

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-072-1(51)	2007	59	106

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 longi-tudinally 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.

LEGEND FOR AS-BUILT POSTINGS

	Squiggly line for as-built deletion
	Double line for as-built deletion
Roadway	Text for as-built posting



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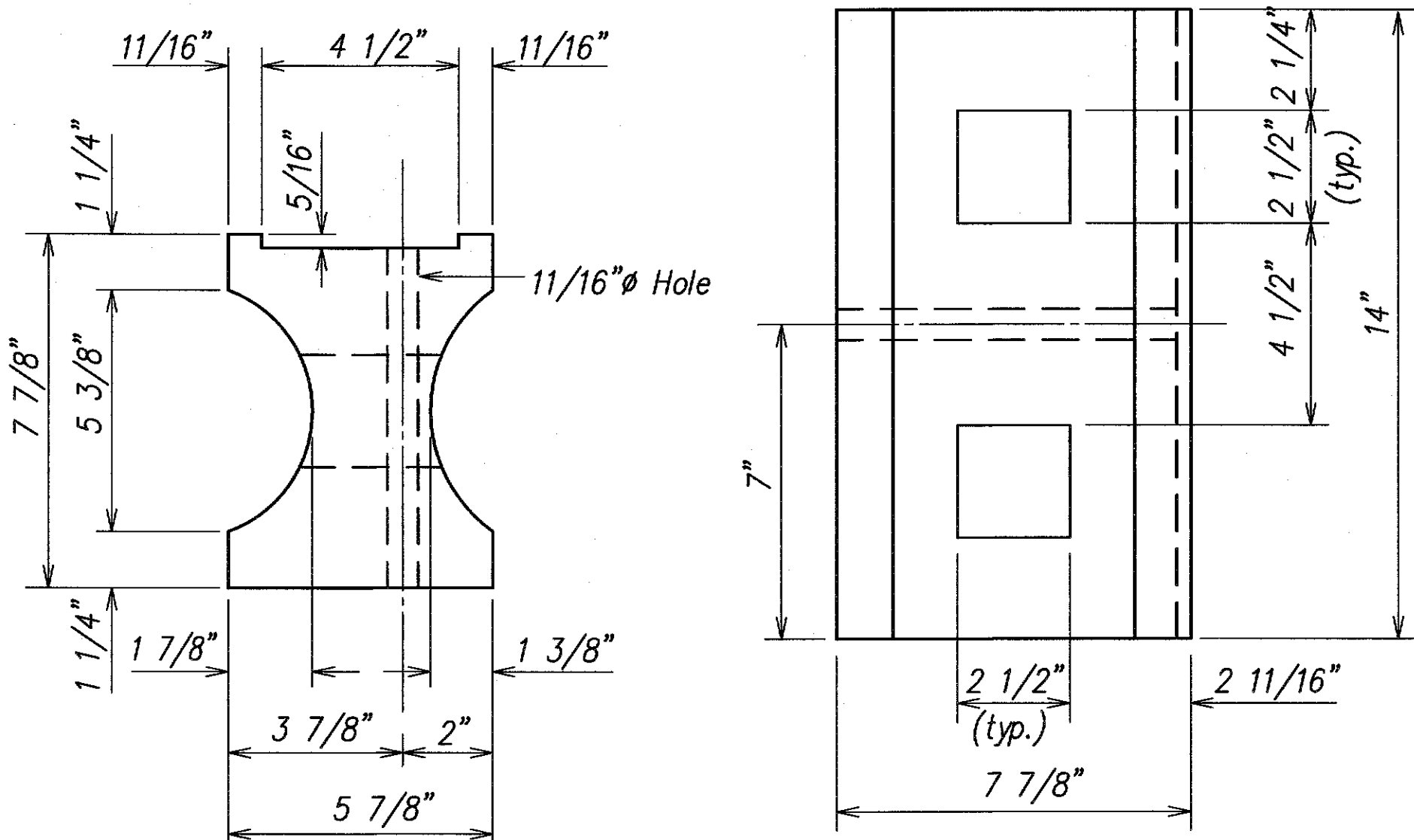
Glen K. Ikeda
 P.E., Inc.
 dba PARK ENGINEERING
 LICENSE EXPIRES 4-30-14

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

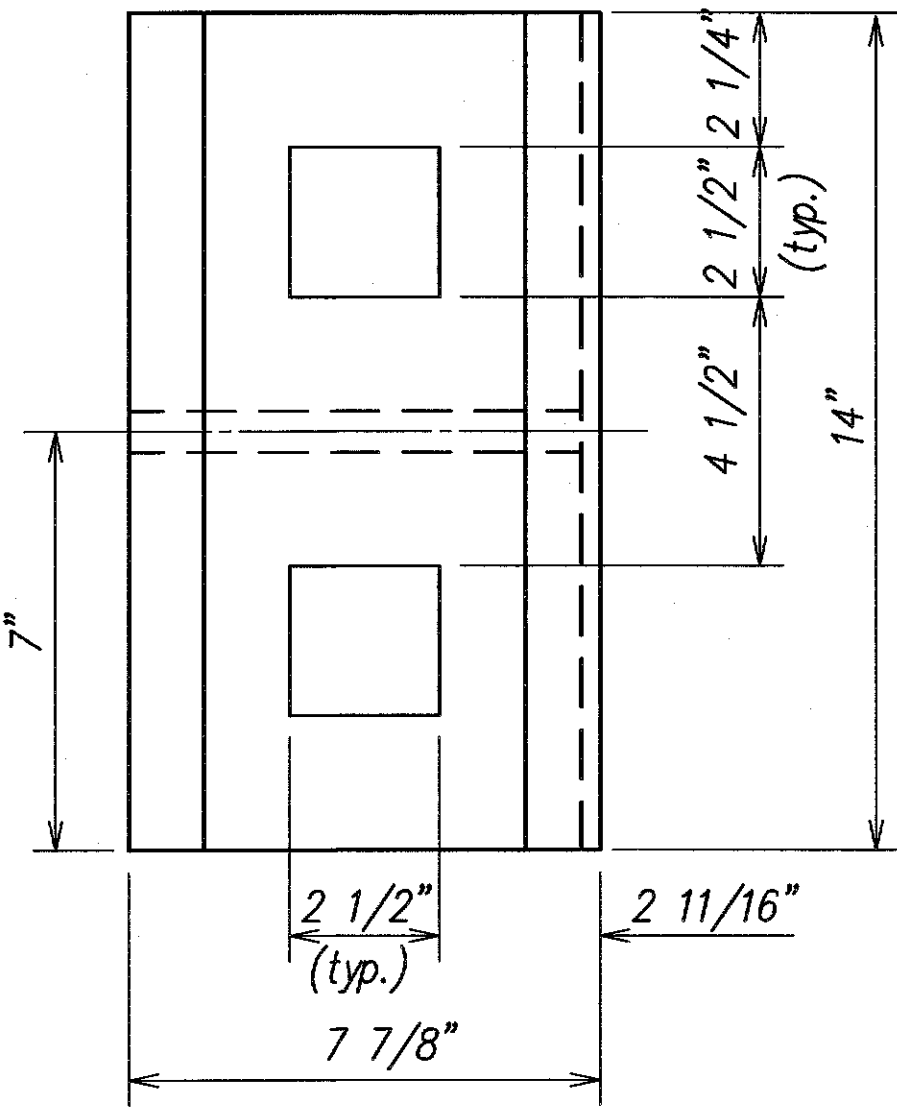
GUARDRAIL DETAILS & NOTES

*Kalaniana'ole Highway Improvements
 Retaining Wall at Makapuu, Oahu
 Federal-Aid Project No. NH-072-1(51)*

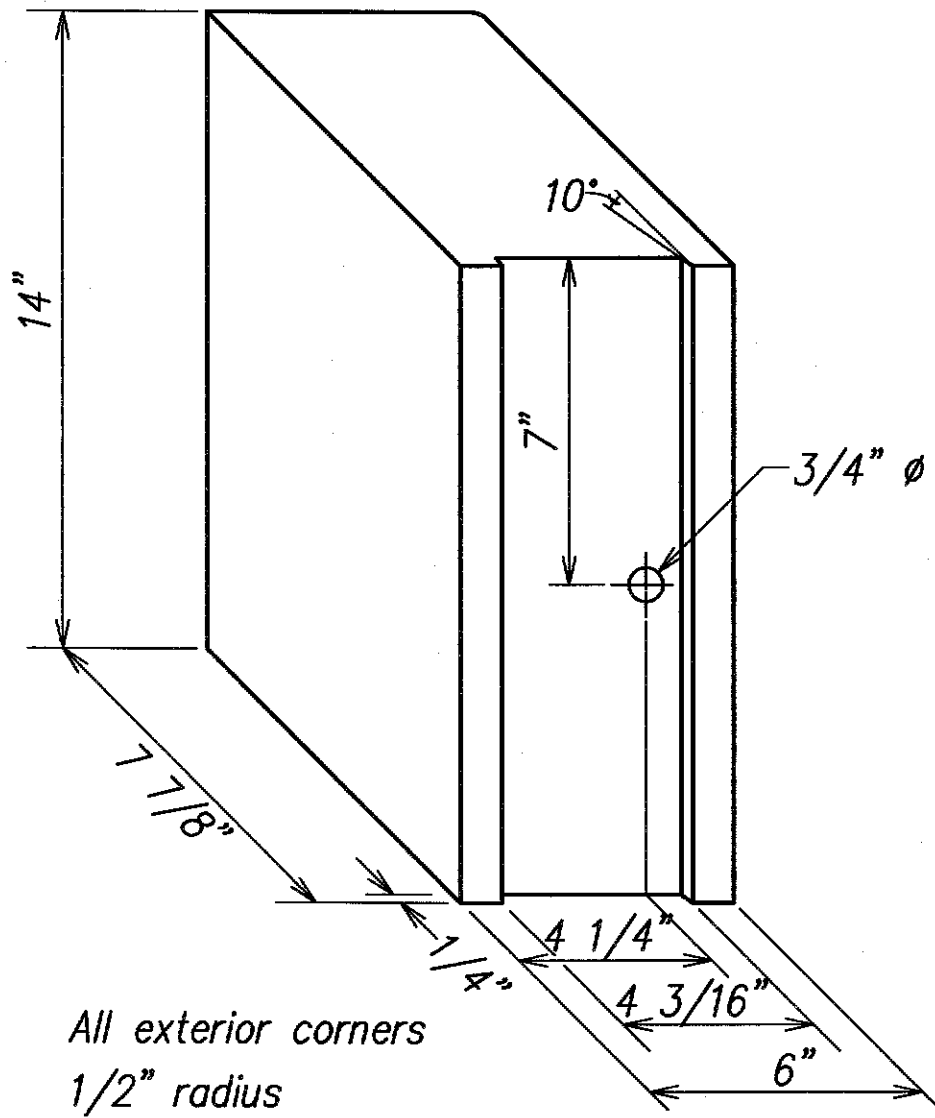
Scale: As Noted Date: APR. 2007
 SHEET No. 1 OF 5 SHEETS



TOP
 RECYCLED PLASTIC BLOCKOUT (TYPE I)



RECYCLED POLYETHYLENE
 OFFSET BLOCK (TYPE II)



