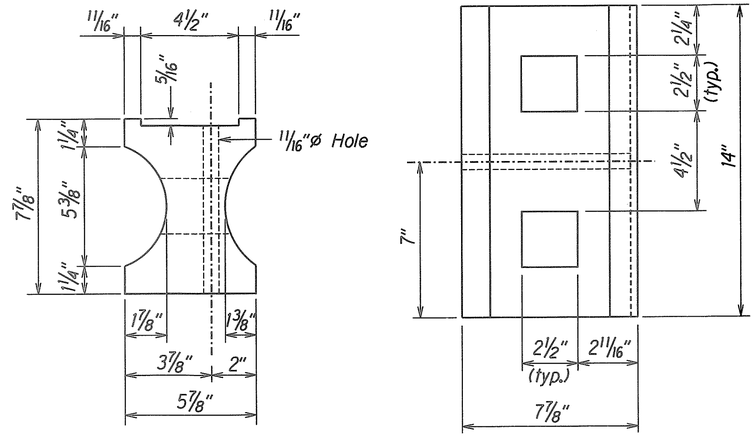
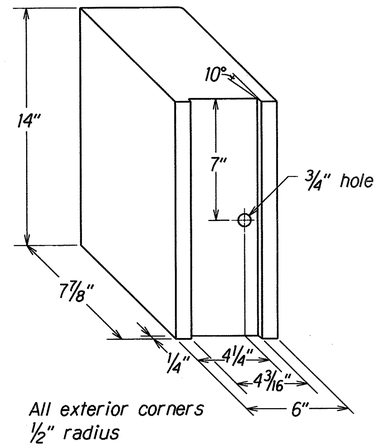
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	8	73

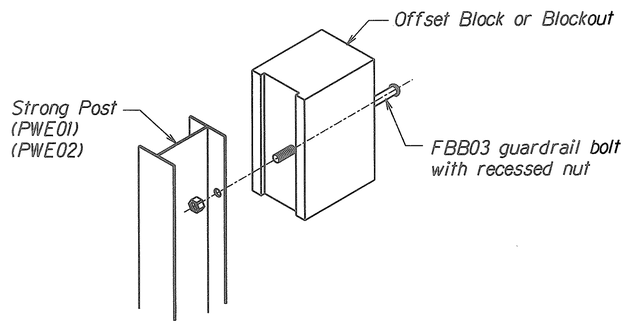


TOP SIDE

RECYCLED PLASTIC BLOCKOUT (TYPE I)

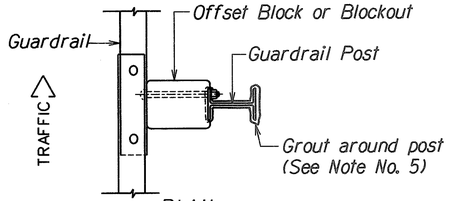


RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)

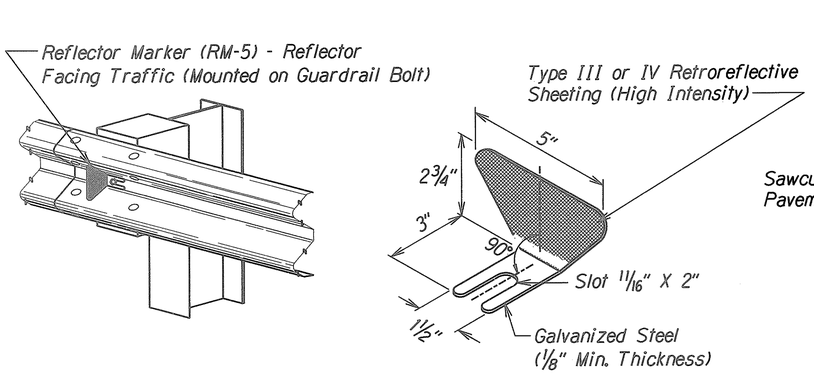


Exploded View
(Rail and washer not shown)

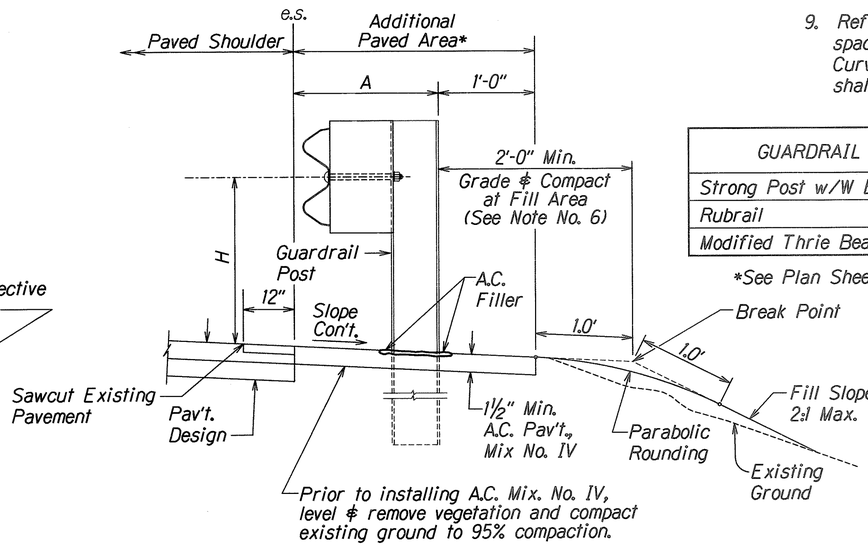
STEEL POST AND BLOCK DETAIL



PLAN



REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



ELEVATION

TYPICAL GUARDRAIL INSTALLATION

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

*See Plan Sheets for Site Specific Requirements.

