

# GENERAL NOTES:

## GENERAL SPECIFICATIONS:

State of Hawaii, Department of Transportation Standard Specifications for Road and Bridge Construction, 1994, and Special Provisions

## DESIGN SPECIFICATIONS:

AASHTO LRFD Bridge Design Specifications, 2nd Edition, 1998 with 1999 interim revisions.

## DESIGN CRITERIA:

- Design Live Load:
  - Culvert ————— Combination of design truck or design tandem and design lane load per AASHTO
  - Sidewalk ————— 85 PSF
  - Railing ————— 50 PLF both transversely and vertically acting simultaneously, plus a concentrated load of 200 lbs at any point and in any direction.
  - Railing Post ————— 200+50L (lbs)  
Where: L=Post Spacing in Feet
- Bridge End Post ————— In accordance with AASHTO TL-2 design forces.
- Retaining Wall:
  - Active Earth Pressure = 40 PCF
  - Restrained Earth Pressure = 55 PCF
  - Below Ground Water = 90 PCF

## GENERAL:

- Refer to Standard Plans for additional details and notes not covered by details and typical drawings.
- All items noted incidental will not be paid for separately.
- The Contractor shall verify all grades, dimensions and site conditions before commencing with any work.
- The Contractor shall verify the locations of all existing utility lines near the bridge and notify their respective owners before commencing the work.
- The Contractor shall be solely responsible for the protection of adjacent property, utilities and existing and new structures from damage due to construction and shall repair any damage at his 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.

## CONSTRUCTION REQUIREMENTS:

- Refer to Hawaii Standard Specifications for Road, Bridge and Public Works Construction, (Hawaii 1994 Edition and Special Provisions).
- Except as noted otherwise, all vertical dimensions are measured plumb.
- The Contractor shall submit shop drawings for construction of falsework, cofferdams or other obstructions required for construction to the Engineer for approval.
- The Contractor shall furnish shop placement and detailed drawings for all structural steel work, including temporary pedestrian bridge layout and design.

## FOUNDATION NOTES:

- Foundation design is based on Geotechnical Investigation by Ernest K Hirata and Associates, Inc. and Report Dated February 4, 2000.
- Excavation for all footings and stems shall be accomplished by maintaining as near a vertical cut as possible and it shall be the Contractor's responsibility to maintain the stability of the existing roadway prism throughout the course of work.
- Spread footings shall be excavated and poured to neat lines as called for on the plans.
- The Engineer may direct the Contractor to over-excavate below the bottom of footing elevation. The additional over-excavation of the footing excavations, as directed by the Engineer, will be measured and paid for as structural excavation as indicated in the specifications.
- The additional over-excavation as directed by the Engineer, below the bottom of footing elevation shall be backfilled with Class D concrete. This item will be measured and paid for as Structural Backfill for Retaining Walls (Class D concrete).

## CONCRETE:

- Structural concrete shall have the following class designations:
  - Approach Slab and End Post ————— Fast setting hydraulic cement concrete. Consult with concrete supplier for mix design. Traffic shall be allowed to pass over the newly poured approach slabs within 8 hours of closing traffic. Refer to "Concrete Testing" note.
  - All others ————— Class A

- The minimum cover measured from the surface of the concrete to the face of any reinforcing bar shall be as follows, except as noted otherwise:
  - Culvert, Endpost and Retaining Walls ————— 2"
  - Concrete cast against and permanently exposed to earth ————— 3"
- Unless noted otherwise, chamfer all exposed concrete edges  $\frac{3}{4}$  inch.
- Construction joints shall be located as shown on the Plans unless otherwise approved by the Engineer.

## LUMBER:

- All lumber shall be termite and rot pressure preservative treated Coastal Douglas Fir.
- All lumber shall be select structural grade.
- All lumber shall be painted all around.

## REINFORCING STEEL:

- All reinforcing steel shall conform to the requirements of ASTM A615 and shall be deformed, Grade 60 unless noted otherwise.
- All reinforcing steel, anchor bolts, dowels and other embedded items shall be securely tied in place prior to pouring of concrete.
- Splice length for reinforcing steel shall be 52 bar diameters but shall be a minimum 2'-4" unless otherwise noted.
- All dimensions relating to reinforcing bars are to centers of bars unless noted otherwise.
- Reinforcing bars shall be detailed in accordance with the latest edition of the ACI Detailing Manual, CRSI Placing Reinforcing Bars and Manual of Standard Practice, and AASHTO LRFD whichever is more stringent governs.

## STRUCTURAL STEEL:

- All structural steel shapes and plates shall conform to ASTM A36, unless noted otherwise.
- All structural steel tubes shall conform to ASTM A500 Grade B.
- All steel pipes shall conform to ASTM A53, Grade B.
- All structural steel shapes, plates, tube and pipes shall be hot-dipped galvanized after fabrication, unless noted otherwise.
- All bolts shall conform to ASTM A307, Grade A, and A153 Hot Dipped Galvanized, Class C
- All nuts shall conform to ASTM A307, Grade A, and A153 Hot Dipped Galvanized, Class C

## TEMPORARY PEDESTRIAN BRIDGE:

- Temporary pedestrian bridges, inclusive of abutments, shall be provided at the Waiahole, Waikane, Kaaawa and Makaua Streams to allow for bicycle and pedestrian crossing. Continuous pedestrian access shall be provided.
- Design specifications: conform to AASHTO LRFD Bridge Design Specifications, 2nd Edition, 1998 with 1999 interim revisions.
- Design criteria: minimum Live Load = 85 psf
- Submit shop drawings and calculations to the Engineer for approval 8 weeks prior to installation of pedestrian bridge.
- Bridge shall be designed and stamped by licensed structural engineer with a minimum of five years of similar license experience.
- Bridge shall conform to ADA requirements.
- Removal: temporary bridge inclusive of abutments, shall be removed by the Contractor. All temporary bridge structures become the property of SDOT and shall be delivered to a state storage yard upon removal from bridge site.
- The Contractor shall not support the temporary bridges on the stream bed. This includes the section of the stream bed that is typically dry except during times of heavy runoff. The Contractor may provide intermediate support for the temporary bridge off the existing bridge if proven by calculation of a Hawaii licensed structural engineer. The proposed design layout and calculation of such supports shall be submitted to the engineer for approval and be stamped and signed by a licensed structural engineer. Also, the Contractor shall analyze the existing bridge to ensure that no element of the substructure or superstructure becomes overstressed from the additional loads by the temporary bridge.

## TRAFFIC CONTROL

During working hours, traffic control may be covered by the one lane traffic control plan described in Section 645 – Traffic Control Devices. However, during non-working hours, additional provisions for safely maintaining traffic shall be required. For example, portable traffic signals to control traffic. Another means to control traffic would be to fully illuminate the site, illuminate approach warning signs, and provide flashing warning lights and flagmen on both approaches. All traffic control costs associated with work being performed on the Waiahole, Waikane, Kaaawa, Makaua, and Hakipuu Bridges shall be incidental to the concrete in end post structure pay item.

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## CONSTRUCTION VEHICLES

All material transfer vehicles, or any other construction vehicle utilized during the implementation of the work, shall not exceed the operating capacity of each bridge within the project limits. These bridges and their loading capacities are listed as follows:

North Waiahole Bridge	48 Tons
Waikane Bridge	64 Tons
Hakipuu Bridge	54 Tons
Kaaawa Bridge	48 Tons
Makaua Bridge	64 Tons

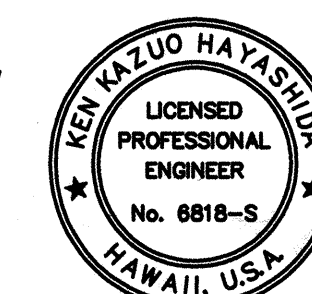
## CONCRETE TESTING:

Before traffic is allowed to travel on the newly poured approach slabs, the combined requirement of a minimum compressive strength of 3,000 psi and a minimum flexural strength of 600 psi is necessary. Concrete cylinders from a test batch shall be tested in advance of pouring approach slabs. Tests shall be tested in accordance with AASHTO T 97 to verify that the minimum strengths have been achieved prior to allowing vehicular traffic on new concrete. Test results shall be provided to the Engineer at least 1 day prior to pouring concrete.

## SHOP DRAWING SUBMITTAL:

Contractor shall submit shop drawings of pedestrian walkways to Engineer for approval. See Sheets S-9 and S-10.

DATE	_____
SURVEY PLOTTED BY	_____
DESIGNED BY	_____
DESIGNED BY	_____
QUANTITIES BY	_____
CHECKED BY	_____
ORIGINAL PLAN	_____
NOTE BOOK	_____
No.	_____



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2/4/02	Added Shop Drawing Note Revised Concrete Note No. 2
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION  GENERAL NOTES  KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: As Noted Date: October 29, 2001	
SHEET No. S-1 OF 27 SHEETS	

ADD. 72





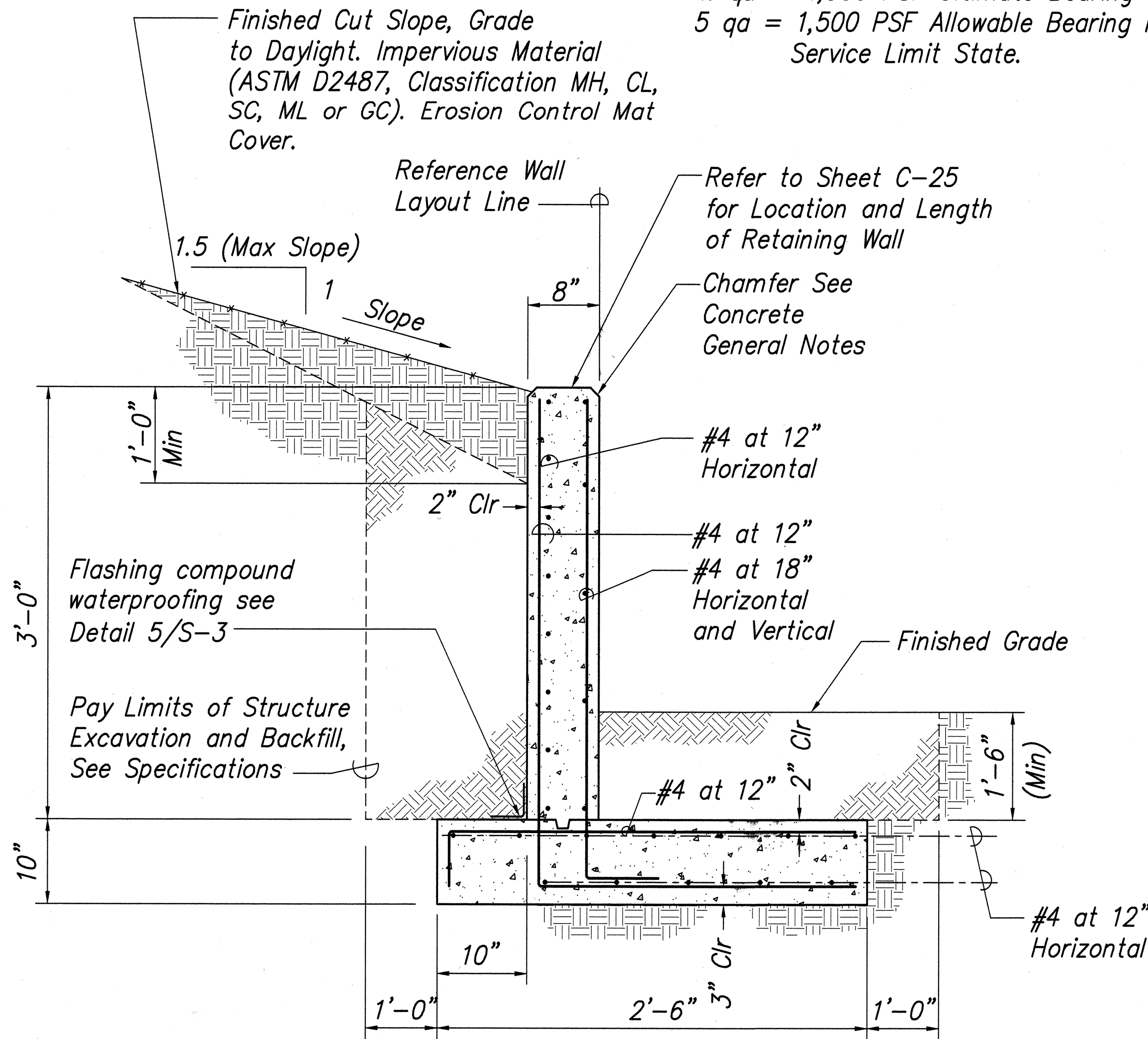




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HAWAII	HAW.	NH-083-1(43)	2001	ADD. 74	121

Note:  
Each End of the Retaining Wall  
Shall be Flared Back into the  
Embankment at a Slope of  
16:1. See Sheet C-25

- DESIGN DATA
1.  $f'_c = 3,000$  psi
  2.  $f_y = 60,000$  psi
  3. Equivalent Fluid Pressure = 40 PCF(Active)  
= 300 PCF(Passive)
  4.  $q_u = 4,500$  PSF Ultimate Bearing Pressure
  - 5  $q_a = 1,500$  PSF Allowable Bearing Pressure,  
Service Limit State.



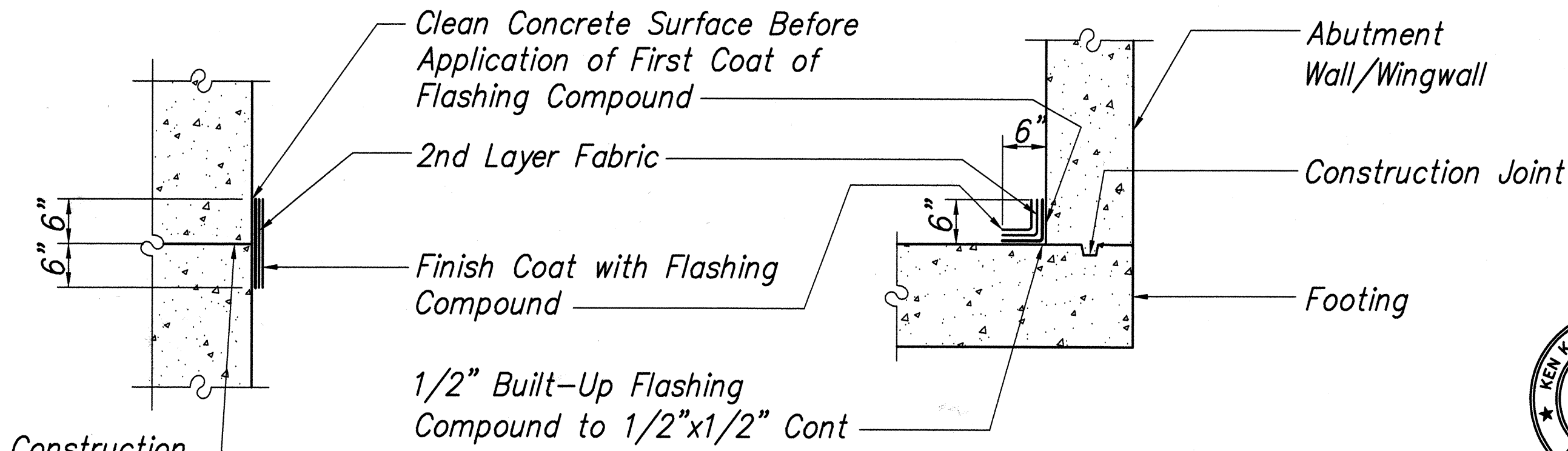
**TYPE 2A RETAINING WALL  
ROADWAY, RIGHT SIDE OF THE SECTION**

Not to Scale

1  
S-3|S-3

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Note:  
Refer to Specification  
Section 705.06 for  
waterproofing material  
requirements.

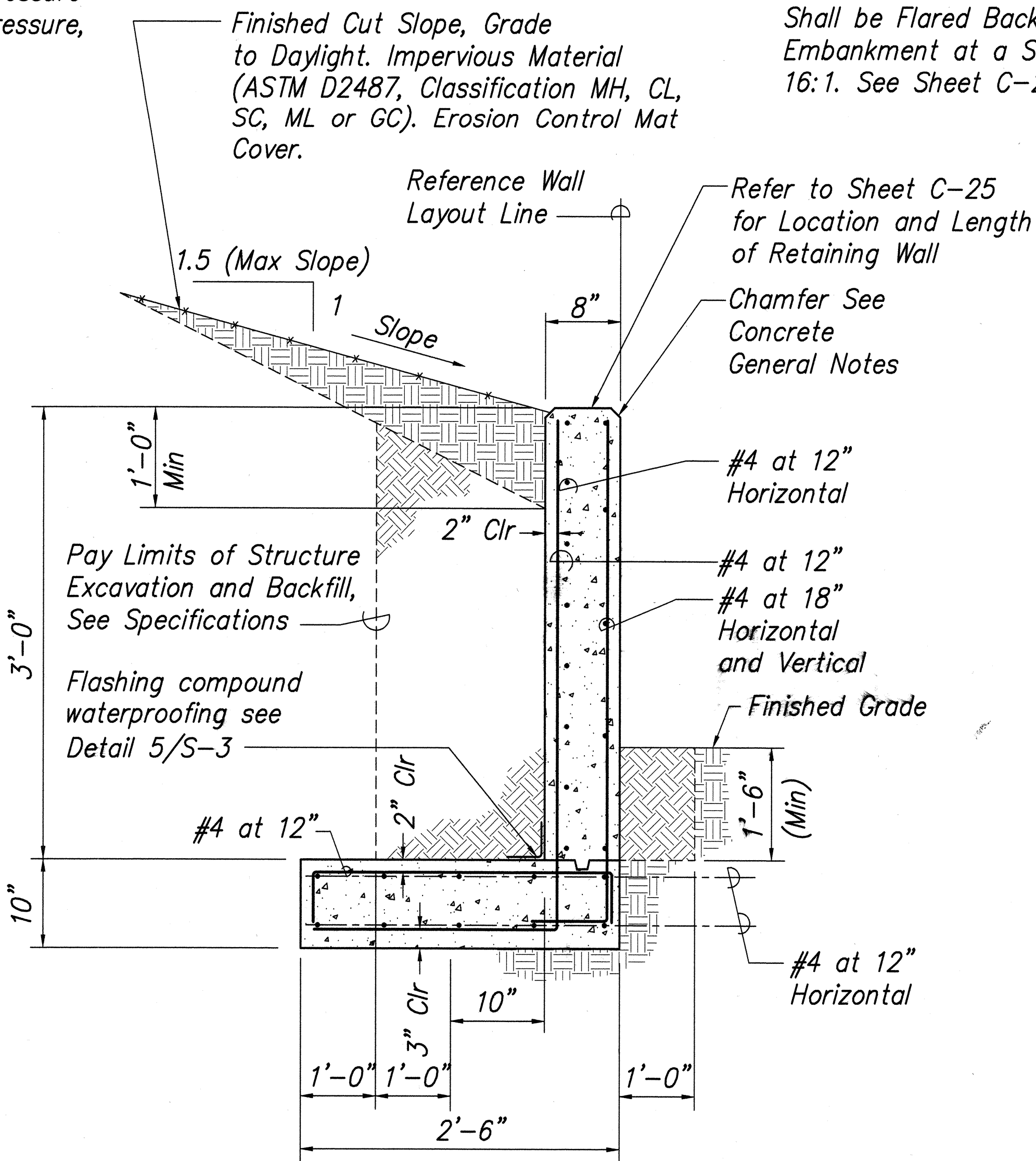


**TYPICAL FLASHING COMPOUND  
WATERPROOFING DETAIL**

Not to Scale

5  
S-3|S-3

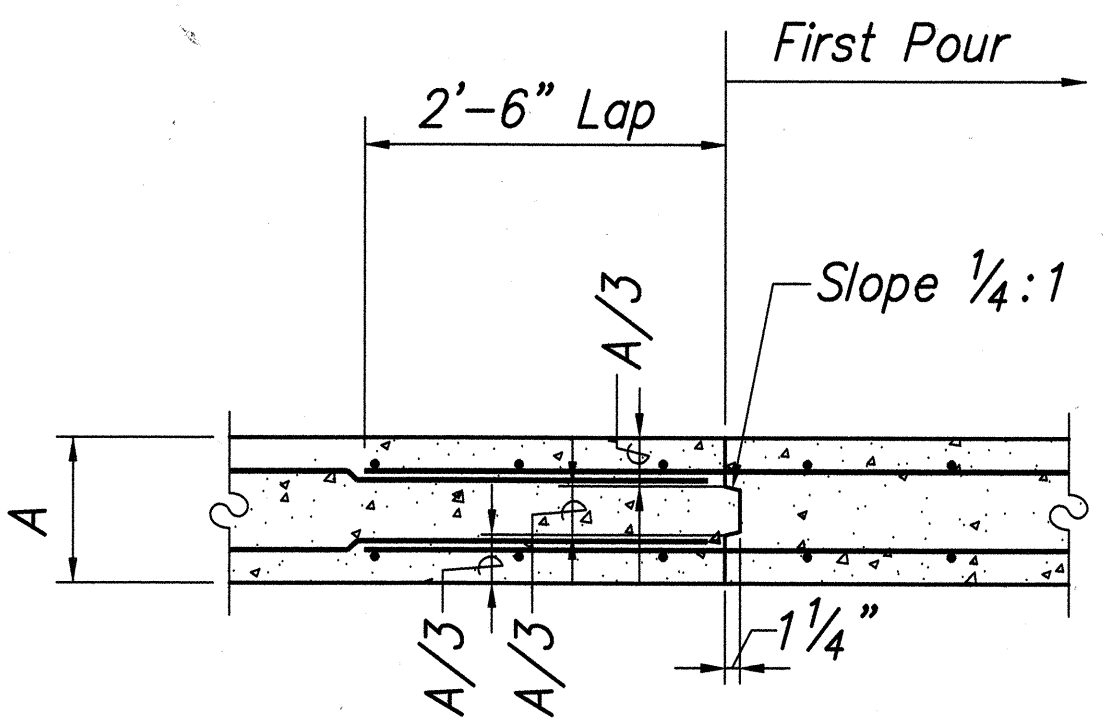
Note:  
Each End of the Retaining Wall  
Shall be Flared Back into the  
Embankment at a Slope of  
16:1. See Sheet C-25



**TYPE 2B RETAINING WALL  
ROADWAY, RIGHT SIDE OF THE SECTION**

Not to Scale

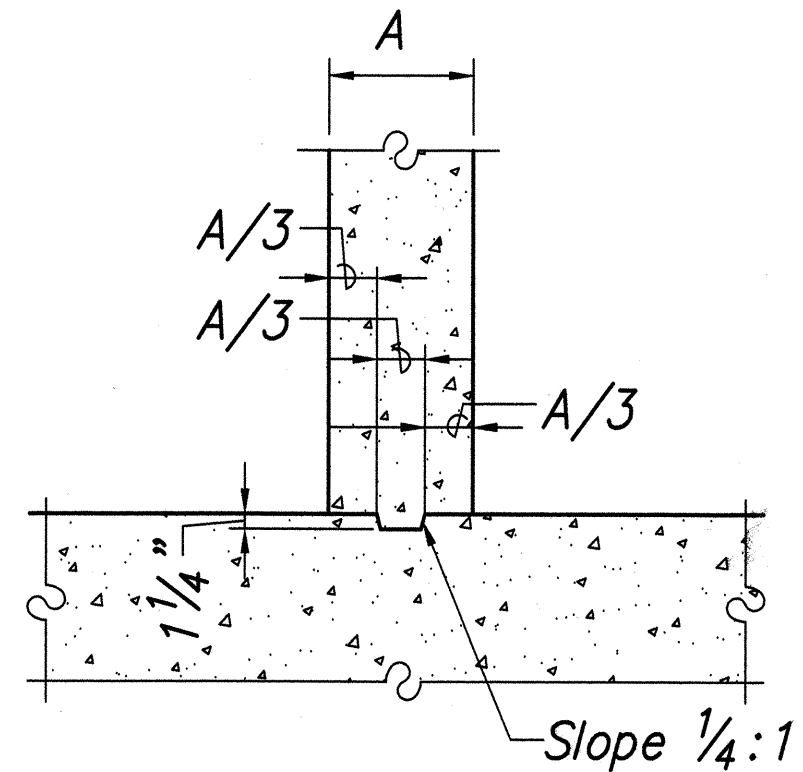
4  
S-3|S-3



**TYPICAL WALL VERTICAL  
CONSTRUCTION JOINT**

Not to Scale

2  
S-2|S-3



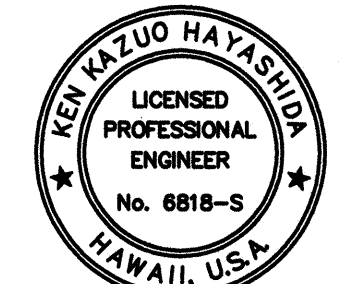
Note: Reinforcing Not Shown for Clarity

**TYPICAL WALL HORIZONTAL  
CONSTRUCTION JOINT**

Not to Scale

3  
S-2|S-3

2/4/02	Added Waterproofing
Date	Revision



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STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**TYPICAL RETAINING WALL  
SECTION AND SCHEDULE  
(TYPE 2)**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

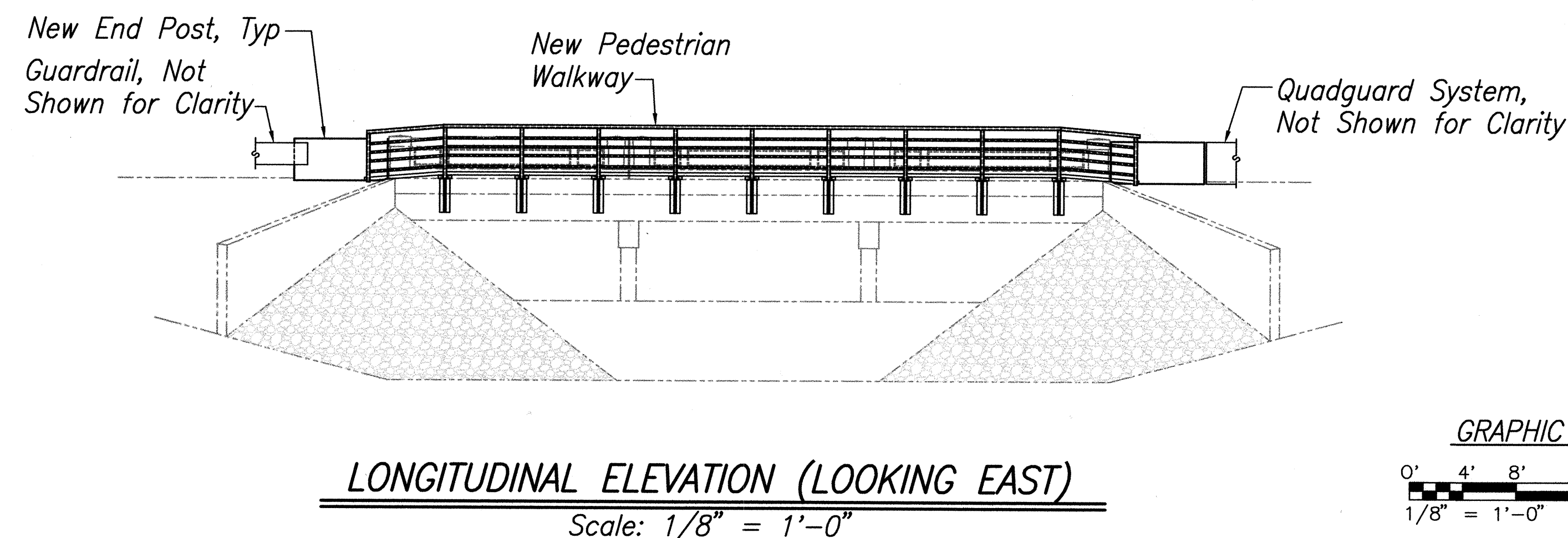
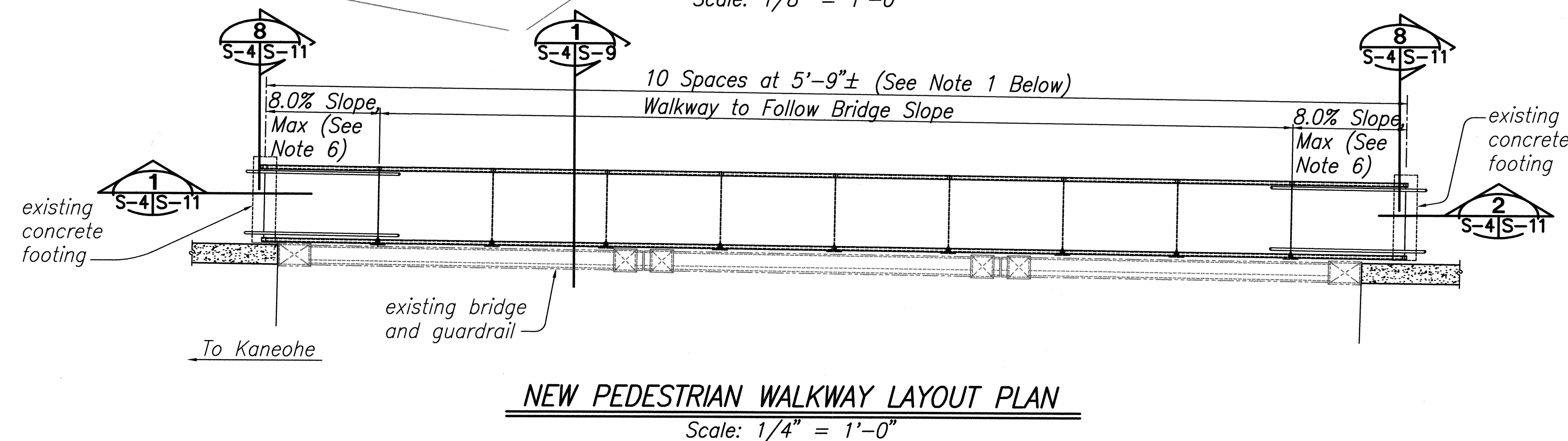
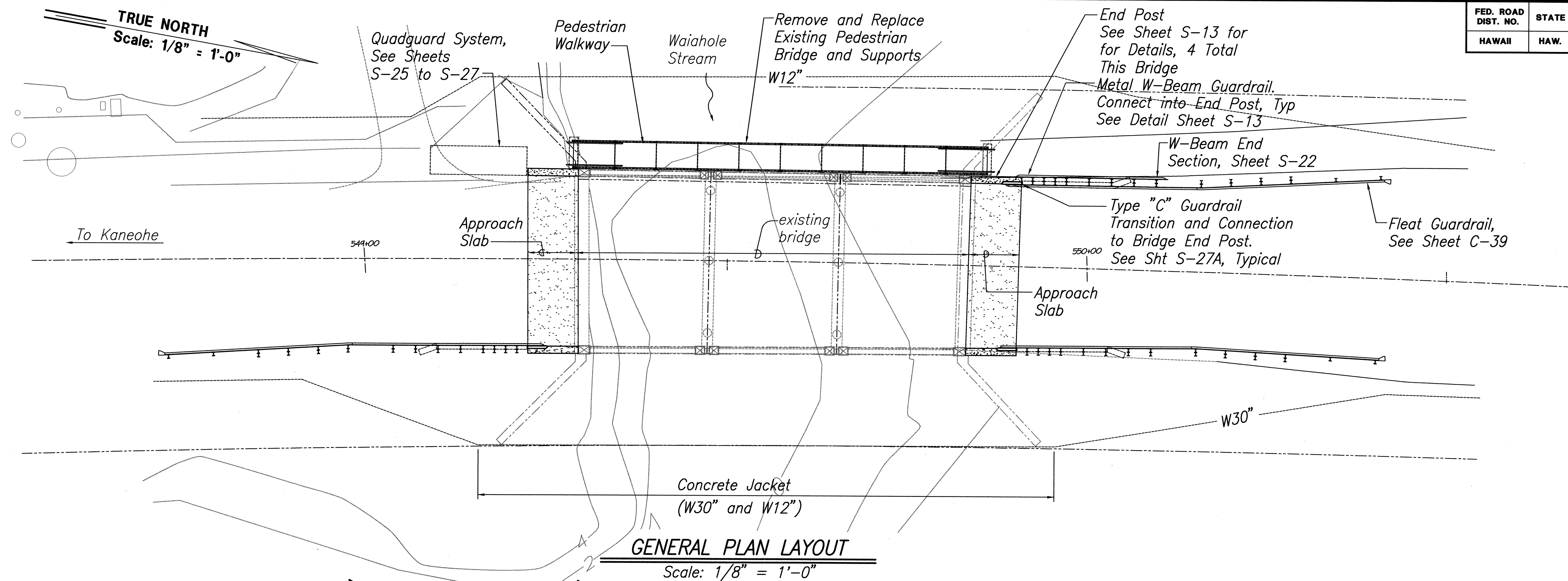
Scale: As Noted Date: October 29, 2001

SHEET No. S-3 OF 27 SHEETS

ADD. 74



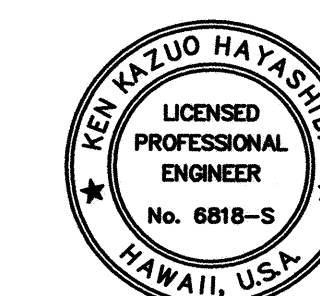
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 75	121



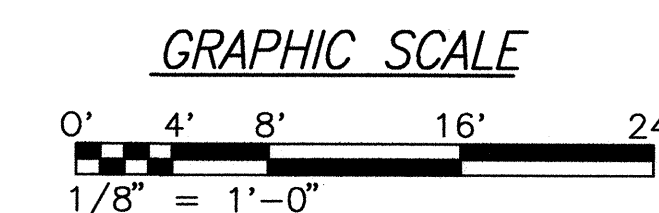
**Notes:**

1. Location of new walkway frames shall generally be the same as existing.
2. Dimensions of existing conditions to be verified by Contractor prior to bidding, construction and ordering of materials.
3. Contractor shall be aware that water level in stream varies.
4. Locate bolt holes to avoid reinforcing in concrete structure.
5. Fabricate after drilling anchor bolt holes in concrete.
6. Adjust span as necessary to keep walkway ramp slope less than 8% (6'-6" max).
7. Work this drawing with Sheet C-39.

SURVEY PLOTTED BY	DATE
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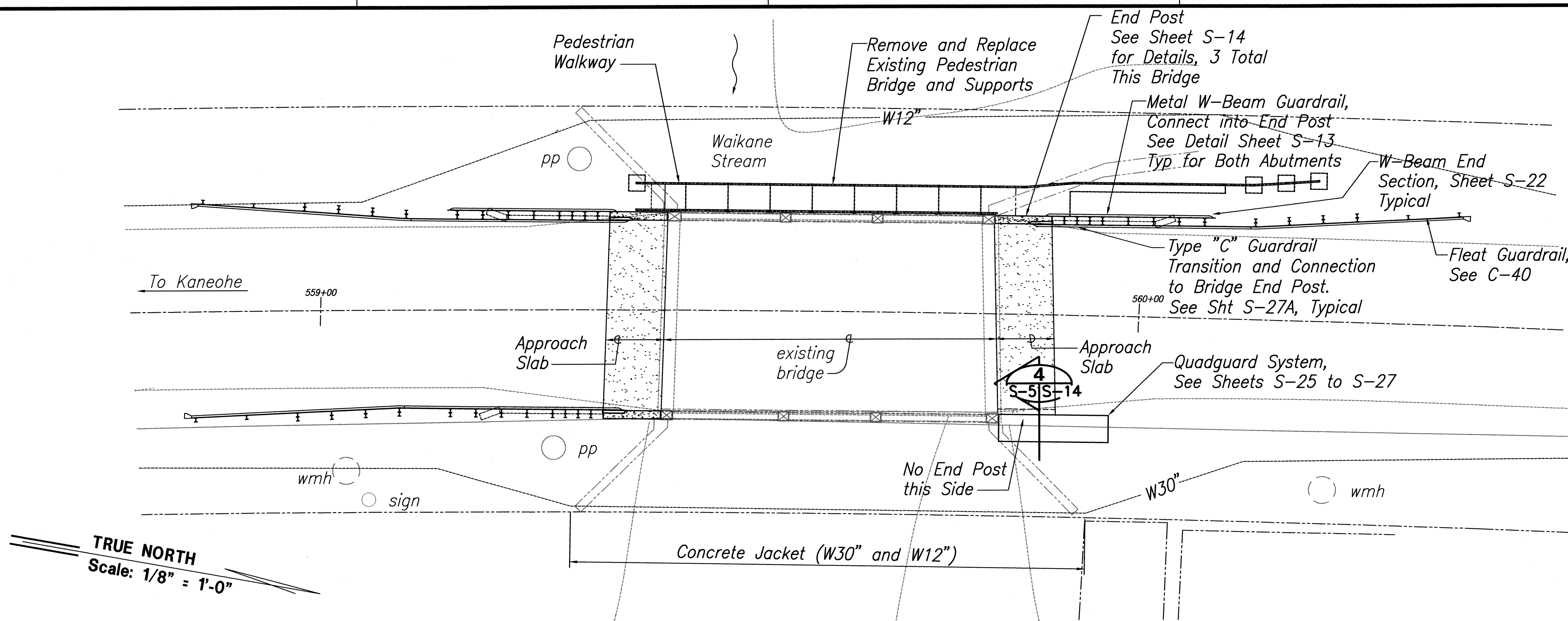
5/7/03	Added Type "C" Guardrail Transition
2/12/02	Revised Handrail in Longitudinal Elevation per Addendum No.2
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**WAIHOLE BRIDGE (NORTH)**  
**GENERAL LAYOUT PLAN**  
**LONGITUDINAL ELEVATION**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)  
Scale: As Noted Date: October 29, 2001  
SHEET No. S-4 OF 27 SHEETS

C.O. 75

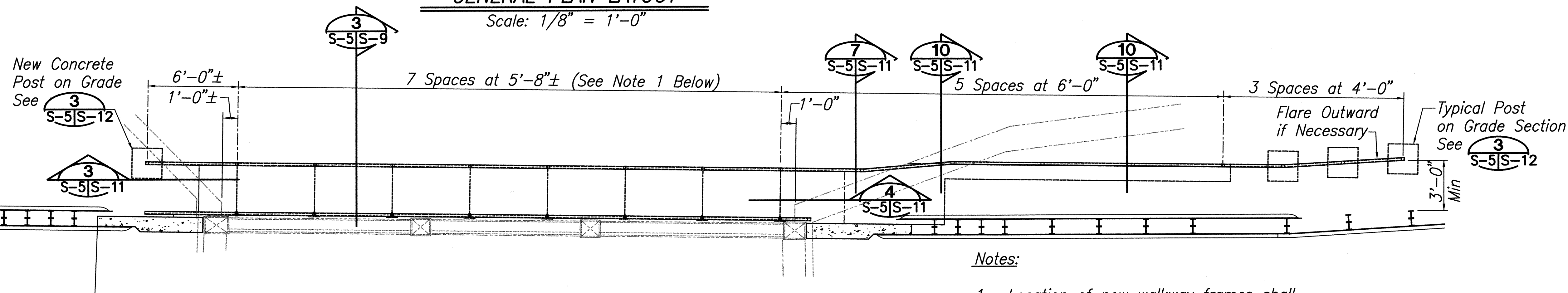


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HAWAII	HAW.	NH-083-1(43)	2001	C.O. 76	121



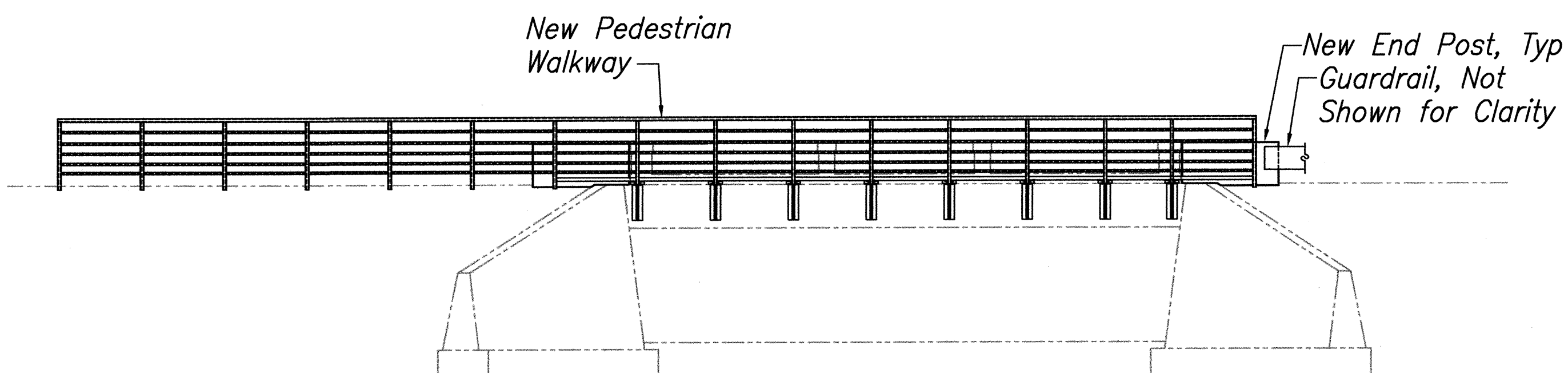
### GENERAL PLAN LAYOUT

Scale: 1/8" = 1'-0"



### NEW PEDESTRIAN WALKWAY LAYOUT PLAN

Scale: 1/4" = 1'-0"

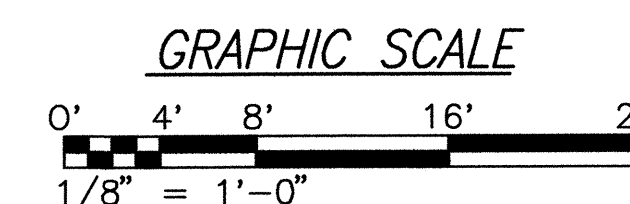
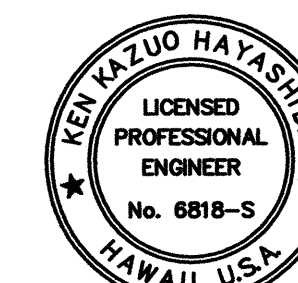


### LONGITUDINAL ELEVATION (LOOKING EAST)

Scale: 1/8" = 1'-0"

#### Notes:

1. Location of new walkway frames shall generally be the same as existing.
2. Dimensions of existing conditions to be verified by Contractor prior to bidding, construction and ordering of materials.
3. Contractor shall be aware that water level in stream varies.
4. Locate bolt holes to avoid reinforcing in concrete structure.
5. Fabricate after drilling anchor bolt holes in concrete.
6. Work this drawing with Sheet C-40.



5/7/03	Added Type "C" Guardrail Transition
2/12/02	Revised Handrail in Longitudinal Elevation per Addendum No.2
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**WAIKANE BRIDGE**  
**GENERAL LAYOUT PLAN**  
**LONGITUDINAL ELEVATION**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: As Noted Date: October 29, 2001

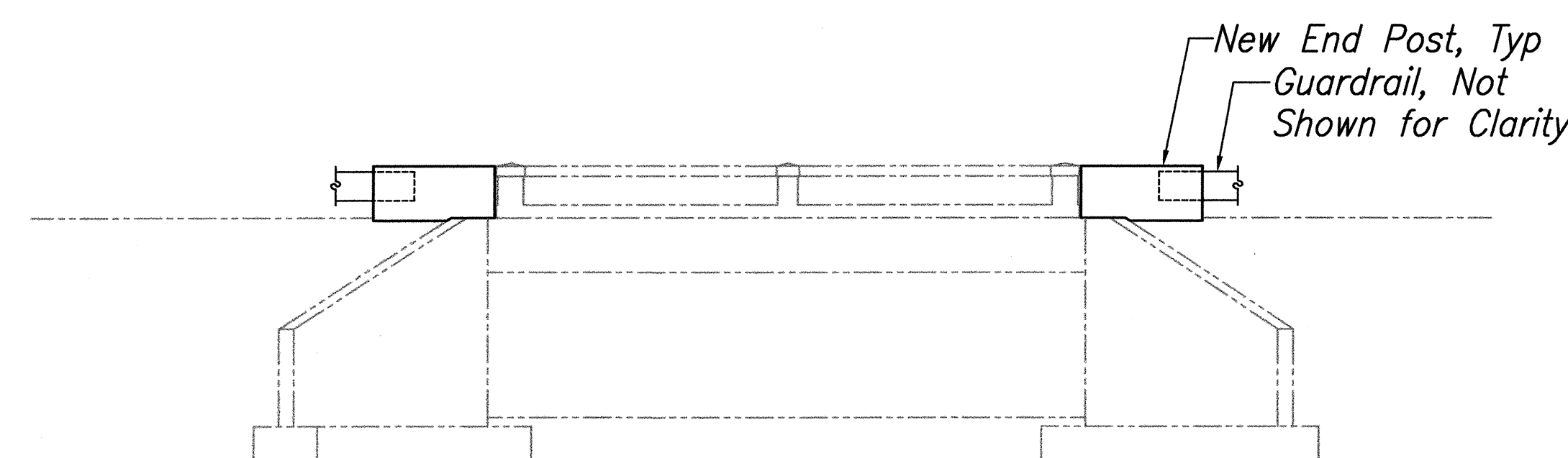
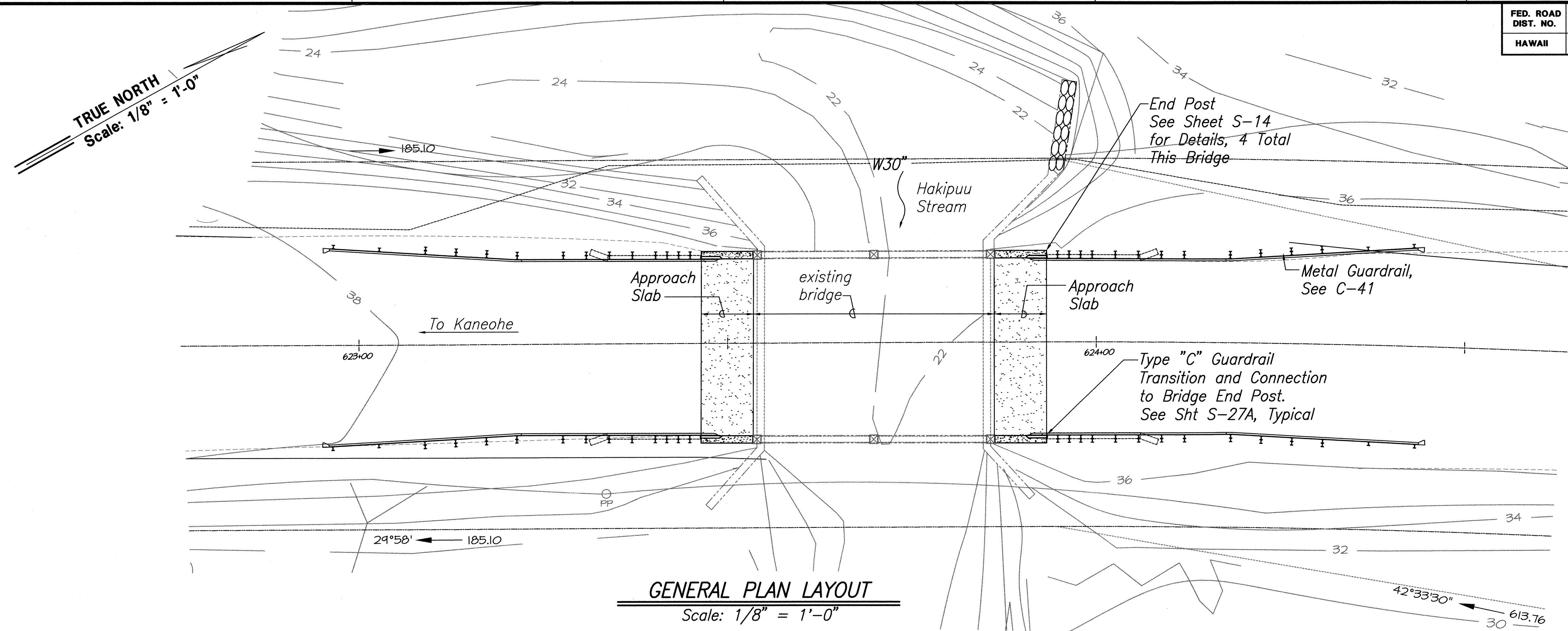
SHEET No. S-5 OF 27 SHEETS

C.O. 76

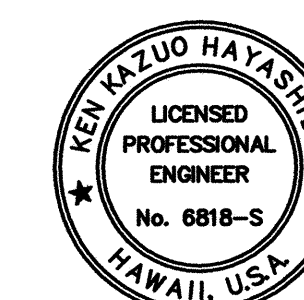
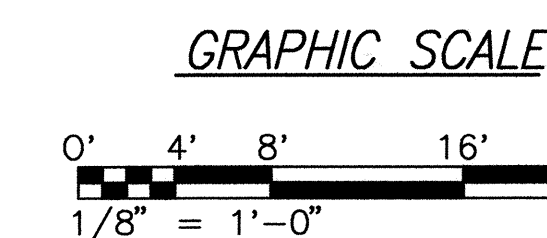
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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LONGITUDINAL ELEVATION  
Scale: 1/8" = 1'-0"



5/7/03	Added Type "C" Guardrail Transition
Date	Revision

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>HAKIPUU BRIDGE</b> <b>GENERAL LAYOUT PLAN</b> <b>LONGITUDINAL ELEVATION</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)
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Scale: As Noted Date: October 29, 2001

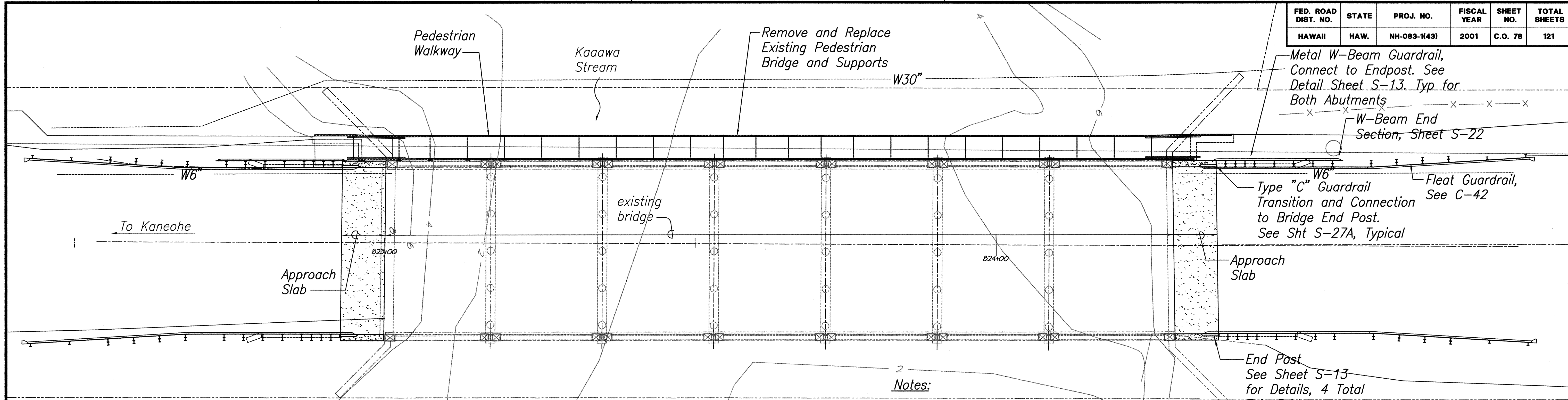
SHEET No. S-6 OF 27 SHEETS

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C.O. 77



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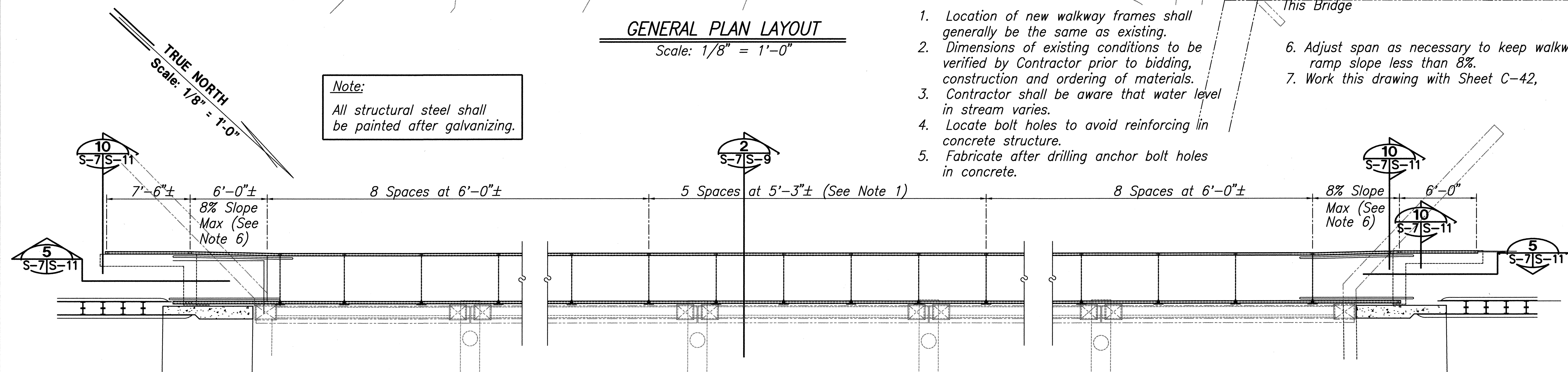
### GENERAL PLAN LAYOUT

Scale: 1/8" = 1'-0"

Note:  
All structural steel shall be painted after galvanizing.

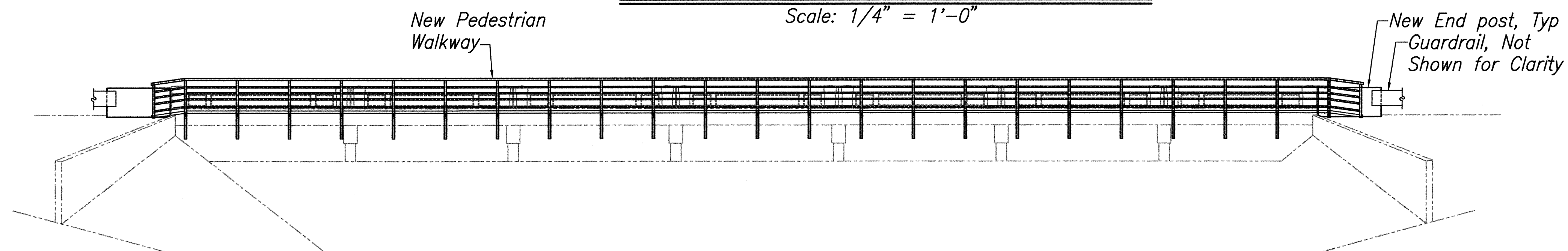
#### Notes:

1. Location of new walkway frames shall generally be the same as existing.
2. Dimensions of existing conditions to be verified by Contractor prior to bidding, construction and ordering of materials.
3. Contractor shall be aware that water level in stream varies.
4. Locate bolt holes to avoid reinforcing in concrete structure.
5. Fabricate after drilling anchor bolt holes in concrete.
6. Adjust span as necessary to keep walkway ramp slope less than 8%.
7. Work this drawing with Sheet C-42,



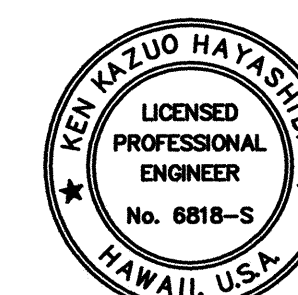
### NEW PEDESTRIAN WALKWAY LAYOUT PLAN

Scale: 1/4" = 1'-0"



### LONGITUDINAL ELEVATION (LOOKING EAST)

Scale: 1/8" = 1'-0"



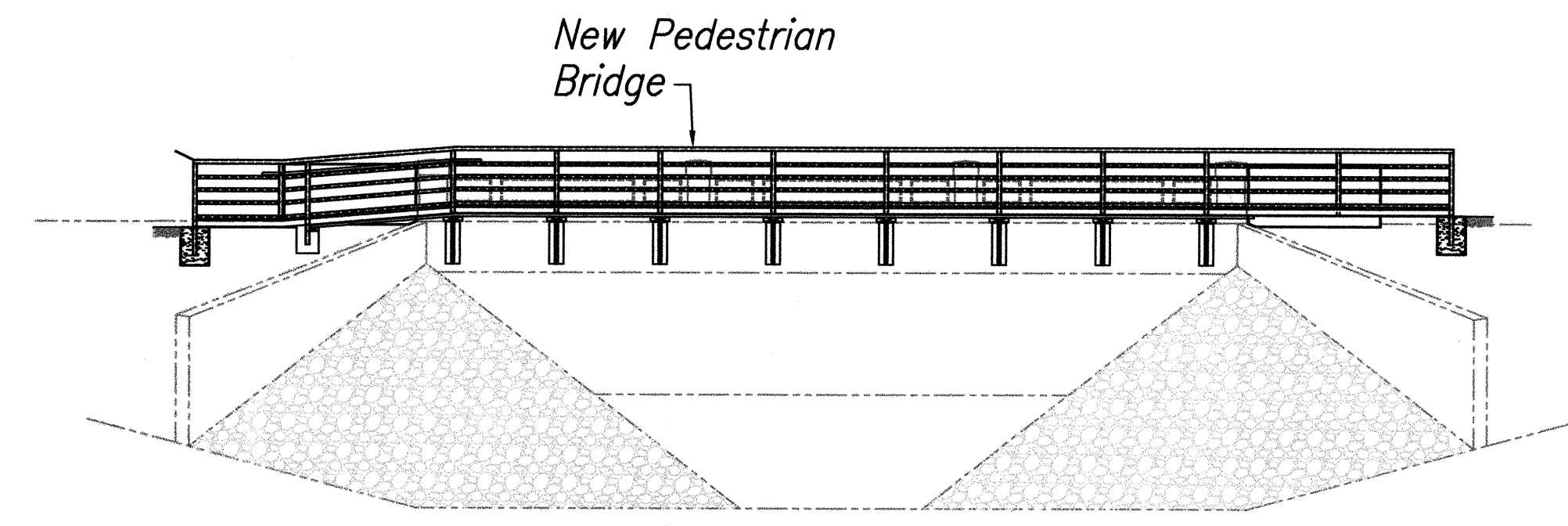
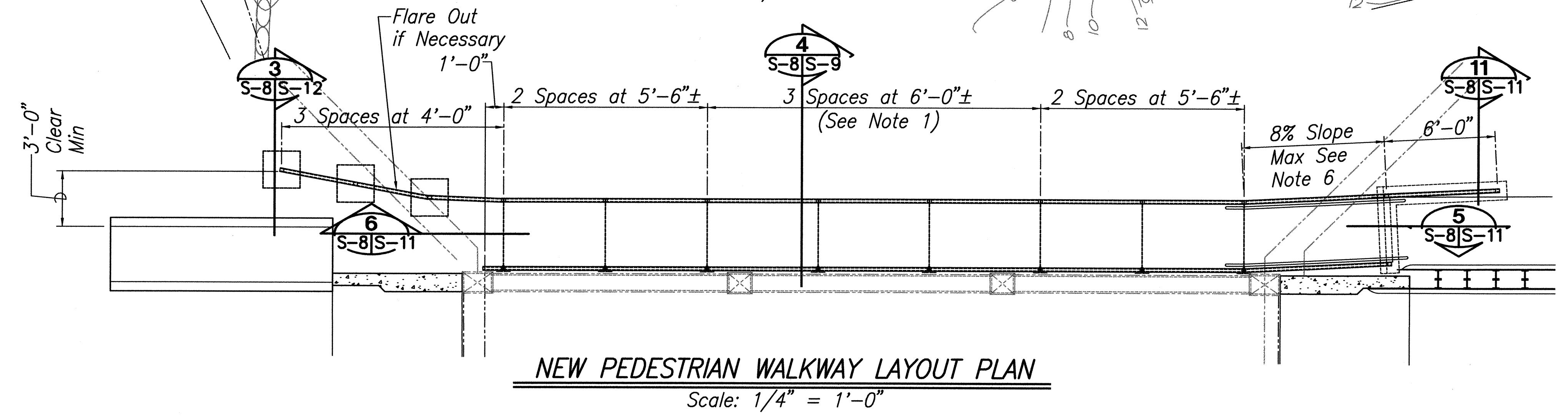
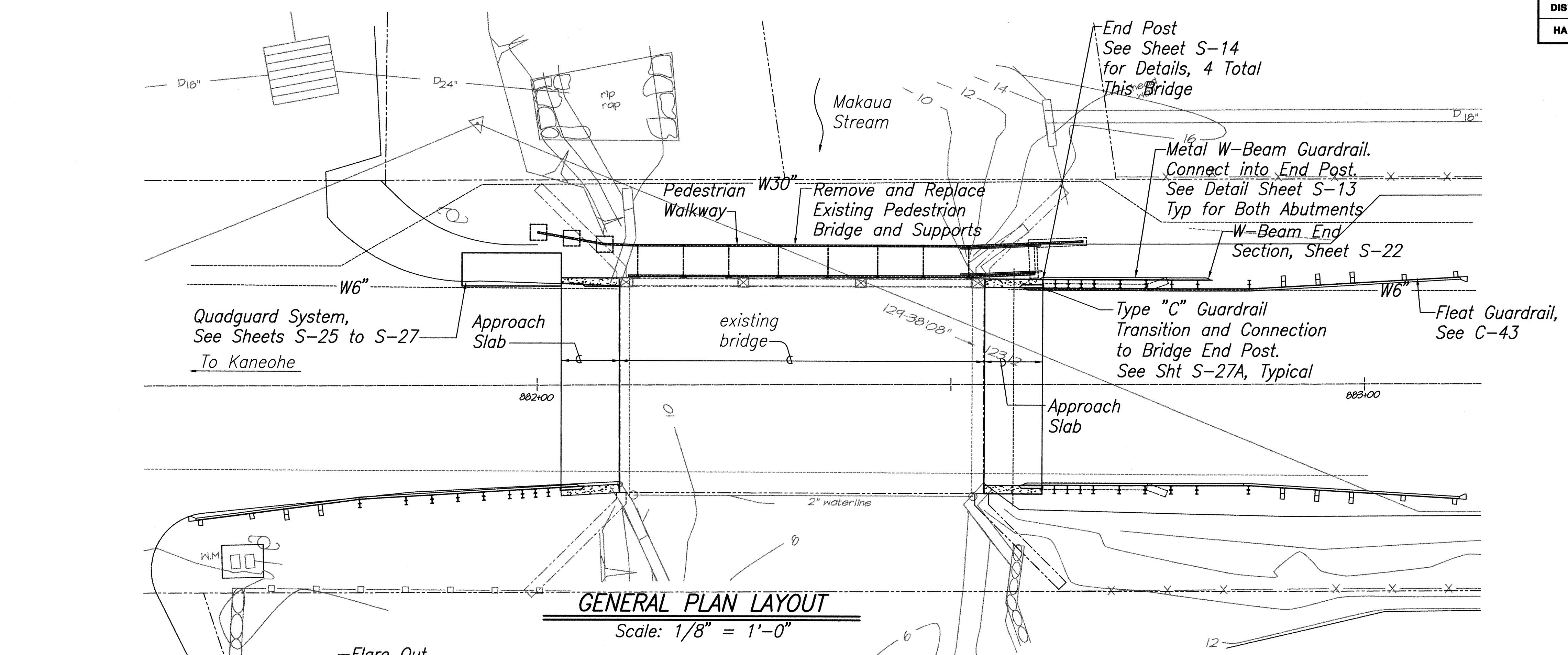
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

5/7/03	Added Type "C" Guardrail Transition
2/12/02	Revised Handrail in Longitudinal Elevation per Addendum No.2
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>KAAWA BRIDGE</b> <b>GENERAL LAYOUT PLAN</b> <b>LONGITUDINAL ELEVATION</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: As Noted	Date: October 29, 2001
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TRUE NORTH  
Scale: 1/8" = 1'-0"



End Post  
See Sheet S-14  
for Details, 4 Total  
This Bridge

Metal W-Beam Guardrail.  
Connect into End Post.  
See Detail Sheet S-13  
Typ for Both Abutments

W-Beam End  
Section, Sheet S-22

Type "C" Guardrail  
Transition and Connection  
to Bridge End Post.  
See Sht S-27A, Typical

Fleet Guardrail,  
See C-43

Quadguard System,  
See Sheets S-25 to S-27  
To Kaneohe

Approach  
Slab

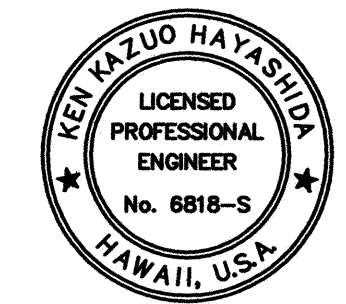
existing  
bridge

Approach  
Slab

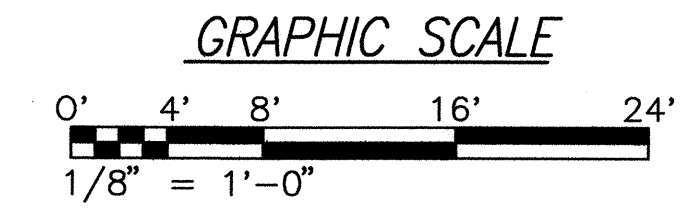
Notes:

1. Location of new walkway frames shall generally be the same as existing.
2. Dimensions of existing conditions to be verified by Contractor prior to bidding, construction and ordering of materials.
3. Contractor shall be aware that water level in stream varies.
4. Locate bolt holes to avoid reinforcing in concrete structure.
5. Fabricate after drilling anchor bolt holes in concrete.
6. Adjust span as necessary to keep walkway ramp slope less than 8%.
7. Work this drawing with Sheet C-43.

5/7/03	Added Type "C" Guardrail Transition
2/12/02	Revised Handrail in Longitudinal Elevation per Addendum No.2
Date	Revision



THIS WORK WAS PREPARED BY  
ME OR UNDER MY SUPERVISION

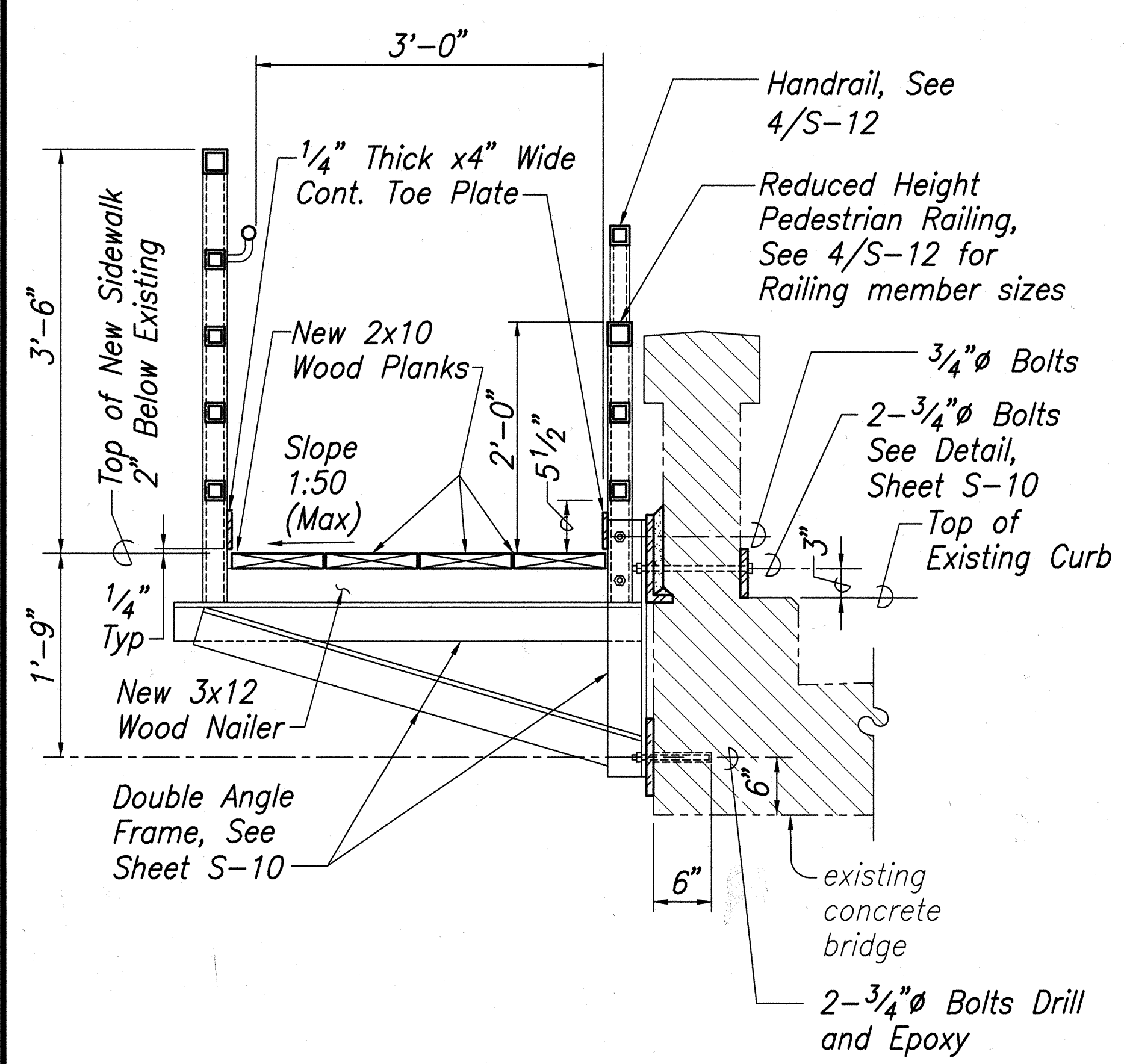


STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**MAKAUA BRIDGE**  
**GENERAL LAYOUT PLAN**  
**LONGITUDINAL ELEVATION**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)  
Scale: As Noted Date: October 29, 2001  
SHEET No. S-8 OF 27 SHEETS

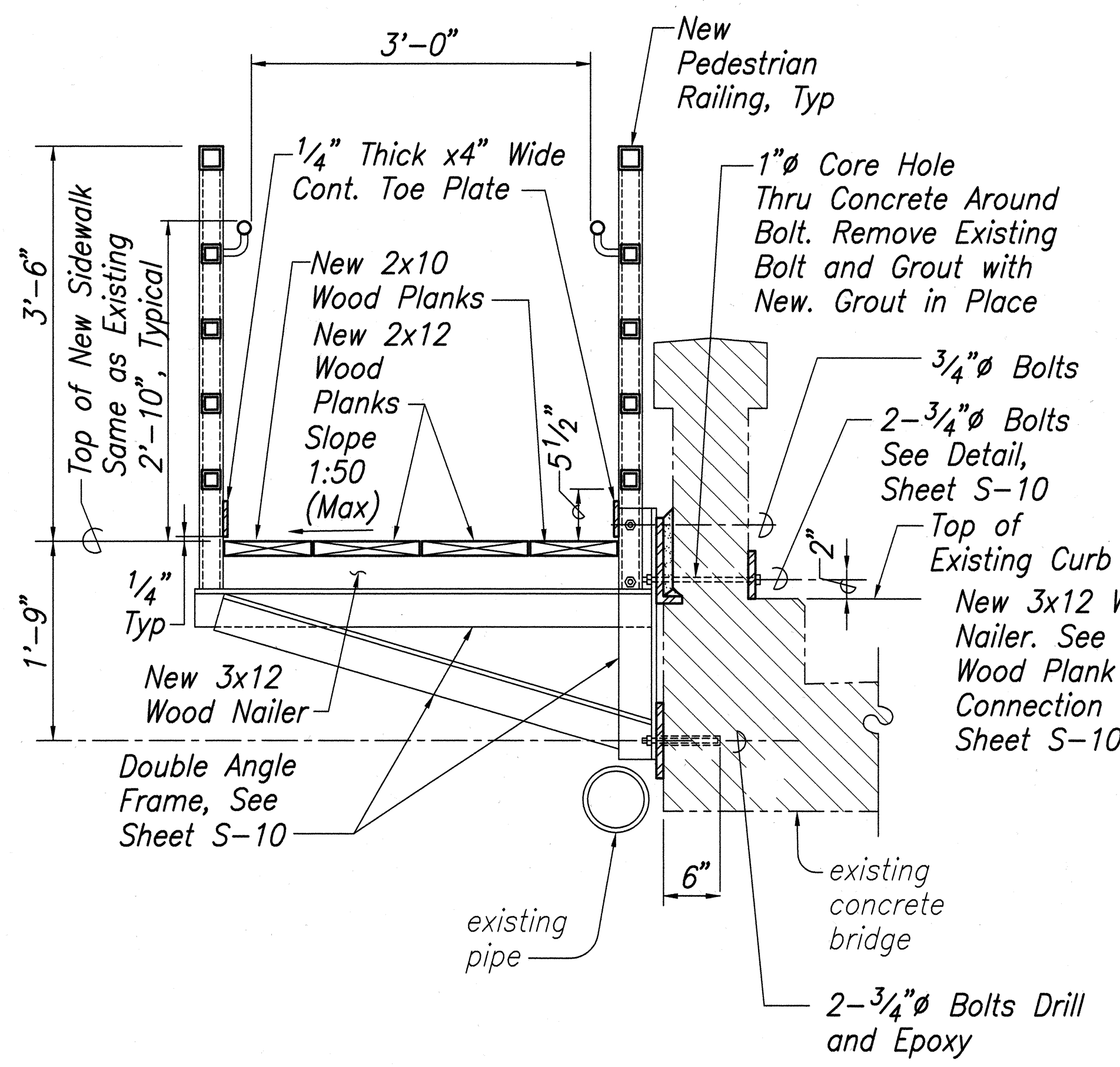
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
CHECKED BY	
NOTE BOOK	
No.	



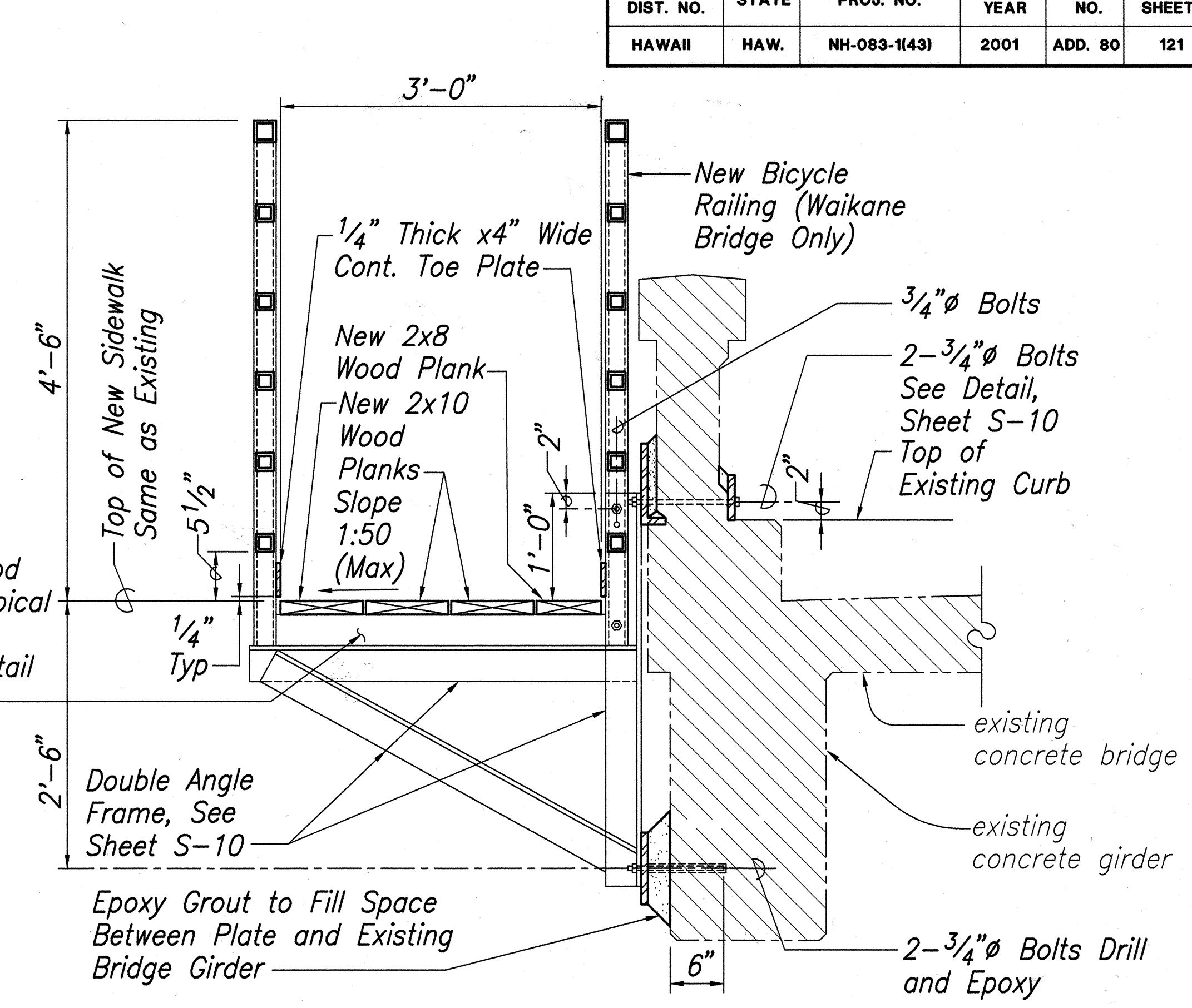
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 80	121



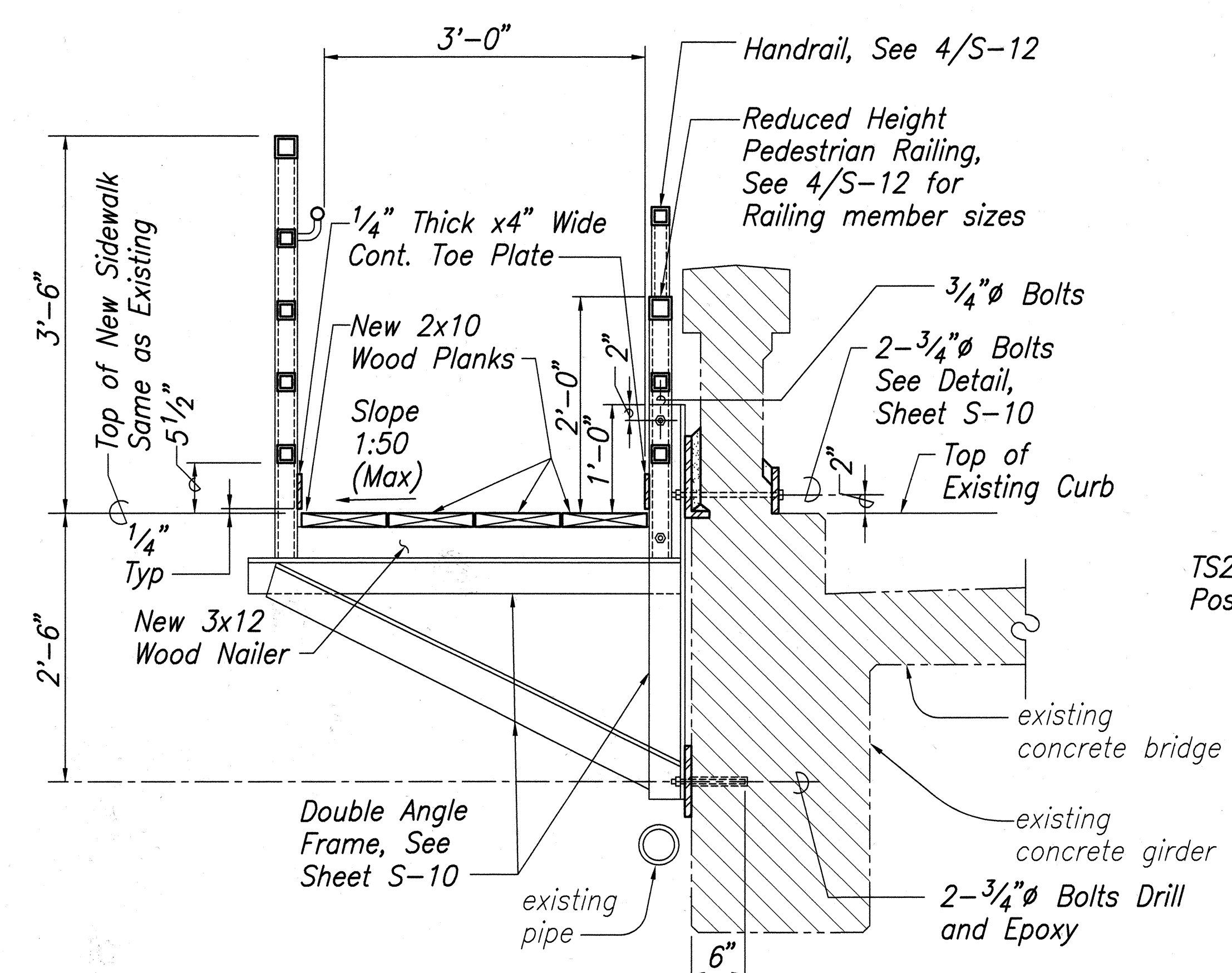
**TYPICAL SECTION AT WAIAHOLE BRIDGE** 1  
Scale 1" = 1'-0"



**TYPICAL SECTION AT KAAAWA BRIDGE** 2  
Scale 1" = 1'-0"

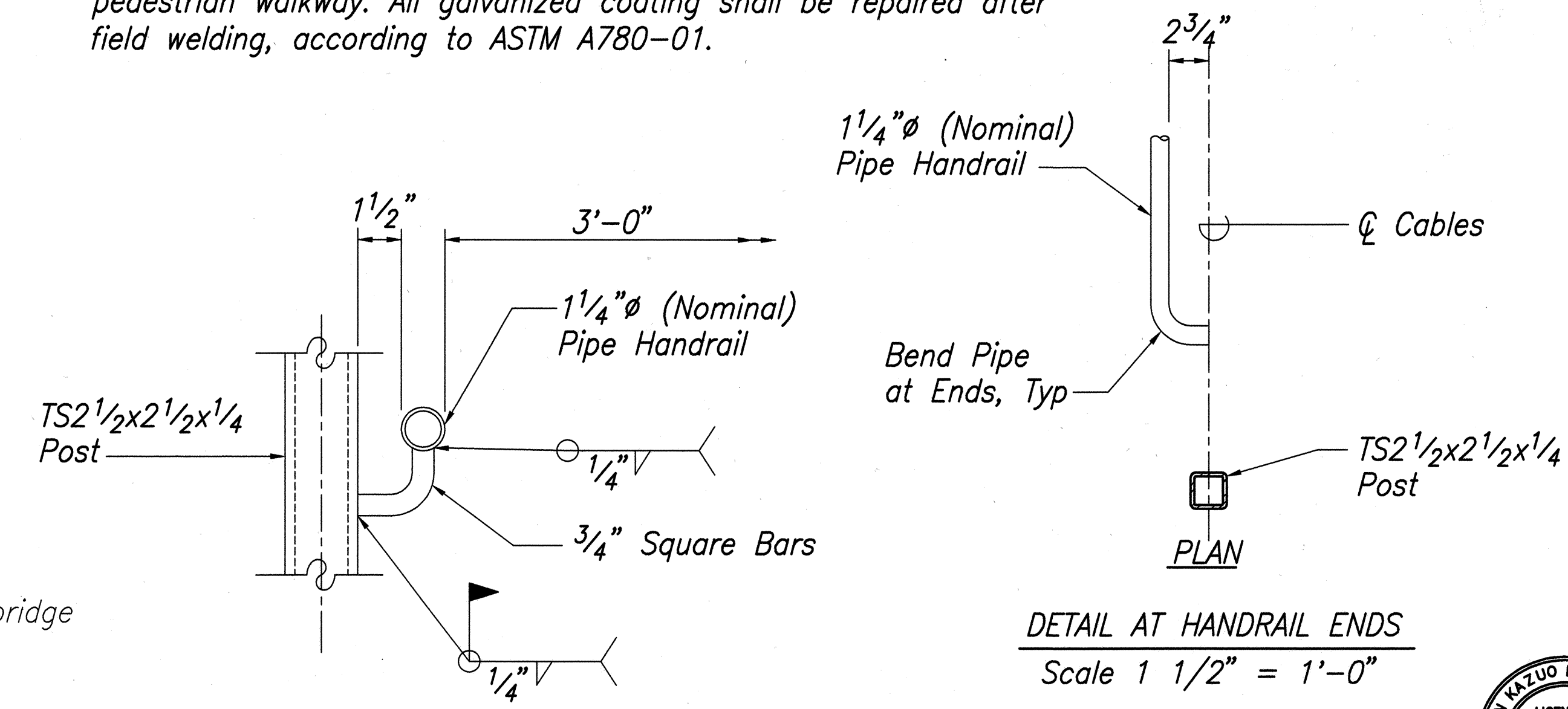


**TYPICAL SECTION AT WAIKANE BRIDGE** 3  
Scale 1" = 1'-0"



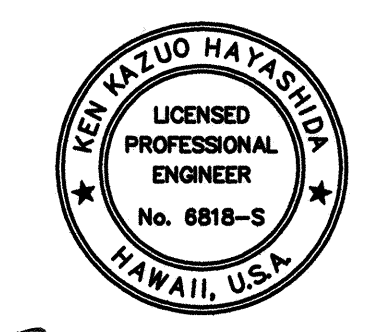
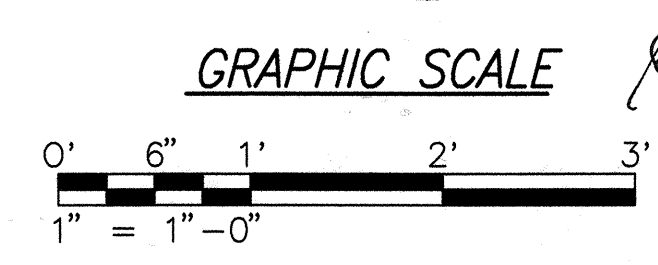
**TYPICAL SECTION AT MAKAUA BRIDGE** 4  
Scale 1" = 1'-0"

**Note:**  
All bolts, nuts, washers, anchor bolts and bearing plates related to the pedestrian bridges and handrails shall be hot dipped galvanized and shall be made incidental to the cost of the pedestrian walkway. All galvanized coating shall be repaired after field welding, according to ASTM A780-01.



