

# INACTIVE

MAR 20 1969

## DEPARTMENT OF HIGHWAYS STATE OF COLORADO

R.O.W. PURCHASED UNDER PROJECT NO. F027-1(4)  
P.E. UNDER PROJECT NO. F027-1(4)  
SOME UTILITIES UNDER PROJECT NO. F027-1(4)

SECTION NO.	DIVISION	PROJECT	SHEET NO.
1	COLORADO	F027-1(5)	1

(R-1) 3-8-68 MEV - Tab. of Length

FINAL CONSTRUCTION

INDEX OF SHEETS

AS CONSTRUCTED  
REVISED DATE 9/16/68

SHEET NO

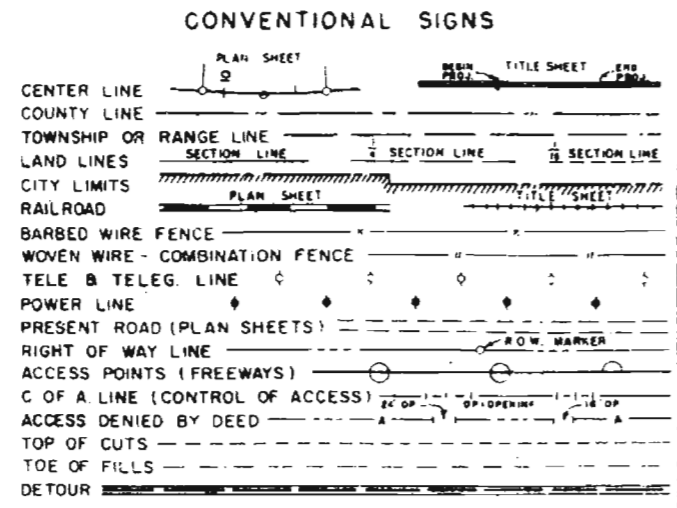
- Title Page, Sketch Map and Tabulation of Length and Design Data
- Typical Section and General Notes
- Typical Curbed Section and Detour Section
- Summary of Approximate Quantities
- Structure Quantities
- Base Course and Surface Course Plan, Subbase Plan, Tabulation of Bituminous Curbing and Embankment Protectors and Topsoil Requirements
- Pit Sketch
- Tabulation of Fencing Requirements, R.O.W. Markers, Delineators and Guardrail
- Tabulation of Removal of Obstructions, Reset Mailbox Structure and Curbs and Gutters, and Subgrade Excavation
- Detail of Guard Post Attachment to top of C.B.C.
- Details of Concrete Slope and Ditch Paving and Paving at Entrance of C.B.C. Sta 24+37 Flared Entrance of C.B.C. Sta 94+15, and Headwall Removal and Concrete Slope & Ditch Paving for Side Ditch Sta 24+97
- Typical Plunge Basin and Riprap and Concrete Slope and Ditch Paving for Culvert Cutout
- Details of Embankment Protector (Type 5) Location of Guard Rail and Section of Curb Type 6 (Section M)
- Details of Detour of Sta 25±
- Plan and Profile Sheets
- Summary of Earthwork Quantities
- Structure Cross Sections
- Cross Sections

### PLAN AND PROFILE OF PROPOSED COMPLETED FEDERAL AID PROJECT NO. F 027-1(5) STATE HIGHWAY NO. 12-160 LAS ANIMAS COUNTY

CONTRACTOR DOMINIC LEONE  
RESIDENT ENGR B.B. WARREN  
PROJECT ENGR W.E. DICK  
PROJECT STARTED March 27, 1968  
PROJECT COMPLETED Sept. 16, 1968

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

'As Constructed  
NO Revisions'  
Sheets NO. 2, 3, 12  
Rev 15 and 21



#### TABULATION OF LENGTH & DESIGN DATA

STATION	WITHIN URBAN LIMITS		OUTSIDE URBAN LIMITS	
	Roadway		Roadway	
	Lin. Ft.		Lin. Ft.	
5+90.1 BEGIN F027-1(5) END OF 5+90.1 ON FAP 91A	4873.4			
54+63.5 Bk. = EQUA 55+28.7 Ah. = EQUA	731.3			
62+60 URBAN LIMIT			1172.3	
74+32.3 Bk. = EQUA 74+02.4 Ah. = EQUA			1,361.2	
87+63.6 Bk. = EQUA 87+63.4 Ah. = EQUA			3,904.5 (R-1)	
126+67.9 END F027-1(5) = 127+00.0 ON FAP 91A				
<b>TOTAL</b>	<b>5,604.7</b>		<b>6,438.0</b>	

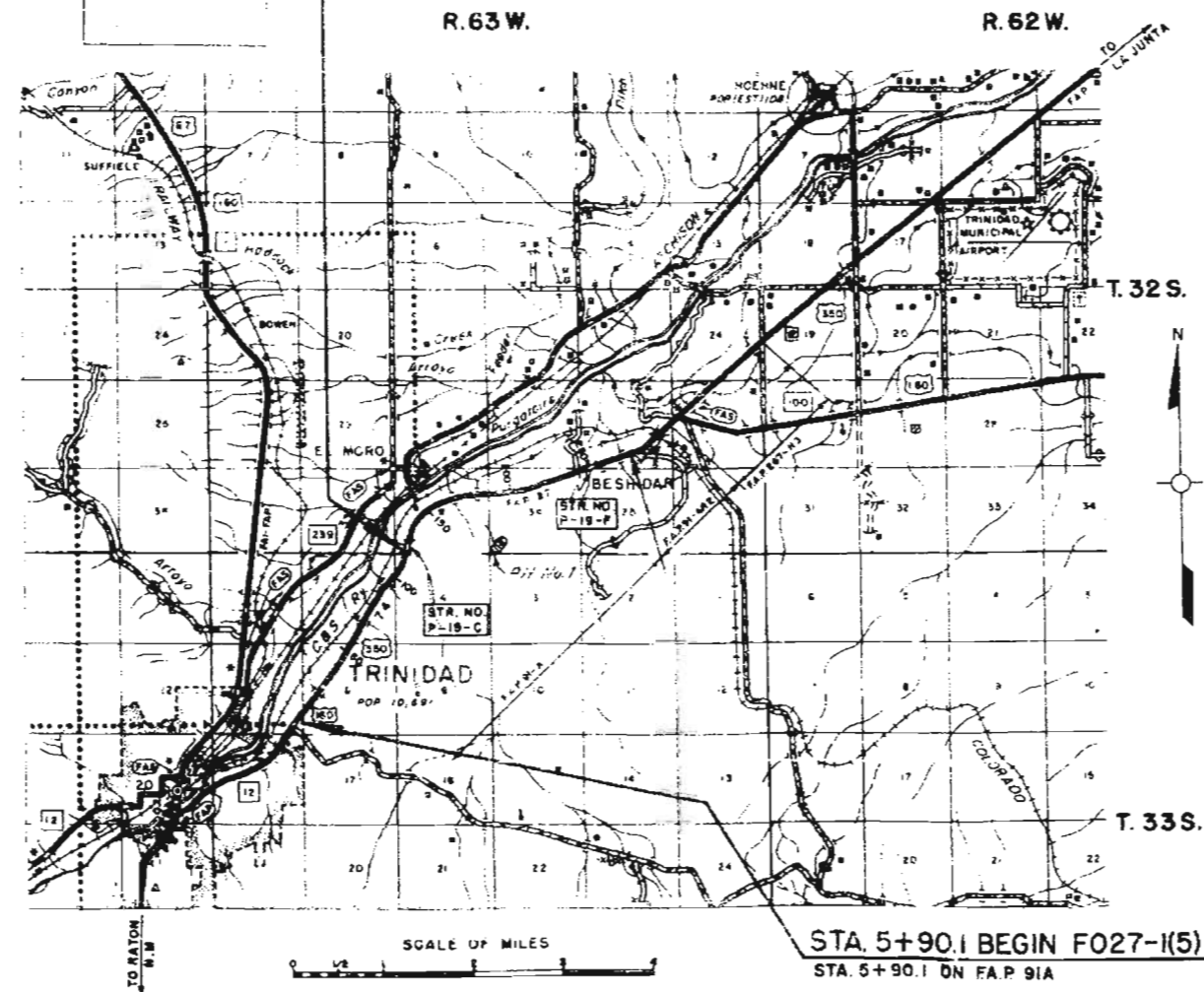
#### SUMMARY

	Lin. Ft.	Miles
ROADWAY - WITHIN URBAN LIMITS	5,604.7	1.062
ROADWAY - OUTSIDE URBAN LIMITS	6,438.0	1.219
<b>TOTAL (Net and Gross Length)</b>	<b>12,042.7</b>	<b>2.281</b>

#### DESIGN DATA

MAXIMUM DEGREE OF CURVE	3° 00'
MAXIMUM GRADE	4.00%
MINIMUM SSD HORIZONTAL	960'
MINIMUM SSD VERTICAL	470'
MAXIMUM DESIGN SPEED	50 MPH

STA. 126+67.9 END F027-1(5) =  
STA. 126+67.9 ON FAP 91A



STA. 5+90.1 BEGIN F027-1(5)  
STA. 5+90.1 ON FAP 91A

- M-203-A Superlevation and Widening of Curves - Crowned Highways 5-26-67
- M-203-B Approach Roads Flaring Out Slope Treatment, Bridge and Creek Widening 7-1-65
- M-203-C Ditch Types 7-1-65
- M-206-A Excavation and Backfill for Structures (2 Sheets) 3-17-67
- M-601-A Single and Double Concrete Box Culverts 7-1-65
- M-601-C Wingwalls for Concrete Box Culverts - 4:1 Side Slopes (2 Sheets) Sh 1 7-17-67  
Sh 2 7-1-65
- M-601-D Wingwalls for Concrete Box Culverts 2:1 Side Slopes 7-17-67
- M-603-CA Concrete and Metal End Sections 11-10-67
- M-603-M Metal Culvert Pipe 3-20-67
- M-603-RC Reinforced Concrete Pipe 3-20-67
- M-606-AA Guard Rail Type 3, 3 Sheets 8-1-67
- M-607-A Wire Fences & Gates (2 Sheets) Sh 1 12-8-66  
Sh 2 2-6-67
- M-609-A Curbs and Gutters 2-14-66
- M-612-A Marker Posts & Bench Marks 5-2-66
- M-612-C Delineators (2 Sheets) Sh 1 7-1-65  
Sh 2 5-4-67
- M-614-A Timber Barricades 7-1-65
- M-614-TB Traffic Signing for Highway Construction (3 Sheets) 7-12-67
- M-614-IA Construction Identification Signs 6-19-67

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
FINAL APPROVAL  
DATE 9-16-68  
DISTRICT CONSTRUCTION DIVISION

SEE SPECIAL PROVISIONS FOR  
NOTICE TO BIDDERS

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

APPROVED: Chas. E. Shumata 1-1-68  
CHIEF ENGINEER DATE

DEPARTMENT OF TRANSPORTATION  
FEDERAL HIGHWAY ADMINISTRATION  
BUREAU OF PUBLIC ROADS

APPROVED: \_\_\_\_\_ DATE \_\_\_\_\_

DIVISION ENGINEER

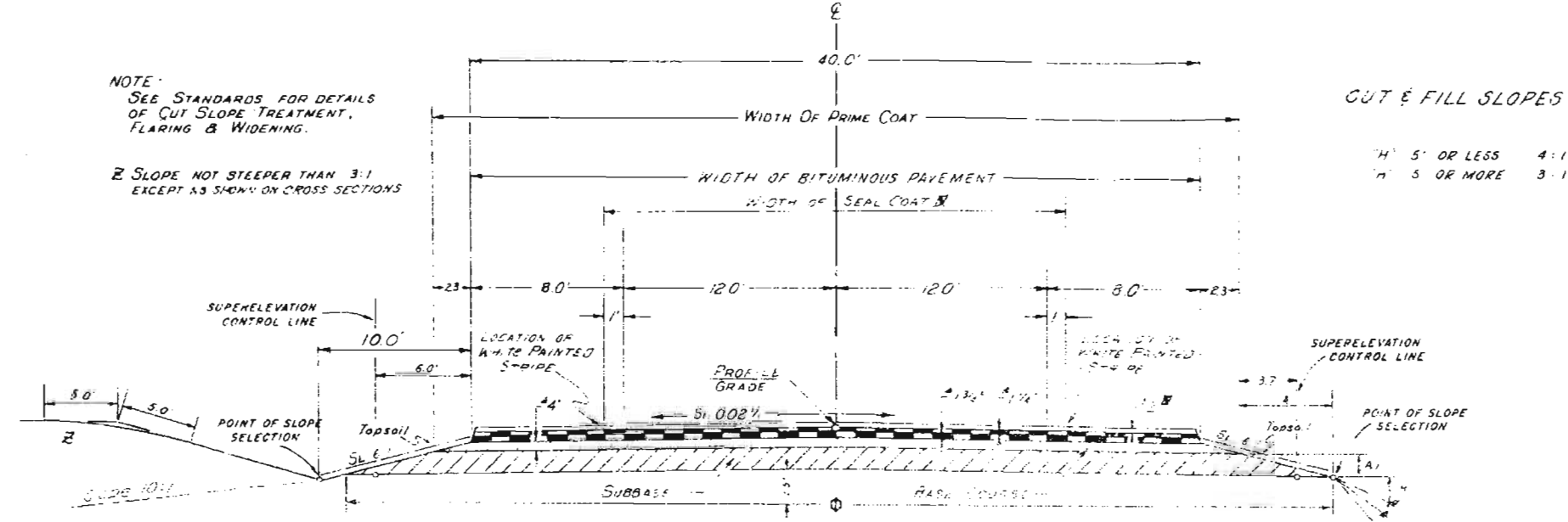
H. G. JOHNSON

MEV

M. E. VAN DEN BOS

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F 027-1(5)	2	

**TYPICAL SECTION A**  
 STA. 16+ to 127+



NOTE:  
 SEE STANDARDS FOR DETAILS OF CUT SLOPE TREATMENT, FLARING & WIDENING.

Z SLOPE NOT STEEPER THAN 3:1 EXCEPT AS SHOWN ON CROSS SECTIONS

THE DEPTH AND WIDTH OF THE SIDE DITCH SHALL BE VARIED WHERE NECESSARY IN ORDER TO PROVIDE PROPER DRAINAGE AND/OR ENTRANCE TO DRAINAGE STRUCTURES  
 EXCAVATION BELOW Z SLOPE EXPOSED 10:1 SLOPE WILL NOT BE PERMITTED.

DURING MULTI-LAYER PAVEMENT CONSTRUCTION, ANY LAYER THAT IS TO HAVE A SUCCEEDING LAYER PLACED THEREON SHALL BE COMPLETED FULL WIDTH BEFORE THE NEXT LAYER IS PLACED.

MATERIAL SHALL BE PLACED IN SEPARATE COURSES  
 12" MINIMUM THICKNESS  
 12" MINIMUM THICKNESS  
 12" MINIMUM THICKNESS

	SECTION A	SECTION B	TONS
TOP LAYER	31	31	TONS
MIDDLE COURSE	21	23	TONS
BASE COURSE	24	29	TONS

HINGE POINT DATA

THICKNESS OF SUBBASE	SECTION A	
	A	A <sub>1</sub>
7"	4.3	0.7
10"	5.7	1.0
12"	6.8	1.1

**GENERAL NOTES**

It is estimated that old road is to be obliterated at the following locations:  
 68+ to 70+ Lt.

The minimum thickness of topsoil shall be 4 inches.

Earth slopes shall be disc'd or roughened by other approved methods for erosion protection.

During construction of this project, traffic will use the present traveled roadway.

It is estimated that 2000 hours of flagging for controlling traffic will be required for this project.

The Force Account Item, "Clearing of Building Sites, etc." shall include removal of all foundations, wells, buildings and other appurtenances not removed by the owner, and any necessary backfilling of cellars, cesspools, wells, etc., to provide neat roadside conditions. It is estimated that this item applies at the following locations:  
 27+ to 28+ Lt.  
 57+ Lt.  
 125+ Lt.  
 130+ Rt.

The preliminary plan quantities of Bituminous materials the following rates of application were used:  
 Prime Coat 1.0 @ 0.40 GAL / SQ. YD

Rate of application and grade of Bituminous material shall be as determined by the Engineer at time of application.

Divided embankments abutment shall be used as a dust palliative where required. Location shall be as ordered.

Road shoulders which require cut bituminous pavement shall be paved and the thickness of pavement placed as follows:  
 Public approaches and entrances to buildings or residences shall be paved 50 ft out from edge of shoulder or to the Right of Way line whichever is less. Field entrances shall be paved 4 ft out from edge of shoulder.

Excavation required for compaction of bases of cuts and fills will be considered as subsidiary to that operation and will not be paid for separately.

Depth of Moisture-Density control for this project shall be as follows:

Full depth of those embankments within 100 feet of bridge abutments. Top 3 feet of those embankments 4 feet or more in height and for full depth of all embankments less than 4 feet in height.

Bases of cuts 1 foot.

Bases of fills 4 feet or less in height, 1 foot.

Full depth of embankment sections used for ditches and channel changes.

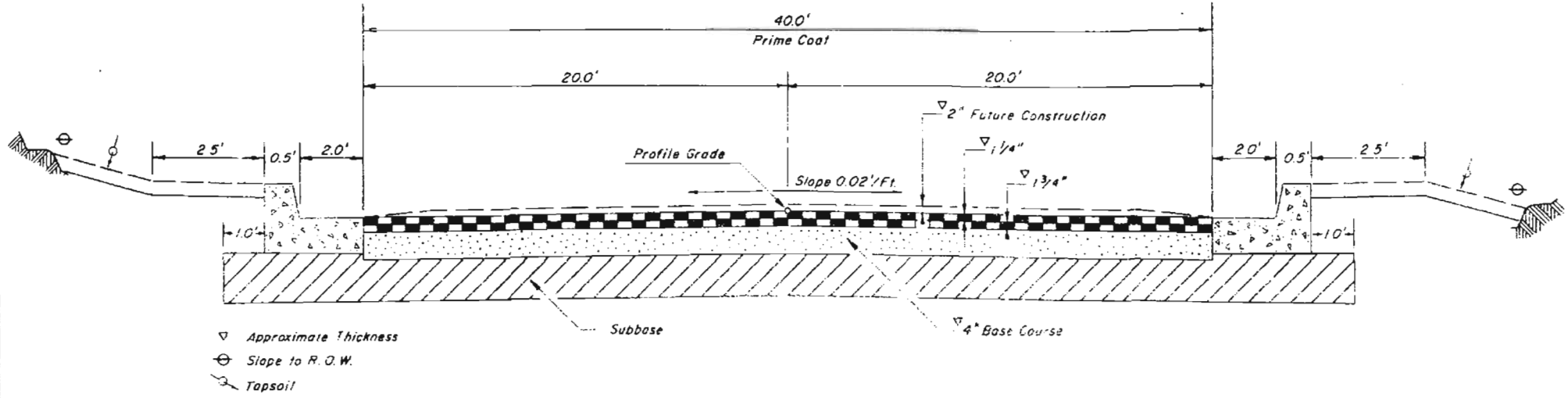
Excavation required for compaction of bases of cuts and fills will be considered as subsidiary to that operation and will not be paid for separately.

# TYPICAL SECTIONS

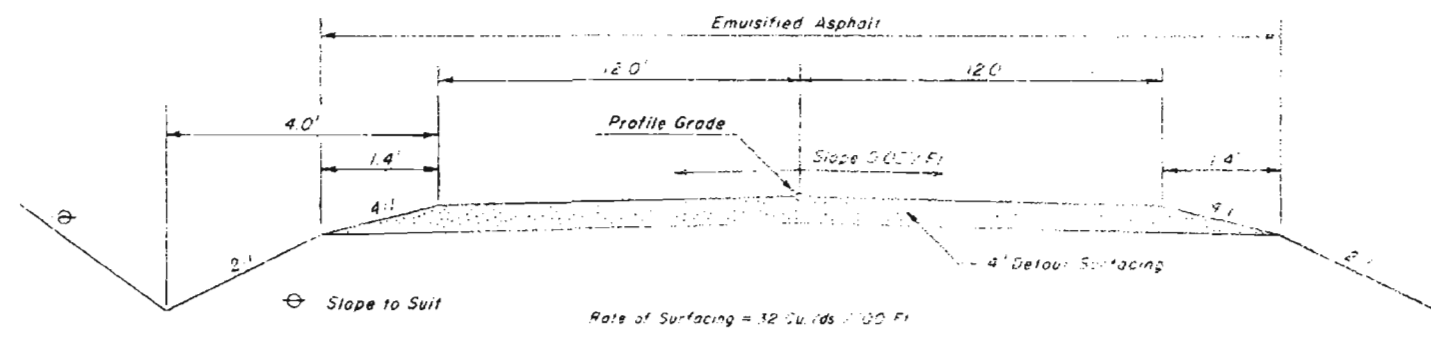
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F027-1(5)	3	

## TYPICAL SECTION B

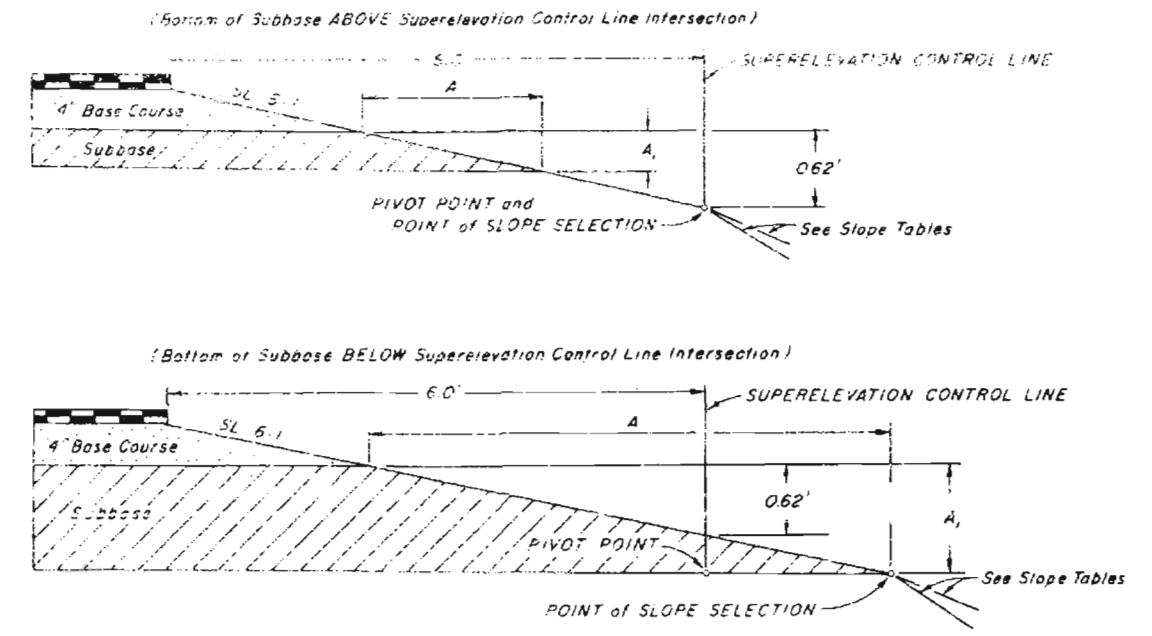
STA. 5+ to 16+



## DETOUR



## TYPICAL SIDE SLOPE DETAILS



FINAL

SUMMARY OF APPROXIMATE QUANTITIES

AS CONSTRUCTED (R-1) 1-31-68 MEV Fencing Items  
REVISED DATE 9-16-68 (R-2) 2-9-68 MEV Ton Mile Haul  
FINAL CONSTRUCTION

FEDERAL ROAD DISTRICT NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	COLORADO	F027-1(5)	4	47

CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	REFERENCES			INSIDE URBAN LIMITS			OUTSIDE URBAN LIMITS				PROJECT TOTALS	FINAL PROJECT TOTAL	DIFFERENCE	
			BOOK	PAGE	SHEET NO.	PLAN ROADWAY	FINAL ROADWAY	DIFFERENCE	PLAN ROADWAY	FINAL ROADWAY	MAJOR STR. NO. P-19-C	DIFFERENCE				
201	Clearing and Grubbing	L.S.	4	58		Prorated			Prorated							
202	Removal of Structures and Obstructions	L.S.	4	18-19	647	Prorated			Prorated							
202	Removal of Headwall	Each			647				4	4			4	4		
202	Removal of Bridge	Each			647								1	1		
202	Removal of Fence	Lin. Ft.	4	28-29	10	5,450	5,648	+ 198	13,450	14,657			18,900	20,305	+ 1,405	
202	Plug Culvert	Each			647				5	5			6	6		
203	Unclassified Excavation	Cu. Yd.			22	43,400			85,600				129,000	99,461	- 29,539	
203	Embankment (Standard)	Cu. Yd.			22	28,700			39,300				68,000	53,498	- 14,502	
204	Haul	Yd. Mi.			22	550			34,650				35,600	9,095	- 26,505	
204	Haul	Ton Mi.			8A, 88B	107,660	117,062	+ 9,402	81,340	77,370			189,000	194,432	+ 5,432	
206	Structure Excavation (Haul)	Cu. Yd.			647	305	461	+ 156	795	813			1,100	1,274	+ 174	
206	Structure Backfill (Class 3) (Haul)	Cu. Yd.			647	427	534	+ 109	553	546			980	1,082	+ 102	
206	Bed Course Material (Haul)	Cu. Yd.			647	22	20	- 2	28	26			50	46	- 4	
207	Topsoil (Haul)	Cu. Yd.	5	33	8	2,370	2,403	+ 33	5,130	5,208			7,500	7,611	+ 111	
209	Wetting	M. Gal.	24	80	11	1,630	1,000	- 630	2,120	940			3,750	1,940	- 1,810	
210	Reset Structure	Each			647	4	4		2	0			5	4	- 1	
210	Reset Mailbox Structure	Each	4	21-22		10	5	+ 5	5	6			15	21	+ 6	
210	Reset Gate	Each	4	33	10	3	3		1	3			4	6	+ 2	
304	Aggregate Base Course (Class 2)	Ton			7A	20,020	21,770.5	+ 1,750.5	23,580	20,421.30			43,600	42,168.35	- 1,431.65	
304	Aggregate Base Course (Class 6)	Ton			8A	6,100	7,138.45	+ 1,038.45	6,500	7,260.00			12,600	14,398.45	+ 1,798.45	
304	Detour Surfacing	Cu. Yd.	4	36	117	400	383	- 17					400	383	- 17	
303	Hot Bituminous Pavement (Grading E) (Hydrated Lime)	Ton			8B	4,730	4,421.30	- 308.7	4,970	5,099.85			9,700	9,521.15	- 178.85	
411	Asphalt Cement (85-100 Penetration)	Ton				311	295.16	- 15.84	329	258.48			640	584.1	- 55.9	
411	Emulsified Asphalt (SS-1)	Gal.				11,120	2,513	- 8,607	11,980	2,884			23,100	5,397	- 17,703	
411	Liquid Asphaltic Material (MC-70)	Gal.				12,910	13,333	+ 423	13,590	14,950			26,500	27,993	+ 1,493	
412	Concrete Pavement (6 Inch)	Sq. Yd.	4	24	11	23	2308	+ 208					23	23.08	+ 0.08	
506	Riprap	Cu. Yd.			647	9	2	- 7	56	56			65	65		
506	Heavy Riprap	Cu. Yd.			647	40	40						40	40		
507	Concrete Slope and Ditch Paving	Cu. Yd.			647	9	14.34	+ 5.34					9	14.02	- 3.32	
507	Bituminous Slope and Ditch Paving	Ton	4	7	67, 68	1	1		16	39.25			17	40.25	+ 1.25	
601	Concrete Class A	Cu. Yd.			647	155	154.50	- 0.50	160	150.60			315	305.1	- 9.9	
602	Reinforcing Steel	Lb.			647	11,350	11,344	- 6	13,250	13,235			24,600	24,531	- 69	
603	50 X 31 Inch Corrugated Steel Pipe Arch	Lin. Ft.			7	7	7		160	160			160	160		
608	50 X 31 Inch Steel End Section	Each			7	7	7		2	2			2	2		
606	Guard Rail Type 3	Lin. Ft.	4	13	10	400	400		450	500			850	300	- 550	
607	End Post	Each	4	59	10	11	10	+ 1	26	23			37	55	+ 18	
607	Corner and Line Brace Post	Each	4	59	10	8	8		32	41			40	51	+ 11	
607	Fence Barbed Wire with Metal Posts	Lin. Ft.	4	31-32	10	5,640	5,486	- 154	4,540	14,572			20,200	20,058	- 142	
607	Fence Combination Wire with Metal Posts	Lin. Ft.	4	32	10	1,978	2,026	+ 48	1,500	1,369			1,500	1,369	- 131	
609	Curb & Gutter Type 2 (Section II B)	Lin. Ft.	4	24	11	46	33	- 13					46	2,026	+ 1,980	
609	Gutter Type 2 (4 Foot)	Lin. Ft.	4	24	11	46	33	- 13					46	33	- 13	
609	Curb Type 6 (Section M)	Lin. Ft.	4	2	2	16	16		2,000	1,766			2,000	1,766	- 234	
612	Delinicator (Type I)	Each	4	15	10	16	16		58	52			72	68	- 4	

(R-2)

FINAL

SUMMARY OF APPROXIMATE QUANTITIES

AS CONSTRUCTED  
 REVISED DATE 9-16-68

FINAL CONSTRUCTION

FEDERAL ROAD DISTRICT NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	COLORADO	F027-4(5)	5	47

CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	REFERENCES			INSIDE URBAN LIMITS			OUTSIDE URBAN LIMITS				WORK ORDER NO.	PROJECT TOTALS	FINAL PROJECT TOTAL	DIFFERENCE
			BOOK	PAGE	SHEET NO.	PLAN ROADWAY	FINAL ROADWAY	DIFFERENCE	PLAN ROADWAY	FINAL ROADWAY	MAJOR STR. NO. P-19-C	DIFFERENCE				
612 614	Right of Way Marker Flagging	Each Hour	4 5	1112 1000	10 10	6 920	6 5529	- -3671	16 1,080	16 6376	- -4454		22 2,000	22 1,187.5	- -812.5	
617 617	18 Inch Culvert Pipe 24 Inch Culvert Pipe	Lin.Ft. Lin.Ft.			627 627	438 48	438 48	- -	66 624	66 608	0 -16		504 672	504 656	0 -16	
617 617	36 Inch Culvert Pipe 42 Inch Culvert Pipe	Lin.Ft. Lin.Ft.			627 627	82 120	92 120	- -					92 120	92 120	- -	
620 620	Field Laboratory Sanitary Facility	Each Each	4 4	60 60		0.5 0.5	0.5 0.5	- -	0.5 0.5	0.5 0.5	- -		1 1	1 1	- -	
626	Mobilization	L.S.				Prorated			Prorated				•	•		
	<u>Force Account</u>															
	Clearing of Building Sites, etc.	L.S.				Prorated			Prorated			•	•			
	Obiterating Old Road	L.S.				Prorated			Prorated			•	•			
	Relocate 2" water Line	L.S.				Prorated			Prorated			•	•			
	<u>State Forces</u>															
	Furnishing and Installing Identification Sign	Each							1				2	2		
	Signing and Striping Entire Project Non-Fed. Aid	L.S.											•	•		





FEDERAL ROAD DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
COLORADO	F 027-1(5)	8	17

TABULATION OF BITUMINOUS CURBING AND EMBANKMENT PROTECTORS

Ref. Bk 4, Pg. 7 And 9

STATION	SIDE	EMBANKMENT PROTECTORS		CURB TYPE 6		STRUCTURE EXCAVATION	STRUCTURE QUANTITIES
		TYPE 5 PLAN TON	TYPE 5 PLAN TON	(Section M) PLAN LIN. FT.	(Section M) PLAN LIN. FT.		
76+50 TO 76+50	LT			200	393		
76+50 TO 76+50	RT			200	274		
77+64	LT	3	4.05			10	14
77+64	RT	2	4.1			5	13
93+00 TO 95+50	LT			250	301		
92+80 TO 95+80	RT			300	RELIEF		
95+27	RT		Deleted			2	0
95+27	LT	2	4.0			2	12
99+50 TO 105+50	LT			500	RELIEF		
99+50	LT		Deleted				
102+50 TO 105+50	LT			300	RELIEF		
102+50	LT						
114+00 TO 115+50	LT			150	175		
115+50	LT						27
127+00 TO 127+00	RT	2	10.1				
TOTAL		4	40.25	7,000	766	43	63

SEE DETAIL OF ASPHALT CURB ON PLAN NO. 4. DO NOT USE DETAIL OF M. 602.3  
 TOTALS CARRIED DIRECTLY TO SUMMARY AS BITUMINOUS SLOPE & DITCH PAVING

TOPSOIL REQUIREMENTS

LOCATION	CU. YDS. PLAN	CU. YDS. FINAL
INSIDE URBAN LIMITS 5+90.1 TO 16+00 FOR BLADING SHOULDERS	232	238
16+00 TO 62+50 FOR BLADING SHOULDERS	1,080	2,165
TOTAL WITHIN URBAN LIMITS	2,312	2,403
OUTSIDE URBAN LIMITS 62+50 TO 127+00 FOR BLADING SHOULDERS	3,587	5,028
TOTAL OUTSIDE URBAN LIMITS	5,899	7,208
PROJECT TOTAL	8,211	9,611

AS CONSTRUCTED  
 REVISION DATE 9-16-68

FINAL CONSTRUCTION

BASE COURSE AND SURFACE COURSE PLAN

See Page 8A And 8B

STATION TO STATION	SOURCE	TONS USED				HAUL - TON MILE			
		AGGREGATE BASE COURSE		HOT BITUMINOUS PAVEMENT		AGGREGATE BASE COURSE		HOT BITUMINOUS PAVEMENT	
		CLASS 6	CLASS 2	1 1/2" TOP GRADE E	1 1/2" BOTTOM GRADE E	CLASS 2	CLASS 6	1 1/2" TOP GRADE E	1 1/2" BOTTOM GRADE E
0+00 - 5+90.1		94		193	14			246	175
5+90.1 - 16+00		899		313	434	1,527		1,228	1,703
16+00 - 54+63.3 or		3,632		1,998	1,682	3,251		4,147	5,763
55+28.7 - 52+50		587		227	375			687	953
ESTIMATED FOR STRUCTURE QUANTITIES		725			350	2,577			1,300
TOTALS (WITHIN URBAN LIMITS)		6,037		3,921	2,804	21,239		6,808	9,884
62+50 - 74+32.3 or		1,102		364	504	2,137		1,036	1,455
74+02.4 or - 87+63.6 or		1,280		422	585	2,136		1,100	1,527
87+63.6 or - 126+15.6 or		3,627		1,855	1,657	3,251		3,245	3,500
126+49.0 or - 127+00		67						38	72
APPROACH TO PROJECT 127+00 TO 128+00		40		5	1			54	38
ESTIMATED FOR WIDENING FOR TYPE 6 CURB STRUCTURE QUANTITIES		170			15			45	245
TOTALS (OUTSIDE URBAN LIMITS)		6,486		3,646	3,157	7,524		5,428	6,817
PROJECT TOTALS		12,523		7,567	5,961	28,763		12,236	16,701

SUBBASE PLAN

See Page 8A

STATION TO STATION	SOURCE	THICKNESS	AGGREGATE BASE COURSE		HAUL - TON MILE	
			CLASS 2	CLASS 6	CLASS 2	CLASS 6
0+00 - 5+50						746
5+50 - 10+00						2,385
10+00 - 16+00						7,295
16+00 - 52+50						43,052
52+50 - 54+63.3 or						2,303
55+28.7 or - 52+50						6,198
SCALE WIDENING STA. 127+00						785
ESTIMATED FOR IRREGULARITIES (28)						6,337
TOTALS (WITHIN URBAN LIMITS)						59,706
62+50 - 74+32.3 or						9,341
74+02.4 or - 82+00						5,939
82+00 - 87+63.6 or						4,892
87+63.6 or - 126+15.6 or						27,923
126+49.0 or - 127+00						239
APPROACH TO PROJECT 127+00 TO 128+00						177
CREST WIDENING STA. 84 & 107+00						1,087
ESTIMATED FOR IRREGULARITIES (105)						4,980
TOTALS (OUTSIDE URBAN LIMITS)						54,578
PROJECT TOTAL						114,284

\* BASED ON DESIGN CURVE D AND ON R VALUE = 70

AS CONSTRUCTED  
REVISED DATE 9-16-68

FINAL CONSTRUCTION

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	COLORADO	F-027-1(5)	28	47

FINAL TABULATION

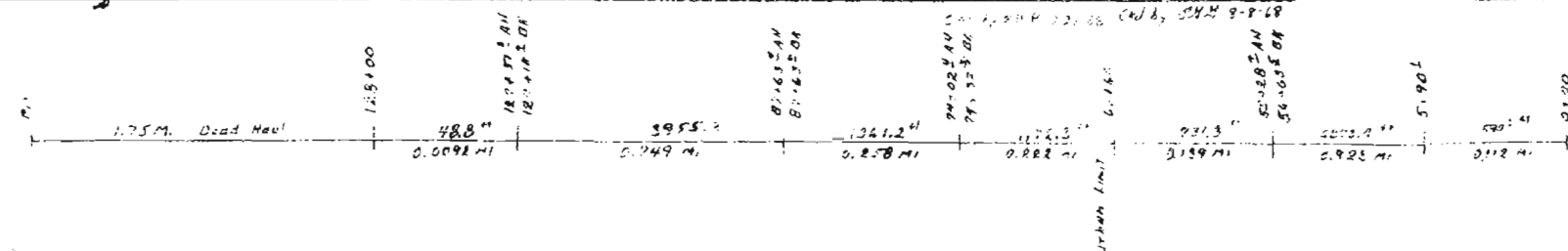
ABC CL 2

Code	Sta. To	Sta.	Center Sta.	Dist. From 128+00	Miles	Ton	Ton Mile Over Haul	Base Depth
1	0+00	6+00	3+00	12432.3	4.105	277.40	1145	
2	6+00	16+00	11+00	11632.4	3.953	3387.55	13399	12
3	16+00	26+00	21+00	10632.4	3.764	3515.10	13231	9
4	26+00	36+00	31+00	9632.4	3.574	3748.40	13375	11
5	36+00	54+63E	45+31E	8200.6	3.303	7585.70	25056	12
6	55+28'	62+60	58+34'	6903.2	3.057	3,235.70	2890	12
7	62+60	66+00	64+30	6387.7	2.956	942.30	2785	12
8	66+00	74+32E	70+16E	5781.4	2.845	2,550.75	7,657	11
9	74+02'	76+00	75+01E	5265.9	2.747	984.20	2,704	11
10	76+00	86+00	81+00	4667.7	2.634	3,913.90	10,309	12
11	86+00	87+63E	86+81E	4085.9	2.524	525.7	1,275	9
12	87+63E	96+00	91+81E	3585.8	2.427	2,470.85	6,030	7
13	96+00	106+00	101+00	2661.9	2.255	1,397.15	3,144	7
14	106+00	116+00	111+00	1675	1.646	3,214.90	5,324	7
15	116+00	127+18E	121+59E	5081	1.8165	4,412.75	8,304	9
16	127+51E	128+00	127+25E	24.1	0.755	0	0	7
Inside Urban Limits						21,747.05	78,096	
Outside Urban Limits						20,421.36	48,413	
Proj Totals						42,168.35	124,509	

FINAL TABULATION

ABC CL 6

Code	Sta. To	Sta.	Center Sta.	Dist. From 128+00	Miles	Ton	Ton Mile Over Haul		
1	0+00	5+90.1	2+95E	12411.1	4.11	0	0		
2	5+90.1	16+00	10+95E	11632.4	3.95	1,142.85	4,514		
3	16+00	54+63E	35+31E	9200.6	3.49	7,757.10	15,555		
4	55+28.7	62+60	58+44E	6703.2	3.05	342.30	2,577		
5	62+60	74+32.3	68+46E	5951.5	2.88	883.0	2,543		
6	74+02	87+63.6	80+82E	4684	2.64	1,704.20	3,654		
7	87+63.4	127+18.7	107+41E	2026.4	2.13	775.15	9,426		
8	127+51E	128+00	127+75E	24.4	1.76	144.05	324		
Approaches									
	8+03	8+80	9+66	LT	8+43E	11,849.4	3.99	14.50	66
	10+14	10+70		LT	10+42E	11,690.4	3.96	20	68
	11+62			LT		11,570.4	3.94	5.65	34
	12+05			LT		11,527.4	3.93	5.65	34
	13+00	13+50	14+05	LT	13+51E	11,380.7	3.91	18.30	72
	15+14			LT		11,218.4	3.87	5.00	19
	15+91	16+40		RT	16+15E	11,112.4	3.84	46.10	175
	17+35	18+75		LT	18+55	10,977.4	3.82	7.90	194
	20+75	21+00	20+87.5	LT	20+15E	10,874.4	3.81	20.40	291
	21+63	22+30		LT	22+46.5	10,759.4	3.78	17.90	273
	27+40	28+70		LT	28+05	10,624.4	3.76	73.10	156
	30+51			LT		10,514.4	3.74	35.00	125
	34+32	33+66		LT	34+49	9,433.4	3.57	64.00	229
	40+18	40+65		LT	40+41.5	8,667.4	3.37	17.30	59
	71+35			RT		7,777.4	3.26	26.90	88
	56+47			LT		7,825.4	3.27	26.30	84
	57+40			RT		7,417.4	3.11	15.0	55
	55+50			LT		7,417.4	3.11	26.60	83
	58+50			RT		6,747.4	3.05	8.10	26
	61+21			RT		6,670.4	3.04	17.30	52
	62+32			LT		6,670.4	3.04	27.20	81
	64+05	65+00		LT	64+52.5	6,117.4	2.97	18.00	53
	73+51	74+60		LT	74+02.5	5,305.4	2.91	62.00	229
	78+40	77+25		LT	78+82.5	4,845.4	2.82	32.00	88
	83+68	87+00		LT	85+34	4,277.4	2.55	57.00	132
	92+50			LT		3,517.4	2.8	17.00	41
	95+00	97+50		RT	97+25	3,042.4	2.73	16.10	42
	107+40			LT		1,823.4	2.0	22.70	74
	126+04			LT		763.4	1.0	7.60	40
	126+19			RT		125.4	1.0	23.10	59
Inside Urban Limits						7,138.95	25,140		
Outside Urban Limits						7,262.60	16,853		
Proj Totals						14,398.45	41,993		



DATE 9-16-68 BY 156

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F027-1(S)	8AX	47

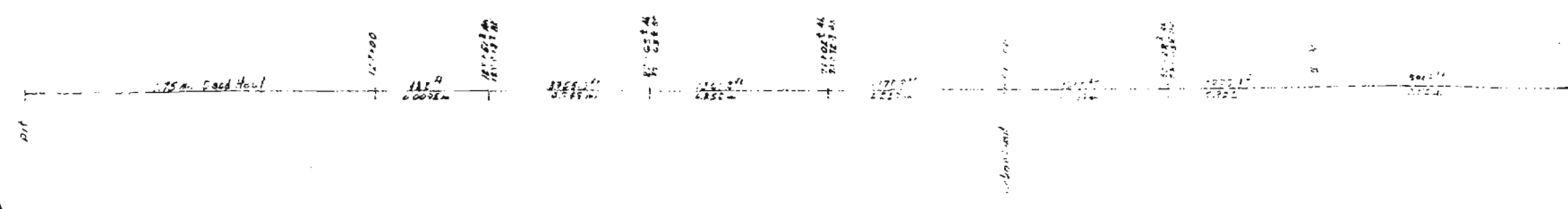
FINAL TABULATION OF  
 700' BITUMINOUS PAVEMENT (GRADING E) (HYDRATED LIME)  
 (AS NOTED OTHERWISE)

AS CONSTRUCTED  
 REVISED DATE 7/1/64

FINAL CONSTRUCTION

Code	Sta. To Sta.	Center Sta.	Dist. From	Miles	Ton	Ton Mile Over Haul
1	0+00 ~ 5+90.1	2+95.2	1,2437.4	6.11	34879	1474
2	5+90.1 ~ 16+00	10+95.2	11,637.4	3.95	73966	2922
3	16+00 ~ 54+63.5	35+31.8	9,200.6	3.49	250545	3754
4	55+28.7 ~ 62+60	58+94.4	6903.2	3.06	46615	1428
5	62+60 ~ 74+32.3	68+46.2	5951.5	2.28	41850	2655
6	74+02.4 ~ 87+63.6	80+83.0	4684.9	2.64	43670	2405
7	87+63.4 ~ 127+18.7	107+41.4	2026.4	2.13	286220	2076
8	127+51.2 ~ 128+00	127+75.2	24.4	0.11	100	0
Approaches						
	2+20 to 5+10 AT	3+65.0	1,347.4	4.04	1120	77
	5+10 AT		100	0.03	0	0
	5+10 to 16+18 AT	10+63.5	11,637.4	3.95	73966	2922
	16+18 to 54+63.5 AT	35+31.8	9,200.6	3.49	250545	3754
	54+63.5 to 55+28.7 AT		1,022.6	0.41	700	27
	55+28.7 to 62+60 AT		1,337.7	0.54	1,000	46
	62+60 to 74+32.3 AT		11,637.4	3.95	73966	2922
	74+32.3 to 87+63.6 AT		10,741.2	3.15	8700	337
	87+63.6 to 127+18.7 AT		6,092.2	2.60	4,700	1,392
	127+18.7 to 128+00 AT		497.2	0.04	440	57
	128+00 to 129+00 AT		386.4	0.15	300	86
	129+00 to 130+00 AT		967.4	0.38	700	267
	130+00 to 132+32 AT		9,507.4	3.55	7,000	2,507
	132+32 to 133+66 AT		9,144.4	3.41	6,500	2,644
	133+66 to 140+68 AT	70+68.2	8,047.4	3.17	6,000	2,047
	140+68 to 147+35 AT		7,997.4	3.21	5,500	2,497
	147+35 to 150+47 AT		7,683.4	3.21	5,500	2,183
	150+47 to 152+76 AT		7,992.4	3.17	5,500	2,492
	152+76 to 158+50 AT	57+00.0	8,072.6	3.07	6,000	2,072
	158+50 to 160+00 AT	57+75.0	2,000.0	0.77	1,500	500
Outside Urban Limits						
	164+63 AT		6,334.6	2.75	4,500	1,834
	173+55 AT		5,442.6	2.35	3,800	1,642
	174+60 AT		1,287.7	0.50	900	387
	181+40 to 177+25 AT	78+82.5	4,885.2	2.08	3,500	1,385
	183+66 AT		3,377.7	1.59	2,500	877
	187+00 AT		3,667.7	1.67	2,500	1,167
	192+50 AT		2,177.5	0.92	1,500	677
	195+00 AT		5,207.5	2.37	3,800	1,407
Proj Sub Totals					9,386.30	27,297

Code	Sta. To Sta.	Center Sta.	Dist. From	Miles	Ton	Ton Mile Over Haul
Approaches						
	99+50 AT		2,311.5	0.92	1,700	611
	107+40 AT		7,825.5	3.01	5,500	2,325
	120+04 to 120+17 AT	122+10.5	443.0	0.17	300	143
Proj Sub Totals					34.6	182
Inside Urban Limits					4421.30	15326
Outside Urban Limits					5199.85	12164
Proj Totals					9521.15	27930



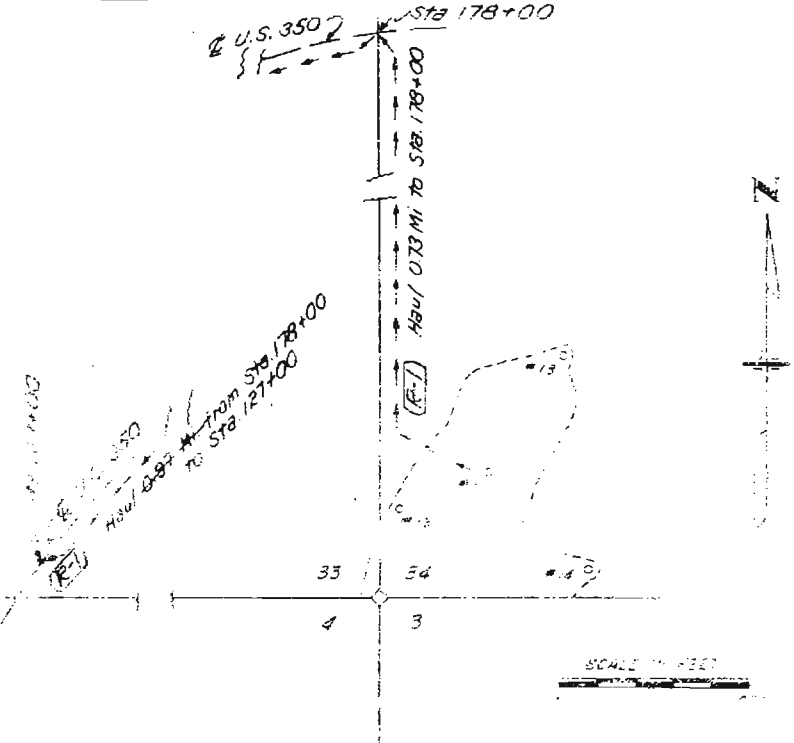
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F 027-1 (5)	9	47

(R-1) 2-9-68 MEV Haul Distance

PIT NO. 1

Owner: Alexander E. and Helen M. Latuda, Trinidad, Colorado.  
 Location: Part of SW 1/4 SW 1/4 Sec. 34  
 T 32 S., R 63 W. & SE 1/4 SE 1/4 Sec. 33, T 32 S., R 63 W.  
 Use: Subbase, Base Course and Bituminous Pavement.  
 Quantity Available: Ample.  
 Stripping: Removing Overburden 5,000 Cu. Yds.  
 Replacing Overburden 5,000 Cu. Yds.

