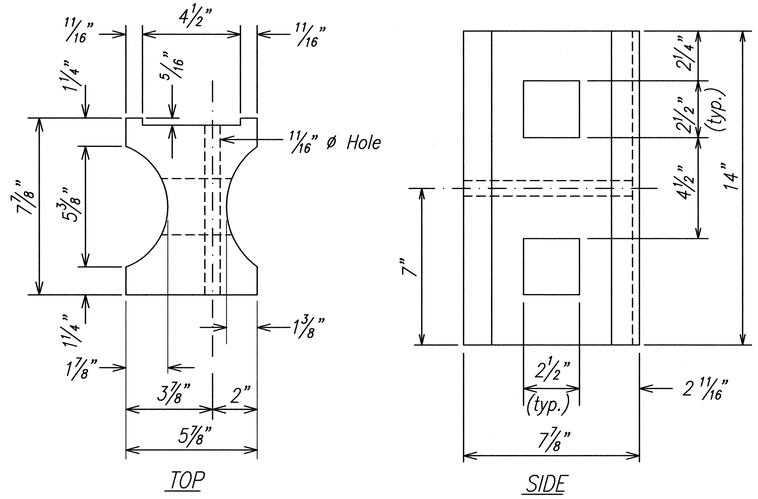
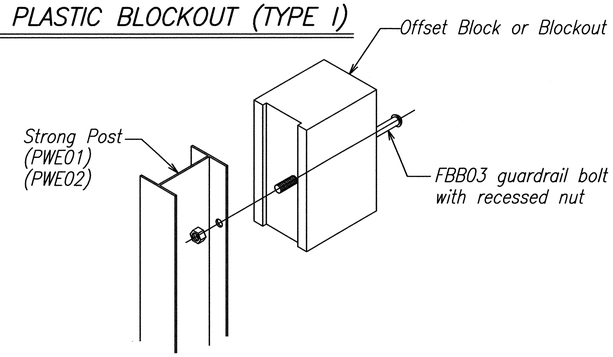
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	215	288

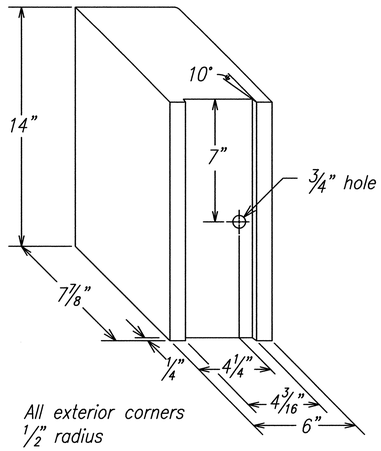


RECYCLED PLASTIC BLOCKOUT (TYPE I)

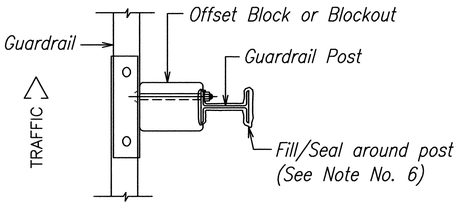


Exploded View
(Rail and washer not shown)

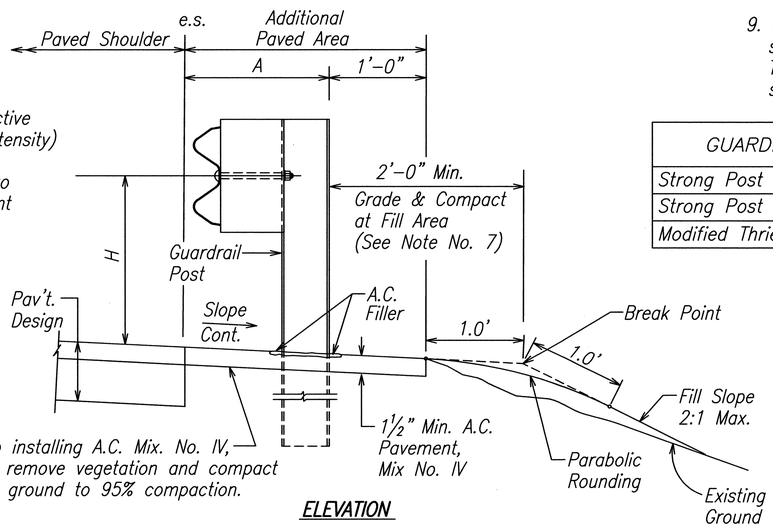
STEEL POST AND BLOCK DETAIL



RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)

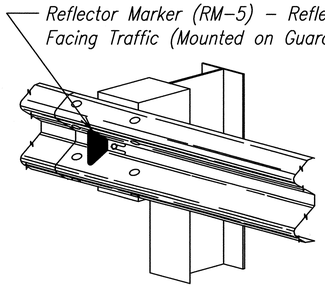


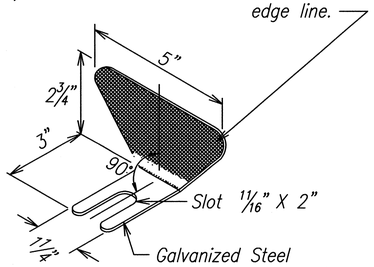
PLAN



ELEVATION

TYPICAL GUARDRAIL INSTALLATION





REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

GENERAL NOTES:

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

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

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

j:\94-56 f\ Ph2-GUARDRAIL.dwg (ESH-1) 1=1 06/07/05 AMR B-1 r12/31/03 td1.ruby/guardrail/te50rev.dgn (standard plan TE-50 09/01/00)

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

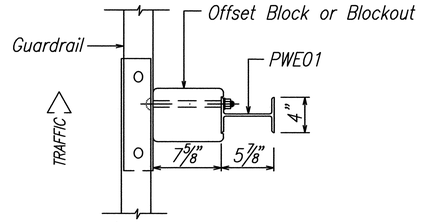
GUARDRAIL DETAILS & NOTES

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

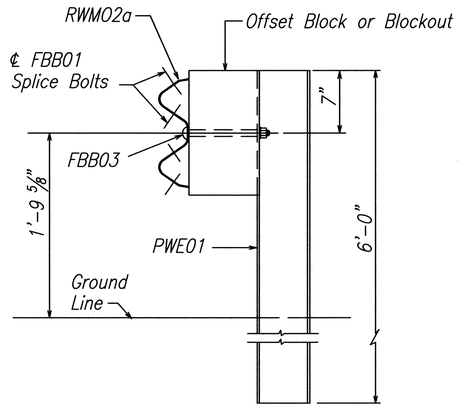
SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 1 OF 14 SHEETS

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	216	288

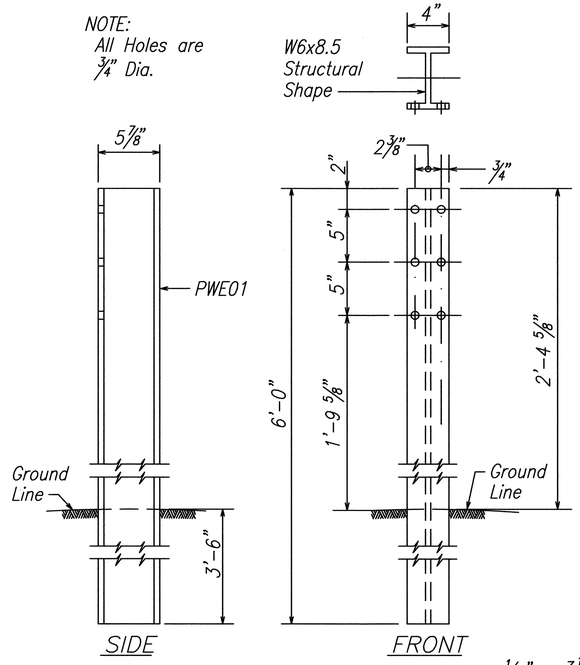


PLAN



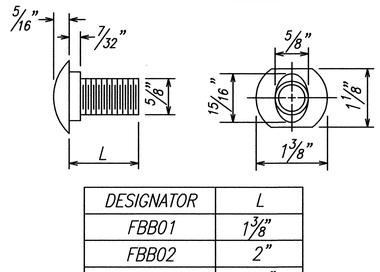
ELEVATION

STRONG POST W-BEAM GUARDRAIL (SGR04a)

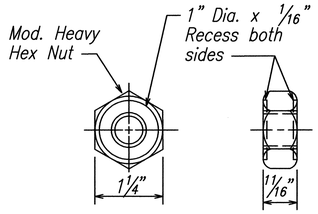


SIDE FRONT

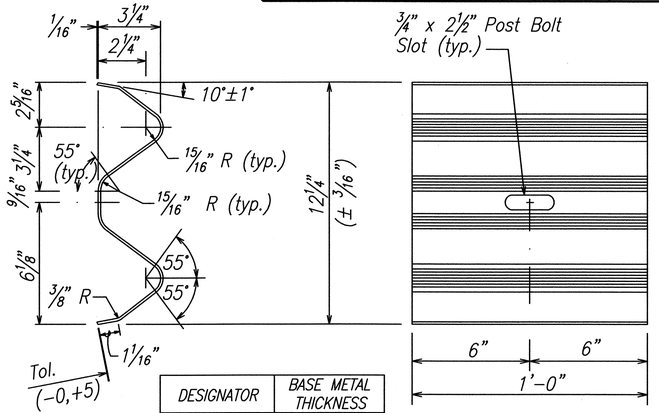
W-BEAM STRONG POST (PWE01)



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

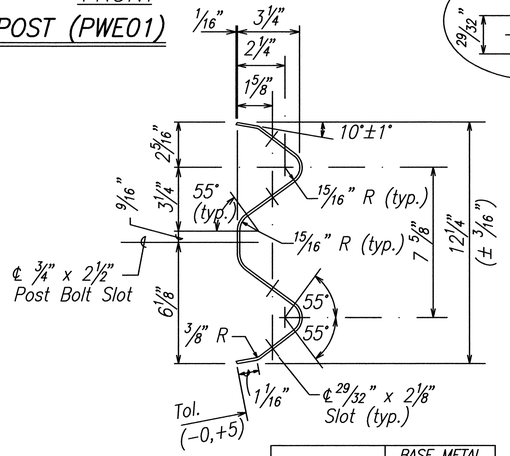


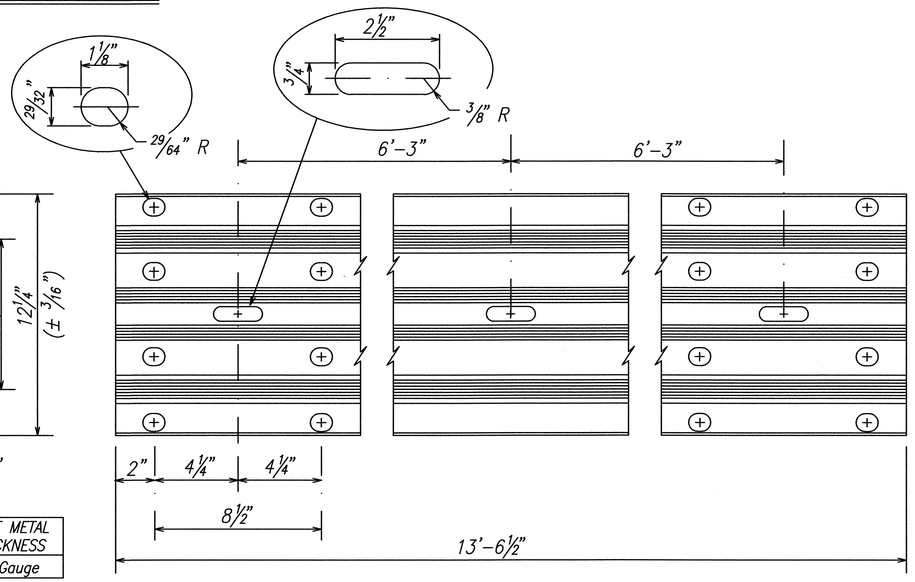
GUARDRAIL BOLTS AND RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 gauge

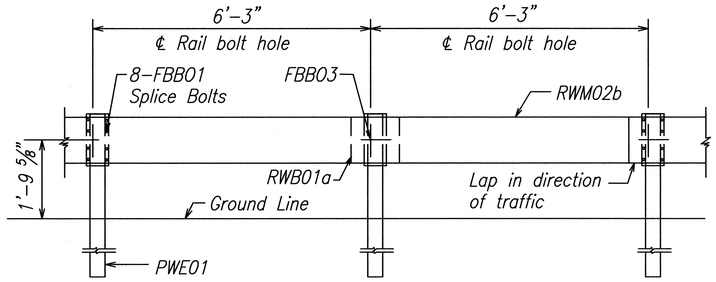
W-BEAM BACK-UP-PLATE (RWB01a)





DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

2 SPACE W-BEAM GUARDRAIL (RWM02a)



ELEVATION

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

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

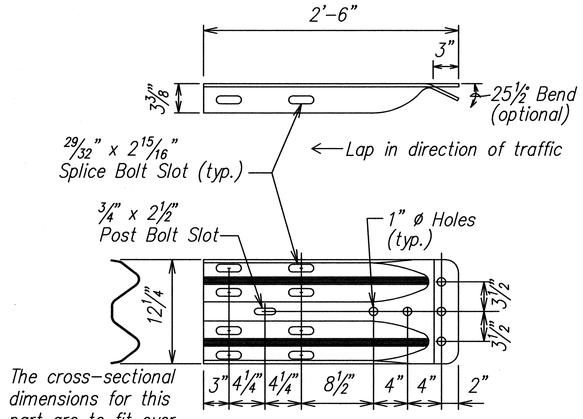
SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 2 OF 14 SHEETS

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

j: 94-56 f: Ph2-WBEAMSP.dwg (ESH-1) 1=1 06/07/05 AMR B-2 r3/24/03 td1.ruby/guardrail/wbeamsp.dgn (standard plan TE-50 r03/06/87)

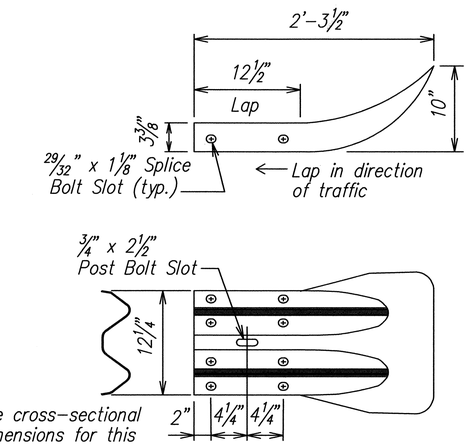
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	217	288



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

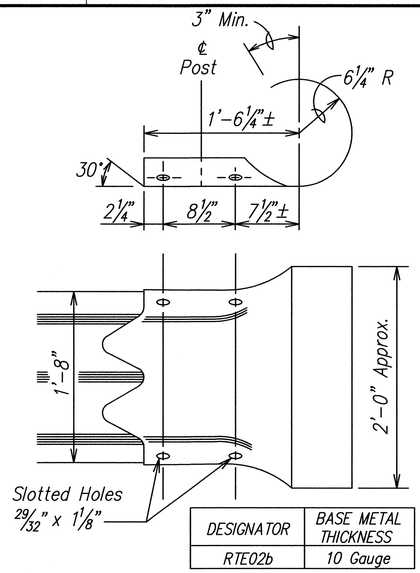
W-BEAM TERMINAL CONNECTOR (RWE02b)



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.

