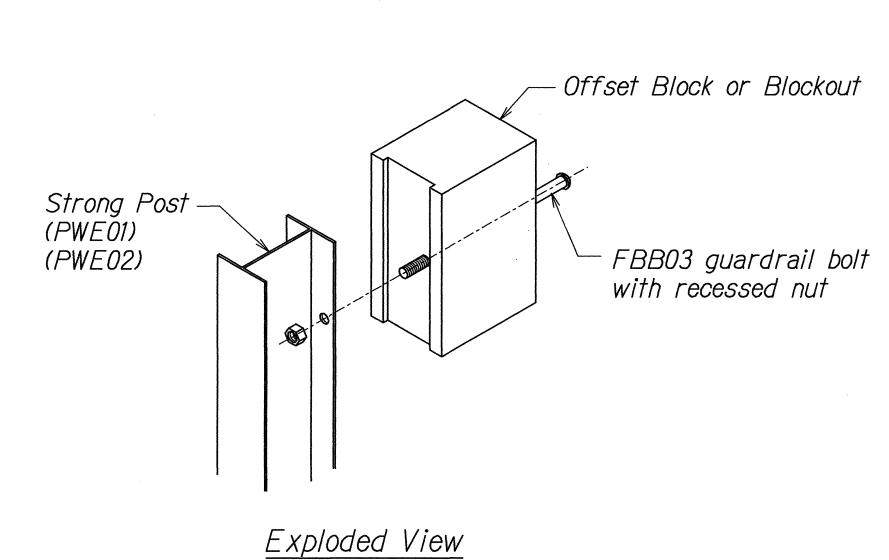
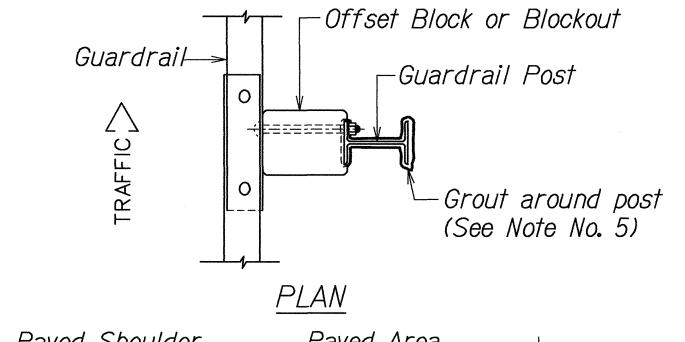


RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)



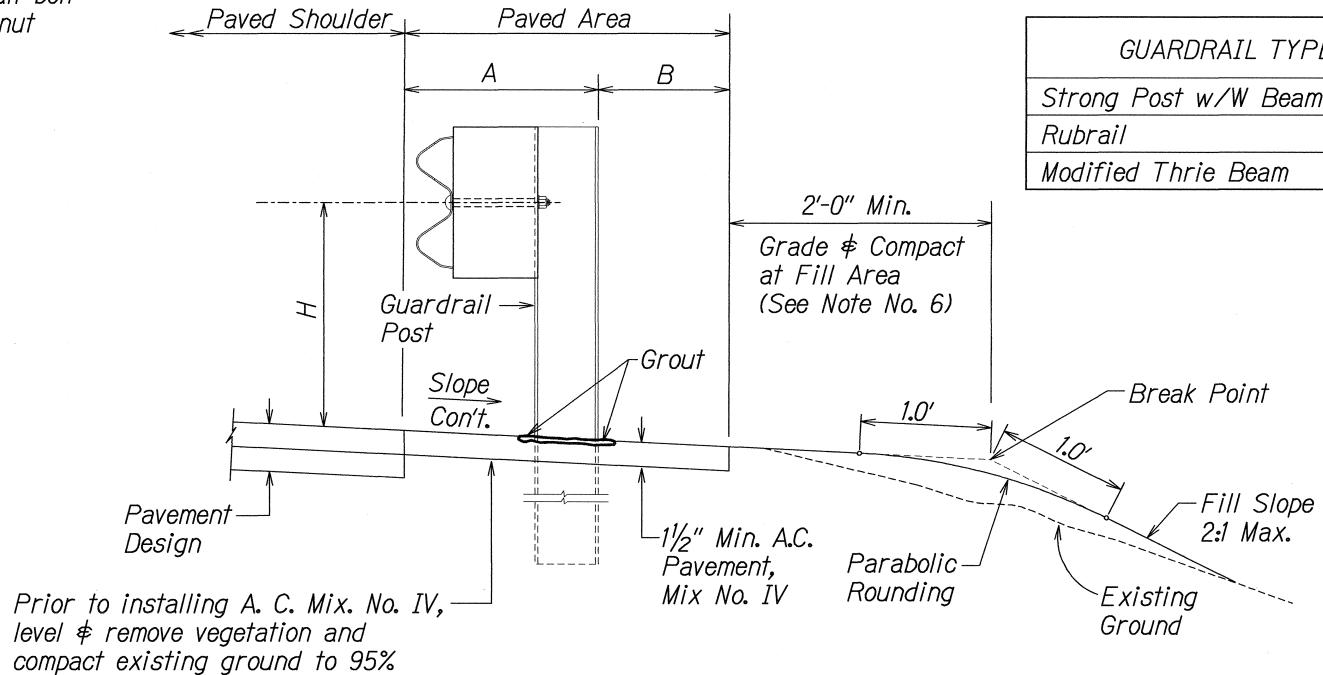
compaction.

