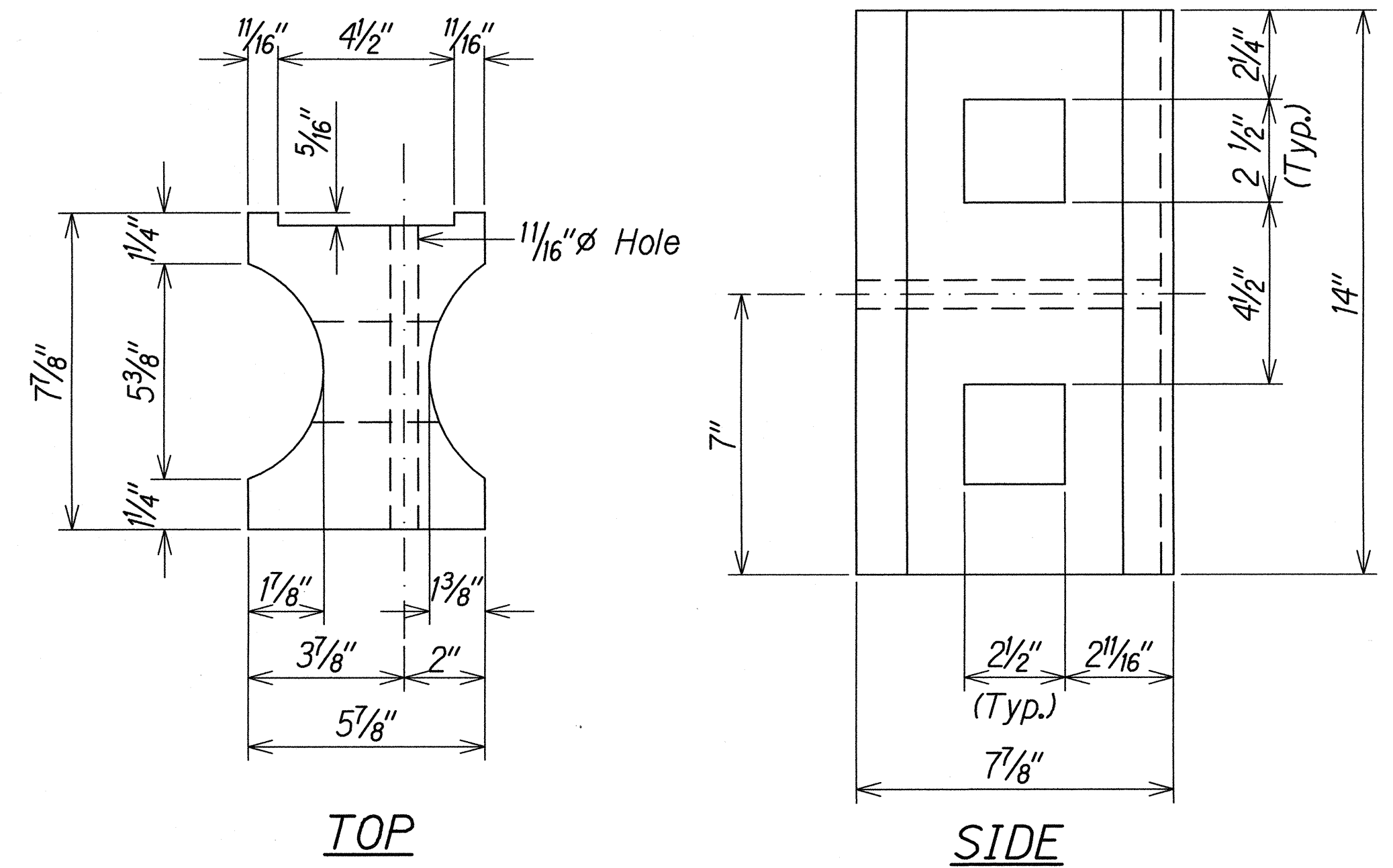
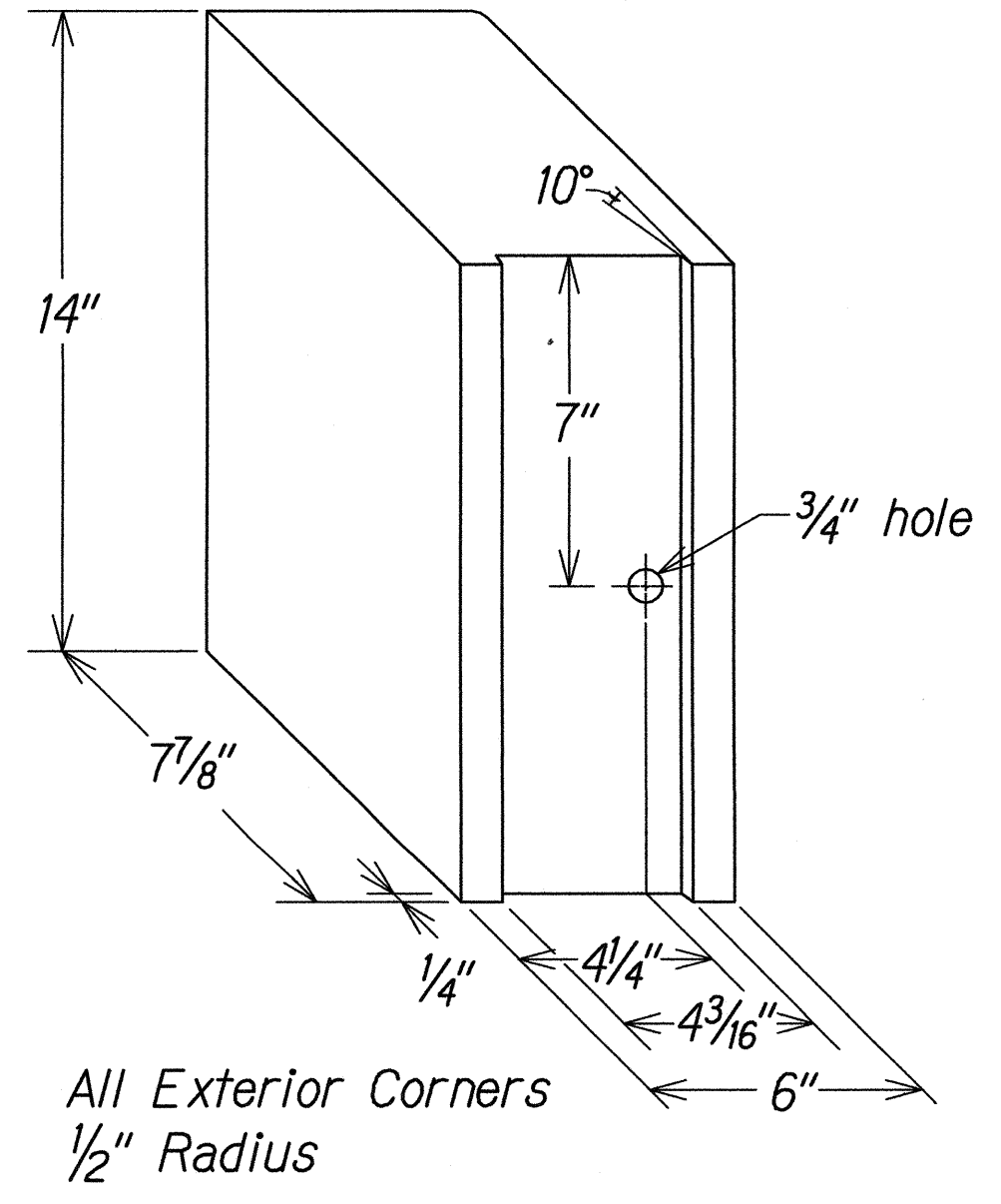


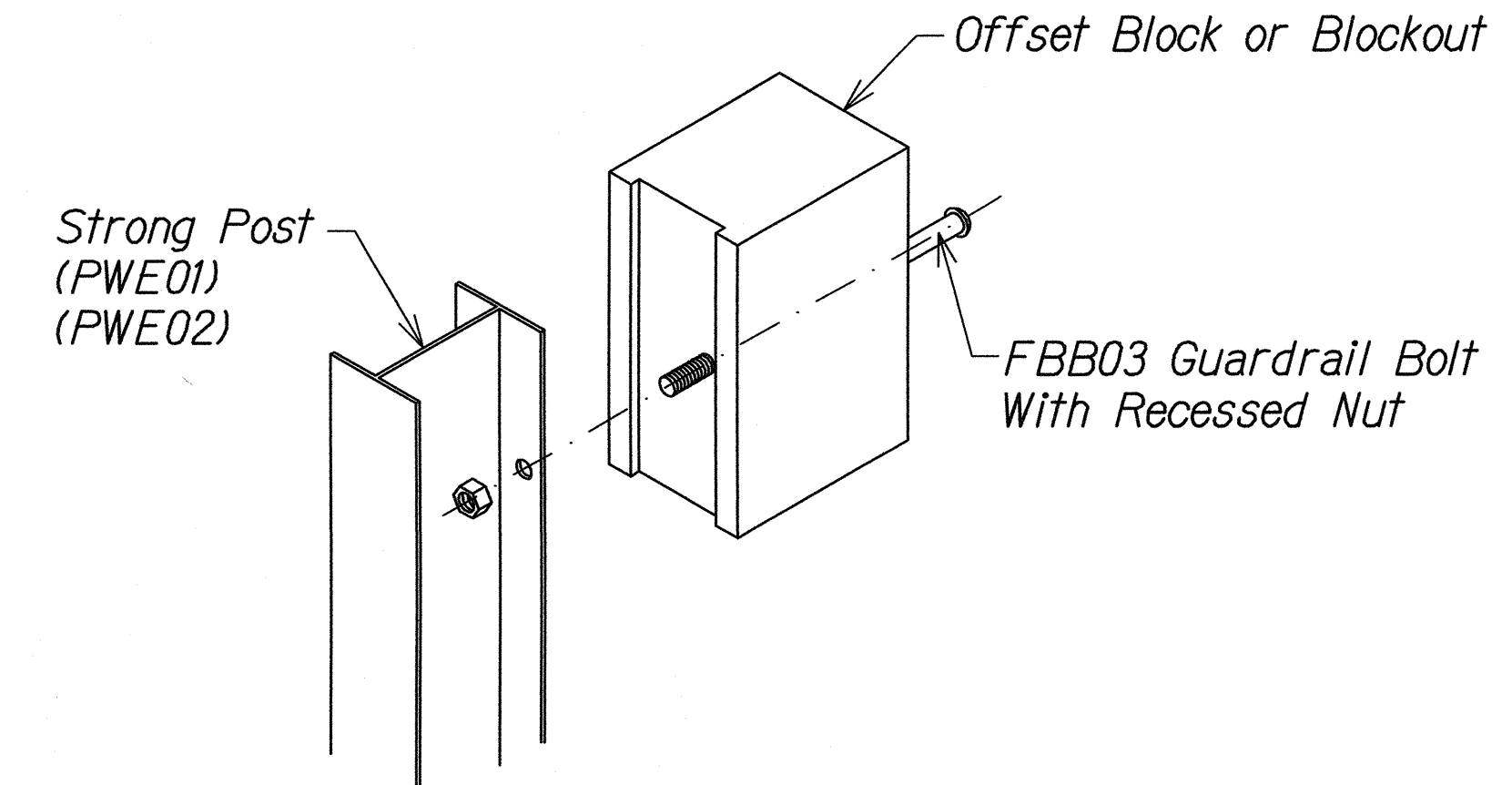
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HAWAII	HAW.	IM-HI-1(242)	2016	94	354



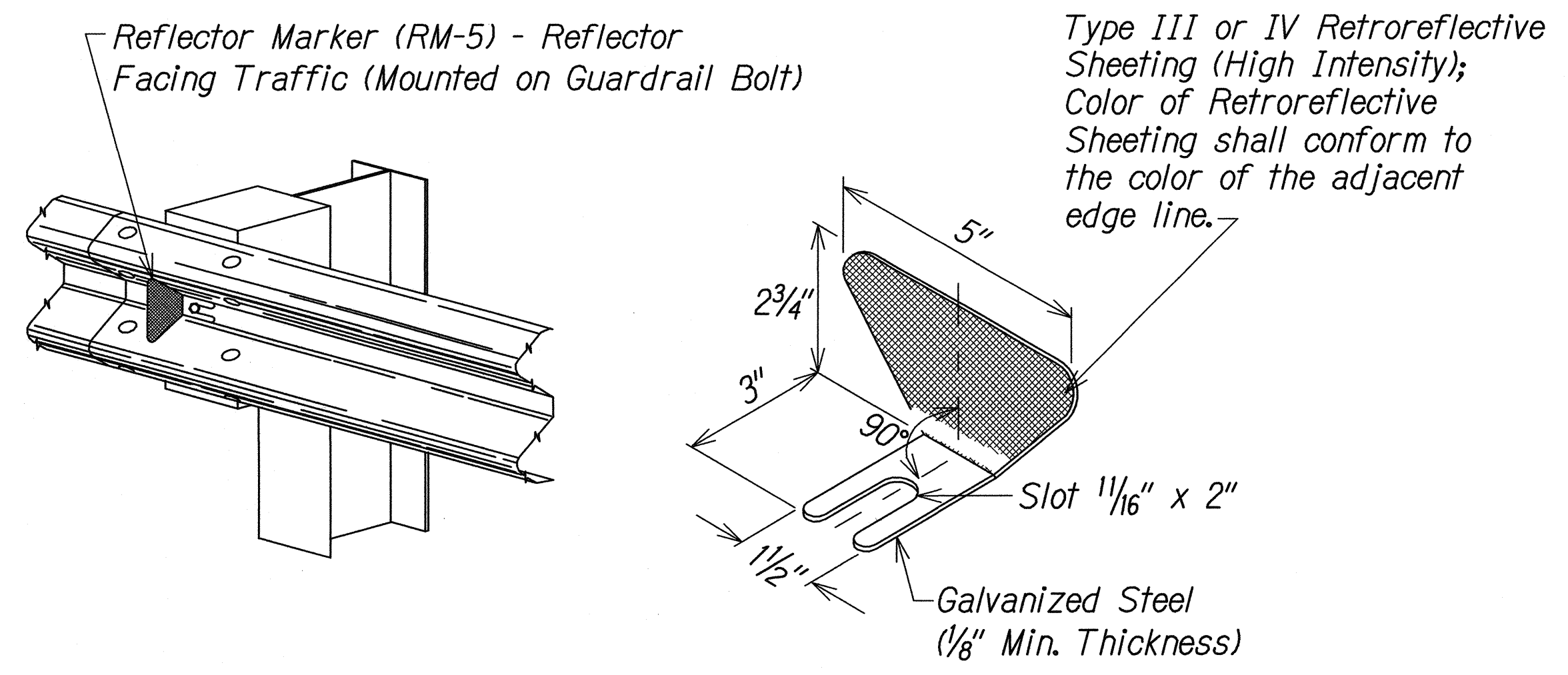
TOP  
RECYCLED PLASTIC BLOCKOUT (TYPE I)



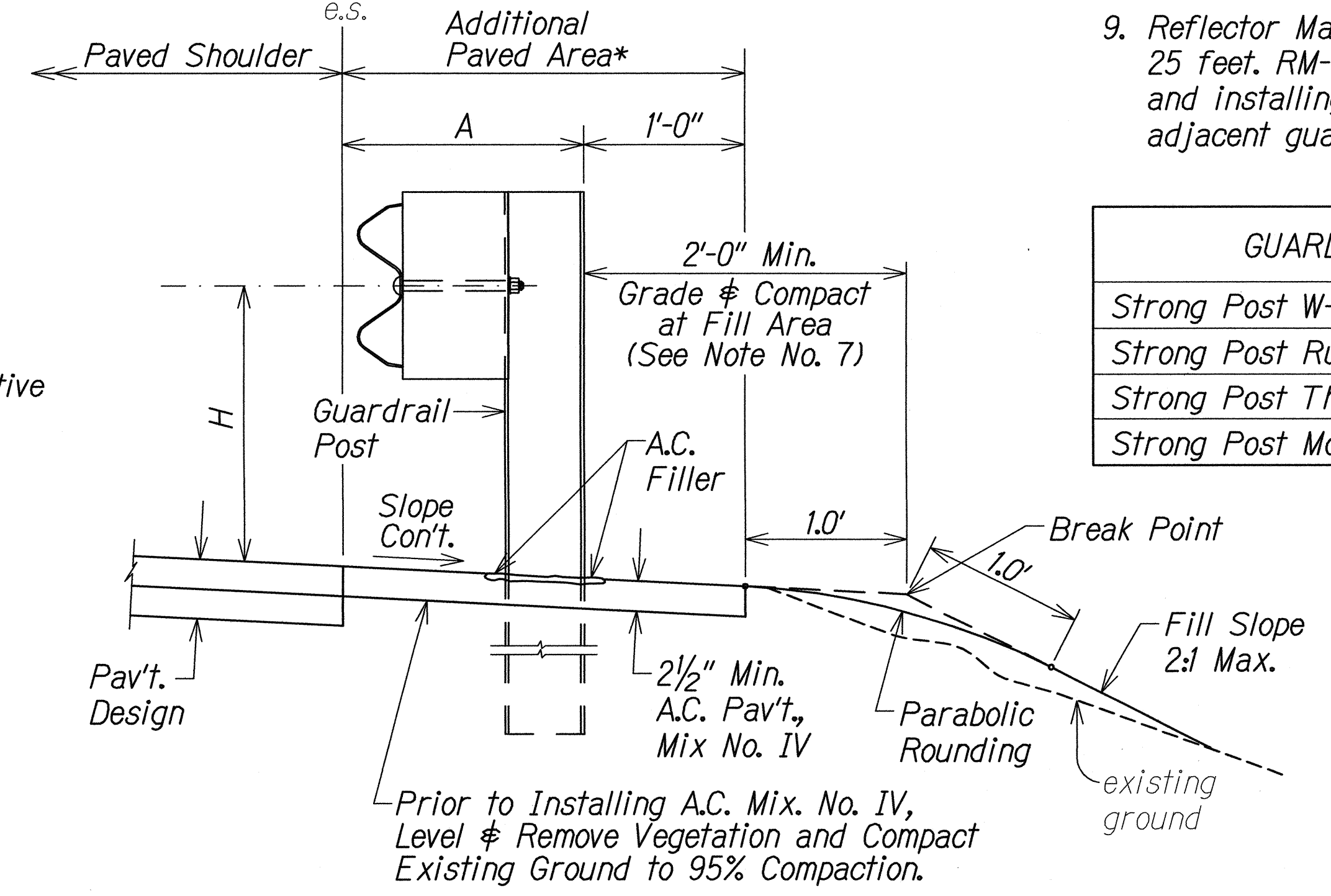
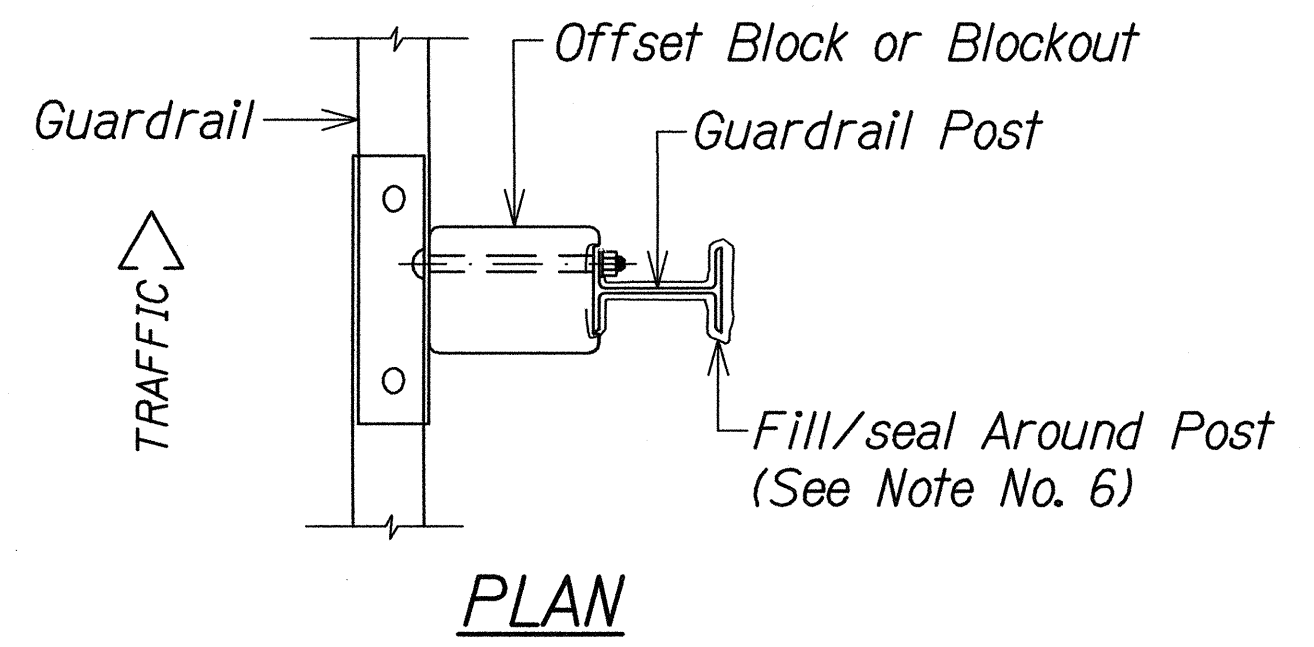
RECYCLED POLYETHYLENE  
OFFSET BLOCK (TYPE II)



Exploded View  
(Rail and Washer Not Shown)  
STEEL POST AND BLOCK DETAIL



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

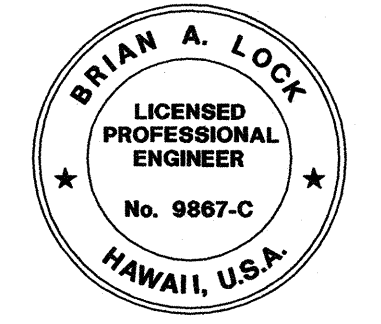


TYPICAL GUARDRAIL INSTALLATION

GENERAL NOTES:

1. All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
2. Where conditions require, special post lengths in increments of 6 inches may be specified.
3. All fasteners, posts, and rail elements (i.e. FBB03, PWE01, RWM02b, etc.) shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware", a report prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, Subcommittee On New Highway Materials, Task Force 13 Report. Dimensions of fastners, posts and rail elements have been converted from metric units into their present form.
4. The Recycled Plastic Block or Offset Block shall be approved by the State.
5. All new guardrail systems (system consists of total length of guardrail including both end treatments) shall include the Additional Paved Area.
6. After the guardrail posts are installed in the paved area, the Contractor shall fill/seal around each guardrail post and all cracks in the paved area caused during the guardrail post installation. If required by the inspector/engineer, the Contractor shall tamper the paved area around the guardrail post prior to filling/sealing. All costs associated with this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
7. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
8. New A.C. pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
9. Reflector Markers (RM-5) mounted on guardrails shall be spaced every 25 feet. RM-5's shall not be installed on Terminal Sections. Furnishing and installing of each RM-5 shall be considered incidental to the adjacent guardrail system.

