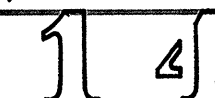


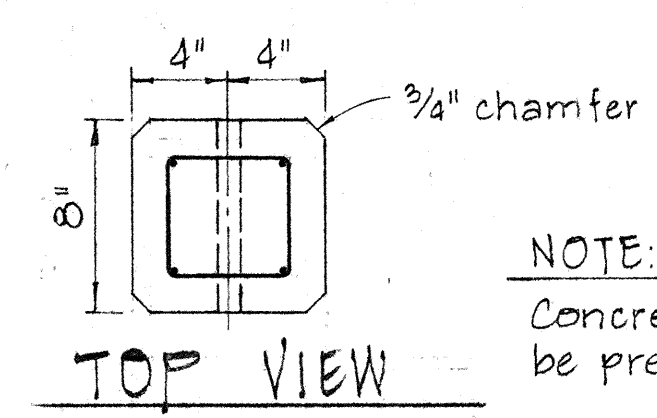
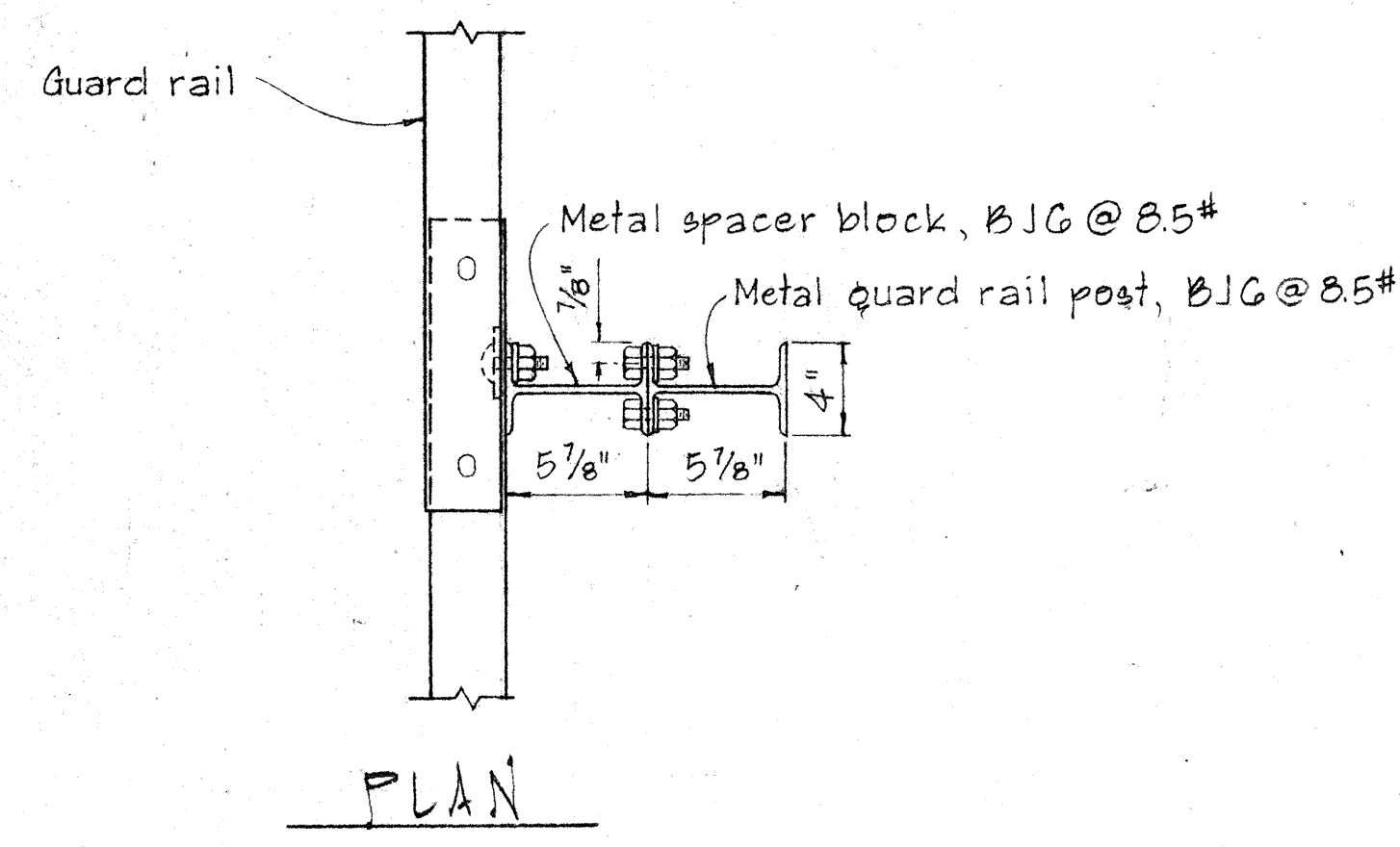
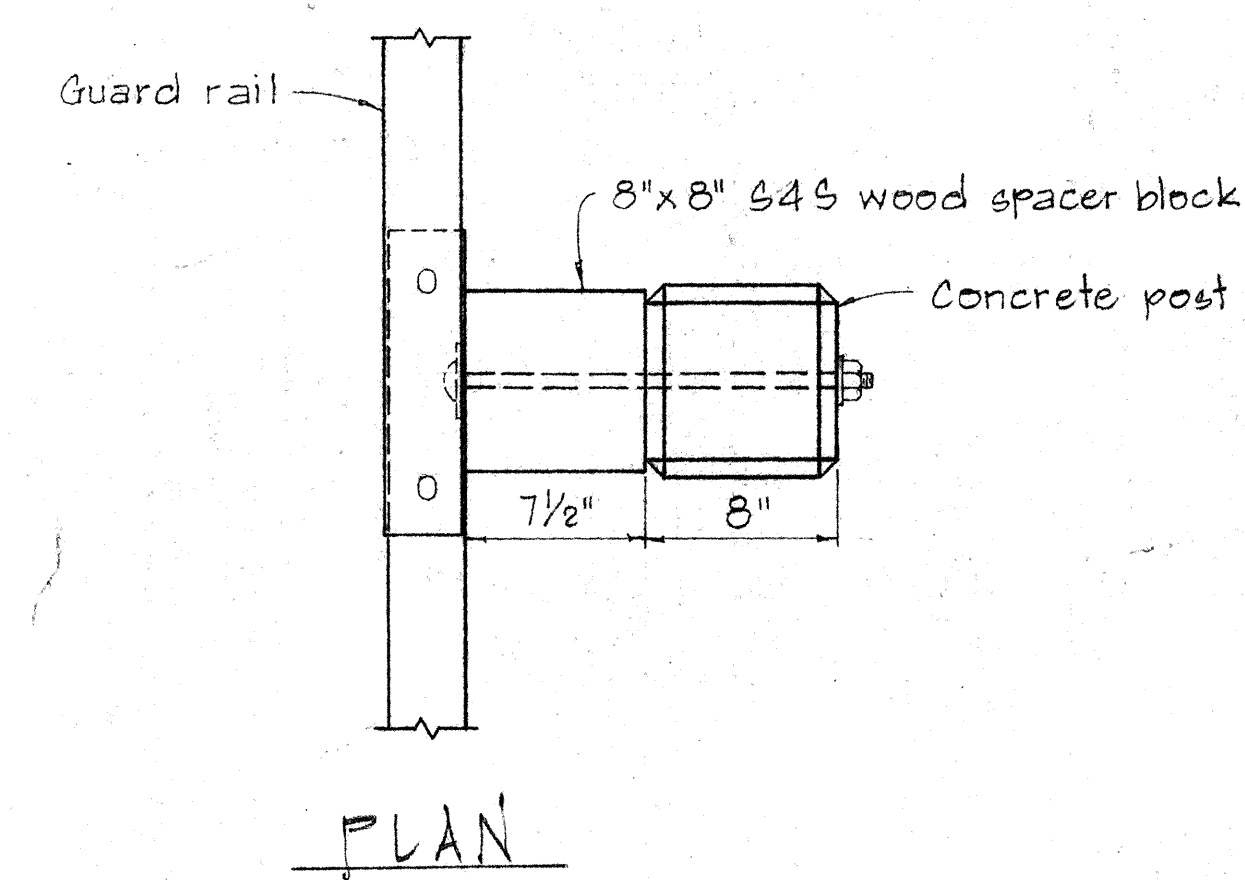
|                  |                        |           |
|------------------|------------------------|-----------|
| ORIGINAL<br>PLAN | SURVEY PLOTTED BY..... | DATE..... |
| NOTE BOOK        | DRAWN BY.....          | ".....    |
|                  | TRACED BY.....         | ".....    |
|                  | DESIGNED BY.....       | ".....    |
|                  | QUANTITIES BY.....     | ".....    |
| No. ....         | CHECKED BY.....        | ".....    |



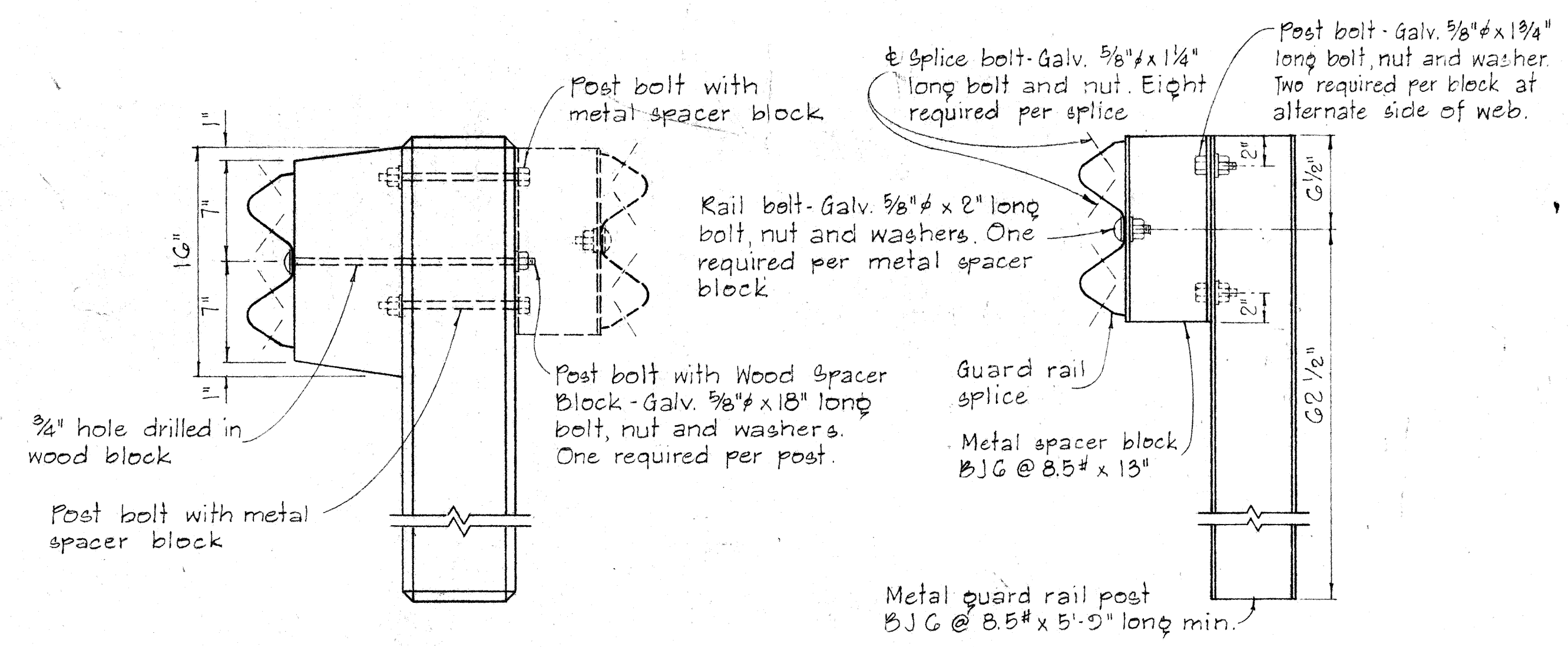
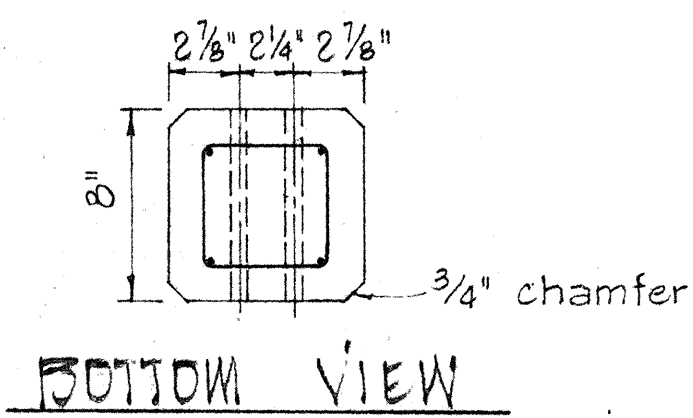
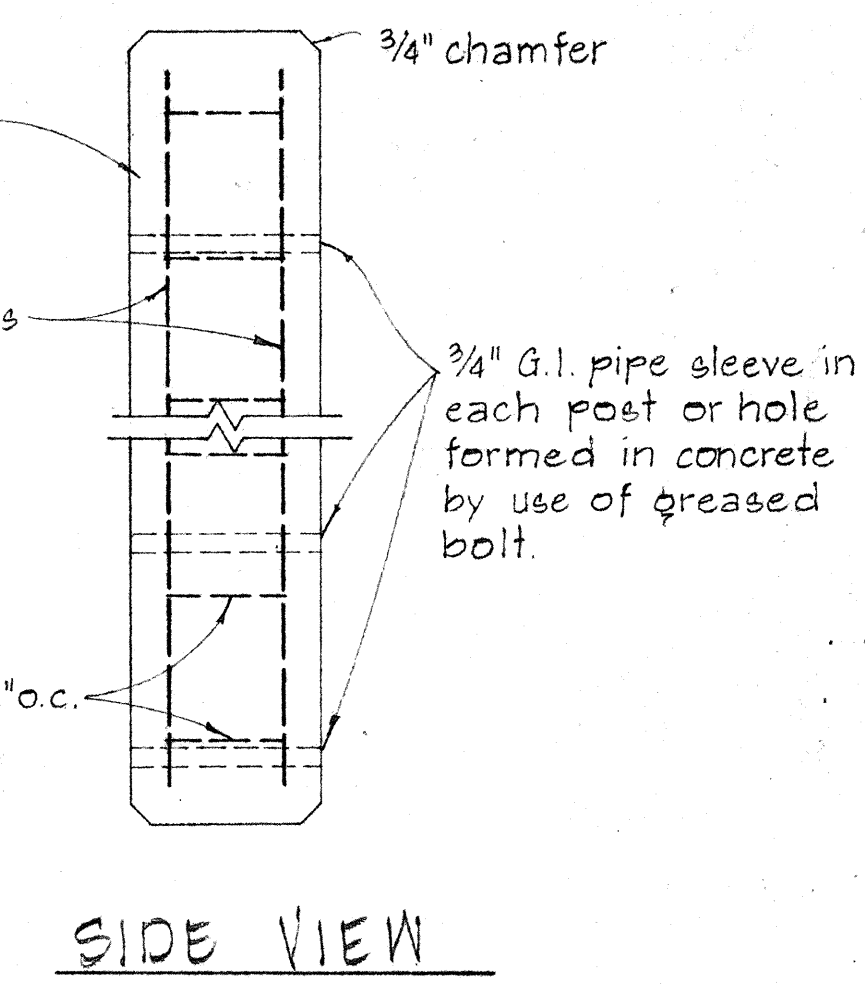
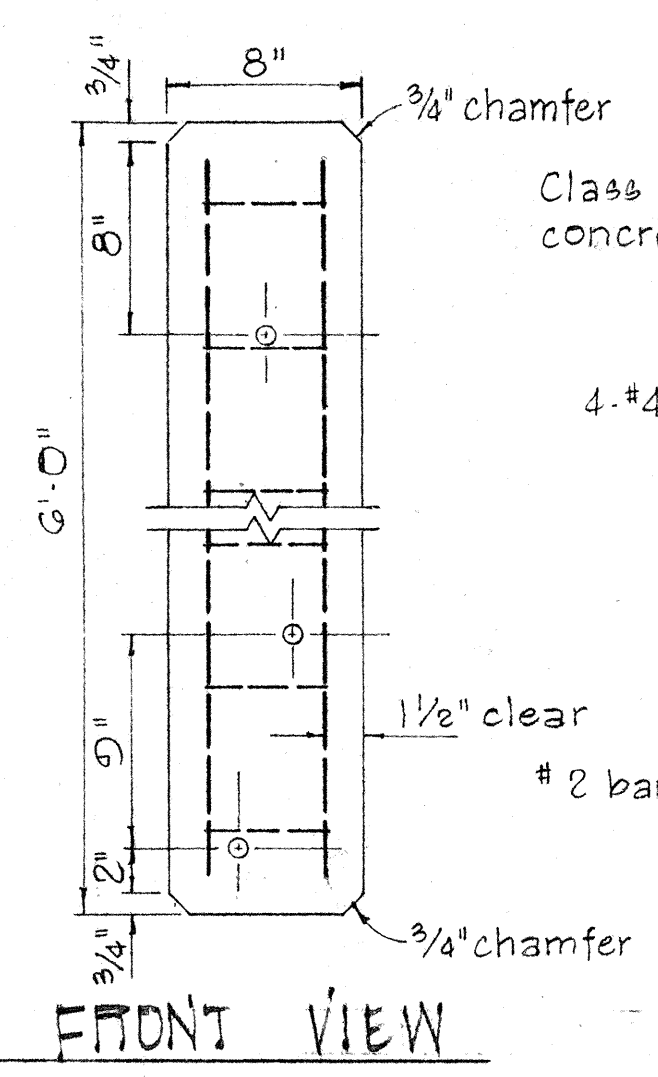


| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-063-1(3)<br>F-083-1(2) | 1969        | 15        | 22           |

REVISED: 12-11-68  
REVISED: 2-26-69

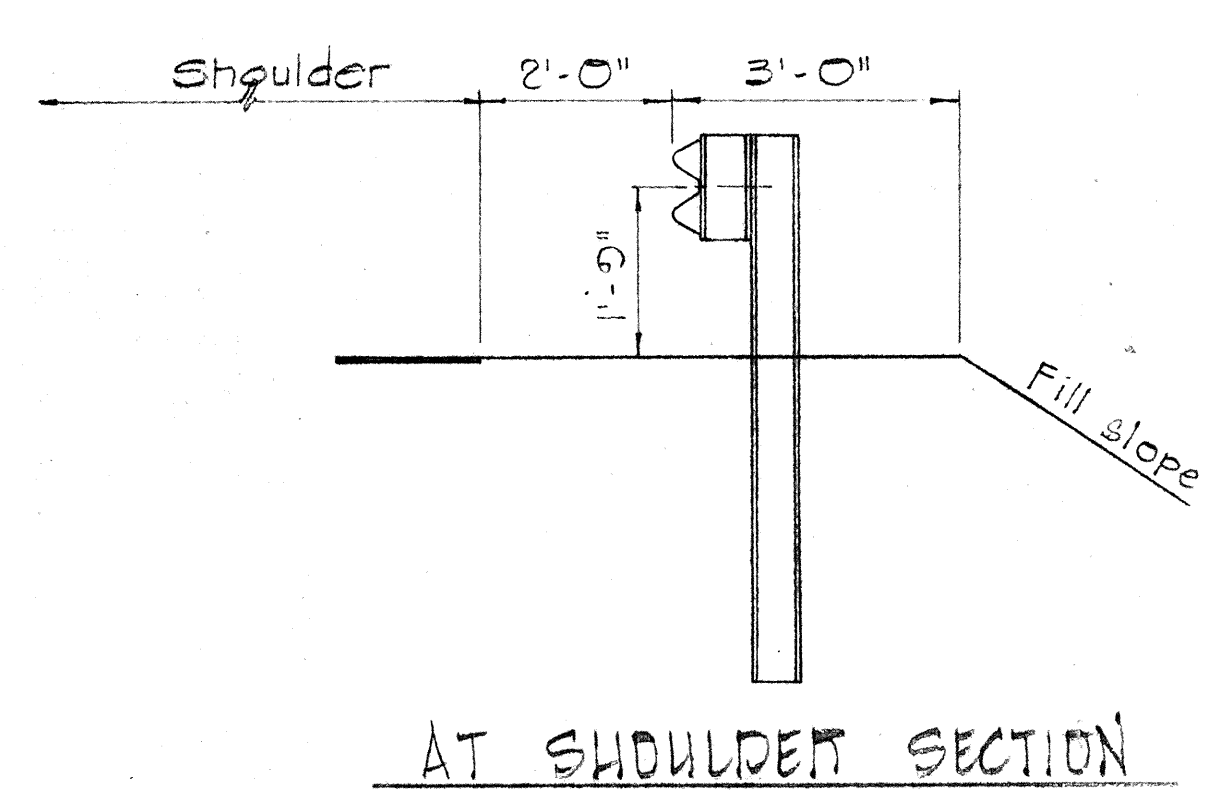
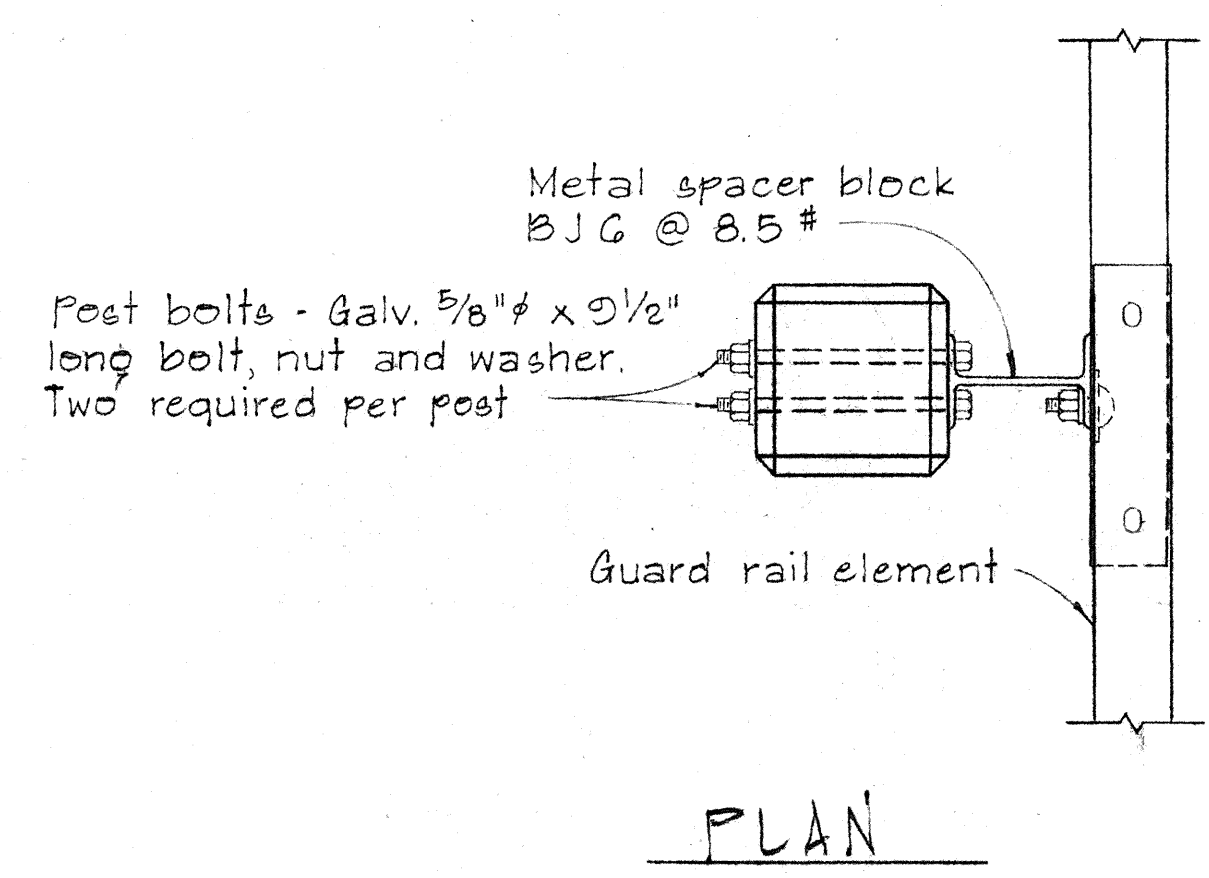


