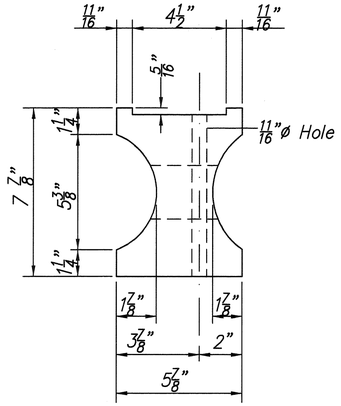
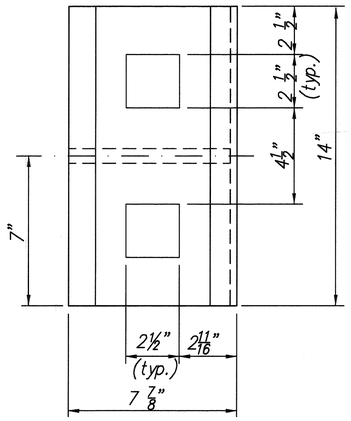
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	44	71

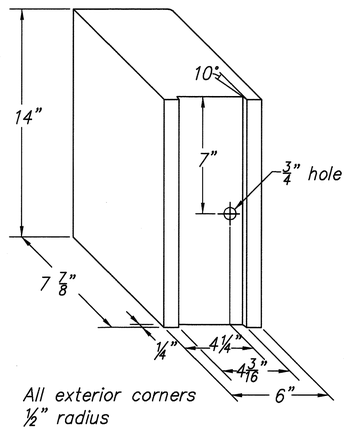


TOP



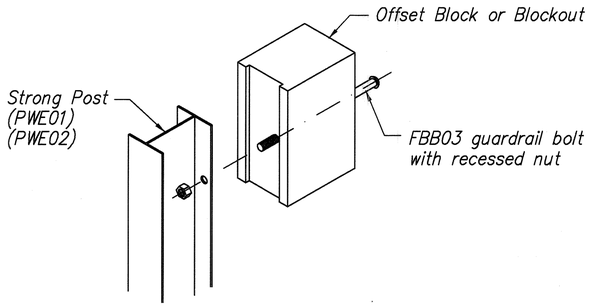
SIDE

RECYCLED PLASTIC BLOCKOUT (TYPE I)



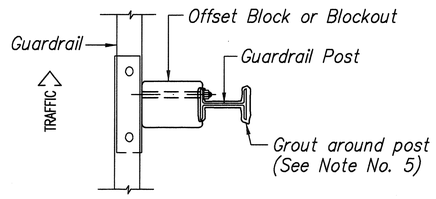
All exterior corners
½" radius

RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)

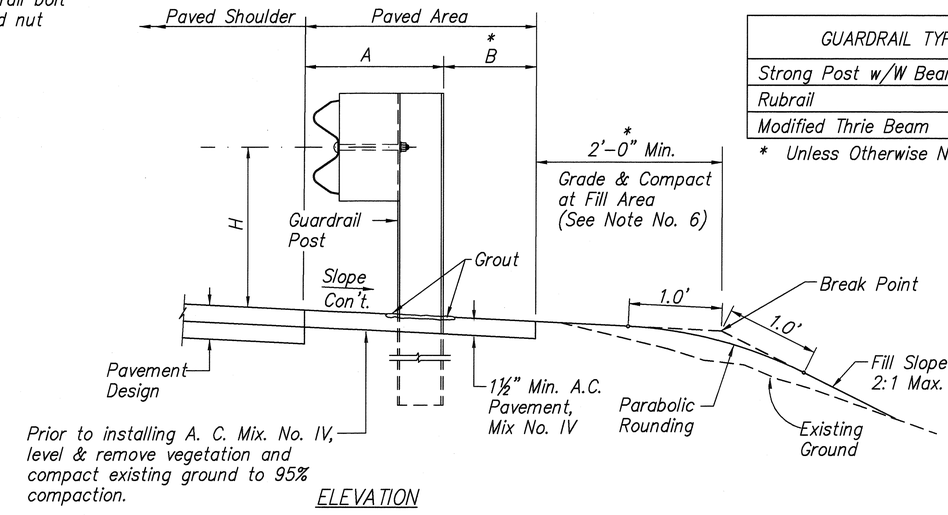


Exploded View
(Rail and washer not shown)

STEEL POST AND BLOCK DETAIL



PLAN



Prior to installing A. C. Mix. No. IV, level & remove vegetation and compact existing ground to 95% compaction.

ELEVATION

TYPICAL GUARDRAIL INSTALLATION

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

* Unless Otherwise Noted

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. After the guardrail posts are installed in the paved area, the Contractor shall grout around the guardrail post and seal all cracks in the paved area that was 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 grouting. The cost for this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.
6. When standards for the fill slope area cannot be met, a site specific, engineer approved design may be used.

FILE: DOT95247
SCALE: 1 = 1
BEG: 3/01/99

PM: HSM
OPR: *RGQ,MSM
REVISED: 06/03/99

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

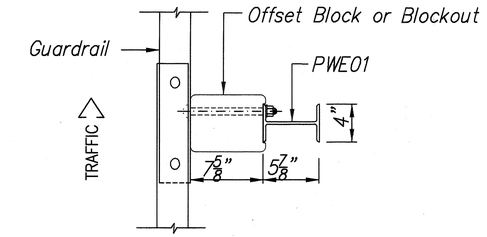
GUARDRAIL DETAILS & NOTES

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

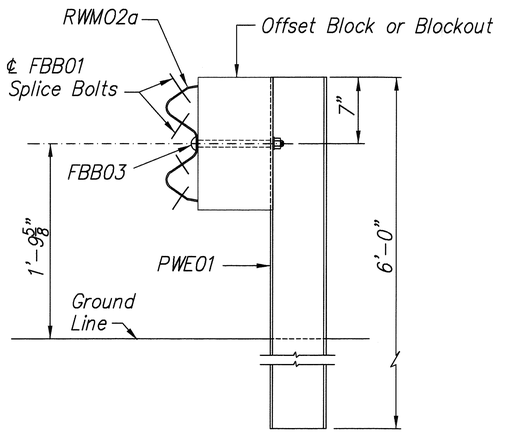
Scale: As shown Date: June 1999

SHEET NO. 1 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	45	71



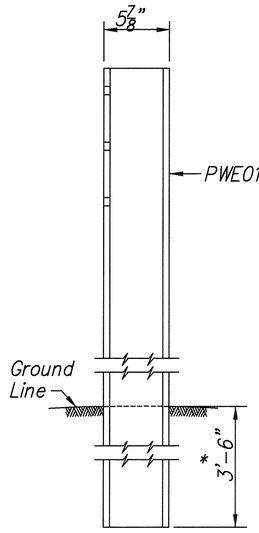
PLAN



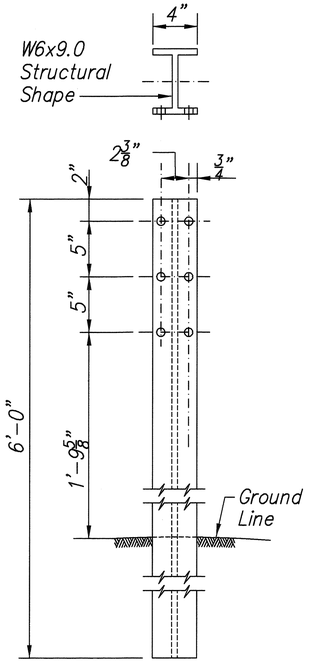
ELEVATION

STRONG POST W-BEAM GUARDRAIL (SGR04a)

