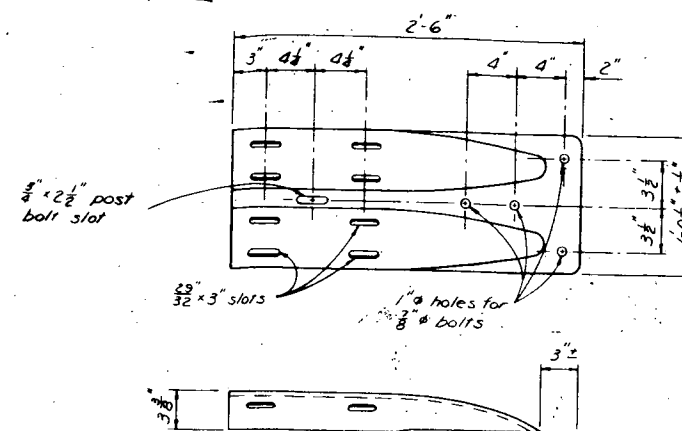


A rectangular loop diagram with two connections. The left vertical line is labeled "Connection A" with an arrow pointing upwards. The right vertical line is labeled "Connection B" with an arrow pointing downwards. Inside the rectangle, two horizontal arrows point in opposite directions, both labeled "Travel Direction". Below the rectangle, three labels are listed: P-17-F, P-16-A, and P-16-D.

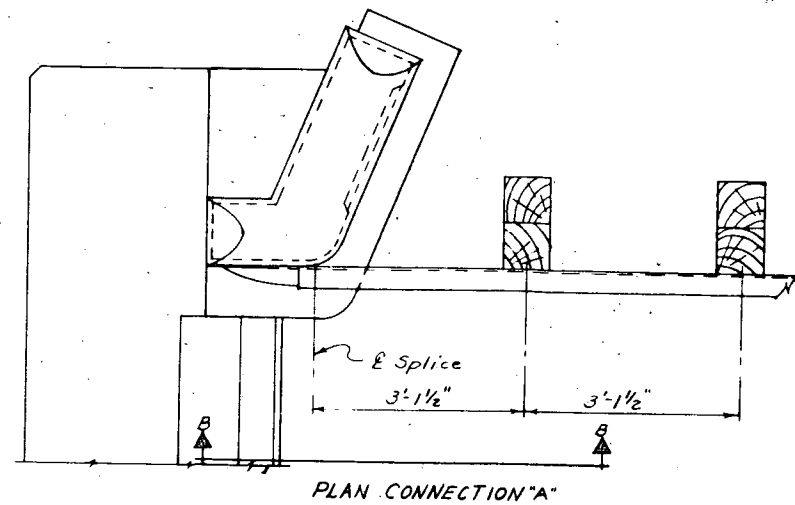


SPECIAL END SHOE  
4-REQ'D. EA. STR.

*Gen. Notes*  
For additional details of guard rail and its installation not shown on these sheets see Std. M-606-AB.

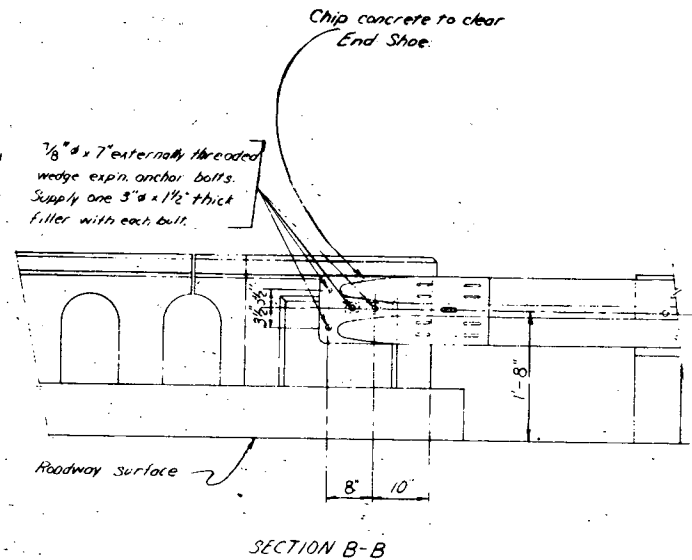
All work necessary to accomplish the above shall be included in the bid price for Item No. 606, Guard Rail Type 3.

The special end shoe shall be 10 ga. steel and galvanized in accordance with ASTM Designation: A 93 or A 123 with coating class 250.

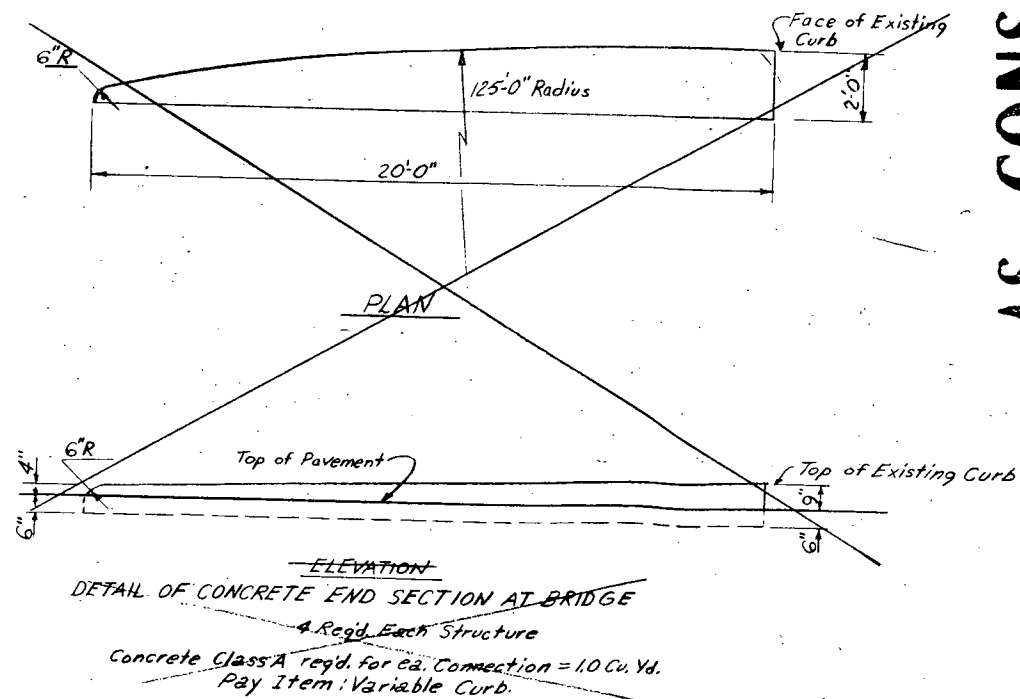


AS CONSTRUCTED  
NO REVISIONS DATE 11/3

May 24, 1973



GUARD RAIL CONNECTION "A"  
4 Req'd. Ea. Structure



<b>DIVISION OF HIGHWAYS</b>	
<i>GUARD RAIL (TYPE 3) CONNECTION TO EXISTING STRUCTURE</i>	
Approved:	Designer: <i>L. Peterson</i> Structure Numbers: Date: <i>Sept 6 1978</i>
Bridge Engineer	Designer: <i>D. Shosky</i> OF <i>1</i>
<b>DWG. No. B 1 OF 1</b>	

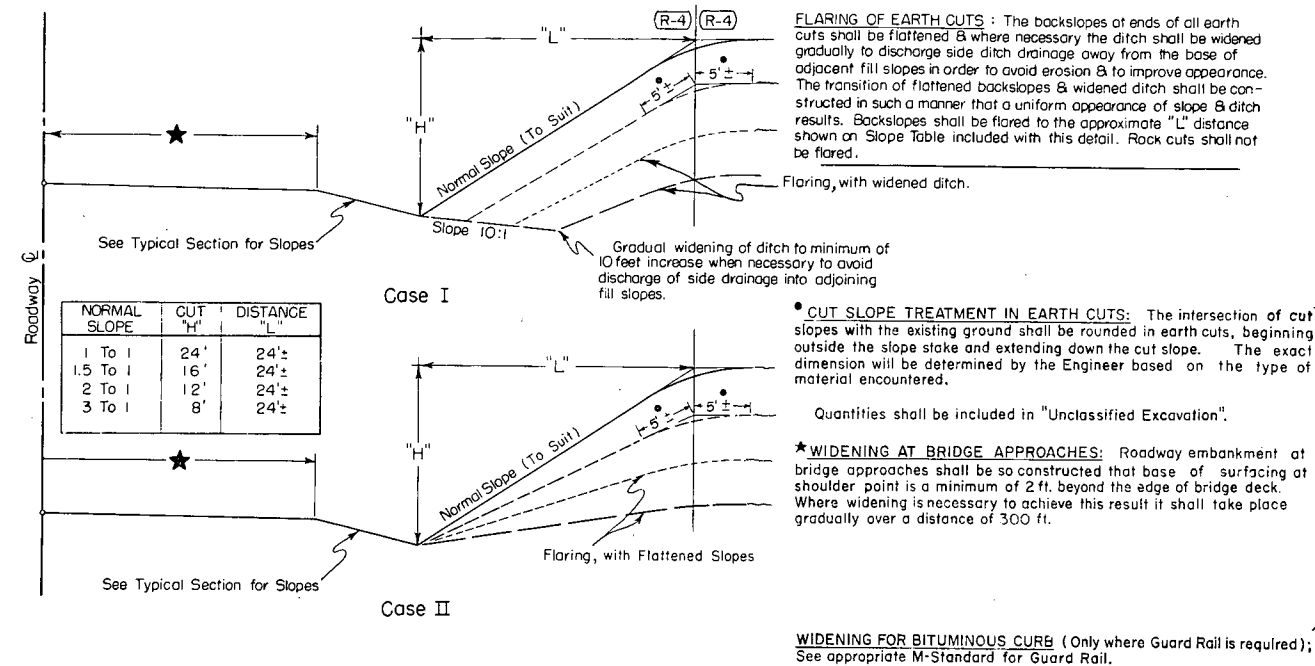
# STANDARD SIDE APPROACH ROADS, FLARING, CUT SLOPE TREATMENT & WIDENING AT BRIDGES AND AT CREST OF GRADES

## STANDARD M-203-B

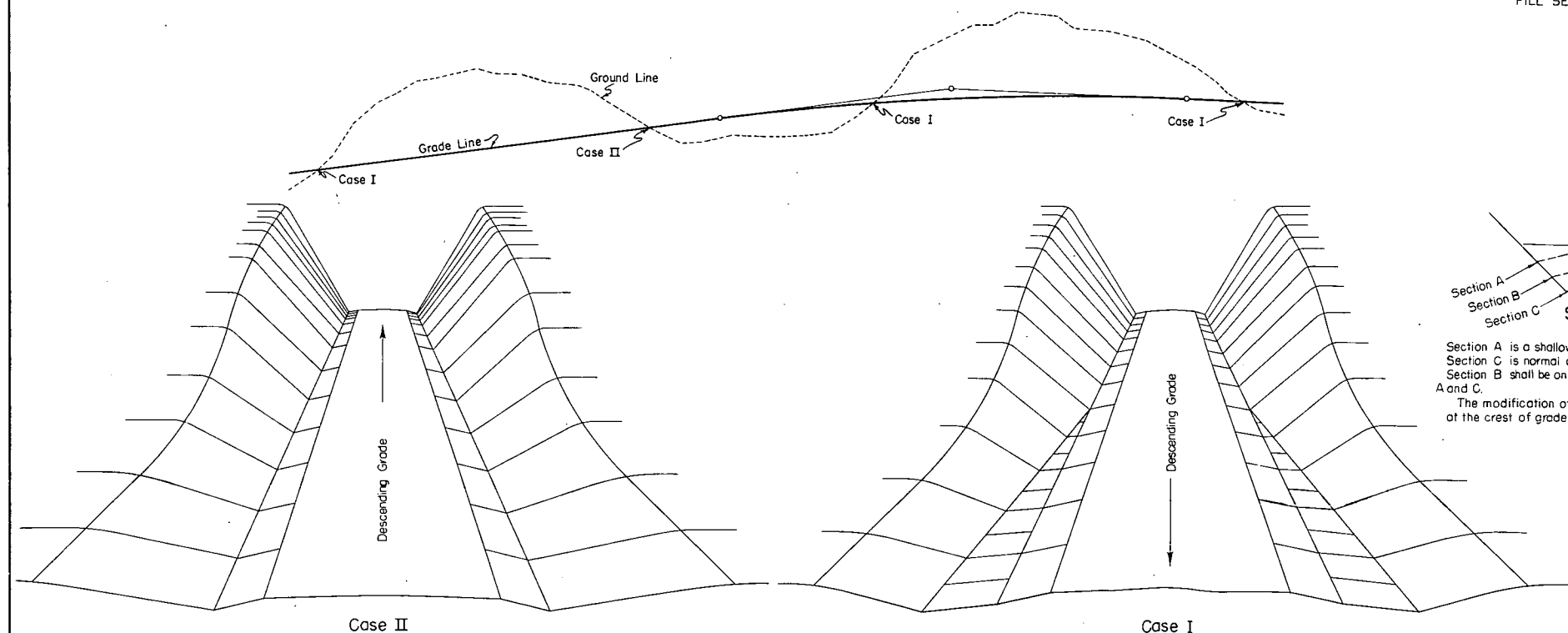
(JULY 1, 1965)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.		

### GENERAL DETAILS FOR FLARING OF EARTH CUTS, CUT SLOPE TREATMENT & WIDENING AT BRIDGES

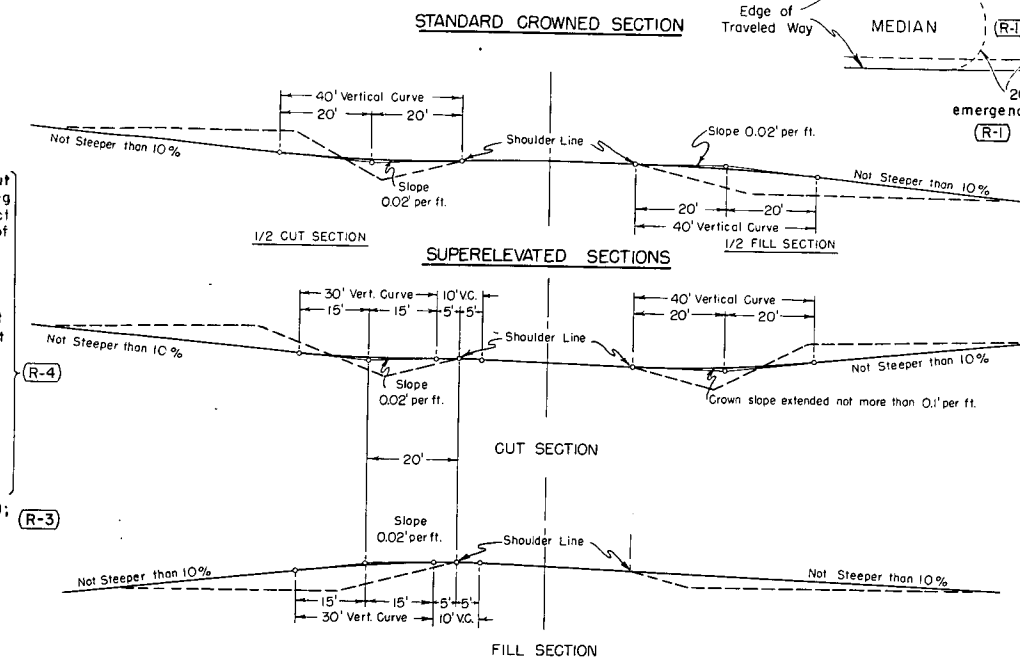
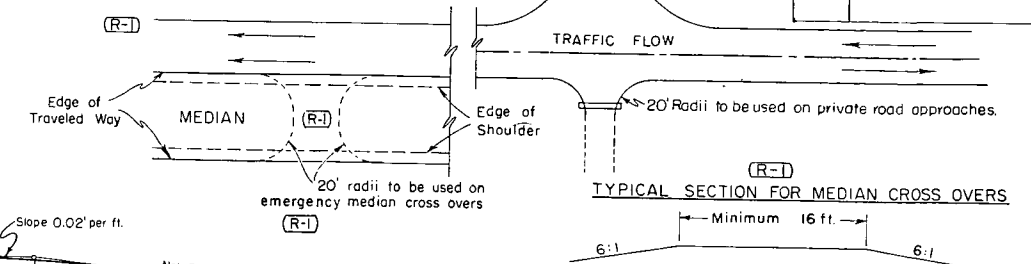


PLAN OF FLARING IN EARTH CUTS



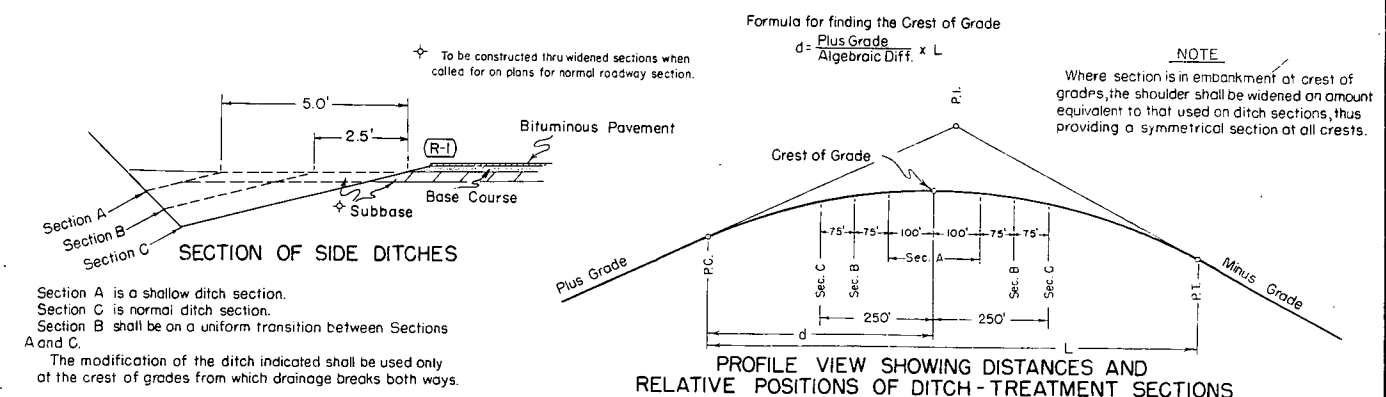
### TYPICAL PLANS FOR SIDE APPROACH ROADS AND EMERGENCY MEDIAN CROSS OVERS

Where practical Side Drains are to be placed in line with the roadway ditches. 50' Radii to be used on all intersecting roads except private approaches. Radii may be varied to suit field conditions.



### DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES

(TO BE USED ONLY WHERE SIGHT DISTANCE AT CREST OF GRADE IS 600 FT. OR LESS)



### GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the Project.

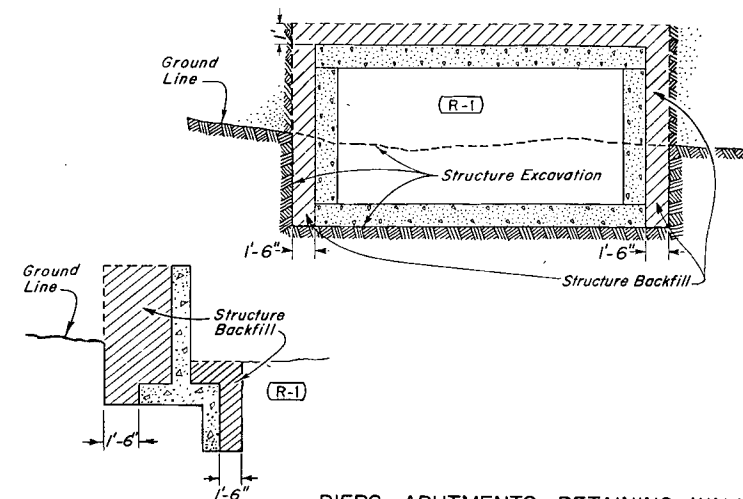
All side approach roads to the Project shall be Gravel Surfaced with a 4 inch thickness of Aggregate Base Course extending approximately to the Right of Way Line. Estimated tonnage and class of material required for this operation are shown in the Aggregate Base Course Plan.

The maximum grades shown are to be the limiting grades for all road approaches. Modifications of grades will be permitted where adherence to the grades as shown would cause damage to property or create other unsatisfactory conditions. Grades flatter than the maximum shown are to be used wherever feasible.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS  
APPROACH ROADS,  
FLARING, CUT SLOPE TREATMENT,  
BRIDGE & CREST WIDENING

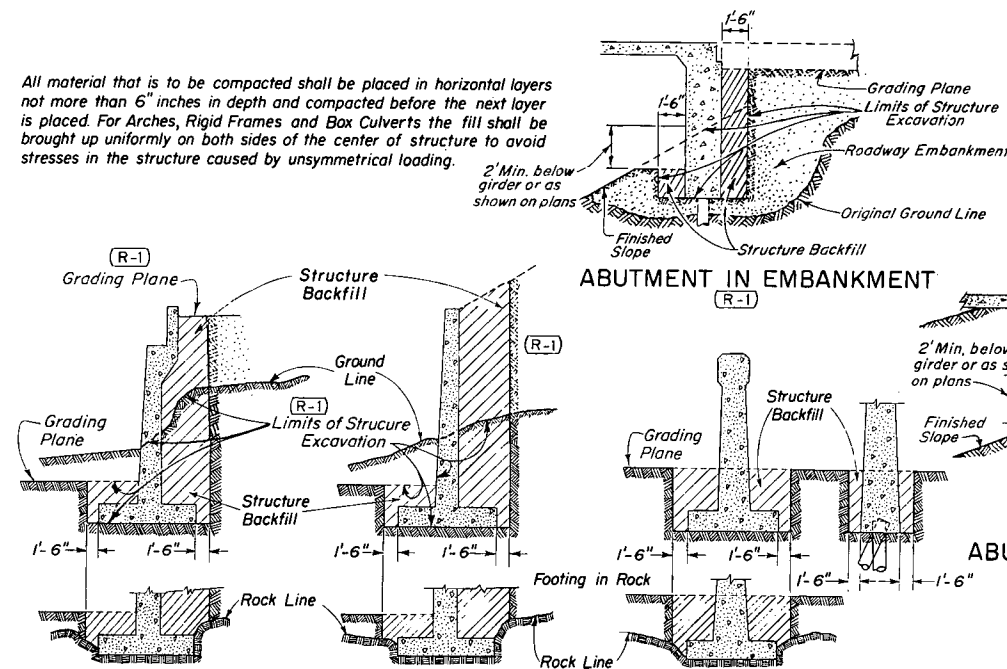
Designed by A. Z. Made by S. J. M. Checked by C. S. Approved by J. E. Staff Design Engr. Date: July 1, 1965.

# CONCRETE BOX CULVERTS & WINGWALLS

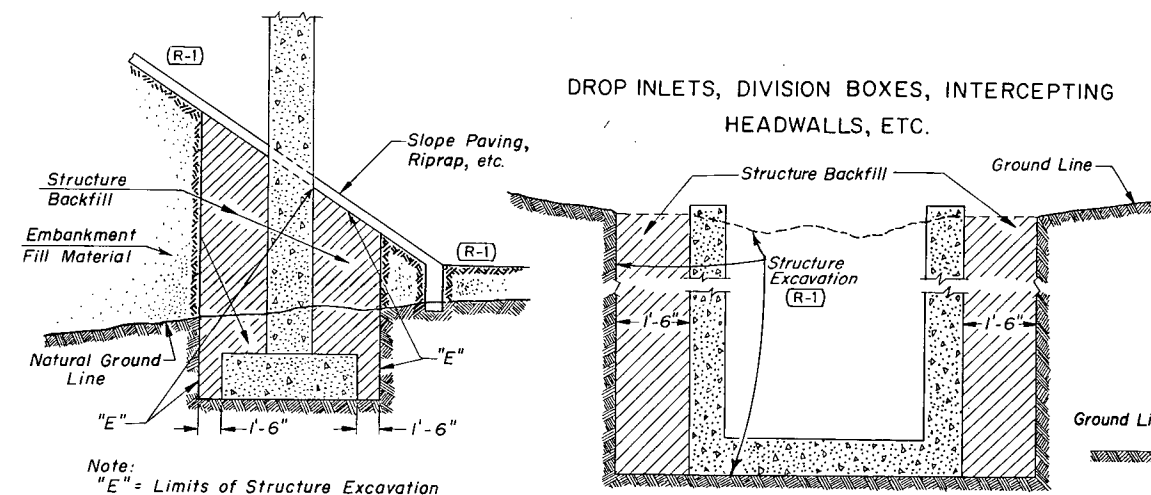


PIERS, ABUTMENTS, RETAINING WALLS ETC.

All material that is to be compacted shall be placed in horizontal layers not more than 6" inches in depth and compacted before the next layer is placed. For Arches, Rigid Frames and Box Culverts the fill shall be brought up uniformly on both sides of the center of structure to avoid stresses in the structure caused by unsymmetrical loading.

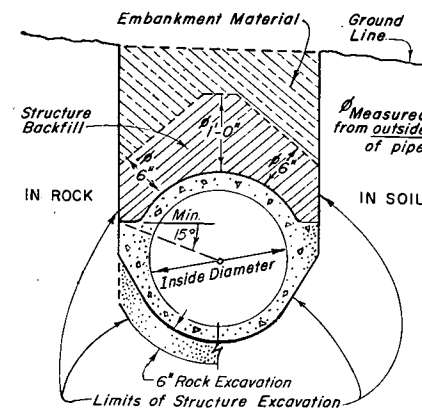


DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS, ETC.



Note: "E" = Limits of Structure Excavation

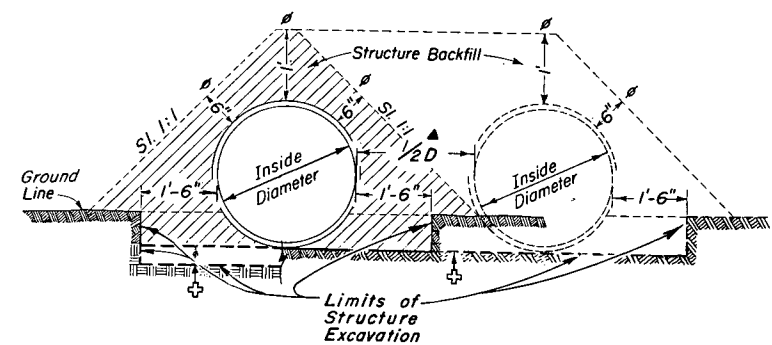
# CAST IN PLACE CONDUIT



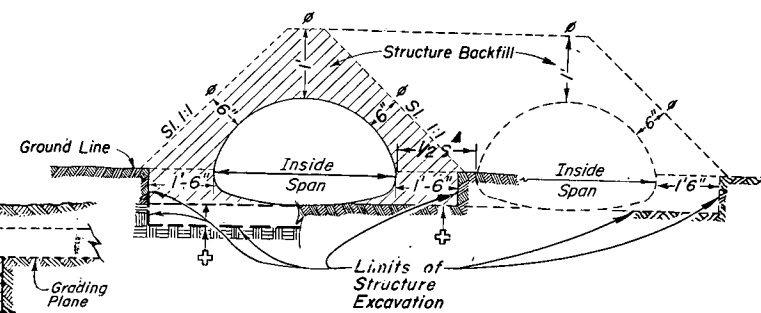
# STANDARD M-206-AA

(MARCH 1, 1971)  
(SHEET 1 OF 2)

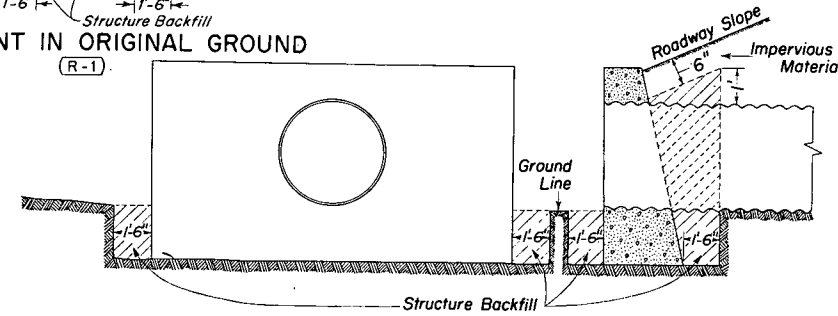
# CIRCULAR CONDUIT



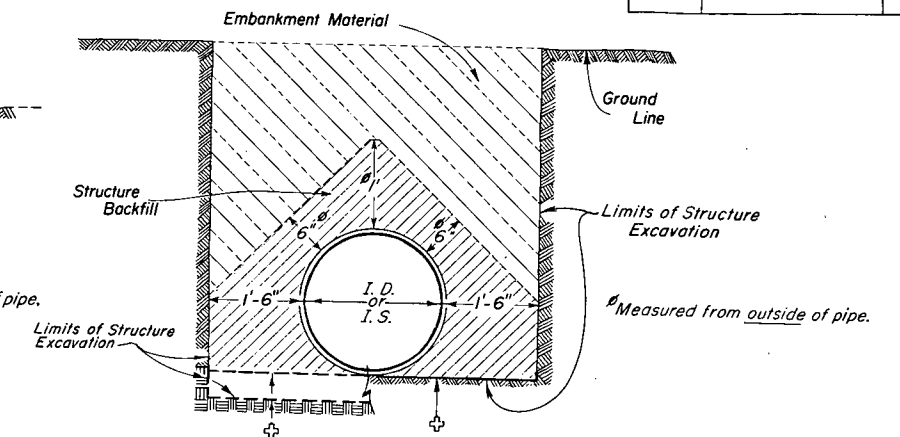
# ELLIPTICAL OR ARCH CONDUIT



# HEADWALLS AND END OF CULVERTS



# SIPHONS OR CONDUIT IN TRENCH



# NOTES:

When two or more conduits are laid side by side they shall be spaced so that the adjacent pipes will be  $\frac{1}{2}$  I.D.,  $\frac{1}{2}$  I.S. or 3 feet apart (including wall thickness), whichever is less. Minimum spacing shall be not less than 1 foot between outside walls of pipe.  
For additional culvert installation details see M Standards for metal, concrete, or structural plate pipe culverts.

Bottom of trench as excavated. For applicable limits of Structure Excavation, see bedding details on standards for culverts.

# GENERAL NOTES

All work shall be done according to the Standard Specifications applicable to the Project.

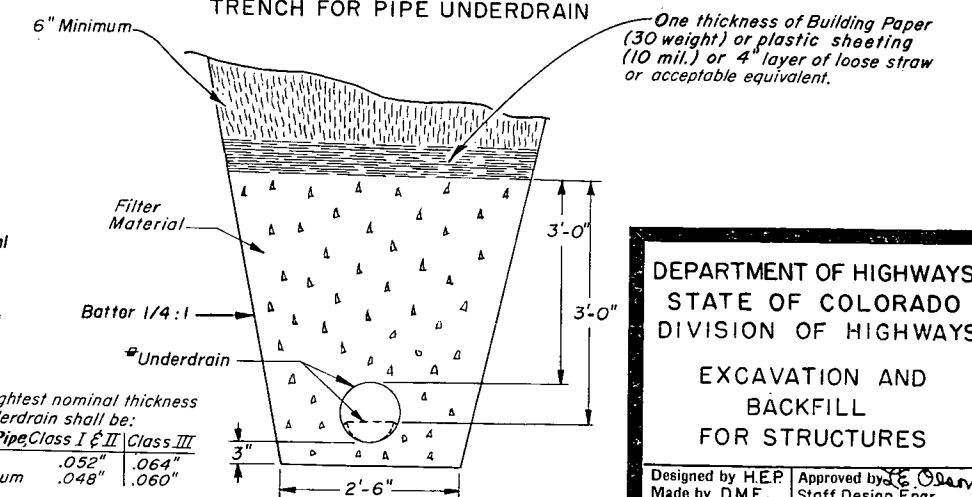
Where the roadway cross section is in fill, excavation for concrete footings (except those in rock or those on piles) and for box culverts shall be done according to the following:

Embankment shall be built up and compacted to a point one foot above the bottom of the box or one foot above the bottom of the footing. The trench shall then be excavated to accommodate construction of the box or footing.

Excavation and backfill patterns different from those indicated on these sheets will be shown elsewhere on the plans.

Excavation for structure installation shall be classified as "Structure Excavation" unless otherwise shown on plans.

# TRENCH FOR PIPE UNDERDRAIN



The lightest nominal thickness for underdrain shall be:  
Type III Pipe Class I & II Class III  
Steel .052" .064"  
Aluminum .048" .060"

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS

EXCAVATION AND  
BACKFILL  
FOR STRUCTURES

Designed by H.E.P.  
Made by D.M.E.  
Checked by L.E.O.  
Approved by E. O'Brien  
Staff Design Engr.  
Date: March 1, 1971

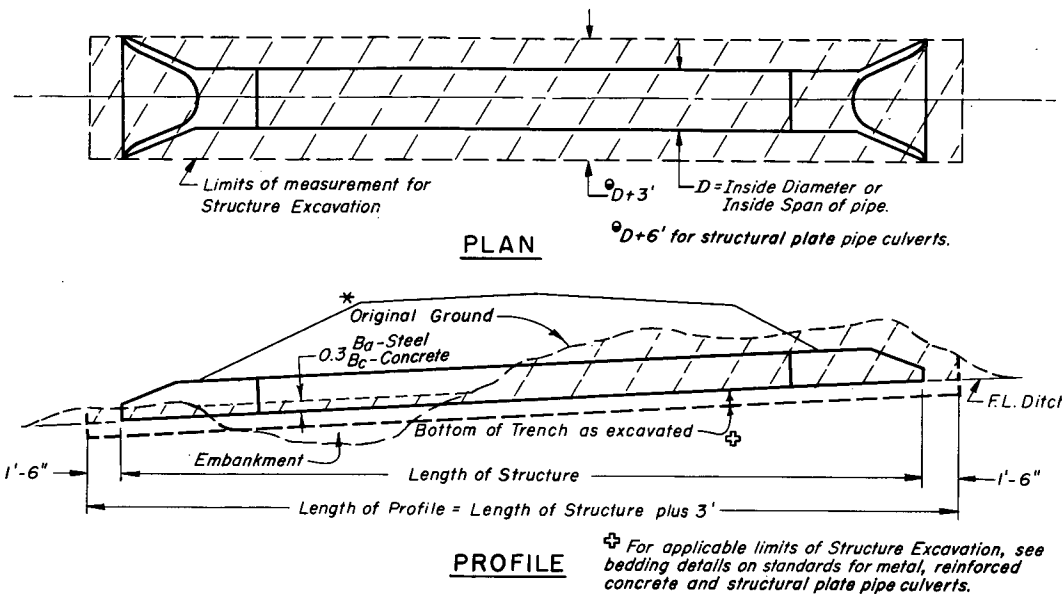
# STANDARD M-206-AA

(MARCH 1, 1971)  
(SHEET 2)

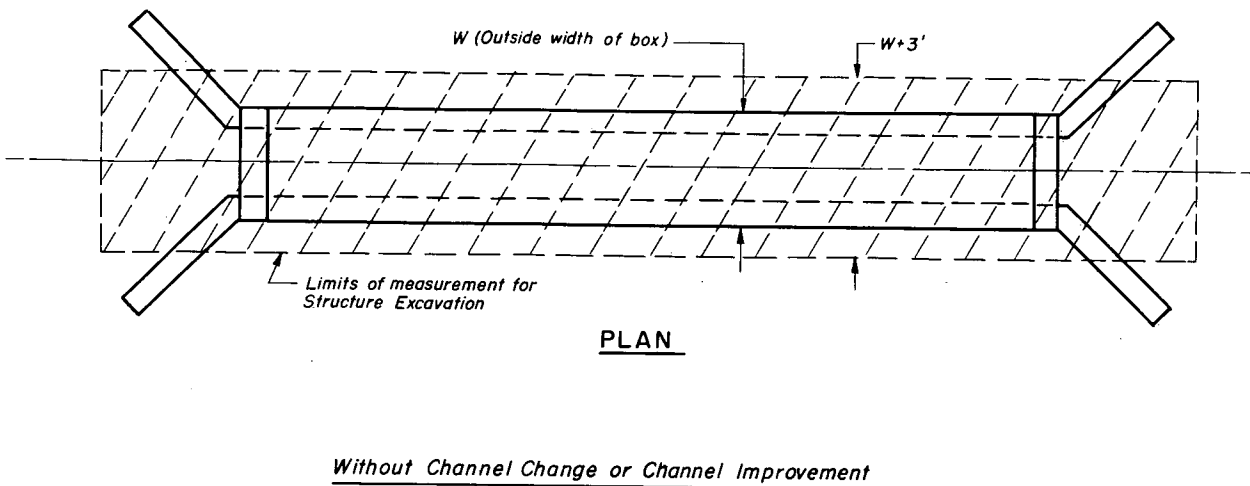
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO			

REVISIONS:		
(R-1)	2-16-72	Revision date only.
		M.R.H.

