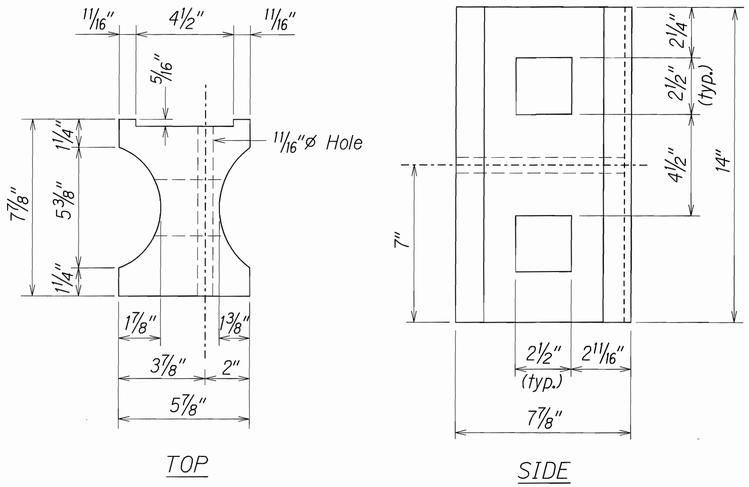
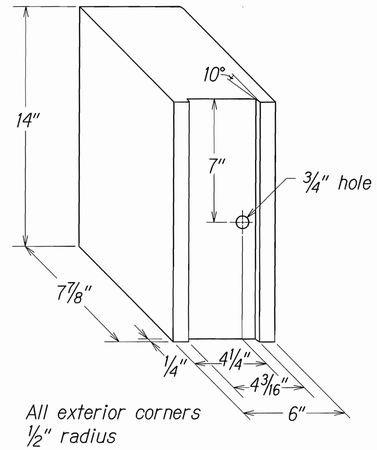
DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	31	42

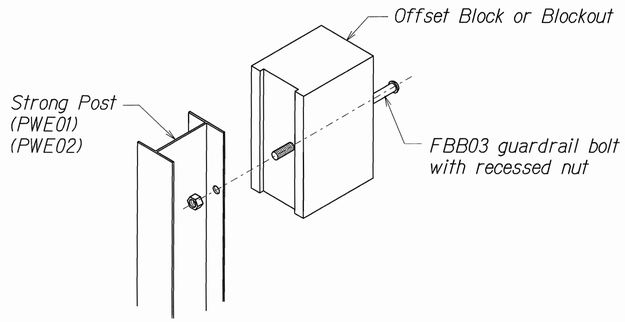


TOP SIDE

RECYCLED PLASTIC BLOCKOUT (TYPE I)

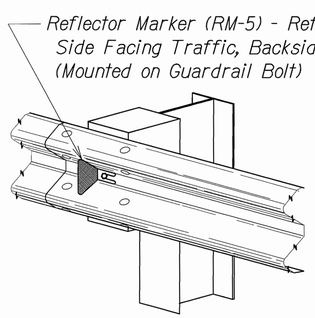


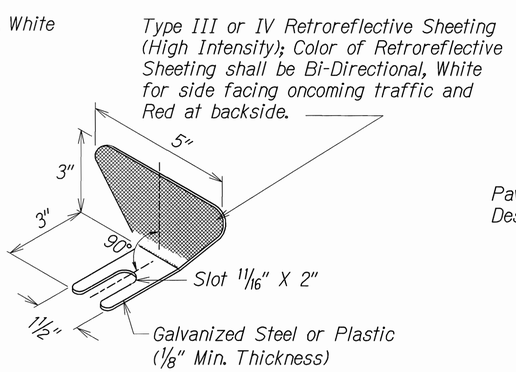
RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)



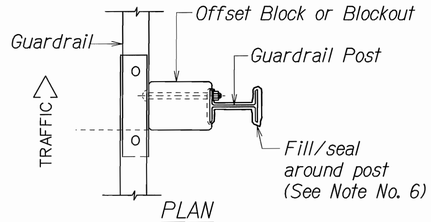
Exploded View
(Rail and washer not shown)

STEEL POST AND BLOCK DETAIL

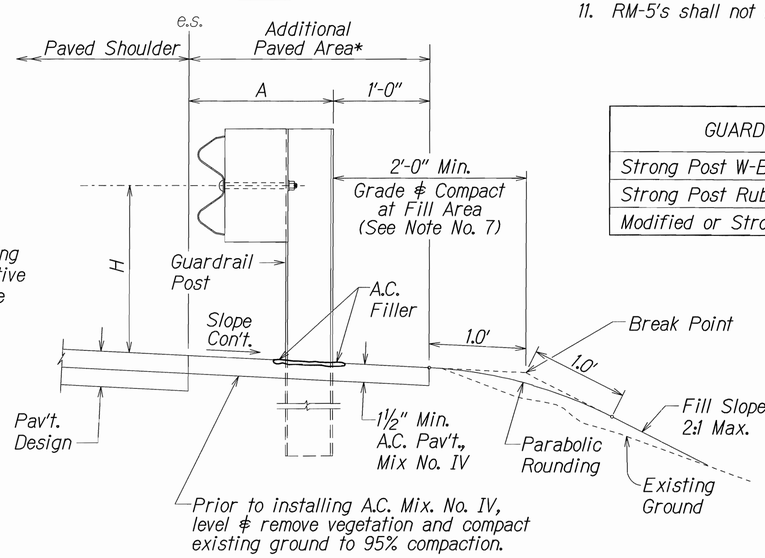




REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION



PLAN



ELEVATION

TYPICAL GUARDRAIL 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 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 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.
10. Reflector Markers (RM-5) shall be bi-directional with white and red retroreflective sheeting.
11. RM-5's shall not be installed on the End Terminals.

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

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY X	
NOTE BOOK hal.jk	TRACED BY X	
N:\dot\tegrdrls\	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	

12/31/03 tdr:/dot/guardrail/rs50rev.dgn standard plan TE-50 09/01/00 (EH)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

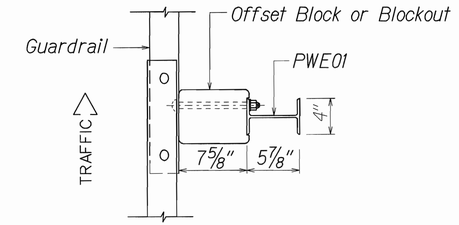
GUARDRAIL DETAILS & NOTES

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

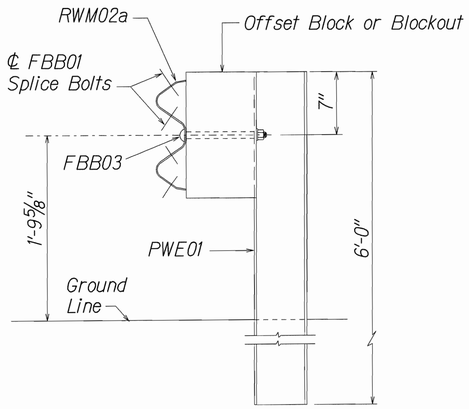
Scale: NTS Date: June, 2012

SHEET No. 1 OF 10 SHEETS

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2011	32	42



PLAN

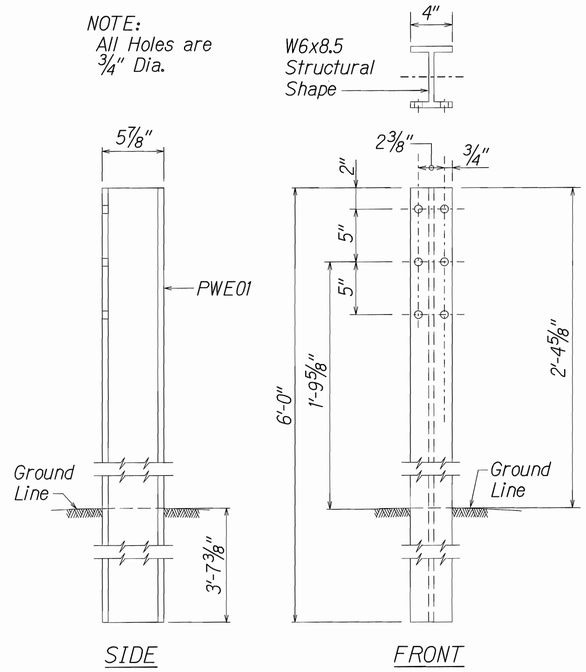


ELEVATION

STRONG POST W-BEAM GUARDRAIL

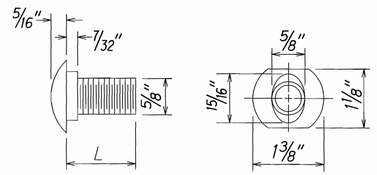
(SGR04a)

NOTE:
All Holes are 3/4" Dia.