(Rail and washer not shown) STEEL POST AND BLOCK DETAIL



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.

FED. ROAD DIST. NO.

STATE

FISCAL SHEET TOTAL YEAR NO. SHEETS

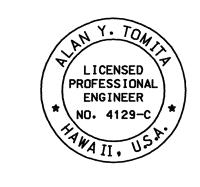
1999

PROJ. NO.

19H-01-99M

- 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.

GUARDRAII TYPF	DIMENSION		
GUARDRAIL TIPE	Н	Α	В
Strong Post w/W Beam	1'-95/8"	1′-6″	1'-0"
Rubrail	2'-0"	1'-6"	2'-0"
Modified Thrie Beam	2'-0"	2'-0"	1'-0"



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Colan y Fromte

DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION

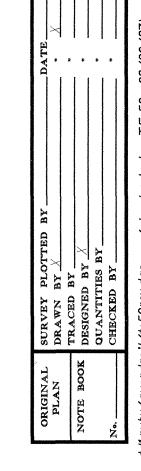
STATE OF HAWAII

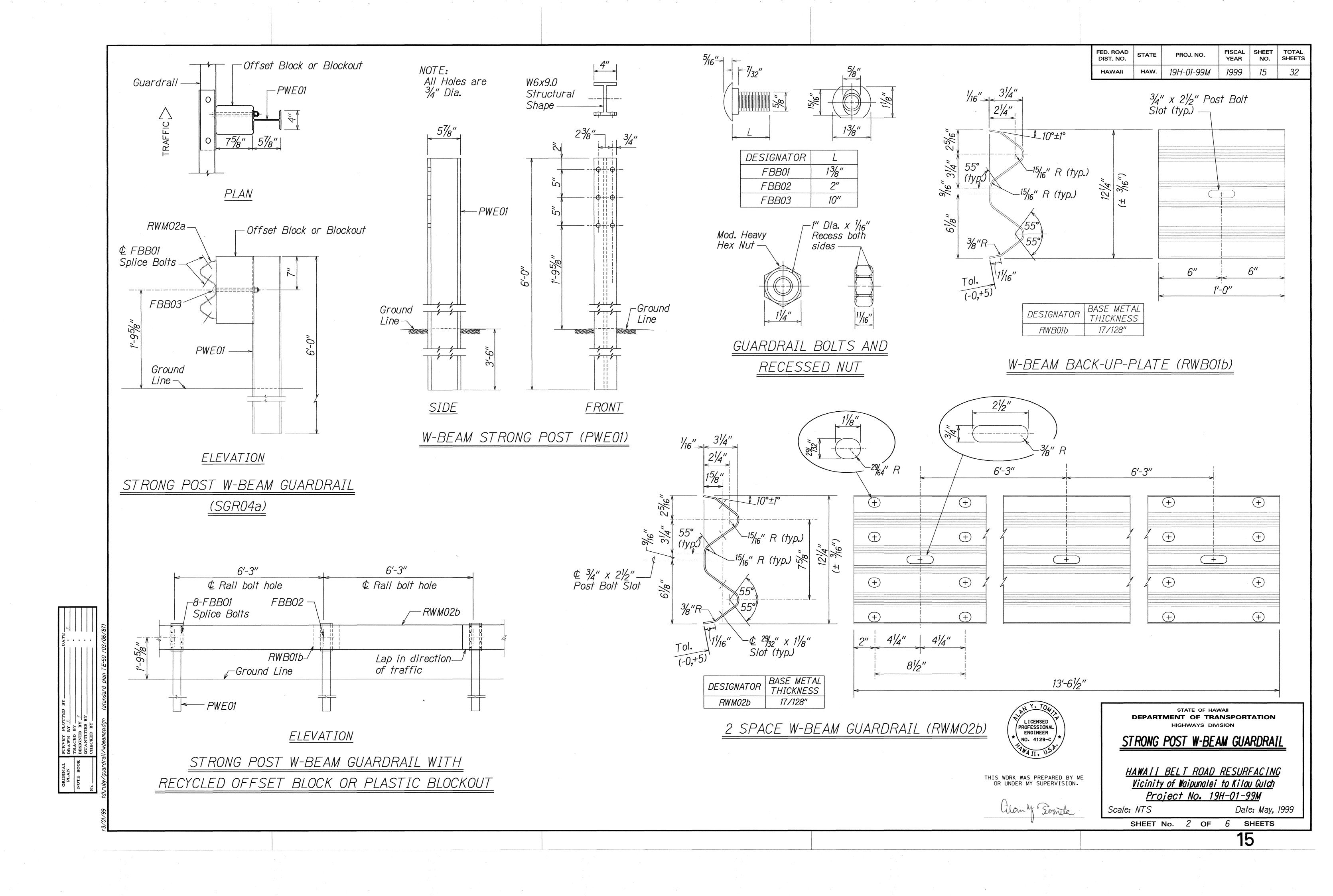
#### GUARDRAIL DETAILS & NOTES

HAWAII BELT ROAD RESURFACING Vicinity of Waipunalei to Kilau Gulch Project No. 19H-01-99M

