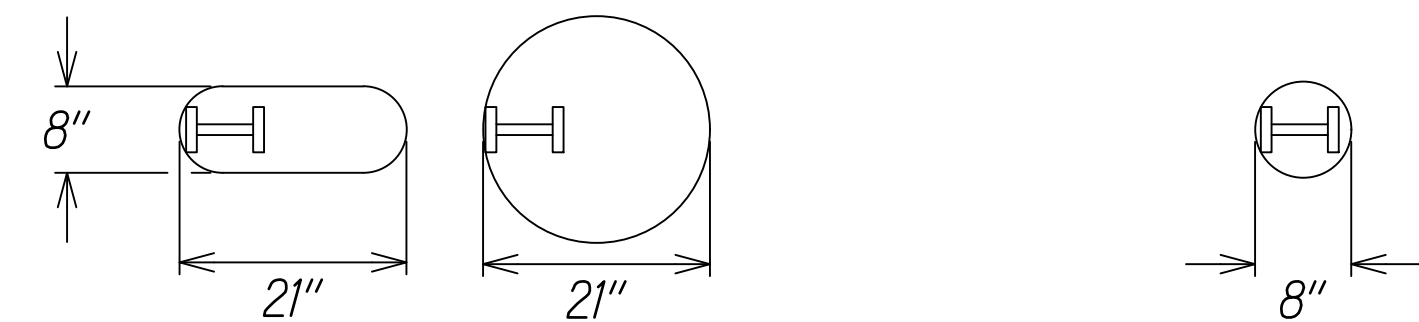
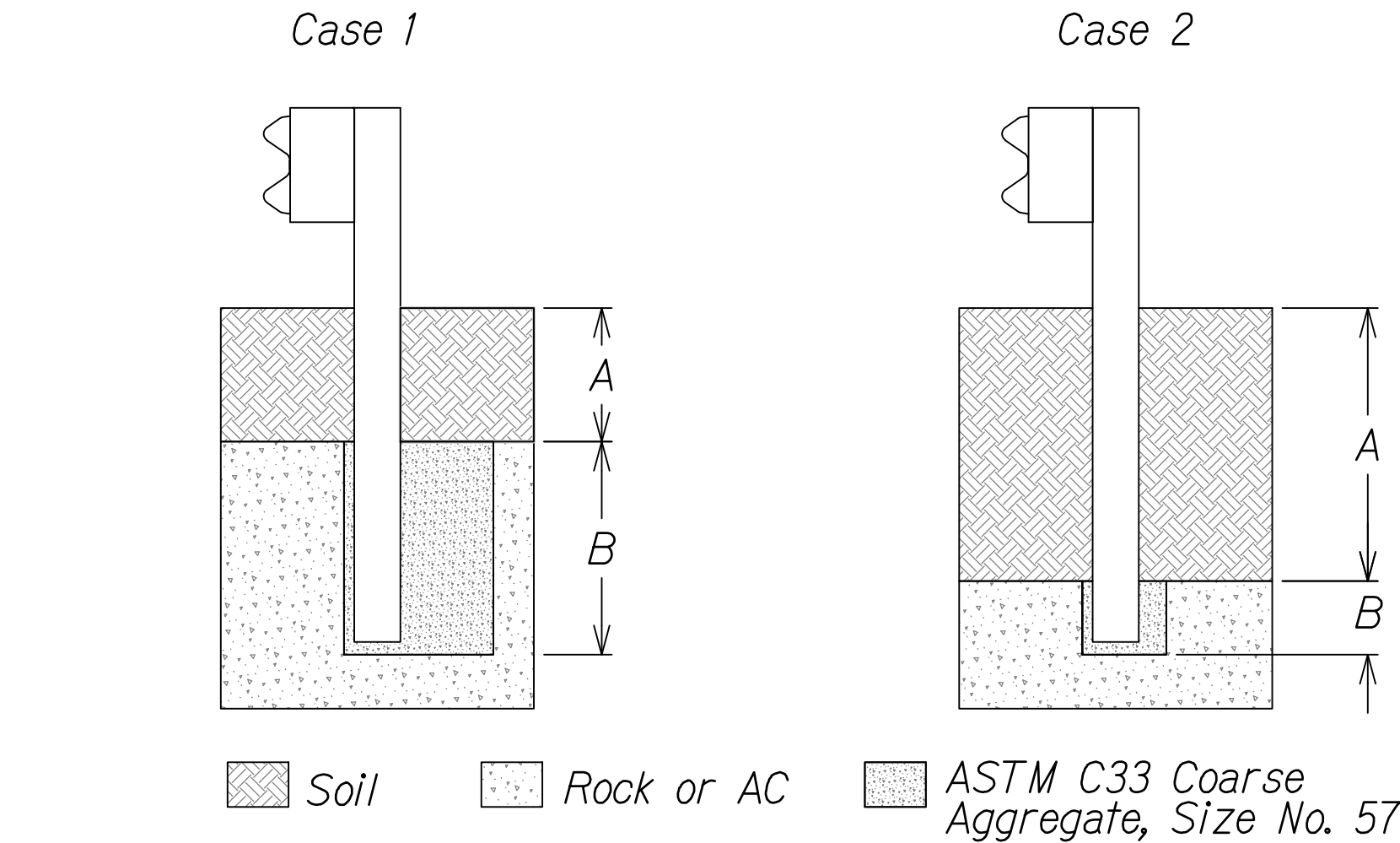


FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	9	70

NOTES (STRONG POST W-BEAM IN ROCK):

- Backfill of drilled holes shall be with compressible material, ASTM C33 Coarse Aggregate, Size No. 57.
- Elongated 21-inch long hole can be accomplished by drilling three 8-inch diameter holes at 6 1/2-inches on center.



Plan View Steel Posts  
Either Hole Configuration Acceptable

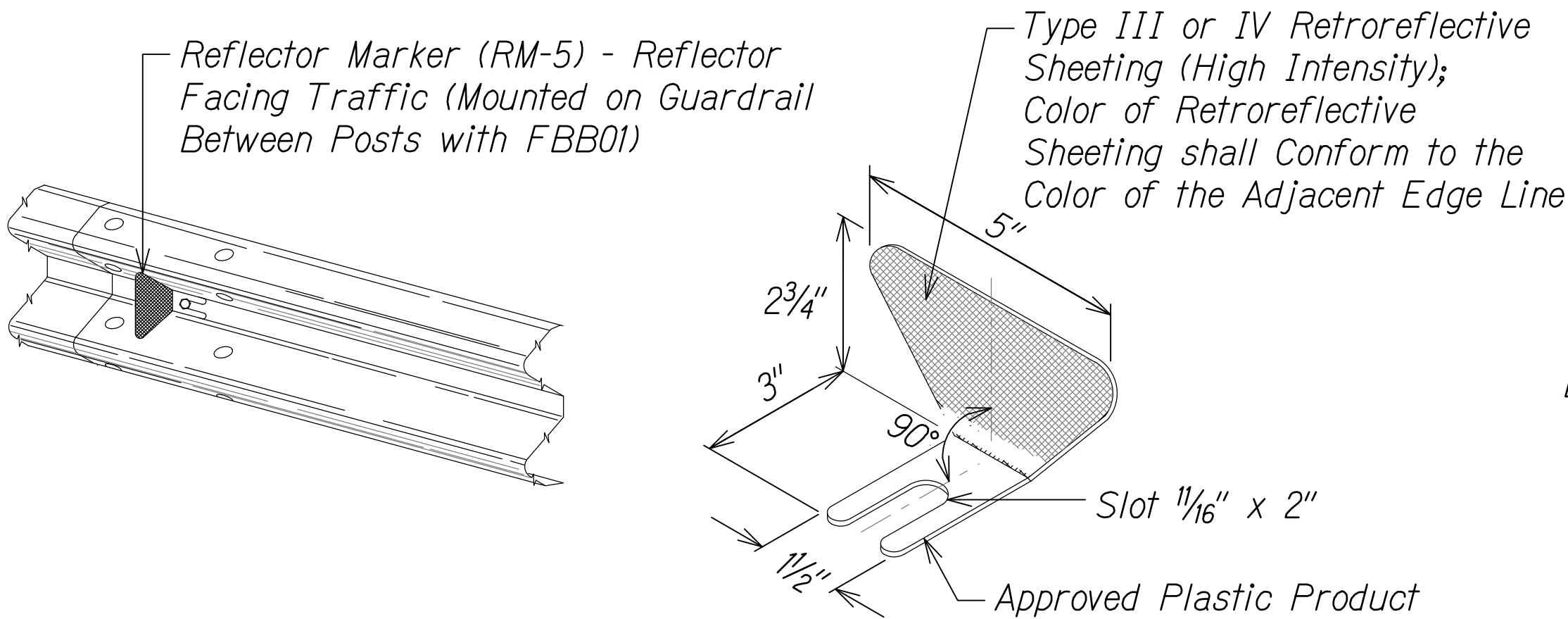
(A) Ranging from 0 to 18-inches,  
the Depth of Required Drilling  
(B) is Equal to 24-Inches.

(A) Ranging from 18-inches to the  
embedment depth of the post, depth  
of required drilling (B) is equal to  
either 12-inches or the desired  
embedment depth minus the depth  
of soil whichever is less.

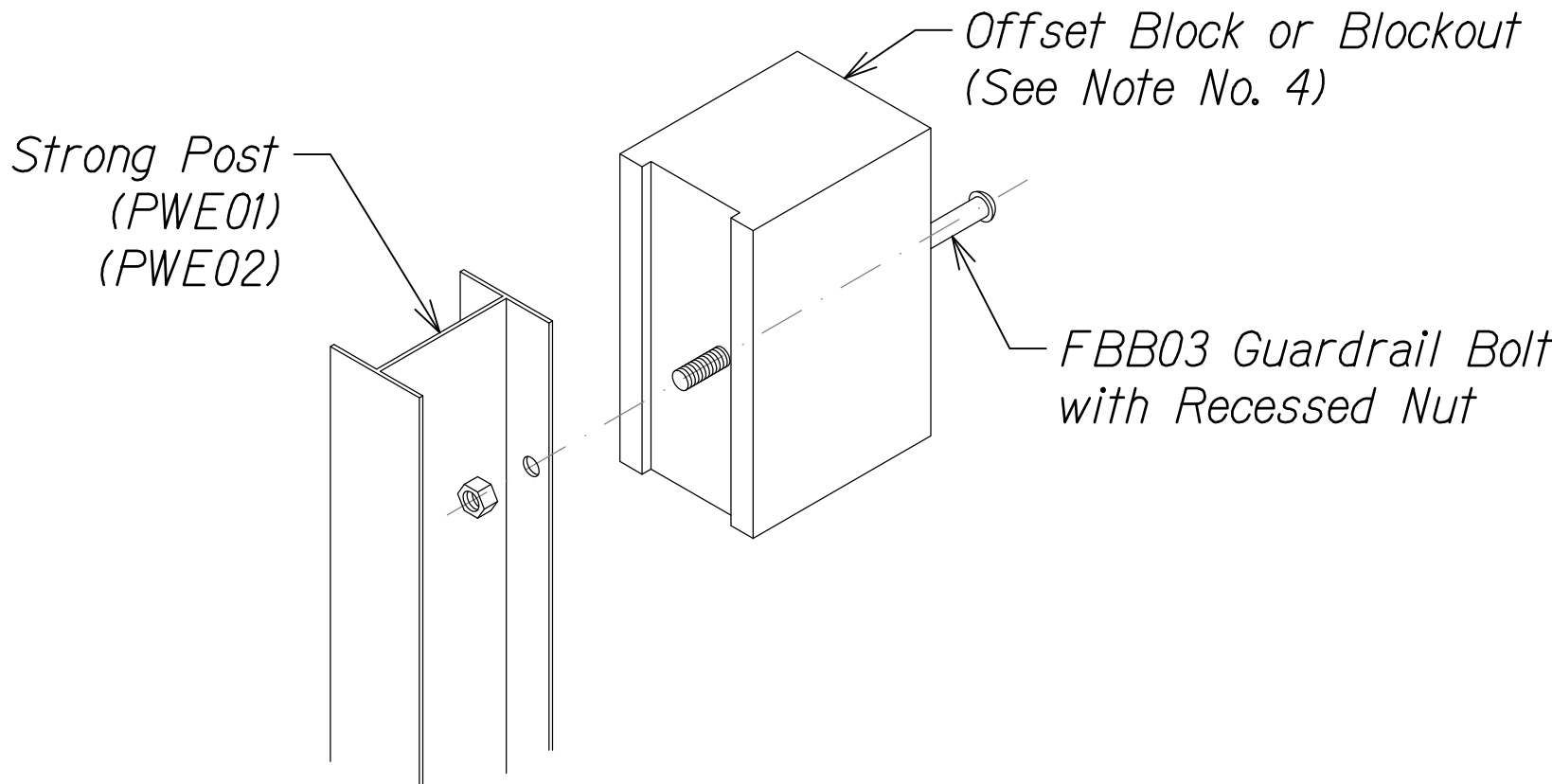
OVERLYING SOIL DEPTHS OF  
0 TO 18-INCHES

OVERLYING SOIL DEPTHS OF  
18 TO 42-INCHES

STRONG POST W-BEAM GUARDRAIL IN ROCK



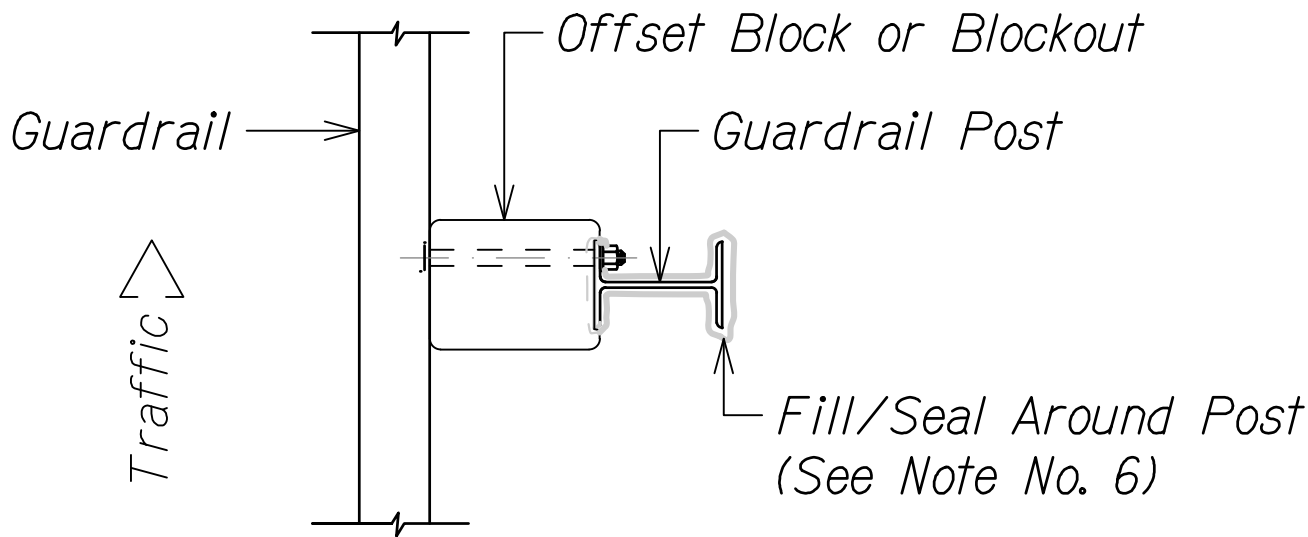
REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