NOTE:
All Holes are ¾" Dia.



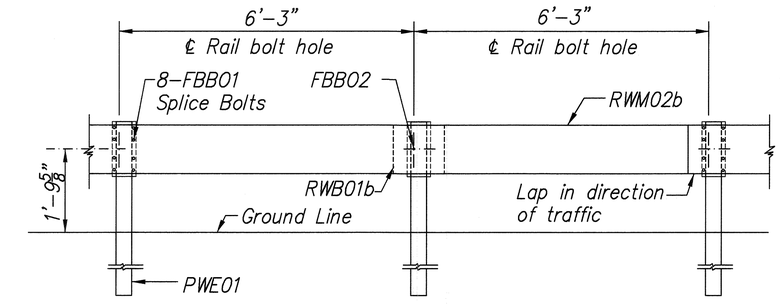
SIDE



FRONT

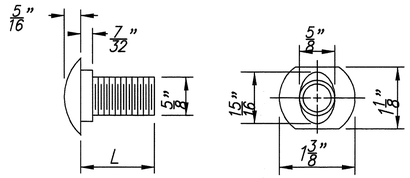
* 5'-6" For 8'-0" Post (See Plan)

W-BEAM STRONG POST (PWE01)

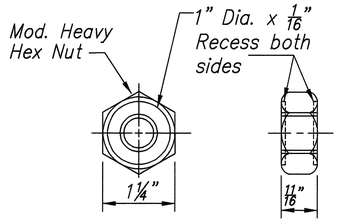


ELEVATION

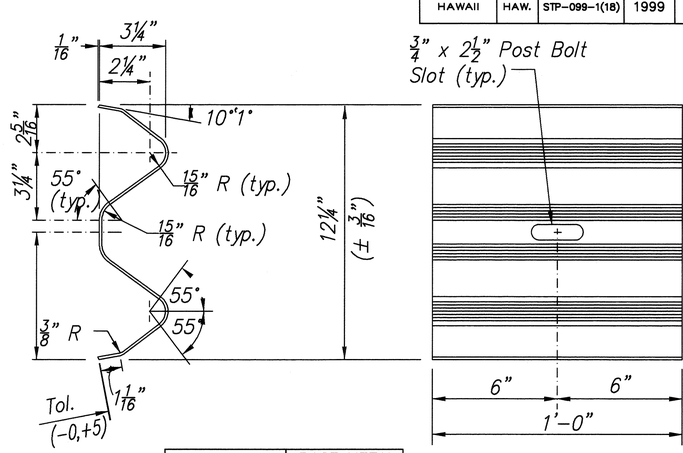
STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



DESIGNATOR	L
FBB01	1⅜"
FBB02	2"
FBB03	10"

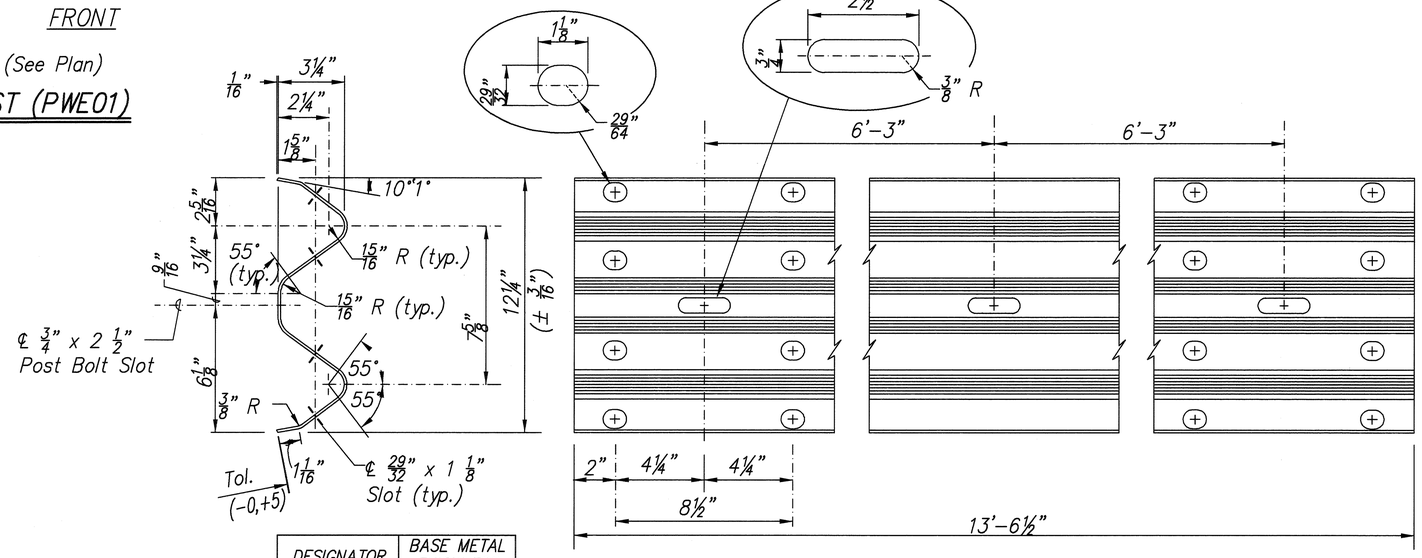


GUARDRAIL BOLTS AND RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWB01b	17/128"

W-BEAM BACK-UP-PLATE (RWB01b)



DESIGNATOR	BASE METAL THICKNESS
RWM02b	17/128"