Scale: NTS Date: May, 1999

> OF *6* SHEET No. 1 SHEETS





FED. ROAD<br/>DIST. NO.STATEPROJ. NO.FISCAL<br/>YEARSHEET<br/>NO.TOTAL<br/>SHEETSHAWAIIHAW.19H-01-99M19991632

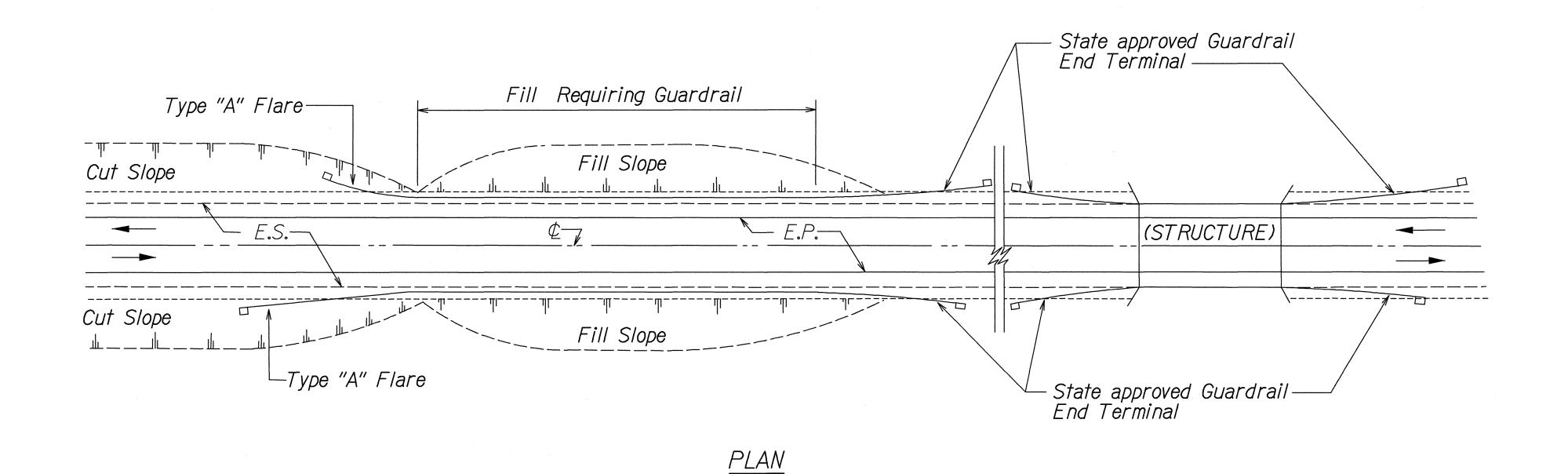
1. Depending on the existing field conditions, the Engineer shall

3. The exact limits and locations of the guardrail and end treatments to be removed and to be installed shall be determined by the Engineer in the field. The Contractor shall layout the locations in the field, as shown on the plans or as directed by the Engineer, for the Engineer's approval prior to beginning any guardrail work.

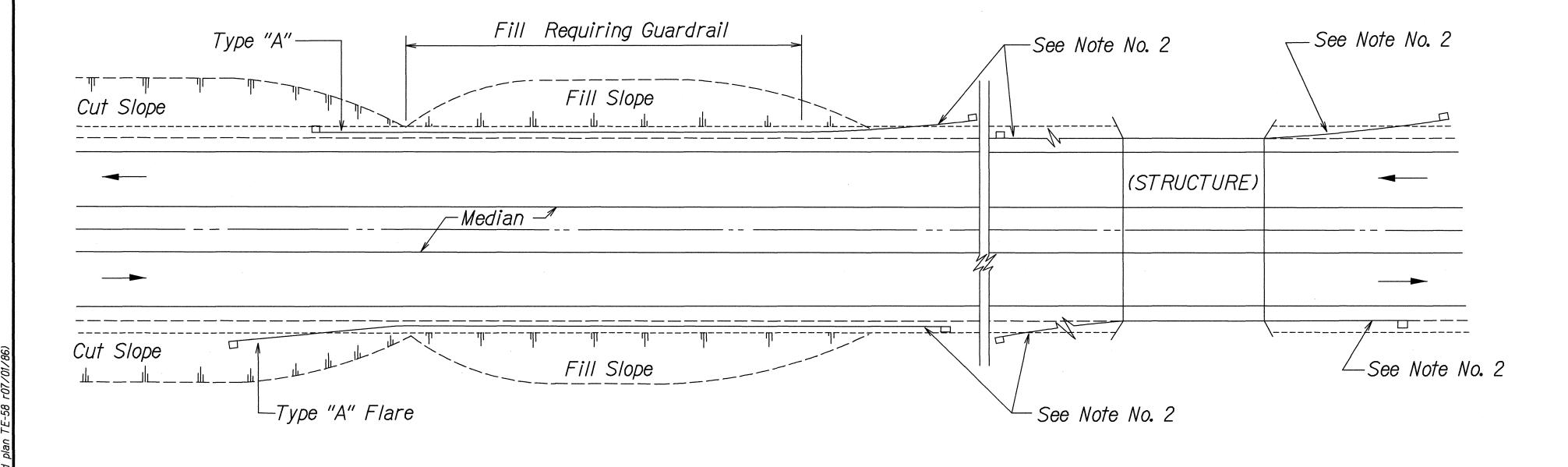
2. Refer to State's most current approved Product List for

