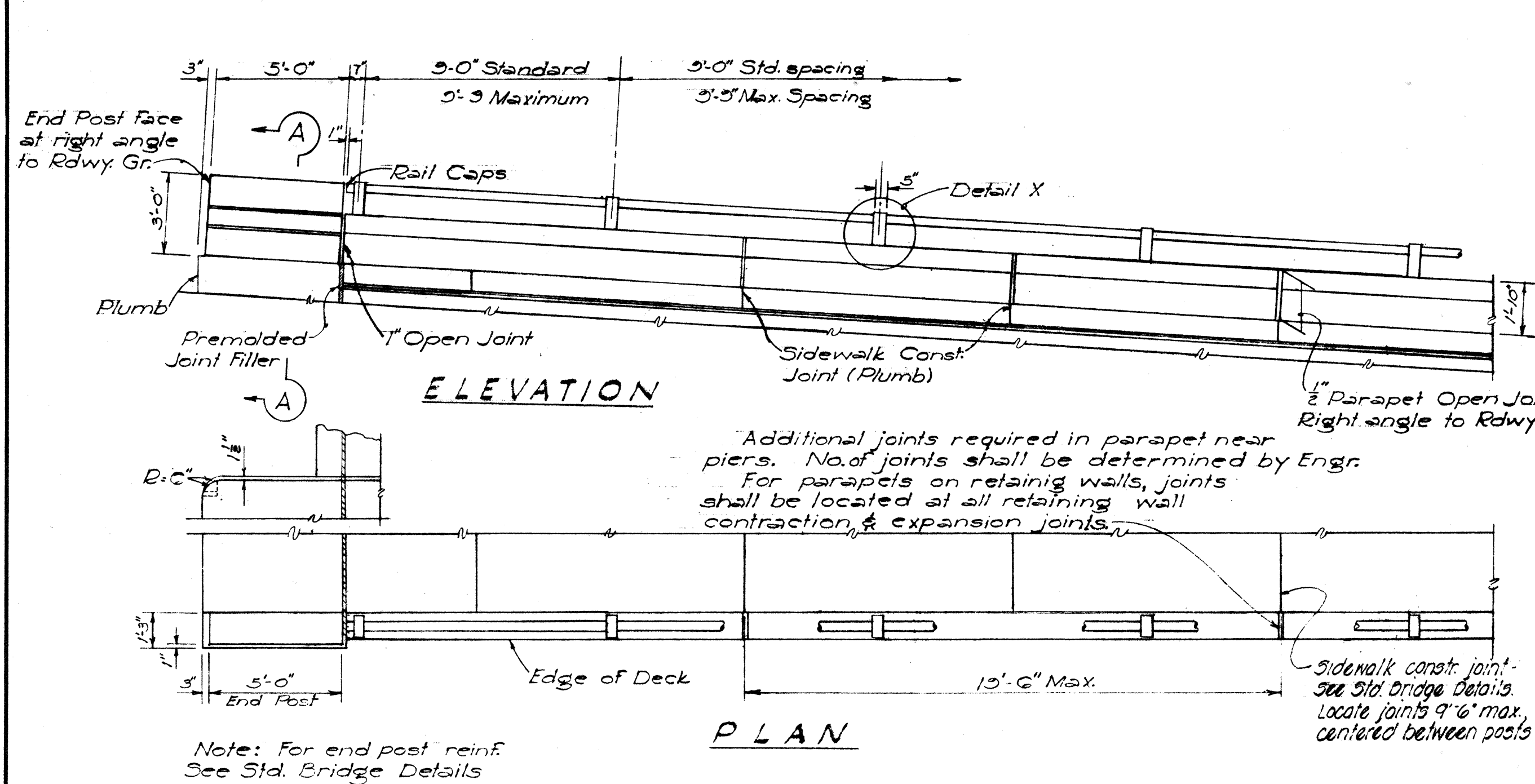
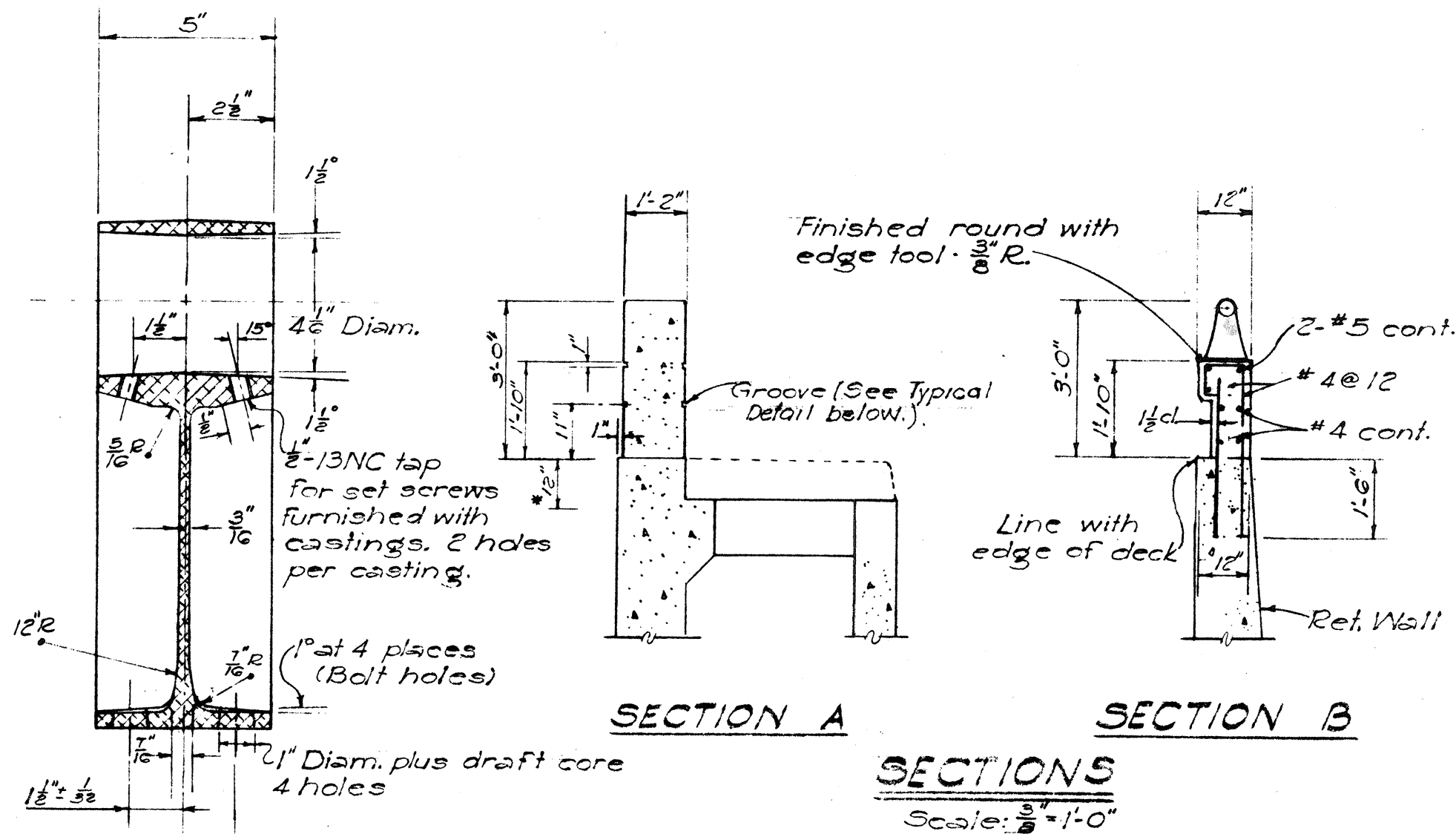
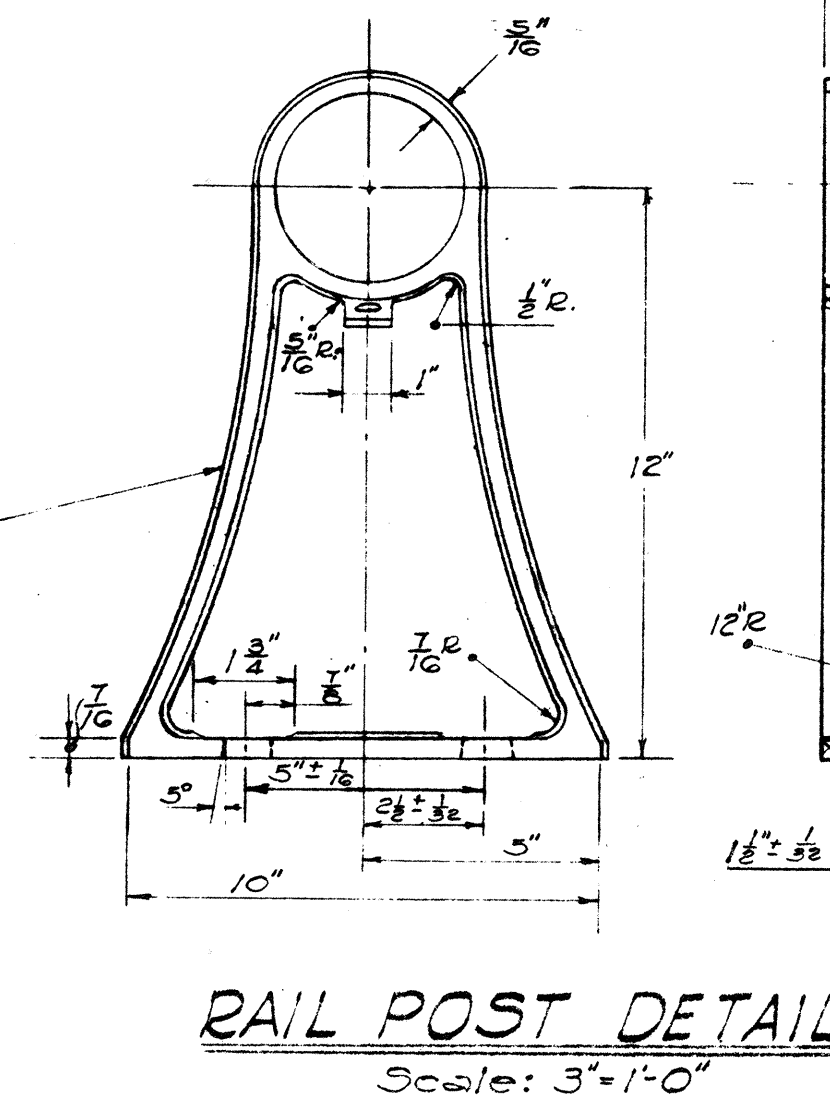
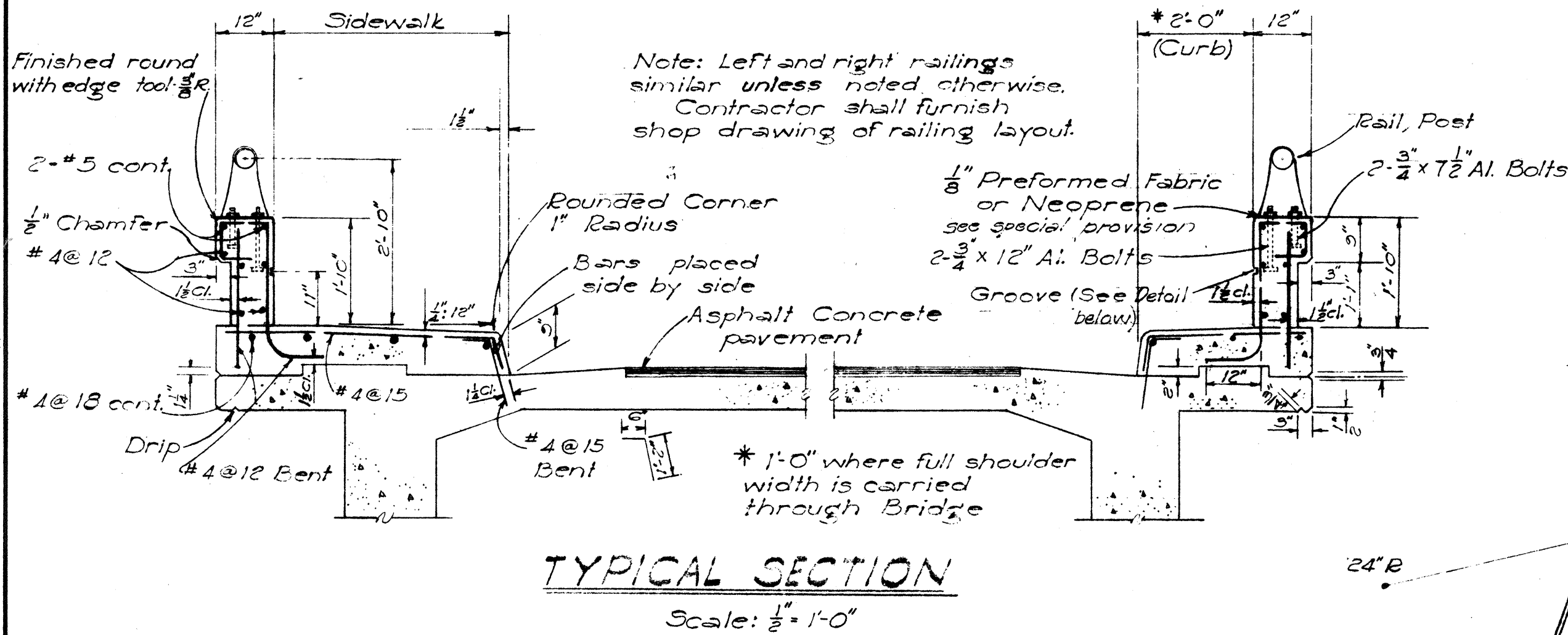