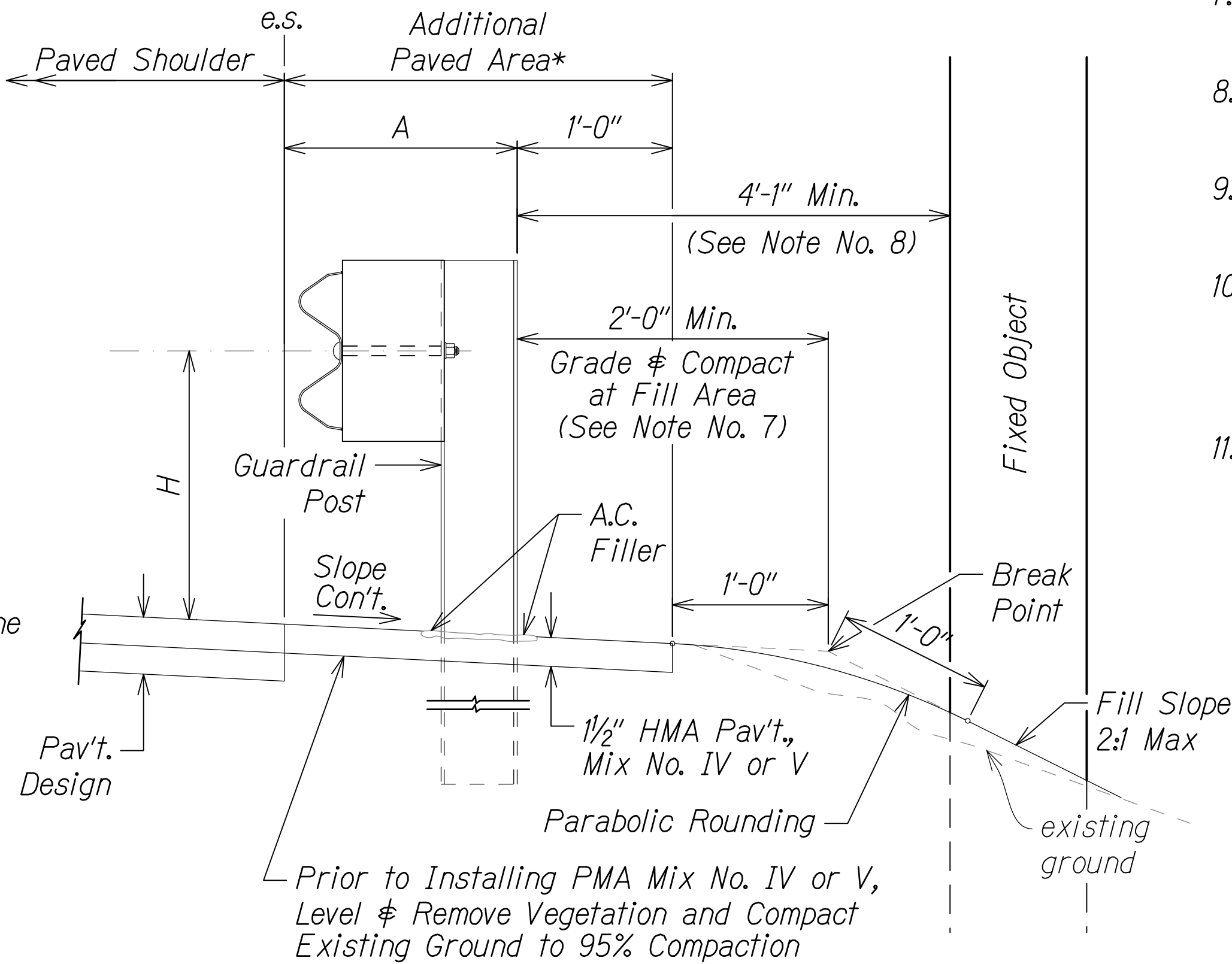
EXPLODED VIEW

(Rail and washer not shown)

STEEL POST AND BLOCK DETAIL



PLAN



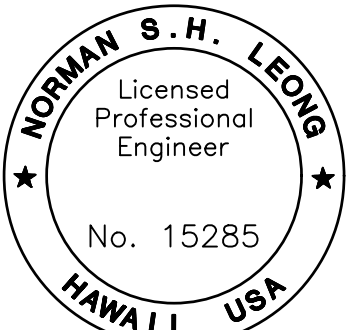
ELEVATION

TYPICAL GUARDRAIL INSTALLATION

GENERAL NOTES

- All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
- Where conditions require, special post lengths in increments of 6 inches may be specified by the Engineer.
- 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 fasteners, posts and rail elements have been converted from metric units into their present form.
- The Blockout or Offset Block shall be approved by the State.
- All new guardrail systems (system consists of total length of guardrail including both end treatments) shall include the Additional Paved Area.
- After the guardrail posts are installed in the paved area, the Contractor shall fill/seal around each guardrail post and all cracks in the paved area caused during the guardrail post installation. If required by the inspector/engineer, the Contractor shall tamper the paved area around the guardrail post prior to filling/sealing. All costs associated with this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
- When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
- Minimum working width (clear distance) between back of MGS post to any fixed object is 4'-1" (49").
- New Polymer Modified Asphalt (PMA) pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
- Reflector Markers (RM-5) mounted on guardrails shall be spaced every 25 feet. RM-5's shall not be installed on Terminal Sections. Furnishing and installing of each RM-5 shall be considered incidental to the guardrail system.
- All costs associated with fill slope area work shall not be paid for separately, but shall be considered incidental to the various guardrail items.

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



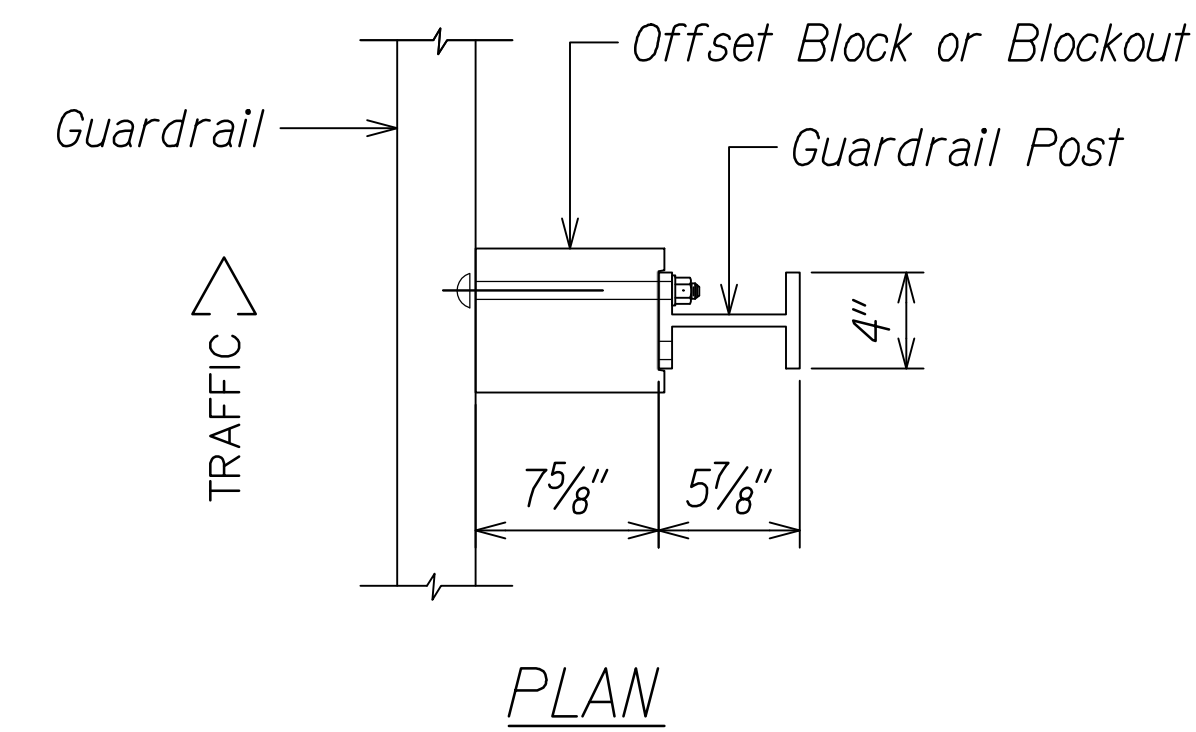
This work was prepared by me or under my supervision and construction of this project will be under my observation.  
*Norman Leong*  
Expiration Date of License 4/24

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

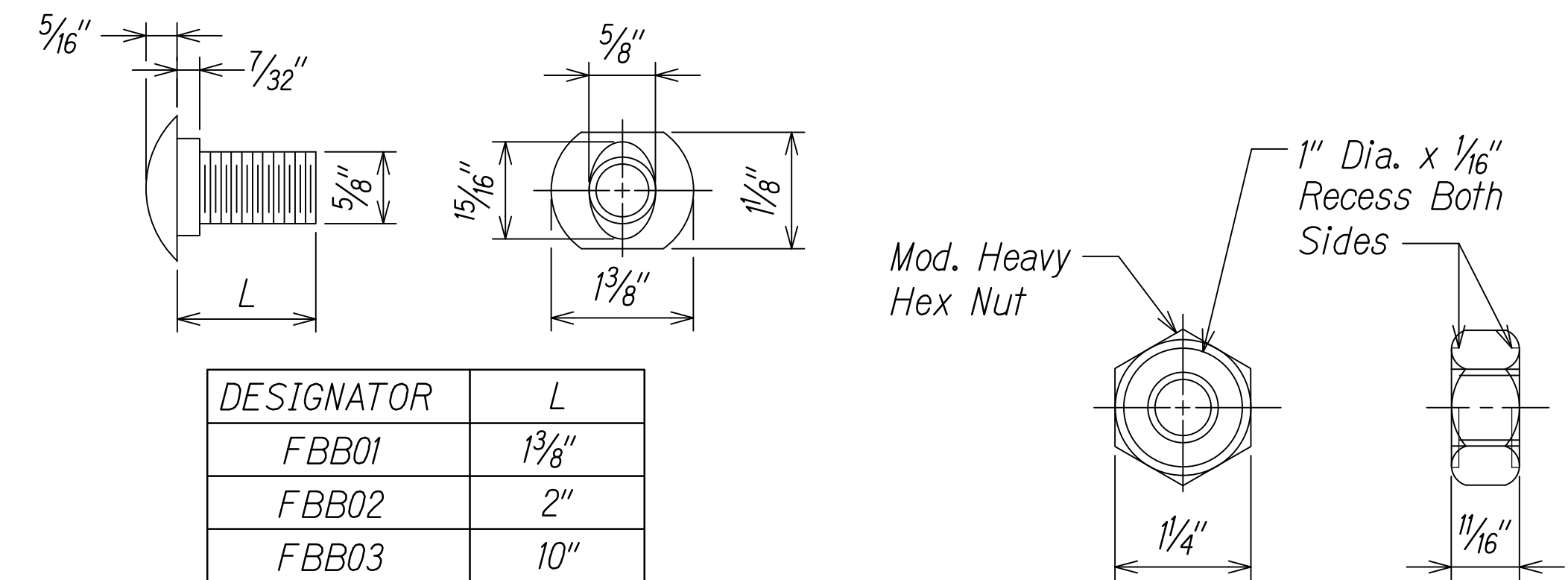
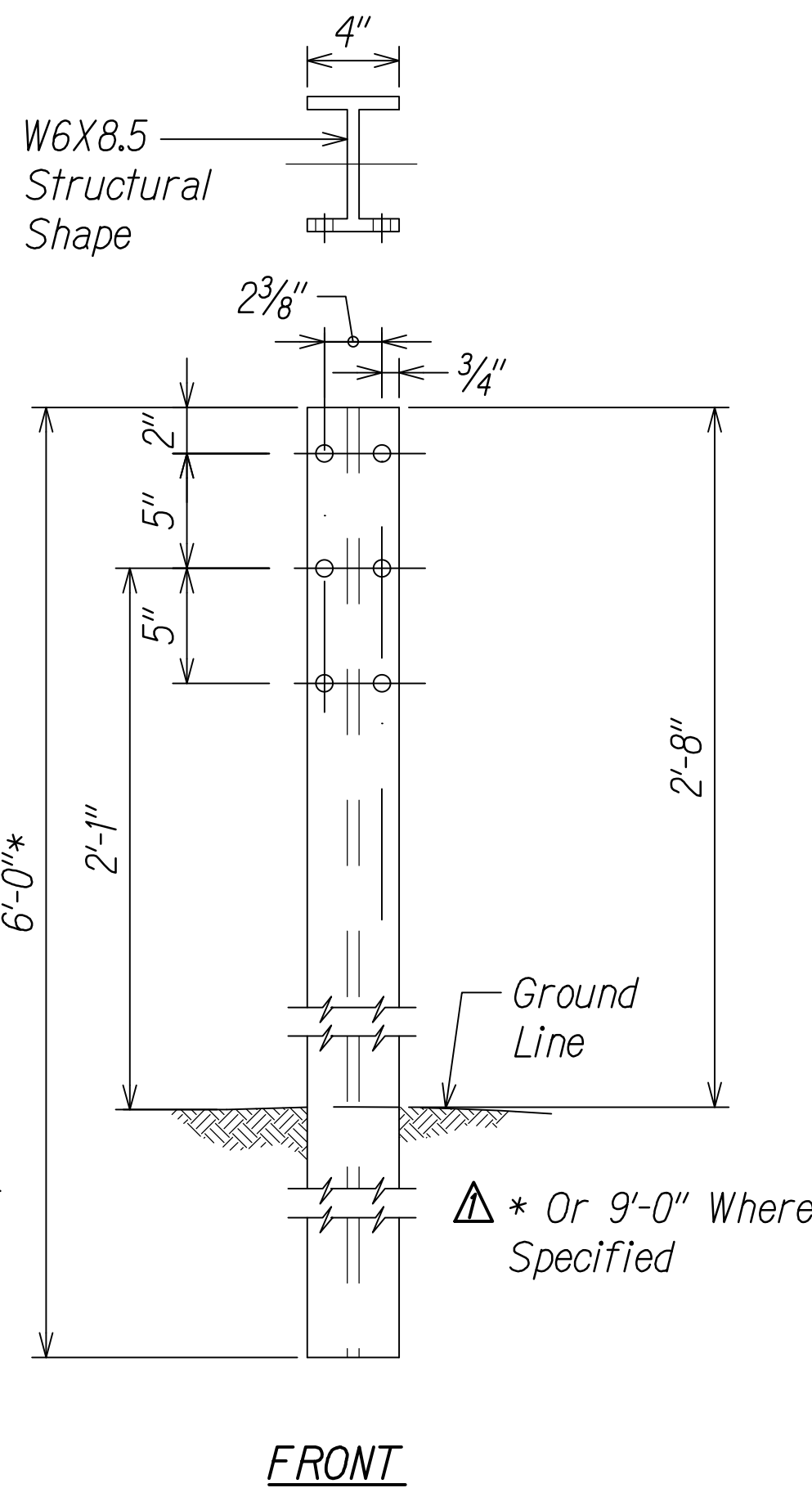
**GUARDRAIL DETAILS AND NOTES**

MAMALAHOA HIGHWAY  
SAFETY IMPROVEMENTS  
East and West of Puuwaawaa Ranch  
Federal Aid Project No. HSIP-0190(018)  
Scale: NTS Date: July 2022

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	ADD. 10	70




NOTE:  
All Holes are  
3/4" Dia.

