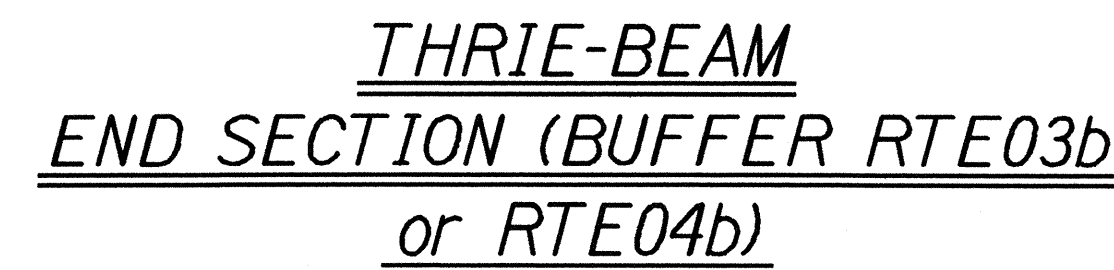


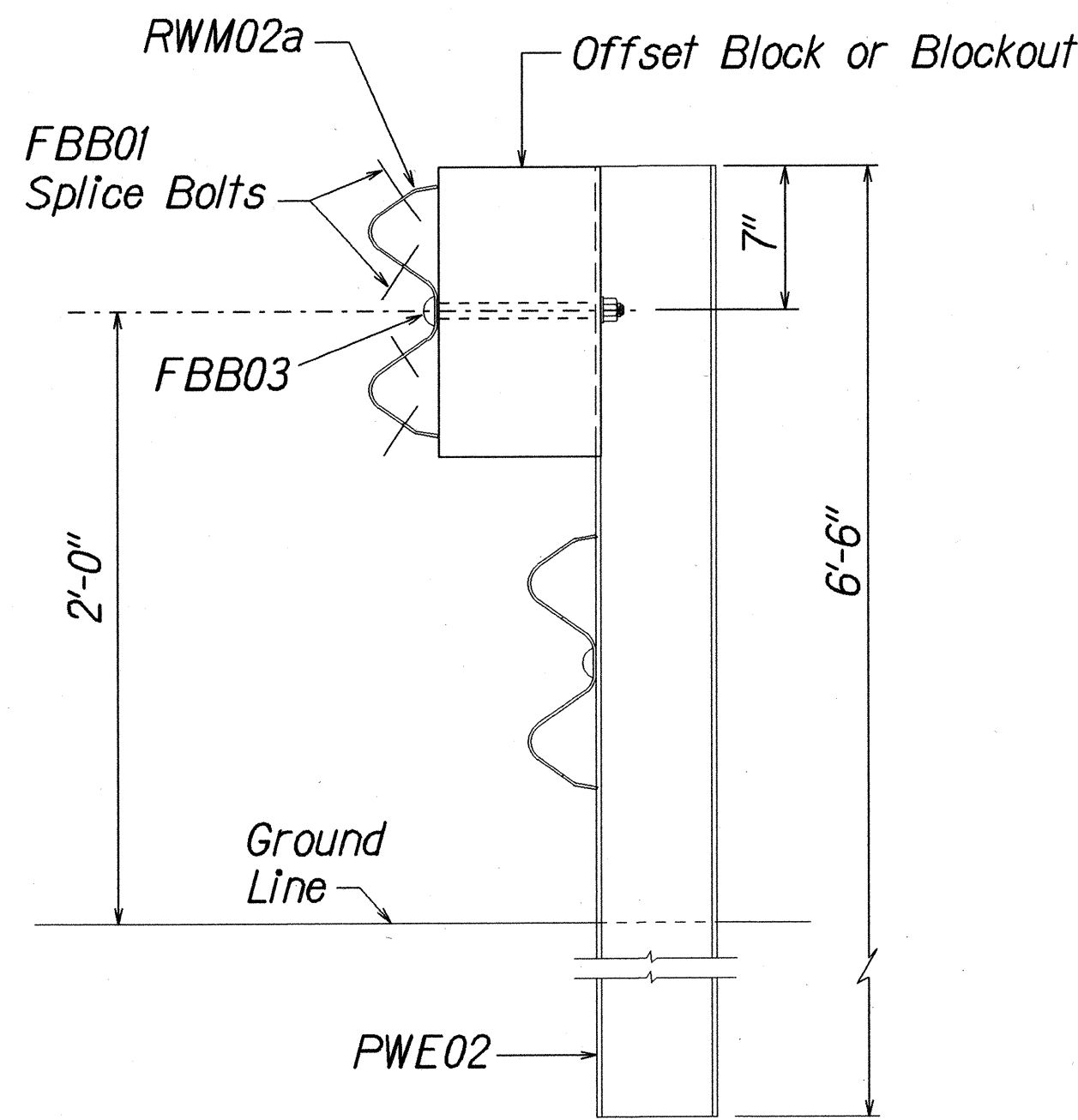
Technical drawing of a tapered shaft. The left end has a diameter of 3". The right end has a diameter of $3\frac{3}{8}$ ". The total length is 2'-6". The shaft is shown in profile with a smooth taper. There are two small circles on the shaft, likely representing keyways or holes, and a vertical centerline passing through the middle of the shaft.



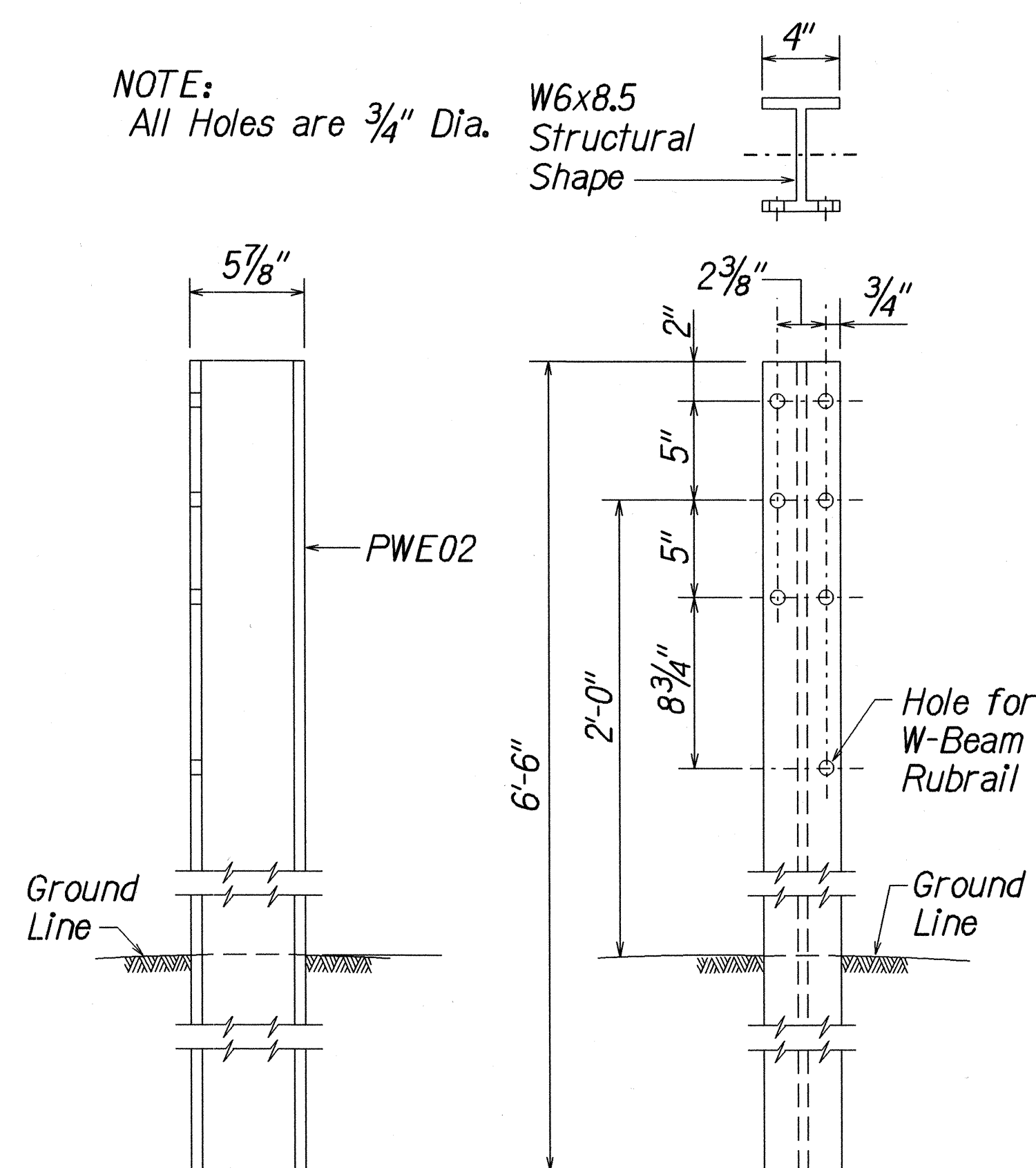
ADD.B-3

 6/21/01 | tdl:ruby/quadrail/te5jrexdan | (standard plan TE-51 009/01/87) |

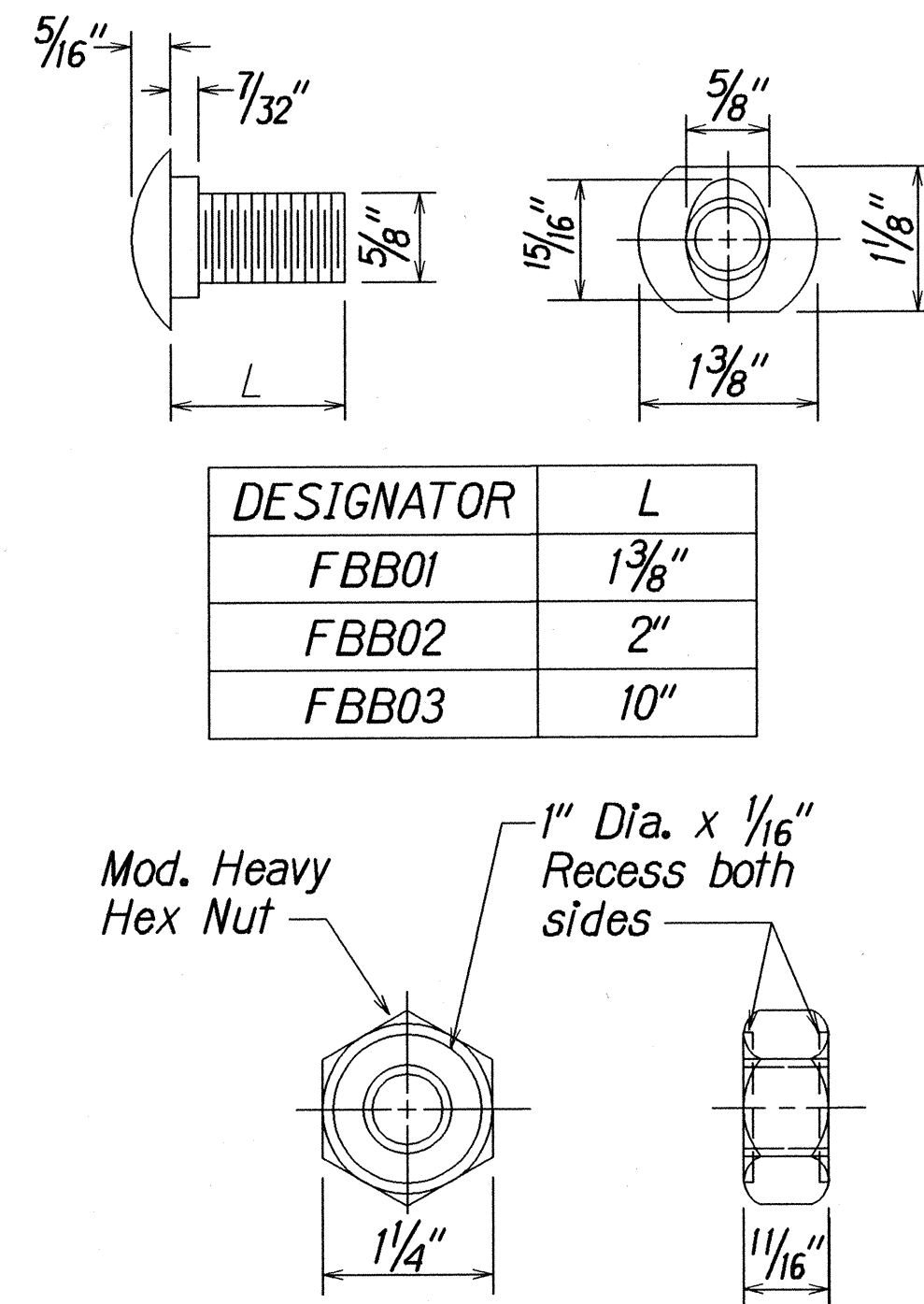
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.33	47



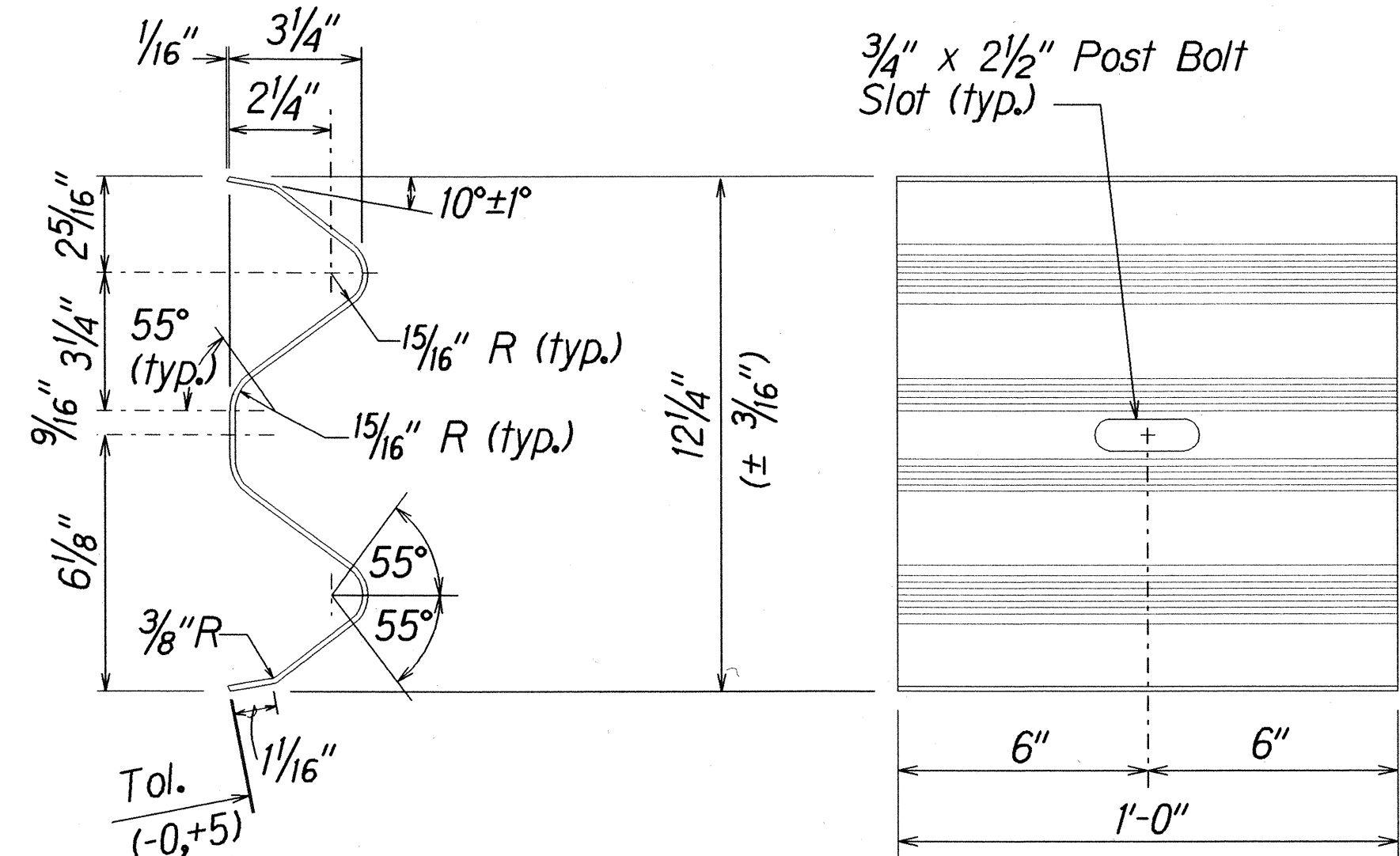
ELEVATION
STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL



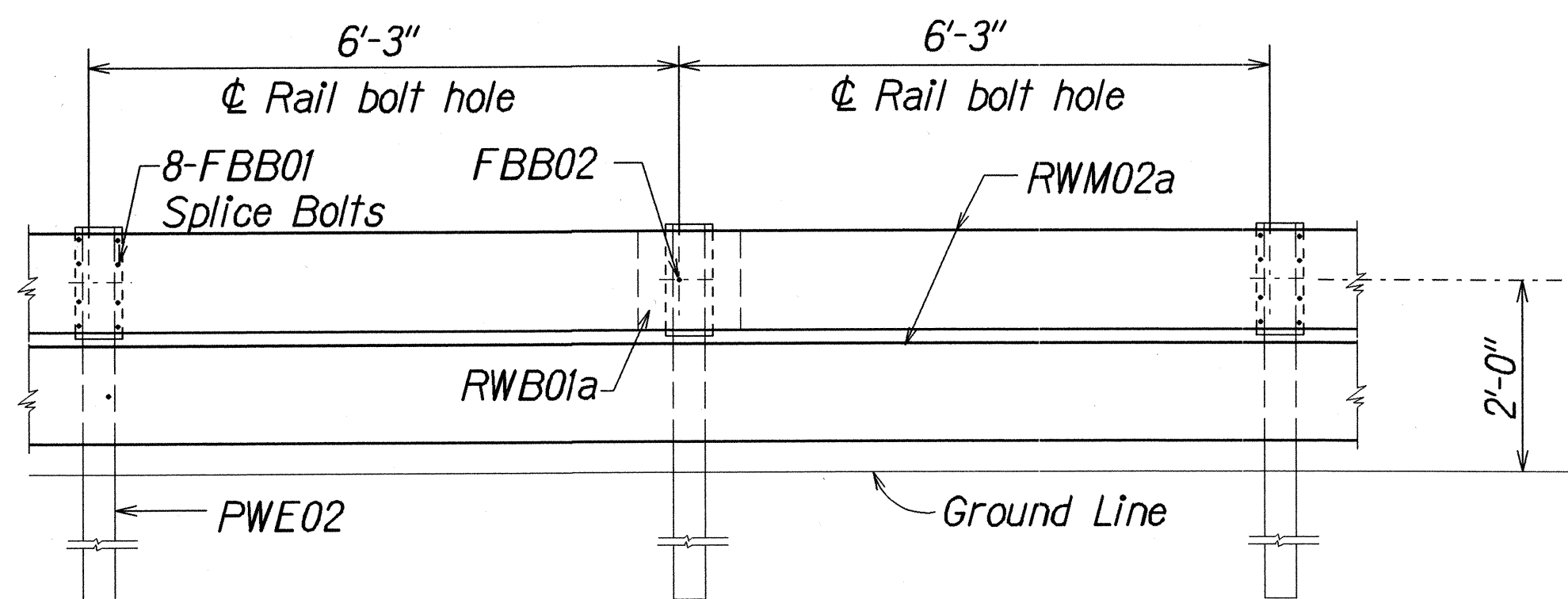
SIDE
FRONT
W-BEAM STRONG POST (PWE02)



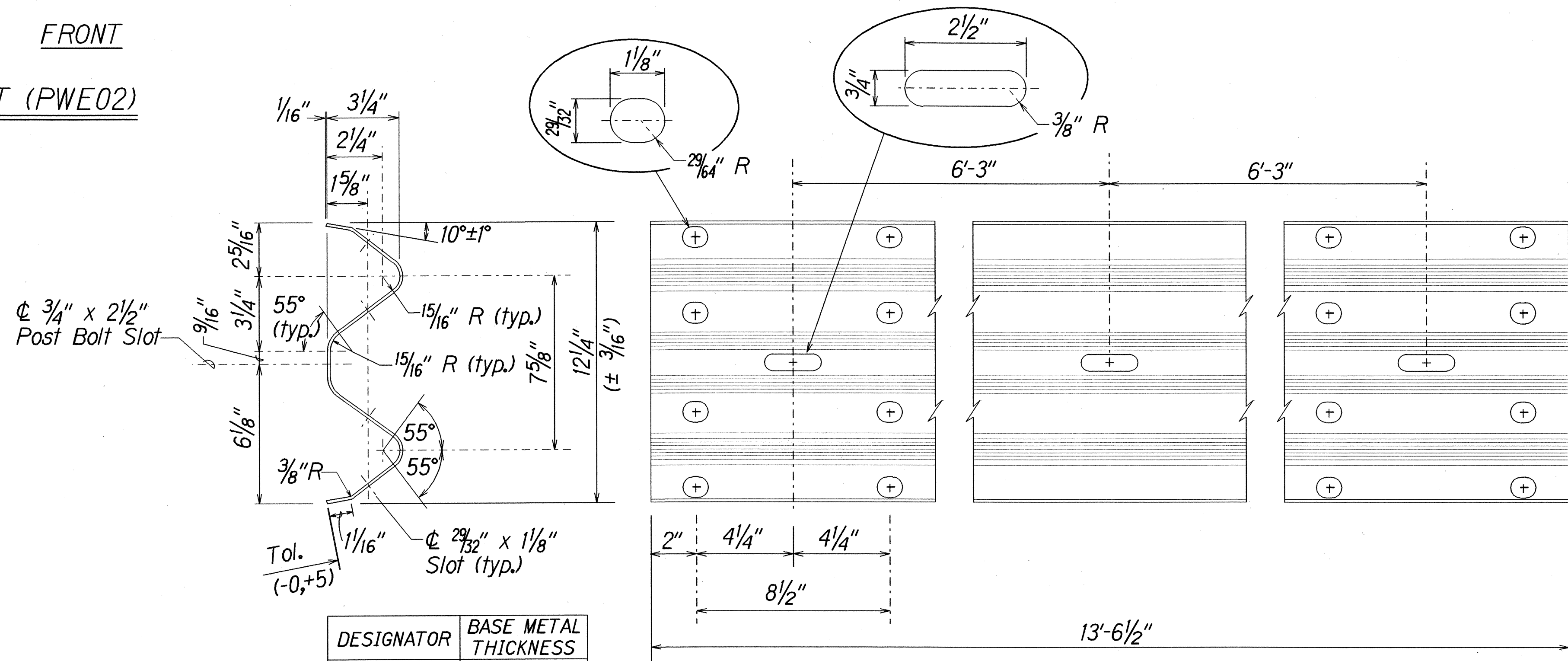
GUARDRAIL BOLTS AND
RECESSED NUT



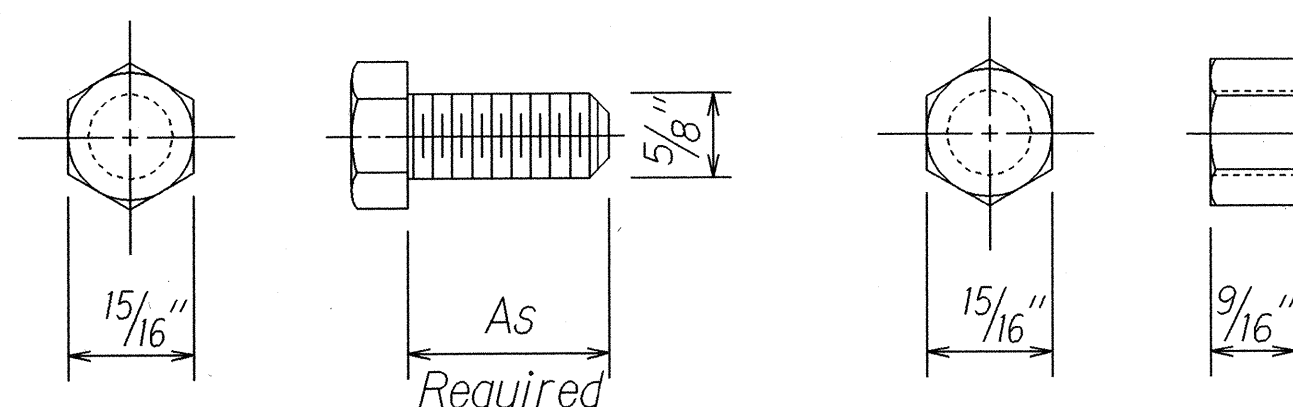
W-BEAM BACK-UP-PLATE (RWB01a)



ELEVATION
STRONG POST RUBRAIL (W-BEAM) GUARDRAIL WITH
RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



2 SPACE W-BEAM GUARDRAIL (RWM02a)



HEX BOLT & NUT (FBX16a)