ALUMINUM RAILING DETAIL
Scale: $\frac{1}{4}'' = 1'-0''$

ANCHOR BOLT DETAIL
Scale: $3'' = 1'-0''$

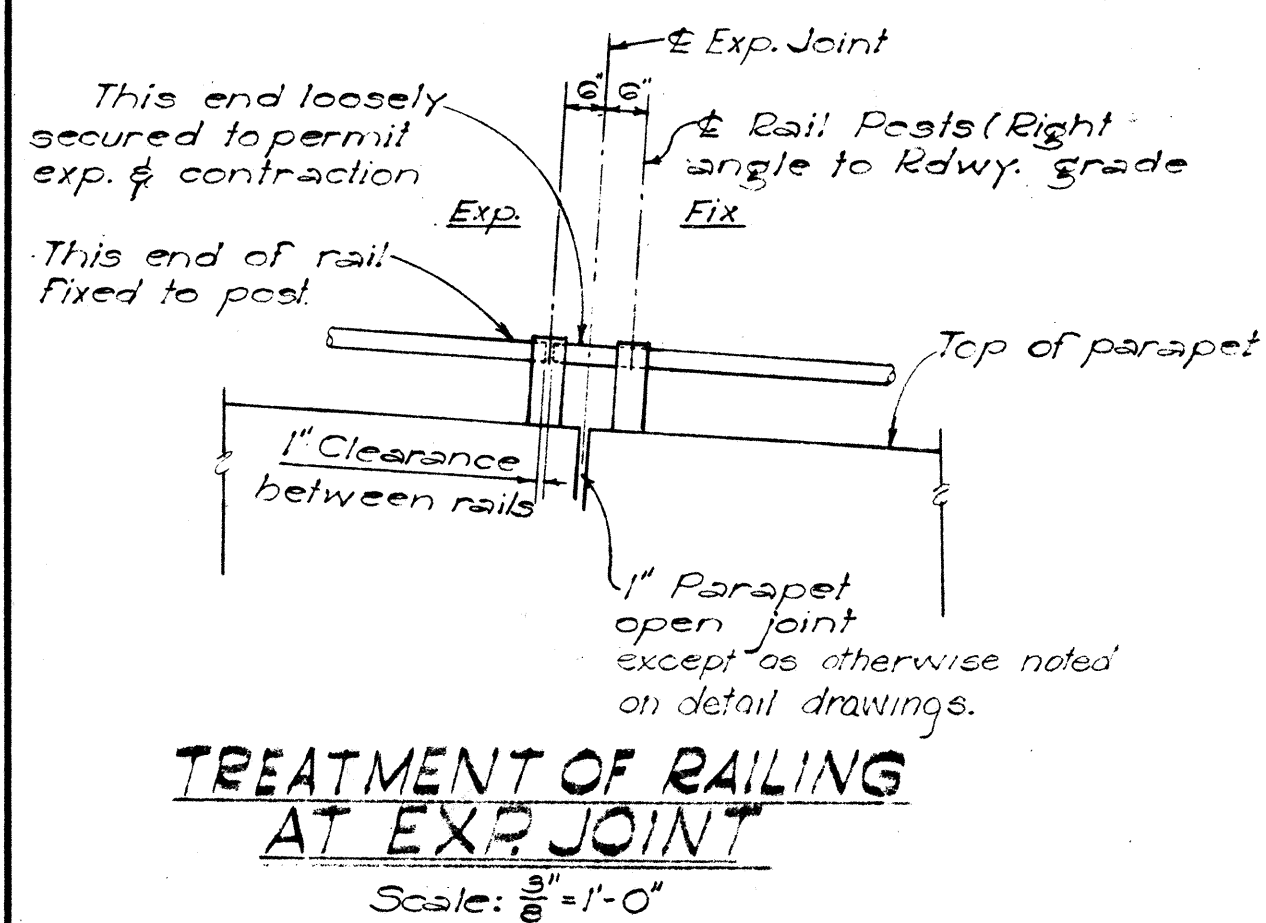
TREATMENT OF RAILING ON RETAINING WALL
Scale: $\frac{1}{4}'' = 1'-0''$