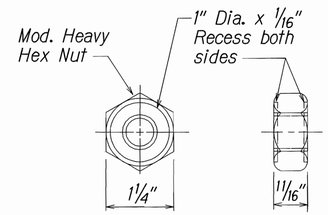


SIDE FRONT

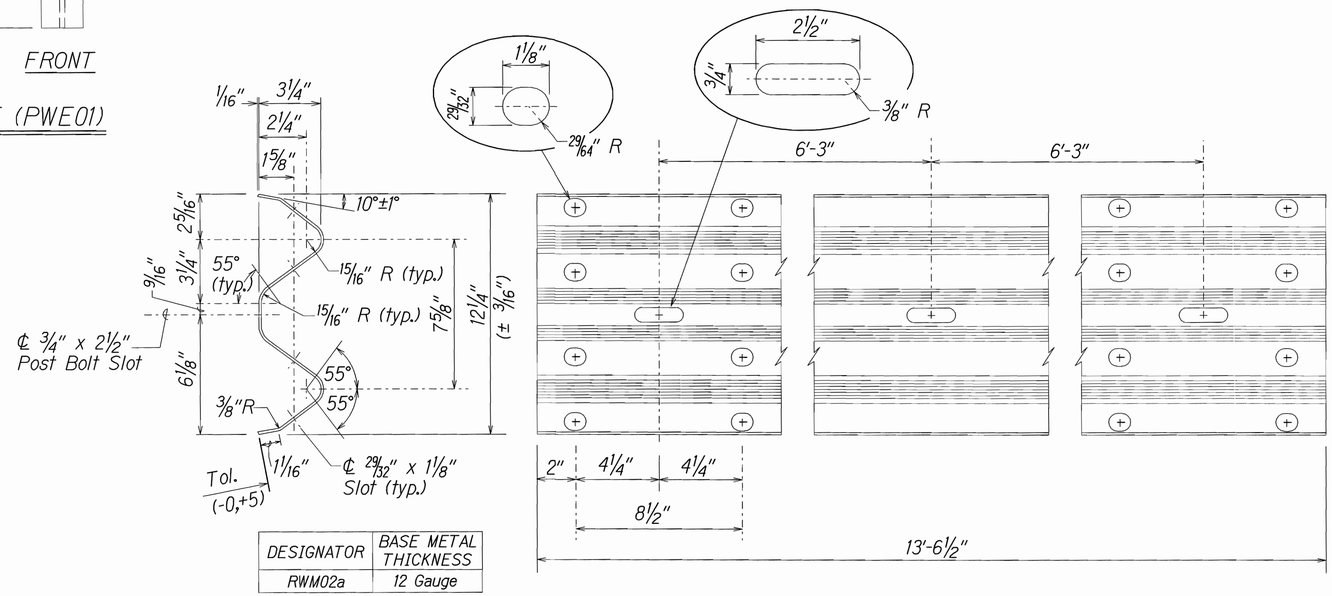
W-BEAM STRONG POST (PWE01)



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

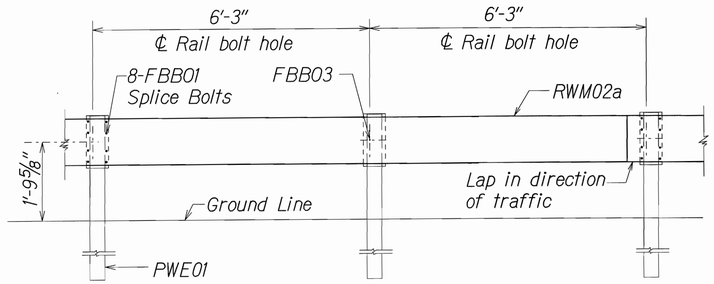


GUARDRAIL BOLTS AND RECESSED NUT



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Gauge

2 SPACE W-BEAM GUARDRAIL (RWM02a)



ELEVATION

STRONG POST W-BEAM GUARDRAIL WITH

RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY JL	
	TRACED BY JL	
NOT'S BOOK	DESIGNED BY JL	
DATE	QUANTITIES BY	
No.	CHECKED BY	

rdl:ruby/guardrail/wbeamsdgn (standard plan TE-90 r03/06/87) (B-2)

r11/01/05

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

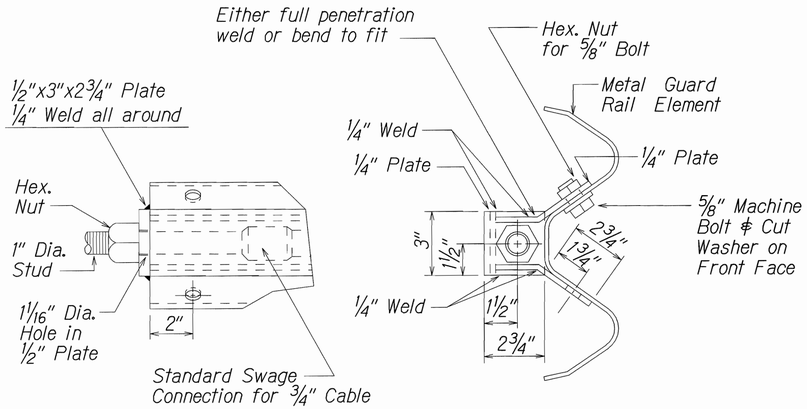
STRONG POST W-BEAM GUARDRAIL

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

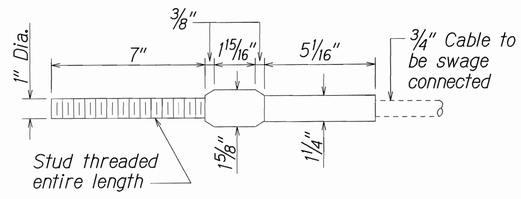
Scale: NTS Date: June, 2012

SHEET No. 2 OF 10 SHEETS

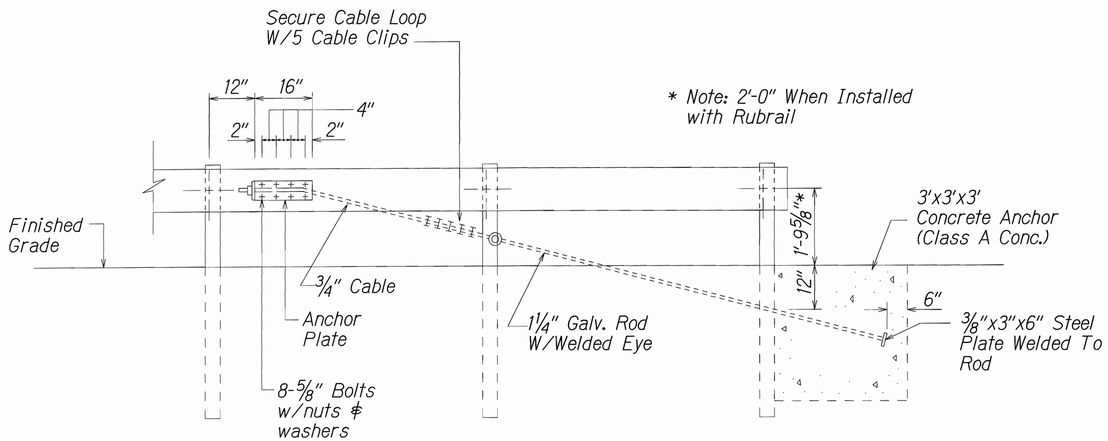
DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	33	42



