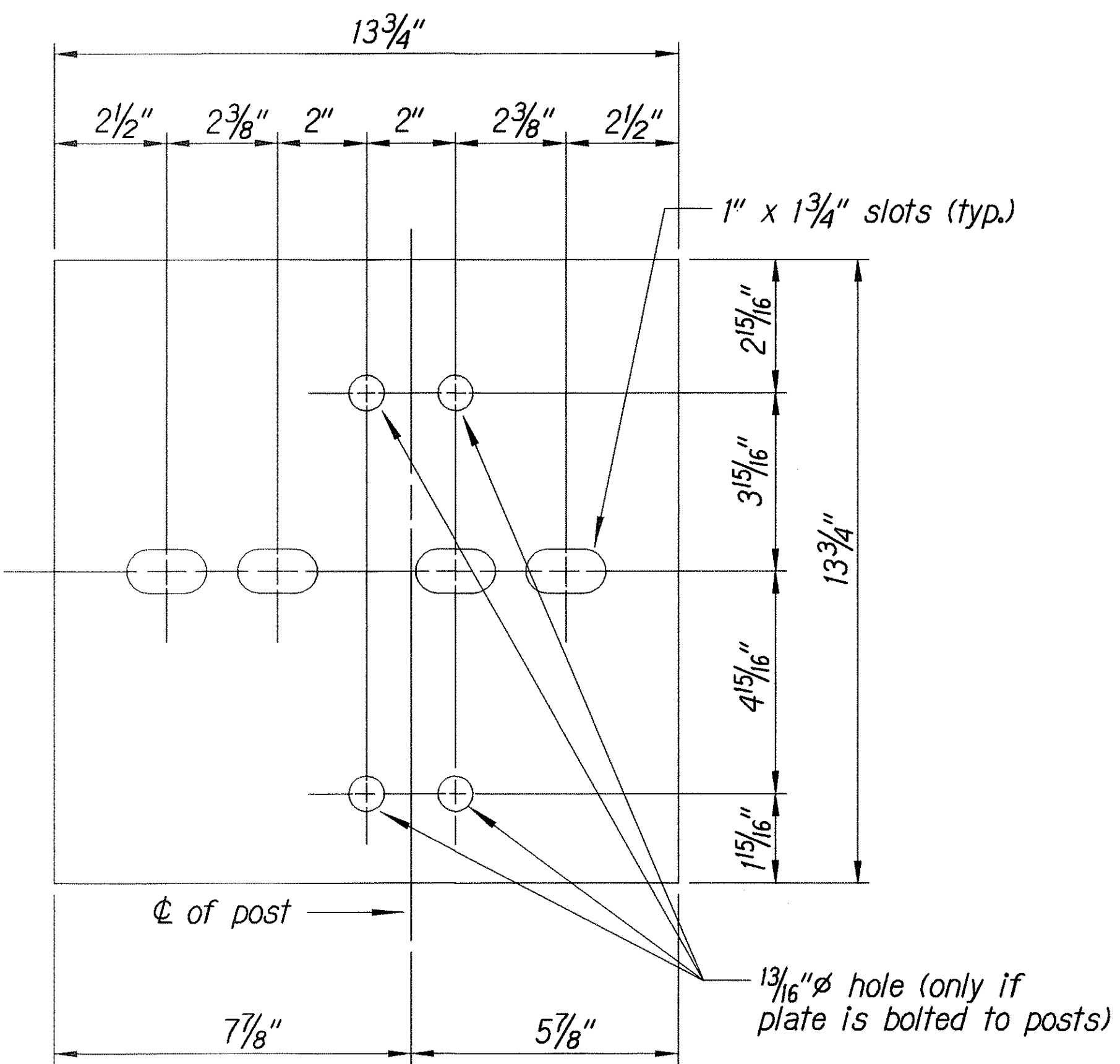


BACKSLOPE ANCHOR TERMINAL (WITH 6:1 PAVED GUTTER AND TYPE "A" FLARE)

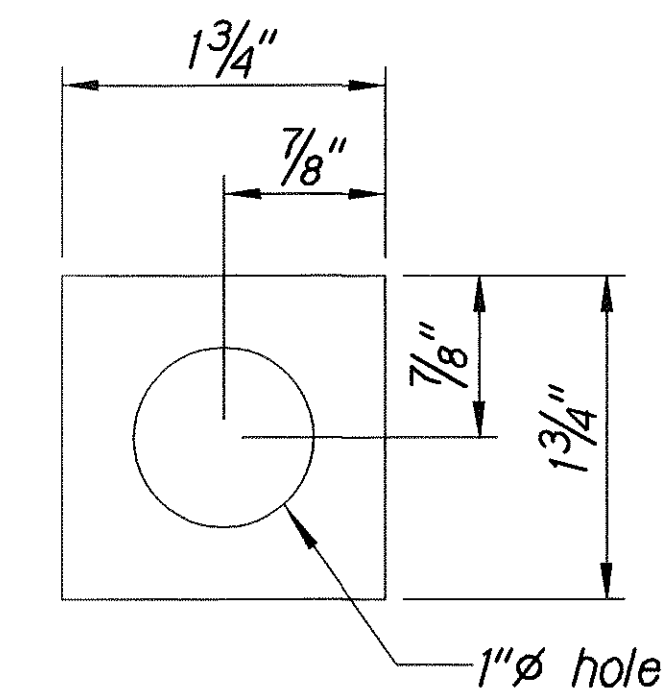
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**TYPE "A" FLARE**  
**OLD KEAAU-PAHOA ROAD RESURFACING**  
**KEA'AU TO KEAAU HIGH SCHOOL**  
**PROJECT NO. 139A-01-05M**  
Scale: NTS  
Date: Nov., 2004

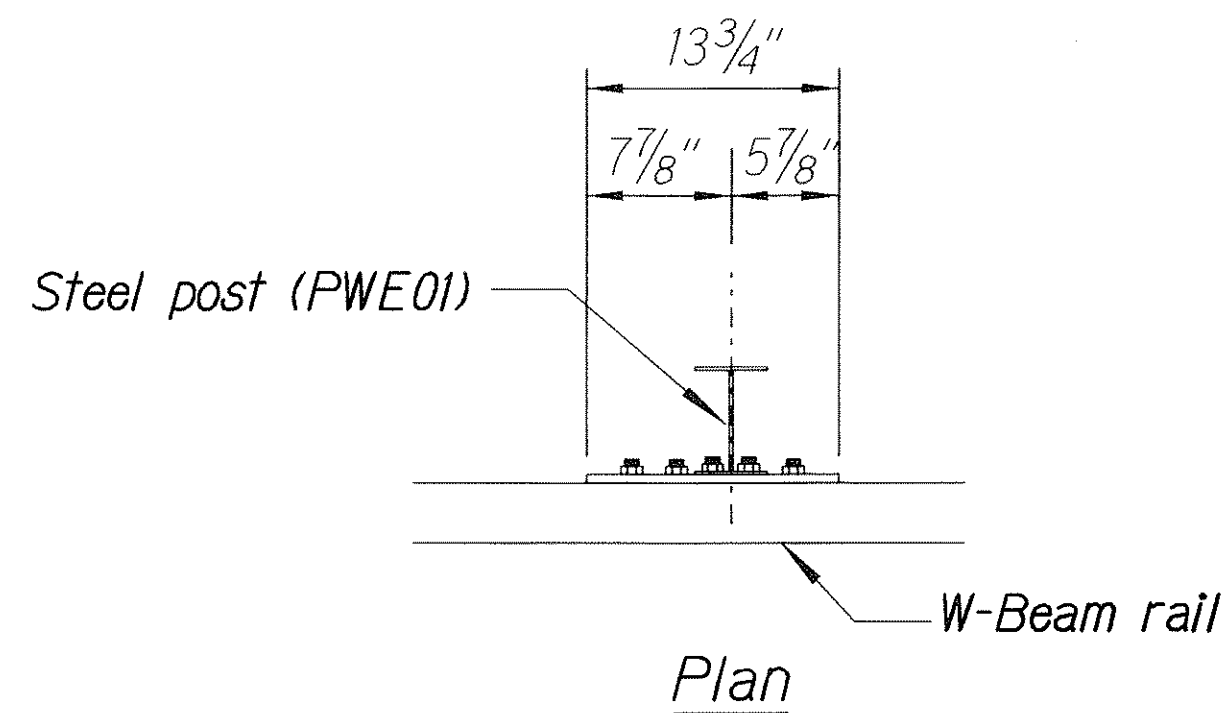
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	86	106



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

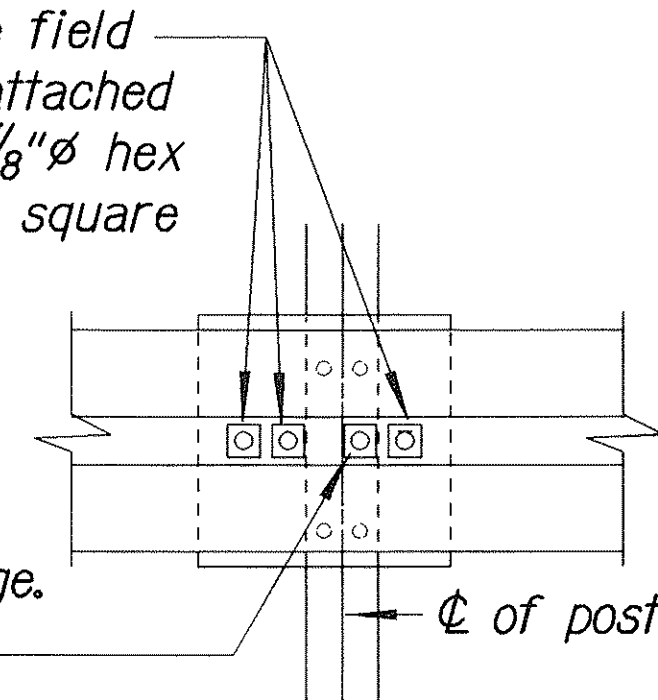


Square Washer  
(3/16" Thick - Hot-dip  
Zinc Coated Galvanized)

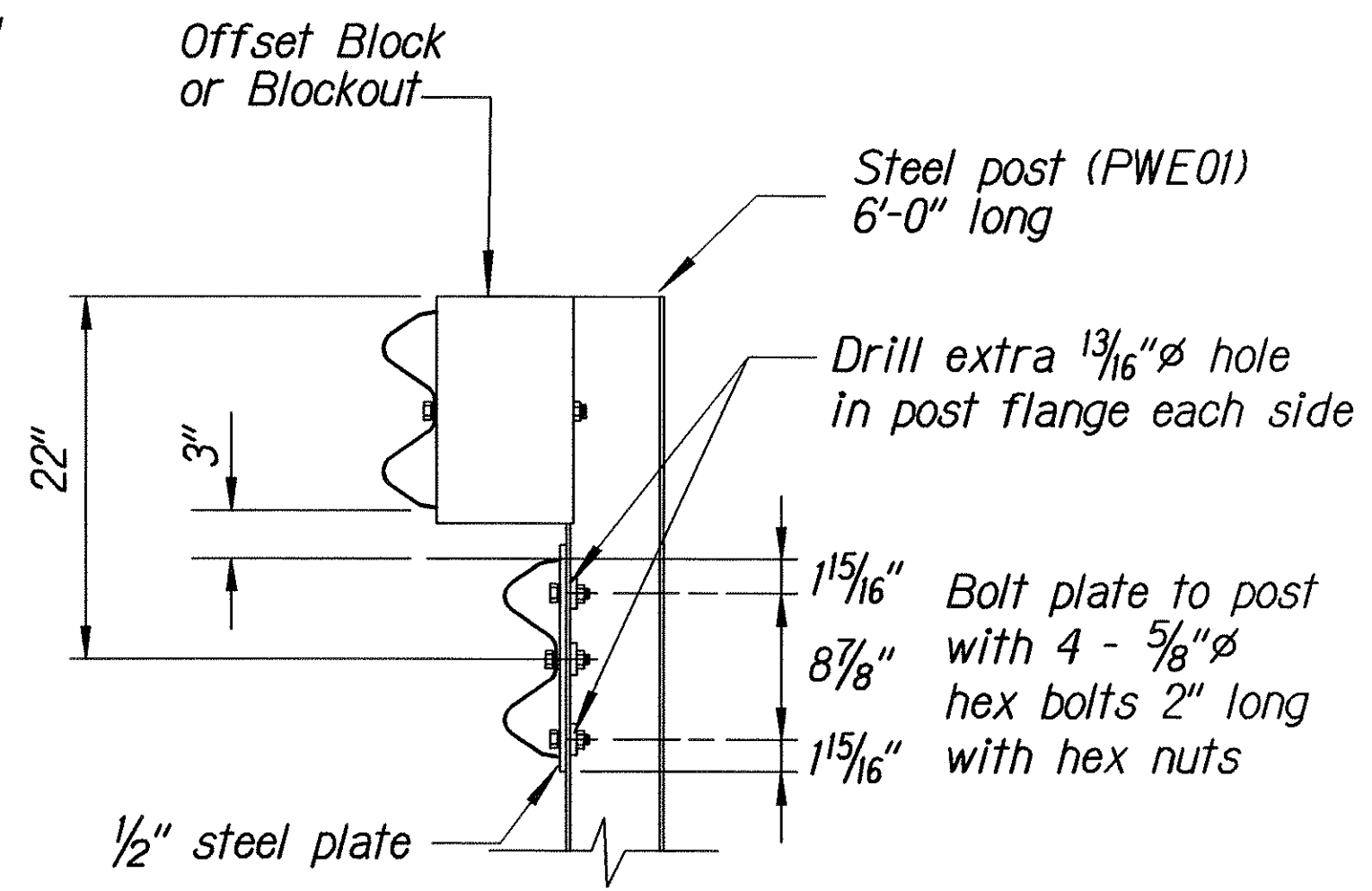


3 - 7/8"  $\phi$  holes to be field drilled in rail and attached to steel plate with 7/8"  $\phi$  hex bolts 1 5/16" long with square washer

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

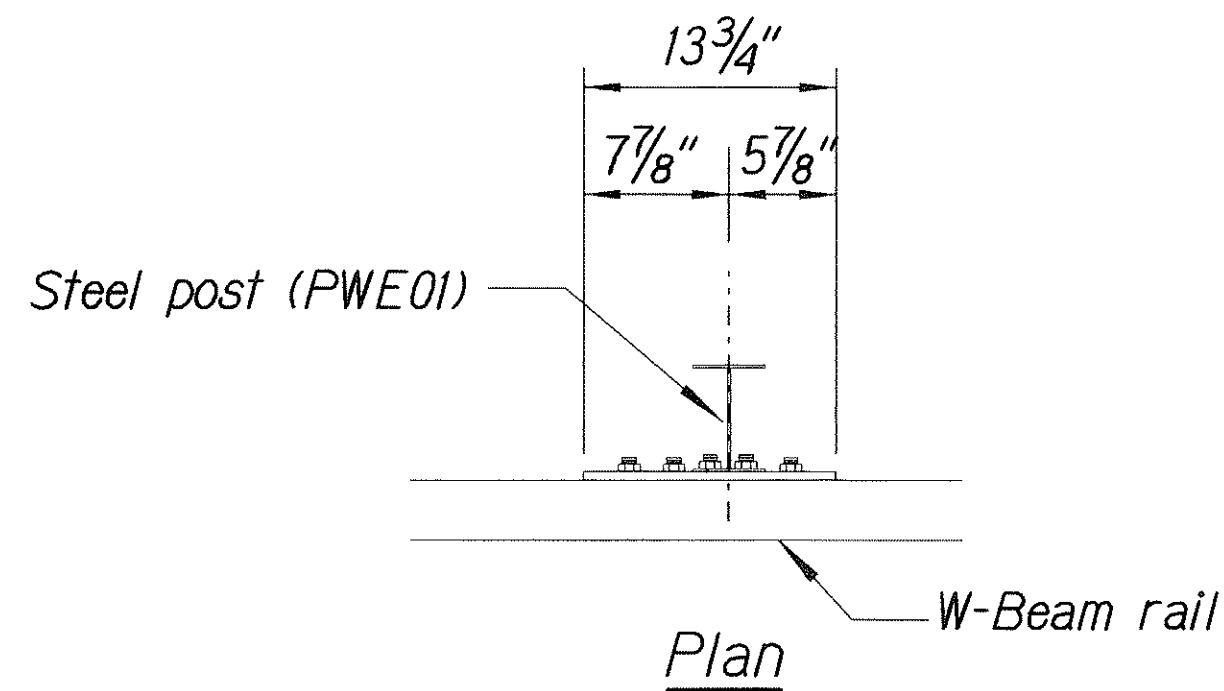


Front View



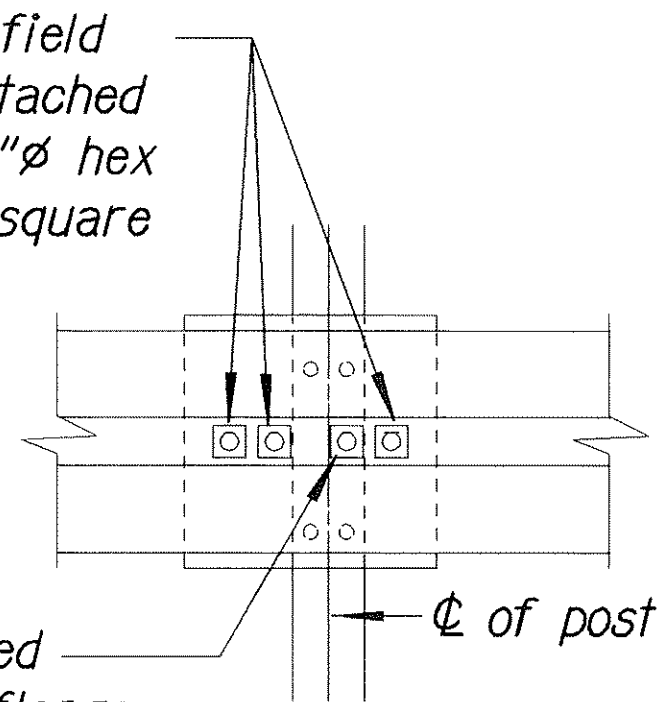
Elevation

#### RUBRAIL ANCHOR DETAILS

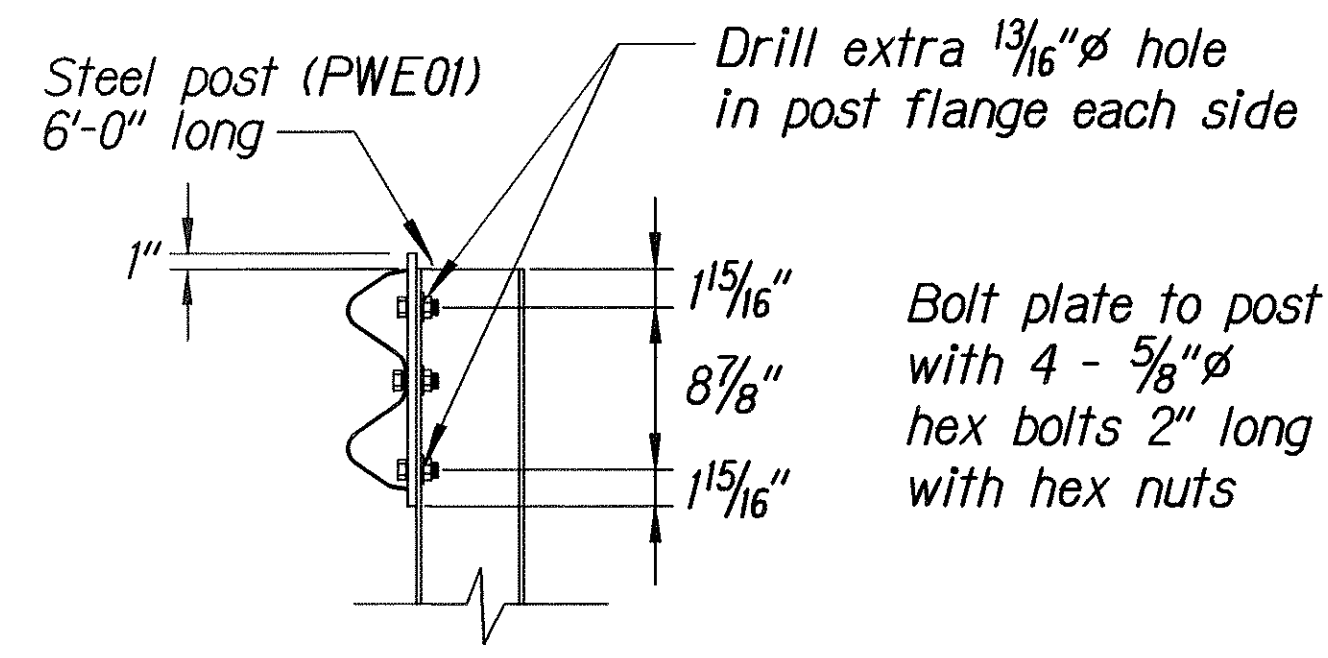


3 - 7/8"  $\phi$  holes to be field drilled in rail and attached to steel plate with 7/8"  $\phi$  hex bolts 1 5/16" long with square washer

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



Front View



Elevation

#### POST ANCHOR DETAILS

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

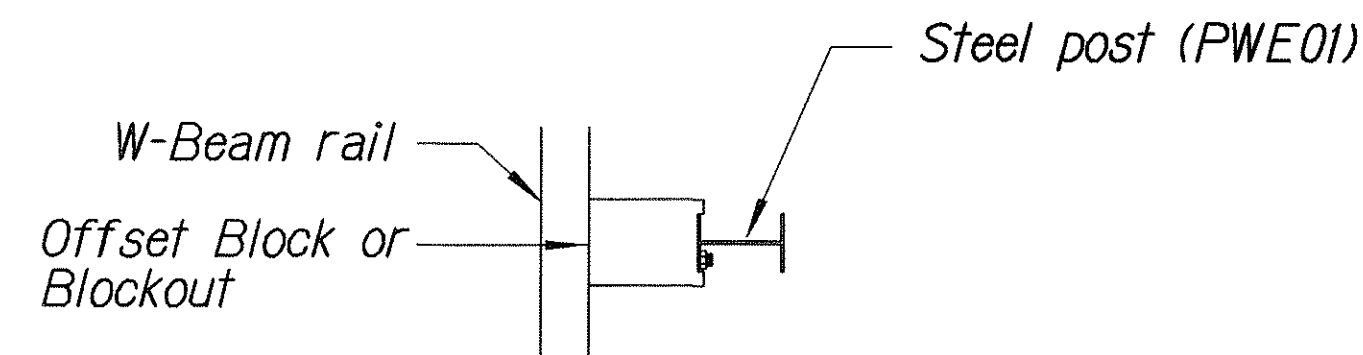
#### Note:

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.