GENERAL NOTES

Except where detailed otherwise in the plans all details on this sheet govern.
Concrete parapet for Aluminum railing & end post to receive "Class 2" Surface Finish.

ITEM	DESCRIPTION	ALLOY	UNIT WT.
RAIL	Al Alloy Drawn or Extruded Tube 4" O.D. x $\frac{5}{8}$ " thick wall	6061-T6	1.75#/ft.
* RAIL POST	Permanent Mold Casting See Rail Post Detail	Post-A35G-T6 Set 50-2024-T4	11.20#/Ea.
RAIL CAP	See Rail Cap Detail	Cap-35G-T6	0.415#/Ea.
BOLTS	See Anchor Bolt Detail. Provide Hex. nut and plain washer.	Bolt 2024-T4 Nut 6051-T6 Wash. 2024-T4	
*	Rail Post Finish: Front, top, and rear faces shall receive scratch brush finish, to be approved by the Engineer.		



TYPICAL CONCRETE RAILING & END POST GROOVE DETAIL
Scale: $3'' = 1'-0''$

REDUCED PLANS
SCALES REDUCED
ACCORDINGLY

APPROVED Oct. 19 1960 DATE:
DIRECTOR, STATE TRANSPORTATION DEPT.

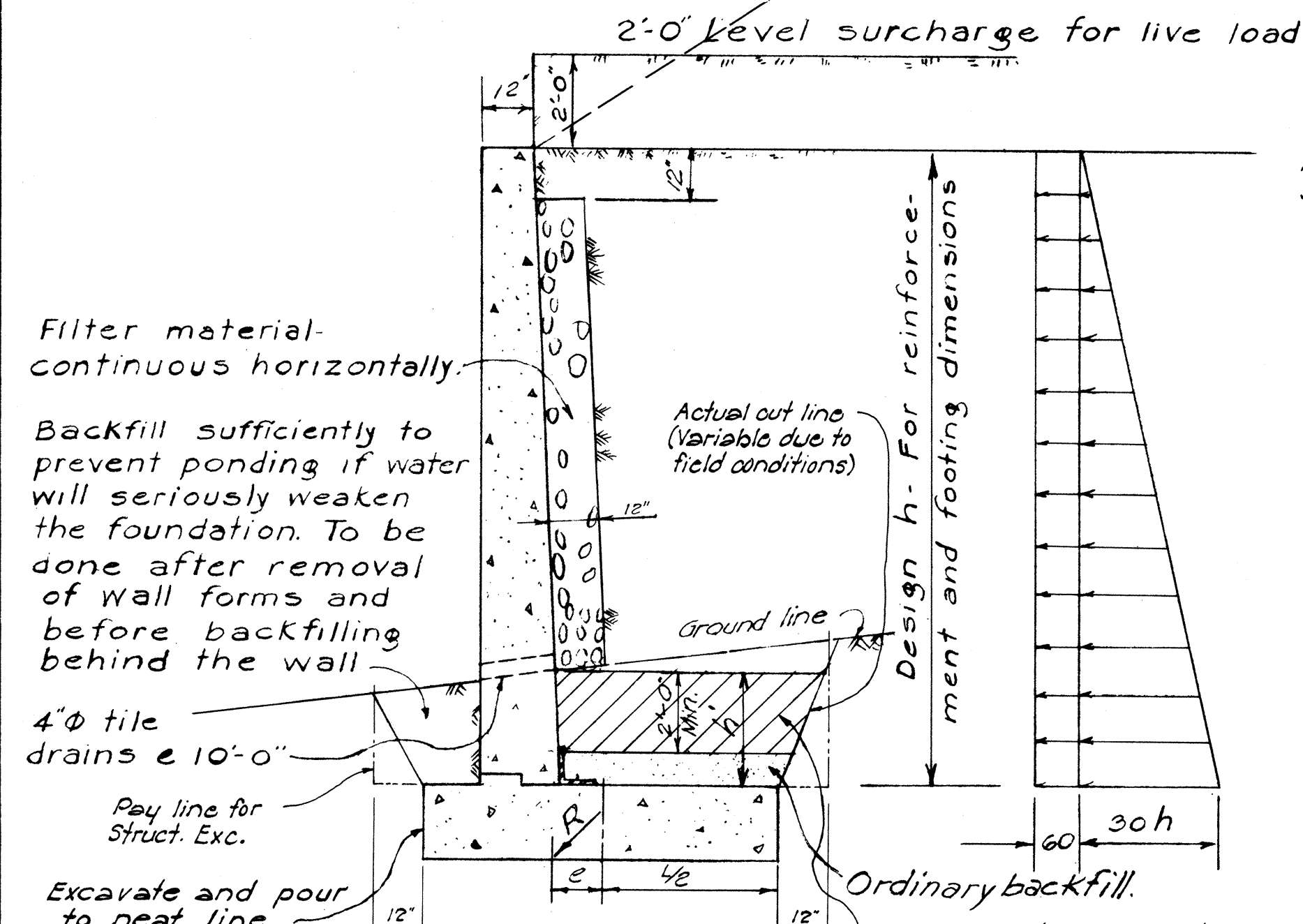
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STATE OF HAWAII