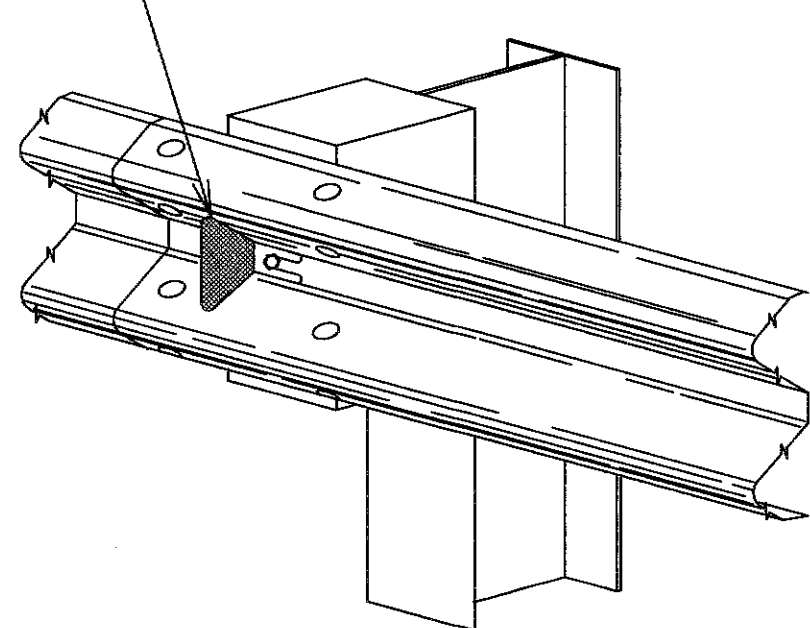
STEEL POST AND BLOCK DETAIL

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

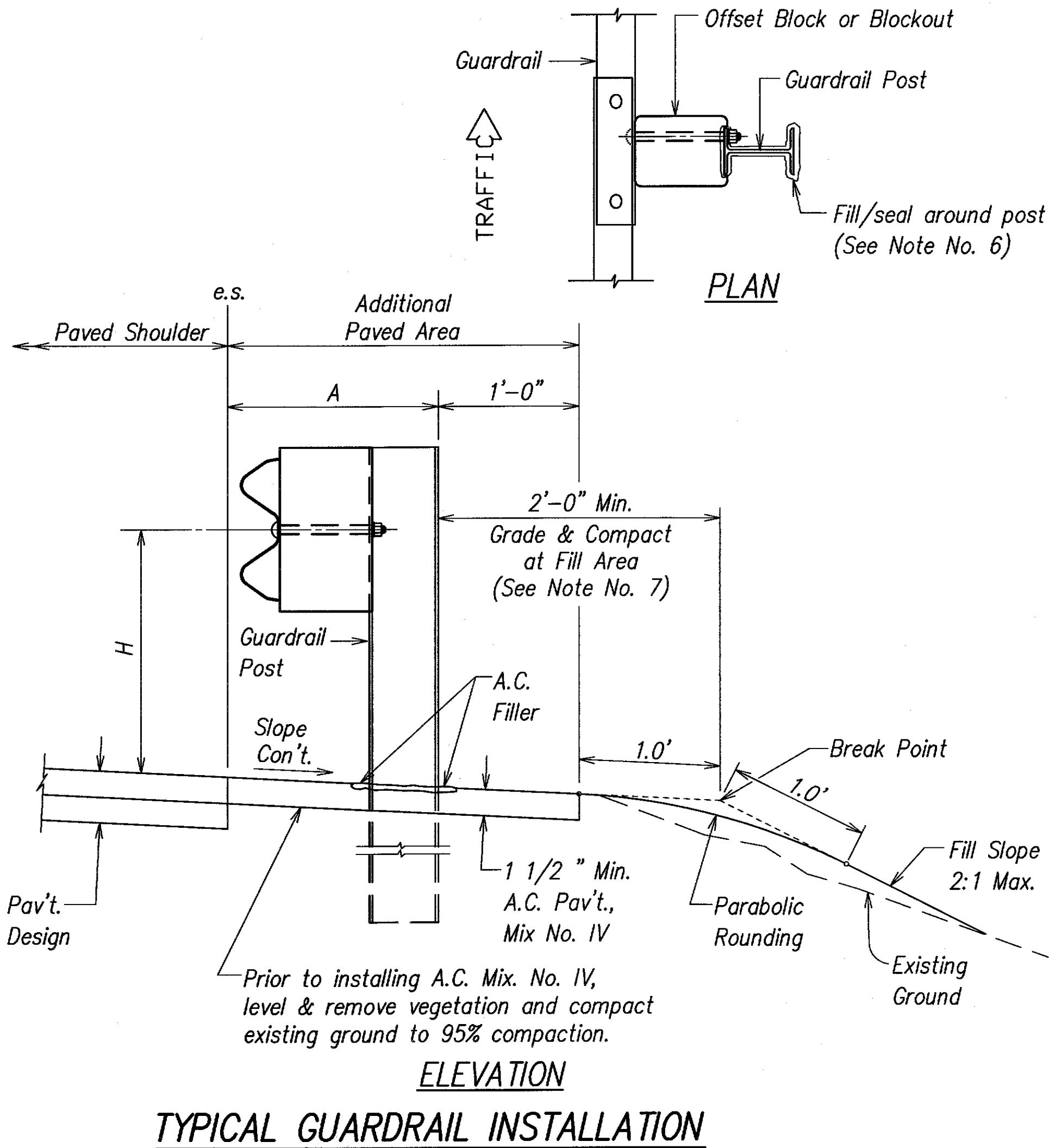
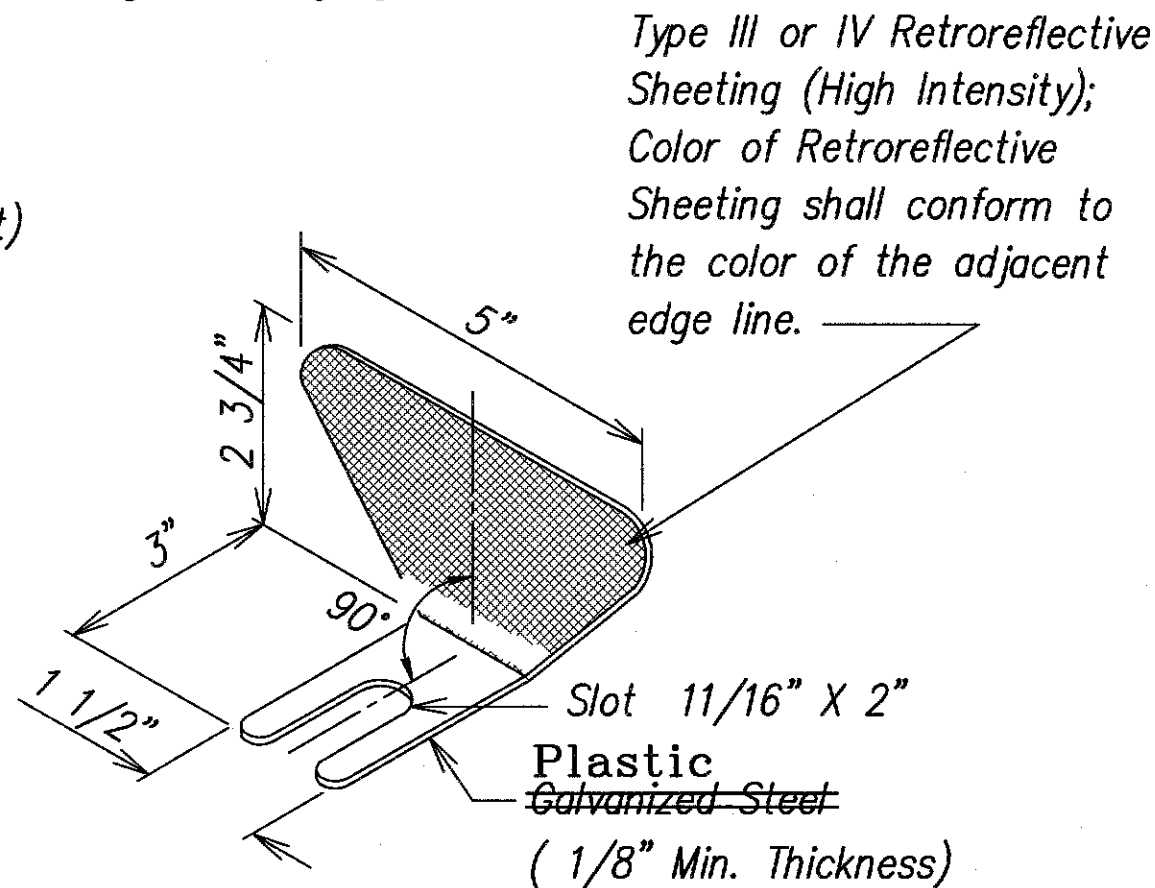
SPECIAL COATING SCHEDULE FOR ZINC COATED METAL BEAMS AND POSTS				
	Option 1	Option 2	Option 3	Option 4
Preparation:	Carboline thinner #2 or surface cleaner #3, per SSPC-SP1, Apply Rustbound Penetrating Sealer	Solvent Clean per SSPC-SP1. Apply Valspar VyGuard Sealer 513-V-110	Solvent Clean per SSPC-SP1, and as recommended by the manufacturer.	Solvent Clean per SSPC-SP1. Apply Galvaprep Zinc Treatment.
1st. Coat:	Carboline 890 epoxy DFT 5 mil (min) WFT 7 mil (min)	Valspar VyGuard V75 Epoxy DFT 5 mil (min) WFT 7 mil (min)	Sherwin Williams Tile Clad High Solids B62 Series DFT 4 mil (min) WFT 7 mil (min)	Ameron Amercoat 385 Epoxy DFT 5 mil (min) WFT 8 mil (min)
Re-Coating Time:	8 Hrs (min) 2 Days (max)	36 Hrs (min) 14 Days (max)	8 Hrs (min) 10 Days (max)	8 Hrs (min) 2 Days (max)
Top Coat:	Carboline 133HB Aliphatic polyurethane DFT 5 mil (min) WFT 7 mil (min)	Valspar VyGuard V41 Series DFT 4 mil (min) WFT 7 mil (min)	Sherwin Williams Cororthone II B65 W200 Series / B60V2 DFT 4 mil (min) WFT 7 mil (min)	Ameron Amercoat 450 SA Polyurethane DFT 4 mil WFT 7 mil

- Notes: 1. Contractor shall shop coat all members. Field coating shall consist of touch up only.
2. Color for top coat shall match gray color of the galvanized steel surface; intermediate coat shall have a contrasting light color. Finish for top coat shall not be gloss or high gloss.

Reflector Marker (RM-5) - Reflector Facing Traffic (Mounted on Guardrail Bolt)