**HANDRAIL CONNECTION DETAIL** 5  
Scale 3" = 1'-0"

**DETAIL AT HANDRAIL ENDS**  
Scale 1 1/2" = 1'-0"



2/12/02	Revised Handrail Design per Addendum No.2
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**PEDESTRIAN WALKWAY SECTIONS AND DETAILS**

KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

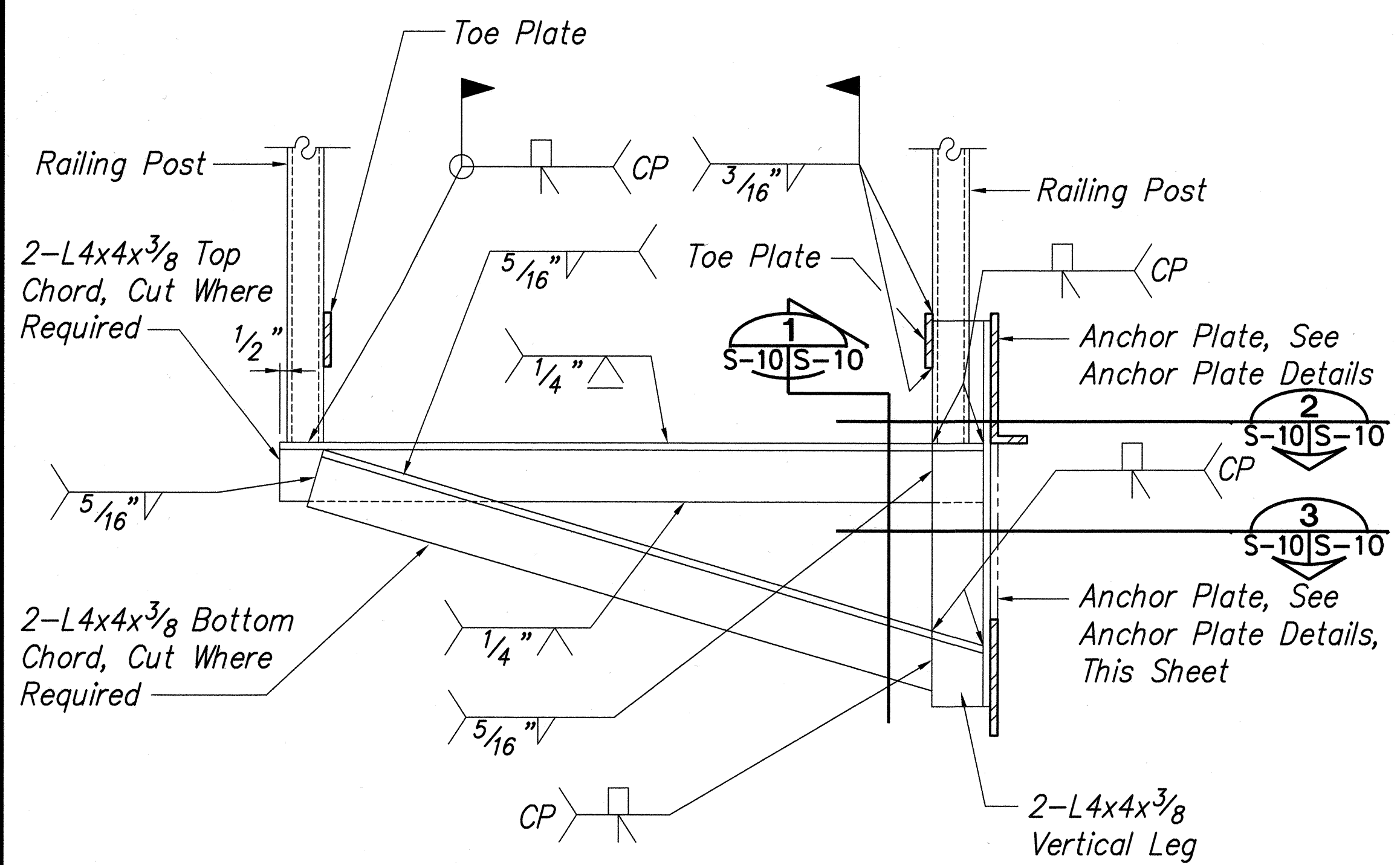
Scale: As Noted Date: October 29, 2001

SHEET No. S-9 OF 27 SHEETS

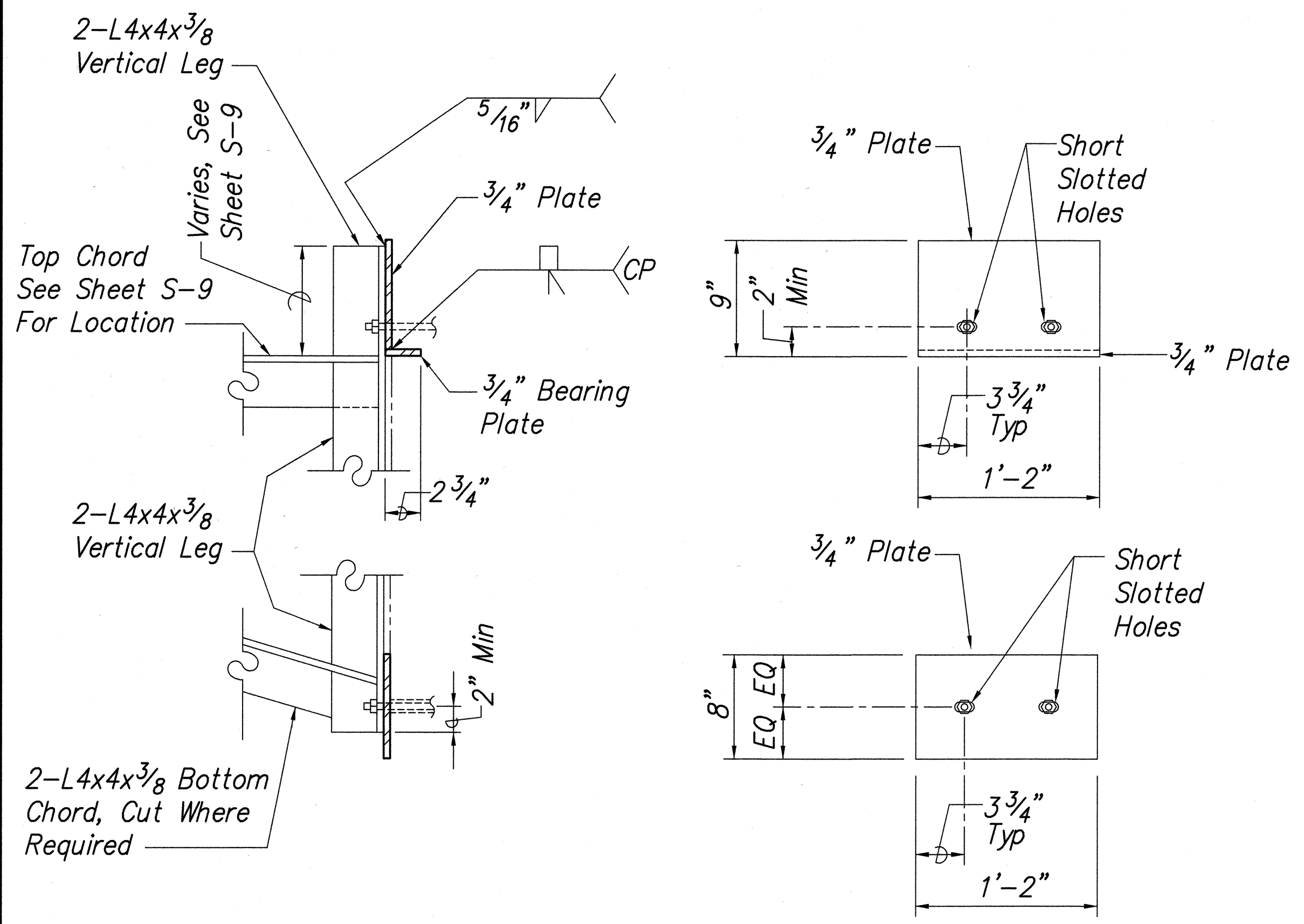
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
NO.	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	81	121

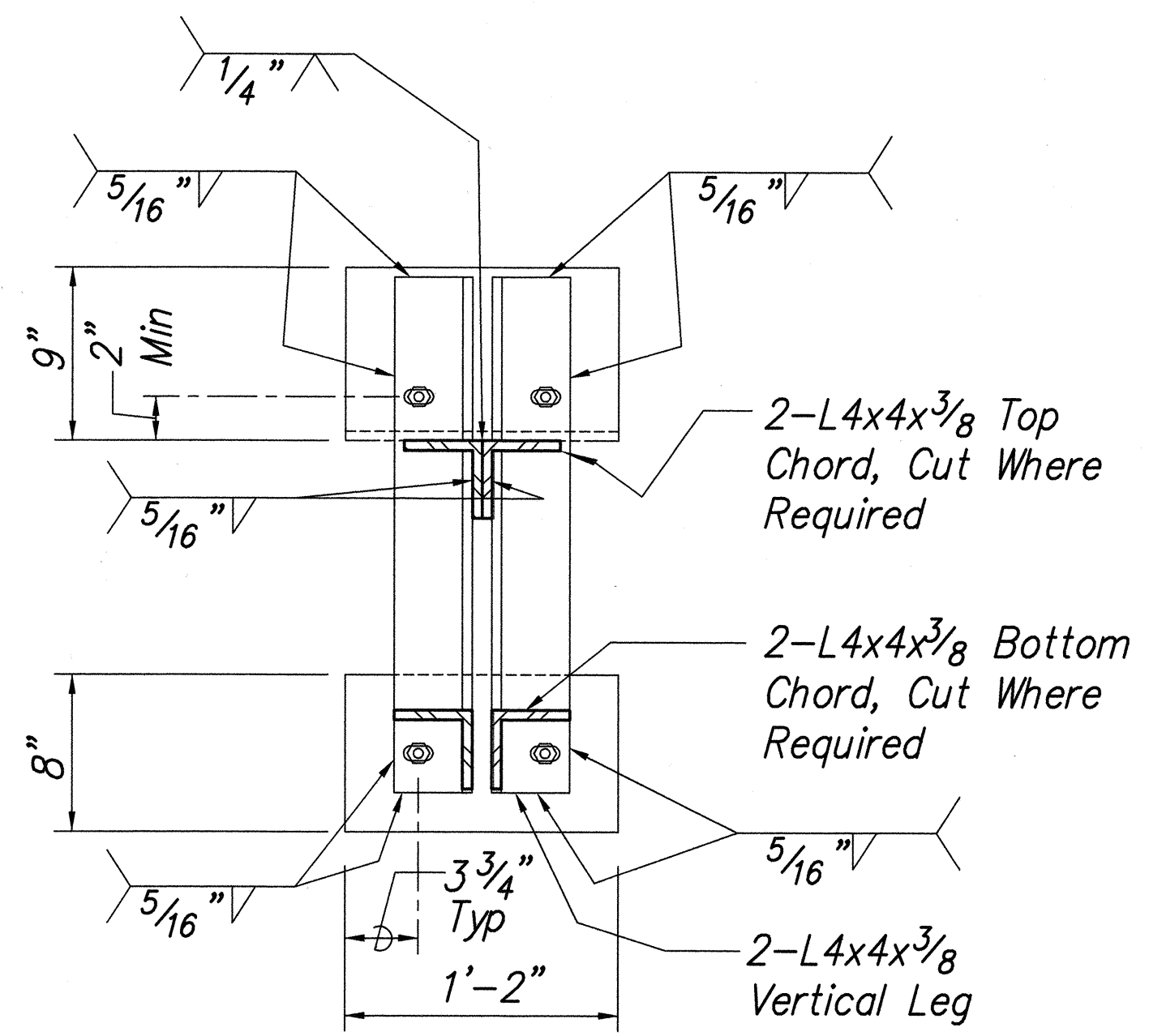


**DOUBLE ANGLE FRAME DETAIL**  
Scale: 1 1/2" = 1'-0"

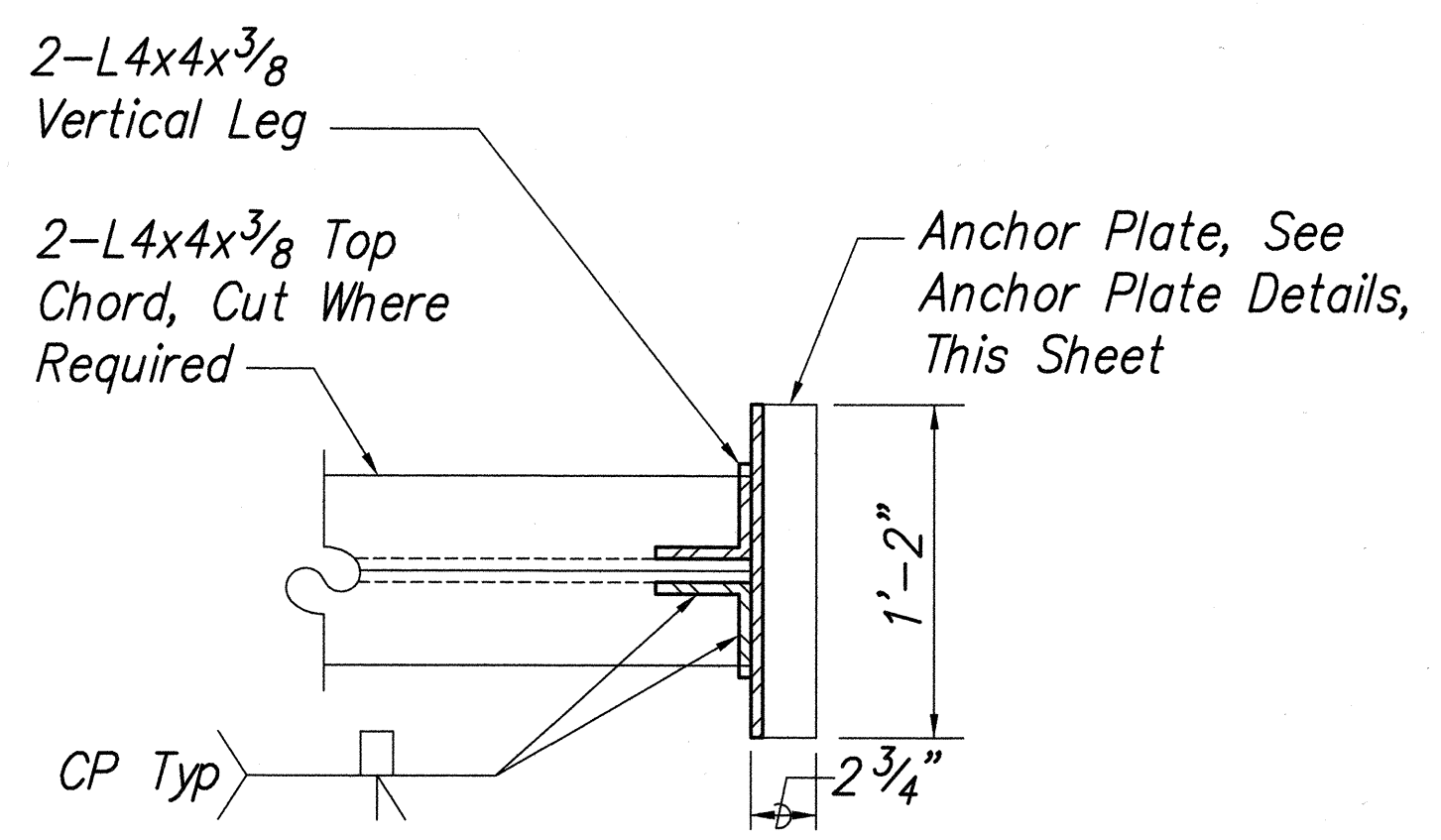


**Note:**  
See Sheet S-9 For Location of Bolts and Anchor Plates

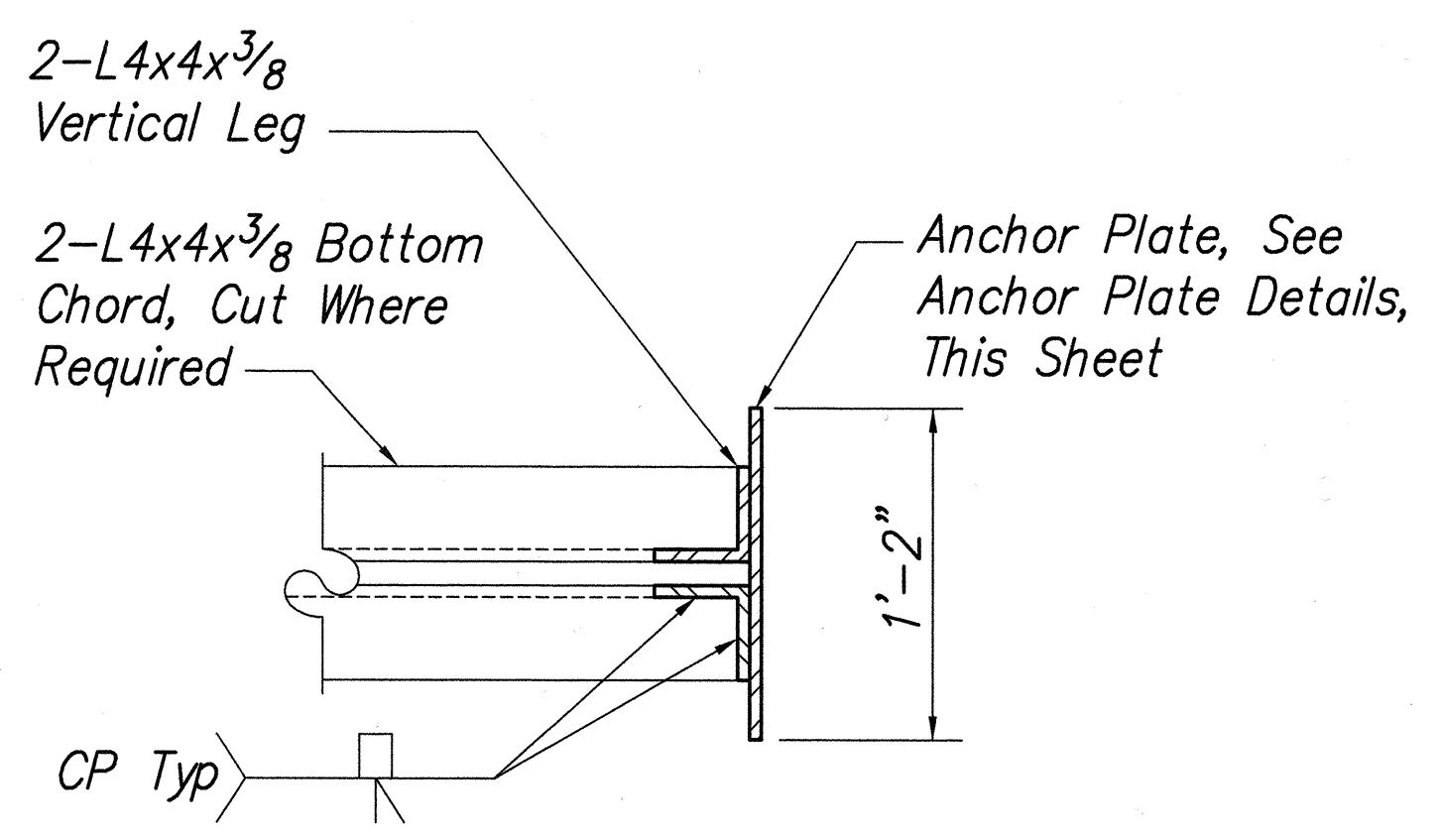
**ANCHOR PLATE DETAILS**  
Scale: 1 1/2" = 1'-0"



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

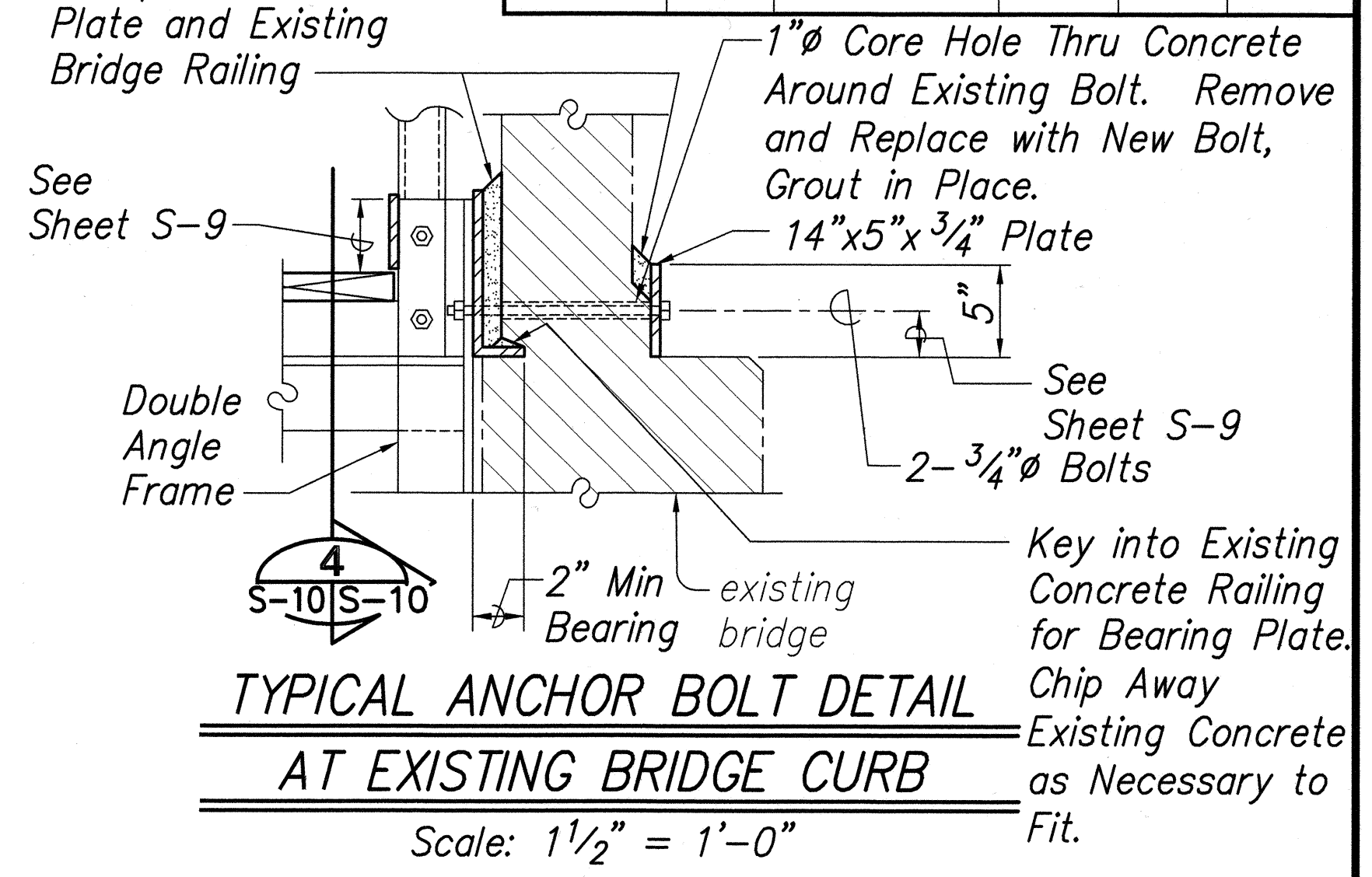


**SECTION 2**  
Scale: 1 1/2" = 1'-0"

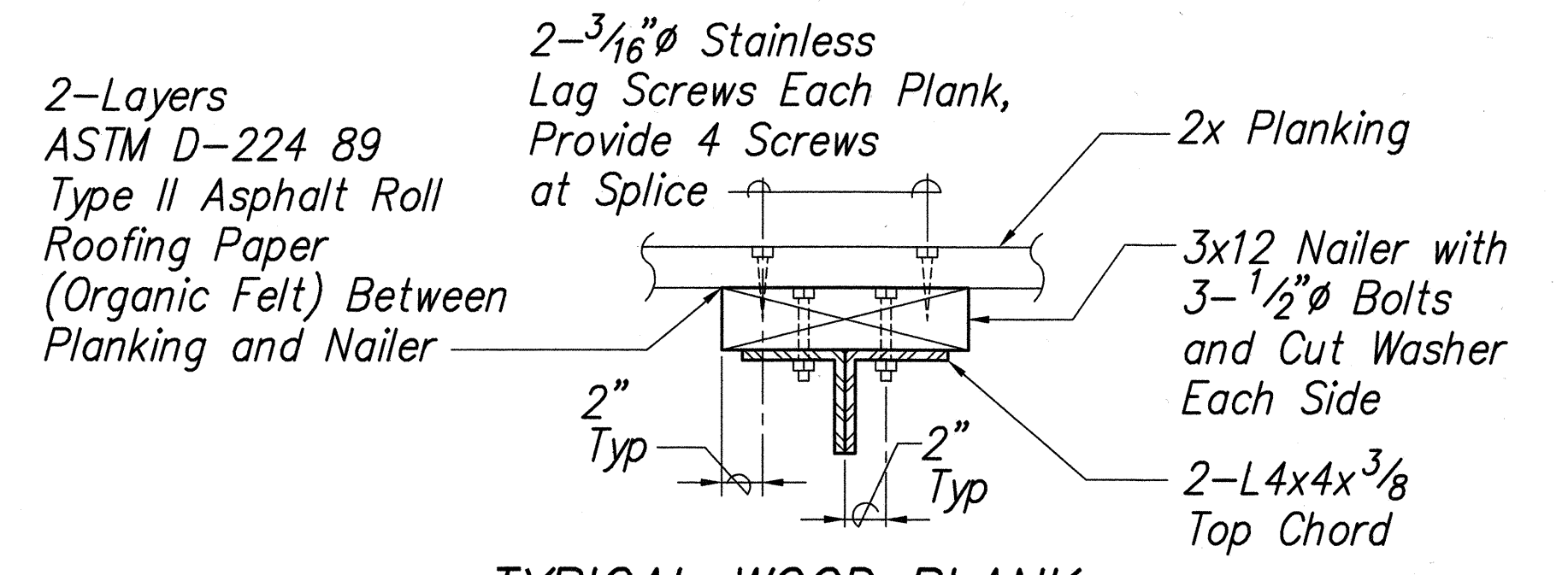


**SECTION 3**  
Scale: 1 1/2" = 1'-0"

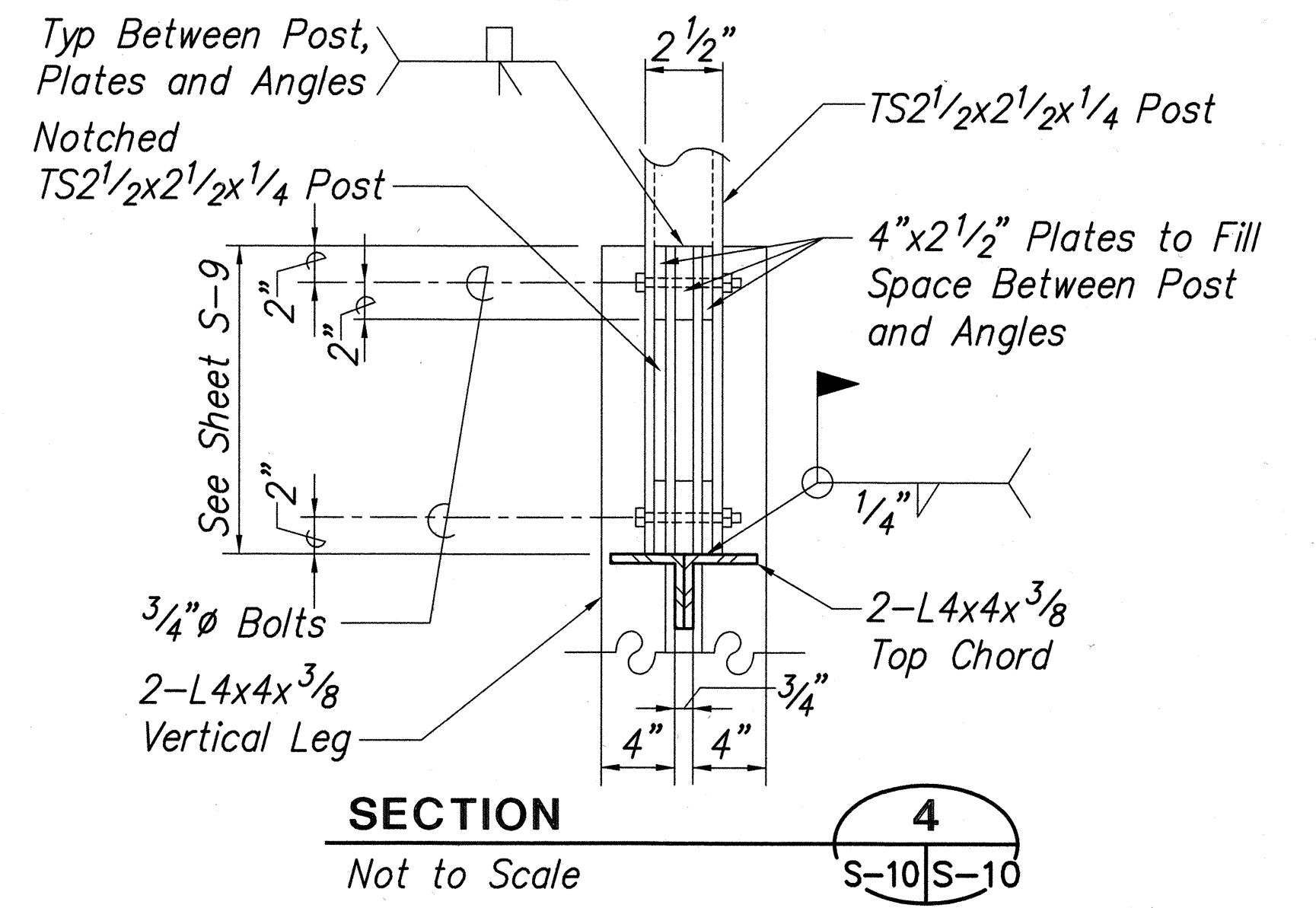
Epoxy Grout to Fill Space Between Plate and Existing Bridge Railing



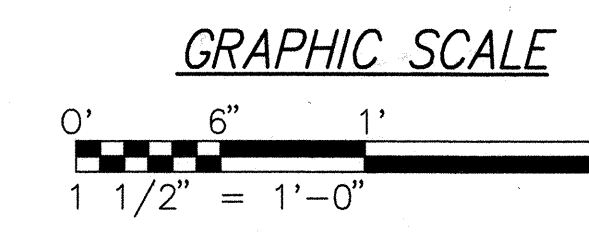
**TYPICAL ANCHOR BOLT DETAIL AT EXISTING BRIDGE CURB**  
Scale: 1 1/2" = 1'-0"



**TYPICAL WOOD PLANK CONNECTION DETAIL**  
Scale: 1 1/2" = 1'-0"



**SECTION 4**  
Not to Scale

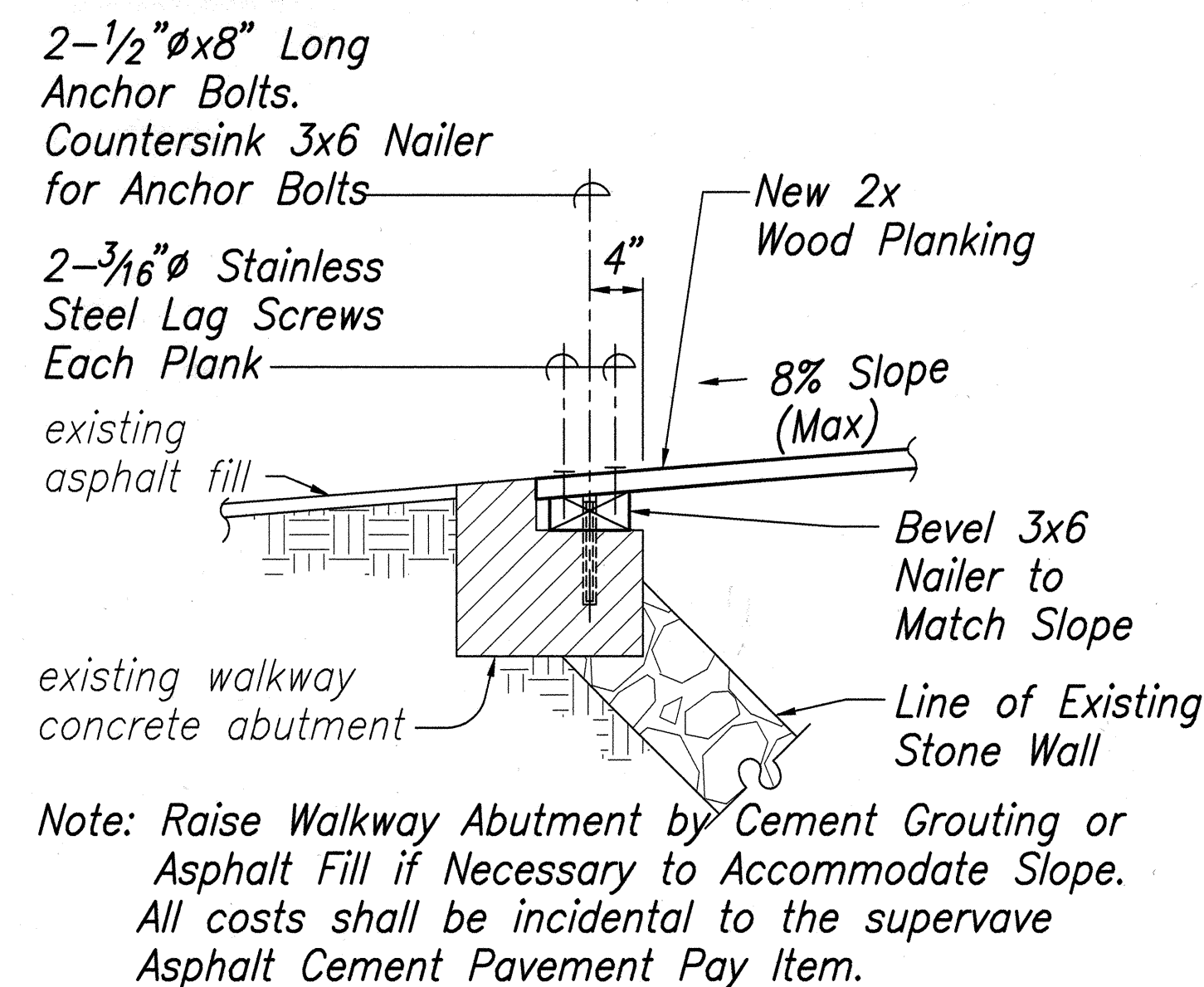


STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**PEDESTRIAN WALKWAY SECTIONS AND DETAILS**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)  
Scale: As Noted Date: October 29, 2001  
SHEET No. S-10 OF 27 SHEETS

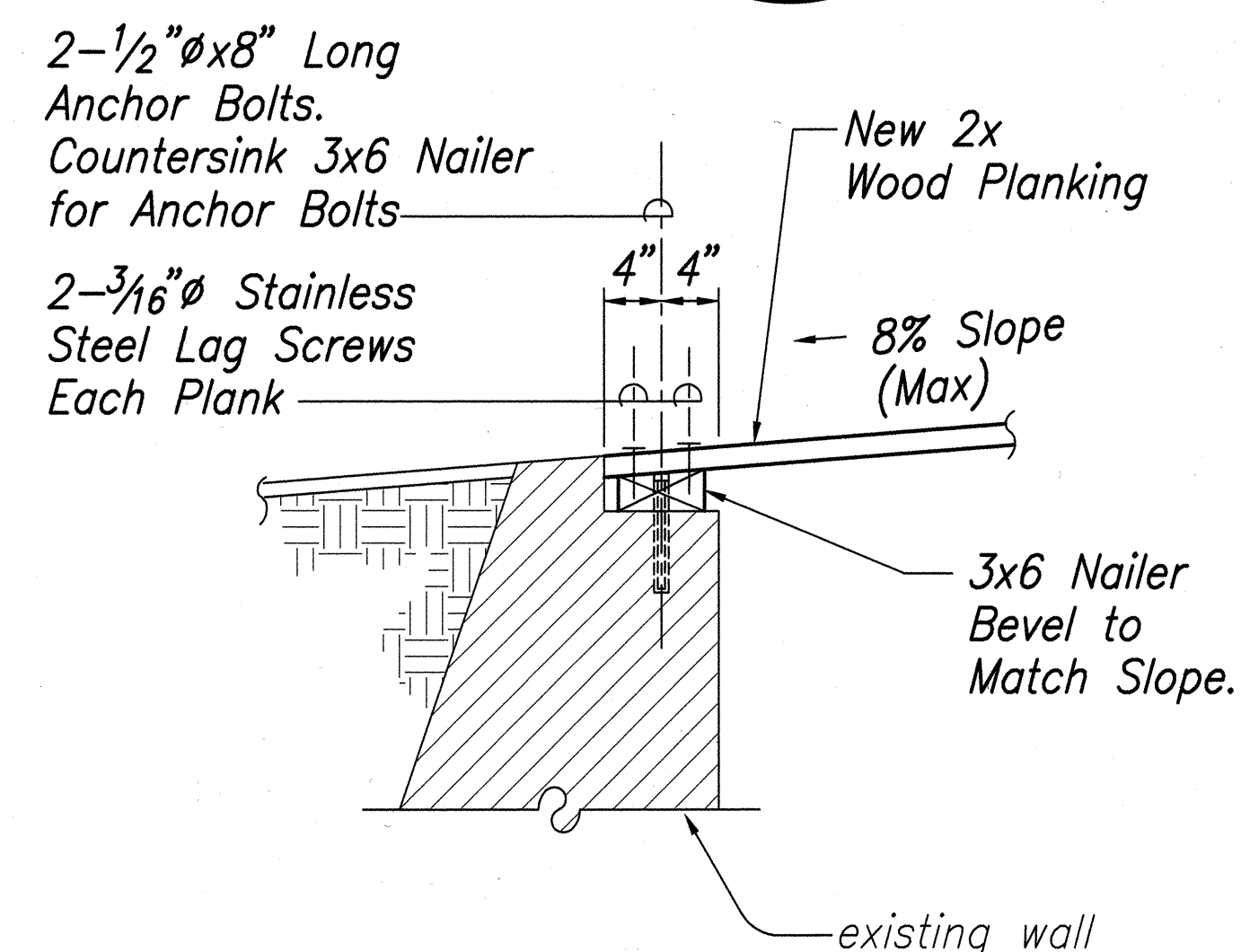
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	



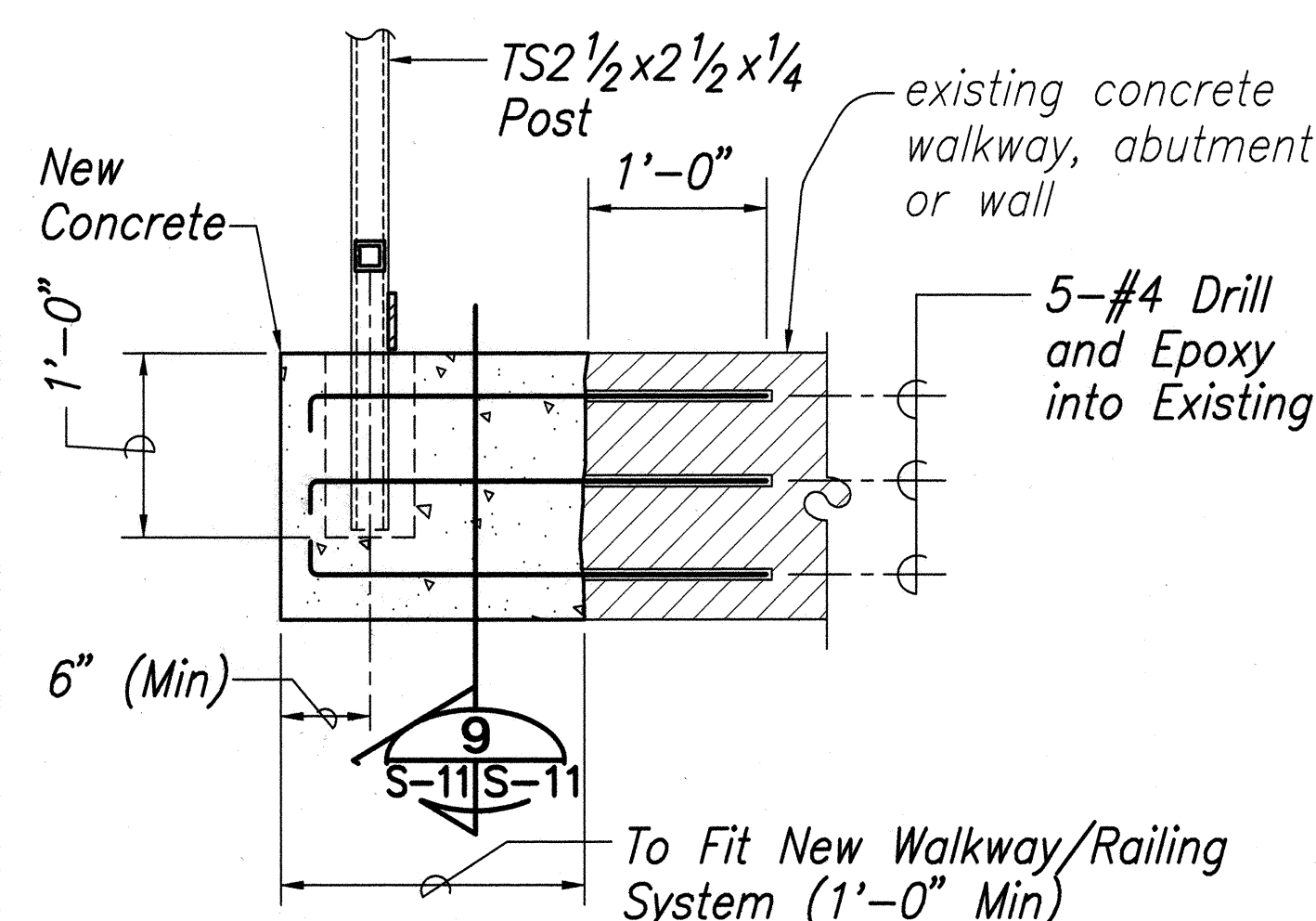
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 82	121



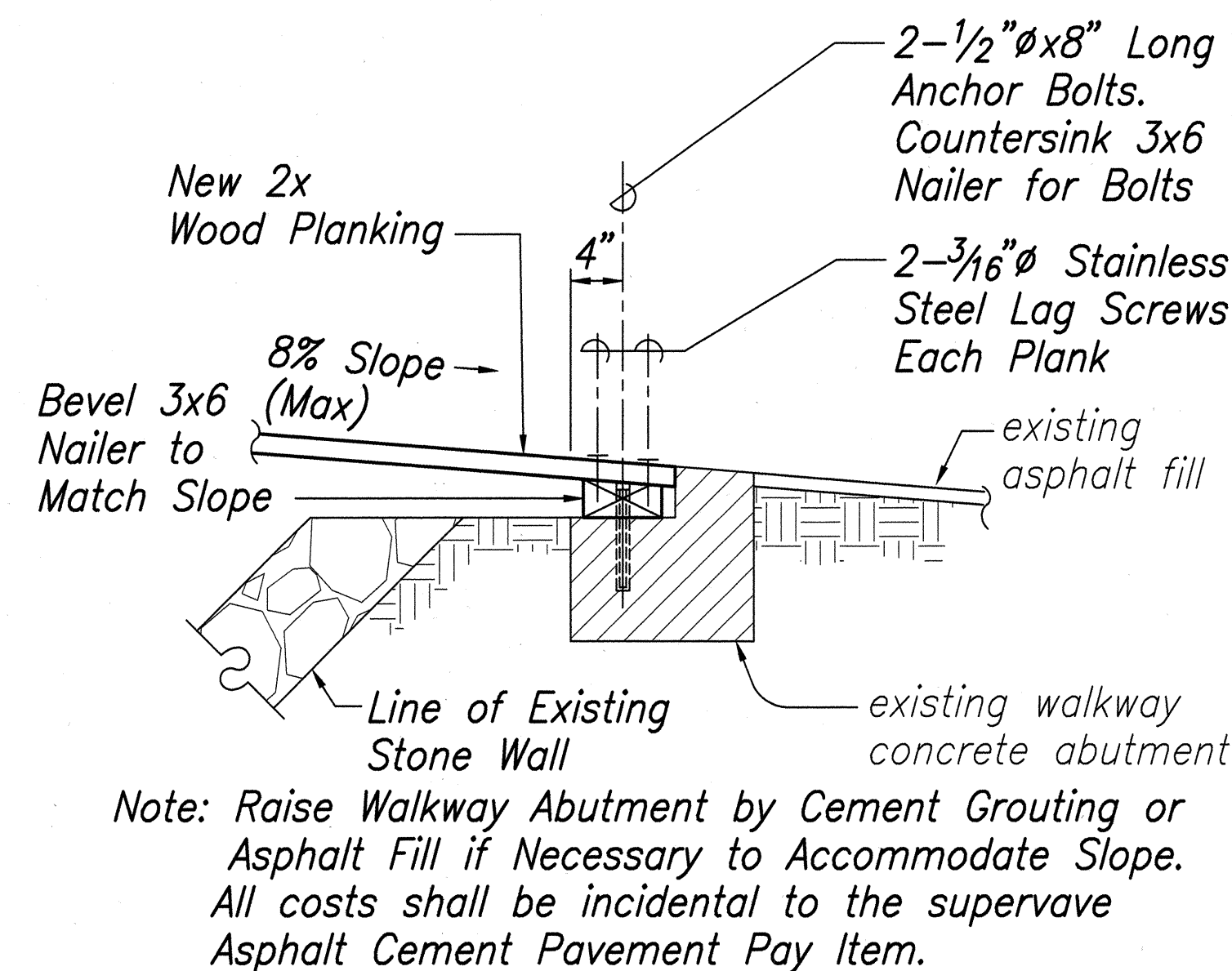
**SECTION 1**  
Scale 1" = 1'-0" S-4|S-11



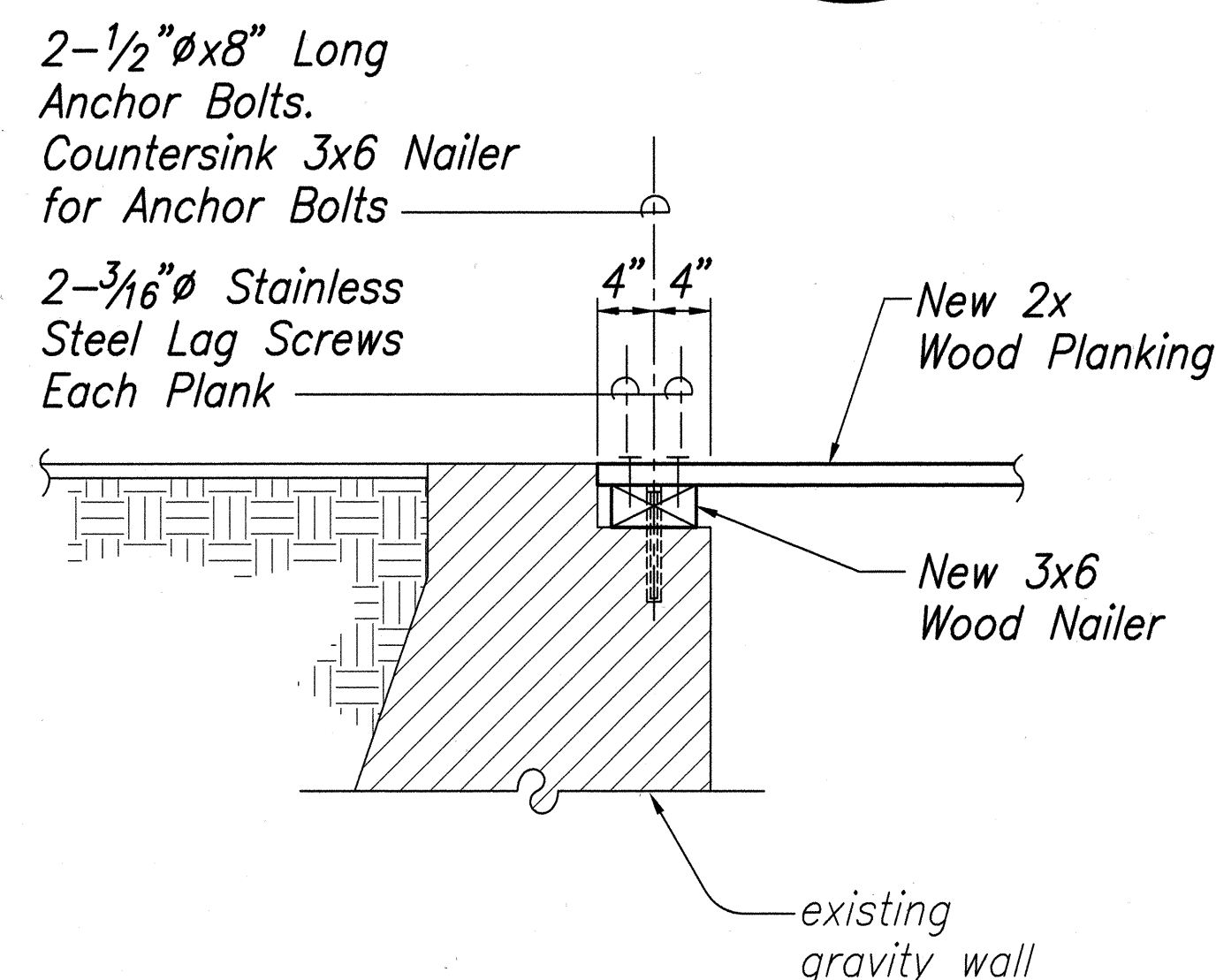
**SECTION 5**  
Scale 1" = 1'-0" S-7,S-8|S-11



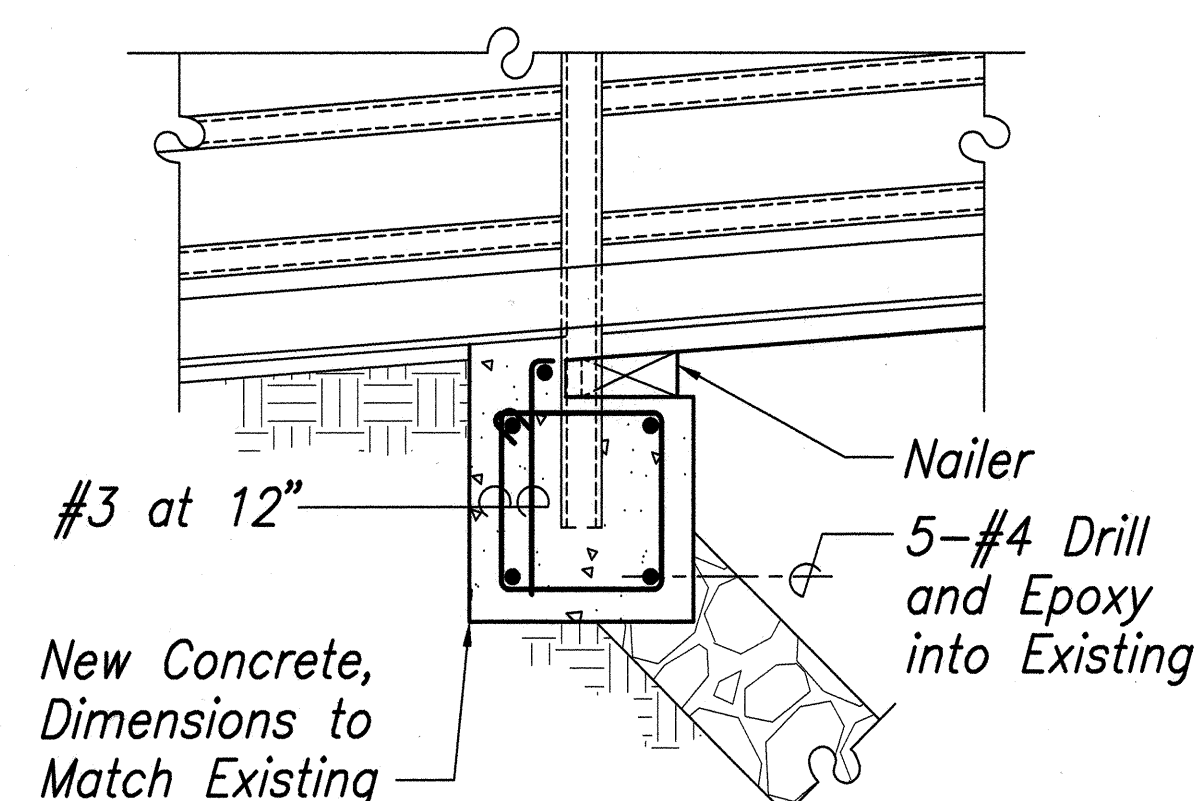
**SECTION 8**  
Scale 1" = 1'-0" S-4|S-11



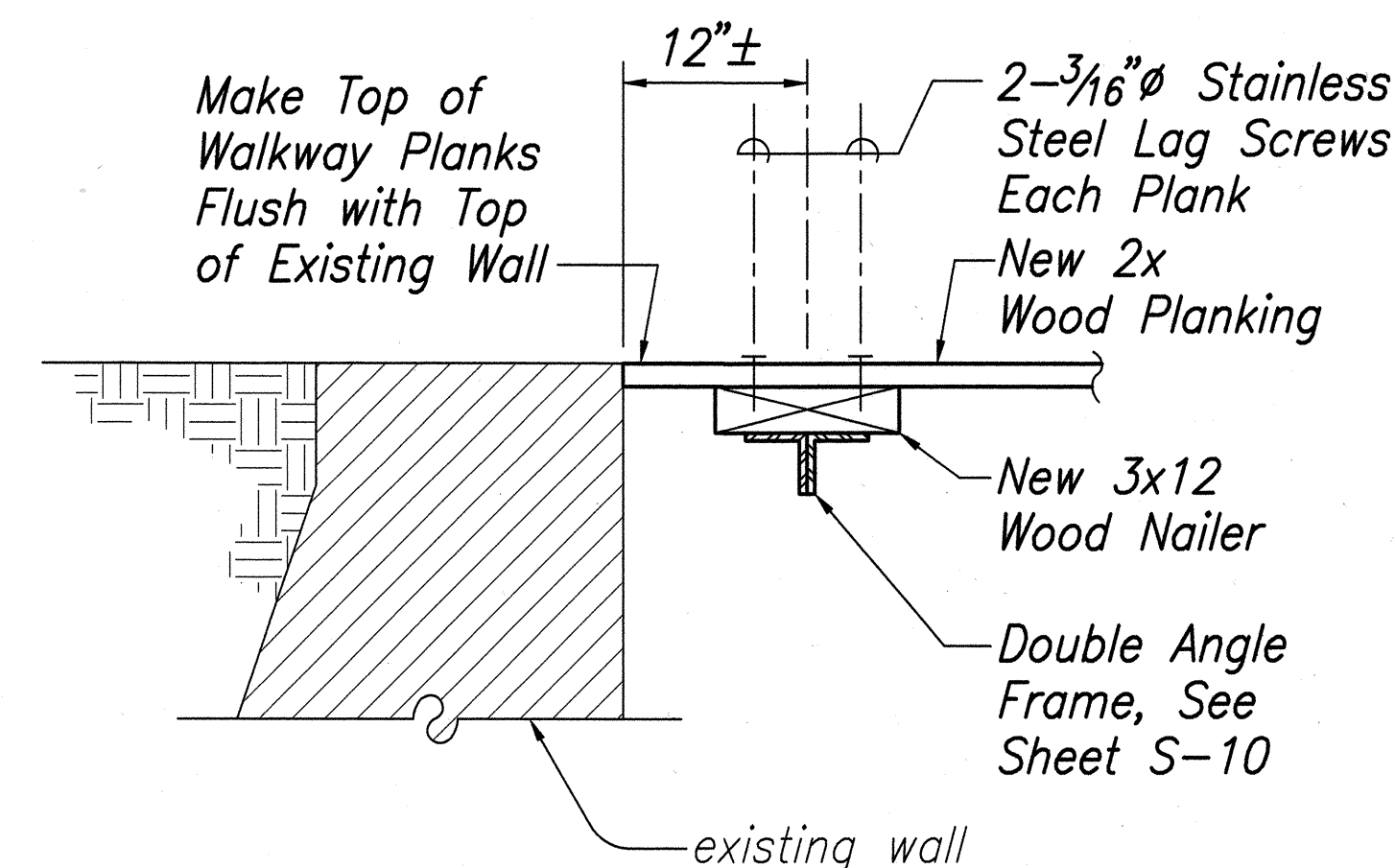
**SECTION 2**  
Scale 1" = 1'-0" S-4|S-11



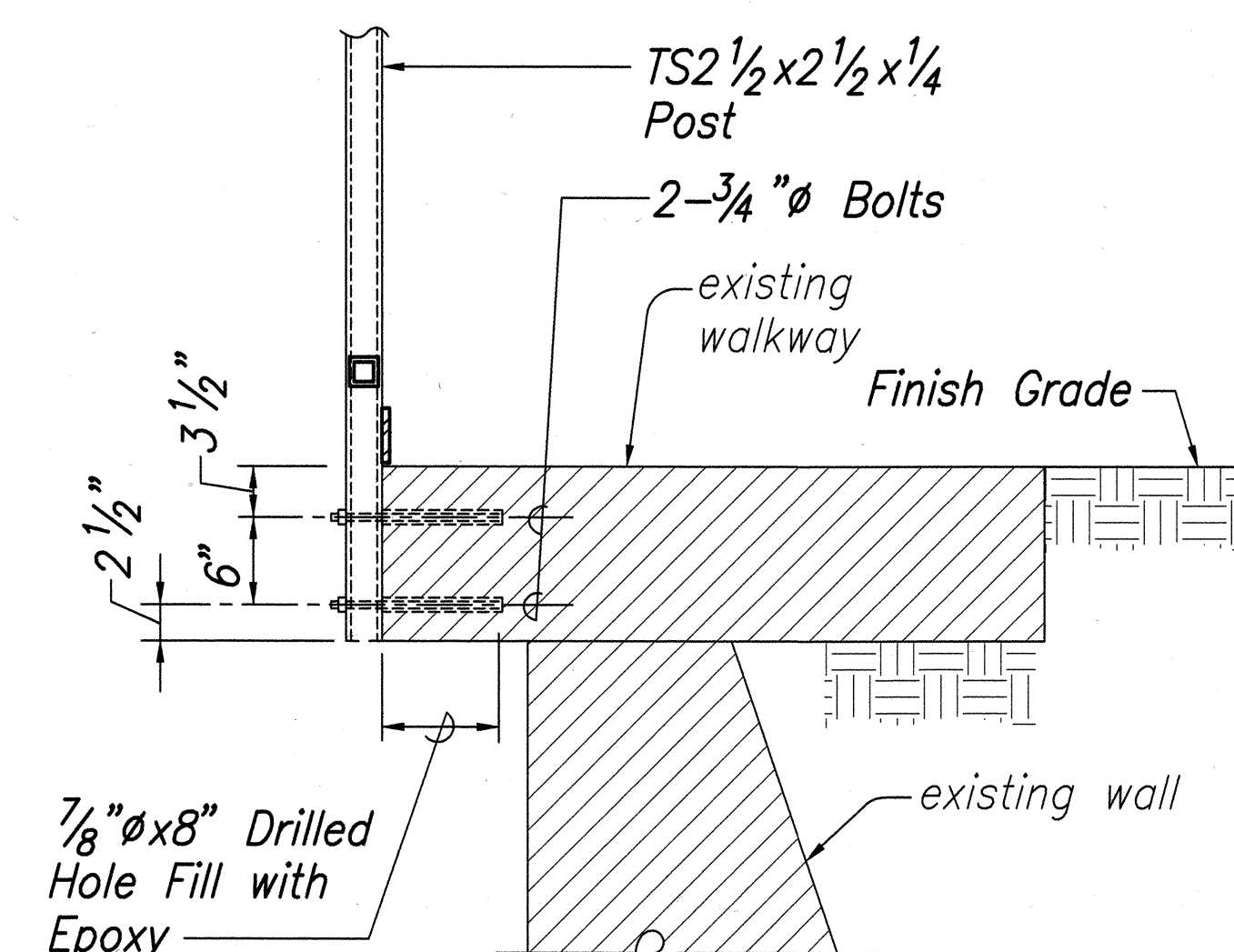
**SECTION 6**  
Scale 1" = 1'-0" S-8|S-11



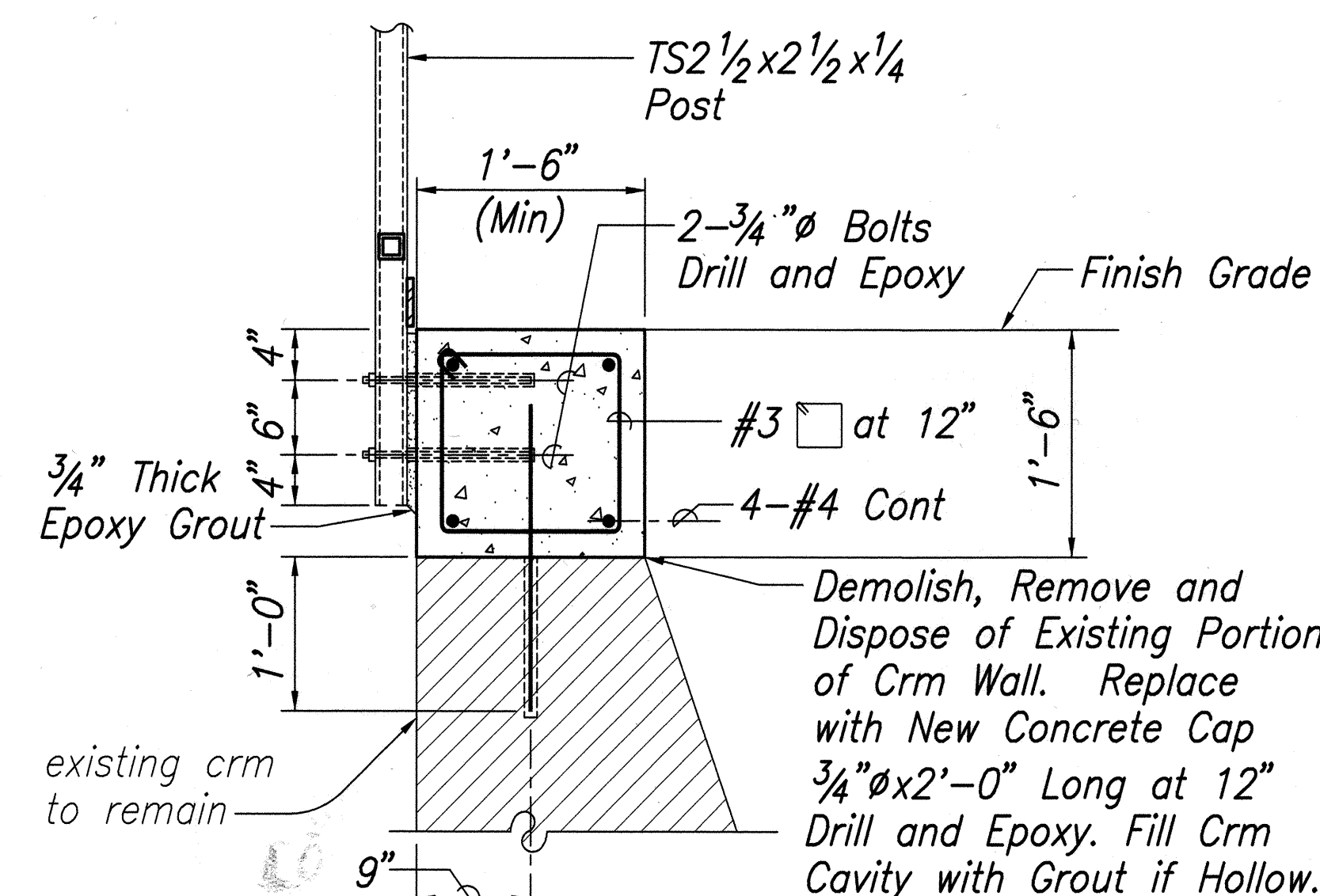
**SECTION 9**  
Scale 1" = 1'-0" S-11|S-11



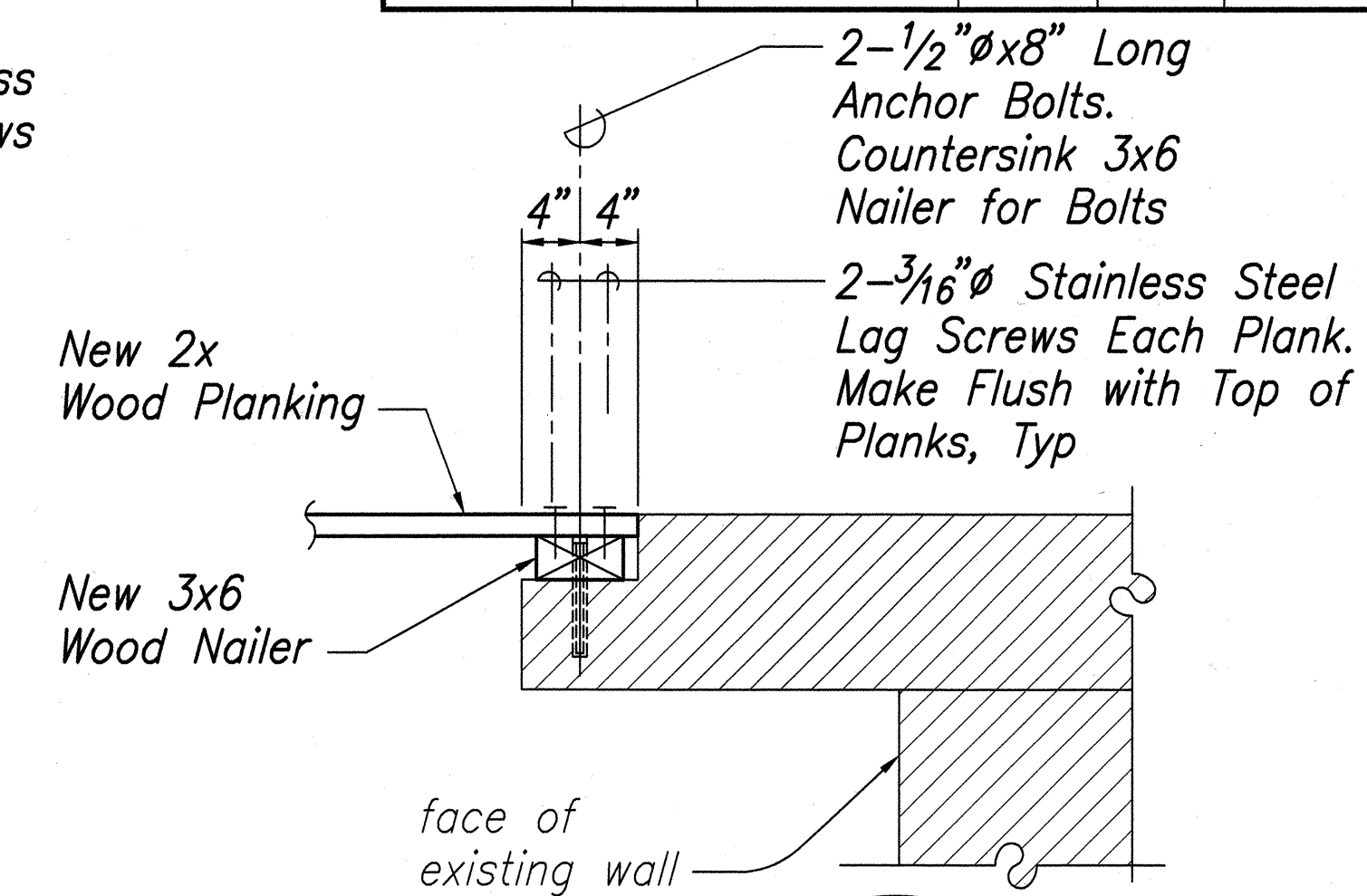
**SECTION 3**  
Scale 1" = 1'-0" S-5|S-11



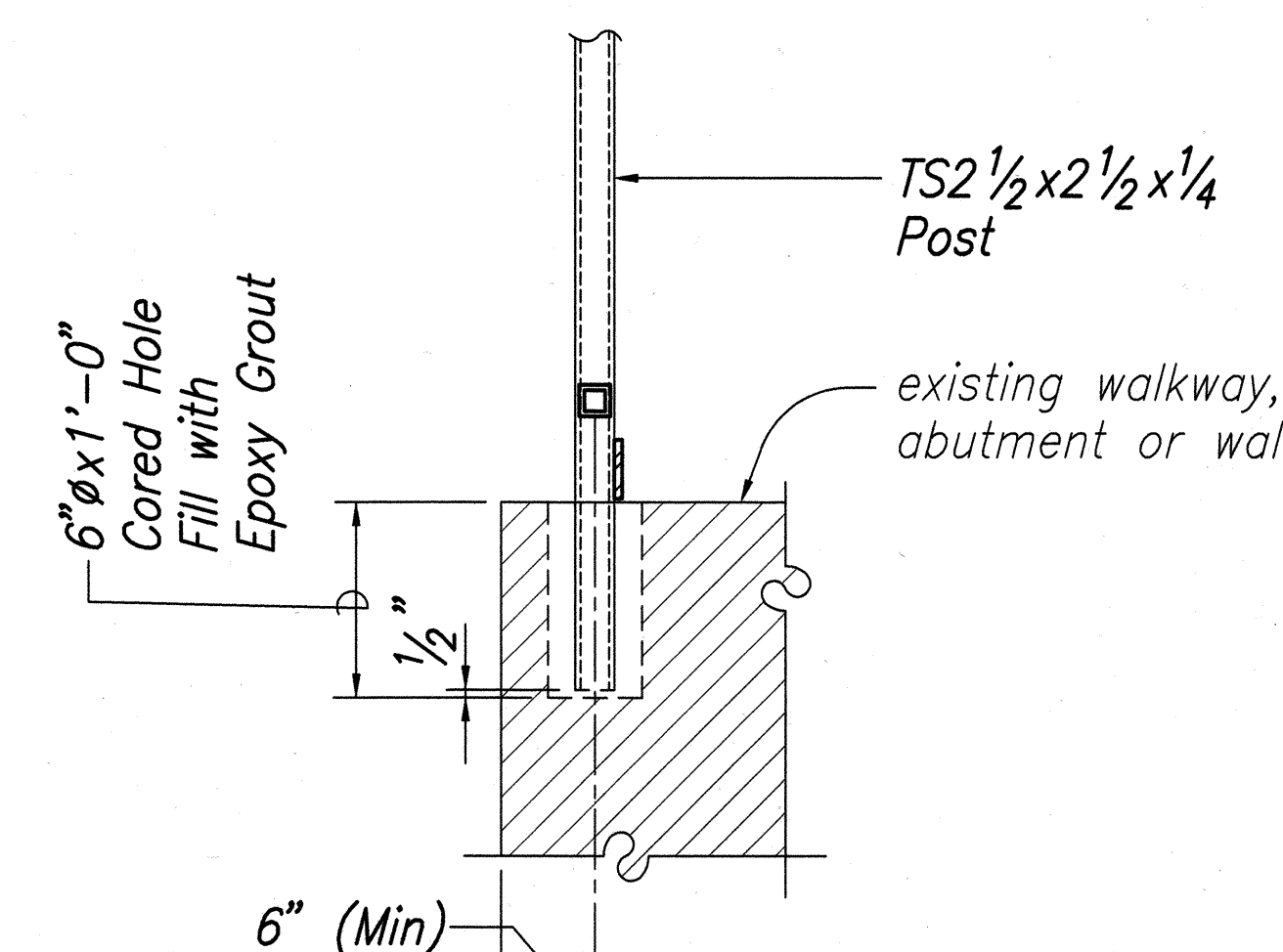
**SECTION 7**  
Scale 1" = 1'-0" S-5|S-11



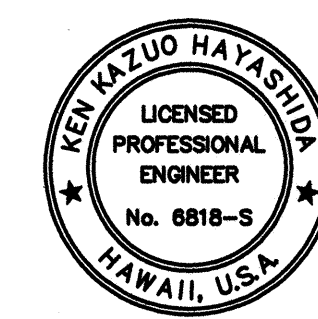
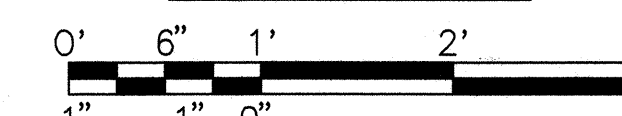
**SECTION 10**  
Scale 1" = 1'-0" S-5,S-7|S-11



**SECTION 4**  
Scale 1" = 1'-0" S-5|S-11



**SECTION 11**  
Scale 1" = 1'-0" S-8|S-11



2/12/02	Revised Handrail in Section 9 per Addendum No.2
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**PEDESTRIAN WALKWAY SECTIONS AND DETAILS**

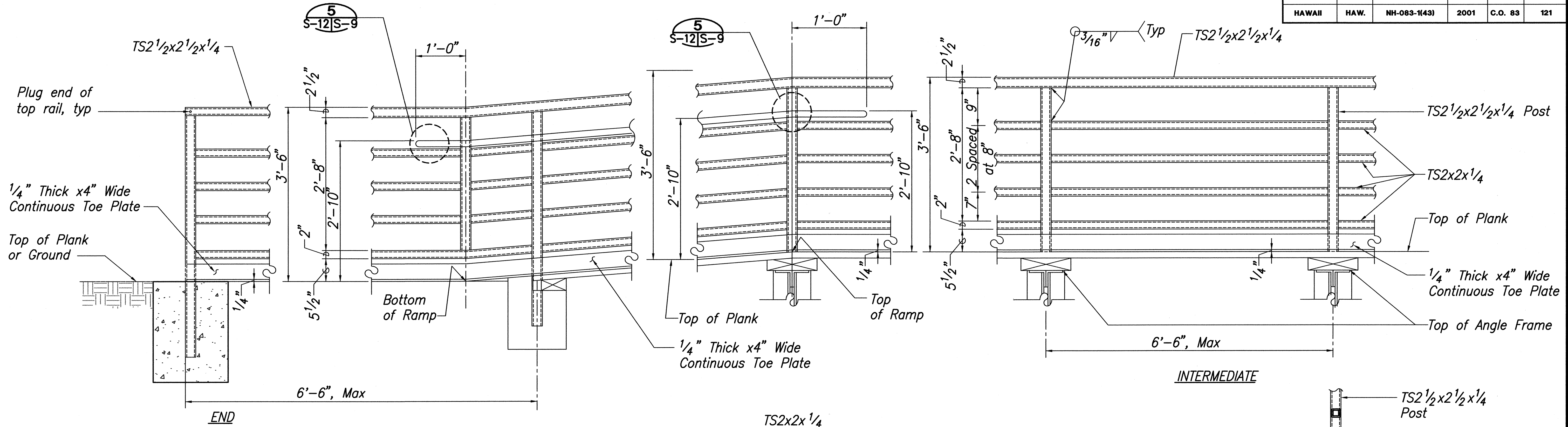
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: As Noted Date: October 29, 2001