NOTE:  
Concrete post shall be precast



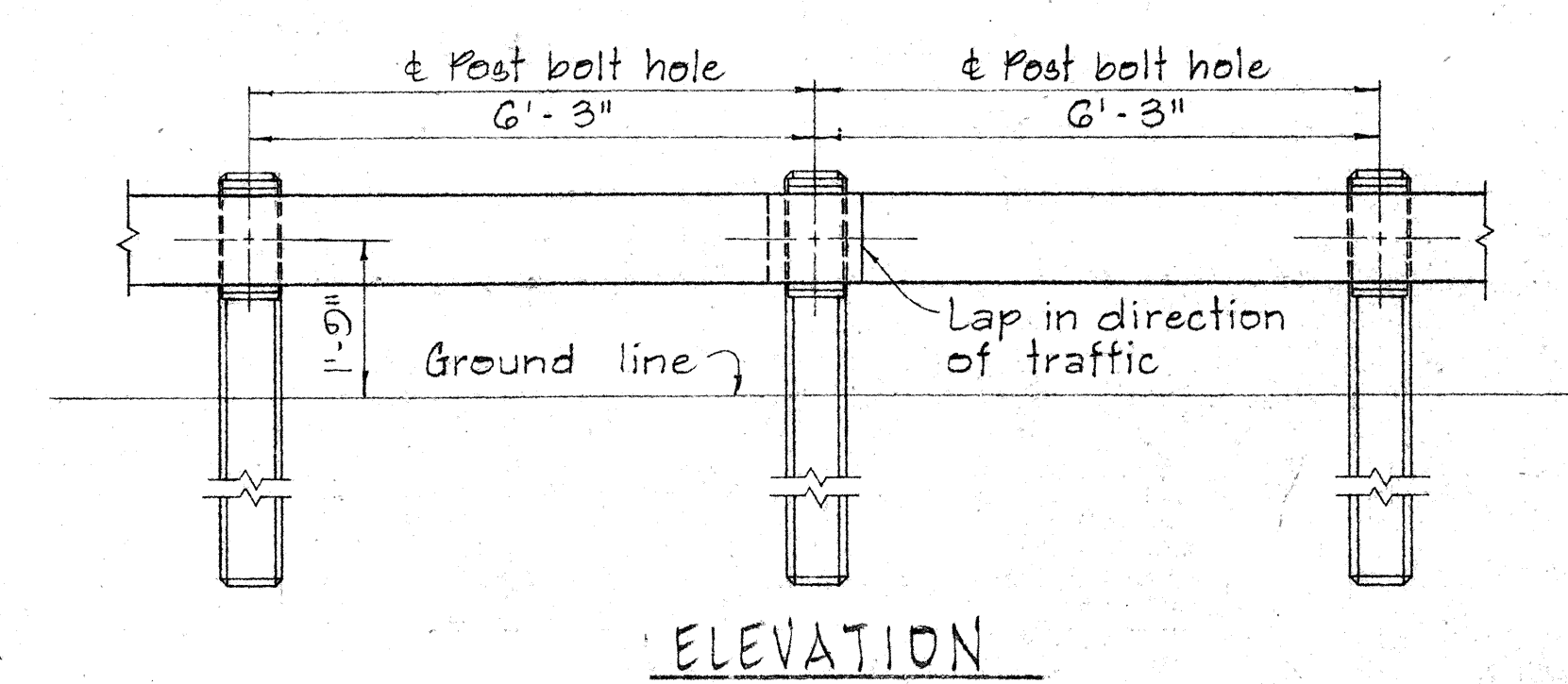
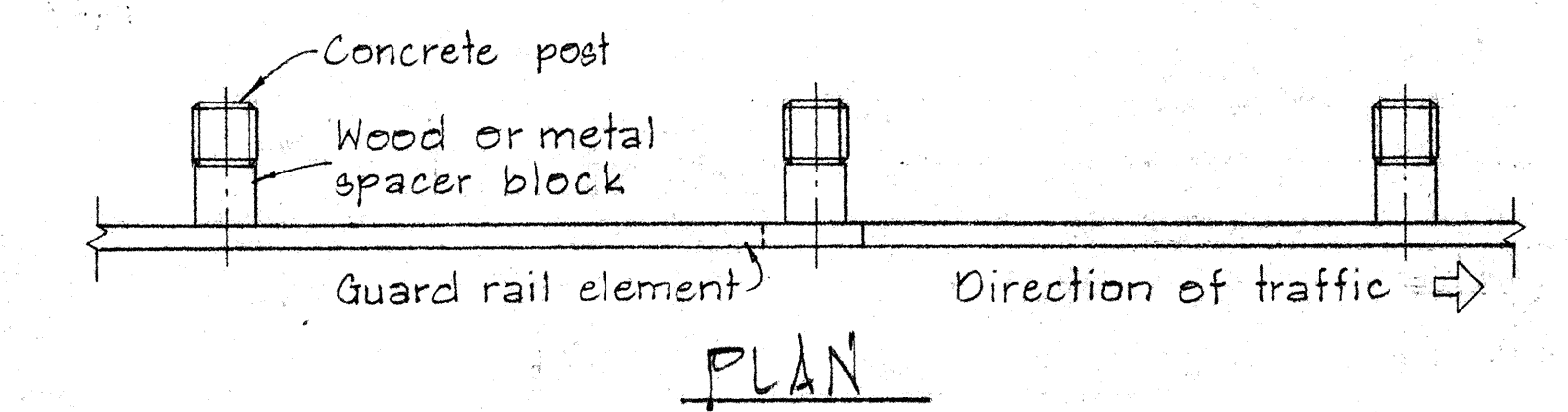
SINGLE METAL GUARD RAIL ON METAL POST WITH METAL SPACER BLOCK  
SCALE: 1 1/2" = 1'-0"

DETAIL OF CONCRETE POST  
SCALE: 1 1/2" = 1'-0"

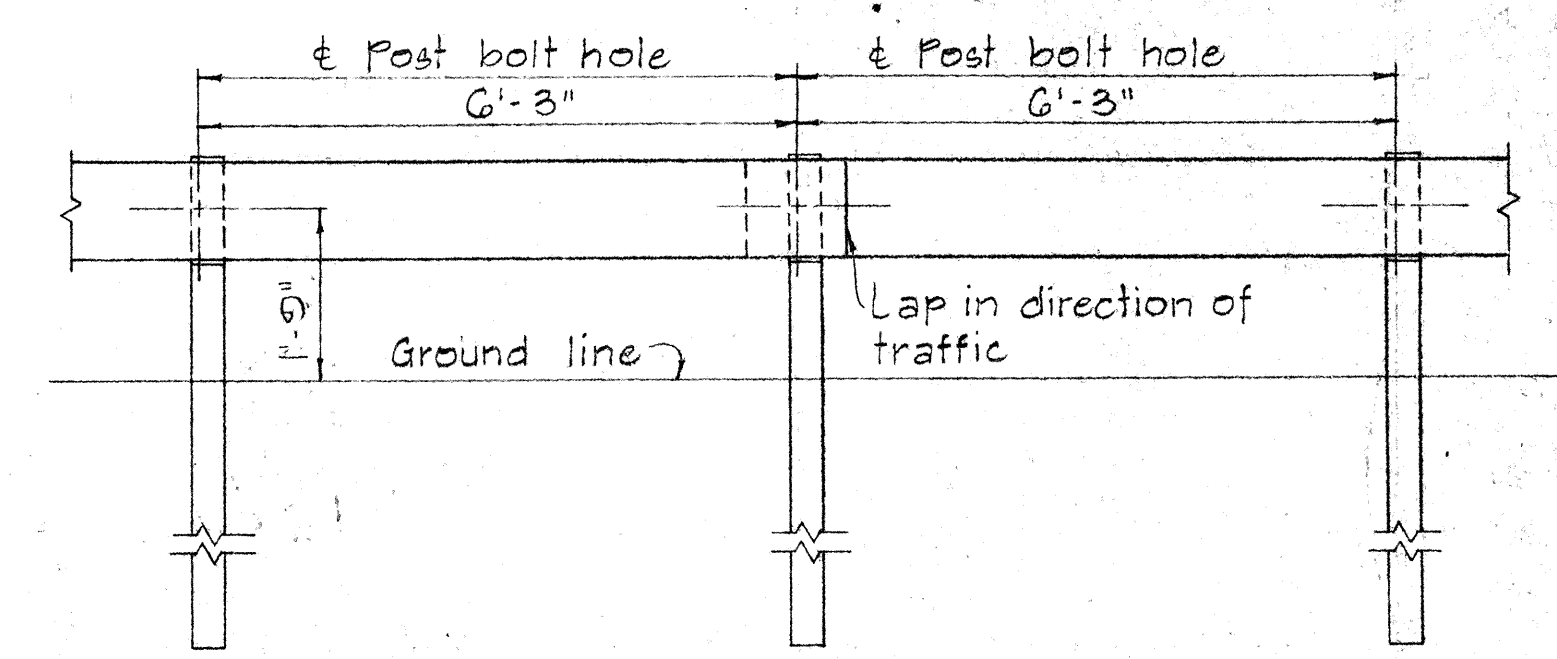
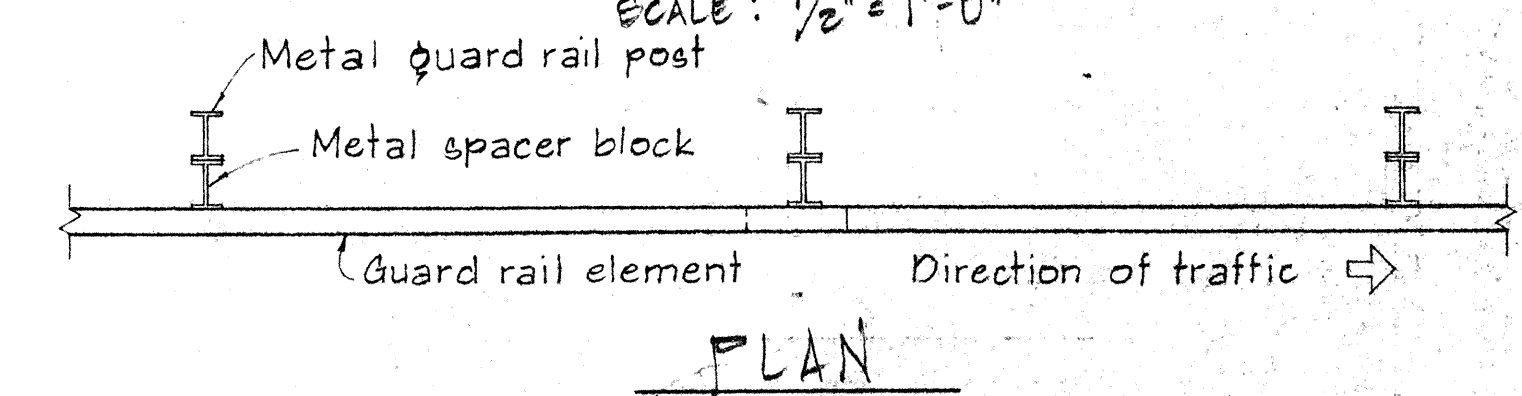


SINGLE METAL GUARD RAIL ON PRECAST CONCRETE POST WITH WOOD OR METAL SPACER BLOCK  
SCALE: 1 1/2" = 1'-0"

TYPICAL METAL GUARD RAIL DETAIL  
SCALE: 1/2" = 1'-0"



METAL GUARD RAIL ON CONCRETE POST WITH WOOD OR METAL SPACER BLOCK  
SCALE: 1/2" = 1'-0"



METAL GUARD RAIL ON METAL POST WITH METAL SPACER BLOCK  
SCALE: 1/2" = 1'-0"

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

STANDARD DETAILS  
METAL GUARD RAIL

SCALE: AS SHOWN NOV. 1968

SHEET No. 2 OF 9 SHEETS PT 500

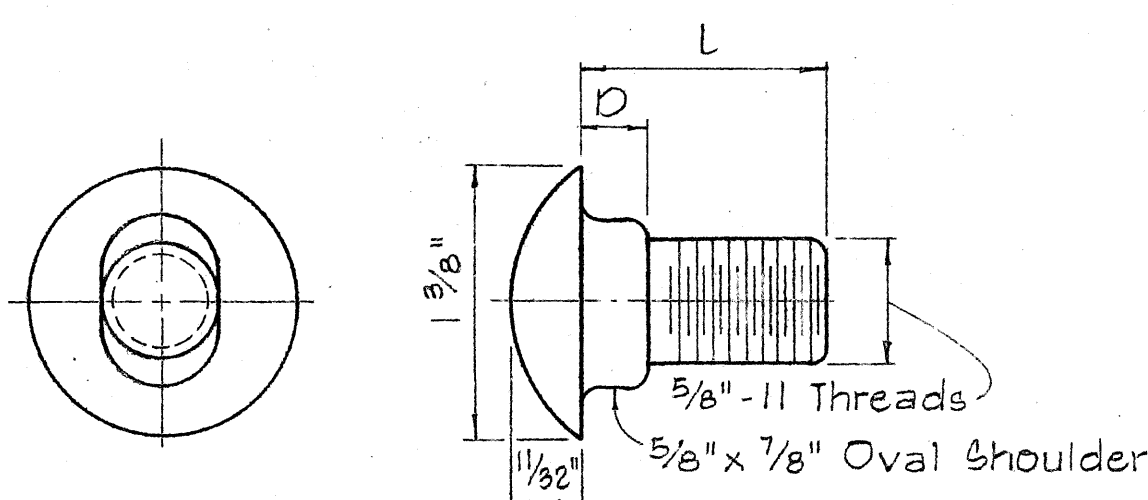


| BOLT DIMENSIONS                                |       |        |
|------------------------------------------------|-------|--------|
| TYPE A BOLT                                    |       |        |
|                                                | D     | L      |
| Splice Bolt                                    | 5/16" | 1 1/4" |
| Post Bolt for Conc. Post w/ Double Wood Blocks | 3/32" | 24"    |
| Post Bolt for Conc. Post w/ Single Wood Block  | 3/32" | 18"    |
| Rail Bolt for Metal Block                      | 3/32" | 2"     |

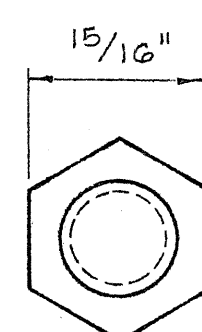
| BOLT DIMENSIONS                          |       |        |
|------------------------------------------|-------|--------|
| TYPE B BOLT                              |       |        |
|                                          | D     | L      |
| Post Bolt for Conc. Post w/ Metal Blocks | 5/16" | 2 1/2" |
| Post Bolt for Metal Post w/ Metal Block  | 5/16" | 1 3/4" |

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-063-1(3)<br>F-083-1(9) | 1969        | 16        | 22           |

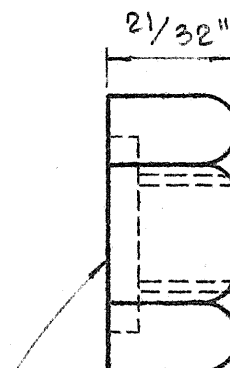
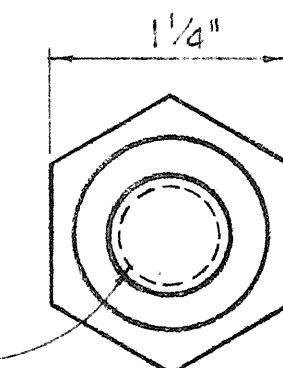
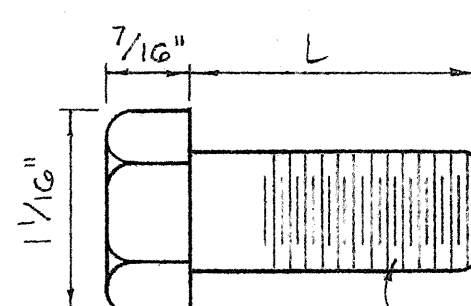
Revised: Dec. 11, 1968



TYPE A BOLT



TYPE B BOLT



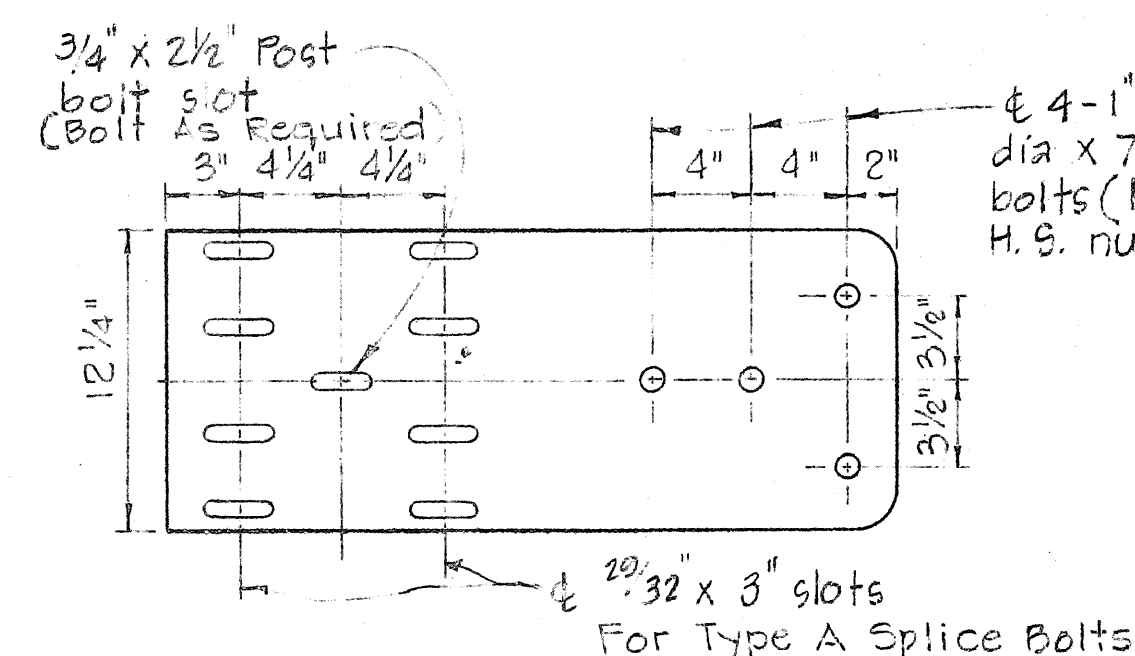
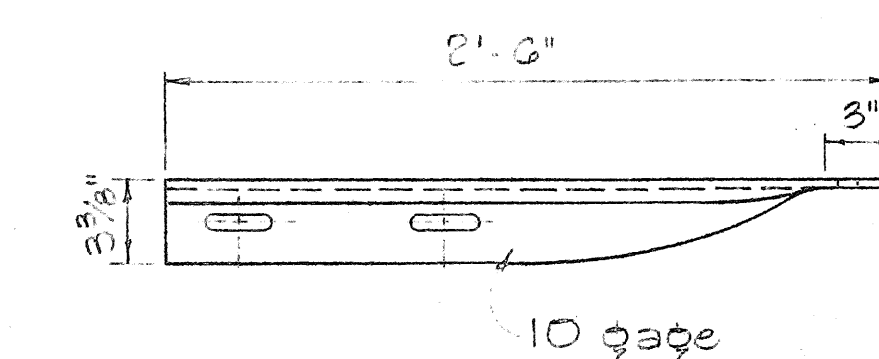
5/32" Deep x 15/16" Dia. C' Bore for Type A Bolt only. Plain nut for Type B Bolt.

