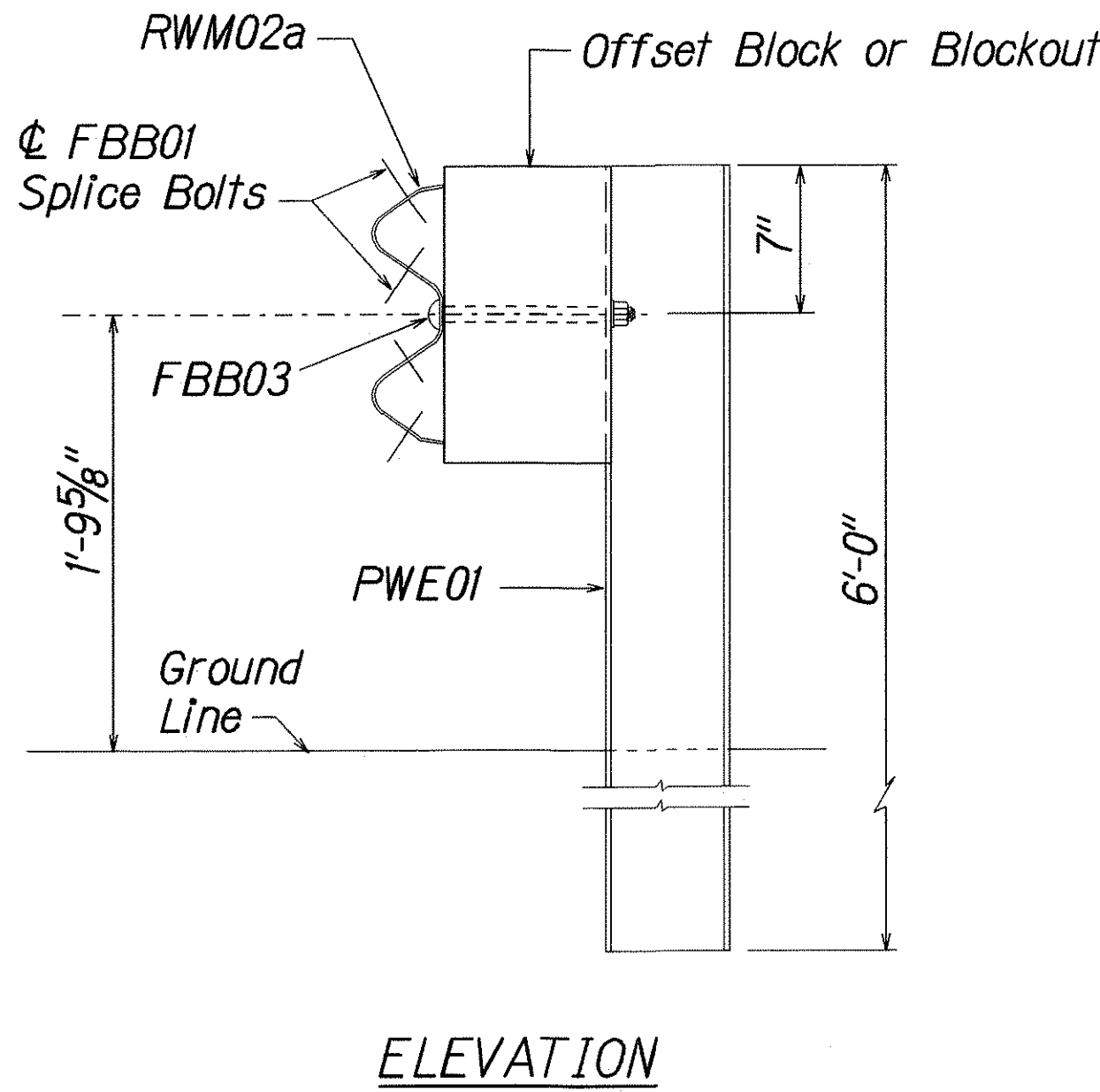
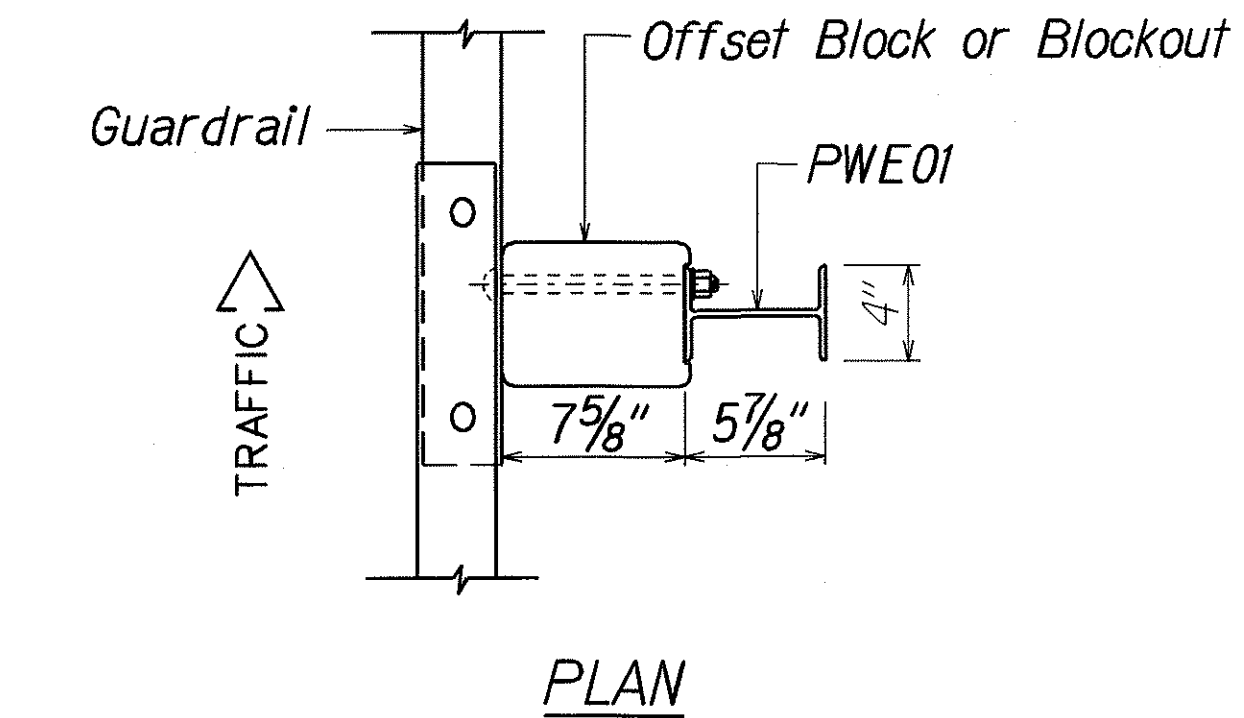
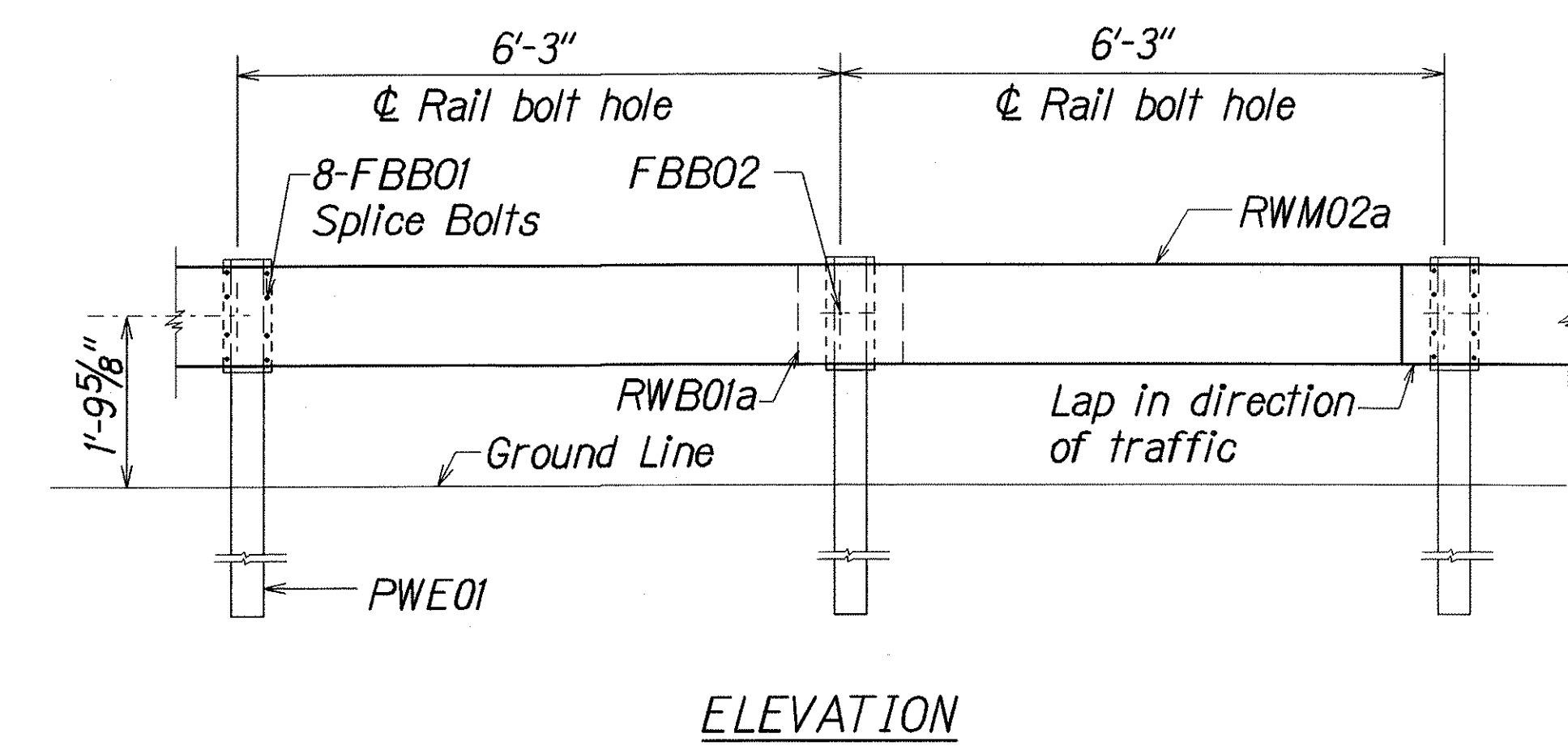


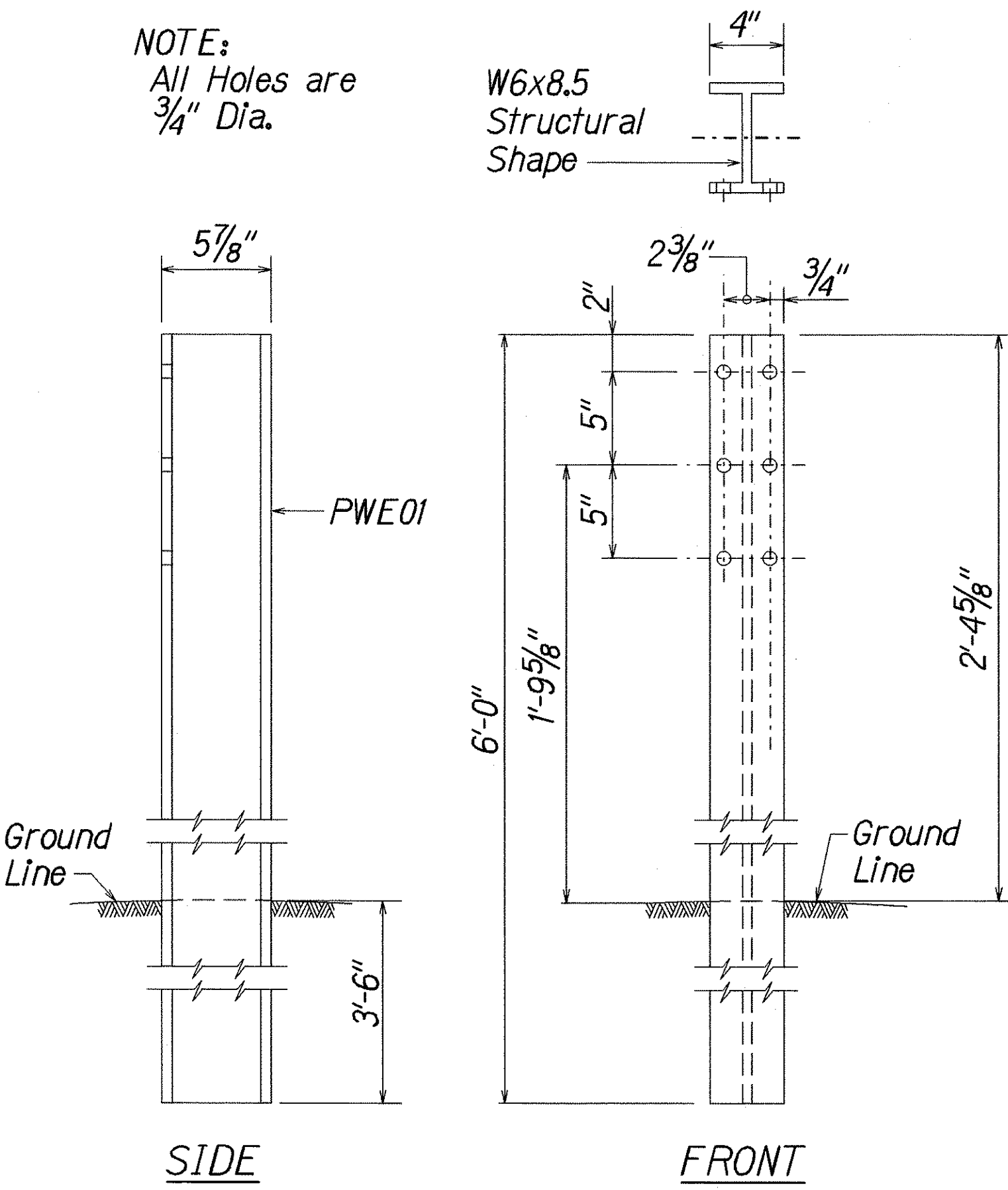
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	21	37



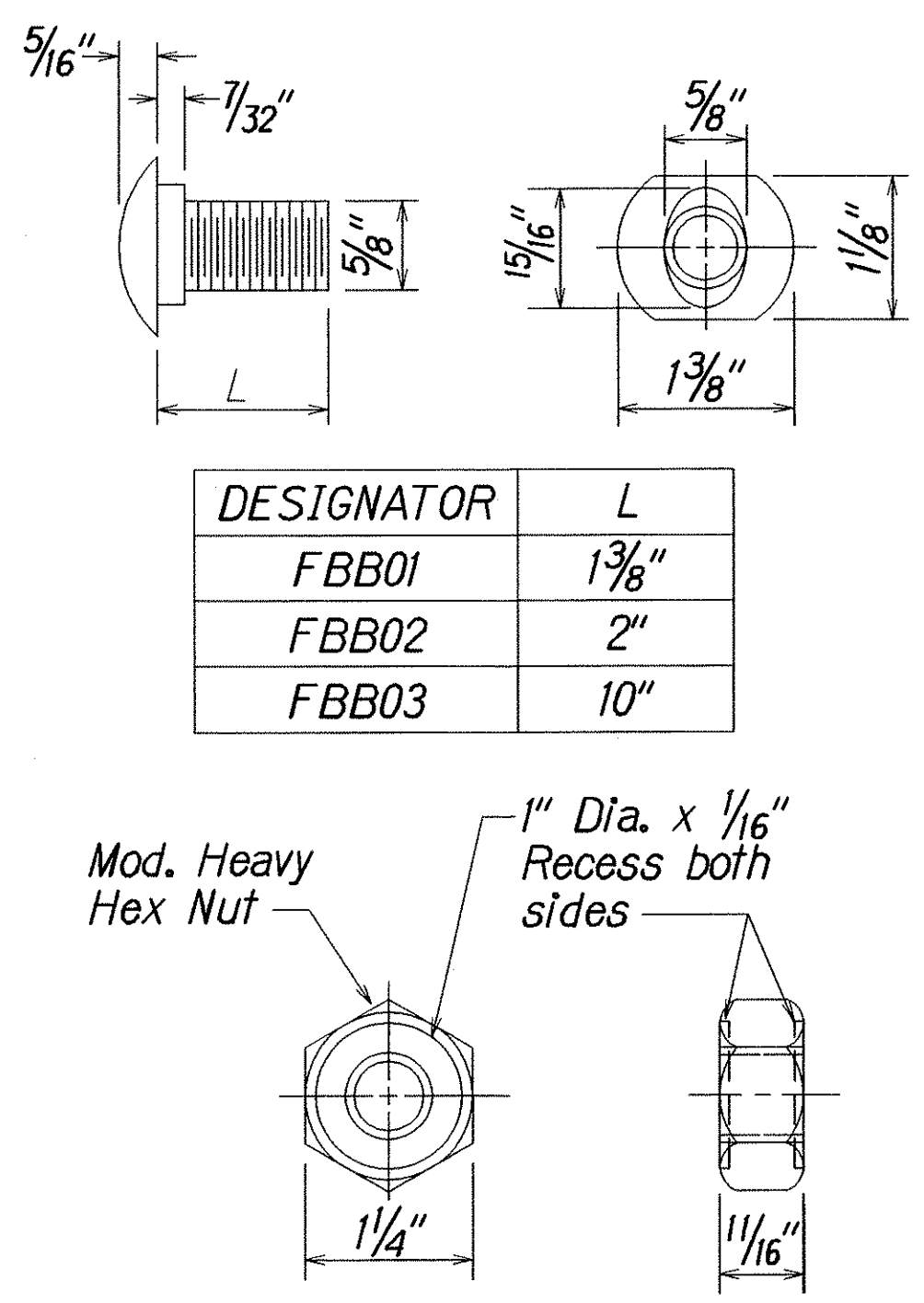
STRONG POST W-BEAM GUARDRAIL
(SGR04a)



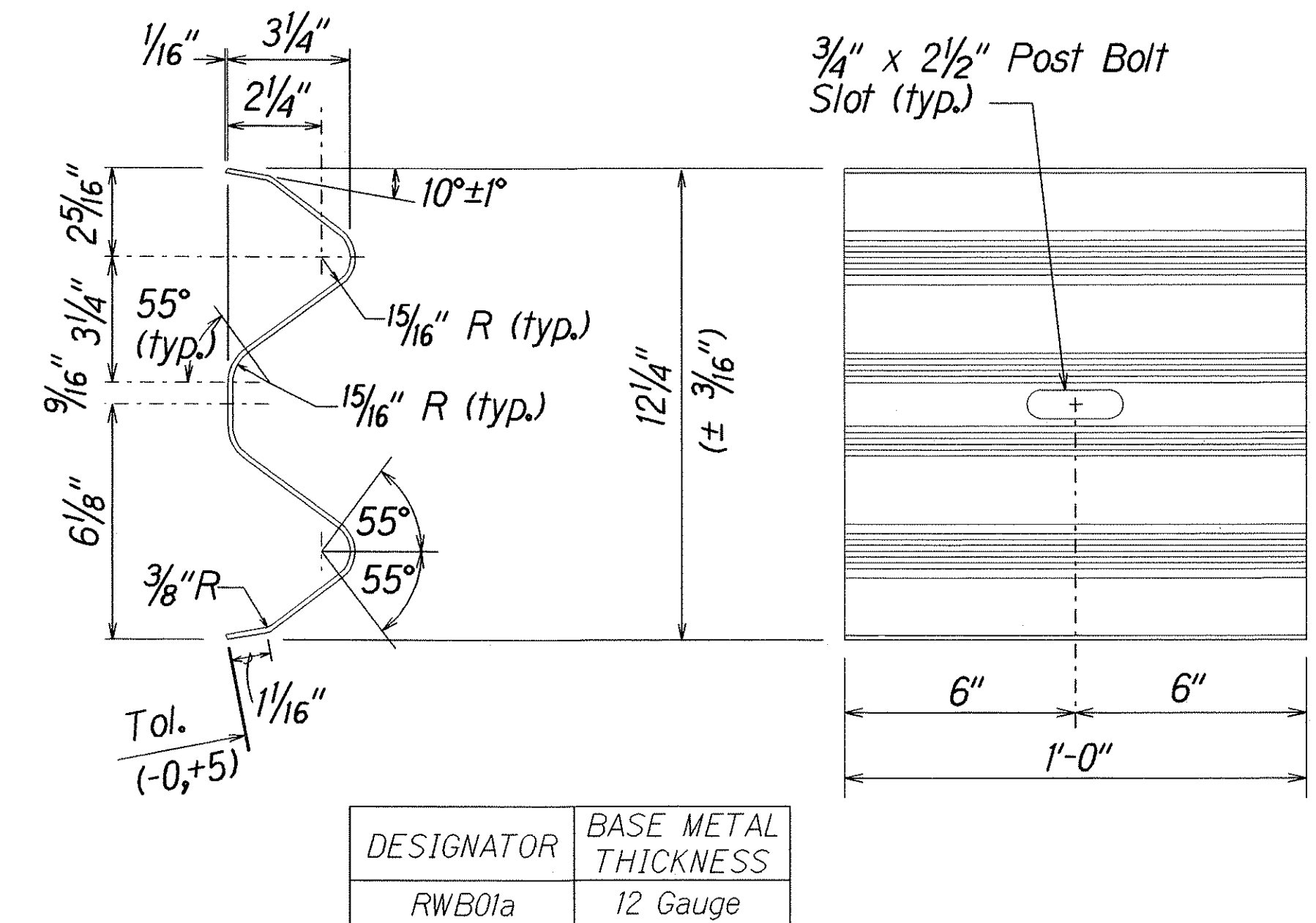
STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



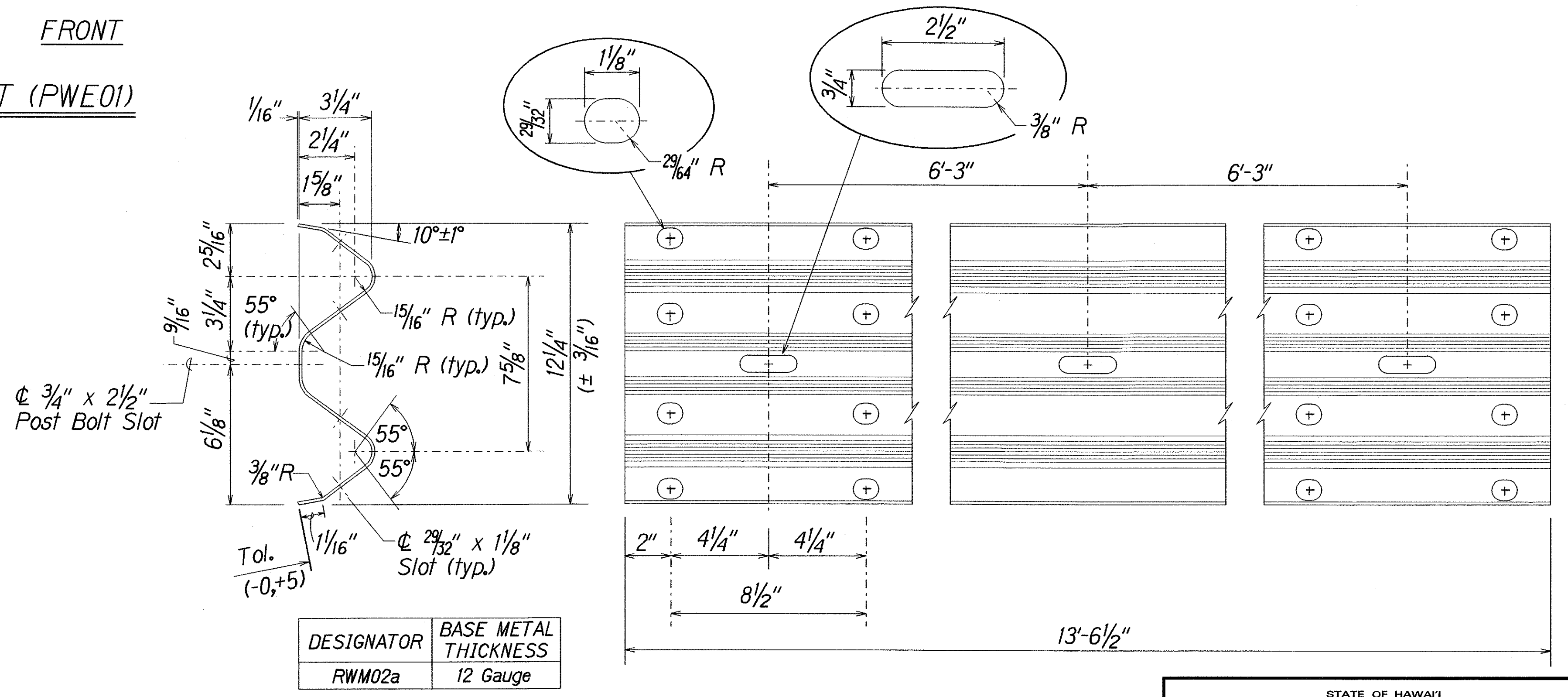
W-BEAM STRONG POST (PWE01)



GUARDRAIL BOLTS AND RECESSED NUT



W-BEAM BACK-UP-PLATE (RWB01a)



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

VICINITY OF KAHUKU

PROJECT NO. 11E-01-02M

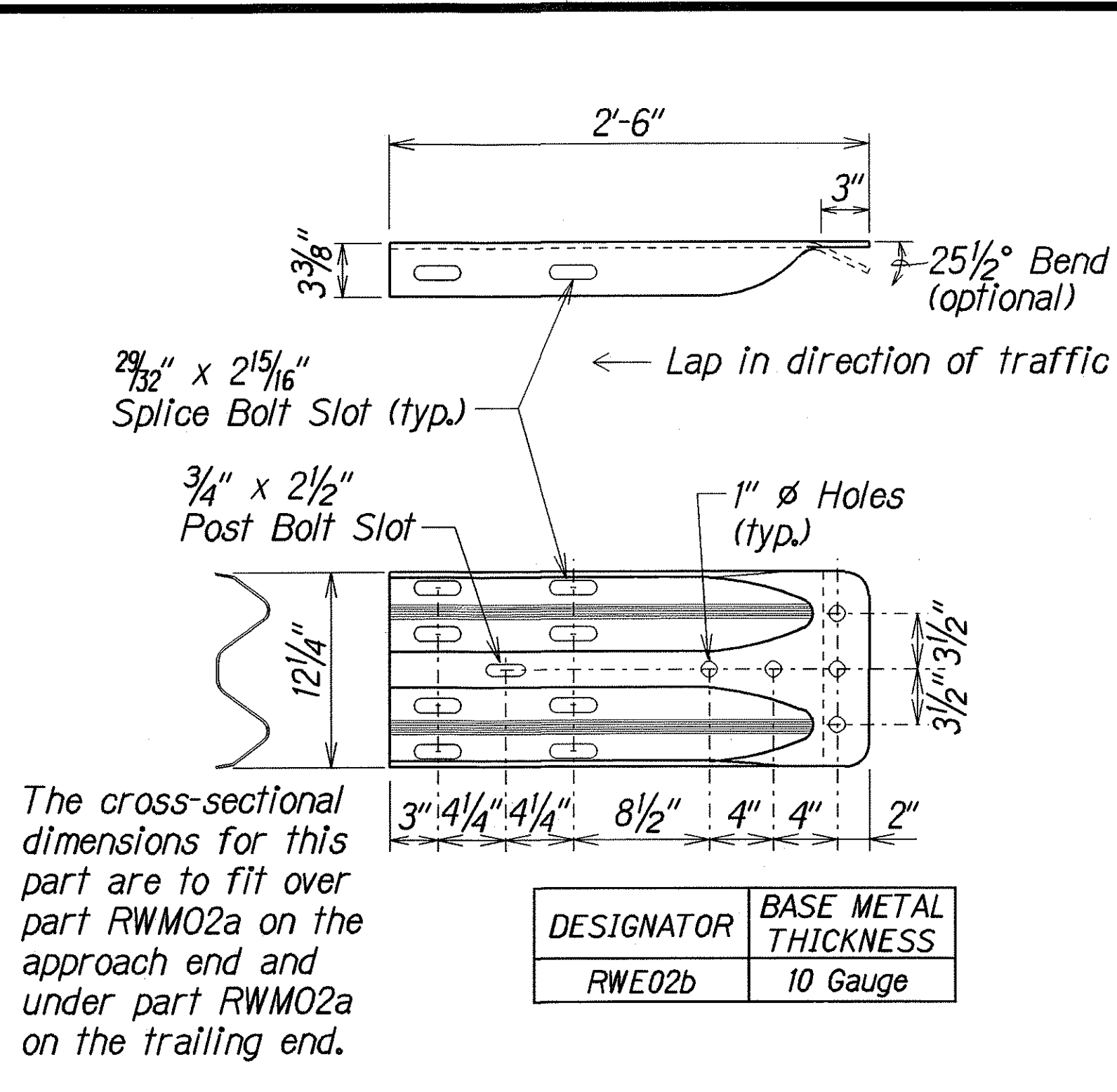
Scale: NTS

Date: April, 2002

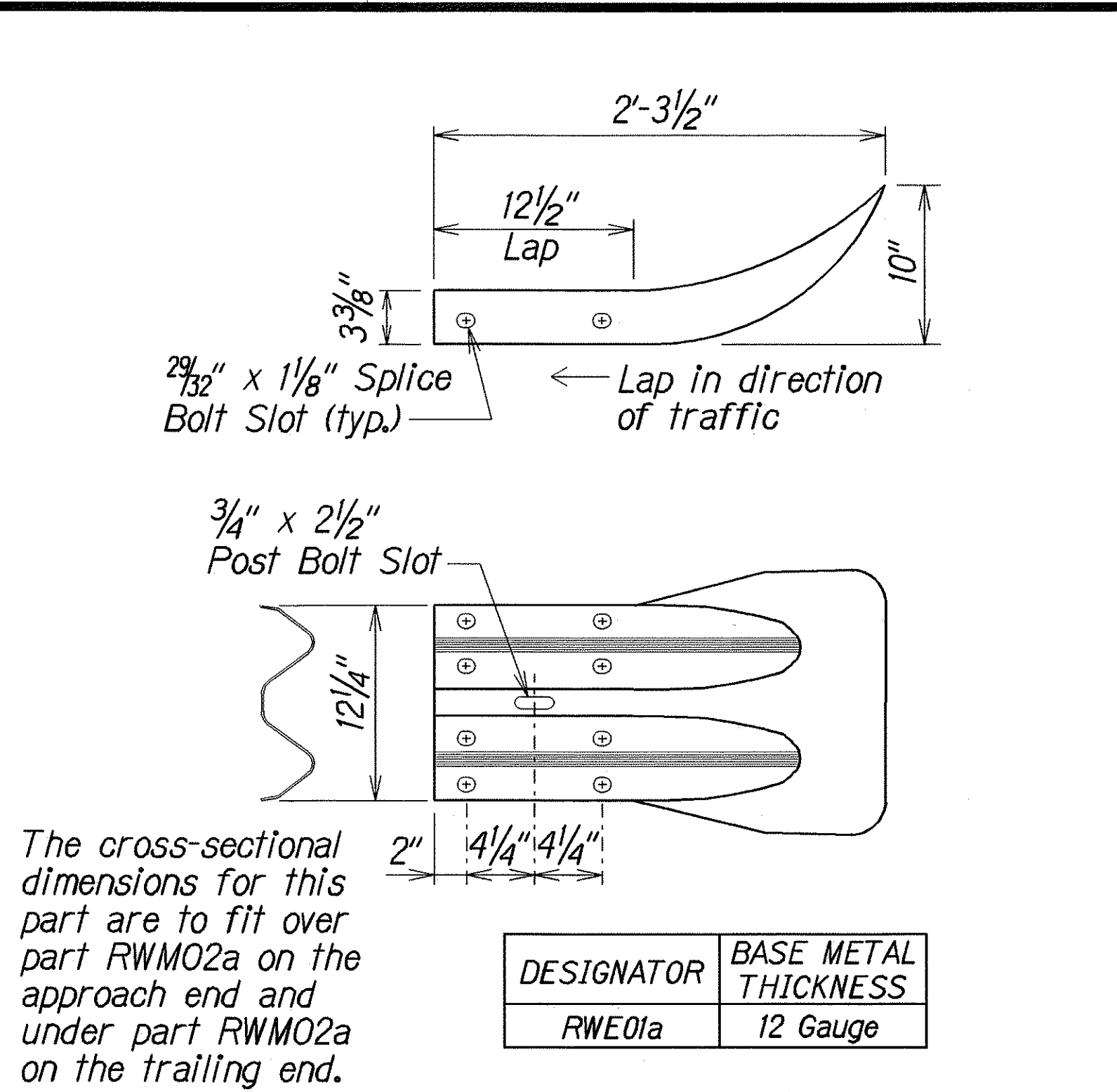
ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NOTED BY	
20/02	
400	

rs/13/01 fdrubyl/guardrail/wbeamsdgn (standard plan TE-50 103/06/87)

