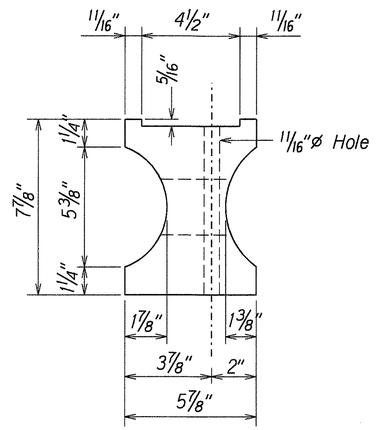
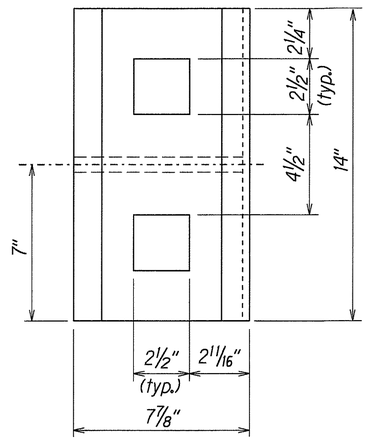
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	22	60

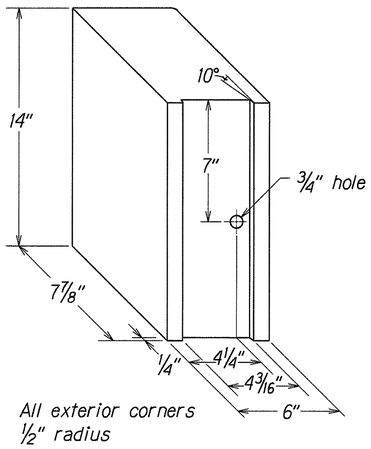


TOP

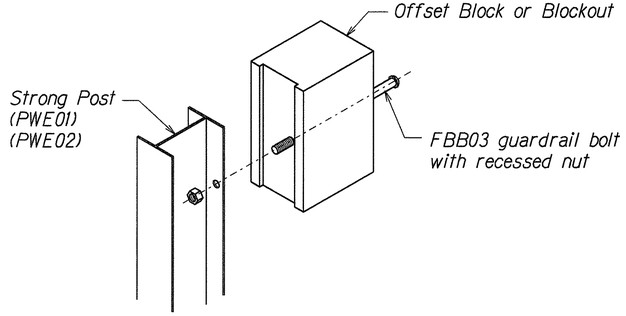


SIDE

RECYCLED PLASTIC BLOCKOUT (TYPE I)

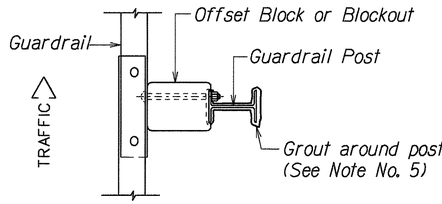


RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)

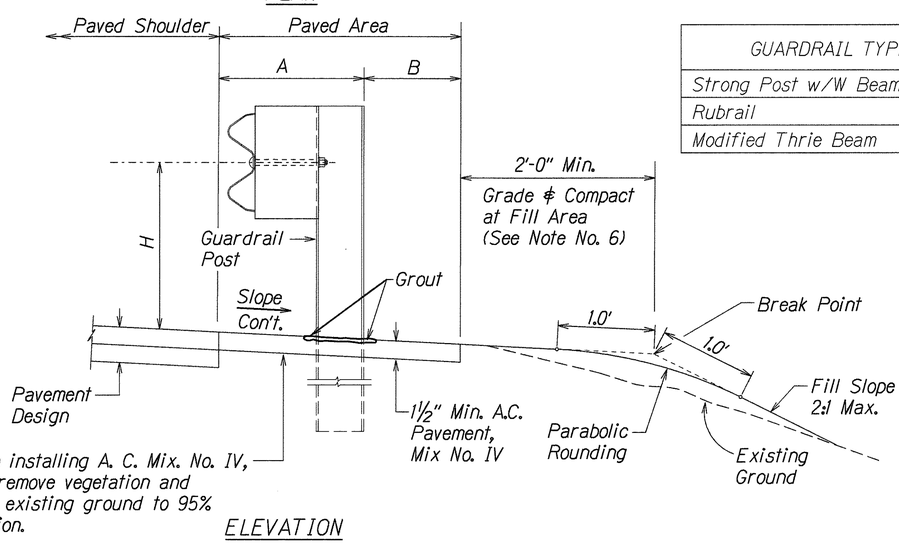


Exploded View
(Rail and washer not shown)

STEEL POST AND BLOCK DETAIL



PLAN



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"

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.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY X	
NOTE BOOK	TRACED BY	
dd6jan99	DESIGNED BY X	
5sep01dgn	QUANTITIES BY	
24sep01dgn	CHECKED BY	

r3/01/99 hdutaby/guardrail/te50rev.dgn (standard plan TE-50 r03/06/81)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

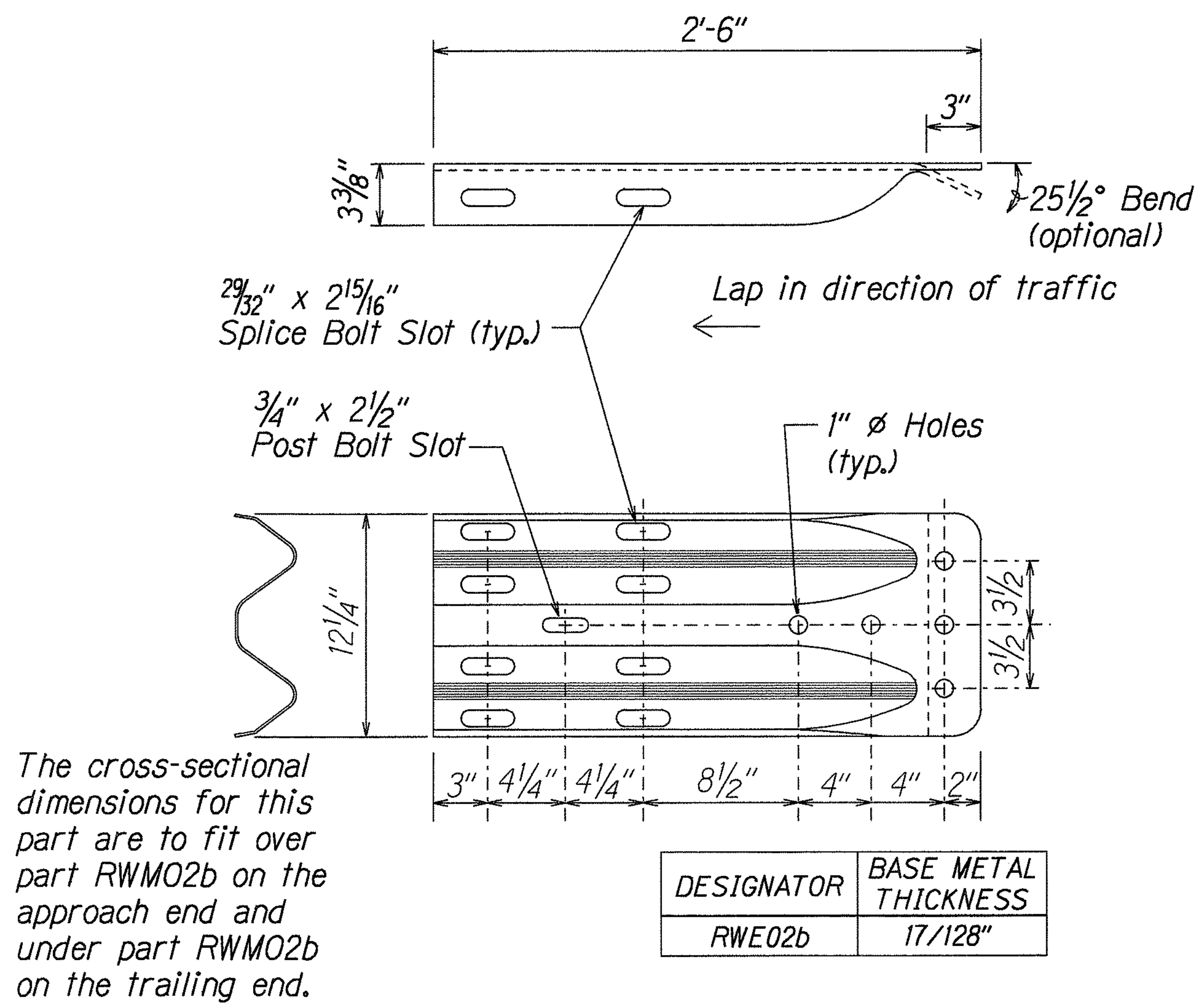
GUARDRAIL DETAILS & NOTES

Waialae Avenue Shoulder Improvements
For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway
and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