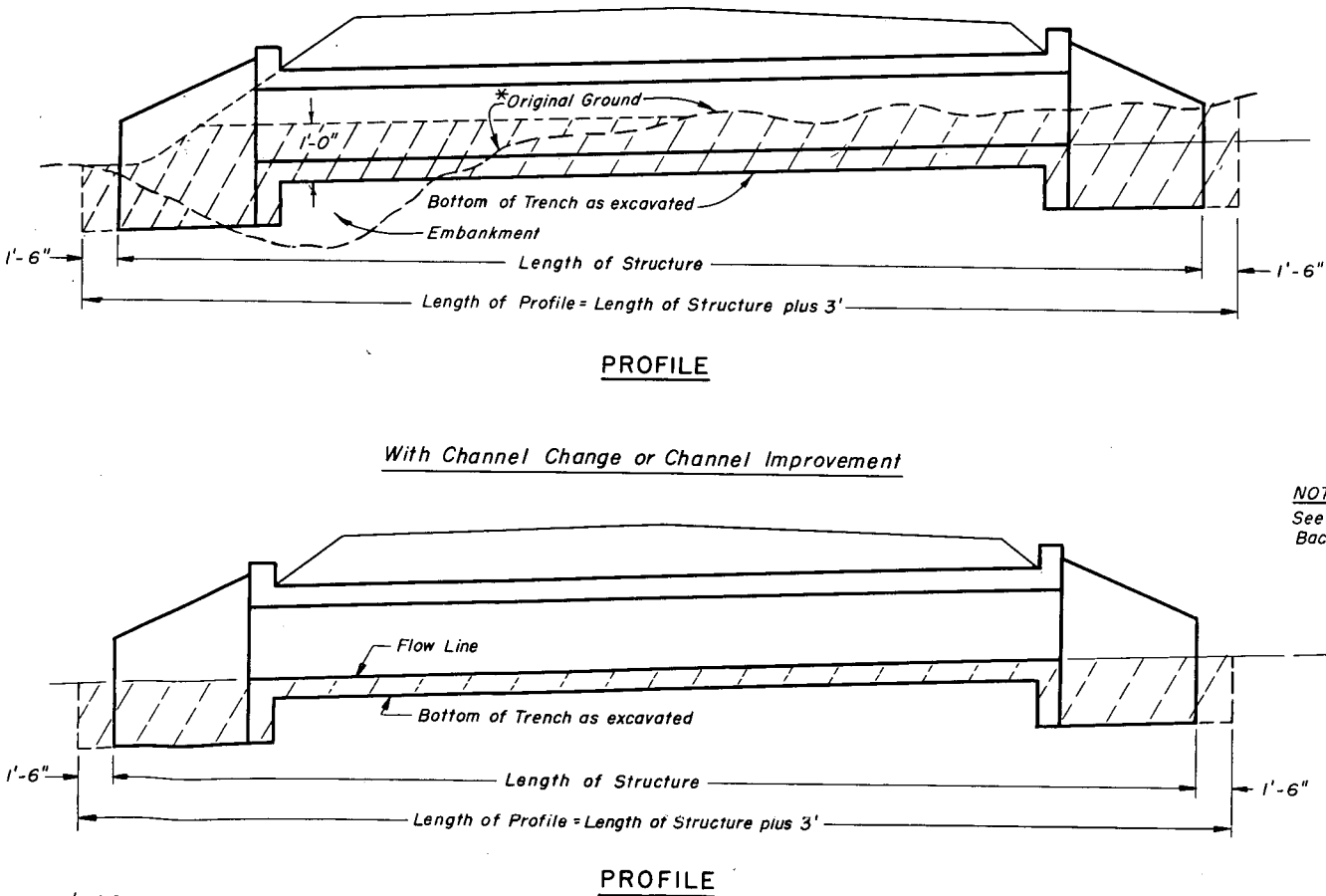
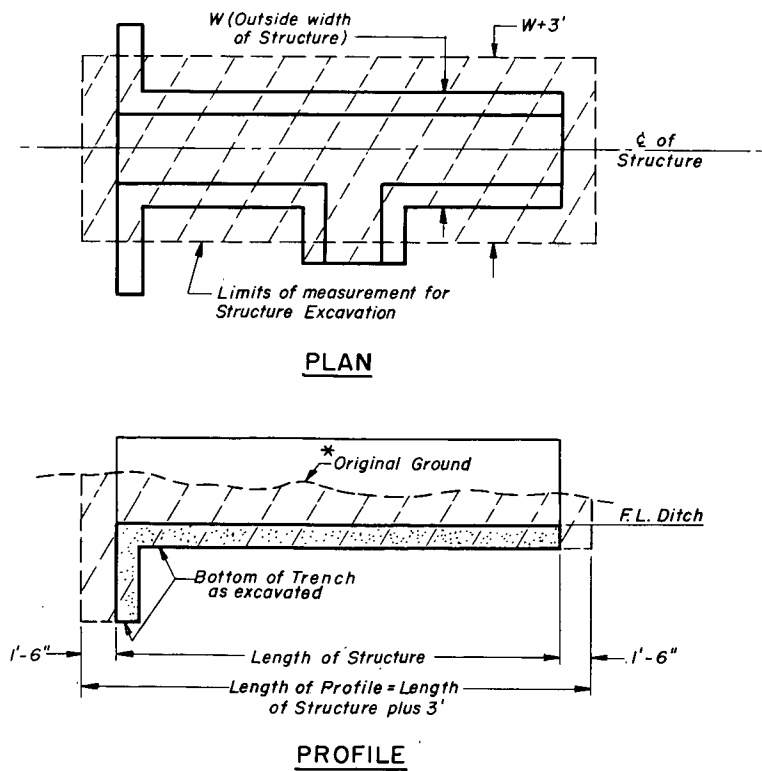
## STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



## STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS



## STRUCTURE EXCAVATION MEASUREMENT FOR DIVERSION OR DIVISION BOXES



**NOTE:**  
See Sheet 1 for General Notes and Backfilling Details.

\* Along  $\bar{C}$  of Structure

Areas to be used for Structure Excavation computations.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS  
EXCAVATION AND BACKFILL  
FOR STRUCTURES

Designed by: M.R.H. Approved by: *[Signature]*  
Made by: H.P.B. Staff Design Engr.  
Checked by: Date: March 1, 1971

# **FILL HEIGHT & THICKNESS TABLES FOR METAL CULVERT PIPE** (RIVETED, WELDED OR HELICAL FABRICATION)

**STANDARD M-603-M**  
(MARCH 20, 1967)

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS			
(R-1)	4-5-68	Added notes.	M.R.H.
(R-2)	7-23-68	Dept. Name, & Ø Note	M.R.H.
(R-3)	2-11-71	Thickness Tables, General Notes.	M.R.H.

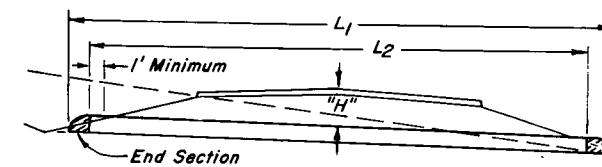
**TABLE I**  
**CORRUGATED STEEL PIPE** (2"x1/2") OR (2-2/3"x1/2") CORRUGATIONS

PIPE SIZE (B <sub>o</sub> ) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET															
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100	
		THICKNESS IN INCHES															
12	0.8	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.079	.109	
15	1.2	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.079	.109	.109	.138	
18	1.8	.064	.064	.064	.064	.064	.064	.064	.064	.079	.079	.109	.109	.138	.168		
24	3.1	.064	.064	.064	.064	.064	.079	.109	.138	.138	.168	<div>----- See General Note.</div>					
30	4.9	.064	.064	.064	.064	.079	.079	.109	.109	.138	.168						
36	7.1	.064	.064	.064	.064	.079	.109	.138	.168								
42	9.6	.064	.064	.064	.064	.064	.079	.109									
48	12.6	.064	.064	.064	.064	.079	.109	.168									
54	15.9	.079	.079	.079	.079	.079	.109	.109	<div>----- See General Note.</div>								
60	19.6	.109	.109	.109	.109	.109	.138										
66	23.8	.109	.109	.109	.109	.138	.168										
72	28.3	.138	.138	.138	.168												
78	33.0	.168	.168	.168													
84	38.0	.168	.168	.168	<div>----- See General Note.</div>												

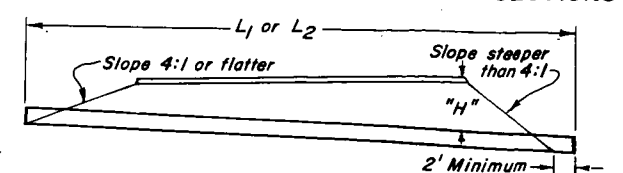
**TABLE II**  
**CORRUGATED STEEL PIPE ARCH** (2"x1/2") OR (2-2/3"x1/2") CORRUGATIONS

PIPE SIZE Span- Rise (Inches)	AREA (Sq.Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET						
			1.5 to 7	7+ to 8	8+ to 9	9+ to 10	10+ to 12	12+ to 13	
			THICKNESS IN INCHES						
18 x 11	1.1	3 1/2	.064	.064	.064	.064	.064	.064	
22 x 13	1.6	4	.064	.064	.064	.064	.064	.064	
25 x 16	2.2	4	.064	.064	.064	.064			
29 x 18	2.8	4 1/2	.064	.064	.064				
36 x 22	4.4	5	.064	.064	.064				
43 x 27	6.4	5 1/2	.064						
50 x 31	8.7	6	.079						
58 x 36	11.4	7	.109						
65 x 40	14.3	8	.109						
72 x 44	17.6	9	.138						

**METAL CULVERT WITH END SECTIONS**



**METAL CULVERT WITHOUT END SECTIONS**



"H" = Maximum height of fill over top of Culvert, including pavement.

L<sub>1</sub> = Length of Culvert to be measured when placed in accordance with Section 617.

L<sub>2</sub> = Length of pipe to be measured when placed in accordance with Section 603.

(R-1) Length of extension, when placed in accordance with Section 617, shall be the actual number of feet of new culvert required.

**TABLE III**  
**CORRUGATED STEEL PIPE** 3" x 1" CORRUGATIONS RIVETED OR HELICAL FABRICATION

PIPE SIZE (B <sub>o</sub> ) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET															
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80			
		THICKNESS IN INCHES															
36	7.1	.064	.064	.064	.064	.064	.079	.079	.109	.109	.109	.109	.138	.168			
42	9.6	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.109	.168				
48	12.6	.064	.064	.064	.079	.079	.079	.109	.109	.109	.138	.168					
54	15.9	.064	.064	.064	.079	.079	.079	.109	.109	.138	.168						
60	19.6	.064	.064	.064	.079	.109	.109	.109	.138								
66	23.8	.064	.064	.079	.079	.109	.109	.138									
72	28.3	.064	.064	.079	.109	.109	.138										
78	33.0	.064	.064	.079	.109	.138	.168										
84	38.0	.079	.079	.109	.109	.109											
90	44.0	.079	.079	.109	.109	.109											
96	50.3	.109	.109	.109	.109	.138											
102	57.0	.109	.109	.109	.109												
108	64.0	.109	.109	.109	.138												
114	70.9	.138	.138	.138	.168												
120	78.6	.138	.138	.138	.168												

--- See General Note.

**TABLE IV**  
**CORRUGATED STEEL PIPE** 3" x 1" CORRUGATIONS \* SPOT WELDED OR BOLTED (1/2" ASTM A 325 BOLTS) FABRICATION

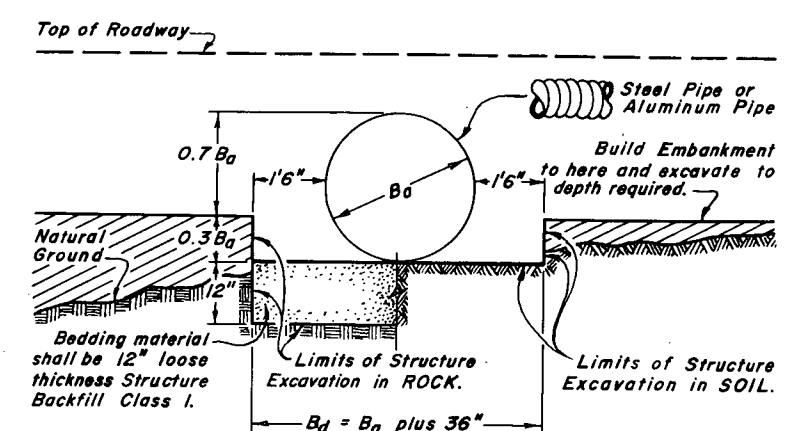
PIPE SIZE (B <sub>d</sub> ) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET															
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100	
		THICKNESS IN INCHES															
36	7.1	.064	.064	.064	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.109	.138	
42	9.6	.064	.064	.064	.064	.064	.064	.064	.079	.079	.109	.109	.109	.138	.168		
48	12.6	.064	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.138	.168			
54	15.9	.064	.064	.064	.064	.064	.079	.079	.109	.138	.138						
60	19.6	.064	.064	.064	.064	.079	.079	.109	.138	.168							
66	23.8	.064	.064	.064	.079	.079	.109	.109	.138	.168							
72	28.3	.064	.064	.064	.079	.079	.109	.109	.138								
78	33.0	.064	.064	.079	.109	.109	.138	.168									
84	38.0	.079	.079	.079	.079	.109	.109	.138									
90	44.0	.079	.079	.079	.079	.109	.109	.138									
96	50.3	.109	.109	.109	.109	.138	.168										
102	57.0	.109	.109	.109	.109	.138	.168										
108	64.0	.109	.109	.109	.109	.138											
114	70.9	.138	.138	.138	.138	.138	.168										
120	78.6	.138	.138	.138	.138	.138											

----- See General Note.