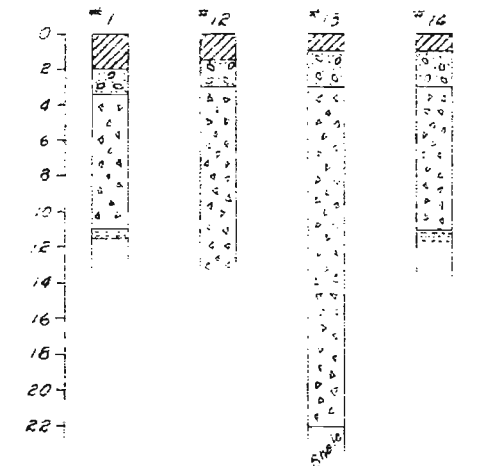
(R-1) haul distance: 1.75 Miles to Sta 127+00. Ref BK 4, 57



LOG OF TEST HOLES  
 SAMPLE NO 2566

LEGEND

- O.B.
- WHITE SOIL & GRAVEL
- SAND & GRAVEL
- S & G W/CLAY
- CLAY & GRAVEL



AS CONSTRUCTED  
 REVISED DATE 9-16-68

FINAL CONSTRUCTION

AS CONSTRUCTED  
 REVISED DATE 9-16-68

AS CONSTRUCTED  
REVISED DATE 9-16-68

FENCING REQUIREMENTS

(R-1) 1-31-68 MEV. REV. FENCING TABULATION

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
2	COLORADO	F 027-1(5)	10	47

FINAL CONSTRUCTION

R.O.W. MARKER

STATION	SIDE	NO.	ELEVATIONS	
			RT	LT
24+50	RT AND LT	1	5981.33	
43+96.8	RT AND LT	2	6000.34	5991.42
54+63.5 BK	RT AND LT	2	5987.03	5981.92
TOTAL (INSIDE URBAN LIMITS)			6.5	
127+71.7 BK	LT	1	5962.66	5962.83
66+43.4	RT AND LT	2	5958.48	5949.07
74+32.3 BK	RT AND LT	2	5963.40	5942.77
83+07.8	RT AND LT	2	5950.63	5943.87
88+01.3	RT AND LT	2	5921.81	5910.88
97+06.0	RT AND LT	2	5968.32	5984.01
109+74.0	RT AND LT	2	5968.88	
118+38.4	RT AND LT	2		
126+16.9 BK	RT AND LT	2	5968.95	5961.83
127+45.4	RT AND LT	2		
TOTAL (OUTSIDE URBAN LIMITS)			16	
PROJECT TOTAL			22.2	

DELINEATORS

STATION	SIDE	SPACING	TYPE	
			I	EACH
35+96.8 - 52+60	RT AND LT	60' 30"	16	
TOTAL (INSIDE URBAN LIMITS)			16	
62+60 - 62+63.5	RT AND RT	33' 30"	2	
63+57.4 - 81+42.3	LT AND RT	17' 30"	18	16
84+03.3 - 95+28.1	LT AND RT	11' 30"	2	
96+64 - 126+16.9	RT AND RT	30' 30"	7	
97+06.0 - 126+16.9	LT AND RT	29' 30"	4	
TOTAL (OUTSIDE URBAN LIMITS)			25	16
PROJECT TOTAL			41	16

GUARDRAIL

STATION	SIDE	TYPE	
		TYPE 1 PLAN LIN. FT.	TYPE 2 FINAL LIN. FT.
23+50 - 26+00	RT	250	250
23+85 - 25+25	LT	150	150
TOTAL (WITHIN URBAN LIMITS)		400	400
33+50 - 95+00	LT	250	250
13+50 - 15+50	LT	75	200
TOTAL (OUTSIDE URBAN LIMITS)		450	500
PROJECT TOTAL		850	900

Note: "R" shown on M-606-AA = 4'

Post spacing is 6'-3"

- ⊙ West End Buried
- ⊗ Both Ends Buried

STATION	SIDE	REMOVE FENCE LIN. FT.	BUILD FENCE		RESET GATES		GATES				
			BARBED WIRE LIN. FT.	COMB. WIRE LIN. FT.	DRIVEWAY EACH	WALK EACH	BARBED WIRE EACH	COMB. WIRE EACH	WALK EACH		
32+32											
27+ TO 32+	LT	29-29									
31+ TO 32+	LT	174+15									
34+ TO 37+	LT	370+25									
40+ TO 41+	LT	374+88									
50+ TO 62+	LT	1210+298									
23+ TO 26+	RT	533+10									
28+ TO 45+	RT	770+746									
45+ TO 62+	RT	1700+700									
41+ TO 45+	LT										
45+ TO 47+	LT										
47+ TO 35+	LT										
47+ TO 50+	LT										
50+ TO 55+	LT										
55+ TO 62+	LT										
55+ TO 49+	LT										
23+ TO 26+	RT										
28+ TO 45+	RT										
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47+ TO 50+	RT					</					

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTL SHEETS
9	COLORADO	F027-1(5)	11	47

**AS CONSTRUCTED**  
**REVISED** DATE 9-16-68

FINAL CONSTRUCTION

**REMOVAL OF OBSTRUCTIONS**

REF BK 4 Pg 18-19

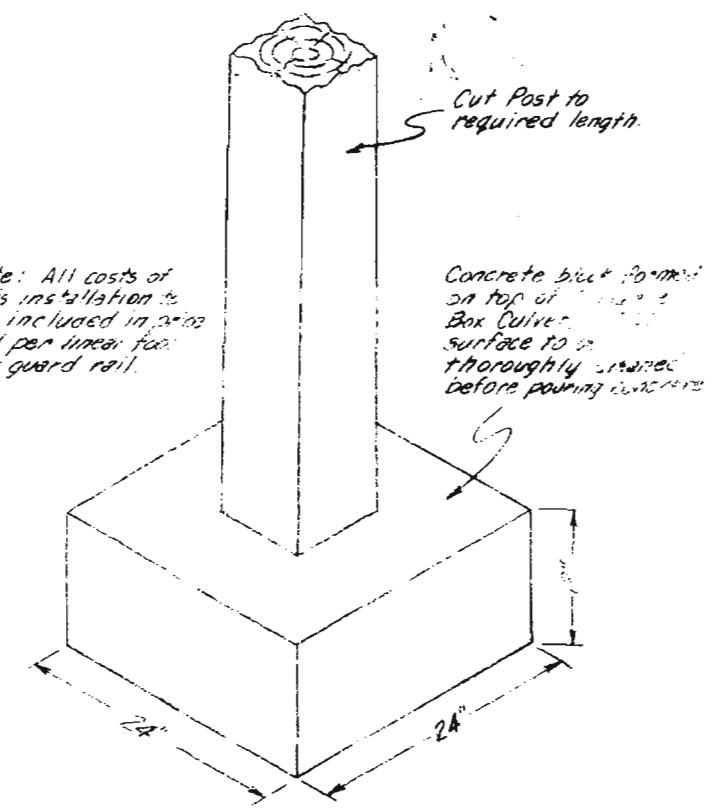
STATION	SIDE	DESCRIPTION
7+	RT	12" x 34" CSP SIDE DRAIN
15+	RT	12" x 34" CSP SIDE DRAIN
17+	RT	15" x 41" CSP SIDE DRAIN
20+	RT	15" x 36" CSP SIDE DRAIN
22+	LT	15" SIDE DRAIN
23+	RT	15" x 36" CSP SIDE DRAIN
26+	RT	24" x 26" CSP SIDE DRAIN
40+	LT	15" x 25" CSP SIDE DRAIN
47+	LT	15" x 20" CSP SIDE DRAIN
55+	LT	15" x 20" CSP SIDE DRAIN
60+	X	2' x 2' x 3' CBC
64+	X	5' x 5' x 14' "
55+	LT	15" x 25" CSP SIDE DRAIN
85+	RT	15" x 25" CSP SIDE DRAIN
93+	LT	15" x 20" CSP SIDE DRAIN
94+	X	3' x 3' x 10' "
20+	X	15" x 20" CSP SIDE DRAIN
26+	X	15" x 20" CSP SIDE DRAIN

**RESET MAILBOX STRUCTURES**

REF BK 4 Pg 11-24

STATION	SIDE	WITHIN URBAN LIMITS PLAN	WITHIN URBAN LIMITS FINAL	OUTSIDE URBAN LIMITS PLAN	OUTSIDE URBAN LIMITS FINAL
12+	RT	1	3		
14+	RT	1	1		
17+	RT	1	3		
20+	RT	1	1		
31+	RT	1	1		
32+	RT	1	1		
40+	RT	1	1		
50+	RT	1	1		
55+	RT	1	1		
61+	RT	1	1		
85+	RT				
85+	RT				
105+	LT				
120+	LT				
126+	RT				
130+	RT				
SUB-TOTAL		10	15	5	6
PROJECT TOTAL			15	5	6

**DETAIL OF GUARD POST ATTACHMENT TO TOP OF CBC**



Note: All costs of this installation to be included in price bid per linear foot for guard rail.

**TABULATION OF CURBS AND GUTTERS**

LOCATION	SIDE	GUTTER TYPE 2 PLAN LIN. FT.	GUTTER TYPE 2 PLAN LIN. FT.	CURB & GUTTER TYPE 2 PLAN LIN. FT.	CURB & GUTTER TYPE 2 PLAN LIN. FT.	6" CONCR. PAVEMENT PLAN SQ. YD.	6" CONCR. PAVEMENT PLAN SQ. YD.
15+00 TO 15+05	RT			118	118		
15+07 TO 15+13	RT	46	33			23	23.06
15+15 TO 15+20	RT			220	220		
15+21 TO 15+27	RT			140	140		
TOTAL		46	33	358	358	23	23.06

**TABULATION FOR SUBGRADE EXCAVATION IN CUTS \***

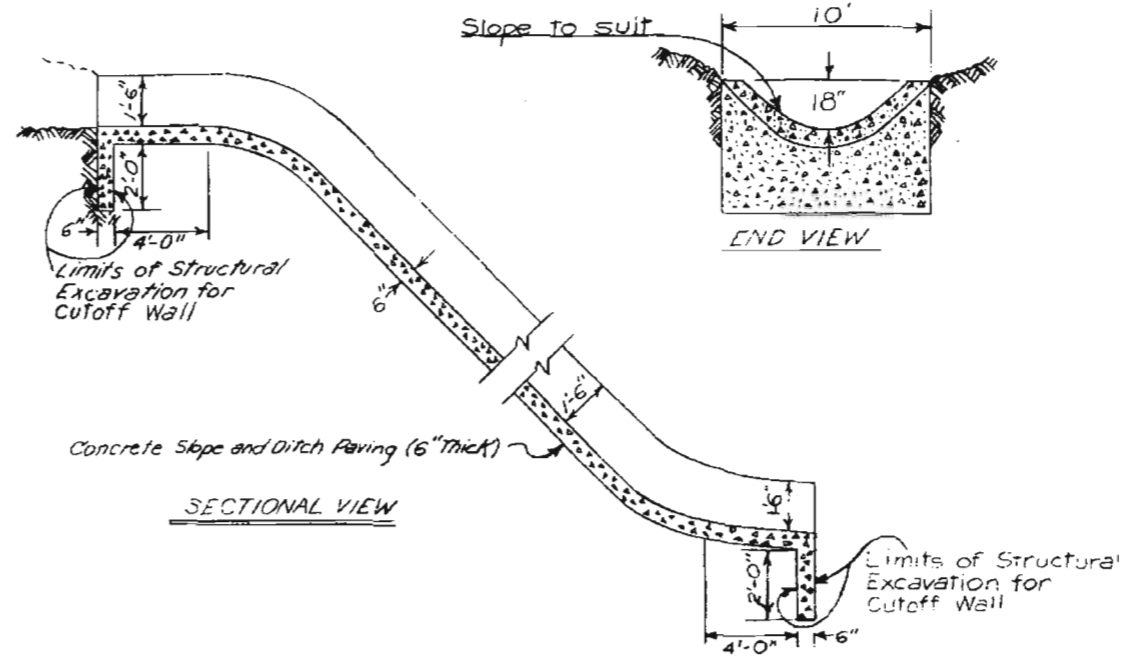
REF BK 4 Pg 20

STATION TO STATION	DEPTH	UNCLASSIFIED EXCAVATION PLAN	UNCLASSIFIED EXCAVATION FINAL
15+00 TO 24+00	1.5	2900 cu yds	2,351 cu yds
27+00 TO 62+60	1.5	1192 cu yds	2,777 cu yds
Total within urban limits			
		1482 cu yds	11,191 cu yds
62+60 TO 66+00	1.5	933 cu yds	884 cu yds
71+00 TO 76+00	1.5	1,805 cu yds	1,407 cu yds
80+ TO 92+	1.5	4,534 cu yds	3,521 cu yds
95+88 TO 98+43	1.5	822 cu yds	725 cu yds
103+ TO 111+	1.5	1,247 cu yds	1,177 cu yds
Total outside urban limits			
		9,341 cu yds	7,814 cu yds
Project total:			
		24,823 cu yds	19,005 cu yds

\* EXCAVATION REQUIRED TO A DEPTH OF 0.5' SUBEXCAVATION QUANTITY IS NOT INCLUDED IN MASS DIAGRAM.  
SUBEXCAVATION QUANTITY SHALL BE USED TO BACKFILL AFTER BEST SUBGRADE CONSTRUCTION OPERATIONS AND WILL BE CONSIDERED AS SUBSIDIARY AND WILL NOT BE PAID FOR SEPARATELY.  
EMBANKMENT AND SETTING WILL BE PAID FOR AS PROVIDED IN THE STANDARD SPECIFICATIONS.

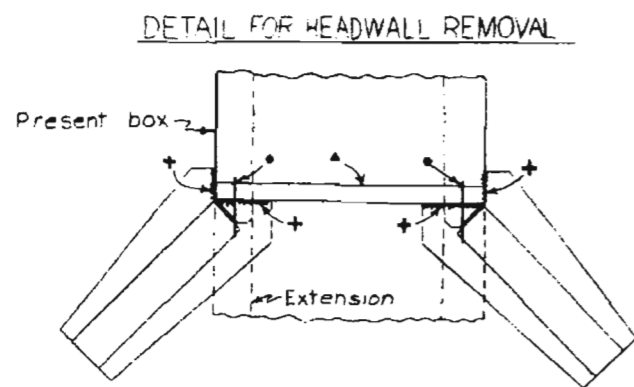
DETAIL of CONCRETE SLOPE AND DITCH PAVING FOR SIDE DITCH  
 STA. 24 + 97

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F027-1(5)	12	

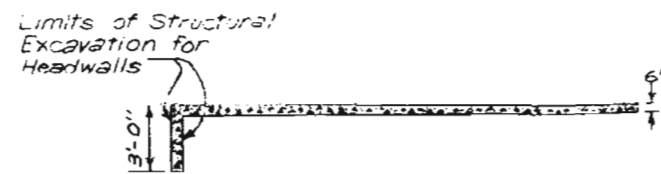
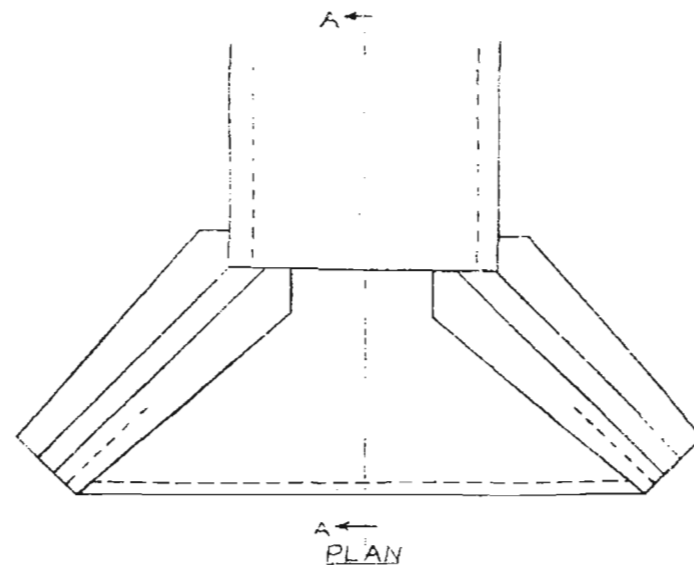


CONCRETE SLOPE PAVING  
 ENTRANCE TO C.B.C.  
 STA. 24 + 97

FLARED ENTRANCE FOR 3'X3' C.B.C. STA. 94+15



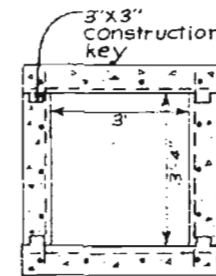
- + Remove along these lines.
  - ▲ This headwall is to be removed when fill over headwall is less than 1 foot.
  - 2 foot reinforcing bars to be placed at every longitudinal bar shown on the standard. Size to be same as longitudinal bars.
- Tie bars are to be grouted in place by a cement grout composed of one part cement and two parts clean well graded sand.  
 The cost of drilling holes and placing tie bars is to be included in payment for "Removal of Headwalls."



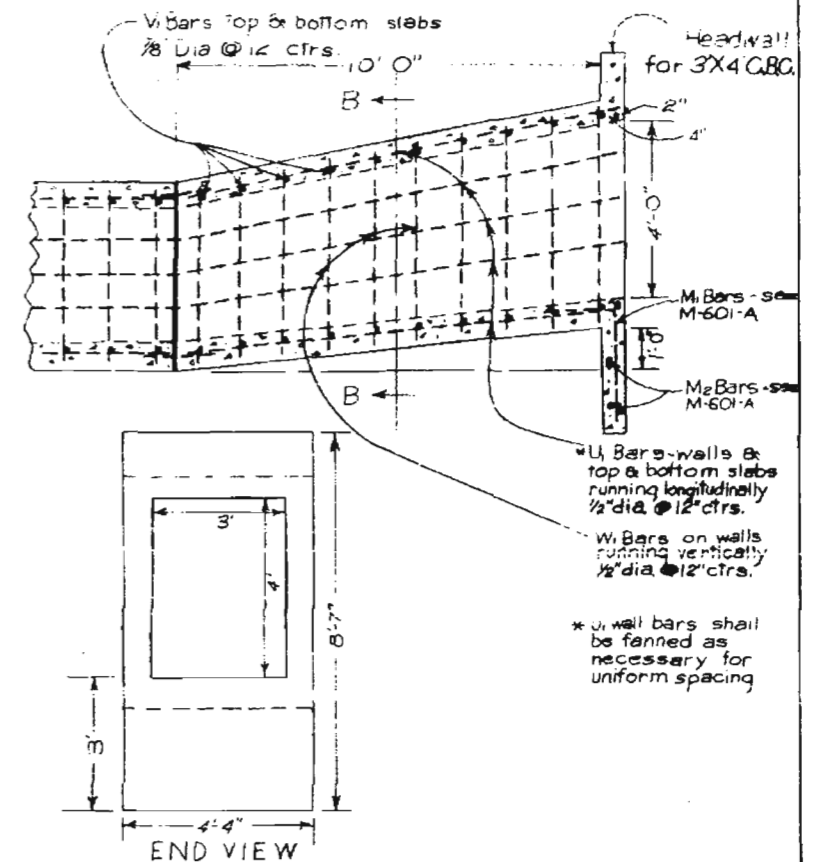
SECTION A-A

MARK	NO. REQD.	TYPE	LENGTH
v Bars	20	Straight	3'-10"
W Bars	20	Straight	3'-9" & 4'-9"
U Bars	12	Straight	9'-9"

Quantities (10' Section Only)	
Steel (lbs.)	Concrete Cu Yds
202	3.36



SECTION B B



### TYPICAL PLUNGE BASIN

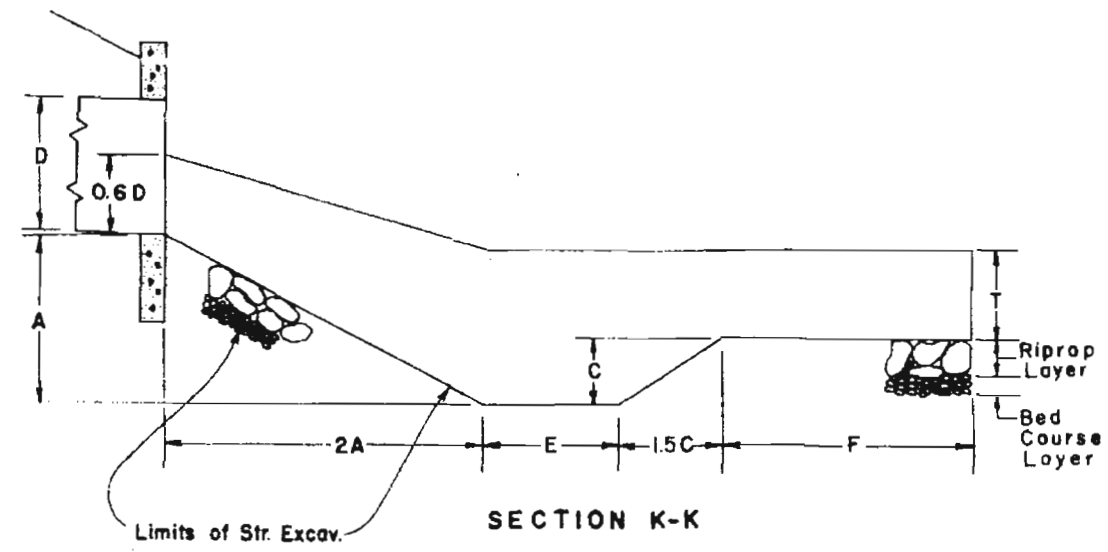
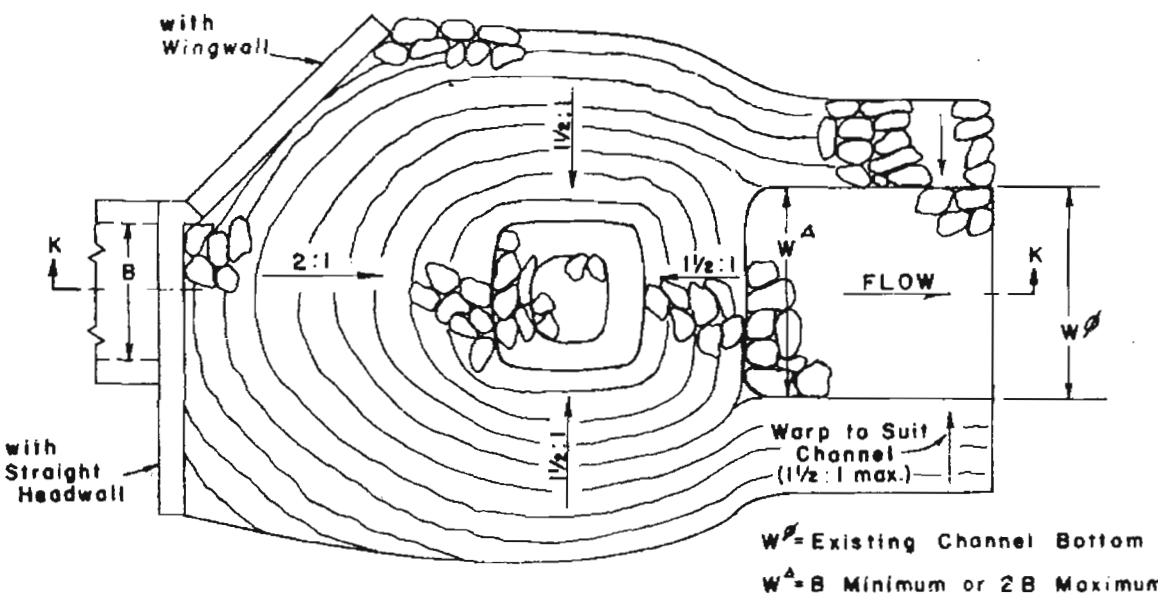
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	FO27-1(5)	13	

Dimensions						Quantities Cu. Yd.					
						Riprap Layer Thickness			Bed Course Layer Thickness		
D	A	C	E	T	F	12"	18"	24"	6"	8"	10"
24"	3'	1.5'	2'	1.5'	4'	6	9	12	3	4	5
30"	3'	1.5'	2.5'	2'	4'	8	11	15	4	5	7
36"	3'	1.5'	3'	2'	5'	9	14	18	5	6	8
42"	3'	1.5'	3.5'	2.5'	5'	11	16	21	6	7	9
48"	4'	2'	4'	2.5'	6'	15	22	29	8	10	12
54"	4'	2'	4.5'	3'	7'	18	27	35	9	12	15
60"	4'	2'	5'	3'	8'	20	30	39	10	13	17
66"	4'	2'	5.5'	3.5'	8'	23	34	45	12	15	19
72"	5'	2.5'	6'	3.5'	9'	28	42	56	14	19	24
3x3	2.5'	1.5'	5'	2.5'	6'		12			5	
8'x8'	3'	1.5'	5'	3'	10'		20			9	
9'x9'	3'	1.5'	8'	4.5'	12'			40			15

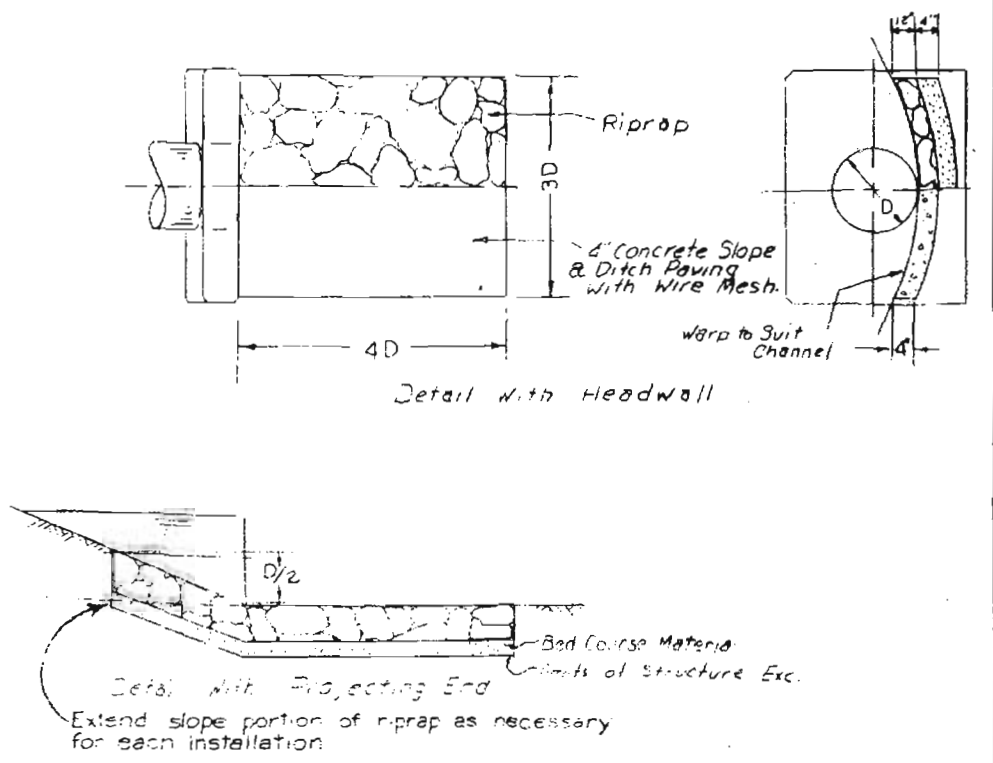
NOTE: For CBC, when B is greater than D, the above dimensions are valid for D, riprap quantities must be increased for B.

#### Riprap Size

Outlet Velocity (Vo) fps	Riprap Size	Riprap Thickness	Bed Course Thickness
14	12"	12"	6"
14 up to 17	18"	18"	8"
17 B 18	24"	24"	10"



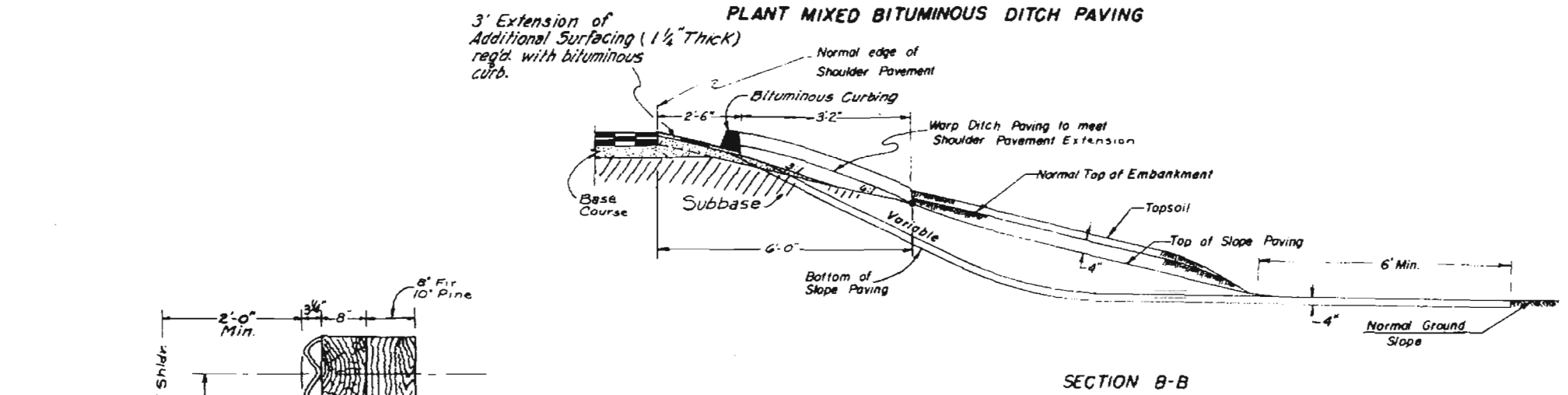
#### RIPRAP AND CONCRETE SLOPE AND DITCH PAVING FOR CULVERT OUTLET



FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
1	COLORADO	F027-1(5)	14	

REVISIONS	

**DETAILS OF EMBANKMENT PROTECTOR (TYPE 5)  
 PLANT MIXED BITUMINOUS DITCH PAVING**

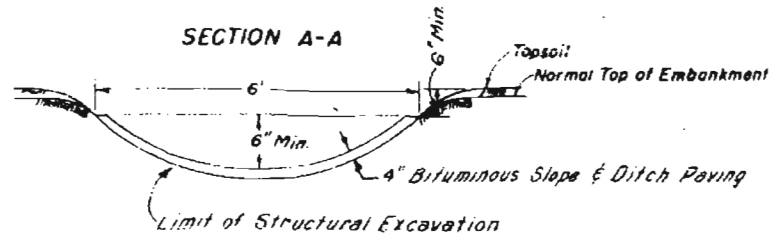
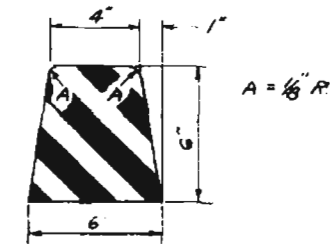
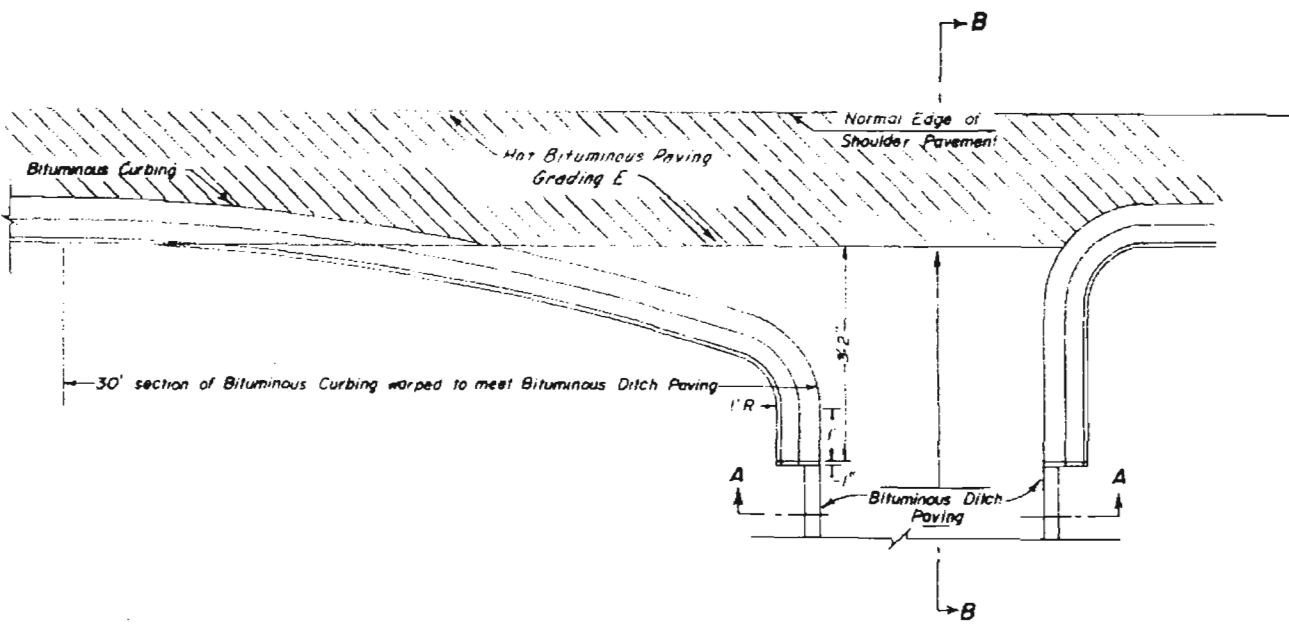
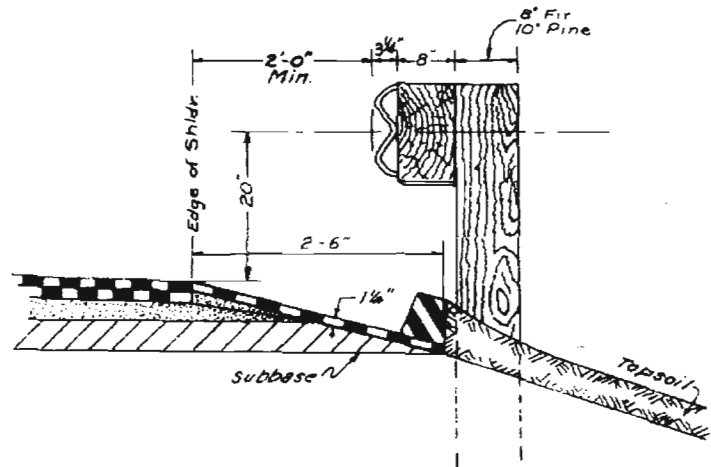


**GENERAL NOTES**

If protector is located in the bottom of a vertical curve, flare bituminous curb on each side of inlet to allow for flow from both directions.

Asphalt runoff to be skewed 75° from tangent in direction of flow

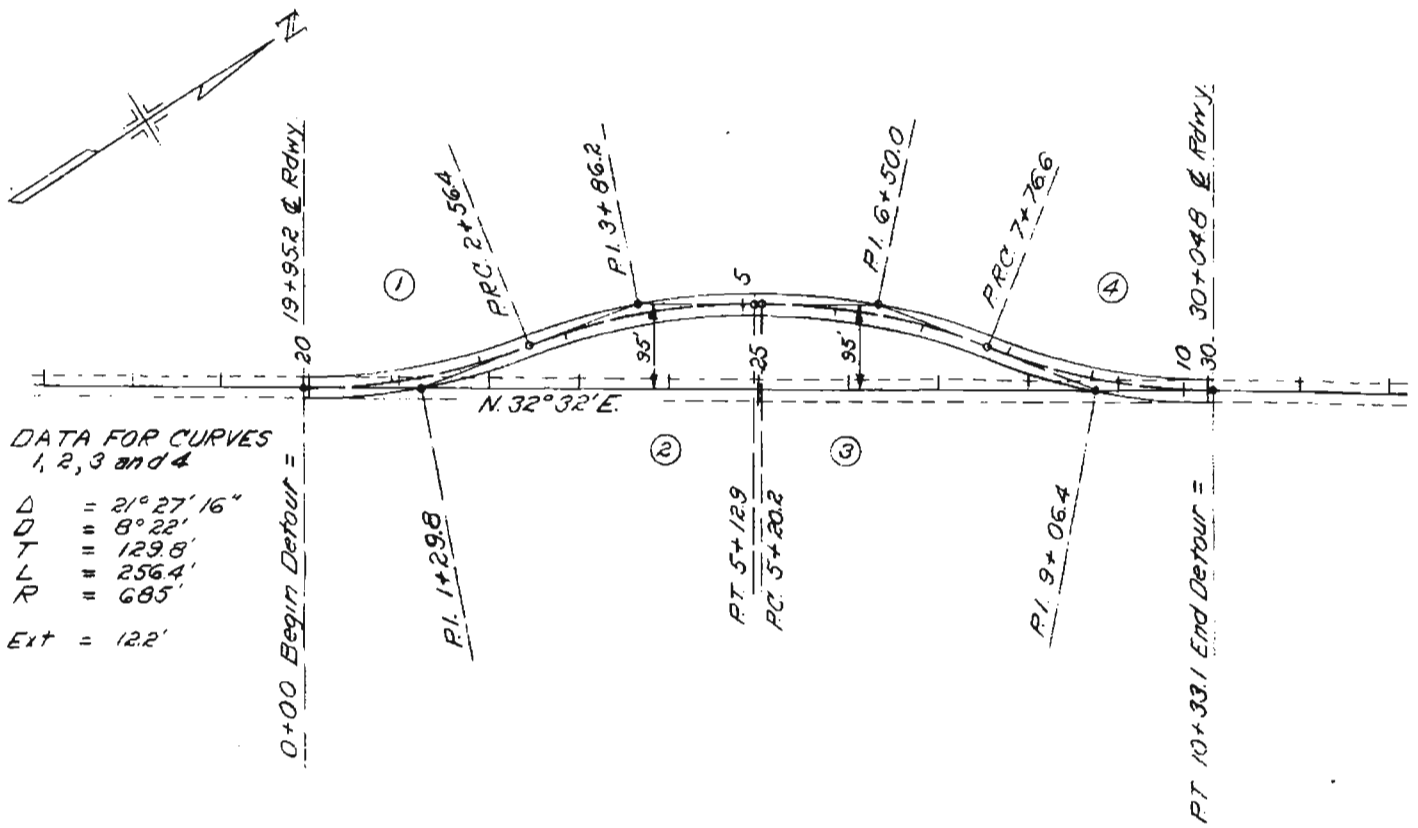
Embankment Protector (Type 5) Shall Be Measured and Paid for as the Number of Tons of Bituminous Slope and Ditch Paving in Accordance with Section 507.



FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F 027-1(5)	15

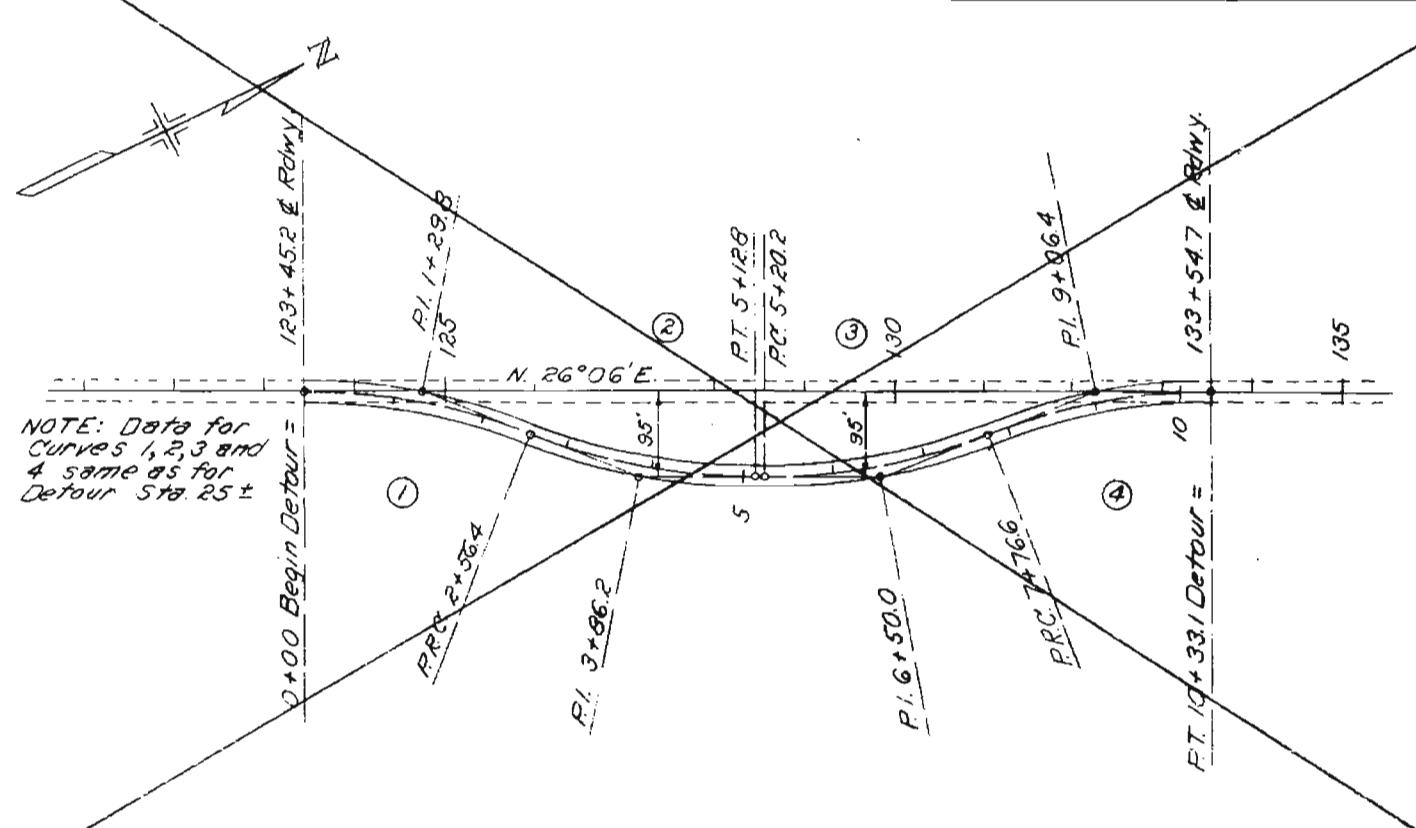
DETOUR LT. STA. 25 ±

DETOUR RT. STA. 128 ±

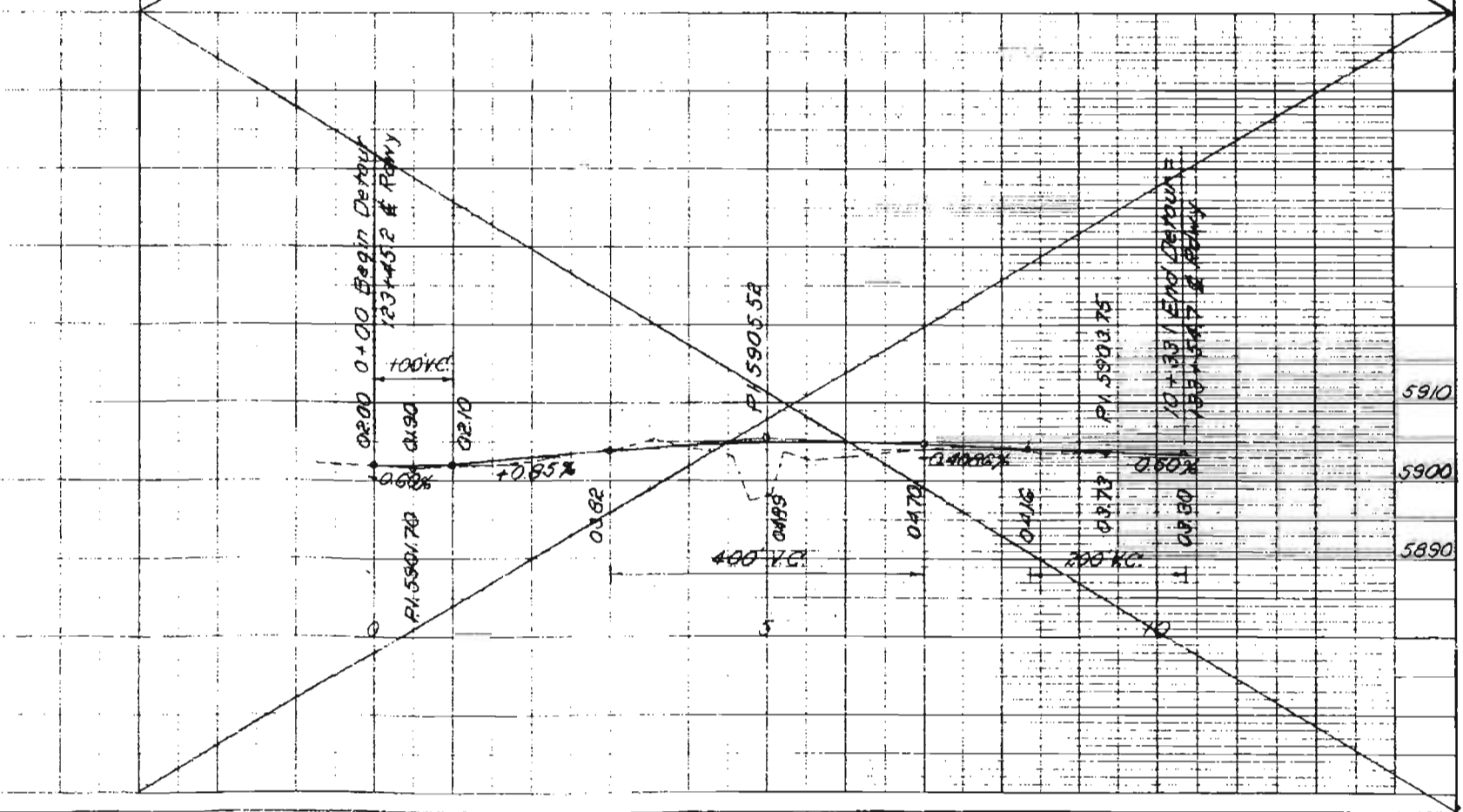
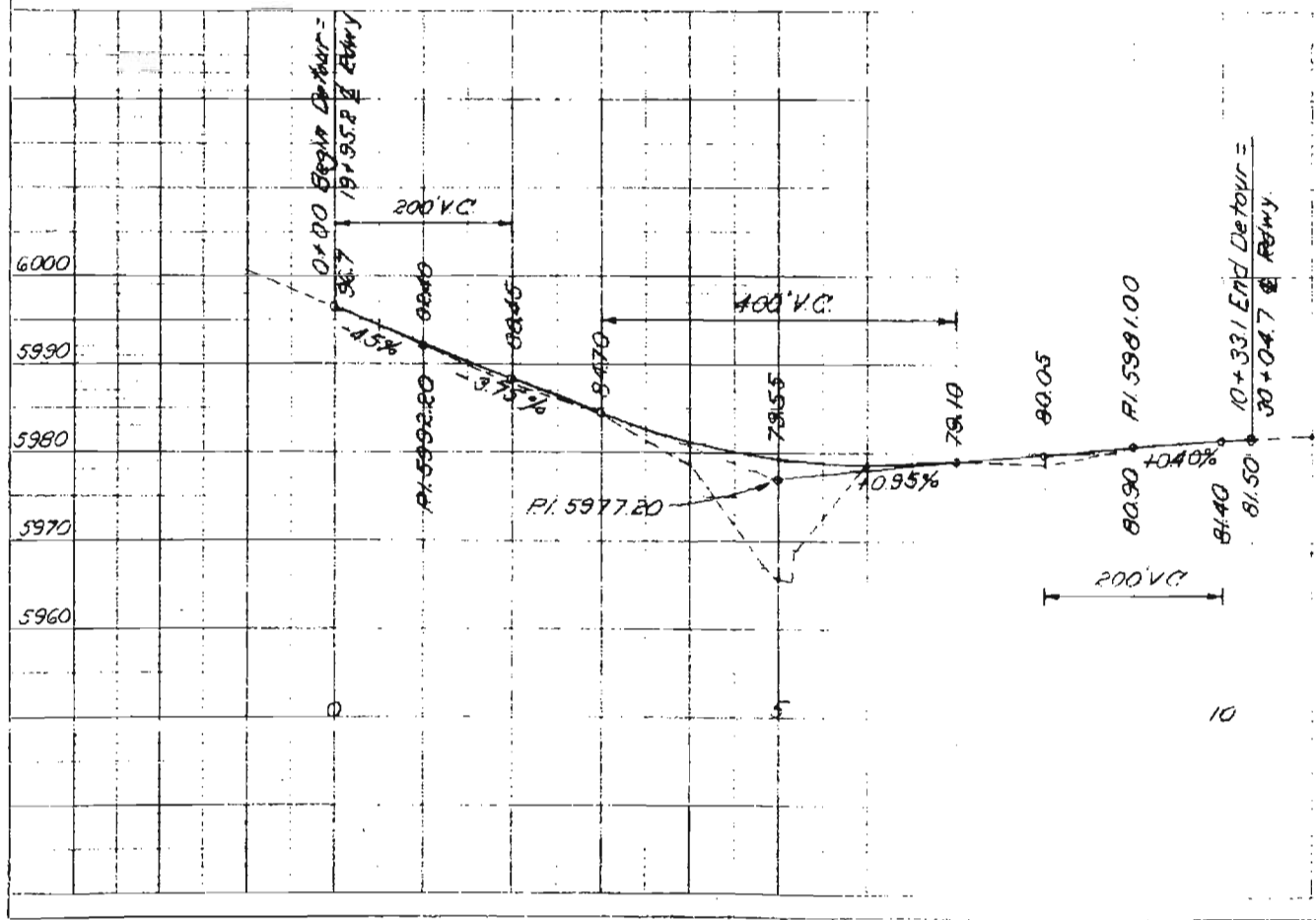


DATA FOR CURVES  
 1, 2, 3 and 4

D = 21° 27' 16"  
 Δ = 8° 22'  
 T = 129.8'  
 L = 256.4'  
 R = 685'  
 Ext = 122'



NOTE: Data for  
 Curves 1, 2, 3 and  
 4 same as for  
 Detour Sta. 25 ±

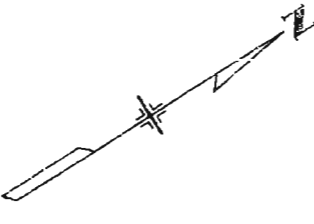


CHECKED BY: [Signature]  
 DATE: [Date]  
 DRAWN BY: [Signature]  
 DATE: [Date]

CHECKED BY: [Signature]  
 DATE: [Date]  
 DRAWN BY: [Signature]  
 DATE: [Date]

FIELD CONSTRUCTION

AS CONSTRUCTED  
REVISED DATE 7/1/57

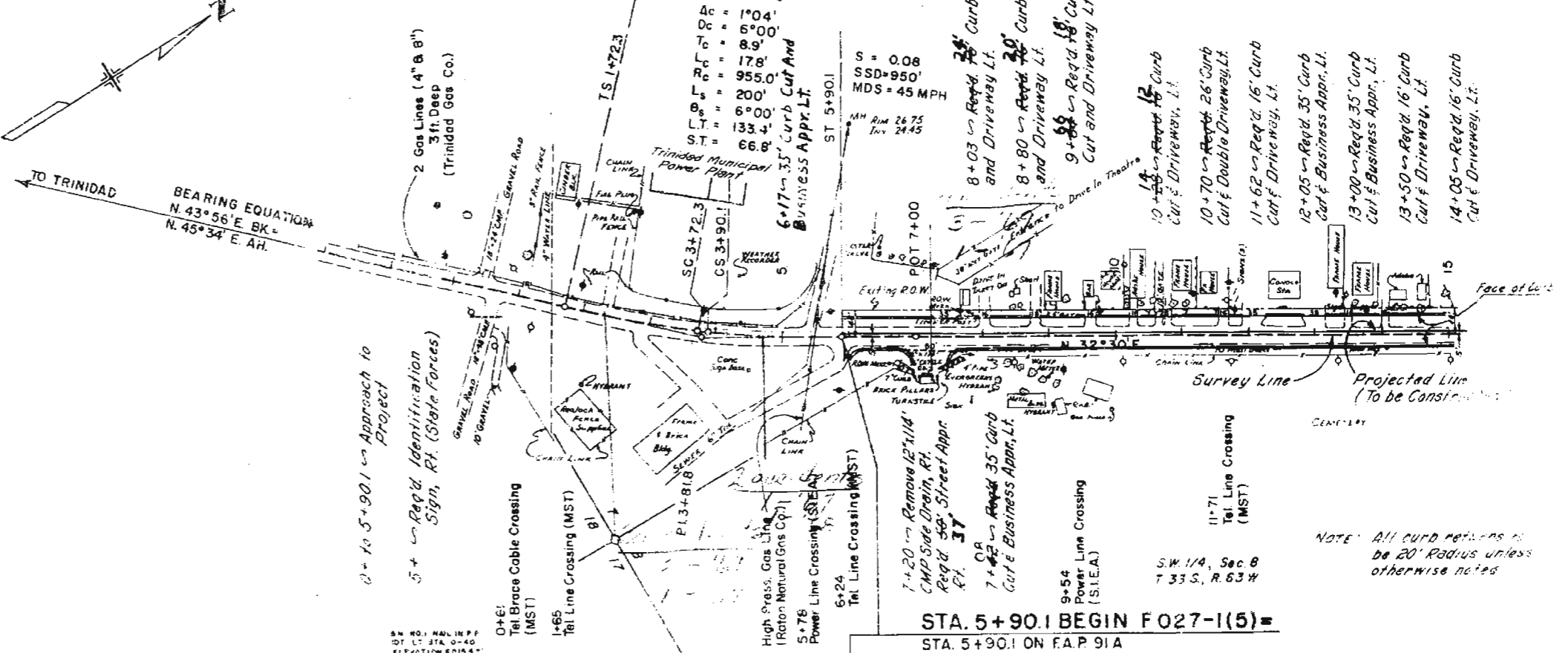


TO TRINIDAD  
BEARING EQUATION  
N. 43° 56' E. BK.  
N. 45° 34' E. AH.

Δ = 13° 04' LT.  
Ts = 209.5'  
Δc = 1° 04'  
Dc = 6° 00'  
Tc = 8.9'  
Lc = 17.8'  
Rc = 955.0'  
Ls = 200'  
Ts = 6° 00'  
Ls = 133.4'  
S.T. = 66.8'

S.E. 1/4, Sec. 7  
T. 33 S., R. 63 W.

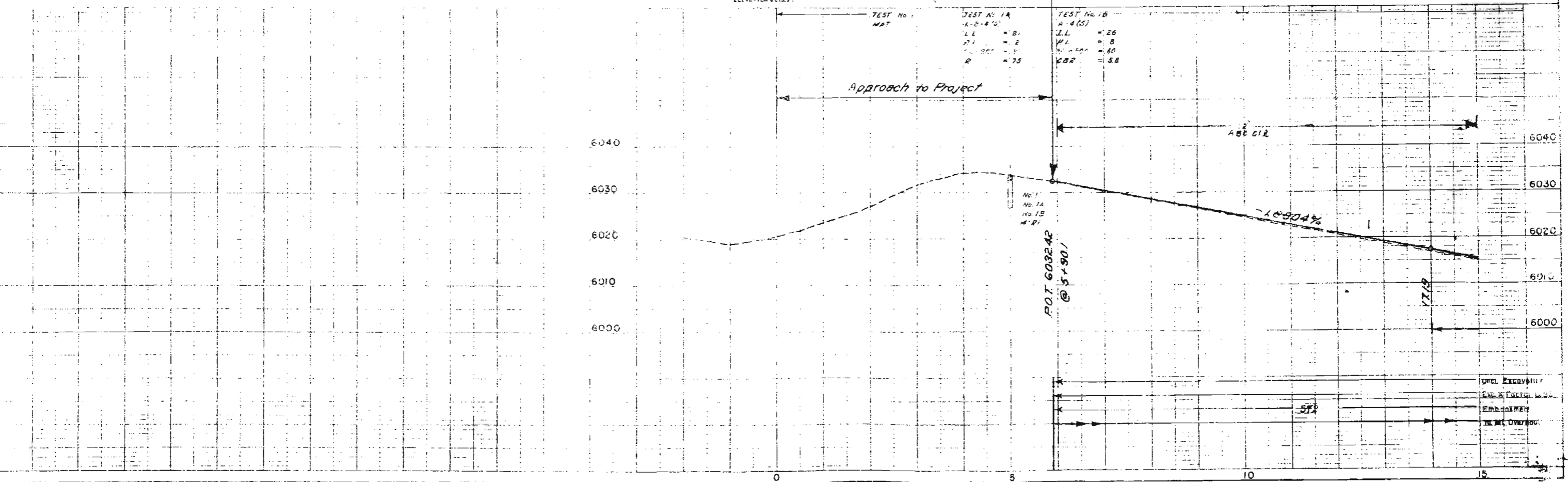
FILE NO.	DIVISION	PROJ. NO.	SHEET NO.	TOT. SHEETS
9	COLD	F 027-1(5)	16	47



0+ to 5+90.1 Approach to Project  
5+ Req'd Identification Sign, R. (State Forces)

STA. 5+90.1 BEGIN F 027-1(5) =  
STA. 5+90.1 ON F.A.P. 91A

NOTE: All CURB RETURNS to be 20' Radius unless otherwise noted







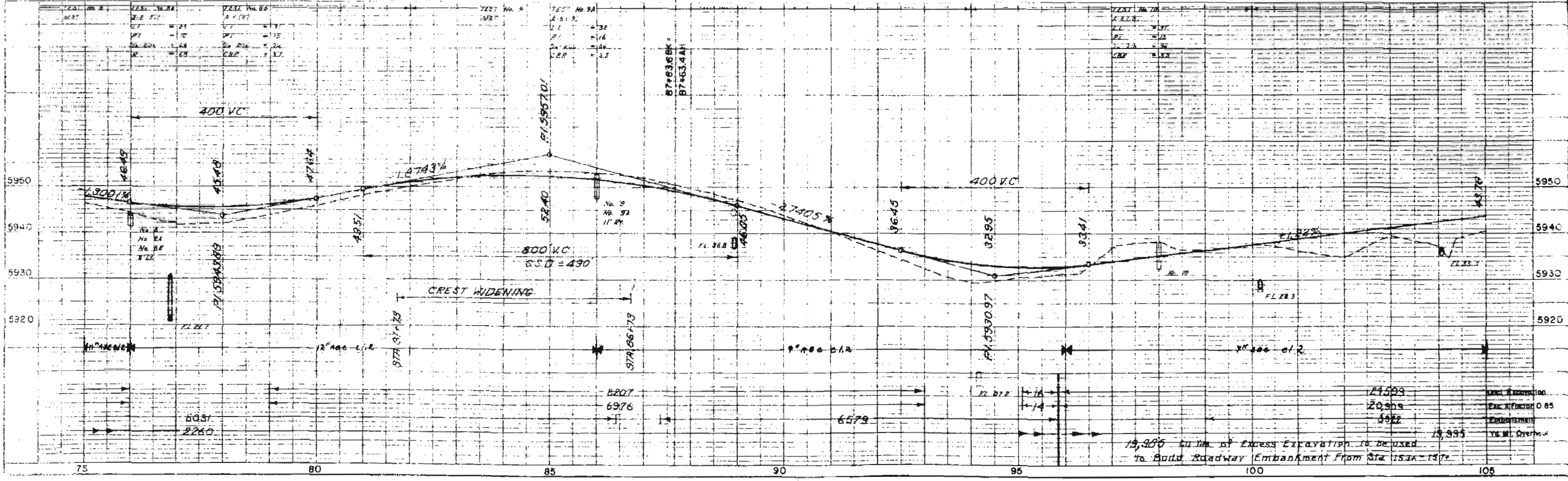
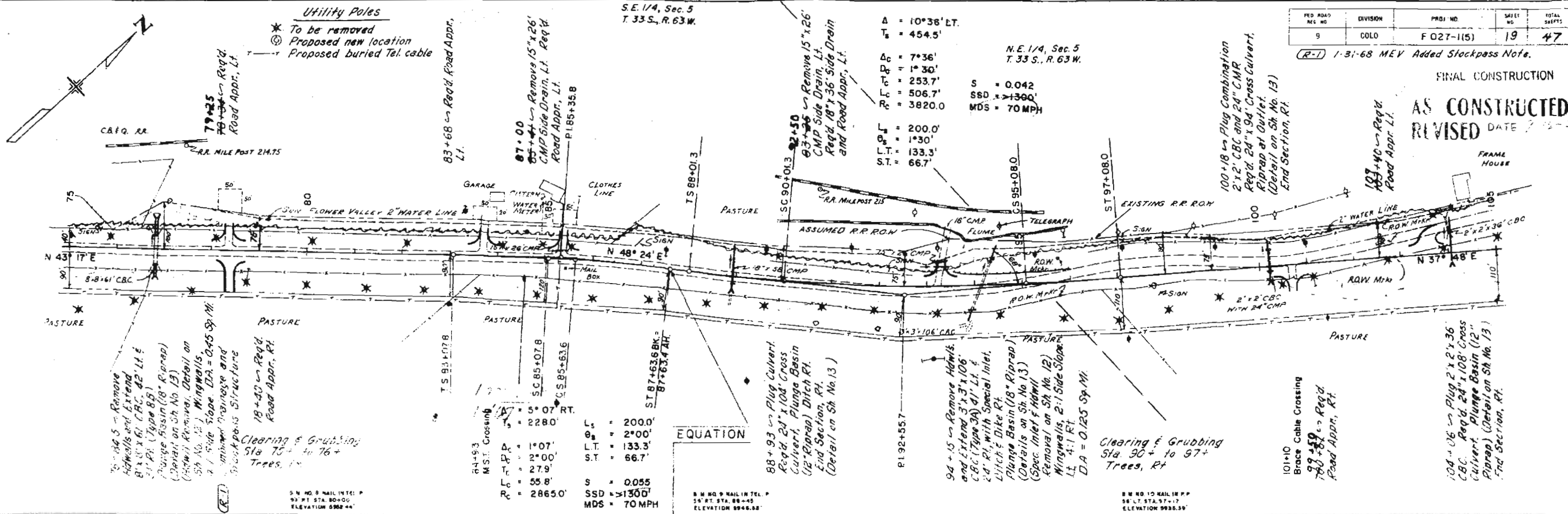
FED. ROAD DIST. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F 027-1(5)	19	47

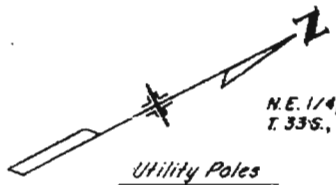
(R-1) 1-31-68 MEV Added Stockpass Note.

FINAL CONSTRUCTION  
 AS CONSTRUCTED  
 REVISED DATE 7-2-68

SE 1/4, Sec. 5  
 T. 33 S., R. 63 W.

NE 1/4, Sec. 5  
 T. 33 S., R. 63 W.





N.E. 1/4, Sec. 5  
T. 33 S., R. 63 W.

**Utility Poles**

- \* To be removed
- ⊙ Proposed new location
- Proposed buried Tel. cable

S = 0.083  
SSD > 1300'  
MDS = 70 MPH

① **PROJECTED LINE**  
 $\Delta_s = 18^\circ 26' \text{ LT.}$   
 $T_s = 435.12'$   
 $\Delta_r = 10^\circ 56'$   
 $D_r = 3^\circ 00'$   
 $T_r = 182.80'$   
 $L_c = 364.44'$   
 $R_c = 1910.0'$   
 $L_s = 250.0'$   
 $\Delta_s = 3^\circ 48'$   
 $L.T. = 166.70'$   
 $S.T. = 83.37'$

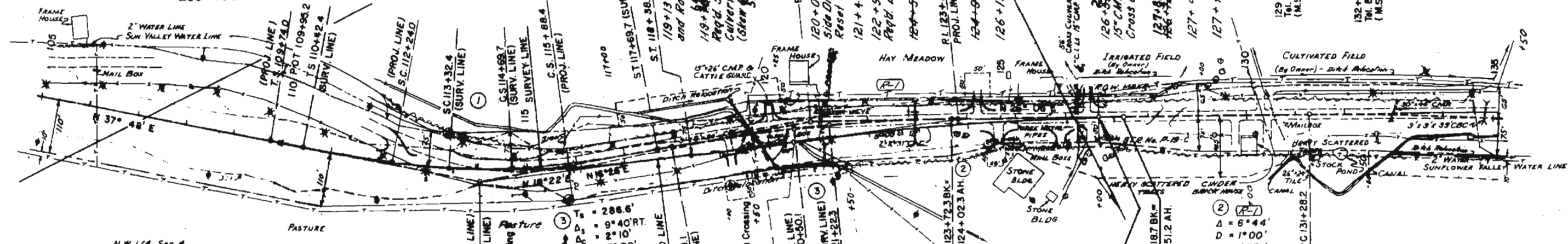
$\Delta_s = 21^\circ 22' \text{ LT.}$   
 $T_s = 366.7'$   
 $\Delta_r = 6^\circ 22'$   
 $D_r = 5^\circ 00'$   
 $T_r = 63.7'$   
 $L_c = 127.3'$   
 $R_c = 1146.0'$   
 $L_s = 300.0'$   
 $\Delta_s = 7^\circ 30'$   
 $L.T. = 200.2'$   
 $S.T. = 100.2'$

PROJ. NO.	SHEET NO.	TOTAL SHEETS
F 027-1(5)	20	47

3-8-68 M.E.K. R.O.W. AND ALIGNMENT

FINAL CONSTRUCTION

**AS CONSTRUCTED**  
 REVISED DATE 9-16-68



N.W. 1/4, Sec. 4  
T. 33 S., R. 63 W.

STA. 126+67.9 END F 027-1(5) =  
 STA 126+67.9 ON F.A.P. 91A

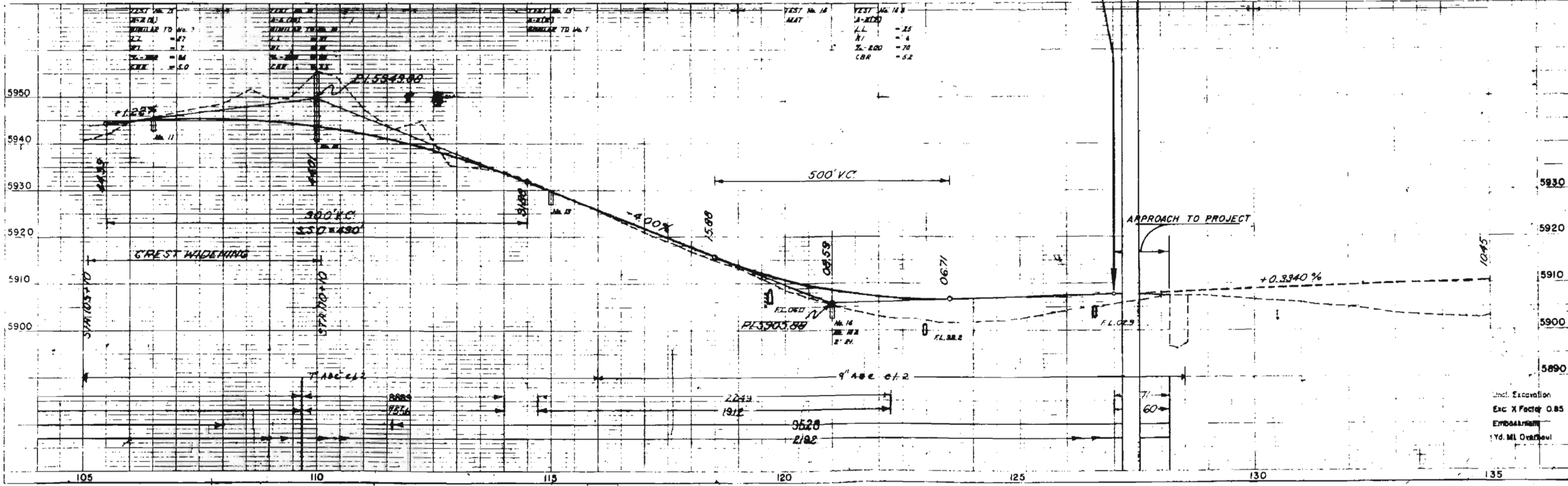
**EQUATION**

②  
 $\Delta = 6^\circ 44'$   
 $D = 1^\circ 00'$   
 $T = 337.1'$   
 $L = 673.3'$   
 $R = 5730.0'$   
 $S = 0.020$   
 $SSD > 1300$   
 $MDS = 50 \text{ MPH}$

Clearing & Grubbing  
 Sta. 120+ to 131+ - Trees, Lt.  
 128+ to 129+ - Trees, Lt.  
 122+ to 130+ - Trees, Rt.

S.W. 1/4, Sec. 33  
T. 32 S., R. 63 W.

S.W. 1/4, Sec. 33  
T. 32 S., R. 63 W.

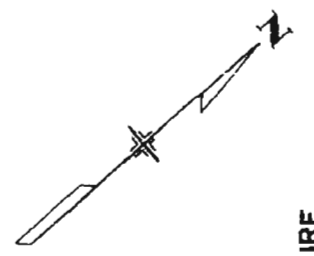


Incl. Excavation  
 Exc. X Factor 0.85  
 Embankment  
 1/2 MI. Outside

PROJECT	DIVISION	PRO. NO.	NO.	TOTAL SHEETS
	CJLO	F 027-1(5)	21	

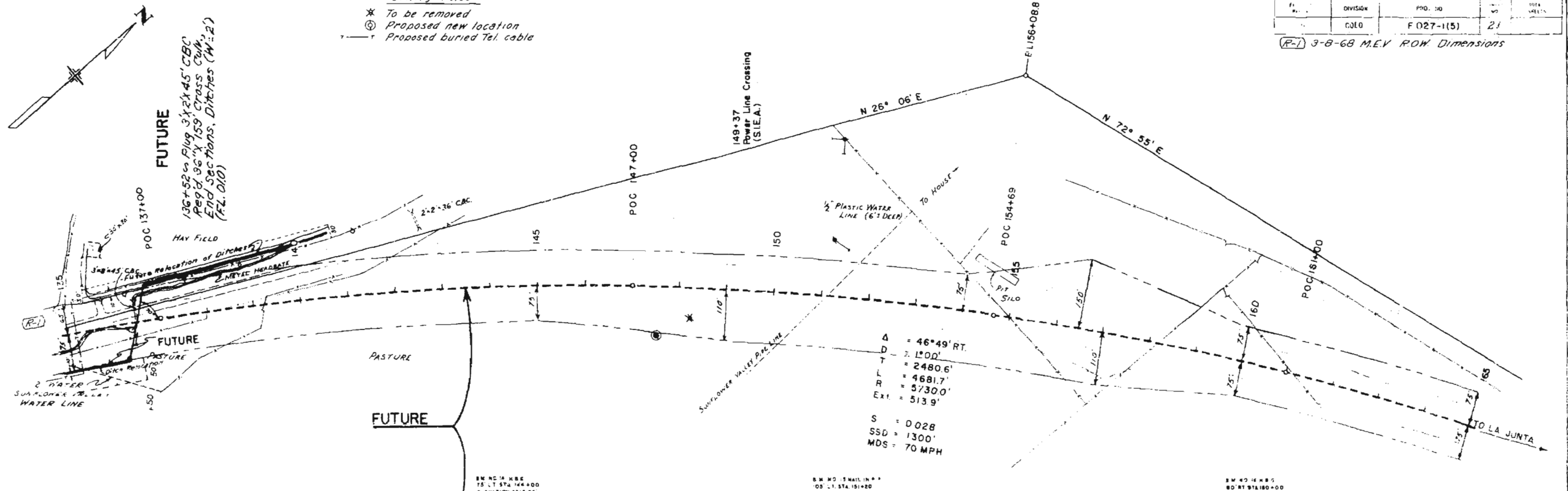
(R-1) 3-8-68 M.E.V. ROW Dimensions

Utility Poles  
 \* To be removed  
 ⊙ Proposed new location  
 - Proposed buried Tel. cable



**FUTURE**

136+52 to Plug 3' x 2' x 45' CBC  
 Reg'd. 36" x 159' cross cut,  
 End sections, Ditches (M=2)  
 (FL 010)



Δ = 46° 49' RT.  
 D = 1° 00'  
 T = 2480.6'  
 L = 4681.7'  
 R = 5730.0'  
 Ext = 513.9'

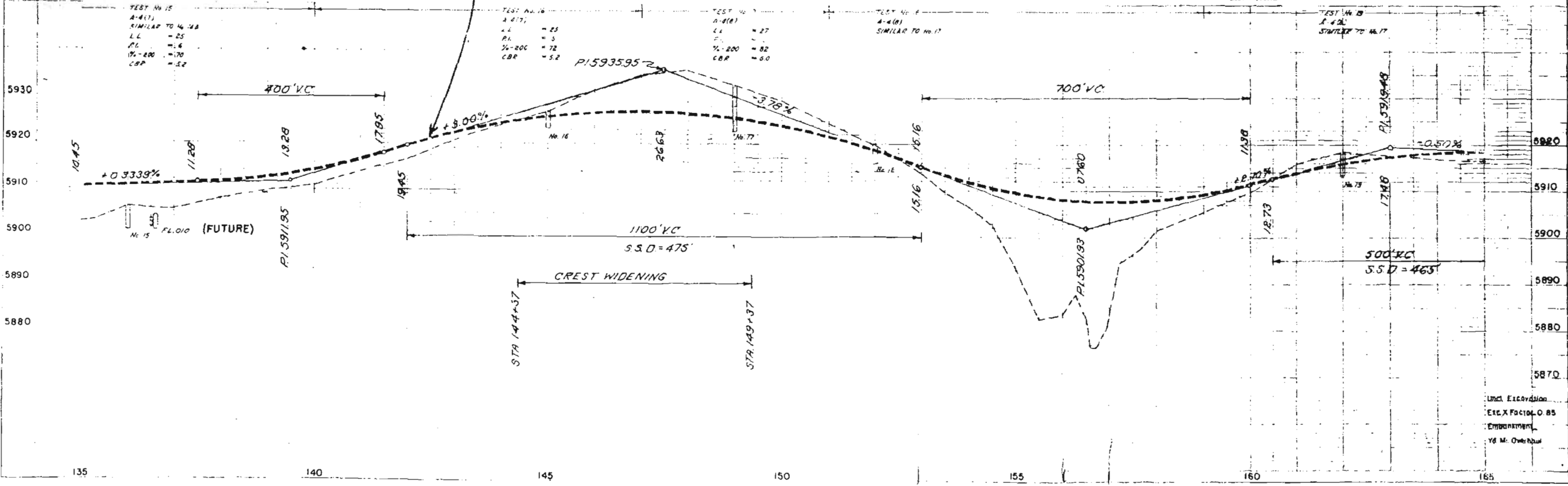
S = 0.028  
 SSD = 1300'  
 MDS = 70 MPH

TEST No 15  
 A-4(1)  
 SIMILAR TO 14.14  
 LL = 25  
 PL = 1.6  
 % - 200 = 170  
 CBR = 52

TEST No 16  
 A-4(1)  
 LL = 25  
 PL = 5  
 % - 200 = 72  
 CBR = 52

TEST No 17  
 A-4(1)  
 LL = 27  
 PL = 5  
 % - 200 = 82  
 CBR = 60

TEST No 18  
 A-4(1)  
 SIMILAR TO 14.17



Undr. Excavation  
 Etc. X Factor 0.85  
 Embankment  
 1/8 M. Overhaul

FED. ROAD REGION	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F 027-1(5)	22	

## SUMMARY OF EARTHWORK QUANTITIES

	URBAN LIMITS		OUTSIDE URBAN LIMITS		PROJECT TOTALS
	Excavation Cu. Yds.	Area	Excavation Cu. Yds.	Area	
<b>UNCLASSIFIED EXCAVATION</b>					
ROADWAY (FROM ELECTRONIC COMPUTER)	10,961	CU YDS.	52,498	CU YDS.	63,459 CU YDS.
ESTIMATED FOR SUBSIDENCE	1,096		5,250		6,346
STRUCTURE QUANTITIES AS EMBANKMENT	3,410		1,735		5,145
STRUCTURE QUANTITIES AS EXCAVATION	2,990		451		3,441
EXCAVATION FOR TOPSOIL	2,344		5,079		7,423
EMB. TO REPLACE TOPSOIL	2,344		5,079		7,423
ESTIMATED FOR DITCH EXCAVATION	137		25		162
ESTIMATED FOR CUT SLOPE TREATMENT	785		344		1,129
STRIPPING (REMOVE OVERBURDEN)	2,300		2,700		5,000
STRIPPING (REPLACING OVERBURDEN)	2,300		2,700		5,000
SUB-EXCAVATION	14,821		9,342		24,163
<b>TOTAL</b>	<b>42,868</b>		<b>85,203</b>		<b>128,091</b>
<b>YARD MILE</b>					
FROM MASS DIAGRAM	859	YD. MILE	31,485	YD. MILE	32,344 YD. MILE
ESTIMATED FOR SUBSIDENCE	86		3,148		3,234
<b>TOTAL</b>	<b>945</b>	<b>YD. MILE</b>	<b>34,633</b>	<b>YD. MILE</b>	<b>35,578 YD. MILE</b>
<b>EMBANKMENTS (STANDARD)</b>					
MOISTURE AND DENSITY CONTROL					
EMBANKMENT (Top 4 Feet & Sub. Excavation)	21,707	CU YDS.	28,420	CU YDS.	50,127 CU YDS.
BASE OF CUTS AND FILLS (Does Not include Subexcavation)	3,523		7,059		10,582
STRUCTURE QUANTITIES AS EMBANKMENT	3,212		3,458		6,665
<b>TOTAL</b>	<b>28,442</b>	<b>CU YDS.</b>	<b>38,932</b>	<b>CU YDS.</b>	<b>67,374 CU YDS.</b>
<b>ROADWAY QUANTITIES (INFORMATION ONLY)</b>					
EXCAVATION (FROM ELECTRONIC COMPUTER)	10,961	CU YDS.	52,498	CU YDS.	63,459 CU YDS.
<b>TOTAL</b>	<b>10,961</b>	<b>CU YDS.</b>	<b>52,498</b>		<b>63,459 CU YDS.</b>
EXCAVATION X FACTOR	8,893	CU YDS.	45,047	CU YDS.	53,940 CU YDS.
<b>TOTAL</b>	<b>8,893</b>	<b>CU YDS.</b>	<b>45,047</b>	<b>CU YDS.</b>	<b>53,940 CU YDS.</b>
EMBANKMENT (FROM ELECTRONIC COMPUTER)	6,128	CU YDS.	28,069	CU YDS.	34,198 CU YDS.
EXCESS EXCAVATION X FACTOR	2,765	CU YDS.	16,987	CU YDS.	19,752 CU YDS.
<b>TOTAL</b>	<b>8,893</b>	<b>CU YDS.</b>	<b>45,047</b>	<b>CU YDS.</b>	<b>53,940 CU YDS.</b>
EXCESS EXCAVATION	3,253	CU YDS.	13,335	EXCAV.	23,238 CU YDS.

FINAL SURVEY POINTS  
1951 DATA  
1952 DATA  
1953 DATA  
1954 DATA  
1955 DATA  
1956 DATA  
1957 DATA

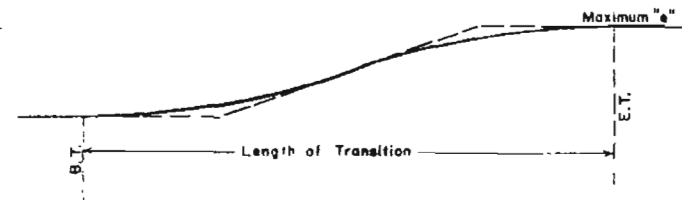
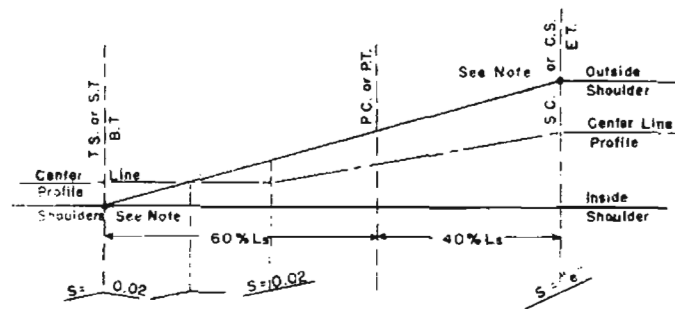
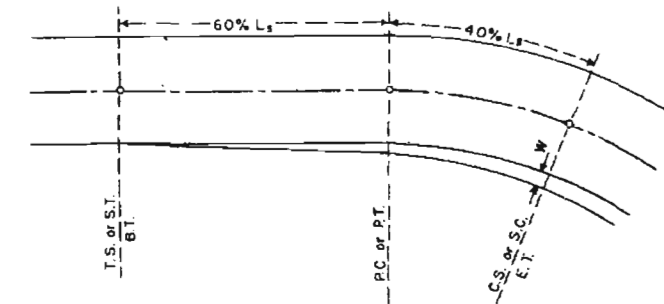
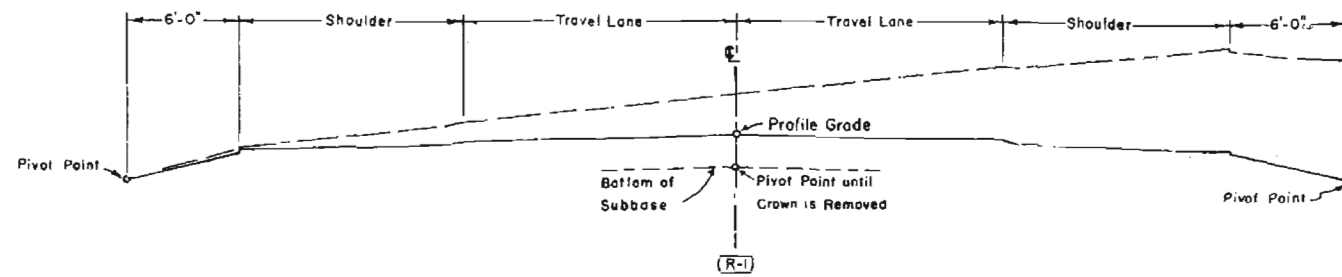
ORIGINAL SURVEY POINTS  
1951 DATA  
1952 DATA  
1953 DATA  
1954 DATA  
1955 DATA  
1956 DATA  
1957 DATA

SHEET TOTALS	EXCAVATION	CU YDS.
	EXCAVATION	CU YDS.
	EMBANKMENT	CU YDS.

# STANDARD M-203-A

(JULY 1, 1965)

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



NOTE - For obtaining smooth profiles on pavement edges, vertical curves can be inserted between the angular breaks at the beginning and the end of the super-elevation transition.

### PAVEMENT WIDENING

Pavement Width	20 Ft.	22 Ft.	24 Ft.
Degree of Curve			
0° - 3°	0 Ft.	0 Ft.	0 Ft.
4° - 6°	2.0 Ft.	0 Ft.	0 Ft.
7° - 10°	2.5 Ft.	0 Ft.	0 Ft.
11° - 17°	3.0 Ft.	2.0 Ft.	0 Ft.
18° - 21°	3.5 Ft.	2.5 Ft.	0 Ft.
22° - Up	4.0 Ft.	3.0 Ft.	2.0 Ft.

Widening is to be on the inside edge of the pavement and the transition is to extend over the same transition length as the super-elevation.

REVISIONS		
(R-1)	5-26-67	Supered Template M.R.H.

**SUPERELEVATION RATES FOR TWO LANE CROWNED SECTION**  
TABLE 1

Degree of Curve	Maximum Super-elevation = 0.08			Maximum Super-elevation = 0.10		
	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length
0°15'	RC	70	200'	RC	70	200'
0°30'	RC	70	200'	RC	70	200'
0°45'	.021	70	200'	.021	70	200'
1°00'	.028	70	200'	.028	70	200'
1°30'	.042	70	200'	.042	70	200'
2°00'	.056	70	200'	.055	70	200'
2°30'	.069	70	200'	.069	70	200'
3°00'	.076	70	250'	.083	70	250'
3°30'	.080	70	250'	.096	70	300'
4°	.080	65	250'	.100	65	300'
5°	.080	60	250'	.100	60	300'
6°	.080	55	200'	.100	55	250'
7°	.080	50	200'	.100	50	250'
8°	.080	45	200'	.100	45	250'
9°	.080	45	200'	.100	45	250'
10°	.080	40	200'	.100	45	250'
11°	.080	40	200'	.100	40	200'
12°	.080	40	200'	.100	40	200'
13°	.080	35	150'	.100	40	200'
14°	.080	35	150'	.100	35	200'
15°	.080	35	150'	.100	35	200'
16°	.080	35	150'	.100	35	200'
17°	.080	30	150'	.100	35	200'
18°	.080	30	150'	.100	30	200'
19°	.080	30	150'	.100	30	200'
20°	.080	30	150'	.100	30	200'
21°	.080	30	150'	.100	30	200'
22°	.080	30	150'	.100	30	200'
23°	.080	30	150'	.100	30	200'
24°	.080	30	150'	.100	30	200'
25°	.080	30	150'	.100	30	200'

NOTES - Plains Areas use 0.10 Maximum Super-elevation Rate.  
Mountainous Areas & areas where icing conditions frequently exist, use 0.08 Maximum Super-elevation Rate.

**SUPERELEVATION RATES FOR SPECIAL CASES**  
TABLE 2

Degree of Curve	30 M.P.H.		35 M.P.H.		40 M.P.H.		45 M.P.H.		50 M.P.H.		55 M.P.H.		60 M.P.H.		Degree of Curve
	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	Required Super-elevation Rate Ft./Ft.	Minimum Length of Transition or Spiral	
	0.08	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.08	0.10	
0°15'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0°15'
0°30'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0°30'
0°45'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0°45'
1°00'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	1°00'
1°30'	RC	RC	100'	RC	RC	150'	RC	RC	150'	.023	.024	150'	.027	.027	1°30'
2°00'	RC	RC	100'	RC	RC	150'	RC	RC	150'	.030	.032	150'	.035	.036	2°00'
2°30'	RC	RC	100'	RC	RC	150'	RC	RC	150'	.036	.039	150'	.043	.045	2°30'
3°00'	.023	.024	100'	.029	.031	150'	.035	.038	150'	.042	.046	150'	.050	.054	3°00'
3°30'	.026	.027	100'	.033	.035	150'	.040	.045	150'	.048	.053	150'	.056	.063	3°30'
4°	.029	.030	100'	.037	.040	150'	.044	.050	150'	.053	.060	150'	.062	.070	4°
5°	.035	.038	100'	.044	.048	150'	.053	.060	150'	.062	.071	200'	.070	.083	5°
6°	.041	.044	100'	.050	.056	150'	.060	.068	150'	.069	.080	200'	.076	.093	6°
7°	.045	.050	100'	.056	.063	150'	.066	.076	150'	.074	.088	200'	.079	.097	7°
8°	.050	.055	100'	.061	.069	150'	.071	.084	200'	.078	.094	200'	.080	.100	8°
9°	.054	.061	100'	.065	.075	150'	.074	.089	200'	.080	.097	250'	.080	.100	9°
10°	.058	.065	150'	.069	.081	150'	.077	.093	200'	.080	.100	250'			10°
11°	.061	.070	150'	.072	.085	200'	.079	.096	200'						11°
12°	.065	.074	150'	.075	.089	200'	.080	.098	200'						12°
13°	.067	.078	150'	.077	.092	200'									13°
14°	.070	.082	150'	.078	.095	200'									
15°	.072	.085	150'	.079	.097	200'									
16°	.074	.087	150'	.080	.099	200'									
17°	.076	.090	150'		.100	200'									
18°	.077	.093	200'		.100	200'									
19°	.078	.095	200'												
20°	.079	.096	200'												
21°	.080	.098	200'												
22°	.080	.099	200'												
23°	.080	.099	200'												
24°	.080	.100	200'												
25°	.080	.100	200'												

NOTES - Transition or Spiral Lengths are shown in the tables for 2 Lane Crowned Highways.  
For 3 Lane Crowned Highways use 1.2 times the lengths shown, rounded to the nearest 50 feet.

Width of Crowned Highway to be figured for Super-elevation - left pivot point to right pivot point.