NCHRP 350 approved Guardrail End Terminals.

determine which guardrail end terminal should be installed.

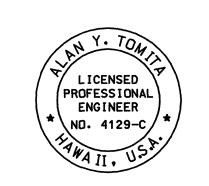


# TWO WAY ROADWAY



## PLAN ONE WAY ROADWAY (DIVIDED HIGHWAY)

6/3/99 Deleted Note No. 1 For Metal Guardrail Connection to Conc. Structures



NOTES:

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alany Territa

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

Revision

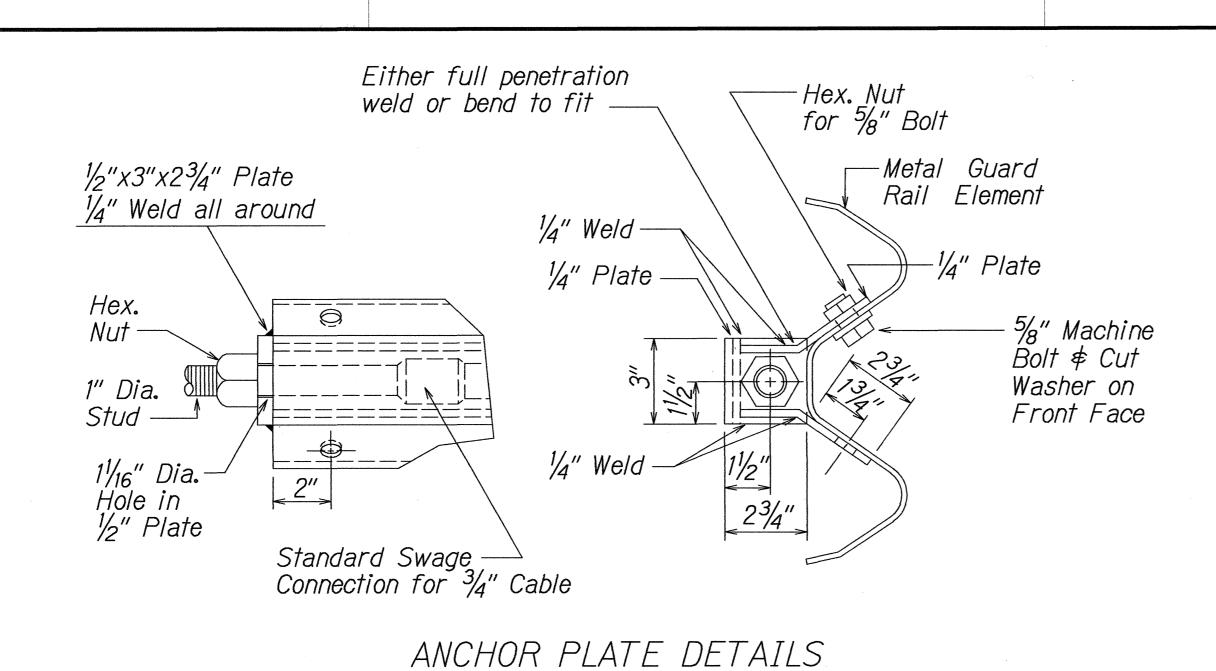
#### GUARDRAIL DETAILS

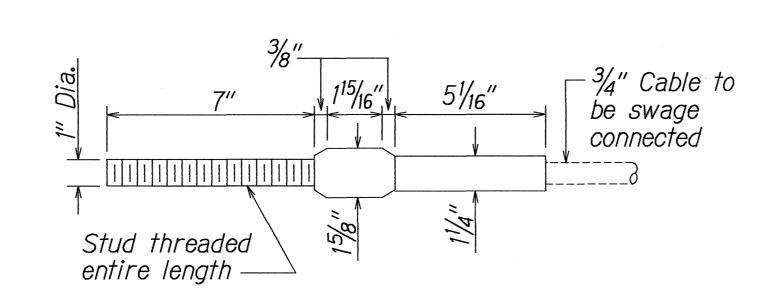
HAWA!! BELT ROAD RESURFAC!NG
Vicinity of Waipunalei to Kilau Gulch
Project No. 19H-01-99M