Scale: NTS Date: June, 2000

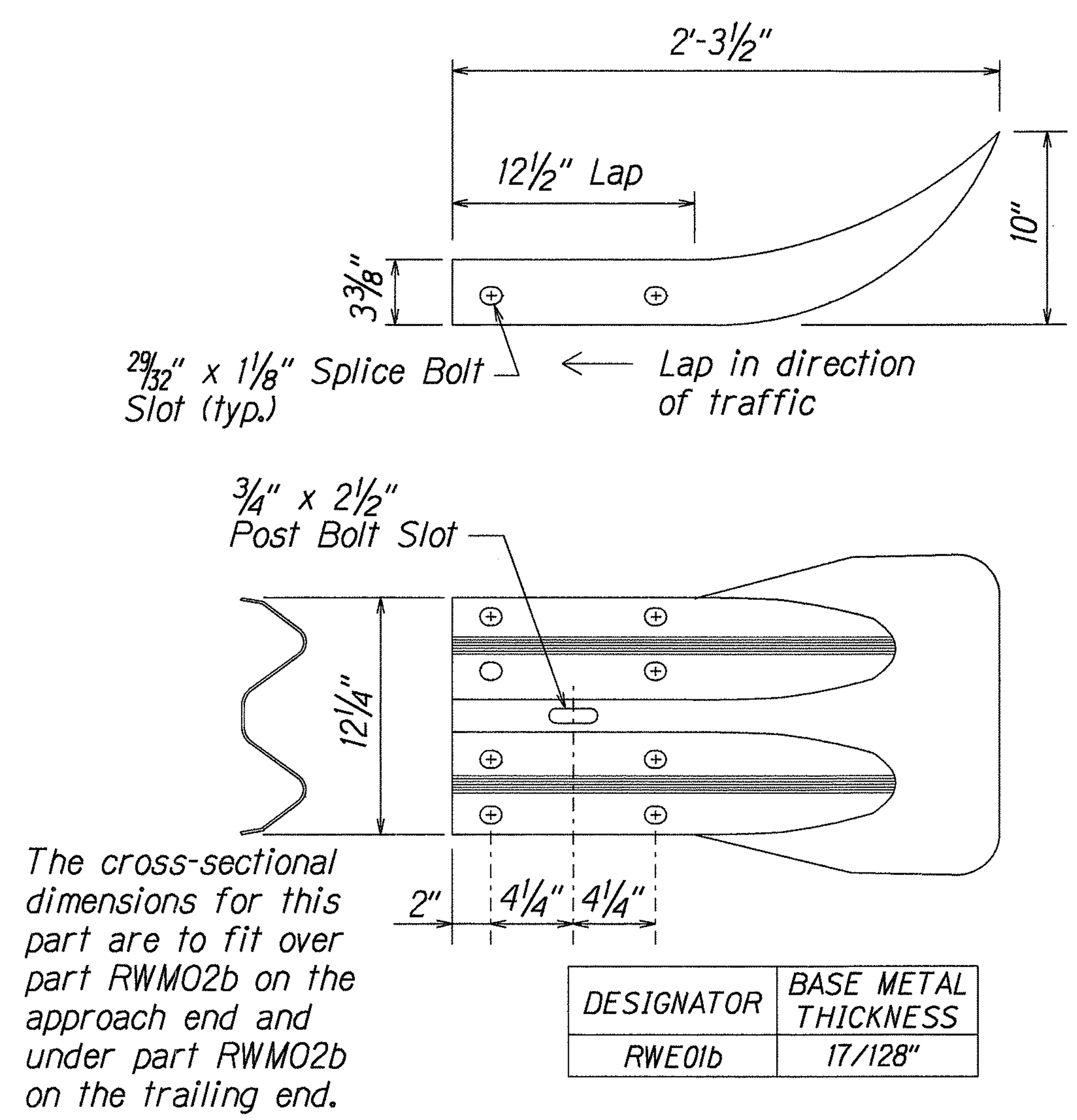
SHEET No. 1 OF 6 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	23	60



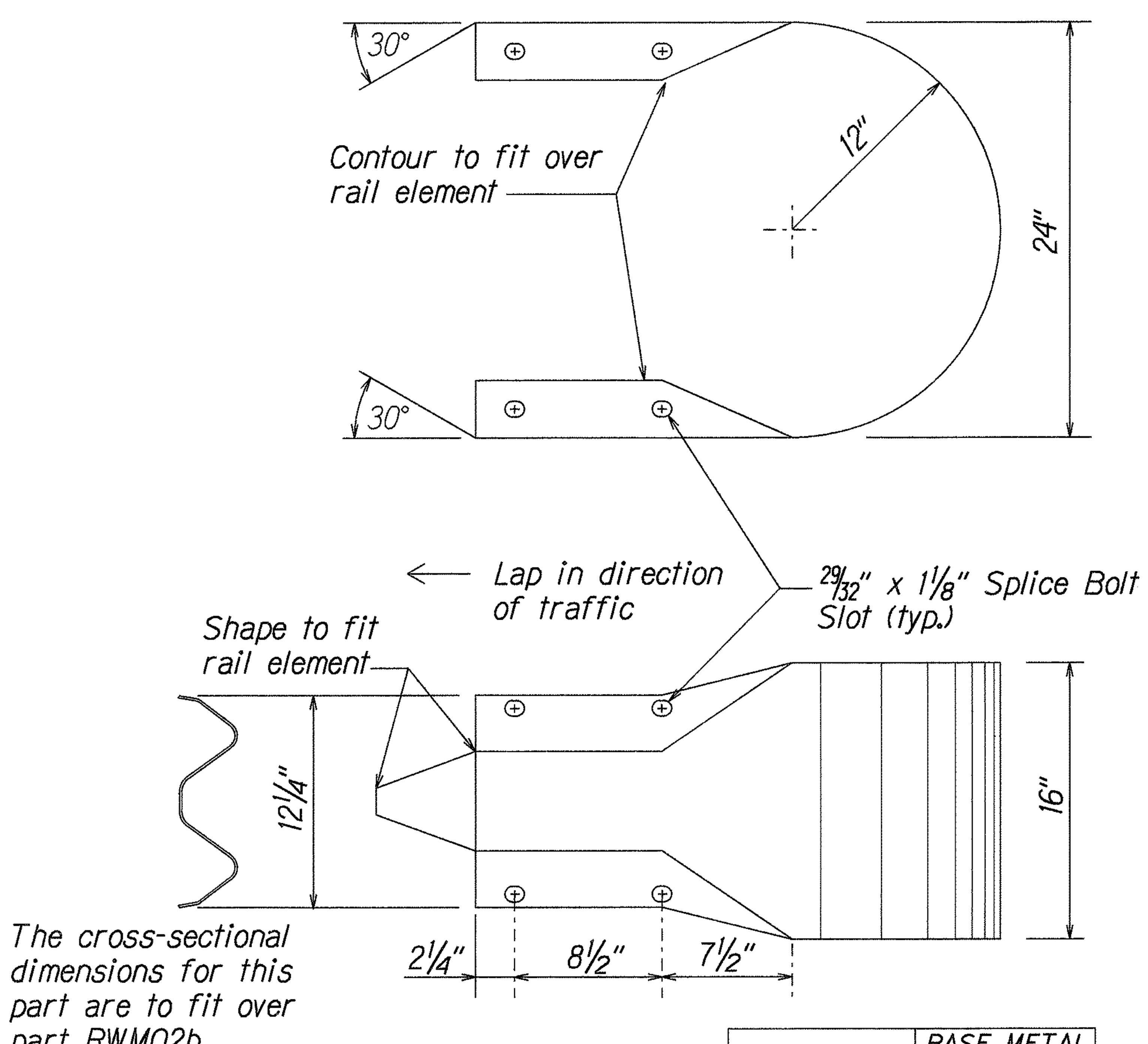
DESIGNATOR	BASE METAL THICKNESS
RWE02b	17/128"