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



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 WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES  
  
INTERSTATE ROUTE H-1  
GUARDRAIL AND SHOULDER IMPROVEMENTS  
Middle Street to Punchbowl Off-Ramp  
Fed. Aid Project No. IM-HI-1(242)  
Scale: As Shown Date: Mar. 2016

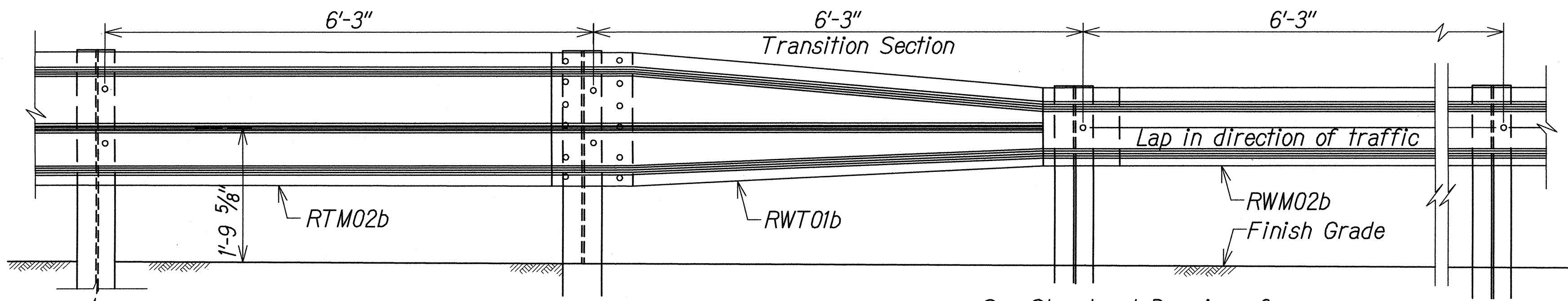
SHEET No. GR-1 OF 11 SHEETS

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

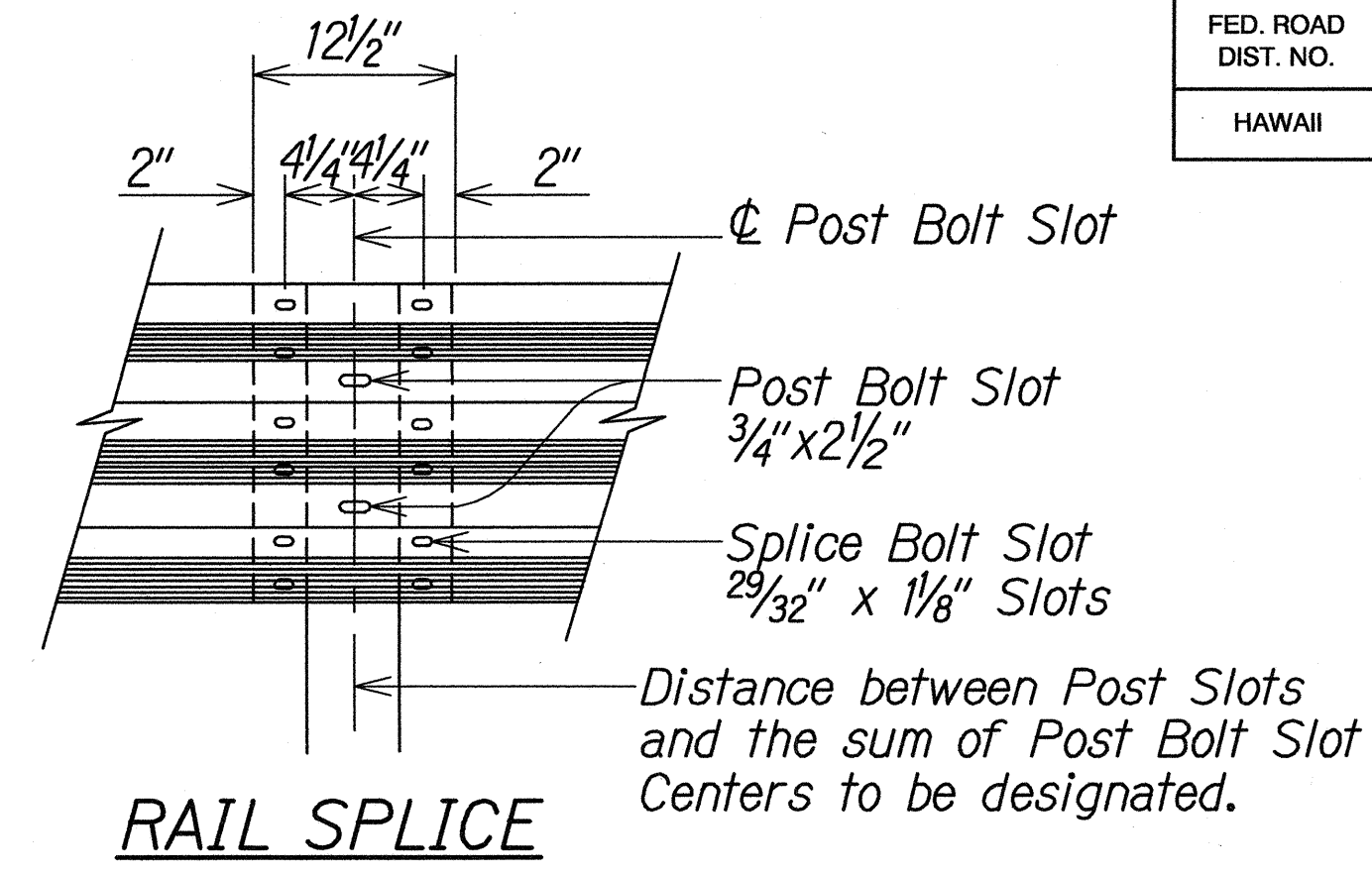




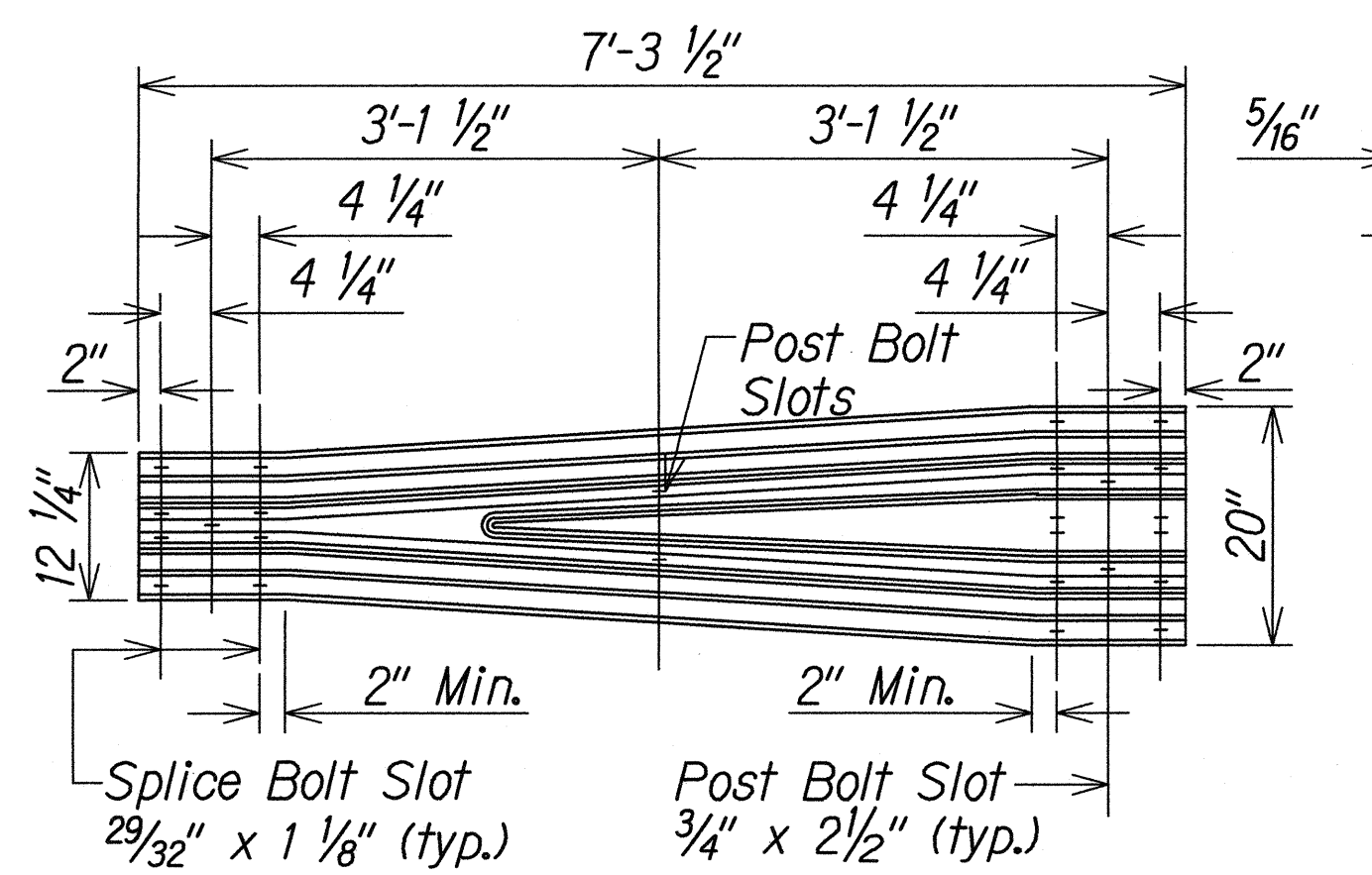
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-HI-1(242)	2016	96	354



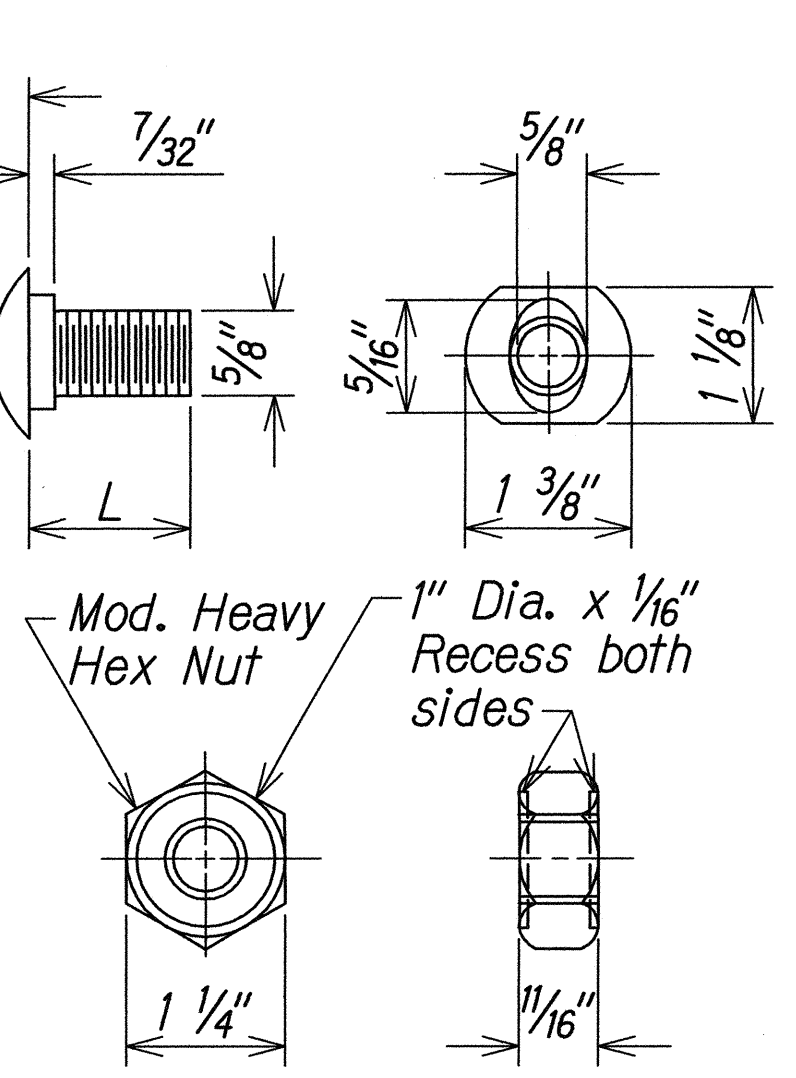
**TRANSITION SECTION \***  
 \* See Structural Drawings for Transition Section Detail.