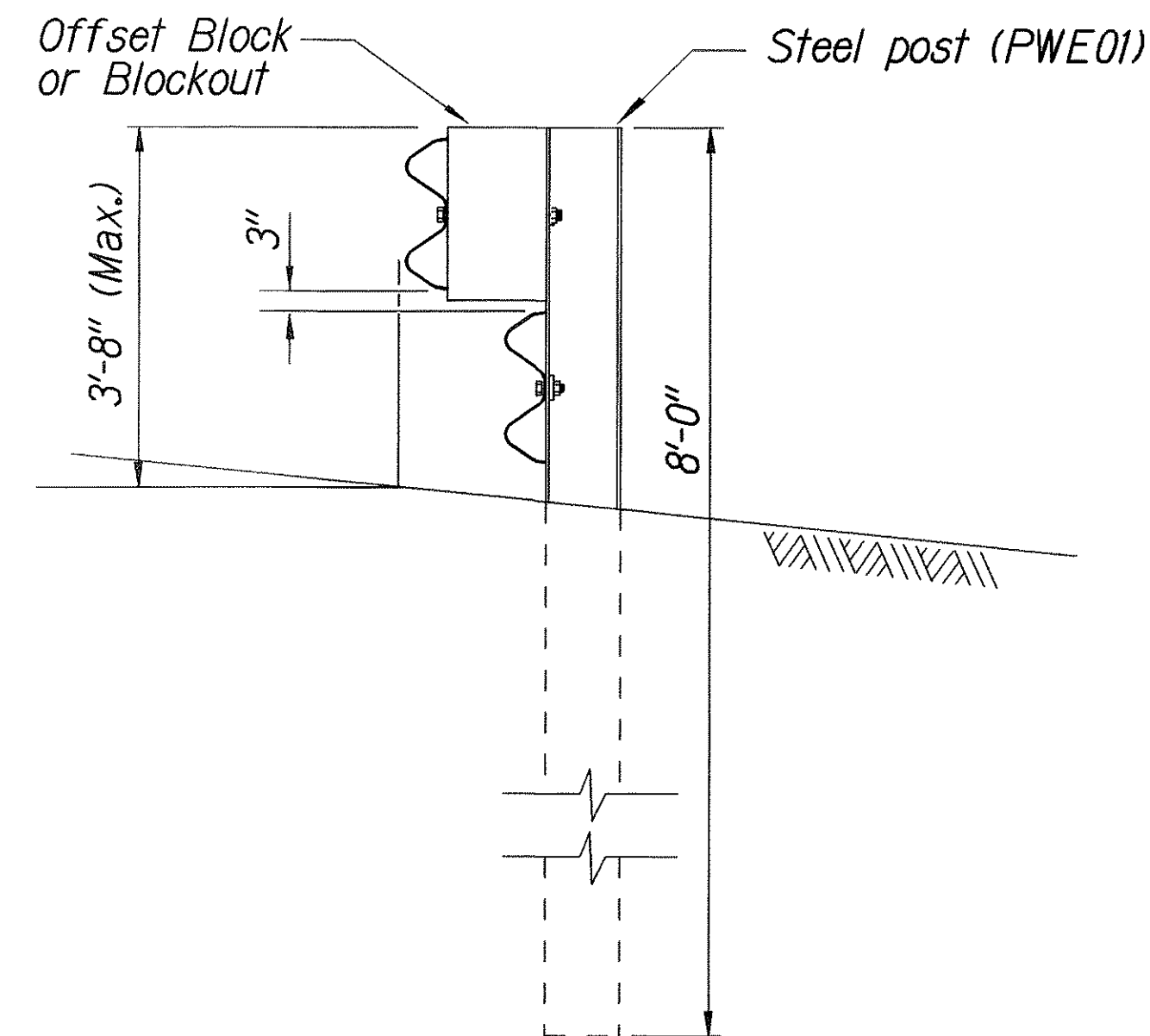
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
<b>TYPE "A" FLARE</b>
OLD KEAAU-PAHOA ROAD RESURFACING KEAAU TO KEAAU HIGH SCHOOL PROJECT NO. 139A-01-05M
Scale: NTS Date: Nov., 2004
SHEET No. 10 OF 20 SHEETS



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	87	106

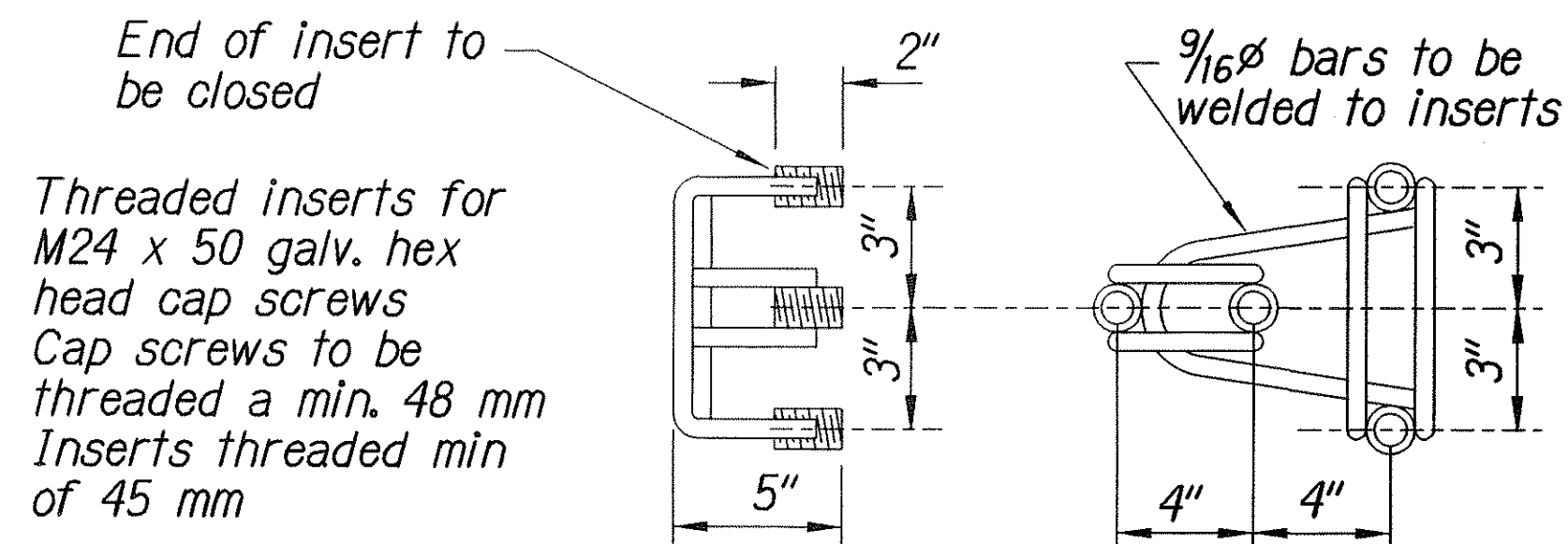


Plan

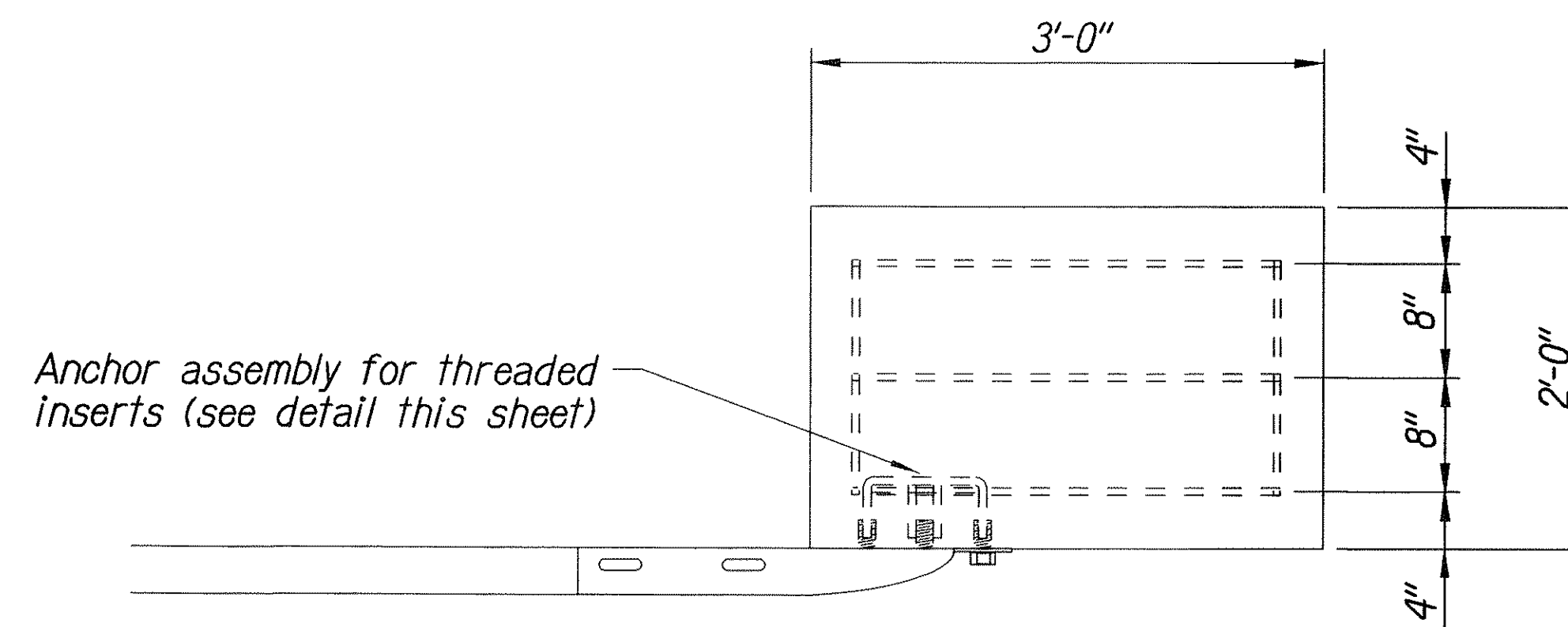


Elevation

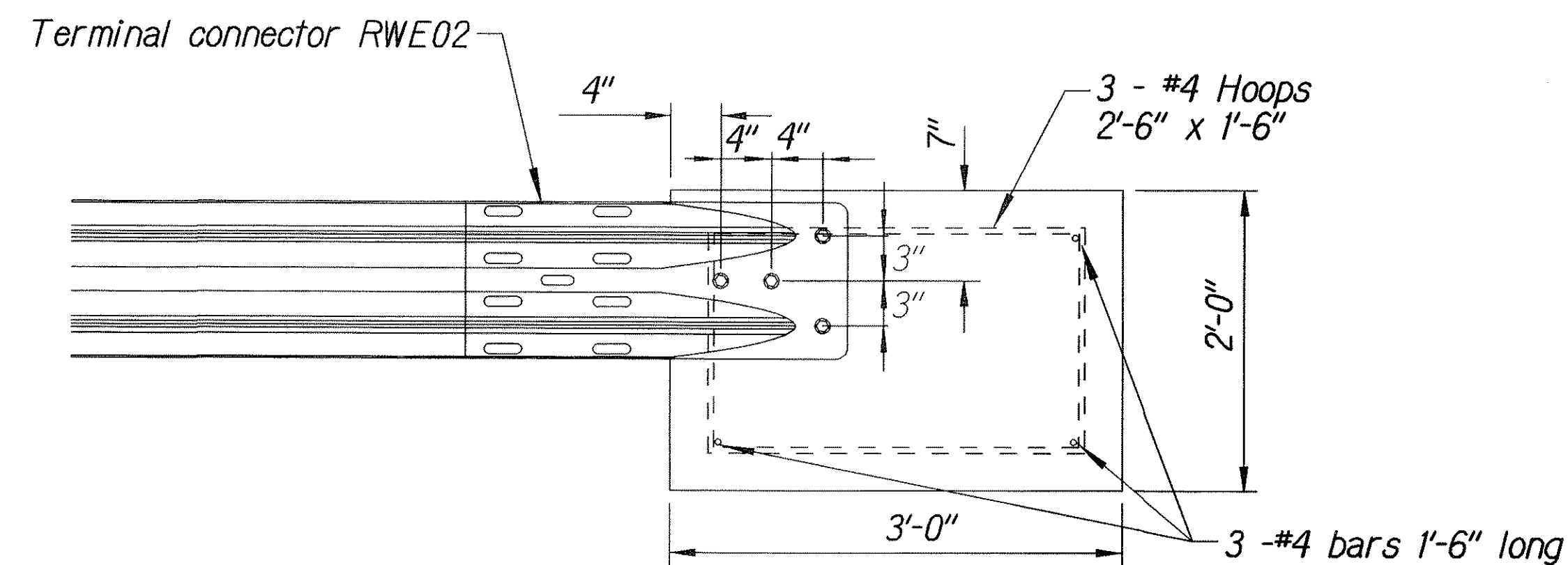
STEEL POST GUARDRAIL  
WITH RUBRAIL



ANCHOR ASSEMBLY  
CONCRETE BLOCK ANCHOR



Plan



Elevation

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	DRAWN BY	X
DESIGNED BY	DESIGNED BY	X
CHECKED BY	CHECKED BY	X
DATE	DATE	

r3/01/09 161rubby/guardrail/04det1.dgn (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

**TYPE "A" FLARE**

OLD KEAAU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M

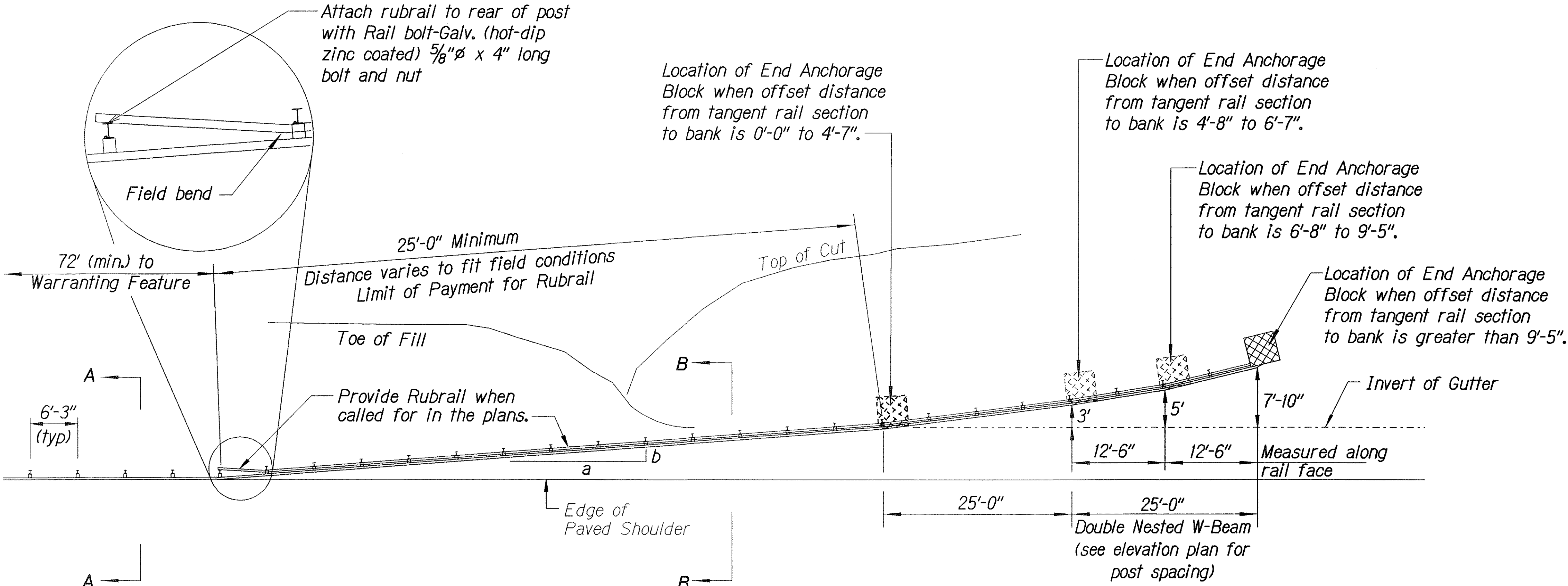
Scale: NTS Date: Nov., 2004

SHEET No. 11 OF 20 SHEETS

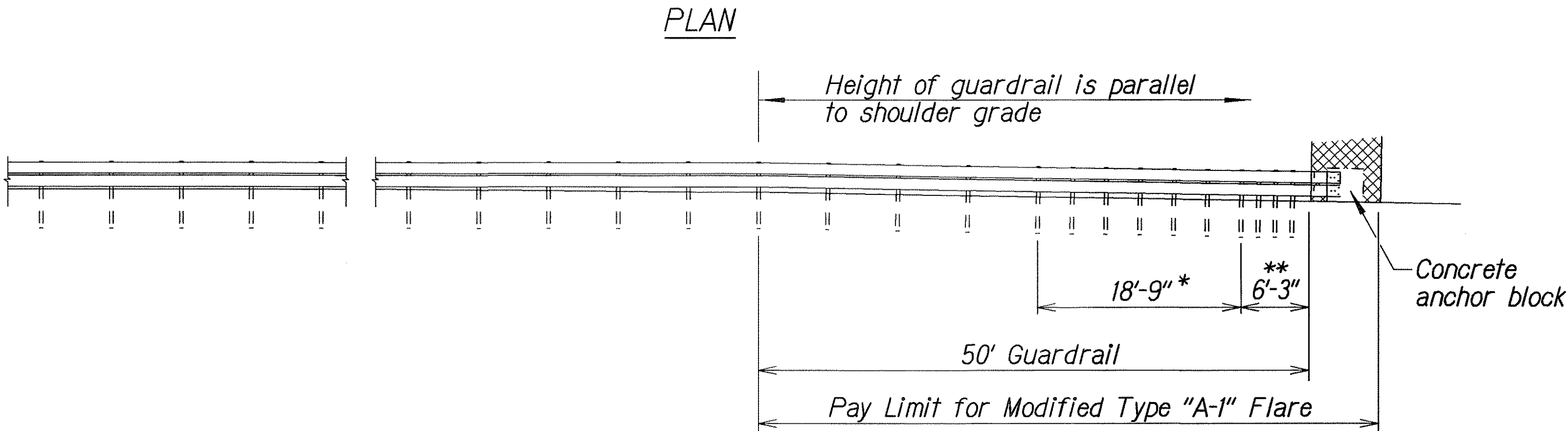
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	88	106

General Notes

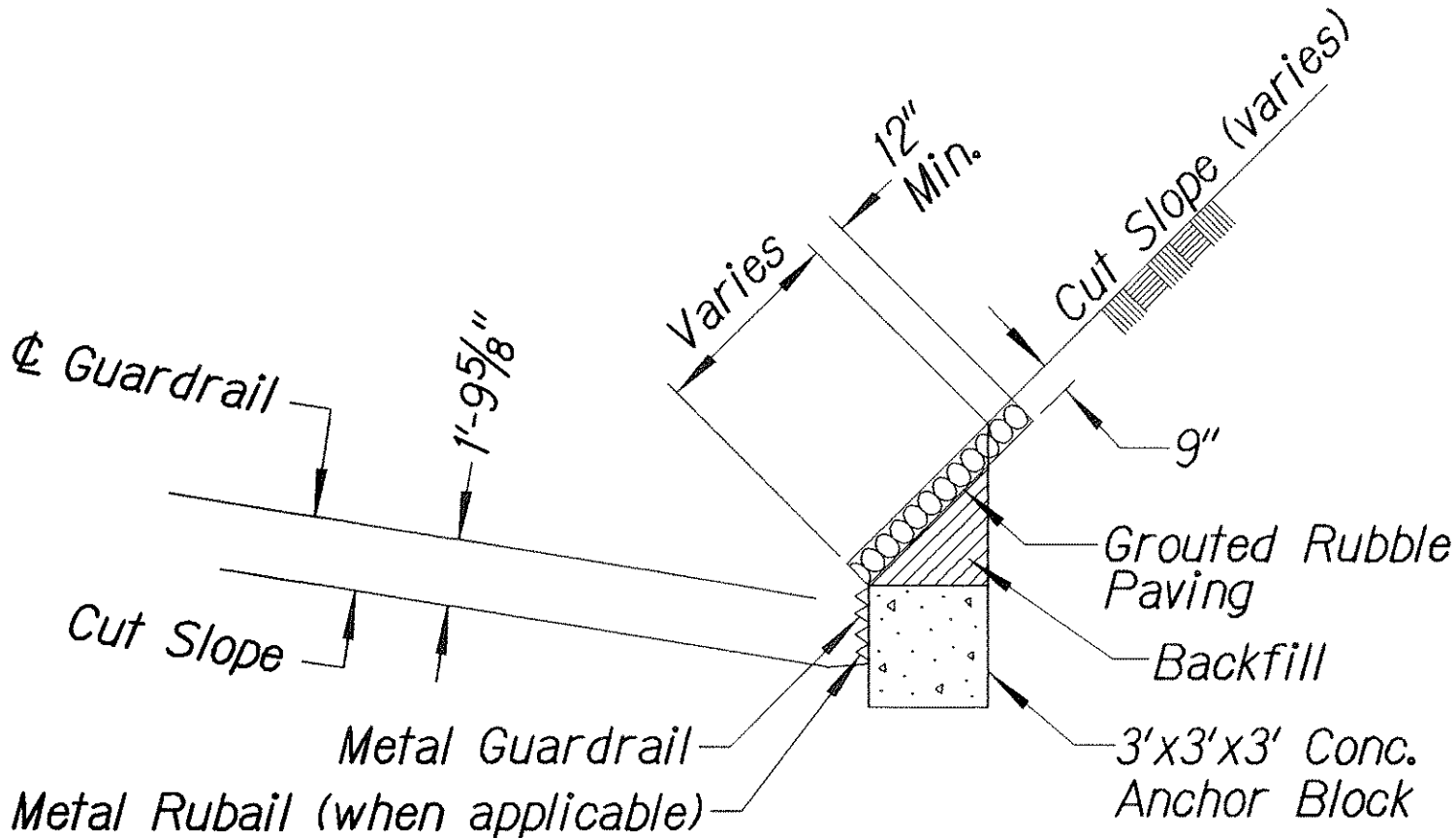
- All posts are 6'-0" in length within the 50'-0" pay limit for the Modified Type "A-1" Flare without rubrail.
- Whenever swales or a change in grade is encountered within the 50'-0" pay limit for the Modified Type "A-1" Flare, a rubrail shall be installed and all posts shall have a minimum embedment of 4'-0". Post lengths shall be adjusted to provide the minimum embedment.
- 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.
- Limit of payment for Modified Type "A-1" Flare shall be 50'-0" from End Shoe including Rubrail (when applicable), Anchor Block and GRP work.
- Excavation, Anchor Block, Backfill and GRP work shall be considered incidental to the Modified Type "A-1" Flare.