W-BEAM TERMINAL CONNECTOR (RWE02b)



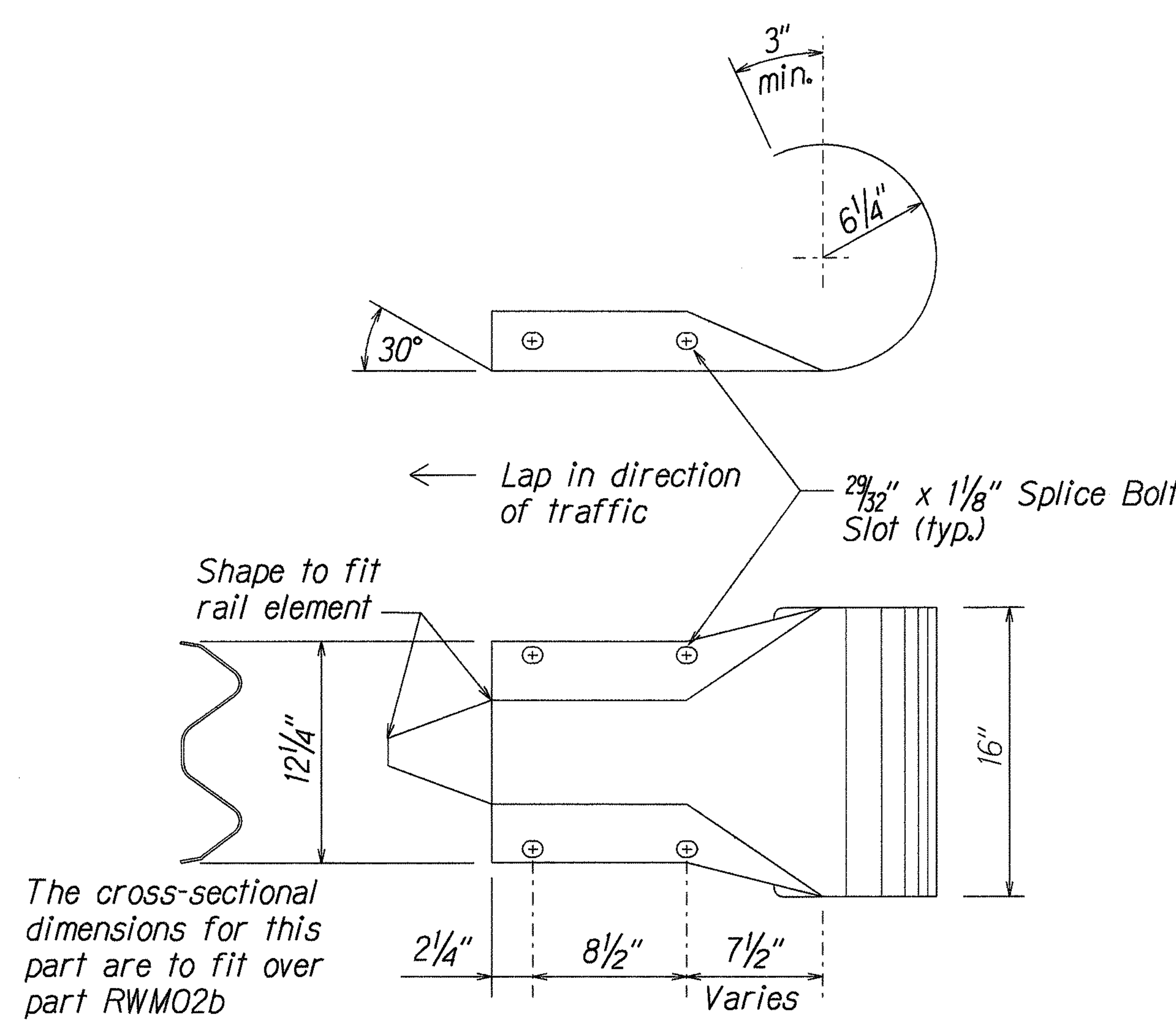
DESIGNATOR	BASE METAL THICKNESS
RWE01b	17/128"

W-BEAM END SECTION (FLARED RWE01b)



DESIGNATOR	BASE METAL THICKNESS
RWE06b	17/128"

W-BEAM END SECTION (BUFFER RWE06b)



DESIGNATOR	BASE METAL THICKNESS
RWE03a	7/64"

W-BEAM END SECTION (ROUNDED RWE03a)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

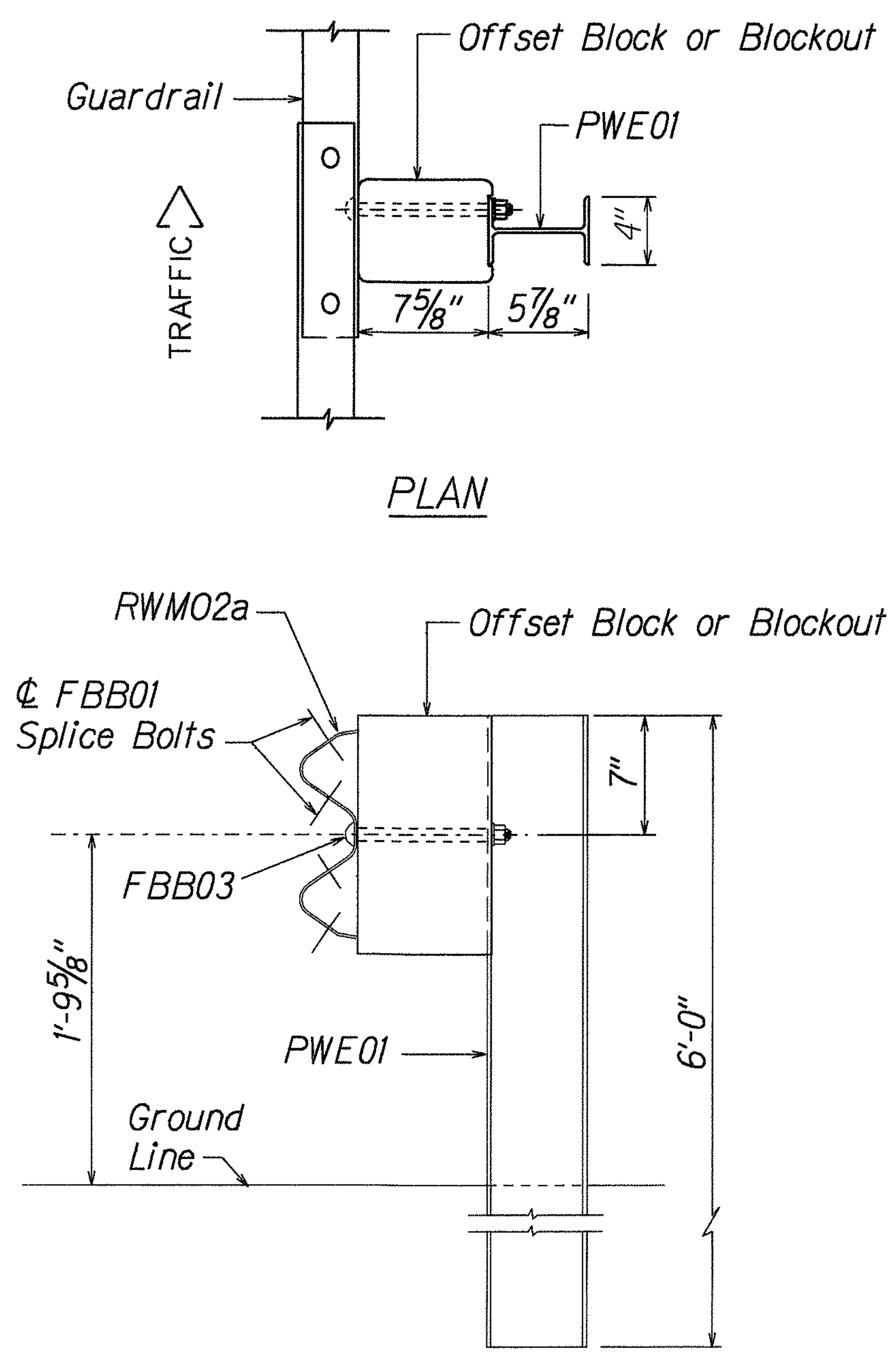
Waialae Avenue Shoulder Improvements
For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway
and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

