

INDEX TO DRAWINGS	
SHEET	DESCRIPTION
Q1	Index, General Notes and Abbreviations
Q2	Location Plans
Q3	Type "A" End Post and Type "B" Bridge Railing Upgrades
Q4	Typical Type "A" Upgrade Details
Q5	Typical Type "A" and "B" Upgrade Details
Q6	Type "A" and "B" Upgrade Details
Q7	Type "C" Upgrade; Bridge Railing Details
Q8	Metal Guardrail Details
Q9	Metal Guardrail Type 3 Thrie Beam and Appurtenances Details

AB	Anchor Bolt	R	Radius
Alum.	Aluminum	Rdwy.	Roadway
Approx.	Approximate	Ref.	Reference
Bal.	Balance	Reinf.	Reinforcing
Beg.	Begin, Beginning	Req'd	Required
B	Baseline	Sect.	Section
Bm.	Beam	Sht.	Sheet
Brg., Brgs.	Bearing, Bearings	Spcs.	Spaces
¢	Center line	Spcg	Spacing
Cl.	Clear	Sta.	Station
Conc.	Concrete	Std.	Standard
Cont.	Continuous	Struct.	Structural
Def.	Detail	Str.	Structure
Dia.	Diameter	T & B	Top and Bottom
Ea.	Each	Thk.	Thick
EF	Each Face	TS	Tubular Steel
Exist.	Existing	Typ.	Typical
Exp.	Expansion	Vert.	Vertical
FF	Front Face	w/	with
Fin.	Finish		

Diagram illustrating the detail symbol components:

- Detail or section designation:** Points to the letter 'A' in the top half of the circle.
- Sheet number section is cut or detail section:** Points to the 'S1' in the bottom-left quadrant.
- Sheet number detail is drawn on:** Points to the 'S1' in the bottom-right quadrant.

DESIGN SPECIFICATIONS - AASHTO:

1. AASHTO LRFD Bridge Design Specifications, 1994 with 1997 Interims.

*MATERIALS:*

1. Reinforced concrete: Class A
2. Reinforced steel: ASTM A 615, Grade 40 or Grade 60.
3. Admixture in concrete: See Special Provisions
4. All expansion and premolded joint filler shall be incidental to concrete and will not be paid for separately.
5. All structural steel other than pipe and tube railing material shall be ASTM A 36 unless otherwise noted. All structural steel shall be hot-dip galvanized after fabrication.
6. All anchor bolts, washers and nuts shall be ASTM A 325, hot-dip galvanized after fabrication, unless noted otherwise.
7. All welding of reinforcing bars shall be in accordance with the current edition of Reinforcing Steel Welding Code AWS D 1.4. All other welding shall conform to the current edition of the Bridge Welding Code ANSI/AASHTO/AWS D 1.5. Welding electrodes for structural steel shall be E 70.

CONSTRUCTION METHODS:

1. Refer to Hawaii Standard Specifications for Road, Bridge and Public Works Construction, 1994 Edition and Special Provisions.
2. Except as noted otherwise, all dimensions are measured plumb.
3. For concrete finish, see Standard Specification and Special Provisions.
4. For steel reinforcing, stagger all splices where possible.
5. Steel reinforcing shall be supported, bent and placed as per the ACI Detailing Manual, 1994.
6. For cast-in-place concrete, minimum reinforcement cover:  
concrete cast against earth: 3"  
walls: 2"
7. At time concrete is placed, reinforcing shall be free from mud, oil, laitance or other coatings adversely affecting bond capacity.
8. Reinforcement, dowels and other embedded items shall be positively secured before pouring.
9. All footings shall bear on firm undisturbed natural soils or properly compacted structural fill.
10. All existing reinforcing and anchor bolts that can be incorporated in the new work shall be bent or cut as required and cleaned before being utilized in the new work.
11. All existing reinforcing and anchor bolts that cannot be incorporated in the new work shall be completely removed or removed to a minimum depth of 1½ inches below finish grade and the area patched with mortar.
12. All existing concrete faces receiving new concrete in the finish product shall be roughened and cleaned prior to placement of the new pour, unless indicated otherwise or as directed by the Engineer.
13. Existing structure is shown by hatched lines. Limits of removal of existing structure are shown by x-hatched lines. Saw-cut 1" deep along cut line of existing structure. Removal shall be done in such a manner as to preclude any damage to the existing structures. Large vibratory type of equipment will not be permitted in the removal operation, nor for drilling of holes. Only small vibratory hand tools approved by the Engineer will be allowed. Any damage to the existing structure due to the Contractor's operation or negligence shall be repaired at his expense with no additional cost to the State, and to the satisfaction of the Engineer.

REFERENCE:

1. Refer to Standard Plans for additional details and notes not covered by details and typical drawings.

GENERAL:

1. All items noted incidental will not be paid for separately.
2. The Contractor shall verify the locations of all existing utility lines and notify their respective owners before commencing with any work.
3. The Contractor shall verify all grades and dimensions in the field before commencing with any work.
4. The Contractor shall be solely responsible for the protection of adjacent property, utilities and existing and new structures from damage due to construction. Repairing any damage shall be at the Contractor's own expense, to the satisfaction of the Engineer. He shall conduct his work in such a manner and provide such temporary shoring or other measures as may be necessary to insure the safety of all concerned and to protect existing structures.
5. Excavation for all footings and footing keys shall be accomplished by maintaining as near a vertical cut as possible.
6. In the event of over-excavation, the space between the footing or footing key and ground shall be filled with a minimum of Class D concrete at the Contractor's expense and as directed by the Engineer.
7. Unless noted otherwise, chamfer all exposed concrete edges three-quarters ( $\frac{3}{4}$ ") of an inch.

<i>ESTIMATED QUANTITIES</i>			
<i>ITEM NO.</i>	<i>ITEM</i>	<i>UNIT</i>	<i>TOTAL</i>
507.7600	Type "A" End Post Upgrade	Each	4 ea.
507.7610	Type "B" Bridge Railing Upgrade	Lin. Ft.	125 l.f.
507.7615	Type "C" Bridge Railing Upgrade	Lin. Ft.	190 l.f.
606.3112	Guardrail Type 3 Thrie Beam Transition to End Post	Lin. Ft.	190 l.f.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	June 1998
	TRACED BY	
NOTE BOOK	DESIGNED BY	June 1998
	QUANTITIES BY	June 1998
	CHECKED BY	June 1998
N. bkalagol		

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

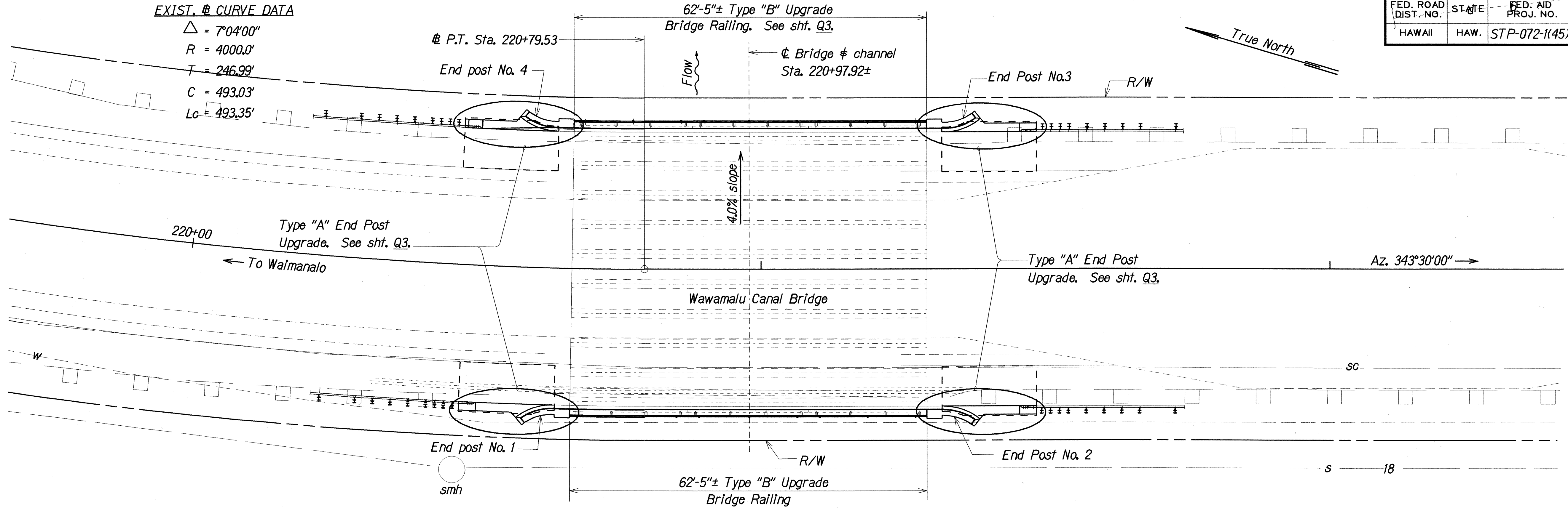
WAWAMALU CANAL BRIDGE AND  
WAWAMALU BRIDGE IMPROVEMENTS  
INDEX, GENERAL NOTES, AND ABBREVIATIONS