Table 2 data may be used for City Streets & Interchanges.  
NC = Normal Crown section.  
RC = Remove adverse crown, super-elevate at normal crown slope.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

**SUPERELEVATION & WIDENING OF CURVES CROWNED HIGHWAYS**

Designed by S.B.L. Approved by S.B.L.  
Made by S.B.L. Staff Design Engr.  
Checked by L.E.O. Date July 1, 1965

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

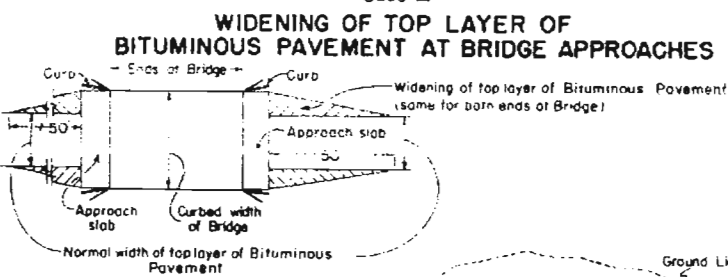
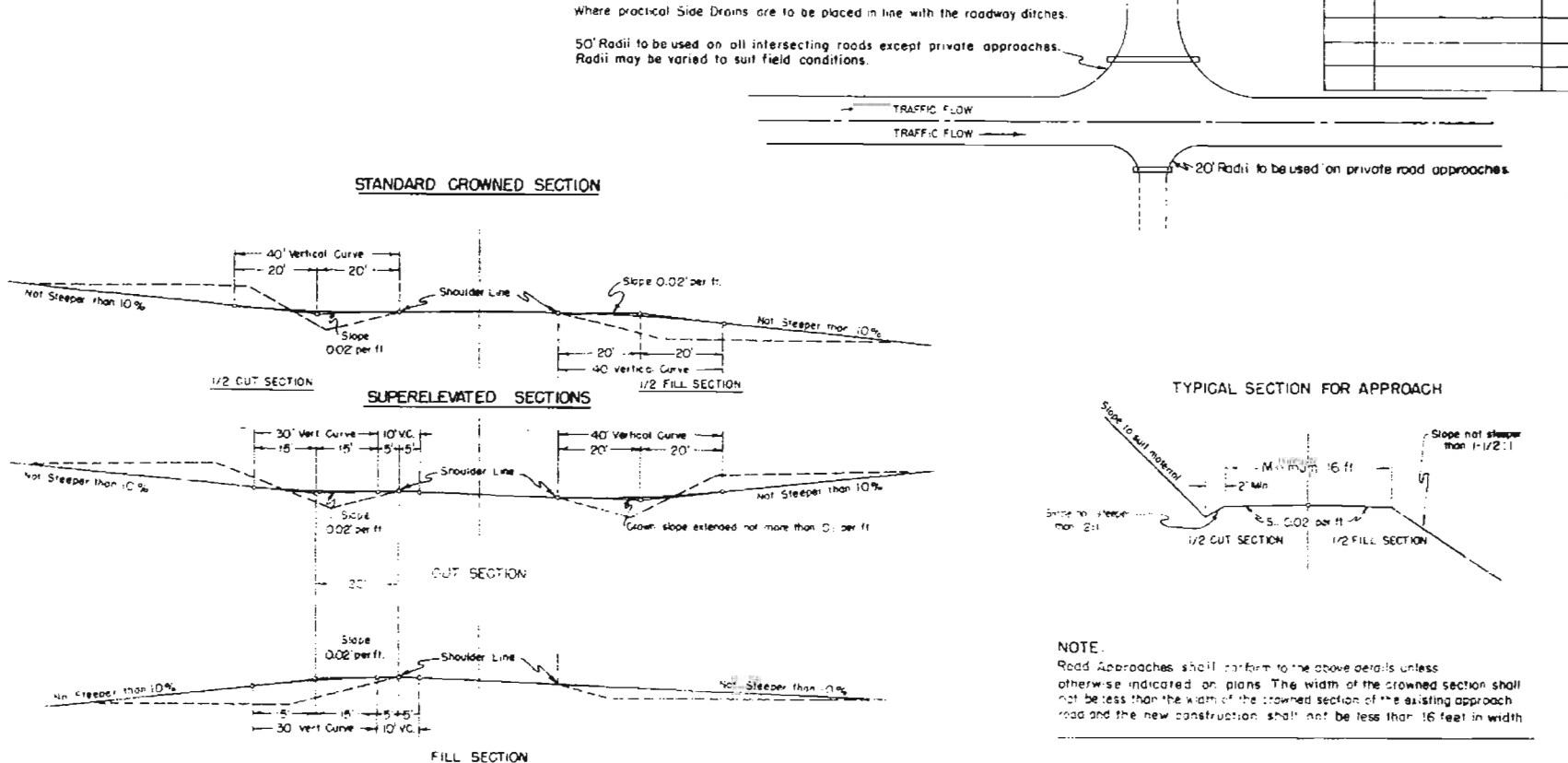
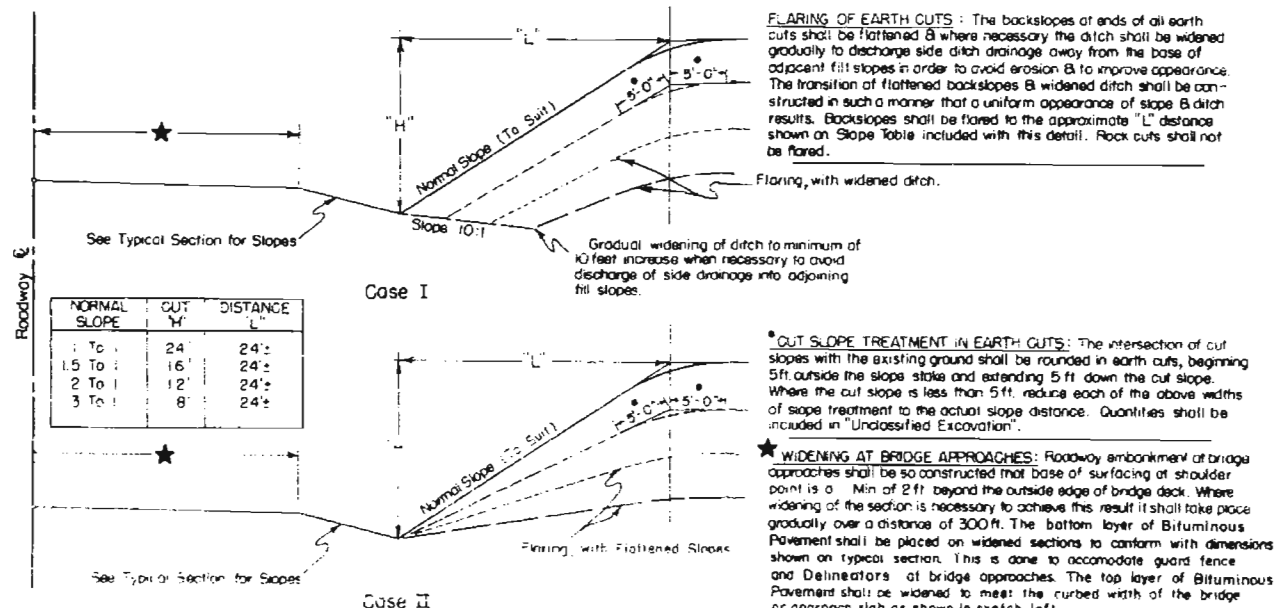
## STANDARD M-203-B (JULY 1, 1965)

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

REVISIONS	

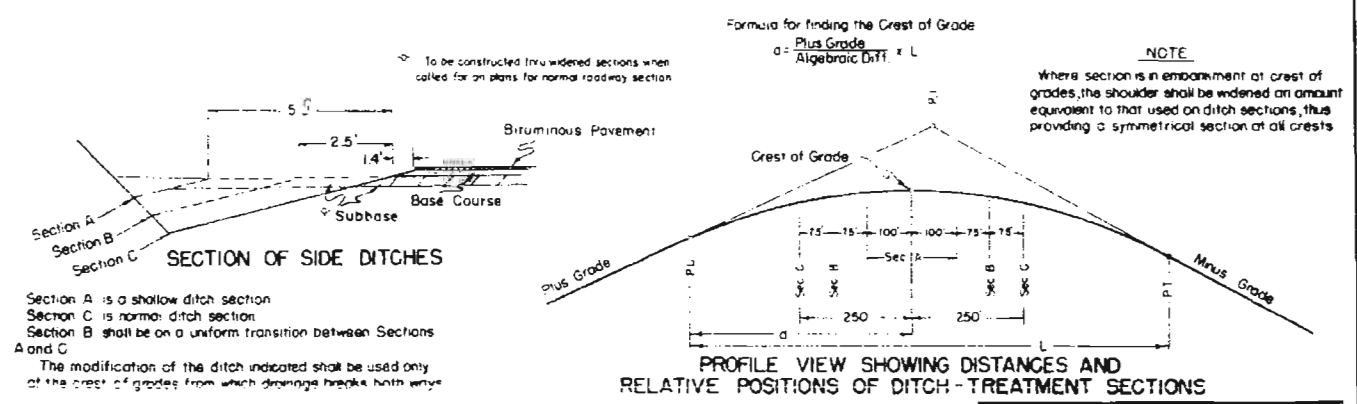
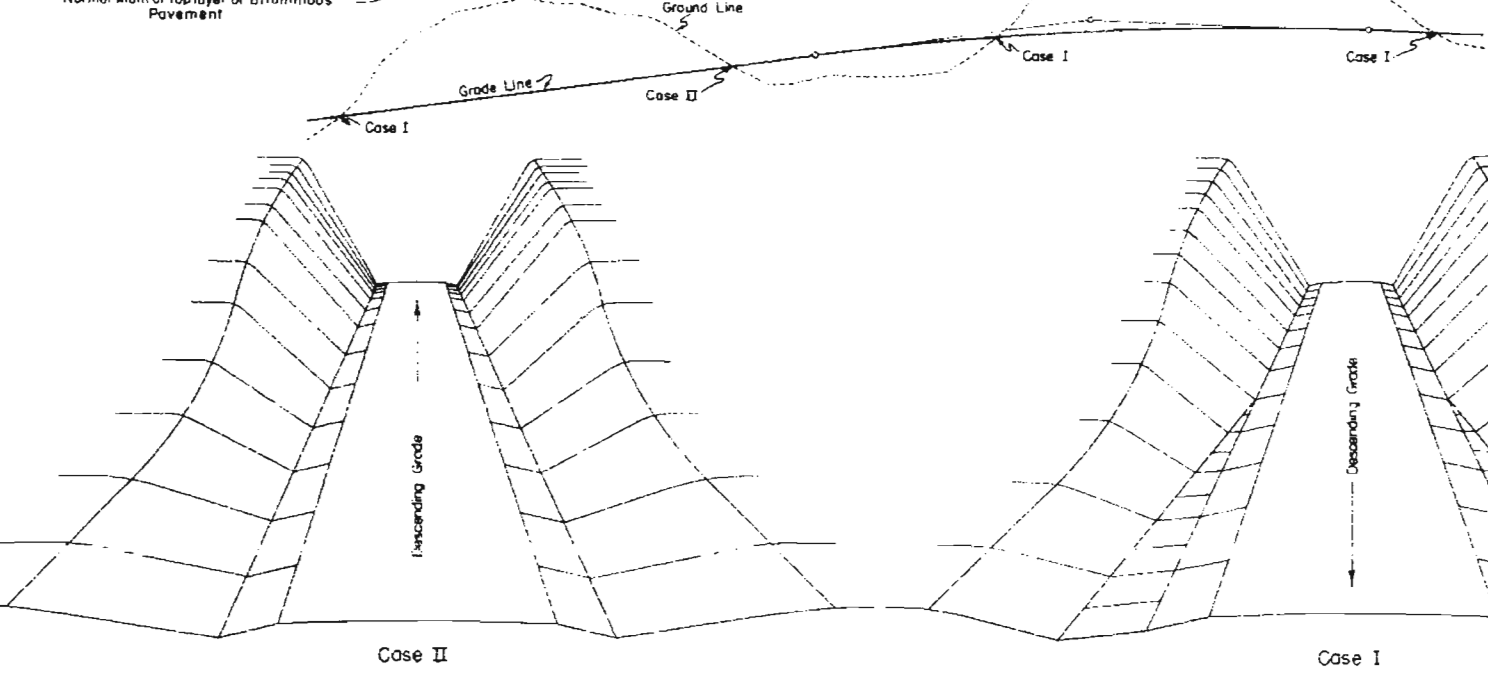
### GENERAL DETAILS FOR FLARING OF EARTH CUTS, CUT SLOPE TREATMENT & WIDENING AT BRIDGES

### TYPICAL PLANS FOR SIDE APPROACH ROADS



### PLAN OF FLARING IN EARTH CUTS

### DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES ( TO BE USED ONLY WHERE SIGHT DISTANCE AT CREST OF GRADE IS 600 FT OR LESS )



### GENERAL NOTES

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

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

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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

APPROACH ROADS,  
FLARING, CUT SLOPE TREATMENT,  
BRIDGE & CREST WIDENING

Designed by A.Z.  
Made by JIM CASB  
Checked by CRS

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

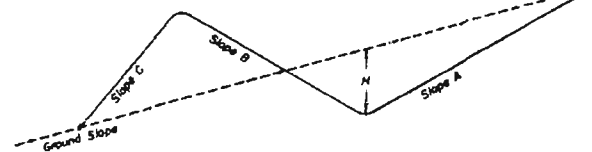
# STANDARD TYPES OF DITCHES AND CONSTRUCTION METHODS

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

FED. ROAD RES. NO.	DIVISION	PROJECT NO.	SHEET NO.
8.	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

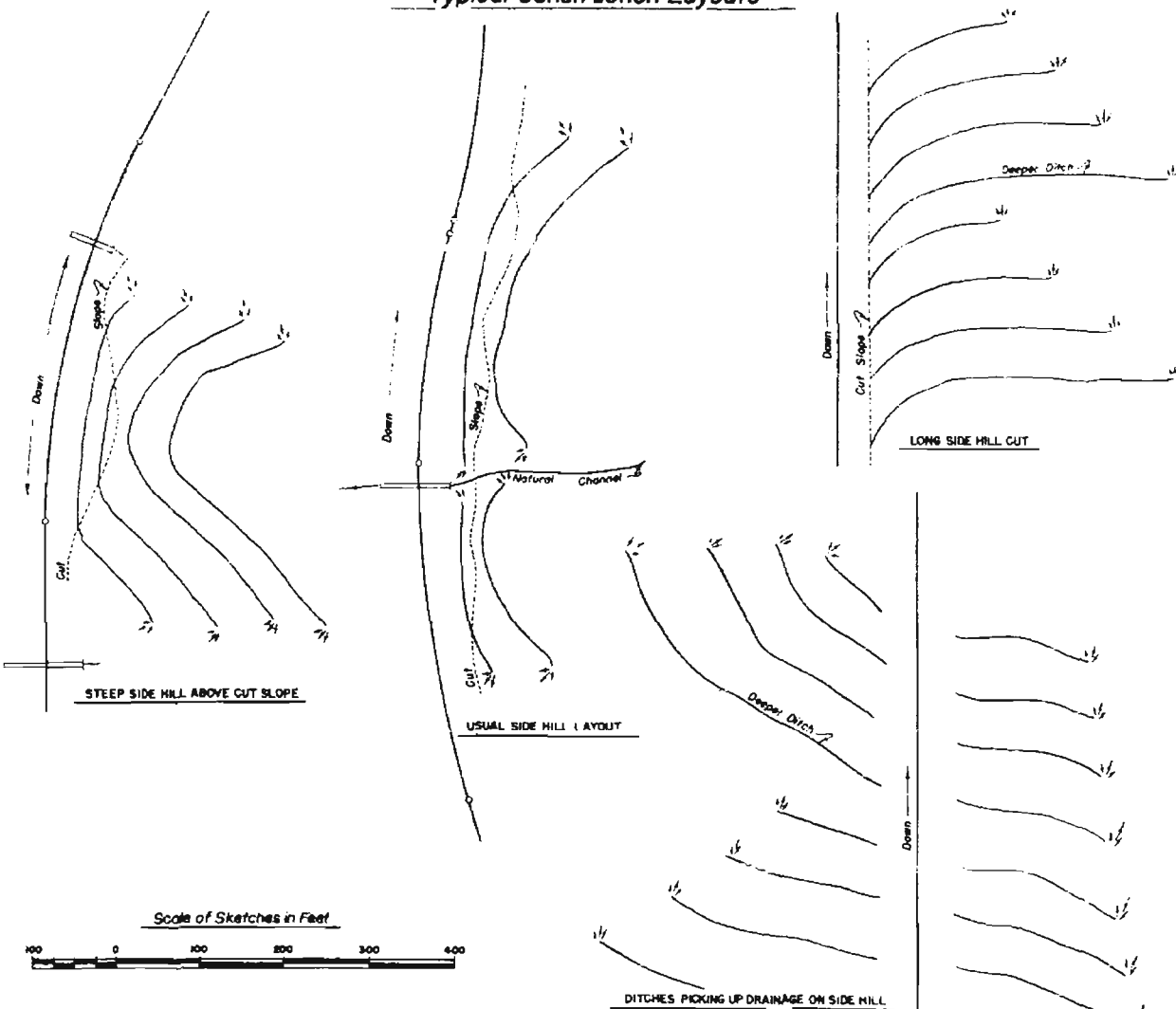
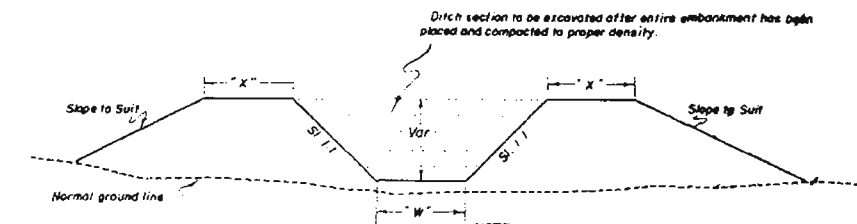


Table of Slopes and Yardages

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

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

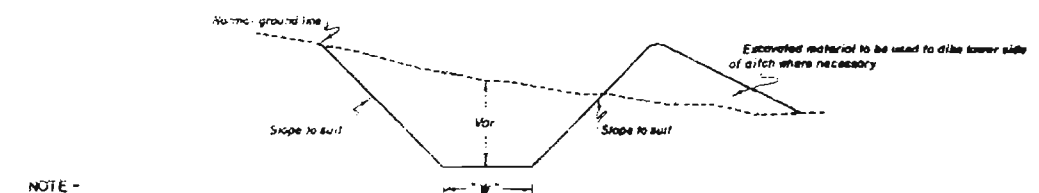
## TYPICAL SECTIONS FOR DRAINAGE, IRRIGATION DITCHES AND CHANNEL CHANGES



NOTE - See Structure Notes in plans for dimension "W". Dimension "X" = W with minimum of 2 feet.

### For Embankment Sections

(Generally for use in Irrigation Ditches & Channel Changes)



NOTE - Unless otherwise shown in Structure Notes of plans, dimension "W" = 1 foot.

### For Cut Sections

REVISIONS

## 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 of 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

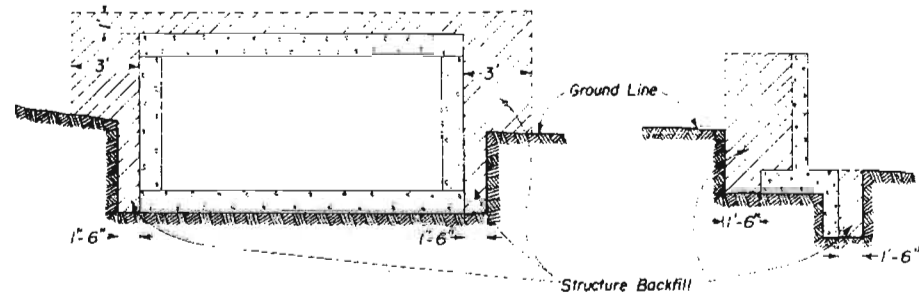
Where ditch checks are required the intervening ditch between one set of ditch checks shall not exceed a grade of 10%. Details of checks will be shown on plans when required.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

DITCH TYPES

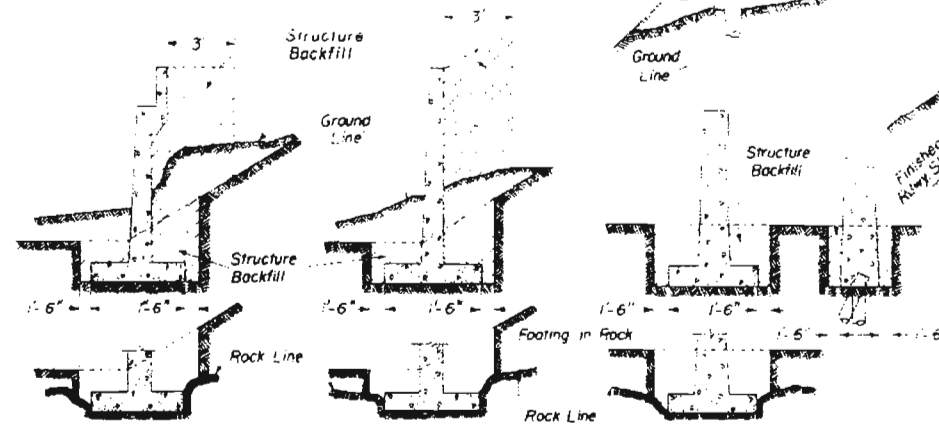
Designed by C.G.M. Approved by J.E. O'Brien  
Made by C.G.M. Staff Design Engr.  
Checked by Date: July 1, 1965

CONCRETE BOX CULVERTS & WINGWALLS

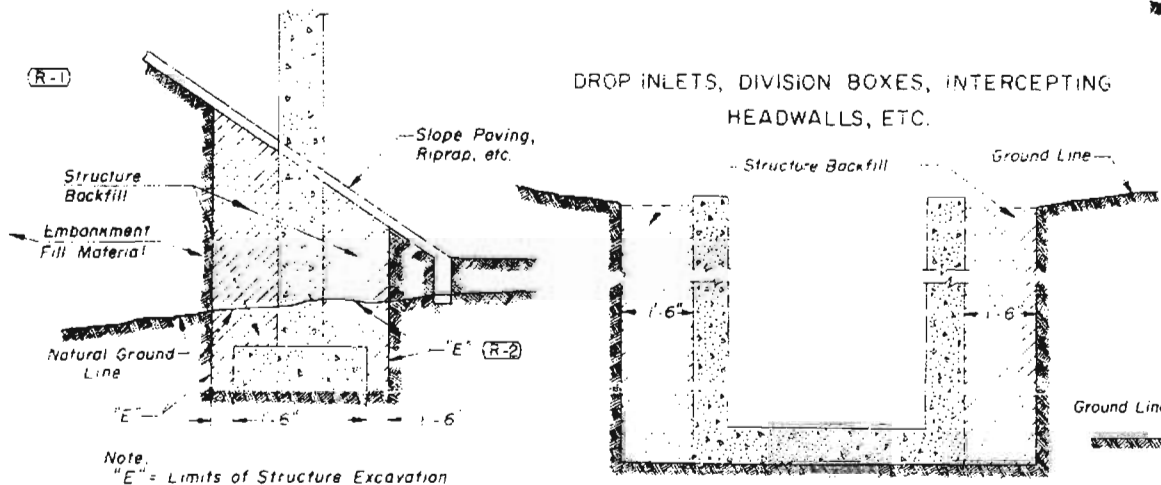


PIERS, ABUTMENTS, RETAINING WALLS ETC.

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



DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS, ETC.



Note: "E" = Limits of Structure Excavation

STANDARD M-206-A

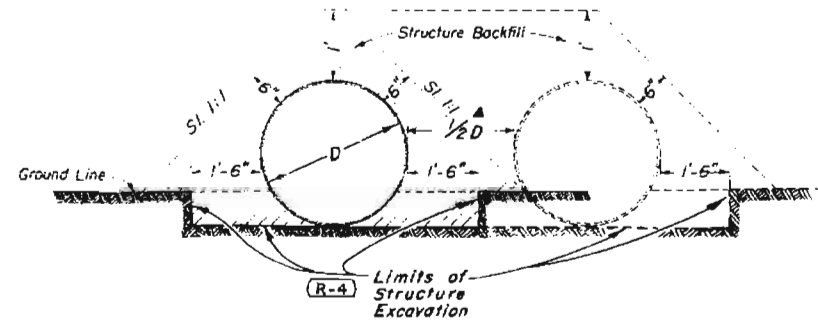
(JULY 1, 1965)  
(SHEET 1 OF 2 SHEETS)

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

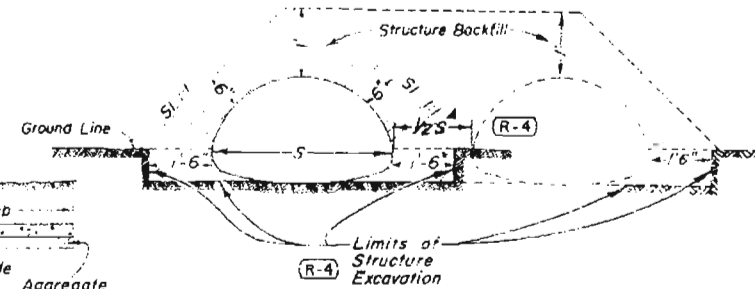
  

REVISION			
(R-1)	10-20-65	ADDED PIER VIEW	MR.H.
(R-2)	12-7-65	STR. EXGV.	MR.H.
(R-3)	4-25-66	Class 2 Backfill (Trench)	MR.H.
(R-4)	3-17-67	Conduit, Underdr'n, Box	MR.H.

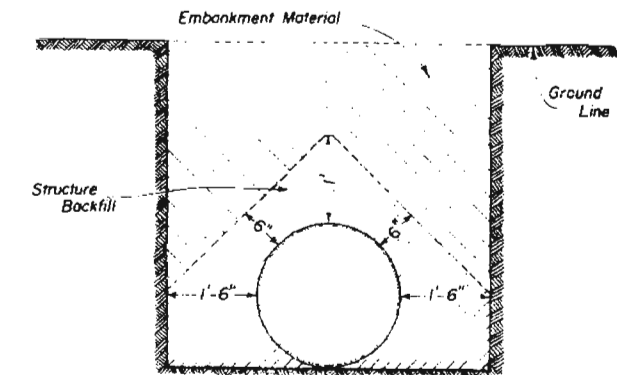
CIRCULAR CONDUIT



ELLIPTICAL OR ARCH CONDUIT



SIPHONS OR CONDUIT IN TRENCH



(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 culvert installation details see M Standards for metal, concrete, or structural plate pipe culverts.

GENERAL NOTES

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

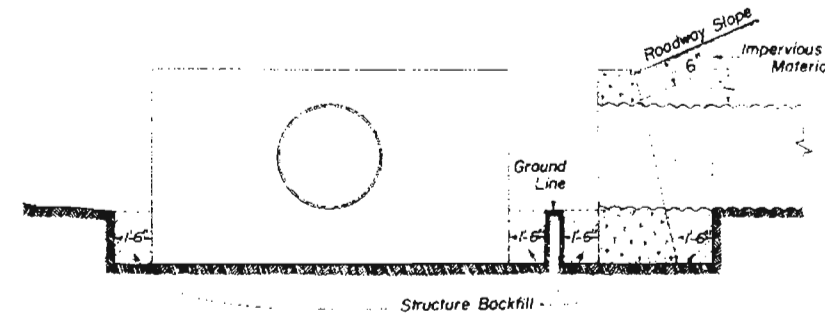
Where the roadway cross section is in fill, excavation for concrete footings except those in rock or those on piers, and for box culverts shall be done according to the following:

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

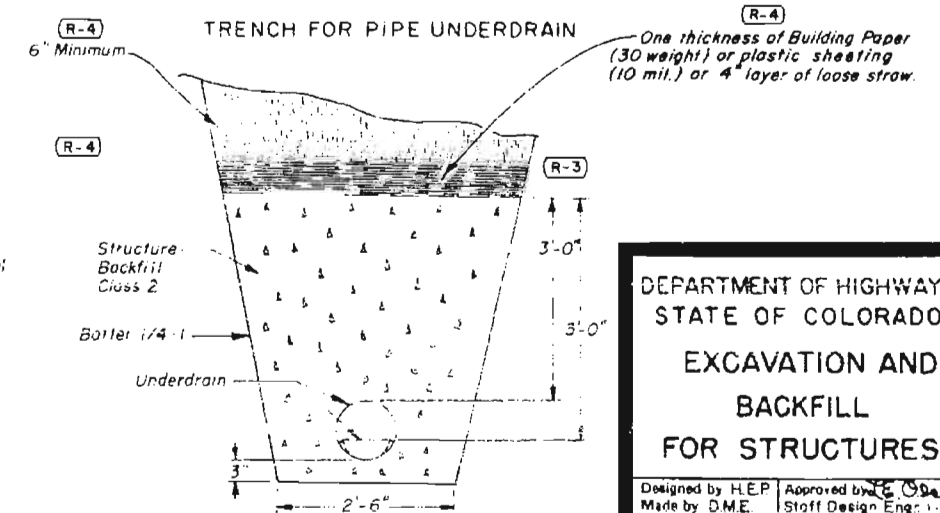
Excavation and backfill patterns different from those indicated on these sheets will be shown elsewhere on the plans.

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

HEADWALLS AND END OF CULVERTS



TRENCH FOR PIPE UNDERDRAIN



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
EXCAVATION AND  
BACKFILL  
FOR STRUCTURES

Designed by H.E.P. Approved by E. Odum  
Made by D.M.E. Staff Design Eng.  
Checked by L.E.O. Date: July 1, 1965

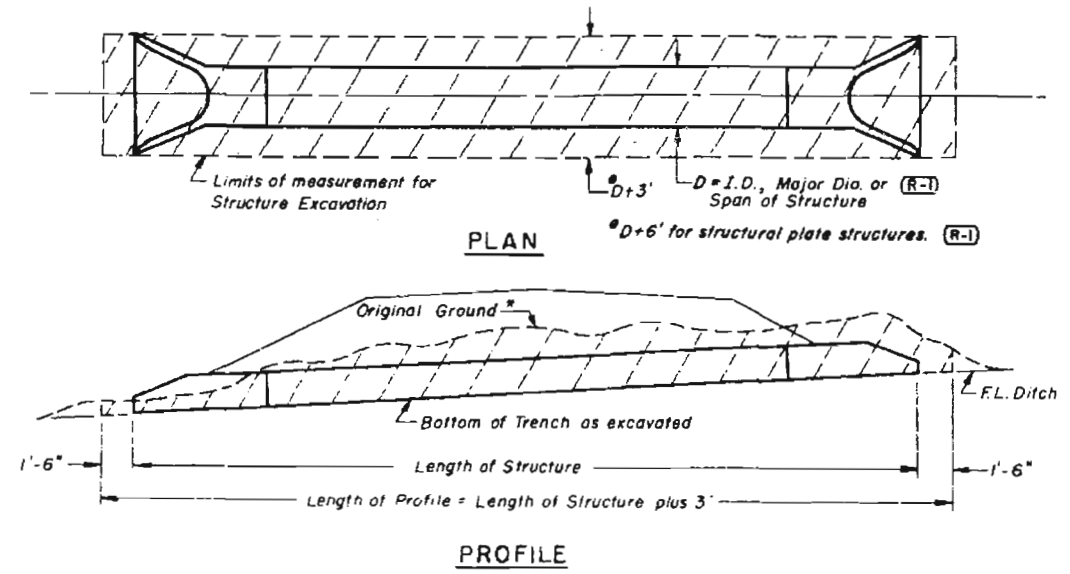
# STANDARD M-206-A

(SHEET 2)  
(JULY 1, 1965)

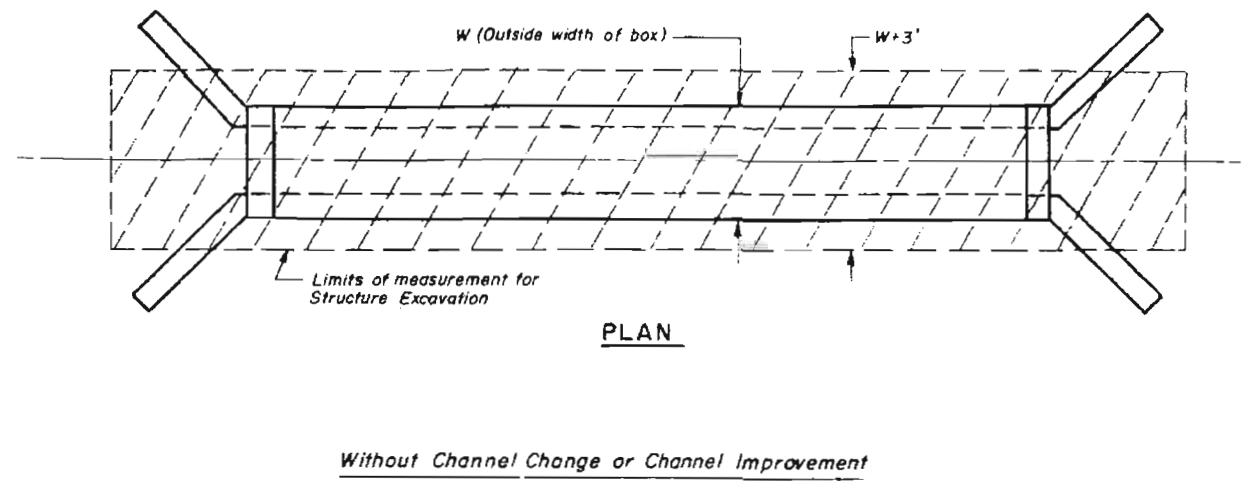
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
1	COLORADO			

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

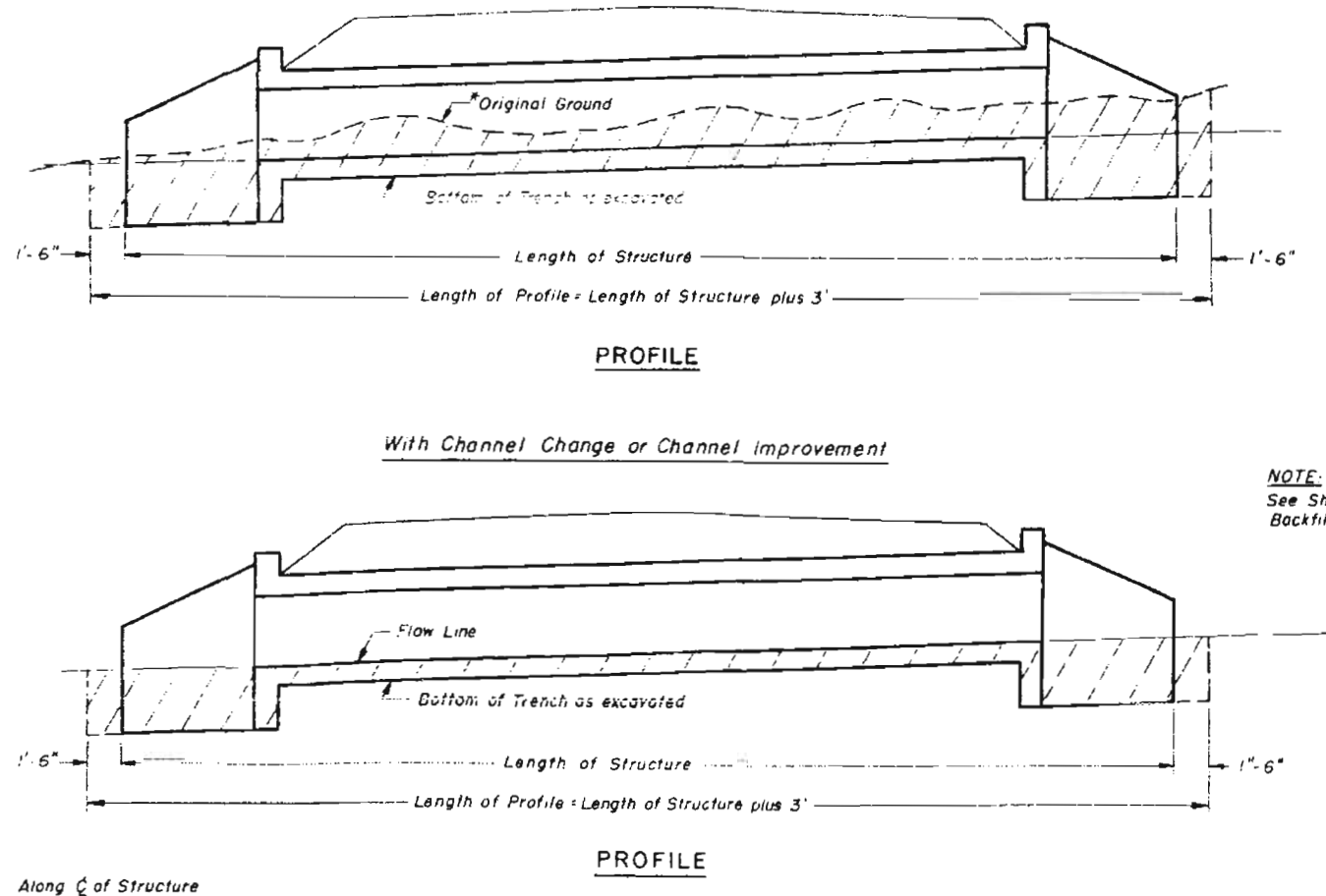
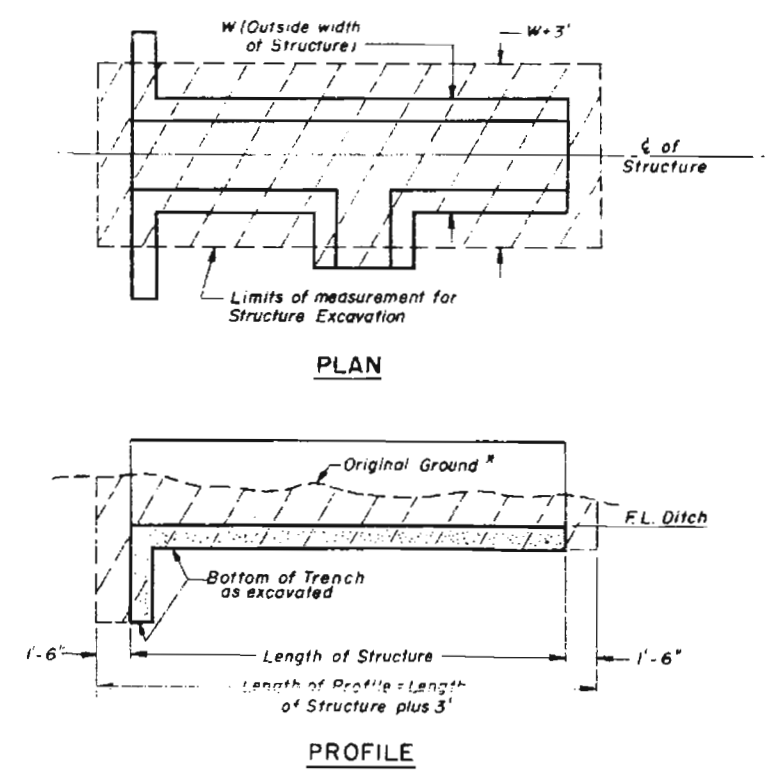
## STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



## STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS



## STRUCTURE EXCAVATION MEASUREMENT FOR DIVERSION OR DIVISION BOXES



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

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

Areas to be used for Structure Excavation computations.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

EXCAVATION AND BACKFILL FOR STRUCTURES

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

SINGLE CONCRETE BOX CULVERT

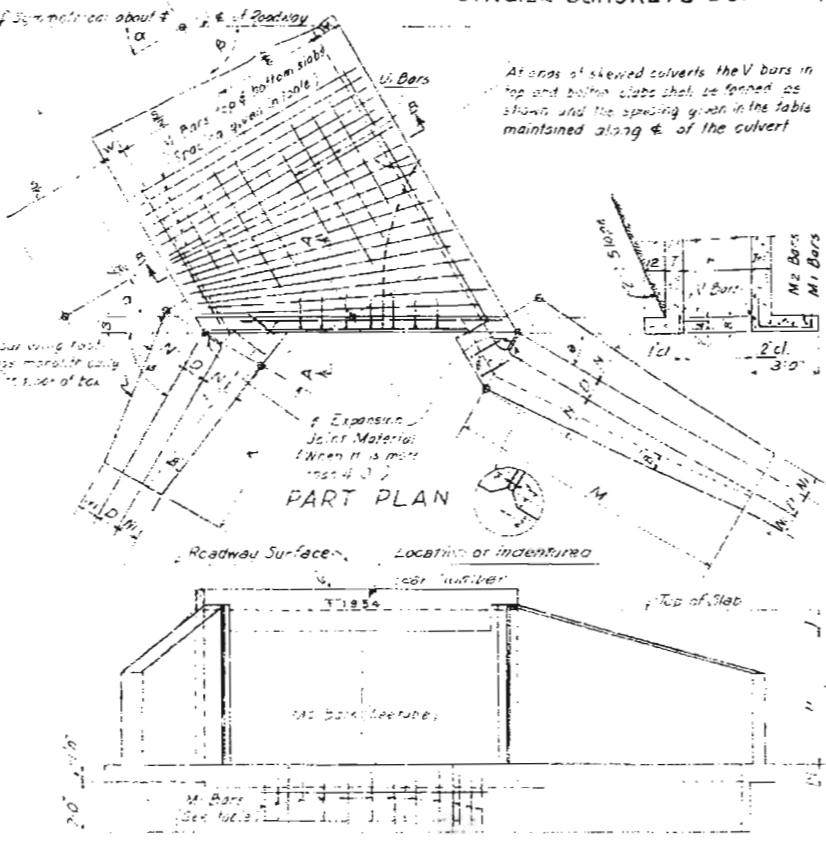
STANDARD M-60I-A

(JULY 1, 1965)

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

Dimensions & Quantities (See Wingwall Standard for Wings)

Height of Fill Allowed	Span	Height	Walls	Wings	Concrete	Steel	Concrete	Steel
35.0	2A	3.0	8	8	1.0	1.0	1.0	1.0
30.0	3A	3.0	7	8	1.0	1.0	1.0	1.0
20.0	4A	4.0	7	8	1.0	1.0	1.0	1.0
16.0	5A	3.0	4	4	1.0	1.0	1.0	1.0
20.0	5B	5.0	8	8	1.0	1.0	1.0	1.0
14.0	6A	6.0	8	8	1.0	1.0	1.0	1.0
20.0	6E	6.0	8	8	1.0	1.0	1.0	1.0
12.0	7A	7.0	9	9	1.0	1.0	1.0	1.0
15.0	7B	10.0	9	9	1.0	1.0	1.0	1.0
20.0	7C	7.0	9	9	1.0	1.0	1.0	1.0
10.0	8A	8.0	10	10	1.0	1.0	1.0	1.0
16.0	8B	8.0	10	10	1.0	1.0	1.0	1.0
20.0	8C	8.0	10	10	1.0	1.0	1.0	1.0
7.0	8A	8.0	10	10	1.0	1.0	1.0	1.0
10.0	8B	8.0	10	10	1.0	1.0	1.0	1.0
13.0	8C	8.0	10	10	1.0	1.0	1.0	1.0
16.0	8D	8.0	10	10	1.0	1.0	1.0	1.0
19.0	8E	8.0	10	10	1.0	1.0	1.0	1.0
22.0	8F	8.0	10	10	1.0	1.0	1.0	1.0
25.0	8G	8.0	10	10	1.0	1.0	1.0	1.0
28.0	8H	8.0	10	10	1.0	1.0	1.0	1.0
31.0	8I	8.0	10	10	1.0	1.0	1.0	1.0
34.0	8J	8.0	10	10	1.0	1.0	1.0	1.0
37.0	8K	8.0	10	10	1.0	1.0	1.0	1.0
40.0	8L	8.0	10	10	1.0	1.0	1.0	1.0
43.0	8M	8.0	10	10	1.0	1.0	1.0	1.0
46.0	8N	8.0	10	10	1.0	1.0	1.0	1.0
49.0	8O	8.0	10	10	1.0	1.0	1.0	1.0
52.0	8P	8.0	10	10	1.0	1.0	1.0	1.0
55.0	8Q	8.0	10	10	1.0	1.0	1.0	1.0
58.0	8R	8.0	10	10	1.0	1.0	1.0	1.0
61.0	8S	8.0	10	10	1.0	1.0	1.0	1.0
64.0	8T	8.0	10	10	1.0	1.0	1.0	1.0
67.0	8U	8.0	10	10	1.0	1.0	1.0	1.0
70.0	8V	8.0	10	10	1.0	1.0	1.0	1.0
73.0	8W	8.0	10	10	1.0	1.0	1.0	1.0
76.0	8X	8.0	10	10	1.0	1.0	1.0	1.0
79.0	8Y	8.0	10	10	1.0	1.0	1.0	1.0
82.0	8Z	8.0	10	10	1.0	1.0	1.0	1.0

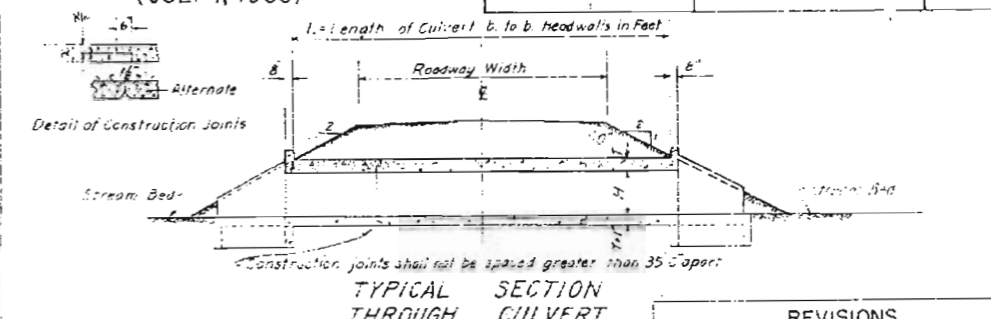


Bar List for Culvert & Headwalls (See Wingwall Standard for Wings)

Mark	Size	No. Req'd	Type	Length
V	See table I	2L	I	5'2W-6
U	See table I	2L	I	4'2T-5
M1	See table II	3	II	3'-6"
M2	See table II	3	II	3'-6"

Possible Combinations (Span & Height)

Span	Height	Span	Height	Span	Height	Span	Height
2' x 2'	5' x 5'	3' x 5'	10' x 7'	11' x 8'	11' x 10'		
3' x 2'	7' x 4'	6' x 6'	9' x 8'	10' x 9'	14' x 8'		
4' x 2'	6' x 5'	7' x 7'	12' x 6'	13' x 7'	13' x 9'		
5' x 3'	5' x 4'	9' x 6'	11' x 7'	12' x 8'	12' x 10'		
4' x 3'	7' x 5'	8' x 7'	13' x 6'	14' x 7'	14' x 9'		
5' x 3'	6' x 6'	10' x 6'	10' x 8'	11' x 9'	13' x 10'		
4' x 4'	8' x 5'	9' x 7'	9' x 9'	10' x 10'	14' x 10'		
5' x 4'	6' x 7'	8' x 8'	12' x 7'	13' x 8'			
6' x 4'	7' x 6'	11' x 6'	14' x 6'	2' x 9'			

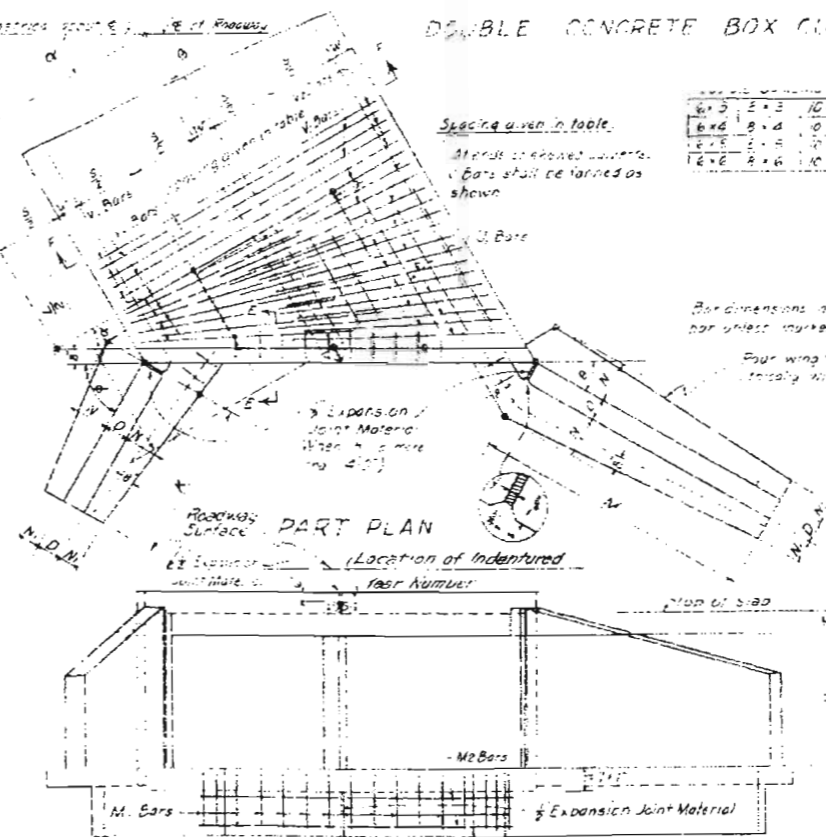


REVISIONS

No.	Description

Dimensions & Quantities (See Wingwall Standard for Wings)

Span	Height	Walls	Wings	Concrete	Steel	Concrete	Steel
10.0	8A	8.0	10	1.0	1.0	1.0	1.0
13.0	8B	8.0	10	1.0	1.0	1.0	1.0
16.0	8C	8.0	10	1.0	1.0	1.0	1.0
19.0	8D	8.0	10	1.0	1.0	1.0	1.0
22.0	8E	8.0	10	1.0	1.0	1.0	1.0
25.0	8F	8.0	10	1.0	1.0	1.0	1.0
28.0	8G	8.0	10	1.0	1.0	1.0	1.0
31.0	8H	8.0	10	1.0	1.0	1.0	1.0
34.0	8I	8.0	10	1.0	1.0	1.0	1.0
37.0	8J	8.0	10	1.0	1.0	1.0	1.0
40.0	8K	8.0	10	1.0	1.0	1.0	1.0
43.0	8L	8.0	10	1.0	1.0	1.0	1.0
46.0	8M	8.0	10	1.0	1.0	1.0	1.0
49.0	8N	8.0	10	1.0	1.0	1.0	1.0
52.0	8O	8.0	10	1.0	1.0	1.0	1.0
55.0	8P	8.0	10	1.0	1.0	1.0	1.0
58.0	8Q	8.0	10	1.0	1.0	1.0	1.0
61.0	8R	8.0	10	1.0	1.0	1.0	1.0
64.0	8S	8.0	10	1.0	1.0	1.0	1.0
67.0	8T	8.0	10	1.0	1.0	1.0	1.0
70.0	8U	8.0	10	1.0	1.0	1.0	1.0
73.0	8V	8.0	10	1.0	1.0	1.0	1.0
76.0	8W	8.0	10	1.0	1.0	1.0	1.0
79.0	8X	8.0	10	1.0	1.0	1.0	1.0
82.0	8Y	8.0	10	1.0	1.0	1.0	1.0
85.0	8Z	8.0	10	1.0	1.0	1.0	1.0



Bar List for Culvert and its Headwalls (See Wingwall Standard for Wings)

Mark	Size	No. Req'd	Type	Length
V	See table I	2L	I	5'2W-6
U	See table I	2L	I	4'2T-5
M1	See table II	3	II	3'-6"
M2	See table II	3	II	3'-6"

Quantities for one culvert shall be quantity for one in ft. of box times L plus quantity for two head walls plus quantities for four wings.