Scale: NTS Date: June, 2000

r3/01/99 td/ruby/guardrail/te51rev.dgn (standard plan TE-51 (09/01/87))

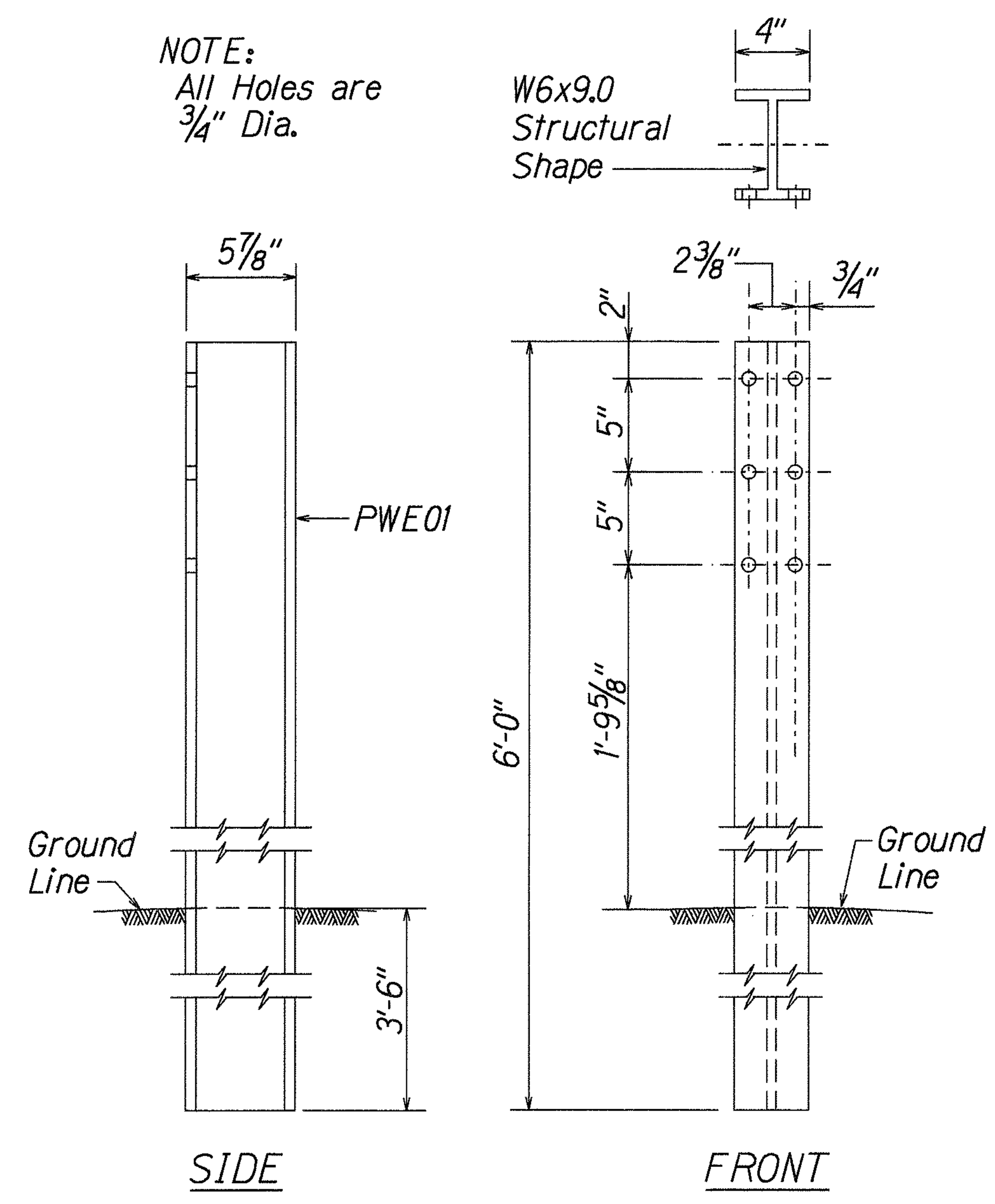
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY X	X
NOTE BOOK	TRACED BY X	
	DESIGNED BY X	
	QUANTITIES BY	
	CHECKED BY	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	24	60

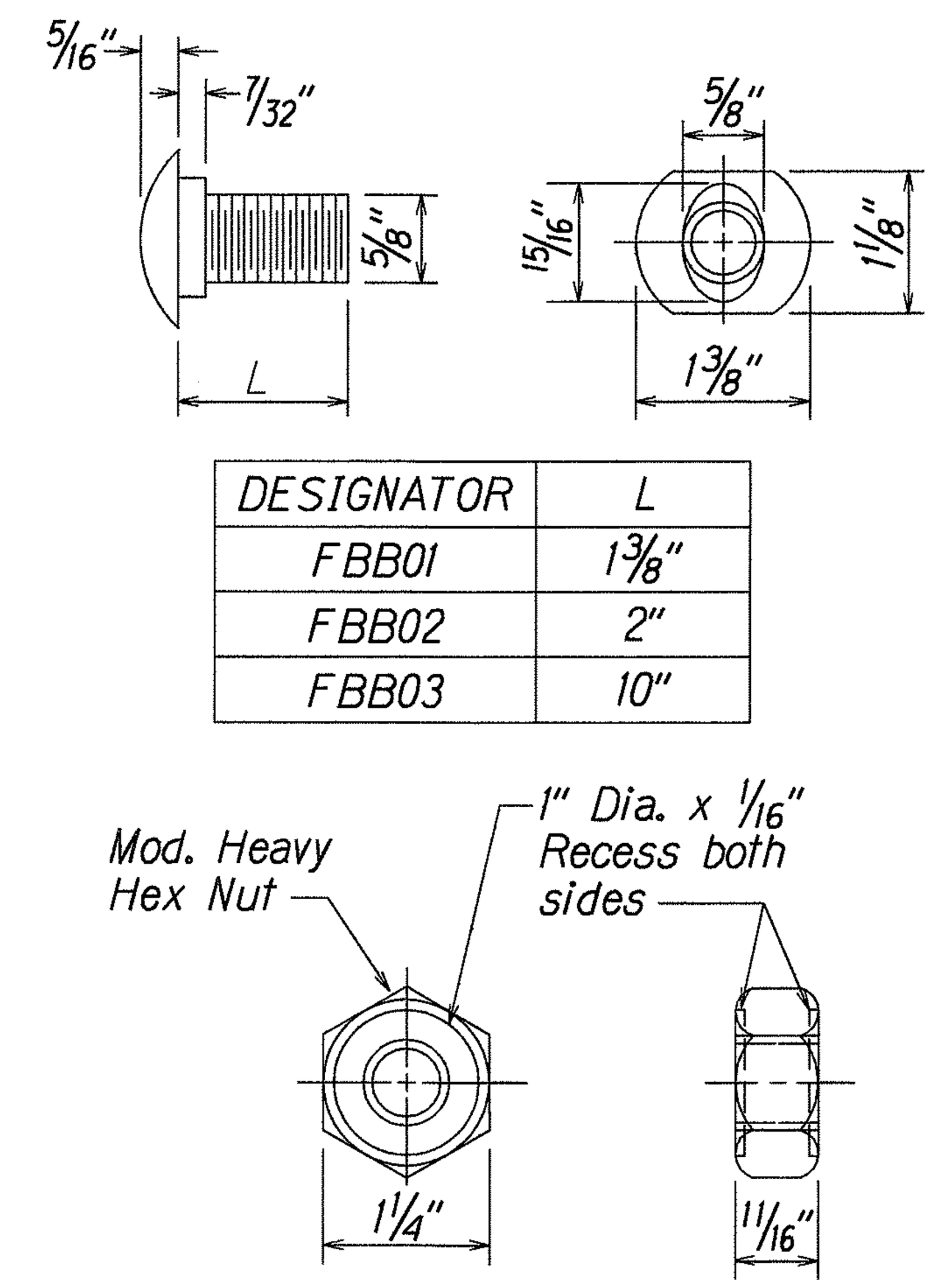


ELEVATION

STRONG POST W-BEAM GUARDRAIL (SGR04a)