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 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 guardrail including both end treatments) shall include the Additional Paved Area.
6. After the guardrail posts are installed in the paved area, the Contractor shall fill/seal around each guardrail post and all cracks in the paved area caused during the guardrail post installation. If required by the inspector/engineer, the Contractor shall tamper the paved area around the guardrail post prior to filling/sealing. All costs associated with this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
7. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.
8. 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 200 feet. Spacing of RM-5's on Horizontal Curves shall comply with Table III-1 of the MUTCD. RM-5's shall not be installed on Terminal Sections.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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No.	CHECKED BY	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

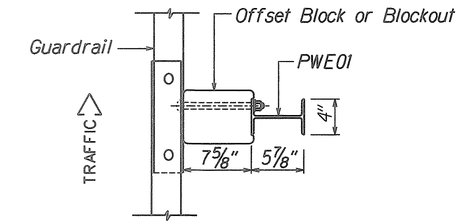
GUARDRAIL DETAILS & NOTES

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

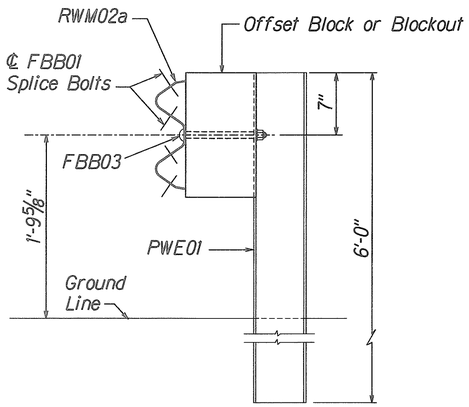
Scale: NTS Date: January, 2001

SHEET No. 1 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	9	73



PLAN

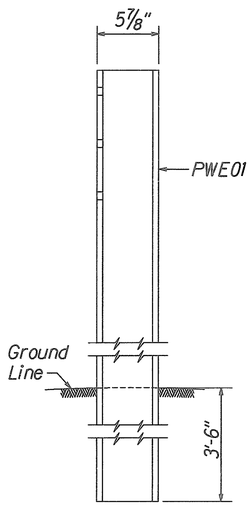


ELEVATION

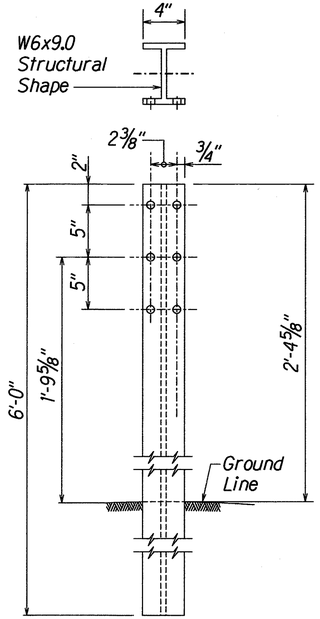
STRONG POST W-BEAM GUARDRAIL

(SGR04a)

NOTE:
All Holes are
3/4" Dia.

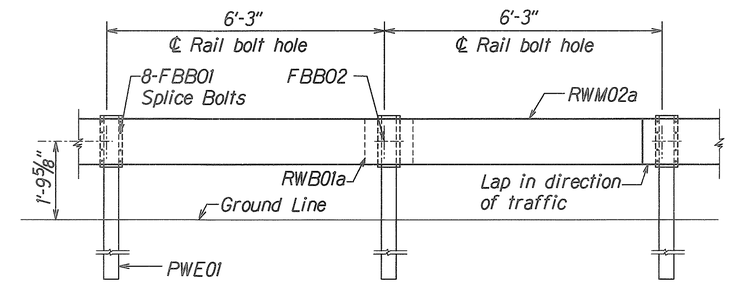


SIDE



FRONT

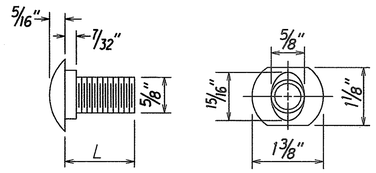
W-BEAM STRONG POST (PWE01)



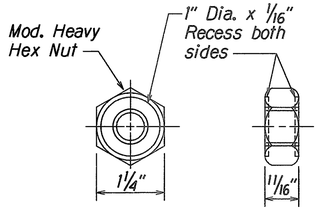
ELEVATION

STRONG POST W-BEAM GUARDRAIL WITH

RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT

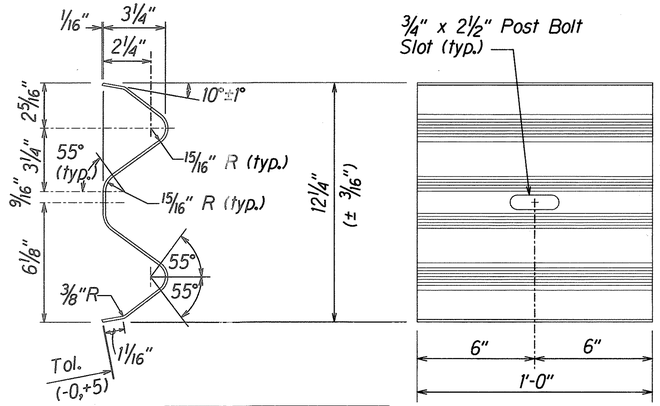


DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"