SHEET No. S-11 OF 27 SHEETS

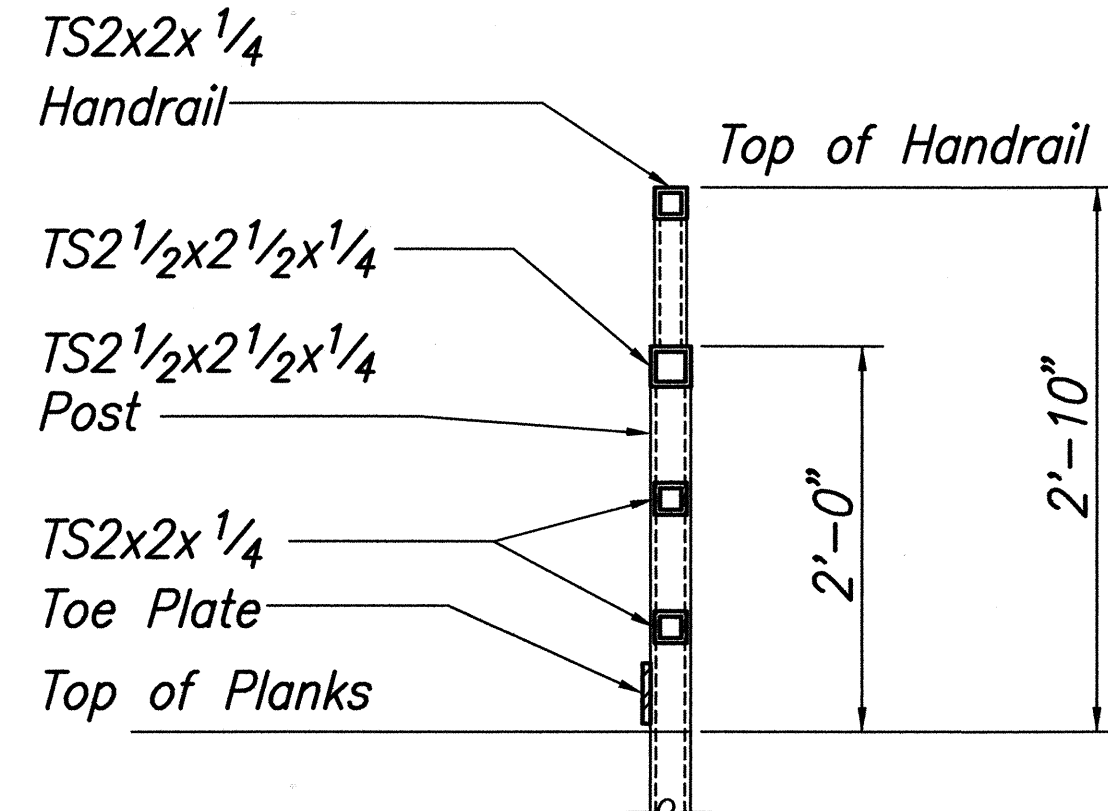


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 83	121

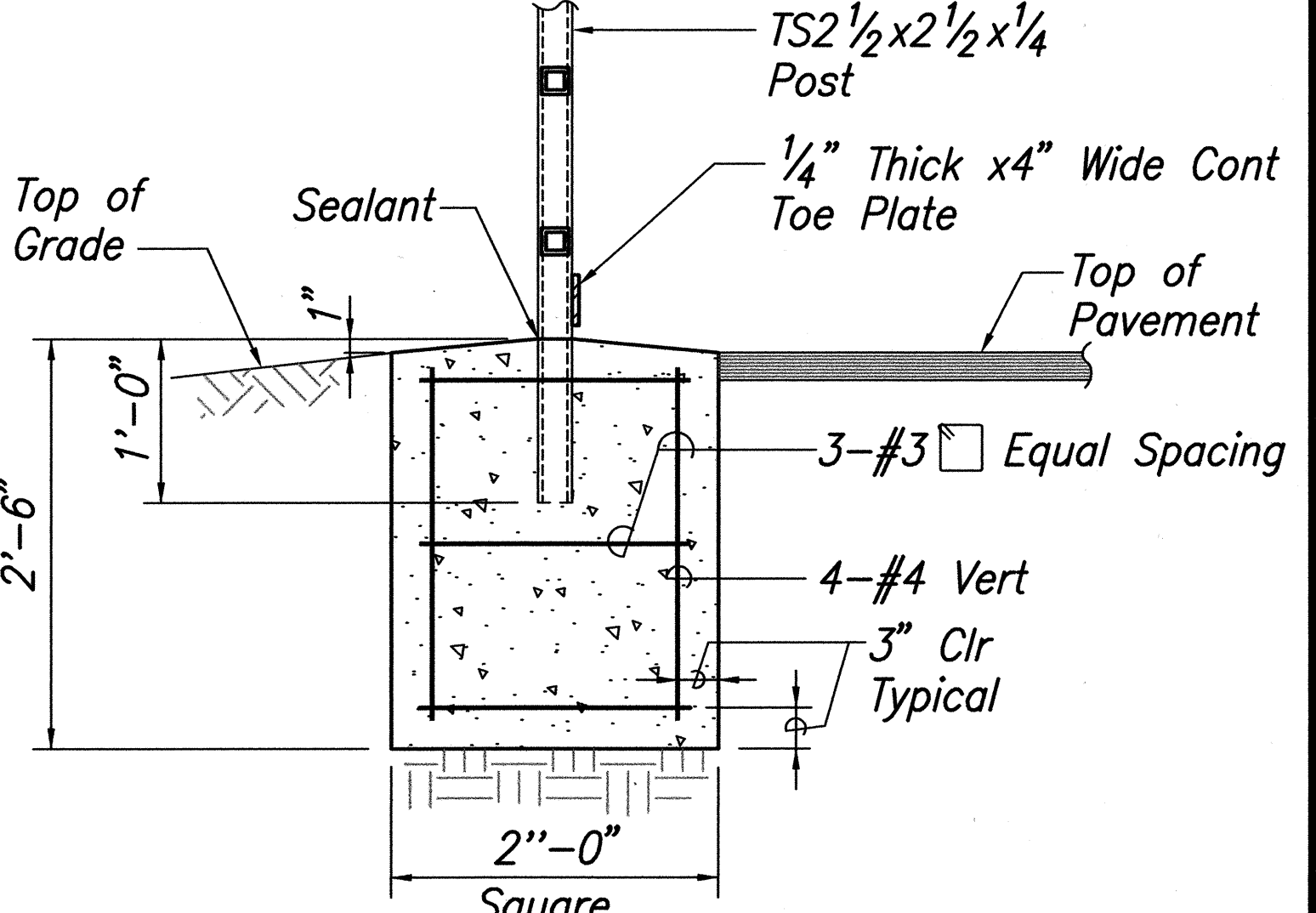


**TYPICAL PEDESTRIAN RAILING ELEVATION** 1  
Scale 1" = 1'-0"

**Notes:**  
1. All railing steel shall be Hot-Dipped Galvanized after fabrication.

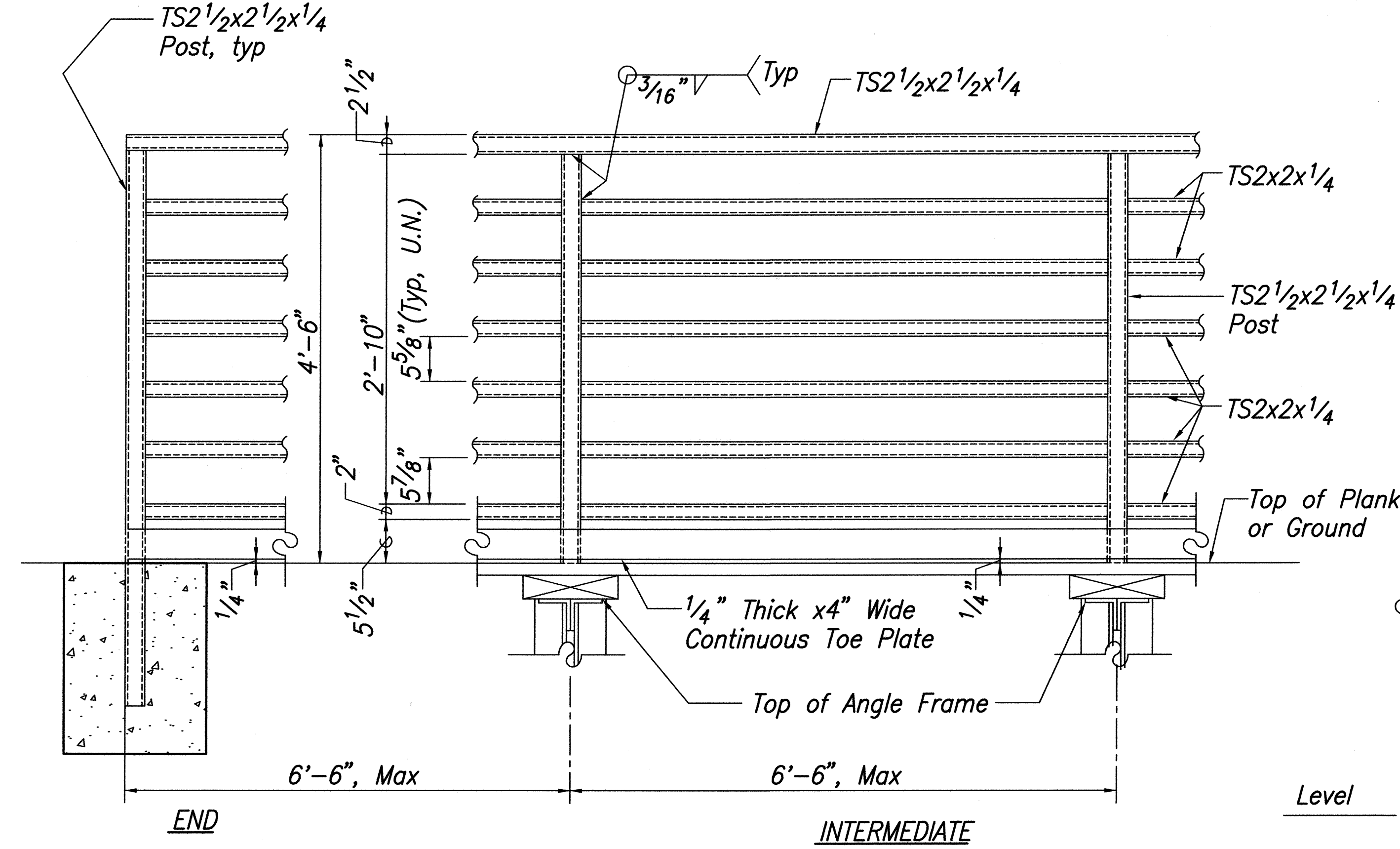


**SECTION A  
TYPICAL SECTION THRU  
HANDRAIL AT WALKWAY RAMPS** 4  
Scale 1" = 1'-0"



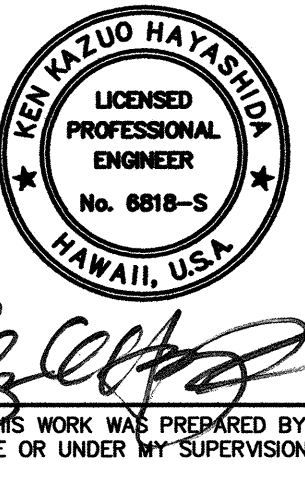
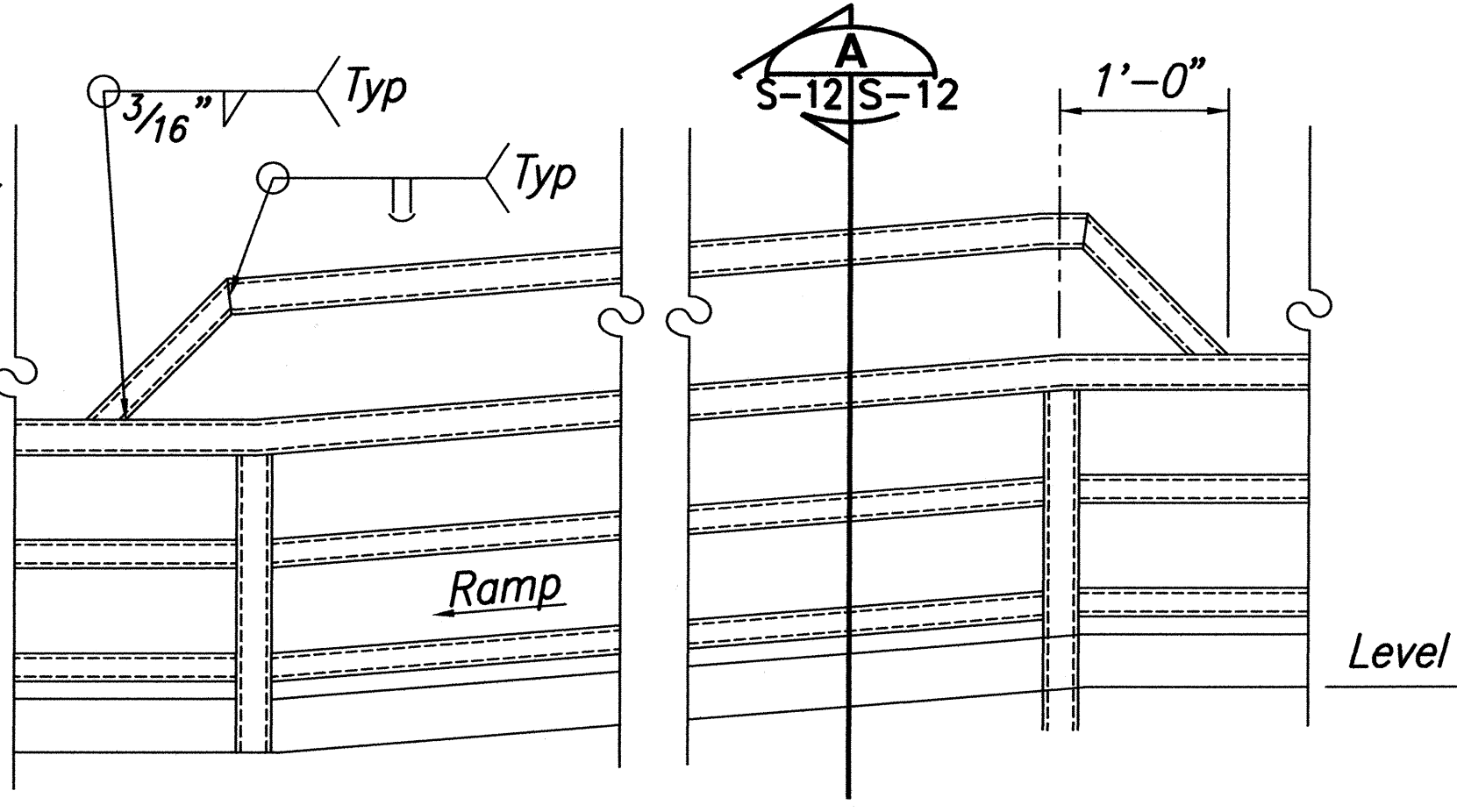
Note: Demolish, Remove and Dispose of Existing Concrete Posts.

**TYPICAL POST  
ON GRADE SECTION** 3  
Scale 1" = 1'-0"



**TYPICAL BICYCLE RAILING ELEVATION** 2  
Scale 1" = 1'-0"

**HANDRAIL DETAIL AT RAMP  
WAIHOLE AND MAKAUUA BRIDGES ONLY** 4  
Scale 1" = 1'-0"

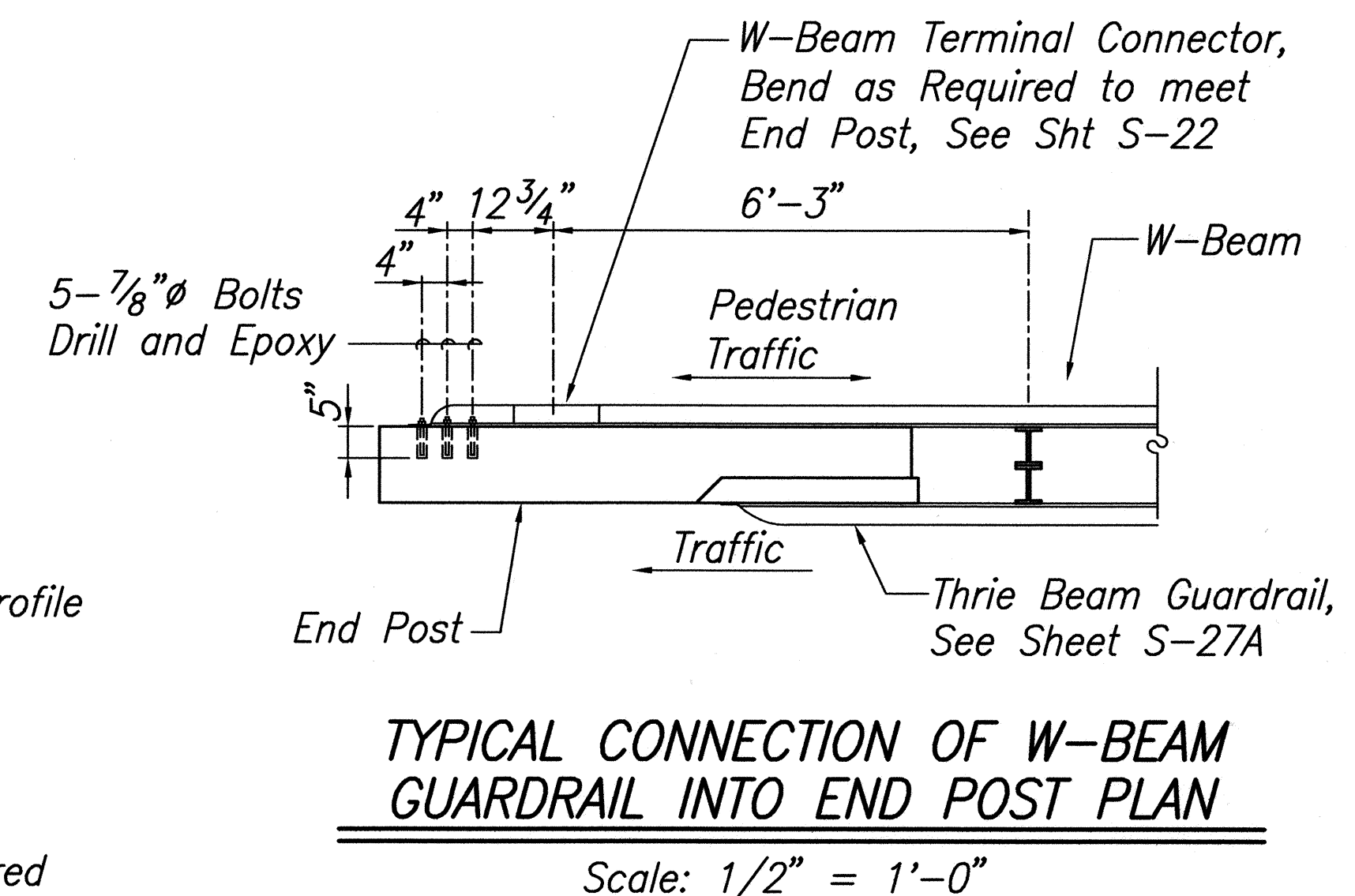
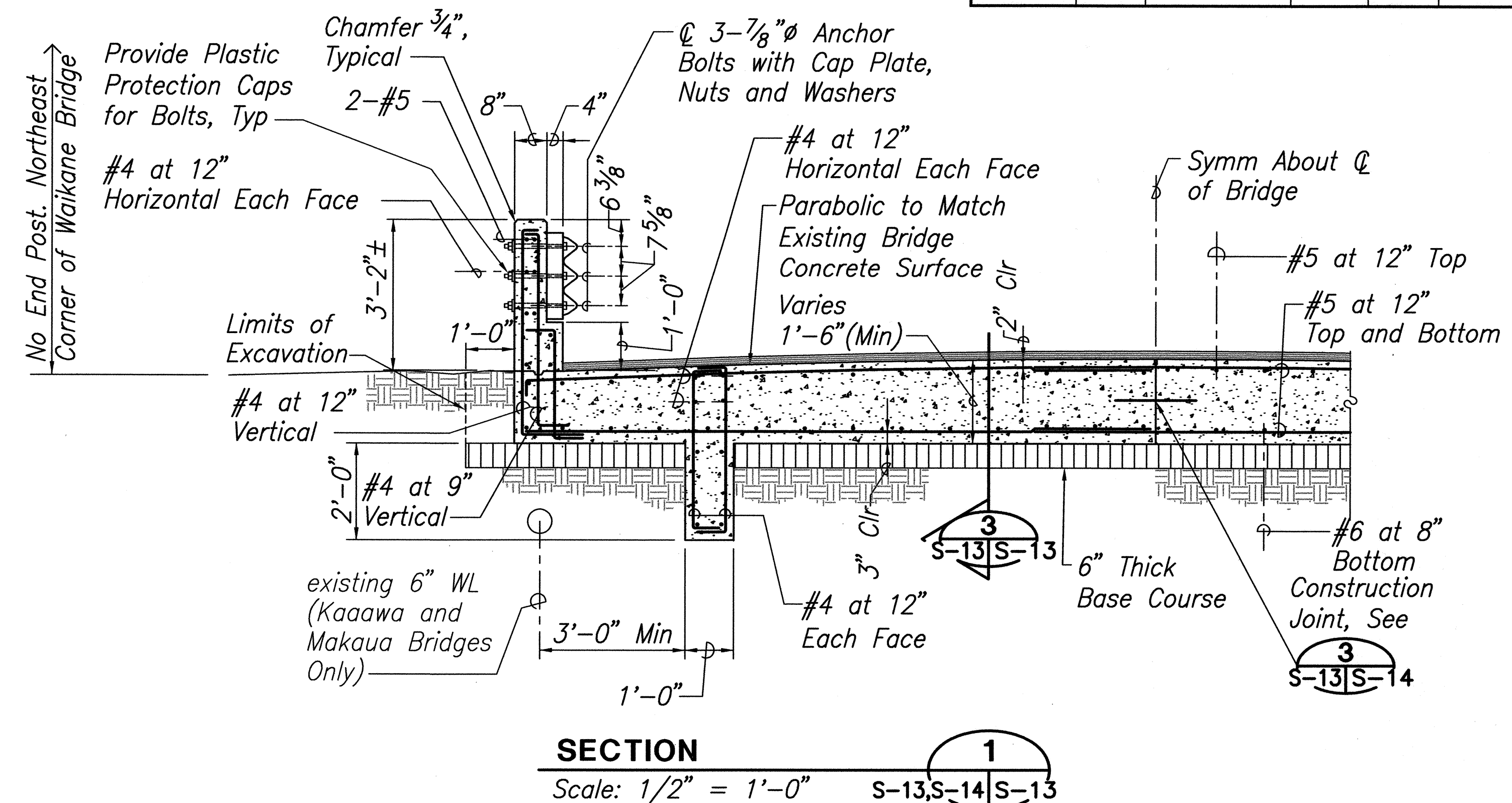
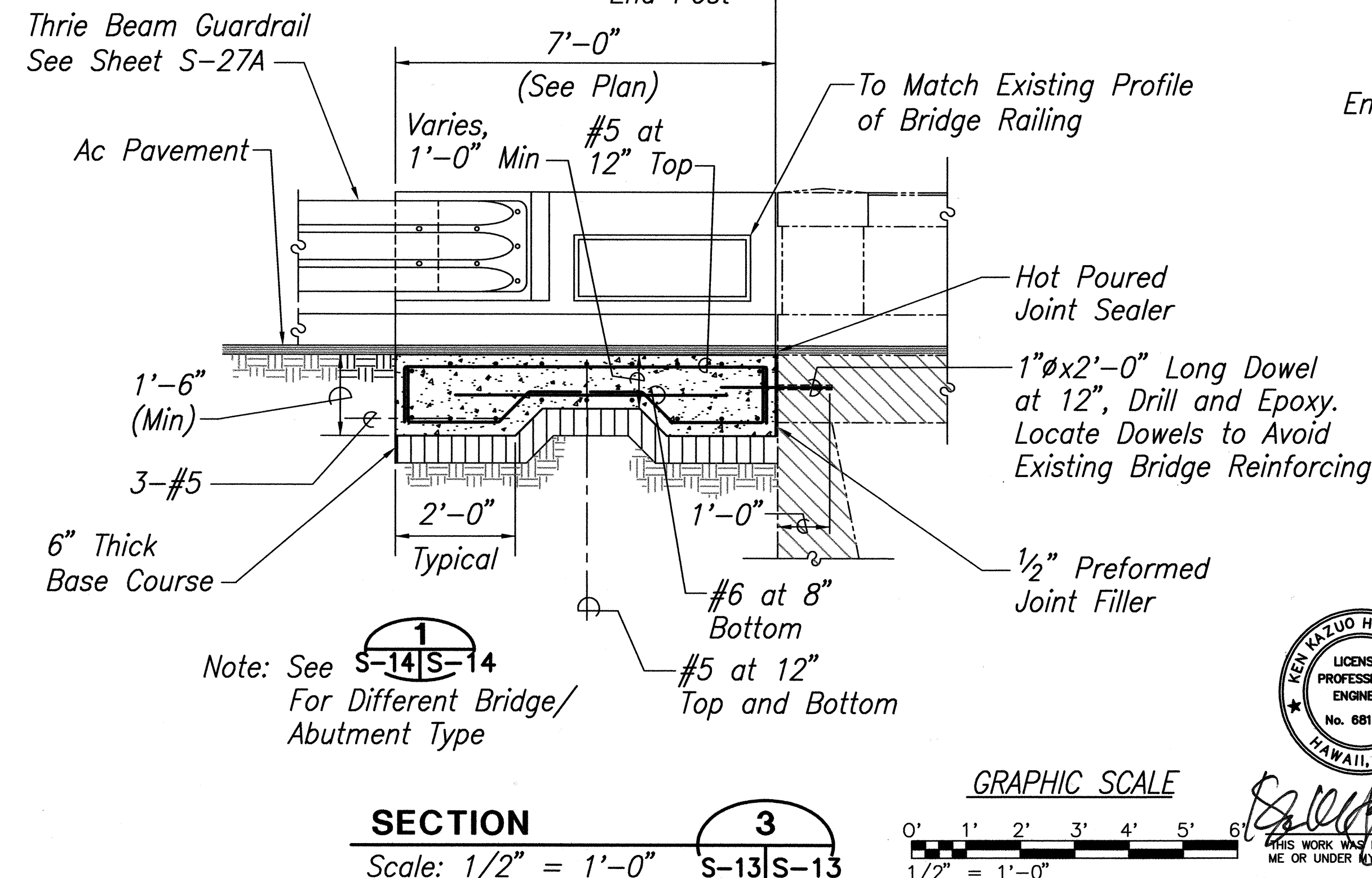
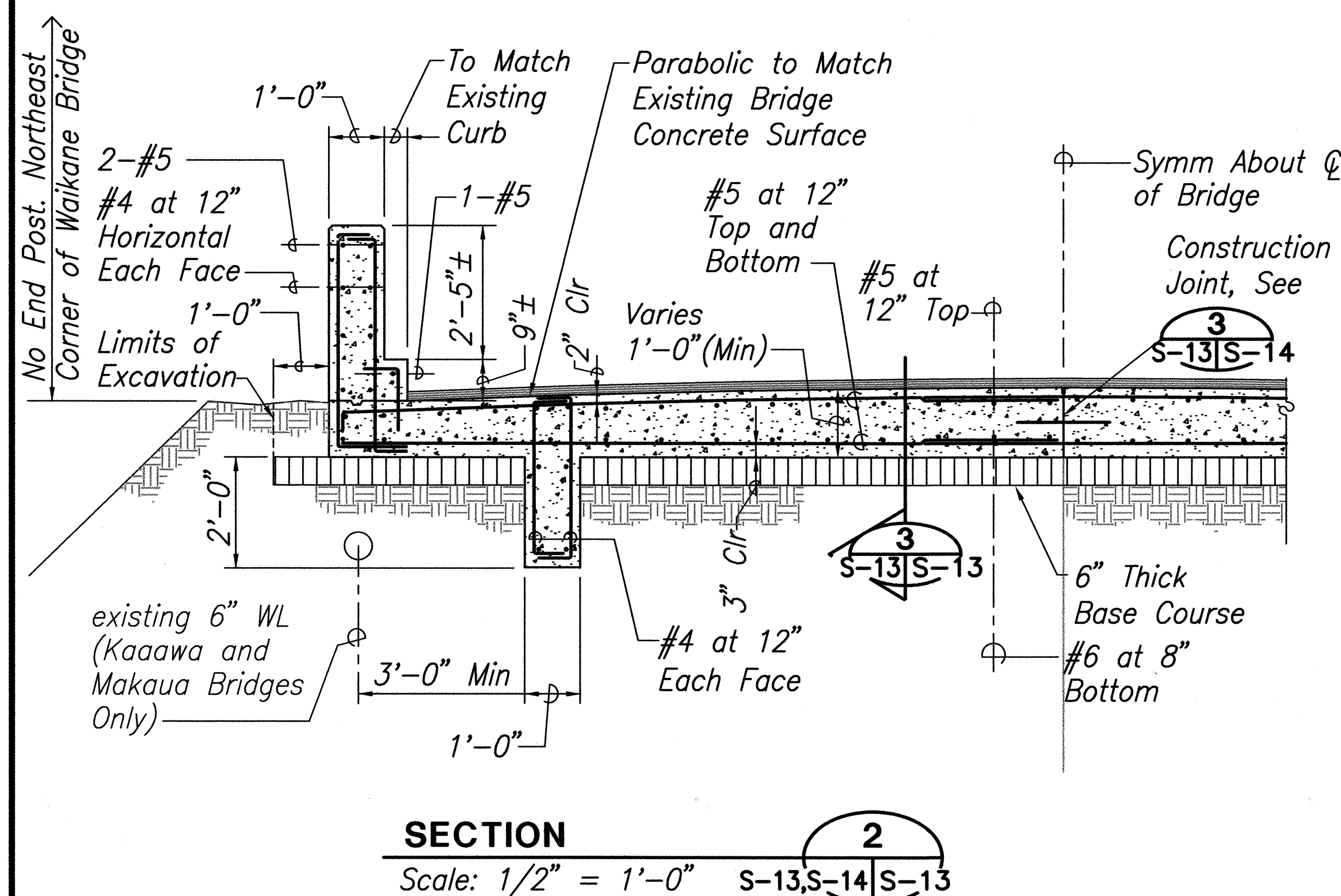
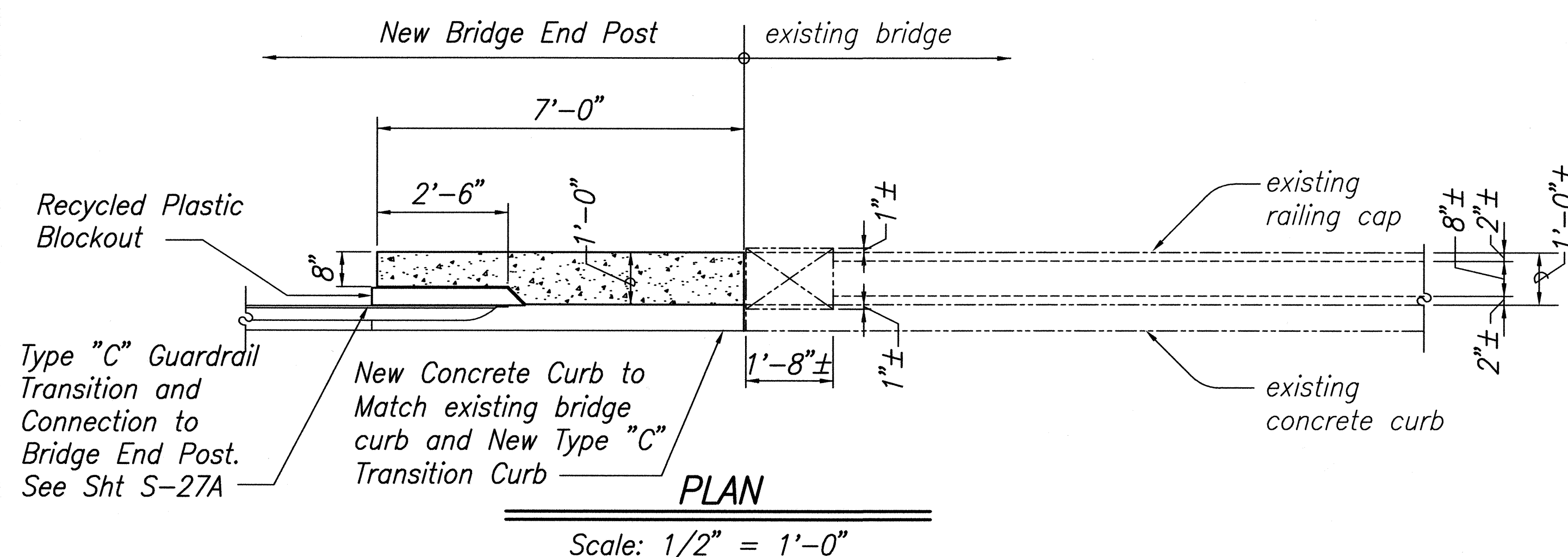
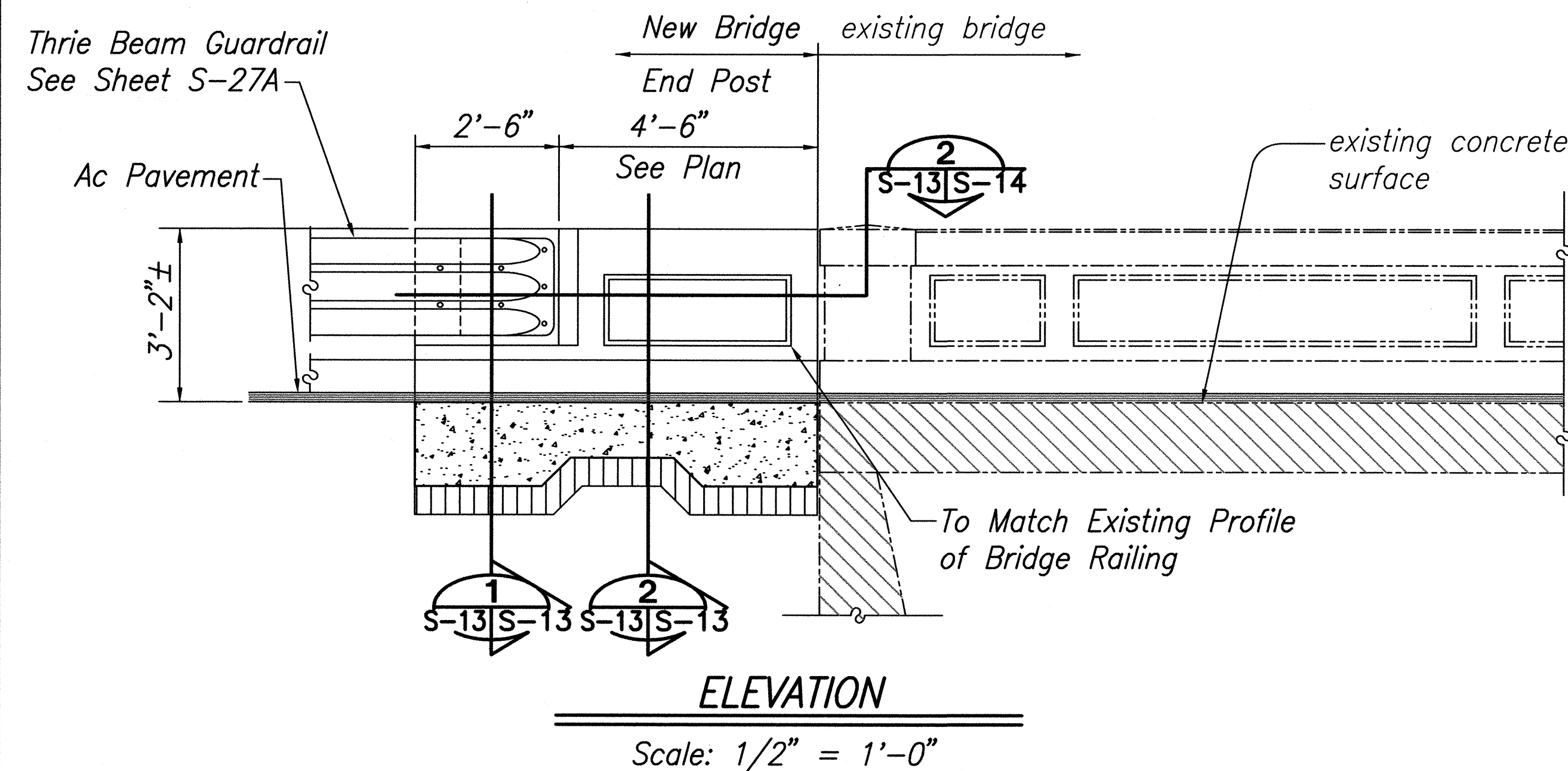


5/30/02	Revised rail spacing, Elevation 2, per Change Order
2/12/02	Revised Handrail Design per Addendum No.2
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>TYPICAL BIKE/PEDESTRIAN            RAILING DETAILS</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: As Noted Date: October 29, 2001 SHEET No. S-12 OF 27 SHEETS	

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	
NOTE BOOK	
QUANTITIES BY	
CHECKED BY	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 84	121



5/7/03	Added Type "C" Guardrail Transition at End Post, Revised End Post Curb
3/07/03	Revised W-Beam Connection Detail
Date	Revision

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

TYP END POST DETAILS

END RAIL POST PLAN

SECTIONS AND DETAILS

KAMEHAMEHA HIGHWAY RESURFACING

Waiahole Valley Road to Crouching Lion Inn

Federal Aid Project No. NH-083-1(43)

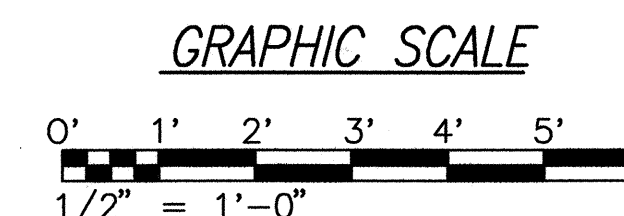
Scale: As Noted

Date: October 29, 2001

SHEET No. S-13 OF 27 SHEETS

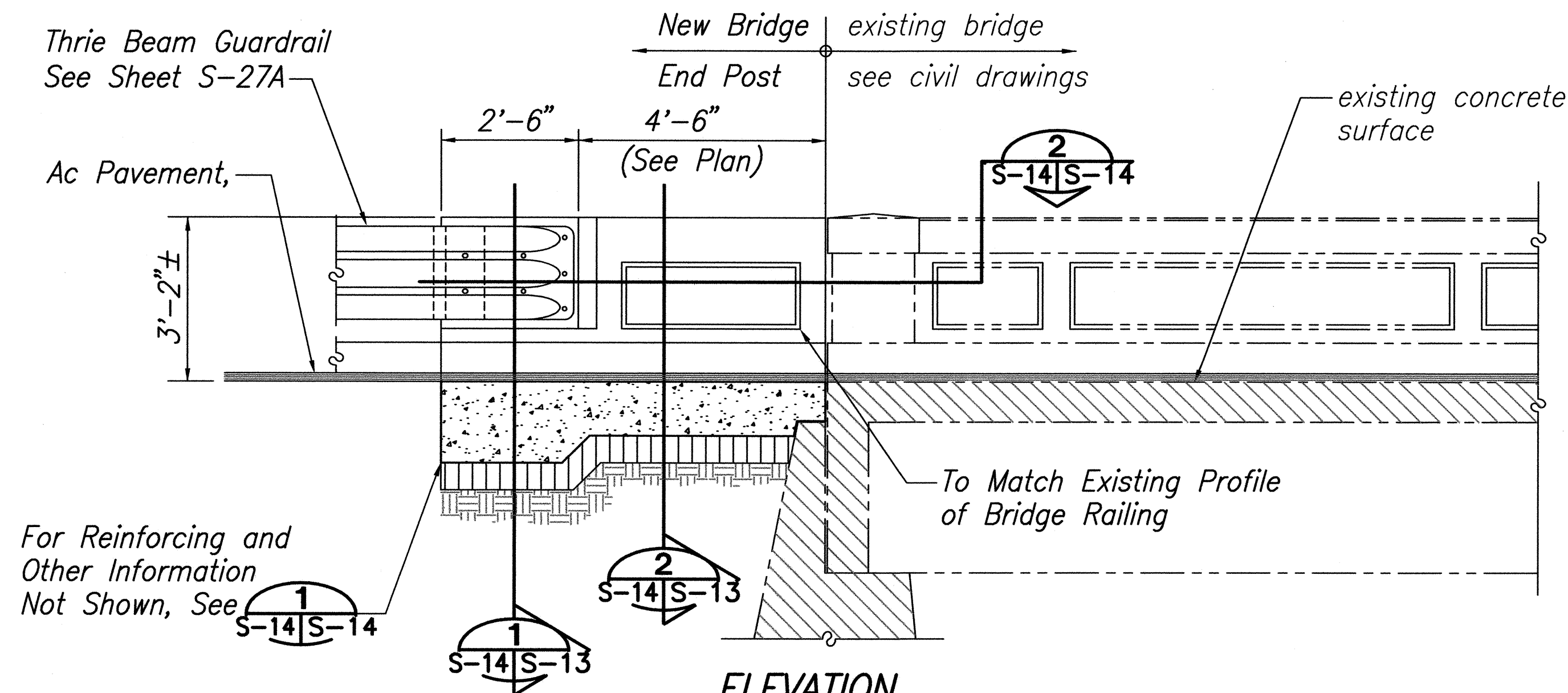
C.O. 84

DATE	_____
SURVEY PLOTTED BY	_____
ORIGINAL PLAN	_____
DESIGNED BY	_____
NOTED BY	_____
CHECKED BY	_____
NO.	_____



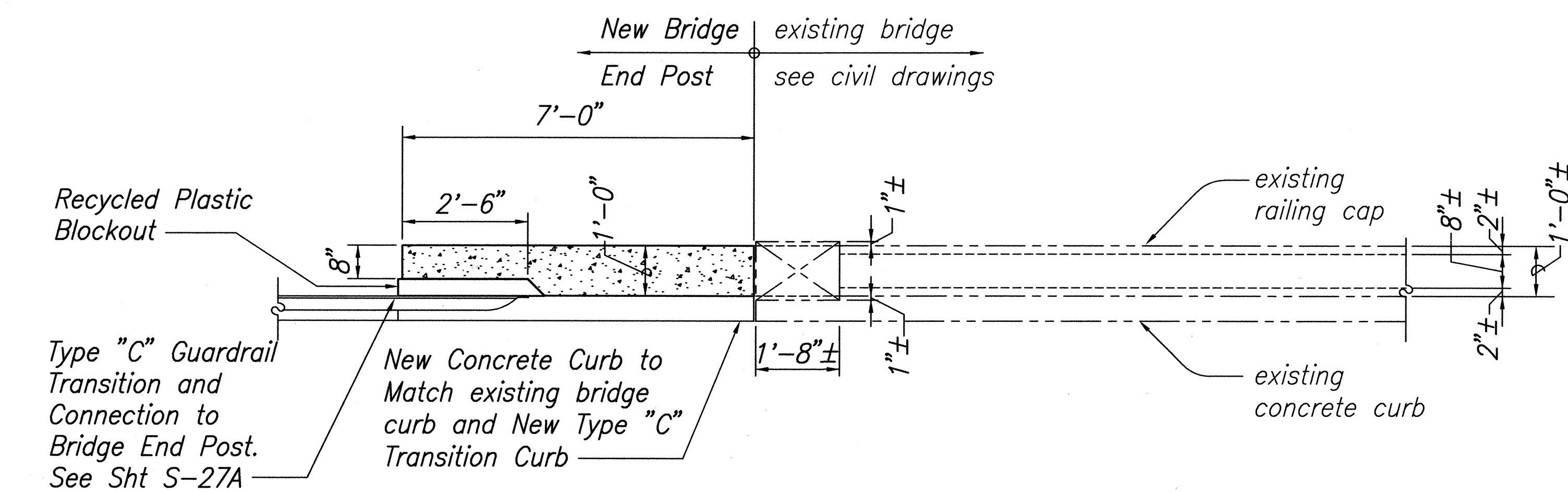


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 85	121



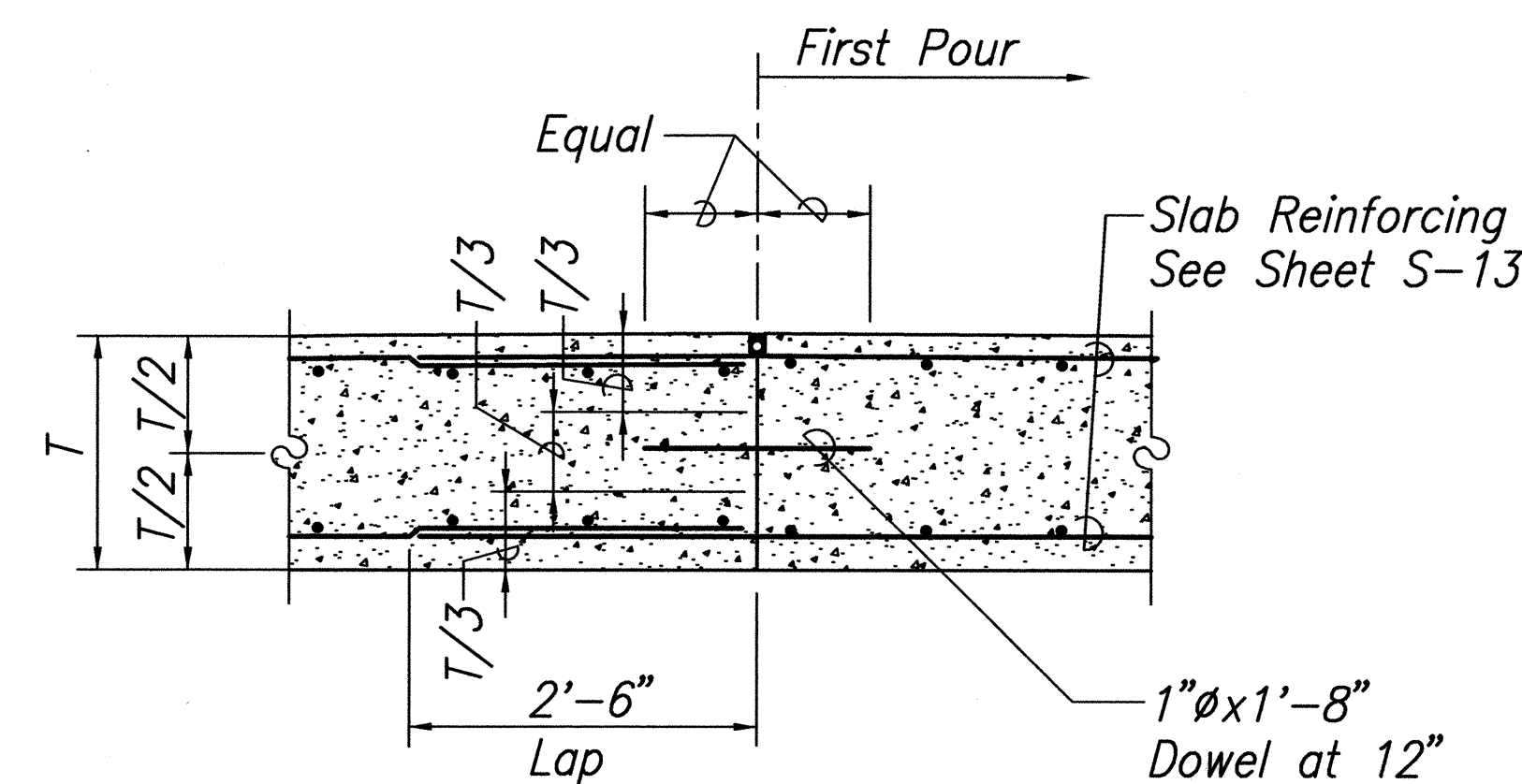
**ELEVATION**

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



**PLAN**

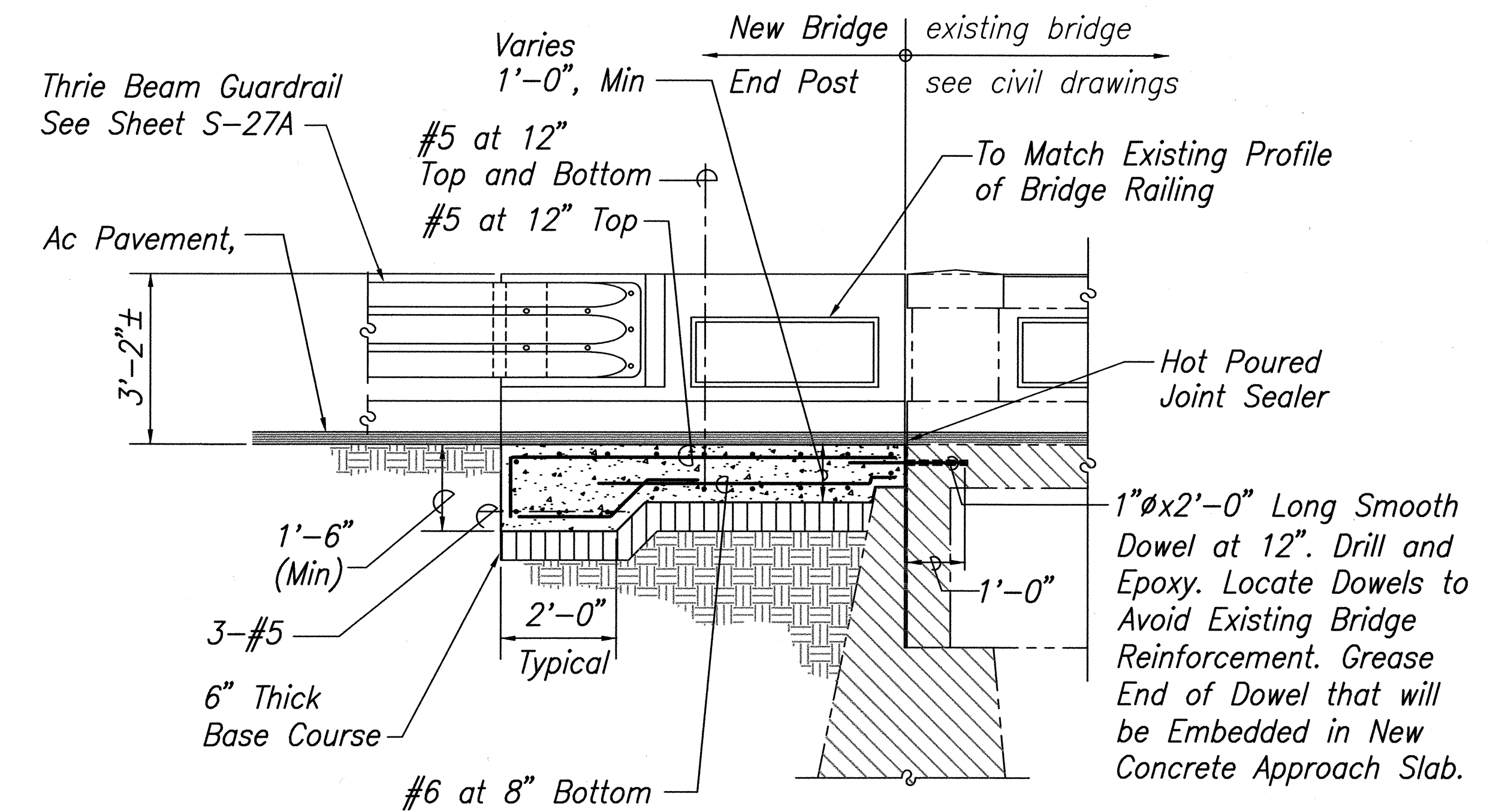
Scale: 1/2" = 1'-0"



**APPROACH SLAB CONSTRUCTION JOINT DETAIL**

Not to Scale

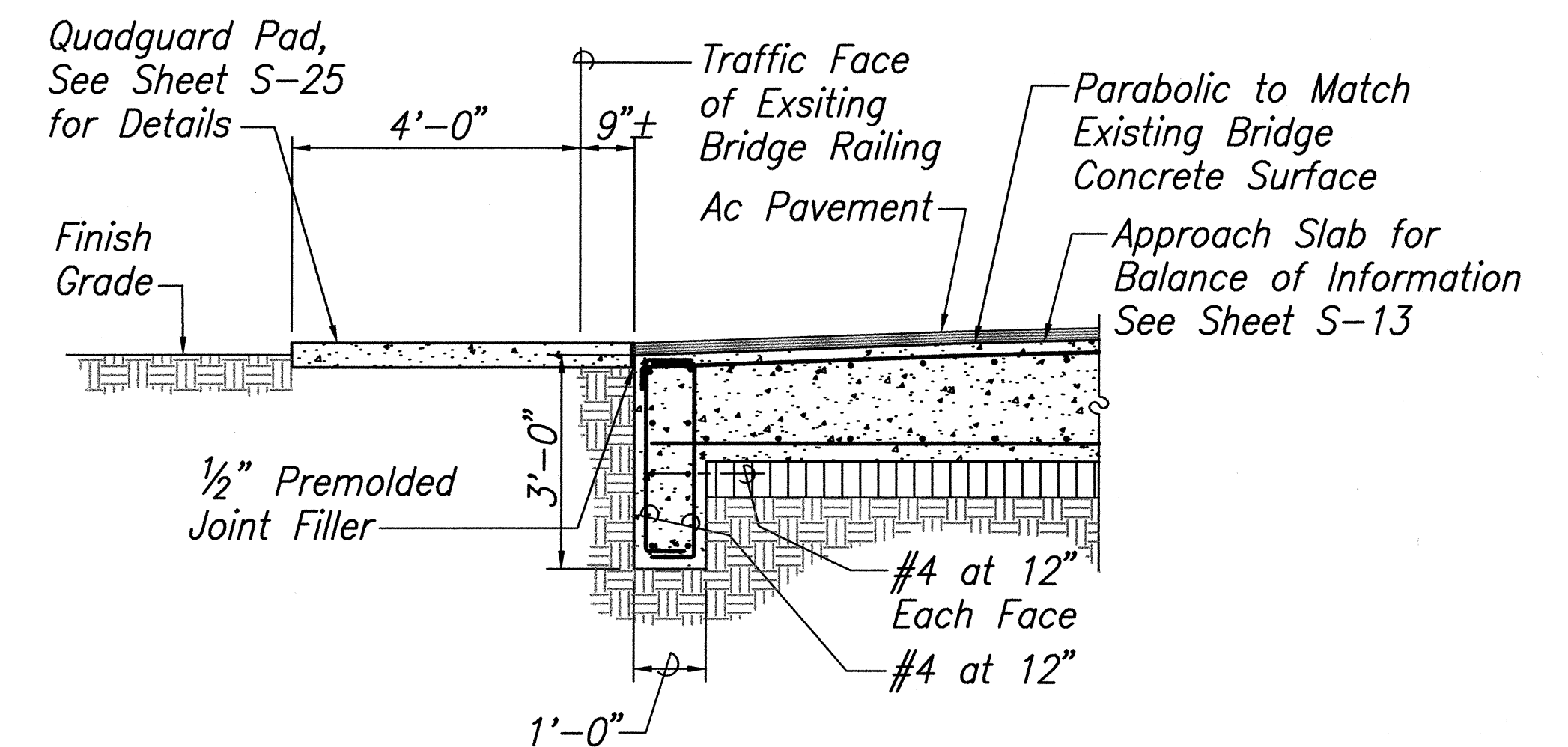
3  
S-13 S-14



**SECTION**

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

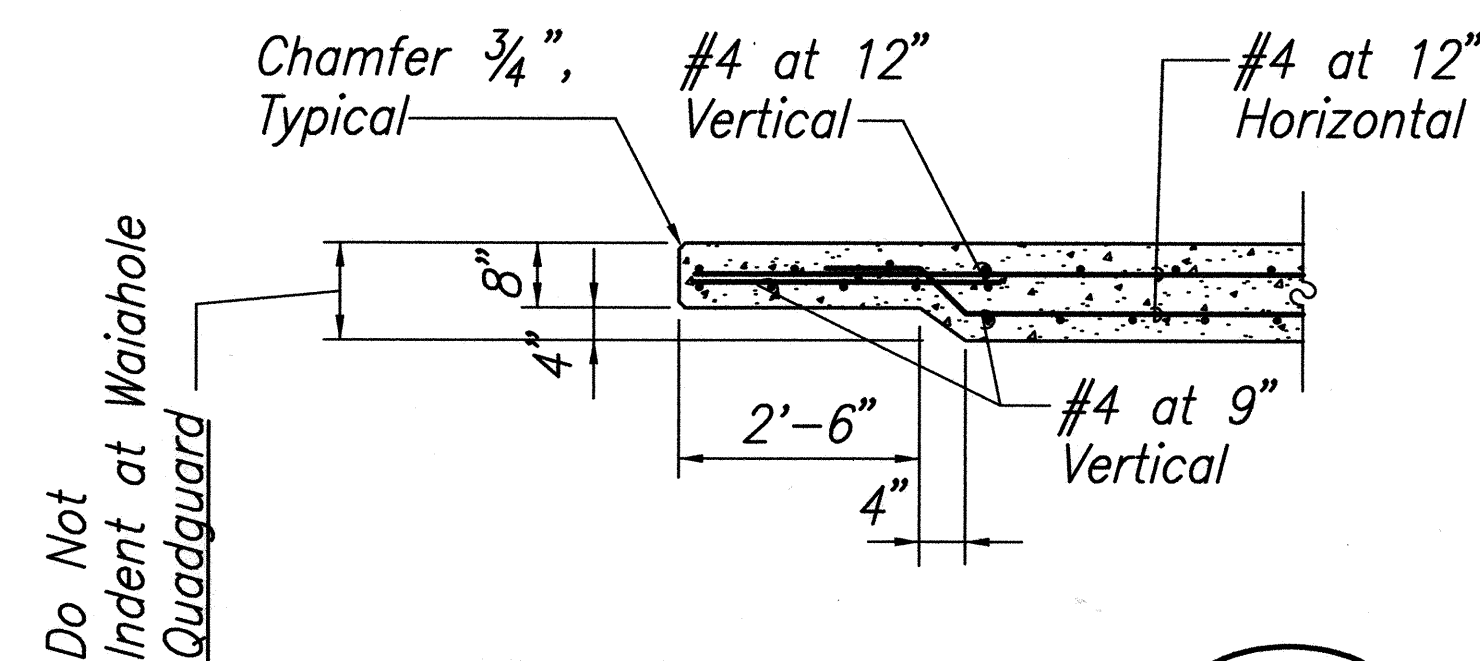
1  
S-14 S-14



**SECTION**

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

4  
S-5 S-14

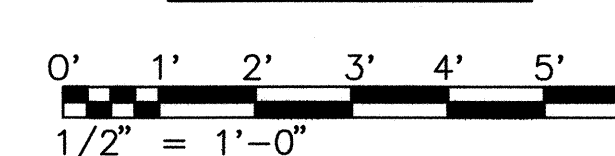


**SECTION**

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

2  
S-13 S-14 S-14

**GRAPHIC SCALE**



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

5/7/03	Added Type "C" Guardrail Transition at End Post, Revised End Post Curb
2/4/02	Revised Note, Section 1
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**TYPICAL END POST DETAILS**  
**END RAIL POST PLAN,**  
**SECTIONS AND DETAILS**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waialeale Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

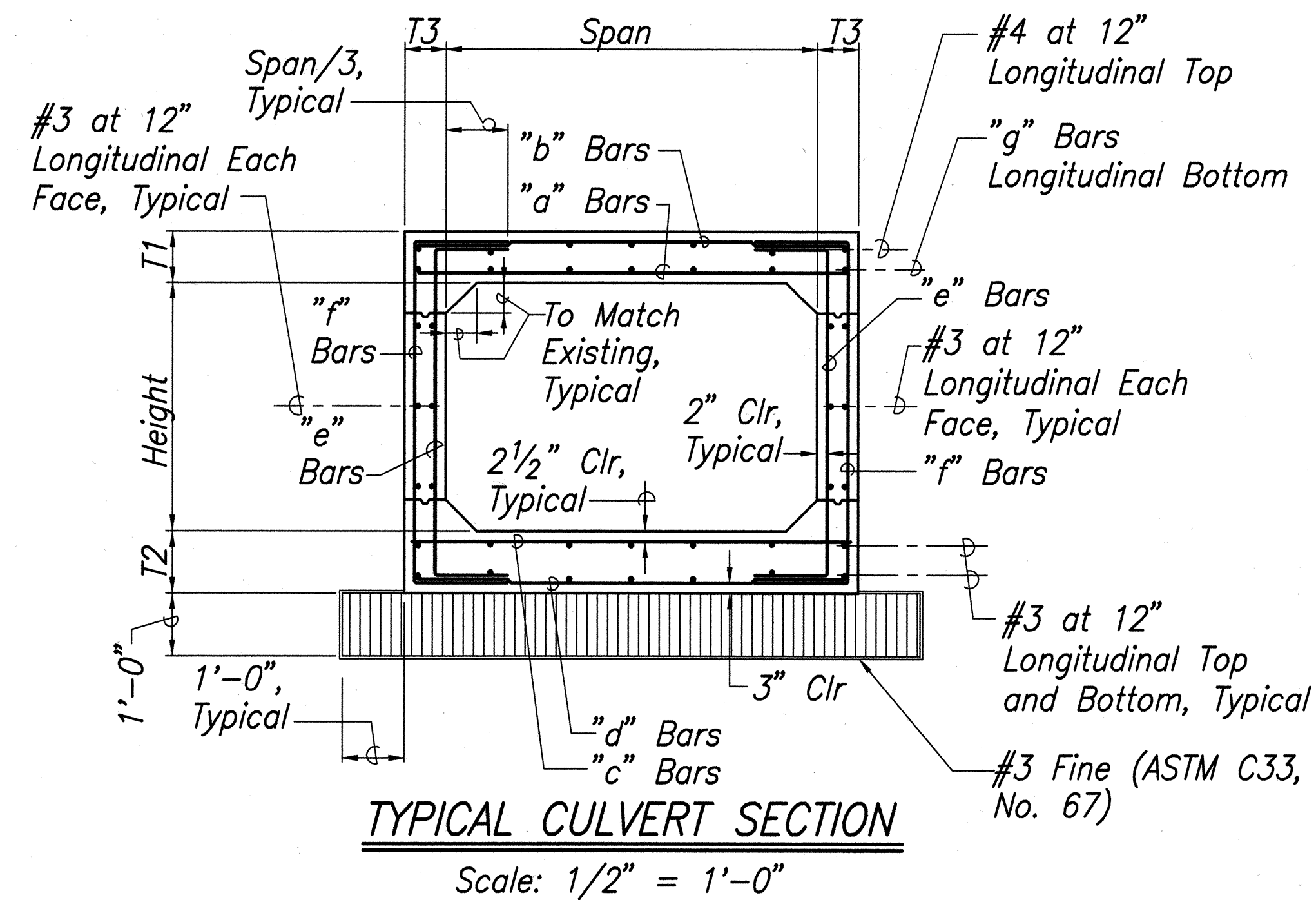
Scale: As Noted Date: October 29, 2001

SHEET No. S-14 OF 27 SHEETS

C.O. 85

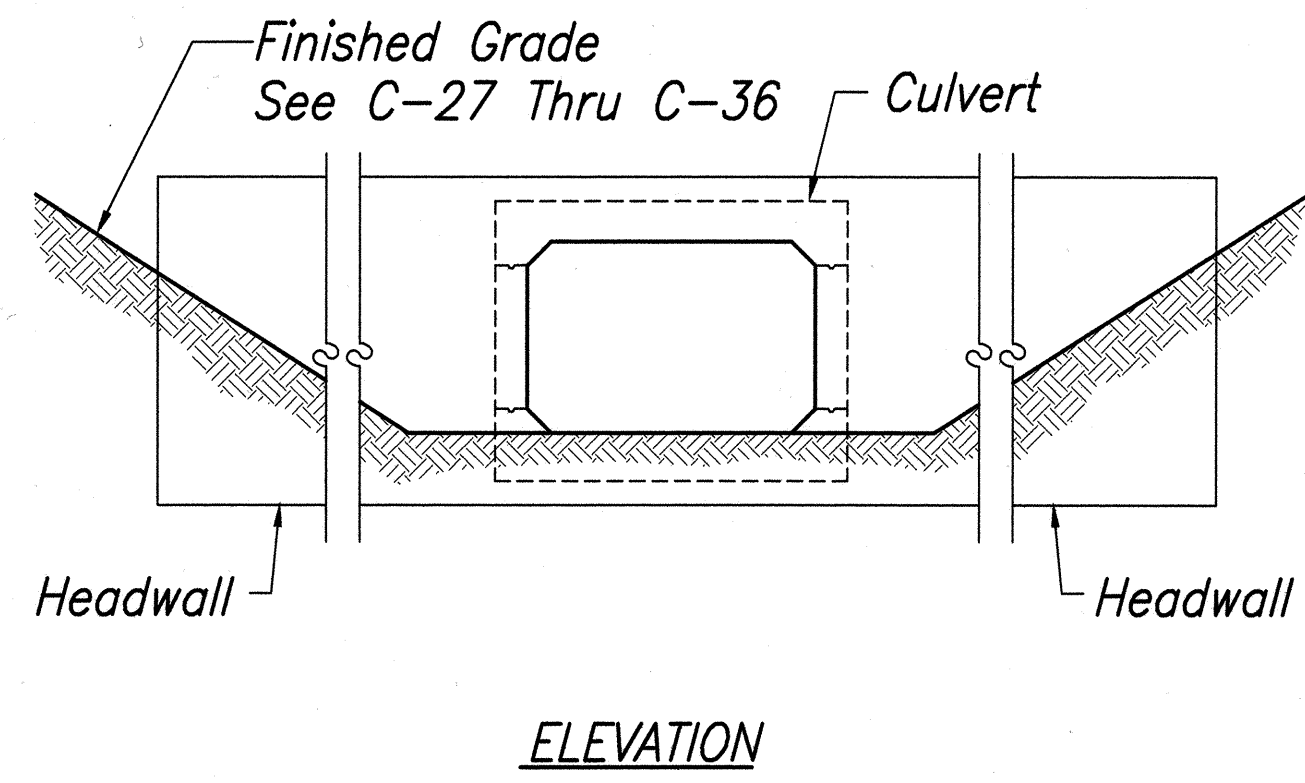
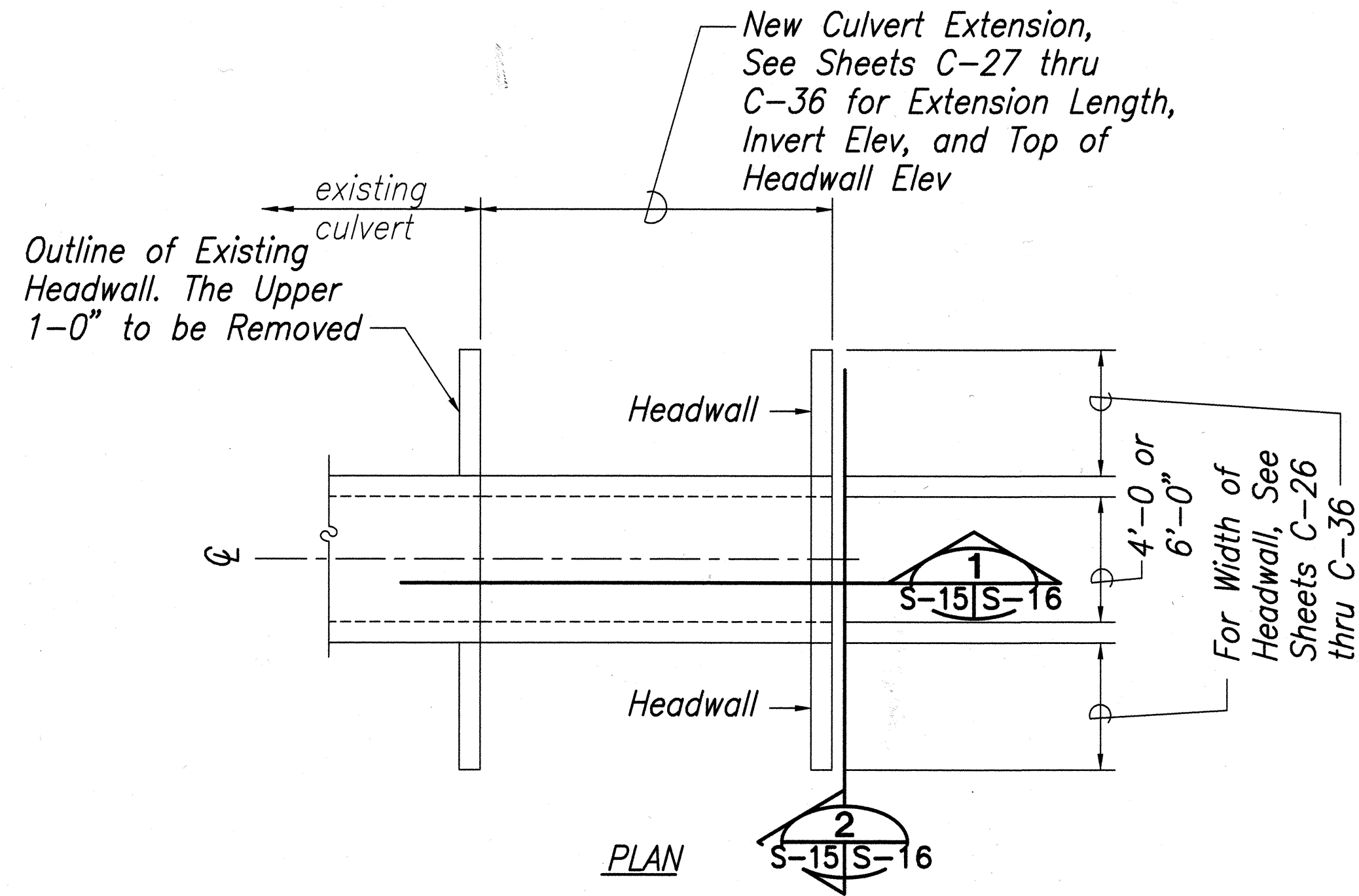


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 86	121



Note: See 4  
S-2S-2 for Construction Joint Detail

CULVERT SCHEDULE		
Span	4'-0"	6'-0"
Height	4'-0"	3.3' or 4'-0"
Top Slab T1	8"	1'-0"
Bottom Slab T2	1'-0"	1'-0"
Sidewall T3	8"	8"
"a" Bars	#6 at 6"	#6 at 8"
"b" Bars	#4 at 12"	#4 at 10"
"c" Bars	#4 at 6"	#6 at 8"
"d" Bars	#4 at 8"	#4 at 10"
"e" Bars	#4 at 12"	#4 at 12"
"f" Bars	#4 at 12"	#4 at 12"
"g" Bars	#6 at 12"	#5 at 12"
remarks		



**TYPICAL 4'-0" AND 6'-0" WIDE CULVERT**  
Scale: 1/4" = 1'-0"

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



THIS WORK WAS PREPARED BY  
ME OR UNDER MY SUPERVISION

2/4/02	Deleted 10' and 12' Culvert Details
Date	Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**TYP BOX CULVERT EXTENSION SECTIONS AND DETAILS**

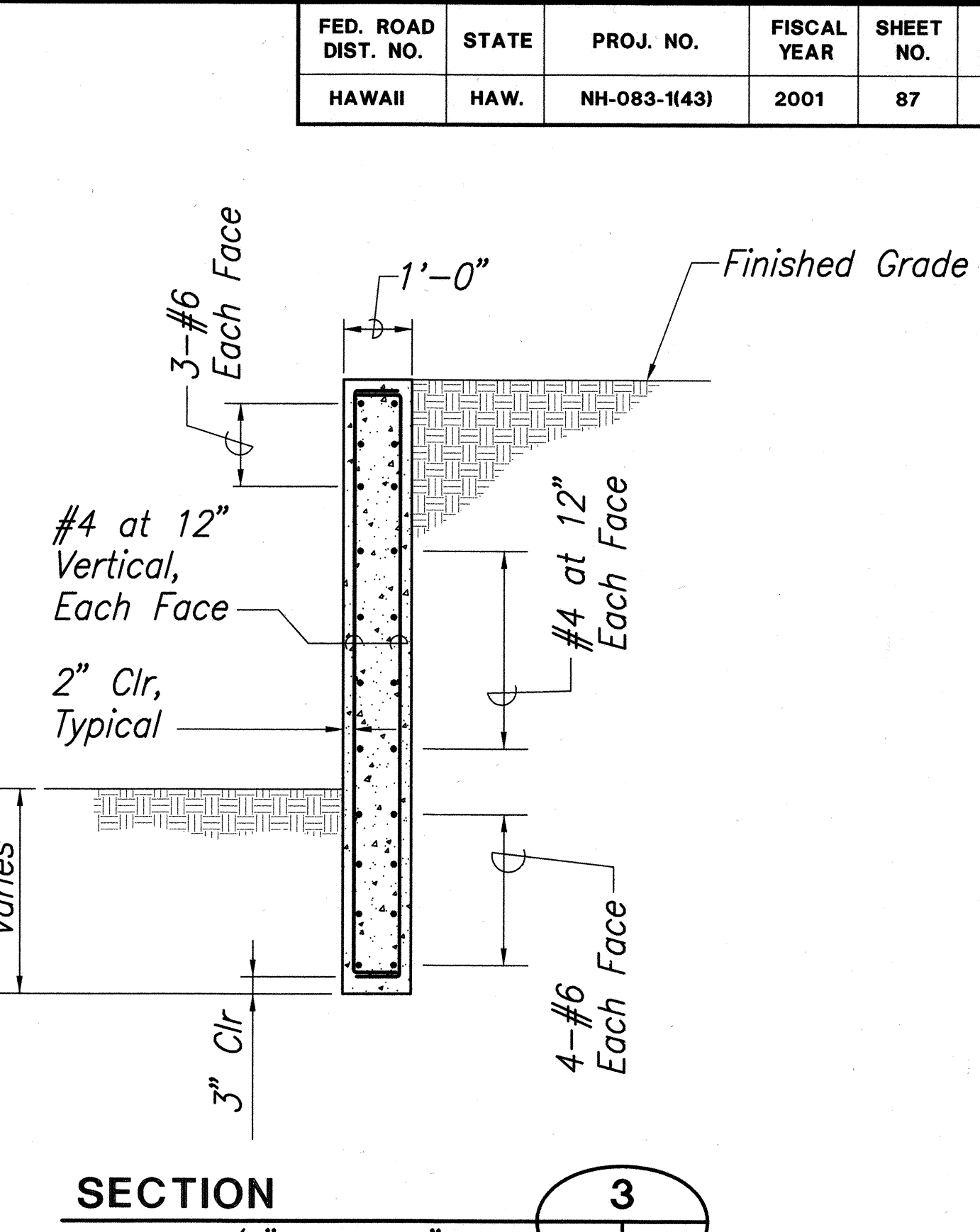
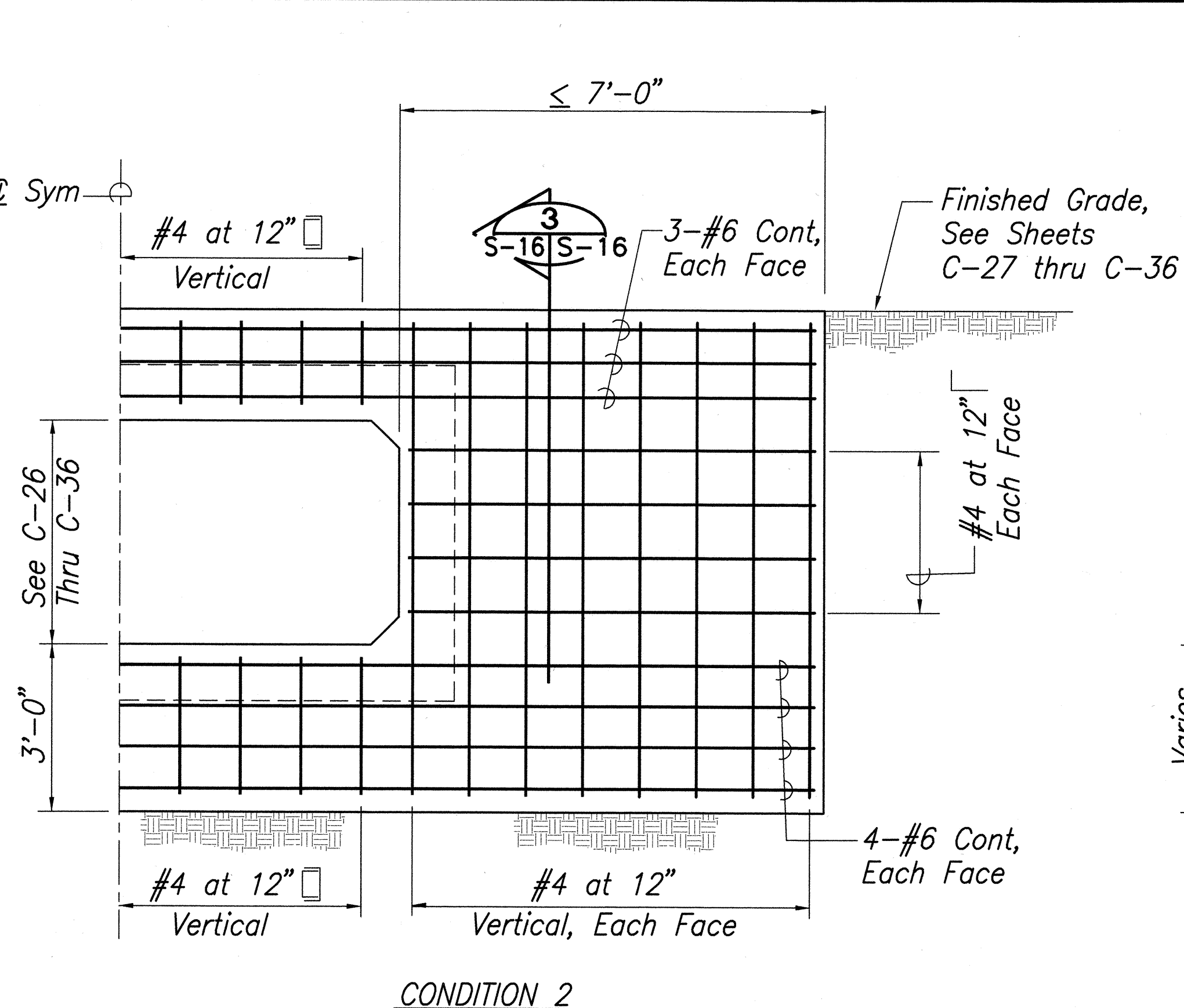
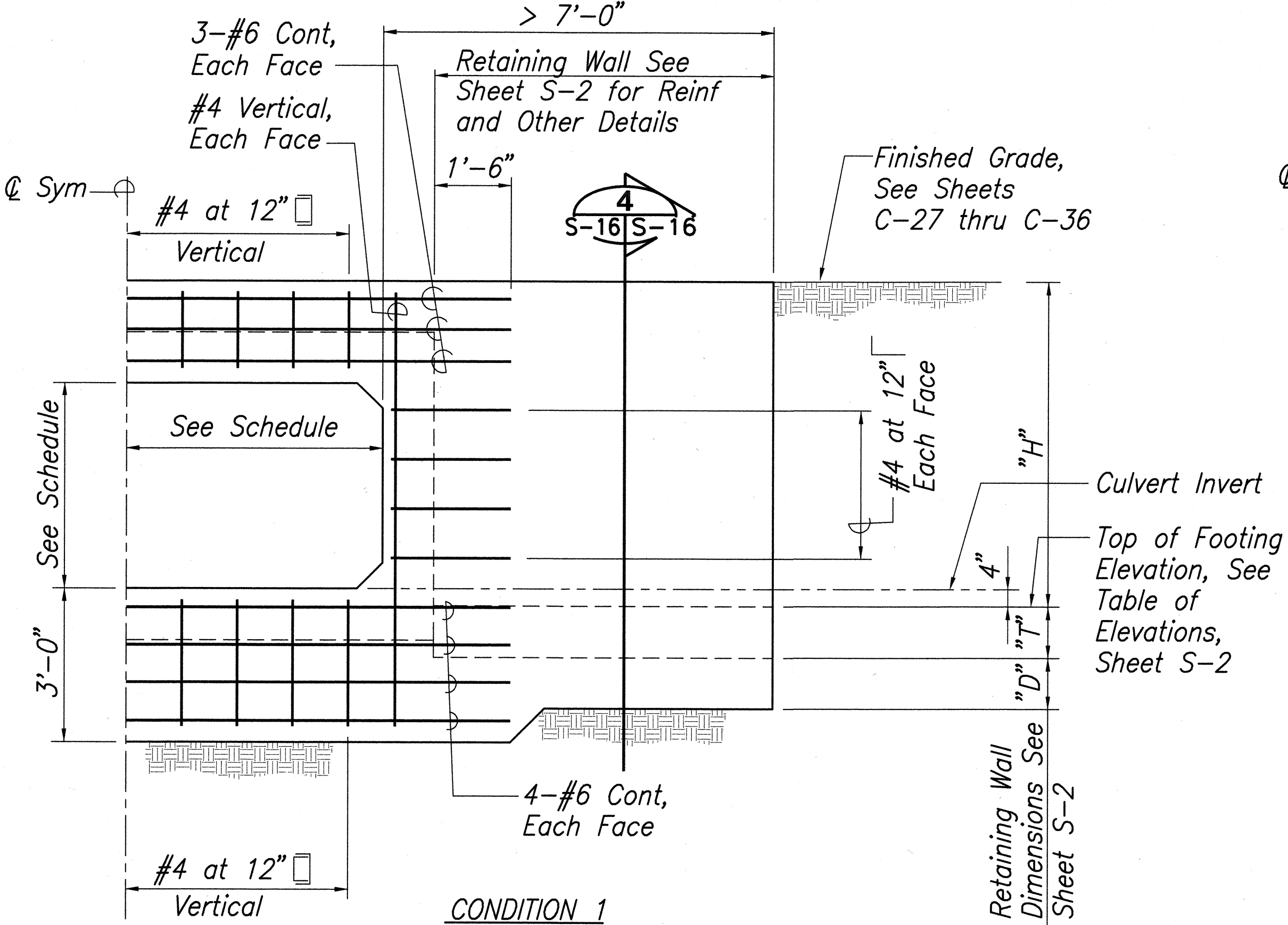
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: As Noted Date: October 29, 2001

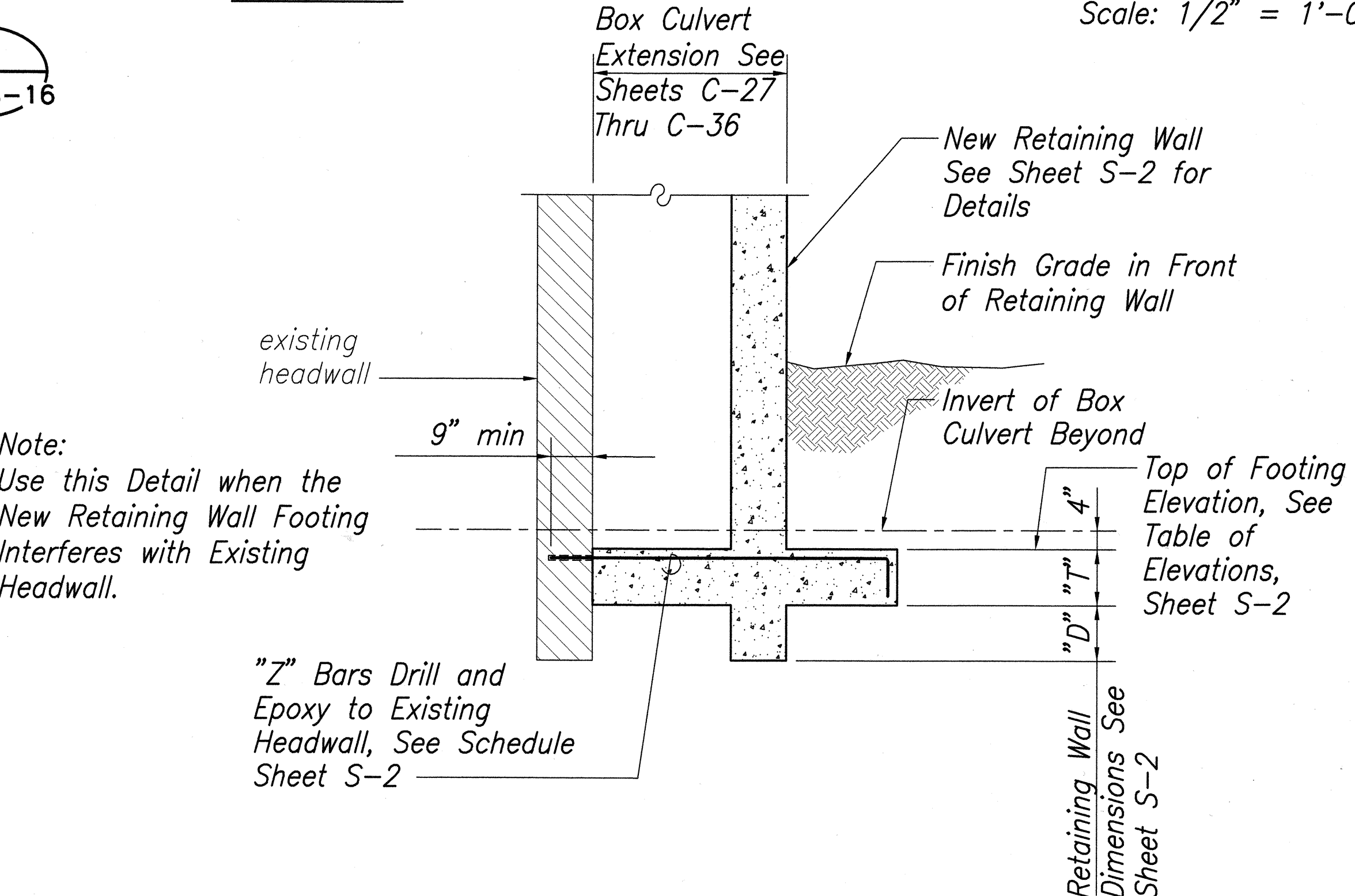
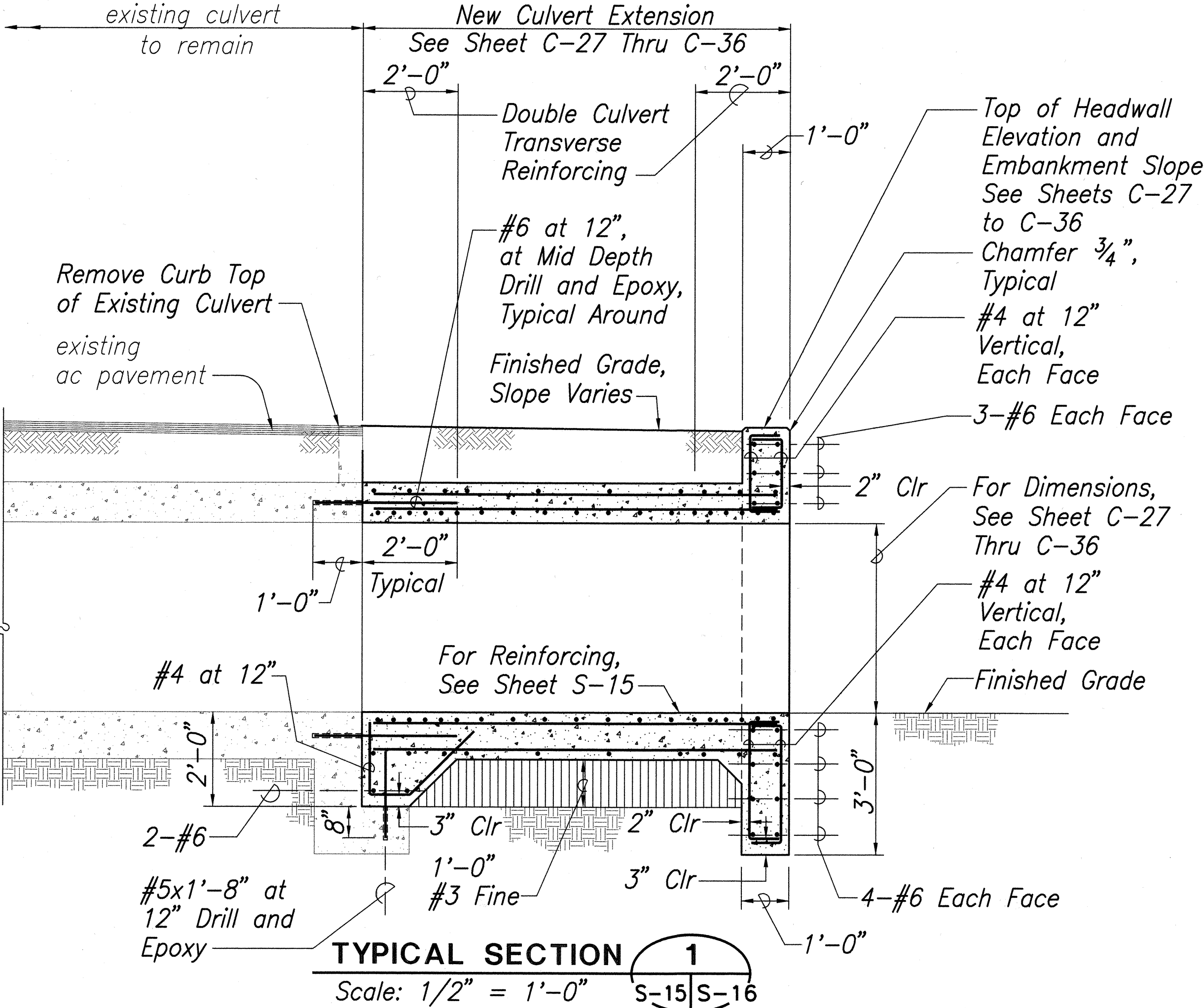
SHEET No. S-15 OF 27 SHEETS



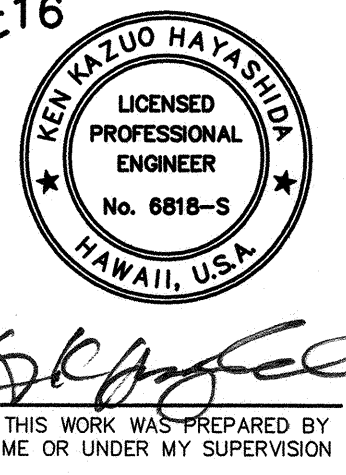
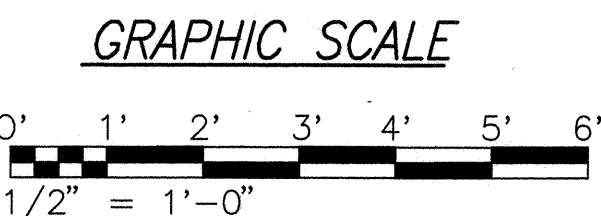
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	87	121



**PART ELEVATION-NEW HEADWALL**  
Scale: 1/2" = 1'-0"  
S-15 | S-16



**RETAINING WALL FOOTING TO EXISTING HEADWALL CONNECTION DETAIL**  
Scale: 1/2" = 1'-0"  
S-16 | S-16



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**TYP BOX CULVERT EXTENSION SECTIONS AND DETAILS**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

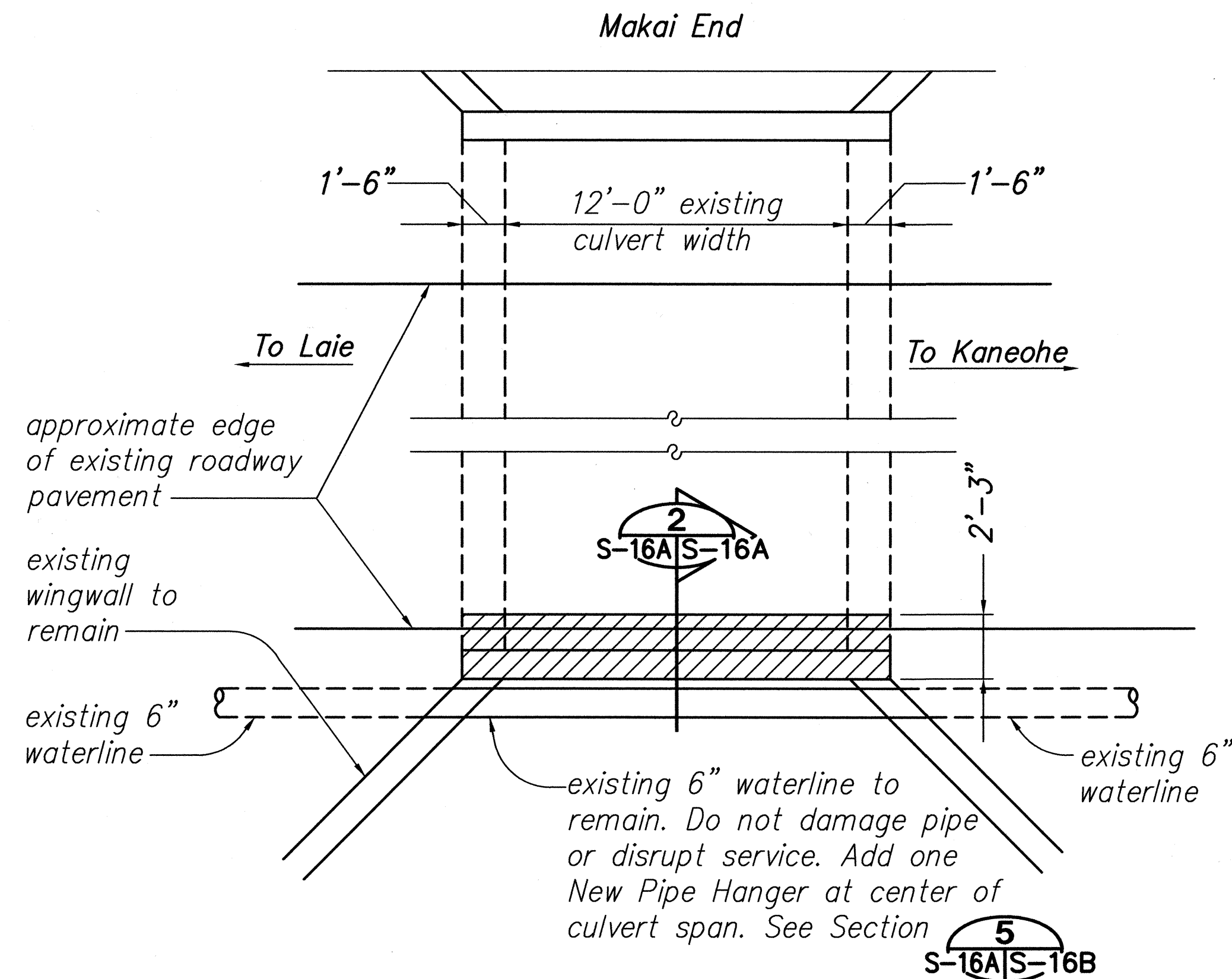
Scale: As Noted
Date: October 29, 2001

SHEET No. S-16 OF 27 SHEETS

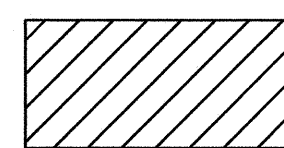
SURVEY PLOTTED BY	DATE
DRAWN BY	
DESIGNED BY	
QUANTITIES BY	
CHECKED BY	
NOTE BOOK	
No.	