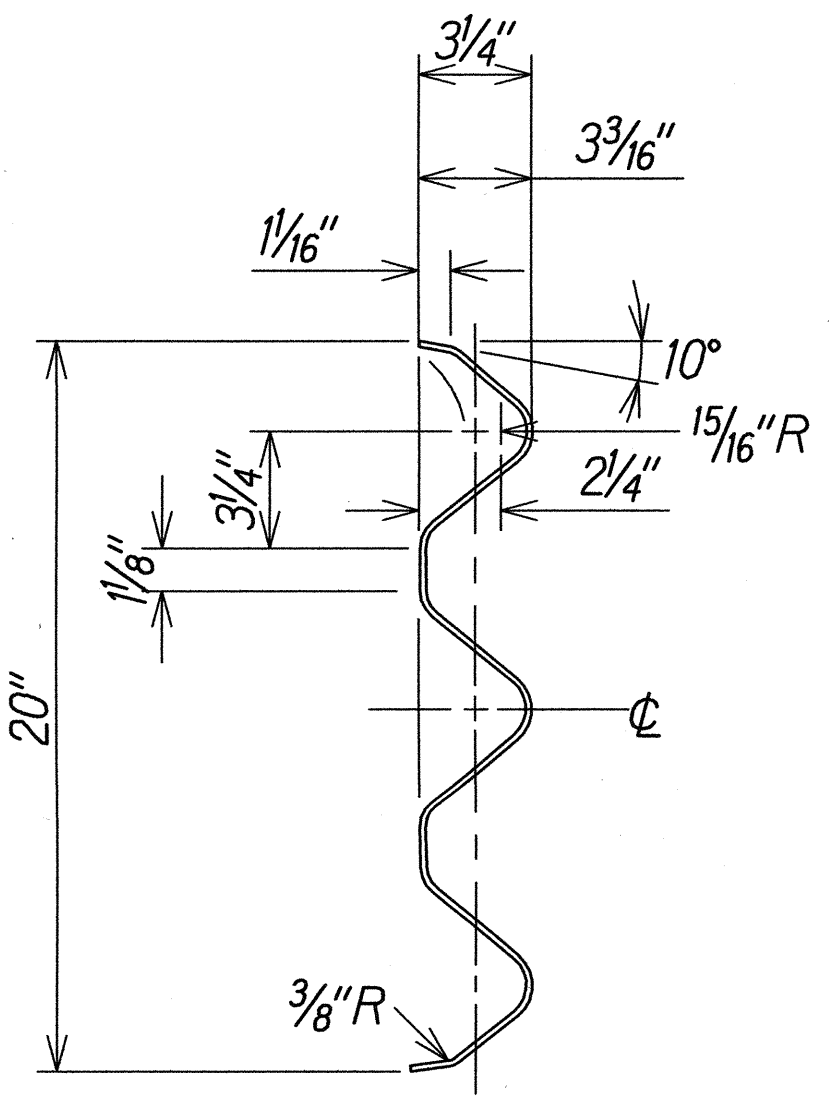
**RAIL SPLICE**



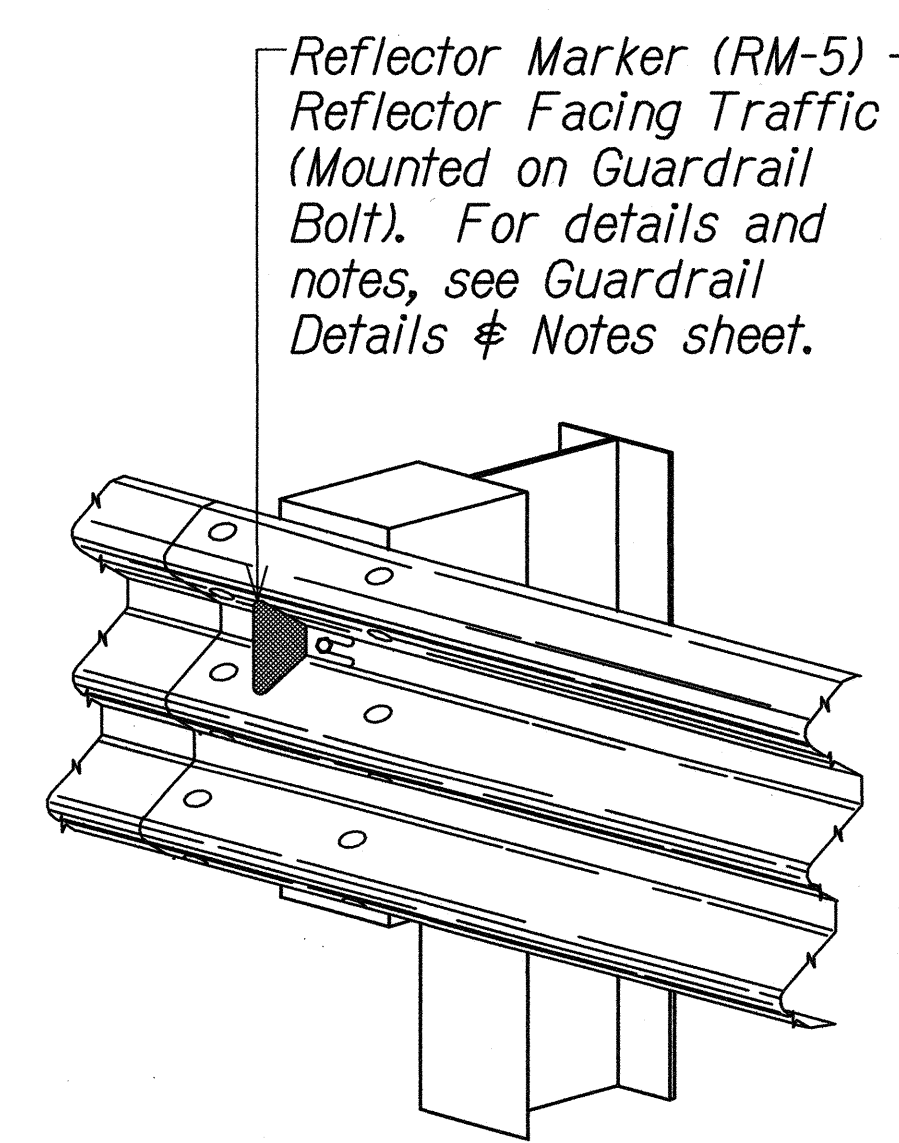
**TRANSITION SECTION (RWT01b)**



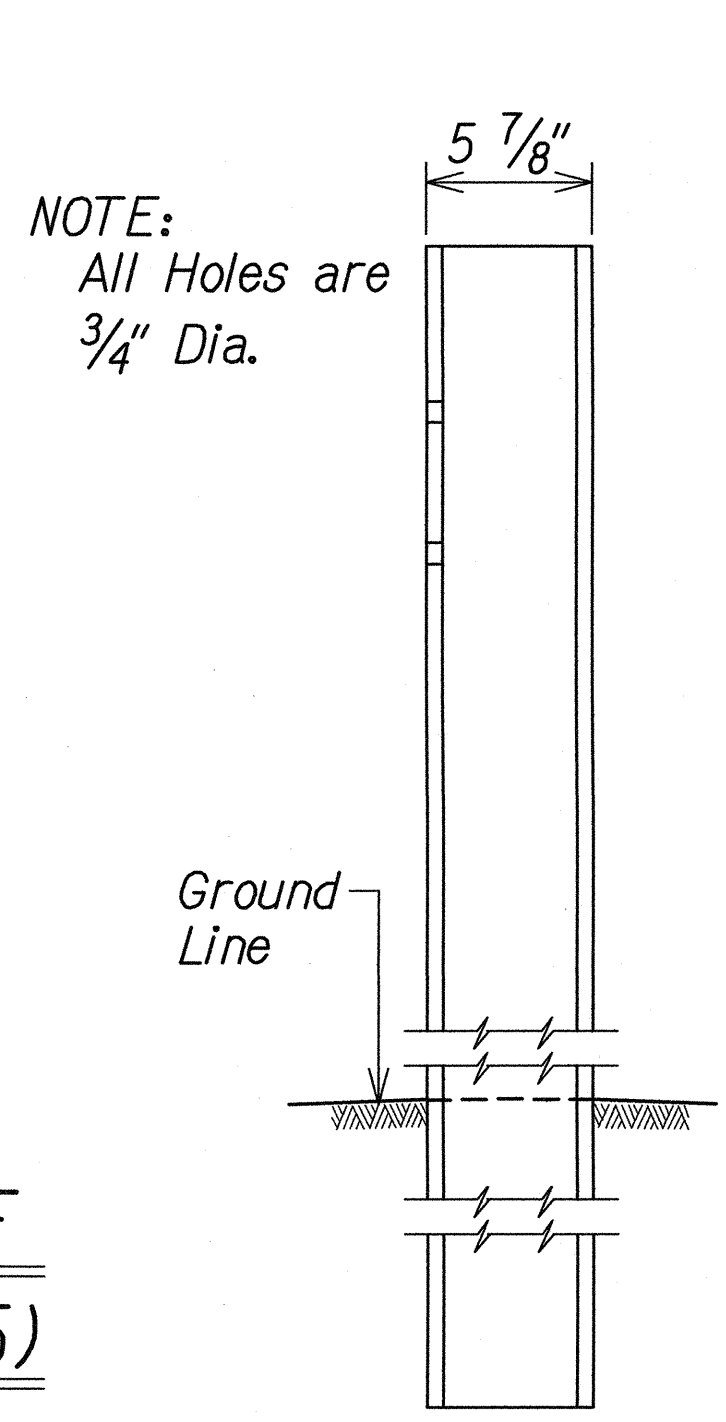
**GUARDRAIL BOLTS AND RECESSED NUT**



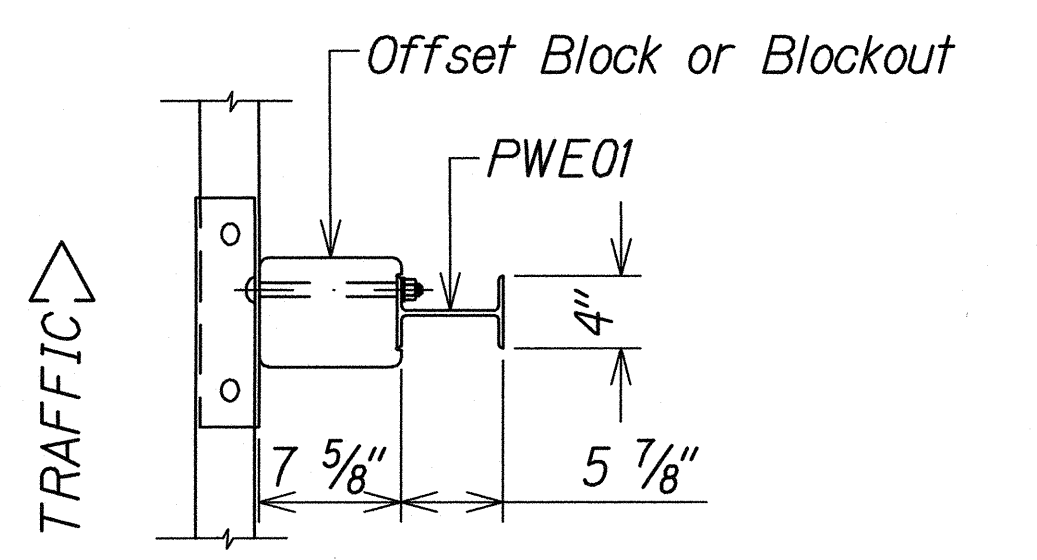
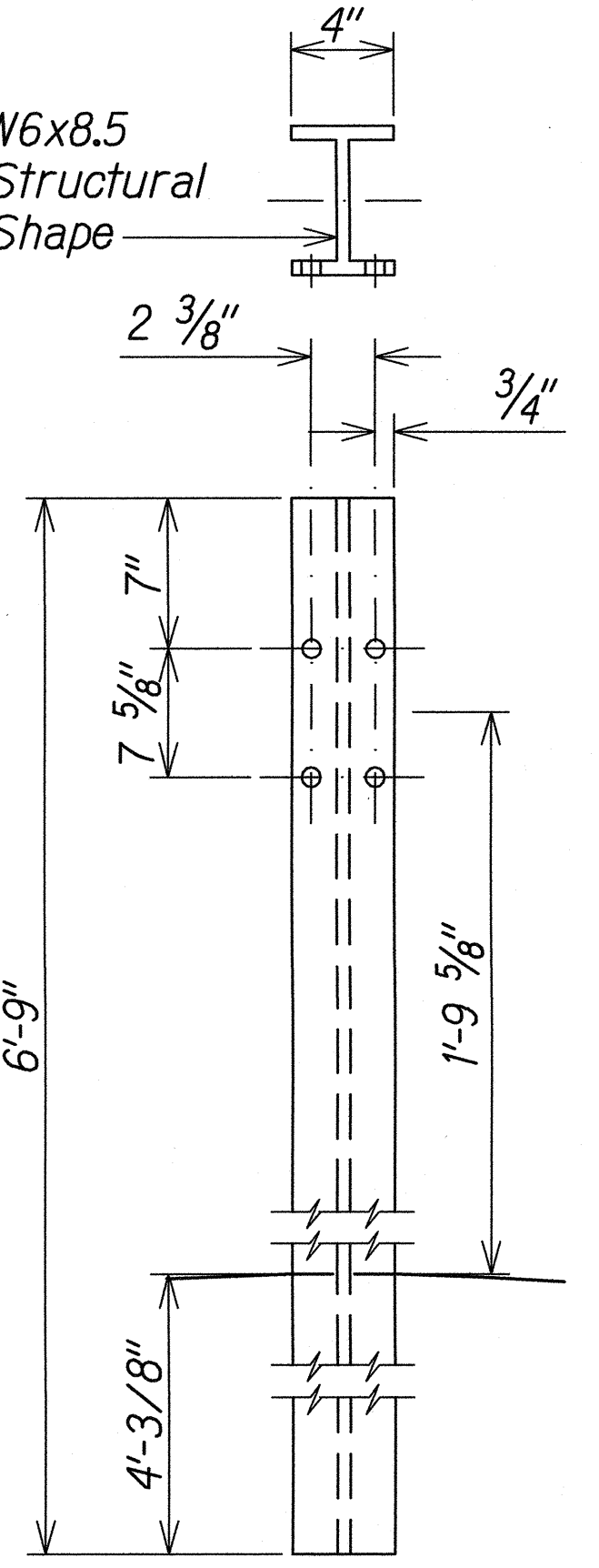
**SECTION THRU RAIL ELEMENT (RTM02b)**