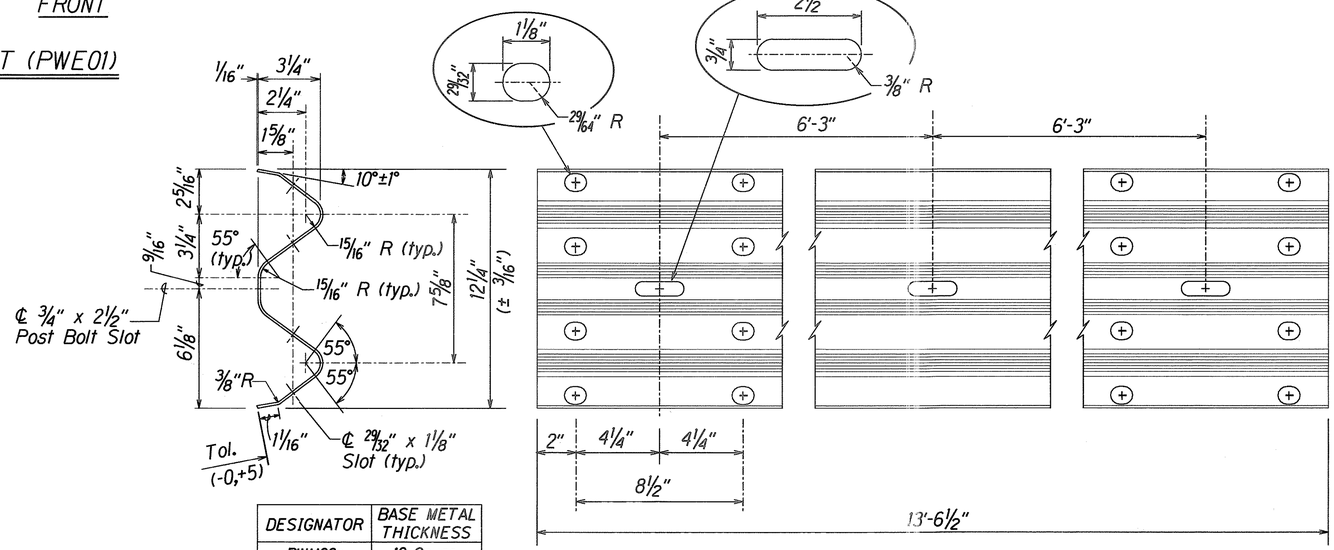
GUARDRAIL BOLTS AND

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)

ORIGINAL PLAN
NOTE BOOK
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QUANTITIES BY
CHECKED BY
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

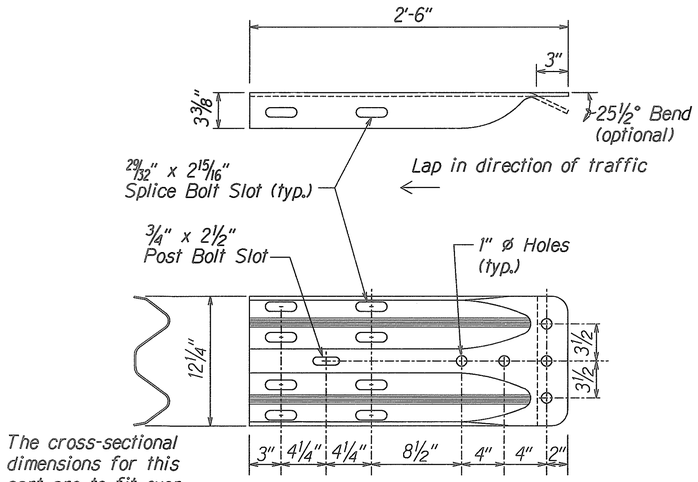
STRONG POST W-BEAM GUARDRAIL

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

Scale: NTS Date: January, 2001

SHEET No. 2 OF 9 SHEETS

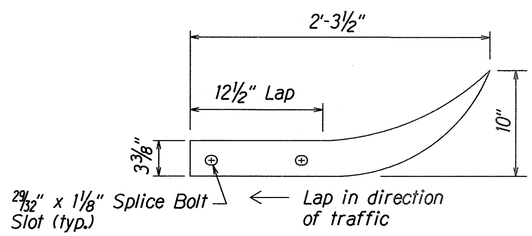
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	10	73



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

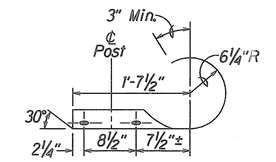
W-BEAM TERMINAL CONNECTOR (RWE02b)



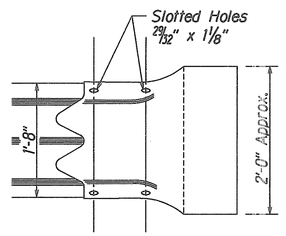
The cross-sectional dimensions for this part are to fit over part RWM02a on the approach end and under part RWM02a on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE01a	12 Gauge

W-BEAM END SECTION (FLARED RWE01a)

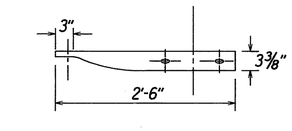


PLAN

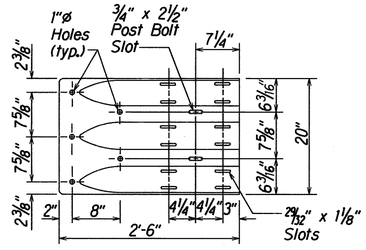


ELEVATION

SECTION (ROUNDED) (RTE02b)