*Makapuu Lookout to Kealahou Street*  
*Federal Aid Project No. STP-072-II(45)*

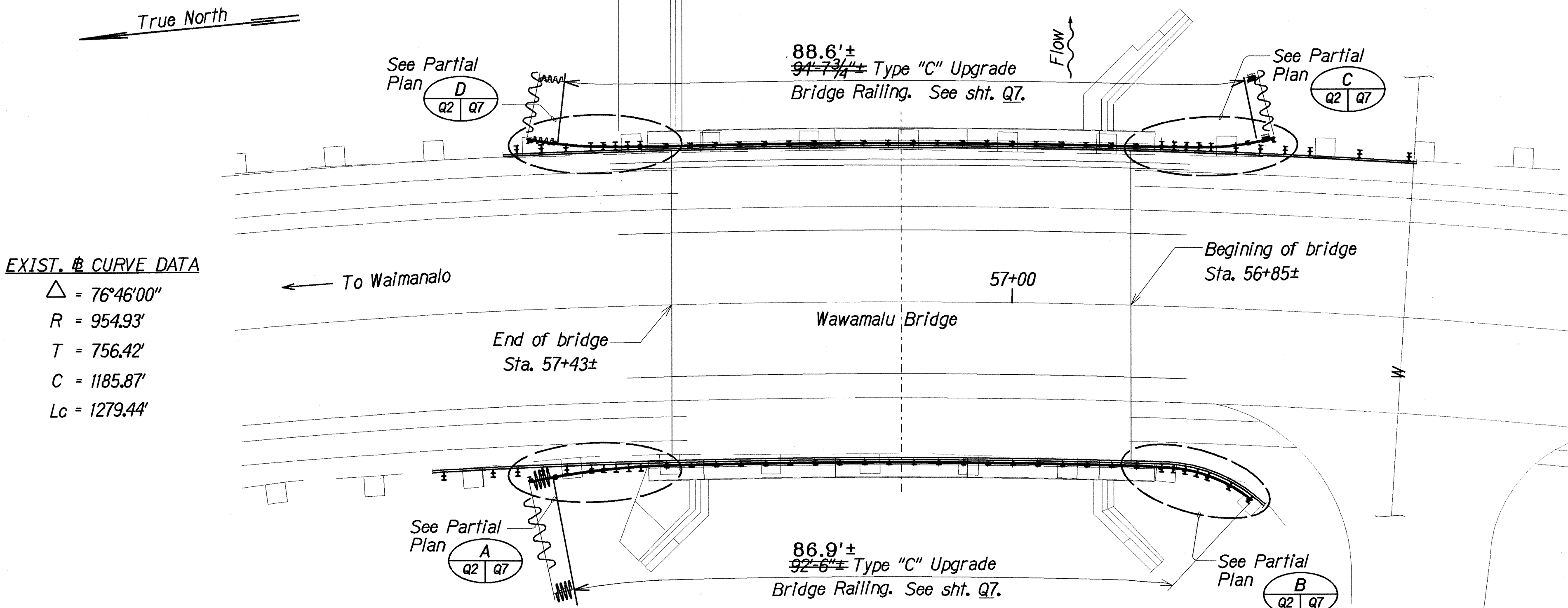
*Scale: As Noted* *Date: Oct. 1998*

SHEET No. 01 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	22	33



**WAWAMALU CANAL BRIDGE**



**WAWAMALU BRIDGE**

**LOCATION PLANS**

Scale: 1" = 10'-0"

**LEGEND FOR AS-BUILT POSTINGS**

	Squiggly line for as-built deletion
	Double line for as-built deletion
Roadway	Text for as-built posting

STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION

**WAWAMALU CANAL BRIDGE AND WAWAMALU BRIDGE IMPROVEMENTS**

**LOCATION PLANS**  
 Makapuu Lookout to Kealahou Street  
 Fed. Aid Project No. STP-072-1(45)

Scale: As Noted Date: Oct. 1998

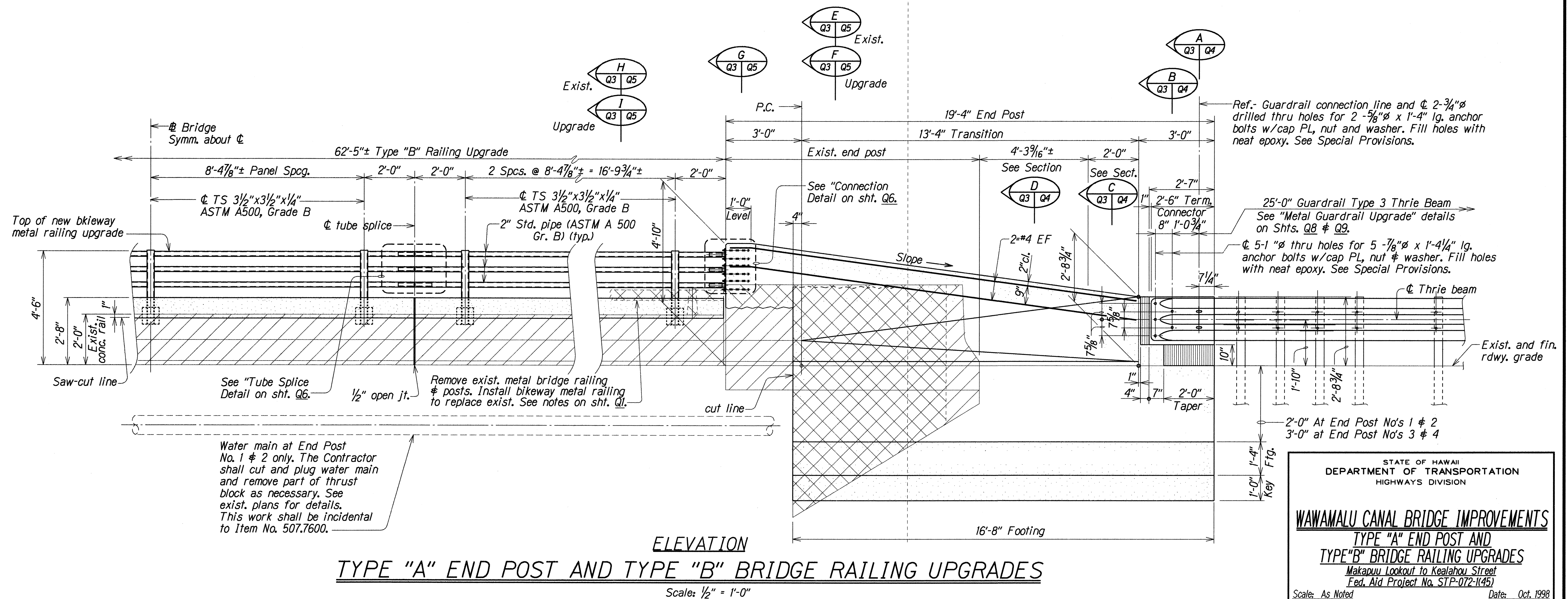
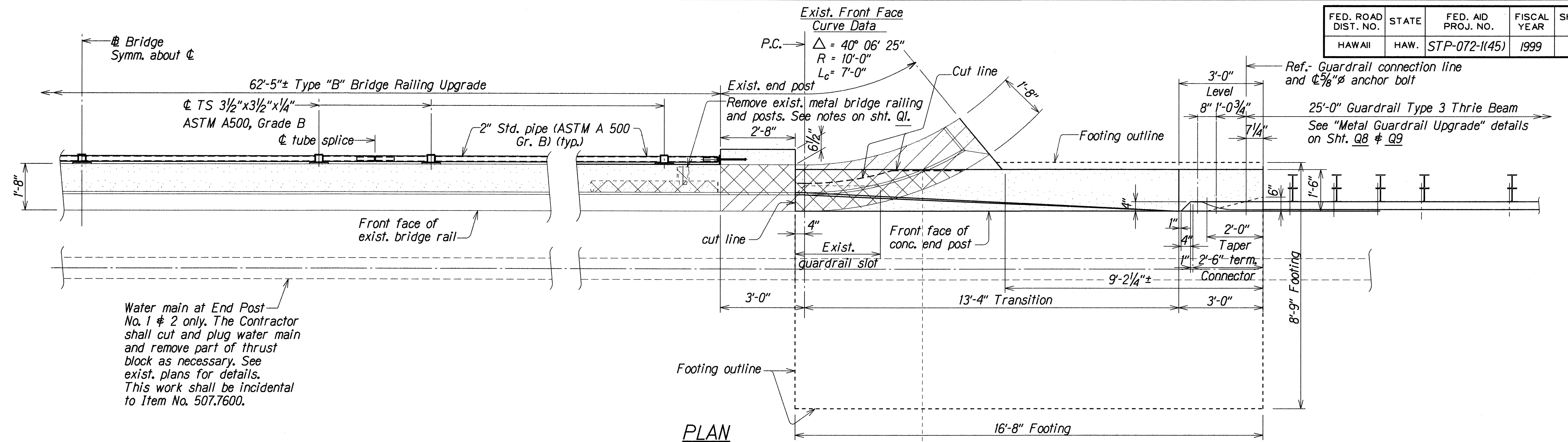
SHEET No. Q2 OF 9 SHEETS

ORIGINAL PLAN	DATE	10/1/99
DESIGNED BY	DATE	10/1/99
TRACED BY	DATE	10/1/99
NOTED BY	DATE	10/1/99
CHECKED BY	DATE	10/1/99

"AS-BUILT"



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	23	33



# TYPE "A" END POST AND TYPE "B" BRIDGE RAILING UPGRADES

Scale: 1/2" = 1'-0"

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**WAWAMALU CANAL BRIDGE IMPROVEMENTS**

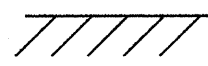
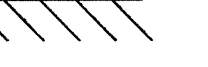
**TYPE "A" END POST AND TYPE "B" BRIDGE RAILING UPGRADES**