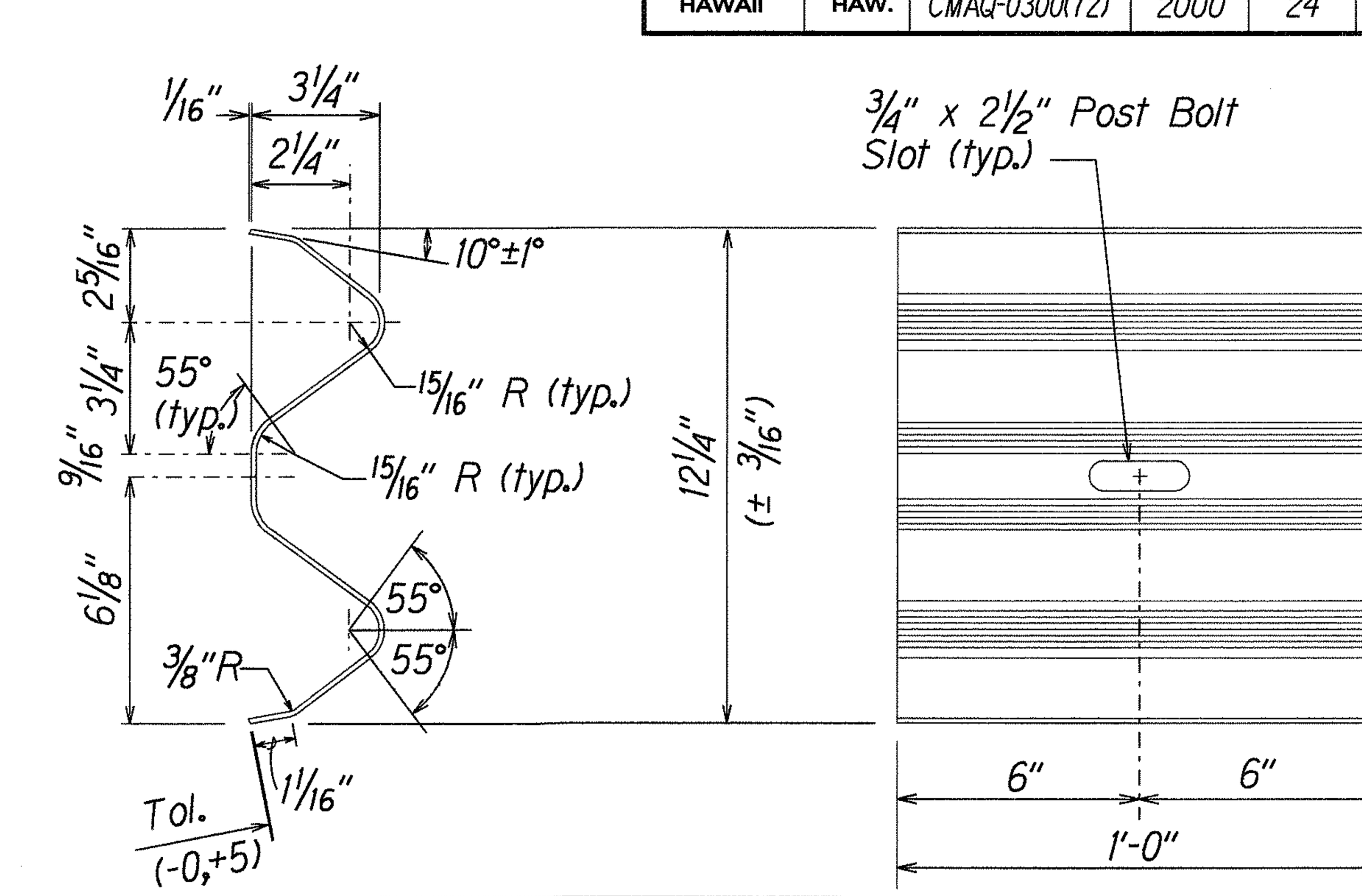


W-BEAM STRONG POST (PWE01)



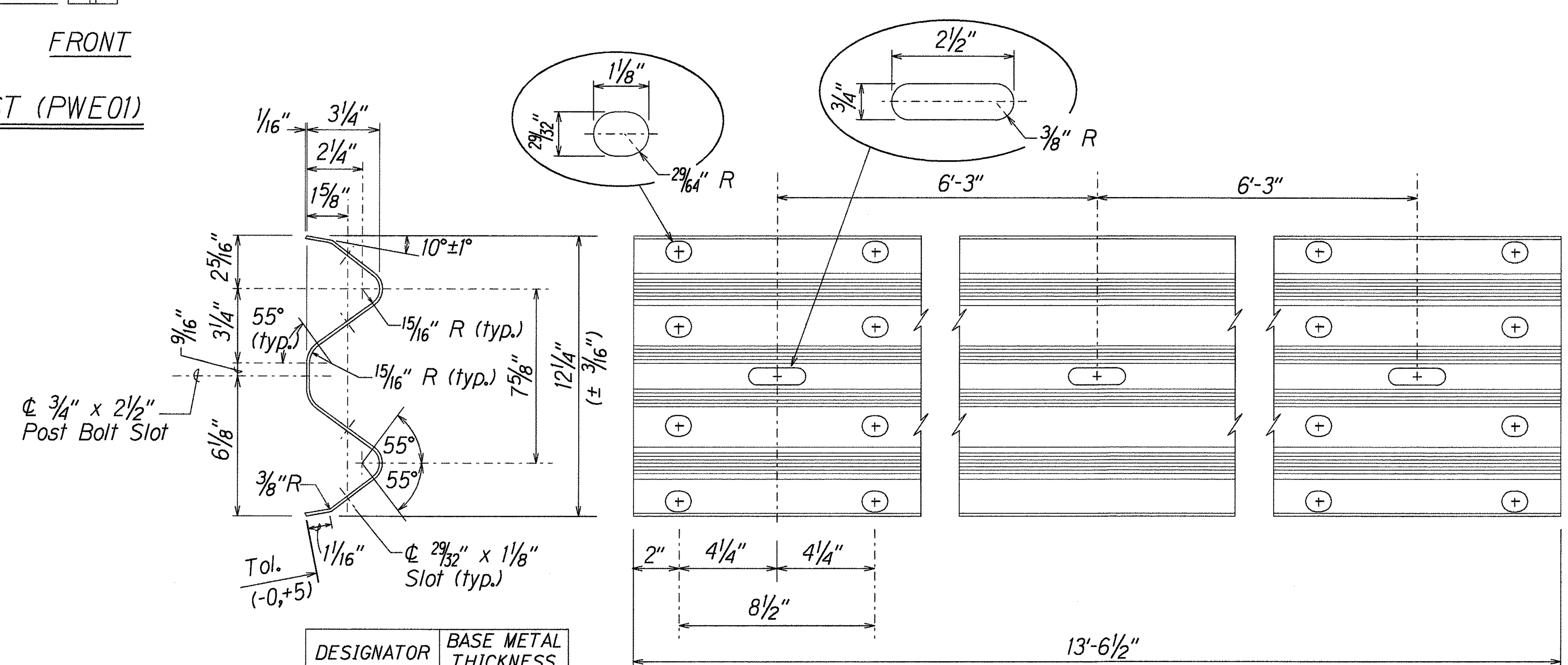
DESIGNATOR	L
FBB01	1⅜"
FBB02	2"
FBB03	10"