ANCHOR PLATE DETAILS

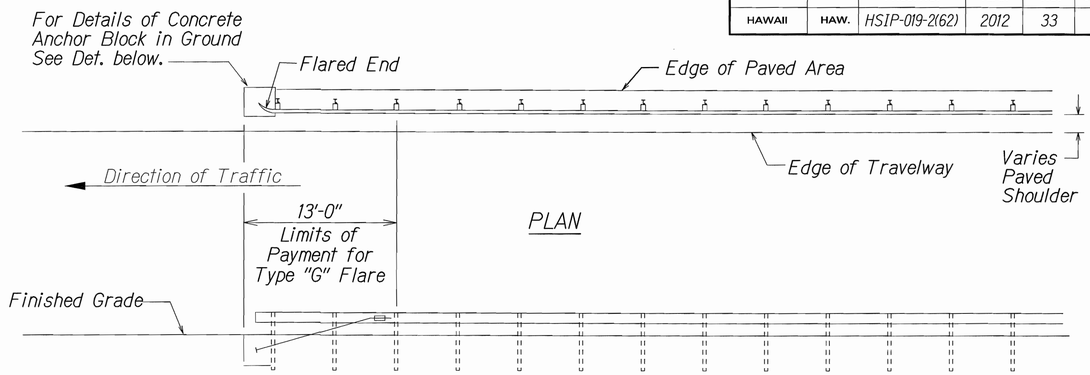


STANDARD SWAGED FITTING AND STUD



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. 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	DATE
	DRAWN BY A.
NOTE BOOK hsi/k	TRACED BY
N:\hsi\grd\3.dgn	DESIGNED BY
	QUANTITIES BY
	CHECKED BY

r3/13/02 hdr/ruby/guardrail/1e59revdgn (standard plan TE-59 rd1/03/89) (B-8)

REDUCED PLAN
(HALF SIZE)
0 1 2 3
3 INCHES OF ORIGINAL PLAN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

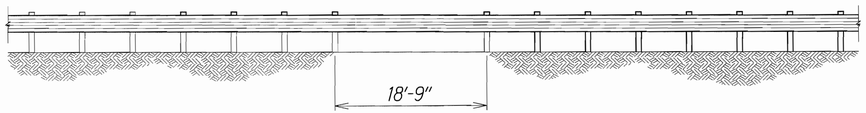
GUARDRAIL DETAILS

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

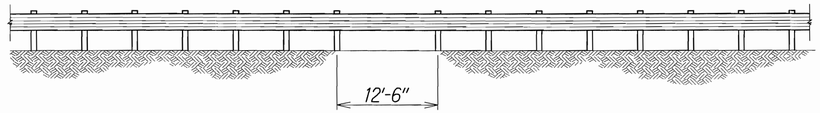
Scale: NTS Date: June, 2012

SHEET No. 3 OF 10 SHEETS

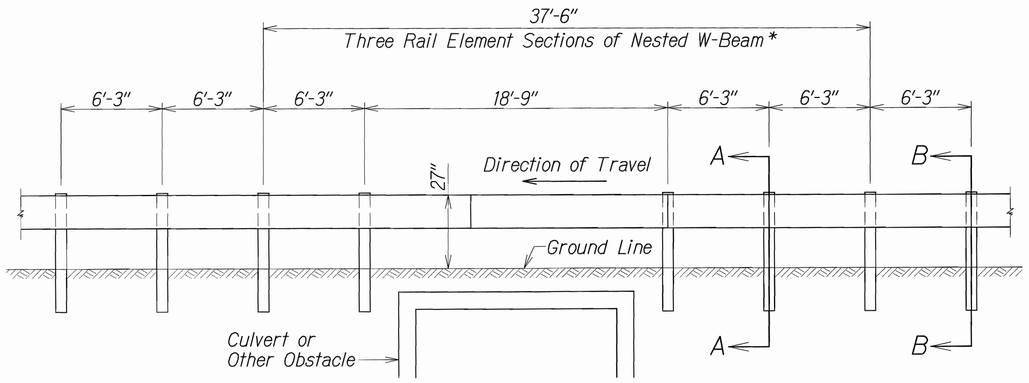
DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	34	42



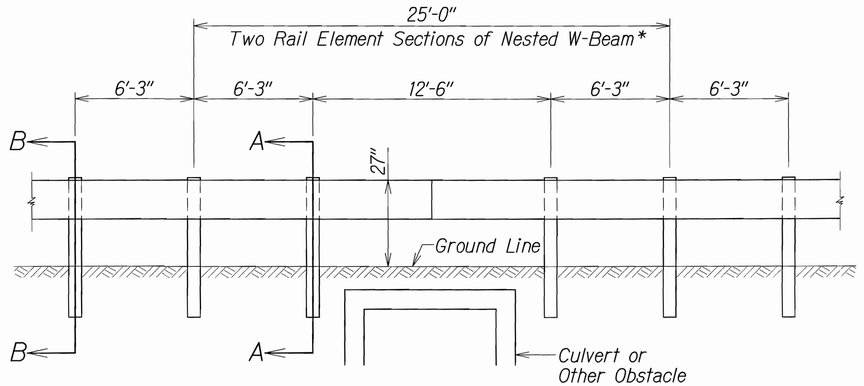
LONG SPAN OVER CULVERT



LONG SPAN OVER CULVERT

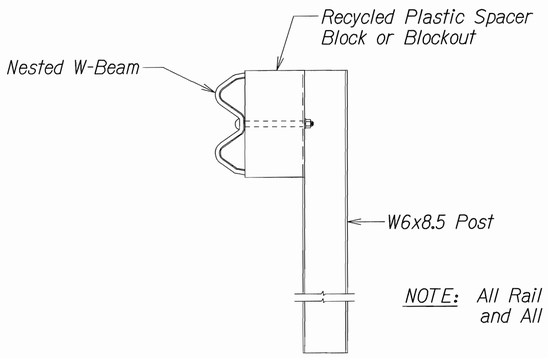


NESTED LONG SPAN STRONG POST
W-BEAM GUARDRAIL OVER 18'-9" CULVERT
(MAXIMUM DYNAMIC DEFLECTION OF 3.2 FT.)

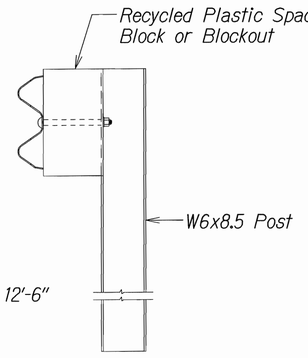


(SPLICE IN CENTER OF 12'-6" SPACING)

NESTED LONG SPAN STRONG POST
W-BEAM GUARDRAIL OVER 12'-6" CULVERT
(MAXIMUM DYNAMIC DEFLECTION OF 3.1 FT.)