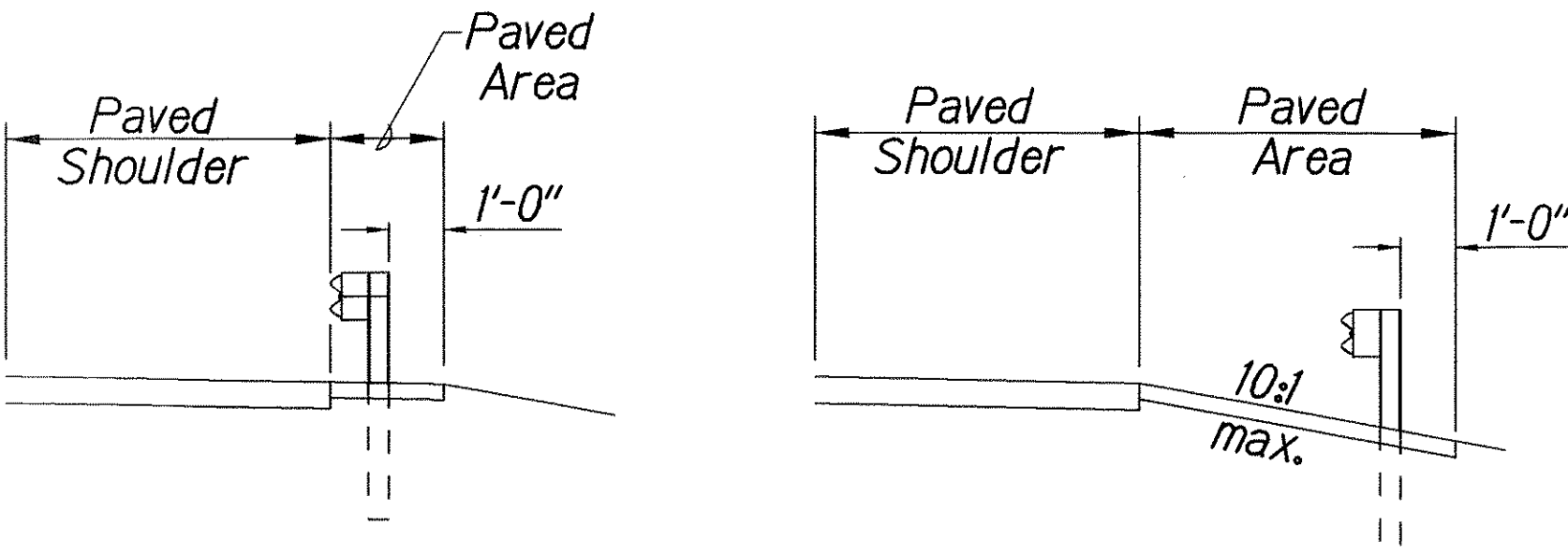
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



- \* Posts at 3'-1 1/2" o.c.
- \*\* Posts at 1'-6 3/4" o.c.

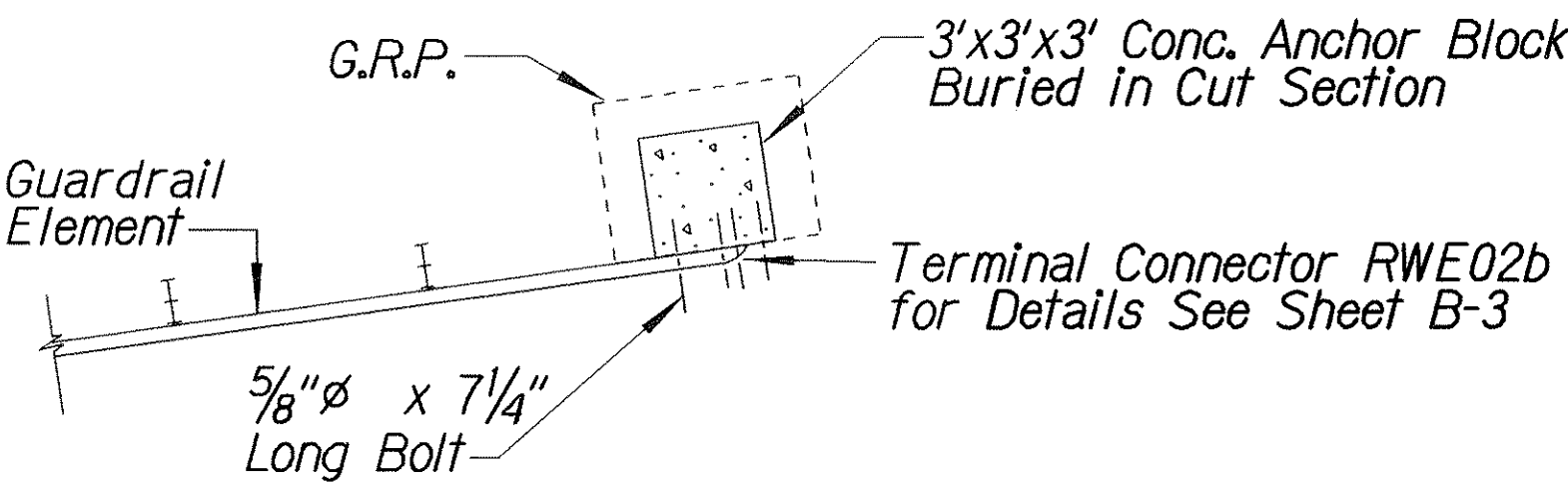


ANCHOR BLOCK IN CUT SECTION



Section A-A

Section B-B



PLAN - ANCHOR BLOCK IN CUT SECTION

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

MODIFIED TYPE "A-1" FLARE

OLD KEAAU-PAHOA ROAD RESURFACING

KEA'AU TO KEAAU HIGH SCHOOL

PROJECT NO. 139A-01-05M

Scale: NTS

Date: Nov., 2004

SHEET No. 12 OF 20 SHEETS

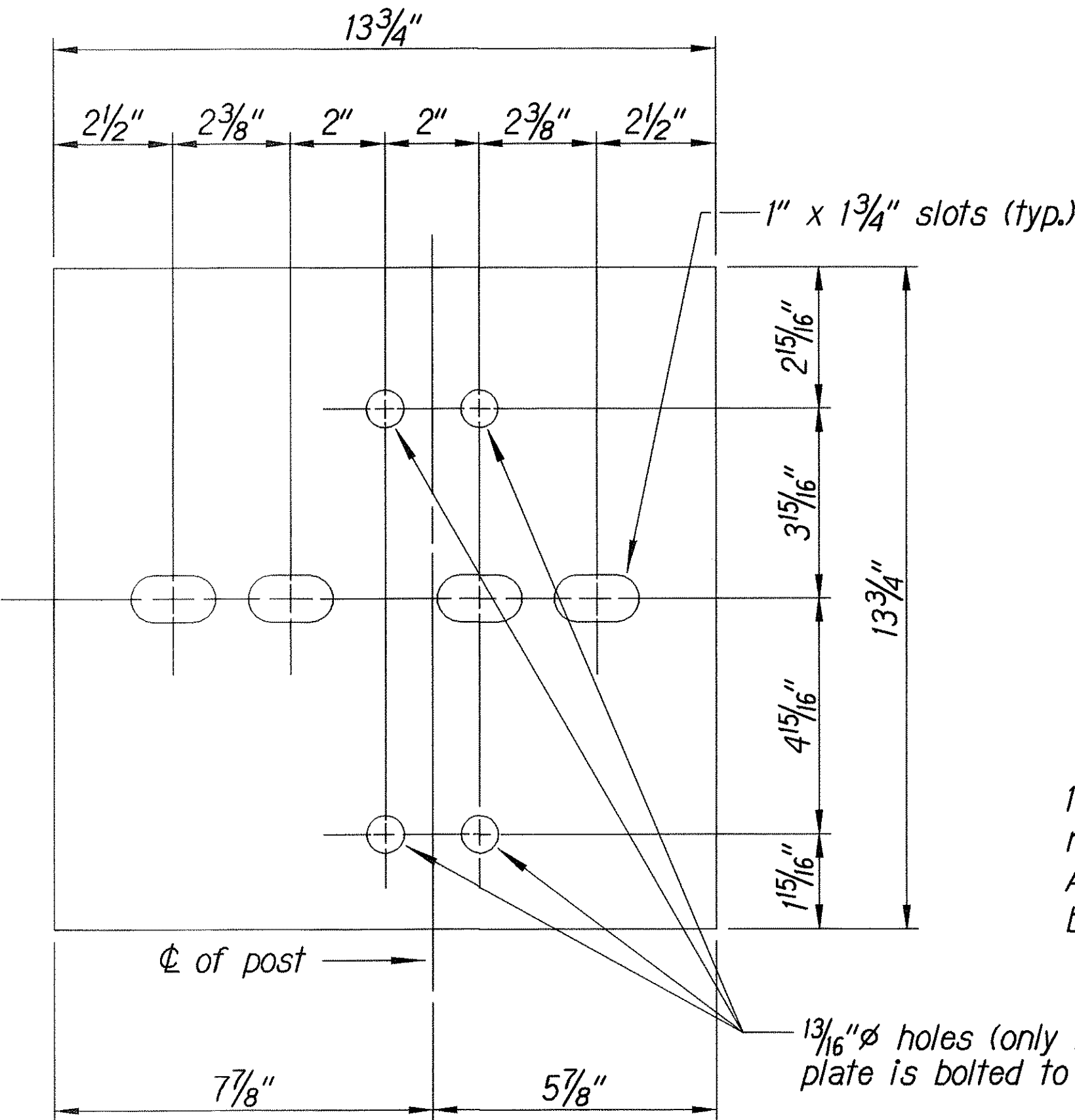
ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
DRAWN BY	
DESIGNED BY	
CHECKED BY	
APPROVED BY	

10/21/01 1dtruby/guardrail/flare\_a1.dgn (standard plan TE-58 r1/01/06 TE-59 r1/03/09 # TE-60 07/01/06)

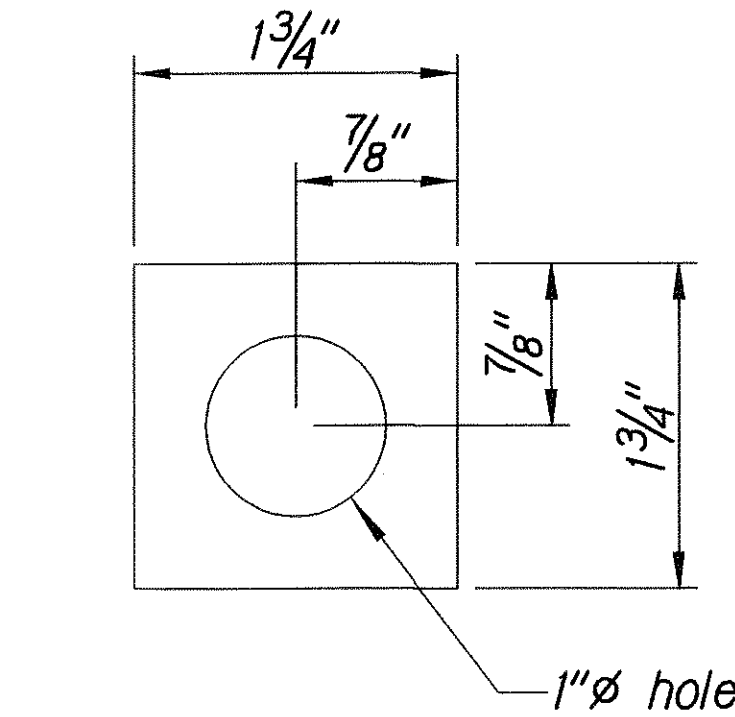




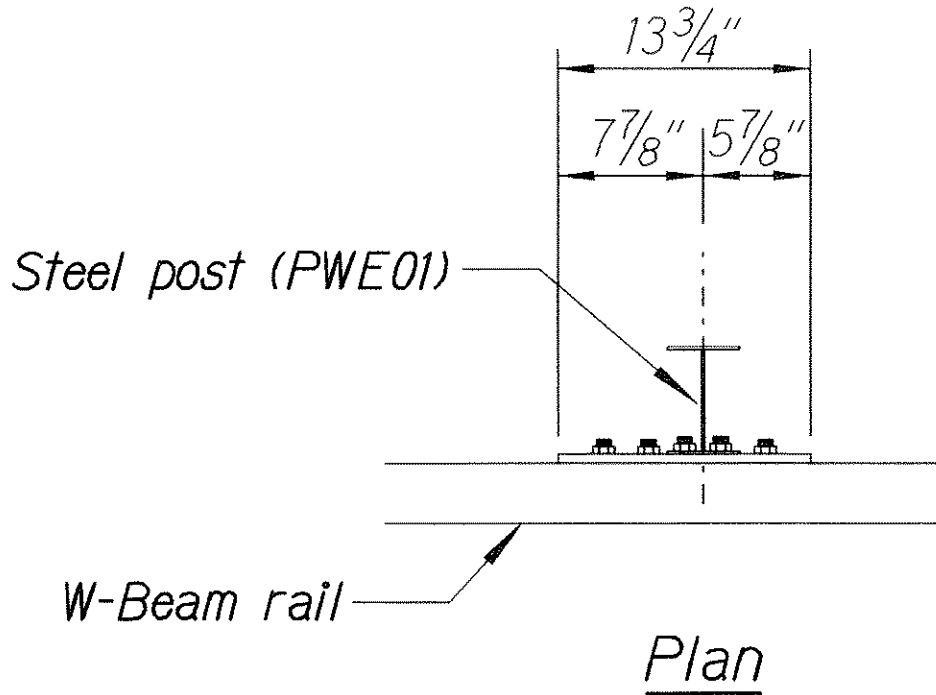
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	90	106



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

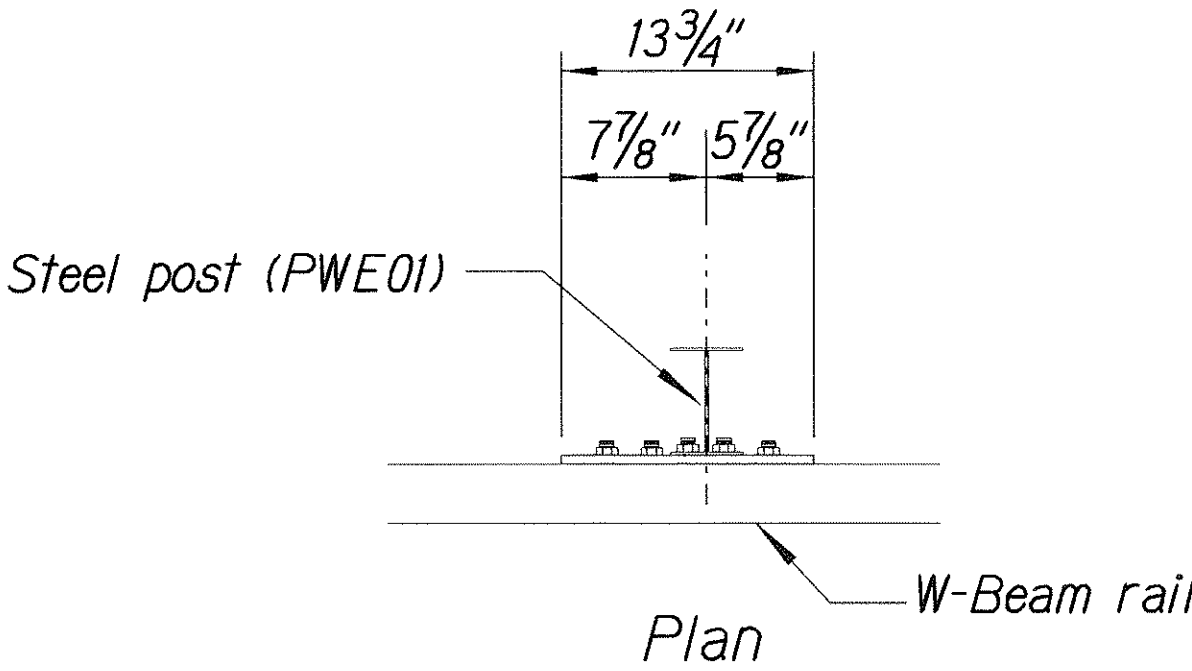


**Square Washer**  
(3/16" Thick - Hot-dip  
Zinc Coated Galvanized)



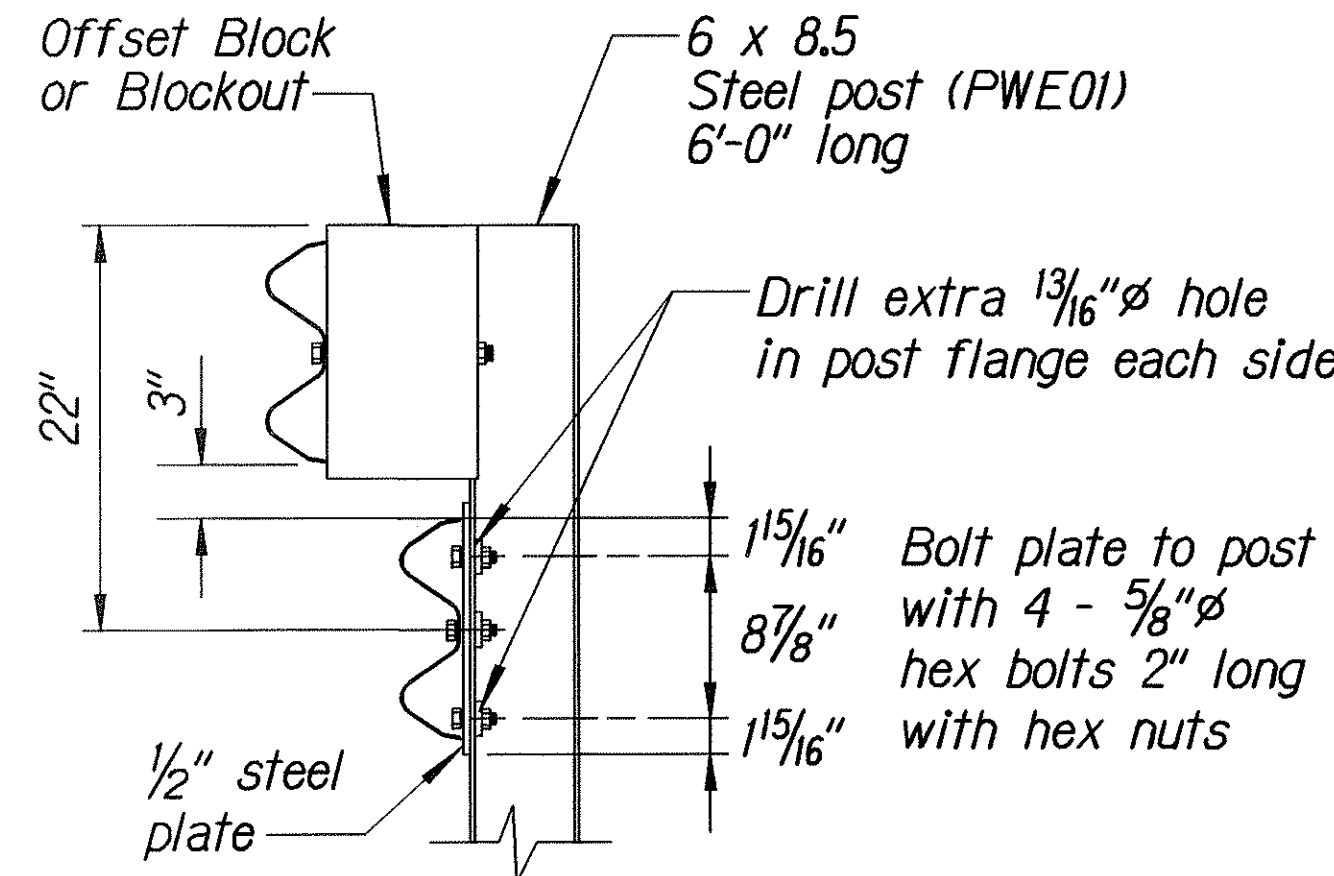
3 - 7/8"  $\phi$  holes to be field drilled in rail  
and attached to steel plate with 7/8"  $\phi$  hex  
bolts 1 15/16" long with square washer

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



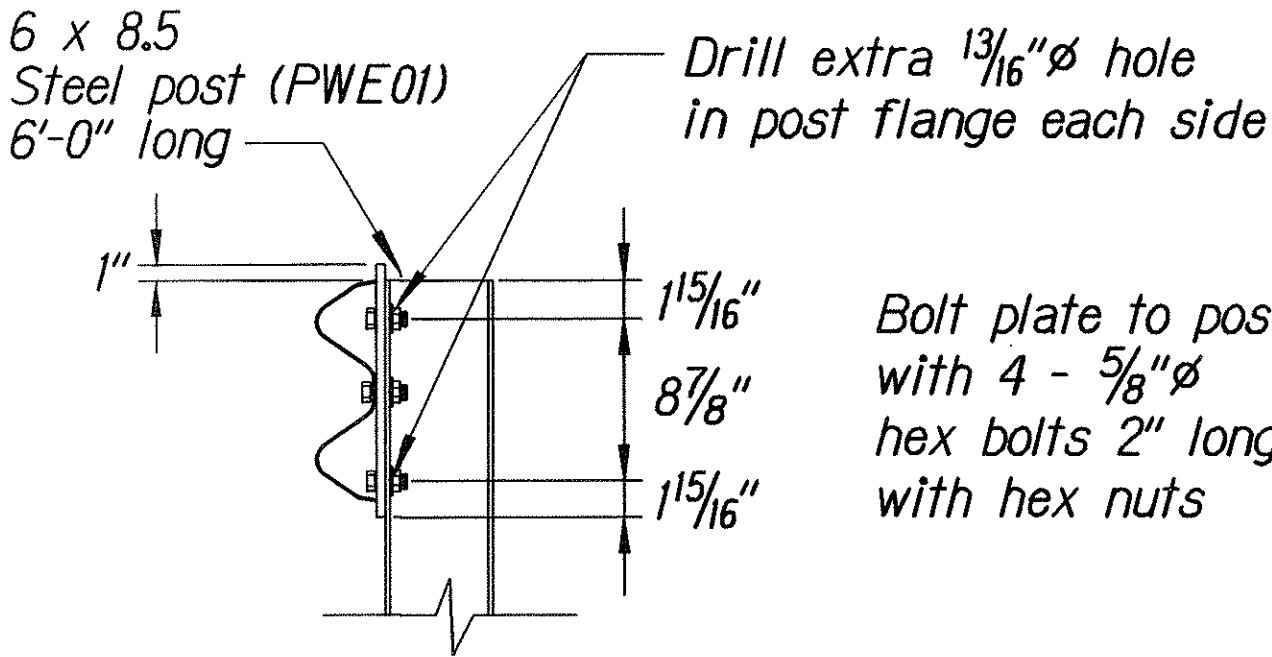
3 - 7/8"  $\phi$  holes to be field drilled in rail  
and attached to steel plate with 7/8"  $\phi$  hex  
bolts 1 15/16" long with square washer