GUARDRAIL BOLTS AND RECESSED NUT



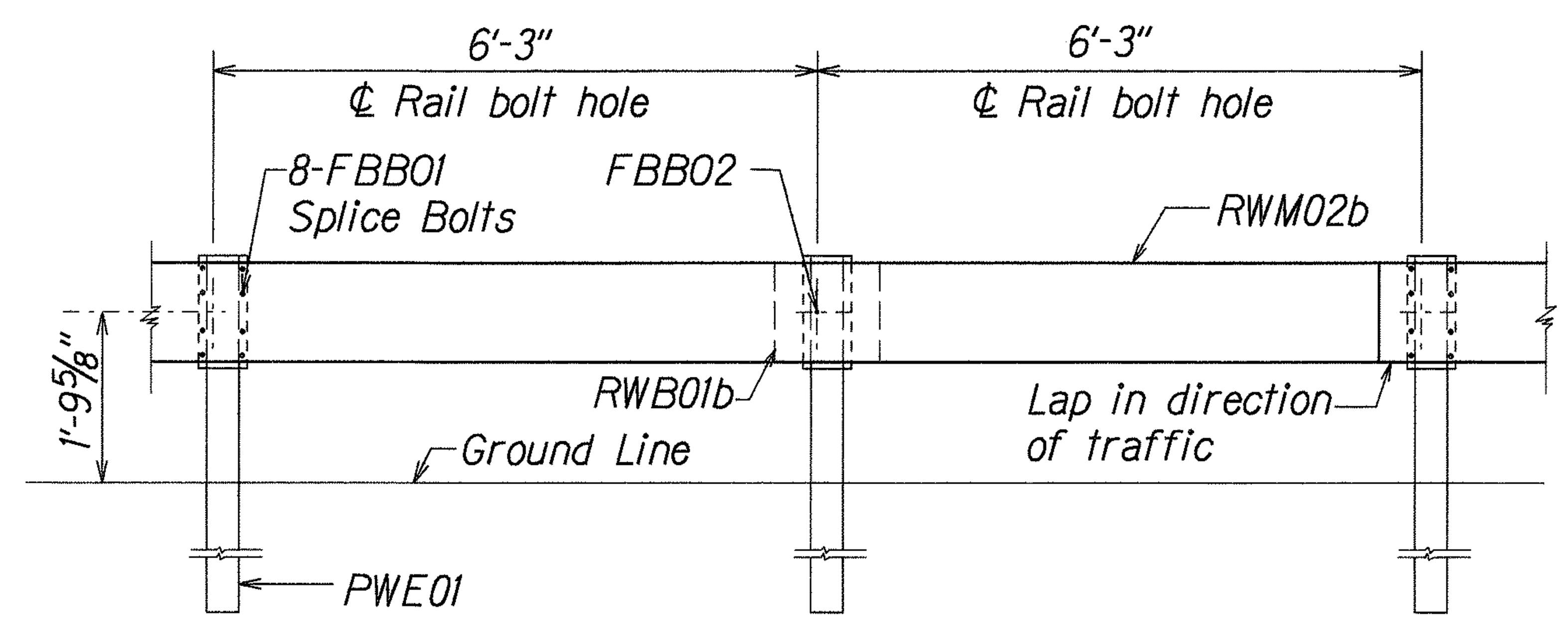
DESIGNATOR	BASE METAL THICKNESS
RWB01b	17/128"

W-BEAM BACK-UP-PLATE (RWB01b)



DESIGNATOR	BASE METAL THICKNESS
RWM02b	17/128"

2 SPACE W-BEAM GUARDRAIL (RWM02b)



ELEVATION

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

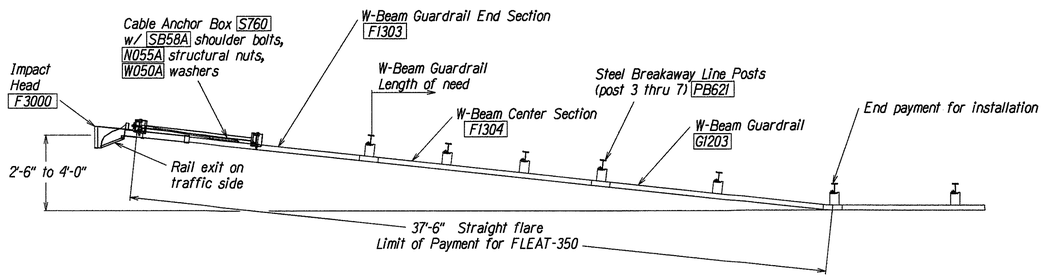
Waialae Avenue Shoulder Improvements
For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway
and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

Scale: NTS — Date: June, 2000

SHEET No. 3 OF 6 SHEETS

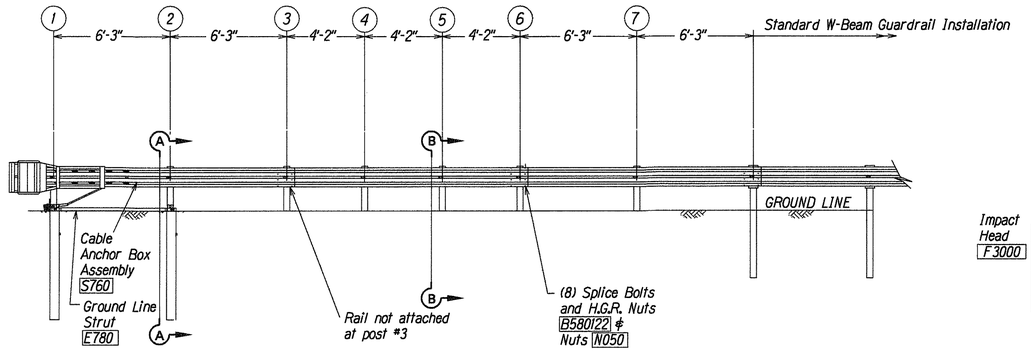
r3/01/99 1d:\ruby\guardrail\wbeamsp.dgn (standard plan TE-50 r03/06/81)

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	25	60

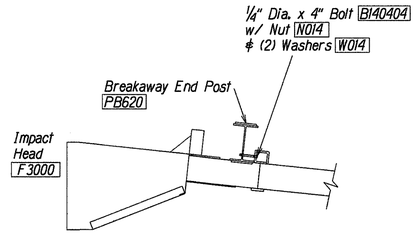


PLAN

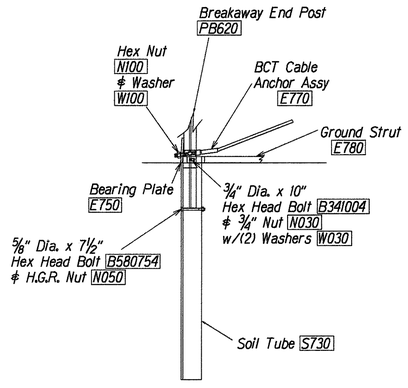
TRAFFIC →



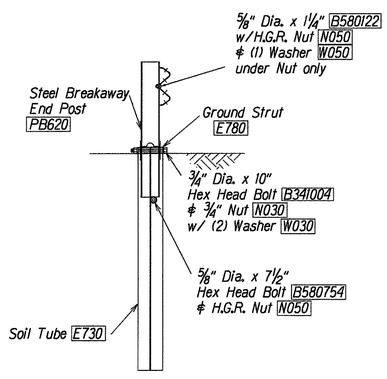
ELEVATION



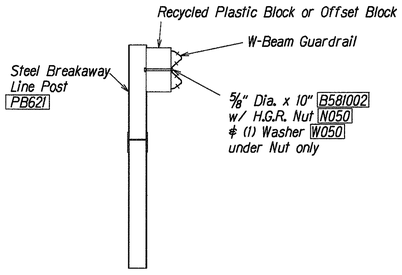
IMPACT HEAD CONNECTING DETAIL



PARTIAL VIEW OF POST 1



SECTION A-A
(@ Post #2)



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

GENERAL NOTES

1. Breakaway posts are required with the FLEAT Terminal.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The soil tubes shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. The soil tubes may be driven with an approved driving head. Soil tubes should not be driven with the post in the tube. If the tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" Dia. post hole, 20" deep may be used if approved by the engineer. Granular material will be placed in the bottom of the hole approx. 2 1/2" deep to provide drainage. The soil tubes will be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

ITEM NO.	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SECTION, 12 GA.
GI203	1	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 72"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	STEEL BREAKAWAY END POST
PB621	5	STEEL BREAKAWAY LINE POST
	5	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
		HARDWARE
B580122	25	5/8" Dia. x 1 1/4" SPLICE BOLT, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLT
B341004	2	3/4" Dia. x 10" HEX BOLT
B581002	5	5/8" Dia. x 10" H.G.R. BOLT (POST 3 THRU 7)
N050	32	5/8" Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, POST 2 THRU 7, 6)
N030	2	3/4" Dia. HEX NUT
W050	6	H.G.R. WASHER
W030	4	3/4" ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	1/4" x 4" HEX BOLT
N014	2	1/4" HEX NUT
W014	4	1/4" WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" A325 STRUCTURAL NUT
W050A	16	1 1/16" OD x 9/16" ID A325 STR. WASHER