**TABLE V**  
**CORRUGATED STEEL PIPE ARCH** 3" x 1" CORRUGATIONS (R-2)

			CORROSION									
PIPE SIZE Span- Rise (Inches)	AREA (Sq.Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET									
			1.5 to 10	10+ to 11	11+ to 12	12+ to 14	14 to 15					
			THICKNESS IN INCHES									
43 x 27	6.4	7 3/4	.064	.064	.064							
50 x 31	8.7	9	.064	.064	.064							
58 x 36	11.4	10 1/2	.064	.064	.064							
65 x 40	14.3	12	.064	.064	.064							
72 x 44	17.6	13 1/4	.064	.064	.064							
73 x 55	22.0	18	.064	.064	.064		.064	.064				
81 x 59	26.0	18	.079	.079	.079	.079	.079	.079				
87 x 63	31.0	18	.079	.079	.079	.079						
95 x 67	35.0	18	.109	.109	.109							
103 x 71	41.0	18	.109	.109								

**INSTALLATION OF METAL CULVERT PIPE**



NOTE: Spacing for multiple pipe installations shall conform to the details shown on M Standard for Excavation and Backfill for Structures.</

# STANDARD M-606-AB (MARCH 1, 1968) (SHEET 1 OF 3)

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

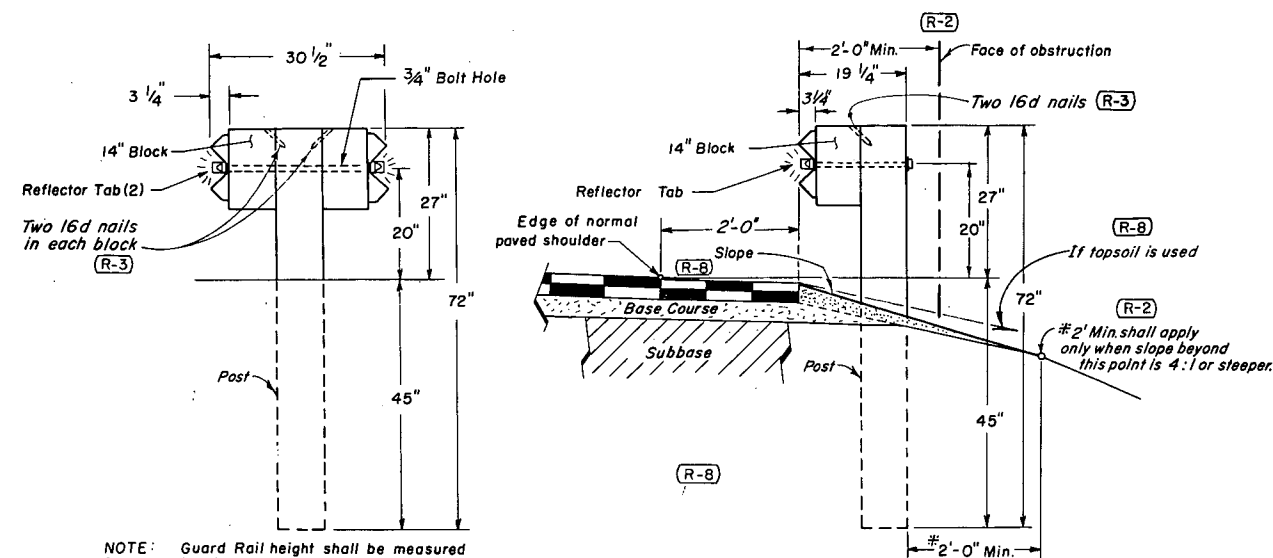
REVISIONS				
(R-7)	10-21-71	Replace post spacing Gen. Note with table.	M.R.H.	
(R-8)	12-20-71	Shoulder treatment with and without curb.	M.R.H.	

TABLE OF OFFSETS  
FOR 75' PARABOLIC FLARES

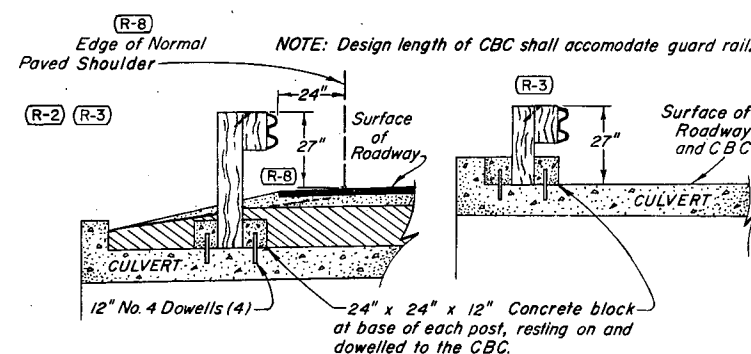
x	W=4'	W=5'	W=10'	W=12'	W=14'	W=16'
12'-6"	0.11	0.14	0.28	0.33	0.39	0.44
25'-0"	0.44	0.55	1.11	1.33	1.56	1.78
37'-6"	1.00	1.25	2.50	3.00	3.50	4.00
50'-0"	1.78	2.22	4.44	5.33	6.23	7.11
62'-6"	2.78	3.48	6.95	8.34	9.73	11.11
75'-0"	4.00	5.00	10.00	12.00	14.00	16.00

## LEGEND

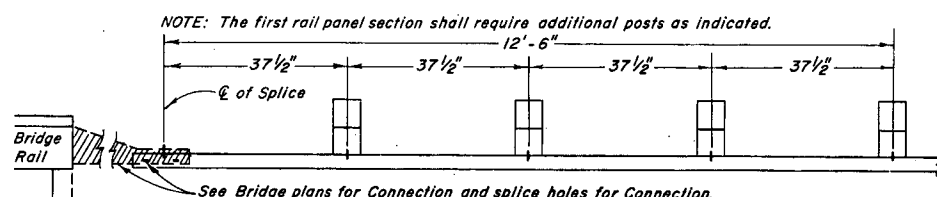
W = Full parabolic offset.  
L = Length of parabolic transition.  
X = Longitudinal dist. from beginning of flare.  
Y = Offset =  $W \cdot \frac{X^2}{L^2}$



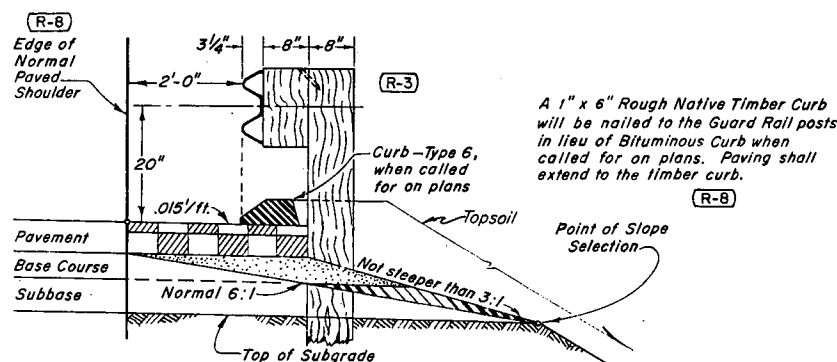
TYPICAL POST INSTALLATIONS & SHOULDER TREATMENT WITHOUT CURB  
(See Table for Post & Block Cross Section)



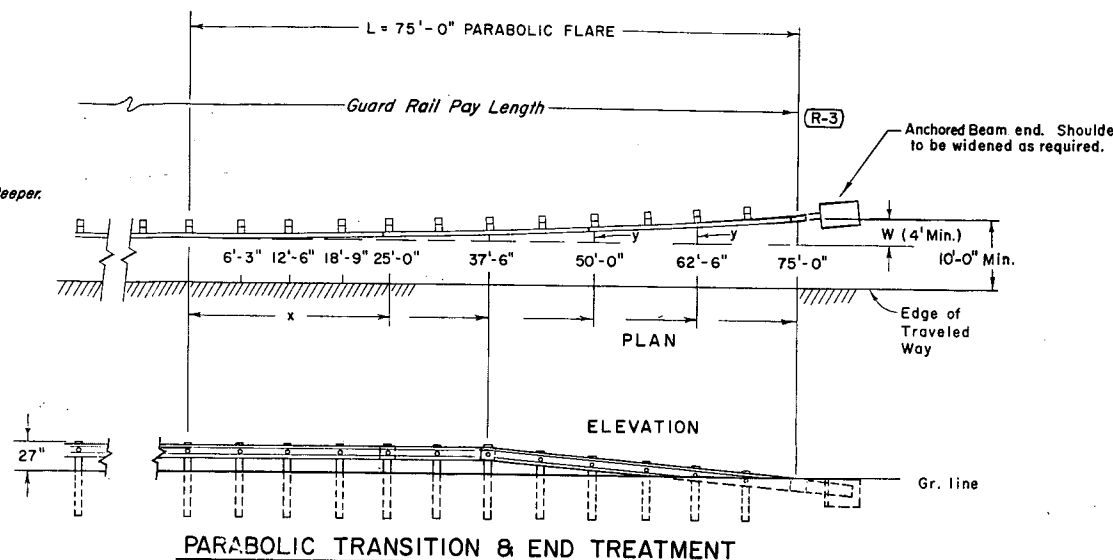
GUARD RAIL ACROSS CONCRETE BOX CULVERT



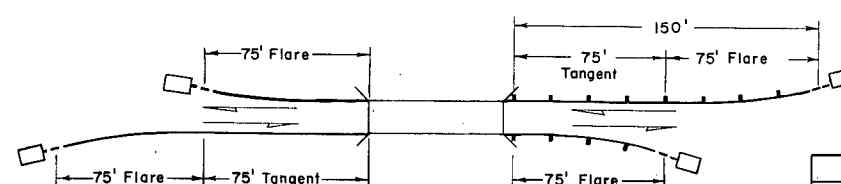
GUARD RAIL AT BRIDGES



GUARD RAIL SHOULDER TREATMENT WITH CURB

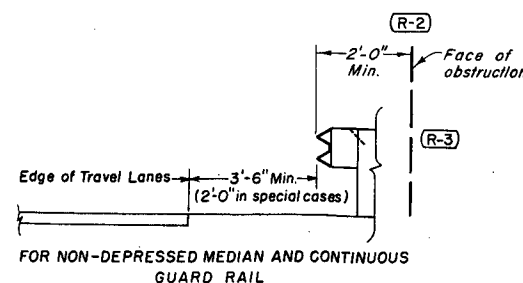


PARABOLIC TRANSITION & END TREATMENT

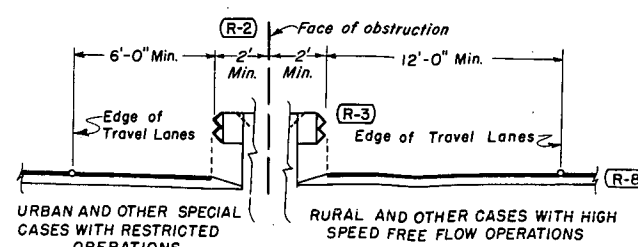


2-LANE HIGHWAY  
BRIDGE APPROACH GUARD RAIL

NOTE: For divided highways see Sheet No. 2.



FOR NON-DEPRESSED MEDIAN AND CONTINUOUS  
GUARD RAIL



GUARD RAIL FOR OBSTRUCTIONS IN MEDIAN

(See Sheet No. 3)

## GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the project.

All timber shall be close grained Douglas Fir of the Coast Region, Dense Longleaf or Shortleaf Southern Pine, Lodgepole Pine, Ponderosa Pine, Western Hemlock, or Larch, and shall conform to the following grading specifications and requirements:

SPECIES	SIZE	FOHC	GRADING RULES
West Coast Douglas Fir	6"x8"	Yes	WCLB #16 Par. 131 b
West Coast Hemlock	6"x8"	Yes	WCLB #16 Par. 131 a
Larch	6"x8"	Yes	WWP 1970 Par. 80.11
Southern Pine	6"x8"	No	SPIB 1970 Par. 285
Lodgepole Pine	6"x8"	No	WWP 1970 Par. 80.10
Ponderosa Pine	6"x8"	No	WWP 1970 Par. 80.10
West Coast Hemlock	8"x8"	Yes	WCLB #16 Par. 131 b

WCLB #16 — "Standard Grading Rules #16 for West Coast Lumber" Published by the West Coast Lumber Inspection Bureau. Effective Sept. 1, 1970.

WWP 1970 — "1970 Standard Grading Rules for Southern Pine Lumber" Published by the Western Wood Products Association. Effective Sept. 1, 1970.

SPIB 1970 — "1970 Standard Grading Rules for Southern Pine Lumber" Published by the Southern Pine Inspection Bureau. Effective Sept. 1, 1970.

FOHC — Free of Heart Centers. See paragraph 714 c of WCLB.

NOTE — 6" x 8" Posts and Blocks shall be installed with the 6" dimension parallel to the roadway.

Post & block cross section — All timber shall be rough, free of wane, square cut and full sawn.

At the time the post or block is installed, any seasoning check which extends the full length of the piece shall not exceed one-quarter inch in width of its maximum width.

Blocks shall be cut from timber of the same cross section, species and grade as the posts and receive the same treatment.

Timber shall be incised and pressure treated in accordance with AASHTO Designation M133, except that blocks need not be incised. Post bolt holes are to be drilled before treatment is applied.

The preservative shall be either (a) Creosote or (b) Pentachlorophenol in a petroleum carrier (liquid or L.P. gas). Unless otherwise permitted by the Engineer, only one preservative shall be used on the project.

Where pedestrian hazard exists and sidewalk is constructed on the roadway shoulder, guard rail shall be placed between the sidewalk and the edge of traffic lane.

Guard rail plate shall not be lighter than No. 12 U.S. Standard Gage. 25' length of rail panels will be permitted.

Metal plate guard rail shall be painted in accordance with standard specifications or shall be galvanized in accordance with AASHTO Designation M-111 or with ASTM Designation A 525, Coating Class 2.50.

Posts used for vertical transition shall be adjusted in length so that a minimum of 45" will be buried.

Standard galvanized wrought steel washers shall be used under all bolt heads or nuts coming in contact with wood posts.

Concrete shall be Class A, B or D.

Blocks shall be toenailed to posts with two 16 penny galvanized nails in the top of each block.

If posts are cut in the field, cut ends shall receive 2 coats of hot creosote.

## NORMAL CENTER-TO-CENTER POST SPACING (R-7)

LOCATION	DESIGN SPEED Less Than 50mph and ADT < 750	DESIGN SPEED 50mph and Over
Tangents	12'-6"	6'-3"
Curves with Radius Over 200'	12'-6"	6'-3"
Curves with Radius of 200' or Less	6'-3"	6'-3"
Flares and Obstructions	6'-3"	6'-3"

## DEPARTMENT OF HIGHWAYS STATE OF COLORADO DIVISION OF HIGHWAYS GUARD RAIL TYPE 3

Designed by M.R.H.  
Made by J.R.B. by Staff Design Engineer  
Checked by R.S.M. Date: March 1, 1968

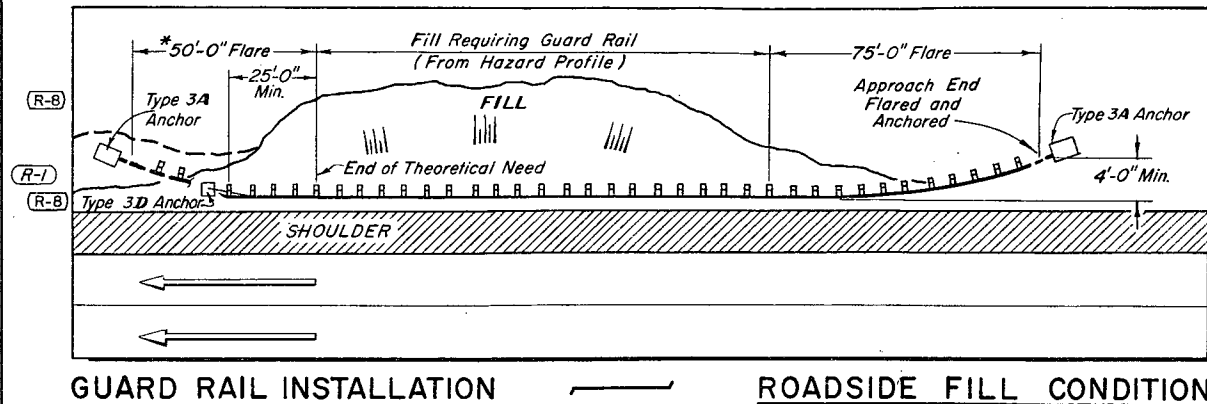


# STANDARD M-606-AB

(MARCH 1, 1968)  
(SHEET 2)

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

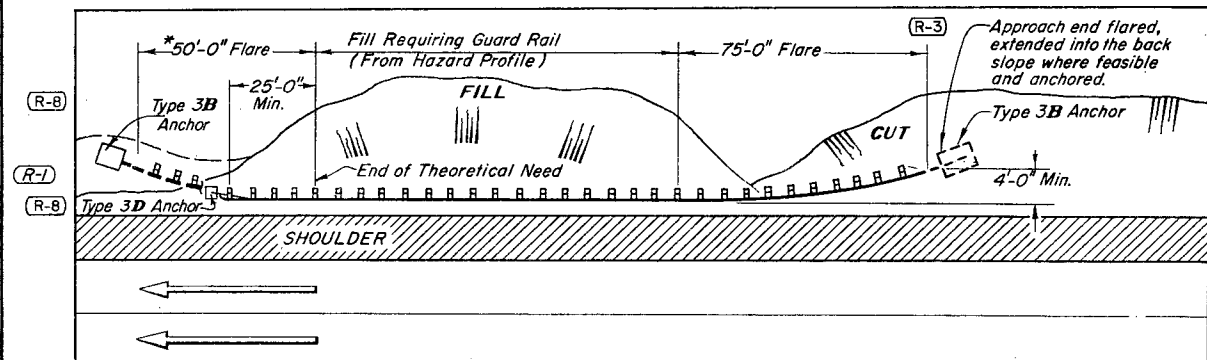
REVISIONS		
(R-7)	10-21-71	Revision date only.
(R-8)	12-20-71	End anchorage type numbers.