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

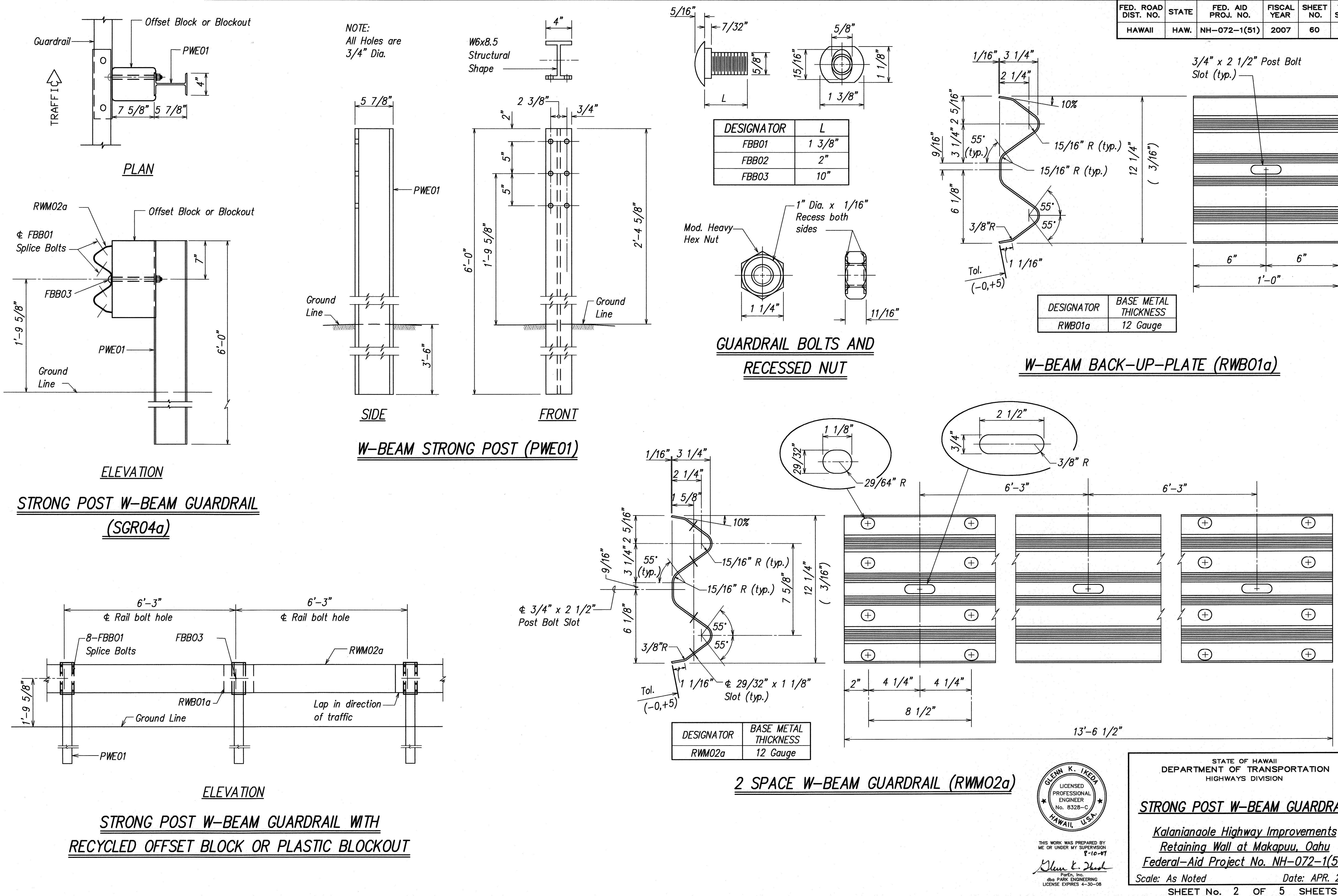


TYPICAL GUARDRAIL INSTALLATION

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NOTE BOOK	
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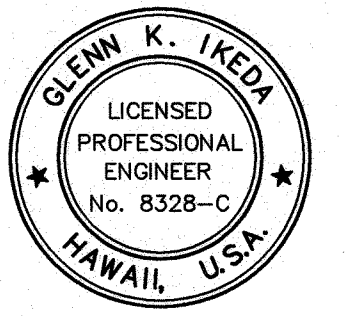
LIB2: STATE DOT/KALANIA'OLE RETAINING WALL/CAADD - KALRW-59-GRO1-B01.dwg 4/16/07

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-072-1(51)	2007	60	106



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LUB2: STATE DOT \KALANIANA'OLE RETAINING WALL V.CADD\ KALBW-60-SR02-B02.dwg 4/16/07



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

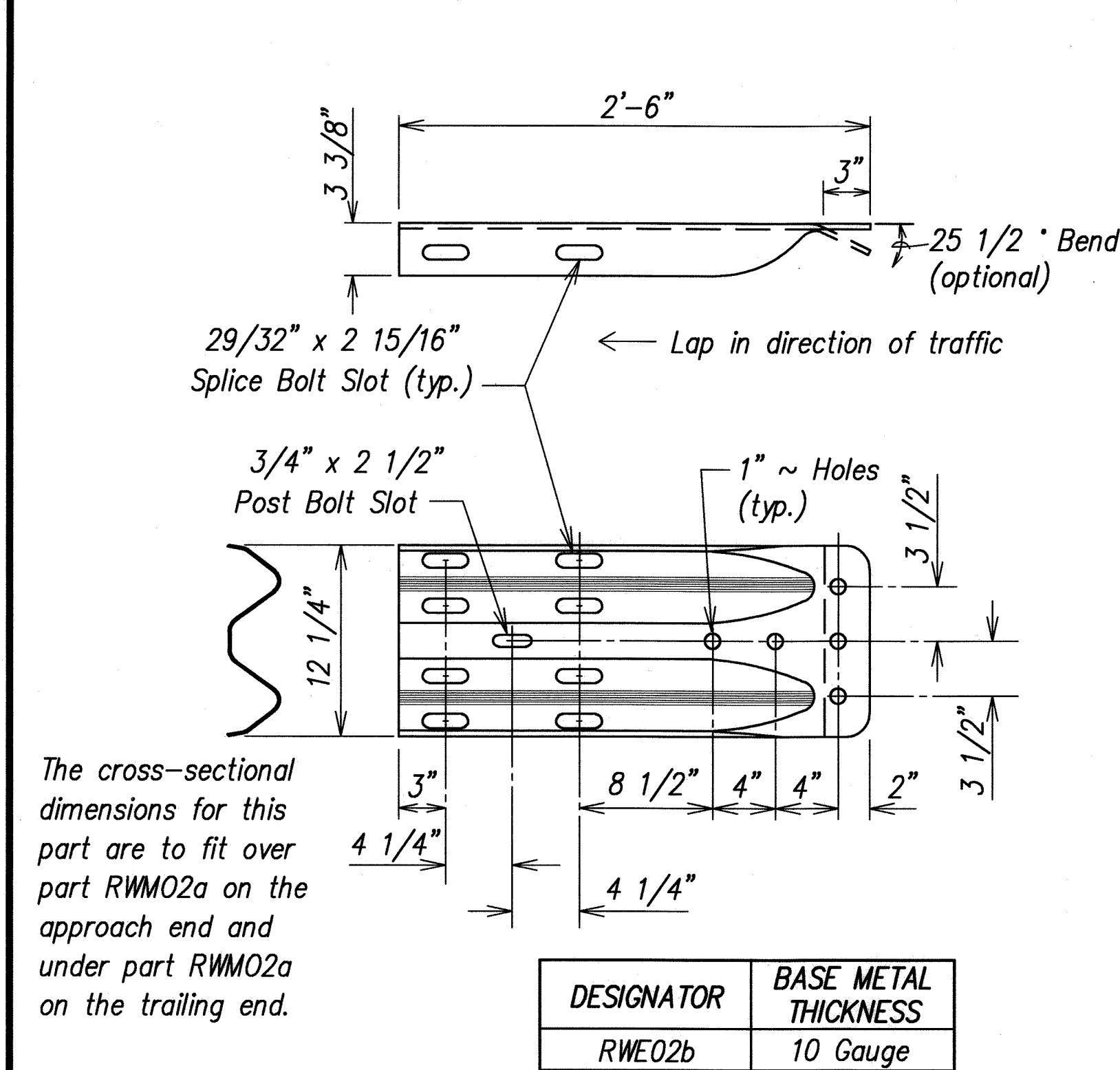
STRONG POST W-BEAM GUARDRAIL

*Kalaniana'ole Highway Improvements
Retaining Wall at Makapuu, Oahu
Federal-Aid Project No. NH-072-1(51)*

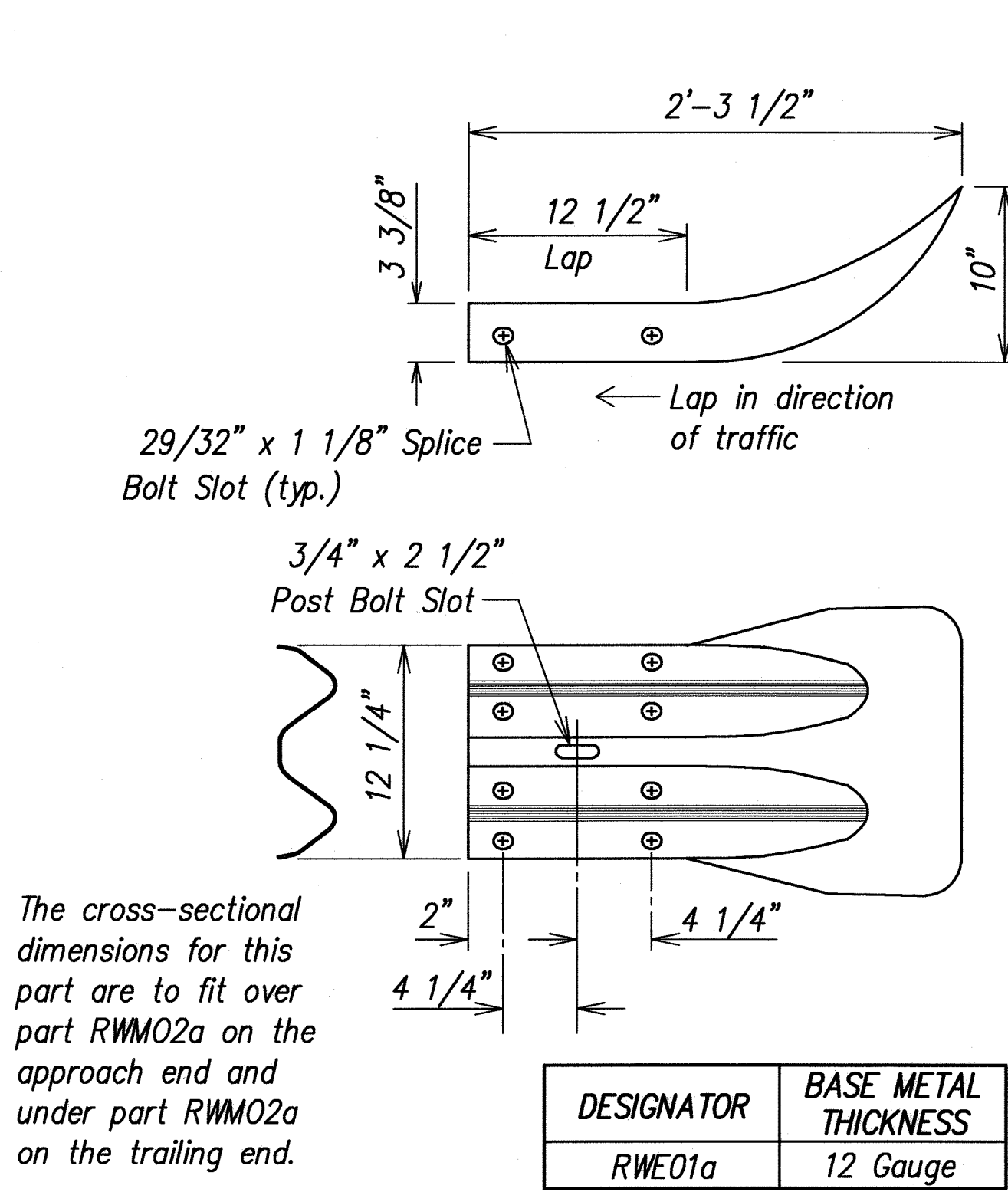
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SHEET No. 2 OF 5 SHEETS