Scale: NTS Date: June, 1999

SHEET No. 3 OF 6 SHEETS

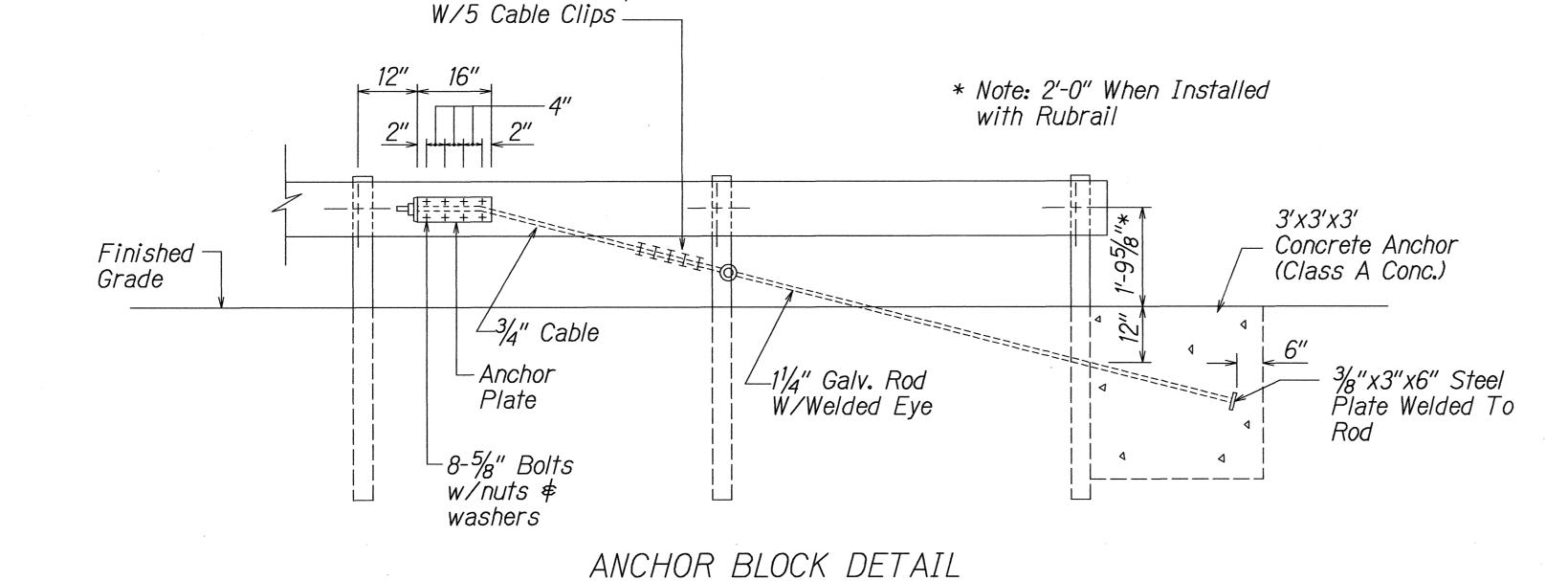
ADD. 16





### STANDARD SWAGED FITTING AND STUD

Secure Cable Loop



1. Concrete, G.R.P., excavation, anchor rod and miscellaneous appurtenances necessary

to anchor the guardrail ends shall be incidental to metal guardrail.

FED. ROAD DIST. NO. STATE PROJ. NO. For Details of Concrete Anchor Block in Ground 19H-01-99M 1999 See Det. below. Flared End - Edge of Paved Area Varies --Edge of Travelway Direction of Traffic Paved Shoulder PLAN Finished Grade— ELEVATION

#### TYPE "G" FLARE END TERMINAL

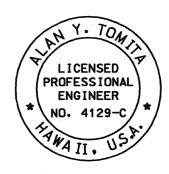
#### NOTE:

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 \$\psi\$ 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 ordering of materials.



Colon y Somita

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

#### GUARDRAIL DETAILS

HAWAII BELT ROAD RESURFACING
Vicinity of Waipunalei to Kilau Gulch
Project No. 19H-01-99M

Scale: Scale: Date: May, 1999

SHEET No. 4 OF 6 SHEETS

 ORIGINAL
 SURVEY PLOTTED BY
 DATE

 PLAN
 DRAWN BY
 .

 NOTE BOOK
 DESIGNED BY
 .

 No.
 CHECKED BY
 .

