

R.D.W. PURCHASED UNDER PROJECT NO. F027-1(4)

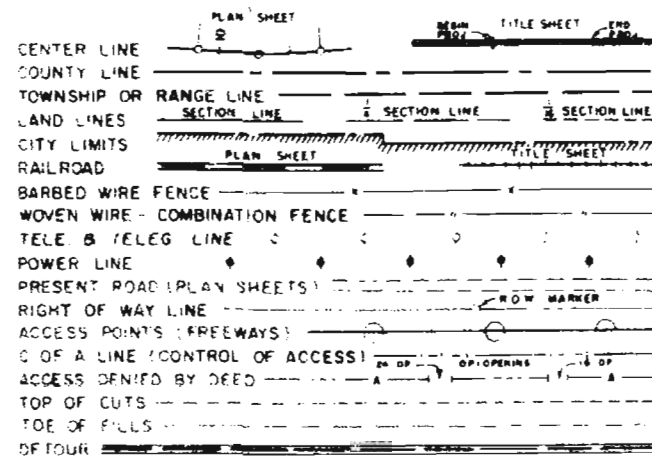
## THE STATE DEPARTMENT OF HIGHWAYS DIVISION OF HIGHWAYS - STATE OF COLORADO

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F027-1(6)	1

FINAL CONSTRUCTION

INDEX OF SHEETS

### CONVENTIONAL SIGNS



### PLAN AND PROFILE OF PROPOSED ~~COMPLETED~~ FEDERAL AID PROJECT NO. F 027-1(6) STATE HIGHWAY NO. 12 ~~160~~ LAS ANIMAS COUNTY

SHEETS NOT REVISED	
Sh. No. 2	
3	
7	
12-18	
20-28	
ADDITIONAL SHEETS	
Sh. No. 8A	
8B	
36-48	

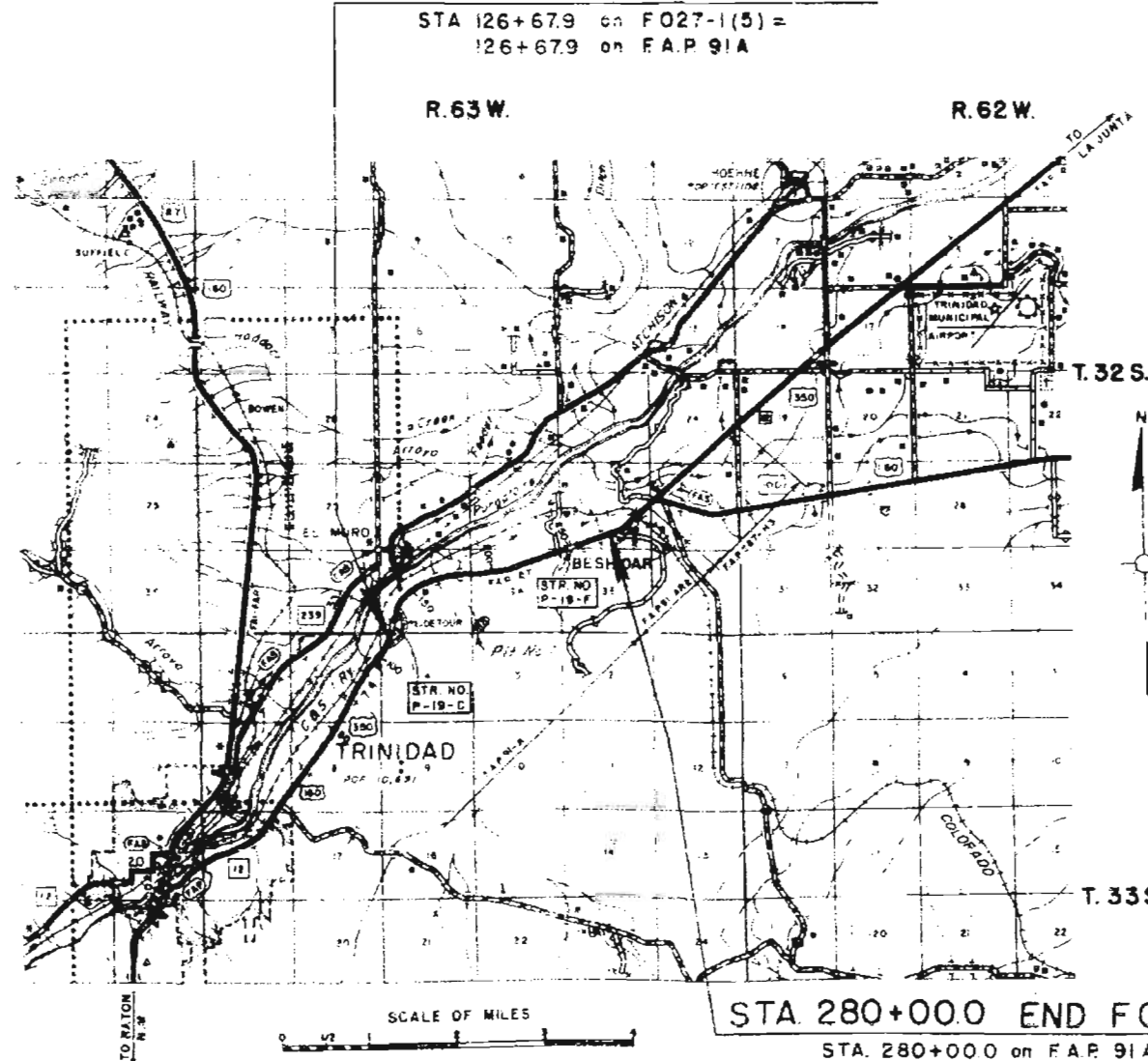
SCALES OF ORIGINAL DRAWINGS  
ON PLAN, 1 IN. = 100 FT.  
ON PROFILE, 1 IN. = 100 FT. HORIZONTAL  
1 IN. = 10 FT. VERTICAL  
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD