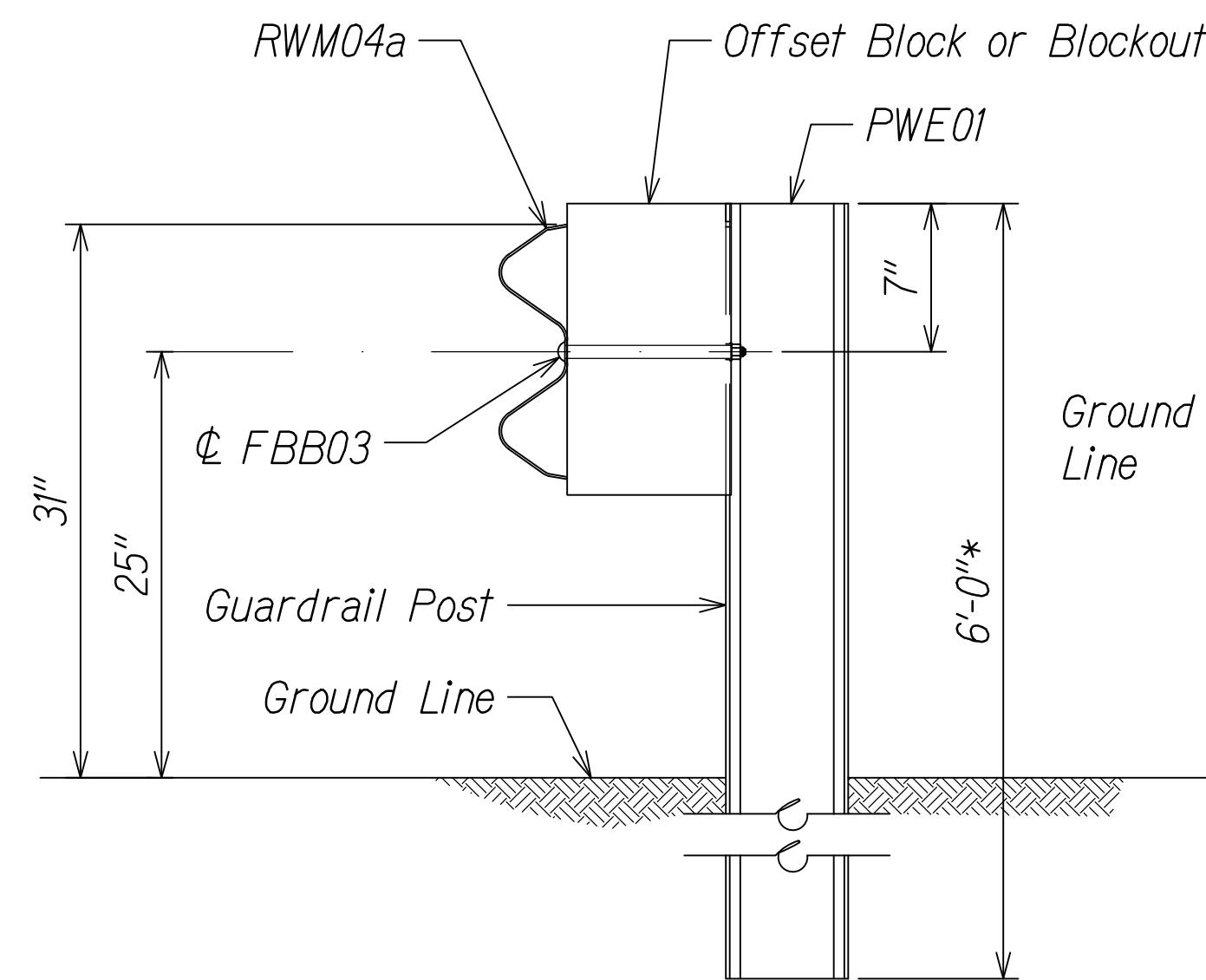


DESIGNATOR	L
FBB01	1 $\frac{3}{8}$ "
FBB02	2"
FBB03	10"

### GUARDRAIL BOLTS AND RECESSED NUT

## LEGEND FOR AS-BUILT POSTINGS

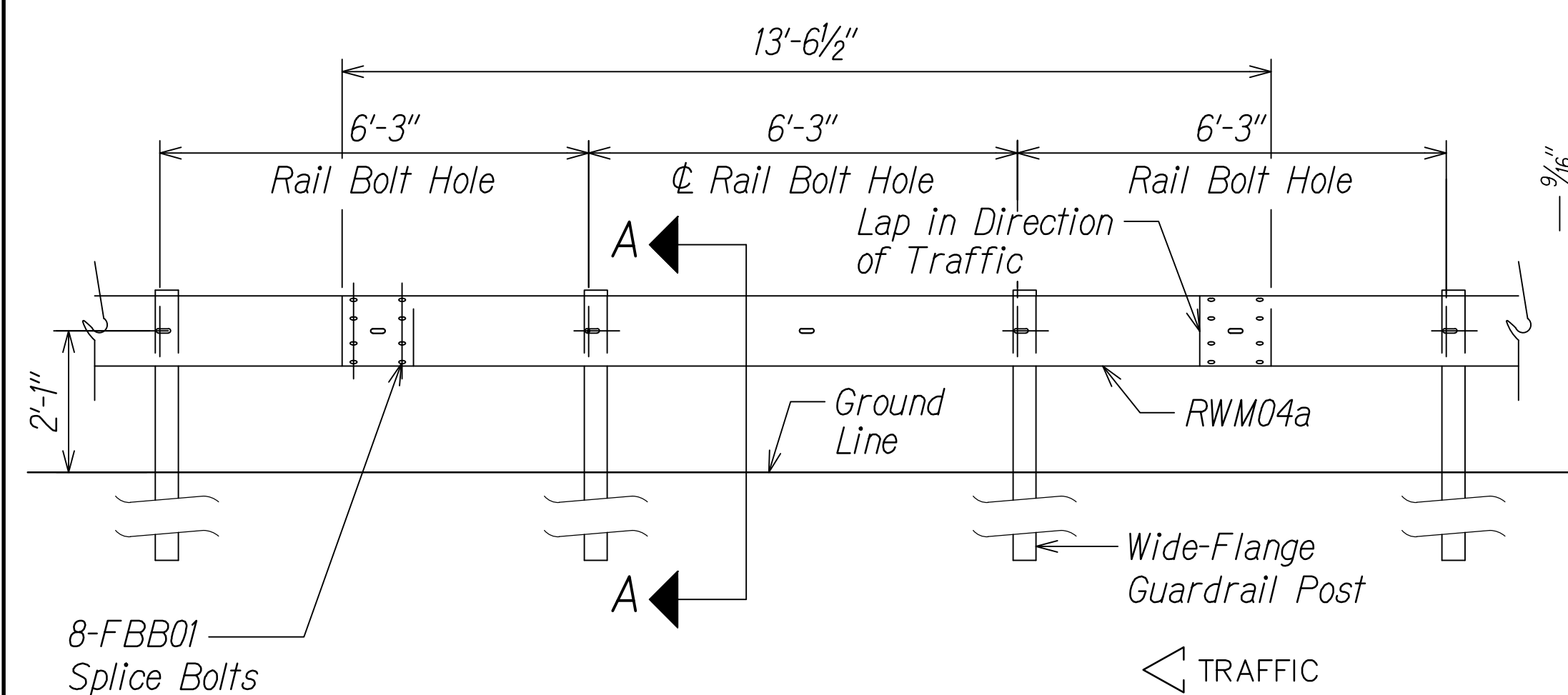
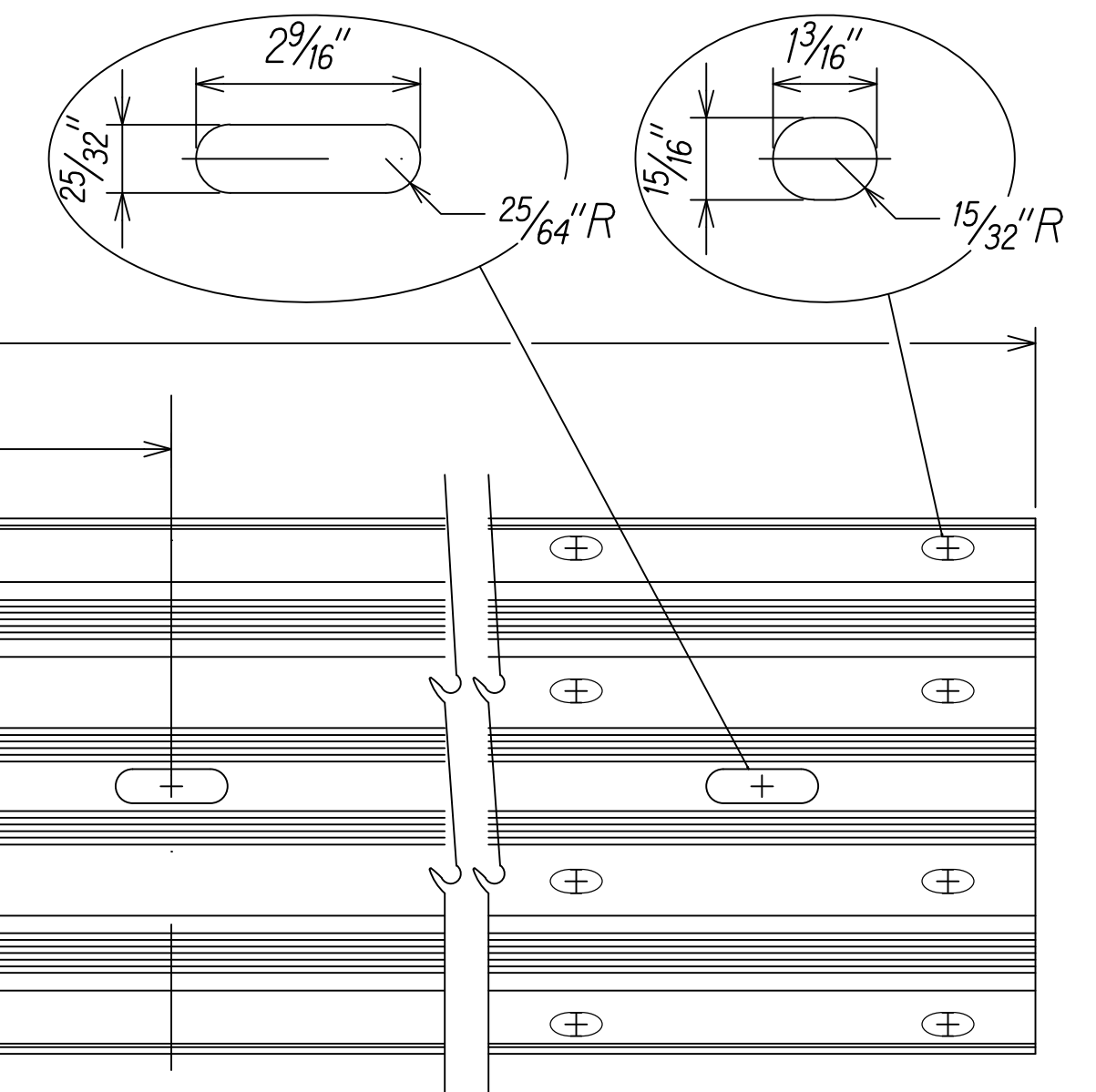
	Squiggly line for as-built deletion
<del>100.00</del> ==	Double line for as-built deletion
Roadway	Text for as-built posting