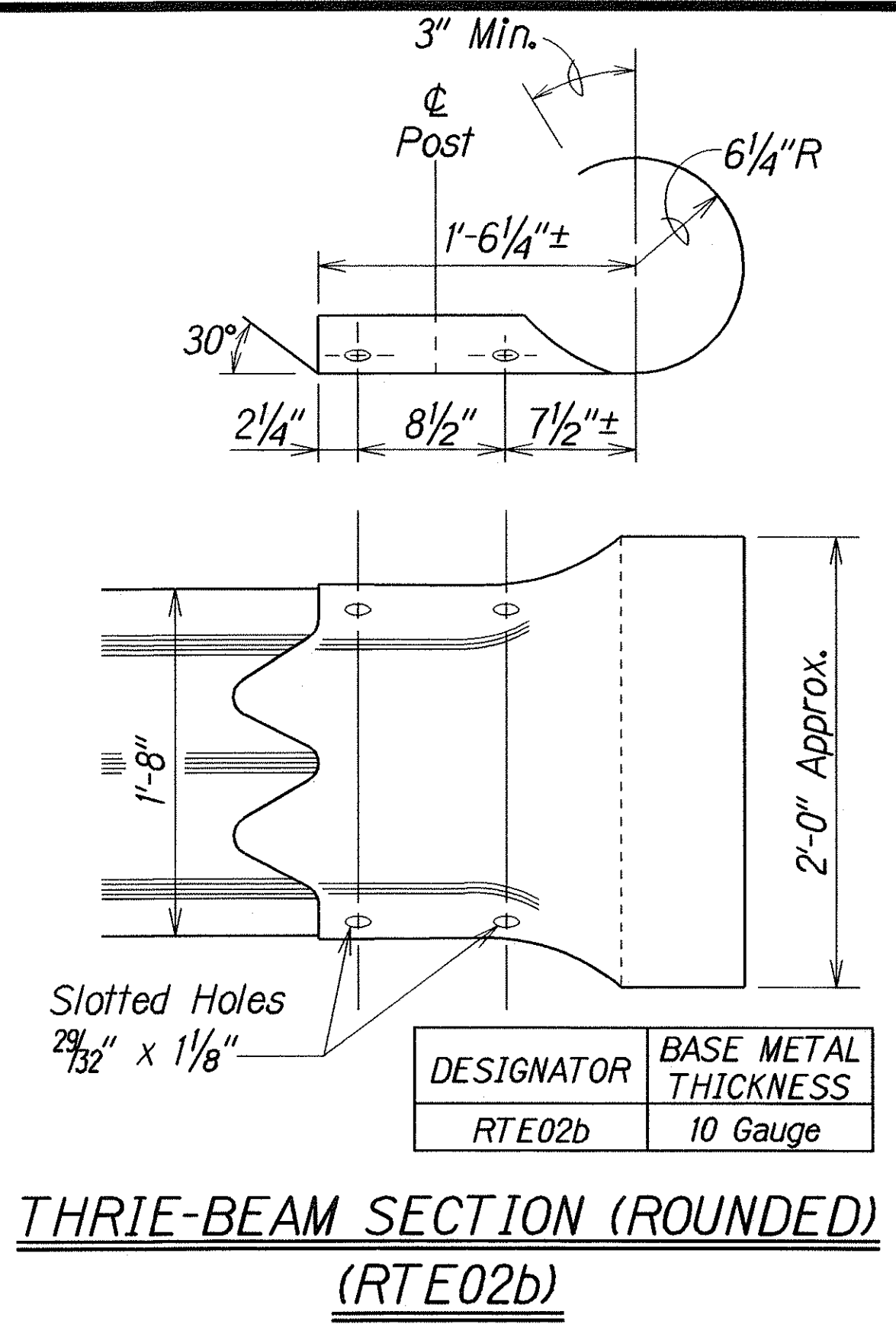
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	22	37



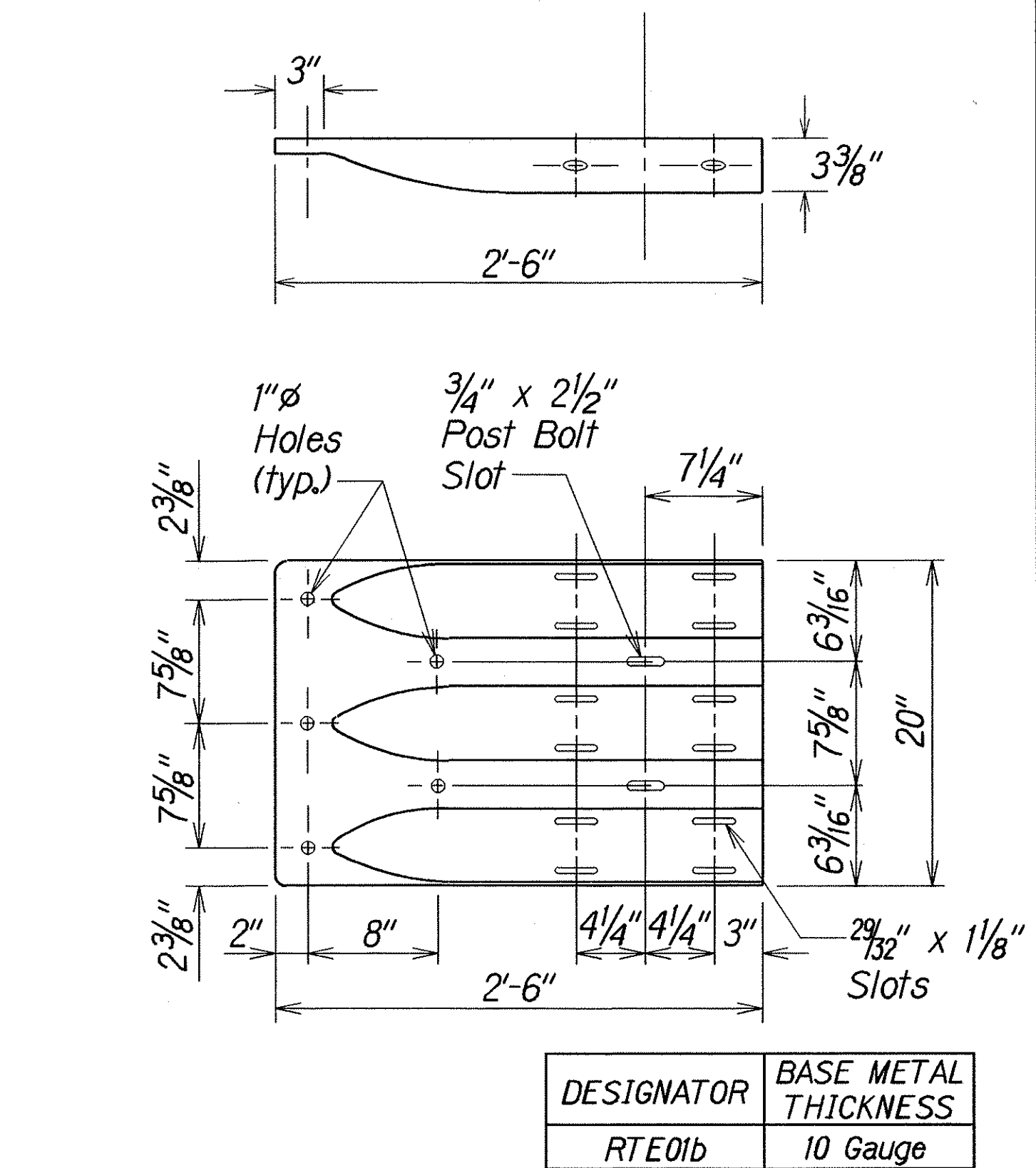
W-BEAM TERMINAL CONNECTOR (RWE02b)



W-BEAM END SECTION (FLARED RWE01a)

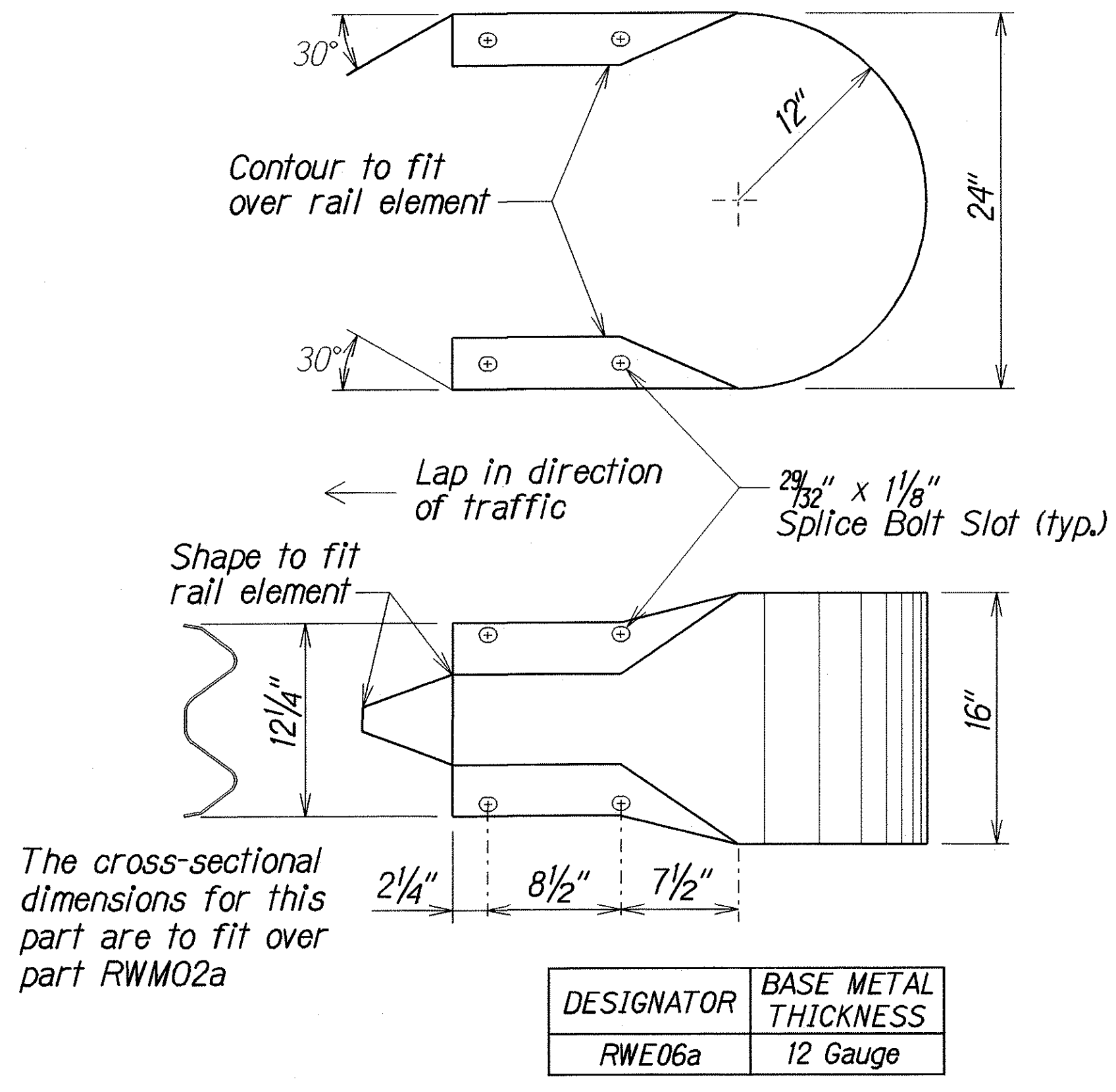


THRIE-BEAM SECTION (ROUNDED) (RTE02b)

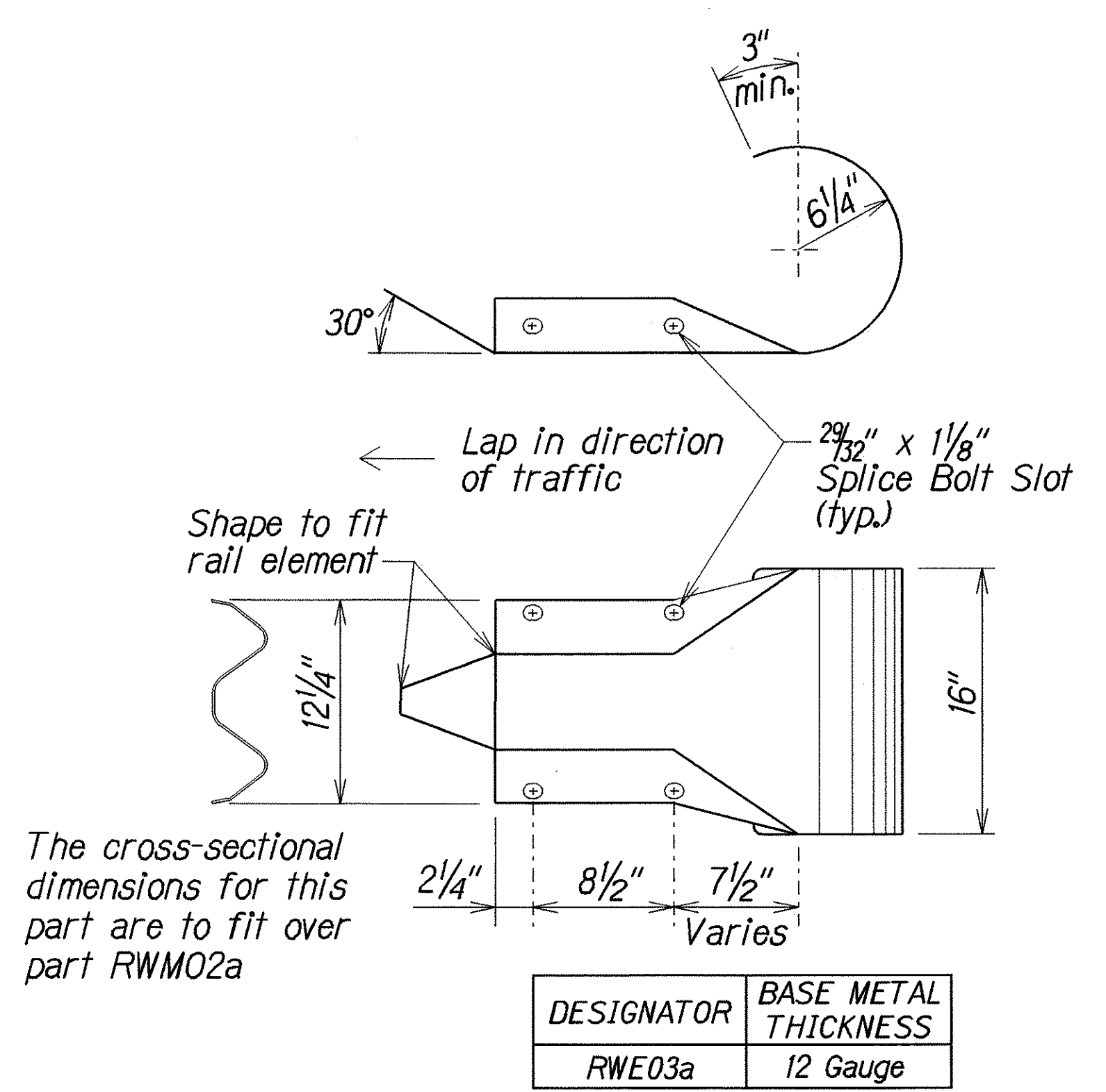


THRIE-BEAM TERMINAL CONNECTOR (RTE01b)

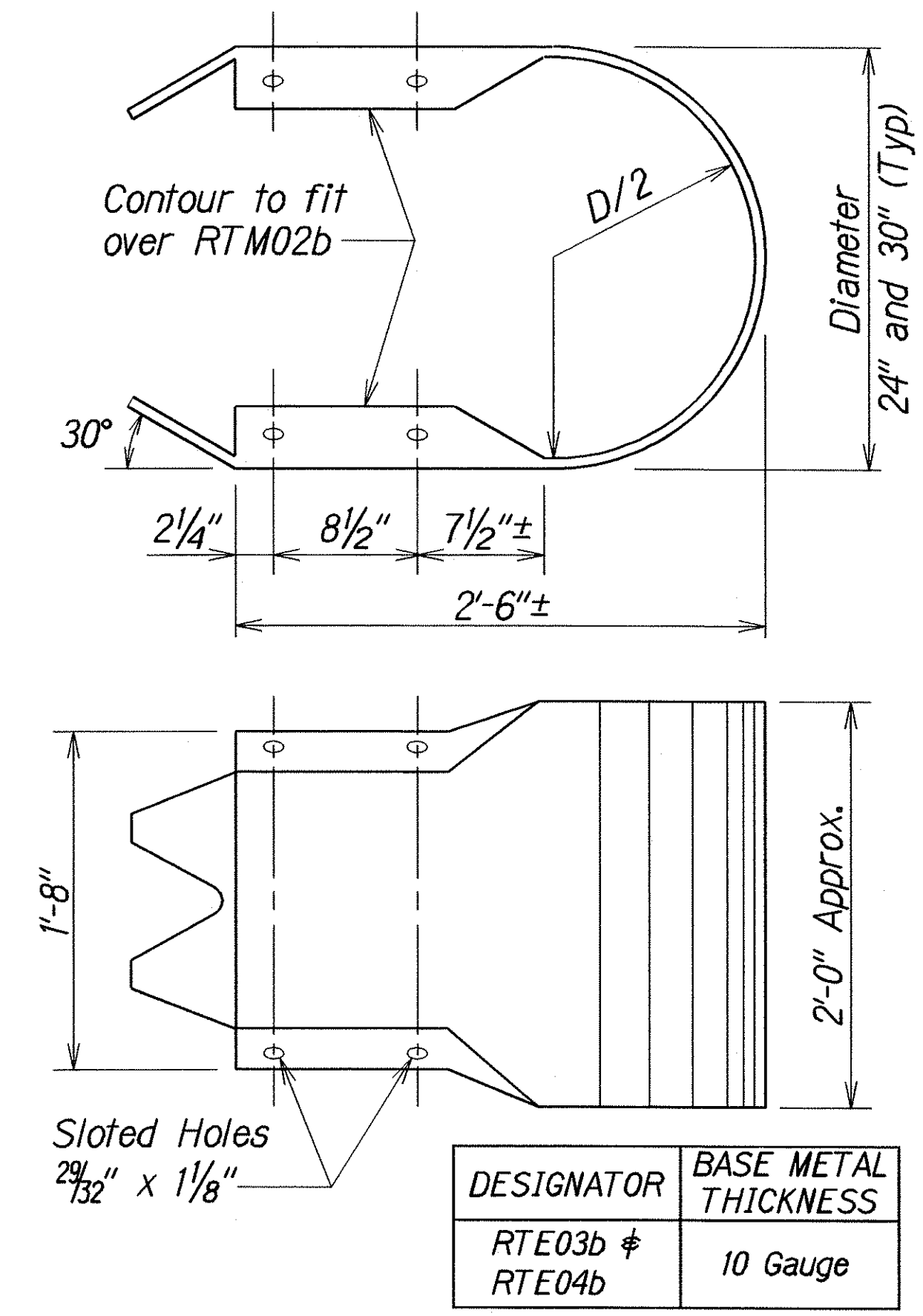
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
TRACED BY		
NOTED BY		
CHECKED BY		
DATE		