2 SPACE W-BEAM GUARDRAIL (RWM02b)

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

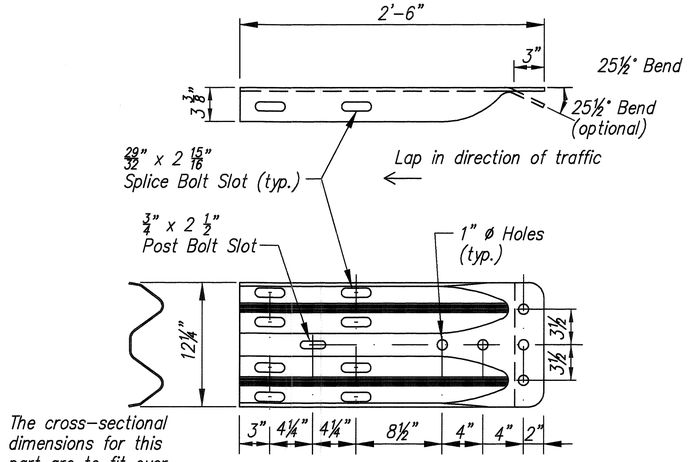
WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

Scale: As shown Date: June 1999

SHEET NO. 2 OF 10 SHEETS

FILE: DOT95248
SCALE: 1 = 1
DES: 3/01/99
PM: HSM
OPR: *RGQ,MSM
REVISED: 06/03/99

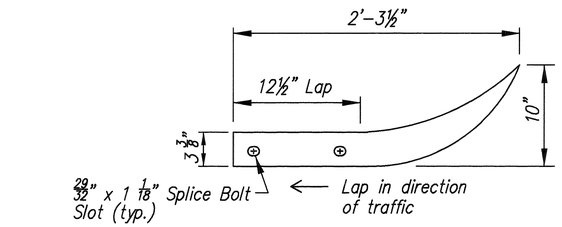
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	46	71



The cross-sectional dimensions for this part are to fit over part RWM02b on the approach end and under part RWM02b on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE02b	17/128"

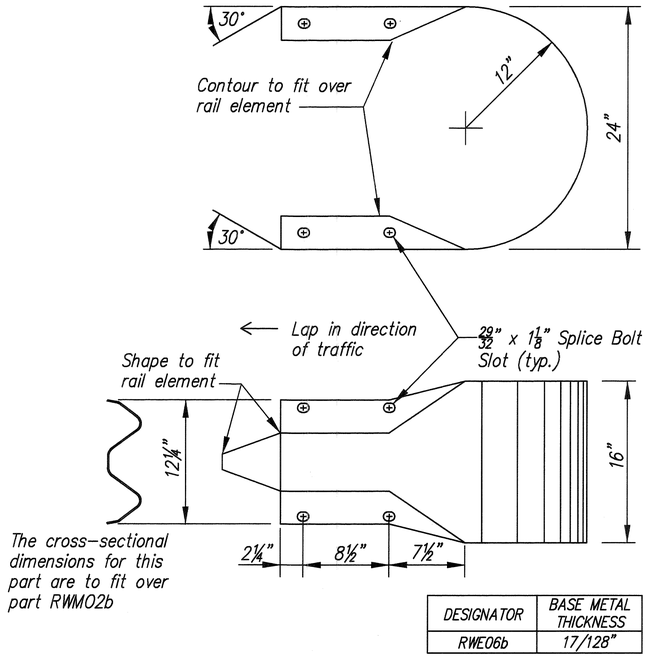
W-BEAM TERMINAL CONNECTOR (RWE02b)



The cross-sectional dimensions for this part are to fit over part RWM02b on the approach end and under part RWM02b on the trailing end.

DESIGNATOR	BASE METAL THICKNESS
RWE01b	17/128"

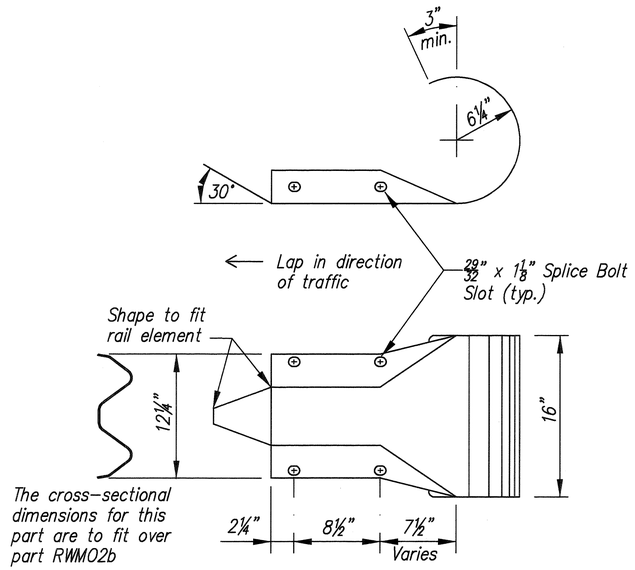
W-BEAM END SECTION (FLARED RWE01b)



The cross-sectional dimensions for this part are to fit over part RWM02b

DESIGNATOR	BASE METAL THICKNESS
RWE06b	17/128"

W-BEAM END SECTION (BUFFER RWE06b)



The cross-sectional dimensions for this part are to fit over part RWM02b

DESIGNATOR	BASE METAL THICKNESS
RWE03a	7/64"

W-BEAM END SECTION (ROUNDED RWE03a)

