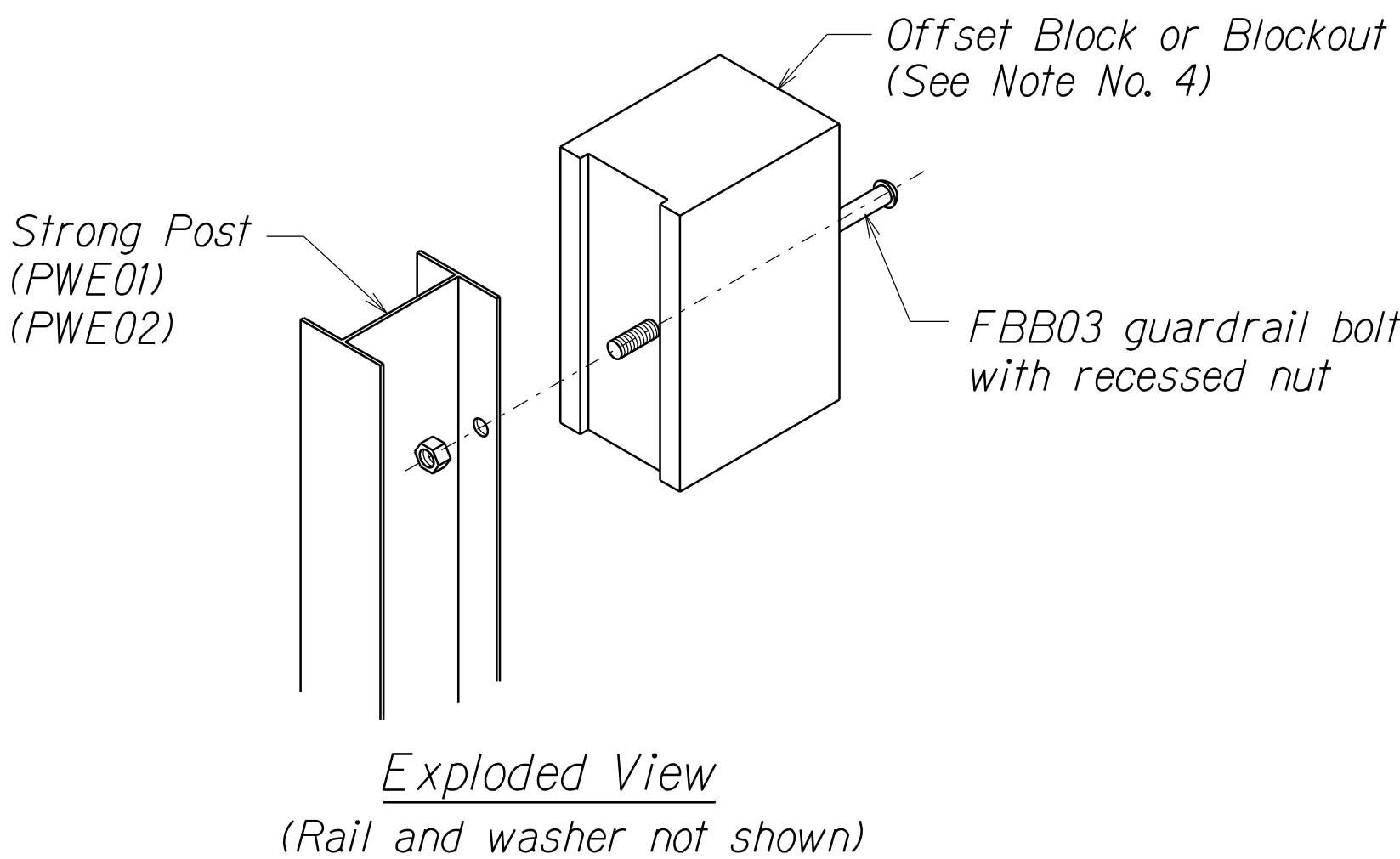
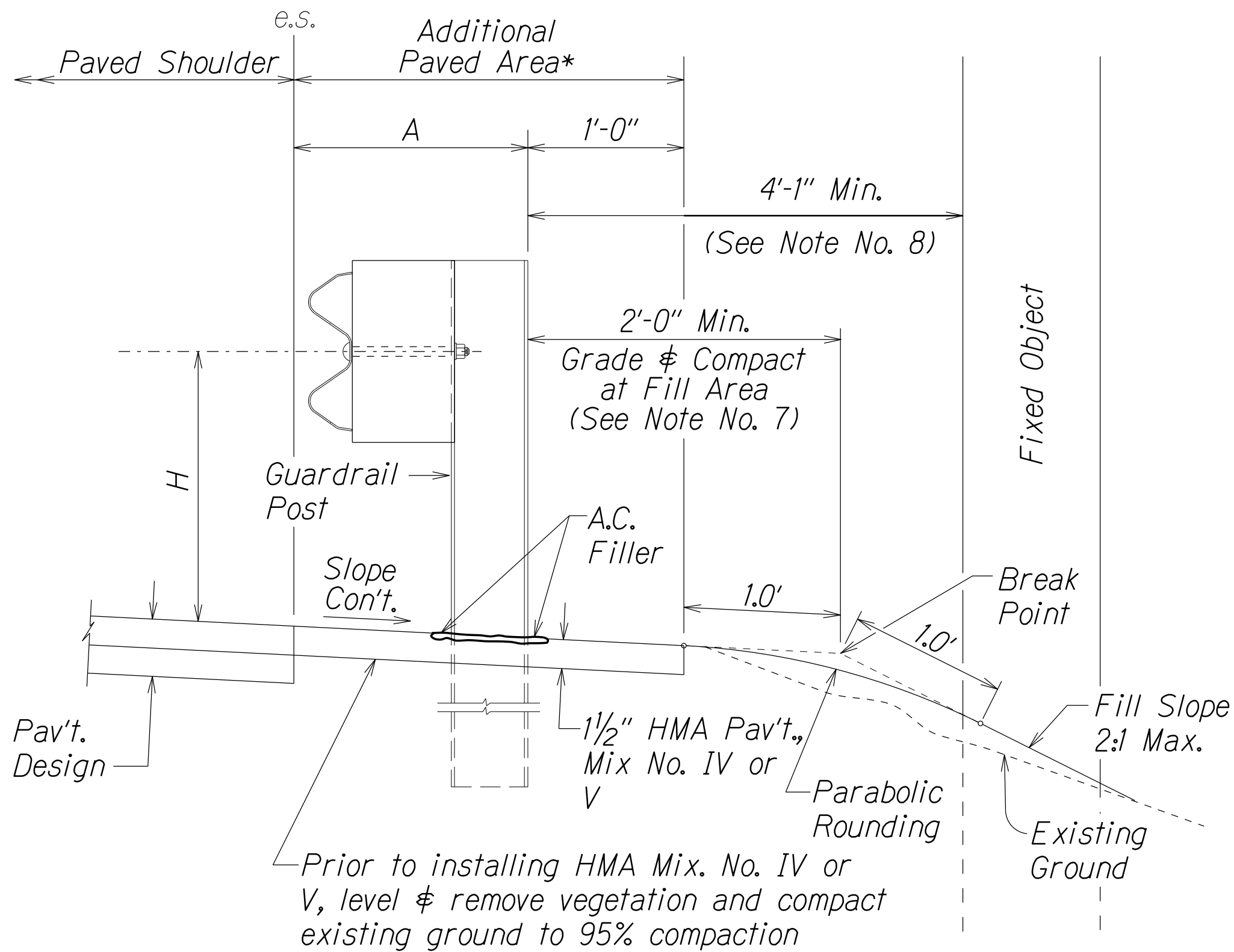
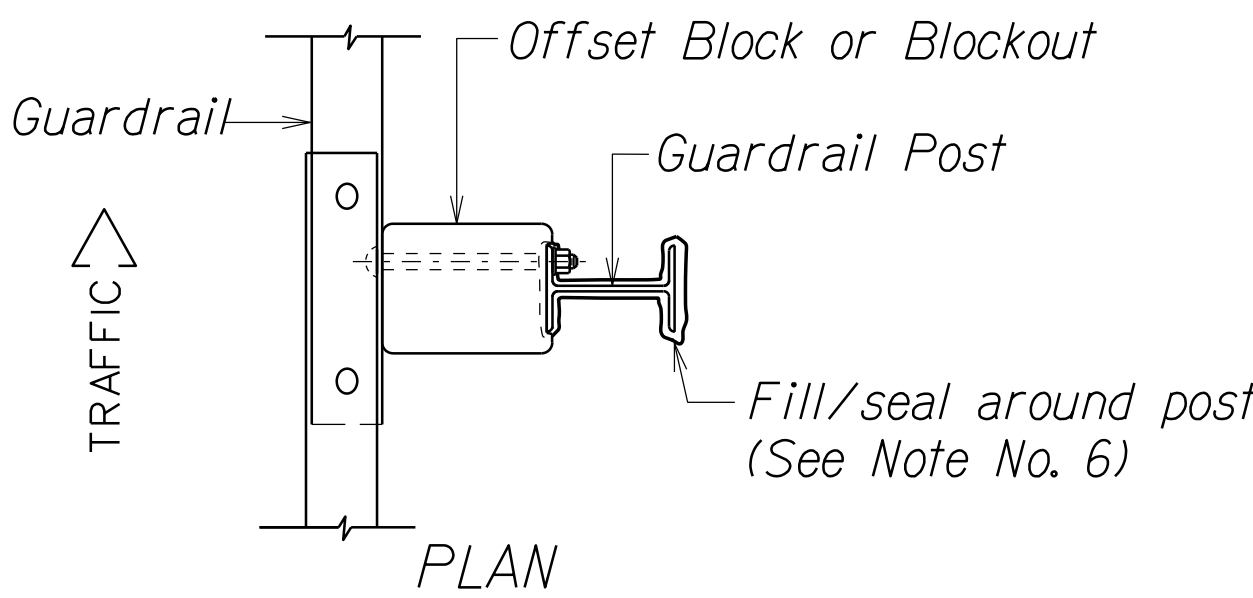


GENERAL NOTES

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 by the Engineer.
3. All fasteners, posts, and rail elements (i.e. FBB03, PWE01, RWM04b, 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 Blockout 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. Minimum working width (clear distance) between back of MGS post to any fixed object is 4'-1" (49").
9. New Hot Mix Asphalt (HMA) pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
10. 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 guardrail system.
11. The pay limit for MSKT-SP-MGS (TL-3), and MAX-Tension (TL-3) is 50 L.F., which shall be measured from Post 1 of the end terminal. Should the manufactured end terminal be less than 50 L.F. in length, the remaining length shall be considered incidental to the end terminal. All end terminal hardware extending beyond Post 1, such as hardware connecting to Post 0, shall also be considered incidental to the end terminal.
12. The pay limit for MSKT-SP-MGS (TL-2), Soft Stop Terminal (TL-2), and MAX-Tension (TL-2) is 25 L.F., which shall be measured from Post 1 of the end terminal. Should the manufactured end terminal be less than 25 L.F. in length, the remaining length shall be considered incidental to the end terminal. All end terminal hardware extending beyond Post 1, such as hardware connecting to Post 0, shall also be considered incidental to the end terminal.

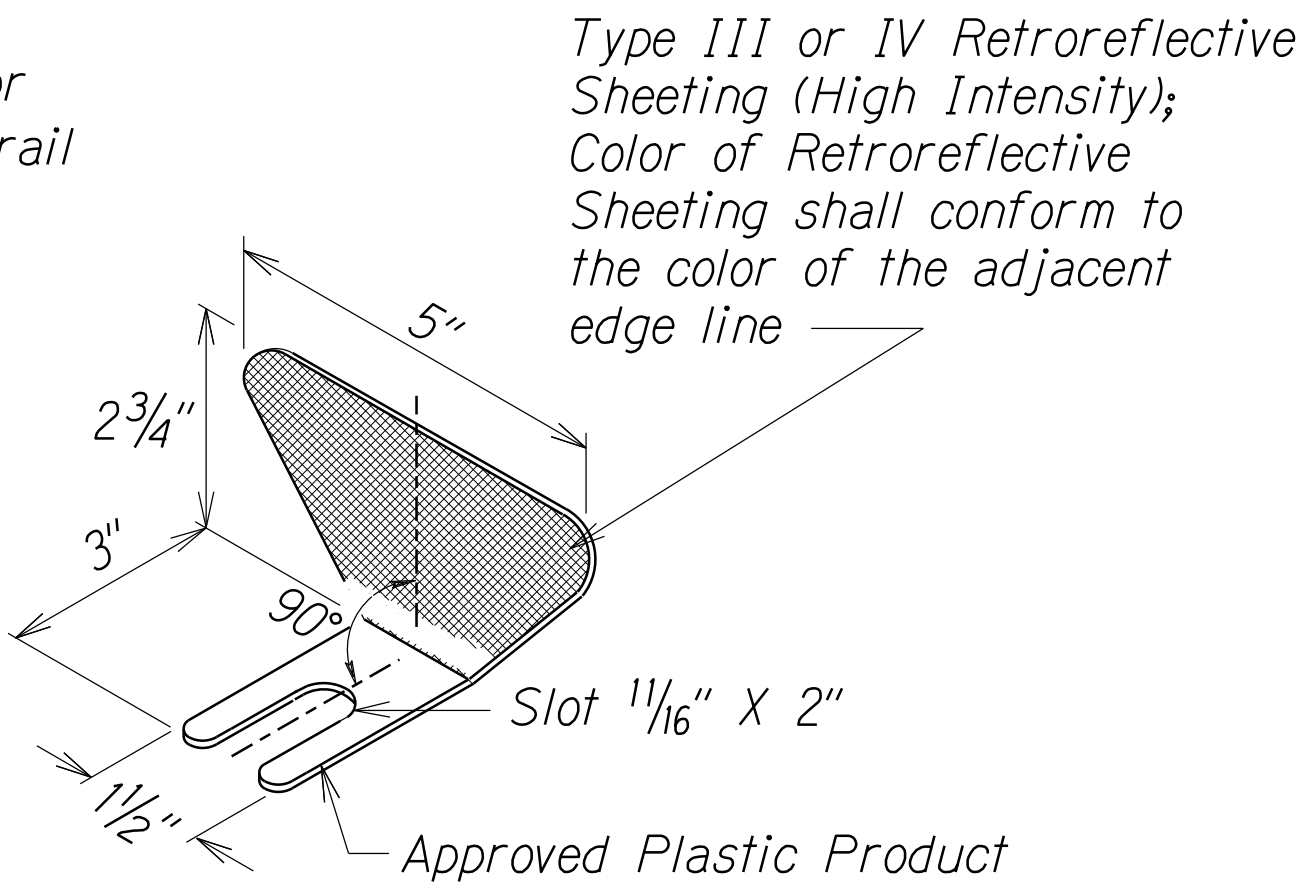
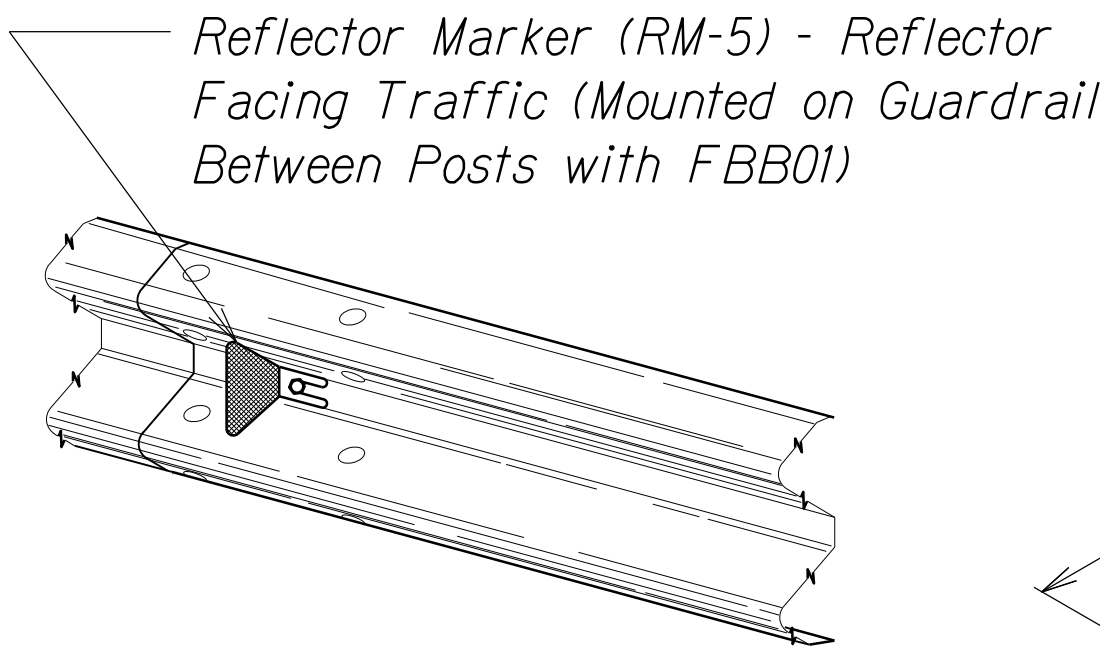


STEEL POST AND BLOCK DETAIL



TYPICAL GUARDRAIL INSTALLATION

GUARDRAIL TYPE	DIMENSION	
	H	A
MGS w/ Standard 8" Offset Block	2'-1"	1'-6"
MGS w/ No Blockout	2'-7/8"	9 1/4"



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES

PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-1(013)

