

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	42	63

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.
- 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.
- The Recycled Plastic Block 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.
- New A.C. 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 adjacent guardrail system.

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



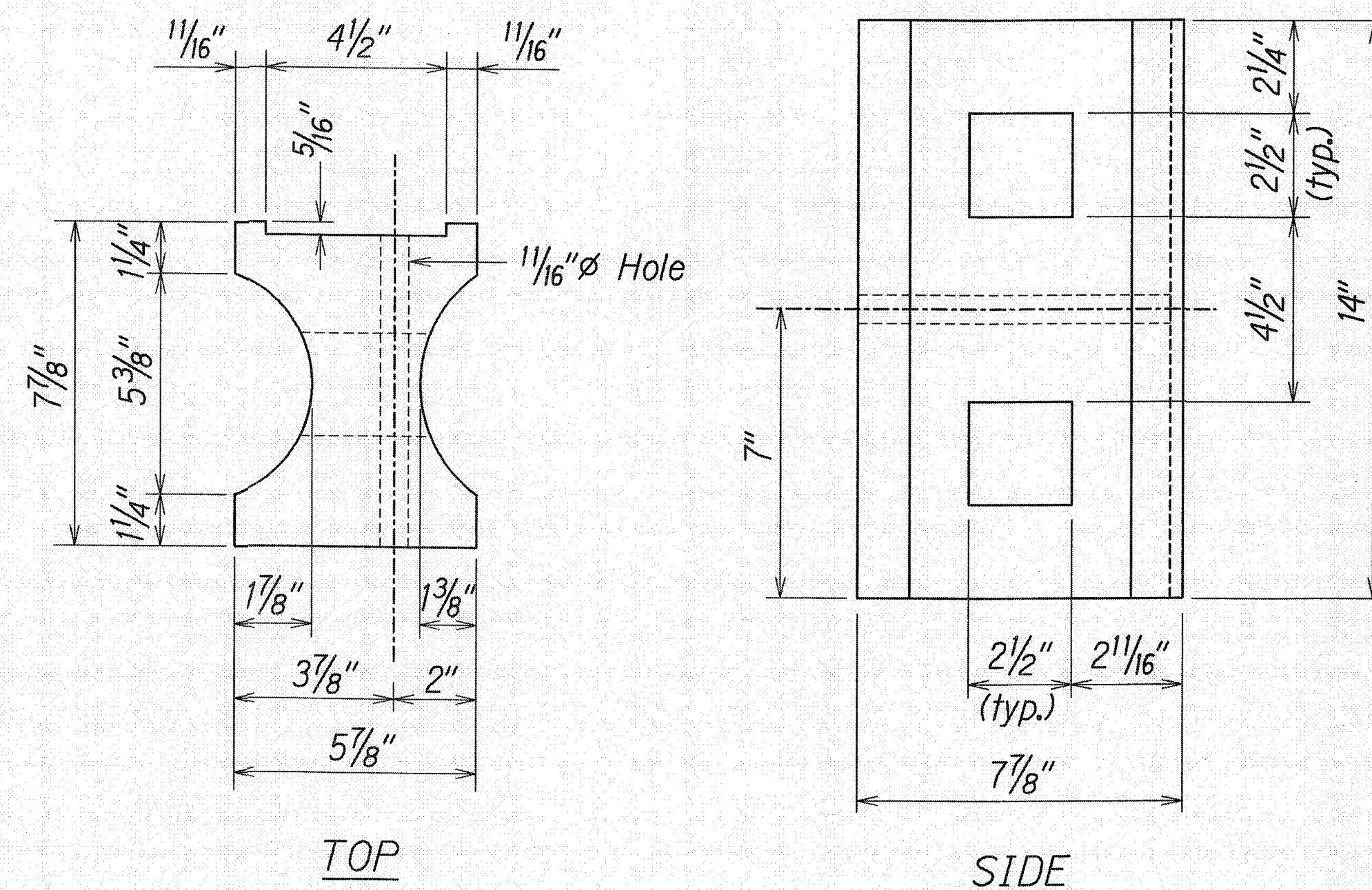
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4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify dimensions at job before proceeding with work.

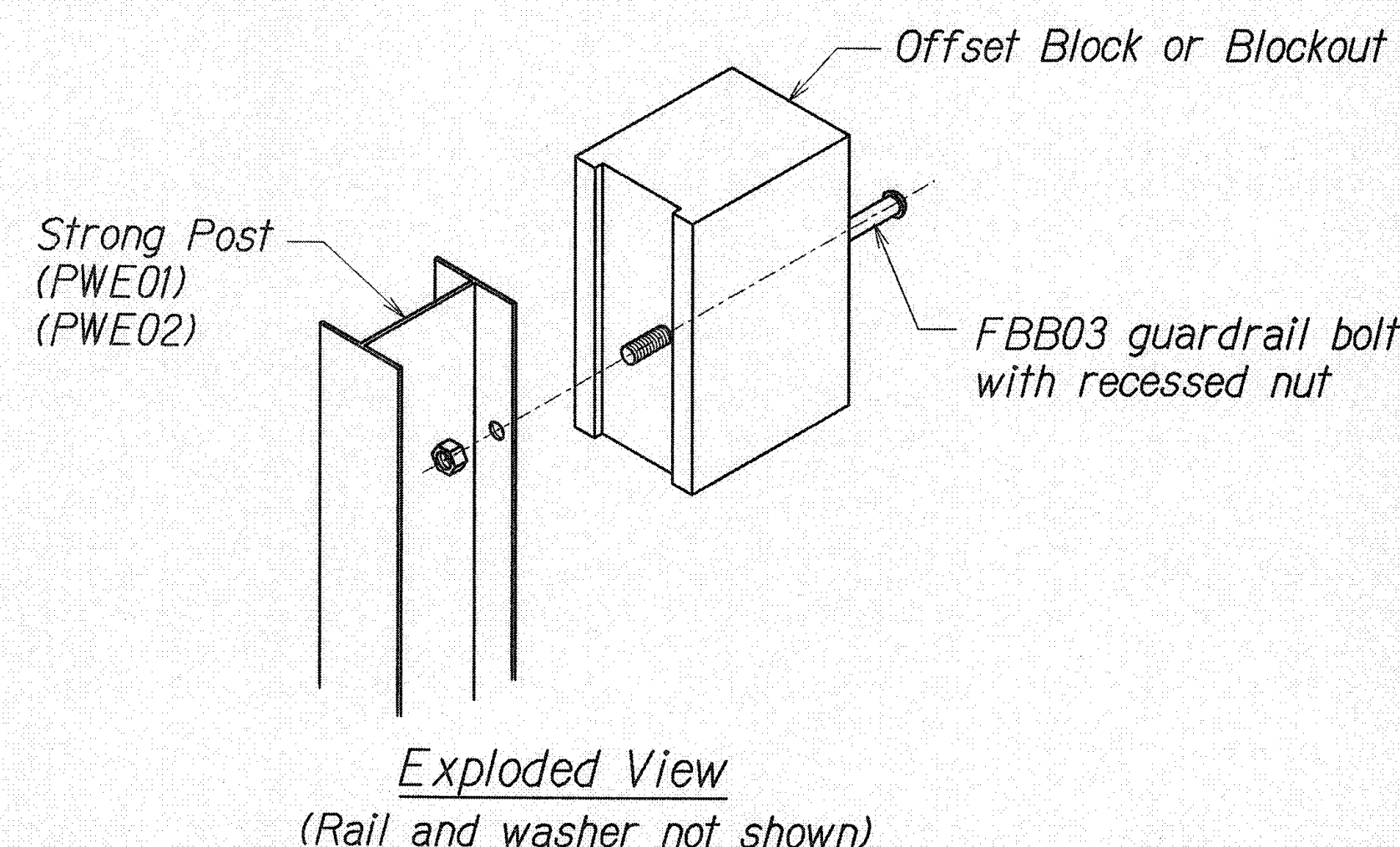
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES

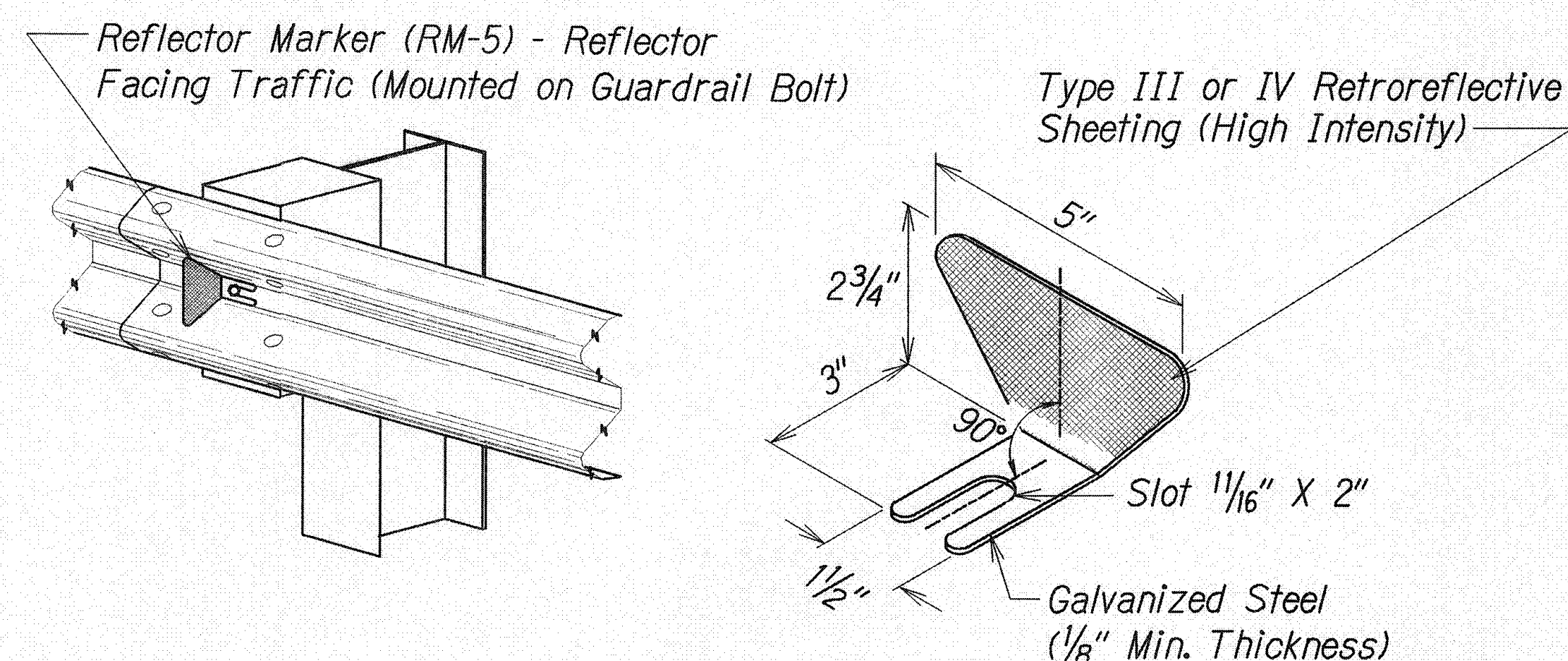
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-40 Date: May 2008



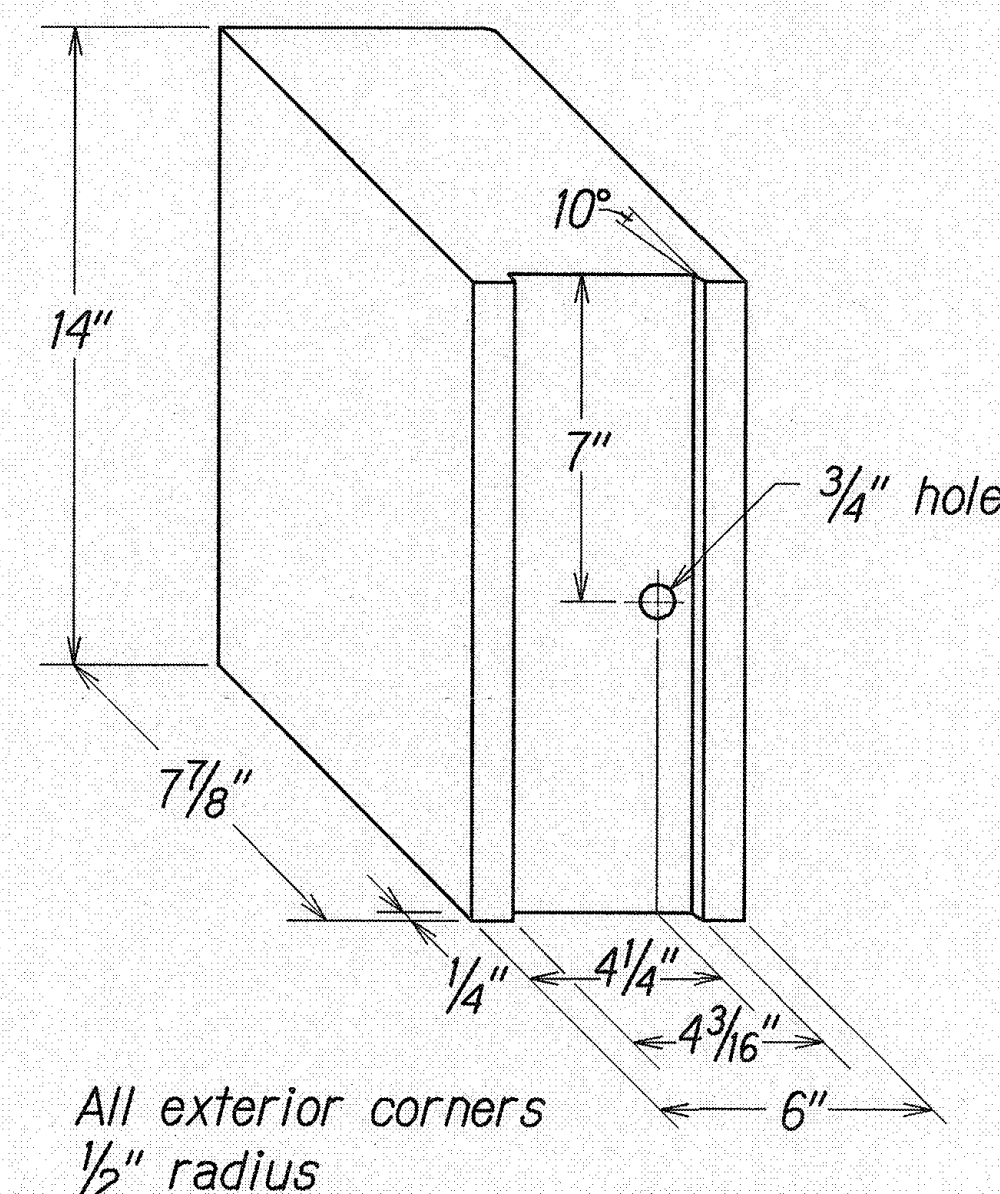
TOP
SIDE
RECYCLED PLASTIC BLOCKOUT (TYPE I)



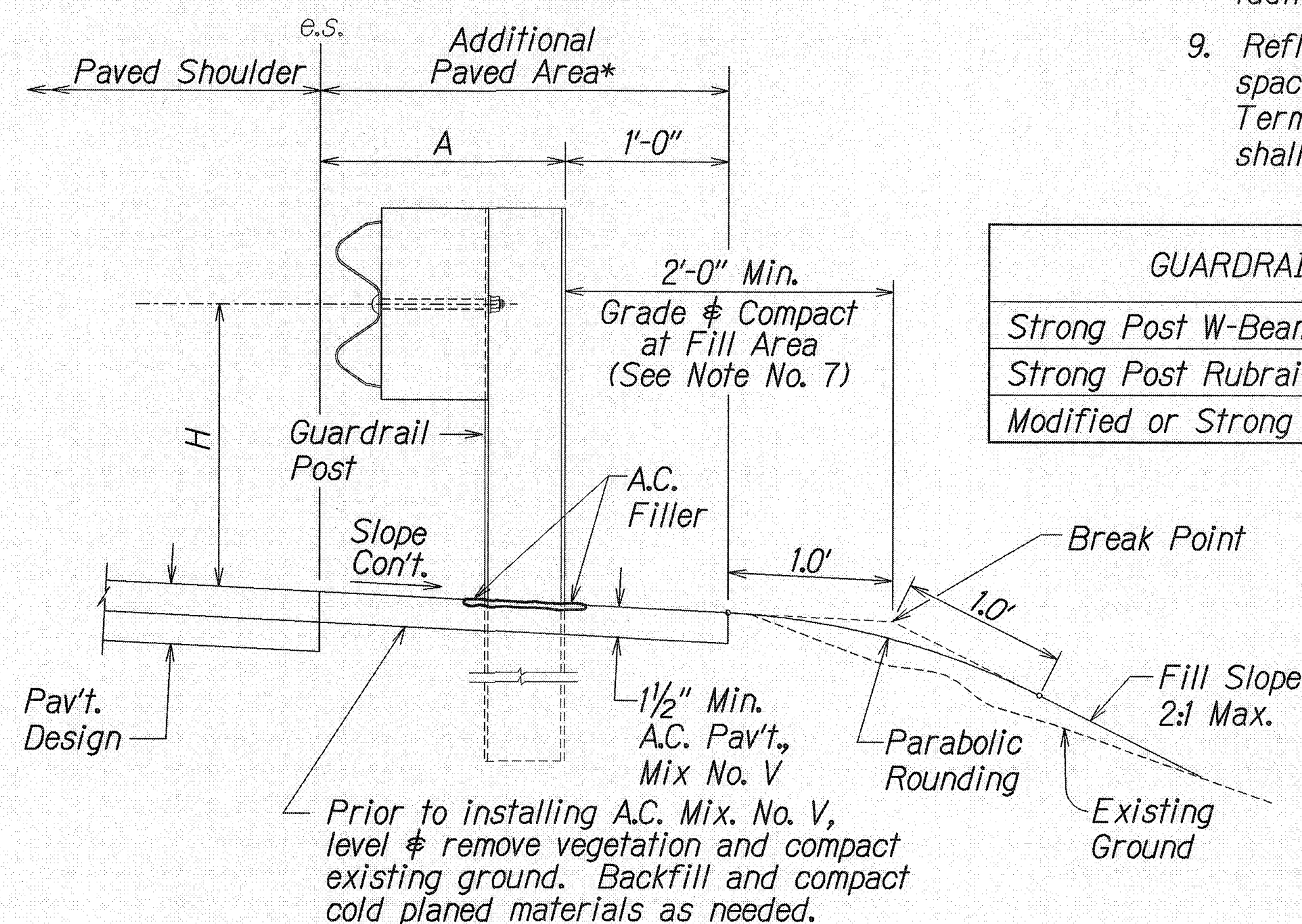
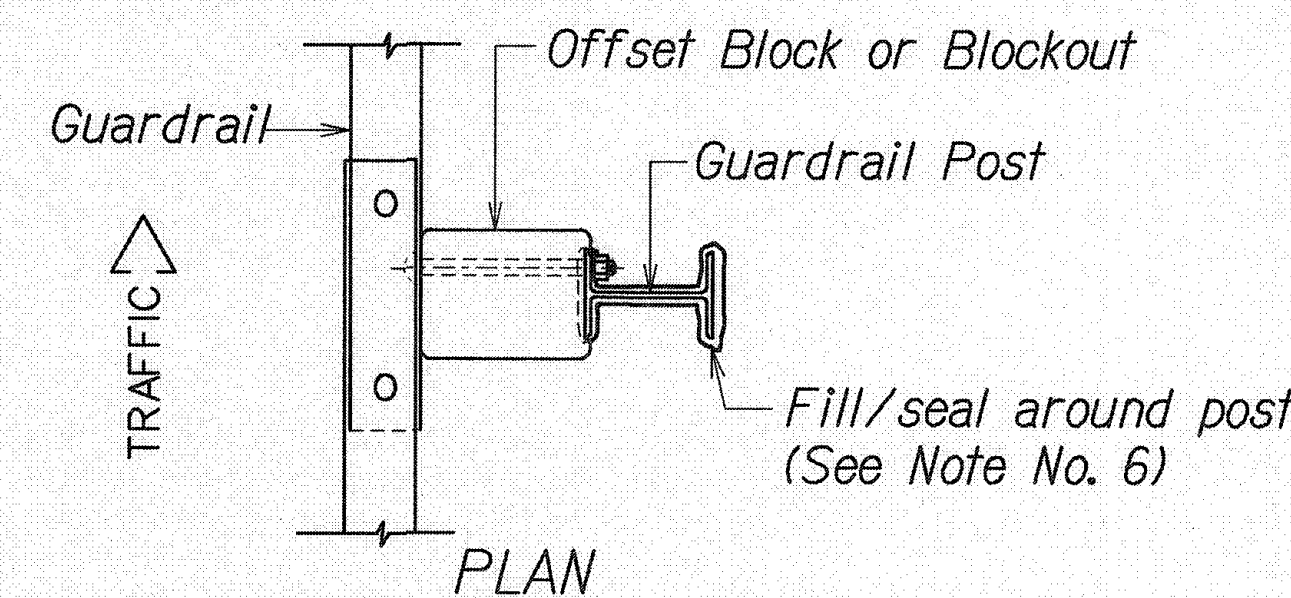
STEEL POST AND BLOCK DETAIL



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



RECYCLED POLYETHYLENE
OFFSET BLOCK (TYPE II)

