

# INACTIVE JUL 3 1968

## DEPARTMENT OF HIGHWAYS STATE OF COLORADO

### PLAN AND PROFILE OF PROPOSED STATE PROJECT NO. C 01-0072-12 STATE HIGHWAY NO. 72 DENVER COUNTY

"As Constructed  
No Revisions"  
Sheet No. 2

FEDERAL ROAD DISTRICT NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	C 01-0072-12	1

AS CONSTRUCTED  
REVISED

DATE June 22, 1968

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#### SCALES OF ORIGINAL DRAWINGS

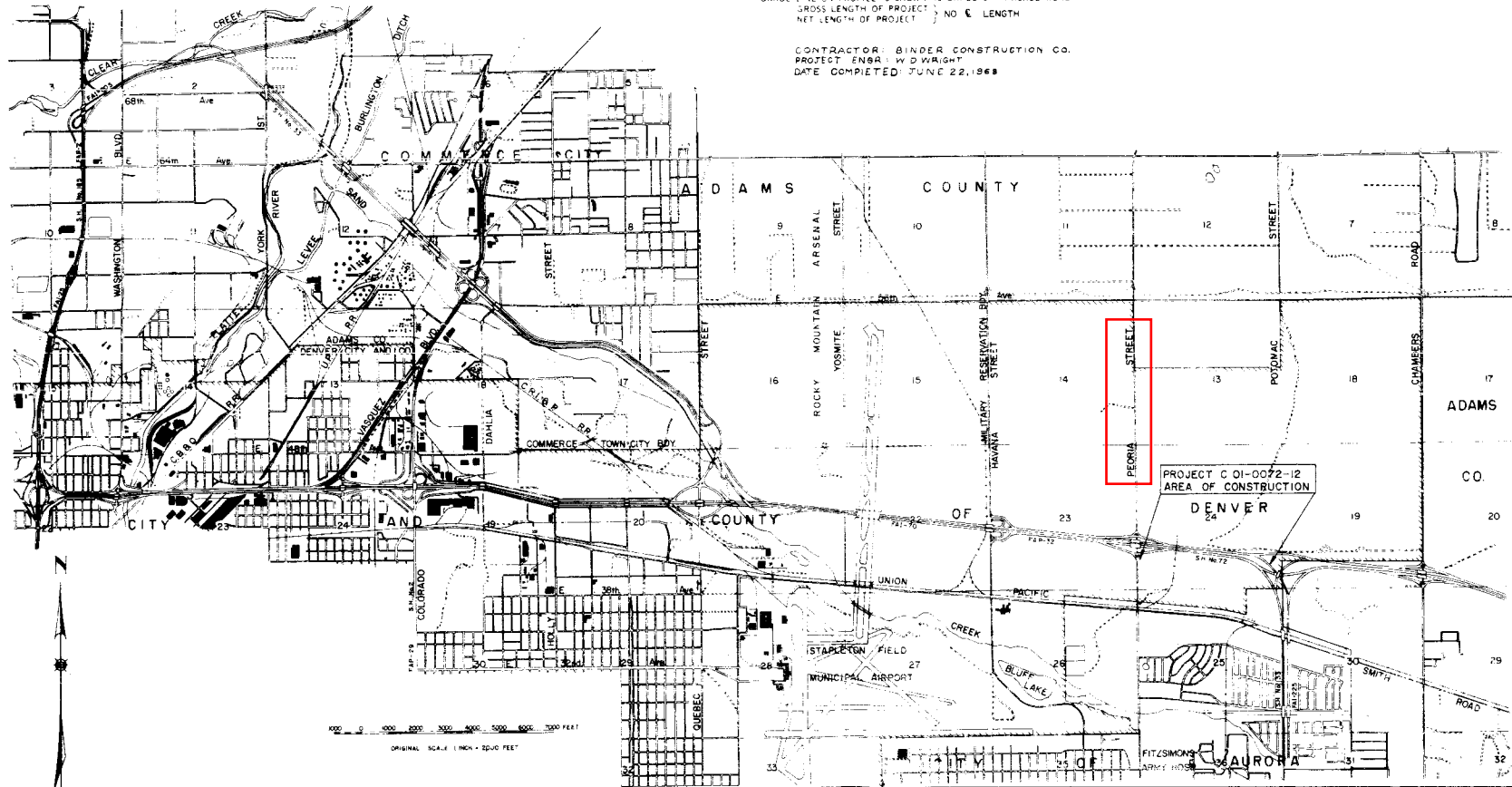
ON PLAN, 1 IN. = 100 FT.  
ON PROFILE, 1 IN. = 100 FT. HORIZONTAL  
1 IN. = 10 FT. VERTICAL  
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD  
GROSS LENGTH OF PROJECT, NO. 6 LENGTH  
NET LENGTH OF PROJECT, NO. 6 LENGTH

CONTRACTOR: BINDER CONSTRUCTION CO.  
PROJECT ENGINEER: W.D. WRIGHT  
DATE COMPLETED: JUNE 22, 1968

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SEE SPECIAL PROVISIONS FOR  
NOTICE TO BIDDERS

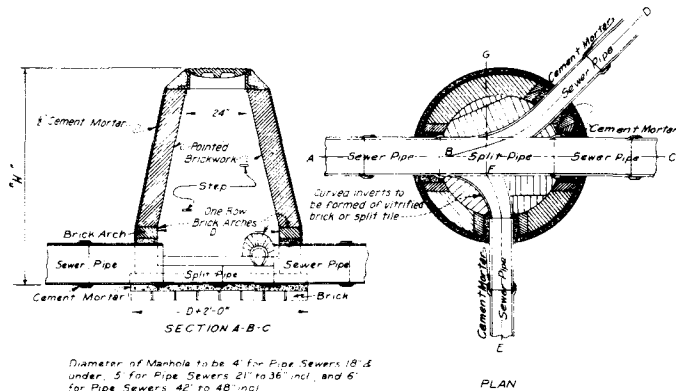
DEPARTMENT OF HIGHWAYS STATE OF COLORADO	
APPROVED:	DATE
By <i>E. E. Shumate</i> 4-4-68 CHIEF ENGINEER	
By <i>L. L. Brown</i> 4-4-68 DEPUTY CHIEF ENGINEER	
DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS	
APPROVED:	DATE
DIVISION ENGINEER	

J.R.W.

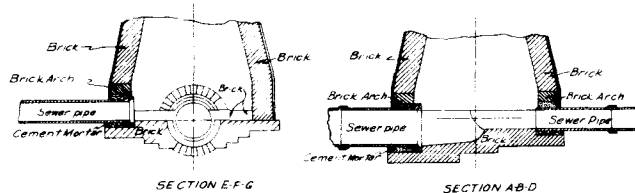
FED. ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	C.O.D.	C.OI-0072-12	2	

AS CONSTRUCTED  
NO REVISIONS DATE June 22, 1968

Steps for Manholes and Inlets, see M-604-D



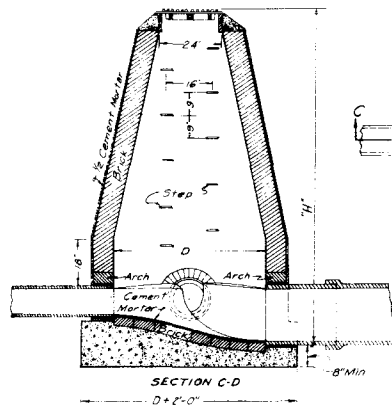
Diameter of Manhole to be 4' for Pipe Sewers 18" & under, 5' for Pipe Sewers 21" to 36" incl, and 6' for Pipe Sewers 42" to 48" incl.



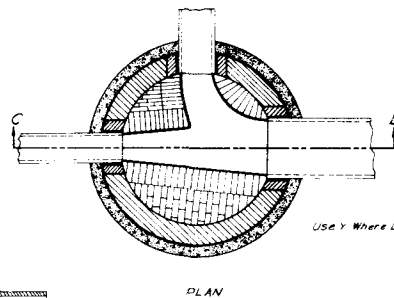
SECTION E-F-G

SECTION A-B-D

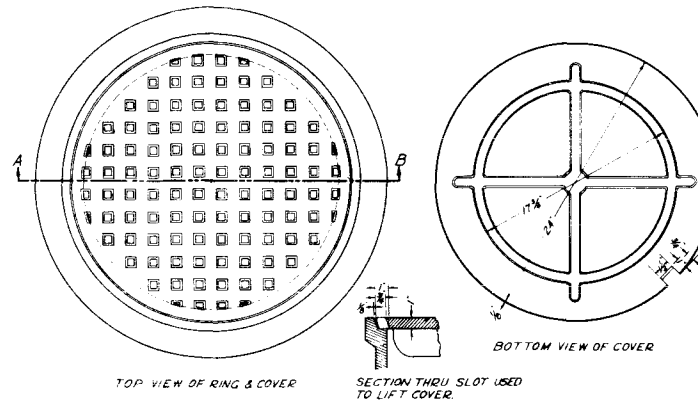
TYPE 1 MANHOLE (STORM & SANITARY)  
Scale 1/2" = 1'-0"



TYPE 1-A MANHOLE  
Scale 1/2" = 1'-0"  
• SANITARY & STORM SEWERS



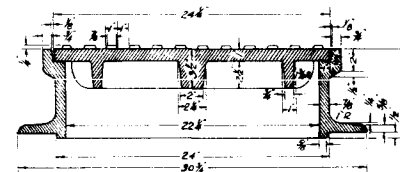
Diameter of Manhole to be 5' for Pipe Sewers 18" and under, and 6' for Pipe Sewers 42" to 48".



TOP VIEW OF RING & COVER

SECTION THRU SLOT USED TO LIFT COVER

BOTTOM VIEW OF COVER



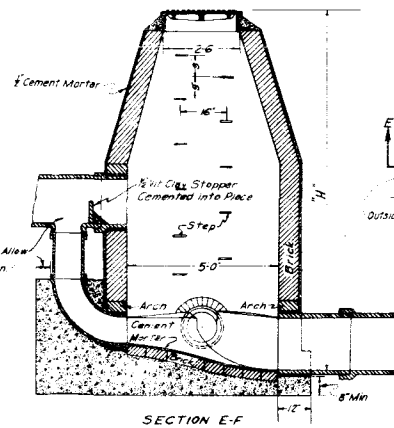
SECTION A-B

DETAILS OF MANHOLE RING & COVER  
Scale 1/2" = 1'-0"

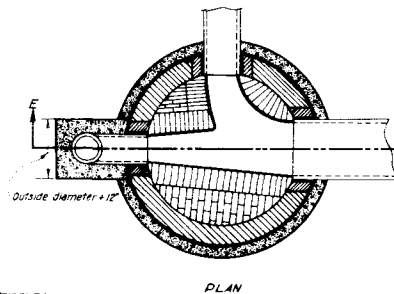
Weight - Frame Approx 224"  
Cover Approx 176"  
Clipped or Dented with Asphalt or Coal Tar & Oil

#### GENERAL NOTES:

All brick in manholes to conform to requirements of grade MA of AASHTO Designation M-91-42. Manhole bottoms may be either brick or concrete. Manhole benches shall be of brick as specified.  
Alternate design for Manholes using Precast Concrete Blocks, Cast in place Concrete, or Precast Concrete Manholes will be permitted after approval of Details by the Department.



SECTION E-F



PLAN

TYPE 2 MANHOLE (SANITARY ONLY)  
Scale 1/2" = 1'-0"

COLORADO DEPARTMENT OF HIGHWAYS	
MANHOLE DETAILS TYPE 1, 1A AND 2	
Designed by:	Approved by:
Checked by:	Date:

**GENERAL NOTES**

All quantities on preliminary plans are to be considered approximate only. During Construction of this Project, Traffic will use the Present Traveled Roadways. For Preliminary plan quantities of Bituminous Materials the following rates of application were used:

Prime Coat (M.C. 70) at 0.40 Gal. per Sq. Yd.

Bituminous Pavement at 110 Lbs. per Sq. Yd. per 1" thickness.

Water lines, gas lines, etc. as shown on Plan and Profile sheets are plotted from the best available information. The Contractor's attention is directed to paragraph 105.06 of the Standard Specifications concerning utilities.

It is estimated that 60 hours of flagging for controlling traffic will be required for this project.

NOTE: Structure Excavation shall be used to fill trench area to original ground or subgrade line and shall be included in contract unit bid price per lin. ft. of pipe.

Unclassified Excavation shall be distributed within project limits as directed by the Engineer at no additional cost.

Compaction for Backfill Material shall be Standard. Cost of compaction shall not be paid for separately, but shall be included in the Unit Bid Price per lin. ft. of pipe.

All reinforced concrete pipe (except jacked concrete pipe) shall be Class II.