Quantities for one culvert shall be quantity for one in ft. of box times L plus quantity for two head walls plus quantities for four wings.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
SINGLE AND DOUBLE  
CONCRETE BOX CULVERTS

Designed by W.W.D. Approved by W.W.D. *W.W.D. Kambell*  
Made by W.W.D. Bridge Engineer  
Checked by T.M. Date: July 1, 1965

# STANDARD M-601-C

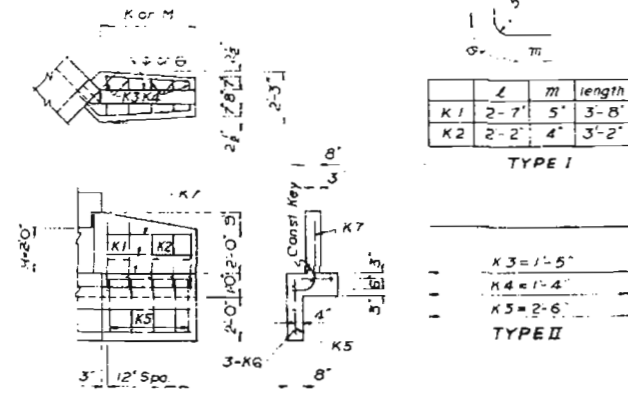
(SHEET 1 OF 2 SHEETS)  
(JULY 1, 1965)

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

TABLE SHOWING VALUES OF K & M WHEN "B" & "H" ARE GIVEN

B	α	φ	θ	H=2-0'		H=3-0'		H=4-0'		H=5-0'		H=6-0'	
				K	M	K	M	K	M	K	M	K	M
45°	45°	67°30'	22°30'	3-1	8-0	4-6	11-0	6-0	14-9	7-6	18-0	8-3	21-0
60°	30°	60°	30°	3-6	6-0	5-0	9-6	6-8	11-3	8-0	4-0	9-3	16-0
75°	15°	52°30'	37°30'	3-9	5-0	5-6	7-0	7-3	9-3	8-9	11-6	10-0	13-3
90°	0°	45°	45°	4-3	4-3	8-0	6-0	5-0	8-0	10-0	10-0	11-6	11-6
105°	15°	37°30'	52°30'	5-0	3-9	7-0	5-6	9-3	7-3	11-6	8-9	13-3	10-0
120°	30°	30°	60°	6-0	3-6	8-6	5-0	3	6-6	14-0	8-0	16-0	9-3
135°	45°	22°30'	67°30'	8-0	3-3	11-0	4-6	4-9	6-0	8-0	7-6	21-0	8-3

B equals the angle between φ of culvert & φ of roadway, α equals the angle between φ of culvert and a normal to φ of roadway, φ and θ are angles between the wingwall and a line parallel with the φ of roadway.  
EXAMPLE FOR USING THE ABOVE TABLE: Suppose a stream makes an angle of B=65° with the φ of roadway, then from the table select the nearest angle B=60° then α, φ, θ equal 30°, 60° & 30° respectively. If the desired height "H" of culvert is 6'-0", then K & M will be 9'-5" and 16'-0". Locate the WING DETAIL WHEN H=6'-0" on this sheet.



When φ or θ equals	l	m	length
K1	2-7'	5'	3-8'
K2	2-2'	4'	3-2'

TYPE I

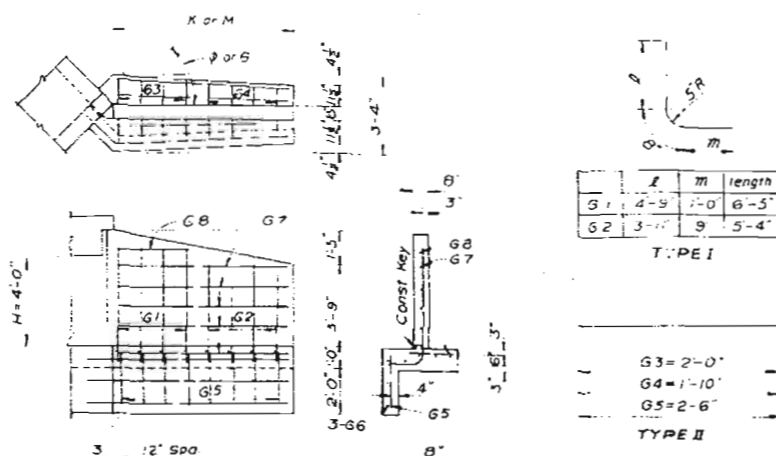
When φ or θ equals	l	m	length
K3	1-5'		
K4	1-4'		
K5	2-6'		

TYPE II

BAR LIST & QUANTITIES FOR ONE WING WHEN H=2-0'

When φ or θ equals	Number of bars required								Length of bars		Quantities for One Wing	
	K1	K2	K3	K4	K5	3-K6	4-K7	4-K7	Concrete	Steel	Cu.Yd.	Lb.
22°30'	4	4	4	4	8	9-10'	7-8'	1.47	80			
30°	3	3	3	3	6	7-4'	5-8'	1.10	59			
37°30'	3	2	3	2	5	6-1'	4-8'	0.92	50			
45°	2	3	2	3	5	5-2'	3-11'	0.78	45			
52°30'	2	2	2	2	4	5-7'	3-5'	0.69	39			
60°	2	2	2	2	4	4-6'	3-2'	0.64	37			
67°30'	2	2	2	2	4	4-0'	2-1'	0.60	36			

WING DETAIL WHEN H=2-0'



When φ or θ equals	l	m	length
G1	4-9'	1-0'	6-5'
G2	3-1'	9	5-4'

TYPE I

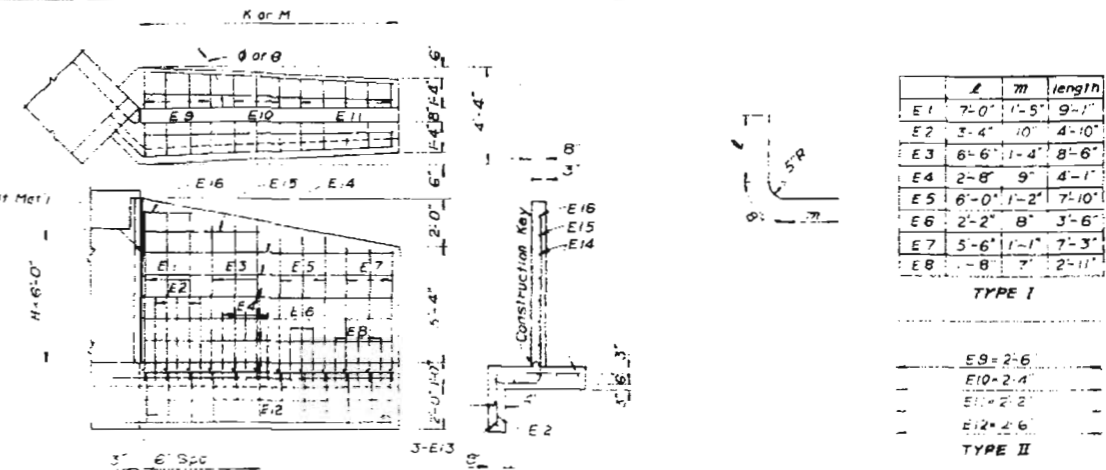
When φ or θ equals	l	m	length
G3	2-0'		
G4	1-10'		
G5	2-6'		

TYPE II

BAR LIST & QUANTITIES FOR ONE WING WHEN H=4-0'

When φ or θ equals	Number of bars required								Length of bars		Quantities for One Wing	
	G1	G2	G3	G4	G5	3-G6	8-G7	1-G8	Concrete	Steel	Cu.Yd.	Lb.
22°30'	6	9	6	9	15	17-4'	14-5'	5-2'	3.97	21.9		
30°	5	7	5	7	12	13-2'	10-1'	4-2'	3.03	17.0		
37°30'	4	6	4	6	10	10-10'	8-11'	3-2'	2.49	14.1		
45°	4	4	4	4	8	9-4'	7-8'	3-2'	2.5	14.8		
52°30'	3	5	3	5	8	9-0'	6-11'	2-2'	1.95	12		
60°	3	4	3	4	7	7-10'	6-2'	2-2'	1.75	9.9		
67°30'	3	3	3	3	6	7-0'	5-2'	2-2'	1.6	8.8		

WING DETAIL WHEN H=4-0'



When φ or θ equals	l	m	length
E1	7-0'	1-5'	9-1'
E2	3-4'	10	4-10'

When φ or θ equals	l	m	length
E3	6-6'	1-4'	8-6'
E4	2-8'	9	4-1'
E5	6-0'	1-2'	7-10'
E6	2-2'	8	3-6'
E7	5-6'	1-1'	7-3'
E8	8	7	2-11'

TYPE I

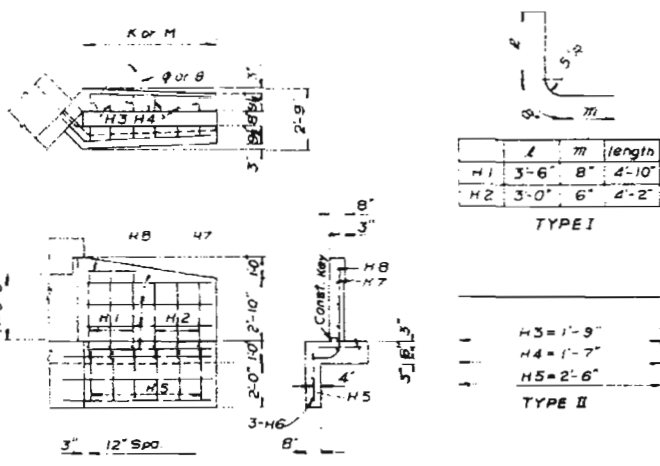
When φ or θ equals	l	m	length
E9	2-6'		
E10	2-4'		
E11	2-2'		
E12	2-6'		

TYPE II

BAR LIST & QUANTITIES FOR ONE WING WHEN H=6-0'

When φ or θ equals	Number of bars required												Length of bars				Quantities for One Wing	
	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	Concrete	Steel
22°30'	6	5	5	5	5	5	5	5	6	7	8	21	24-3'	20-8'	10-2'	5-2'	7.30	43.0
30°	4	4	4	4	4	4	4	3	5	5	6	16	18-5'	15-8'	7-2'	3-2'	5.56	32.6
37°30'	4	3	3	3	3	3	3	4	4	5	5	4	15-3'	12-1'	6-2'	3-2'	4.60	27.8
45°	3	3	3	3	3	3	3	4	4	5	5	12	13-2'	10-1'	5-2'	2-2'	3.99	24.0
52°30'	3	2	2	2	2	2	2	3	3	4	3	10	12-1'	9-8'	4-2'	2-2'	3.47	20.2
60°	3	2	2	2	2	2	2	3	3	3	3	10	10-10'	8-1'	4-2'	2-2'	3.21	19.4
67°30'	3	2	2	2	2	2	2	2	3	3	3	9	9-11'	8-5'	4-2'	2-2'	3.04	18.0

WING DETAIL WHEN H=6-0'



When φ or θ equals	l	m	length
H1	3-6'	8	4-10'
H2	3-0'	6	4-2'

TYPE I

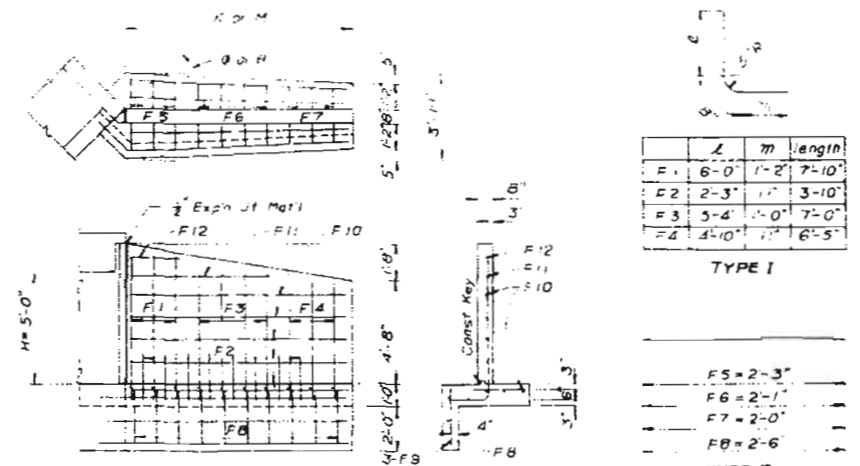
When φ or θ equals	l	m	length
H3	1-9'		
H4	1-7'		
H5	2-6'		

TYPE II

BAR LIST & QUANTITIES FOR ONE WING WHEN H=3-0'

When φ or θ equals	Number of bars required								Length of bars		Quantities for One Wing	
	H1	H2	H3	H4	H5	3-H6	5-H7	1-H8	Concrete	Steel	Cu.Yd.	Lb.
22°30'	6	5	6	5	11	13-2'	10-8'	5-2'	2.47	13.1		
30°	5	4	5	4	9	10-2'	8-2'	4-2'	1.91	10.4		
37°30'	4	3	4	3	7	8-4'	6-8'	3-2'	1.57	8.2		
45°	3	3	3	3	6	7-1'	5-2'	2-2'	1.35	7.2		
52°30'	3	3	3	3	6	7-0'	5-2'	2-2'	1.23	6.8		
60°	3	2	3	2	5	6-2'	4-8'	2-2'	1.12	5.9		
67°30'	3	2	3	2	5	5-4'	4-2'	2-2'	1.01	5.6		

WING DETAIL WHEN H=3-0'



When φ or θ equals	l	m	length
F1	6-0'	1-2'	7-10'
F2	2-3'	11	3-10'

TYPE I

When φ or θ equals	l	m	length
F3	3-4'	10	7-0'
F4	4-10'	11	6-5'

TYPE II

BAR LIST & QUANTITIES FOR ONE WING WHEN H=5-0'

When φ or θ equals	Number of bars required												Length of bars				Quantities for One Wing	
	F1	F2	F3	F4	F5	F6	F7	F8	3-F9	8-F10	1-F11	1-F12	Concrete	Steel	Cu.Yd.	Lb.		
22°30'	8	14	7	5	6	7	5	18	20-11'	17-8'	12-2'	5-2'	5.61	32.8				
30°	5	11	5	4	5	5	4	14	16-2'	13-8'	9-2'	4-2'	4.36	25.4				
37°30'	4	4	4	4	4	4	4	12	13-3'	11-2'	7-2'	3-2'	3.58	21.1				
45°	3	8	4	3	3	4	3	10	11-6'	9-8'	6-2'	2-2'	3.11	18.0				
52°30'	3	7	3	3	3	3	3	9	10-8'	8-5'	5-2'	2-2'	2.72	16.0				
60°	3	6	2	3	3	3	3	8	9-6'	7-8'	4-2'	2-2'	2.49	14.3				
67°30'	3	6	3	2	3	3	2	8	8-7'	7-2'	5-2'	2-2'	2.33	14.0				

WING DETAIL WHEN H=5-0'

LOADING DATA INTERSTATE ALTERNATE  
LIVE LOAD: A.A.S.H.O. (HS 20-44)  
DEAD LOAD: CONCRETE 150 POUNDS PER CUBIC FOOT  
EARTH 84 POUNDS PER CUBIC FOOT

DESIGNING DATA  
A.A.S.H.O. 1953 UNIT STRESS EXCEPT AS NOTED  
Reinforcing Steel: f<sub>s</sub> 200,000 LBS PER SQ. IN.  
Structural Steel: f<sub>c</sub> 180,000 LBS PER SQ. IN.  
f<sub>c</sub> 12,000 LBS PER SQ. IN.  
n 10

REVISIONS		
7-17-67	General Note	M.R.H.

GENERAL NOTES  
ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT  
ALL CONCRETE SHALL BE CLASS "A"  
ALL WING SURFACES TO RECEIVE CLASS "1" FINISH  
WING FOOTINGS & FLOOR OF BOX SHALL BE POURED MONOLITHICALLY  
FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED  
SOUNDING AND DEPTH OF FOOTINGS SHOWN ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF RE-DESIGN IS NECESSARY  
ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE NUMBER DESIGNATION AND THE STATION NUMBER OF THE PROJECT. SECONDARY BARS WHEN SPICED SHALL LAP IT DIAMETERS OF THE BAR. DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTER LINE OF THE BAR. OUT TO OUT DIMENSIONS SHALL BE USED ON BAR BENDING DETAILS.  
SUPPORTING SOILS FOR ALL CULVERTS MUST BE COMPOSED OF FIRM AND UNIFORM MATERIAL THROUGHOUT. HORIZONTAL CONSTRUCTION KEYS ARE NOT REQUIRED WHEN FOOTING AND WALL ARE POURED MONOLITHICALLY. ALL CONSTRUCTION KEYS SHOWN BETWEEN FOOTINGS AND WALLS ARE 3" X 3"  
STEEL WEIGHTS INCLUDE 1% ± FOR OVERRUN  
EXPANSION JOINT MATERIAL IS TO BE INCLUDED IN THE PRICE OF CLASS "A" CONCRETE AND SHALL CONFORM TO A.A.S.H.O. SPECIFICATION M-153-52 TYPE III  
FOR CULVERTS REQUIRED AND GOVERNING DIMENSIONS SEE "LIST OF STRUCTURES"  
WHEN EXCAVATING FOR FOOTINGS THE FINAL SURFACE ELEVATION SHALL BE UNDISTURBED NATURAL OR COMPACTED SOIL.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
WINGWALLS FOR  
CONCRETE BOX CULVERTS  
4:1 SIDE SLOPES

Across Sta. \_\_\_\_\_ Sec. \_\_\_\_\_ T. \_\_\_\_\_ R. \_\_\_\_\_  
Near \_\_\_\_\_  
Designed by \_\_\_\_\_ Approved by \_\_\_\_\_  
Made by \_\_\_\_\_ Bridge Engineer  
Checked by \_\_\_\_\_ Date: July 1, 1965

# STANDARD M-601-C

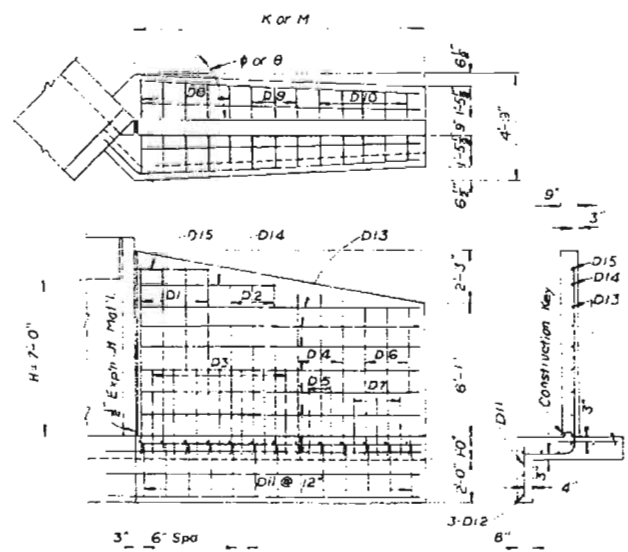
(SHEET 2)  
(JULY 1, 1965)

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

TABLE SHOWING VALUES OF K & M WHEN  $\theta$  &  $\phi$  ARE GIVEN

$\theta$	$\alpha$	$\phi$	$\beta$	H=7'-0"		H=8'-0"		H=9'-0"		H=10'-0"	
				K	M	K	M	K	M	K	M
45°	45°	67°30'	22°30'	10'-0"	23'-9"	11'-0"	26'-9"	12'-3"	29'-6"	13'-6"	32'-3"
60°	30°	60°	30°	10'-6"	18'-3"	11'-9"	20'-6"	13'-0"	23'-9"	14'-3"	24'-9"
75°	15°	57°30'	37°30'	11'-6"	15'-0"	13'-0"	16'-9"	14'-3"	18'-6"	15'-9"	20'-3"
90°	0°	45°	45°	13'-0"	13'-0"	14'-6"	14'-6"	16'-0"	16'-0"	17'-6"	17'-6"
105°	15°	37°30'	52°30'	15'-0"	11'-6"	16'-9"	13'-0"	18'-6"	14'-3"	20'-3"	15'-9"
120°	30°	30°	60°	18'-3"	10'-6"	20'-6"	11'-9"	23'-9"	3'-0"	24'-9"	14'-3"
135°	45°	22°30'	67°30'	23'-9"	10'-0"	26'-9"	11'-0"	29'-6"	12'-3"	32'-3"	13'-6"

$\theta$  equals the angle between  $\Sigma$  of culvert and  $\Sigma$  of roadway,  $\alpha$  equals the angle between  $\Sigma$  of culvert and a normal to  $\Sigma$  of roadway,  $\phi$  and  $\beta$  are angles between the wingwall and a line parallel with the  $\Sigma$  of roadway.  
EXAMPLE FOR USING THE ABOVE TABLE: Suppose a stream makes an angle of  $\theta=65^\circ$  with  $\Sigma$  of roadway, then, from the table, select the nearest angle  $\theta=60^\circ$ ; then  $\alpha, \beta$  equal  $30^\circ, 60^\circ$  respectively. If the desired height "h" of culvert is 8'-0", then "K" & "M" will be 11'-9" & 20'-6". Locate the WING DETAIL WHEN H=8'-0" on this sheet.



D	ℓ	m	length
D1	7'-11"	1'-8"	10'-3"
D2	7'-4"	1'-6"	9'-6"
D3	3'-4"	1'-0"	5'-0"
D4	6'-9"	1'-5"	8'-10"
D5	2'-8"	1'-0"	4'-2"
D6	6'-3"	1'-3"	8'-2"
D7	2'-2"	9"	3'-7"

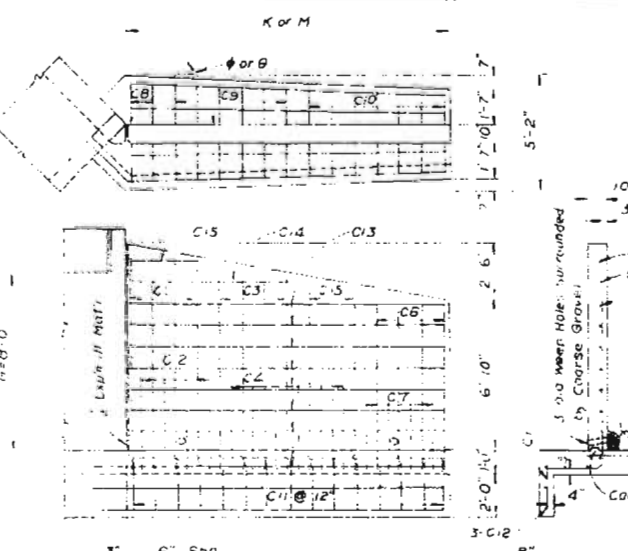
TYPE I

D8 = 2'-8"
D9 = 2'-6"
D10 = 2'-4"
D11 = 2'-6"

TYPE II

When $\theta$ or $\phi$ equals	Number of bars required										Length of bars					Quantities for One Wing	
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	3-D12	1-D13	1-D14	1-D15	Concrete Cu Yd.	Steel Lb.
22°30'	7	6	12	6	6	5	8	7	9	24	27	4	23-5	12-2	6-2	9.62	592
30°	5	5	9	5	5	4	6	6	7	19	20-11	17-11	9-2	4-2	7.39	457	
37°30'	4	4	6	4	3	3	5	5	5	15	17-2	14-6	7-2	3-2	6.07	368	
45°	4	3	7	3	2	3	5	3	5	13	14-10	12-8	6-2	3-2	5.26	321	
52°30'	3	3	6	3	2	3	4	4	4	11	13-0	10-2	5-2	2-2	4.66	287	
60°	3	3	5	3	2	2	4	3	4	11	12-3	10-2	5-2	2-2	4.25	262	
67°30'	3	3	5	2	2	2	4	3	3	10	11-4	9-8	5-2	2-2	4.05	245	

BAR LIST & QUANTITIES FOR ONE WING WHEN H=7'-0"



C	ℓ	m	length
C1	8'-10"	1'-11"	11'-5"
C2	3'-8"	1'-2"	5'-6"
C3	8'-3"	1'-9"	10'-8"
C4	3'-4"	1'-0"	5'-0"
C5	7'-8"	1'-8"	10'-0"
C6	7'-0"	1'-6"	9'-2"
C7	2'-7"	11"	4'-2"

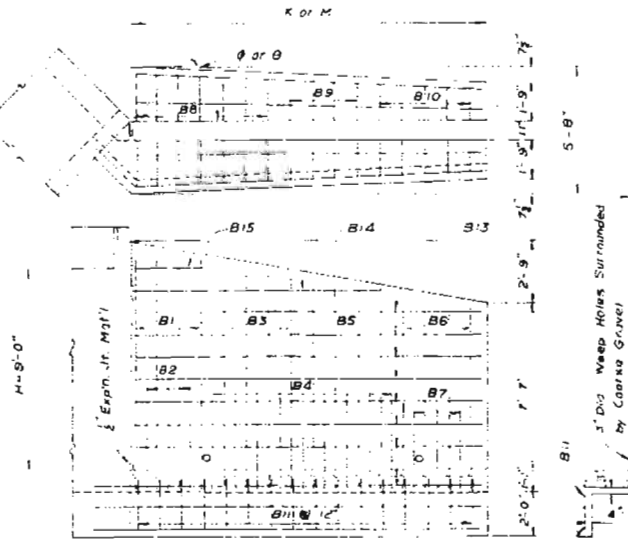
TYPE I

C8 = 5'-0"
C9 = 2'-9"
C10 = 2'-6"
C11 = 2'-6"

TYPE II

When $\theta$ or $\phi$ equals	Number of bars required										Length of bars					Quantities for One Wing	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	3-A11	1-A12	1-A13	1-A14	Concrete Cu Yd.	Steel Lb.	
22°30'	9	16	8	8	16	9	10	12	13	36-10	31-11	16-2	8-2	19.74	1224		
30°	7	12	6	6	12	6	10	8	11	28-2	24-5	12-2	6-2	15.44	930		
37°30'	6	10	5	5	10	5	6	7	8	23-1	19-11	10-2	5-2	12.39	775		
45°	5	9	4	4	8	4	5	6	6	19-5	17-2	8-2	4-2	10.71	665		
52°30'	5	8	3	3	7	4	5	6	5	18-9	15-5	7-2	4-2	9.63	597		
60°	4	7	3	3	7	4	4	6	5	16-6	13-1	7-2	3-2	8.72	543		
67°30'	4	7	3	3	6	3	4	5	5	15-2	12-2	6-2	3-2	8.26	515		

BAR LIST & QUANTITIES FOR ONE WING WHEN H=10'-0"



B	ℓ	m	length
B1	9'-11"	2'-3"	12'-10"
B2	4'-2"	1'-4"	6'-2"
B3	9'-2"	2'-0"	11'-11"
B4	3'-11"	1'-3"	5'-10"
B5	8'-5"	1'-10"	10'-11"
B6	7'-9"	1'-9"	10'-2"
B7	3'-7"	1'-1	4'-10"

TYPE I

B8 = 3'-3"
B9 = 2'-9"
B10 = 2'-7"
B11 = 2'-6"

TYPE II

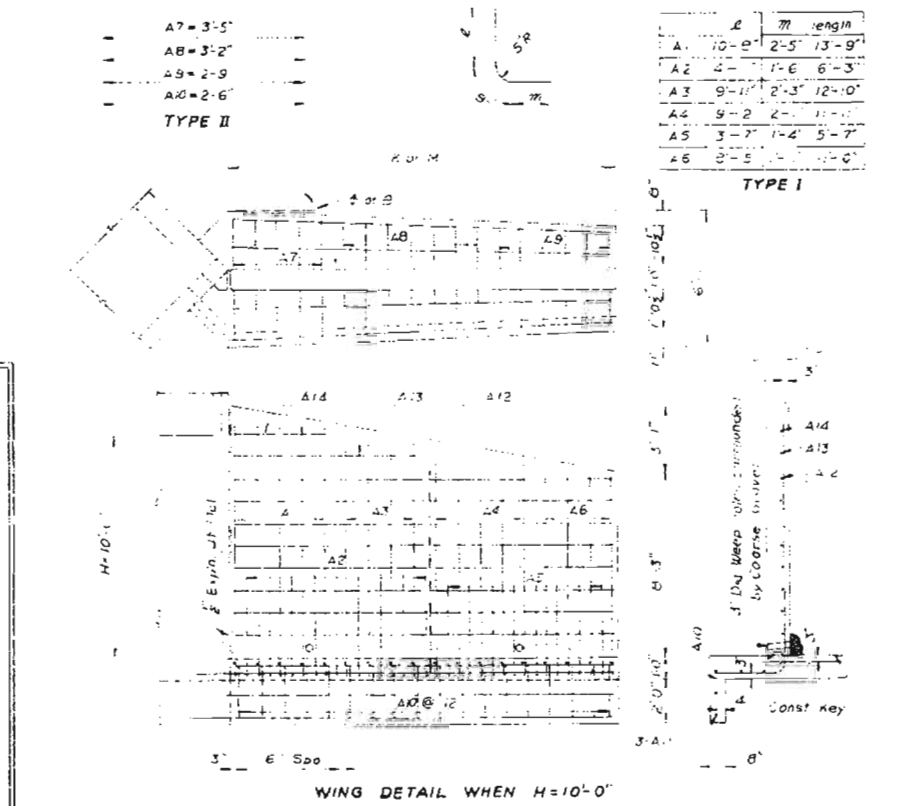
When $\theta$ or $\phi$ equals	Number of bars required										Length of bars					Quantities for One Wing	
	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	3-C12	1-C13	1-C14	1-C15	Concrete Cu Yd.	Steel Lb.	
22°30'	8	7	6	12	6	7	5	10	12	27	30-8	26-5	13-2	7-2	12.53	779	
30°	6	5	5	10	4	6	5	4	7	10	23-5	20-2	10-2	5-2	9.60	603	
37°30'	5	4	4	8	4	4	4	3	6	8	19-1	16-5	8-2	4-2	7.84	517	
45°	4	4	4	6	3	4	4	2	6	7	16-6	14-3	7-2	3-2	6.13	424	
52°30'	4	3	3	6	3	3	3	2	5	6	15-6	13-0	6-2	2-2	5.73	374	
60°	4	3	2	6	3	3	2	2	4	6	13-8	11-5	5-2	3-2	5.50	344	
67°30'	3	3	3	5	2	3	2	2	4	5	12-5	10-8	5-2	2-2	5.13	315	

BAR LIST & QUANTITIES FOR ONE WING WHEN H=8'-0"

When $\theta$ or $\phi$ equals	Number of bars required										Length of bars					Quantities for One Wing	
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	3-B12	1-B13	1-B14	1-B15	Concrete Steel Cu Yd. Lb.	
22°30'	7	6	8	16	8	7	7	13	8	9	33-9	28-2	22-2	6-2	15.93	930	
30°	5	5	7	13	6	6	5	10	7	7	24	27-0	23-5	17-2	4-2	12.82	742
37°30'	4	4	5	10	5	5	4	9	5	6	19	21-1	18-2	13-2	3-2	9.99	580
45°	4	3	4	9	4	4	3	7	4	5	16	18-2	15-8	11-2	3-2	8.63	495
52°30'	3	3	4	8	4	4	3	6	4	5	17-0	13-1	10-2	2-2	7.69	453	
60°	3	3	4	7	3	3	2	6	3	4	15-1	12-8	9-2	2-2	7.01	406	
67°30'	3	2	3	7	4	3	3	5	3	3	13-3	11-1	8-2	2-2	6.81	385	

BAR LIST & QUANTITIES FOR ONE WING WHEN H=9'-0"

WING DETAIL WHEN H=9'-0"



WING DETAIL WHEN H=10'-0"

REVISIONS	

**DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO**

WINGWALLS FOR  
CONCRETE BOX CULVERTS  
4:1 SIDE SLOPES

Access: \_\_\_\_\_ Sta: \_\_\_\_\_

Near: \_\_\_\_\_ Sec: \_\_\_\_\_ T: \_\_\_\_\_ R: \_\_\_\_\_

Designed by: \_\_\_\_\_ Approved by: \_\_\_\_\_  
Made by: \_\_\_\_\_ Bridge Engineer  
Checked by: \_\_\_\_\_ Date: July 1, 1965

STRUCTURE NO.

# STANDARD M-60I-D

(JULY 1, 1965)

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.		
REVISIONS			
7-17-67 General Note M.R.H.			

TABLE SHOWING VALUES OF K AND M WHEN  $\beta$  AND H ARE GIVEN

$\beta$	$\alpha$	$\theta$	H=2'-0"		H=3'-0"		H=4'-0"		H=5'-0"		H=6'-0"		H=7'-0"		H=8'-0"		H=9'-0"		H=10'-0"		
			K	M	K	M	K	M	K	M	K	M	K	M	K	M	K	M	K	M	
45°	45°	67°30'	2.2	2.4	6.2	3.7	8.7	4.1	11.7	5.1	14.2	6.1	16.5	7.3	18.8	8.3	20.1	9.3	22.8	10.3	25.6
60°	30°	60°	2.9	2.9	4.9	3.0	6.7	5.2	8.4	6.3	10.1	7.3	12.7	8.3	14.5	9.3	16.3	10.3	17.9	11.3	19.6
75°	15°	52°30'	3.0	3.0	3.1	4.2	5.5	5.7	7.3	6.4	8.1	8.1	10.4	9.0	11.3	10.4	12.7	11.4	14.7	13.9	16.0
90°	0°	45°	3.4	3.4	4.4	4.8	6.3	6.3	7.8	7.8	8.8	11.1	10.2	11.4	11.4	14.7	13.9	16.0	13.9	16.0	13.9
105°	15°	37°30'	3.1	3.1	3.0	5.5	4.2	7.3	5.7	8.4	10.4	7.3	12.7	11.3	14.5	10.3	17.9	11.3	19.6	11.3	19.6
120°	30°	60°	4.9	2.9	6.7	3.0	8.7	5.2	11.7	6.3	14.2	7.3	16.5	8.3	18.8	9.3	20.1	9.3	22.8	10.3	25.6
135°	45°	22°30'	6.2	2.4	8.7	3.7	11.7	4.1	14.2	5.1	16.5	6.1	18.8	7.3	20.1	8.3	22.8	9.3	25.6	10.3	25.6

B EQUALS THE ANGLE BETWEEN  $\theta$  OF CULVERT AND  $\theta$  OF ROADWAY.  $\alpha$  EQUALS THE ANGLE BETWEEN  $\theta$  OF CULVERT AND A NORMAL TO  $\theta$  OF ROADWAY.  $\beta$  AND  $\theta$  ARE ANGLES BETWEEN THE NORMAL AND A LINE PARALLEL WITH THE CENTER LINE OF ROADWAY. EXAMPLE FOR USING THE ABOVE TABLE: SUPPOSE A STREAM MAKES AN ANGLE OF  $8.65^\circ$  WITH THE CENTER LINE OF ROADWAY. THEN, FROM THE TABLE SELECT THE NEAREST ANGLE  $\theta = 60^\circ$ . THEN  $\beta$  AND  $\alpha$  EQUAL  $30^\circ$ ,  $60^\circ$  AND  $90^\circ$  RESPECTIVELY. IF THE DESIRED HEIGHT "H" OF CULVERT IS 8'-0", THEN "K" AND "M" WILL BE "3.1" AND "3.0". LOCATE THE WING DEPTH WHEN H=8'-0" ON THIS SHEET.

BAR LIST & QUANTITIES FOR ONE WING WHEN H=2'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing			
			Concrete/Steel			
22°30'	4	3	8	2.2	1.07	64
30°	3	3	6	1.2	0.82	47
37°30'	2	2	5	0.8	0.68	40
45°	2	2	4	0.57	0.57	36
52°30'	2	2	4	0.52	0.52	33
60°	2	2	4	0.48	0.48	28
67°30'	2	2	4	0.40	0.40	26

BAR LIST & QUANTITIES FOR ONE WING WHEN H=5'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing									
			Concrete/Steel									
22°30'	5	5	6	7	8	17	17.3	13.1	9.2	4.2	4.06	237
30°	3	4	5	5	6	13	13.3	10.6	7.2	3.2	3.10	180
37°30'	3	3	4	4	5	11	11.0	8.7	5.2	2.2	2.55	147
45°	2	3	3	4	4	9	9.6	7.4	5.2	2.2	2.20	130
52°30'	2	2	3	3	4	8	8.6	6.6	4.2	2.2	1.96	113
60°	2	2	3	3	4	7	7.9	5.1	4.2	2.2	1.79	109
67°30'	2	2	3	3	4	7	7.3	5.7	3.2	1.2	1.63	97

BAR LIST & QUANTITIES FOR ONE WING WHEN H=8'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing										
			Concrete/Steel										
22°30'	4	4	5	6	7	15	24.2	20.6	16.2	12.2	7.2	900	526
30°	3	4	4	5	6	13	19.0	15.8	12.2	9.2	5.2	6.91	402
37°30'	2	3	3	4	5	12	16.0	12.0	10.2	7.2	4.2	5.69	330
45°	2	3	3	4	5	11	14.0	11.0	9.2	6.2	3.2	4.89	287
52°30'	2	2	3	3	4	10	12.0	9.9	7.2	5.2	3.2	4.35	257
60°	2	2	3	3	4	9	11.0	8.1	7.2	5.2	3.2	3.99	242
67°30'	2	2	2	2	3	8	10.3	8.4	6.9	4.6	2.4	3.74	228

TABLE SHOWING VALUES OF K AND M WHEN  $\beta$  AND H ARE GIVEN

When  $\theta$  or  $\beta$  equals

$\theta$	$\beta$	K	M
22°30'	4	3	8
30°	3	4	6
37°30'	2	5	5
45°	2	6	4
52°30'	2	7	3
60°	2	8	3
67°30'	2	9	2

BAR LIST & QUANTITIES FOR ONE WING WHEN H=3'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing				
			Concrete/Steel				
22°30'	4	4	5	4	2	1.78	99
30°	3	4	4	3	2	1.36	76
37°30'	3	3	3	2	1	0.97	54
45°	2	3	3	2	1	0.86	52
52°30'	2	2	2	2	1	0.79	44
60°	2	2	2	2	1	0.74	43
67°30'	2	2	2	2	1	0.74	43

BAR LIST & QUANTITIES FOR ONE WING WHEN H=6'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing									
			Concrete/Steel									
22°30'	5	5	6	7	8	17	19.9	16.1	12.3	8.2	5.21	317
30°	3	4	4	5	6	13	15.0	12.3	9.2	5.2	3.99	243
37°30'	3	3	3	4	5	12	12.6	10.0	7.2	4.2	3.28	203
45°	2	3	3	4	5	11	10.9	8.7	5.2	3.2	2.83	171
52°30'	2	2	3	3	4	10	9.8	7.4	4.2	2.2	2.51	156
60°	2	2	2	3	3	9	8.9	6.7	3.2	1.2	2.30	145
67°30'	2	2	2	2	3	8	8.3	6.3	2.2	1.2	2.17	134

BAR LIST & QUANTITIES FOR ONE WING WHEN H=9'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing										
			Concrete/Steel										
22°30'	6	6	7	8	9	18	24.2	20.6	16.2	12.2	7.2	900	526
30°	4	5	5	6	7	15	19.0	15.8	12.2	9.2	5.2	6.91	402
37°30'	3	4	4	5	6	13	16.0	12.0	10.2	7.2	4.2	5.69	330
45°	3	4	4	5	6	12	14.0	11.0	9.2	6.2	3.2	4.89	287
52°30'	2	3	3	4	5	11	12.0	9.9	7.2	5.2	3.2	4.35	257
60°	2	3	3	4	5	10	11.0	8.1	7.2	5.2	3.2	3.99	242
67°30'	2	2	2	3	3	9	10.3	8.4	6.9	4.6	2.4	3.74	228

TABLE SHOWING VALUES OF K AND M WHEN  $\beta$  AND H ARE GIVEN

When  $\theta$  or  $\beta$  equals

$\theta$	$\beta$	K	M
22°30'	4	3	8
30°	3	4	6
37°30'	2	5	5
45°	2	6	4
52°30'	2	7	3
60°	2	8	3
67°30'	2	9	2

BAR LIST & QUANTITIES FOR ONE WING WHEN H=4'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing										
			Concrete/Steel										
22°30'	6	6	6	7	8	18	24.2	20.6	16.2	12.2	7.2	900	526
30°	4	5	5	6	7	15	19.0	15.8	12.2	9.2	5.2	6.91	402
37°30'	3	4	4	5	6	13	16.0	12.0	10.2	7.2	4.2	5.69	330
45°	3	4	4	5	6	12	14.0	11.0	9.2	6.2	3.2	4.89	287
52°30'	2	3	3	4	5	11	12.0	9.9	7.2	5.2	3.2	4.35	257
60°	2	3	3	4	5	10	11.0	8.1	7.2	5.2	3.2	3.99	242
67°30'	2	2	2	3	3	9	10.3	8.4	6.9	4.6	2.4	3.74	228

BAR LIST & QUANTITIES FOR ONE WING WHEN H=7'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing									
			Concrete/Steel									
22°30'	5	5	6	7	8	17	19.9	16.1	12.3	8.2	5.21	317
30°	3	4	4	5	6	13	15.0	12.3	9.2	5.2	3.99	243
37°30'	3	3	3	4	5	12	12.6	10.0	7.2	4.2	3.28	203
45°	2	3	3	4	5	11	10.9	8.7	5.2	3.2	2.83	171
52°30'	2	2	3	3	4	10	9.8	7.4	4.2	2.2	2.51	156
60°	2	2	2	3	3	9	8.9	6.7	3.2	1.2	2.30	145
67°30'	2	2	2	2	3	8	8.3	6.3	2.2	1.2	2.17	134

BAR LIST & QUANTITIES FOR ONE WING WHEN H=10'-0"

When $\theta$ or $\beta$ equals	Number of Bars Required	Length of Bars	Quantities for One Wing										
			Concrete/Steel										
22°30'	6	6	7	8	9	18	24.2	20.6	16.2	12.2	7.2	900	526
30°	4	5	5	6	7	15	19.0	15.8	12.2	9.2	5.2	6.91	402
37°30'	3	4	4	5	6	13	16.0	12.0	10.2	7.2	4.2	5.69	330
45°	3	4	4	5	6	12	14.0	11.0	9.2	6.2	3.2	4.89	287
52°30'	2	3	3	4	5	11	12.0	9.9	7.2	5.2	3.2	4.35	257
60°	2	3	3	4	5	10	11.0	8.1	7.2	5.2	3.2	3.99	242
67°30'	2	2	2	3	3	9	10.3	8.4	6.9	4.6	2.4	3.74	228

TABLE SHOWING VALUES OF K AND M WHEN  $\beta$  AND H ARE GIVEN

When  $\theta$  or  $\beta$  equals

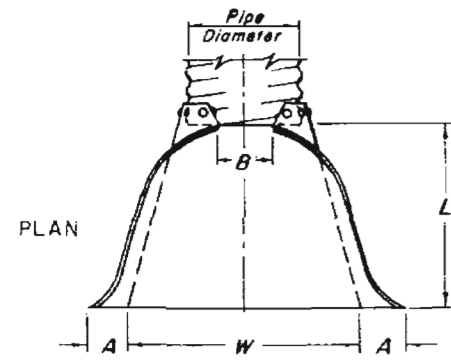
$\theta$	$\beta$	K	M
22°30'	4	3	8
30°	3	4	6
37°30'	2	5	5
45°	2	6	4
52°30'	2	7	3
60°	2	8	3

# STANDARD M-603-CA

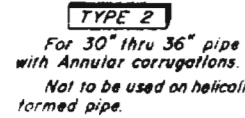
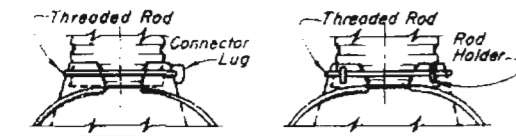
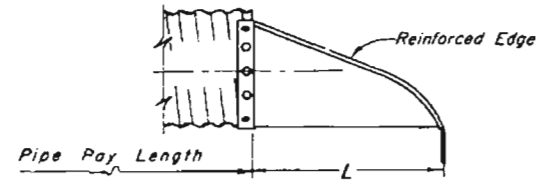
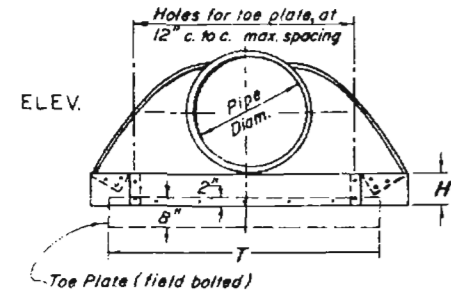
(NOVEMBER 10, 1967)

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.	H (1"±) in.	L (1 1/2"±) in.	W (2"±) 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	84	
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	



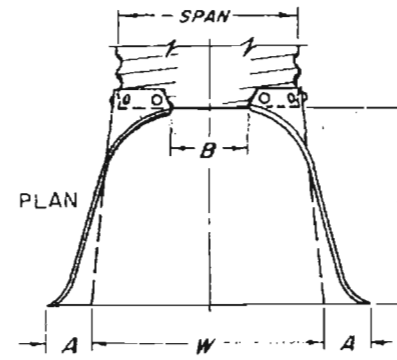
**NOTE:**  
Type 3 connections shall consist of an end section shop attached to a minimum 2 ft. of pipe with galvanized rivets or bolts.