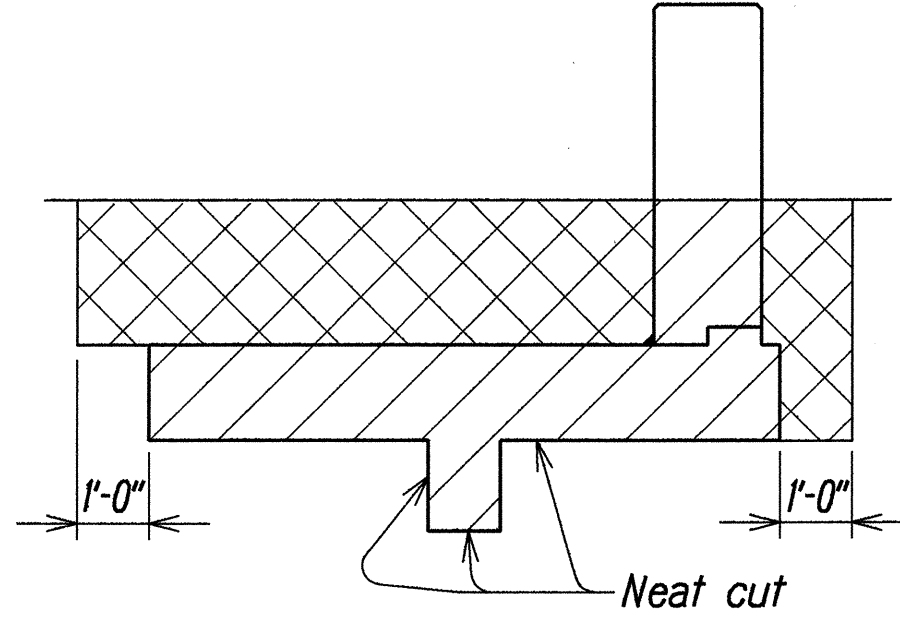
Makapuu Lookout to Kealahou Street  
Fed. Aid Project No. STP-072-1(45)

Scale: As Noted Date: Oct. 1998

SHEET No. Q3 OF 9 SHEETS

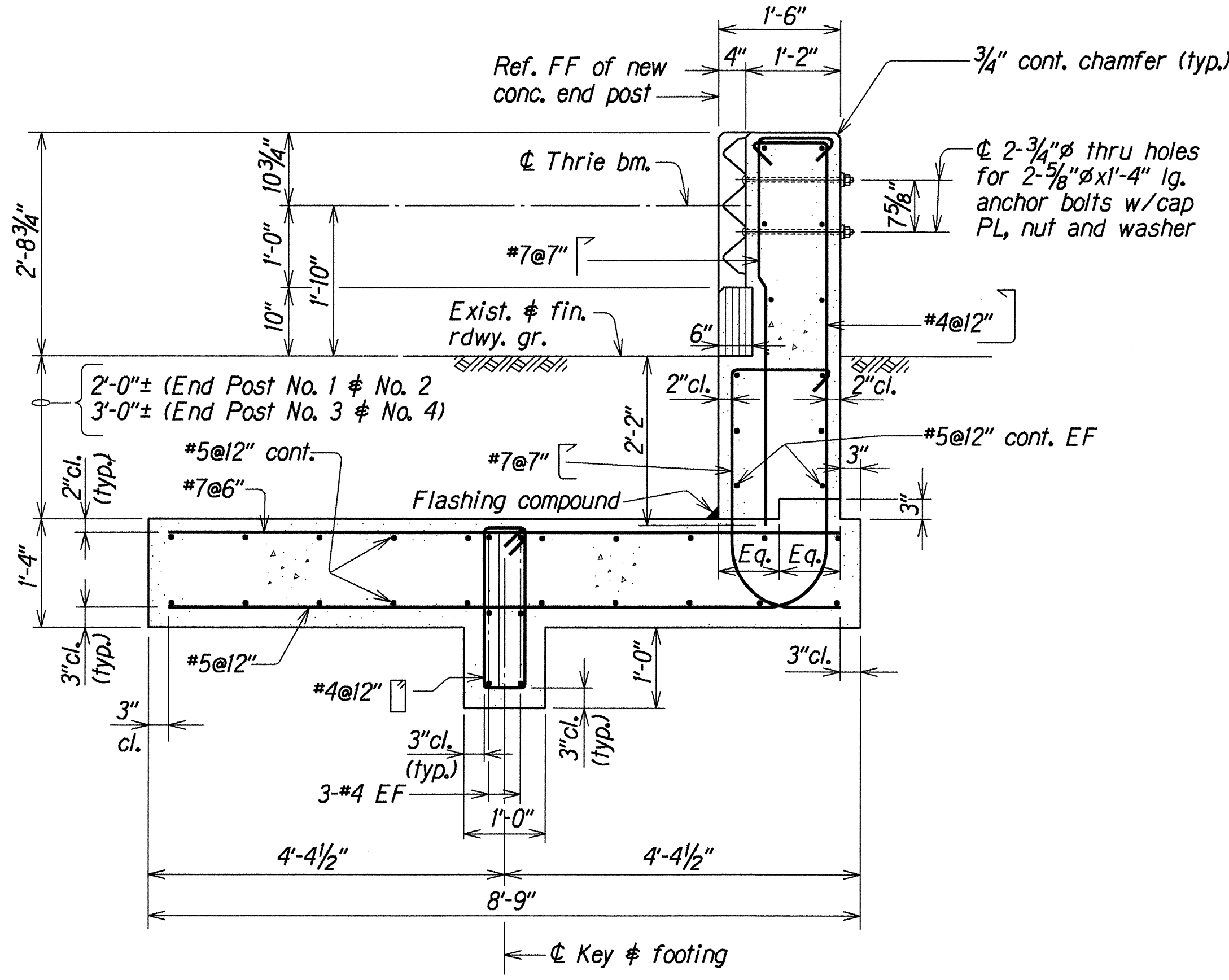
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	24	33

NOTE:  
 Structure excavation shown thus   
 Structure backfill shown thus   
 Structure backfill material shall conform to glassphalt base course. See Section 312 of Standard Specifications.