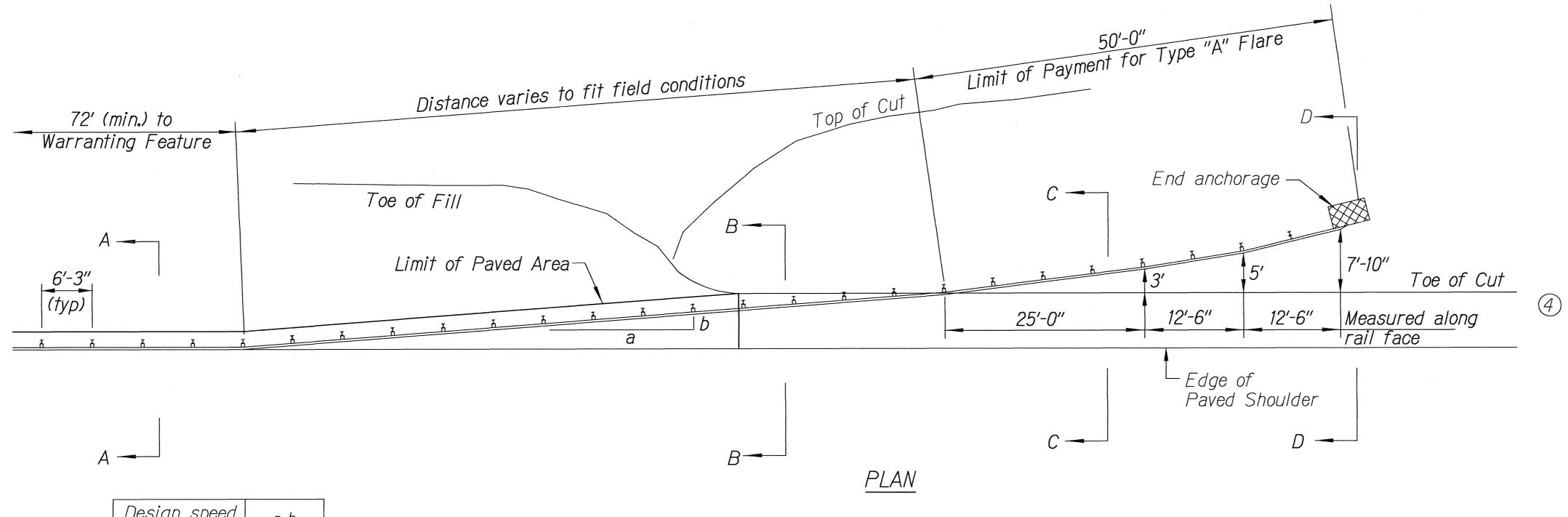
 Adl.ruby/guardrail/te59rev.dgn
 (standard plan TE-59 r11/03/89)

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FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	19H-01-99M	1999	18	32

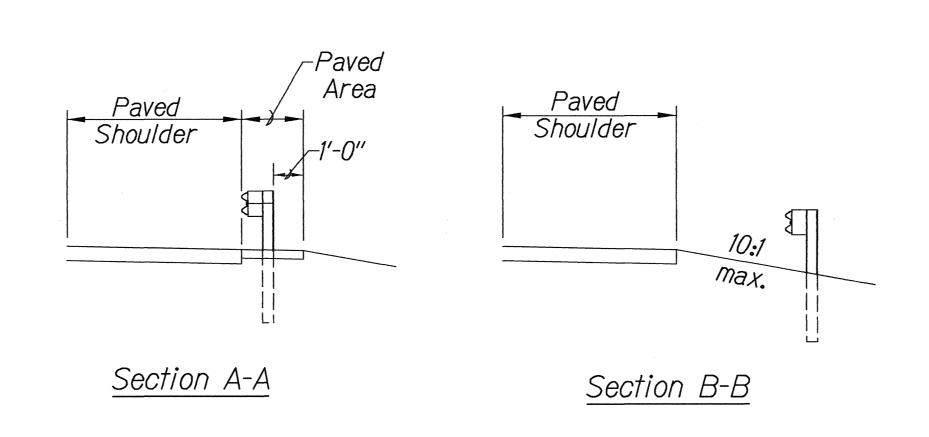
#### General Notes

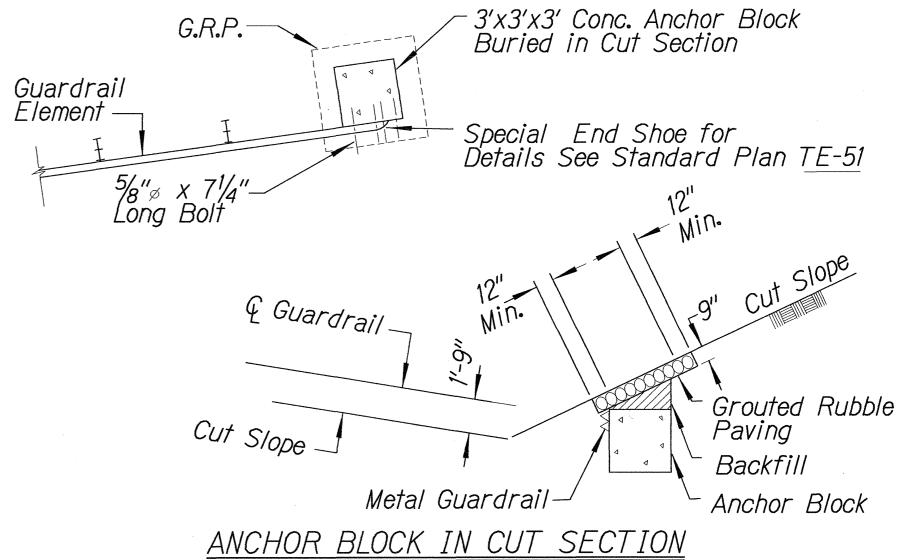
- 1. All posts are 8'-0" in length from where the guardrail flares away from the shoulder back to the anchor block.
- 2. All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