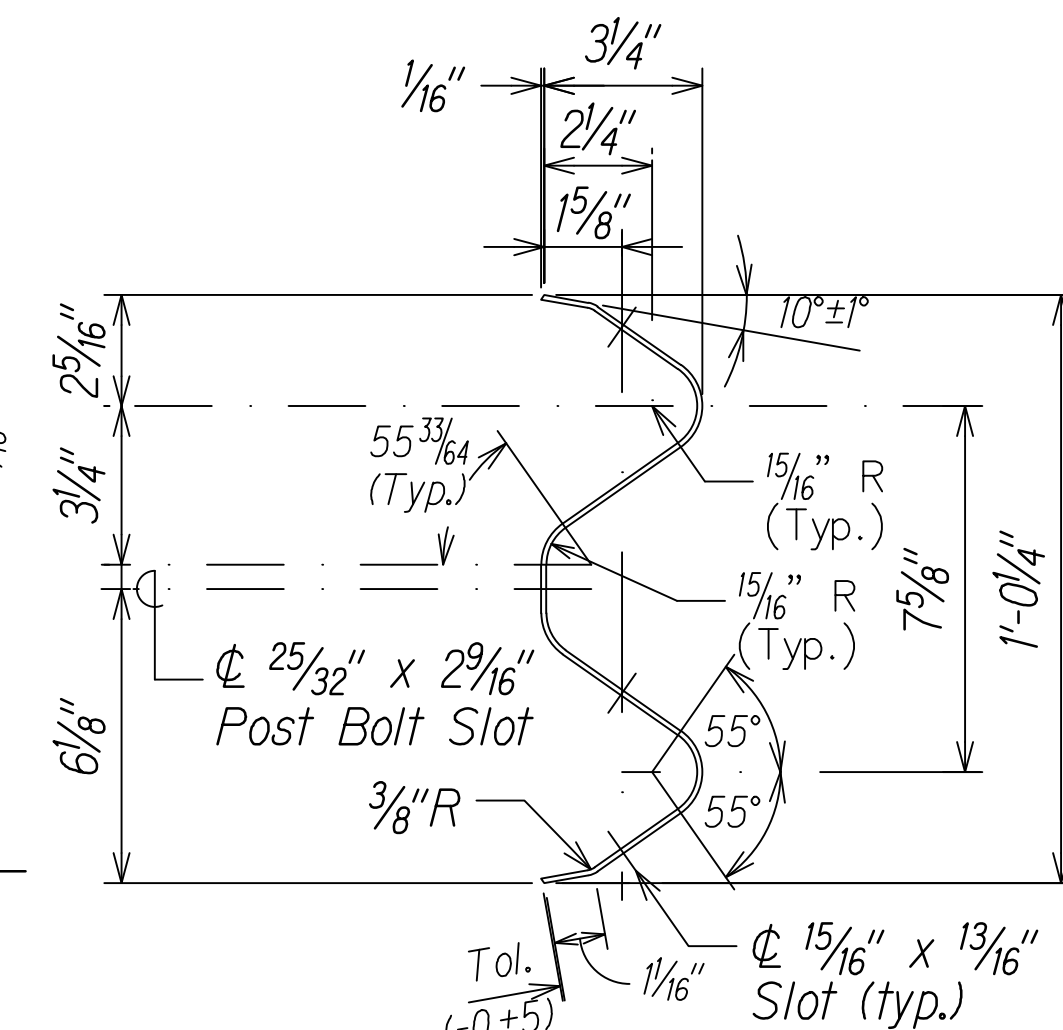
SECTION A-A

WIDE-FLANGED GUARDRAIL POST  
(PWE01)

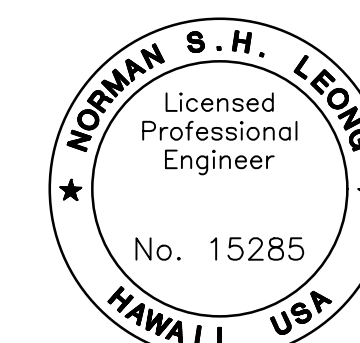
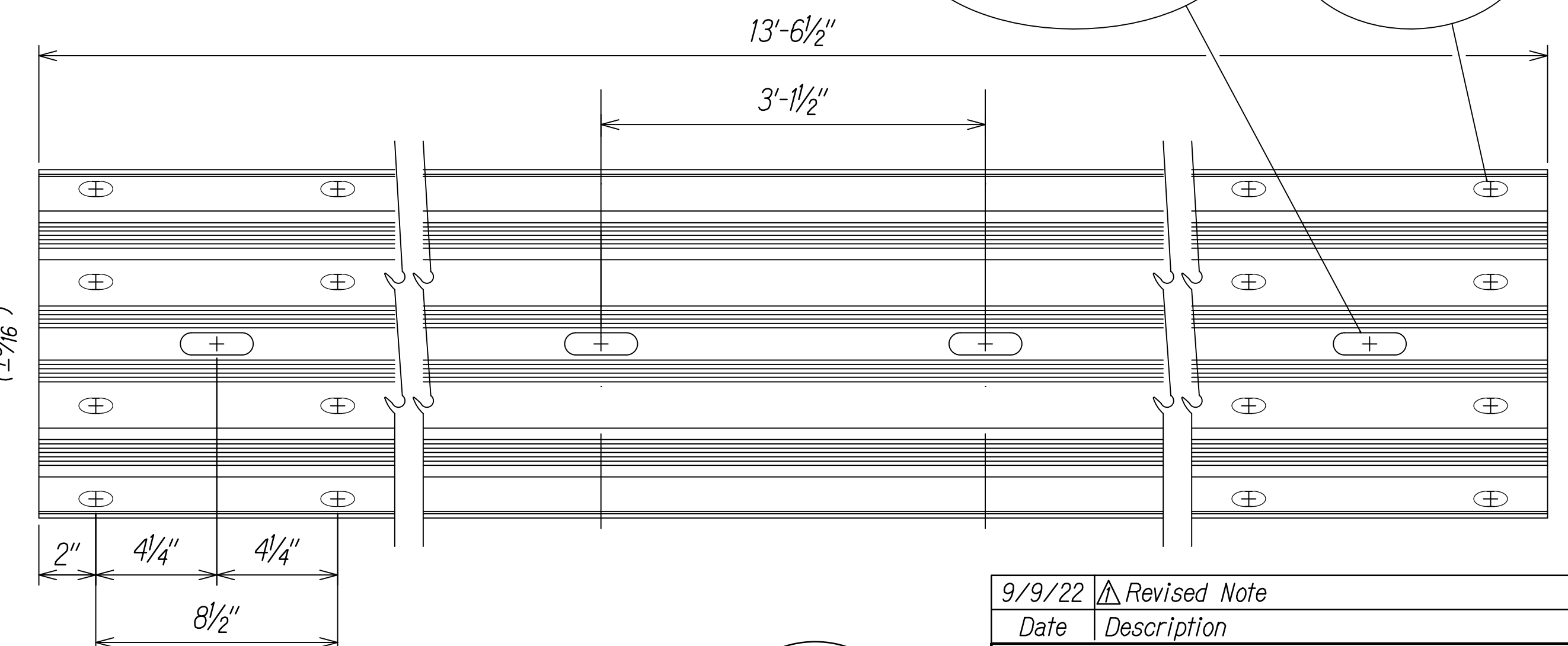
<i>DESIGNATOR</i>	<i>BASE METAL THICKNESS</i>
<i>RWM04a</i>	<i>12 Gauge</i>

ELEVATION

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



4 SPACE W-BEAM GUARDRAIL (RWM04a)



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Expiration Date of License	4/24
----------------------------	------

9/9/22	<u>A</u> Revised Note
Date	Description

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**MIDWEST GUARDRAIL SYSTEM**

**8" BLOCKOUT**

MAMALAHOA HIGHWAY

SAFETY IMPROVEMENTS

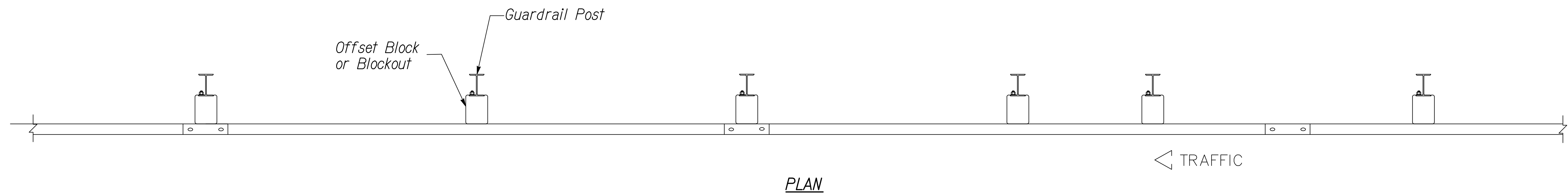
*East and West of Puuwaawaa Ranch*  
*Federal Aid Project No. HSIP-0190(018)*

**Scale: NTS** **Date: July 2022**

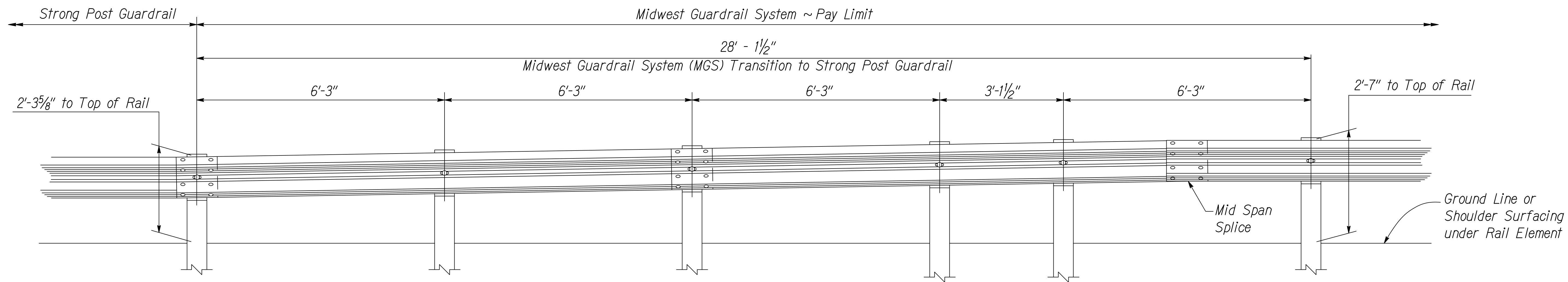
SHEET No.    24    OF    7    SHEETS

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

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	11	70

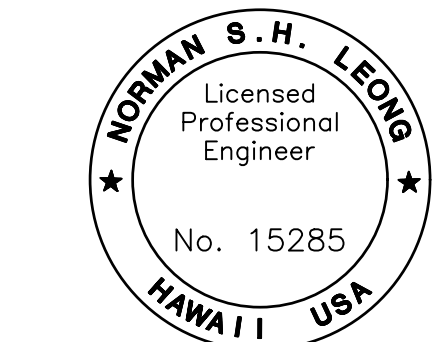


PLAN



ELEVATION

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



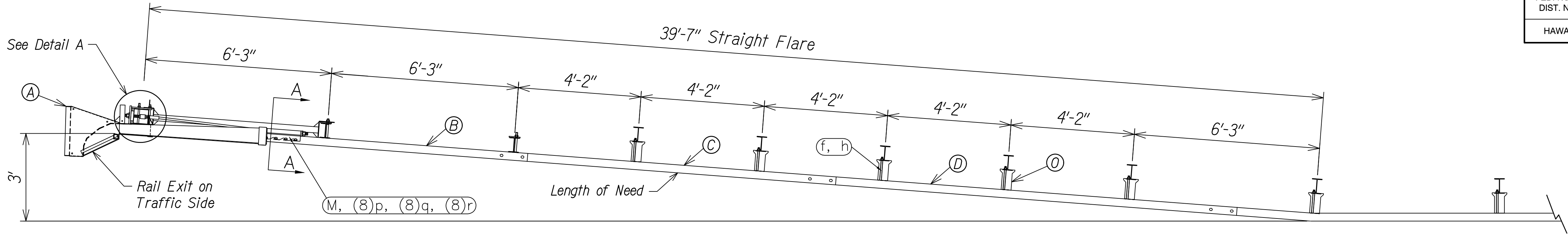
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*Norman S.H. Leong*  
Expiration Date of License 4/24

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**MGS TRANSITION TO  
STRONG POST GUARDRAIL**  
MAMALAHOA HIGHWAY  
SAFETY IMPROVEMENTS  
East and West of Puuwaawaa Ranch  
Federal Aid Project No. HSIP-0190(018)  
Scale: NTS Date: July 2022