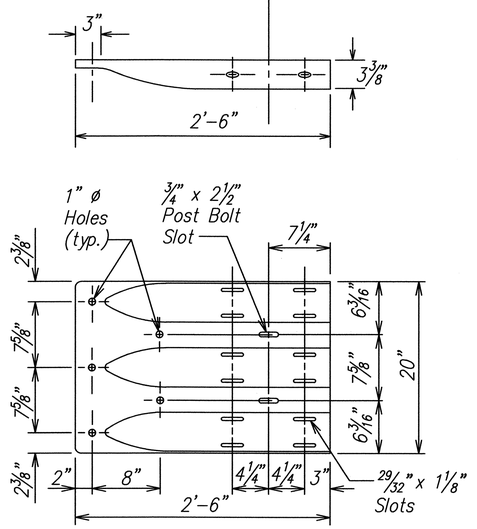
DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 Gauge

W-BEAM END SECTION (FLARED RWE01a)



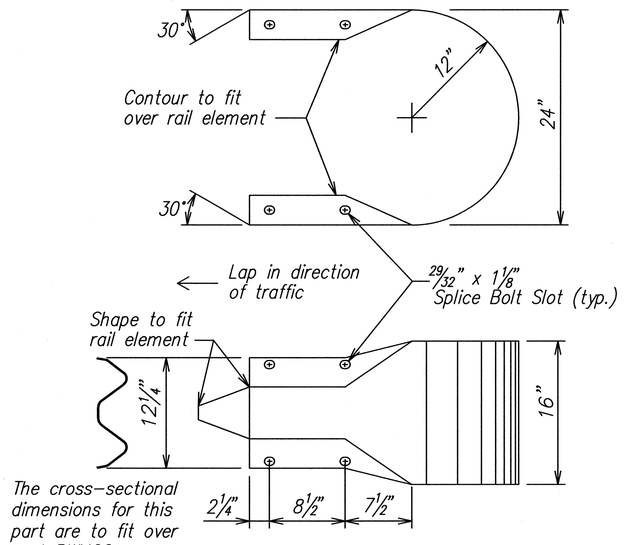
DESIGNATOR	BASE METAL THICKNESS
RTE02b	10 Gauge

THRIE-BEAM SECTION (ROUNDED) (RTE02b)



DESIGNATOR	BASE METAL THICKNESS
RTE01b	10 Gauge

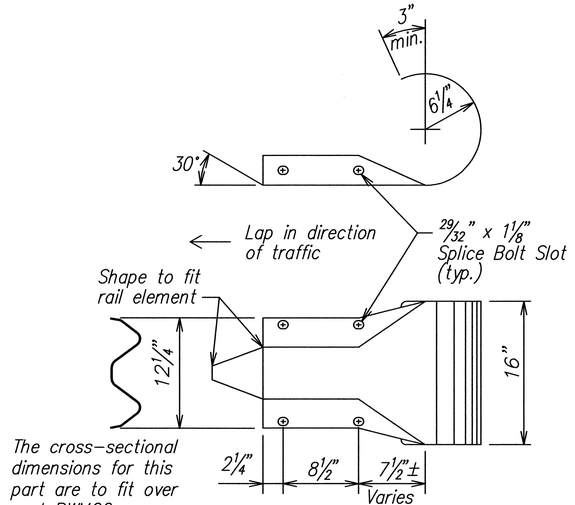
THRIE-BEAM TERMINAL CONNECTOR (RTE01b)



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

DESIGNATOR	BASE METAL THICKNESS
RWE06a	12 Gauge

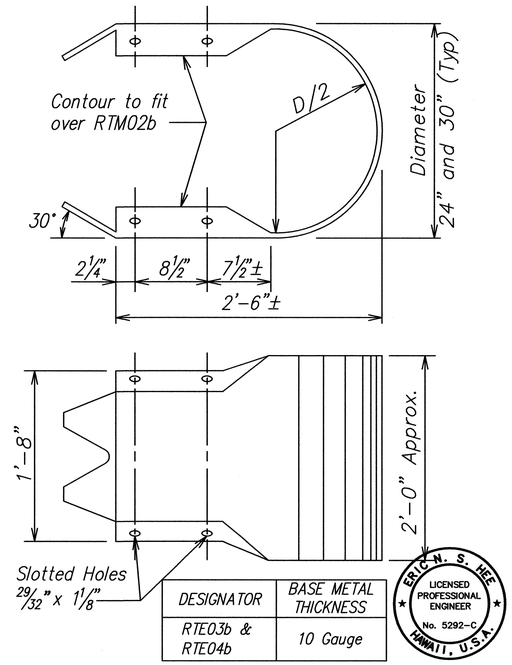
W-BEAM END SECTION (BUFFER RWE06a)



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)

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THRIE-BEAM TERMINAL CONNECTOR (RTE01b)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

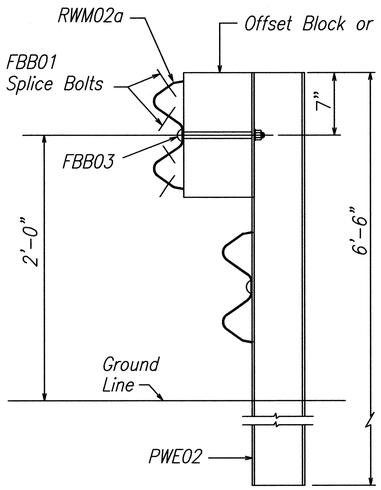
SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 3 OF 14 SHEETS

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

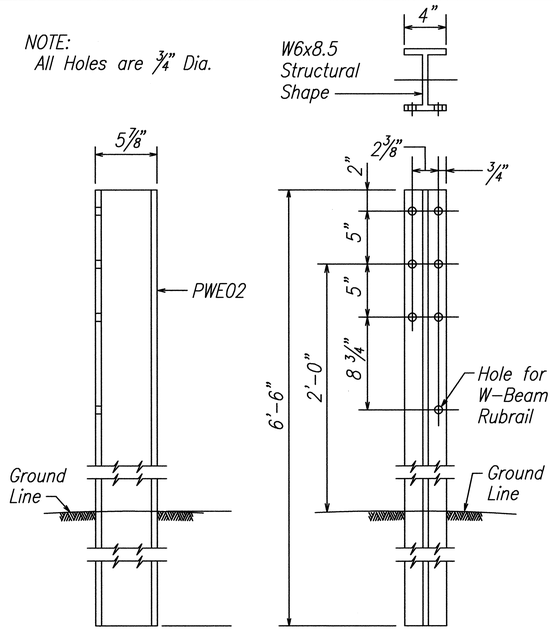
j: 04-56 f:\ph2-wbeamsp-1.dwg (ESH-1) 1=1 06/07/05 AMR B-3 r6/21/01 td1.ruby/guardrail/te51rev.dgn (standard plan TE-51 r09/01/87)

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	218	288



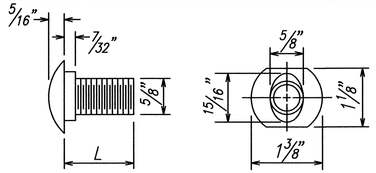
ELEVATION

STRONG POST RUBRAIL (W-BEAM) GUARDRAIL

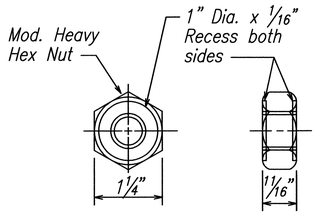


SIDE FRONT

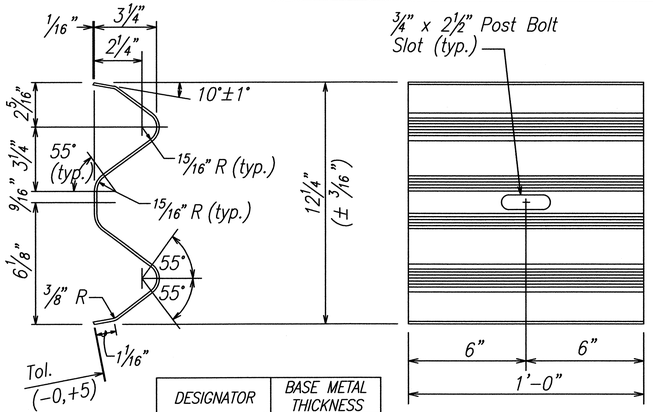
W-BEAM STRONG POST (PWE02)



DESIGNATOR	L
FBB01	1⅜"
FBB02	2"
FBB03	10"

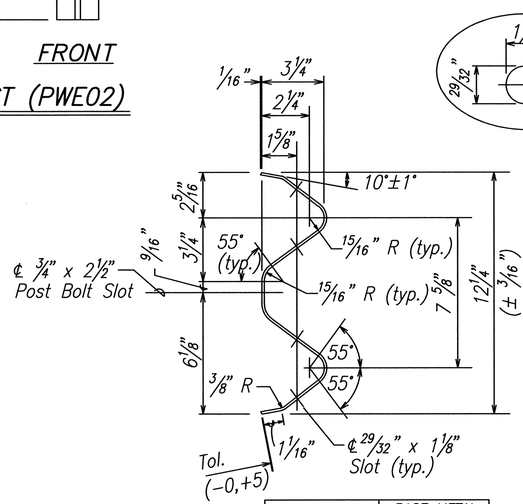


GUARDRAIL BOLTS AND RECESSED NUT

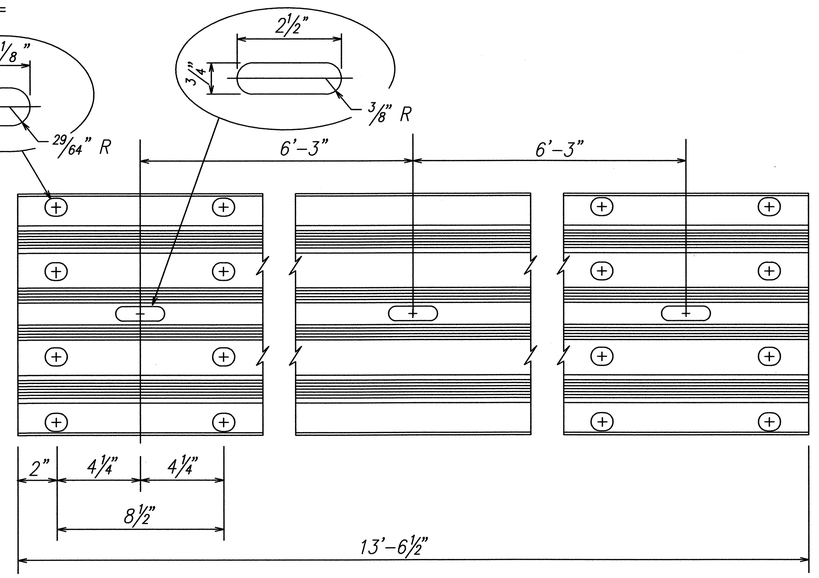


DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Gauge

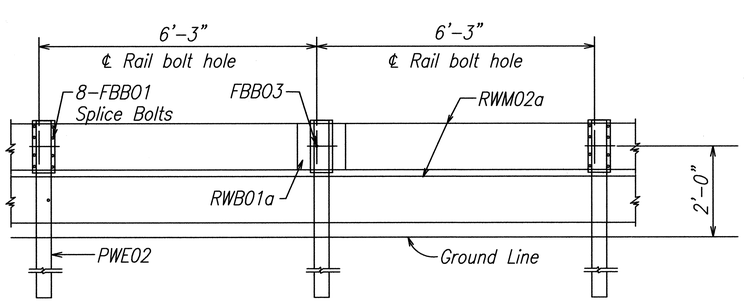
W-BEAM BACK-UP-PLATE (RWB01a)



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

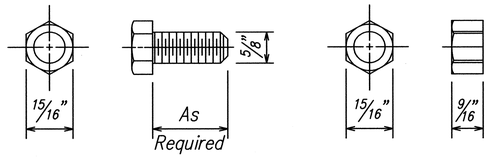


2 SPACE W-BEAM GUARDRAIL (RWM02a)



ELEVATION

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



HEX BOLT & NUT (FBX16a)

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST RUBRAIL (W-BEAM) GUARDRAIL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

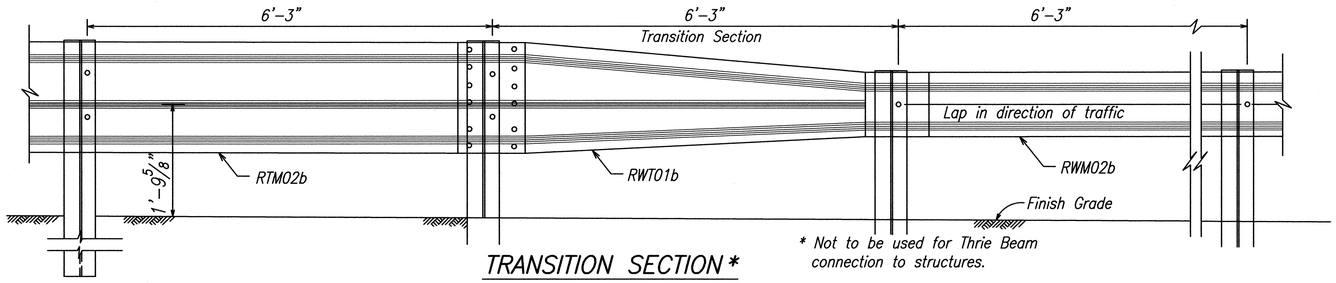
SHEET No. 4 OF 14 SHEETS

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

j: 94-56 f: RUBRAIL.dwg (ESH-1) 1=1 05/07/05 AMR B-4 r3/24/03 td1:ruby/guardrail/rubrail.dgn (standard plan TE-52 r11/03/89)

