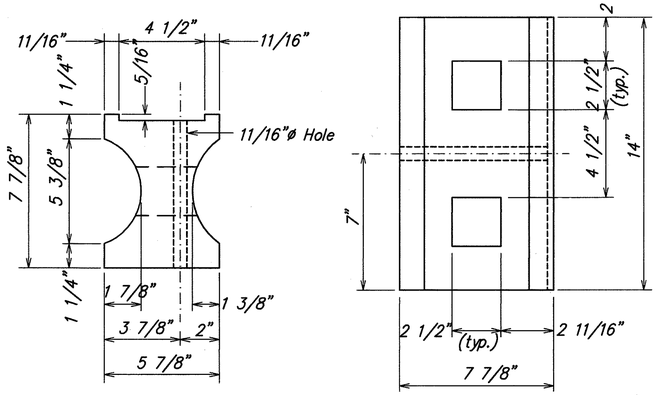
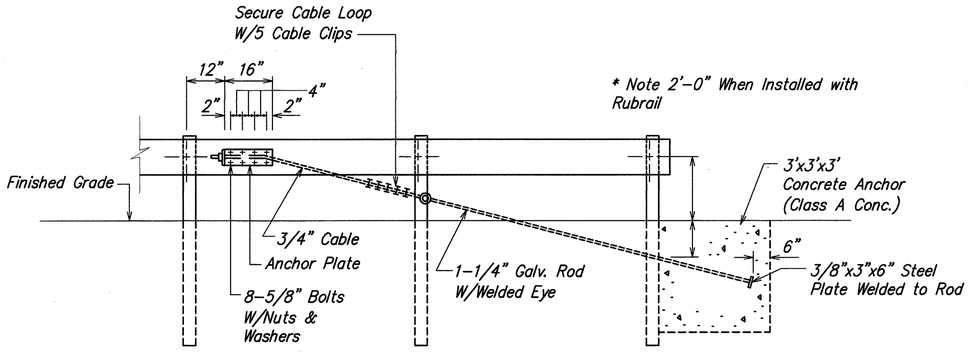
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-7310(1)	2003	110	193



TOP SIDE

RECYCLED PLASTIC BLOCKOUT (TYPE I)

N.T.S.



ANCHOR BLOCK DETAIL FOR TYPE "G" MODIFIED END TERMINAL

N.T.S.

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

NOTE: (Type "G" Modified End Terminal)

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.

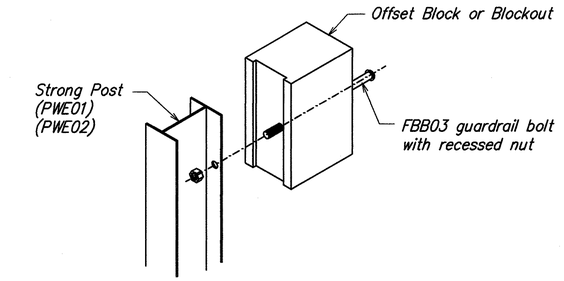
The taper (flare rate) of the guardrail shall follow the latest edition of AASHTO'S Roadside Design Guide (currently, Table 5.6 – Suggested Flare Rate for Barrier Design, page 5-21, Jan. 1996 edition).

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 th 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 proir to installation.

GENERAL NOTES

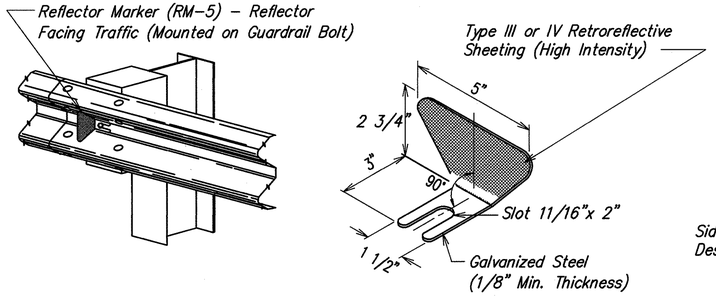
1. All hardware, posts and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.
2. Where conditions require, special post lengths in increments of 6 inches may be specified.
3. All fasteners, posts, and rail elements (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. 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.
7. New A.C. pavement at guardrails shall extend 6 feet longitudinally beyond terminal ends.
8. 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.