SECTION A-A



SECTION B-B

NOTE: All Rail Elements Sections are 12'-6" and All Posts are 6' Long

*Note: All nested W-Beam splices points shall be staggered.

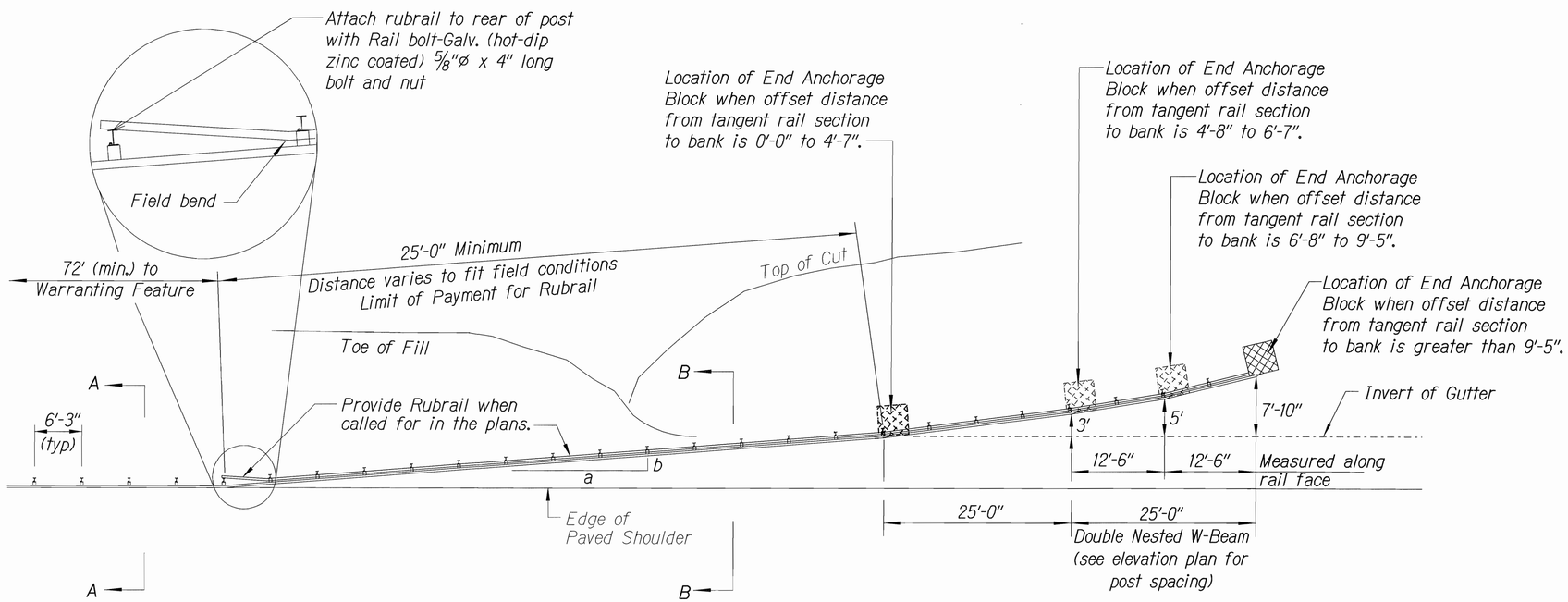
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
NESTED LONG SPAN STRONG POST
W-BEAM GUARDRAIL OVER CULVERT
HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)
Scale: NTS Date: June, 2012

SHEET No. 4 OF 10 SHEETS

ORIGINAL PLAN
SURVEY PLOTTED BY DATE
DRAWN BY X
TRACED BY
DESIGNED BY X
QUANTITIES BY
CHECKED BY
NOTE BOOK hsip019-2(62)
No. 2011sgr04.dgn

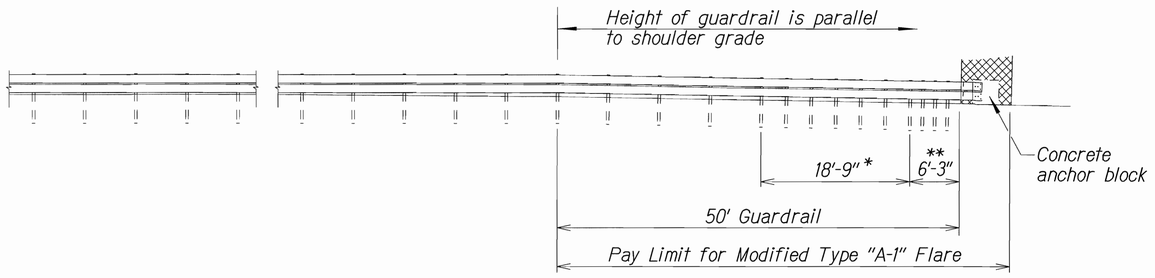
tdr:uby/guardrail/nstdwbeam5.dgn
4/22/04

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAI'I	HAW.	HSIP-019-2(62)	2012	35	42



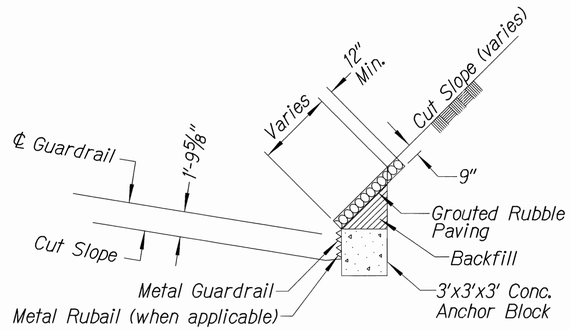
PLAN

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

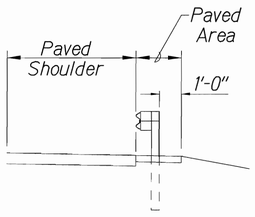


* Posts at 3'-1½" o.c.
** Posts at 1'-6¾" o.c.

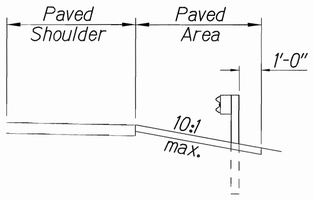
ELEVATION (Profile Along Rail)



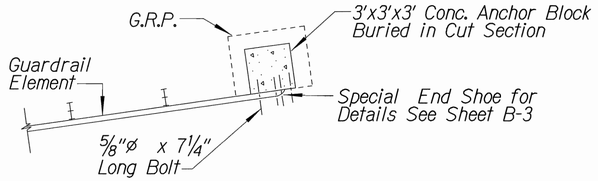
ANCHOR BLOCK IN CUT SECTION



Section A-A



Section B-B



PLAN - ANCHOR BLOCK IN CUT SECTION

General Notes

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

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY X	
	TRACED BY	
	DESIGNED BY X	
	QUANTITIES BY	
	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