## SPICE RAIL AND POST BOLTS

Scale: Full Size

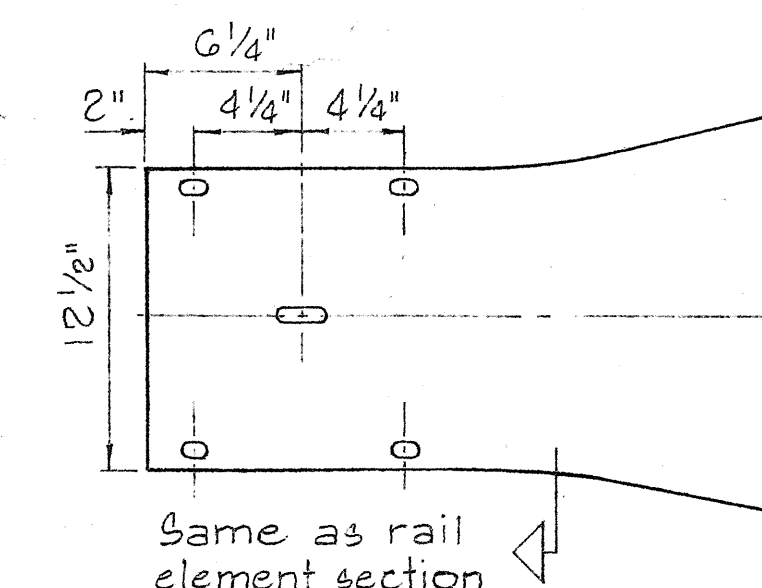
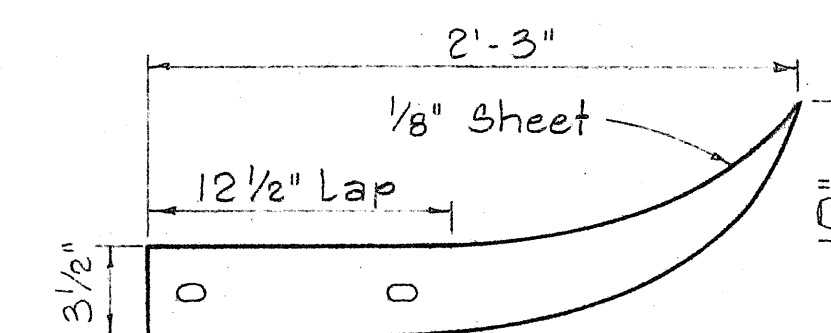
## HEXAGON NUT

Scale: Full Size



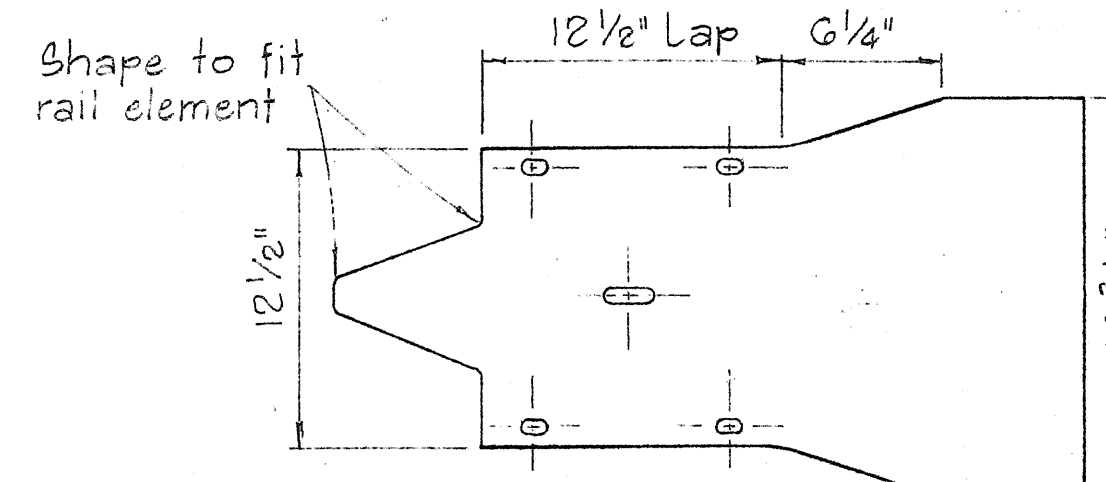
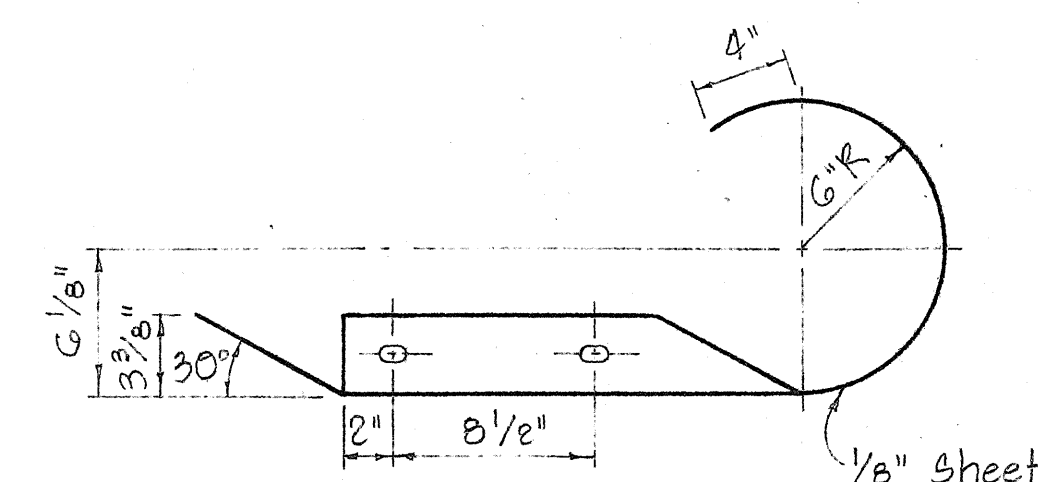
## SPECIAL END SHOE

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



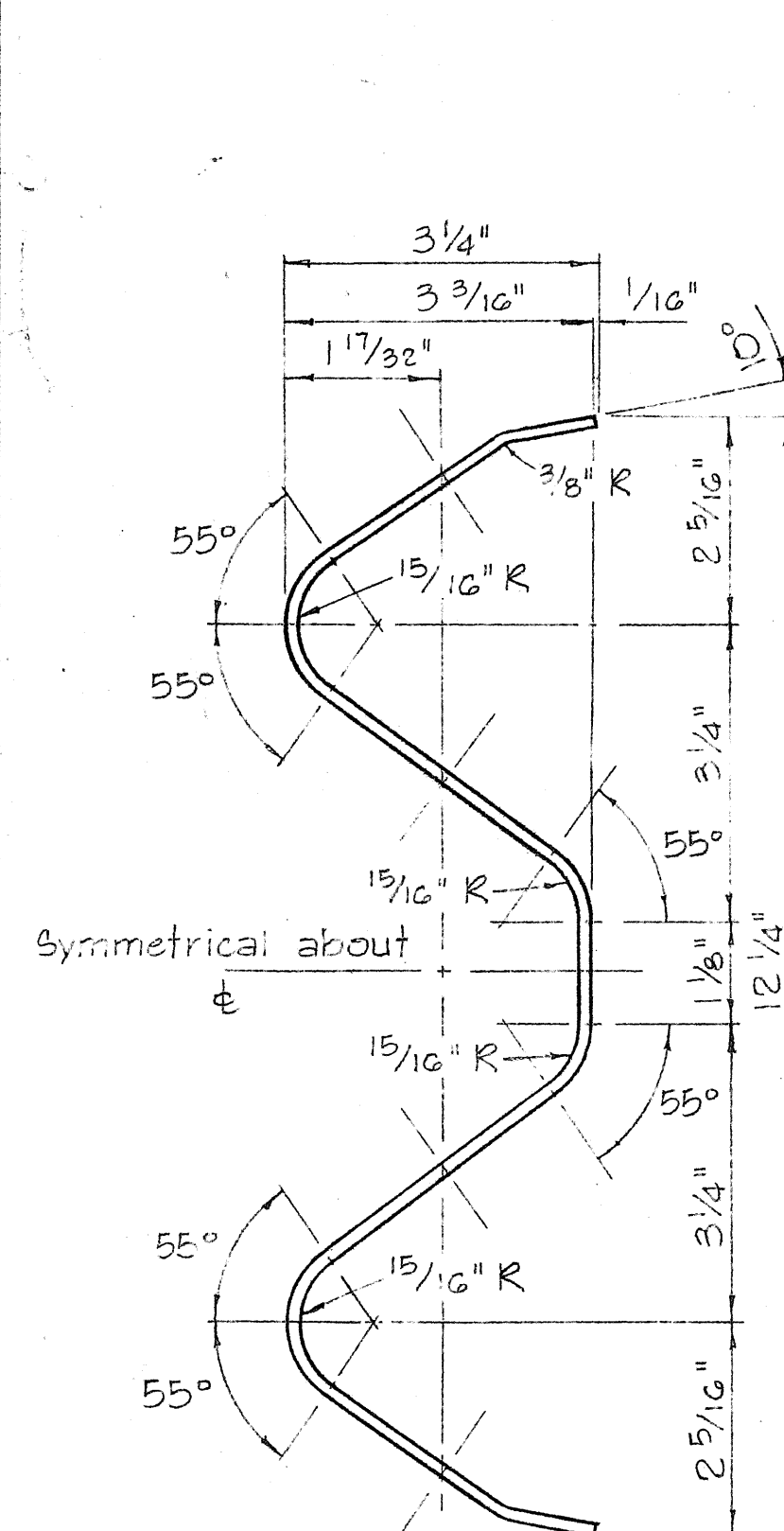
## FLARED END

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



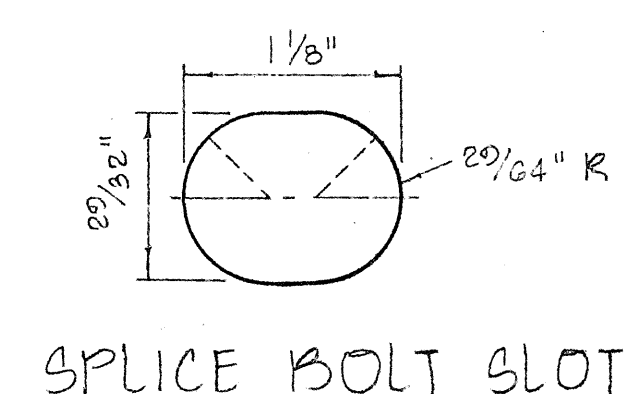
## CURVED END

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



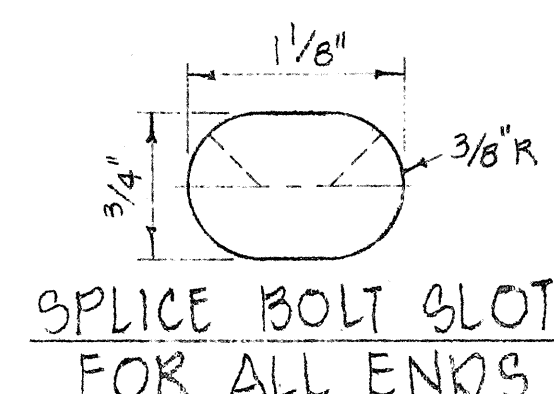
## RAIL ELEMENT SECTION

Scale: 6" = 1'-0"

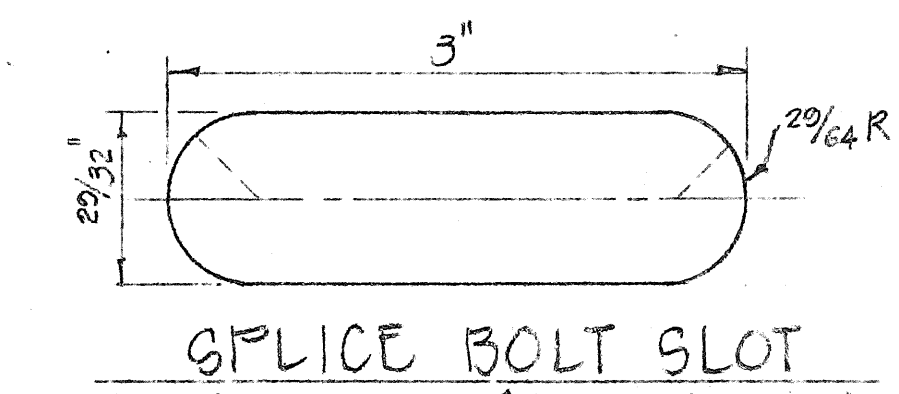


## SPICE BOLT SLOT

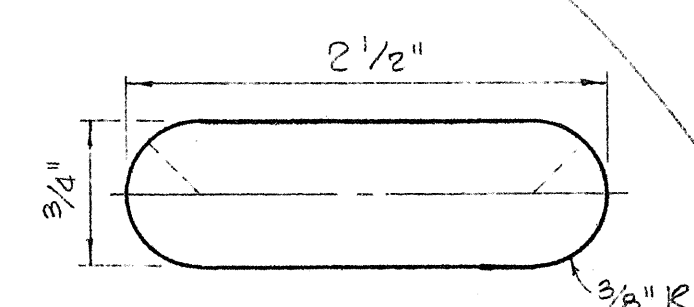
Scale: Full Size



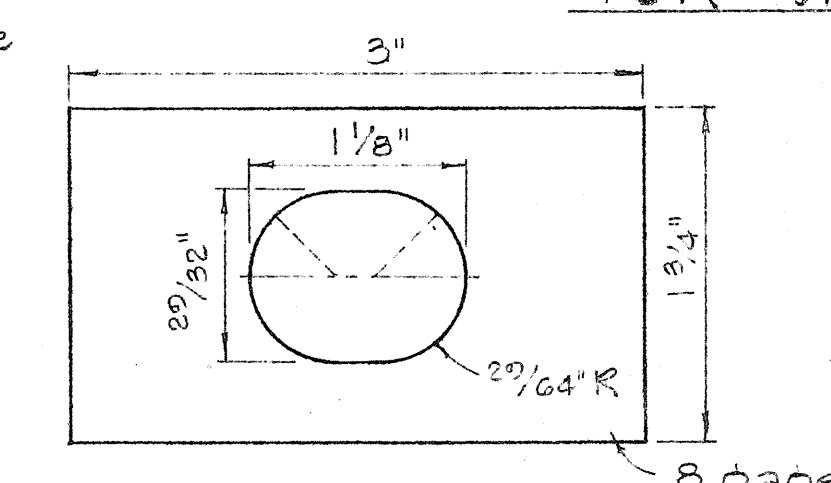
## SPICE BOLT SLOT FOR ALL ENDS



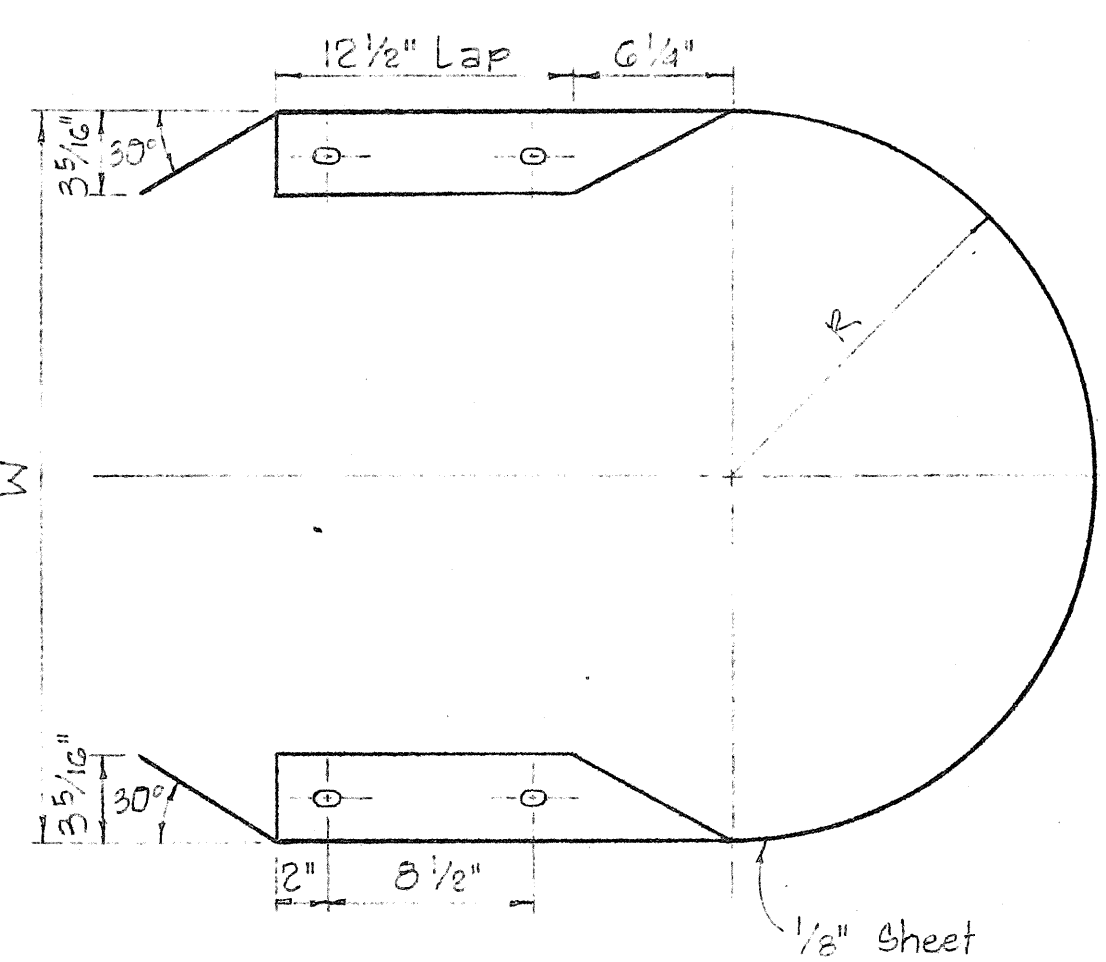
## SPICE BOLT SLOT FOR SPECIAL END SHOE



## POST BOLT SLOT

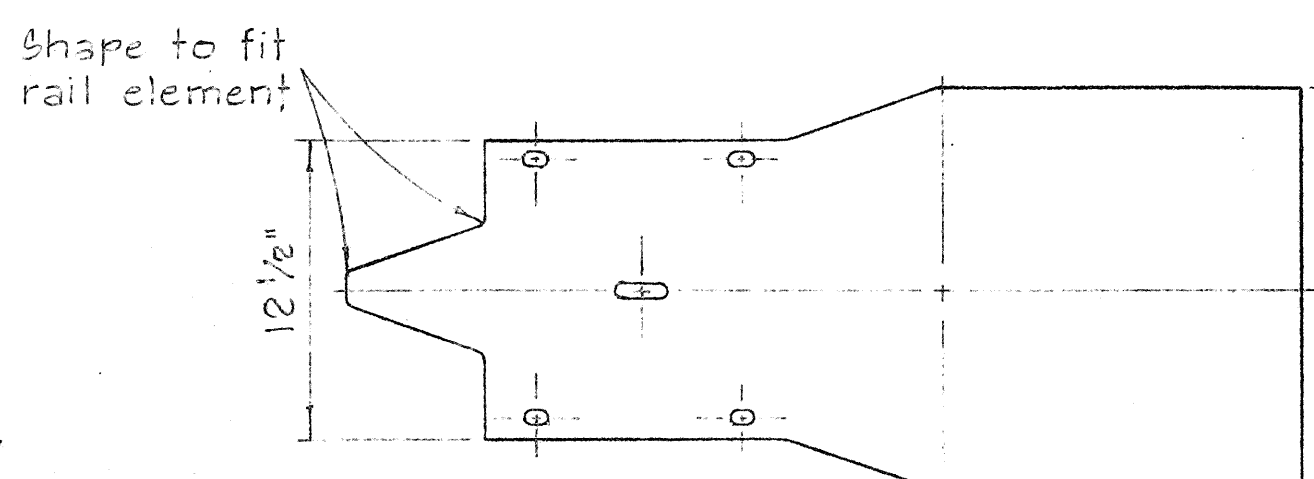


## RAIL WASHER

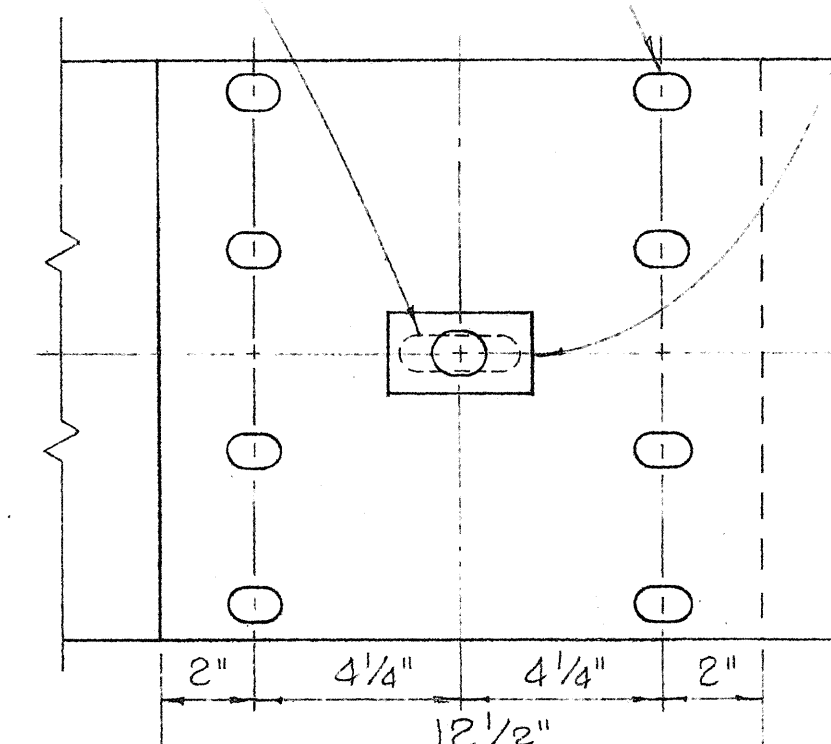


## MEDIAN END

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



| MEDIAN END DIMENSIONS                                            |         |          |
|------------------------------------------------------------------|---------|----------|
| TYPE OF POST AND BLOCK                                           | W       | R        |
| Double Metal Guard Rail on Concrete Post with Wood Blocks        | 20 3/4" | 14 1/8"  |
| Double Metal Guard Rail on Concrete Post with Metal Blocks (BJG) | 26 1/2" | 13 1/4"  |
| Double Metal Guard Rail on Metal Post with Metal Blocks (BJG)    | 24 3/8" | 12 3/16" |



## RAIL SPICE

Scale: 3" = 1'-0"

- NOTES:
1. H.S. Bolts shall conform to the requirements of ASTM A-325.
  2. Special End Shoe shall be fabricated from 10 Gage steel conforming to the requirements of AASHO 180.

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

STANDARD DETAILS  
METAL GUARD RAIL

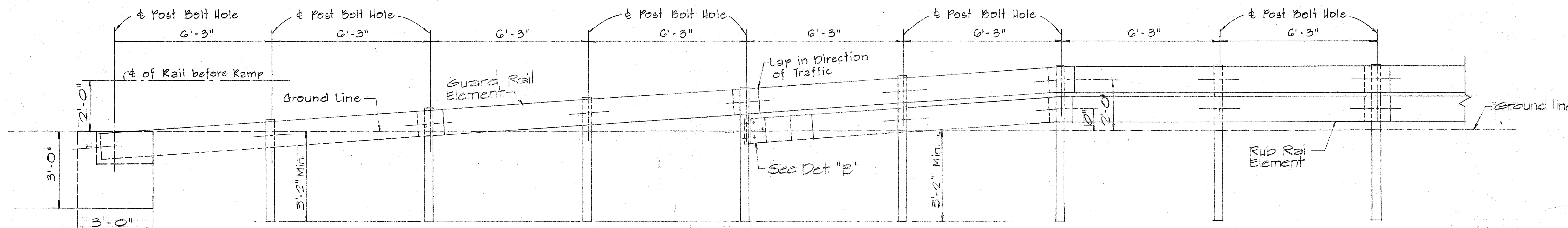
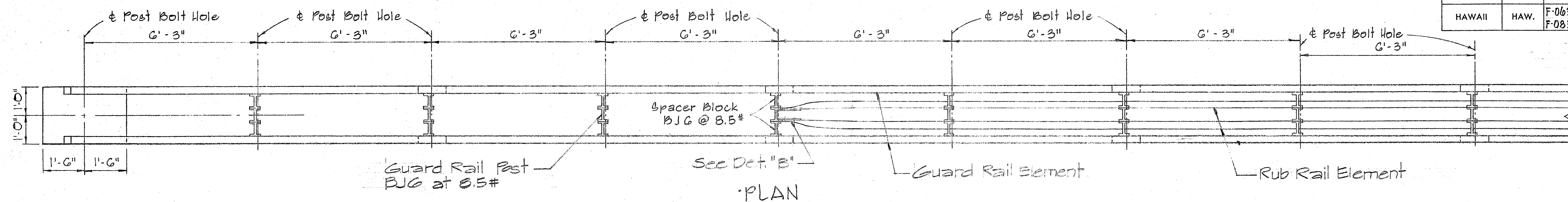
Scale: As Noted August, 1968

SHEET No. 3 OF 9 SHEETS DT 501



| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-063-1(3)<br>F-063-1(9) | 1969        | 17        | 22           |