FILE: DOT95249
SCALE: 1 = 1
BEG: 3/01/99

PM: HSM
OPR: RGO,MSM,*BKM
REVISED: 06/12/99

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

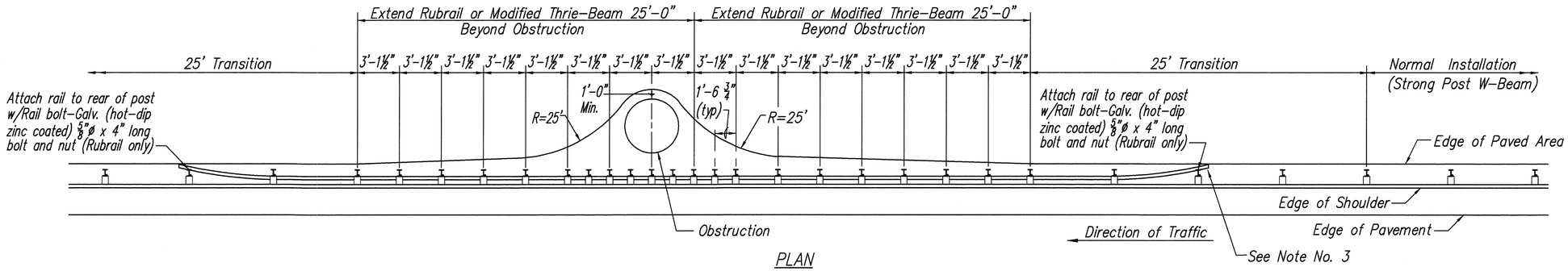
STRONG POST W-BEAM GUARDRAIL

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

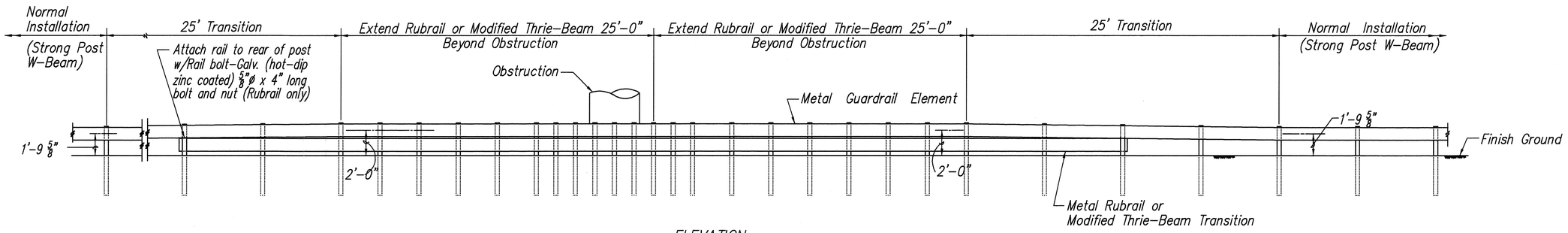
Scale: As shown Date: June 1999

SHEET NO. 3 OF 10 SHEETS

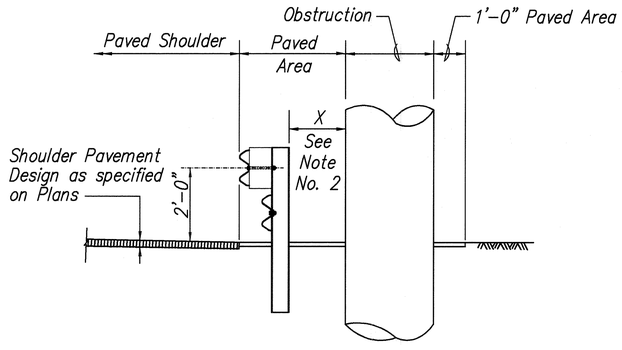
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	47	71



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" ≤ X < 3'-0", Strong Post Rubrail or Modified Thrie-Beam with reduced post spacing.
   3'-0" ≤ X, Strong Post W-Beam or Modified Thrie-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

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS
(AT OBSTRUCTION)

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

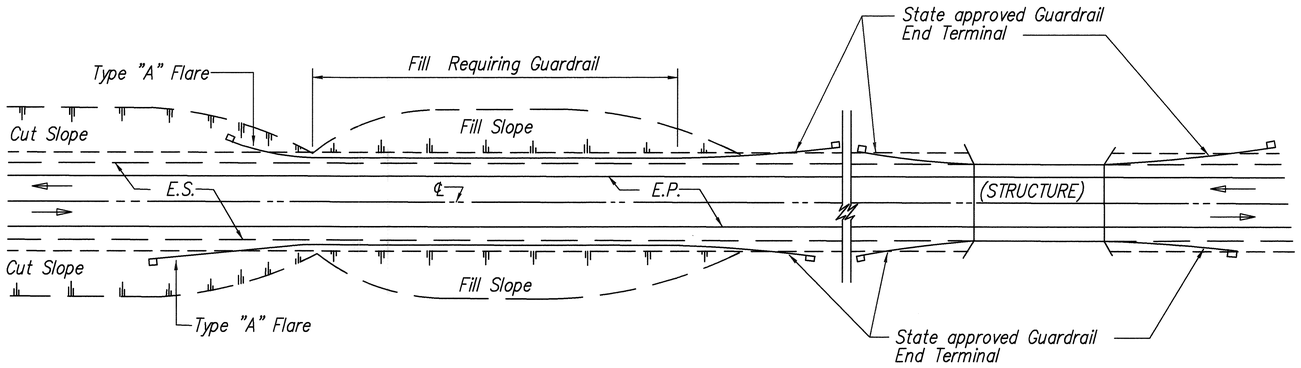
Scale: As shown Date: June 1999

SHEET NO. 4 OF 10 SHEETS

X
FILE: DOT95250
SCALE: 1 = 1
BEG: 3/01/99

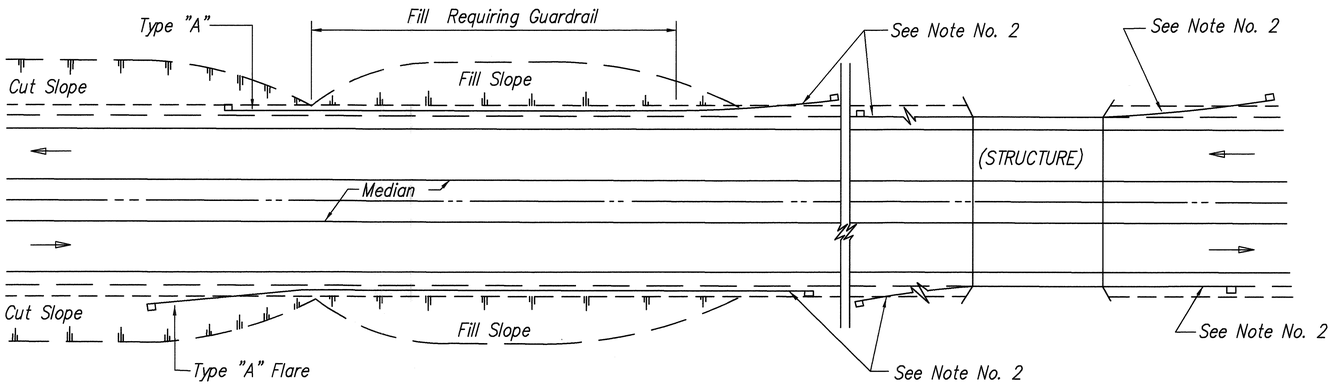
X
PM: HSM
OPR: *RGO.MSM
REVISED: 06/03/99

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	48	71



PLAN

TWO WAY ROADWAY



PLAN

ONE WAY ROADWAY (DIVIDED HIGHWAY)

NOTES:

1. Metal Guardrail connection to concrete structures requires End Post Connection. See Structure Plans.
2. Depending on the existing field conditions, the Engineer shall determine which guardrail end terminal should be installed.
3. Refer to State's most current approved Product List for NCHRP 350 approved Guardrail End Terminals.