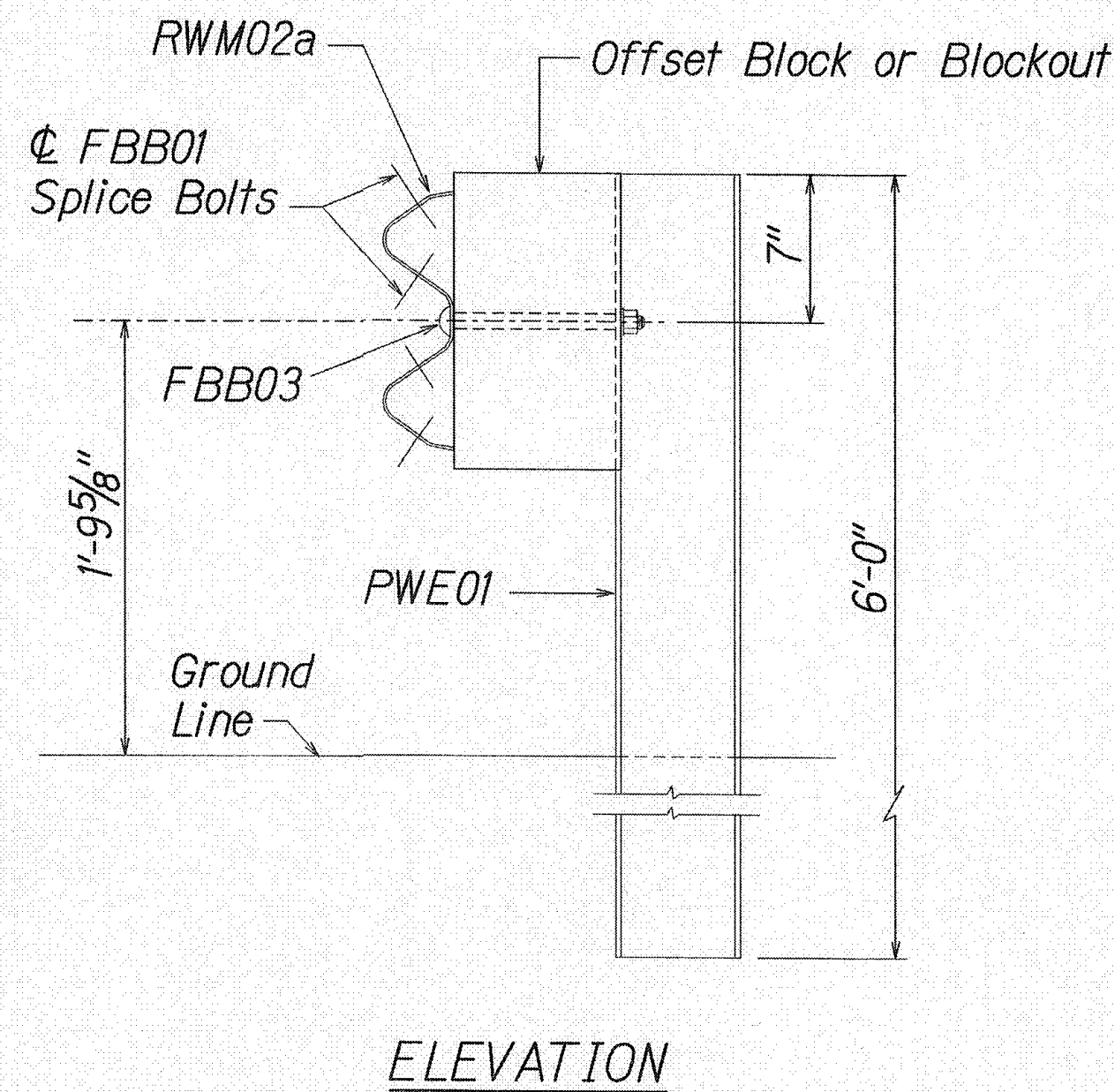
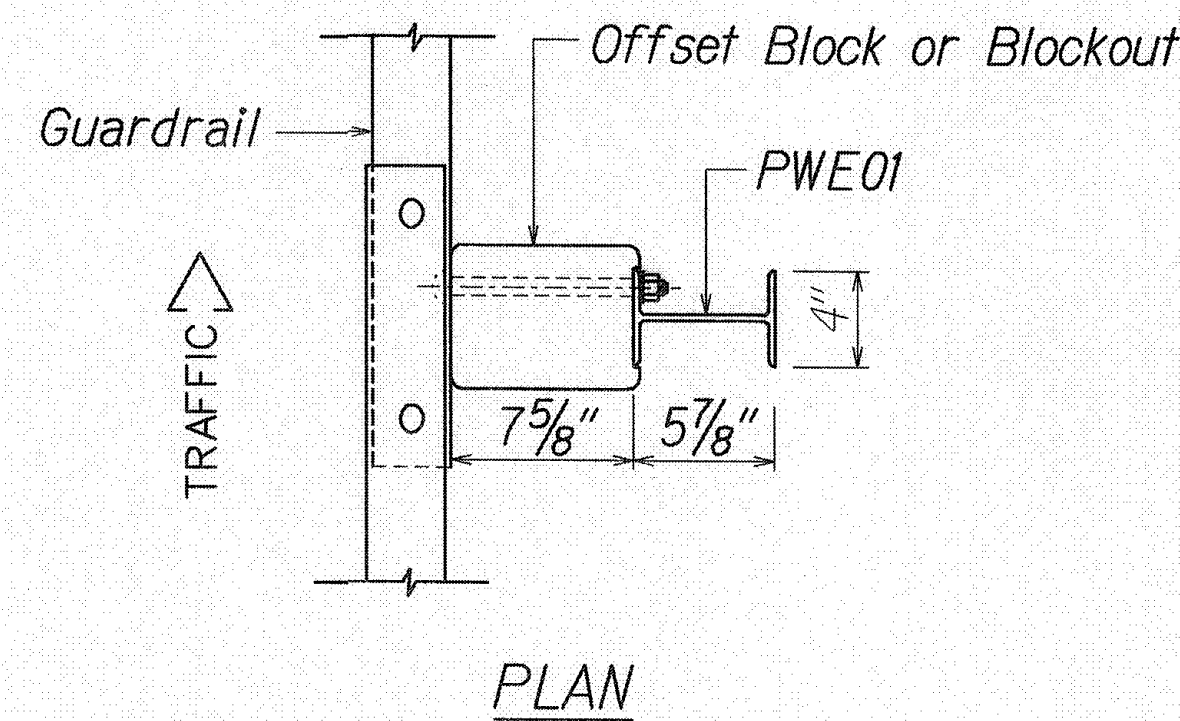


ELEVATION

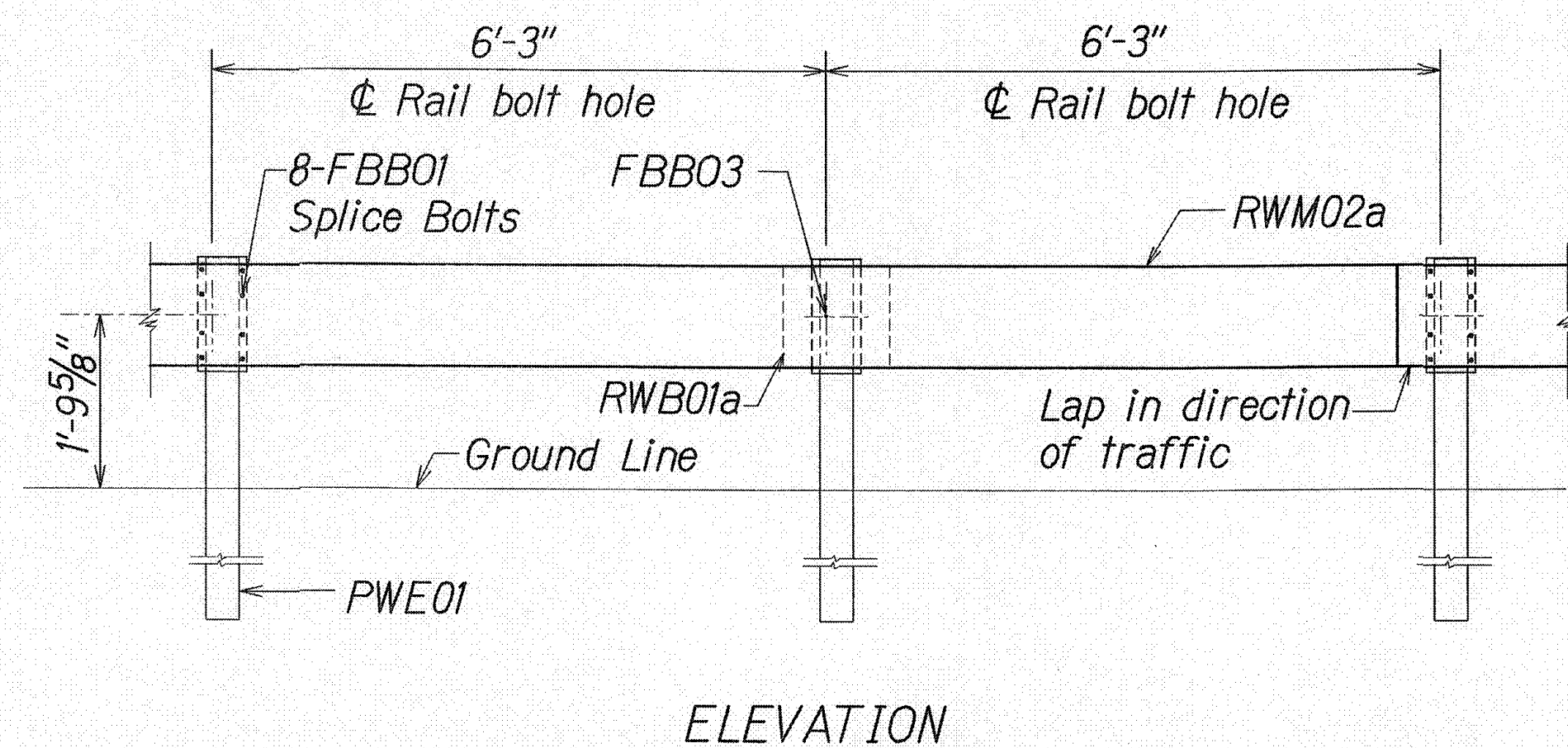
TYPICAL GUARDRAIL INSTALLATION

DATE	2/08
SURVEY PLOTTED BY	CH
DESIGNED BY	MITSUNAGA & ASSOCIATES, INC.
QUANTITIES BY	MITSUNAGA & ASSOCIATES, INC.
CHECKED BY	HW-H
ORIGINAL PLAN	
NOTE BOOK	
No.	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	43	63

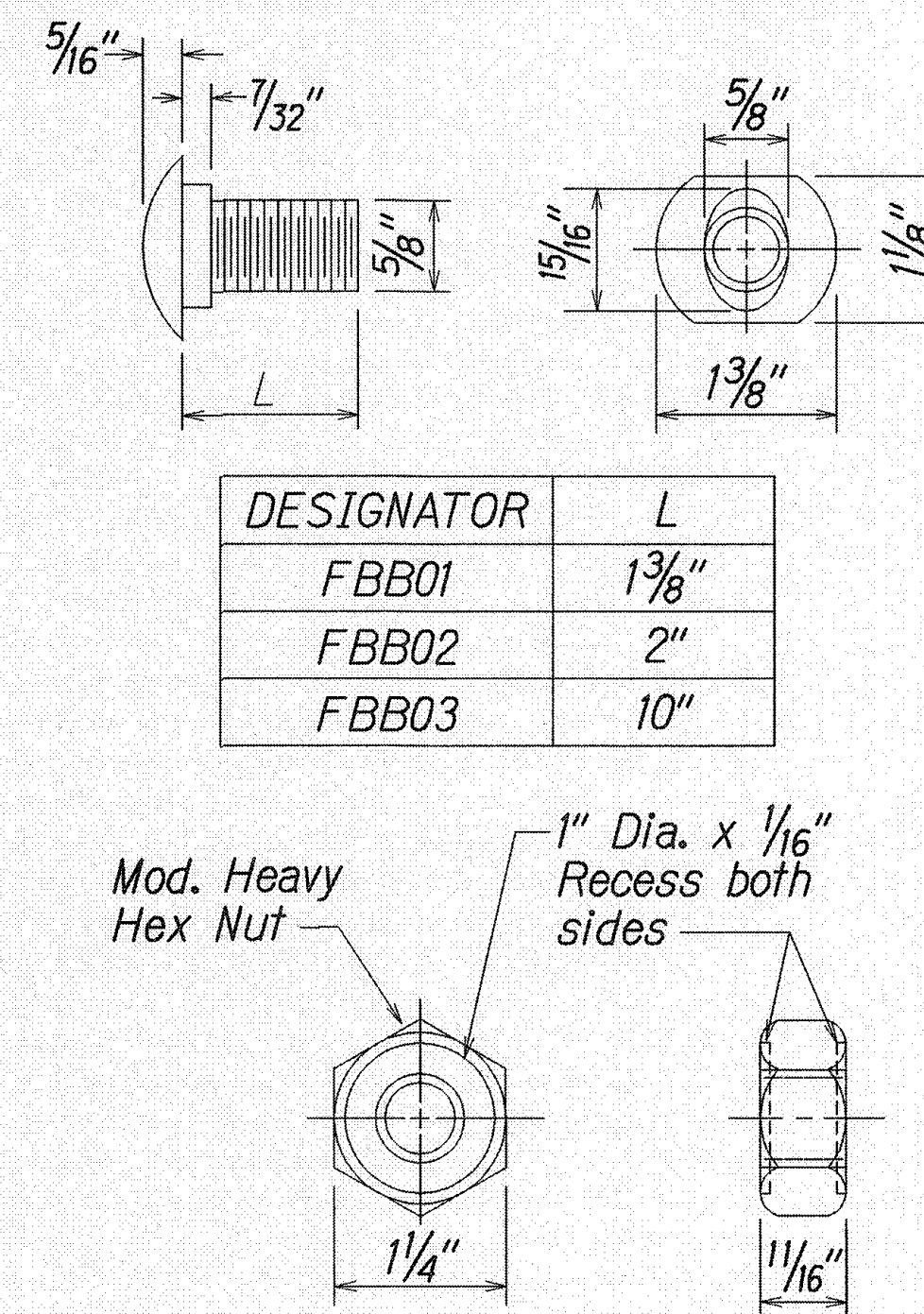
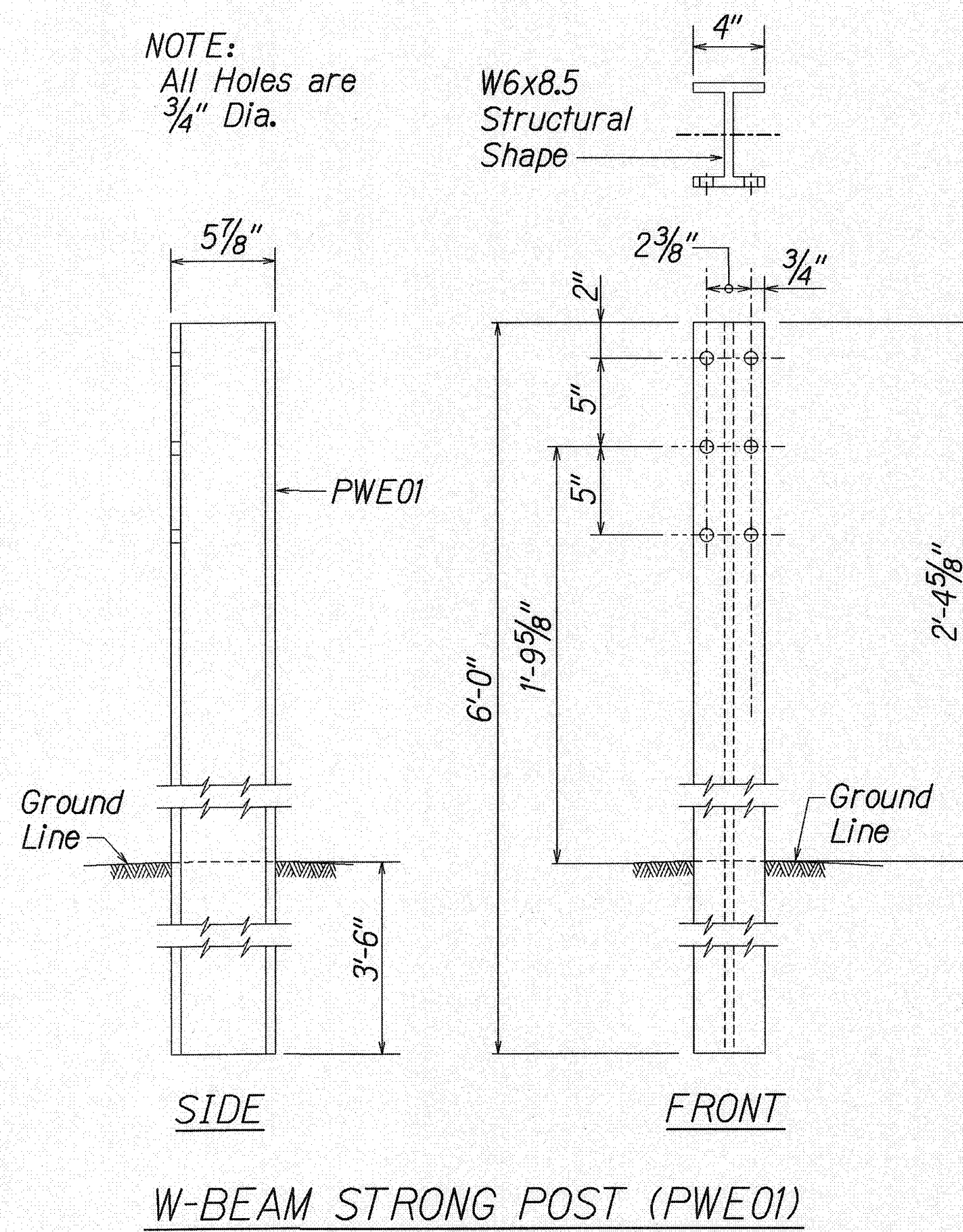


STRONG POST W-BEAM GUARDRAIL
(SGR04a)

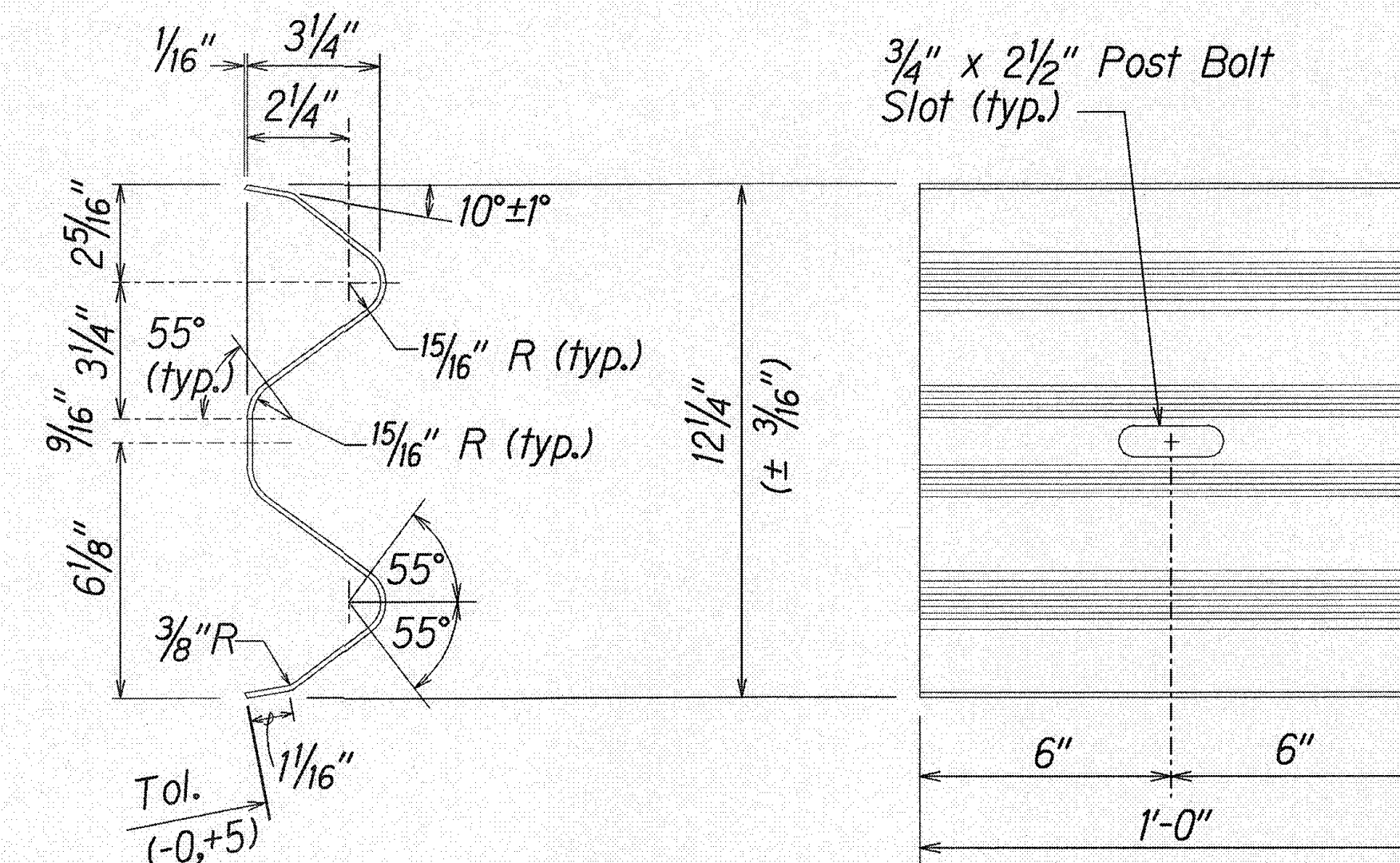


STRONG POST W-BEAM GUARDRAIL WITH
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT

NOTE:
All Holes are
3/4" Dia.

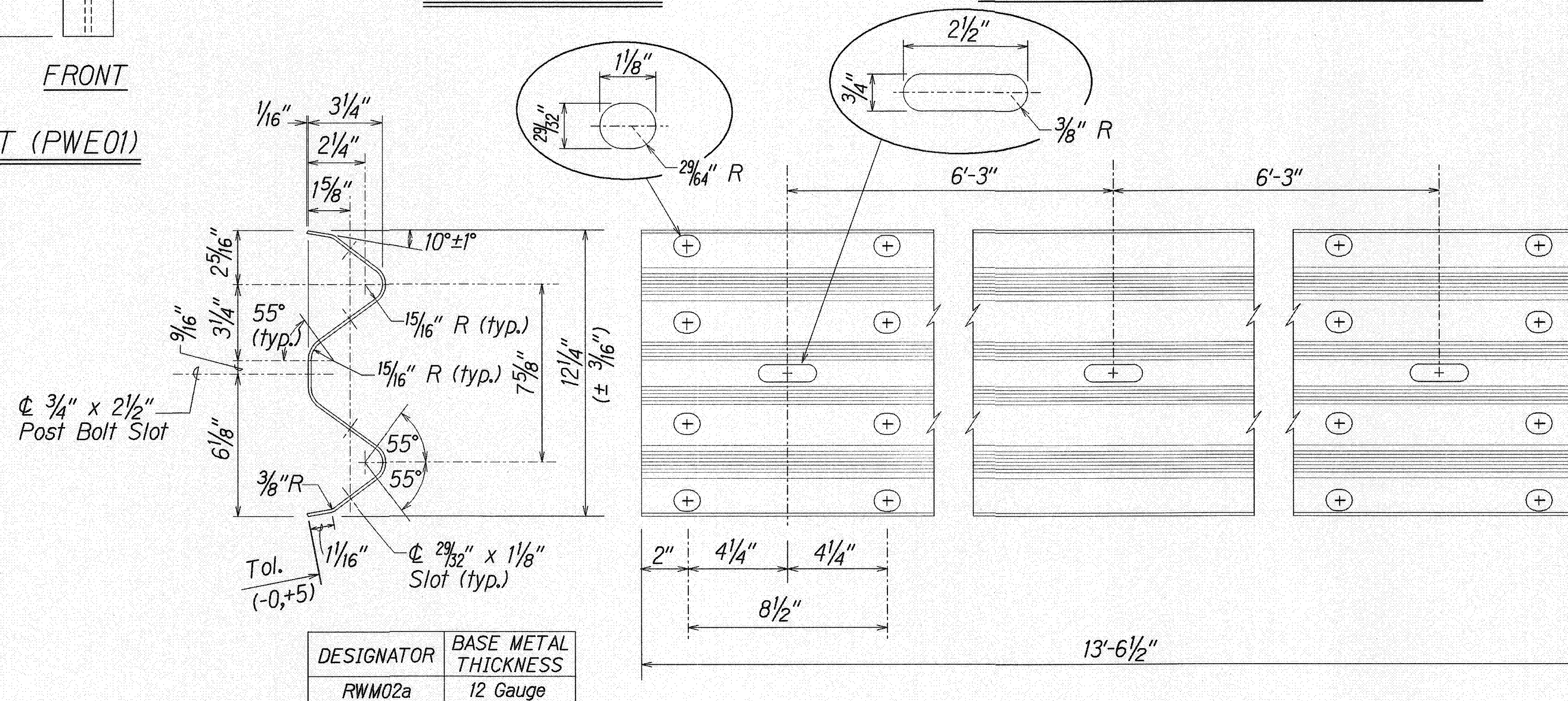


GUARDRAIL BOLTS AND
RECESSED NUT

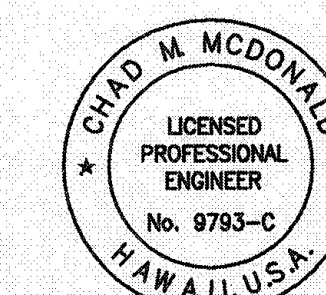


DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

W-BEAM BACK-UP-PLATE (RWB01a)



2 SPACE W-BEAM GUARDRAIL (RWM02a)



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Chad M. McDonald 4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify
dimensions at job before proceeding with work.