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

HAWAII BELT ROAD

GUARDRAIL AND SHOULDER IMPROVEMENTS

VICINITY OF KAHUKU

PROJECT NO. 11E-01-02M

Scale: As Shown

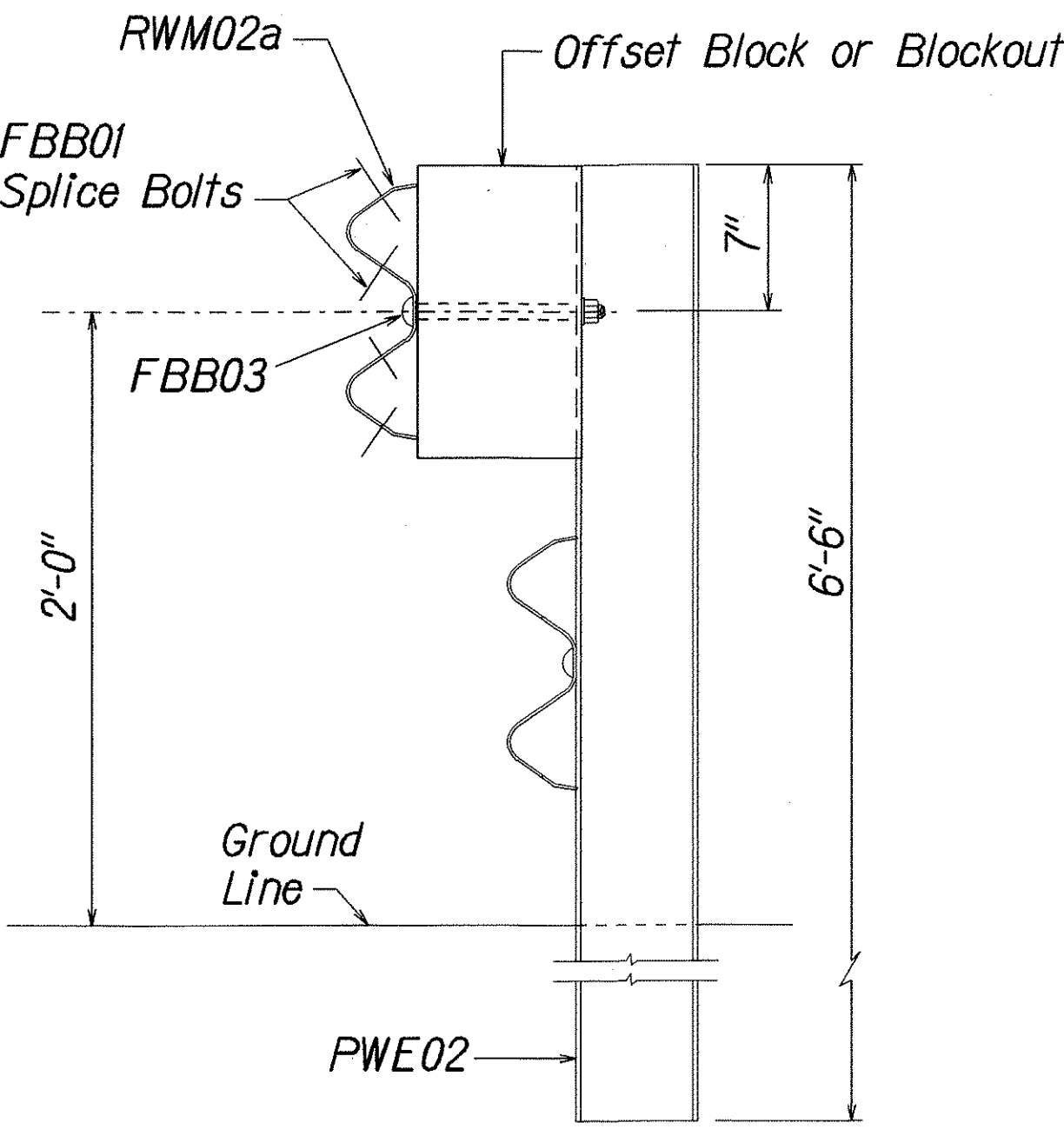
Date: April, 2002

SHEET No. 1

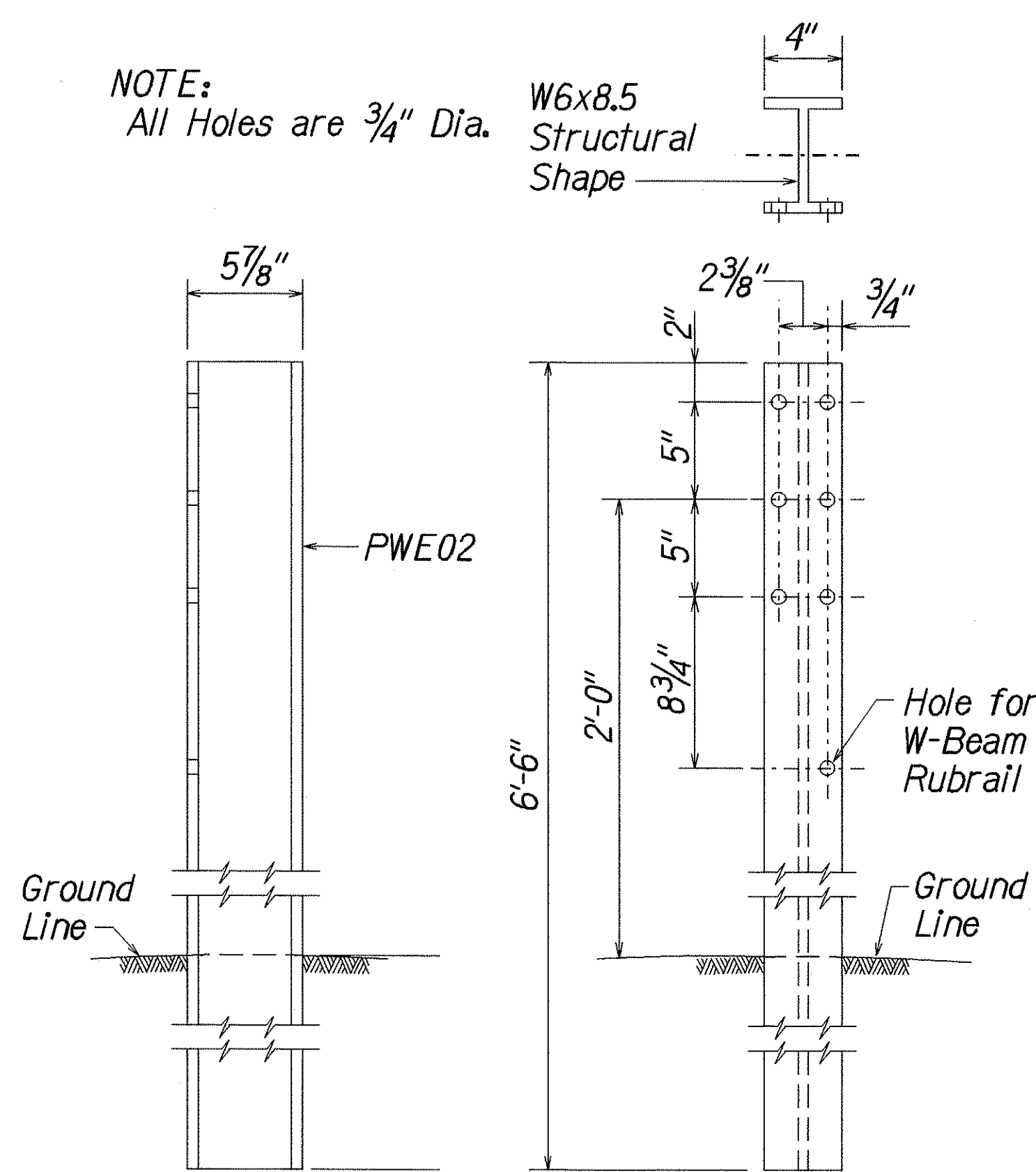
OF 1

SHEETS

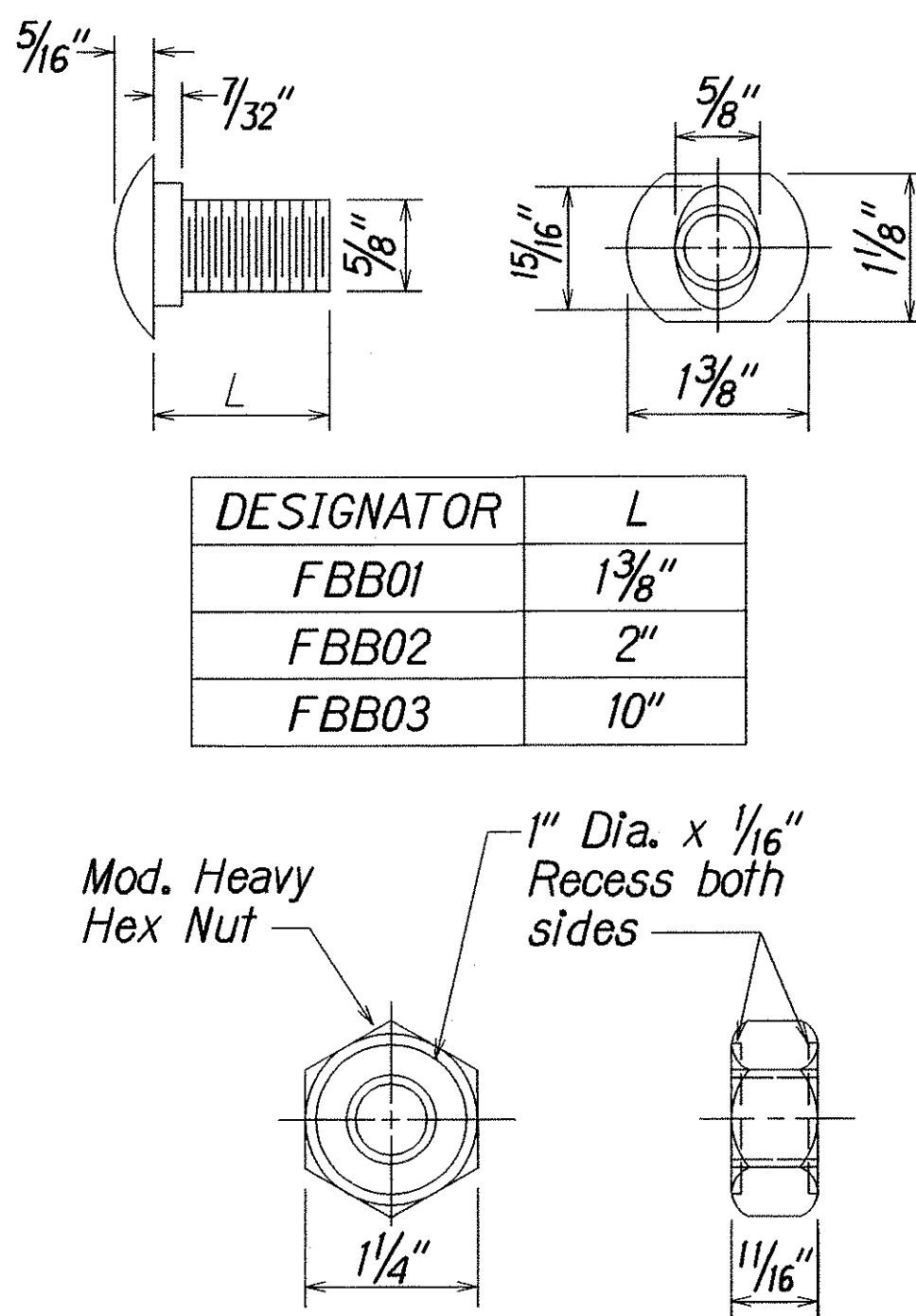
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HAWAII	HAW.	11E-01-02M	2002	23	37



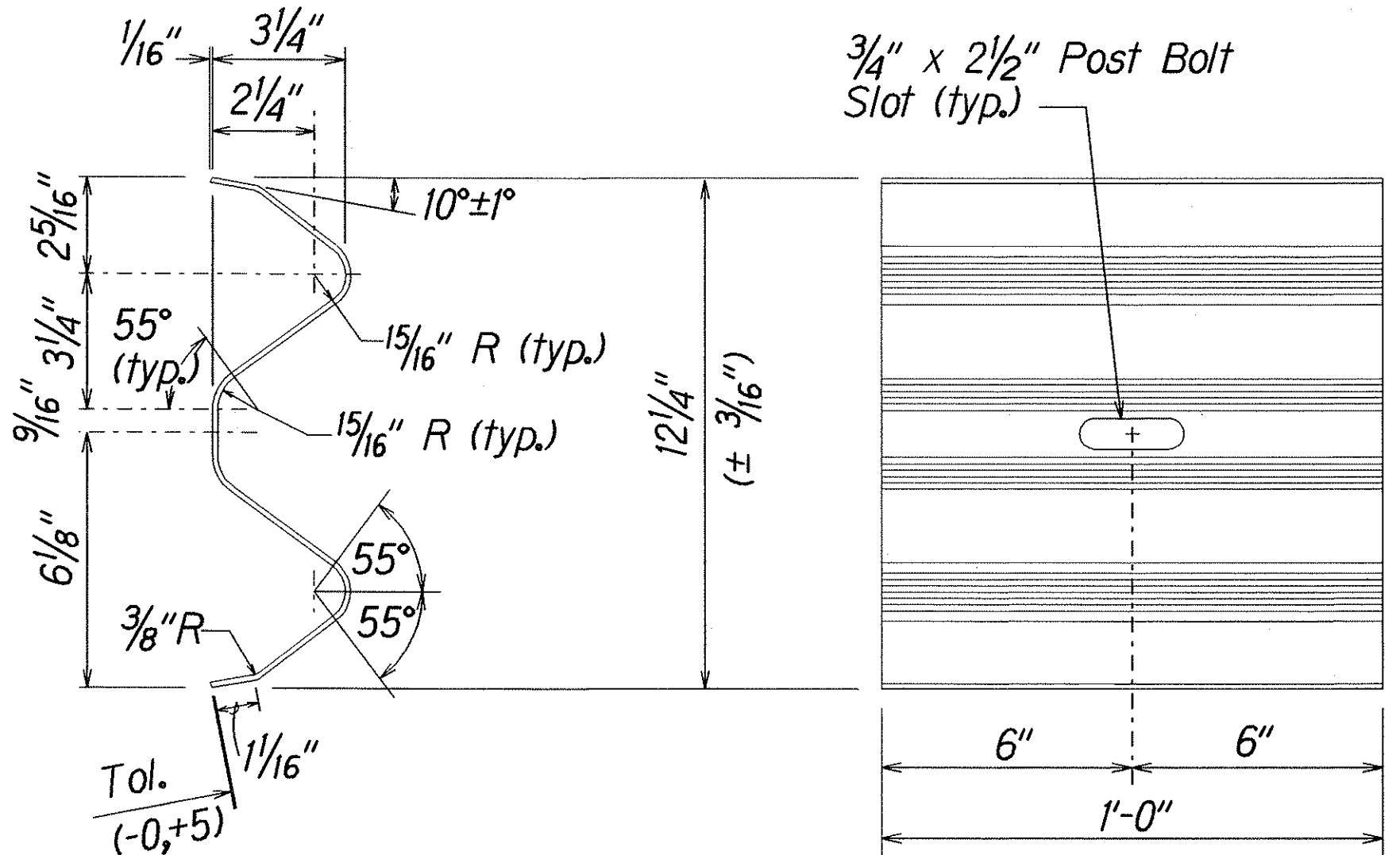
ELEVATION
STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL



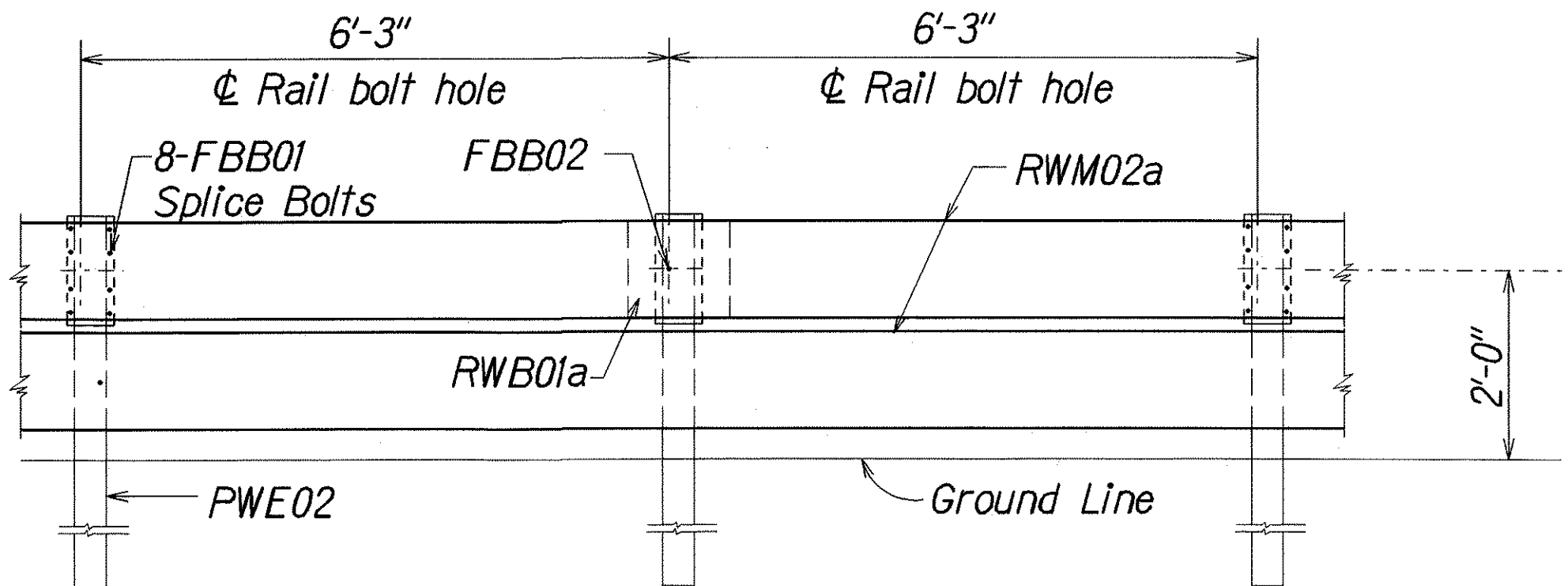
SIDE
FRONT
W-BEAM STRONG POST (PWE02)



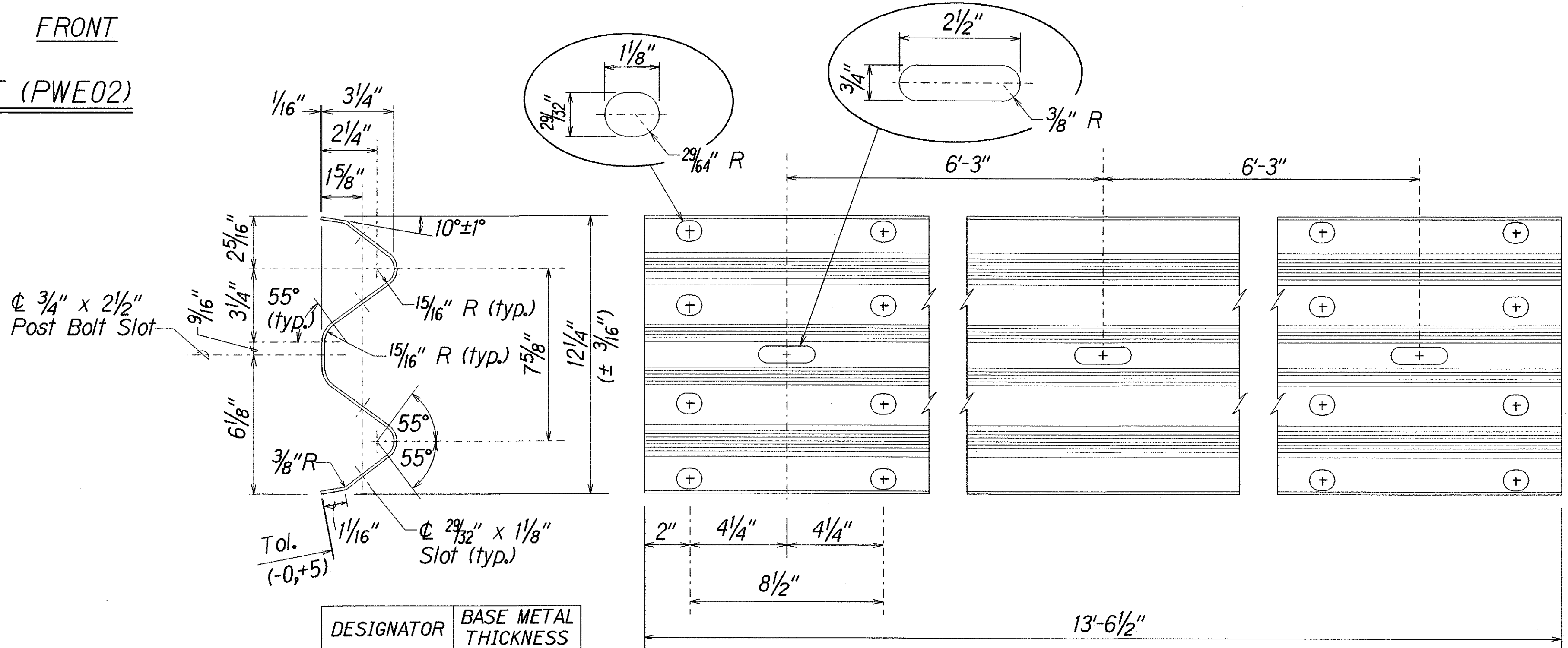
GUARDRAIL BOLTS AND
RECESSED NUT



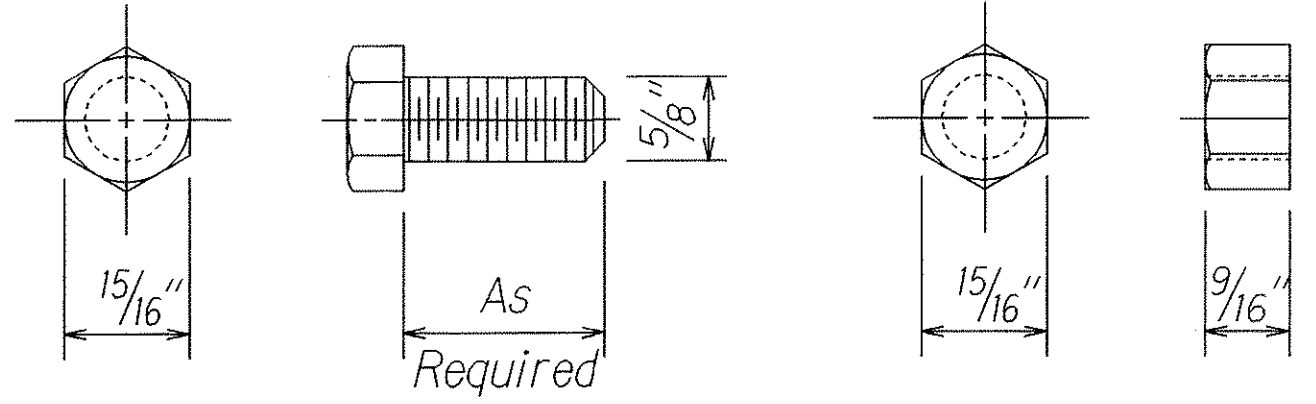
W-BEAM BACK-UP-PLATE (RWB01a)



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



2 SPACE W-BEAM GUARDRAIL (RWM02a)



HEX BOLT & NUT (FBX16a)

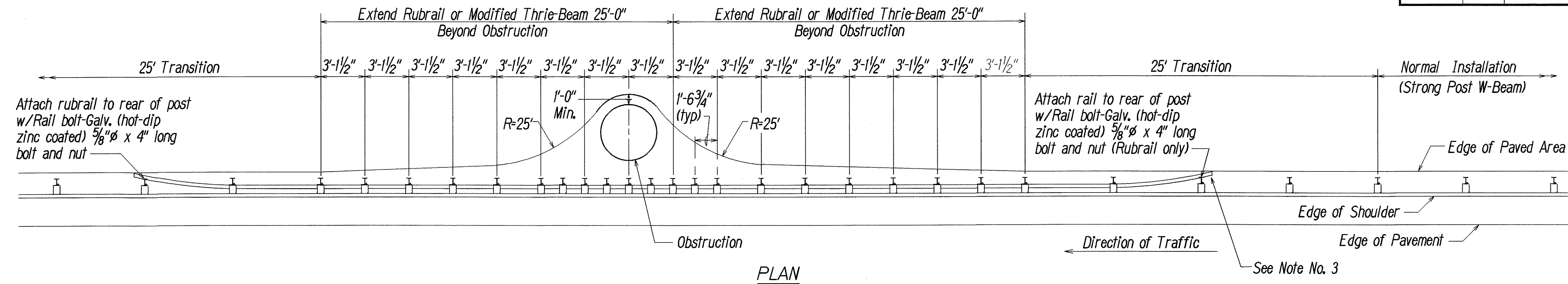
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
Scale: As Shown Date: April, 2002
SHEET No. 1 OF 1 SHEETS

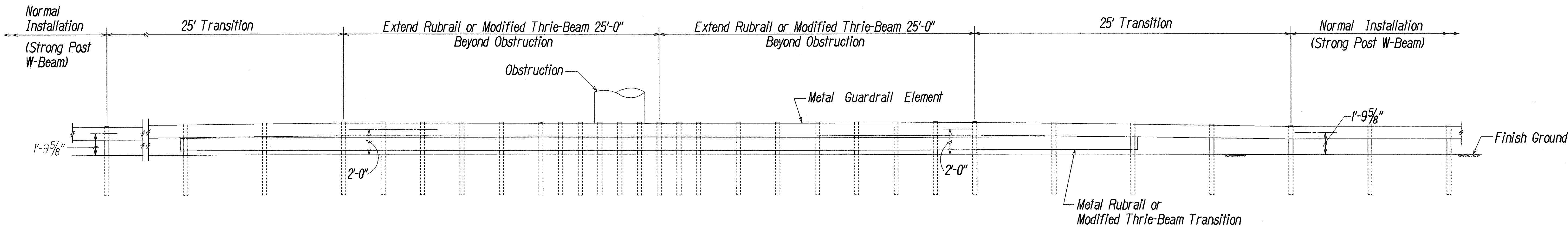
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
201104	TRACED BY	
	QUANTITIES BY	
	CHECKED BY	

16/03/01 1d:\rob\guardrail\rubrail.dgn (standard plan TE-52 11/03/89)

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	25	37



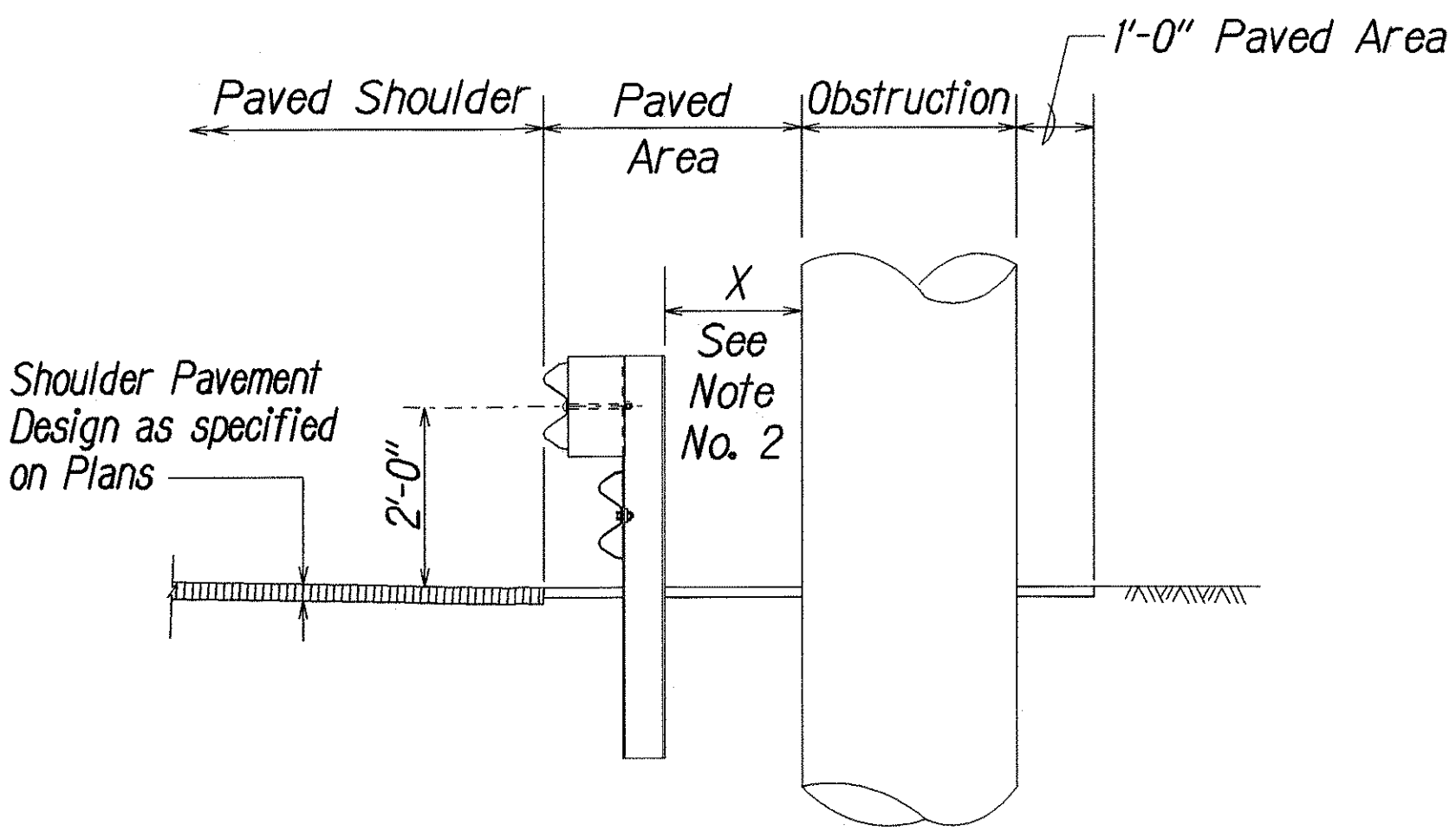
PLAN



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

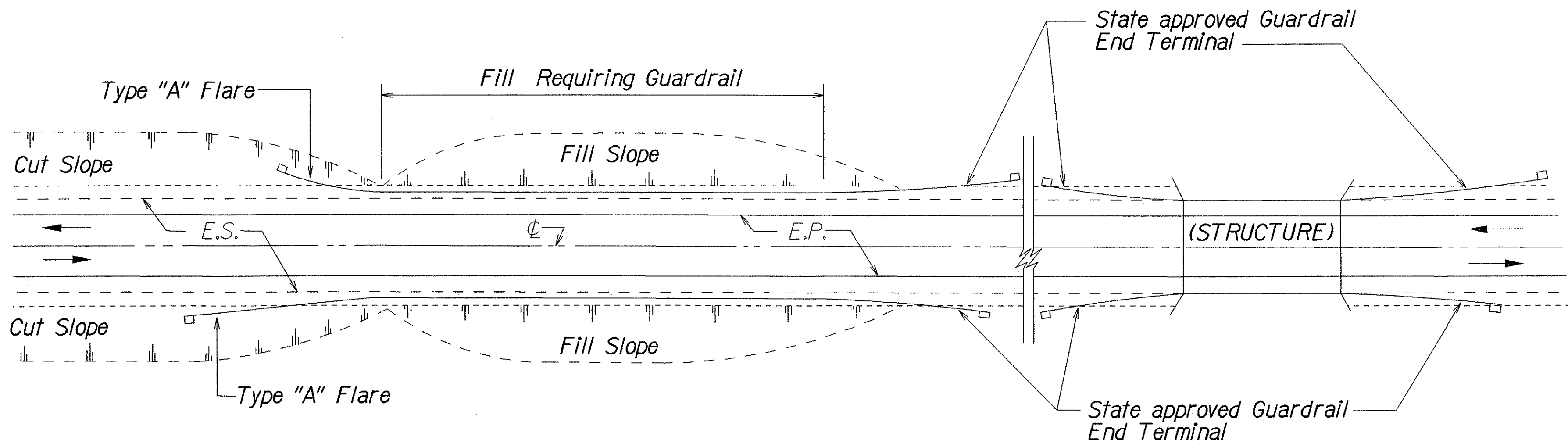
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
2b/ab6	TRACED BY	
N. dgn	QUANTITIES BY	
	CHECKED BY	

18/21/01 tdruby:guardrail/tesdredon (standard plan TE-53 r09.01/87 & TE-54 n1/03/89)

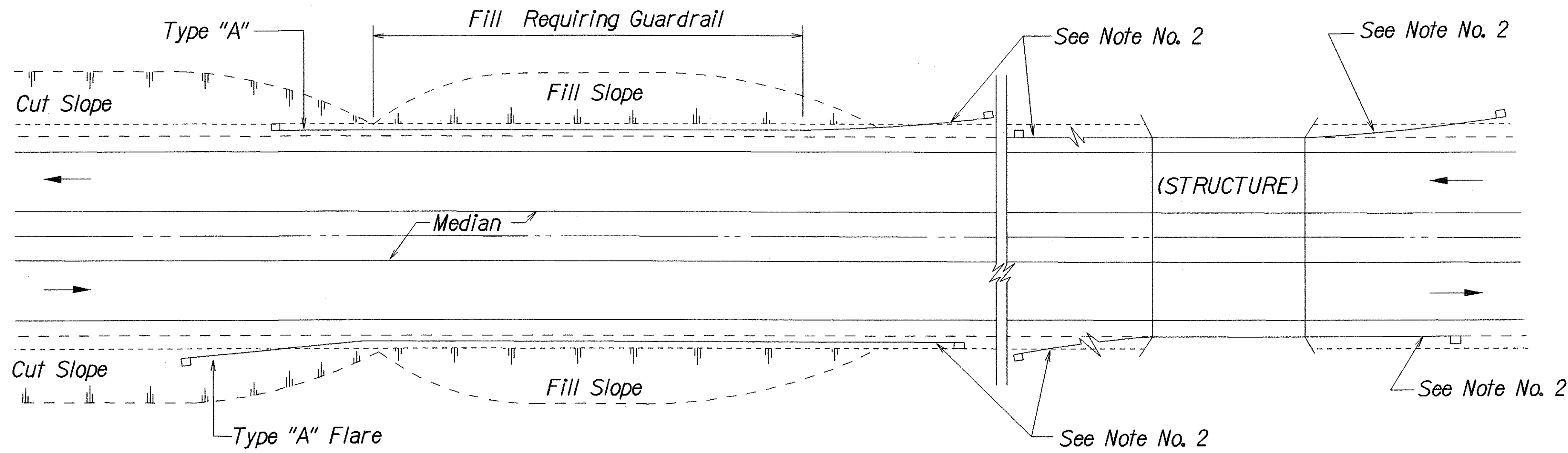
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS
(AT OBSTRUCTION)
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
Scale: As Shown Date: April, 2002
SHEET No. 1 OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	26	37



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	DATE
SURVEY PLOTTED BY	
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NOTED BY	
DATE	
NO.	