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 87 S-1	121



**Legend:**

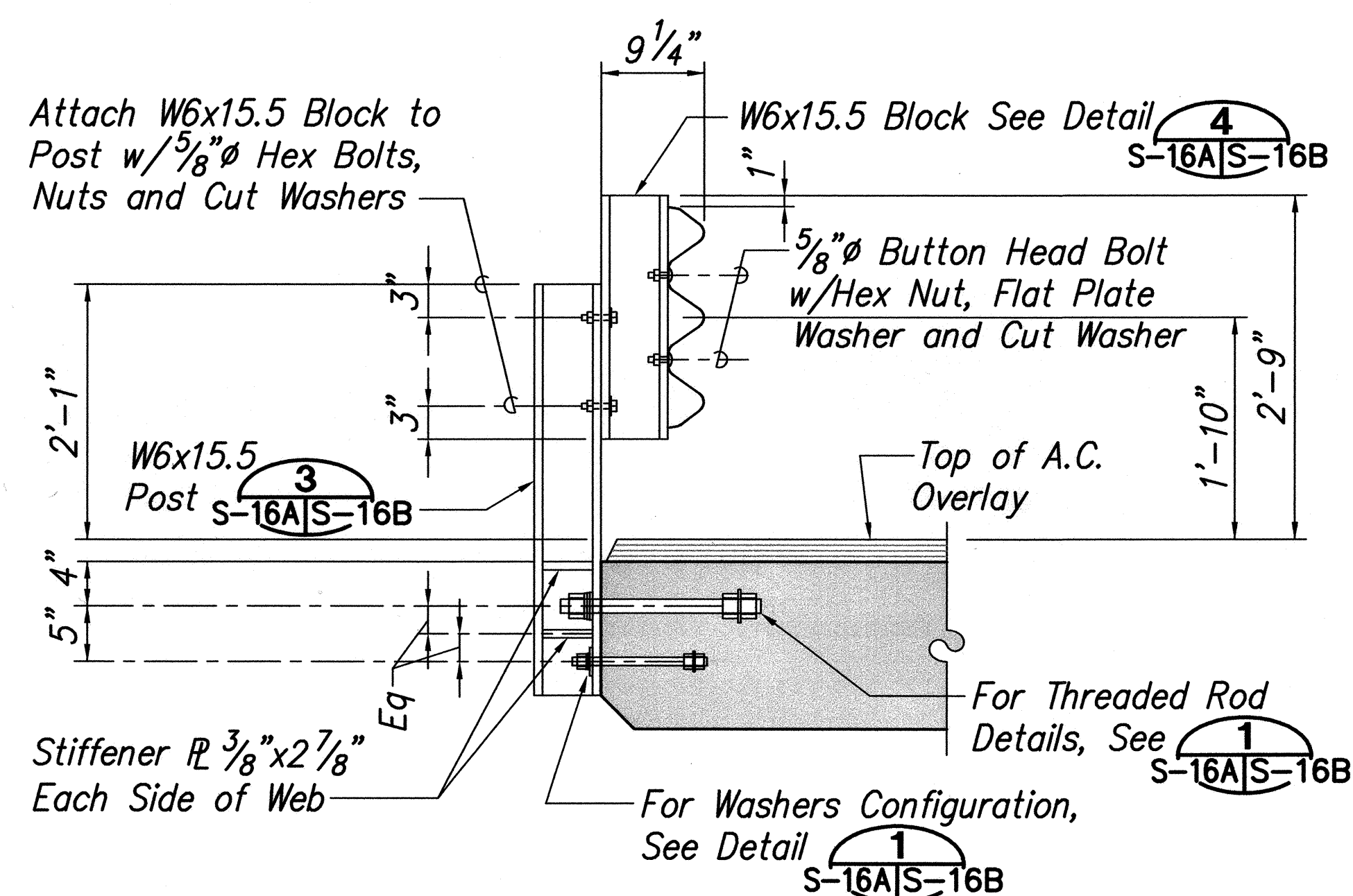


Denotes Concrete to be Demolished. Existing Rebar Within Demolished Area Shall be Cleaned, Cut, and Bent According to Section 4 S-16A/S-16A

**DEMOLITION PLAN- MAUKA END OF 12'x5' CONCRETE BOX CULVERT**

Scale: 1/4"=1'-0"

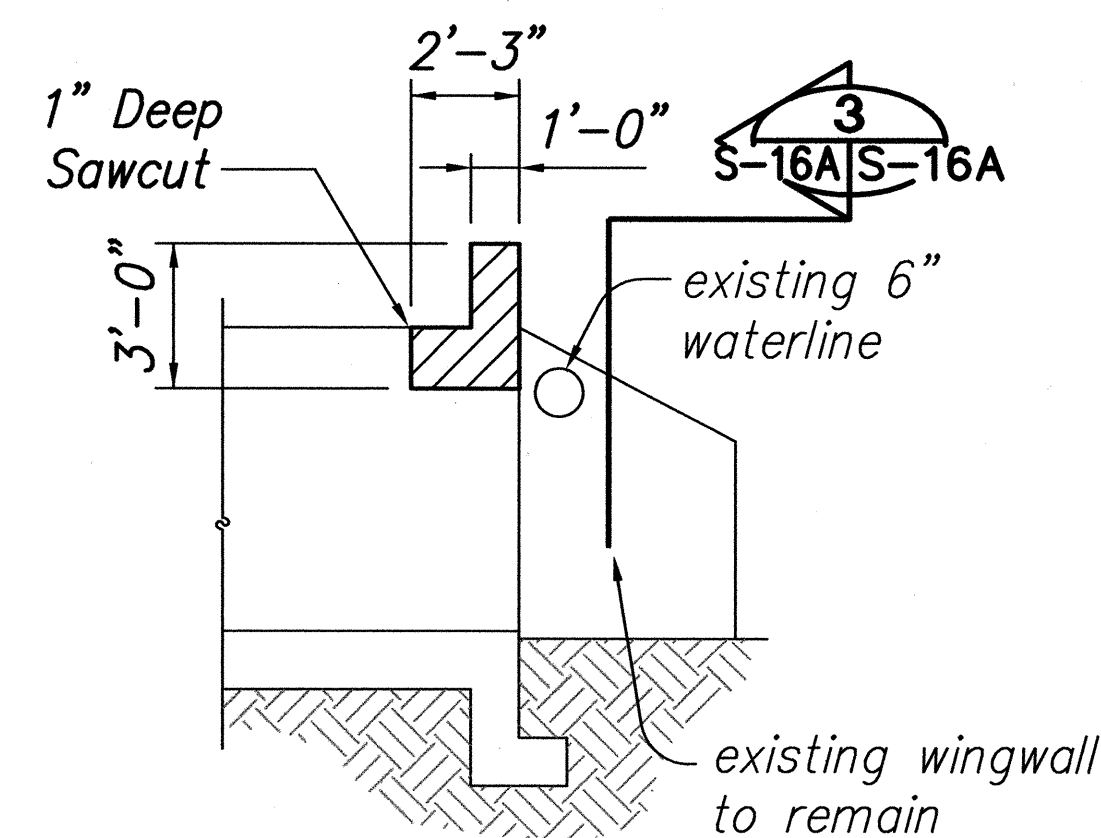
1 S-16A/S-16A



**ANCHOR BOLT DETAIL**

Scale: 1"=1'-0"

6 S-16A/S-16A



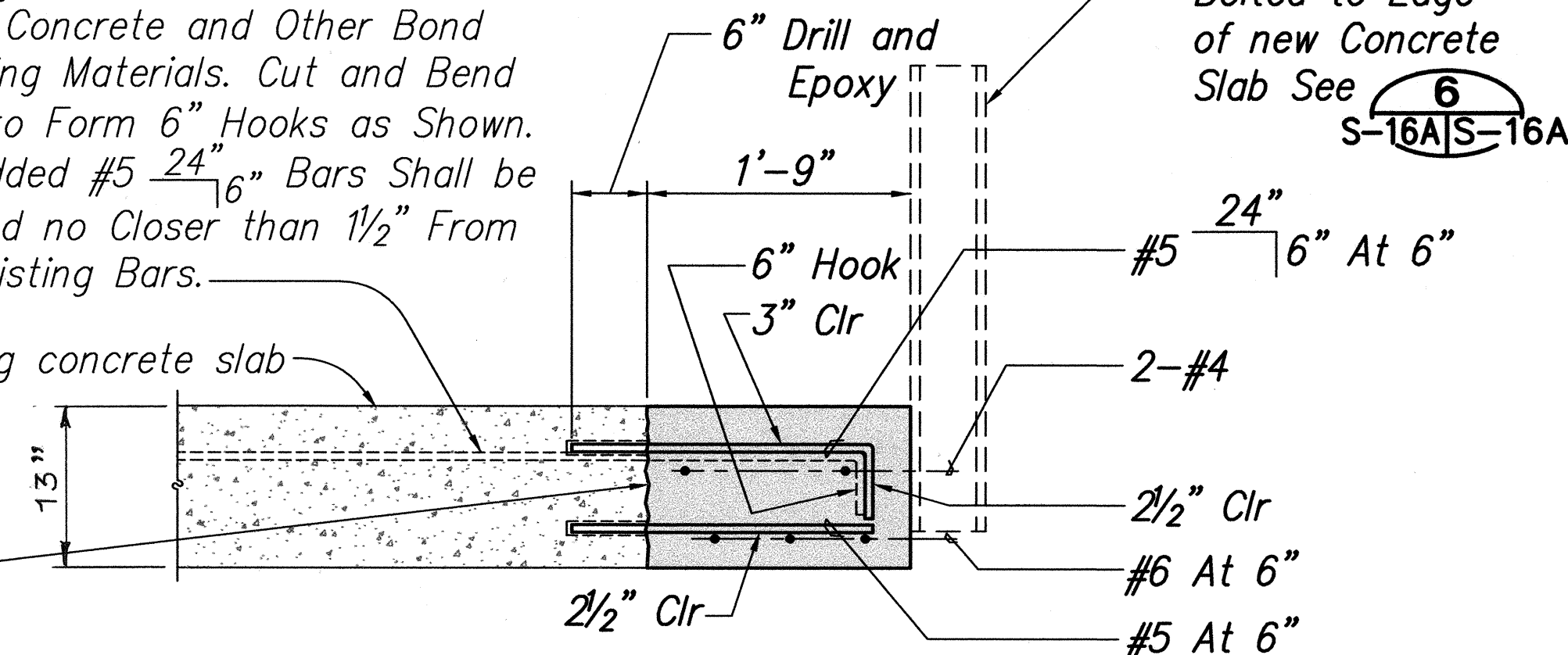
**SECTION 2**

Scale: 1/4"=1'-0"

2 S-16A/S-16A

existing rebar. Clean Rebars of All Loose Concrete and Other Bond Inhibiting Materials. Cut and Bend Ends to Form 6" Hooks as Shown. The Added #5 24" Bars Shall be Located no Closer than 1 1/2" From the Existing Bars.

existing concrete slab

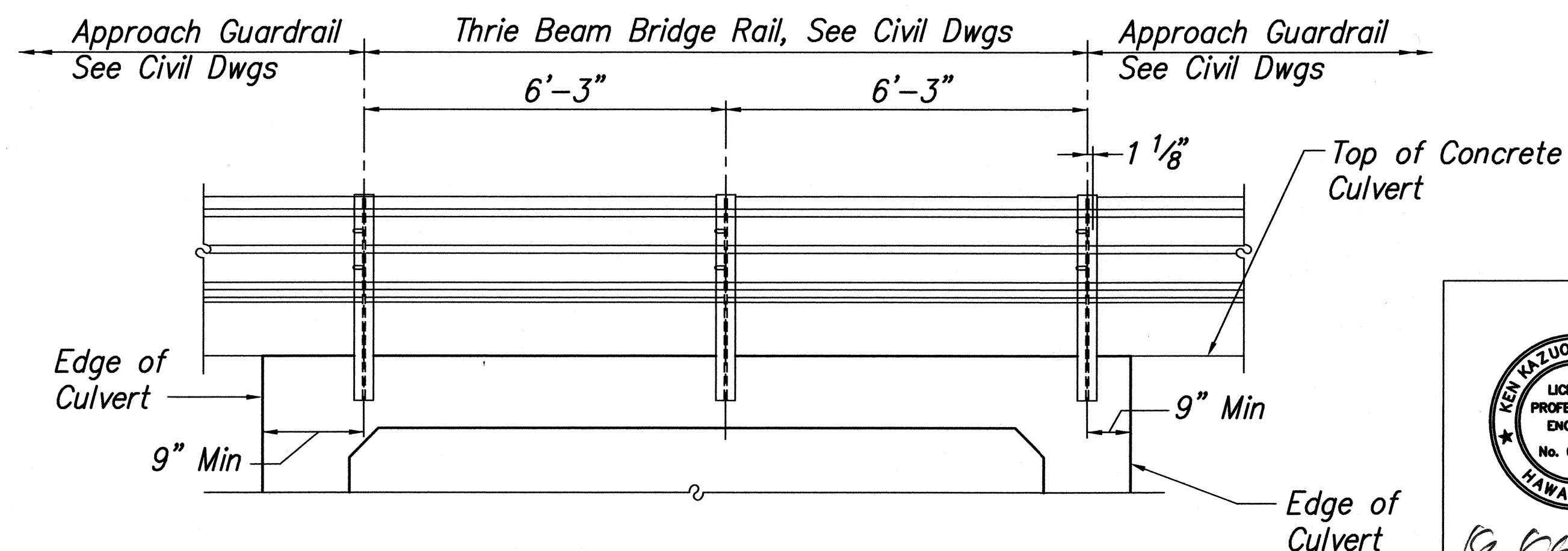


Clean and Roughen Existing Concrete Surface, Coat with Bonding Agent Prior to Placing New Concrete. The Bonding Agent Shall Be a two Component, Moisture-Insensitive Adhesive, Conforming to ASTM C 1881, Class C. Use Type IV, Grade 3 (Non-Sag) of this System in a Neat Form For Vertical or Overhead Bonding and Embedment. Use Type V to Bond Freshly Mixed Concrete to Harden Concrete for All Load-Bearing Structural Applications.

**SECTION-NEW SLAB 4**

Scale: 1/4"=1'-0"

4 S-16A/S-16A



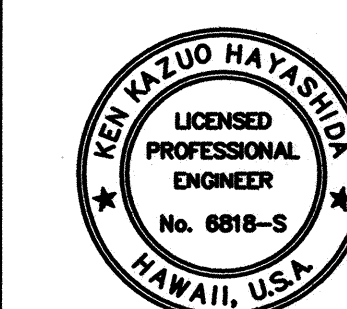
**ELEVATION-GUARDRAIL LAYOUT AT CULVERT**

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

APPROVED:

*Joseph W. Keane*  
Principal Executive, Maintenance Unit, BWS

8/28/02  
Date

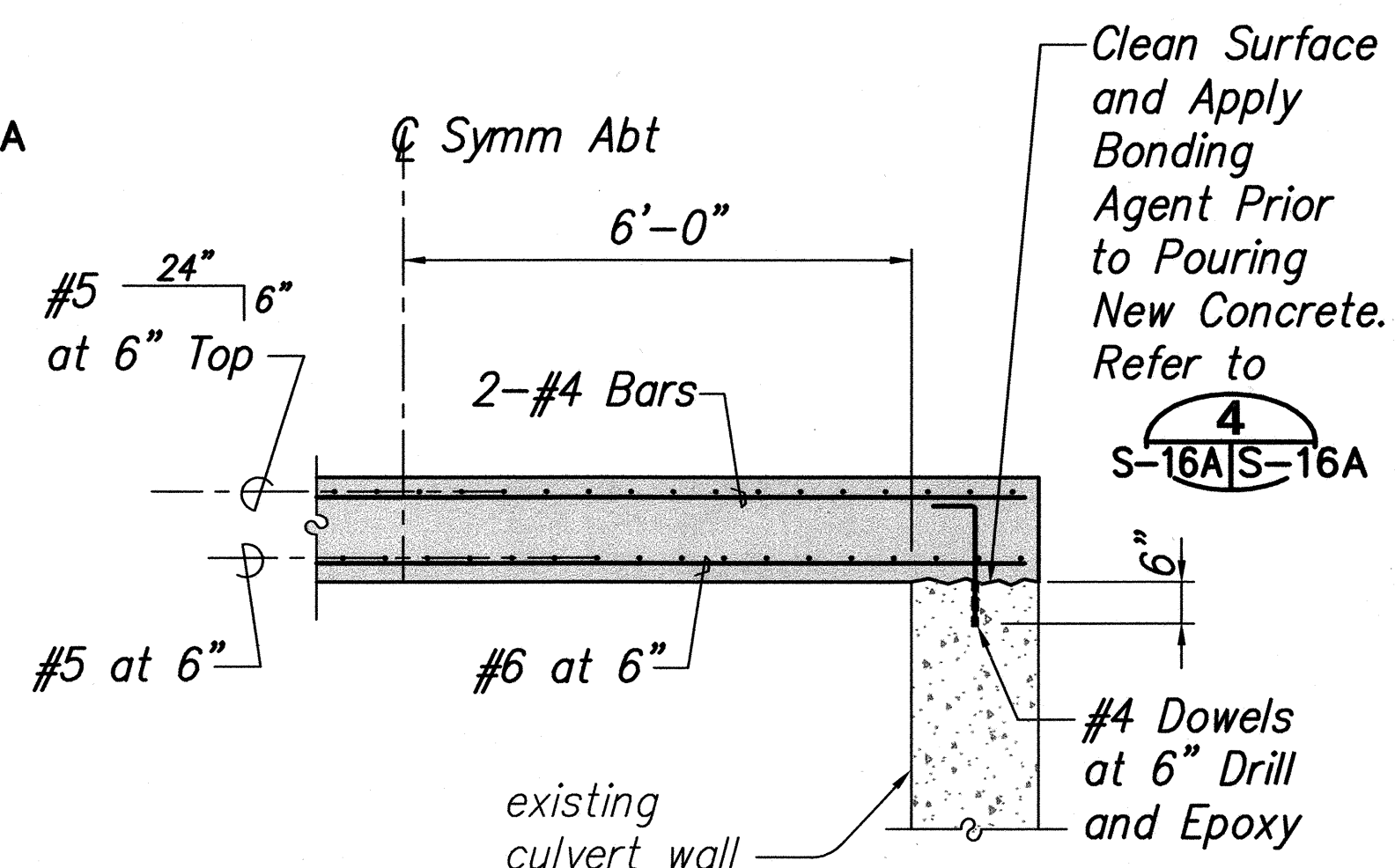
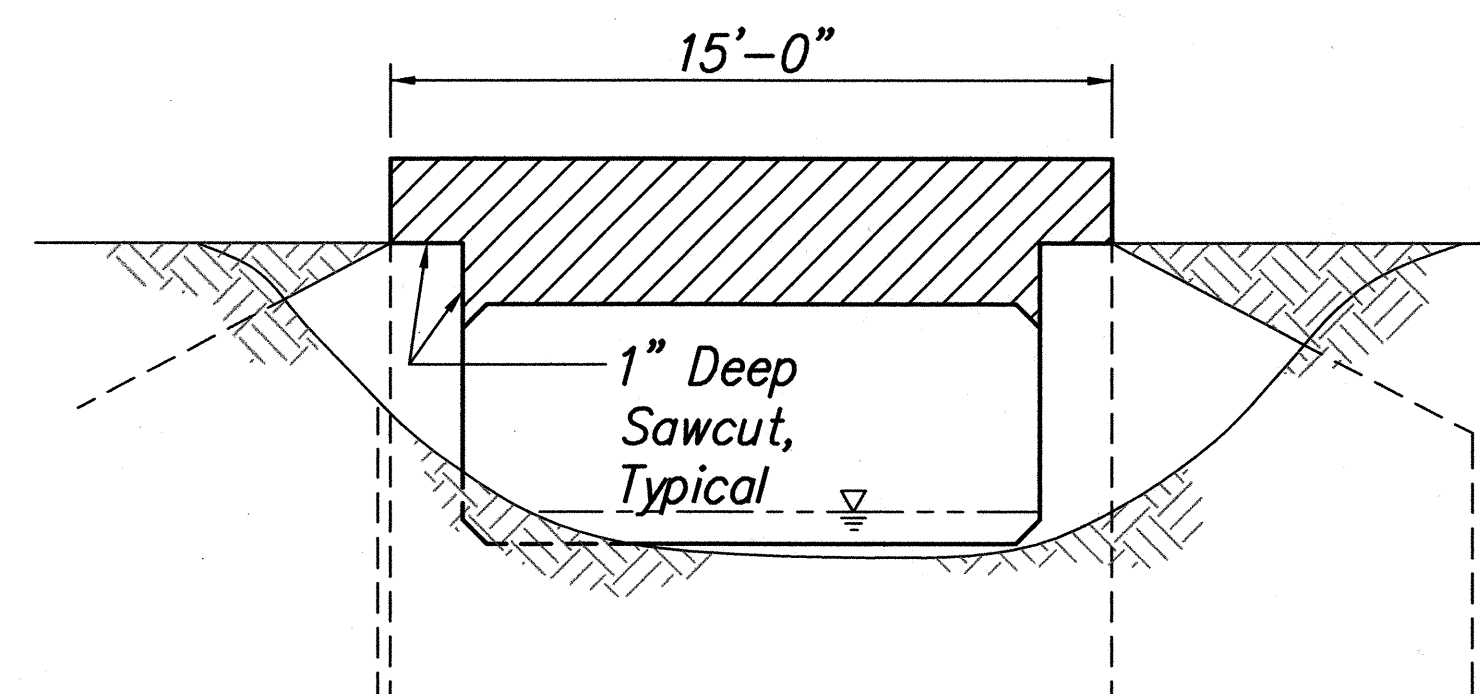


THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

**SECTION 3**

Scale: 1/4"=1'-0"

3 S-16A/S-16A



**Notes:**

- Guardrail Post and Anchor Bolts not shown for Clarity
- Existing rebars not shown for Clarity.

**SECTION 5**

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

5 S-16A/S-16A

8/28/02 Added New Pipe Hanger

8/15/02 Altered reinforcing steel per change order

7/17/02 Altered culvert headwall per change order

Date Revision

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**12'x5' BOX CULVERT RENOVATION**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

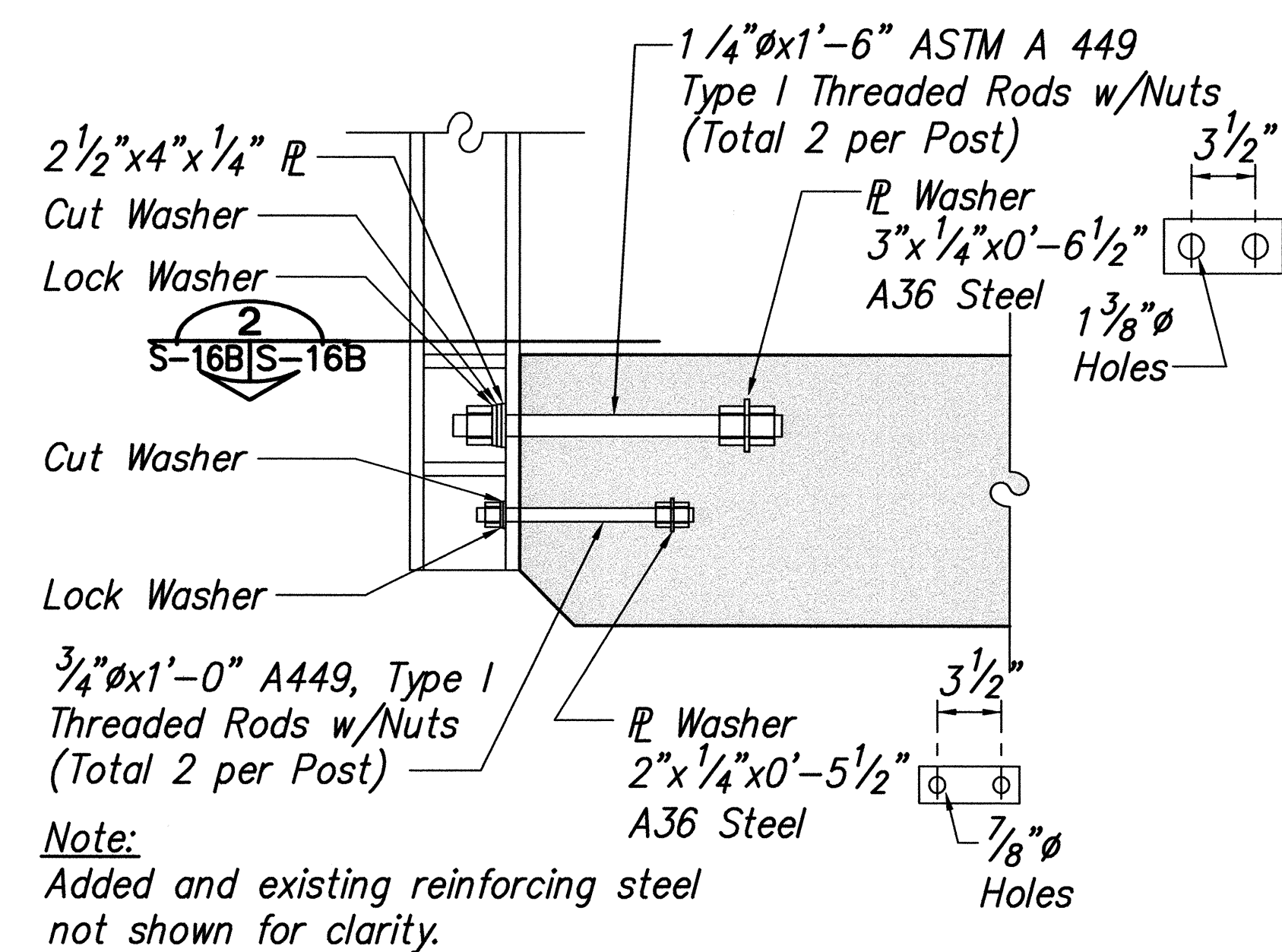
Scale: As Noted Date: October 29, 2001

SHEET No. S-16A OF 27 SHEETS

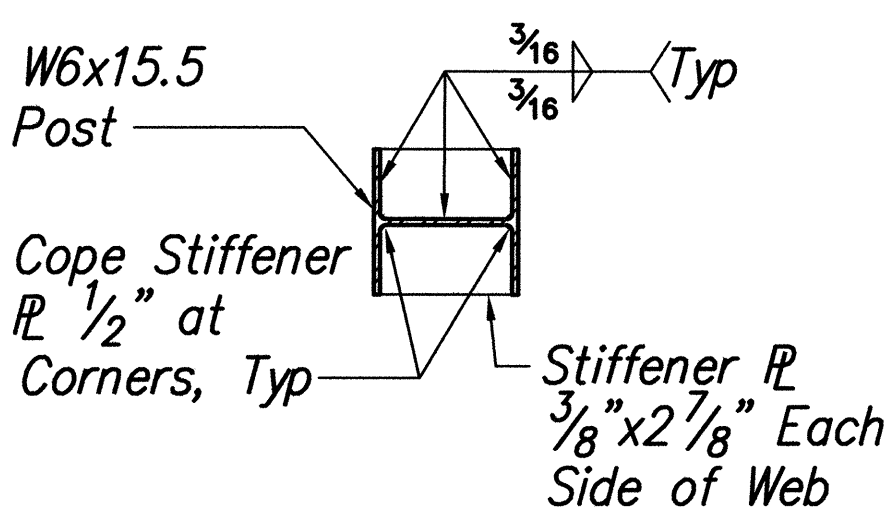
C.O. 87 S-1



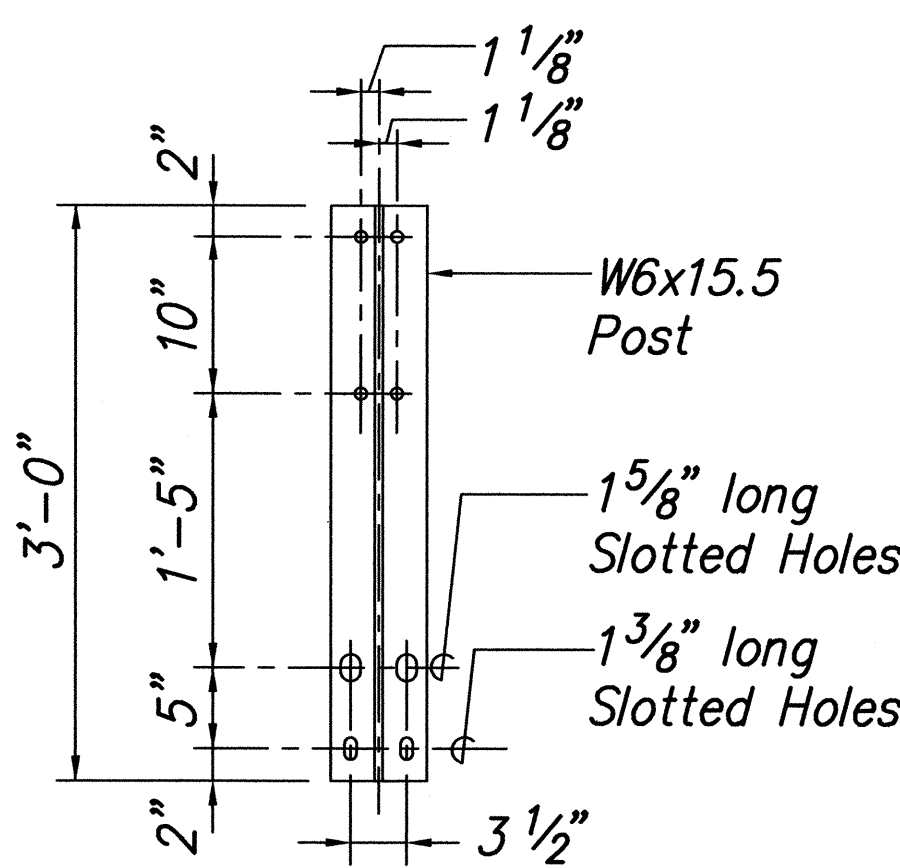
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 87 S-2	121



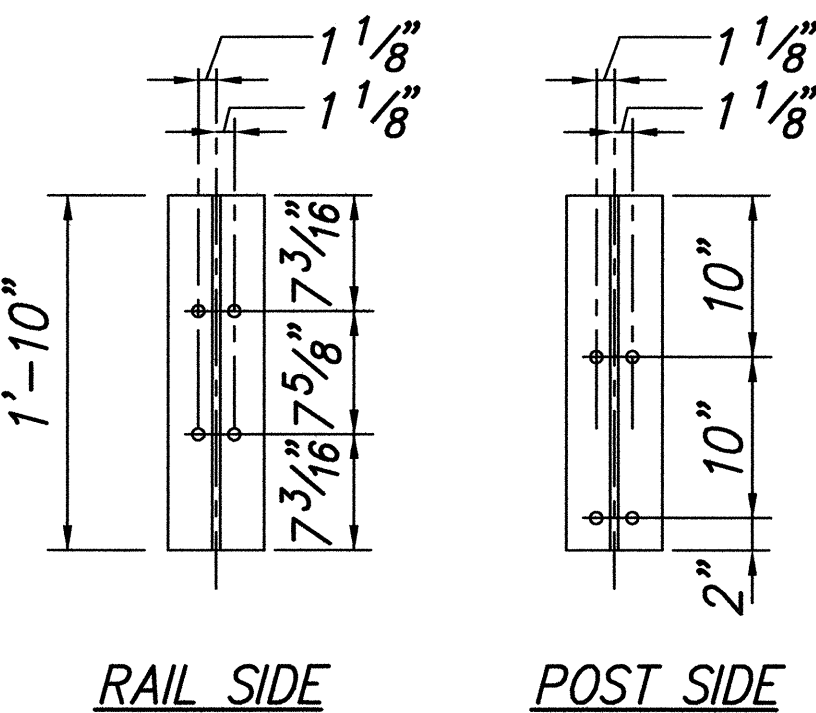
**DETAIL 1**  
Scale: 1 1/2"=1'-0" S-16A|S-16B



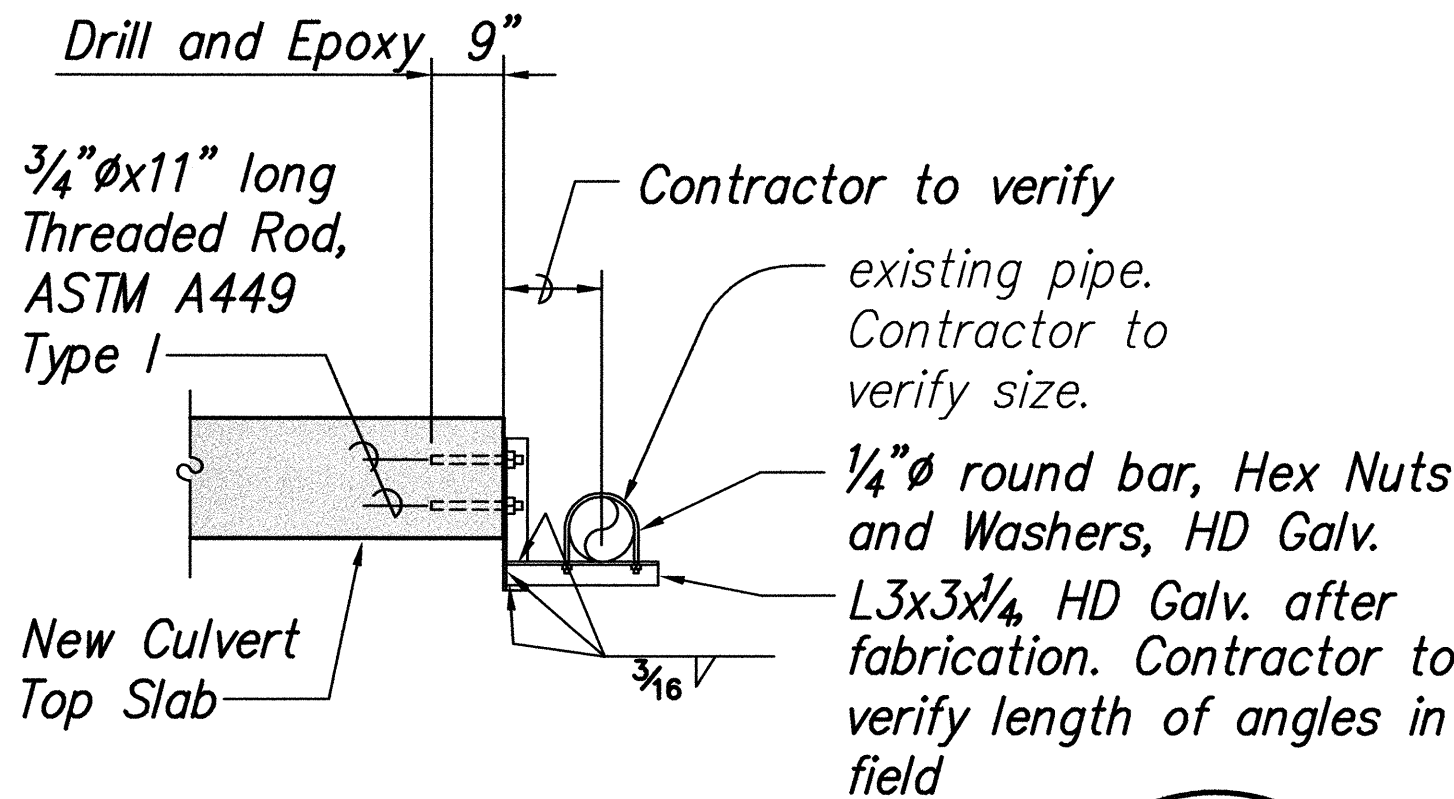
**SECTION 2**  
Scale: 1 1/2"=1'-0" S-16B|S-16B



**POST DETAIL 3**  
Scale: 1"=1'-0" S-16A|S-16B



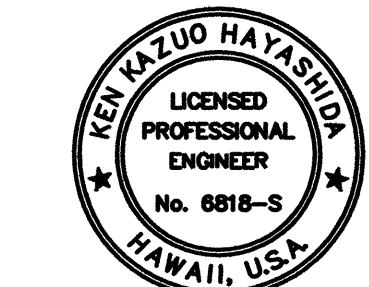
**BLOCK DETAIL 4**  
Scale: 1"=1'-0" S-16A|S-16B



**NEW PIPE HANGER-SECTION 5**  
Scale: 1/2"=1'-0" S-16A|S-16B

ORIGINAL PLAN	DATE
DESIGNED BY	DATE
TRACED BY	DATE
NOTED BY	DATE
CHECKED BY	DATE

8/28/02	Added New Pipe Hanger
8/15/02	Added sheet. Altered reinforcing steel per change order
7/17/02	Altered culvert headwall per change order
Date	Revision



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APPROVED:  
*Joseph W. Kaakua* 8/28/02  
Principal Executive, Maintenance Unit, BWS Date

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**12' x 5' BOX CULVERT RENOVATION**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

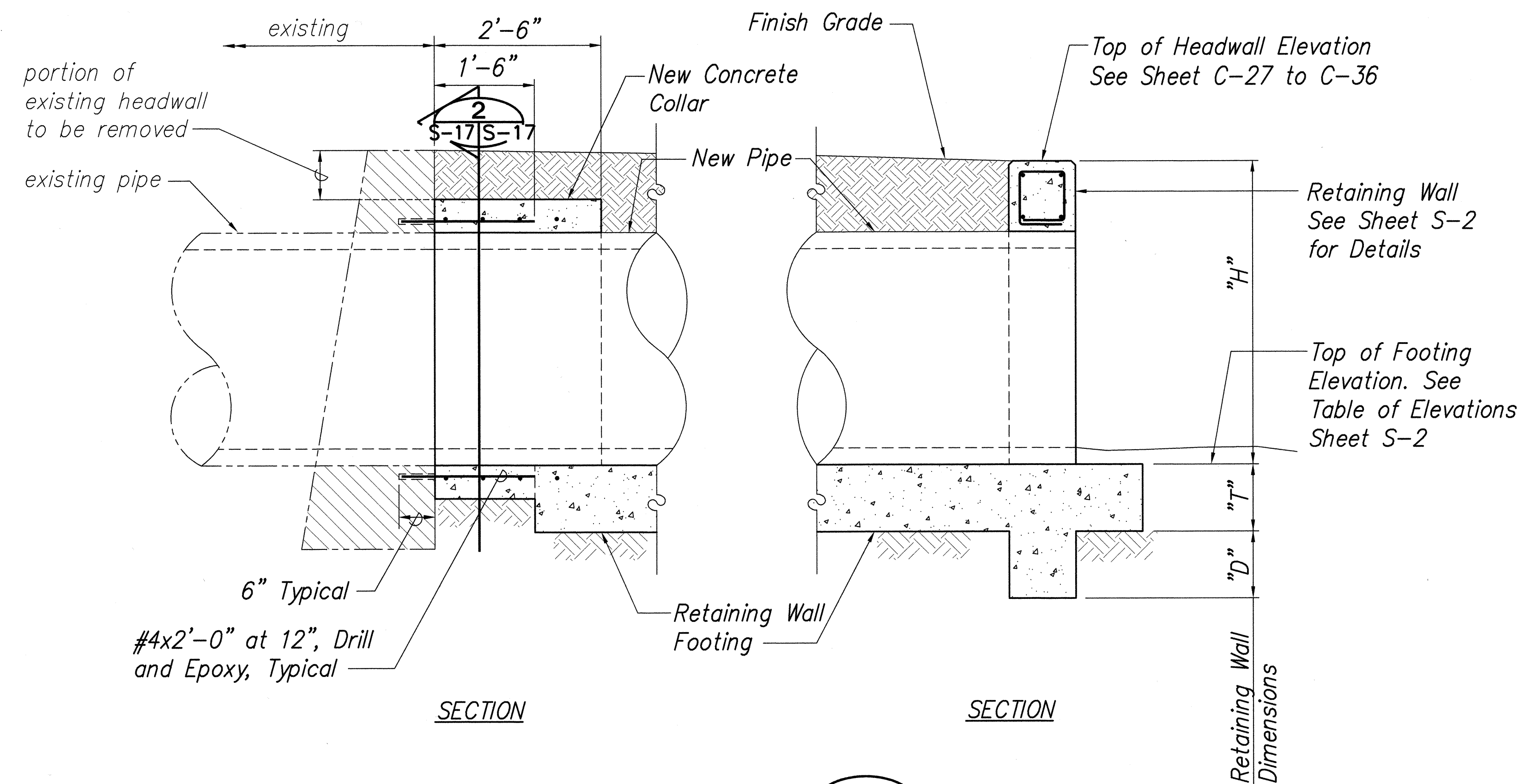
Scale: As Noted Date: October 29, 2001

SHEET No. S-16B OF 27 SHEETS

C.O. 87 S-2



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	88	121

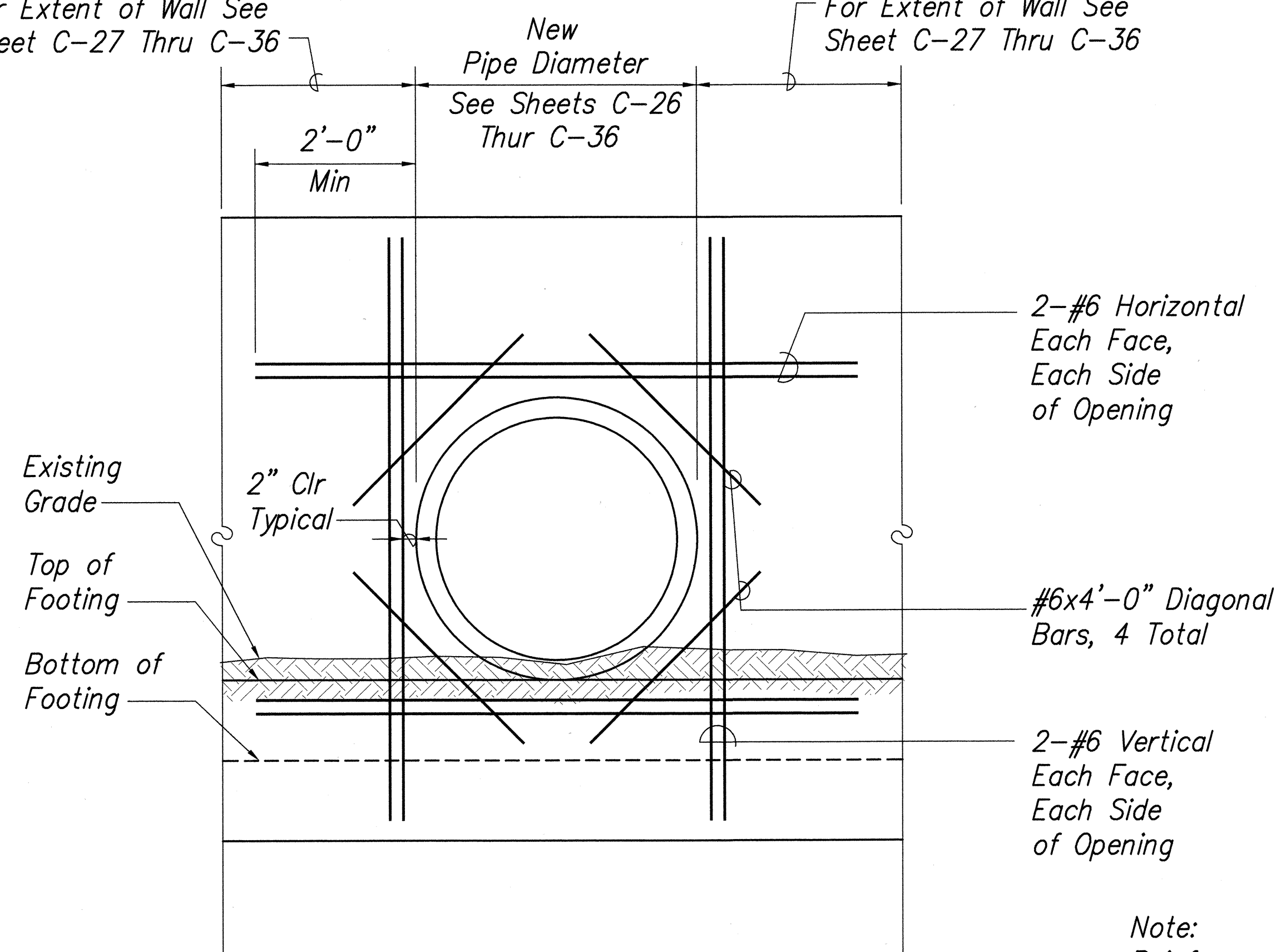


**TYPICAL PIPE EXTENSION DETAIL**

Not to Scale

1  
S-17/S-17

For Extent of Wall See Sheet C-27 Thru C-36

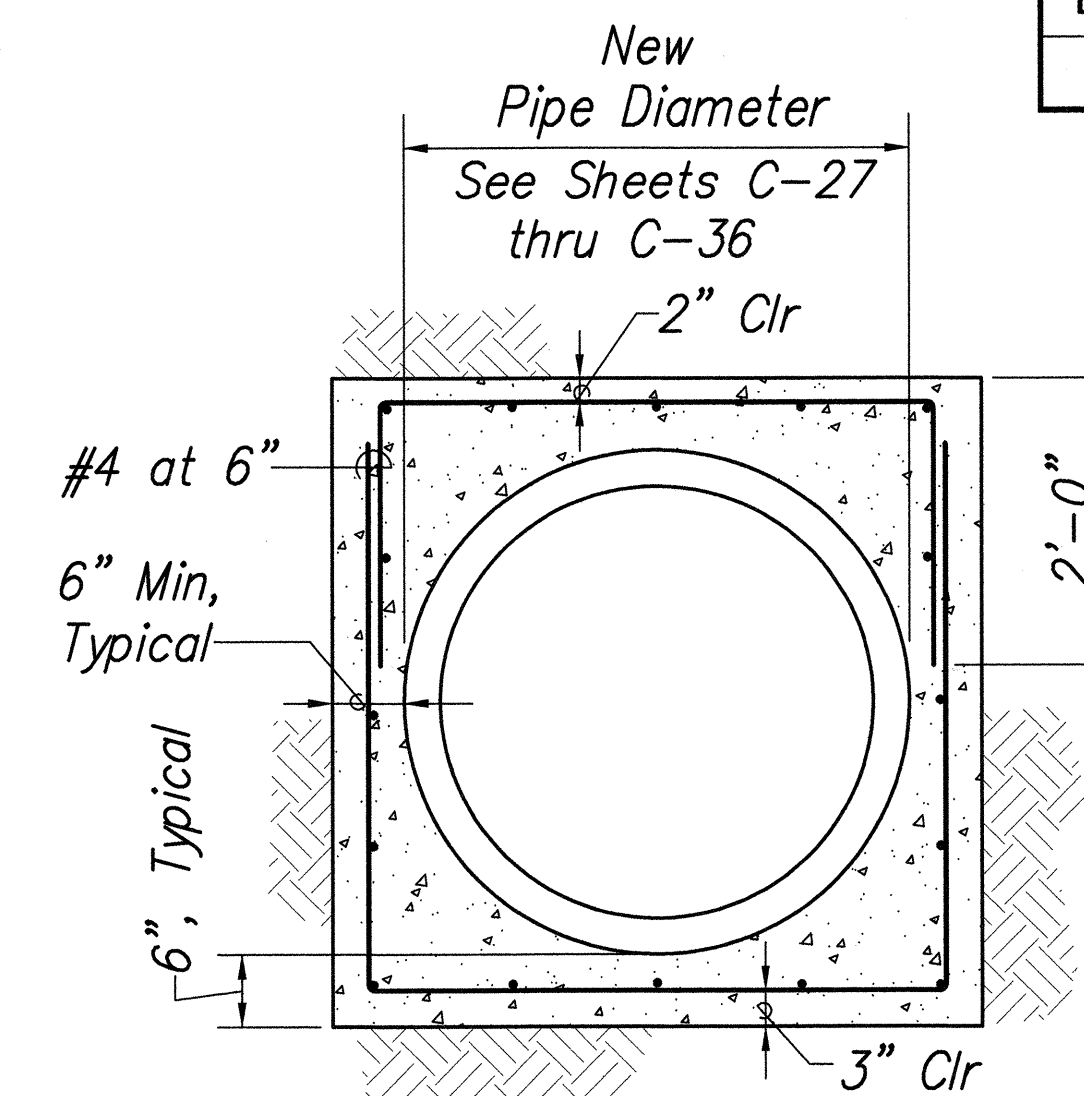


**TYPICAL WALL OPENING DETAIL**

Not to Scale

3  
S-17/S-17

Note:  
Reinforcement Shown is in Addition to Reinforcement Shown in Typical Retaining Wall Section, Sheet S-2.



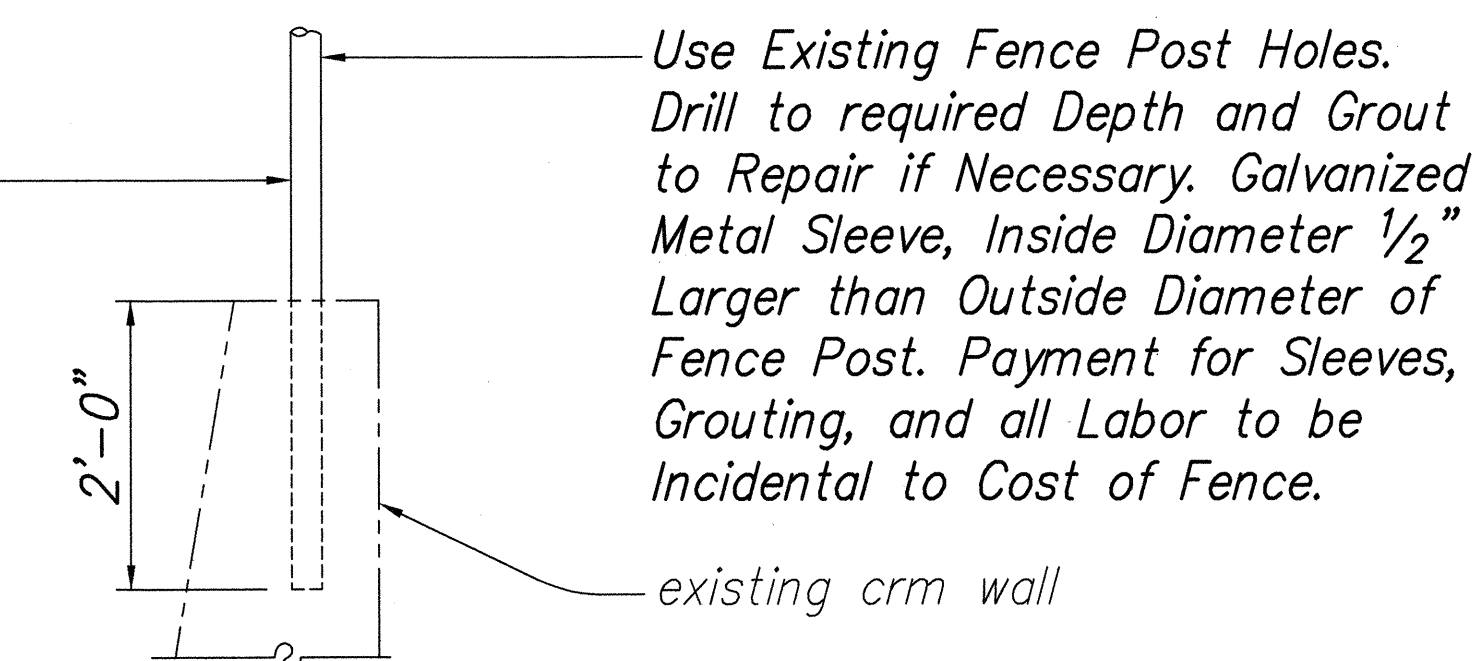
**SECTION**

**SECTION**

Not to Scale

2  
S-17/S-17

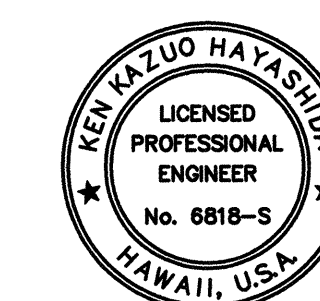
New Chainlink Fence to be Installed in Existing Holes in Wall. Refer to Sheet C-19



**CHAINLINK FENCE POST CONNECTION INTO EXISTING CRM WALL**

Not to Scale

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

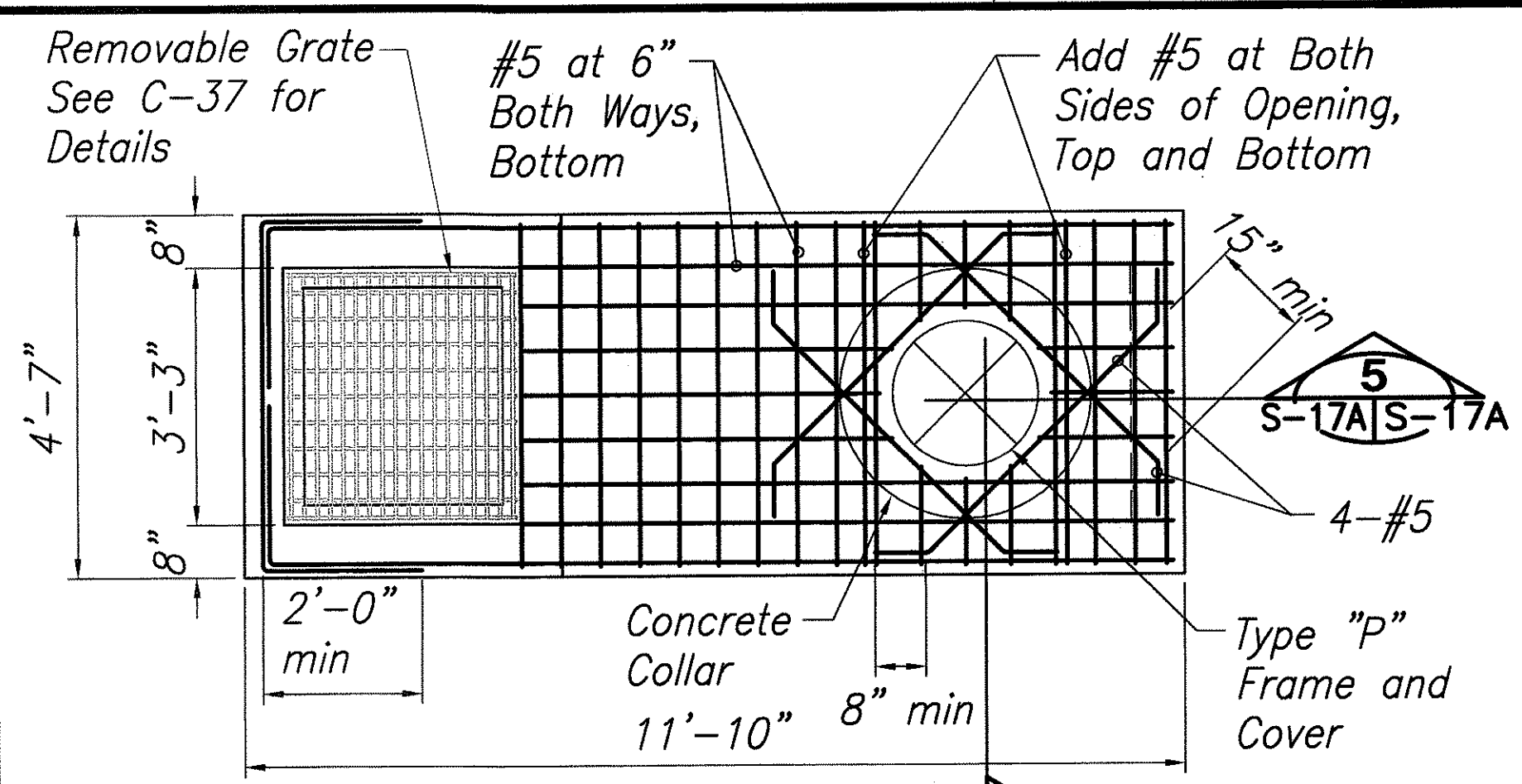


THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
<b>TYP PIPE CULVERT EXTENSION AND MISC DETAILS</b>
KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)
Scale: As Noted Date: October 29, 2001
SHEET No. S-17 OF 27 SHEETS

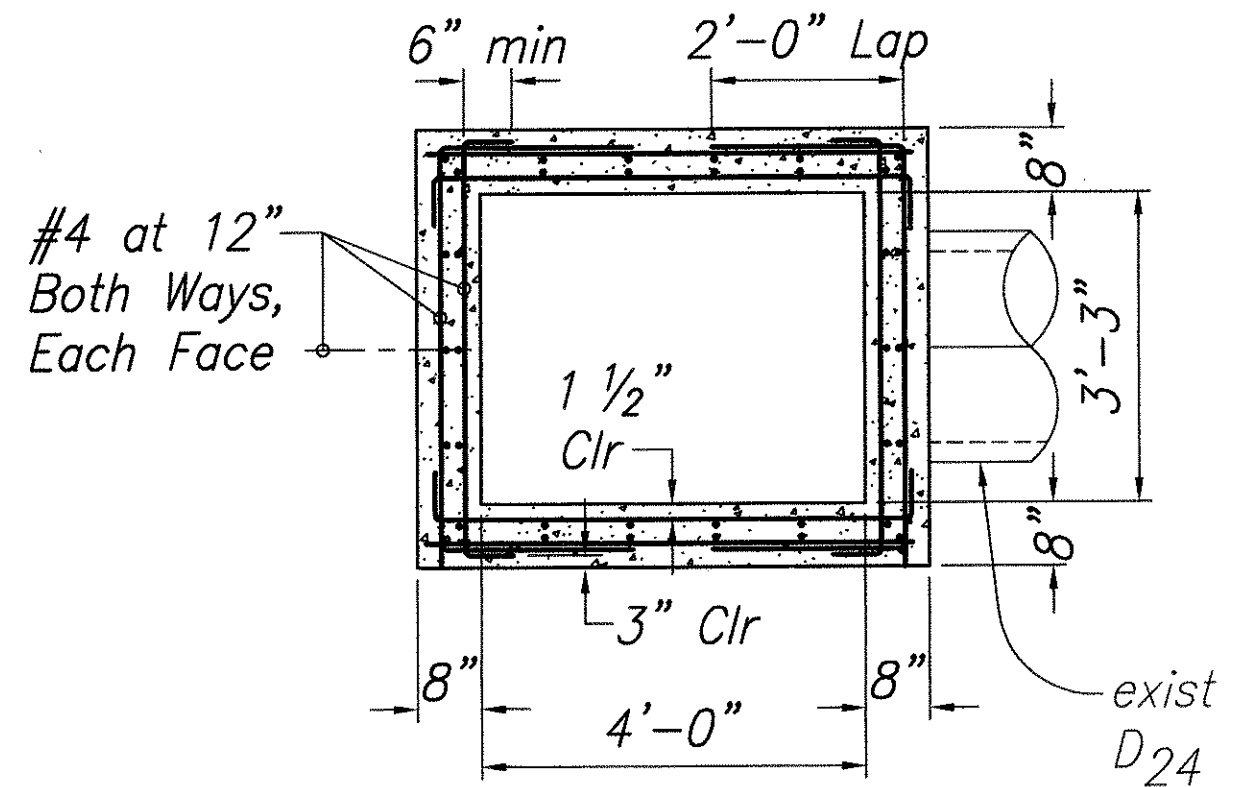


FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 88 S-1	121



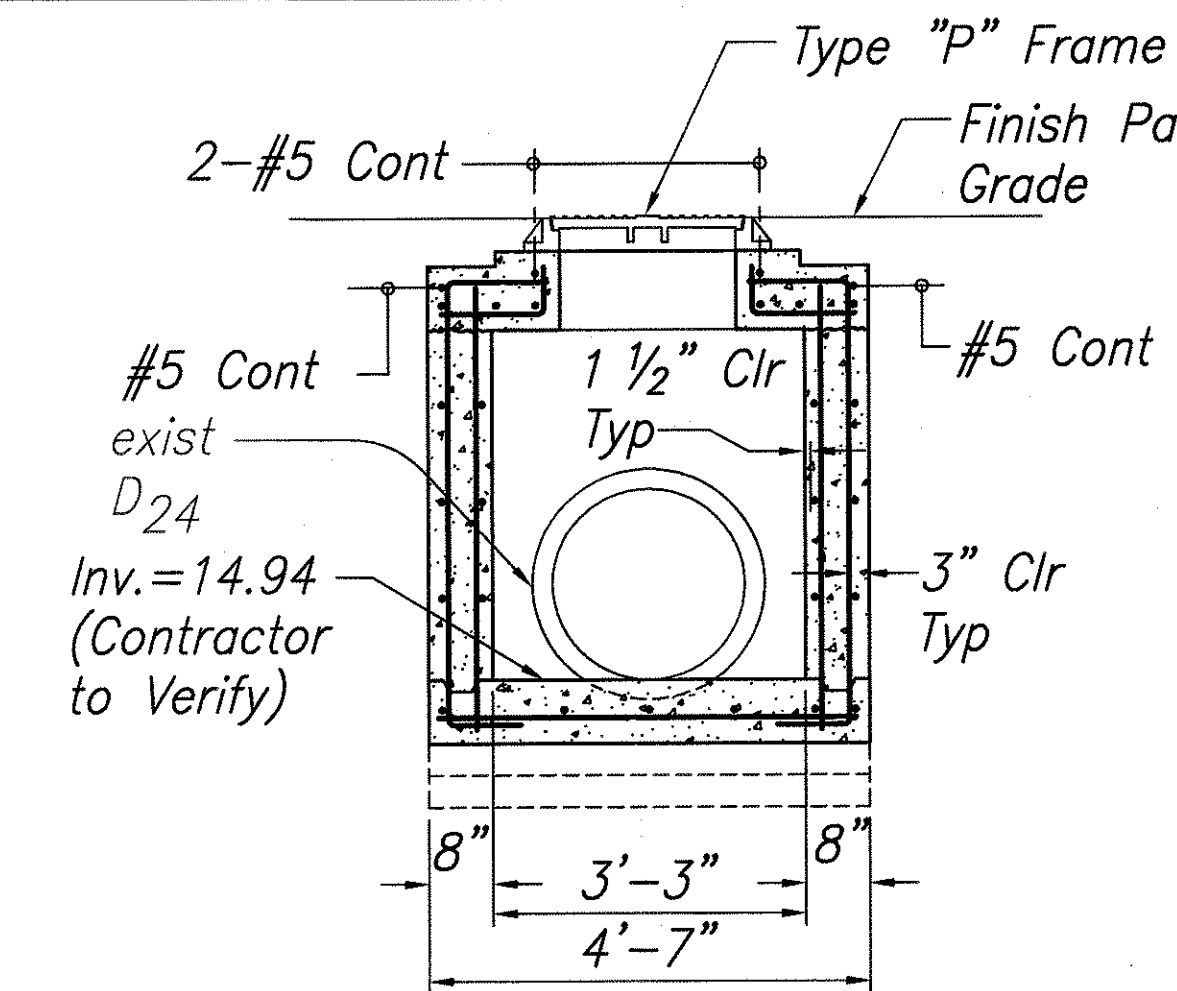
PLAN VIEW

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



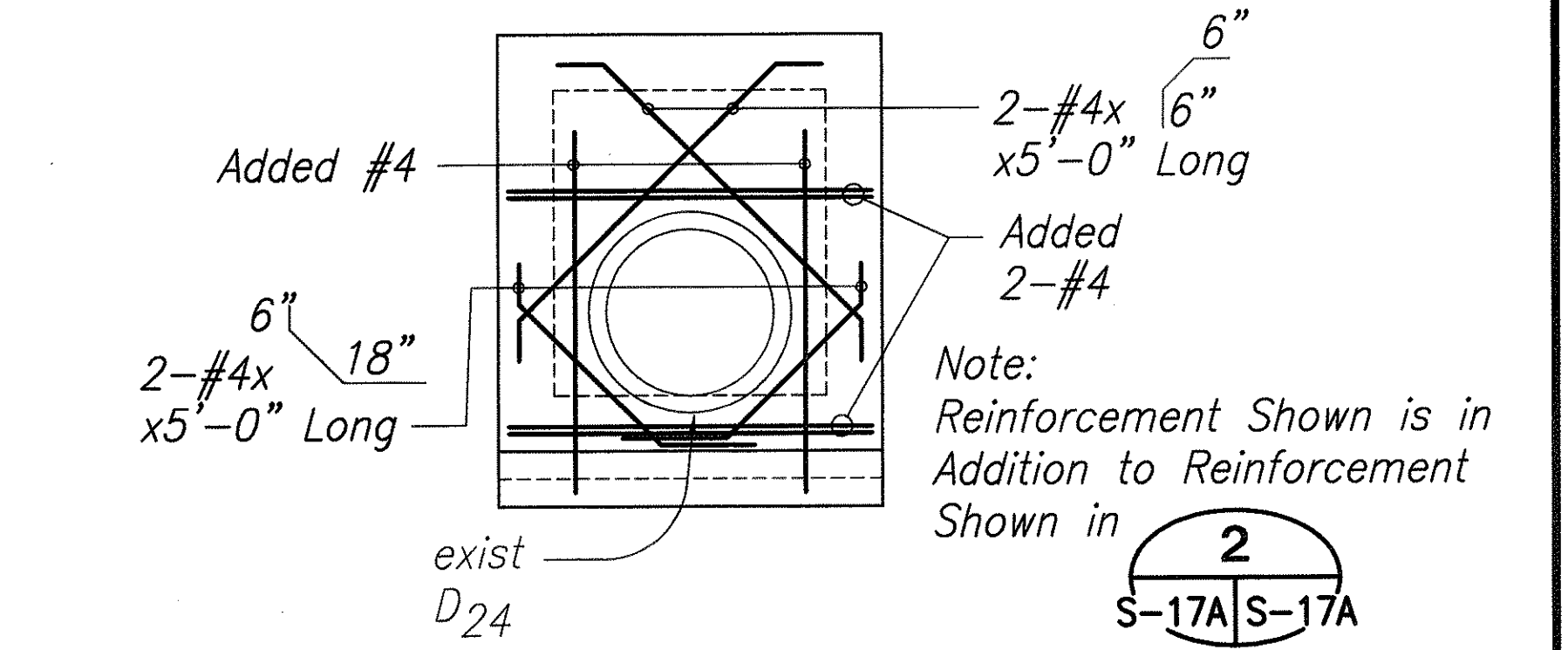
PLAN VIEW OF WALL SECTION

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



SECTION

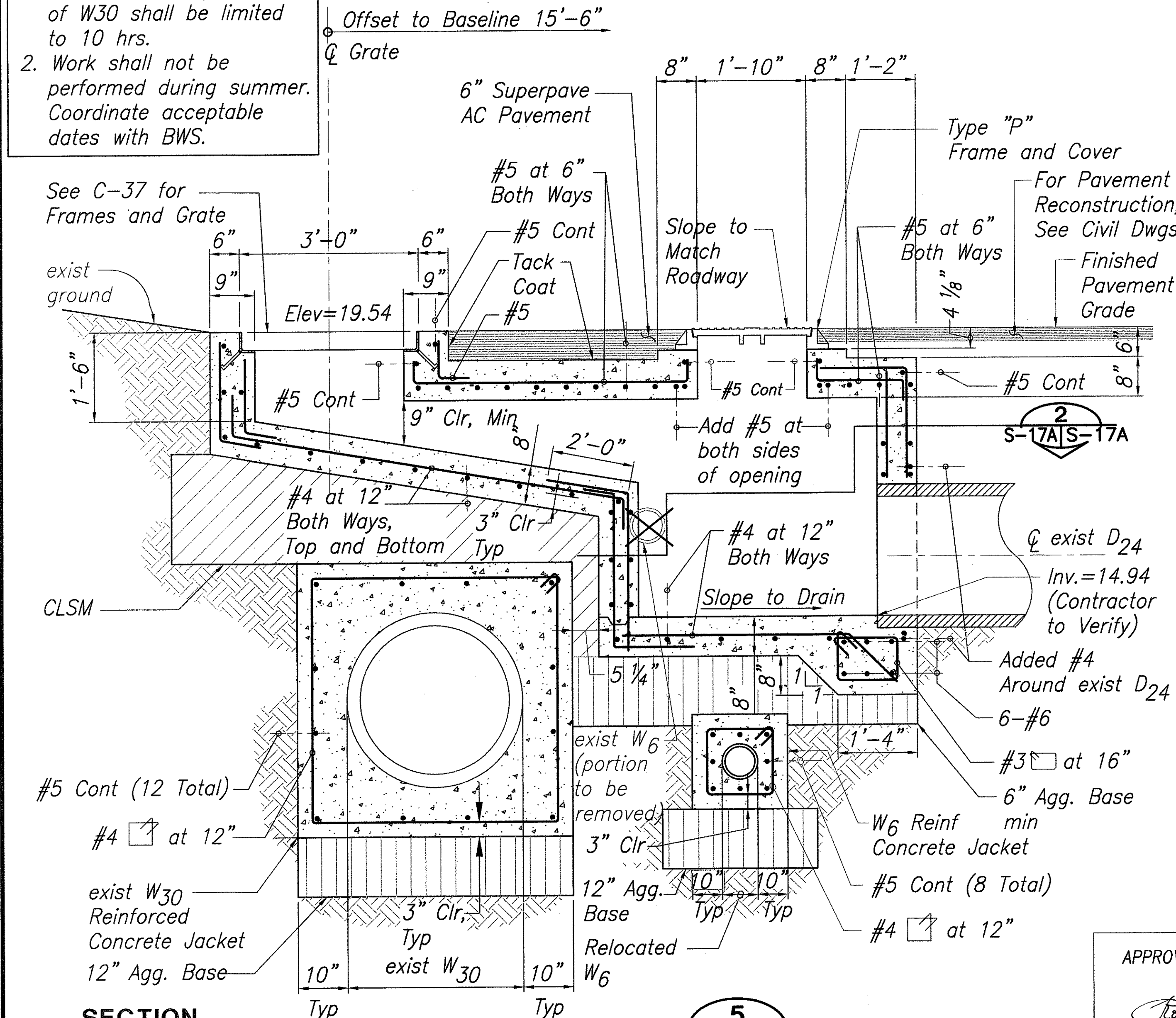
Scale : 1/2" = 1'-0"



WALL OPENING DETAIL

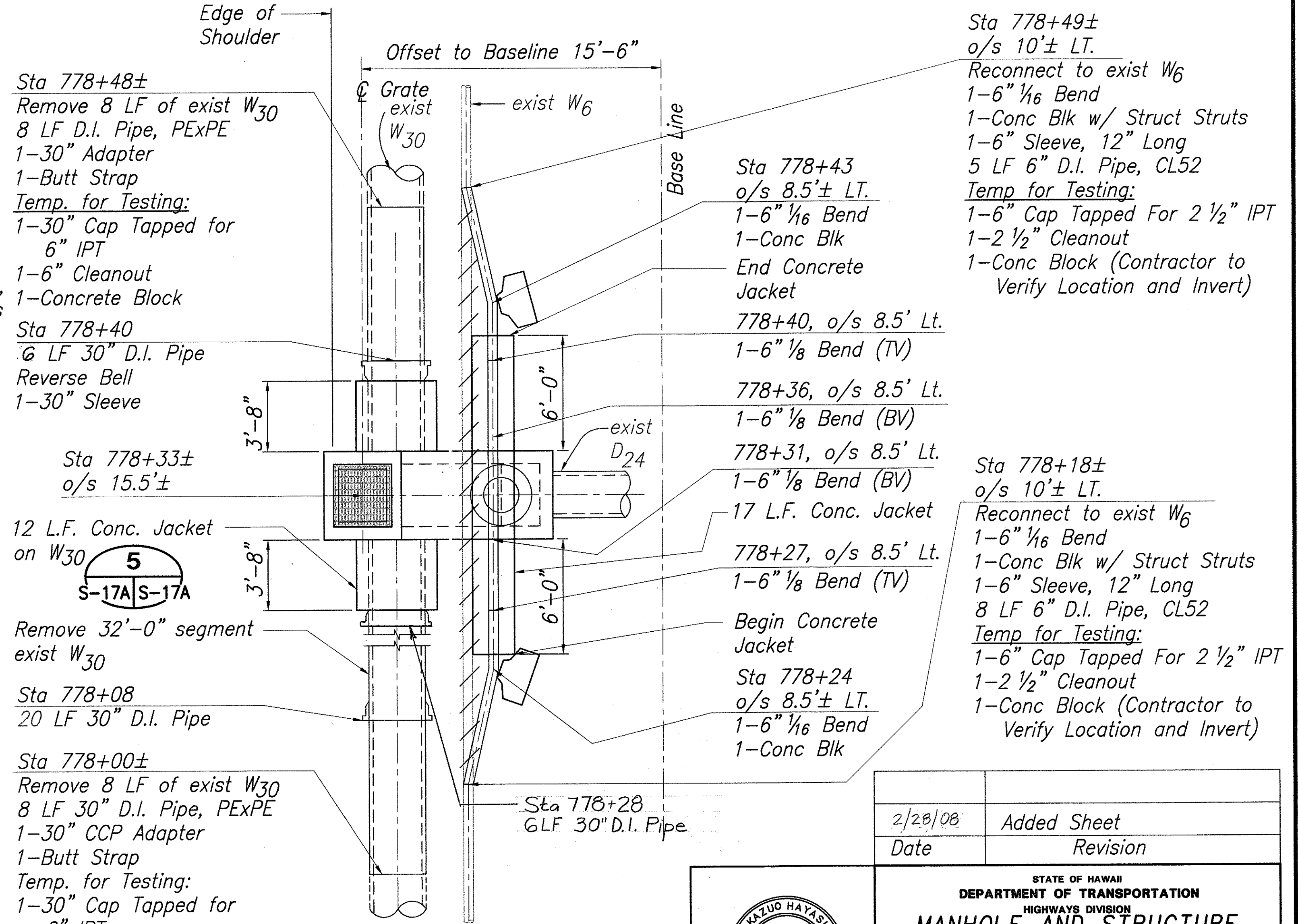
Scale : 1/2" = 1'-0"

Waterline Notes:  
1. Removal and replacement of W30 shall be limited to 10 hrs.  
2. Work shall not be performed during summer. Coordinate acceptable dates with BWS.