Exploded View
(Rail and washer not shown)

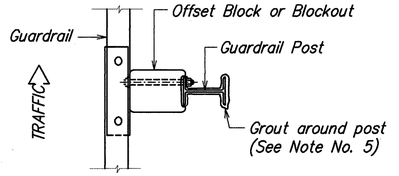
STEEL POST AND BLOCK DETAIL

N.T.S.

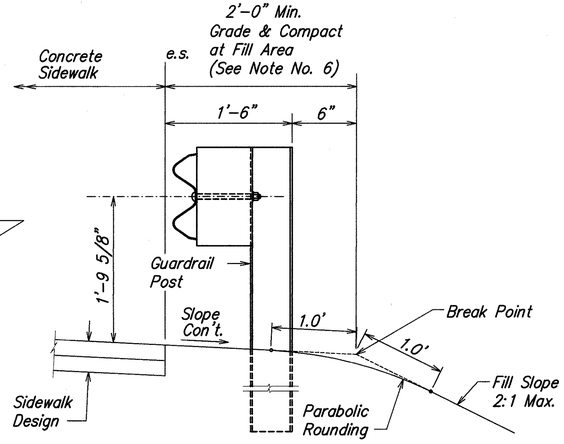


REFLECTOR MARKER (RM-5) DETAIL AND TYPICAL INSTALLATION

N.T.S.



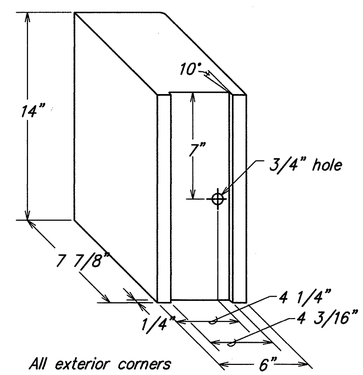
PLAN



ELEVATION

TYPICAL GUARDRAIL INSTALLATION

N.T.S.



All exterior corners
1/2" radius

RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)

N.T.S.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

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

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Expiration Date of the License: 04/30/04

GUARDRAIL DETAILS & NOTES

PUULOA ROAD IMPROVEMENTS
Kamehameha Hwy. to Salt Lake Blvd.
Federal Aid Project No. STP-7310(1)

Scale: As shown Date: May 2003

SHEET NO. 110 OF 193 SHEETS

110

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LAST MODIFIED: Fri, 09 May 2003 - 6:45pm

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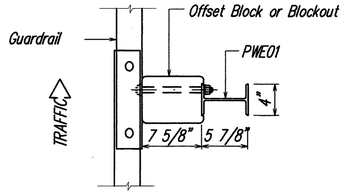
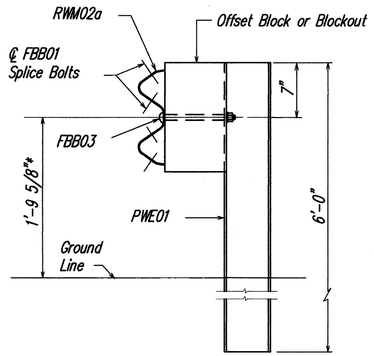
ORIGINAL PLAN	NOTEBOOK	No.	DATE

SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-7310(1)	2003	111	193

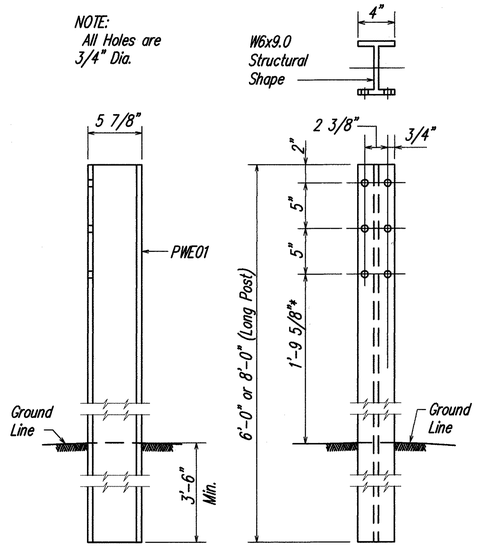


PLAN



ELEVATION

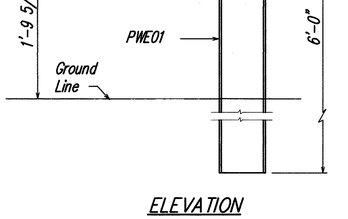
STRONG POST W-BEAM GUARDRAIL
N.T.S.