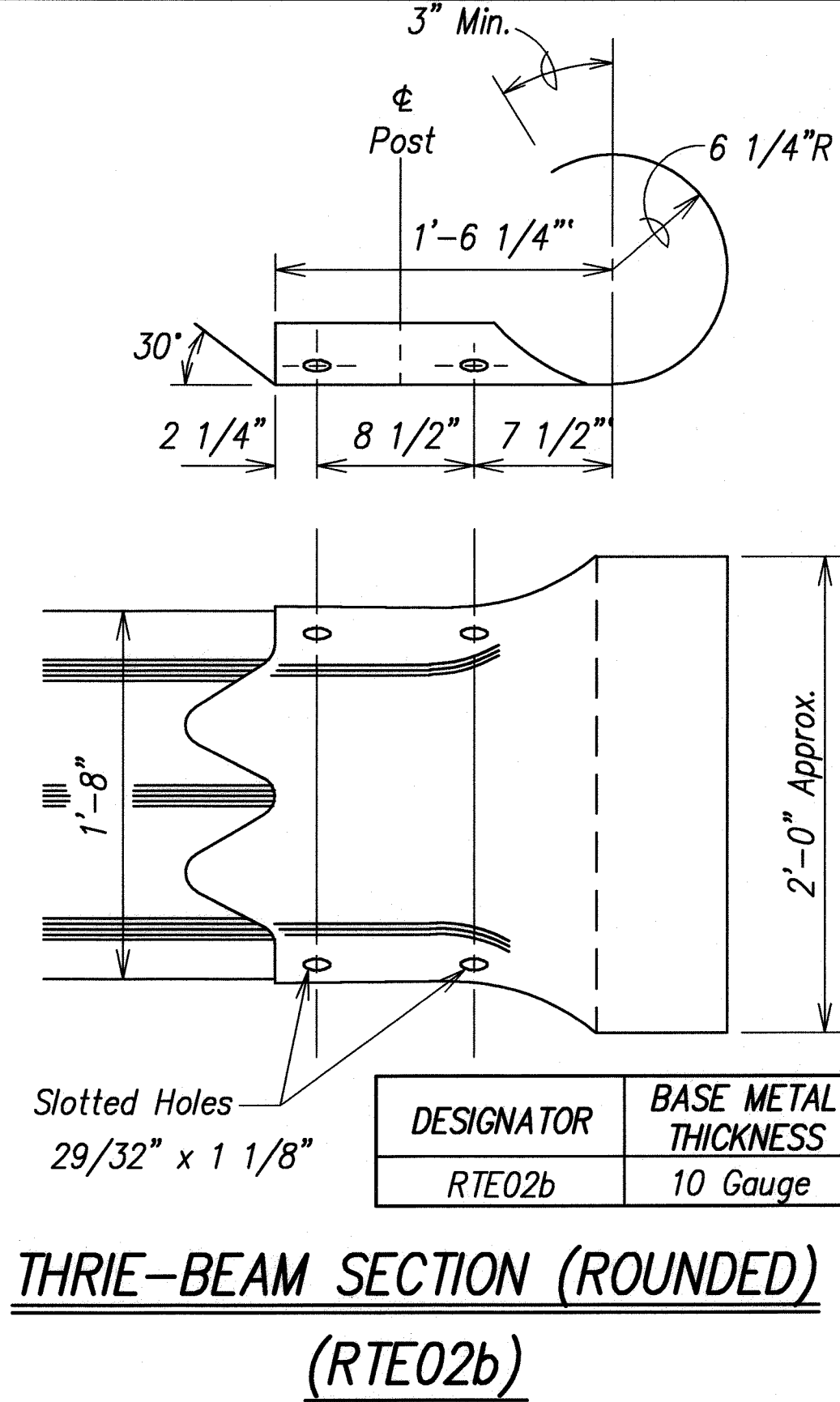
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HAWAII	HAW.	NH-072-1(51)	2007	61	106



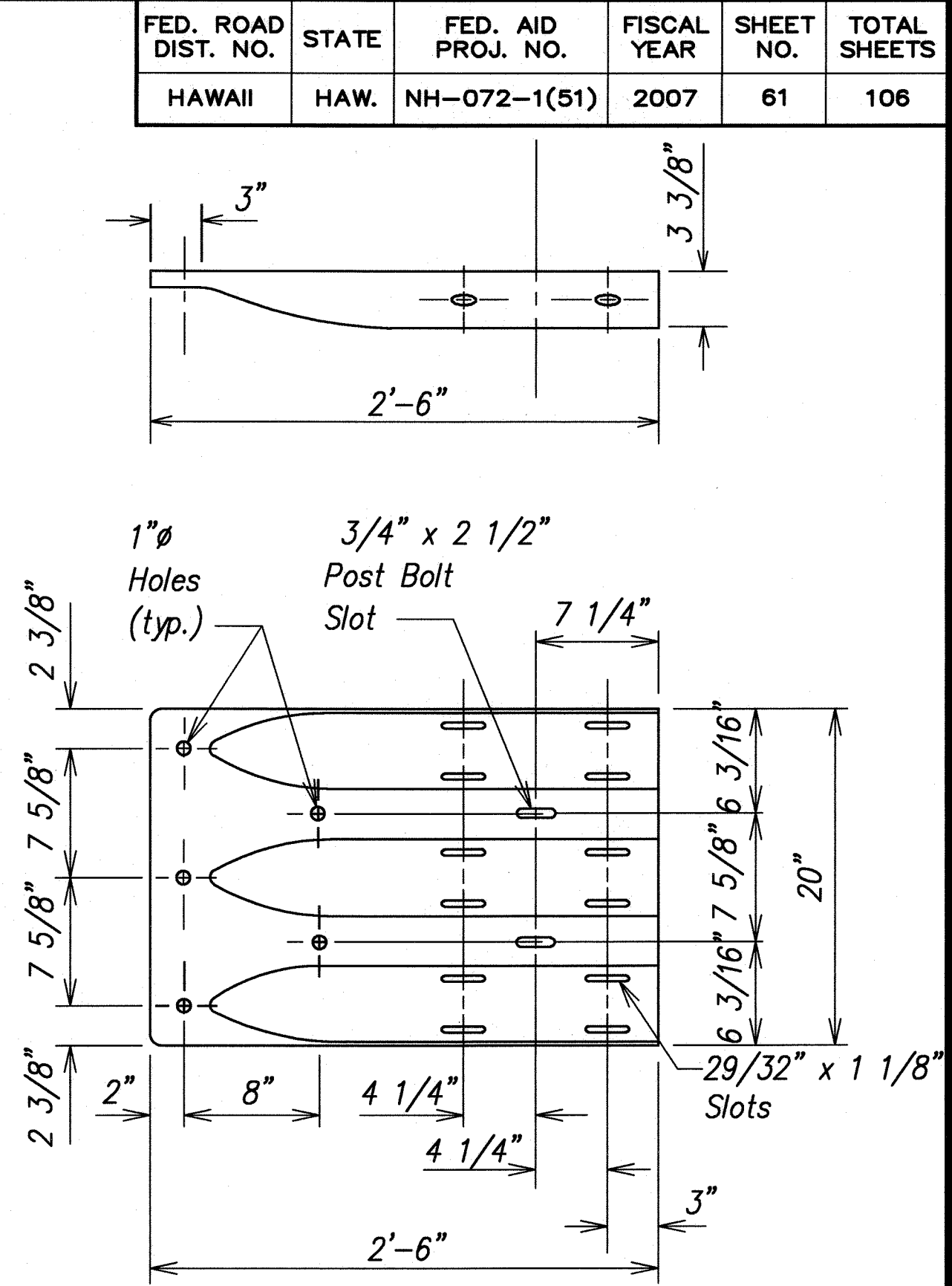
W-BEAM TERMINAL CONNECTOR (RWE02b)



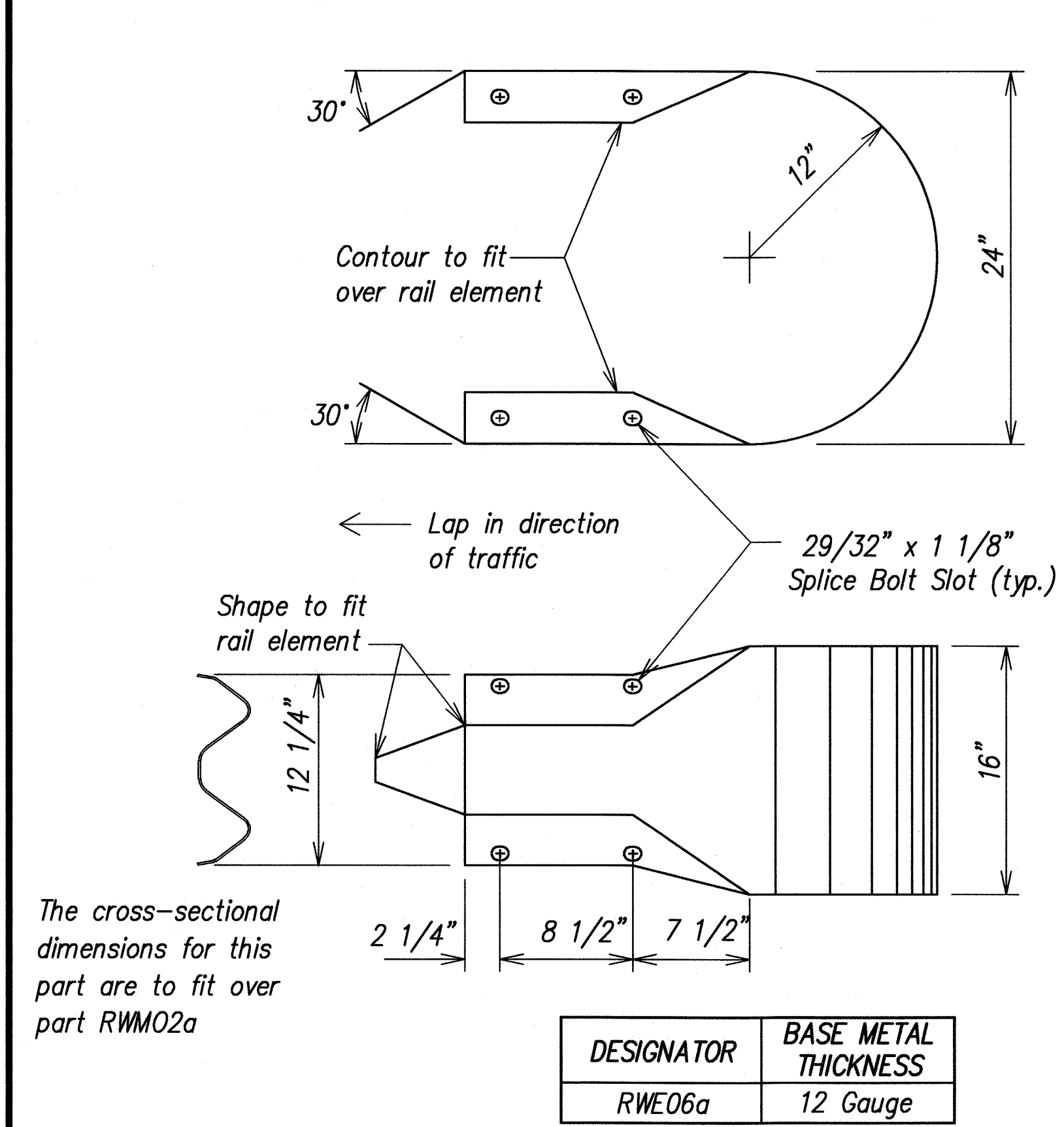
W-BEAM END SECTION (FLARED RWE01a)