FILE: DOT95251
SCALE: 1 = 1
BEG: 3/01/99

PM: HSM
OPR: *RGQ,MSM
REVISED: 06/03/99

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

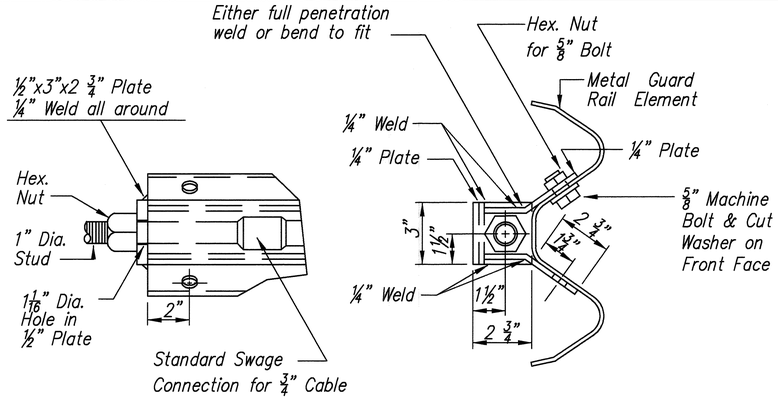
GUARDRAIL DETAILS

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

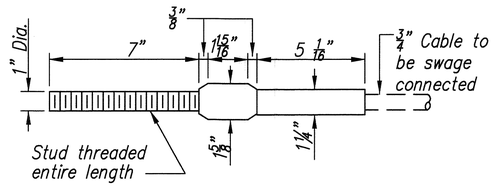
Scale: As shown Date: June 1999

SHEET NO. 5 OF 10 SHEETS

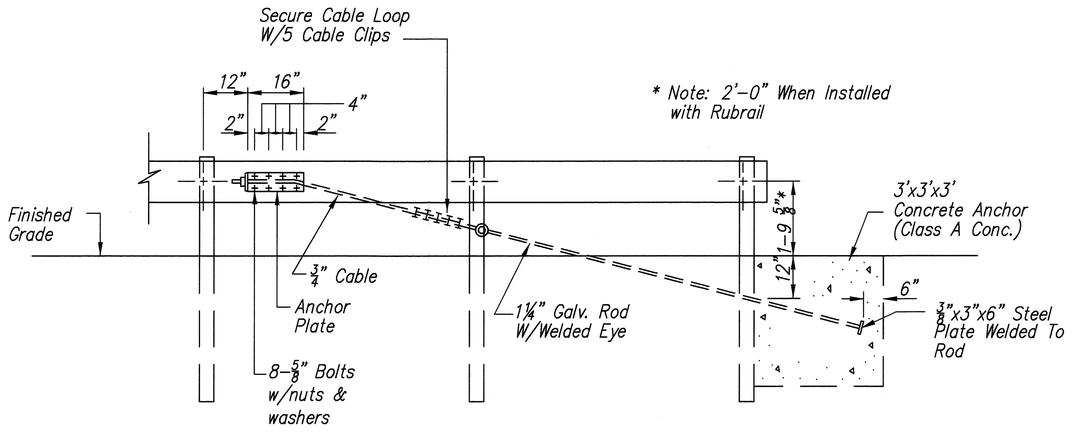
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	49	71



ANCHOR PLATE DETAILS

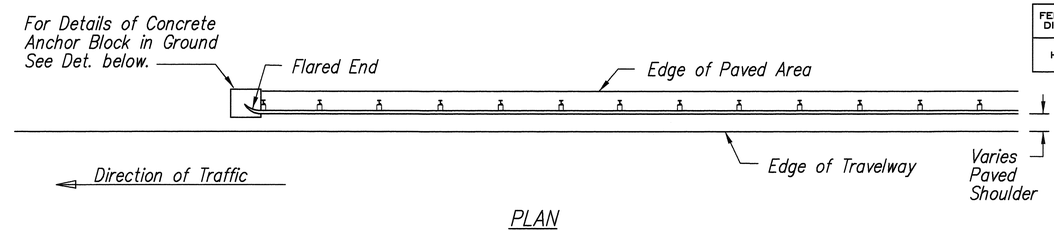


STANDARD SWAGED FITTING AND STUD

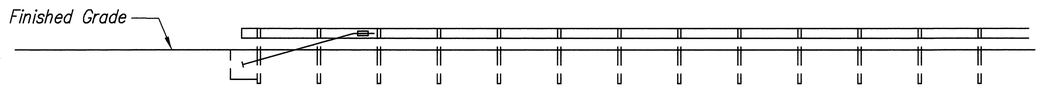


ANCHOR BLOCK DETAIL

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.