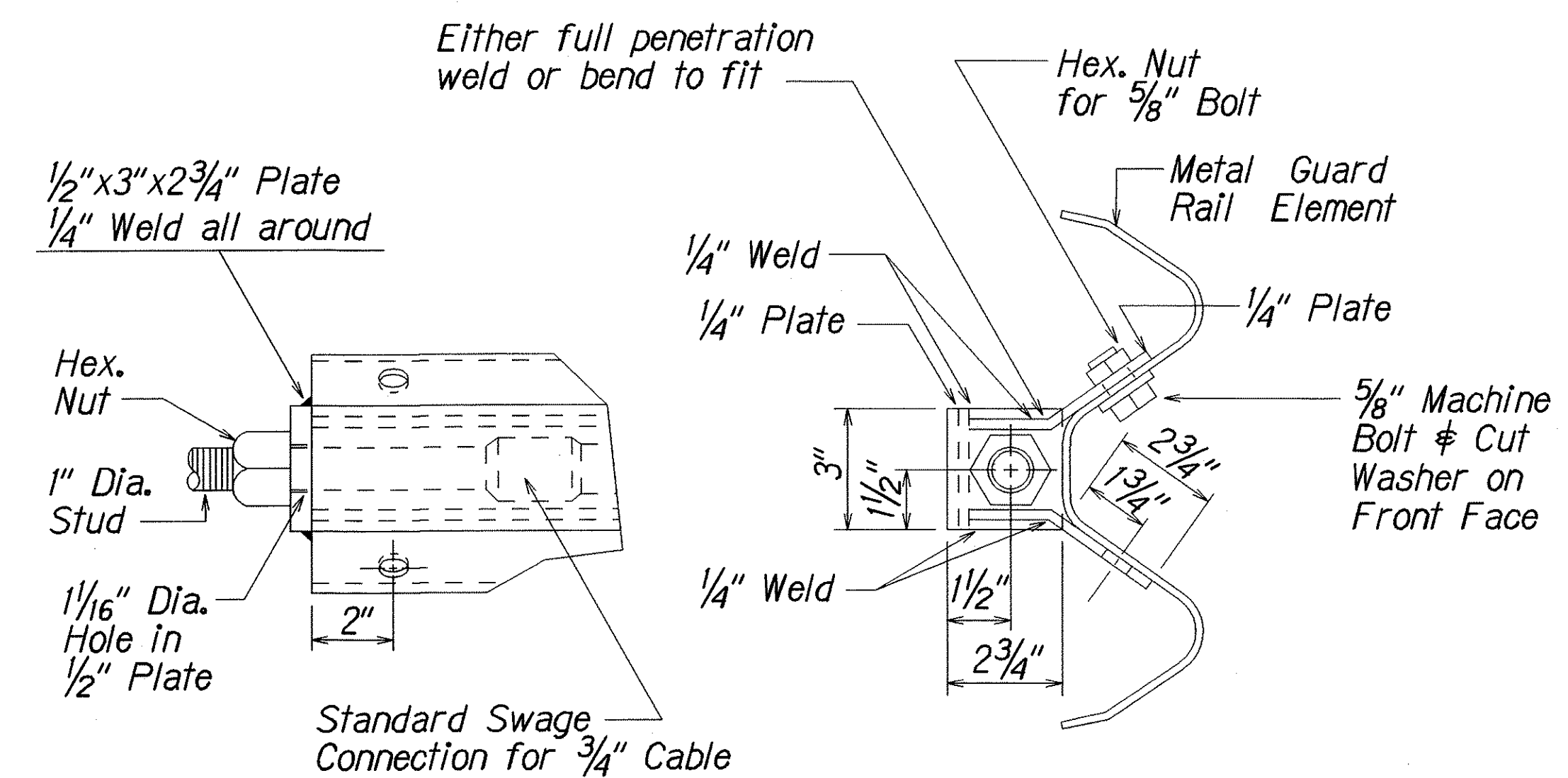
10/3/01/99 tdr/ruby/guardrail/11E01-02M (standard plan TE-58 rev 01/01/86)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

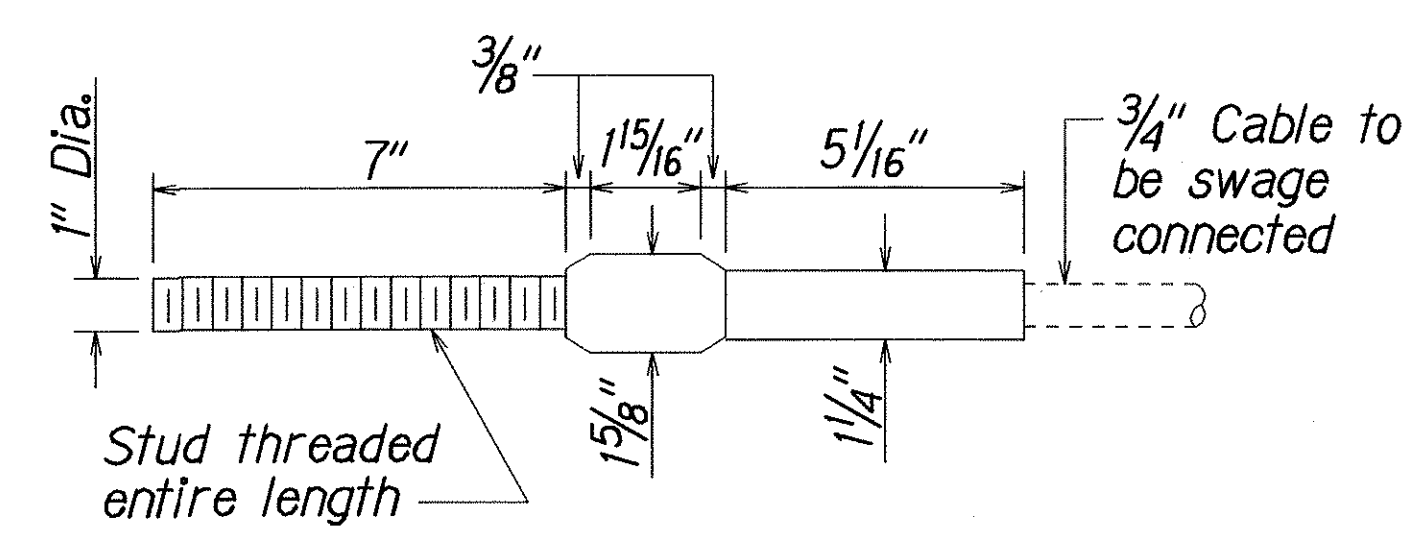
GUARDRAIL DETAILS
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
Scale: Noted Date: April, 2002

SHEET No. 1 OF 1 SHEETS

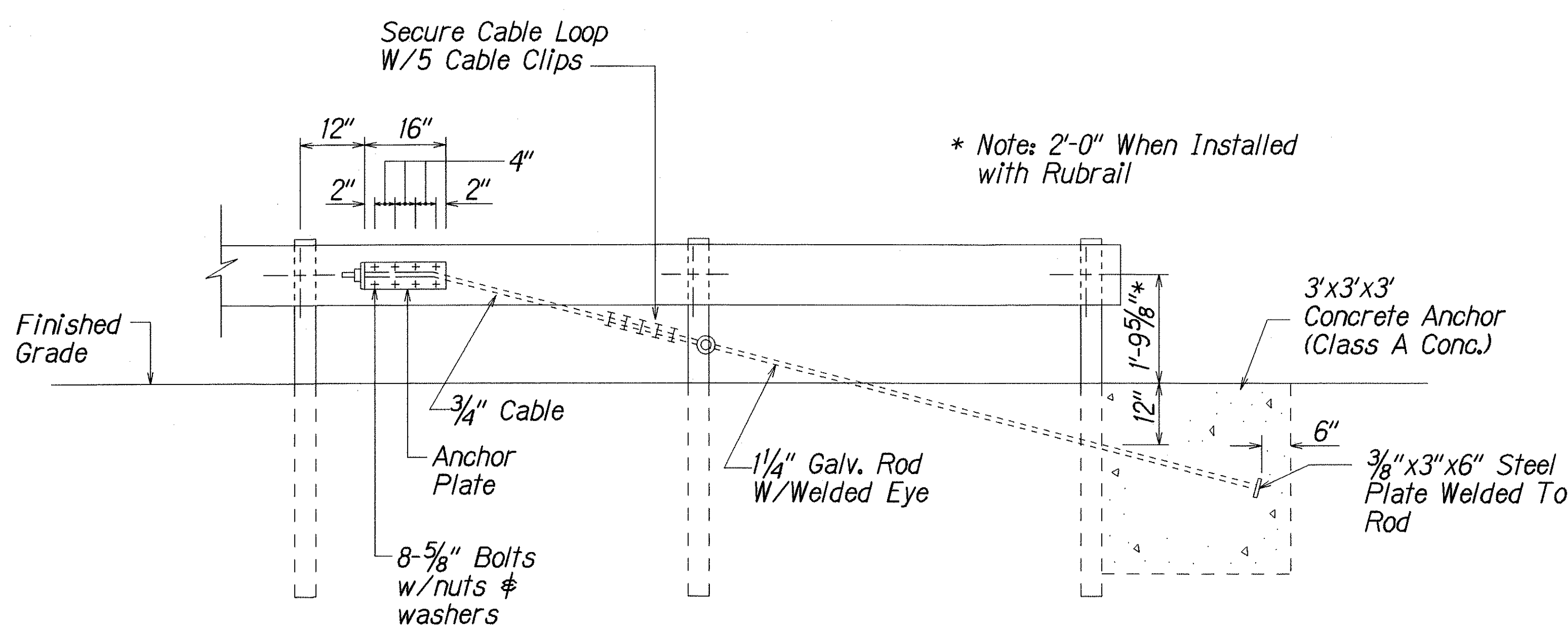
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	27	37



ANCHOR PLATE DETAILS

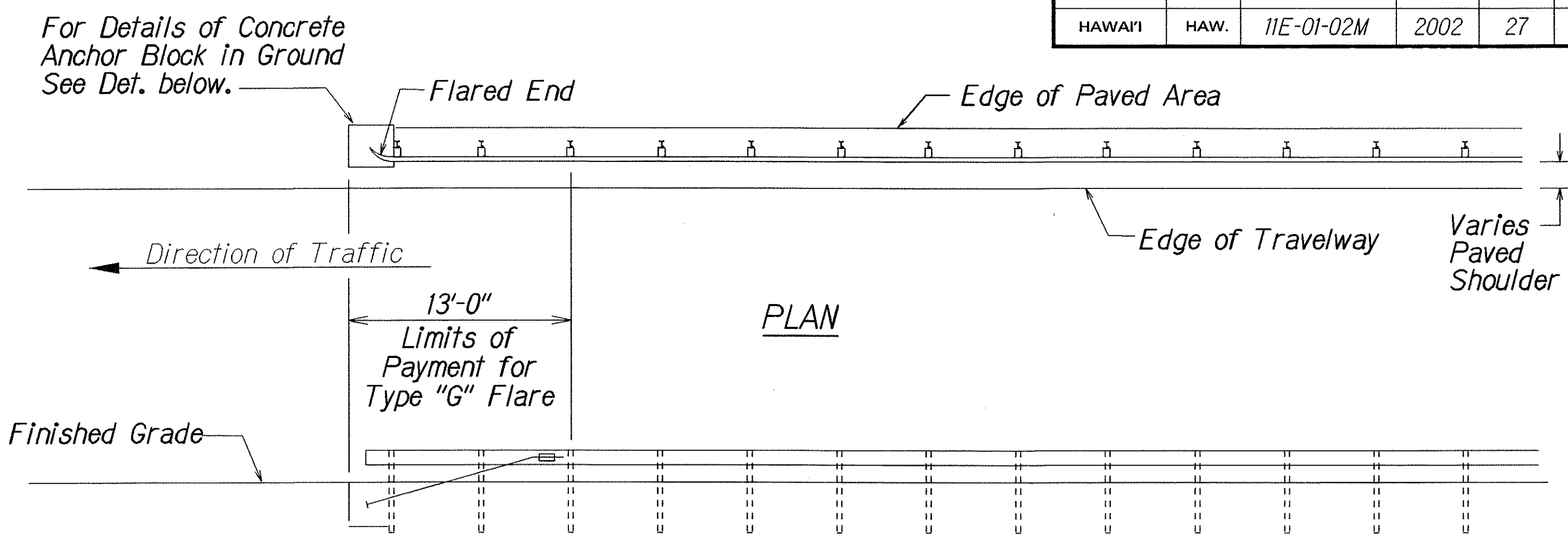


STANDARD SWAGED FITTING AND STUD



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.



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	DRAWN BY	
20/rao	TRACED BY	
20/rao	CHECKED BY	
20/rao		

13/13/02 tedrubby/guardrail/rao/rao (standard plan TE-59 rev/03/89)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

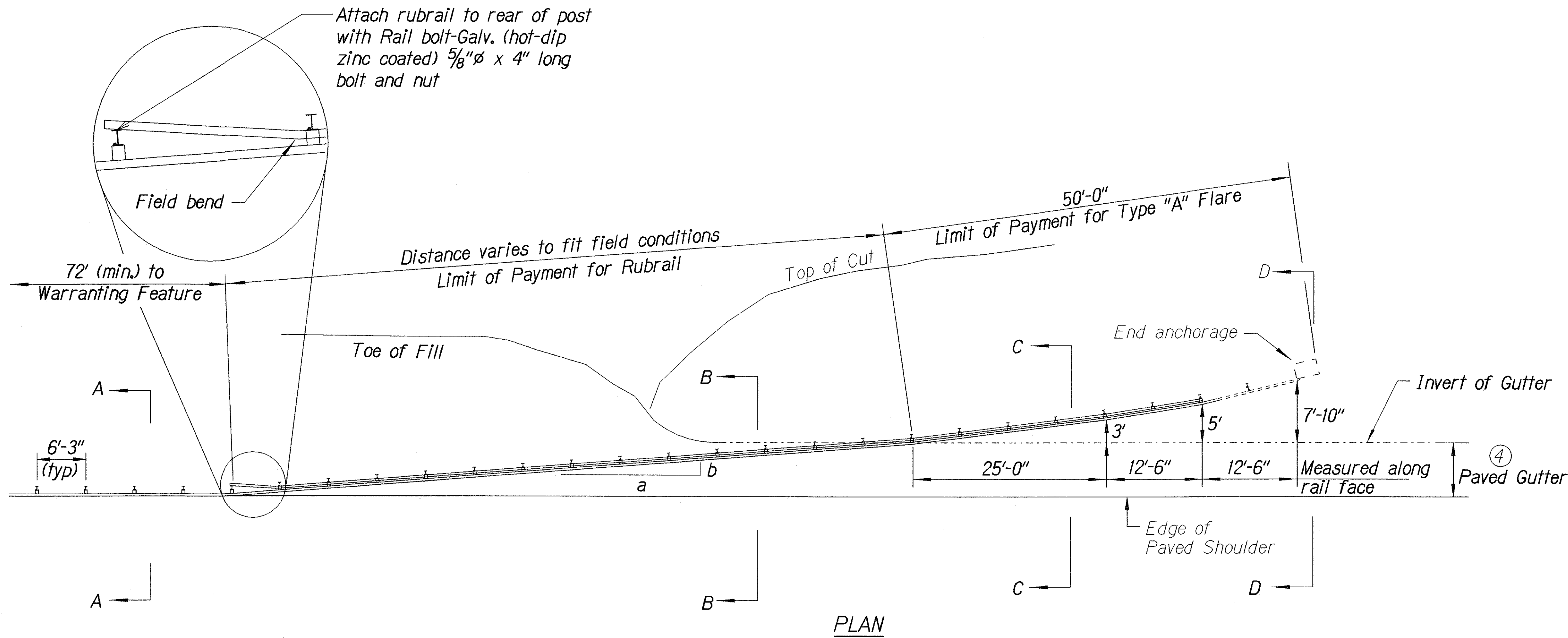
GUARDRAIL DETAILS
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
Scale: Noted Date: April, 2002

SHEET No. 1 OF 1 SHEETS

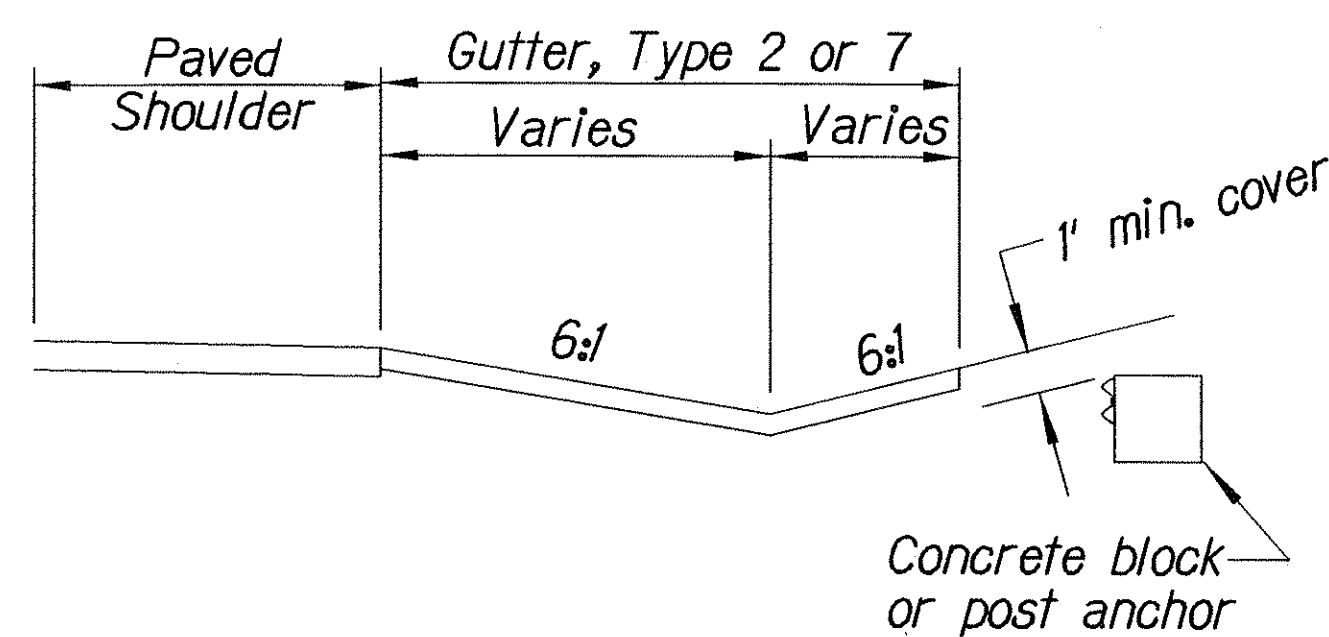
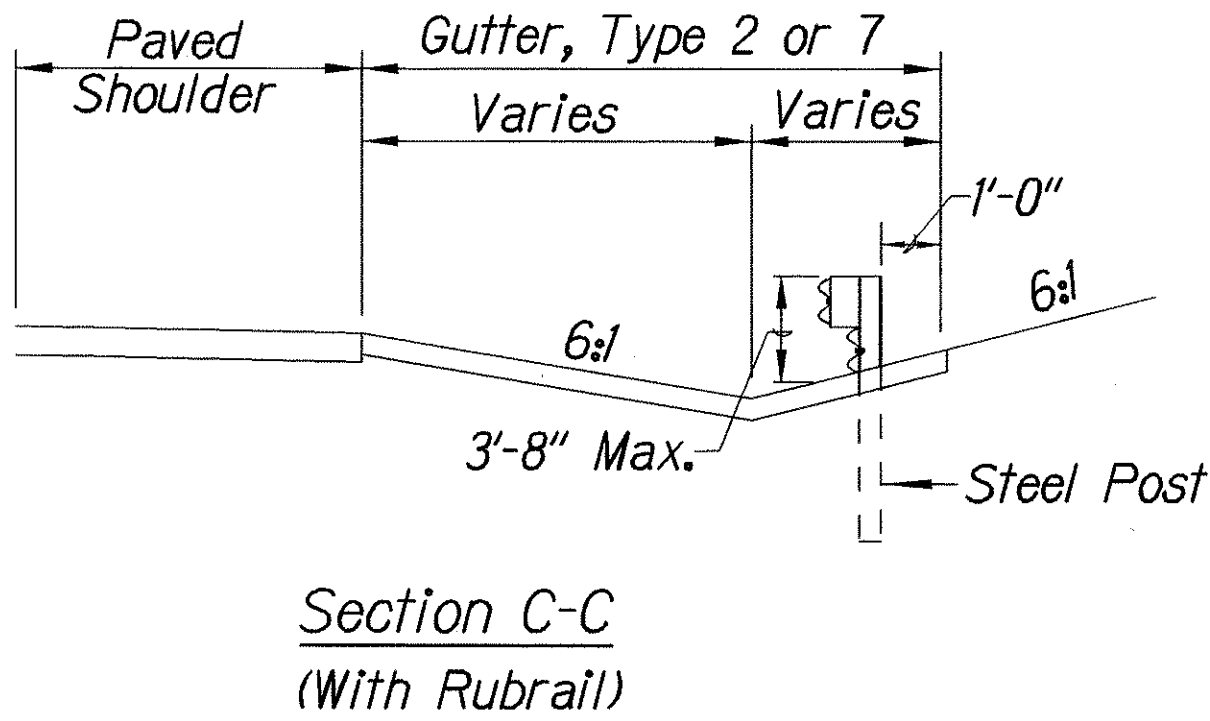
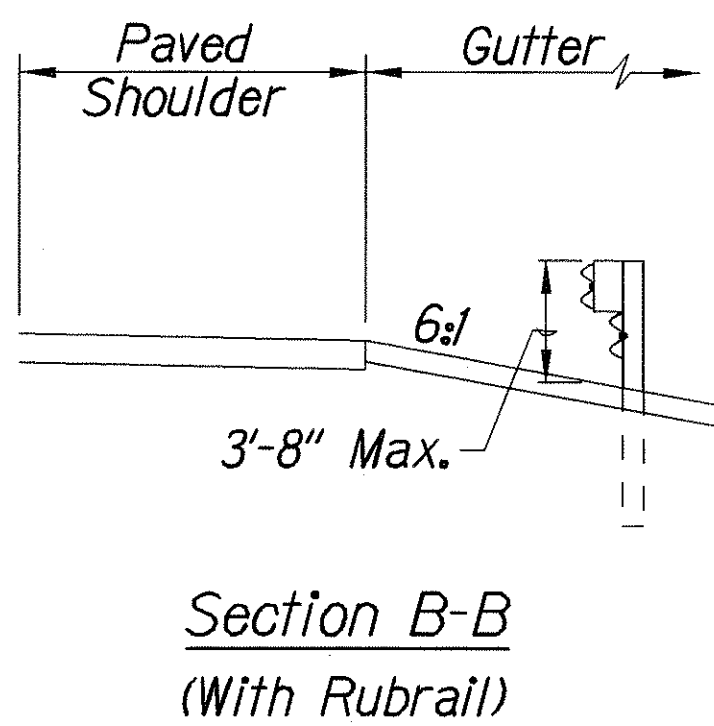
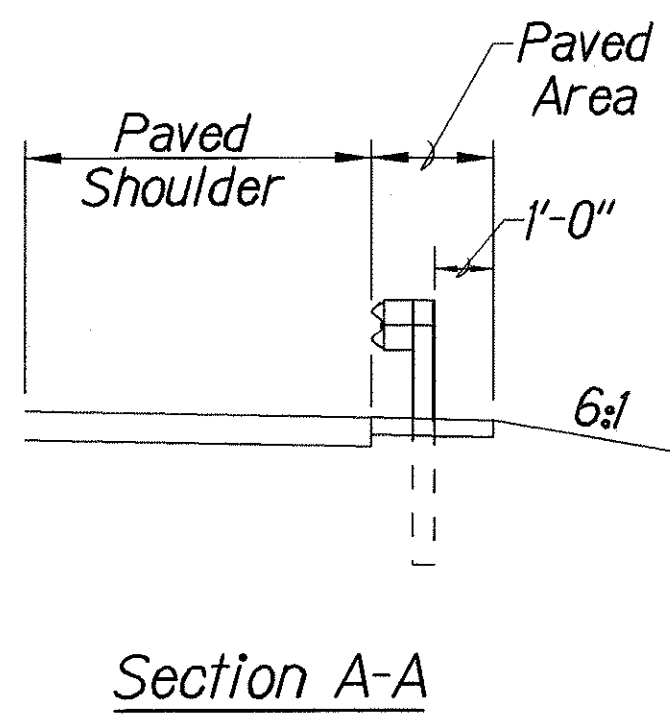
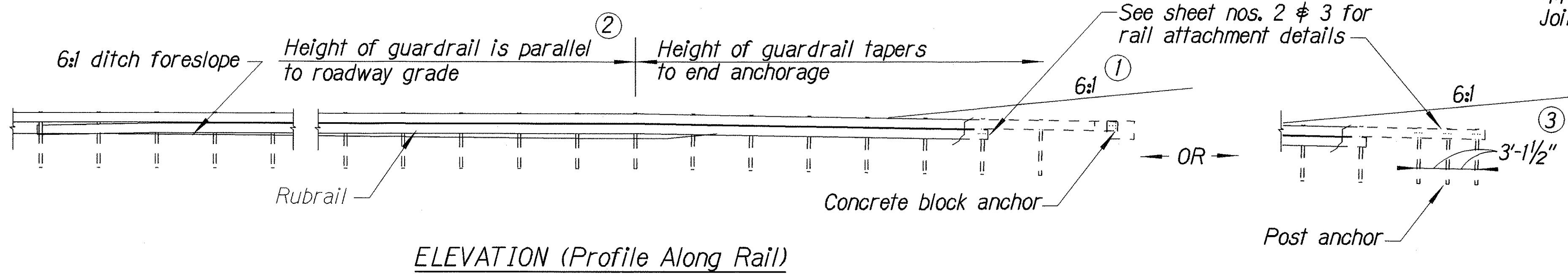
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	28	37

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

HAWAII BELT ROAD

GUARDRAIL & SHOULDER IMPROVEMENTS

VICINITY OF KAHUKU

PROJECT NO. 11E-01-02M

Scale: Noted

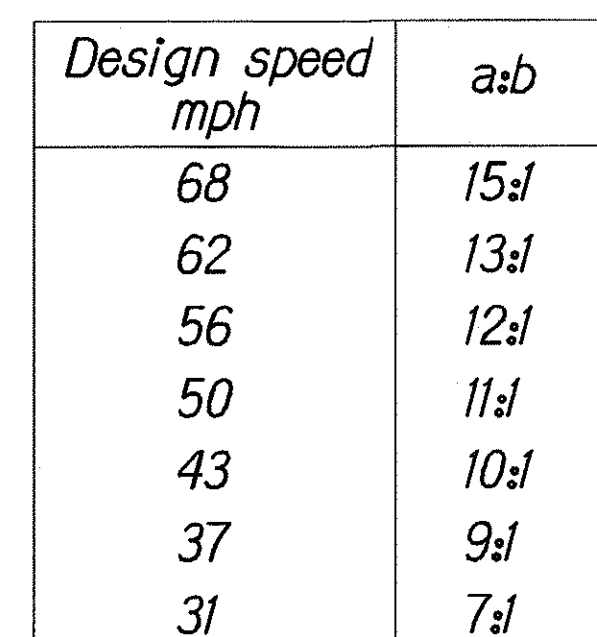
Date: April, 2002

General Notes

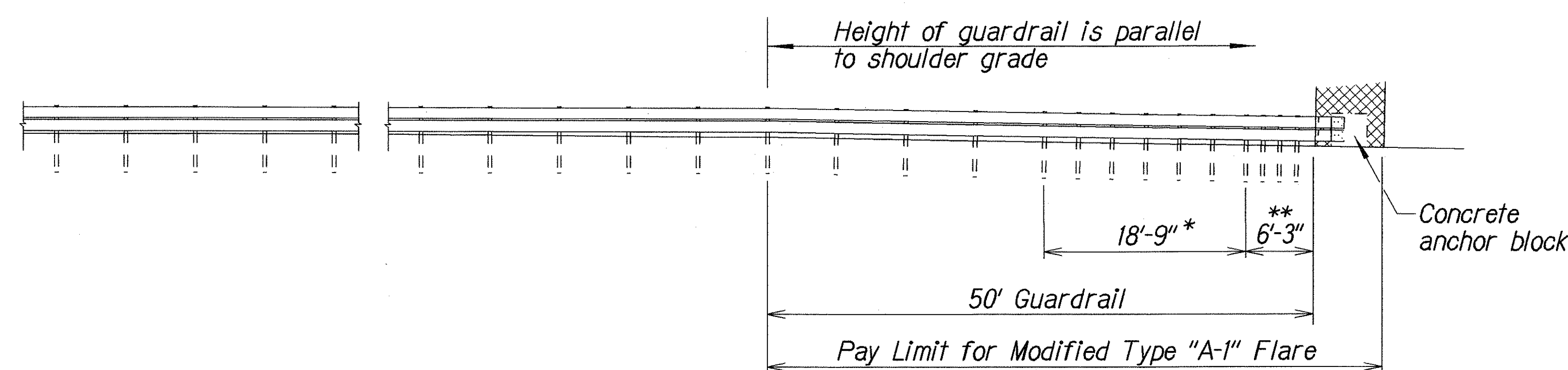
-
- Diagram illustrating the connection between a guardrail and a concrete anchor block. The diagram shows a cross-section of the guardrail assembly. The guardrail is labeled "Guardrail" and has a thickness of "1'-9 5/8\"". The rubrail is labeled "Metal Rubrail (when applicable)". The concrete anchor block is labeled "3'x3'x3' Conc. Anchor Block". The guardrail is supported by a "Grouted Rubble Paving" layer, which is supported by "Backfill". The "Cut Slope" is indicated on both sides of the anchor block. The distance from the guardrail to the anchor block is labeled "Varies". The distance from the anchor block to the cut slope is labeled "12\" Min.". The distance from the anchor block to the backfill is labeled "9\"".