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

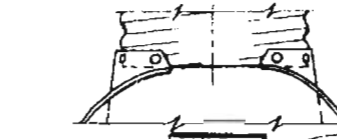
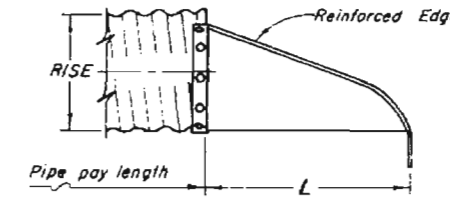
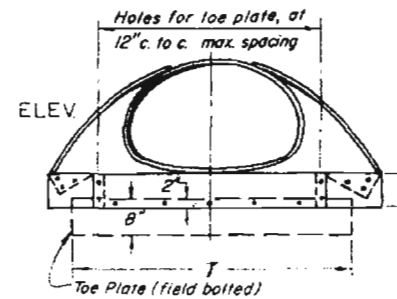
**TYPE 2**  
For 30" thru 36" pipe with Annular corrugations.  
Not to be used on helically formed pipe.

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

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

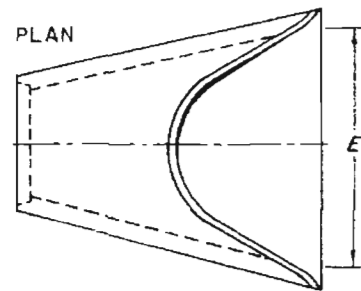


PIPE ARCH SPAN - RISE In. in.	GAGE	D I M E N S I O N S						
		A (1"±) in.	B (Max.) in.	H (1"±) in.	L (1 1/2"±) in.	W (2"±) in.	T in.	
18 x 11	16	7	9	6	19	30	40	
22 x 13	16	7	10	6	23	36	46	
25 x 16	16	8	12	6	28	42	52	
29 x 18	16	9	14	6	32	48	58	
36 x 22	14	10	16	6	39	60	70	
43 x 27	14	12	18	8	46	75	85	
50 x 31	12	13	21	9	53	85	103	
58 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	

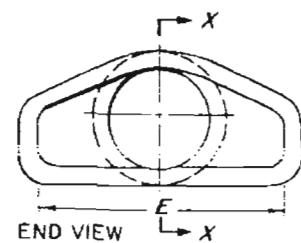
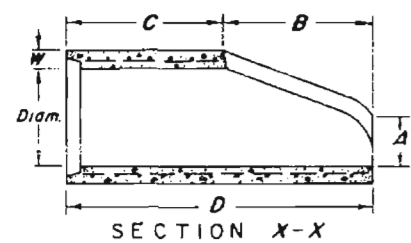


**NOTE:**  
End sections for pipe arches shall be shop attached to a minimum 2 ft. of pipe by galvanized rivets or bolts.

## 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.	W in.
12	5 1/2	23	49	72	24	2
15	7	26	47	73	29	2 1/4
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

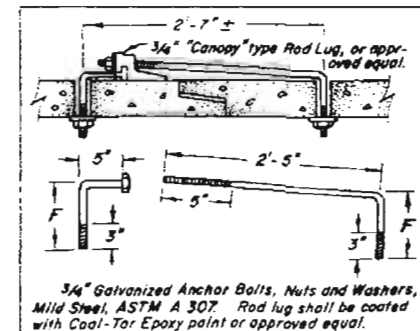


**NOTE:** Alternate equivalent designs for End Sections may be submitted to the Department for approval. Design length of culvert is based on length of End Section shown in column "D".

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.

## SECTION X-X END SECTION FOR REINFORCED CONCRETE PIPE CULVERT



PIPE DIAMETER	F
24" - 30"	5"
36" - 42"	6"
48" - 60"	7"
72" - 84"	9"

## 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	<i>J. R. B.</i>
Made by	J. R. B.	Staff Design Engineer (ASSP)	
Checked by	R. S. M.	Date:	November 10, 1967

# STANDARD M-603-M

(MARCH 20, 1967)

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

## FILL HEIGHT AND GAGE TABLES FOR METAL CULVERT PIPE (RIVETED, WELDED OR HELICAL FABRICATION)

REVISIONS	

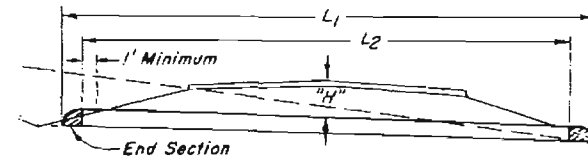
**TABLE I**  
CORRUGATED STEEL PIPE  
(2" x 1/2") OR (2-2/3" x 1/2") CORRUGATIONS

PIPE SIZE (B <sub>g</sub> ) Inches	AREA (Sq. Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET																	
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100			
12	0.8	16	16	16	16	16	16	16	16	16	16	16	16	16	14	12			
15	1.2	16	16	16	16	16	16	16	16	16	16	16	14	12	10				
18	1.8	16	16	16	16	16	16	16	16	14	14	12	12	10	8				
24	3.1	16	16	16	16	16	14	14	12	10	10	8							
30	4.9	16	16	16	16	16	14	14	12	12	10	8							
36	7.1	16	16	16	16	14	14	12	10	8									
42	9.6	16	16	16	16	16	14	14	12	10									
48	12.6	16	16	16	16	16	14	14	12	10									
54	15.9	14	14	14	14	14	12	12											
60	19.6	12	12	12	12	12	10	10											
66	23.8	12	12	12	12	10	10	8											
72	28.3	10	10	10	10	8													
78	33.0	8	8	8	8														
84	38.0	8	8	8															

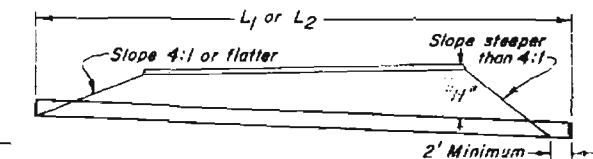
**TABLE II**  
CORRUGATED STEEL PIPE ARCH  
(2" x 1/2") OR (2-2/3" x 1/2") CORRUGATIONS

PIPE SIZE Span-Rise (Inches)	AREA (Sq. Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET									
			1.5 to 7	7+ to 8	8+ to 9	9+ to 10	10+ to 12	12+ to 13				
18 x 11	1.1	3 1/2	16	16	16	16	16	16				
22 x 13	1.6	4	16	16	16	16	16	16				
25 x 16	2.2	4	16	16	16	16	16					
29 x 18	2.8	4 1/2	16	16	16							
36 x 22	4.4	5	16	16	16							
43 x 27	6.4	5 1/2	16									
50 x 31	8.7	6	14									
58 x 36	11.4	7	12									
65 x 40	14.3	8	12									
72 x 44	17.6	9	10									

**METAL CULVERT WITH END SECTIONS**



**METAL CULVERT WITHOUT END SECTIONS**



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

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

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

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

PIPE SIZE (B <sub>g</sub> ) Inches	AREA (Sq. Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET																	
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80					
36	7.1	16	16	16	16	14	14	12	12	12	10	8							
42	9.6	16	16	16	16	14	14	12	12	12	10	8							
48	12.6	16	16	16	16	14	14	12	12	12	10	8							
54	15.9	16	16	16	16	14	14	12	12	10	8								
60	19.6	16	16	16	16	14	14	12	12	10									
66	23.8	16	16	16	16	14	14	12	12	10									
72	28.3	16	16	16	16	14	14	12	12	10									
78	33.0	16	16	16	16	14	14	12	12	10									
84	38.0	14	14	14	14	12	12												
90	44.0	14	14	14	14	12	12												
96	50.3	12	12	12	12	10	10												
102	57.0	12	12	12	12	10	10												
108	64.0	12	12	12	12	10	10												
114	70.9	10	10	10	10	8	8												
120	78.6	10	10	10	10	8	8												

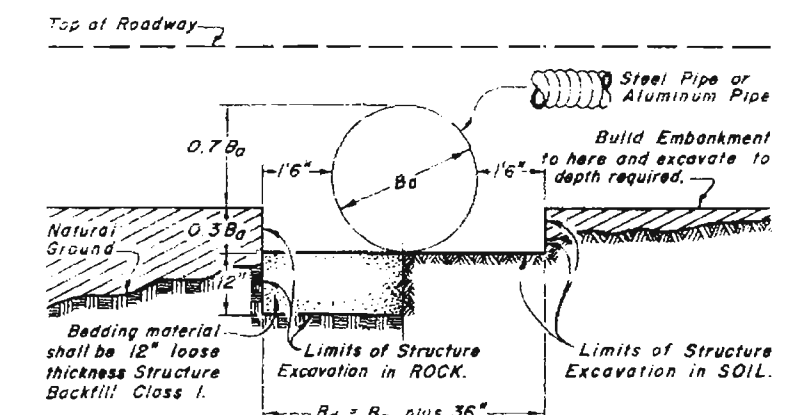
**TABLE IV**  
CORRUGATED STEEL PIPE  
\* SPOT WELDED OR BOLTED (1/2" ASTM A 325 BOLTS) FABRICATION  
3" x 1" CORRUGATIONS

PIPE SIZE (B <sub>g</sub> ) Inches	AREA (Sq. Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET																	
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100			
36	7.1	16	16	16	16	16	16	14	14	14	12	12	12	10	8				
42	9.6	16	16	16	16	16	16	14	14	14	12	12	12	10	8				
48	12.6	16	16	16	16	16	16	14	14	14	12	12	12	10	8				
54	15.9	16	16	16	16	16	16	14	14	14	12	12	10	10					
60	19.6	16	16	16	16	16	16	14	14	14	12	12	10	8					
66	23.8	16	16	16	16	16	16	14	14	14	12	12	10	8					
72	28.3	16	16	16	16	16	16	14	14	14	12	12	10	8					
78	33.0	16	16	16	16	16	16	14	14	14	12	12	10	8					
84	38.0	14	14	14	14	14	14	12	12	10									
90	44.0	14	14	14	14	14	14	12	12	10									
96	50.3	12	12	12	12	12	12	10	10	8									
102	57.0	12	12	12	12	12	12	10	10	8									
108	64.0	12	12	12	12	12	12	10	10	8									
114	70.9	10	10	10	10	10	10	8	8										
120	78.6	10	10	10	10	10	10	8	8										

**TABLE V**  
CORRUGATED STEEL PIPE ARCH  
3" x 1" CORRUGATIONS

PIPE SIZE Span-Rise (Inches)	AREA (Sq. Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET									
			1.5 to 10	10+ to 11	11+ to 12	12+ to 14	14+ to 15					
43 x 27	6.4	7 3/4	16	16	16							
50 x 31	8.7	9	16	16	16							
58 x 36	11.4	10 1/2	16	16	16							
65 x 40	14.3	12	16	16	16							
72 x 44	17.6	13 1/4	16	16	16							
73 x 55	22.0	18	16	16	16	16	16					
81 x 59	26.0	18	14	14	14	14	14					
87 x 63	31.0	18	14	14	14	14	14					
95 x 67	35.0	18	12	12	12	12	12					
103 x 71	41.0	18	12	12								
112 x 75	46.0	18	12									
117 x 79	52.0	18	12									
128 x 83	58.0	18	10									

**INSTALLATION OF METAL CULVERT PIPE**



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

<sup>5</sup>/<sub>16</sub>" rivets or helical fabrication shall be used on pipes with gages to the left of or above the heavy solid line.  
<sup>3</sup>/<sub>8</sub>" rivets or helical fabrication shall be used on pipes with gages to the right of or below the heavy solid line.

\* <sup>3</sup>/<sub>8</sub>" rivets may be used on pipes with gages to the left of or above the heavy solid line.  
<sup>7</sup>/<sub>16</sub>" rivets may be used on pipes with gages to the right of or below the heavy solid line.

**TABLE VI**  
CORRUGATED ALUMINUM PIPE  
2-2/3" x 1/2" CORRUGATIONS

PIPE SIZE (B <sub>g</sub> ) Inches	AREA (Sq. Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET																	
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80					
12	0.8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
18	1.8	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
24	3.1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
30	4.9	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
36	7.1	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	
42	9.6	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
48	12.6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
54	15.9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
60	19.6	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
66	23.8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
72	28.3	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	

**TABLE VII**  
CORRUGATED ALUMINUM PIPE ARCH  
2-2/3" x 1/2" CORRUGATIONS

PIPE SIZE Span-Rise (Inches)	AREA (Sq. Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET									
			1.5 to 7	7+ to 9	9+ to 11	11+ to 13	13+ to 15					
18 x 11	1.1	4 3/4	16	16	16	16	16	16				

# STANDARD M-603-RC

(MARCH 20, 1967)

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

REVISIONS	

## REINFORCED CONCRETE PIPE DIMENSIONS (FOR INFORMATION ONLY)

PIPE SIZE (In. I.D.) B <sub>a</sub>	* WALL THICKNESS (Inches)	OUTSIDE DIAMETER (Feet) B <sub>c</sub>	0.3 B <sub>c</sub> (Feet)	0.7 B <sub>c</sub> (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 <sub>a</sub>	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	to..	to..
12-18	18	23	23	36
21-27	19	24	24	36
30-39	19	25	25	37
42-48	19	25	25	37
51-63	20	26	26	37
66-72	20	26	26	37
75-84	20	26	26	37
87-108	20	26	26	37

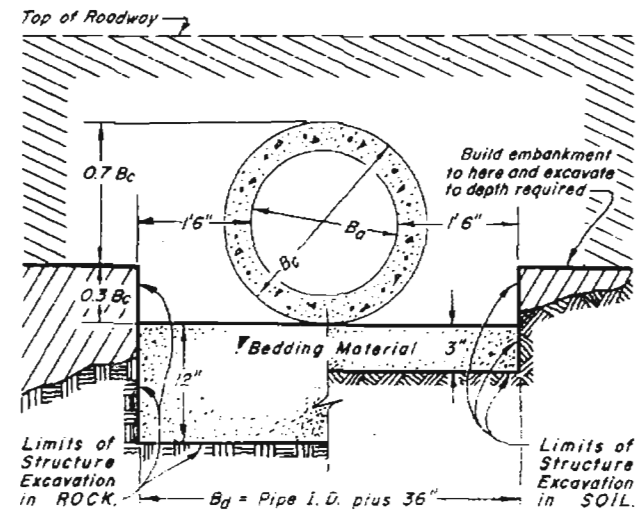
Pipe design is based on a safety factor of 1.33 on ultimate strength. Pipe Class is designated at .01 inch crack D-load. (See ASTM Designation C 76.)

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

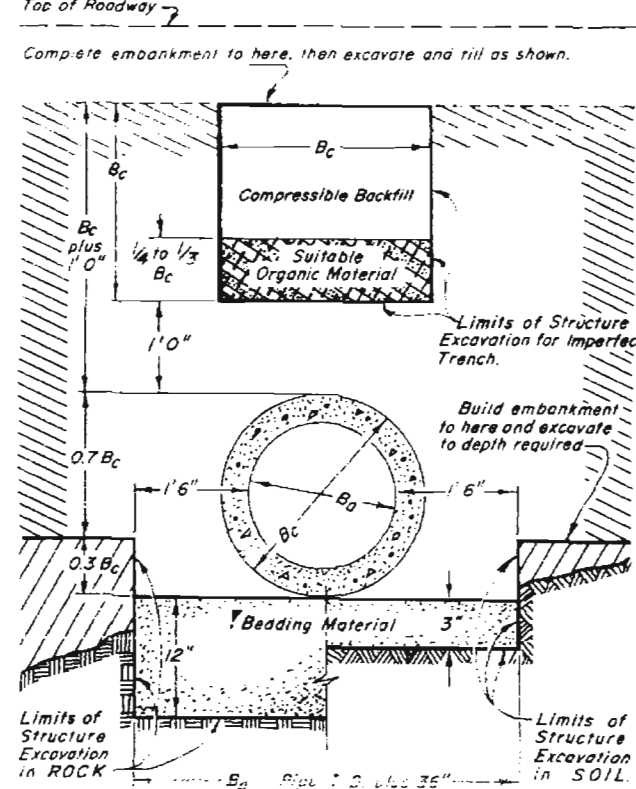
Changes in design factors will require compensating change in pipe design.

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

## PIPE INSTALLATION (WITH 0.7 PROJECTION RATIO)

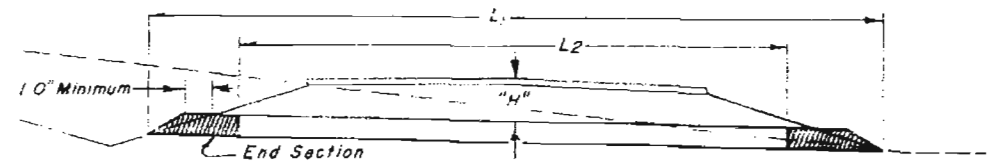


## IMPERFECT TRENCH PIPE INSTALLATION (WITH 0.7 PROJECTION RATIO)

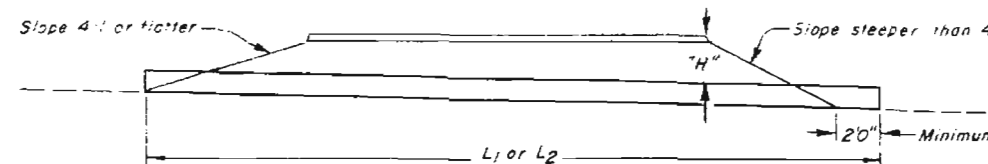


\* Bedding Material for SOIL shall be 3" loose thickness Structure Backfill Class 3. Bedding Material for ROCK shall be 12" loose thickness Structure Backfill Class 1.

## CONCRETE CULVERT WITH END SECTIONS



## CONCRETE CULVERT WITHOUT END SECTIONS



"H" = Maximum height of fill over top of Culvert, including pavement.  
L<sub>1</sub> = Length of Culvert to be measured when placed in accordance with Section 617.  
L<sub>2</sub> = Length of Pipe to be measured when placed in accordance with Section 603.

## 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.

Fill heights greater than maximum shown 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

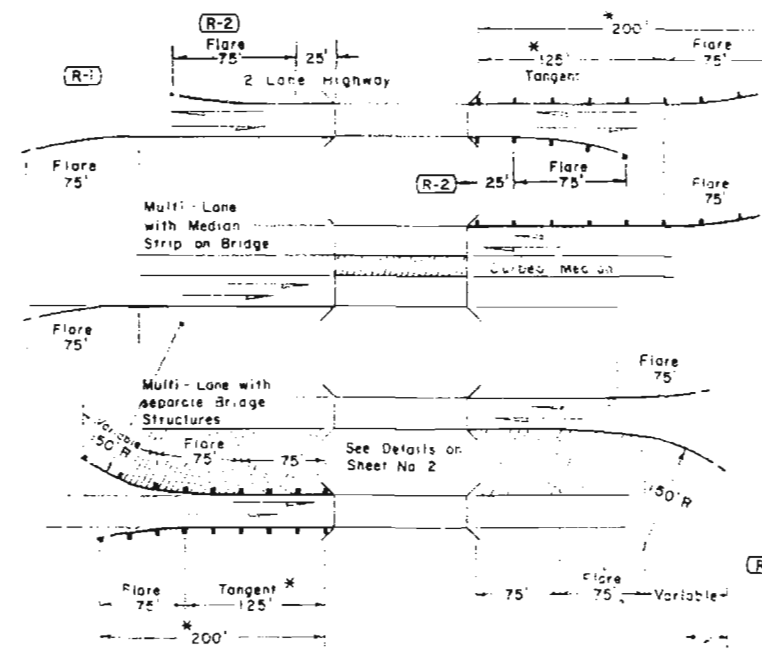
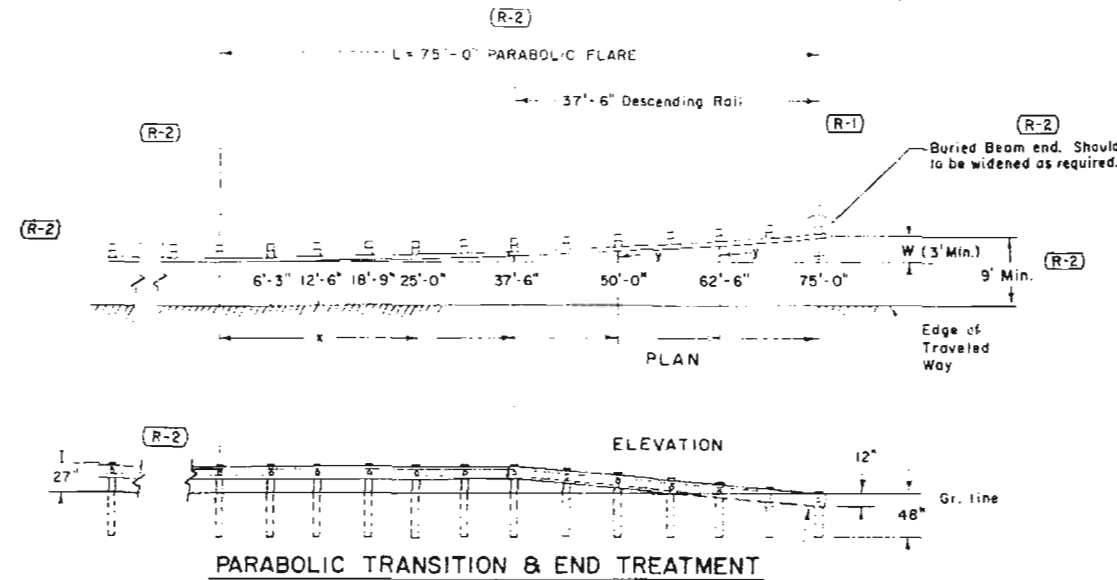
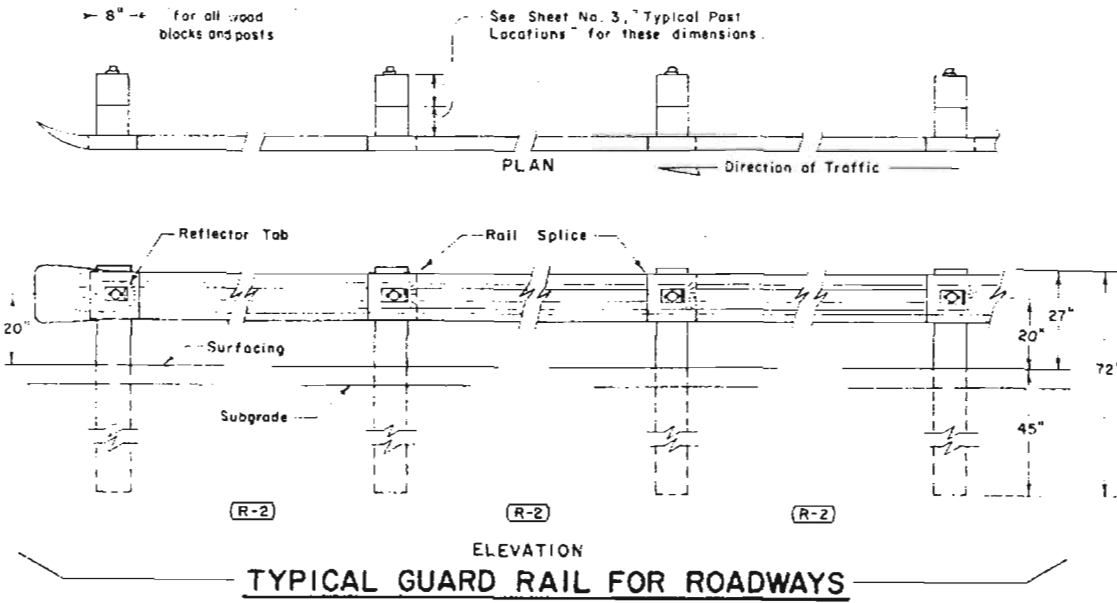
Designed by M. R. H. Approved by  
Made by J. R. B. Staff Design Eng'r.  
Checked by R. S. M. Date:

# STANDARD M-606-AA

(MAY 26, 1967)  
(SHEET 1 OF 3)

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

REVISIONS			
(R-1)	6-26-67	Added rail for 2-lane bridges	M.R.H.
(R-2)	8-1-67	Guard Rail at Bridges, Post Sp.	R.S.M.



## GENERAL NOTES

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

All timber shall be close grained Douglas Fir of the Coast Region, Dense Longleaf or Shortleaf Southern Pine, or Lodgepole Pine. Timber shall be free of heart centers and shall conform to Construction Grade, Paragraph 125 B of Standard No. 15 Grading and Dressing Rules of West Coast Douglas Fir (1956) or Dense Structural 58 and LL Structural 58, Paragraph 285 of 1956 Grading Rules for Southern Pine.

Timber shall be square edged, full sawn, and the tops of posts shall be beveled as shown. Blocks and posts shall be 8"x8" except that posts fabricated from Lodgepole Pine shall be 8"x10" (install with 8" face parallel to roadway center line).

Timber shall be incised and pressure treated with Grade I Creosote to a net retention of 8 pounds per cubic foot with a minimum penetration of 5/8 of an inch, except that blocks need not be incised before treatment. All bolt holes are to be drilled 1/16 inch larger than diameter of bolt before treatment is applied.

Posts shall be spaced at 6'-3" center to center except when otherwise designated by note or in the guardrail tabulation on the plans, and except for the first rail section adjacent to the bridge as shown hereon.

Where pedestrian hazards exist, sidewalks are to be constructed on the roadway shoulder. Guard rail shall be placed between the sidewalk and the edge of traffic lane.

Guard rail plate shall not be lighter than No. 12 U.S. Standard Gage. 25' long elements will be permitted.

Metal plate guard rail shall be painted in accordance with standard specifications.

Metal plate guard rail galvanized in accordance with AASHTO Designation M-III or with Coating Class 2-50 of Table I of ASTM Designation A 525 may be furnished in lieu of painting requirements.

Standard galvanized wrought steel washers shall be used under all bolt heads.

Do not use nuts coming in contact with wood posts.

LEGEND

W = Full Parabolic Offset.

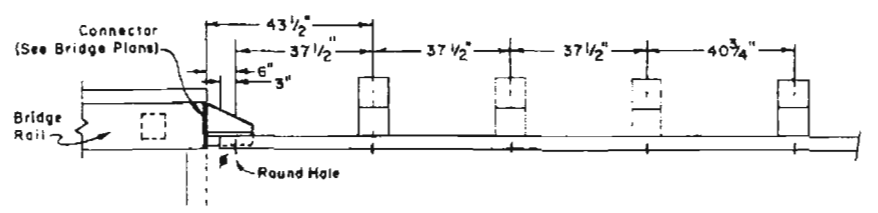
L = Length of Parabolic Transition

x = Distance 'x's of Posts, from 'C' of first Post at beginning of Flare

y = Offset at each Post.  $y = W \cdot \frac{x^2}{L^2}$

TABLE OF OFFSETS FOR 75' PARABOLIC FLARES

x	W=3'	W=4'	W=5'	W=6'	W=7'	W=8'
6'-3"	0.02	0.03	0.03	0.04	0.05	0.06
12'-6"	0.08	0.11	0.14	0.17	0.19	0.22
18'-9"	0.19	0.25	0.31	0.37	0.44	0.50
25'-0"	0.33	0.44	0.56	0.67	0.78	0.89
31'-3"	0.52	0.69	0.87	1.04	1.22	1.39
37'-6"	0.75	1.00	1.25	1.50	1.75	2.00
43'-9"	1.02	1.36	1.70	2.04	2.38	2.72
50'-0"	1.33	1.78	2.22	2.67	3.11	3.56
56'-3"	1.69	2.25	2.81	3.38	3.94	4.50
62'-6"	2.08	2.78	3.47	4.17	4.86	5.56
68'-9"	2.52	3.36	4.20	5.04	5.88	6.72
75'-0"	3.00	4.00	5.00	6.00	7.00	8.00



NOTE: The first rail panel section shall require holes and additional posts as indicated.

Factory punch 3/4" hole in center of rail 3" from this end. Omit rail splice holes at this end.

\* NOTE:

250' Over 60 mph.

200' Up to 60 mph.

Up to 60 mph 125' Tangent

75' Flare

Over 60 mph 175' Tangent

75' Flare

37'-6" Descending Rail at end of Guard Rail.

## BRIDGE APPROACH GUARD RAIL

## GUARD RAIL AT BRIDGES

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

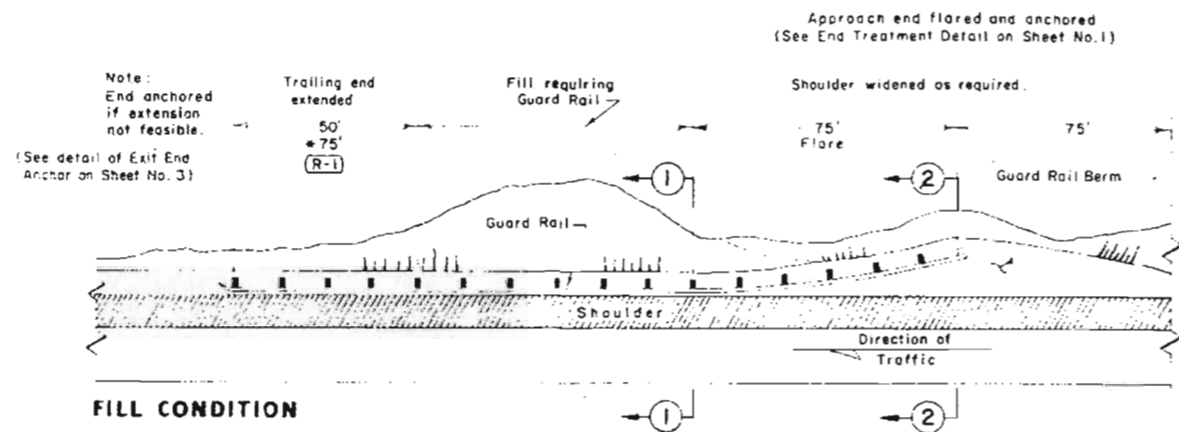
GUARD RAIL  
TYPE 3

Designed by M.R.H. Approved by R.S.M.  
Made by J.R.B. Staff Design Engineer  
Checked by R.S.M. Date: MAY 26, 1967

# STANDARD M-606-AA

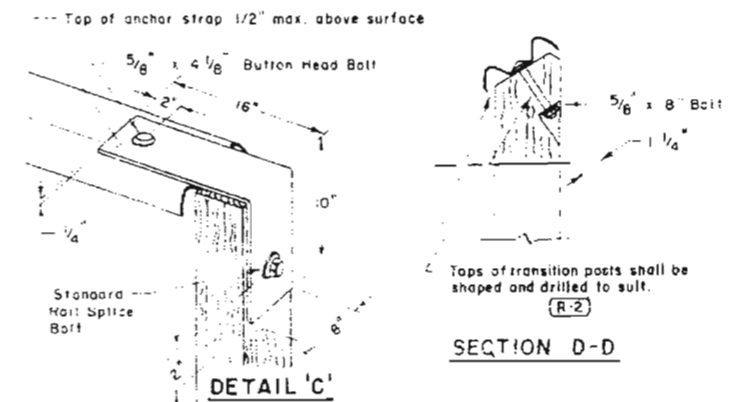
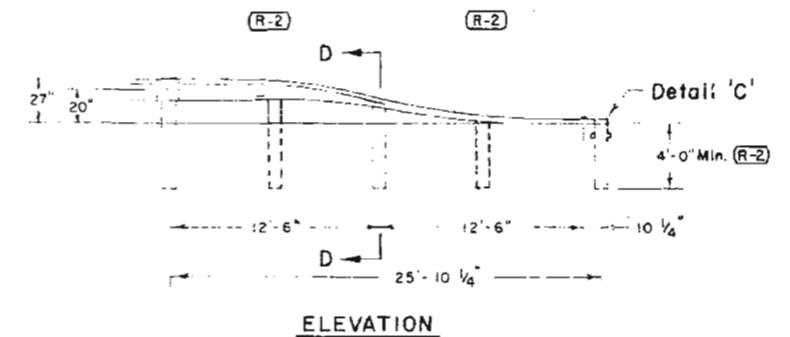
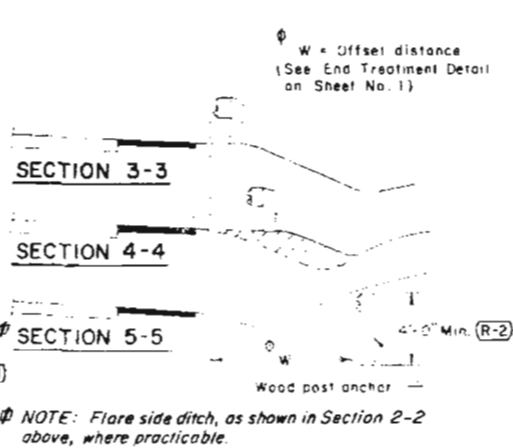
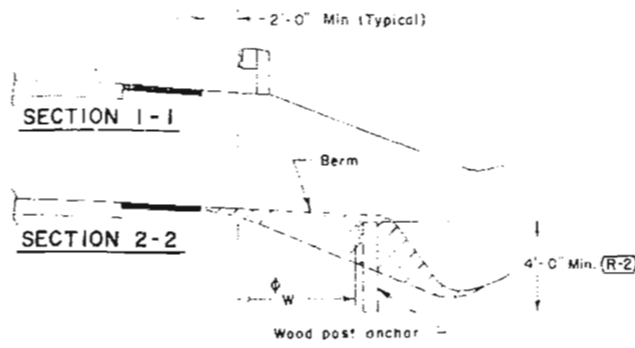
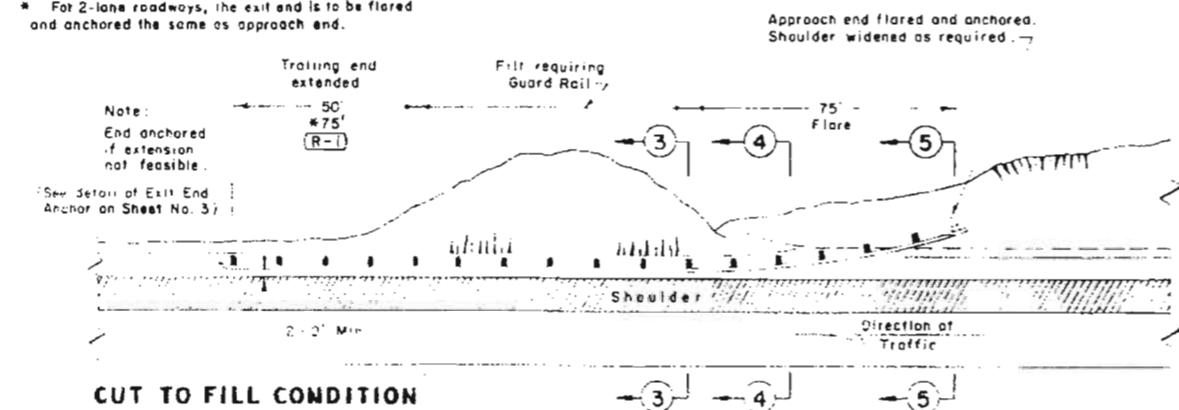
(MAY 26, 1967)  
(SHEET 2)

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

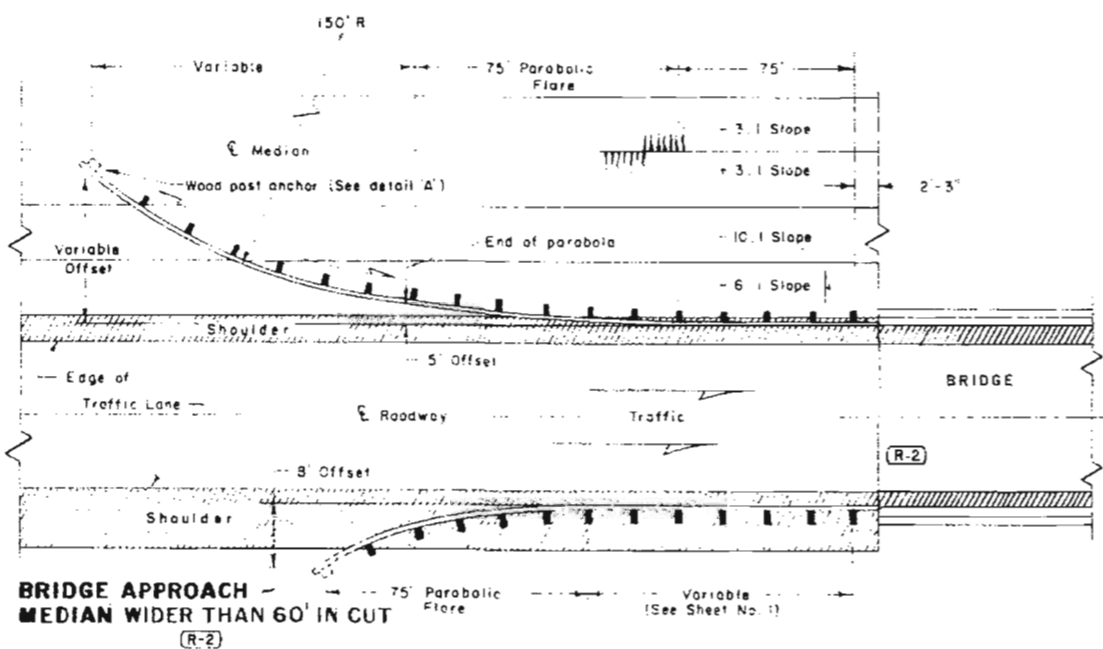


(R-1) NOTE:

\* For 2-lane roadways, the exit end is to be flared and anchored the same as approach end.

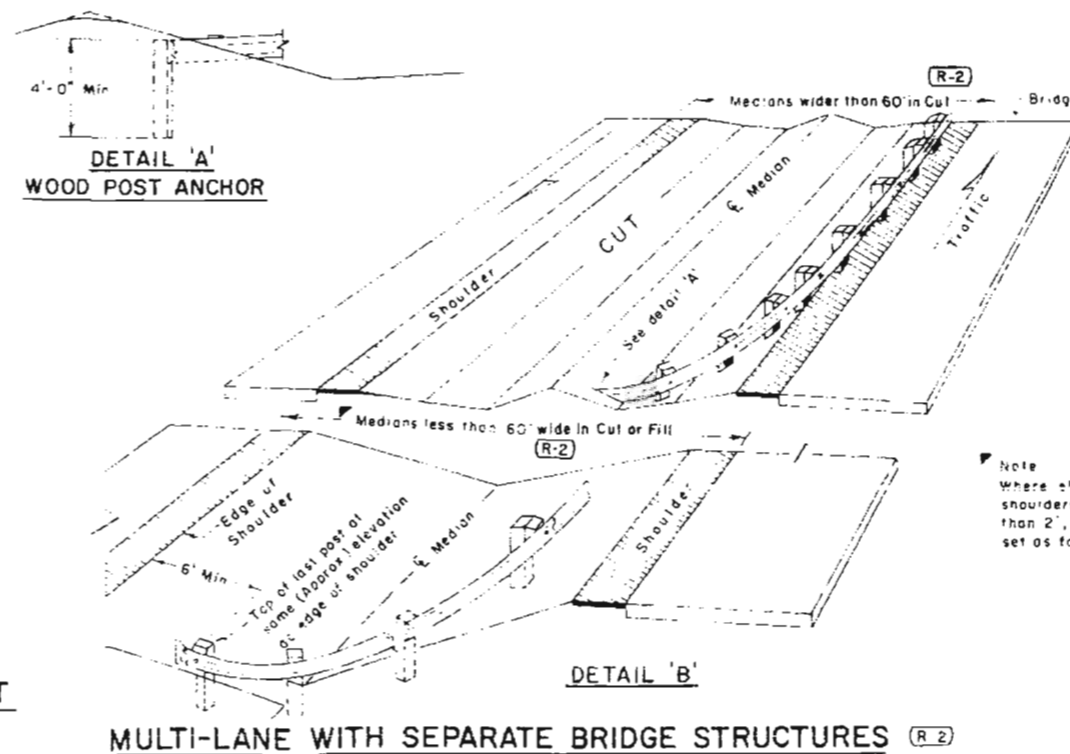


## ALTERNATE END TREATMENT - 90° TWISTED BEAM



(R-2) Medians wider than 60' in fill - Treat as separate roadways with Guard Rail on both sides.

## GUARD RAIL END TREATMENT



Note: Where elevations of paved shoulders differ by more than 2', Guard Rail shall be set as for separate roadways.