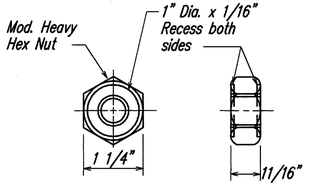
SIDE FRONT

W-BEAM STRONG POST
N.T.S.

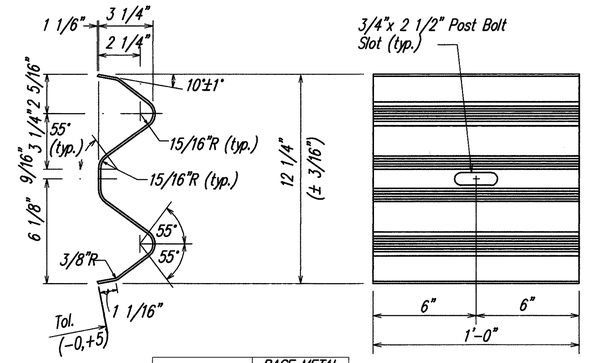
* Or As Directed By The Engineer



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

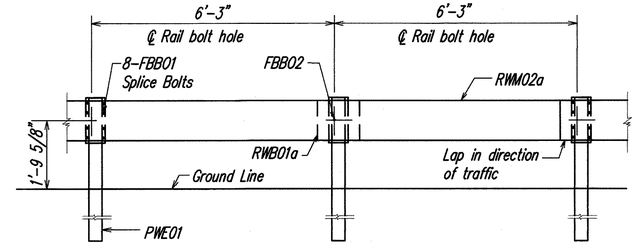


GUARDRAIL BOLTS AND RECESSED NUT
N.T.S.



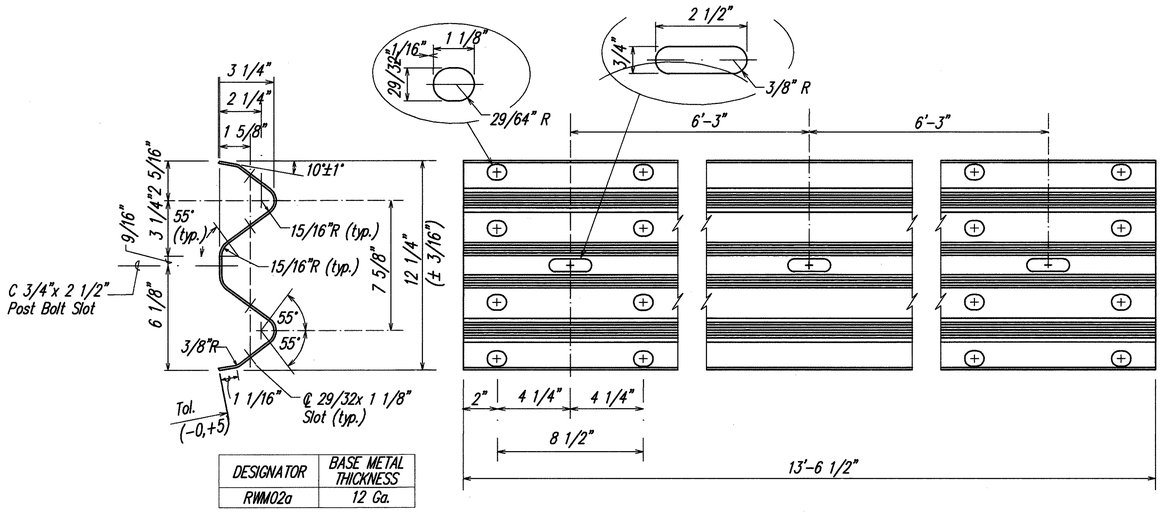
DESIGNATOR	BASE METAL THICKNESS
RWB01a	12 Ga.

W-BEAM BACK-UP-PLATE (RWB01a)
N.T.S.



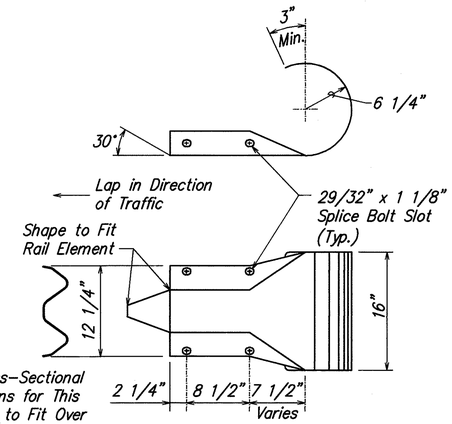
ELEVATION

STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT
N.T.S.