Foundation Tube Options For Posts 1 & 2

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

FLEAT - 350 FLARED ENERGY ABSORBING TERMINAL

Waialae Avenue Shoulder Improvements
For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway
and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

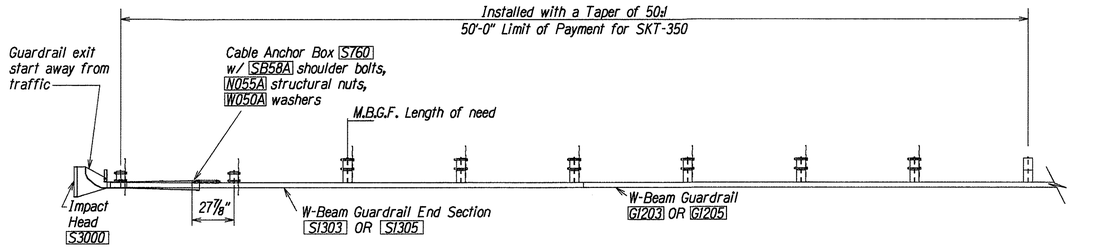
Scale: NTS Date: June, 2000

SHEET No. 4 OF 6 SHEETS

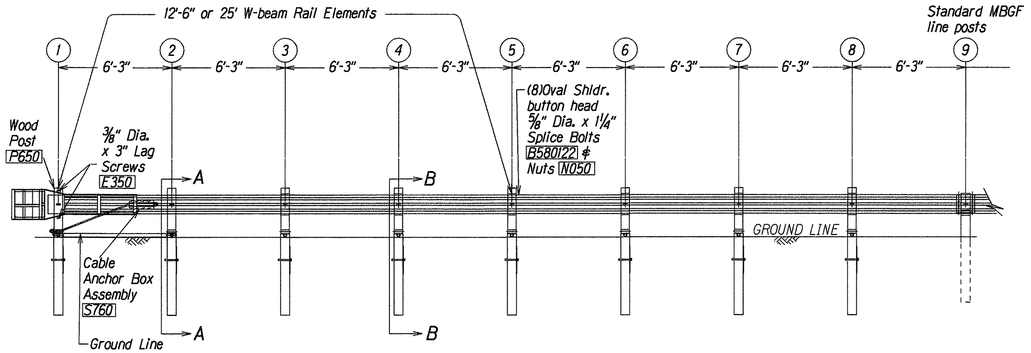
ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY X | DATE X
NOTE BOOK dd/gg/ff | TRACED BY X | DESIGNED BY X | QUANTITIES BY | CHECKED BY

r1/31/2000 d:\ruby\guardrail\fleat350.dgn (standard plan TE-61 rl1/03/89 & TE-62 r09/01/87)

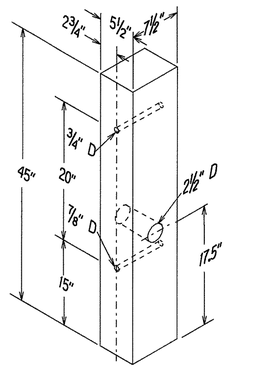
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	26	60



PLAN

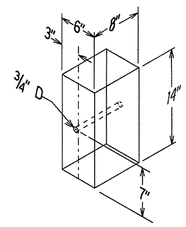


ELEVATION



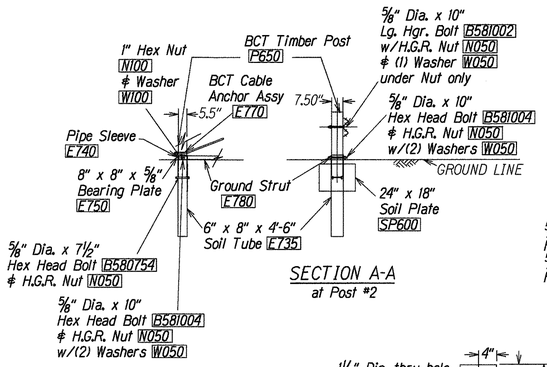
POSTS 1 thru 8 P650

All measurements should be taken from bottom of post



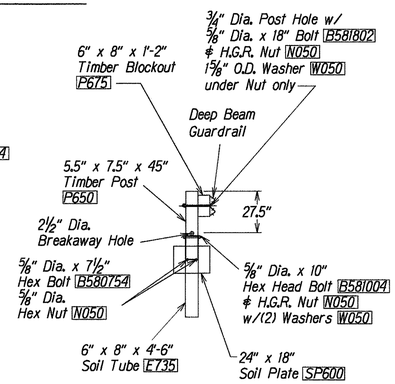
TIMBER BLOCKOUT P675

**not supplied by Road Systems.

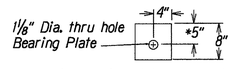


SECTION A-A
at Post #2

PARTIAL VIEW OF POST 1

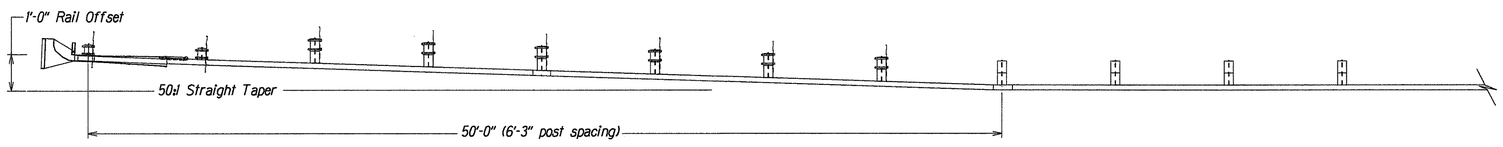


SECTION B-B
typical @ Post 3 - 8



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

BEARING PLATE E750



TYPICAL FLARE CONFIGURATION

ITEM NO.	QTY	BILL OF MATERIALS
S3000	1	IMPACT HEAD
SI303/SI305	1	W-BEAM GUARDRAIL END SECTION 12 GA. 12.5' or 25'
GI203/GI205	3/1	W-BEAM GUARDRAIL, 12 GA., 12.5' or 25'
E735	8	FOUNDATION SOIL TUBE, 6" x 8" x 4'-6"
SP600	8	SOIL PLATE, 24" x 18" x 1/4"
E740	1	PIPE SLEEVE
E750	1	BEARING PLATE, 8" x 8" x 5/8"
S760	1	CABLE ANCHOR BOX
E770	1	BCT ANCHOR CABLE
E780	1	GROUND STRUT
P650	8	5.5" x 7.5" x 45" WOOD POSTS
P675	6	6" x 8" x 14" TIMBER BLOCKOUT
E3151	1	**IMPACT HEAD OBJECT MARKER (Not Shown)
		HARDWARE
B580122	16 / 32	5/8" Dia. x 1 1/4" SPLICE BOLT
B580754	16	5/8" Dia. x 7 1/2" HEX BOLT
B581004	8	5/8" Dia. x 10" HEX BOLT
B581002	1	5/8" Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B581802	6	5/8" Dia. x 18" H.G.R. BOLT (POST 3-8)
N050	47/63	5/8" Dia. H.G.R. NUT (SPLICE 16 / 32, SOIL TUBES 22, STRUT 2, POST 2-8, 7)
W050	23	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	1 1/16" OD X 9/16" ID A325 STR. WASHER

GENERAL NOTES:

1. Wood 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 MBGF installation, the MBGF shall be flared at a rate of 50:1 to prevent the impact head from encroaching on the shoulder.
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. Soil tubes shall be installed for all wood posts.
5. 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.

