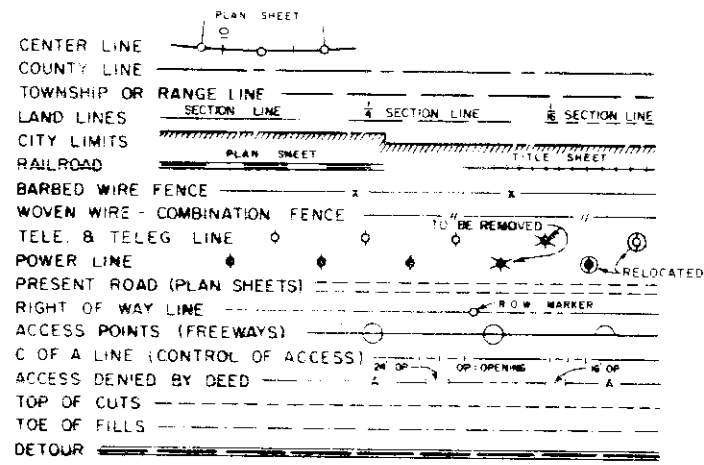


TITLE SHEET

STATE DEPARTMENT OF HIGHWAYS DIVISION OF HIGHWAYS—STATE OF COLORADO

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	C 11-0287-00	1

CONVENTIONAL SIGNS



PLAN AND PROFILE OF PROPOSED STATE PROJECT NO. C 11-0287-00 STATE HIGHWAY NO. 287 JEFFERSON COUNTY

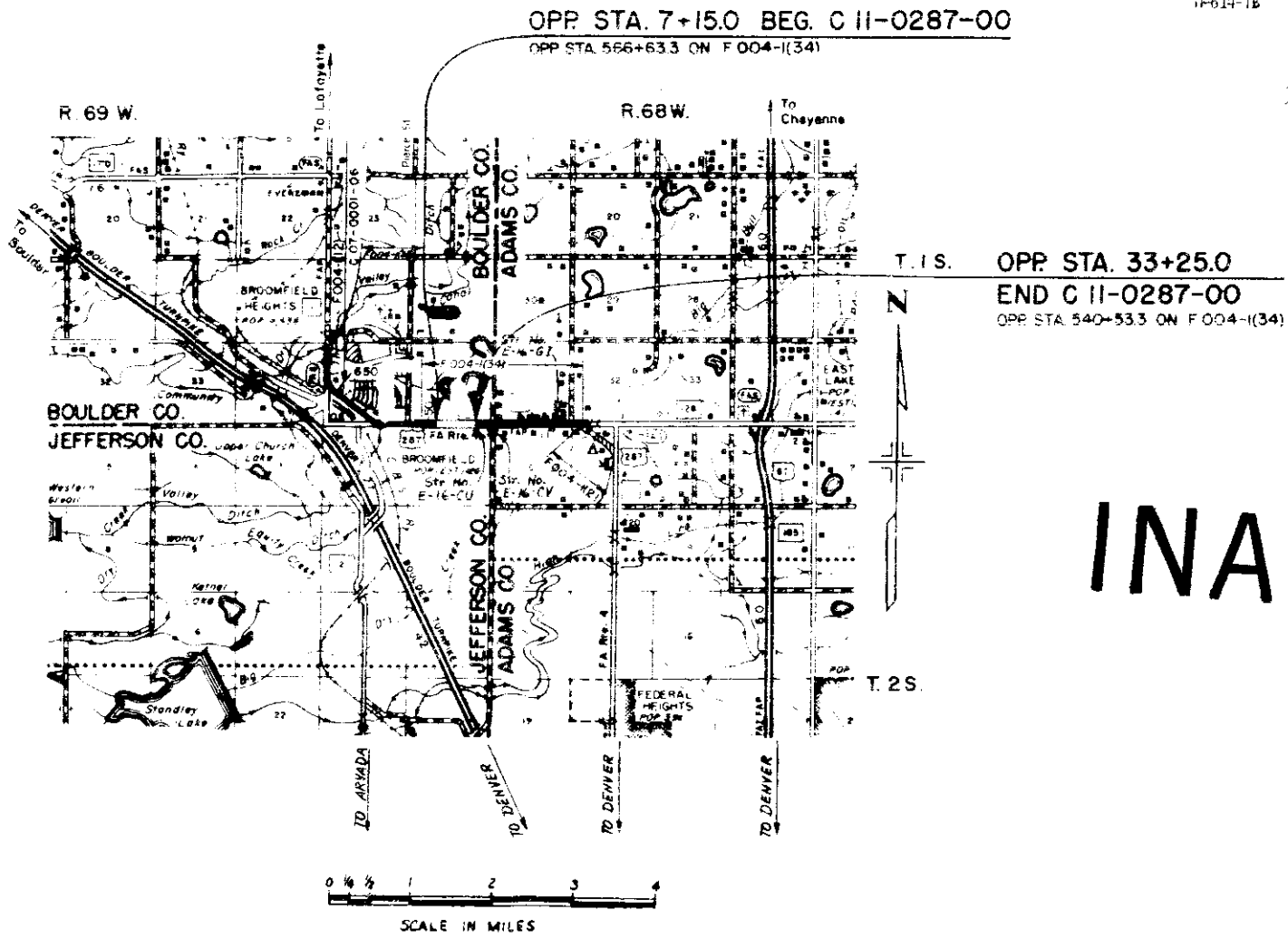
SHEET NO.

INDEX OF SHEETS

- | | | | |
|-----------|--|------------|----------|
| 1 | SKETCH MAP AND TITLE PAGE. | | |
| 2 | TYPICAL SECTION, GENERAL NOTES AND SUMMARY OF APPROXIMATE QUANTITIES | | |
| 3 | TABULATION OF STORM SEWER SYSTEM. | | |
| 4 | DETAILS OF INLET SPECIAL. | | |
| 5 - 7 | ALIGNMENT PLAN AND PROFILE. | | |
| 8 - 10 | STRUCTURE CROSS SECTIONS. | | |
| 11-206-AA | EXCAVATION AND BACKFILL FOR STRUCTURES | (2 SHEETS) | 3-1-71 |
| 11-603-RC | REINFORCED CONCRETE PIPE | | 3-1-71 |
| 11-604-BA | INLET, TYPE C | | 5-24-71 |
| 11-604-W | STEPS FOR MANHOLES AND ULLETS | | 7-23-68 |
| 11-604-E | MANHOLES | | 4-20-71 |
| 11-614-A | TIMBER BARRICADES | | 4-23-69 |
| 11-614-1B | TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION | (3 SHEETS) | 12-24-68 |

AS CONSTRUCTED
REVISED DATE: 12-29-71

SCALES OF ORIGINAL DRAWINGS
ON PLAN, 1 IN. = 50 FT.
ON PROFILE, 1 IN. = 50 FT. HORIZONTAL
1 IN. = 10 FT. VERTICAL



"As Constructed No Revisions"
Sheet 4 and 7

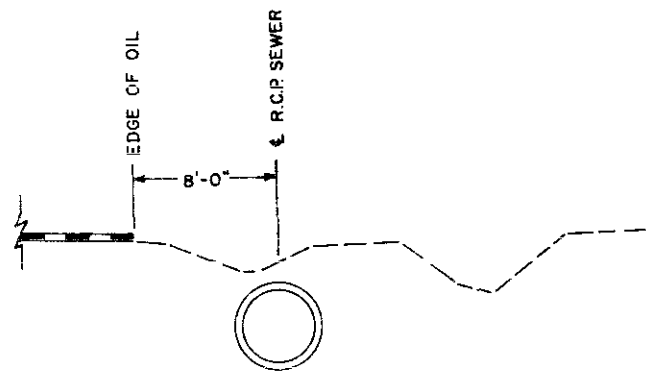
INACTIVE

SEE SPECIAL PROVISIONS FOR
NOTICE TO BIDDERS

DIVISION OF HIGHWAYS	
APPROVED	
<i>L. B. Brown</i> 2-24-71	
CHIEF ENGINEER	DATE

FEDERAL ROAD DIVISION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
5	COLORADO	C11-0287-00	2	

TYPICAL SECTION



GENERAL NOTES

It is estimated that 200 Hours of Flagging for controlling traffic will be required for this project.

The following listed C.S.P. or R.C.P. Side Drains are to be Removed:

STATION	SIDE	SIZE	TYPE
20+55	Rt.	12"	R.C.P.
21+00	Rt.	18"	C.S.P.
22+25	Rt.	18"	C.S.P.

SUMMARY OF APPROXIMATE QUANTITIES

AS CONSTRUCTED
REVISED DATE: 12-29-71

INDEX			CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	PROJECT TOTALS	CONSTRUCTED TOTALS	
BOOK	PAGE	SHEET						
1	16		202	Removal of Structure	Each	3	3	
2	31							
		3	206	Structure Excavation	Cu. Yd.	4,270	5,063	
		3	206	Structure Backfill (Class 2)	Cu. Yd.	1,250	1,647	
		3	507	Concrete Slope and Ditch Paving (Reinforced)	Cu. Yd.	6	8.89	
		3	604	Inlet Type C (5 Foot)	Each	1	3	
		3	604	Inlet Special (10 Foot)	Each	4	4	
		3	604	Manhole Box Base (10 Foot)	Each	1	1	
		3	604	36 Inch Reinforced Concrete Pipe Sewer	Lin. Ft.	498	509	
		3	604	42 Inch Reinforced Concrete Pipe Sewer	Lin. Ft.	668	662	
		3	604	48 Inch Reinforced Concrete Pipe Sewer	Lin. Ft.	576	573	
		3	604	54 Inch Reinforced Concrete Pipe Sewer	Lin. Ft.	674	676	
		55	614	Flagging	Hour	200	120	
		54	626	Mobilization	Lump Sum	•	100%	
				WORK ORDER # 13741				
		3	604	24 inch Reinforced Concrete Pipe Sewer	Lin. ft	74	70	
		3	604	30 inch Reinforced Concrete Pipe Sewer	Lin. ft.	1,110	1,102	

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C 11-0287-00	3	

AS CONSTRUCTED
REVISED DATE: 12-29-77

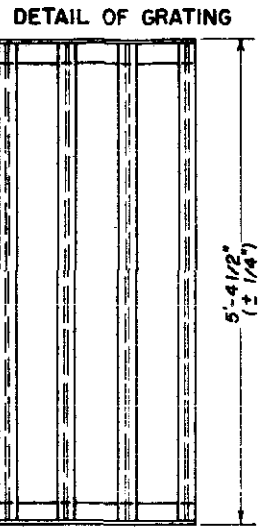
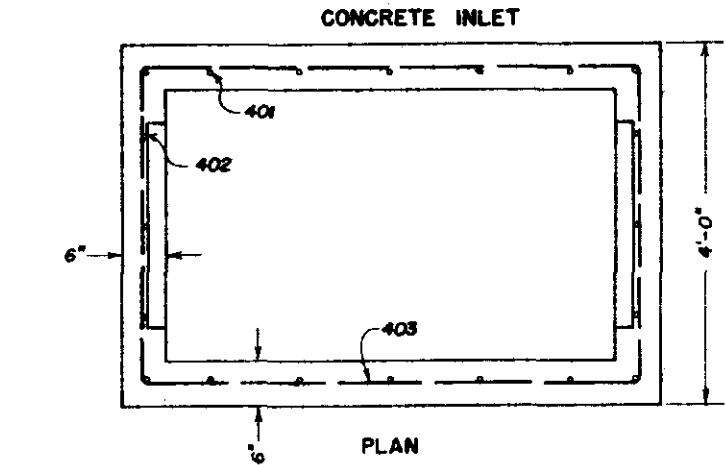
TABULATION OF STORM SEWER SYSTEM