DESIGNATOR	BASE METAL THICKNESS
RWM02a	12 Ga.

2 SPACE W-BEAM GUARDRAIL (RWM02a)
N.T.S.



DESIGNATOR	BASE METAL THICKNESS
RWE03a	12 Ga.

W-BEAM END SECTION (ROUNDED RWE03a)
N.T.S.

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

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Expiration Date of the License: 04/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

PUULOA ROAD IMPROVEMENTS
Kamehameha Hwy. to Salt Lake Blvd.
Federal Aid Project No. STP-7310(1)

Scale: As shown Date: May 2003

SHEET NO. 111 OF 193 SHEETS

111

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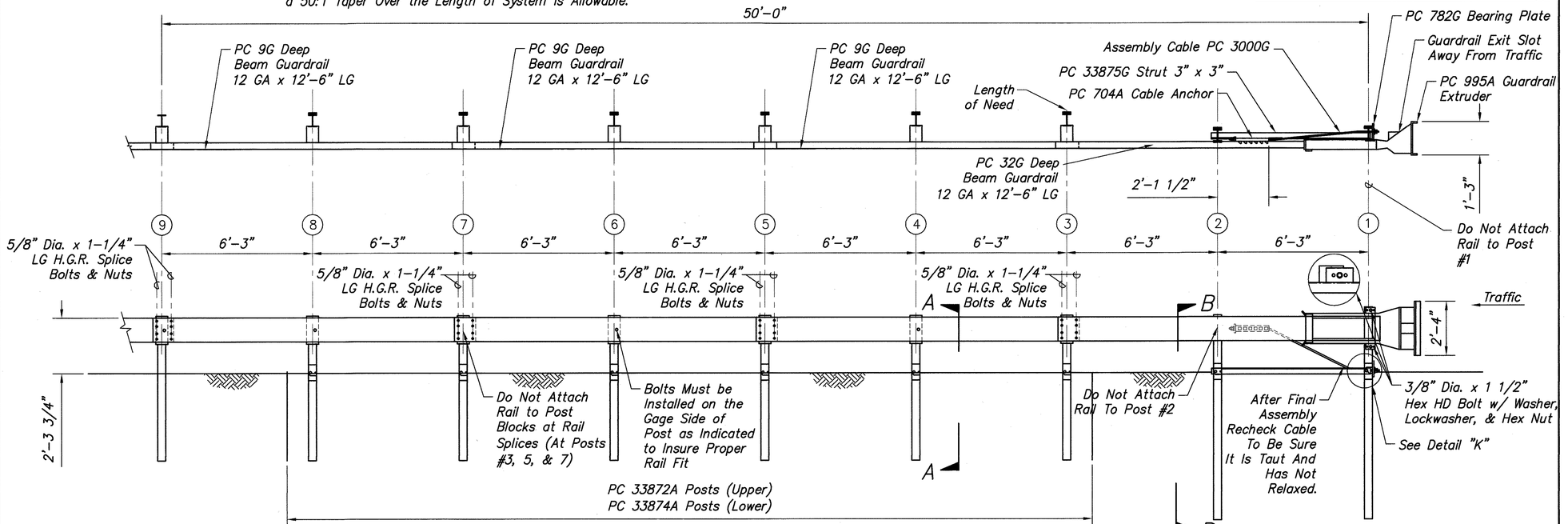
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | NOTEBOOK | No. | DATE

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-7310(1)	2003	112	193

BILL OF MATERIALS

PC	QTY	DESCRIPTION
9G	3	12 Ga./12'6"/6'3"/S (Gaurdrail)
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
33875A	1	6'-6" Angle Strut ET HBA

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.