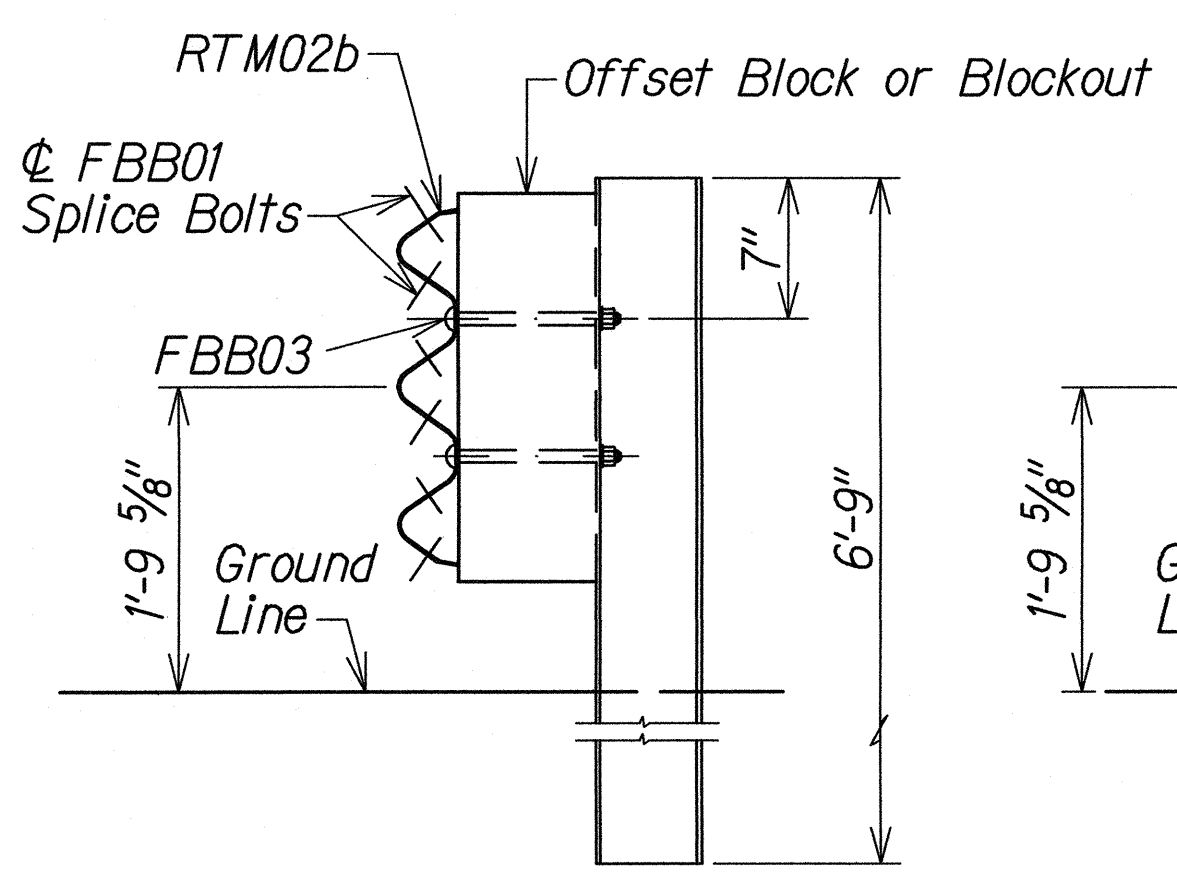
**TYPICAL INSTALLATION OF REFLECTOR MARKER (RM-5)**



**THRIE-BEAM STRONG POST FOR PLASTIC SPACER BLOCKS**

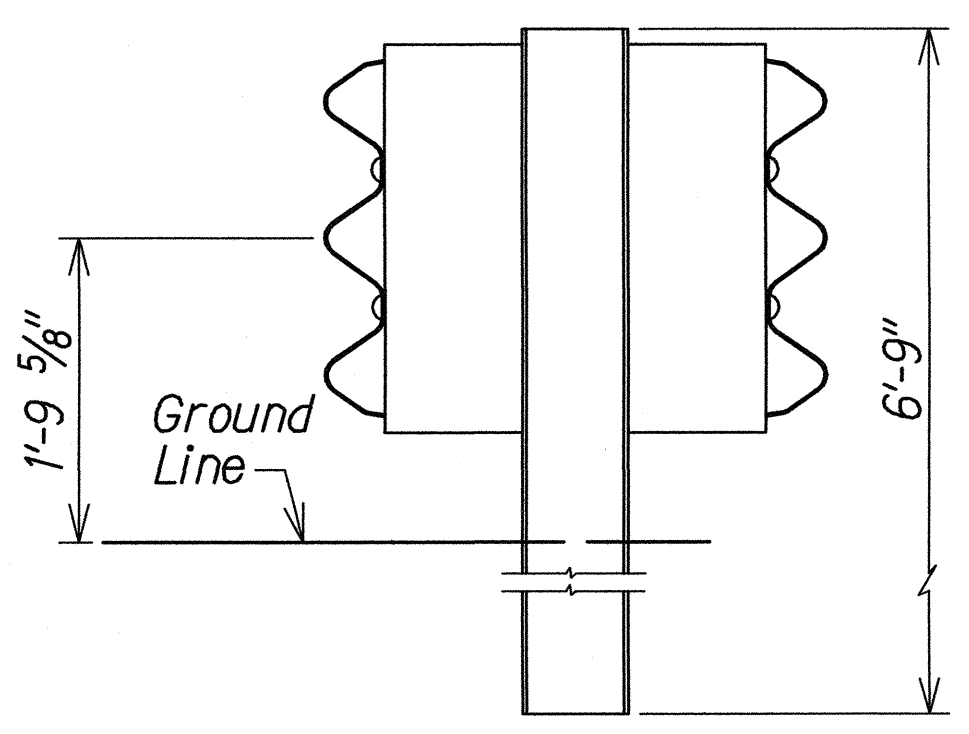


**PLAN**



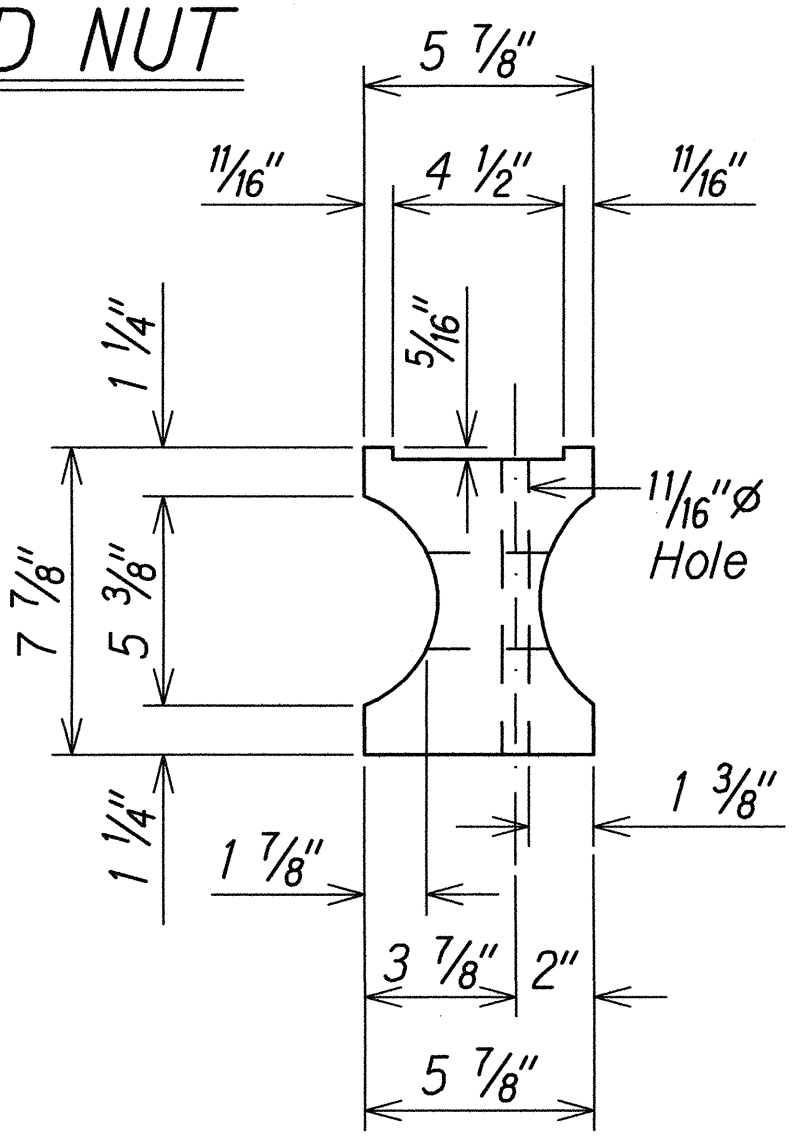
**ELEVATION**

**STRONG POST THRIE-BEAM GUARDRAIL (SGR09a)**

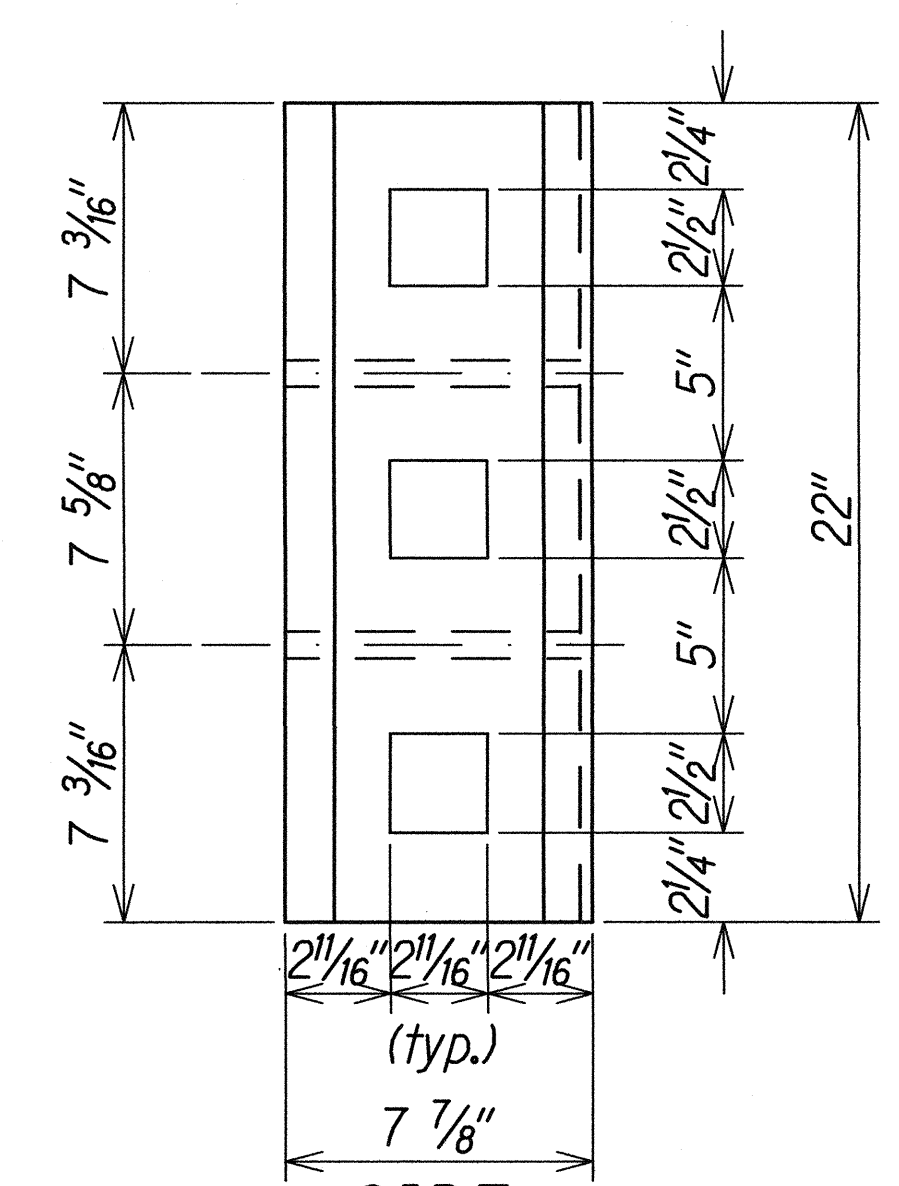


**ELEVATION**

**STRONG POST THRIE-BEAM MEDIAN GUARDRAIL (SGM09a)**

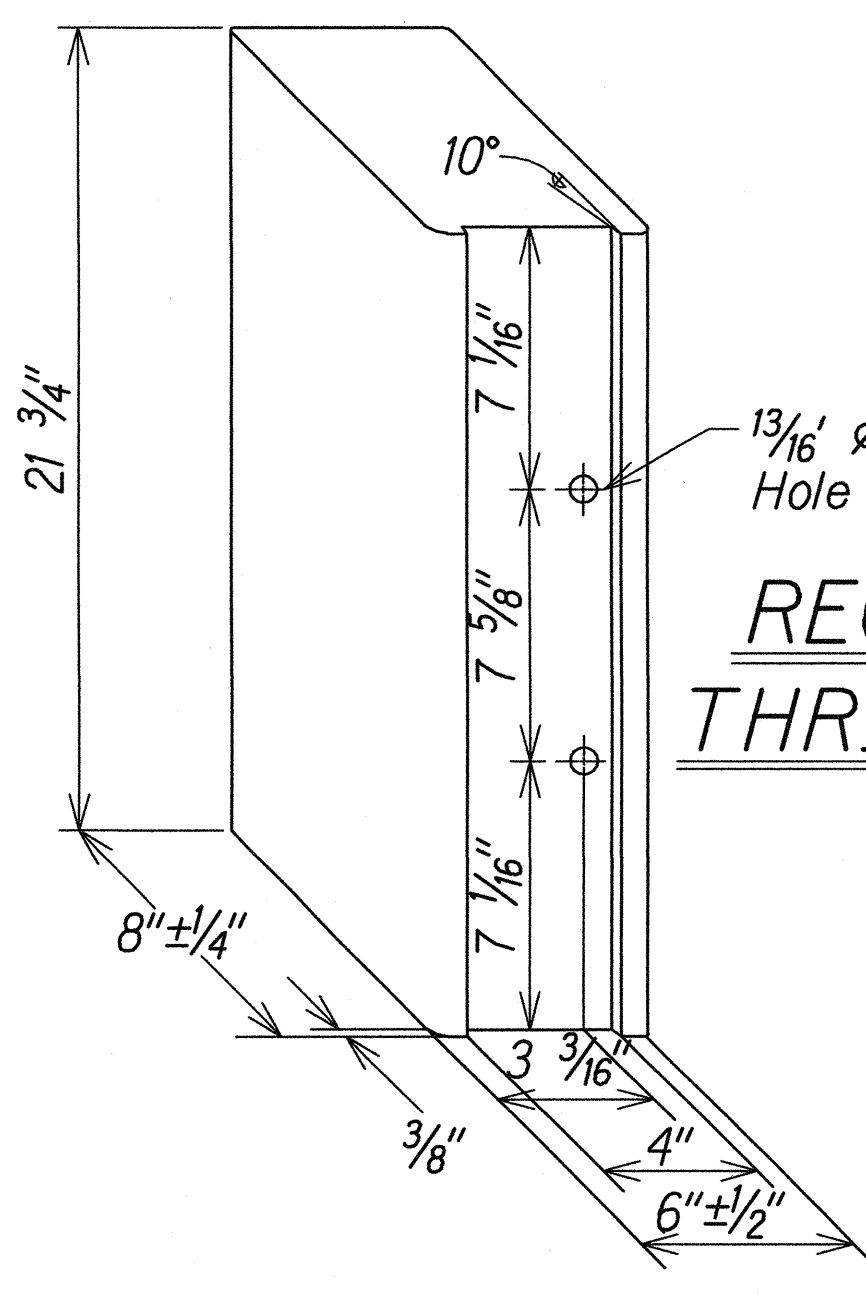


**TOP**

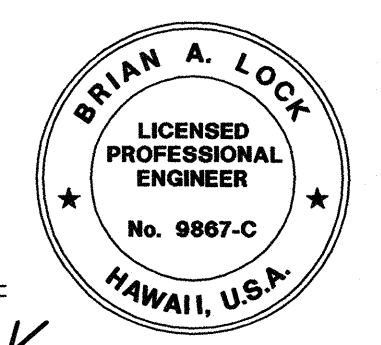


**SIDE**

**MODIFIED 6X8X22 PLASTIC BLOCKOUT (TYPE I-THRIE)**



**RECYCLED POLYETHYLENE THRIE-BEAM OFFSET BLOCK (TYPE II - THRIE)**



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 WILSON OKAMOTO CORPORATION  
 APRIL 30, 2016  
 LIC. EXP. DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**STRONG POST  
THRIE-BEAM GUARDRAIL**  
INTERSTATE ROUTE H-1  
GUARDRAIL AND SHOULDER IMPROVEMENTS  
Middle Street to Punchbowl Off-Ramp  
Fed. Aid Project No. IM-HI-1(242)  
Scale: As Shown Date: Mar. 2016

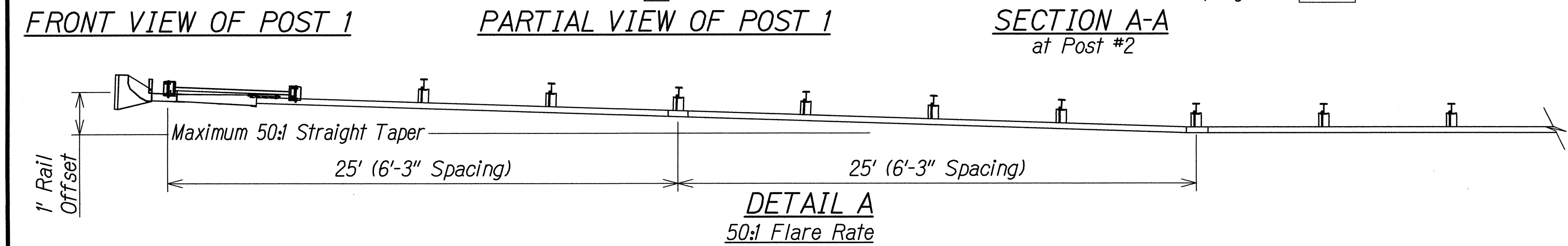
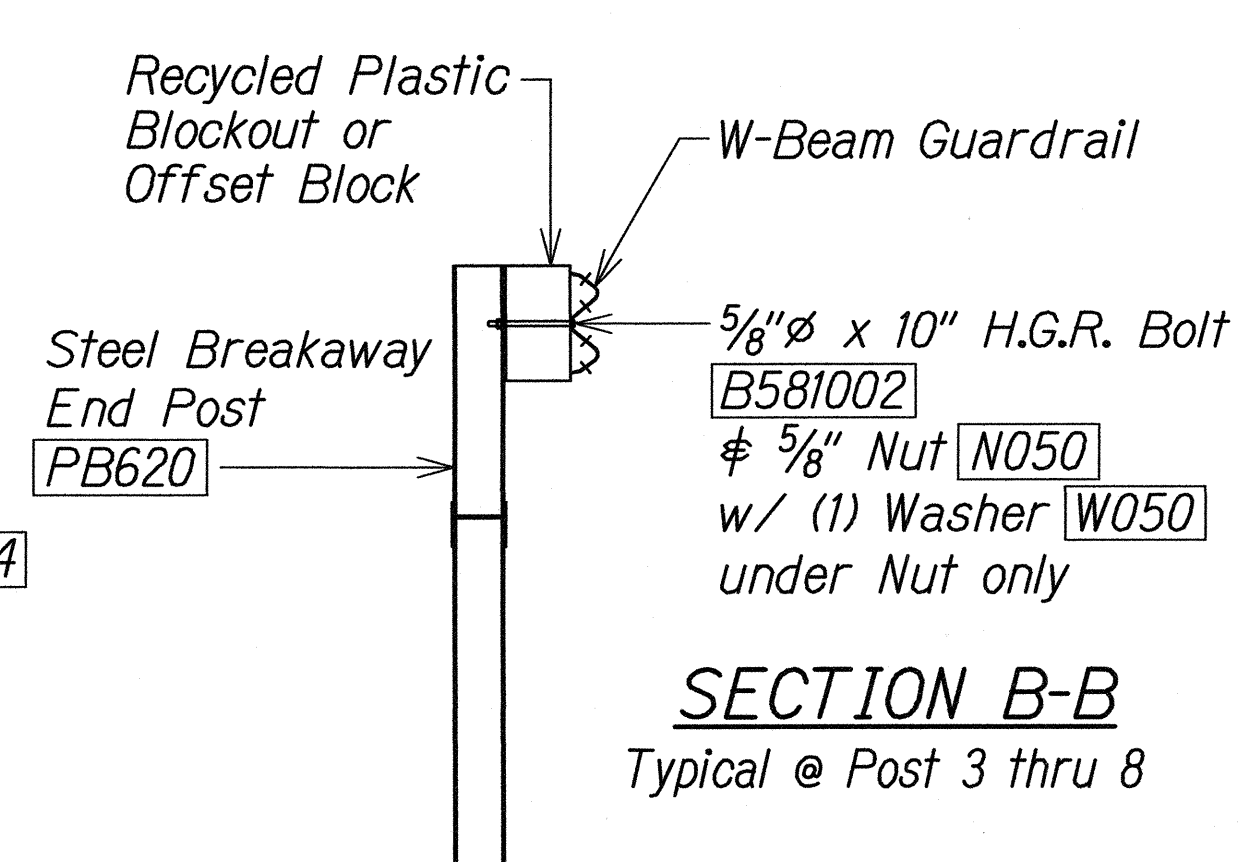
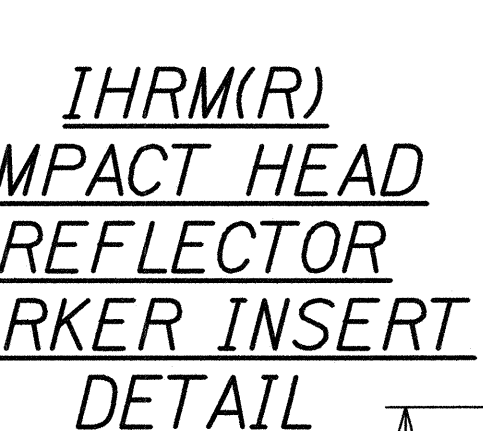
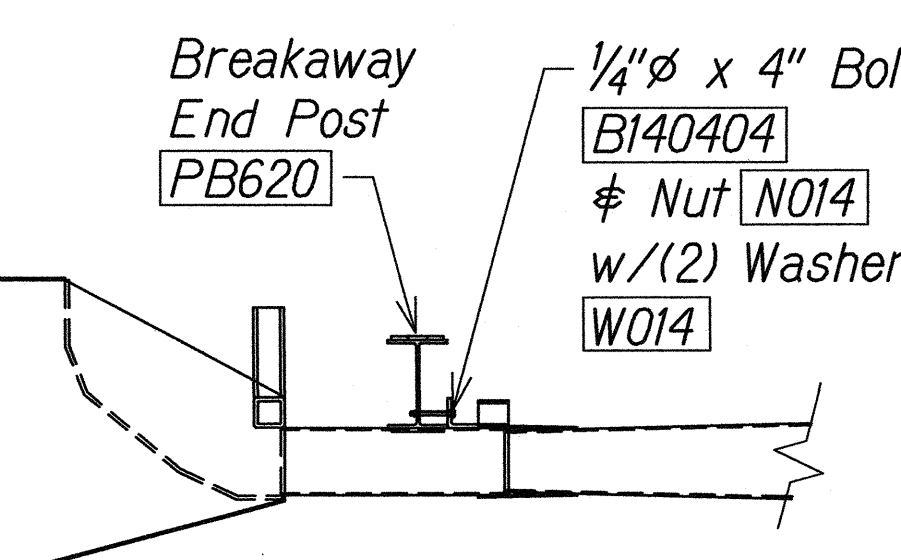
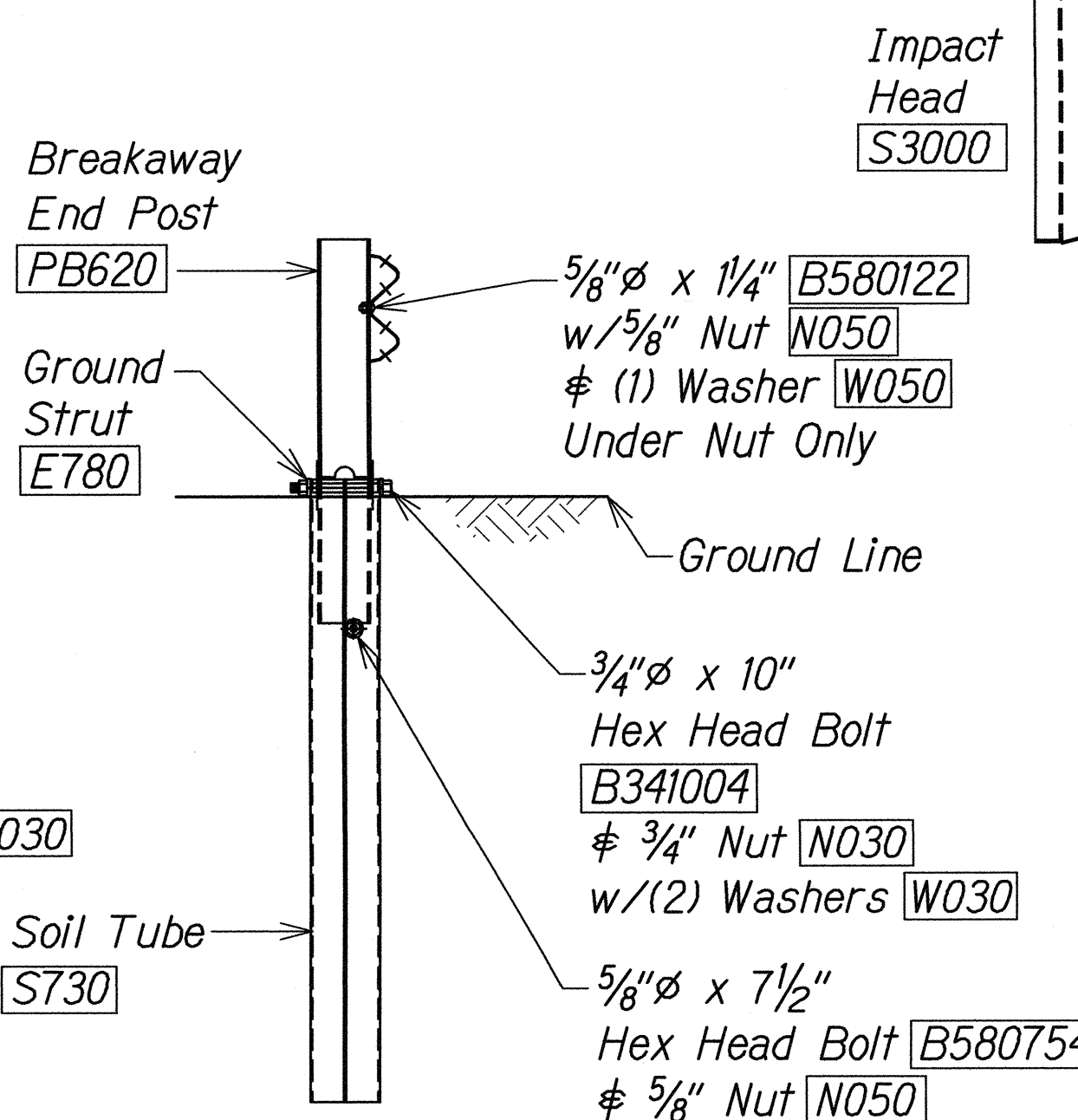
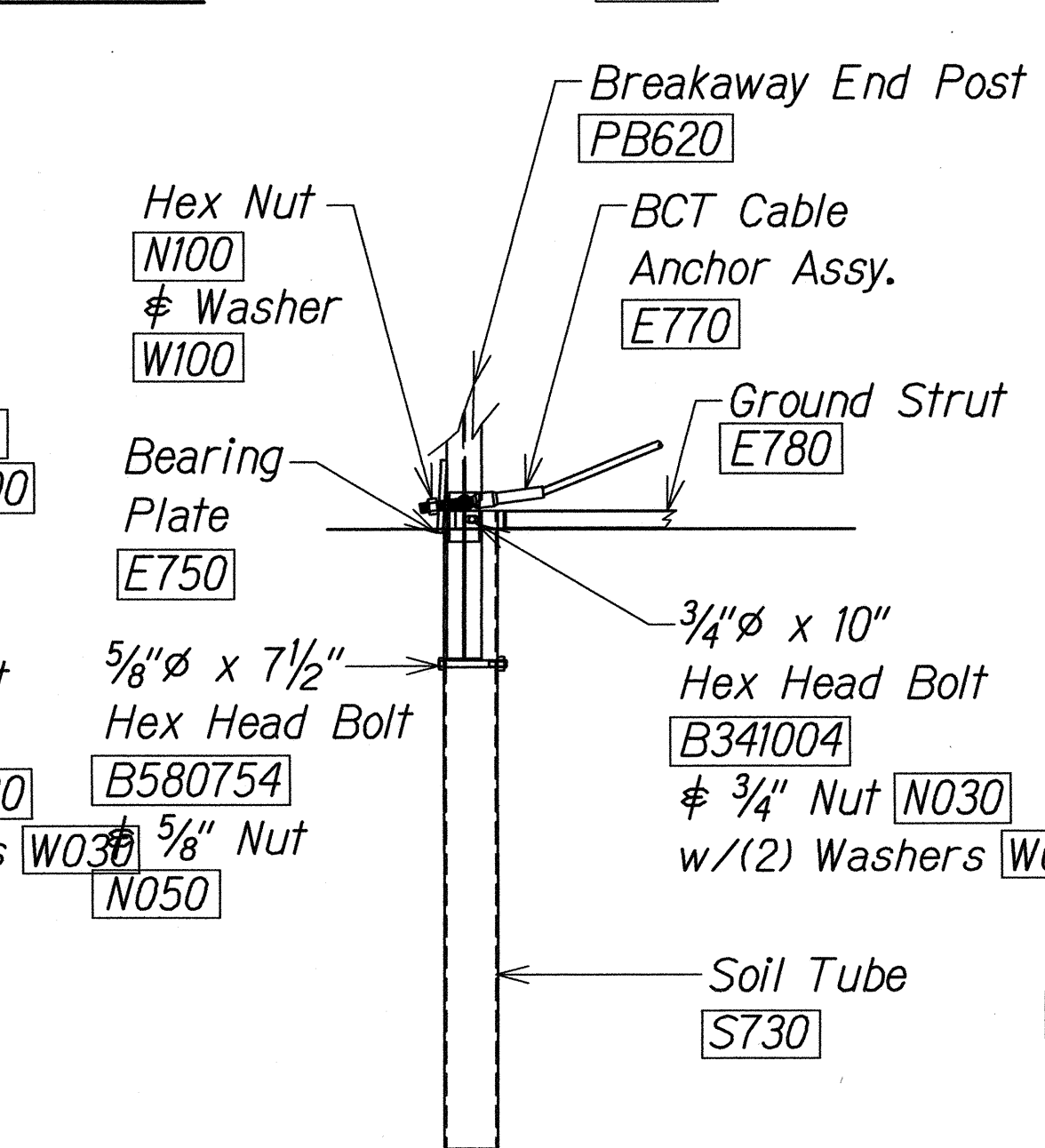
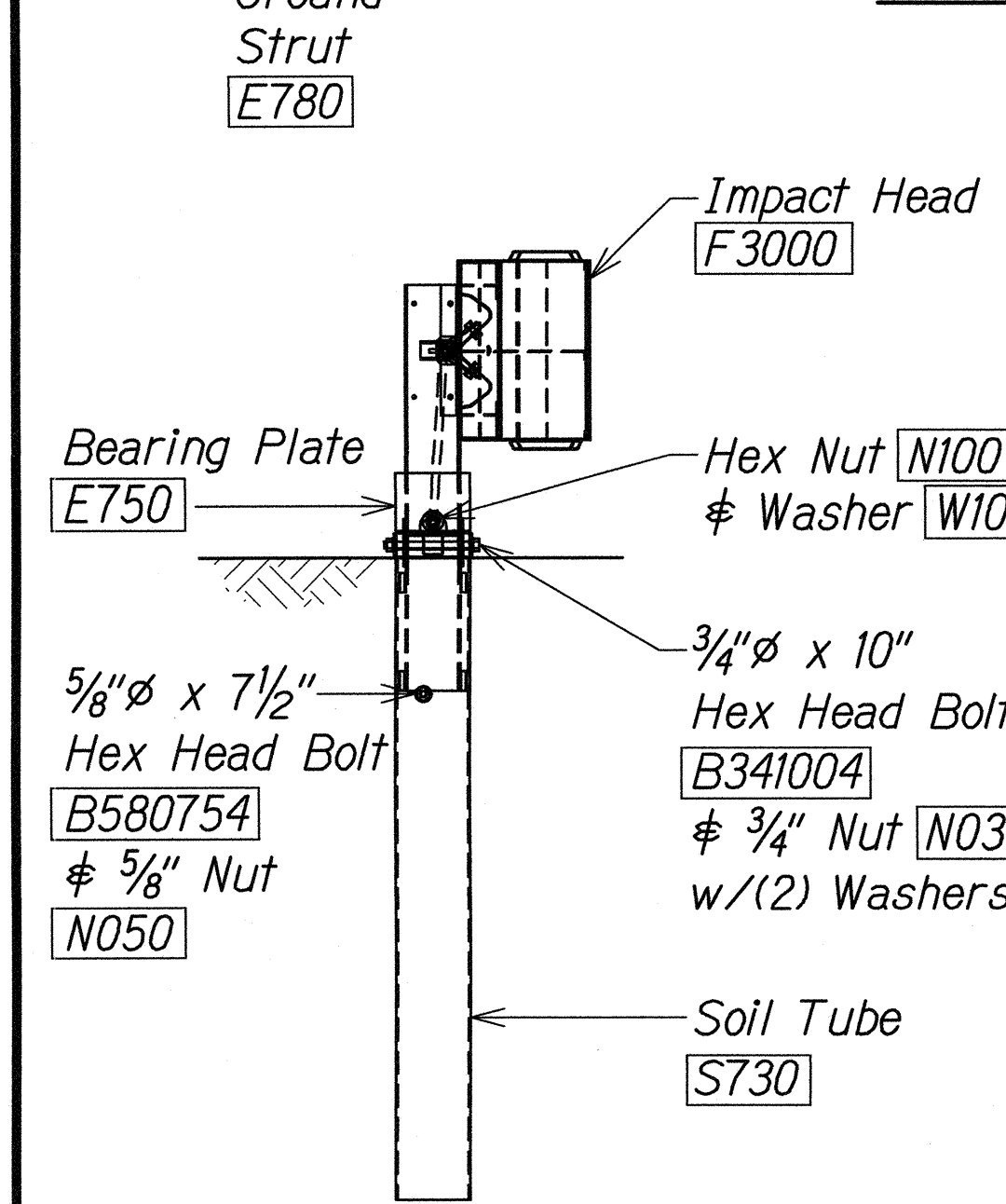
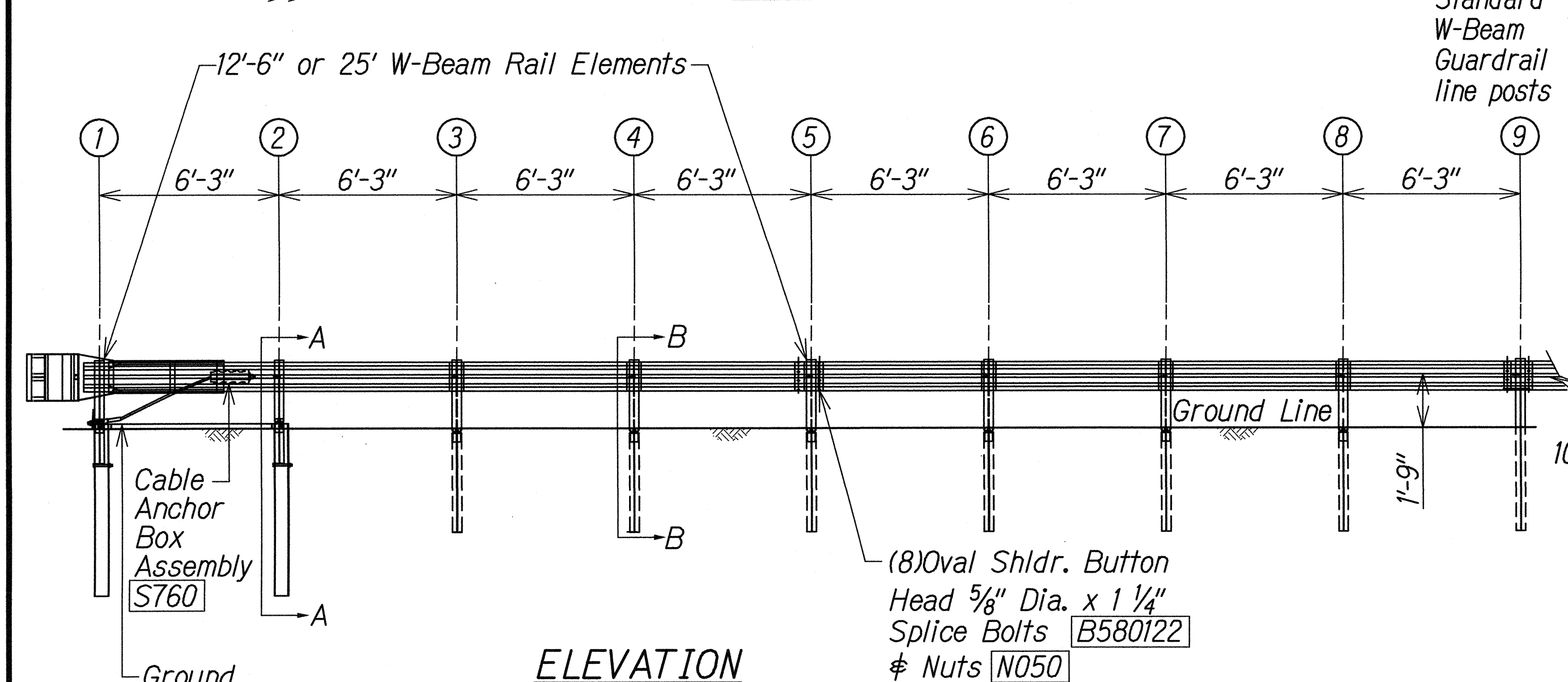
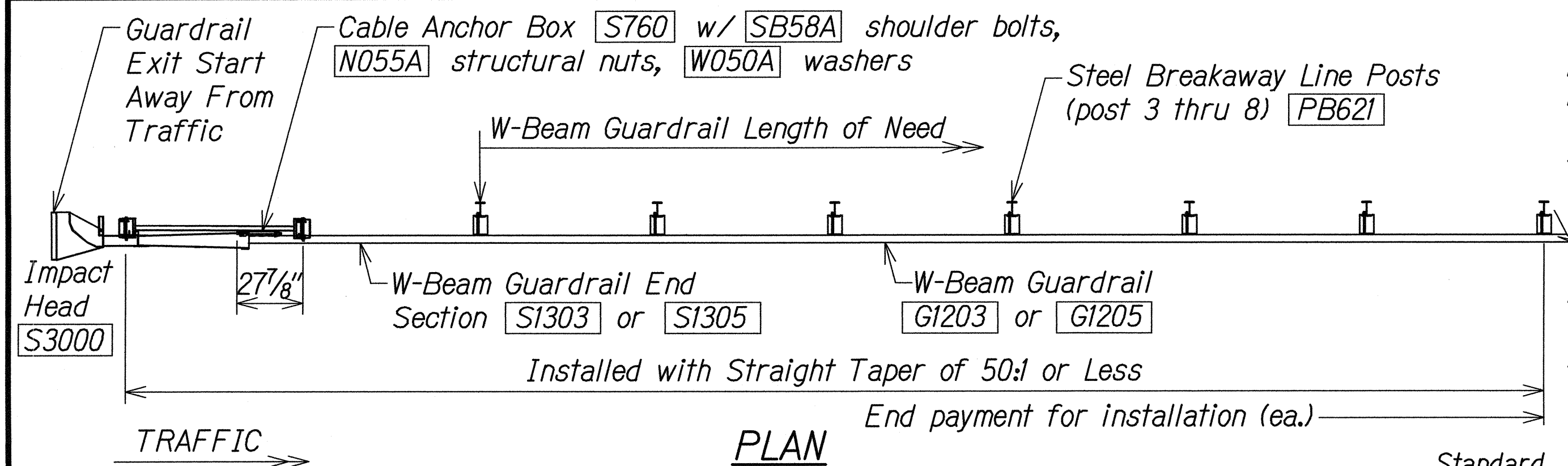
SHEET No. GR-3 OF 11 SHEETS