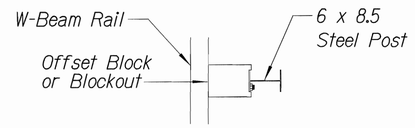
MODIFIED TYPE "A-1" FLARE

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

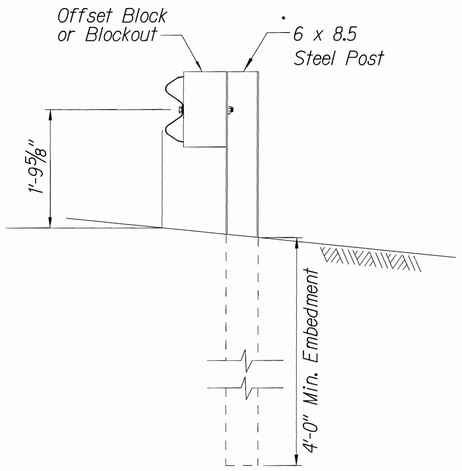
Scale: NTS Date: June, 2012

SHEET No. 5 OF 10 SHEETS

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	36	42

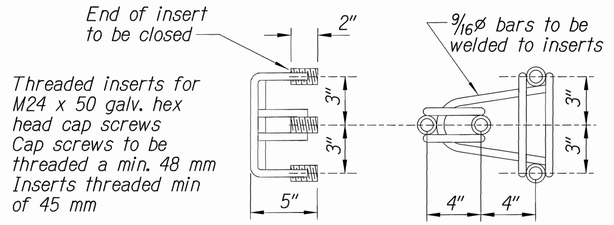


Plan

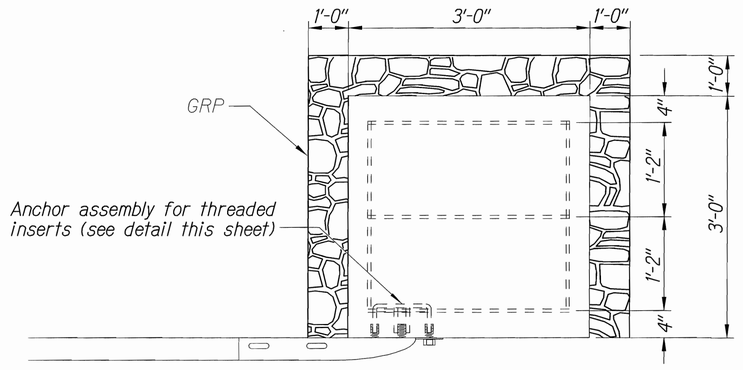


Elevation

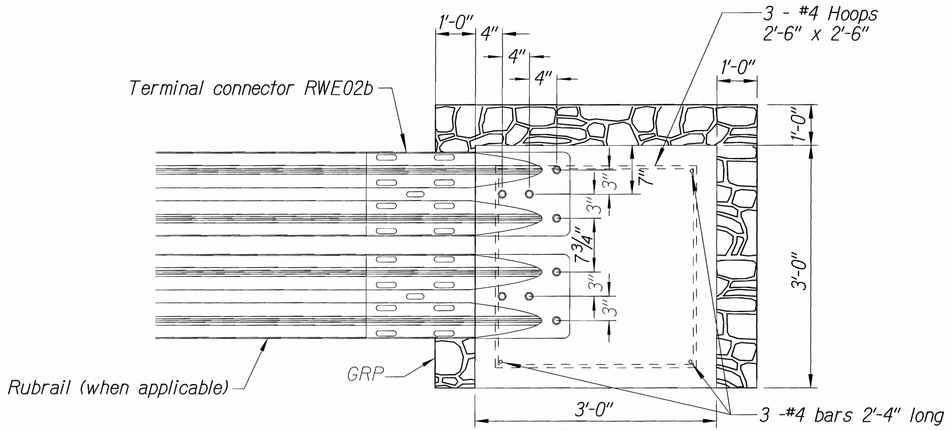
STRONG POST W-BEAM GUARDRAIL



ANCHOR ASSEMBLY
CONCRETE BLOCK ANCHOR



Plan



Elevation

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

BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
MODIFIED TYPE "A-1" FLARE

Note:

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

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY X	
NOTE BOOK	TRACED BY X	
	DESIGNED BY	
hel/k	QUANTITIES BY	
N:\altgrd\dsf	CHECKED BY	

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

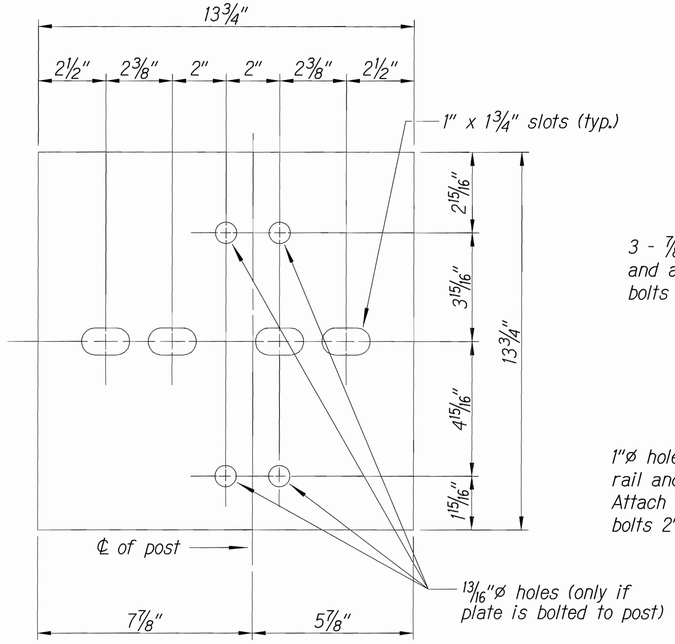
MODIFIED TYPE "A-1" FLARE

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

Scale: NTS Date: June, 2012

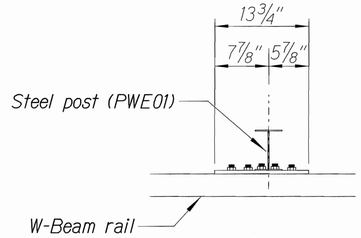
SHEET No. 6 OF 10 SHEETS

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAI'I	HAW.	HSIP-019-2(62)	2012	37	42

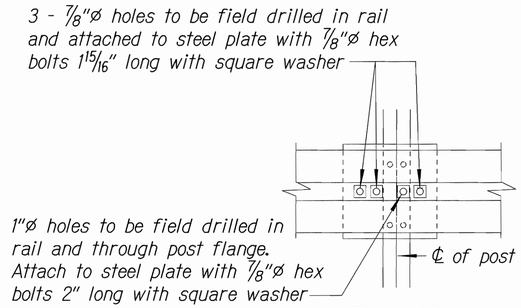


Steel Plate - ½"

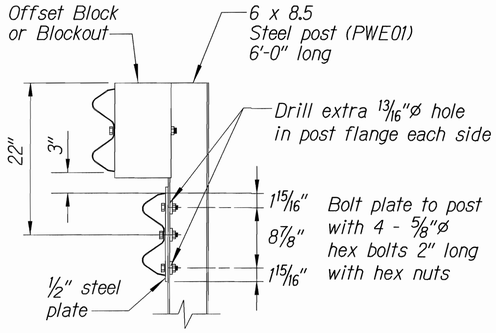
(Hot-dip Zinc Coated Galvanized- Welded or Bolted to Post)