SECTION

Scale : 3/4" = 1'-0"

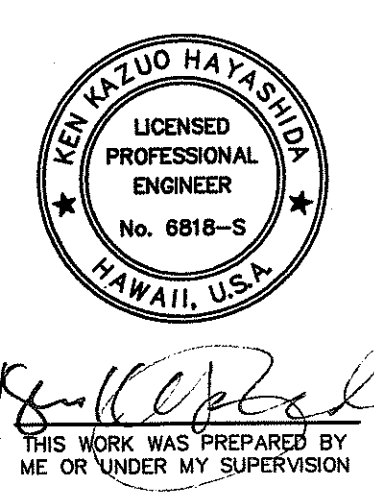
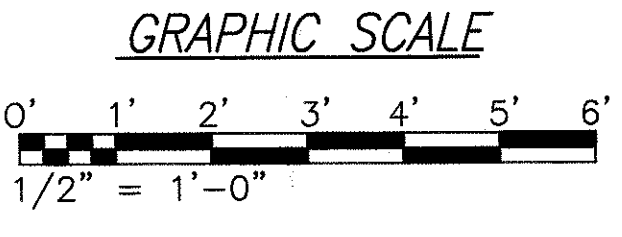


PLAN-CONCRETE JACKET

Scale : 1/4" = 1'-0"

APPROVED: *Robert Chun*  
For Chief, Capital Projects Division, BWS

DATE: 2/11/08



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**MANHOLE AND STRUCTURE  
AT STATION 778+33**

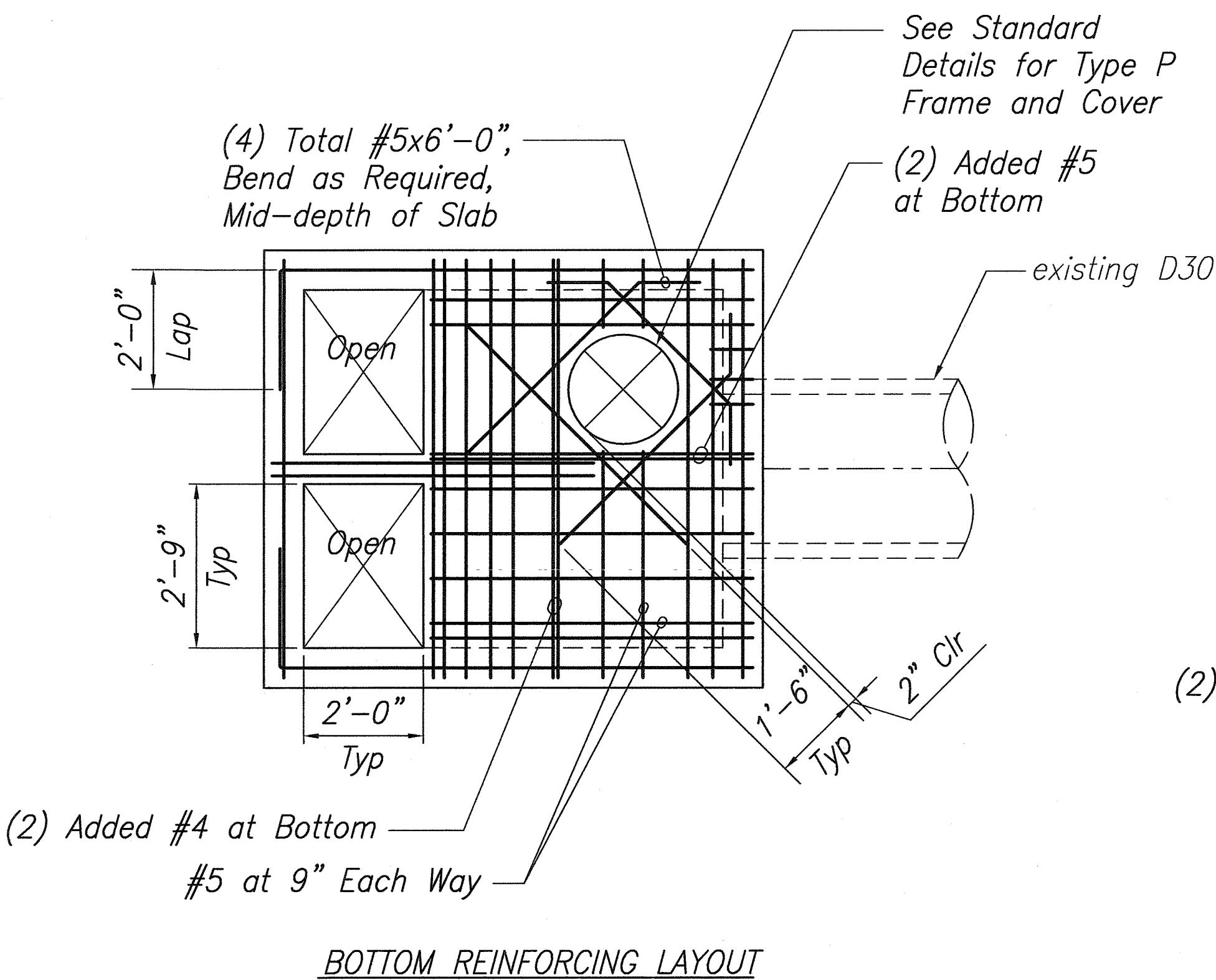
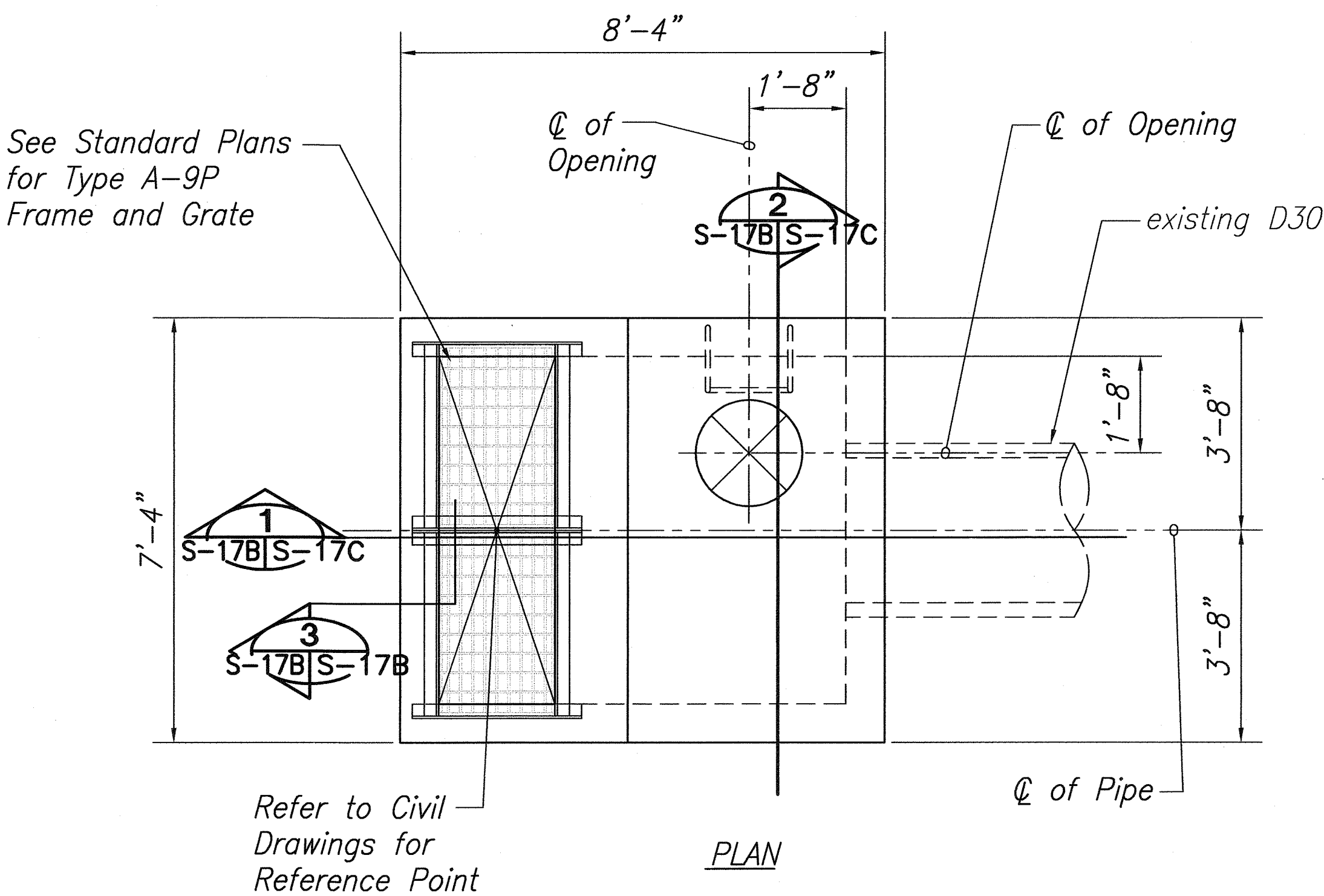
KAMEHAMEHA HIGHWAY RESURFACING  
Waialeale Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: As Noted Date: October 29, 2001

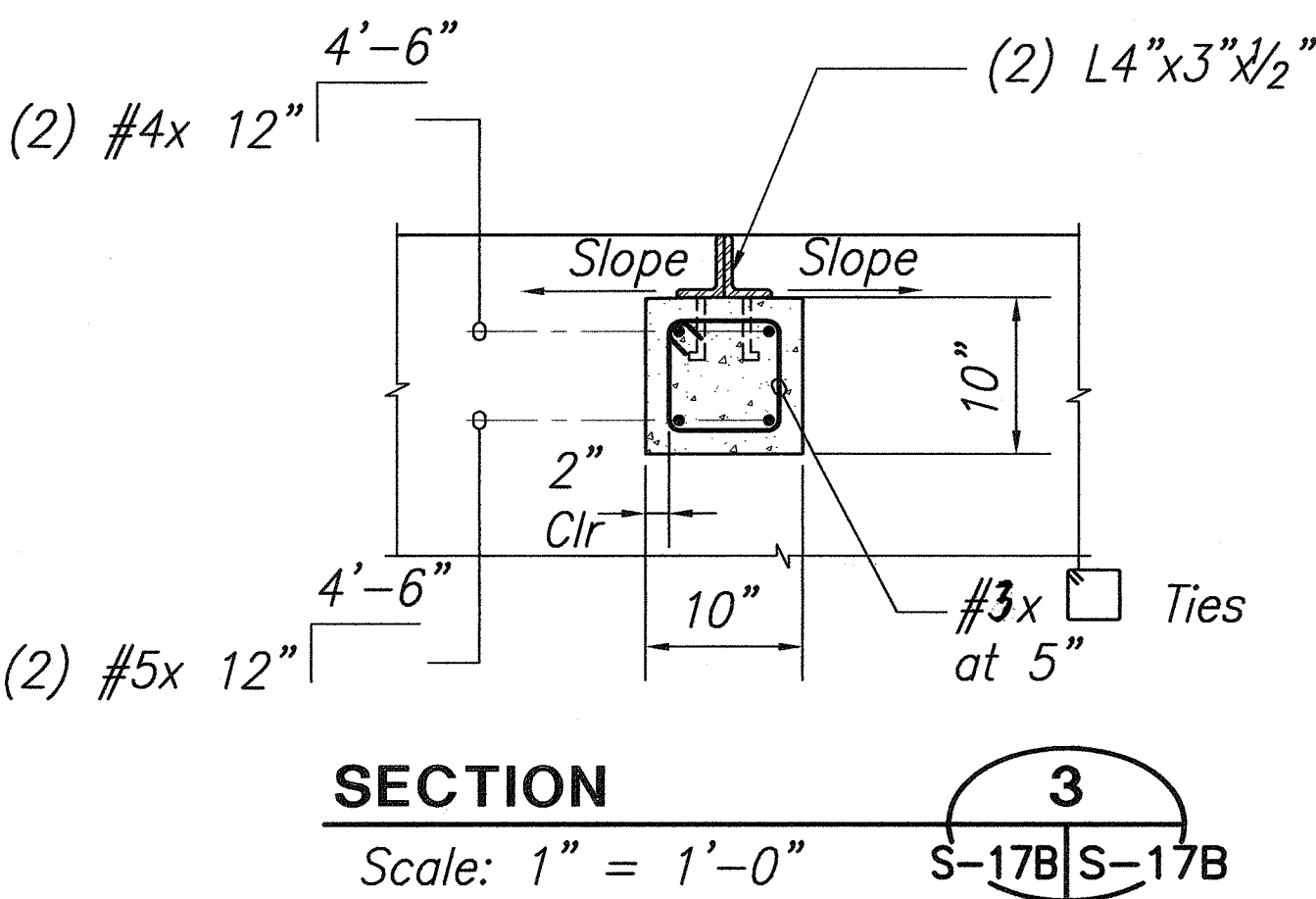
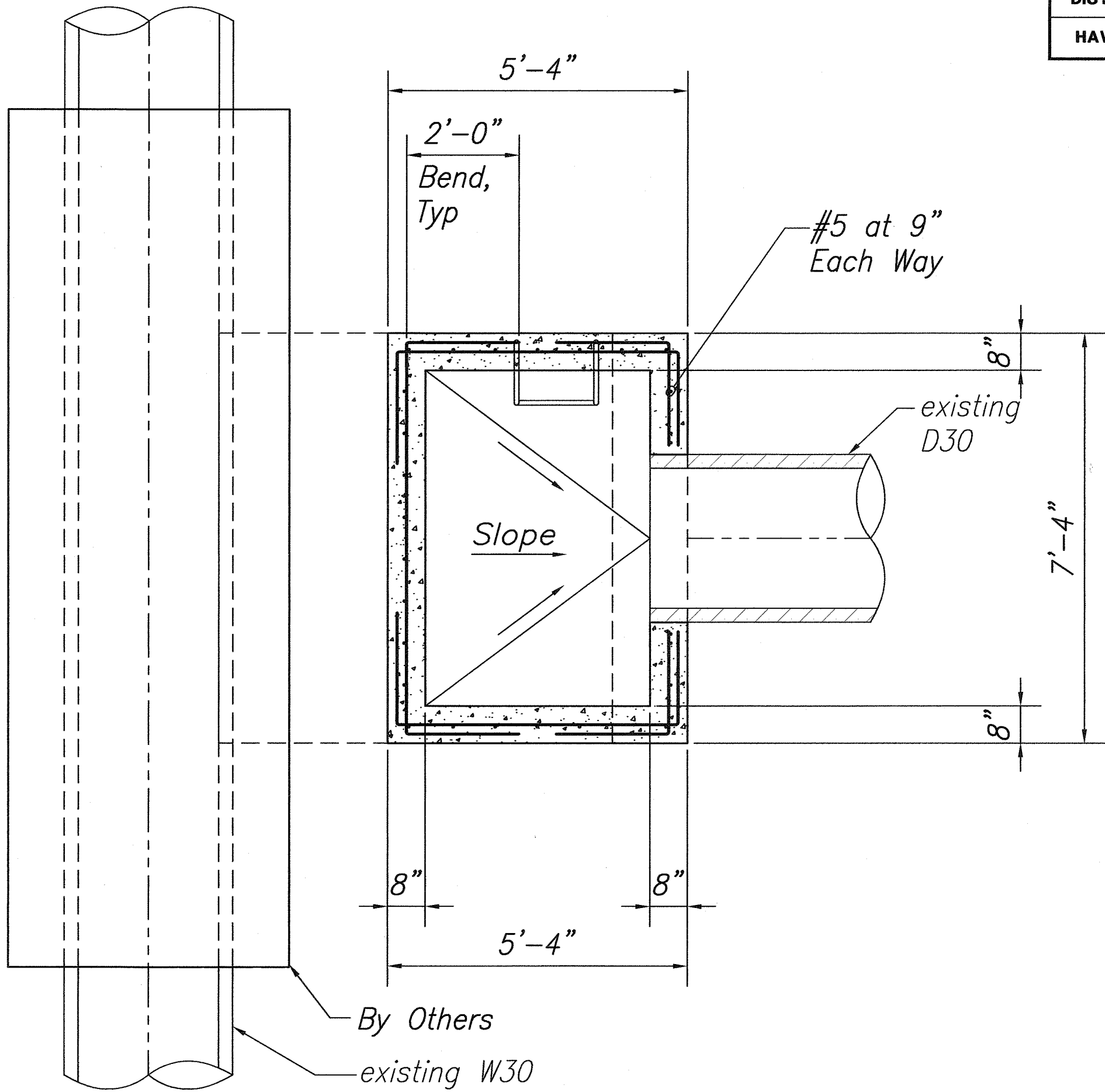
SHEET No. S-17A OF 27 SHEETS



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 88 S-2	121



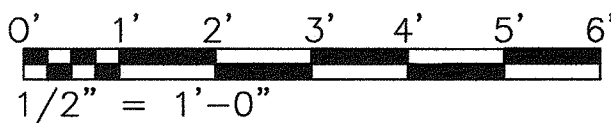
**TOP SLAB PLAN VIEW** 1  
Scale: 1/2" = 1'-0" S-17B | S-17B



APPROVED:

*Domini K. Dia* 3/3/10  
Chief, Capital Projects Division, BWS

GRAPHIC SCALE



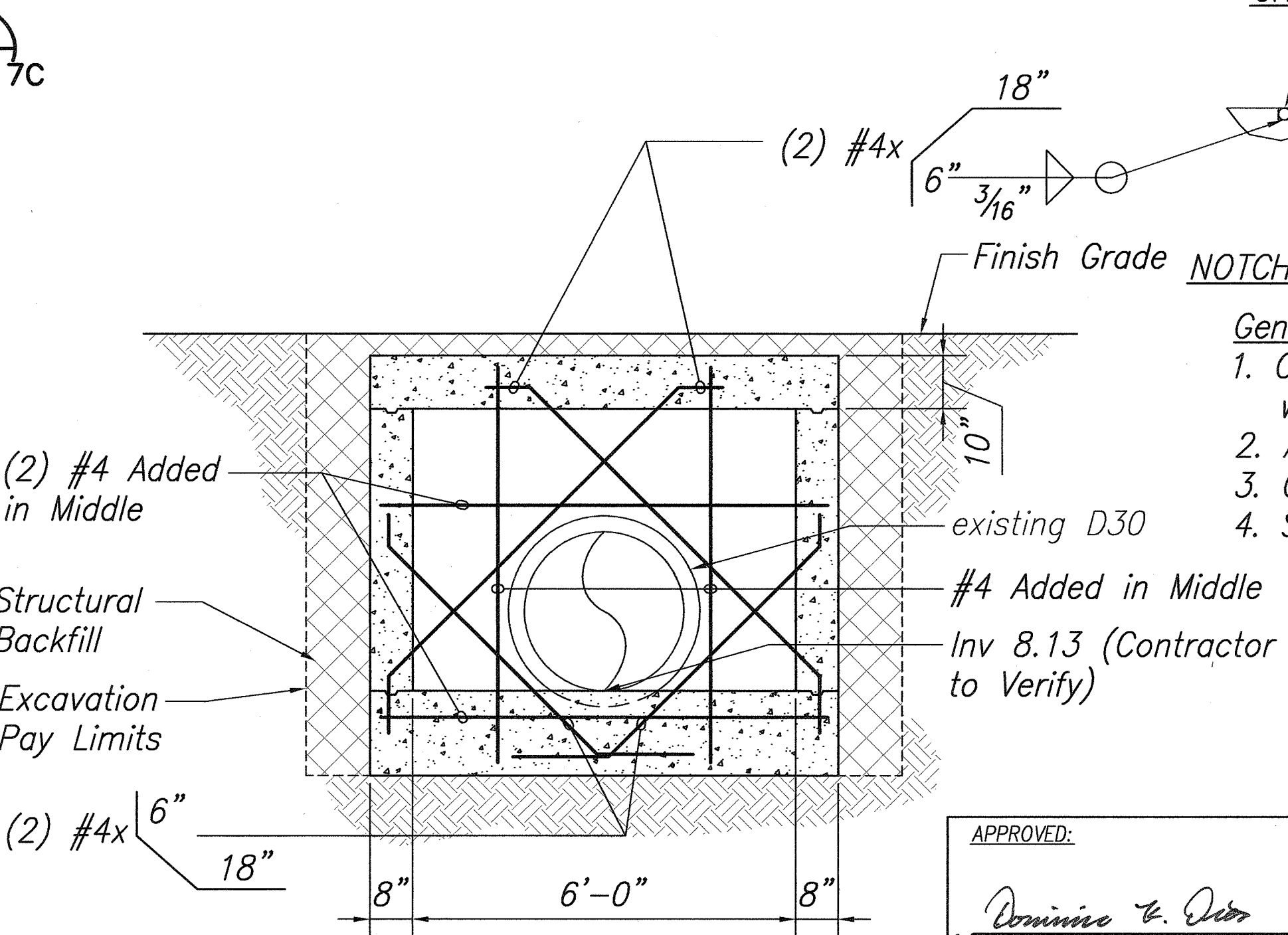
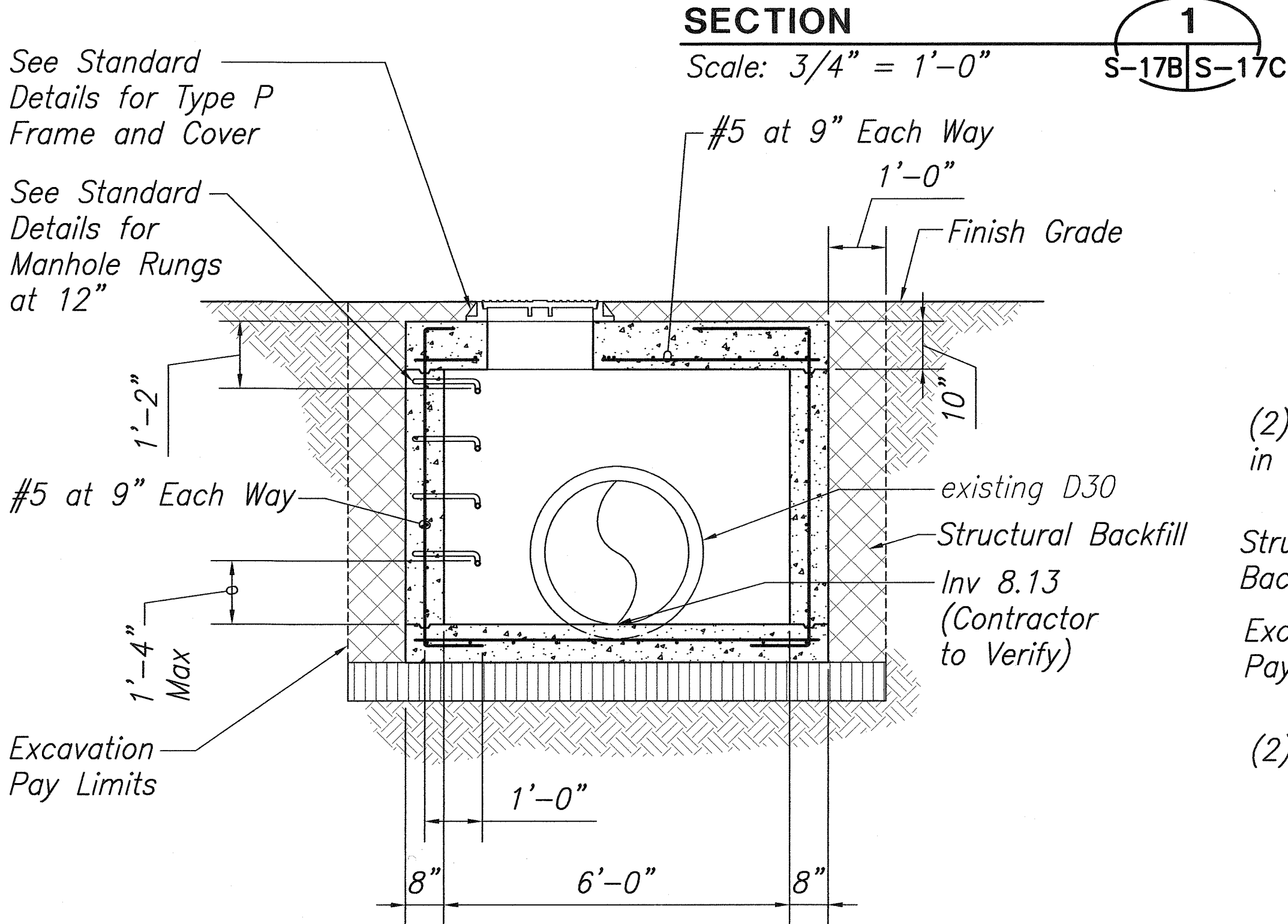
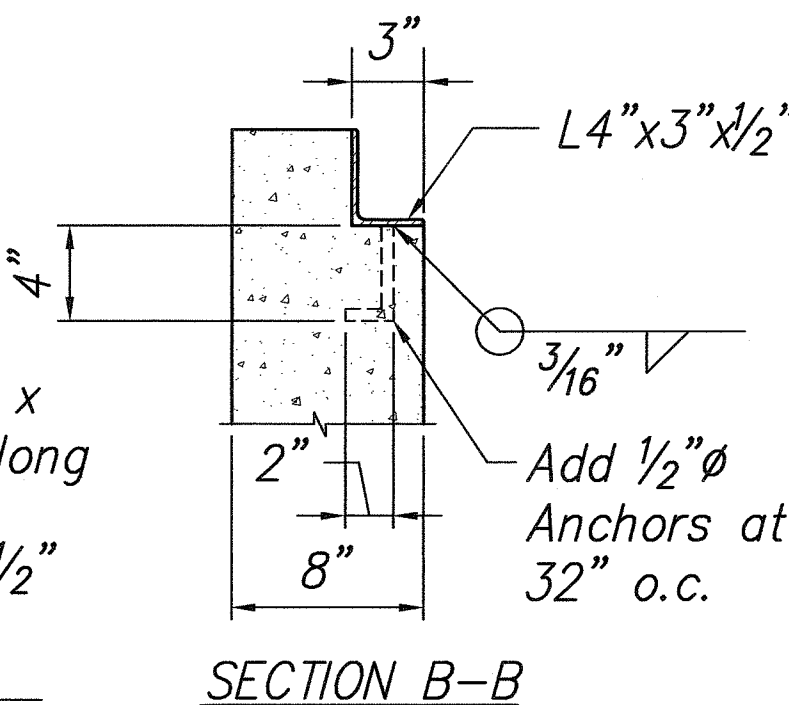
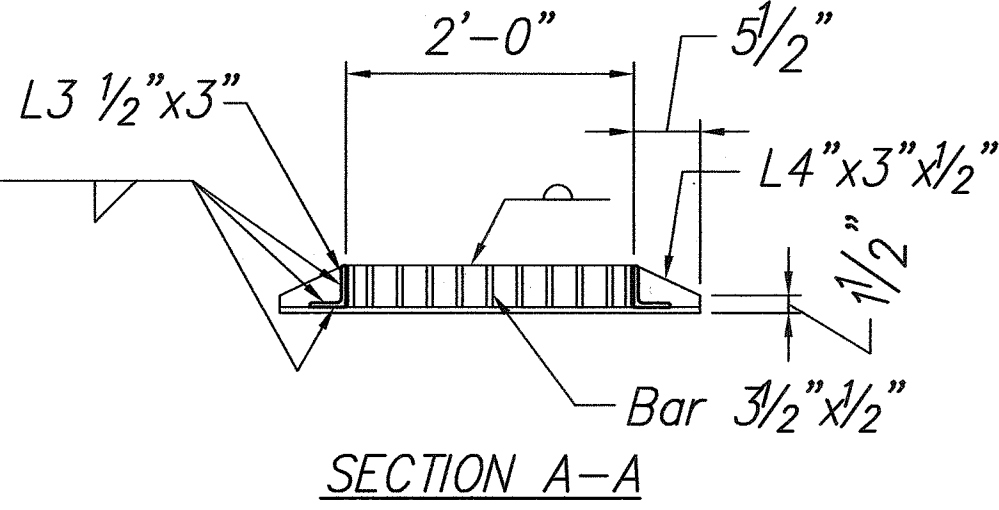
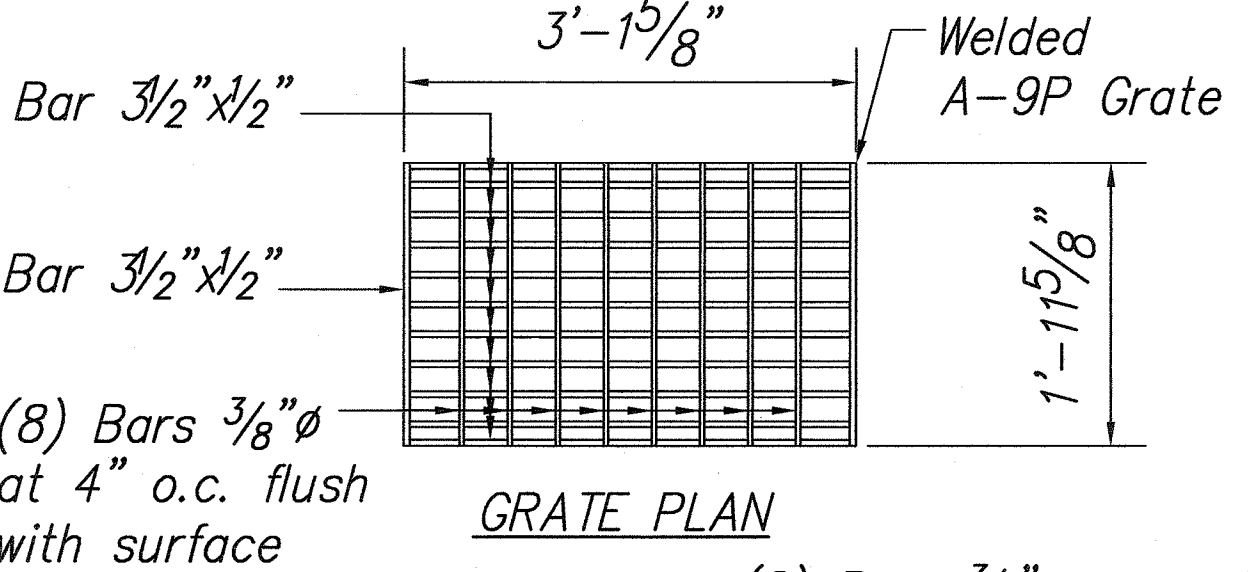
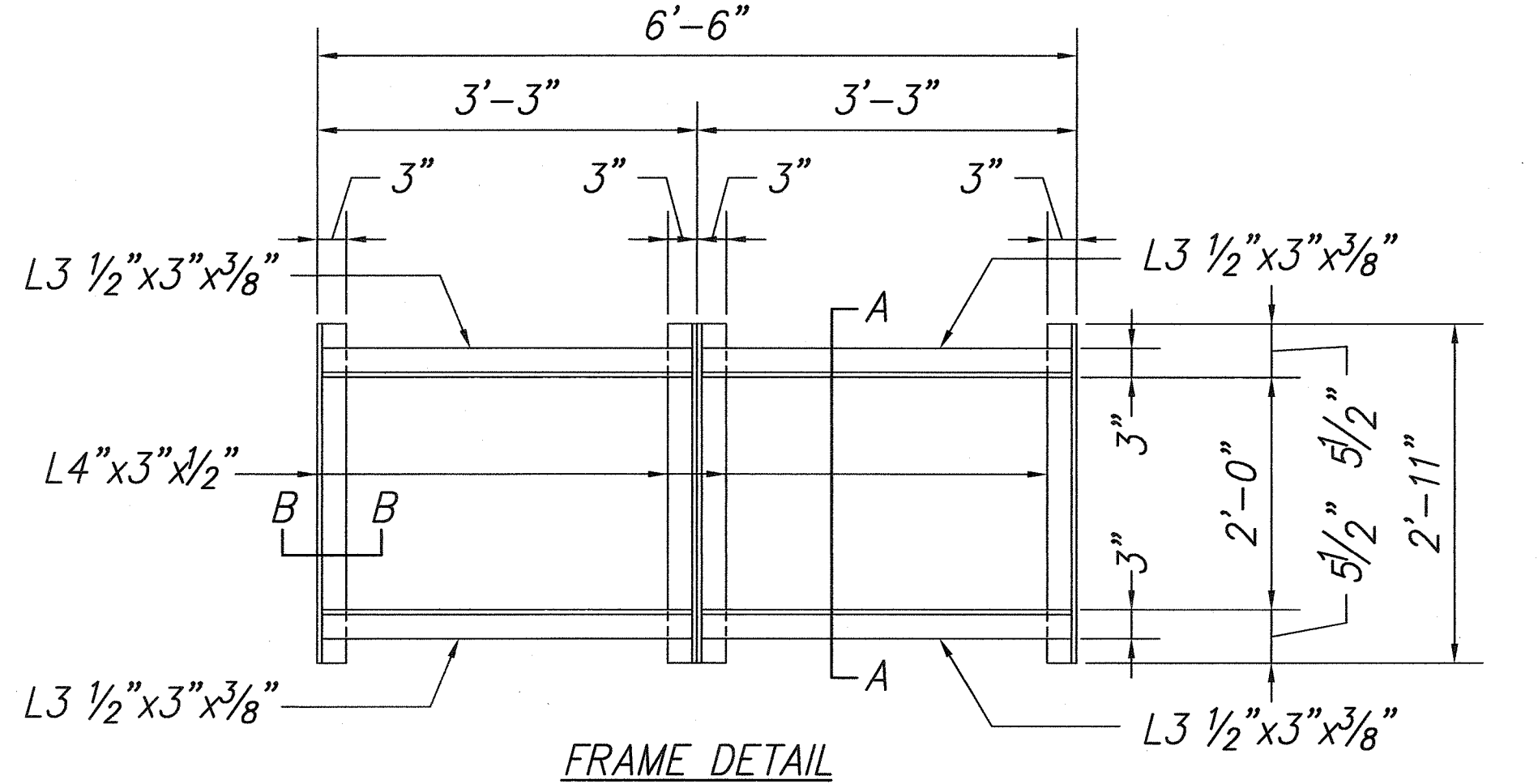
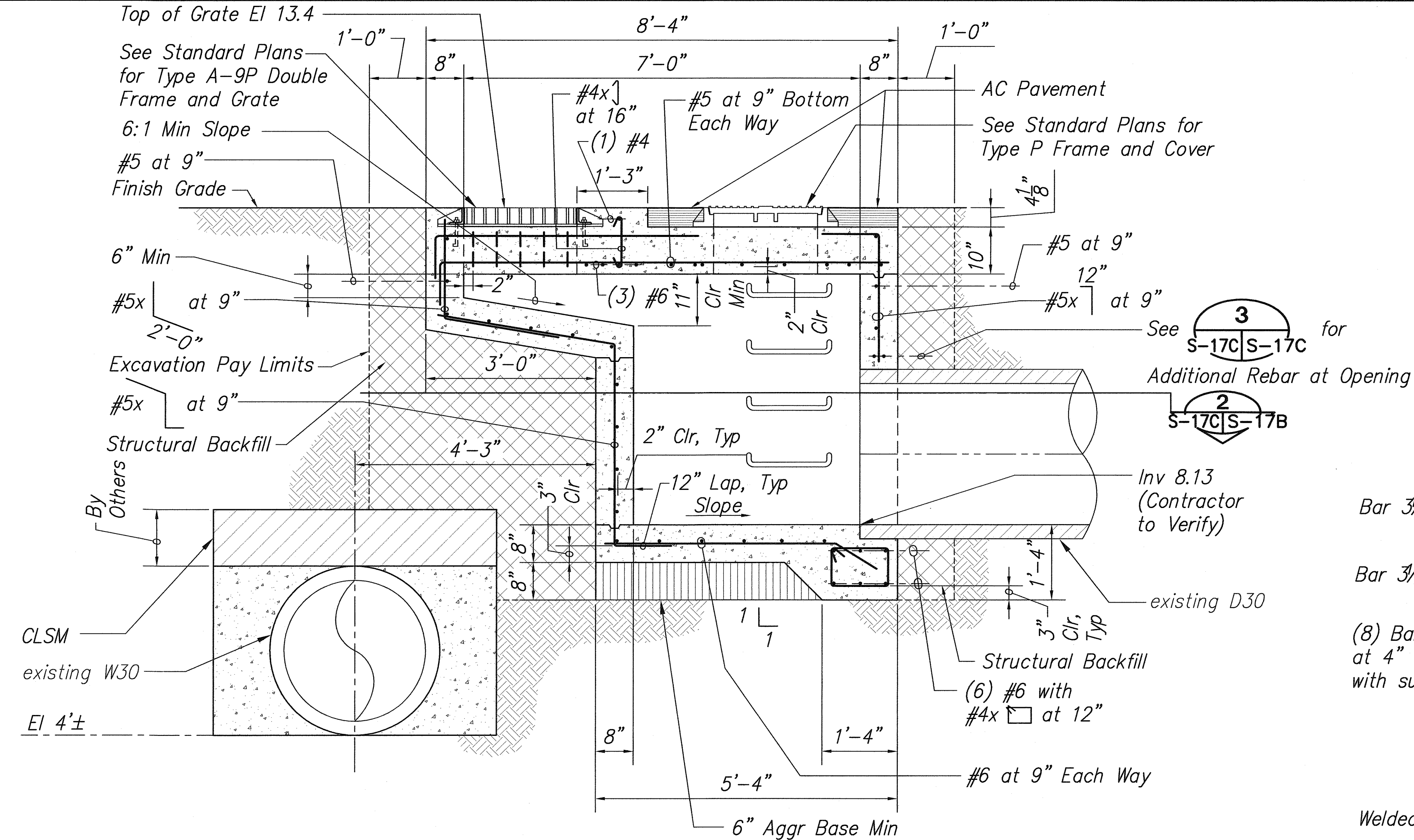
EXPIRATION DATE OF THE LICENSE: 4/30/2010  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

1/15/10	Added Sheet
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>MANHOLE AND STRUCTURE AT STATION 678+50</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: As Noted	Date: October 29, 2001
SHEET No. S-17B OF 27 SHEETS	

C.O. 88 S-2



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 88 S-3	121



- General Notes:
- Contractor has the option of using cast modular iron, cast steel, welded, bolted, or cast end block grate.
  - All welds 3/8" unless otherwise noted.
  - Grates shall be zinc coated after fabrication.
  - See Standard B-01 for additional notes.

FRAME AND GRATE DETAILS

Scale: 3/4" = 1'-0"

4

S-17B S-17C

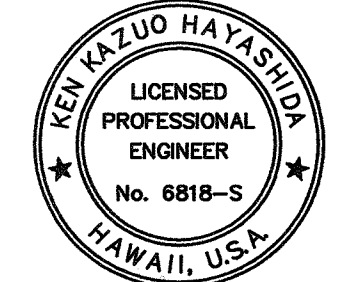
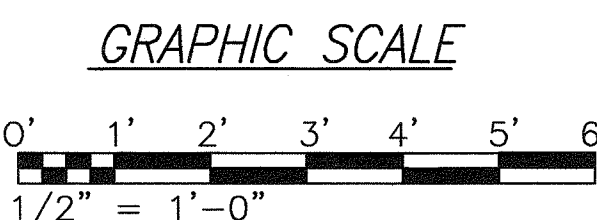
APPROVED:

*Domino E. Dea*

Chief, Capital Projects Division, DHS 000

3/3/00

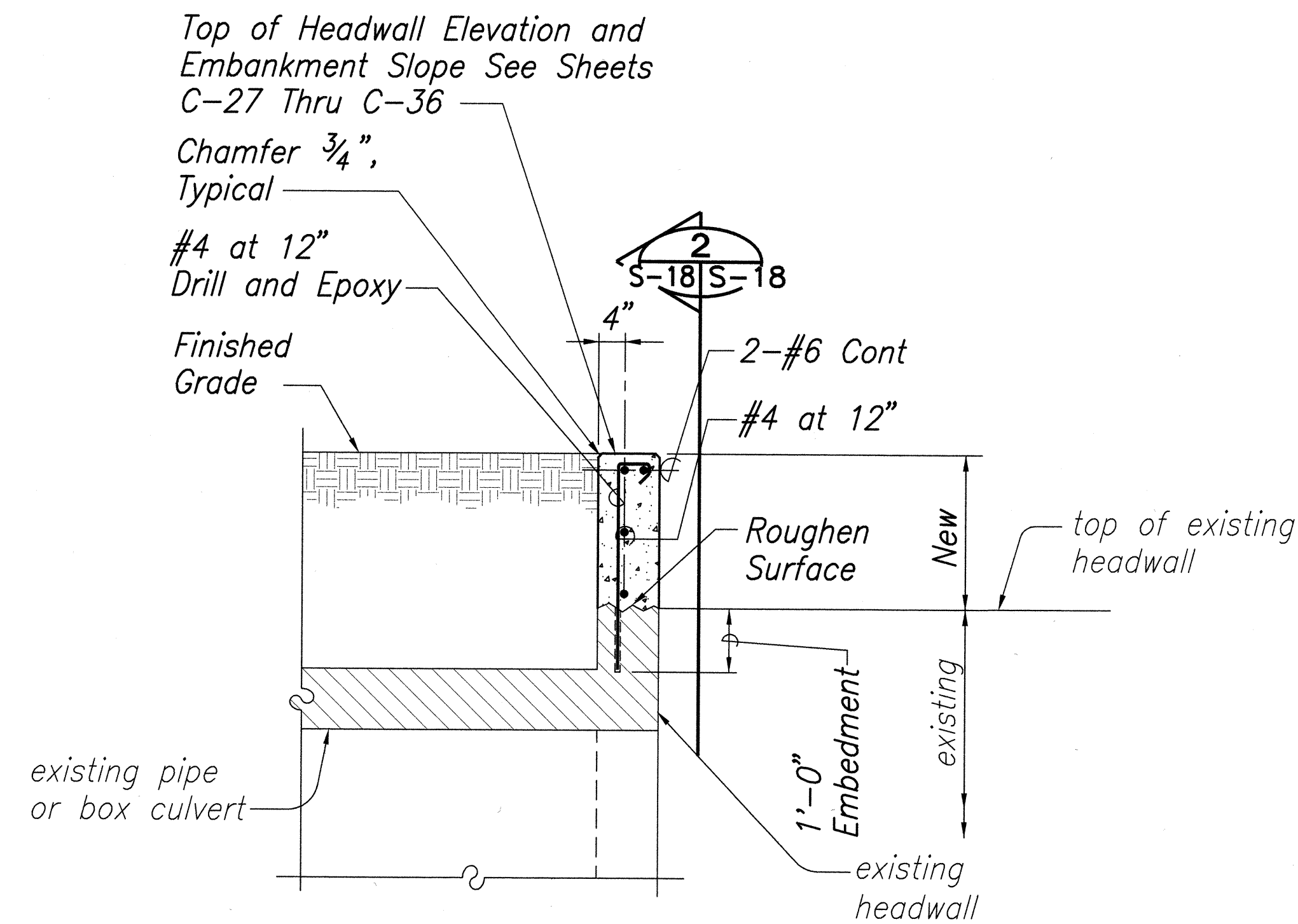
Date



1/15/10	Added Sheet
Date	Revision
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>MANHOLE AND STRUCTURE AT STATION 678+50</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: As Noted	Date: October 29, 2001
SHEET No. S-17C OF 27 SHEETS	



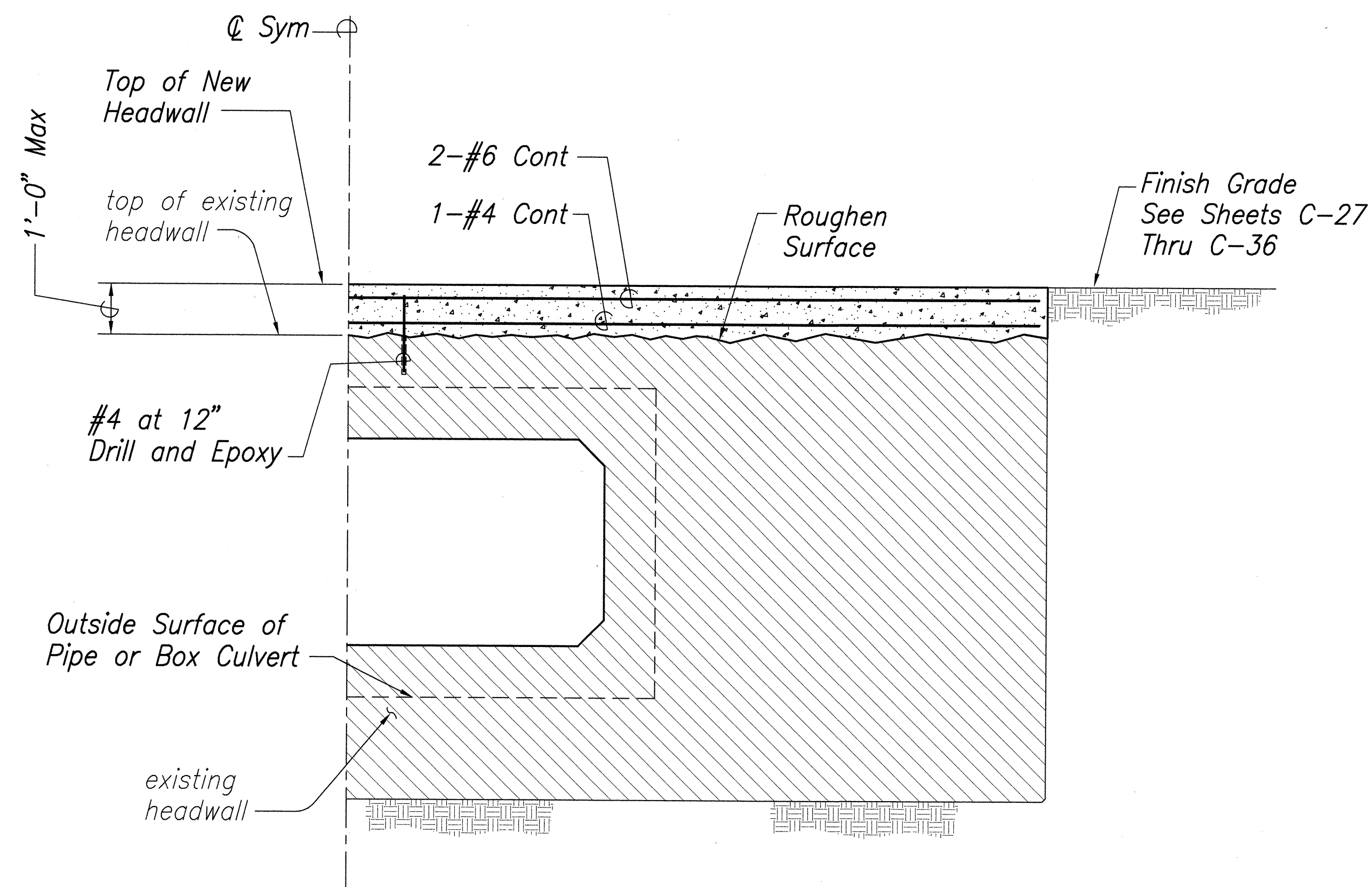
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	89	121



**TYPICAL TOP OF HEADWALL HEIGHT EXTENSION DETAIL**

Scale:  $\frac{1}{2}" = 1'-0"$

1  
S-18 | S-18

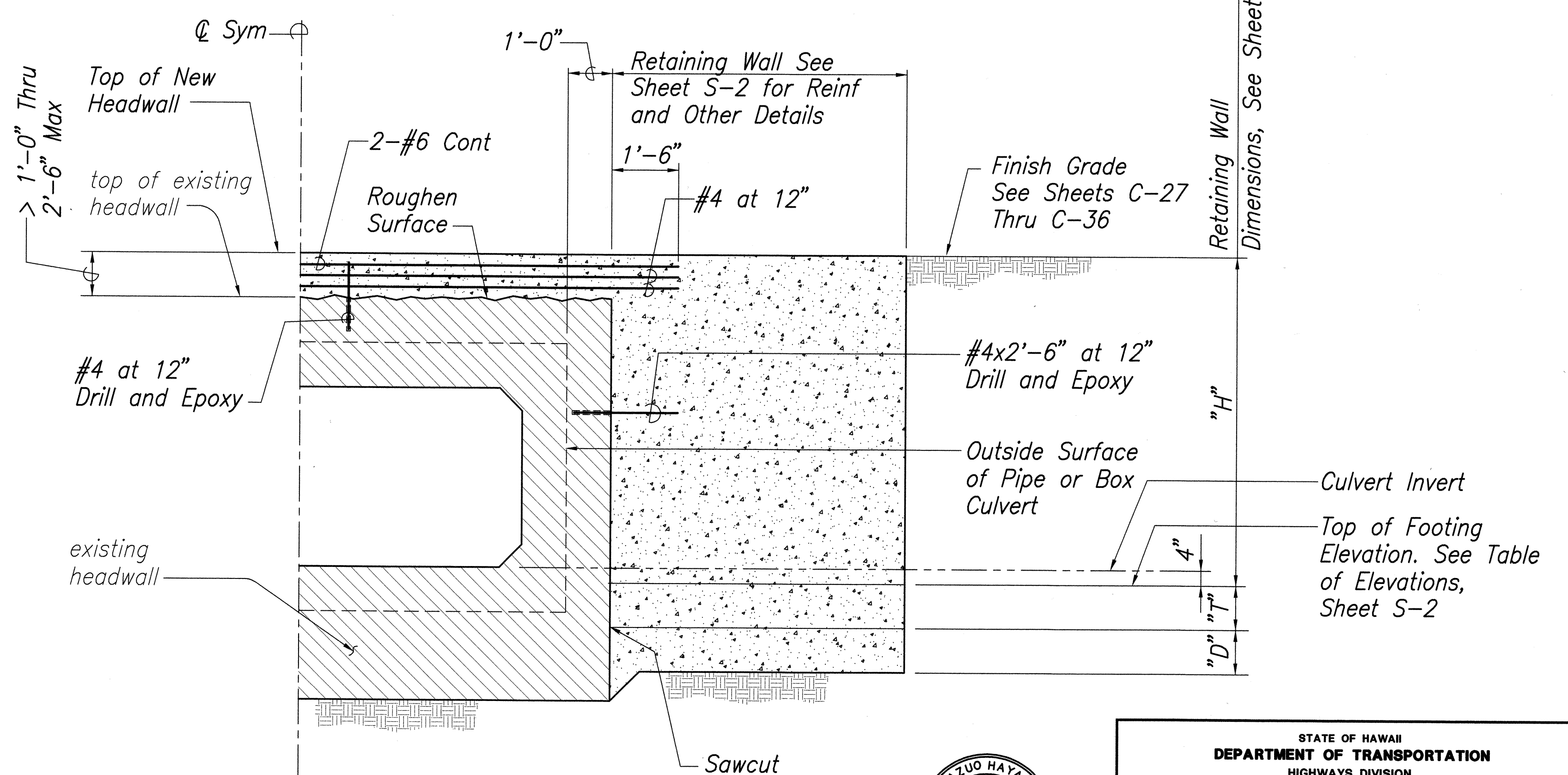


**CONDITION 1 (1 FT. HEIGHT EXTENSION)**

**SECTION - ELEVATION (PIPE OR BOX CULVERT)**

Scale:  $\frac{1}{2}" = 1'-0"$

2  
S-18 | S-18

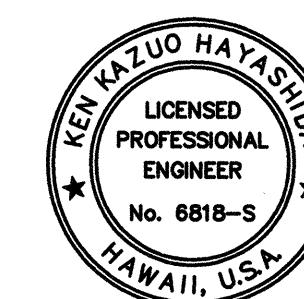


**CONDITION 2 (HEIGHT EXTENSION > 1'-0" THRU 2'-6" MAX)**

**GRAPHIC SCALE**

0' 1' 2' 3' 4' 5' 6'

$\frac{1}{2}" = 1'-0"$



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**TYP HEADWALL  
HEIGHT EXTENSION DETAILS**

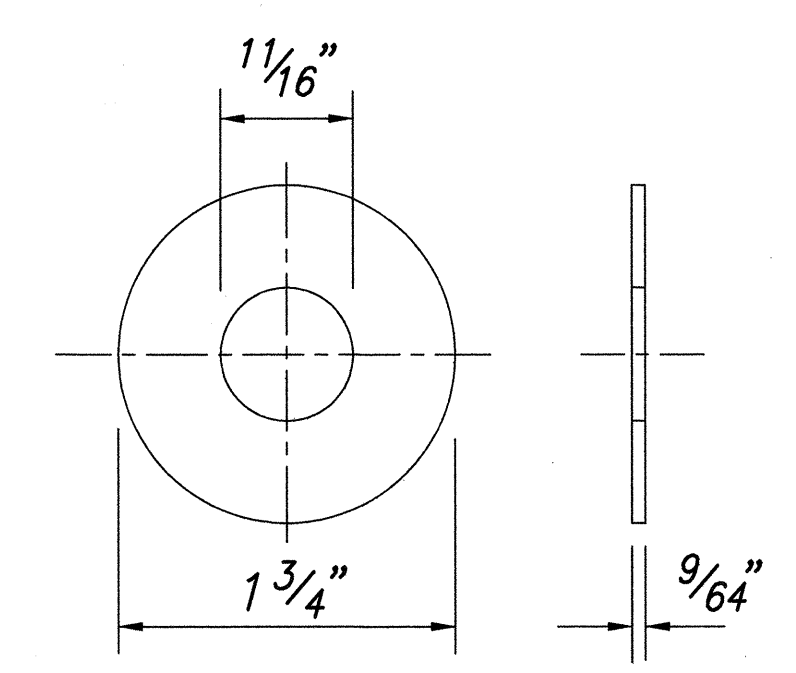
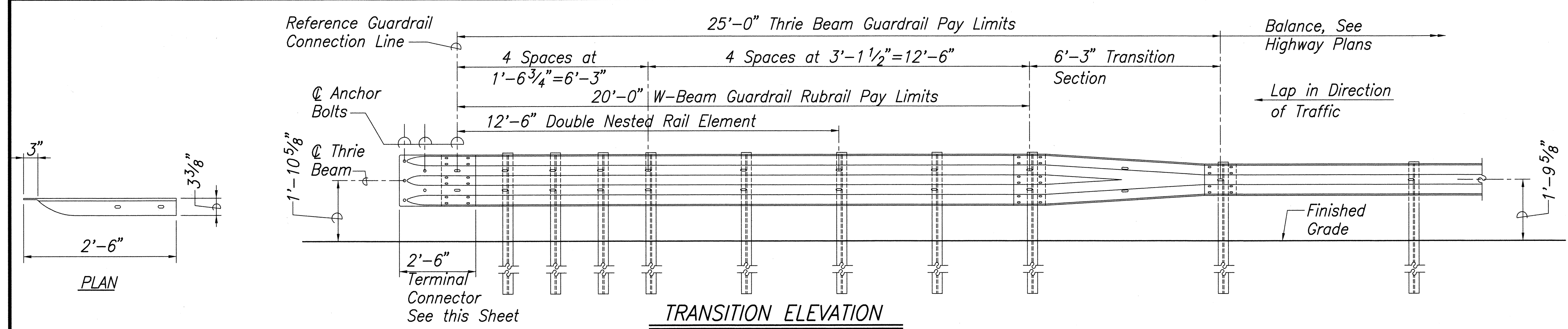
KAMEHAMEHA HIGHWAY RESURFACING  
Waialeale Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: As Noted Date: October 29, 2001

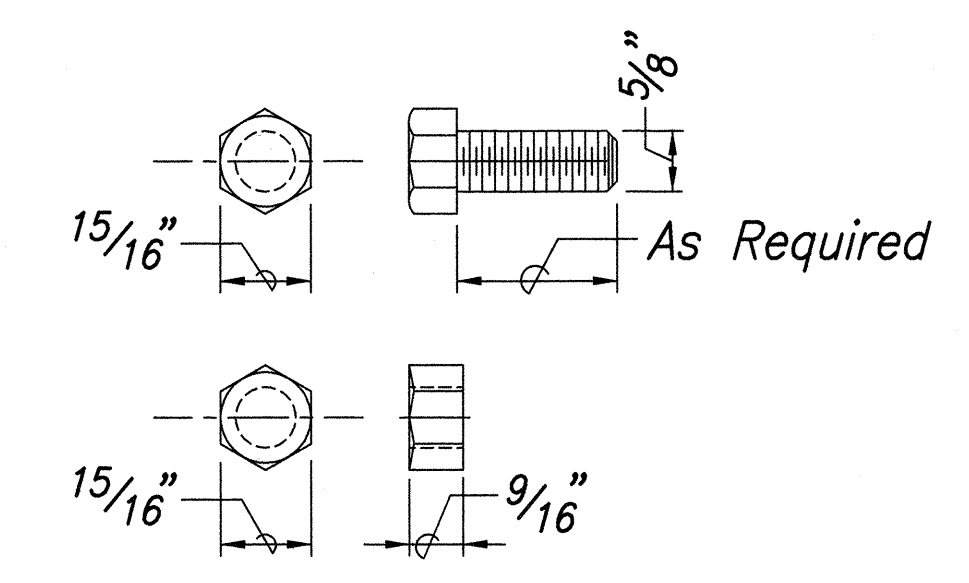
SHEET No. S-18 OF 27 SHEETS



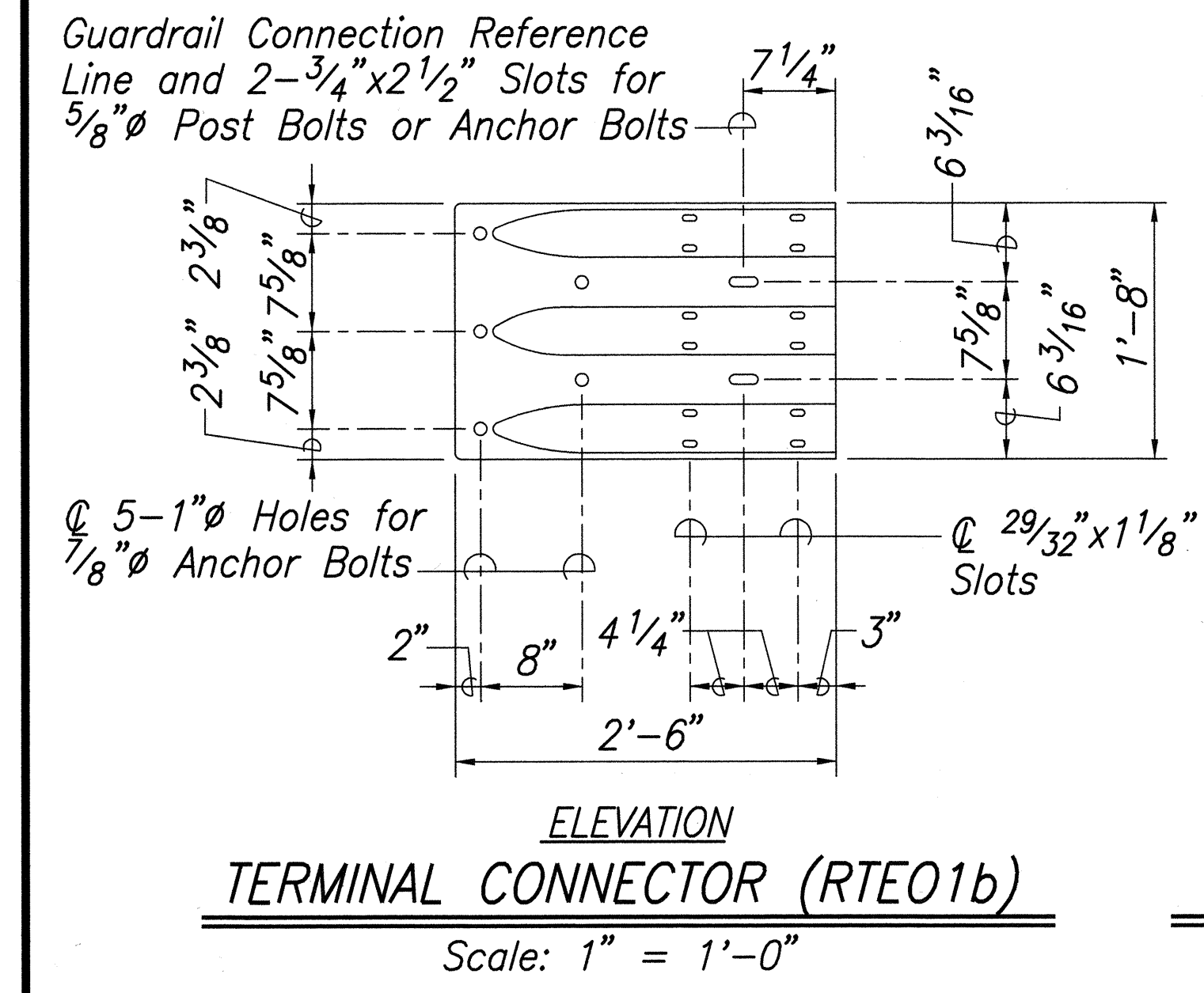
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	90	121



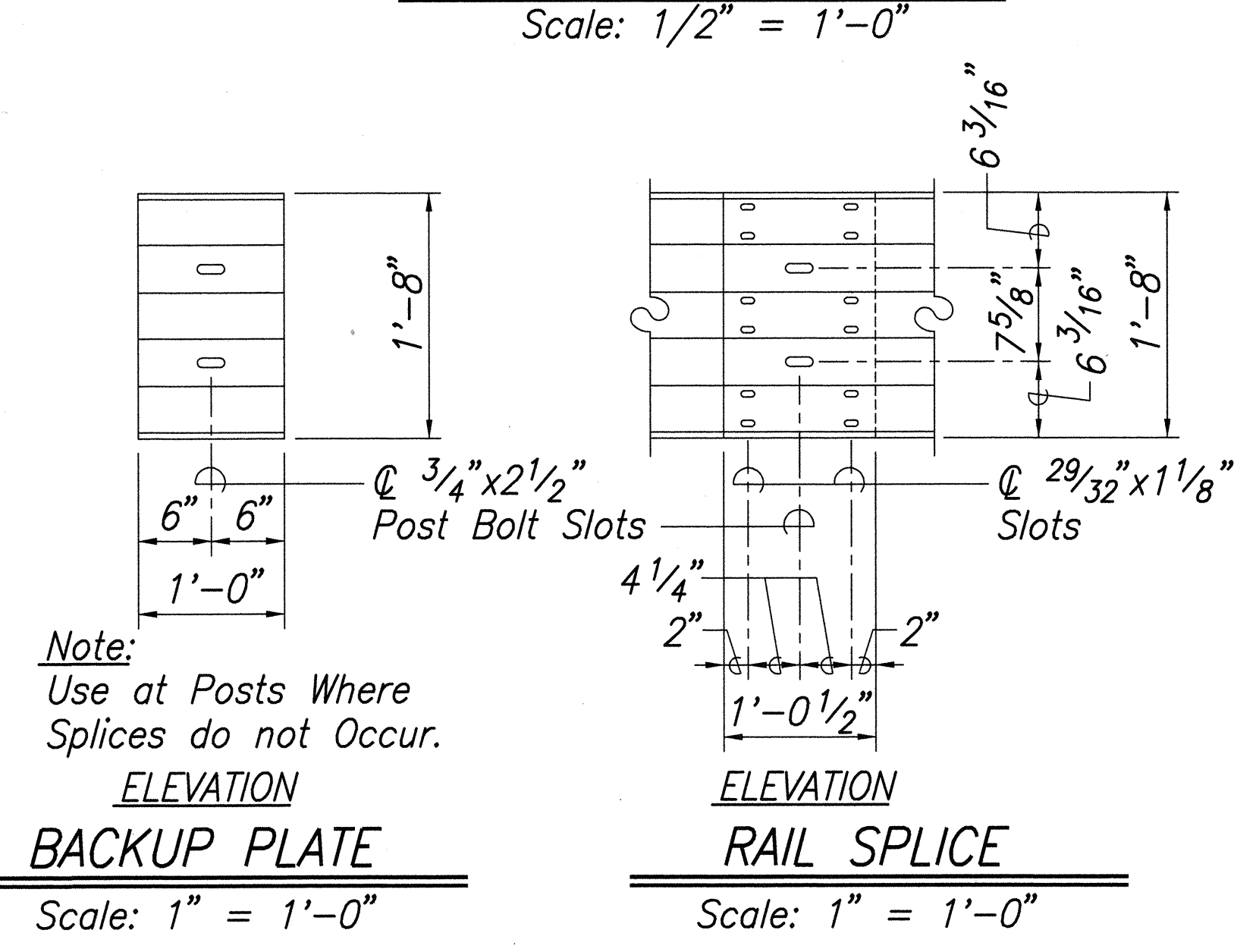
**STEEL WASHER  
FOR 5/8" BOLT**  
Not to Scale



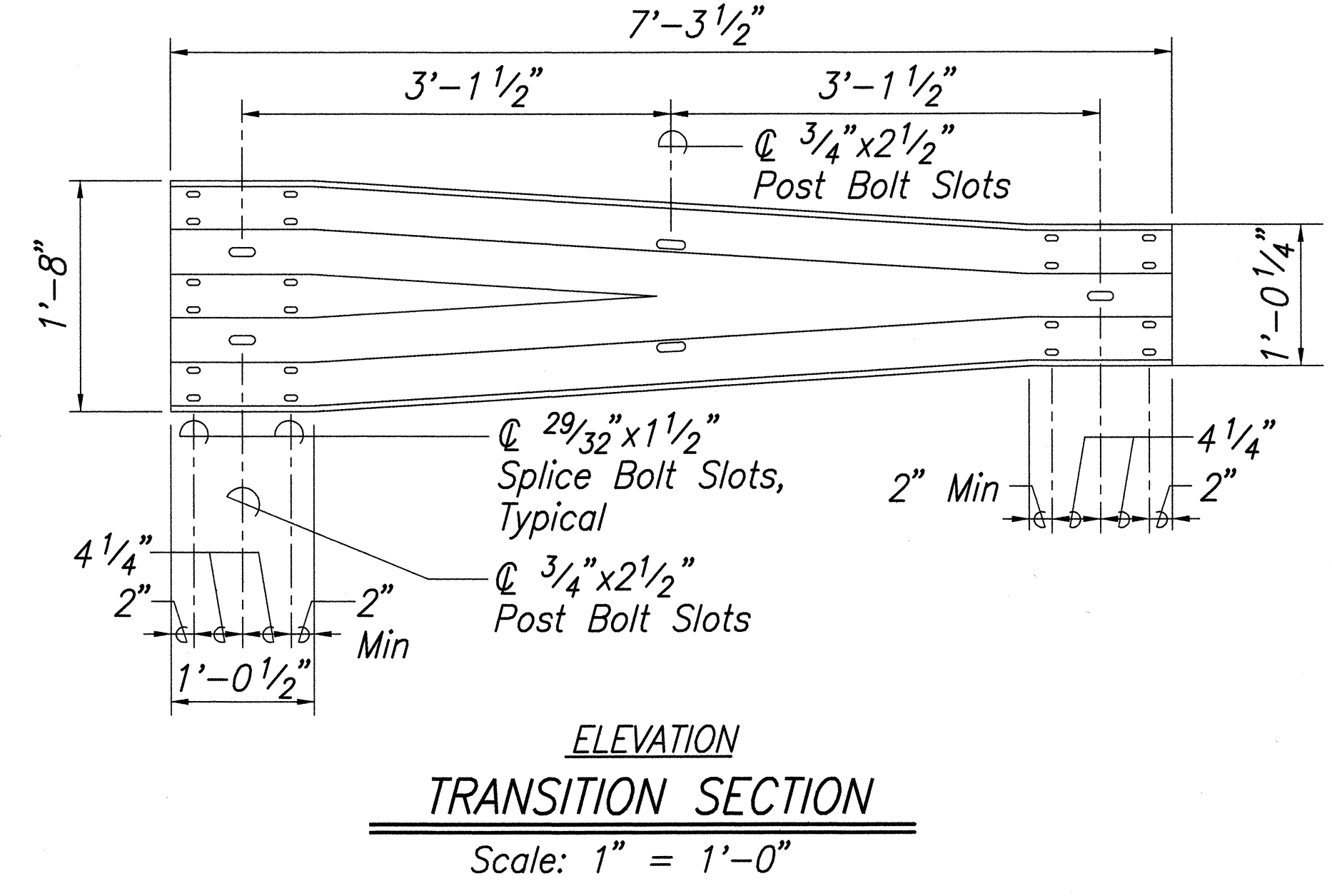
**HEX BOLT AND NUT  
(FBX16a)**  
Not to Scale



**TERMINAL CONNECTOR (RTE01b)**  
Scale: 1" = 1'-0"

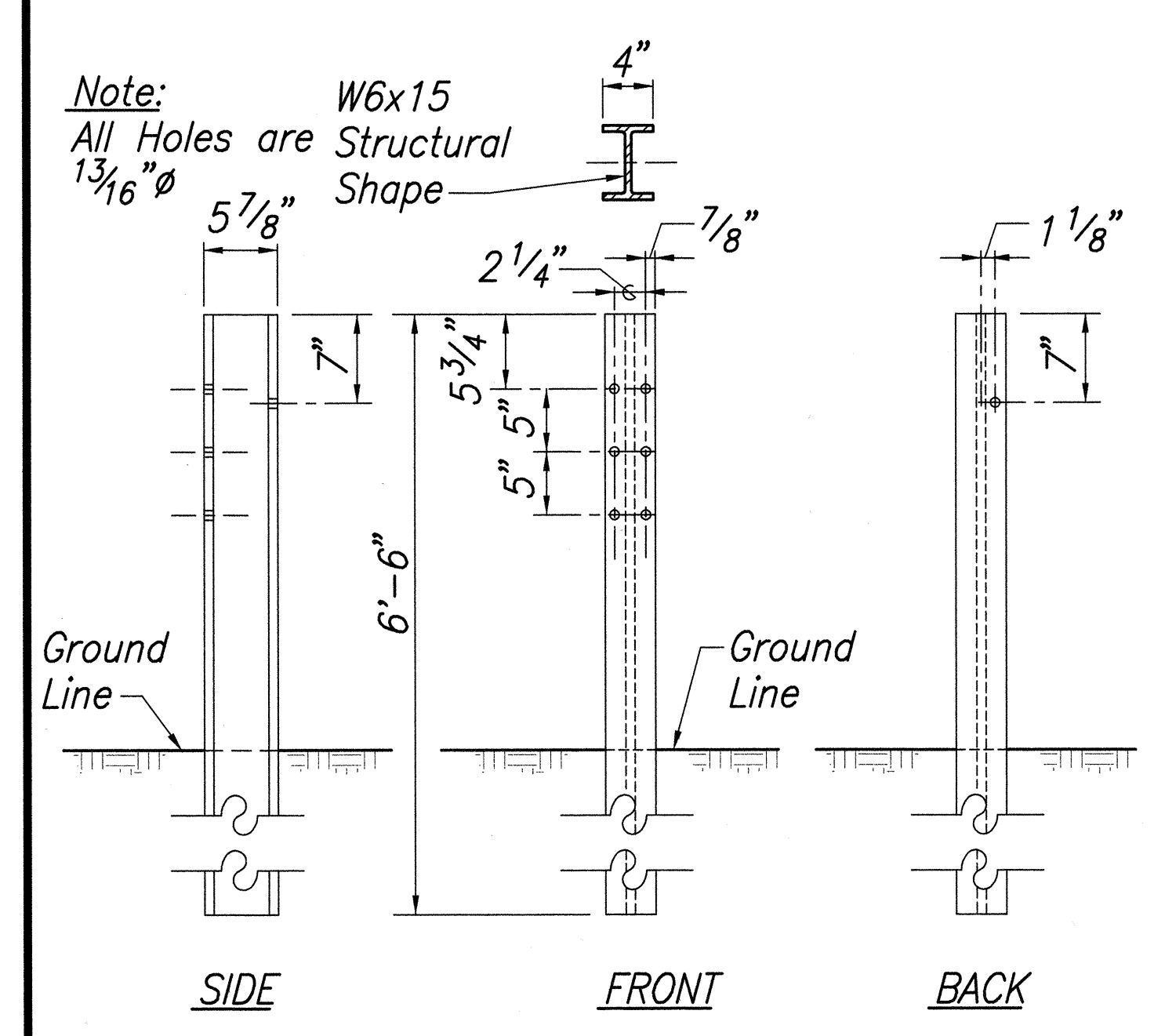


**BACKUP PLATE**  
Scale: 1" = 1'-0"

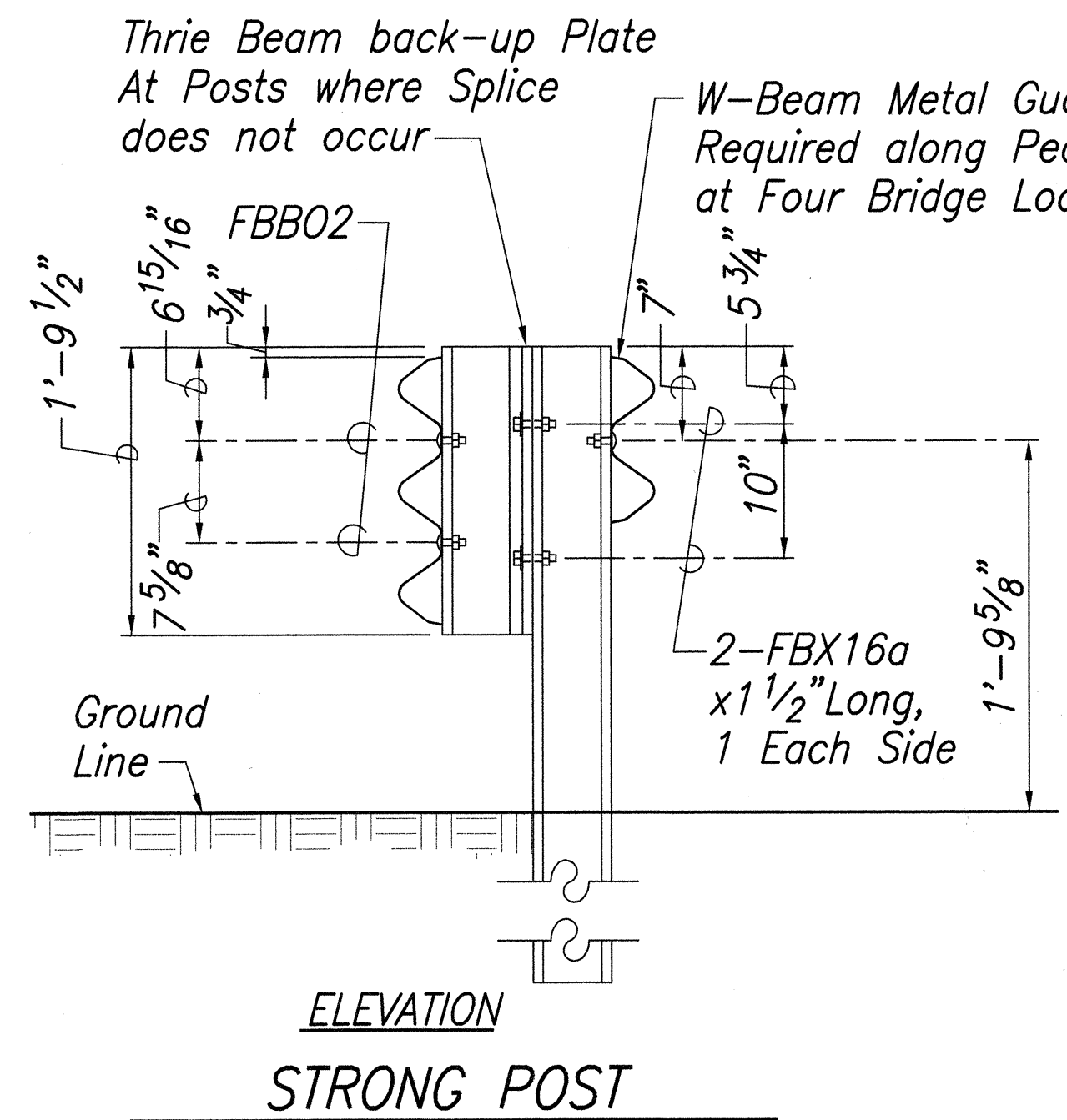


**TRANSITION SECTION**  
Scale: 1" = 1'-0"

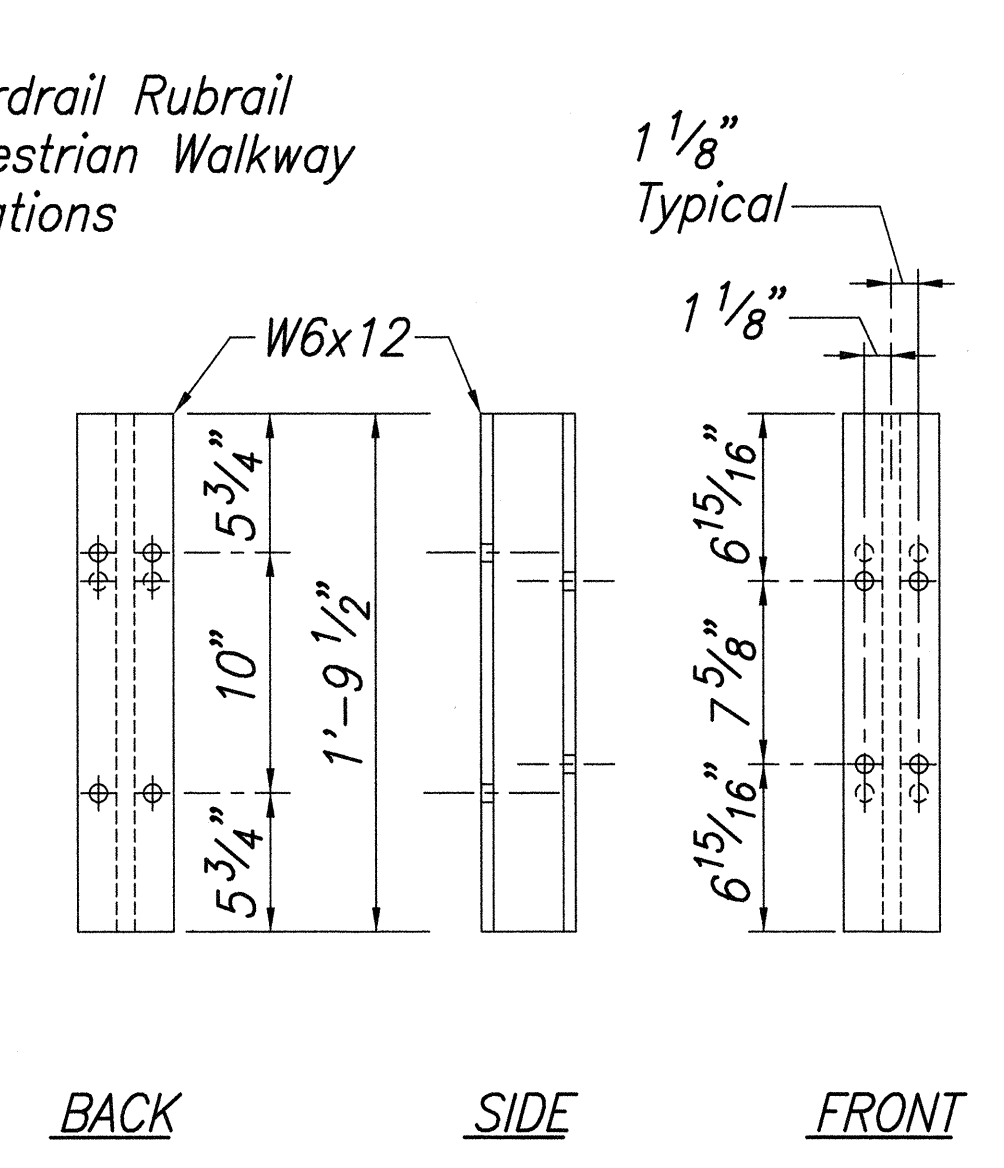
**TYPICAL STRONG POST THRIE BEAM GUARDRAIL DETAILS**  
As Noted