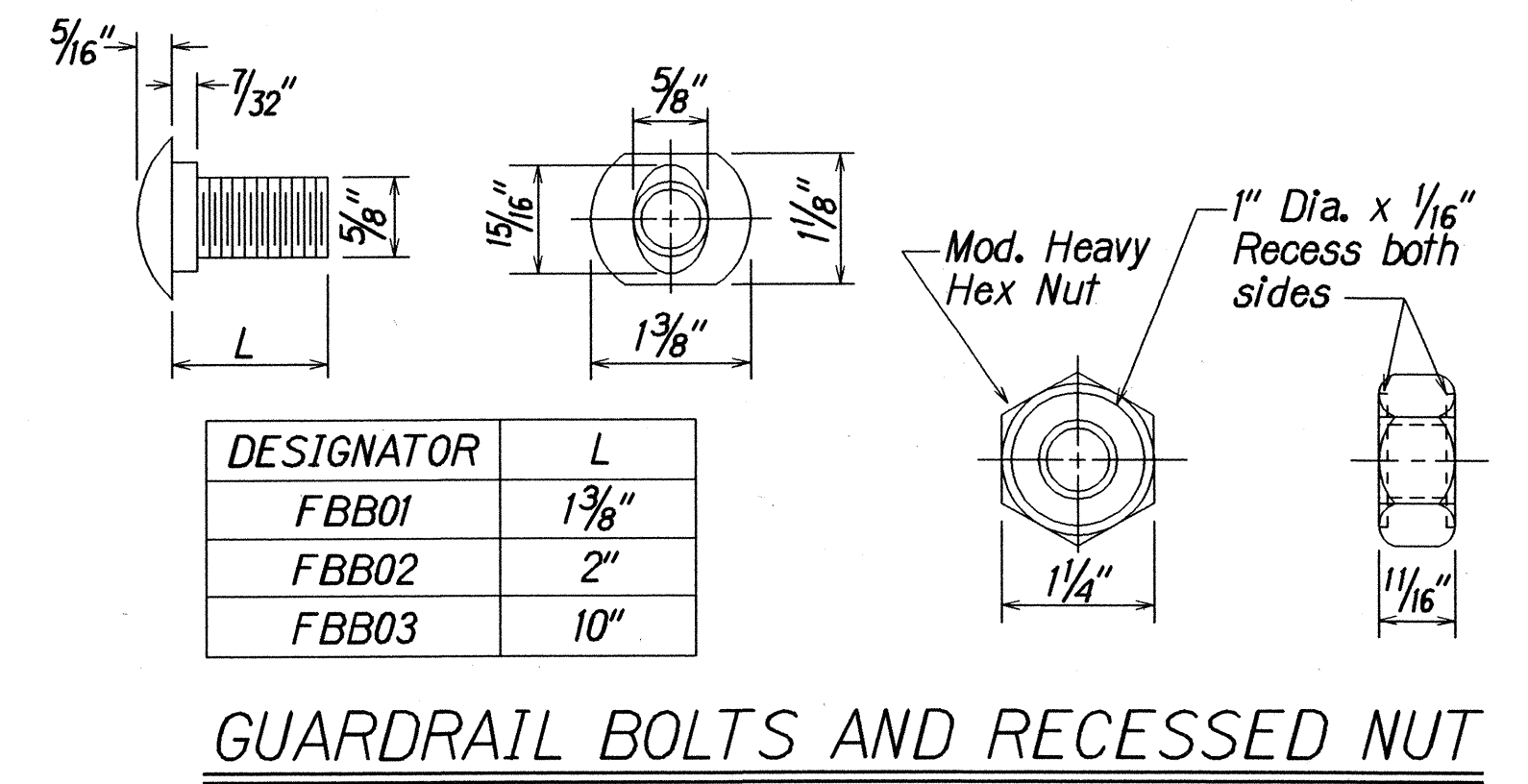
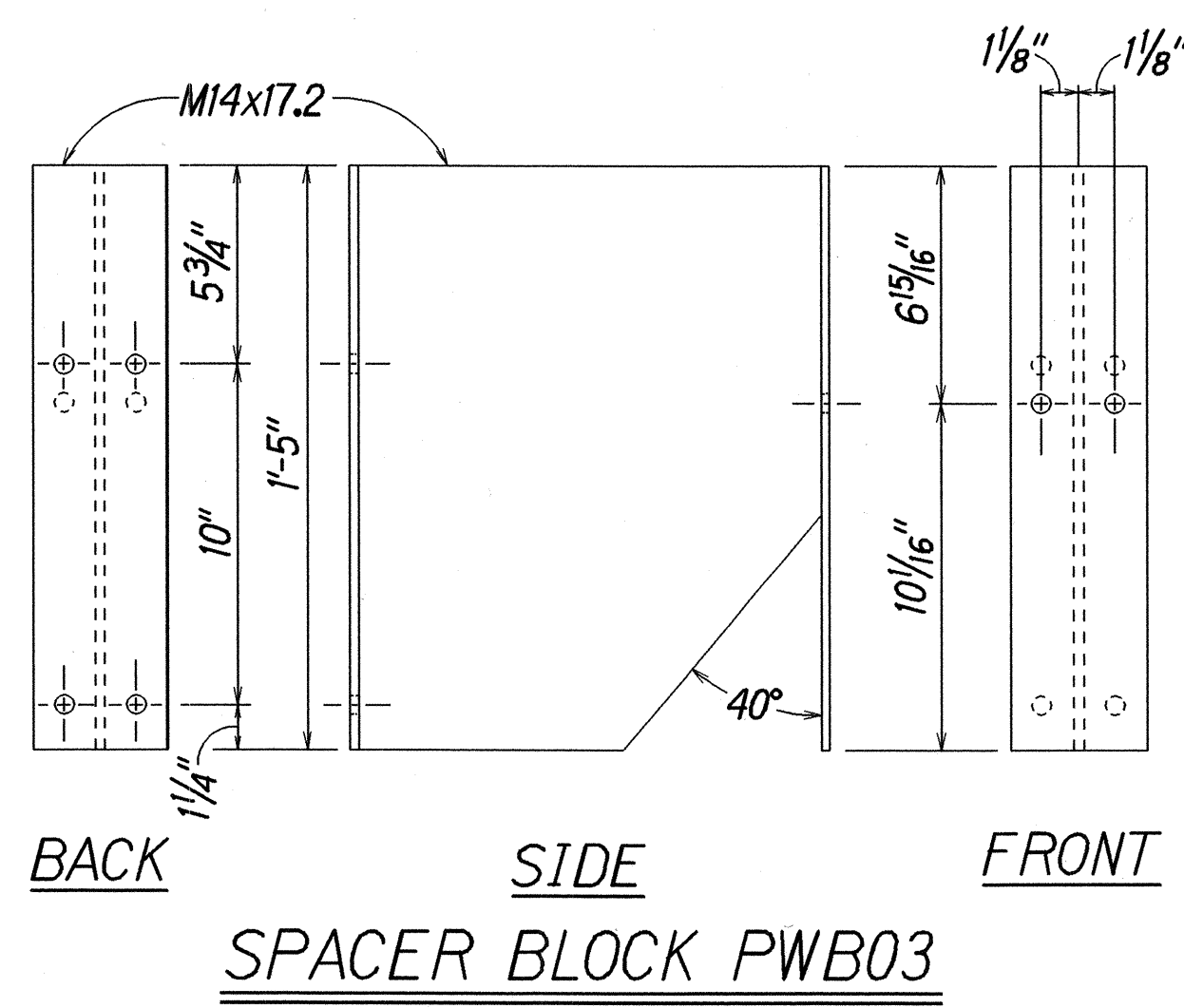
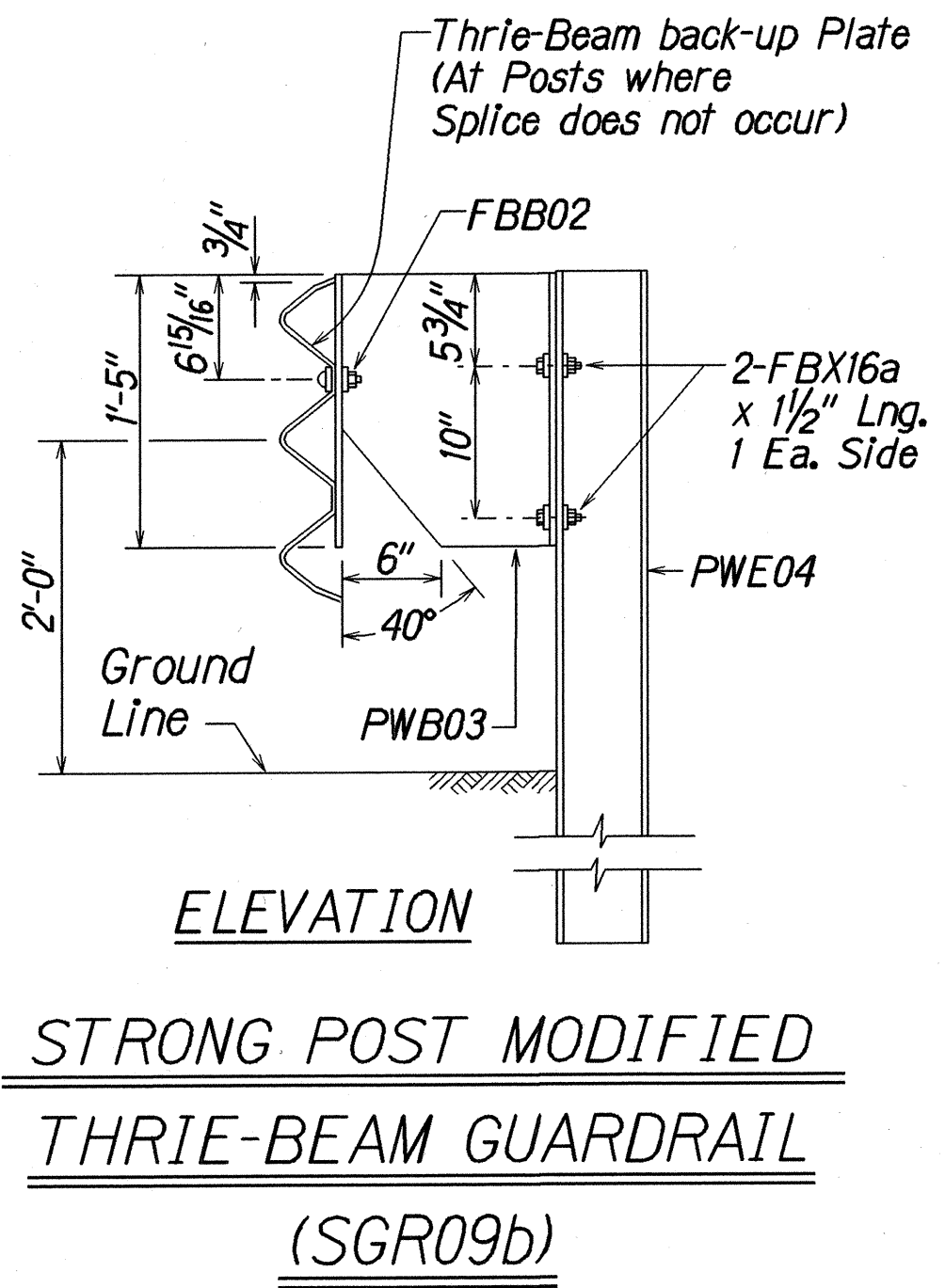
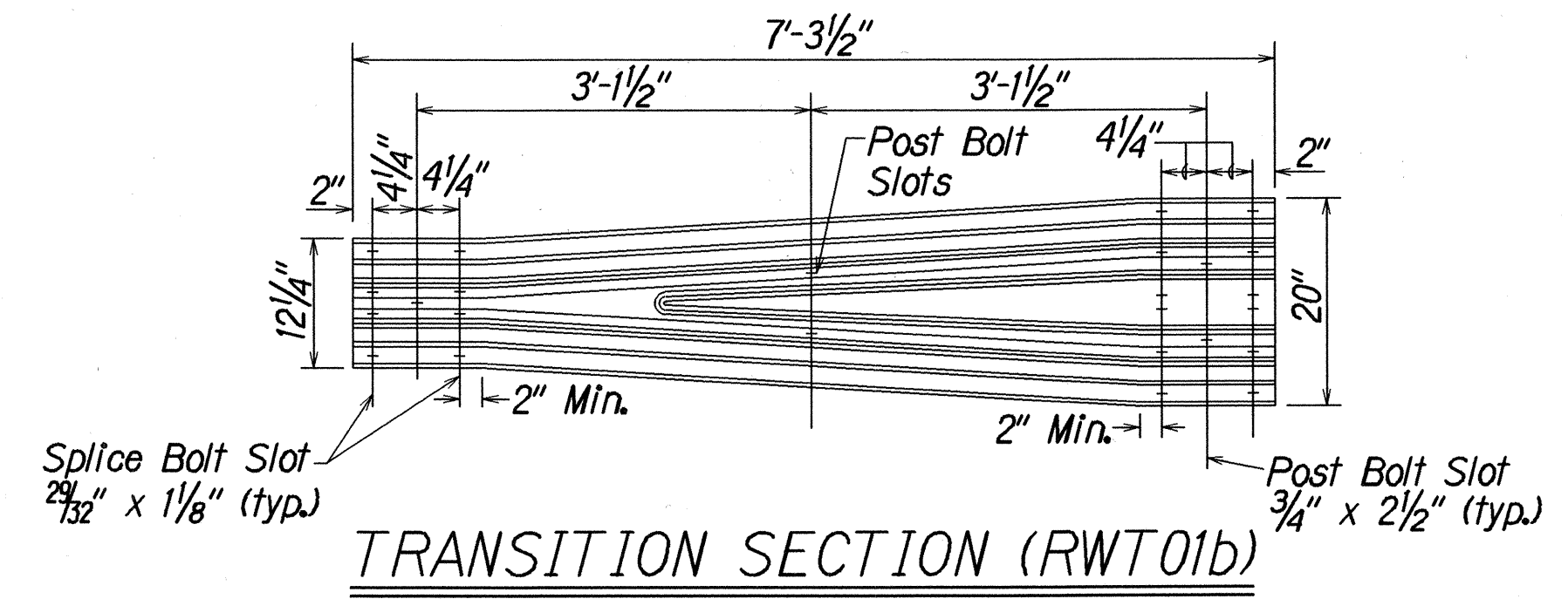
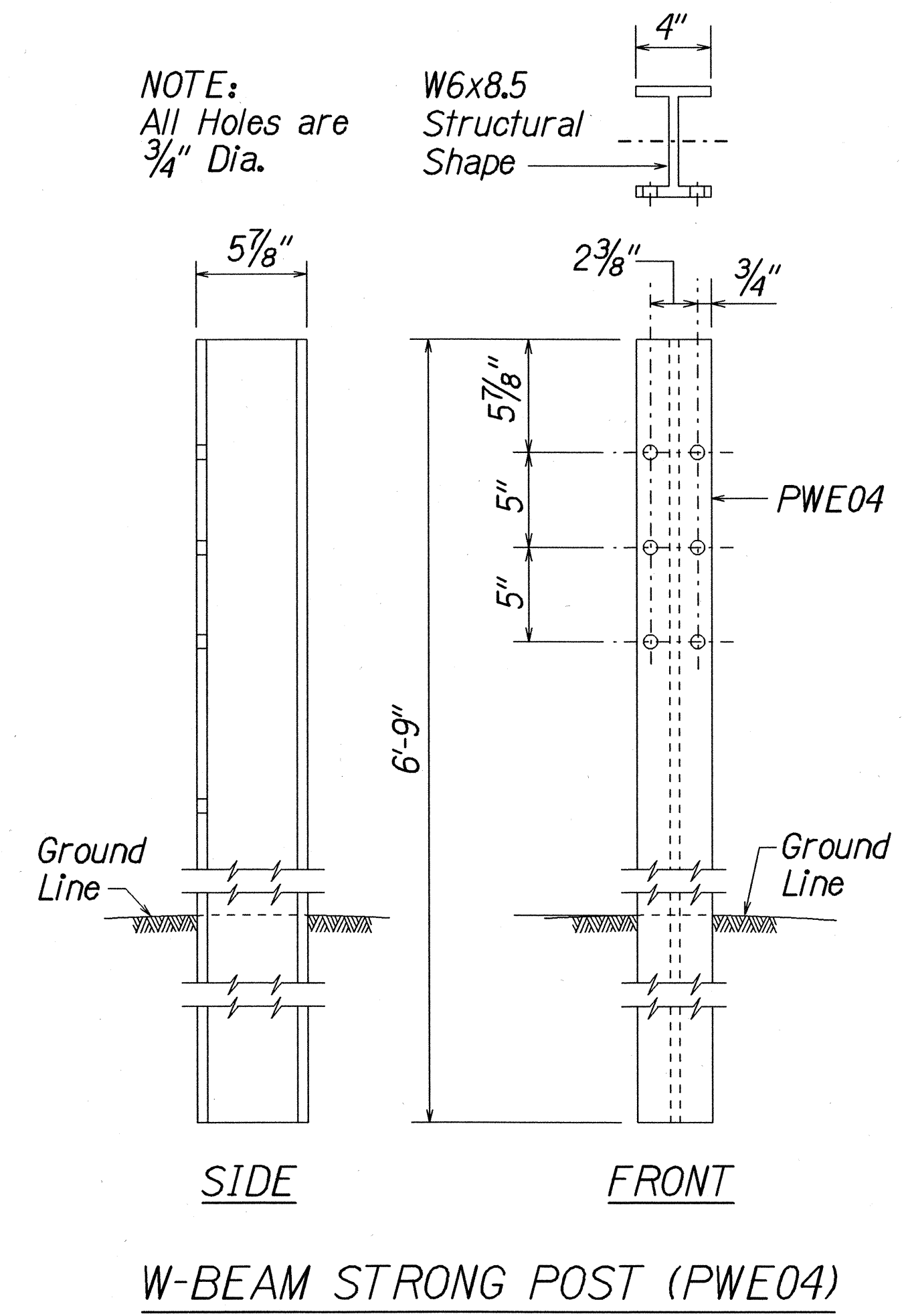
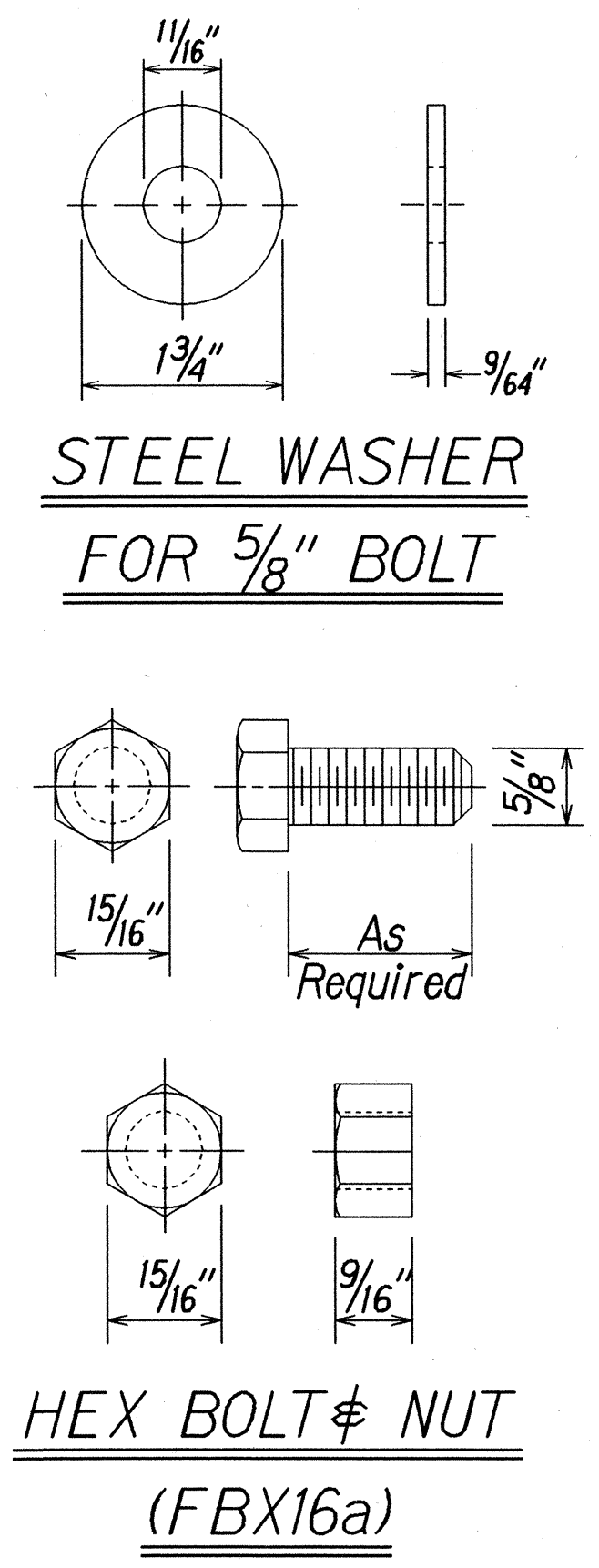
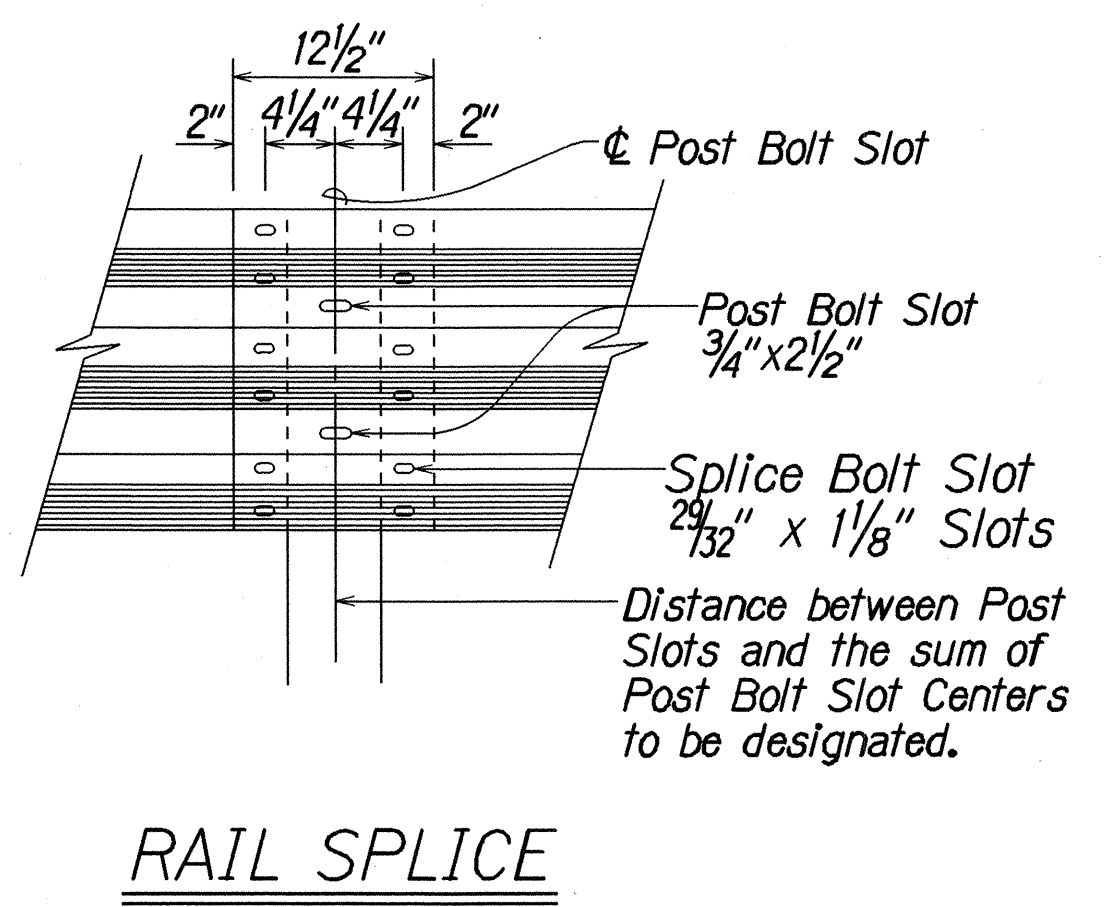
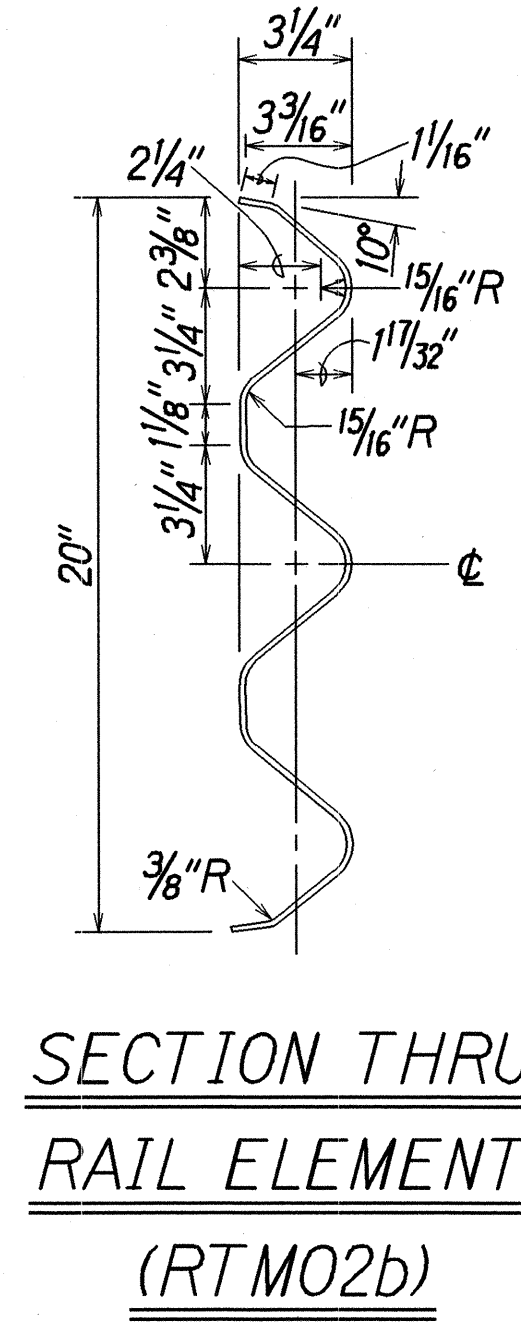
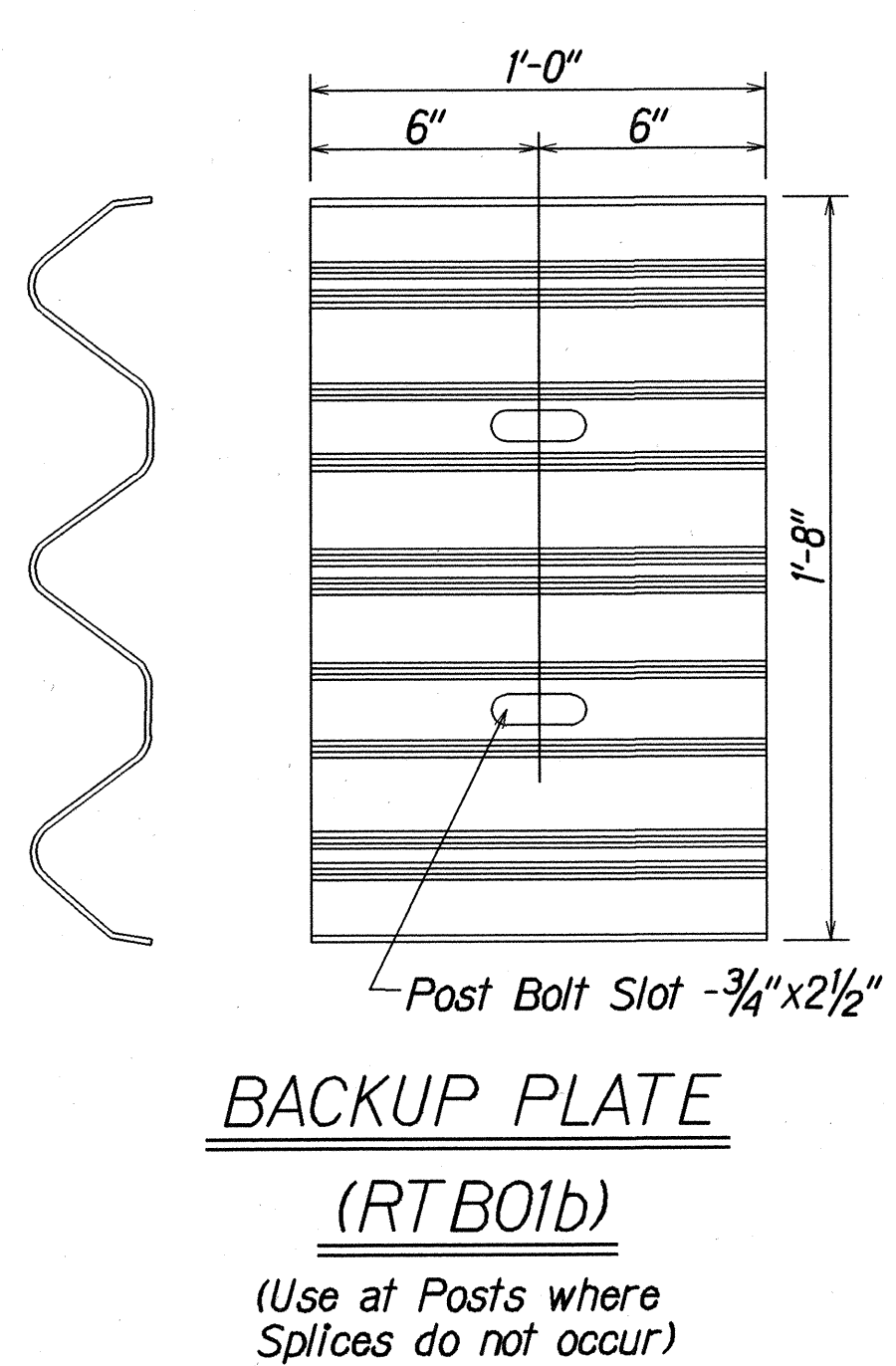
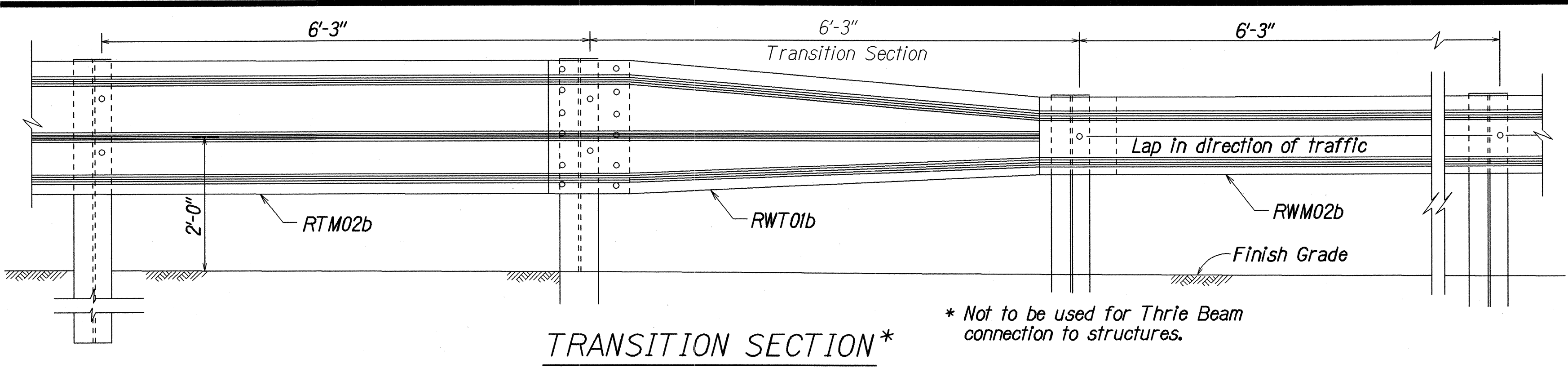
12/10/01	Plan Sheet No. ADD.B-4 shall supercede Plan sheet No. B-4 per Addendum No. 1.
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST RUBRAIL
(W-BEAM) GUARDRAIL
QUEEN KA'AHUMANU HIGHWAY
GUARDRAIL AND SHOULDER IMPROVEMENTS
KAWAIHAE TO HAPUNA
F.A. PROJECT NO. NH-019-1(28)
Scale: As Shown Date: July, 2001

SHEET No. 1 OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.34	47



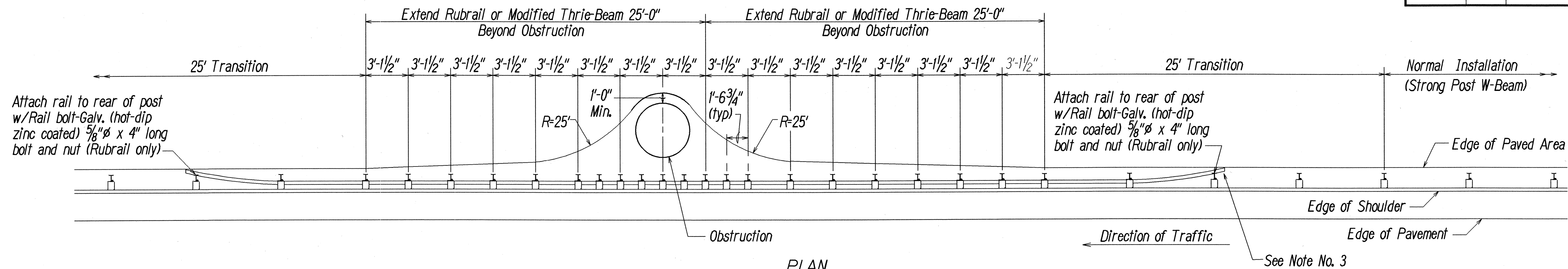
DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"