ORIGINAL PLAN	DATE
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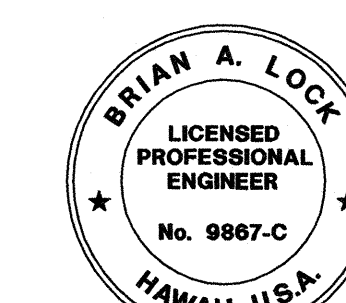
# GENERAL NOTES:

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 50:1 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.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	IM-HI-1(242)	2016	98	354

ITEM NO.	QTY.	BILL OF MATERIALS
S3000	1	IMPACT HEAD
SI303/SI305	1	W-BEAM GUARDRAIL END SECTION 12 GA. 12.5' or 25'
G1203/G1205	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	$\frac{5}{8}$ " Dia. x $1\frac{1}{4}$ " SPLICE BOLTS, POST #2
B580754	2	$\frac{5}{8}$ " Dia. x $7\frac{1}{2}$ " HEX BOLTS
B341004	2	$\frac{3}{4}$ " Dia. x 10" HEX BOLTS
B341002	6	$\frac{5}{8}$ " Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B581802	6	$\frac{5}{8}$ " Dia. x 18" H.G.R. BOLT (POST 3 THRU 8)
N050	26/42	$\frac{5}{8}$ " Dia. H.G.R. NUT (SPLICE 17/33, SOIL TUBES 2, POST 2 THRU 8)
N030	2	$\frac{3}{4}$ " Dia. HEX NUTS
W050	7	H.G.R. WASHER
W030	4	$\frac{3}{4}$ " ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	$\frac{1}{4}$ " x 4" HEX BOLT
N014	2	$\frac{1}{4}$ " HEX NUT
W014	4	$\frac{1}{4}$ " WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLTS
N055A	8	$\frac{1}{2}$ " A325 STRUCTURAL NUTS
W050A	16	$\frac{1}{6}$ " OD x $\frac{5}{16}$ " 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



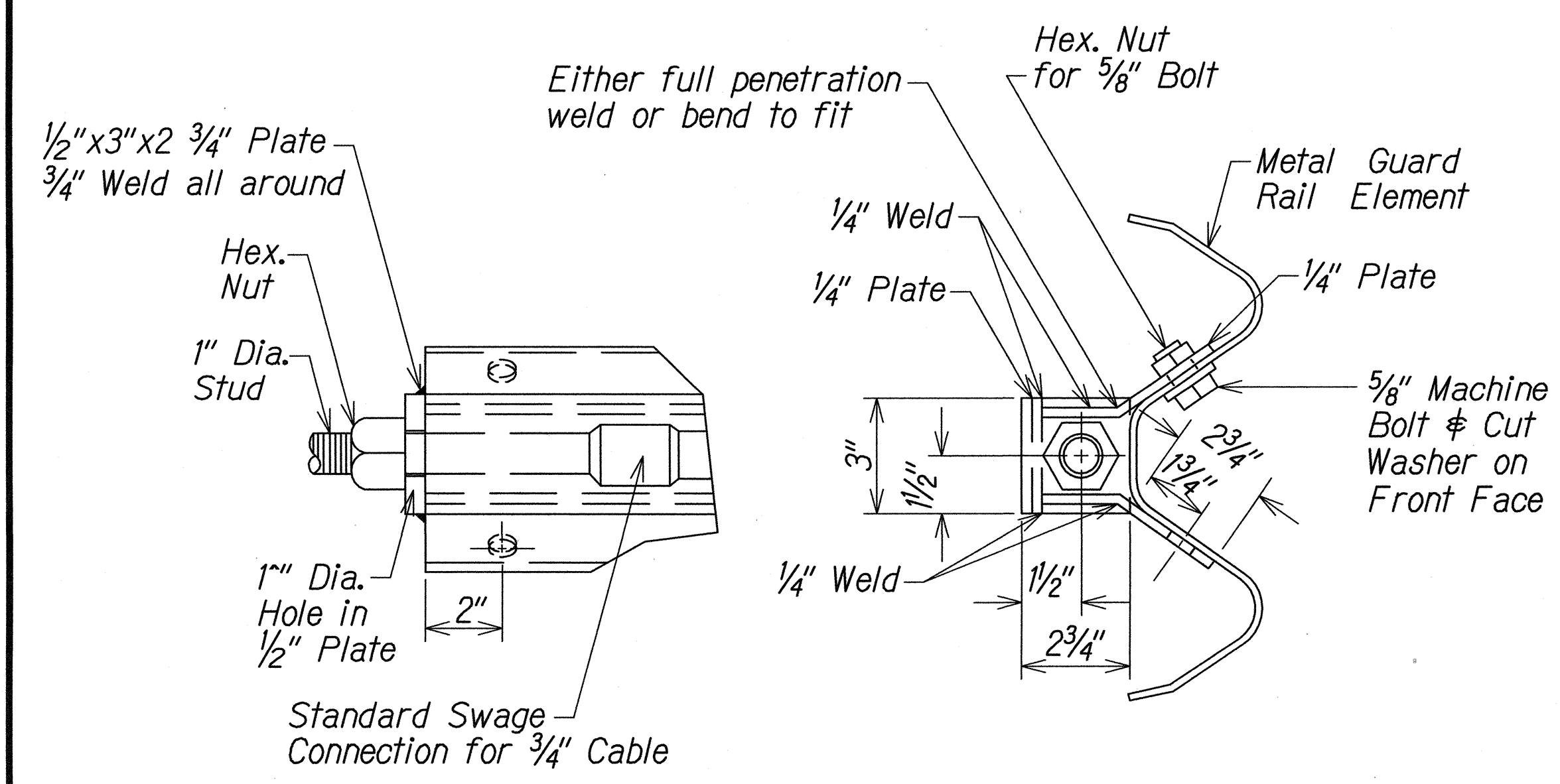
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 WILSON OKAMOTO CORPORATION APRIL 30, 2018 LIC. EXP. DATE

STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION  
**SKT-350**  
**SEQUENTIAL KINKING TERMINAL**  
 INTERSTATE ROUTE H-1  
 GUARDRAIL AND SHOULDER IMPROVEMENTS  
 Middle Street to Punchbowl Off-Ramp  
 Fed. Aid Project No. IM-HI-1(242)  
 Scale: As Shown Date: Mar. 2016  
 SHEET No. GR-5 OF 11 SHEETS

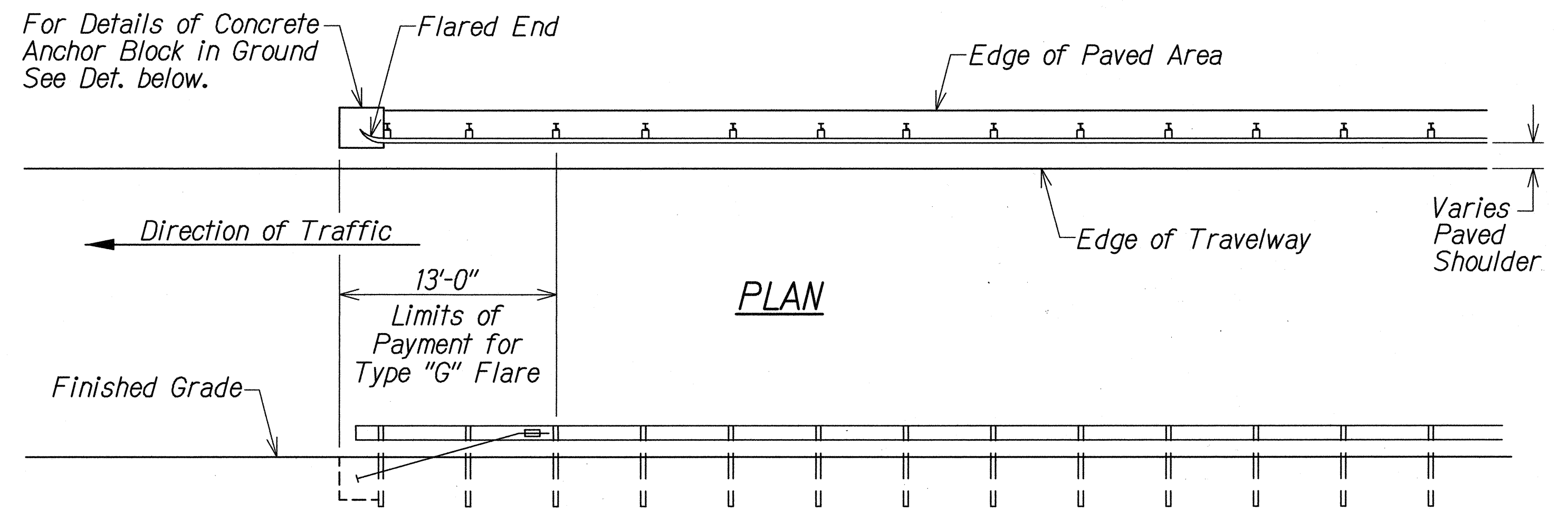
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NOTE BOOK	
QUANTITIES BY	
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FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H1-1(242)	2016	99	354



ANCHOR PLATE DETAILS



PLAN

ELEVATION

TYPE "G" FLARE END TERMINAL

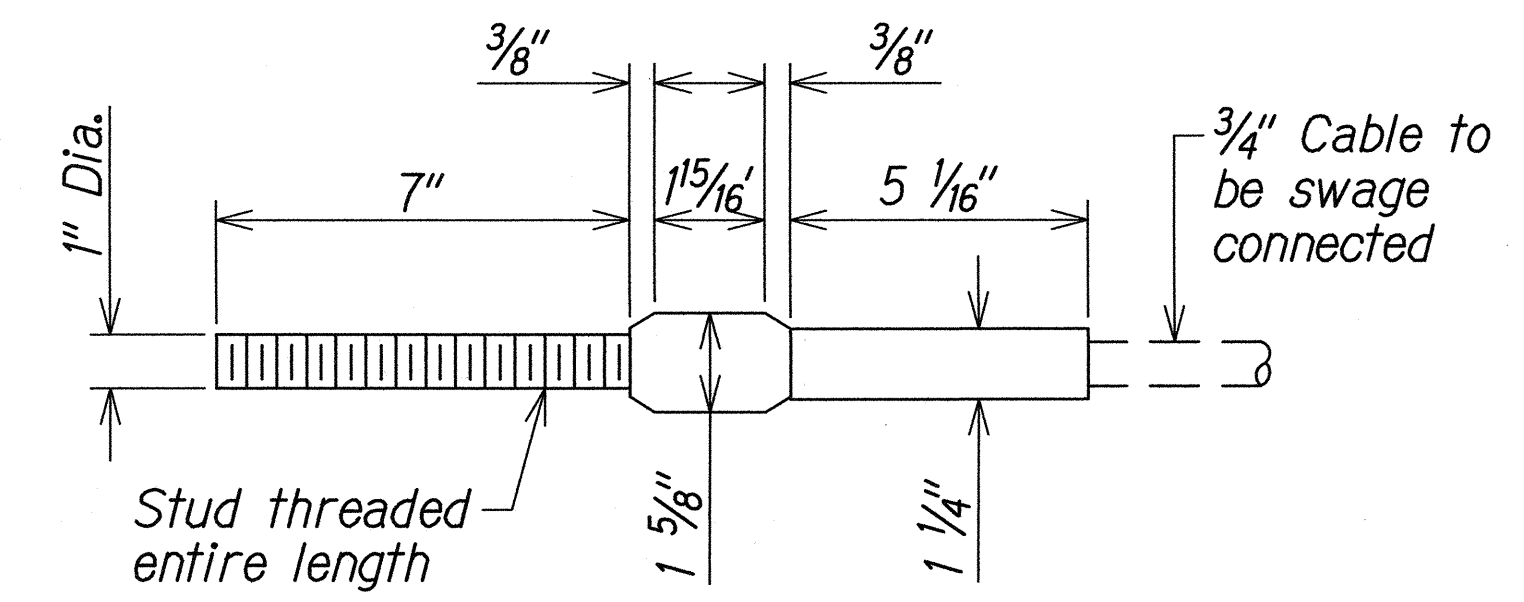
NOTE:

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.

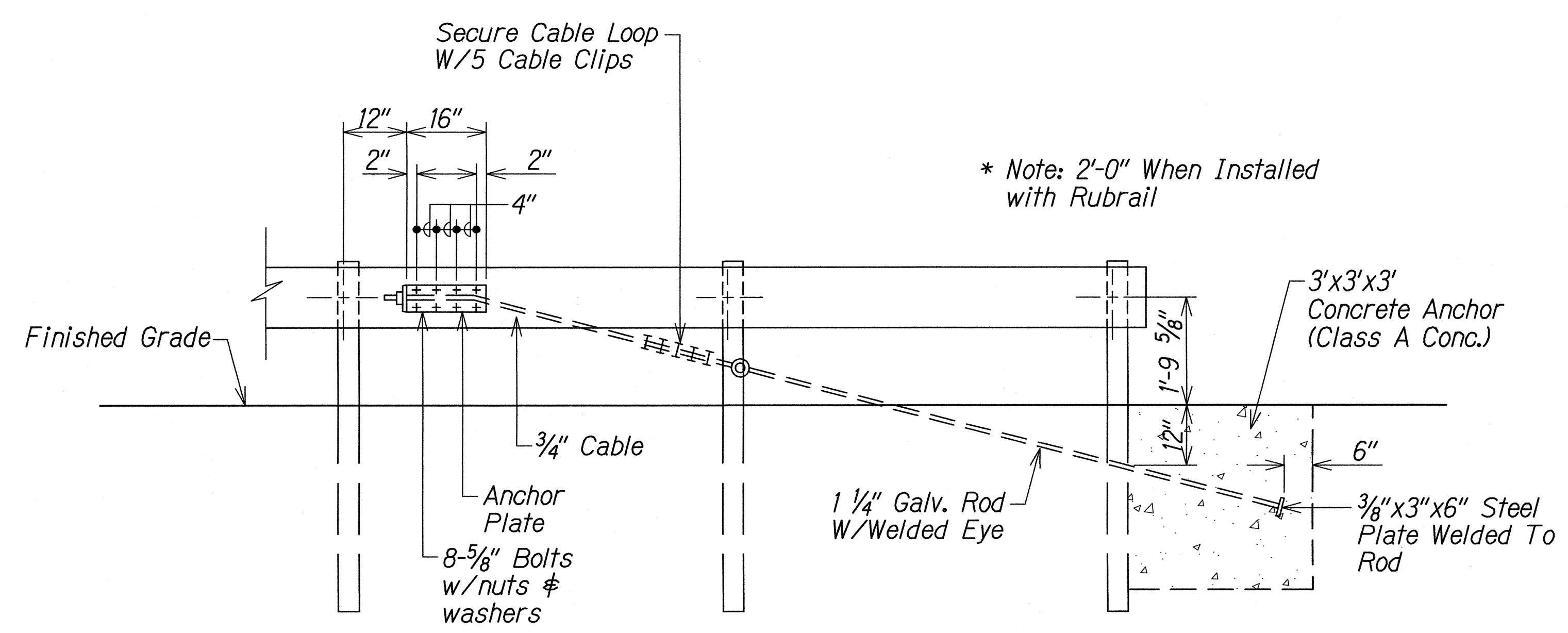
The taper (flare rate) of the guardrail shall follow the latest edition of AASHTO'S Roadside Design Guide (currently, Table 5.6 - Suggested Flare Rate for Barrier Design, page 5-21, Jan. 1996 edition).