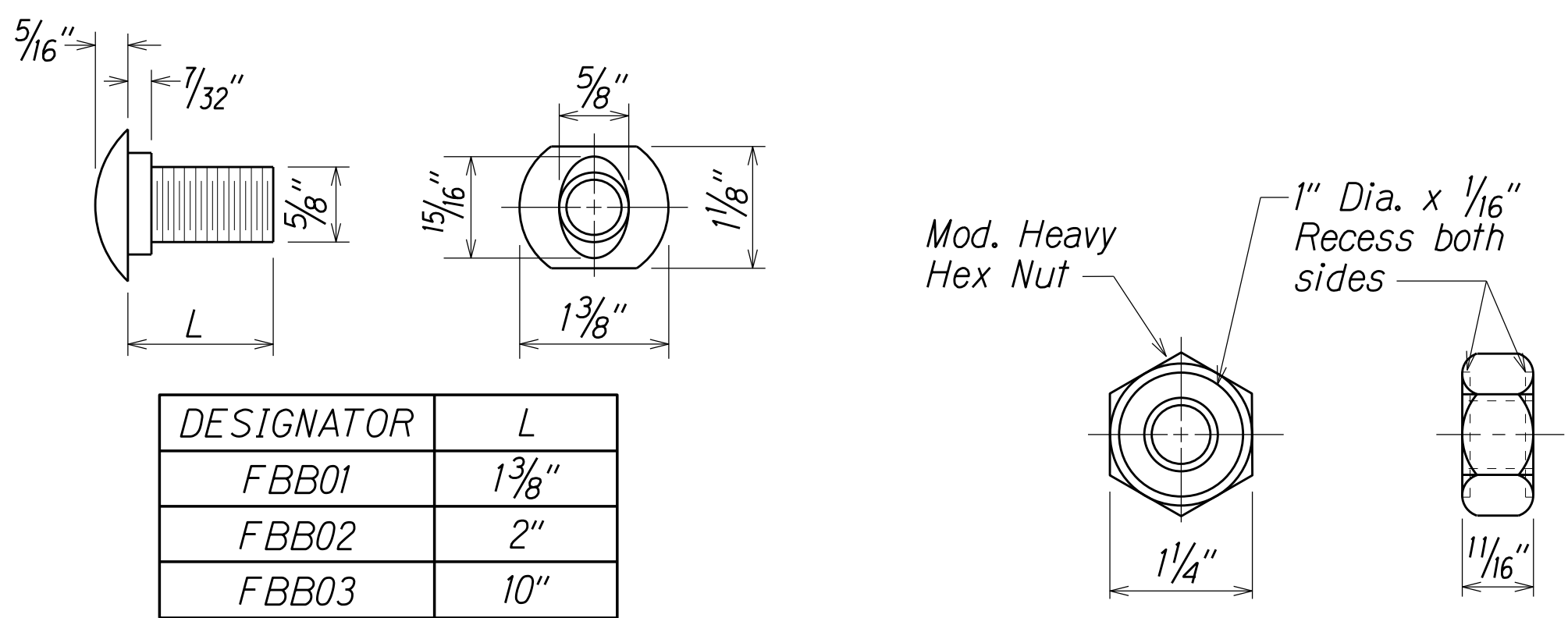
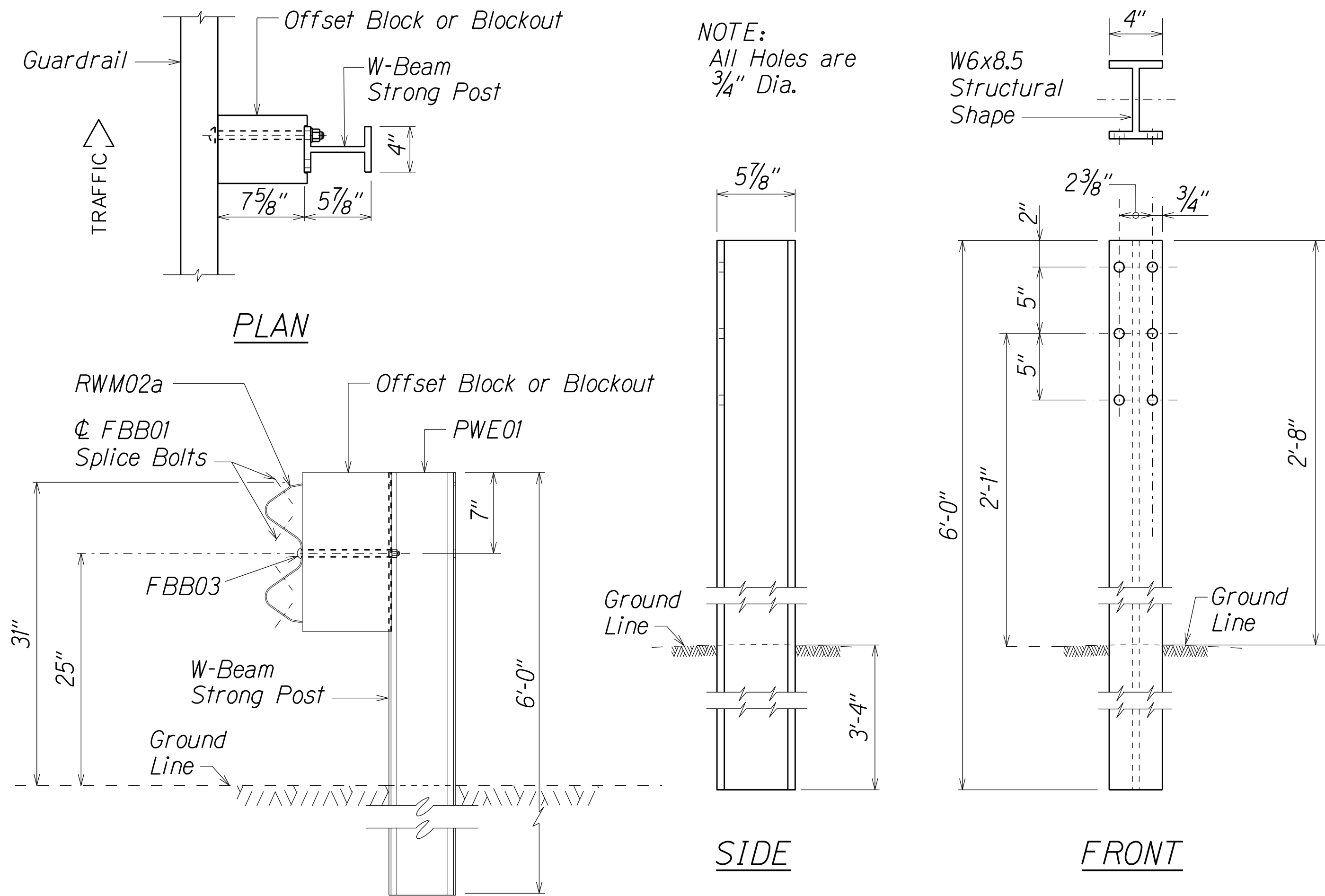
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SHEET No. 1 OF 9 SHEETS

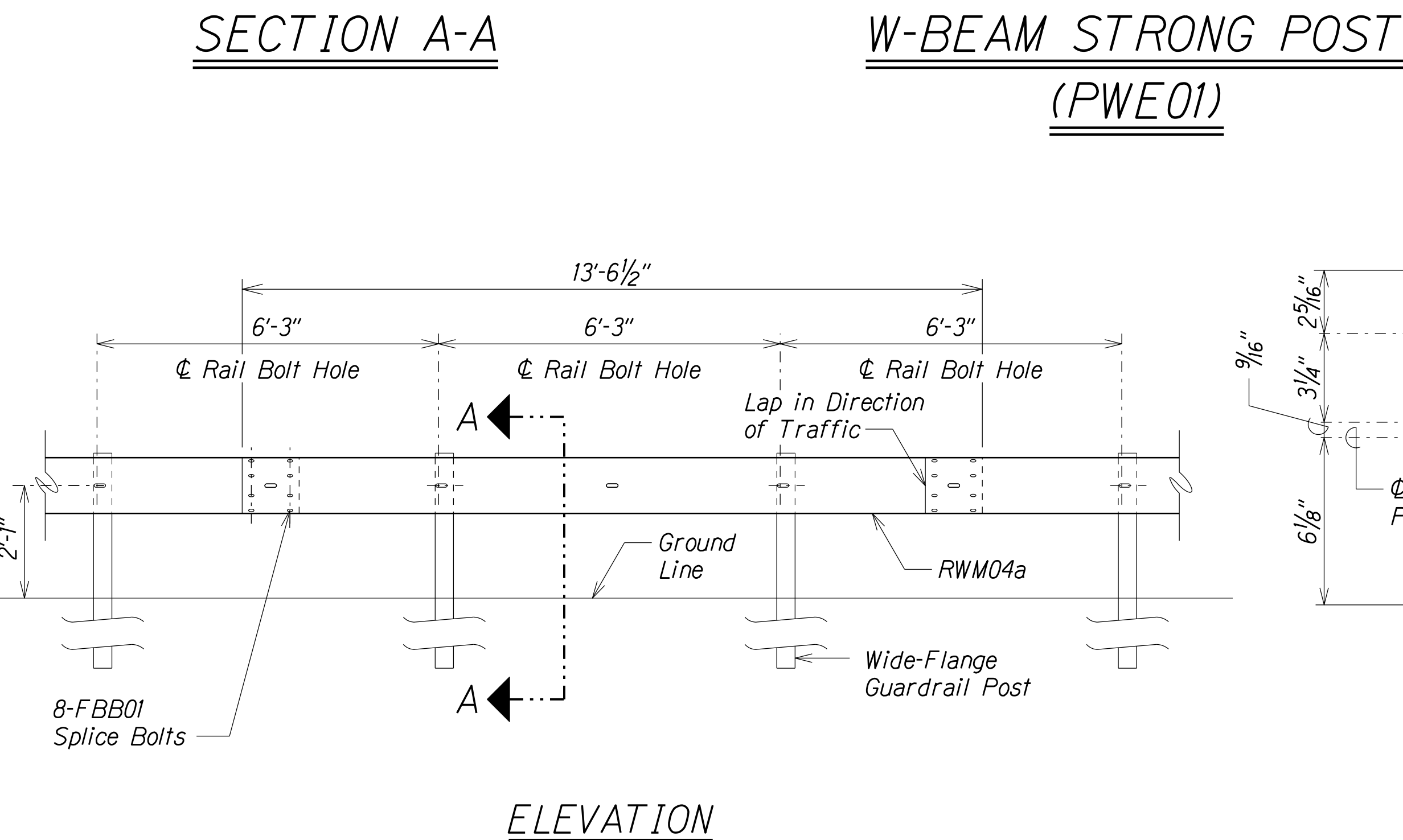
SURVEY PLOTTED BY	DATE
DRAWN BY	
TRACED BY	
DESIGNED BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	

r09/15/17 Dusr2\Ernest\standards\Traffic Guardrail Standards\ml_1650rev.dgn

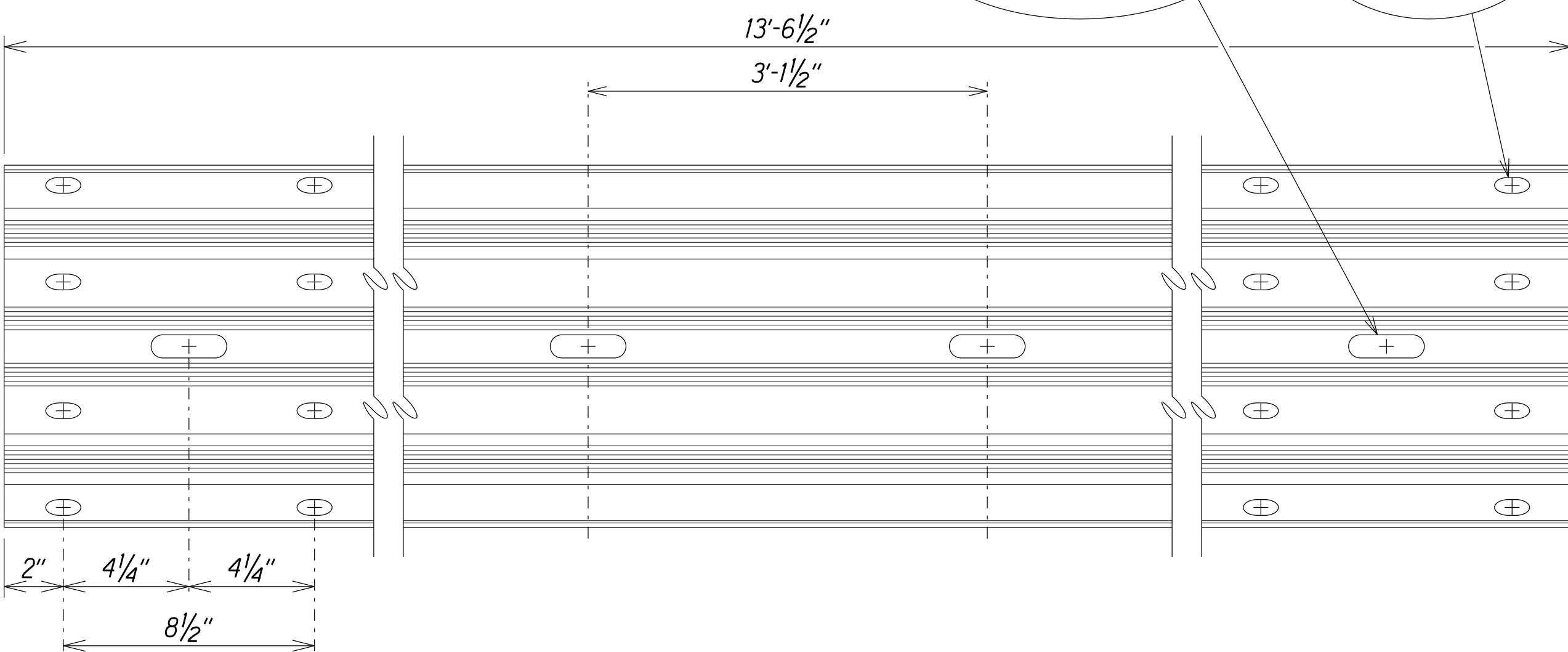
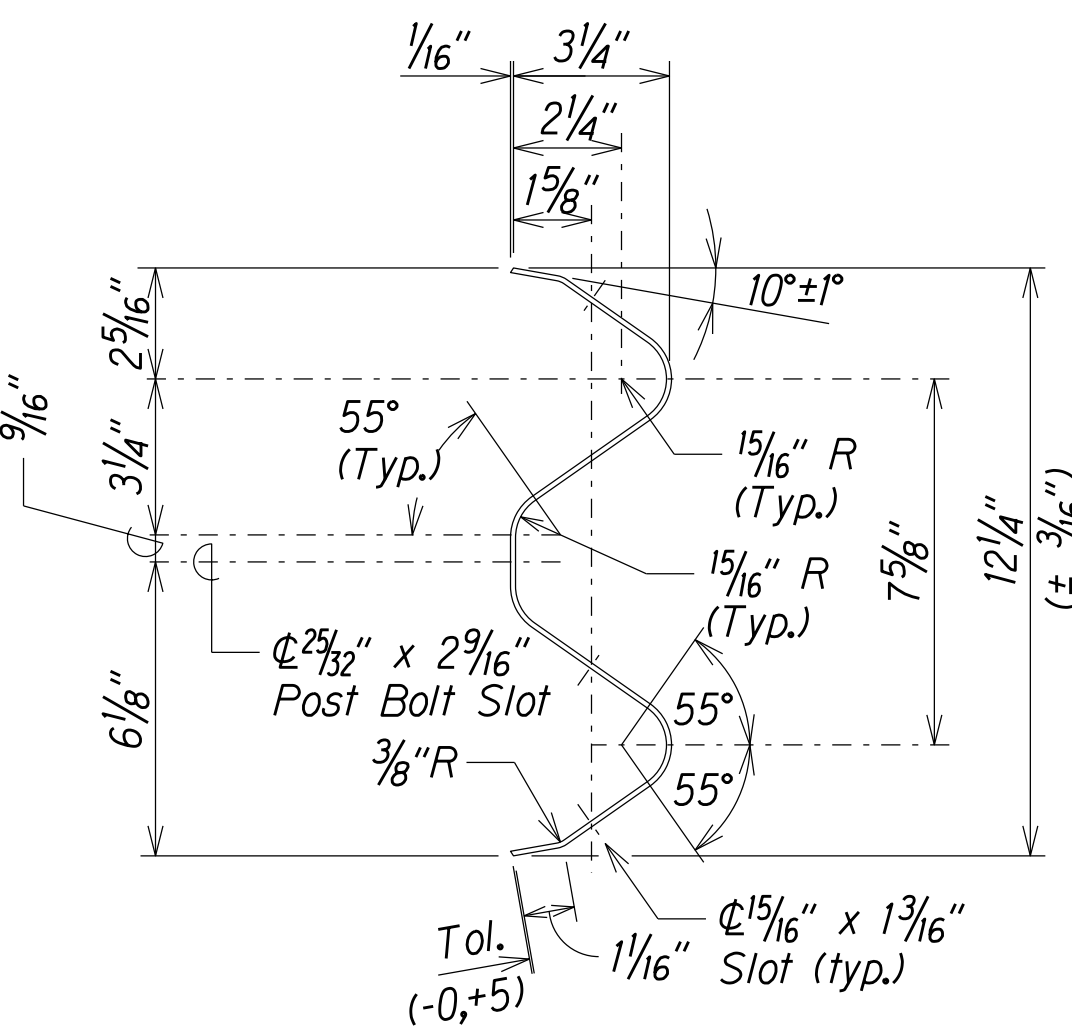
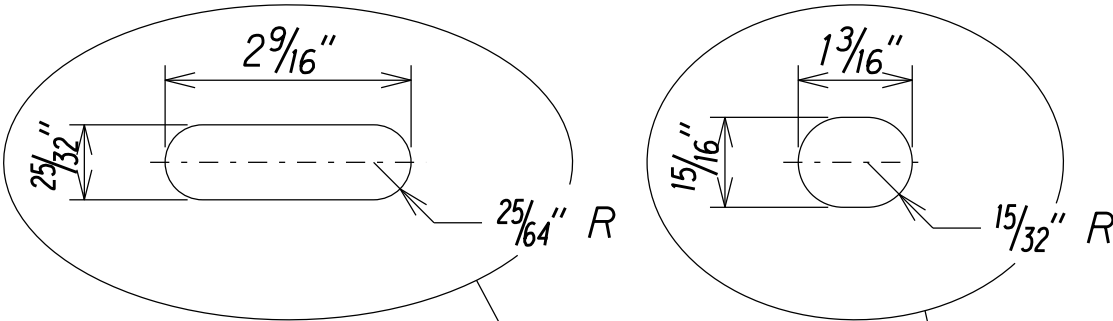
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-K013	2019	8	39



GUARDRAIL BOLTS AND RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWM04a	12 Gauge