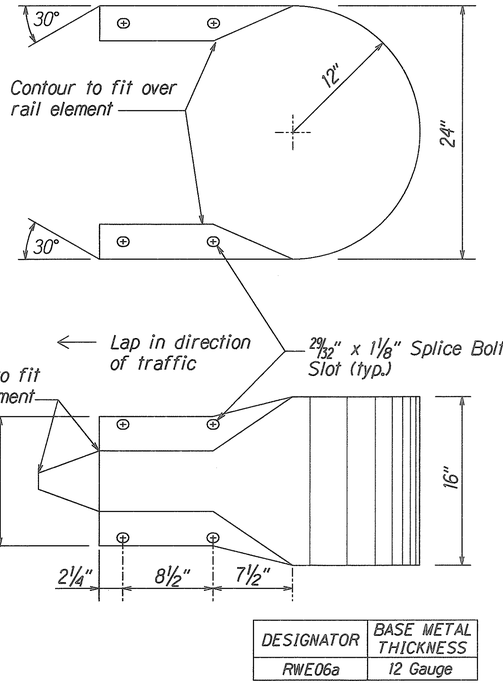


PLAN



ELEVATION

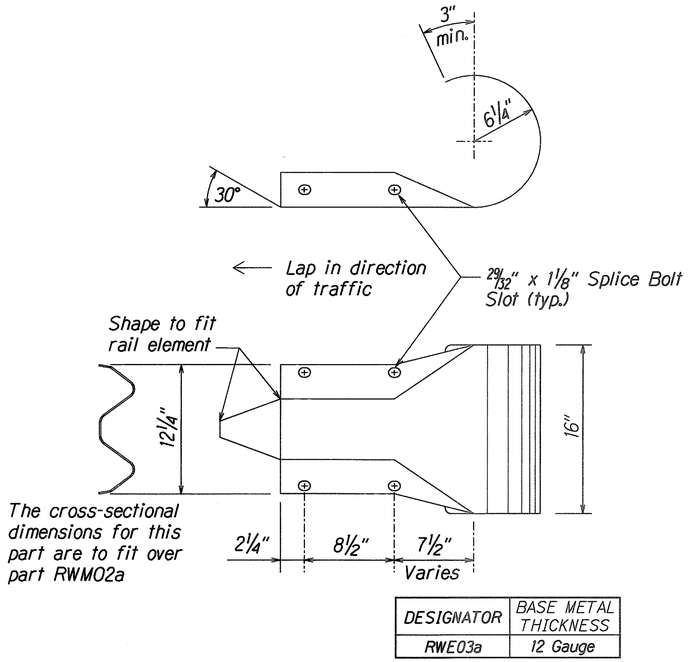
TERMINAL CONNECTOR (RTE01b)



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)

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

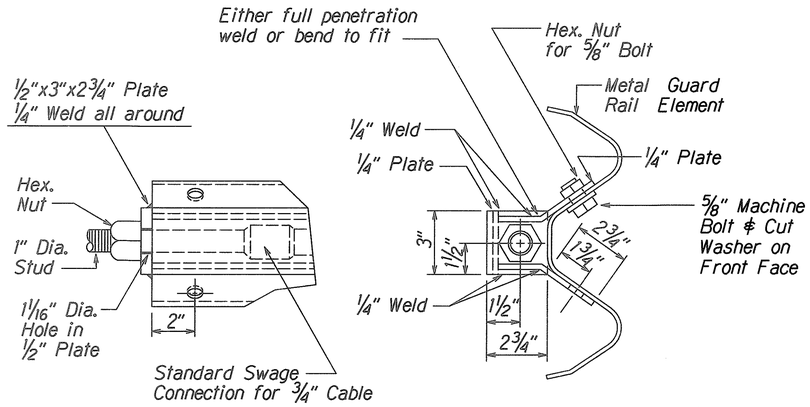
STRONG POST W-BEAM GUARDRAIL

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

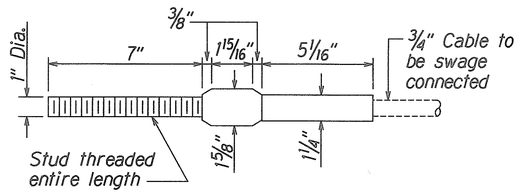
Scale: NTS Date: January, 2001

SHEET No. 3 OF 9 SHEETS

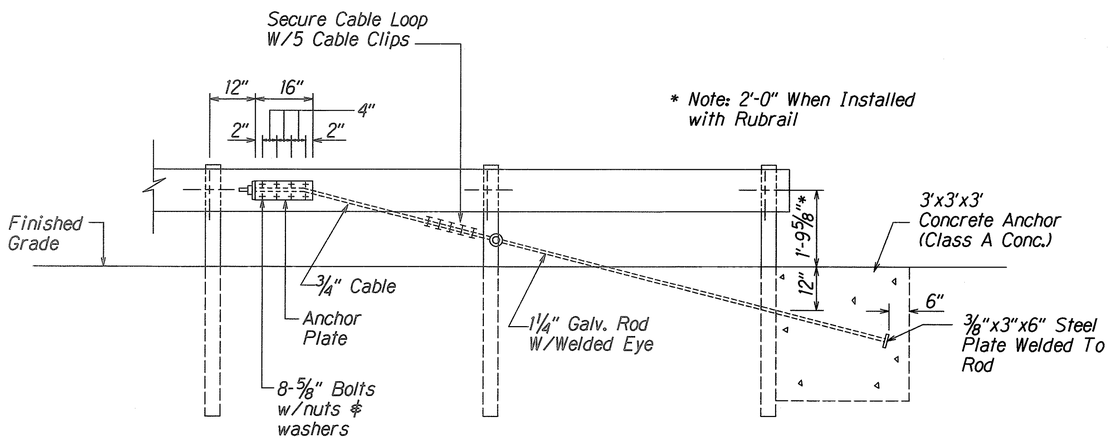
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	11	73



ANCHOR PLATE DETAILS

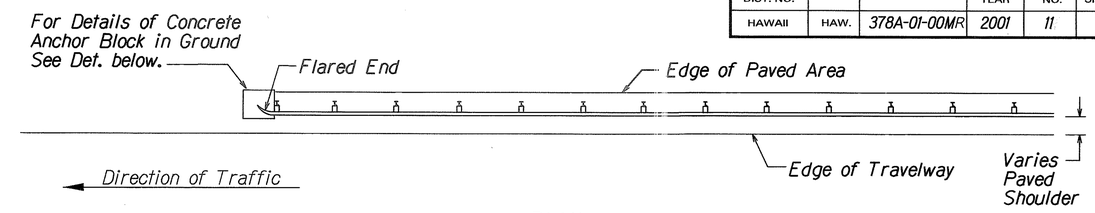


STANDARD SWAGED FITTING AND STUD

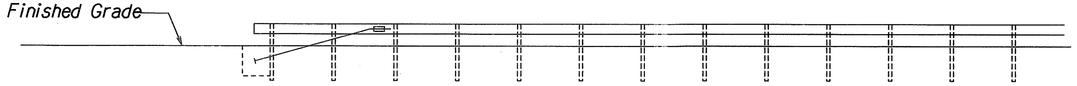


ANCHOR BLOCK DETAIL

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



PLAN



ELEVATION

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 5.6 - 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
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
NOTE BOOK
No.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