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



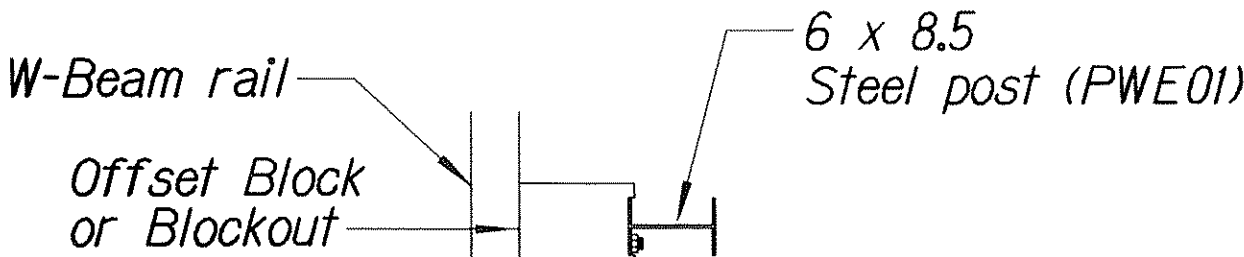
**RUBRAIL ANCHOR DETAILS**

**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.

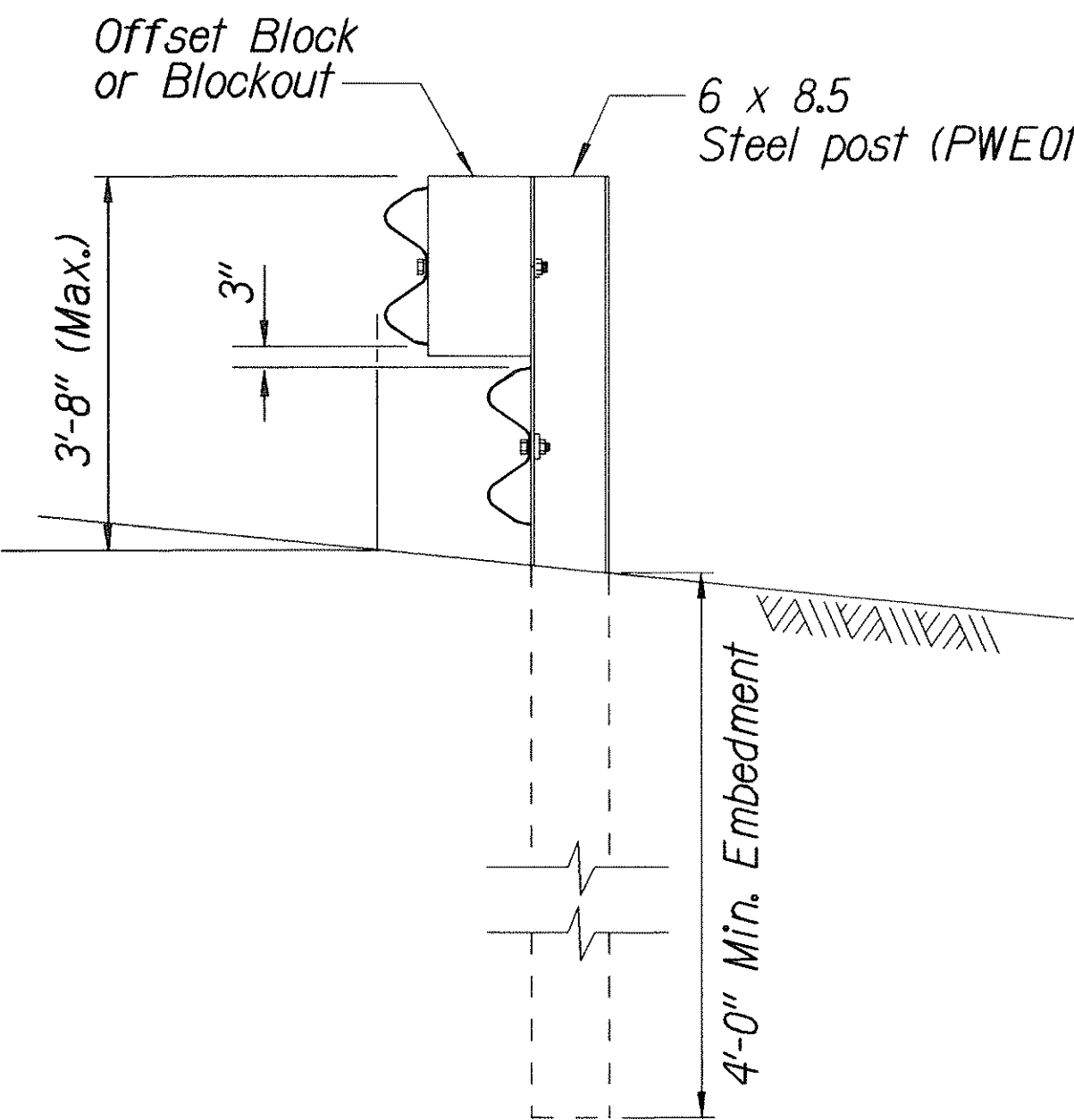


**POST ANCHOR DETAILS**

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



**Plan**



**Elevation**

**STEEL POST GUARDRAIL  
WITH RUBRAIL**

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**MODIFIED TYPE "A-1" FLARE  
RUBRAIL DETAILS**

OLD KEA'AU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M

Scale: As Noted Date: Nov., 2004

ORIGINAL PLAN	DATE
DESIGNED BY	
CHECKED BY	
IN CHARGE	
NOTED BY	
REVISIONS	
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15/2/01 1dloby/quadrail/flare al 3dgo



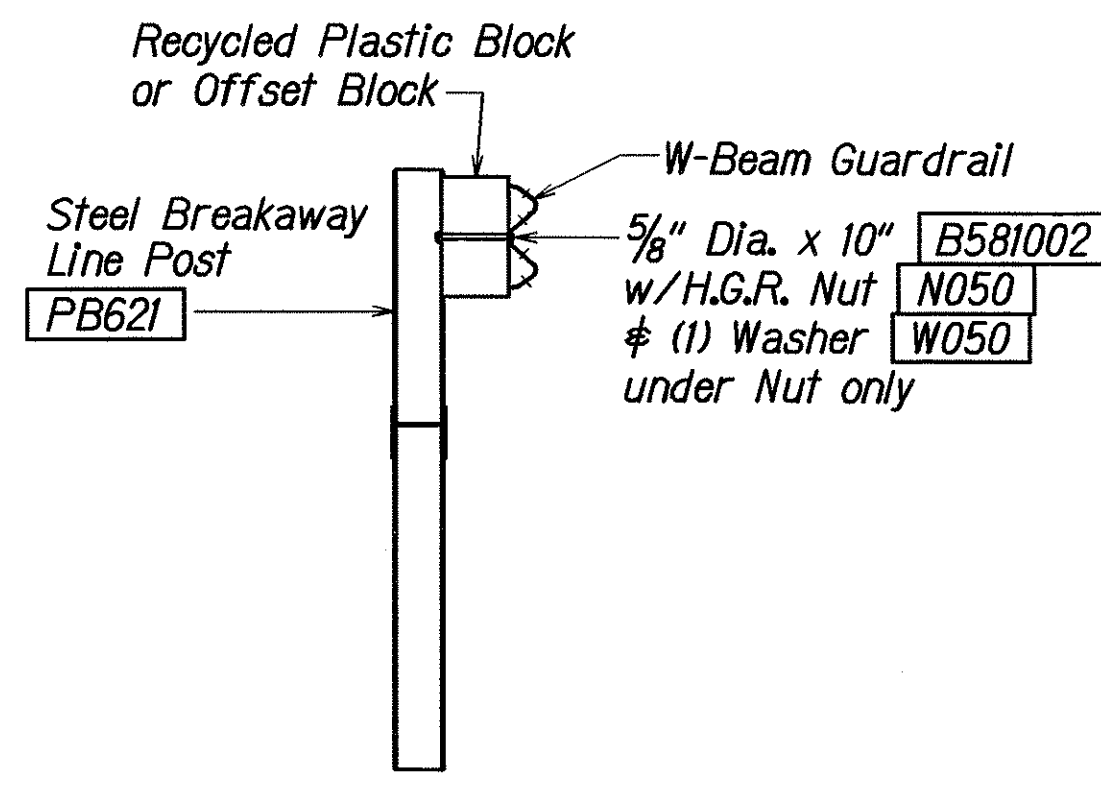
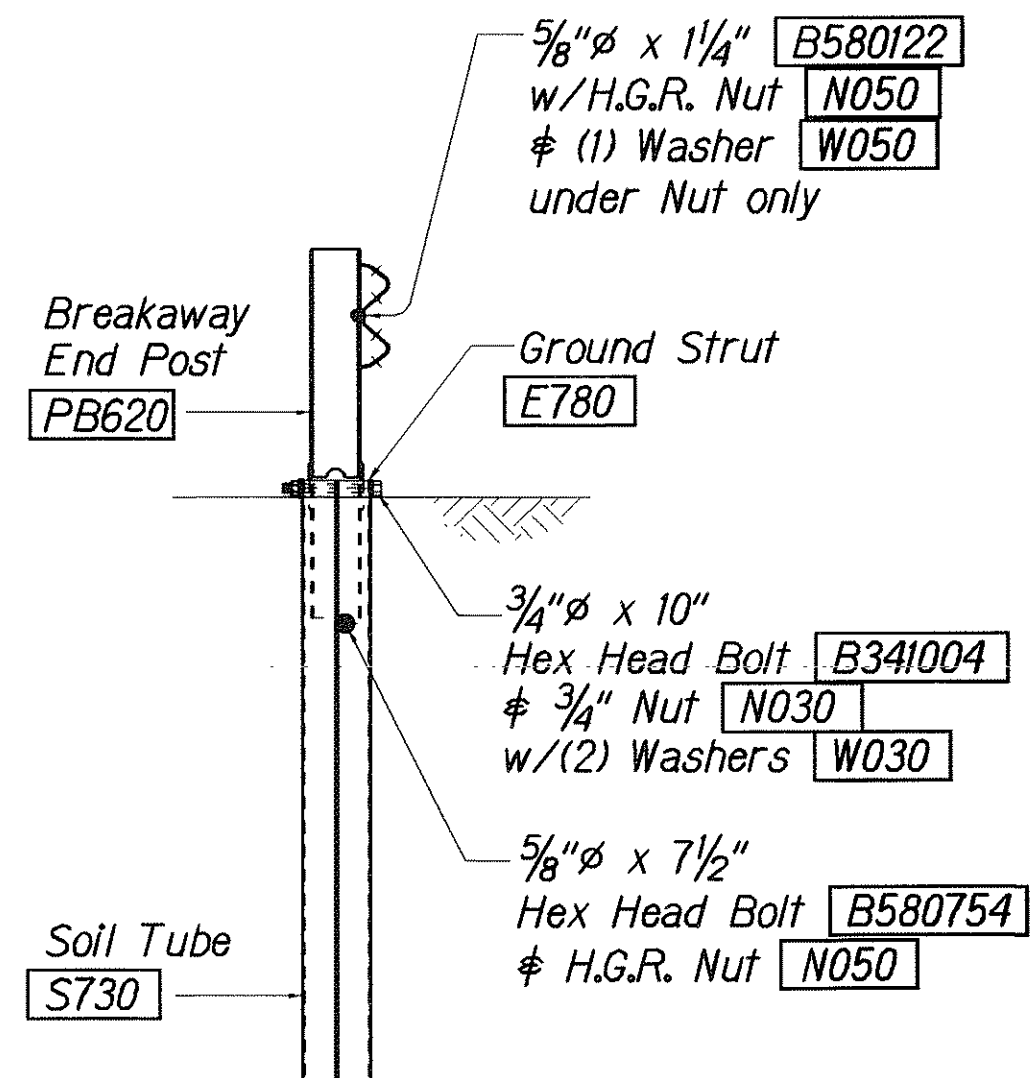
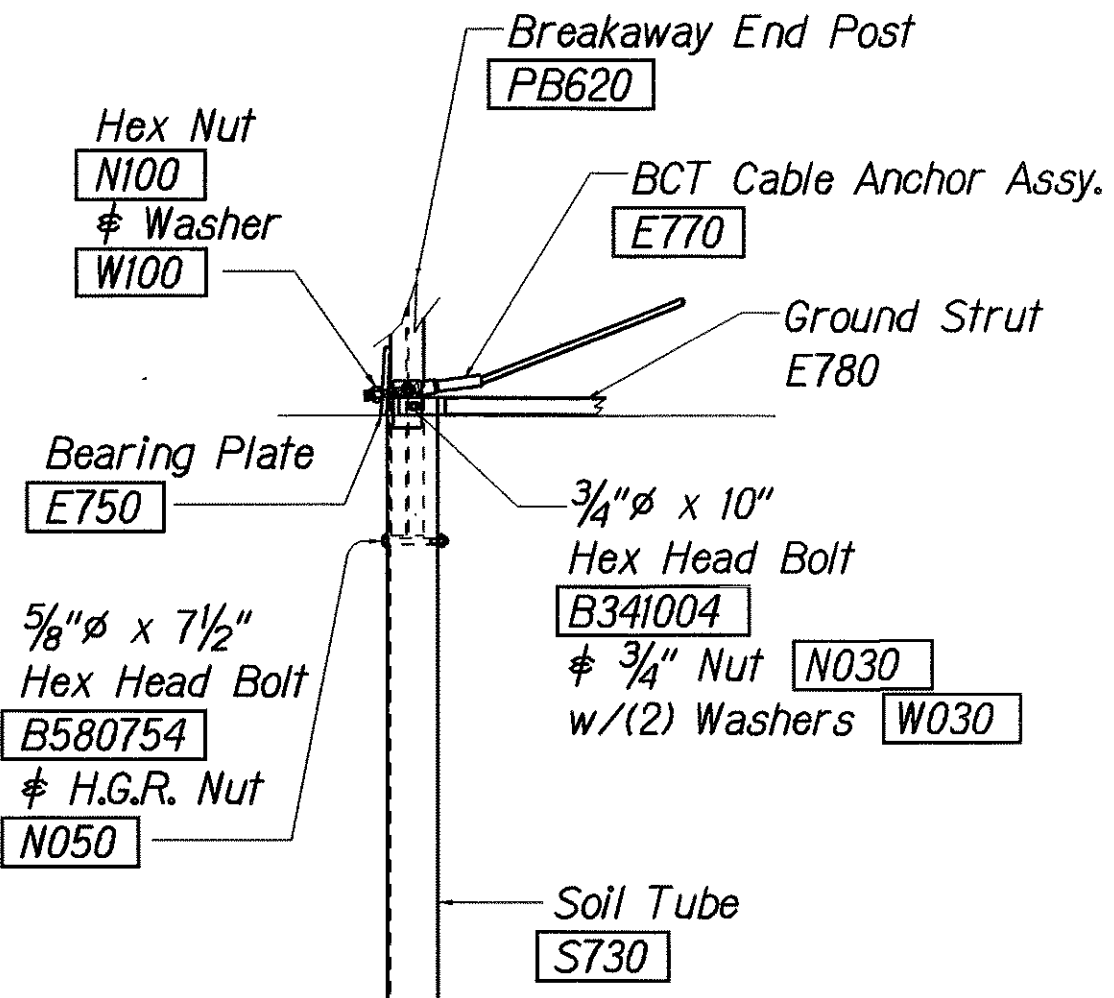
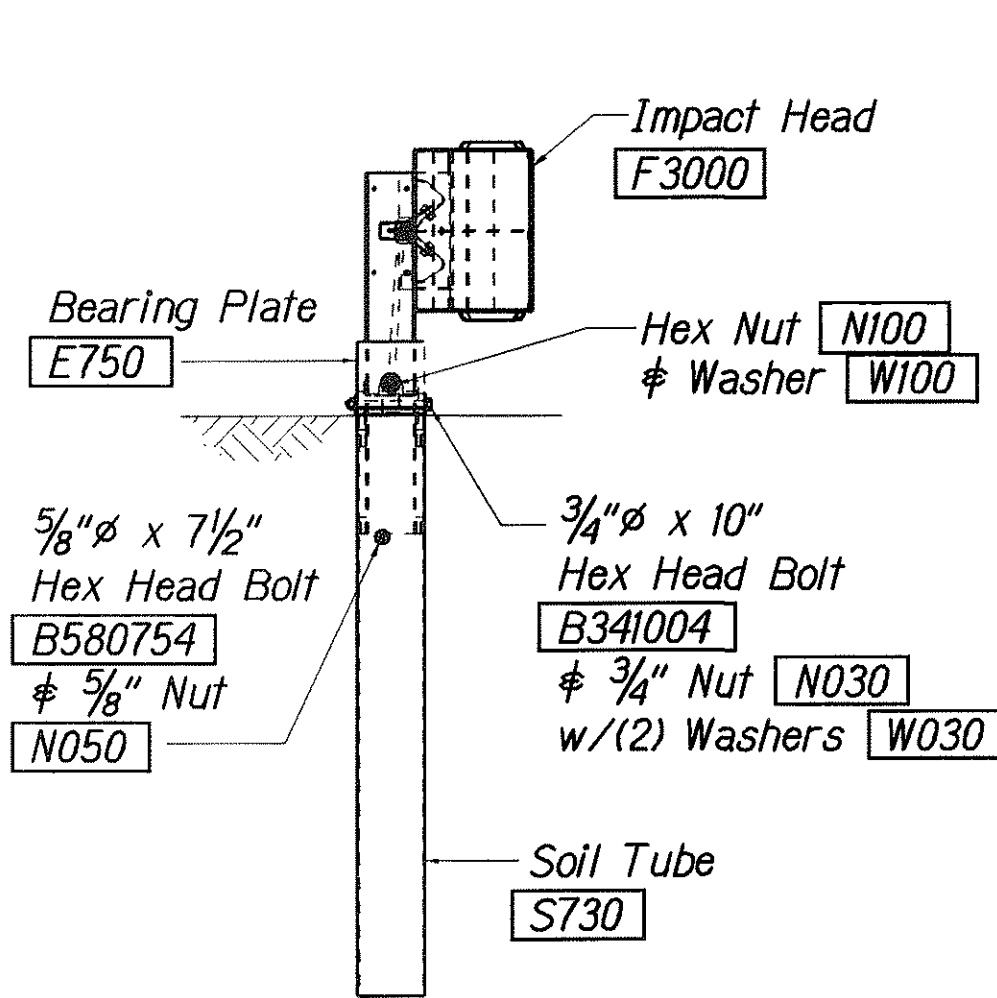
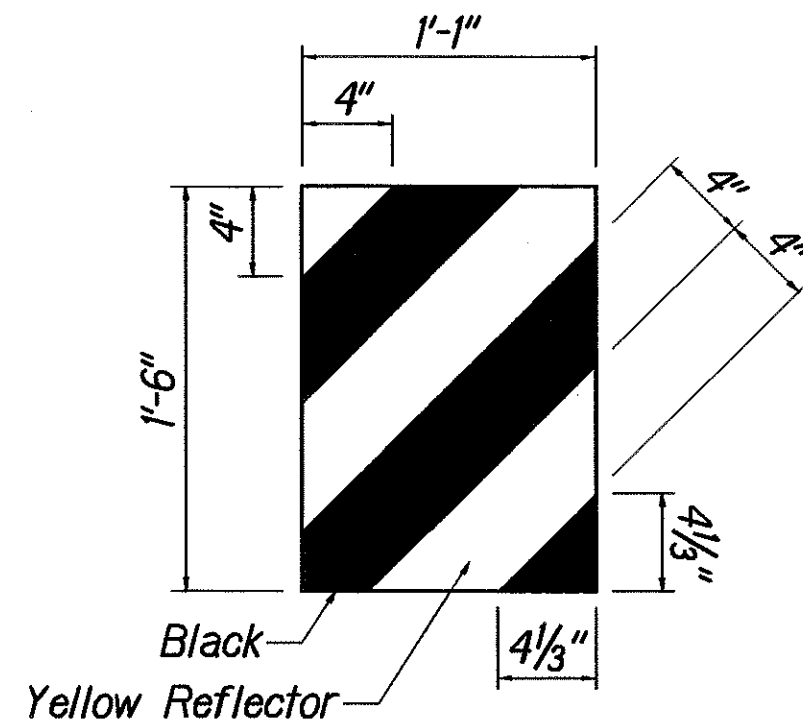
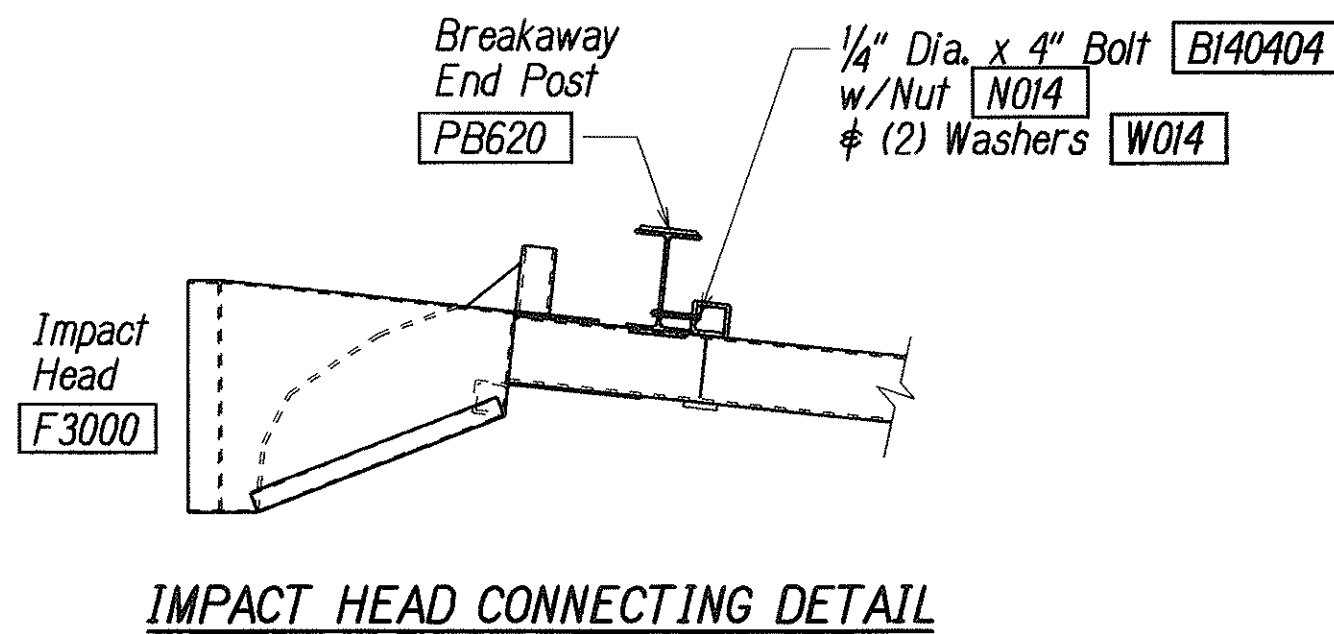
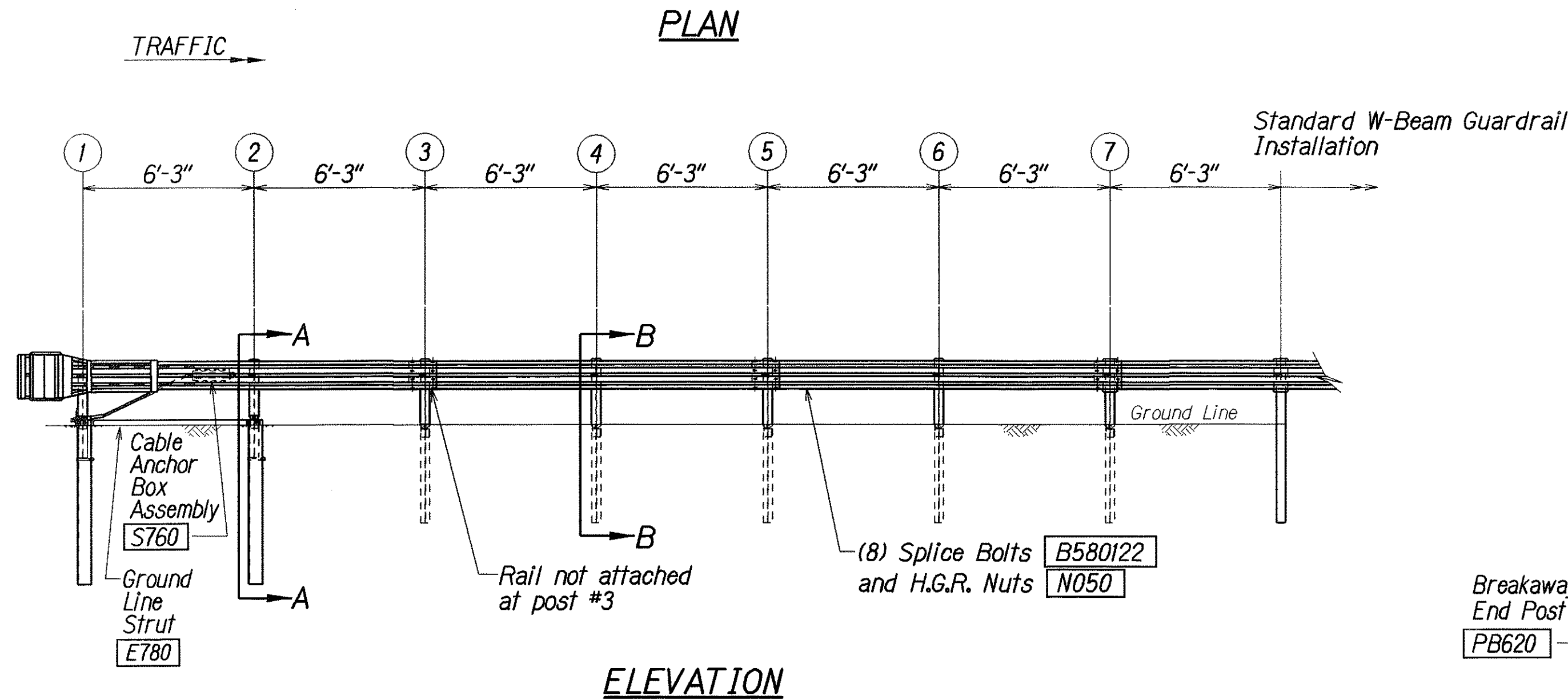
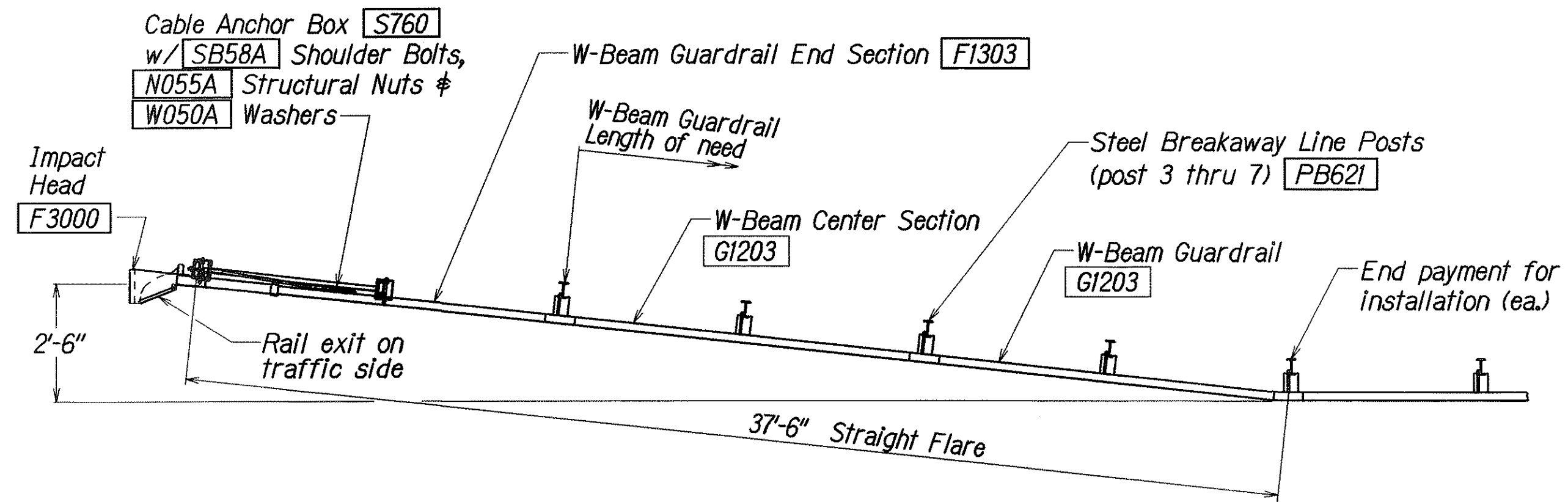
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	91	106