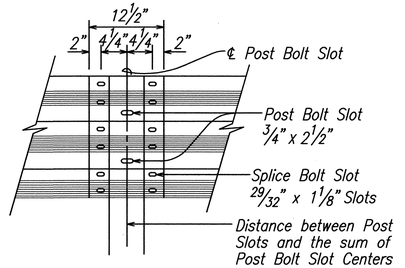
218

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	219	288



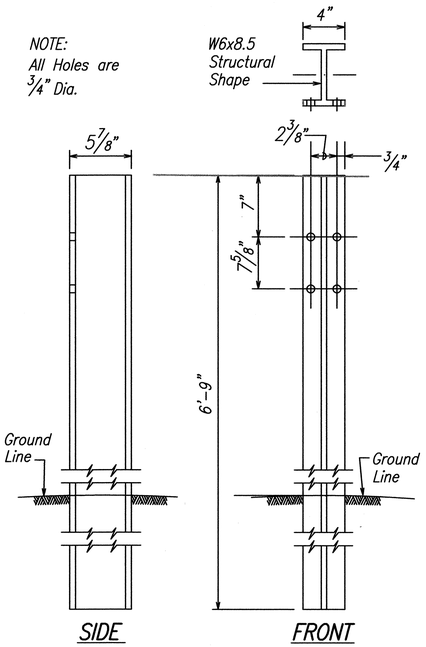
TRANSITION SECTION *

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



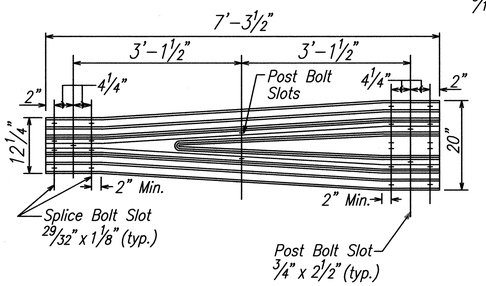
RAIL SPLICE

NOTE:
All Holes are 3/4" Dia.

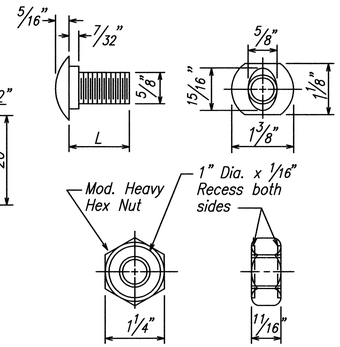


SIDE FRONT

THRIE-BEAM STRONG POST FOR PLASTIC SPACER BLOCKS

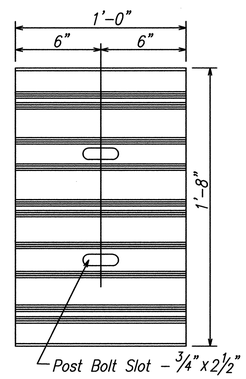


TRANSITION SECTION (RWT01b)



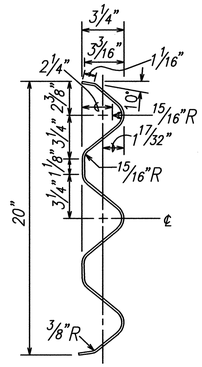
DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"

GUARDRAIL BOLTS AND RECESSED NUT

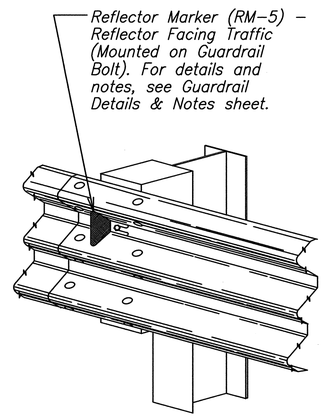


BACKUP PLATE (RTB01b)

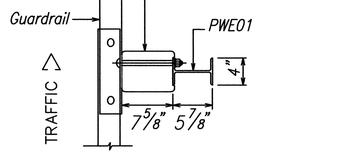
(Use at Posts where Splices do not occur)



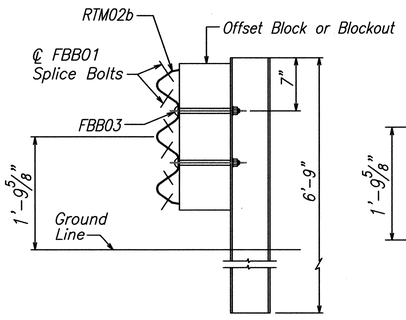
SECTION THRU RAIL ELEMENT (RTM02b)



TYPICAL INSTALLATION OF REFLECTOR MARKER (RM-5)

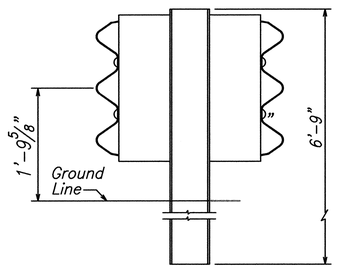


PLAN



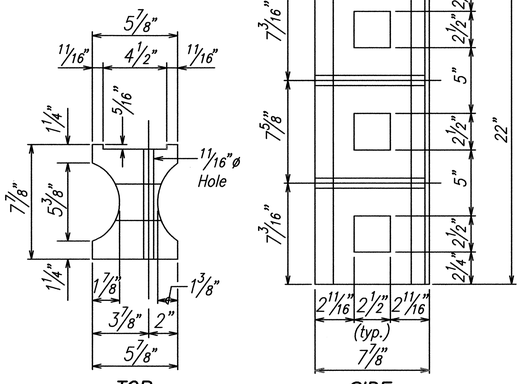
ELEVATION

STRONG POST THRIE-BEAM GUARDRAIL (SGR09a)



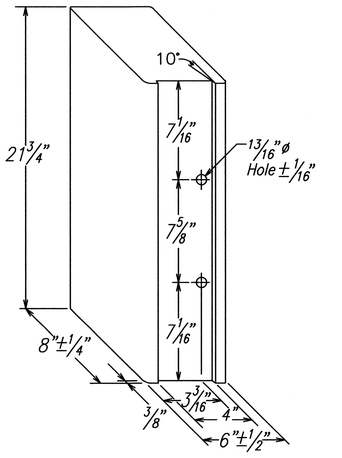
ELEVATION

STRONG POST THRIE-BEAM MEDIAN GUARDRAIL (SGM09a)



TOP SIDE

MODIFIED 6X8X22 PLASTIC BLOCKOUT (TYPE I-THRIE)



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

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST MODIFIED THRIE-BEAM GUARDRAIL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

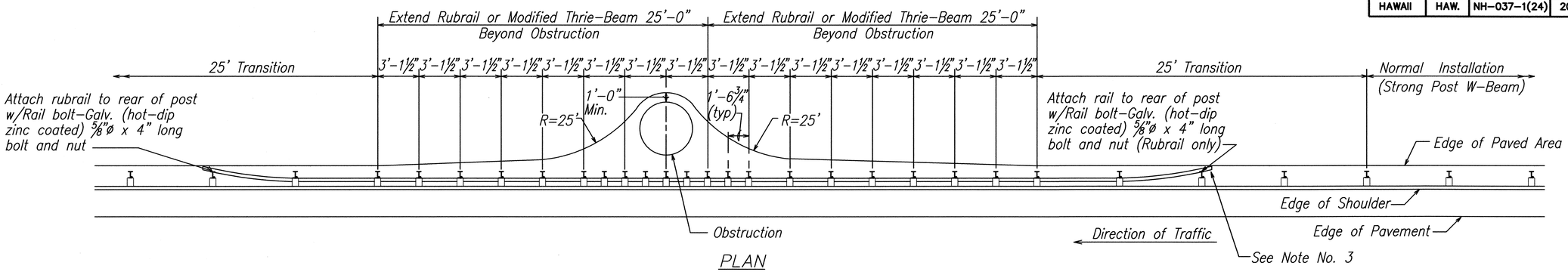
SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 5 OF 14 SHEETS

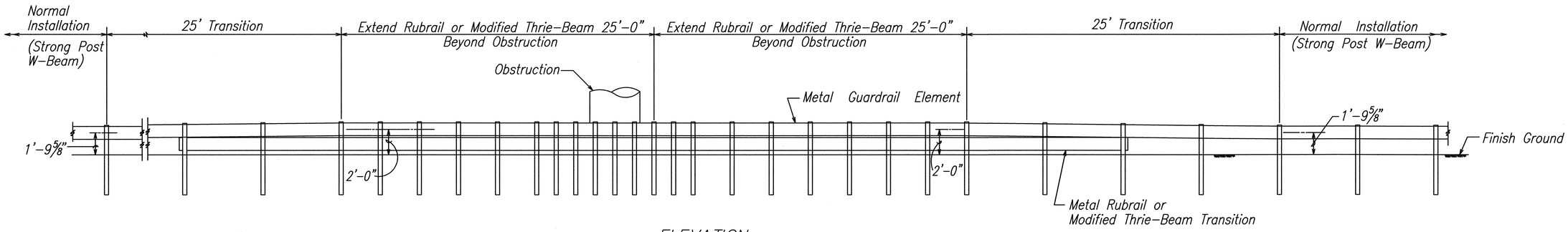
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
No.	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	

j: 94-56 f:\MODTHRIE.dwg (ESH-1) 1=1 06/07/2005 AMR B-5 r9/17/01 td1:ruby/guardrail/thriebeam.dgn (standard plan TE-57 r11/03/89 & TE-57a r11/03/89)

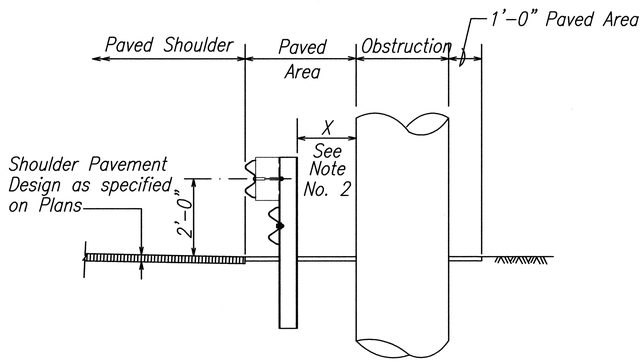
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	220	288



PLAN



ELEVATION



TYPICAL SECTION AT OBSTRUCTION

NOTES:

1. All Guardrail and Concrete Barrier Designs at Obstructions shall be approved by the Engineer.
2. 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)
3. 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.

DETAIL OF GUARDRAIL INSTALLATION AT OBSTRUCTION

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

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ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS (AT OBSTRUCTION)

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

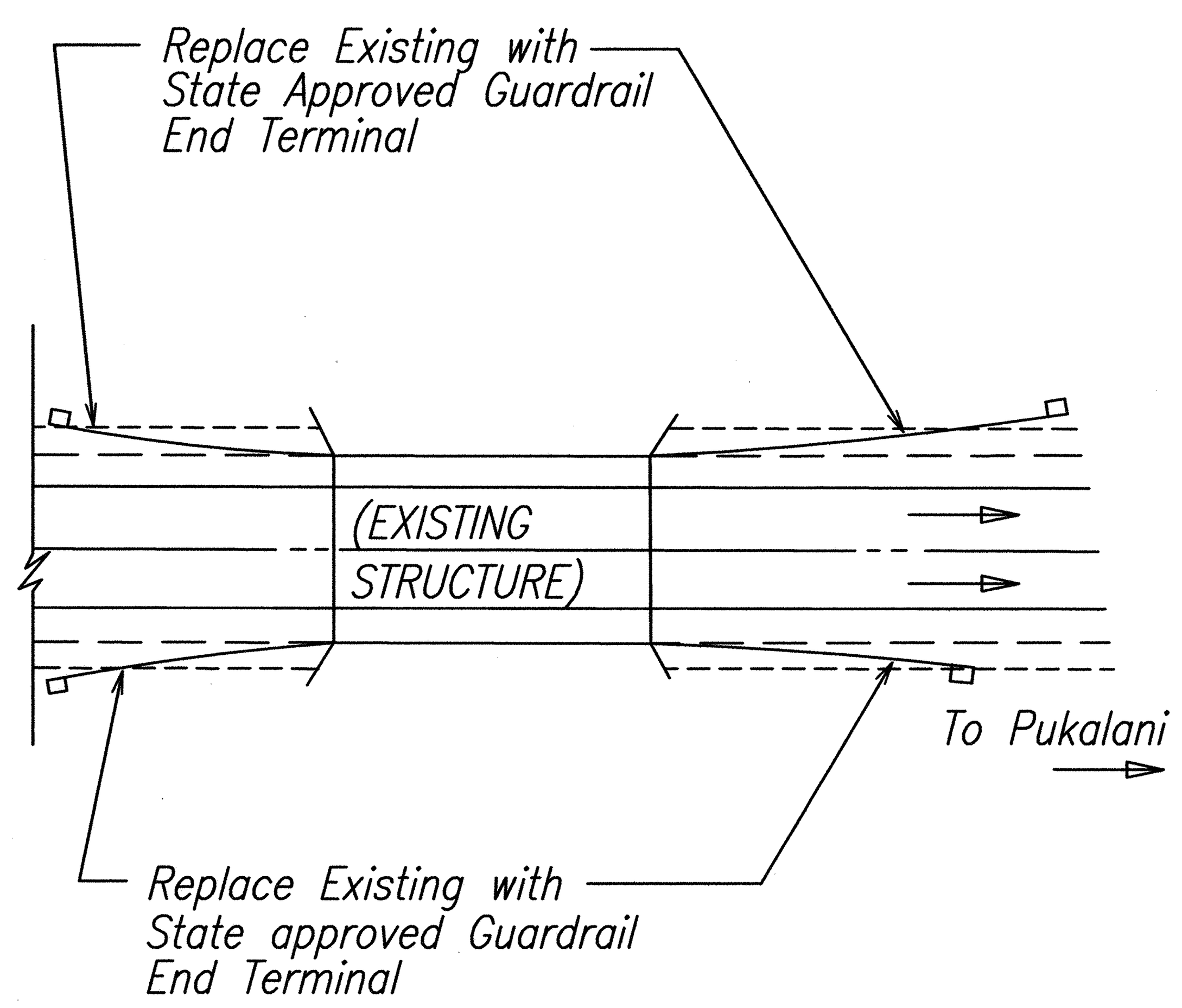
SHEET No. 6 OF 14 SHEETS

220

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

j: 94-56 f: TE54REV.dwg (ESH-1) 1=1 06/07/05 AMR B-6 r8/21/01 td1.ruby/guardrail/te54rev.dgn (standard plan TE-53 r09/01/87 & TE-54 r11/03/89)