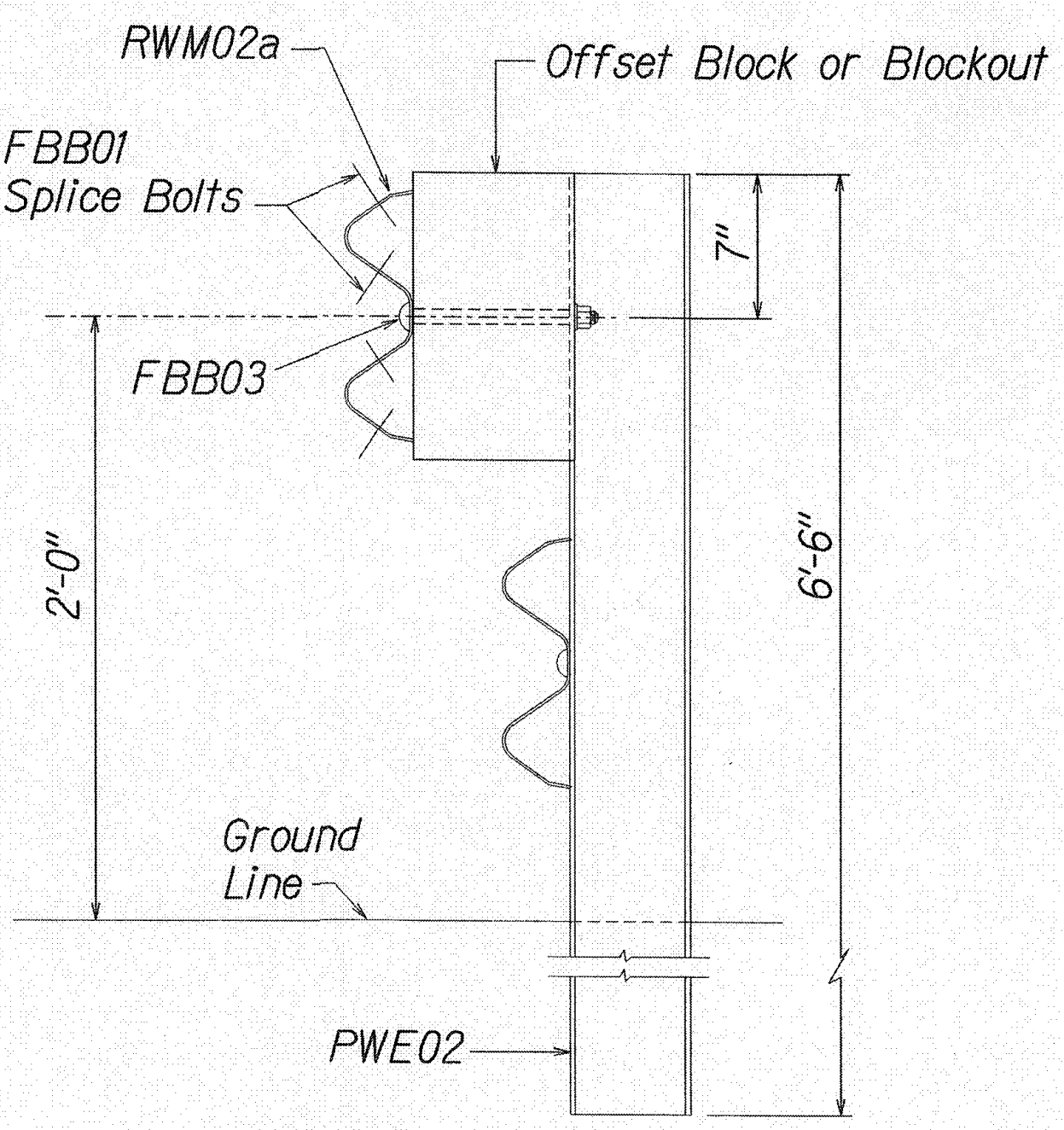
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

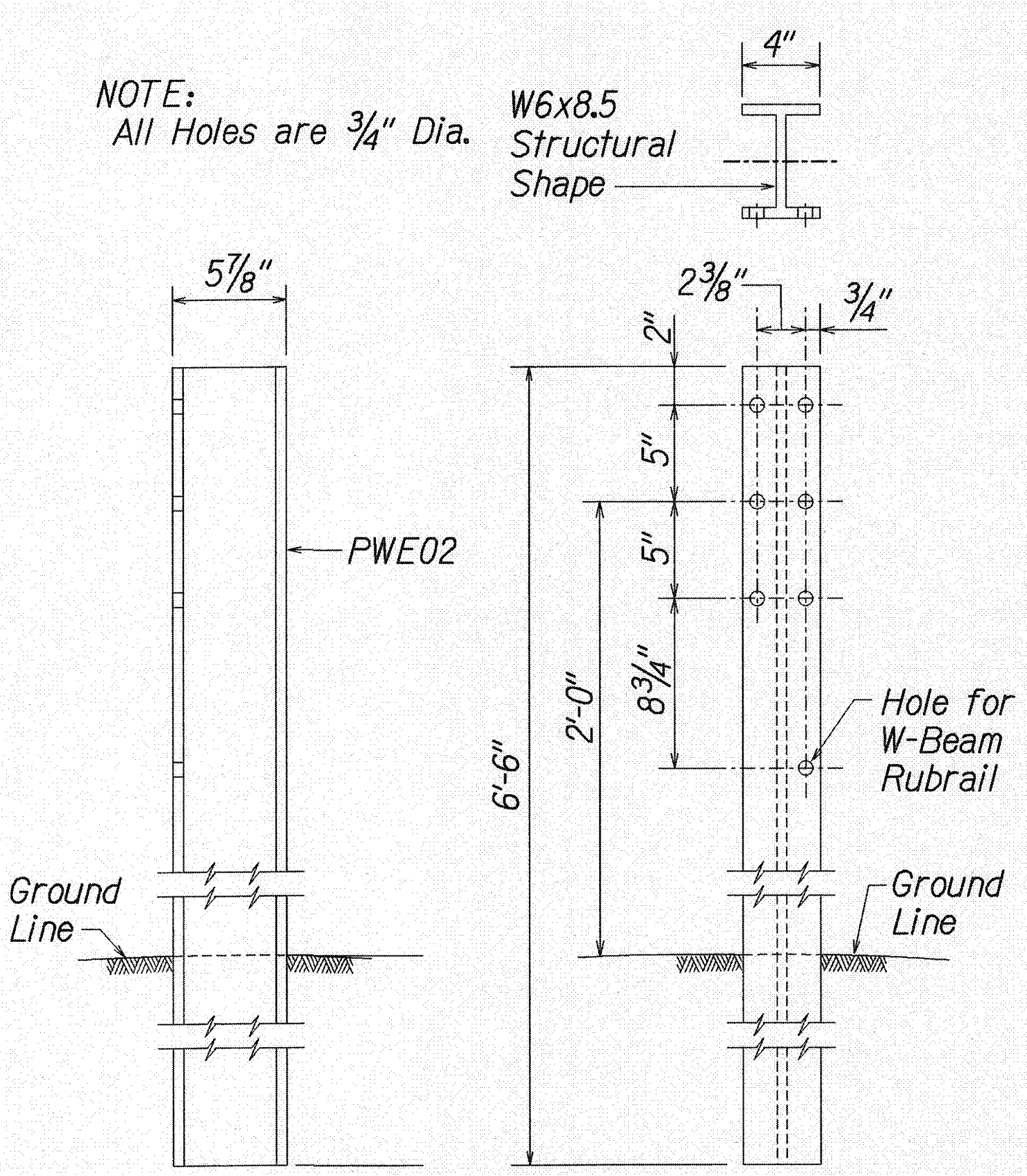
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-41 Date: May 2008

SURVEY PLOTTED BY	DATE
DESIGNED BY	2/08
DESIGNED BY	2/08
CHECKED BY	2/08
CHECKED BY	2/08

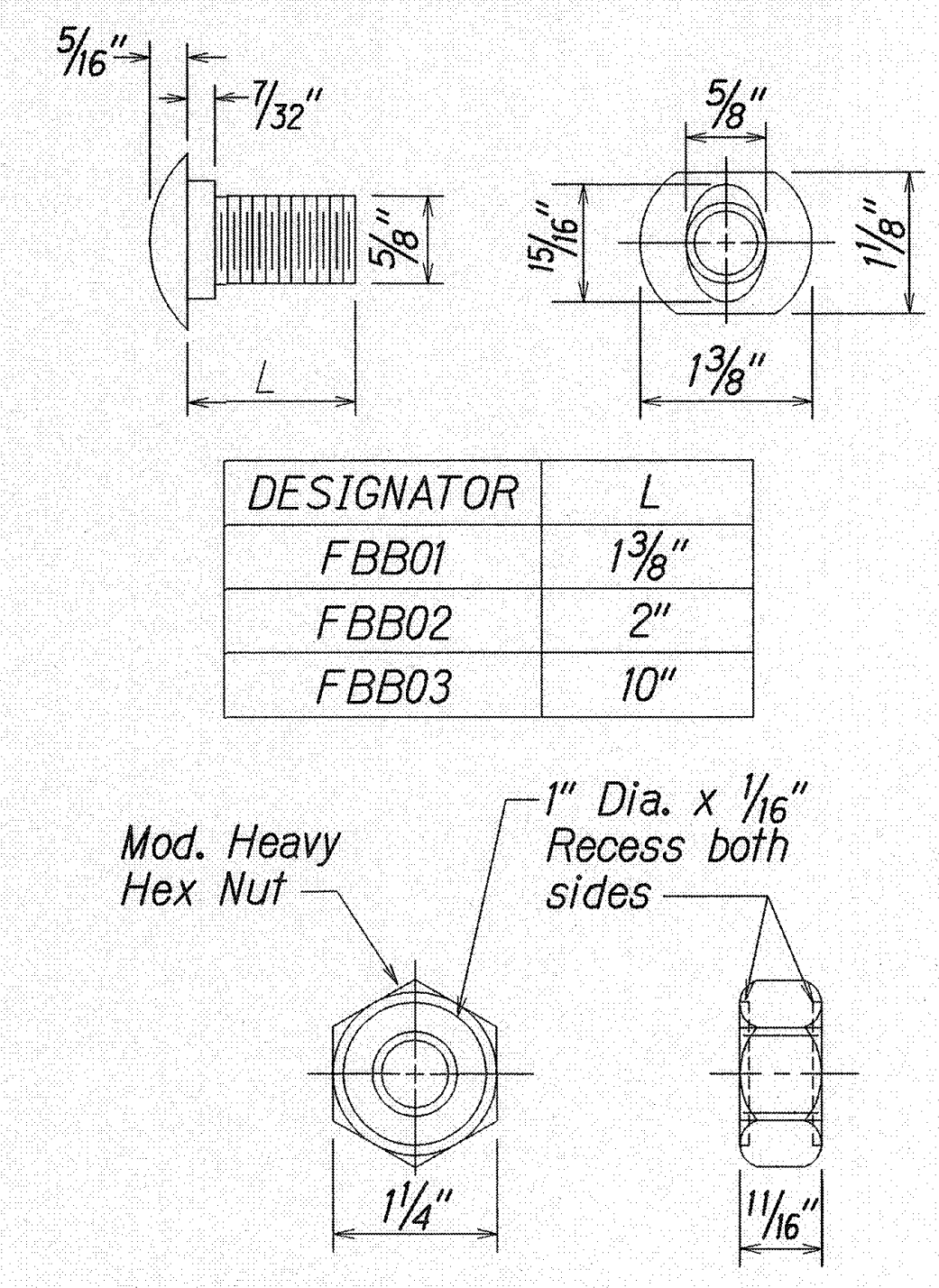
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	44	63



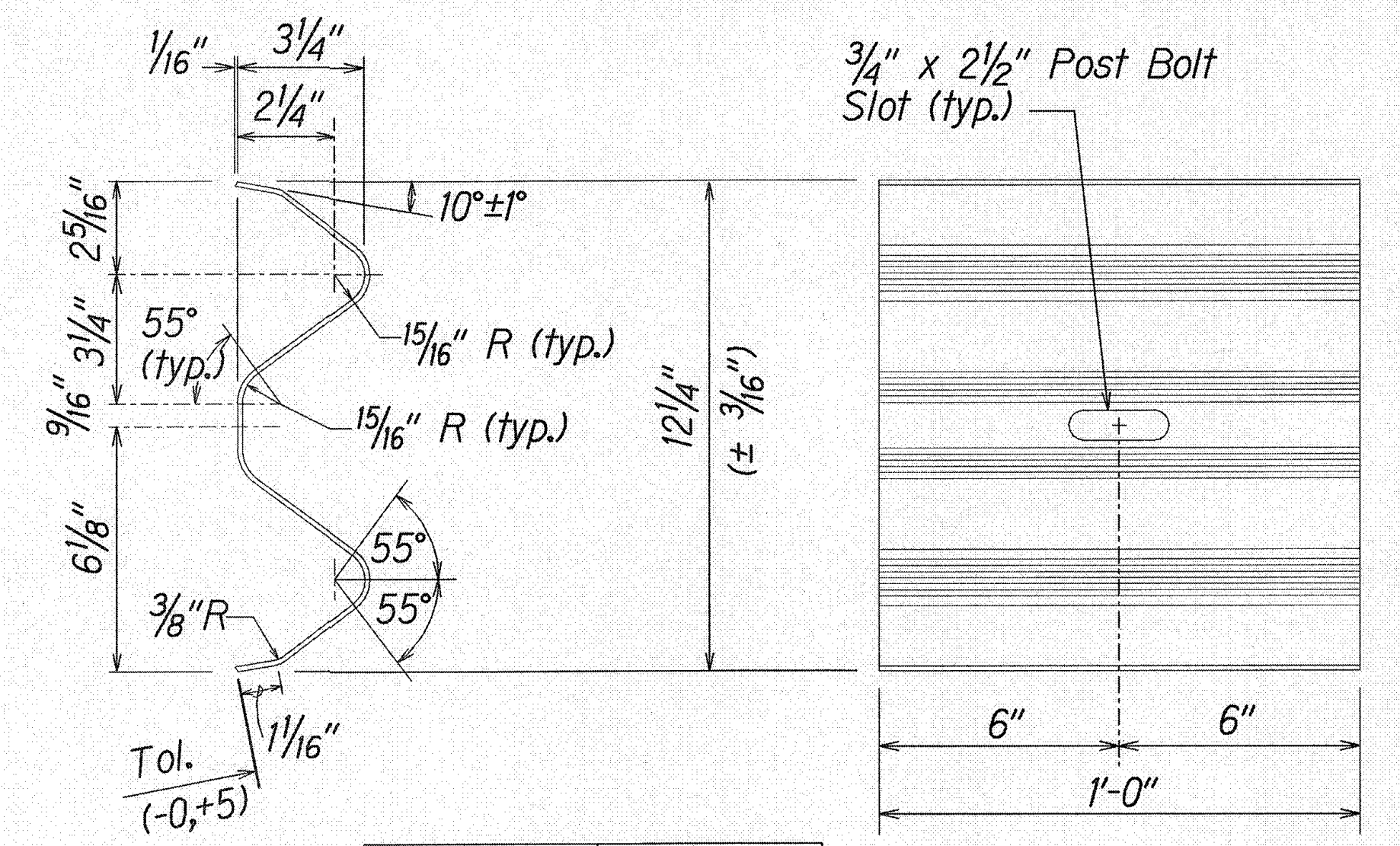
ELEVATION
STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL



SIDE
W-BEAM STRONG POST (PWE02)

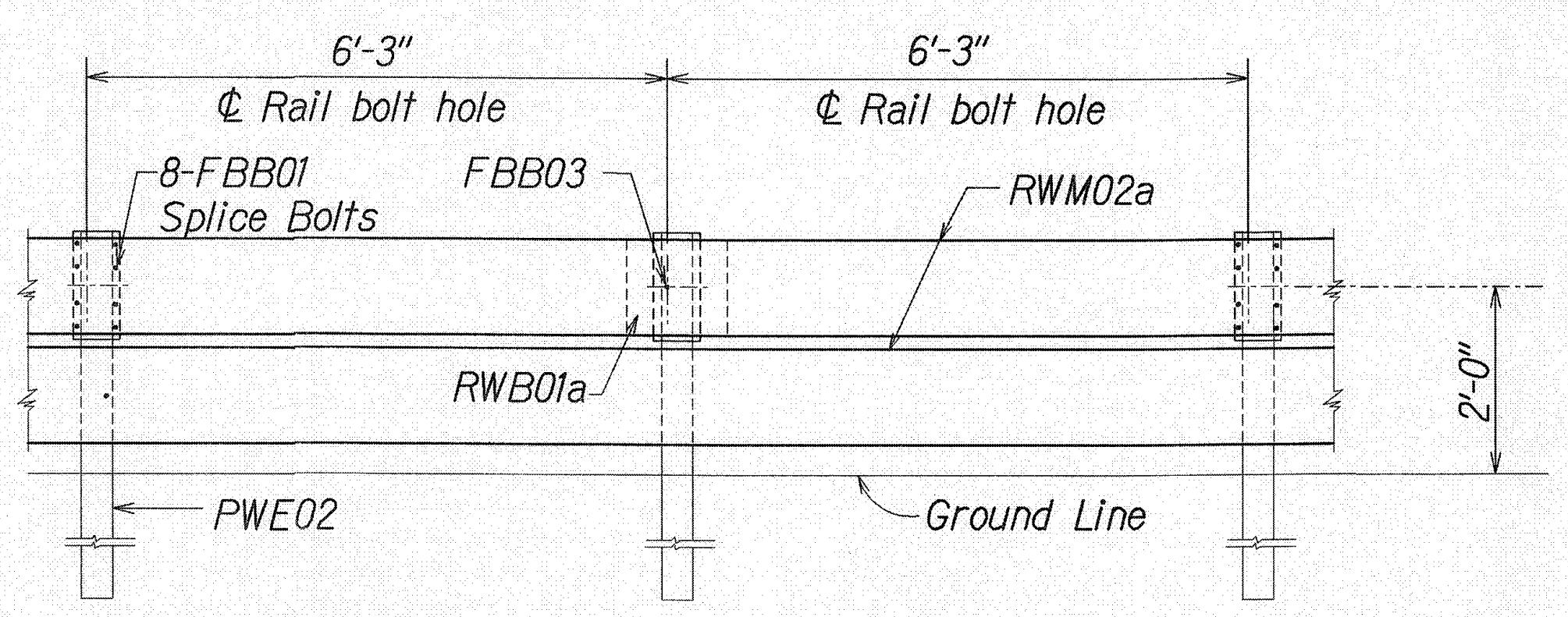


GUARDRAIL BOLTS AND
RECESSED NUT

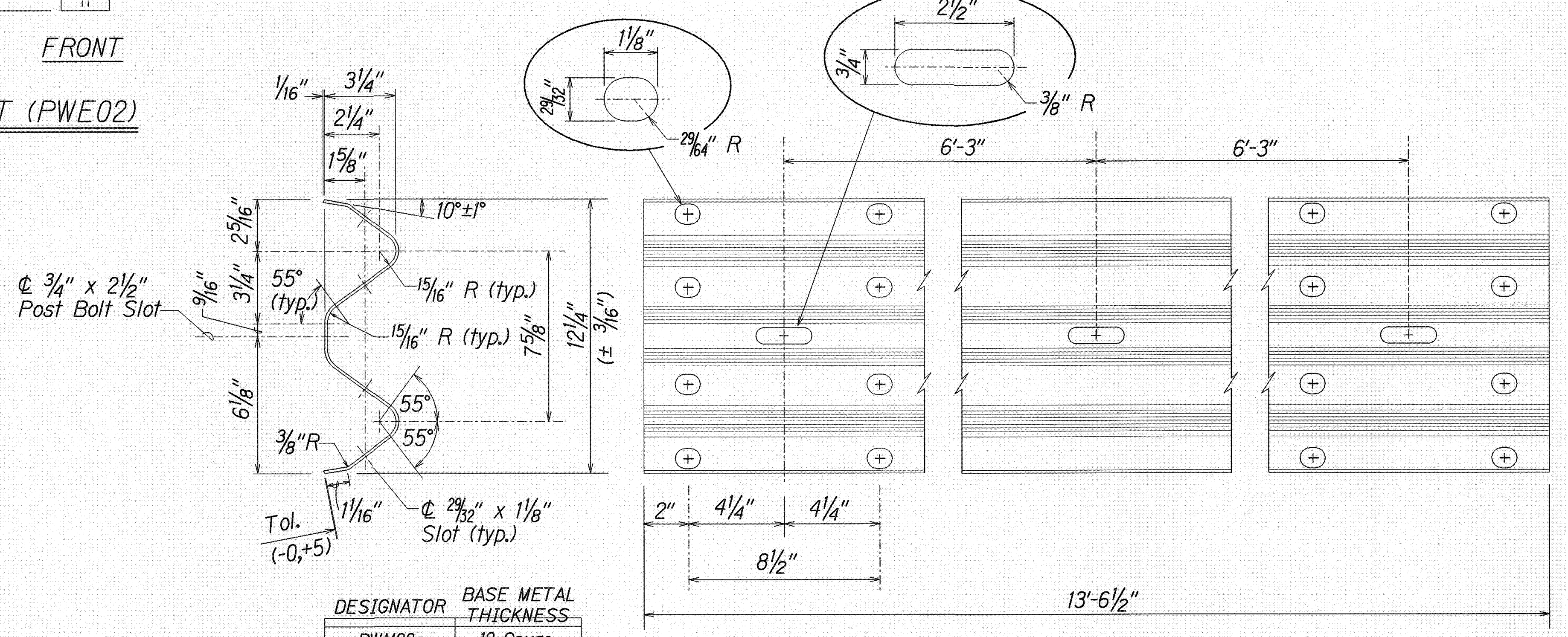


DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

W-BEAM BACK-UP-PLATE (RWB01a)

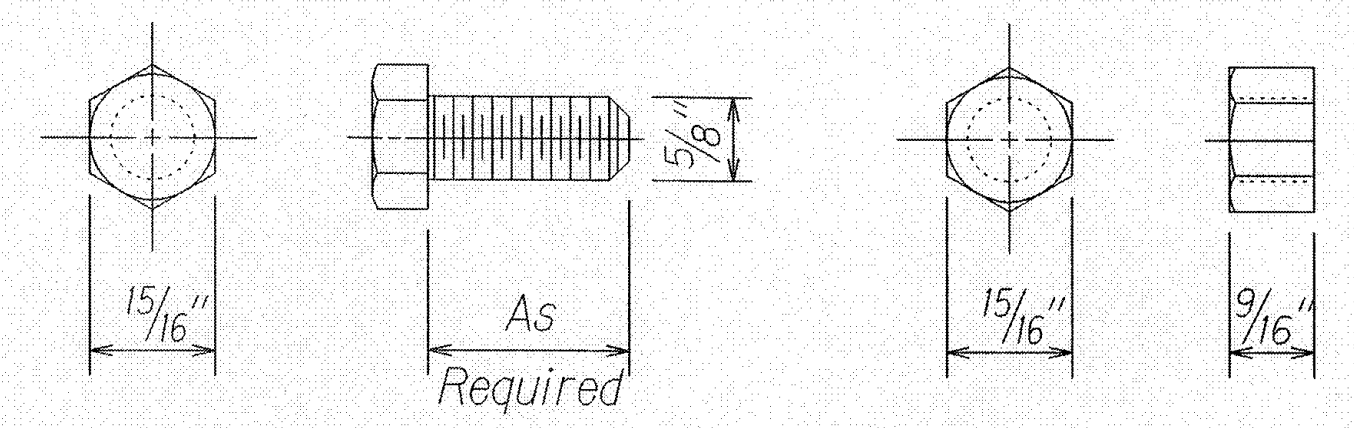


ELEVATION
STRONG POST RUBRAIL (W-BEAM) GUARDRAIL WITH
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



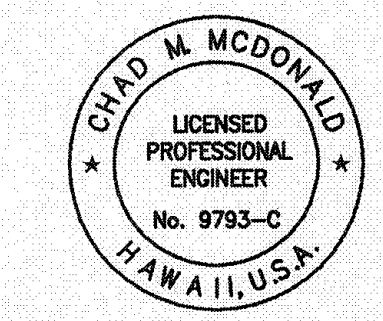
DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