INDEX			NOTE NO.	LOCATION	INLET			CONC. SLOPE & DITCH PAVING (REINFORCED) CU. YD.	MANHOLE			HEIGHT (H)	ELEVATIONS		REINFORCED CONCRETE PIPE SEWER								PIPE COVER "H"	STRUCT. EXCAV. CU. YD.	STRUCT. BACKFILL (CLASS 2) CU. YD.	PIPE INVERT ELEVATIONS		LINE		% GRADE	MISCELLANEOUS	
					EACH				EACH						Linear Feet																	
					SPECIAL		TYPE C								BOX BASE																	
					BK	PG	SH		10'		5'			10'			Σ RIM	INVERT	24"	30"			36"	42"	48"	54"	OUT OF LOWER	INTO UPPER	FROM	TO		
1	25		OUTLET	33+25				1.3					88.5								129	126	1'	248	77	88.5	89.6	OUTLET	1	0.87	OUTLET INTO EXISTING CONC. SLOPE & DITCH PAVING	
1	24		1	32+00 ⁰³	1			1			6'-6"	95.6	89.6							547	548	1'	1,060	334	89.6	95.0	1	2	0.98			
1	23		2	26+50 ⁴²	1			1			6'-6"	91.0	95.0							543	546	2'	1,012	296	95.0	94.2	2	3	1.67			
1	22		3	20+00 ²⁵						1	8'-0"	10.6	04.2							30	28	2'	50	15	04.2	04.7	3	4	1.67			
1	21		4	20+70 ¹⁰⁺⁶¹	1			1			6'-8"	10.2	04.7							662	668	3'	1,267	321	04.7	16.5	4	5	1.76			
1	20		5	14+00 ¹⁴⁺⁰³	1			1			5'-6"	21.5	16.5							509	498	3'	627	204	16.5	27.5	5	6	2.20			
			6	9+00 ⁸⁺⁷⁰									27.5												27.5	31.0	6	7	1.90	EXISTING 36"x184' R.C.P.		
1	16		7	7+15 ⁷⁺²⁰			1	1.1			5'-0"	35.2	31.0																		CONNECT TO EXISTING 36" R.C.P.	
2	35			7+03 ~ 45+25																			799									
2	36			7+03 ~ 45+25																				400								
2	37			45+25, 46+00 1+25				2.45																								
2	34			45+25 ~ 46+00																												
2	33			46+00 ~ 7+15																												
2	28			46+00				1																								
2	29			7+15				1																								
PROJECT TOTALS						4		3	3.35												509	662	573	676	5,263	1,647						
								5.1			1										498	668	576	674	4,264	1,247						

Σ Elevation approximate only, actual elevation to be determined during construction.

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C 11-0287-00	4	

DETAILS OF INLET SPECIAL



GRATING IDENTICAL TO ST'D M-604-BA
GRATING EXCEPT FOR LENGTH



QUANTITIES FOR ONE INLET

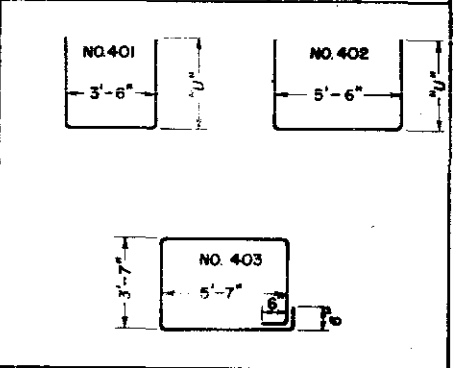
H	CONC. CU. YDS.	REINF. STEEL LBS.	NO. STEPS REQ'D
5'-6"	2.25	160	2
6'-0"	2.42	180	2
6'-6"	2.58	186	3

*NOTE: INCLUDES VOLUME OCCUPIED BY PIPES.

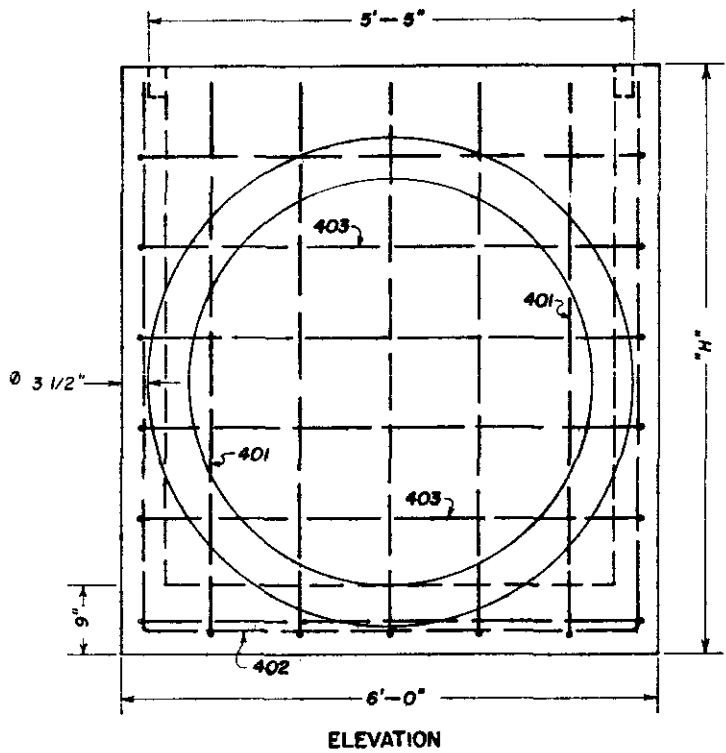
REQUIRES 1.0 CU.YD. CONC. SLOPE &
DITCH PAVING (REINFORCED)

BAR LIST AND BENDING DIAGRAM

H	MARK	NO. REQ'D	HGT. "U"	LENGTH
5'-6"	401	7	5'-1"	13'-8"
5'-6"	402	3	5'-1"	15'-8"
5'-6"	403	5		19'-4"
6'-0"	401	7	5'-7"	14'-8"
6'-0"	402	3	5'-7"	16'-8"
6'-0"	403	6		19'-4"
6'-6"	401	7	6'-1"	15'-8"
6'-6"	402	3	6'-1"	17'-8"
6'-6"	403	6		19'-4"



ALL BARS TO BE 1/2" DIA. — CUT OR BEND
AROUND PIPES AS REQUIRED.



Ø FOR 54" R.C.P.

MATERIAL LIST FOR GRATING, FASTENERS

PART	NO. REQ'D	SIZE	LBS. PER UNIT	WEIGHT LBS.
FLAT	2	3 1/2" X 1/4" X 2'-2 5/8"	2.98 / ft.	13
FLAT	2	3" X 1/4" X 2'-2 5/8"	2.6 / ft.	12
BEAM	4	4 I 7.7 X 5'-4"	7.7 / ft.	164
FASTENER	2	6" X 1/4" X 2 1/2"	1.0 ea.	
BOLT	2	5/8" X 8"	0.8 ea.	
WASHER	2		0.1 ea.	
TOTAL WEIGHT				193

FOR ADDITIONAL DIMENSIONS AND DETAILS SEE
STANDARD M-604-BA

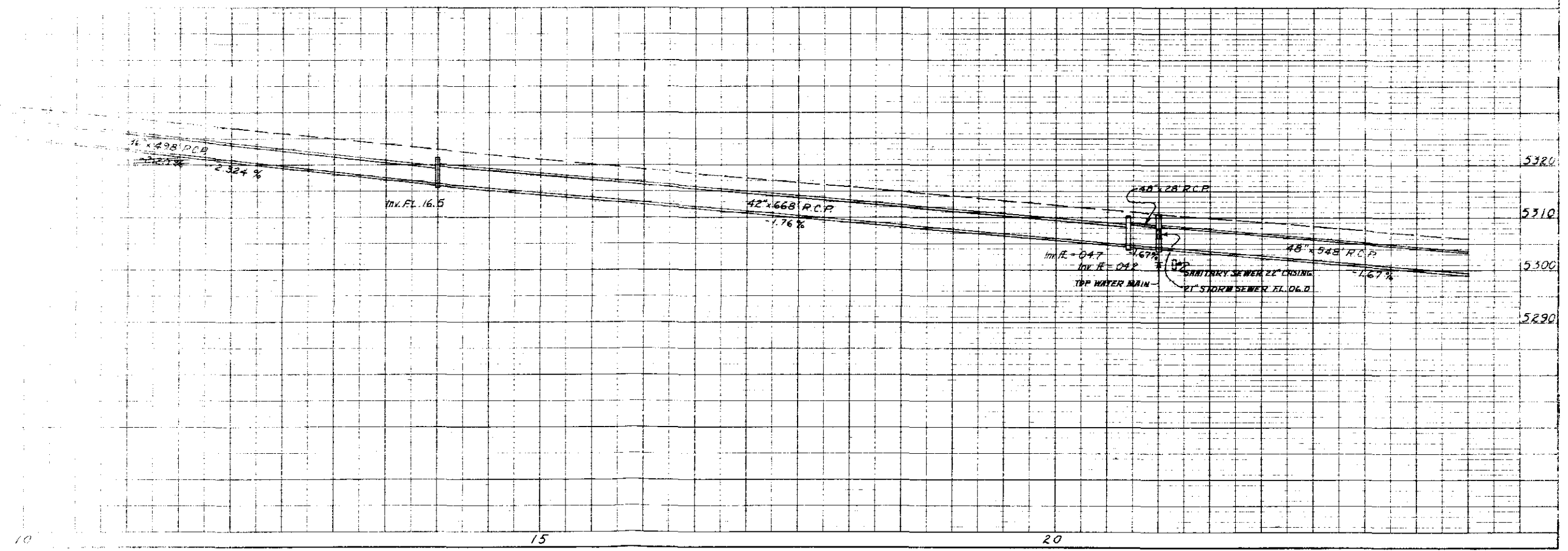
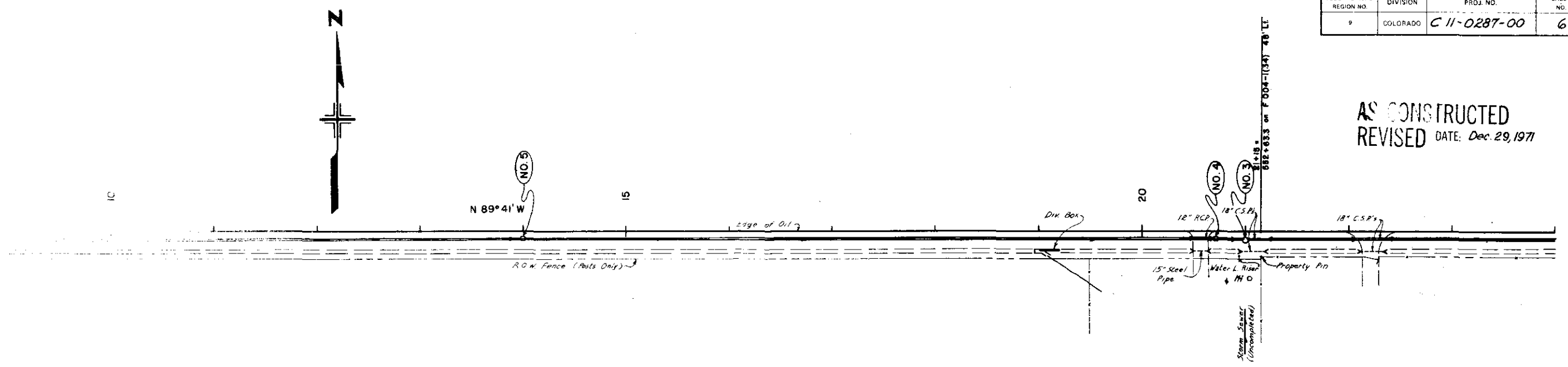
DATE: 12/29/77
 DRAWN BY: J. L. FORD
 JULY 1965

PLAN
 1" = 40' HORIZ.
 1" = 4' VERT.