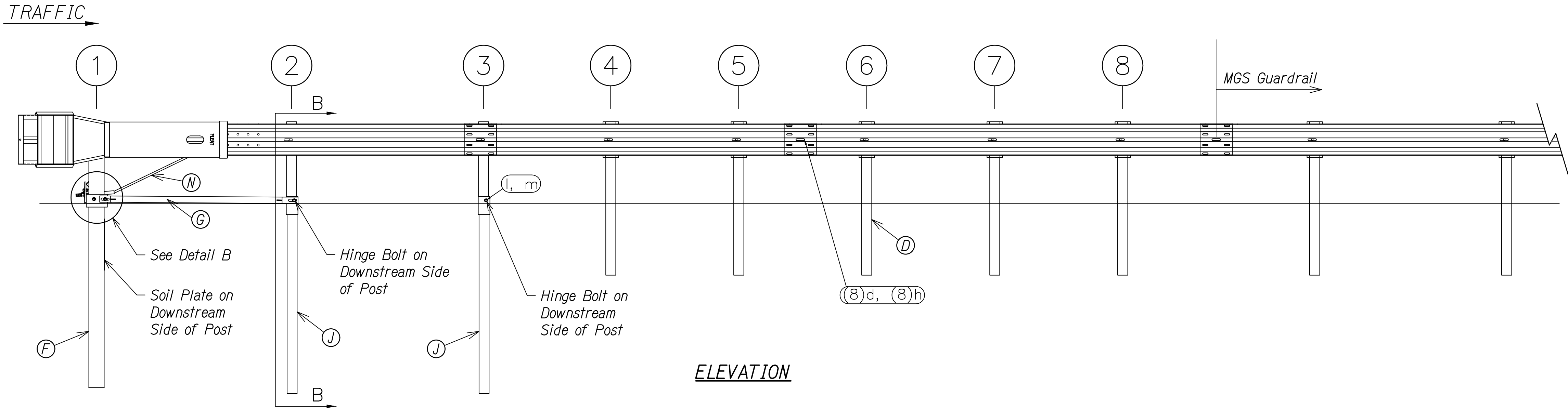
SHEET No. 3 OF 7 SHEETS



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	12	70

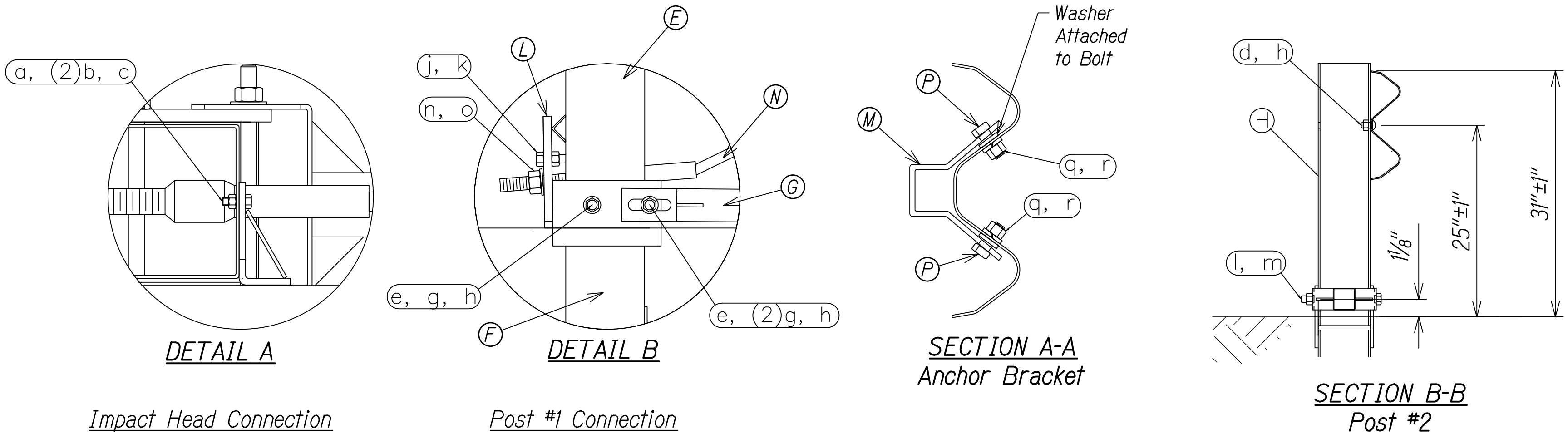


PLAN



ELEVATION

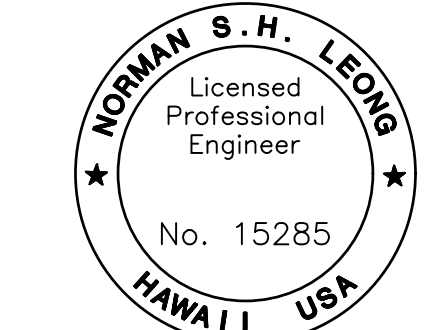
ITEM	QTY	BILL OF MATERIALS	ITEM NO.
A	1	FLEAT IMPACT HEAD	MF3000
B	1	FLEAT ANCHOR RAIL 12'-6"	SF1303
C	1	FLEAT SECOND RAIL 10'-5"	F1324
D	1	FLEAT THIRD RAIL 13'-6 1/2"	F1334
E	1	FIRST POST TOP (6X6X $\frac{1}{4}$ " Tube)	MP1A
F	1	FIRST POST BOTTOM (6' W6X15)	MP1B
G	1	GROUND STRUT	MS785
H	2	HINGE POST UPPER	MHP2A
J	2	HINGED POST LOWER	HP2B
K	5	STEEL LINE POST 6'	P621
L	1	MASH BEARING PLATE	ME750
M	1	CABLE ANCHOR BOX	S760
N	1	BCT CABLE ANCHOR ASSEMBLY	E770
O	5	RECYCLED PLASTIC BLOCK OR EQUIV.	CBSP-14
HARDWARE (ALL DIMENSIONS IN INCHES)			
a	2	5/16 x 1 HEX BOLT GRD 5	B5160104A
b	4	5/16 WASHER	W0516
c	2	5/16 HEX NUT	N0516
d	18	5/8 x 1 1/4 SPLICE BOLT	B580122
e	2	5/8 x 9 HEX BOLT GRD 5	B580904A
f	5	5/8 x 10 H.G.R. BOLT	B581002
g	3	5/8 WASHER	W050
h	25	5/8 H.G.R. NUT	N050
j	1	5/8 x 5" BOLT FULL THREAD GRD A449	B580504A
k	1	5/8 HEX NUT	N055
l	2	3/4 x 8 1/2 HEX BOLT GRD A449	B340854A
m	2	3/4 HEX NUT	N030
n	2	1 ANCHOR CABLE HEX NUT	N100
o	2	1 ANCHOR CABLE WASHER	W100
p	8	1/2 RSI SHOULDER BOLT W/WASHER	SB12A
q	8	1/2 STRUCTURAL NUT	N012A
r	8	1/2 STRUCTURAL WASHER	W012A



GENERAL NOTES:

- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The lower sections of the posts 1, 2 and 3 shall not protrude more than 4 in above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The lower sections of the hinged posts should not be driven with the upper post attached. If the post is placed in a drilled hole, the backfill material must be satisfactorily compacted to prevent settlement.
- When competent rock is encountered, a 12"Ø post hole, 20 in. deep cored into the rock surface may be used if approved by the engineer for Posts 1 and/or 2. Granular material will be placed in the bottom of the hole, approximately 2.5" deep to provide drainage. The first and/or second post can be field cut to length, placed in the hole and backfilled with suitable backfill. The soil plate may be trimmed if required.
- 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.

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



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*Norman S.H. Leong*  
 Expiration Date of License 4/24

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**MASH MFLEAT**  
**FLARED END TERMINAL**  
MAMALAHOA HIGHWAY  
SAFETY IMPROVEMENTS  
East and West of Puuwaawaa Ranch  
Federal Aid Project No. HSIP-0190(018)  
Scale: NTS  
Date: July 2022

SHEET No. 4 OF 7 SHEETS

**MASH Test Level 3 (TL-3) Length of SoftStop Terminal**

**NOTE:**  
Install rail parallel to roadway edge line. When taper is required by Design Engineer a 25:1 taper of the length of the system is allowable.

**Length of Need**

**Ground Strut**

**See Detail "C"**

**SoftStop Head**

**13'-5"±**

**8**, **7**, **6**, **5**, **4**, **3**, **2**, **1**

**6'-3"**, **6'-3"**, **6'-3"**, **6'-3"**, **6'-3"**, **6'-3"**, **6'-3"**, **5'-8"**, **4'-0"**

**5/16"Øx1 1/2" Hex HD Bolt with Nut and Washers Under Bolt Head and Nut**

**3'-4 1/2"**

**See Note 5**

**Reference Line Parallel to Grade**

**MGS Guardrail**

**SoftStop Anchor Guardrail Panel**

**Do not Attach Rail at Post #2**

**Grade Line**

**See Detail "D"**

**40"**

**See Detail**

**Posts**

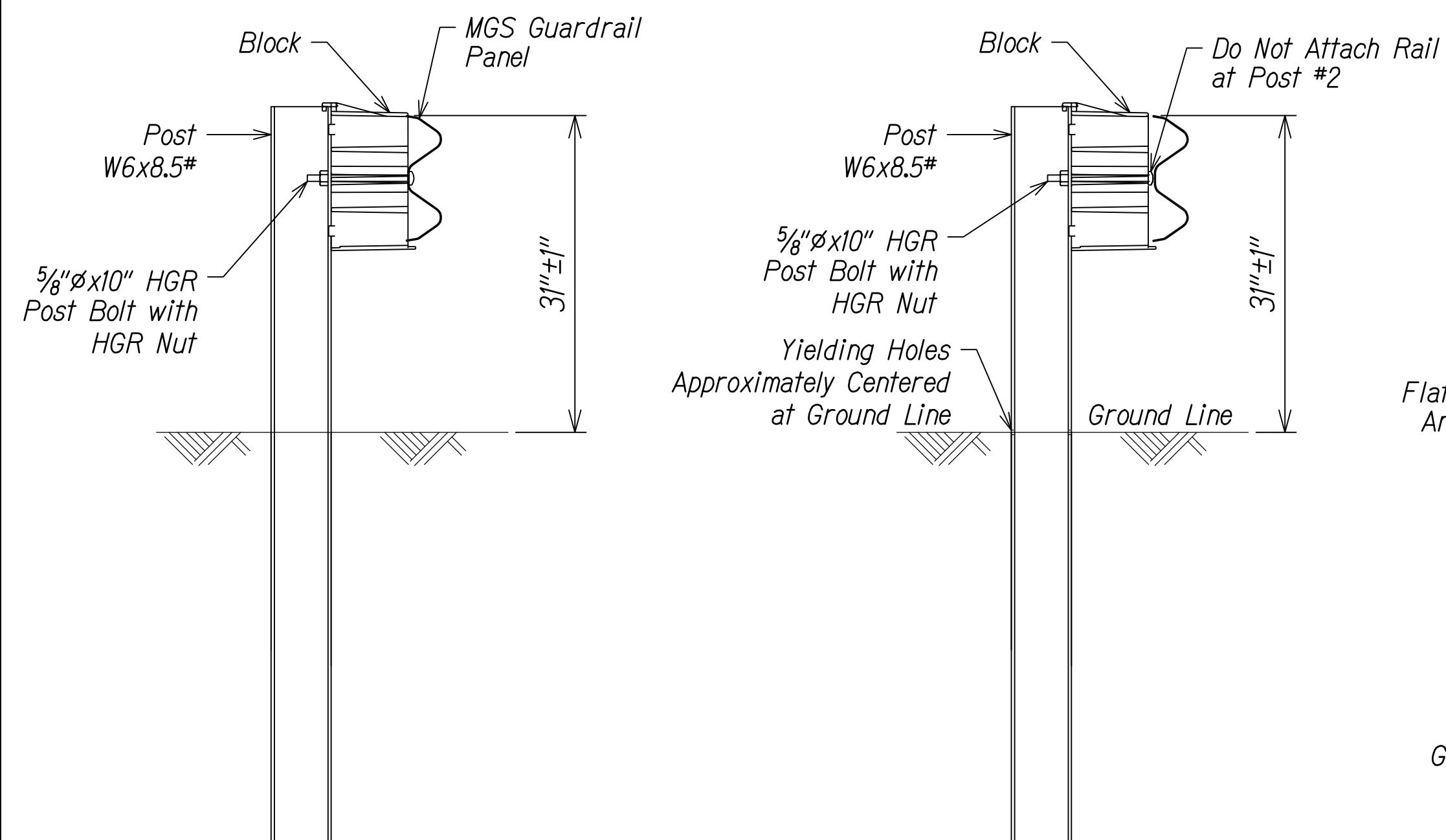
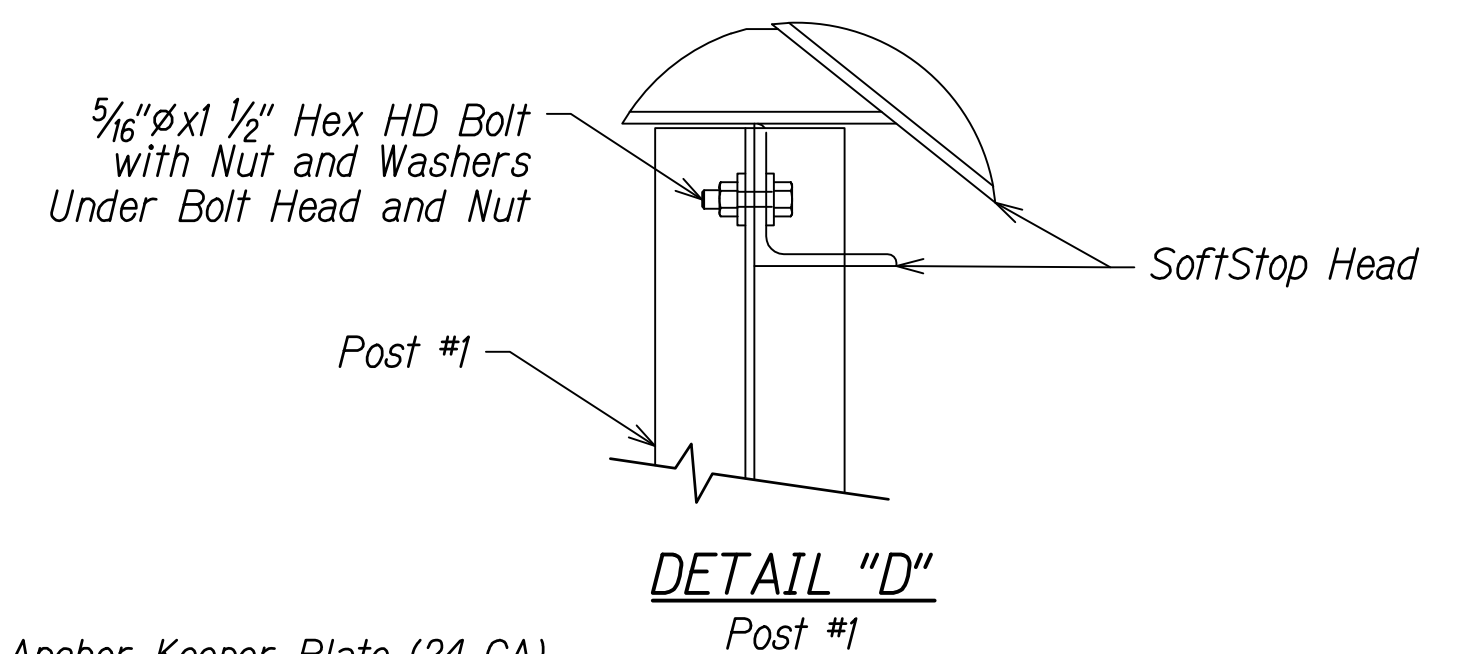
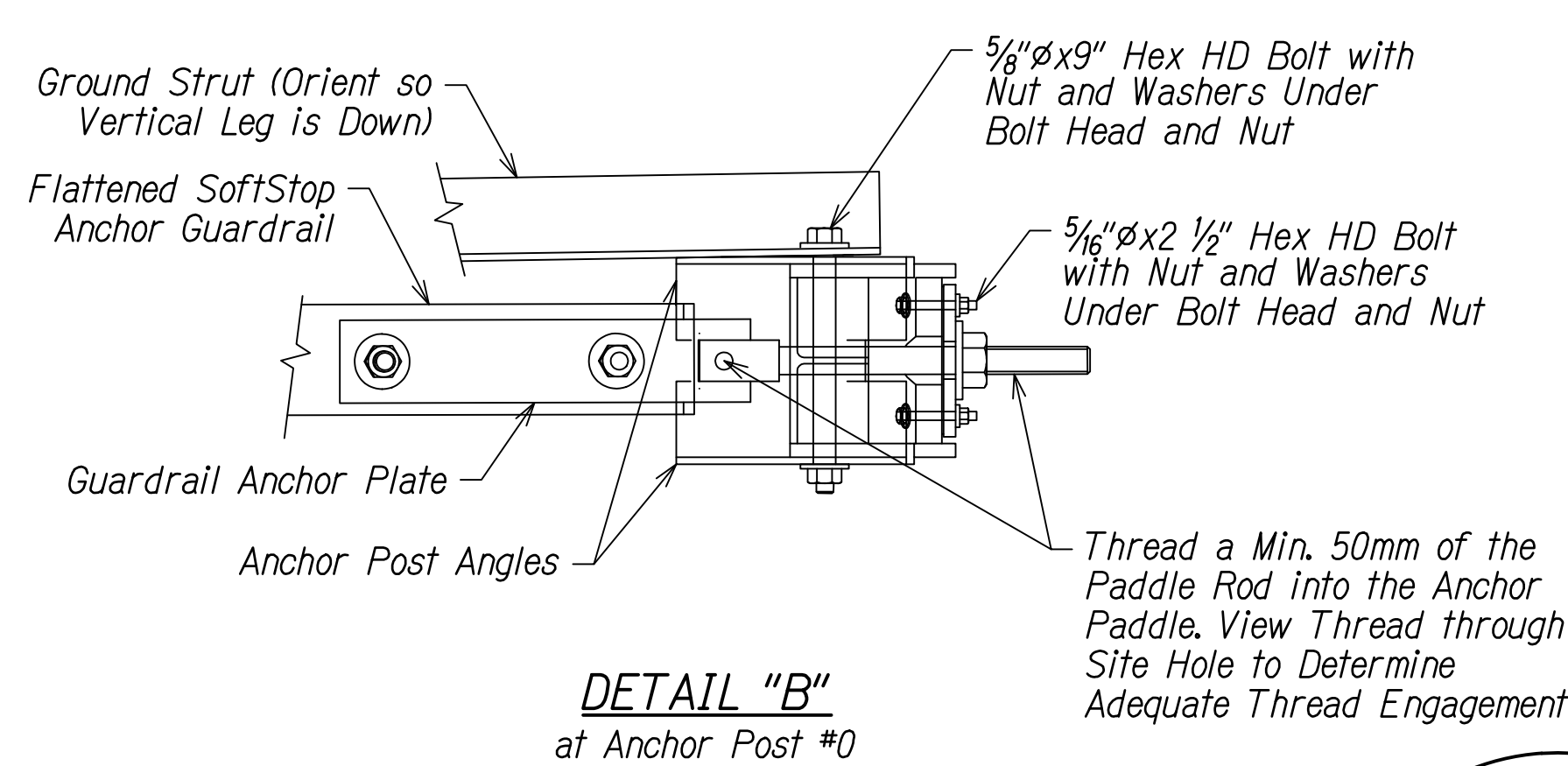
**Ground Strut (Orient so Vertical Load is Driven)**