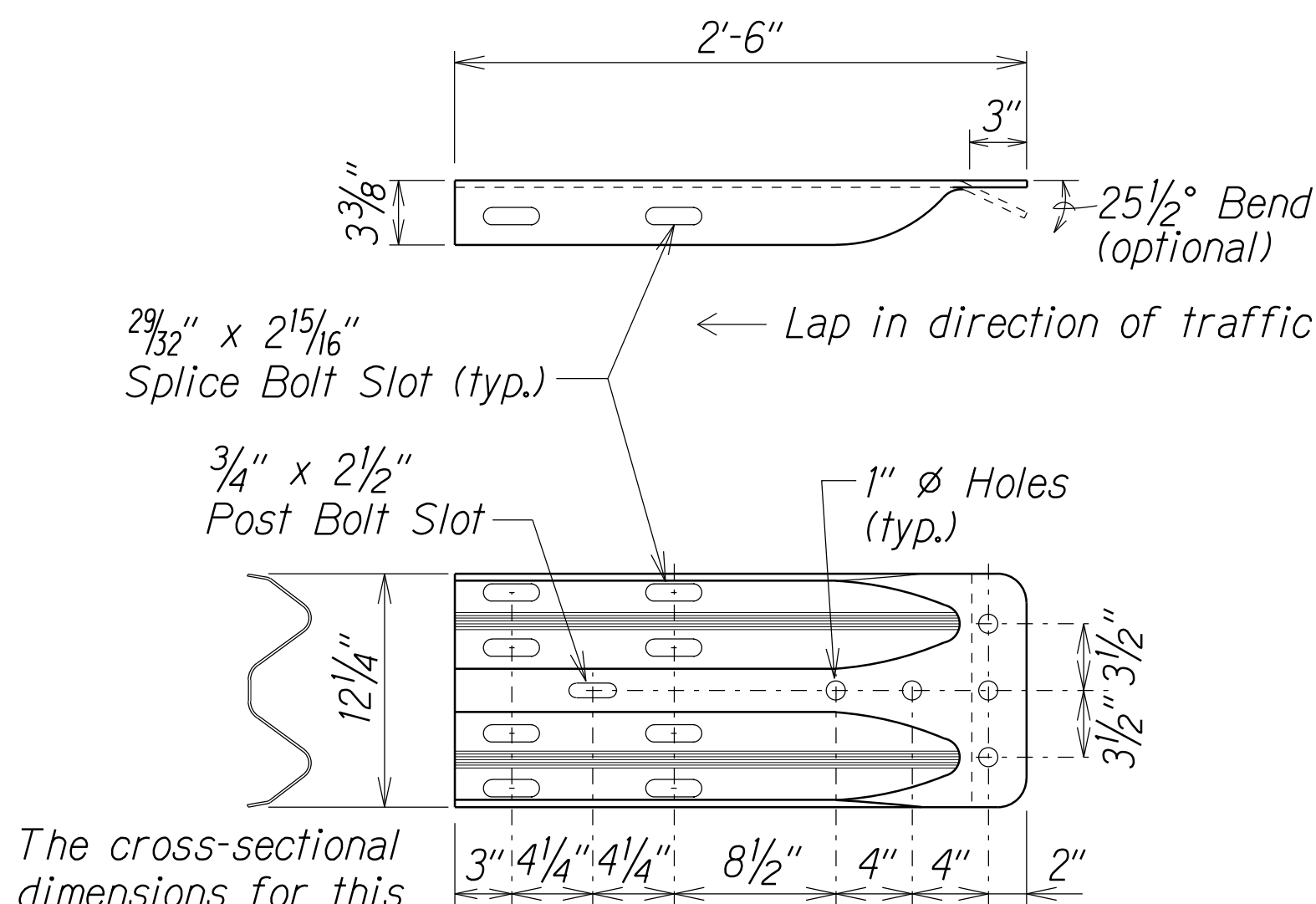


4 SPACE W-BEAM GUARDRAIL (RWM04a)

MIDWEST GUARDRAIL SYSTEM WITH STANDARD 8" OFFSET BLOCK (SGR47)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
**31" W-BEAM GUARDRAIL WITH
STANDARD 8" OFFSET BLOCK**
PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-K013
Scale: NTS Date: August, 2018
SHEET No. 2 OF 9 SHEETS

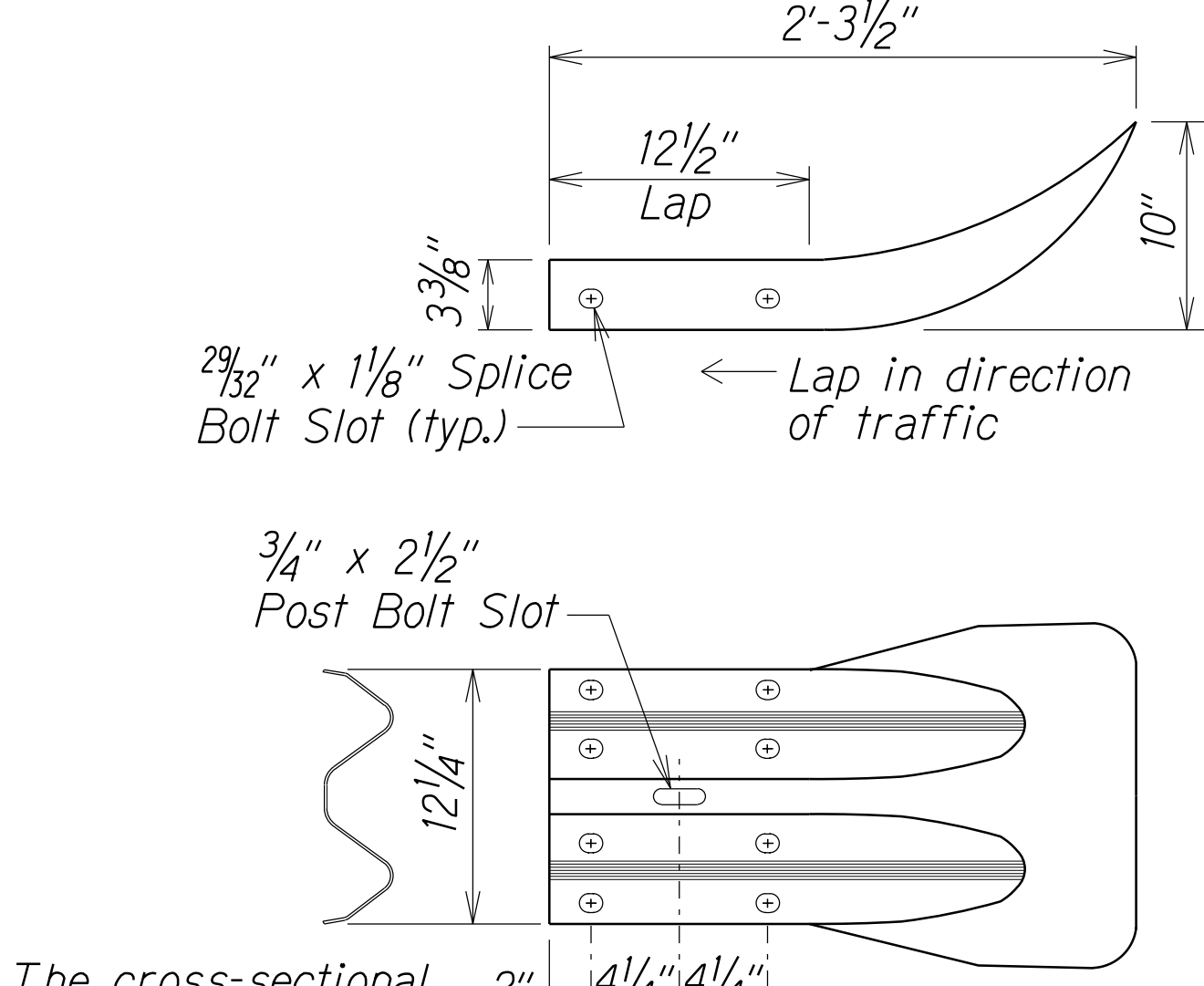
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-031-1(013)	2019	9	39



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE02b	10 Gauge

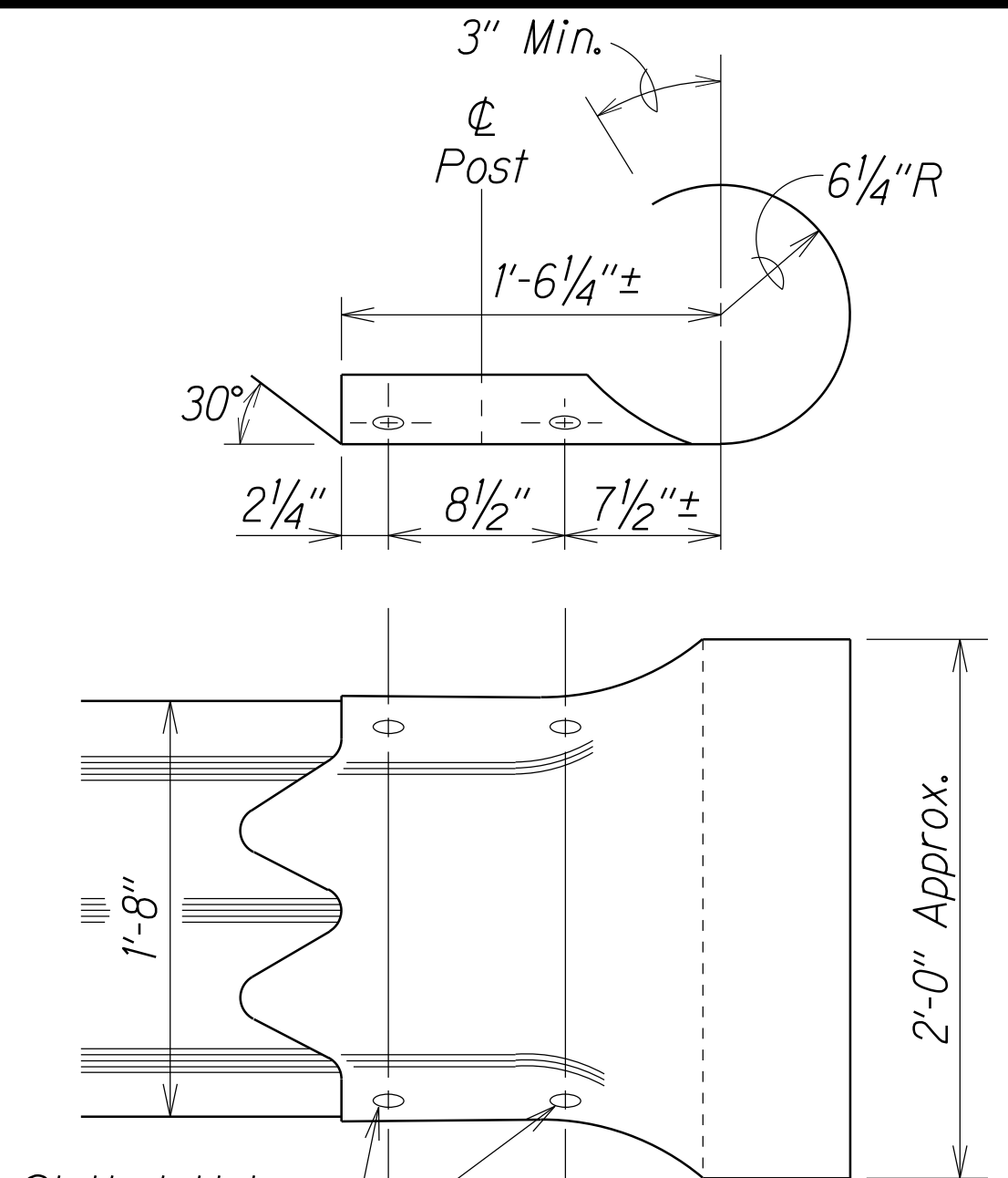
W-BEAM TERMINAL CONNECTOR (RWE02b)



The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

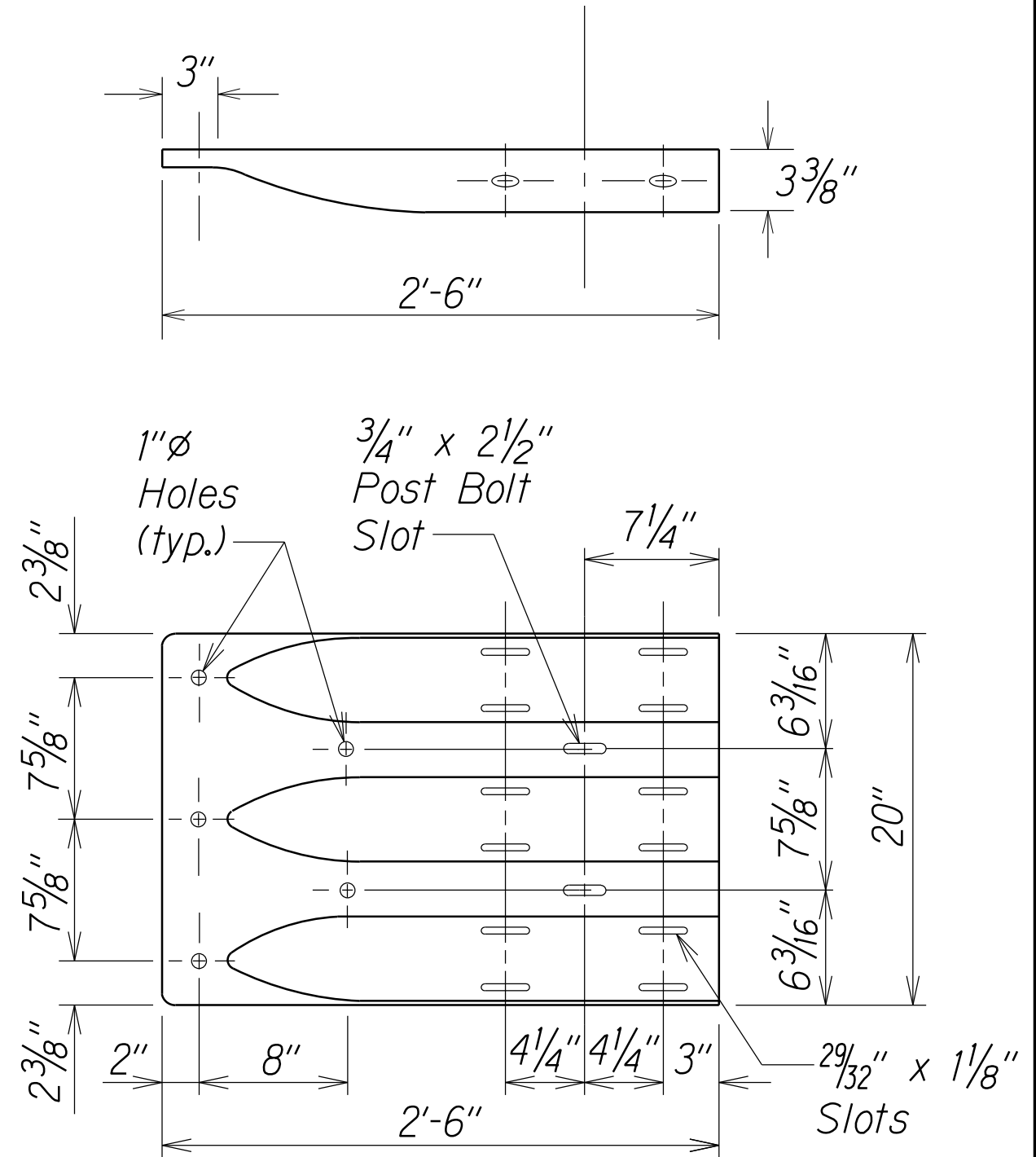
DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 Gauge

W-BEAM END SECTION (FLARED RWE01a)



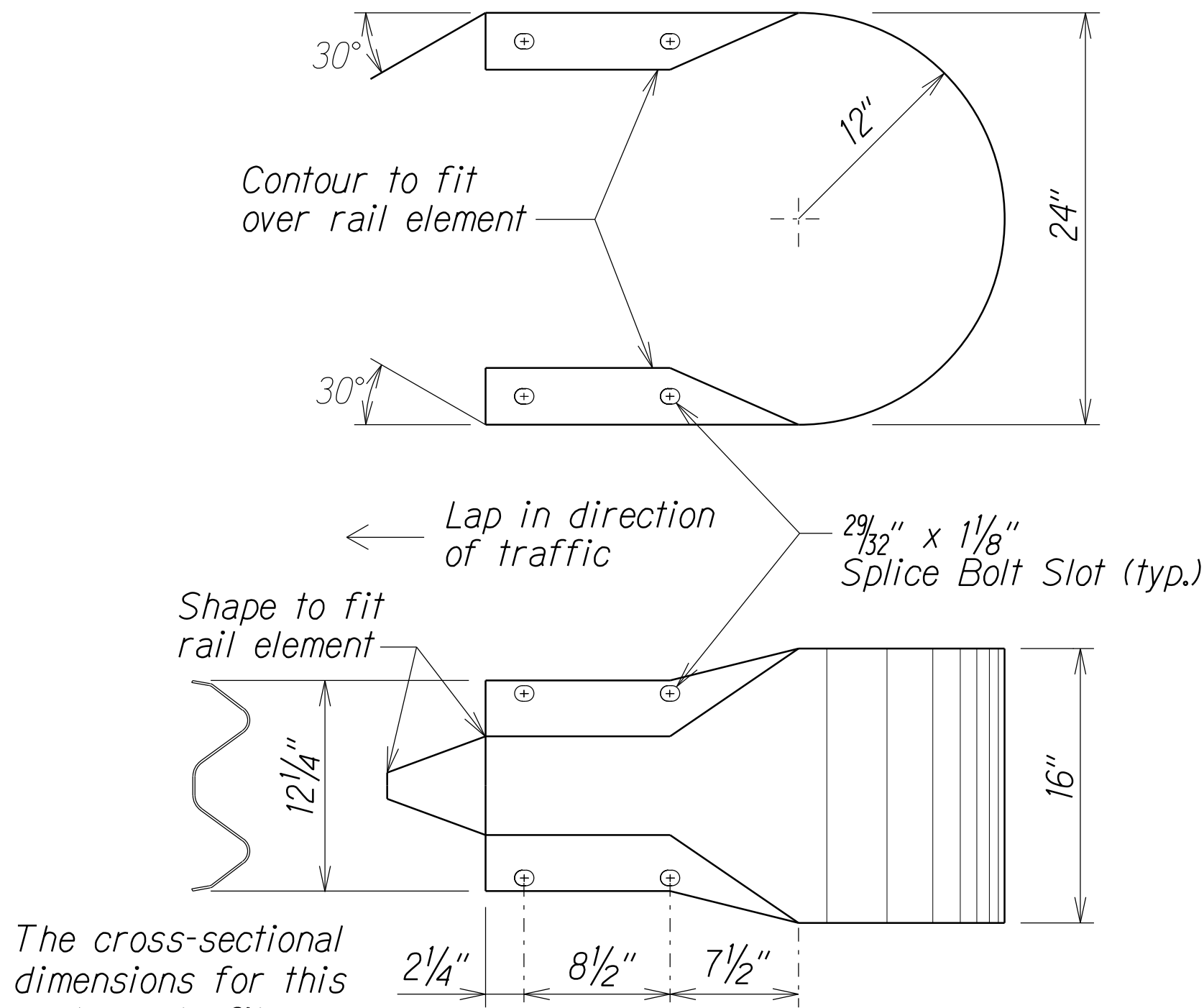
DESIGNATOR	BASE METAL THICKNESS
RTE02b	10 Gauge

THRIE-BEAM SECTION (ROUNDED) (RTE02b)