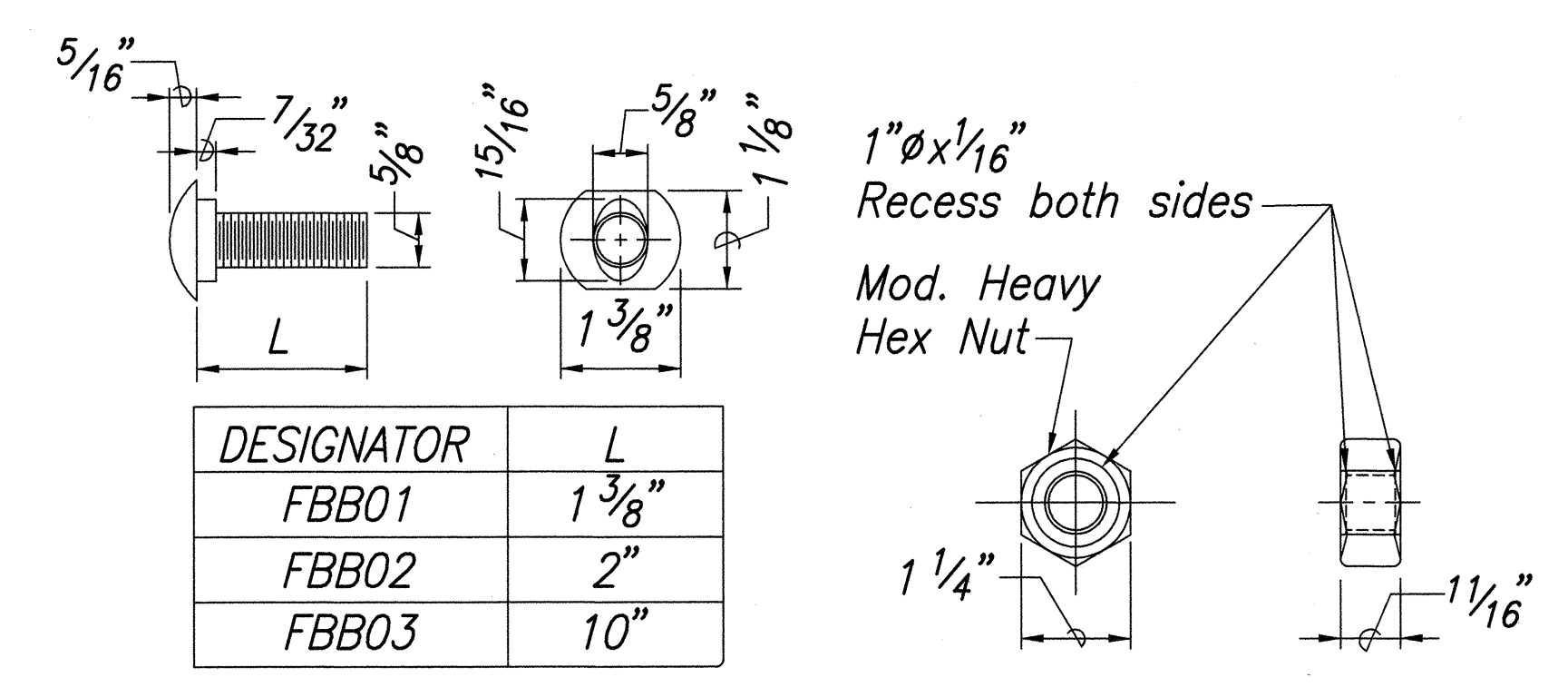
**W-BEAM STRONG POST**  
Scale: 1" = 1'-0"



**THRIE BEAM GUARDRAIL**  
Scale: 1" = 1'-0"

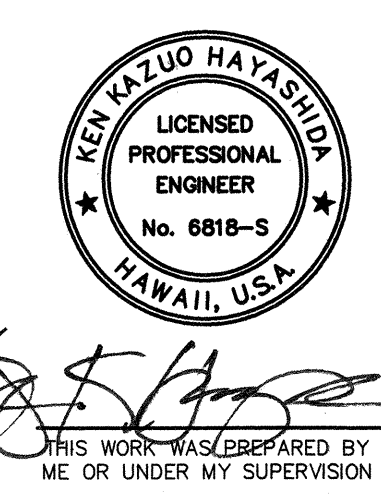
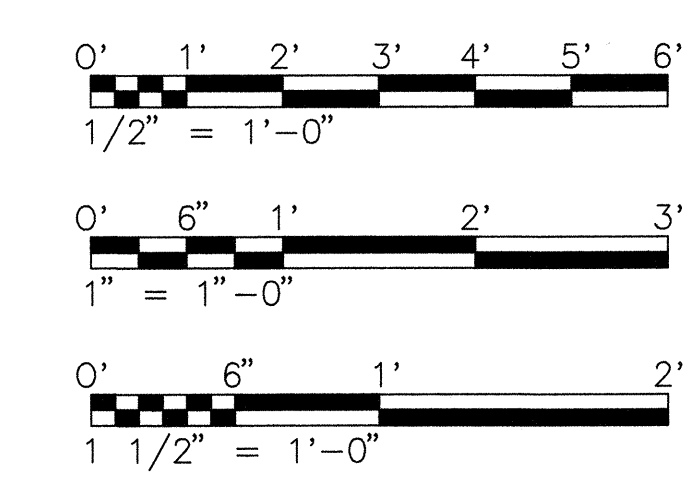


**SPACER BLOCK**  
Scale: 1 1/2" = 1'-0"



**GUARDRAIL BOLTS AND RECESSED NUT**  
Not to Scale

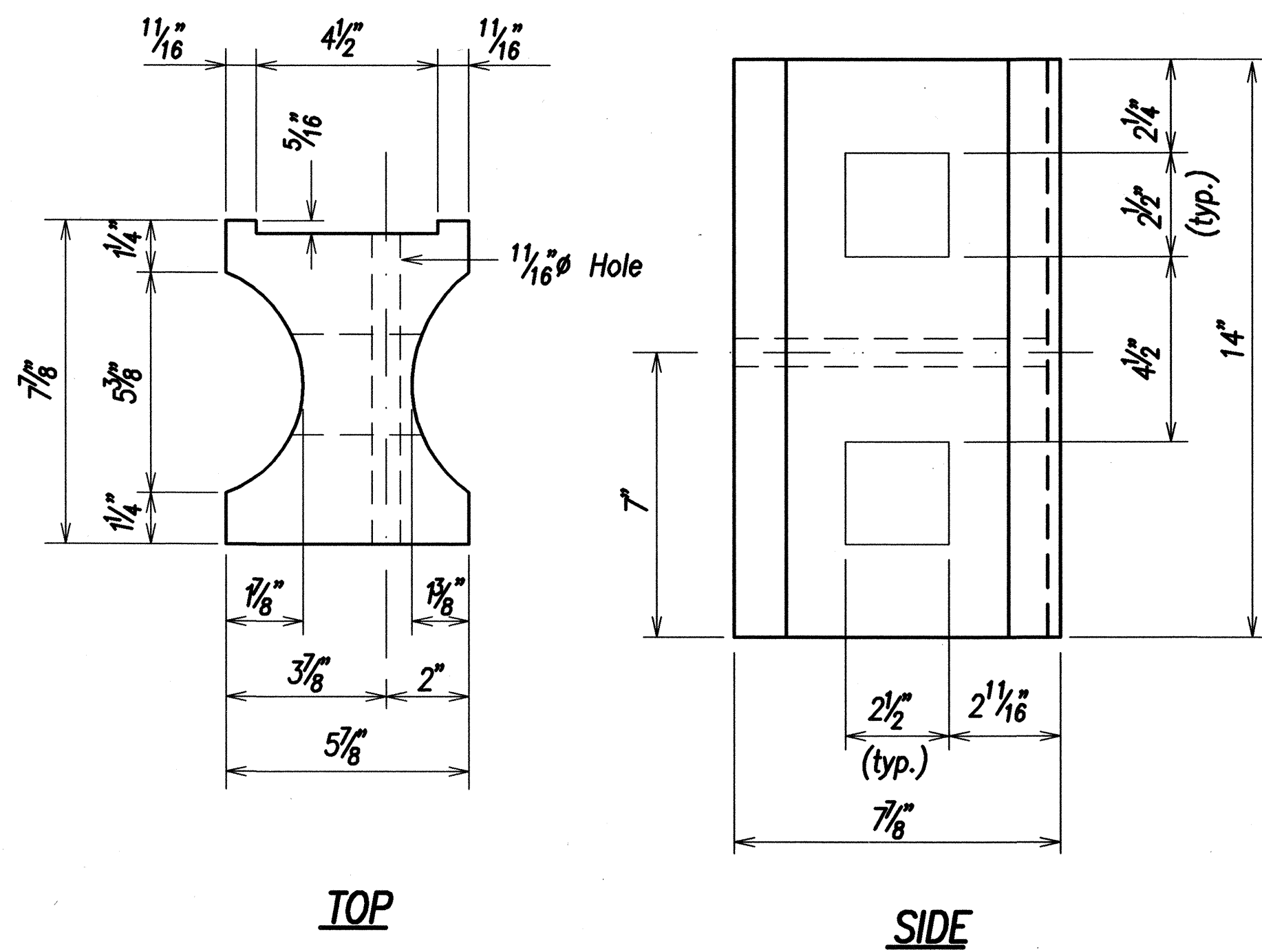
ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
NOTE BOOK	DRAWN BY	
	DESIGNED BY	
	QUANTITIES BY	
	CHECKED BY	



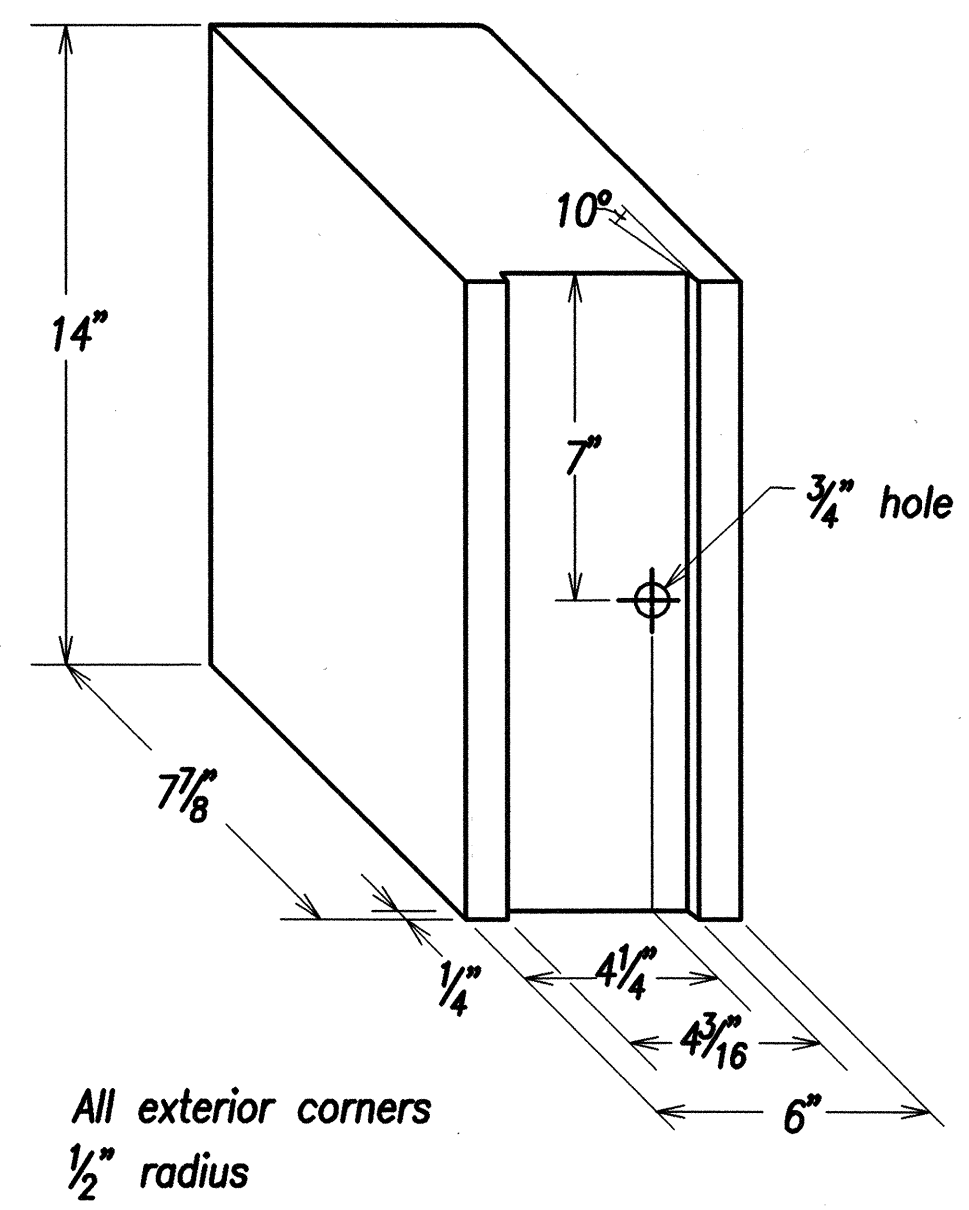
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION  
**GUARDRAIL DETAILS**  
**TYP STRONG POST**  
**GUARDRAIL DETAILS**  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)  
Scale: As Noted Date: October 29, 2001  
SHEET No. S-19 OF 27 SHEETS



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 91	121

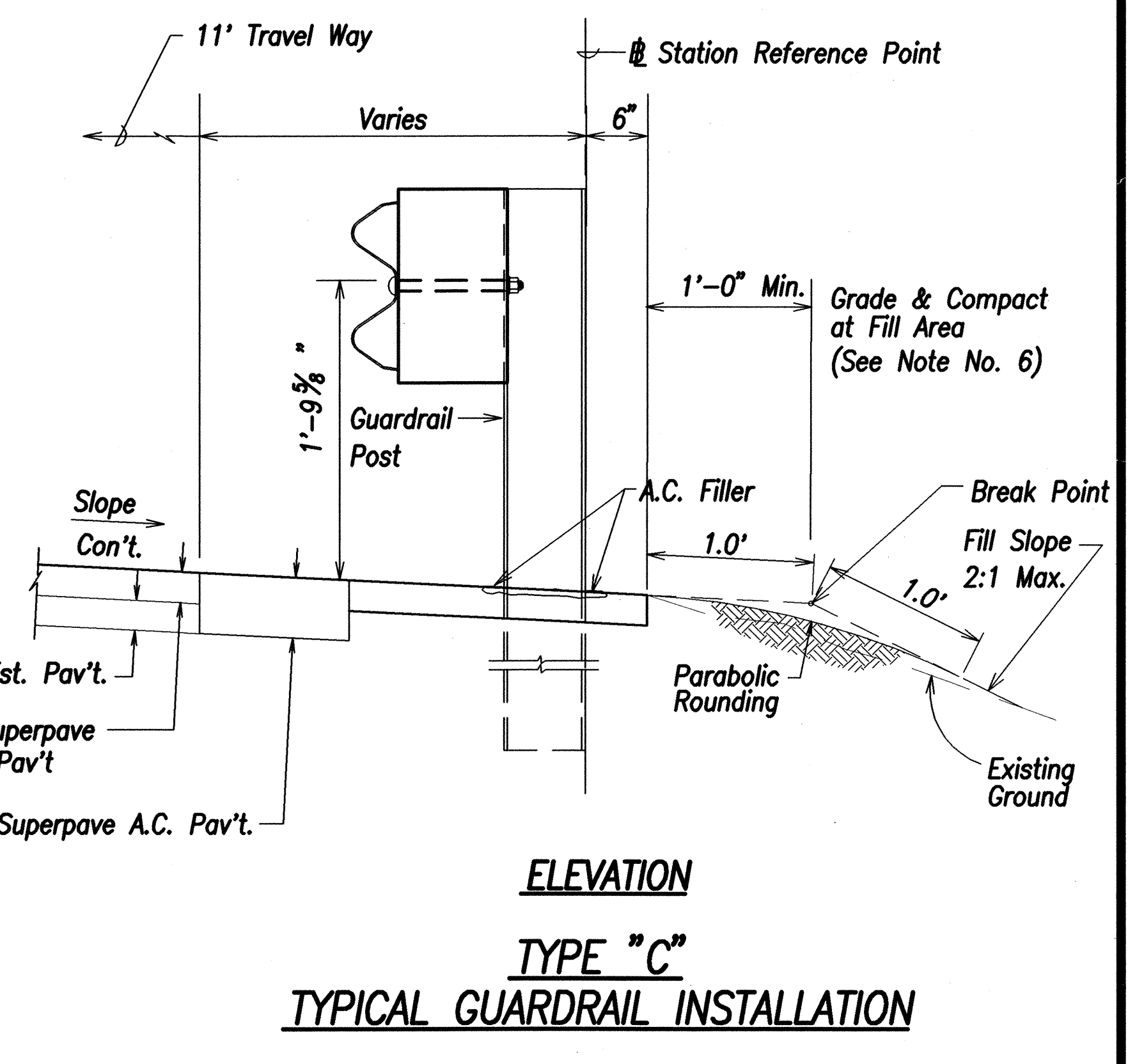
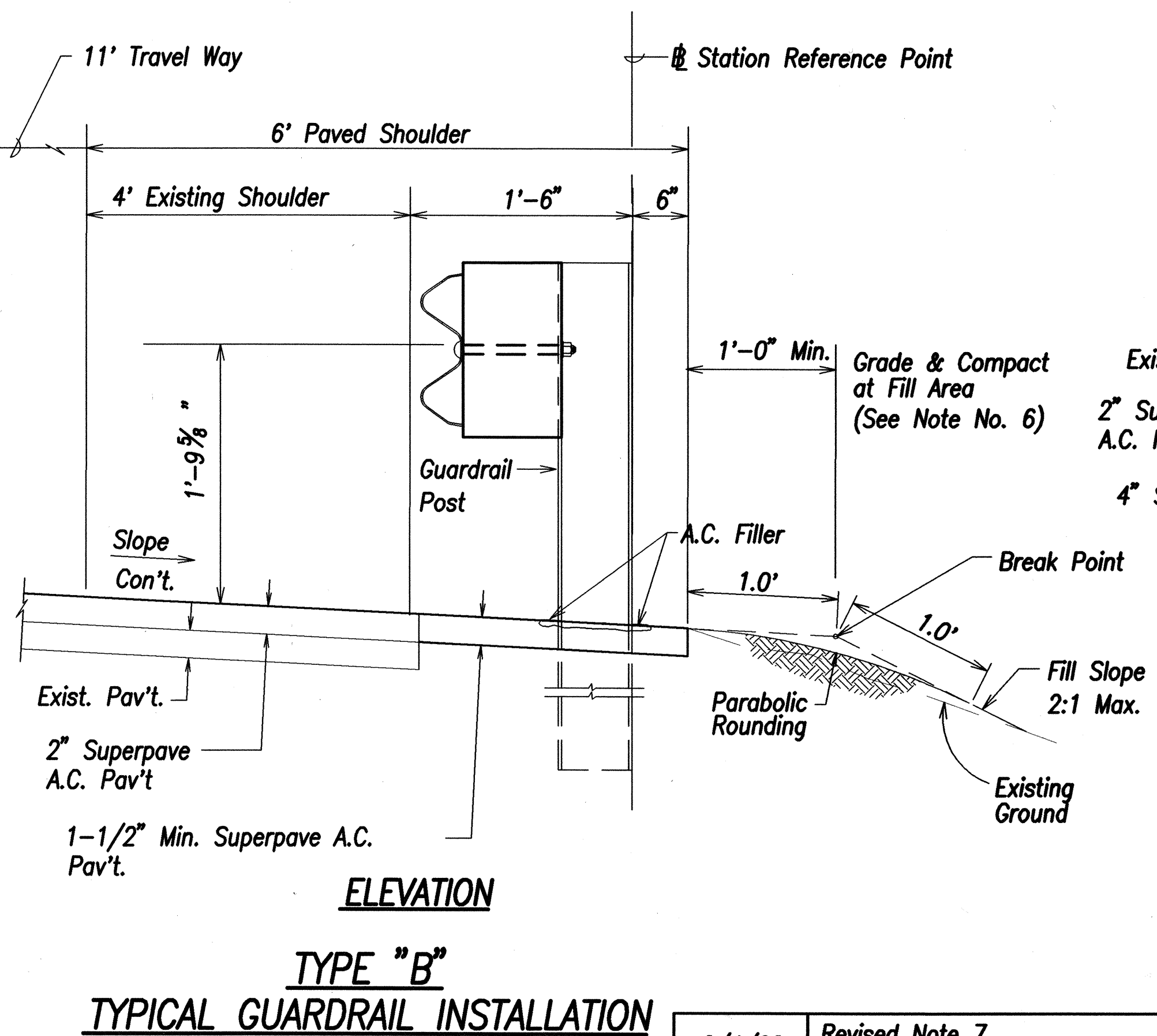
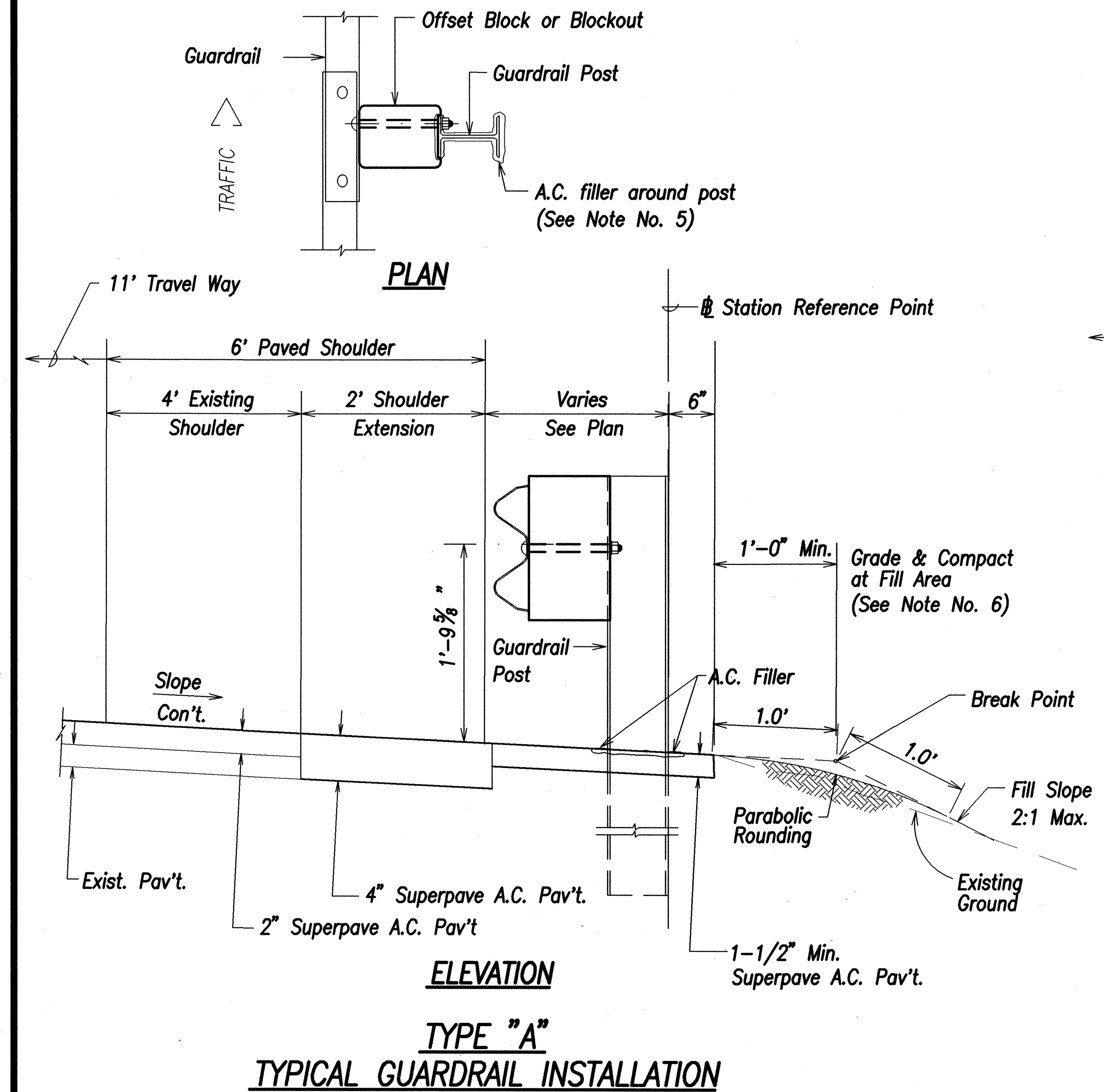
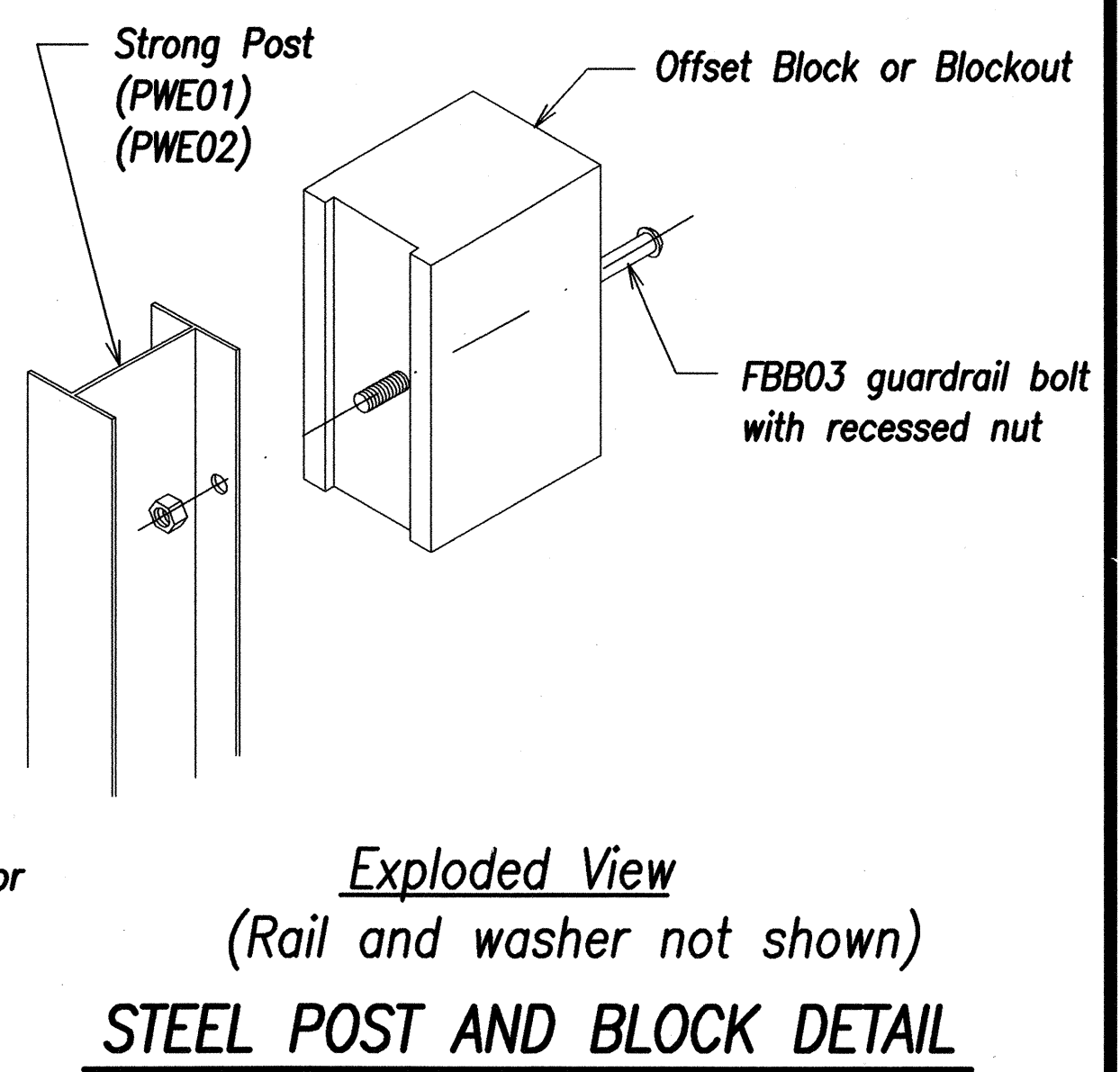


**RECYCLED PLASTIC BLOCKOUT (TYPE I)**

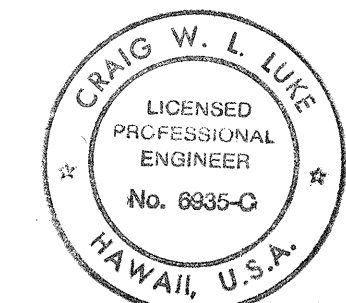


**GENERAL NOTES**

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 fill around the guardrail post and seal all cracks in the paved area w/ A.C. filler 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 using A.C. filler. 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. All guardrail posts shall be 8'-0" in length.



DESIGNED BY	DATE
CHECKED BY	
NOTED BY	
QUANTITIES BY	
TRACED BY	
ORIGINAL PLAN	

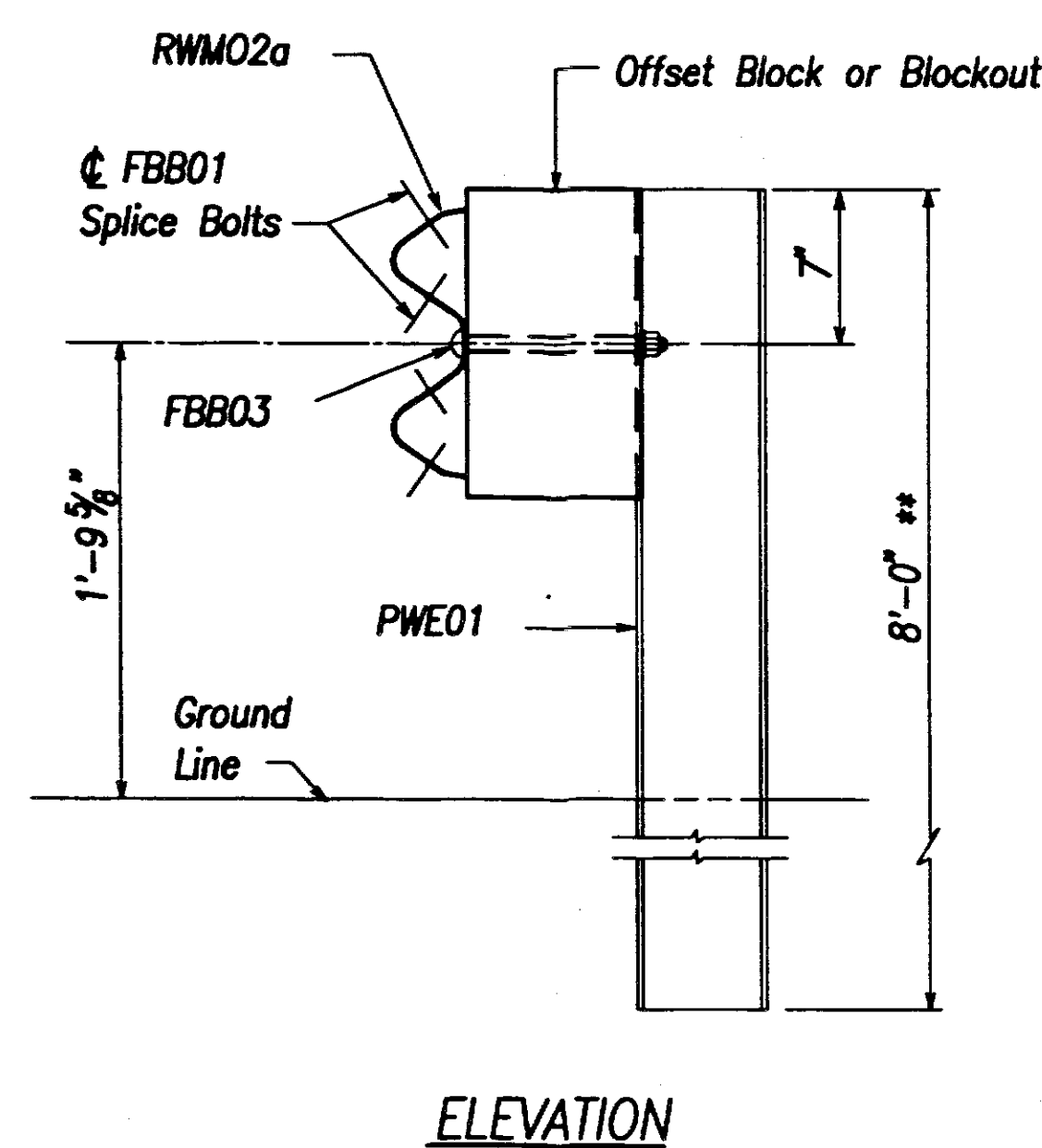
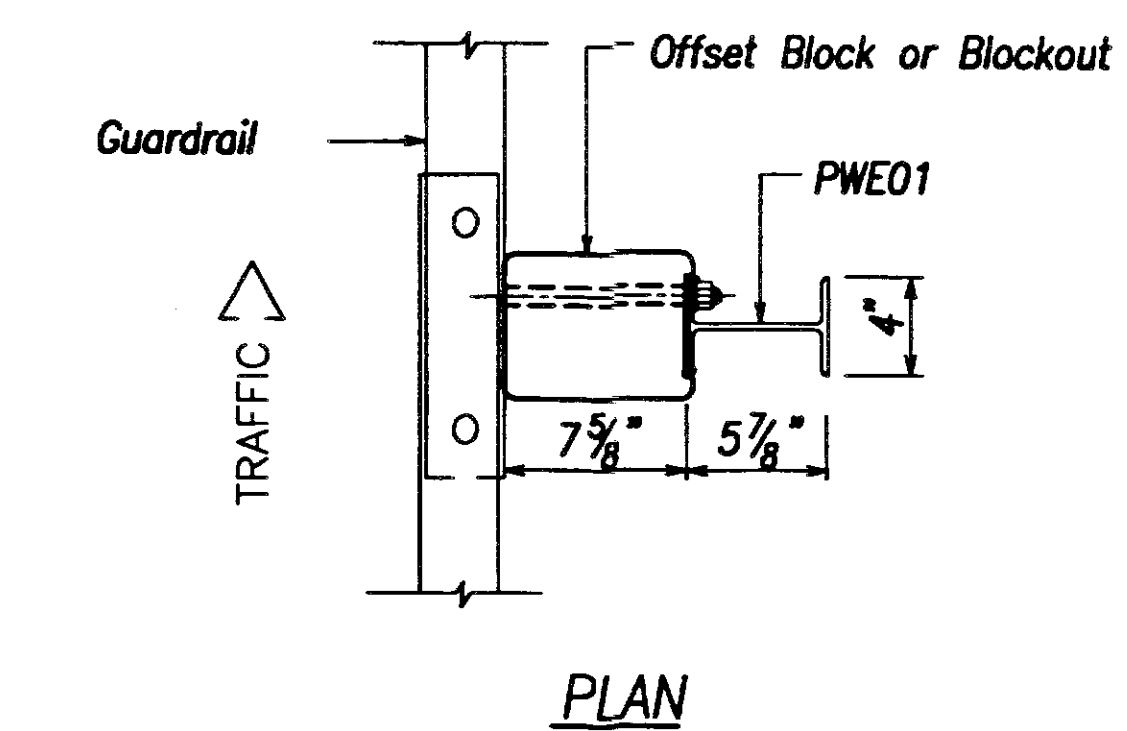


STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

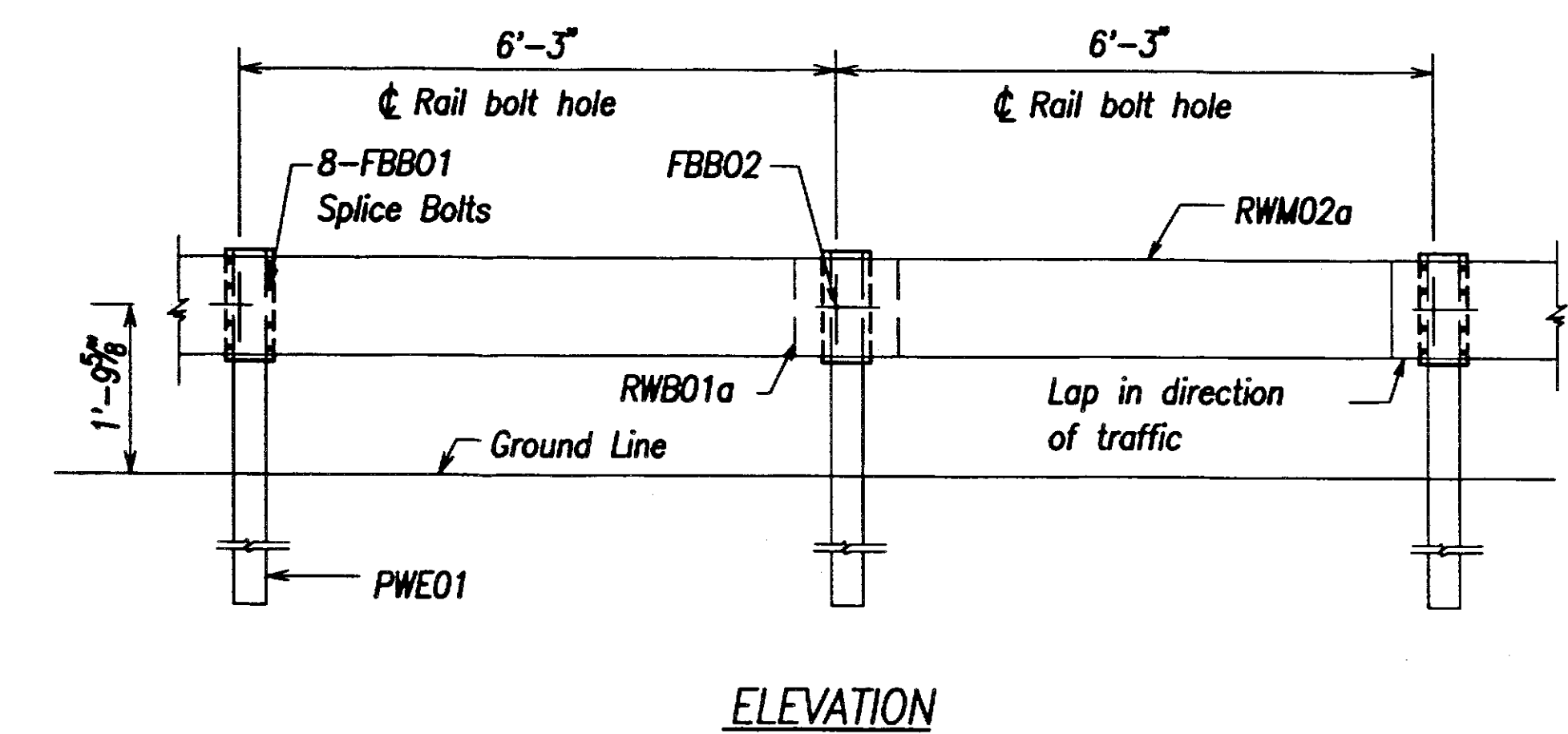
**GUARDRAIL DETAILS & NOTES**  
  
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)  
  
Scale: None      Date: August 1, 2000

2/4/02	Revised Note 7 Per Addendum No. 2
DATE	REVISION

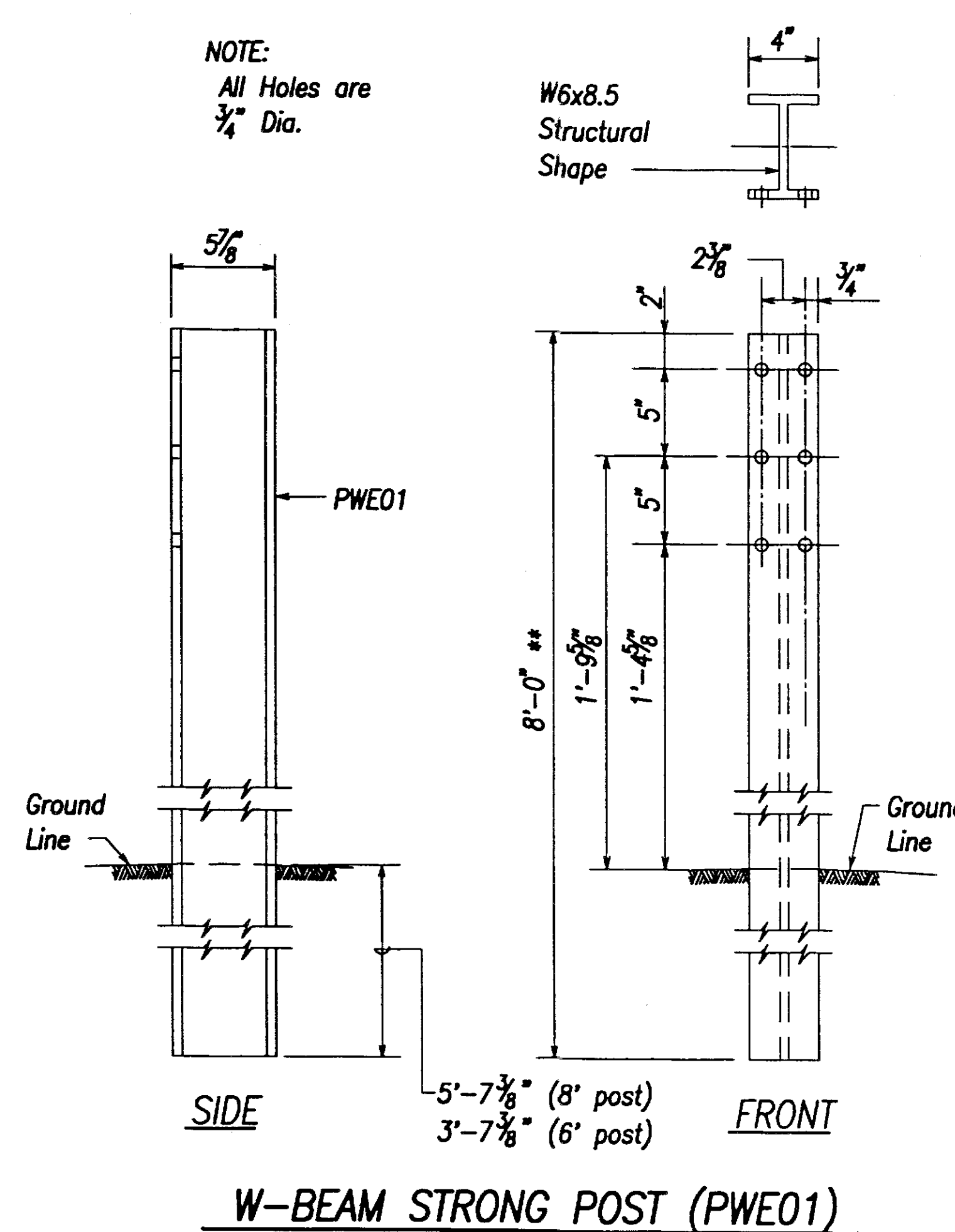
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 92	118



**STRONG POST W-BEAM GUARDRAIL (SGR04a)**

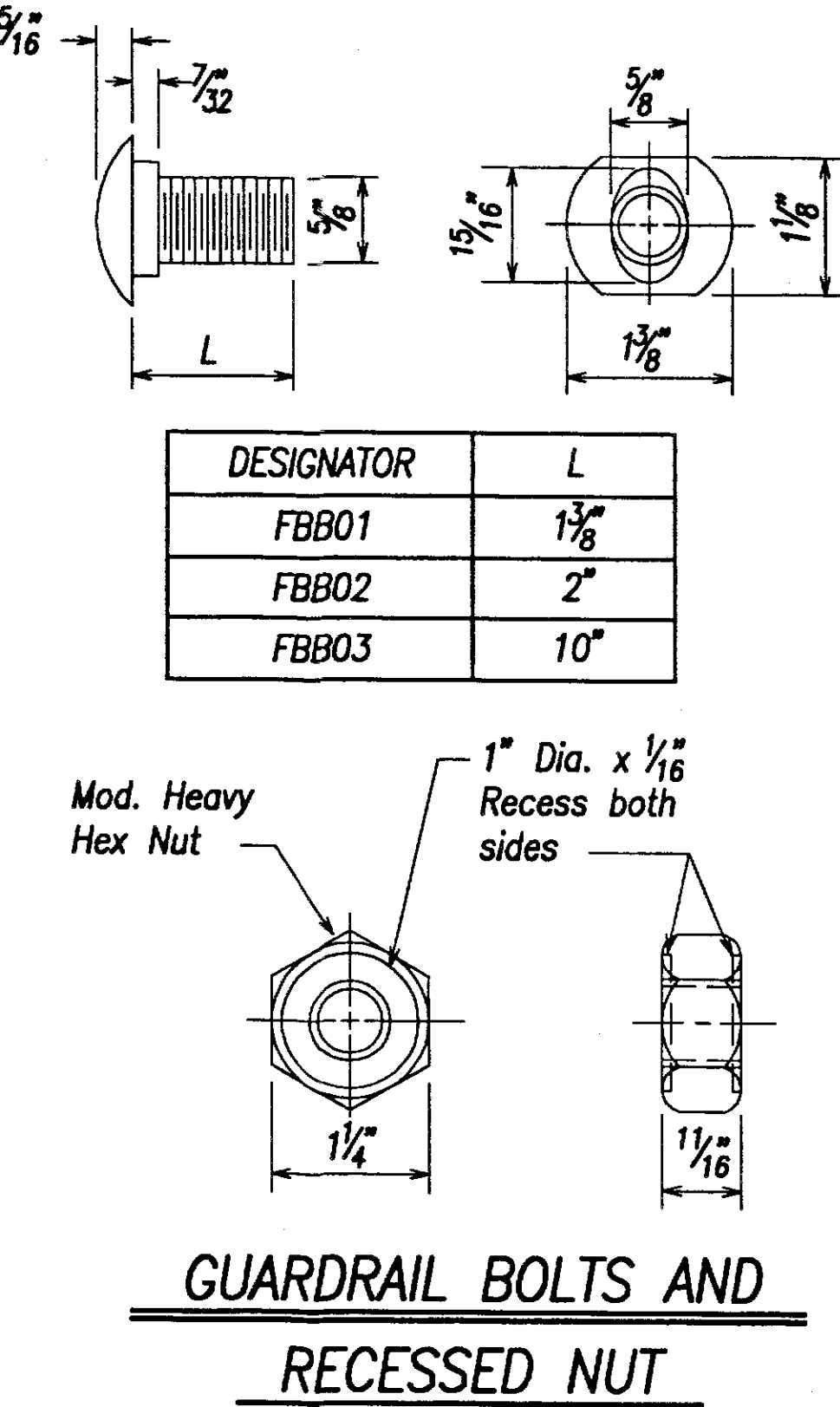


**STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT**

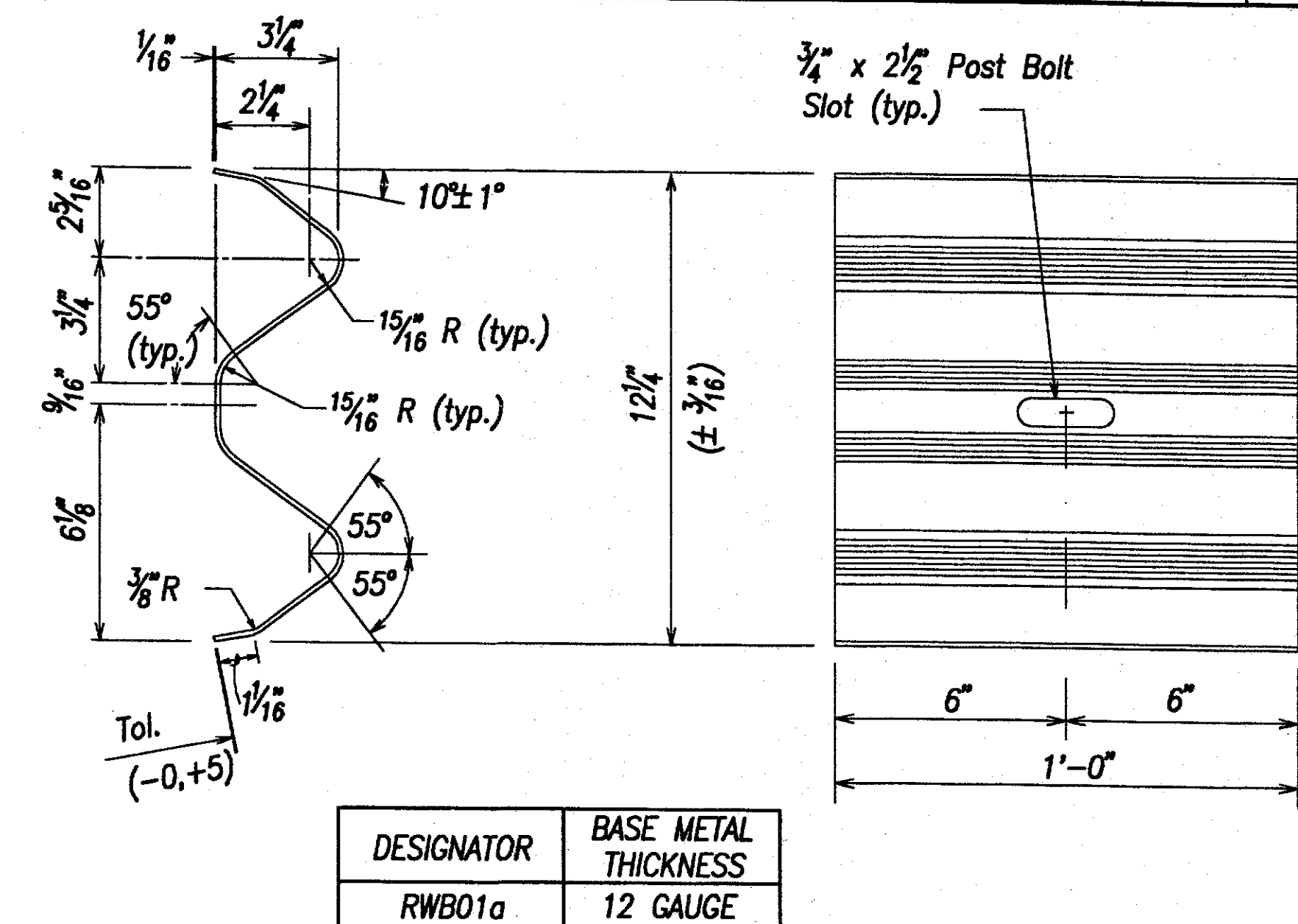


**NOTE:**  
All Holes are 3/4" Dia.

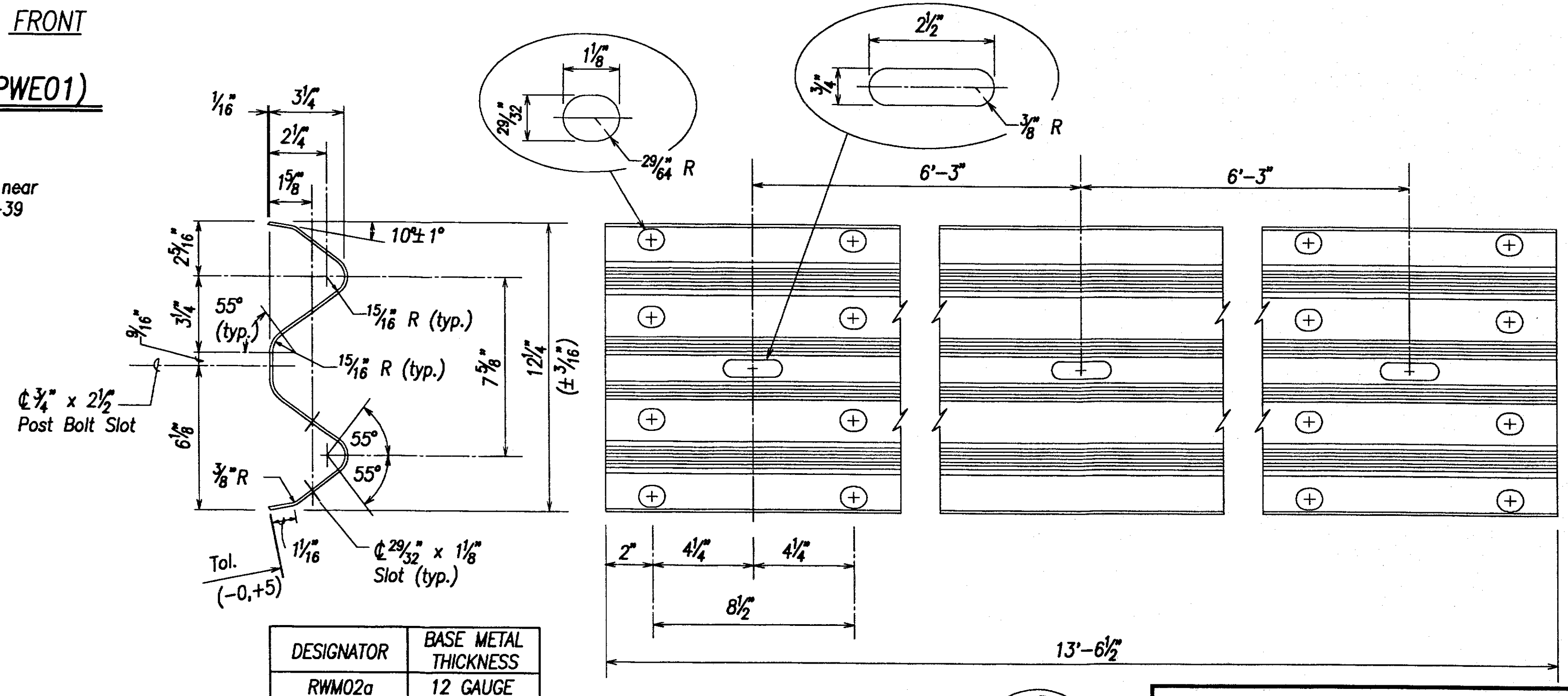
**\*\* NOTE:**  
Install 6'-0" posts at locations near existing utilities. See sheets C-39 to C-43 for specific locations.



**GUARDRAIL BOLTS AND RECESSED NUT**

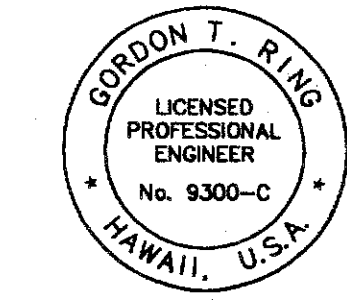


**W-BEAM BACK-UP-PLATE (RWB01a)**



**2 SPACE W-BEAM GUARDRAIL (RWM02a)**

1/15/09	Revised Post Length
2/4/02	Revised Post Length Per Addendum No. 1
DATE	REVISION



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**STRONG POST W-BEAM GUARDRAIL**

KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Scale: None Date: August 1, 2000

SHEET No. S-21 OF 27 SHEETS

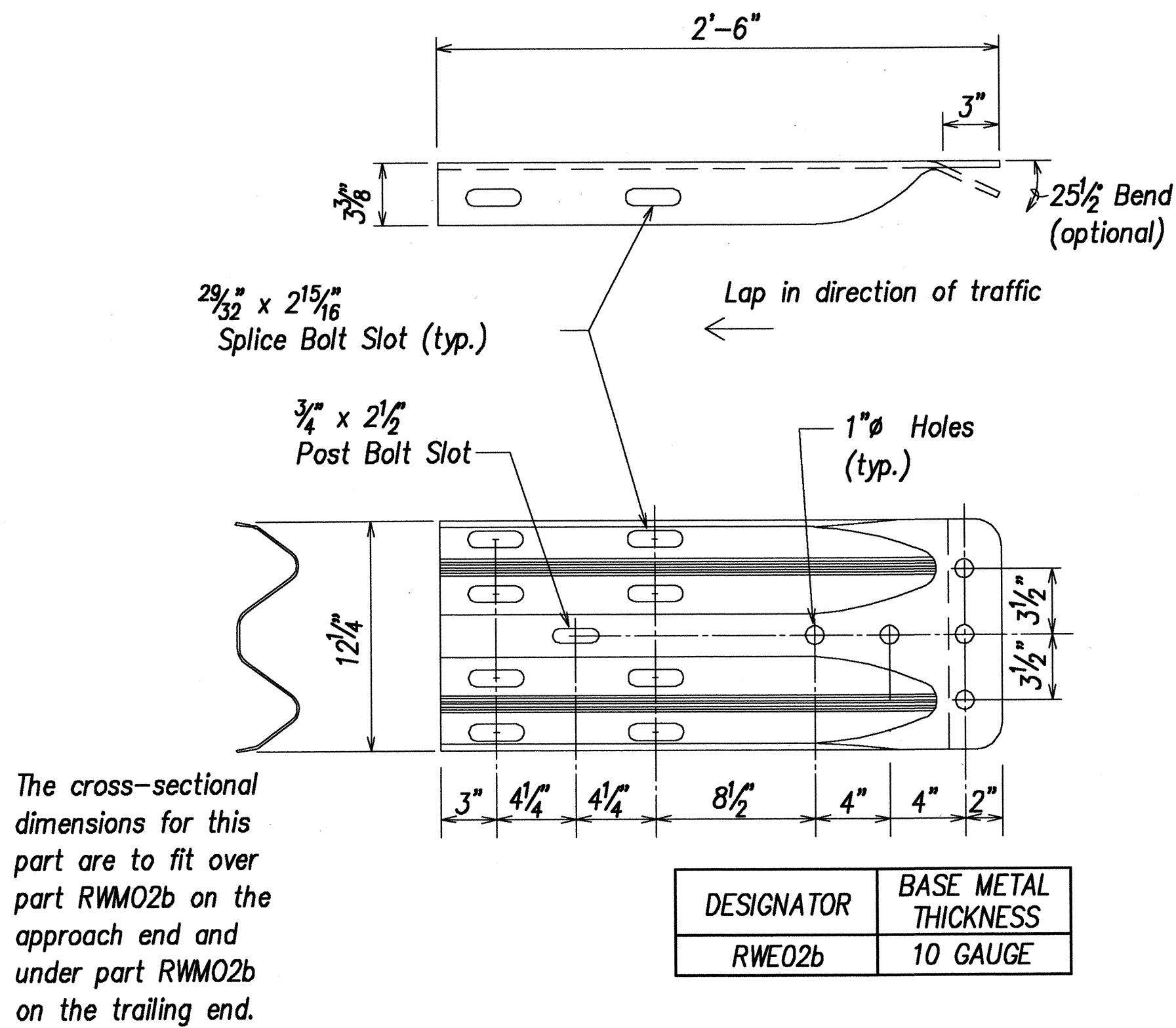
DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
APPROVED BY	
DATE	



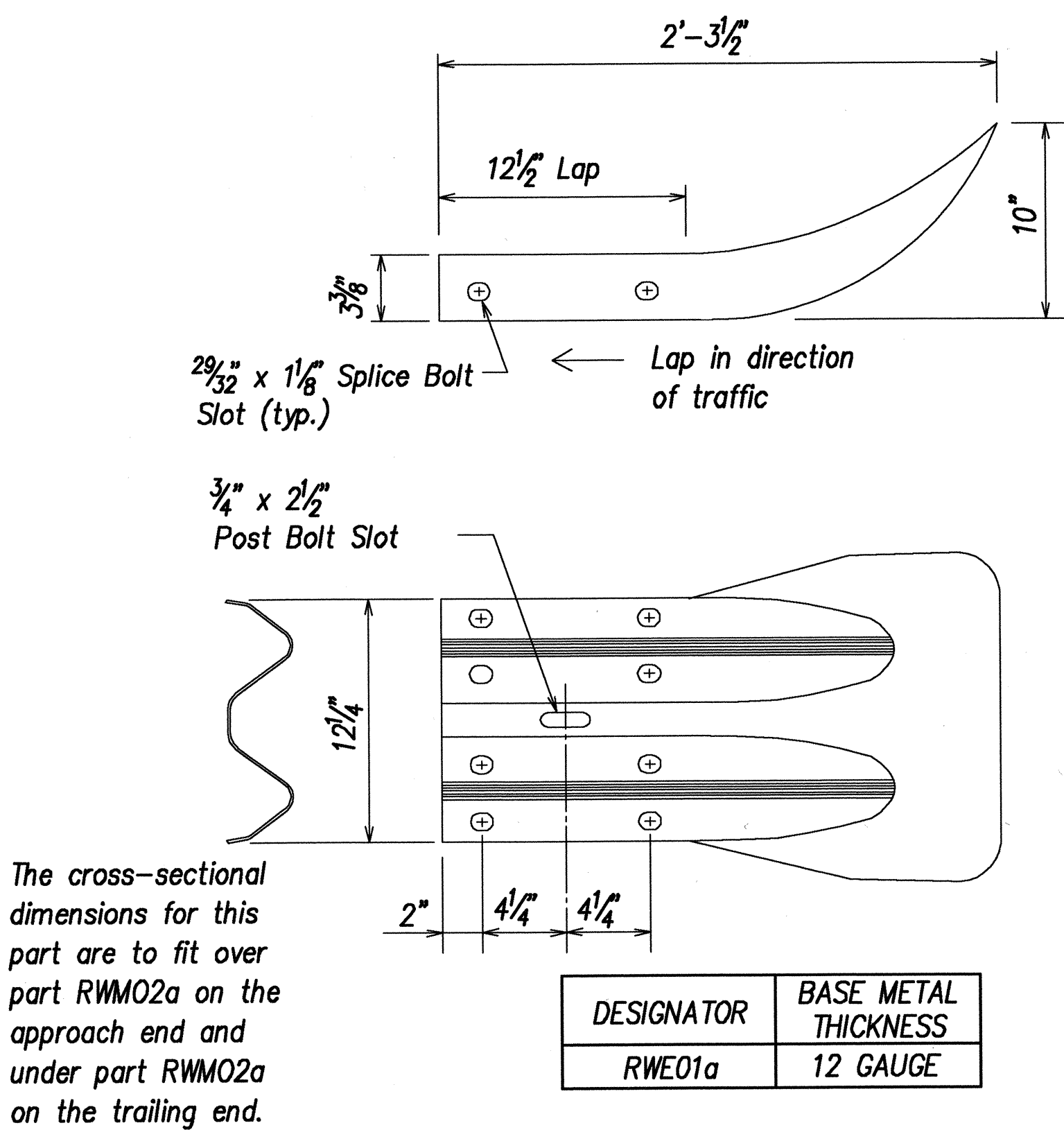
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 93	121

**NOTES:**

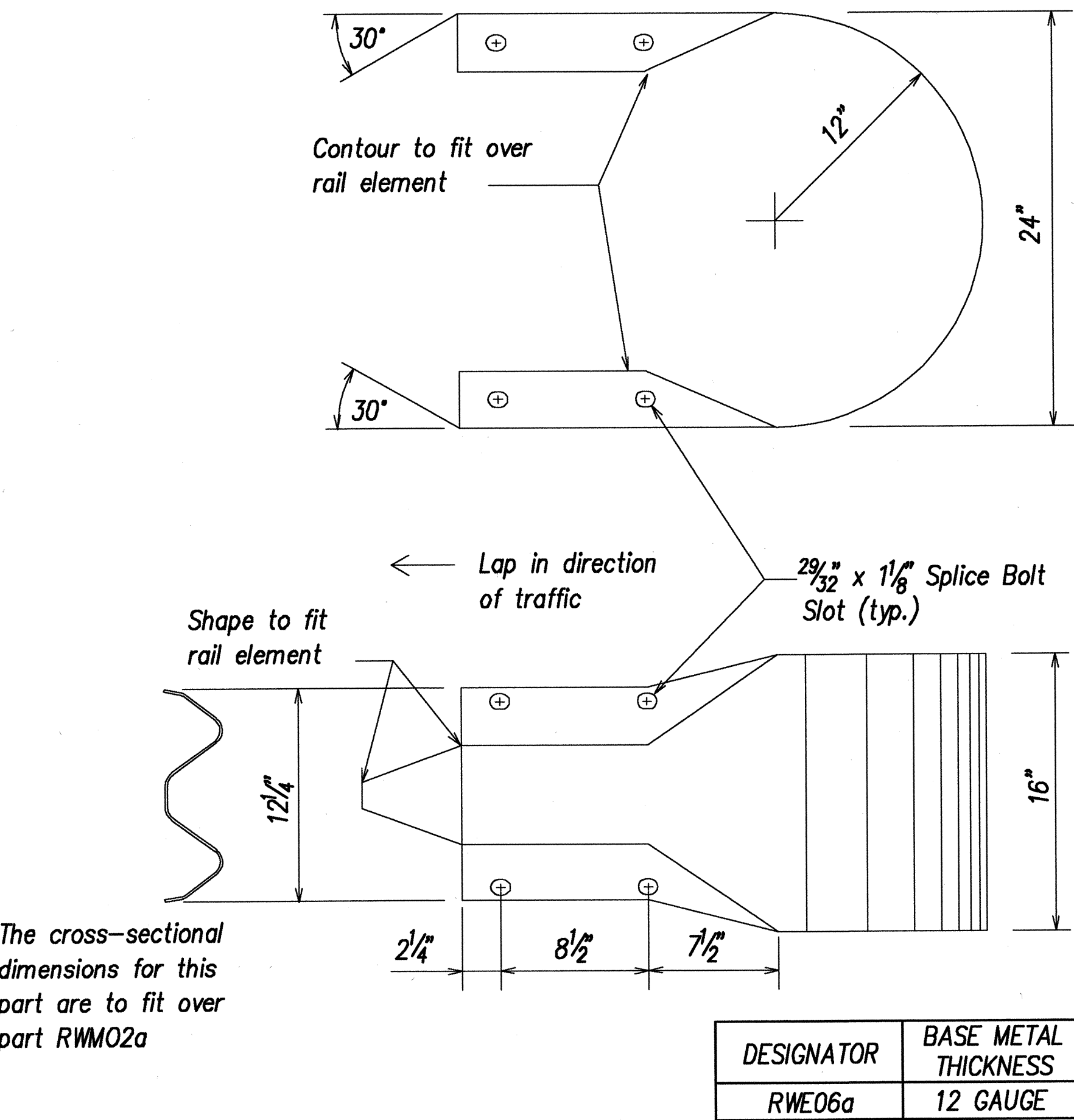
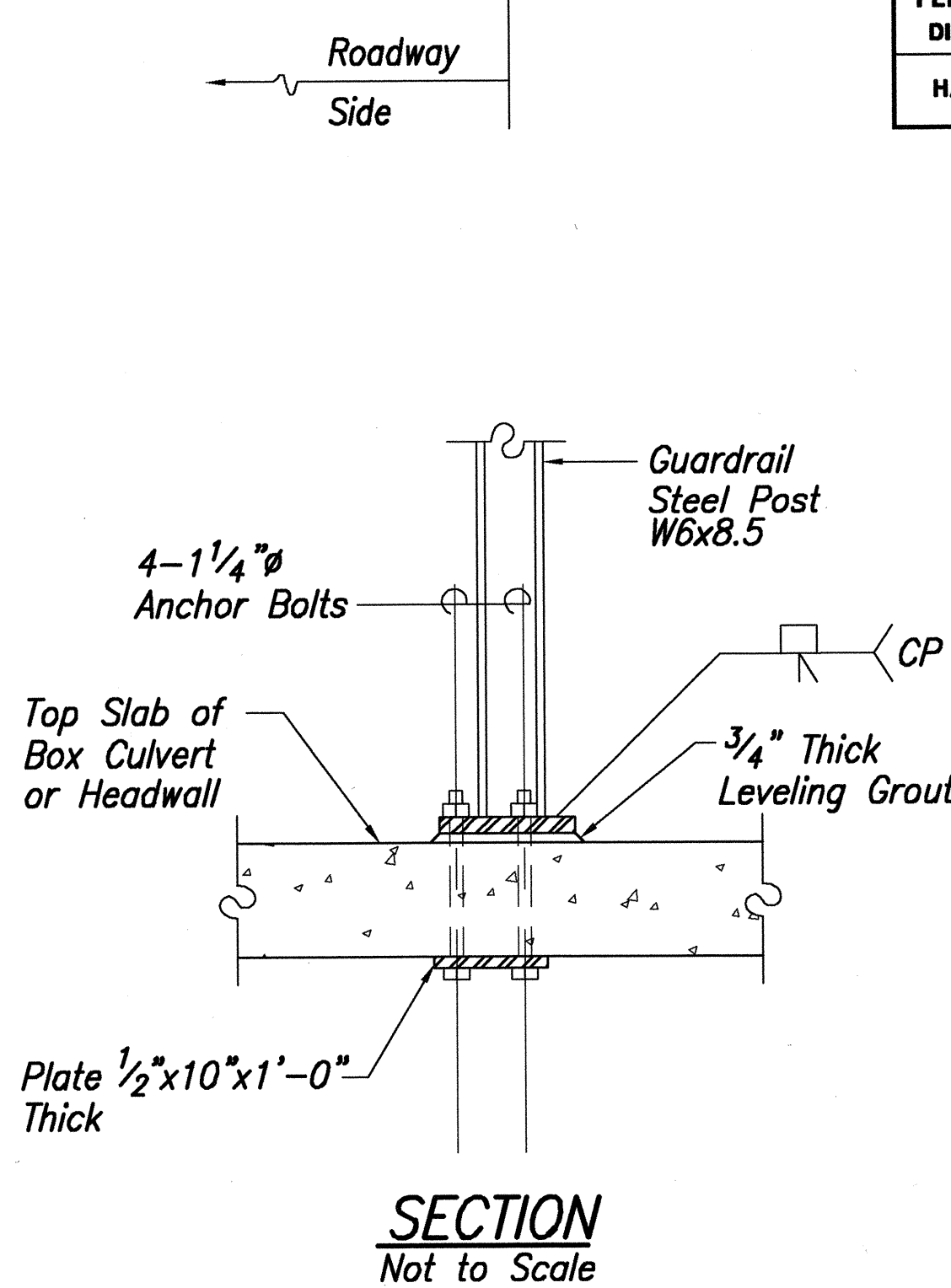
1. All steel and bolts to be hot-dipped galvanized.
2. The Contractor shall adjust the height of the guardrail steel post as necessary to match the height of the typical guardrail installation along the roadway.
3. All work and materials necessary to install the guardrail post onto a box culvert or headwall shall be considered incidental to the various guardrail contract items.
4. Thrie beam guardrail shall be used in lieu of W-Beam wherever guardrail posts are attached to headwalls. The 6'-3" transition shown on Sht. S-19 shall be installed on both ends of the thrie beam section to connect to the W-Beam guardrail.
5. The thrie beam guardrail segments and transition sections used for headwall connections shall be considered incidental to the various guardrail pay items.



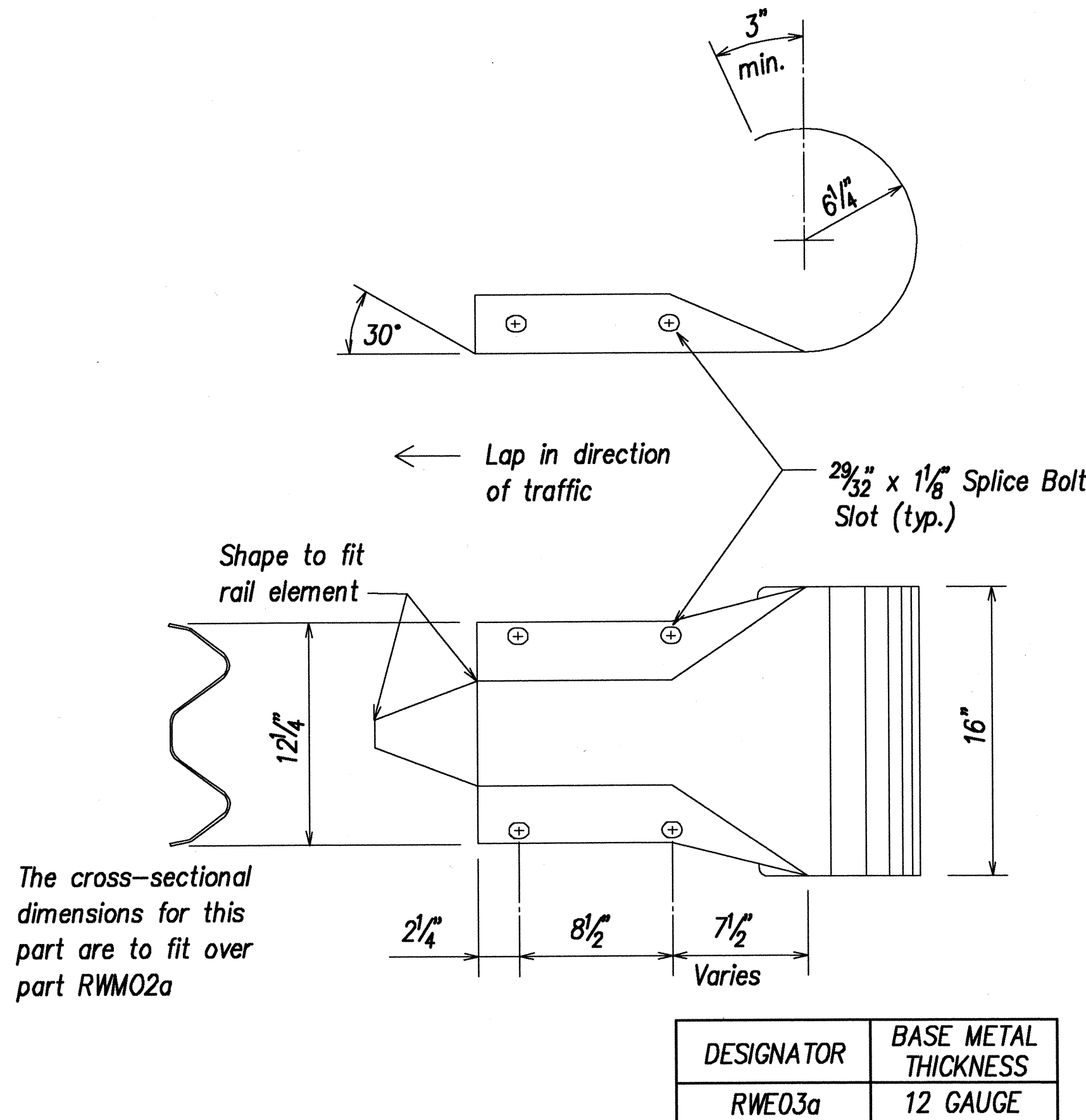
**W-BEAM TERMINAL CONNECTOR (RWE02b)**



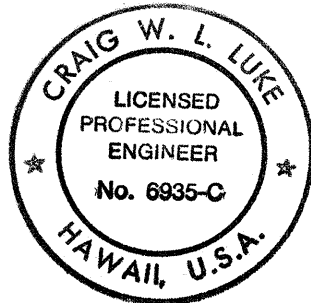
**W-BEAM END SECTION (FLARED RWE01a)**



**W-BEAM END SECTION (BUFFER RWE06a)**



**W-BEAM END SECTION (ROUNDED RWE03a)**

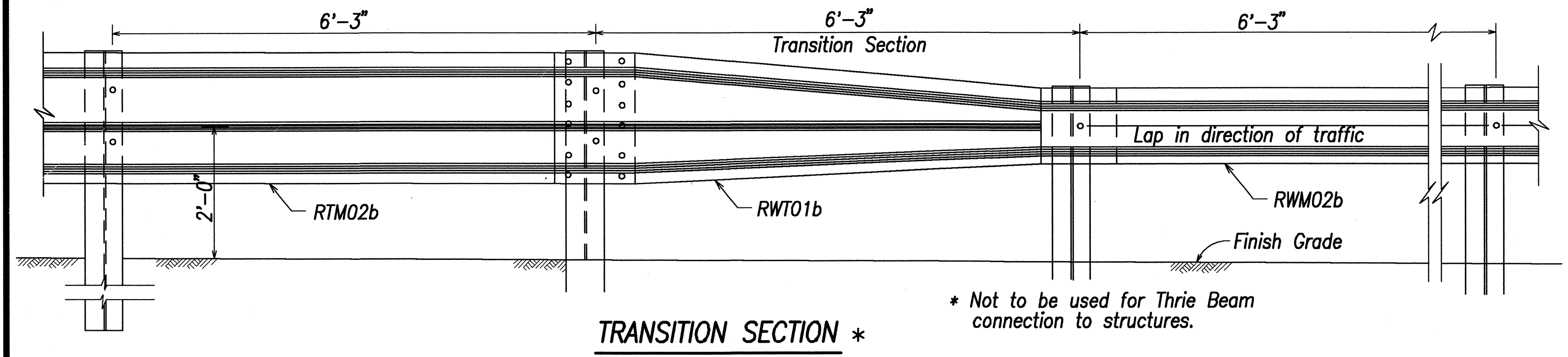


THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Signature: *[Signature]* DATE: 2/4/02

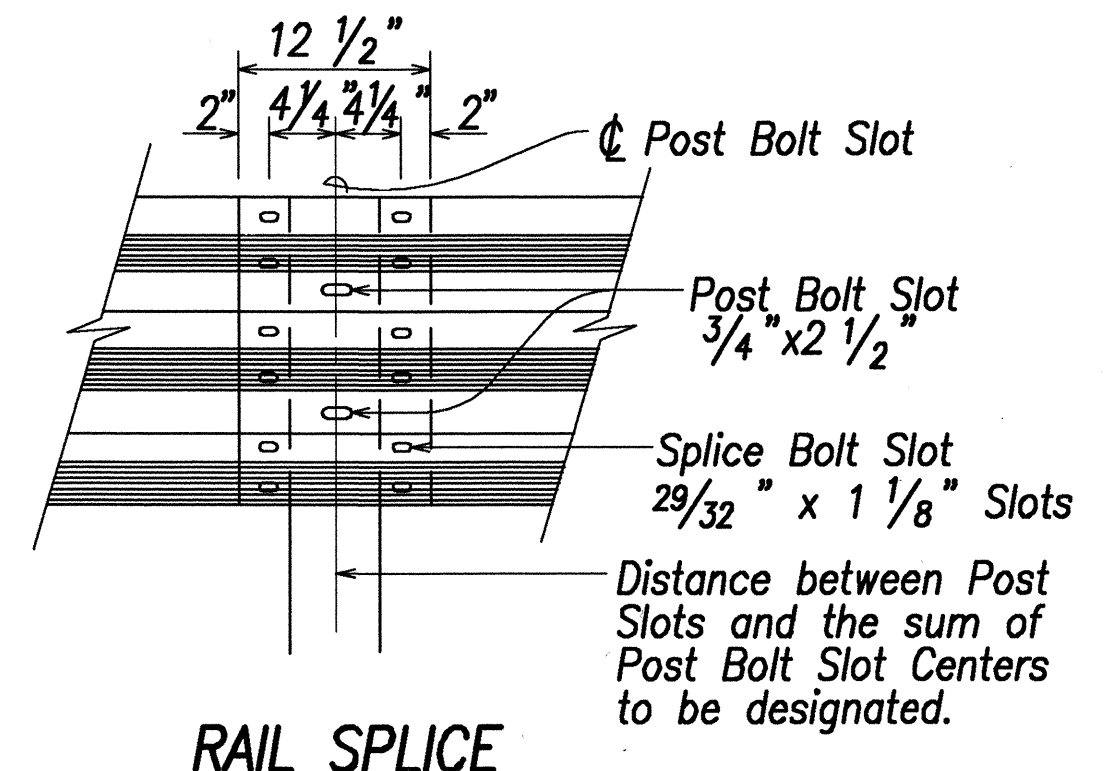
2/4/02	Revised Post Dimension; Deleted Post to Culvert Conn. Dtl. Per Addendum No. 2
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>STRONG POST W-BEAM GUARDRAIL</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: None	Date: August 1, 2000
SHEET No. S-22 OF 27 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. ADD 93S-1	121

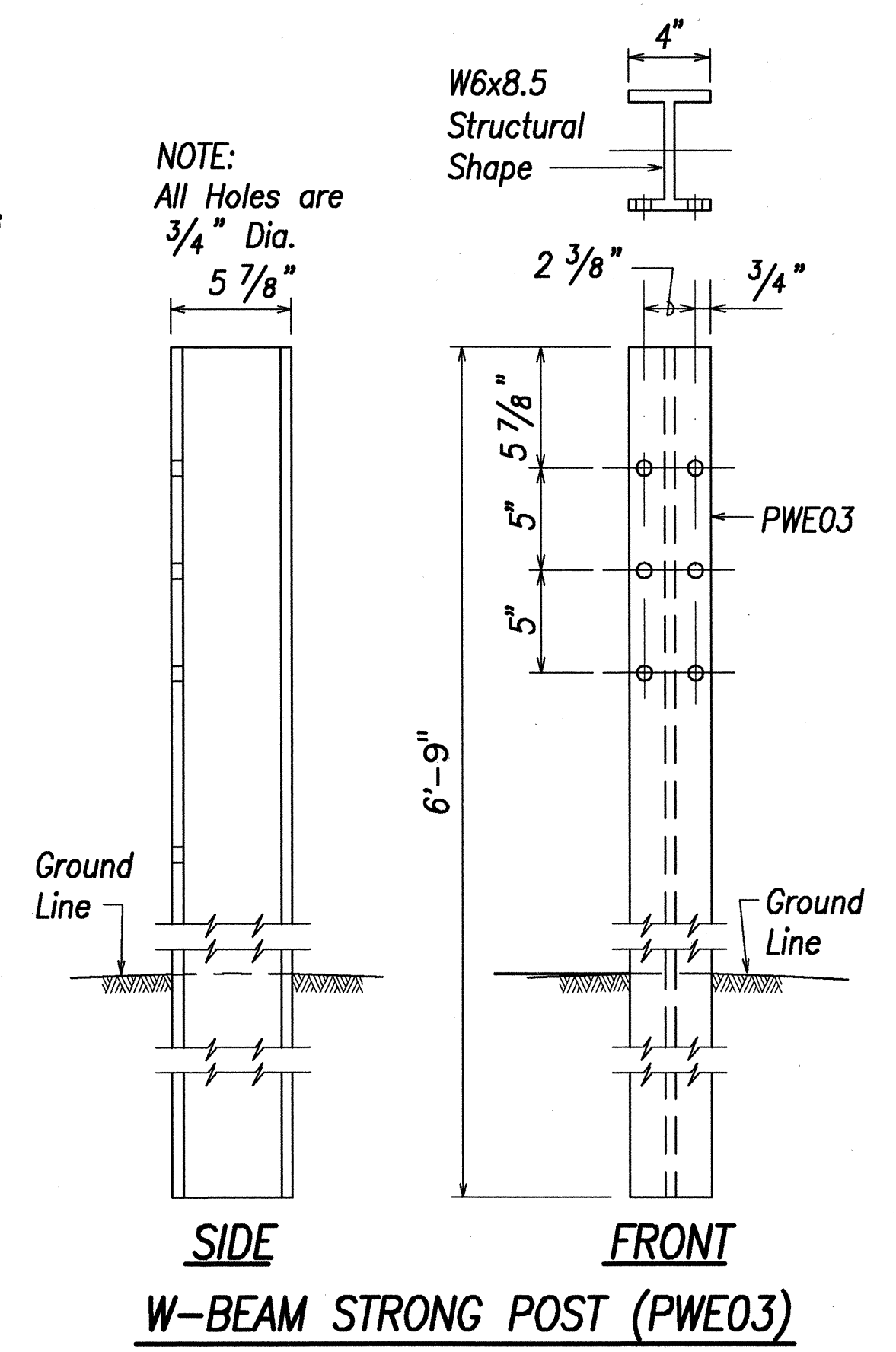


TRANSITION SECTION \*

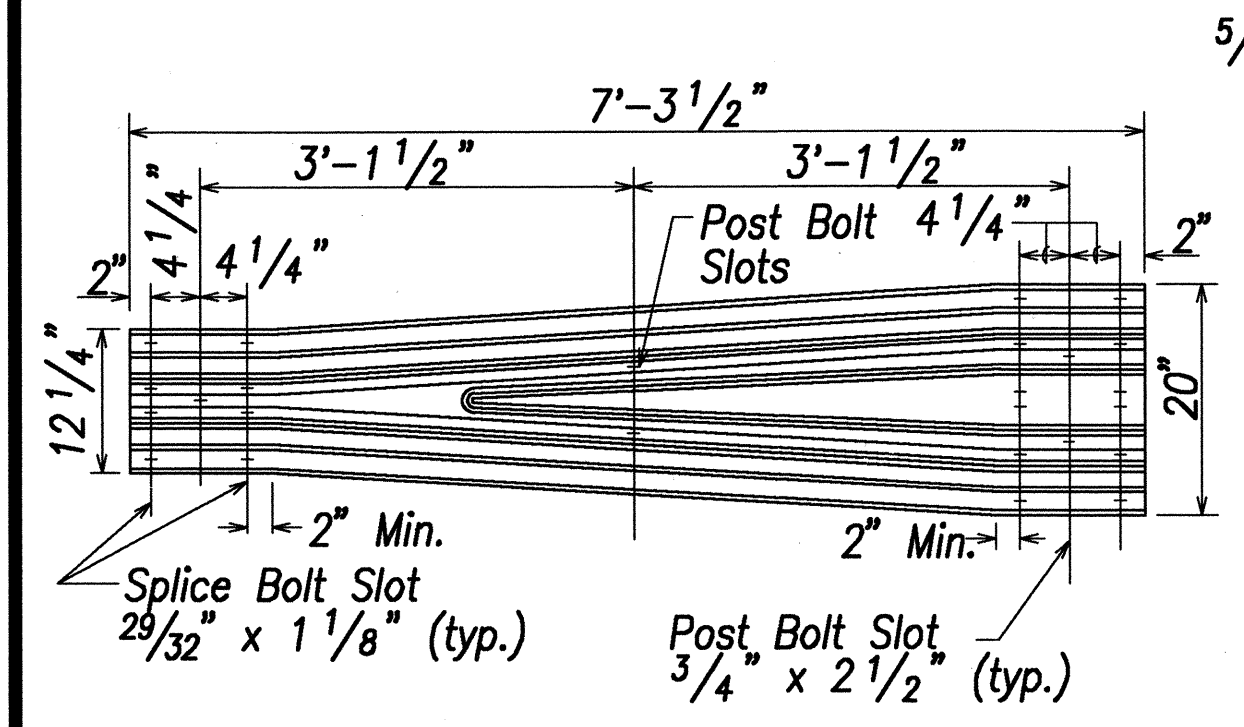
\* Not to be used for Thrie Beam connection to structures.