2 SPACE W-BEAM GUARDRAIL (RWM02a)



HEX BOLT & NUT (FBX16a)

ORIGINAL PLAN	DATE
DESIGNED BY	2/08
TRACED BY	2/08
QUANTITIES BY	2/08
CHECKED BY	2/08

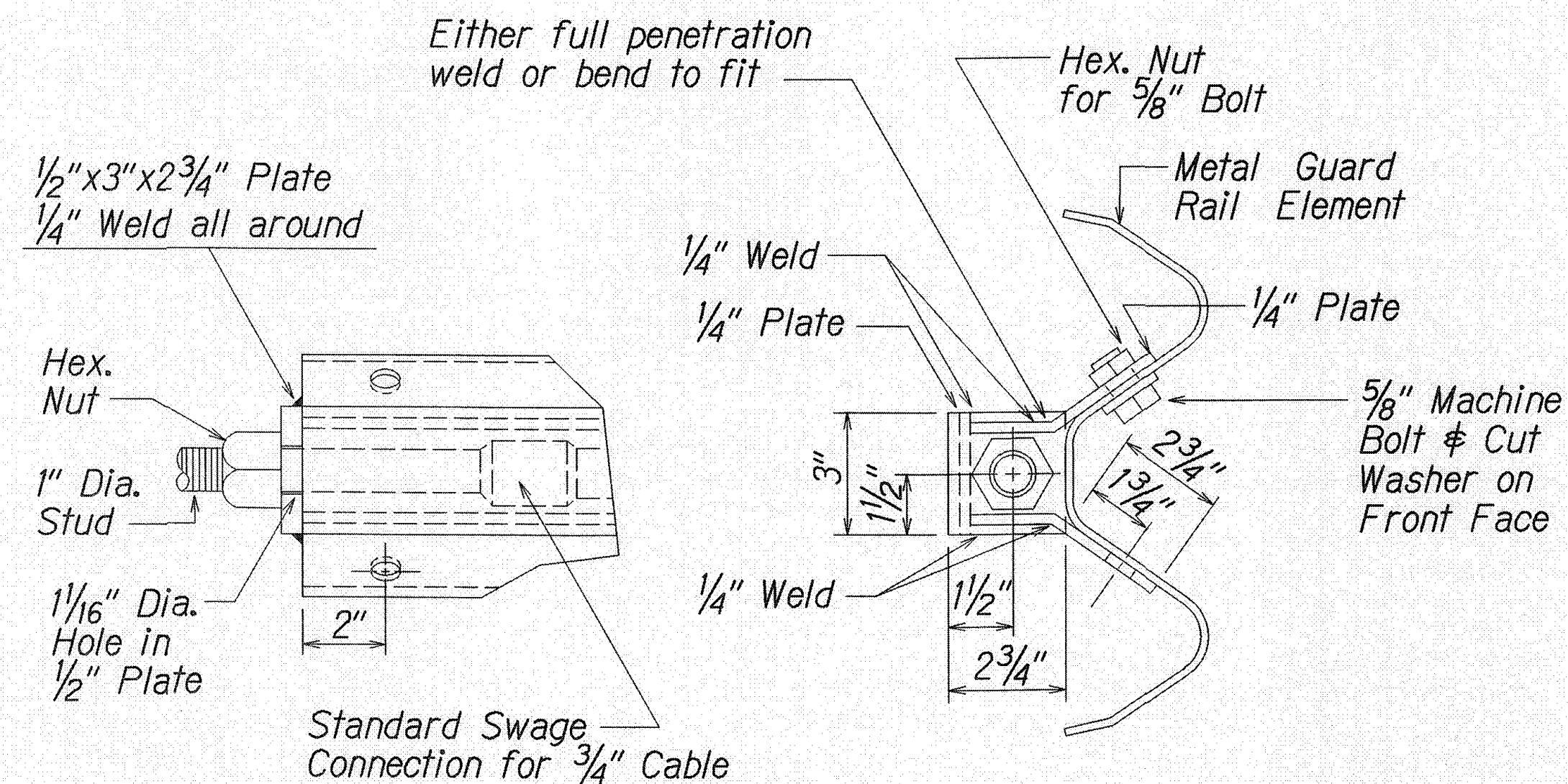


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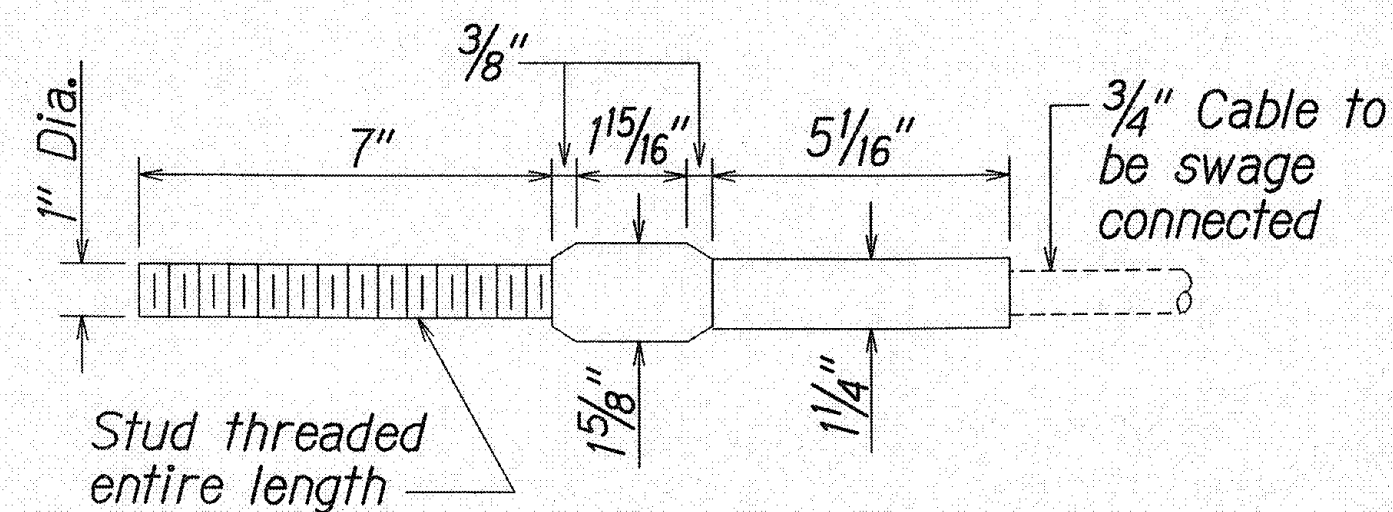
4/30/2008
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NOTE: Contractor to check and verify dimensions at job before proceeding with work.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-42 Date: May 2008

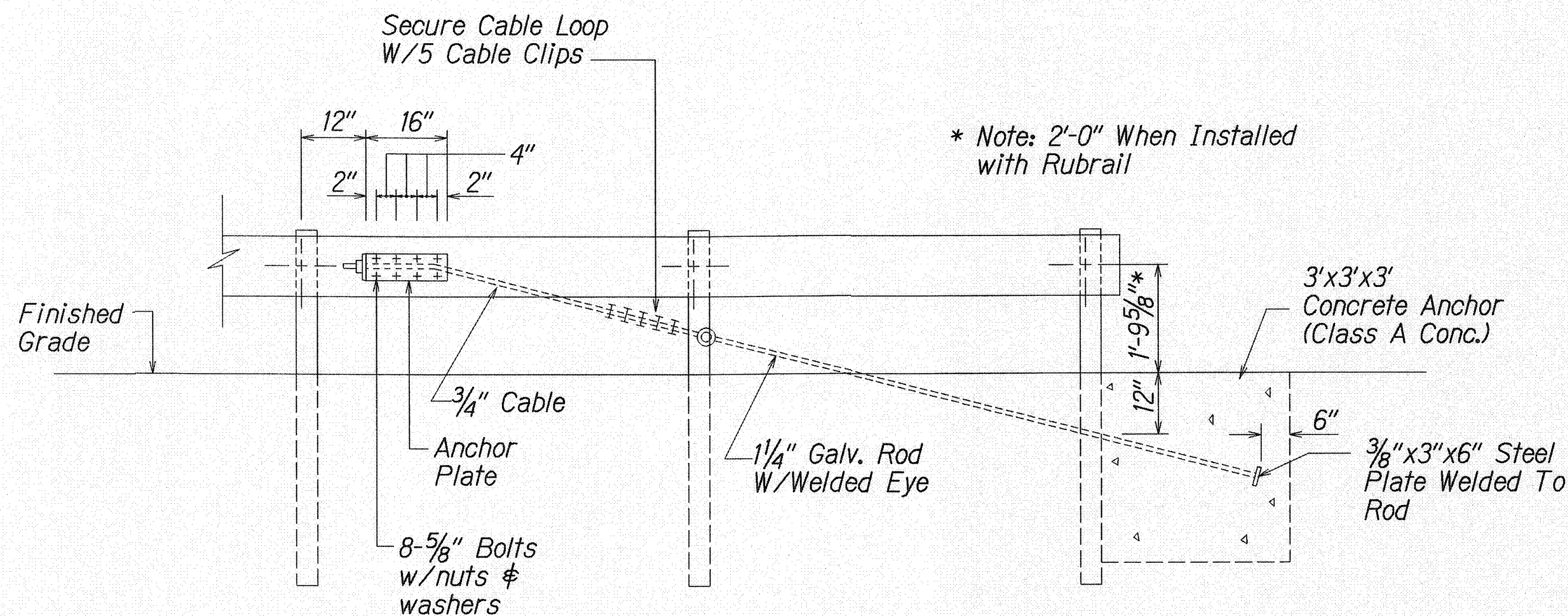
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	45	63



ANCHOR PLATE DETAILS

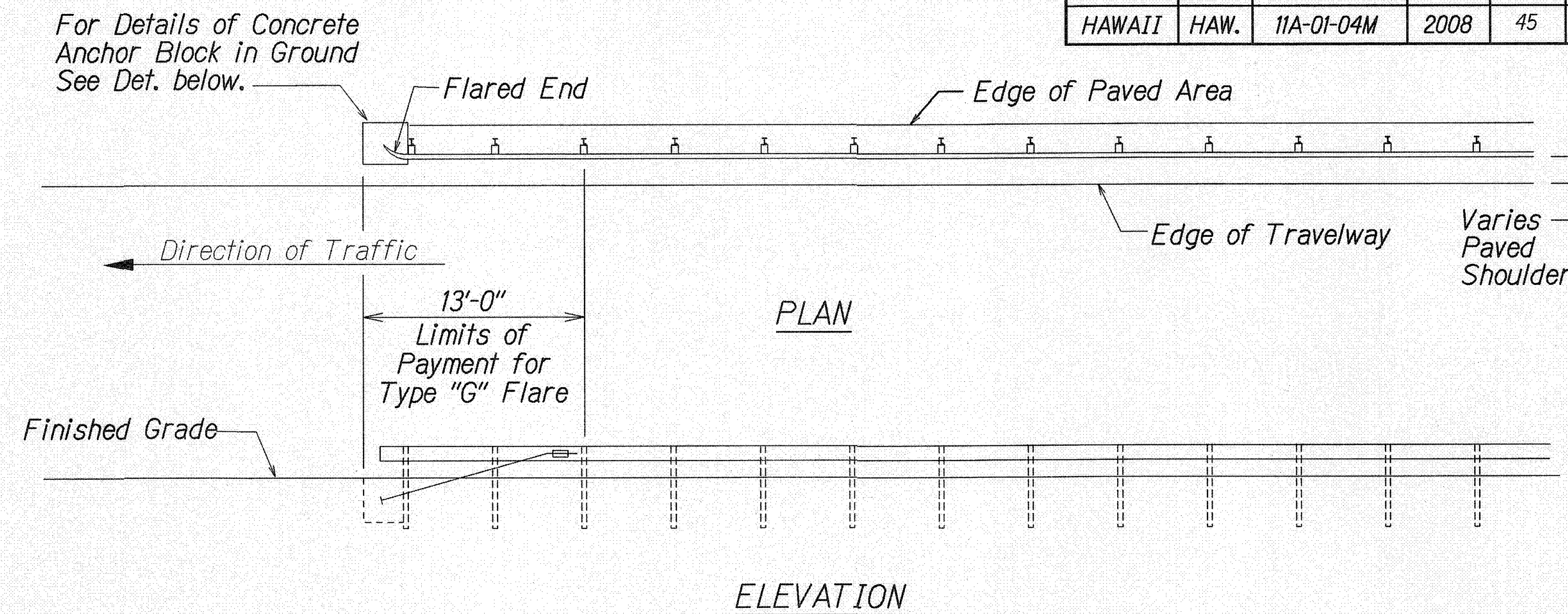


STANDARD SWAGED FITTING
AND STUD



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.



TYPE "G" FLARE END TERMINAL

NOTE:

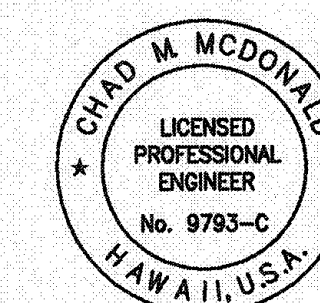
Type "G" Modified End Terminal is a site specific end terminal with a taper and radial termini. A site specific detailed drawing is required for all Type "G" Modified End Terminal and must receive Engineer's approval.

The taper (flare rate) of the guardrail shall follow the latest edition of AASHTO'S Roadside Design Guide (currently, Table 5.7 - Suggested Flare Rate for Barrier Design, page 5-32, Jan. 2002 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.

SURVEY PLOTTED BY	DATE
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CHECKED BY	2/08
ORIGINAL PLAN	
NOTE BOOK	
No.	



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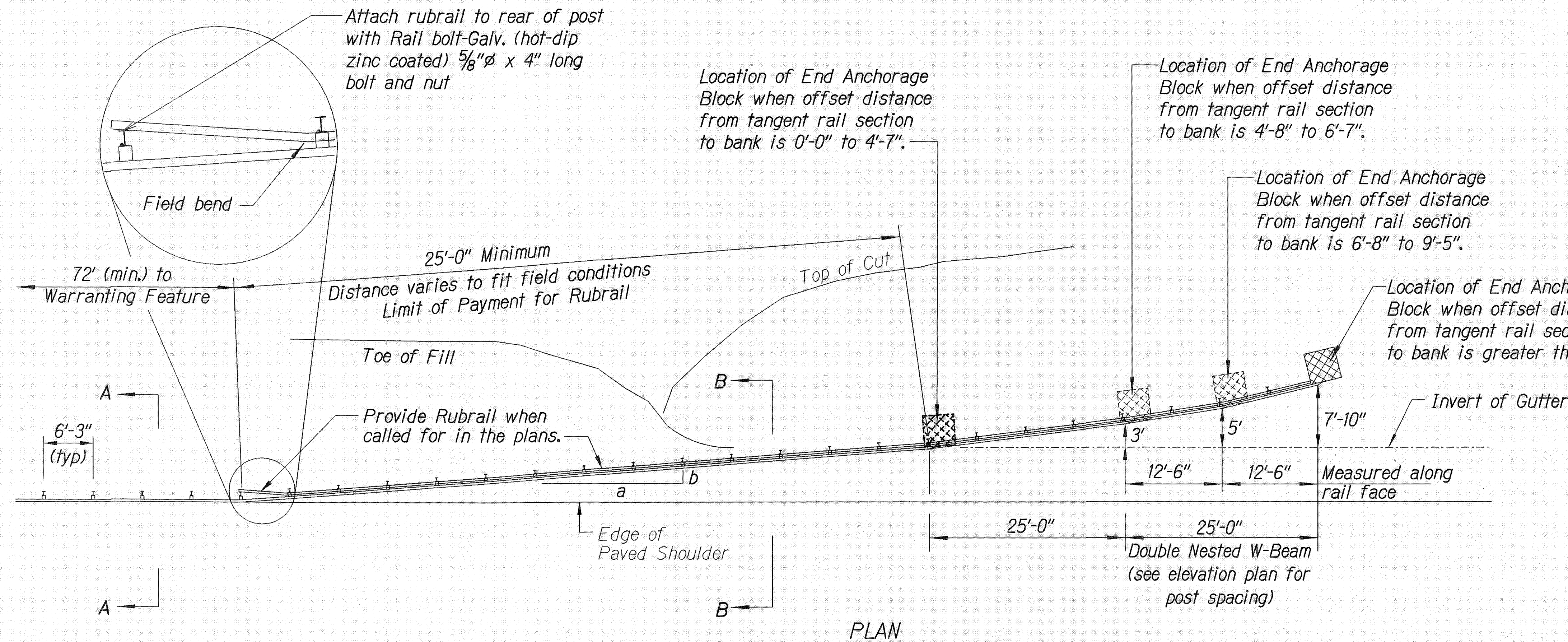
4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify dimensions of job before proceeding with work.

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
GUARDRAIL DETAILS
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-43 Date: May 2008

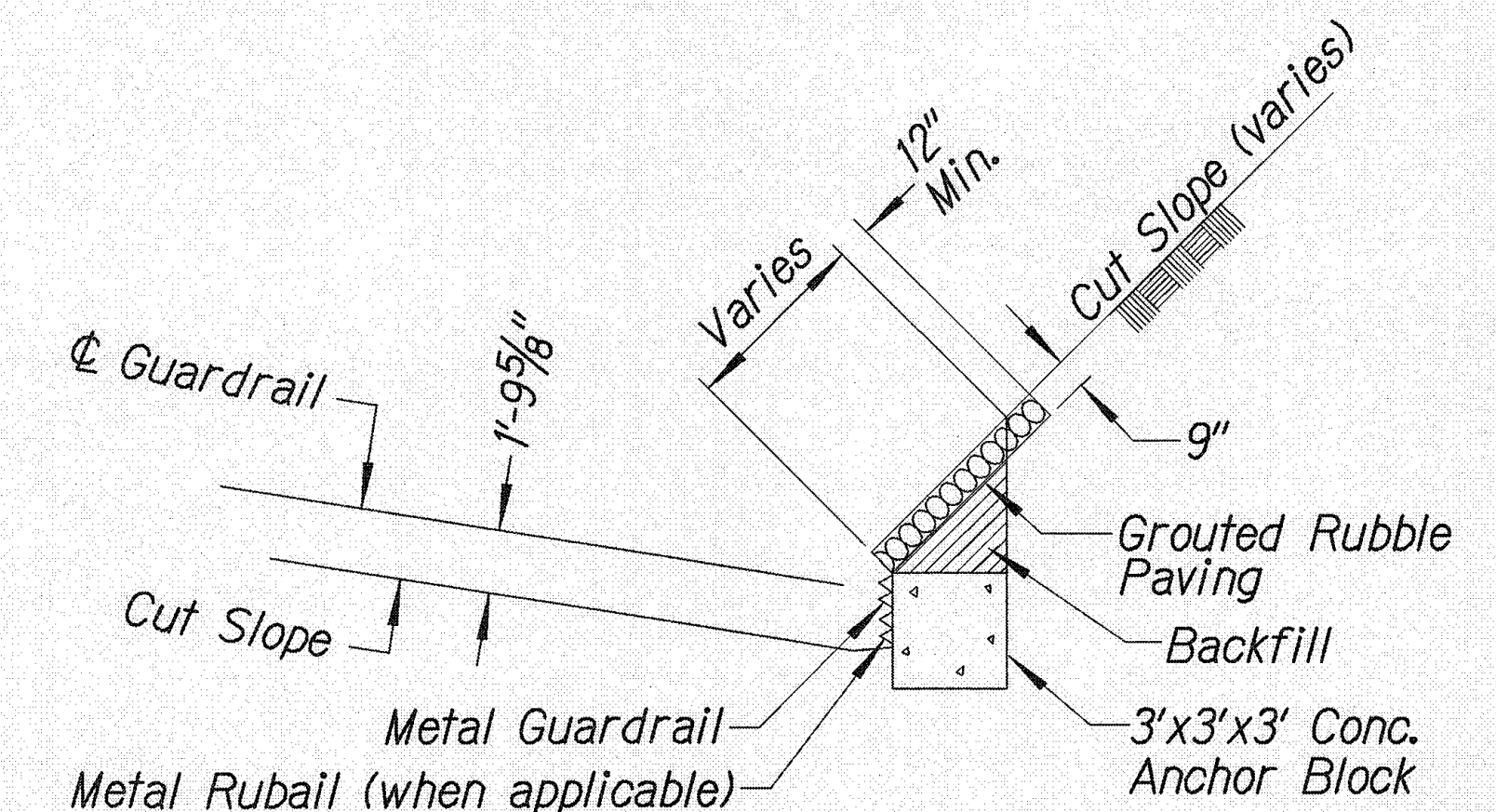
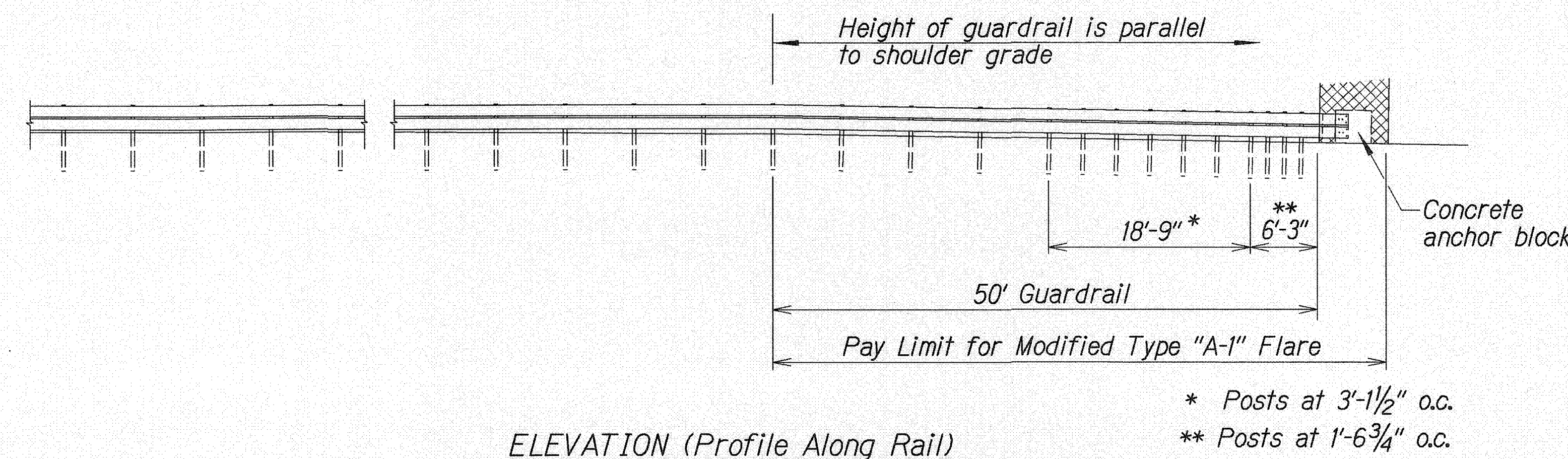
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	46	63

General Notes

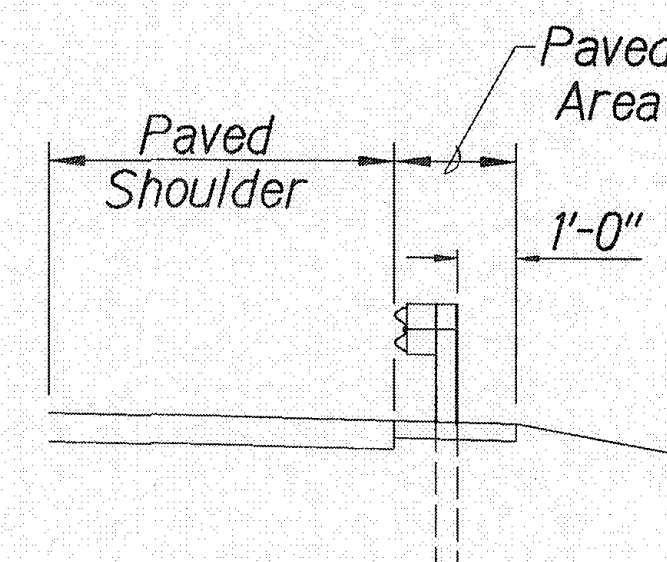
- All posts are 6'-0" in length within the 50'-0" pay limit for the Modified Type "A-1" Flare without rubrail.
- Whenever swales or a change in grade is encountered within the 50'-0" pay limit for the Modified Type "A-1" Flare, a rubrail shall be installed and all posts shall have a minimum embedment of 4'-0". Post lengths shall be adjusted to provide the minimum embedment.
- All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware", a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee and HDOT's Statewide Guideline for Permanent Highway Safety Hardware.
- Limit of payment for Modified Type "A-1" Flare shall be 50'-0" from End Shoe including Rubrail (when applicable), Anchor Block and GRP work.
- Excavation, Anchor Block, Backfill and GRP work shall be considered incidental to the Modified Type "A-1" Flare.