GUARD RAIL INSTALLATION

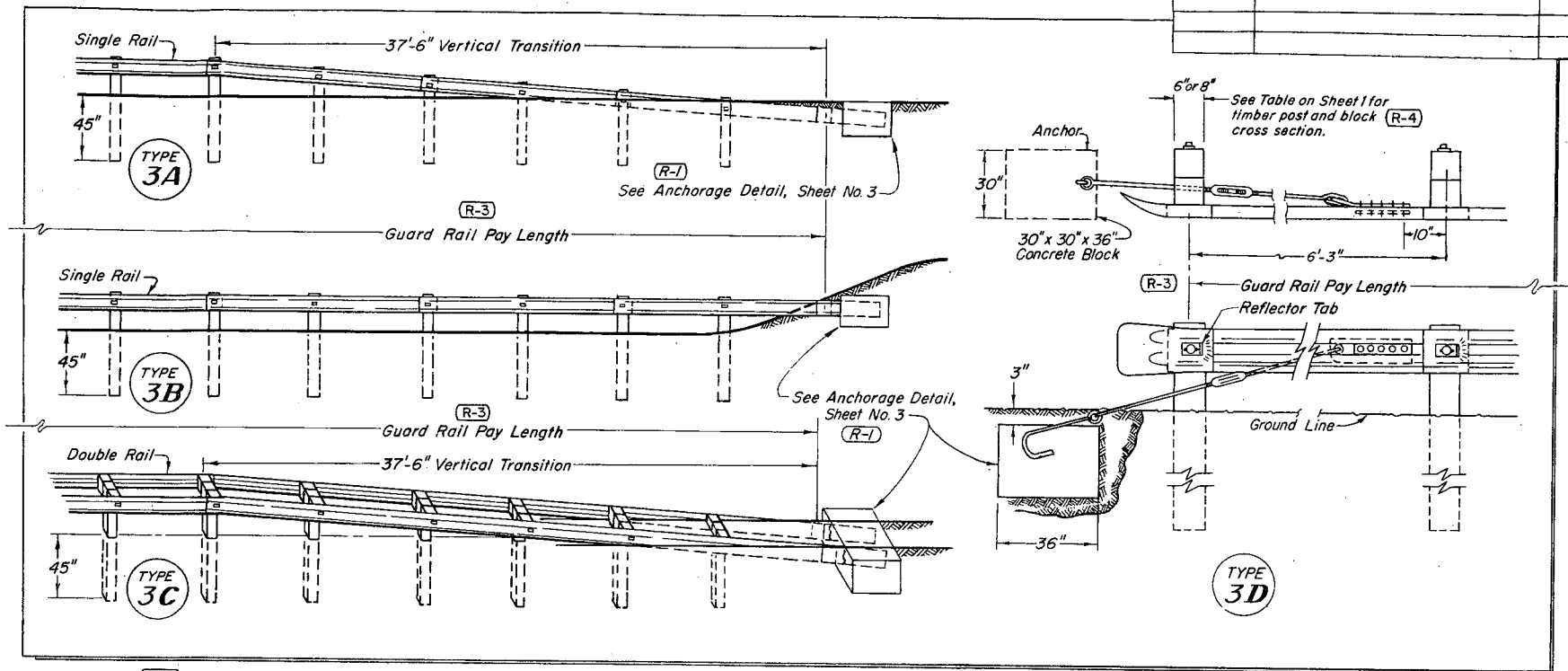
ROADSIDE FILL CONDITION

NOTES:  
\* 2-Lane Highways — The exit end of Guard Rail shall extend 50 feet past the end of theoretical need and shall be flared and anchored.

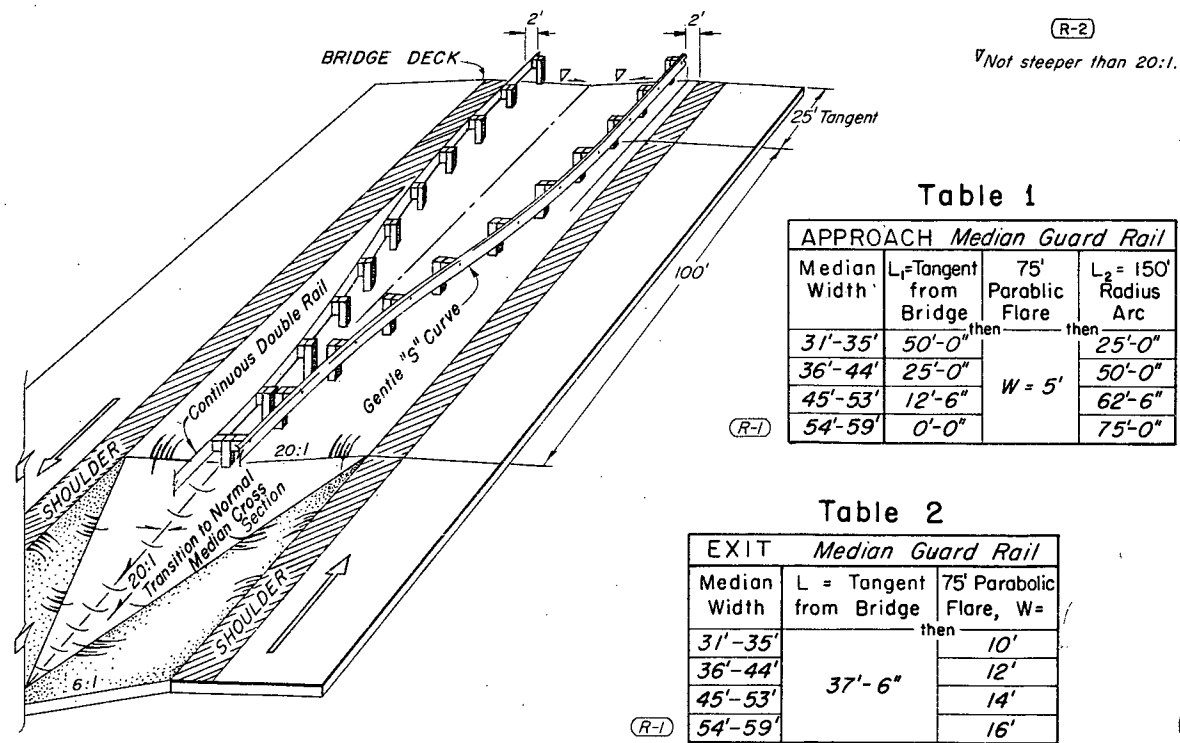


GUARD RAIL INSTALLATION

ROADSIDE CUT TO FILL CONDITION



TYPICAL END ANCHORAGE



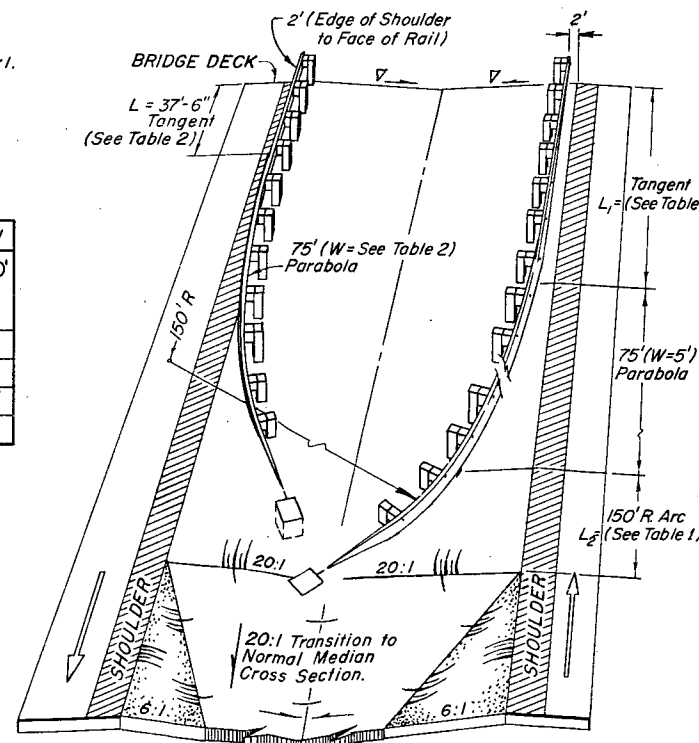
21' to 30' MEDIAN

Table 1

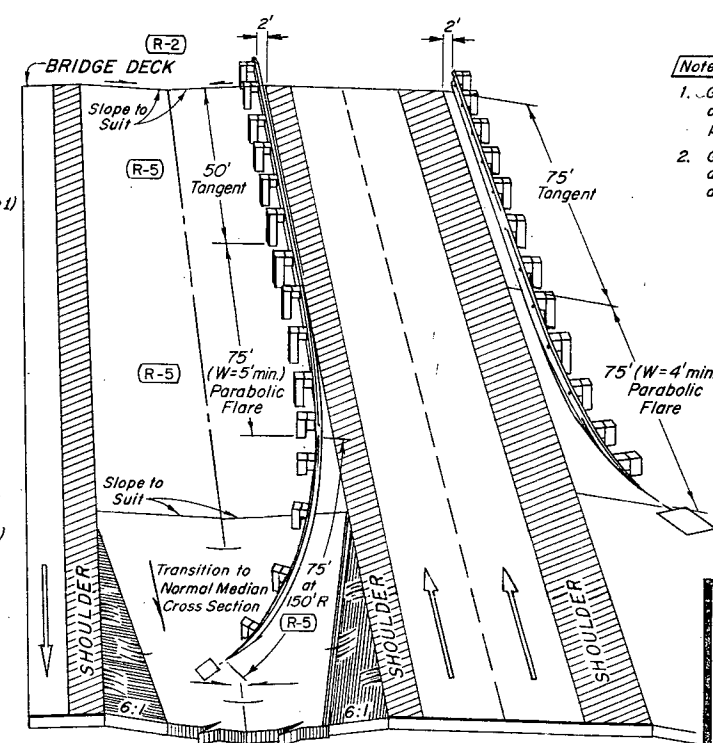
APPROACH Median Guard Rail			
Median Width	$L_1$ = Tangent from Bridge	75' Parabolic Flare	$L_2$ = 150' Radius Arc
31'-35'	50'-0"	then	25'-0"
36'-44'	25'-0"	then	50'-0"
45'-53'	12'-6"	then	62'-6"
54'-59'	0'-0"	then	75'-0"

Table 2

EXIT Median Guard Rail		
Median Width	$L$ = Tangent from Bridge	75' Parabolic Flare, $W$ =
31'-35'	37'-6"	10'
36'-44'		12'
45'-53'		14'
54'-59'		16'



31' to 59' MEDIAN



MEDIAN 60' AND OVER

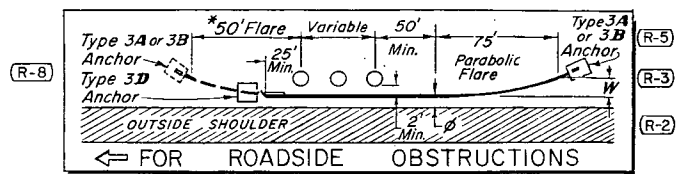
- [Note] EXIT FROM BRIDGES:
- Guard rail for OUTSIDE shoulders at exit end of bridges on divided highways to be determined from hazard profile.
  - Guard rail for INSIDE shoulders at exit end of bridges on divided highways with medians 60' and over to be determined from hazard profile.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS

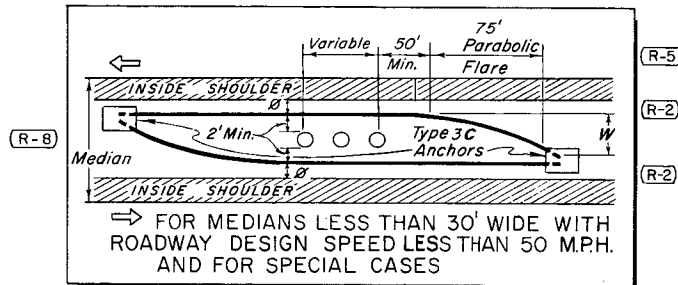
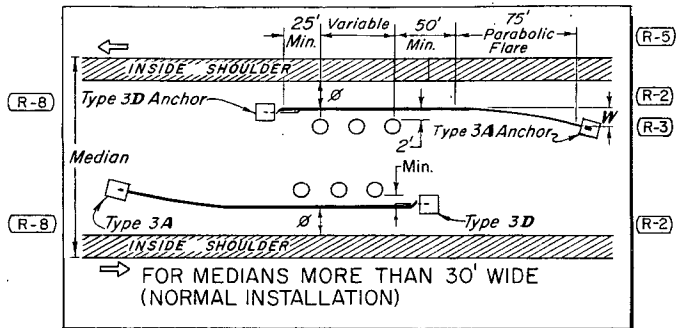
**GUARD RAIL  
TYPE 3**

Designed by M. R. H.  
Made by J. R. B.  
Checked by R. S. M.

Approved by [Signature]  
Staff Design Engineer  
Date: March 1, 1968

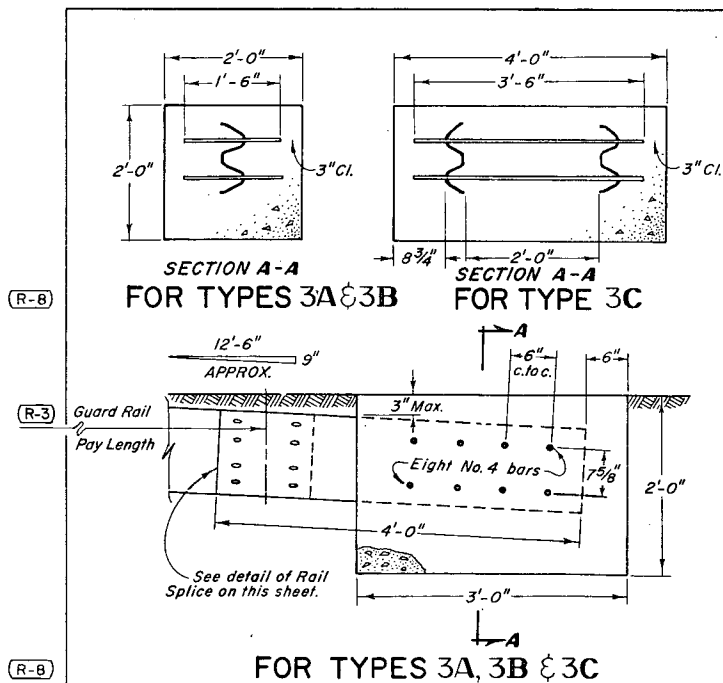


\* 2-Lane Highways — The exit end of Guard Rail shall extend 50 ft. past the end of theoretical need and shall be flared and anchored.

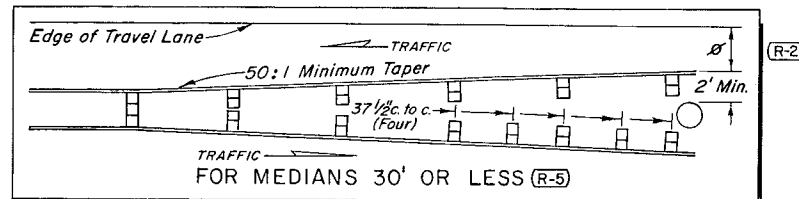
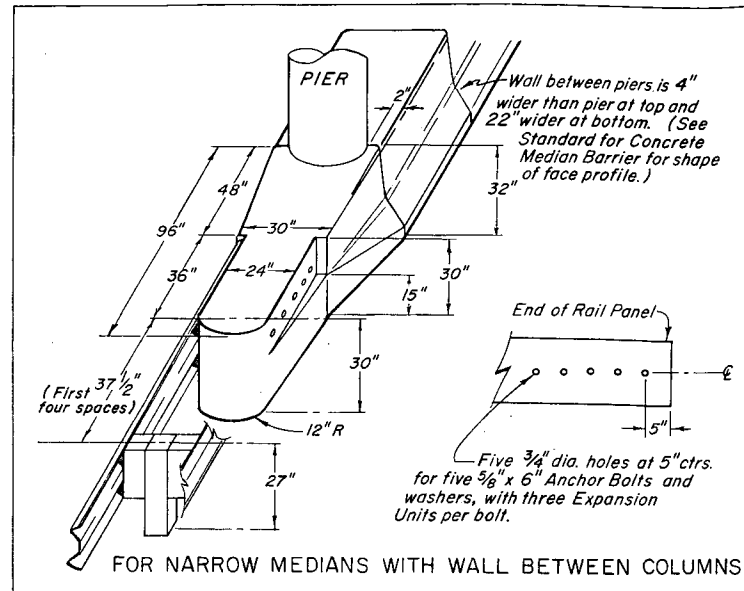


### NON-CONTINUOUS RAIL

## TYPICAL GUARD RAIL FOR OBSTRUCTIONS



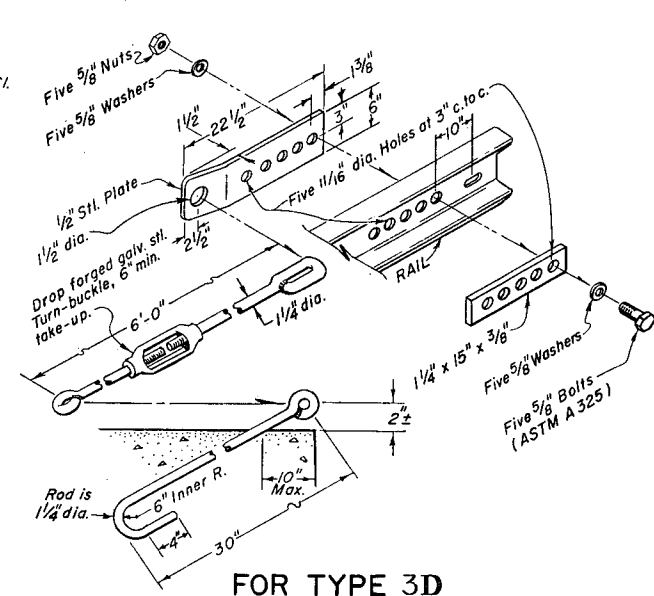
## DETAILS FOR TYPICAL END ANCHORAGE



### CONTINUOUS RAIL

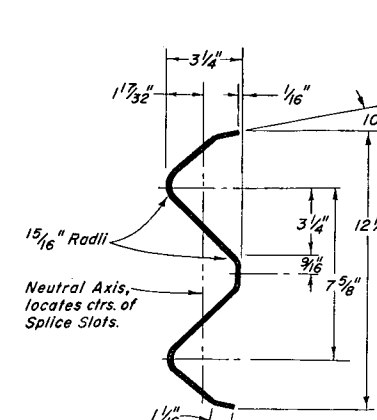
When slope is 6:1 or flatter and an obstruction is present, increase where possible, to allow more area for vehicle recovery.