REVISED: 12-11-68  
REVISED: 2-24-69

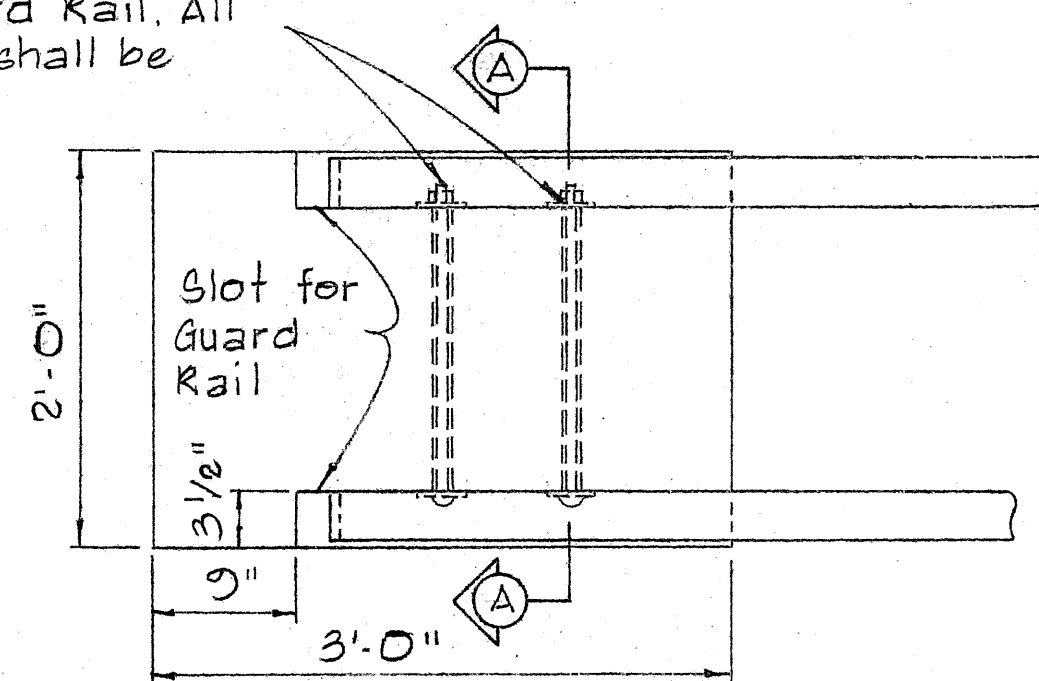


### ELEVATION

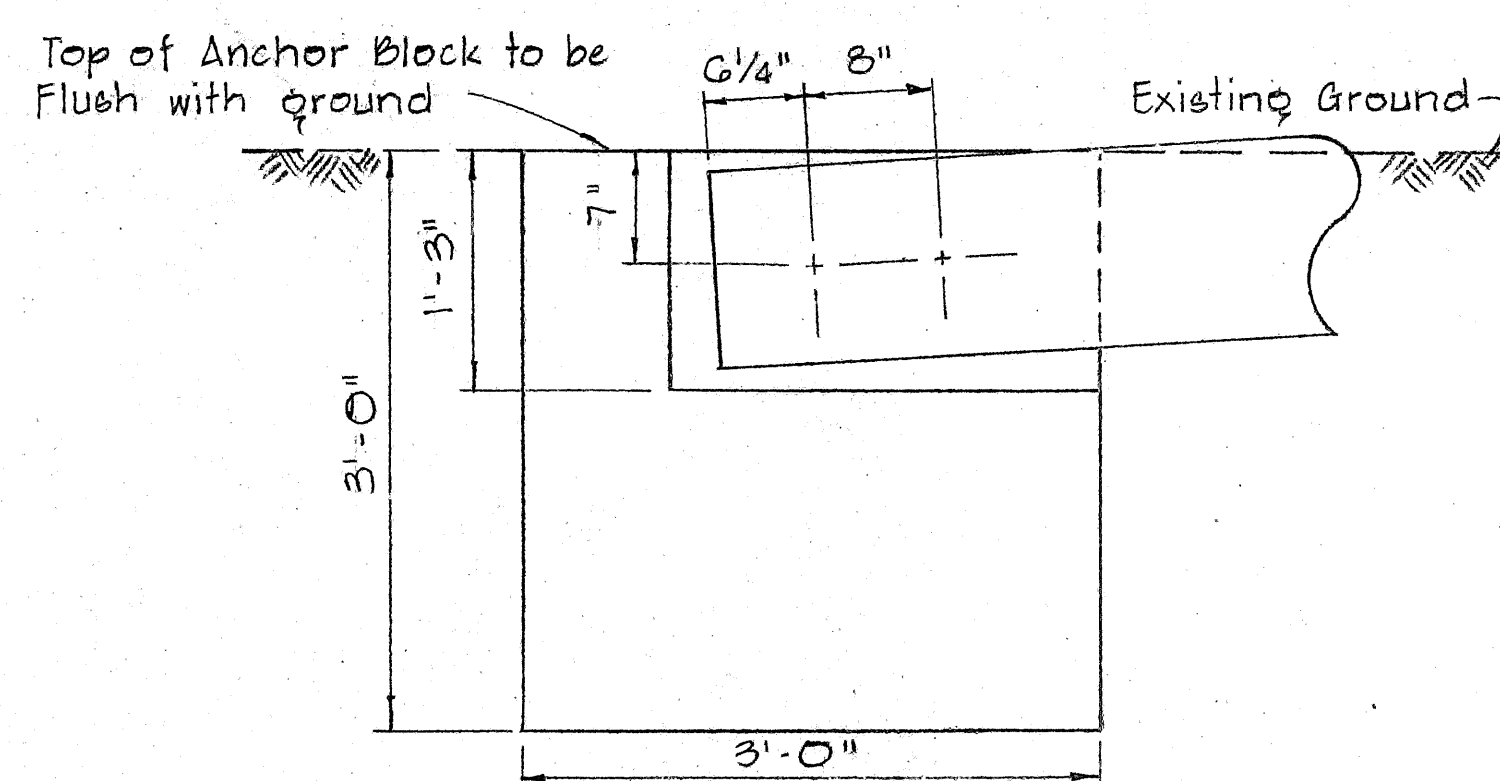
## STRAIGHT APPROACH - RAMP END ANCHORAGE (MEDIAN)

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

5/8" Bolts with 3/4" G.I. Pipe Sleeve in each hole. Incidental to Metal Guard Rail. All Metal Pieces shall be Galvanized.



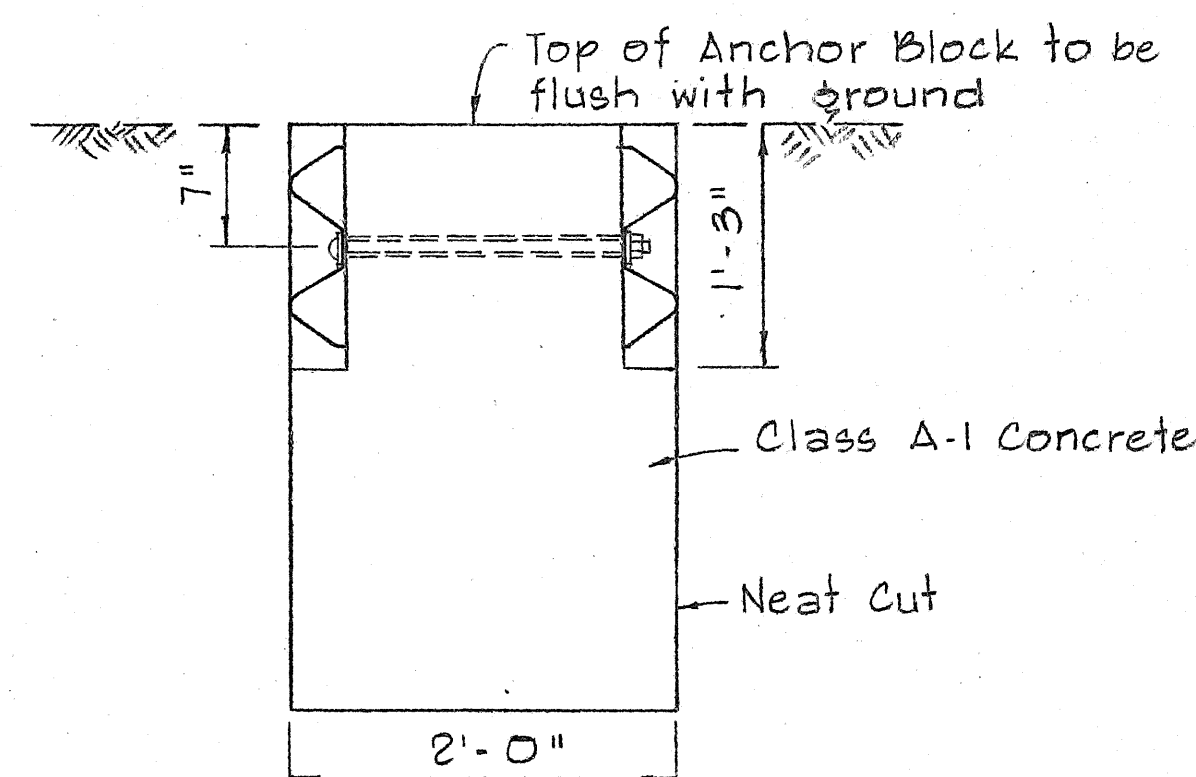
### PLAN



### ELEVATION

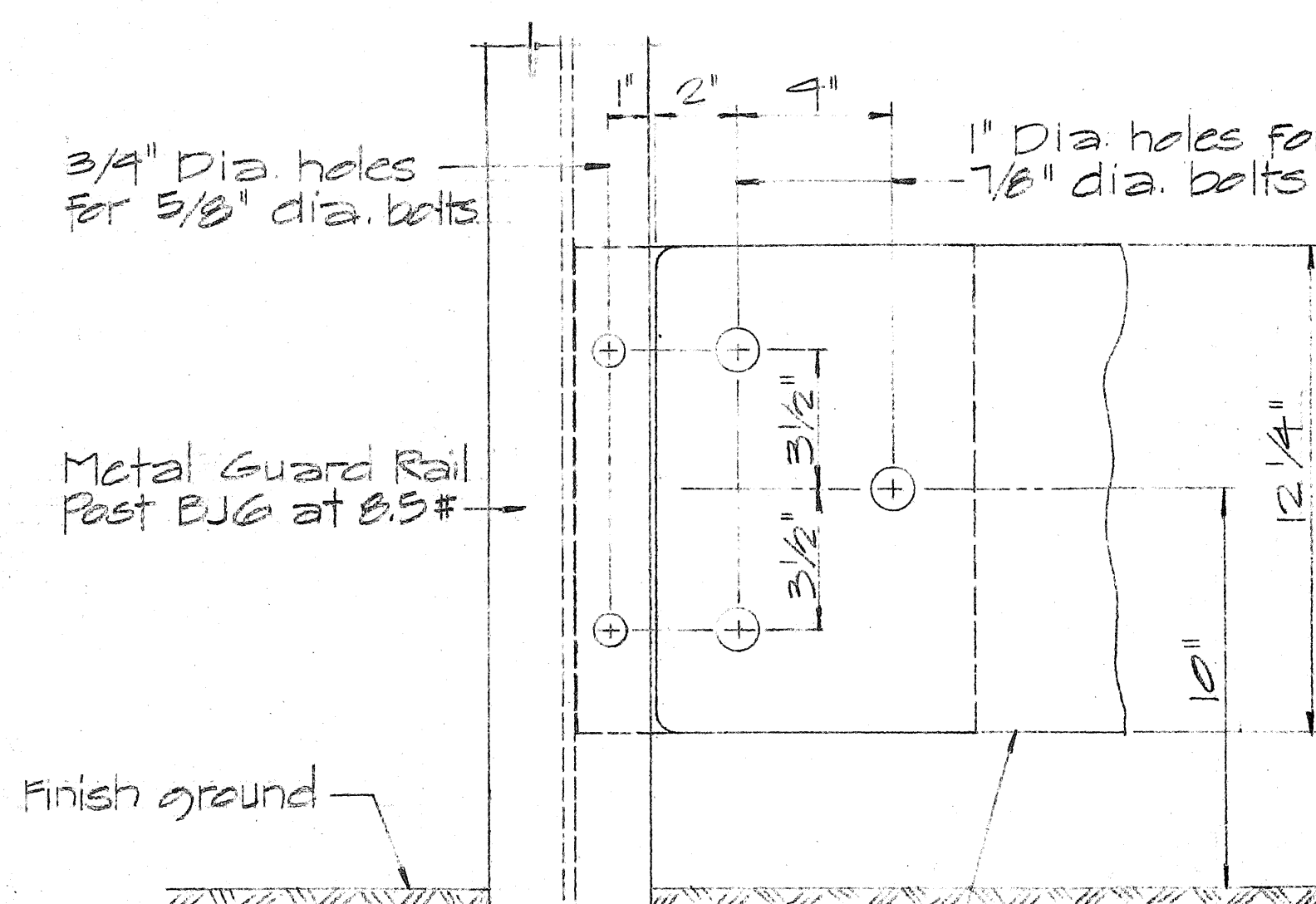
## CONCRETE ANCHOR BLOCK FOR RAMP END

Scale: 1"=1'-0"



### SECTION A-A

NOTE: Concrete, Excavation, and Miscellaneous Appurtenances necessary to anchor the Guard Rail Ends, shall be incidental to the Metal Guard Rail.

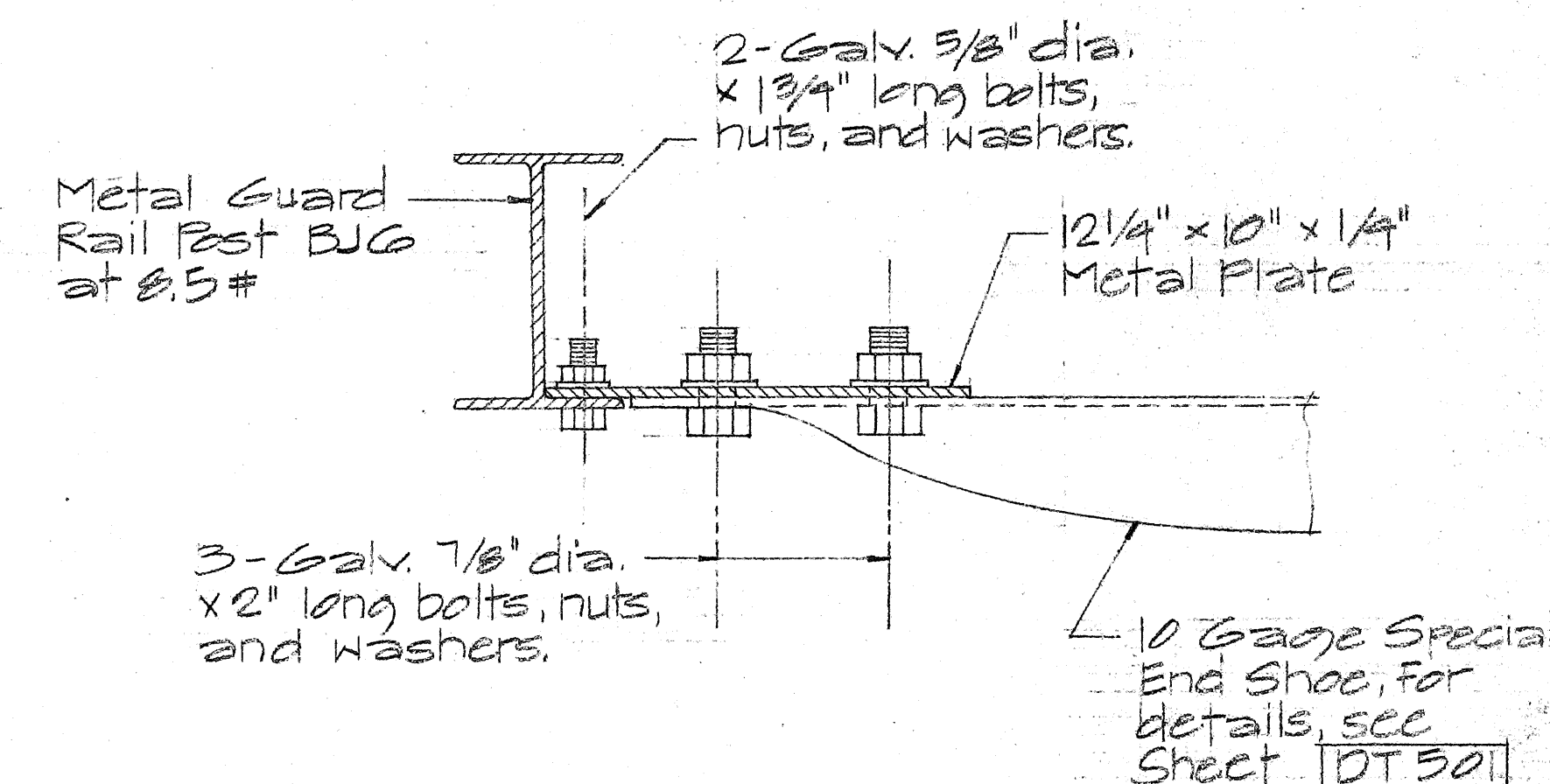


### ELEVATION

## DETAIL "B"

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

NOTE: All Shoe Assembly, including anchor bolts, nuts, and washers, shall be galvanized.



### PLAN

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

## STANDARD DETAIL GUARD RAIL RAMP END ANCHORAGE

Scale: as Noted

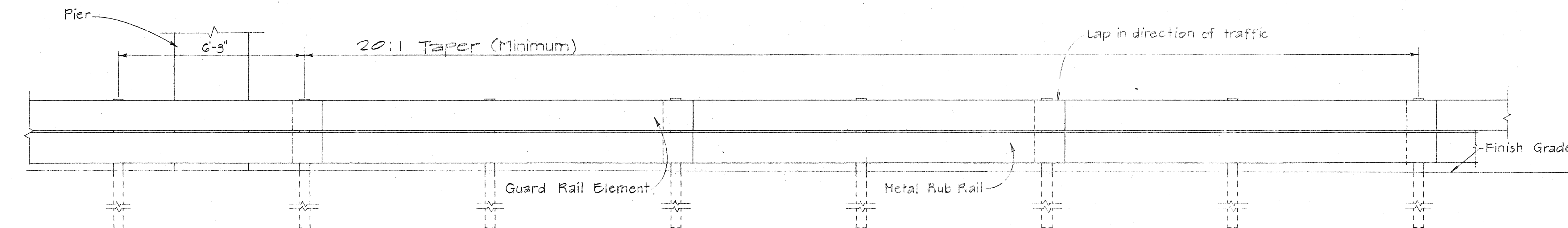
August, 1968

SHEET No. 4 OF 9 SHEETS DT 502



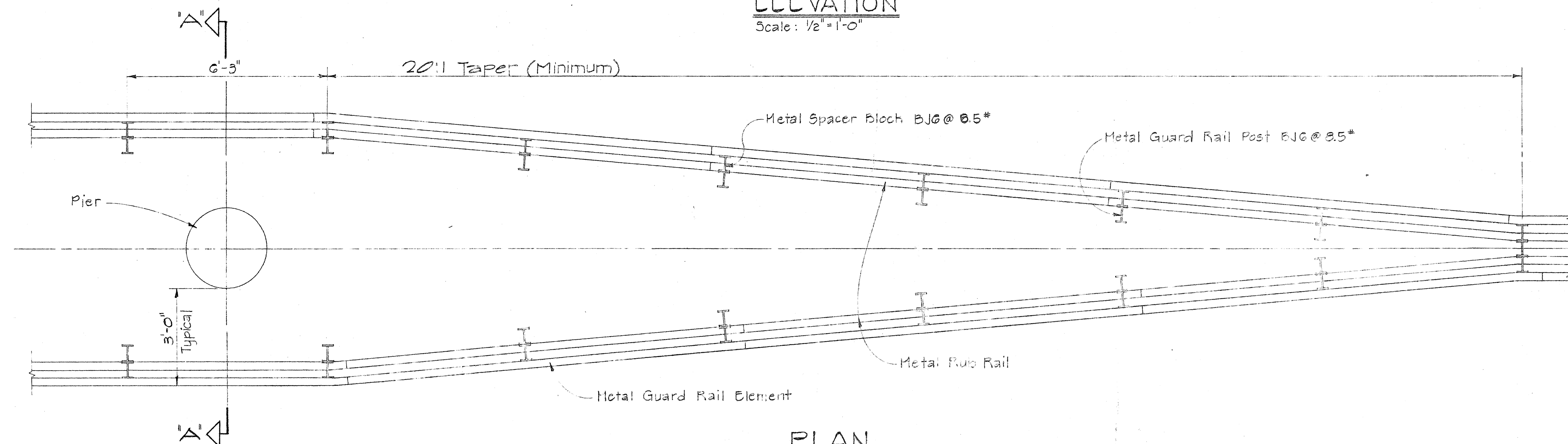
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-003-1(3)<br>F-003-1(9) | 1969        | 18        | 22           |