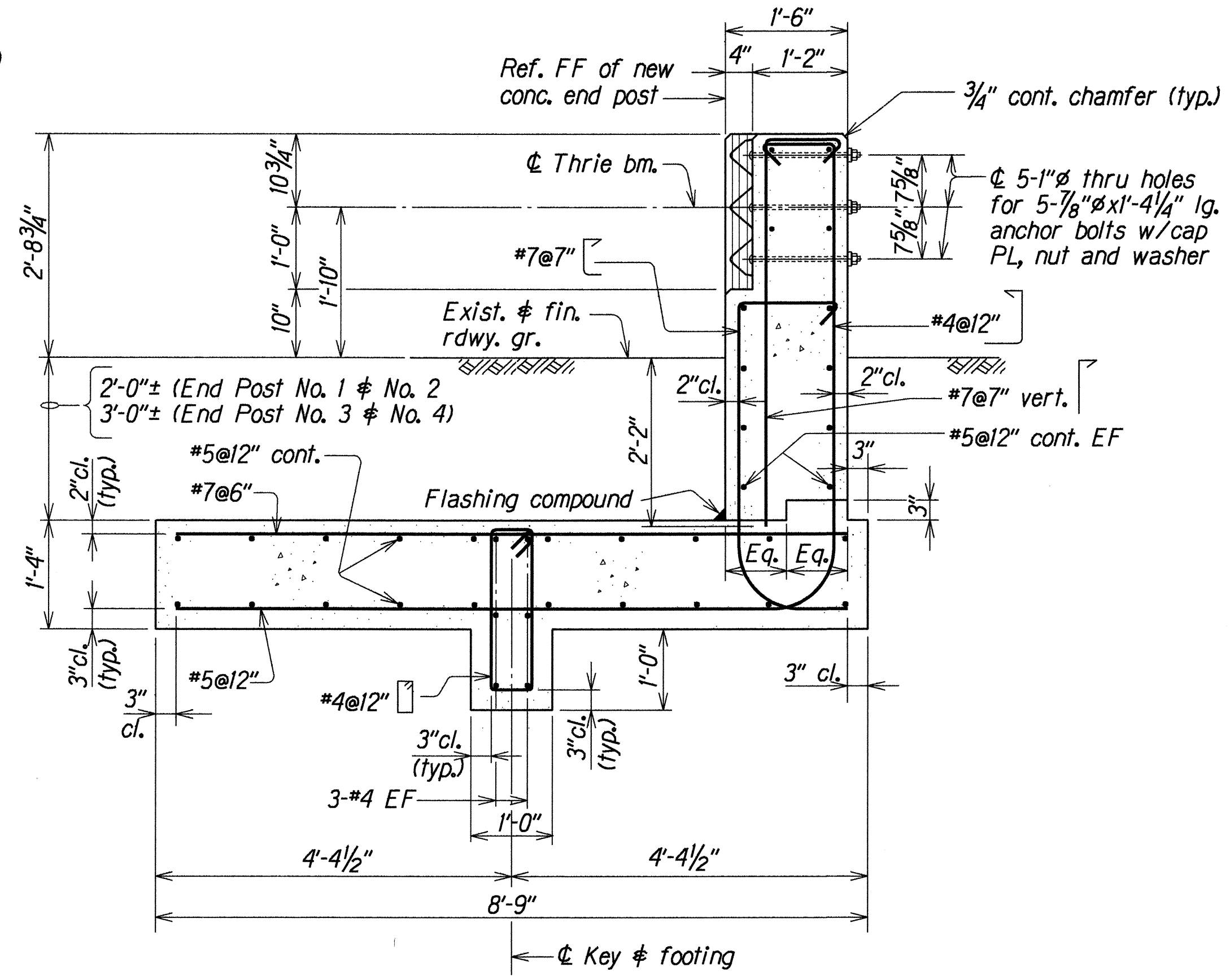


# **TYPICAL STRUCTURE EXCAVATION AND BACKFILL**

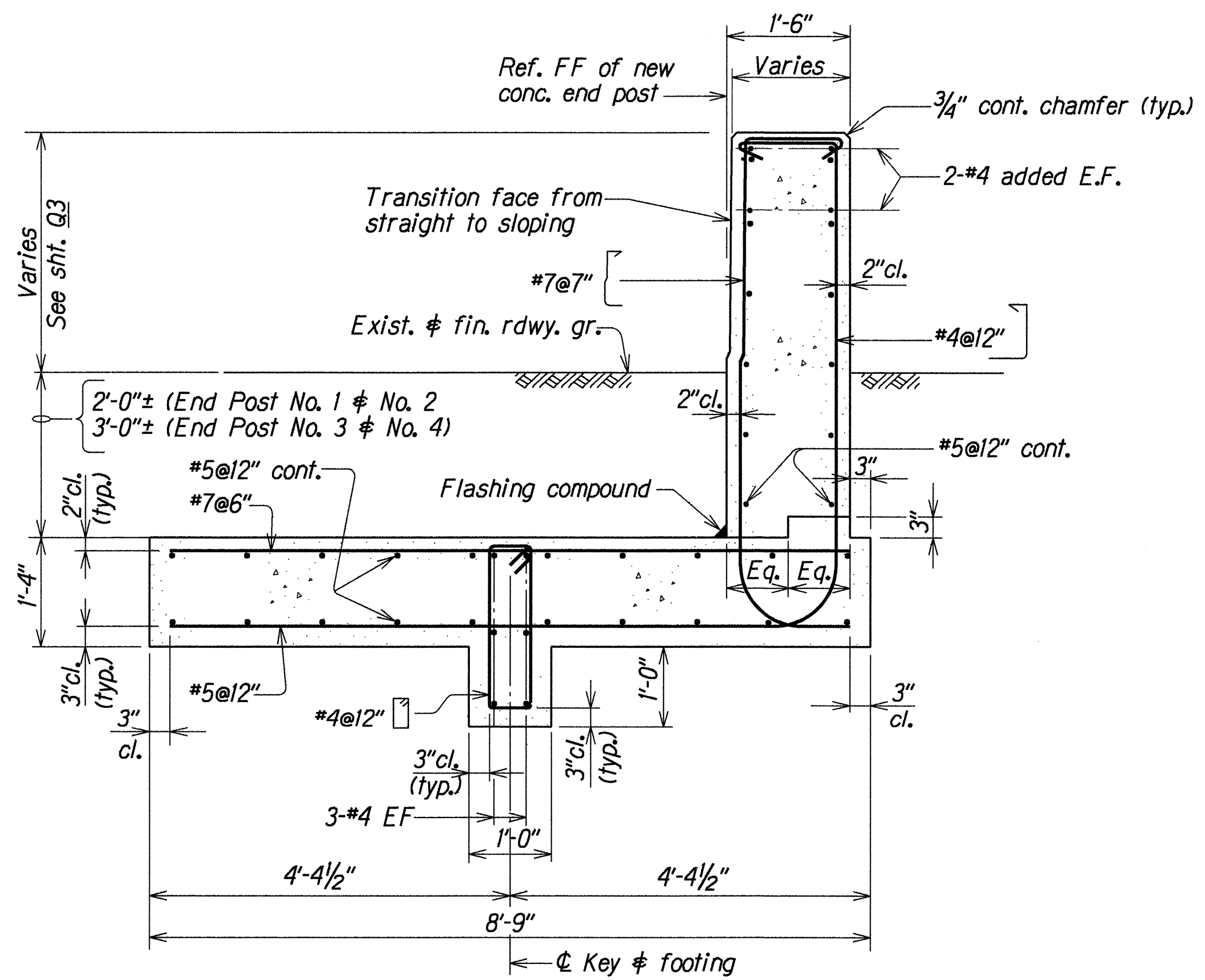
Not to Scale



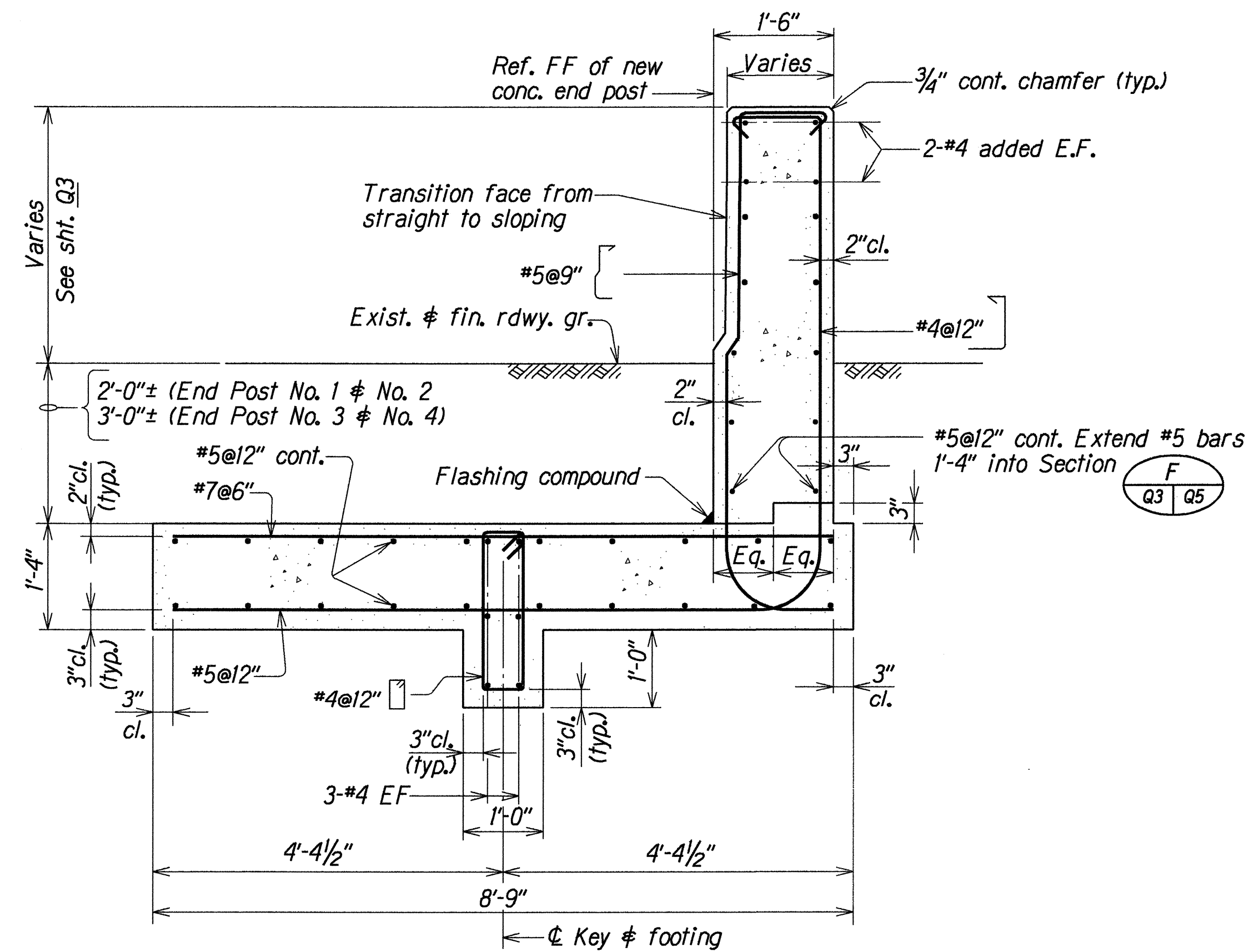
**SECTION A**  
 Scale: 3/4"=1'-0"



**SECTION B**  
 Scale: 3/4"=1'-0"



**SECTION C**  
 Scale: 3/4"=1'-0"



**SECTION D**  
 Scale: 3/4"=1'-0"

ORIGINAL PLAN	DATE	1/1/99
DRAWN BY	DATE	1/1/99
DESIGNED BY	DATE	1/1/99
CHECKED BY	DATE	1/1/99

STATE OF HAWAII  
 DEPARTMENT OF TRANSPORTATION  
 HIGHWAYS DIVISION

**WAWAMALU CANAL BRIDGE**  
 TYPICAL TYPE "A" UPGRADE DETAILS  
 Makapuu Lookout to Kealahou Street  
 Federal Aid Project No. STP-072-1(45)

Scale: As Noted  
 Date: Oct. 1998

SHEET No. Q4 OF 9 SHEETS



[illegible]

SECTION E  
 Scale:  $\frac{3}{4}" = 1'-0"$  Q3 | Q5

SECTION  F

[illegible]