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.



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.

SURVEY PLOTTED BY	DATE
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DESIGNED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	



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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

TYPE "G"

GUARDRAIL DETAILS

INTERSTATE ROUTE H-1

GUARDRAIL AND SHOULDER IMPROVEMENTS

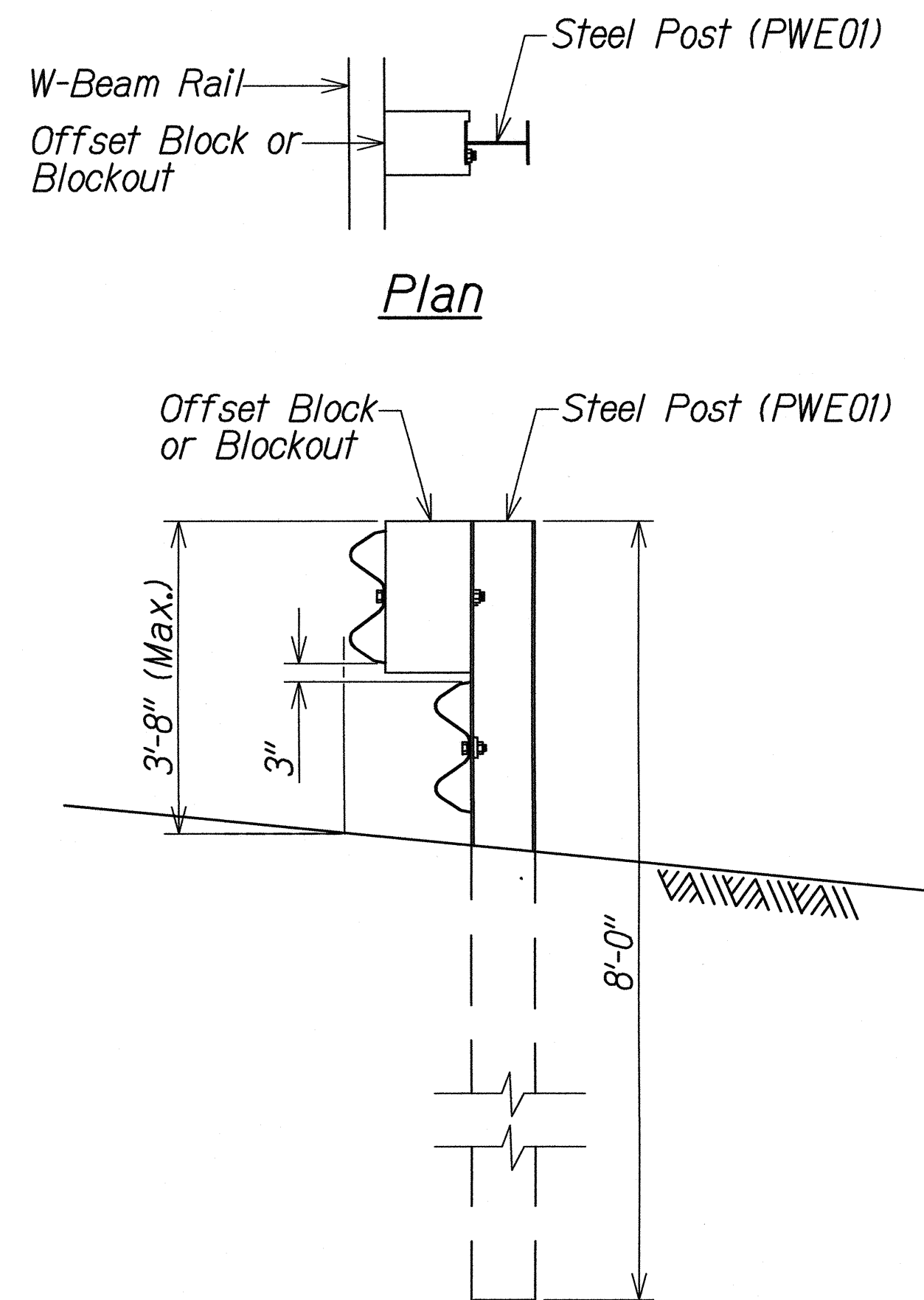
Middle Street to Punchbowl Off-Ramp

Fed. Aid Project No. 1M-H1-1(242)

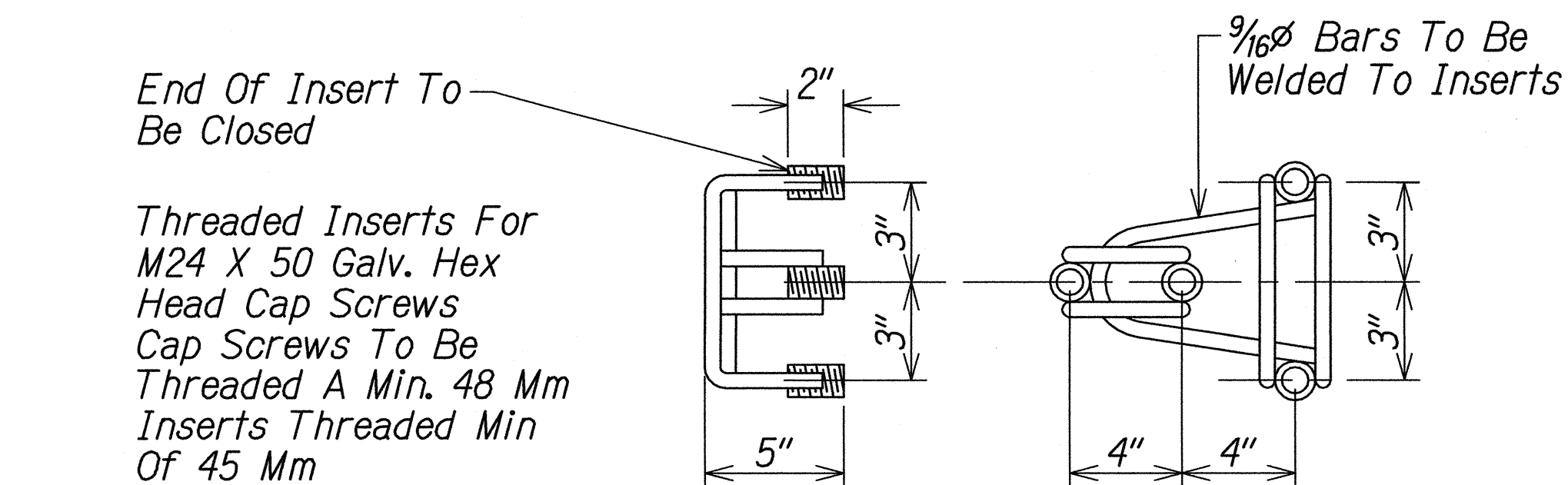
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SHEET No. GR-6 OF 11 SHEETS

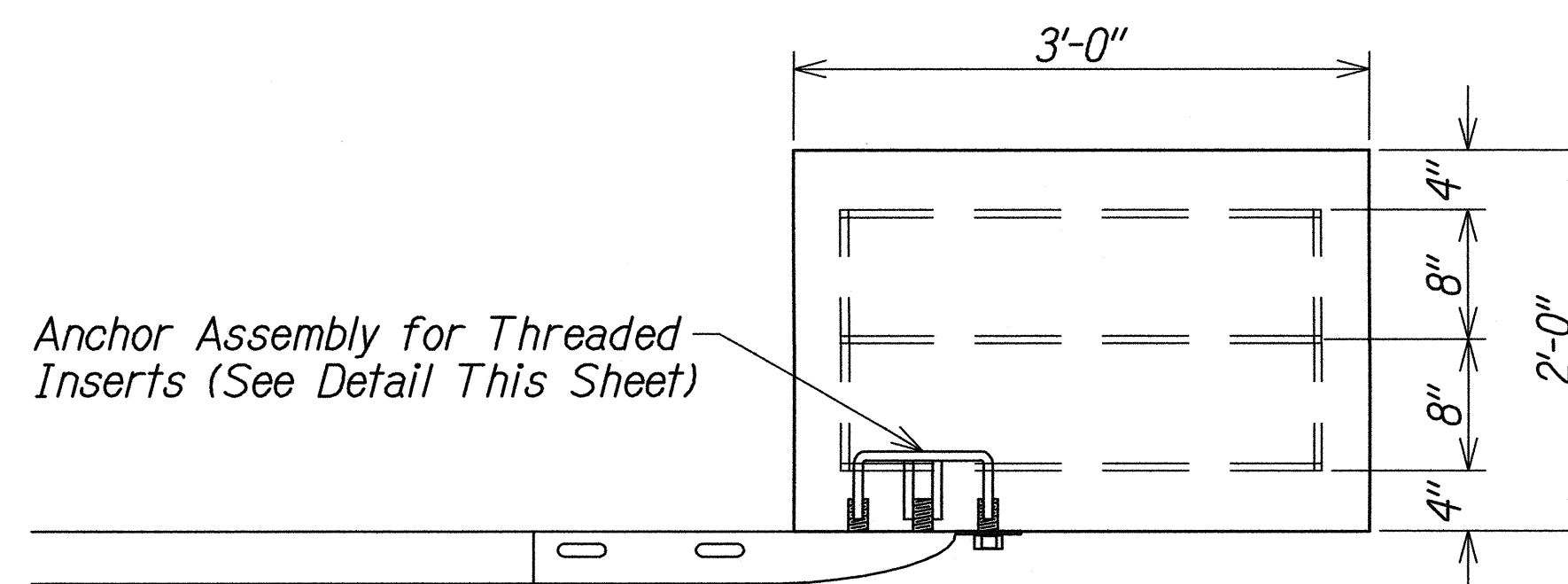
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HAWAII	HAW.	1M-H1-1(242)	2016	100	354



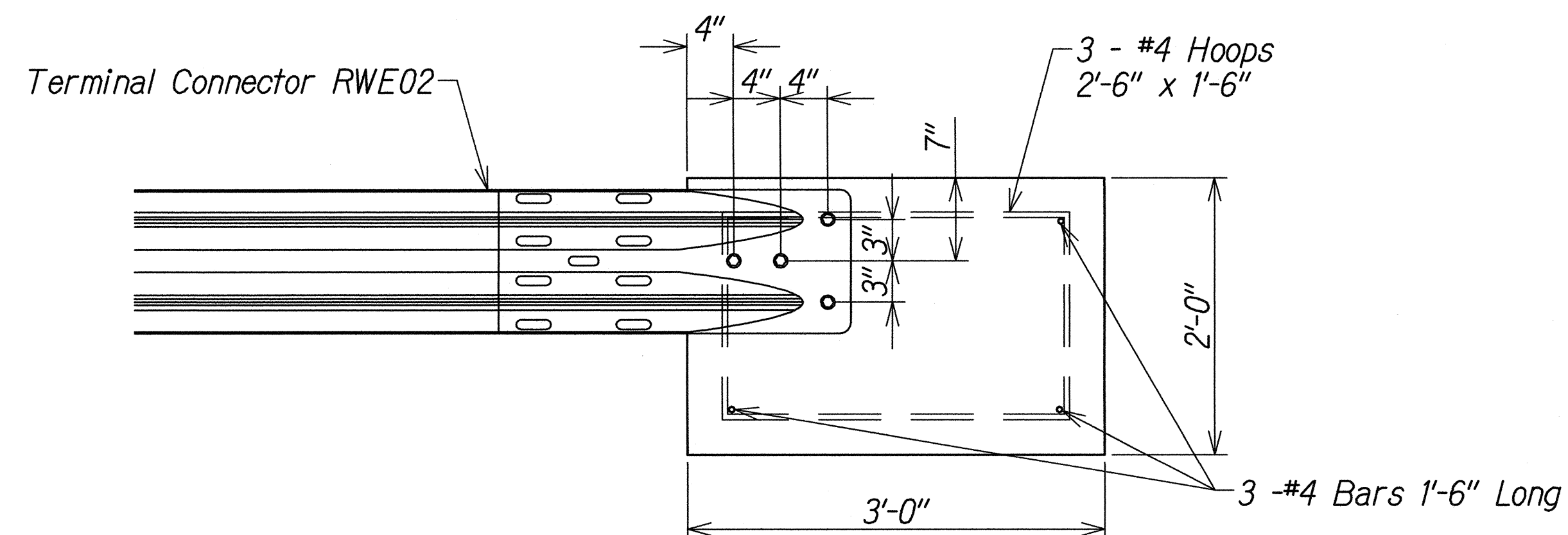
STEEL POST GUARDRAIL  
WITH RUBRAIL



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	
	DESIGNED BY	
	CHECKED BY	



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*[Signature]*  
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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

TYPE "A"

GUARDRAIL DETAILS

INTERSTATE ROUTE H-1

GUARDRAIL AND SHOULDER IMPROVEMENTS

Middle Street to Punchbowl Off-Ramp

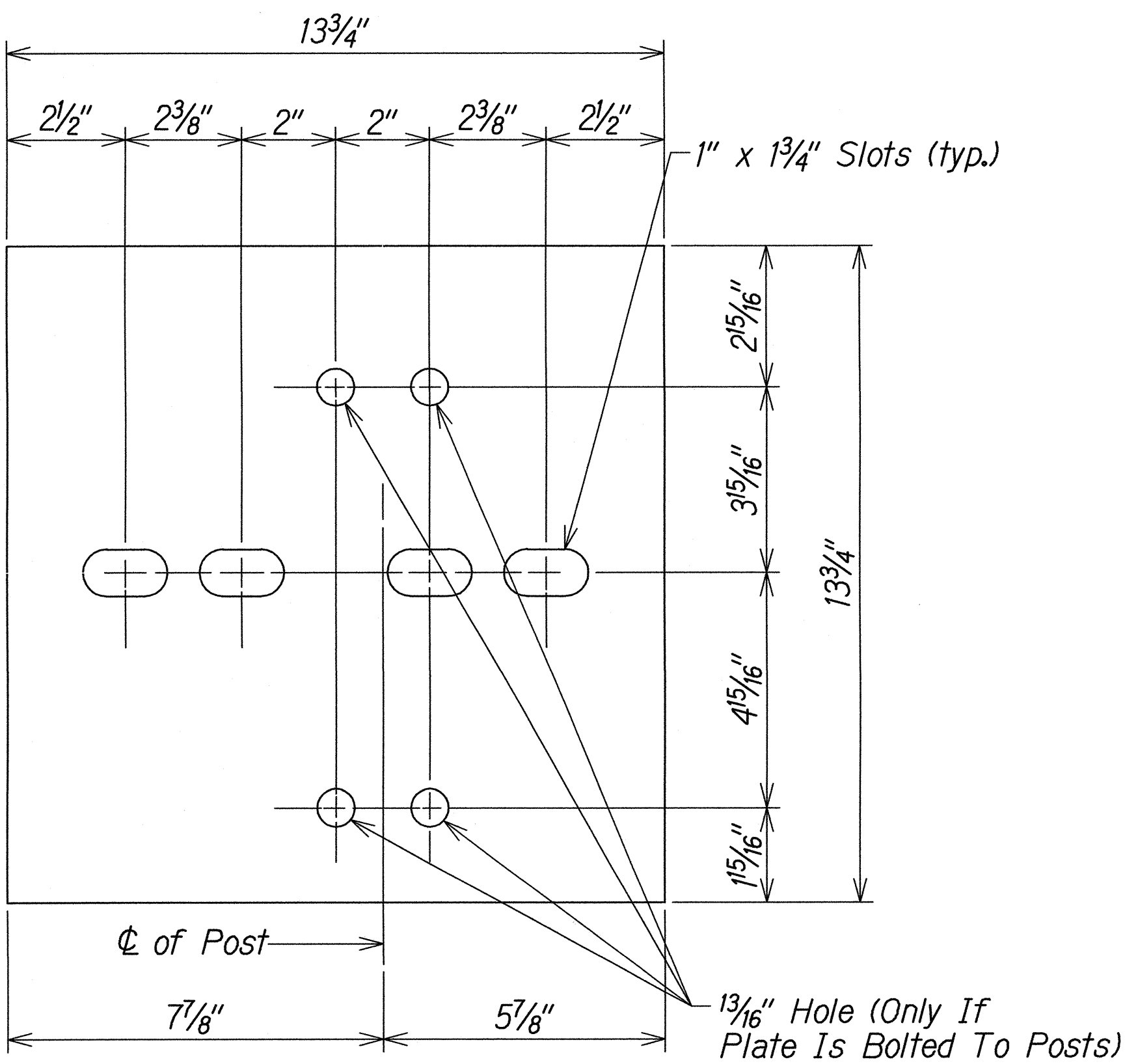
Fed. Aid Project No. 1M-H1-1(242)

Scale: As Shown Date: Mar. 2016

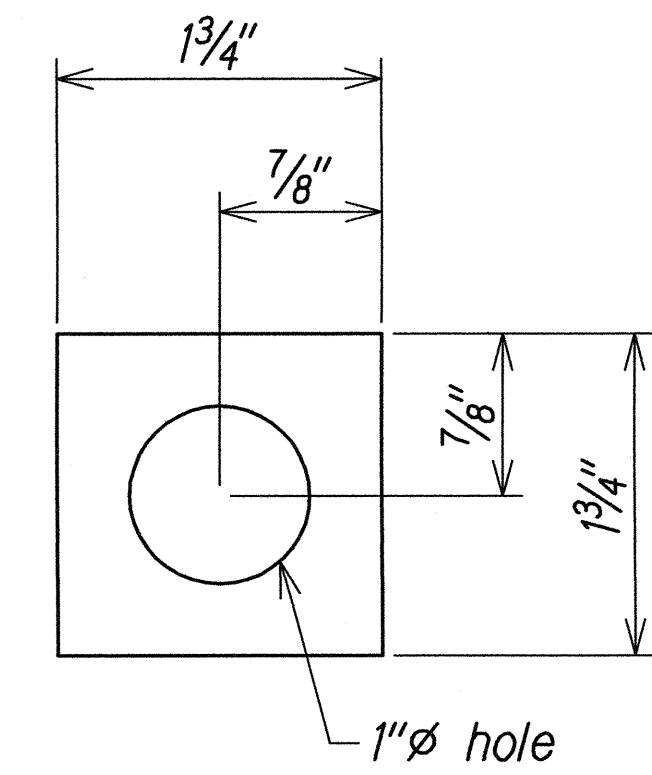
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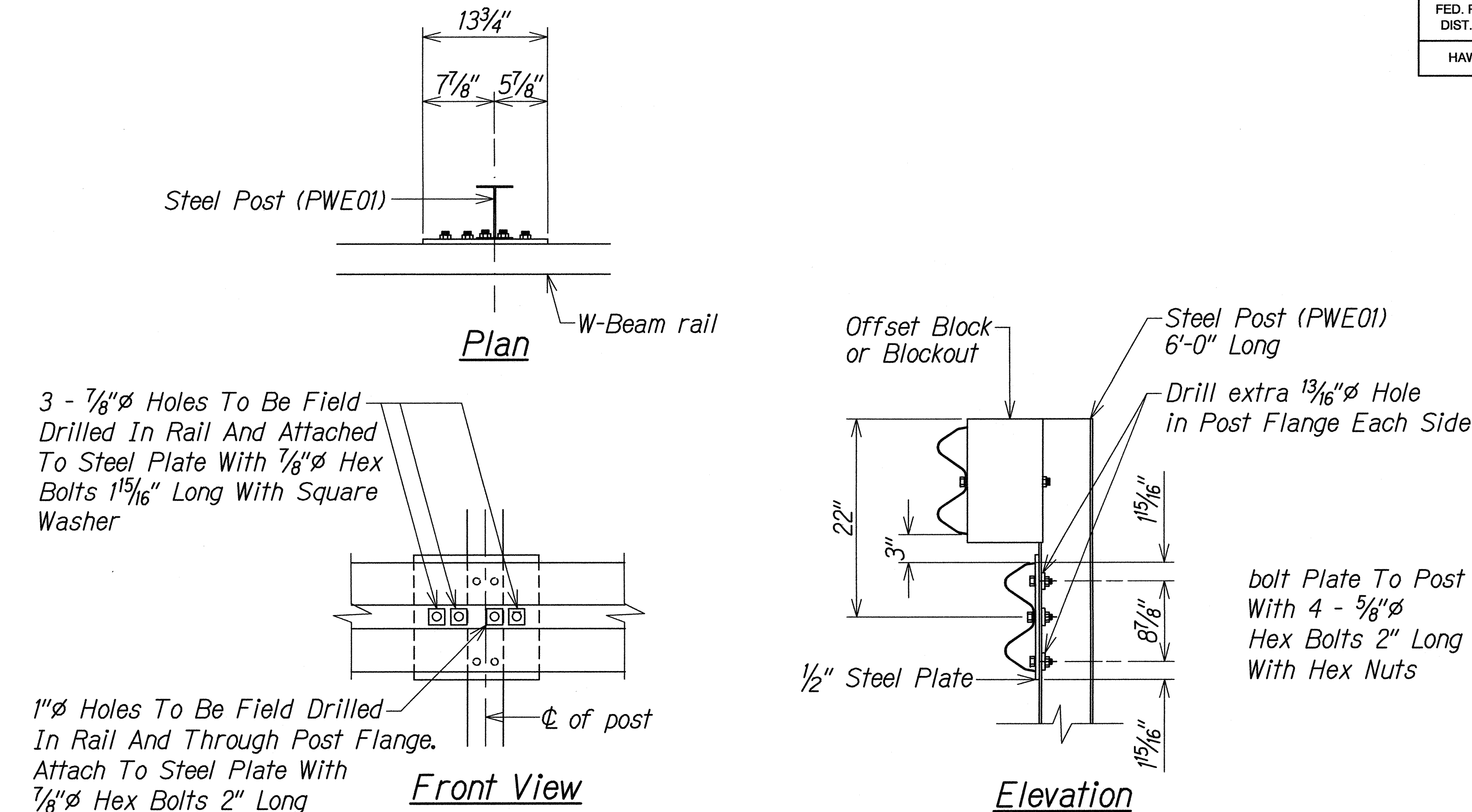
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HAWAII	HAW.	1M-H1-1(242)	2016	101	354