STANDARD DETAILS
ALUMINUM RAILING

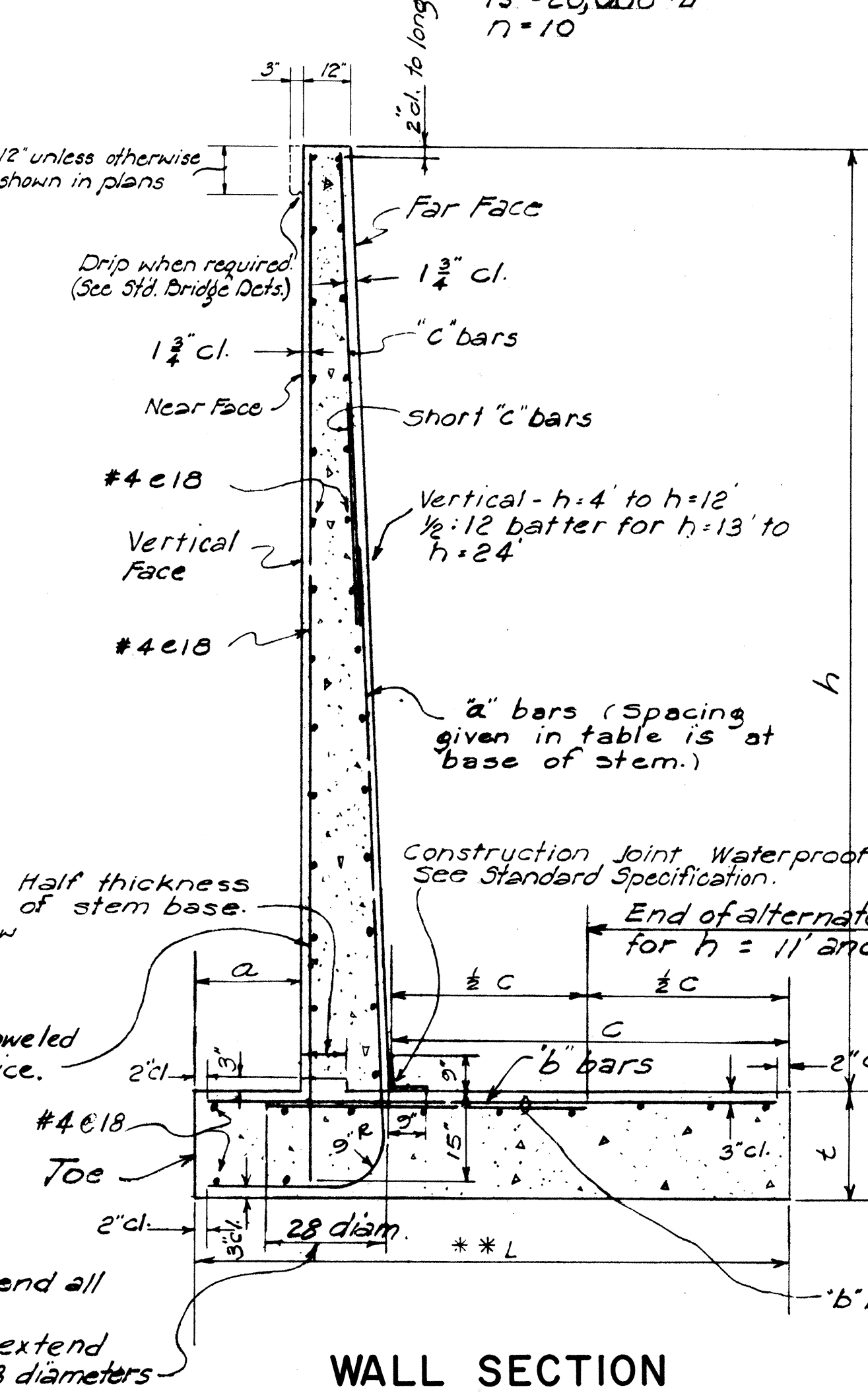
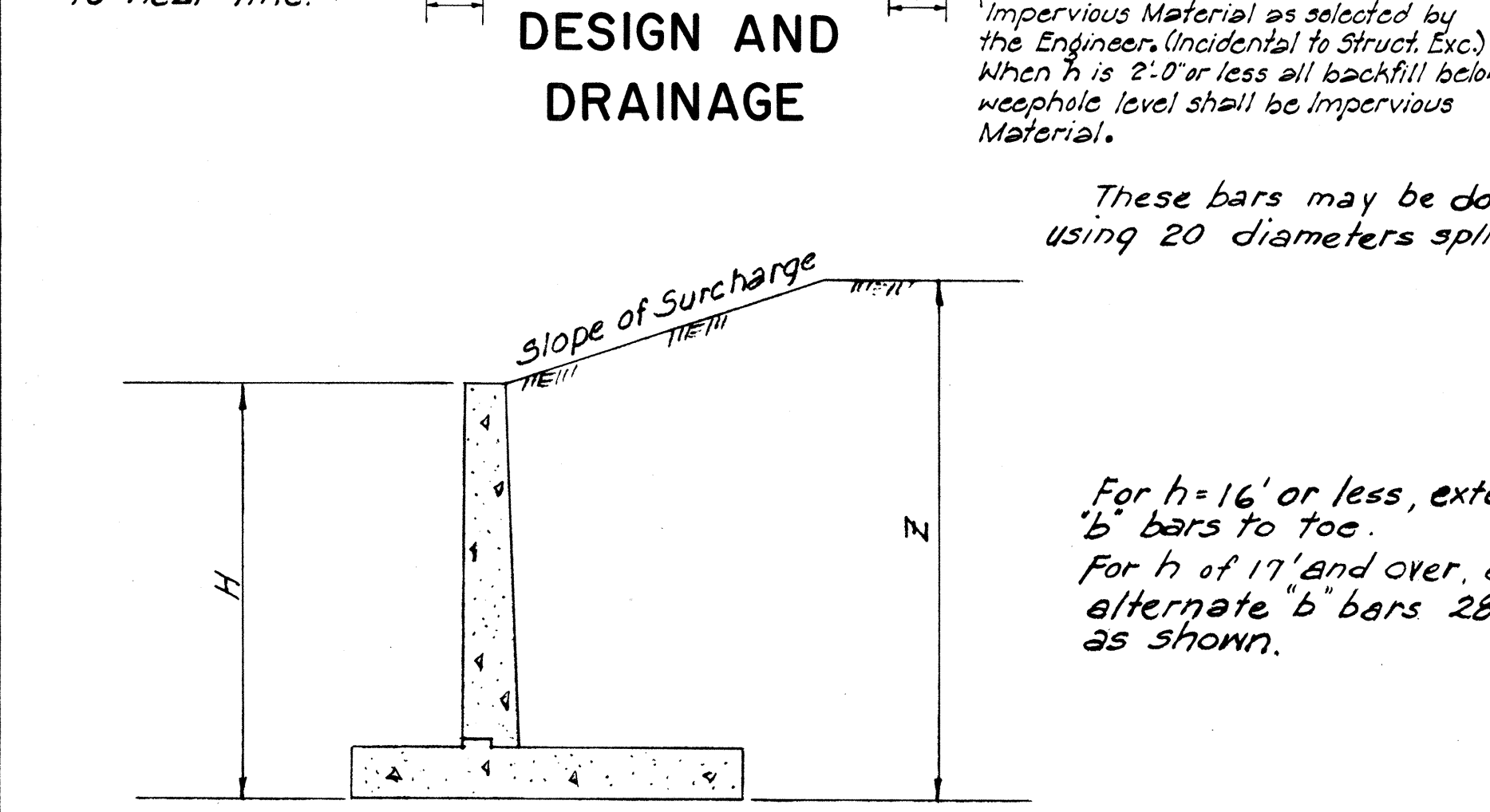
SCALE AS NOTED