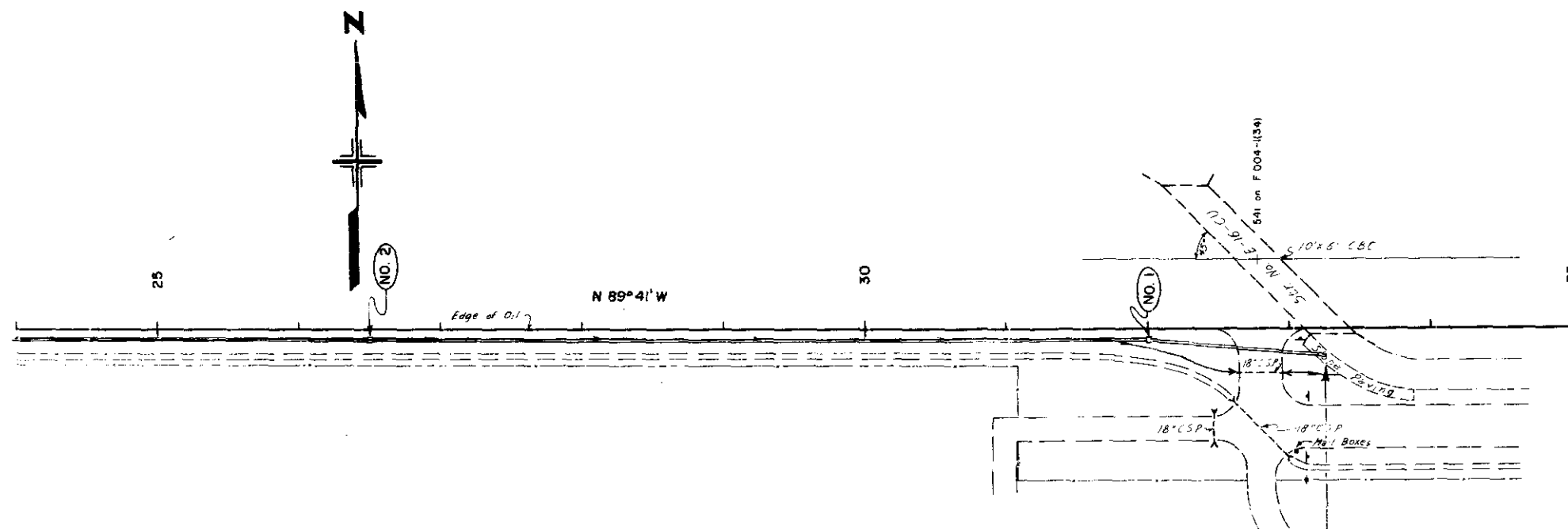
PROFILE
 1" = 4' HORIZ.
 1" = 4' VERT.

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	C 11-0287-00	6	

AS CONSTRUCTED
 REVISED DATE: Dec. 29, 1977

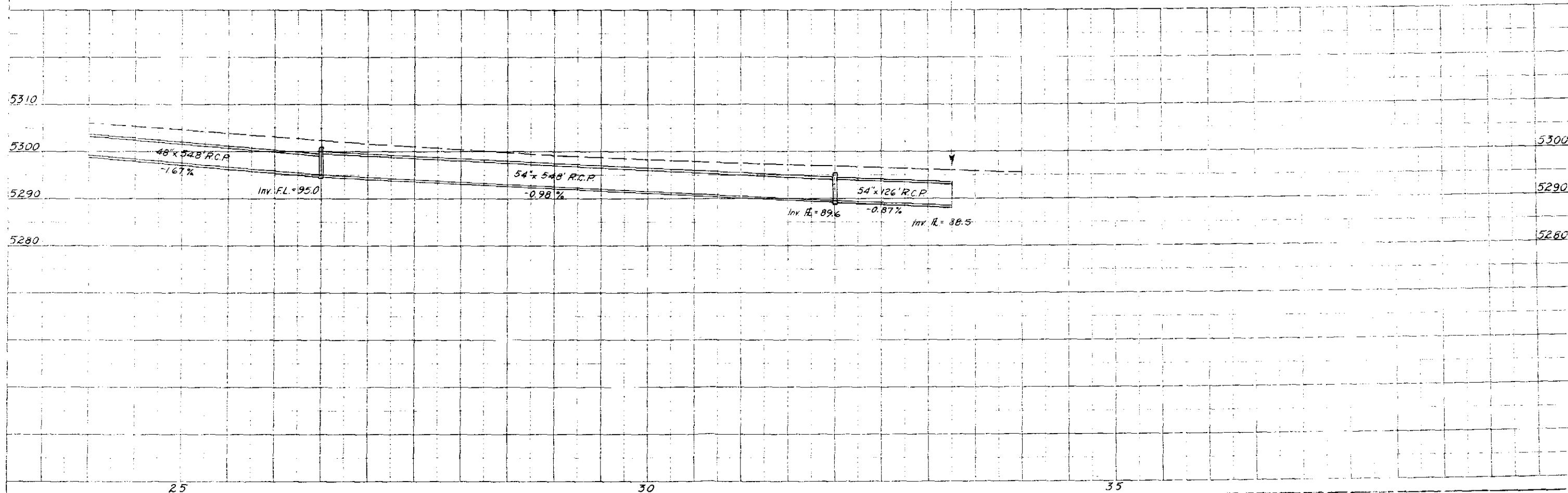


PLAN
NOT TO SCALE
No.

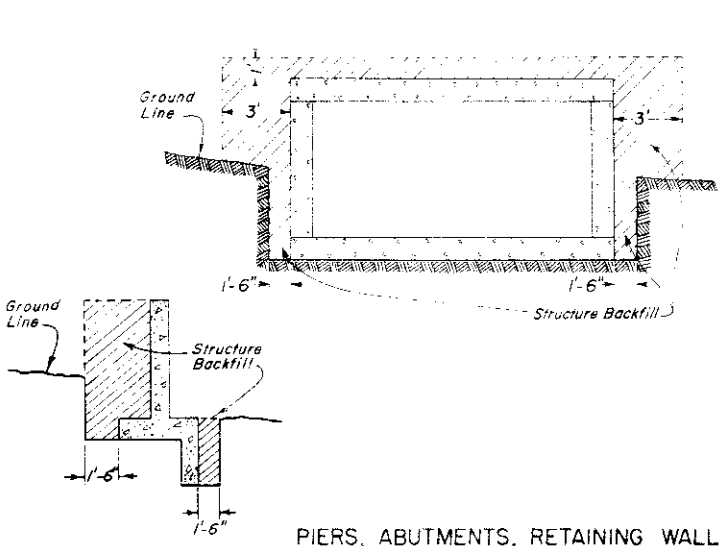


OPP. STA. 33+25.0 END C II-0287-00
OPP. STA. 340+53.3 ON F004-1(34)

PROFILE
NOT TO SCALE
No.



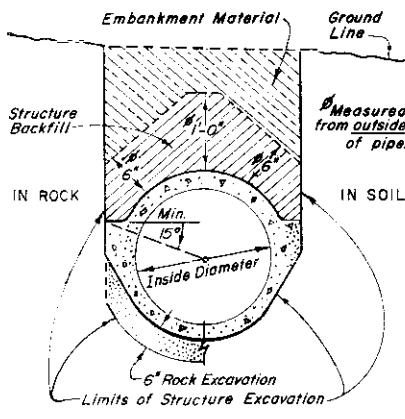
CONCRETE BOX CULVERTS & WINGWALLS



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.

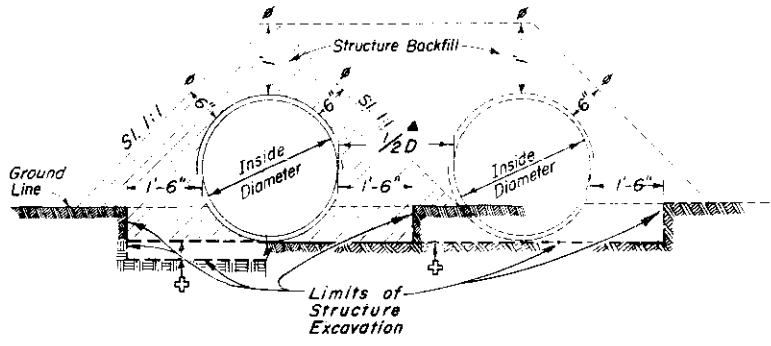
CAST IN PLACE CONDUIT



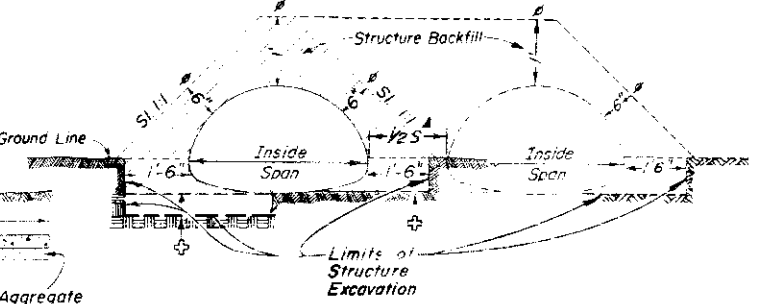
STANDARD M-206-AA

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

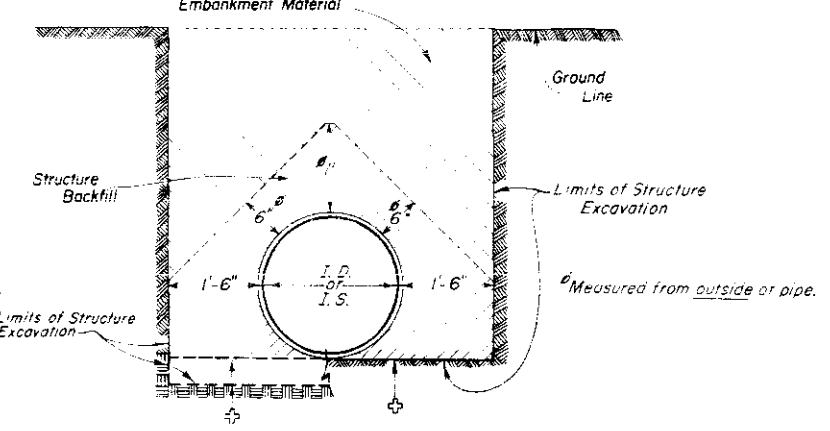
CIRCULAR CONDUIT



ELLIPTICAL OR ARCH CONDUIT



SIPHONS OR CONDUIT IN TRENCH

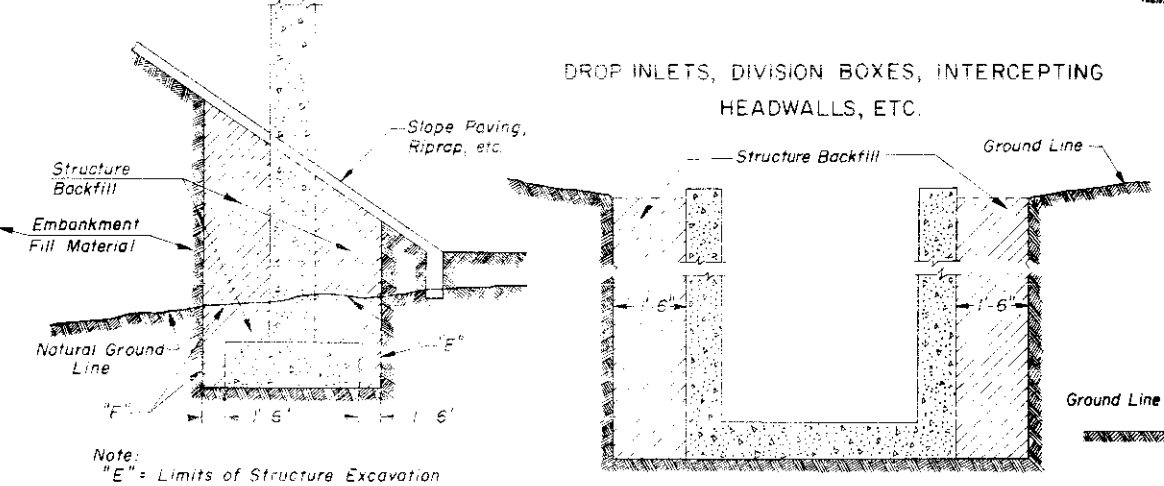


NOTES:
▲ When two or more conduits are laid side by side they shall be spaced so that the adjacent pipes will be $\frac{1}{2}I.D.$, $\frac{1}{2}I.S.$ or 3 feet apart (including wall thickness), whichever is less. Minimum spacing shall be not less than 1 foot between outside walls of pipe.
For additional conduit 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 leading details on standards for culverts.

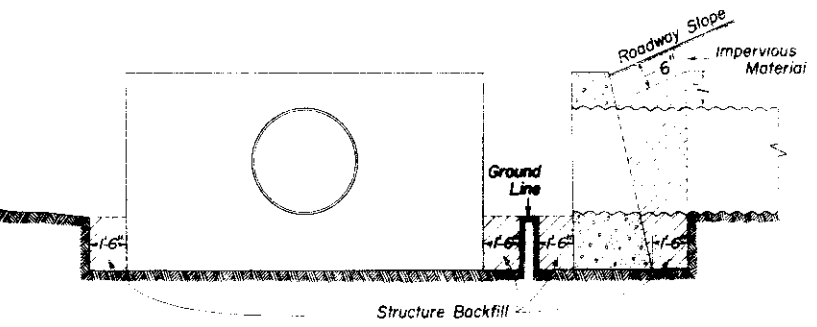
GENERAL NOTES

All work shall be done according to the Standard Specifications applicable to the Project.
Where the roadway cross section is in full, excavation for concrete footings except those in rock or those on piers, 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.