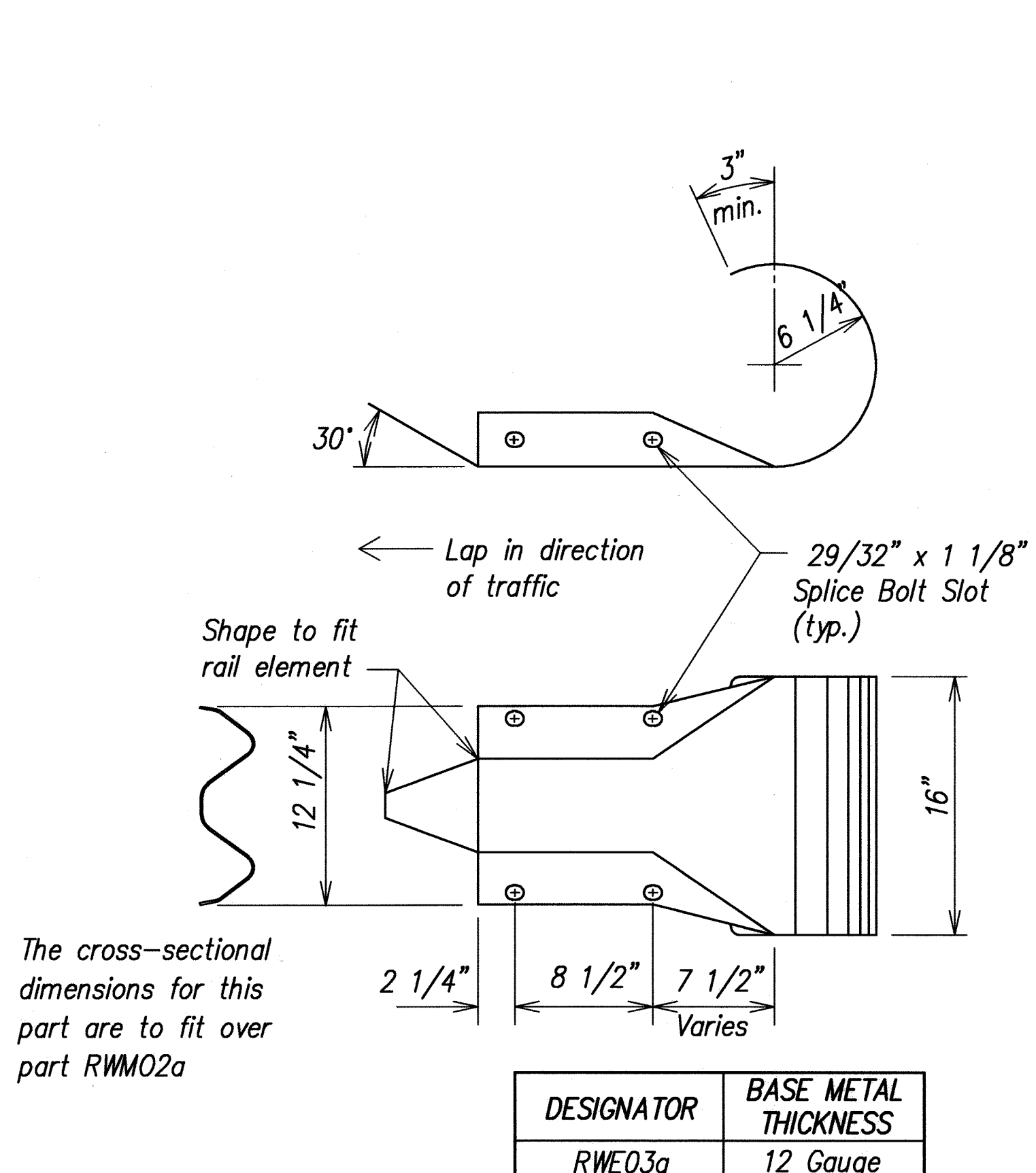
THRIE-BEAM SECTION (ROUNDED) (RTE02b)



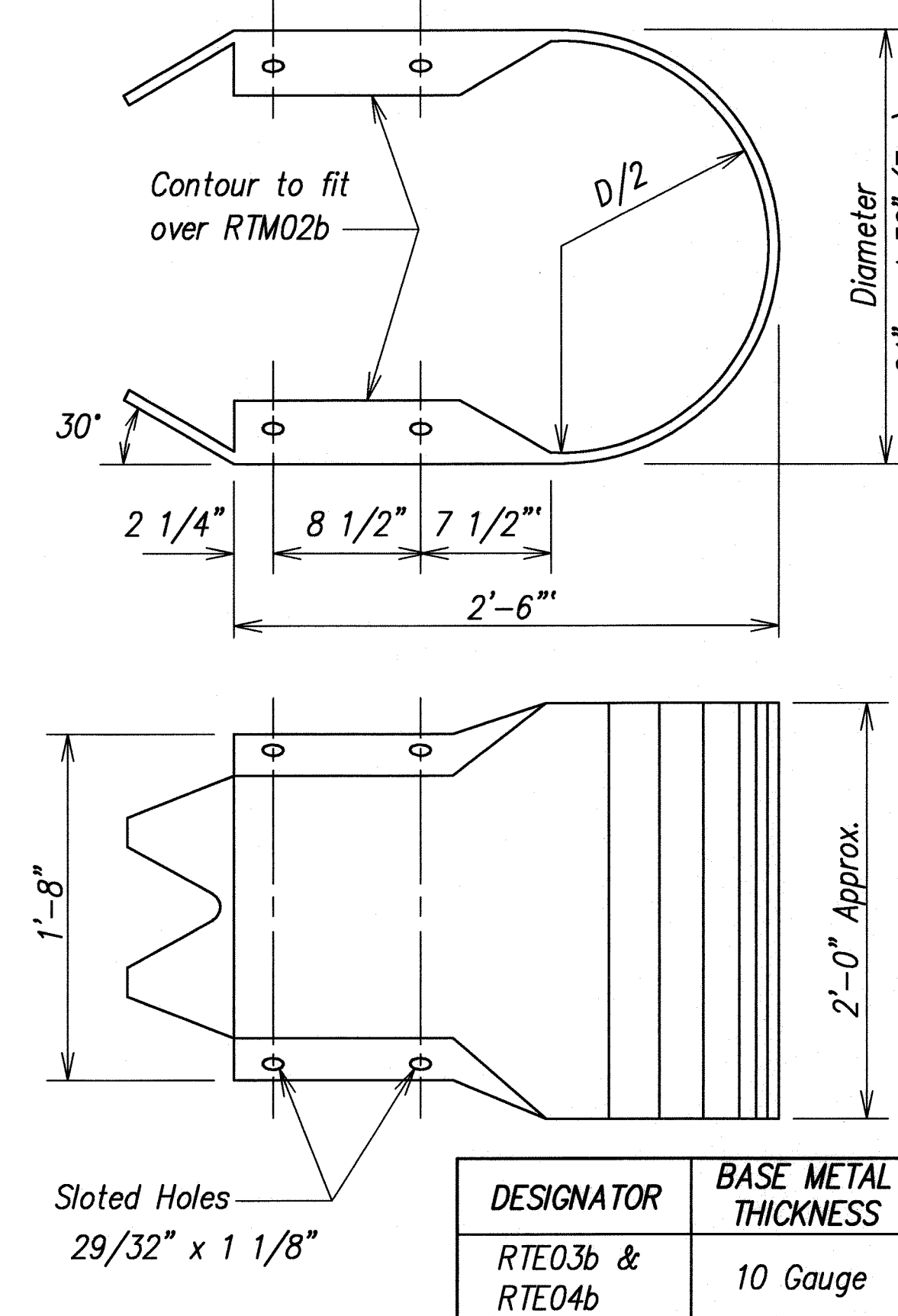
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



W-BEAM END SECTION (BUFFER RWE06a)



W-BEAM END SECTION (ROUNDED RWE03a)



THRIE-BEAM END SECTION (BUFFER RTE03b or RTE04b)

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

GUARDRAIL TERMINAL CONNECTORS

AND END SECTIONS

Kalanianaʻole Highway Improvements

Retaining Wall at Makapuu, Oahu

Federal-Aid Project No. NH-072-1(51)

Scale: As Noted

Date: APR. 2007

SHEET No. 3 OF 5 SHEETS



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8-16-07
Glenn K. Ikeda
Parks, Inc.
dba PARK ENGINEERING
LICENSE EXPIRES 4-30-08

ORIGINAL PLAN	DATE
NO. 1	
NO. 2	
NO. 3	
NO. 4	
NO. 5	
NO. 6	
NO. 7	
NO. 8	
NO. 9	
NO. 10	

LIB2: STATE DOT \KALANIAOLE\RETAINING WALL\CADD\ KALRW-61-GRO3-B03.dwg 4/16/07

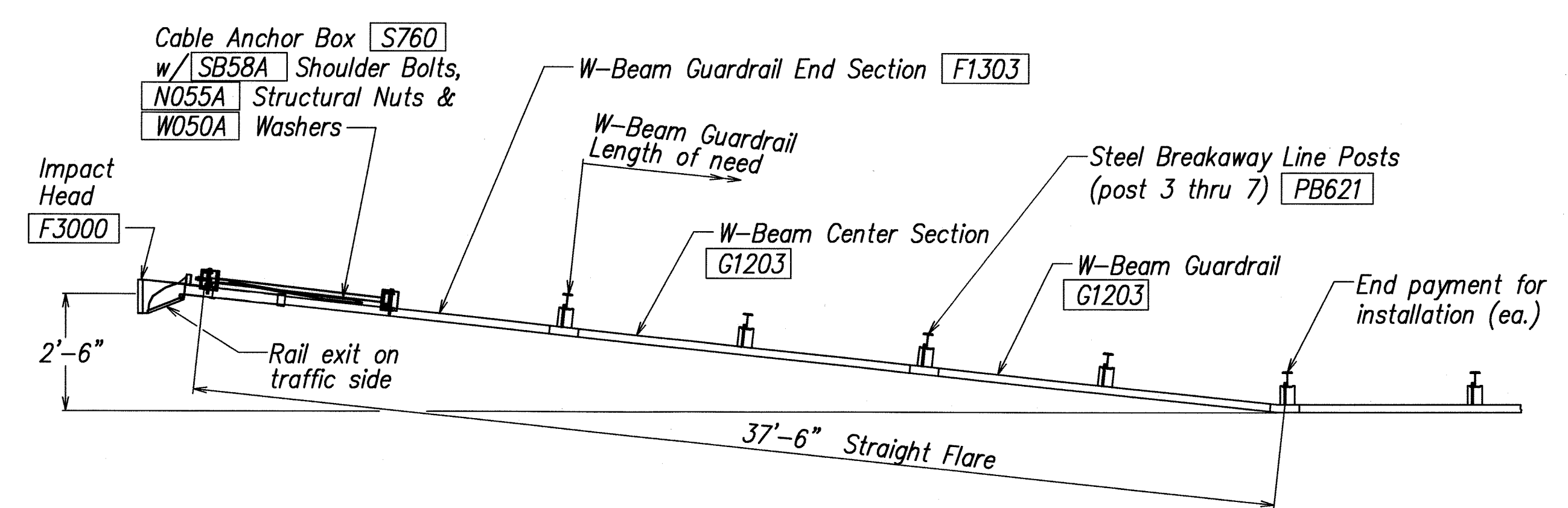
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-072-1(51)	2007	62	106

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 9/16" ID A325 STR. WASHER

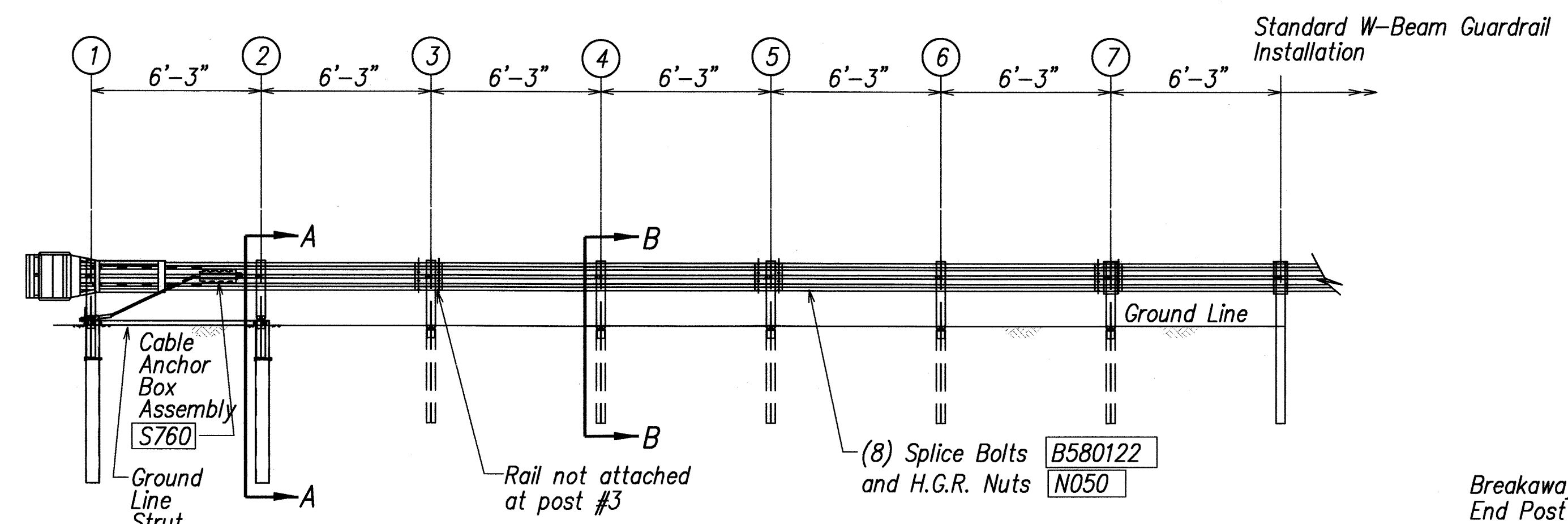
Foundation Tube Options For Posts 1 & 2
 *6'-0" Split Foundation Tubes S730
 *6'-0" Solid Foundation Tubes E731
 *5'-0" Foundation Tubes S735 W/Soil Plates SP600
 *4'-6" Foundation Tubes E735 W/Soil Plates SP600