12/10/01	Plan Sheet No. ADD.B-5 shall supercede Plan Sheet No. B-5 per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION STRONG POST MODIFIED THRIE-BEAM GUARDRAIL QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: As Shown Date: July, 2001 SHEET No. 1 OF 1 SHEETS	

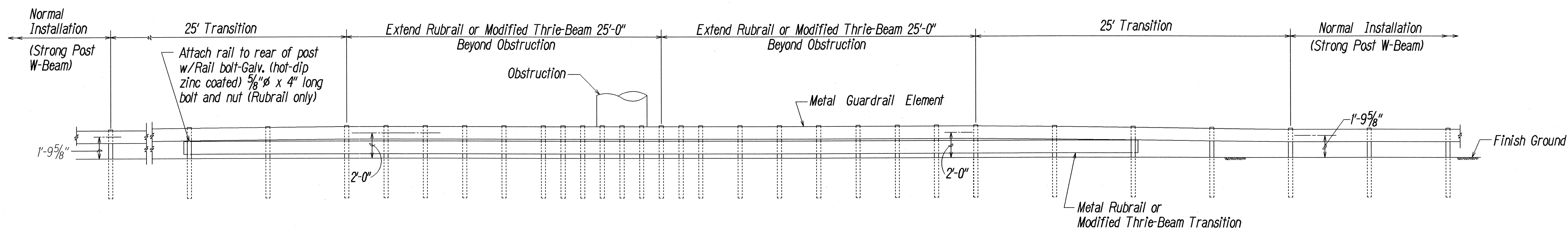
ORIGINAL	DESIGNED BY	DATE
NOTED	DESIGNED BY	
QUANTITIES BY	DESIGNED BY	
CHECKED BY	DESIGNED BY	

16/13/01 tdruby/quadrail/modtriedgn standard plan TE-57 rll/03/03/03 # TE-57a rll/03/03/03

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.35	47



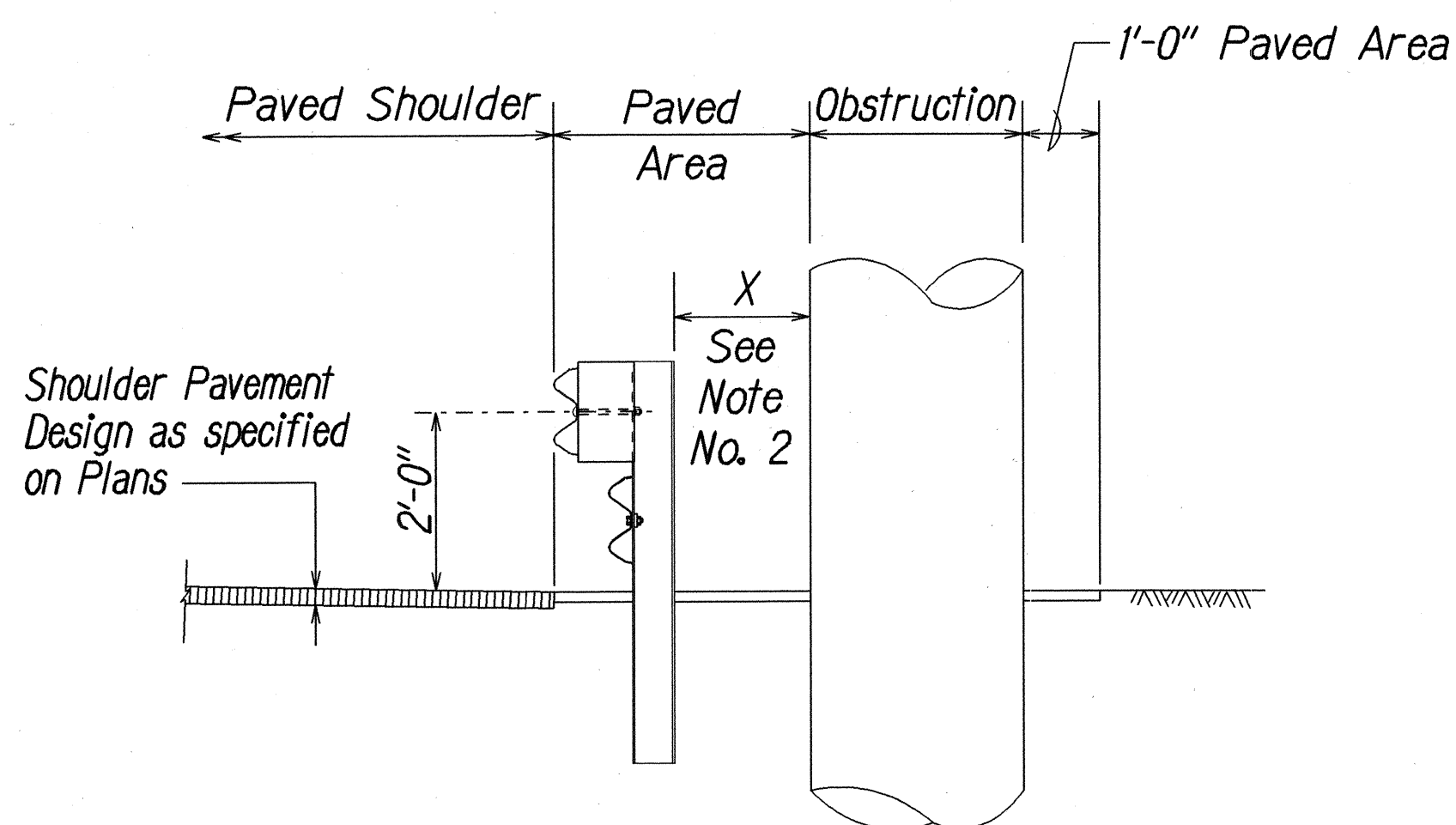
PLAN



ELEVATION

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.
 $2'-0" \leq X < 3'-0"$, Strong Post Rubrail or Modified Thrie-Beam with reduced post spacing.
 $3'-0" \leq X$, 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.



TYPICAL SECTION AT OBSTRUCTION

DETAIL OF GUARDRAIL INSTALLATION AT OBSTRUCTION

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

13.01/99 TEL:rubyl/guardrail/rs4rev.dgn (standard plan TE-53 r09/01/07 # TE-54 r11/03/09)

12/10/01	Plan Sheet No. ADD.B-6 shall supercede Plan sheet No. B-6 per Addendum No. 1.
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DATE	REVISION
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STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION GUARDRAIL DETAILS (AT OBSTRUCTION) QUEEN KAAHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS F.A. PROJECT NO. NH-019-1(28)

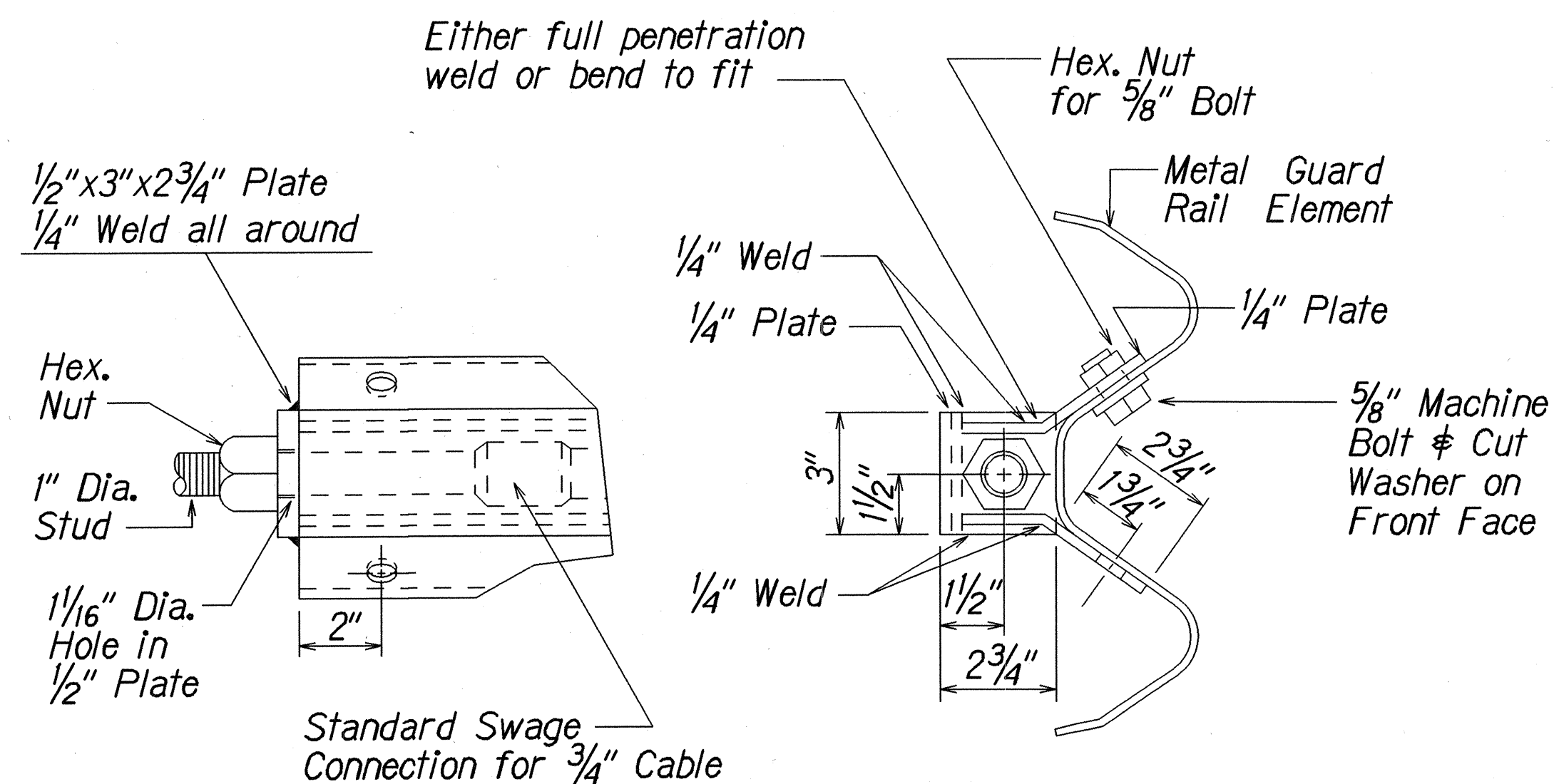
Scale: NTS

Date: July, 2001

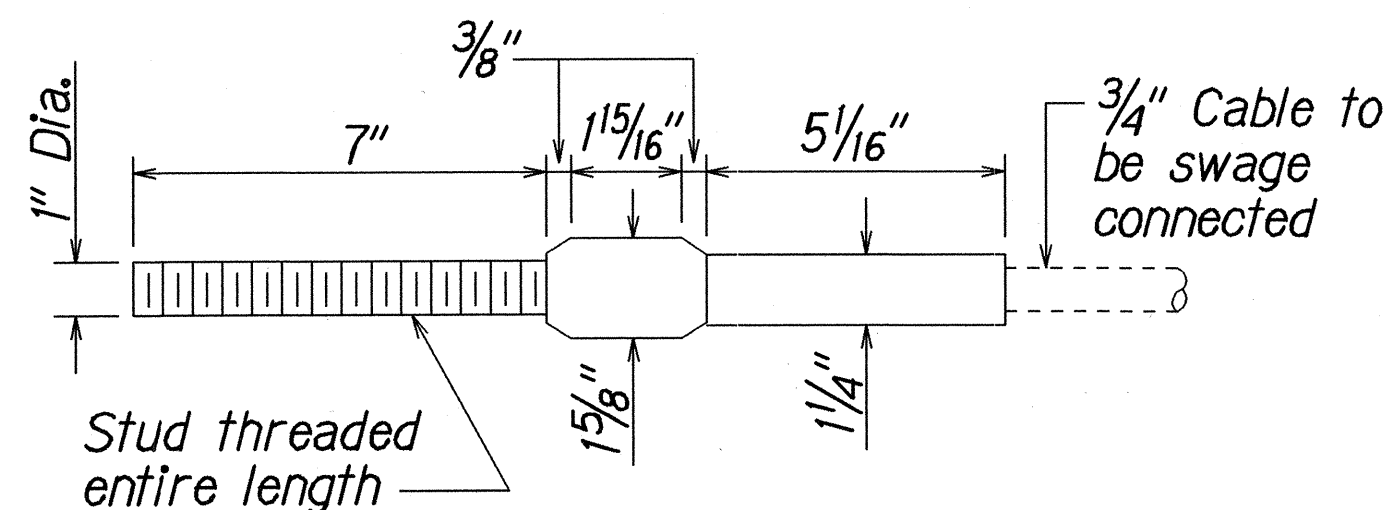
SHEET No. 1 OF 1 SHEETS

ADD.B-6

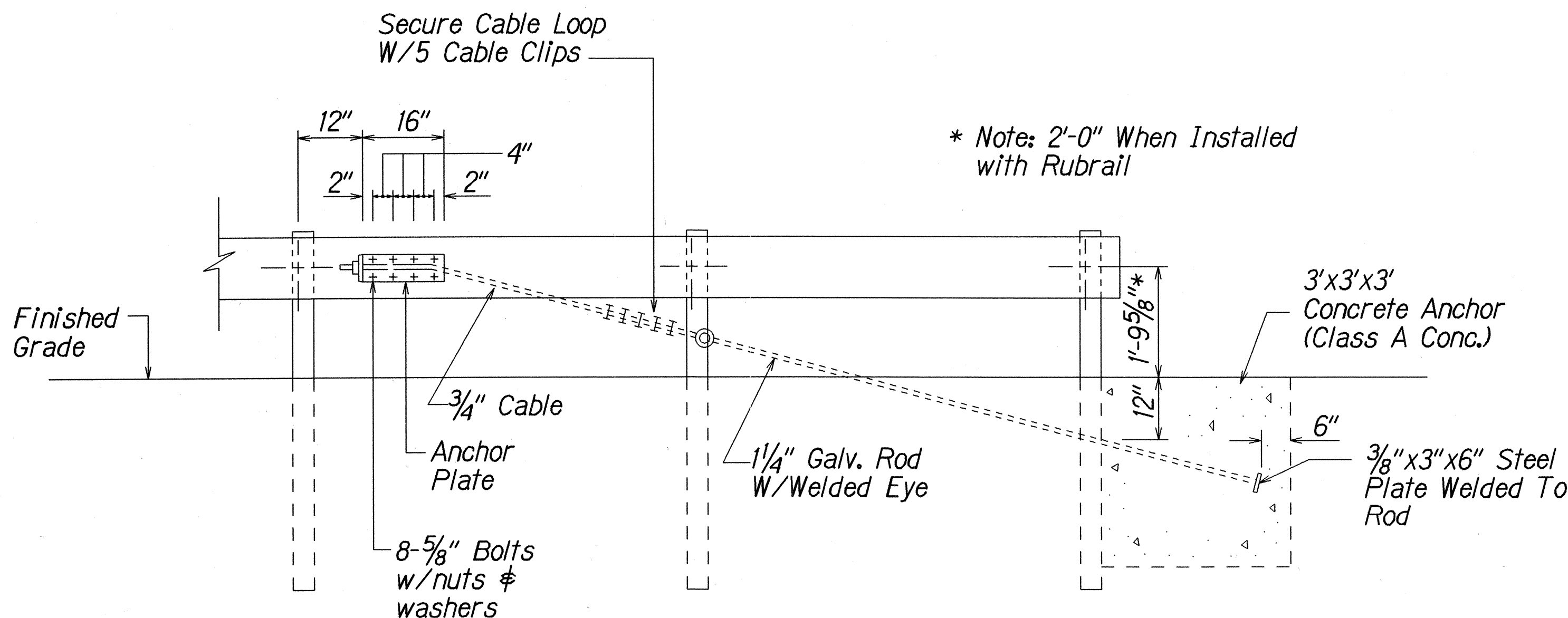
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.37	47



ANCHOR PLATE DETAILS



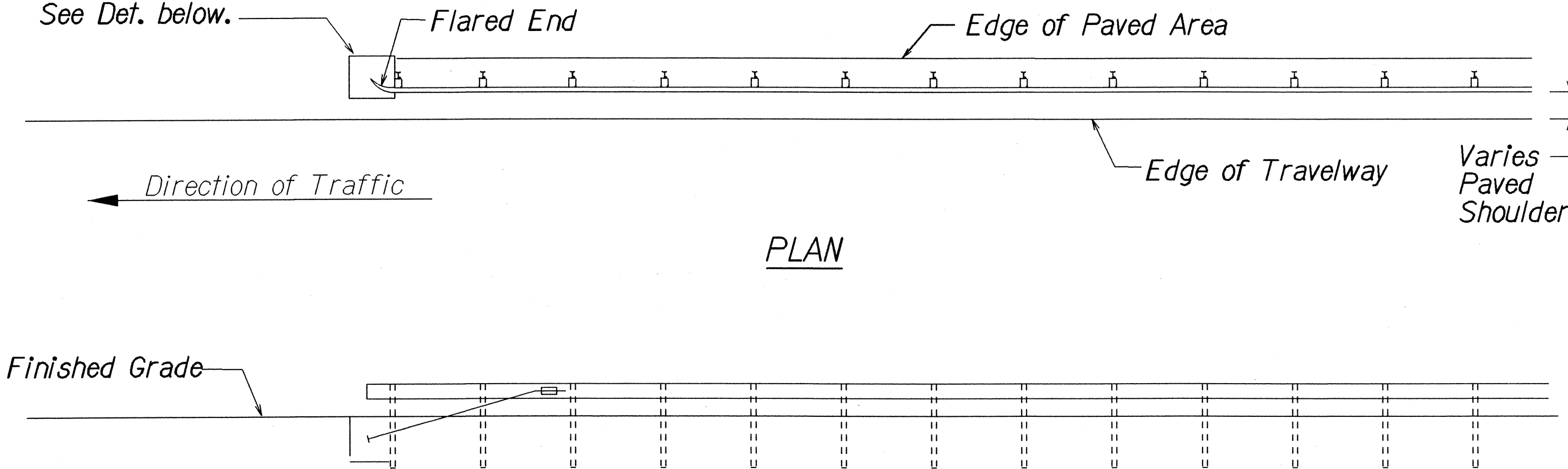
STANDARD SWAGED FITTING
AND STUD



ANCHOR BLOCK DETAIL

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

For Details of Concrete Anchor Block in Ground See Det. below.



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.

SURVEY PLOTTED BY	DATE
DESIGNED BY	
TRACED BY	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	
DATE	

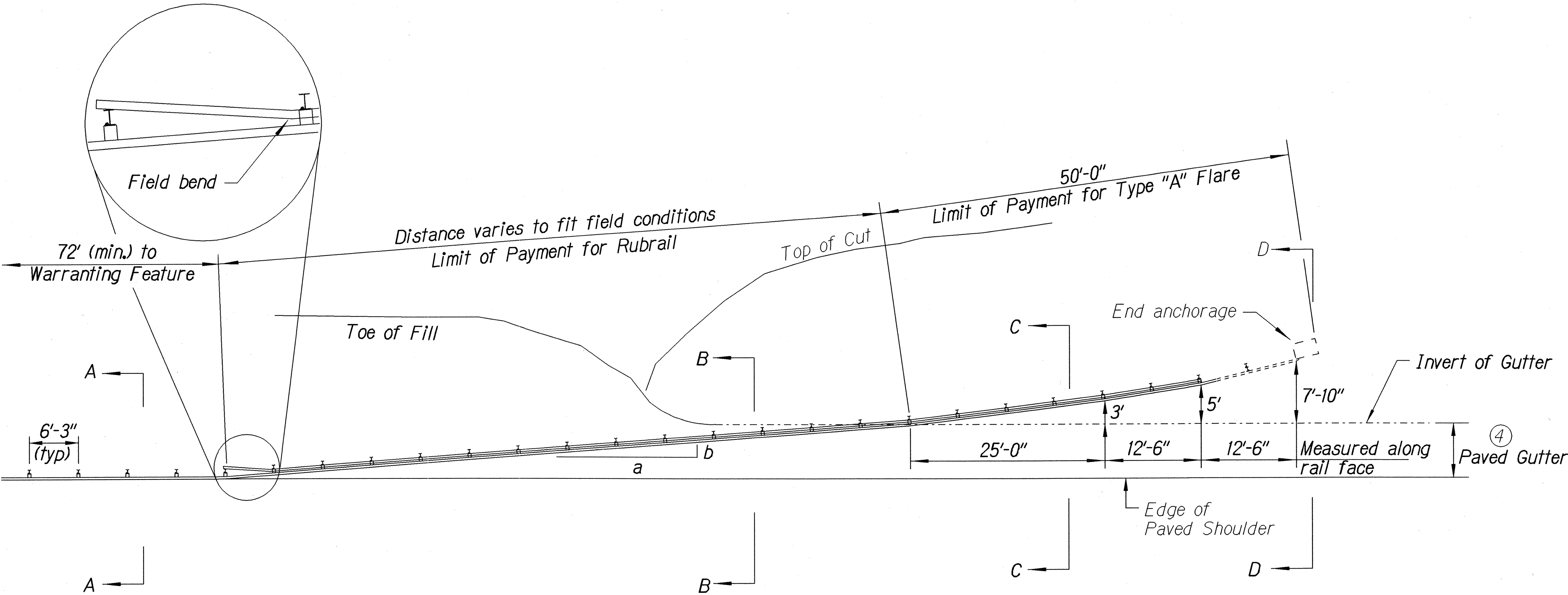
13/01/99 141/cub/guardrail/h55redup (Standard Plan TE-59, r11/03/89)

12/10/01	Plan Sheet No. ADD.B-8 shall supercede Plan sheet No. B-8 per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION GUARDRAIL DETAILS QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: Noted Date: July, 2001	
SHEET No. 1	OF 1 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.38	47

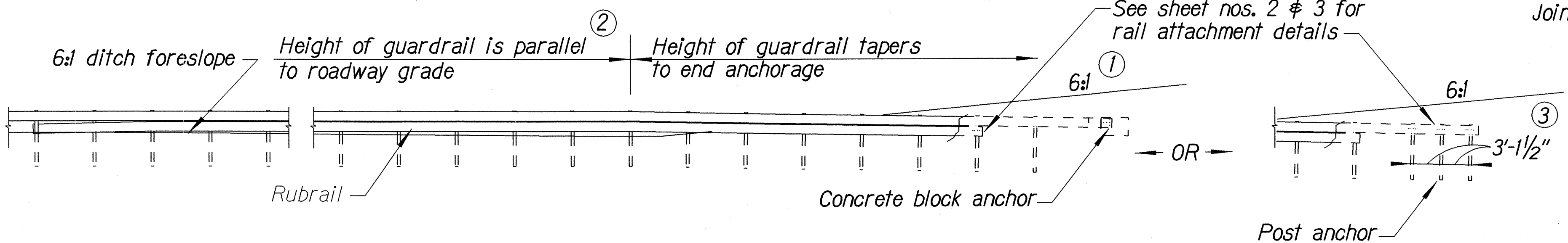
General Notes

1. A 6:1 or flatter slope is desirable. 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.

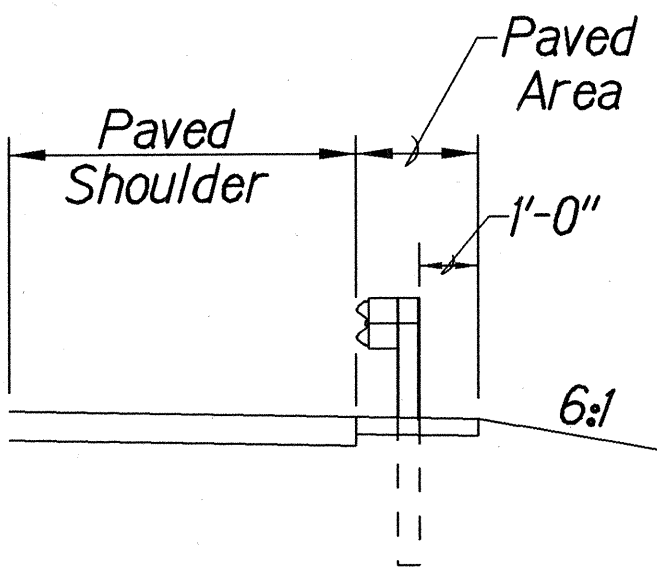


PLAN

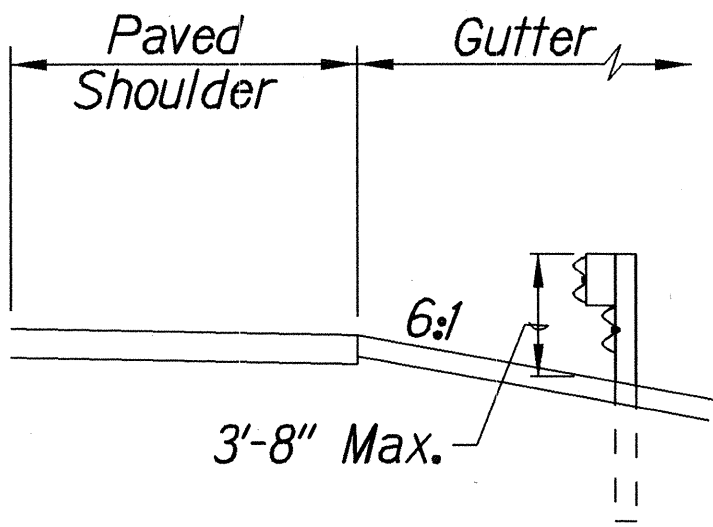
Design speed mph	a:b
68	15:1
62	13:1
56	12:1
50	11:1
43	10:1
37	9:1
31	7:1



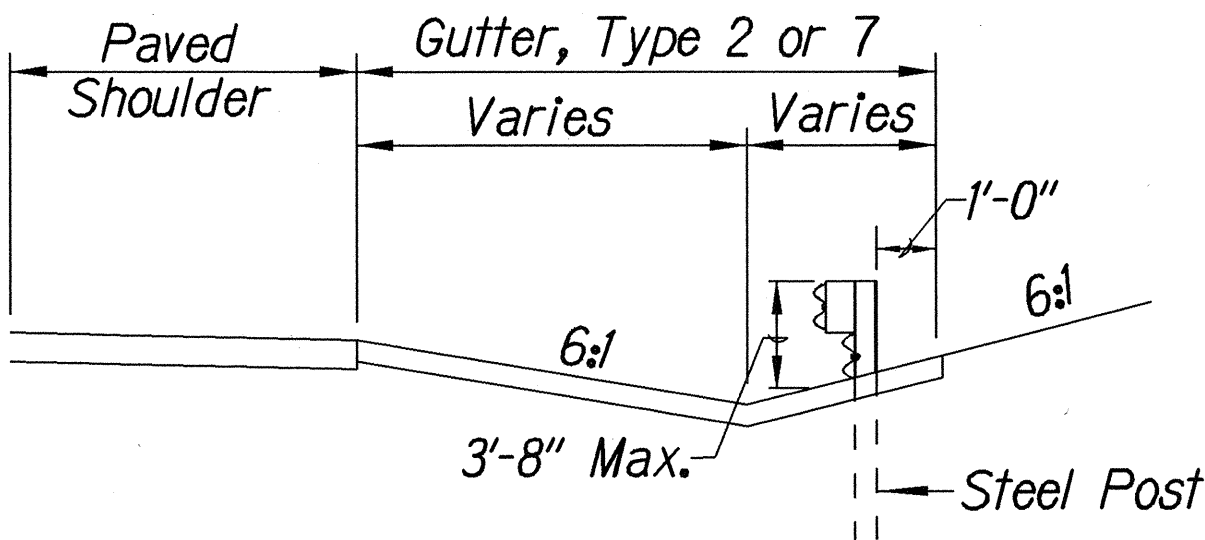
ELEVATION (Profile Along Rail)



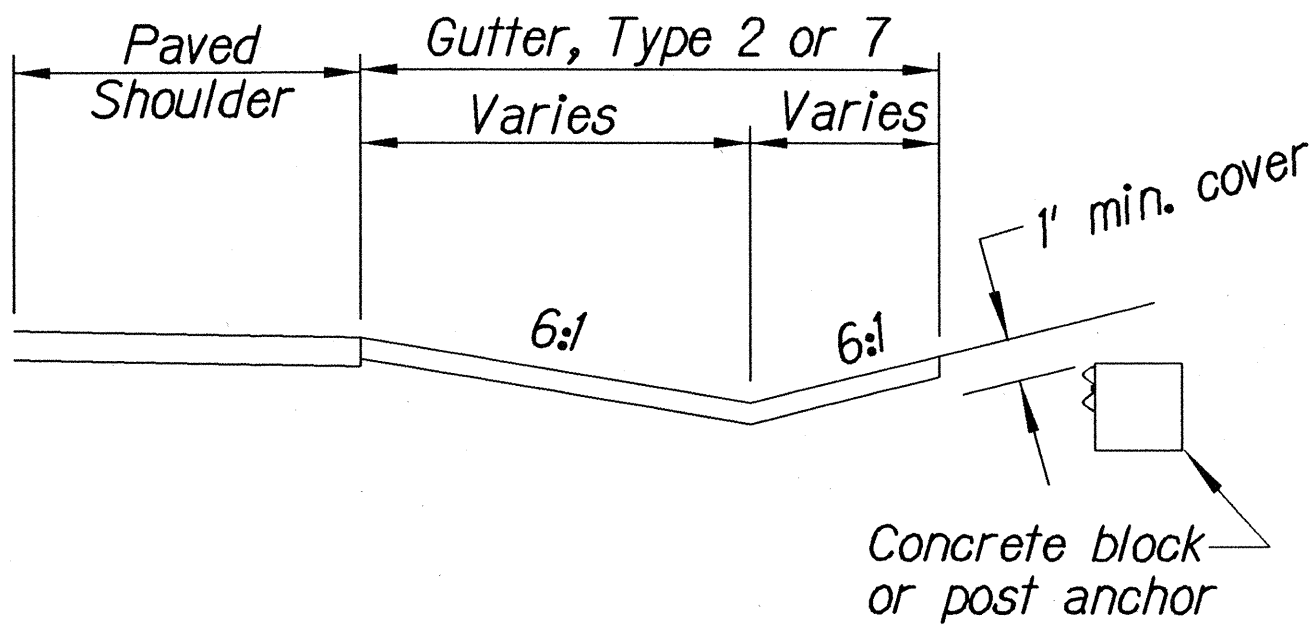
Section A-A



Section B-B
(With Rubrail)