ANCHOR BLOCK IN CUT SECTION

31

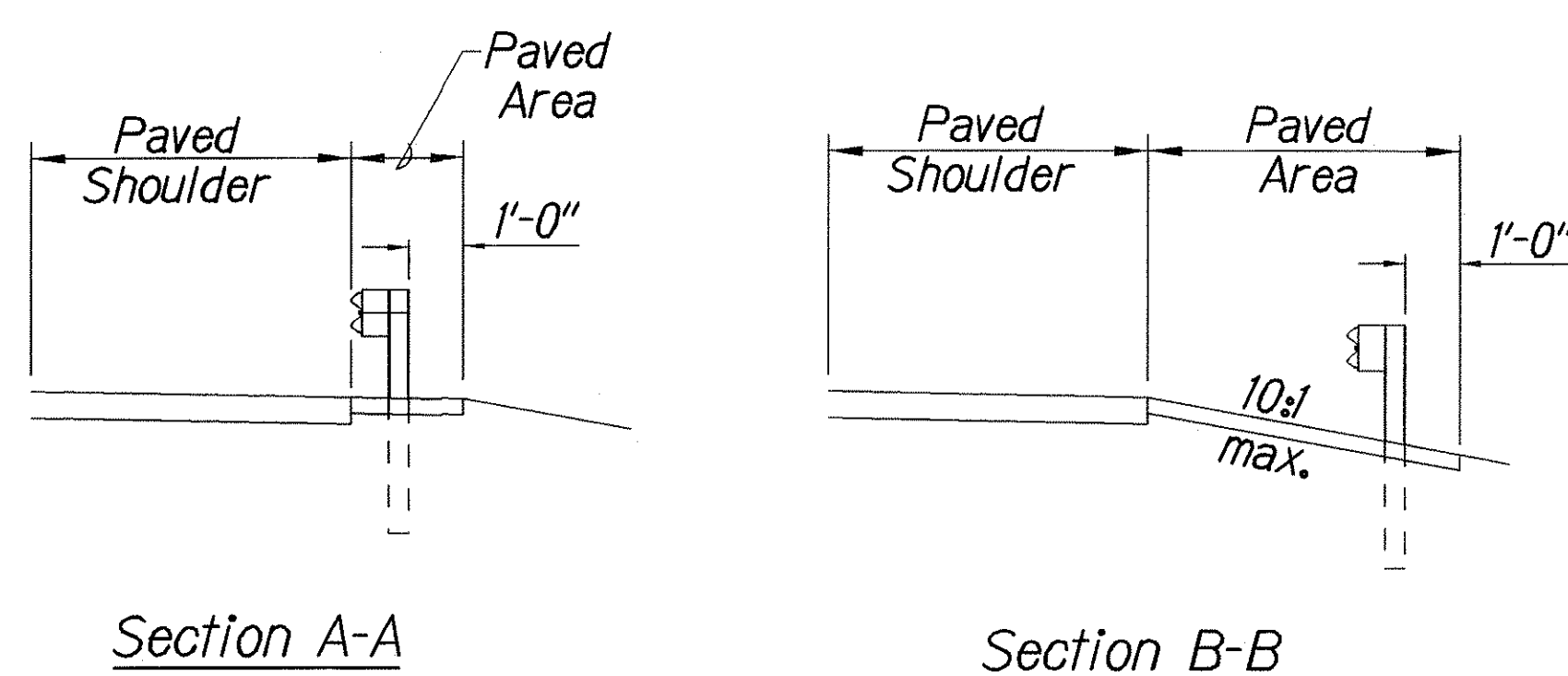


PLAN



ELEVATION (Profile Along Rail)

* Posts at 3'-1½" o.c.
** Posts at 1'-6¾" o.c.



Guardrail Element

G.R.P.

3'x3'x3' Conc. Anchor Block Buried in Cut Section

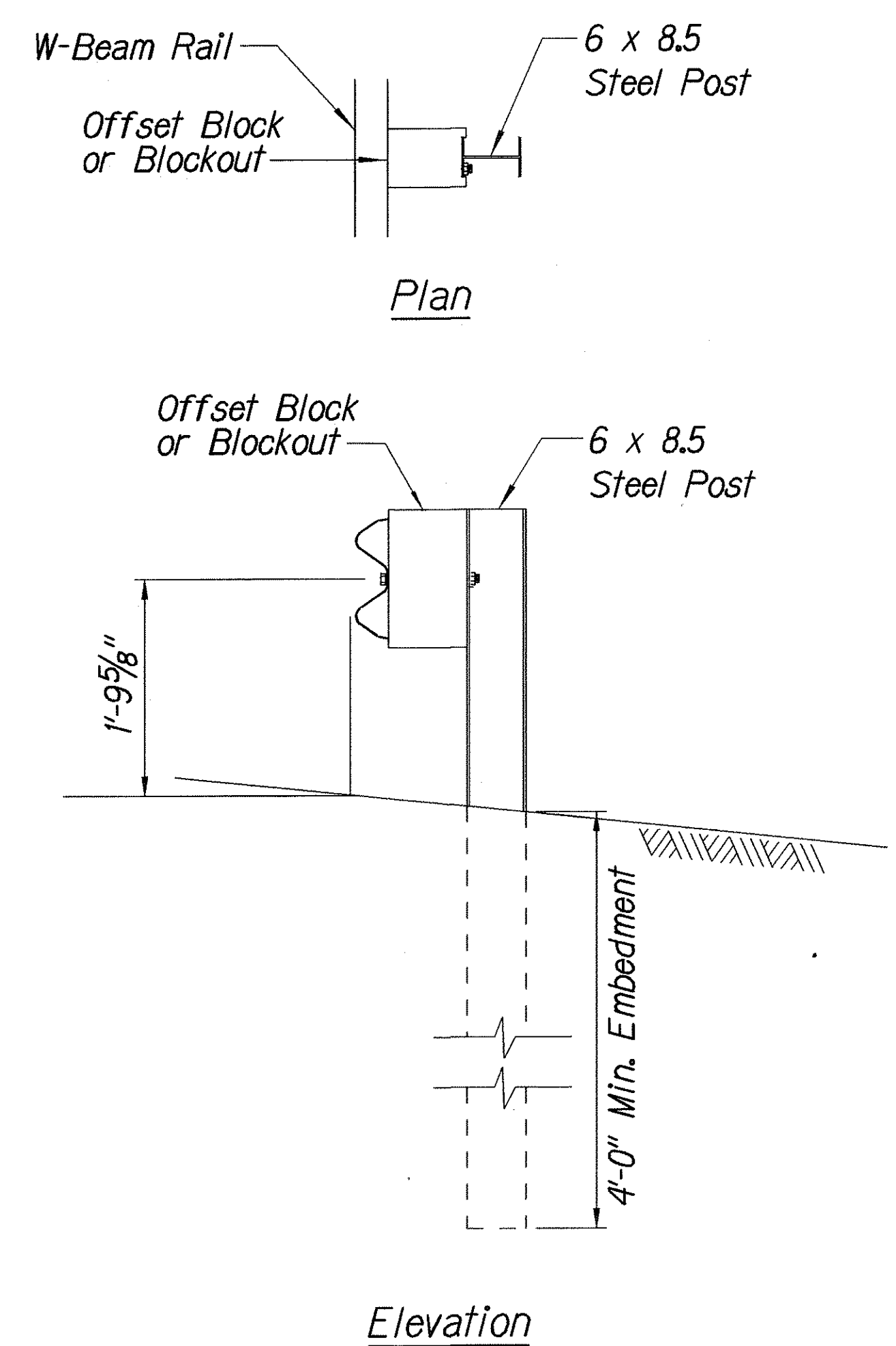
Special End Shoe for Details See Sheet 22

5/8" ø x 7 1/4" Long Bolt

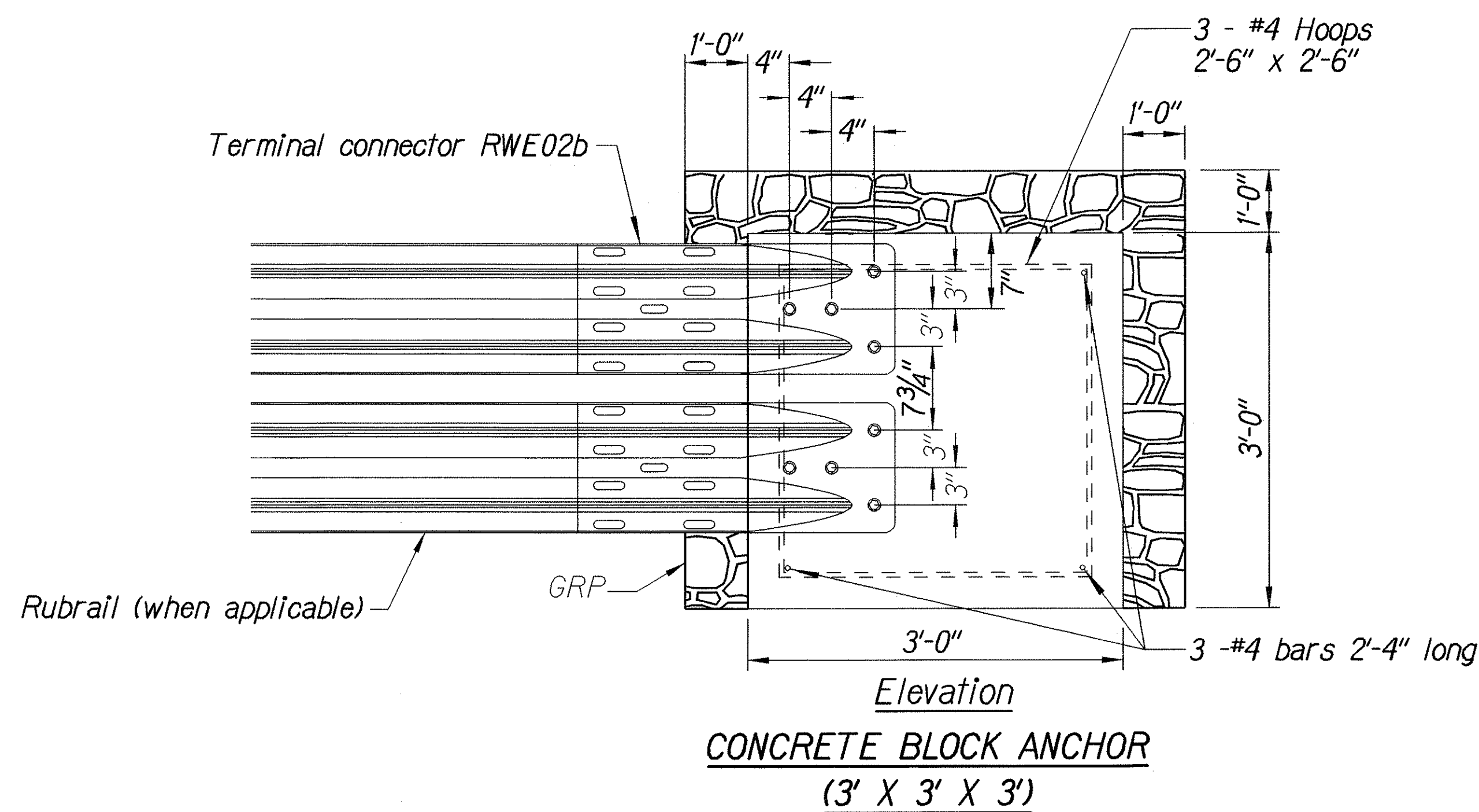
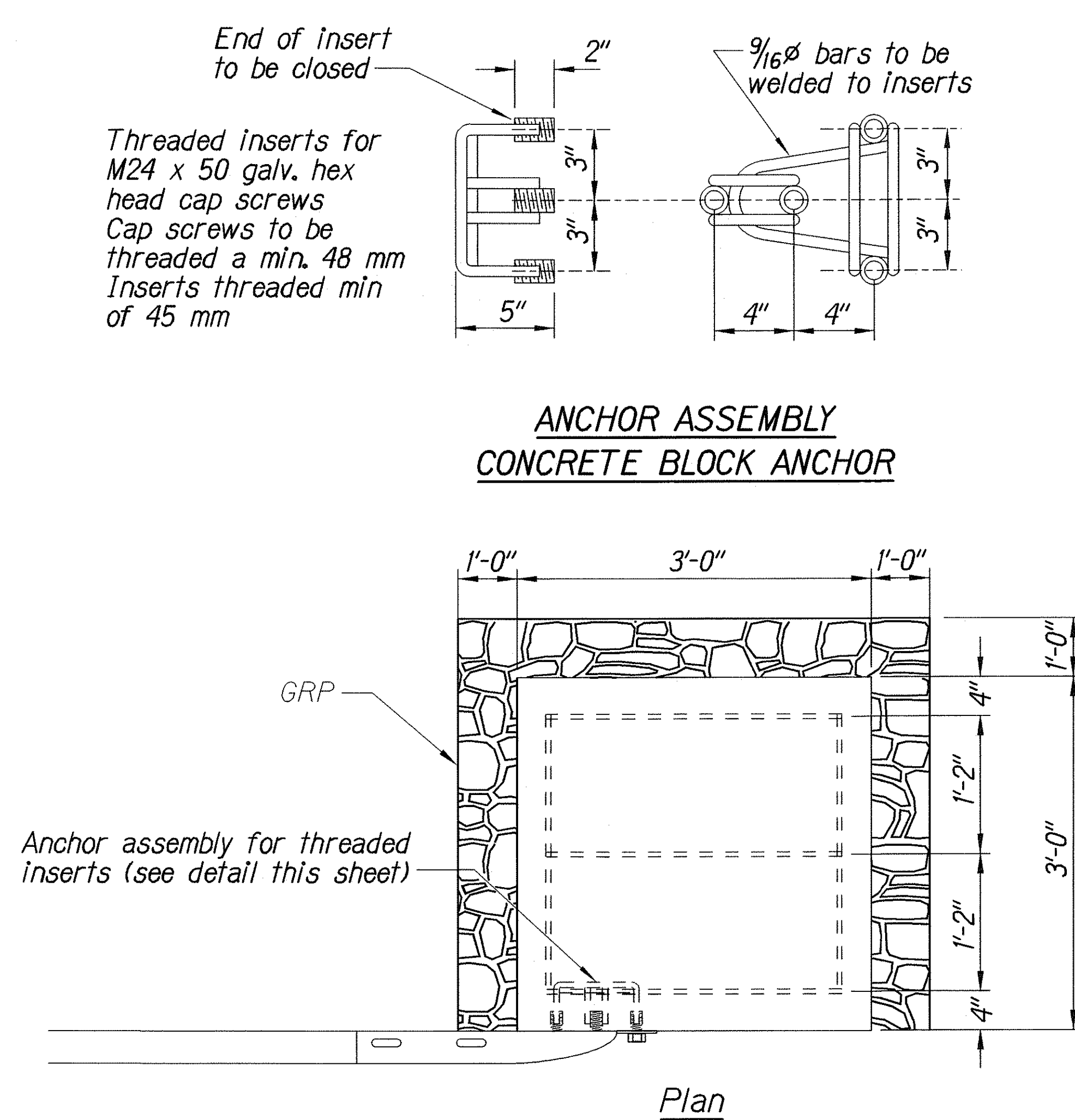
PLAN - ANCHOR BLOCK IN CUT SECTION

ORIGINAL PLAN	SURVEY PLOTTED BY _____ DATE _____
NOTE BOOK	DRAWN BY <u>χ</u> _____
207 Feb 0a	TRACED BY _____
	DESIGNED BY <u>χ</u> _____
	QUANTITIES BY _____
	CHECKED BY _____
N. <u>dgn</u>	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	32	37



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	11/03/02
20/0000	TRACED BY	
	QUANTITIES BY	
	CHECKED BY	

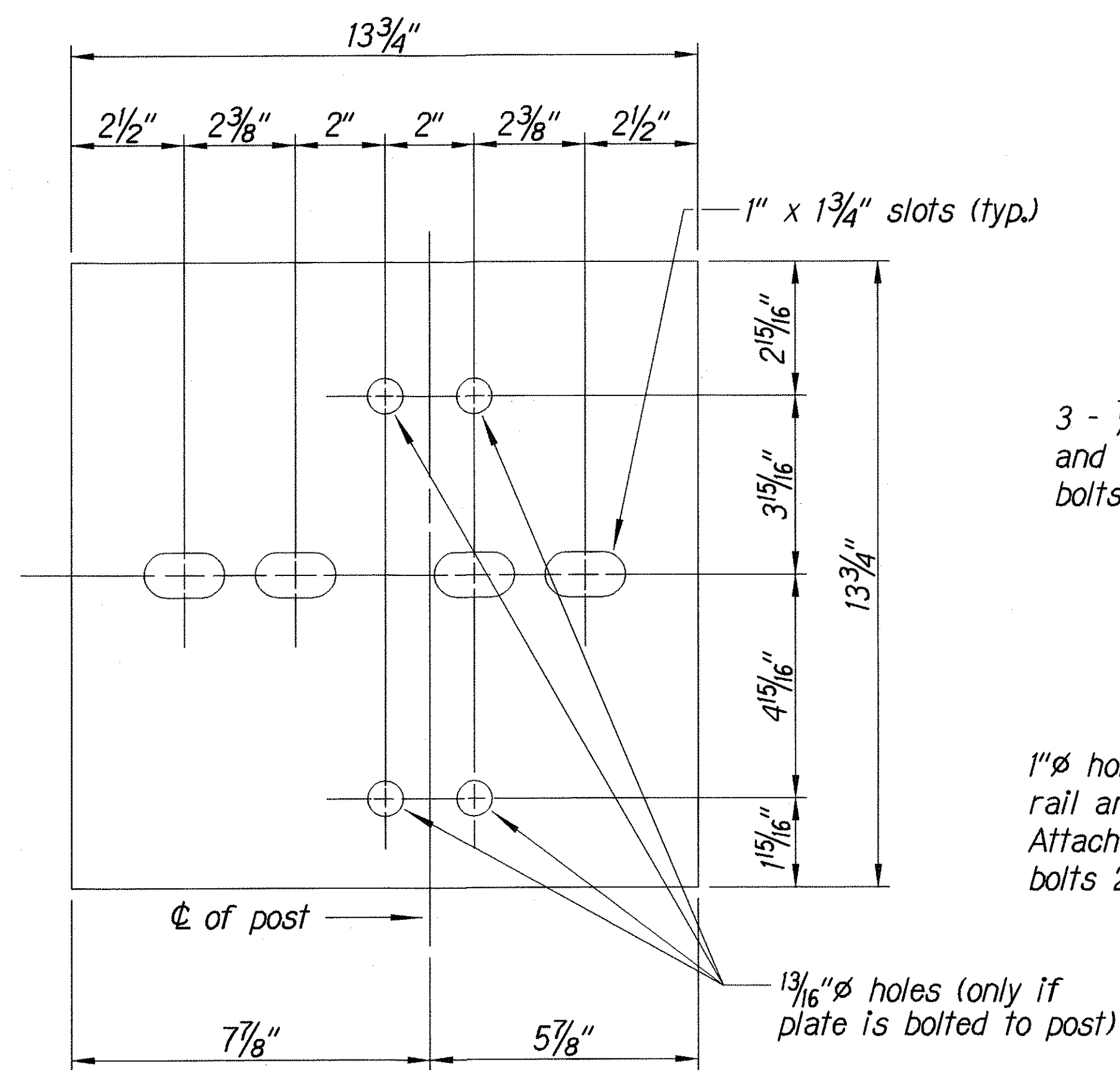
Standard plan TE-59 07/07/86, TE-59 01/03/89 & TE-60 07/01/86
15/12/01

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

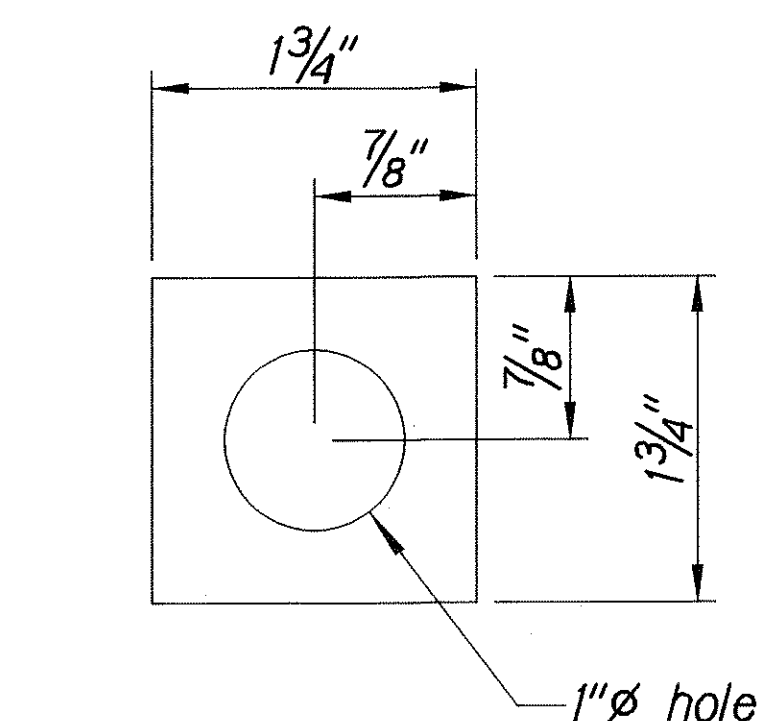
MODIFIED TYPE "A-1" FLARE
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
Scale: Noted Date: April, 2002

SHEET No. 1 OF 1 SHEETS

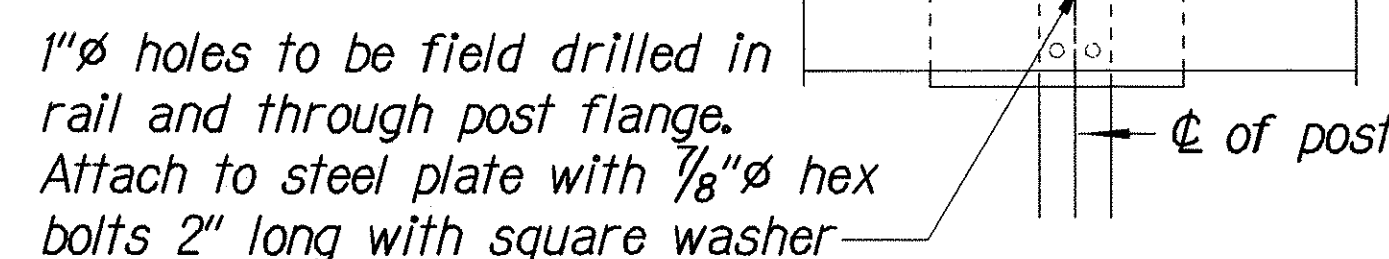
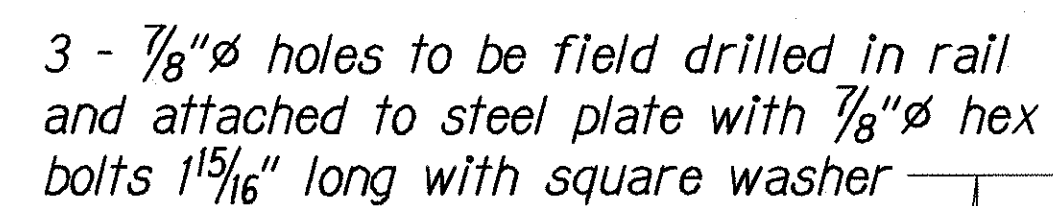
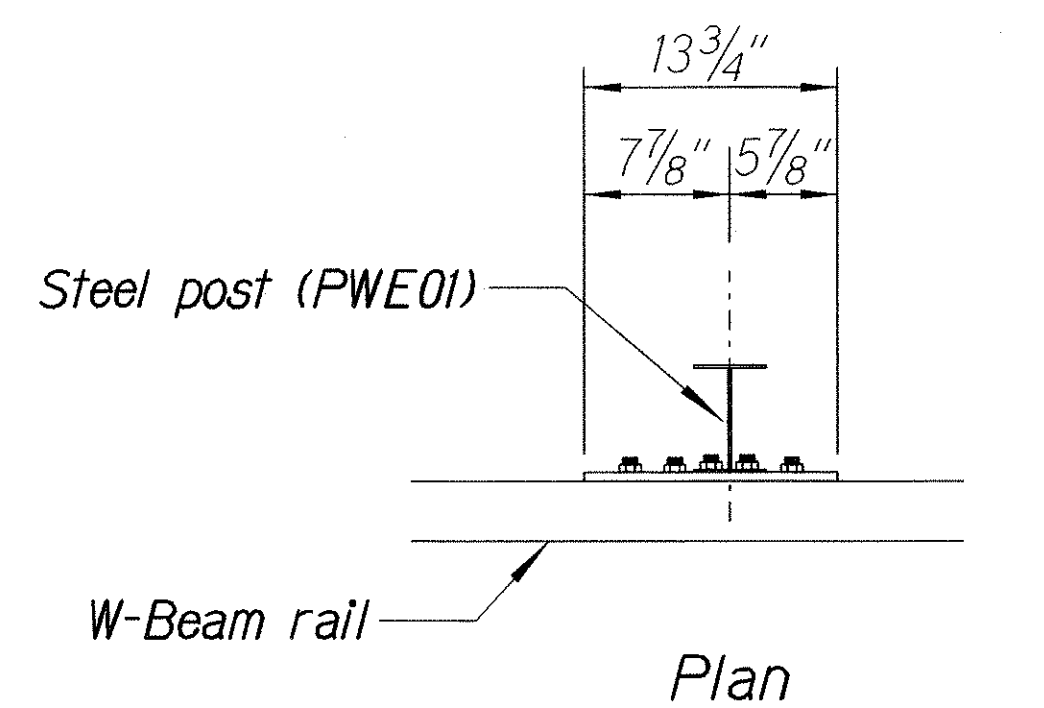
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	33	37



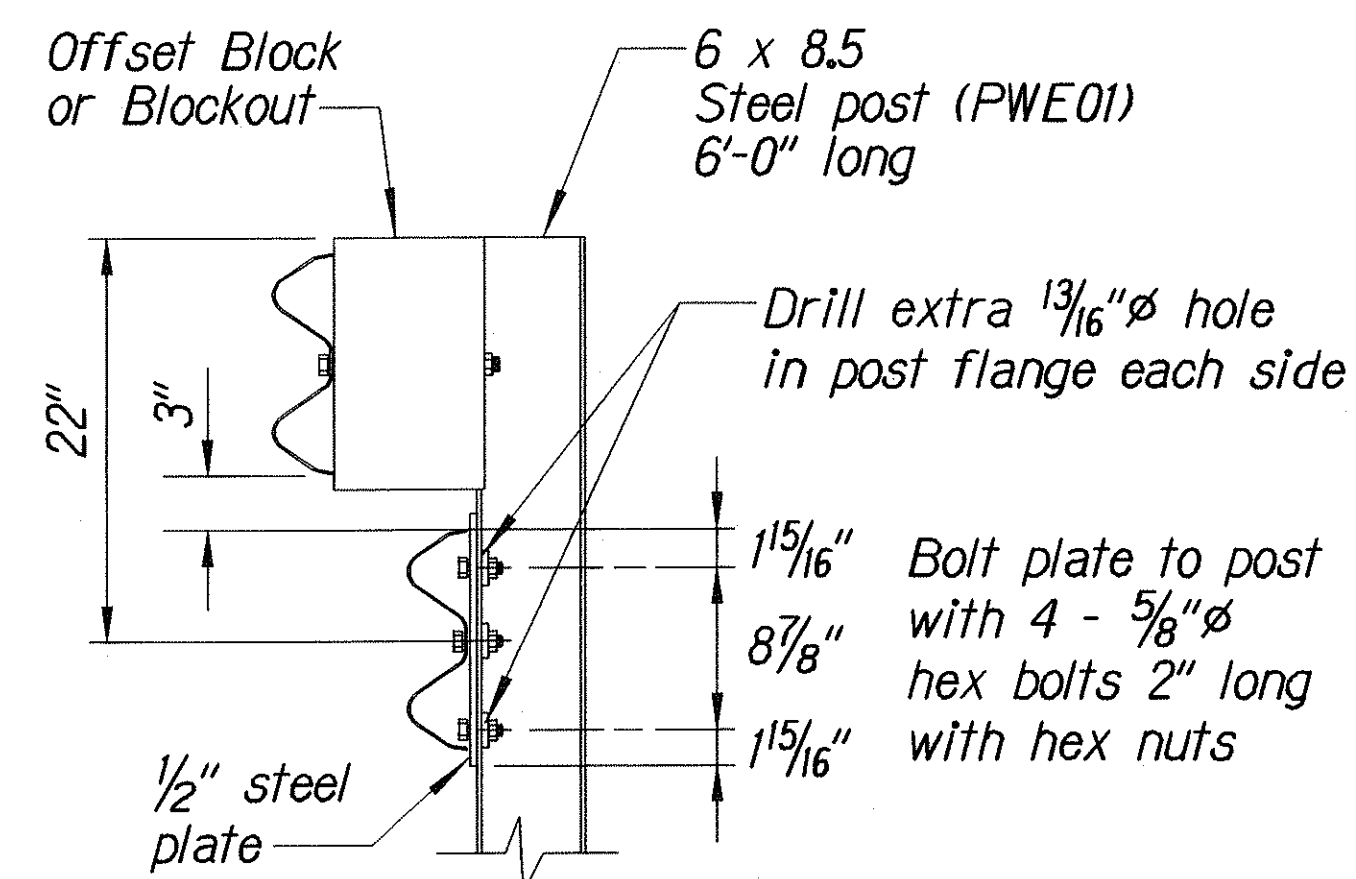
Steel Plate - 1/2"
(Hot-dip Zinc Coated Galvanized-
Welded or Bolted to Post)