REVISIONS			
(R-1)	6-26-67	Added note for 2-lane, Ditch flare.	M.R.H.
(R-2)	9-1-67	Bridge Approach, End Treatment	R.S.M.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

## GUARD RAIL TYPE 3

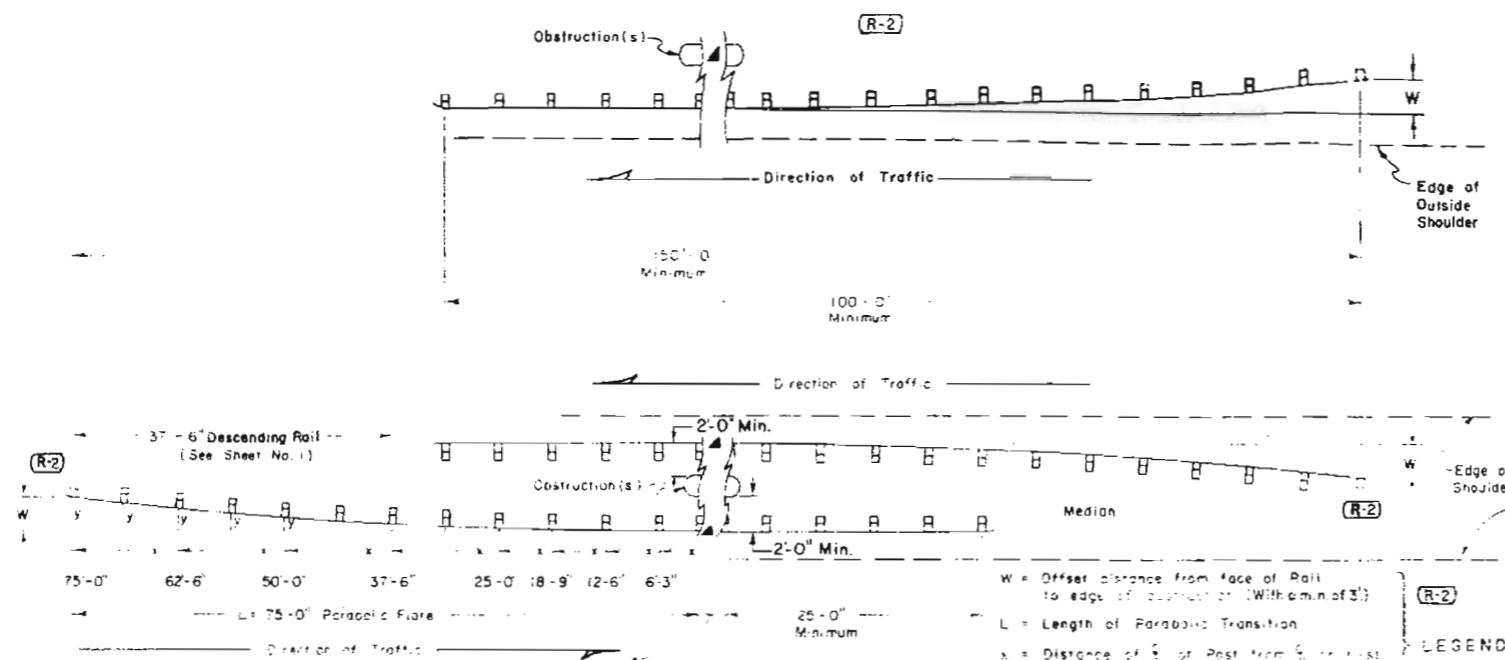
Designed by M.R.H. Approved by R.S.M.  
Made by R.S.M. Staff Design Engineer  
Checked by R.S.M. Date: MAY 26, 1967

# STANDARD M-606-AA

(MAY 26, 1967)  
(SHEET 3)

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

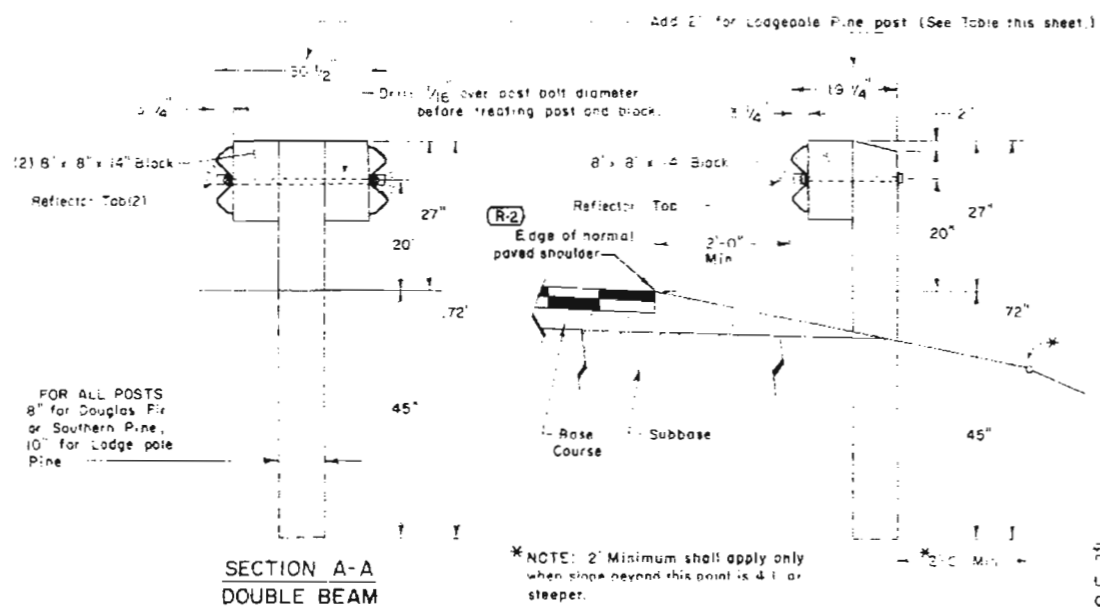
REVISIONS:  
(R-2) 8-1-67 Guard Rail for Obstr. B Medians R.S.M.



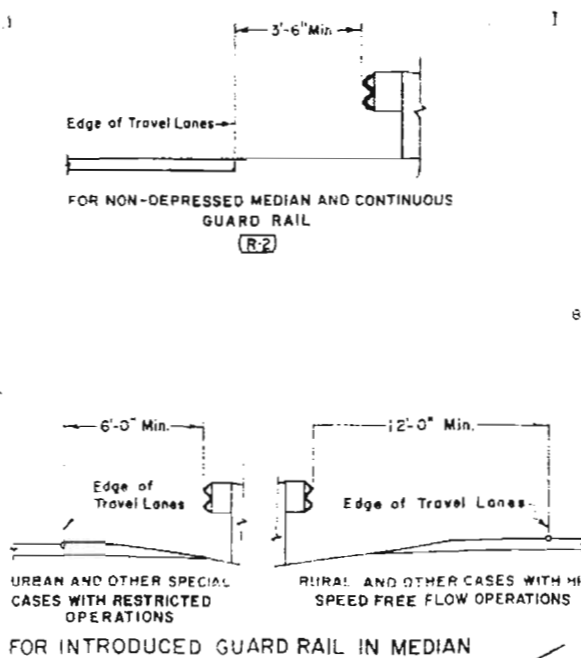
TYPICAL GUARD RAIL FOR OBSTRUCTIONS

W = Offset distance from face of Rail to edge of obstruction (Within min. of 3')  
L = Length of Parabolic Transition  
x = Distance of 1st Post from 1st Post at beginning of Flare  
y = Offset at each Post (y = W - L/2)

NOTE: Flared end as shown is for approaching traffic. If protection is for traffic from both directions, the 75-foot flare shall be on both ends.

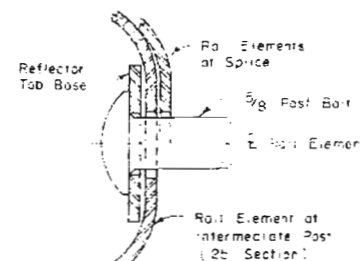
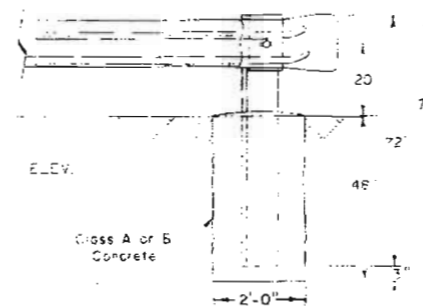


TYPICAL POST INSTALLATIONS



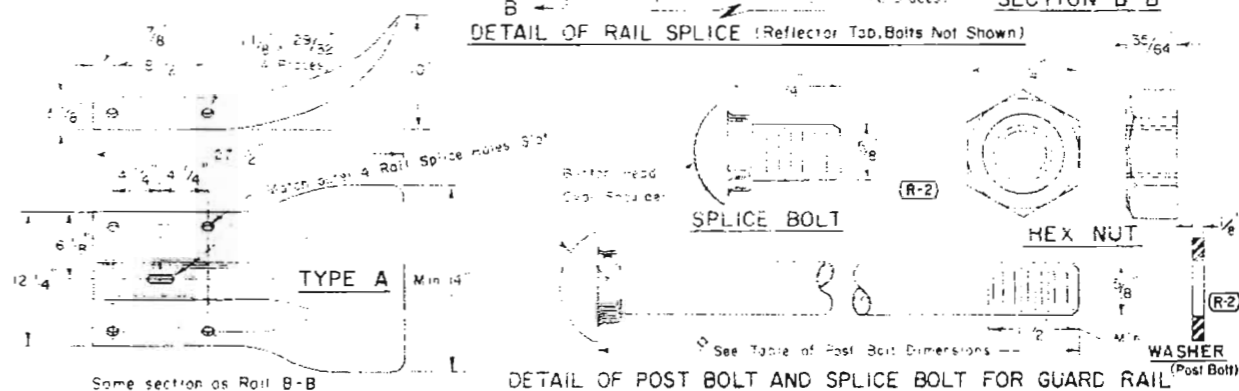
DETAILS OF TERMINAL SECTIONS

EXIT END ANCHOR (Concrete)



SECTION C-C

DETAIL OF RAIL SPLICE (Reflector Tab Bolts Not Shown)



SPLICE BOLT

HEX NUT

WASHER (Post Bolt)

DETAIL OF POST BOLT AND SPLICE BOLT FOR GUARD RAIL

TYPE POST	BOLT SIZE
8" x 8" Double Rail	5/8" x 25 3/4"
8" x 8" Single Rail	5/8" x 17 1/2"
Lodgepole Pine	
8" x 10" Double Rail	5/8" x 27 3/4"
8" x 10" Single Rail	5/8" x 19 1/2"

Number Splice Bolts Required  
8 per Splice or 4 Terminals, 4 per A or C Term.

TABLE OF POST BOLT DIMENSIONS

INSTALLATION DETAILS OF REFLECTOR TAB

Reflector Tab shall be furnished and installed with Guard Rail

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

GUARD RAIL  
TYPE 3

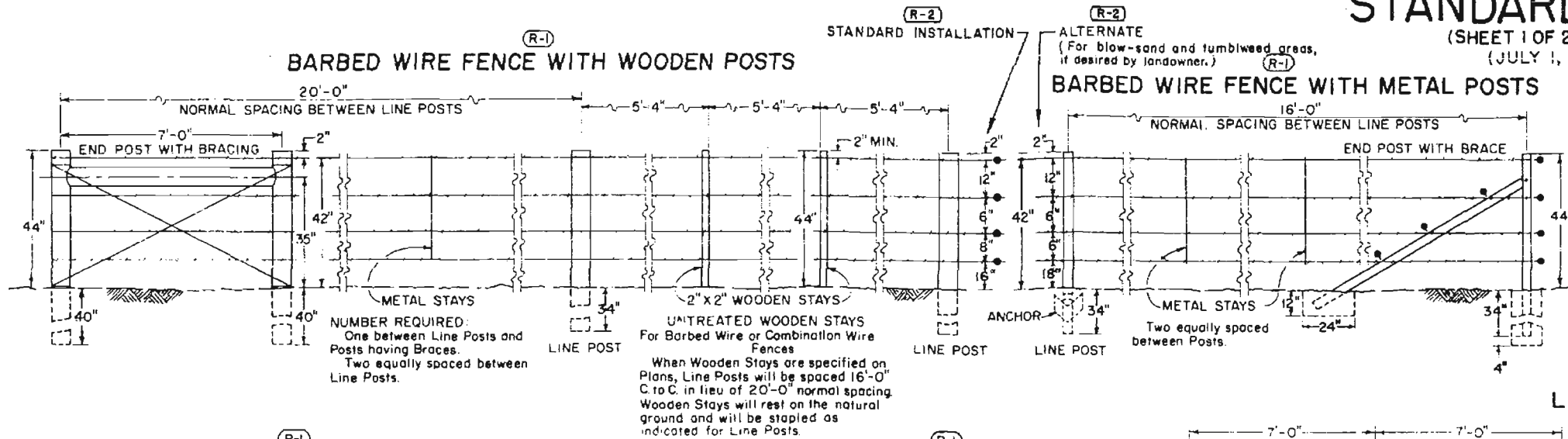
Designed by M.R.H. Approved by R.S.M.  
Made by ARB by Staff Design Engineer  
Checked by R.S.M. Date MAY 26, 1967

# STANDARD M-607-A

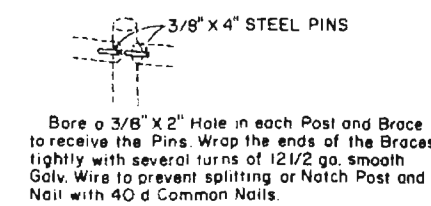
(SHEET 1 OF 2 SHEETS)  
(JULY 1, 1965)

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

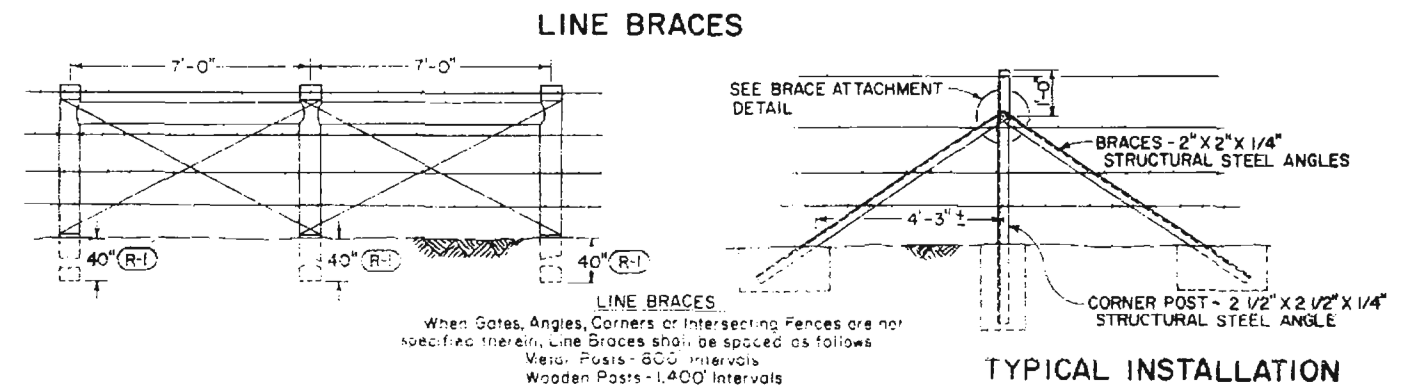
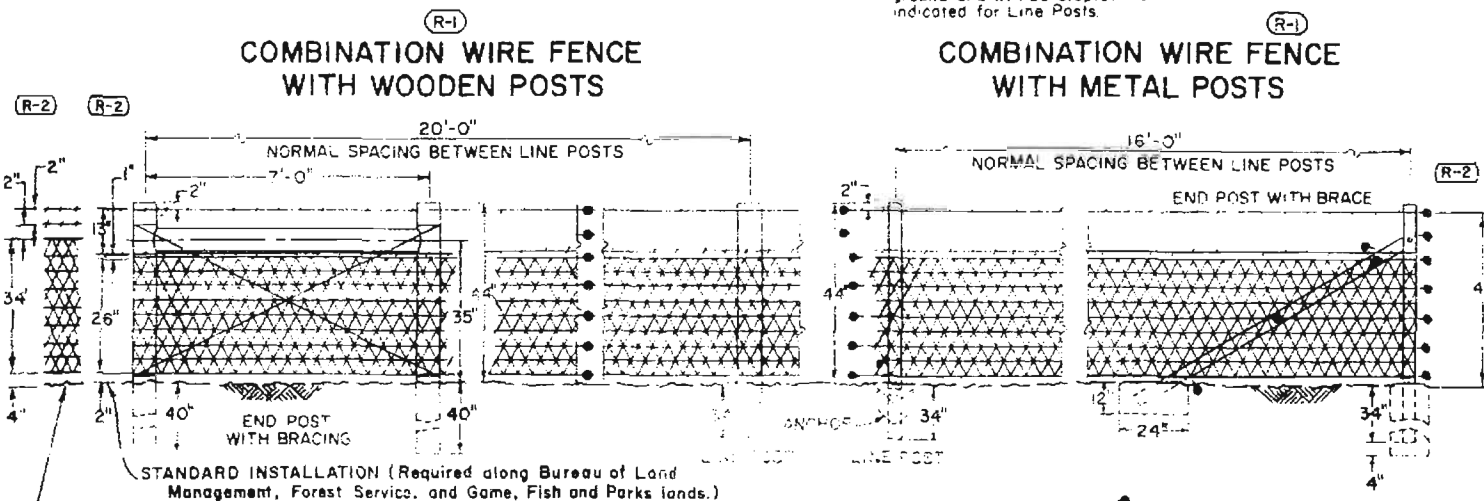
REVISIONS		
8-2-66	Vertical Dimensions and Note	M.R.H.
12-8-66	Vert. Dims., Std. and Alternate	M.R.H.



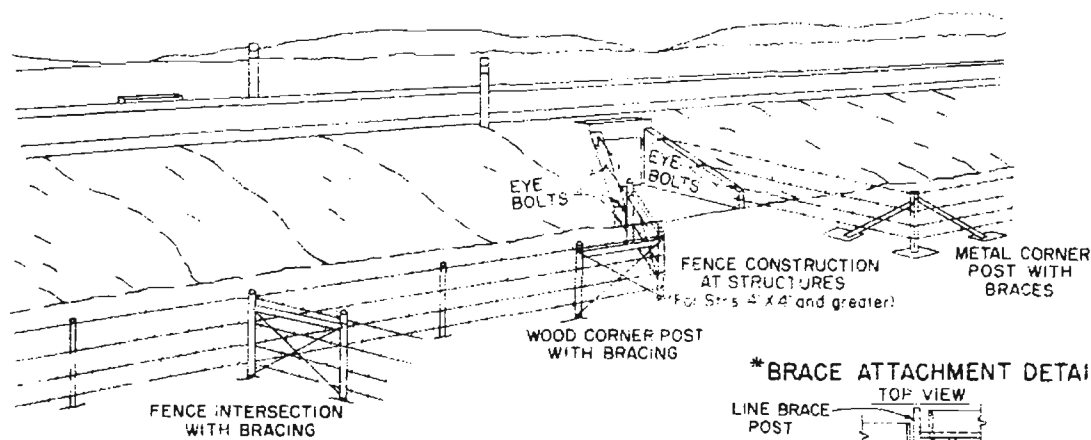
### CROSS BRACE DOWELING DETAIL



**NOTE:**  
See Sheet 2 for General Notes.



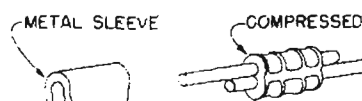
### ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES



**NOTE**  
At all structures of 4" x 4" and over, the fence shall be ended of 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.

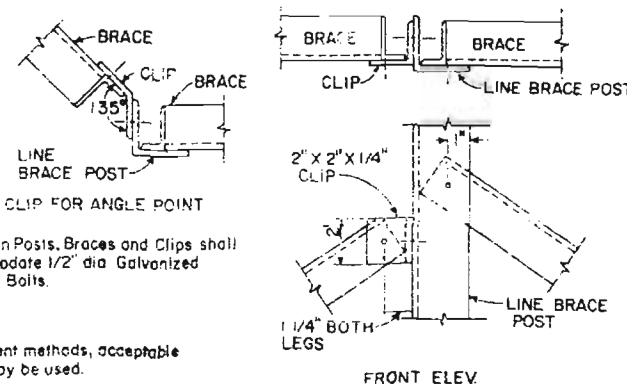
Fence wire will be stapled to wooden posts or tied to metal posts as shown marked on barbed wire or combination wire fence details.

### ACCEPTABLE WIRE SPLICE



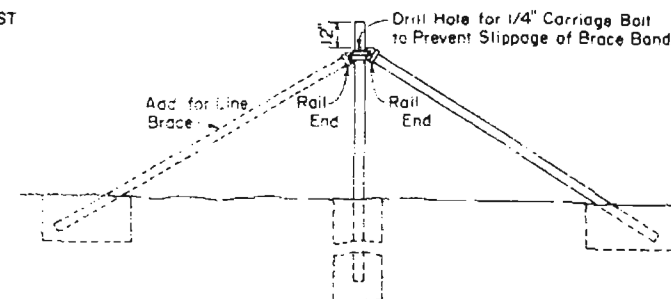
Splicing Sleeve shall be approved by the Engineer.

### \*ALTERNATE BRACE ATTACHMENT DETAIL



### 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 T.E.F. Staff Des. Eng.  
Checked by E.E.O. Date: July 1, 1965

# STANDARD M-607-A

(SHEET 2)

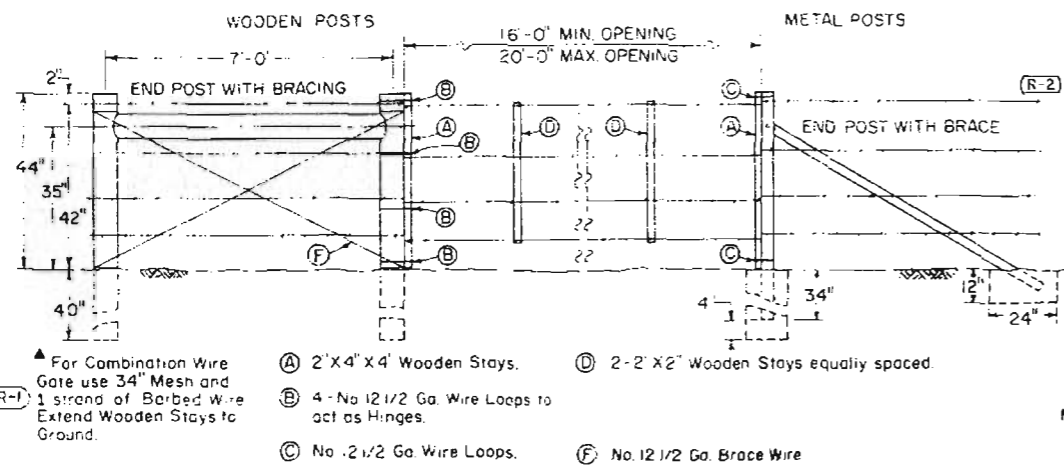
(JULY 1, 1965)

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

### REVISIONS

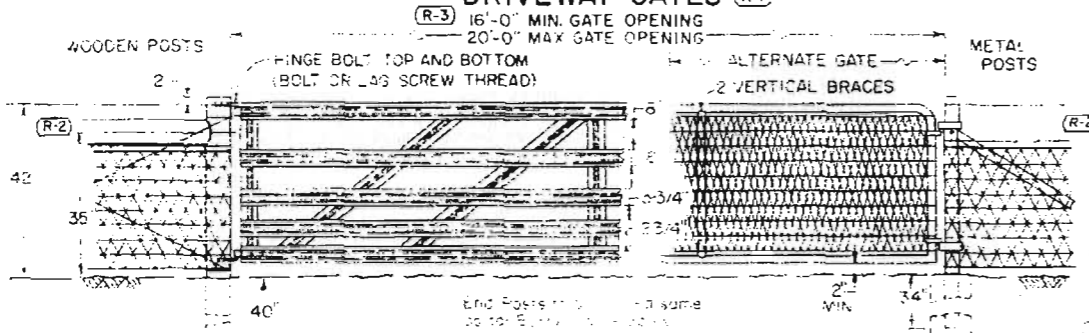
(R-1)	8-2-66	Vert. Dims. & Gen'l. Notes	M.R.H.
(R-2)	12-8-66	Vert. Dims., Std. and Alternate	M.R.H.
(R-3)	2-6-67	Gates and General Notes	M.R.H.

## BARBED WIRE GATE (R-1)

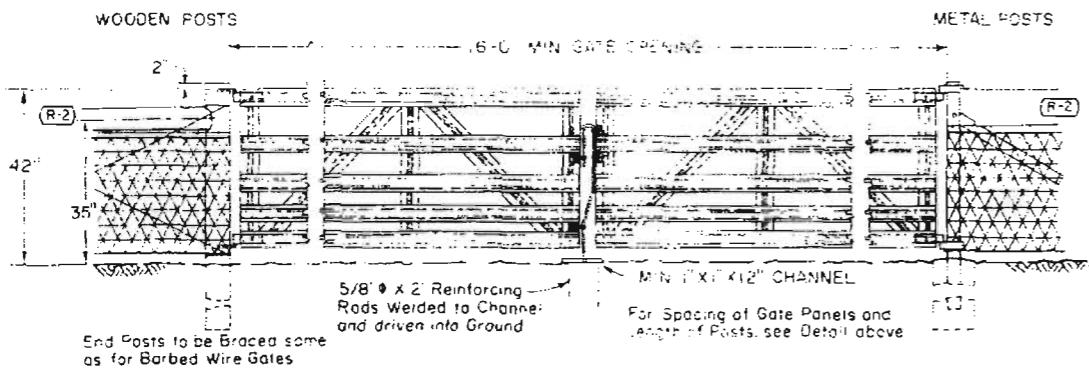


- (A) 2' X 4' X 4' Wooden Stays.
- (B) 4 - No. 12 1/2 Ga. Wire Loops to act as Hinges.
- (C) No. 12 1/2 Ga. Wire Loops.
- (D) 2 - 2' X 2' Wooden Stays equally spaced.
- (E) No. 12 1/2 Ga. Wire Loops.
- (F) No. 12 1/2 Ga. Brace Wire

## DRIVEWAY GATES (R-1)

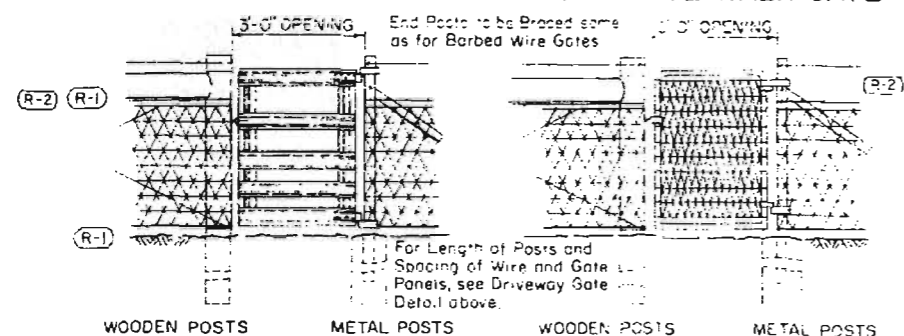


## TWIN DRIVEWAY GATES (R-1)



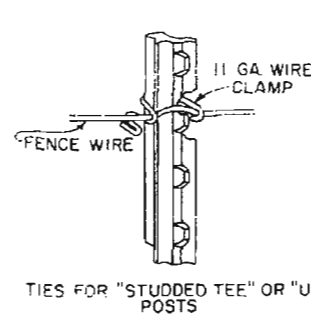
## WALK GATE

## ALTERNATE WALK GATE



For Length of Posts and Spacing of Wire and Gate Panels, see Driveway Gate Detail above.

## 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 fence.

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 - 3.8 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

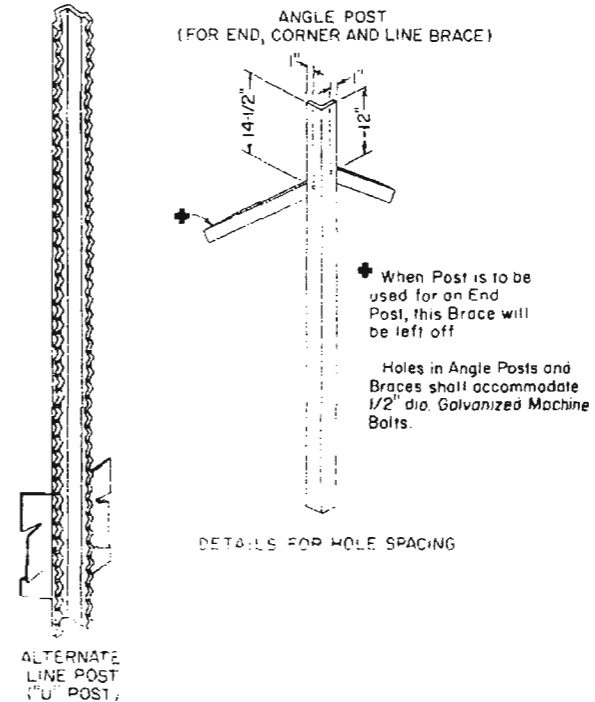
Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles  
Weight - 3.8 lbs./lin. ft. Min.  
Length - 6'-6" Min.  
No. of Braces - 1

### 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 US Dept. of Commerce Standard 194-5. 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 - 3/8" O.D. Tubular Steel with 2 1/2" Brace Band, Hinge Bolt and 1 3/8" O.D. Roll End, all Galvanized.  
Weight - 5.1 lbs./lin. ft. Min.  
Length - 6'-6" Min.

### BARBED WIRE

Steel barbed wire shall conform to ASTM Designation A 121, 12 1/2 Gauge with Class I 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.

### 4' X 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.	

### (R-2)

Width - 26"

### (R-3)

### DRIVEWAY GATES

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

(R-1) Weight - Galvanized Steel, 7.5 lbs. Min. - Tempered Aluminum, 4.5 lbs. Min.  
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"

(R-1) Weight - Not less than 90 lbs. complete with latch and hinges.

Width of gate opening - 16'-0"

Gate Frame - 3/4" O.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

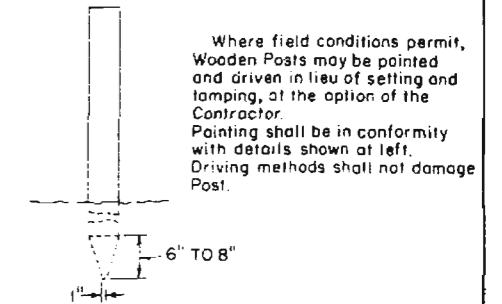
Height - approx. 42" (5 panels)

(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"

(R-1) Weight - Not less than 18 lbs. complete with latch and hinges.  
Width of gate opening - 3'-0"

Gate Frame - 3/4" O.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 and post and snaphook into chain.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
WIRE FENCES  
AND  
GATES

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

# STANDARD CURBS AND GUTTERS

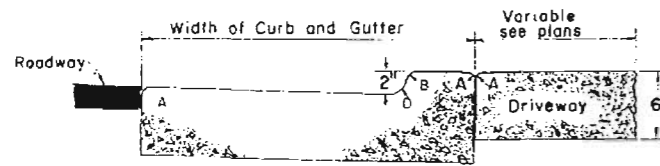
# STANDARD M-609-A

(JULY 1, 1965)

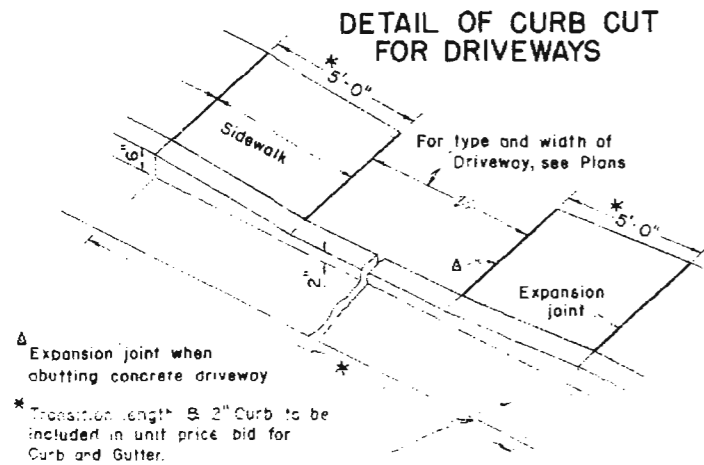
FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLG.		

REVISIONS			
(R-1)	11-16-65	Subtitles.	M.R.H.
(R-2)	2-14-66	General Notes.	M.R.H.

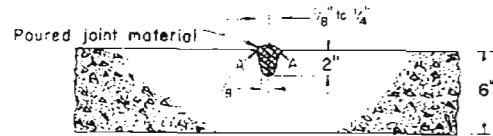
## CONCRETE PAVEMENT (DRIVEWAYS)



## DETAIL OF CURB CUT FOR DRIVEWAYS

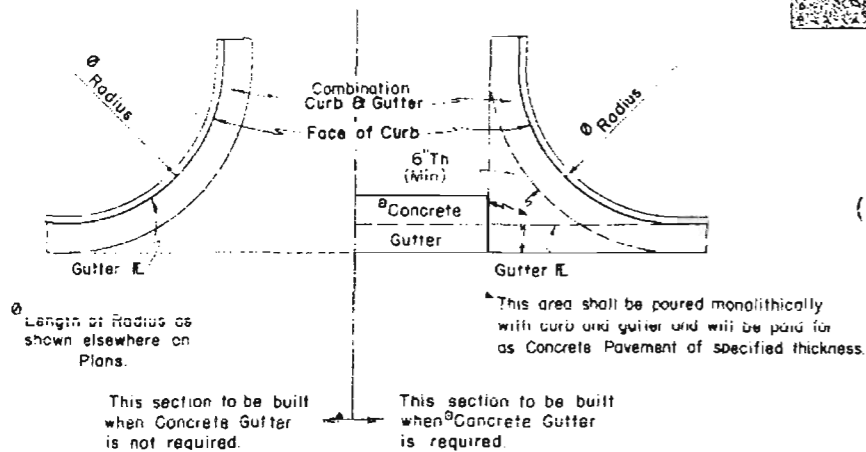


## TRANSVERSE CONTRACTION JOINT FOR CONCRETE PAVEMENT (DRIVEWAYS)

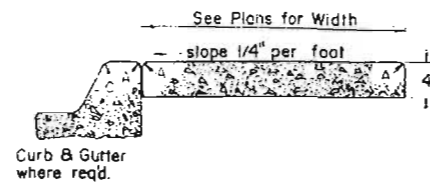


This joint required where length of slab exceeds 15 feet.

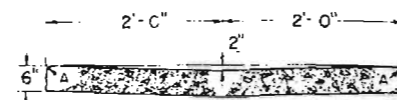
## CONSTRUCTION OF CONCRETE GUTTERS AT INTERSECTIONS



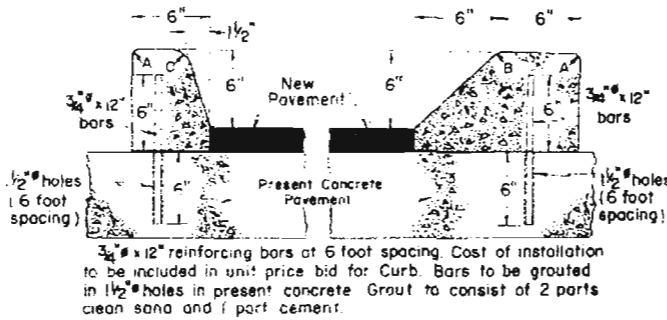
## CONCRETE SIDEWALK



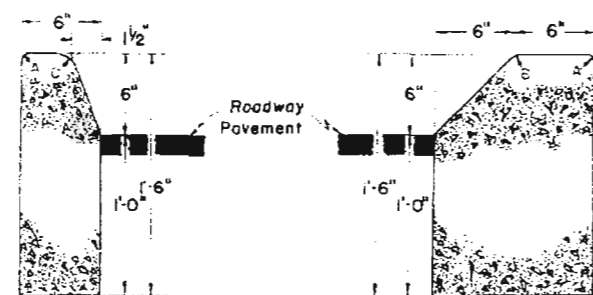
## GUTTER Type 2 (4' Foot) (R-1)



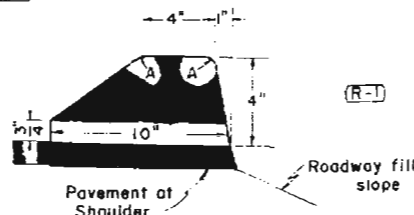
## CURB Type 4 (6" Barrier) (Section B) (R-1) CURB Type 4 (6" Mountable) (Section M) (R-1)



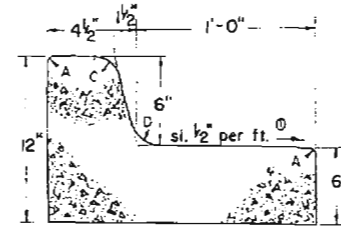
## CURB Type 2 (6" Barrier) (Section B) (R-1) CURB Type 2 (6" Mountable) (Section M) (R-1)



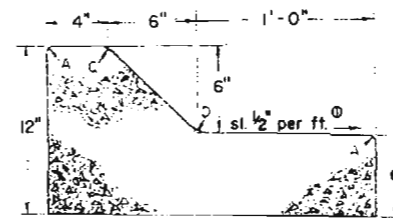
## CURB Type 6 (4" Mountable) (Section M) (R-1)



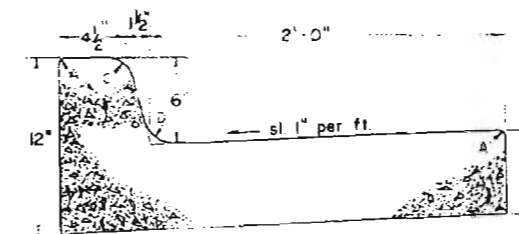
## CURB AND GUTTER Type 2 (6" Barrier - 1' Gutter) (Section IB) (R-1)



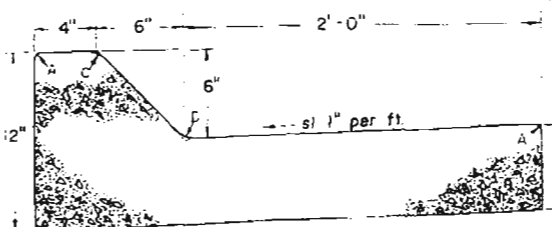
## CURB AND GUTTER Type 2 (6" Mountable - 1' Gutter) (Section IM) (R-1)



## CURB AND GUTTER Type 2 (6" Barrier - 2' Gutter) (Section IIB) (R-1)

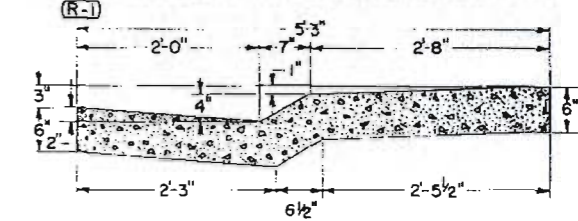


## CURB AND GUTTER Type 2 (6" Mountable - 2' Gutter) (Section IIM) (R-1)

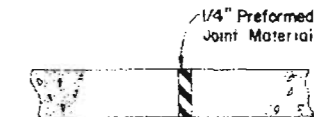


LEGEND FOR RADII	
A	= 1/8"
B	= 1"
C	= 1 1/2"
D	= 1 1/2" to 2"

## CURB AND GUTTER (Type 2) (4" Mountable with Sidewalk) (Section MS) (R-1)



## SIDEWALK EXPANSION JOINT



## GENERAL NOTES

- All work shall be done in accordance with the Standard Specifications applicable to the project.
- On Curves 3 degrees and sharper, Curbs and/or Gutters are to be placed on the Arc of the Curve unless otherwise noted on plans. A maximum chord length of 10 feet may be used when the degree of curve is less than 3 degrees.
- Interval between expansion joints shall not be less than 4 feet; nor more than 15 feet.
- Concrete shall be Class "A" or Class "D".

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

CURBS AND GUTTERS

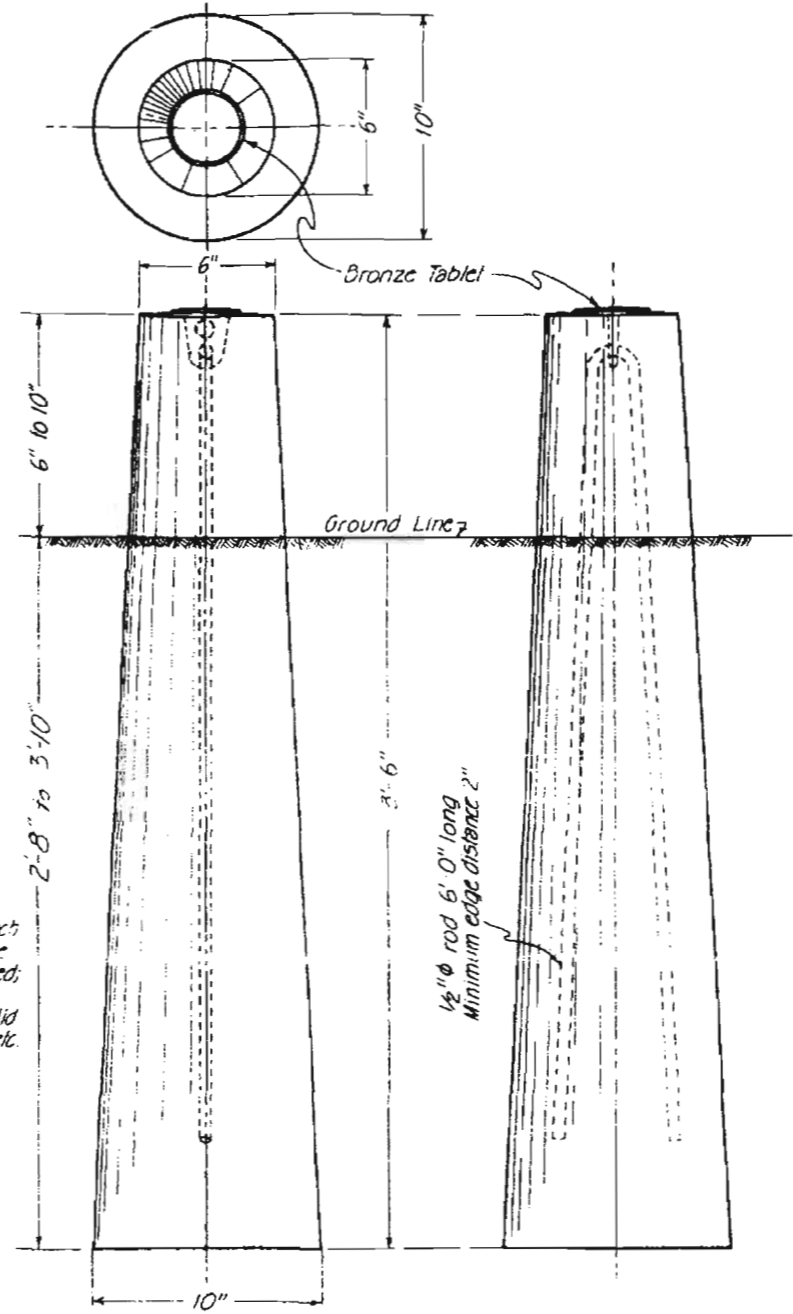
Designed by *W.C.*  
Made by *W.C.*  
Checked by *C.S.*  
Approved by *W.C. Brown*  
Staff Design Engr.  
Date: July 1, 1965

# RIGHT OF WAY MARKER POST STANDARD M-612-A

(JULY 1, 1965)

FEDERAL ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
2	COLORADO		

REVISIONS		
R-1	5-2-66 R.O.W. Marker Note	M.R.H.



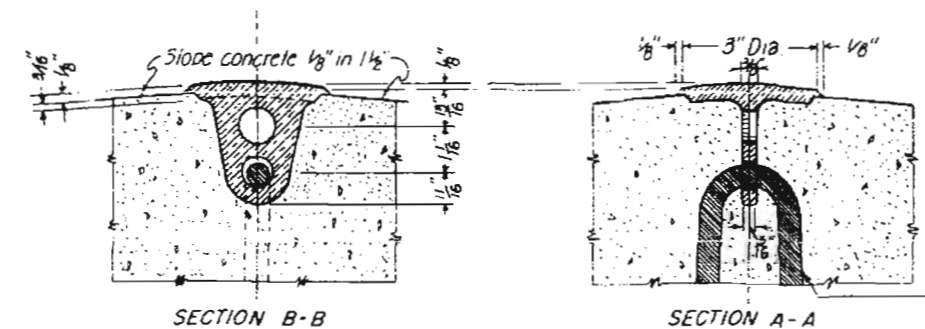
### NOTES FOR R.O.W. MARKER POSTS

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

Posts shall be made of class 'A' Concrete. The upper 12 inches of marker posts shall be rubbed free of form marks, and the top surface of the post must be constructed to drain thoroughly.

**B-1** Light weight aggregate conforming to ASTM Designation C-330 will be allowed.

All exposed surfaces of the bronze tablet are to be ground to a smooth surface. All letters are to be depressed a minimum of 1/16 inch. Information on the bronze tablet indicated by pin lines is to be stamped in field by the engineering party after marker is placed; 3/16 inch letters and figures to be used. Project designations on tablets shall be properly shown (i.e.; I for Fed. Aid Interstate; F for Fed. Aid Primary; S for Fed. Aid Secondary, etc. B. C. for State Projects. see detail below.)



DETAIL OF BRONZE TABLET FOR RIGHT OF WAY MARKER POST AND BENCH MARK

Omit and use 1/2" x 1/2" rod for Bench Mark Tablet.

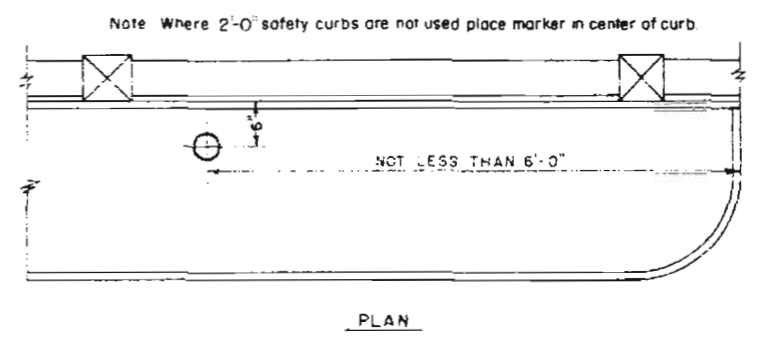
### BENCH MARK

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

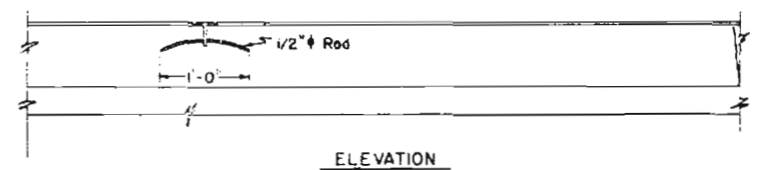
All exposed surfaces of the bronze tablet are to be ground to a smooth surface. All letters are to be depressed a minimum of 1/16 inch. Information on the bronze tablet indicated by pin lines is to be stamped in field by the engineering party after marker is placed. 3/16 inch letters and figures to be used. Project designation on tablets shall be properly shown (i.e.; I for Fed. Aid Interstate, F for Fed. Aid Primary, S for Fed. Aid Secondary, etc. B. C. for State Projects. See details below).

Bronze Bench Mark Tablets will be furnished by the Department at no expense to the Contractor.

Installation of Bronze Bench Mark Tablets will not be paid for directly, but shall be included in the price bid for Concrete.