ITEM NO.	QTY.	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
G1203	2	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
BI40404	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

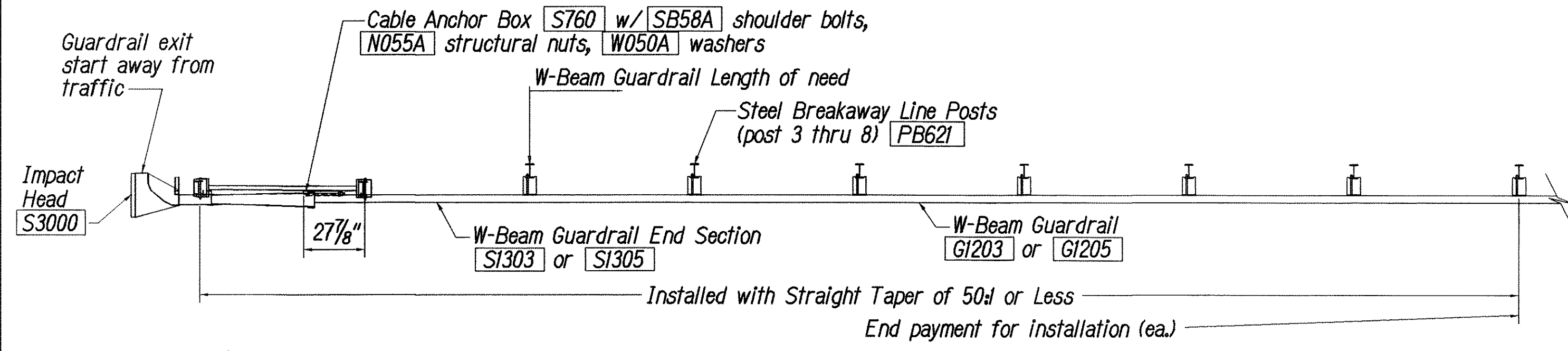
#### GENERAL NOTES

- 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.

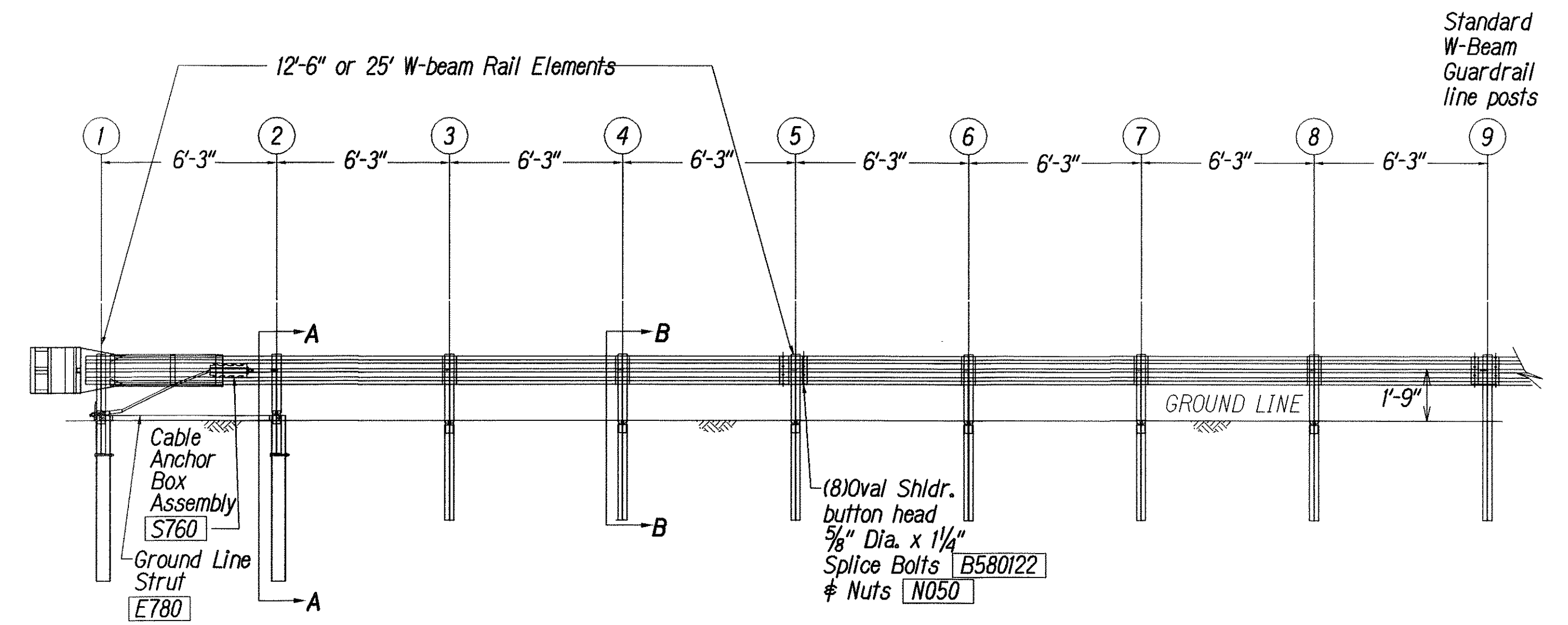


SECTION B-B  
 (Typical @ Post 3 - 7)  
 NOTE: RAIL NOT BOLTED @ POST #3

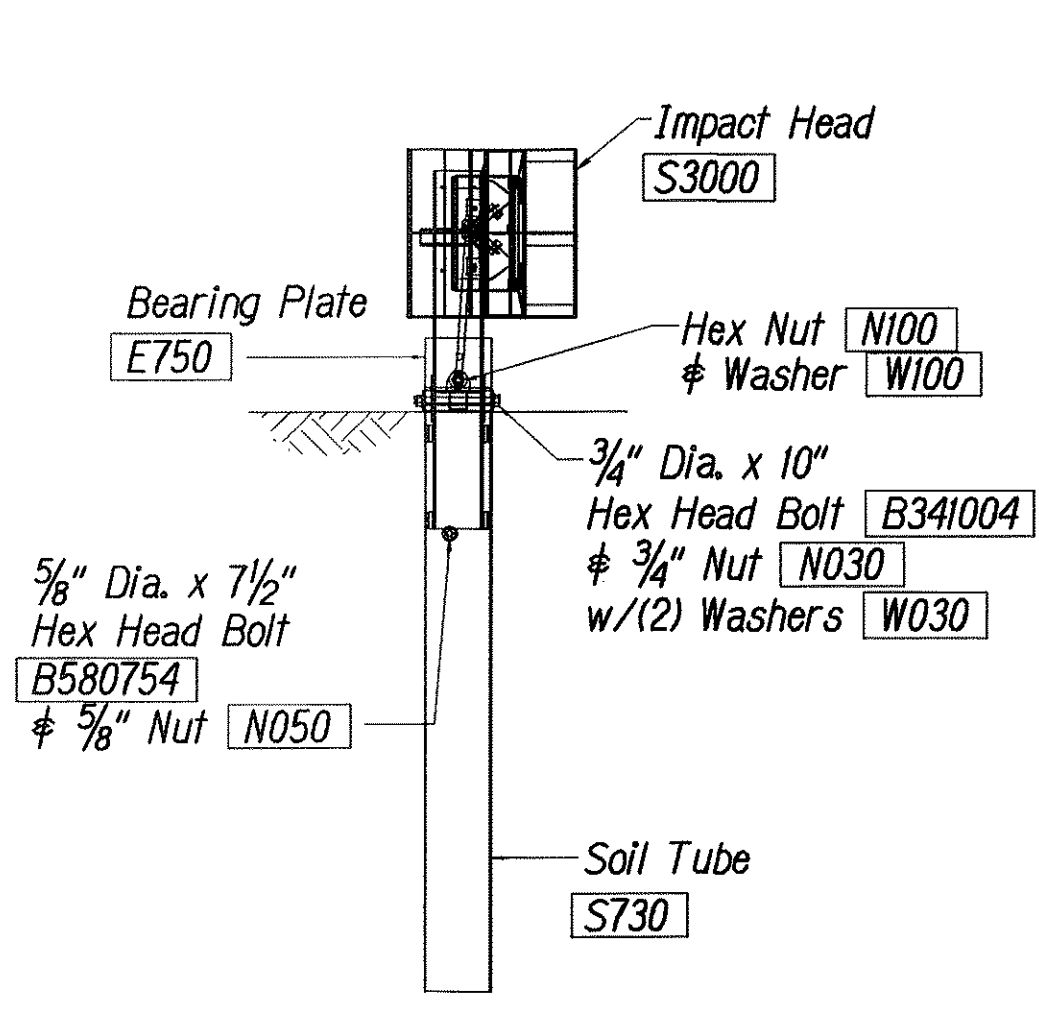
STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION  
**FLEAT-350**  
**FLARED ENERGY ABSORBING TERMINAL**  
 OLD KEA'AU-PAHOA ROAD RESURFACING  
 KEA'AU TO KEA'AU HIGH SCHOOL  
 PROJECT NO 139A-01-05M  
 Not to Scale Date: Nov., 2004  
 SHEET No. 15 OF 20 SHEETS