Square Washer
($\frac{3}{16}$ " Thick - Hot-dip
Zinc Coated Galvanized)

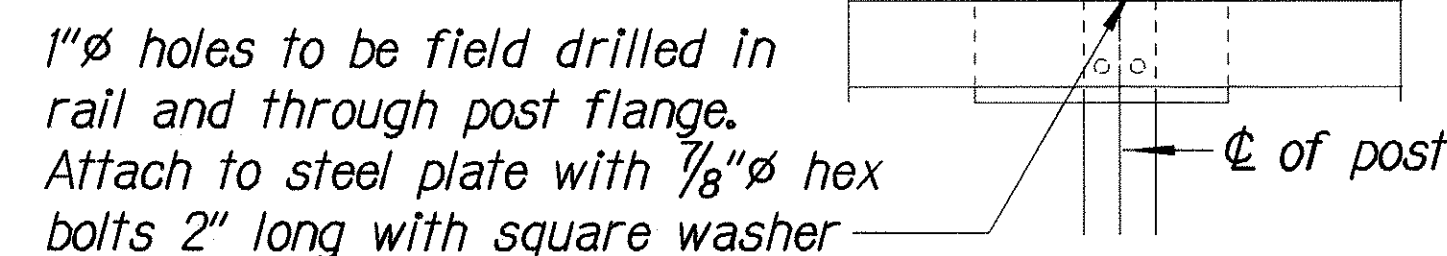
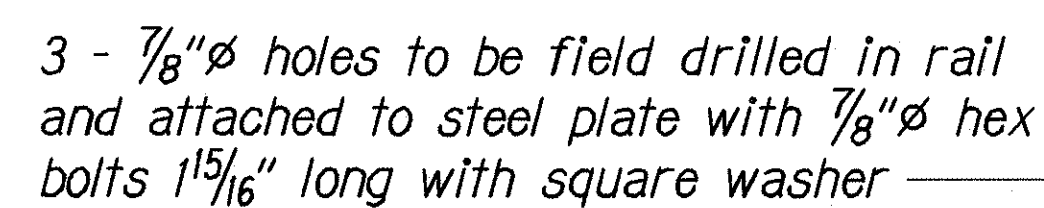
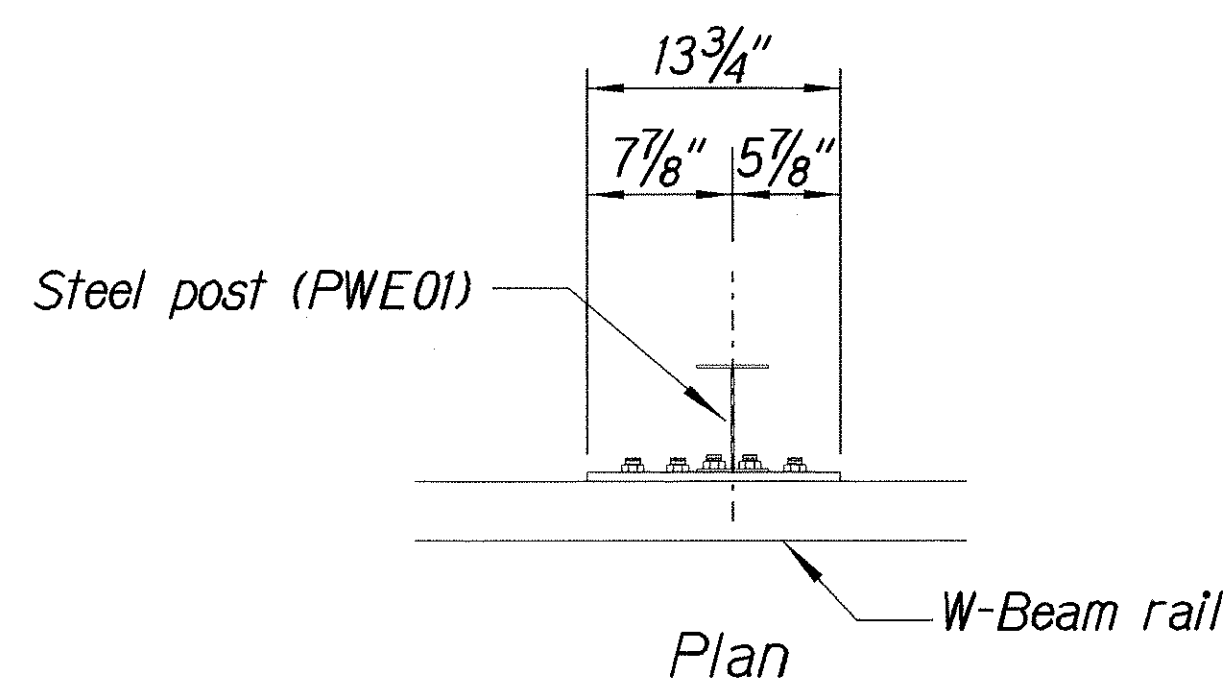


Front View

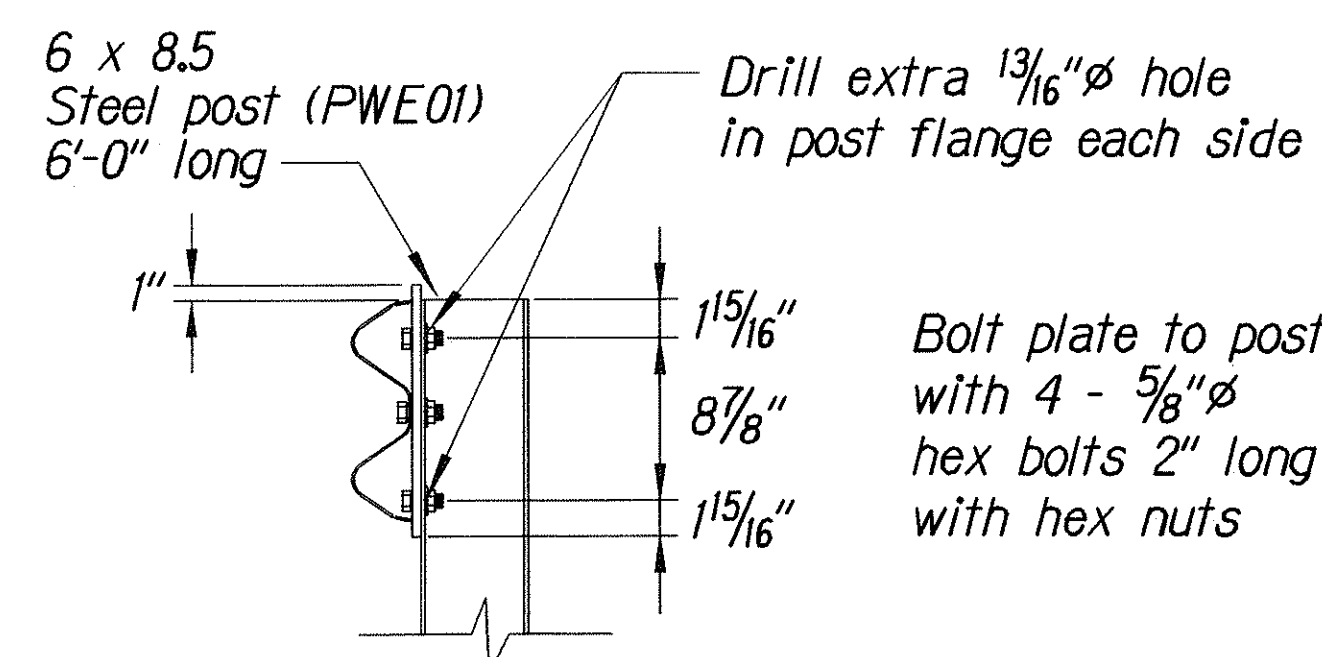


Elevation

RUBRAIL ANCHOR DETAILS



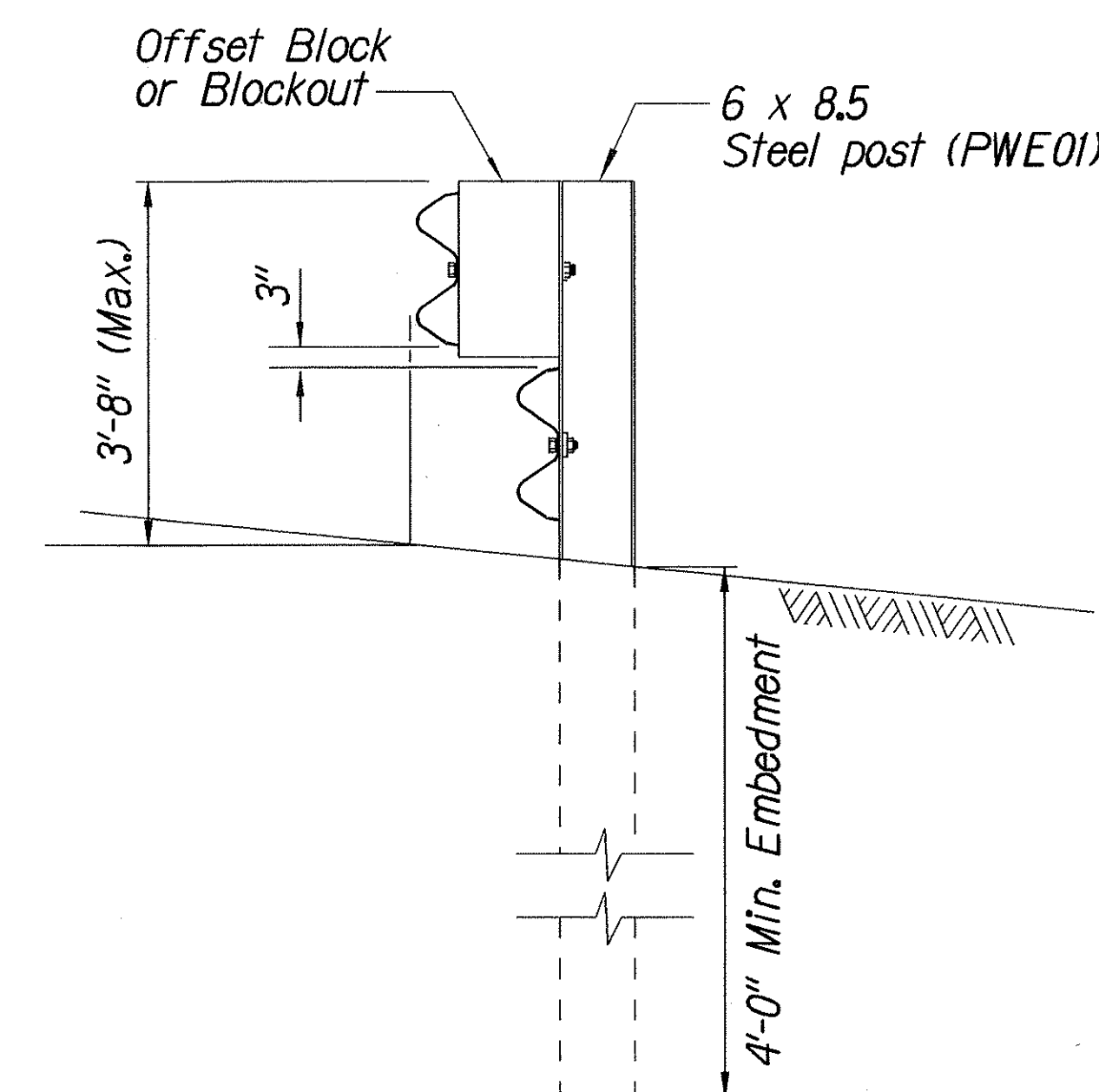
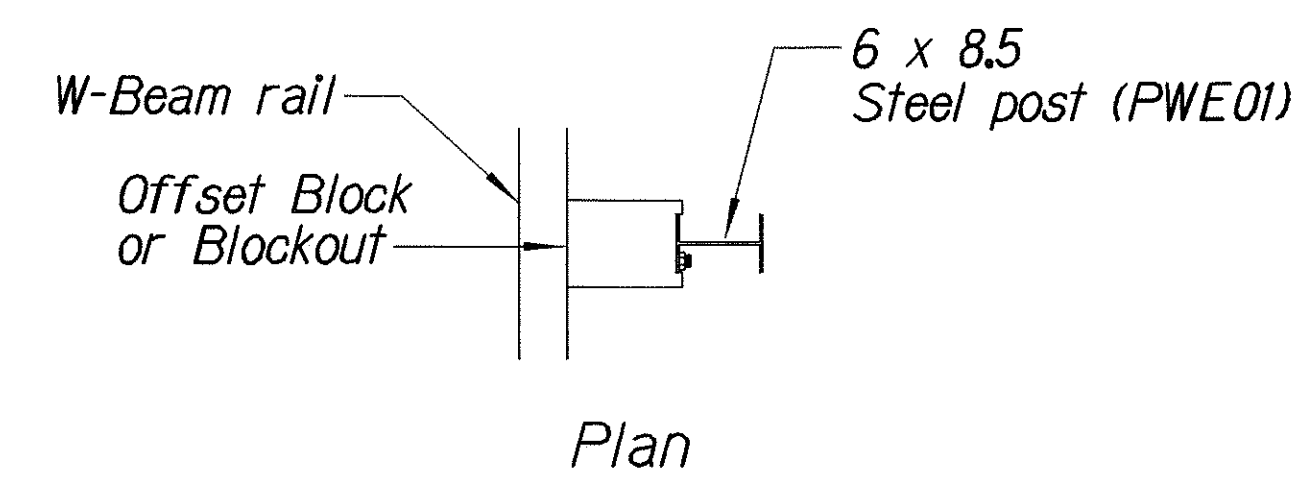
Front View



Elevation

POST ANCHOR DETAILS

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



Elevation

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.

ORIGINAL PLAN	SURVEY PLOTTED BY _____ DATE _____
	DRAWN BY <u>X</u> _____ *
NOTE BOOK	DESIGNED BY _____ *
<u>207tab0c</u>	QUANTITIES BY _____ *
<u>S₆</u>	CHECKED BY _____
	<u>dgm</u> S ₆ _____

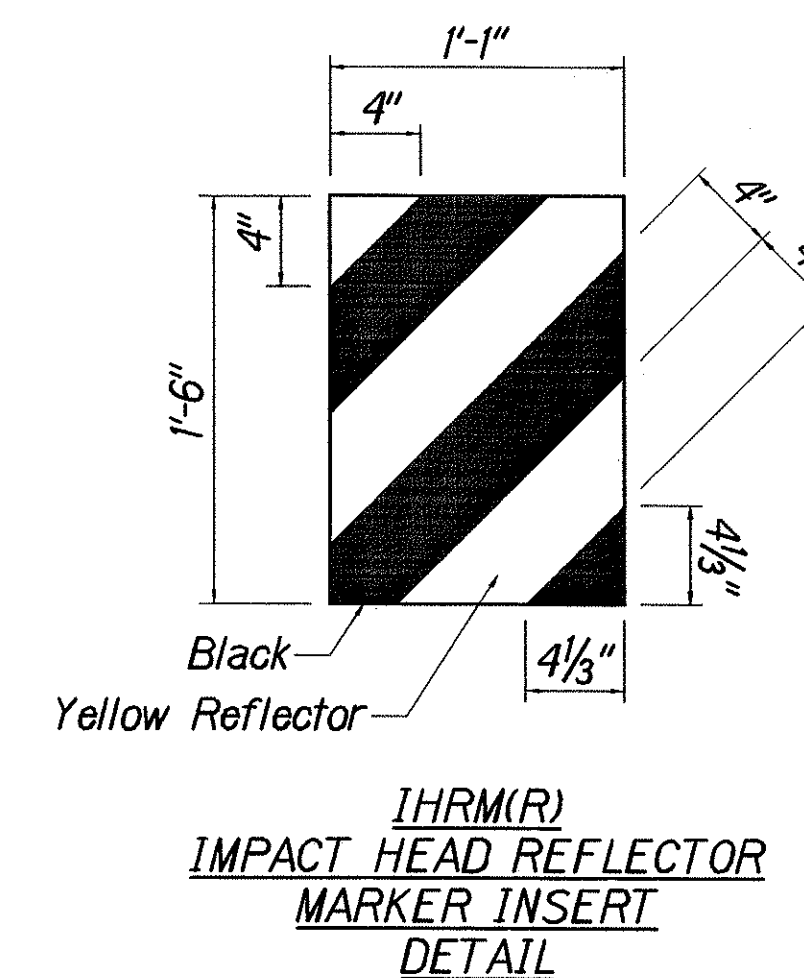
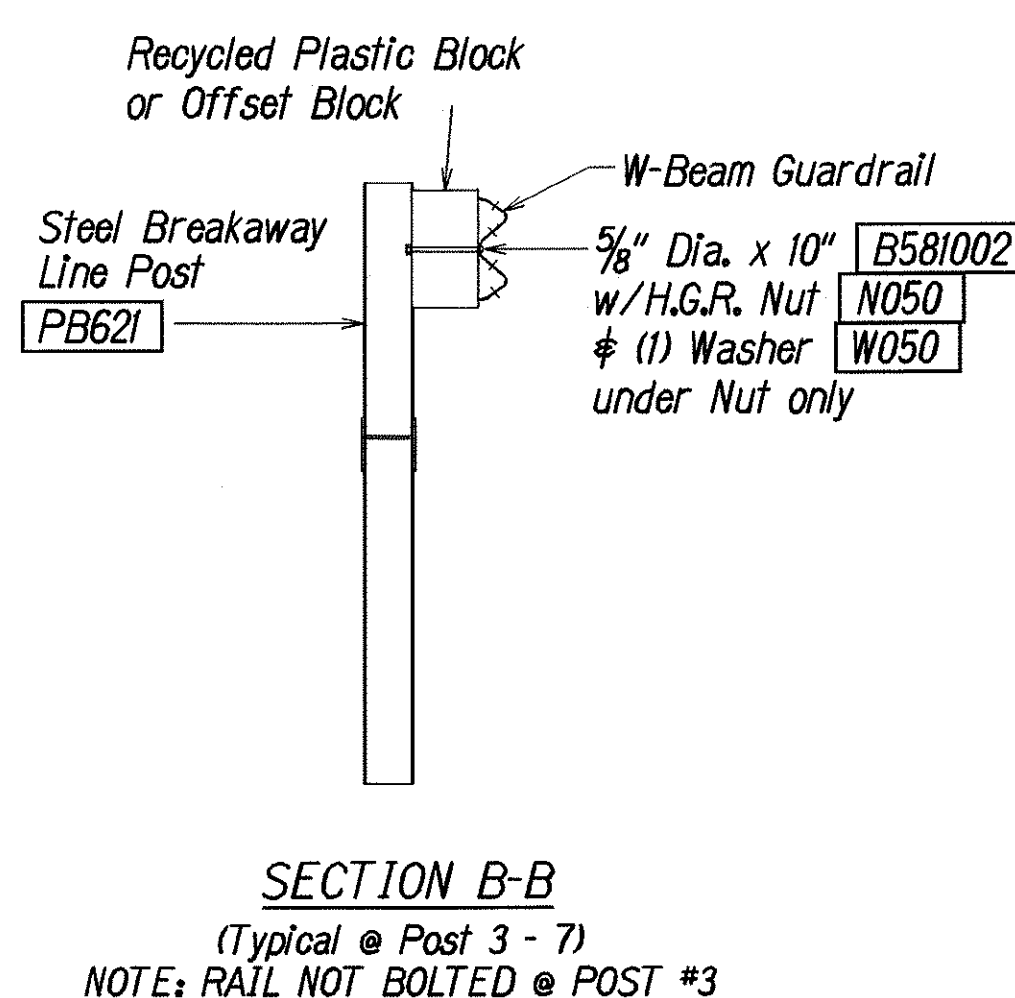
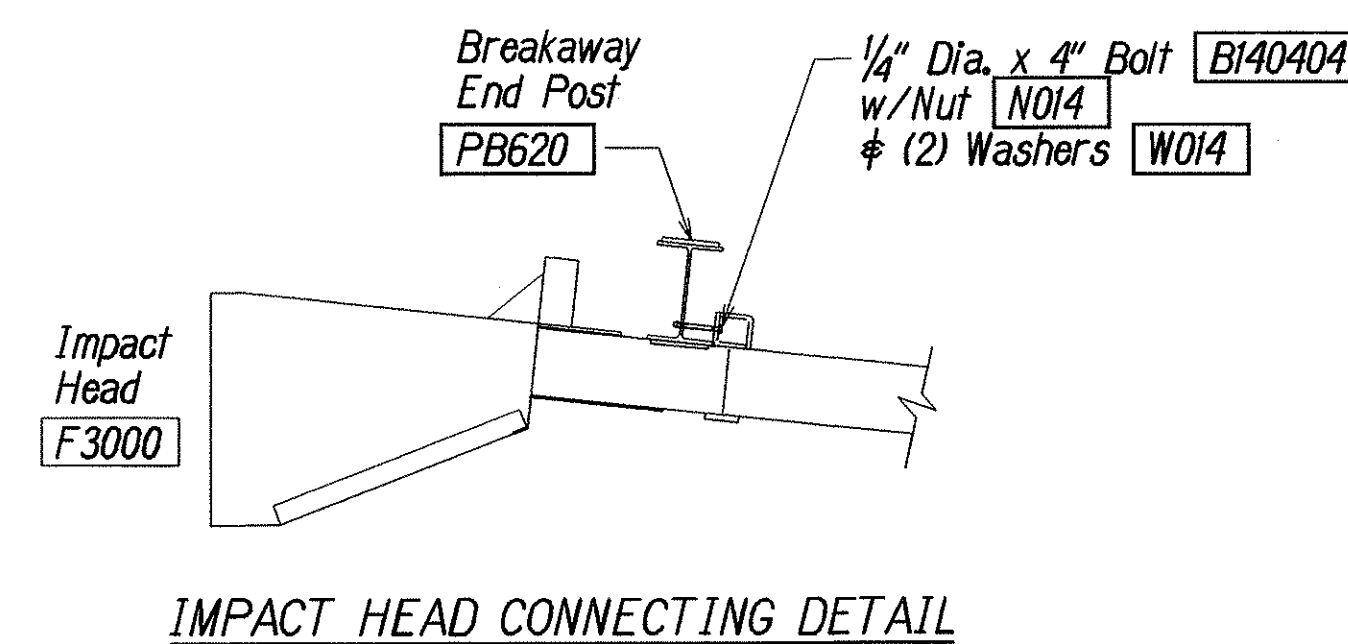
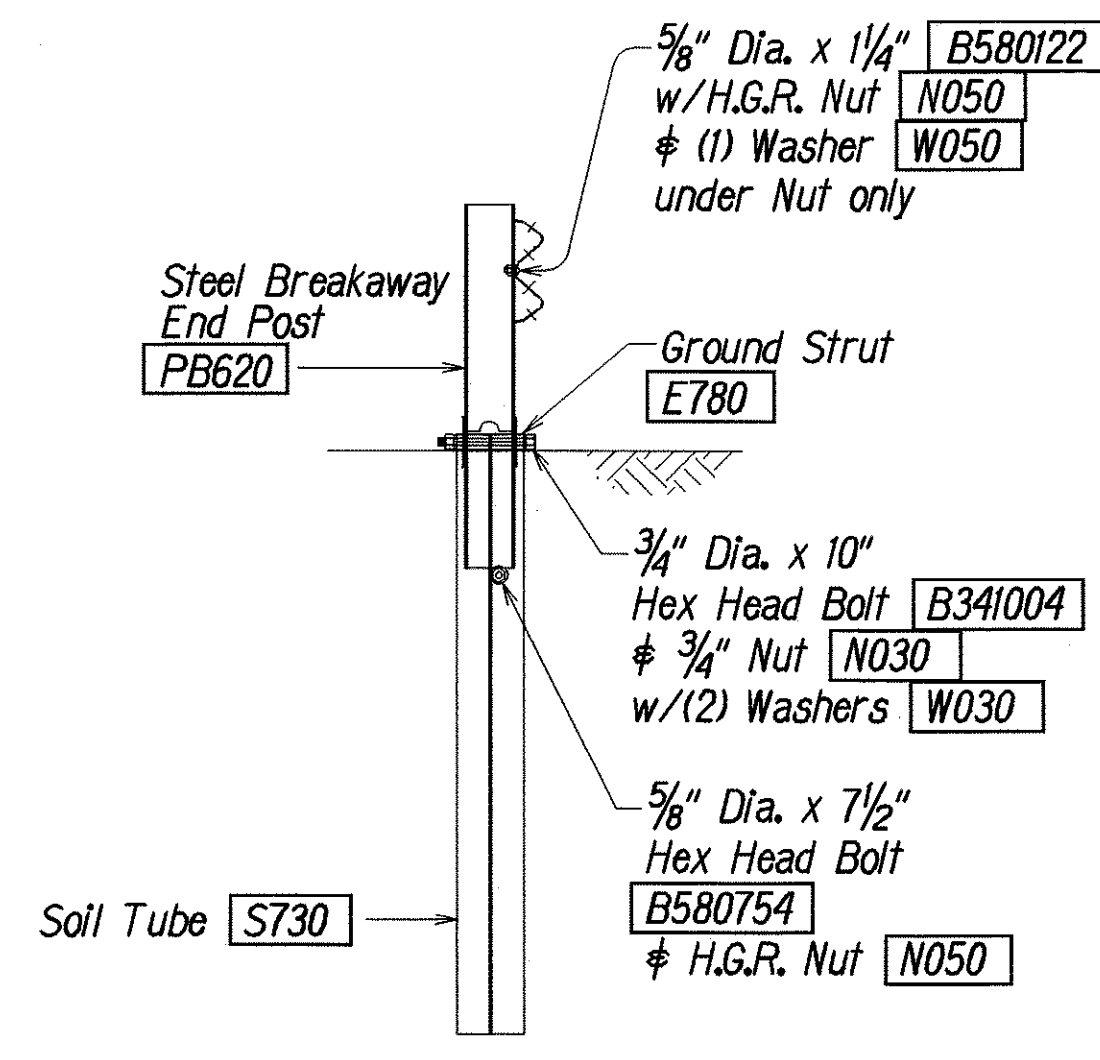
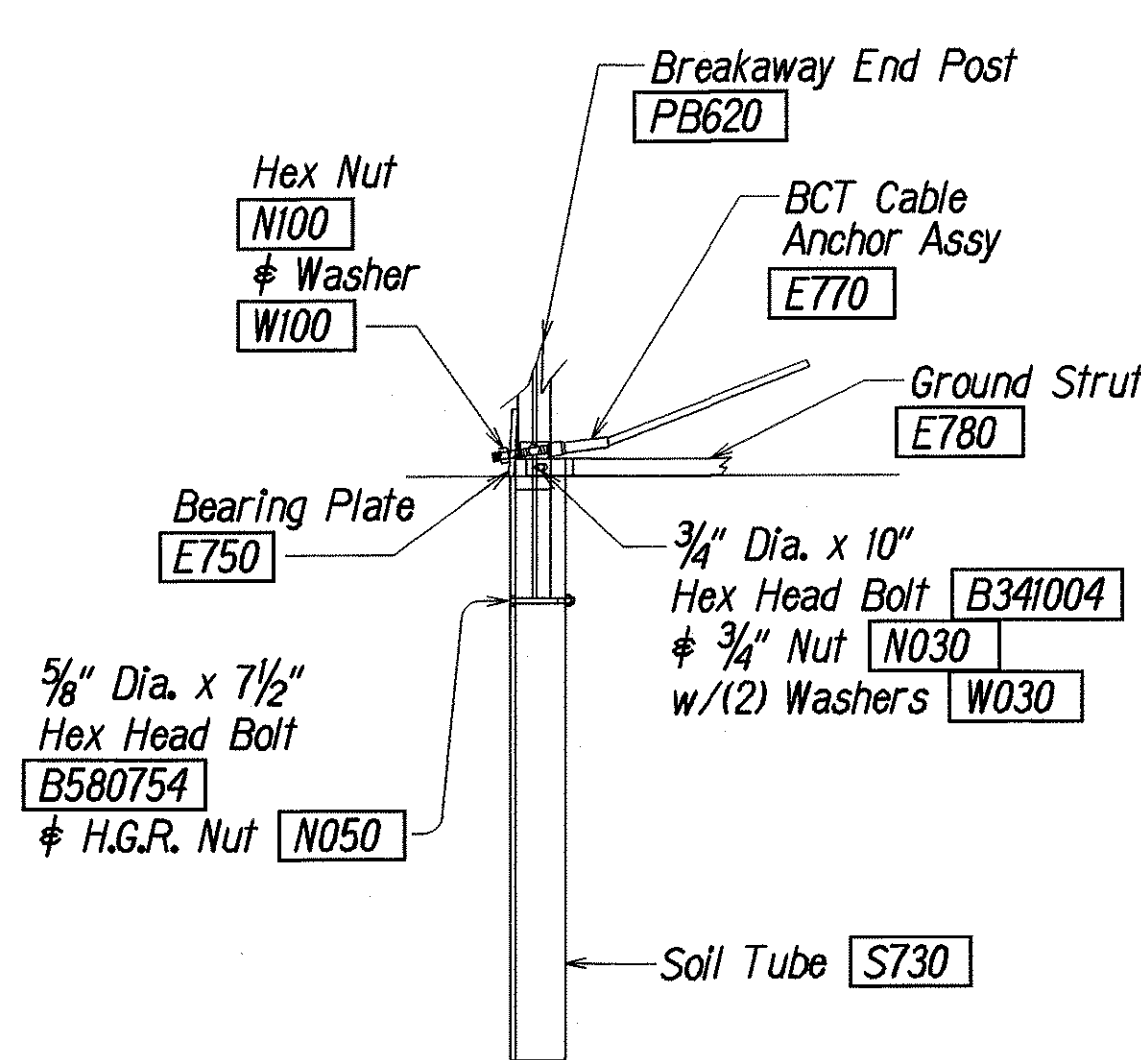
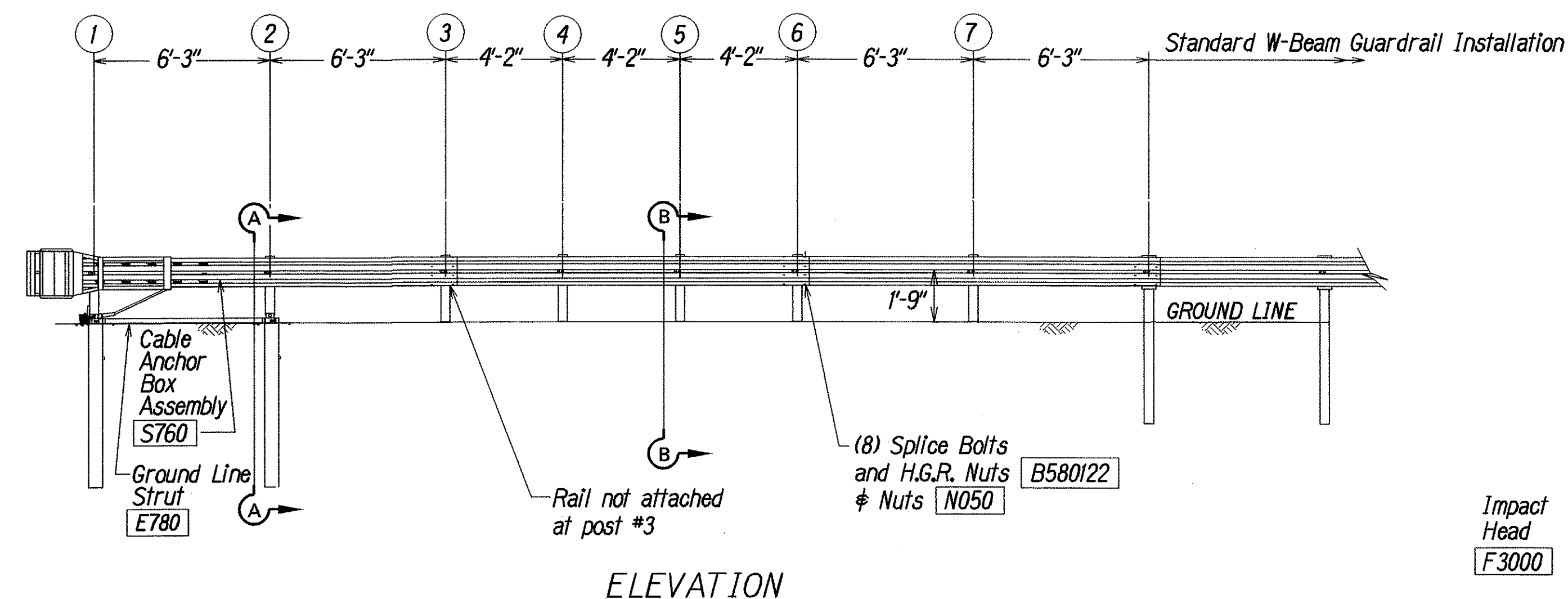
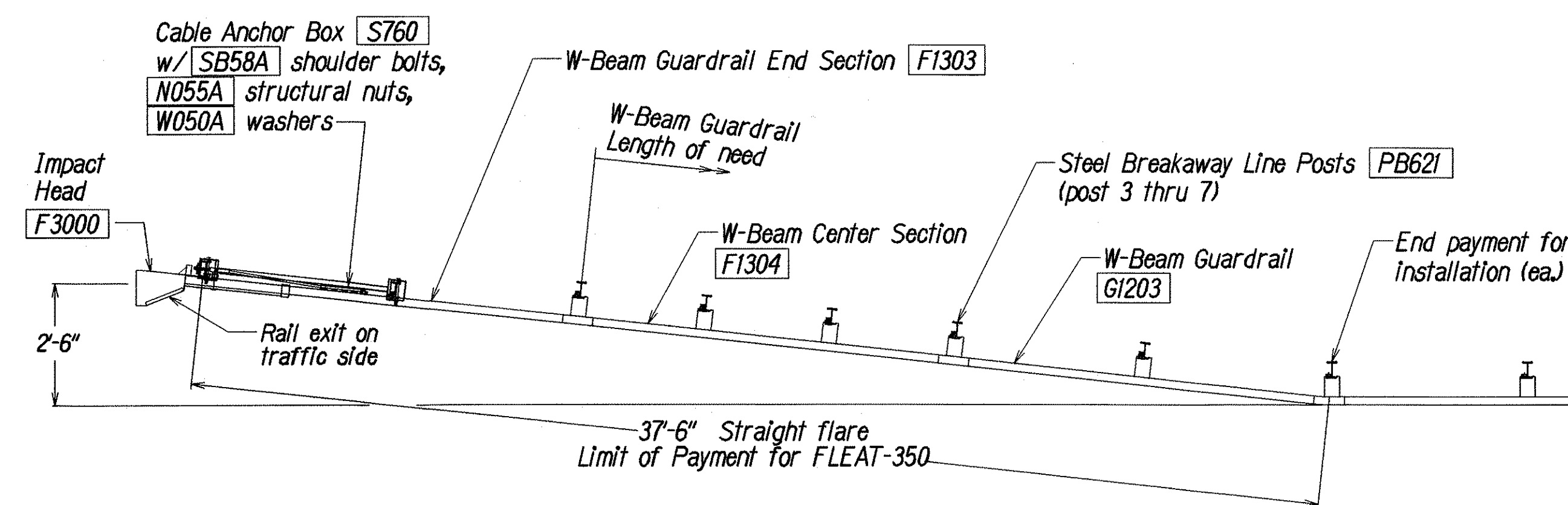
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MODIFIED TYPE "A-1" FLARE
RUBRAIL DETAILS
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. IIE-01-02M