DESIGNATOR	BASE METAL THICKNESS
RTE01b	10 Gauge

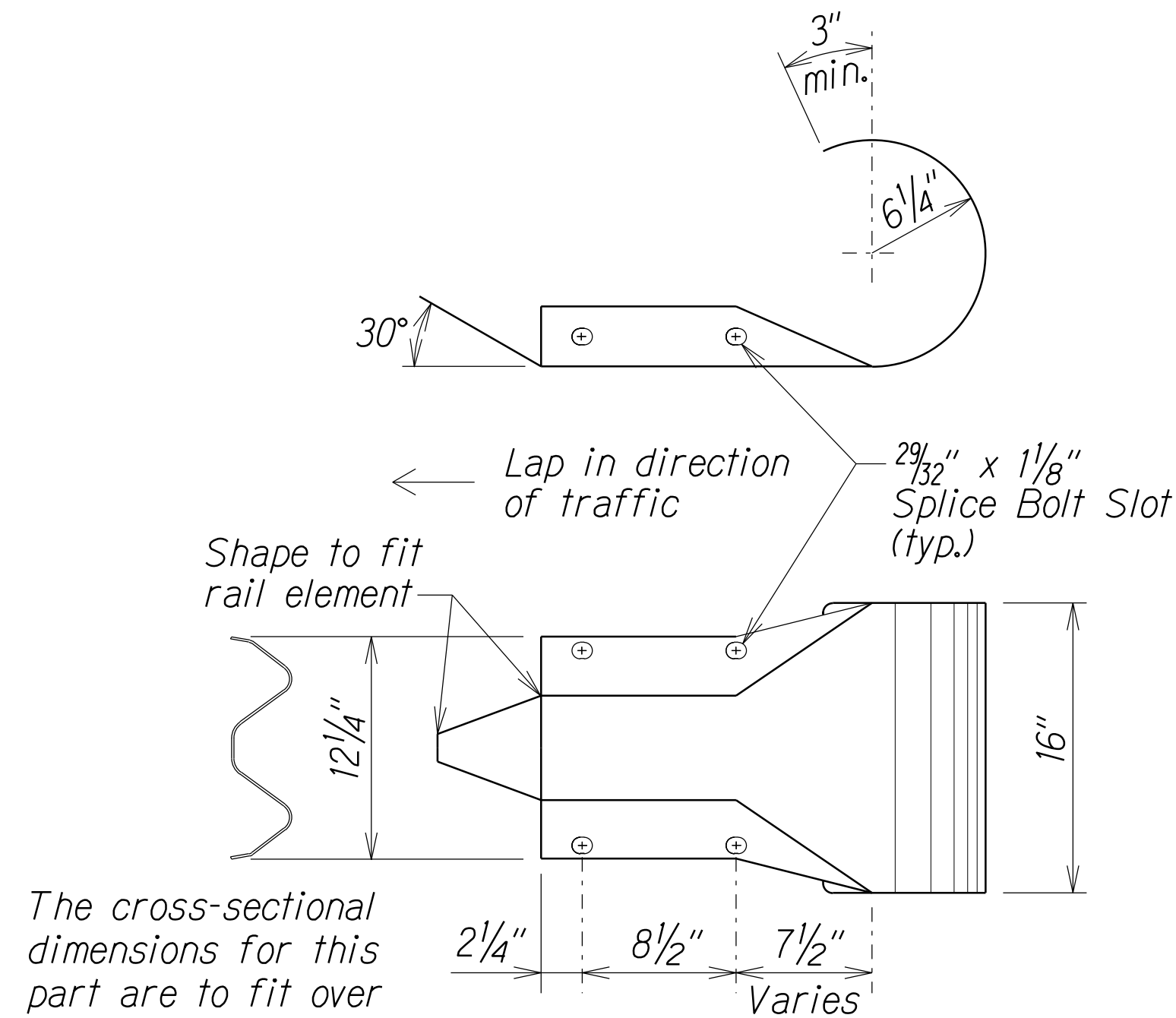
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



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

DESIGNATOR	BASE METAL THICKNESS
RWE06a	12 Gauge

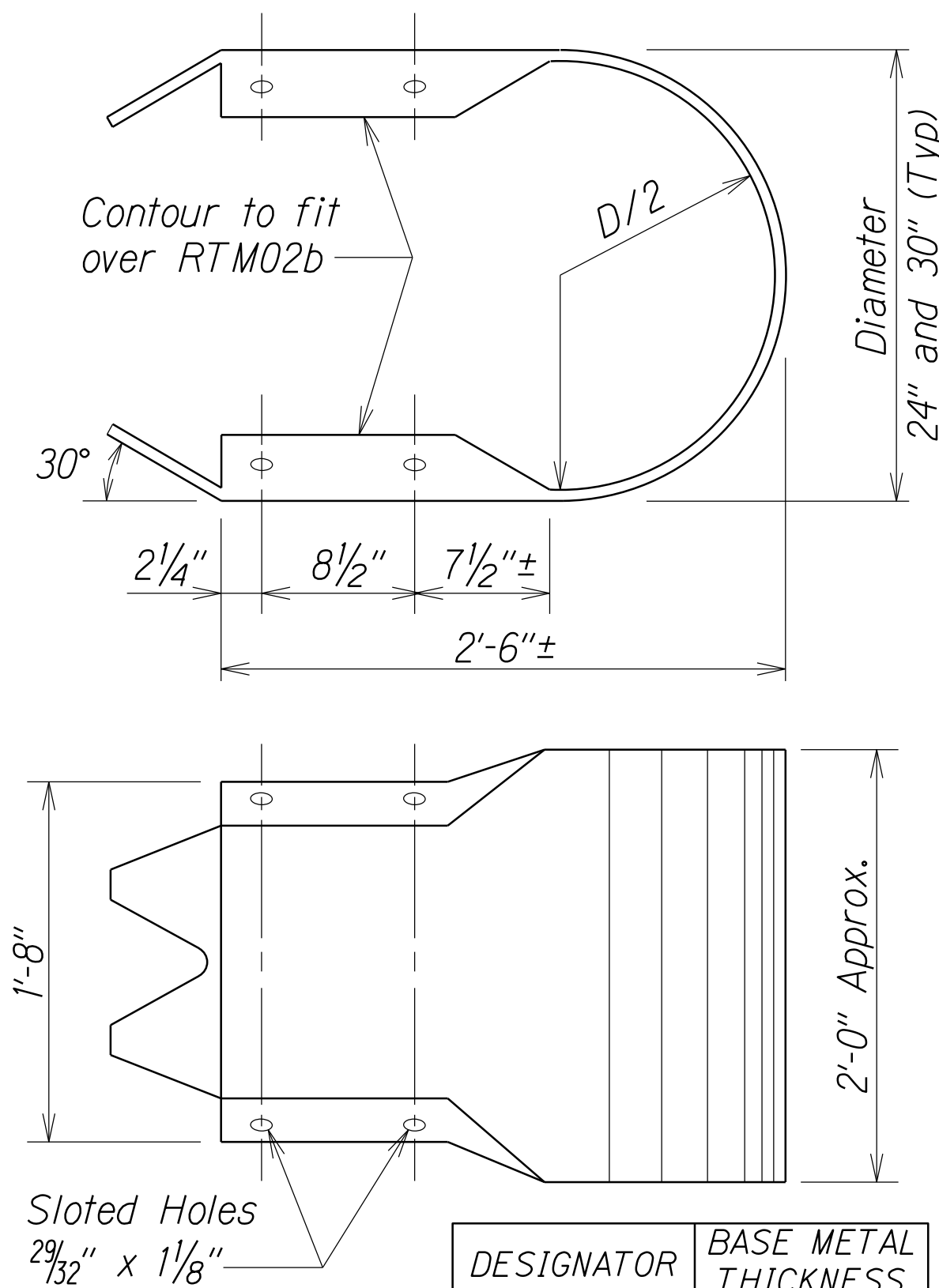
W-BEAM END SECTION (BUFFER RWE06a)



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

DESIGNATOR	BASE METAL THICKNESS
RWE03a	12 Gauge

W-BEAM END SECTION (ROUNDED RWE03a)



DESIGNATOR	BASE METAL THICKNESS
RTE03b & RTE04b	10 Gauge

THRIE-BEAM END SECTION (BUFFER RTE03b or RTE04b)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**GUARDRAIL TERMINAL CONNECTORS
AND END SECTIONS**

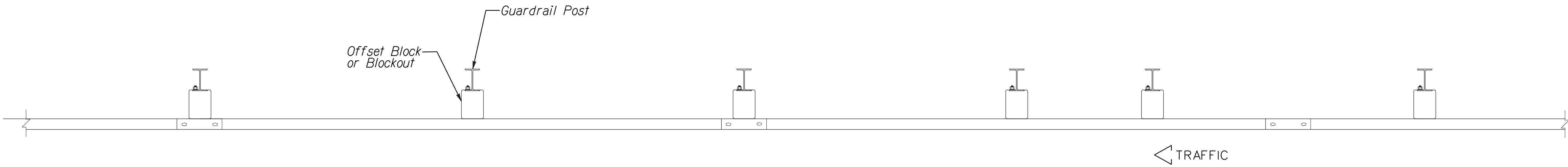
PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HSIP-031-1(013)
Scale: NTS Date: June, 2019

SHEET No. 3 OF 9 SHEETS

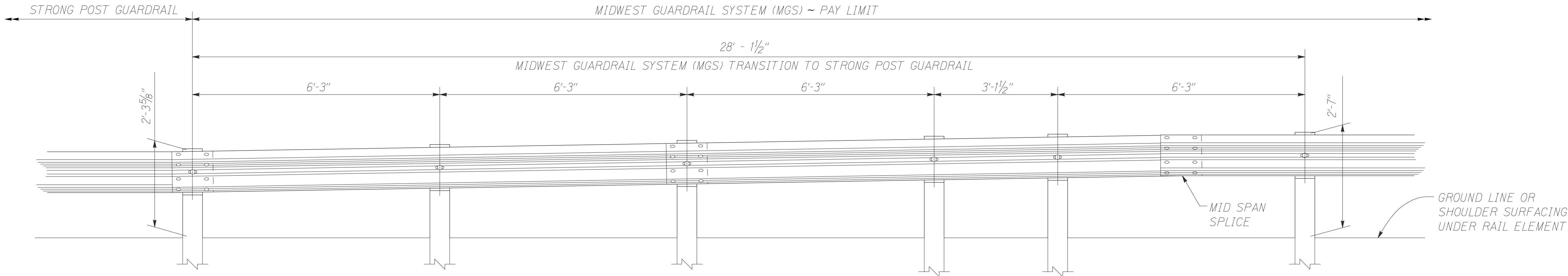
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	DESIGNED BY	
	CHECKED BY	

Drawn by Ernest/Standards/Traffic Guardrail Standards/md_tes5rev.dgn
r0728/17

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-K(013)	2019	10	39



PLAN



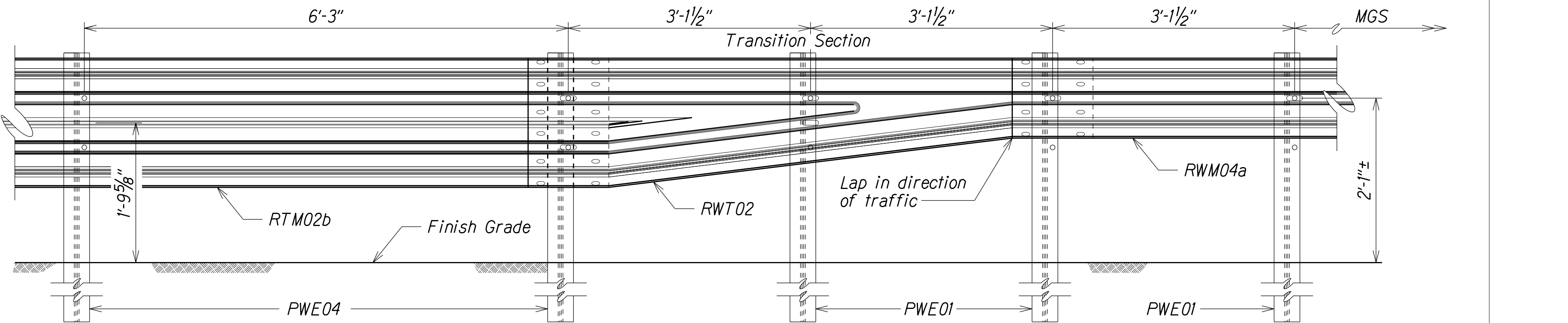
ELEVATION

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

r09/06/16 D:\r09\standards\Traffic Guardrail Standards\ml_midwest.dgn

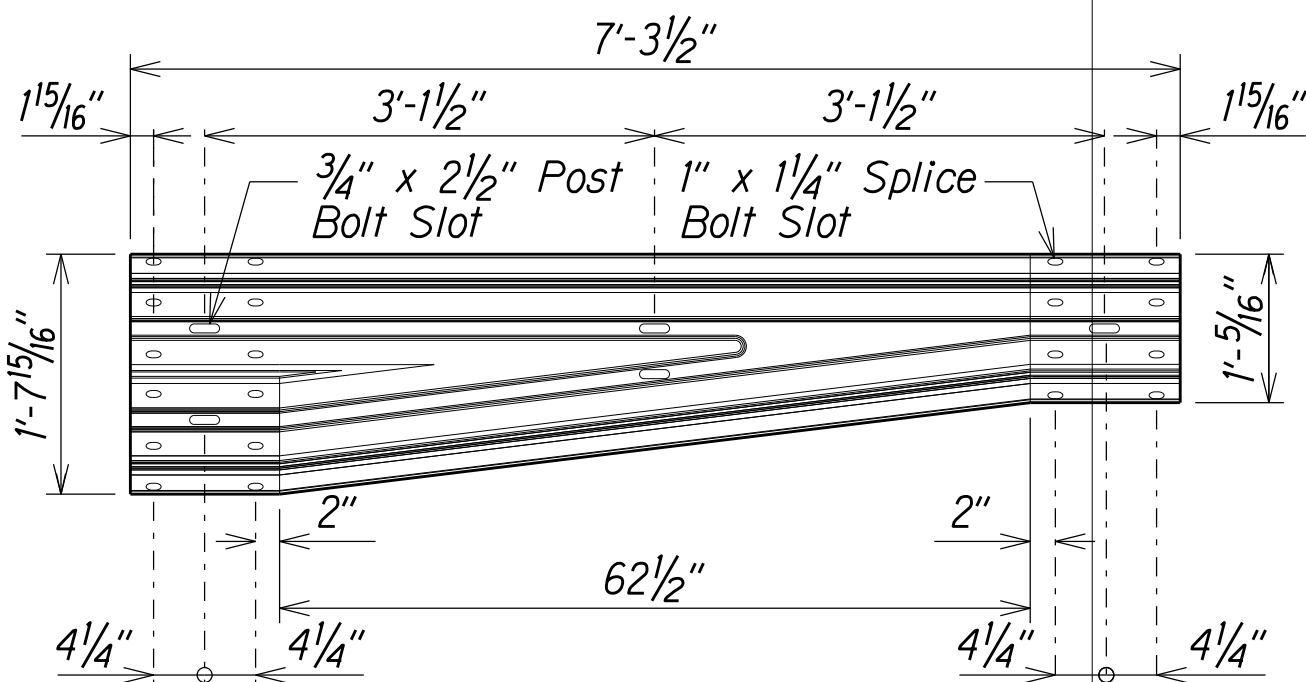
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
MGS TRANSITION TO
STRONG POST GUARDRAIL
PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-K(013)
Scale: NTS Date: April, 2019
SHEET No. 4 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-K013	2019	11	39



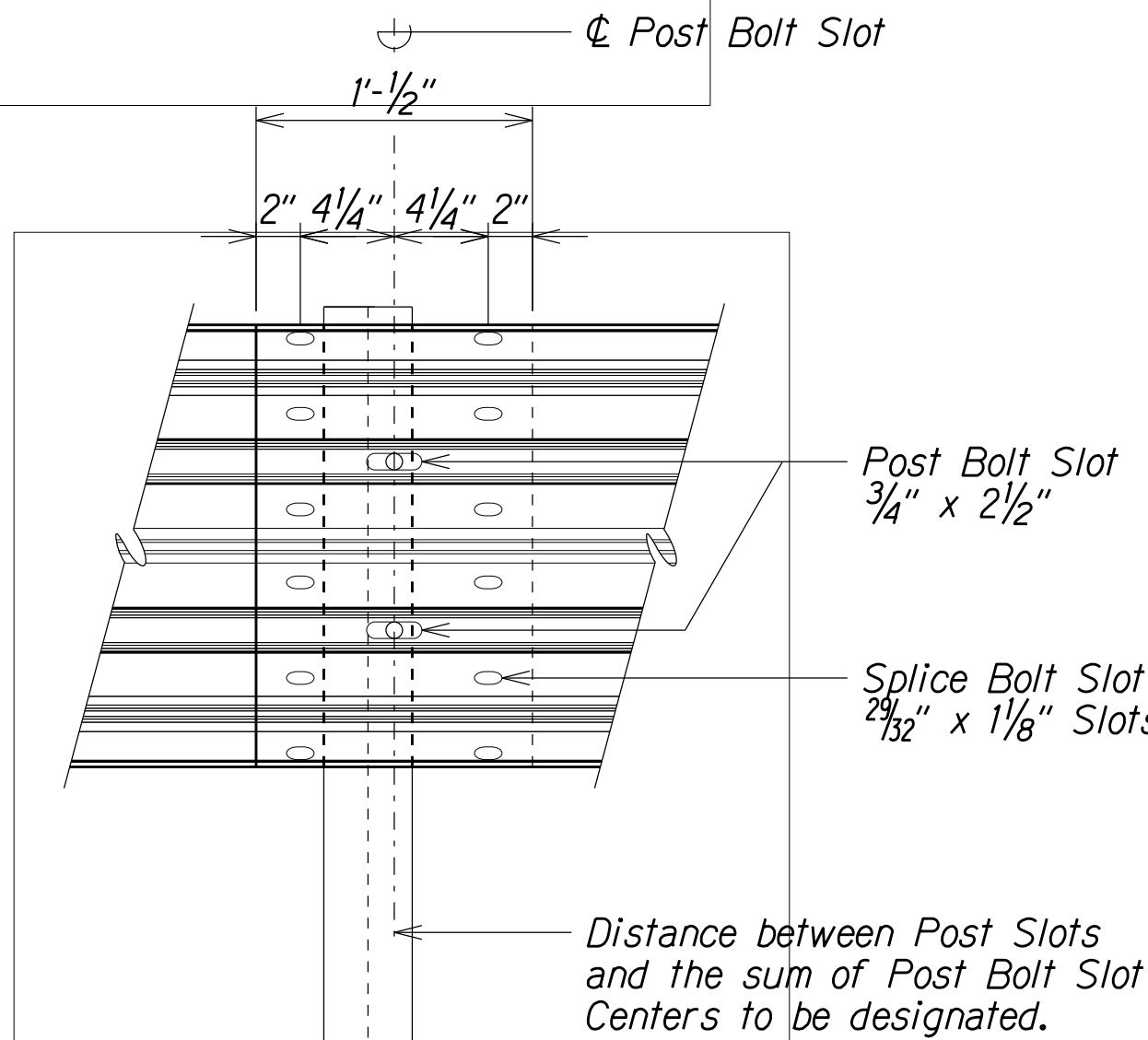
* Not to be used for Thrie Beam connection to structures.