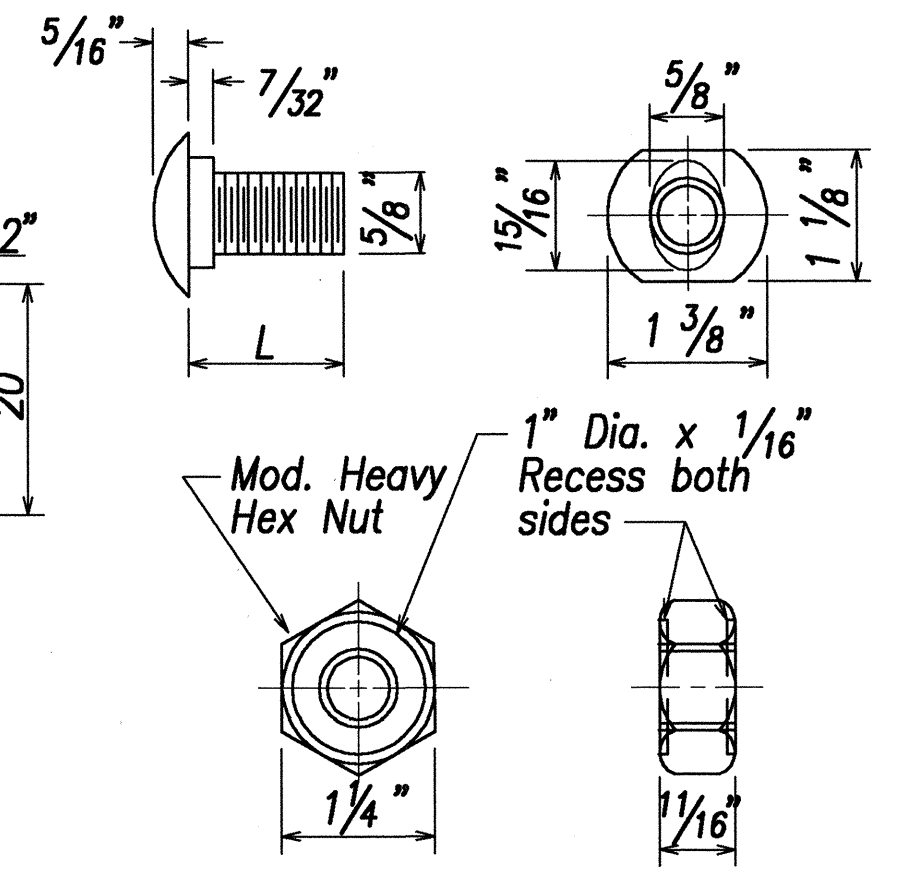
RAIL SPLICE



SIDE  
FRONT  
W-BEAM STRONG POST (PWE03)

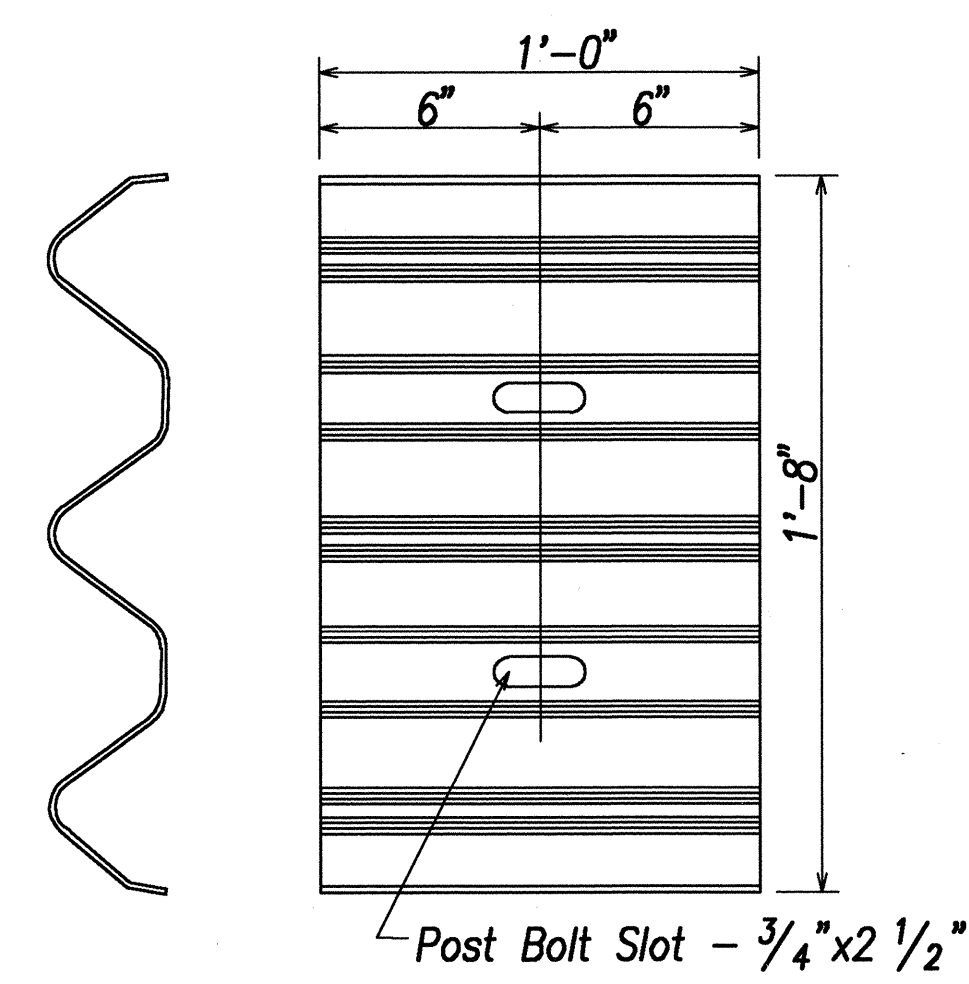


TRANSITION SECTION (RWT01b)

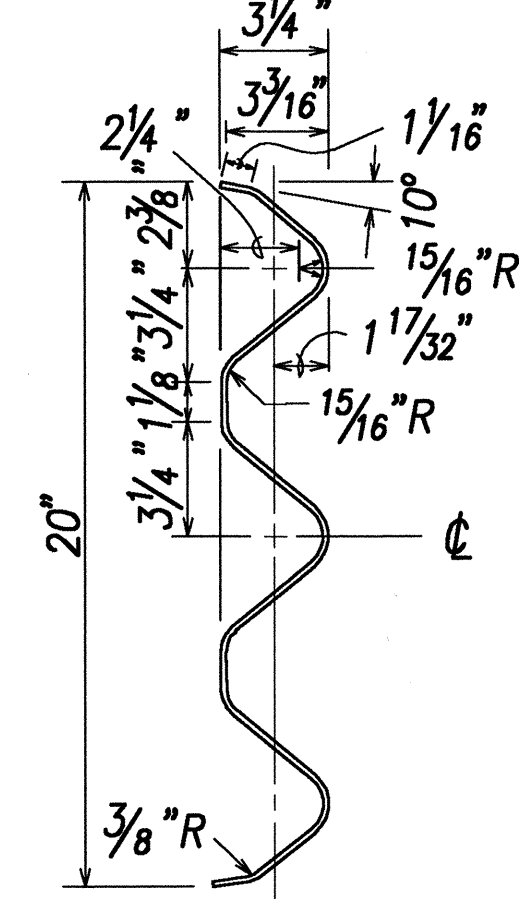


DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"

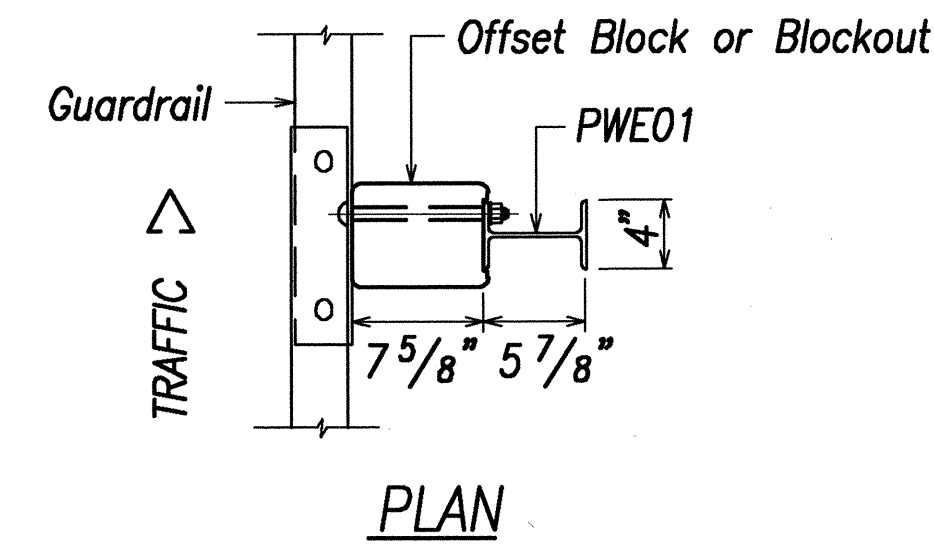
GUARDRAIL BOLTS AND RECESSED NUT



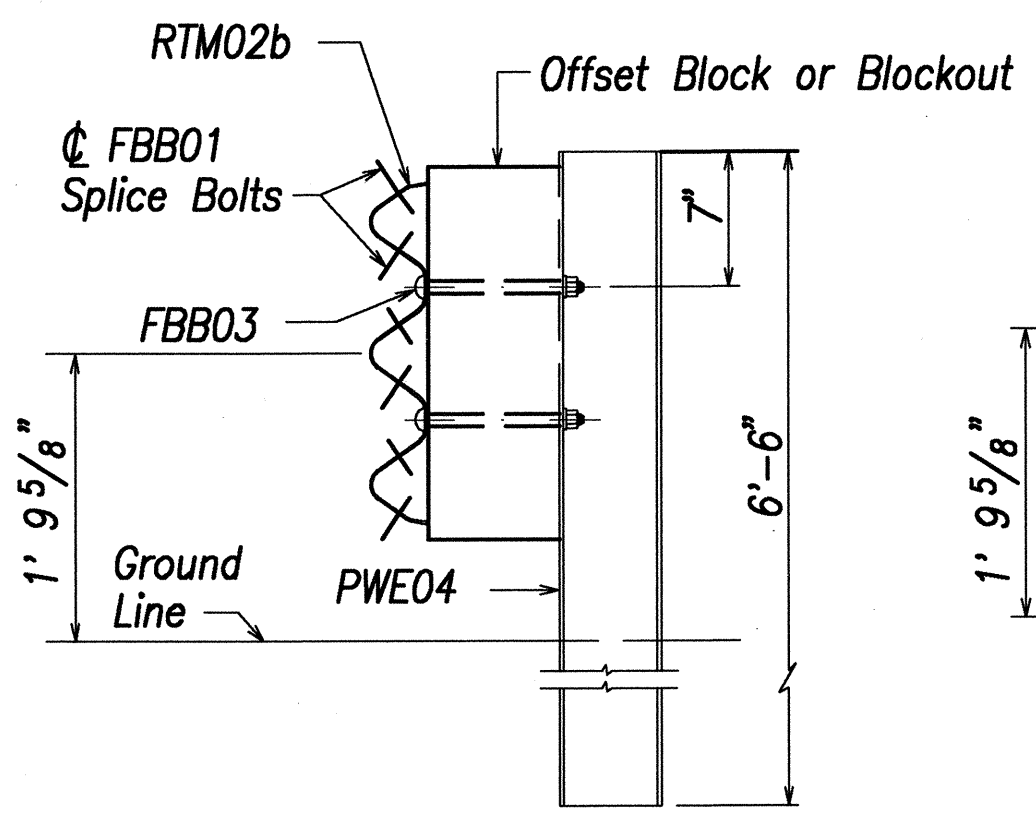
BACKUP PLATE (RTB01b)



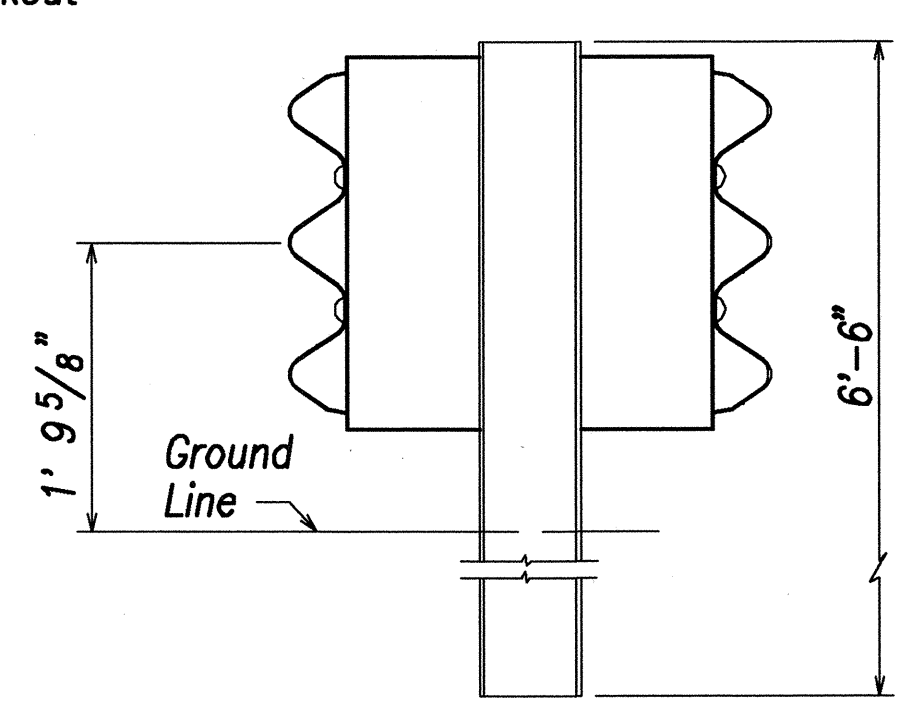
SECTION THRU RAIL ELEMENT (RTM02b)



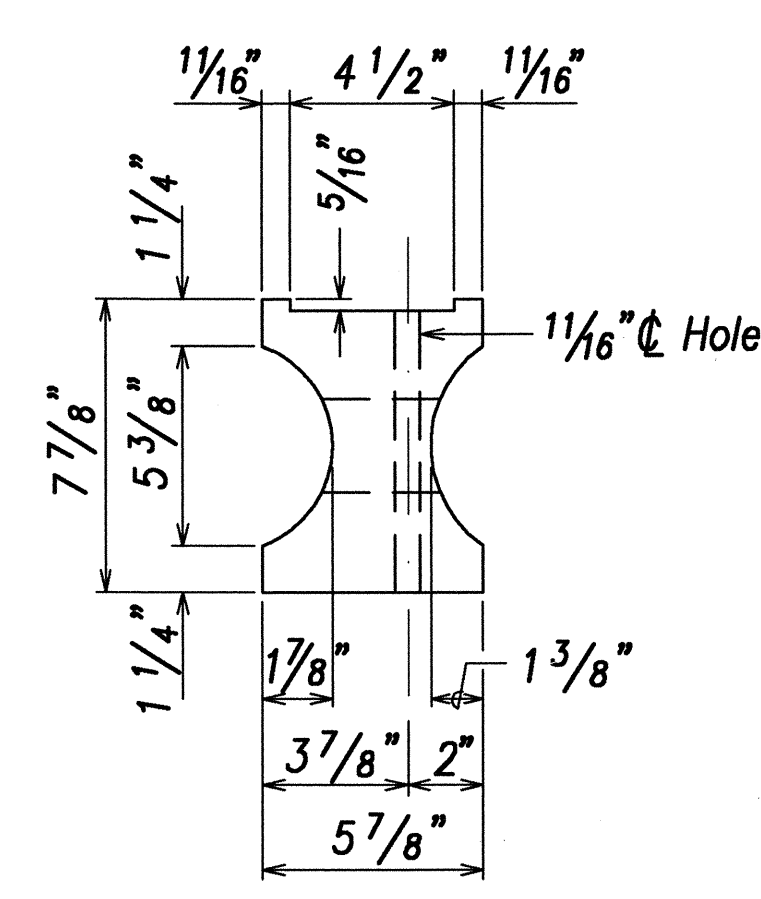
PLAN



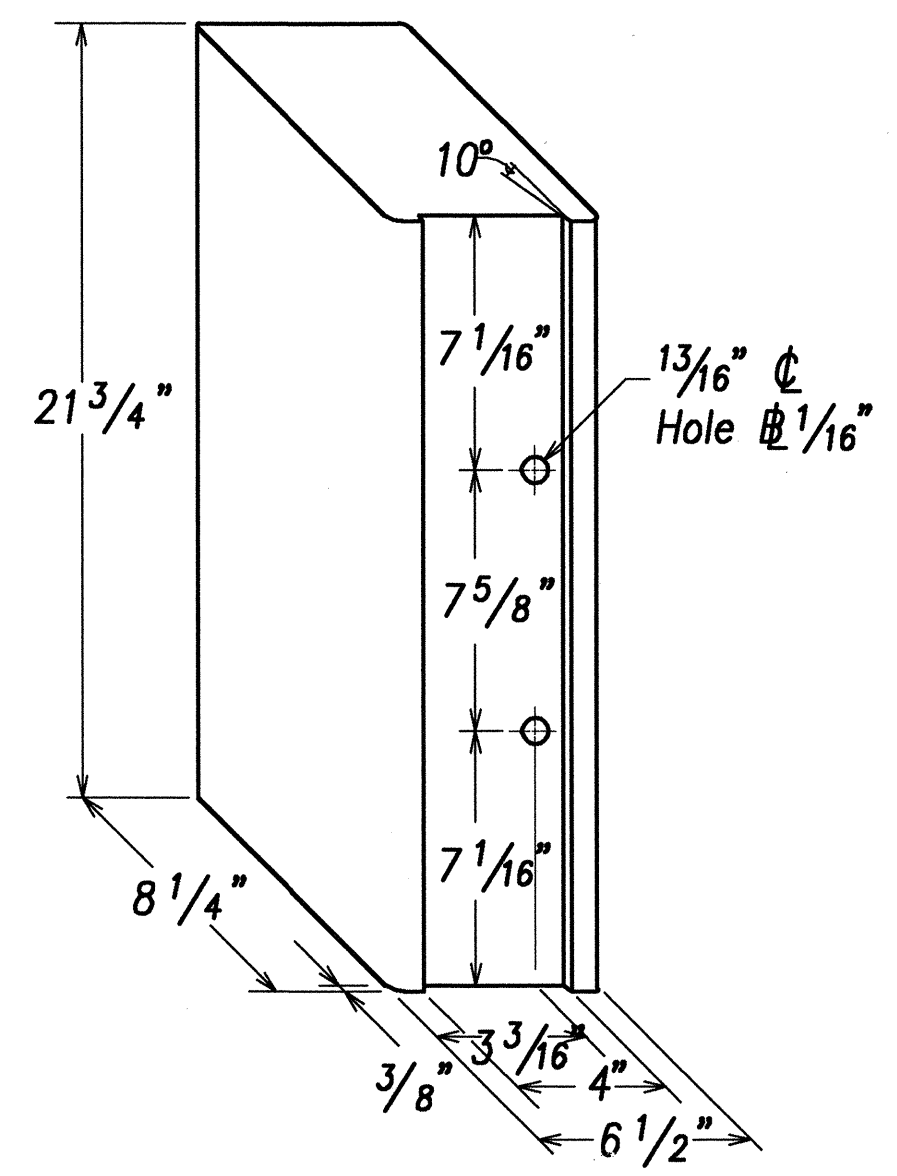
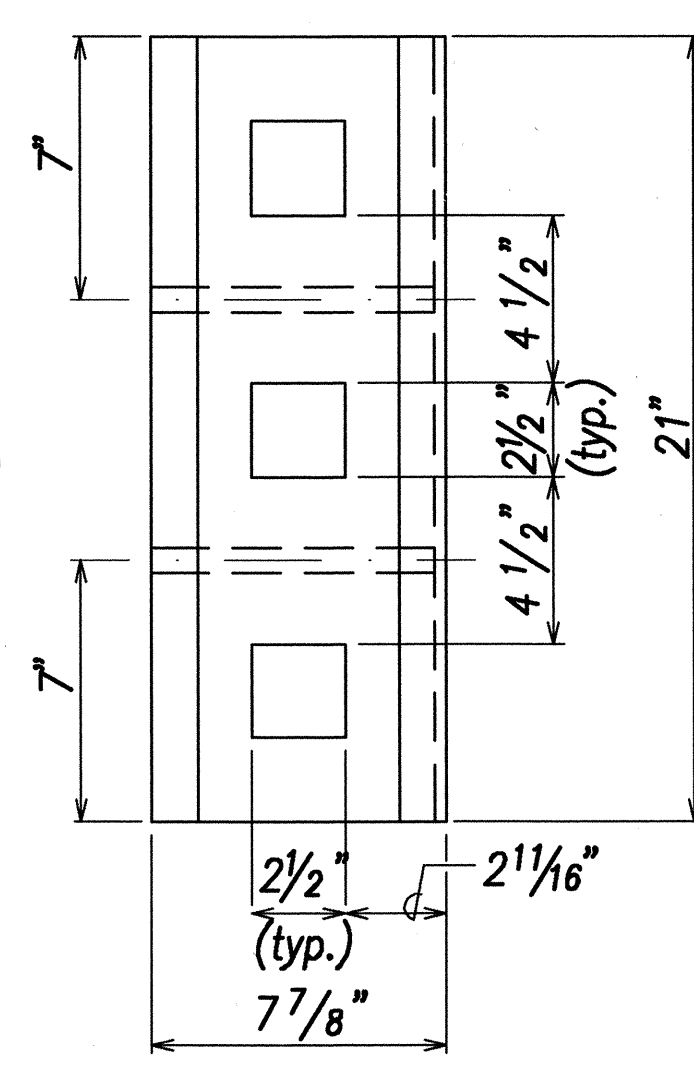
ELEVATION  
STRONG POST THRIE-BEAM GUARDRAIL (SGR09a)



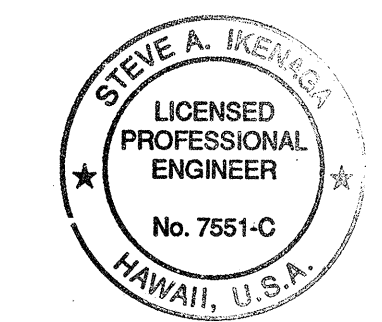
ELEVATION  
STRONG POST THRIE-BEAM MEDIAN GUARDRAIL (SGM09a)



TOP  
SIDE  
RECYCLED PLASTIC BLOCKOUT (TYPE I-THRIE)



RECYCLED POLYETHYLENE THRIE-BEAM OFFSET BLOCK (TYPE II - THRIE)



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION  
SIGNATURE DATE

4/1/02	Revise W-Beam Strong Post Length.
2/4/02	Added New Sheet Per Addendum No. 2.
DATE	REVISION

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION

HIGHWAYS DIVISION

STRONG POST

THRIE-BEAM GUARDRAIL

KAMEHAMEHA HIGHWAY RESURFACING

Waiahole Valley Road to Crouching Lion Inn

Federal Aid Project No. NH-083-1(43)

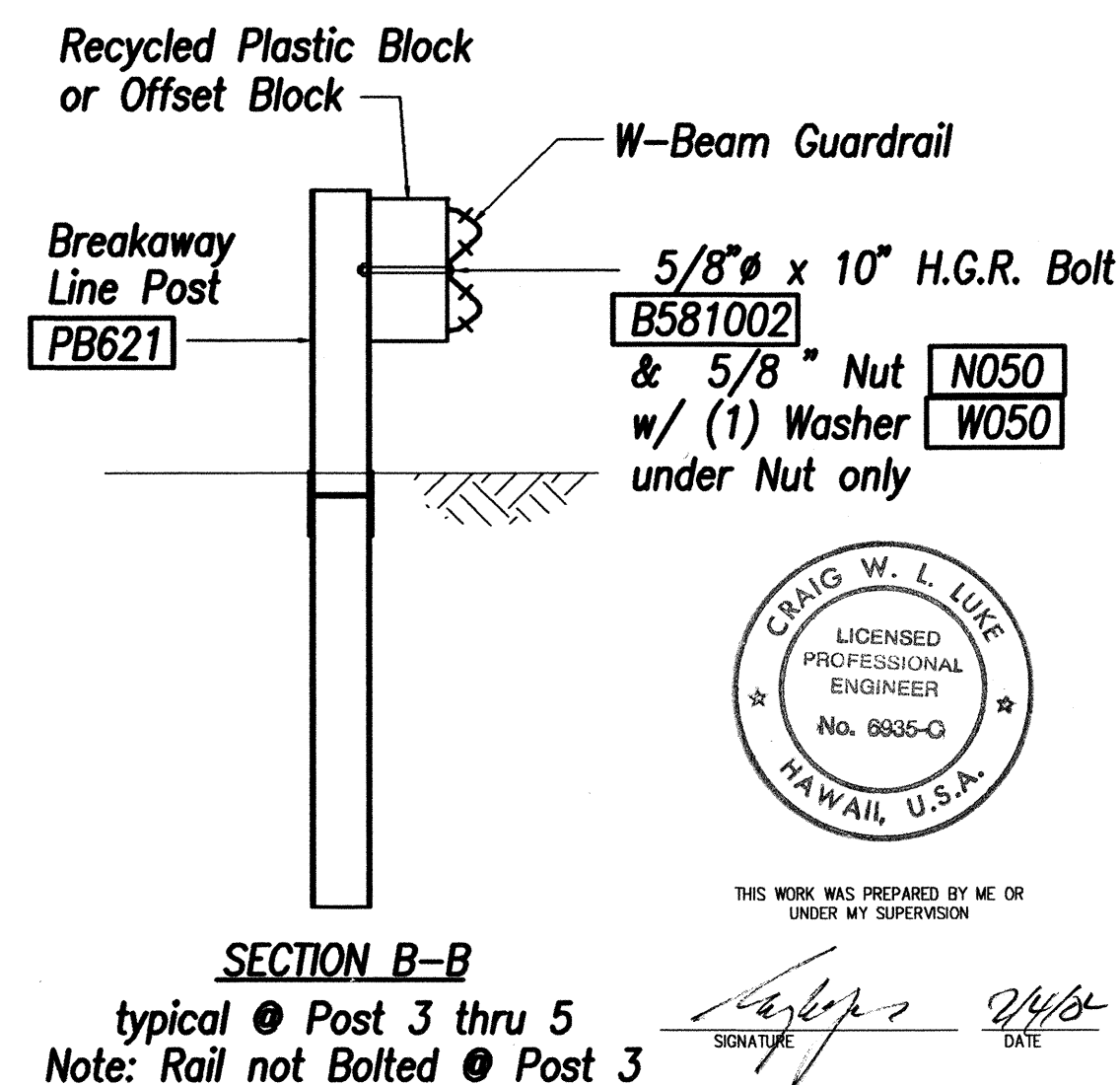
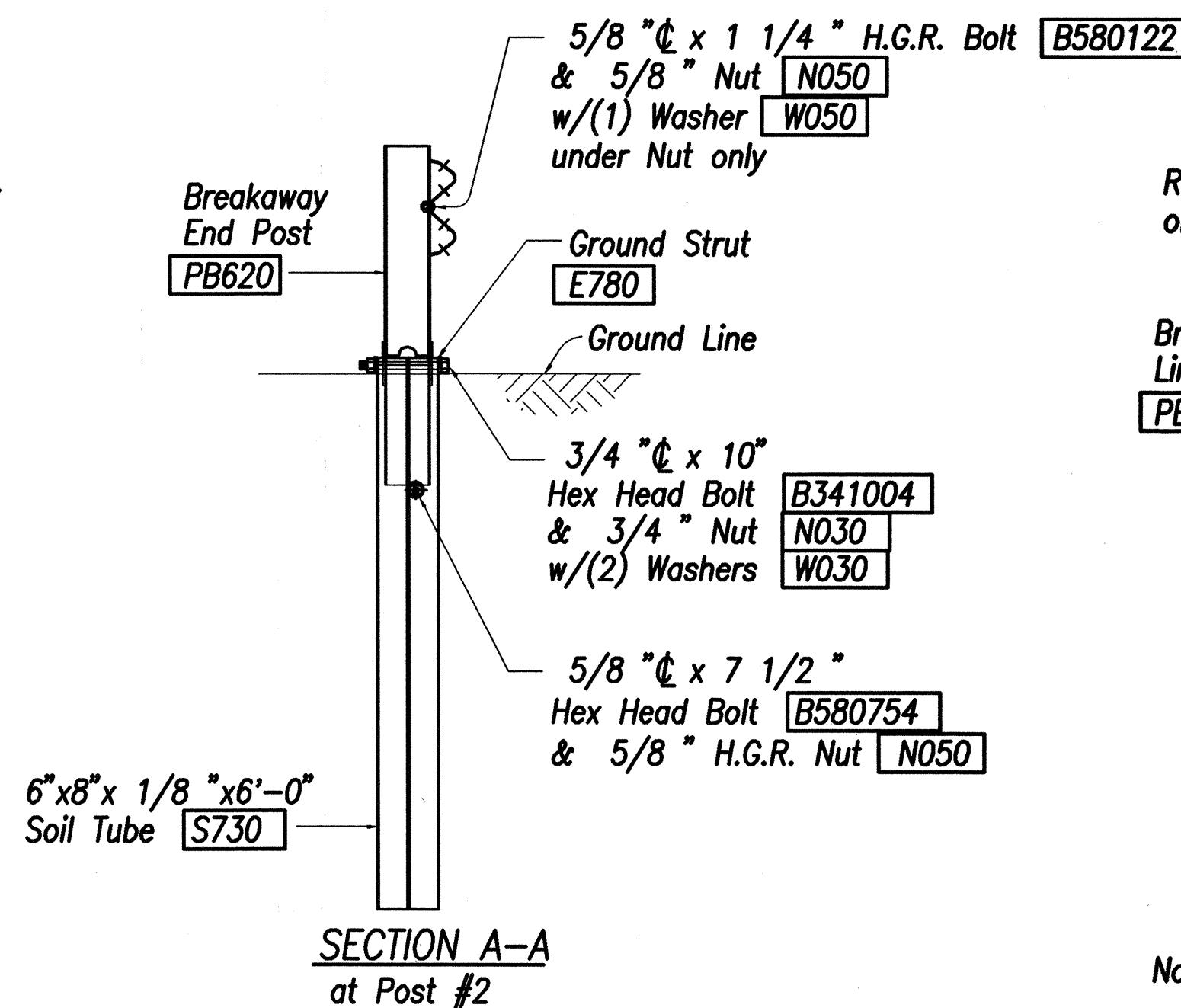
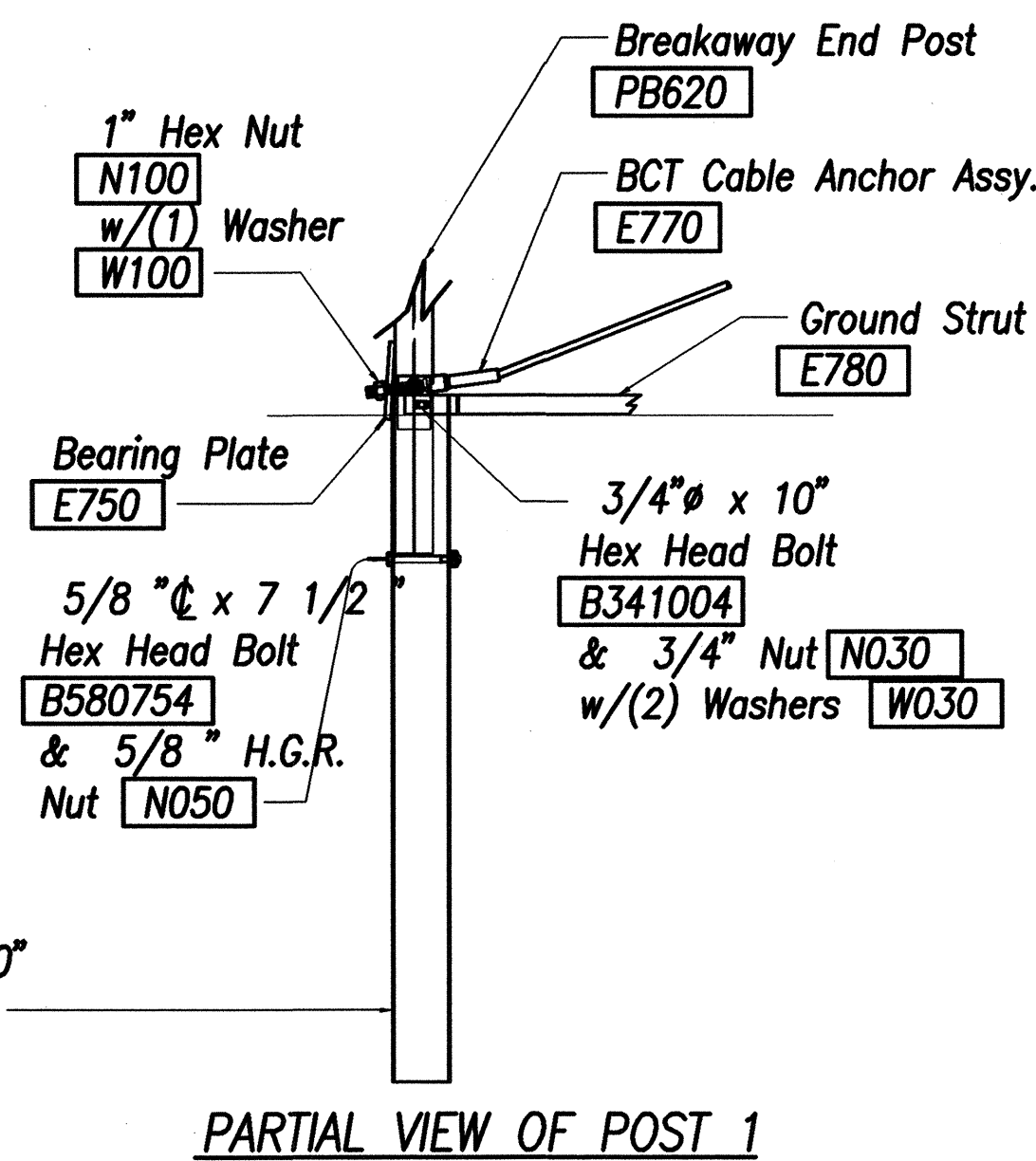
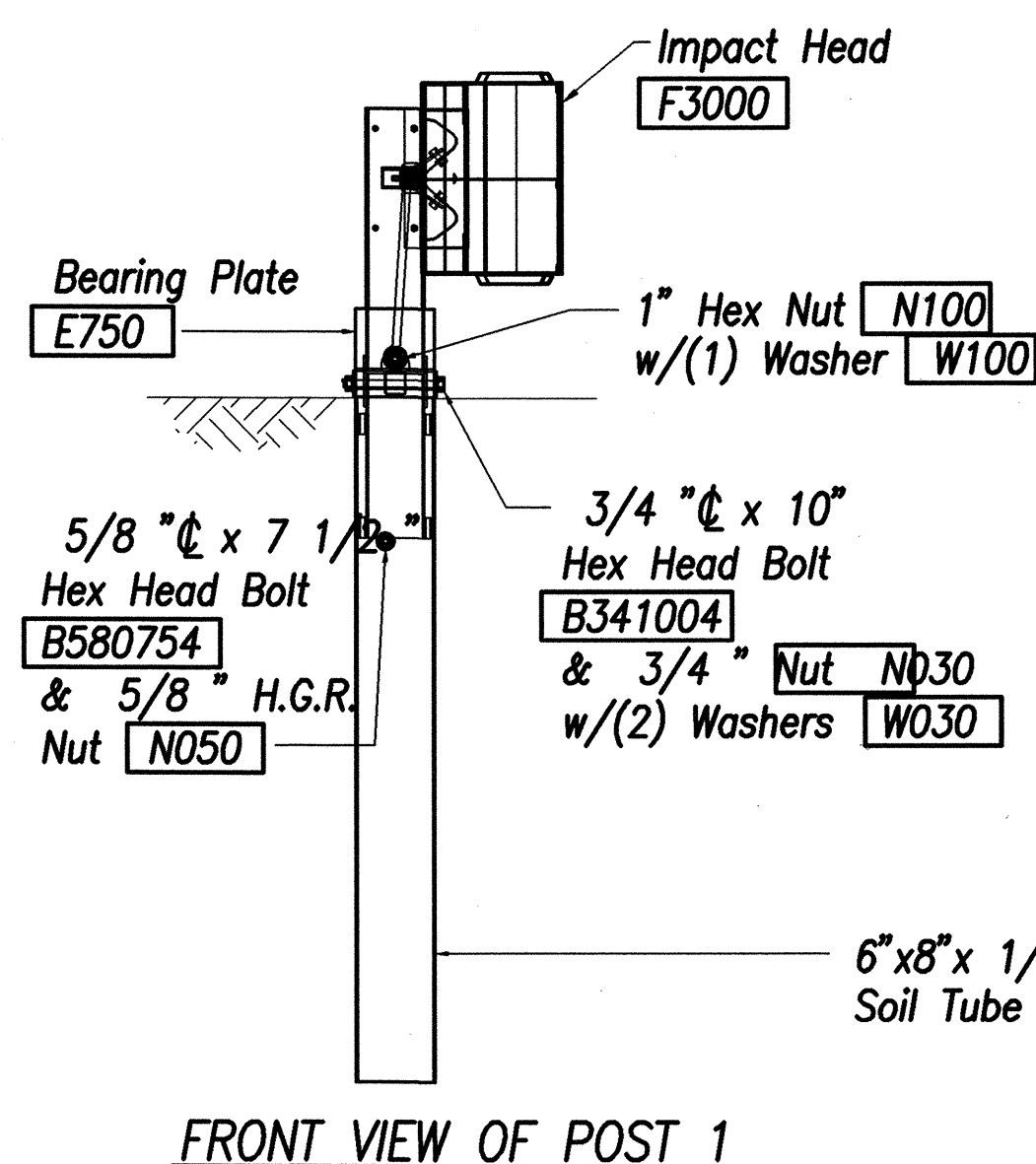
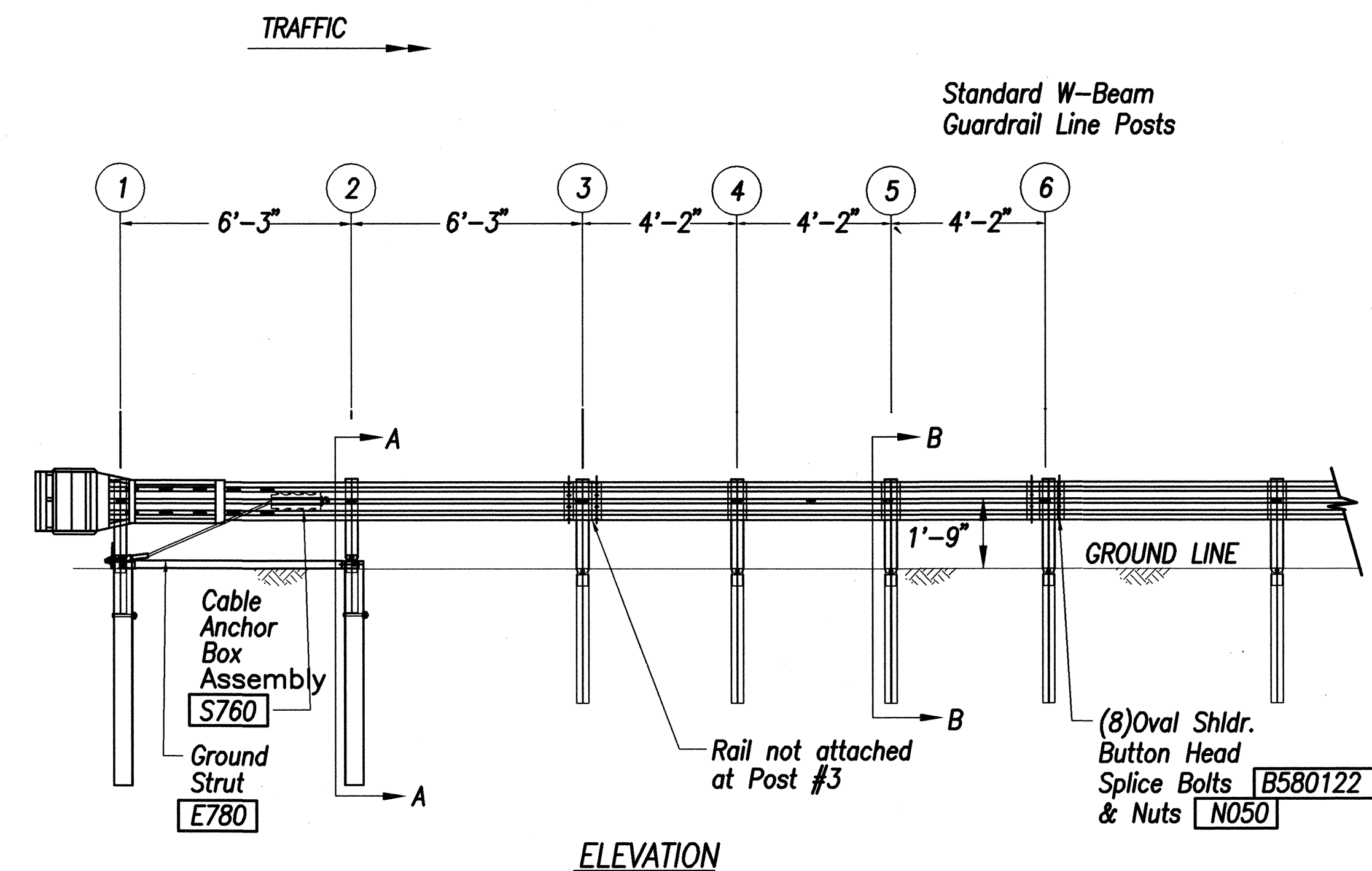
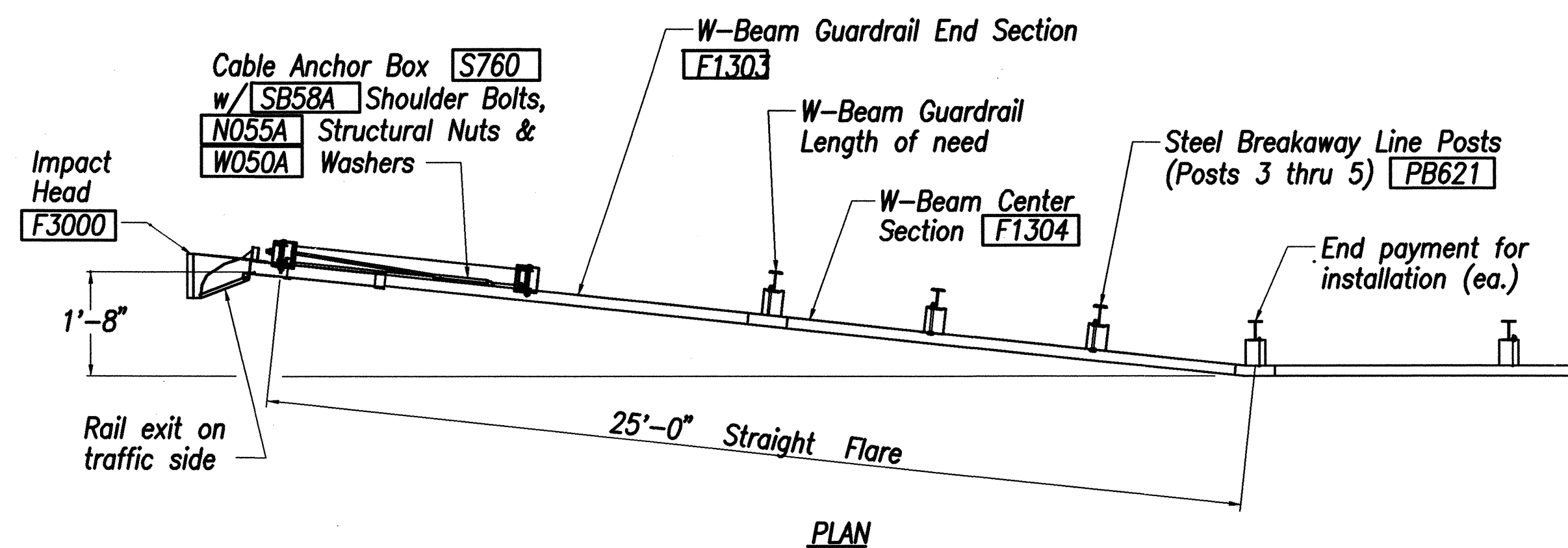
Scale: None

Date: August 1, 2000

SHEET No. S-22A OF 27 SHEETS

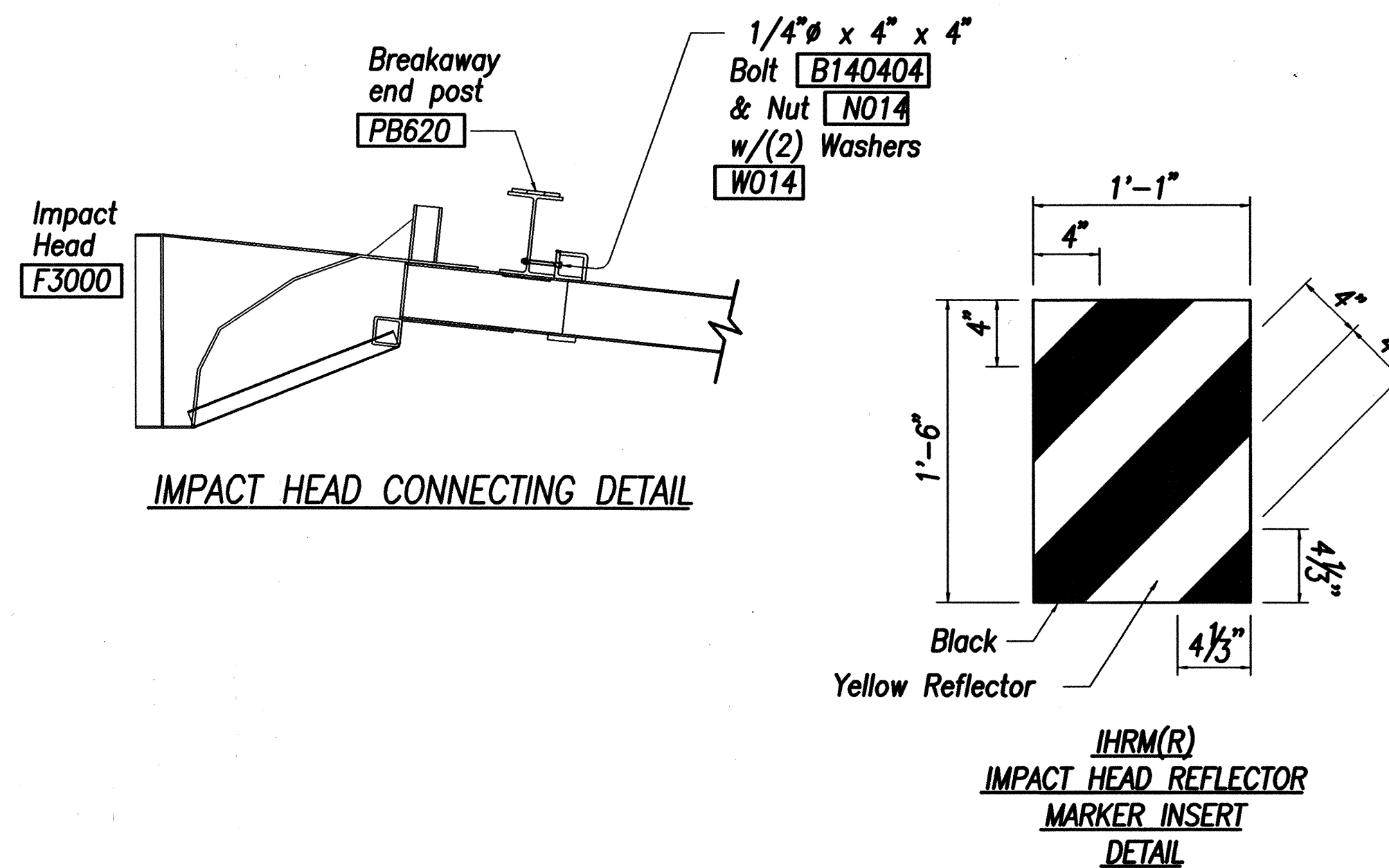
DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
QUANTITIES BY	
CHECKED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	





# 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 tube 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. 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.
- 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.



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 94	121

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.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 6'-0"
E750	1	BEARING PLATE, 8" x 8" x 5/8"
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	BREAKAWAY END POST
PB621	3	BREAKAWAY LINE POST
	3	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
	1	IMPACT HEAD REFLECTOR MARKER - IHRM(R) OR (L)
HARDWARE		
B580122	17	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	3	5/8" Dia. x 10" H.G.R. BOLT (POSTS 3 THRU 5)
N030	2	3/4" Dia. HEX NUT
N050	22	5/8" Dia. H.G.R. NUT (SPLICE 16, SOIL TUBES 2, POSTS 2, 1; POSTS 3 THRU 5, 3)
W030	4	3/4" I.D. WASHER
W050	4	H.G.R. 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 Tube S730  
 \*6'-0" Solid Foundation Tube E731  
 \*5'-0" Foundation Tube S735 W/Soil Plate SP600  
 \*4'-6" Foundation Tube E735 W/Soil Plate SP600

2/4/02	Revised Fleat TL-2 Detail Sheet Per Addendum No. 2
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>FLEAT TL-2</b> <b>FLARED ENERGY ABSORBING TERMINAL</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: None	Date: August 1, 2000

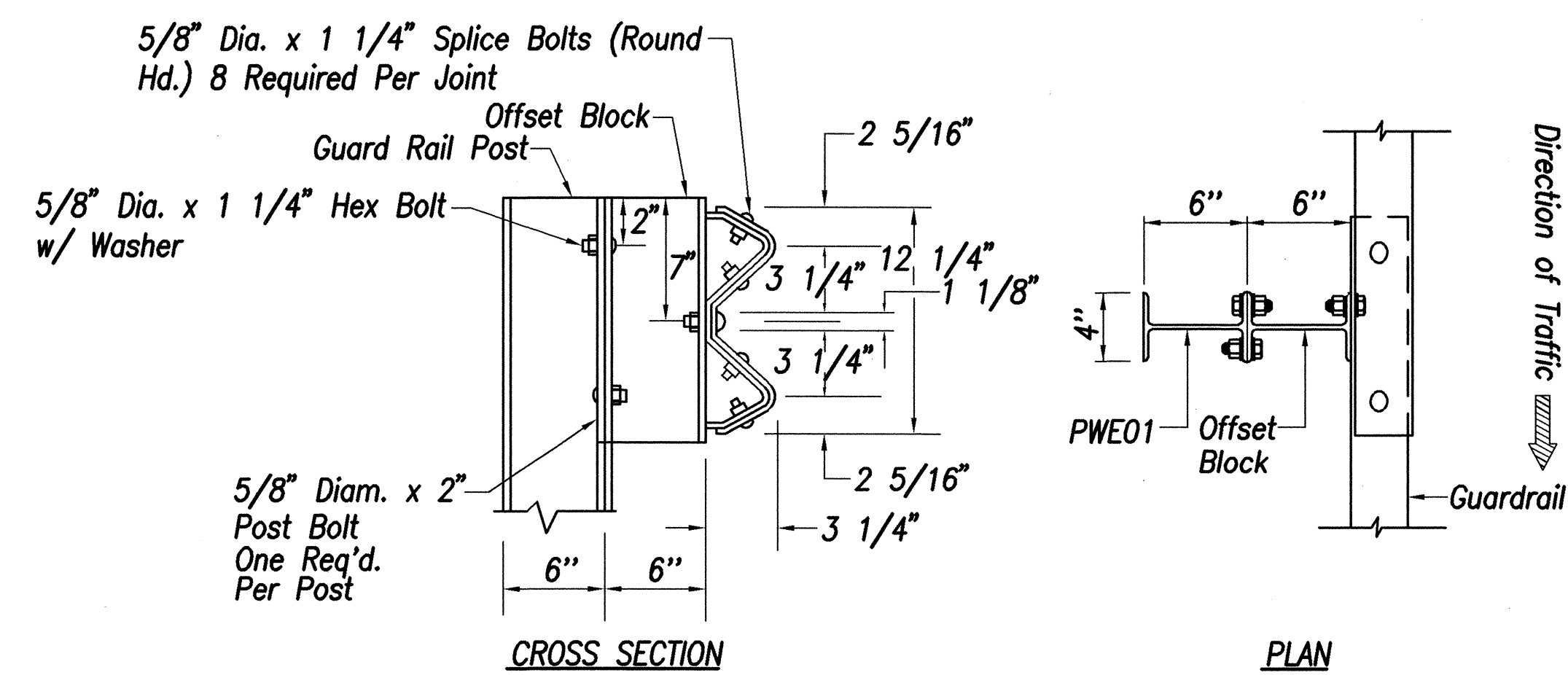
SHEET No. S-23 OF 27 SHEETS

ADD. 94

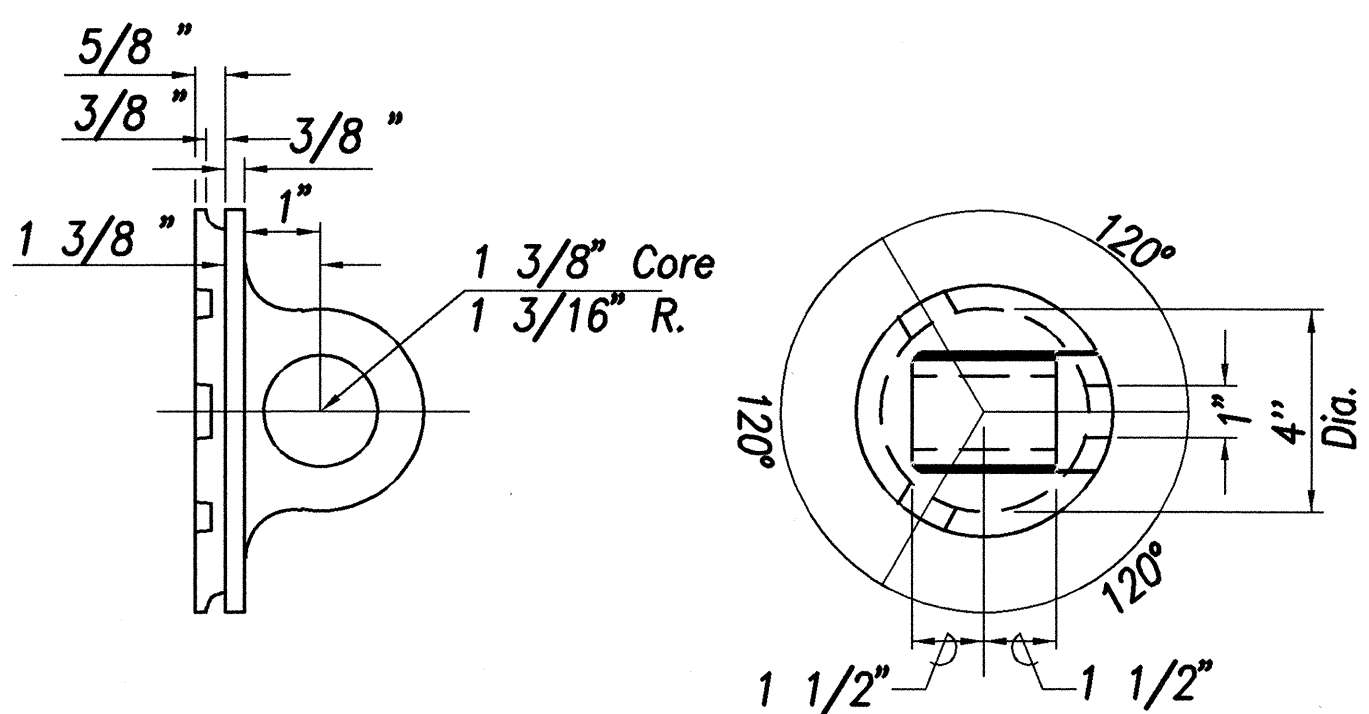




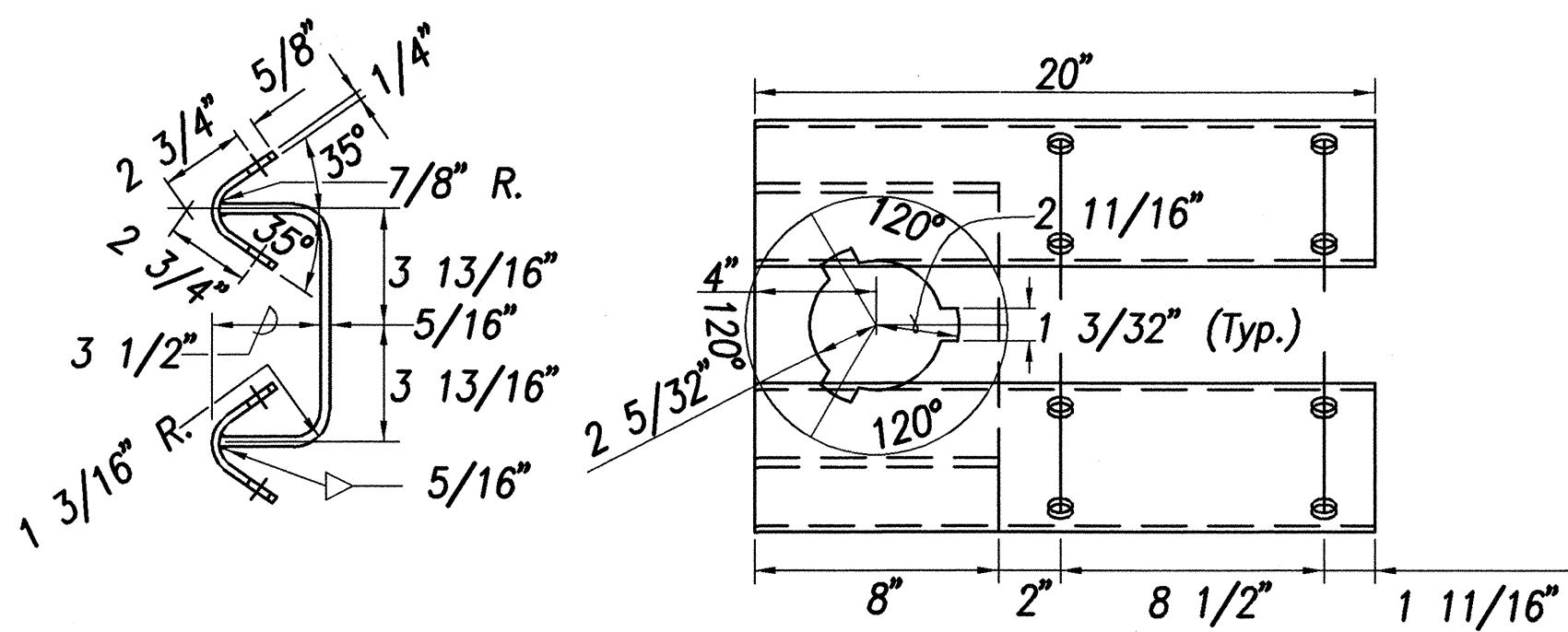
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	95	118



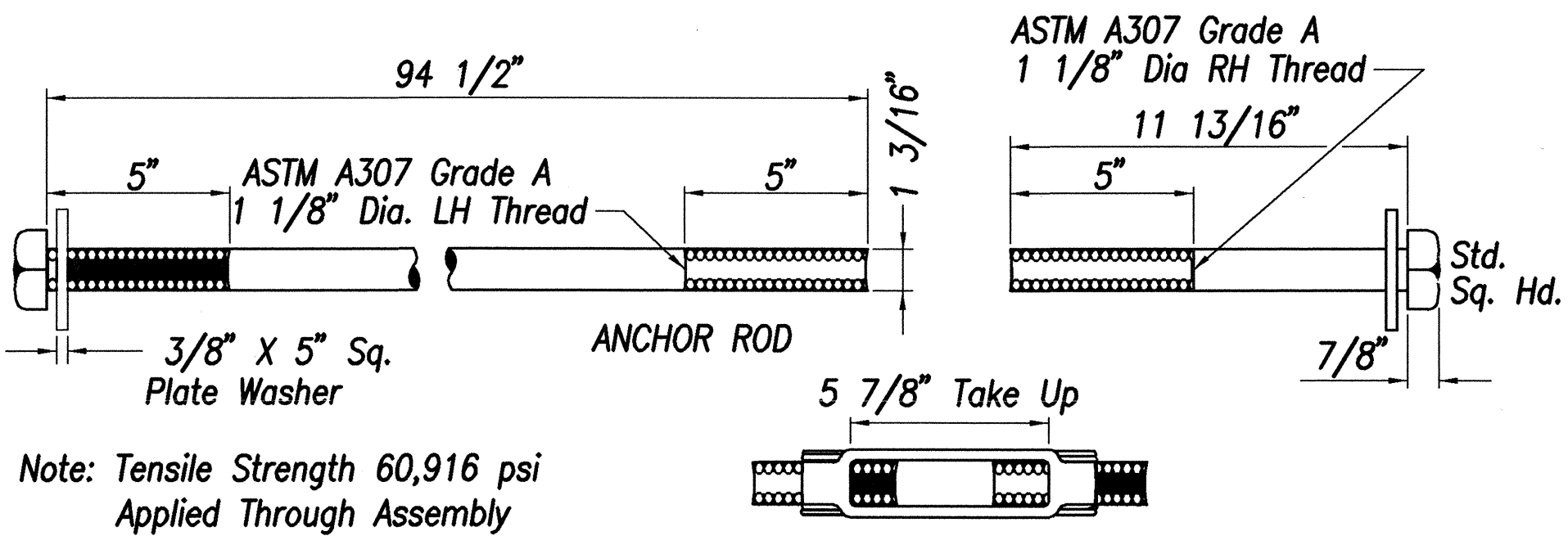
GUARDRAIL SPLICE



ANCHOR ROD CONNECTOR  
(MALLEABLE IRON CASTING OR EQUAL)

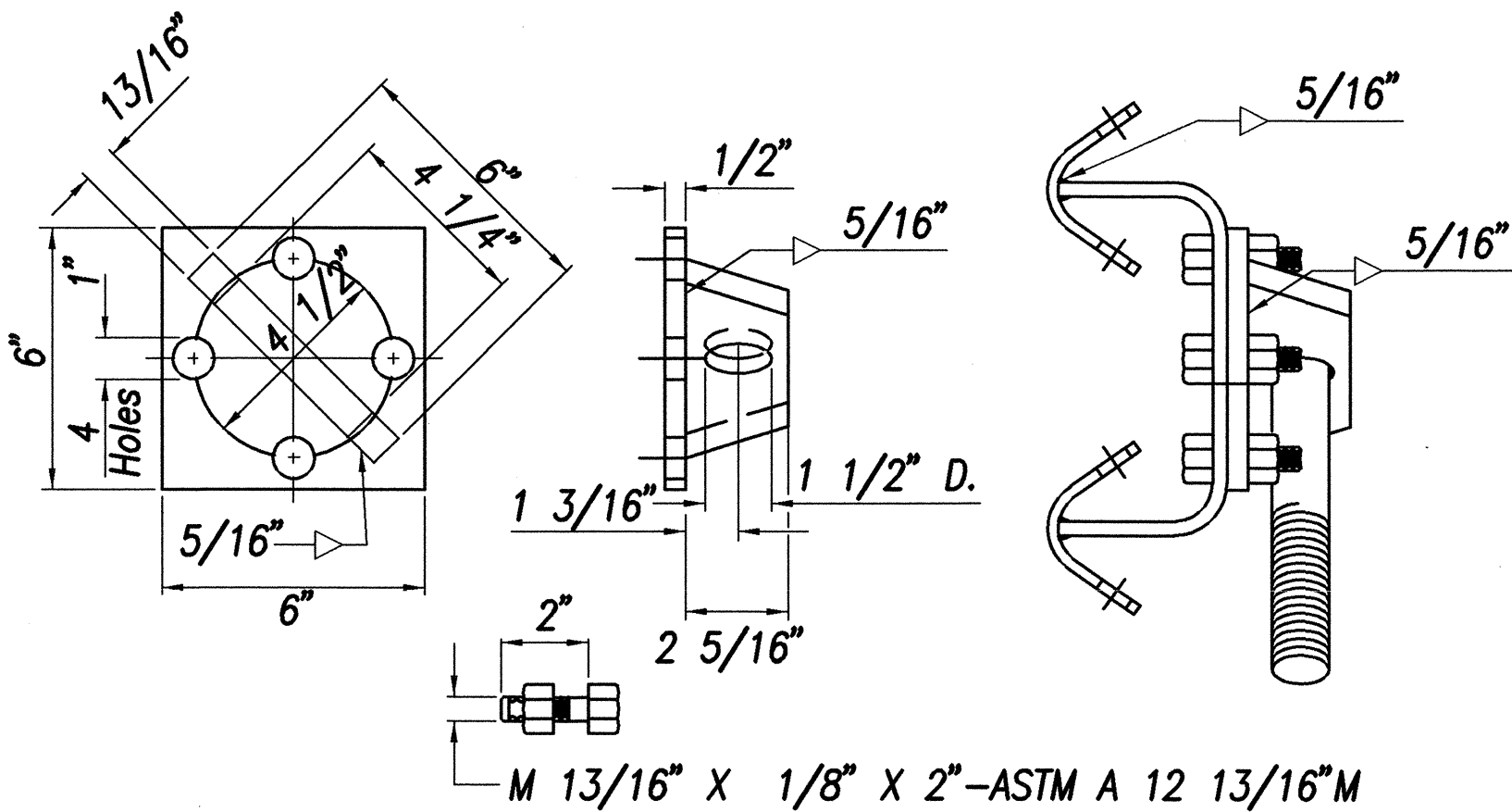


ANCHOR SPIDER  
(WELDMENT)



Note: Tensile Strength 60,916 psi  
Applied Through Assembly

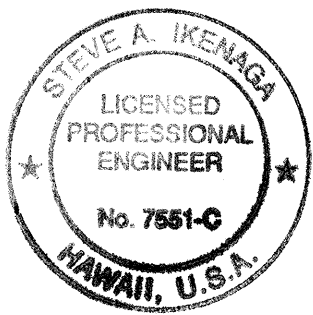
TURNBUCKLE



ALTERNATE ANCHOR ROD CONNECTOR

DESIGNED BY	DATE
DRAWN BY	
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	

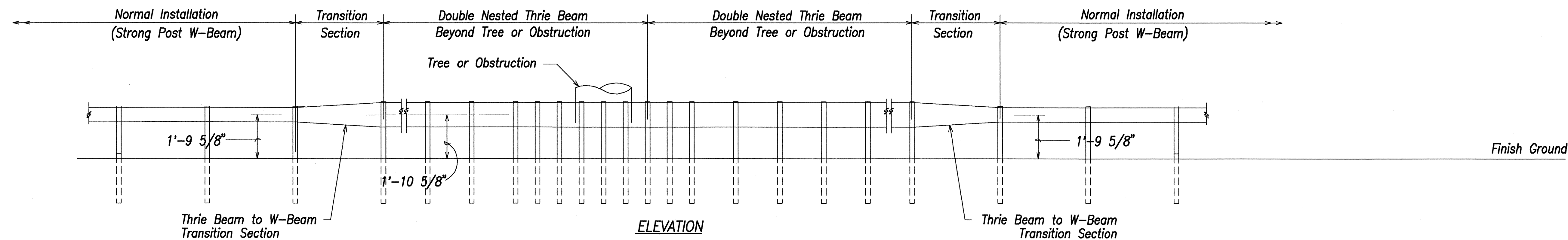
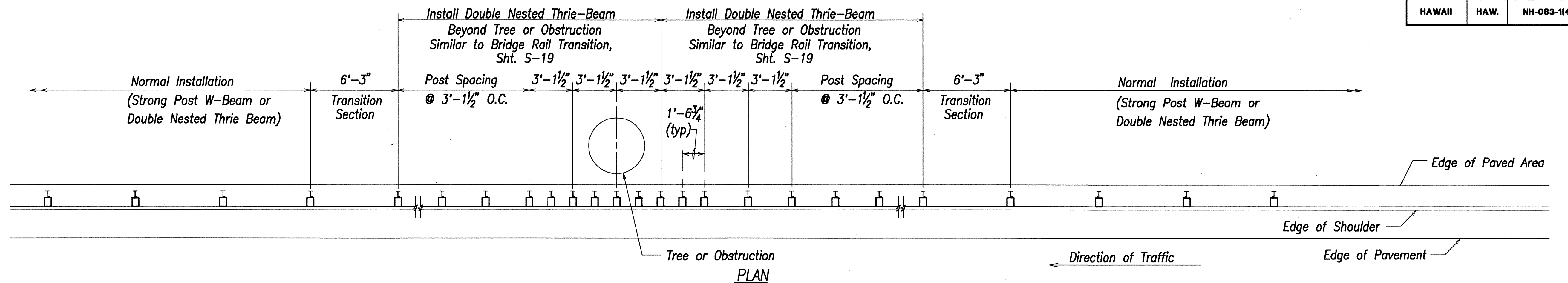
13/01/99 ted.ruby/guardrail/tes9rev.dgn(standard plan TE-59 r11/03/89)



THIS WORK WAS PREPARED BY ME OR  
UNDER MY SUPERVISION  
DATE 7-22-03  
SIGNATURE

6/30/03	Add'l. guardrail details per change order.
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>TYPE "G" MODIFIED GUARDRAIL            DETAILS</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: None Date: August 1, 2000 SHEET No. S-24A OF 27 SHEETS	

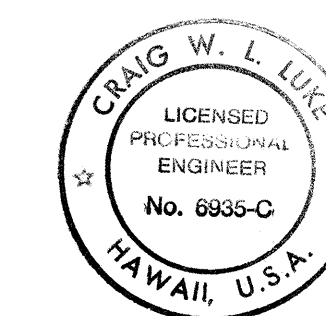
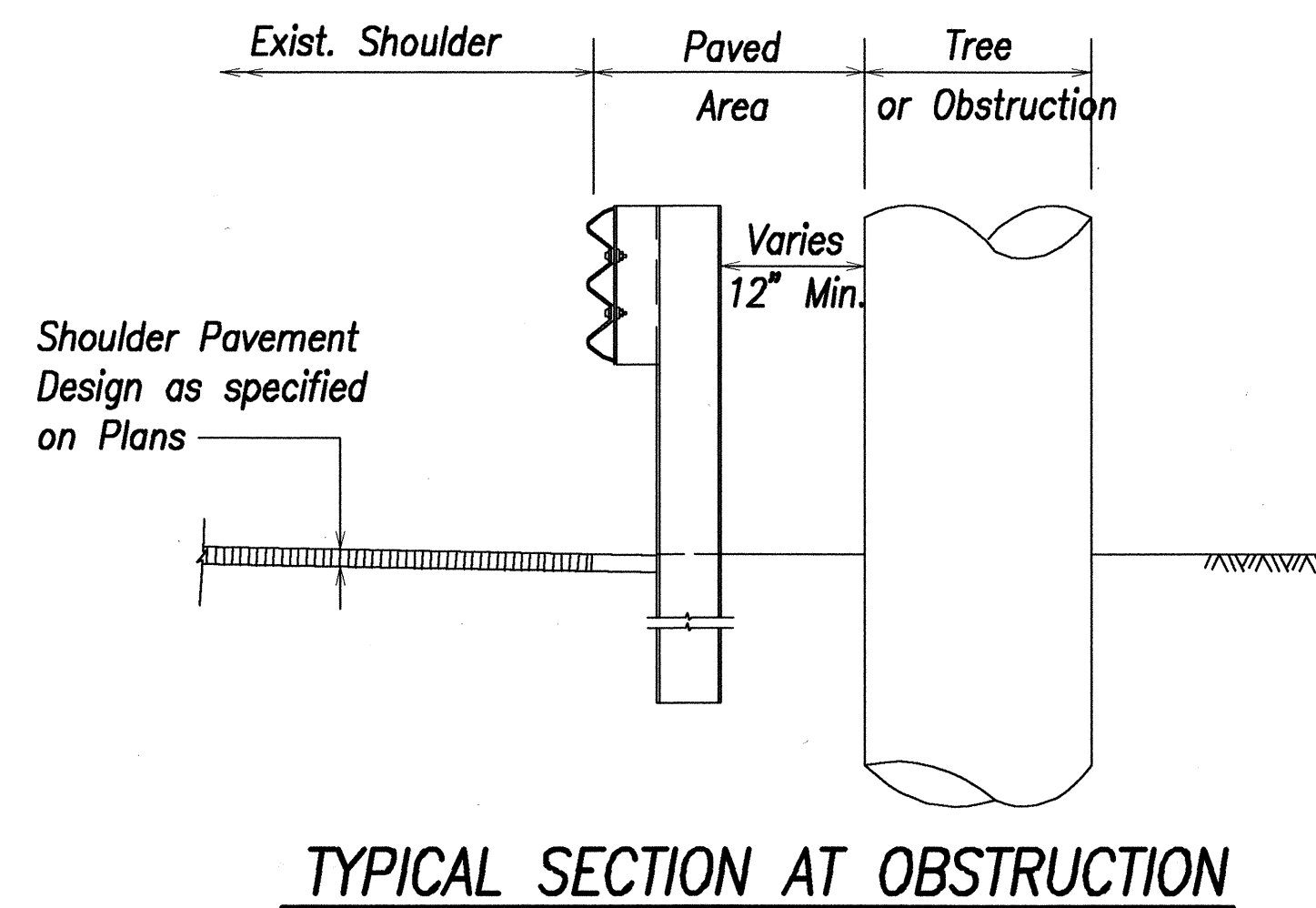
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 96	121



### GUARDRAIL INSTALLATION AT TREE OR OBSTRUCTION

#### NOTES:

1. Double Nested Thrie beam guardrail shall be installed according to the details shown on sheet S-19.
2. For required lengths of thrie beam, see Roadway Plans.
3. 6'-3" transition sections shall be considered incidental to the various guardrail items.