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	221	288



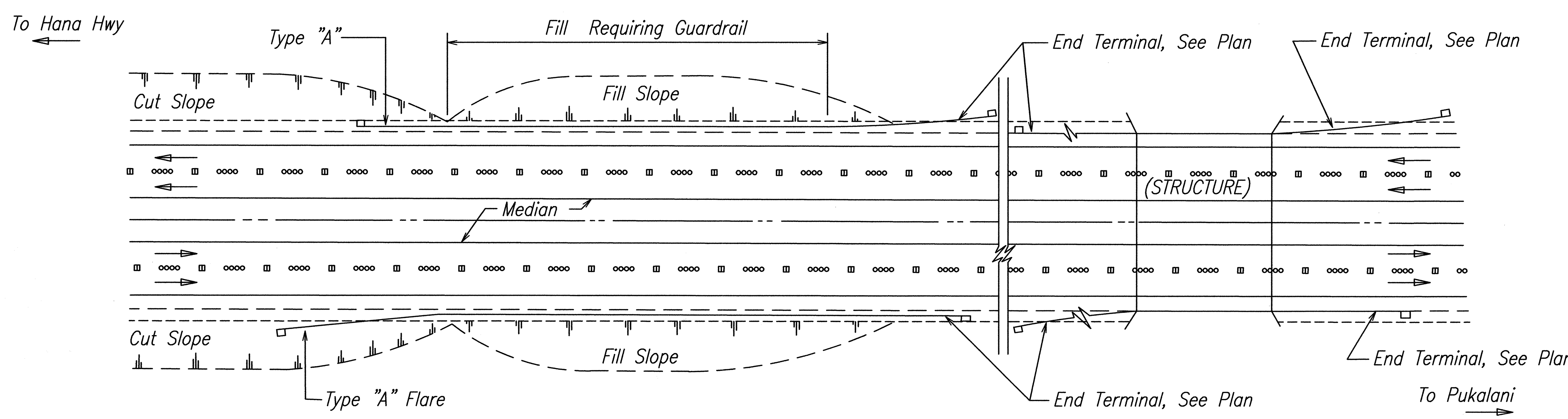
PLAN – HALEAKALA HIGHWAY

ONE WAY ROADWAY

NOTES:

1. Metal Guardrail connection to concrete structures requires End Post Connection. See Structure Plans.

2. Refer to State's most current approved Product List for NCHRP 350 approved Guardrail End Terminals.



PLAN – HALEAKALA HIGHWAY

ONE WAY ROADWAY (DIVIDED HIGHWAY)

ERIC N. S. HEE LICENSED PROFESSIONAL ENGINEER No. 5292-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS

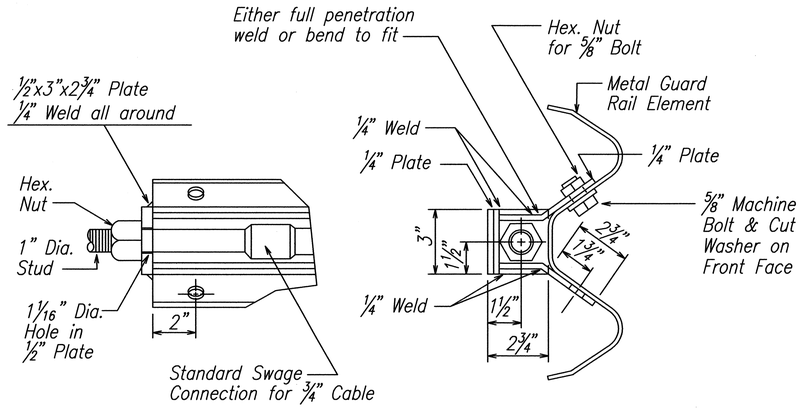
HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

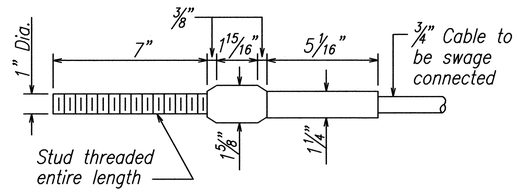
SHEET No. 7 OF 14 SHEETS

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

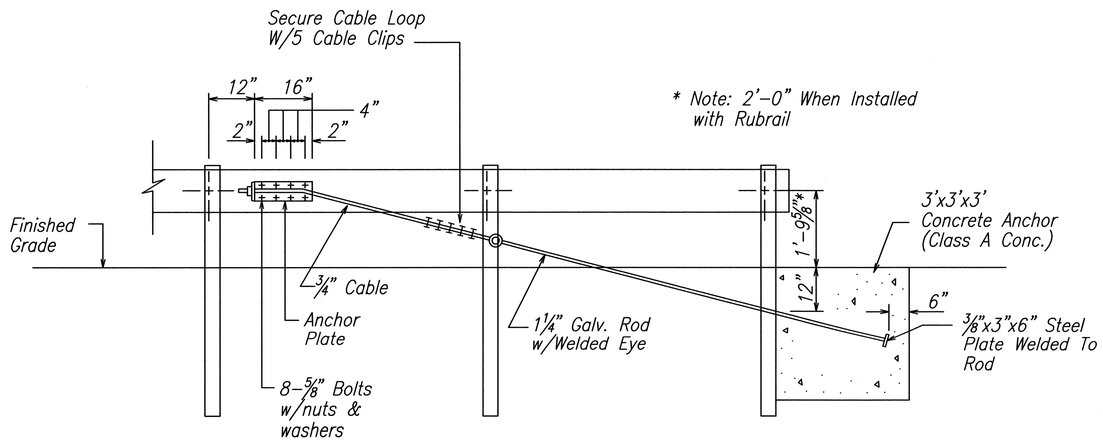
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	222	288



ANCHOR PLATE DETAILS

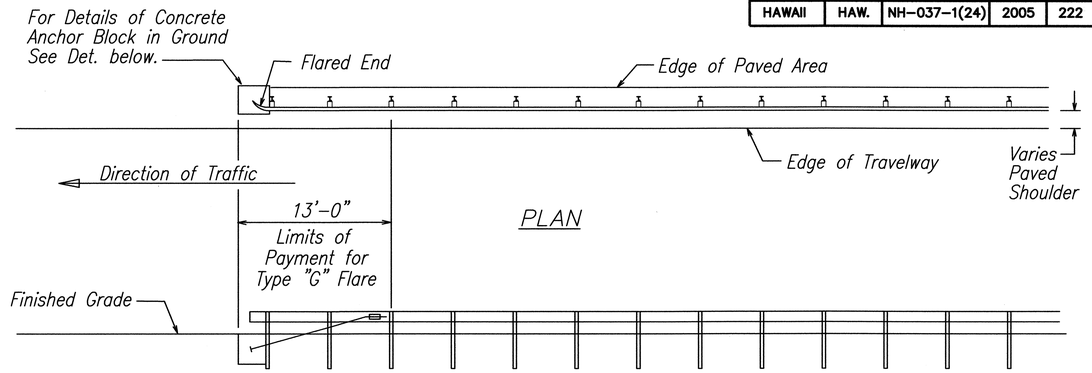


STANDARD SWAGED FITTING AND STUD



ANCHOR BLOCK DETAIL

1. Concrete, G.R.P., excavation, anchor rod and miscellaneous appurtenances necessary to anchor the guardrail ends shall be incidental to metal guardrail.



ELEVATION

TYPE "G" FLARE END TERMINAL

NOTE:

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

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

The radius of the radial termini is an Engineer's judgement based on the site evaluation. The Engineer shall consider safety (minimize the spearing & blunt end situation); degree and potential seriousness of the hazard; bicycle and pedestrian accessibility; maintenance equipment accessibility; Right-of-Way availability; the smallest radii the metal w-beam/thrie-beam railing can be constructed (check with supplier/contractor); posted speed limit; angle of vehicle impact; and aesthetics when designing the Type "G" Modified End Terminal.

During construction, the Contractor shall layout the proposed Type "G" Modified End Terminal and receive approval from the Construction Engineer prior to installation.

ORIGINAL PLAN | NOTE BOOK No. ____

SURVEY PLOTTED BY ____ DATE
DRAWN BY ____
TRACED BY ____
DESIGNED BY ____
QUANTITIES BY ____
CHECKED BY ____

j: 94-56 f: TE59REV.dwg (ESH-1) 1=1 07/14/05 AMR B-8 r3/13/02 td1.ruby/guardrail/1e59rev.dgn (standard plan TE-59 r11/03/89)

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

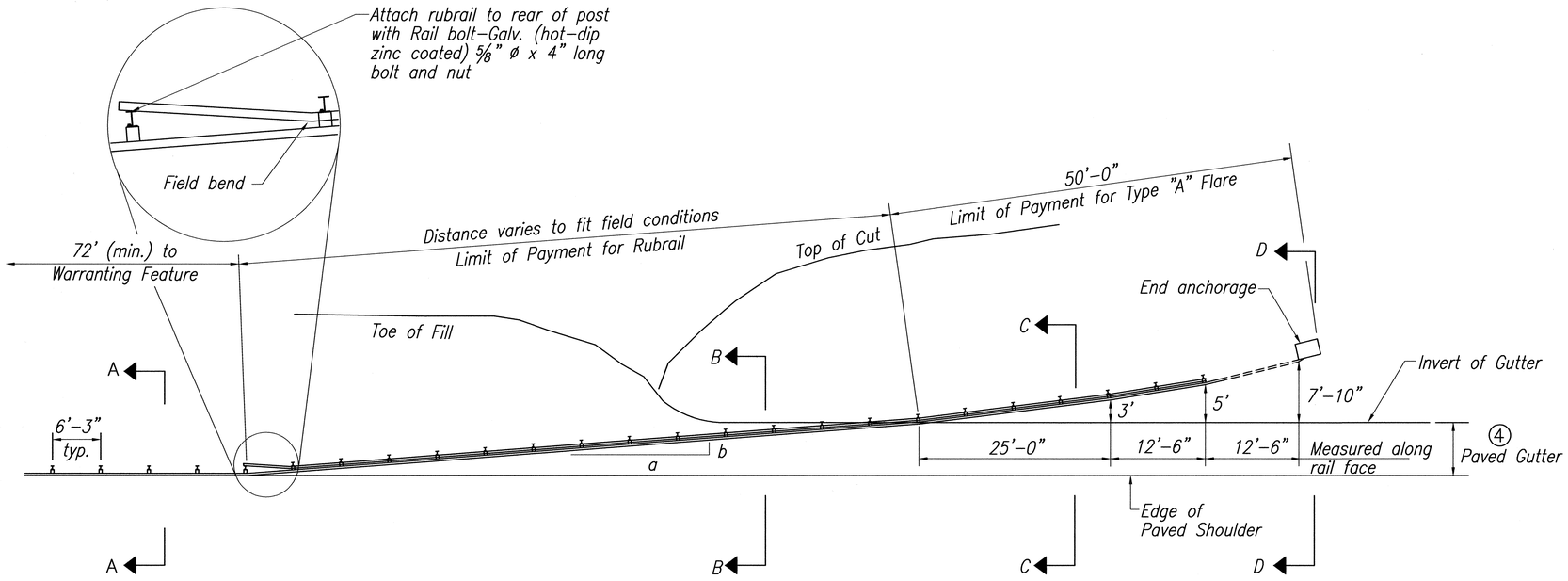
TYPE "G" FLARE END TERMINAL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

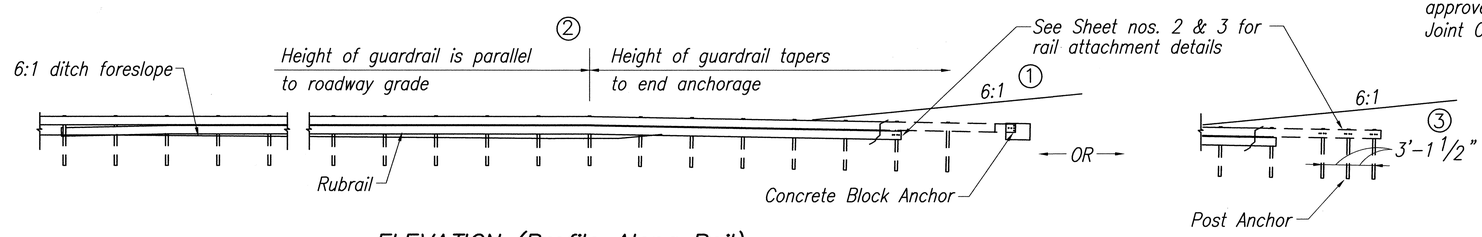
SHEET No. 8 OF 14 SHEETS

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	223	288

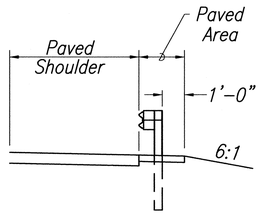


PLAN

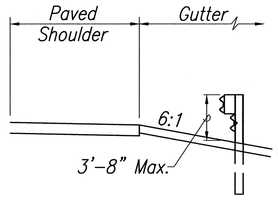
Design Speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



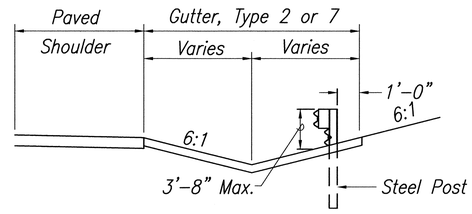
ELEVATION (Profile Along Rail)



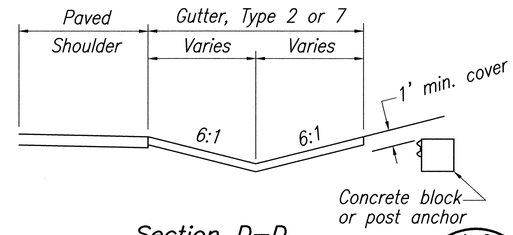
Section A-A



Section B-B
(with Rubrail)



Section C-C
(with Rubrail)



Section D-D

General Notes

1. A 6:1 or flatter slope is desirable. However, a steeper or flatter existing slope may be used.
2. Heigth 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 Committe.