NOTE: All components other than turn-buckle shall be steel conforming to ASTM A 36 and entire assembly shall be galvanized. Anchor rod and bolt eyes shall be closed by welding after assembly.

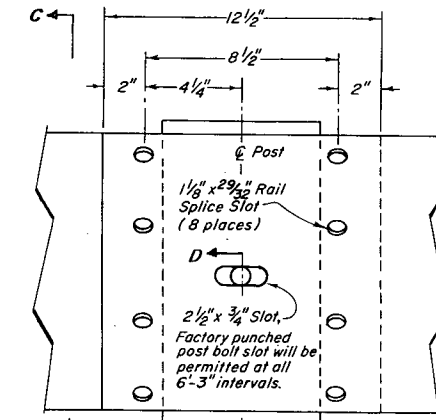


## STANDARD M-606-AB

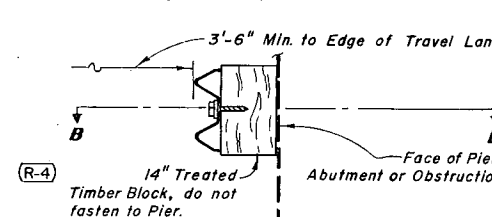
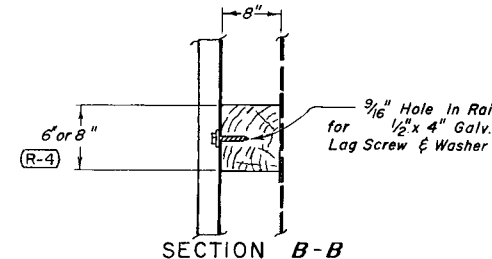
(MARCH 1, 1968)  
(SHEET 3)



### SECTION C-C



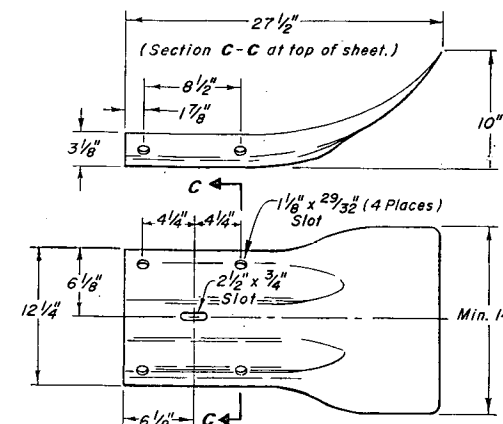
## DETAIL OF RAIL AND SPLICE



### FOR NARROW MEDIANS

(To be used only when 2' min. clearance cannot be obtained.)

SEE TABLE ON SHEET 1 FOR TIMBER CROSS SECTION  
NOTE: Four 37 1/2" post spaces shall be used at obstruction approach. Posts between piers shall be evenly spaced at 37 1/2" c. to c. or less. Timber blocks fastened to abutments or obstructions shall be spaced 37 1/2" c. to c. or less.

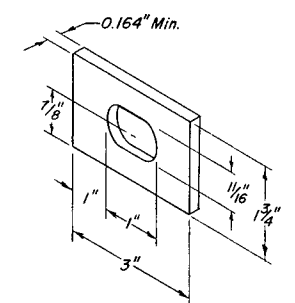
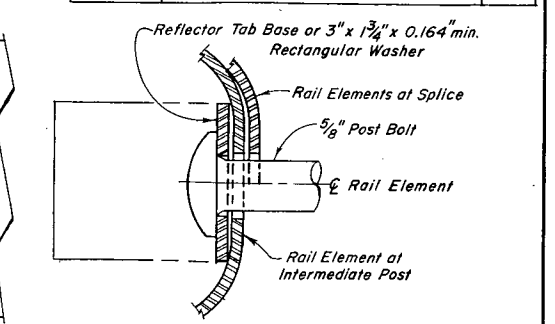


NOTE: Slots shown shall match outer 4 and center Rail end slots.

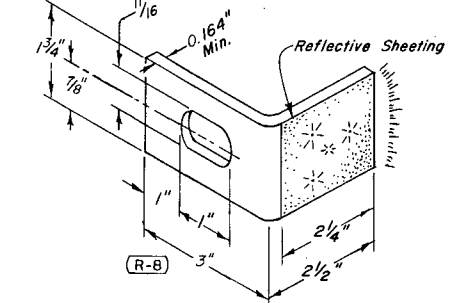
### DETAIL OF TERMINAL SECTION

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

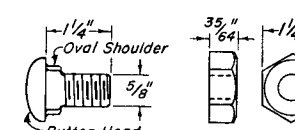
REVISIONS		
REVISION	REVISION DATE ONLY	M.R.H.
R-7	10-21-71	
R-8	12-20-71	



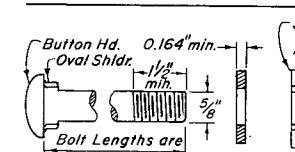
### RECTANGULAR WASHER DETAIL



### REFLECTOR TAB DETAIL



(NEED 8 PER SPLICE, 4 PER TERMINAL)



NOTE: Reflector Tab shall be installed on alternate posts or at max. 12'-6" spacing, beginning at the 3rd post from the buried anchor.

### TABLE OF POST BOLT SIZES

Block	Post	RAIL	BOLT SIZE
8" x 8"	Double	5/8" x 25 3/4"	
8" x 8"	Single	5/8" x 17 1/2"	

NOTE: When 6" x 8" timber is used, the 8" dimension shall be perpendicular to the roadway.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS

GUARD RAIL  
TYPE 3

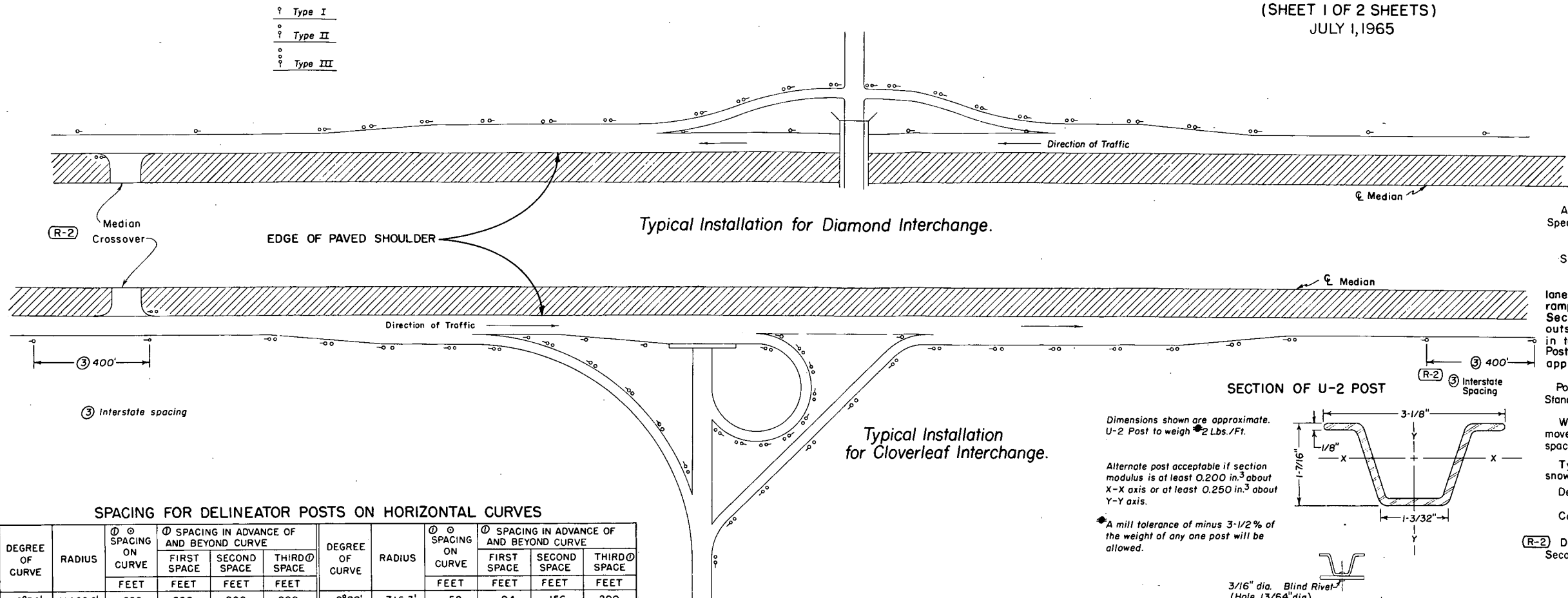
Designed by M. R. H. Approved by J. R. B.  
Made by J. R. B. Staff Design Engineer  
Checked by R. S. M. Date: March 1, 1968



STANDARD M-612-C  
(SHEET 1 OF 2 SHEETS)  
JULY 1, 1965

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO		

REVISIONS			
R-2	1-9-68	Median Crossover, Genl. Note	M.R.H.
R-3	7-11-68	Division Name	M.R.H.



GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the project.

See tabulation in plans for delineator post requirements.

Spacing between Posts on acceleration and deceleration lanes and on relatively straight portions of interchange ramps shall be 100' on Interstate and 200' on Primary and Secondary Projects. Spacing between Posts on the outside of interchange ramp curves shall be as indicated in table for the appropriate degree of curve with a 24 min. spacing. Post spacing in advance and beyond curve shall not apply to ramp curves.

Posts shall meet requirements of Par. 4.5 of U.S. Dept. of Commerce Commercial Standard 184-51. Acceptable material includes re-rolled railroad rails.

When normal delineator spacing falls on a road approach or crossover, move delineator either direction a distance not to exceed 1/4 normal spacing.

Type, location and spacing of delineators for tunnels and snow sheds shall be as directed by the Engineer.

Delineator Posts are not to be placed along Frontage Roads.

Color of Posts shall be Interstate Green.

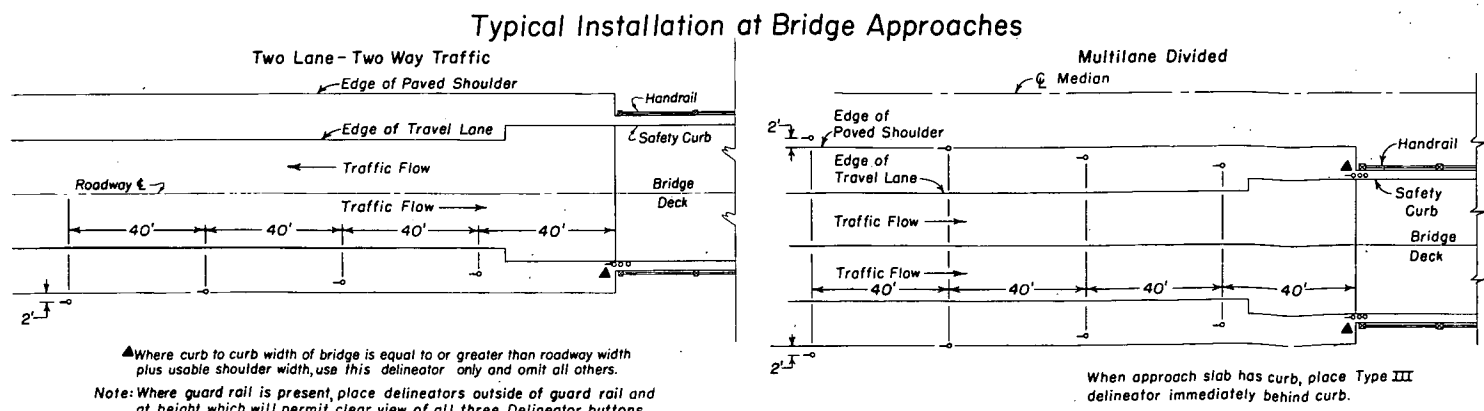
(R-2) Delineators will not be required on tangents for Primary and Secondary roadways.

SPACING FOR DELINEATOR POSTS ON HORIZONTAL CURVES

DEGREE OF CURVE	RADIUS	SPACING ON CURVE	SPACING IN ADVANCE OF AND BEYOND CURVE			DEGREE OF CURVE	RADIUS	SPACING ON CURVE	SPACING IN ADVANCE OF AND BEYOND CURVE		
			FIRST SPACE	SECOND SPACE	THIRD SPACE				FIRST SPACE	SECOND SPACE	THIRD SPACE
0°30'	11460.0'	200	200	200	200	8°00'	716.3'	52	94	156	200
1°00'	5730.0'	151	200	200	200	8°30'	674.1'	50	90	150	200
1°30'	3820.0'	123	200	200	200	9°00'	636.7'	48	86	144	200
2°00'	2865.0'	106	191	200	200	9°30'	603.2'	47	85	141	200
2°30'	2292.0'	95	171	200	200	10°00'	573.0'	46	83	138	200
3°00'	1910.0'	86	155	200	200	10°30'	545.7'	45	81	135	200
3°30'	1637.1'	80	144	200	200	11°00'	520.9'	43	77	129	200
4°00'	1432.5'	74	133	200	200	11°30'	498.3'	42	76	126	200
4°30'	1273.3'	70	126	200	200	12°00'	477.5'	41	74	123	200
5°00'	1146.0'	66	119	198	200	15°00'	382.0'	36	65	108	200
5°30'	1041.8'	63	113	189	200	18°00'	318.3'	33	59	99	198
6°00'	955.0'	60	108	180	200	21°00'	272.9'	30	54	90	180
6°30'	881.5'	58	104	174	200	25°00'	229.2'	27	49	81	162
7°00'	818.6'	55	99	165	200	30°00'	191.0'	24	43	72	144
7°30'	764.0'	53	95	159	200						

$S = 2 \sqrt{R-50}$  1-ST. SPACE = 1.8S 2-ND. SPACE = 3S 3-RD. SPACE = 6S  
NO SPACES TO EXCEED 200 FT.

Ø Omit third space on Secondary and Primary Routes and double the distance on the curve and in advance of and beyond curve.  
For curves less than 2 degrees on Interstate through roadways use Interstate tangent spacing.

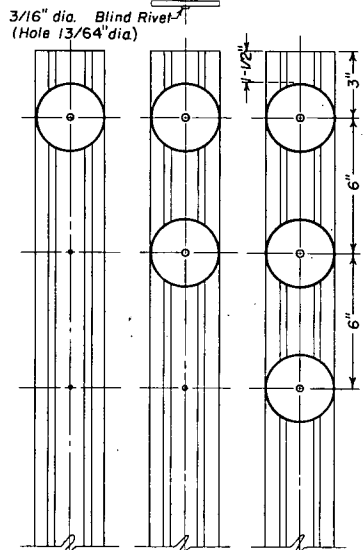
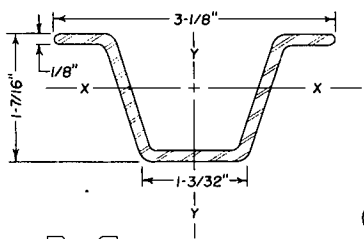


Dimensions shown are approximate.  
U-2 Post to weigh 2 Lbs./Ft.

Alternate post acceptable if section modulus is at least 0.200 in.<sup>3</sup> about X-X axis or at least 0.250 in.<sup>3</sup> about Y-Y axis.

A mill tolerance of minus 3-1/2% of the weight of any one post will be allowed.

SECTION OF U-2 POST

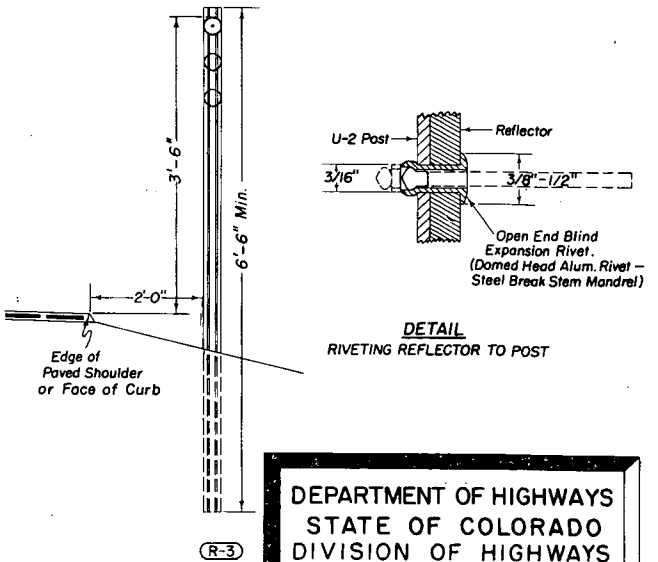


TYPE I  
1-3" dia.  
Crystal  
Reflector  
on U-2 Post

TYPE II  
2-3" dia.  
Yellow  
Reflectors  
on U-2 Post

TYPE III  
3-3" dia.  
Yellow  
Reflectors  
on U-2 Post

Min. 3 holes in all posts required as shown.



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS

DELINEATORS

Designed by CKM  
Made by WNC  
Checked by LEO

Approved by [Signature]  
Staff Design Engr.  
Date: July 1, 1965

# STANDARD M-612-C

(SHEET 2)  
(JULY 1, 1965)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO		

REVISIONS			
(R-1)	5-4-67	Median and Island Delineators	M.R.H.
(R-2)	1-9-68	Median Crossover	M.R.H.
(R-3)	7-11-68	Division Name	M.R.H.