(R-1) Concrete pipe joints (except jacked concrete pipe and cast-in-place concrete pipe) shall be made with the following:

- Portland Cement Mortar
- Epoxy Cement Mortar
- Rubber Gaskets
- Gum and Joint Compound
- Plastic Caulking

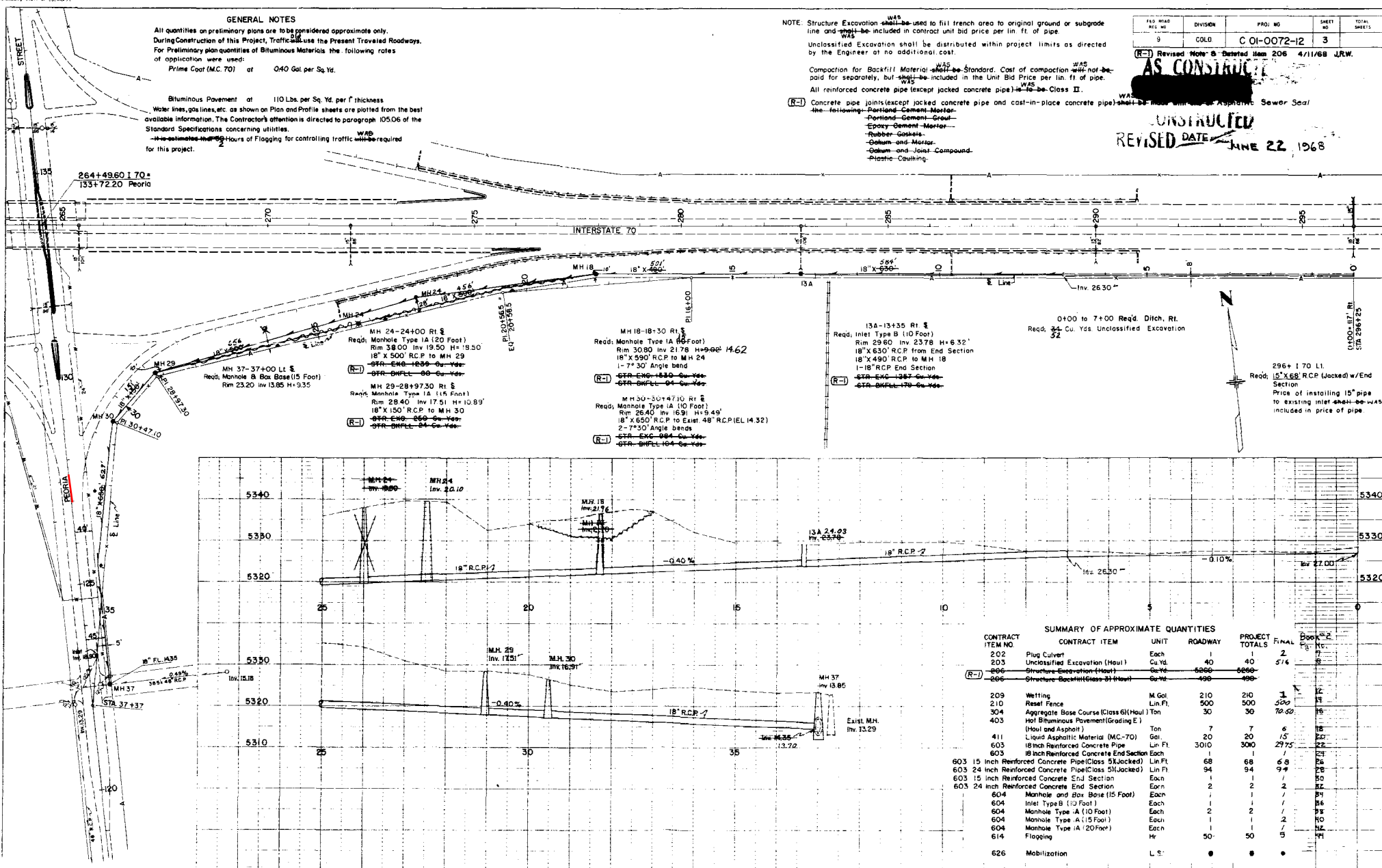
AS CONSTRUCTED

UNSTRUCTURED

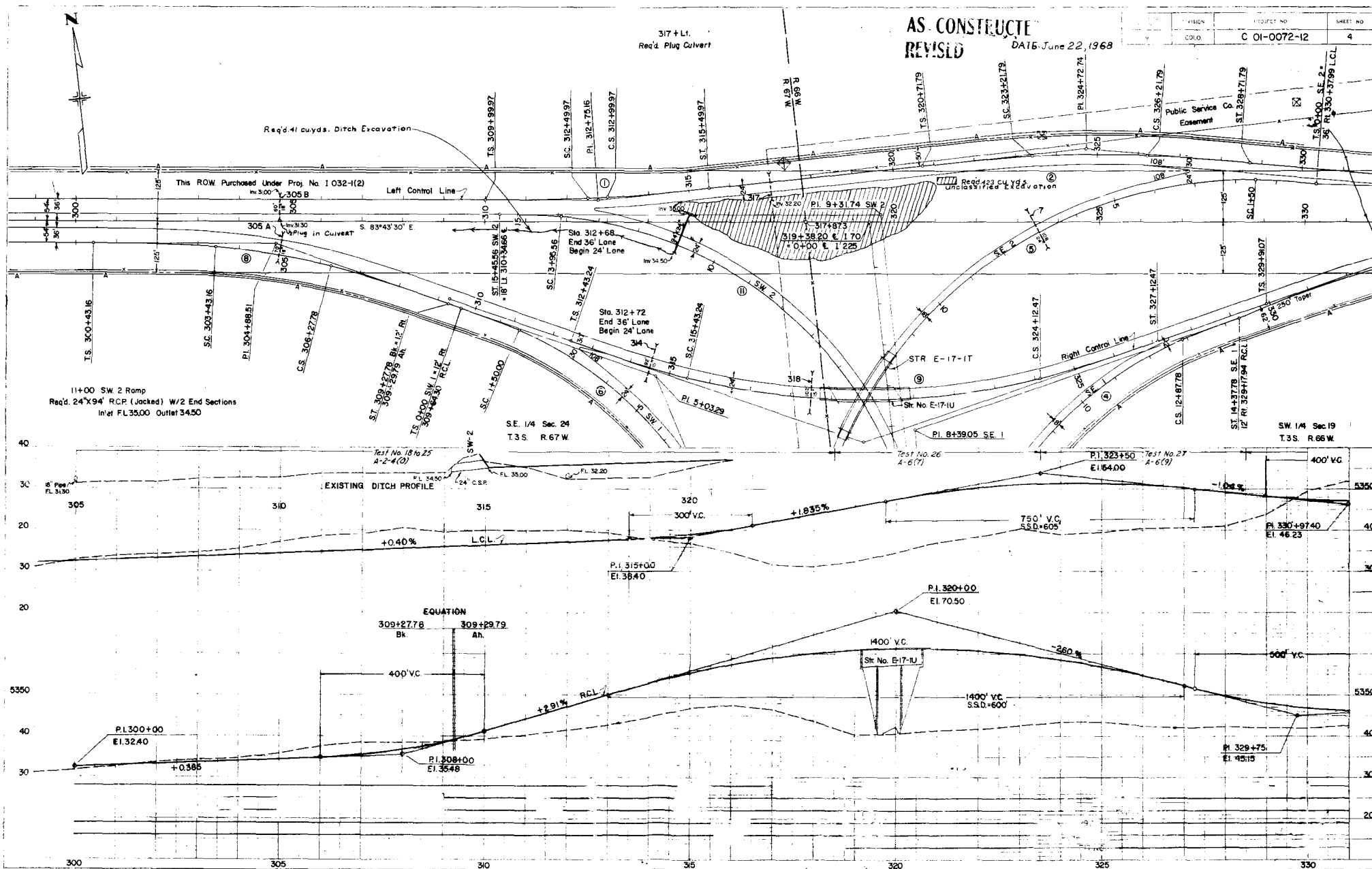
REVISED DATE JUNE 22, 1968

FED. ROAD DIST. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLD	C 01-0072-12	3	

(R-1) Revised Note 6 Dated Jan 206 4/11/68 J.R.W.



SUMMARY OF APPROXIMATE QUANTITIES									
CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY	PROJECT TOTALS	FINAL	Book 2			
202	Plug Culvert	Each		1	2	1			
203	Unclassified Excavation (Haul)	Cu Yd	40	40	576	5			
(R-1) 206	Structure Excavation (Haul)	Cu Yd	6666	6666					
206	Structure Backfill (Class II Haul)	Cu Yd	498	498					
209	Wetting	M Gal	210	210	1	12			
210	Resurf Fence	Lin Ft	500	500					
304	Aggregate Base Course (Class 6) (Haul) 1 Ton	30	30	30	70.50	18			
403	Hot Bituminous Pavement (Grading E) (Haul and Asphalt)	Ton	7	7	6	23			
411	Liquid Asphaltic Material (MC-70)	Gal	20	20	15	22			
603	18 inch Reinforced Concrete Pipe	Lin Ft	3010	3010	2975	26			
603	18 inch Reinforced Concrete End Section	Each			1	23			
603 15	15 inch Reinforced Concrete Pipe (Class 5) (Jacked)	Lin Ft	68	68	6	26			
603 24	24 inch Reinforced Concrete Pipe (Class 5) (Jacked)	Lin Ft	94	94	99	28			
603 15	15 inch Reinforced Concrete End Section	Each	1	1	1	50			
603 24	24 inch Reinforced Concrete End Section	Each	2	2	2	52			
604	Manhole and Box Base (15 Foot)	Each	1	1	1	31			
604	Inlet Type B (10 Foot)	Each	1	1	1	56			
604	Manhole Type A (10 Foot)	Each	2	2	2	58			
604	Manhole Type A (15 Foot)	Each	1	1	2	60			
604	Manhole Type A (20 Foot)	Each	1	1	1	62			
614	Flagging	Ls	50	50	5	61			
626	Mobilization	Ls							



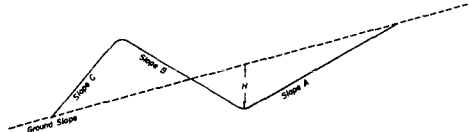
# STANDARD TYPES *of* DITCHES *and* CONSTRUCTION METHODS

STANDARD M-203-C  
(JULY 1, 1965)

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

## DETAILS *for* CONTOUR INTERCEPTING DITCHES

### Typical Section for Contour Intercepting Ditches



#### PURPOSE & USE OF THE TABLE

The primary purpose of the information for Contour and Intercepting Ditches shown on this sheet is to serve as a guide in construction and to readily arrive at yardages of excavation involved.  
Foremost consideration in constructing these ditches is given first to the natural ground line slope confronted in construction, thence to the other values shown on the Typical Section.  
By properly arriving at the combination of values shown on the Typical Section and in the Table for a specified condition, the number of cubic yards of excavation per 100 lin. ft. of ditch may be read under the appropriate column for this item.

### Typical Construction Layouts

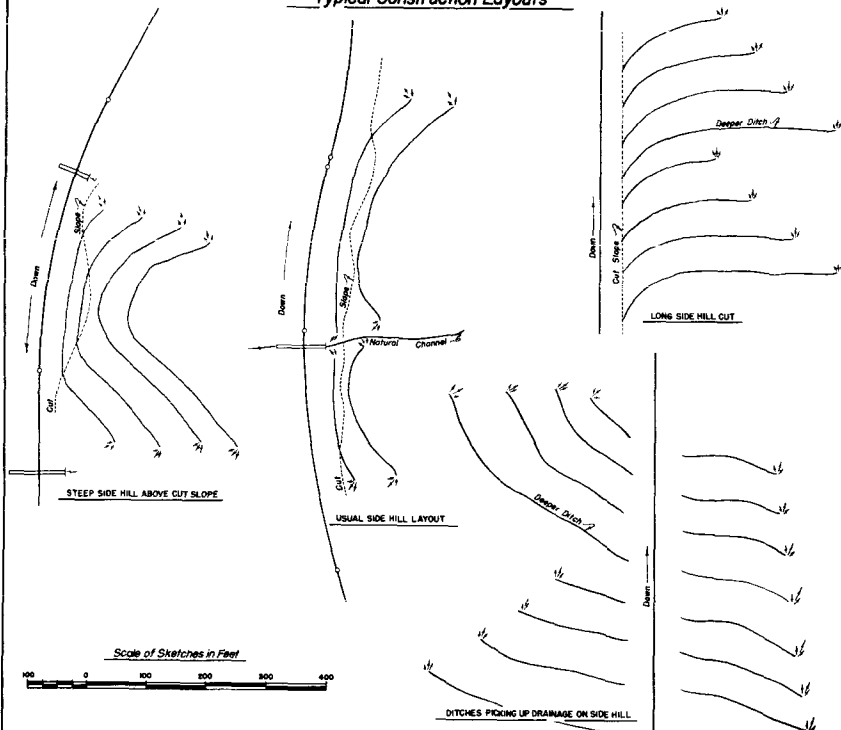
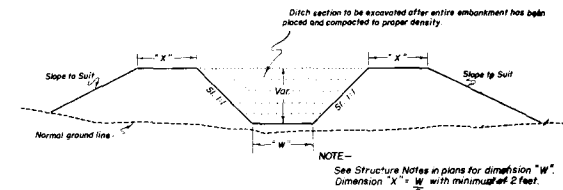


Table of Slopes and Yardages

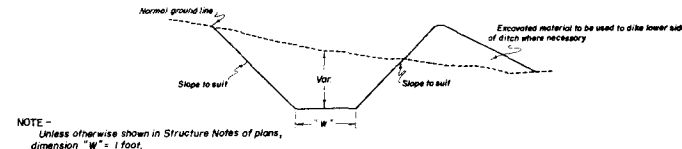
SLOPES				H	Cubic Yards per 100 lin. ft. of Ditch
Ground	A	B	C		
5:1 Or Flatter	2:1	4:1	2:1	15'	16
				16'	23
				21'	32
				15'	15
				18'	22
				21'	30
	1-1/2:1	3:1	1-1/2:1	15'	14
				18'	20
				21'	27
				15'	13
				18'	19
				21'	25
4:1	2:1	4:1	2:1	15'	12
				18'	18
				21'	25
				15'	12
				18'	17
				21'	23
	1-1/2:1	3:1	1-1/2:1	15'	10
				18'	14
				21'	19
				15'	17
				18'	25
				21'	34
3:1	2:1	4:1	2:1	15'	17
				18'	25
				21'	34
				15'	17
				18'	24
				21'	32
	1-1/2:1	3:1	1-1/2:1	15'	15
				18'	21
				21'	29
				15'	13
				18'	18
				21'	25
2:1	1-1/2:1	2:1	1-1/2:1	15'	12
				18'	17
				21'	23
				15'	11
				18'	16
				21'	21
1-1/2:1	1:1	1-1/2:1	1:1	15'	10
				18'	14
				21'	20
				15'	22
				18'	31
				21'	43
1:1	1:1	1:1	1:1	15'	9
				18'	13
				21'	17
				15'	8
				18'	12
				21'	16
1-1/2:1	1:1	1:1	1:1	15'	11
				18'	16
				21'	21
				15'	11
				18'	16
				21'	21

▲ Slopes are approximate and may be varied to suit conditions encountered during construction.