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

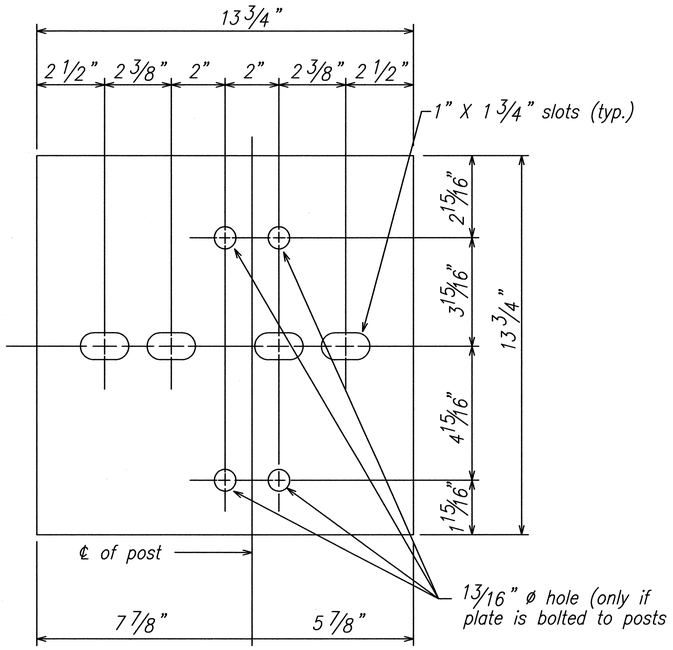
SHEET No. 9 OF 14 SHEETS

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

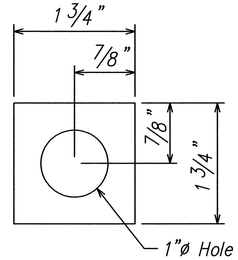
ORIGINAL PLAN | NOTE BOOK No.
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

j94-56 f:\G4GR\VEEDITCH.dwg (ESH-1) 1=1 06/07/05 AMR B-9A r8/21/01 td1.ruby/guardrail/g4grveeditch.dgn (standard plan TE-58 07/01/86, TE-59 r11/03/89 & TE-60 07/01/86)

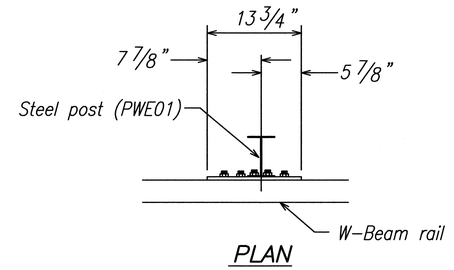
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	224	288



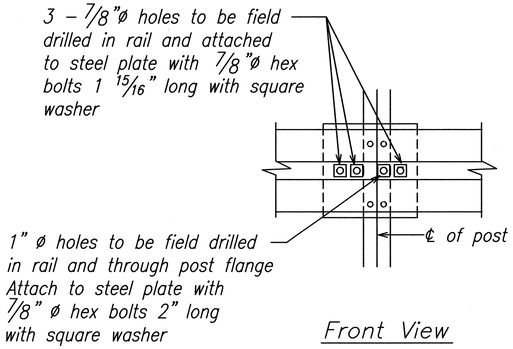
Steel Plate – 1/2"
(Hot-dip Zinc Coated Galvanized Welded or Bolted to Post)



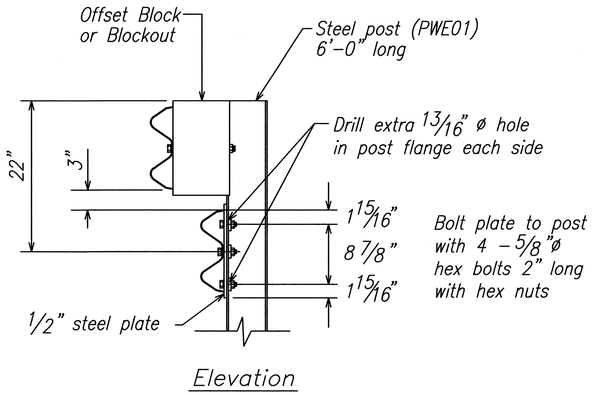
Square Washer
(3/16" Thick – Hot-dip Zinc Coated Galvanized)



PLAN

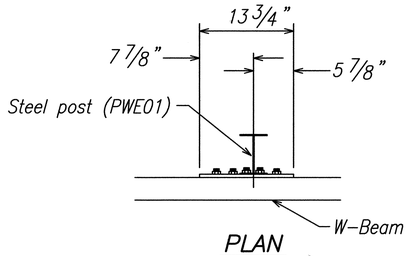


Front View

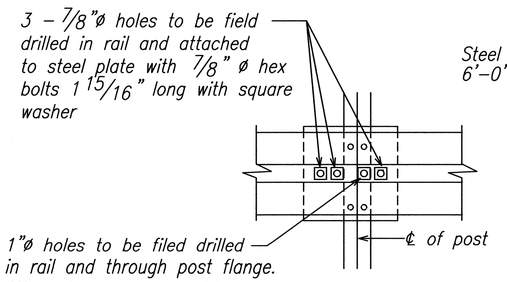


Elevation

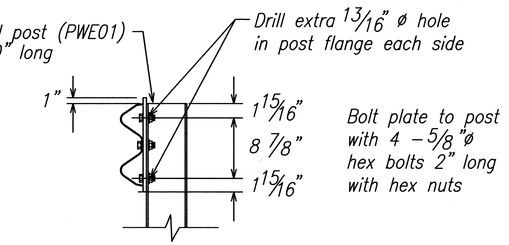
RUBRAIL ANCHOR DETAILS



PLAN



Front View



Elevation

POST 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.

BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
TYPE "A" FLARE

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

j: 94-56 f:G4DET2.dwg (ESH-1) 1=1 06/07/05 AMR B-98 r3/01/99 td1.ruby/guardrail/g4det2.dgn (standard plan TE-58 07/01/86, TE-59 r11/03/89 & TE-60 07/01/86))

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

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ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

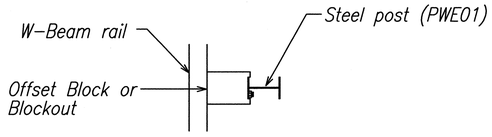
HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

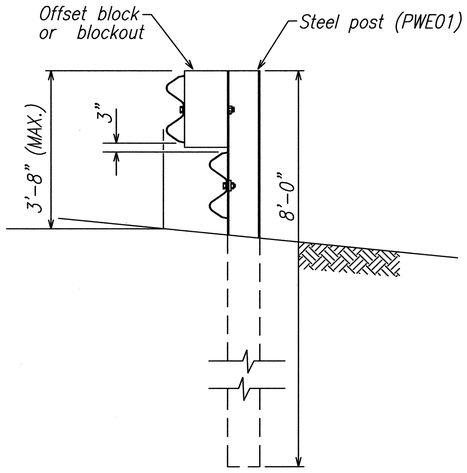
SHEET No. 10 OF 14 SHEETS

224

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	225	288

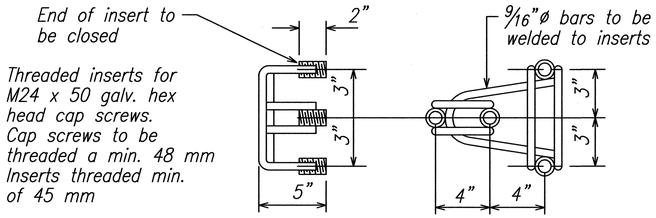


Plan

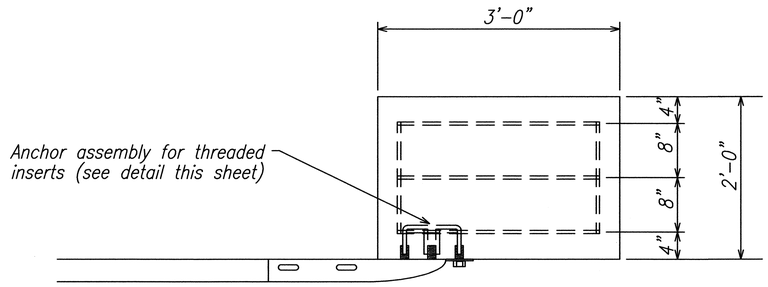


Elevation

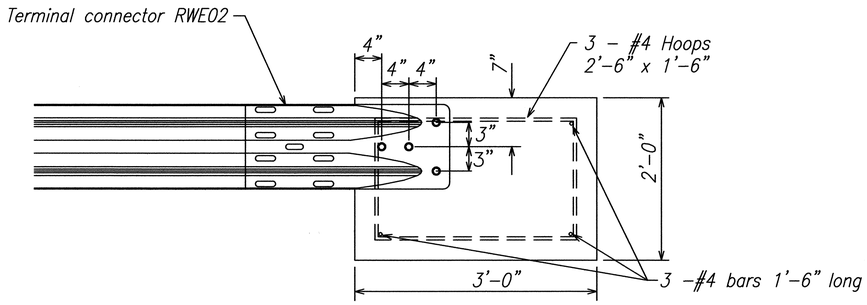
STEEL POST GUARDRAIL WITH RUBRAIL



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 | NOTE BOOK No. | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

j: 94-56 f:G4DET1.dwg (ESH-1) 1=1 06/07/05 AMR B-9C r3/01/99 td1.ruby/guardrail/g4det1.dgn (standard plan TE-58 07/01/86, TE-59 r11/03/89 & TE-60 07/01/86)

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

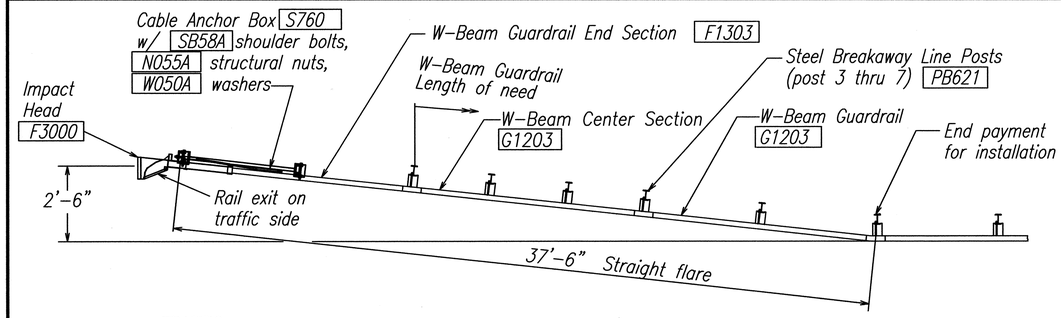
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

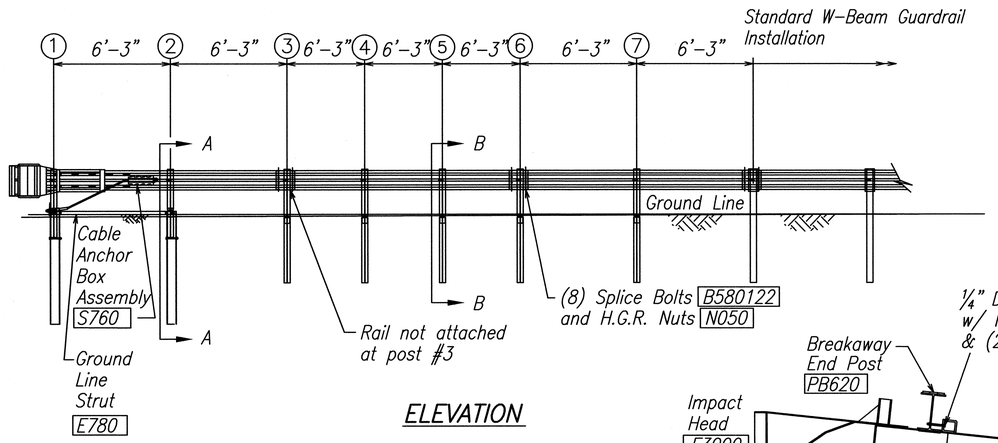
HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