**5/8"Ø x 1 3/4" Hex HD Bolt with Nut and Washers**

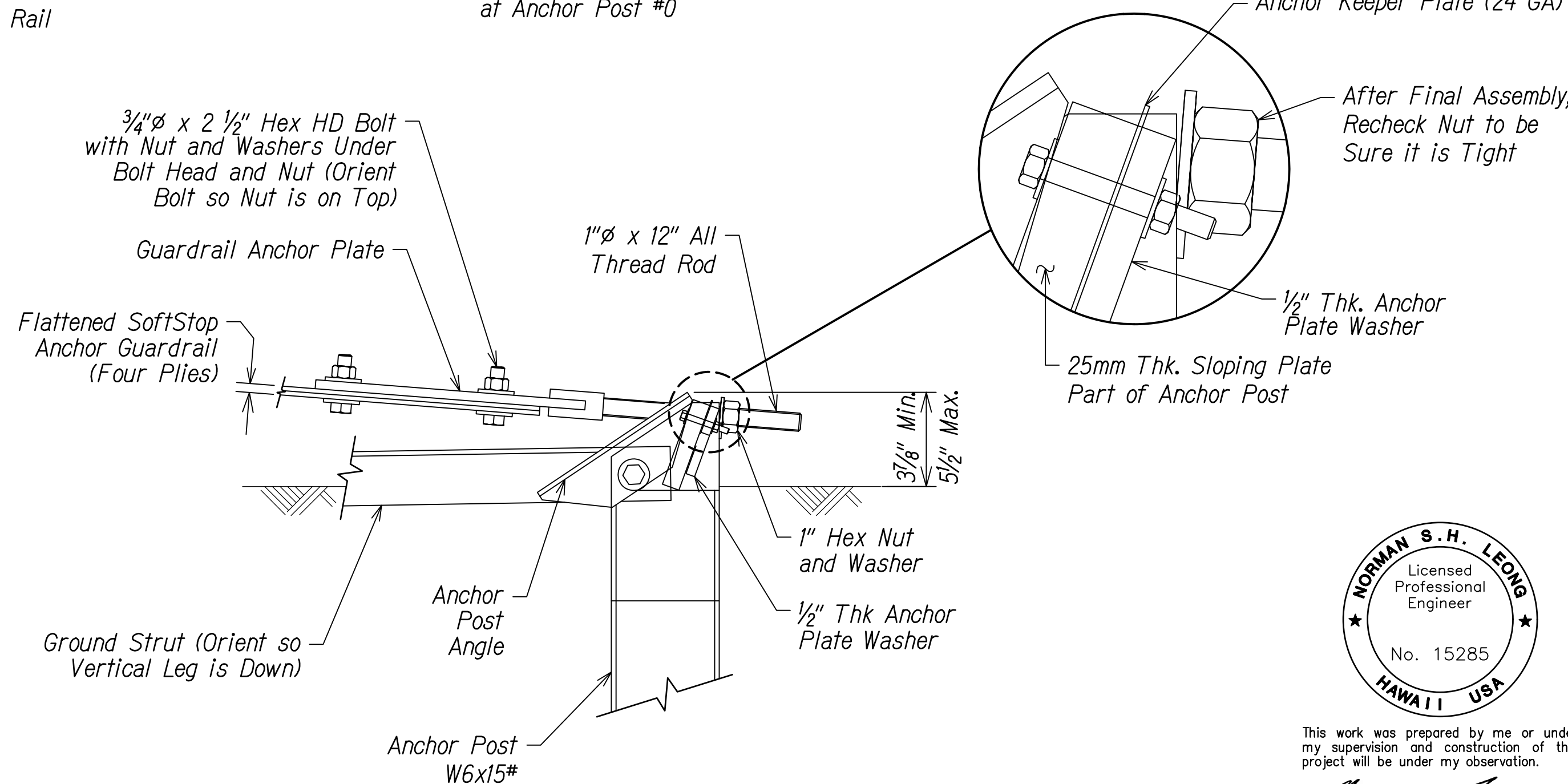
**Ground Strut (Orient so**

**5/8"Øx9" Hex HD Bolt with Nut and Washers Under**

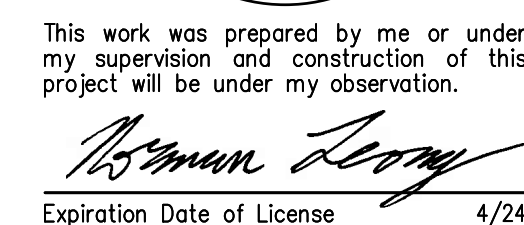
1. Refer to SoftStop Assembly Manual
2. SoftStop is a MASH Test Level 3 (TL-3) End Treatment
3. All steel components HDG to AS/NZS4680.
4. Manufacturer suggests customer to provide reflectorization of the terminal.
5. It is acceptable to install the SoftStop head parallel to the grade line or with an upward tilt. See SoftStop Assembly Manual for specific details.



SECTION "B-B"  
Post #2



DETAIL "A"  
At Anchor Post #0



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

*SOFTSTOP END TERMINAL*

*MAMALAHOA HIGHWAY*  
*SAFETY IMPROVEMENTS*

*East and West of Puuwaawaa Ranch*  
*Federal Aid Project No. HSIP-0190(018)*

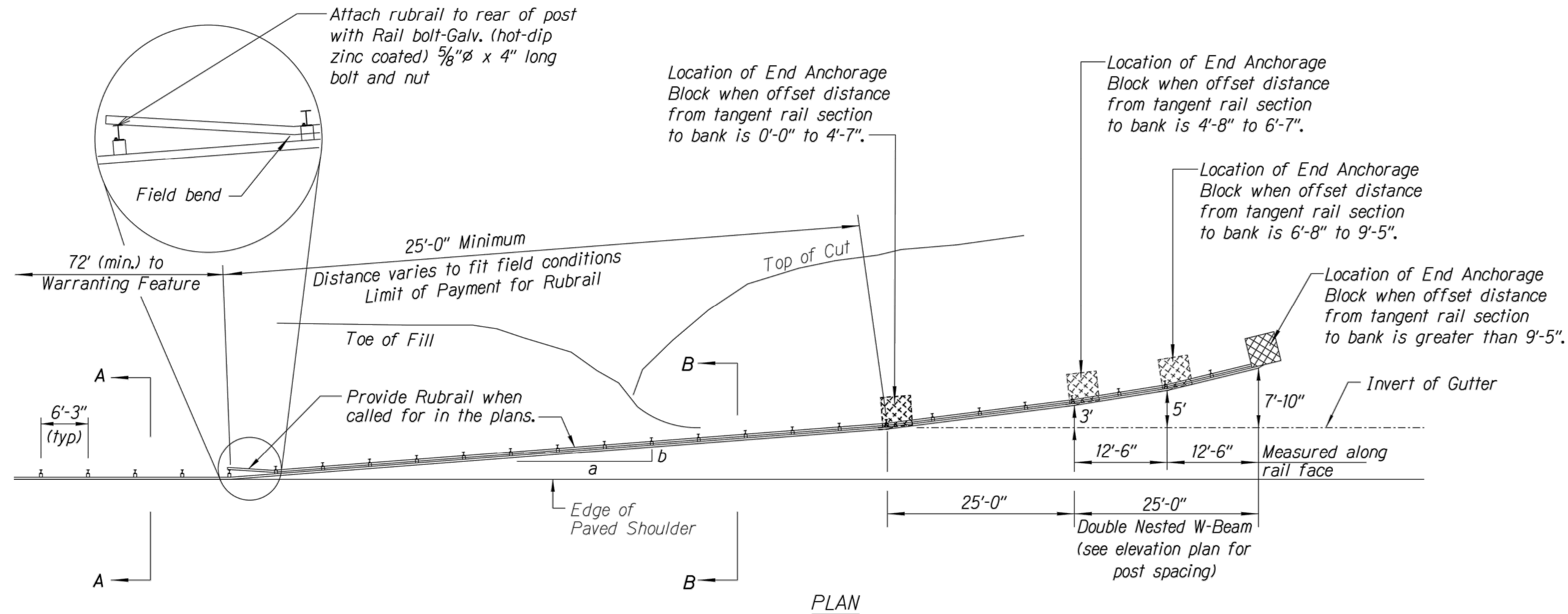
*Scale: NTS* *Date: July 2022*

SHEET NO. 5 OF 7 SHEETS

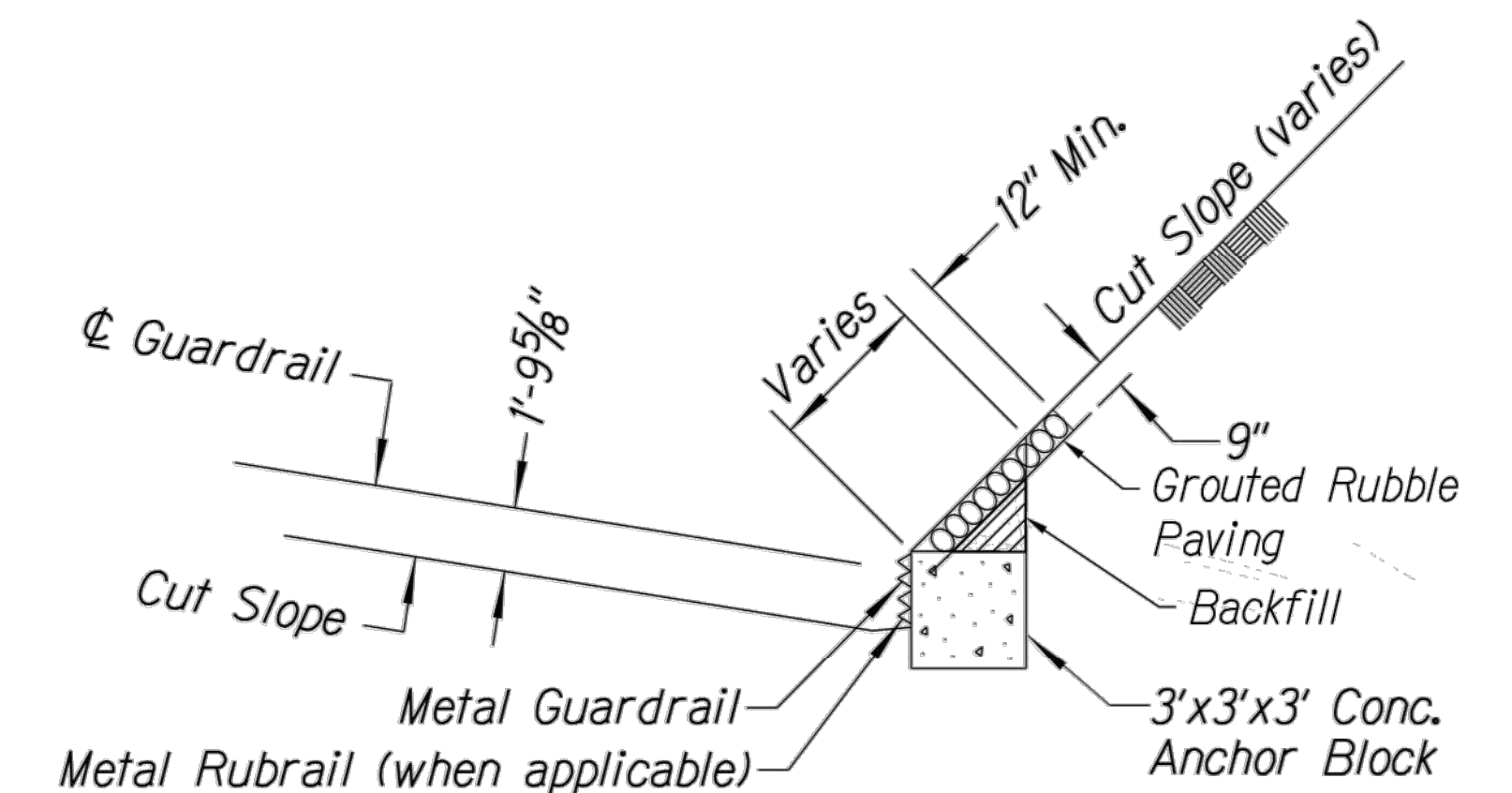
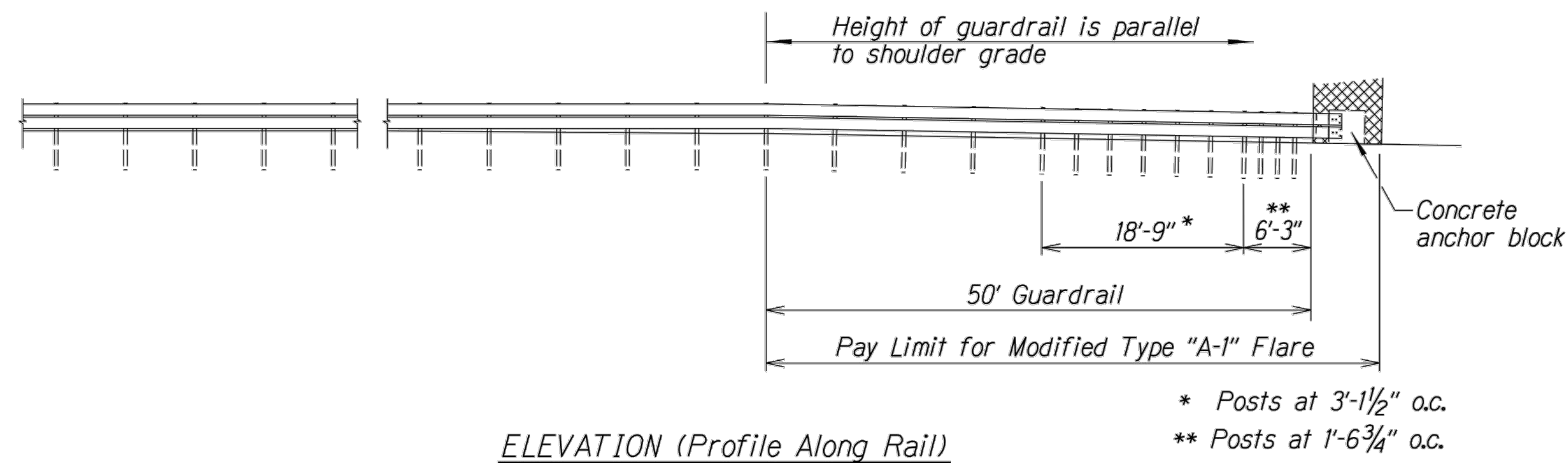
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	14	70