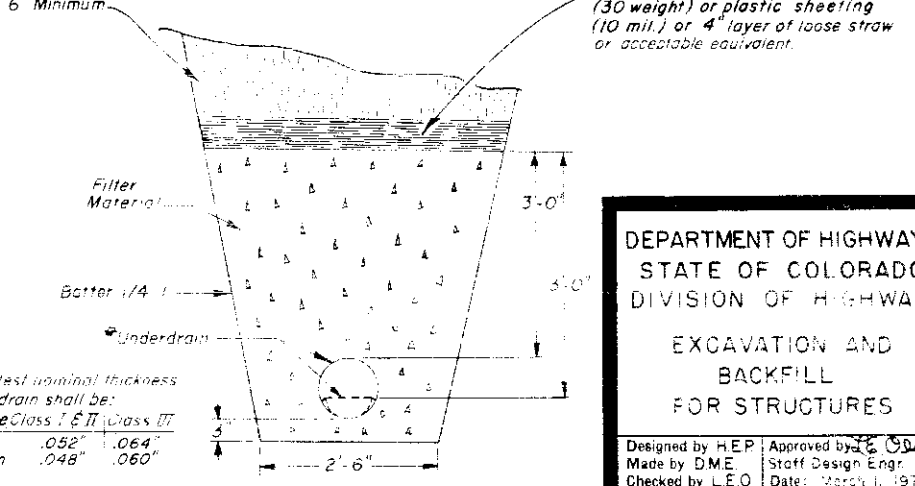
DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS, ETC.



HEADWALLS AND END OF CULVERTS



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. Approved by L.E.O.
Made by D.M.E. Staff Design Engr.
Checked by L.E.O. Date: March 1, 1971

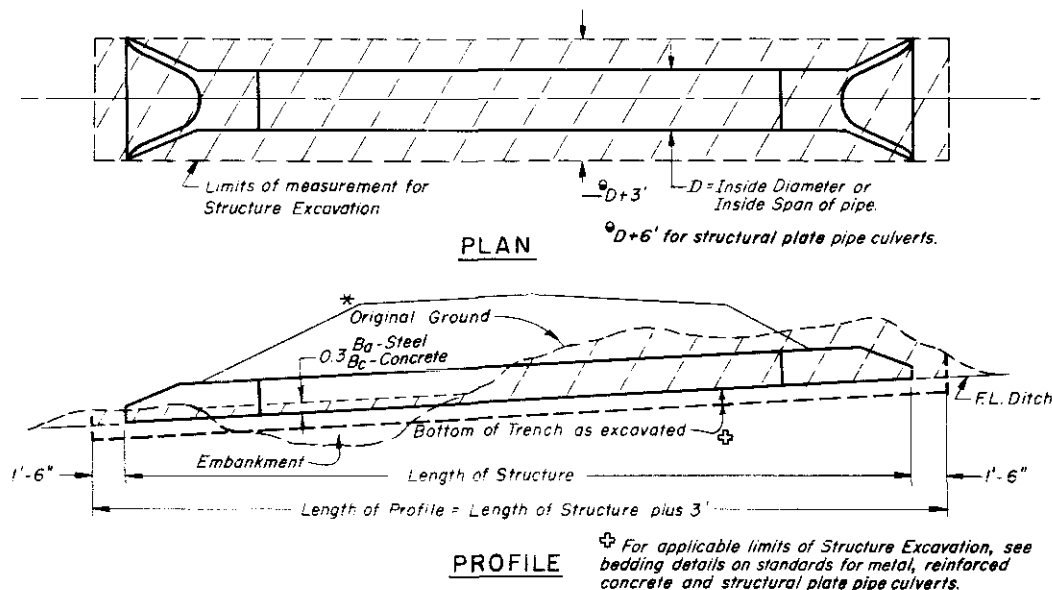
STANDARD M-206-AA

(MARCH 1, 1971)
(SHEET 2)

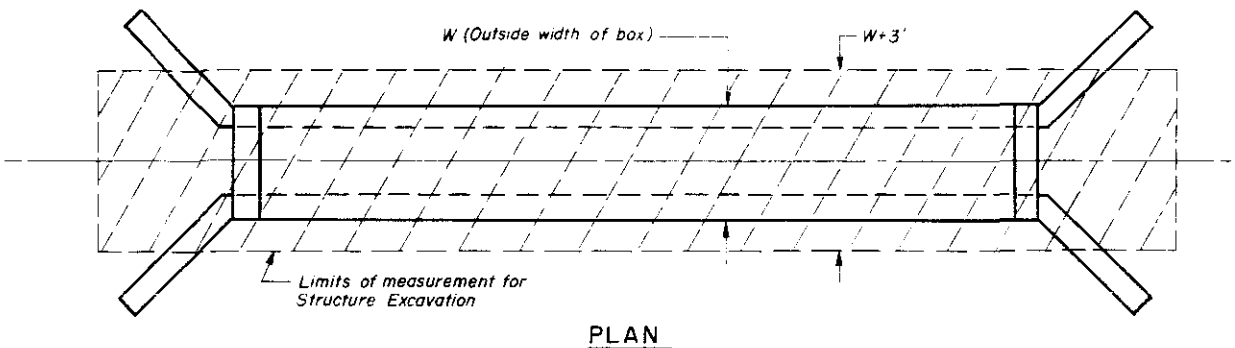
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS:	

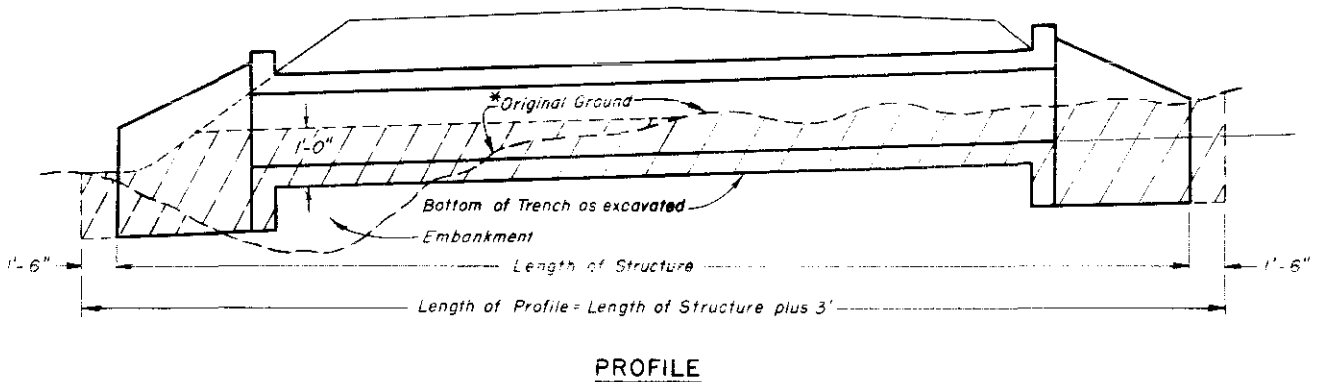
STRUCTURE EXCAVATION MEASUREMENT
FOR PIPE CULVERTS



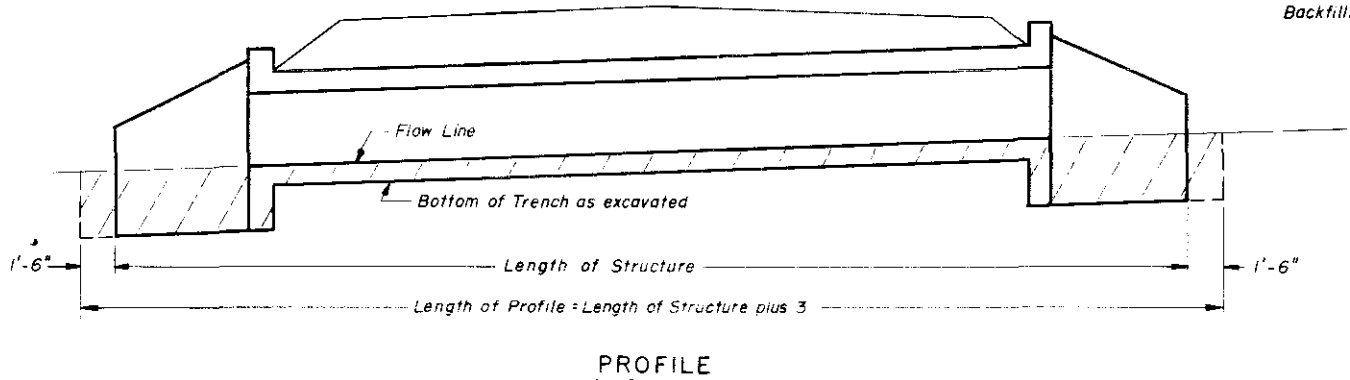
STRUCTURE EXCAVATION MEASUREMENT
FOR CONCRETE BOX CULVERTS



Without Channel Change or Channel Improvement

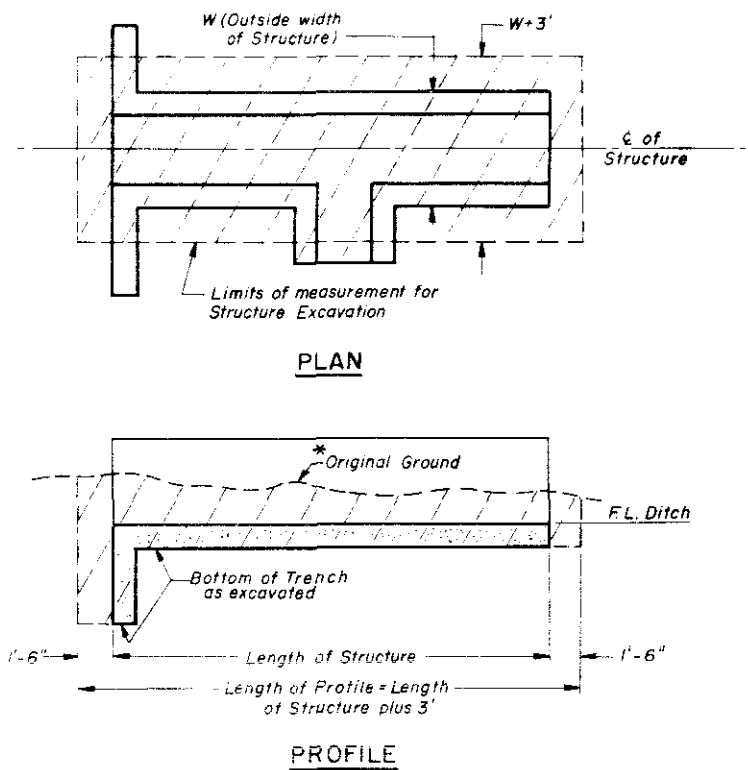


With Channel Change or Channel Improvement



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

STRUCTURE EXCAVATION MEASUREMENT
FOR DIVERSION OR DIVISION BOXES



* Along ϕ 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: H.P.B.)
Made by: H.P.B. Staff Design Engr.
Checked by: Date: March 1, 1971

STANDARD M-603-RC

(MARCH 20, 1967)

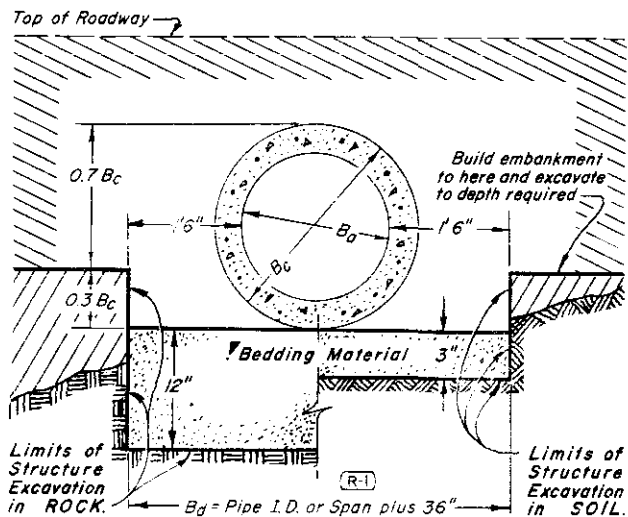
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS			
(R-1)	4-19-68	Added Arch and Elliptical Pipe Gen. Notes	M.R.H.
(R-2)	7-23-68	Dept. Name	M.R.H.
(R-3)	3-1-71	GN's for B bed and NRCP. Cl. 2 bed matl.	M.R.H.