REVISED: 12-11-68  
REVISED: 2-27-69



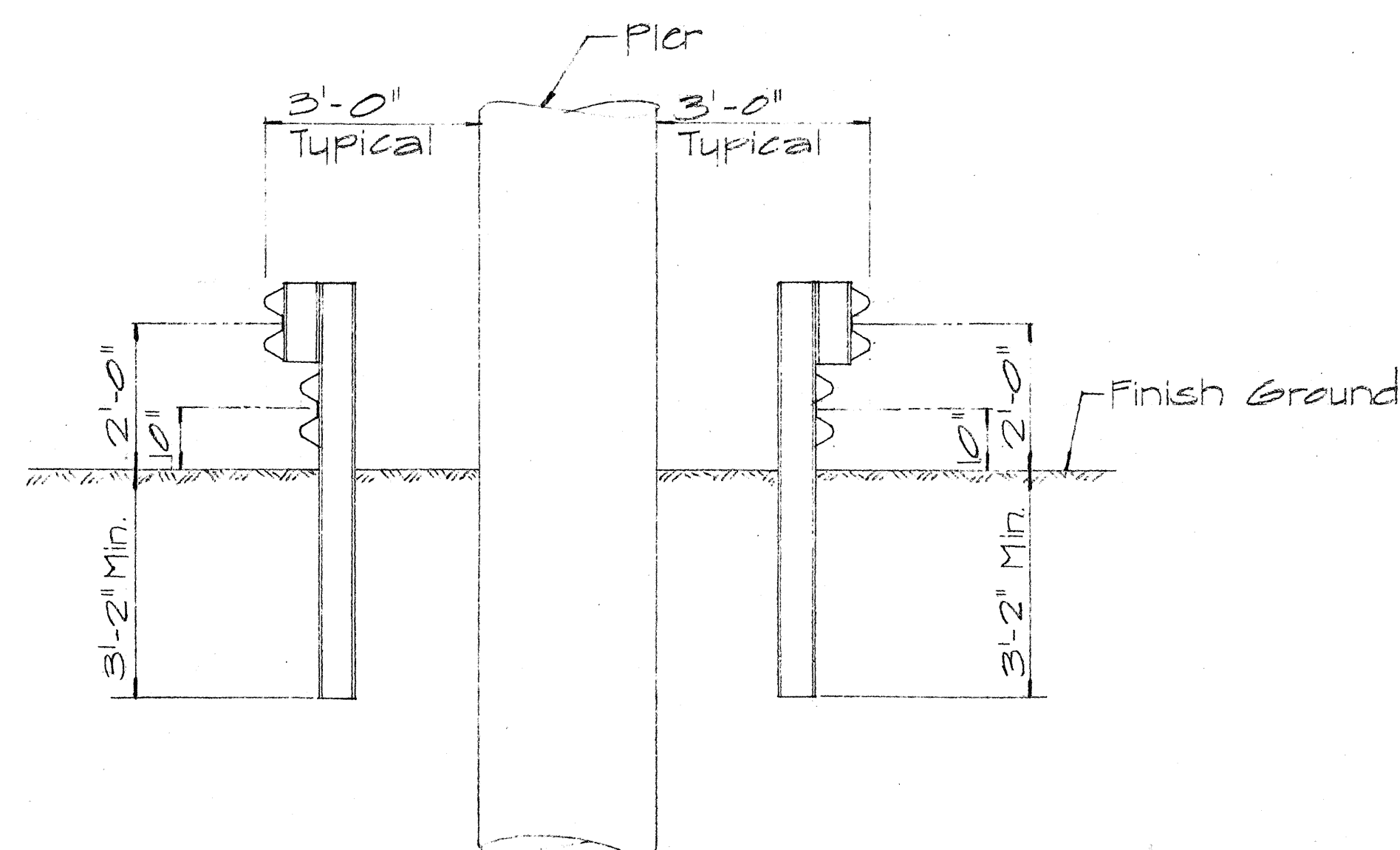
**ELEVATION**

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



**PLAN**

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



**SECTION "A"-A"**

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

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

TRANSITION DETAIL OF  
METAL GUARD RAIL  
WITH RUB RAIL AT  
OBSTRUCTION

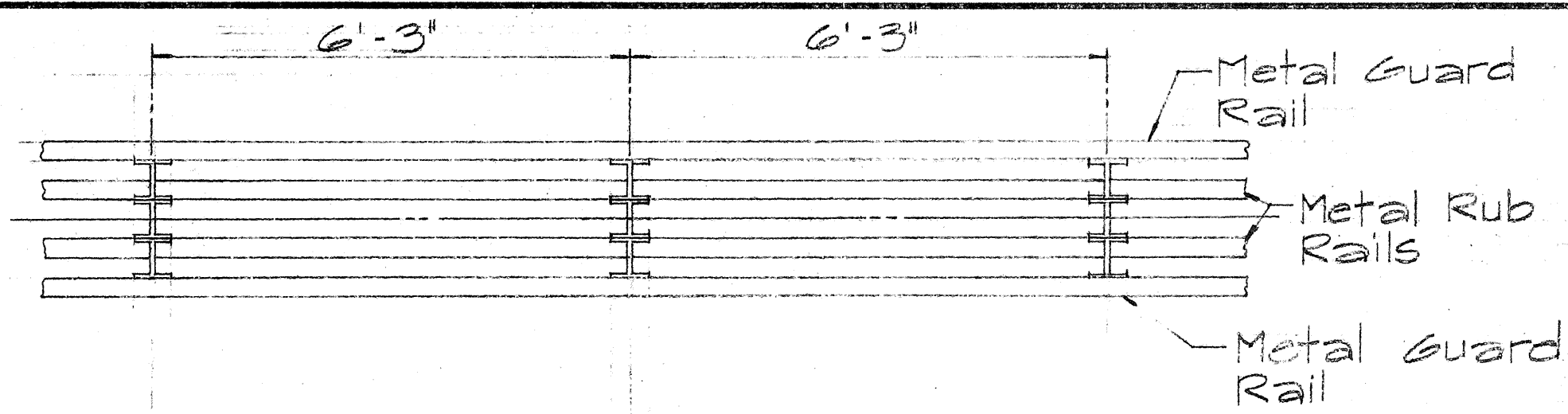
Scale: As Shown

Nov. 1968

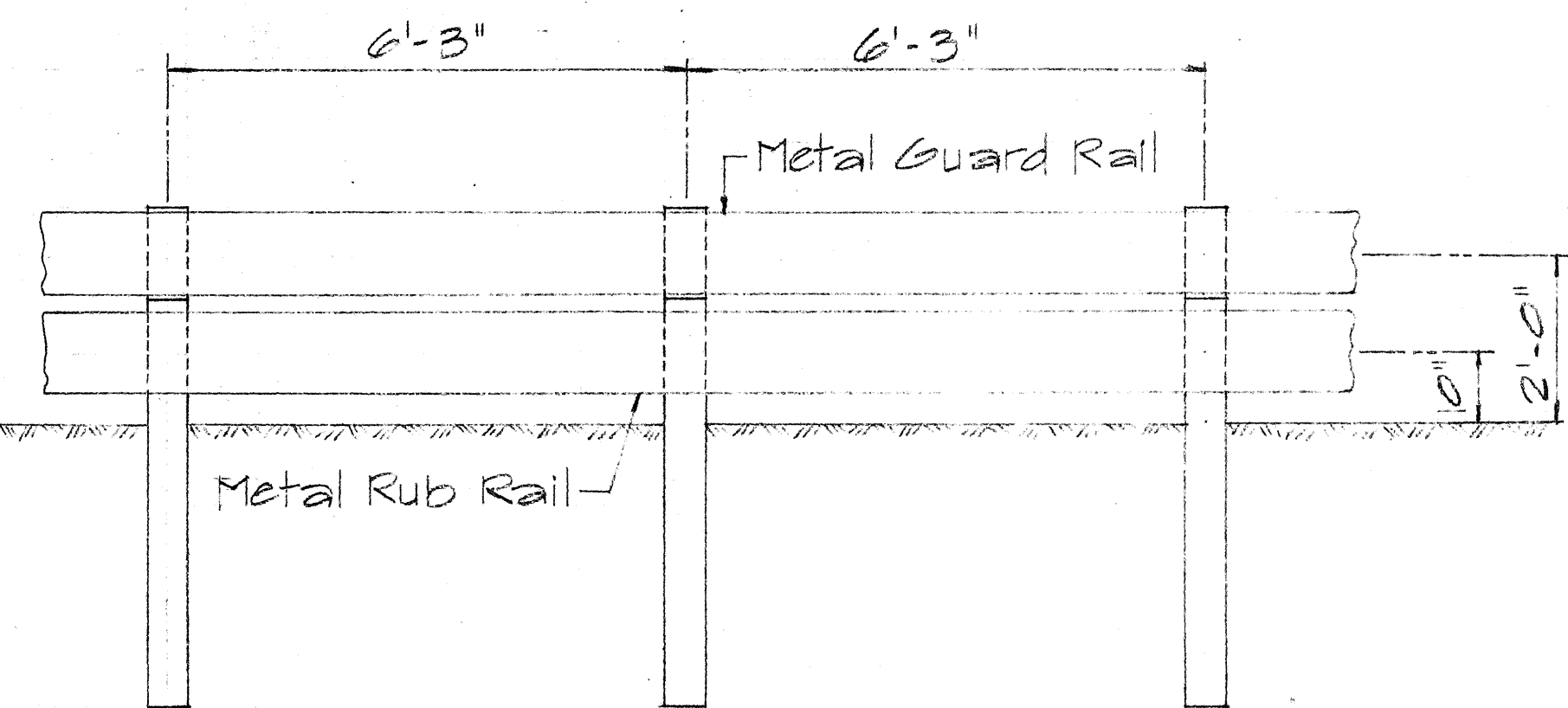
SHEET No. 5 OF 9 SHEETS DT 505



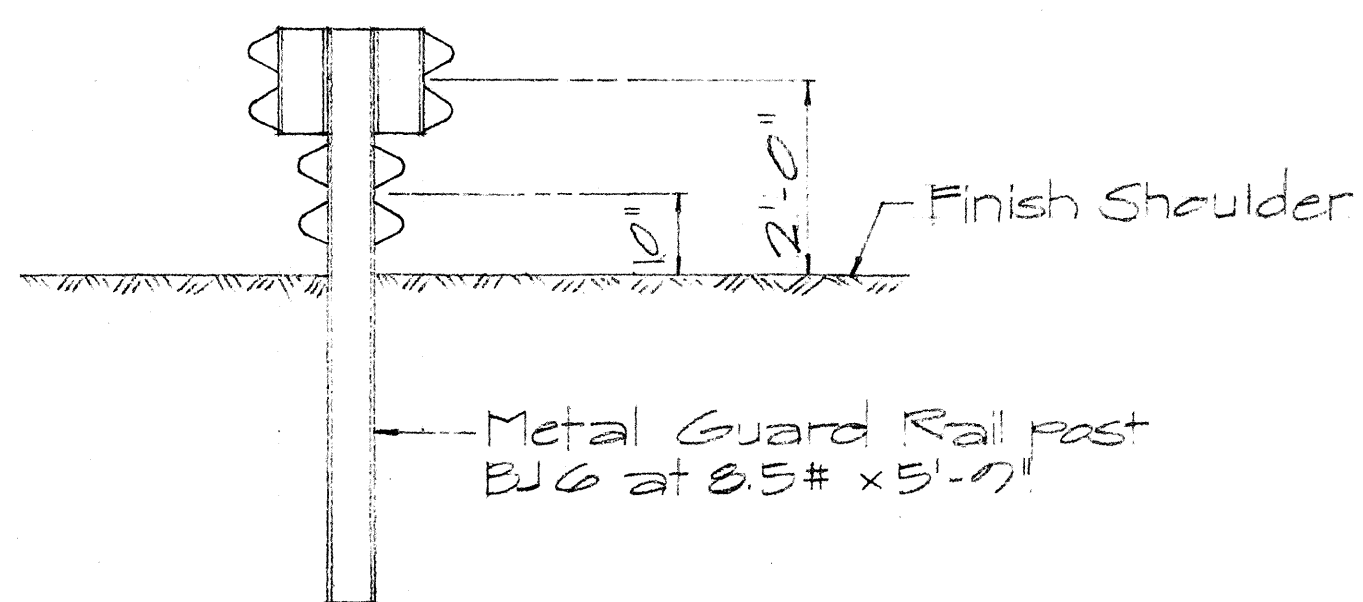
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-003-1(3)<br>F-003-1(9) | 1960        | 19        | 22           |



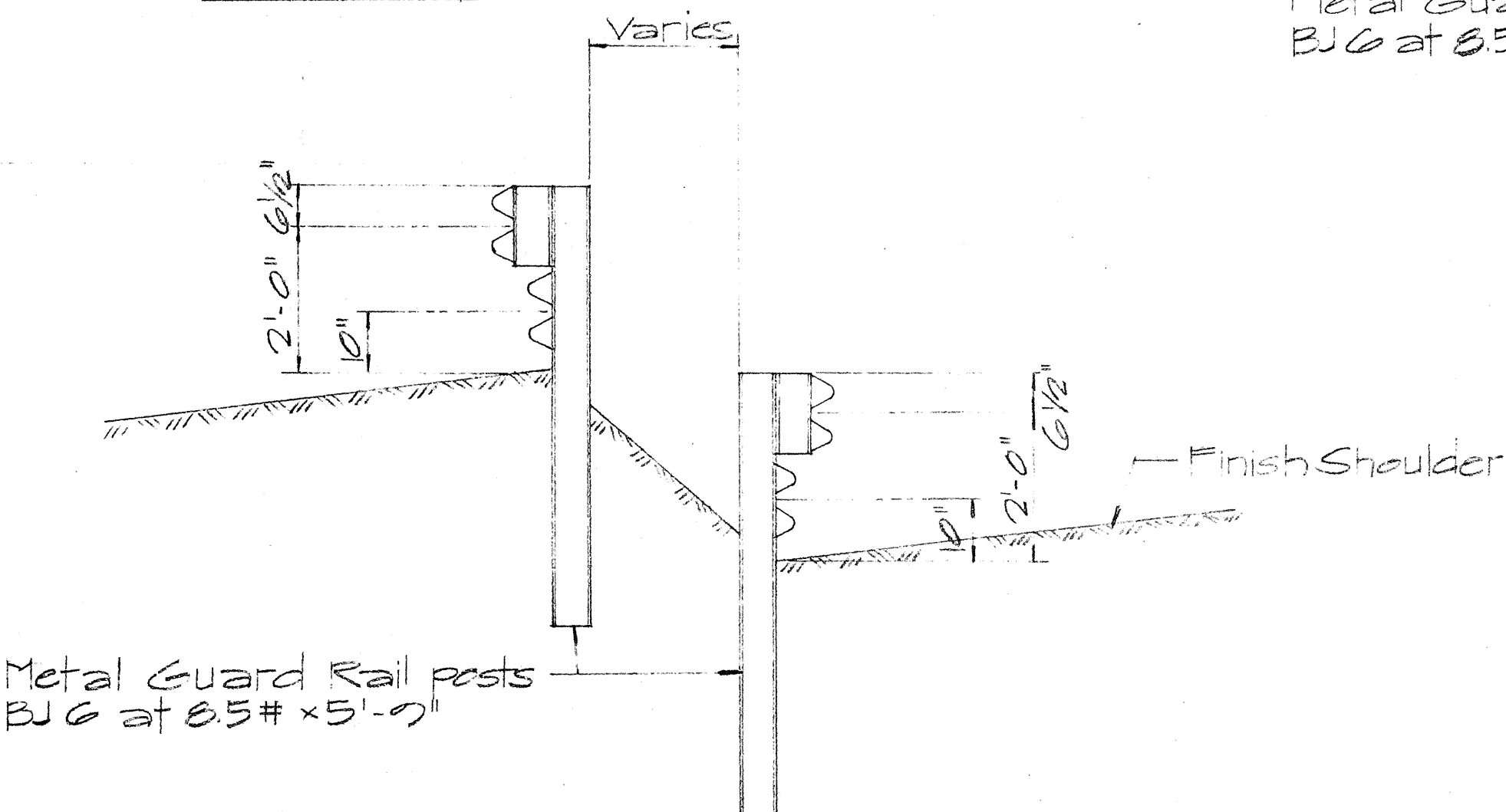
PLAN



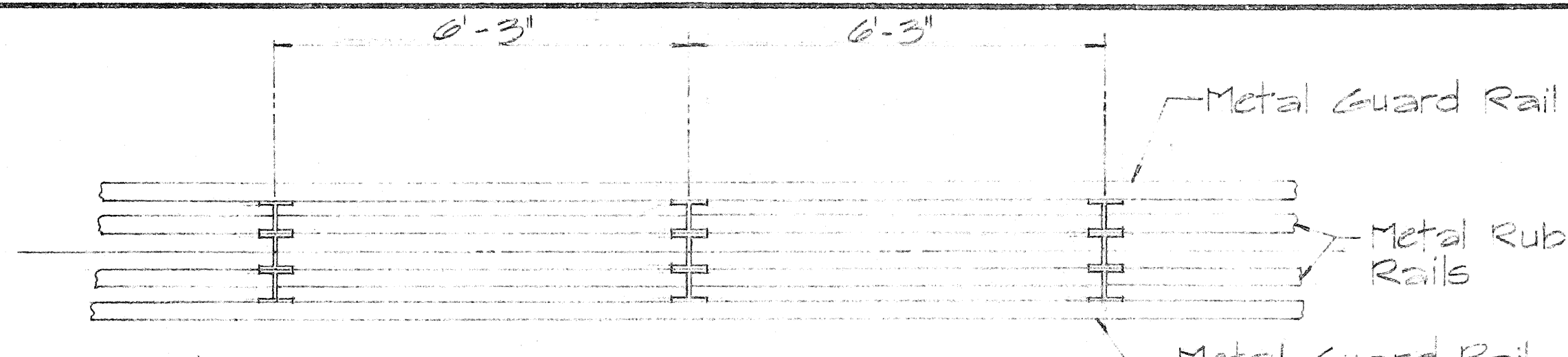
ELEVATION



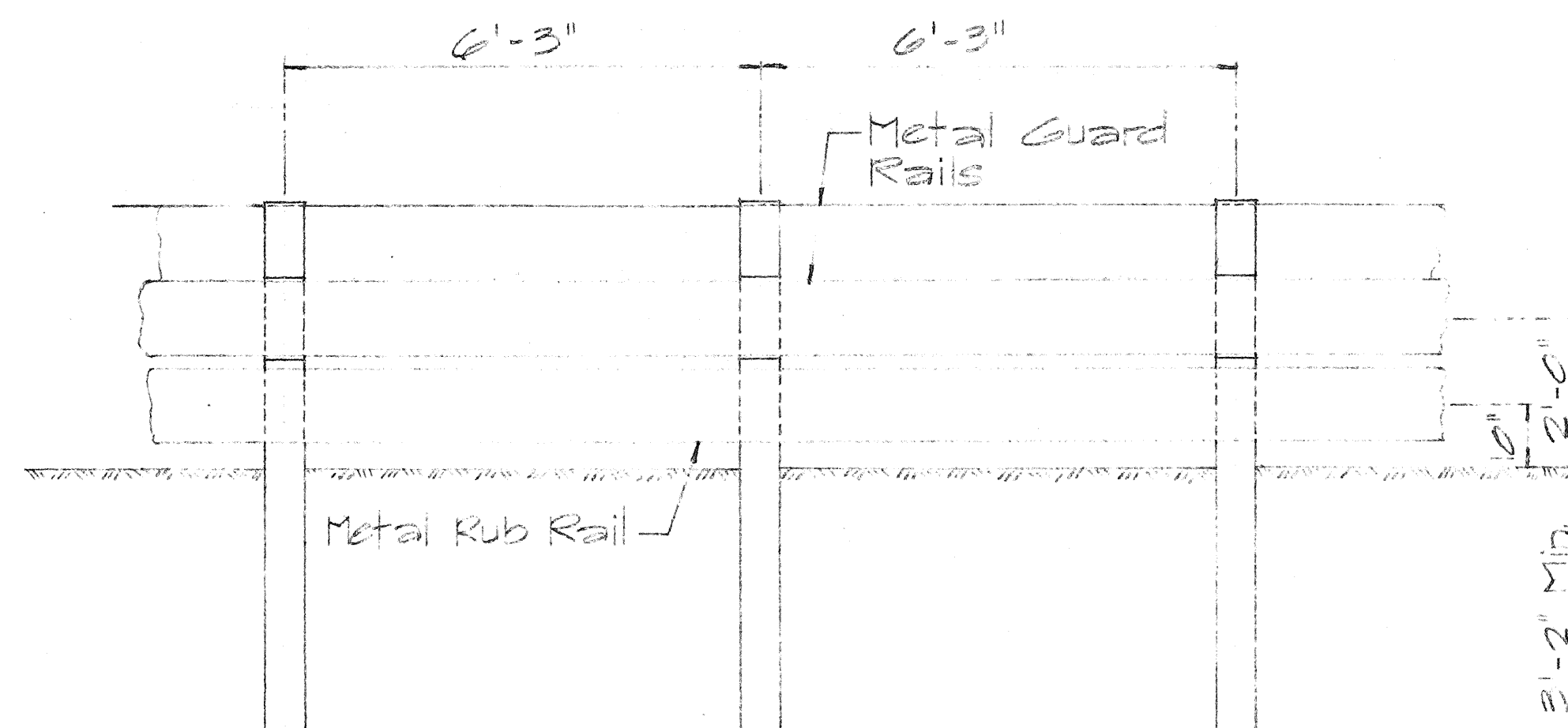
SECTION



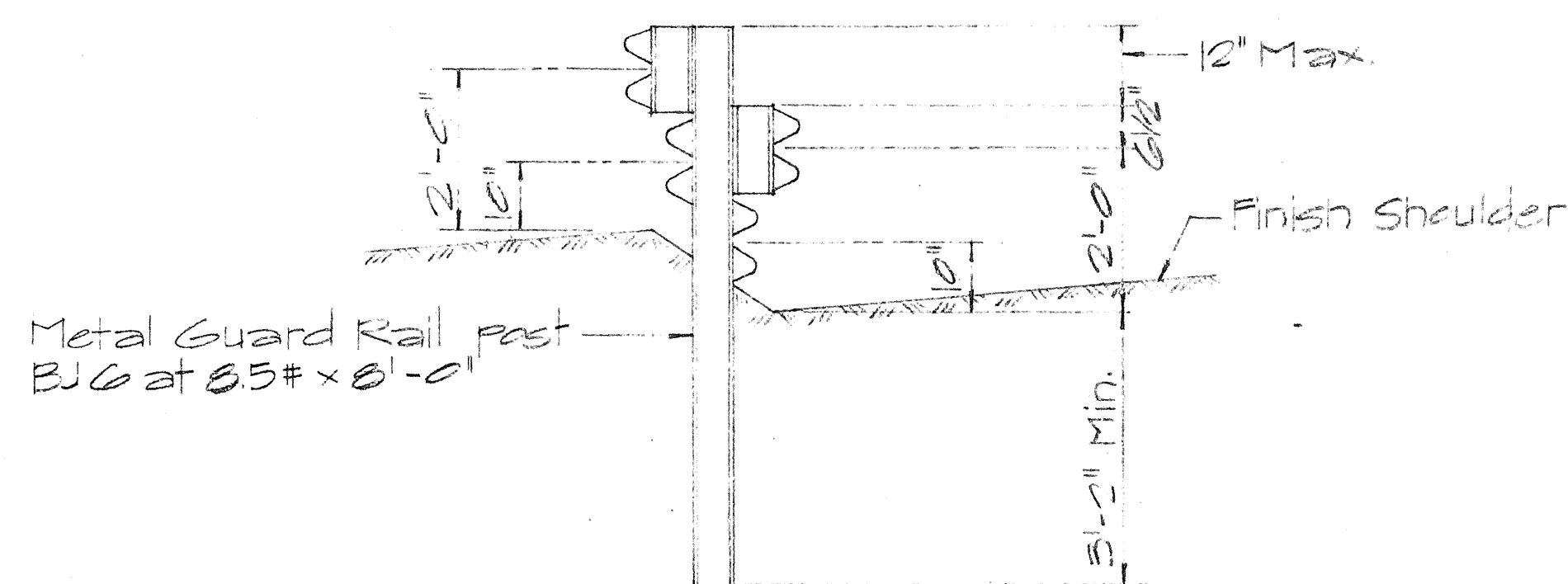
TYP. DOUBLE POST SEC.