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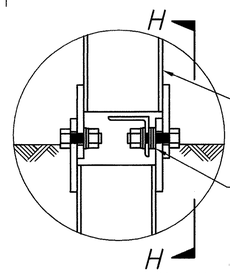
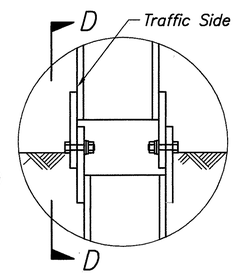


Detail "H"
Scale: Not to Scale
(Post #2)



Detail "D"
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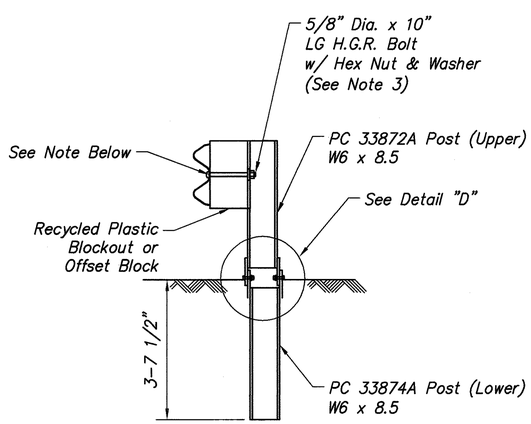
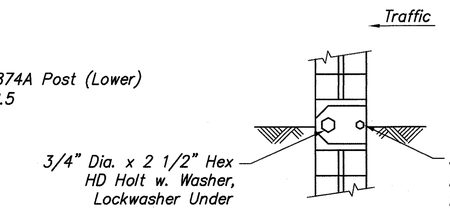
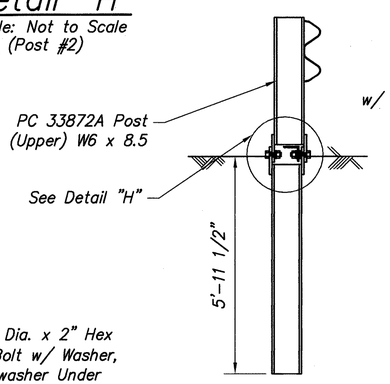


Note:
Section "A-A" is Similar @ Post #3, 5, & 7. Except Rail is Not Attached.

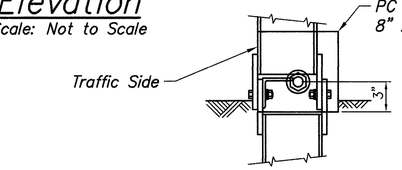
Section "A-A"
Scale: Not to Scale
(Typ. @ Posts #4, 6, & 8)



View "D-D"
Scale: Not to Scale



Section "B-B"
Scale: Not to Scale
(Post #2)



View "K-K"
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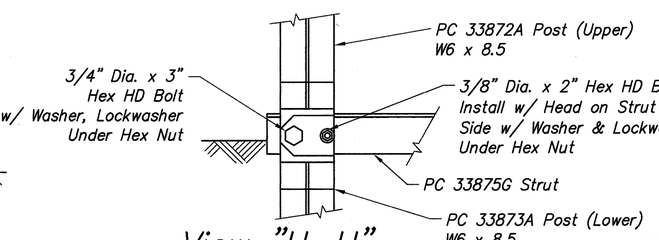
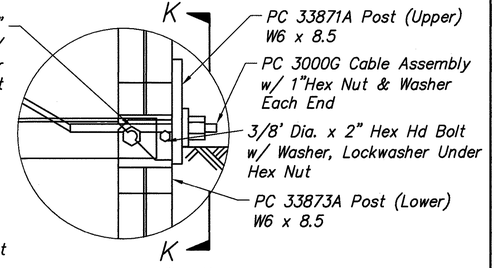


View "H-H"
Scale: Not to Scale
(Post #1)



Detail "K"
Scale: Not to Scale
(Post #1)

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.

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

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Expiration Date of the License: 04/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ET-2000 PLUS

PUULOA ROAD IMPROVEMENTS
Kamehameha Hwy. to Salt Lake Blvd.
Federal Aid Project No. STP-7310(1)

Scale: As shown Date: May 2003

SHEET NO. 112 OF 193 SHEETS

112

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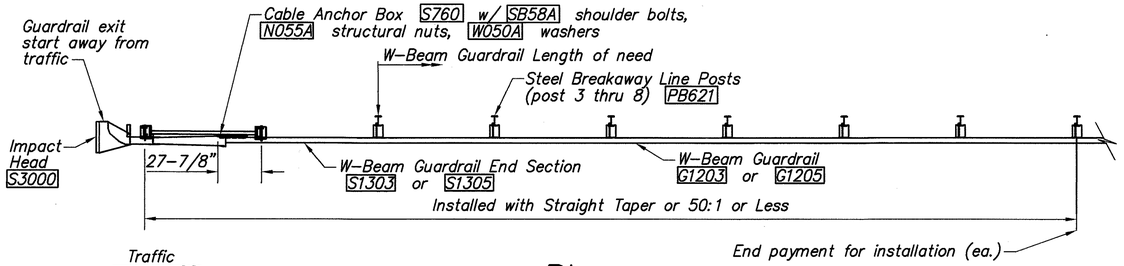