## TYPICAL SECTIONS *for* DRAINAGE, IRRIGATION DITCHES *and* CHANNEL CHANGES



### For Embankment Sections (Generally for use in Irrigation Ditches & Channel Changes)



### For Cut Sections

## GENERAL NOTES

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

All ditches are to be constructed to lines and grades as staked by the Engineer using the ditch section shown on plans or as ordered by the Engineer.

CONTOUR INTERCEPTING DITCHES: Ditches are to be laid out along the ground contour on a grade of not over 1% (Type of soil shall govern the grade).

Ends of ditches are to be lined up so that concentration of flow from a higher contour ditch into one at lower contour is, as far as possible avoided. The use of a deeper ditch is recommended where this condition is encountered.

The following horizontal spacing of ditches is recommended:

4% to 6%	Approximately 70' Centers
8% to 10%	Approximately 60' Centers
20% to 4:1 Slope	Approximately 55' Centers
30% to 1-1/2:1 Slope	Approximately 50' Centers

Where ditch checks are required the intervening ditch between one set of ditch checks shall not exceed a grade of 1:1. Details of checks will be shown on plans when required.

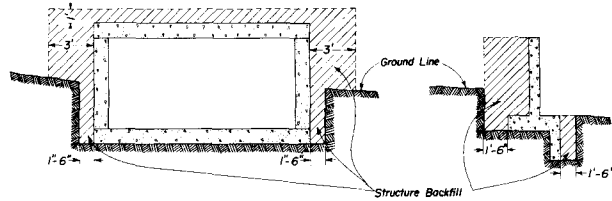
## REVISIONS

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

DITCH TYPES

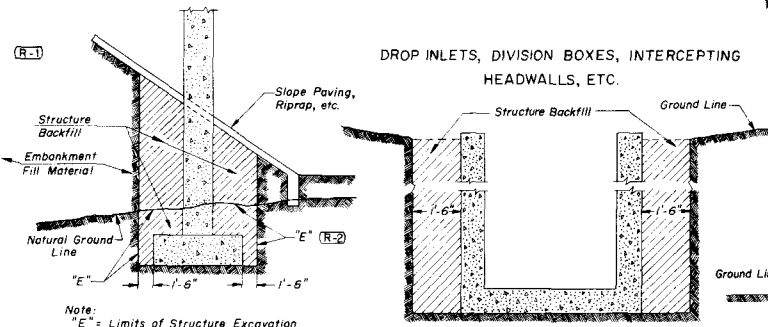
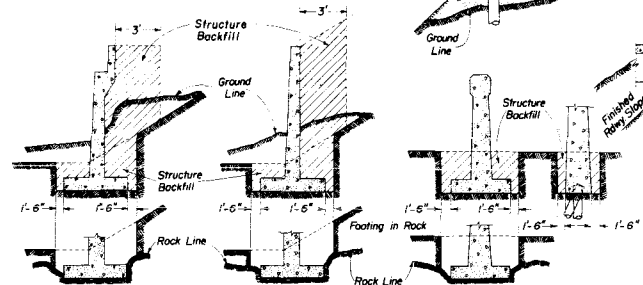
Designed by G.M. Made by G.M. Checked by  
Approved by Staff Design Engr. Date: July 1, 1965

# 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.



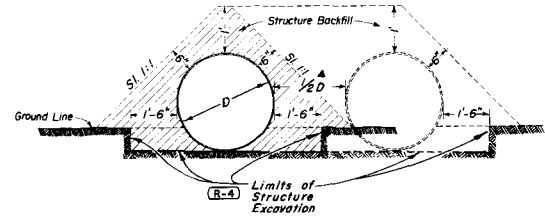
Note: "E" = Limits of Structure Excavation

# STANDARD M-206-A

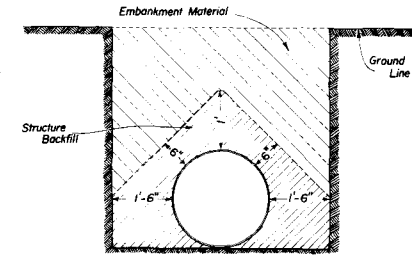
(JULY 1, 1965)  
(SHEET 1 OF 2 SHEETS)

FED. ROAD DISTRICT NO.	DIVISION	PROJECT NO.	SHEET NO.
8	COLD.		
REVISION			
(R-1)	10-20-65	ADDED PIER VIEW	MRH.
(R-2)	12-7-66	STR. EXCV.	MRH.
(R-3)	4-25-66	Class 2 Backfill (Trench)	MRH.
(R-4)	3-17-67	Conduit, Underdrn, Box	MRH.

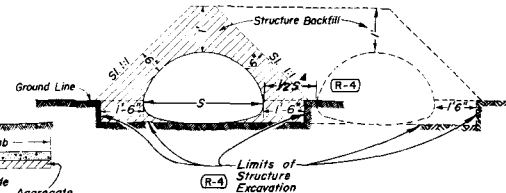
## CIRCULAR CONDUIT



## SIPHONS OR CONDUIT IN TRENCH



## ELLIPTICAL OR ARCH CONDUIT



### (R-4) NOTES:

When two or more conduits are laid side by side they shall be spaced so that adjacent sides of pipe shall be 1/2 the Diameter or Span or 3 feet apart whichever is less. Minimum spacing shall not be less than 1 foot. For additional conduit installation details see M Standards for metal, concrete, or structural plate pipe culverts.

(R-4)

### GENERAL NOTES

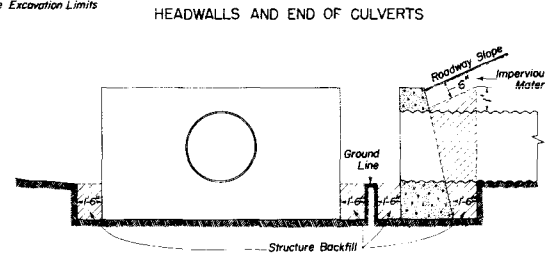
All work shall be done according to the Standard Specifications applicable to the Project.

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.

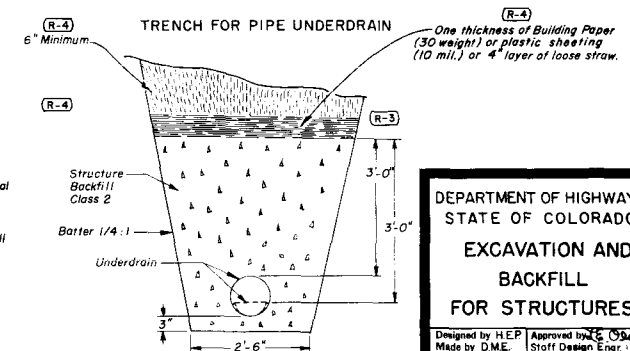
Embankment shall be built up and compacted to a point one foot above the flowline of the box or the top of the footing. The trench shall then be excavated to accommodate construction of the box or footing.

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

(R-4) Excavation for structure installation shall be classified as "Structure Excavation" unless otherwise shown on plans.



## HEADWALLS AND END OF CULVERTS



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
EXCAVATION AND  
BACKFILL  
FOR STRUCTURES

Designed by HEP  
Made by D.M.E.  
Checked by L.E.O.  
Approved by J.E. O'Donnell  
Staff Design Engr.  
Date: July 1, 1965

# STANDARD M-206-A

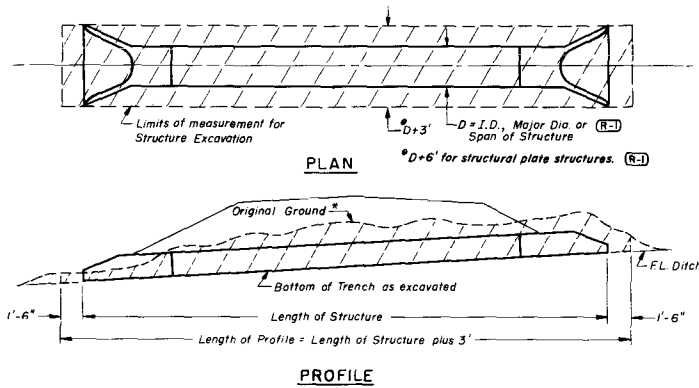
(SHEET 2)

(JULY 1, 1965)

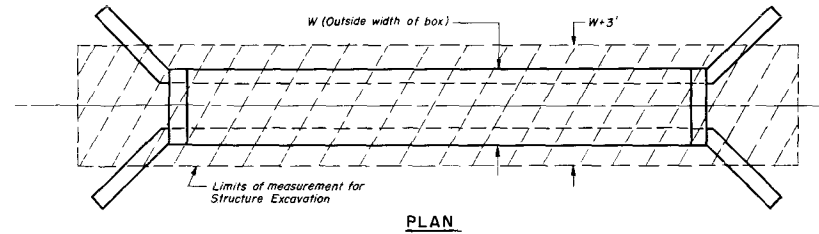
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS:	
(R-1)	3-17-67 I. D. on Pipe Culvert Span or D.M.R.H.

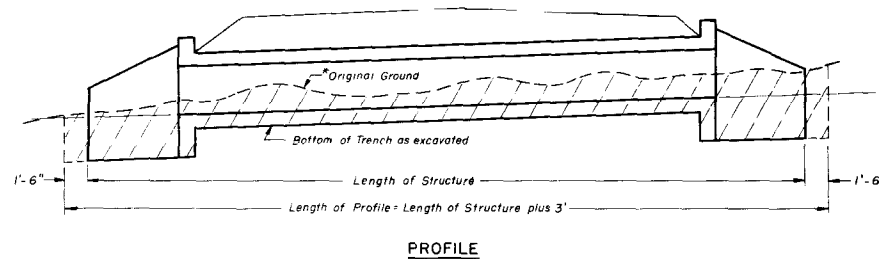
## STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



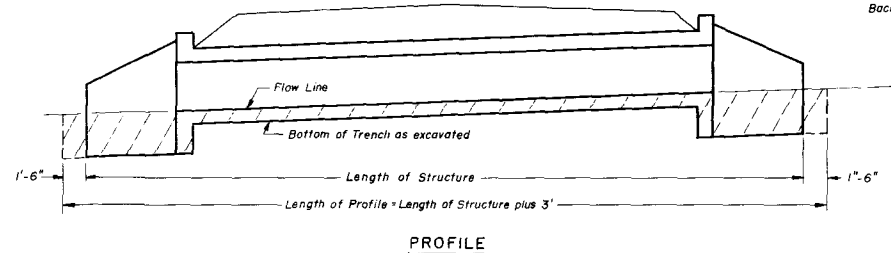
## STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS



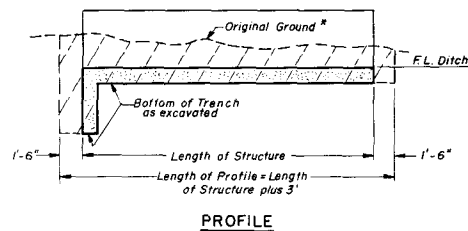
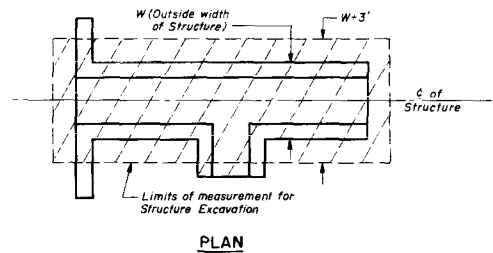
*Without Channel Change or Channel Improvement*



*With Channel Change or Channel Improvement*



## STRUCTURE EXCAVATION MEASUREMENT FOR DIVERSION OR DIVISION BOXES



\* Along C of Structure

Areas to be used for Structure  
Excavation computations.