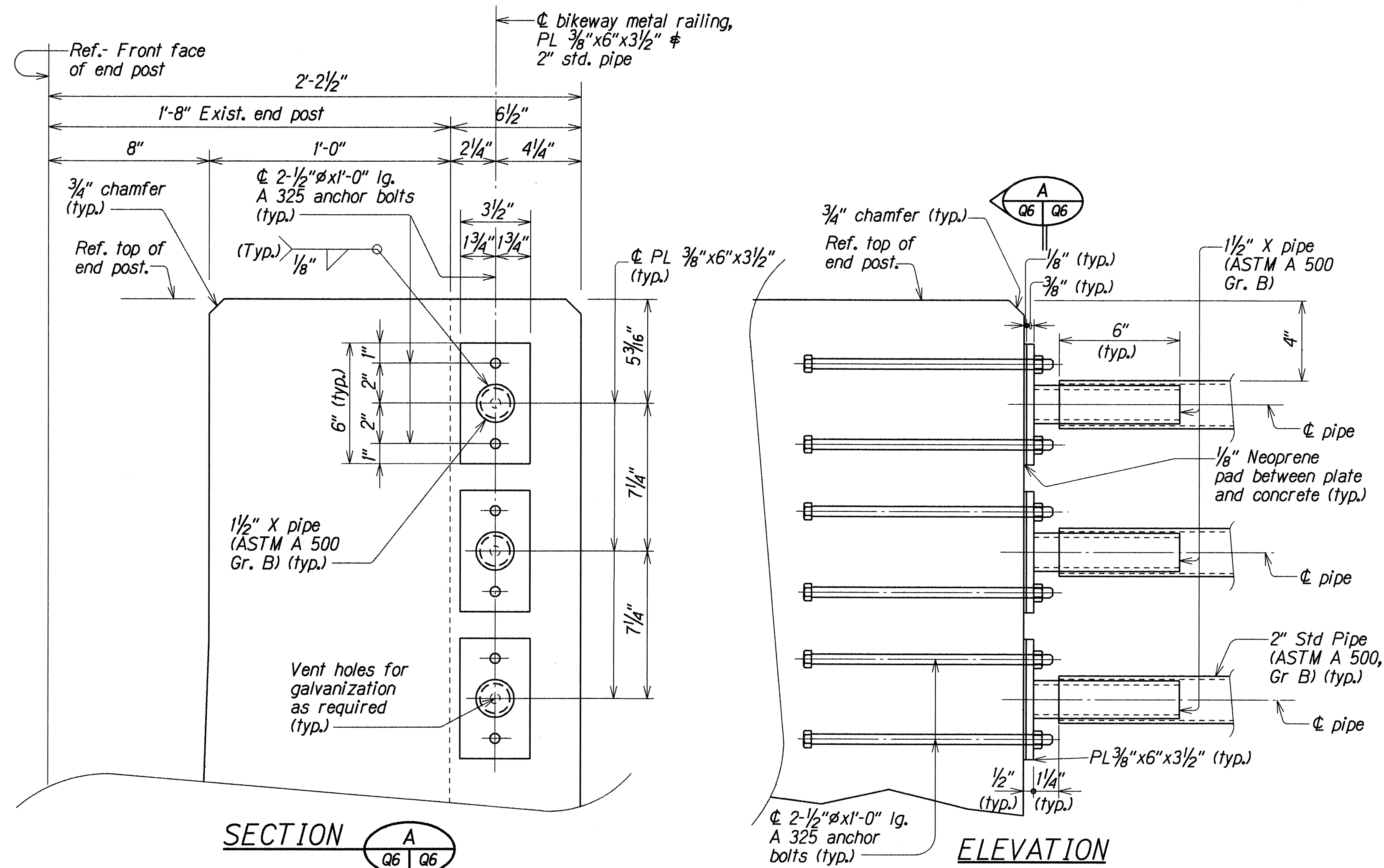
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

WAWAMALU CANAL BRIDGE

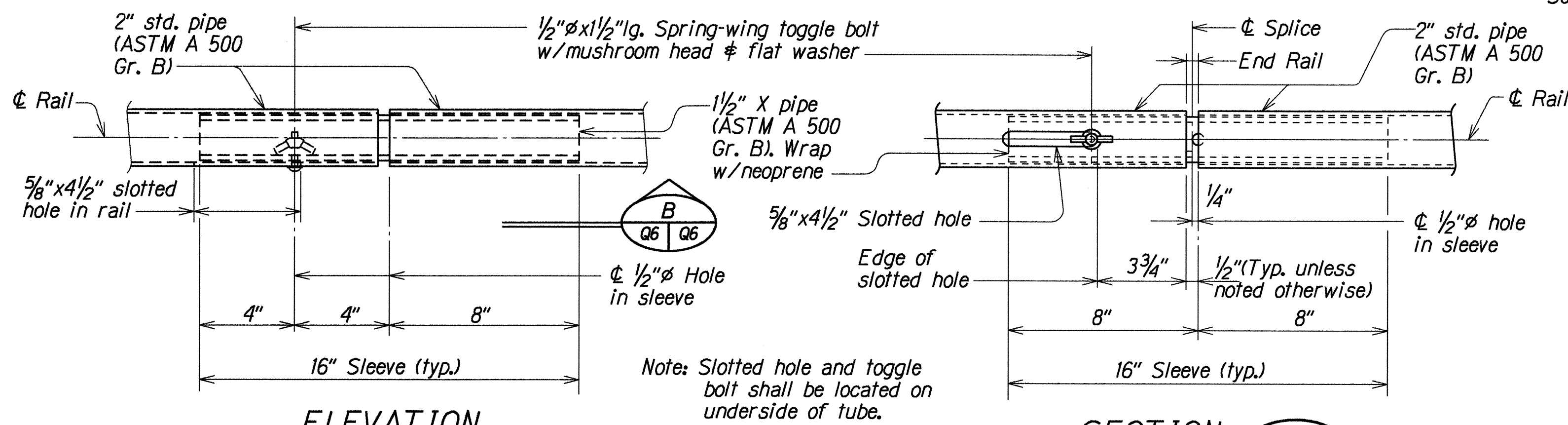
TYPICAL TYPE "A" AND "B" UPGRADE DETAILS

*Makapuu Lookout to Kealahou Street  
Federal Aid Project No. STP-072-1(45)*

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	26	33



TYPICAL RAIL SLEEVE ANCHOR AT END POST CONNECTION DETAILS



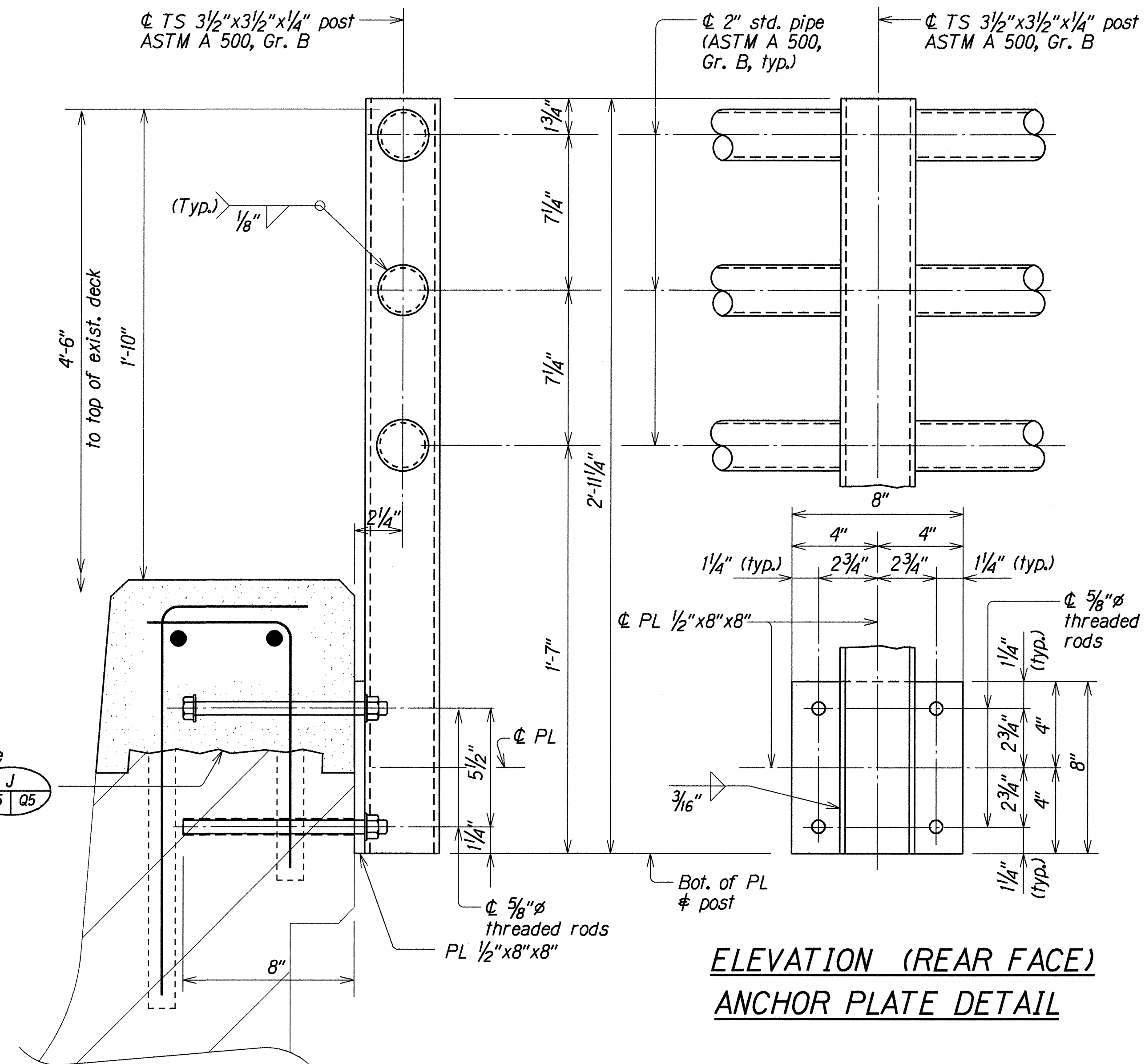
ELEVATION

TYPICAL TUBE SPLICE DETAILS

SECTION B

TYPE B BRIDGE RAILING UPGRADE

Scale: 3"=1'-0"