SHEET NO.	DESCRIPTION	DATE
1	TITLE PAGE, SKETCH MAP AND TABULATIONS OF LENGTH & DESIGN DATA	
2	TYPICAL SECTION AND GENERAL NOTES	
3	SUMMARY OF APPROXIMATE QUANTITIES	
4	STRUCTURE QUANTITIES	
5	TABULATION OF SURFACING, SUBBASE, BITUMINOUS CURBING & EMBANKMENT	
6	PROTECTORS AND TOPSOIL	
7	P.T. SKETCH	
8	TABULATION OF FENCING, ROW MARKERS, DELINEATORS AND GUARD RAIL	
9	DETAIL OF: 5' CURTAIN WALL	
10	TABULATION OF: REMOVAL OF OBSTRUCTIONS, RESET MAILBOX STRUCTURES, BRIDGE APPROACH SLABS AND SUBGRADE EXCAVATION	
11	DETAILS OF: GUARD POST ATTACHMENT TO TOP OF CBC, CHECK DAM AND CONCRETE SLOPE & DITCH PAVING	
12	DETAIL OF: TYPICAL PLUNGE BASIN, INLET BASIN, RIPRAP RUNDOWNS AND RIPRAP OUTLETS	
13	DETAIL: SPECIAL CBC, STA. 157+	
14	DETAIL: DETOUR, STA. 128+	
15	DETAIL OF: EMBANKMENT PROTECTOR TYPE 5 AND CURB TYPE 6	
16	DETAIL OF BRIDGE, STA. 128+	
17	PLAN AND PROFILE SHEETS	
18	SUMMARY OF EARTHWORK QUANTITIES	
19	STRUCTURE CROSS-SECTIONS	
20	CROSS SECTIONS	