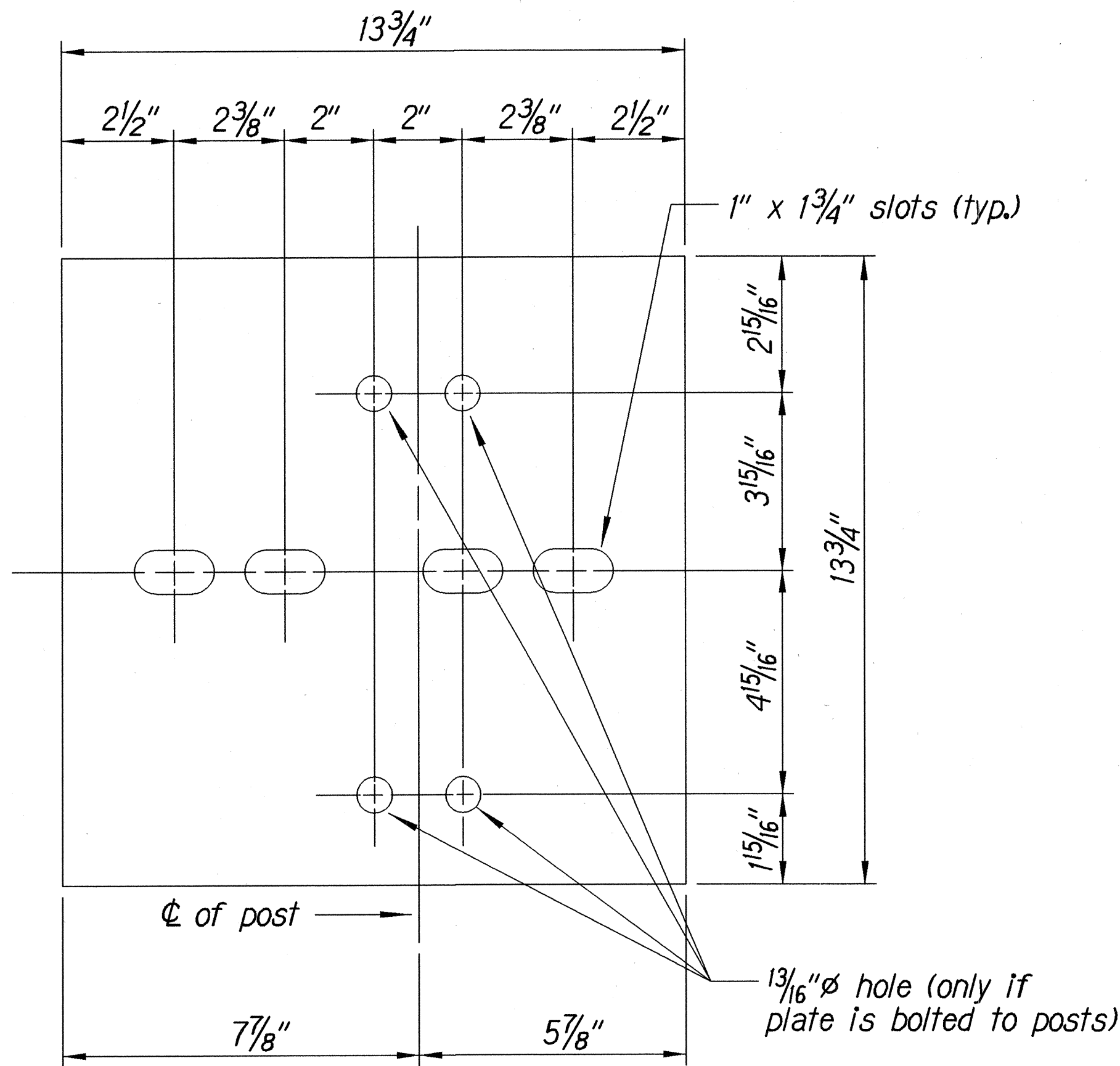
Section C-C
(With Rubrail)



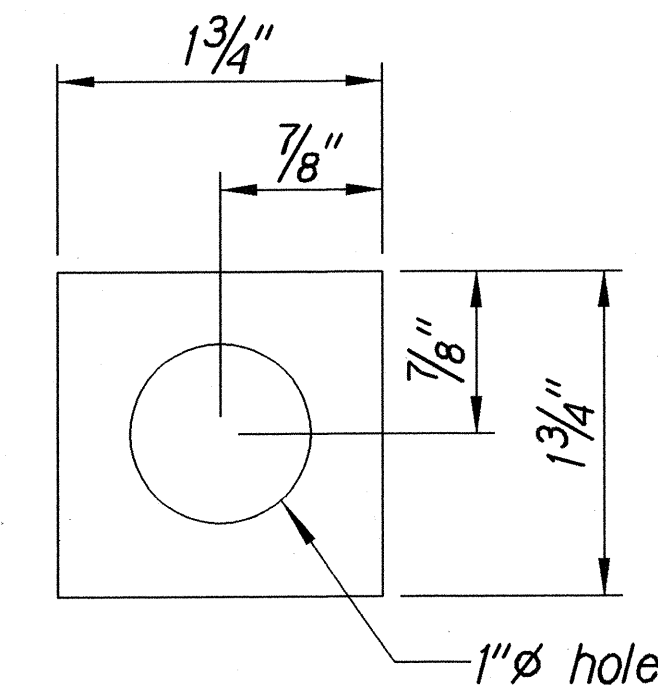
BACKSLOPE ANCHOR TERMINAL (WITH 6:1 PAVED GUTTER AND TYPE "A" FLARE)

12/10/01	Plan Sheet No. ADD.B-9A shall supercede Plan sheet No. B-9A per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION TYPE "A" FLARE QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: NTS Date: July, 2001	
SHEET No. 1 OF 3 SHEETS	

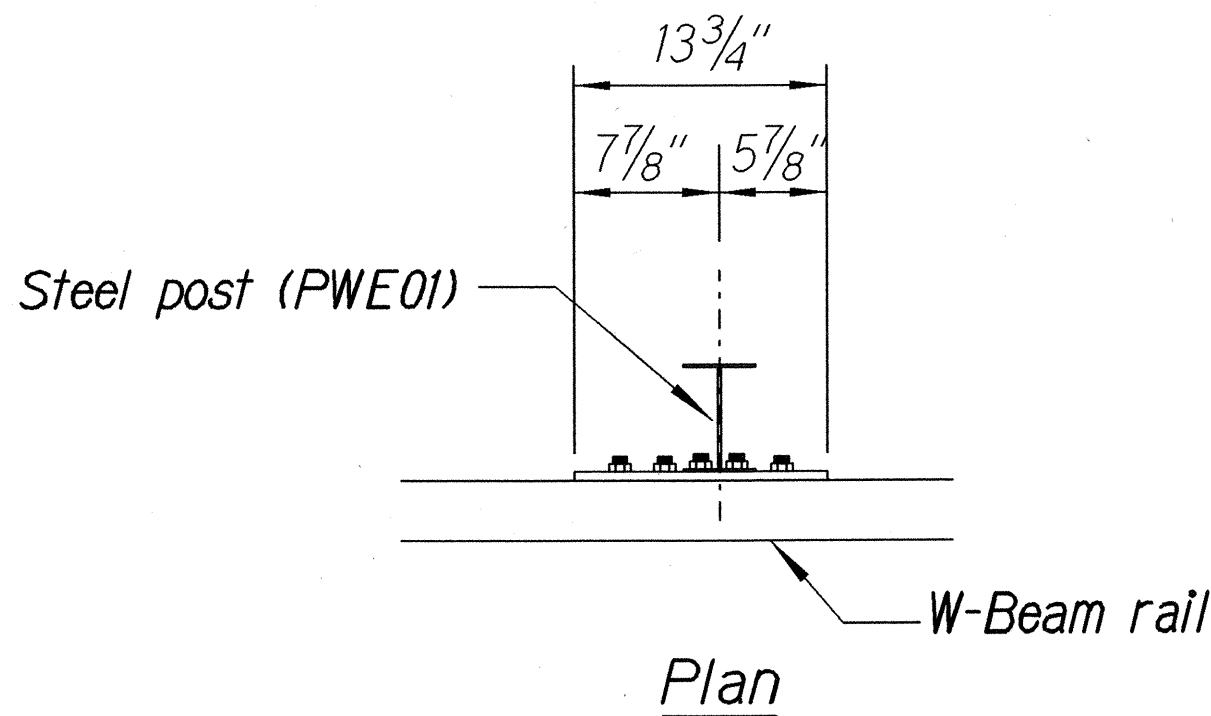
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.39	47



Steel Plate - 1/2"
(Hot-dip Zinc Coated Galvanized
Welded or Bolted to Post)

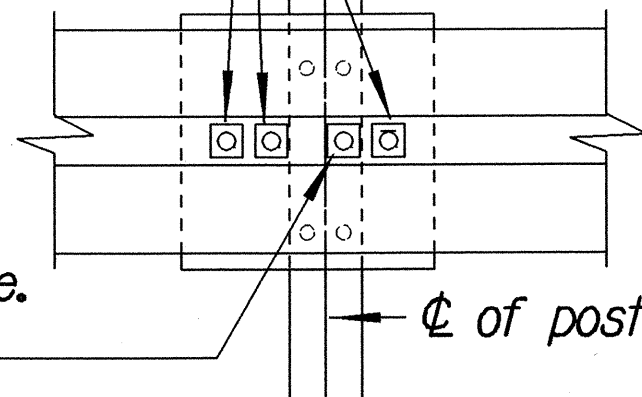


Square Washer
(3/16" Thick - Hot-dip
Zinc Coated Galvanized)

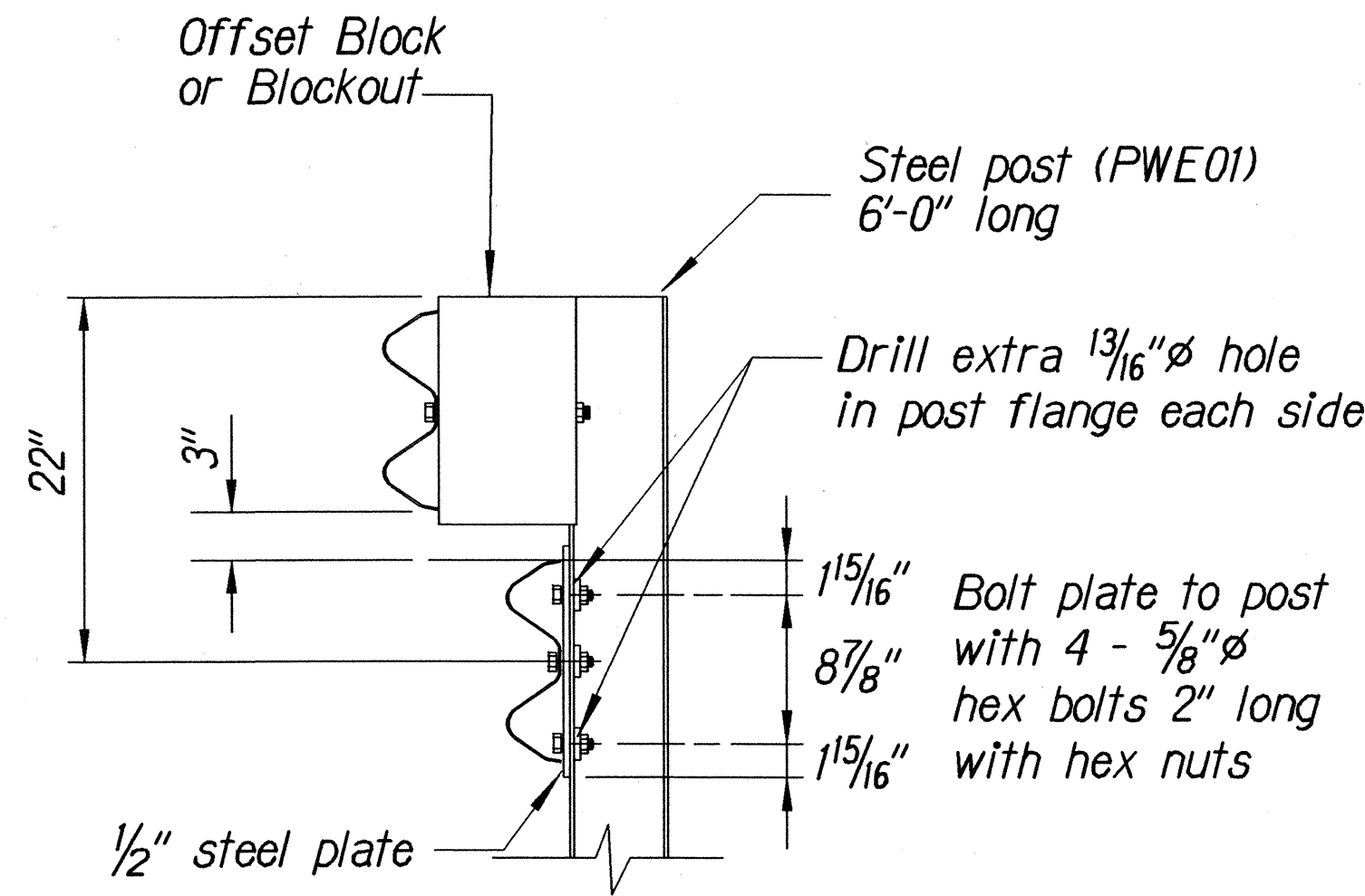


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 15/16" long with square washer

1"Ø holes to be field drilled in rail and through post flange. Attach to steel plate with 7/8"Ø hex bolts 2" long with square washer

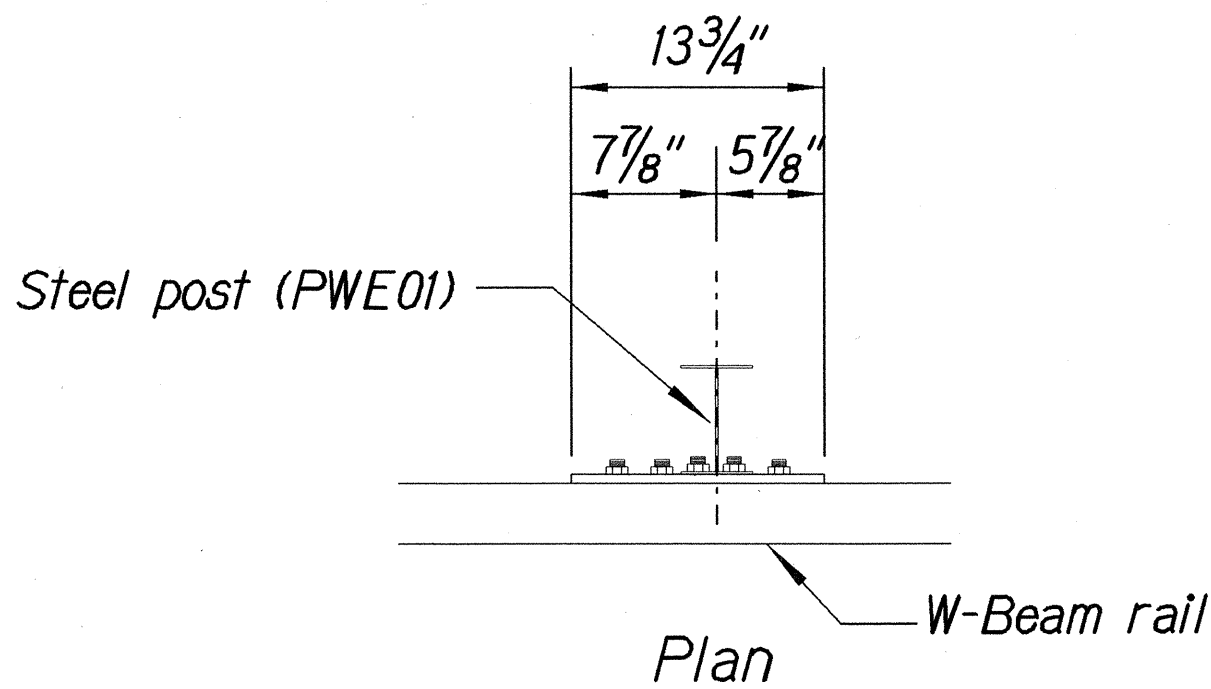


Front View



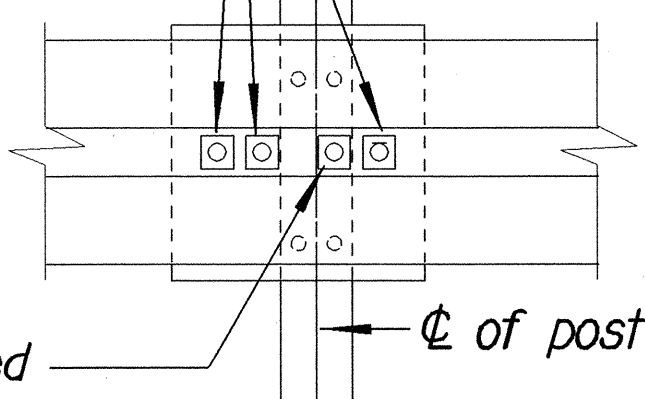
Elevation

RUBRAIL ANCHOR DETAILS

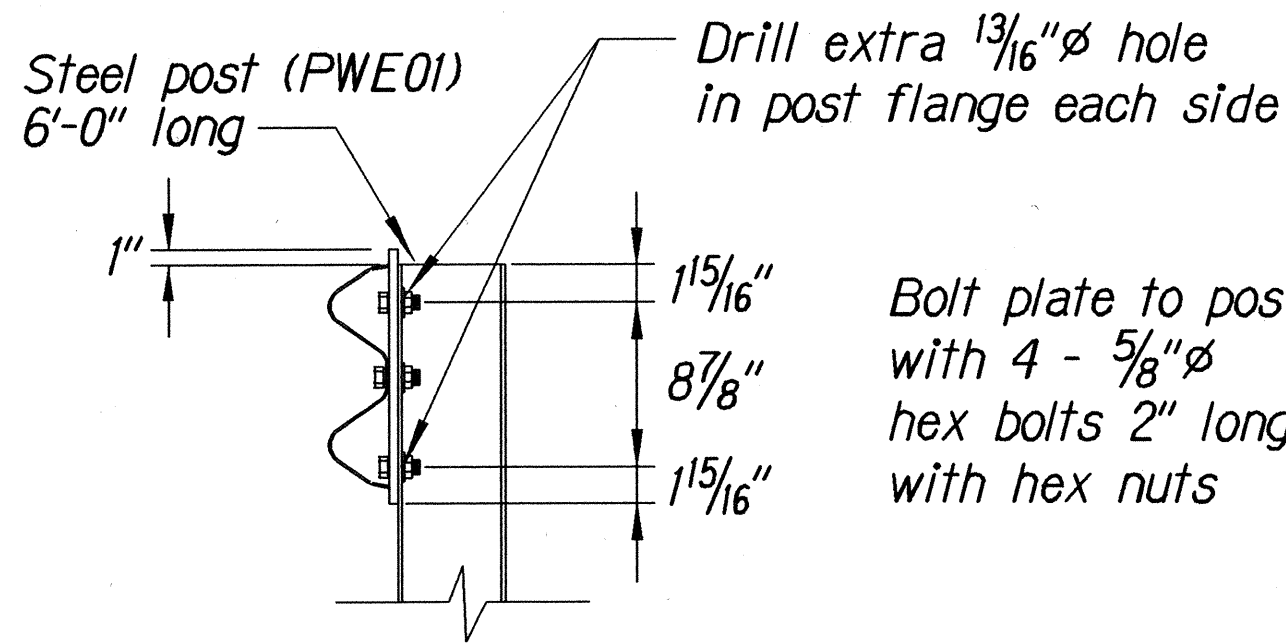


3 - 7/8"Ø holes to be field drilled in rail and attached to steel plate with 7/8"Ø hex bolts 1 15/16" long with square washer

1"Ø holes to be field drilled in rail and through post flange. Attach to steel plate with 7/8"Ø hex bolts 2" long with square washer



Front View



Elevation

POST ANCHOR DETAILS

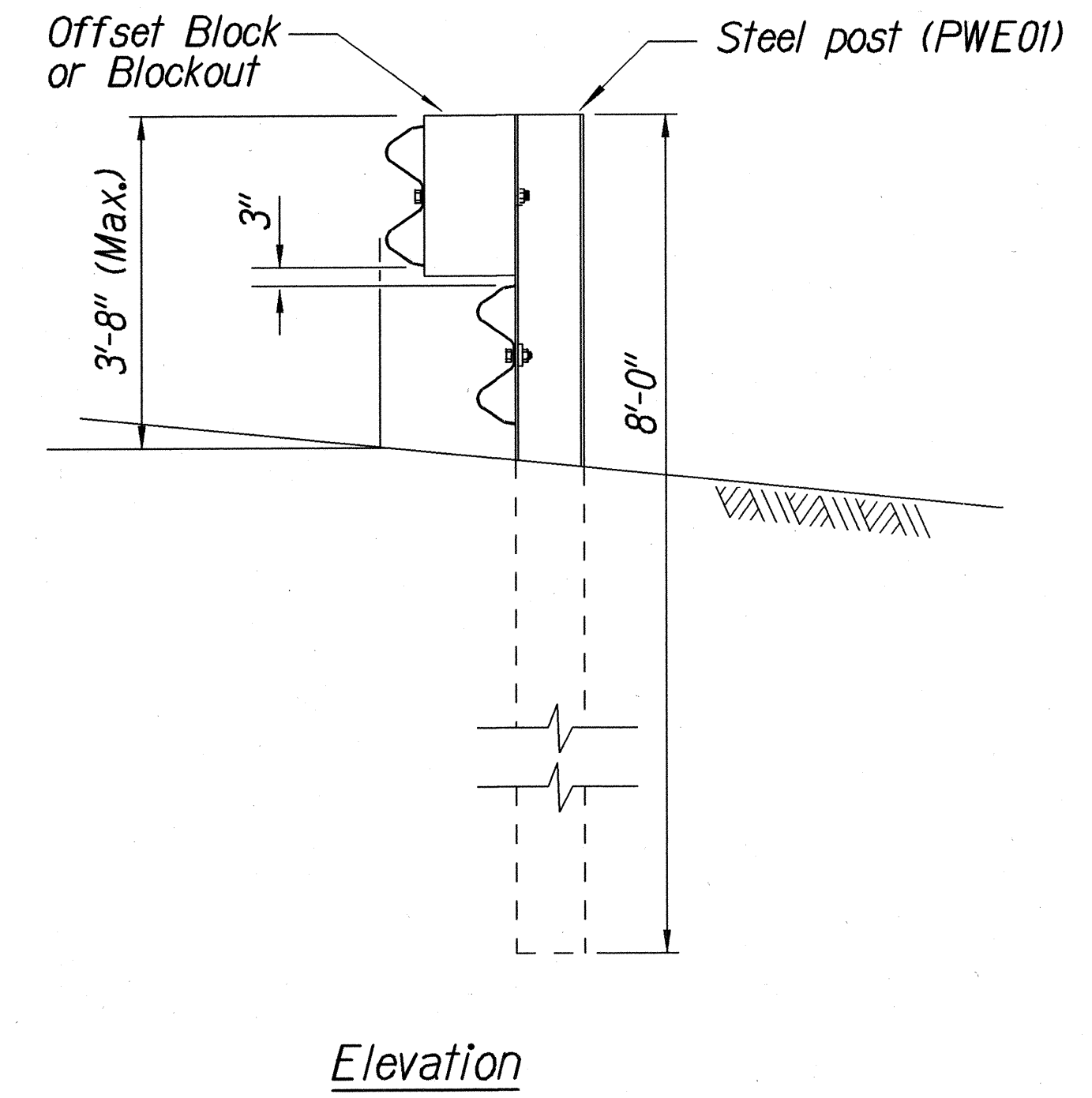
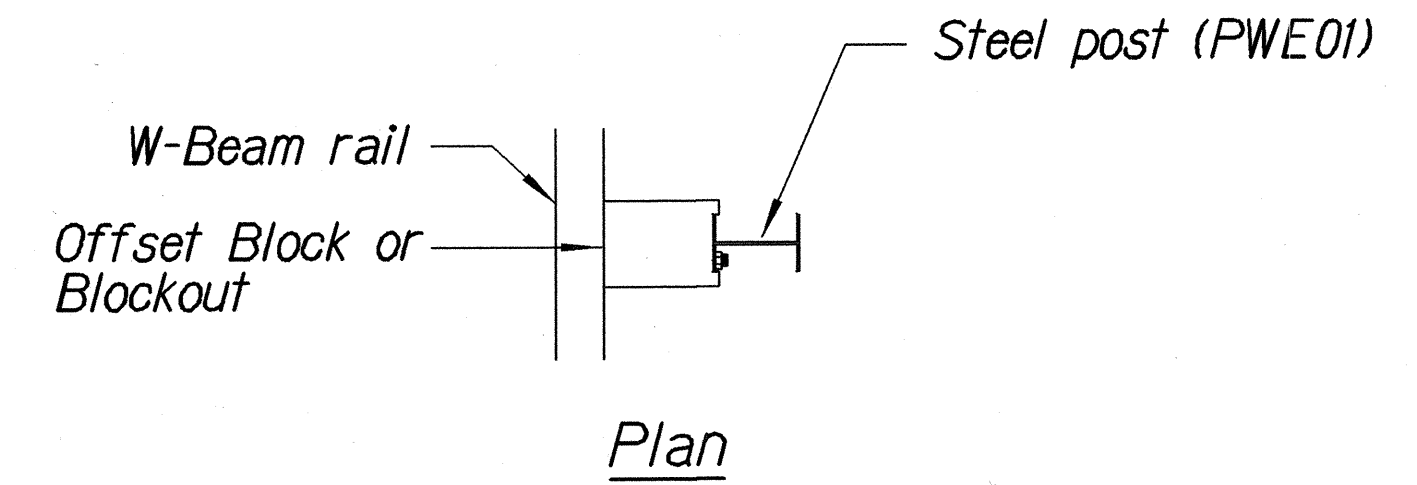
BACKSLOPE ANCHOR TERMINAL END ANCHORAGE DETAILS
TYPE "A" FLARE)

Note:

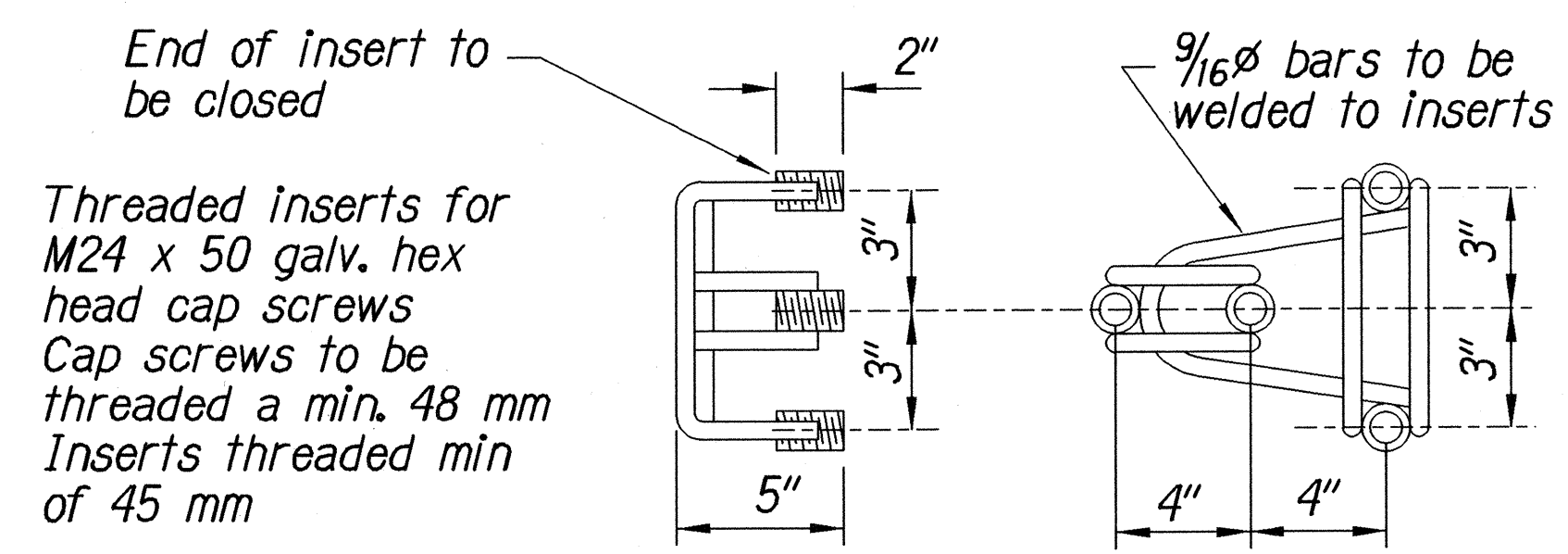
All fasteners, posts, blocks and rail elements shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGCARTBA Joint Cooperative Committee.