PLAN

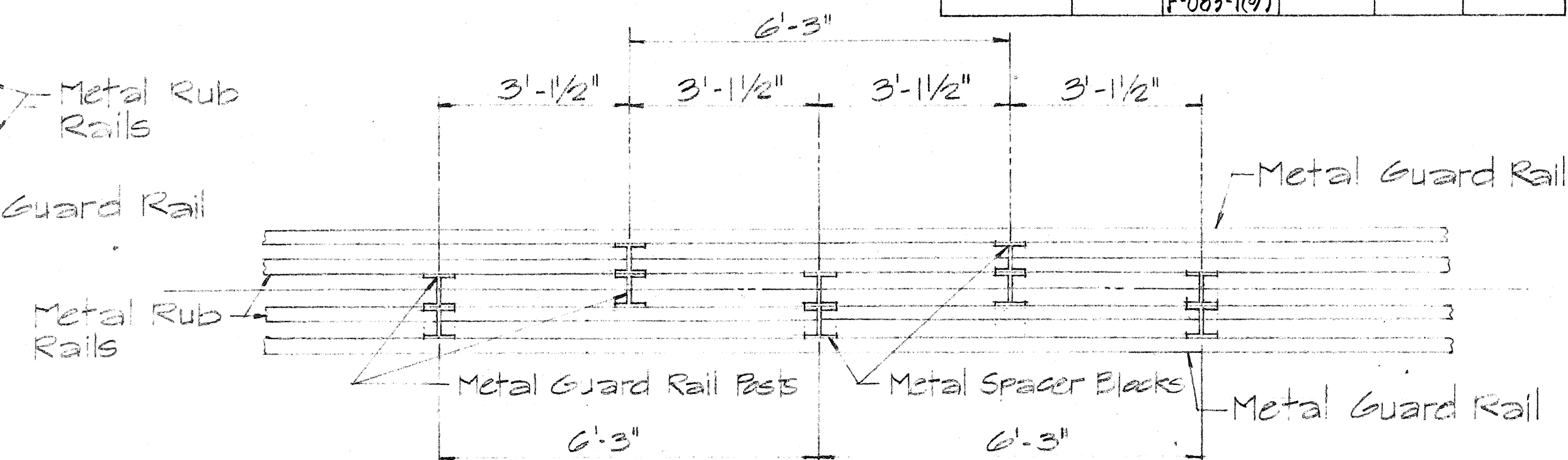


ELEVATION

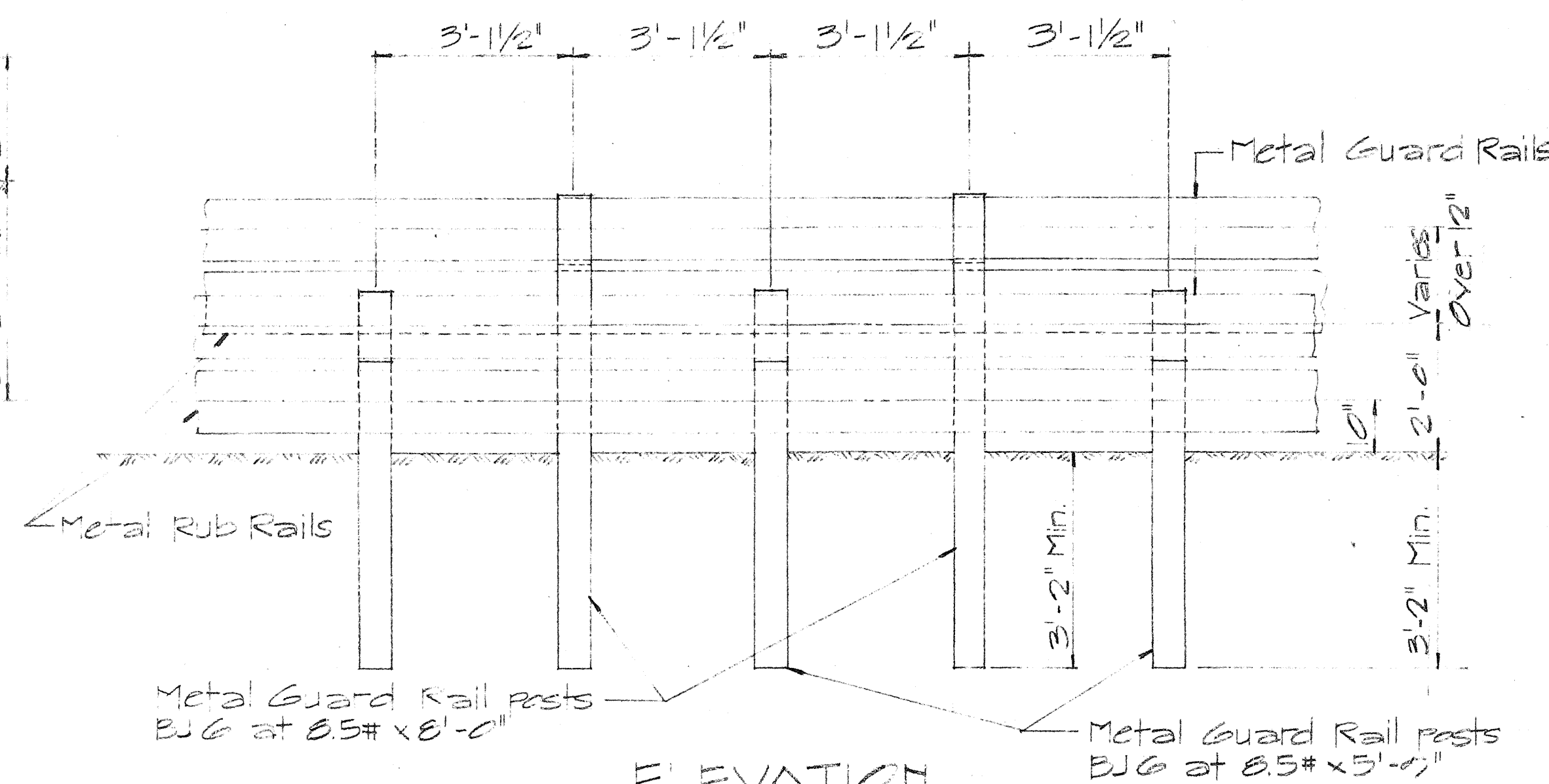


SECTION

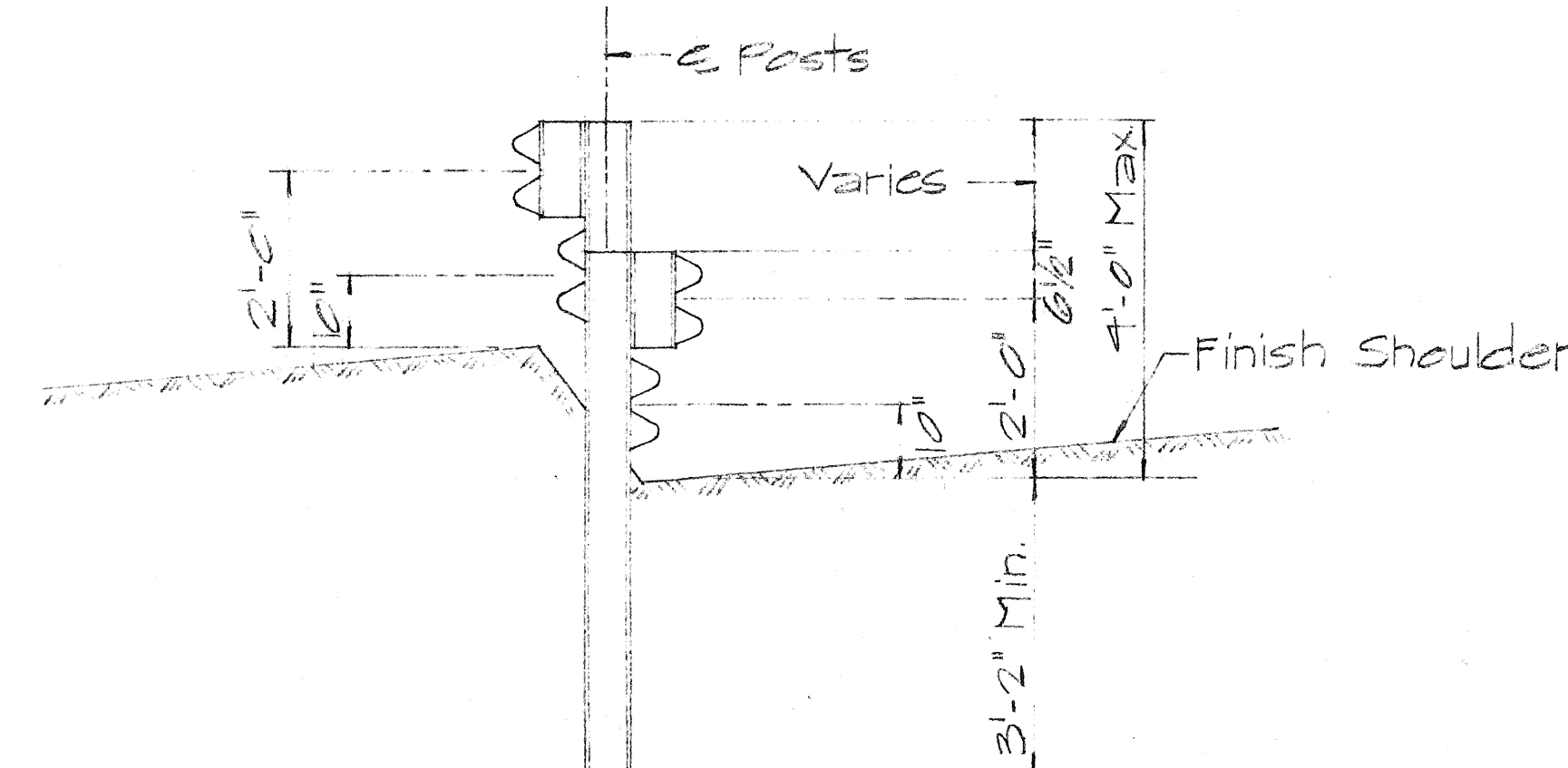
TYPICAL SAW TOOTH INSTALLATION  
SC. 1/2" = 1'-0"



PLAN



ELEVATION



SECTION

TYPICAL STAGGERED INSTALLATION  
SC. 1/2" = 1'-0"

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

STANDARD DETAIL  
METAL GUARD RAIL  
WITH RUB RAIL

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

Feb. 19, 60

SHEET No. 6 OF 9 SHEETS DT 514







| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-063-1(3)<br>F-063-1(9) | 1969        | 21        | 22           |

# GENERAL NOTES

- Contractor has the option of using cast malleable iron, cast steel, welded, bolted or cast steel end block grate.
- Grates and Frames shall be hot dip galvanized after fabrication, see specifications.
- All welds  $\frac{3}{8}$ " unless otherwise noted.
- Center support assembly shall be used when two or more grates are specified. Incidental to Types A-9 or A-12 Frame and Grates.
- Refer to "Grate Bar Spacing Table" for Types A-9 and A-12 Grate dimensions.
- The various materials shall conform to the specifications of ASTM as listed in the following tabulation and the Std. Specifications.

| Material                   | ASTM Designation   |
|----------------------------|--------------------|
| Structural Steel.....      | A283, Grade D      |
| Cast Steel.....            | A27, Grade 65-35   |
| Malleable Iron Casting.... | A47, Gr. No. 35018 |

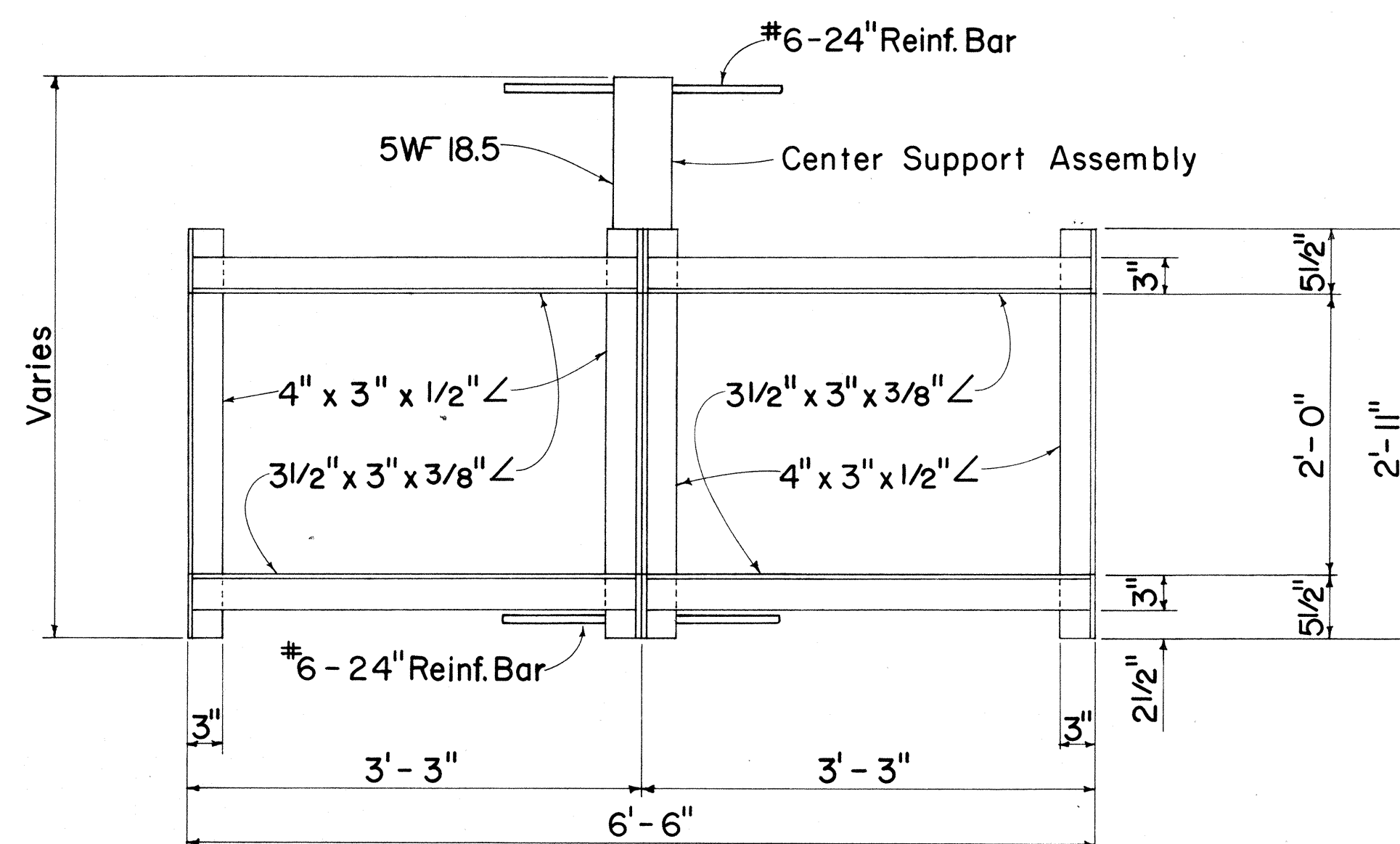
## GRATE BAR SPACING TABLE

| TYPE | NO. BARS | CLEAR BAR SPACING-W | X                 |
|------|----------|---------------------|-------------------|
| A-9  | 9        | 2"                  | $1\frac{9}{16}$ " |
| A-12 | 12       | $1\frac{3}{8}$ "    | $1\frac{1}{4}$ "  |

### NOTE:

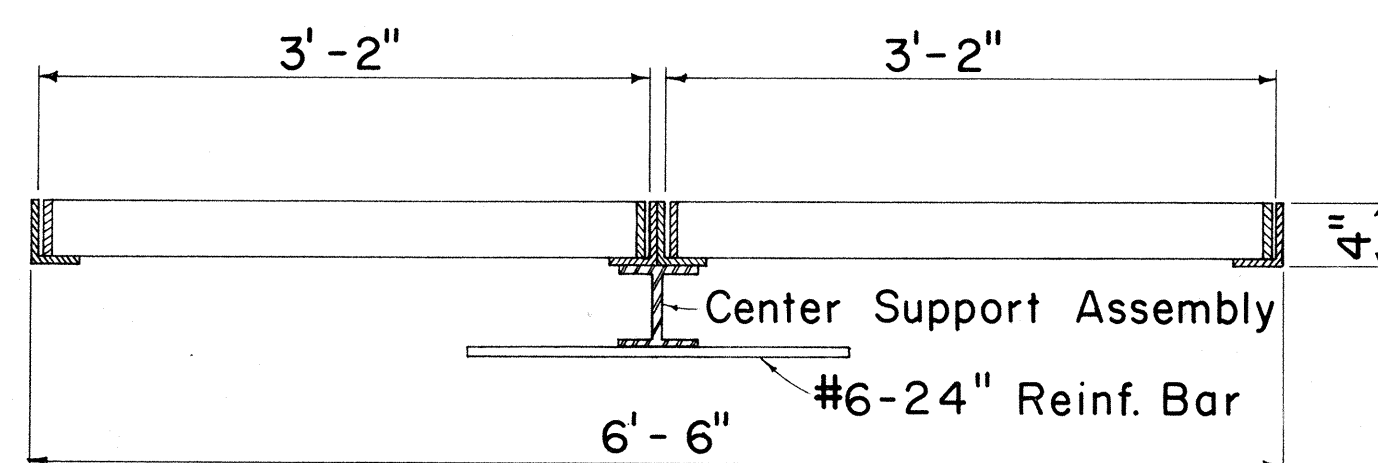
- Type A-9 - Use in locations off the roadbed on all types of highways.
- Type A-12 - Use within the roadbed on all types of highways.

|                                                                      |                 |
|----------------------------------------------------------------------|-----------------|
| STATE OF HAWAII<br>DEPARTMENT OF TRANSPORTATION<br>HIGHWAYS DIVISION |                 |
| STANDARD DETAILS                                                     |                 |
| TYPES A-9 AND A-12                                                   |                 |
| FRAMES AND GRATES                                                    |                 |
| Scales: As Noted                                                     | Date: Aug. 1968 |
| SHEET No. 8 OF 9 SHEETS                                              |                 |



### PLAN

(Two or More Grates)

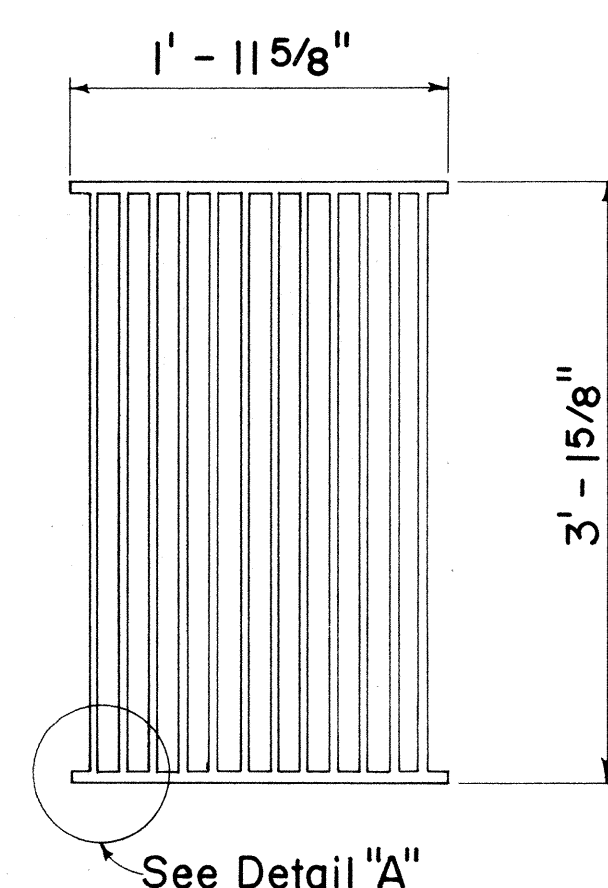


### LONGITUDINAL SECTION

(Thru Frame & Grate)

## FRAME DETAILS

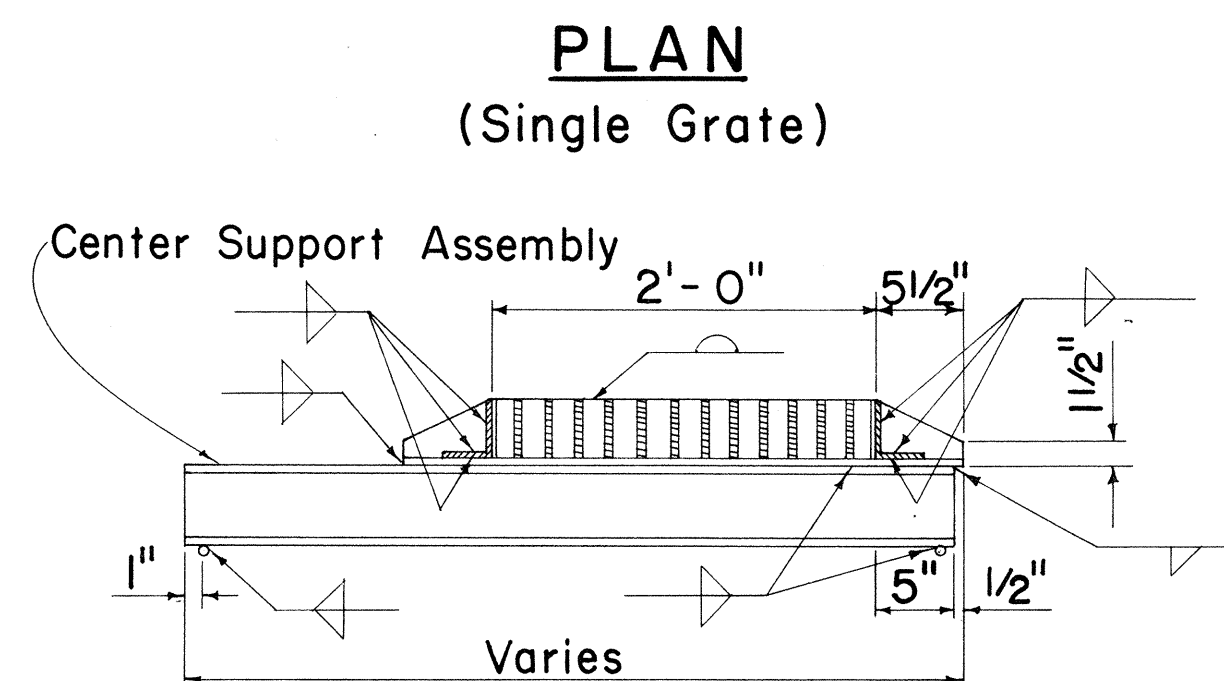
Scale: 1"= 1'- 0"



### PLAN

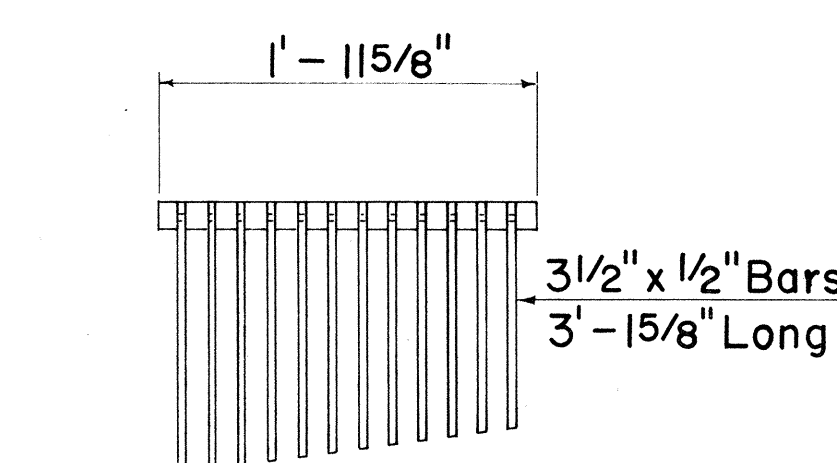
Scale: 1"= 1'- 0"

## ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL GRATE



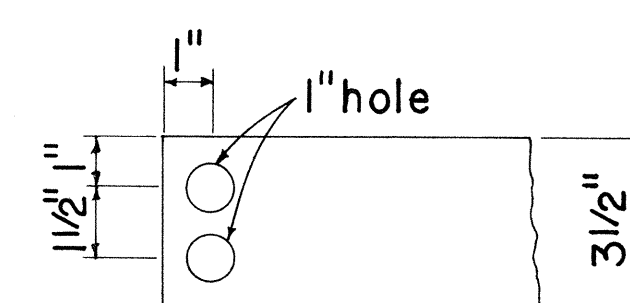
### CROSS SECTION

(Thru Frame & Grate)



### CAST END BLOCK

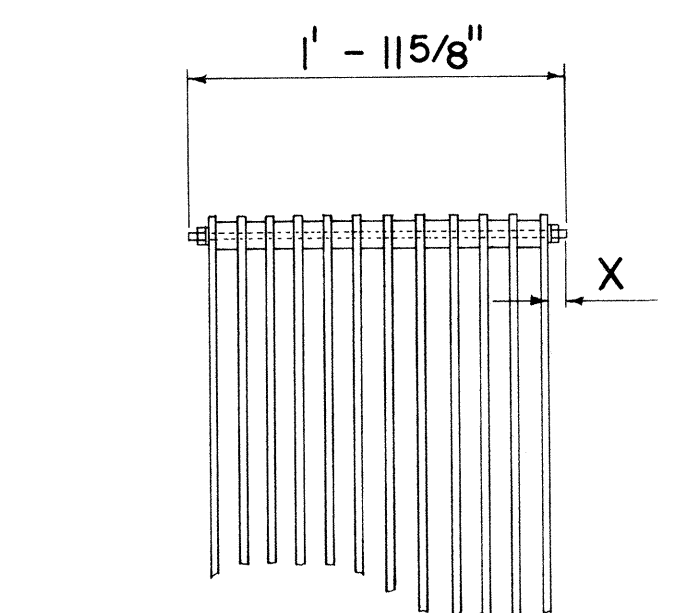
Scale: 1"= 1'- 0"



### END OF BAR

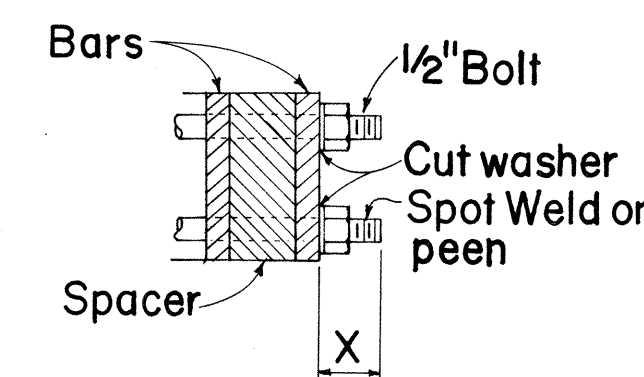
Scale: 3"= 1'- 0"