GENERAL NOTES

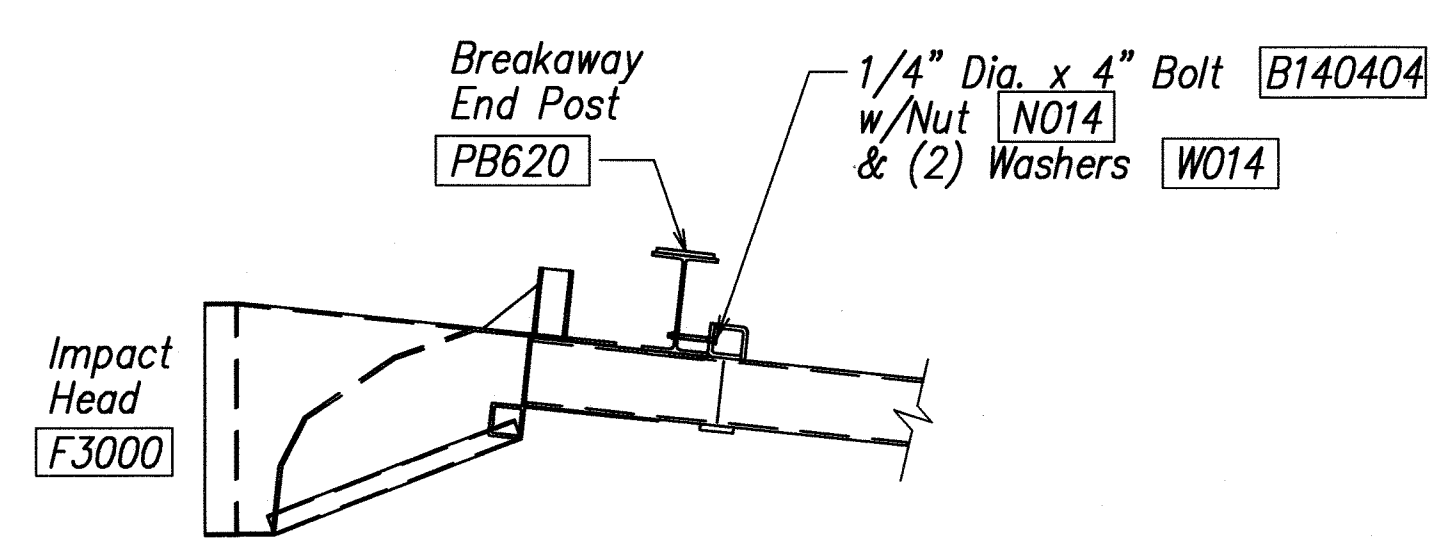
- Breakaway steel posts are required with the FLEAT Terminal.
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The soil tubes shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- 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.



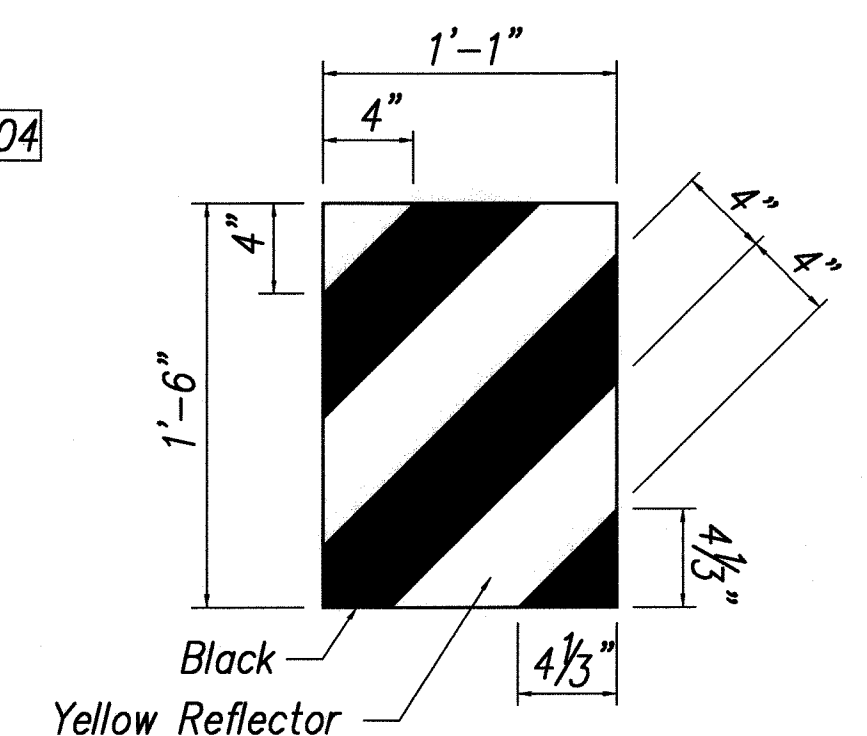
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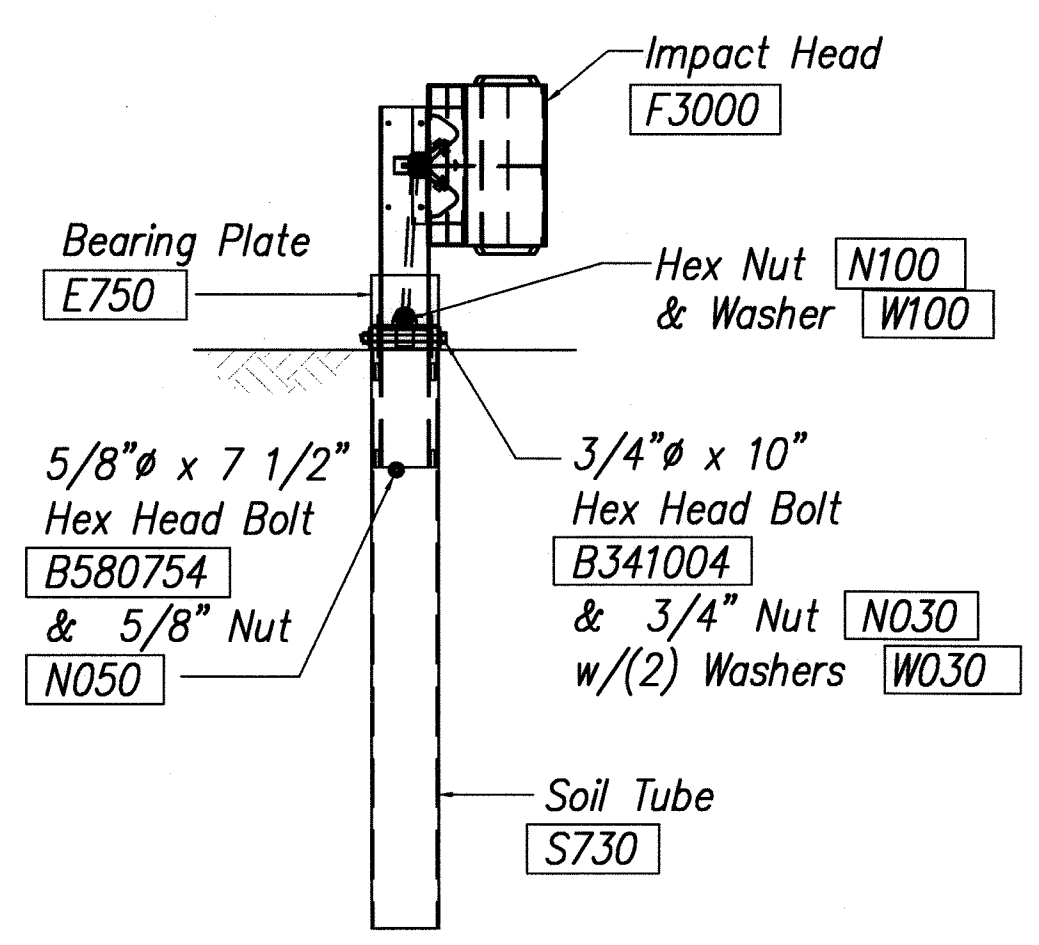
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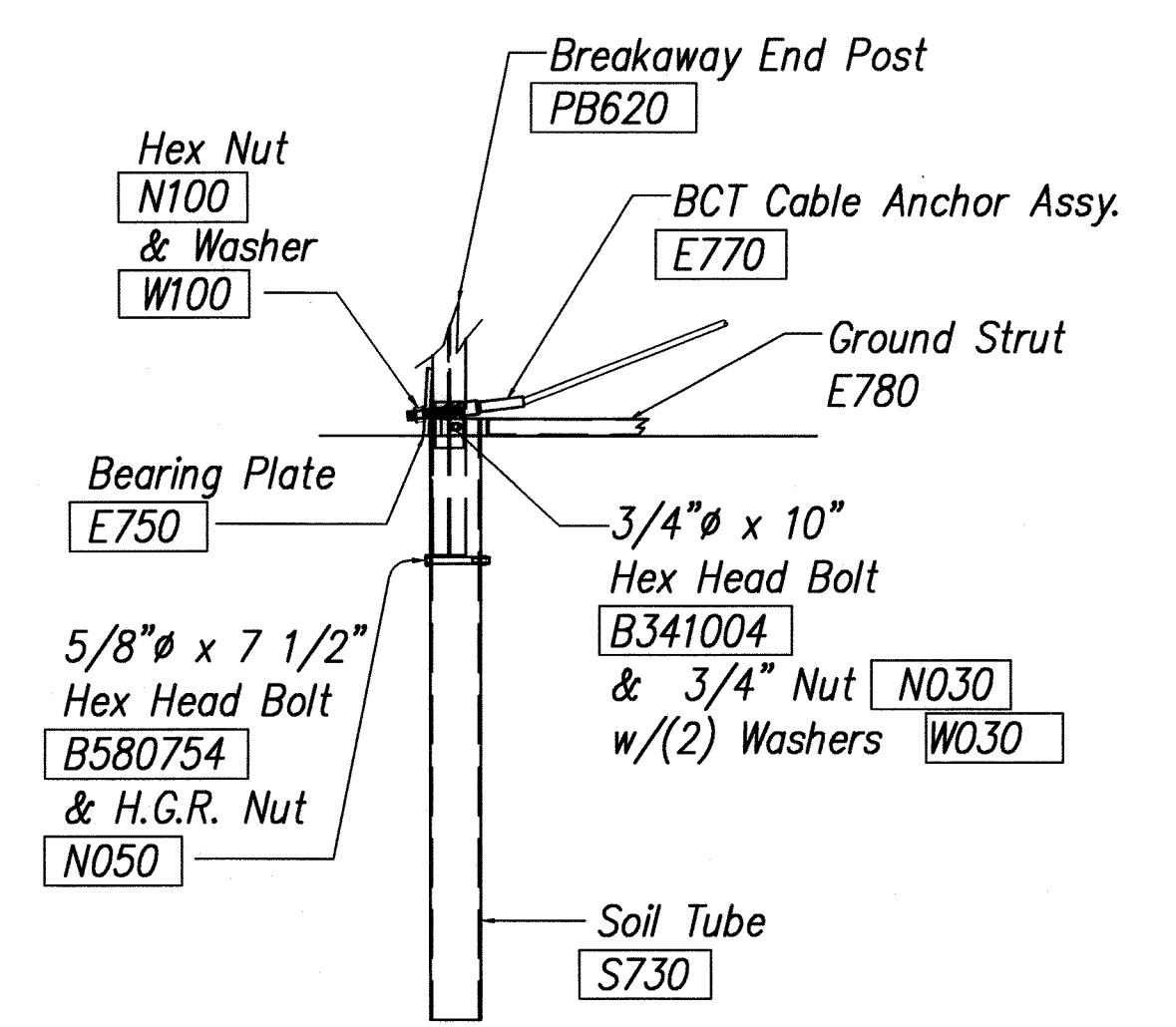
IMPACT HEAD CONNECTING DETAIL