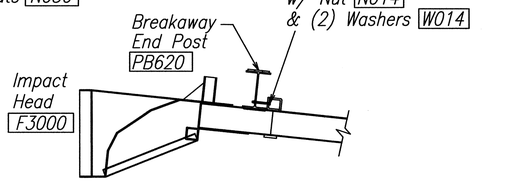
SHEET No. 11 OF 14 SHEETS



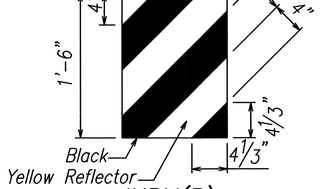
PLAN



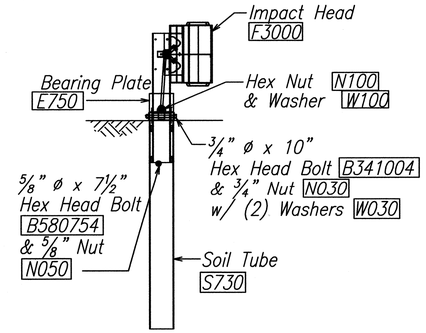
ELEVATION



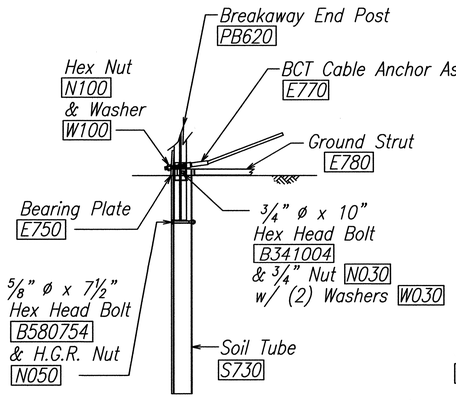
IMPACT HEAD CONNECTING DETAIL



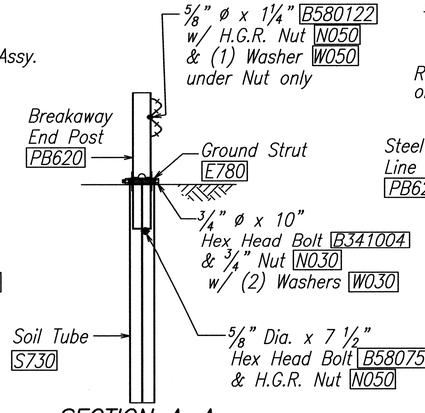
IHRM(R) IMPACT HEAD REFLECTOR MARKER INSERT DETAIL



FRONT VIEW OF POST 1

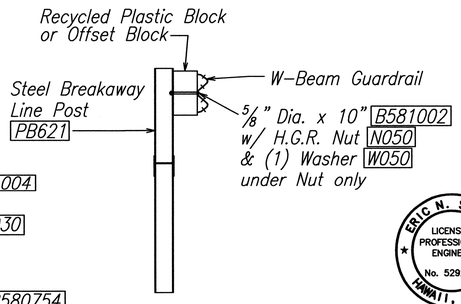


PARTIAL VIEW OF POST 1



SECTION A–A

(at Post #2)



SECTION B–B

(Typical @ Posts #3–7)
NOTE: RAIL NOT BOLTED @ POST #3

GENERAL NOTES:

1. Breakaway steel posts are required with the FLEAT Terminal.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. 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.
4. 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.
5. 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.
6. 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.
7. (R) or (L) indicates right or left Impact Head Reflector Marker (IHRM). Providing and installing of IHRM shall be considered incidental to end treatment.
8. The stripes for IHRM shall slope downward at an angle of 45° towards the side of the end treatment that traffic is to pass

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	226	288

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

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

ORIGINAL PLAN
NOTE BOOK
No.

B-11 r8/12/02 td1:ruby/guardrail/fleat350.dgn (standard plan TE-61 r11/03/89 & TE-62 r09/01/87)
j: 94-56 f: FLEAT350.dwg (ESH-1) 1=1 06/07/05 AMR

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
No. 5292-C
HAWAII, U.S.A.

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ENGINEERS SURVEYORS HAWAII, INC.
LICENSE EXPIRATION DATE: 4/30/06

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

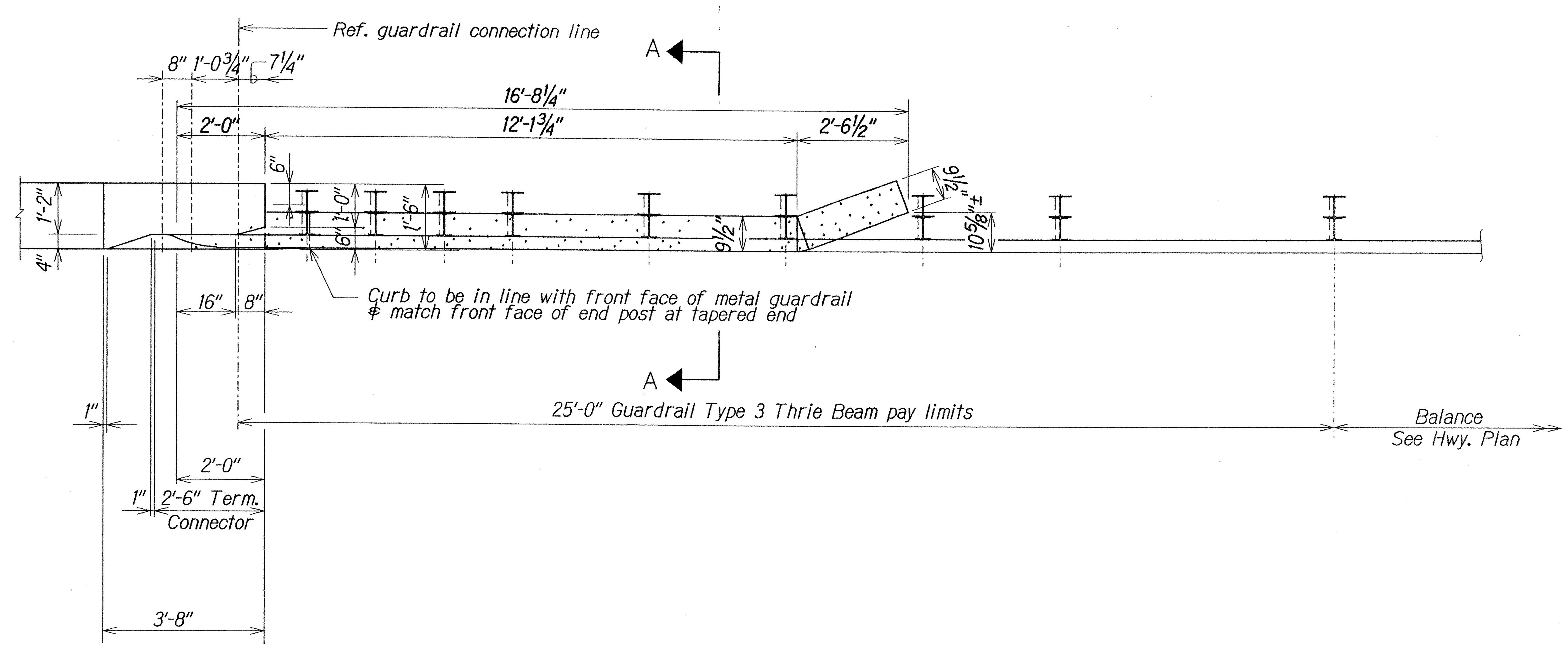
FLEAT - 350
FLARED ENERGY ABSORBING TERMINAL

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

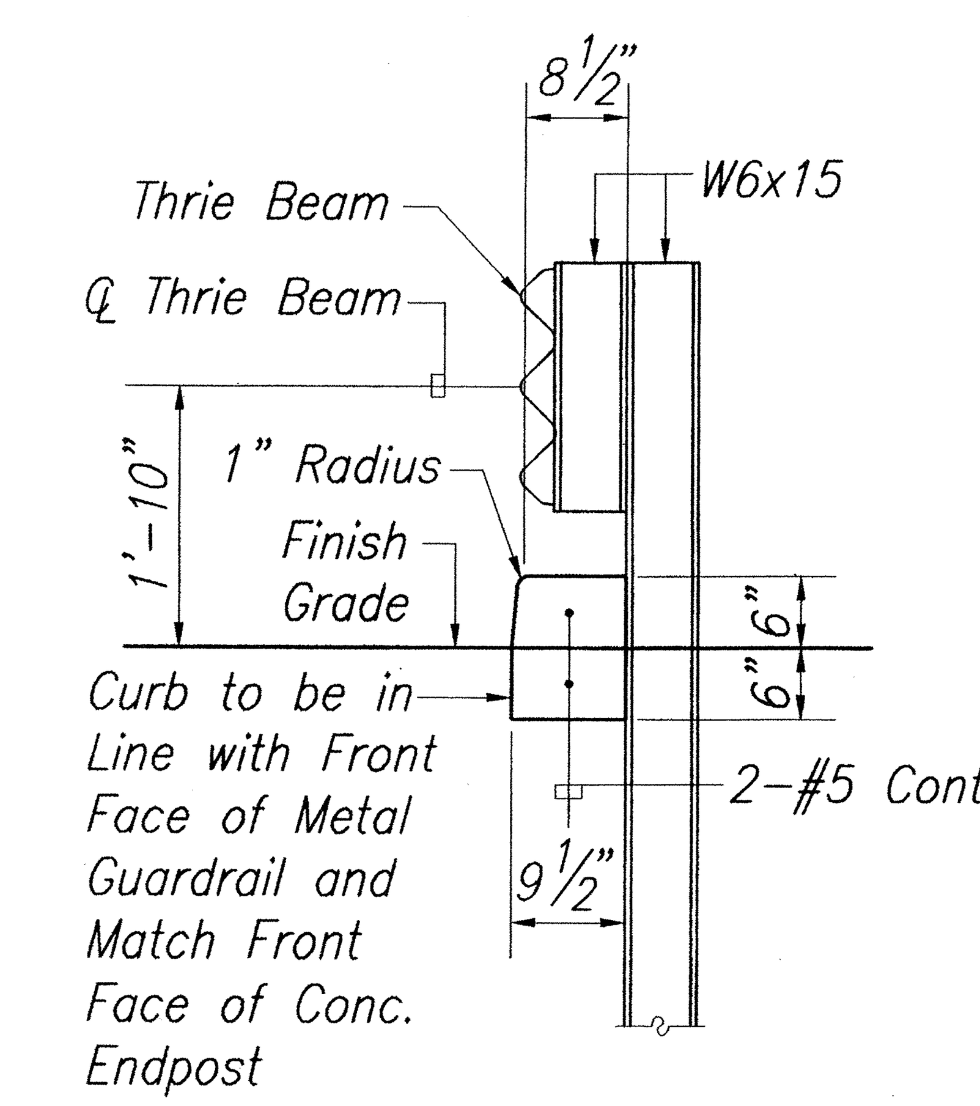
SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 12 OF 14 SHEETS

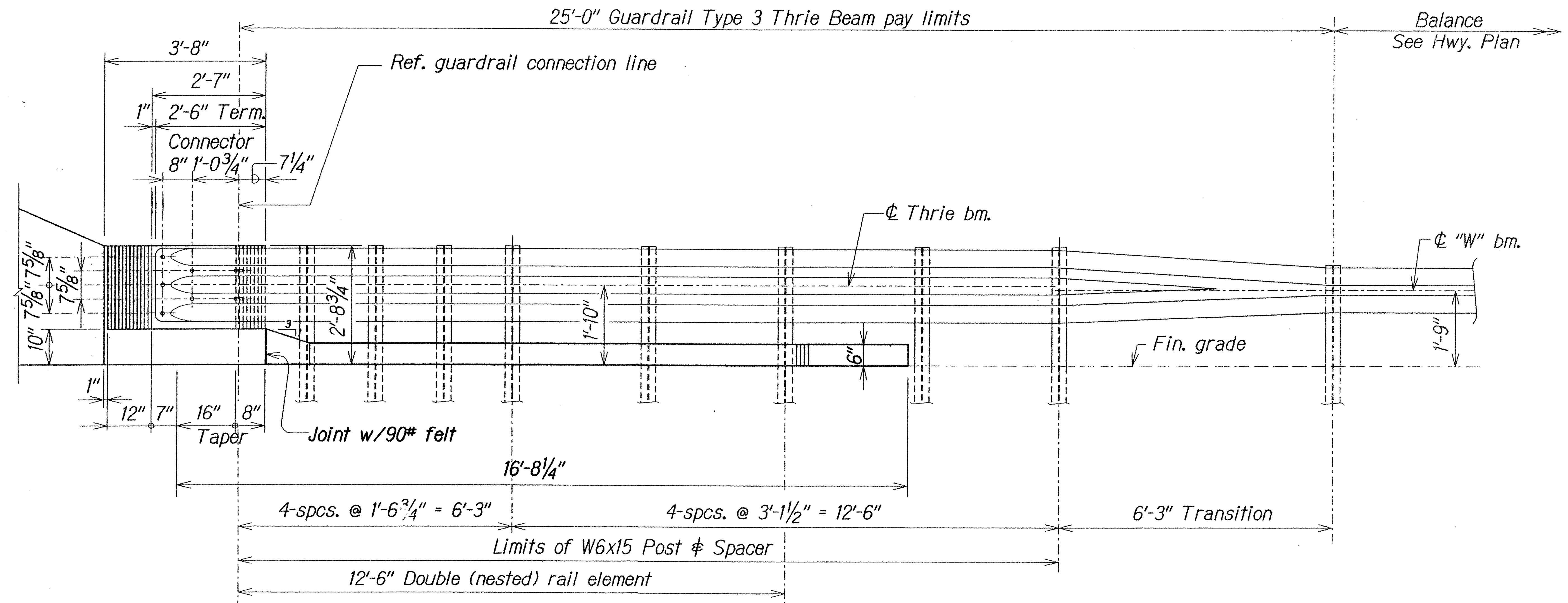
FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	227	288



PLAN
Scale: ½" = 1'-0"



SECTION A–A
Scale: 3/4"=1'-0"



ELEVATION
Scale: ½" = 1'-0"

ENDPOST PLAN AND ELEVATION

ERIC N. S. HEE
LICENSED PROFESSIONAL ENGINEER
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HAWAII, U.S.A.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

METAL GUARDRAIL TYPE 3
THRIE BEAM PLAN & ELEVATION

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
FED. AID PROJ. NO. NH-037-1(24)

SCALE: AS NOTED DATE: MAY, 2005

SHEET No. 13 OF 14 SHEETS

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

FED.ROAD DIST.NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-037-1(24)	2005	228	288

NOTES:

A. The work necessary to connect guardrail to concrete end post shall include all labor, materials, tools, equipment and incidentals necessary to complete the work and will not be paid for separately.

B. Lap terminal connector and rail element in direction of traffic to prevent snagging.

C. All anchor bolts shall be high strength bolts conforming to the requirements of ASTM 325 and Standard Specification, Section 713.04.

D. Anchor bolt length shall be such that a snug fit of the elements and full thread engagement plus 1/4" (max) is attained.

E. "Terminal Connector", "Transition Section" and thrie beam shall be fabricated from 10gauge steel conforming to the requirements of AASHTO M 180, Type II, Class B.

F. "Terminal Connector" and standard spacer, including all anchor bolts, cap PL, nuts and washers, shall be hot-dip galvanized after fabrication.