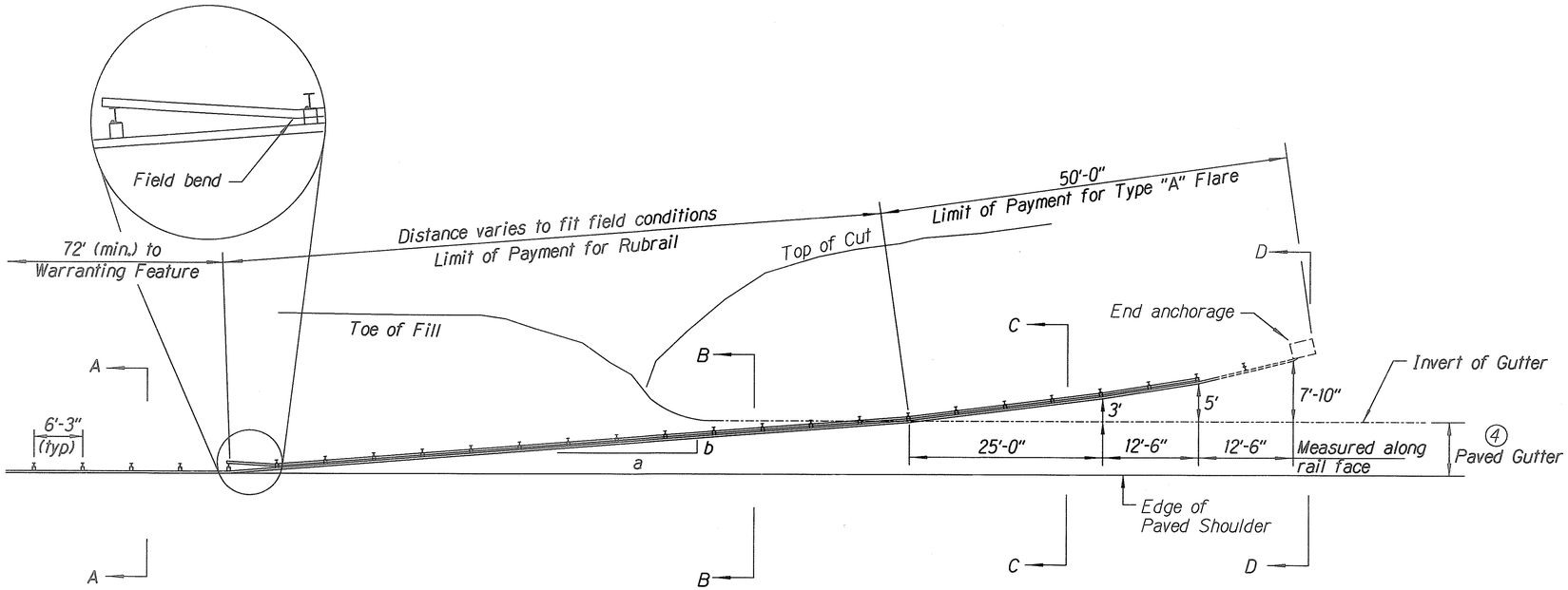
GUARDRAIL DETAILS

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

Scale: NTS Date: January, 2001

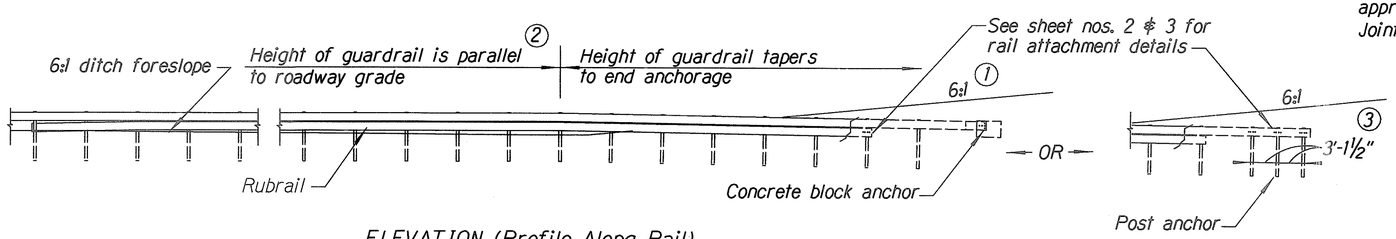
SHEET No. 4 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	12	73

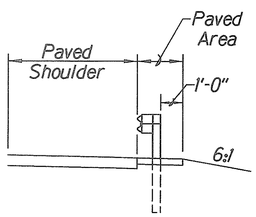


PLAN

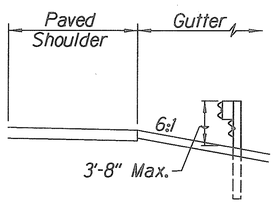
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



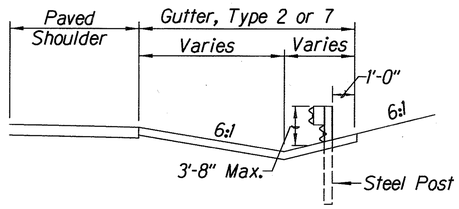
ELEVATION (Profile Along Rail)



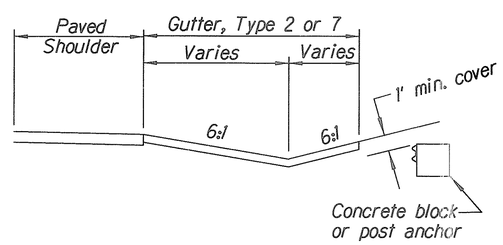
Section A-A



Section B-B
(With Rubrail)



Section C-C
(With Rubrail)



General Notes

1. A 6:1 or flatter slope is desireable. However, a steeper or flatter existing slope may be used.
2. Height of guardrail may be tapered down in elevation to maintain 3'-8" maximum height.
3. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the post anchor. Posts for the post anchor are 6'-0" long.
4. Variable Paved Gutter offsets may be used to fit field conditions.
5. The Guardrail Posts shall be located away from the gutter/swale invert.
6. All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