TRANSITION SECTION*

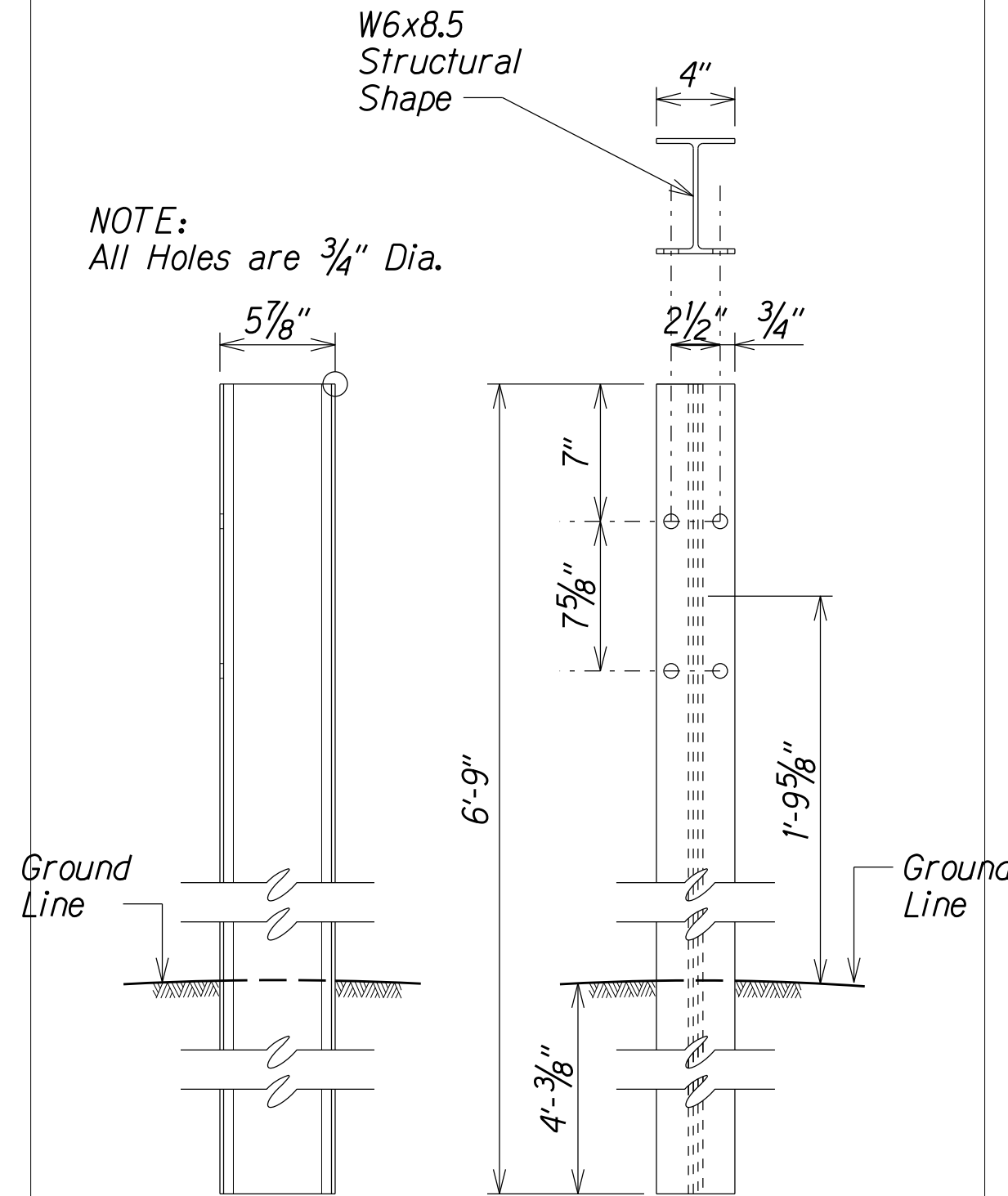


TRANSITION SECTION (RWT02)

Reflector Marker (RM-5) - Reflector Facing Traffic (Mounted on Guardrail Bolt). For details and notes, see Guardrail Details & Notes sheet.

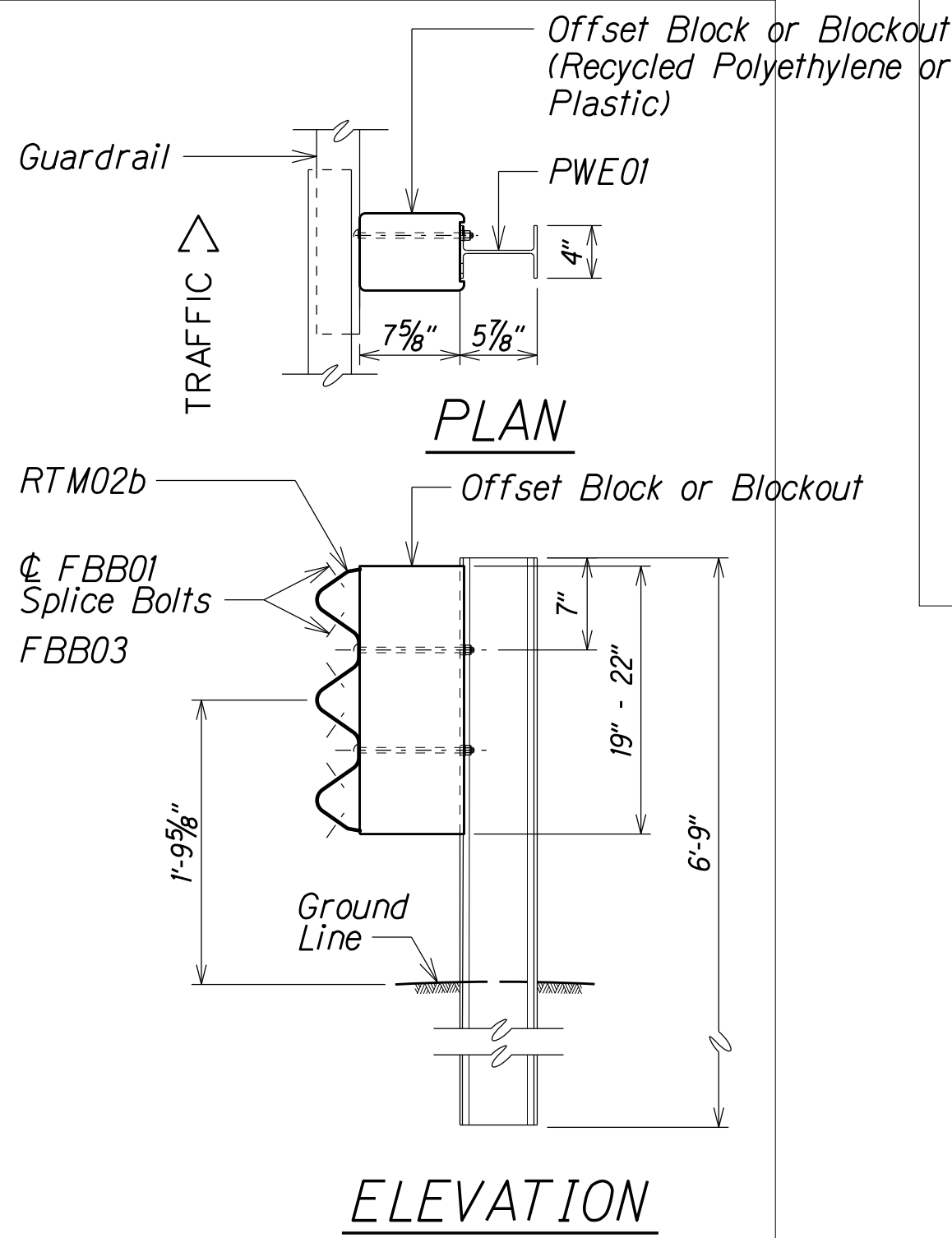


RAIL SPLICE



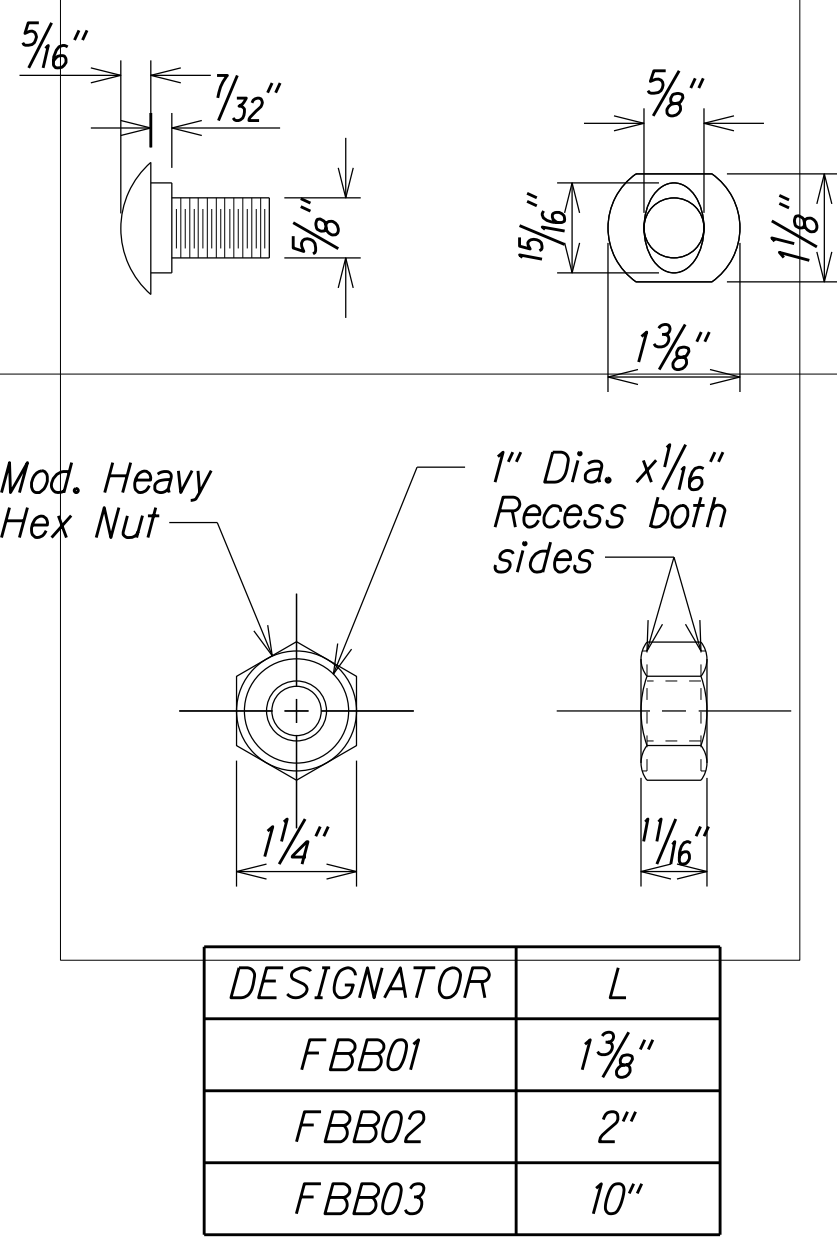
THRIE-BEAM STRONG POST FOR PLASTIC SPACER BLOCKS

PWE04



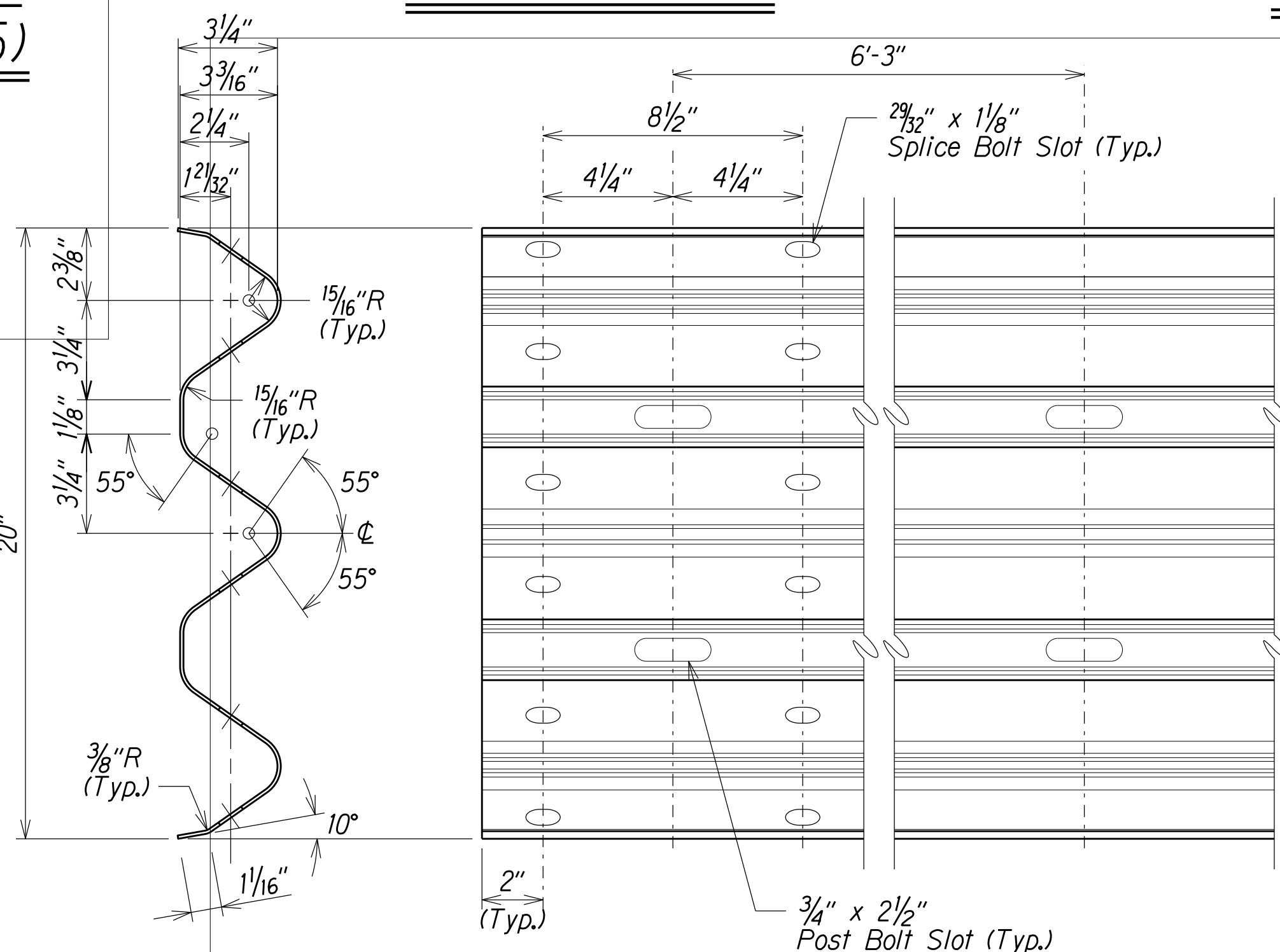
STRONG POST THRIE-BEAM GUARDRAIL (SGR09a)

TYPICAL INSTALLATION OF REFLECTOR MARKER (RM-5)