G. Cap PL shall be fabricated from ASTM A 36.

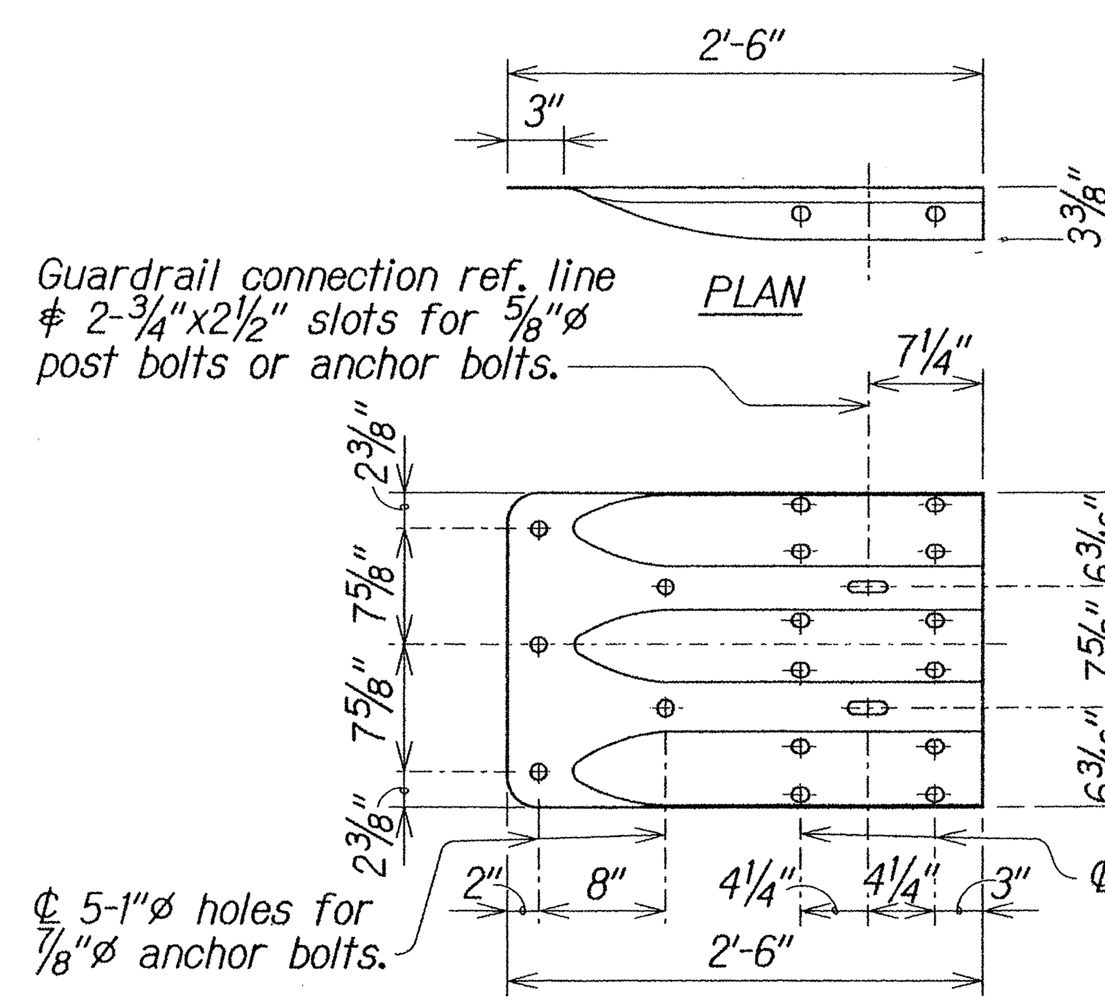
H. First 25'-0" of guardrail adjoining "Terminal Connector" shall be galvanized steel and supports spaced as shown on the detail drawings. This section of rail shall be placed on tangent to end post or parallel to roadway, unless conditions at site renders it impossible to do so. Flare point to be determined in field.

I. Double (nest 1st panel) thrie beam elements at all end post connections, except on highways with one-way traffic pattern, use single thrie beam elements at end post on trailing end only.

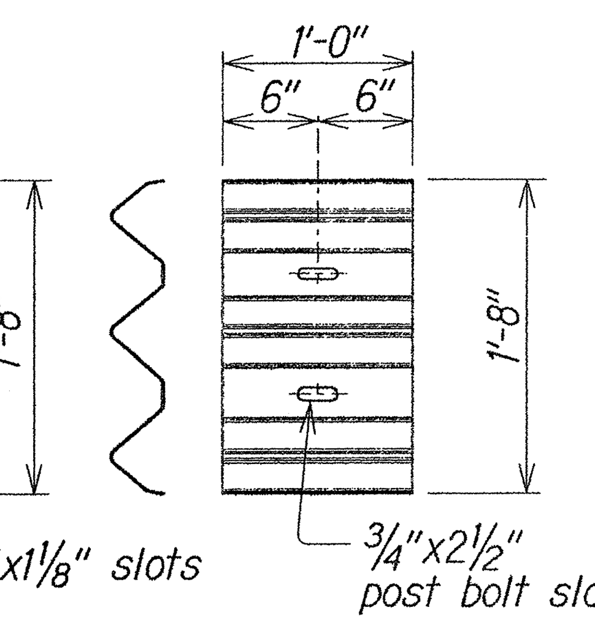
J. Where double (nested) beam occur, 12" "Back-up Plate" not required.

K. Heads of through anchor bolts shall be placed on the traffic side of the rail.

L. All steel shapes, rails and plates shall conform to ASTM A 36 specifications.

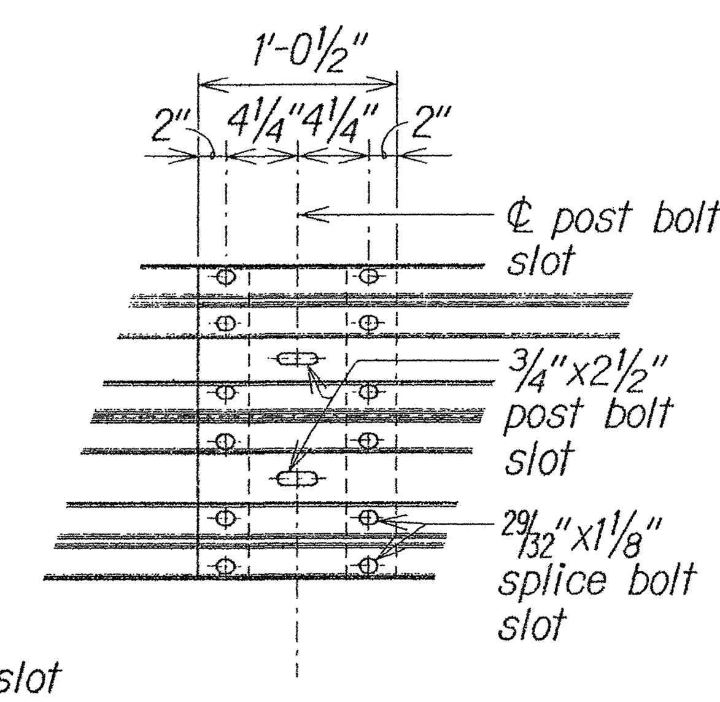


TERMINAL CONNECTOR
Scale: 1" = 1'-0"

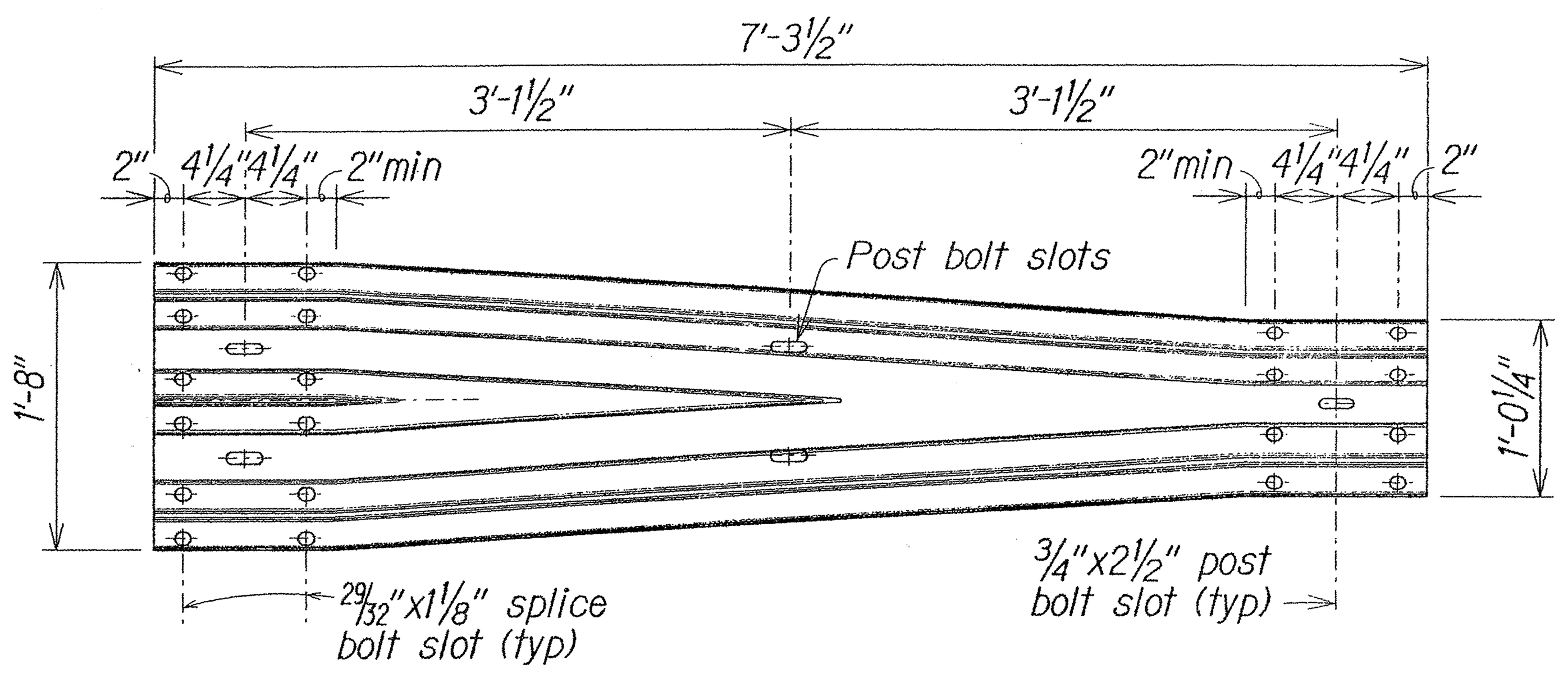


(Use at posts where splices do not occur.)

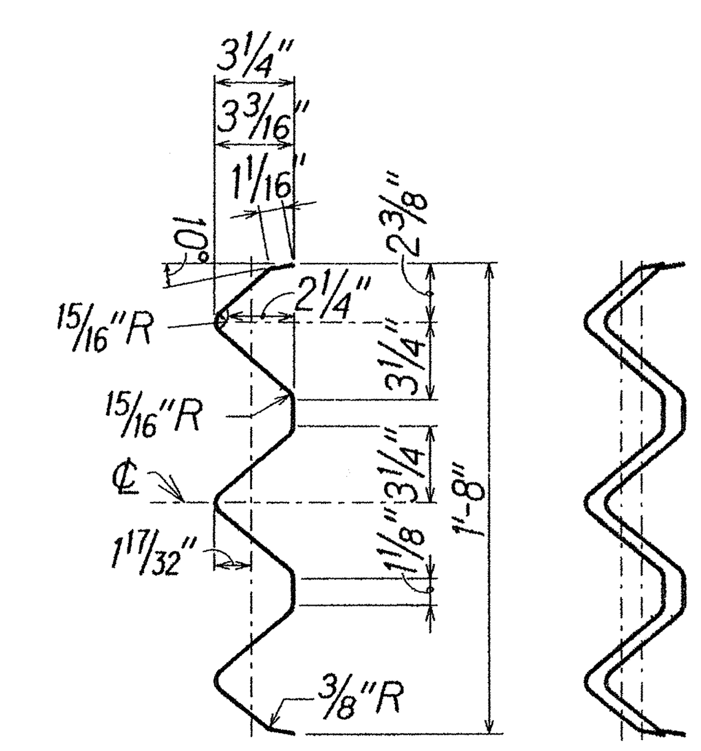
BACKUP PLATE
Scale: 1" = 1'-0"



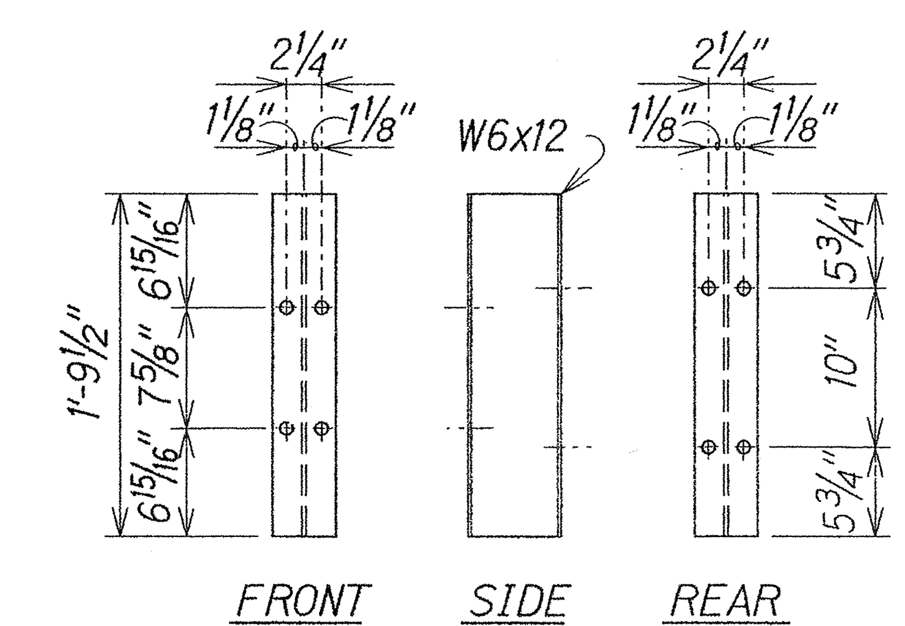
RAIL SPLICE
Scale: 1" = 1'-0"