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

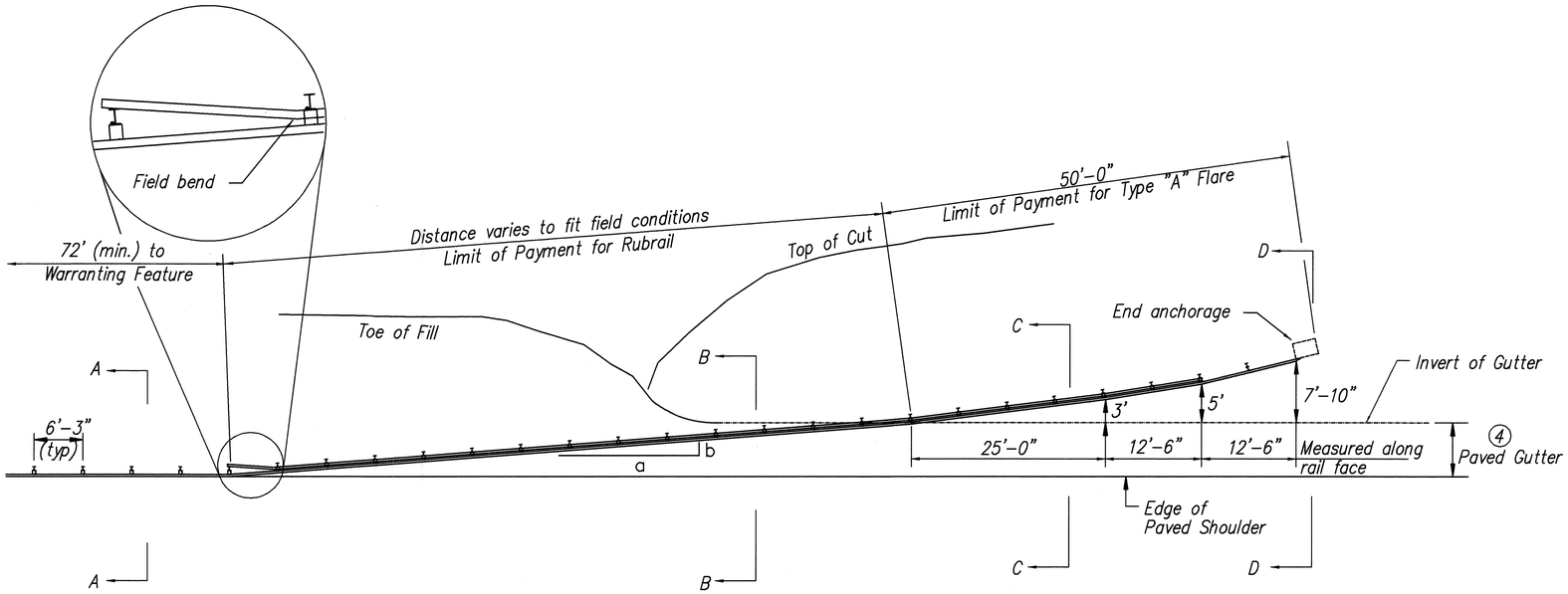
Scale: As shown Date: June 1999

SHEET NO. 6 OF 10 SHEETS

FILE: DOT95252
SCALE: 1 = 1
BEG: 3/01/99

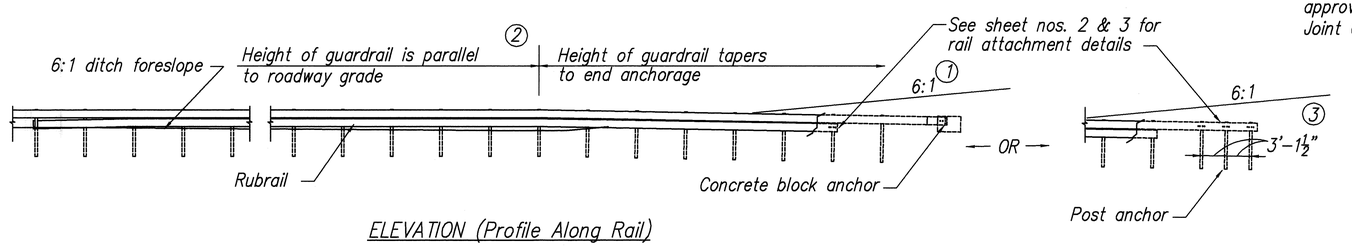
PM: HSM
OPR: *RGQ,MSM
REVISED: 06/03/99

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	50	71

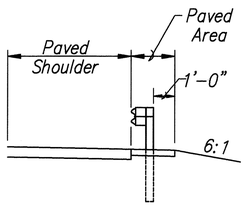


PLAN

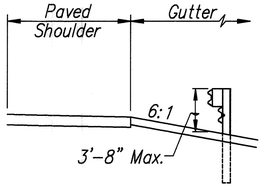
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



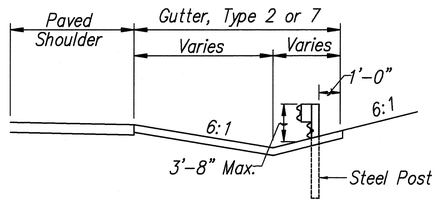
ELEVATION (Profile Along Rail)



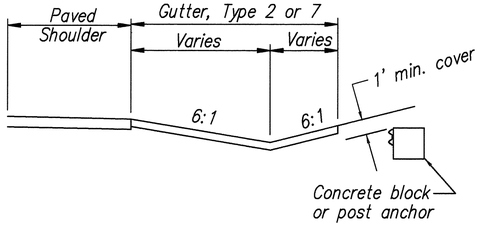
Section A-A



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.

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

FILE: DOT95254
SCALE: 1 = 1
BEG: 3/01/99
PM: HSM
OPR: *RGQ,MSM
REVISED: 06/04/99

BARRY K. MURANAKA ★ LICENSED PROFESSIONAL ENGINEER No.8418-C ★ HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

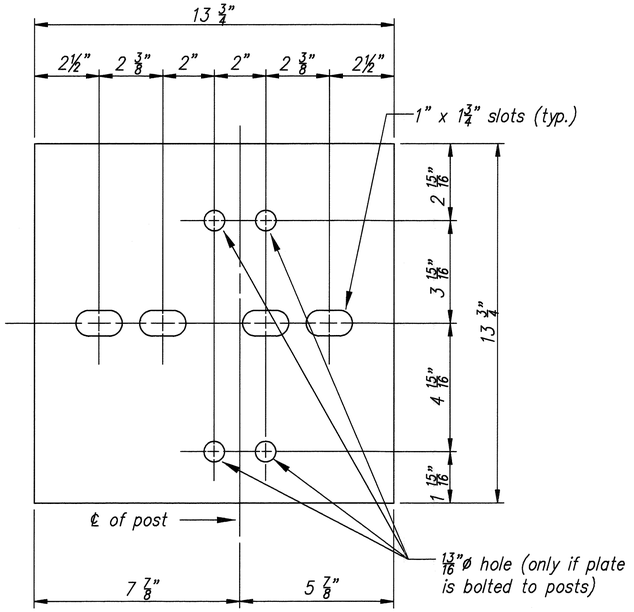
TYPE "A" FLARE

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

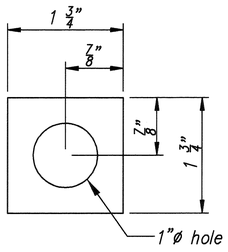
Scale: As shown Date: June 1999

SHEET NO. 7 OF 10 SHEETS

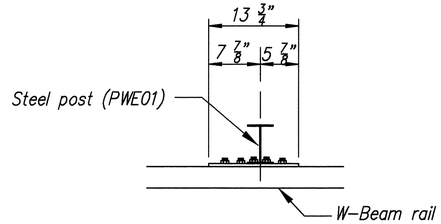
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	51	71



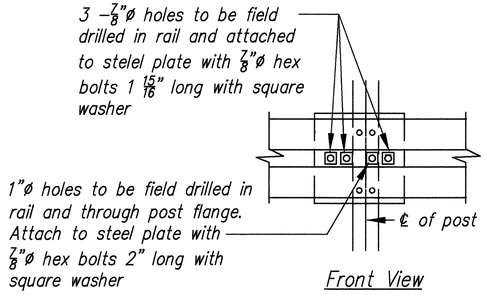
Steel Plate – ½"
(Hot-dip Zinc Coated Galvanized Welded or Bolted to Post)