GUARDRAIL BOLTS AND RECESSED NUT

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

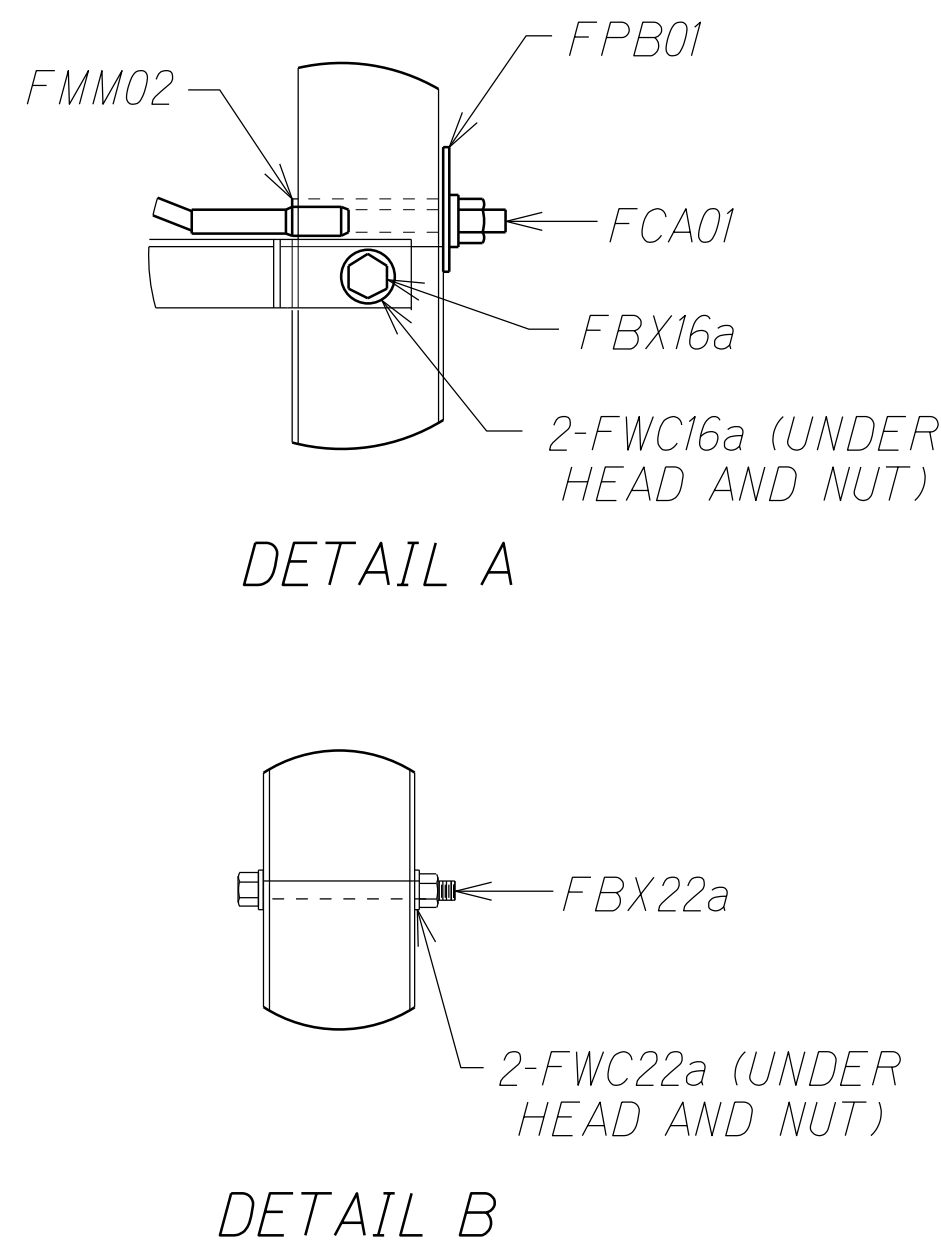
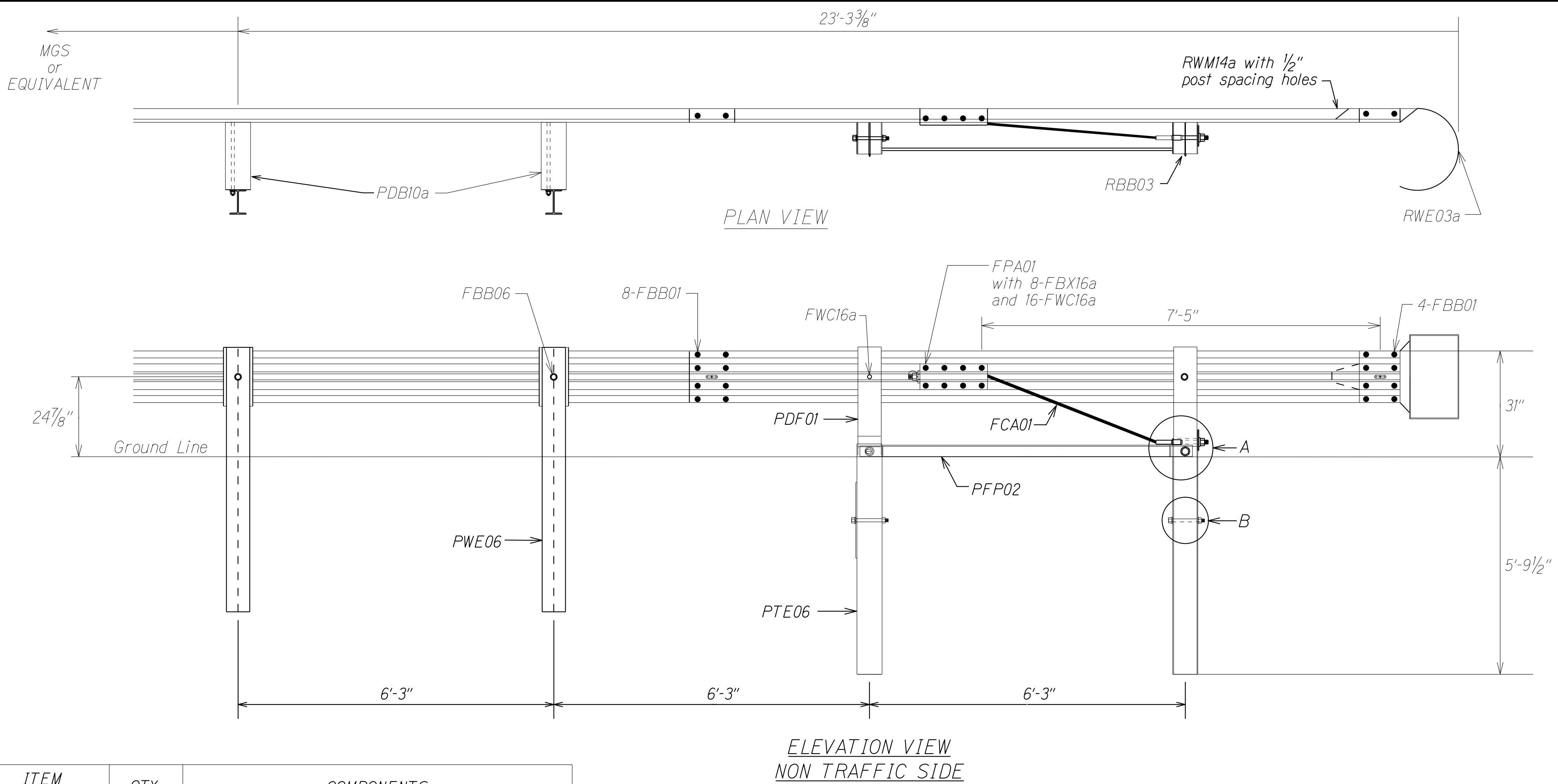


1 & 2 SPACE THRIE-BEAM GUARDRAIL (RTM02b)

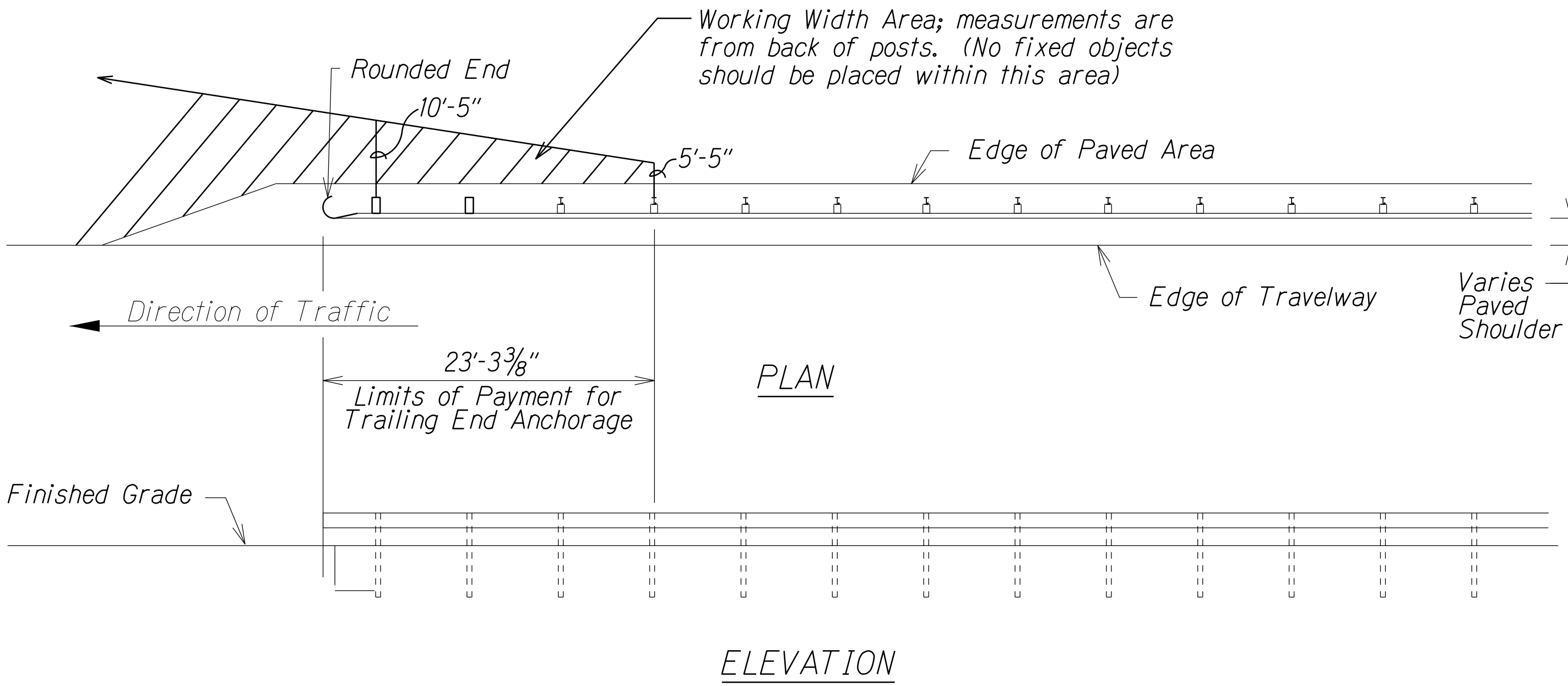
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST
THRIE-BEAM GUARDRAIL
PILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-K013
Scale: NTS
Date: June, 2019

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-031-1(013)	2019	12	39



ITEM NO.	QTY	COMPONENTS
FBB01	12	Guardrail Bolt and Nut
FBB03	2	Guardrail Bolt and Nut
FBB06	1	Guardrail Bolt and Nut
FBX16a	2	Hex Head Bolt (10") and Nut
FBX16a	8	Hex Head Bolt (1 1/2") and Nut
FBX22a	2	Hex Head Bolt (7 1/2") and Nut
FCA01	1	BCT Anchor Cable Assembly
PDB10a	2	MGS Timber Blockout
PFP02	1	Strut and Yoke Assembly
PWE06	1	Wide-Flange Guardrail Post
FMM02	1	BCT Post Sleeve
FPA01	1	Anchor Bracket Assembly
FPB01	1	BCT Bearing Plate
FWC16a	22	Circular Washer
FWC22a	4	Circular Washer
PDF01	2	BCT Timber Post
PTE06	2	Foundation Tube
RWE03a	1	W-Beam Rounded End Section
RWM14a	1	W-Beam MGS End Section



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

11/16/17 1d2m/guardrail/M-8

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**TRAILING-END ANCHORAGE
SYSTEM**

PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HSIP-031-1(013)

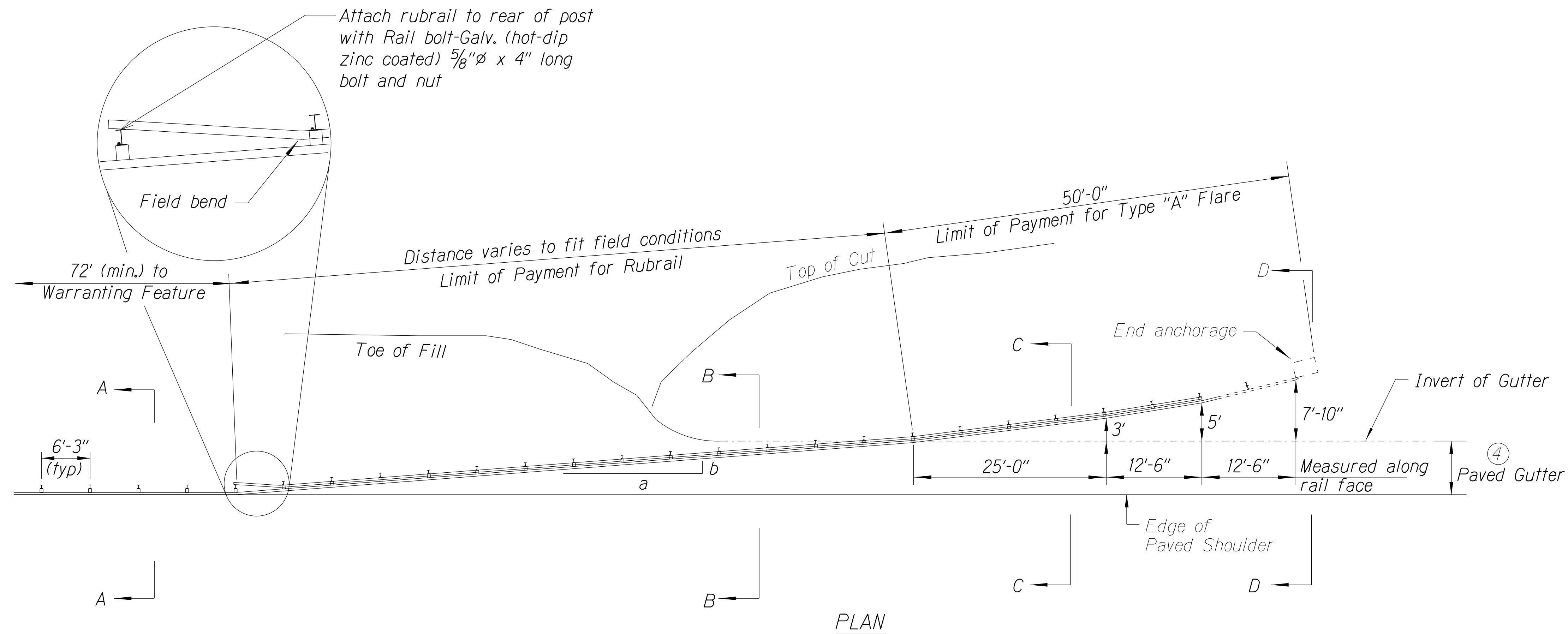
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SHEET No. 6 OF 9 SHEETS

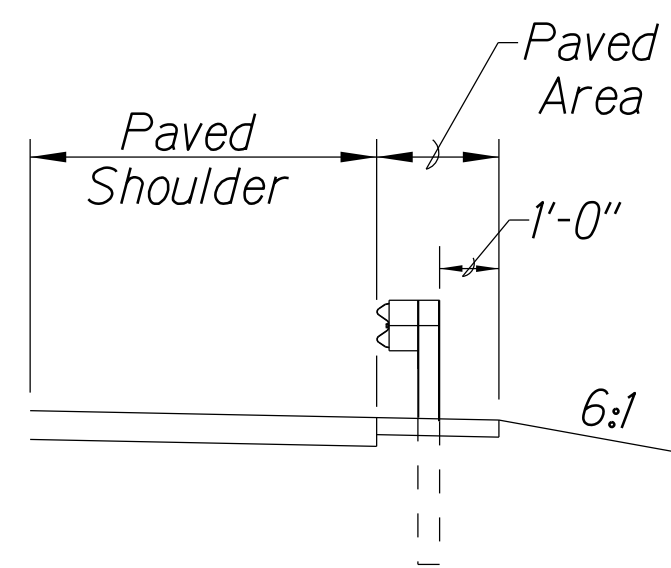
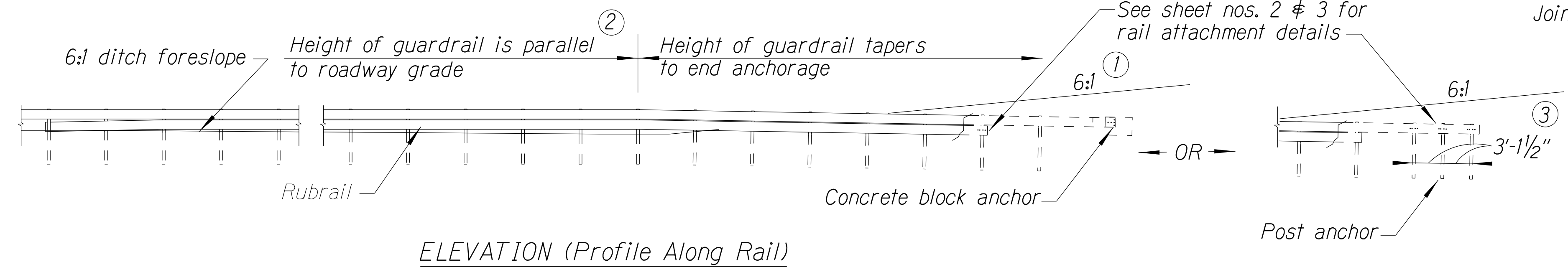
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-1(013)	2019	13	39

General Notes

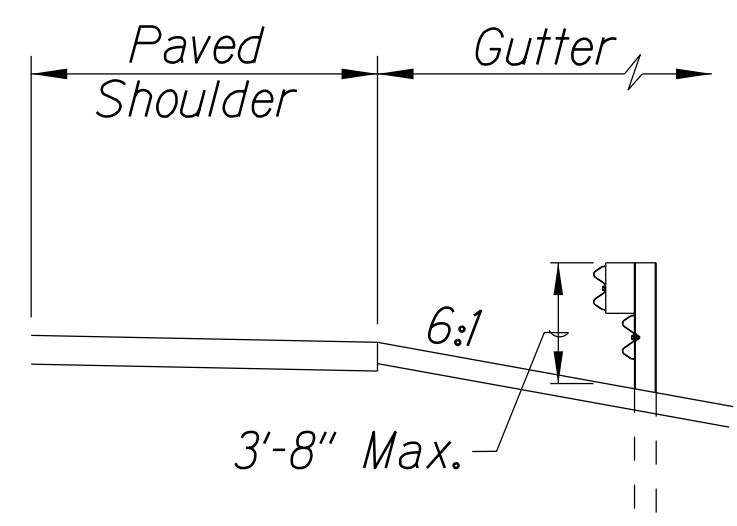
1. A 6:1 or flatter slope is desirable. However, a steeper or flatter existing slope may be used.
2. Height of guardrail may be tapered down in elevation to maintain 3'-8" maximum height.
3. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the post anchor. 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.



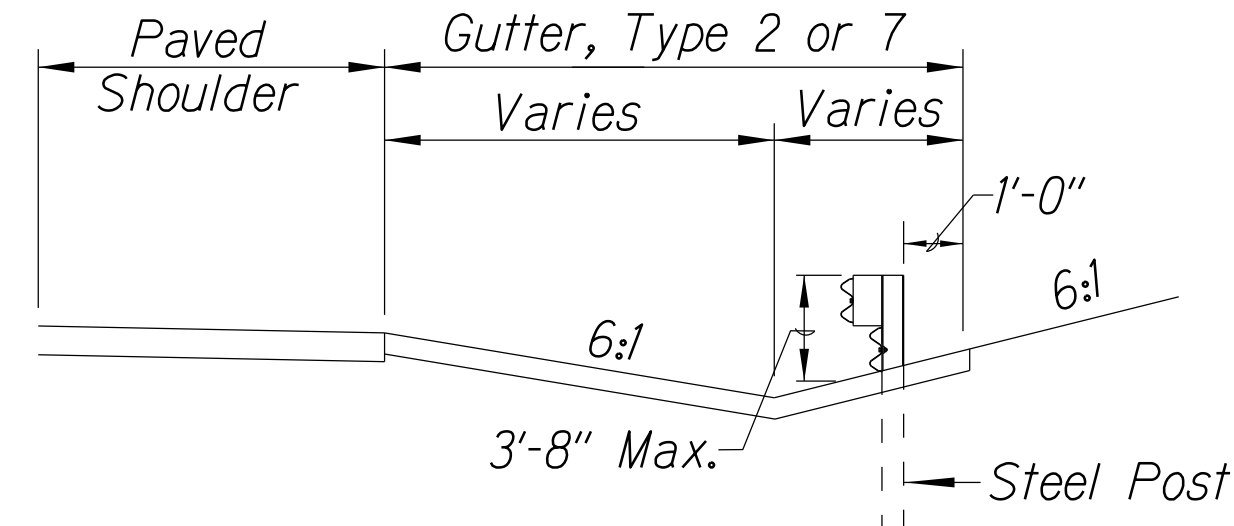
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