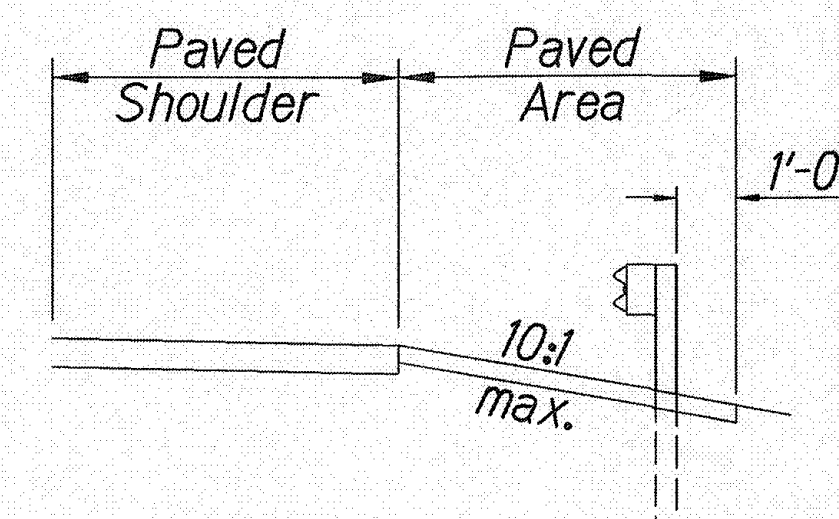
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



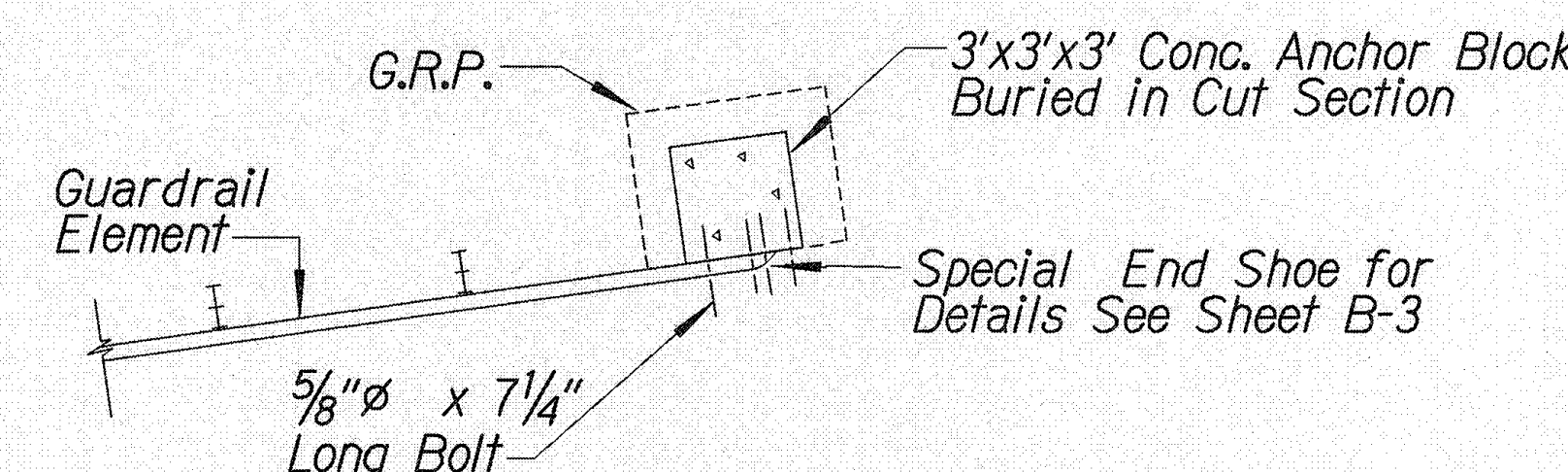
ANCHOR BLOCK IN CUT SECTION



Section A-A



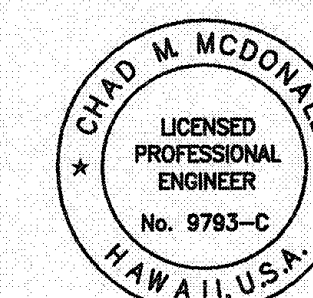
Section B-B



PLAN - ANCHOR BLOCK IN CUT SECTION

SURVEY PLOTTED BY	DATE
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TRACED BY	2/08
QUANTITIES BY	2/08
CHECKED BY	2/08

ORIGINAL PLAN	NOTE BOOK
No.	No.



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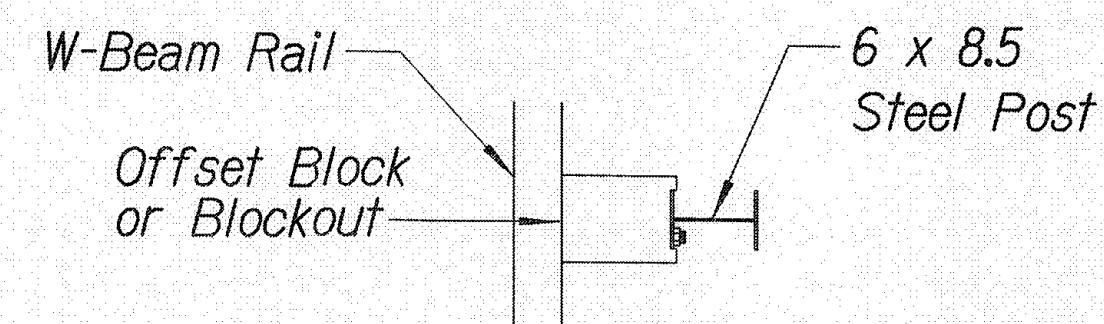
Chad M. McDonald
MITSUNAGA & ASSOCIATES, INC. EXP. DATE 4/30/2008
NOTE: Contractor to check and verify dimensions of job before proceeding with work.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

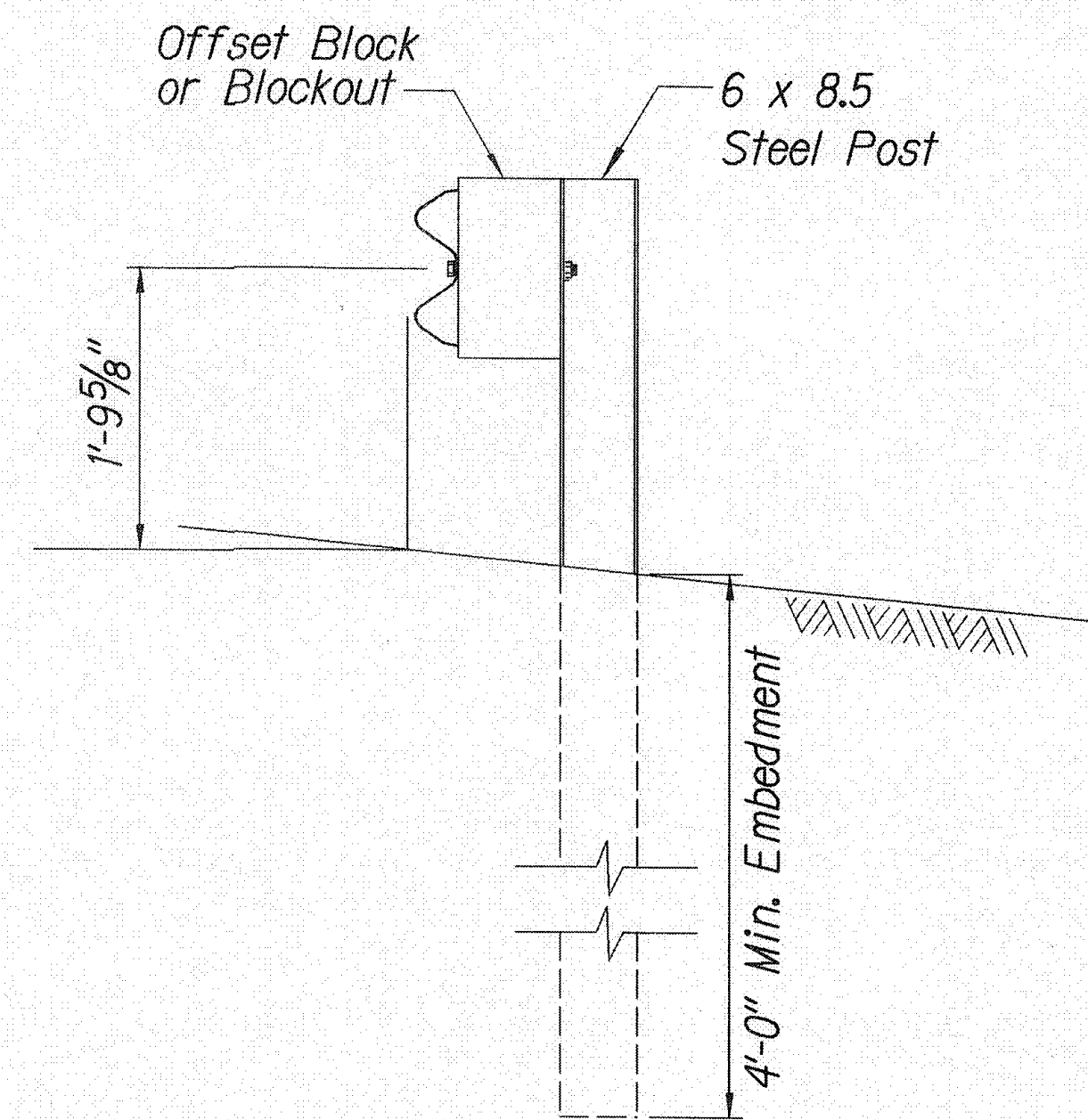
MODIFIED TYPE "A-1" FLARE

QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted **C-44** Date: May 2008

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	47	63

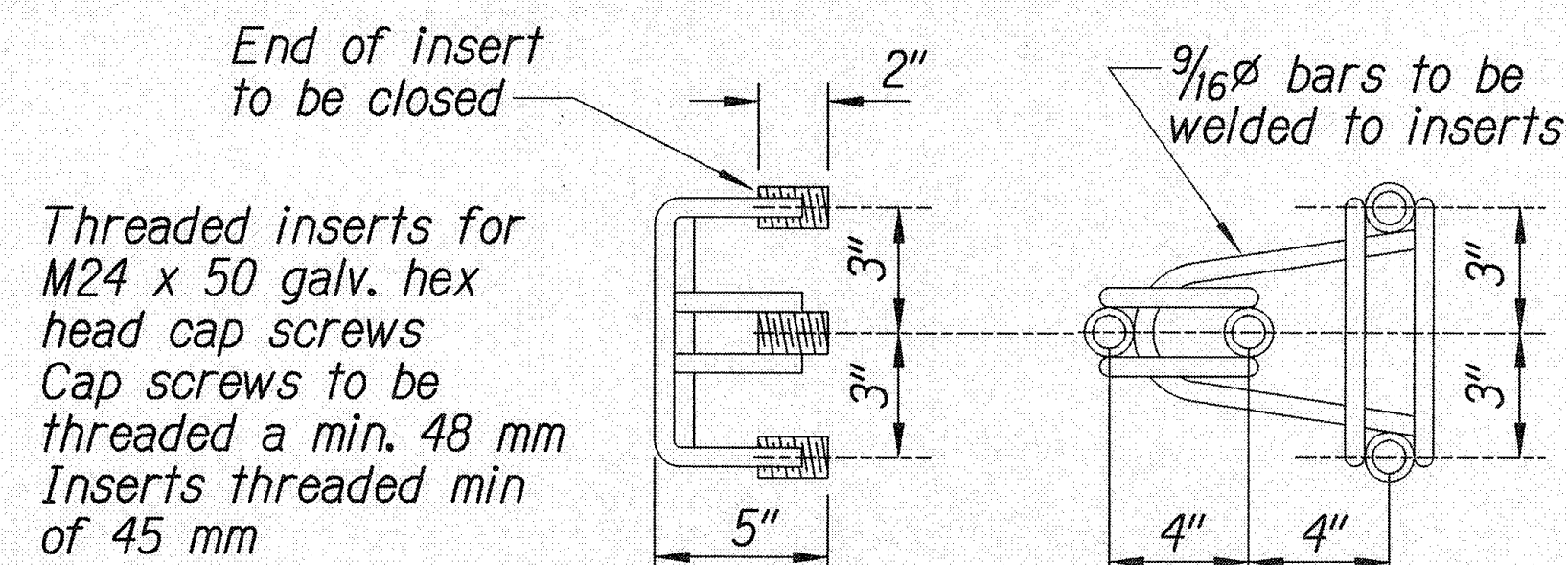


Plan



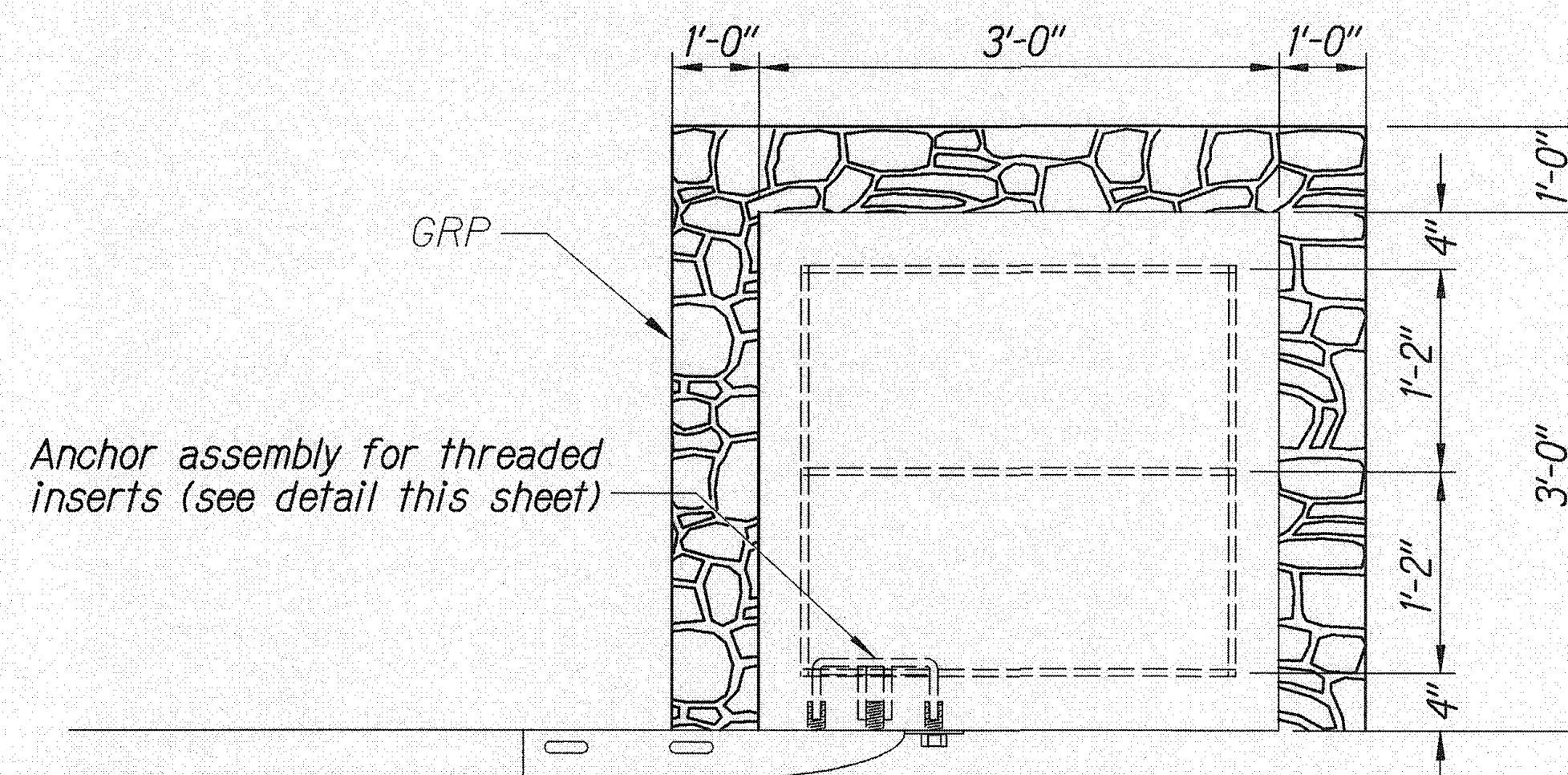
Elevation

STRONG POST W-BEAM GUARDRAIL

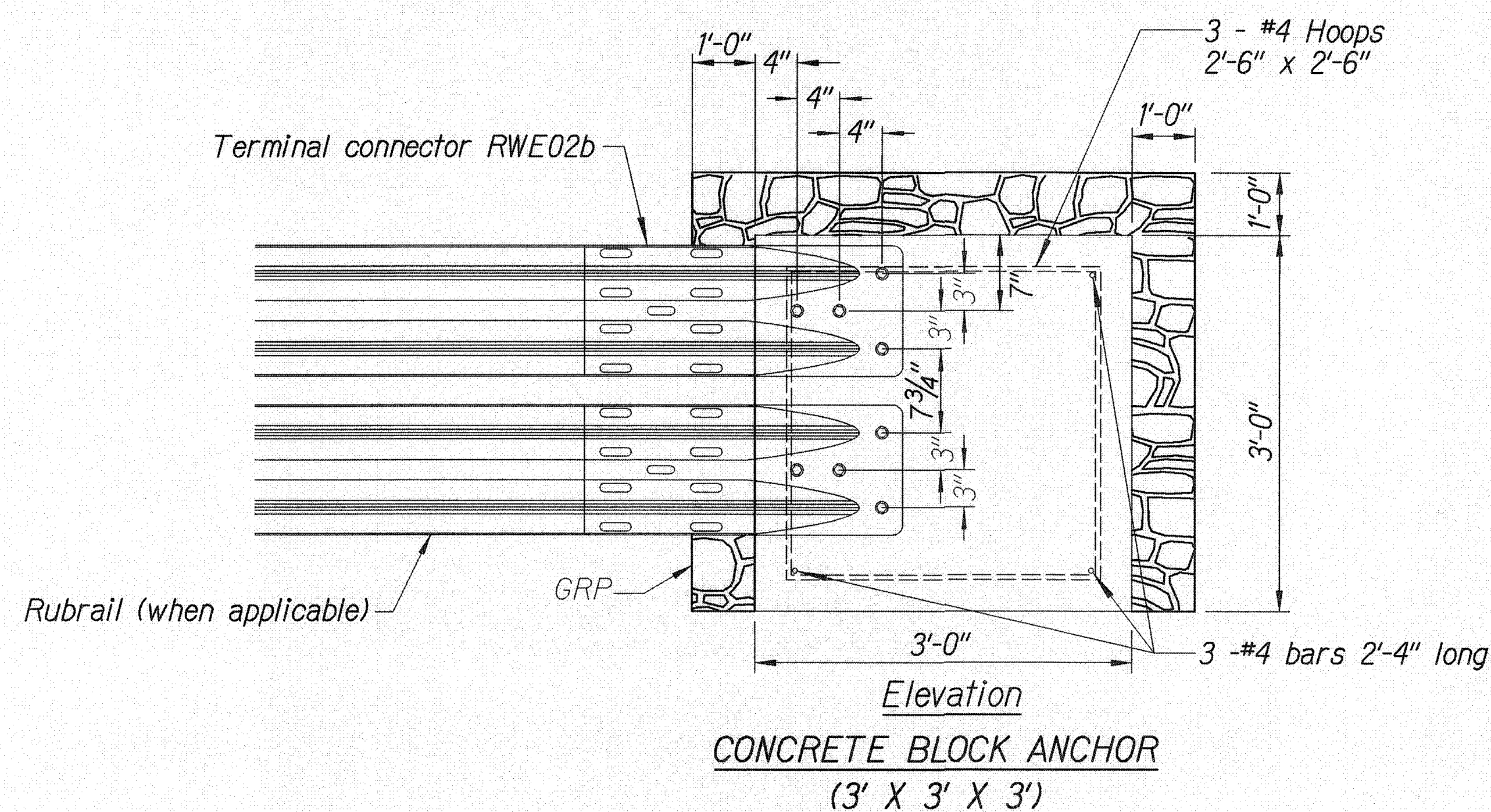


Threaded inserts for M24 x 50 galv. hex head cap screws
Cap screws to be threaded a min. 48 mm
Inserts threaded min of 45 mm