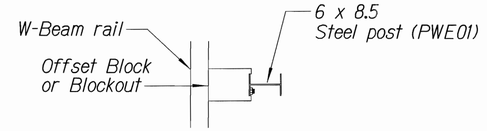
Plan



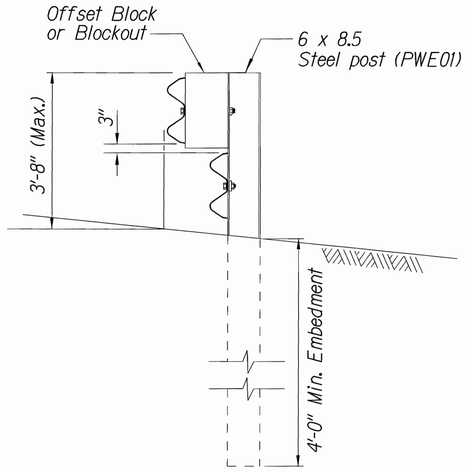
Front View



Elevation



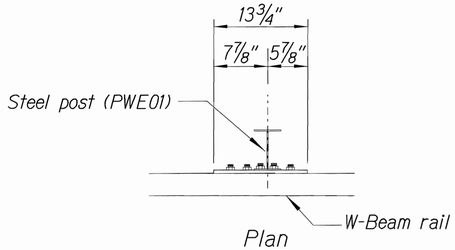
Plan



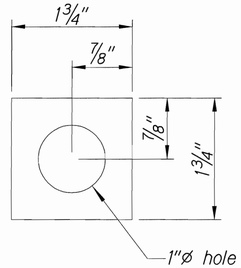
Elevation

RUBRAIL ANCHOR DETAILS

STEEL POST GUARDRAIL WITH RUBRAIL

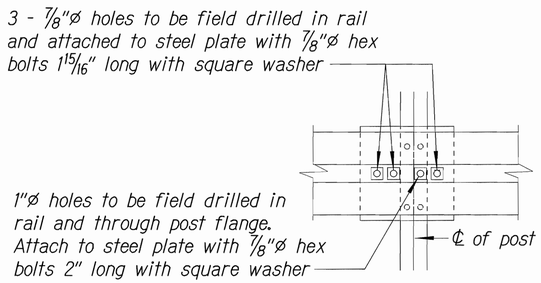


Plan

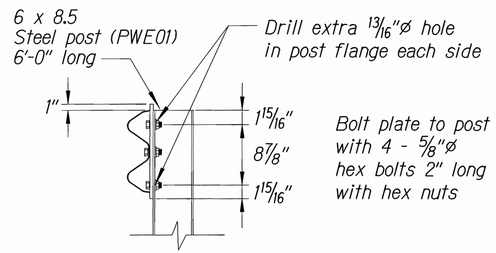


Square Washer

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



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.

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

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY X	
NOTE BOOK	TRACED BY	
	DESIGNED BY X	
	QUANTITIES BY	
	CHECKED BY	

hel/k /oldtsgrd1.dgn
15/2/01 tdr:ruby/guardrail/flare_al_3.dgn (B-10C)

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MODIFIED TYPE "A-1" FLARE RUBRAIL DETAILS

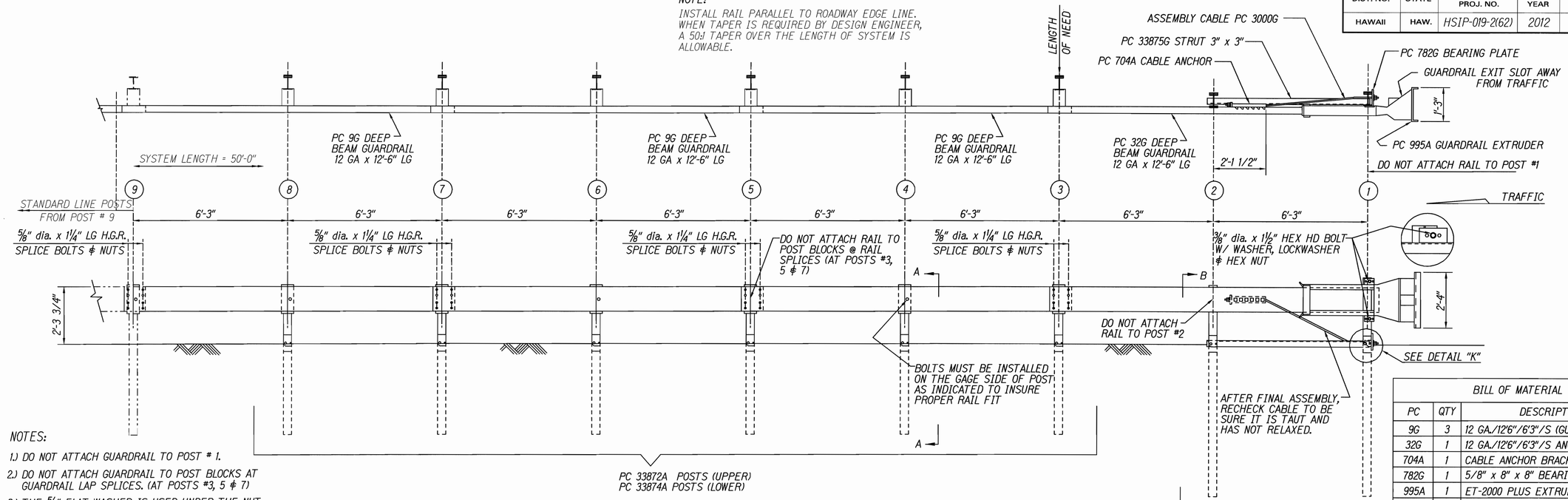
HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

Scale: NTS Date: June, 2012

SHEET No. 7 OF 10 SHEETS

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	38	42

NOTE:
INSTALL RAIL PARALLEL TO ROADWAY EDGE LINE. WHEN TAPER IS REQUIRED BY DESIGN ENGINEER, A 50:1 TAPER OVER THE LENGTH OF SYSTEM IS ALLOWABLE.



NOTES:

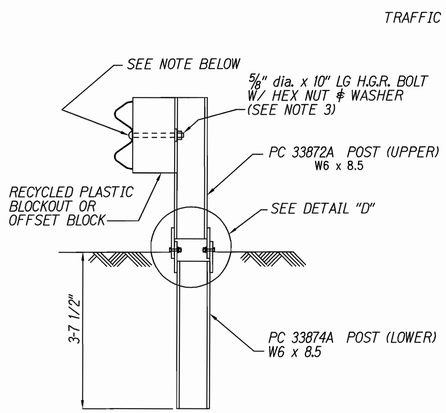
1.) DO NOT ATTACH GUARDRAIL TO POST # 1.

2.) DO NOT ATTACH GUARDRAIL TO POST BLOCKS AT GUARDRAIL LAP SPLICES. (AT POSTS #3, 5 & 7)

3.) THE 5/8" FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.

4.) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF TERMINAL.

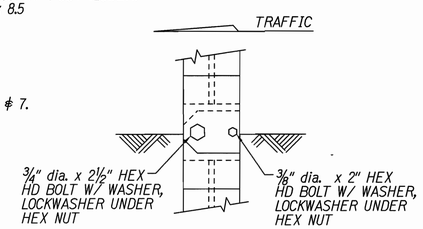
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
9G	3	12 GA./12'6"/6'3"/S (GUARDRAIL)
32G	1	12 GA./12'6"/6'3"/S ANC (GUARDRAIL)
704A	1	CABLE ANCHOR BRACKET
782G	1	5/8" x 8" x 8" BEARING PLATE
995A	1	ET-2000 PLUS EXTRUDER
3000G	1	CABLE 3/4" x 6'6"
3300G	6	5/8" WASHER
3340G	38	5/8" HEX NUT
3360G	32	5/8" dia. x 1 1/4" SPLICE BOLT
3500G	6	5/8" dia. x 10" POST BOLT
3701G	19	3/4" WASHER
3704G	16	3/4" HEX NUT
3717G	15	3/4" dia. x 2 1/2" HEX HD BOLT
3718G	1	3/4" dia. x 3" HEX HD BOLT
3900G	2	1" WASHER
3910G	2	1" HEX NUT
5326B	6	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
4254G	18	3/8" WASHER
4255G	2	3/8" FENDER WASHERS
4258G	16	3/8" LOCKWASHER
4261G	2	3/8" dia. x 1 1/2" HEX HD BOLT
4699G	16	3/4" LOCKWASHER
6321G	16	3/8" dia. x 2" HEX HD BOLT
6405G	18	3/8" HEX NUT
33871A	1	ET2000 HBA POST #1 TOP
33872A	7	ET2000 HBA POST #2-#8 TOP
33873A	2	ET2000 HBA POST #1-#2 BOTTOM
33874A	6	ET2000 HBA POST #3-#8 BOTTOM
33875G	1	6'-6" ANGLE STRUT ET HBA



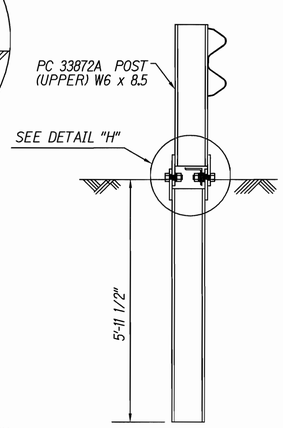
DETAIL "D"

NOTE:
SECTION "A-A" IS SIMILAR @ POST #3, 5 & 7. EXCEPT RAIL IS NOT ATTACHED.