Plan

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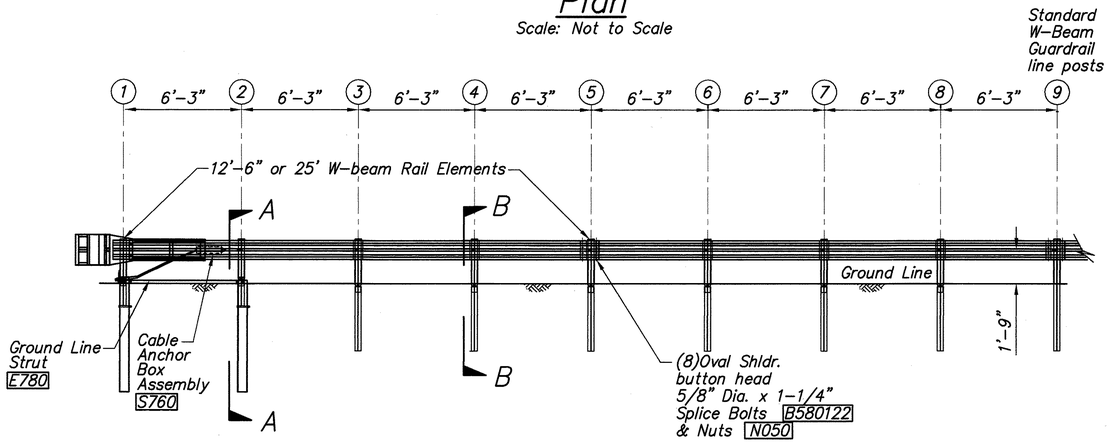

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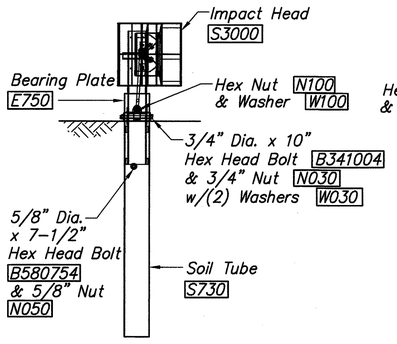
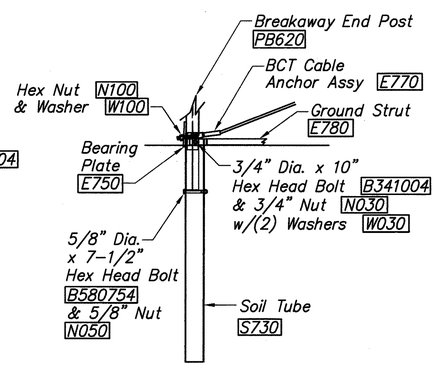