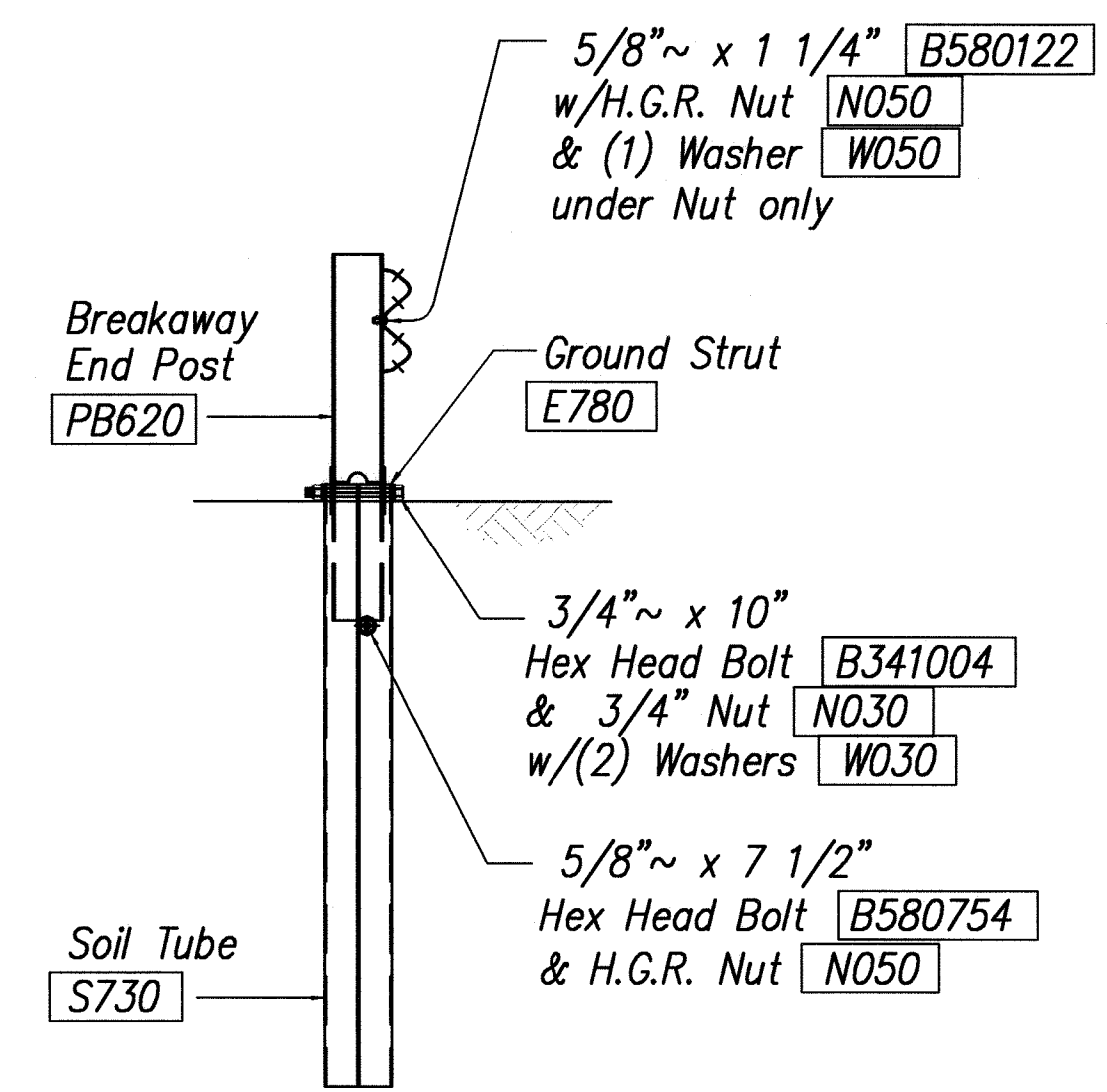
IHRM(R)
IMPACT HEAD REFLECTOR
MARKER INSERT
DETAIL



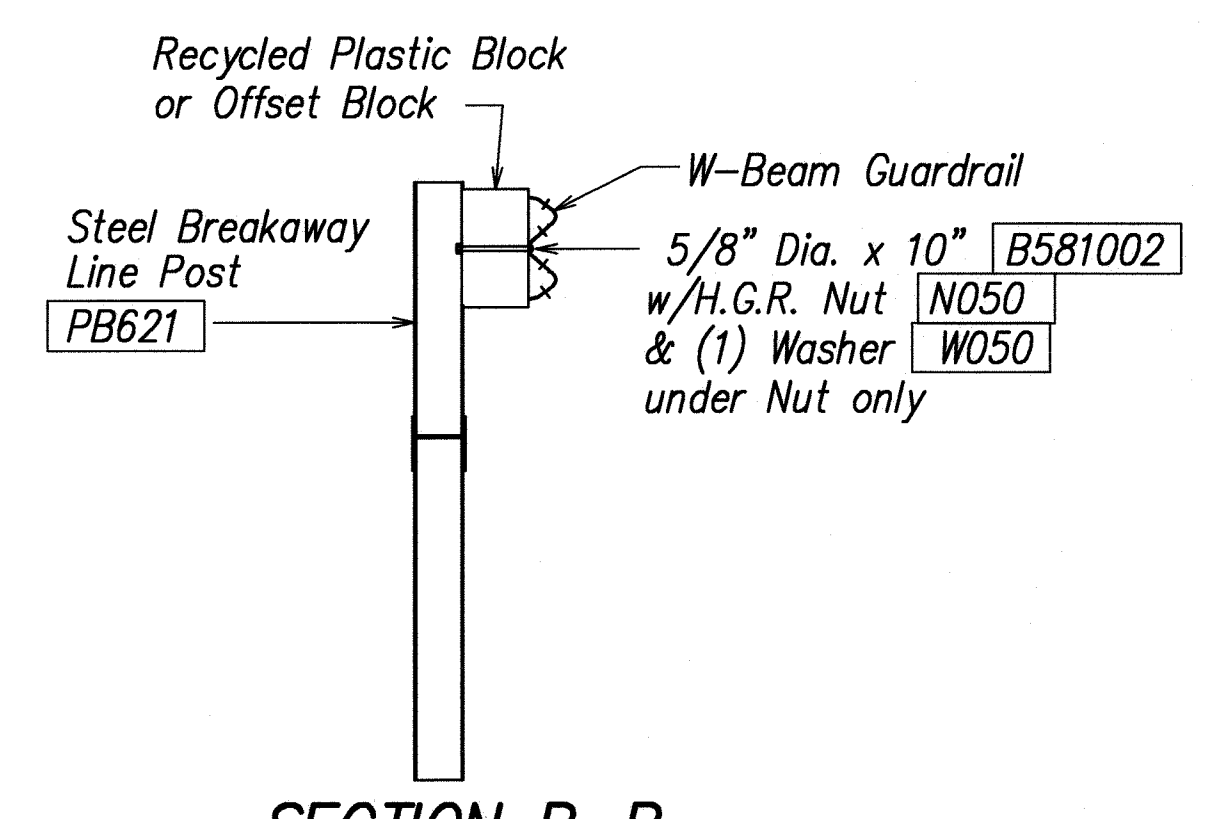
FRONT VIEW OF POST 1



PARTIAL VIEW OF POST 1



SECTION A-A
at Post #2



SECTION B-B
(Typical @ Post 3 - 7)
NOTE: RAIL NOT BOLTED @ POST #3

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION

FLEAT-350
FLARED ENERGY ABSORBING TERMINAL

Kalaniana'ole Highway Improvements
Retaining Wall at Makapuu, Oahu
 Federal-Aid Project No. NH-072-1(51)

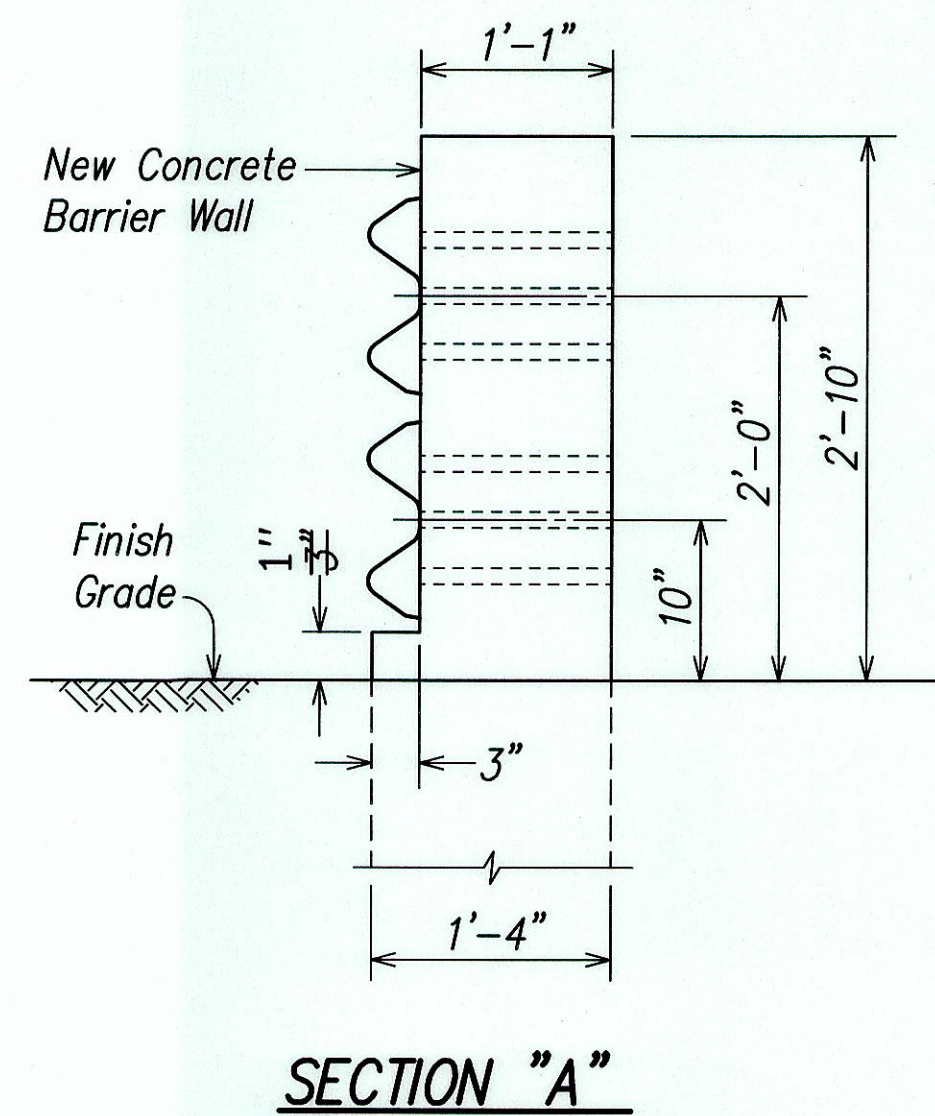
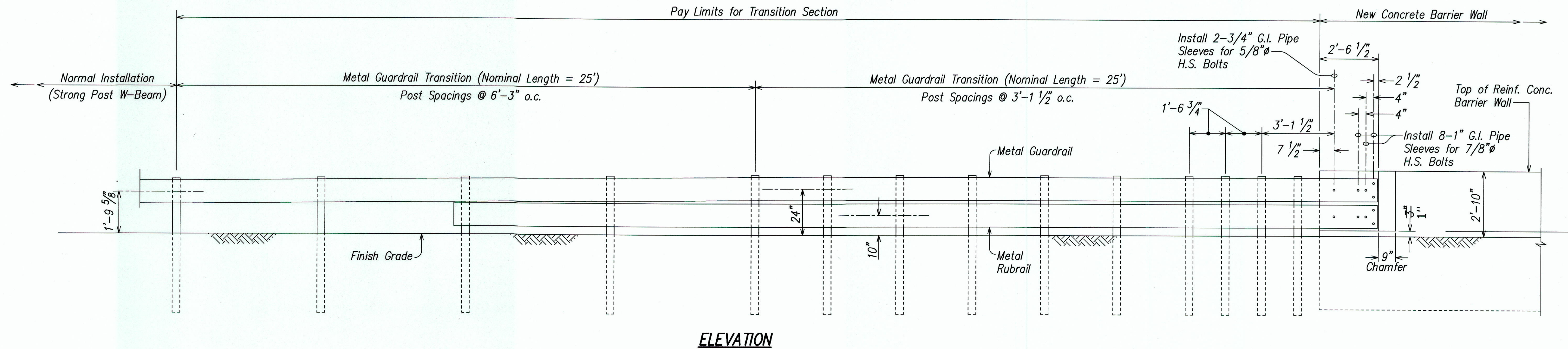
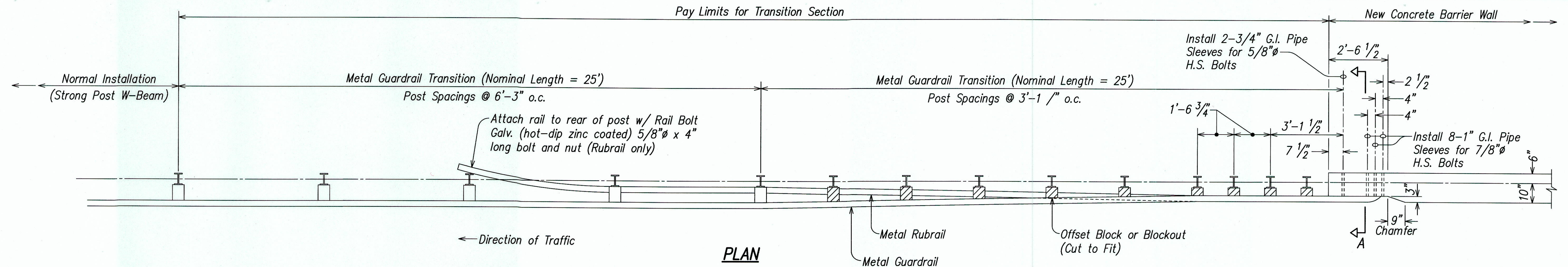
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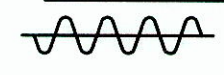
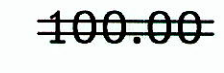
SHEET No. 4 OF 5 SHEETS