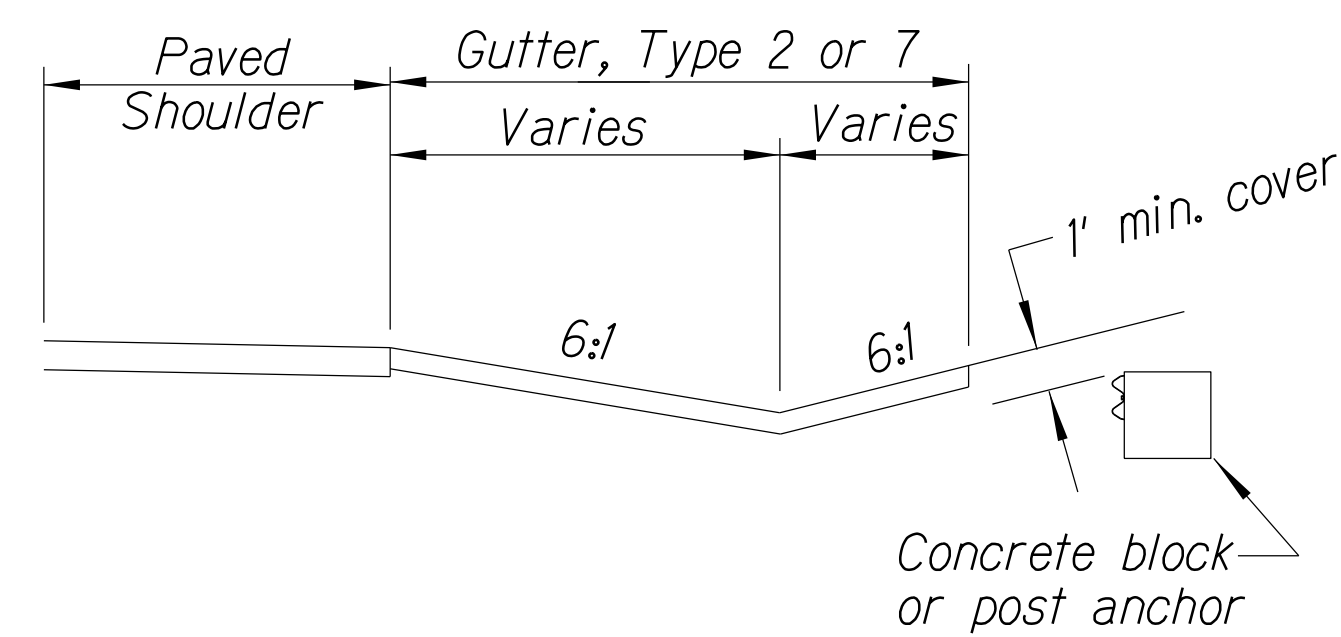
Section A-A



Section B-B
(With Rubrail)



Section C-C
(With Rubrail)



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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

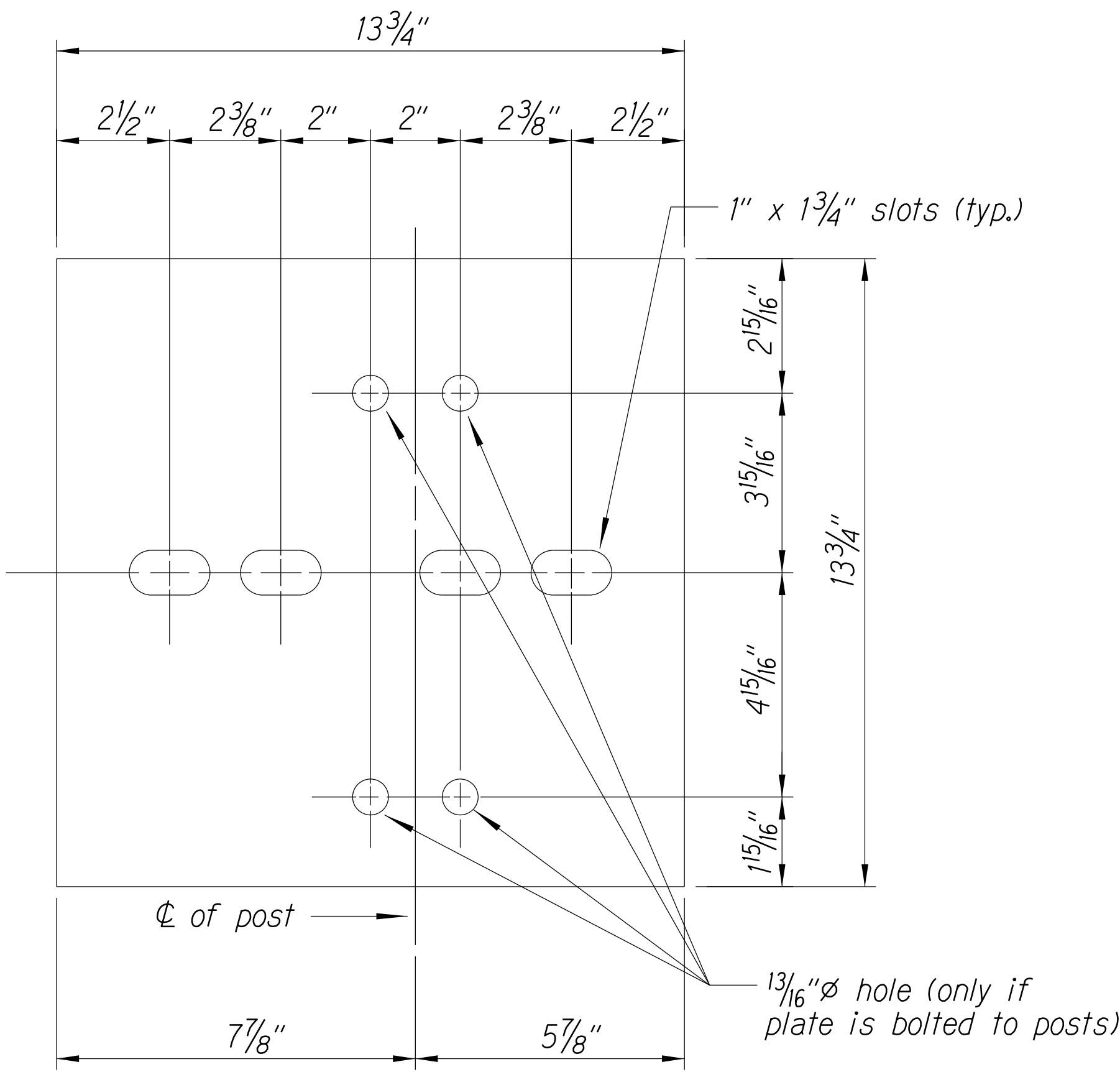
TYPE "A" FLARE

PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-1(013)

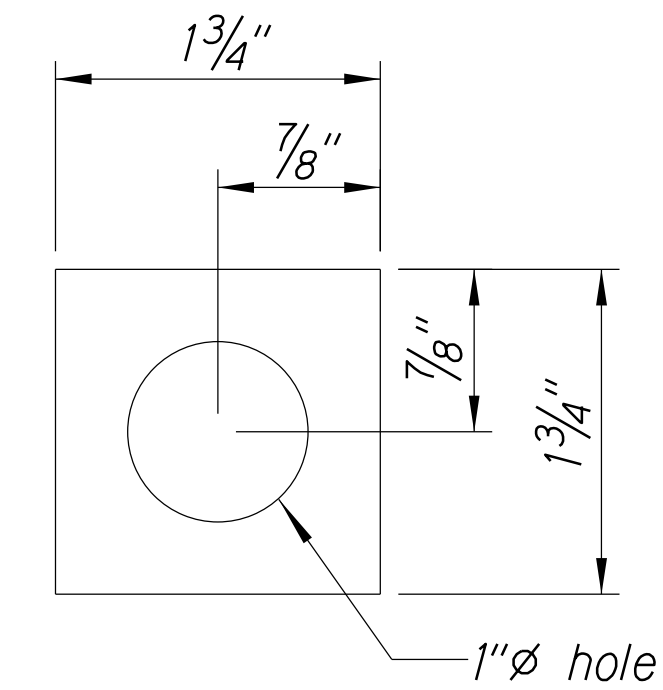
Scale: NTS Date: June, 2019

SHEET No. 7 OF 9 SHEETS

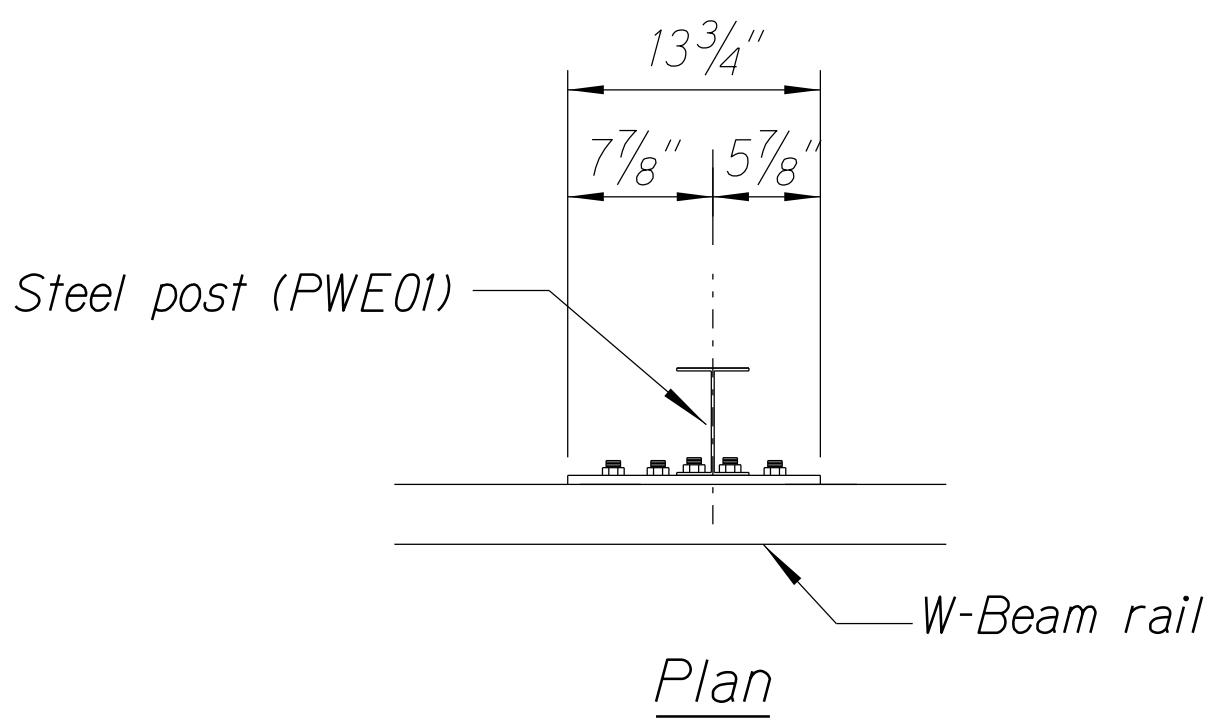
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-1(013)	2019	14	39



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

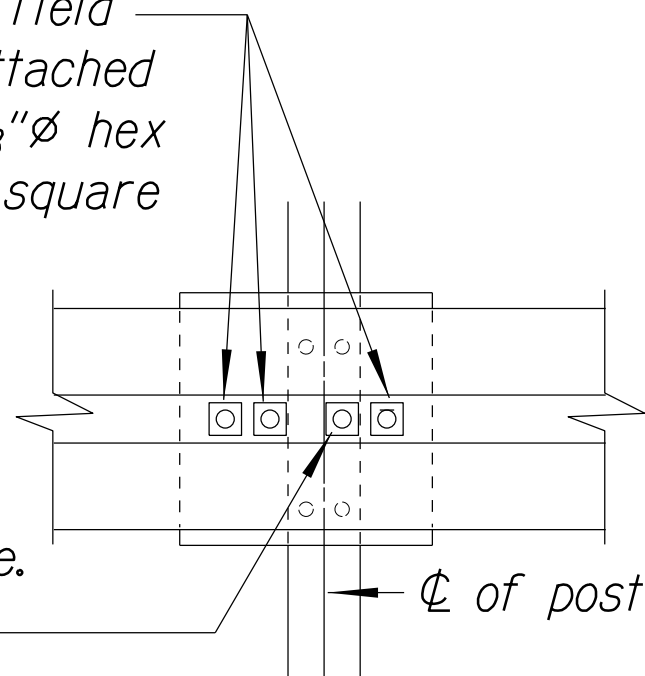


Square Washer
(3/16" Thick - Hot-dip
Zinc Coated Galvanized)

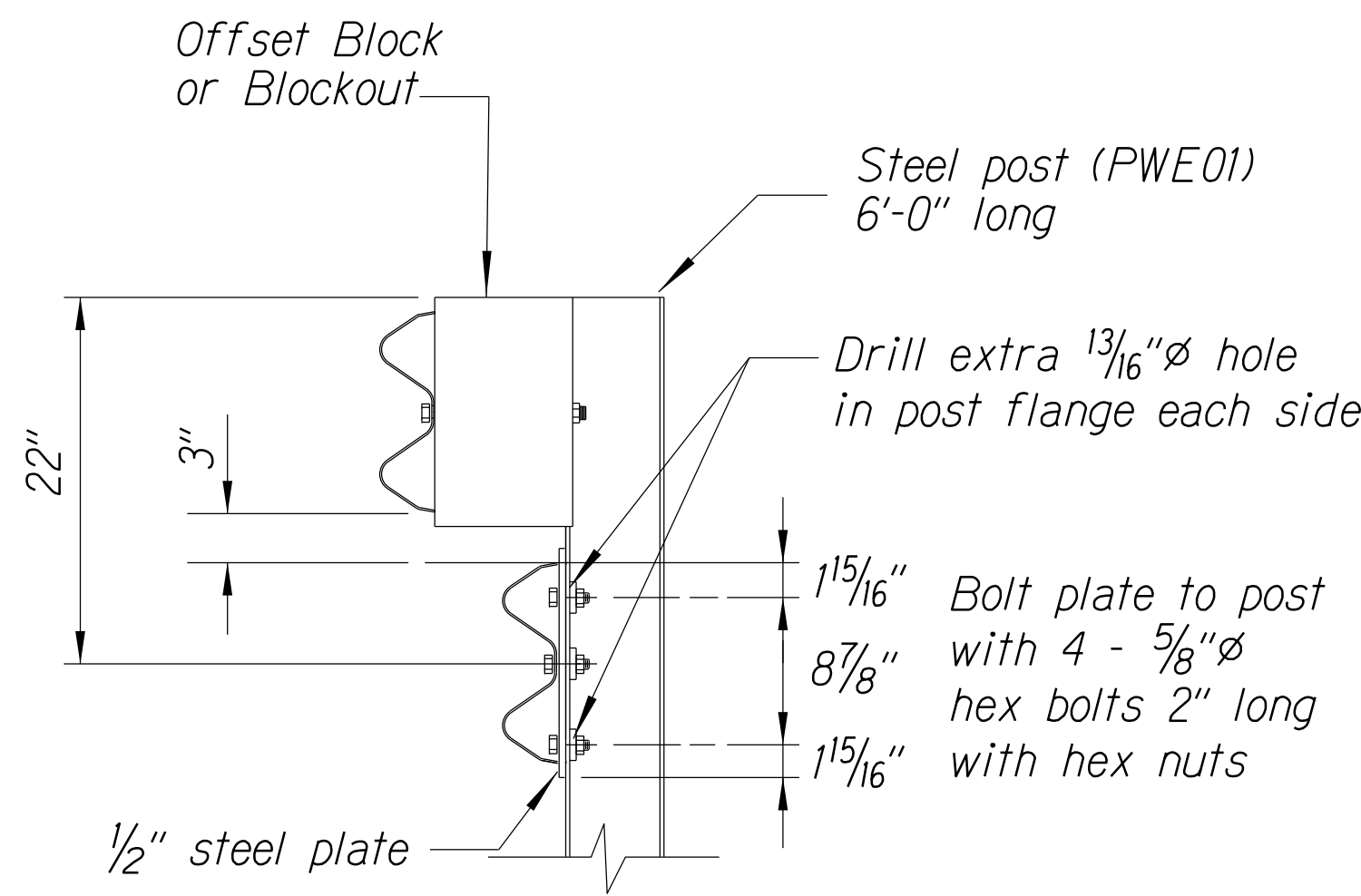


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 5/16" long with square washer

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



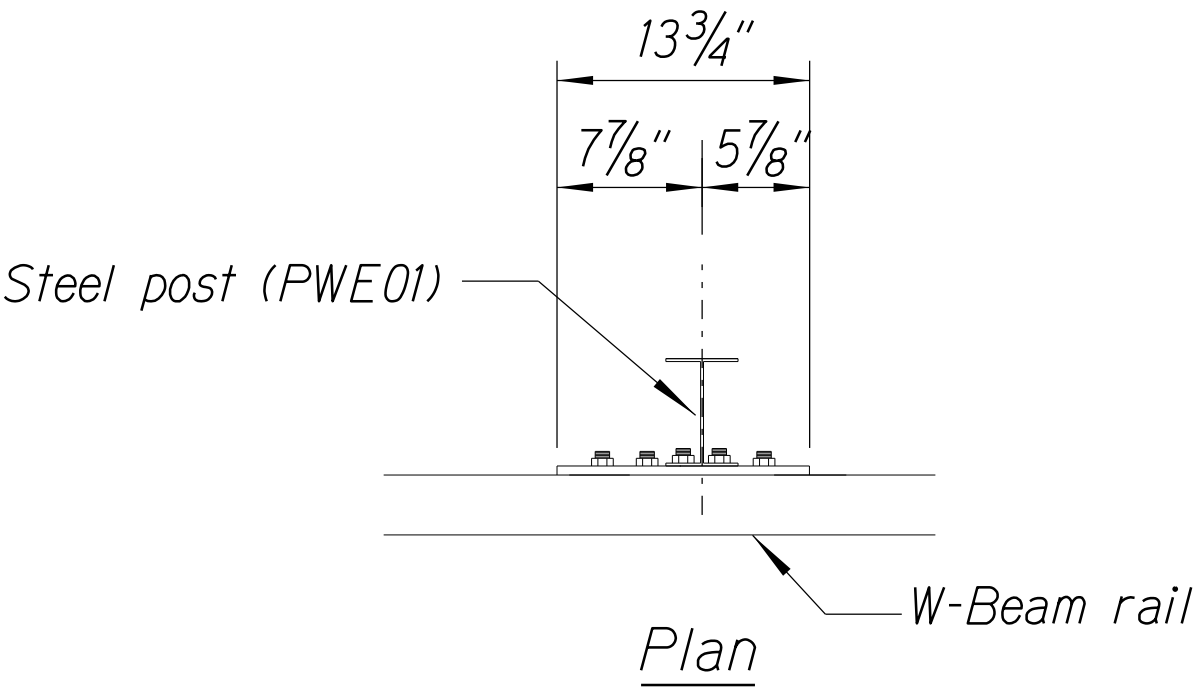
Front View



Elevation

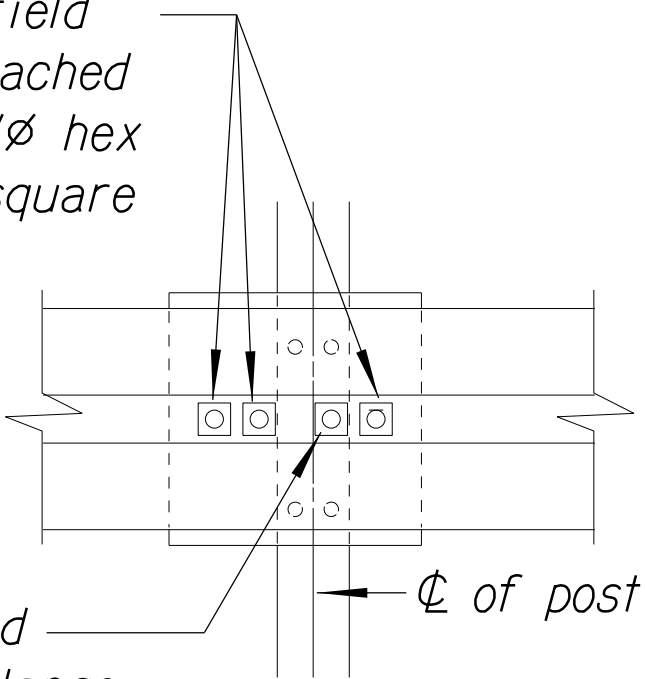
RUBRAIL ANCHOR DETAILS

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.