ORIGINAL PLAT
NOTE BOOK
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QUANTITIES BY
CHECKED BY

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

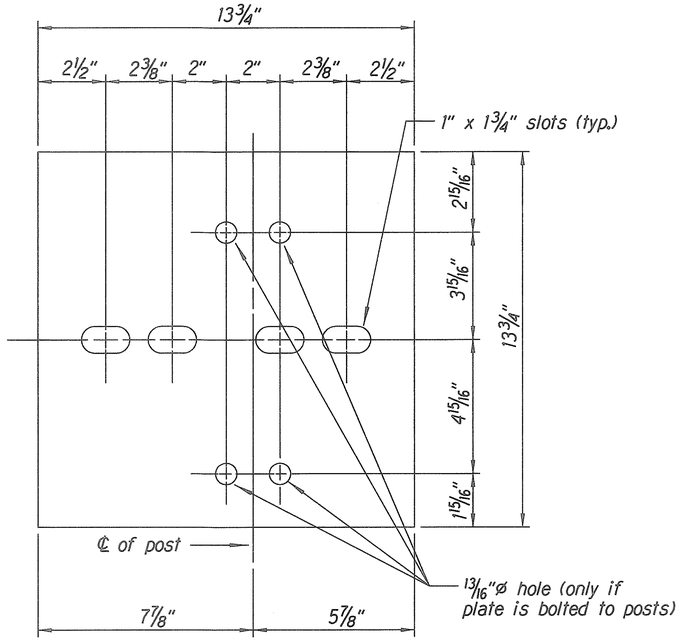
TYPE "A" FLARE

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

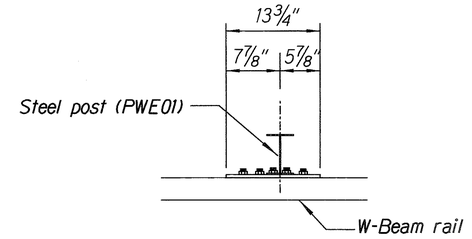
Scale: NTS Date: January, 2001

SHEET No. 5 OF 9 SHEETS

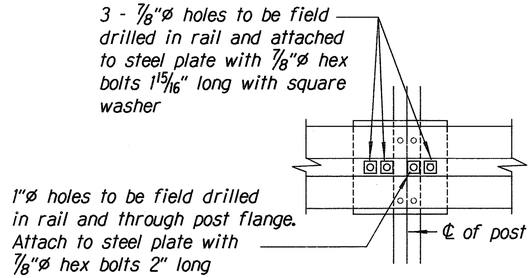
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	13	73



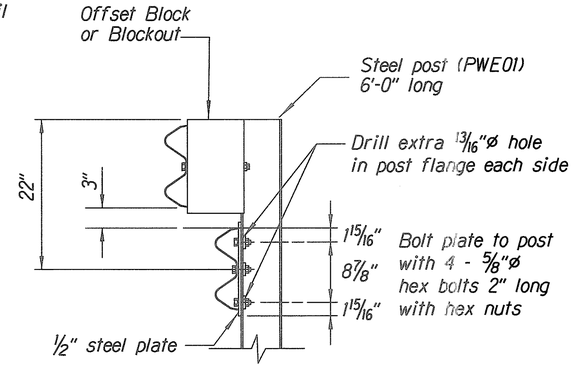
Steel Plate - ½"
(Hot-dip Zinc Coated Galvanized Welded or Bolted to Post)



Plan

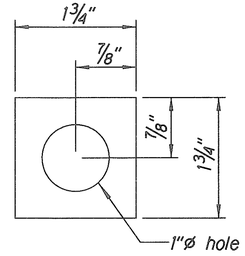


Front View

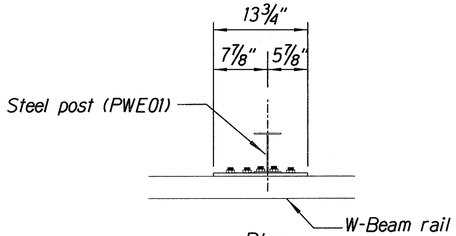


Elevation

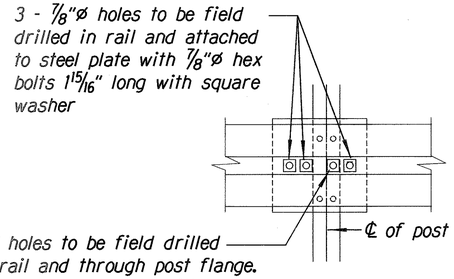
RUBRAIL ANCHOR DETAILS



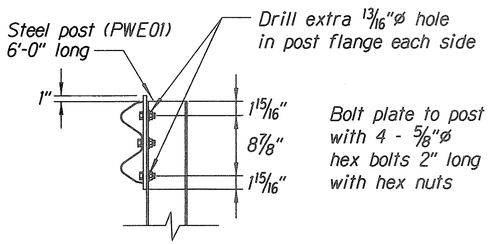
Square Washer
(3⁄16" Thick - Hot-dip Zinc Coated Galvanized)



Plan



Front View



Elevation

POST ANCHOR DETAILS

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

Note:

All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

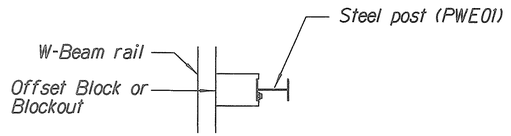
TYPE "A" FLARE

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

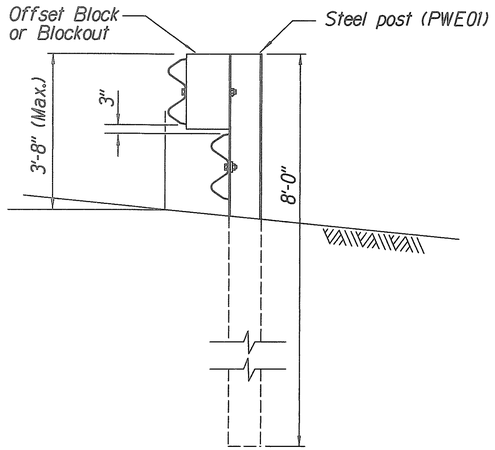
Scale: NTS Date: January, 2001

SHEET No. 6 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	14	73

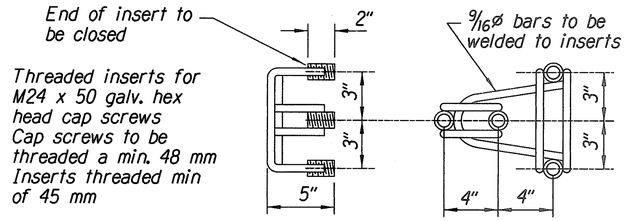


Plan

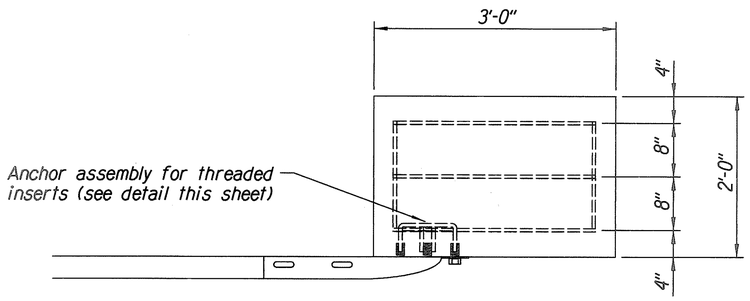


Elevation

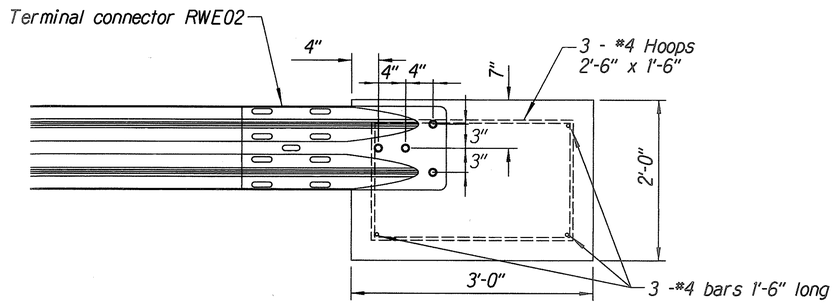
STEEL POST GUARDRAIL
WITH RUBRAIL



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:

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

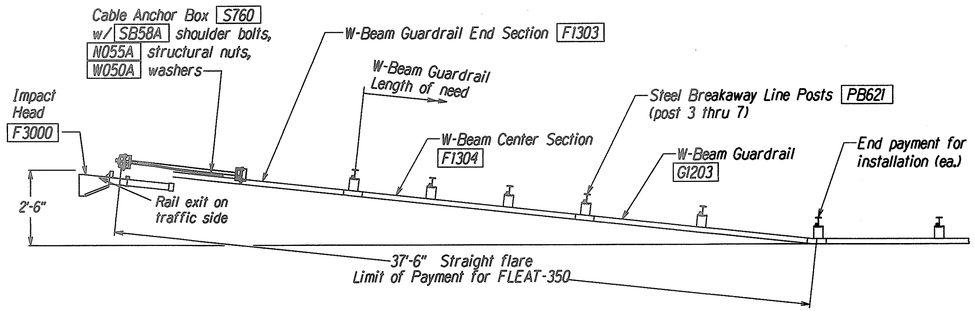
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPE "A" FLARE