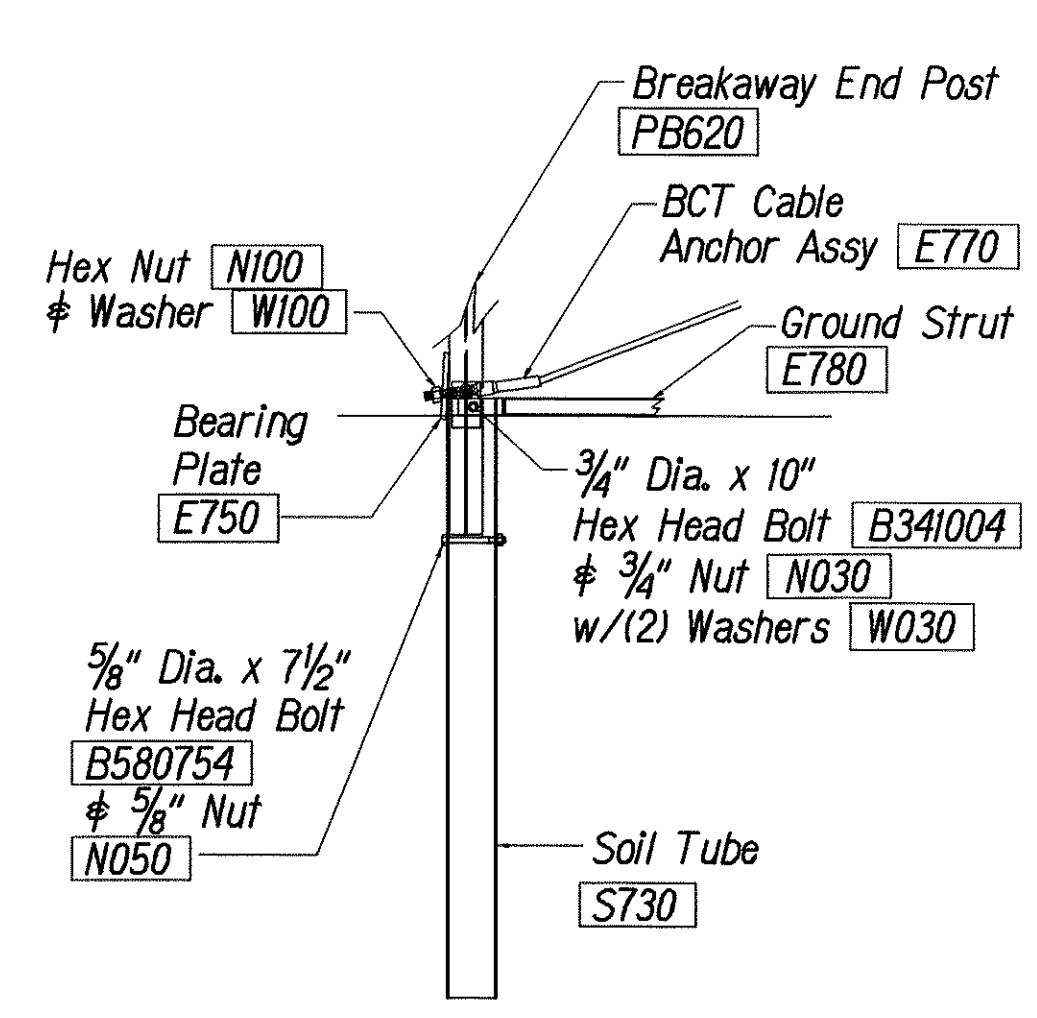
PLAN



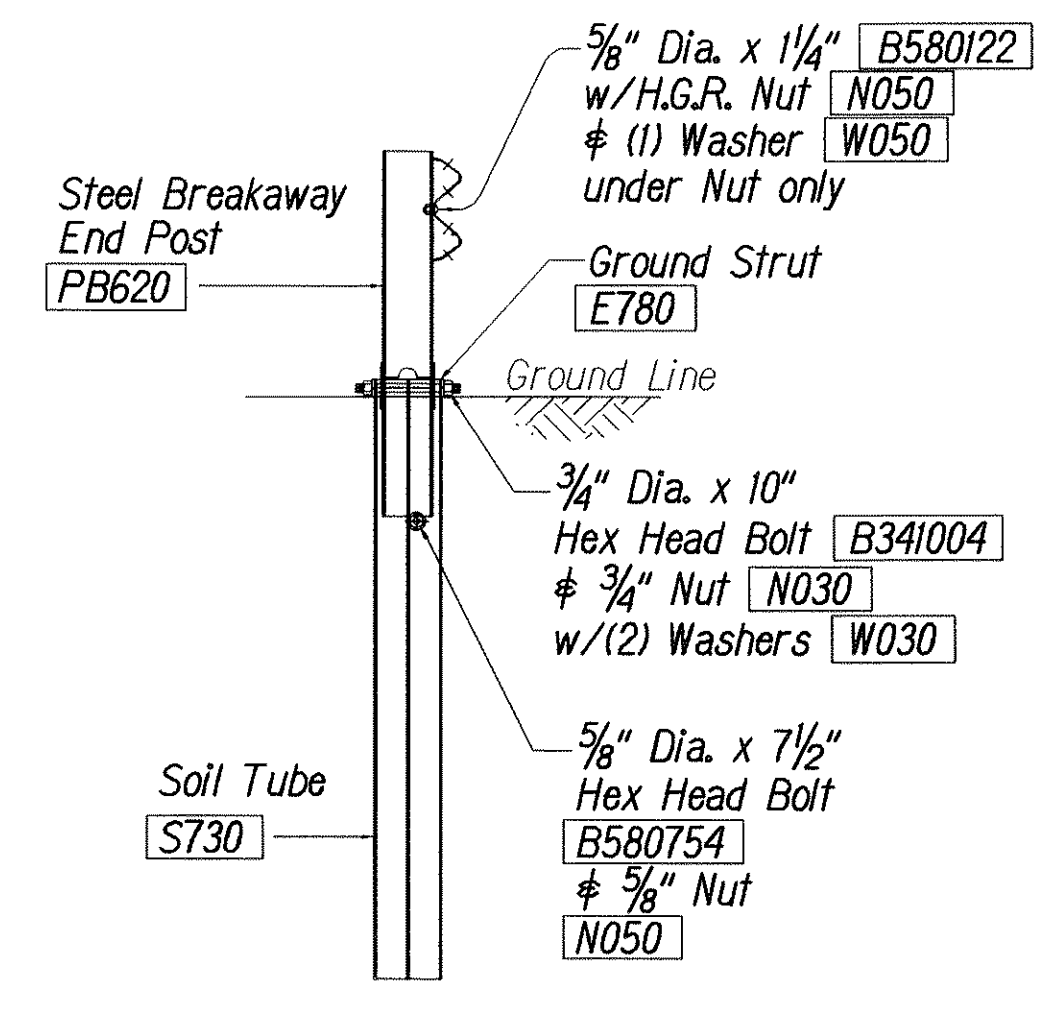
ELEVATION



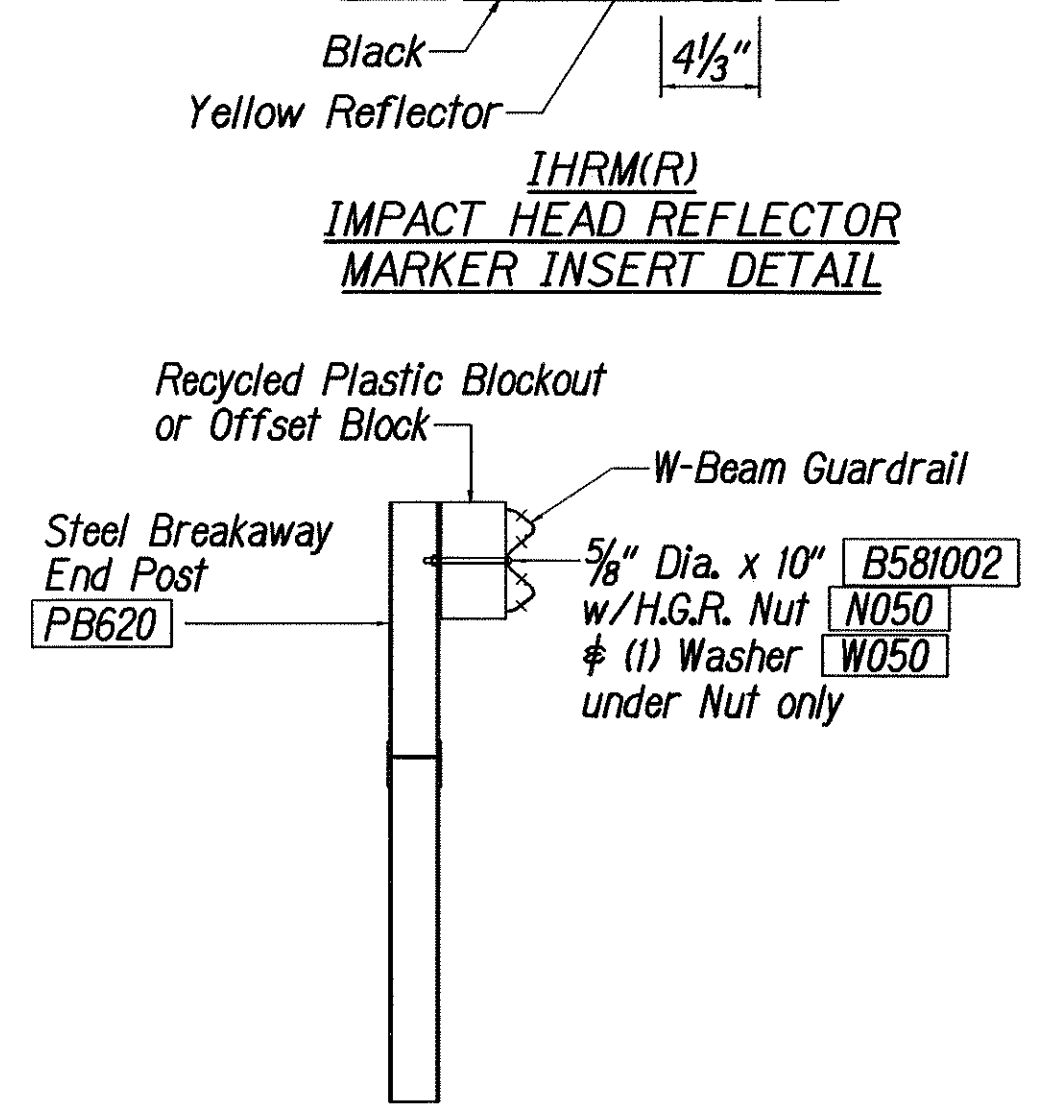
FRONT VIEW OF POST 1



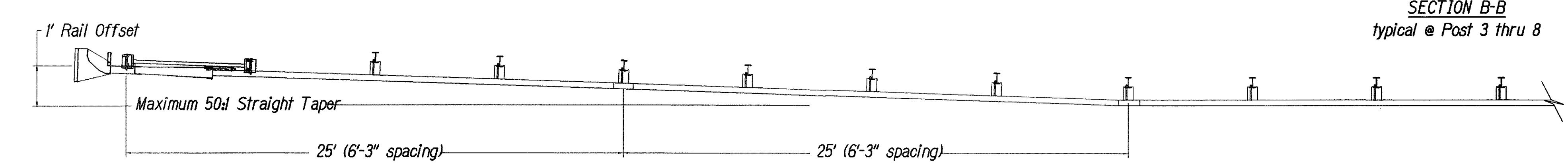
PARTIAL VIEW OF POST 1



SECTION A-A at Post #2



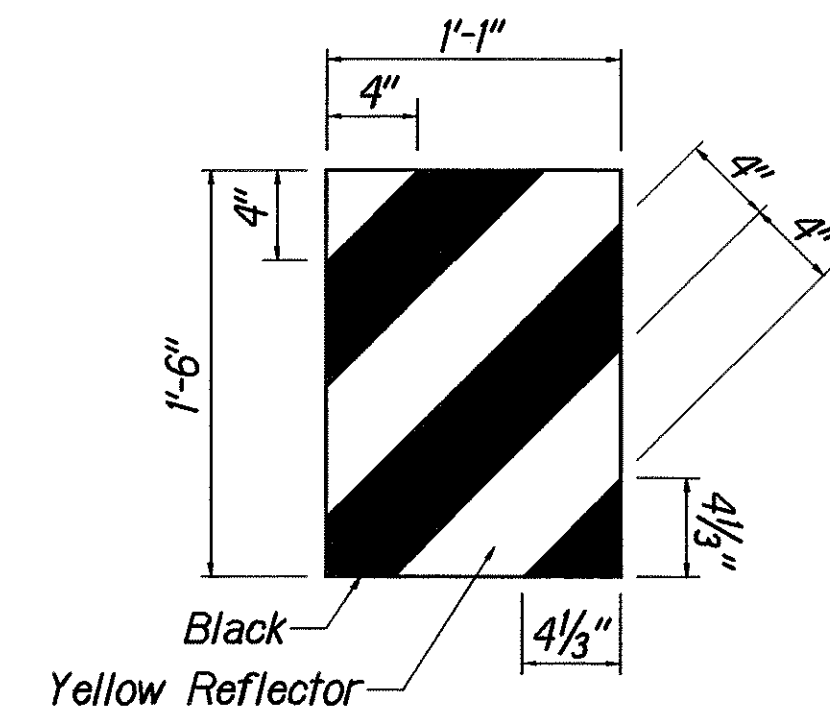
SECTION B-B typical @ Post 3 thru 8



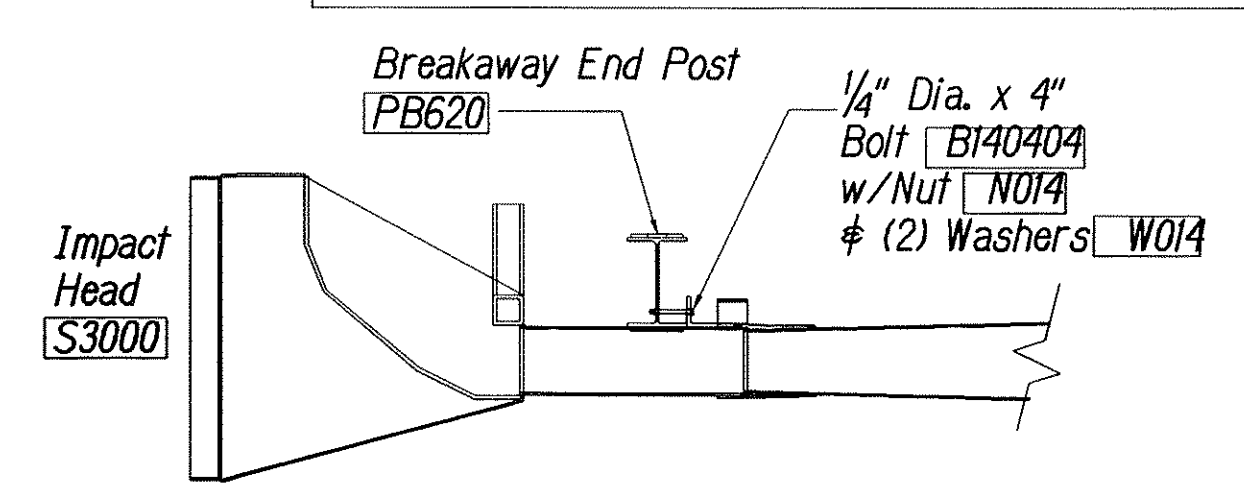
DETAIL A 50% flare rate

GENERAL NOTES:

1. Breakaway steel posts are required with the Sequential Kinking Terminal.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. When the Sequential Kinking Terminal is selected as the end treatment for W-Beam Guardrail installation, the W-Beam Guardrail will be flared at a rate of 50% to prevent the impact head from encroaching on the shoulder. The flare is not required and may be decreased or eliminated for specific installations.
4. 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.
5. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube. If the soil tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
6. 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.
7. 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.
8. A special site evaluation should be considered prior to using the Sequential Kinking Terminal where there is less than 25' between the outlet side of the Sequential Kinking Terminal and any adjacent driving lane.
9. (R) or (L) Indicates right or left Impact Head Reflector Marker (IHRM). Providing and installing of IHRM shall be considered incidental to end treatment.
10. The stripes for IHRM shall slope downward at an angle of 45° towards the side of the end treatment that traffic is to pass.



IMPACT HEAD REFLECTOR MARKER INSERT DETAIL



IMPACT HEAD CONNECTION DETAIL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	92	106

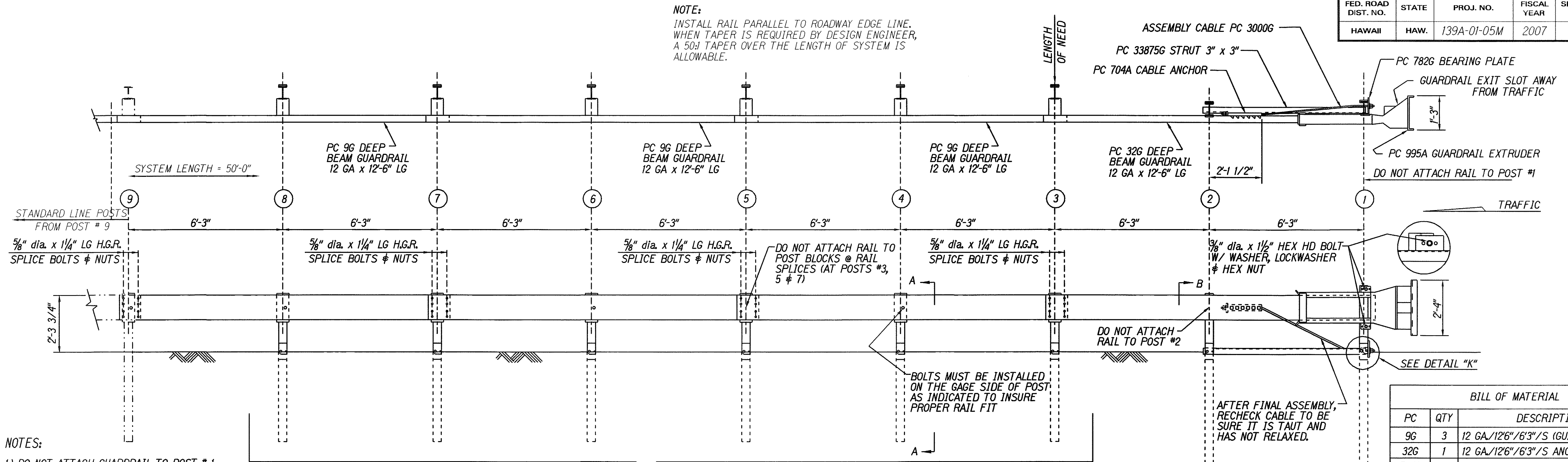
ITEM NO.	QTY.	BILL OF MATERIALS
S3000	1	IMPACT HEAD
SI303/SI305	1	W-BEAM GUARDRAIL END SECTION 12 GA. 12.5' or 25'
GI203/GI205	3/1	W-BEAM GUARDRAIL, 12 GA., 12.5' or 25'
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 72"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	STEEL BREAKAWAY END POSTS
PB621	6	STEEL BREAKAWAY LINE POSTS
	6	RECYCLED PLASTIC BLOCKOUTS OR OFFSET BLOCK
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
HARDWARE		
B580122	17/33	5/8" Dia. x 1 1/4" SPLICE BOLTS, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLTS
B341004	2	3/4" Dia. x 10" HEX BOLTS
B341002	6	5/8" Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B581802	6	5/8" Dia. x 18" H.G.R. BOLT (POST 3 THRU 8)
N050	26/42	5/8" Dia. H.G.R. NUT (SPLICE 17/33, SOIL TUBES 2, POST 2 THRU 8)
N030	2	3/4" Dia. HEX NUTS
W050	7	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 BOLTS
N055A	8	1/2" A325 STRUCTURAL NUTS
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

STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION  
**SKT-350**  
**SEQUENTIAL KINKING TERMINAL**  
 OLD KEA'AU-PAHOA ROAD RESURFACING  
 KEA'AU TO KEAAU HIGH SCHOOL  
 PROJECT NO 139A-01-05M  
 Not to Scale Date: Nov., 2004  
 SHEET No. 16 OF 20 SHEETS



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	93	106

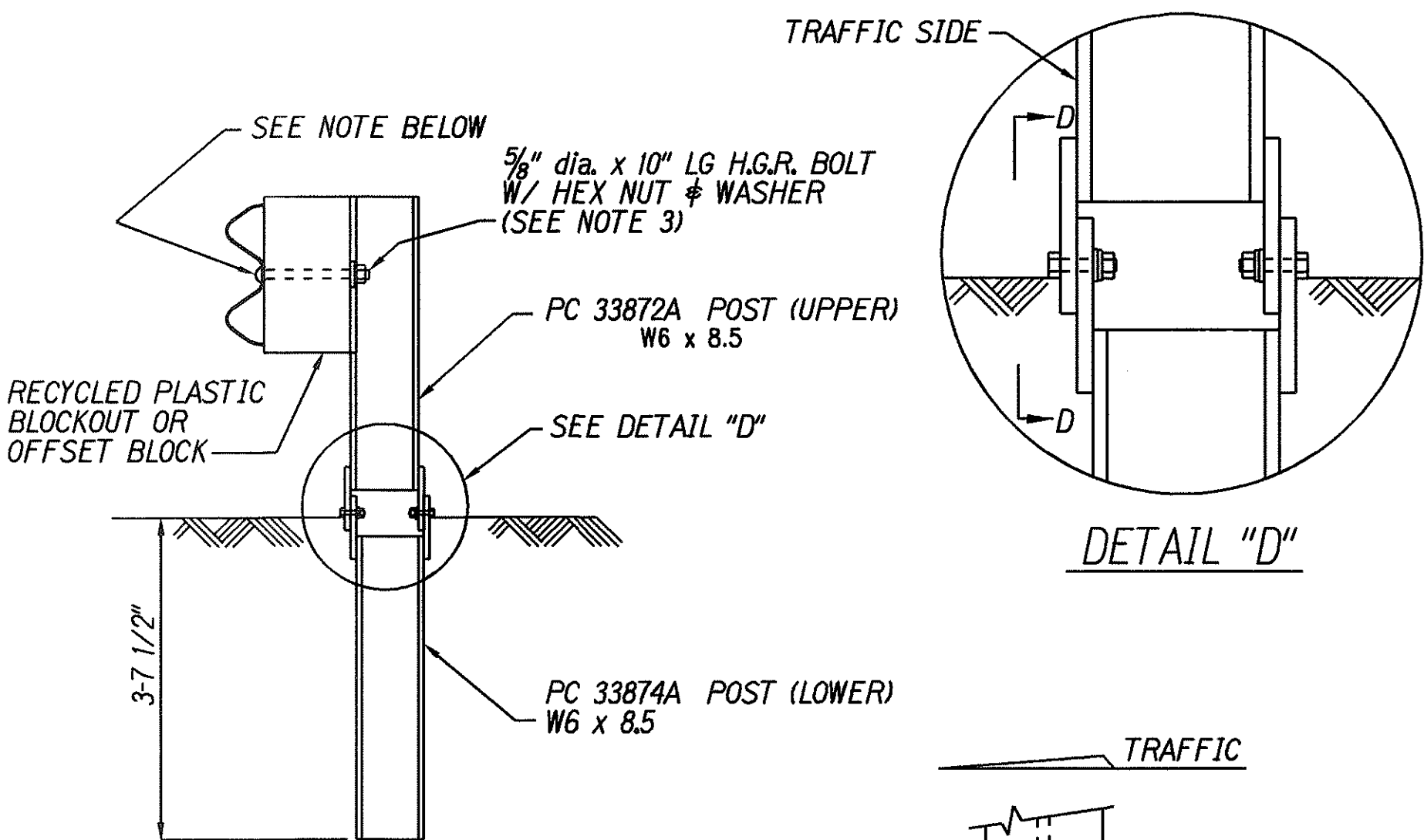


#### NOTES:

- DO NOT ATTACH GUARDRAIL TO POST # 1.
- DO NOT ATTACH GUARDRAIL TO POST BLOCKS AT GUARDRAIL LAP SPLICES. (AT POSTS #3, 5 & 7)
- THE 3/8" FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
- MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF TERMINAL.

PC 33872A POSTS (UPPER)  
PC 33874A POSTS (LOWER)

BILL OF MATERIAL		
PC	QTY	DESCRIPTION
9G	3	12 GA/12'6"/6'3"/S (GUARDRAIL)
32G	1	12 GA/12'6"/6'3"/S ANC (GUARDRAIL)
704A	1	CABLE ANCHOR BRACKET
782G	1	5/8" x 8" x 8" BEARING PLATE
995A	1	ET-2000 PLUS EXTRUDER
3000G	1	CABLE 3/4" x 6'6"
3300G	6	5/8" WASHER
3340G	38	5/8" HEX NUT
3360G	32	5/8" dia. x 1 1/4" SPLICE BOLT
3500G	6	5/8" dia. x 10" POST BOLT
3701G	19	3/4" WASHER
3704G	16	3/4" HEX NUT
3717G	15	3/4" dia. x 2 1/2" HEX HD BOLT
3718G	1	3/4" dia. x 3" HEX HD BOLT
3900G	2	1" WASHER
3910G	2	1" HEX NUT
5326B	6	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
4254G	18	3/8" WASHER
4255G	2	3/8" FENDER WASHERS
4258G	16	3/8" LOCKWASHER
4261G	2	3/8" dia. x 1 1/2" HEX HD BOLT
4699G	16	3/4" LOCKWASHER
6321G	16	3/8" dia. x 2" HEX HD BOLT
6405G	18	3/8" HEX NUT
33871A	1	ET2000 HBA POST #1 TOP
33872A	7	ET2000 HBA POST #2-#8 TOP
33873A	2	ET2000 HBA POST #1-#2 BOTTOM
33874A	6	ET2000 HBA POST #3-#8 BOTTOM
33875G	1	6'-6" ANGLE STRUT ET HBA



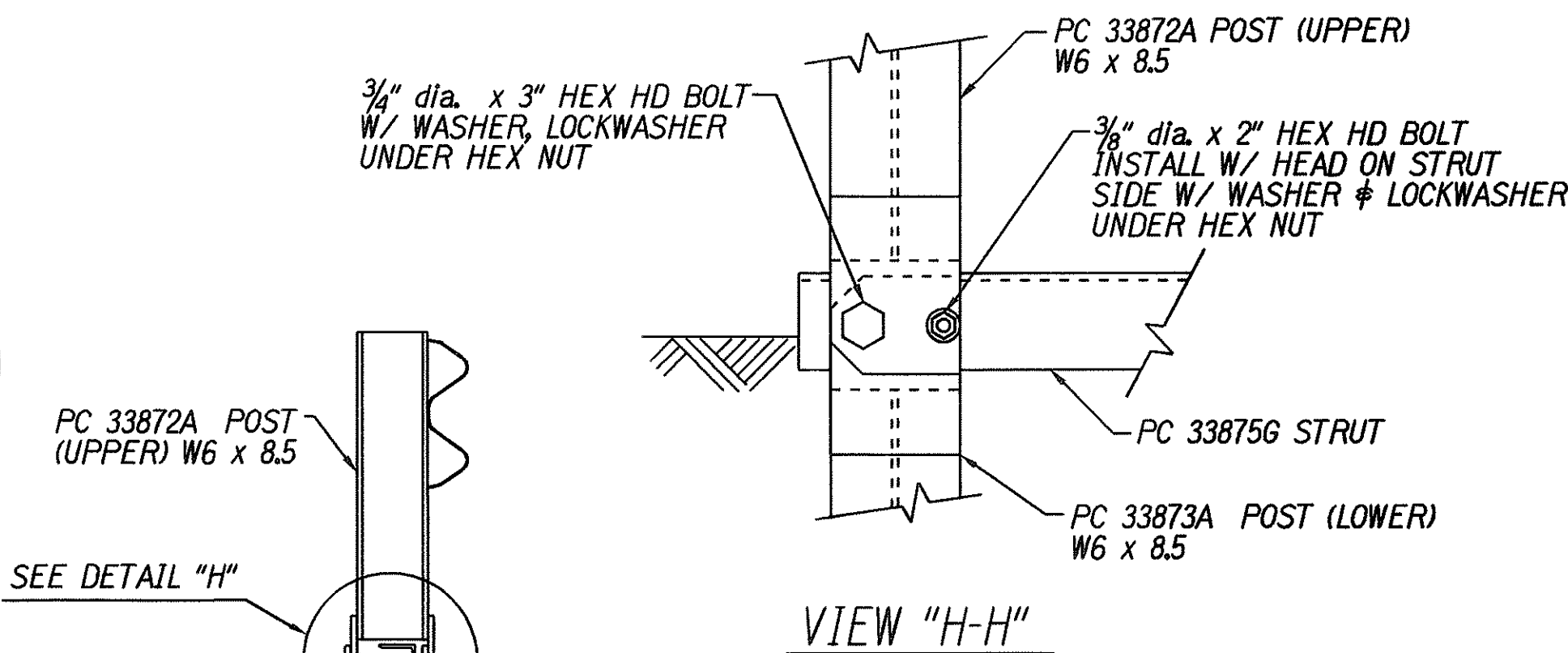
NOTE:  
SECTION "A-A" IS SIMILAR @ POST #3, 5 & 7.  
EXCEPT RAIL IS NOT ATTACHED.