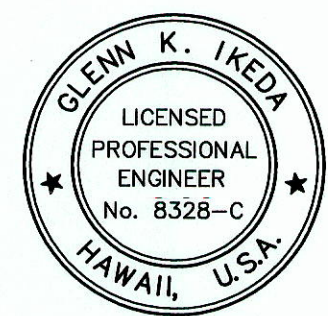
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FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-072-1(51)	2007	63	106



LEGEND FOR AS-BUILT POSTINGS	
	Squiggly line for as-built deletion
	Double line for as-built deletion
Roadway	Text for as-built posting



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Glenn K. Ikeda

PUREN, INC.
dba PARK ENGINEERING
LICENSE EXPIRES 4-30-14

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**TRANSITION SECTION
BARRIER WALL TO TYPE 3 GUARDRAIL**

*Kalaniana'ole Highway Improvements
Retaining Wall at Makapuu, Oahu
Federal-Aid Project No. NH-072-1(51)*

Scale: As Noted Date: APR. 2007

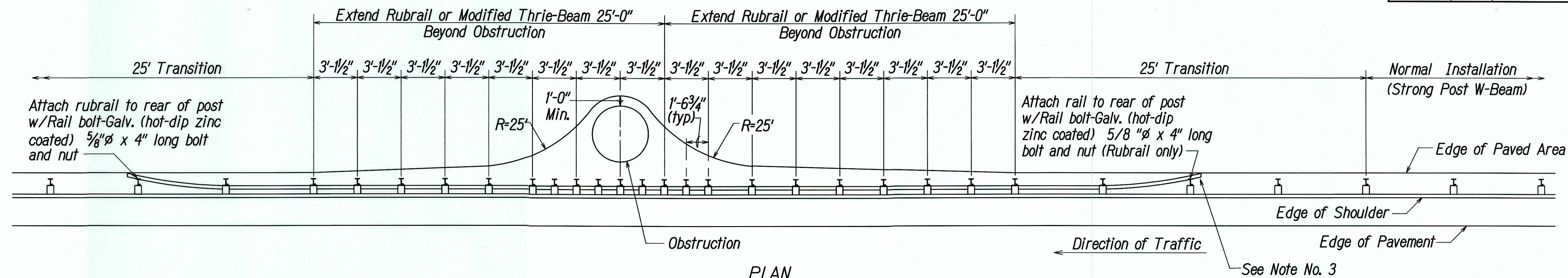
SHEET No. 5 OF 5 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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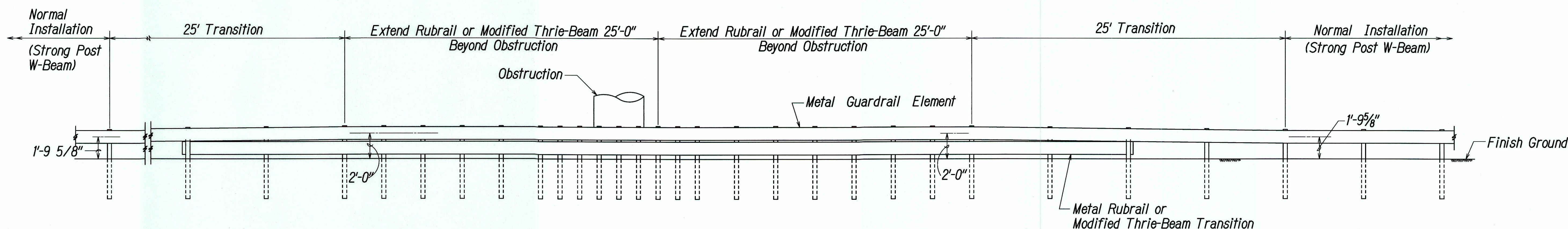
LIB2: STATE\DOT\KALANIA'OLE\RETAINING WALL\CADD\ KALRW-63-ENDCON.dwg 4/16/07

"AS-BUILT"

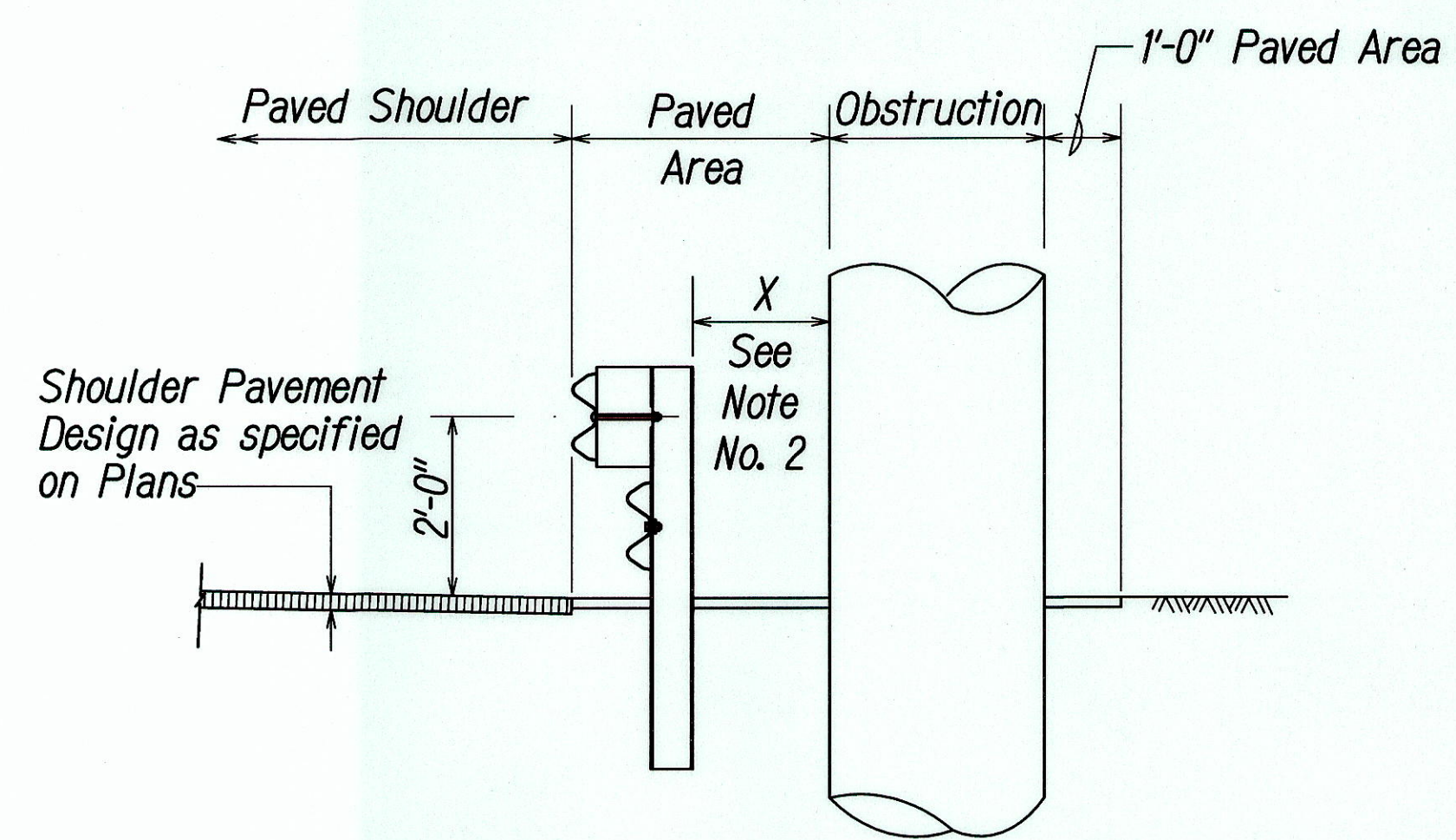
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-072-1(51)	2007	C.O.63 S-1	106



PLAN

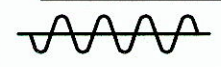


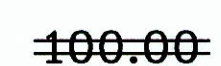
ELEVATION




TYPICAL SECTION AT OBSTRUCTION

LEGEND FOR
AS-BUILT POSTINGS

 Squiggly line for as-built deletion

 Double line for as-built deletion

 Text for as-built posting

- NOTES:
- All Guardrail and Concrete Barrier Designs at Obstructions shall be approved by the Engineer.
 - If $X < 2'-0"$, Concrete Barrier or special guardrail design;
 $2'-0" \leq X < 3'-0"$, Strong Post Rubrail or Strong Post Thrie-Beam with reduced post spacing;
 $3'-0" \leq X$, Strong Post W-Beam with 6'-3" post spacing (Normal Installation).
 - If a pedestrian walkway or bicycle route is located behind the guardrail, the Engineer should install the Modified Thrie-Beam System. The Rubrail termini may become a hazard to pedestrians & bicyclists.

2/08/13

New Sheet for As-Built Changes.

DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TRANSITION SECTION

Kalaniana'ole Highway Improvements
Retaining Wall at Makapuu, Oahu
Federal-Aid Project No. NH-072-1(51)

Scale: As Noted

Date: APR. 2007

SHEET No. 5A OF 5 SHEETS

GLENN K. IKEDA

LICENSED PROFESSIONAL ENGINEER

No. 8328-C

HAWAII, U.S.A.

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John K. Ikeda

ParEn, Inc.

480 PARK ENGINEERING

LICENSE EXPIRES 4-30-14

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LIB2: STATE\DOT\KALANIAOLE RETAINING WALL\CAED\ KALEW-63-ENDDOWN.dwg 4/16/07