Scale: As Noted Date: April, 2002

SHEET No. 3 OF 3 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	34	37



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.

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

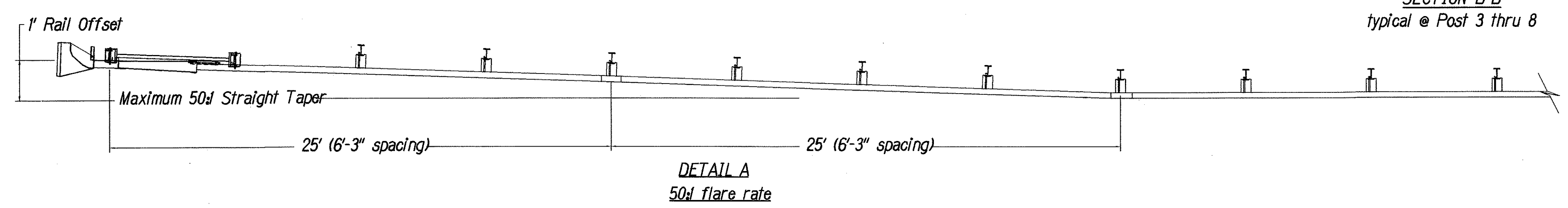
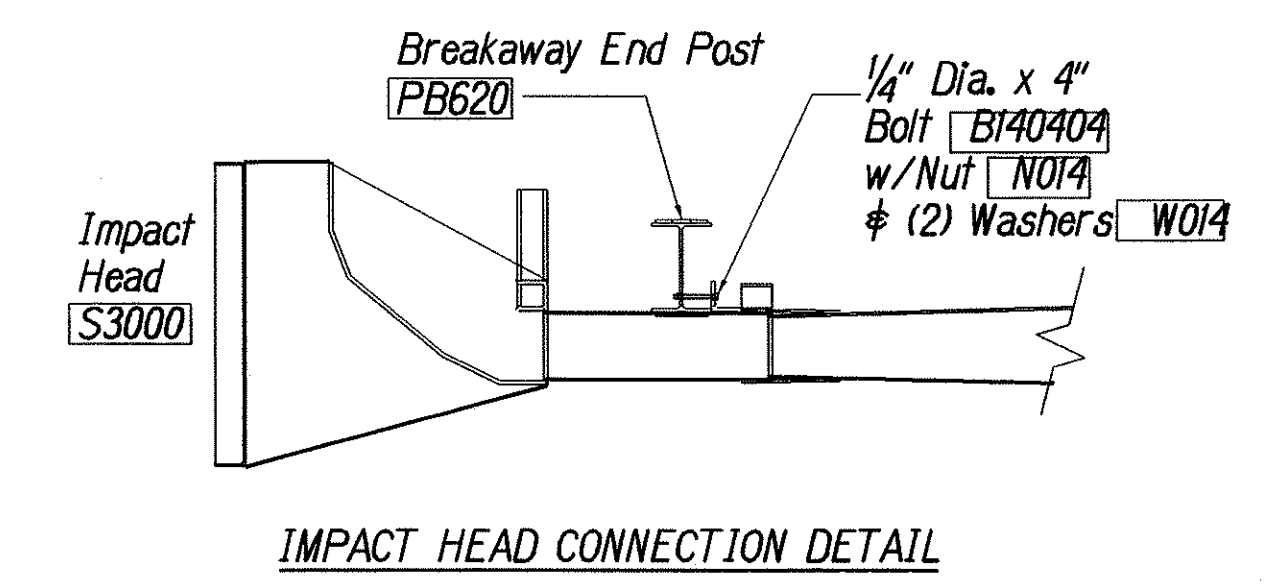
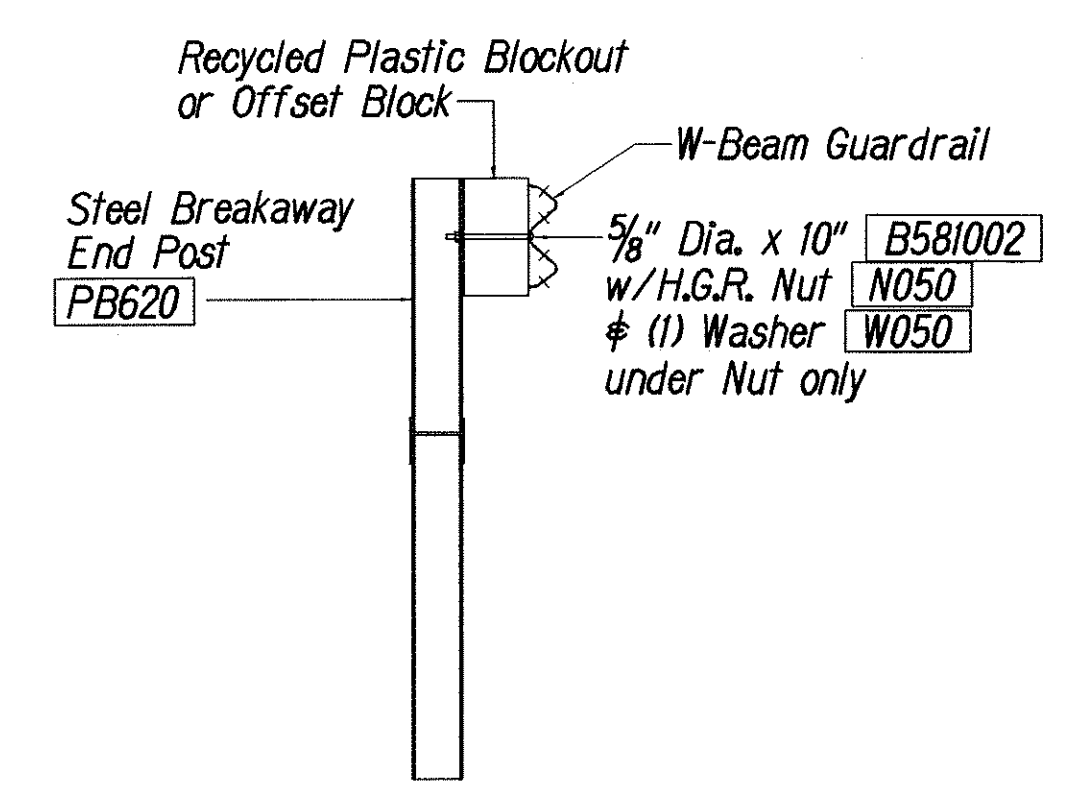
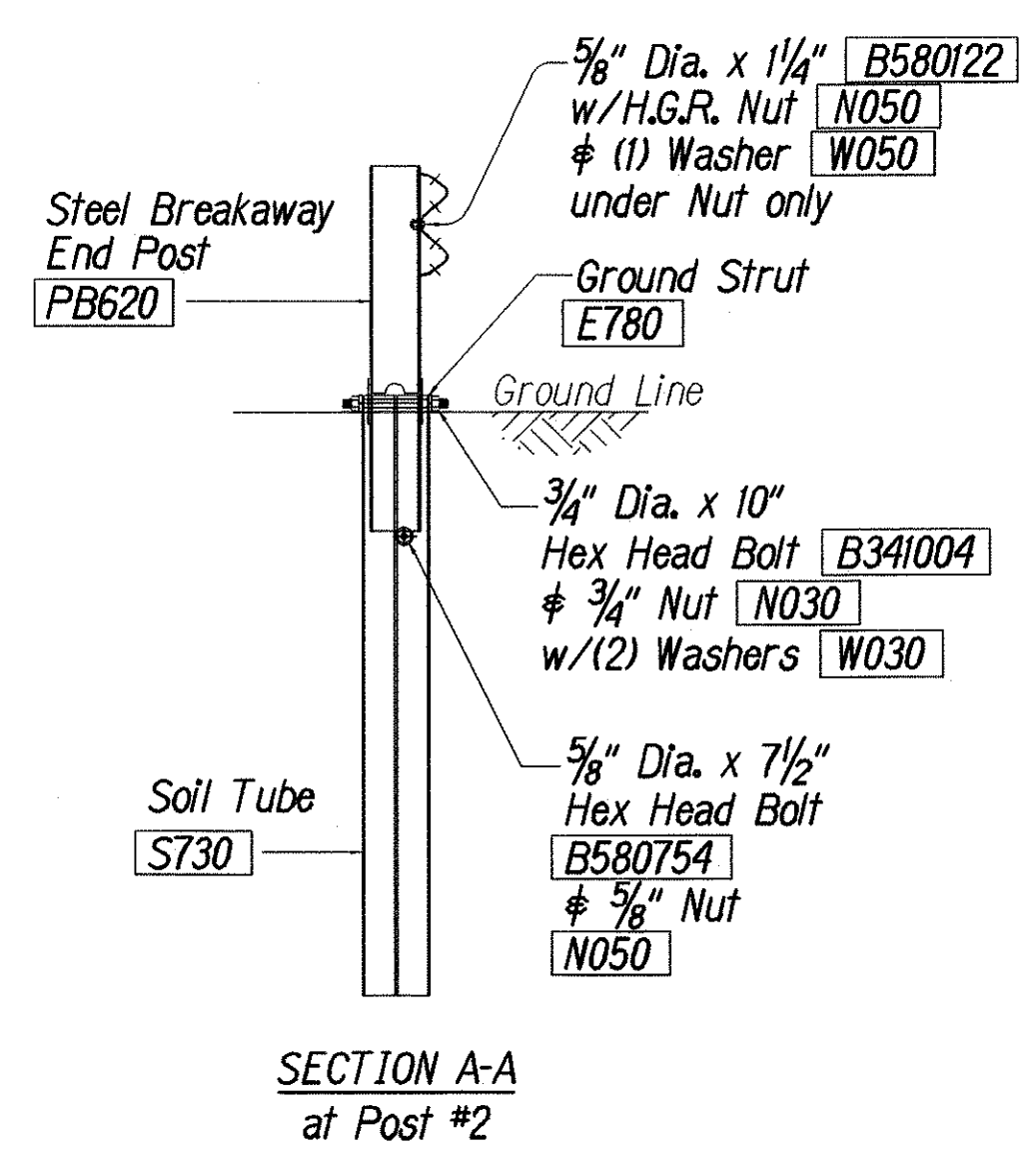
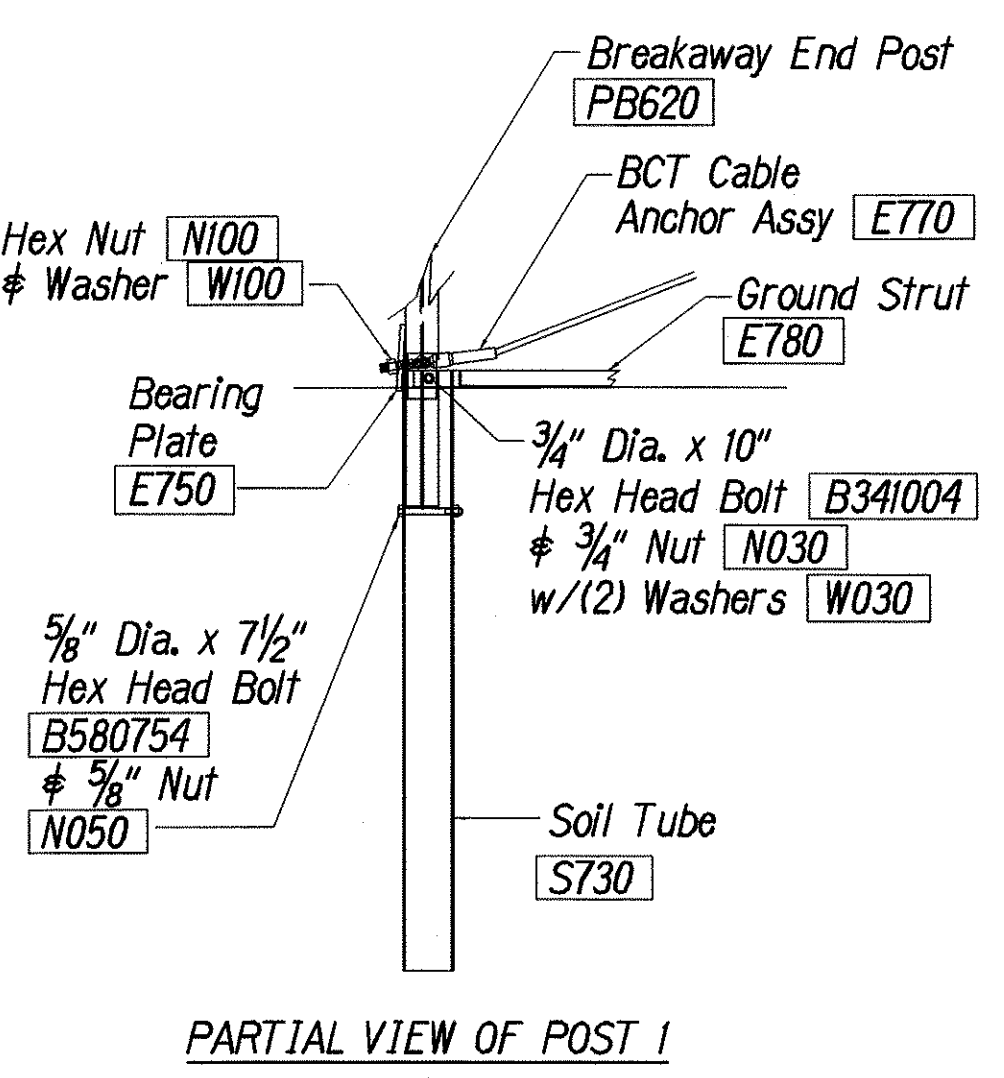
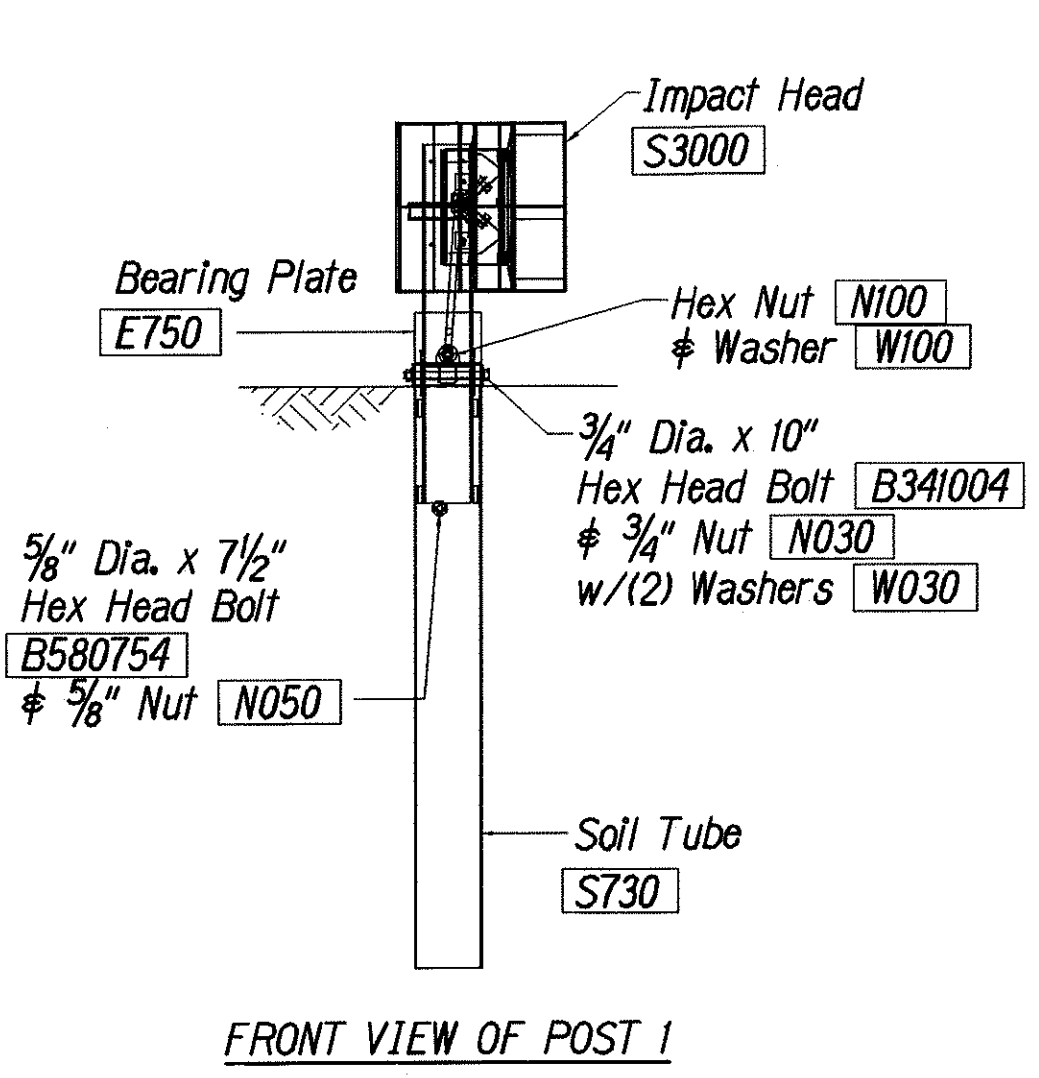
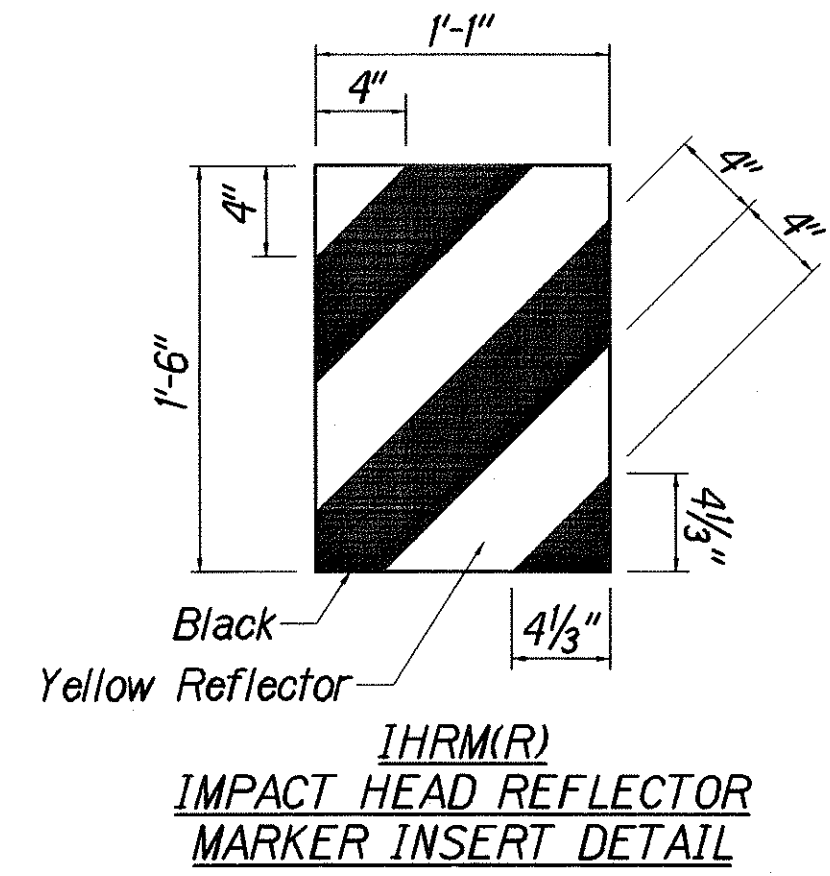
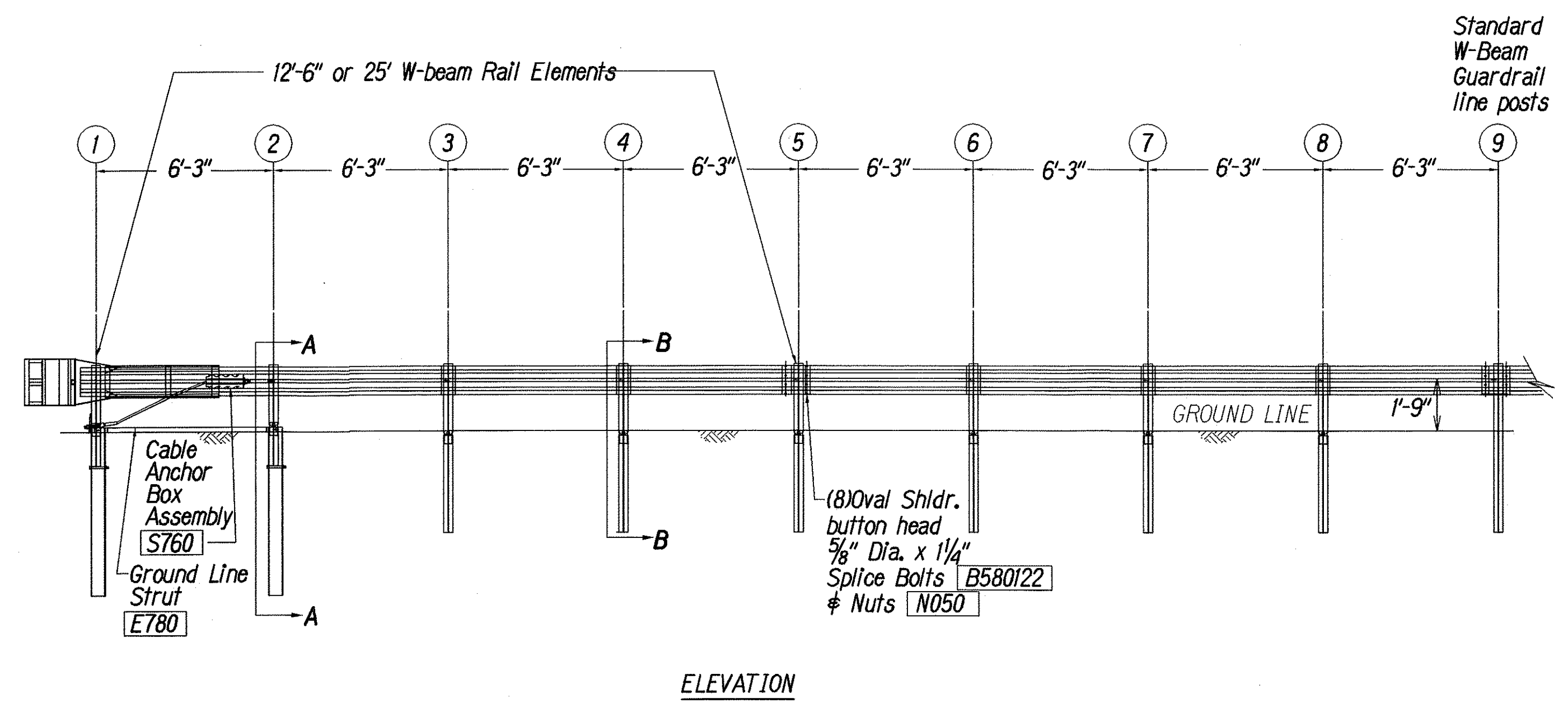
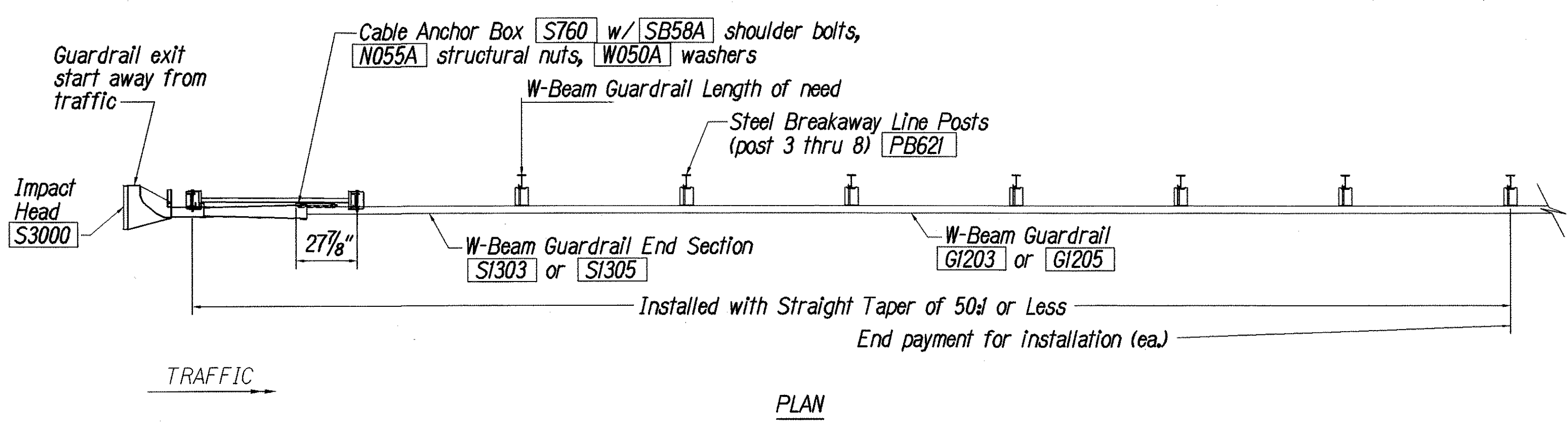
STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
FLEAT-350
FLARED ENERGY ABSORBING TERMINAL
HAWAII BELT ROAD
GUARDRAIL & SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
 Scale: As Shown Date: April, 2002
 SHEET No. 1 OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	35	37