**ANCHOR ASSEMBLY
CONCRETE BLOCK ANCHOR**



Plan

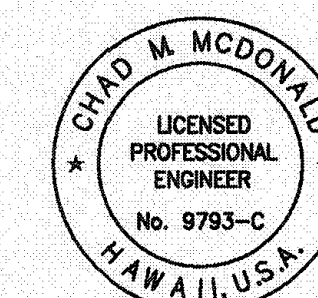


**CONCRETE BLOCK ANCHOR
(3' X 3' X 3')**

**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.



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

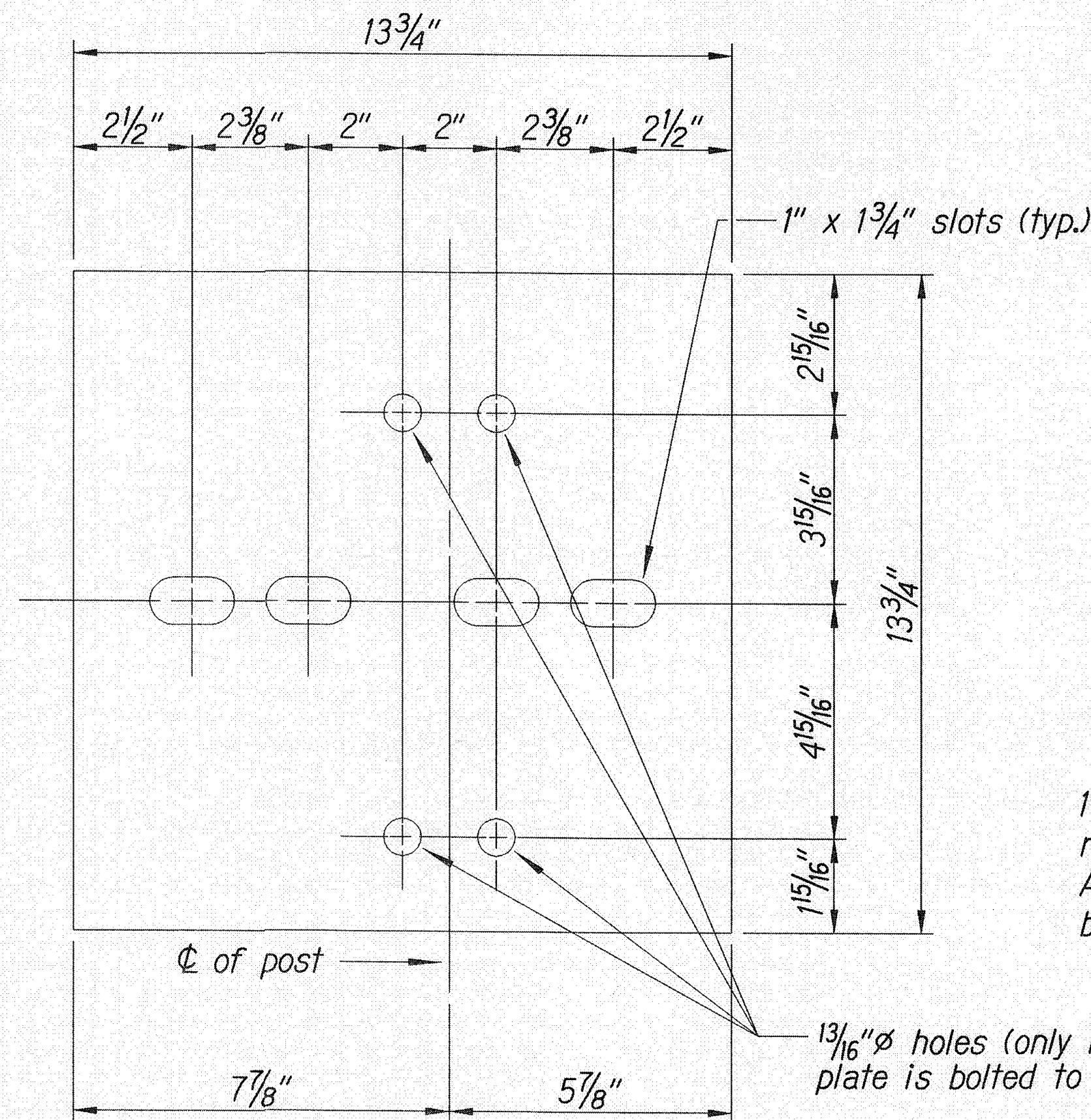
MODIFIED TYPE "A-1" FLARE

QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M

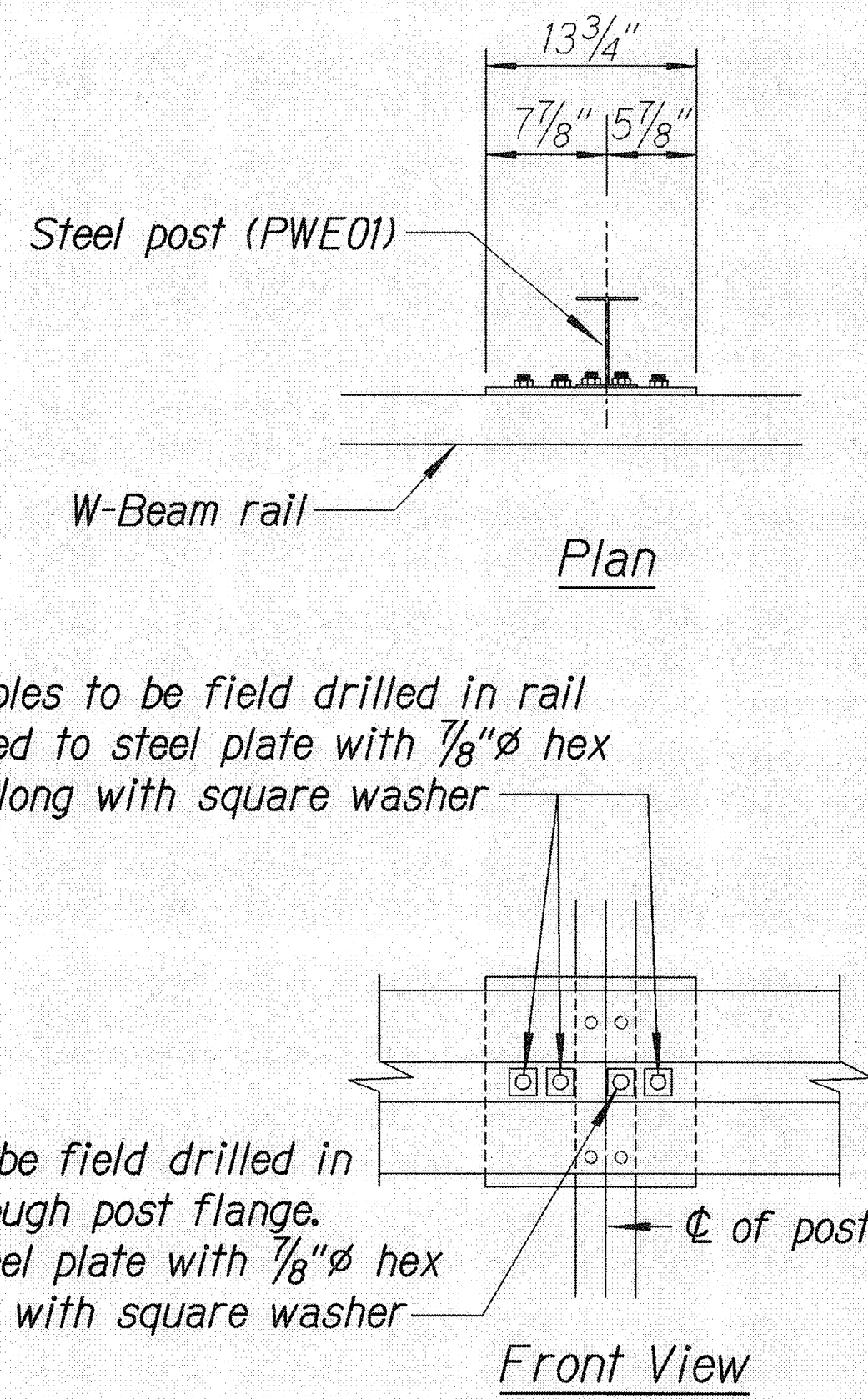
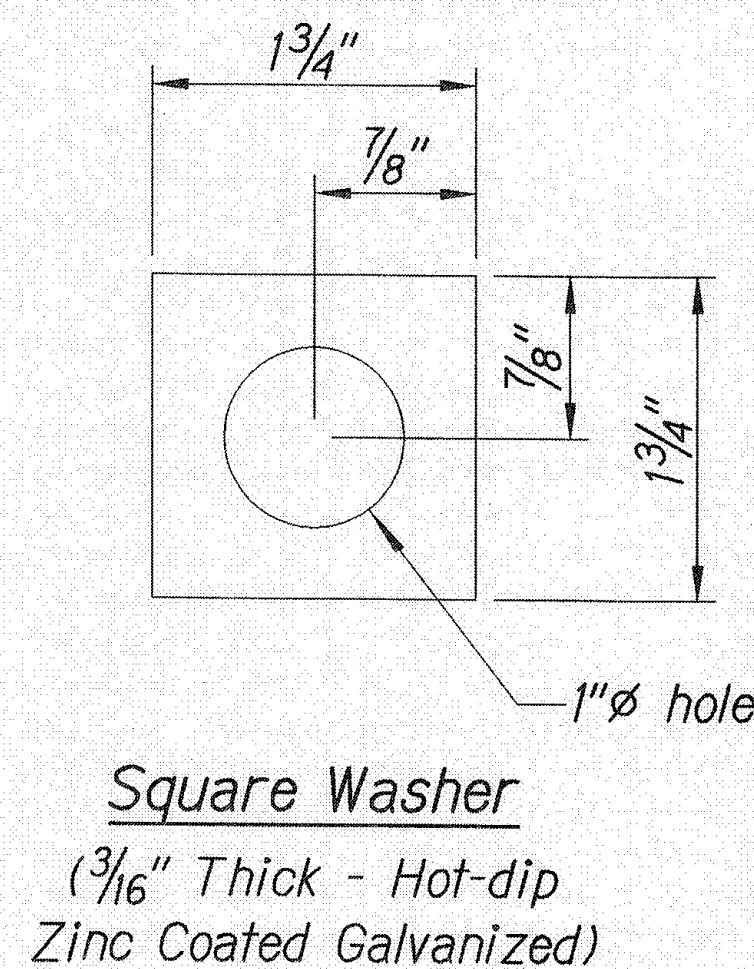
Scale: As Noted C-45 Date: May 2008

SURVEY PLOTTED BY	DATE
DRAWN BY	2/08
DESIGNED BY	2/08
QUANTITIES BY	2/08
CHECKED BY	2/08

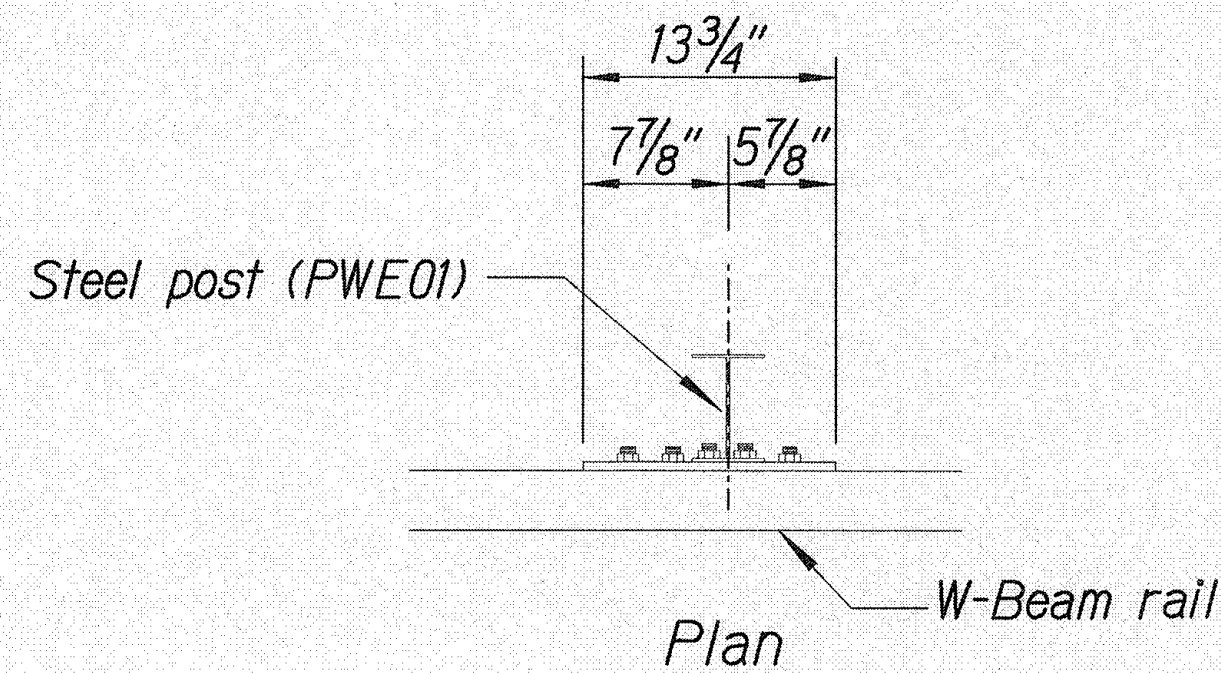
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	48	63



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

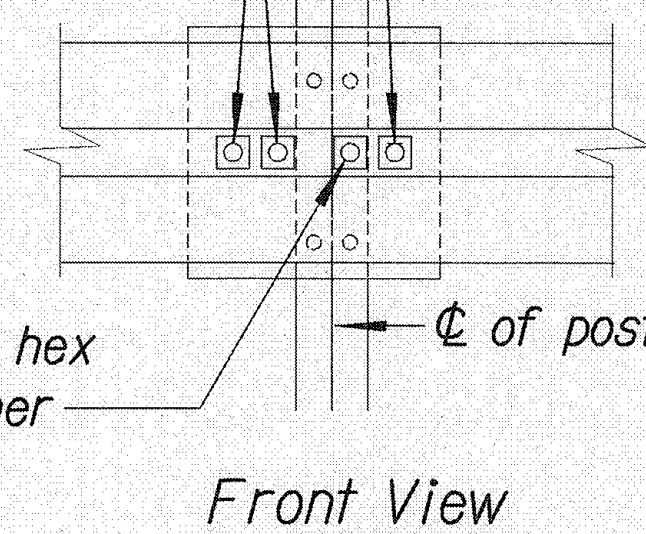


RUBRAIL ANCHOR DETAILS



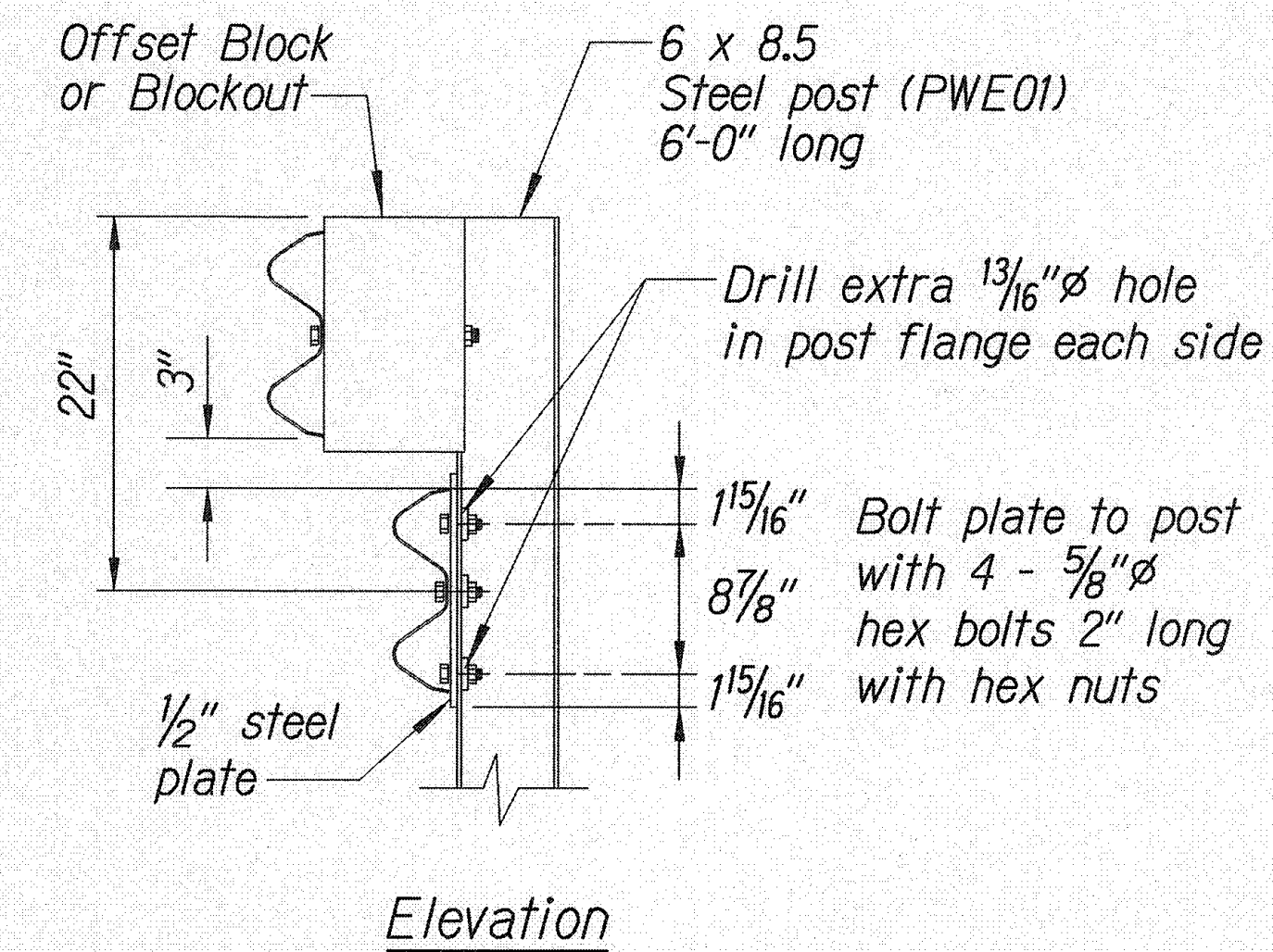
3 - 7/8" ϕ holes to be field drilled in rail
and attached to steel plate with 7/8" ϕ hex
bolts 1 15/16" long with square washer

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



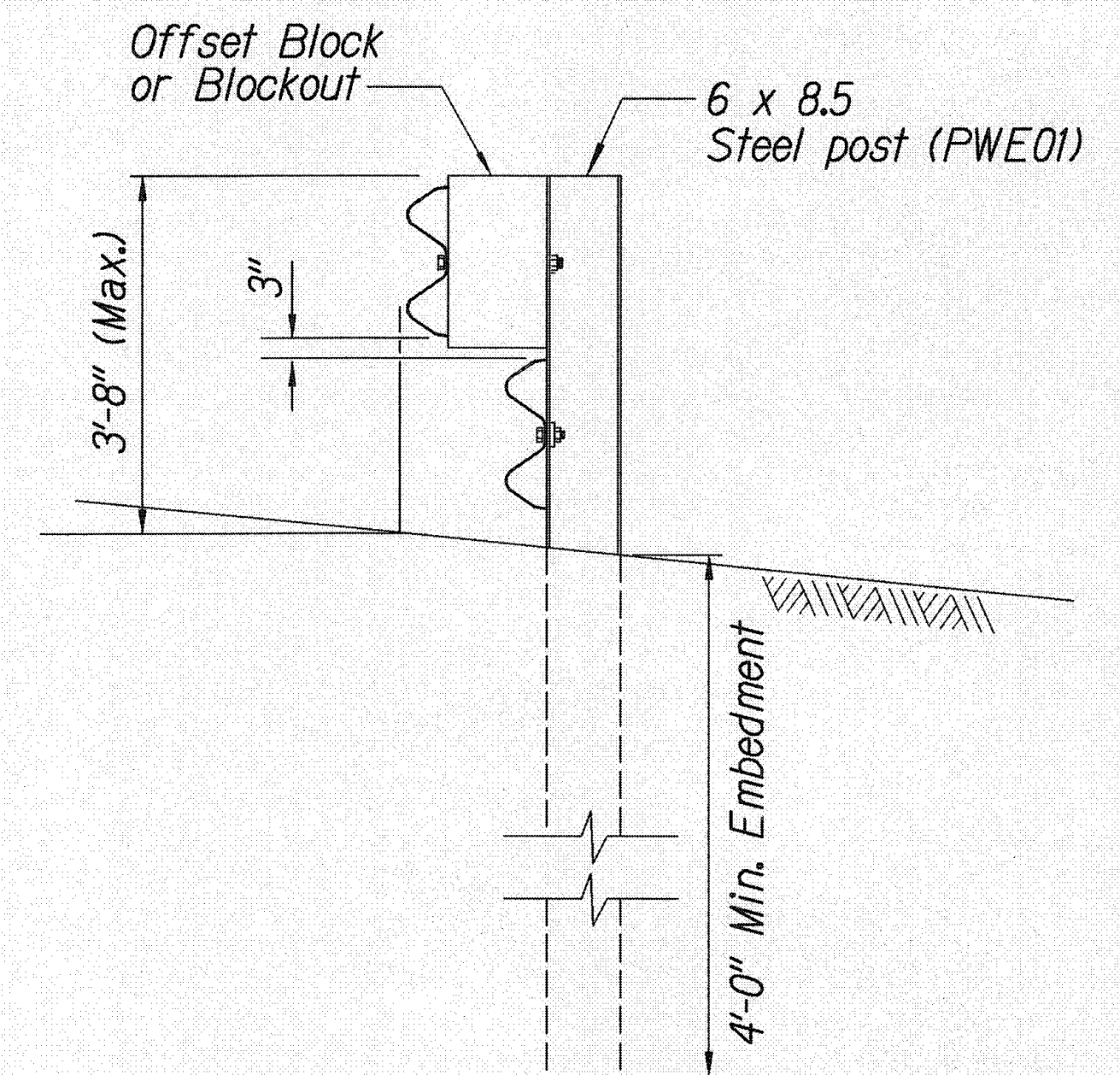
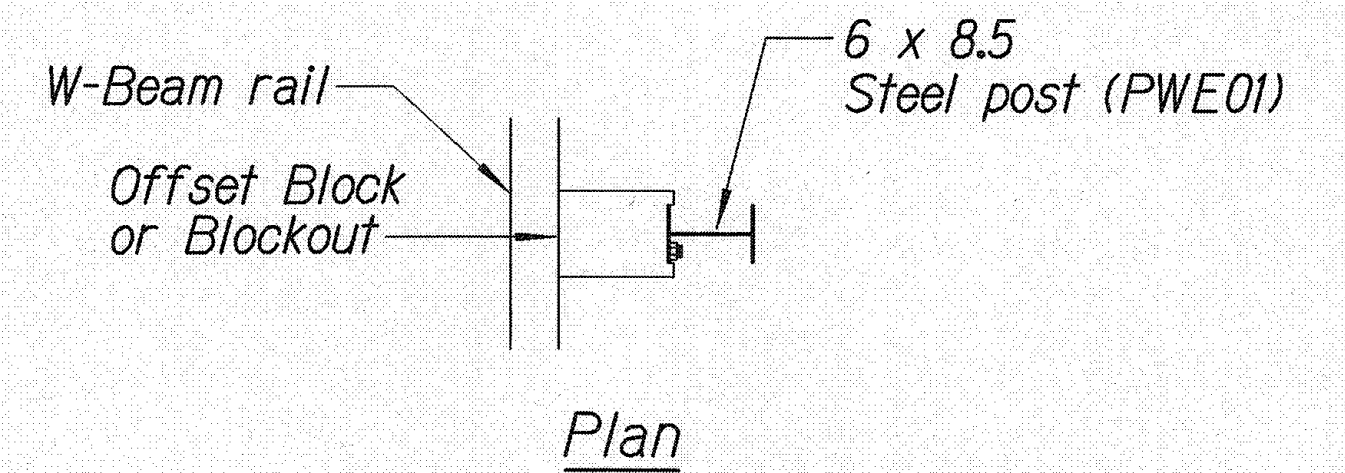
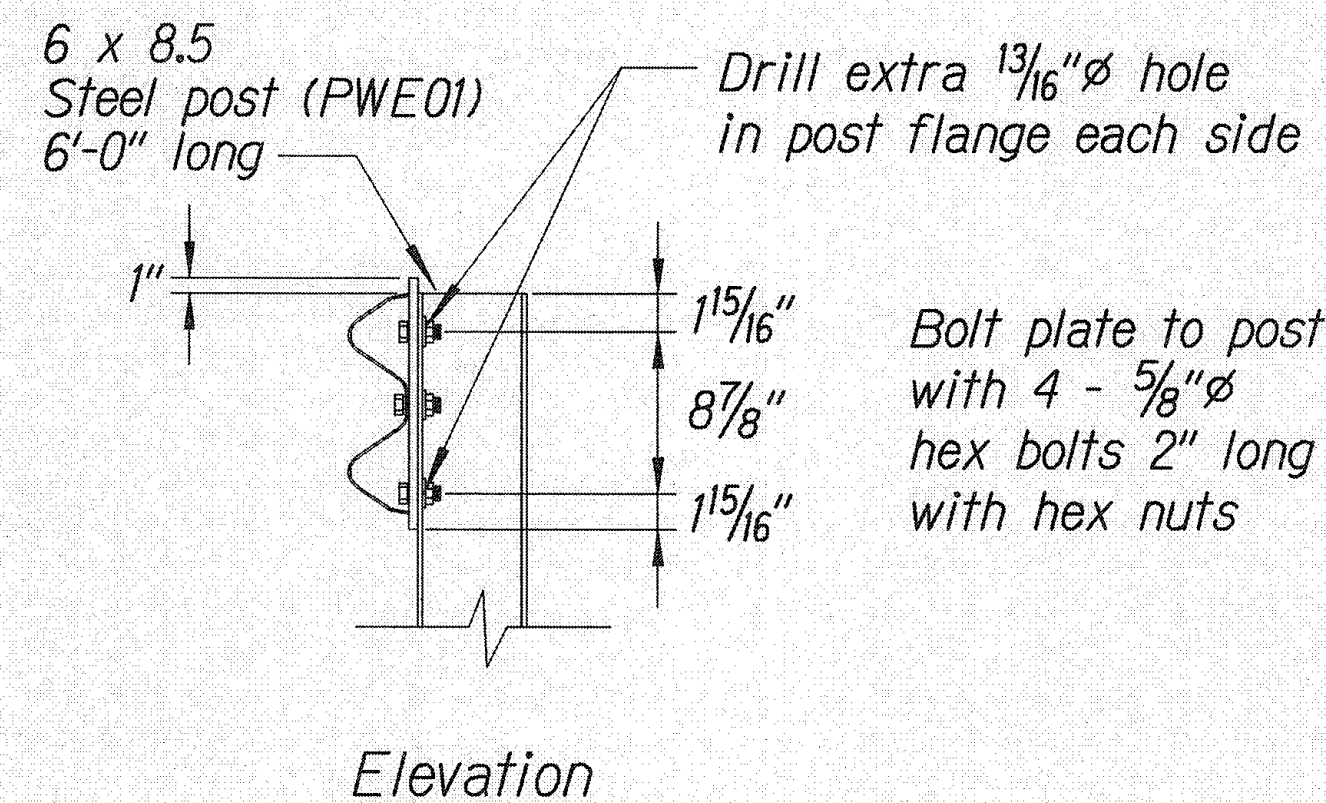
POST ANCHOR DETAILS