GENERAL NOTES: (continued)

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 wil lbe 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. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks.
9. 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.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SKT-350 SEQUENTIAL KINKING TERMINAL

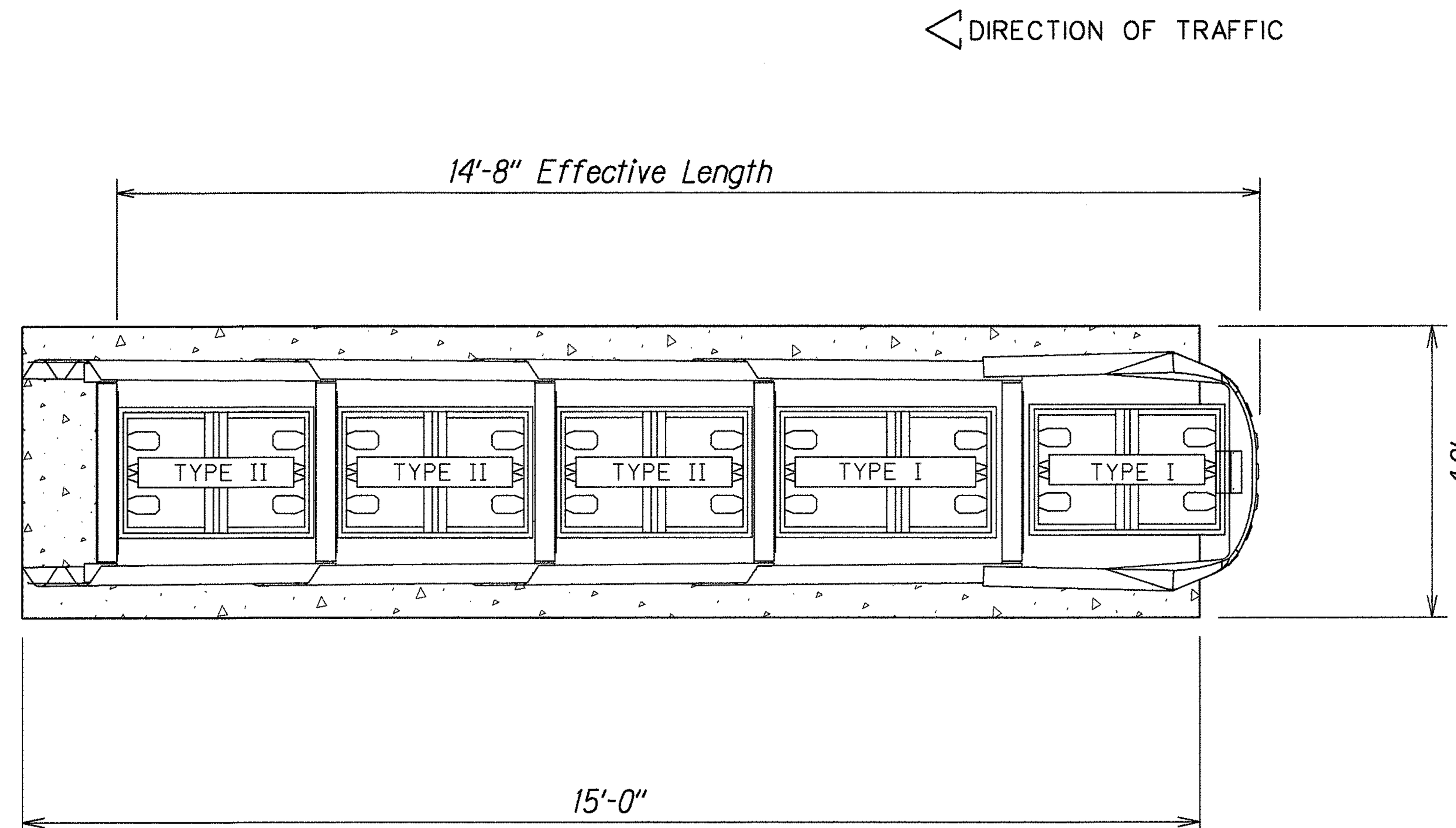
Waialae Avenue Shoulder Improvements For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

Scale: NTS Date: June, 2000

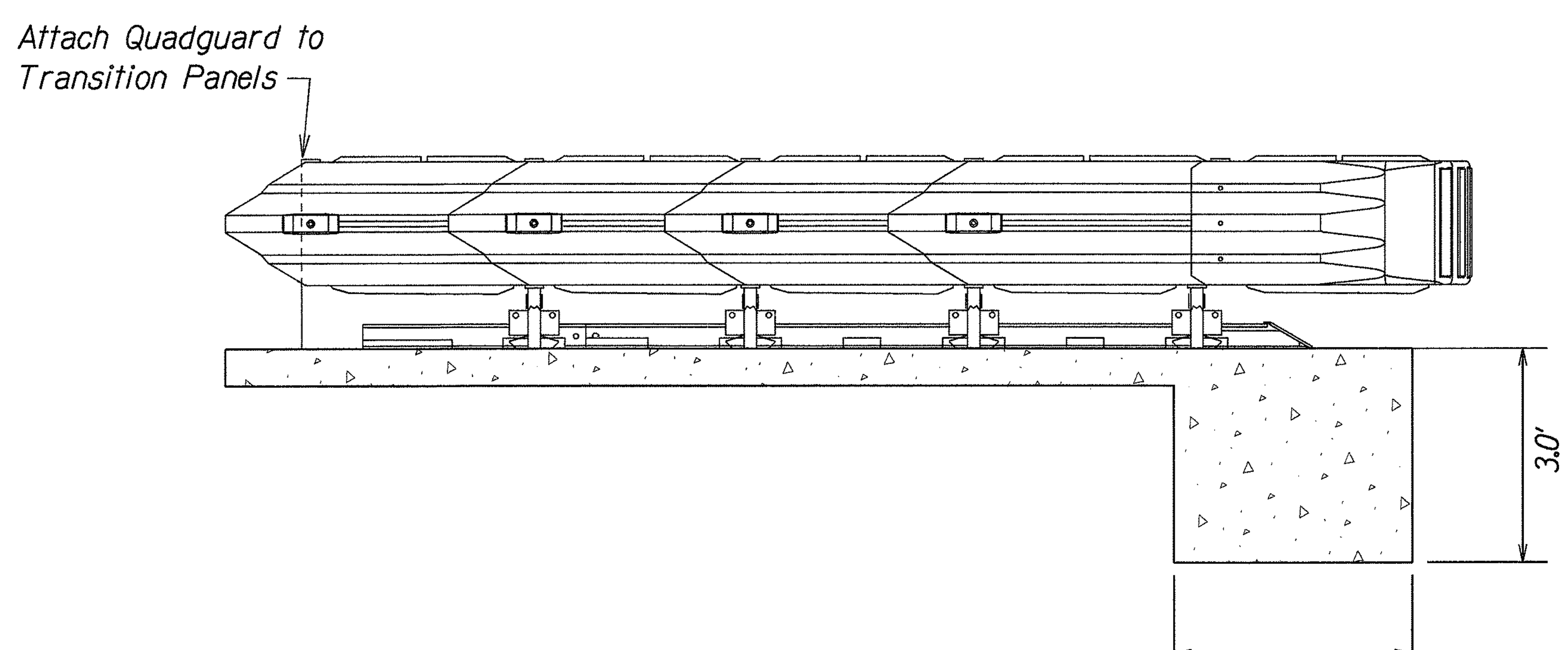
SHEET No. 5 OF 6 SHEETS

ORIGINAL PLANS
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
NOTE BOOK
rdl:ruby/guardrail/skt350.dgn (Stand Plan TE-61 rlt:03/89 & TE-62 rlt:09/01/87)
3/01/99

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	CMAQ-0300(72)	2000	27	60



PLAN VIEW



ELEVATION VIEW

QUARDGUARD CRASH ATTENUATOR WITH CONCRETE PAD DETAILS

4-BAY SYSTEM - MODEL QS3004Y

Not To Scale

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK dd6.george 5misdgr06 No.	DRAWN BY G. A.	r3/6/99
	TRACED BY	
	DESIGNED BY i.f., l.o.	
	QUANTITIES BY	
	CHECKED BY	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

QUARDGUARD DETAILS

Waialae Avenue Shoulder Improvements
For Bicycle Lanes
Kealaolu Avenue to Kalanianaole Highway
and 17th Avenue to 21st Avenue
Federal Aid Project No. CMAQ-0300(72)

Scale: As Shown   Date: June, 2000

SHEET No. 6 OF 6 SHEETS