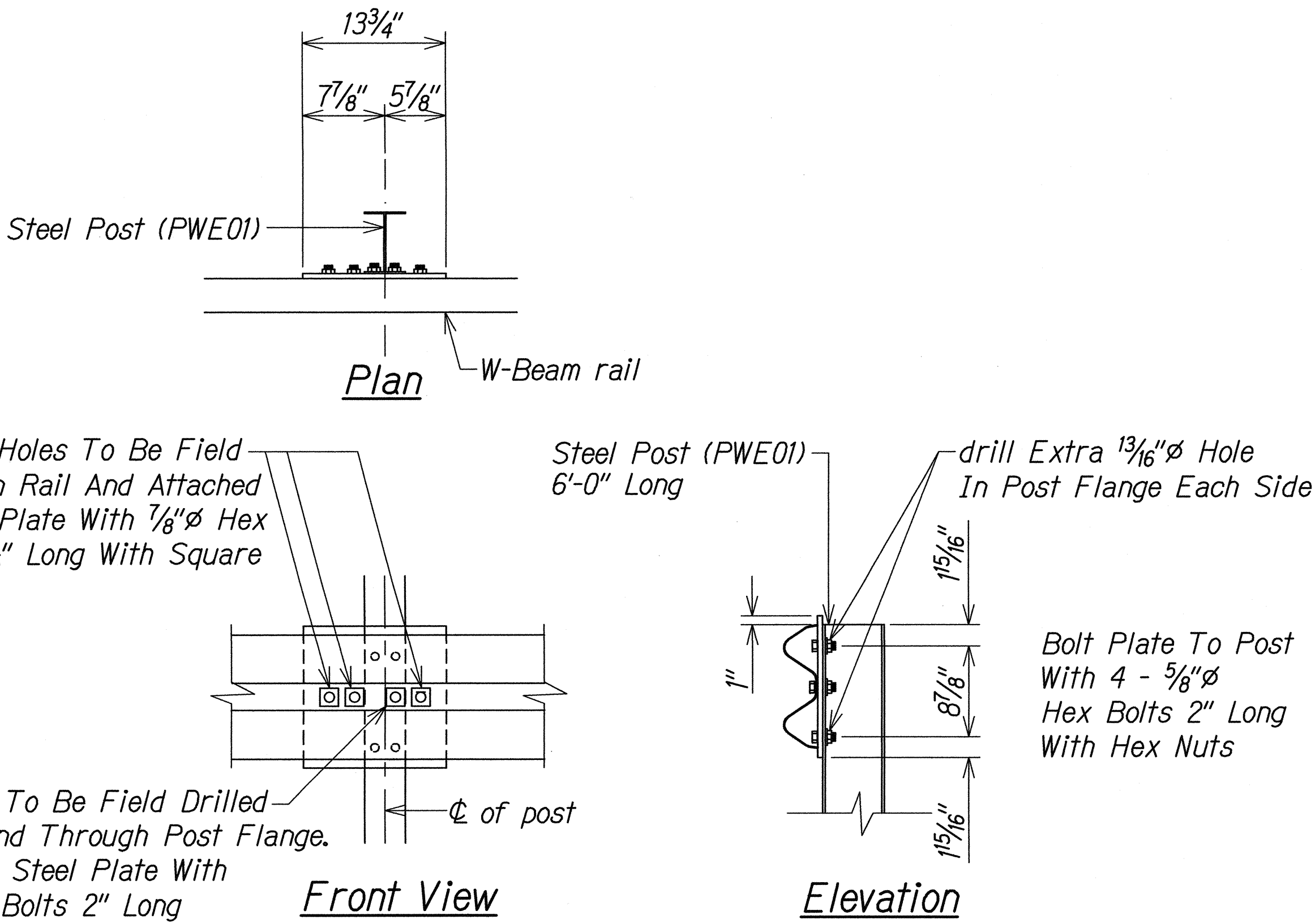
Steel Plate - 1/2"  
(Hot-dip Zinc Coated Galvanized  
Welded or Bolted to Post)



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



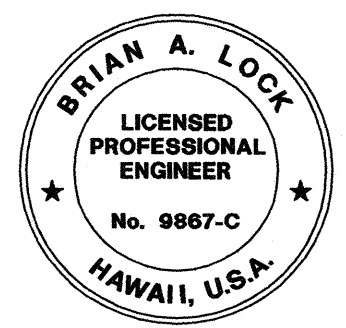
RUBRAIL ANCHOR DETAILS



POST ANCHOR DETAILS

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

Note:  
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WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**TYPE "A"**  
**GUARDRAIL DETAILS**  
INTERSTATE ROUTE H-1  
GUARDRAIL AND SHOULDER IMPROVEMENTS  
Middle Street to Punchbowl Off-Ramp  
Fed. Aid Project No. 1M-H1-1(242)  
Scale: As Shown Date: Mar. 2016

SHEET No. GR-8 OF 11 SHEETS

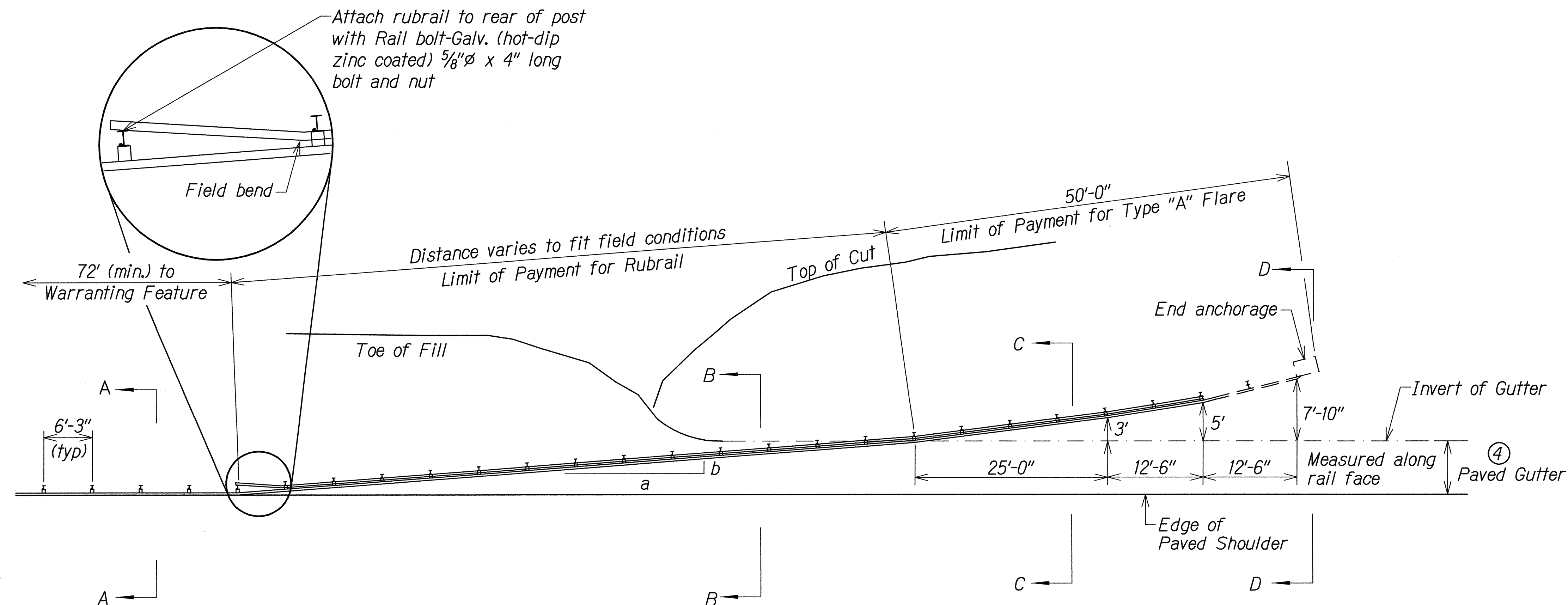
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	DESIGNED BY	
	CHECKED BY	
	NO.	



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H1-1(242)	2016	102	354

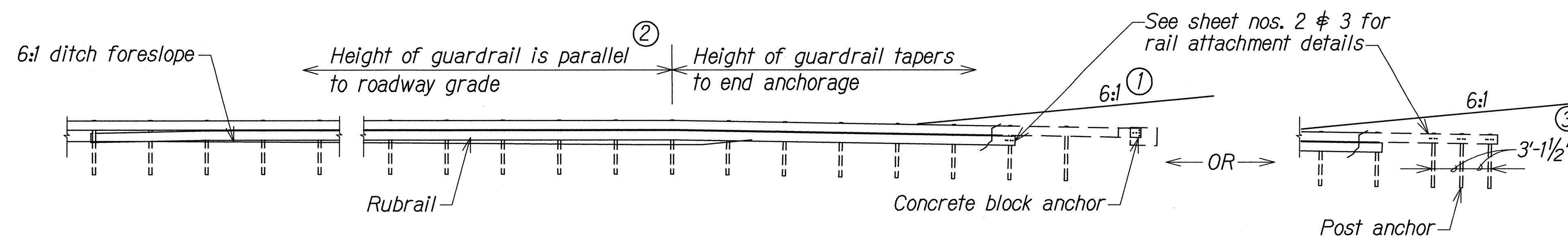
# General Notes

1. A 6:1 or flatter slope is desirable. However, a steeper or flatter existing slope may be used.
2. Height of guardrail may be tapered down in elevation to maintain 3'-8" maximum height.
3. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the post anchor. Posts for the post anchor are 6'-0" long.
4. Variable Paved Gutter offsets may be used to fit field conditions.
5. The Guardrail Posts shall be located away from the gutter/swale invert.
6. All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

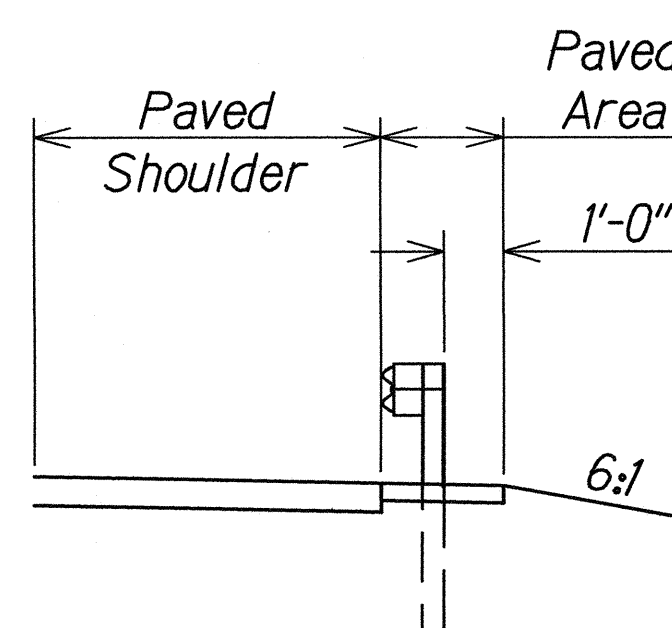


PLAN

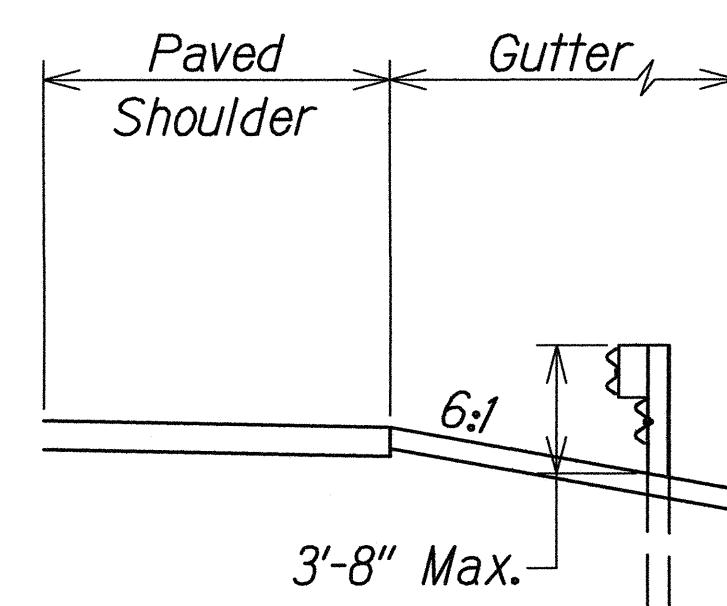
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



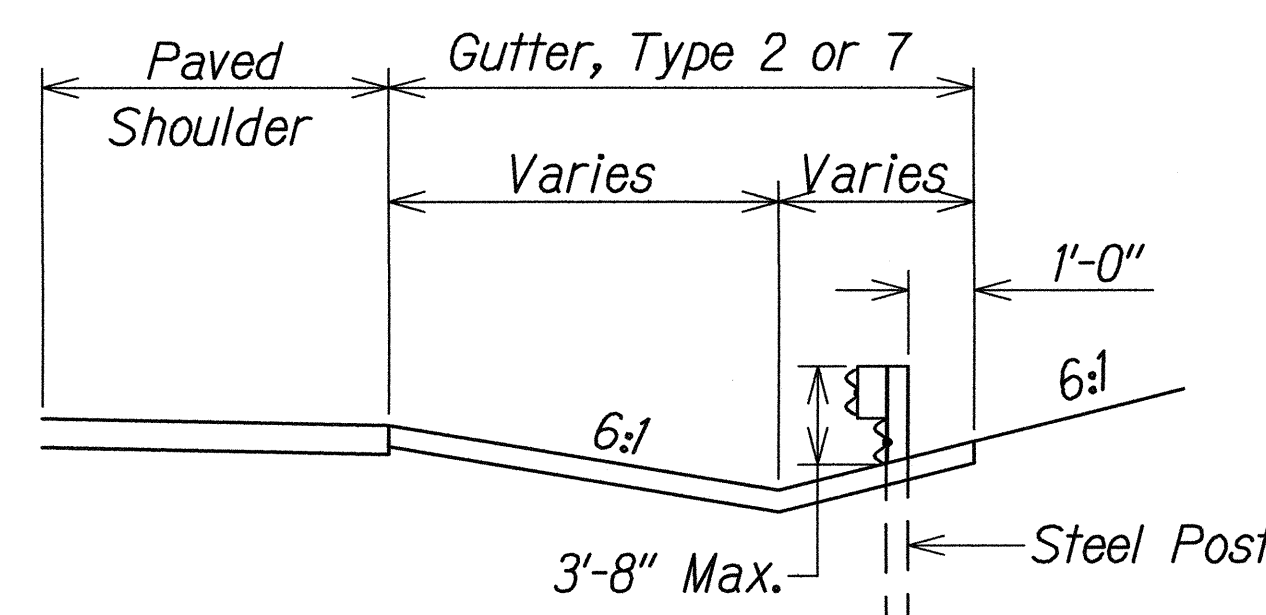
ELEVATION (Profile Along Rail)



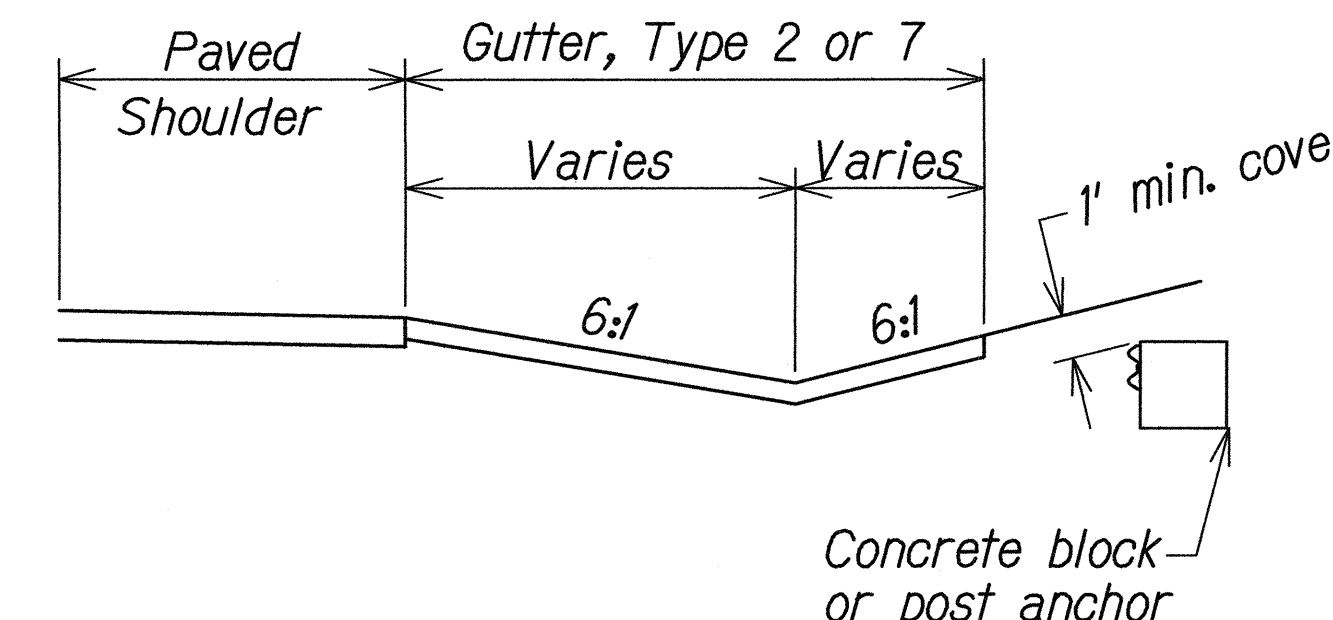
Section A-A



Section B-B  
(With Rubrail)



Section C-C  
(With Rubrail)



Concrete block  
or post anchor

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

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ORIGINAL PLAN	
NOTE BOOK	
No.	