SHEET NO. OF SHEETS

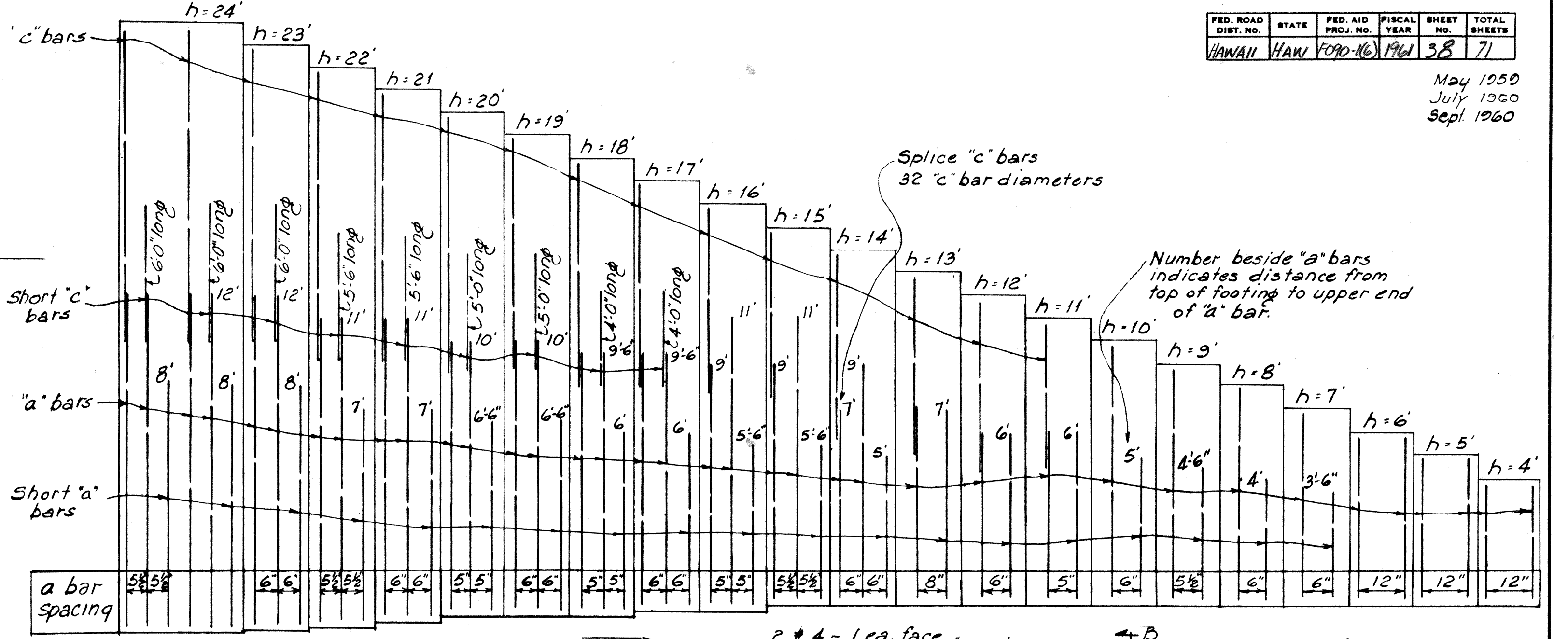
May 1959
July 1960
Sept 1960



DESIGN AND DRAINAGE

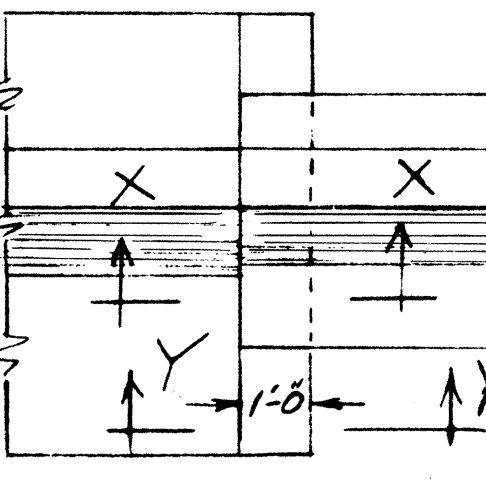


WALL SECTION



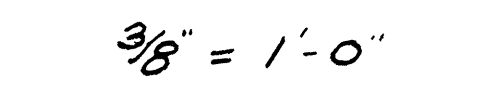
TYPICAL ARRANGEMENT FOR SLOPING WALLS

SECTION X-X



FOOTING STEP

SECTION Y-Y



JOINT DETAIL

(Spacing of Joints)
Contraction Joint - 30'-0" Max
Expansion Joint - 90'-0" Max

GENERAL NOTE

Except where detailed otherwise in the plans, all details on this sheet govern.

SPECIAL CASES:

- Retaining walls shown are also applicable for the following conditions of loading:
 - For $h = 4'$ to $7'$
1.58:1 or less sloping surcharge unlimited.
1.5:1 sloping surcharge limited to $\frac{H}{4} = 2.3$
 - For h of 8 and 9'
1.62:1 or less sloping surcharge unlimited.
1.5:1 sloping surcharge limited to $\frac{H}{4} = 1.8$
 - For h of 10 and 11'
1.9:1 or less sloping surcharge unlimited.
1.5:1 sloping surcharge limited to $\frac{H}{4} = 1.4$
 - For $h = 13, 14,$ and $15'$
2.2:1 or less sloping surcharge unlimited.
1.5:1 sloping surcharge limited to $\frac{H}{4} = 1.2$
 - For $h = 18$ to $21'$
2.7:1 or less sloping surcharge unlimited.
 - For $h = 22'$ to $24'$
3:1 sloping surcharge unlimited

* Special cases are not applicable if traffic can come within a distance from the top of the stem equal to one-half its height.

** When footing is on rock, L shall be reduced to $L_p = 0.4(h+t+2')$ to increase footing pressure. L_p shall be measured from the toe. Adjust footing design accordingly.

TABLE OF DIMENSIONS AND REINFORCING STEEL

h	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	21'	22'	23'	24'
a	6"	6"	6"	12"	12"	12"	12"	12"	12"	12"	15"	18"	21"	24"	24"	24"	27"	30"	33"	36"	39"
**L	2.5'	3.0'	3.5'	4.0'	4.5'	5.0'	5.5'	6.0'	6.5'	7.0'	7.75'	8.25'	9.0'	9.75'	10.5'	11.5'	12.5'	13.5'	14.5'	15.25'	16.0'
t	14"	14"	14"	14"	14"	14"	14"	18"	18"	18"	18"	18"	21"	21"	24"	24"	24"	27"	30"	31"	33"
"a" bars	#3 @ 12	#3 @ 12	#4 @ 12	#3 @ 6	#4 @ 6	#4 @ 5 1/2	#5 @ 6	#5 @ 5	#6 @ 6	#6 @ 8	#6 @ 6	#6 @ 5 1/2	#6 @ 5	#7 @ 6	#7 @ 5	#8 @ 6	#8 @ 5	#9 @ 6	#9 @ 5 1/2	#10 @ 6	#10 @ 5 1/2
"b" bars	#3 @ 12	#3 @ 12	#3 @ 12	#3 @ 12	#3 @ 12	#4 @ 11	#5 @ 12	#5 @ 10	#5 @ 6	#6 @ 8	#6 @ 6	#6 @ 5 1/2	#6 @ 5	#7 @ 6	#7 @ 5	#8 @ 6	#8 @ 5	#9 @ 6	#9 @ 5 1/2	#10 @ 6	#10 @ 5 1/2
"c" bars	—	—	—	—	—	—	—	#4	#4	#4	#4	#4	#4	#4	#4	#5	#5	#6	#6	#7	#7
F.S. Sliding *	1.30	1.29	1.28	1.16	1.17	1.18	1.17	1.17	1.20	1.23	1.25	1.21	1.25	1.26	1.33	1.39	1.42	1.48	1.53	1.53	1.54
F.S. Overturning	1.38	1.45	1.50	1.54	1.61	1.64	1.63	1.71	1.76	1.81	1.96	1.97	2.05	2.19	2.47	2.49	2.70	2.85	3.02	3.06	3.11
Concr. C.Y./ft	0.26	0.32	0.37	0.43	0.49	0.55	0.61	0.74	0.81	1.00	1.10	1.19	1.37	1.49	1.69	1.83	1.97	2.26	2.53	2.72	2.97
Steel lbs./ft	11.1	13.5	17.7	20.0	27.3	32.8	43.8	51.0	67.7	59.6	76.2	87.8	103.7	125.8	145.4	178.3	222.7	249.2	278.4	339.0	376.6
Eccentricity e	0.88'	1.01'	1.14	1.21	1.20	1.42	1.63	1.63	1.74	1.83	1.83	1.89	1.93	1.89	1.98	1.94	1.86	2.00	1.75	1.82	1.82
Toe Pressure	2800	2600	3200	2800	2900	3200	3700	3600	3800	4100	3800	3900	3900	3800	4000	3900	4100	3900	4100	4100	4100

* F.S. Against Sliding based on friction factor of 0.40

APPROVED: _____ DATE: Aug. 29, 1959
STATE HIGHWAY ENGINEER

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STATE OF HAWAII

RETAINING WALL STANDARDS

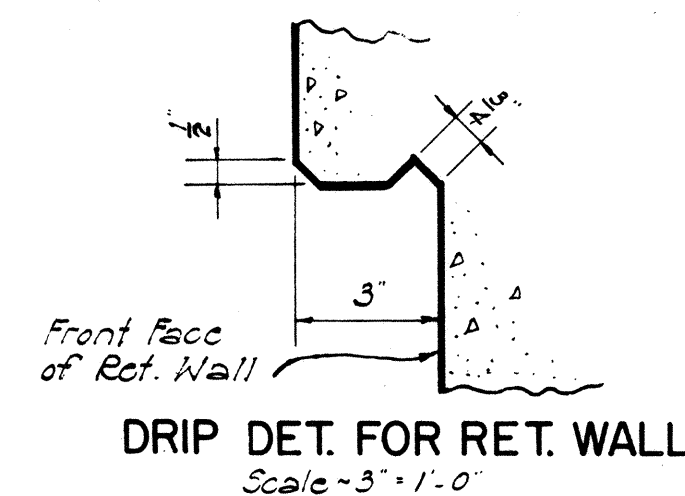
SCALES AS NOTED MAY 1956

SHEET NO. OF SHEETS

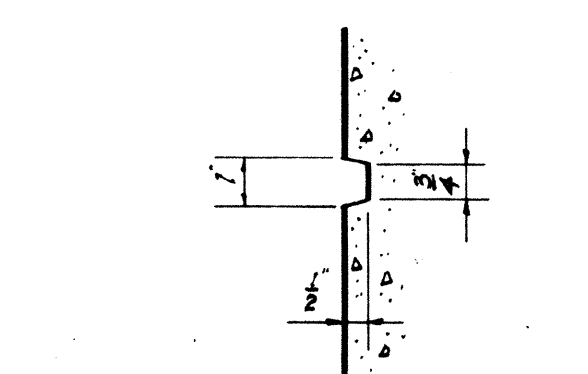
NAME DATE
Use correct name of bridge Date of year built
LEFT HAND SIDE RIGHT HAND SIDE