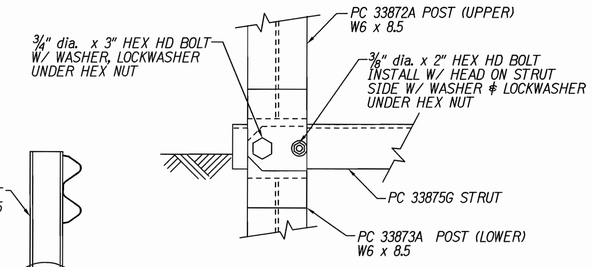
SECTION "A-A"
(TYP @ POSTS #4, 6 & 8)



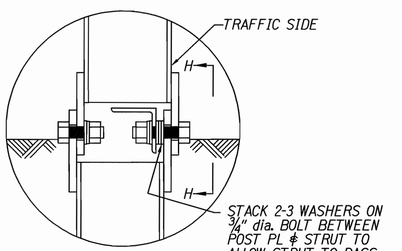
VIEW "D-D"



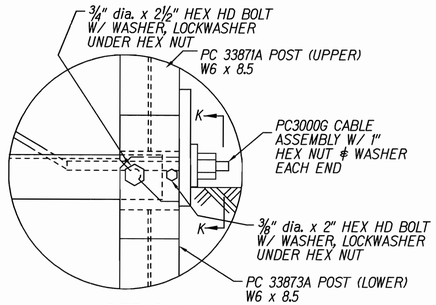
SECTION "B-B"
(POST #2)



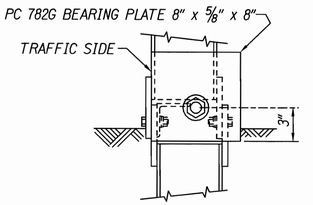
VIEW "H-H"



DETAIL "H"
(POST #2)



DETAIL "K"
(POST #1)



VIEW "K-K"

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ET-2000 PLUS

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

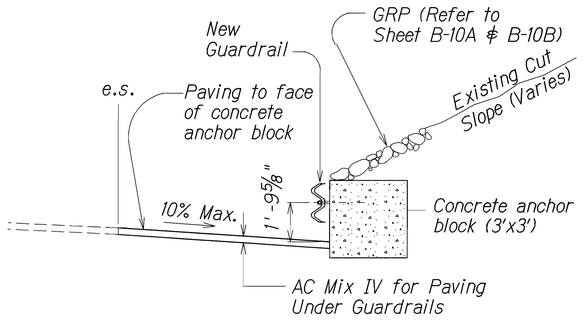
Scale: NTS Date: June, 2012

SHEET No. 8 OF 10 SHEETS

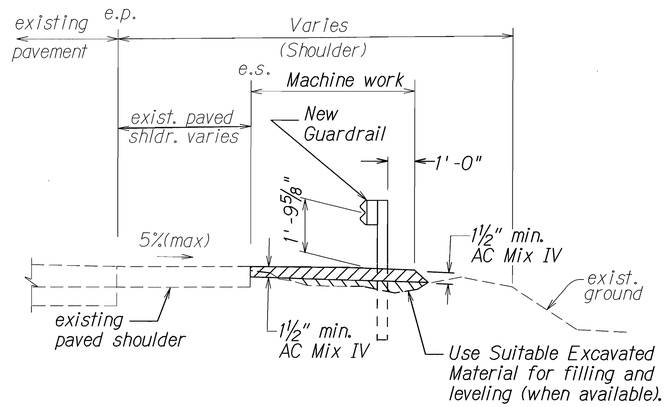
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY X | TRACED BY | DESIGNED BY X | QUANTITIES BY | CHECKED BY | DATE X
NOTE BOOK hel/k
N:\2dfiles\rdr\roby\guardrail\et2000.dgn

8/1/00

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	HSIP-019-2(62)	2012	39	42



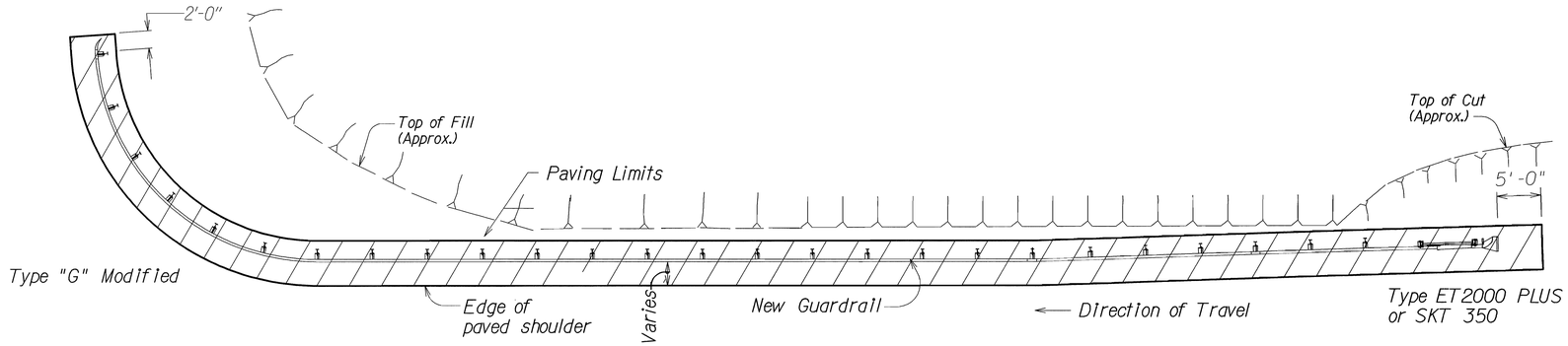
SECTION "A-A"
Not To Scale



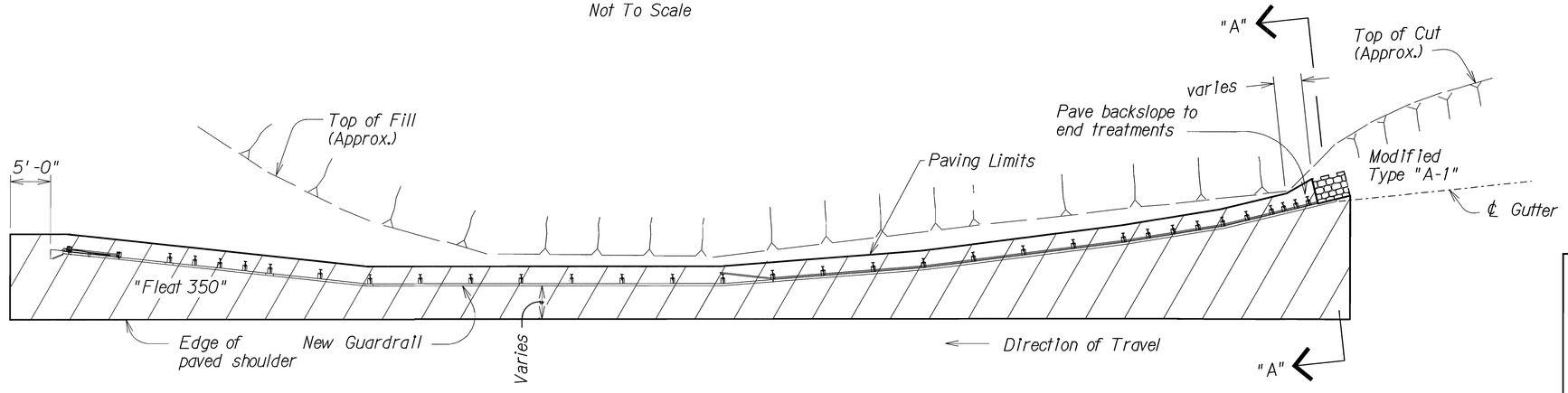
TYPICAL PAVING UNDER NEW GUARDRAIL
Not To Scale