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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

EXCAVATION AND  
BACKFILL  
FOR STRUCTURES

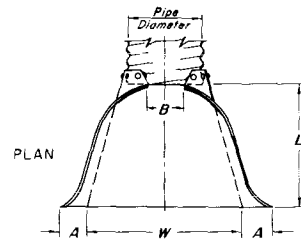
Designed by M.R.H. Approved by H.P.B.  
Made by H.P.B. Staff Design Eng.  
Checked by Date July 1, 1965

# STANDARD M-603-CA

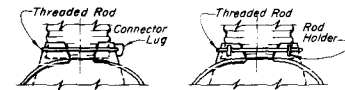
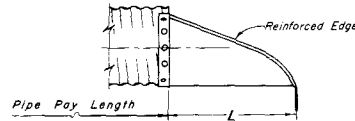
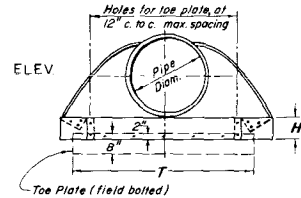
(NOVEMBER 10, 1967)

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

REVISIONS	

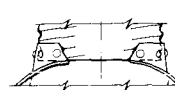


PIPE DIAM. in.	GAGE	D I M E N S I O N S						
		A (1"±) in.	B (Max.) in.	C (1"±) in.	D (1½"±) in.	E (2"±) in.	F in.	T in.
12	16	6	6	6	21	24	34	
15	16	7	8	6	26	30	40	
18	16	8	10	6	31	36	46	
21	16	9	12	6	36	42	52	
24	16	10	13	6	41	48	58	
30	14	12	16	8	51	60	70	
36	14	14	19	9	60	72	94	
42	12	16	22	11	69	84	106	
48	12	18	27	12	78	90	112	
54	12	18	30	12	84	102	124	
60	12	18	33	12	87	114	136	
66	12	18	36	12	87	120	142	
72	12	18	39	12	87	126	148	
78	12	18	42	12	87	132	154	
84	12	18	45	12	87	138	160	



**TYPE 1**  
For 12" thru 24" pipe with Annular corrugations.  
Not to be used on helically formed pipe.

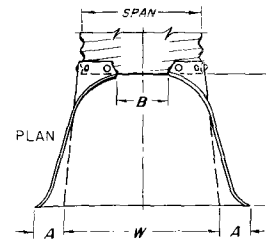
**TYPE 2**  
For 30" thru 36" pipe with Annular corrugations.  
Not to be used on helically formed pipe.



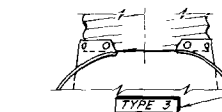
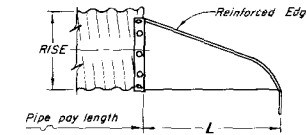
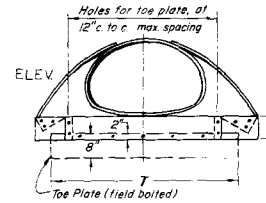
**TYPE 3**  
For 42" thru 84" pipe with Annular corrugations, and all sizes of pipe with Helical corrugations.

**NOTE:**  
Type 3 connections shall consist of an end section shop attached to a minimum 2 ft. of pipe with galvanized rivets or bolts.

## TYPICAL CONNECTIONS END SECTION AND CONNECTION DETAILS FOR ROUND CORRUGATED STEEL PIPE CULVERTS

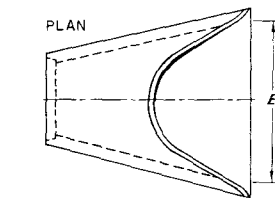


PIPE ARCH SPAN • RISE in. in.	GAGE	D I M E N S I O N S						
		A (1"±) in.	B (Max.) in.	C (1"±) in.	D (1 1/2"±) in.	E (2"±) in.	F in.	T in.
18 x 11	16	7	9	6	19	30	40	
22 x 13	16	7	10	6	23	36	46	
25 x 16	16	8	12	6	28	42	52	
29 x 18	16	9	14	6	32	48	58	
36 x 22	14	10	16	6	39	60	70	
43 x 27	14	12	18	8	46	75	85	
50 x 31	12	13	21	9	53	85	103	
59 x 36	12	18	26	12	63	90	108	
65 x 40	12	18	30	12	70	102	120	
72 x 44	12	18	33	12	77	114	132	

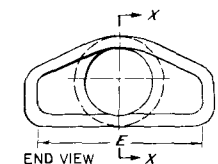
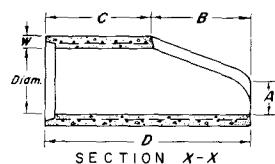


**NOTE:**  
End sections for pipe arches shall be shop attached to a minimum 2 ft. of pipe by galvanized rivets or bolts.

## CONNECTION END SECTION AND CONNECTION DETAIL FOR CORRUGATED STEEL PIPE ARCH CULVERT

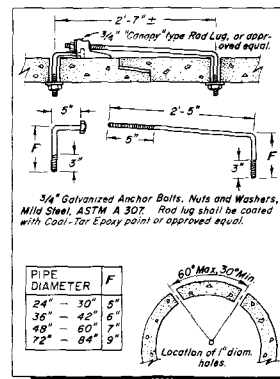


PIPE I. D. in.	D I M E N S I O N S						
	A in.	B in.	C in.	D in.	E in.	F in.	T in.
12	5 1/2	23	49	72	24	2	
15	7	26	47	73	29	2 1/2	
18	11 1/2	26	48	74	36	2 1/2	
24	12	43	54	97	48	3	
30	17	53	43	96	60	3 1/2	
36	18	60	37	97	71	4	
42	24	61	36	97	78	4 1/2	
48	28	70	28	98	84	5	
54	27	65	35	100	90	5 1/2	
60	36	58	40	98	96	6	
72	34 1/2	75	21	96	108	7	

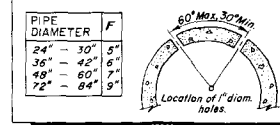


**NOTE:** Alternate equivalent designs for End Sections may be submitted to the Department for approval. Design length of culvert is based on length of End Section shown in column "D".  
Additional pipe required to provide the design length of the culvert shall be furnished by and at the expense of the Contractor.  
Concrete End Sections shall conform to the requirements of ASSHO Designation M 170, for Class II pipe.

## END SECTION FOR REINFORCED CONCRETE PIPE CULVERT



3/4" Galvanized Anchor Bolts, Nuts and Washers, Mild Steel, ASTM A 307. Rod lug shall be coated with Coal-Tar Epoxy paint or approved equal.



## CONCRETE JOINT FASTENER

**NOTE:**  
This assembly, or approved equal, shall be used for joining sections where shown on plans.

**GENERAL NOTES**  
All work shall be done in accordance with the Standard Specifications applicable to the project.  
Concrete End Sections are to be furnished with tongue or groove as required.  
Galvanized Toe Plate as shown will be required on End Sections for corrugated steel pipe and shall be the same gage as the End Sections. Toe Plate shall be field bolted to End Section with 3/8" galvanized bolts, nuts and washers.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

CONCRETE AND METAL  
END SECTIONS

Designed by M. R. H. Approved by L. M. C.  
Made by J. A. B. Staff Design Engineer (ASSP)  
Checked by R. S. M. Date: November 10, 1967

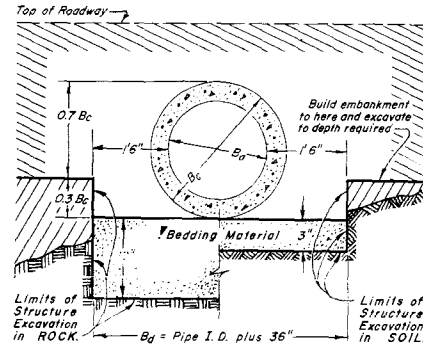


# STANDARD M-603-RC

(MARCH 20, 1967)

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
5	COLORADO			
REVISIONS				

## PIPE INSTALLATION (WITH 0.7 PROJECTION RATIO)



## REINFORCED CONCRETE PIPE DIMENSIONS (FOR INFORMATION ONLY)

PIPE SIZE (In. I.D.) B_o	* WALL THICKNESS (Inches) B_c	OUTSIDE DIAMETER (Feet) B_o	0.3 B_c (Feet)	0.7 B_c (Feet)
12	2	1.33	0.40	0.93
15	2 1/4	1.63	0.49	1.14
18	2 1/2	1.92	0.58	1.34
21	2 3/4	2.21	0.66	1.55
24	3	2.50	0.75	1.75
27	3 1/4	2.79	0.84	1.95
30	3 1/2	3.08	0.92	2.16
33	3 3/4	3.38	1.01	2.37
36	4	3.67	1.10	2.57
42	4 1/2	4.25	1.28	2.97
48	5	4.83	1.45	3.38
54	5 1/2	5.42	1.62	3.80
60	6	6.00	1.80	4.20
66	6 1/2	6.58	1.97	4.61
72	7	7.17	2.15	5.02
78	7 1/2	7.75	2.32	5.43
84	8	8.33	2.50	5.83
90	8 1/2	8.92	2.68	6.24
96	9	9.50	2.85	6.65
102	9 1/2	10.08	3.02	7.06
108	10	10.67	3.20	7.47

\* Wall thickness dimensions are based on ASTM Designation C 76 (Wall B).

## SAFE HEIGHTS OF FILL OVER REINFORCED CONCRETE PIPE

PIPE SIZE (In. I.D.) B_o	HEIGHT OF FILL OVER TOP OF PIPE IN FEET	CLASS II 1000 - D	CLASS III 1350 - D	CLASS IV 2000 - D	CLASS V 3000 - D
Thru...	Min. to	Min. to	Min. to	Min. to	Min. to
12	18	23	23	36	45
21	27	24	24	36	45
30	39	25	25	37	46
42	48	25	25	37	46
54	63	26	26	37	47
66	72	26	26	37	47
78	84	26	26	37	47
90	108	26	26	37	47

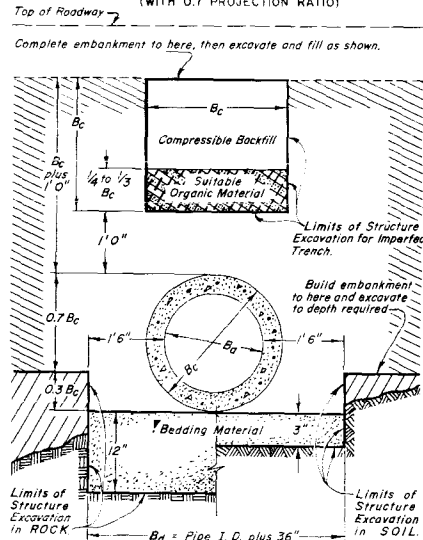
Pipe design is based on safety factor of 1.33 on ultimate strength. Pipe Class is designated on 1/16 inch crack D-load. (See ASTM Designation C 76.)

Safe heights of fill over top of pipe are based on unit weight of soil at 120 lbs. per cubic foot.

Changes in design factors will require compensating change in pipe design.

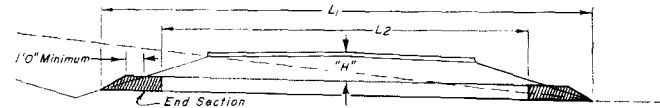
For Imperfect Trench, compute pipe class required as outlined in the Concrete Pipe Handbook prepared by the American Concrete Pipe Association (for other references with Iowa State College Theories).

## IMPERFECT TRENCH PIPE INSTALLATION (WITH 0.7 PROJECTION RATIO)

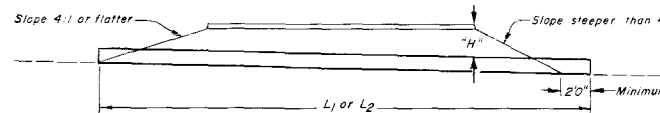


\* Bedding Material for SOIL shall be 3" loose thickness Structure Backfill Class 3. Bedding Material for ROCK shall be 12" loose thickness Structure Backfill Class 1.

## CONCRETE CULVERT WITH END SECTIONS



## CONCRETE CULVERT WITHOUT END SECTIONS



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

L\_1 = Length of Culvert to be measured when placed in accordance with Section 617.

L\_2 = Length of Pipe to be measured when placed in accordance with Section 603.

## GENERAL NOTES

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

Class II pipe shall not be used on main roadway but is permissible in medians, road approaches and other areas not subject to repeated traffic loads.

### IMPERFECT TRENCH

Fill heights greater than maximum allowed in the Safe Heights of Fill Table on this sheet will require Imperfect Trench type of installation or special design of structure. If possible, use safe overfill and stronger pipe up to the limit shown on the Safe Heights of Fill Table.

Minimum cover excluding pavement shall be 1 foot.

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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

REINFORCED CONCRETE  
PIPE

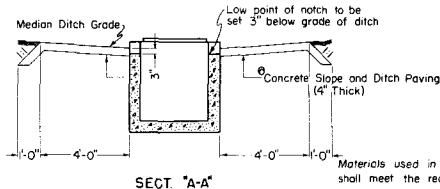
Designed by M. R. H. Approved by  
Made by J. R. B. Staff Design Eng.  
Checked by R. S. M. Date:

# STANDARD M-604-B

(JULY 1, 1965)

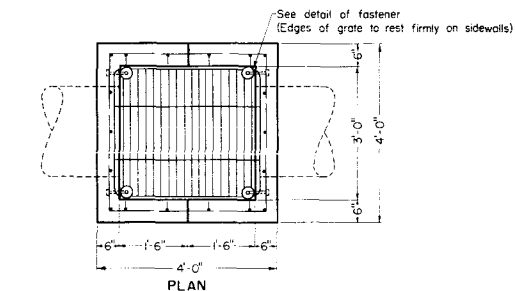
FED. ROAD  
REG. NO. DIVISION PROJECT NO. SHEET  
9 COLORADO

## (R-2) CONCRETE INLET Type A FOR USE IN MEDIAN AT BOTTOM OF VERTICAL CURVE

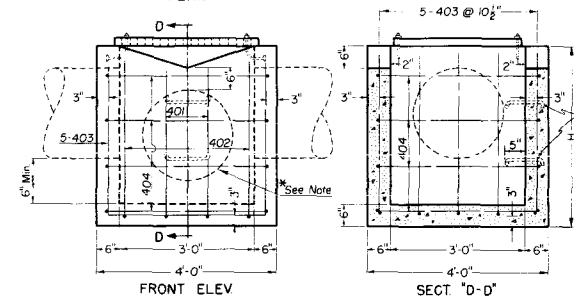


SECT. "A-A"

Materials used in the construction of Inlet Gratings shall meet the requirements of Section 604.