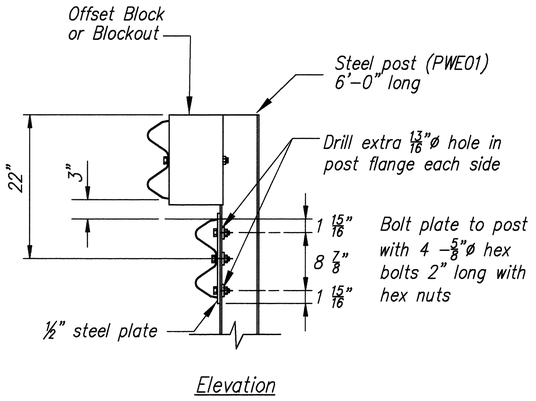
Square Washer
(3/16" Thick – Hot-dip Zinc Coated Galvanized)



Plan

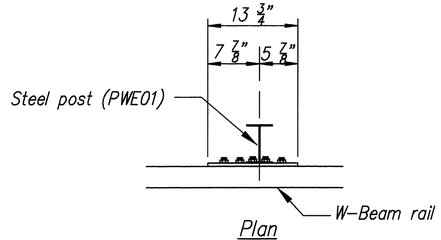


Front View

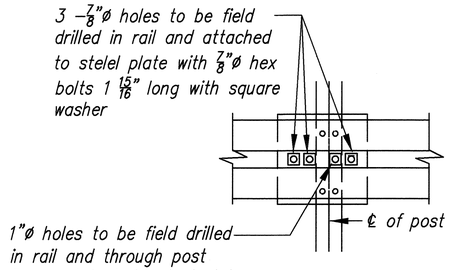


Elevation

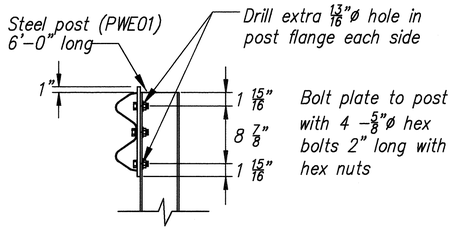
RUBRAIL ANCHOR DETAILS



Plan



Front View



Elevation

POST ANCHOR DETAILS

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.

FILE: DOT95255
SCALE: 1 = 1
BEG: 3/01/99
PM: HSM
OPR: *RGQ,MSM
REVISED: 06/04/99

BARRY K. MURANAKA
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No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

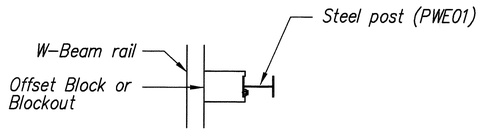
TYPE "A" FLARE

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

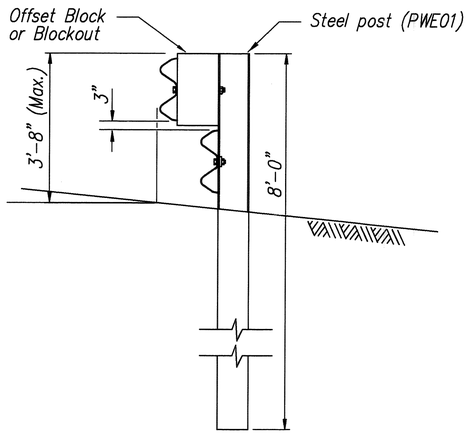
Scale: As shown Date: June 1999

SHEET NO. 8 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	52	71

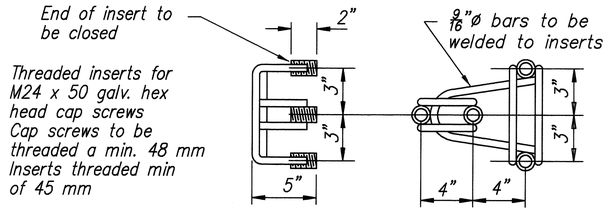


Plan

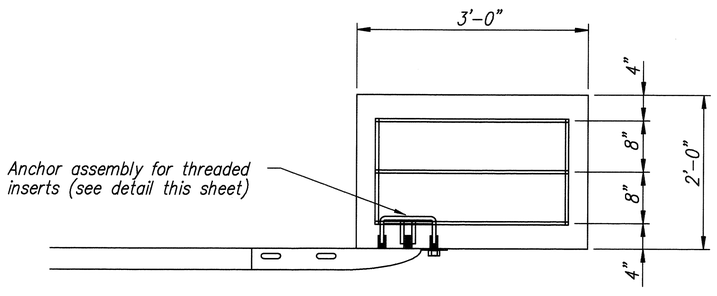


Elevation

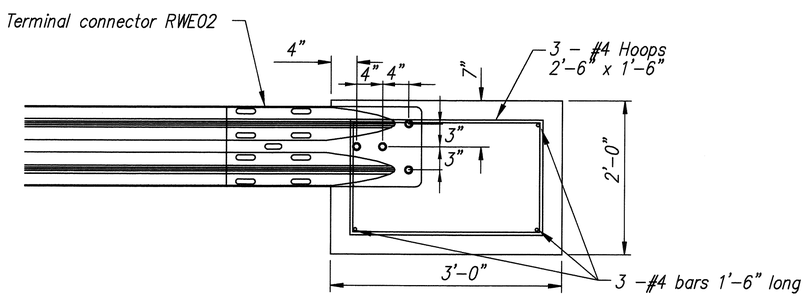
STEEL POST GUARDRAIL WITH RUBRAIL



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.

FILE: DOT95256
SCALE: 1" = 1'
DES: 3/01/99
PM: HSM
OPR: *RGQ
REVISED: 06/04/99

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

"THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

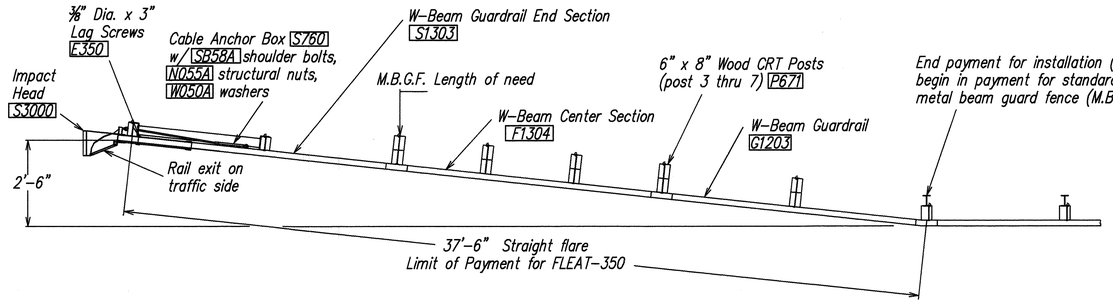
TYPE "A" FLARE

WILIKINA DR. INTERSECTION IMPROVEMENTS
AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