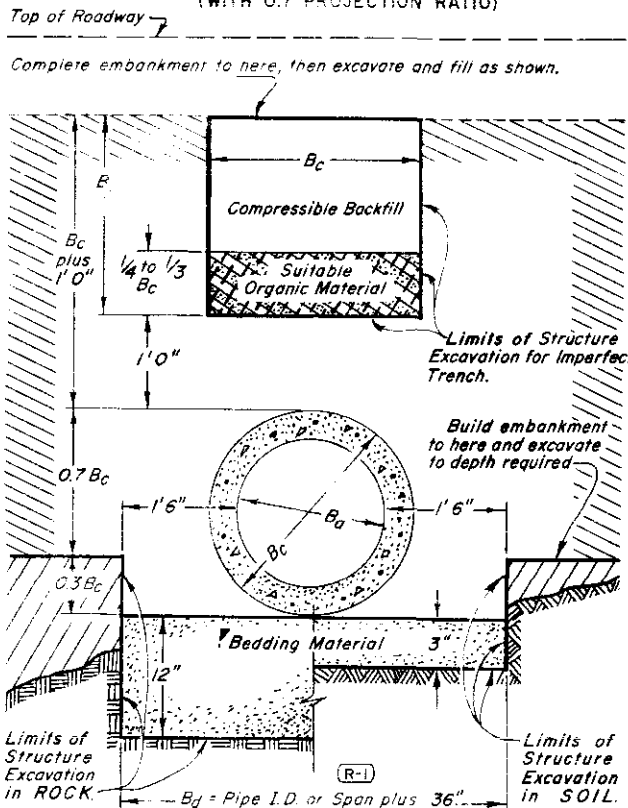
(R-1)

NOTE: B_c is the outside dimension for diameter, span or rise.

PIPE INSTALLATION
(WITH 0.7 PROJECTION RATIO)



IMPERFECT TRENCH PIPE INSTALLATION
(WITH 0.7 PROJECTION RATIO)



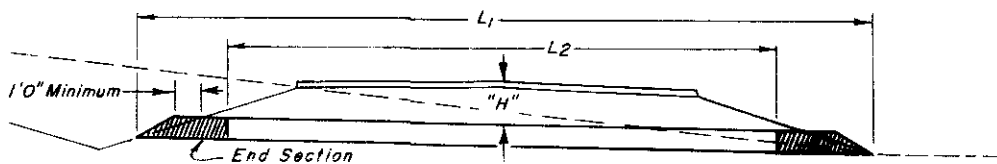
Bedding Material for SOIL shall be 3" loose thickness Structure Backfill Class 2. (R-3)
Bedding Material for ROCK shall be 12" loose thickness Structure Backfill Class 1.

DIMENSIONS FOR REINFORCED CONCRETE PIPE
(For Information Only)

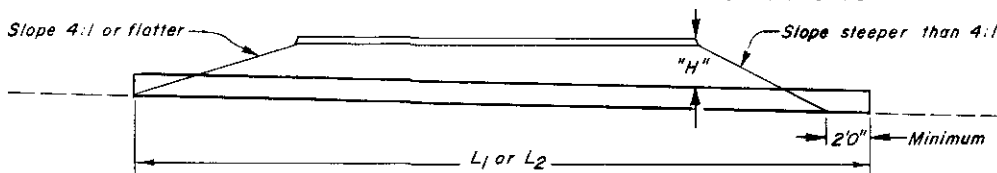
CIRCULAR			ARCH			(VE) VERTICAL ELLIPTICAL				(HE) HORIZONTAL ELLIPTICAL				
▲ PIPE SIZE- B_o (In. I.D.)	Wall Thickness (Inches)	0.3 B_c (Outside Dia.) (Feet)	ϕ Span (Inches)	ϕ Rise (Inches)	Wall Thickness (Inches)	0.3 Outside Rise (Feet)	Span (Inches)	Rise (Inches)	Wall Thickness (Inches)	0.3 Outside Rise (Feet)	Span (Inches)	Rise (Inches)	Wall Thickness (Inches)	0.3 Outside Rise (Feet)
12	2	0.40												
15	2-1/4	0.49												
18	2-1/2	0.58	18	11	2-1/4	0.39					23	14	2-3/4	0.49
			22	13	2-1/2	0.45								
21	2-3/4	0.66	25	16	2-3/4	0.54								
24	3	0.75	29	18	3	0.60					30	19	3-1/4	0.66
27	3-1/4	0.84									34	22	3-1/2	0.73
30	3-1/2	0.92	36	22	3-1/2	0.73					38	24	3-3/4	0.79
33	3-3/4	1.01									42	27	3-3/4	0.86
36	4	1.10	43	27	4	0.88	29	45	4-1/2	1.35	45	29	4-1/2	0.95
39														
42	4-1/2	1.28	50	31	4-1/2	1.00	32	49	4-3/4	1.46	49	32	4-3/4	1.04
48	5	1.45	58	36	5	1.15	34	53	5	1.58	53	34	5	1.10
							38	60	5-1/2	1.78	60	38	5-1/2	1.23
54	5-1/2	1.62	65	40	5-1/2	1.28	43	66	6	2.00	68	43	6	1.38
60	6	1.80	72	44	6	1.40	48	76	6-1/2	2.23	76	48	6-1/2	1.53
66	6-1/2	1.97					53	83	7	2.43	83	53	7	1.68
72	7	2.15	88	54	7	1.70	58	91	7-1/2	2.65	91	58	7-1/2	1.83
78	7-1/2	2.32					63	98	8	2.85	98	63	8	1.98
84	8	2.50	102	62	8	1.95	68	106	8-1/2	3.08	106	68	8-1/2	2.13
90	8-1/2	2.68	115	72	8-1/2	2.23	72	113	9	3.28	113	72	9	2.25
96	9	2.85	122	77	9	2.38	77	121	9-1/2	3.50	121	77	9-1/2	2.40
102	9-1/2	3.02					82	128	9-3/4	3.69	128	82	9-3/4	2.54
108	10	3.20	138	87	10	2.68	87	136	10	3.90	136	87	10	2.68

Also equivalent round dimension for Arch and Elliptical pipe.
 ϕ Sizes shown are for identification purposes only. Actual sizes shall conform to those listed in Fig. 1 of ASTM Spec. C506.

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

HEIGHTS OF FILL OVER REINFORCED CONCRETE PIPE

ALL SIZES

TYPE OF PIPE	HEIGHT OF FILL OVER TOP OF PIPE IN FEET (0.01" Crack D-Load)					
	CLASS OF PIPE					
	Class II	Class III	Class IV	Class V	Class VI	Class VII
	Class VE II	Class VE III	Class VE IV	Class VE V	Class VE VI	Class VE VII
CIRCULAR	1000 D	1350 D	2000 D	3000 D	4000 D	
ARCH						
VERTICAL ELLIPTICAL						
HORIZONTAL ELLIPTICAL						
PIPE INSTALLATION WITH 0.7 PROJECTION RATIO						
CIRCULAR	Min. to 18	Min. to 25	25+ to 37	37+ to 45		
ARCH	Min. to 18	Min. to 25	25+ to 37	37+ to 45		
VERTICAL ELLIPTICAL	Min. to 18	Min. to 25	25+ to 37	37+ to 45	45+ to 62	
HORIZONTAL ELLIPTICAL	Min. to 18	Min. to 25	25+ to 37	37+ to 45	45+ to 62	
PIPE INSTALLATION WITH IMPERFECT TRENCH						
ALL TYPES	up to 35	up to 49	48+ to 75	75+ to 96		

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the project.
Minimum cover excluding pavement shall be 1 foot.
Fill heights greater than maximum allowed in the Heights of Fill Table on this sheet will require special design of structure.
Pipe design is based on safety factor of 1.33 on ultimate strength.
The heights of fill over top of pipe are based on unit weight of soil at 120 lbs per cubic foot.
Pipe Class is determined from .01 inch crack D-load.
Bedding is Class B (Modified) with Settlement Ratio $R_{30} = 0.0$ (Yielding Bed).

Changes in design factors will require compensating change in pipe design.
Minimum wall thickness dimensions are based on AASHTO Designation M 170 (Wall B) for Circular Pipe, AASHTO Designation M 206 for Arch Pipe and AASHTO Designation M 207 for Elliptical Pipe.
Spacing for multiple pipe installations shall conform to the details shown on M Standard for Excavation and Backfill for Structures.
When a culvert is to be extended with pipe of different material, the connection shall conform to the detail on plans or be approved.

NONREINFORCED CONCRETE PIPE
Nonreinforced Concrete Pipe is required to meet the same D-Load to produce the ultimate load under the three-edge-bearing method as specified for Reinforced Concrete Pipe in accordance with AASHTO M-170. Wall thickness of pipe may be increased as required to meet D-Load requirement.

All requirements for Reinforced Concrete Pipe, except those referring to reinforcement shall apply to Nonreinforced Concrete Pipe.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS
REINFORCED CONCRETE
PIPE

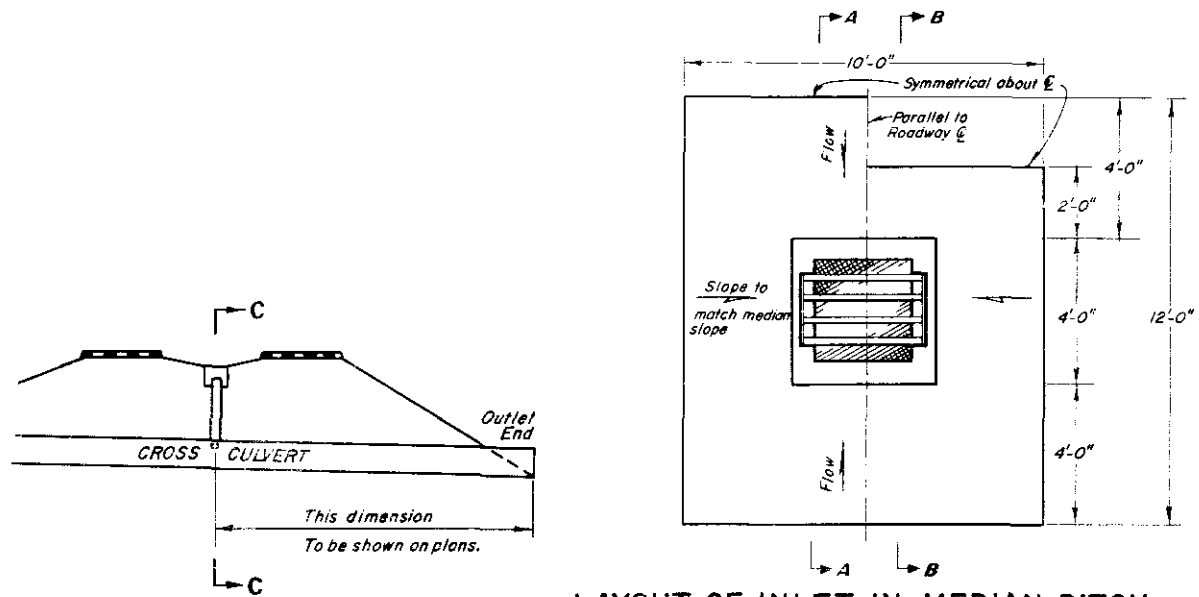
Designed by M.R.H. Approved by J.R.B.
Made by J.R.B. Staff Design Eng'r.
Checked by R.S.M. Date: 4-19-68

STANDARD M-604-BA

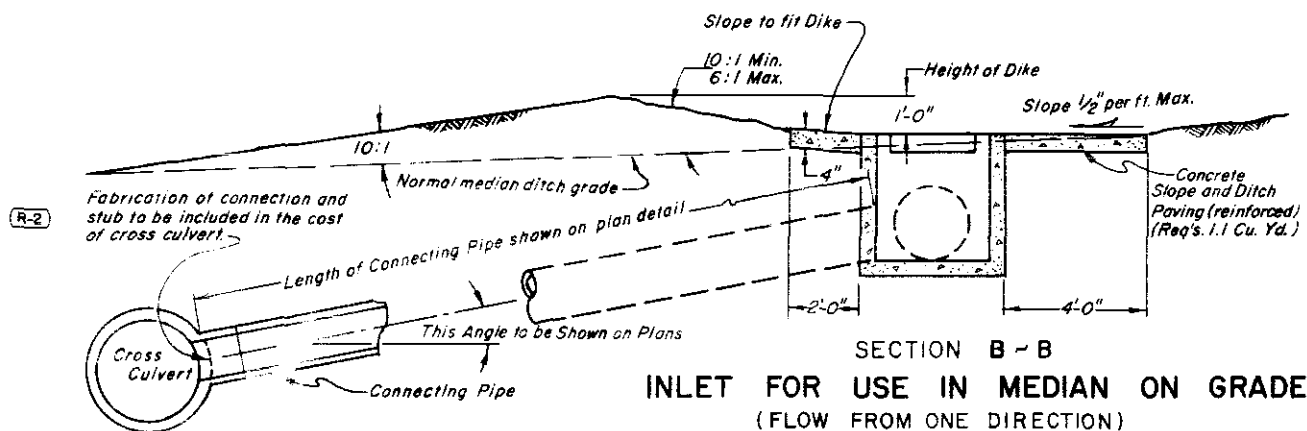
(JUNE 1, 1967)

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

REVISIONS			
R-1	9-13-67	Grate Detail & Quant.	M.R.H.
R-2	2-22-68	Changes to skewed culvert, General Note	M.R.H.
R-3	7-19-68	Change to Dept. Name	M.R.H.
R-4	8-15-68	Change to G.N. and note. Re-do grate welds	M.R.H.
R-5	2-23-69	Change fastener bolt so top is flush w. conc.	M.R.H.