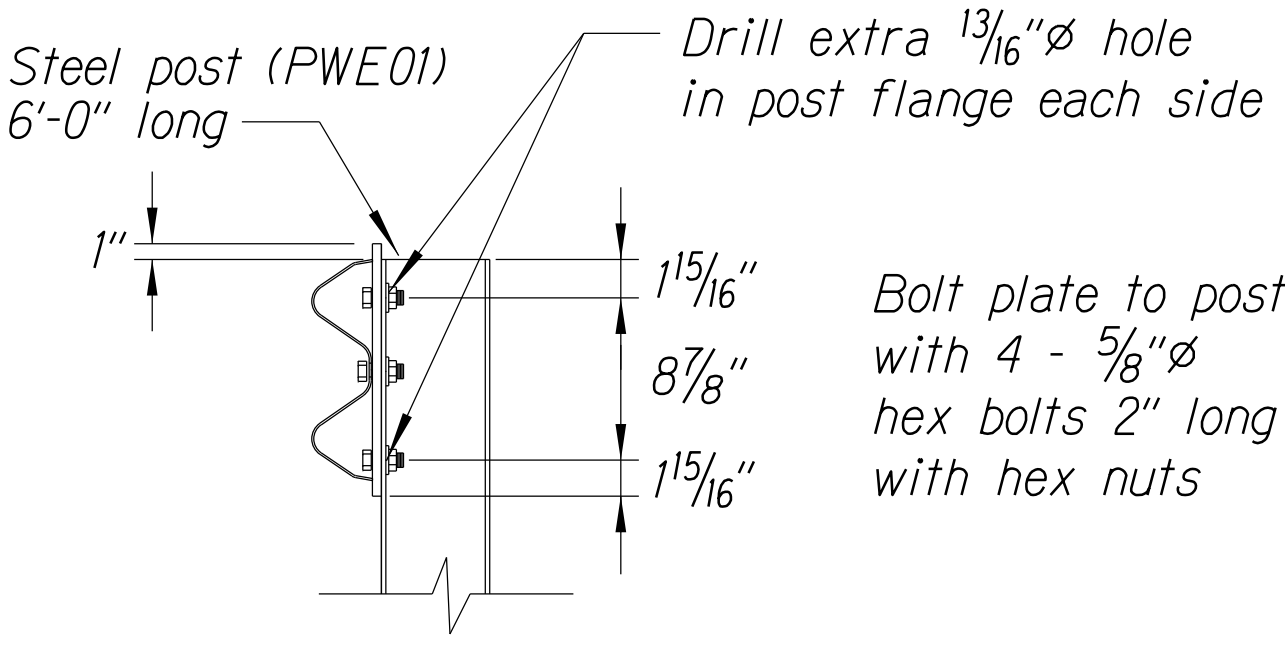


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 5/16" long with square washer

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



Front View



Elevation

POST ANCHOR DETAILS

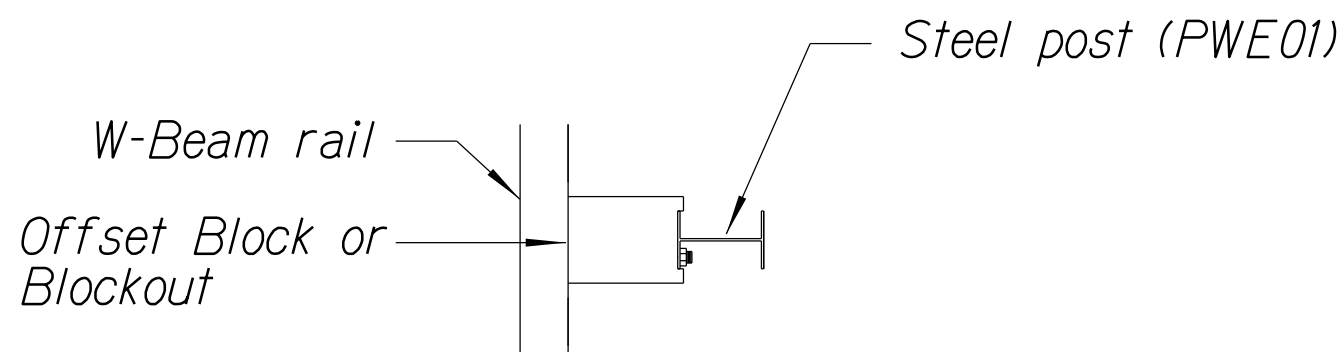
BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
TYPE "A" FLARE)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TYPE "A" FLARE
PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-1(013)
Scale: NTS Date: June, 2019
SHEET No. 8 OF 9 SHEETS

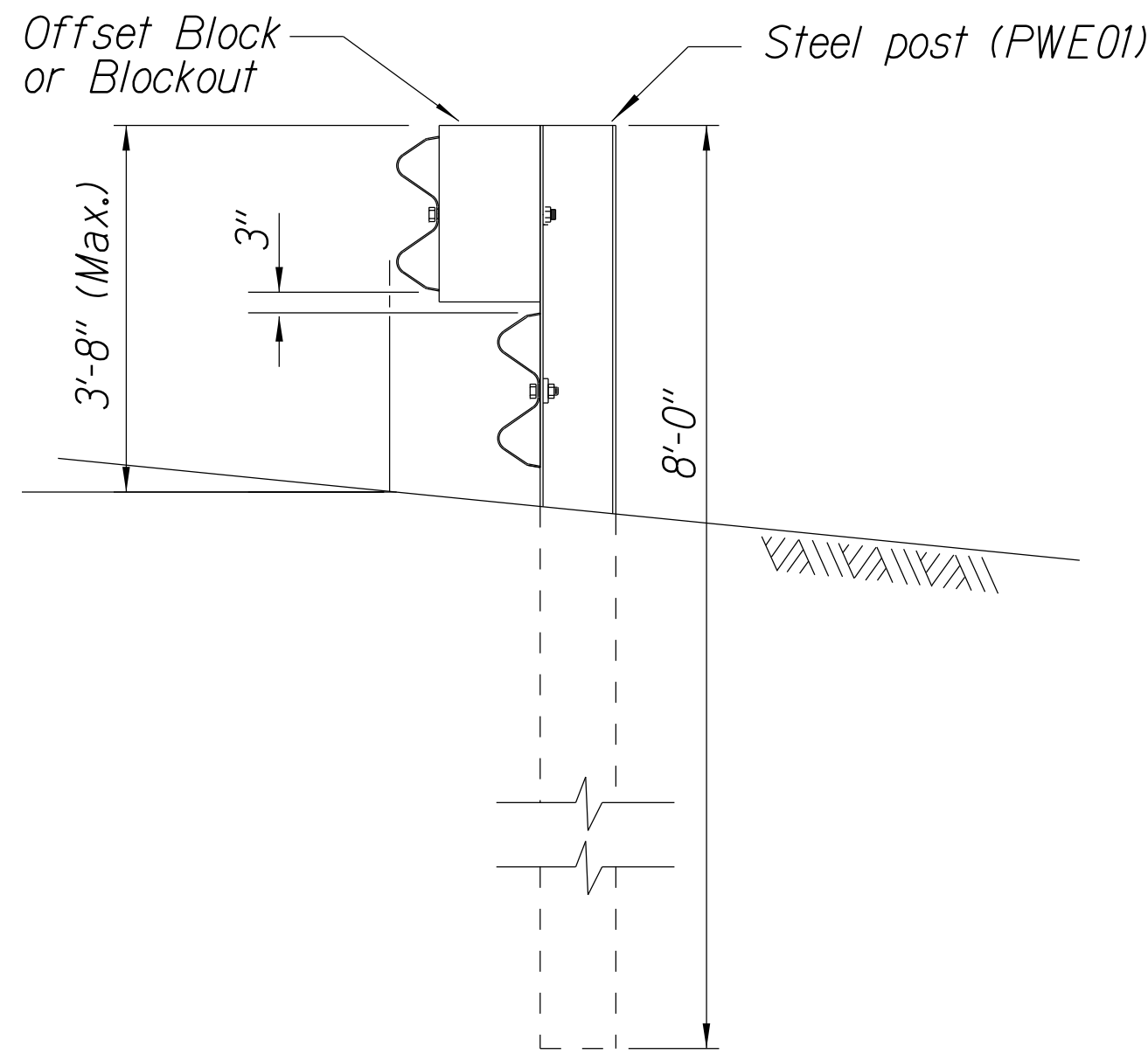
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
DESIGNED BY	TRACED BY	
CHECKED BY	DESIGNED BY	
	CHECKED BY	

f-3/01/99 tdr.ruby/guardrail/gddet2.dgn (standard plan TE-58 07/01/86, TE-59 r11/03/89 & TE-60 07/01/86)

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HS1P-031-1(013)	2019	15	39

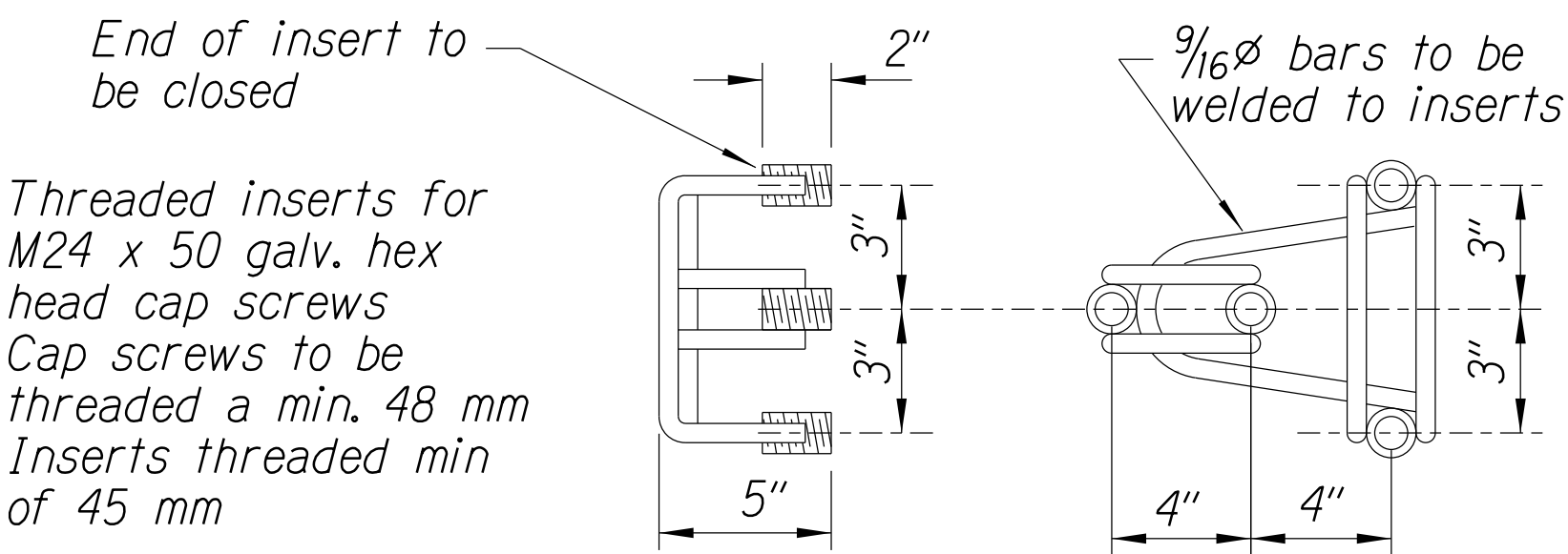


Plan

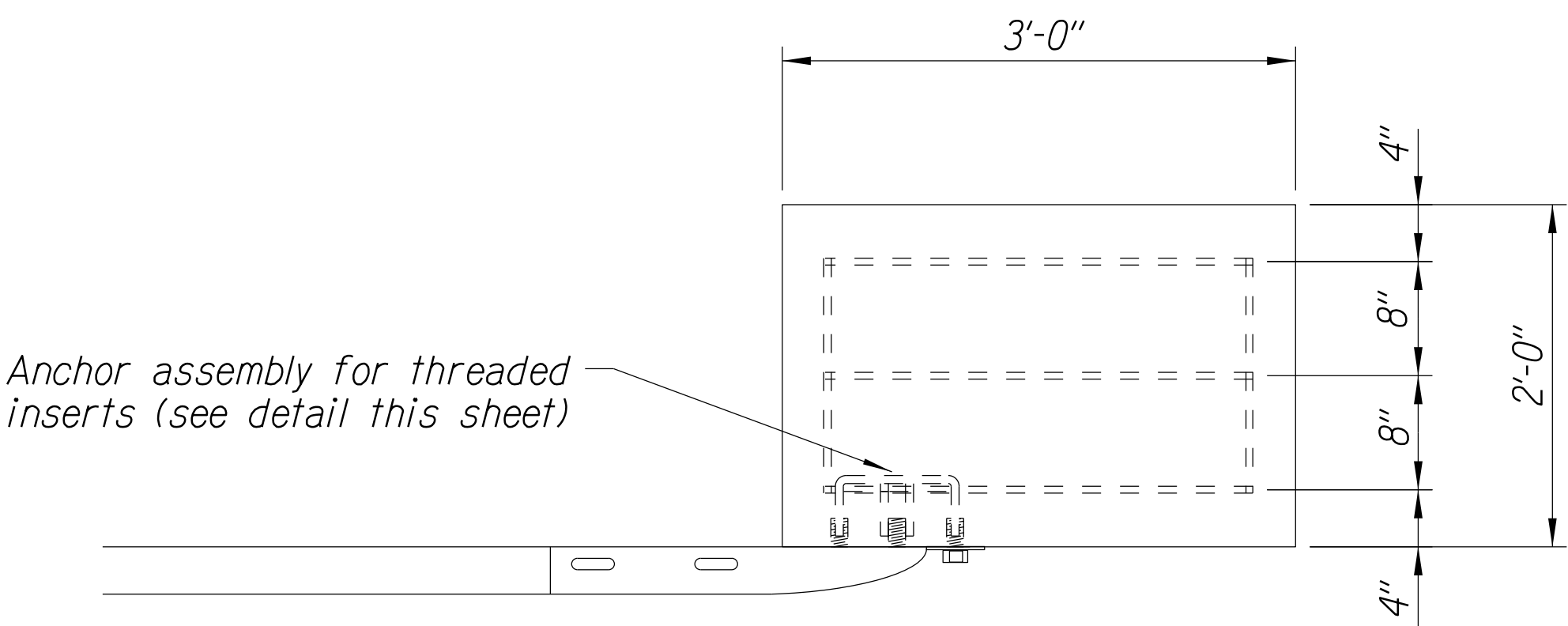


Elevation

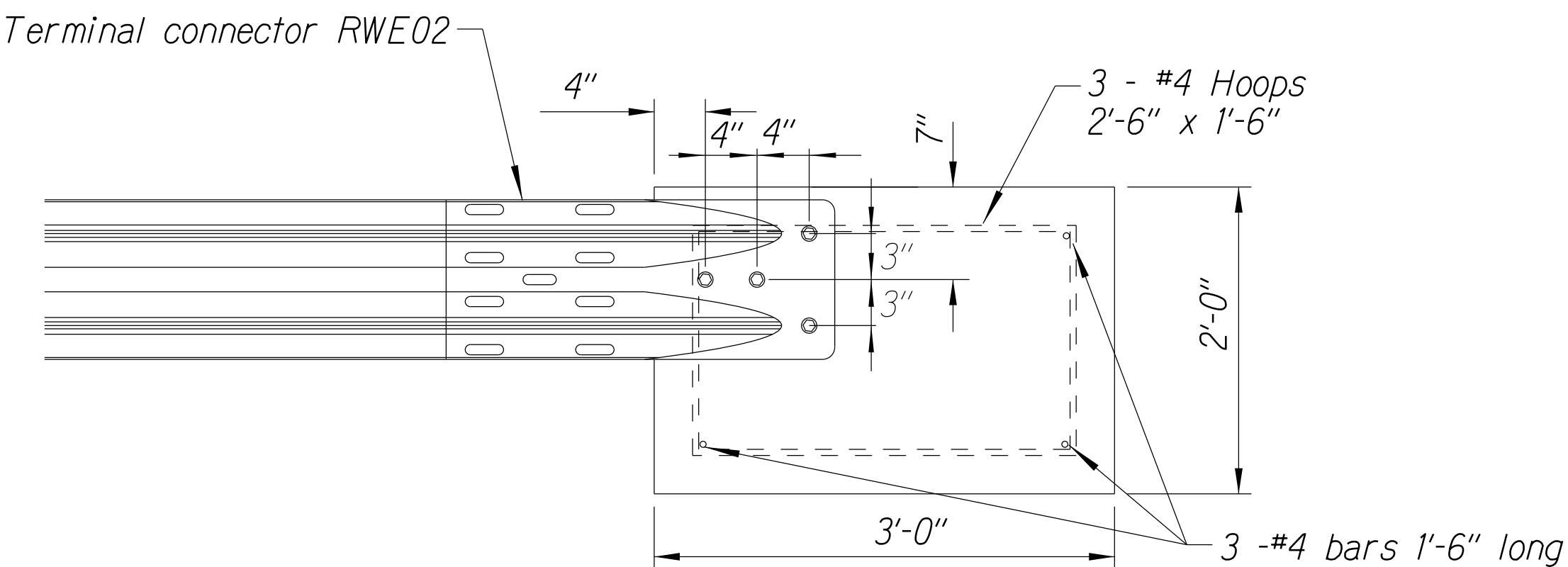
STEEL POST GUARDRAIL
WITH RUBRAIL



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	TRACED BY	
CHECKED BY	DESIGNED BY	
	CHECKED BY	

r-3/01/99 10trubyl/guardrail/gddefl.dgn (standard plan TE-58 07/01/86, TE-59 r1/03/89 & TE-60 07/01/86)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

PIILANI HIGHWAY SAFETY IMPROVEMENTS
North Kihei Road to the Vicinity of Wailea Ike Dr.
Federal-Aid Project No. HS1P-031-1(013)

Scale: NTS
Date: June, 2019

SHEET No. 9 OF 9 SHEETS