DETAIL OF LETTERS AND FIGURES AT BOTH APPROACHES

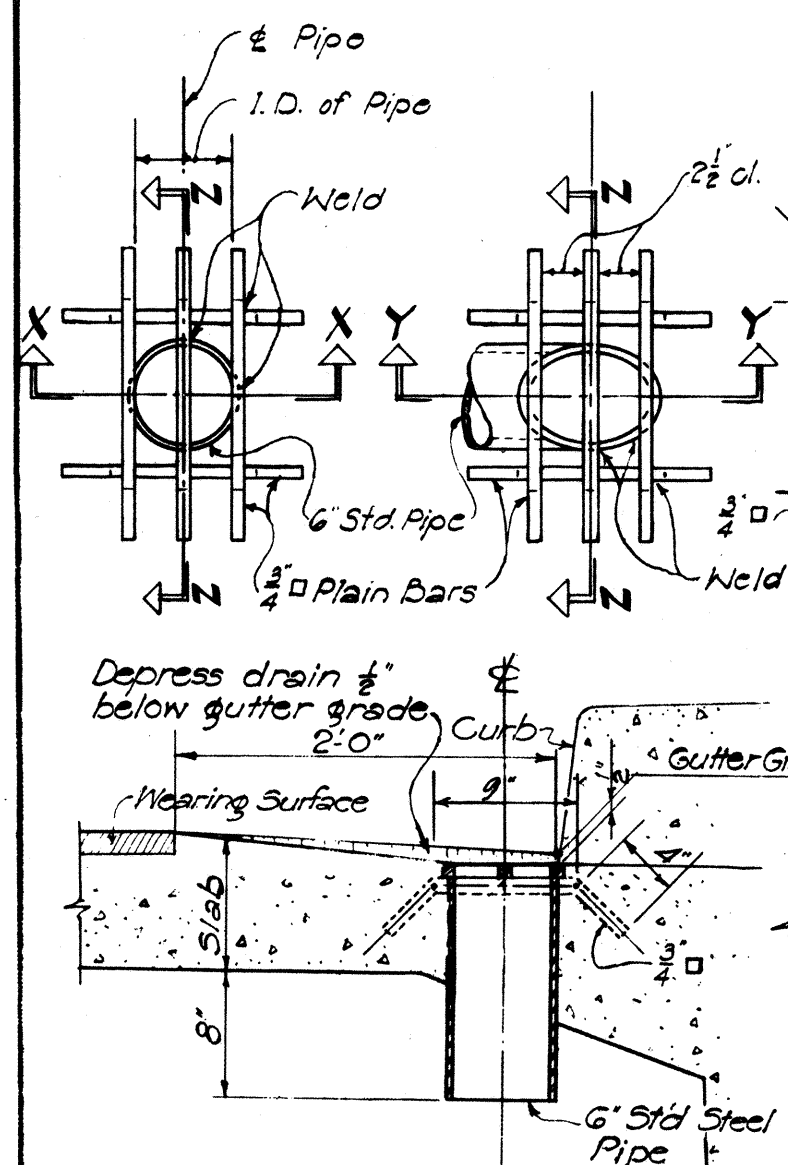
NOTE: Name of bridge to be placed in left end post panels and date in right post panels on entering bridge using modified block letters 3" in height. In case of stream crossings use name of stream for name of bridge. For all others use name as designated by the Engineer.



DRIP DET. FOR RET. WALL
Scale: 3/4"=1'-0"



END POST GROOVE DET.
Scale: 3/4"=1'-0"



SECTION "X-X"

DRAINAGE DETAIL

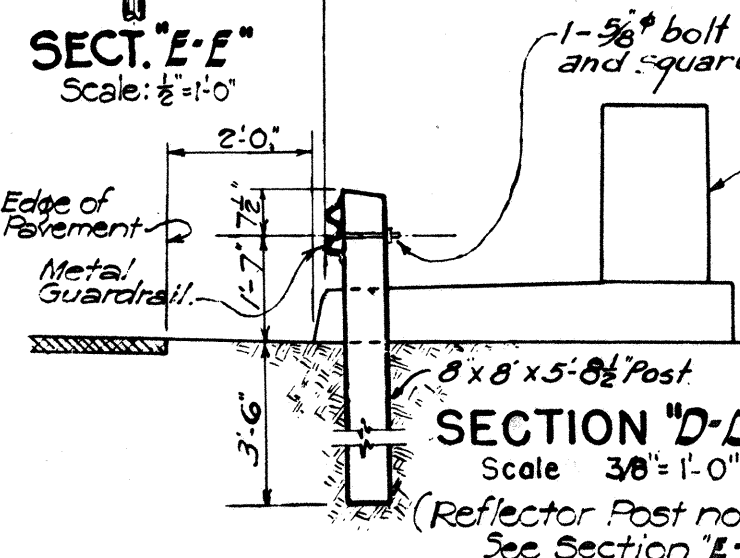
Scale: 1/2"=1'-0"

SECTION "Y-Y"

SECTION "Y-Y"

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

NOTE: See REGULATORY & WARNING Signs Sheet for details of W-42, W-43, and railing posts. See Std. Details Sheet for reinforcement of conc. posts.



SECTION "D-D"

Scale: 3/8"=1'-0"

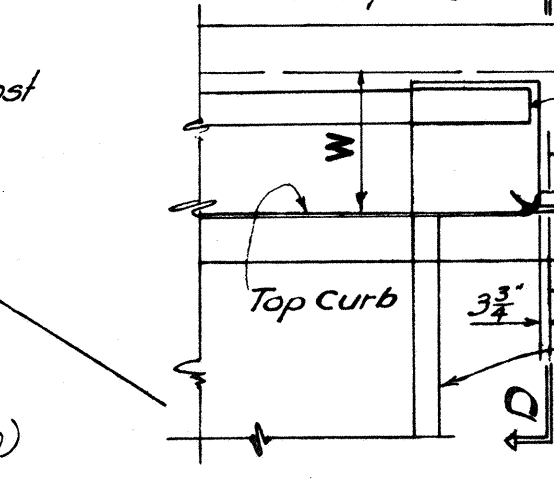
(Reflector Post not shown) See Section "E-E"

SECTION "Z-Z"

SECTION "Z-Z"

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

NOTE: Metal drains shall be considered incidental to Class A-1 Concrete in both concrete and steel bridges and will not be paid for separately. Assembly of grillage and pipe shall be hot-dip galvanized after all welding is completed.



SECTION "Z-Z"

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

(Reflector Post not shown) See Section "E-E"

GENERAL NOTES

CONCRETE: Class of concrete to be used in different parts of the structure are as noted on plans.
REINFORCING STEEL: All reinforcing steel shall be Billet Steel Bars A.S.T.M. A15 intermediate grade.
Steel shall be made by the open-hearth or Electric Furnace Process. Mill certificate shall be required.