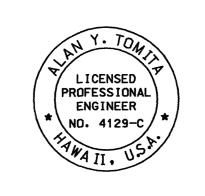


Design speed mph	a:b	
68	15:1	Height of guardrail is parallel
62	13:1	to shoulder grade cut slope
56	12:1	
50	11:1	
43	10:1	
37	9:1	Concrete anchor block
31	7:1	









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STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

TYPE "A" FLARE

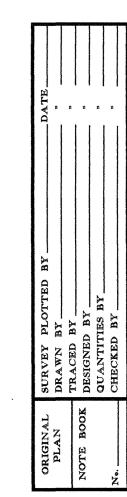
<u>HAWA!! BELT ROAD RESURFACING</u>
<u>Vicinity of Waipunalei to Kilau Gulch</u>

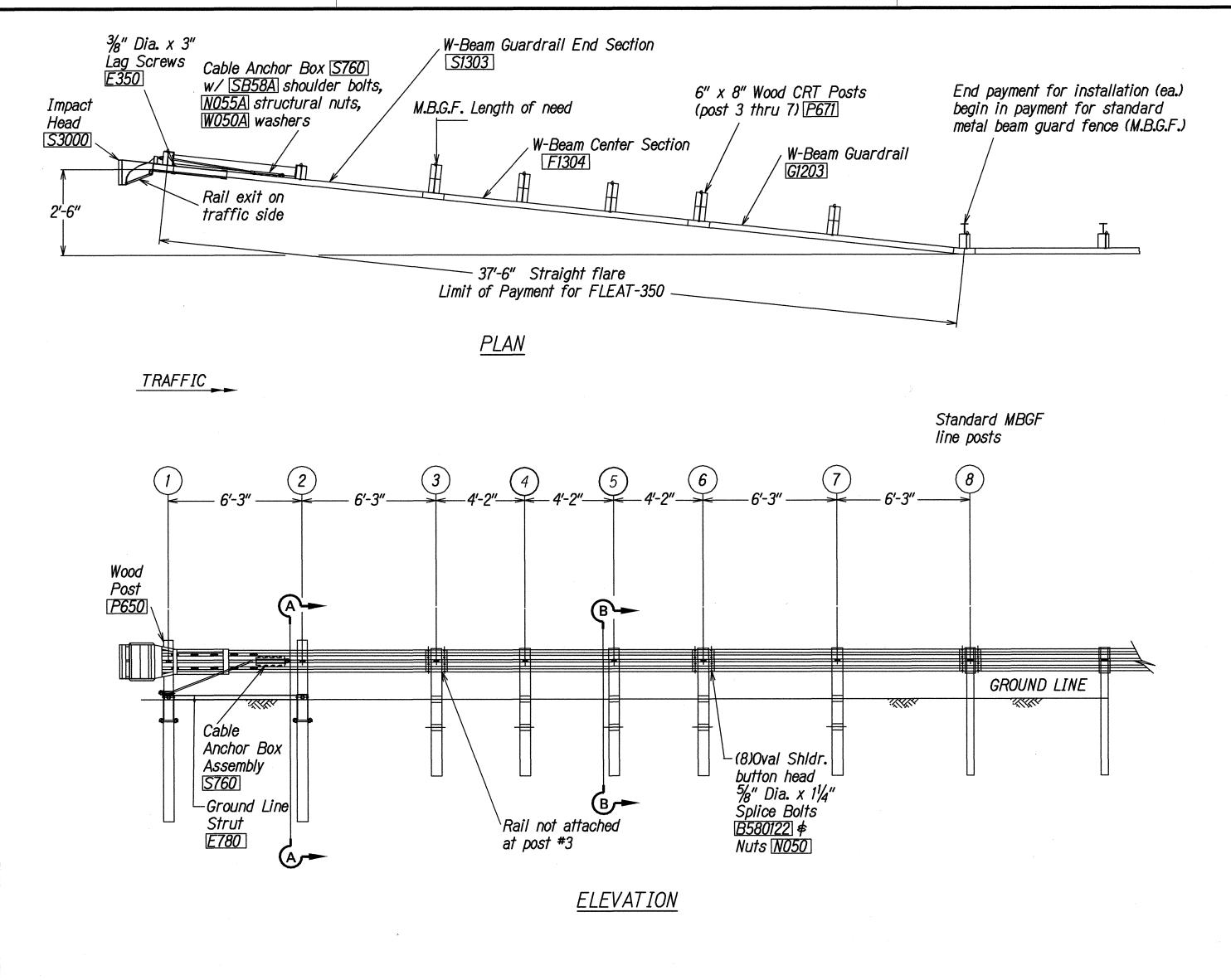
<u>Project No. 19H-01-99M</u>

Scale: NTS

Date: May, 1999

SHEET No. 5 OF 6 SHEETS





BCT Timber Post P650

5/8" Dia. x 10"

Lg. Hgr. Bolt <u>B581002</u> w/H.G.R. Nut <u>N050</u> \* (1) Washer <u>W050</u>

under Nut only

`5%" Dia. x 7½" Hex Head Bolt <u>B580754</u> \$ H.G.R. Nut <u>N050</u>

5/8" Dia. x 10"

# H.G.R. Nut <u>N050</u> # (2) Washers <u>W050</u>

Ground Strut -E780

6" x 8" x 6'

Soil Tube E735

SECTION A-A

at Post #2

#### GENERAL NOTES

- 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. 21/2" 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. 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.