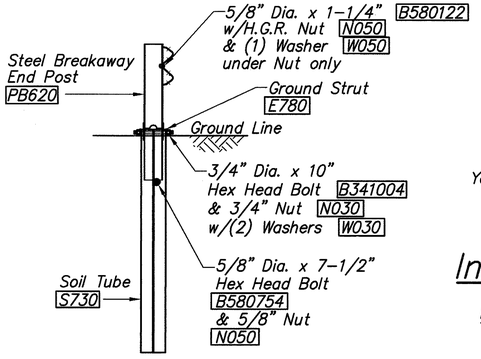
Front View of Post 1

Scale: Not to Scale



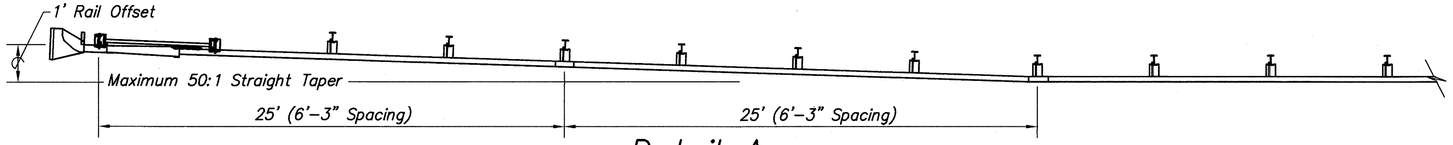
Partial View of Post 1

Scale: Not to Scale



Section A-A @ Post #2

Scale: Not to Scale

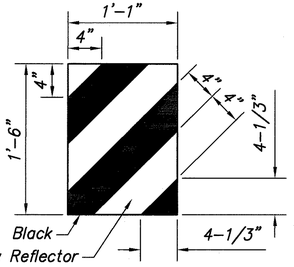


Detail A

50:1 flare rate

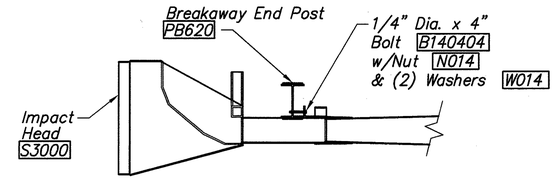
GENERAL NOTES:

1. Breakaway steel posts are required with the Sequential Kinking Terminal.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. When the Sequential Kinking Terminal is selected as the end treatment for W-Beam Guardrail installation, the W-Beam Guardrail will be flared at a rate of 50:1 to prevent the impact head from encroaching on the shoulder. The flare is not required and may be decreased or eliminated for specific installations.
4. 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.
5. The soil tubes may be driven with an approved driving head. They shall not be driven with the post in the tube. If the soil tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
6. 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.
7. 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.
8. A special site evaluation should be considered prior to using the Sequential Kinking Terminal where there is less than 25' between the outlet side of the Sequential Kinking Terminal and any adjacent driving lane.
9. (R) or (L) indicates right or left Impact Head Reflector Marker (IHRM). Providing and installing of IHRM shall be considered incidental to end treatment.
10. The stripes for IHRM shall slope downward at an angle of 45° towards the side of the end treatment that traffic is to pass.



IHRM(R) Impact Head Reflector Marker Insert Detail

Scale: Not to Scale



Impact Head Connection Detail

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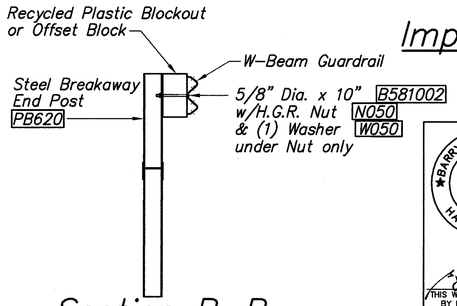

Section B-B

Scale: Not to Scale

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-7310(1)	2003	113	193

ITEM NO.	QTY.	BILL OF MATERIALS
S3000	1	IMPACT HEAD
S1303/S1305	1	W-BEAM GUARDRAIL END SECTION, 12 GA.,
		12.5' OR 25'
G1203/G1205	3/1	W-BEAM GUARDRAIL, 12 GA., 12.5' or 25'
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 POSTS
PB621	6	STEEL BREAKAWAY LINE POSTS
	6	RECYCLED PLASTIC BLOCKOUTS OR OFFSET BLOCK
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
		HARDWARE
B580122	17/33	5/8" Dia. x 1-1/4" SPLICE BOLTS, POST #2
B580754	2	5/8" Dia. x 7-1/2" HEX BOLTS
B341004	2	5/8" Dia. x 10" HEX BOLTS
B341002	6	5/8" Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B581802	6	5/8" Dia. x 18" H.G.R. BOLT (POST 3 THRU 8)
N050	26/42	5/8" Dia. H.G.R. NUT (SPLICE 17/33, SOIL TUBES 2,
		POST 2 THRU 8)
N030	2	3/4" Dia. HEX NUTS
W050	7	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 BOLTS
N055A	8	1/2" 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

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

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
Expiration Date of the License: 04/30/04

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SKT-350
SEQUENTIAL KINKING TERMINAL

PUULOA ROAD IMPROVEMENTS
Kamehameha Hwy. to Salt Lake Blvd.
Federal Aid Project No. STP-7310(1)

Scale: As shown Date: May 2003

SHEET NO. 113 OF 193 SHEETS

113

PREFIX: G:\DOTH9601A\ACAD\
FILE: sk1350d.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: rki
PREV. OPR:
CURRENT TIME: May 09, 2003 - 6:51pm
LAST SAVED BY:
LAST MODIFIED: Fri, 09 May 2003 - 6:47pm

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

ORIGINAL PLAN
NOTEBOOK
No.