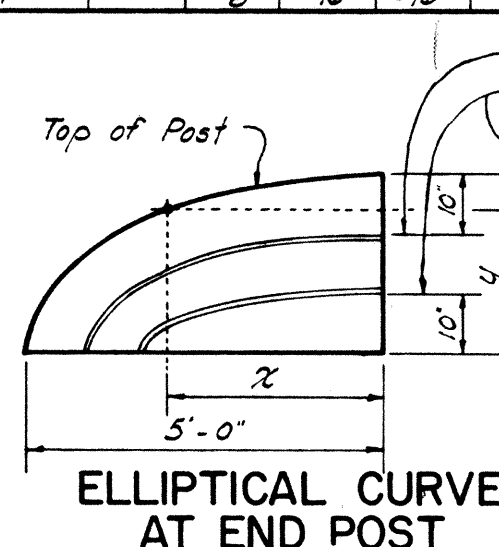
Deformations shall conform to A.S.T.M. A305.
Splicing of reinforcing other than in main deck slab, girder and frame bars shall be done as shown in above sketch except where shown otherwise. Splices are to be staggered. Splices in main girder and frame bars are permitted only in bars exceeding 60'-0" in length at points to be indicated by the Engineer. These splices to be electrically are welded according to detail and specifications. No allowance will be made in the quantities for extra weight of steel required for splices not shown on the plans.

Minimum spacing between parallel bars shall be 2 1/2 times the diameter of bars, but in no case shall the clear distance between the bars be less than 1 1/2 times the maximum size of the coarse aggregate.
Minimum covering, measured from the surface of the concrete to the face of any reinforcing bar, shall be not less than 2 inches except in slabs where the minimum covering shall be 1 1/2 inches. In the footings of abutments and retaining walls and in piers the minimum covering shall be 3 inches. In work exposed to the action of sea water the minimum covering shall be 4 inches except in precast concrete piles where a minimum of 3" may be used.
All dimensions relating to reinforcing are to centers of bars unless otherwise noted.

CONSTRUCTION JOINTS: All construction joints to have surface roughened and 1:2 cement grout applied immediately before the second pour. Construction joints to be located at places indicated in the plans. See Sec. 46.3.F(3) of the "Standard Specifications."

ELLIPSE COORDINATES

Top of Post	X	0	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	4'-10"	5'-0"
Y	0	2'-6"	2'-5 1/2"	2'-4 1/2"	2'-3 1/2"	2'-2 1/2"	2'-1 1/2"	2'-0"	1'-9 1/2"	1'-6"	1'-3 1/2"	0
Top Line of Upper Groove	X	0	6"	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"
Y	0	1'-8"	1'-7 1/2"	1'-7 1/2"	1'-6 1/2"	1'-5 1/2"	1'-4 1/2"	1'-3 1/2"	1'-2 1/2"	1'-1 1/2"	1'-0"	0
Bot. Line of Lower Groove	X	0	6"	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"
Y	0	10"	9 1/2"	9 1/2"	8 1/2"	8"	6 1/2"	5 1/2"	4 1/2"	3 1/2"	2 1/2"	0



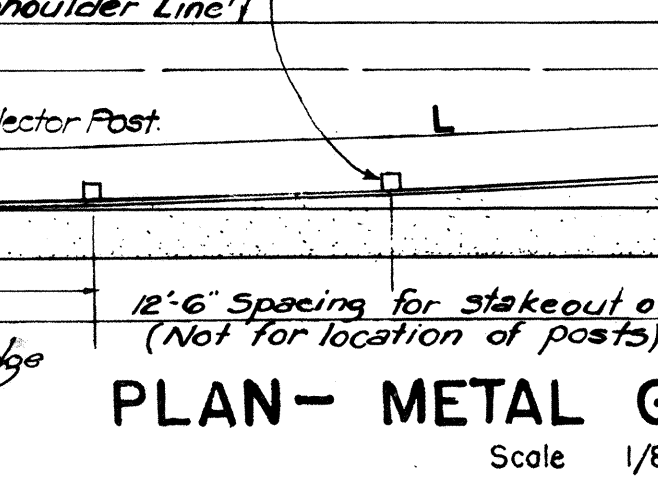
ELLIPTICAL CURVE AT END POST

GUARDRAIL OFFSET

X	W=3'	W=4'	W=5'	W=6'	W=7'	W=8'
12.5	0.19	0.16	0.14	0.12	0.09	0.08
25.0	0.75	0.64	0.55	0.49	0.35	0.32
37.5	1.69	1.44	1.25	1.10	0.78	0.72
50.0	3.00	2.56	2.22	1.96	1.38	1.28
62.5	4.00	3.47	3.06	2.16	2.00	
75.0		5.00	4.41	3.11	2.88	
87.5			6.00	4.23	3.92	
100.0				5.53	5.12	
112.5					7.00	6.48
125.0						8.00

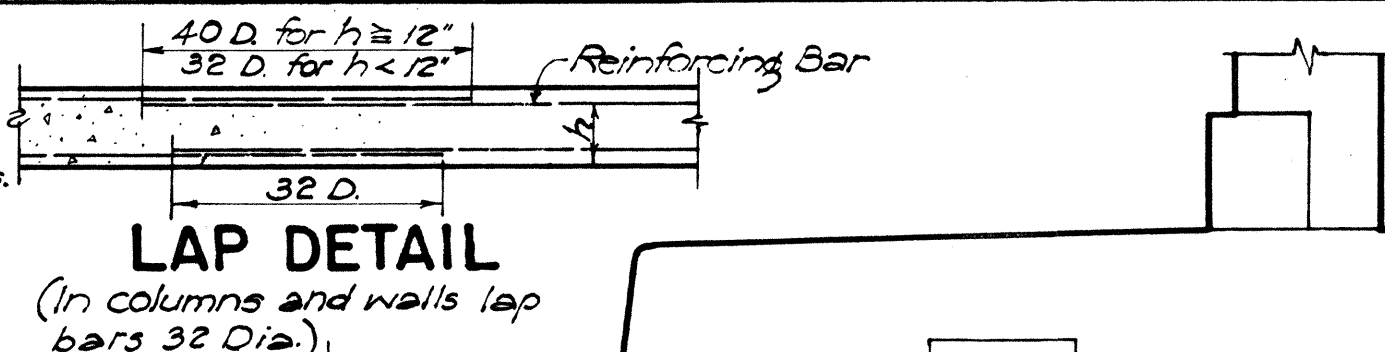
W = Guardrail flare
X = Distance from post at bridge to offset points.
Y = Guardrail flare offset

NOTE: See REGULATORY & WARNING Signs Sheet for details of W-42, W-43, and railing posts. See Std. Details Sheet for reinforcement of conc. posts.