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	19H-01-99M	1999	19	32

ITEM NO.	QTY	BILL OF MATERIALS	
<i>S3000</i>	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.	
<i>S730</i>	2	*FOUNDATION SOIL TUBE, 6" x 8" x 6'	
E740	1	PIPE SLEEVE	
E750	1	BEARING PLATE, 8" x 8" x 5%"	
<i>S</i> 760	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 11/4" 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	1/2" A325 STRUCTURAL NUTS	
W050A	16	11/16" OD X 9/16" ID A325 STR. WASHER	

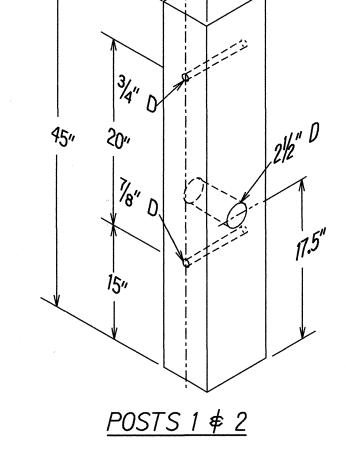
Foundation Lube Uptions For Posts 1 \$ 2

\*6'-0" Split Foundation Tubes S730 \*6'-0" Solid Foundation Tubes E731

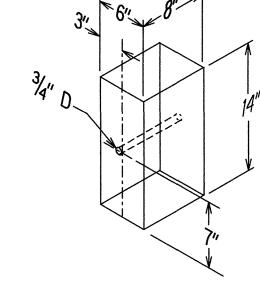
\*5'-0" Foundation Tubes S735 W/Soil

Plates SP600

\*4'-6" Foundation Tubes E735 W/Soil Plates SP600



23/4" 51/2" 11/2"



TIMBER BLOCKOUT

LICENSED PROFESSIONAL ENGINEER NO. 4129-C

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Colany Somite

**DEPARTMENT OF TRANSPORTATION** HIGHWAYS DIVISION FLEAT-350

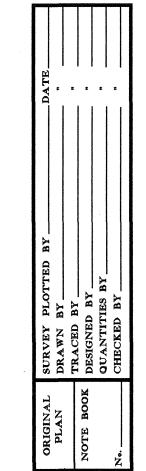
STATE OF HAWAII

FLARED ENERGY ABSORBING TERMINAL

HAWAII BELT ROAD RESURFACING <u>Vicinity of Waipunalei to Kilau Gulch</u> Project No. 19H-01-99M

Date: May, 1999 Scale: NTS

SHEET No. 6 SHEETS OF



5%" Dia. x 10" Hex Head Bolt <u>B581004</u> ♦ H.G.R. Nut <u>W050</u> w/(2) Washers <u>W050</u>

BCT Timber Post

€5.5" E770

BCT Cable

Anchor Assy

Ground Strut

Soil Tube E735

6" x 8" x 6'

P650

PARTIAL VIEW OF POST 1

Hex Nut

N100

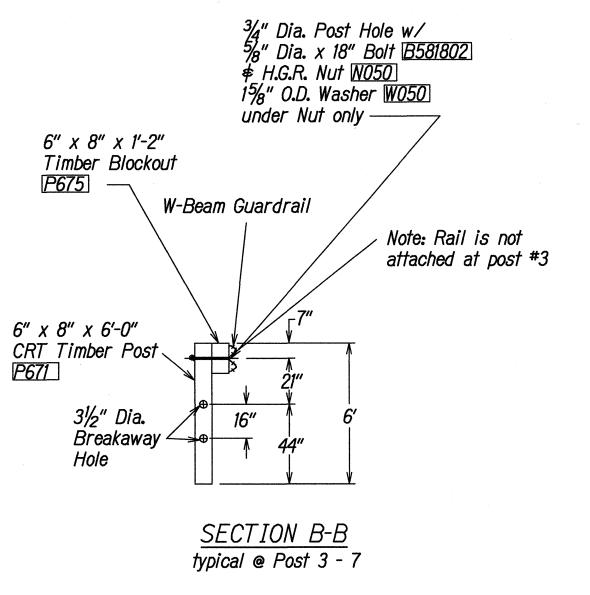
W100

W100

8" x 8" x 5/8"/ Bearing Plate / E750

5%" Dia. x 7½"

Hex Head Bolt <u>B580754</u> **♦ H.G.R.** Nut <u>N050</u>



\*for bearing plate placement, the 5" side should be installed up BEARING PLATE E750