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

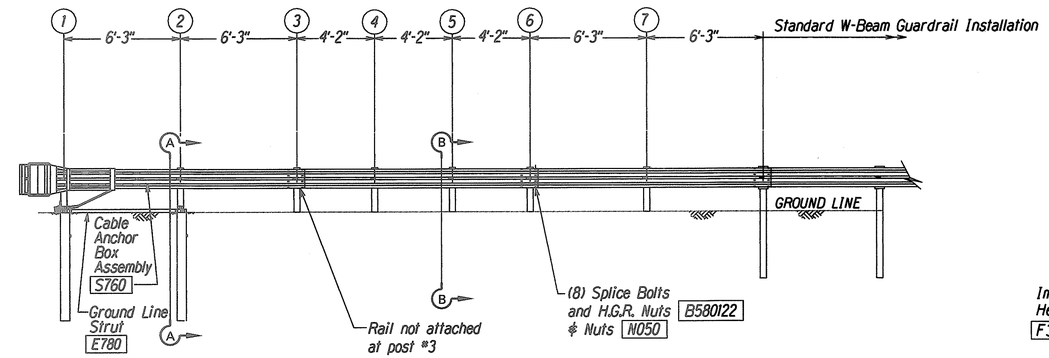
Scale: NTS Date: January, 2001

SHEET No. 7 OF 9 SHEETS

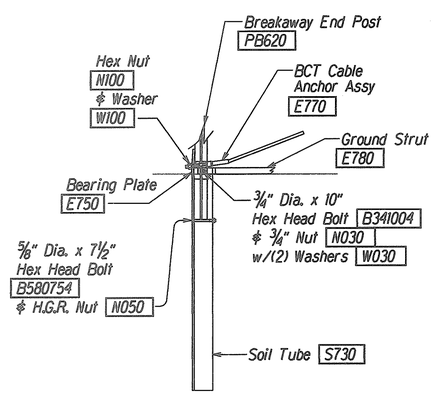


PLAN

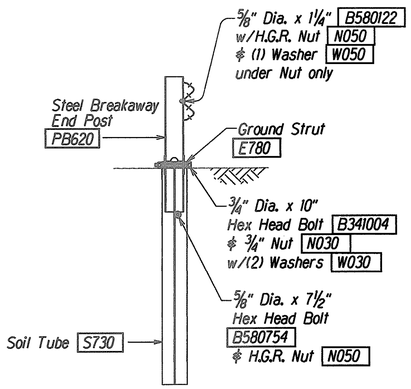
TRAFFIC



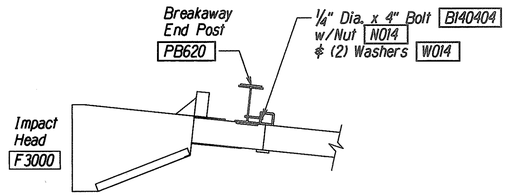
ELEVATION



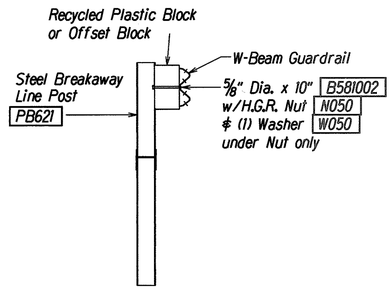
PARTIAL VIEW OF POST 1



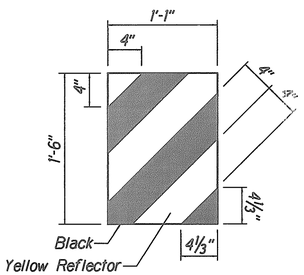
SECTION A-A
(@ Post #2)



IMPACT HEAD CONNECTING DETAIL



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



IHRM(R)
IMPACT HEAD REFLECTOR MARKER INSERT DETAIL

GENERAL NOTES

1. Breakaway 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 Imapct Head Reflector Marker (IHRM).
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	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	15	73

ITEM NO.	QTY.	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SECTION, 12 GA.
G1203	1	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
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CHECKED BY
DATE
ORIGINAL PLAN
NOTE BOOK
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

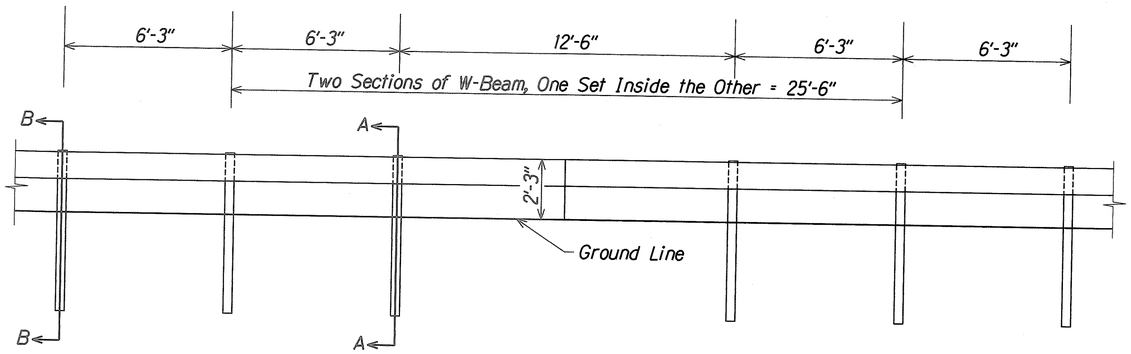
FLEAT-350
FLARED ENERGY ABSORBING TERMINAL

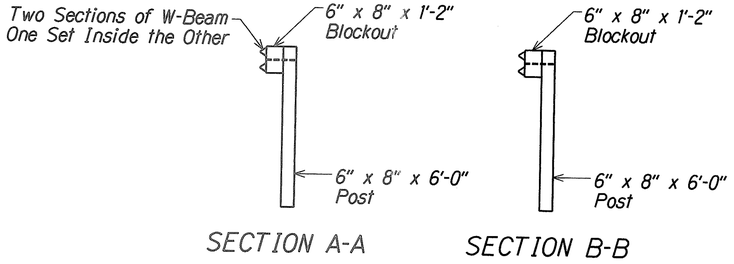
HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

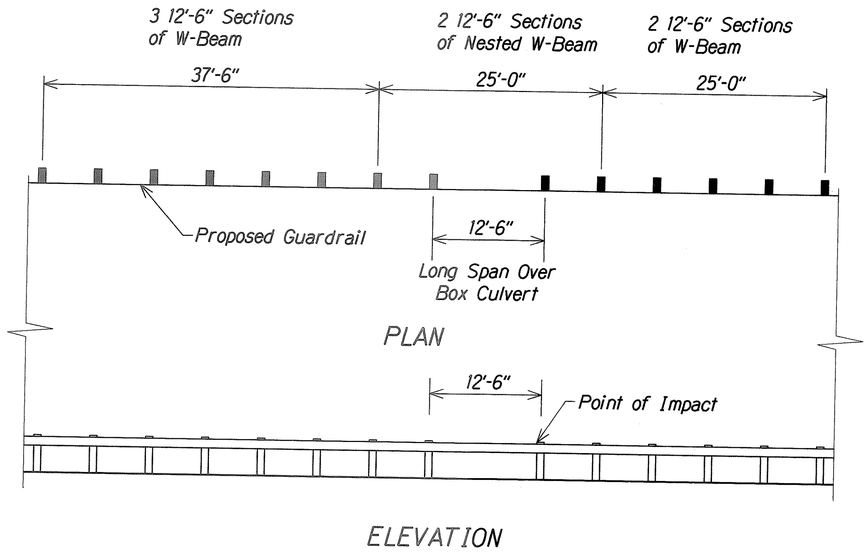
Scale: NTS Date: January, 2001

SHEET No. 8 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	378A-01-00MR	2001	16	73







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

COREY H. KOGASHI
LICENSED PROFESSIONAL ENGINEER
No. 9971-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WAS BE UNDER MY OBSERVATION.

DATE: 5/3/01

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST NESTED W-BEAM

HALEAKALA CRATER ROAD
REPAIRS AND MAINTENANCE
PROJECT NO. 378A-01-00MR

Scale: NTS Date: January, 2001

SHEET No. 9 OF 9 SHEETS