12/10/01	Plan Sheet No. ADD.B-9B shall supercede Plan Sheet No. B-9B per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION TYPE "A" FLARE QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: Noted Date: July, 2001	
SHEET No. 2 OF 3 SHEETS	

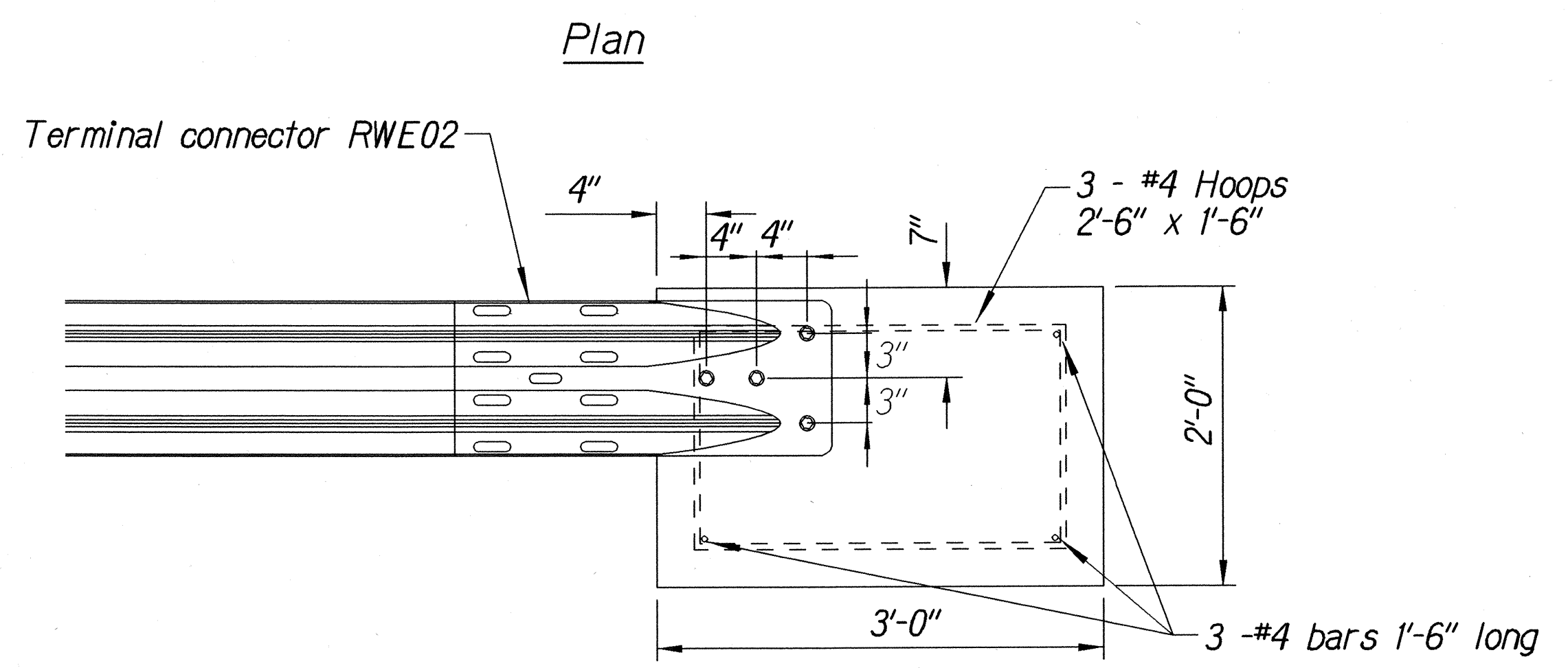
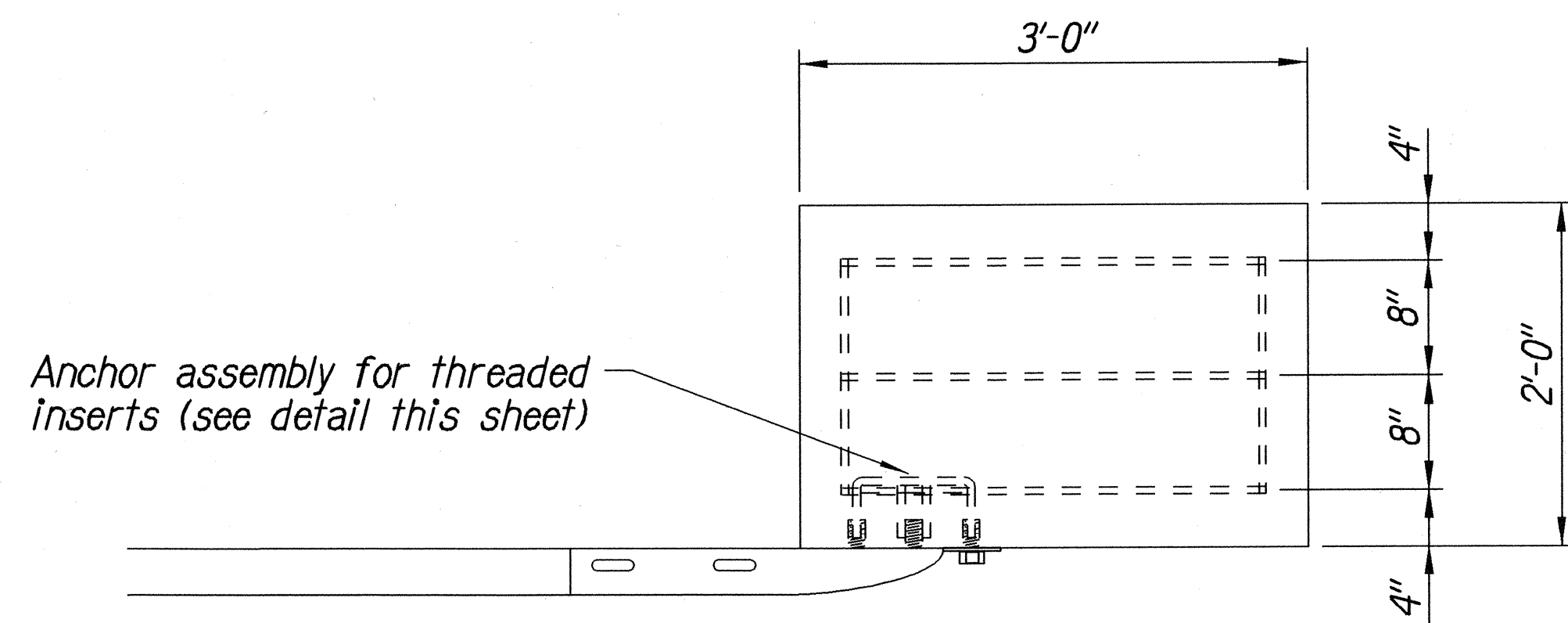
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.40	47



STEEL POST GUARDRAIL WITH RUBRAIL



ANCHOR ASSEMBLY
CONCRETE BLOCK ANCHOR



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.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
DESIGNED BY	TRACED BY	
CHECKED BY	DESIGNED BY	
N. dgn	CHECKED BY	

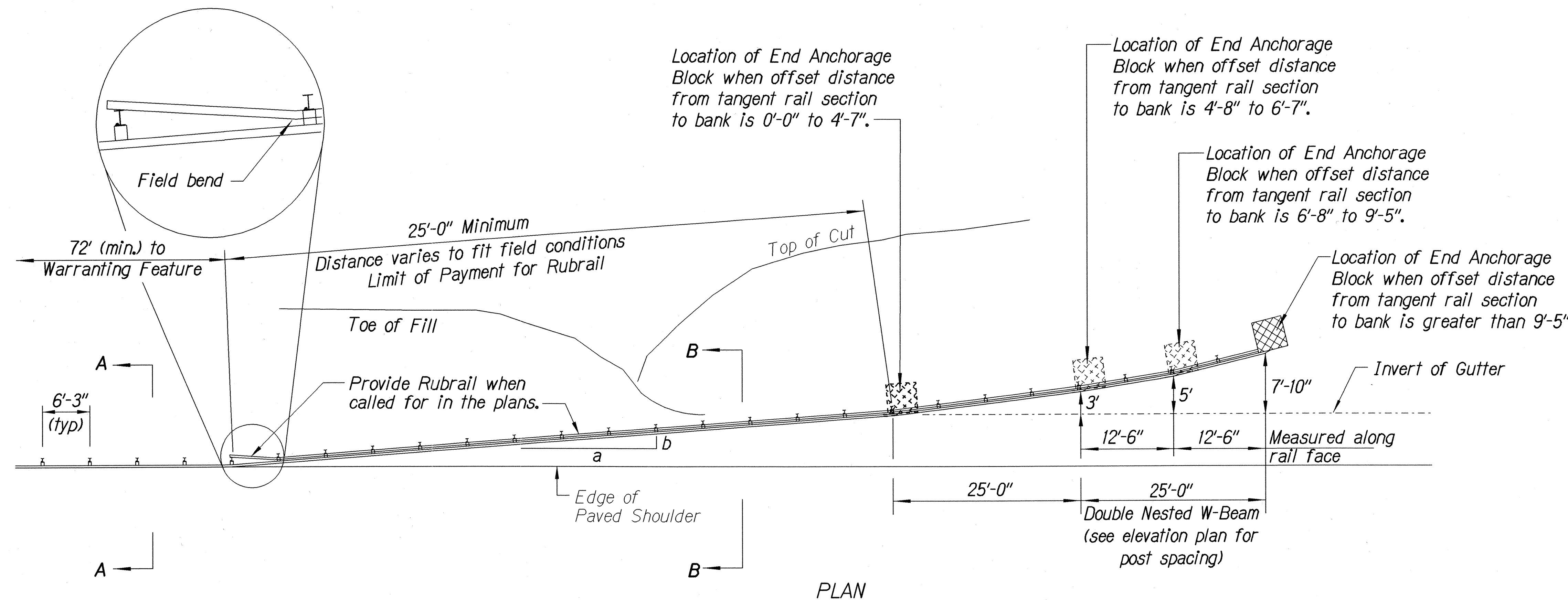
13/01/99 rd/rubyl/guardrail/gd4del.dgn (standard plan TE-59 07/01/86, TE-59 r11/03/89 # TE-60 07/01/86)

12/10/01	Plan Sheet No. ADD.B-9C shall supercede Plan sheet No. B-9C per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION TYPE "A" FLARE QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: Noted Date: July, 2001	
SHEET No. 3 OF 3 SHEETS	

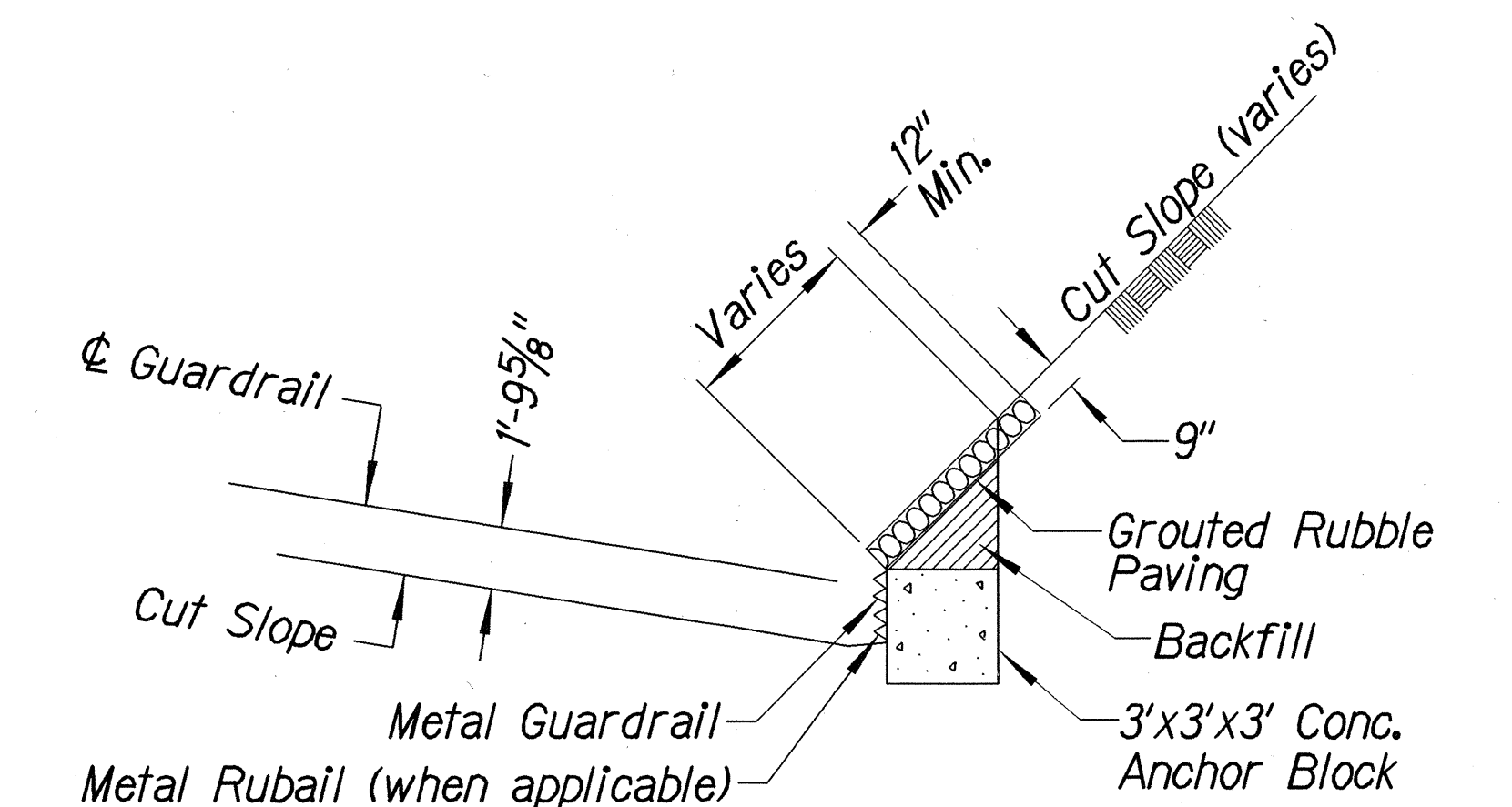
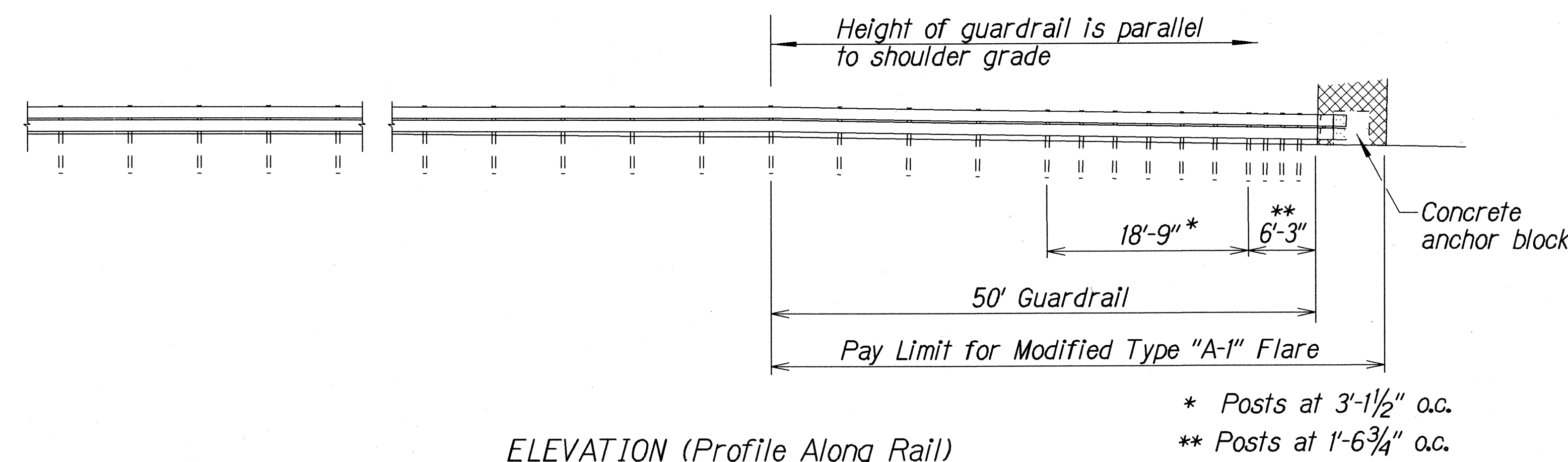
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-(28)	2002	ADD.41	47

General Notes

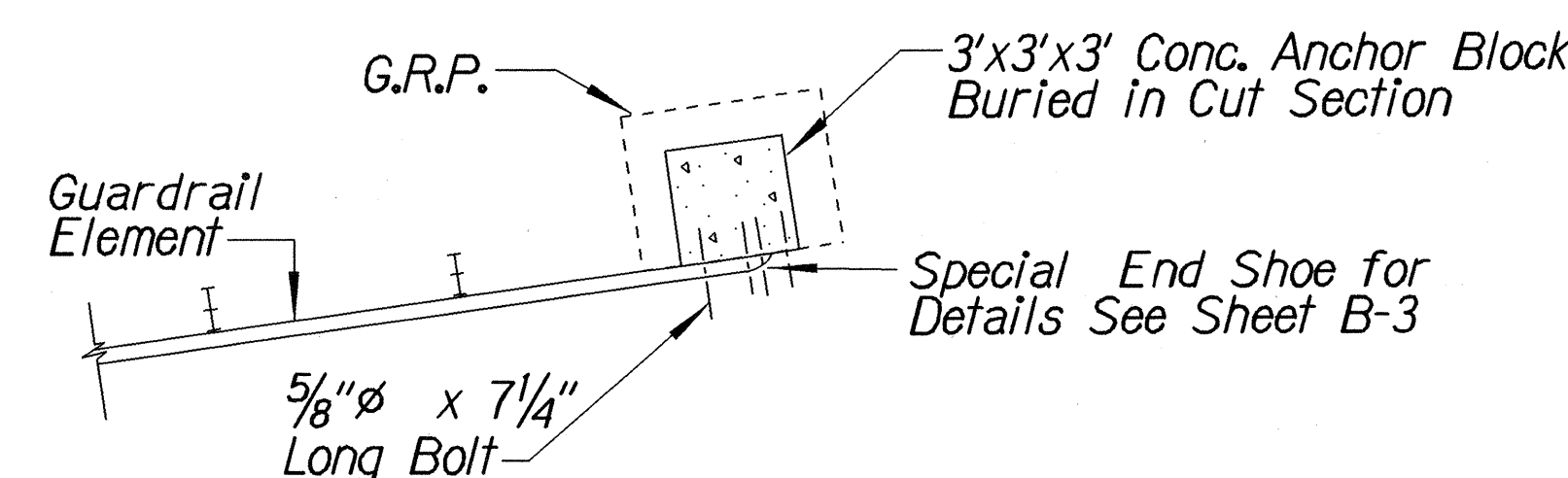
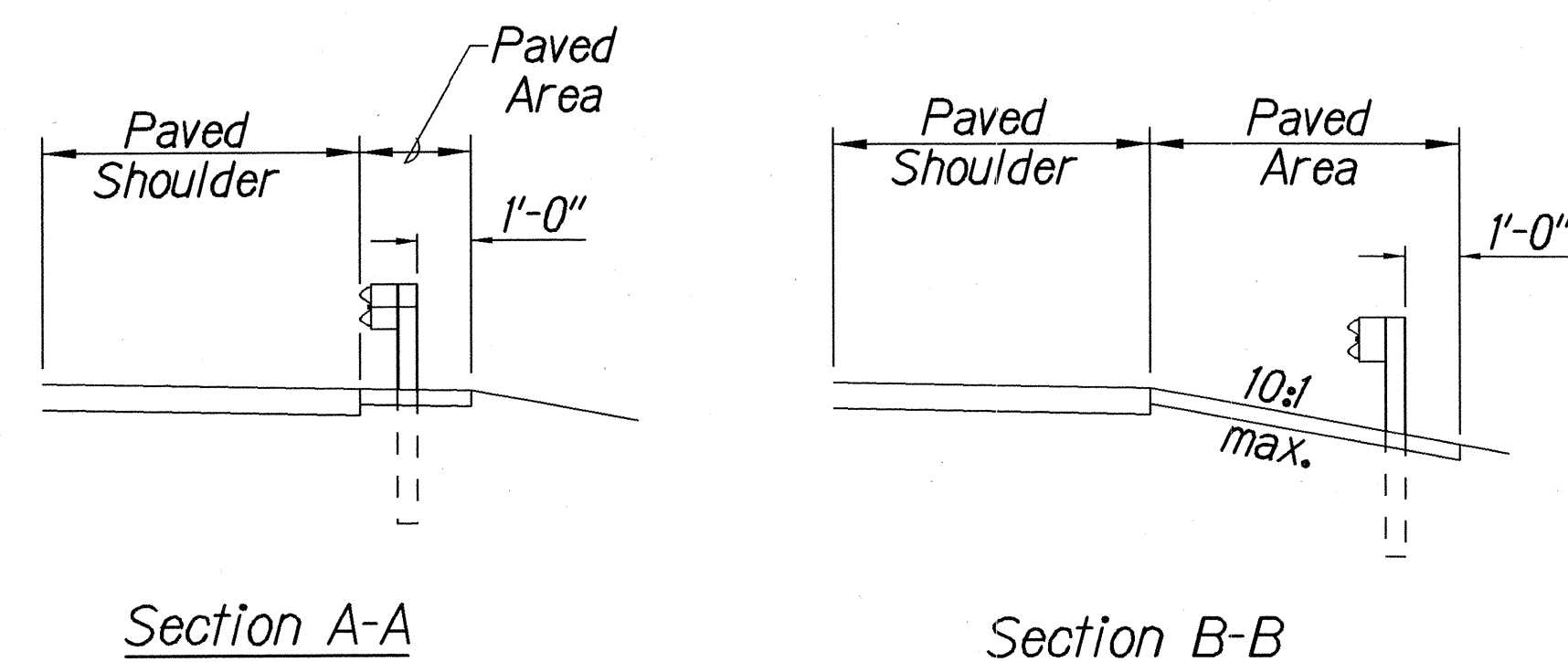
1. All posts are 6'-0" in length within the 50'-0" pay limit for the Modified Type "A-1" Flare without rubrail.
2. Whenever swales or a change in grade is encountered within the 50'-0" pay limit for the Modified Type "A-1" Flare, a rubrail shall be installed and all posts shall have a minimum embedment 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.



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



ANCHOR BLOCK IN CUT SECTION

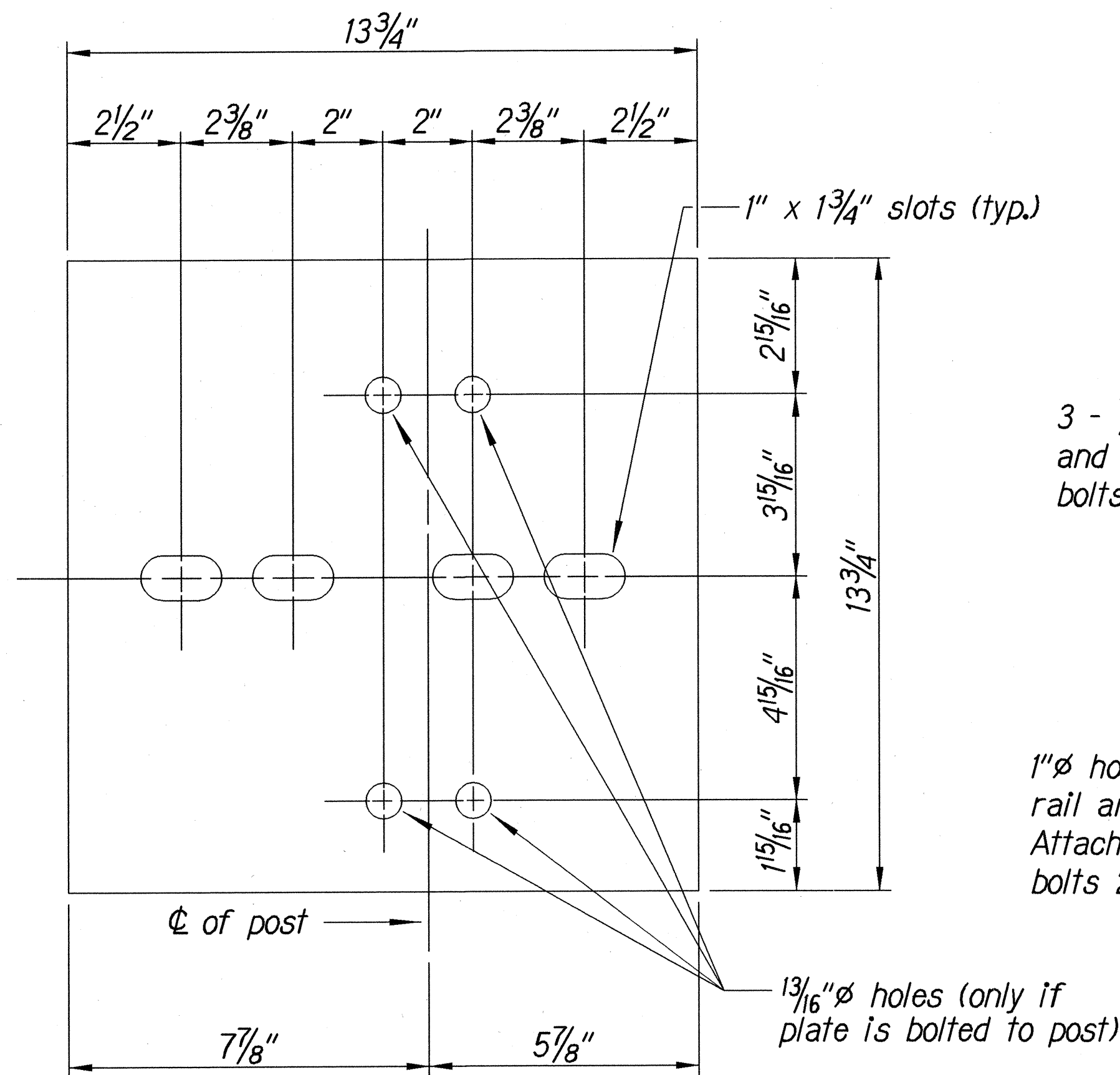


PLAN - ANCHOR BLOCK IN CUT SECTION

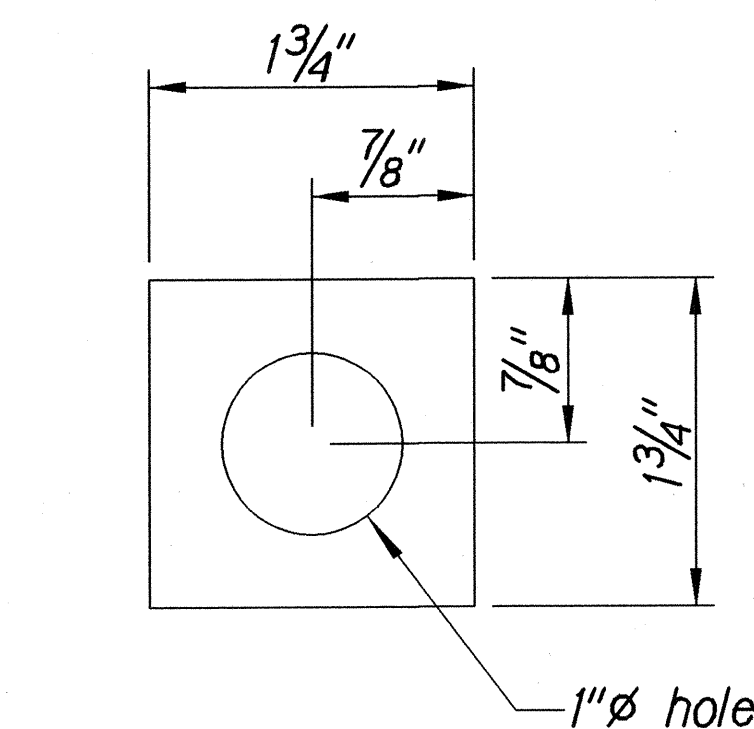
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DRAWN BY	
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NOTE BOOK	
QUANTITIES BY	
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PLAN	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	
ORIGINAL	

12/10/01	Plan Sheet No. ADD.B-10A shall supercede Plan Sheet No. B-10A per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
MODIFIED TYPE "A-1" FLARE	
QUEEN KA'AHUMANU HIGHWAY	
GUARDRAIL AND SHOULDER IMPROVEMENTS	
KAWAIHAE TO HAPUNA	
F.A. PROJECT NO. NH-019-(28)	
Scale: Noted	Date: July, 2001
SHEET No. 1 OF 3 SHEETS	