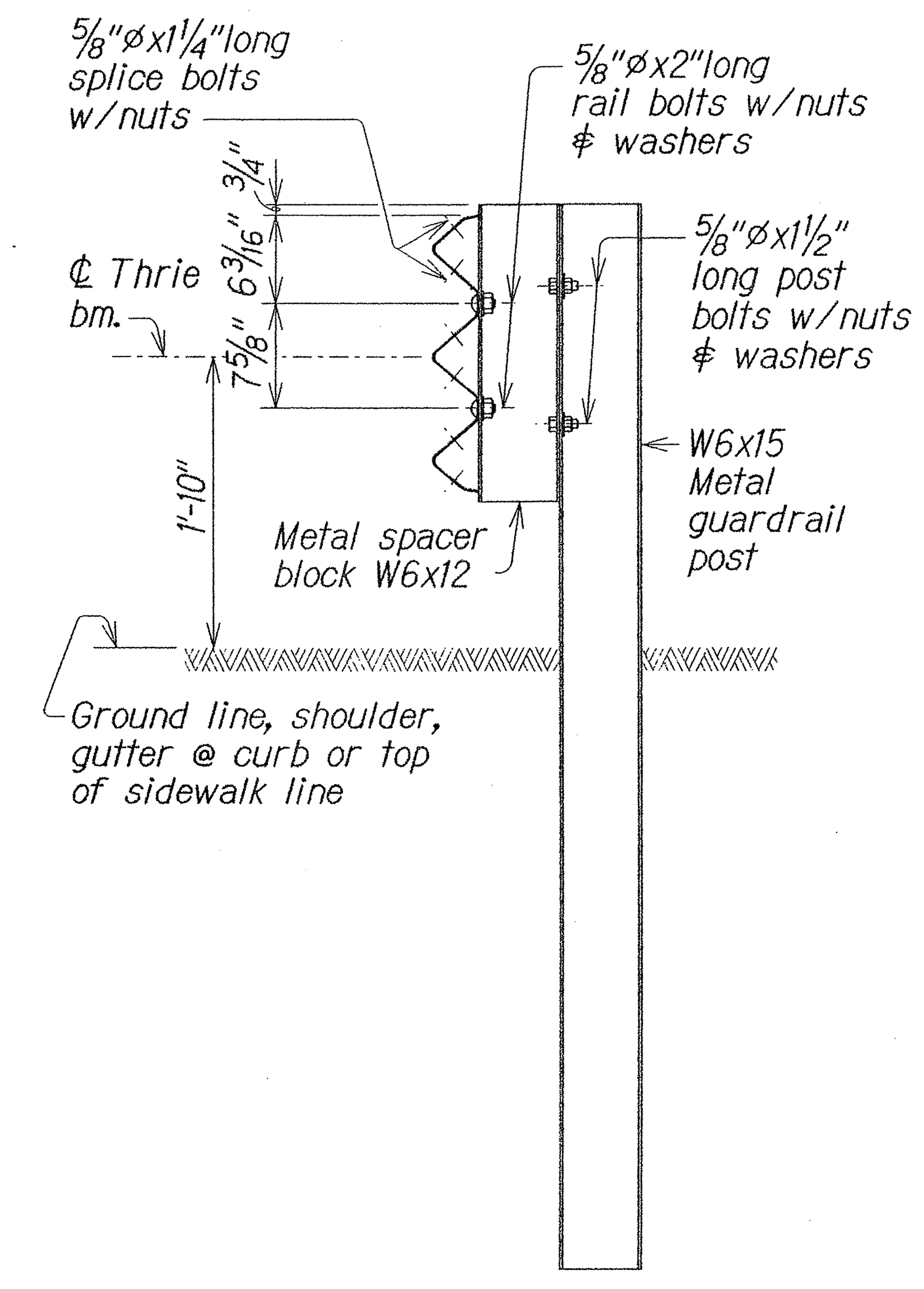
TRANSITION SECTION
Scale: 1" = 1'-0"



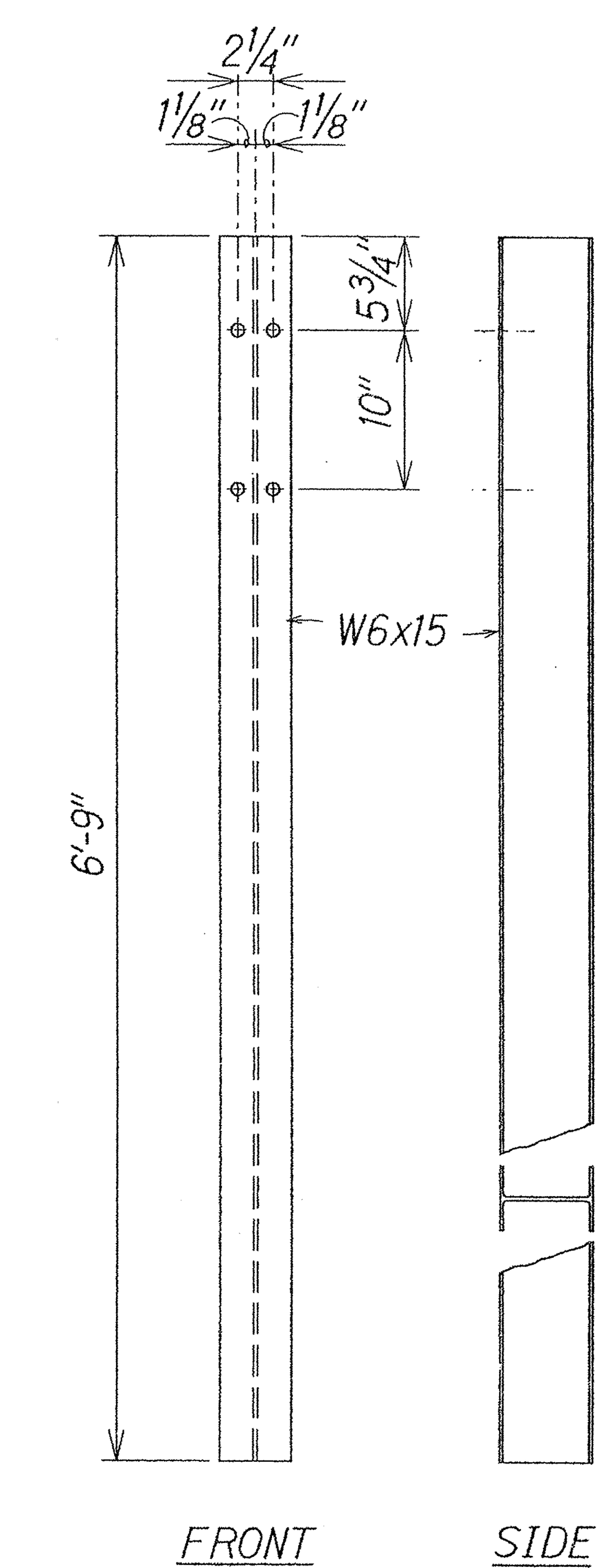
SECTION THRU RAIL ELEMENT
Scale: 1½" = 1'-0"



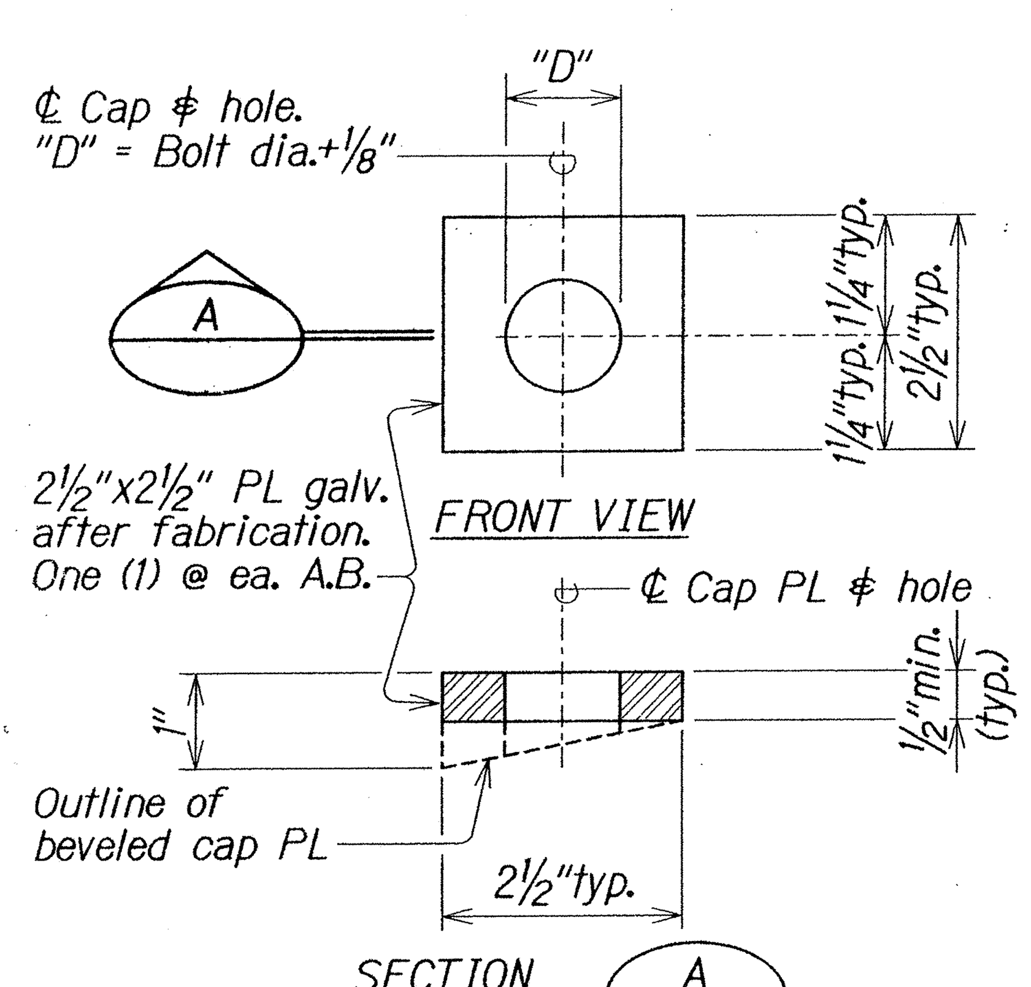
SPACER BLOCK DETAILS
Scale: 1" = 1'-0"



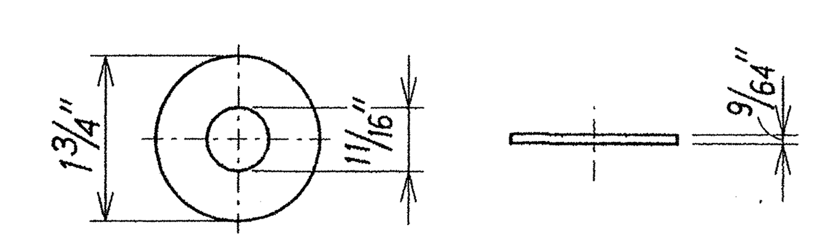
TYPICAL SECTION
METAL GUARDRAIL ON METAL POST WITH METAL SPACER BLOCK
Scale: 1" = 1'-0"



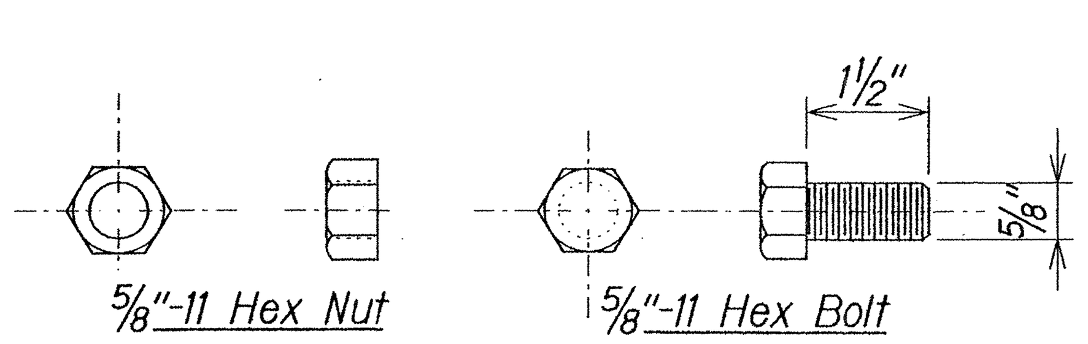
POST DETAILS
Scale: 1" = 1'-0"



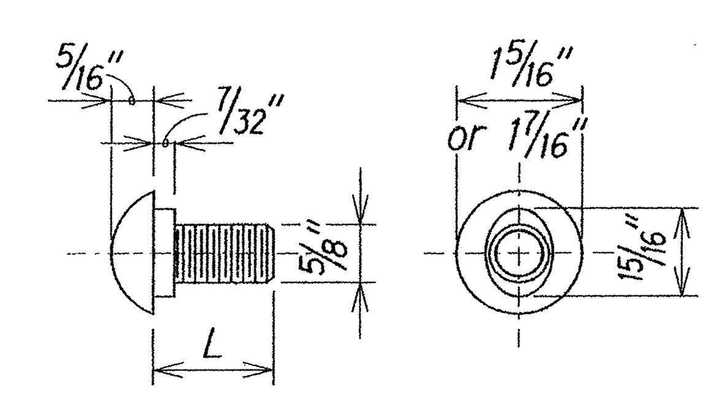
CAP (BEARING) PLATE DETAIL
Scale: 6" = 1'-0"



STEEL WASHER FOR 5/8"ø BOLT
Scale: 6" = 1'-0"



5/8"ø HEX BOLT & NUT
Scale: 6" = 1'-0"



L	Thread Length
1¼"	Full thread
2"	1½"min. thread length

5/8"ø BUTTON HEAD BOLT & RECESS NUT
Scale: 6" = 1'-0"

METAL GUARDRAIL TYPE 3 THRIE BEAM AND APPURTENANCES DETAILS

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METAL GUARDRAIL TYPE 3
THRIE BEAM & APPURTENANCES DETAILS

HALEAKALA HIGHWAY WIDENING, PHASE 2
HANA HIGHWAY TO PUKALANI BYPASS
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SCALE: AS NOTED   DATE: MAY, 2005

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