PLAN



ELEVATION



One marker to be placed on Bridges as shown. The station shown on marker shall be the center-line stationing directly opposite the marker.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

MARKER POSTS  
AND  
BENCH MARKS

Designed by R.E.L. Approved by *[Signature]*  
Made by E.E.O. Staff Design Engr.  
Checked by R.E.L. Date: July 1, 1965

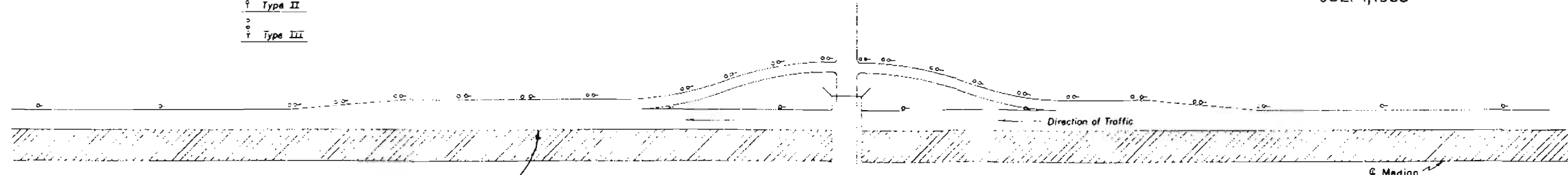
# STANDARD M-612-C

(SHEET 1 OF 2 SHEETS)  
JULY 1, 1965

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

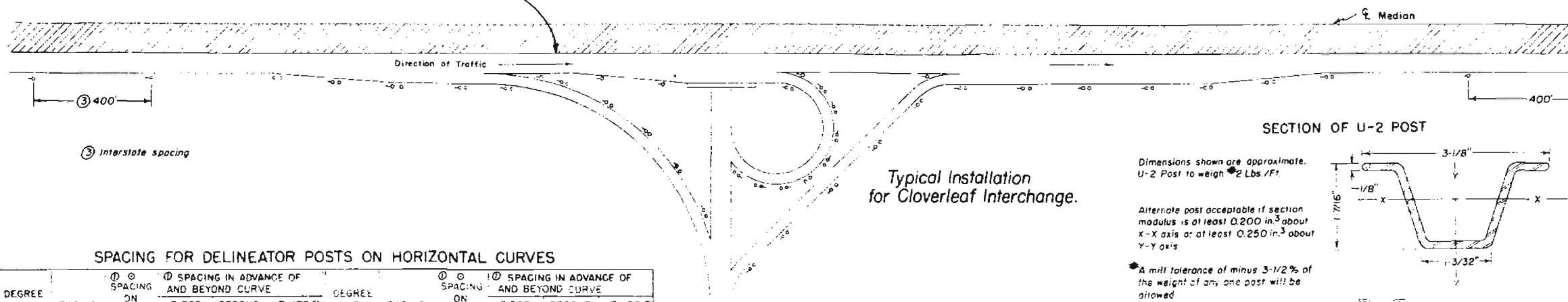
REVISIONS	

- Type I
- Type II
- Type III



EDGE OF PAVED SHOULDER

Typical Installation for Diamond Interchange.



Typical Installation for Cloverleaf Interchange.

## GENERAL NOTES

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

See tabulation in plans for delineator post requirements.

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

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

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

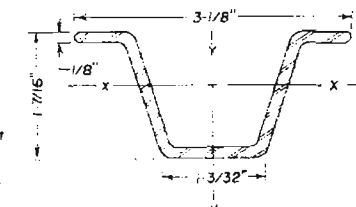
Type, location and spacing of delineators for tunnels and snow sheds shall be as directed by the Engineer.

Delineator Posts are not to be placed along Frontage Roads.

Color of Posts shall be Interstate Green.

## SECTION OF U-2 POST

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



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

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

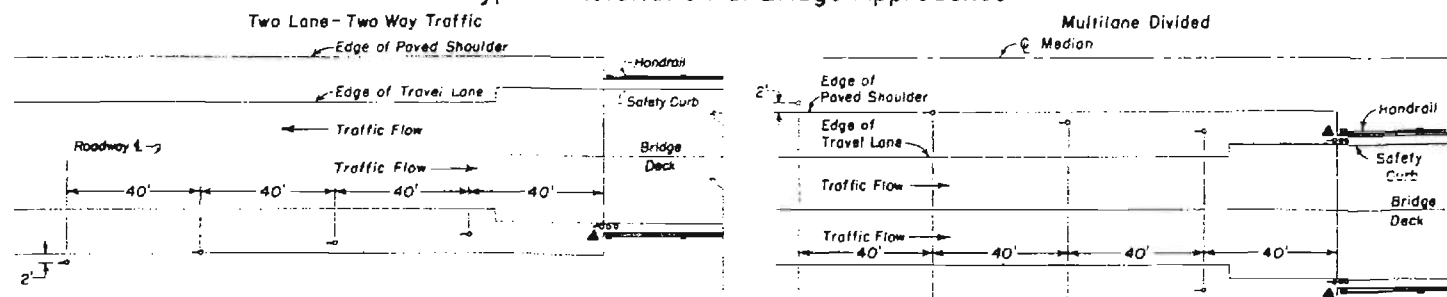
## SPACING FOR DELINEATOR POSTS ON HORIZONTAL CURVES

DEGREE OF CURVE	RADIUS	SPACING IN ADVANCE OF AND BEYOND CURVE			DEGREE OF CURVE	RADIUS	SPACING IN ADVANCE OF AND BEYOND CURVE			
		FIRST SPACE	SECOND SPACE	THIRD SPACE			FIRST SPACE	SECOND SPACE	THIRD SPACE	
0°30'	1460.0	200	200	200	8°00'	716.3	52	94	156	200
1°00'	5730.0	151	200	200	8°30'	674.1	50	90	150	200
1°30'	3820.0	123	200	200	9°00'	636.7	48	86	144	200
2°00'	2865.0	106	191	200	9°30'	603.2	47	85	141	200
2°30'	2292.0	95	171	200	10°00'	573.0	46	83	138	200
3°00'	1910.0	86	155	200	10°30'	545.7	45	81	135	200
3°30'	1637.1	80	144	200	11°00'	520.9	43	77	128	200
4°00'	1432.5	74	133	200	11°30'	498.3	42	76	126	200
4°30'	1273.3	70	126	200	12°00'	477.5	41	74	123	200
5°00'	1146.0	66	119	198	15°00'	382.0	36	65	108	200
5°30'	1041.8	63	113	189	18°00'	318.3	33	59	99	198
6°00'	955.0	60	108	180	21°00'	272.9	30	54	90	180
6°30'	881.5	58	104	174	25°00'	229.2	27	49	81	162
7°00'	818.6	55	99	165	30°00'	191.0	24	43	72	144
7°30'	764.0	53	95	159						

ST. SPACE = 1 BS 2-ND. SPACE = 3S 3-RD. SPACE = 6S  
NO SPACES TO EXCEED 200 FT.

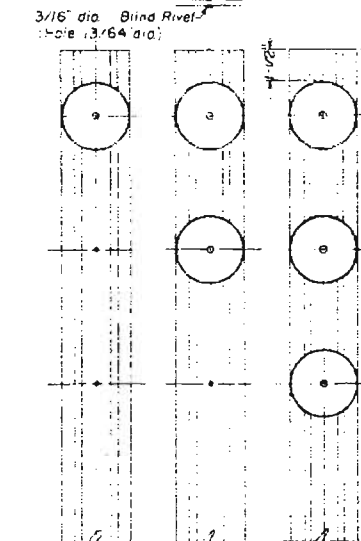
① Omit third space on Secondary and Primary Routes and double the distance on the curve and in advance of and beyond curve. For curves less than 2 degrees on interstate through roadways use interstate tangent spacing.

## Typical Installation at Bridge Approaches



Where curb to curb width of bridge is equal to or greater than roadway width plus usable shoulder width, use this delineator only and omit all others.  
Note: Where guard rail is present, place delineators outside of guard rail and at height which will permit clear view of all three Delineator buttons.

When approach slab has curb, place Type III delineator immediately behind curb.

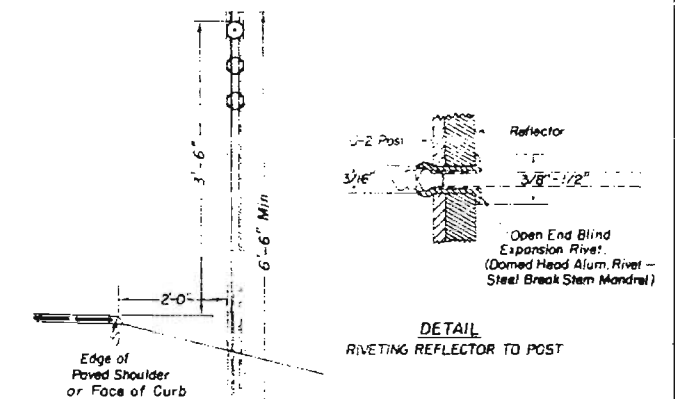


TYPE I  
1-3" dia. Crystal Reflector on U-2 Post

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

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

Min. 3 holes in all posts required as shown.



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

DELINEATORS

Designed by CKM  
Made by WNC  
Checked by LEO

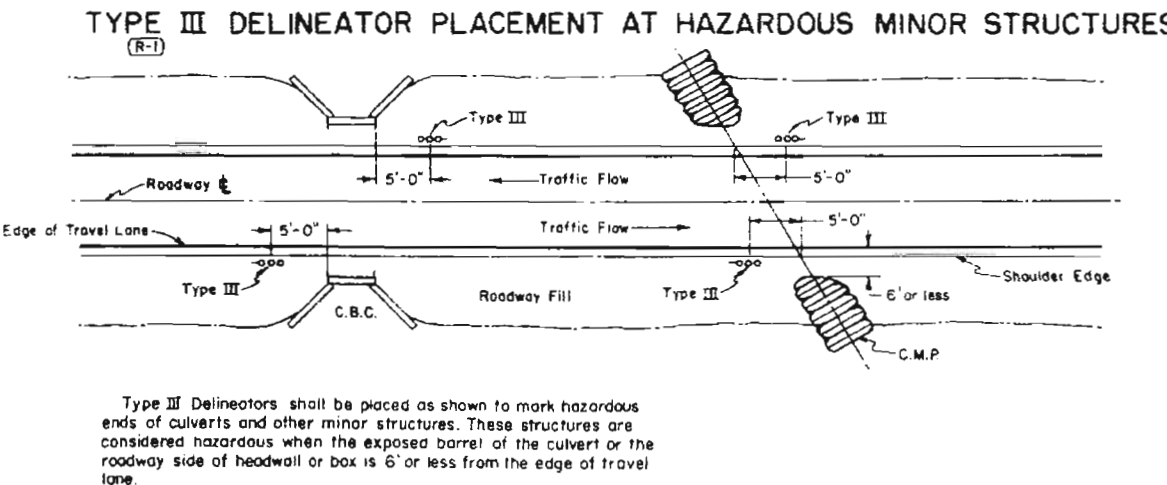
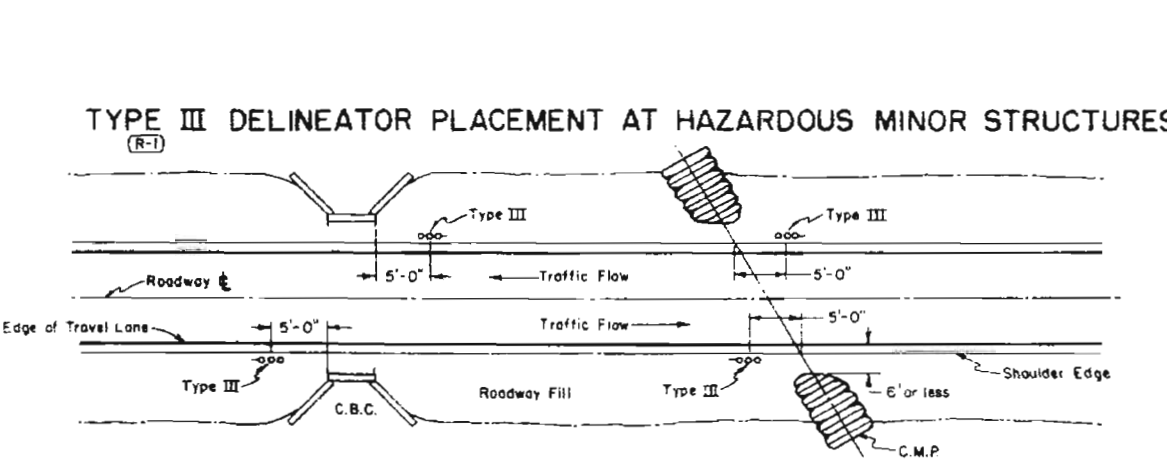
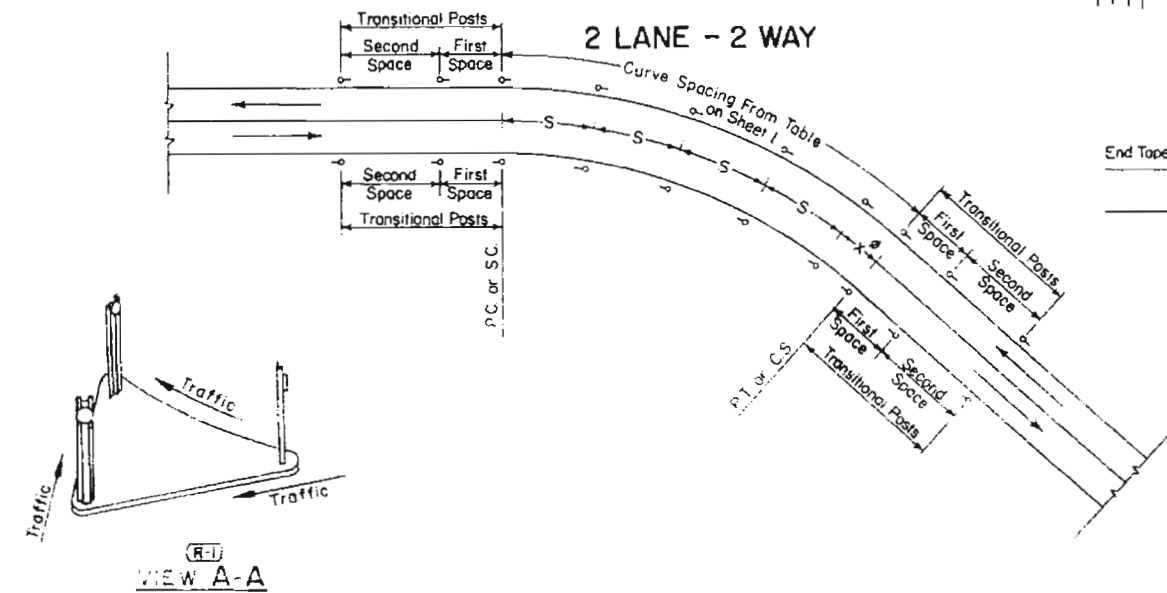
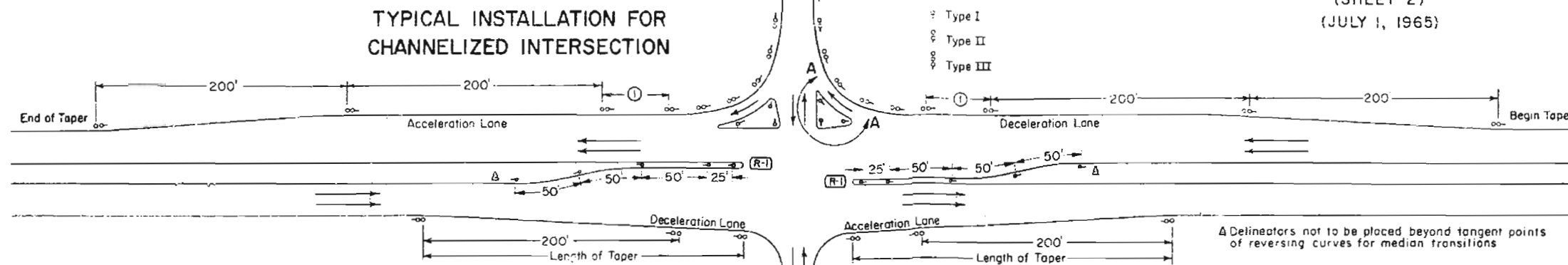
Approved by J. E. Olson  
Staff Design Engr.  
Date July 1, 1965

# STANDARD M-612-C

(SHEET 2)  
(JULY 1, 1965)

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

REVISIONS			
(R-1)	5-4-67	Median and Island Delineators	M.R.H.



Type III Delineators shall be placed as shown to mark hazardous ends of culverts and other minor structures. These structures are considered hazardous when the exposed barrel of the culvert or the roadway side of headwall or box is 6' or less from the edge of travel lane.

## GENERAL NOTES

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

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

Place face of button at 90° to C of roadway.

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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

## DELINEATORS

Designed by C.K.M. Approved by J.C. O'Connell  
Made by T.E.F. Staff Design Engr.  
Checked by L.E.O. Date July 1, 1965

# STANDARD M-614-A

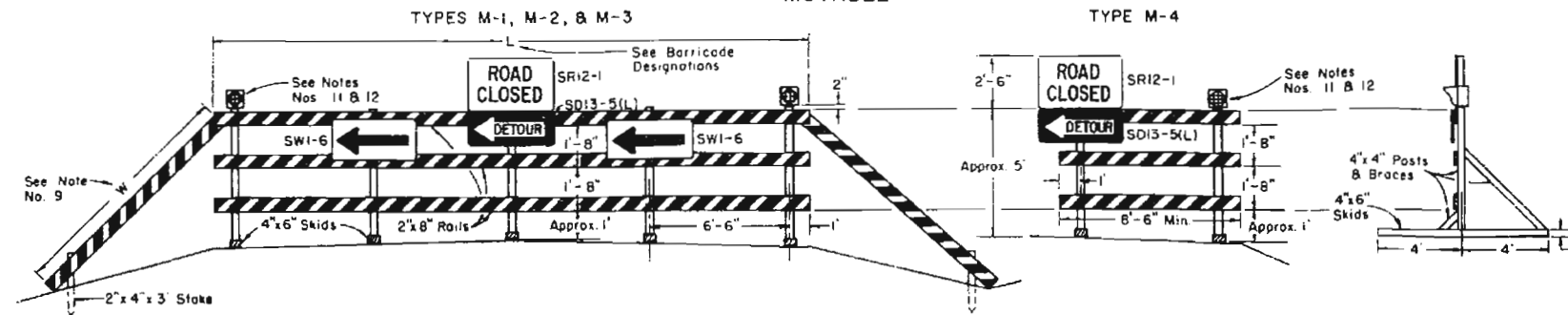
(JULY 1, 1965)

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

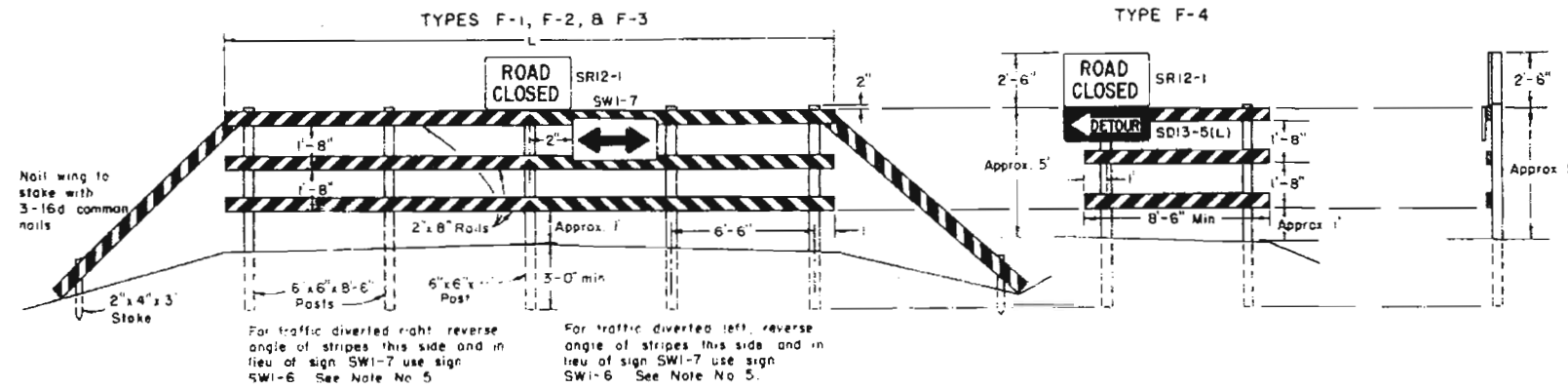
REVISIONS	

## CLASS I BARRICADES (3 RAILS)

MOVABLE



FIXED

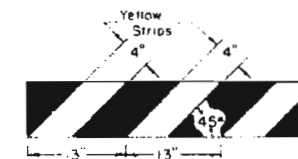
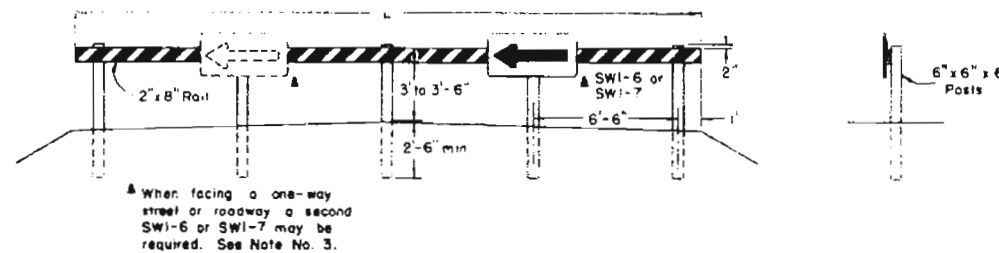


## GENERAL NOTES

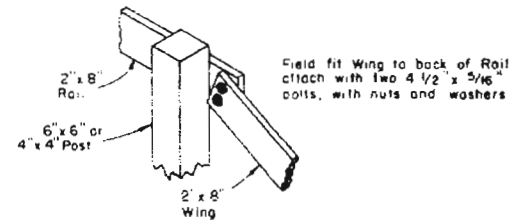
- All work shall be done in accordance with the Standard Specifications applicable to the Project.
- All signs and sign materials shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for All Classes of Streets and Highways" published by the Department of Highways 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." 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 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 123B or 125B of Standard No. 15 Grading & Dressing Rule 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.
- 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).

## CLASS II BARRICADE (1 RAIL)

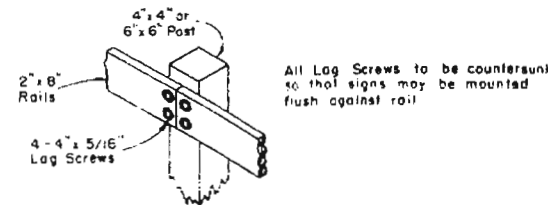
FIXED  
TYPE F-6



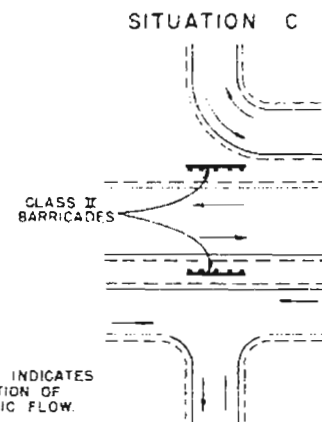
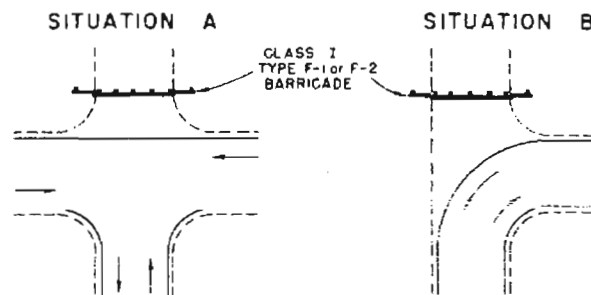
DETAIL OF RAIL AND WING STRIPING



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



METHOD OF ATTACHING PLANKING TO POSTS AT JOINTS



INDICATES DIRECTION OF TRAFFIC FLOW.

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	Variable 6'-6" min.	Barricade with extension wings complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-4	F-4	Variable	Variable 6'-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.S.  
Approved By: [Signature]  
Date: JULY 1, 1965

# STANDARD M-614-TB

(SHEET 1 OF 3 SHEETS)

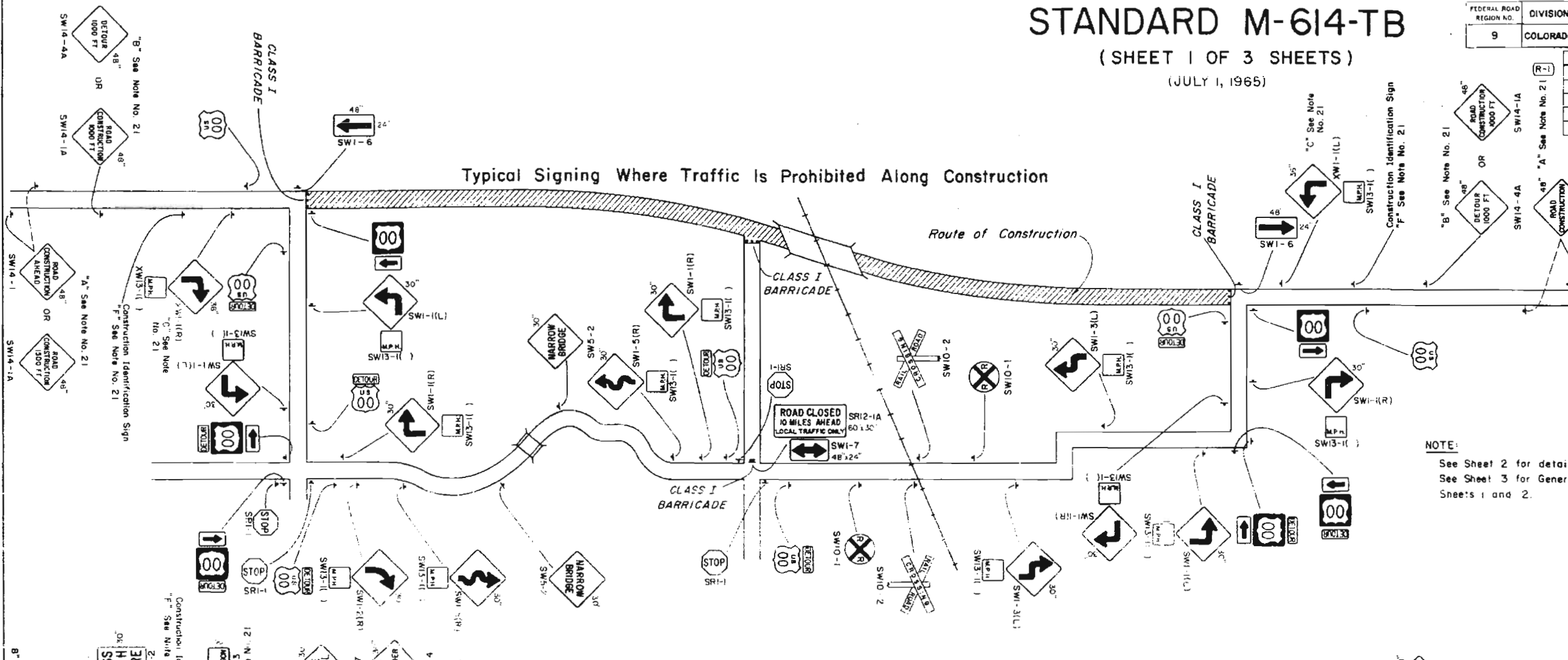
(JULY 1, 1965)

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

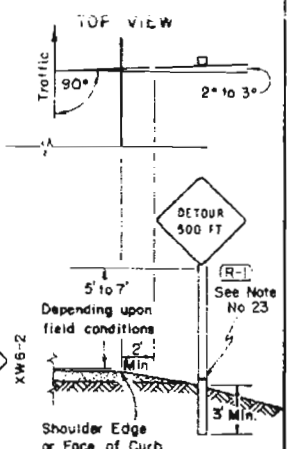
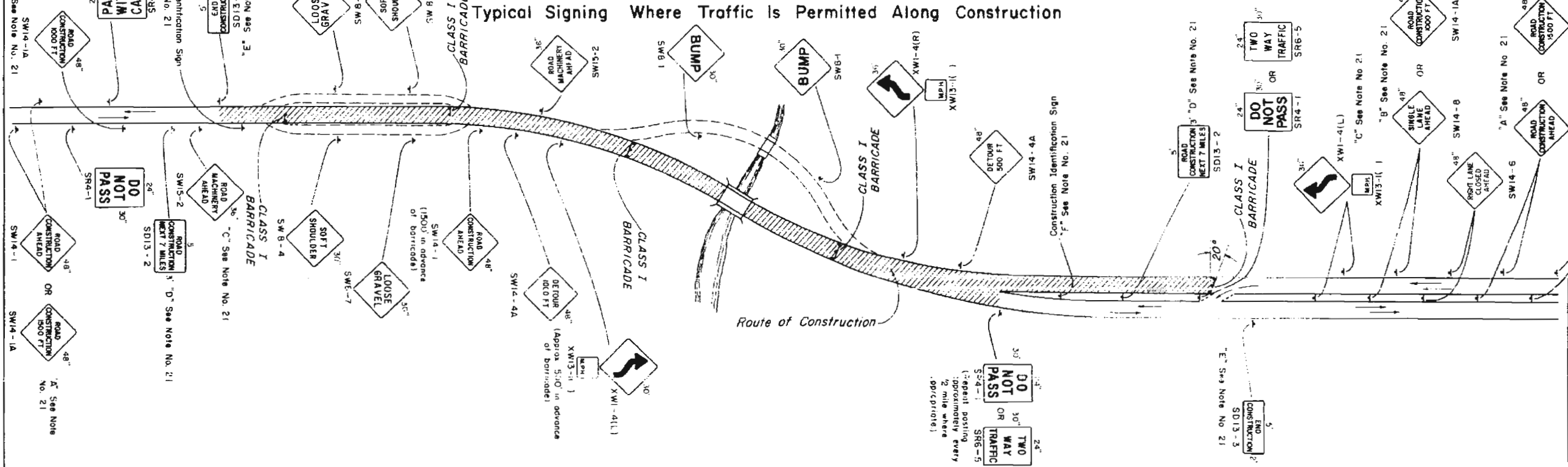
REVISIONS		
7-12-67	Note 23	G.W.F.

## Typical Signing Where Traffic Is Prohibited Along Construction



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

## Typical Signing Where Traffic Is Permitted Along Construction



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

**TRAFFIC SIGNING  
FOR HIGHWAY  
CONSTRUCTION**

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

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

# STANDARD M-614-TB

(SHEET 2 OF 3 SHEETS)

(JULY 1, 1965)

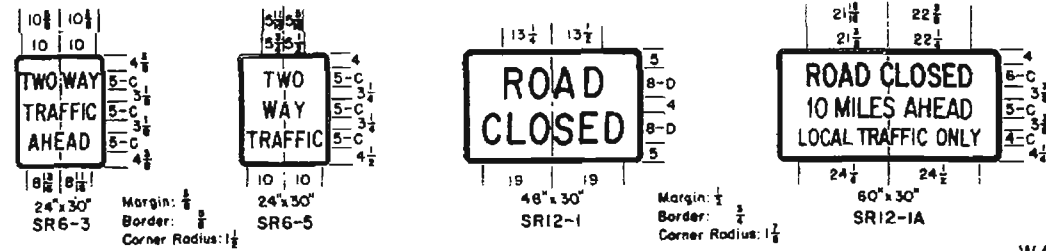
FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
1	COLORADO		

REVISIONS		
(R-1)	7-12-67	M.R.H.

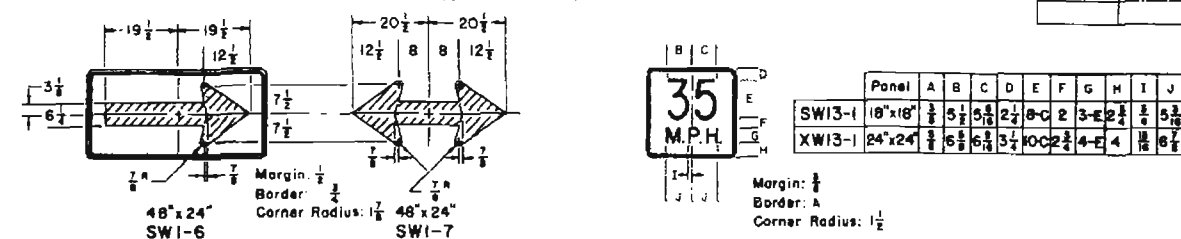
## REGULATORY SIGNS

See Note No. 9



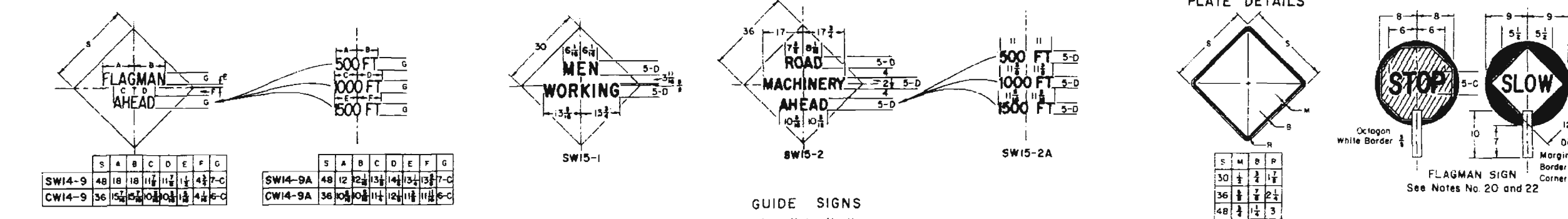
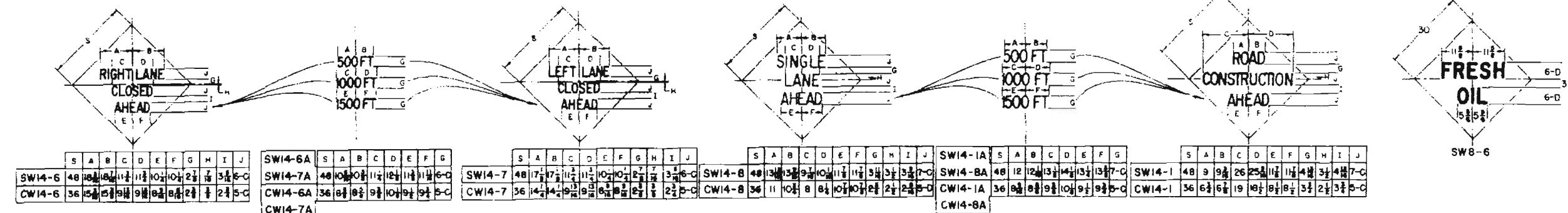
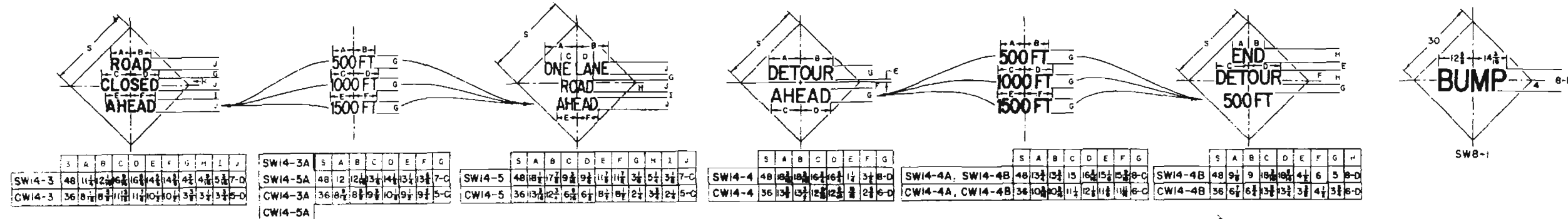
## WARNING SIGNS

See Note No. 10



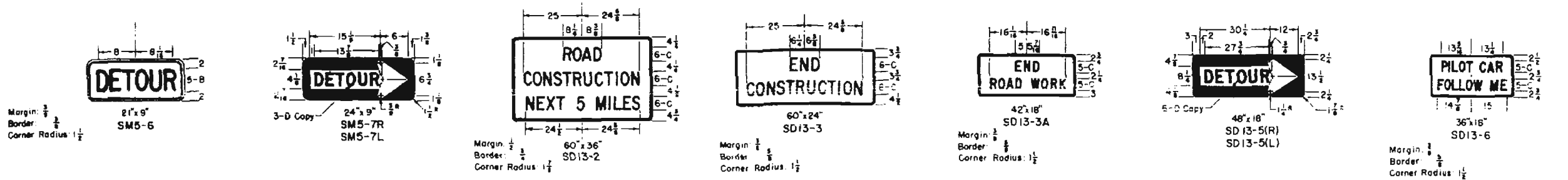
## WARNING SIGNS

See Note No. 10



## GUIDE SIGNS

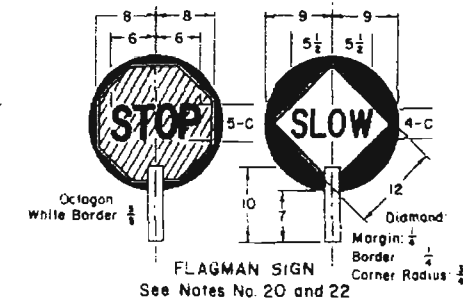
See Note No. 11



### 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

TRAFFIC SIGNING  
FOR HIGHWAY  
CONSTRUCTION

Designed By: D.R.W.  
Made By: H.E.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.
1	COLORADO		

REVISIONS			
(R-1)	7-12-67	Added Note 23	G.W.F.

## 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.
- 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 undivided 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 active 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 1/2" Ø for 6"x6" and 1" Ø for 4"x4" timber posts. The underground portion plus 6" shall be treated with creosote.

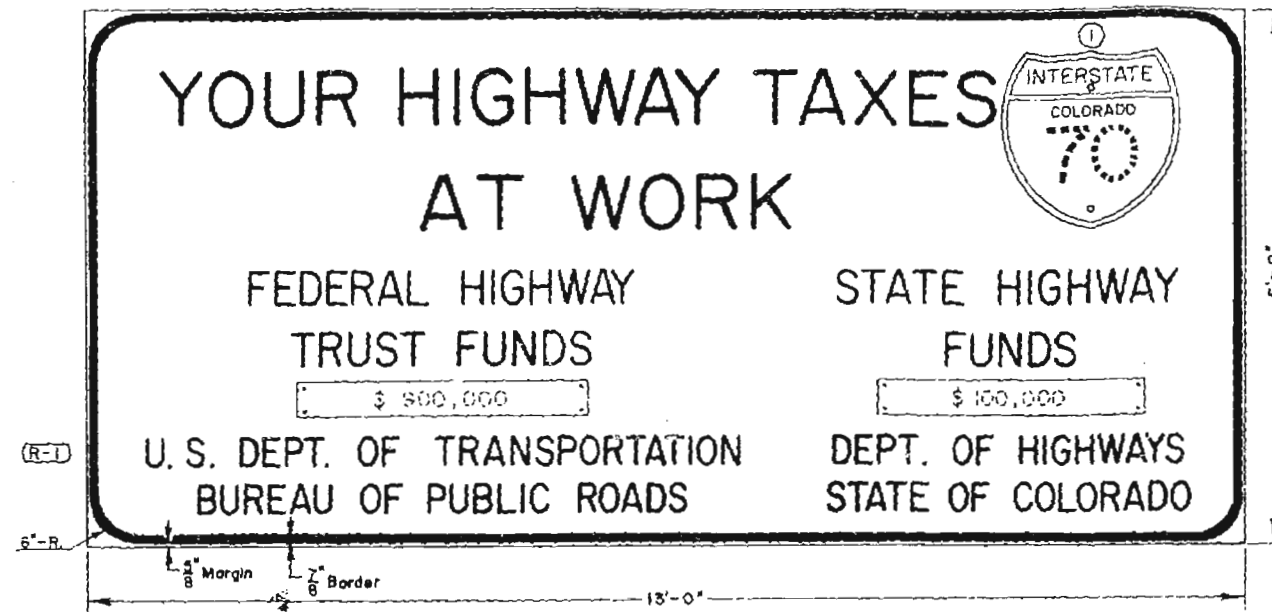
SPECIAL NOTE: Requirements of this Standard are optional to those of Standard M-614-TA through 12-31-65. Following that date Standard M-614-TA will be obsolete.

DEPARTMENT OF HIGHWAYS STATE OF COLORADO	
TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION	
Designed By D.R.W. Made By J.C.S. Checked By J.B.	Approved By <i>[Signature]</i> Traffic Engineer Date AUGUST 9, 1965

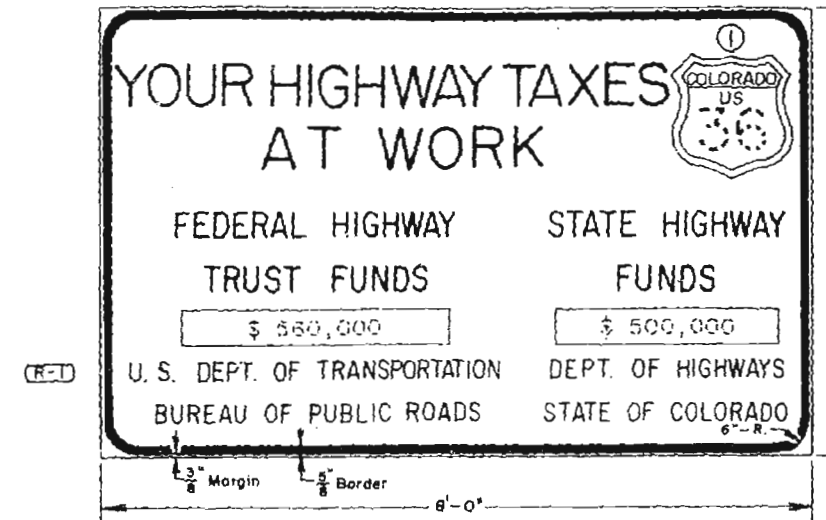
# TYPICAL SIGNS

STANDARD M-614-1A  
(JULY 1, 1965)

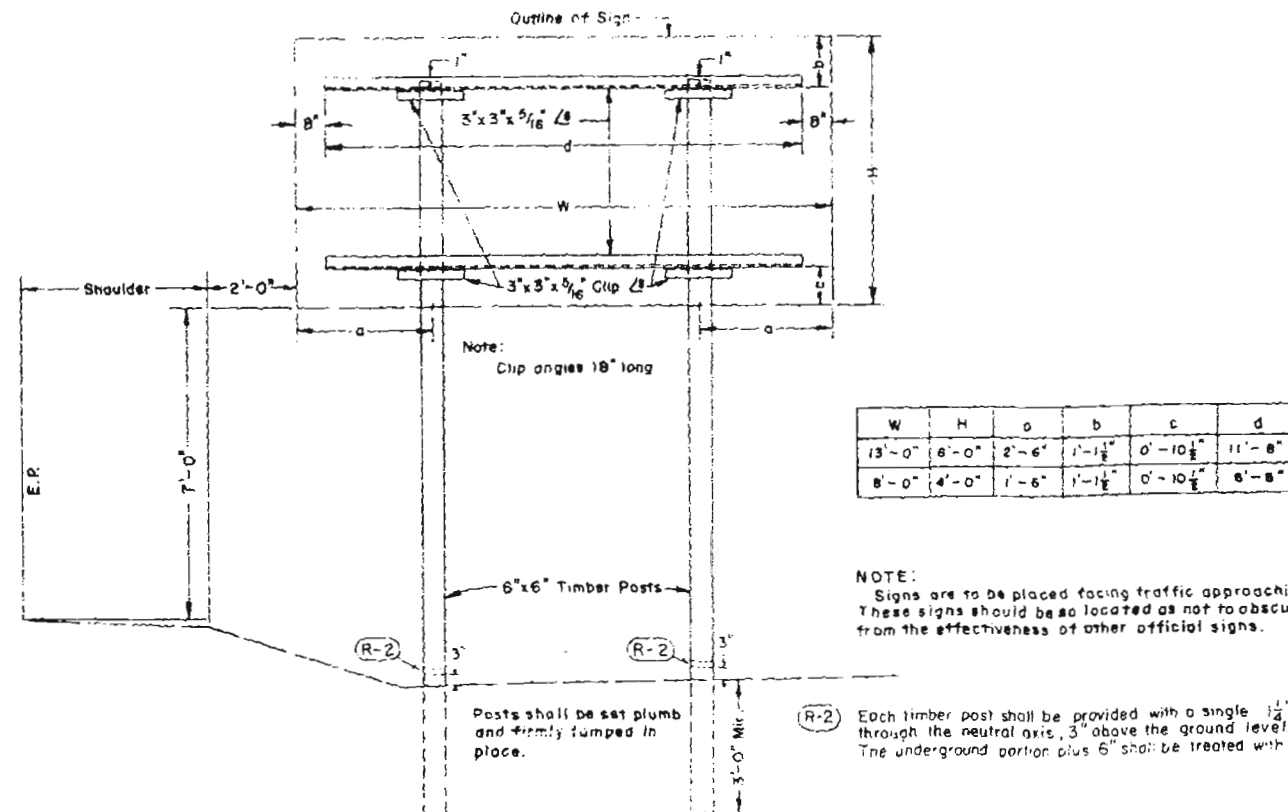
## INTERSTATE SYSTEM



## PRIMARY & SECONDARY SYSTEM



## INSTALLATION DETAIL



## GENERAL NOTES

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

Signs shall be made of 3/4" Plywood or other material approved by the Department.

When a third governmental agency is participating its official name should be included centrally in lines 6 and 7.

Paste shall be 6" X 6" S4S timber or other material approved by the Department and shall be painted white.

Signs are to be non-reflectORIZED, black letters, numerals, and border on plain white background. Route Marker plaques to be the appropriate standard colors, non-reflectORIZED.

Layout of signs will be furnished by the Traffic Engineering Section indicating the details as to letter size, symbols, spacing, figure for amount of funds, etc. which are required for these signs.

These signs will be furnished and installed by State Forces.

(R-1) Applicable Interstate, U.S. Shield or State Route Shield

DEPARTMENT OF HIGHWAY  
STATE OF COLORADO  
CONSTRUCTION  
IDENTIFICATION  
SIGNS

Designed by B.F.R. Approved by [Signature]  
Made by D.J.B. Traffic Engineer  
Checked by M.R.H. Date: July 1, 1965