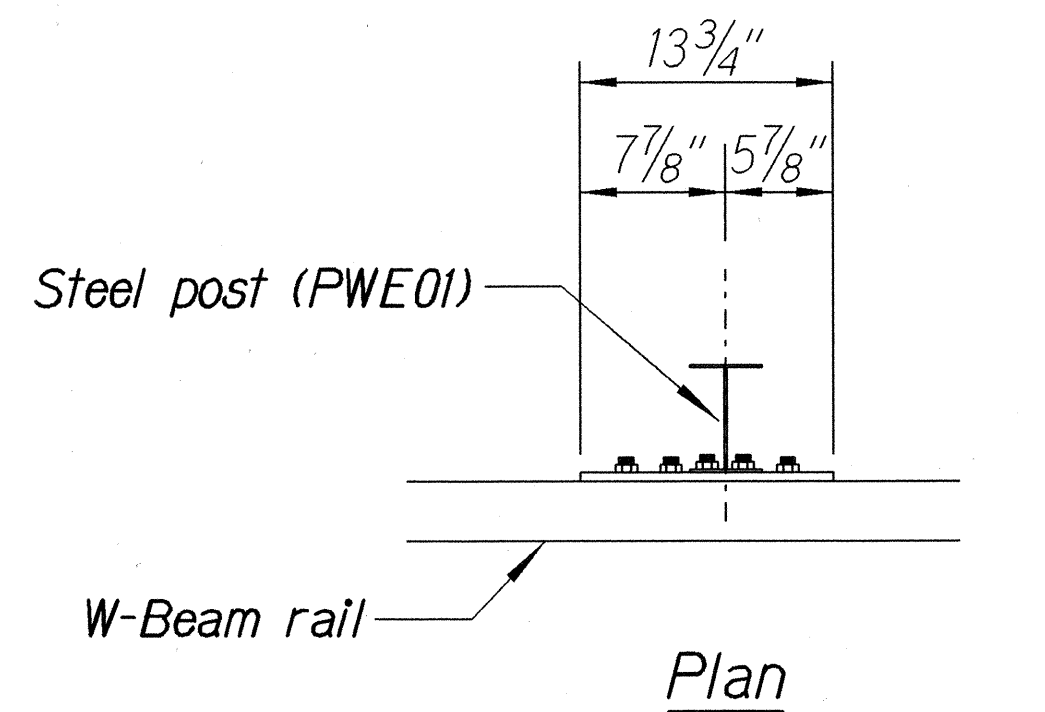
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.43	47



Steel Plate - 1/2"
(Hot-dip Zinc Coated Galvanized-
Welded or Bolted to Post)



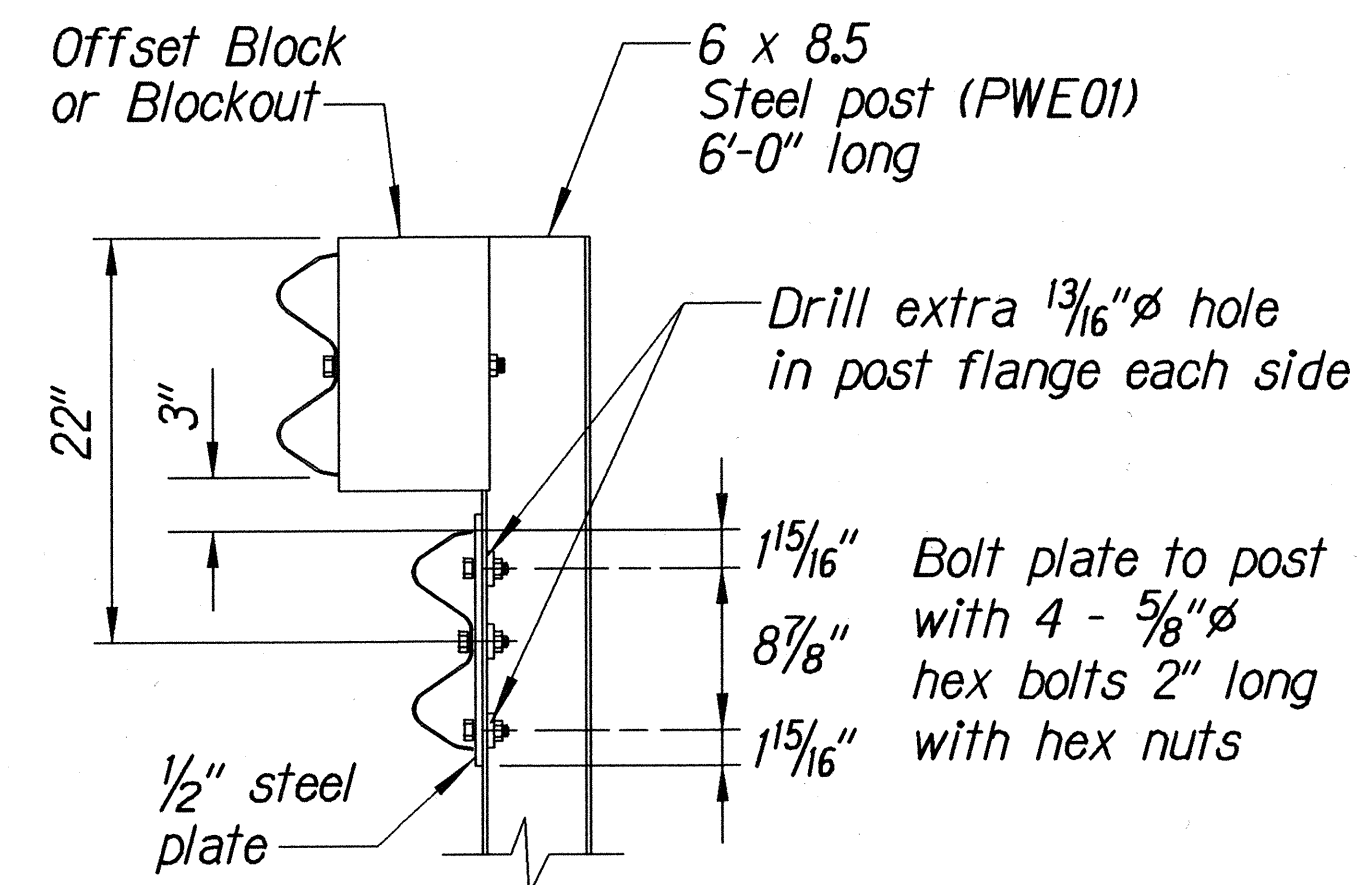
Square Washer
(3/16" Thick - Hot-dip
Zinc Coated Galvanized)



3 - 7/8" ϕ holes to be field drilled in rail
and attached to steel plate with 7/8" ϕ hex
bolts 1 5/16" long with square washer

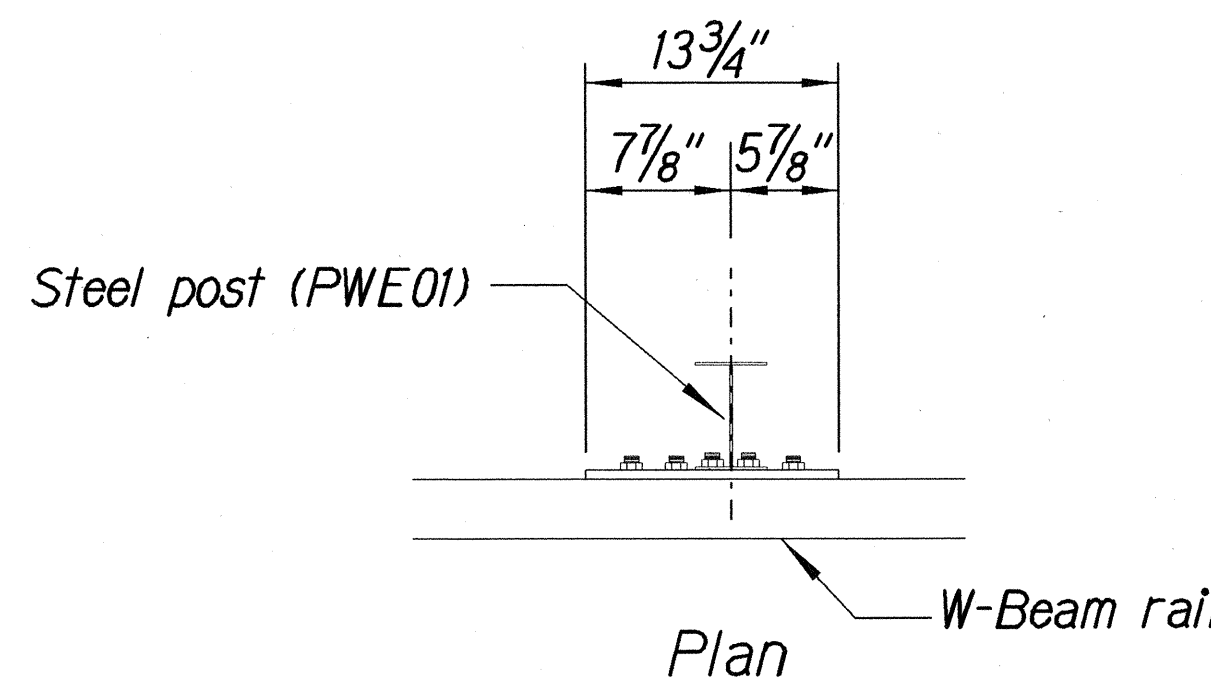
1" ϕ holes to be field drilled in
rail and through post flange.
Attach to steel plate with 7/8" ϕ hex
bolts 2" long with square washer

Front View



Elevation

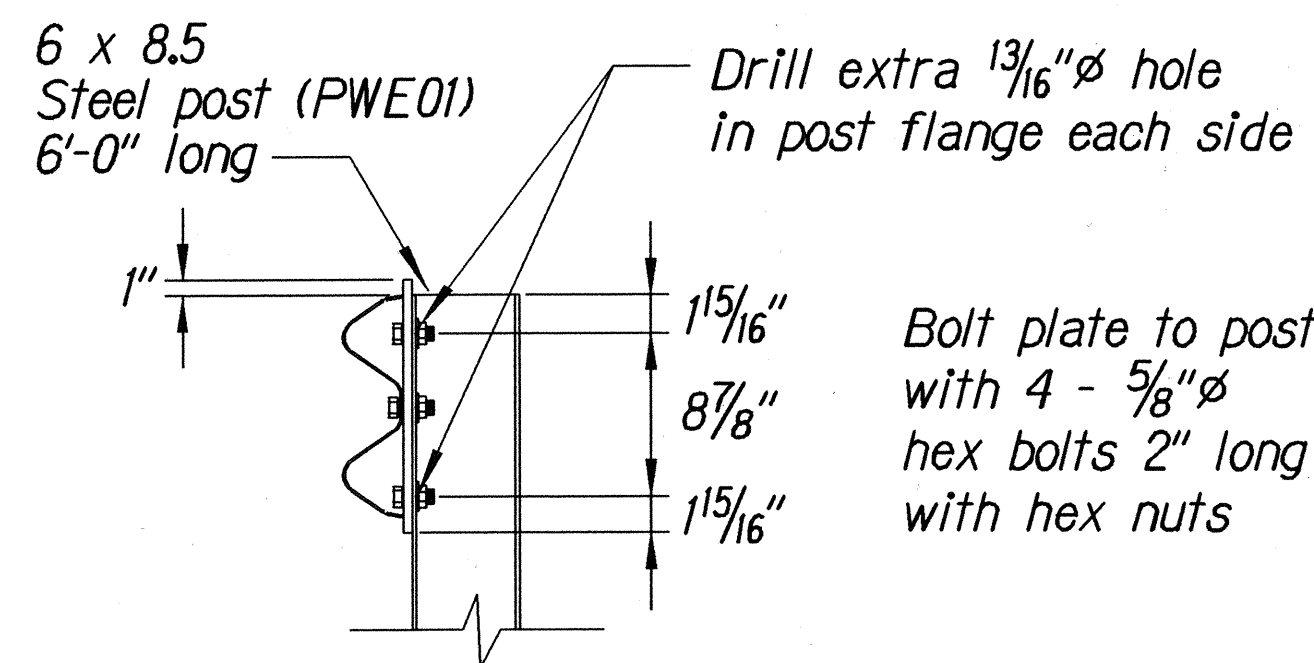
RUBRAIL ANCHOR DETAILS



3 - 7/8" ϕ holes to be field drilled in rail
and attached to steel plate with 7/8" ϕ hex
bolts 1 5/16" long with square washer

1" ϕ holes to be field drilled in
rail and through post flange.
Attach to steel plate with 7/8" ϕ hex
bolts 2" long with square washer

Front View



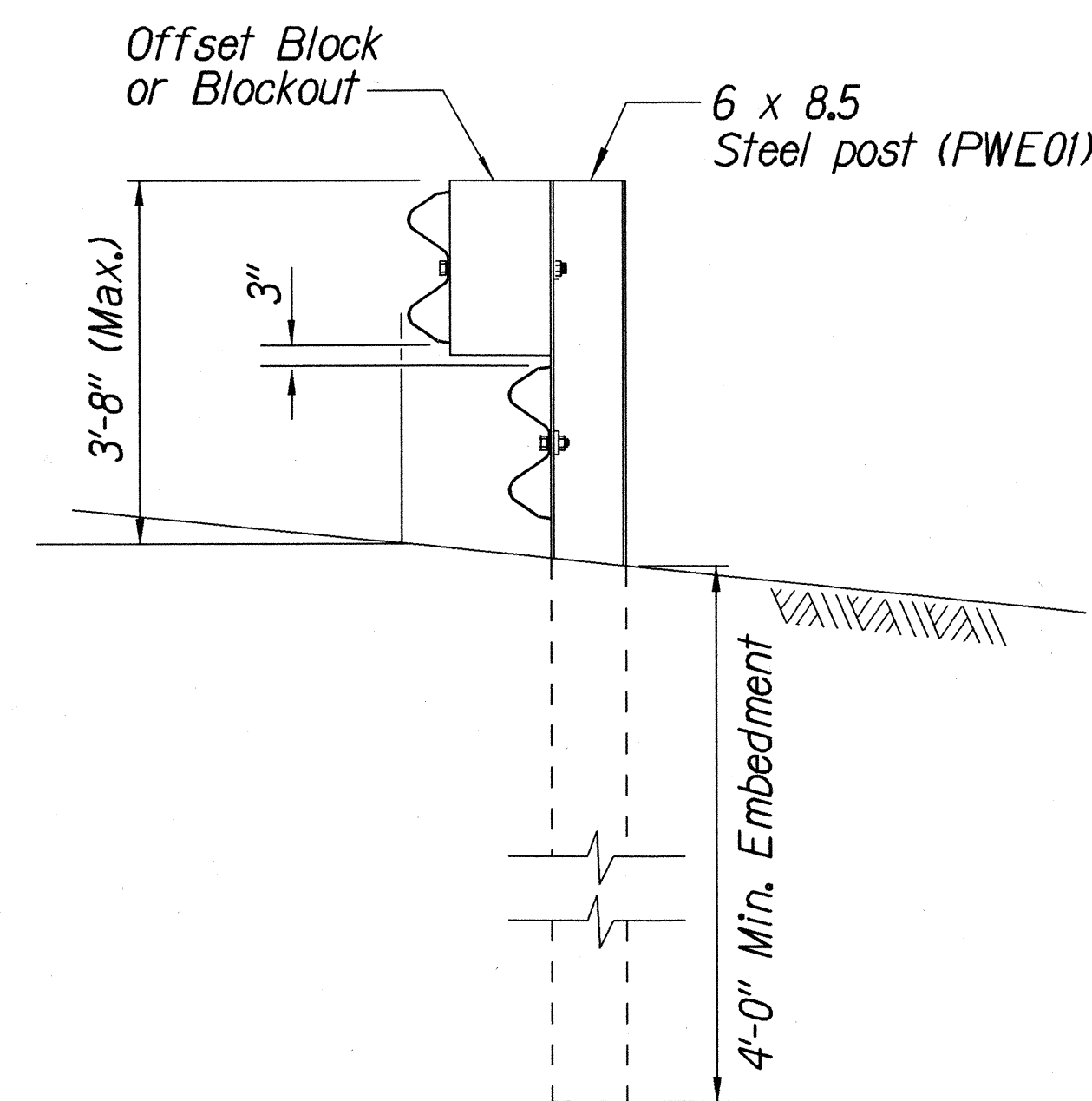
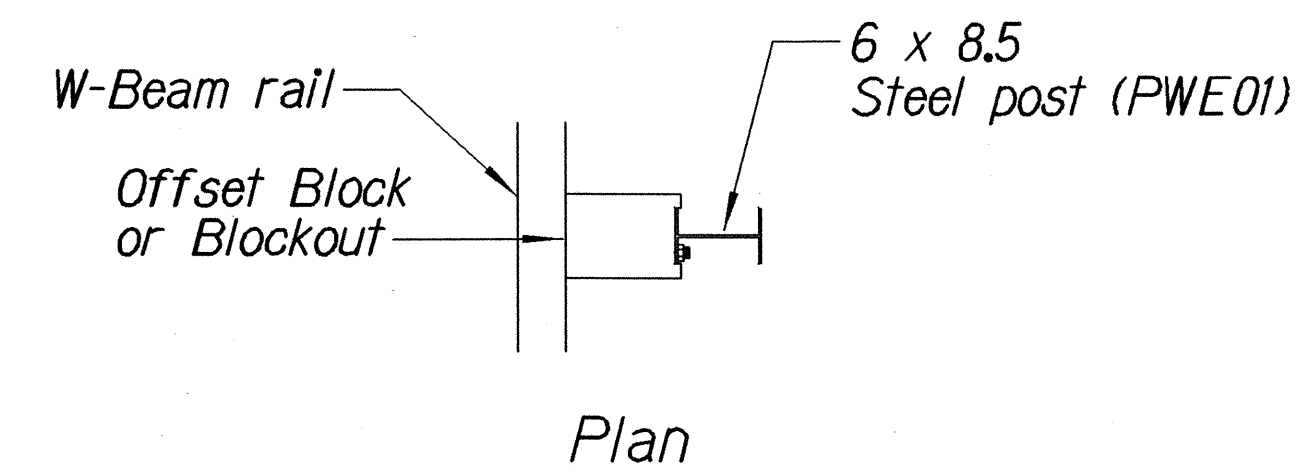
Elevation

POST ANCHOR DETAILS

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

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.



Elevation

STEEL POST GUARDRAIL WITH RUBRAIL

DATE	REVISION
12/10/01	Plan Sheet No. ADD.B-10C shall supercede Plan sheet No. B-10C per Addendum No. 1.

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
MODIFIED TYPE "A-1" FLARE RUBRAIL DETAILS
QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28)
Scale: As Noted Date: July, 2001
SHEET No. 3 OF 3 SHEETS

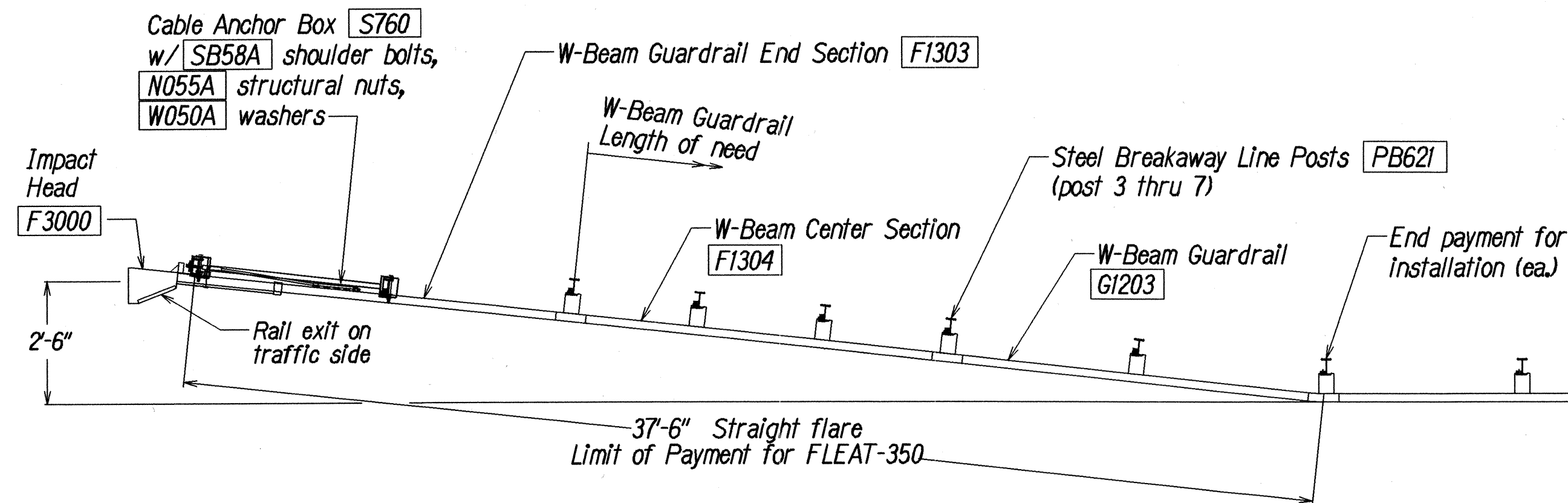
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.44	47

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.
G1203	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
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
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

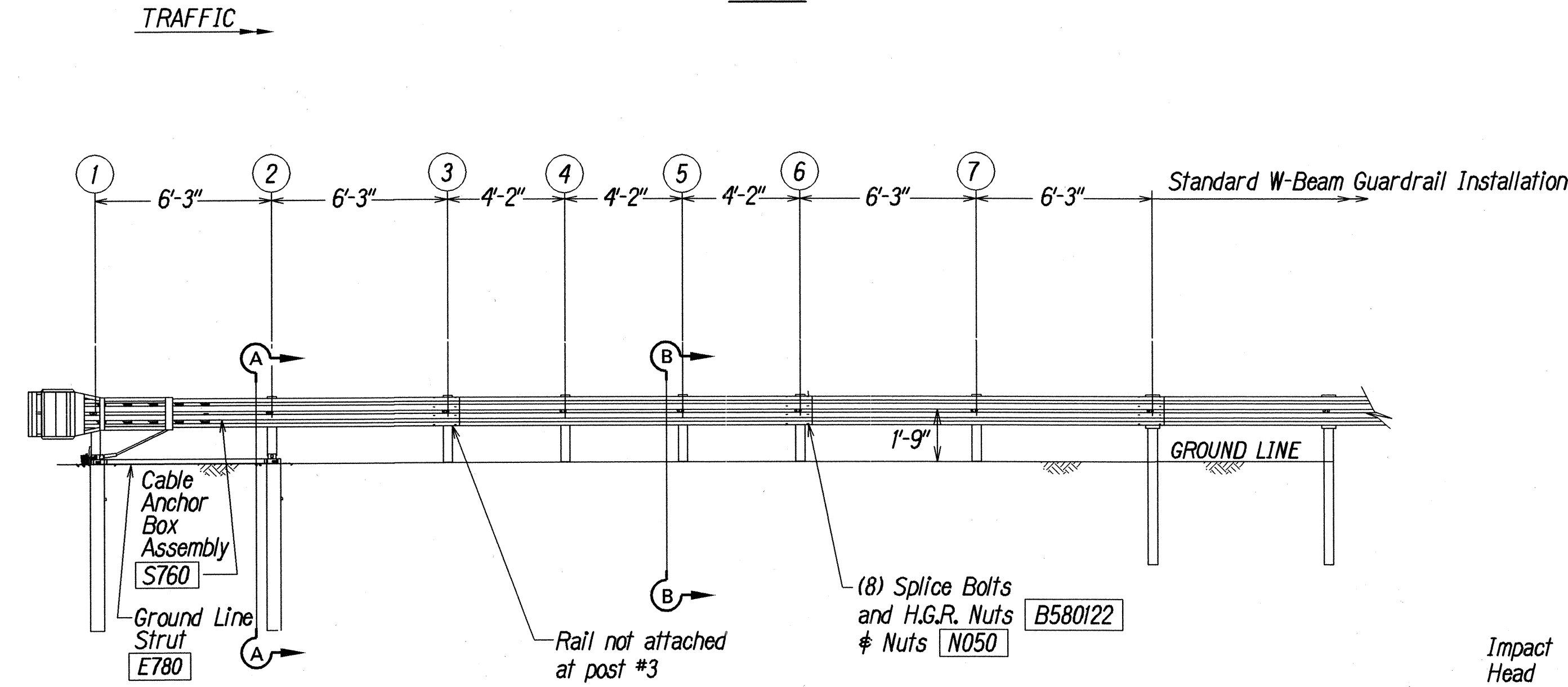
Foundation Tube Options For Posts 1 & 2
 *6'-0" Split Foundation Tubes S730
 *6'-0" Solid Foundation Tubes E731
 *5'-0" Foundation Tubes S735 W/Soil Plates SP600
 *4'-6" Foundation Tubes E735 W/Soil Plates SP600

GENERAL NOTES

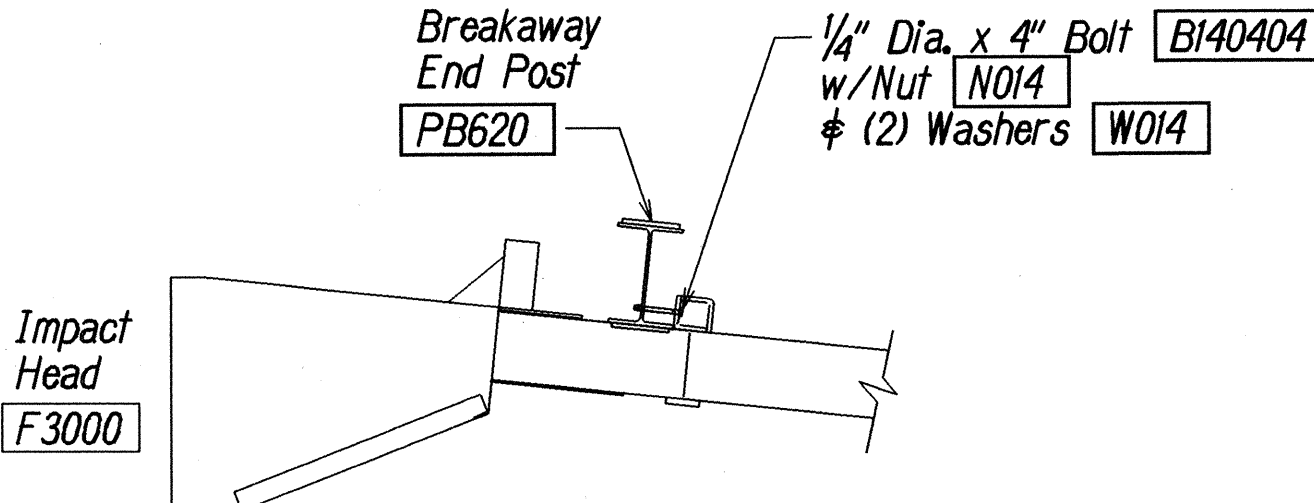
- Breakaway steel posts are required with the FLEAT Terminal.
- All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
- The soil tubes shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
- The soil tubes may be driven with an approved driving head. Soil tubes shall 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.
- 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.
- 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.
- (R) or (L) Indicates right or left Impact Head Reflector Marker (IHRM). Providing and installing of IHRM shall be considered incidental to end treatment.
- The stripes for IHRM shall slope downward at an angle of 45° towards the side of the end treatment that traffic is to pass.