SECTION "A-A"  
(TYP @ POSTS #4, 6 & 8)

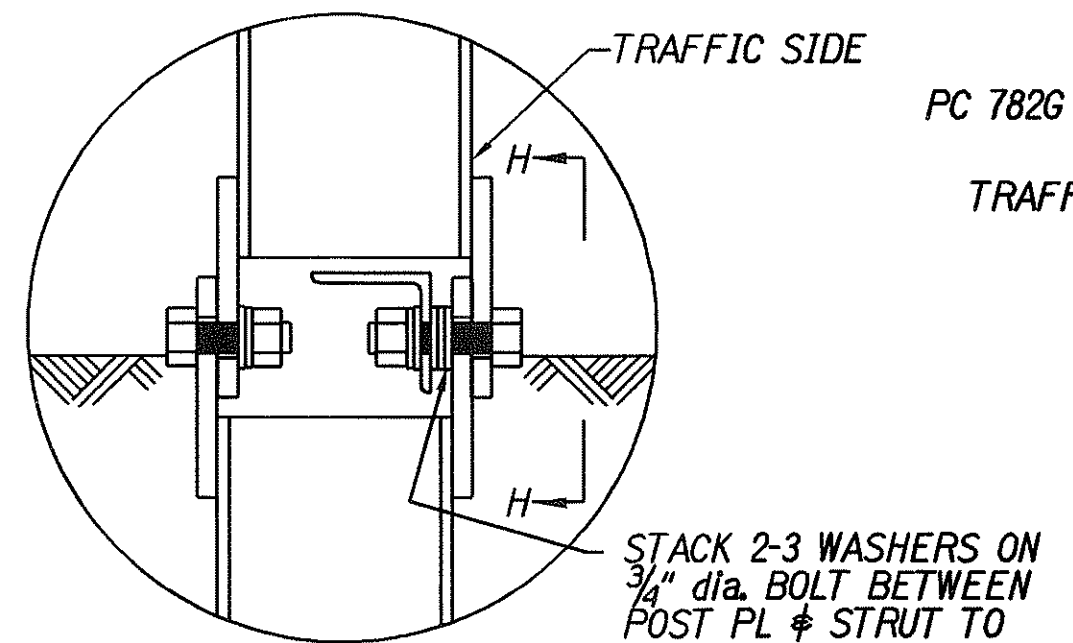
3/4" dia. x 2 1/2" HEX HD BOLT W/ WASHER, LOCKWASHER UNDER HEX NUT

3/4" dia. x 2" HEX HD BOLT W/ WASHER, LOCKWASHER UNDER HEX NUT

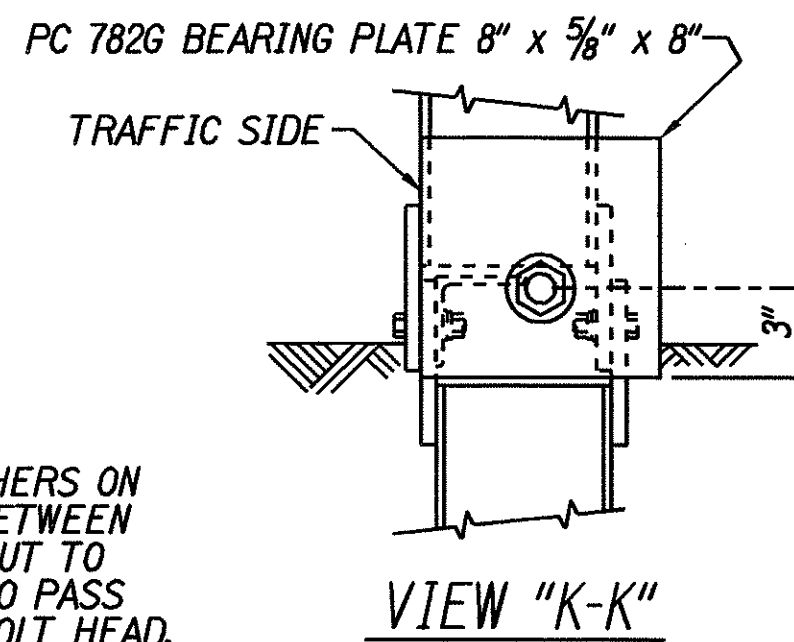
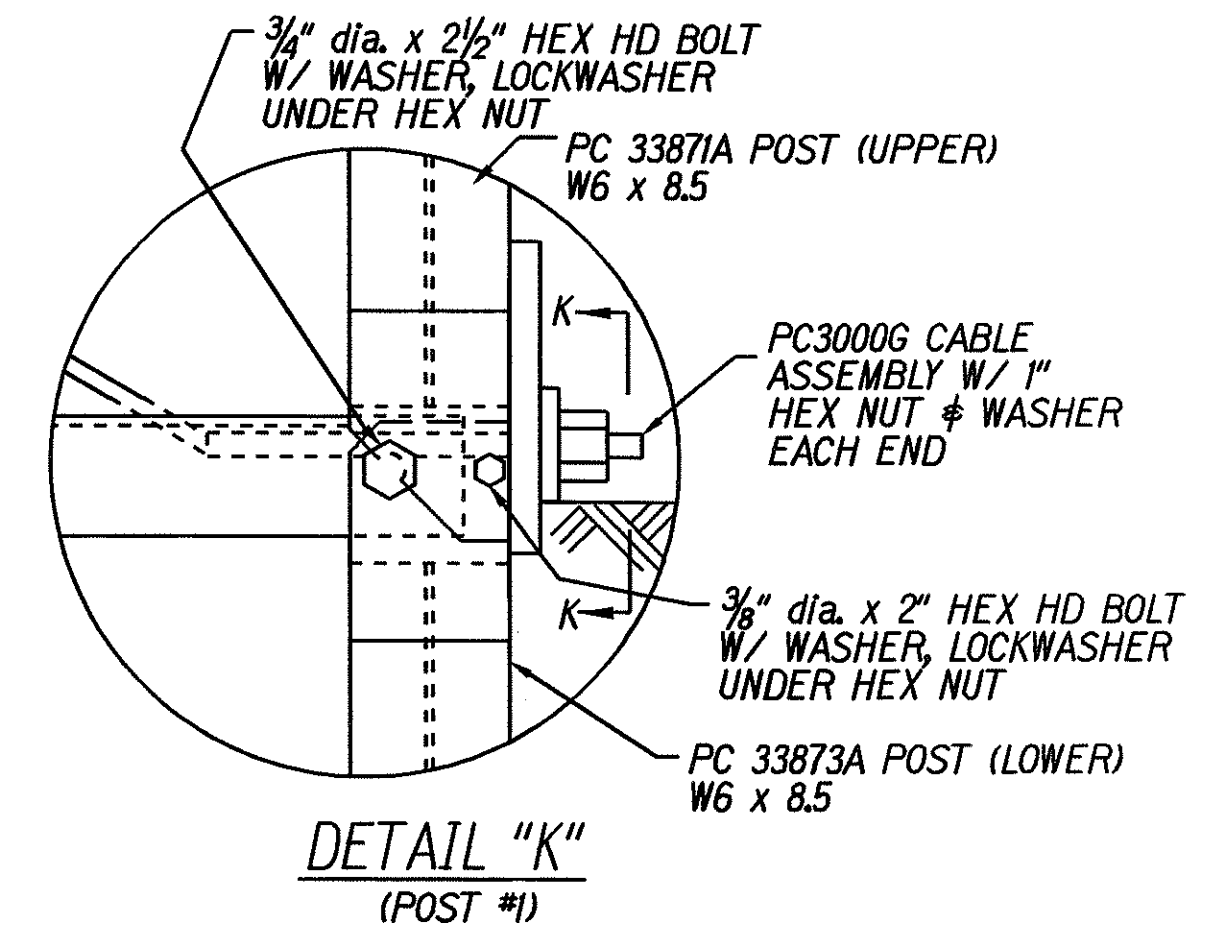
VIEW "D-D"



SECTION "B-B"  
(POST #2)



DETAIL "H"  
(POST #2)



STACK 2-3 WASHERS ON 3/4" dia. BOLT BETWEEN POST PL & STRUT TO ALLOW STRUT TO PASS OVER 3/8" dia. BOLT HEAD.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**ET-2000 PLUS**

OLD KEAAU-PAHOA ROAD RESURFACING  
KEA'AU TO KEAAU HIGH SCHOOL  
PROJECT NO. 139A-01-05M

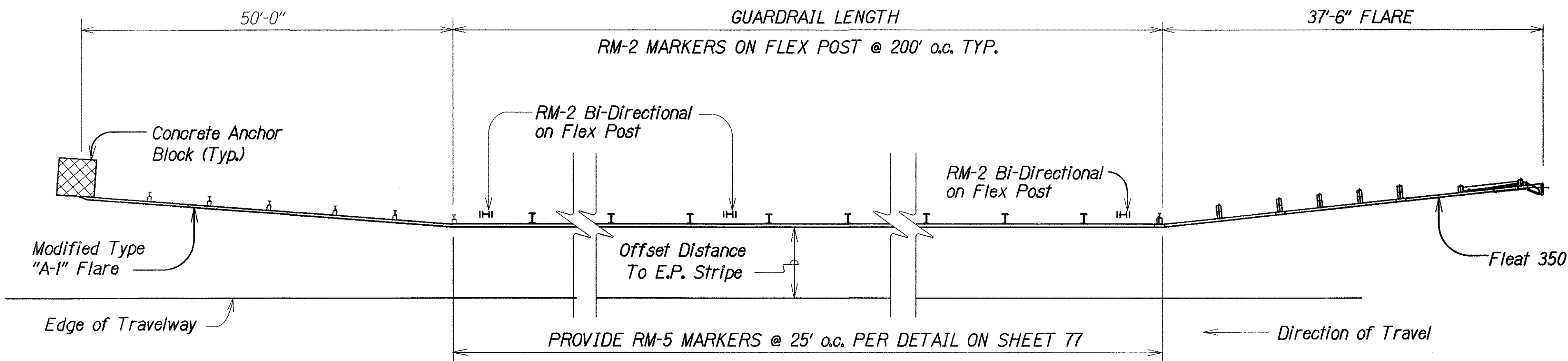
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SHEET No. 17 OF 20 SHEETS

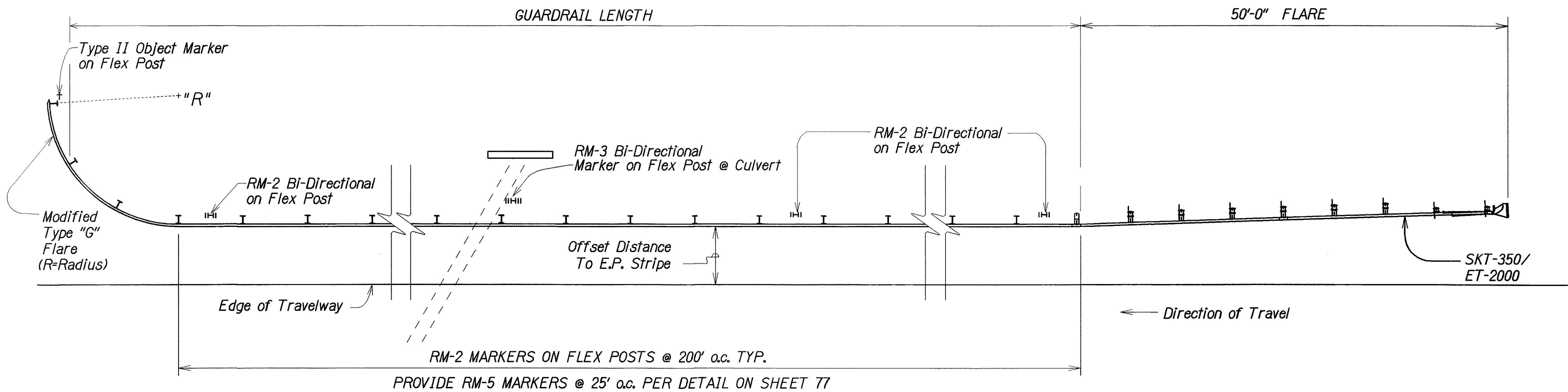
FED. ROAD DIST.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	94	106

NOTES:

1. All reflector markers located behind guardrail and other locations shall be installed with flexible delineator posts.
2. Exact location of Reflector Markers shall be determined in the field by the Engineer.
3. Color of flexible delineator posts shall be white except for RM-3, RM-3 bidirectional, and RM-3/RM-2 combinations shall be yellow posts.
4. RM-2 Bi- Directional shall be white in color.
5. RM-5 shall be per Standard Guardrail Details.



TYPICAL @ "MODIFIED A" & "FLEAT 350" END TREATMENT



TYPICAL @ MODIFIED "G" & "SKT-350"/"ET-2000" END TREATMENT

TYPICAL GUARDRAIL REFLECTOR MARKER INSTALLATION

Not To Scale

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

GUARDRAIL REFLECTOR

MARKER DETAIL

OLD KEA'AU-PAHOA ROAD RESURFACING

KEA'AU TO KEAAU HIGH SCHOOL

PROJECT NO. 139A-01-05M

Scale: none

Date: Nov., 2004

SHEET No. 18 OF 20

SHEETS

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

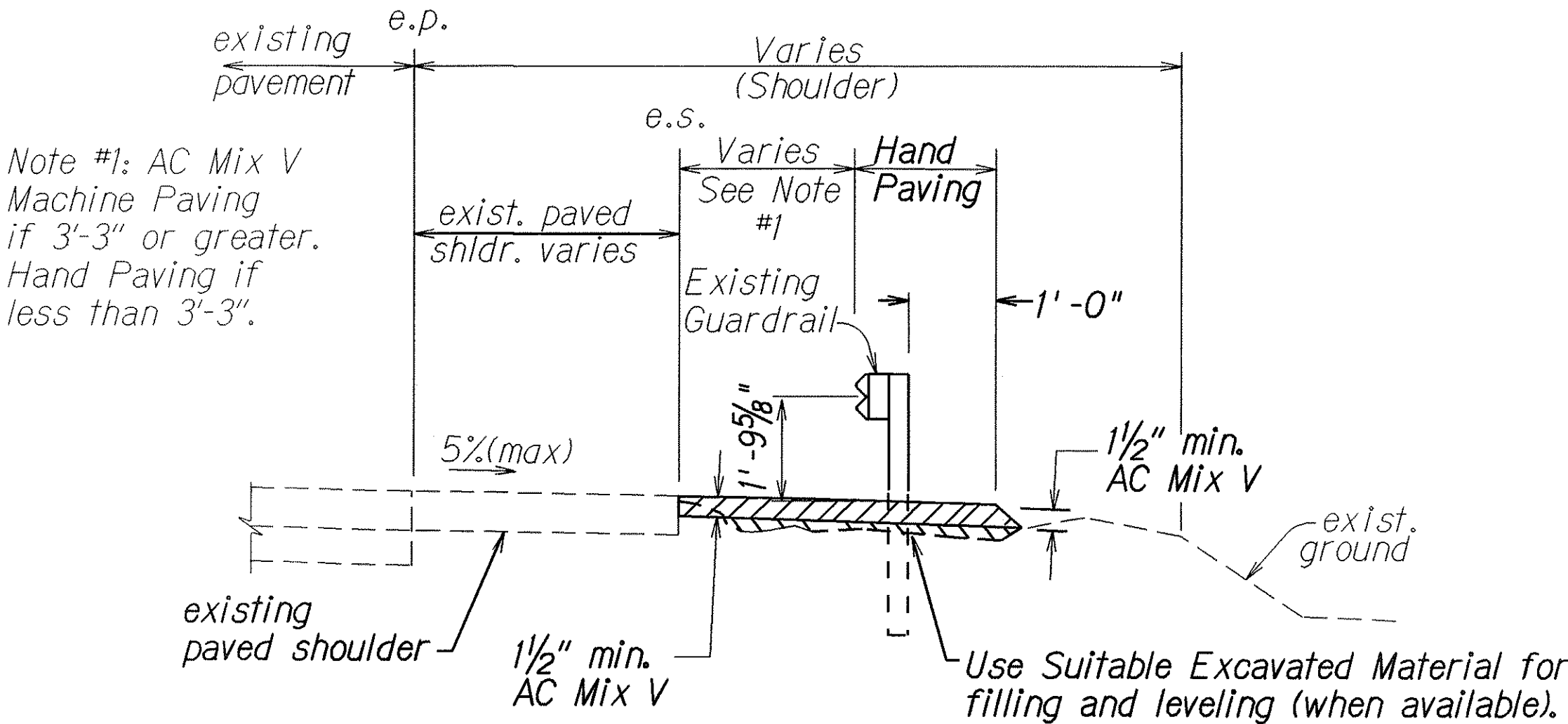
13/13/02 he31-usr/2/Hawaii District Project Plans/Guardrail Details/bdhwjrlmldet.dgn



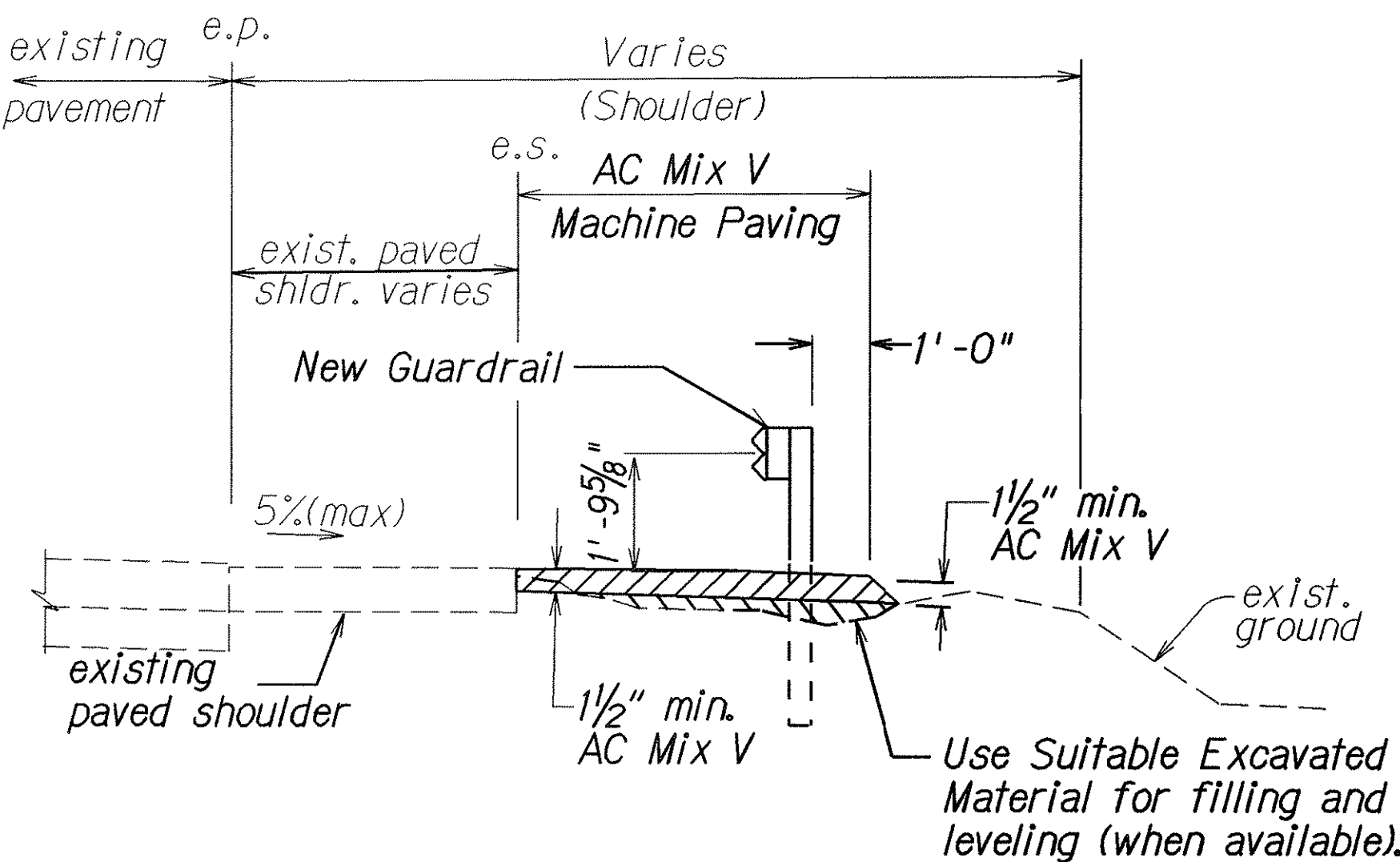
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	95	106

NOTES:

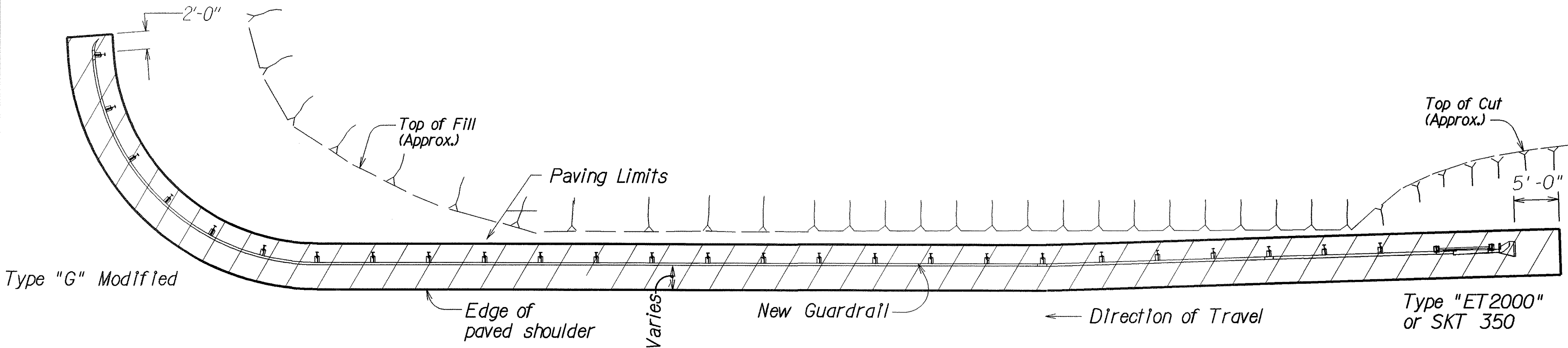
1. Pay limits for AC Mix V, Machine Paving and AC Mix V, Hand Paving, are as shown.
2. AC Mix No. V, Hand Paving shall be paid for under Item No. 401.0420 and AC Mix No. V, Machine Paving shall be paid for under Item No. 401.0410.
3. Excavating, placing, leveling, and compacting of suitable excavated material shall not be paid for separately, but shall be considered incidental to various contract items in Section 401 - Asphalt Concrete Pavement.
4. Compaction requirements of Cold Planed material shall be in accordance with Section 203 - Excavation and Embankment.
5. Maintain longitudinal drainage as shown on the plans or as directed by the Engineer.
6. Contractor's attention is called to the increase in the asphalt content and compaction requirements in Section 401 - Asphalt Concrete Pavement, Paragraph 401.03-(FX3) of the Special Provisions.