NOTES:

1. Excavating, placing, leveling, and compacting of suitable excavated material shall not be paid for separately, but shall be considered incidental to various contract items in Section 401 - Asphalt Concrete Pavement.
2. Compaction requirements of Cold Planed material shall be in accordance with Section 203 - Excavation and Embankment.
3. Maintain longitudinal drainage as shown on the plans or as directed by the Engineer.
4. Contractor's attention is called to the increase in the asphalt content and compaction requirements in Section 401 - Asphalt Concrete Pavement, Paragraph 401.05-(E)-(3) of the Special Provisions.



PLAN - PAVING UNDER GUARDRAIL
Not To Scale



PLAN - PAVING UNDER GUARDRAIL
Not To Scale

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY JL	
	TRACED BY	
NOTE BOOK hel/jl	DESIGNED BY JL	
No. hel/grd/3a/g	QUANTITIES BY	
	CHECKED BY	

r 3/25/02 he3/usr2/Hawaii District Project Plans/Guardrail Details/pavefullgr.dgn (HB-I)

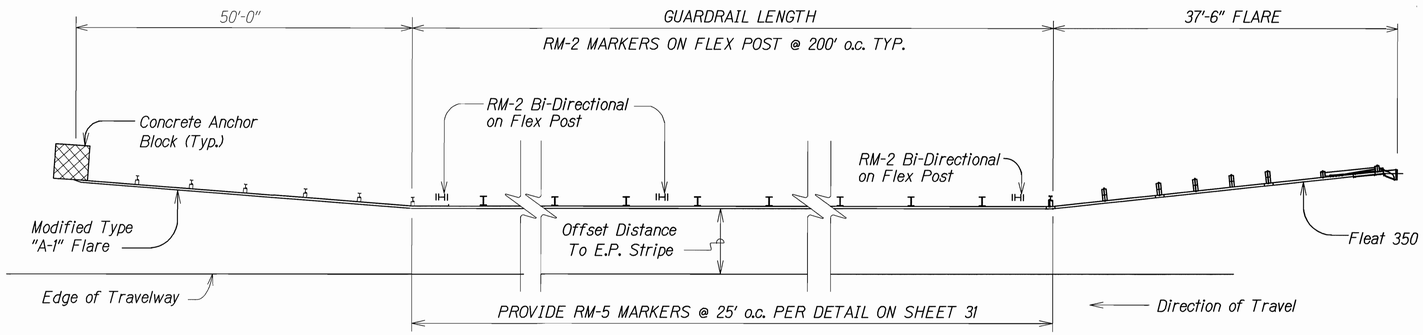
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPICAL GUARDRAIL PAVING DETAILS
FULL PAVING UNDER GUARDRAIL
HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

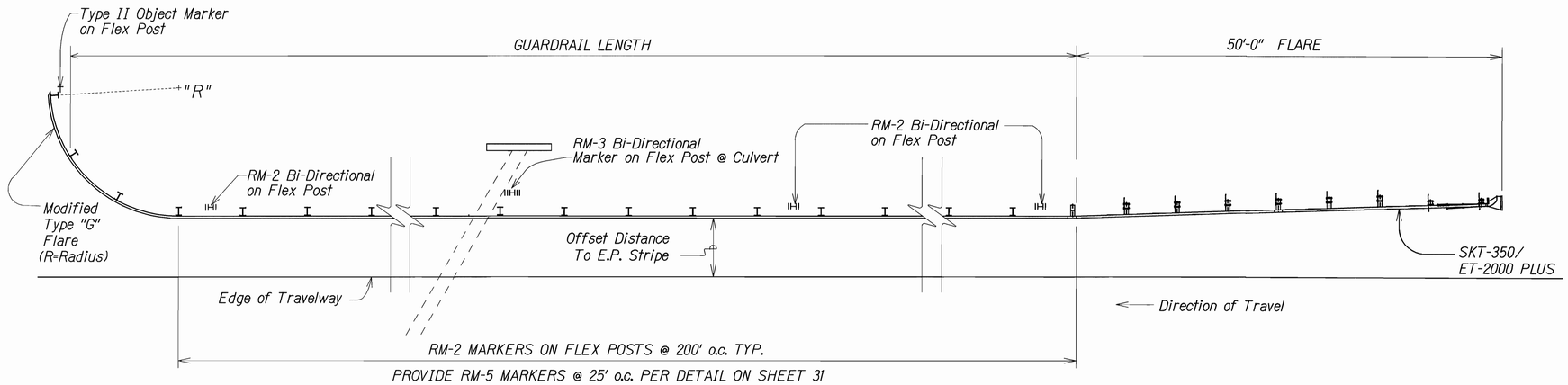
Scale: NTS Date: June, 2012

SHEET No. 9 OF 10 SHEETS

DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAI'I	HAW.	HSIP-019-2(62)	2012	40	42



TYPICAL @ "MODIFIED A" & "FLEAT 350" END TREATMENT



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

TYPICAL GUARDRAIL REFLECTOR MARKER INSTALLATION

Not To Scale

Approximate Spacing for Delineators on Horizonatal Curves	
Radius (R) Of Curve Of Curve (feet)	Approximate Spacing (S) on Curve (feet)
50	20
115	25
180	35
250	40
300	50
400	55
500	65
600	70
700	75
800	80
900	85
1000	90
Distances were rounded to the nearest 5 feet	

Spacing for specific radii may be interpolated from table. The minuimum spacing should be 6.1 m (20 ft). The spacing on curves should not exceed 90 m (300 ft). In advance of or beyond a curve, and proceeding away from the end of the curve, the spacing of the first delineator is 2S, the second 3S, and the third 6S but not to exceed 90 m (300 ft.). S refers to the delineator spacing for specific radii computed from the formula S=1.7 R-15 for metric units and S=3 R-50 for Englis units.

NOTES:

1. All reflector markers located behind guardrail and other locations shall be installed with flexible delineator posts.
2. Exact location of Reflector Markers shall be determined in the field by the Engineer.
3. Color of flexible delineator posts shall be white except for RM-3, RM-3 bidirectional, and RM-3/RM-2 combinations shall be yellow posts.
4. RM-2 Bi- Directional shall be white in color.
5. RM-5 shall be per Standard Guardrail Details.

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY X | TRACED BY | DESIGNED BY X | QUANTITIES BY | CHECKED BY | DATE X
NOTE BOOK | hsl.k
N:\2012\tsgrdl01.dgn

c:\3\3\02 te3\usr2\Hawaii District Project Plans\Guardrail Details-pkhwyhtrtetc.dgn (HB-2)

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL REFLECTOR MARKER DETAIL

HAWAII BELT ROAD
Safety Improvements
Laupahoehoe Gulch and Ka'awali'i Gulch
Federal Aid Project No. HSIP-019-2(62)

Scale: NTS Date: June, 2012

SHEET No. 10 OF 10 SHEETS