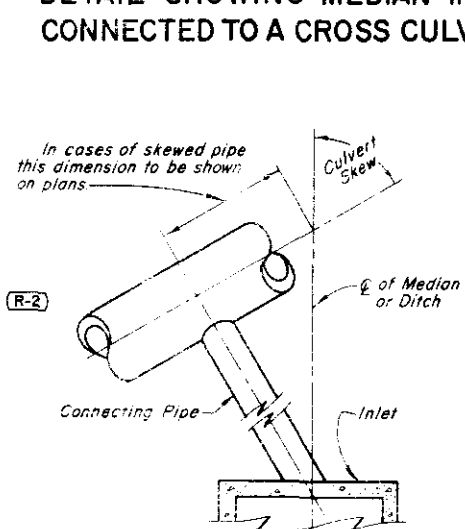


LAYOUT OF INLET IN MEDIAN DITCH

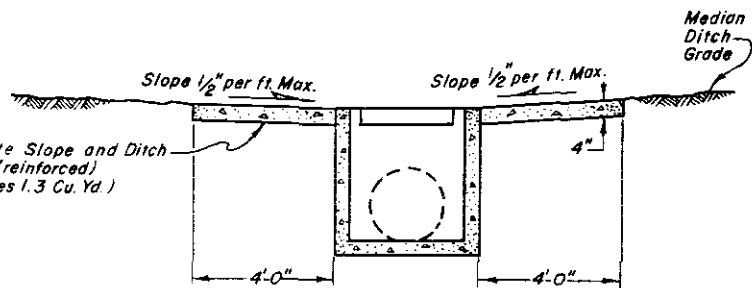


SECTION B-B
INLET FOR USE IN MEDIAN ON GRADE
(FLOW FROM ONE DIRECTION)

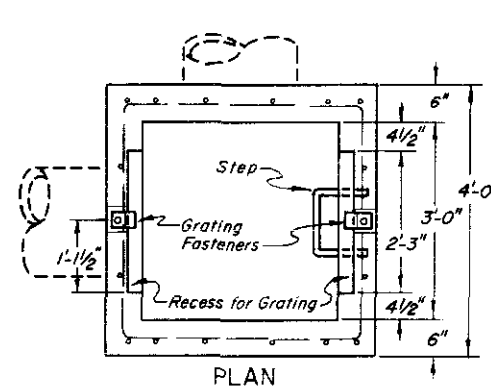
SECTION C-C
DETAIL SHOWING MEDIAN INLET
CONNECTED TO A CROSS CULVERT



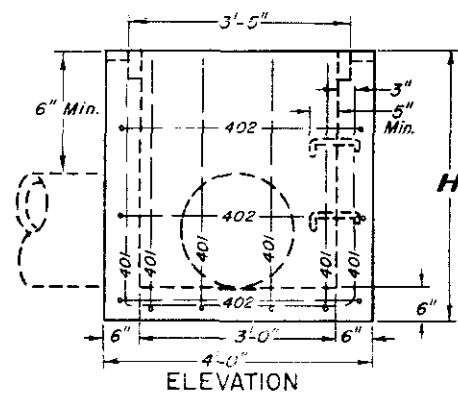
DETAIL SHOWING MEDIAN INLET CONNECTED
TO A SKEWED CROSS CULVERT



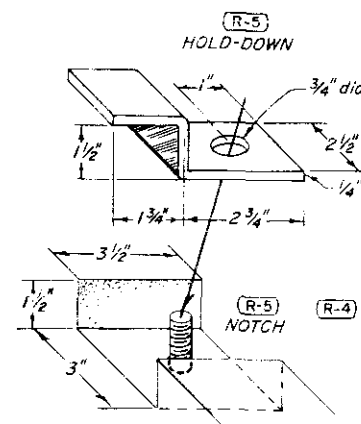
SECTION A-A
INLET FOR USE IN MEDIAN
AT BOTTOM OF VERTICAL CURVE



PLAN



ELEVATION
CONCRETE INLET



SECTION D-D
DETAIL OF RECESS AND
GRATING FASTENER
(2 REQUIRED)

QUANTITIES FOR ONE INLET

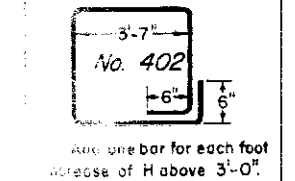
H	CONCRETE (CU. YDS.)	REIN. STEEL (LBS.)	NO. STEPS REQ'D
3'-0"	1.0	83	0
3'-6"	1.1	89	0
4'-0"	1.2	95	0
4'-6"	1.4	101	0
5'-0"	1.5	107	2
5'-6"	1.6	114	2
6'-0"	1.7	120	2
6'-6"	1.9	127	2
7'-0"	2.0	134	3
7'-6"	2.1	141	3
8'-0"	2.3	148	3
8'-6"	2.4	155	4
9'-0"	2.5	162	4
9'-6"	2.6	169	4
10'-0"	2.8	176	5
11'-0"	3.0	183	5
12'-0"	3.3	190	6

* Note: includes quantity of concrete for steps.

BAR LIST FOR H=3' AND
BENDING DIAGRAM

MARK	NO. REQ'D	HGT. "U"	LENGTH
401	9	2'-7"	8'-8"
402	3		15'-4"

Increase dimension "U" 6" for each 6" increase of H above 3'-0".



401 bars to be 1/2" Dia. - Cut and bend around pipes as required.

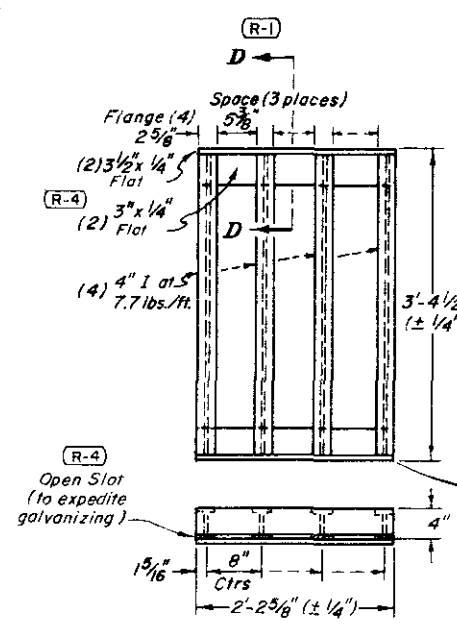
GENERAL NOTES

- All work shall be done in accordance with the Standard Specifications applicable to the project.
- All concrete shall be Class A, B or D.
- For detail of Inlet Step, see M-Standard "Steps for Manholes and Inlets".
- 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 ϵ of bar.
- Concrete slope and ditch paving shall conform to Section 507. Reinforcement for concrete slope paving shall be 4 x 4, 10/10.
- Grating shall conform to Section 604.
- Inlet grating shall be galvanized as described for Frames, Grates, Covers and Steps in Section 712.
- Steps or ladder will be required when Inlet depth exceeds 3'-0".

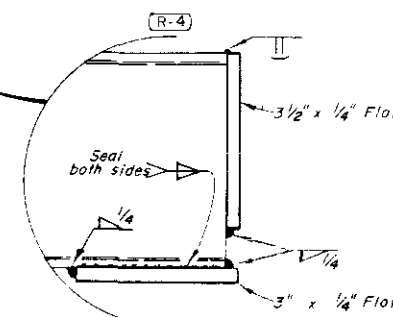
MATERIAL LIST FOR GRATING, FASTENERS

PART	NO. REQ'D	SIZE	ILBS. PER UNIT	WEIGHT - LBS.
Flange	2	2 1/2" x 1/4"	2.98/lb.	13
Flange	2	2 1/2" x 1/4"	2.6/lb.	12
Beam	2	2 1/2" x 1/4"	7.7/lb.	103
Fastener	2	6" x 1/4" x 2 1/2"	1.0 ea.	
Bolt	2	5/8" x 8"	0.8 ea.	
Washer	2		0.1 ea.	
TOTAL WEIGHT				132

(R-4)



DETAIL OF GRATING



DEPARTMENT OF HIGHWAYS STATE OF COLORADO DIVISION OF HIGHWAYS INLET, TYPE C

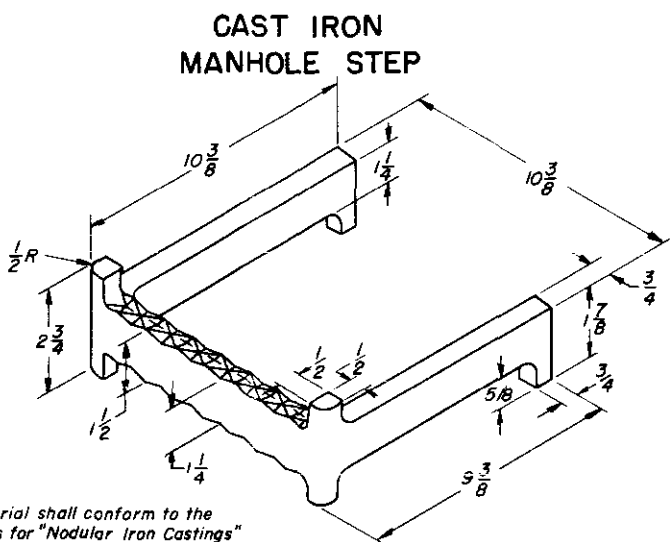
Designed by J. B. R. Approved by J. E. Olson
Made by J. B. R. Staff Design Engineer
Checked by R. S. M. Date: JUNE 1, 1967

STANDARD M-604-D

(JULY 1, 1965)

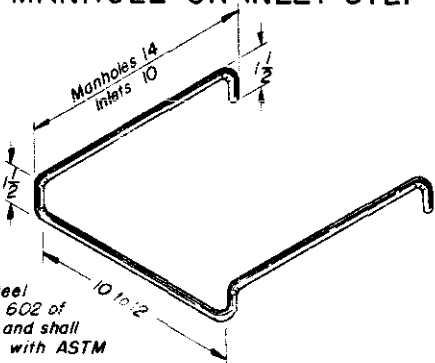
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS			
(R-1)	7-23-68	Depl. Name.	M.R.H.