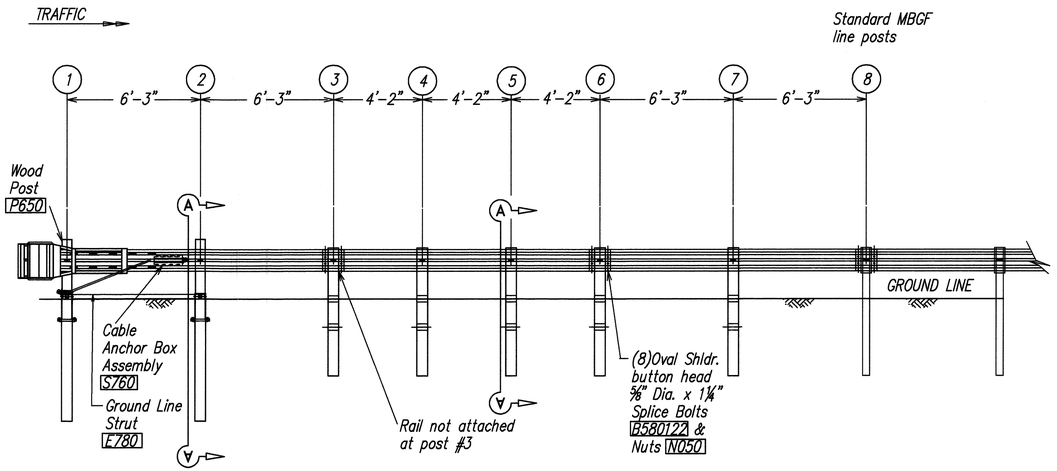
Scale: As shown Date: June 1999

SHEET NO. 9 OF 10 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-099-1(18)	1999	53	71



PLAN



ELEVATION

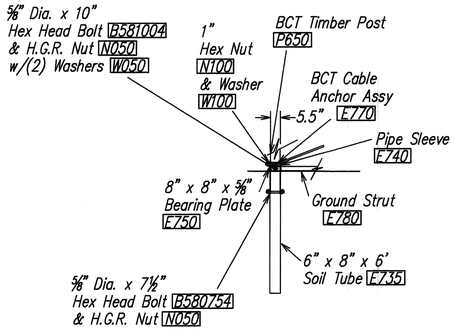
GENERAL NOTES

1. Wood posts are required with the fleat.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The soil tube 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. They shall not be driven with the wood post in the tube. If the soil 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. 2½" 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. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
8. For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will require field drilling new holes to accommodate the rail to the post connecting bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the engineer.

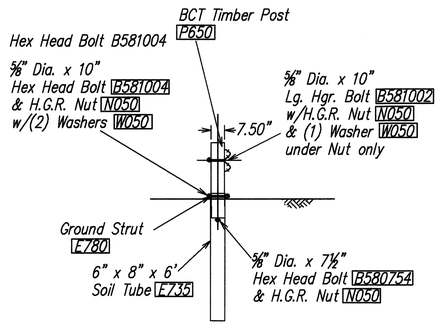
ITEM NO.	QTY	BILL OF MATERIALS
S3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SEC., 12 GA.
G1203	1	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 6'
E740	1	PIPE SLEEVE
E750	1	BEARING PLATE, 8" x 8" x 5/16"
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
P650	2	5.5" x 7.5" x 45" WOOD POSTS
P671	5	6" x 8" x 6' WOOD CRT POST
P675	5	6" x 8" x 14" TIMBER BLOCKOUT
		HARDWARE
B580122	24	5/8" Dia. x 1¼" SPLICE BOLT
B580754	2	5/8" Dia. x 7½" HEX BOLT
B581004	2	5/8" Dia. x 10" HEX BOLT
B581002	1	5/8" Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B581802	5	5/8" Dia. x 18" H.G.R. BOLT (POST 3-7)
N050	34	5/8" Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, STRUT 2, POST 2, 1; POST 3 THRU 7, 5.)
W050	10	5/8" Dia. H.G.R. WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
E350	2	3/8" x 3" LAG SCREW
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLTS
N055A	8	½" A325 STRUCTURAL NUTS
W050A	16	1 1/16 OD X 9/16 ID A325 STR. WASHER

Foundation Tube Options For Posts 1 & 2

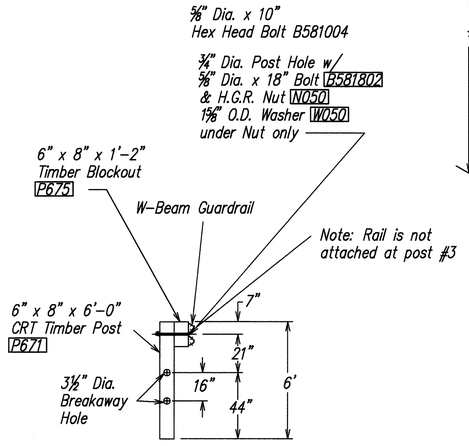
*6'-0" Split Foundation Tubes S730
*6'-0" Solid Foundation Tubes E731
*5'-0" Foundation Tubes S735 W/Soil Plates SP600
*4'-6" Foundation Tubes E735 W/Soil Plates SP600



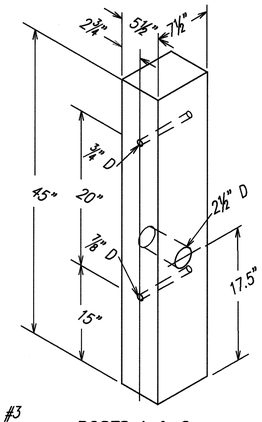
PARTIAL VIEW OF POST 1



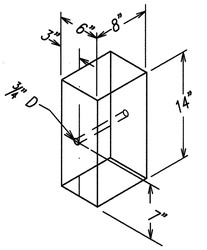
SECTION A-A
at Post #2



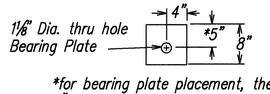
SECTION B-B
typical @ Post 3 - 7



POSTS 1 & 2



TIMBER BLOCKOUT



*for bearing plate placement, the 5" side should be installed up

BEARING PLATE E750

DATE	REVISION

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

FLEAT-350

FLARED ENERGY ABSORBING TERMINAL

WILIKINA DR. INTERSECTION IMPROVEMENTS AT KAMANANUI ROAD
Federal Aid Project No. STP-099-1(18)

Scale: As shown Date: June 1999

SHEET NO. 10 OF 10 SHEETS

PM: STY
OPER: CKY,SALKKF,BKM,*RGQ
REVISED: 03/29/99

FILE: DOT95245
SCALE: 1=1
BEG: 03/06/97

ORIGINAL PLANS	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTEBOOK	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	