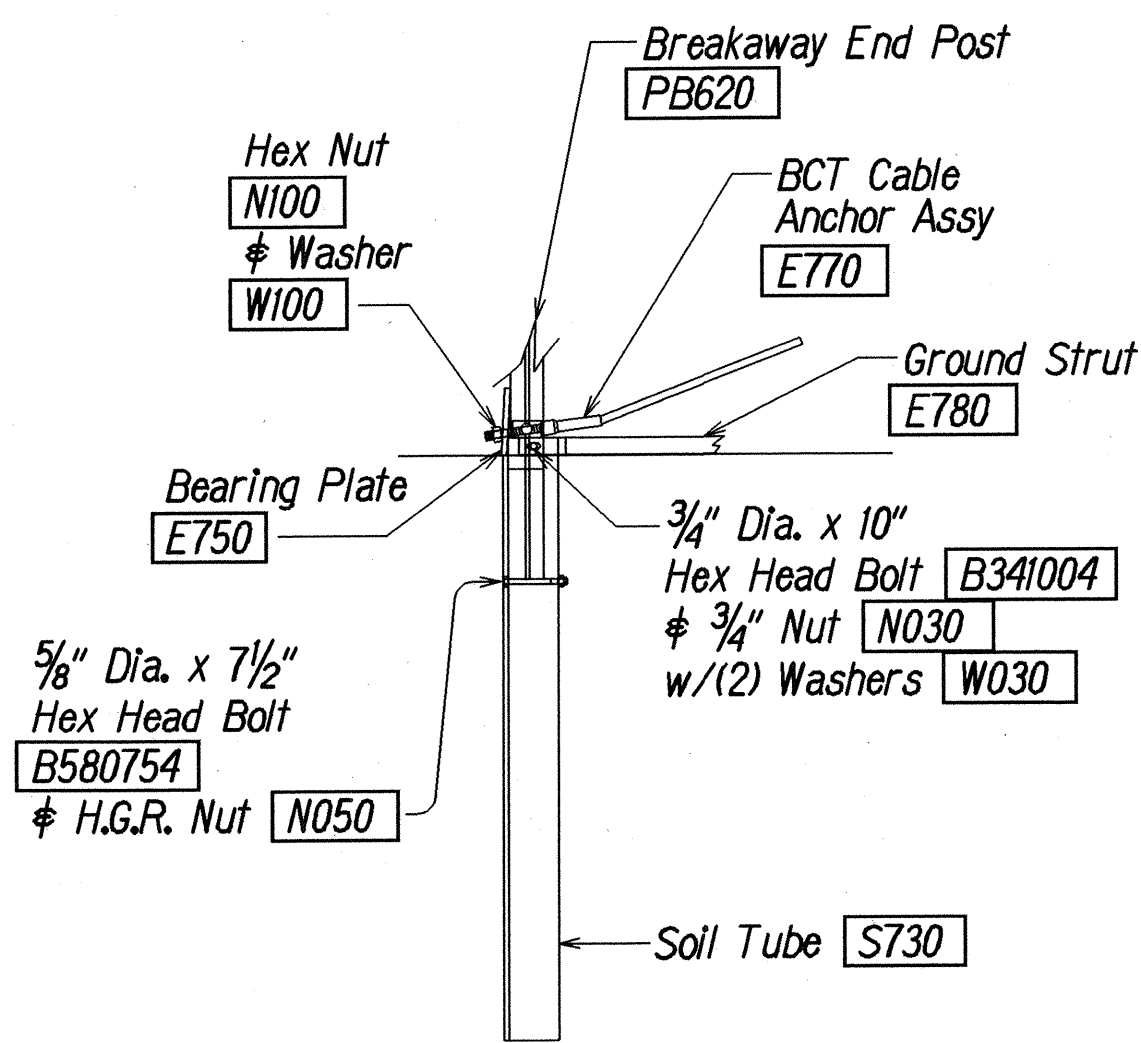
PLAN



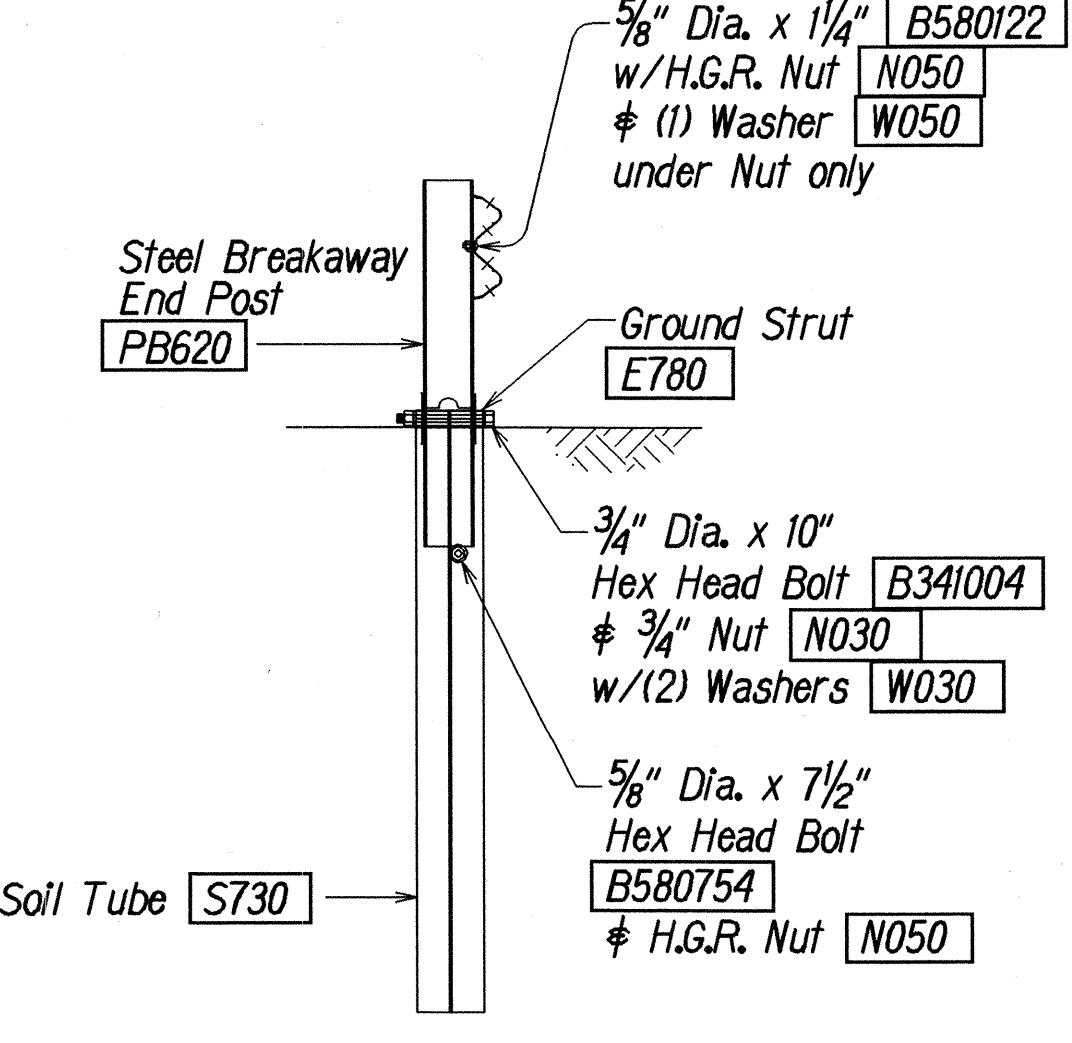
ELEVATION



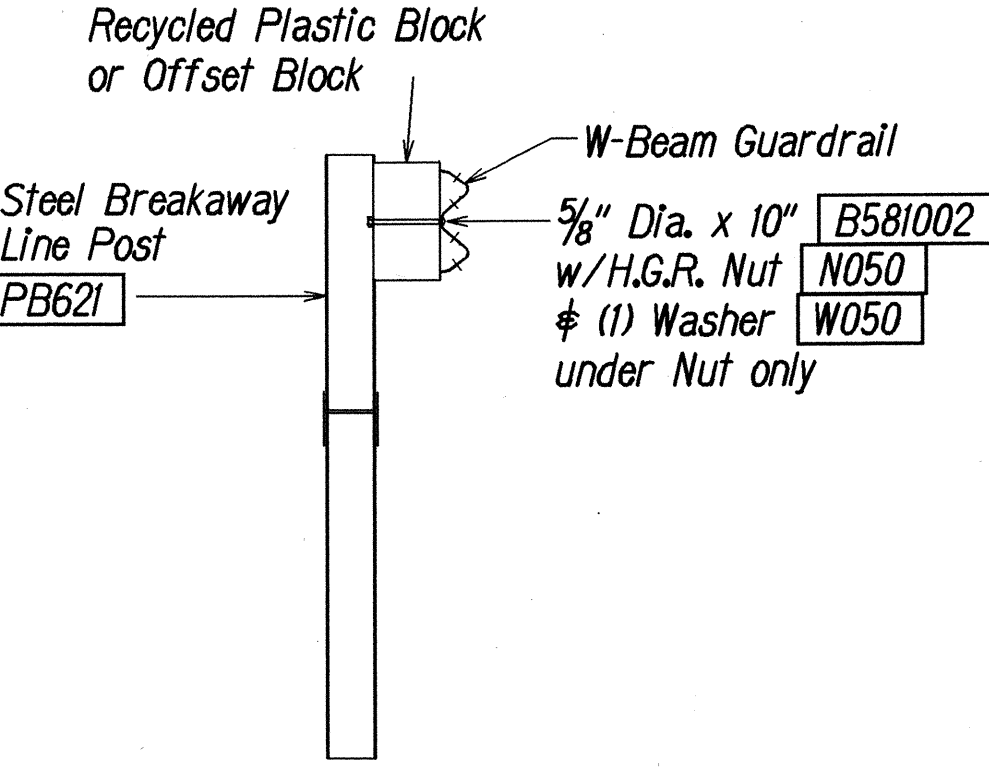
IMPACT HEAD CONNECTING DETAIL



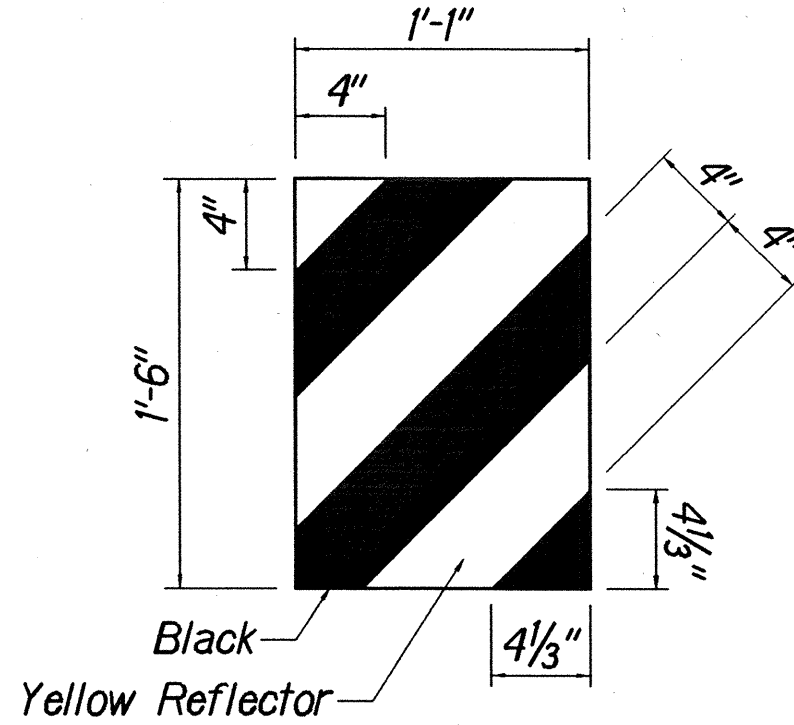
PARTIAL VIEW OF POST 1



SECTION A-A
 (@ Post #2)

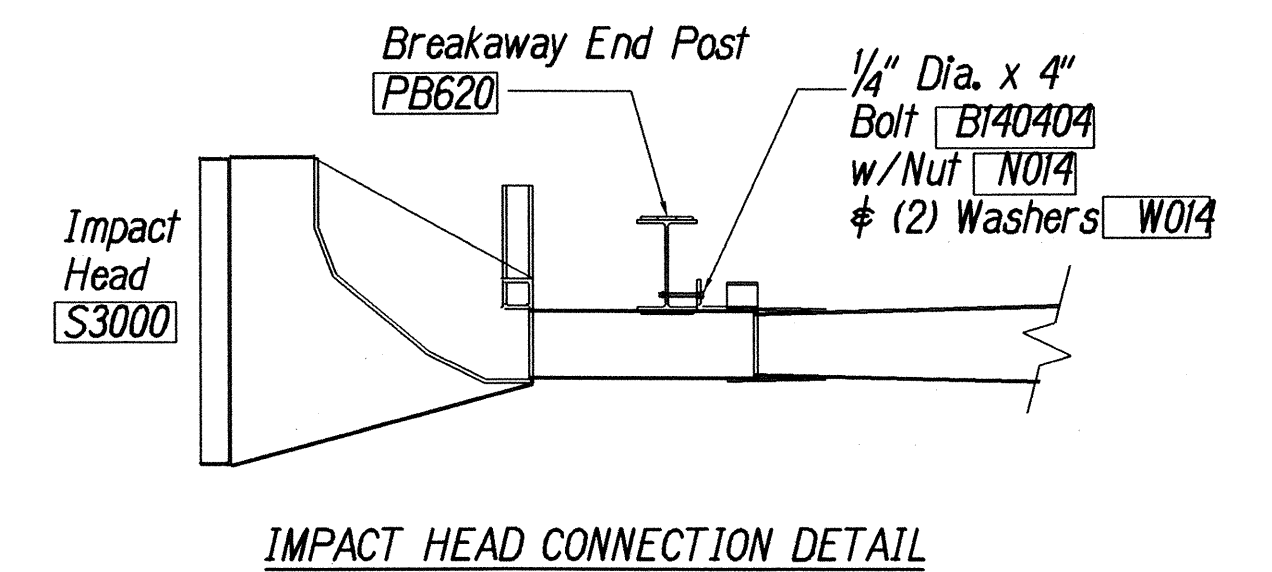
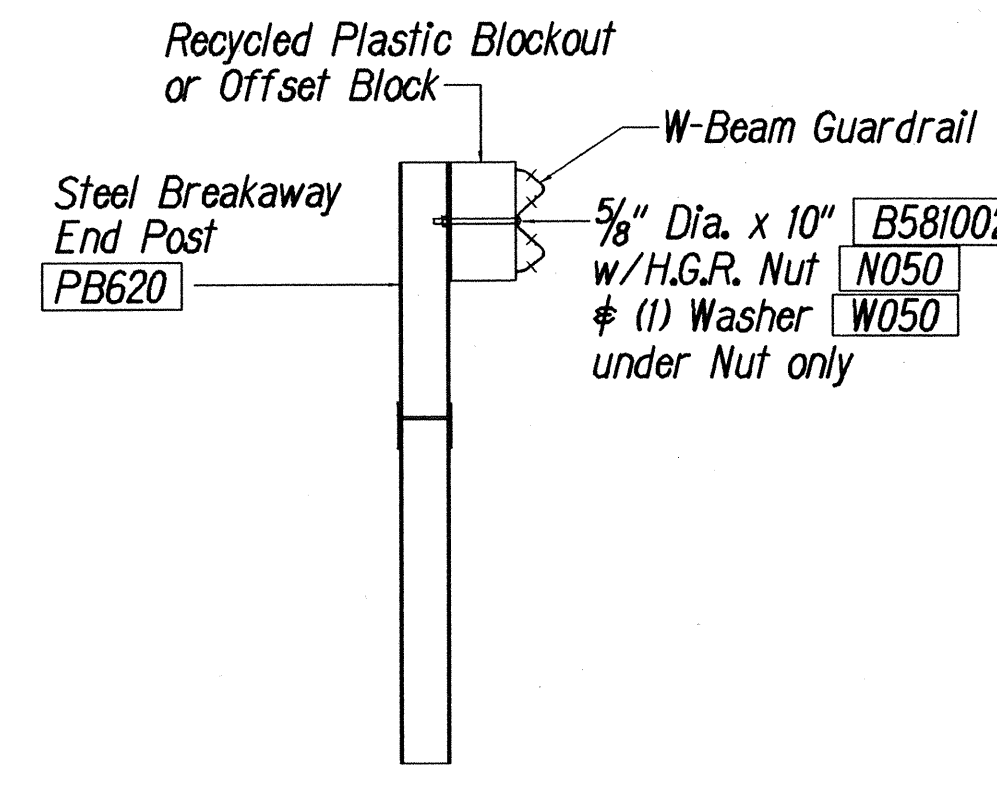
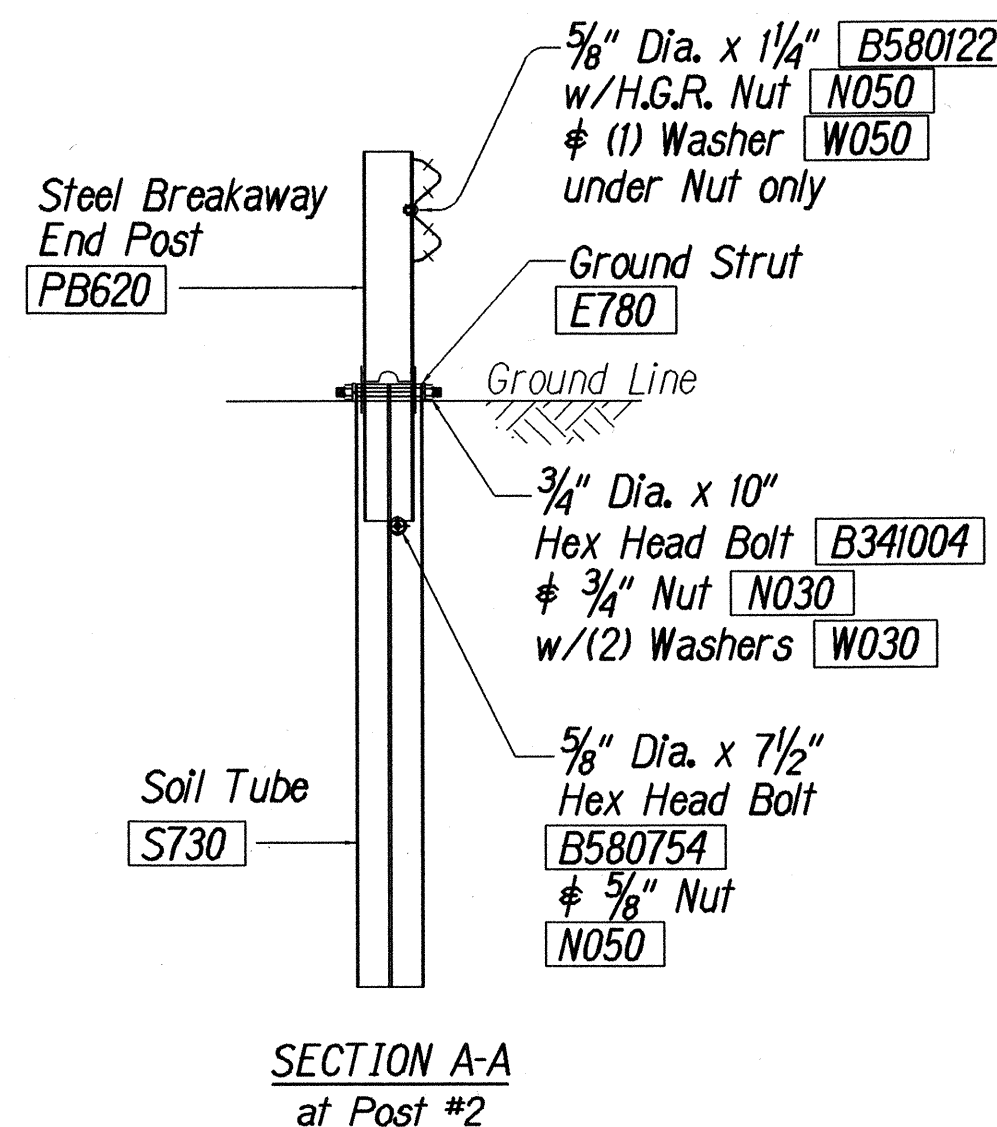
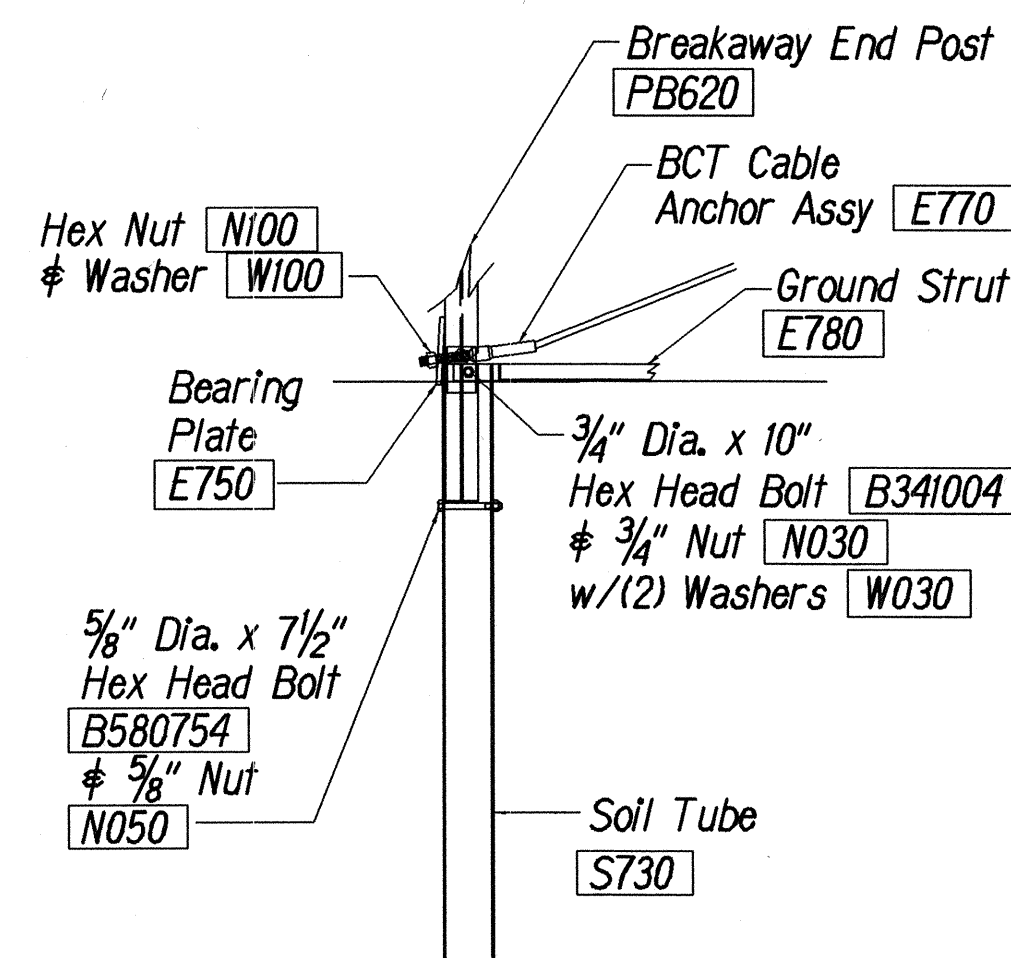
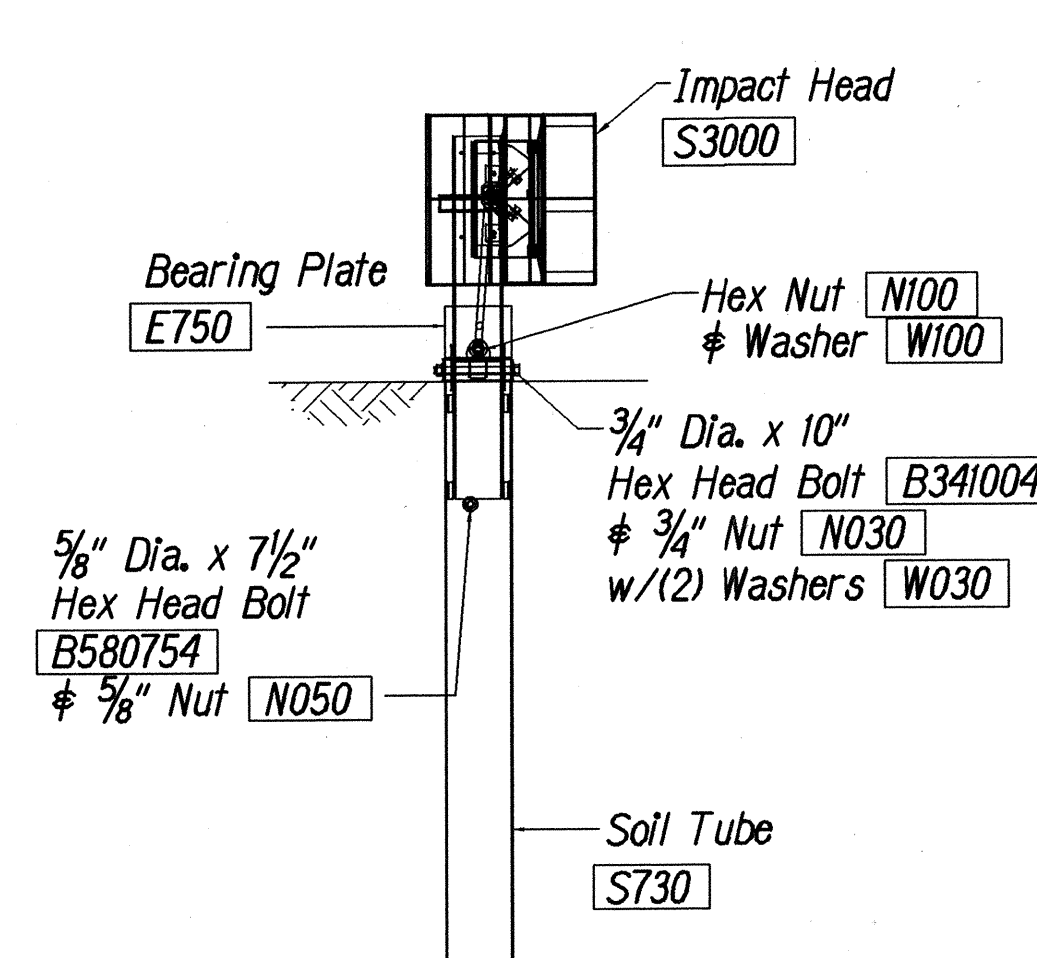
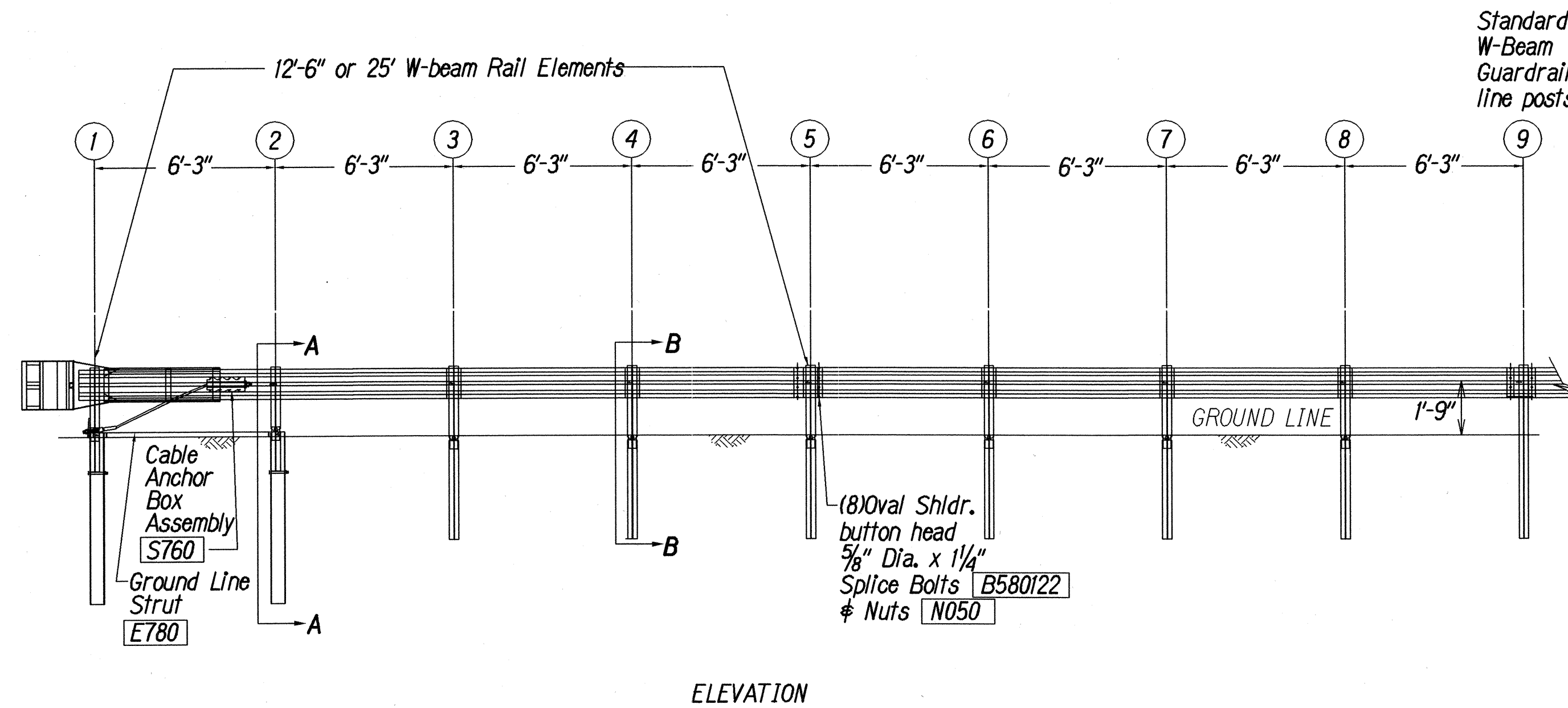
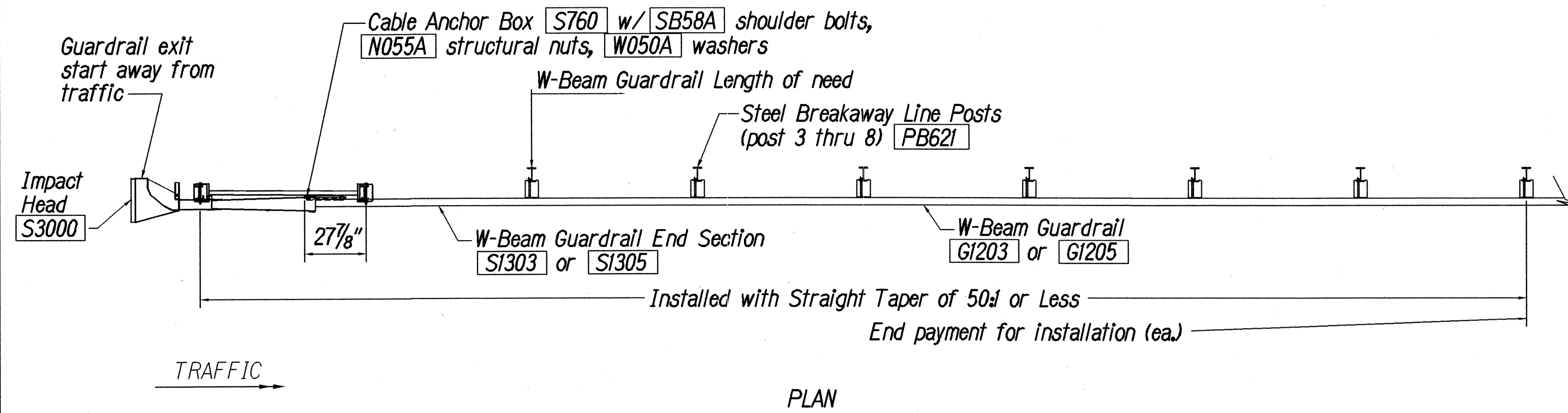


SECTION B-B
 (Typical @ Post 3 - 7)
 NOTE: RAIL NOT BOLTED @ POST #3



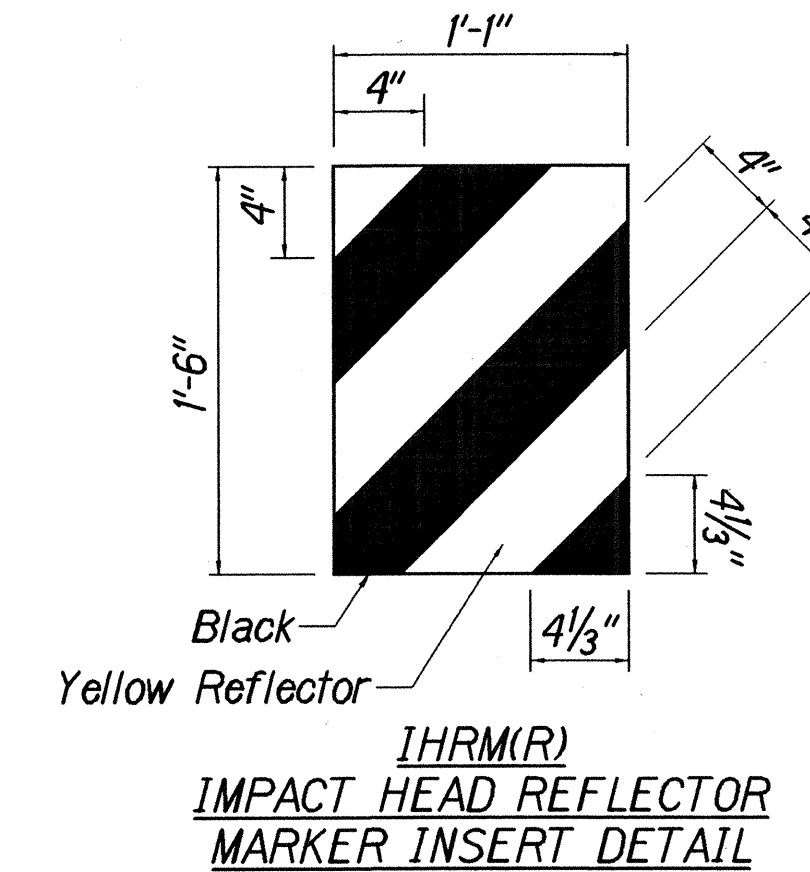
IHRM(R)
 IMPACT HEAD REFLECTOR
 MARKER INSERT
 DETAIL

DATE	REVISION
12/10/01	Plan Sheet No. ADD.B-11 shall supercede Plan Sheet No. B-11 per Addendum No. 1.
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION FLEAT-350 FLARED ENERGY ABSORBING TERMINAL QUEEN KAAHUMANU HIGHWAY GUARDRAIL & SHOULDER IMPROVEMENTS KAWAIHAE TO HAPUNA F.A. PROJECT NO. NH-019-1(28) Scale: As Shown Date: July, 2001	
SHEET No. 1 OF 1 SHEETS	



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% 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.