### TABULATION OF LENGTH & DESIGN DATA

STATION	ROADWAY		MAJOR STRUCTURE	
	Lin Ft.		Lin Ft.	
126+67.9 on F027-1(5) = 126+67.9 on F.A.P. 91A				
126+67.9 EQUATION	598			
126+67.9 MAJOR STRUCTURE 26-28			4.8	
126+67.9 EQUATION	66057			
126+67.9 EQUATION	13829			
126+67.9 EQUATION	12410			
126+67.9 EQUATION	9226			
126+67.9 EQUATION	5105			
126+67.9 EQUATION	5348			
126+67.9 EQUATION	25735			
<b>TOTAL</b>	<b>14,790.4</b>		<b>56.3</b>	
<b>SUMMARY</b>				
ROADWAY	Lin Ft.	Miles		
2 MAJOR STRUCTURES	14,790.4	2.801		
<b>TOTAL (Net and Gross Length)</b>	<b>14,856.7</b>	<b>2.814</b>		
<b>DESIGN DATA</b>				
MAXIMUM DEGREE OF CURVE	3°30'			
MAXIMUM GRADE	3.88%			
MINIMUM SSD HORIZONTAL	1300'			
MINIMUM SSD VERTICAL	465'			
MAXIMUM DESIGN SPEED	60 MPH			

STA. 126+67.9 BEGIN F027-1(6) =



M-203-A	SUPERELEVATION & A DENTING OF CURVES - CROWNED HIGHWAYS	MAY 24 1967
M-203-B	APPROACH ROADS, FLAR NG CUT SLOPE TREATMENT, BRIDGE & CREST WIDENING	FEB 6 1968
M-203-C	DITCH TYPES	JULY 1 1968
M-203-D	EXCAVATION AND BACKFILL FOR STRUCTURES	APR 26 1968
M-203-E	LETTERS AND FIGURES FOR STRUCTURE NUMBERS	JULY 1 1968
M-203-F	SINGLE AND DOUBLE CONCRETE BOX CULVERTS	JULY 1 1965
M-203-G	WINDMILL FOR CONCRETE BOX CULVERTS - 12' SHOE 50' 12.5' SH. 12.5' SH. 12.5' SH. 12.5' SH.	MAY 2 JULY 1 1965
M-203-H	CONCRETE AND METAL END CONNECTIONS	APR 2 1968
M-203-I	WELDED CONCRETE PIPE - 48" DIA. 12' SH. 12.5' SH. 12.5' SH. 12.5' SH.	FEB 1 1968
M-203-J	WELDED CONCRETE PIPE - 48" DIA. 12' SH. 12.5' SH. 12.5' SH. 12.5' SH.	MAR 1 1968
M-203-K	WELDED CONCRETE PIPE - 48" DIA. 12' SH. 12.5' SH. 12.5' SH. 12.5' SH.	DEC 8 1966
M-203-L	WELDED CONCRETE PIPE - 48" DIA. 12' SH. 12.5' SH. 12.5' SH. 12.5' SH.	FEB 6 1967
M-203-M	CATTLE GUARD - 10' FT. HIGH AND 7' FT. ROW	NOV 1 1967
M-203-N	MARKER POSTS AND BENCH MARKS	MAY 3 1968
M-203-O	DELINEATORS	JAN 9 1968
M-203-P	TIMBER RIPRAP	JULY 1 1965
M-203-Q	CONSTRUCTION BENCH MARKS	JUNE 19 1967
M-203-R	TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION	JULY 12 1967

**H. G. JOHNSON**  
**M. E. VAN DEN BOS**

SEE SPECIAL PROVISIONS FOR  
NOTICE TO BIDDERS

CONTRACTOR: ENGINEER: CHIEF OF  
RESIDENT ENGINEER: BILL WARREN  
PROJECT ENGINEER: JOHN BACH  
DESIGN STARTED: JULY 15, 1968  
DESIGN COMPLETED: DEC 4, 1968