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

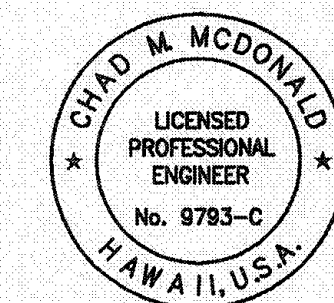


Note:

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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.



STEEL POST GUARDRAIL WITH RUBRAIL

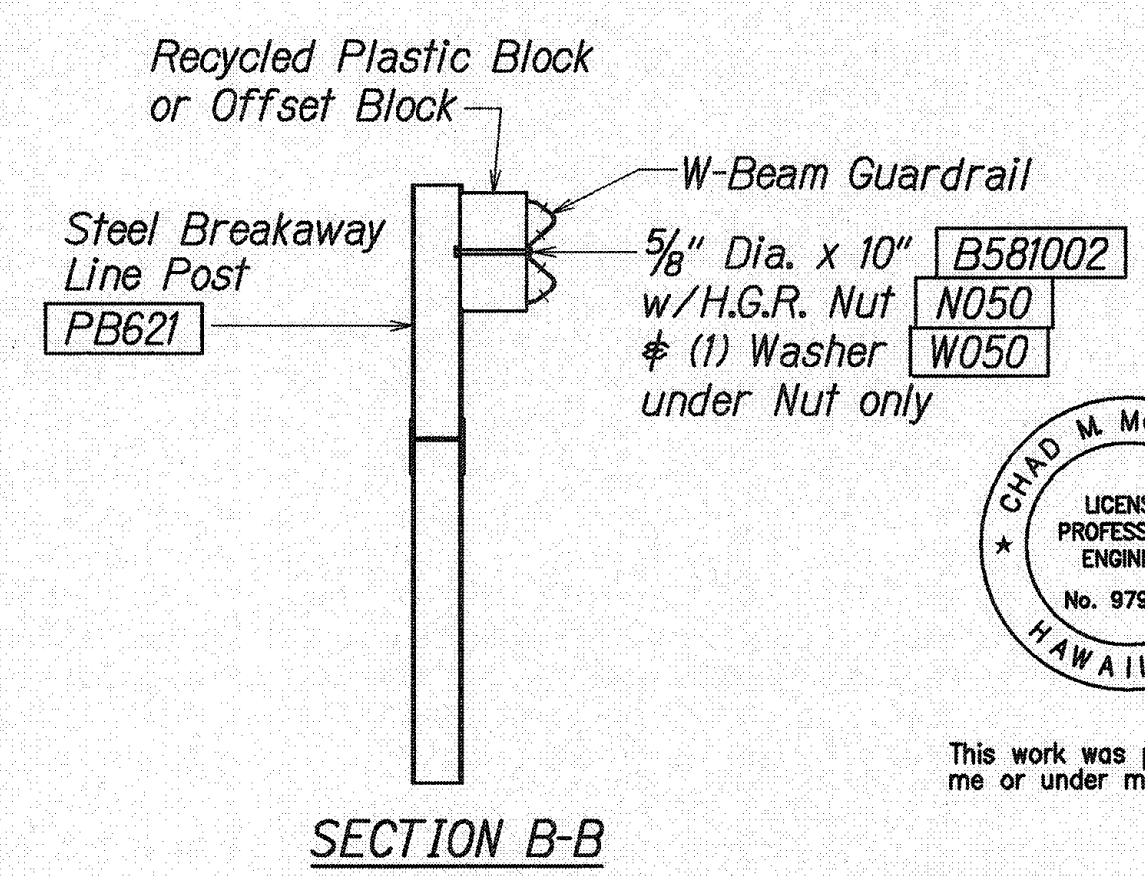
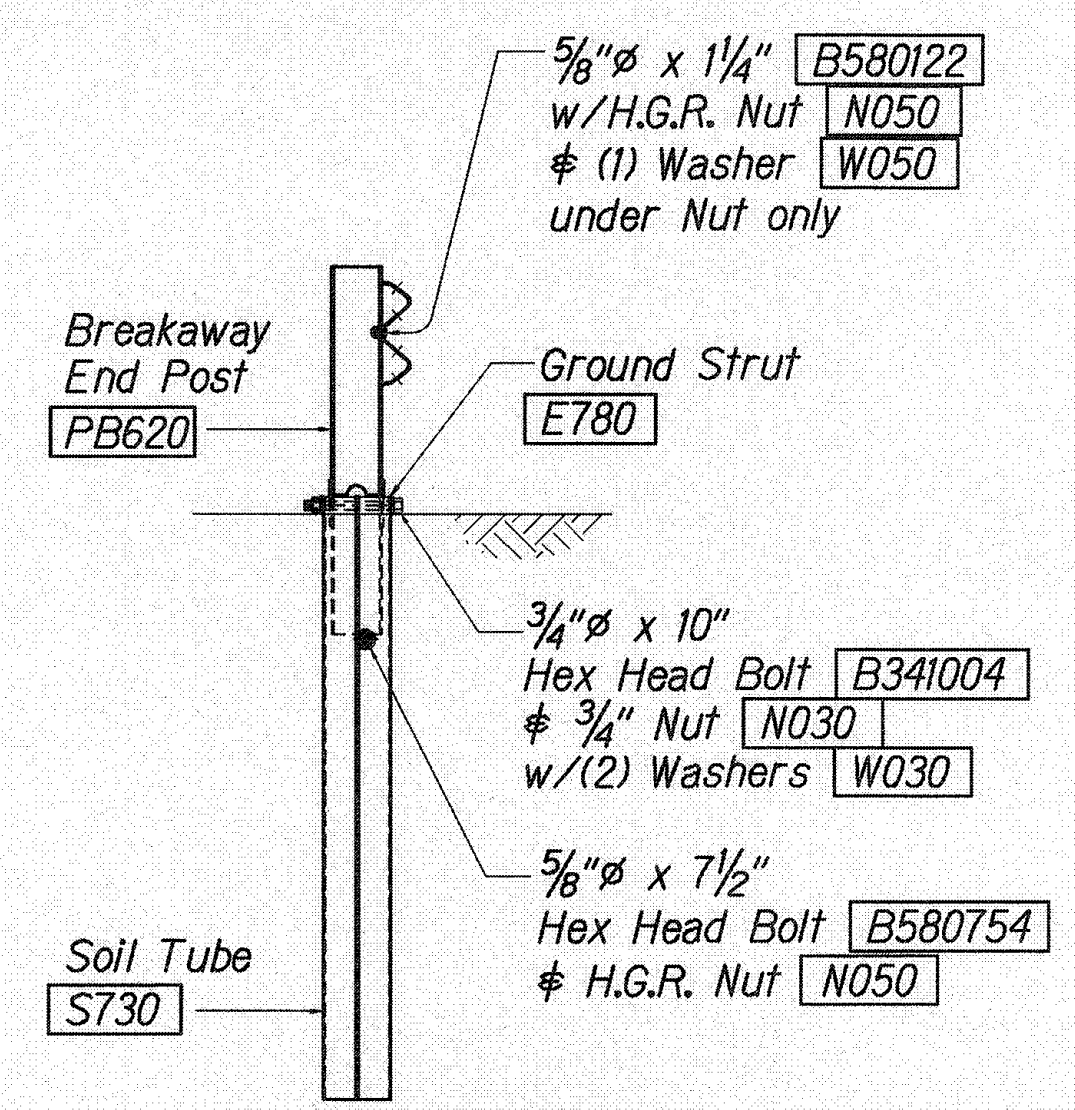
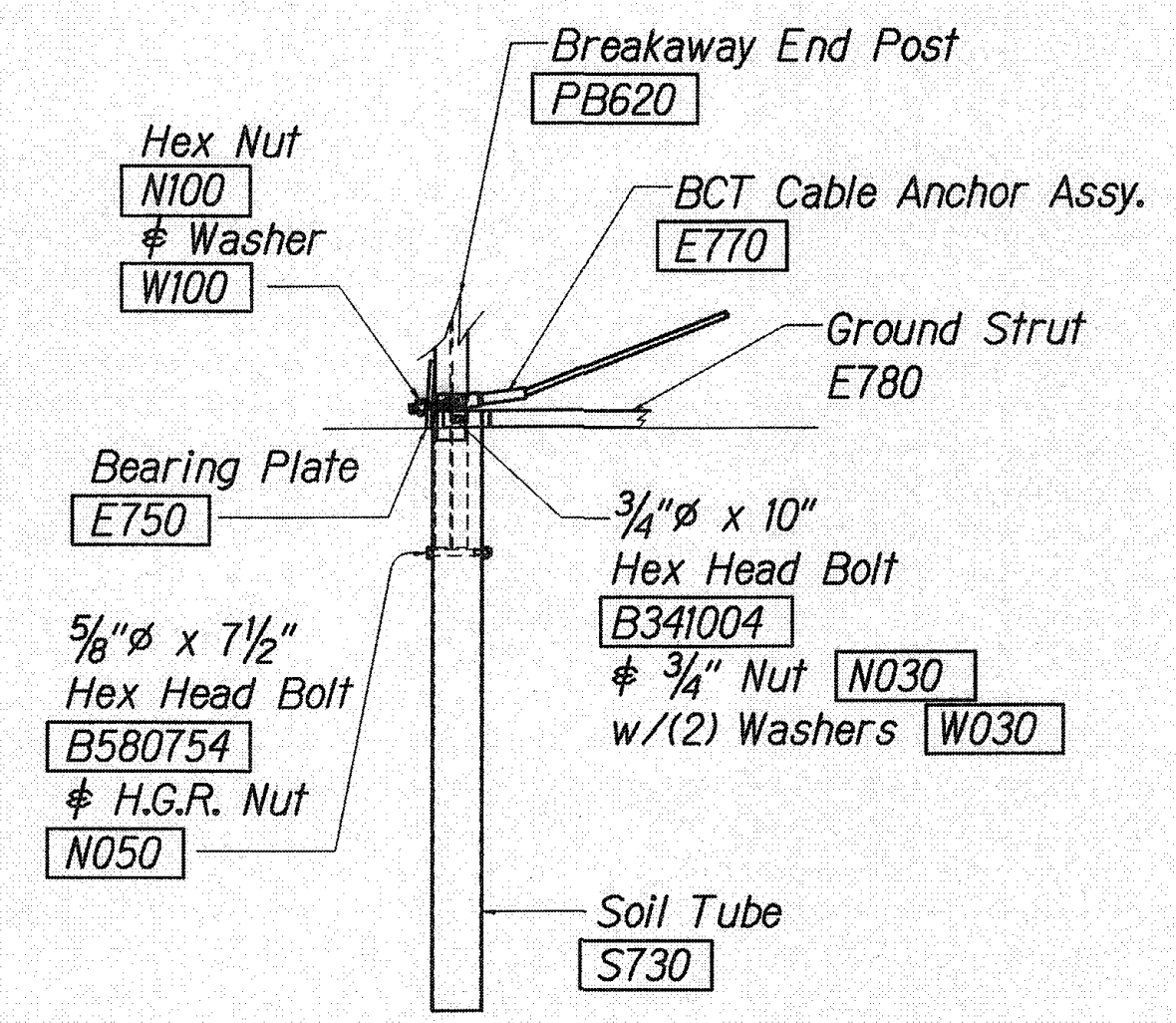
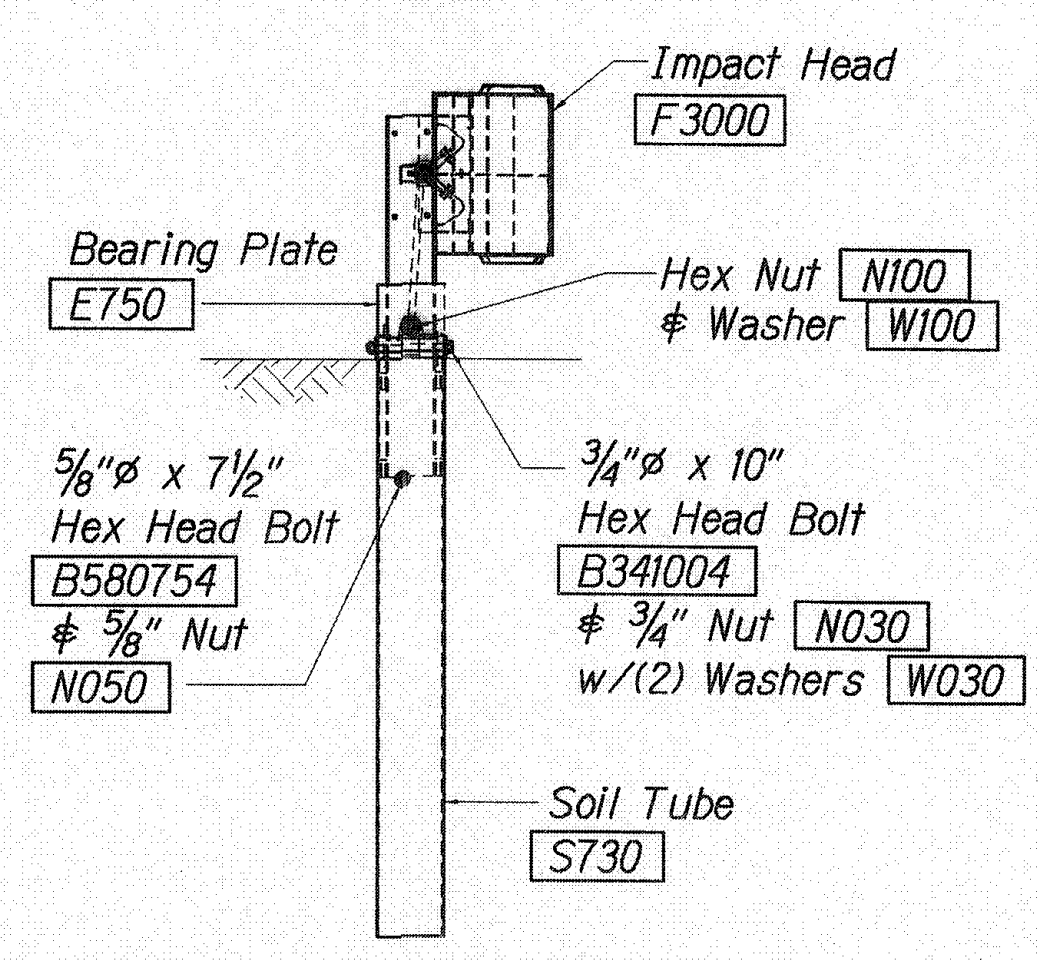
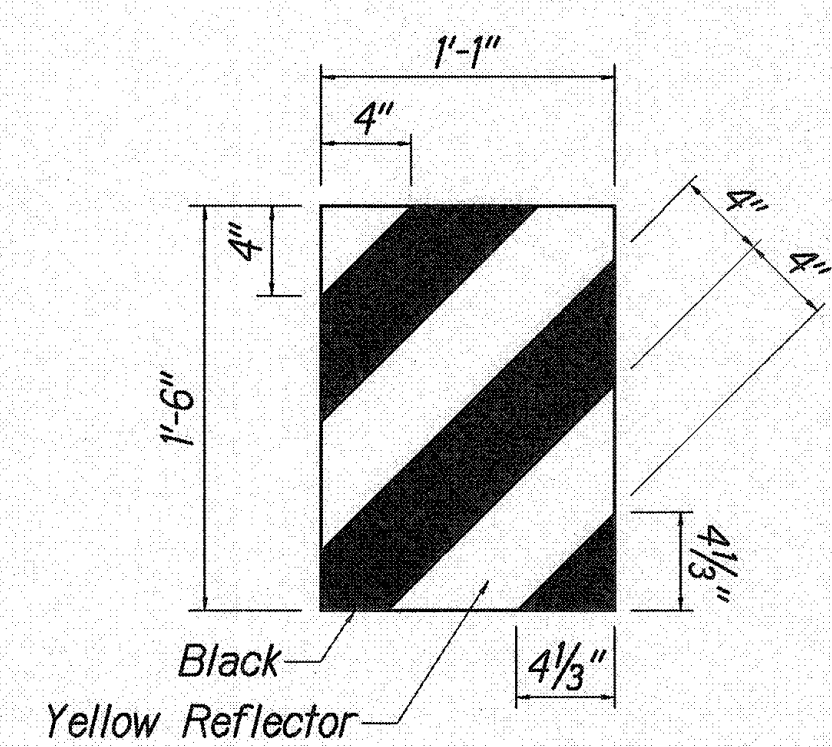
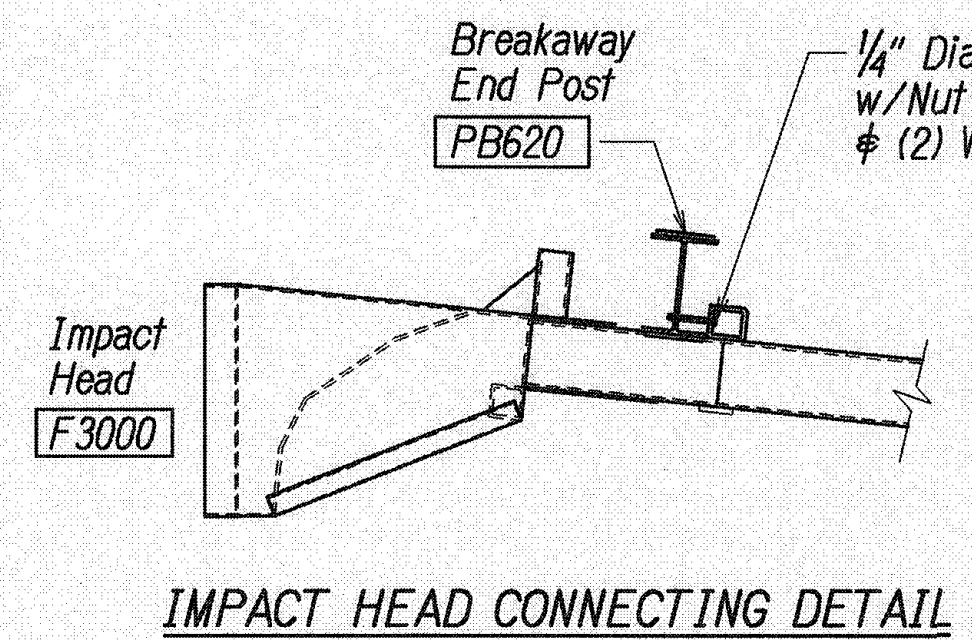
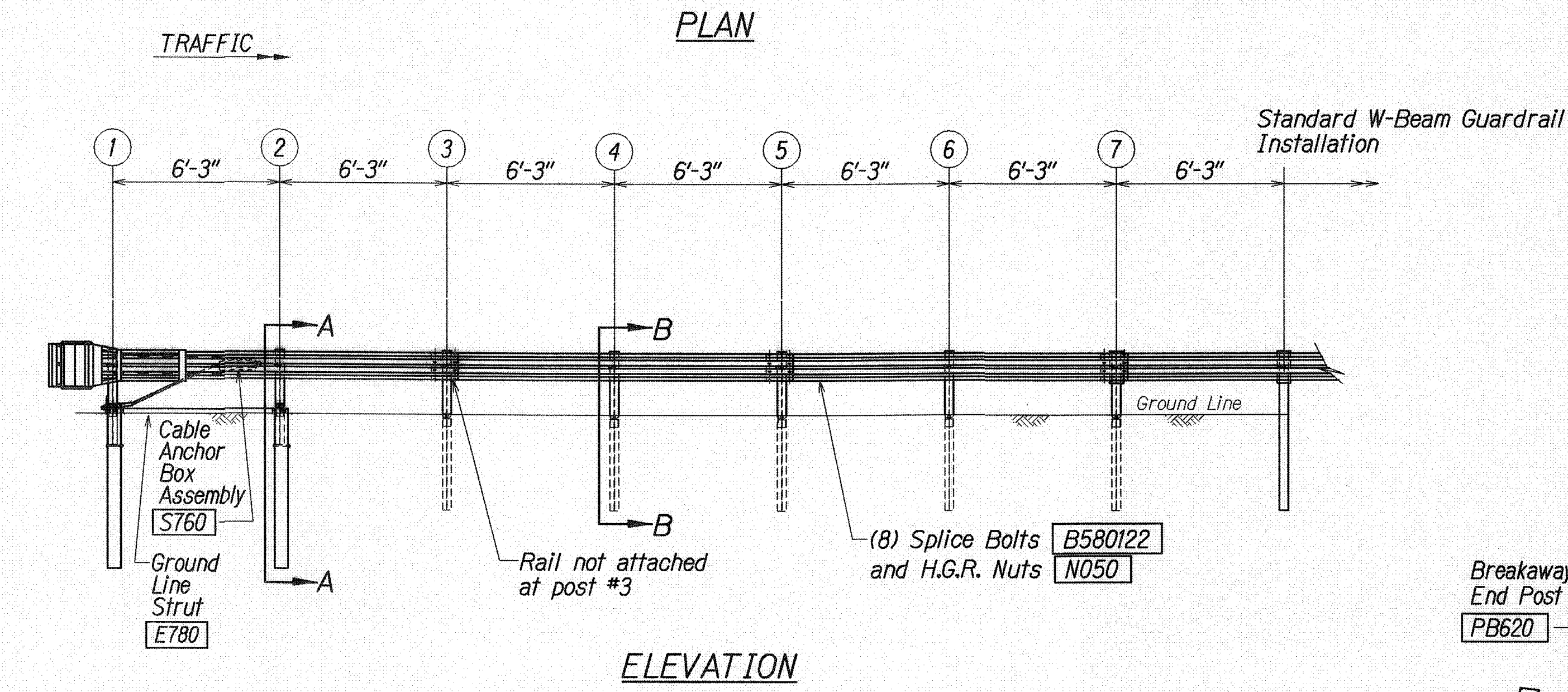
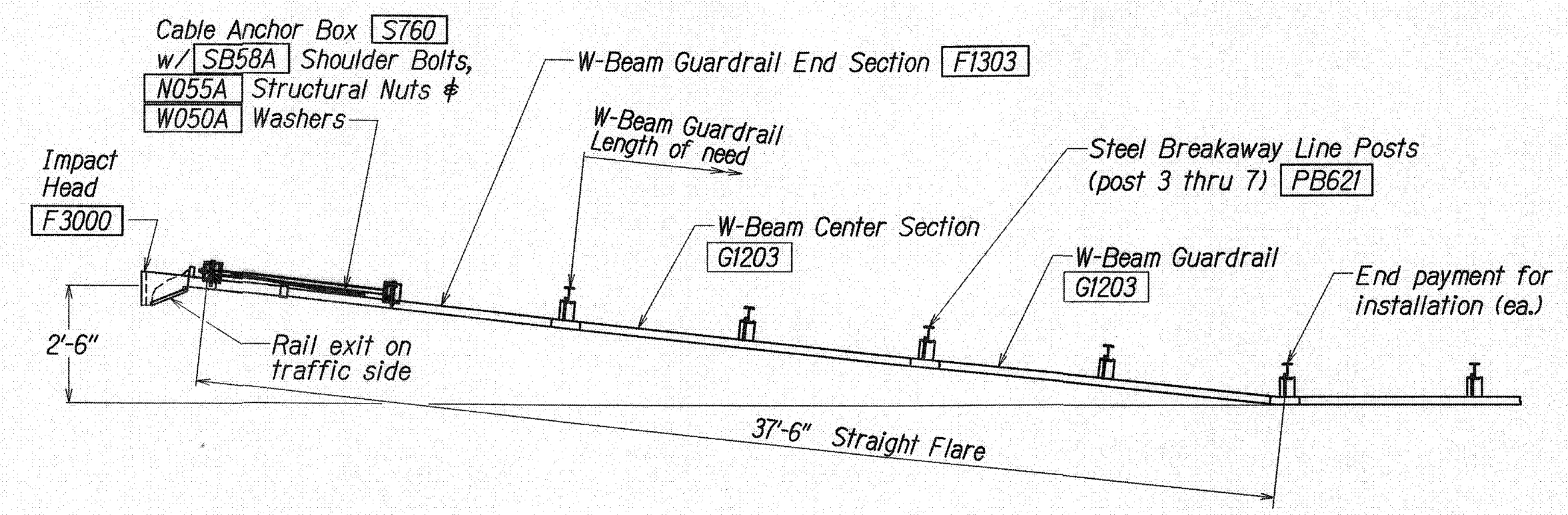