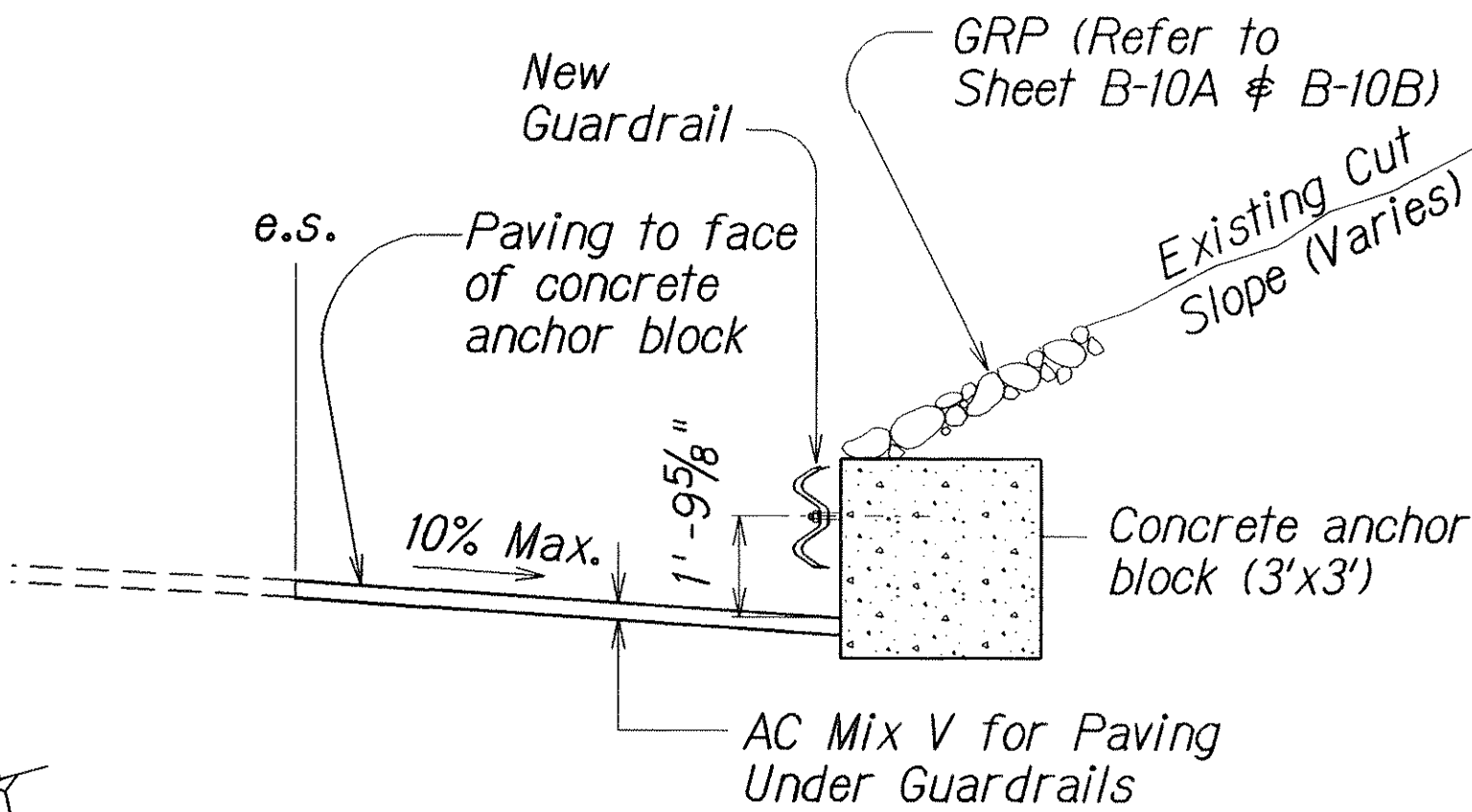
TYPICAL PAVING UNDER EXISTING GUARDRAIL  
Not To Scale



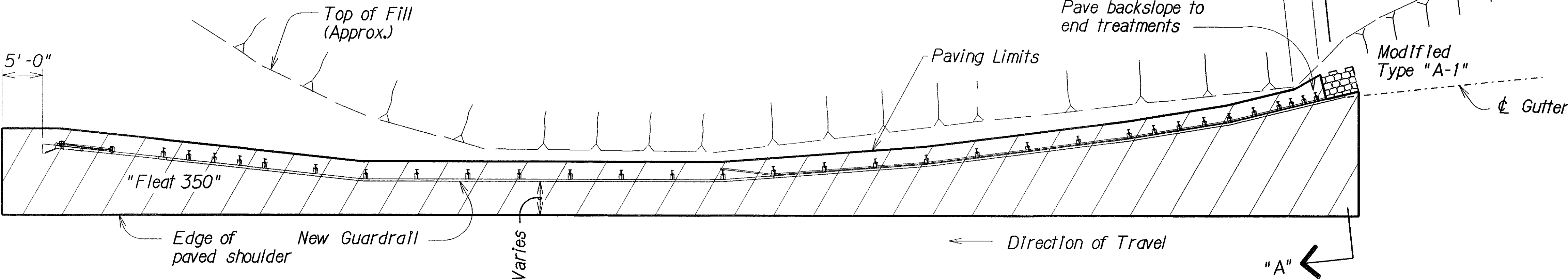
TYPICAL PAVING UNDER NEW GUARDRAIL  
Not To Scale



PLAN - PAVING UNDER GUARDRAIL  
Not To Scale



SECTION "A-A"  
Not To Scale



PLAN - PAVING UNDER GUARDRAIL  
Not To Scale

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**TYPICAL GUARDRAIL PAVING DETAILS**  
**FULL PAVING UNDER GUARDRAIL**  
OLD KEA'AU-PAHOA ROAD RESURFACING  
KEA'AU TO KEA'AU HIGH SCHOOL  
PROJECT NO. 139A-01-05M  
Scale: None Date: Nov., 2004  
SHEET No. 19 OF 20 SHEETS

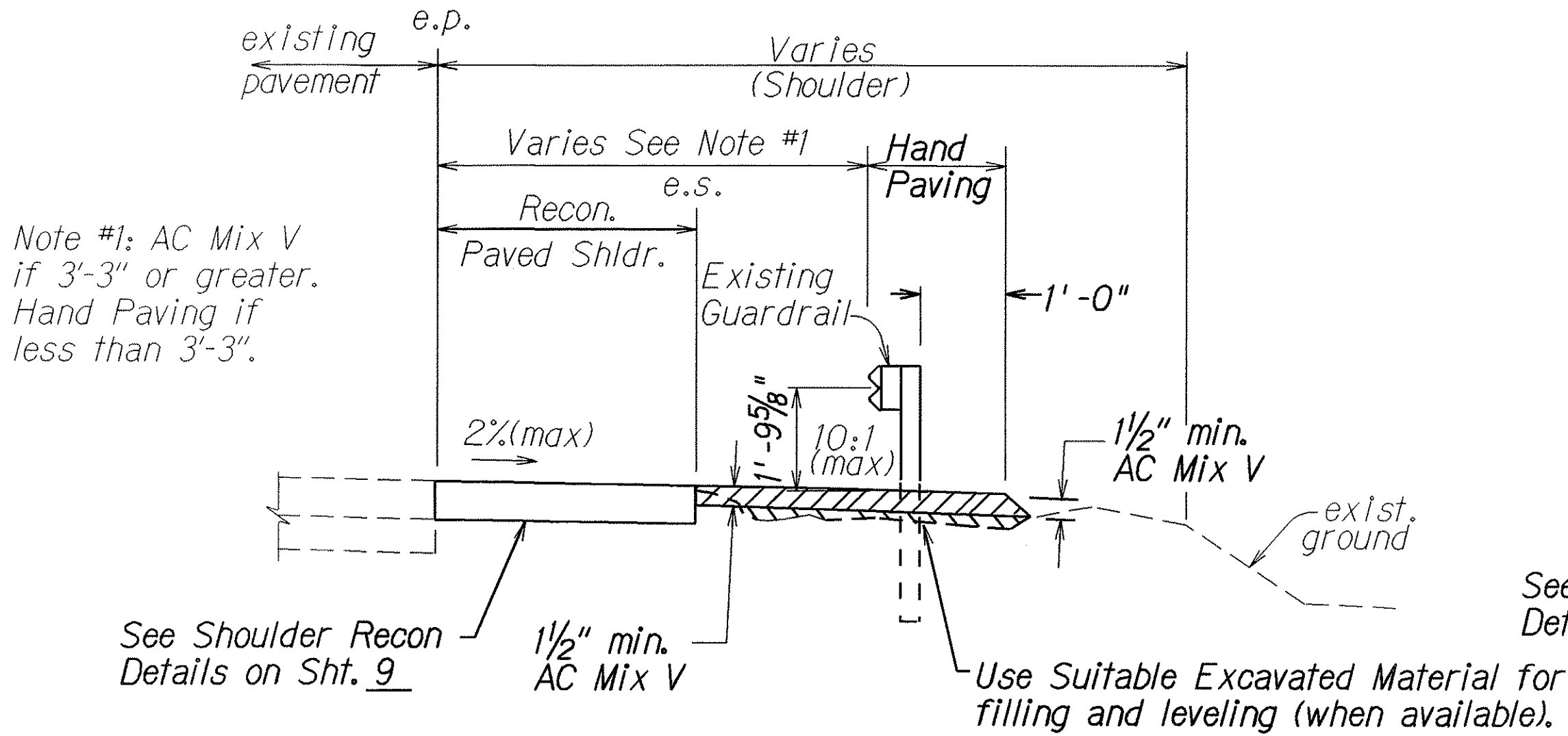
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
DESIGNED BY	TRACED BY	
CHECKED BY	DESIGNED BY	
NOTED BY	CHECKED BY	

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FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	139A-01-05M	2007	96	106

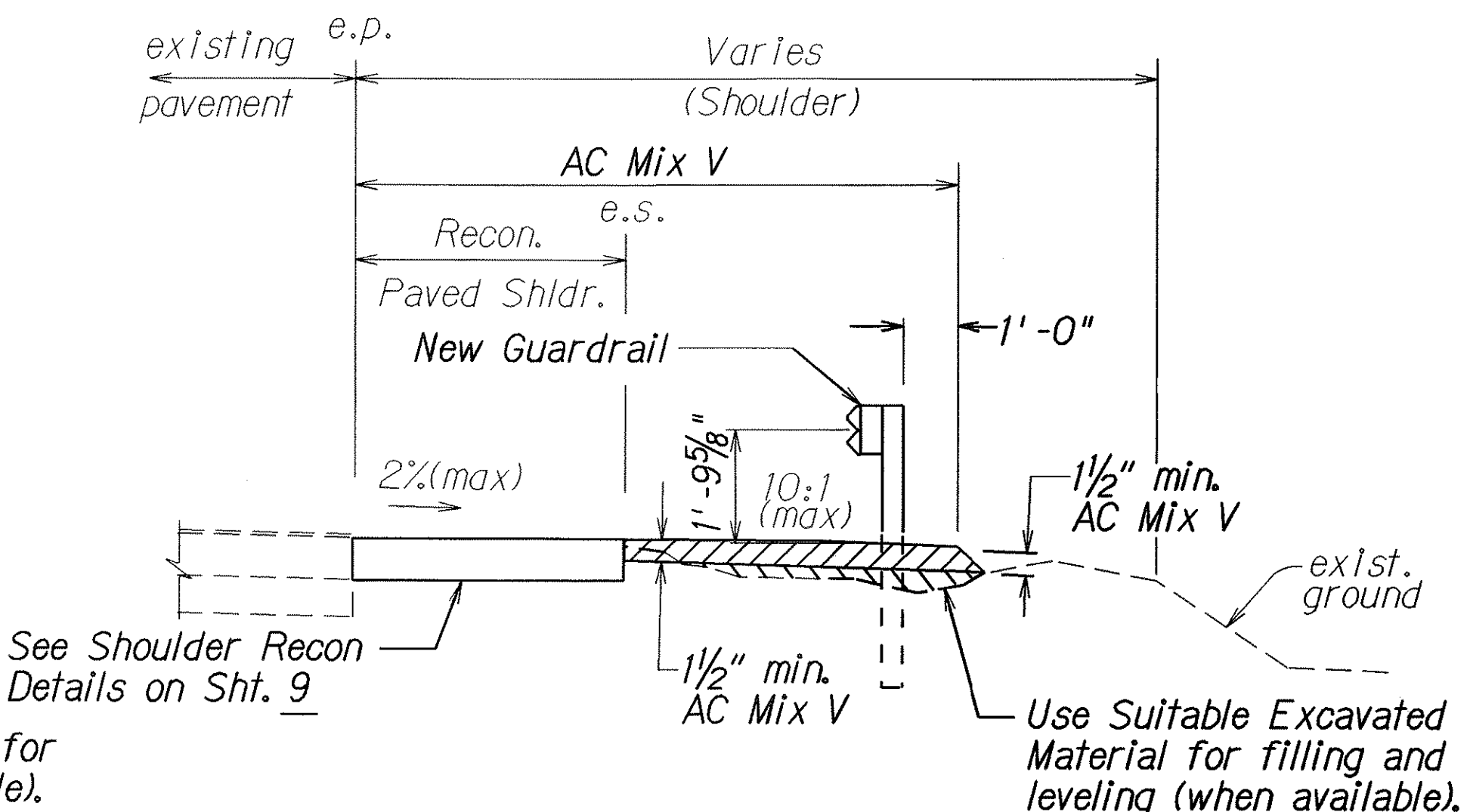
**NOTES:**

1. Pay limits for AC Mix V, Machine Paving and AC Mix V, Hand Paving, are as shown.
2. AC Mix V, shall be paid for under Item No. 401.0410; AC Mix No. V, Hand Paving shall be paid for under Item No. 401.0420; AC Mix No. V, Machine Paving shall be paid for under Item No. 401.0410.
3. Excavating, placing, leveling, and compacting of suitable excavated material shall not be paid for separately, but shall be considered incidental to various contract items in Section 401 - Asphalt Concrete Pavement.
4. Compaction requirements of Cold Planed material shall be in accordance with Section 203 - Excavation and Embankment.
5. Maintain longitudinal drainage as shown on the plans or as directed by the Engineer.
6. Contractor's attention is called to the increase in the asphalt content and compaction requirements in Section 401 - Asphalt Concrete Pavement, Paragraph 401.03-(F)(3) of the Special Provisions.



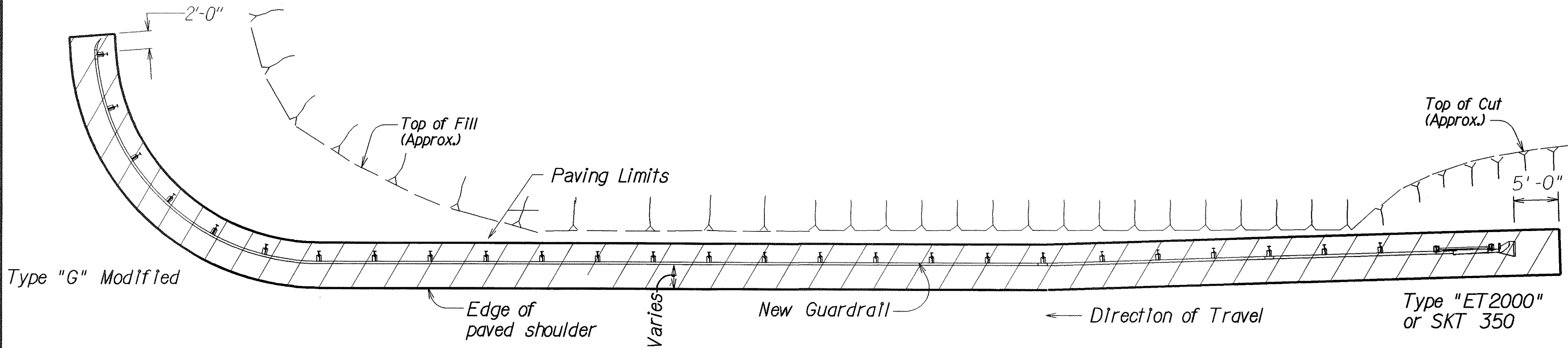
**TYPICAL PAVING UNDER EXISTING GUARDRAIL**

Not To Scale



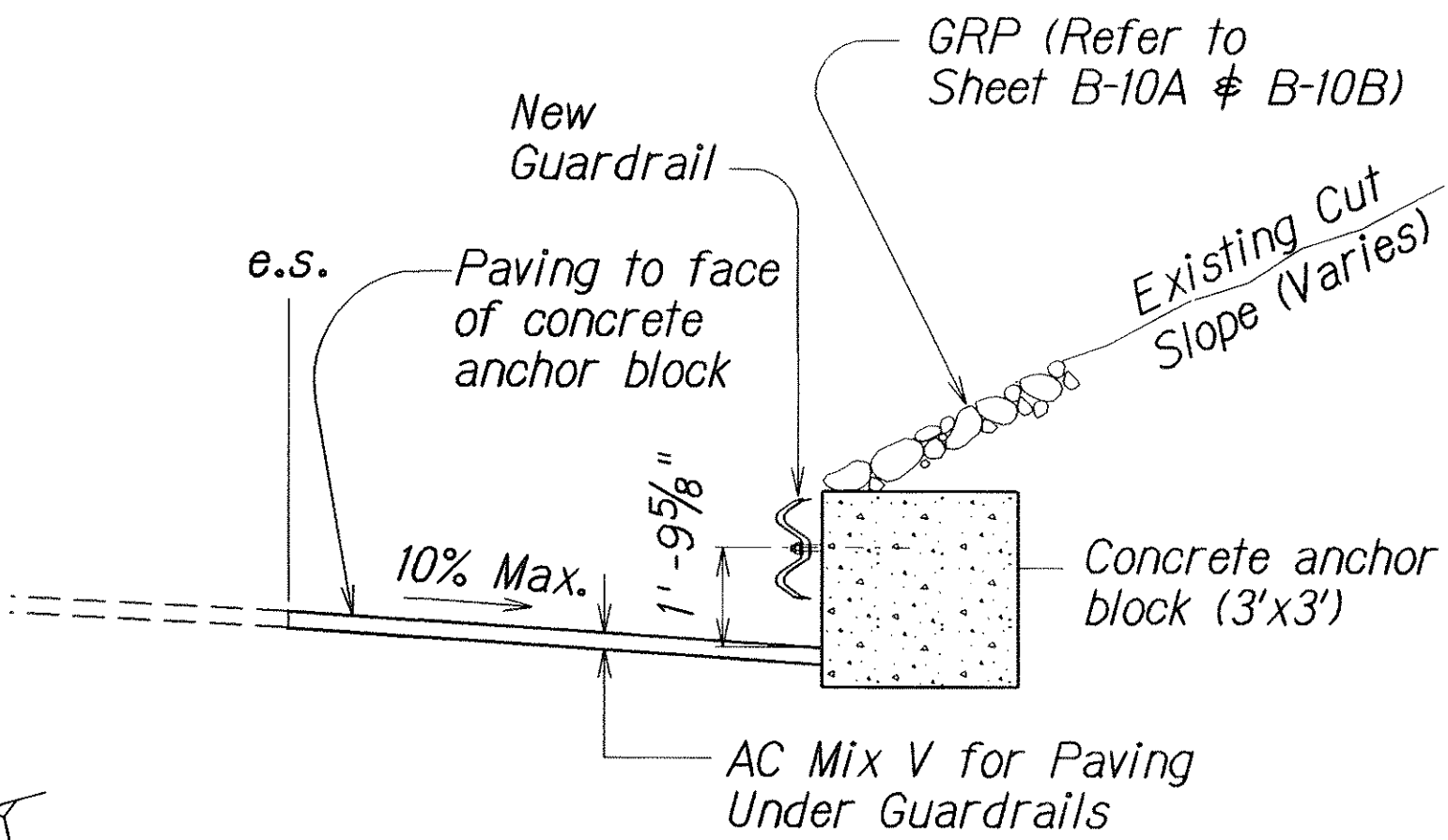
**TYPICAL PAVING UNDER NEW GUARDRAIL**

Not To Scale



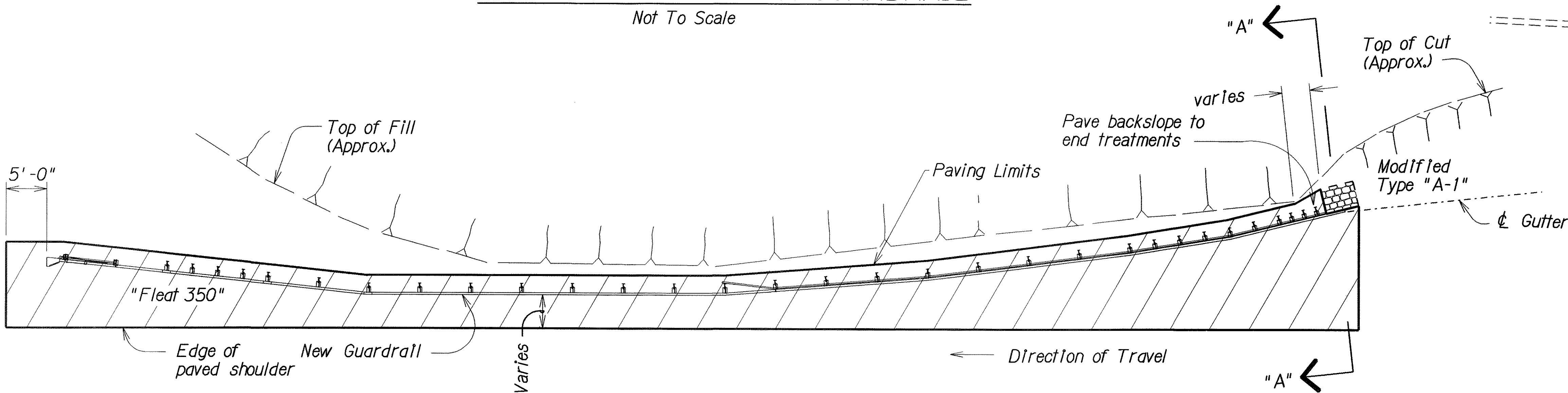
**PLAN - PAVING UNDER GUARDRAIL**

Not To Scale



**SECTION "A-A"**

Not To Scale



**PLAN - PAVING UNDER GUARDRAIL**

Not To Scale

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**RECONSTRUCTION OF SHOULDERS  
AND FULL PAVING UNDER GUARDRAIL**  
OLD KEA'AU-PAHOA ROAD RESURFACING  
KEA'AU TO KEA'AU HIGH SCHOOL  
PROJECT NO. 139A-01-05M  
Scale: none Date: Nov., 2004

SHEET No. 20 OF 20 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTED BY	DRAWN BY	
DESIGNED BY	TRACED BY	
CHECKED BY	NOTED BY	
	DESIGNED BY	
	CHECKED BY	

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