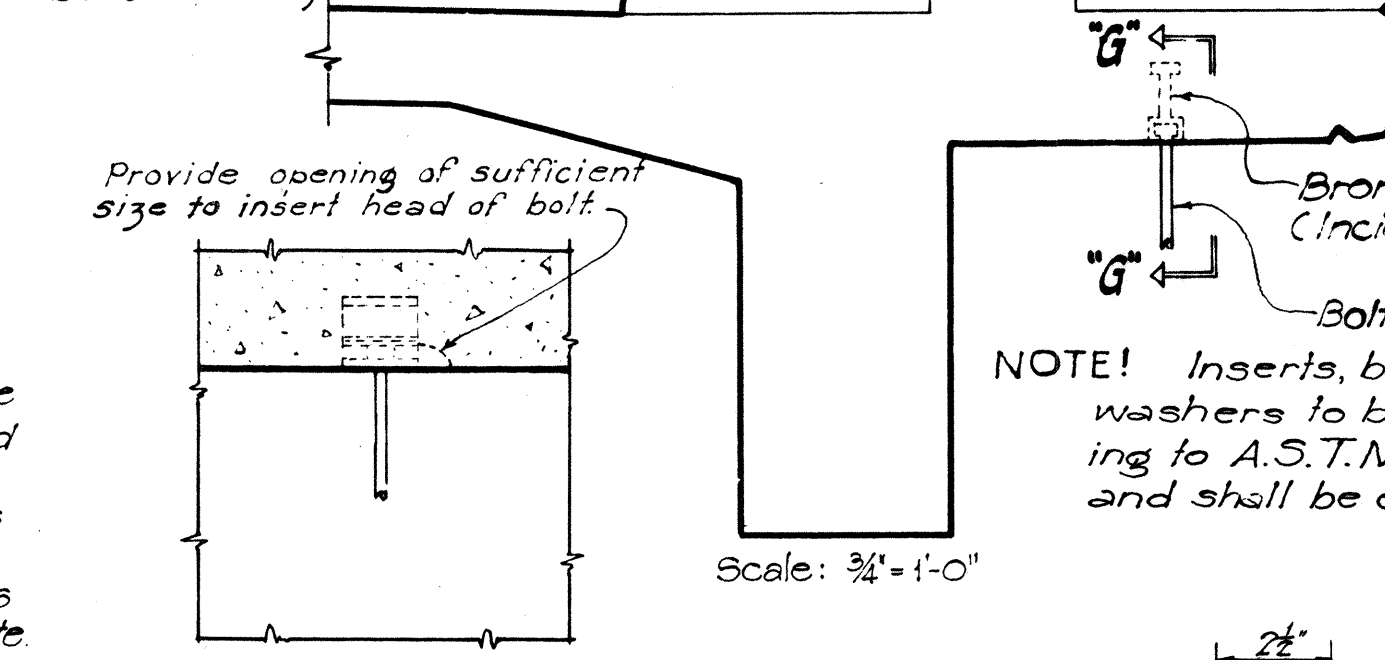
PLAN - METAL GUARDRAIL FLARE

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



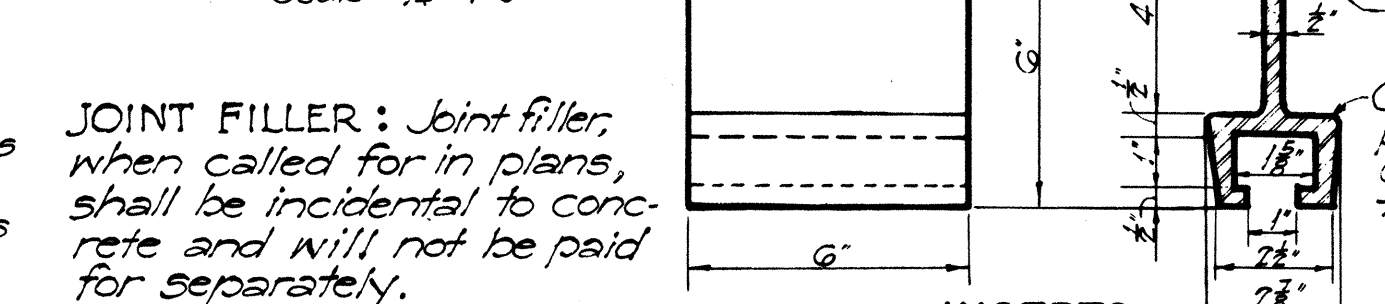
LAP DETAIL

(In columns and walls lap bars 32 Dia.)



SECTION "G-G"

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

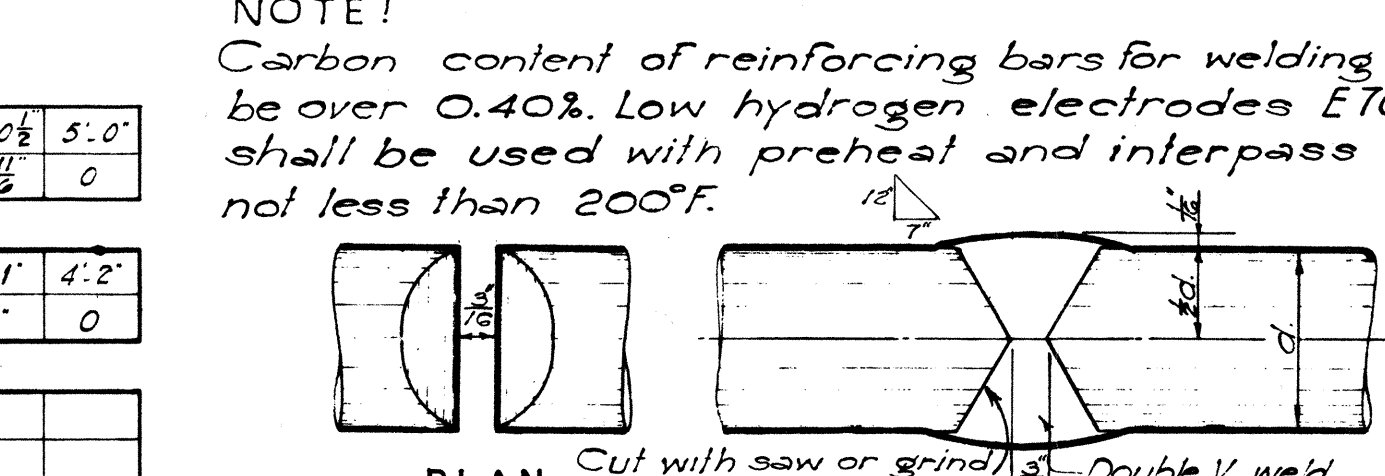


JOINT FILLER

NOTE: Inserts, bolts, plates, nuts & washers to be Bronze conforming to A.S.T.M. Designation B22 and shall be glass 'D' grade.

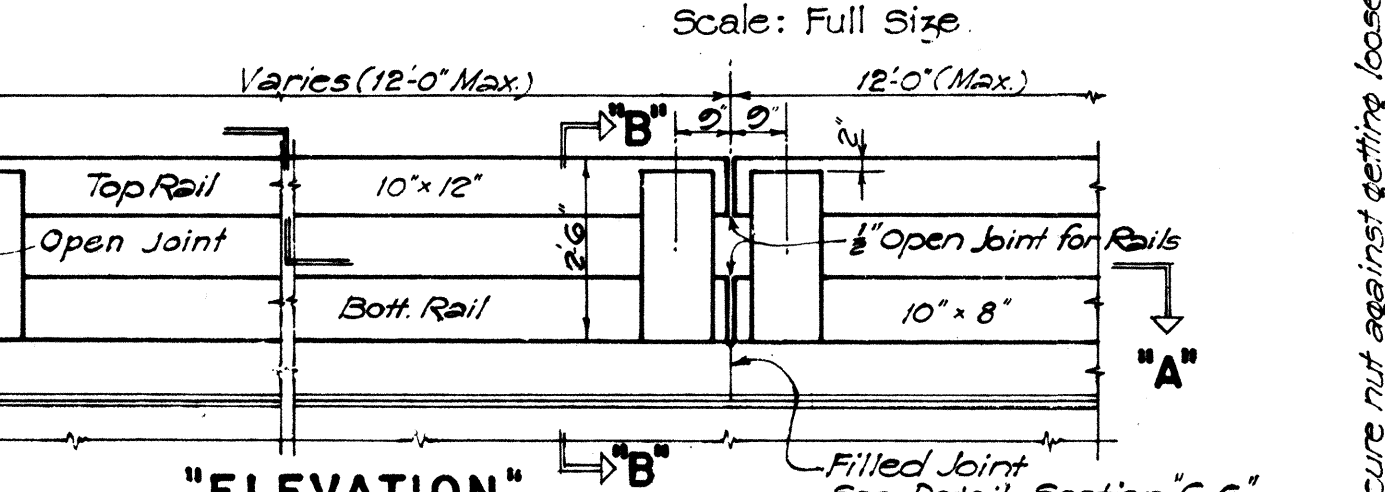
Contractor to take proper precautions to prevent the concrete from flowing into the opening of the insert.

NOTE! Carbon content of reinforcing bars for welding shall not be over 0.40%. Low hydrogen electrodes E7015 or E7016 shall be used with preheat and interpass temperature not less than 200°F.



REINFORCING BAR SPLICE

Scale: Full Size



"ELEVATION" RAILING AND END POST DETAIL

Scale: 3/8"=1'-0"

NOTE: TOP RAIL - Bottom forms for top rails shall be kept in place a minimum of 14 days from date of pour.

Widen for pedestrian walkway when required.

Edge of Pavement

End of Bridge

End Post - W-42 Reflector Post.

Top Curb

12'-6" Spacing for stakeout of guardrail flare (Not for location of posts)

Shoulder Line

8'x8'x5'-8 1/2" Post

1-5/8" bolt with washer and square nut (Galv)

See Std. Details Sheet for reinforcement of conc. posts.

See Proposal Schedule for material.

12'-6" Spacing of posts

Widen for pedestrian walkway when required.

Edge of Pavement

End of Bridge

End Post - W-42 Reflector Post.

Top Curb

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Shoulder Line

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12'-6" Spacing of posts

Widen for pedestrian walkway when required.

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End Post - W-42 Reflector Post.

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12'-6" Spacing of posts

Widen for pedestrian walkway when required.

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End of Bridge

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