This work was prepared by
me or under my supervision

Chad M. McDonald 4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify
dimensions at job before proceeding with work.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
**MODIFIED TYPE "A-1" FLARE
RUBRAIL DETAILS**
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-46 Date: May 2008

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	49	63



- 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.
G1203	2	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 72"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	STEEL BREAKAWAY END POST
PB621	5	STEEL BREAKAWAY LINE POST
	5	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
HARDWARE		
B580122	25	5/8" Dia. x 1 1/4" SPLICE BOLT, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLT
B341004	2	3/4" Dia. x 10" HEX BOLT
B581002	5	5/8" Dia. x 10" H.G.R. BOLT (POST 3 THRU 7)
N050	32	5/8" Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, POST 2 THRU 7, 6)
N030	2	3/4" Dia. HEX NUT
W050	6	H.G.R. WASHER
W030	4	3/4" ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
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 3/16" 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

SURVEY PLOTTED BY	DATE
DRAWN BY	2/08
TRACED BY	2/08
QUANTITIES BY	2/08
CHECKED BY	2/08

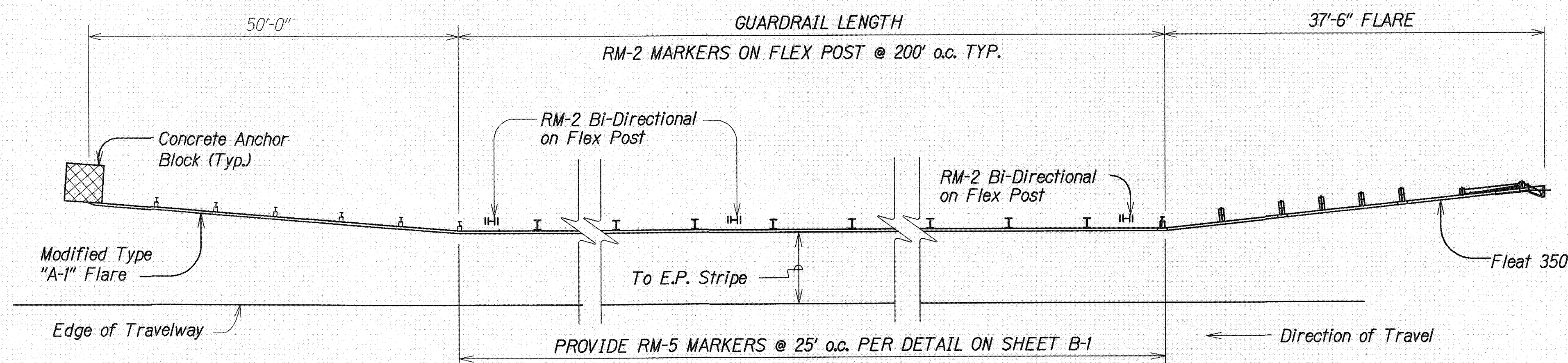
CHAD M. McDONALD
 LICENSED PROFESSIONAL ENGINEER
 No. 9793-C
 HAWAII, U.S.A.
 This work was prepared by me or under my supervision
 4/30/2008
 MITSUNAGA & ASSOCIATES, INC. EXP. DATE

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
FLEAT-350
FLARED ENERGY ABSORBING TERMINAL
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
 Scale: As Noted C-47 Date: May 2008

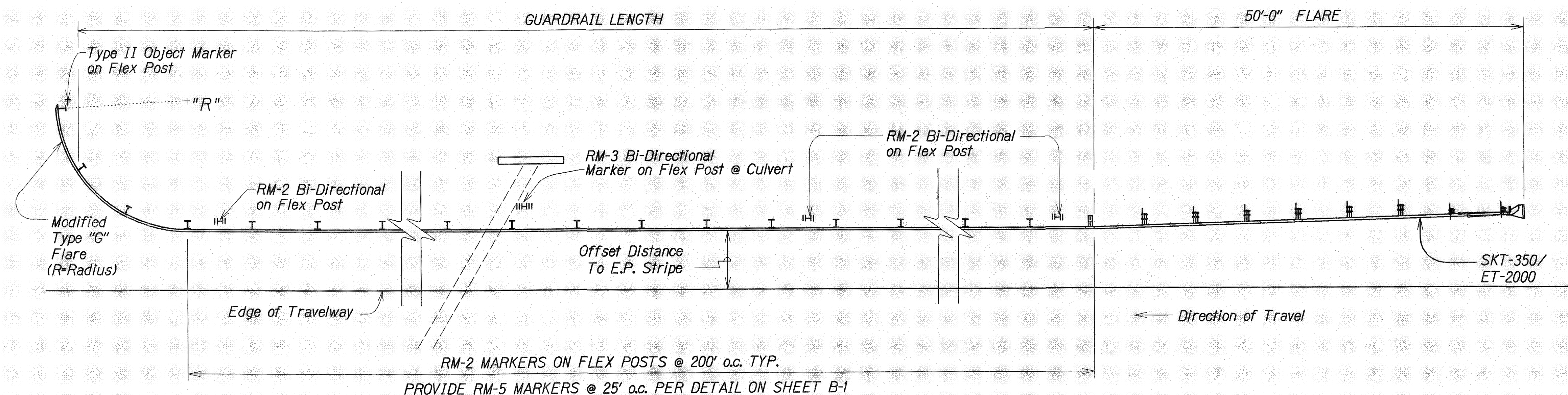
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	50	63

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

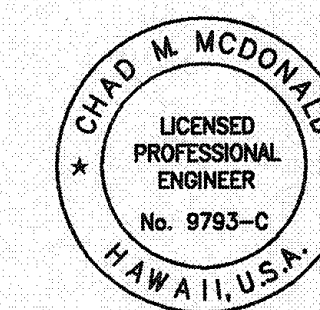


TYPICAL @ MODIFIED "G" & "SKT-350" / "ET-2000" END TREATMENT

TYPICAL GUARDRAIL REFLECTOR MARKER INSTALLATION

Not To Scale

ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	2/08
DRAWN BY	2/08
DESIGNED BY	2/08
QUANTITIES BY	2/08
CHECKED BY	2/08



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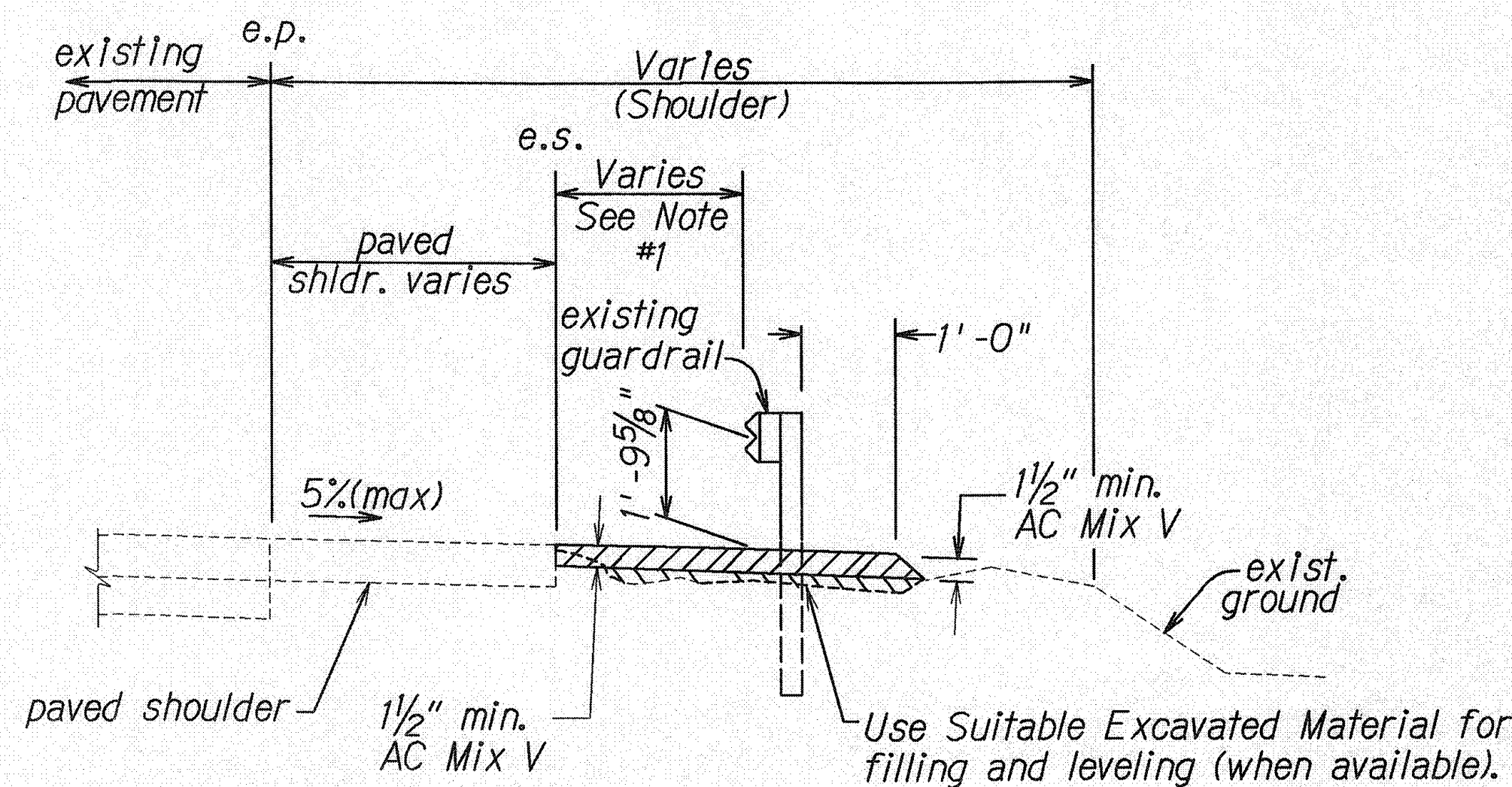
4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify dimensions at job before proceeding with work.

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
GUARDRAIL REFLECTOR MARKER DETAIL
QUEEN KAAHUMANU HIGHWAY Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-48 Date: May 2008

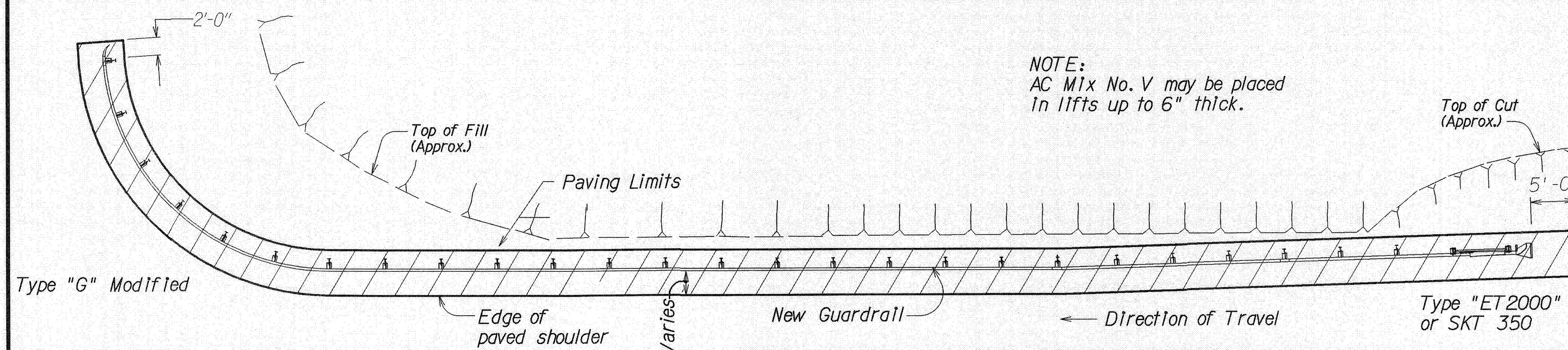
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	11A-01-04M	2008	51	63

NOTES:

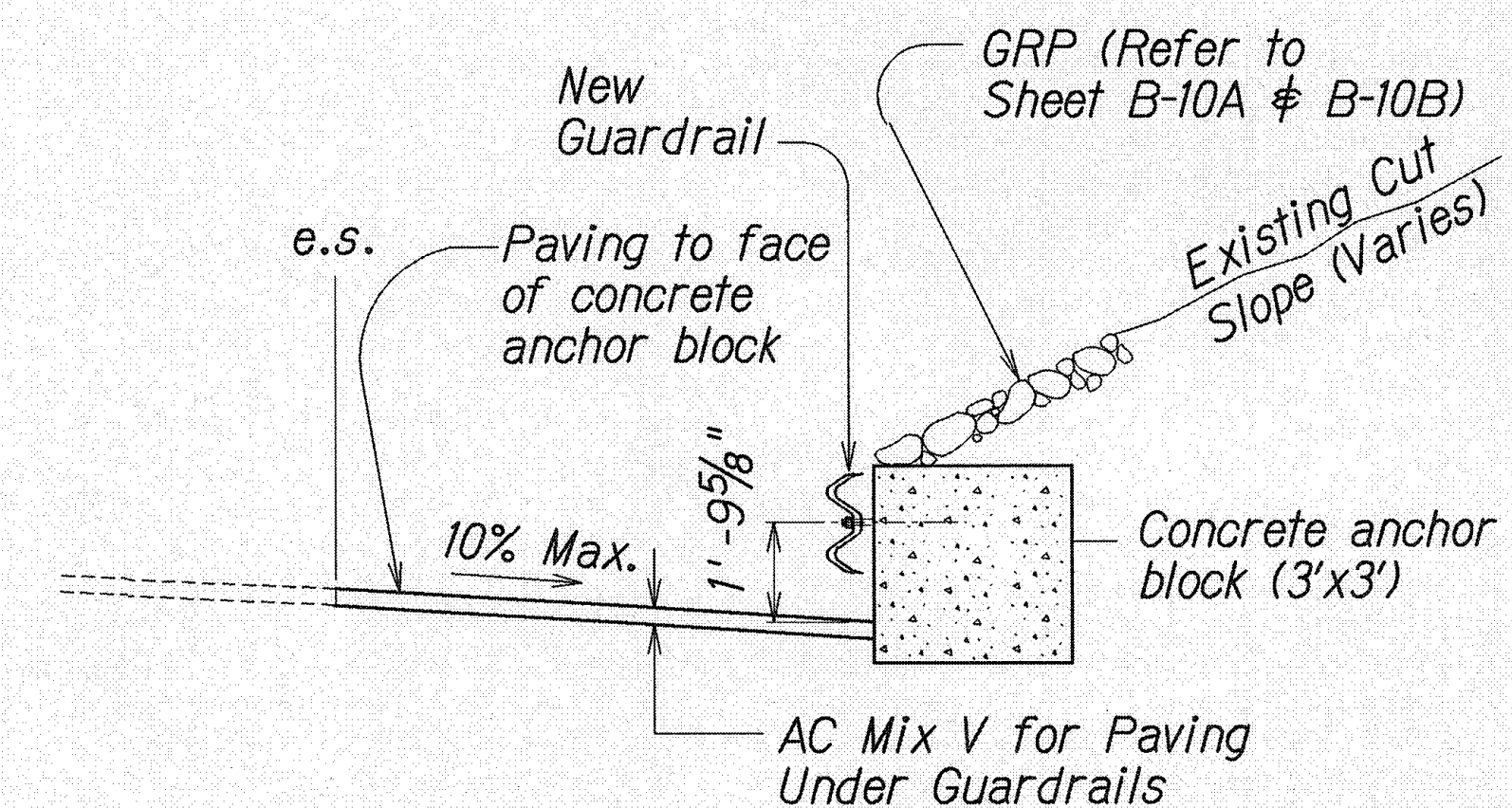
1. Pay limits for Paving Under Existing Guardrail A.C. Mix V, Are As Shown.
2. Paving Under Guardrails Shall be Paid for Under Item No. 401.0501 - HMA Pavment Mix No. V, (Paving Under Guardrails).
3. Excavating, placing, leveling, and compacting of suitable excavated material shall not be paid for separately, but shall be considered incidental to various contract items.
4. Compaction requirements of Cold Planed material shall be in accordance with Section 203 - Excavation and Embankment.
5. Maintain longitudinal drainage as shown on the plans or as directed by the Engineer.
6. Contractor's attention is called to the increase in the asphalt content and compaction requirements in Section 401 - Hot Mix Asphalt (HMA) Pavement, Paragraph 401.03 (FX3) of the Standard Specifications.



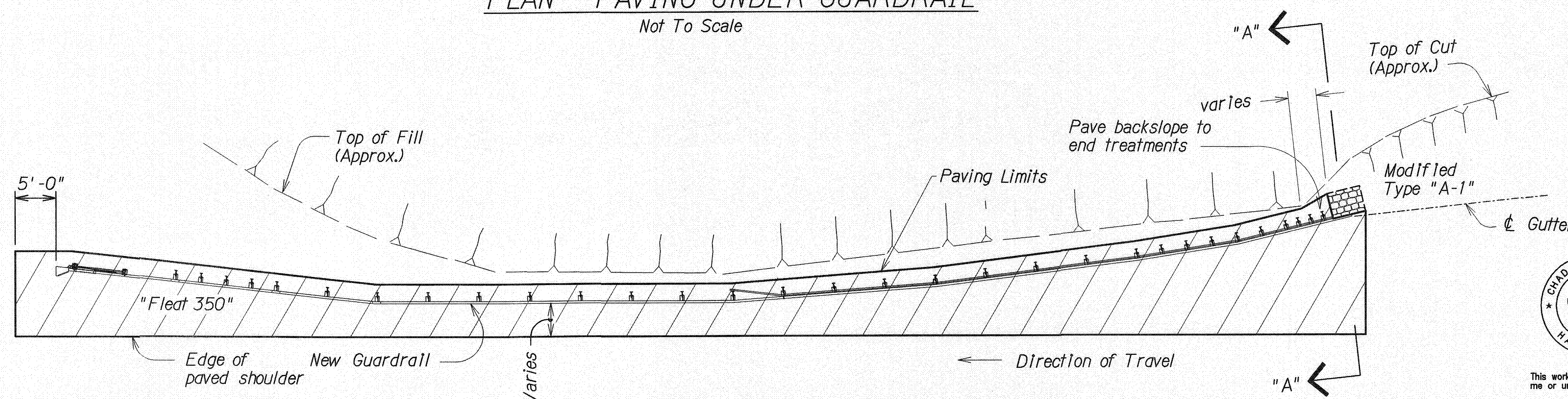
TYPICAL PAVING UNDER EXISTING GUARDRAIL
Not To Scale



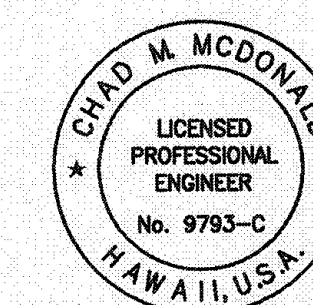
PLAN - PAVING UNDER GUARDRAIL
Not To Scale



SECTION "A-A"
Not To Scale



PLAN - PAVING UNDER GUARDRAIL
Not To Scale



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Chad M. McDonald 4/30/2008
MITSUNAGA & ASSOCIATES, INC. EXP. DATE
NOTE: Contractor to check and verify dimensions at job before proceeding with work.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
TYPICAL GUARDRAIL PAVING DETAILS
FULL PAVING UNDER GUARDRAIL
QUEEN KAAHUMANU HIGHWAY
Resurfacing, Henry Street to Lako Road
Project No. 11A-01-04M
Scale: As Noted C-49 Date: May 2008

ORIGINAL PLAN	DATE
SURVEY PLATTED BY	2/08
DRAWN BY	2/08
DESIGNED BY	2/08
CHECKED BY	2/08