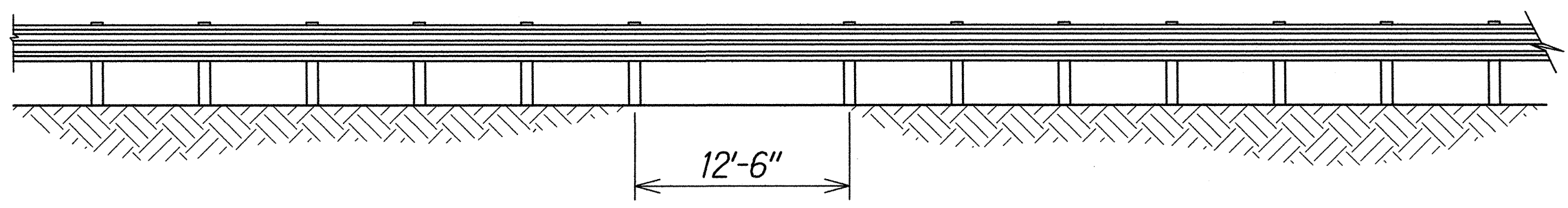


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*[Signature]*  
WILSON OKAMOTO CORPORATION APRIL 30, 2018 LIC. EXP. DATE

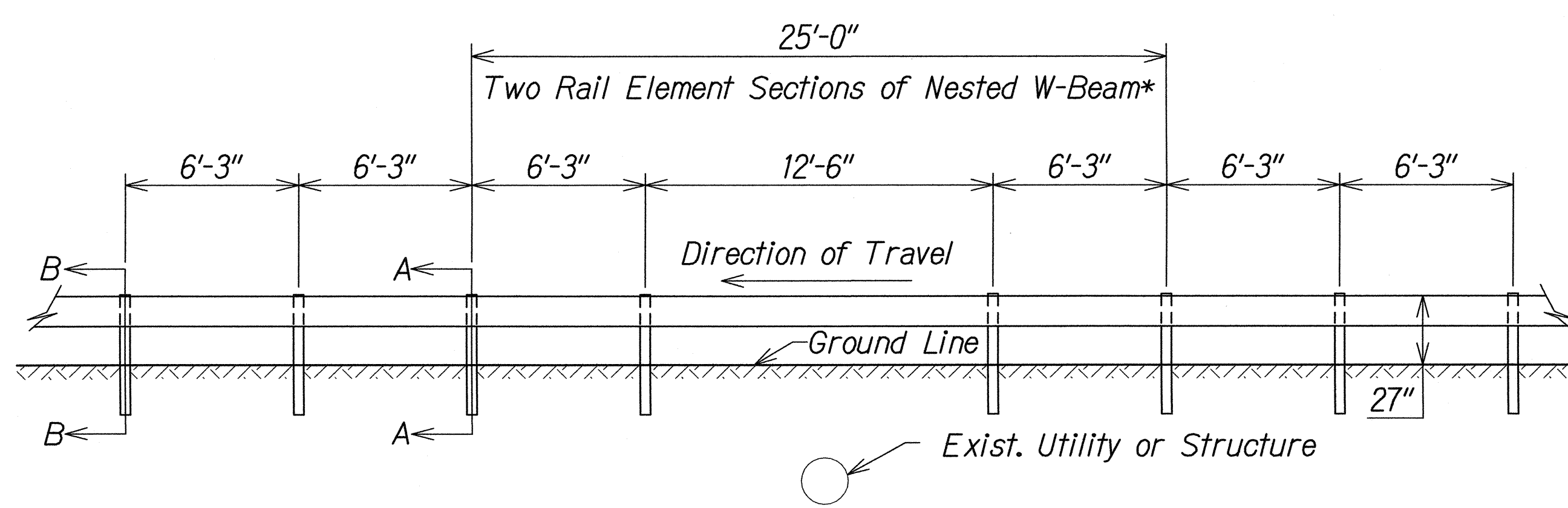
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**TYPE "A"**  
**GUARDRAIL DETAILS**  
INTERSTATE ROUTE H-1  
GUARDRAIL AND SHOULDER IMPROVEMENTS  
Middle Street to Punchbowl Off-Ramp  
Fed. Aid Project No. 1M-H1-1(242)  
Scale: As Shown Date: Mar. 2016

SHEET No. GR-9 OF 11 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H1-1(242)	2016	103	354

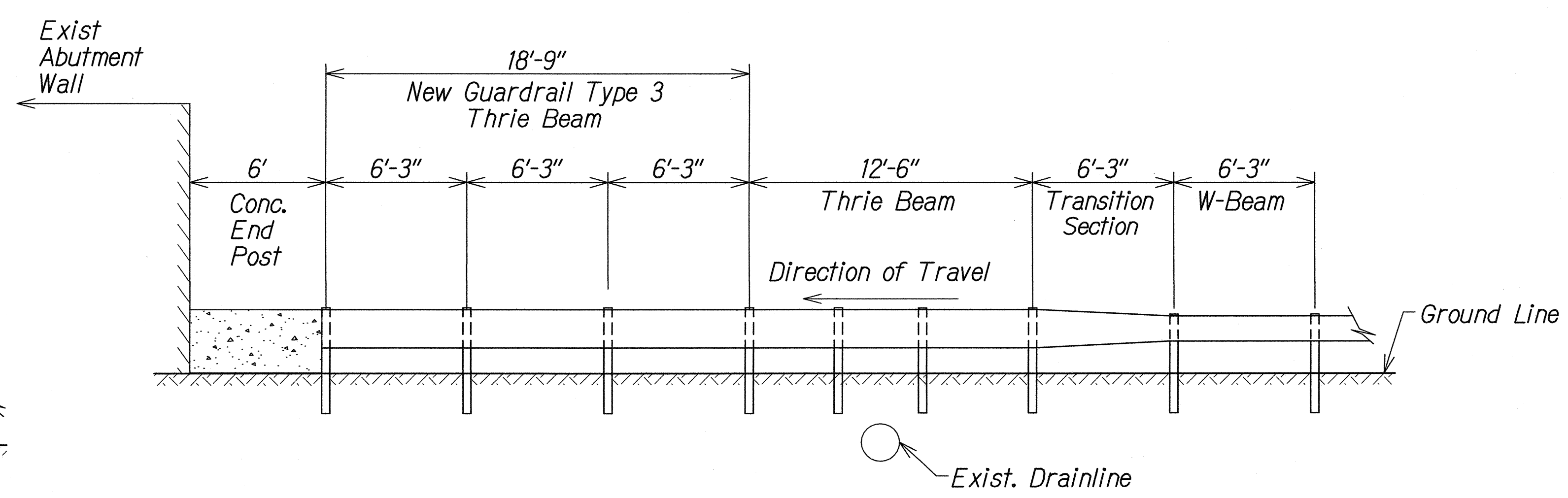


LONG SPAN OVER UTILITY/STRUCTURE

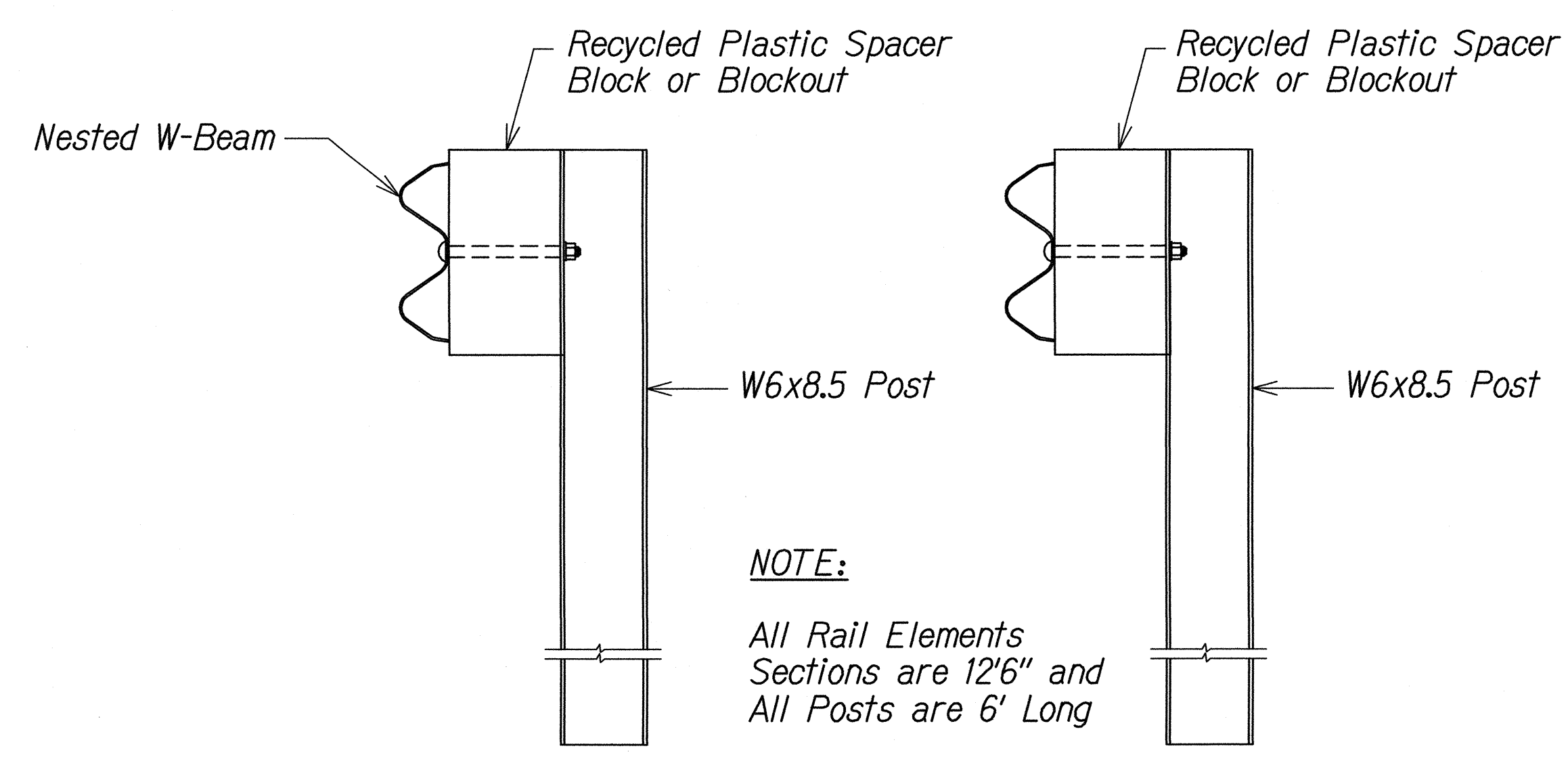


(SPLICE IN CENTER OF 12'-6" SPACING)

NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL OVER UTILITY/STRUCTURE  
(MAXIMUM DYNAMIC DEFLECTION OF 3.1 FT.)



TYPE 3 THRIE BEAM TRANSITION STA 136+43  
Scale: (NTS)

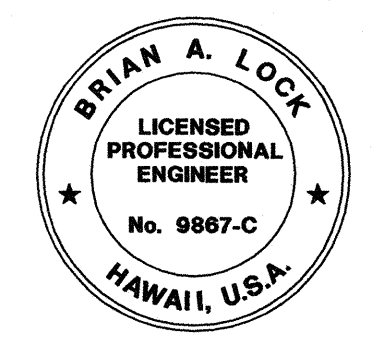


NOTE:  
All Rail Elements  
Sections are 12'-6" and  
All Posts are 6' Long

SECTION A-A

SECTION B-B

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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	CHECKED BY	
No.		

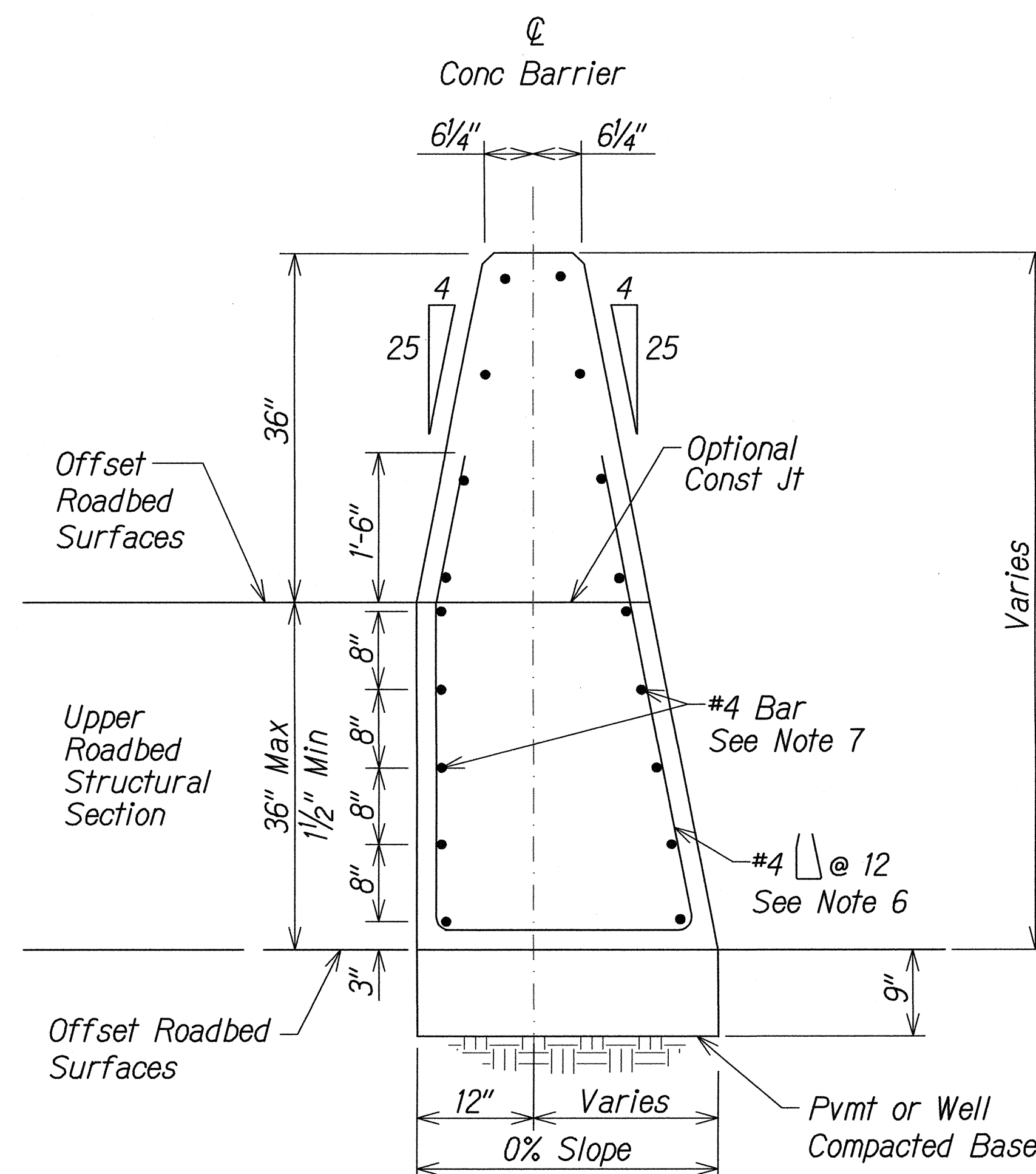


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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
  
GUARDRAIL DETAILS  
  
INTERSTATE ROUTE H-1  
GUARDRAIL AND SHOULDER IMPROVEMENTS  
Middle Street to Punchbowl Off-Ramp  
Fed. Aid Project No. 1M-H1-1(242)  
Scale: As Shown Date: Mar. 2016  
SHEET No. GR-10 OF 11 SHEETS



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	1M-H1-1(242)	2016	104	354



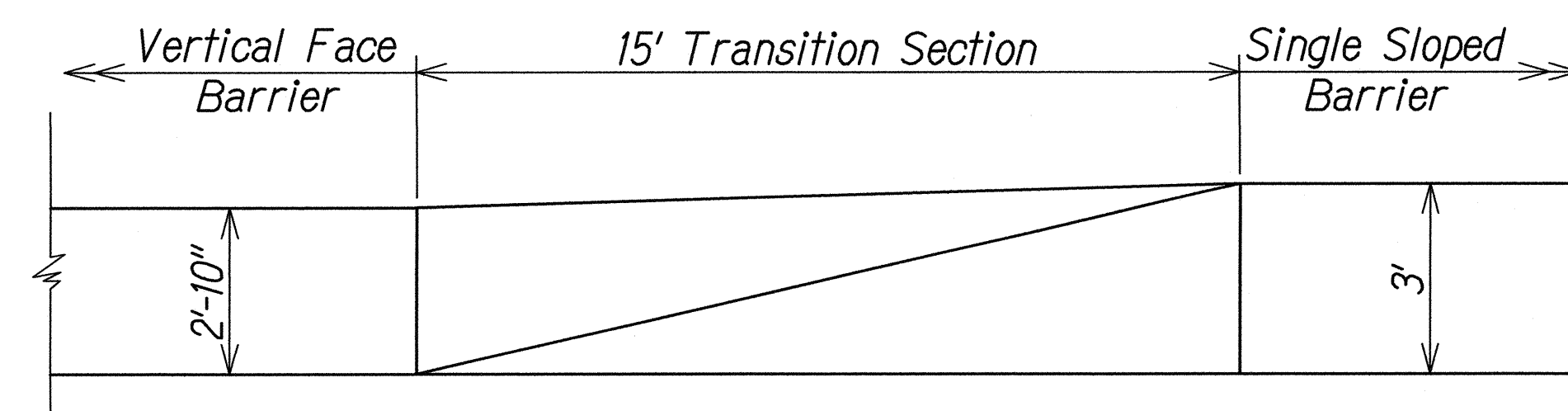
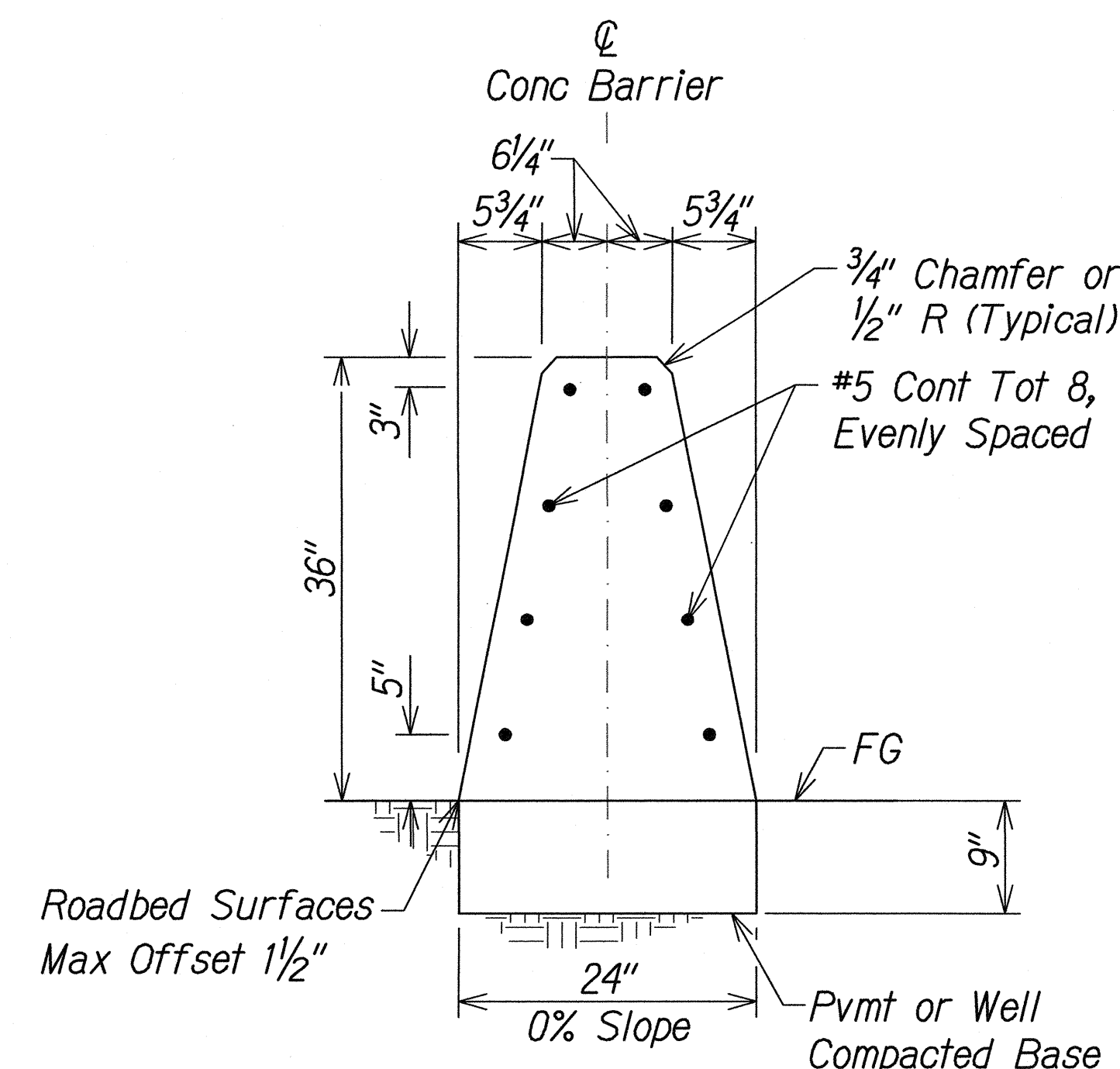
Note: Details similar to Type 4 Rigid Barrier Single Slope Concrete Barrier except as noted. Use concrete barrier end anchor when necessary. 36" roadbed surfaces offset shown.

### TYPE 4 RIGID BARRIER SINGLE SLOPE CONCRETE BARRIER END ANCHOR

Scale: NTS

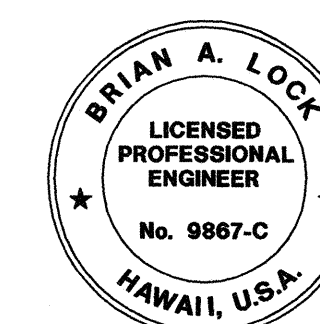
### TYPE 4 RIGID BARRIER SINGLE SLOPE CONCRETE BARRIER

Scale: NTS



### TYPE 4 RIGID BARRIER TRANSITION ELEVATION

Scale: NTS



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*msh*  
 WILSON OKAMOTO CORPORATION LIC. EXP. DATE

STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION

### GUARDRAIL DETAILS

INTERSTATE ROUTE H-1  
 GUARDRAIL AND SHOULDER IMPROVEMENTS  
 Middle Street to Punchbowl Off-Ramp  
 Fed. Aid Project No. 1M-H1-1(242)  
 Scale: As Shown Date: Mar. 2016

SHEET No. GR-11 OF 11 SHEETS

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