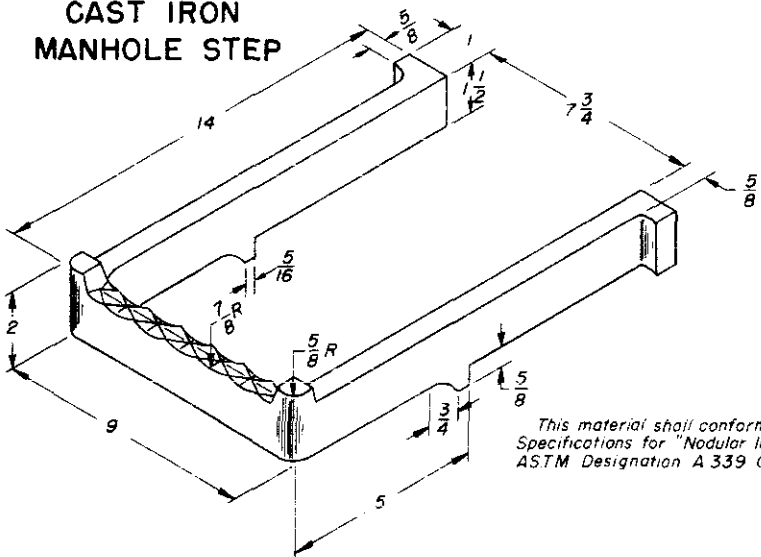
This material shall conform to the
Specifications for "Nodular Iron Castings"
ASTM Designation A 339 Grade 60-45-10

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.

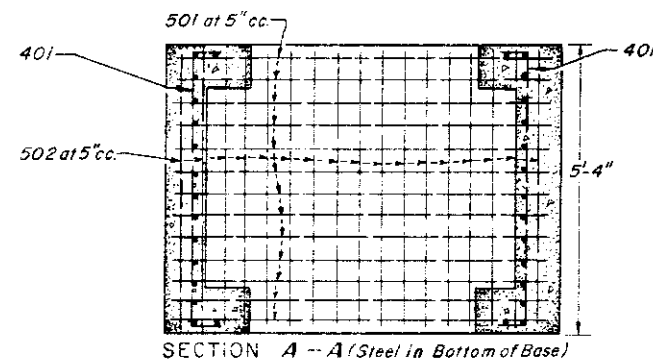
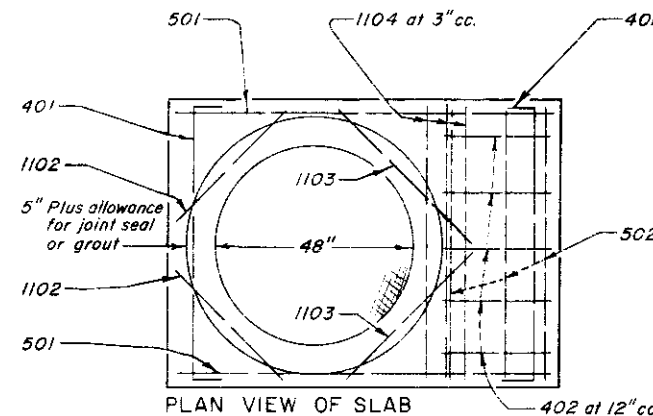
DEPARTMENT OF HIGHWAYS STATE OF COLORADO DIVISION OF HIGHWAYS	
STEPS FOR MANHOLES AND INLETS	
Designed by: M.R.H.	Approved by: <i>[Signature]</i>
Made by: H.P.B.	Staff Design Engr.
Checked by:	Date: July 1, 1965

STANDARD M-604-E

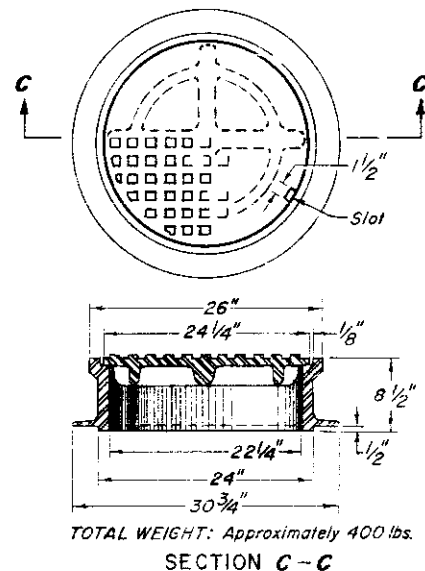
(OCTOBER 11, 1967)

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

REVISIONS			
(R-1)	7-24-68	Dept. Name	M.R.H.
(R-2)	4-20-71	Concrete in Gen. Note.	M.R.H.



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	18 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 = $\left(\frac{12 + I.D. + 2W}{6}\right) + 6$
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'-6" 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. = $\left(\frac{17 + I.D. + 2W}{5}\right) + \left(\frac{I.D. - 36}{12}\right) + 3$
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	1102	TYPE I Straight
1103	11	I	5.31	{ NO. REQ'D. LENGTH WEIGHT, lbs.	2 3'-6" 37.2	2 3'-6" 37.2	2 3'-6" 37.2	2 3'-6" 37.2	2 3'-6" 37.2	2 3'-6" 37.2	1103	TYPE II 59" long
1104	11	I	5.31	{ NO. REQ'D. LENGTH WEIGHT, lbs.	3 5'-0" 79.7	3 5'-0" 79.7	3 5'-0" 79.7	3 5'-0" 79.7	3 5'-0" 79.7	3 5'-0" 79.7	1104	TYPE III 12" x 12" x 10"
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 (R-2)

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, B or D concrete.

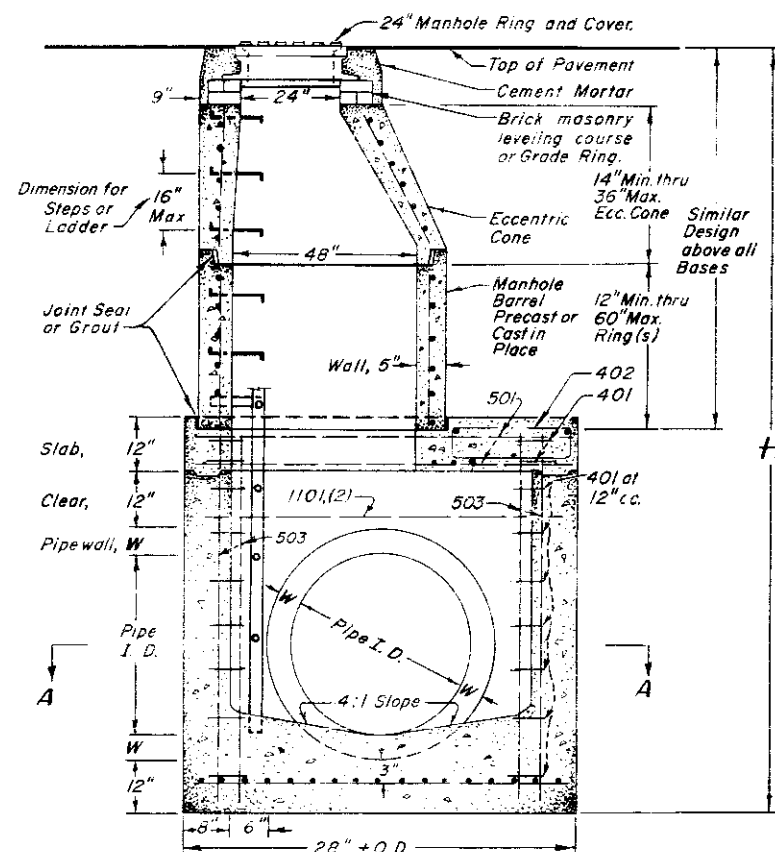
The following alternate materials for Manholes may be used when design details for construction are included in the plans:

MATERIAL	CONFORMANCE DESIGNATION
Clay or Shale Brick	AASHTO M 91
Concrete Brick	ASTM C 55, Grade P-I or P-II
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.

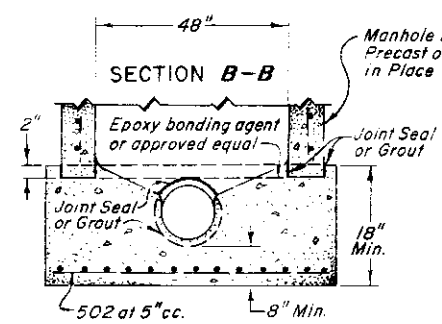
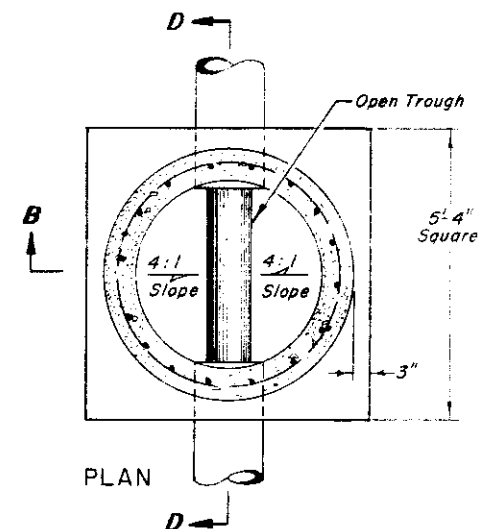
Alternate designs will be permitted after approval by the Division.

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



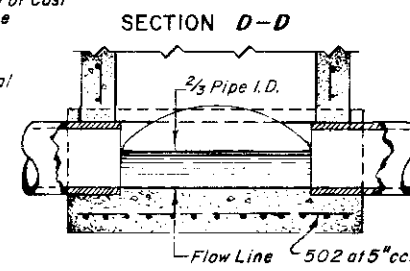
CONCRETE MANHOLE AND BOX BASE

(Typical for Conduit 36" I.D. and Larger.)



CONCRETE SLAB BASE

(Typical for Conduit Smaller than 36" I.D.)



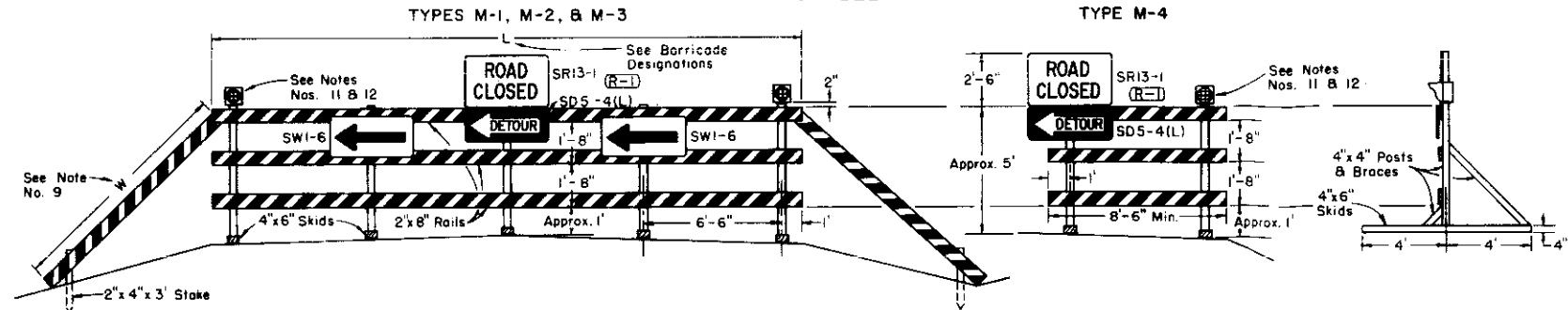
DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS
MANHOLES

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

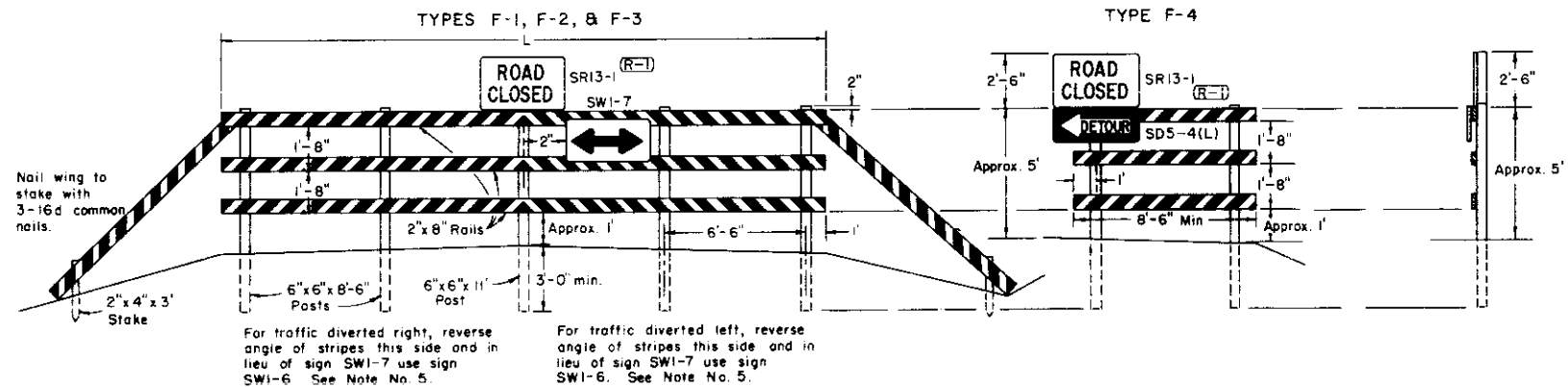
Approved by J.E.O.
Staff Design Engineer
Date: October 11, 1967