General Notes

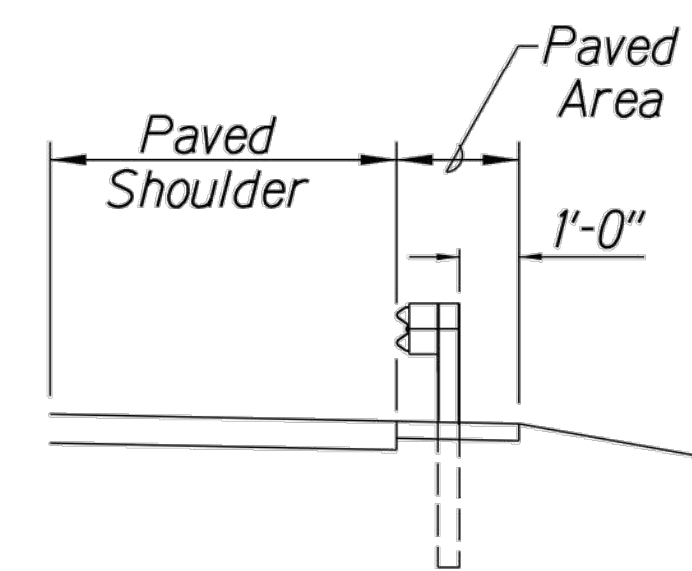
1. *All posts are 6'-0" in length within the 50'-0" pay limit for the Modified Type "A-1" Flare without rubrail.*
2. *Whenever swales or a change in grade is encountered within the 50'-0" pay limit for the Modified Type "A-1" Flare, a rubrail shall be installed and all posts shall have a minimum embedment of 4'-0". Post lengths shall be adjusted to provide the minimum embedment.*
3. *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.*
4. *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.*
5. *Excavation, Anchor Block and GRP work shall be considered incidental to the Modified Type "A-1" Flare.*



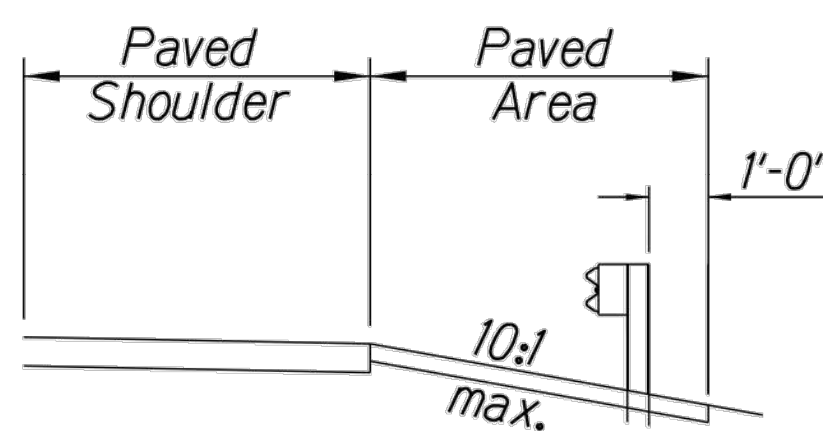
<i>Design speed mph</i>	<i>a:b</i>
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



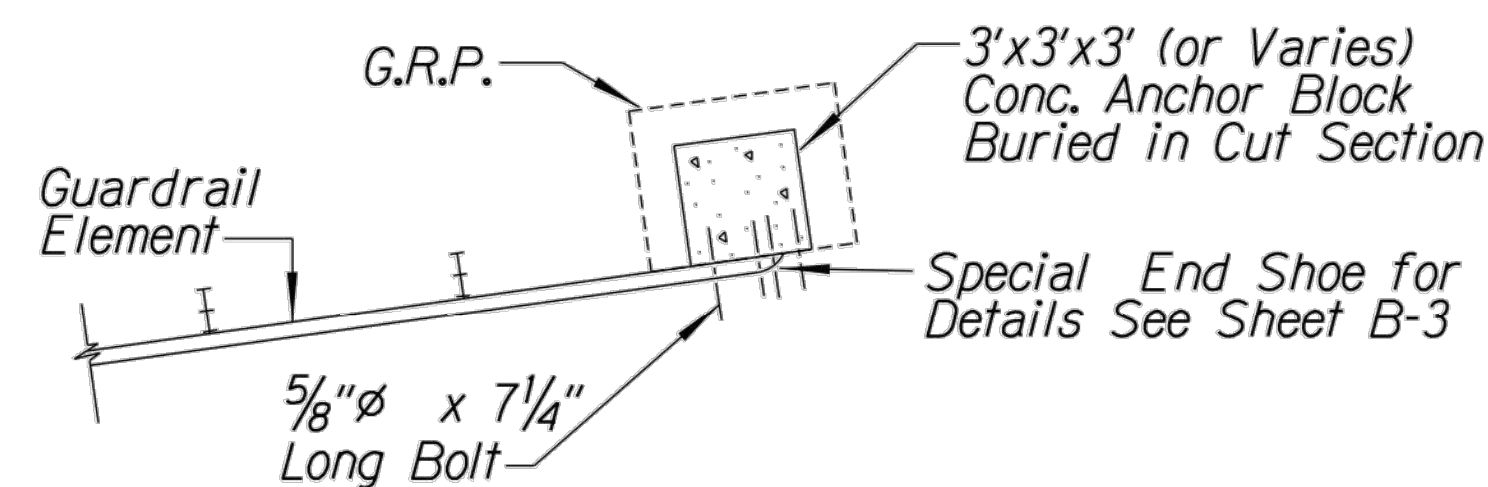
ANCHOR BLOCK IN CUT SECTION



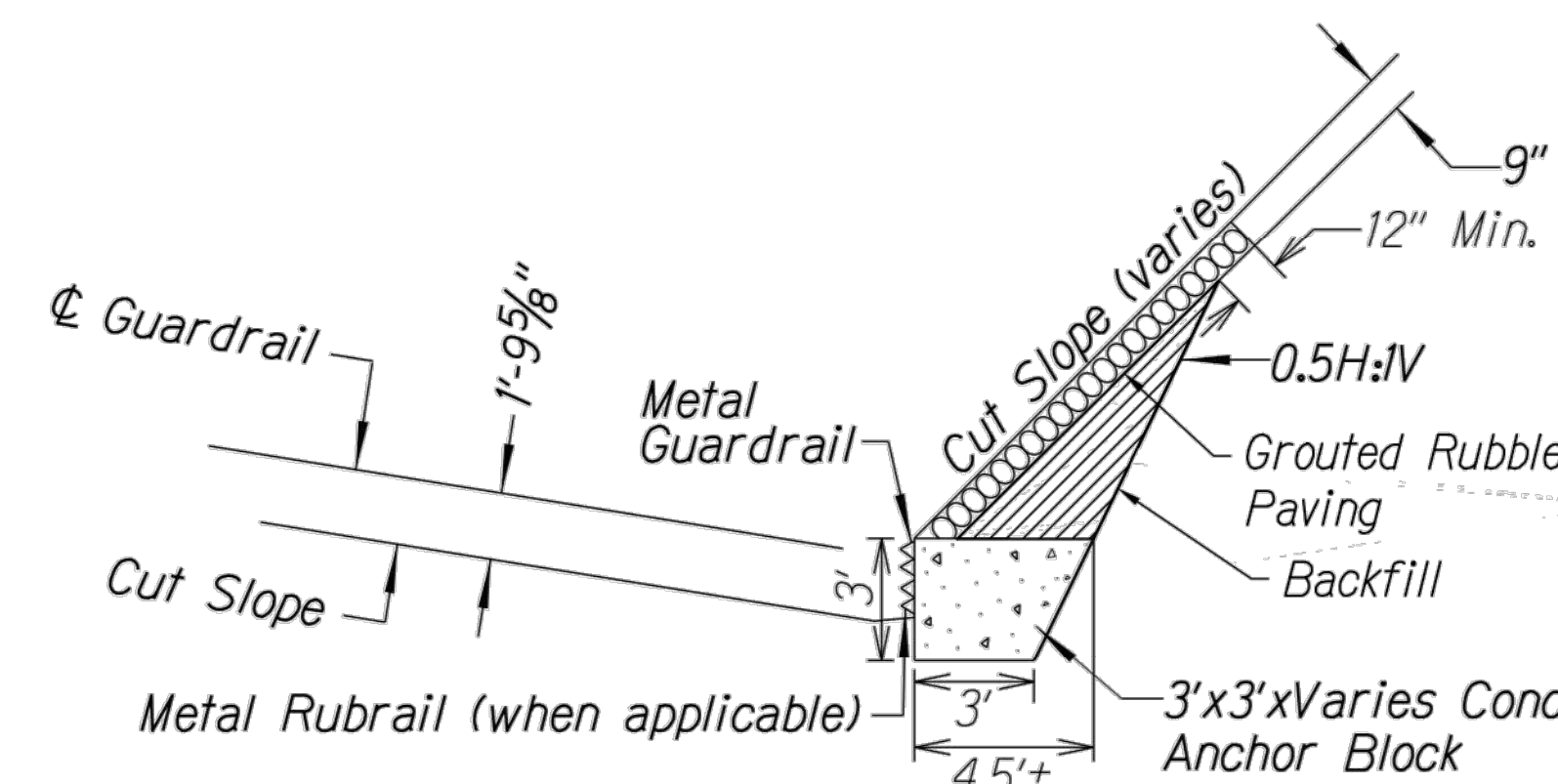
Section A-A



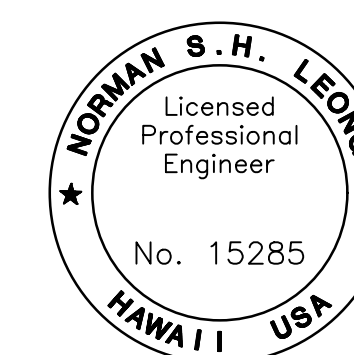
Section B-B



PLAN - ANCHOR BLOCK IN CUT SECTION



ANCHOR BLOCK IN CUT SECTION  
WITH SLOPE STABILITY CONCERNS



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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

MODIFIED TYPE "A-1" FLARE

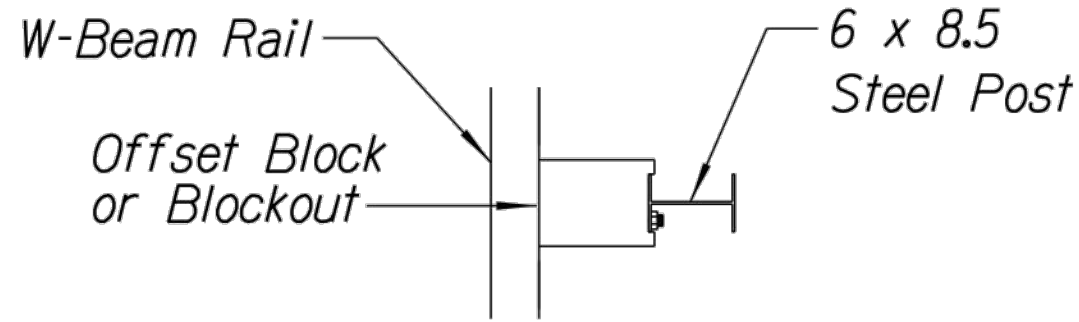
MAMALAHOA HIGHWAY  
SAFETY IMPROVEMENTS

East and West of Puuwaawaa Ranch  
Federal Aid Project No. HSIP-0190(018)