PLAN



FRONT ELEV.

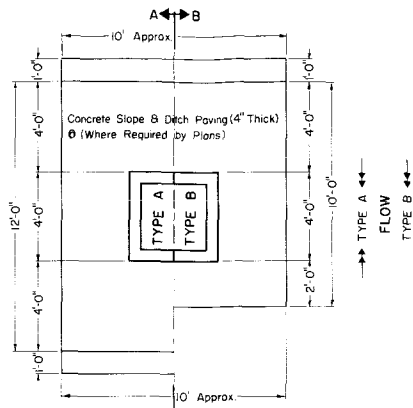
SECT. "D-D"

\*Note for Longitudinal Pipe: 6" minimum between bottom of Inlet Opening and top of Longitudinal Pipe.

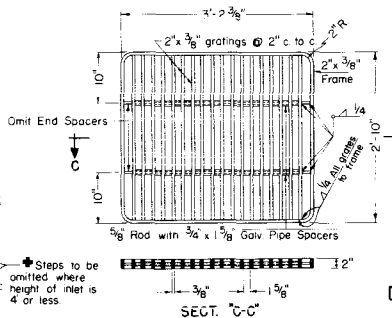
### BAR LIST FOR H=4'-0"

MARK	NO.	KIND	TYPE A			TYPE B		
REQ'D			M	N	O	M	N	O
401	2	I	3'-6"	3'-3"	3'-3"	10'-0"		
402	2	I	3'-6"	3'-6"	3'-6"	10'-6"		
403	5	I	3'-6"	3'-7"	3'-7"	10'-8"		
404	4	II	3'-7"	3'-7"		15'-4"		
405	1	I				3'-7"	3'-7"	3'-7"
406	1	I				3'-6"	4'-1"	4'-1"
407	1	I				3'-6"	4'-0"	4'-0"
408	1	I				3'-6"	3'-10"	3'-10"
409	1	I				3'-6"	3'-8"	3'-8"
410	1	I				3'-6"	3'-7"	3'-7"

All reinforcing bars to be  $\frac{1}{2}$ "



LAYOUT OF INLET IN MEDIAN DITCH



SECT. "C-C"

### +DETAIL OF GRATING

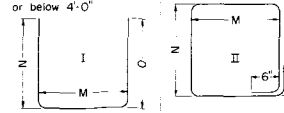
MATERIAL LIST FOR GRATING AND FASTENERS			
Strap Iron Frame	1 pc	2" x $\frac{3}{8}$ " x 11'-9 $\frac{1}{2}$ "	@ 2.55 lb. per ft = 30.0 lb.
Strap Iron Gratings	18 pcs	2" x $\frac{3}{8}$ " x 2'-9 $\frac{1}{2}$ "	@ 2.55 lb. per ft = 127.2 lb.
Galv Iron Pipe Spacers	34 pcs	$\frac{3}{8}$ " x 1 $\frac{1}{2}$ "	@ 1.13 lb. per ft = 5.2 lb.
Tie Rods	2 pcs	$\frac{3}{8}$ " x 3'-1 $\frac{1}{2}$ "	@ 1.04 lb. per ft = 6.5 lb.
Bolts	4 pcs	$\frac{3}{8}$ " x 10"	@ 0.35 lb. ea. = 4.1 lb.
Washers	4 pcs	$\frac{3}{8}$ "	@ 0.23 lb. ea. = 0.9 lb.

† NOTE: Acceptable equivalent Gratings may be substituted after approval by the Engineer.

### ▲ BENDING DIAGRAMS (SAME FOR TYPES A & B) All dimensions out to out of bars

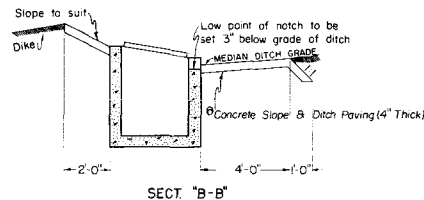
- Steps required as follows:
- H=4'-6", 5'-6" B 6'-0" 1 step
  - H=5'-0", 5'-6" B 6'-0" 2 steps
  - H=5'-6", 7'-0" B 7'-6" 3 steps
  - H=6'-0", 8'-6" B 9'-0" 4 steps
  - H=6'-6", 10'-0" B 10'-6" 5 steps
  - H=11'-0", 11'-6" B 12'-0" 6 steps

+ increase or decrease dimensions N & O 6" for each 6" increase or decrease of H above or below 4'-0"

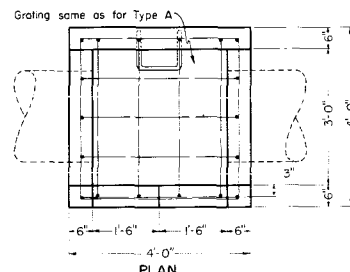


Note for 404 bar: Subtract one bar for H less than 4'. Add one bar for each foot increase in H.

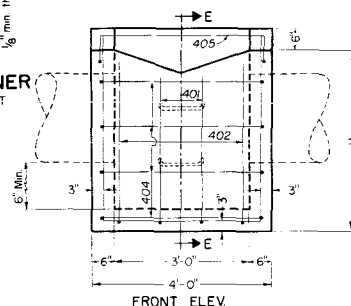
## (R-2) CONCRETE INLET Type B FOR USE IN MEDIAN ON GRADE FLOW FROM ONE DIRECTION



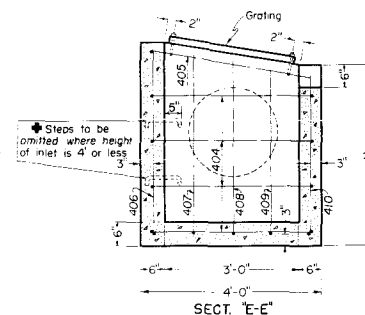
SECT. "B-B"



PLAN



FRONT ELEV.



SECT. "E-E"

### QUANTITIES FOR ONE INLET

H	CLASS "A" CONCRETE CU YDS		REINFORCING STEEL 0 LBS	
	TYPE A	TYPE B	TYPE A	TYPE B
3'-0"	0.91	1.00	83	93
3'-6"	1.04	1.13	89	100
4'-0"	1.17	1.26	105	116
4'-6"	1.30	1.39	115	126
5'-0"	1.43	1.52	136	146
5'-6"	1.56	1.65	142	153
6'-0"	1.69	1.78	158	169
6'-6"	1.82	1.91	168	179
7'-0"	1.95	2.04	185	195
7'-6"	2.08	2.17	191	202
8'-0"	2.21	2.30	211	222
8'-6"	2.34	2.43	217	228
9'-0"	2.47	2.56	234	244
9'-6"	2.60	2.69	244	255
10'-0"	2.73	2.82	260	271
10'-6"	2.86	2.95	266	277
11'-0"	2.99	3.08	287	297
11'-6"	3.12	3.21	293	304
12'-0"	3.25	3.34	309	320

0 Includes 1% for overrun

(R-1)

### GENERAL NOTES

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

All concrete shall be Class "K".  
All walls shall have forms on both sides. Bevel all exposed corners to a 1" face.  
All reinforcing bars shall be deformed, of intermediate grade, and shall be tagged with the station number and bar designation.

All edge distances not marked clear are to the C of the bar.  
Inlet grating to be painted as per specifications for structural steel. One shop coat of Basic Lead Silico Chromate primer and two field coats of Aluminum paint.  
Details of Steps on Standard M-604-D.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

CONCRETE INLETS  
TYPES A AND B

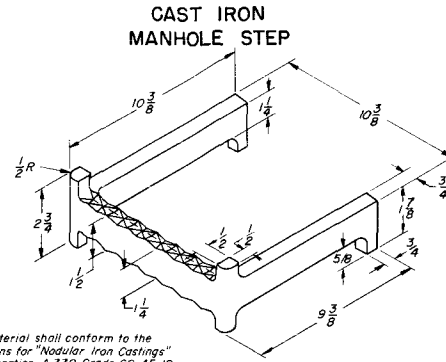
Designed by  
Made by  
Checked by  
Approved by  
Staff Design Engr.  
Date July 1, 1965

# STANDARD M-604-D

(JULY 1, 1965)

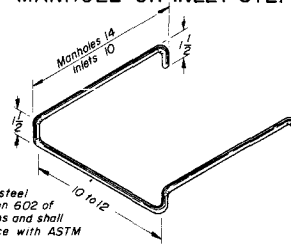
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS		



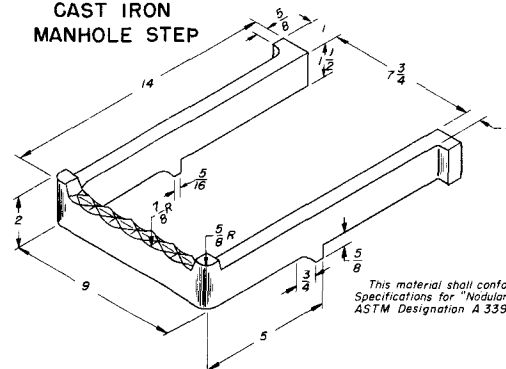
This material shall conform to the  
Specifications for "Nodular Iron Castings"  
ASTM Designation A 339 Grade 60-45-10

## MILD STEEL MANHOLE OR INLET STEP



Step shall be 3/4 Dia. steel  
bars conforming to Section 602 of  
the Standard Specifications and shall  
be galvanized in accordance with ASTM  
Designation A 123.

## CAST IRON MANHOLE STEP



This material shall conform to the  
Specifications for "Nodular Iron Castings"  
ASTM Designation A 339 Grade 60-45-10.

## GENERAL NOTES

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

Steps shall be included in the cost of "Manholes" or "Inlets".

All dimensions shown in inches.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

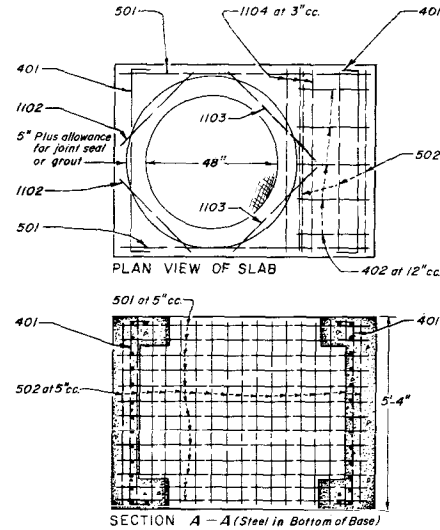
## STEPS FOR MANHOLES AND INLETS

Designed by M.R.H. | Approved by *[Signature]*  
Made by: H.P.B. Staff Design Engr.  
Checked by: *[Signature]* | Date: July 1, 1965

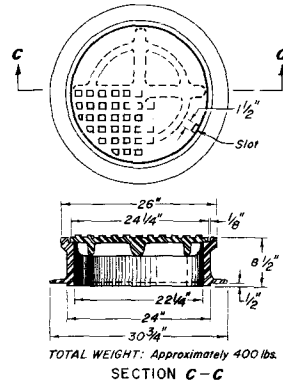
# STANDARD M-604-E

(OCTOBER 11, 1967)

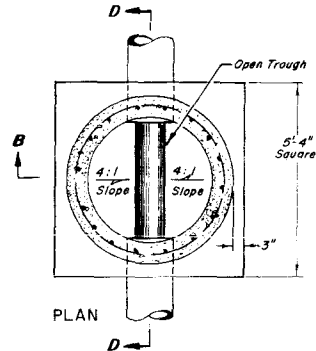
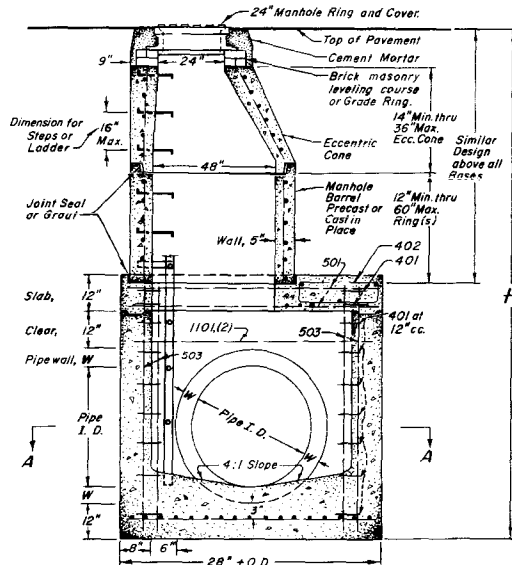
FEDERAL ROAD DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
5 COLORADO			
REVISIONS			



NOTE: Manhole Ring and Cover shall be dipped or painted with Asphalt or Coal Tar and Oil.