ELEVATION (REAR FACE)  
ANCHOR PLATE DETAIL

TYPICAL SECTION  
BIKEWAY METAL RAILING

DESIGNED BY	DATE
TRACED BY	JUN 1998
QUANTITIES BY	JUN 1998
CHECKED BY	JUN 1998
NO.	100006

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**WAWAMALU CANAL BRIDGE**  
**TYPE "A" AND "B" UPGRADE DETAILS**  
Makapuu Lookout to Kealahou Street  
Fed. Aid Project No. STP-072-1(45)

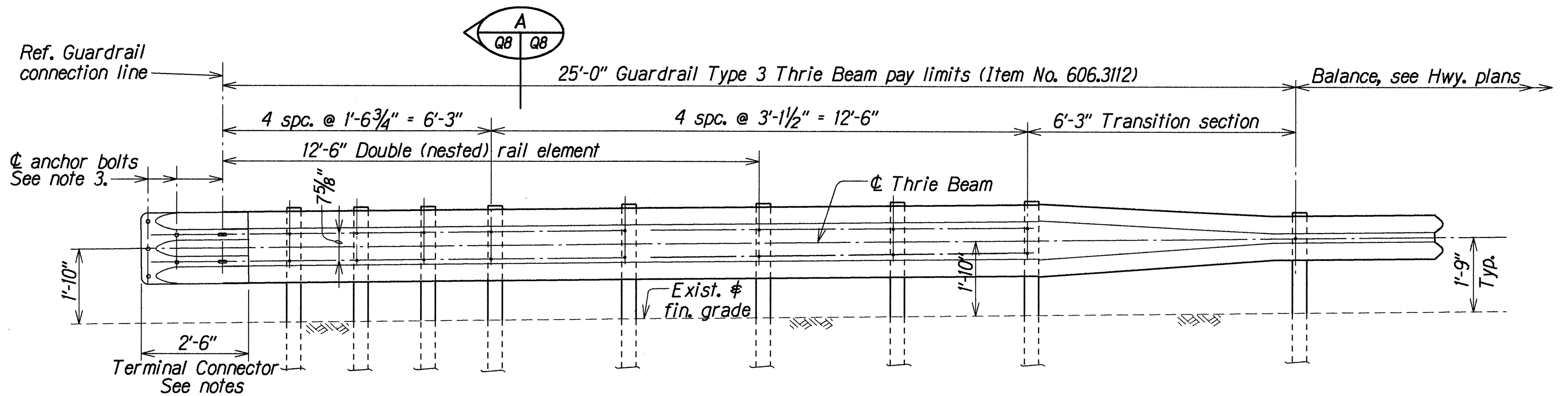
Scale: As Noted Date: Oct. 1998

SHEET No. Q6 OF 9 SHEETS





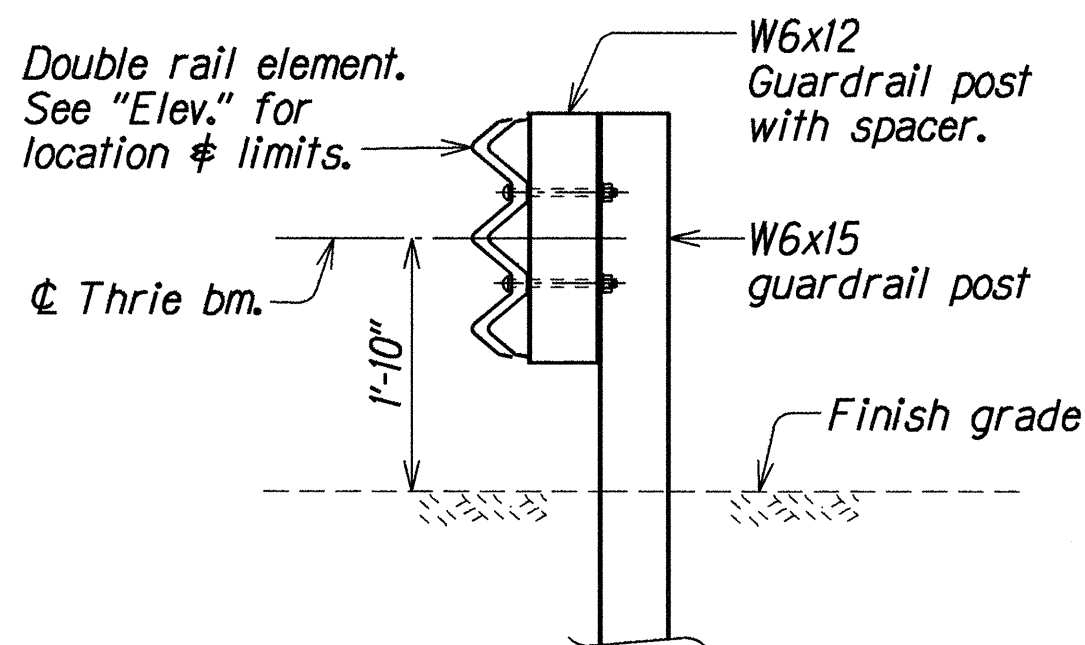
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	28	33



ELEVATION

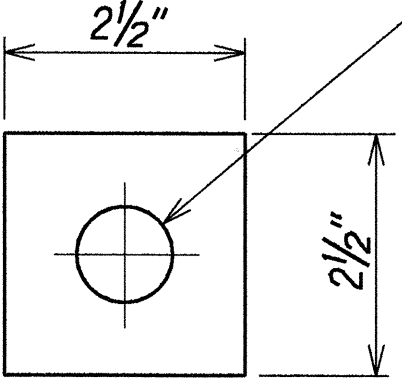
### TYPICAL TYPE 3 THRIE BEAM METAL GUARDRAIL UPGRADE FOR END POST UPGRADE

Scale: 1/2"=1'-0"



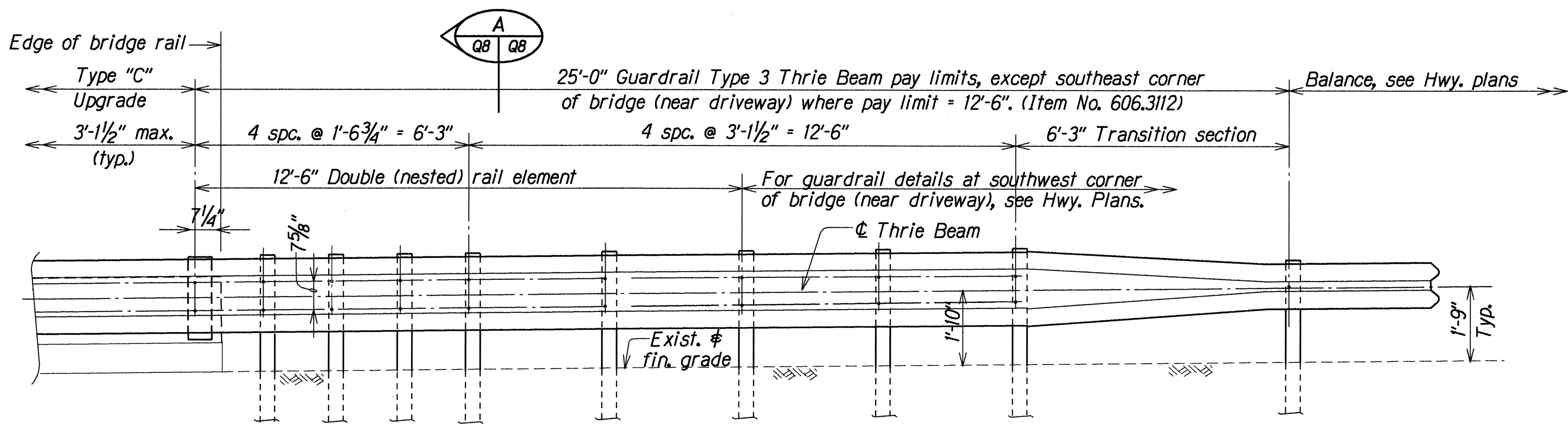
SECTION A  
Q8 Q8  
Scale: 3/4"=1'-0"

Hole centered in 1/2" thick  
steel PL (bolt size + 1/8")  
Galvanize after fabrication



CAP PLATE DETAIL

Scale: 6" = 1'-0"



ELEVATION

### TYPICAL TYPE 3 THRIE BEAM METAL GUARDRAIL UPGRADE FOR TYPE "C" UPGRADE ON EXISTING WAWAMALU BRIDGE

Scale: 1/2"=1'-0"

#### NOTES:

- The work necessary to connect guardrail to concrete end post shall include all labor, materials, tools, equipment and incidentals necessary to complete the work and shall be incidental to Item No. 606.3112, Guardrail Type 3 Thrie Beam on Steel Post and will not be paid for separately.
- See "General Notes" on Sht. Q1 for additional guardrail and drilling information.
- All anchor bolts shall be high strength bolts conforming to the requirements of AASHTO M 164. See Special Provisions.
- Anchor bolt length shall be such that a snug fit of the elements and full thread engagement plus 1/4" (max) is attained.
- Terminal connector, Thrie Beam Metal Guardrail and Transition Section shall be fabricated from 10 gauge steel conforming to the requirements of AASHTO M 180 and shall be hot-dip galvanized after fabrication. See Special Provisions.
- Guardrail post and spacer block including all anchor bolts, cap PL, bolts, nuts, and washers shall be hot-dip galvanized after fabrication.
- Cap PL shall be fabricated from ASTM A 36.
- First 25'-0" of guardrail adjoining "Terminal Connector" shall be galvanized steel and supports spaced as shown on the detail drawings. This section of rail shall be placed on tangent to end post or parallel to roadway, unless conditions at site renders it impossible to do so. Flare point to be determined in field.
- Double (nest 1st panel) thrie beam elements at all end post connections.
- Where double (nested) beam occur, 12" "Back-up Plate" not required.
- Heads of through anchor bolts shall be placed on the traffic side of the rail.
- Drilling of through holes shall be done in such a manner as to prevent cone puncturing of the daylighting end.