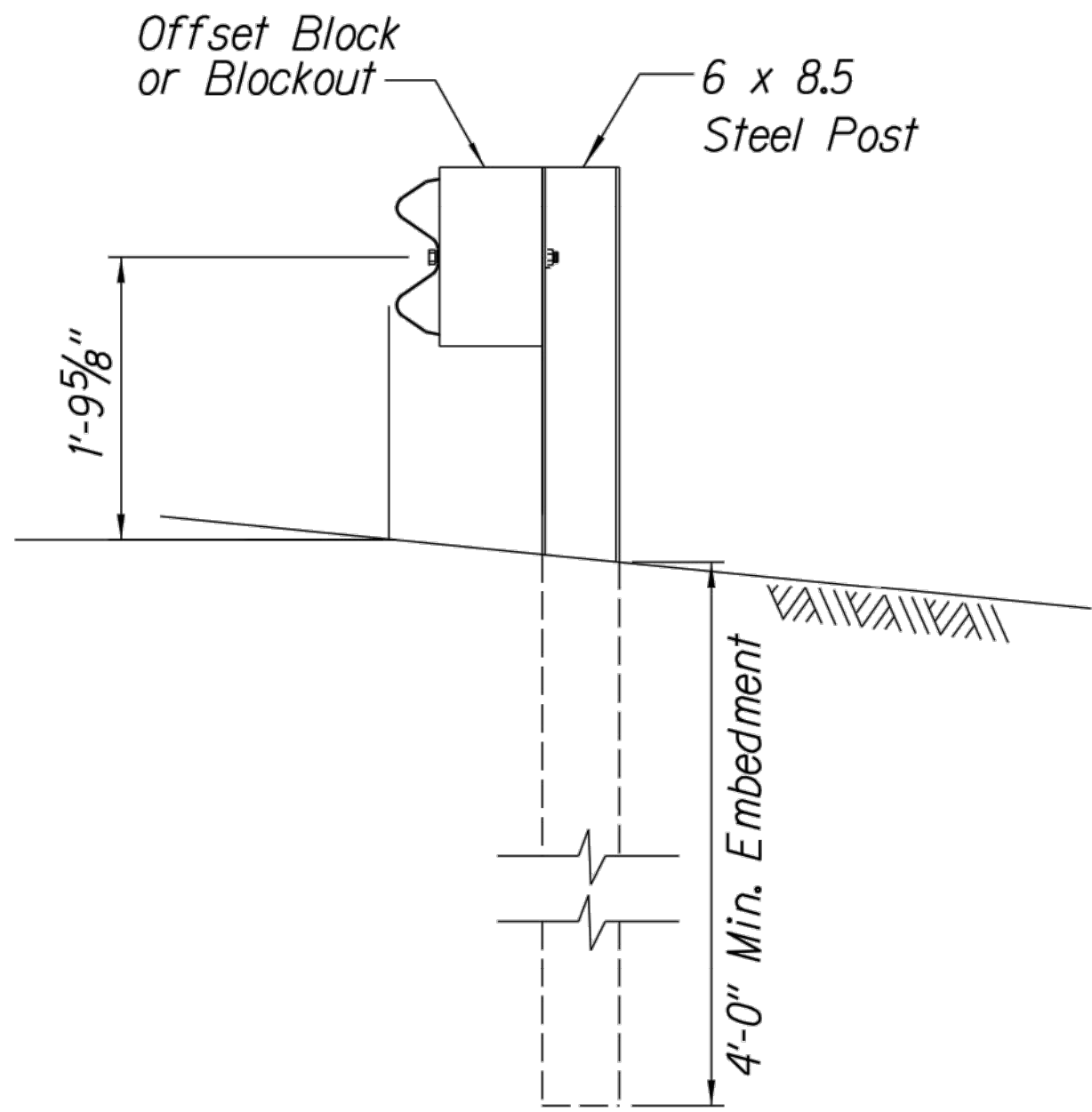
Scale: NTS Date: July 2022



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-0190(018)	2022	15	70

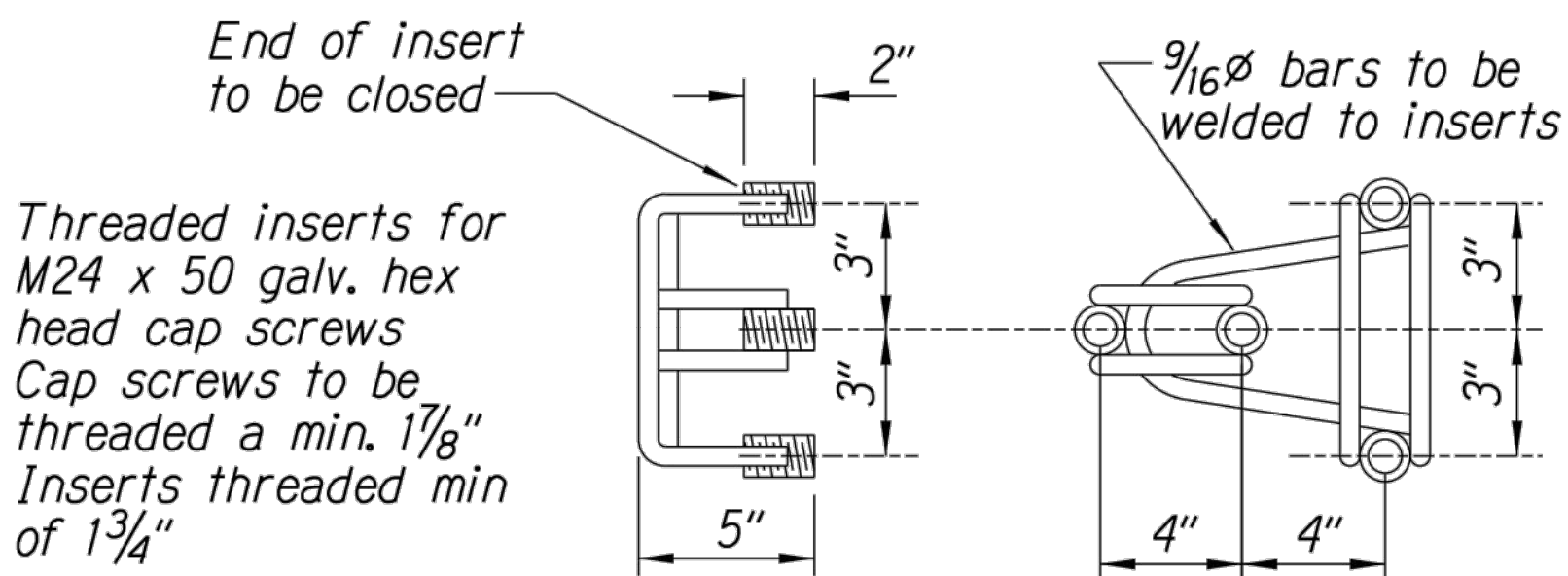


Plan

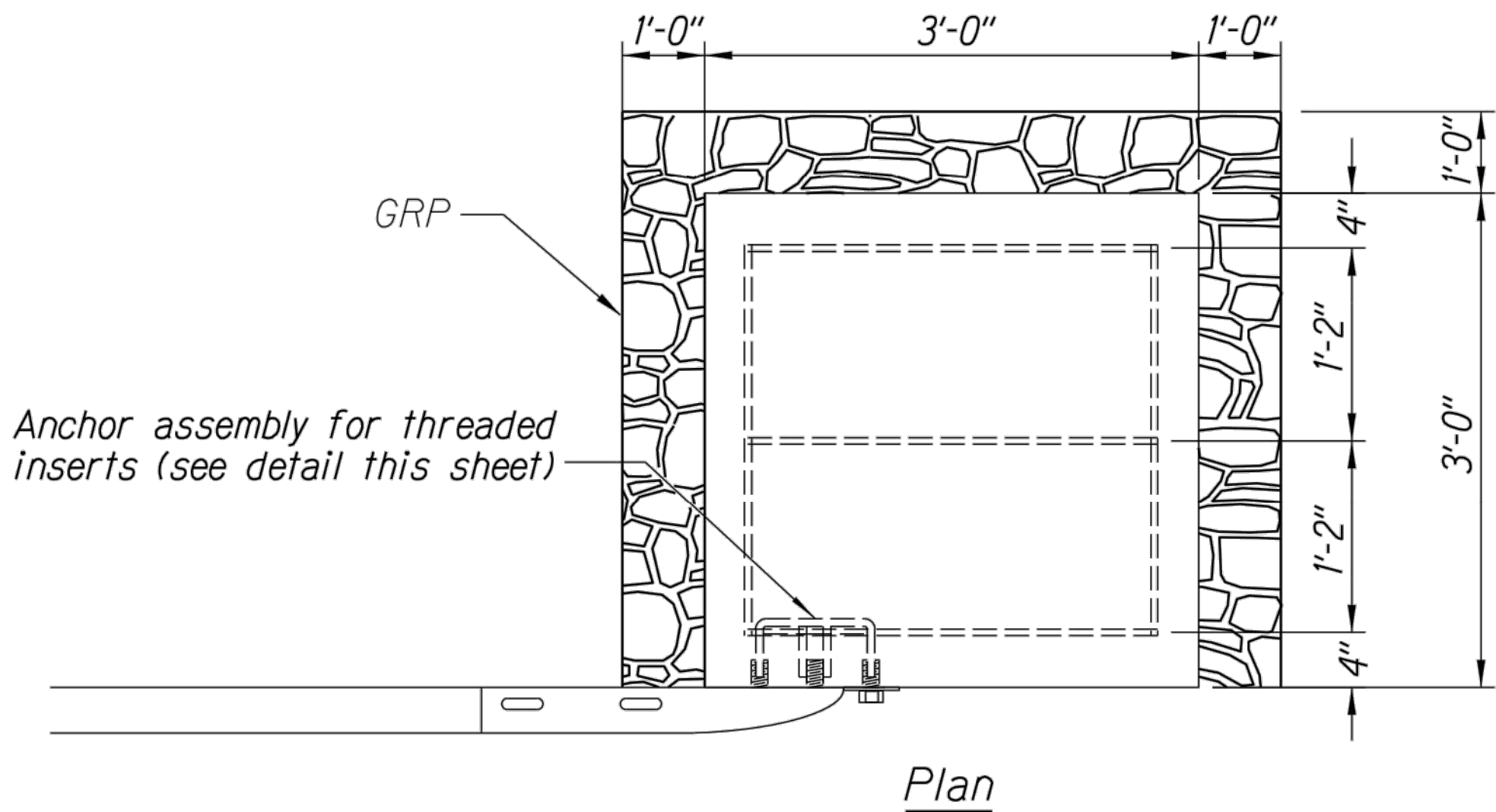


Elevation

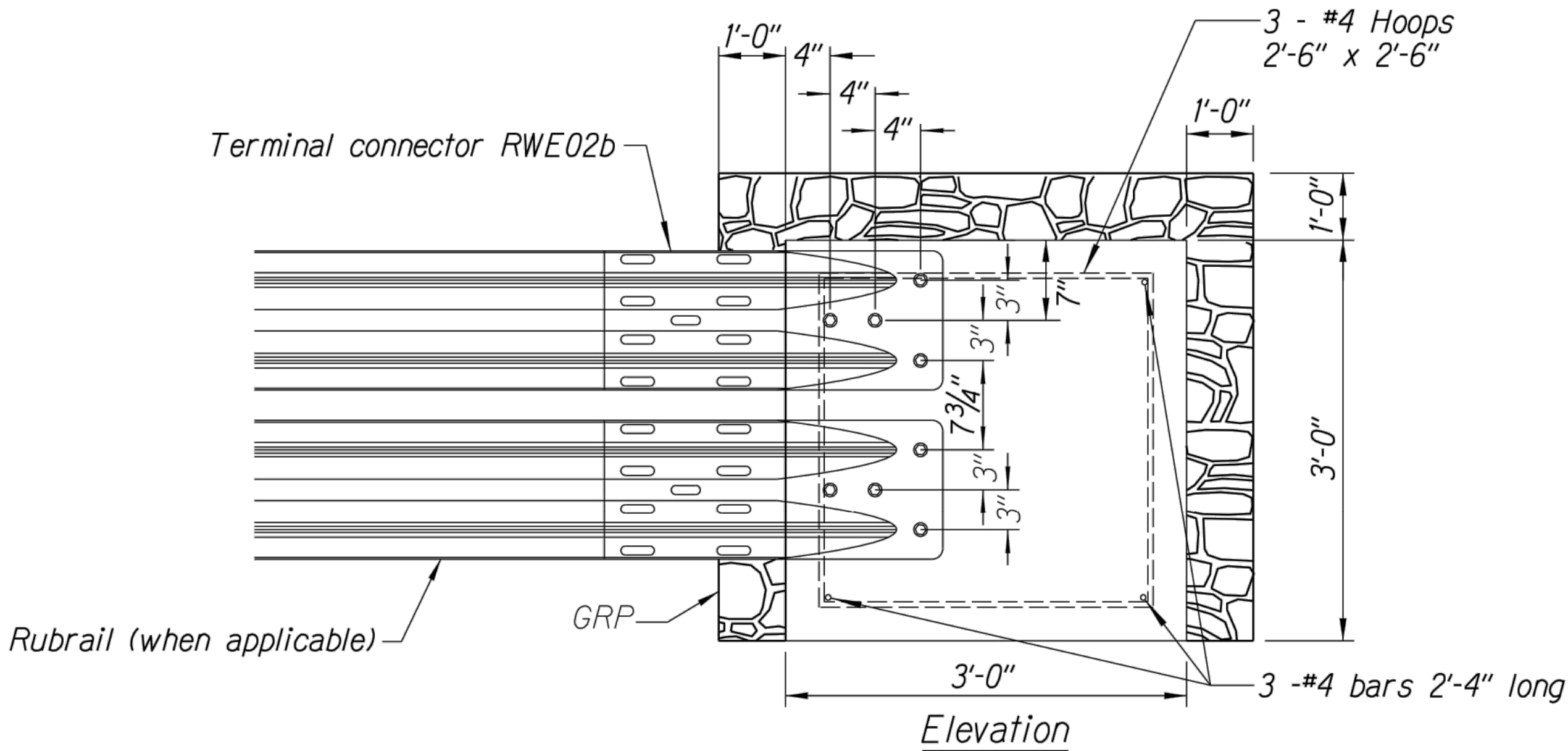
**STRONG POST W-BEAM GUARDRAIL**



**ANCHOR ASSEMBLY**  
**CONCRETE BLOCK ANCHOR**



Plan



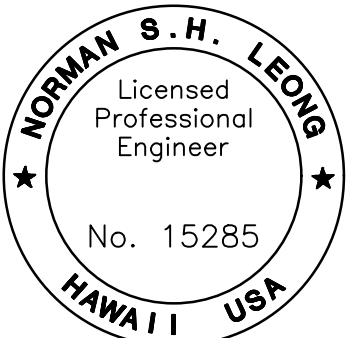
**CONCRETE BLOCK ANCHOR**  
**(3' X 3' X 3')**

**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.

SURVEY PLOTTED BY	DATE
DRAWN BY	"
DESIGNED BY	"
QUANTITIES BY	"
CHECKED BY	"
ORIGINAL PLAN	No.



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*Norman S.H. Leong*  
Expiration Date of License 4/24

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

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

MAMALAHOA HIGHWAY  
SAFETY IMPROVEMENTS  
East and West of Puuwaawaa Ranch  
Federal Aid Project No. HSIP-0190(018)

Scale: NTS Date: July 2022

SHEET No. 7 OF 7 SHEETS