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

*[Signature]* DATE 2/4/02

2/4/02	Revised Guardrail Layout Per Addendum No. 2
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>THRIE BEAM GUARDRAIL AT OBSTRUCTION</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: None	Date: August 1, 2000

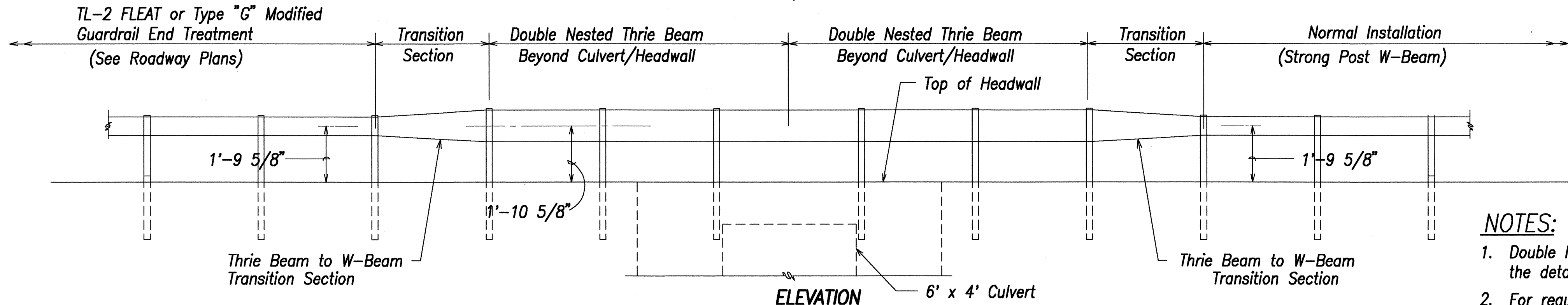
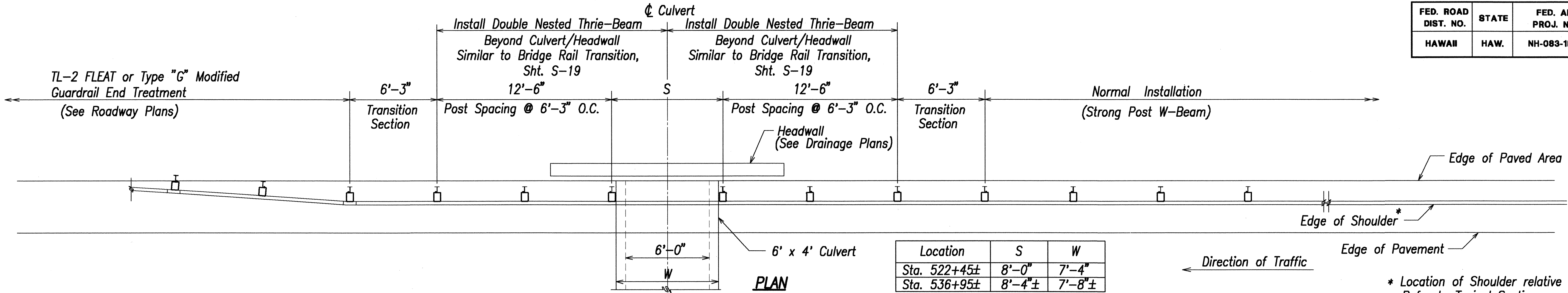
SHEET No. S-25 OF 27 SHEETS

ADD. 96

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

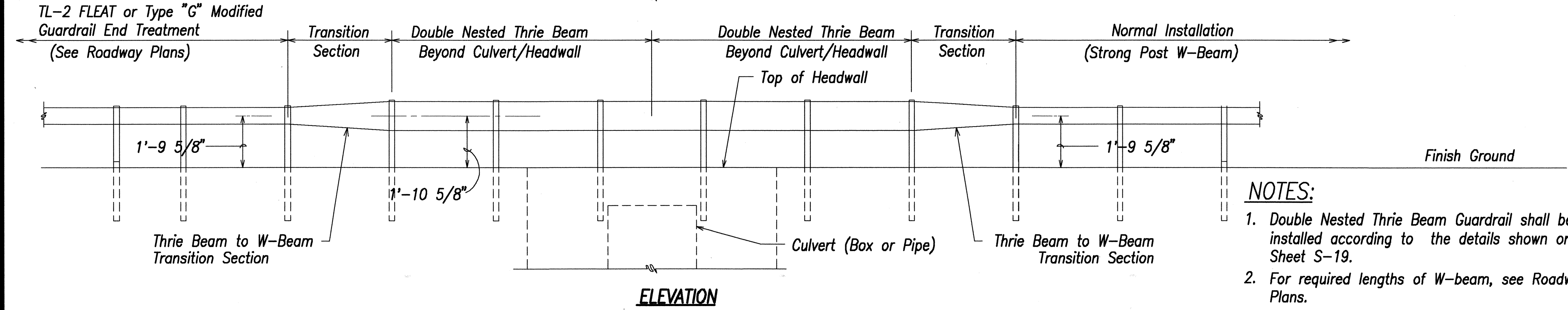
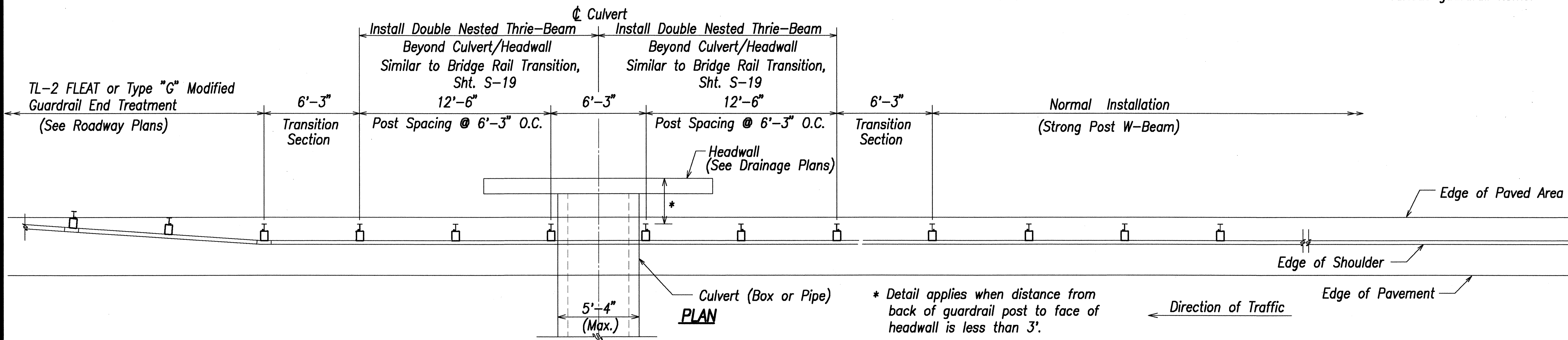


FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. ADD. 96S-1	121



**GUARDRAIL INSTALLATION AT 6' x 4' CULVERT (Sta. 522+45± & Sta. 536+95±)**

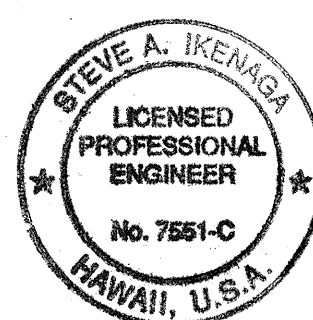
- NOTES:**
- Double Nested Thrie Beam Guardrail shall be installed according to the details shown on Sheet S-19.
  - For required lengths of W-beam, see Roadway Plans.
  - 6'-3" transition sections shall be considered incidental to the various guardrail items.



**GUARDRAIL INSTALLATION AT CULVERTS**

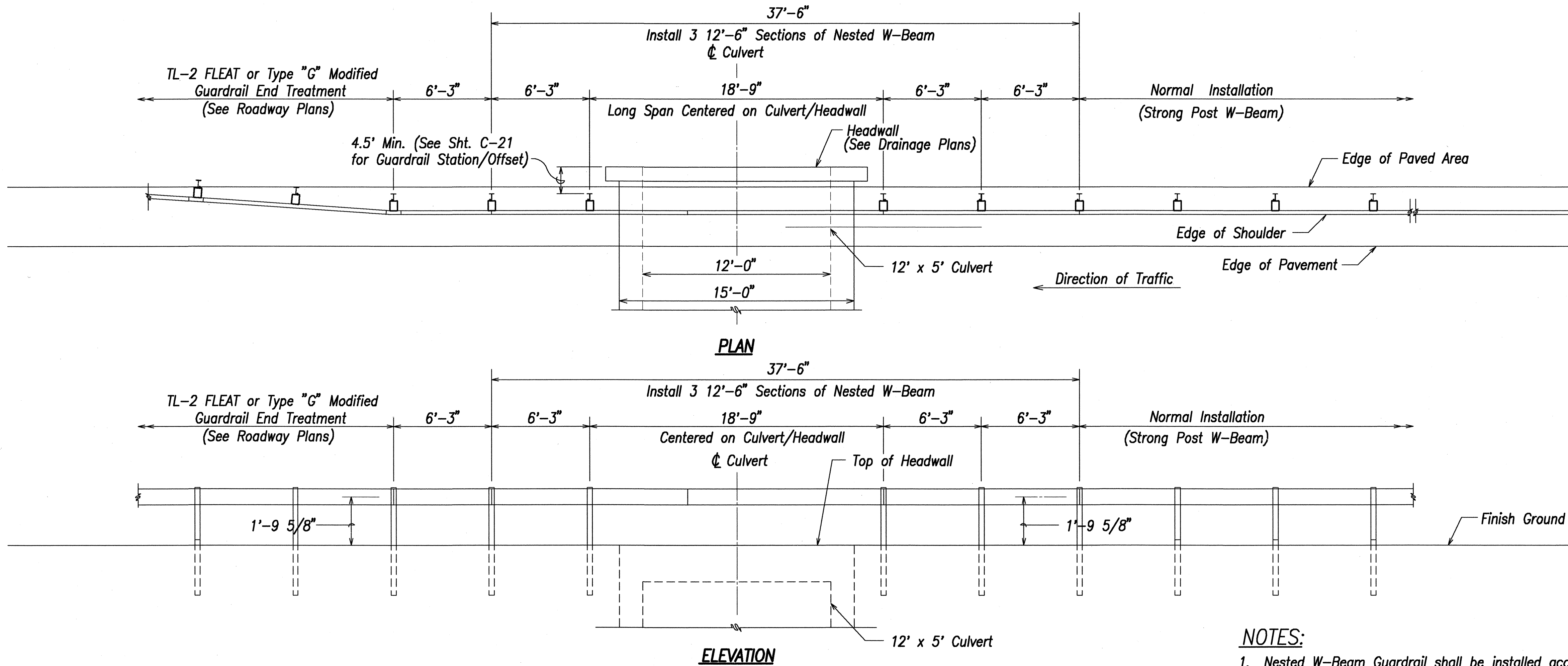
- NOTES:**
- Double Nested Thrie Beam Guardrail shall be installed according to the details shown on Sheet S-19.
  - For required lengths of W-beam, see Roadway Plans.
  - 6'-3" transition sections shall be considered incidental to the various guardrail items.

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



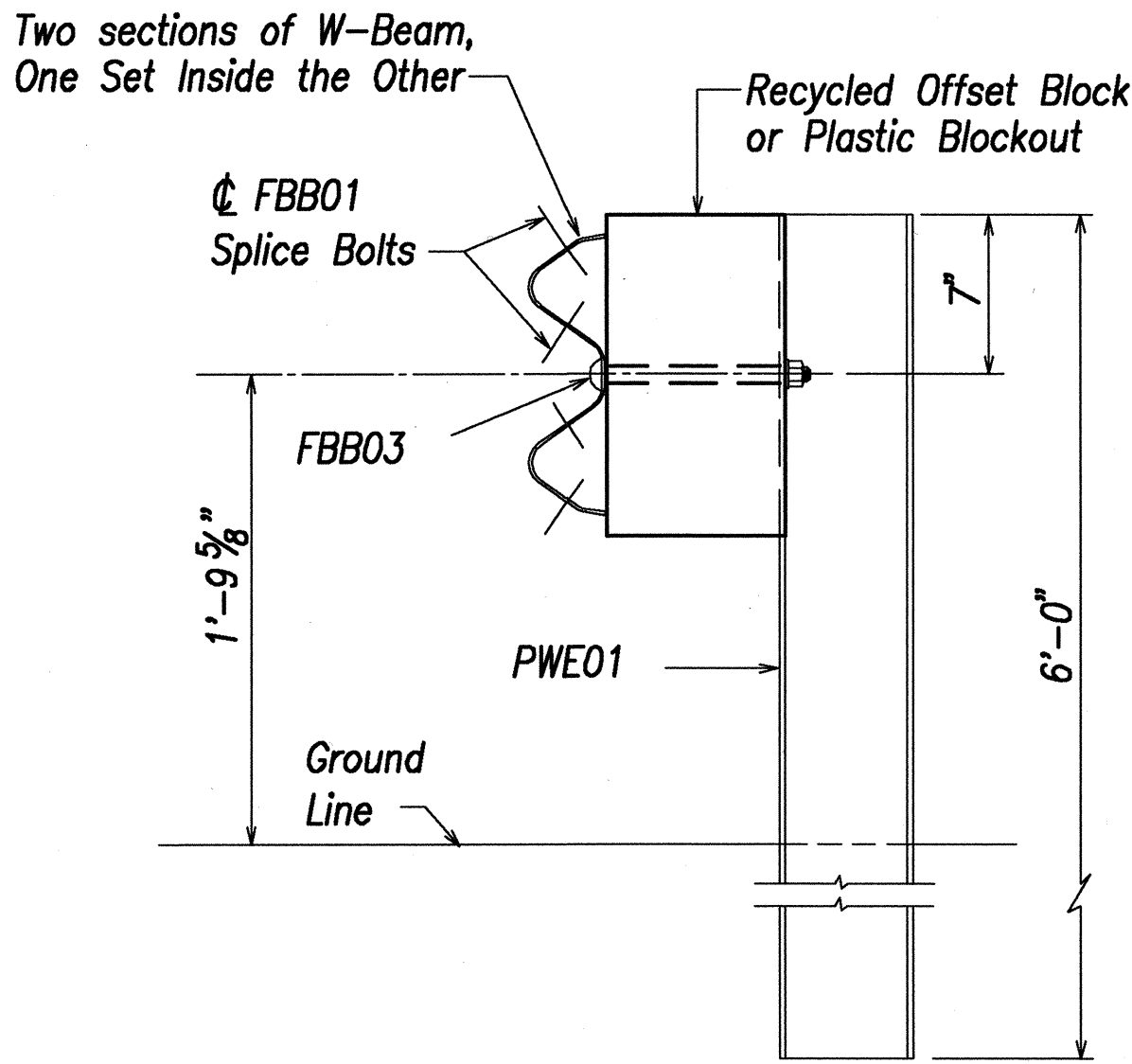
4/23/03	Revised to Add Guardrail Details for 6'x4' Culvert at Sta. 536+95± Per Change Order
2/4/02	Added New Sheet Per Addendum No. 2
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>THRIE BEAM GUARDRAIL AT CULVERTS</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: None Date: August 1, 2000 SHEET No. S-25A OF 27 SHEETS	

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 96 S-2	121



### GUARDRAIL INSTALLATION AT 12' x 5' CULVERT (Sta. 826+85±, Rt.)

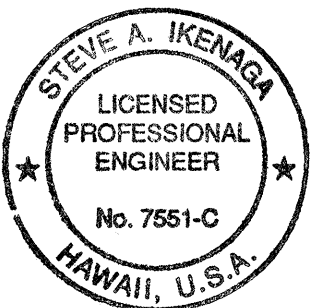
- NOTES:**
1. Nested W-Beam Guardrail shall be installed according to the details shown on this sheet, and Sheets S-19 through S-22.
  2. For required lengths of W-beam, see Roadway Plans.
  3. All rail elements are 12'-6" in length.



**ELEVATION**

**NESTED W-BEAM GUARDRAIL**

DESIGNED BY	DATE
CHECKED BY	
NOTED BY	
ORIGINAL PLAN	
NOTE BOOK	
No.	



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Signature: *Steve A. Ikemaga* 4-20-04

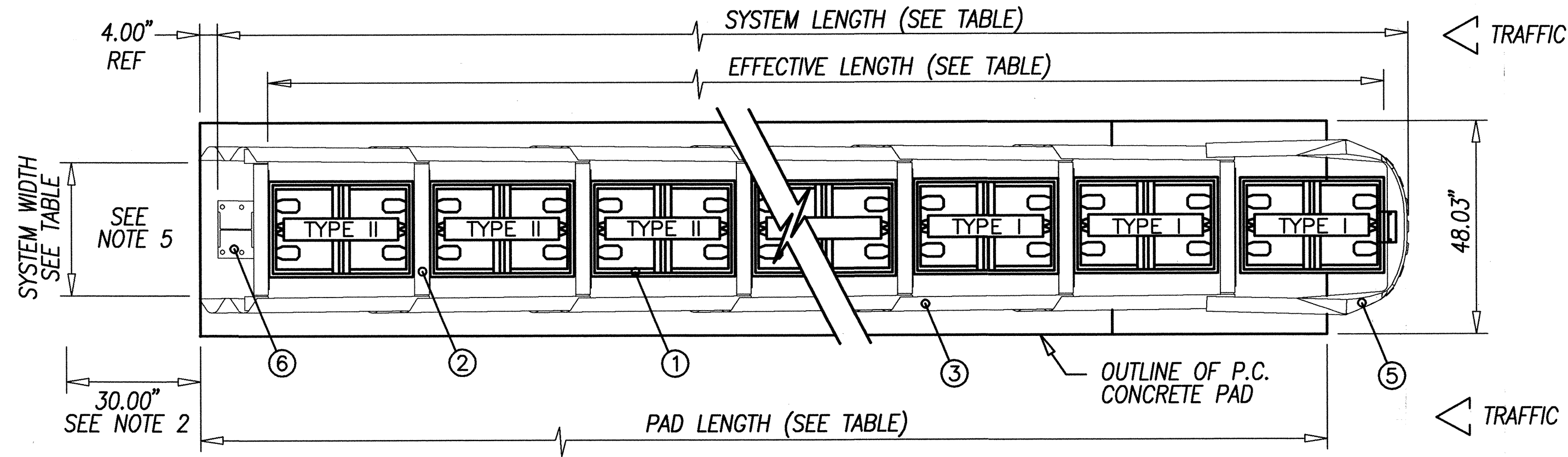
EXPIRATION DATE OF THE LICENSE

8/15/02	Added New Sheet Per Change Order
DATE	REVISION
DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>NESTED W-BEAM GUARDRAIL INSTALLATION AT CULVERTS</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: None	Date: August 1, 2000
SHEET No. S-25B OF 27 SHEETS	

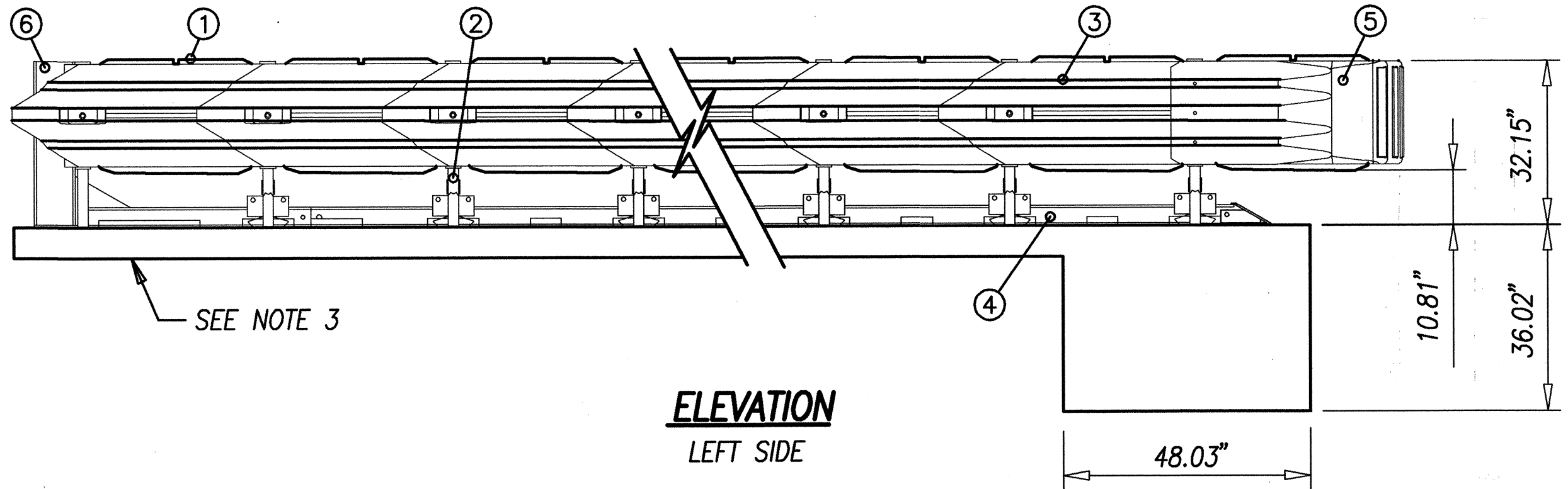
C.O. 96 S-2



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	ADD. 97	121



- KEY
- ① QUADGUARD CARTRIDGE
  - ② DIAPHRAGM
  - ③ FENDER PANEL
  - ④ MONORAIL
  - ⑤ NOSE ASSEMBLY
  - ⑥ TENSION STRUT BACKUP

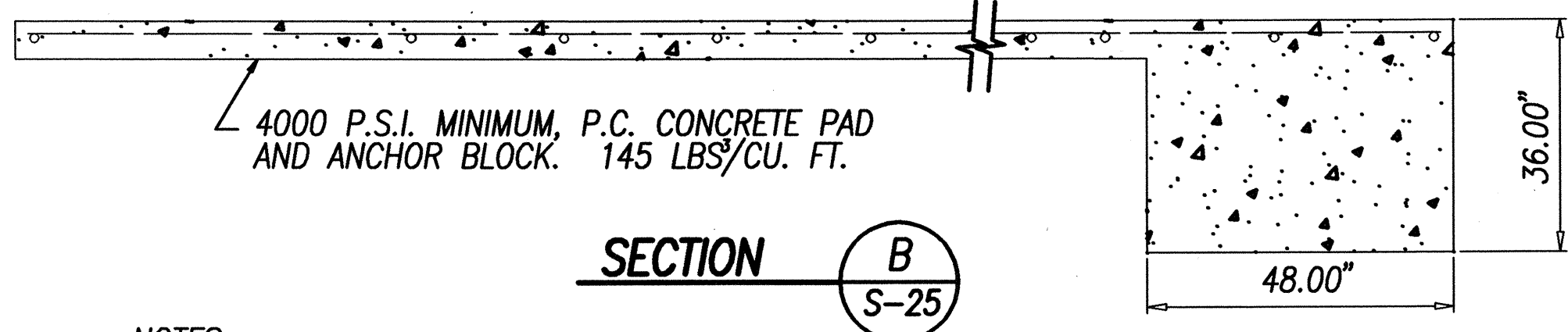
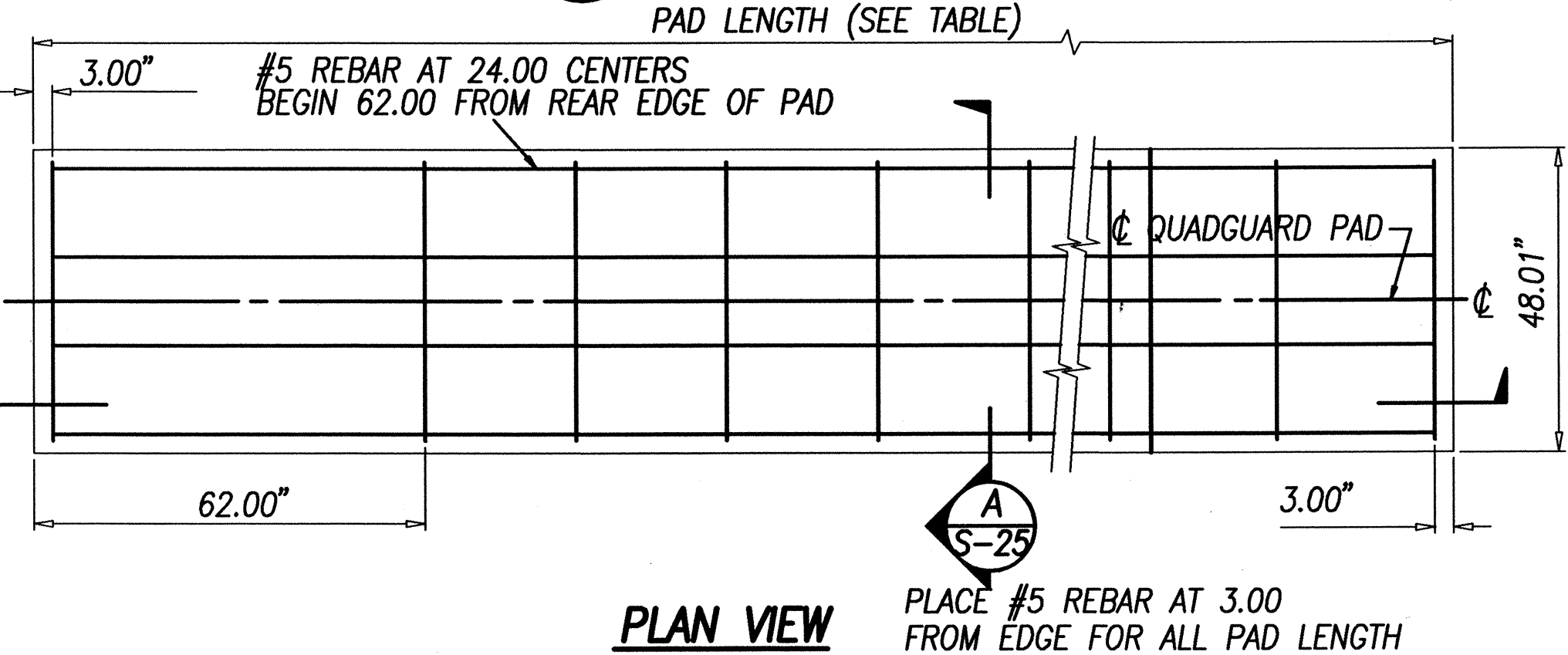
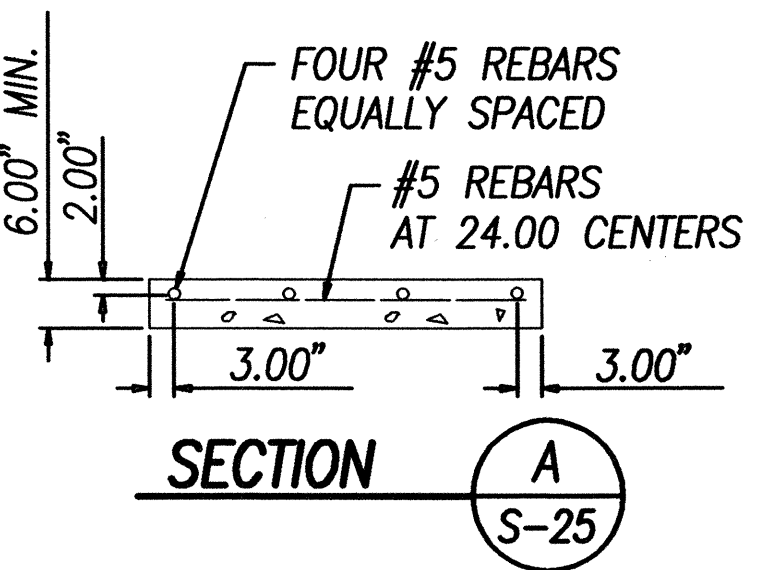


- NOTES:
- IN COMPLIANCE WITH THE AASHTO 1996 ROADSIDE DESIGN GUIDE, MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
  - PROVISION SHALL BE MADE FOR REAR FENDER PANELS TO SLIDE REARWARD UPON IMPACT 30.00" MINIMUM.
  - 6.00" MINIMUM REINFORCED 4000 PSI P.C. CONCRETE PAD.
  - SEE THE "QUADGUARD SYSTEM DESIGN MANUAL" CODED ENE 820-796 FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (312) 467-6750.
  - WHERE NECESSARY THE CONTRACTOR SHALL SUPPLY A TRANSITION FROM THE QUADGUARD SYSTEM TO THE OBJECT BEING SHIELDED.

BAYS	24" WIDTH MODEL# YELLOW	SYSTEM LENGTH ft-in	EFFECTIVE LENGTH ft-in	PAD LENGTH ft-in	REBAR REQUIRED ft-in	VOL. OF CONC. IN PAD YARDS <sup>3</sup>
3	QS2403Y	13'-1"	11'-8"	12'-0"	68'-0"	2.4

### QUADGUARD SYSTEM W/ TENSION STRUT BACKUP

NTS

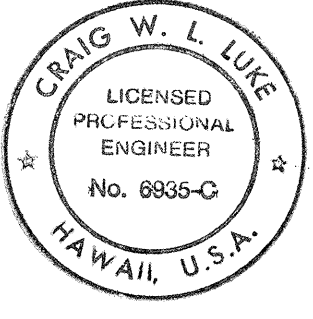


- NOTES:
- CROSS SLOPE OF PAD SHALL NOT EXCEED 8%, AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.

### QUADGUARD SYSTEM CONCRETE PAD, TENSION STRUT, QG

NTS

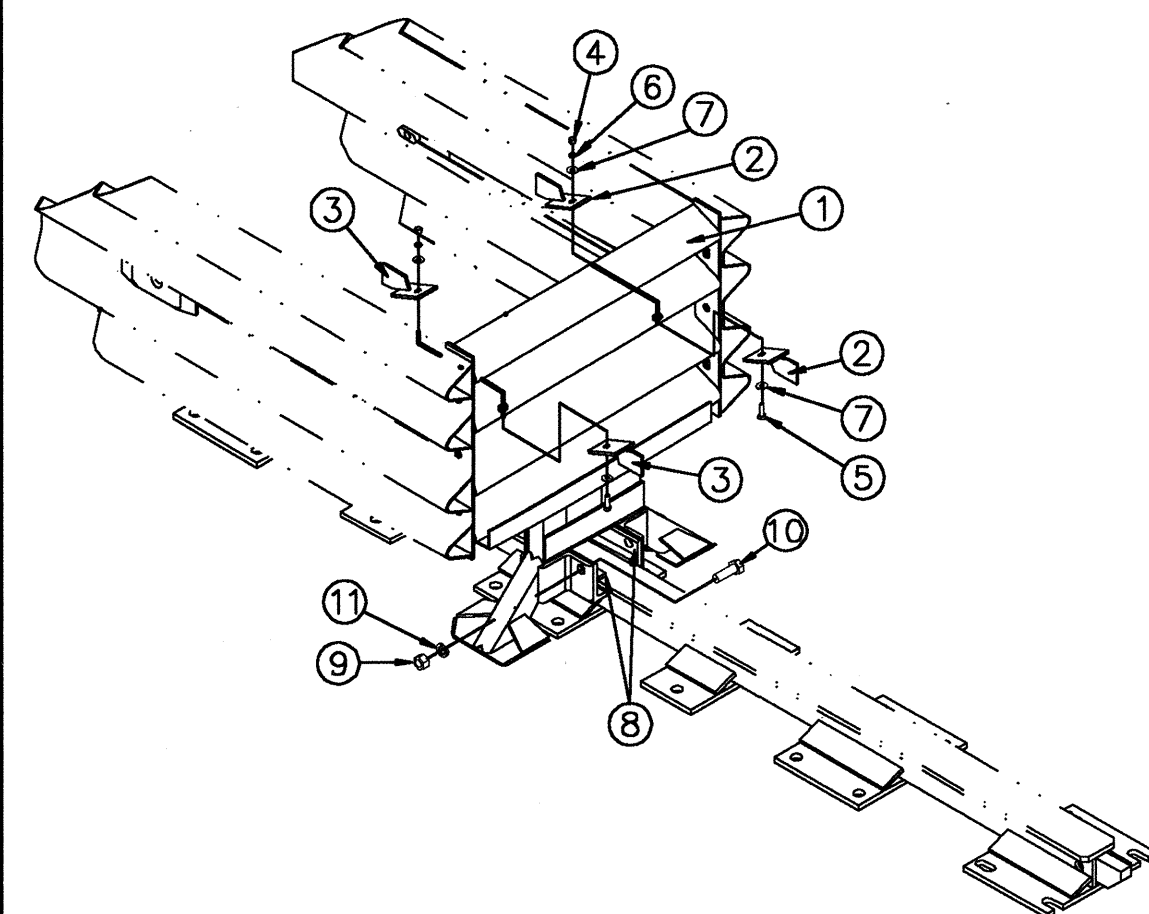
DATE	_____
SURVEY PLOTTED BY	_____
DESIGNED BY	_____
TRACED BY	_____
NOTE BOOK	_____
QUANTITIES BY	_____
CHECKED BY	_____
No.	_____



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DATE

2/4/02	Revised Notes Per Addendum No. 2
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>QUADGUARD SYSTEM-1</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: 1" = 10'      Date: August 1, 2000 SHEET No. S-26 OF 27 SHEETS	



DIAPHRAGM ASSEMBLY PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	REQ'D.
1	SEE TABLE A	DIAPHRAGM, QB, QG,G	1.00
2	2760101-0000	BRACKET, CARTRIDGE SUPPORT, R, QG, G	2.00
3	2760111-0000	BRACKET, CARTRIDGE SUPPORT, L, QG, G	2.00
4	2704031-0000	NUT, HX, 3/8, G	2.00
5	2701021-0000	BOLT, HX, 3/8X1 1/2,G2, G	2.00
6	2708041-0000	WASHER, LOCK, 3/8, G	2.00
7	2708021-0000	WASHER, FLAT, 3/8X1,G	4.00
8	2760091-0000	MONORAIL GUIDE, QG,G	2.00
9	2704341-0000	NUT, HX, 3/4, GR DH	4.00
10	2699121-0000	BOLT, HX, 3/4 X 2, G8,G	4.00
11	2708201-0000	WASHER, LOCK 3/4, G	4.00

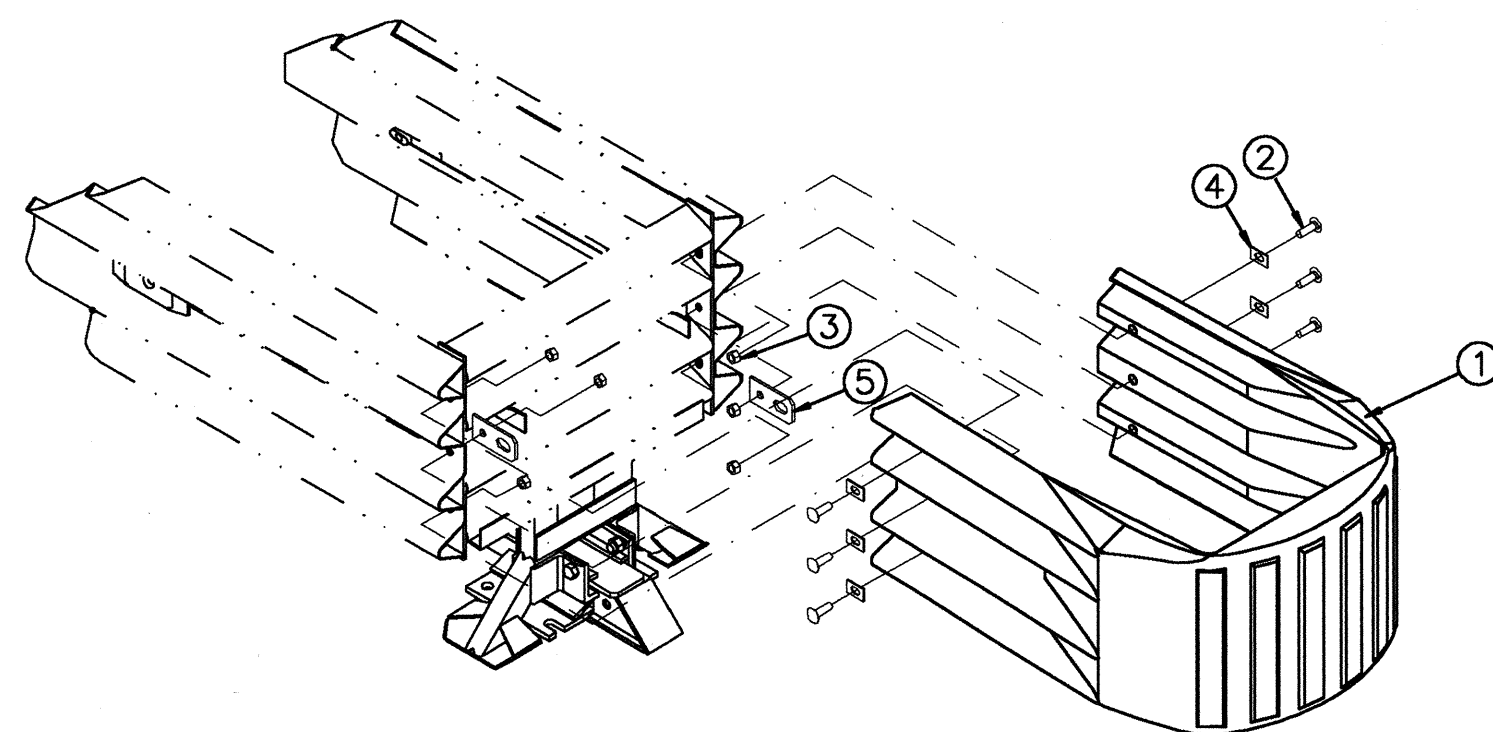
TABLE A

ASSY. NO.	STOCK NO.	DESCRIPTION
3540071-0000	276011-0000	DIAPHRAGM, QB, 24, QG,G

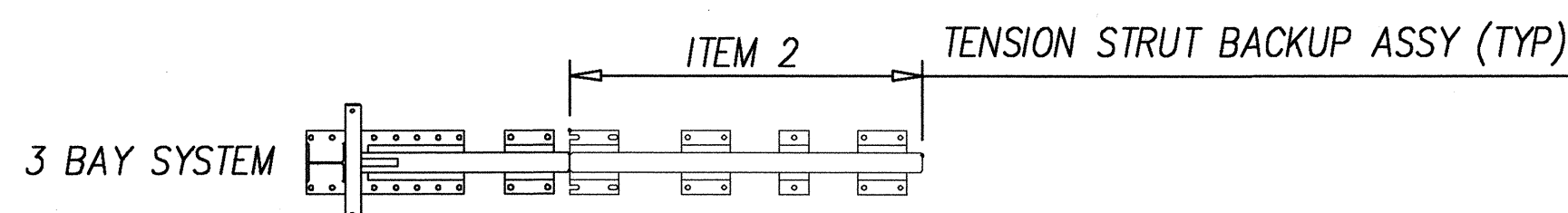
### DIAPHRAGM ASSEMBLY, QG

NOSE ASSEMBLY PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	REQ'D.
1	3540130-0*00	NOSE, W/SUPPORT BRACKET	1.00
2	2699341-0000	BOLT, RAIL, 5/8 X 2, G	6.00
3	2704191-0000	NUT, HX, 5/8, G, RAIL	6.00
4	2708871-0000	WASHER, BAR, 1/8 X 1 1/4 X 2, W/HOLE, G	6.00
5	2760251-0000	BRACKET, PULL-OUT	2.00

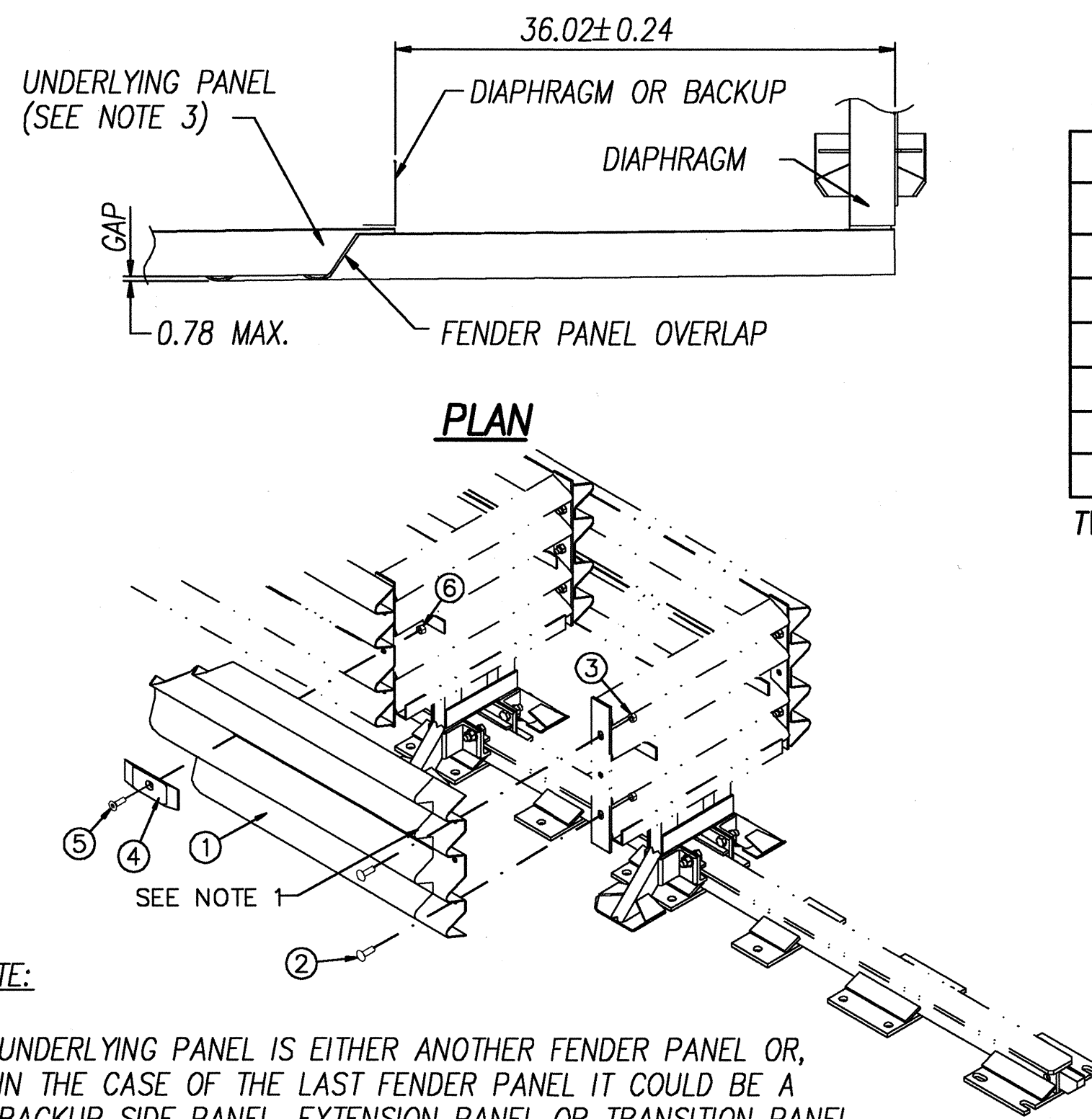
\* 0 INDICATES GRAY  
\* 1 INDICATES YELLOW



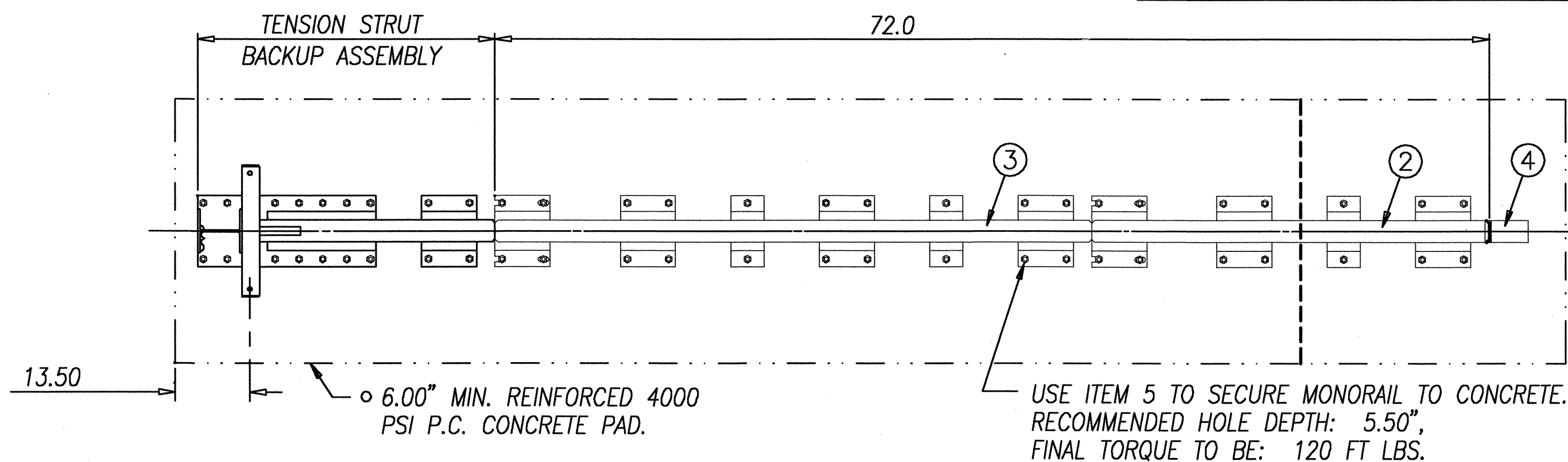
### NOSE ASSEMBLY, QG



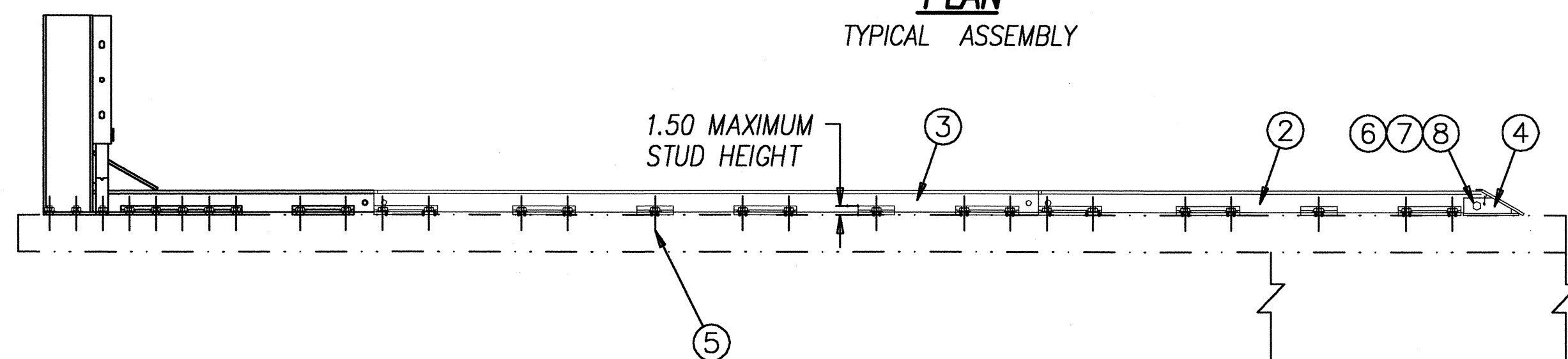
### 3 BAY MONORAIL ASSEMBLY, QG



### FENDER PANEL ASSEMBLY, QG



PLAN  
TYPICAL ASSEMBLY



ELEVATION

#### NOTES:

- USE MONORAIL(S) (ITEM 1, 2, AND 3) AS TEMPLATE(S) TO LOCATE MP-3 ANCHOR BOLTS (ITEM 5).
- CROSS SLOPE OF PAD SHALL NOT EXCEED 8% AND NOT VARY MORE THAN 2% FROM FRONT TO BACK.

### TYPICAL MONORAIL ASSEMBLY, QG W/ TENSION STRUT BACKUP

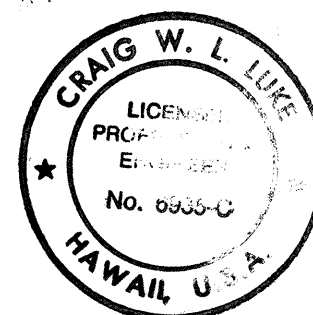
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	98	121

FENDER PANEL ASSEMBLY PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	REQ'D.
1	2760081-0000	PANEL, FENDER, QG, G	1.00
2	2699341-0000	BOLT, RAIL, 5/8 X 2, G	2.00
3	2704191-0000	NUT, HX, 5/8, G, RAIL	2.00
4	2708841-0000	WASHER, MUSHROOM, CAST QG, G	1.00
5	2701731-0000	BOLT, FL, 5/8 X 3, G8, G, SOCKET	1.00
6	2704141-0000	NUT, HX, 5/8, G	1.00

TWO FENDER PANEL ASSEMBLIES REQUIRED PER BAY

NOTE: MONORAIL & BACKUP ASSEMBLY MUST BE STRAIGHT TO WITHIN 0.5"

MONORAIL ASSEMBLY PARTS LIST			
ITEM	STOCK NO.	DESCRIPTION	REQ'D.
1	2760051-0000	MONORAIL, ONE BAY, QG, G	0
2	2760061-0000	MONORAIL, TWO BAY, QG, G	1.00
3	2760071-0000	MONORAIL, THREE BAY, QG, G	0
4	2760041-0000	END CAP, MONORAIL, QG, G	1.00
5	2535300-0000	ANCHOR, MP-3, PT-KIT, 3/4 X 7, VT	3.00
6	2699251-0000	BOLT, HX, 3/4 X 3 1/2, G5, G	1.00
7	2704341-0000	NUT, HX, 3/4, G, GR DH	1.00
8	2708201-0000	WASHER, LOCK, 3/4, G	1.00



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**QUADGUARD SYSTEM-2**

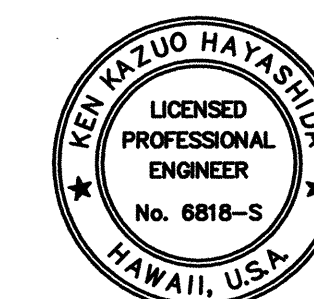
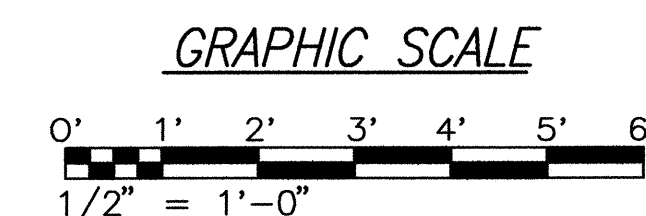
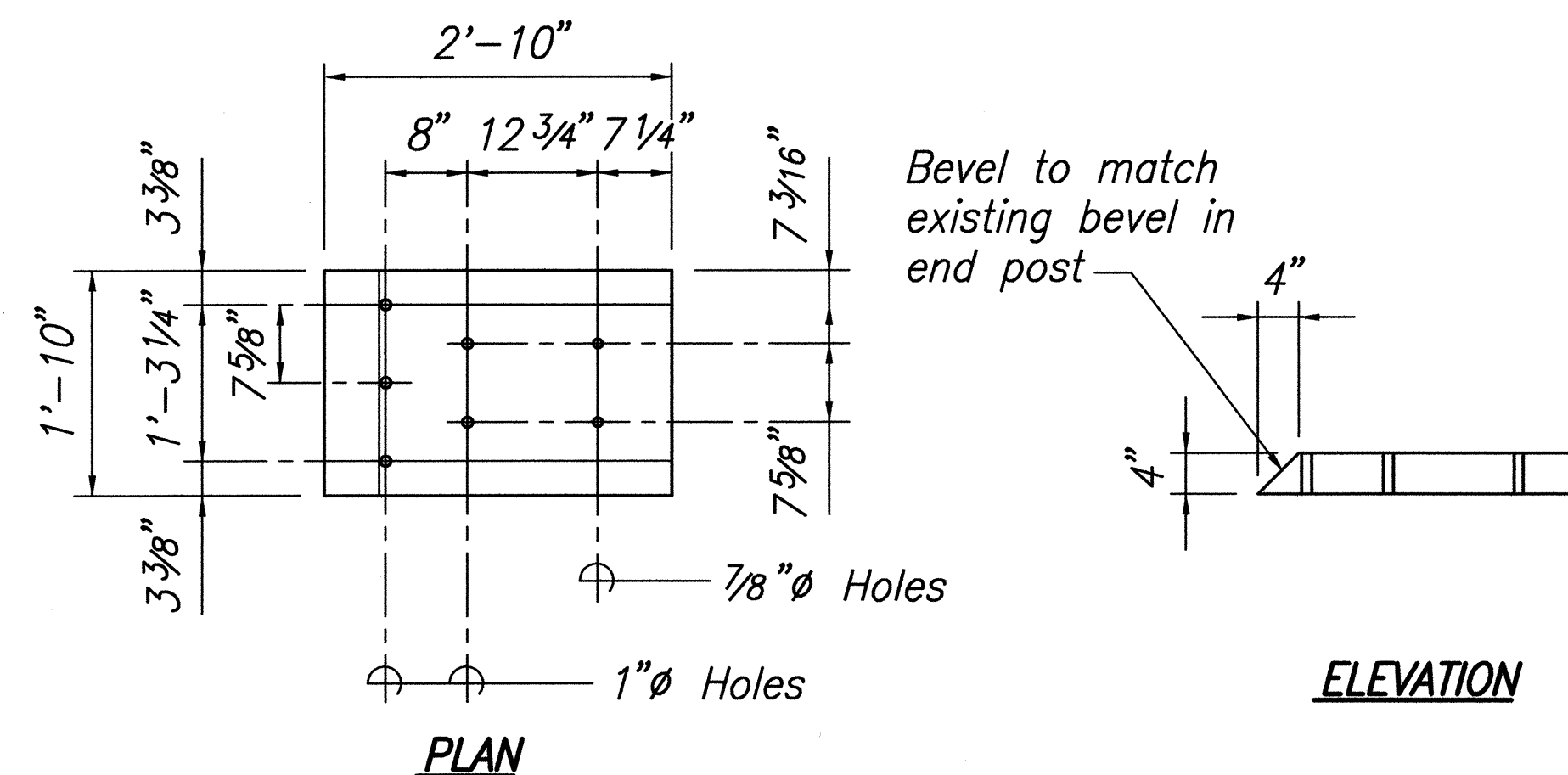
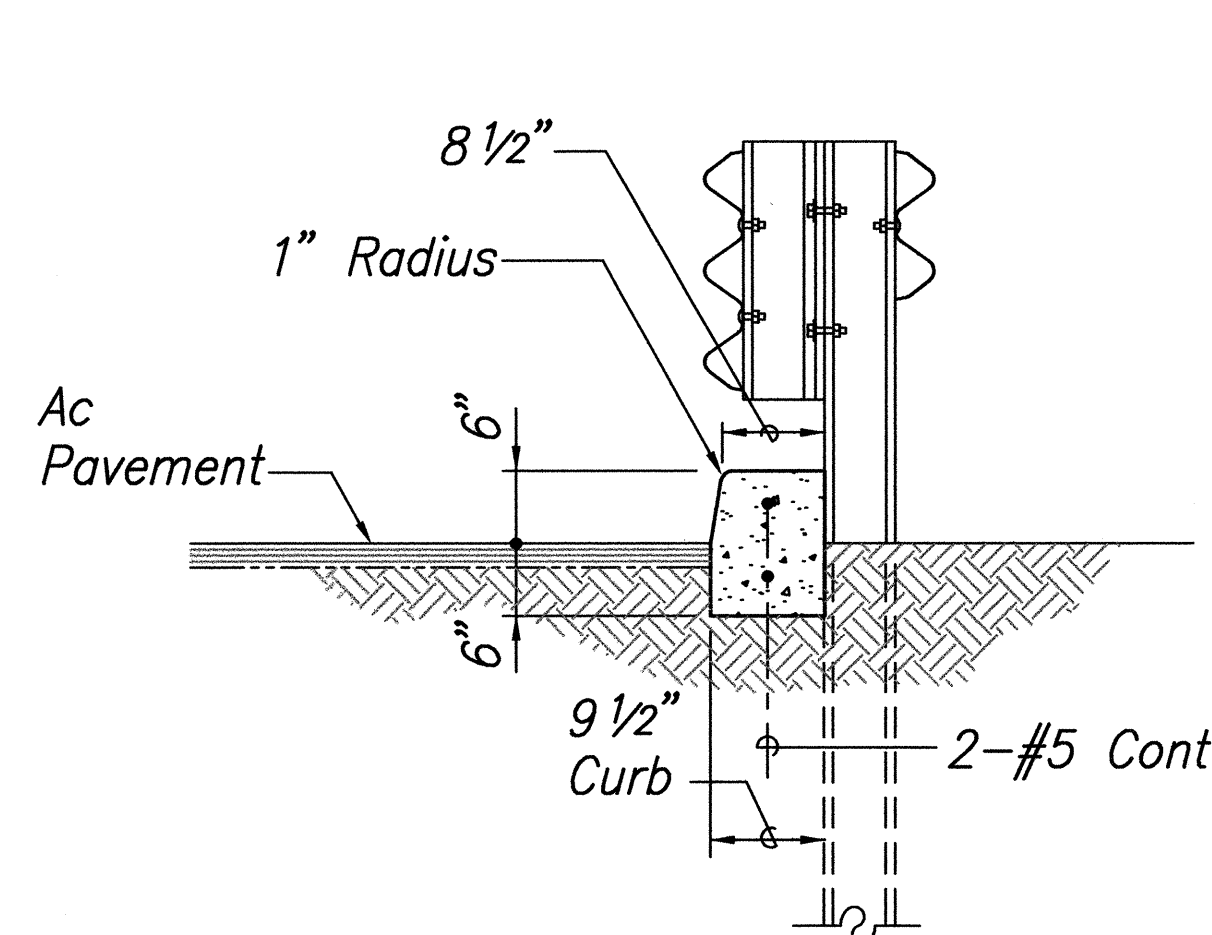
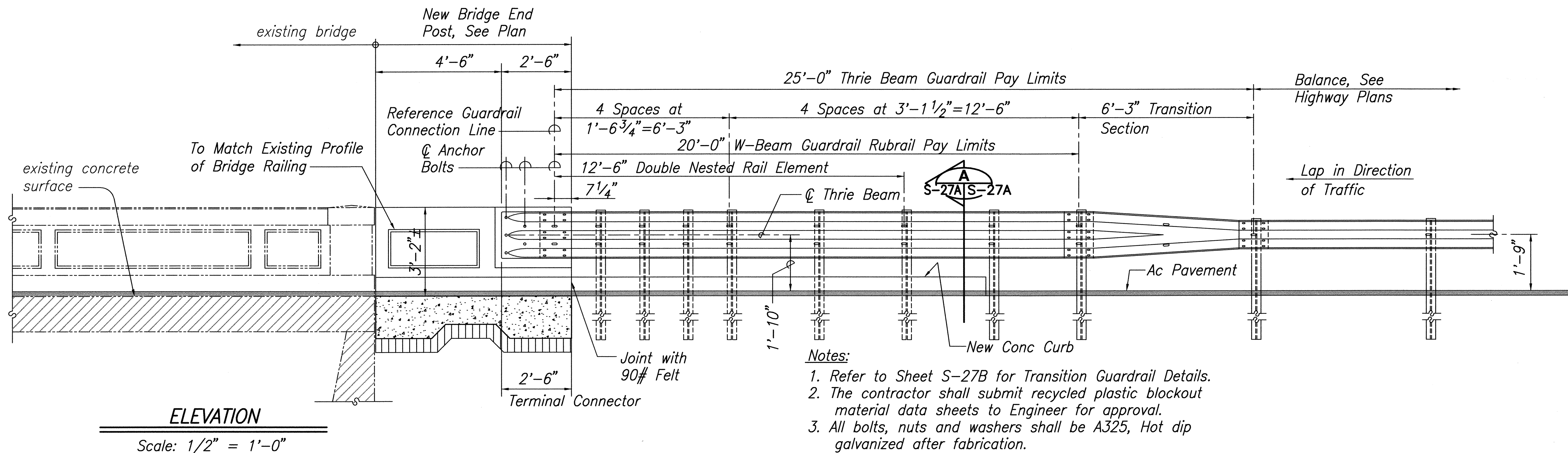
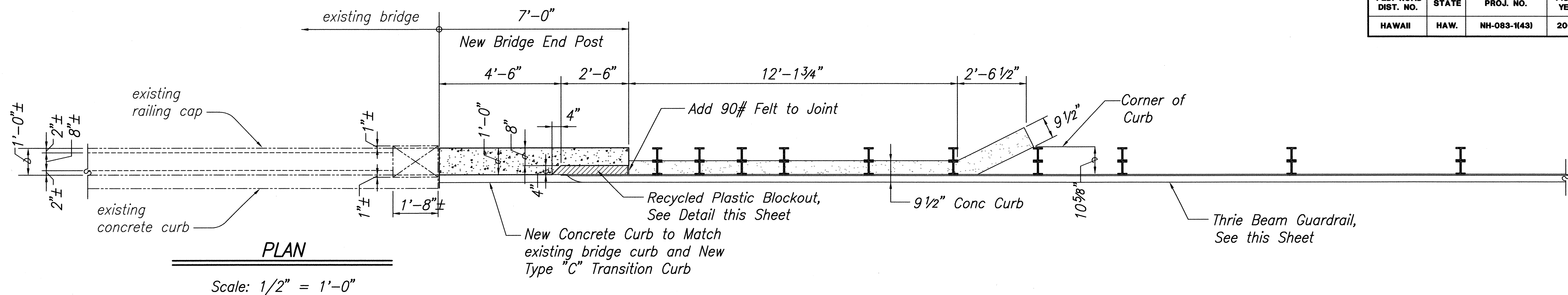
KAMEHAMEHA HIGHWAY RESURFACING  
Waiahole Valley Road to Crouching Lion Inn  
Federal Aid Project No. NH-083-1(43)

Not to Scale Date: August 1, 2000

SHEET No. S-27 OF 27 SHEETS



FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 98 S-1	121



5/7/03	Added Sheet
Date	Revision

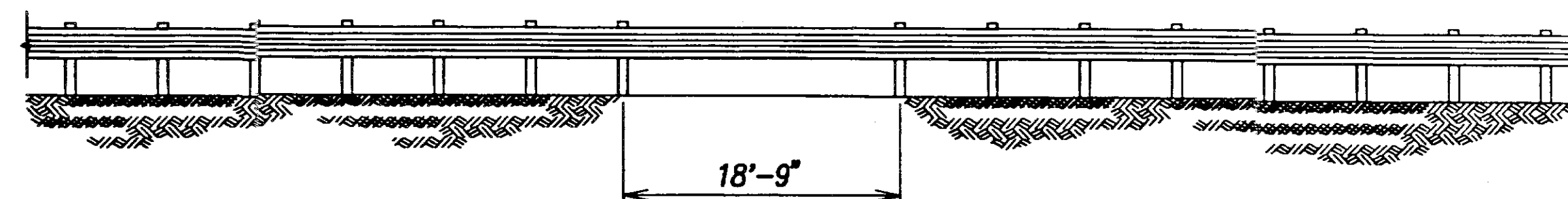
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>TYPE "C" GUARDRAIL TRANSITION AT BRIDGE END POSTS</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43) Scale: As Noted Date: October 29, 2001 SHEET No. S-27A OF 27 SHEETS
--

C.O. 98 S-1

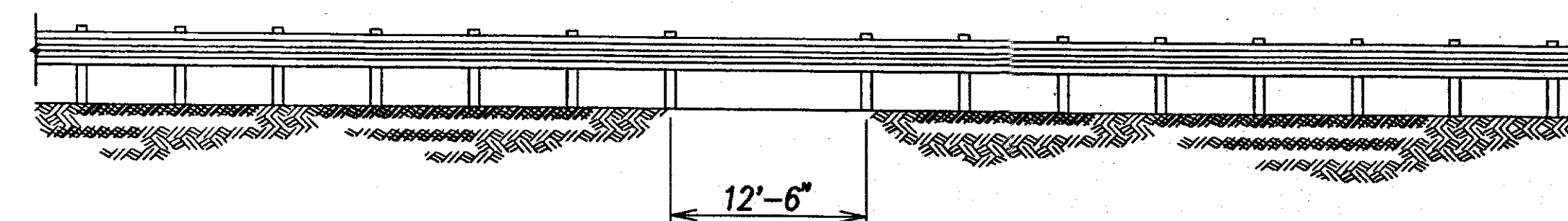




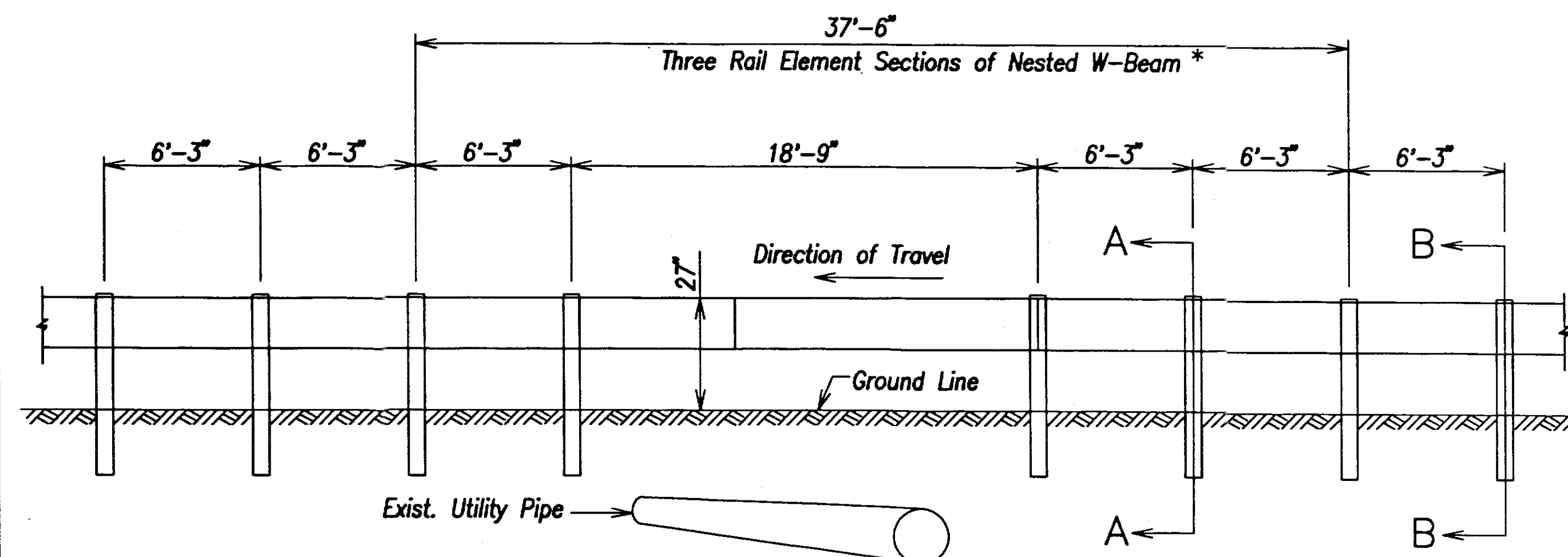
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-083-1(43)	2001	C.O. 98 S-3	118



LONG SPAN OVER UTILITY PIPE

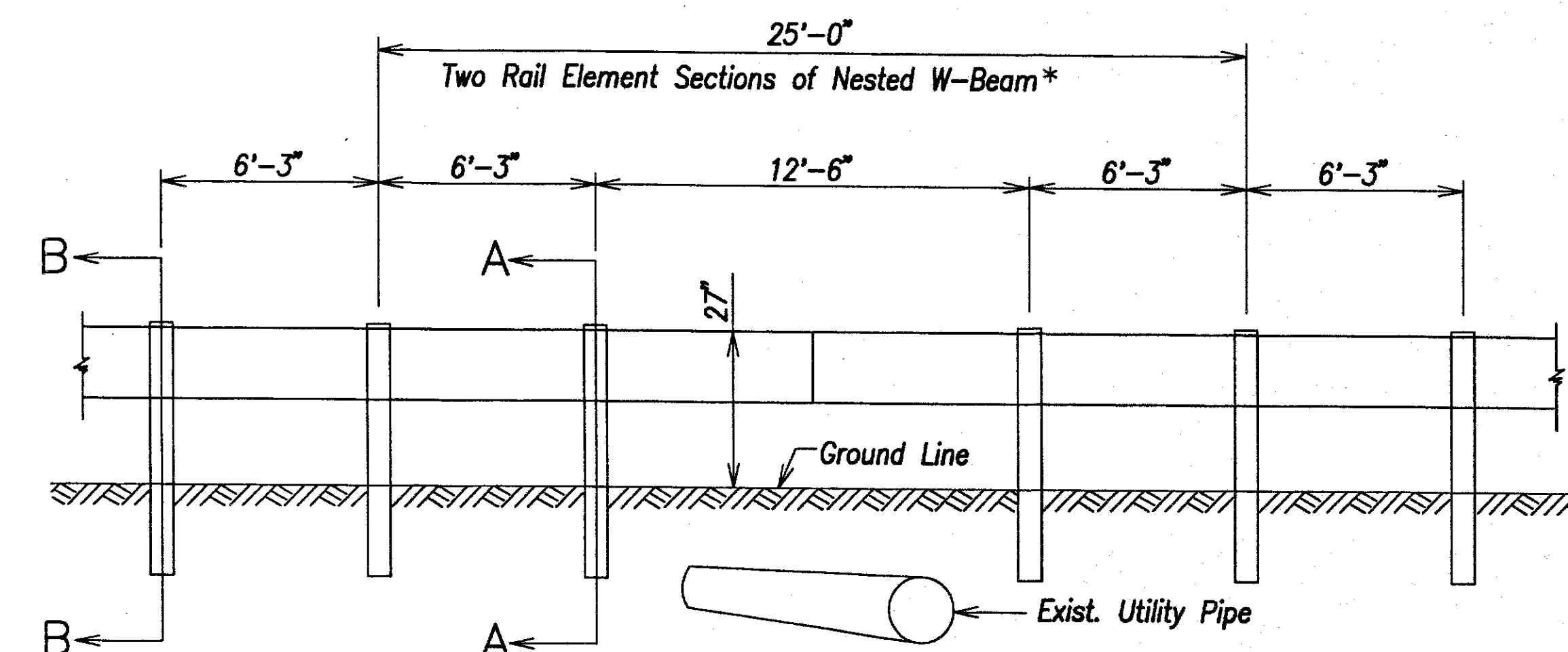


LONG SPAN OVER UTILITY PIPE



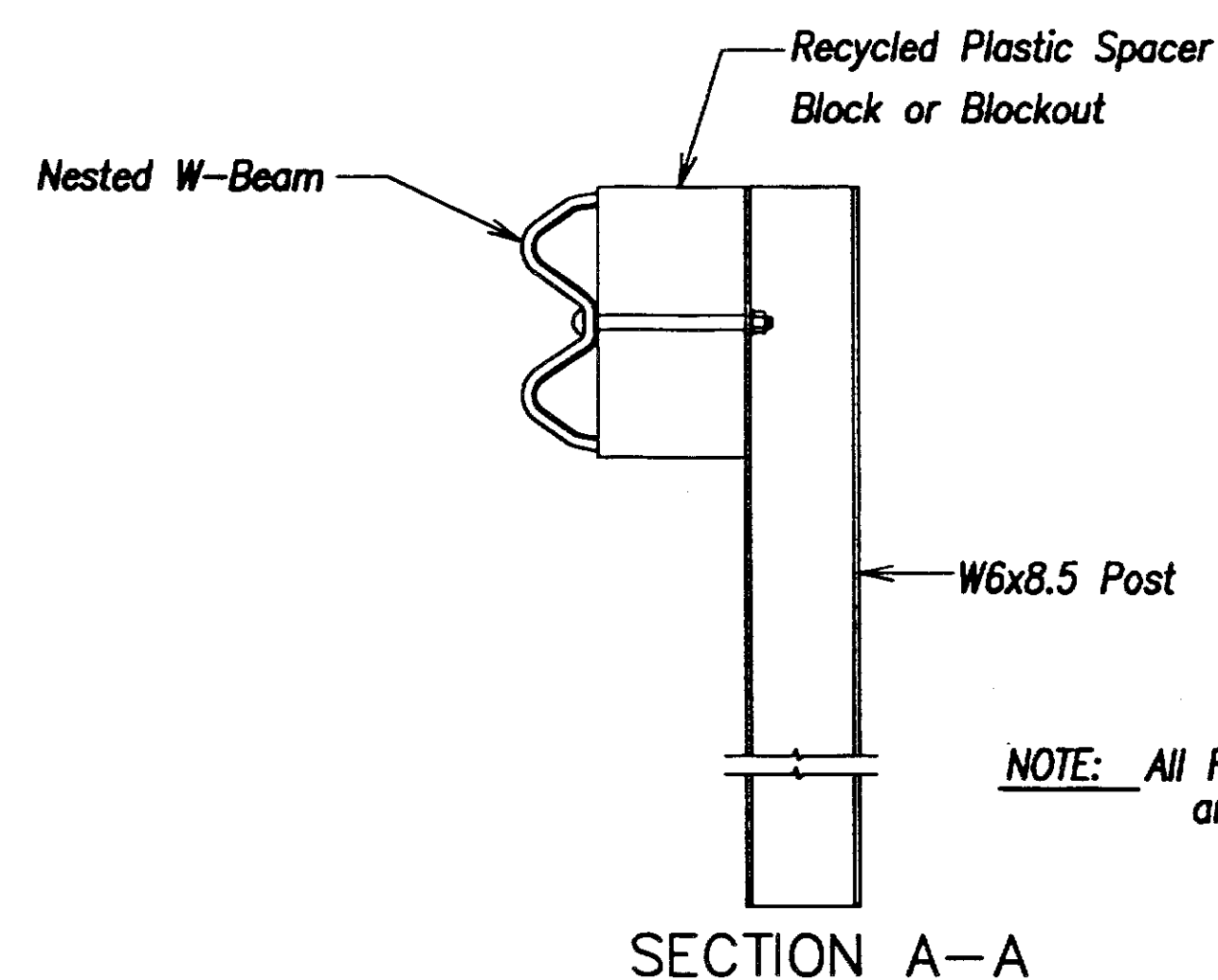
NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL 18'-9" CROSSING  
(MAXIMUM DYNAMIC DEFLECTION OF 3.2 FT.)

\* Note: All nested W-Beam splice points shall be staggered.

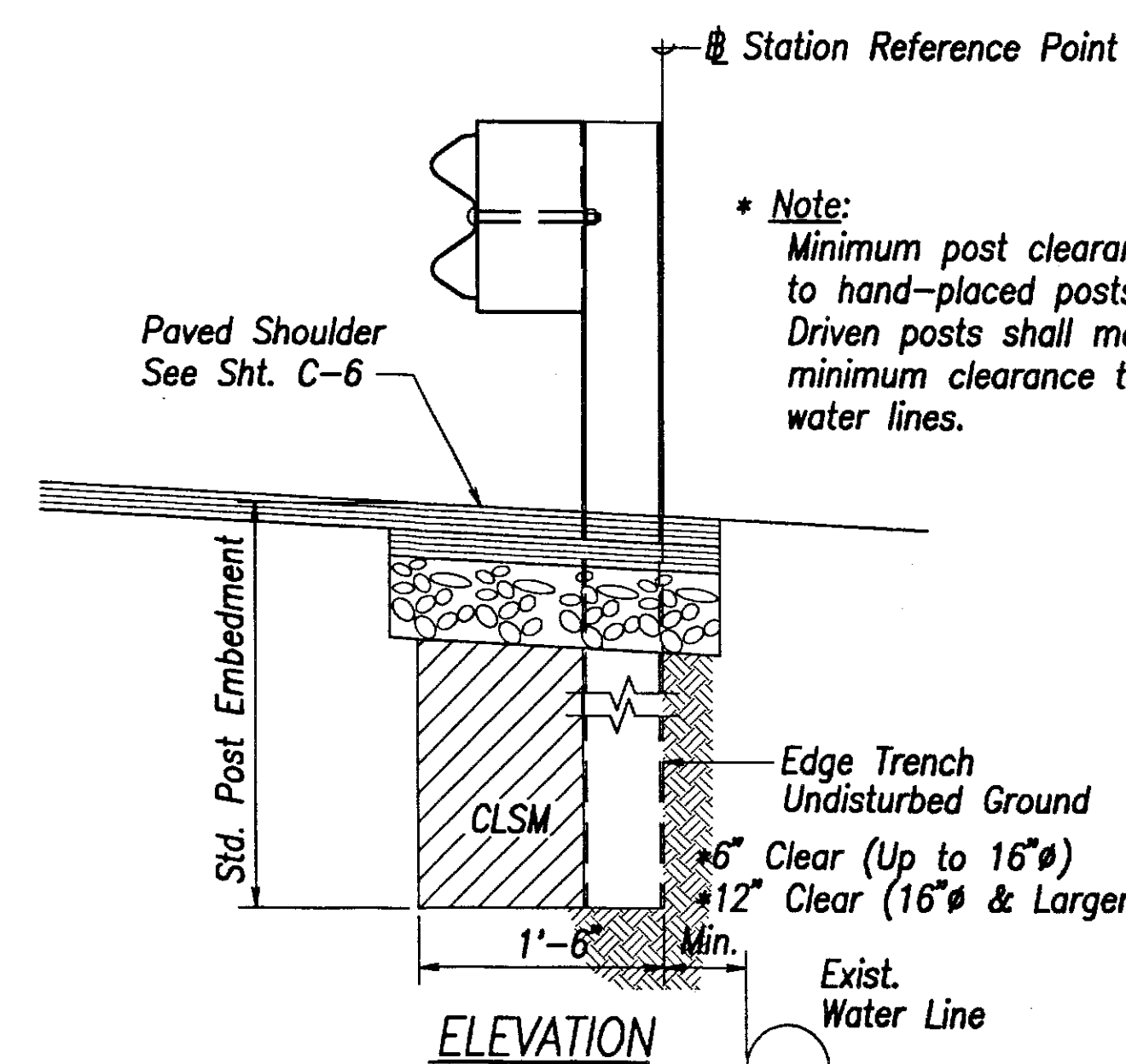
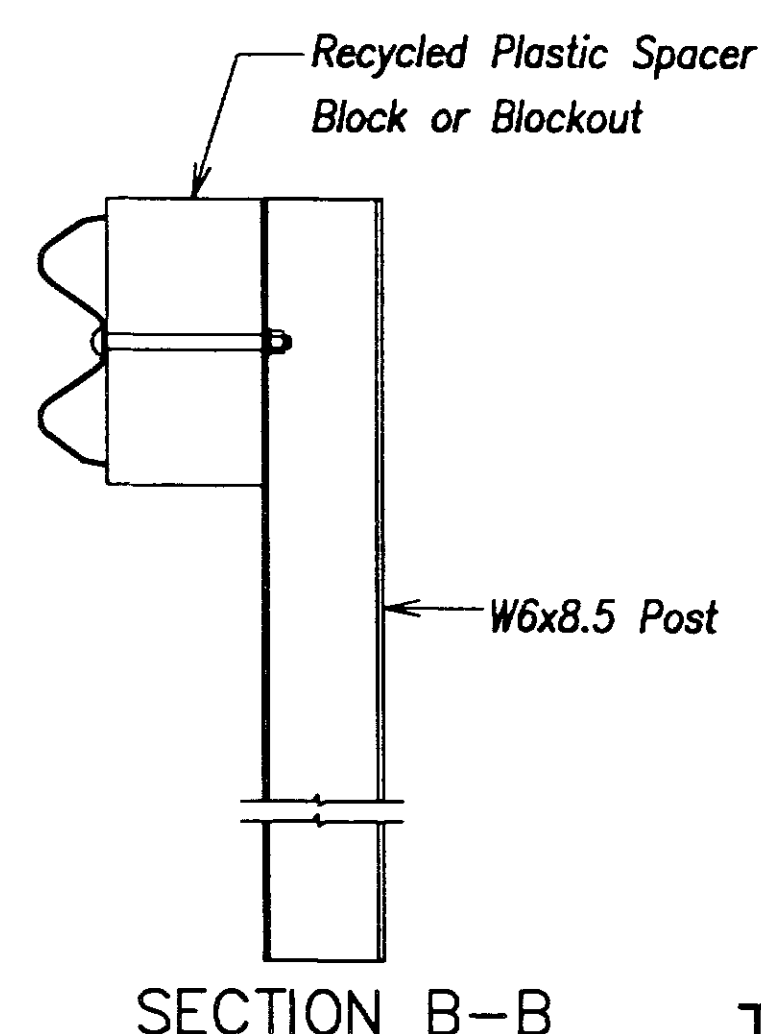


(SPlice IN CENTER OF 12'-6" SPACING)

NESTED LONG SPAN STRONG POST  
W-BEAM GUARDRAIL 12'-6" CROSSING  
(MAXIMUM DYNAMIC DEFLECTION OF 3.1 FT.)



NOTE: All Rail Elements Sections are 12'-6" and All Posts are 6' Long



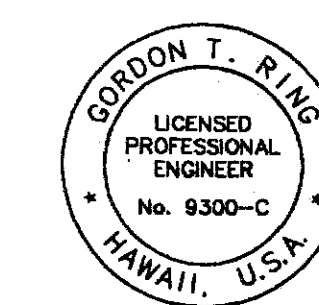
\* Note: Minimum post clearance applies to hand-placed posts only. Driven posts shall maintain 18" minimum clearance to existing water lines.

APPROVED:

*Dominic K. Ota*  
Chief, Capital Projects Division, BWS

Date

7/1/09	Added New Sheet
DATE	REVISION
STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION <b>GUARDRAIL DETAILS - 2</b> KAMEHAMEHA HIGHWAY RESURFACING Waiahole Valley Road to Crouching Lion Inn Federal Aid Project No. NH-083-1(43)	
Scale: None	Date: August 1, 2000
SHEET No. S-28 OF 27 SHEETS	



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SIGNATURE DATE 4/30/00 LIC. EXP. DATE

C O 98 S-3