## MANHOLE RING AND COVER



## QUANTITIES FOR CONCRETE MANHOLE BOX BASE

MARK	SIZE	TYPE	Lb./Ft.	BARS	I.D. 36"	48"	60"	72"	84"	96"	FORMULAS
401	4	II	0.67	{ NO REQ'D. LENGTH WEIGHT, lbs.	16 6'-7" 70.4	16 6'-7" 79.2	20 6'-7" 88.0	22 6'-7" 96.8	25 6'-7" 110.0	27 6'-7" 118.8	401 Number Bars Required = $\frac{(12 + I.D. + 2W)}{6} + 6$
402	4	III	0.67	{ NO REQ'D. LENGTH WEIGHT, lbs.	0 0 0	5 4'-10" 16.2	5 6'-0" 20.0	5 7'-2" 23.9	5 8'-4" 27.8	5 9'-8" 31.7	402 Bar Length = I.D. + 2W
501	5	I	1.04	{ NO REQ'D. LENGTH WEIGHT, lbs.	17 5'-8" 100.5	17 6'-10" 121.2	17 8'-0" 141.9	17 9'-2" 162.5	17 10'-4" 183.2	17 11'-6" 203.9	501 Bar Length = 24" + I.D. + 2W
502	5	I	1.04	{ NO REQ'D. LENGTH WEIGHT, lbs.	15 5'-0" 78.2	19 5'-0" 99.1	23 5'-0" 120.0	27 5'-0" 140.8	31 5'-0" 161.7	34 5'-0" 177.3	502 Number Bars Req'd. = $\frac{(17 + I.D. + 2W)}{5} + \frac{(I.D. - 36)}{12} + 3$
503	5	I	1.04	{ NO REQ'D. LENGTH WEIGHT, lbs.	30 6'-2" 193.0	30 7'-4" 229.5	30 8'-6" 266.0	30 9'-8" 302.5	30 10'-10" 339.5	30 12'-0" 375.5	503 Bar Length = 30" + I.D. + 2W
1101	11	I	5.31	{ NO REQ'D. LENGTH WEIGHT, lbs.	4 5'-8" 120.5	4 6'-10" 145.2	4 8'-0" 170.0	4 9'-2" 194.8	4 10'-4" 219.6	4 11'-6" 244.4	1101 Bar Length = 24" + I.D. + 2W
1102	11	I	5.31	{ NO REQ'D. LENGTH WEIGHT, lbs.	2 2'-6" 26.6	2 2'-6" 26.6	2 2'-6" 26.6	2 2'-6" 26.6	2 2'-6" 26.6	2 2'-6" 26.6	
1103	11	I	5.31	{ NO REQ'D. LENGTH WEIGHT, lbs.	3 3'-6" 37.2	3 3'-6" 37.2	3 3'-6" 37.2	3 3'-6" 37.2	3 3'-6" 37.2	3 3'-6" 37.2	
1104	11	I	5.31	{ NO REQ'D. LENGTH WEIGHT, lbs.	3 5'-0" 79.7	3 6'-0" 79.7	3 6'-0" 79.7	3 6'-0" 79.7	3 6'-0" 79.7	3 6'-0" 79.7	
REINFORCING STEEL - Pounds - Total					706.1	833.9	949.1	1064.8	1185.3	1295.1	
CONCRETE - Cubic Yards - Total					4.2	5.3	6.6	8.0	9.5	11.1	

NOTE: Quantities are based on same size pipe entrance to and exit from base and a 4 ft. manhole entrance into top slab of base.

## GENERAL NOTES

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

Since all pipe entries into the base are variable, the dimensions shown are typical. Actual dimensions and quantities for concrete and reinforcement shall be as required in the work.

Design is based on straight runs of conduit or change in direction under 45°.

All bars shall be a minimum 2" clear.

Precast Manholes shall conform to ASTM Designation C 478.

Cast in place Manholes shall be Class "A" concrete.

The following alternate materials for Manholes may be used when design details for construction are included in the plans:

MATERIAL	CONFORMANCE-DESIGNATION
Clay or Shale Brick	AASHTO M 91
Concrete Brick	ASTM C 55, Grade A
Concrete Masonry Block	ASTM C 139
Corrugated Steel Unit	AASHTO M 36

All pipe entries into the base of Manhole shall be connected by open gutter adjusted for pipe size, shape, slope and direction of flow.

Alternate designs will be permitted after approval by the Department.

Steps or Ladder will be required when Manhole depth exceeds 3'-6".

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

## MANHOLES

Designed by M.R.H. Approved by J.B.B.  
Made by J.R.B. Staff Design Engineer  
Checked by R.S.M. Date: October 11, 1967

# STANDARD M-607-A

(SHEET 1 OF 2 SHEETS)  
(JULY 1, 1965)

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

REVISIONS			
(R-1)	8-2-66	Vertical Dimensions and Note	M.R.H.
(R-2)	12-8-66	Vert. Dims., Std. and Alternate	M.R.H.

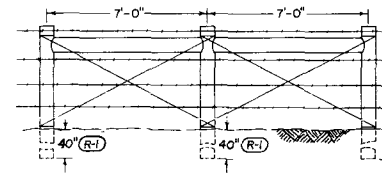
(R-1) NOTE:  
See Sheet 2  
for General Notes.

## CROSS BRACE DOWELING DETAIL

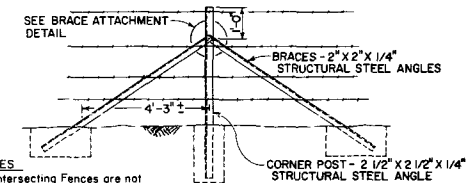
3/8" x 4" STEEL PINS

Bore a 3/8" x 2" Hole in each Post and Brace to receive the Pins. Wrap the ends of the Braces tightly with several turns of 12/12 go. smooth Galv. Wire to prevent splitting or Notch Post and Nail with 40 d Common Nails.

## LINE BRACES

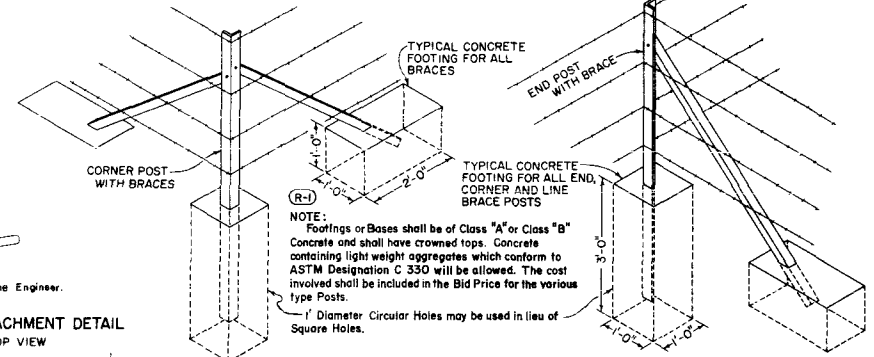


When Gates, Angles, Corners or Intersecting Fences are not specified herein, Line Braces shall be spaced as follows:  
Metal Posts - 800' Intervals  
Wooden Posts - 1,400' Intervals



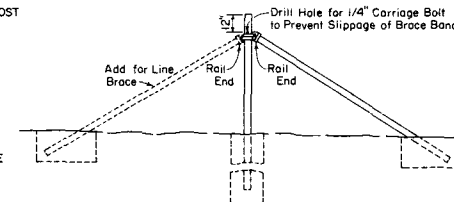
## TYPICAL INSTALLATION AT FENCE INTERSECTIONS

## TYPICAL CORNER POST INSTALLATION



## ALTERNATE POST

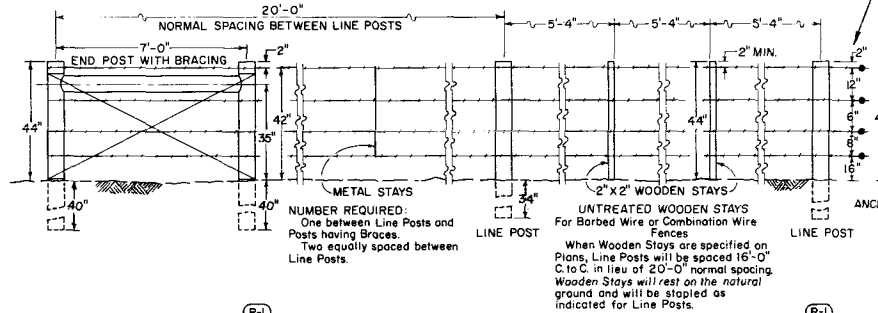
(FOR END, CORNER OR LINE BRACE POSTS)



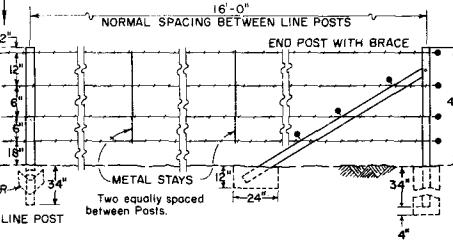
DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
WIRE FENCES  
AND  
GATES

Designed by L.E.O. Approved by E.E.O.  
Made by T.E.F. Staff Des. Eng.  
Checked by E.E.O. Date: July 1, 1965

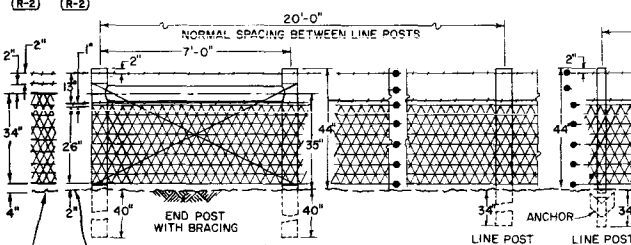
## BARBED WIRE FENCE WITH WOODEN POSTS



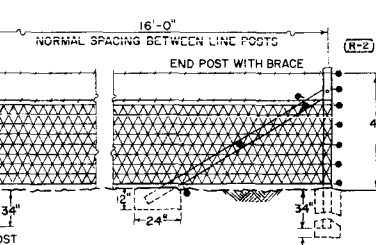
## BARBED WIRE FENCE WITH METAL POSTS



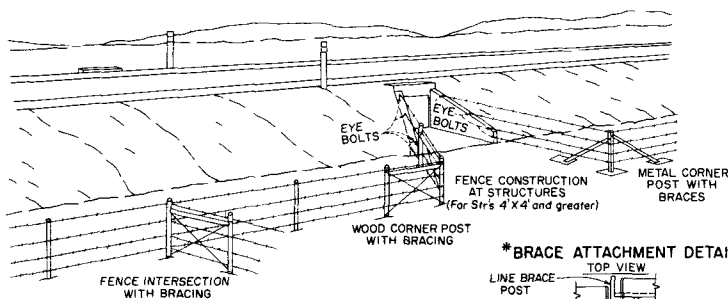
## COMBINATION WIRE FENCE WITH WOODEN POSTS



## COMBINATION WIRE FENCE WITH METAL POSTS

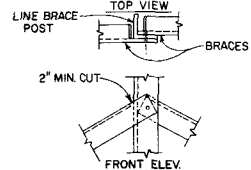


## ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES

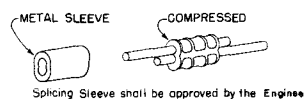


NOTE:  
At all structures of 4' x 4' and over, the fence shall be ended at eye-bolts in the wings of the structure. Where the type of structure prohibits the use of eye-bolts, an end post with brace shall be used. Eye-bolts shall be made of 1/2" round bars with a minimum of six (6) inches of body length embedded in the concrete and a minimum of 1" inside eye diameter. Eye-bolts shall be furnished and installed by the Contractor. Cost of eye bolts will be included in the contract price for fencing.

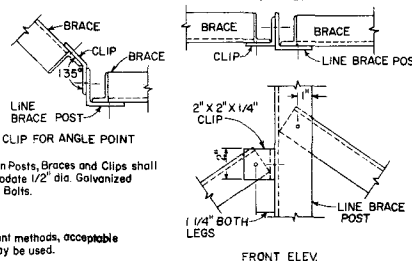
## \*BRACE ATTACHMENT DETAIL



## ACCEPTABLE WIRE SPICE



## \*ALTERNATE BRACE ATTACHMENT DETAIL



# STANDARD M-607-A

(SHEET 2)

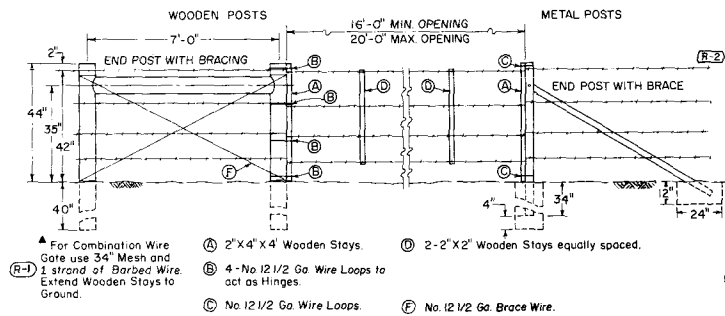
(JULY 1, 1965)

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

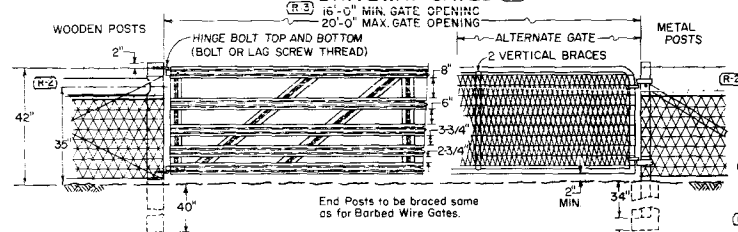
## REVISIONS

REV.	DESCRIPTION	BY
R-1	8-2-66 Vert. Dims. & Gen'l. Notes	M.R.H.
R-2	12-8-66 Vert. Dims., Std. and Alternate	M.R.H.
R-3	2-6-67 Gate and General Notes	M.R.H.