ORIGINAL PLAN	DATE	May 1998
DRAWN BY	LMA	
DESIGNED BY	JW	May 1998
QUANTITIES BY	JW	May 1998
CHECKED BY	DCO	May 1998
IN	000008	

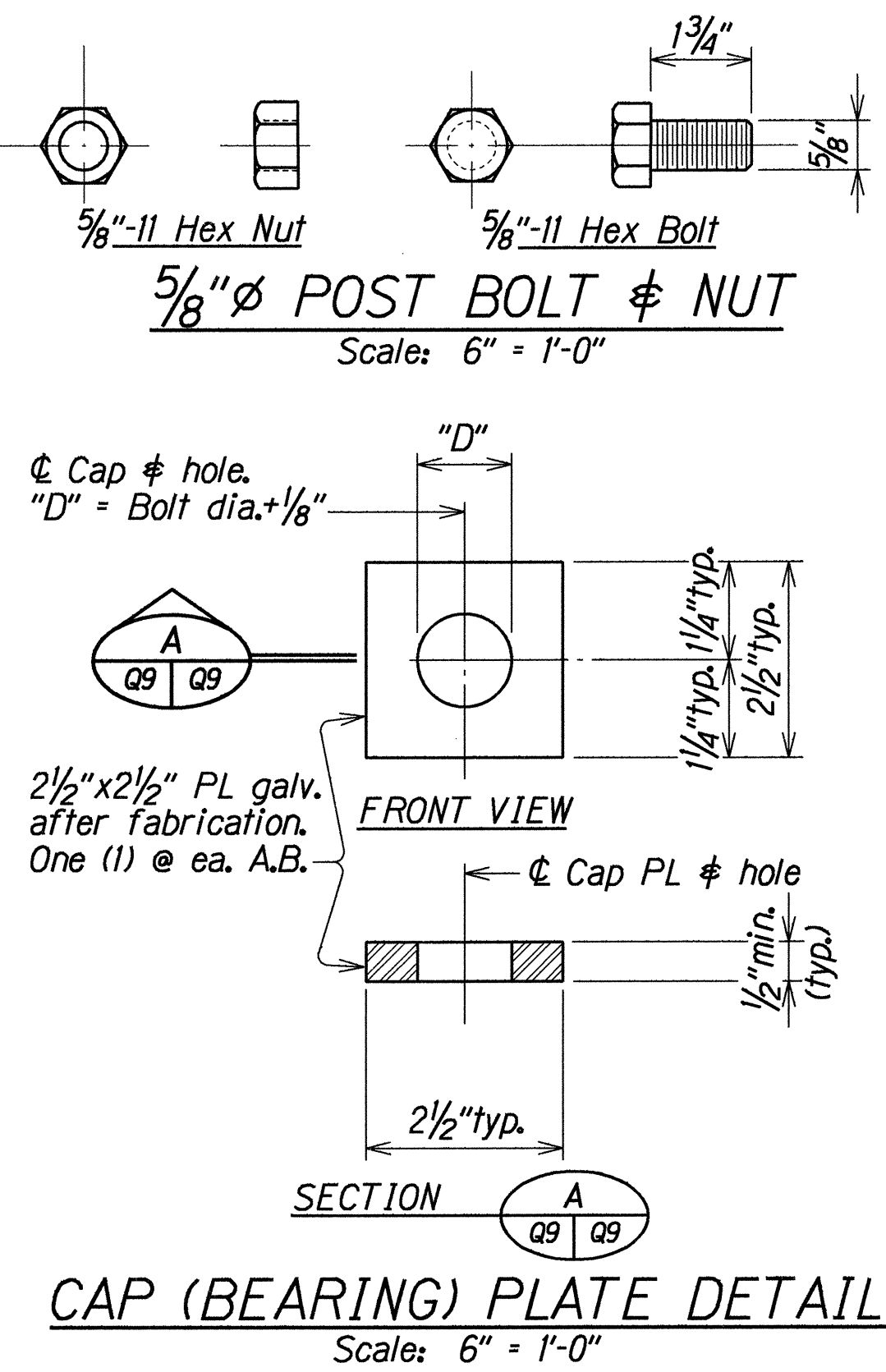
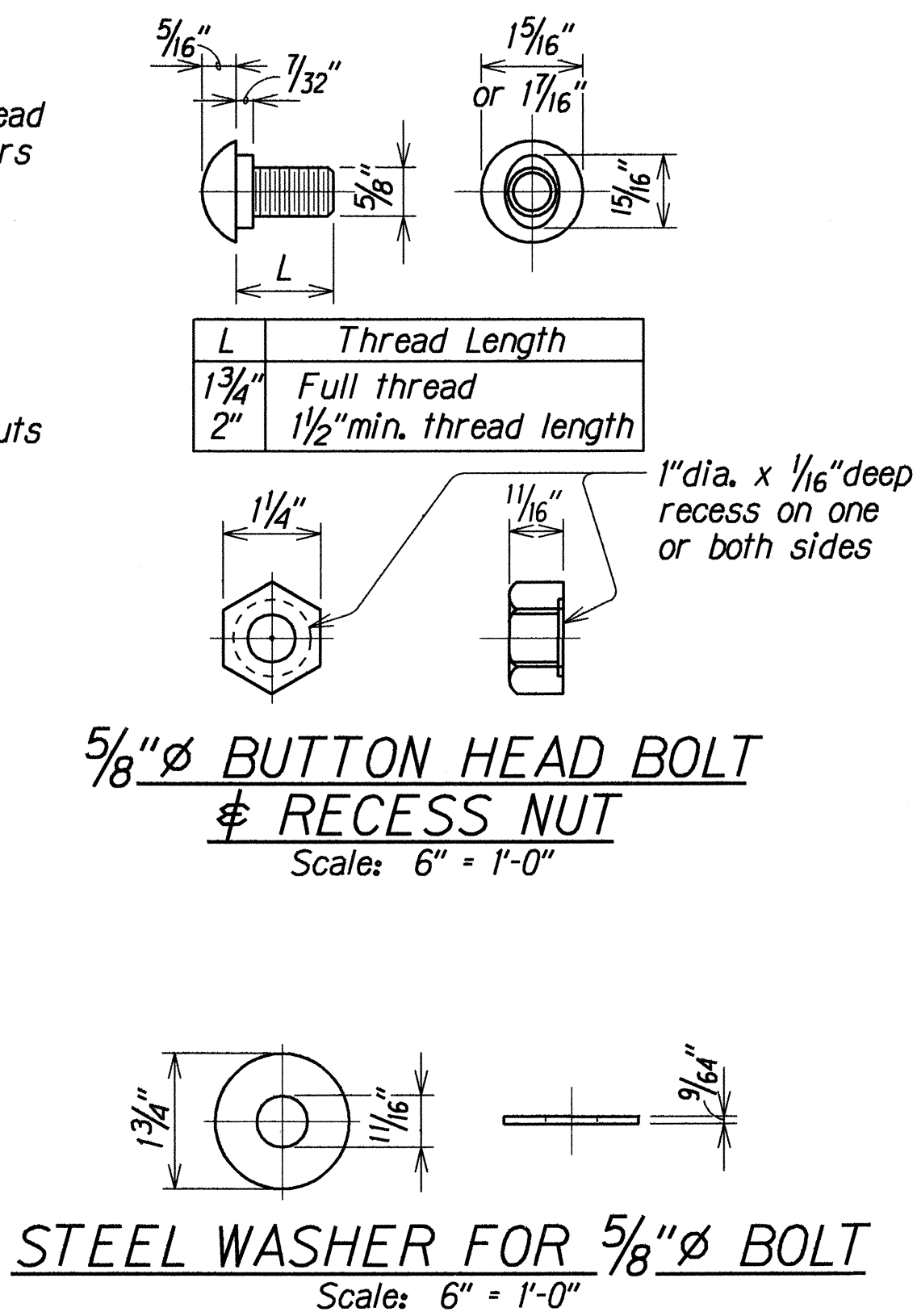
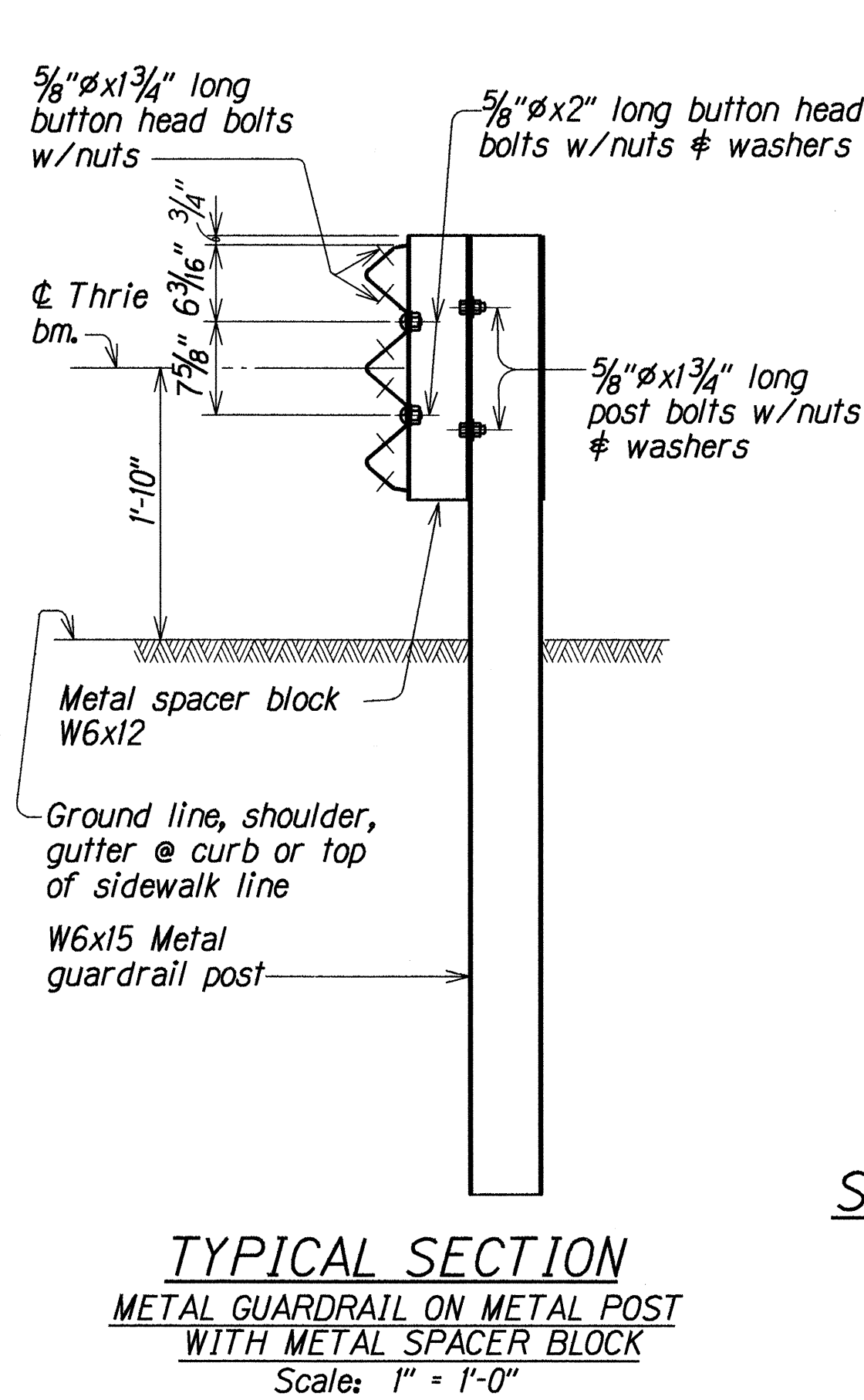
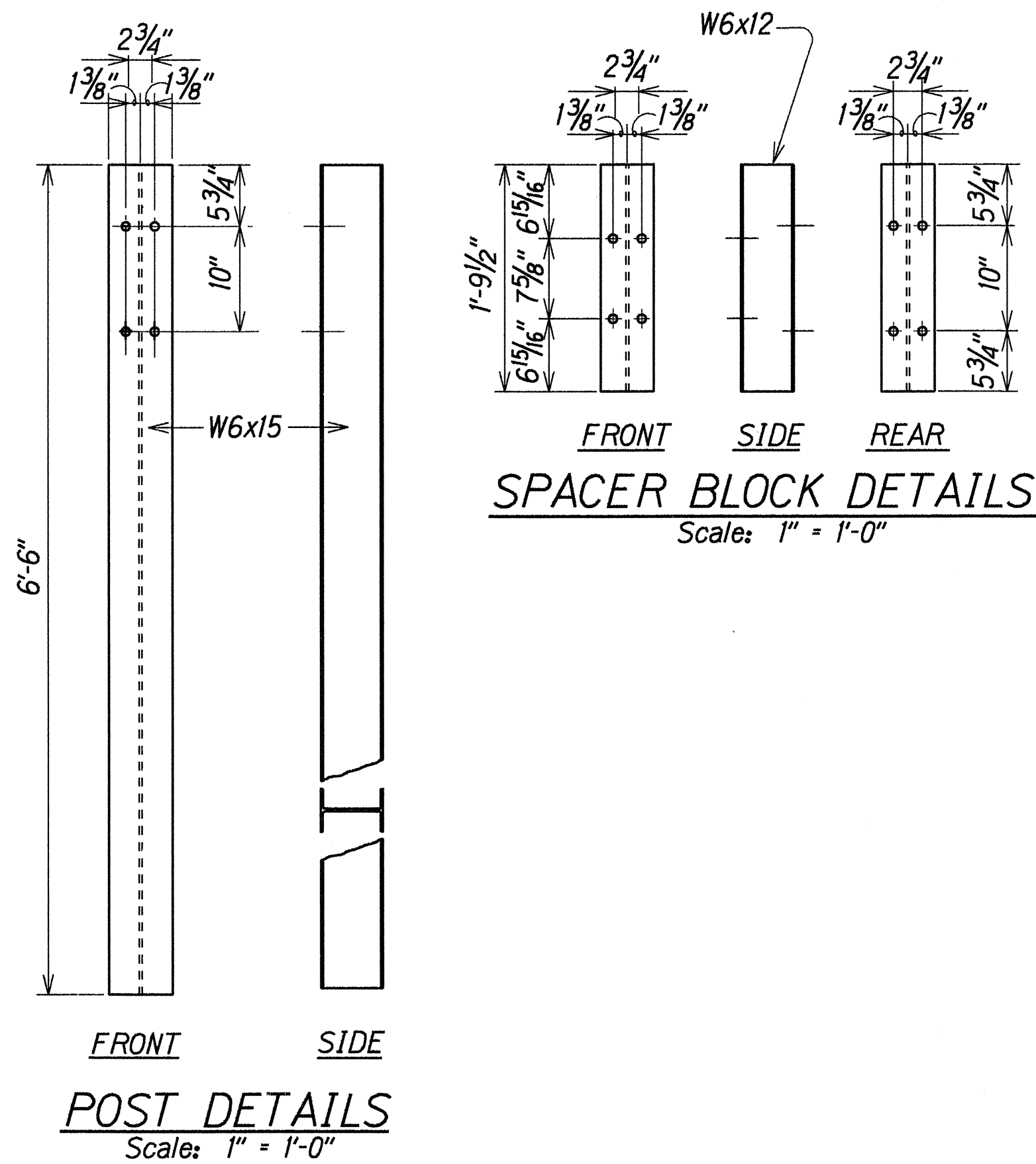
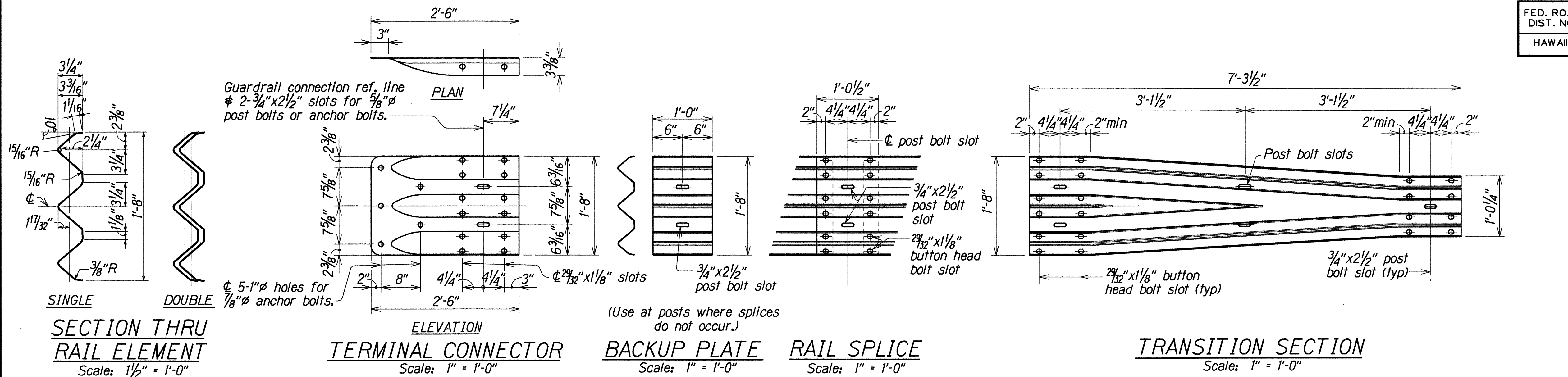
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

WAWAMALU CANAL BRIDGE AND  
WAWAMALU BRIDGE IMPROVEMENTS  
METAL GUARDRAIL DETAILS  
Makapuu Lookout to Kealahou Street  
Federal Aid Project No. STP-072-1(45)  
Scale: As Noted  
Date: Oct. 1998



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(45)	1999	29	33

- NOTES:
- For details not shown, see "DOT Standard Plan" Sht. #TE-57.
  - Bolt length varies and shall be verified in the field. Dimensions shown are approximate.



# METAL GUARDRAIL TYPE 3 THRIE BEAM AND APPURTENANCES DETAILS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTES BOOK	DRAWN BY	May 1997
SK	CHECKED BY	May 1997
DCO	DESIGNED BY	May 1997

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

WAWAMALU CANAL BRIDGE AND

WAWAMALU BRIDGE IMPROVEMENTS

METAL GUARDRAIL TYPE 3 THRIE BEAM

AND APPURTENANCES DETAILS

Makapuu Lookout to Kealahou Street

Federal Aid Project No. STP-072-1(45)

Scale: As Noted

Date: Oct. 1998

SHEET No. 09 OF 9 SHEETS

29