## ALTERNATIVE CAST MALLEABLE IRON OR CAST STEEL END BLOCK GRATE



### BOLTED END BLOCK

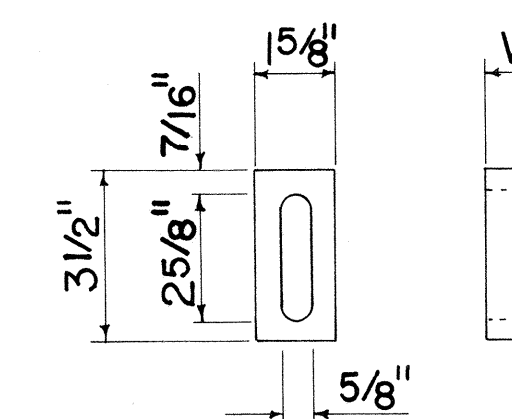
Scale: 1"= 1'- 0"



### BOLTING DETAIL

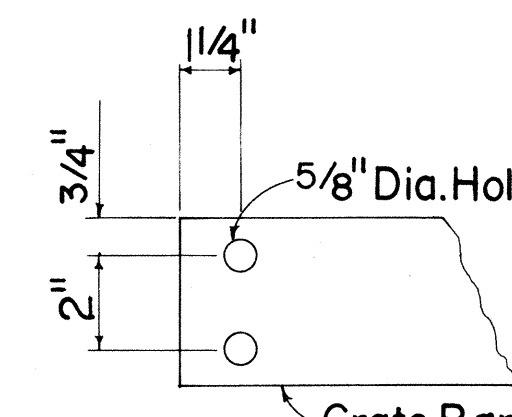
Scale: 3"= 1'- 0"

## ALTERNATIVE BOLTED GRATE



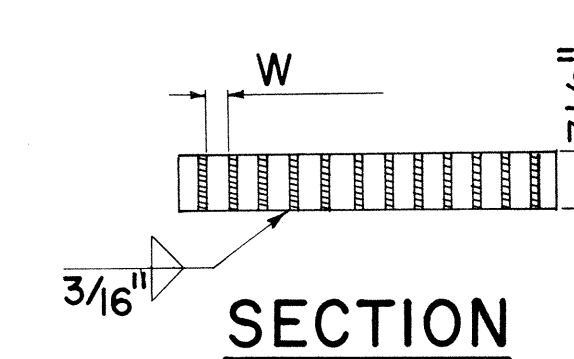
### BAR SPACER

Scale: 3"= 1'- 0"

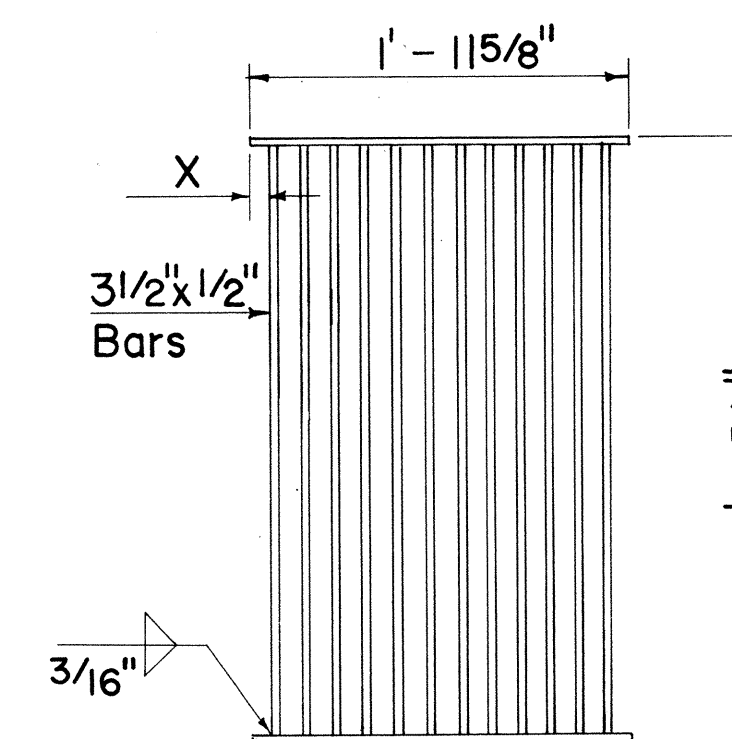


### END OF BAR

Scale: 3"= 1'- 0"



### SECTION



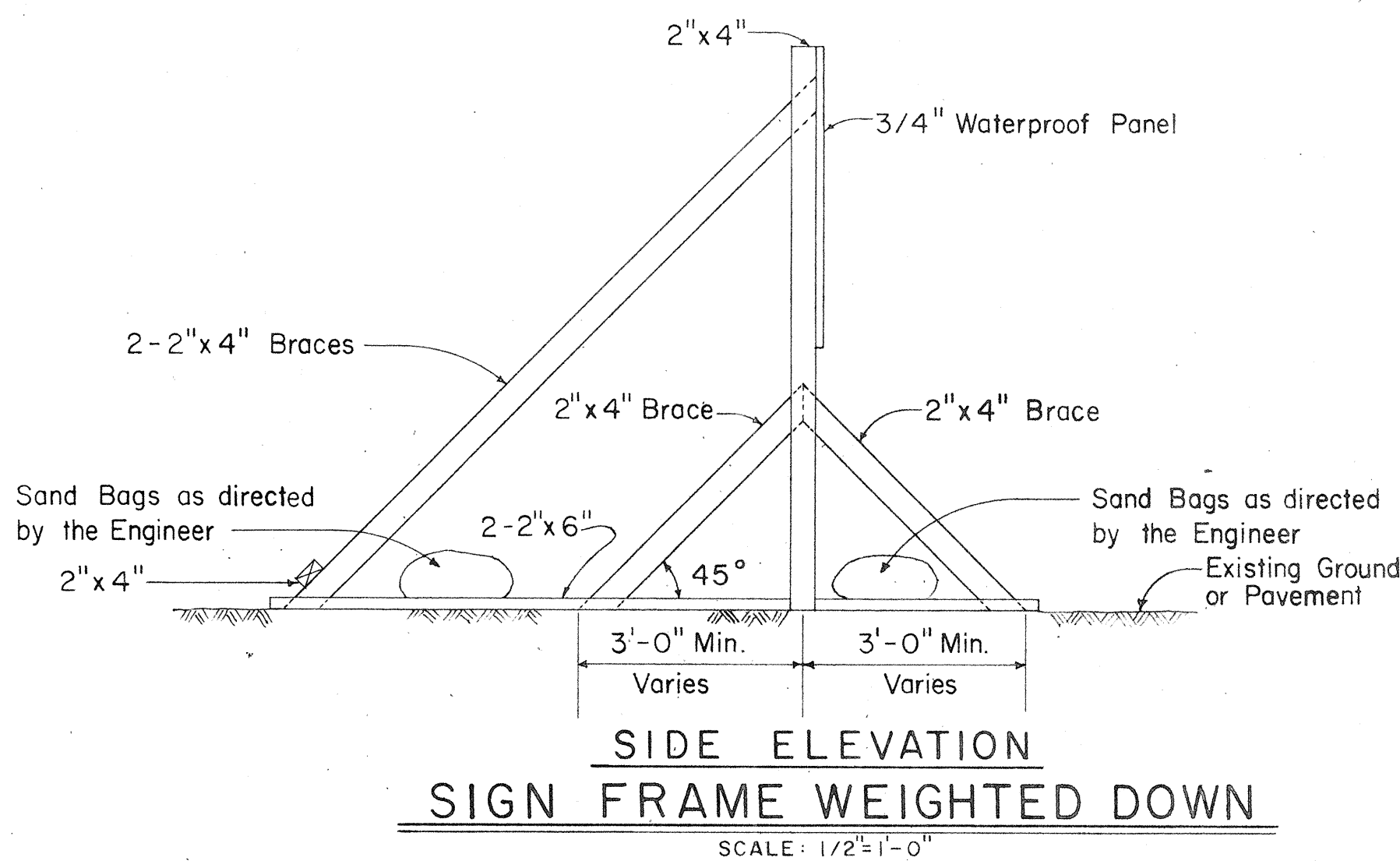
### PLAN

## ALTERNATIVE WELDED GRATE

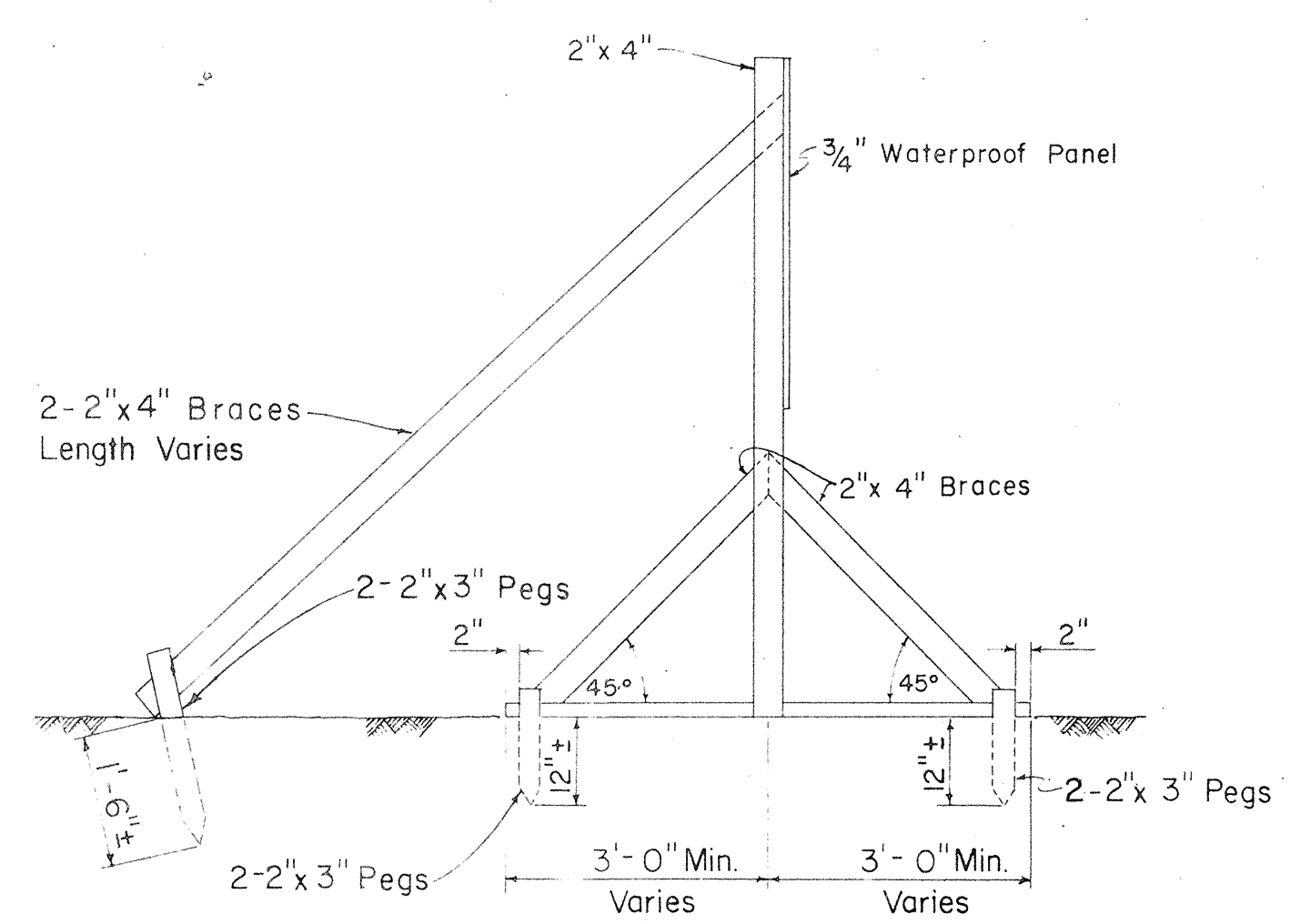
Scale: 1"= 1'- 0"



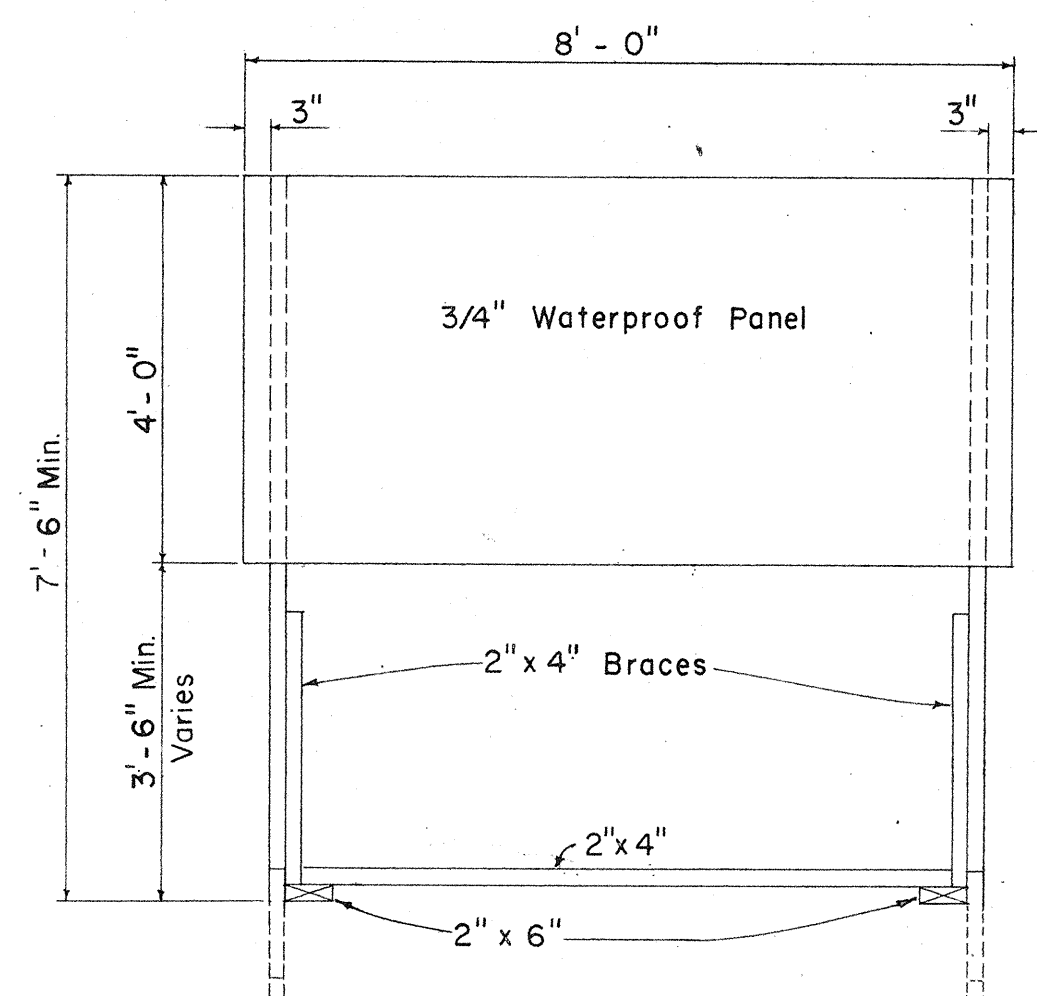
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-003-1(3)<br>F-083-1(9) | 1969        | 22        | 22           |



SIDE ELEVATION  
SIGN FRAME WEIGHTED DOWN  
SCALE: 1/2" = 1'-0"



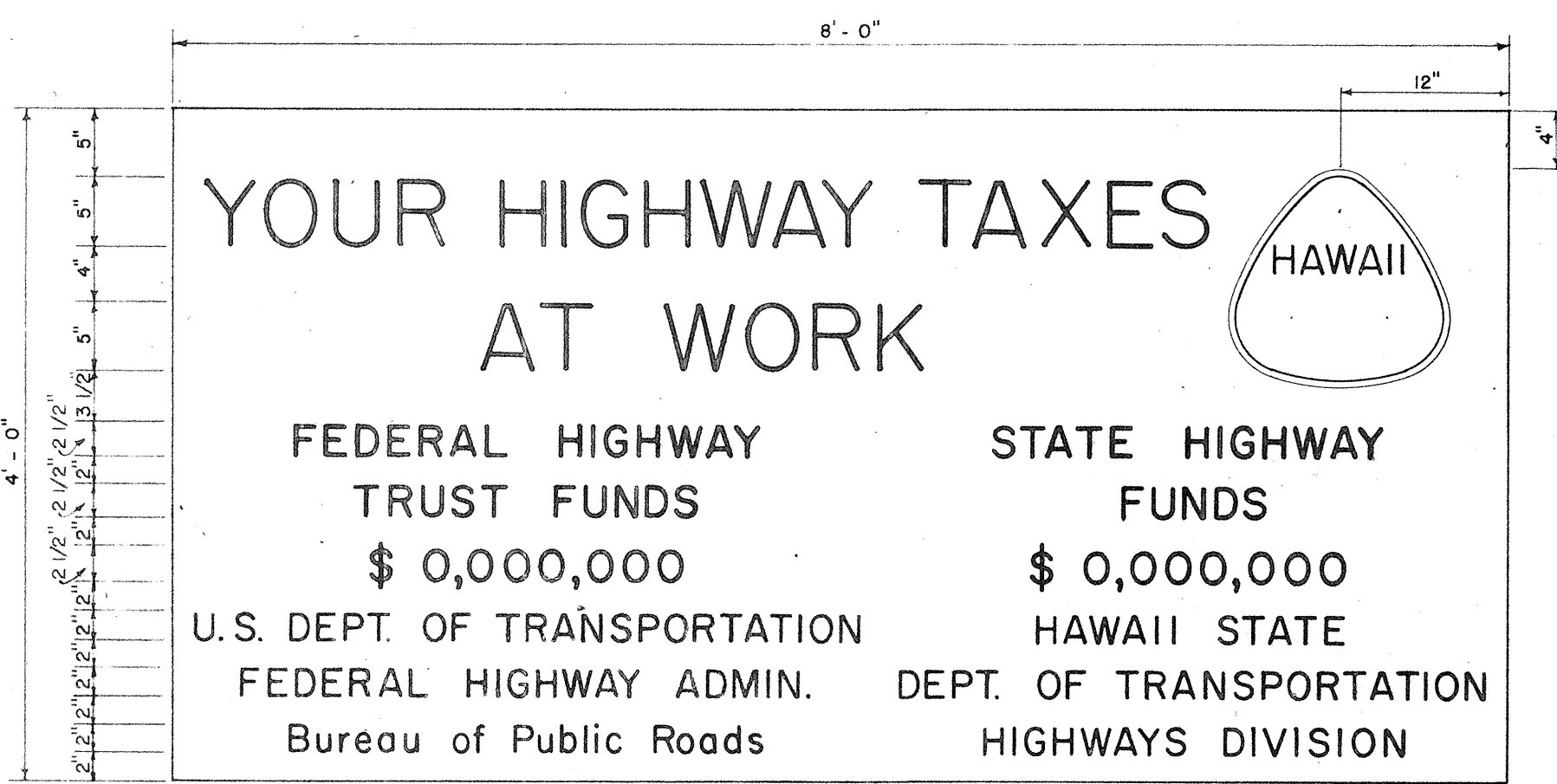
SIDE ELEVATION  
SIGN FRAME ANCHORED IN GROUND  
Scale: 1/2" = 1'-0"



FRONT ELEVATION

CONSTRUCTION IDENTIFICATION SIGN NOTES

1. The sign legend shall be black or white background.
2. The Contractor shall construct, install and maintain the project signs at the locations shown on the plans and as ordered by the Engineer.
3. Letters shall be Series "C" of the sizes shown on the plan and shall conform with the "Standard Alphabet for Highway Signs", Bureau of Public Roads, 1952.
4. The Contractor shall fill in the proper numerals in place of ciphers as ordered by the Engineer.



SIGN PANEL  
Scale: 1" = 1'-0"