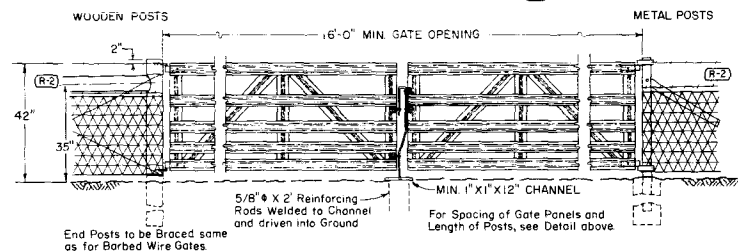
## \*BARBED WIRE GATE



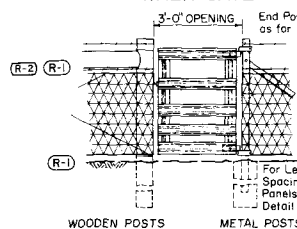
## DRIVEWAY GATES



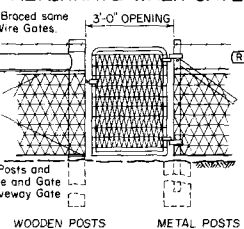
## TWIN DRIVEWAY GATES



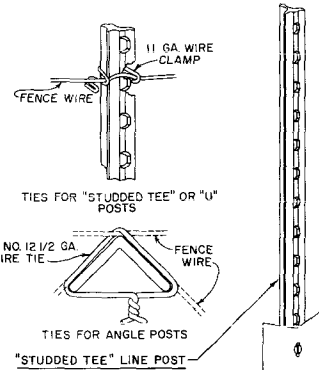
## WALK GATE



## ALTERNATE WALK GATE



## FENCE WIRE TIES



## GENERAL NOTES

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

R-1 At each location where an electric transmission, distribution or secondary line crosses a wood post fence the Contractor shall furnish and install a ground conforming to Section 9 of the National Electric Safety Code.

R-2 Dimensions shown for "Standard" and "Alternate" apply for both wooden and metal post fences.

Fence wire shall be ended, double wrapped and tied off at end posts, angle posts and line brace posts. Fence to be continued shall then be restarted in like manner.

Fence wire to be placed on either road or field side of posts depending on local conditions, i.e. on curves the wire should be placed on the side of the post which would prevent tension on fence ties. This will also apply where wind drift, tumble weeds or other conditions would exert unusual pressure against the wire.

### WOOD POSTS

All line posts shall have a min dia of four (4) inches & be 6'-6" long. All end, corner, intersection and brace posts shall have a minimum diameter of five (5) inches and be 7'-0" long. Fence wire will be stapled to wooden posts or tied to metal posts as shown marked. On barbed wire or combination wire fence details. Staples shall be No. 9 wire min, at least 1 1/2 inches long & shall be galvanized.

ALL POSTS AND BRACES SHALL BE OF THE TYPES AND WEIGHTS SHOWN OR ACCEPTABLE EQUIVALENTS. Holes to be provided in end, corner and gate posts as detailed.

### CORNER POSTS

Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles. Weight - 3.81 lbs./lin. ft. Min. Length - 6'-6" Min. No. of Braces - 2

### LINE POSTS

Type - "Studded Tee" or "U" Weight - 1.28 lbs./lin. ft. Min. (without Anchor) Length - 6'-6" Min. Anchor - Securely fastened with bearing surface sufficient to resist movement of post. Weight - 0.57 lb. Min.

### END POSTS

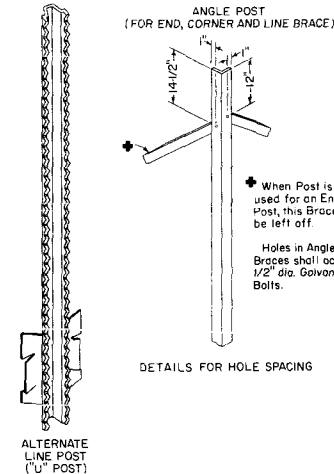
Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles. Weight - 3.81 lbs./lin. ft. Min. Length - 6'-6" Min. No. of Braces - 1

### BRACES (For Corner, End or Line Brace Posts)

Type - 2" X 2" X 1/4" Structural Steel Angles. Weight - 3.08 lbs./lin. ft. Min. Length - Same as corner and end posts used.

Posts shall meet requirements of Par. 4.5 of U.S. Dept. of Commerce Commercial Standard 184-S1. Acceptable material includes re-rolled railroad rails.

## TYPICAL METAL POSTS



### ALTERNATES

#### END, CORNER AND LINE BRACE POSTS

Type - 2 1/2" Std. Galvanized Pipe.

Weight - 3.65 lbs./lin. ft. Min.

#### BRACES

Type - 1 3/8" O.D. Tubular Steel with 2 1/2" Brace Band, Hinge Bolt and 1 3/8" I.D. Roll End; all Galvanized.

Weight - 16 lbs./lin. ft. Min. Length - 6'-6" Min.

### BARBED WIRE

Steel barbed wire shall conform to ASTM Designation A 121, 1/2 Gauge with Class 1 coating.

Aluminum barbed wire shall conform to ASTM Designation B 211, with alloy 5052-O for the line wire and alloy 5052-H38 for the barbs.

### 5/4" WIRE MESH

Wire mesh used in combination wire fence as shown shall be galvanized and conform to the following:

	STANDARD	ALTERNATE
Width	26"	34"
Weight - Lbs./Lin. Ft. Min.	0.54	0.76
Horizontal Wires	2 Strands, No. 12 1/2 gage.	
Cross Wires	1 Strand, No. 14 gage.	

Fabrication: cross wires to be woven with horizontal wires making a one piece fabric.

### GATES

#### DRIVEWAY GATES

Height - approximately 42" (5 panels) --- Width of gate opening - 16'-0" Min.

R-1 Gates to be of Riveted construction as follows: Min. 4 No. 10 rivets at each right angle connection and where diagonal braces connect to horizontal panels; Min. 3 No. 10 rivets where diagonal braces connect to top and bottom panels.

#### ALTERNATE DRIVEWAY GATES

Height - 42" Weight - Not less than 90 lbs. complete with latch and hinges. Width of gate opening - 16'-0"

R-1 Gate Frame - 1" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction.

Mesh to be of same construction as shown for 4" X 4" wire mesh except it shall be 2" X 4" mesh 42" high.

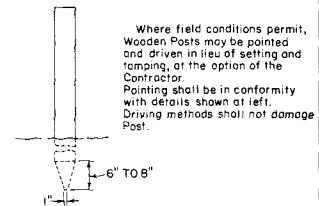
#### WALK GATES

Height - approx. 42" (5 panels)

R-1 Weight - [Galvanized Steel, 16 lbs. Min. [Tempered Aluminum, 10 lbs. Min.

Width of gate opening - 3'-0"

## POST POINTING DETAILS



### ALTERNATE WALK GATES

Height - 42" Weight - Not less than 18 lbs. complete with latch and hinges. Width of gate opening - 3'-0"

R-1 Gate Frame - 3/4" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction. Mesh to be of same construction as shown for Driveway Gate.

Alternate equivalent standard metal gates other than shown will be acceptable subject to the Engineer's approval.

In lieu of galvanized finish on gate frames, Cadmium Plated pipe or Aluminum painting will be considered to be equivalent.

### LATCHES AND HINGES

Galvanized steel or Aluminum of standard make.

Hinges shall be placed as shown, to prevent theft. In lieu of standard make latches it will be permissible to use an electro-galvanized chain, eyebolt and snaphook type latch.

Eyebolt, chain and snaphook assembly to be secured to latch side of gate. Gate closure effected by wrapping chain around end post and snapping hook into chain.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

WIRE FENCES

AND

GATES

Designed by L.E.O. Approved by T.E.F. Stoff Des. Engr.  
Made by T.E.F. Stoff Des. Engr.  
Checked by E.E.O. Date: July 1, 1965

# CLASS I BARRICADES (3 RAILS)

MOVABLE

# STANDARD M-614-A

(JULY 1, 1965)

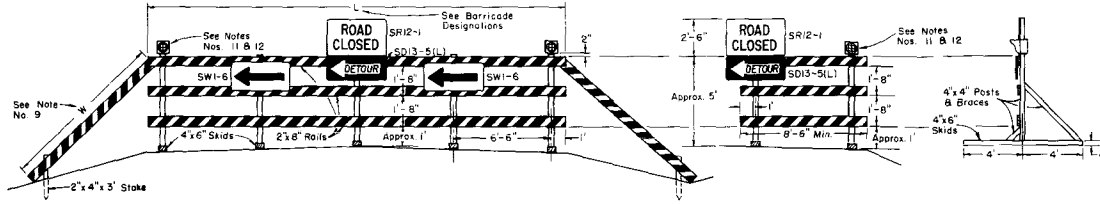
FEDERAL ROAD REGION NO.	DISTRICT	PROJECT NO.	SHEET NO.
9	COLORADO		
REVISIONS			

## GENERAL NOTES

- All work shall be done in accordance with the Standard Specifications applicable to the Project.
- All signs and sign materials shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for All Classes of Streets and Highways" published by the Department of Highways 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. All traffic controls shall be placed for best visibility and legibility and maintained in good condition at all times. Oversigning is to be avoided.
- Painting shall conform with Subsection 508.08 of the Standard Specifications. All skids, braces, and posts shall be painted with 2 coats of "Exterior Black Paint." Planing and wings on all barricades shall be painted with 2 coats of "Exterior Black Paint" on all sides before adding reflective strips. Reflective strips shall be "cut from smooth surface yellow reflective sheeting" of a type approved by the Department.
- Each barricade rail shall be striped on the face side only with reflective yellow strips slanting downward at a 45° angle toward the side to which traffic is to turn or pass. See "DETAIL OF RAIL AND WING STRIPING."
- When barricades are designated on plans the portion of the posts below ground line shall either be dipped in or painted with hot creosote oil. The portion of the post above ground line shall be painted with 2 coats of "Exterior Black Paint."
- All skids, braces, 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 used shall conform to the Standard Specifications for Miscellaneous Untreated Timber S4S. Timber shall conform to Construction grade Paragraph 123R or 125R of Standard No. 15 Grading & Dressing Rule 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.
- Detachable extension wings for bypassing of construction equipment are permitted. "W" is variable, length shall be adequate to provide closing of borrow pit and/or shoulder as required.
- Alternate materials or other reflective elements on Traffic signs or Barricades will be permitted only after approval of such material by the Department in writing.
- A Flashing Beacon for use on Barricades is a section of a standard traffic signal head or a similar-type device having a yellow lens in the face, which is illuminated by intermittent flashes. Where commercial power is not available, the beacon may be adapted to operate from storage batteries. Each signal unit lens shall have a visible diameter of not less than 8 inches. Each unit complete shall be of such design as to render the lens when illuminated clearly visible to traffic facing the signal at all distances up to 1000 feet under all atmospheric conditions except dense fog. The color of the yellow lens for caution shall be in accordance with Technical Report No. 1 of the Institute of Traffic Engineers. All beacon flashers shall be equipped with filters for suppression of radio interference. The illuminating element in a flashing yellow beacon shall be flashed at a rate of not less than 50 times nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total cycle. The use of Flashing Beacons will be governed by field conditions. Flashing Beacons when warranted generally should be operated continuously throughout the 24 hours of the day. Warrant for Flashing Beacons may be found in Sec. 3G of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).
- Flashers are portable, power-operated, lens-directed, enclosed lights, illuminated by rapid intermittent flashes of short duration. Flashers may be used in connection with barricades when approved by the Engineer. An array of random flashers, which tends to obscure rather than delineate the traveled way, will not be permitted. The use of flashers on a job will be governed by Sec. 5D of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision). The color of the light emitted by a flasher shall be yellow.
- Flashing Beacons and Flashers, when used, shall be positioned above the top rail of the barricades to produce the most effective results.
- 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.
- For additional general information on control of traffic through work areas refer to the "Manual on Uniform Traffic Control Devices for Streets and Highway", Part V, published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

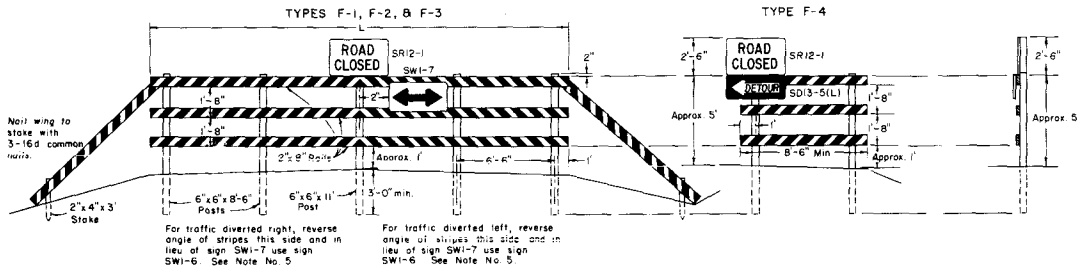
TYPES M-1, M-2, & M-3

TYPE M-4



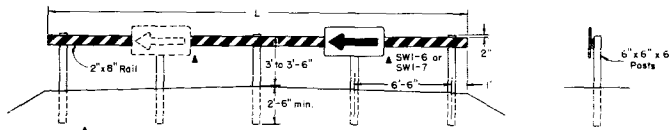
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TYPE F-4

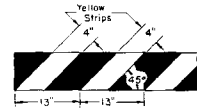


## CLASS II BARRICADE (1 RAIL)

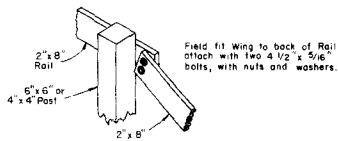
FIXED  
TYPE F-6



When facing a one-way street or roadway a second SW1-6 or SW1-7 may be required. See Note No. 3.