## GENERAL NOTES

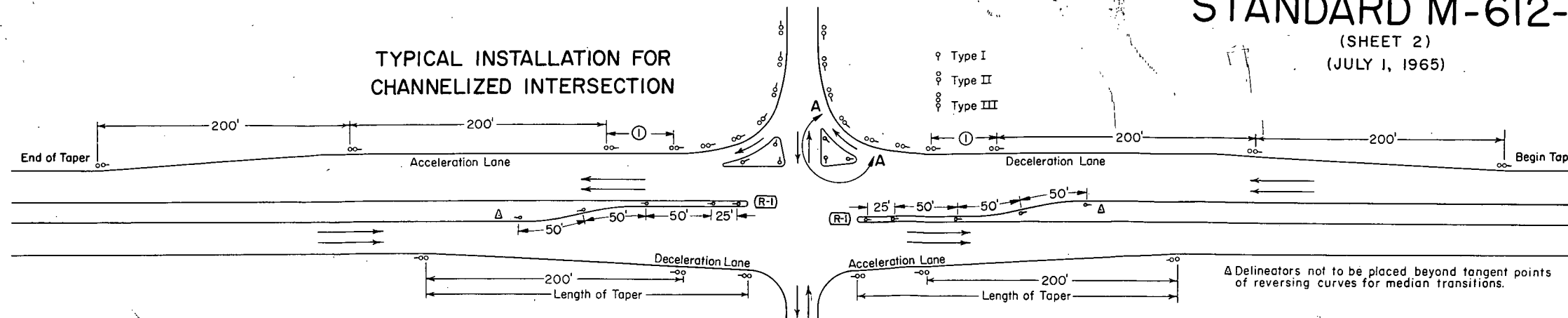
For Radii greater than 200 Feet, use spacing from Table included on Sheet 1 of this Standard.

For additional General Notes, see Sheet 1 of this Standard.

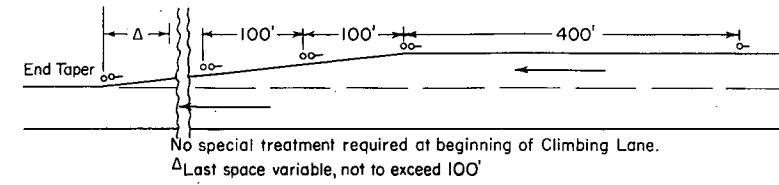
Place face of button at 90° to  $\ell$  of roadway.

Lengths of speed change lanes including tapers shall be as shown on plans.

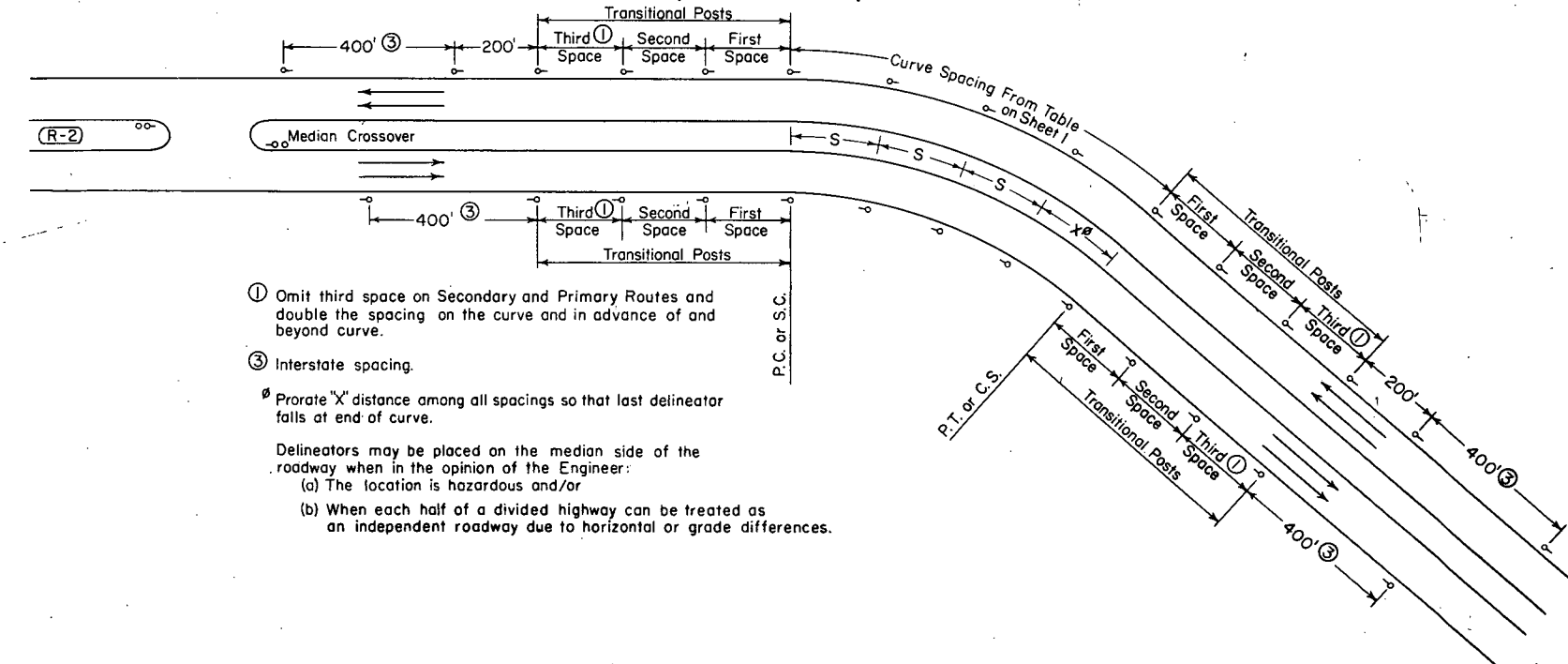
## TYPICAL INSTALLATION FOR CHANNELIZED INTERSECTION



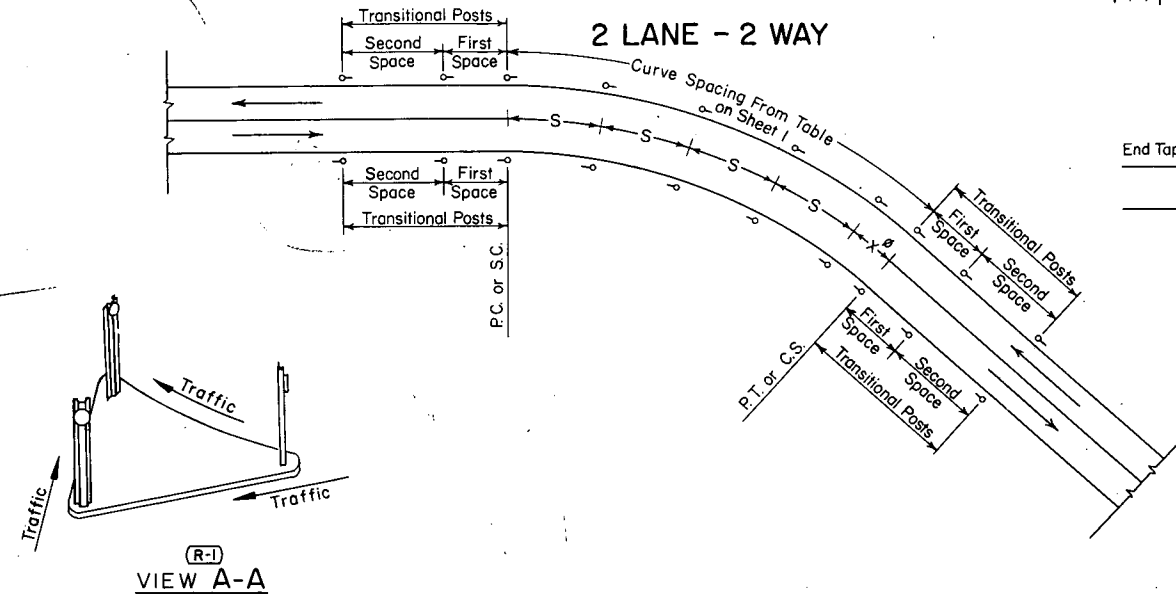
## TYPICAL INSTALLATION FOR CLIMBING LANE TRANSITION



## 4 LANE DIVIDED (INTERSTATE)



- ① Omit third space on Secondary and Primary Routes and double the spacing on the curve and in advance of and beyond curve.
  - ③ Interstate spacing.
  - ④ Prorate "X" distance among all spacings so that last delineator falls at end of curve.
- Delineators may be placed on the median side of the roadway when in the opinion of the Engineer:
- (a) The location is hazardous and/or
  - (b) When each half of a divided highway can be treated as an independent roadway due to horizontal or grade differences.



VIEW A-A

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS

## DELINEATORS

Designed by C.K.M. Approved by *[Signature]*  
Made by T.E.F. Staff Design Engr.  
Checked by L.E.O. Date: July 1, 1965

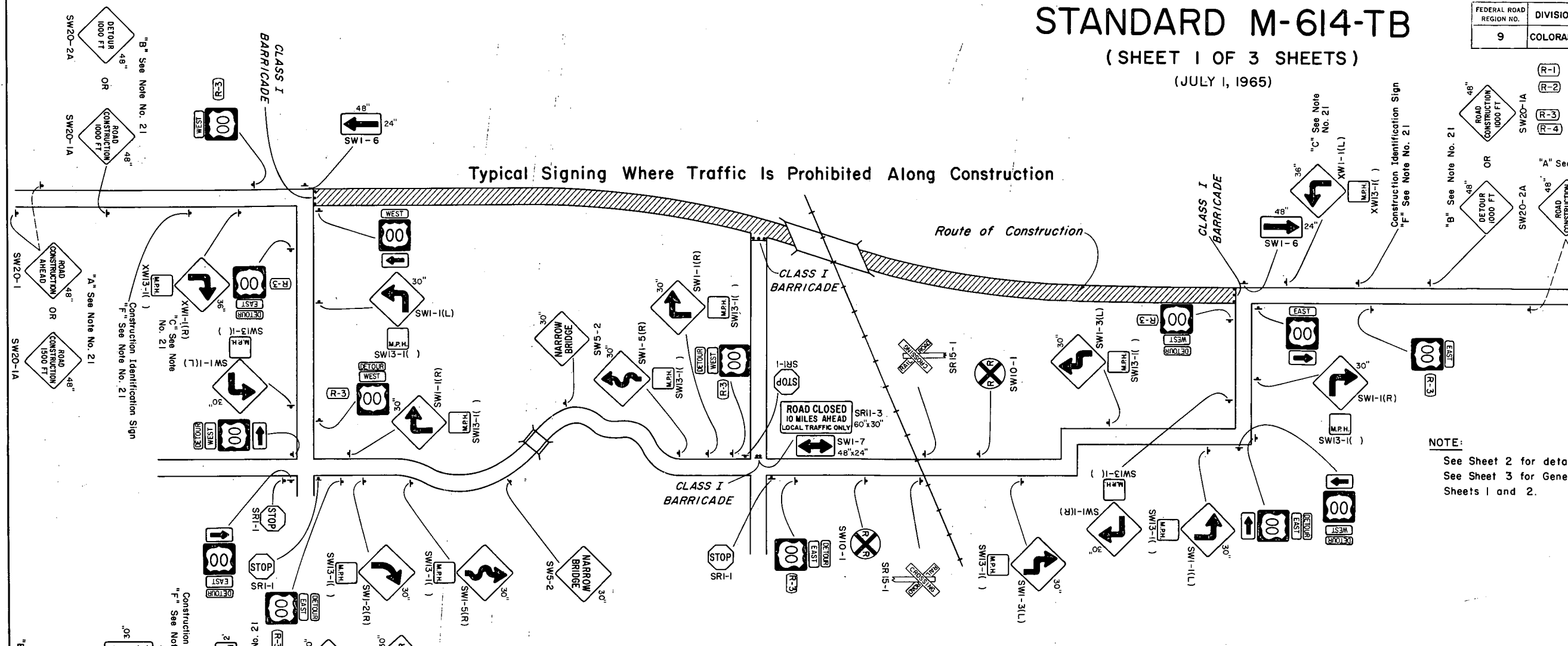
# STANDARD M-614-TB

(SHEET 1 OF 3 SHEETS)

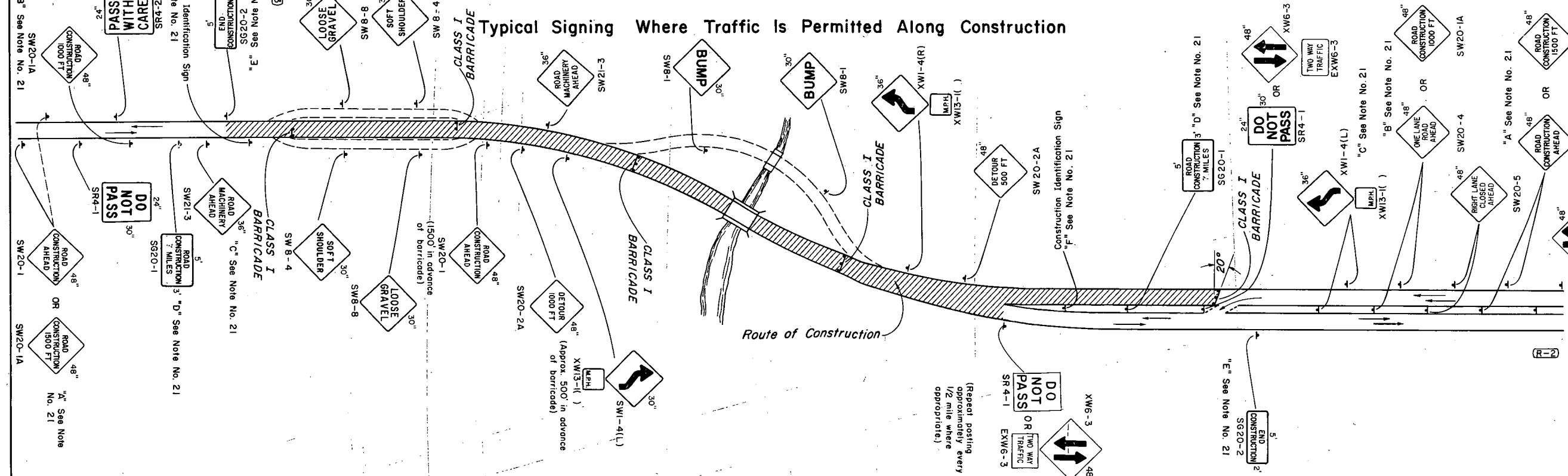
(JULY 1, 1965)

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO		

REVISIONS		
NO.	DATE	DESCRIPTION
R-1	7-12-67	Note 23
R-2	7-8-68	Rev. Break-away, Placement, Code No's, & Dept. Name
R-3	12-24-68	Rev. U.S. Shields
R-4	11-22-71	Rev. Signs & Code Nos

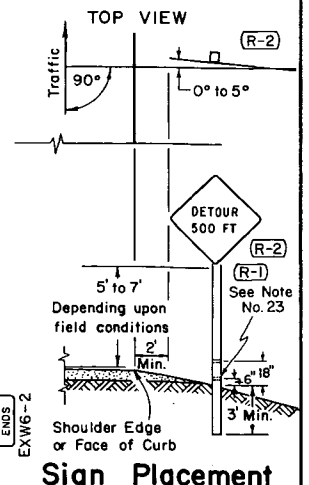


Typical Signing Where Traffic Is Prohibited Along Construction



Typical Signing Where Traffic Is Permitted Along Construction

NOTE:  
See Sheet 2 for detailed drawings of signs.  
See Sheet 3 for General Notes applicable to  
Sheets 1 and 2.



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS  
TRAFFIC SIGNING  
FOR HIGHWAY  
CONSTRUCTION

Designed By: D.R.W.  
Made By: J.L.S.  
Checked By: J.B.

Approved By: *[Signature]*  
Traffic Engineer  
Date: AUGUST 9, 1965



# STANDARD M-614-TB

(SHEET 3 OF 3 SHEETS)  
(JULY 1, 1965)

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO		

REVISIONS			
(R-1)	7-12-67	Added Note 23	G.W.F.
(R-2)	7-8-68	Rev. Note 23 & Dept. Name -	
		Deleted Note	G.W.F.
(R-3)	12-24-68	Rev. Note No. 18	J.L.S.
(R-4)	11-22-71	Rev. Notes	J.J.S.