PRIMARY AND SECONDARY SYSTEMS  
CONSTRUCTION IDENTIFICATION SIGN

Scale: As Shown

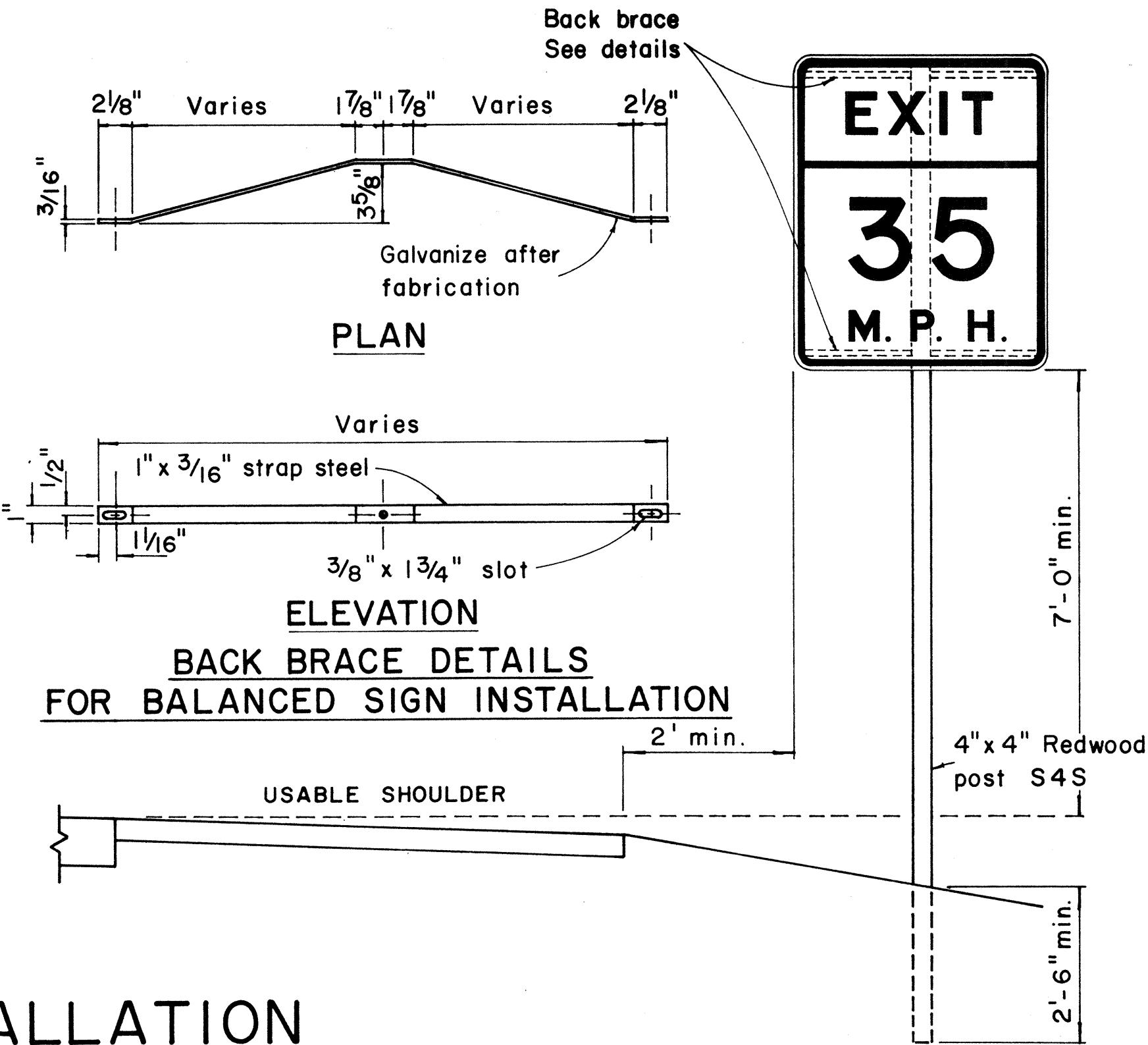
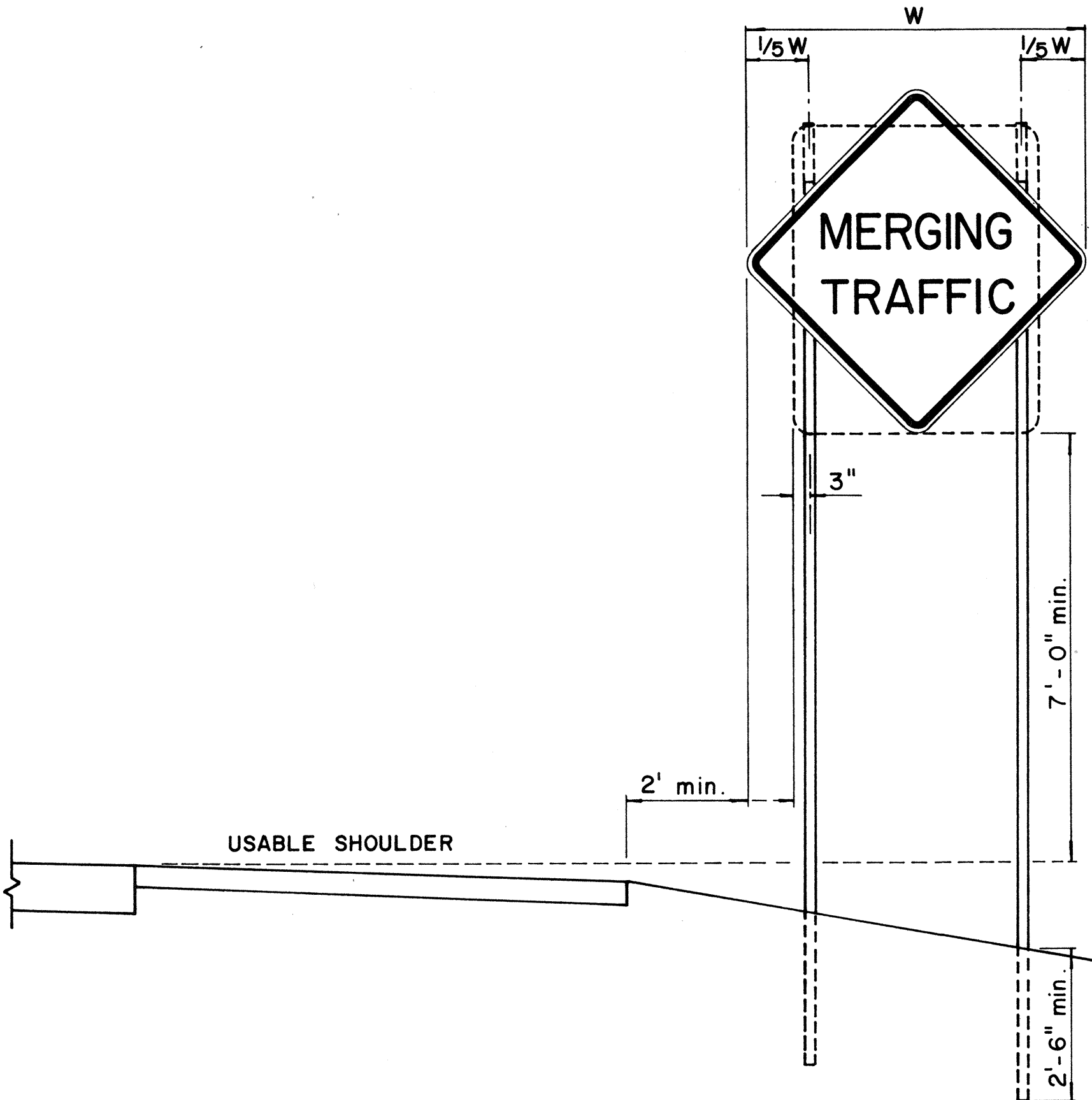
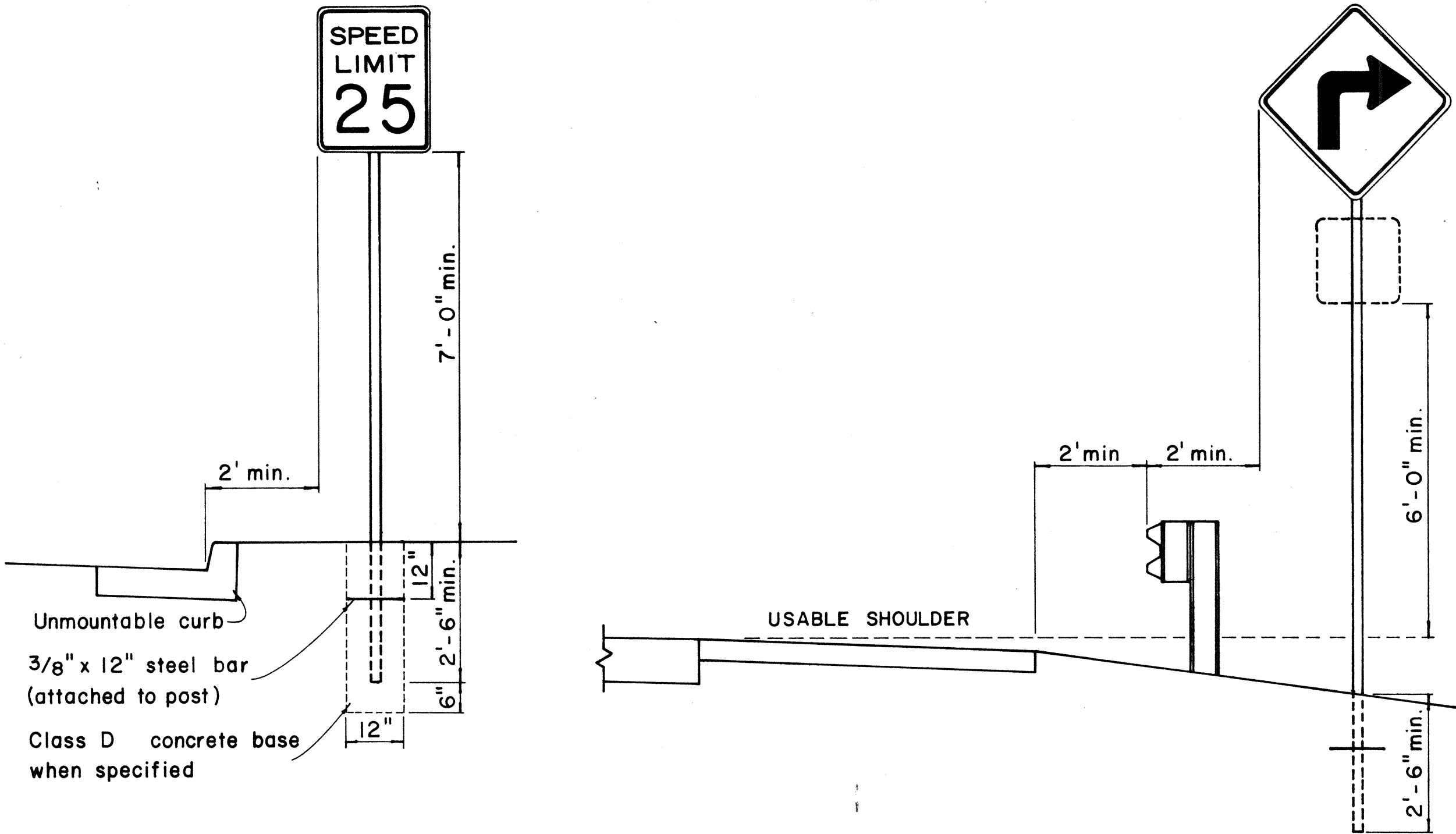
NOTE:

On projects financed entirely with State Funds, the above sign detail shall be modified by deleting the State Route Marker, and references to Federal funds, and centering the remaining legend on a 4'-0" x 6'-0" panel.

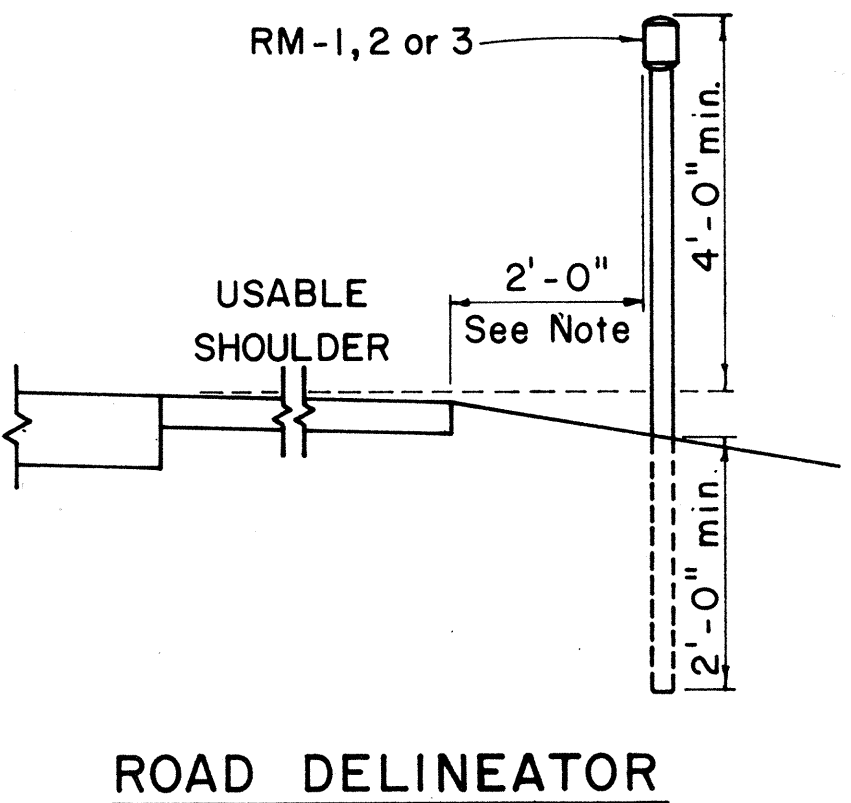
STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
STANDARD DETAILS  
PRIMARY AND SECONDARY SYSTEMS  
CONSTRUCTION IDENTIFICATION SIGNS



| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO.       | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---------------------|-------|--------------------------|-------------|-----------|--------------|
| HAWAII              | HAW.  | F-063-1(3)<br>F-083-1(9) | 1969        | 22A       | 22           |

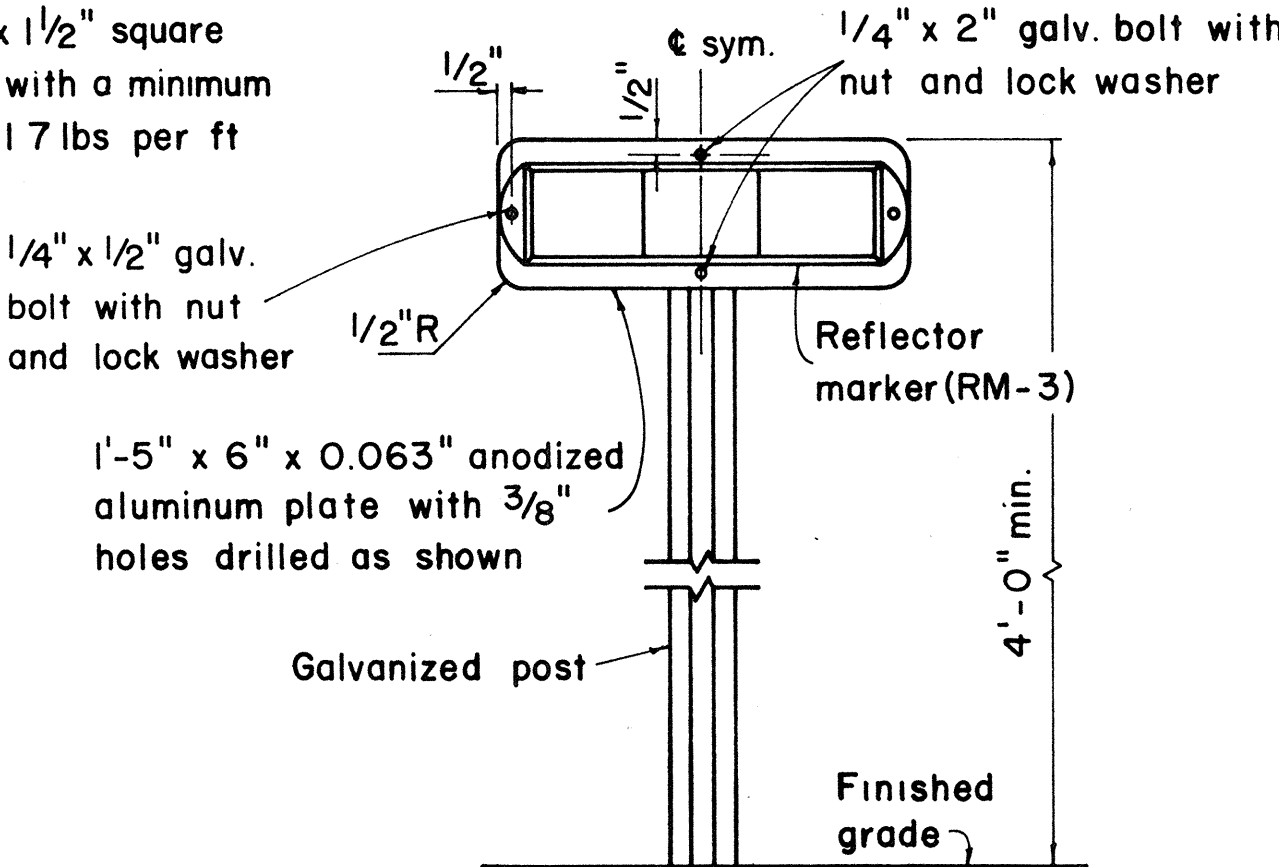
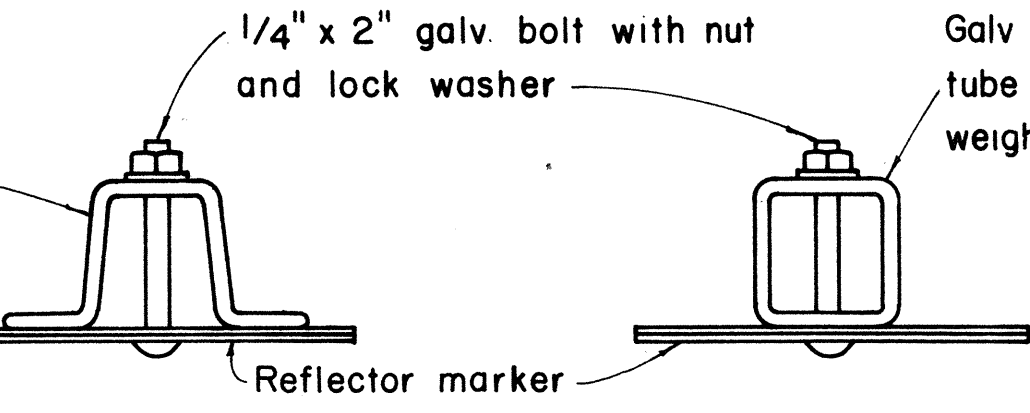


# HEIGHT AND LATERAL LOCATION OF SIGNS - TYPICAL INSTALLATION

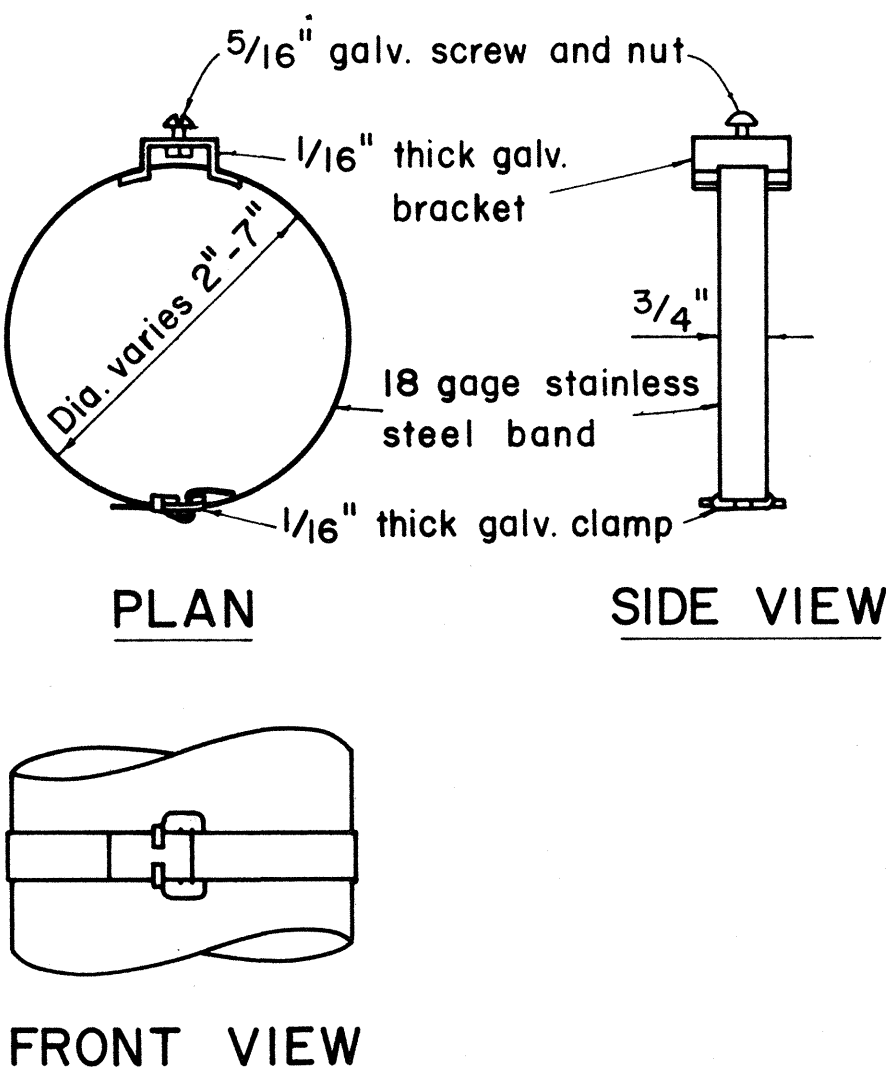


Galv. flanged channel  
1/8" x 3 1/16" rolled section  
post with a minimum  
weight of 2 lbs. per ft..  
Upper 2 ft. shall have  
a single row of 3/8" holes  
centered in the web at  
1" o.c.

TYPICAL SECTION OF ROAD DELINEATOR



TYPICAL DETAIL  
HORIZONTAL REFLECTOR MARKER  
RM-3H



TYPICAL BAND BRACKET FOR  
MOUNTING TRAFFIC SIGNS

## GENERAL NOTES:

- Sign posts shall be 2" galv. standard pipe or 2" x 2" galv. sq. tube post.
- Signs 48" and wider or larger than 10 sq. ft. in area shall be mounted on two 2" galv. standard pipe or two 2" x 2" galv. sq. tube post or 4" x 4" redwood post S4S.
- Signs shall be attached to post with 5/16" galv. bolts with nuts and 7/8" x 0.06 stainless steel washers with neoprene rubber gasket.
- Sign posts shall extend 3 1/2" above sign where required for City and County street name signs.
- Reflector markers RM-1, 2, 3 shall be glass sphere reflector markers with 4" x 5" reflector units (as shown) or plastic prismatic reflector markers with 3" diameter reflector units.
- Clearance markers (RM-3, RM-4) shall be installed with the edge of the marker in line with the inner edge of the obstruction.
- (R) or (L) indicates right or left and shall be as shown on the plans.

APPROVAL RECOMMENDED:  
*Erich Tanaka* 12/29/69  
TRAFFIC ENGINEER DATE

APPROVED:  
*John J. DeLain* 12-30-69  
ASSISTANT CHIEF, ENGINEERING DATE

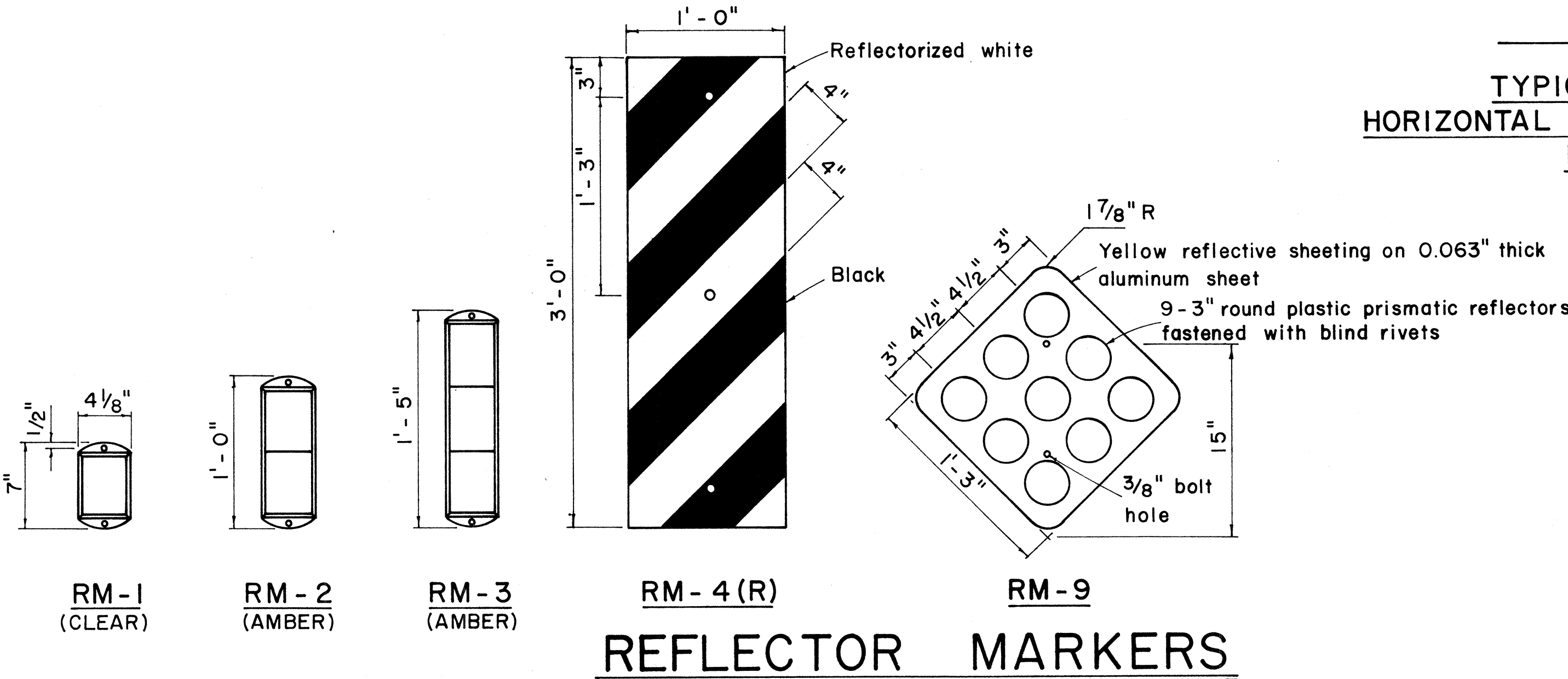
| NO. | REVISION | APPROVED BY | DATE |
|-----|----------|-------------|------|
|     |          |             |      |

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
HIGHWAYS DIVISION

**STANDARD DETAILS**  
MISCELLANEOUS SIGN DETAILS

Not to scale March, 1968

SHEET No. OF SHEETS DT 100



REFLECTOR MARKERS

|               |      |
|---------------|------|
| ORIGINAL PLAN | DATE |
| DRAWN BY      |      |
| DESIGNED BY   |      |
| QUANTITIES BY |      |
| CHECKED BY    |      |