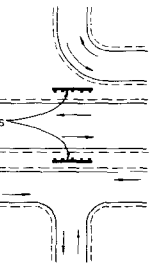


DETAIL OF RAIL AND WING STRIPING

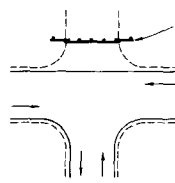


REAR VIEW OF BARRICADE SHOWING WING ATTACHED (See Note No. 9)

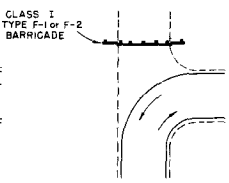
SITUATION C



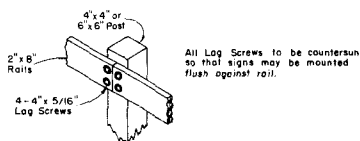
SITUATION A



SITUATION B



INDICATES DIRECTION OF TRAFFIC FLOW



METHOD OF ATTACHING PLANKING TO POSTS AT JOINTS

## BARRICADE DESIGNATIONS

Class	Type		Roadway Width	L	Description
	Movable	Fixed			
I	M-1	F-1	26'-34'	28'	Barricade complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-2	F-2	35'-44'	41'	Barricade complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-3	F-3	Variable	28'	Barricade (without extension wings) complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-4	F-4	Variable	Variable 8'-6' min.	Wing Barricade (signs only as appropriate).
II	-	F-6	Variable	28'	Barricade complete with appropriate signs.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

## TIMBER BARRICADES

Designed By D.R.W. Made By J.L.S. Checked By J.B. Approved By [Signature] Date [Signature]

# STANDARD M-614-TB

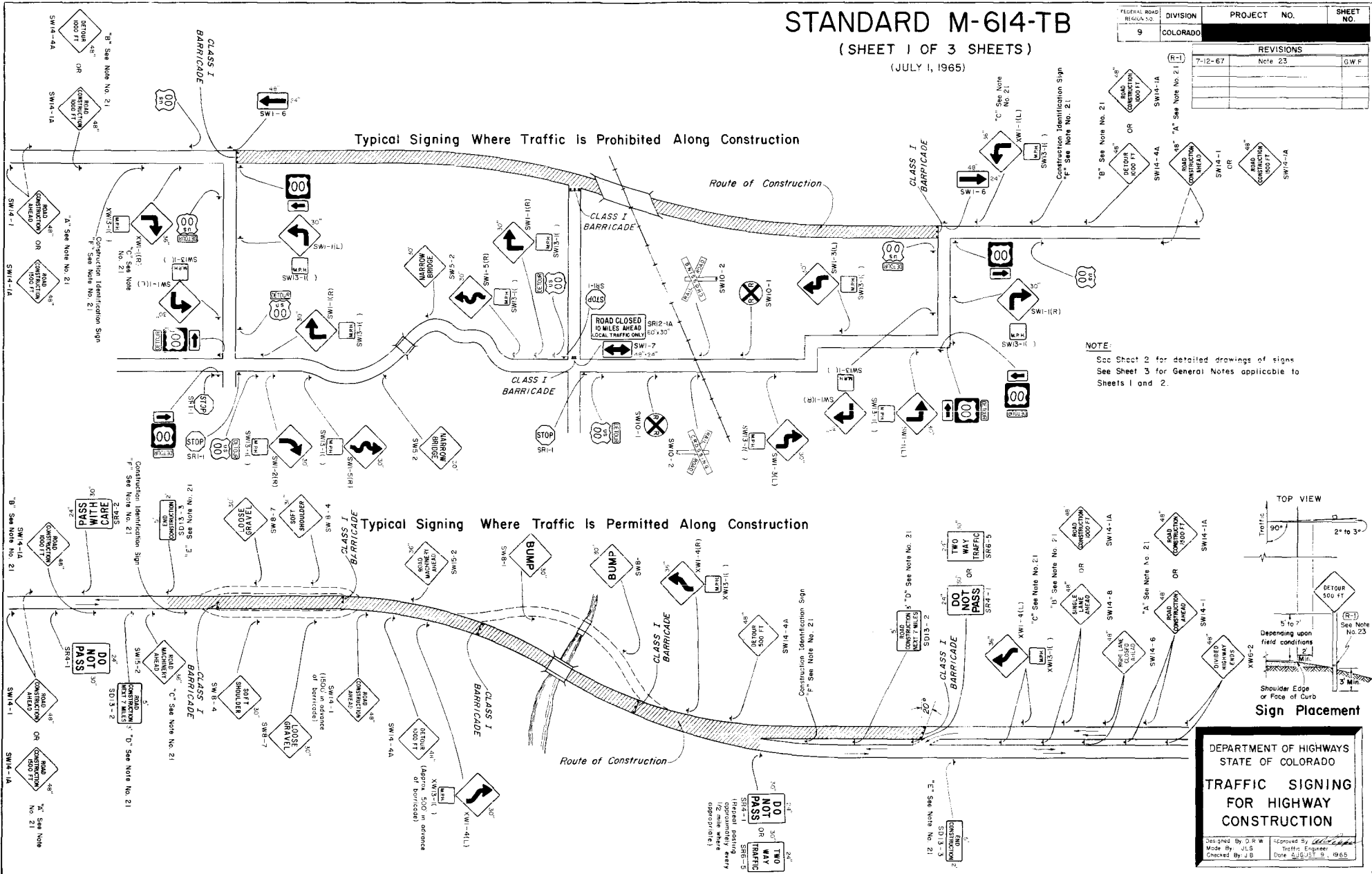
(SHEET 1 OF 3 SHEETS)

(JULY 1, 1965)

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

REVISIONS		
7-12-67	Note 23	GWF





# STANDARD M-614-TB

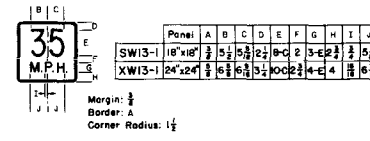
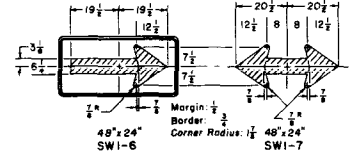
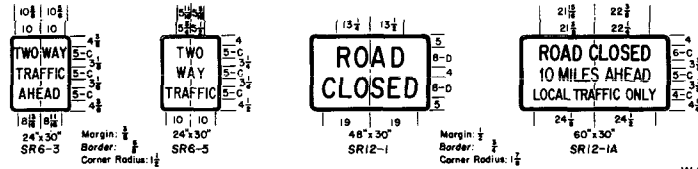
(SHEET 2 OF 3 SHEETS)

(JULY 1, 1965)

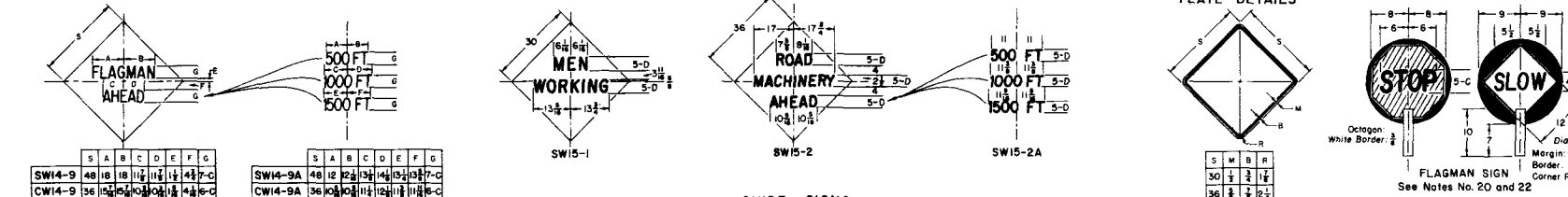
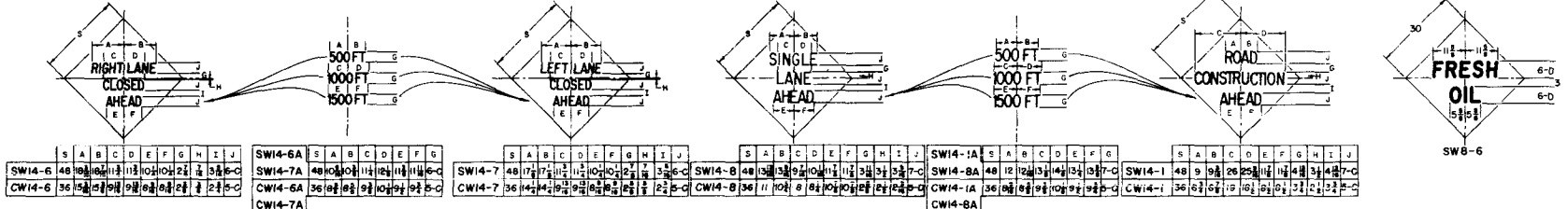
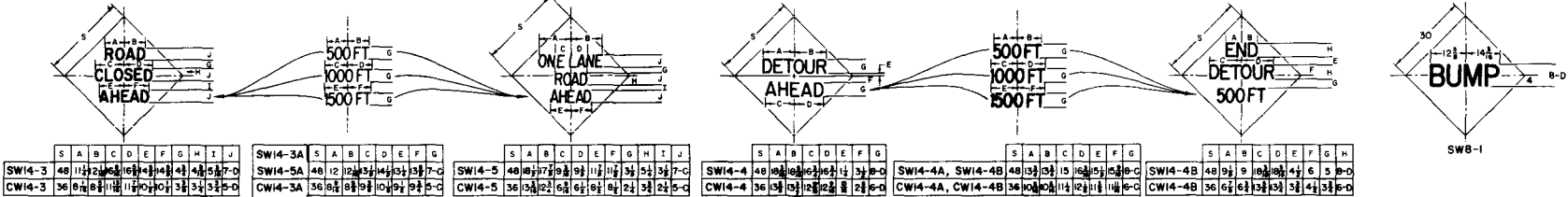
REGULATORY SIGNS  
See Note No. 9

WARNING SIGNS  
See Note No. 10

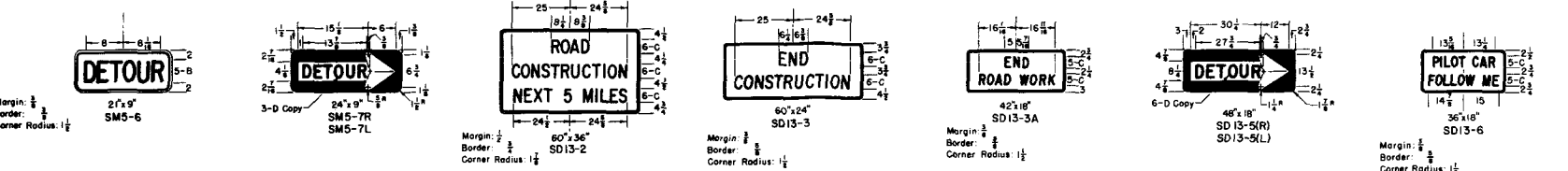
FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO		
REVISIONS			
(R-1)	7-12-67		M.R.H.



WARNING SIGNS  
See Note No. 10



GUIDE SIGNS  
See Note No. 11



NOTES:  
SEE SHEET 1 FOR TYPICAL SIGNING AND SIGN PLACEMENT.  
SEE SHEET 3 FOR GENERAL NOTES APPLICABLE TO SHEETS 1 AND 2.

ALL DIMENSIONS ARE NOT LABELED ARE IN INCHES.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

TRAFFIC SIGNING  
FOR HIGHWAY  
CONSTRUCTION

Designed By: D.R.W.  
Made By: H.B.D.  
Checked By: J.B.

Approved By: [Signature]  
Traffic Engineer  
Date: AUGUST 2, 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 GWF

## GENERAL NOTES

- 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 Department of Highways.
- 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.
- Where traffic is prohibited from the Project the Detour will be marked by the Department 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 Department. The location and positioning of Warning Signs, Barricades, and Regulatory Signs shall be as recommended by the appropriate District Engineering Forces of the Department.
- 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.
- 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.
- 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.
- 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 stated 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.
- 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 Department of Highways.
- 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.
- Signs with the prefix "W" in the sign code are Warning signs and are used to alert traffic to existing or potentially hazardous conditions.
- 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.
- All signs shall be reflectorized unless otherwise specified on plans. Regulatory and Guide 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 a highway yellow flexible reflective sheeting, non-exposed lens background. The back side of Warning signs shall be painted with two coats of "Federal Yellow Synthetic Sign Enamel."
- Painting for wood surfaces shall conform with Section 508 of the Standard Specifications.
- 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 58 and LL Structural 58 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."
- 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.
- All material shall be sound and durable. Barricades, signs, symbols, and lettering shall be of good workmanship. Uneven lettering will not be accepted.
- 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 Department.
- Torches and Lanterns shall be either of the fuel-burning or battery-powered type approved by the Department. Particular care shall be taken to protect all signs and barricades from smoke and smudge.
- Barricades, Flashing Beacons and Flashers - Refer to appropriate "M" Standard (Timber Barricades) for details.
- 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 yellow reflective sheeting. Handle to be grooved on one side to indicate reading of sign to Flagman.
- 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": SD13-2 - 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": SD13-3 - 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 Department 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 "M" Standard (Identification Signs) for sign details.  
Signs A through F shall be furnished, installed and maintained by the Department.
- 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) Each timber post shall be provided with a single hole drilled through the neutral axis normal to the roadway 3" above the ground level. The holes shall be 1/2" Ø for 6"x6" and 1" Ø for 4"x4" timber posts. The underground portion plus 6" shall be treated with creosote.

SPECIAL NOTE: Requirements of this Standard are optional to those of Standard M-614-TA through 12-31-65. Following that date Standard M-614-TA will be obsolete.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

TRAFFIC SIGNALING  
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