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

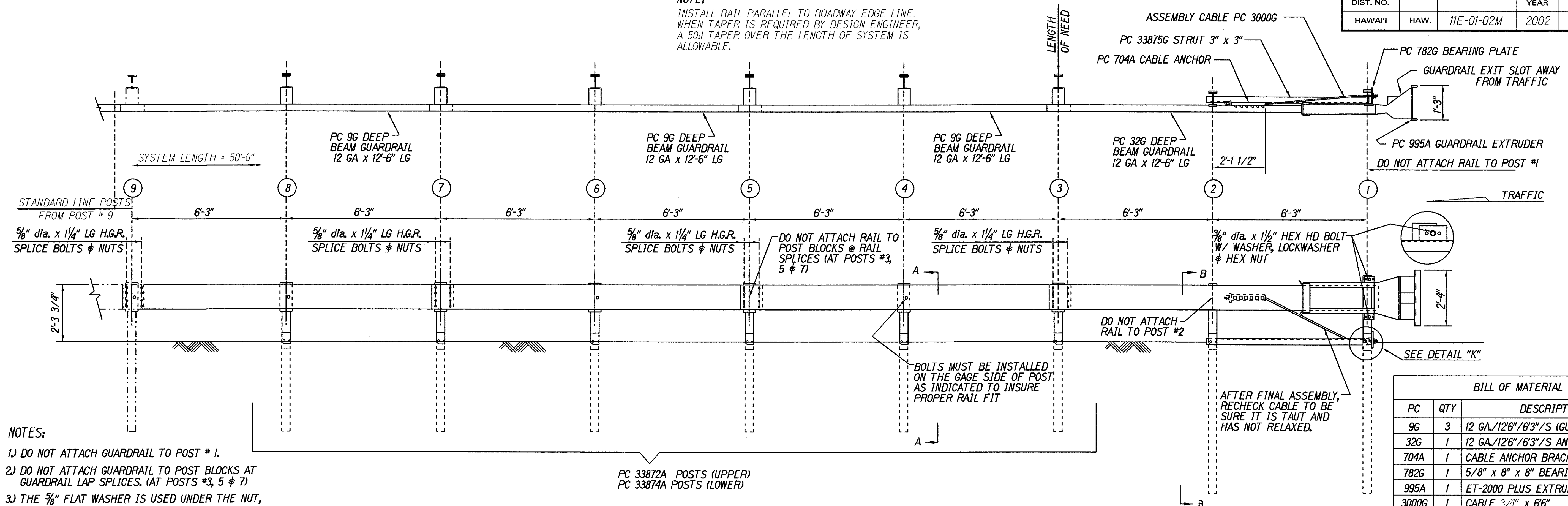
- GENERAL NOTES:**
- Breakaway steel posts are required with the Sequential Kinking Terminal.
 - All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
 - When the Sequential Kinking Terminal is selected as the end treatment for W-Beam Guardrail installation, the W-Beam 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.
 - 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.
 - 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.
 - 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.
 - 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.
 - (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.



STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
SKT-350
SEQUENTIAL KINKING TERMINAL
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M
 Scale: As Shown Date: April, 2002
 SHEET No. 1 OF 1 SHEETS

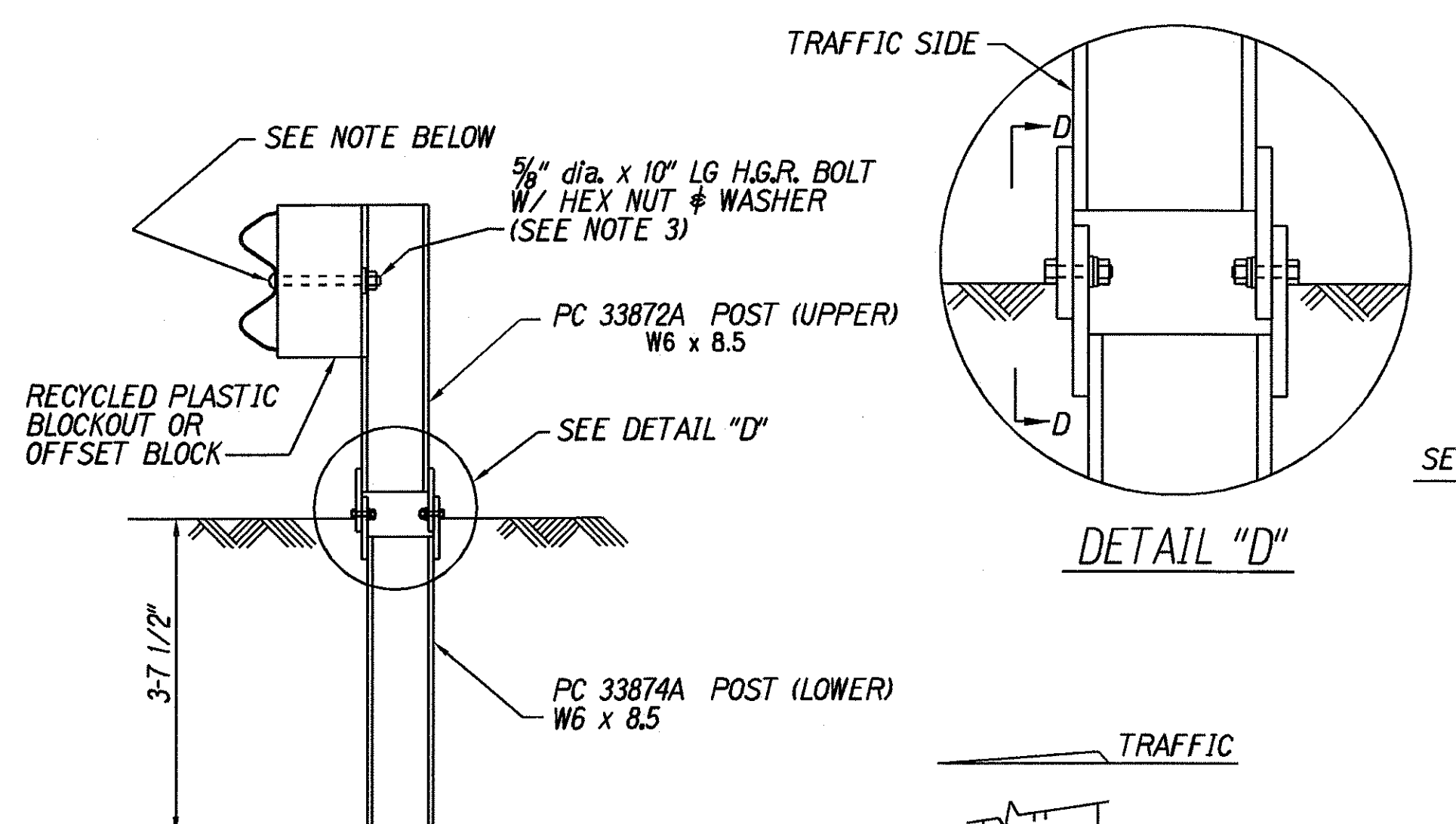
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	36	37

NOTE:
INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE.
WHEN TAPER IS REQUIRED BY DESIGN ENGINEER,
A 50:1 TAPER OVER THE LENGTH OF SYSTEM IS
ALLOWABLE.



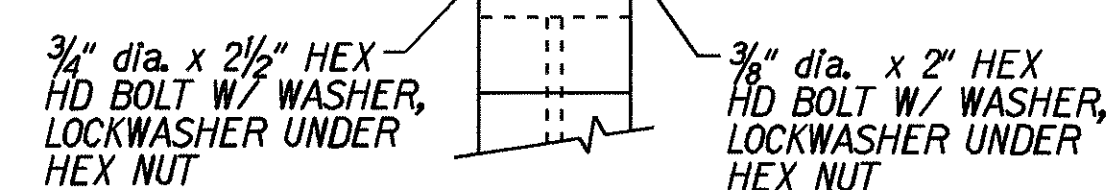
- NOTES:**
- 1.) DO NOT ATTACH GUARDRAIL TO POST # 1.
 - 2.) DO NOT ATTACH GUARDRAIL TO POST BLOCKS AT GUARDRAIL LAP SPLICES, (AT POSTS #3, 5 & 7)
 - 3.) THE 5/8" FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
 - 4.) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION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

BILL OF MATERIAL		
PC	QTY	DESCRIPTION
9G	3	12 GA./126"/63"/S (GUARDRAIL)
32G	1	12 GA./126"/63"/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

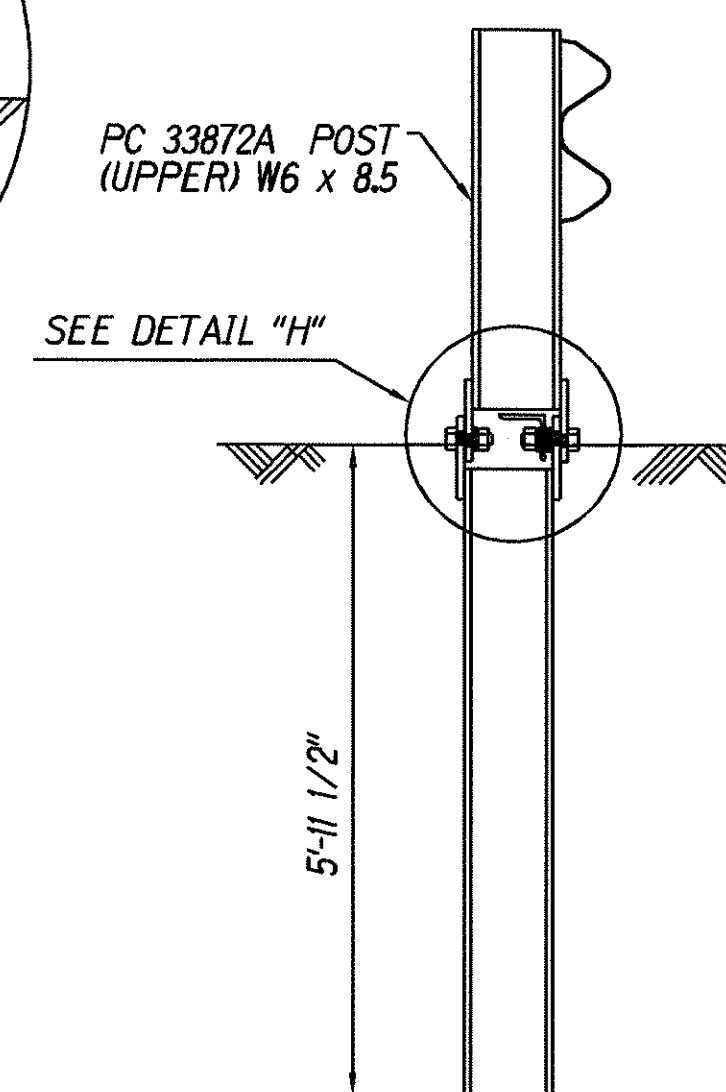


NOTE:
SECTION "A-A" IS SIMILAR @ POST #3, 5 & 7.
EXCEPT RAIL IS NOT ATTACHED.

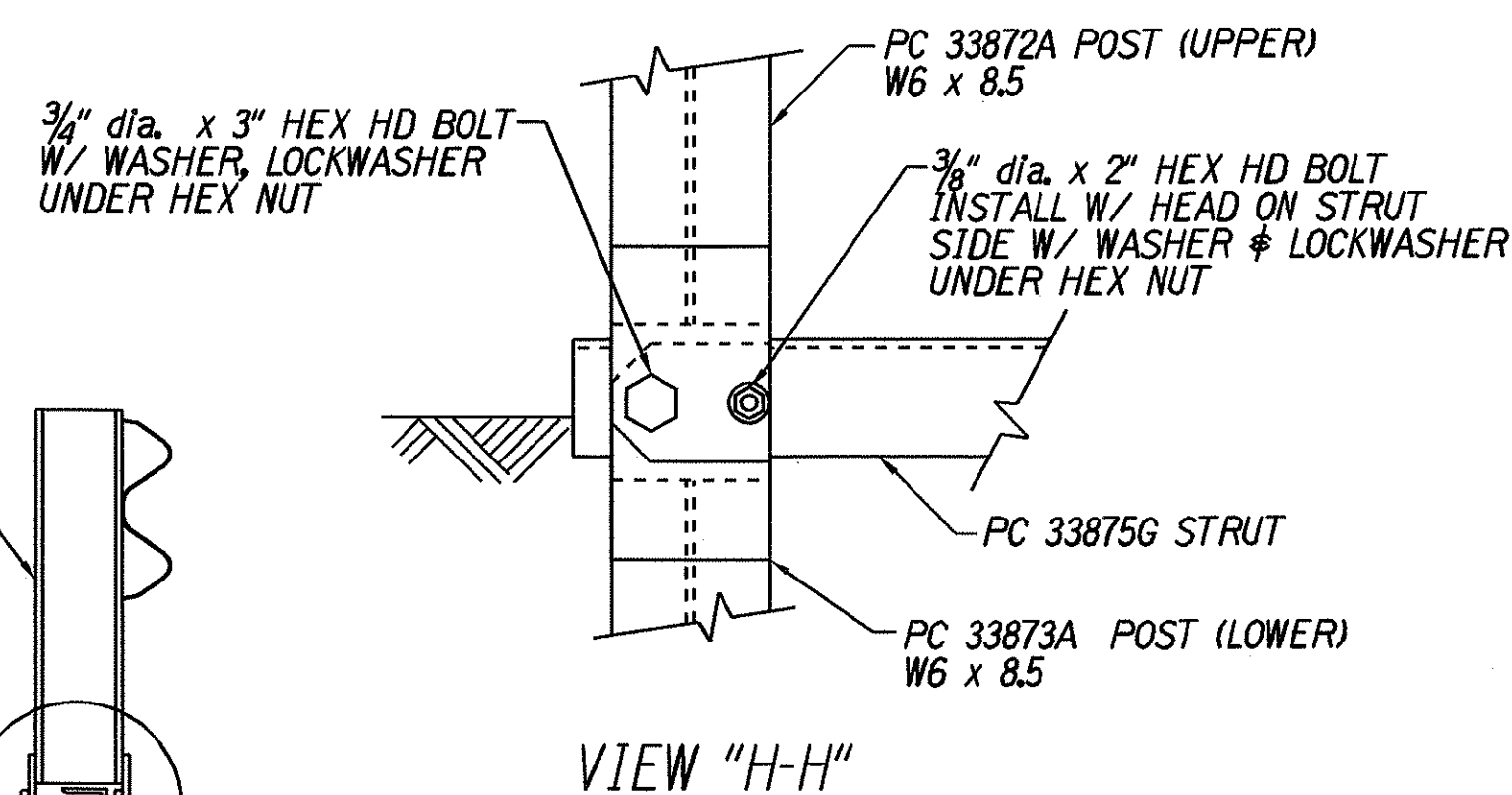
SECTION "A-A"
(TYP @ POSTS #4, 6 & 8)



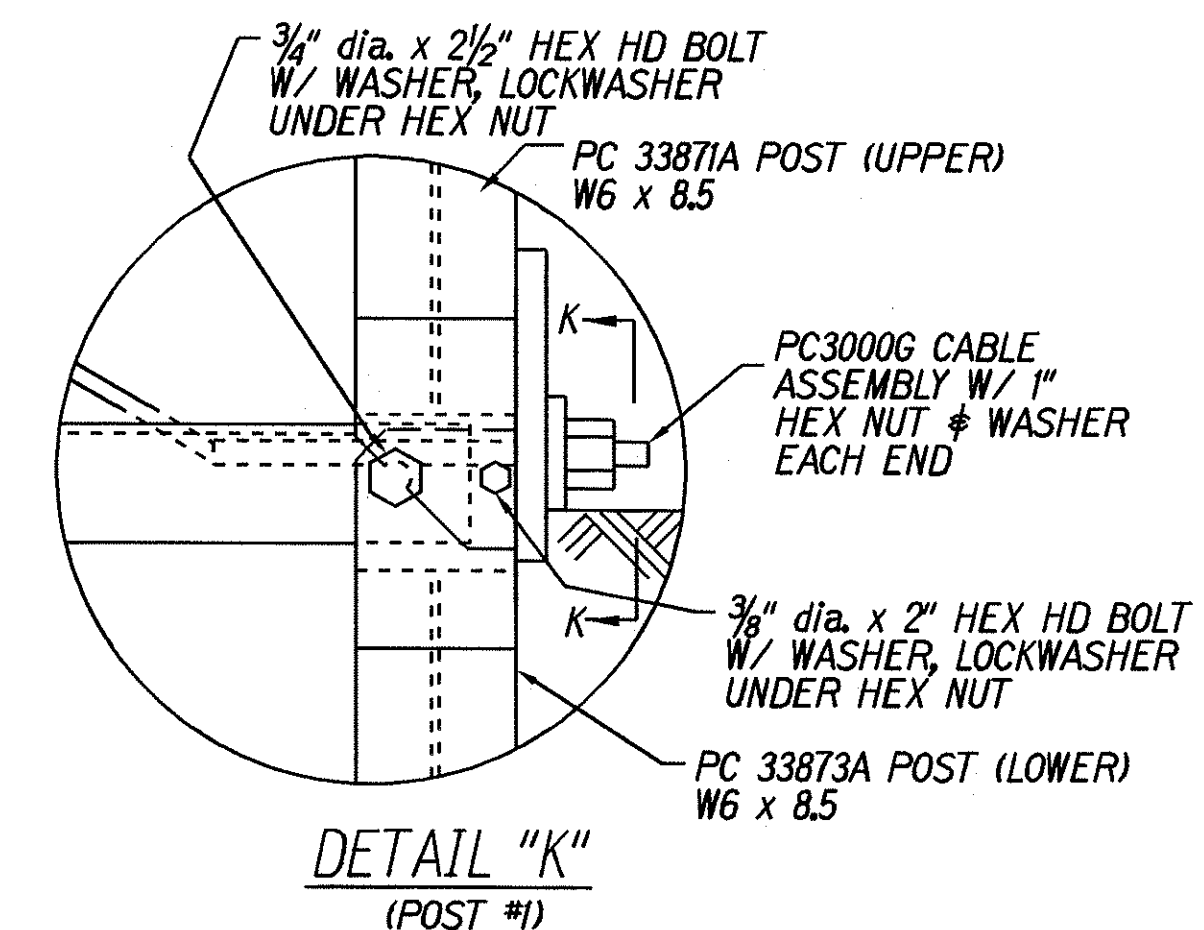
VIEW "D-D"



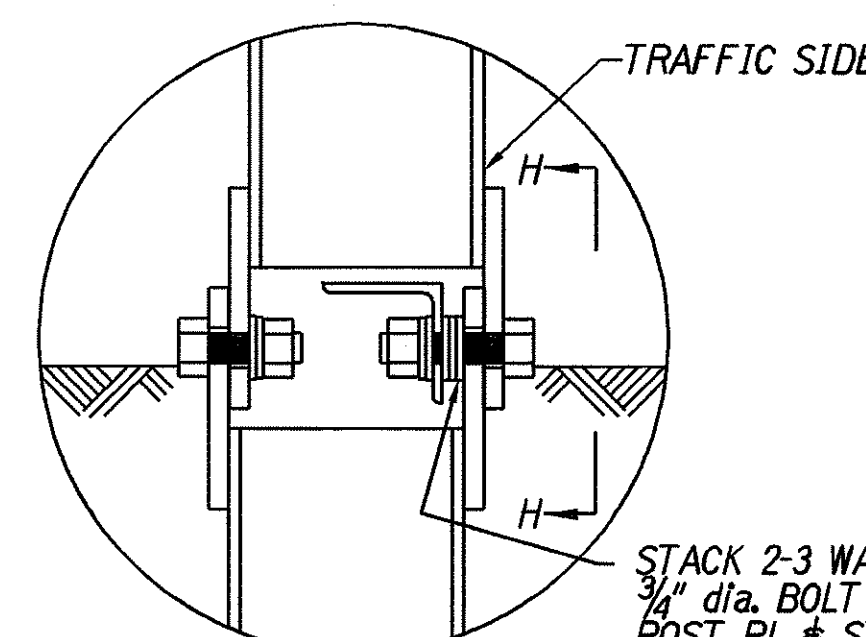
SECTION "B-B"
(POST #2)



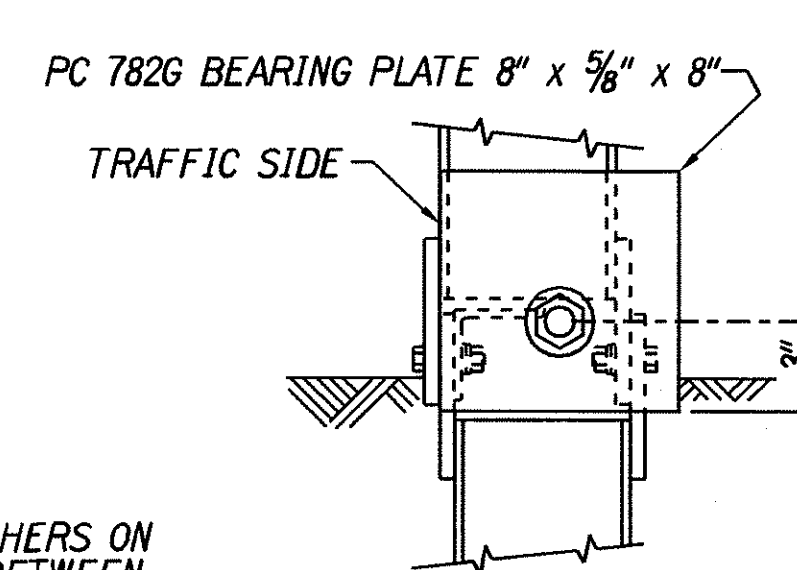
VIEW "H-H"



DETAIL "K"
(POST #1)



DETAIL "H"
(POST #2)



VIEW "K-K"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
ET-2000 PLUS
HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M

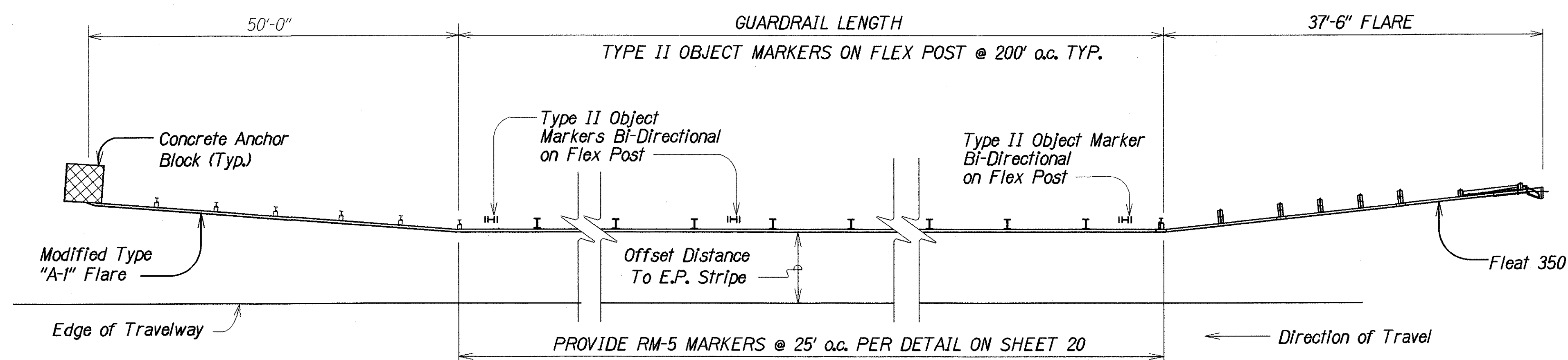
Scale: Noted Date: April, 2002

SHEET No. 1 OF 1 SHEETS

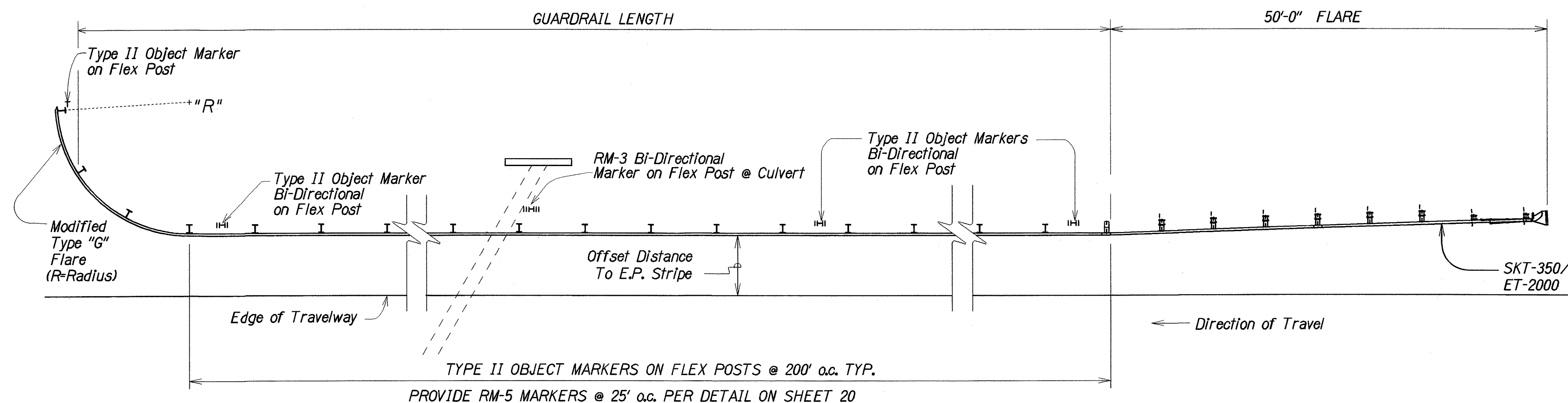
FED. ROAD DIST.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11E-01-02M	2002	37	37

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

DESIGNED BY	DATE
TRACED BY	
NOTED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NO. 2001	
N. 2001	

13/13/02 ne3/002/Hawaii District Project Plans/Guardrail Details/11E-01-02M.dwg

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**GUARDRAIL REFLECTOR
MARKER DETAIL**

HAWAII BELT ROAD
GUARDRAIL AND SHOULDER IMPROVEMENTS
VICINITY OF KAHUKU
PROJECT NO. 11E-01-02M

Scale: As Noted Date: April, 2002

SHEET No. 1 OF 1 SHEETS