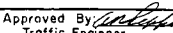
## GENERAL NOTES

- (R-4) 1. All work shall be done in accordance with: (a) the Standard Specifications applicable to the Project, and (b) the "Manual on Uniform Traffic Control Devices for all Classes of Streets and Highways" published by the U.S. Department of Transportation, Federal Highway Administration, and the related Colorado Supplement.
2. Where traffic is maintained through or over any part of the Project the Contractor will be required to mark all hazards within the limits of the Project (including connecting roads) with well-maintained Barricades, Warning, and Guide Signs. All Barricades and Signs shall be moved, added to, changed or removed as required during the progress of construction and removed entirely when the Project is completed.
- (R-4) 3. Where traffic is prohibited from the Project the Detour will be marked by the Division except that the Contractor shall provide, erect and maintain Barricades, complete, (when required) at the ends of the Project, ends of the Detour and connecting roads. All U.S. or State Route Markers required for the Project will be furnished and installed by the Division. The location and positioning of Warning Signs, Barricades, and Regulatory Signs shall be as recommended by the appropriate District Engineering Forces of the Division.
4. Work on the Project shall not be started until all required signs are in place and approved by the Engineer. Where speed control appears necessary such speed control shall be requested from the Engineer by the Contractor. Control of speed through a construction zone may be achieved by Advisory Speed plates in conjunction with Warning Signs (SW13-1 for use with 30" Warning Signs and XW13-1 for use with 36" and 48" Warning Signs). The Advisory Speed plate is to be posted only at those locations where the safe speed is lower than the imposed Regulatory speed limit.
5. All Signs and Barricades shall be placed for best visibility and legibility, maintained in good condition and kept clean and free of dirt at all times. Contractor's and Engineer's vehicles and equipment must be parked so that signs and barricades are visible to approaching traffic at all times.
6. Where two identical signs are used for dual posting they are to be staggered on the two sides of the roadway for a minimum distance of 75' to avoid a tunneling effect.
7. Examples for marking Projects, as shown on Sheet 1, are typical of signs required and are subject to alteration to fit actual conditions encountered in the field. Locations for control devices are to be staked by the Engineer. In all cases Warning signs are to be placed well in advance of the hazard, the distance depending on topography and existing approach speeds. Additional markings and any special signs required for the guidance and protection of traffic will be placed as required on the Project at the Contractor's expense.
- (R-4) 8. Desirable sizes for signs are shown on Sheet 1 of this Standard. Larger or smaller signs shall be used where warranted. Detailed dimensions for signs normally used in connection with construction are shown on Sheet 2 of this Standard. For information on standard roadway signs not detailed on this Standard see the "Manual on Uniform Traffic Control Devices for all Classes of Streets and Highways" published by the U.S. Department of Transportation, Federal Highway Administration, and the related Colorado Supplement.
9. Signs with the prefix "R" in the sign code are Regulatory signs and as such impose legal compulsions or restrictions on drivers and should only be used as authorized by the Engineer.
10. Signs with the prefix "W" in the sign code are Warning signs and are used to alert traffic to existing or potentially hazardous conditions.
11. Signs with the prefix "D" or "M" in the sign code are Guide signs. Those with the prefix "D" convey general information and those with the prefix "M" are used for marking the traffic route.
- (R-4) 12. All signs shall be reflectorized unless otherwise specified on plans. Regulatory signs (unless otherwise specified) shall have a screen processed black legend and border on a white flexible reflective sheeting, non-exposed lens background. The back side of Regulatory and Guide signs shall be painted with two coats of "Exterior Sign White Paint." Warning signs shall have a screen processed black legend and border on an orange flexible reflective sheeting, non-exposed lens background. The back side of Warning signs shall be painted with two coats of exterior sign white. Guide signs shall have a black message on an orange background.
13. Painting for wood surfaces shall conform with Section 508 of the Standard Specifications.
14. Posts for regulatory, warning, and guide signs will normally be 4"x4" or 6"x6" and shall conform to the Standard Specifications for Untreated Timber-S4S. Timber shall conform to Construction grade Paragraph 123B or 125B of Standard No. 15 Grading & Dressing Rules for West Coast Douglas Fir (1956) or Dense Structural 5B and LL Structural 5B Paragraph 284 or 285 of 1956 Grading Rules for Southern Pine. Posts shall be painted with one coat of "White Wood Primer" and one coat of "Outside White Paint."
15. Sign panels furnished by the Contractor for use only during construction may be fabricated from plywood, aluminum, steel or other suitable material but shall be stable and durable enough to meet other requirements of this Standard.
16. All material shall be sound and durable. Barricades, signs, symbols, and lettering shall be of good workmanship. Uneven lettering will not be accepted.
- (R-4) 17. Alternate methods of processing signs or the substitution of symbols or other reflecting elements for painted symbols will be permitted only after approval by the Division.
- (R-3) 18. Lanterns and Torches - Lanterns, shall be used only in low speed urban areas. Open-flame torches shall not be used under any circumstances.
- (R-4) 19. Barricades, Flashing Beacons and Flashers - Refer to appropriate Division Standard Drawings (Timber Barricades) for details.
20. Flagman Sign - This sign shall have a black painted background on both sides to form a contrast for the octagonal Stop sign and the diamond Warning sign. The "STOP" sign shall be fabricated by reverse screen process using transparent red paint on smooth surface silver reflective sheeting. The "SLOW" side of the Flagman Sign shall be black process paint on smooth surface orange reflective sheeting. Handle to be grooved on one side to indicate reading of sign to Flagman.
- (R-4) 21. Sign "A": This is the first advance warning sign and shall be placed 1,500 feet ahead of Barricade or project terminal. Postings are required on both sides of the roadway on divided highways. Dual posting is required where warranted on two-lane, two-way highways. Sign "B": This is the second advance warning sign and shall be placed 1,000 feet ahead of barricade or project terminal. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways. Sign "C": This is the third advance warning sign in cases where barricades are used and shall be placed 500 to 750 feet ahead of barricade or potentially hazardous condition. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways. Sign "D": SG20-1 This sign shall be placed to mark the beginning of a Project of more than 2 miles in extent, where traffic is maintained through the project. It shall be placed singly and near the beginning of construction. Sign "E": SG20-2 This sign shall be placed to mark the end of the Project. It shall be placed singly and may be placed opposite barricade if desirable. Sign "F": Construction Identification signs shall be furnished and installed by the Division on all Federal-Aid and Forest Highway Projects where actual construction is in progress and visible to highway users. These signs should be located so as not to obscure or detract from the effectiveness of other official signs. Where two or more projects are contiguous the appropriate data may be included in one set of signs. Refer to appropriate Division Standard Drawings (Identification Signs) for sign details. Signs A through F shall be furnished, installed and maintained by the Division.
22. When Flags are used in lieu of the Flagman Sign, they shall be a minimum of 18"x18", made of a good grade of bright red material, and fastened securely to a staff of approximately 3 foot length. The free edge should be weighted to insure that the flag will hang vertically, even in heavy winds.
- (R-1) 23. Each 6"x6" timber sign post shall be provided with two 2" diameter holes through the neutral axis normal to the roadway, one hole at 6" and one hole at 18" above the ground level. The 4"x4" timber posts shall not be provided with any type of break-away device. The inside portion of each 2" diameter hole shall be painted white. The underground portion of each timber post shall be treated with creosote.

(R-2)

(R-2)

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS  
TRAFFIC SIGNING  
FOR HIGHWAY  
CONSTRUCTION

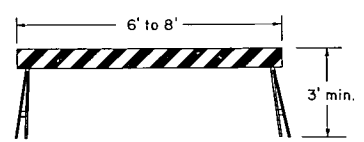
Designed By: D.R.W.  
Made By: J.L.S.  
Checked By: J.B.  
Approved By:   
Date: AUGUST 9, 1965

STANDARD S-614-52A

(MARCH 1, 1972)

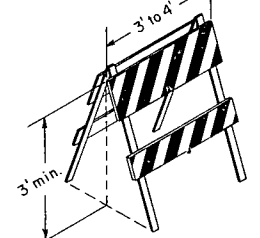
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO			
REVISIONS				

TYPE 1 BARRICADE



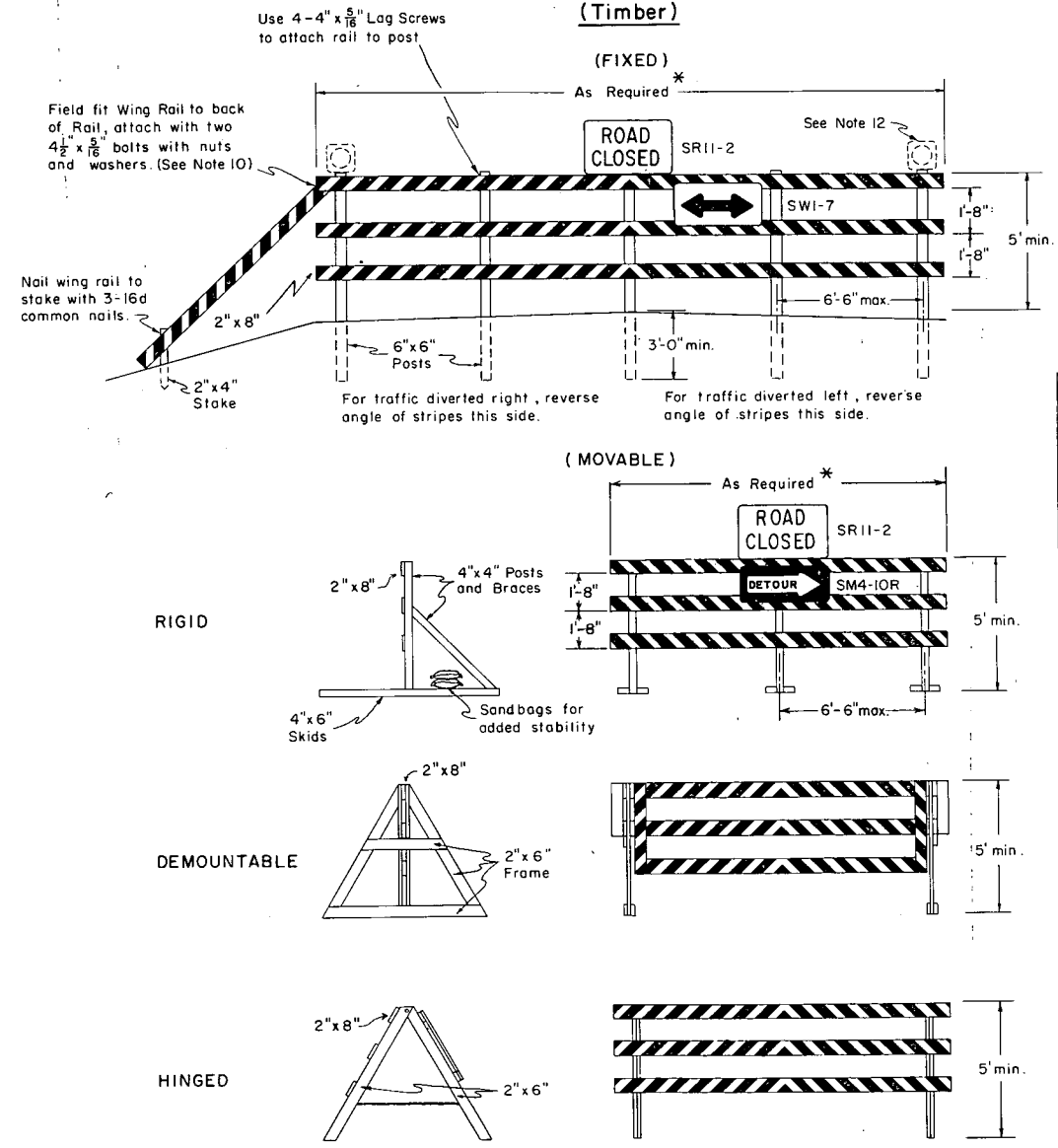
May be fabricated of lumber, aluminum or other suitable light weight materials of structural soundness. Stands may be detachable for mobility.

TYPE 2 BARRICADE



May be fabricated of lumber, aluminum or other suitable light weight materials of structural soundness.

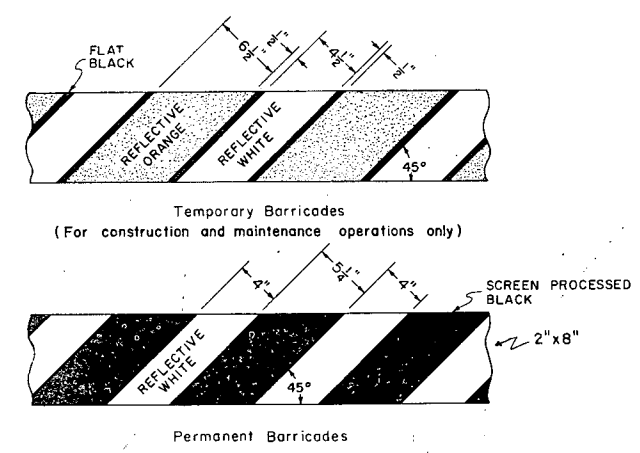
TYPICAL TYPE 3 BARRICADES (Timber)



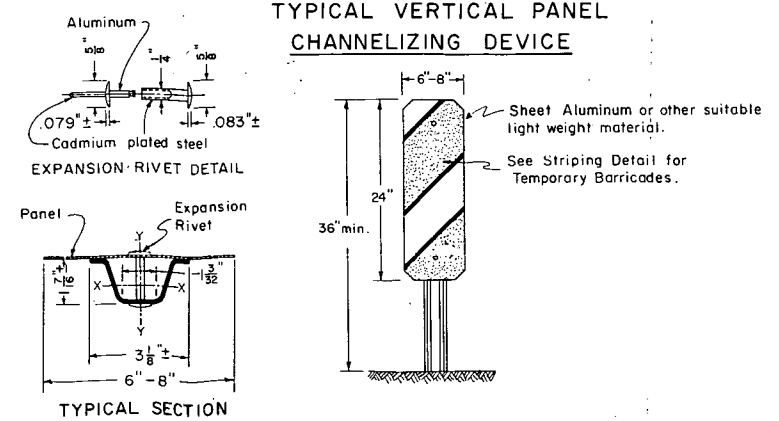
	BARRICADE DESIGNATIONS		
	TYPE 1	TYPE 2	TYPE 3
Rail Width	8" min. - 12" max.	Top: 8" min. - 12" max. Mid: 4" min. - 8" max.	8" min. - 12" max.
Rail Length	6' to 8'	3' to 4'	As Required, see Table *
Height	3' min.	3' min.	5' min.
Stripes	See Detail of Barricade Striping		See Notes 4 & 7
Frame	Demountable or Heavy Duty "A" Frame	Light "A" Frame	Posts, Skids or "A" Frame
Flexibility	Movable	Portable	Fixed or movable
Use	Temporary	Temporary	Temporary or Permanent

RAIL LENGTH TABLE *		
TYPE 3 BARRICADE		LENGTH
FIXED	MOVABLE	
F - A	M - A	8' - 14'
F - B	M - B	15' - 24'
F - C	M - C	25' - 35'
F - D	M - D	> 35'

DETAIL OF BARRICADE RAIL STRIPING



TYPICAL VERTICAL PANEL CHANNELIZING DEVICE



GENERAL NOTES

- All work shall be done in accordance with the Standard Specifications applicable to the project.
- All signs, sign materials, beacons, and barricade warning lights shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the Federal Highway Administration, of current issue, and the Colorado Supplement thereto, and this standard.
- The various types and combinations of approved signs and beacons for barricades required for each project shall be governed by field conditions and subject to approval by the Engineer. Typical barricade applications are shown in Part 6 of the Manual on Uniform Traffic Control Devices for Streets and Highways.
- Painting shall conform with Subsections 508.08 and 614.07 of the Standard Specifications. All skids, braces and posts shall be painted with 2 coats of "Exterior White Paint". Horizontal and wing rails on all temporary barricades shall have orange and white stripes with a narrow flat black stripe separating the orange and white stripes as shown in striping detail. The entire area of orange and white stripes shall be reflectorized. For striping of permanent barricades see Note 7.
- Each barricade rail shall be striped on the face side only with stripes slanting downward at a 45° angle toward the side to which traffic is to turn or pass. The backsides of rails shall be painted with "Exterior White Paint".
- When fixed barricades are designated on plans, the portion of the posts below ground line shall be dipped in hot creosote oil. The portion of the post above ground line shall be painted with 2 coats of "Exterior White Paint".
- A Fixed Type 3 Barricade which is required as a permanent installation shall have rails striped with black and white in lieu of orange and white. The white stripes shall be 4" in width, the black stripes shall be 5/4" wide as shown in striping detail. The white stripes shall be reflectorized. The posts of a permanent installation shall be painted with 2 coats of "Exterior White Paint".
- All skids, braces, rails and posts shall be nailed together with No. 20d nails. All screws, bolts, nuts and washers shall be galvanized or cadmium plated. Skids (bases) of movable barricades shall be weighted where necessary to provide stability.
- All timber shall be Grade No. 2 or better, S 4 S, Douglas fir or Larch, as described in the 1970 Standard Grading Rules published by the Western Wood Products Association, and shall conform to paragraph 62.12 for the rails and paragraph 80.12 for the posts.
- Detachable extension wing rails for bypassing of construction equipment are permitted when necessary. The length is variable and shall be adequate to provide closing of borrow pit and/or shoulder as required. May be used on Fixed or Movable Type 3 Barricades.
- Alternate materials or other reflective elements on traffic signs or barricades will be permitted only after approval of such material by the Division in writing.
- Flashing Beacons or Barricade Warning Lights shall be used in connection with barricades when called for by the Engineer. When used, they shall be positioned above the top rail of the barricades to produce the most effective results. When used, Barricade Warning Lights shall be type "B" as described by Section 6D-5 of the 1970 "Manual on Uniform Traffic Control Devices for Streets and Highways" (published in 1971).
- Reflective Sheeting shall be of the smooth surface type.
- Barricades used as "Traffic Controls for Highway Construction" are not to be paid for separately.
- Barricades will be paid for separately when designated on plans as bid items.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DIVISION OF HIGHWAYS  
BARRICADES AND  
VERTICAL PANEL  
CHANNELIZING DEVICES

Designed By: GWF  
Made By: JVN  
Checked By: GWF

Approved By: [Signature]  
Traffic Engineer  
Date: March 1, 1972