CLASS I BARRICADES
(3 RAILS)

MOVABLE

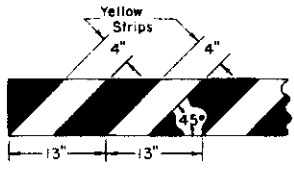
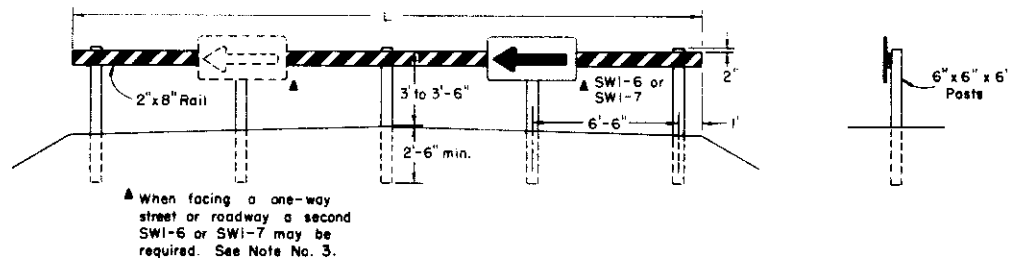


FIXED

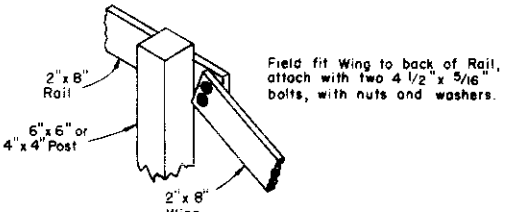


CLASS II BARRICADE
(1 RAIL)

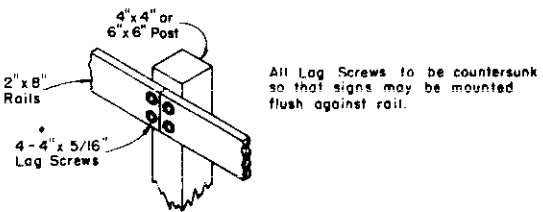
FIXED
TYPE F-6



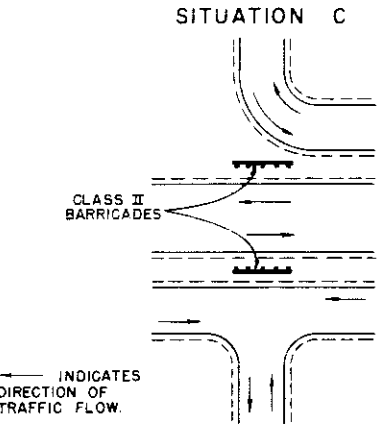
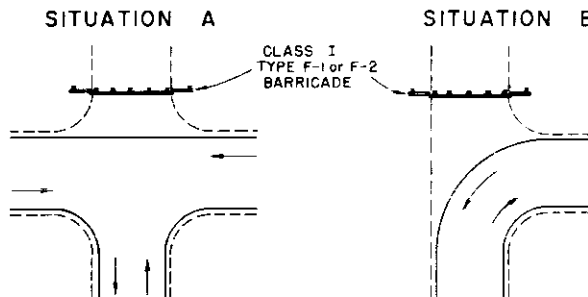
DETAIL OF RAIL
AND WING STRIPING



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



METHOD OF ATTACHING PLANKING
TO POSTS AT JOINTS



INDICATES
DIRECTION OF
TRAFFIC FLOW.

STANDARD M-614-A

(JULY 1, 1965)

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

REVISIONS			
(R-1)	11-15-68	Rev. Dept. Name & Code Nos.	JLS
(R-2)	4-23-69	Rev. Code No. & Notes	JLS

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 Division 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." Planking 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 Division.
- 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 shall be Standard Grade or better, S4S, Douglas Fir or Larch, as described in the 1965 Standard Grading Rules published by the Western Wood Products Association, and shall conform to paragraph 123c for the rails and paragraphs 122c and 125c for the posts.
- 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 Division 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 IV, published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

BARRICADE DESIGNATIONS					
Class	Type		Roadway Width	L	Description
	Movable	Fixed			
I	M-1	F-1	26'-34'	28'	Barricade complete with SR13-1 sign and SWI-6 or SWI-7 signs as required.
I	M-2	F-2	35'-44'	41'	Barricade complete with SR13-1 sign and SWI-6 or SWI-7 signs as required.
I	M-3	F-3	variable	26'	Barricade (without extension wings) complete with SR13-1 sign and SWI-6 or SWI-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.

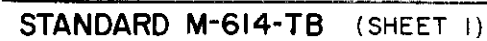
DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TIMBER
BARRICADES

Designed By: D.R.W.
Made By: JLS
Checked By: J.B.
Approved By: [Signature]
Date: JULY 1, 1965

(JULY 1, 1965)

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



STANDARD M-614-TB

(SHEET 2 OF 3 SHEETS)

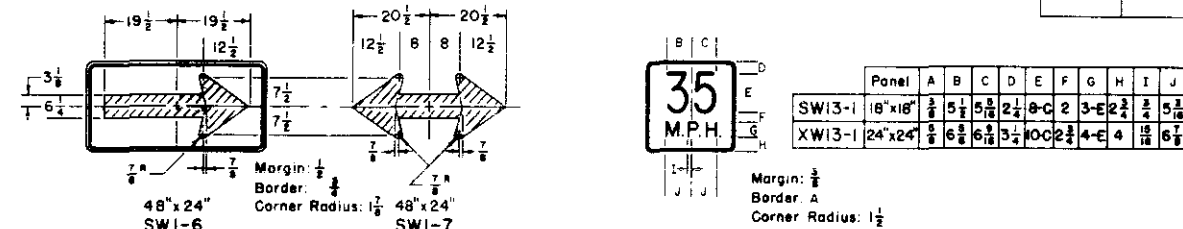
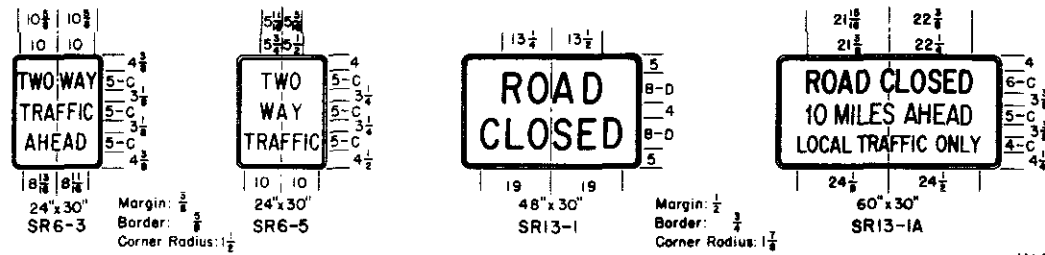
(JULY 1, 1965)

REGULATORY SIGNS
See Note No. 9

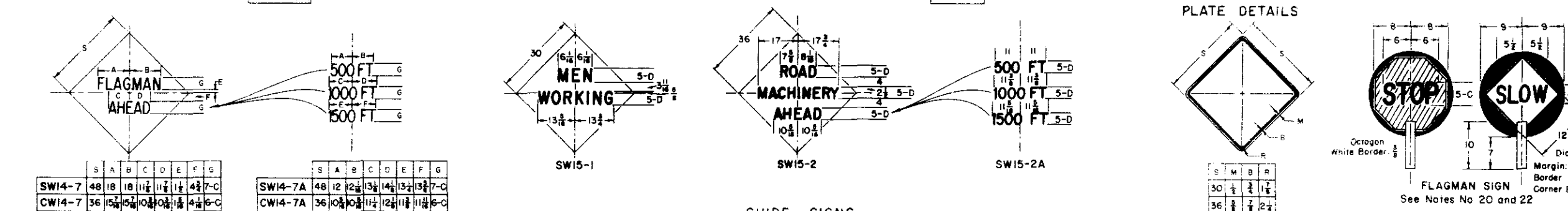
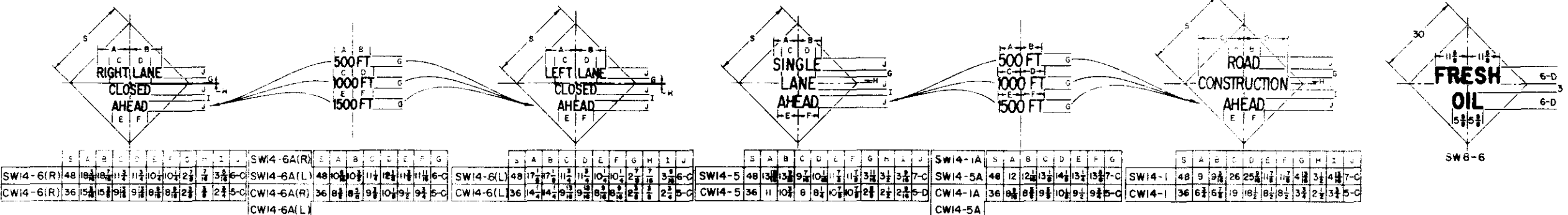
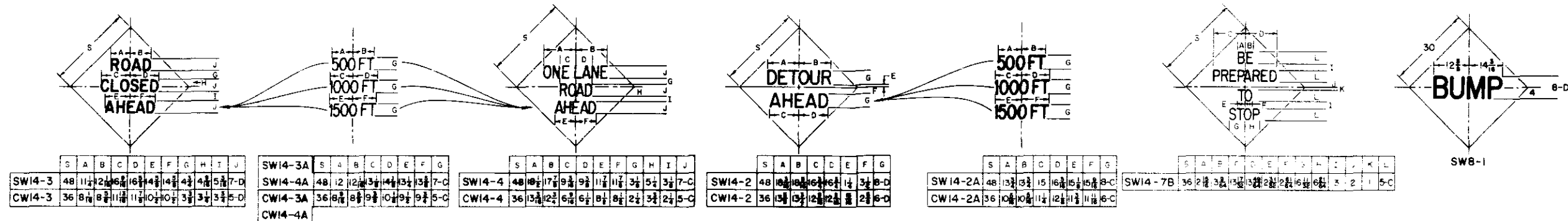
WARNING SIGNS
See Note No. 10

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

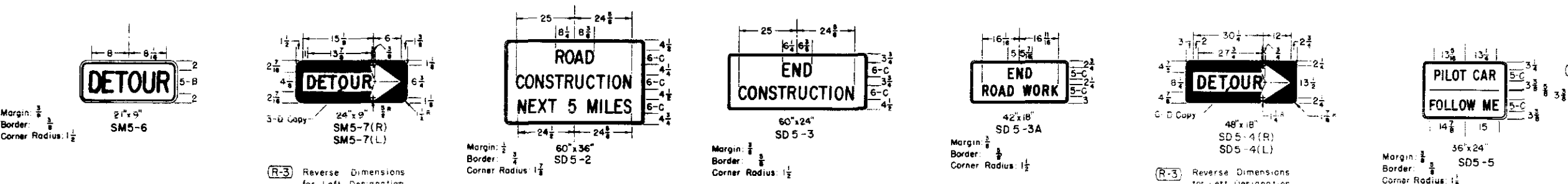
REVISIONS			
REV.	DATE	REVISION	BY
(R-1)	7-12-67		M.R.H.
(R-2)	7-8-68	Rev. Code No. & Dept. Name	G.W.F.
(R-3)	12-24-68	Added Notes	J.L.S.



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 THAT ARE NOT LABELED ARE IN INCHES.

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

Designed By: DRW
Made By: H.B.D.
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.

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 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.
- 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 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."
- 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.
- (R-3) 18. Lanterns and Torches - Lanterns, with red globes, shall be used only in low speed urban areas. Open-flame torches shall not be used under any circumstances.
- 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" - SD5-2 - 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" - SD5-3 - 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) (R-2) 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.

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

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