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.45	47

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
PB62I	6	STEEL BREAKAWAY LINE POSTS
	6	RECYCLED PLASTIC BLOCKOUTS OR OFFSET BLOCK
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
HARDWARE		
B580I22	17/33	5/8" Dia. x 1 1/4" SPLICE BOLTS, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLTS
B34I004	2	3/4" Dia. x 10" HEX BOLTS
B34I002	6	5/8" Dia. x 10" H.G.R. BOLT (POST 2 ONLY)
B58I802	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 E73I
 *5'-0" Foundation Tubes S735 W/Soil Plates SP600
 *4'-6" Foundation Tubes E735 W/Soil Plates SP600

12/10/01 Plan Sheet No. ADD.B-12 shall supercede Plan sheet No. B-12 per Addendum No. 1.

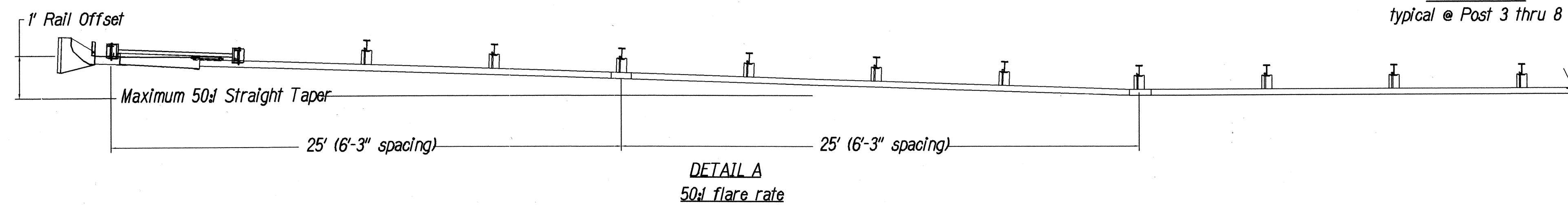
DATE REVISION

STATE OF HAWAII
 DEPARTMENT OF TRANSPORTATION
 HIGHWAYS DIVISION
SKT-350
SEQUENTIAL KINKING TERMINAL
QUEEN KA'AHUMANU HIGHWAY
GUARDRAIL AND SHOULDER IMPROVEMENTS
KAWAIHAE TO HAPUNA
F.A. PROJECT NO. NH-019-1(28)
 Scale: As Shown Date: July, 2001
 SHEET No. 1 OF 1 SHEETS

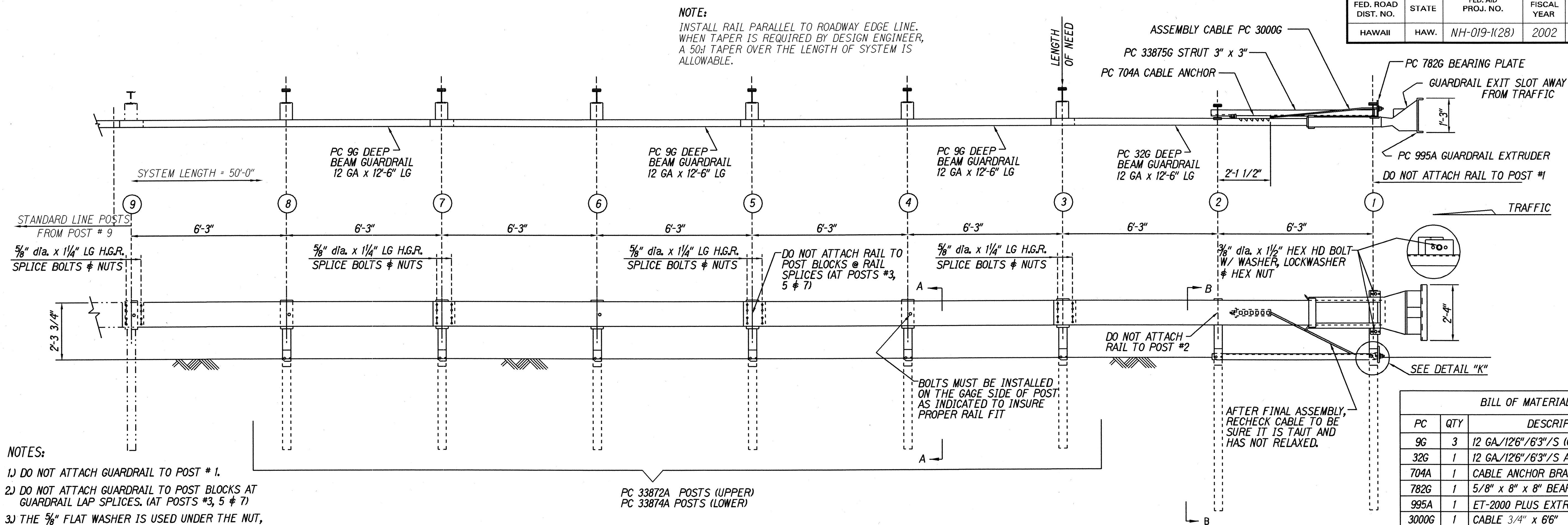
ADD.B-12

ORIGINAL PLAN	DATE
SURVEY PLOTTED BY	
DRAWN BY	
NOTE BOOK	
DESIGNED BY	
CHECKED BY	
No. dgm	

13/28/01 101-ruby/guardrail/skt350.dgn (Stand Plan TE-61 n1/03/03 # TE-62 r09/01/07)

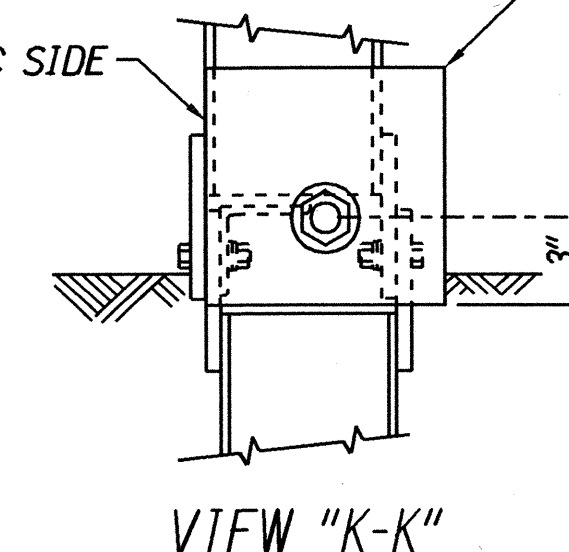
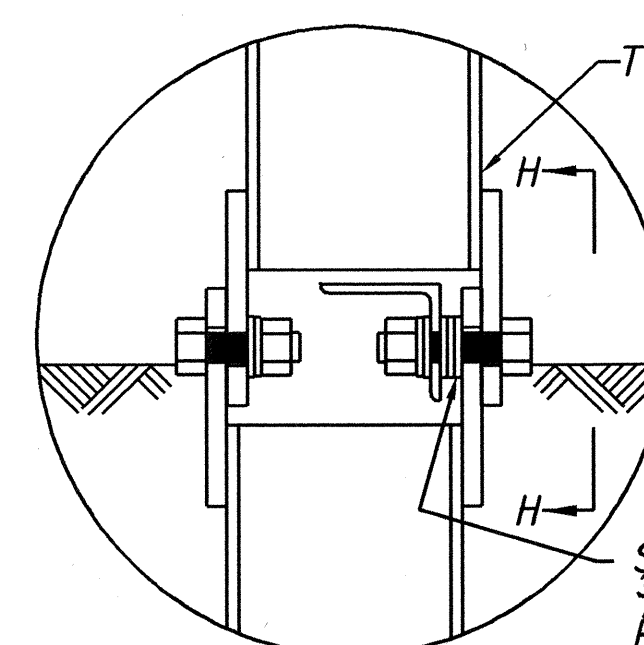
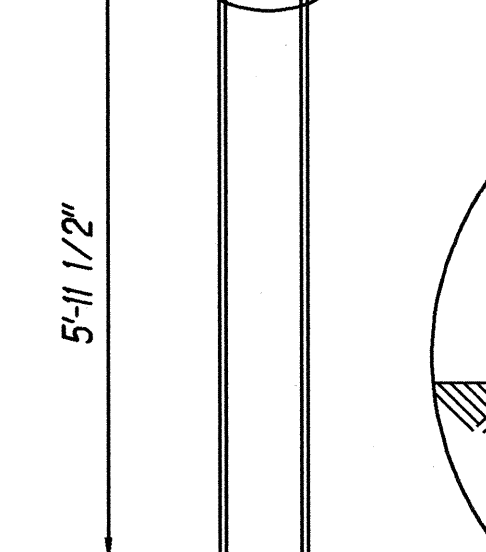
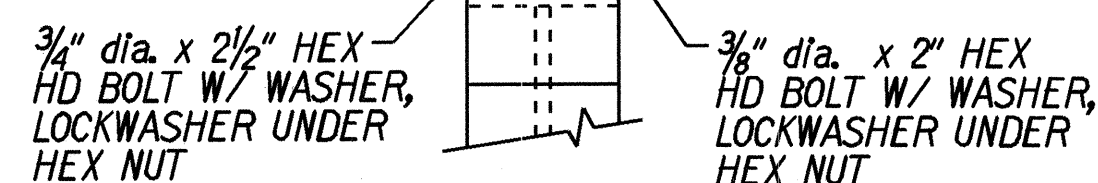
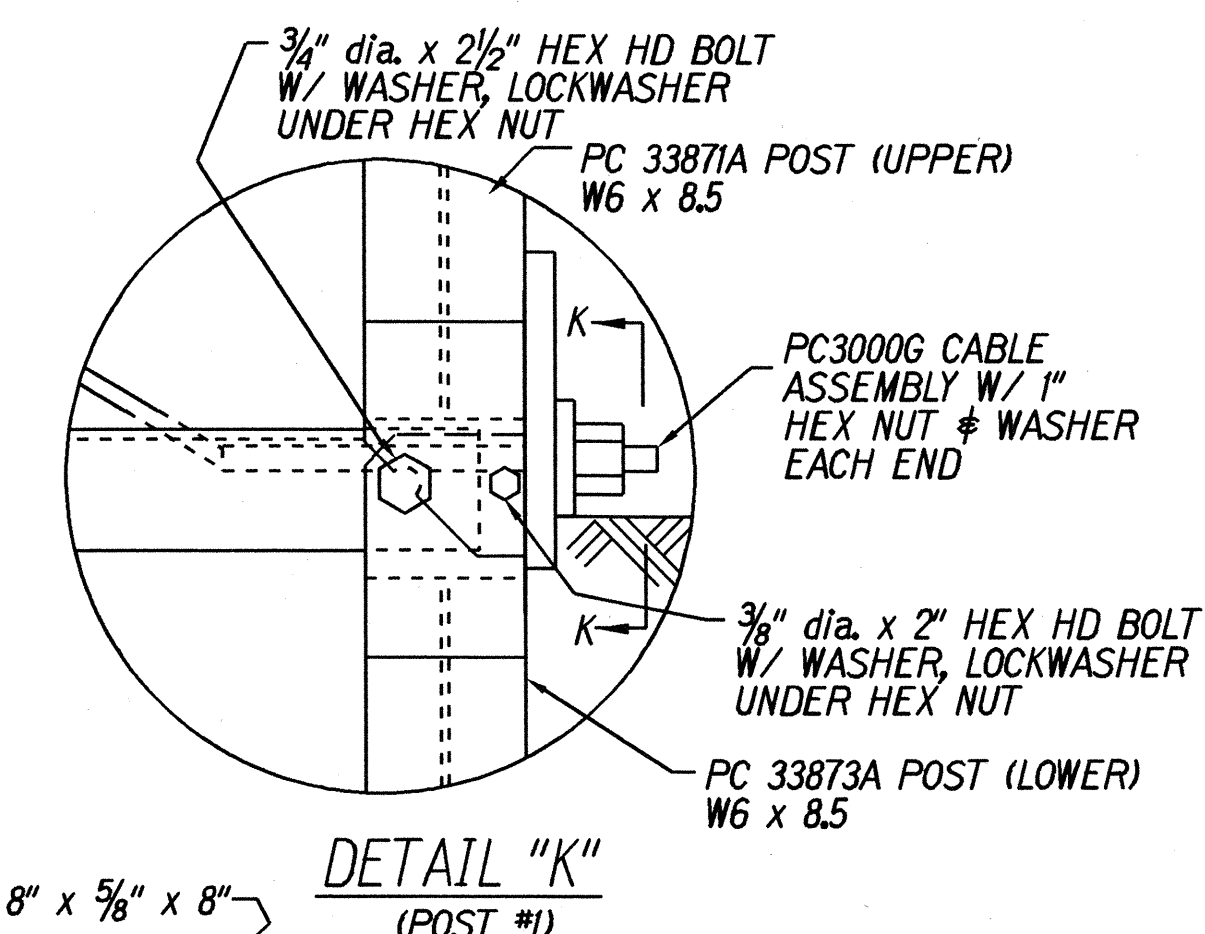
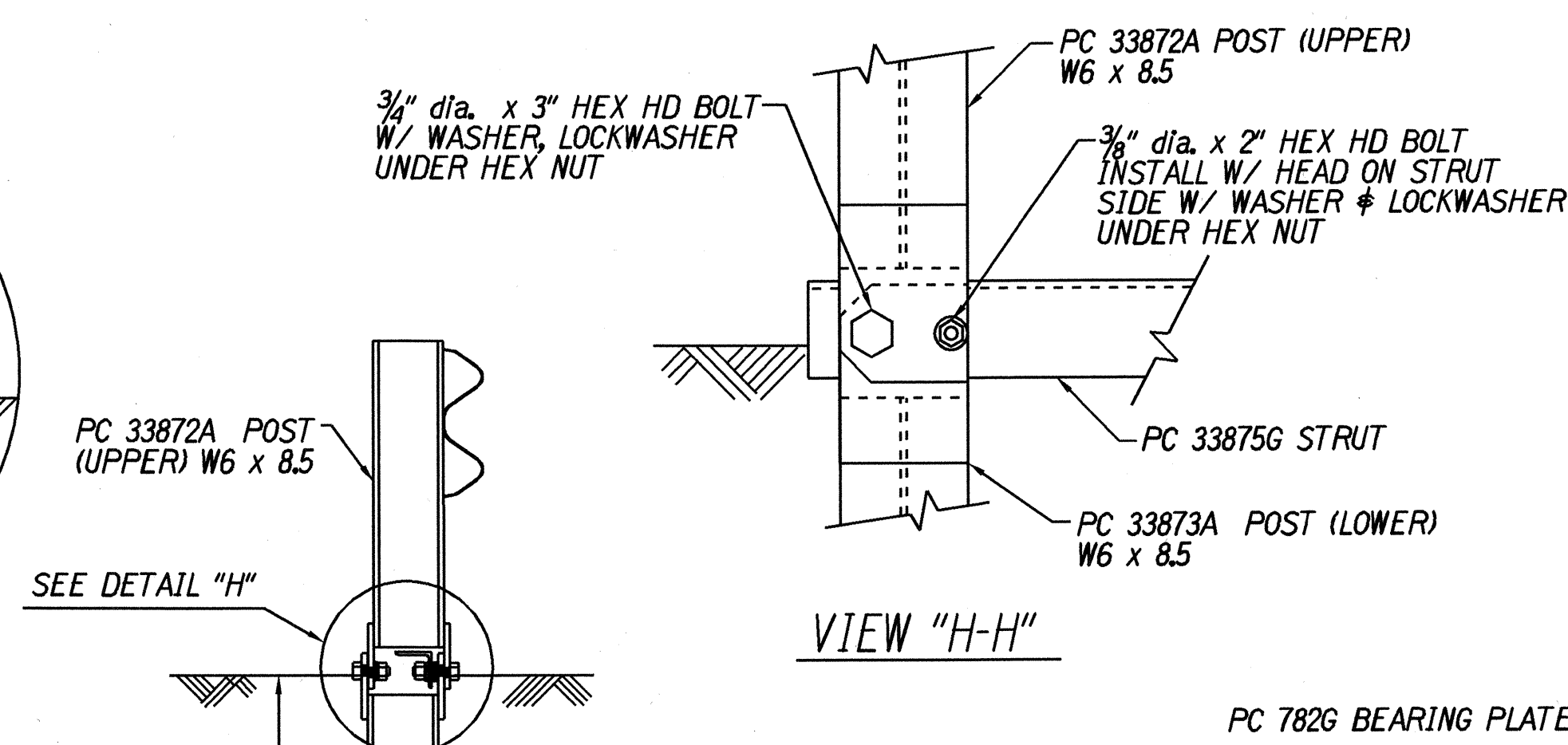
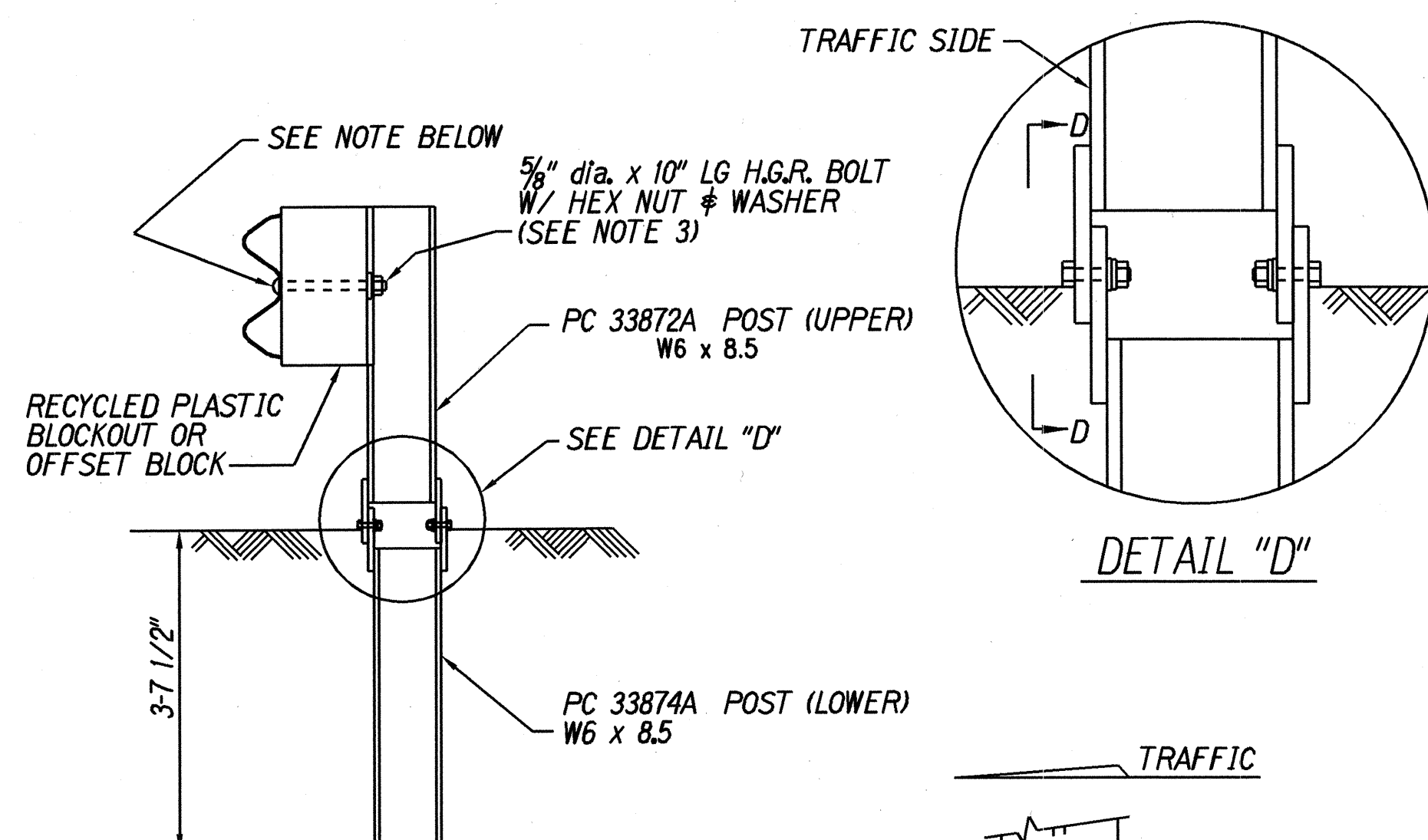


FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-K(28)	2002	ADD.46	47



- 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./126" /6'3" /S (GUARDRAIL)
32G	1	12 GA./126" /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 66"
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



12/10/01	Plan Sheet No. ADD.B-13 shall supercede Plan sheet No. B-13 per Addendum No. 1.
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ET-2000 PLUS

QUEEN KA'AHUMANU HIGHWAY
GUARDRAIL AND INTERSECTION IMPROVEMENTS

KAWAIIHAE TO HAPUNA
PROJECT NO. FLH-019-1(28)

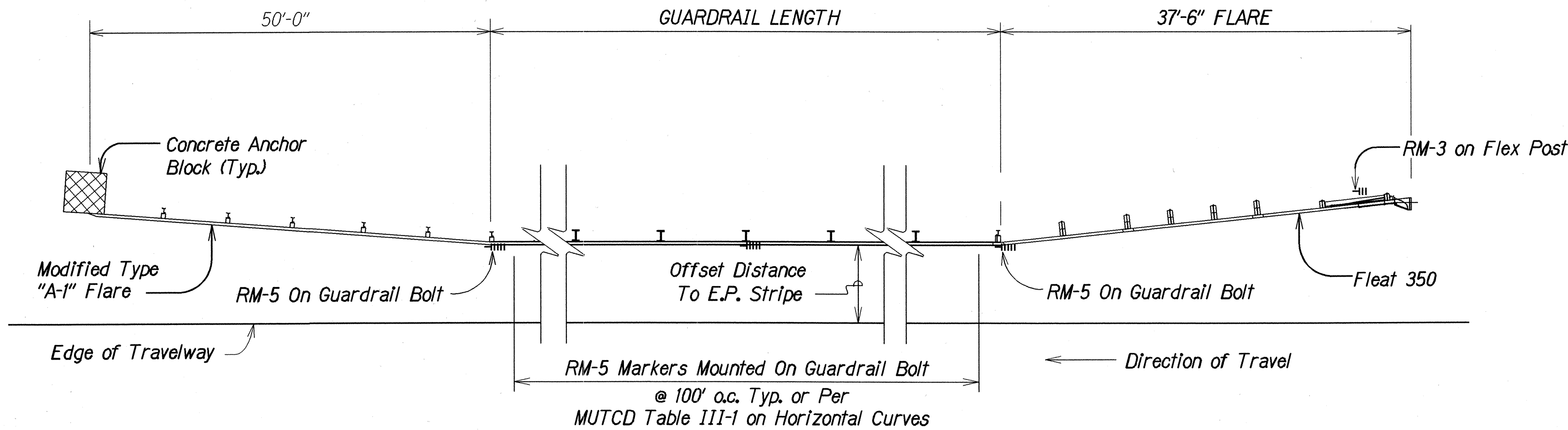
Scale: Noted Date: July, 2001

SHEET No. 1 OF 1 SHEETS

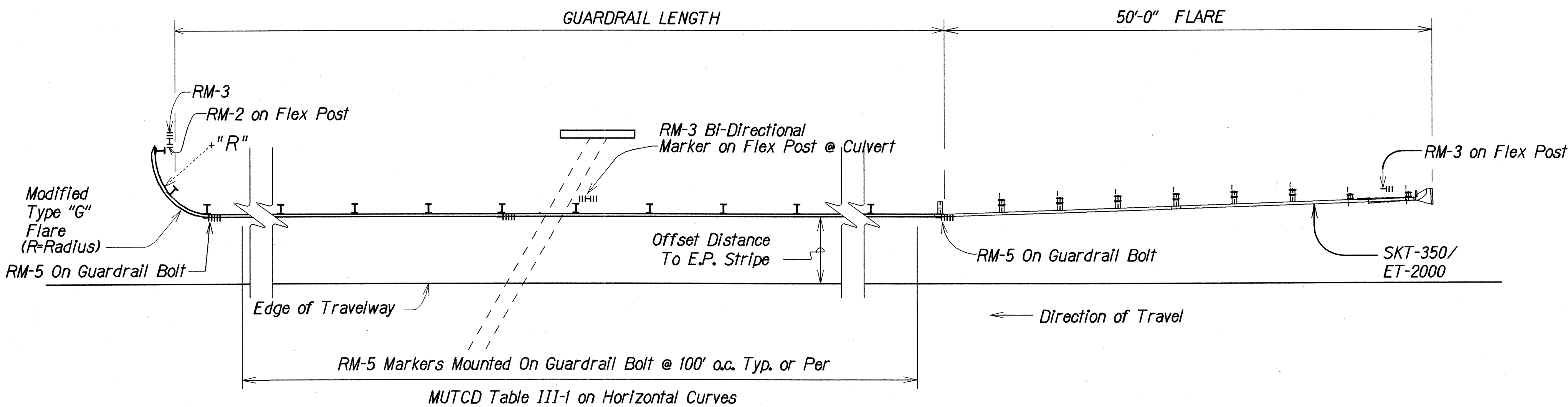
FED. ROAD DIST.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-019-1(28)	2002	ADD.47	47

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 shall be white.
5. RM-5 shall be per Standard Guardrail Details.



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



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

TYPICAL GUARDRAIL REFLECTOR MARKER INSTALLATION

Not To Scale

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
QUANTITIES BY	
DATE	

12/10/01	Plan Sheet No. ADD.B-14 shall supercede Plan sheet No. B-14 per Addendum No. 1.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION GUARDRAIL REFLECTOR MARKER DETAIL QUEEN KA'AHUMANU HIGHWAY GUARDRAIL AND SHOULDER IMPROVEMENTS F.A. PROJECT NO. NH-019-1(28) Scale: none Date: April, 2001	
SHEET No. 1	OF 1 SHEETS