**AS CONSTRUCTED  
REVISED DATE DEC 4 1968**

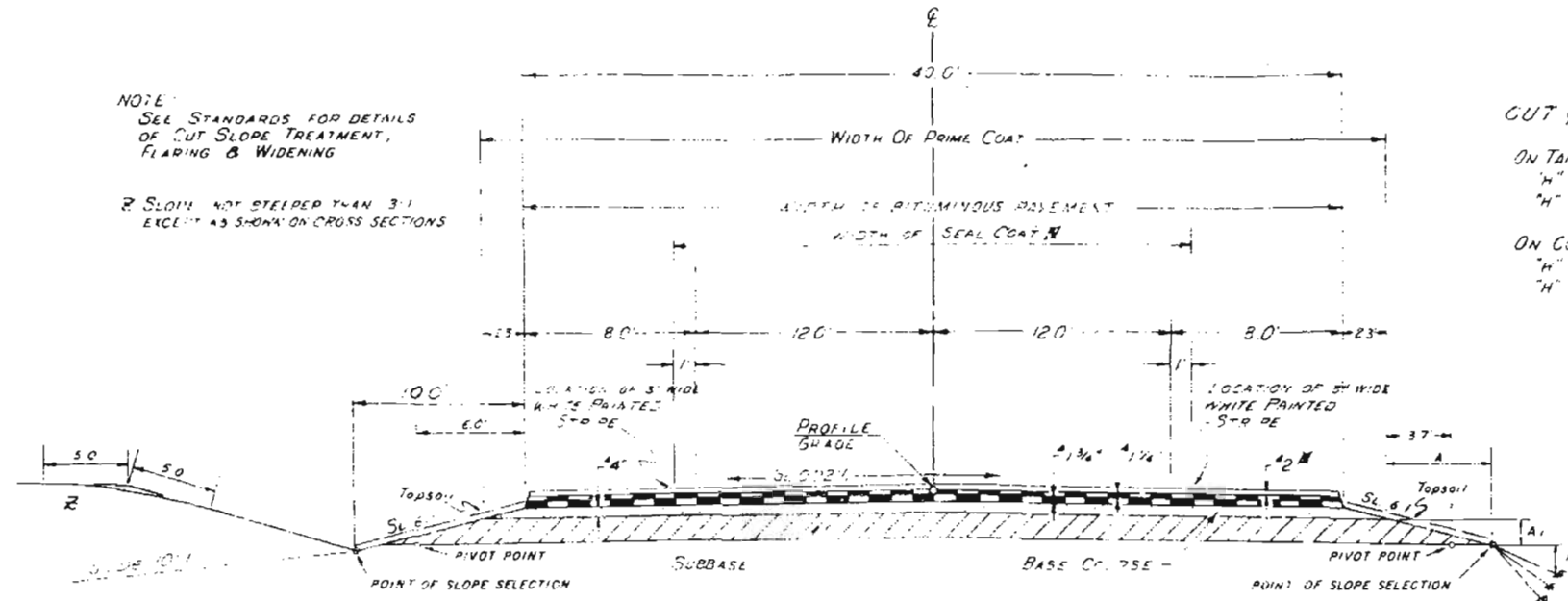
DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

Final Approval  
As Constructed Plans  
*[Signature]* 1-6-69

APPROVED	
<i>[Signature]</i>	DATE
By: <i>[Signature]</i> Deputy Chief Eng.	
DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION BUREAU OF PUBLIC ROADS	
APPROVED	
DATE	
DIVISION ENGINEER	

MEV

TYPICAL SECTION  
 STA. 127+ to 280+



NOTE:  
 SEE STANDARDS FOR DETAILS OF CUT SLOPE TREATMENT, FLARING & WIDENING  
 2 SLOPE NOT STEEPER THAN 3:1 EXCEPT AS SHOWN ON CROSS SECTIONS

CUT & FILL SLOPES  
 ON TANGENT  
 "H" 5' OR LESS 4:1  
 "H" 5' OR MORE 3:1  
 ON CURVES  
 "H" 5' OR LESS 4:1  
 "H" 5' OR MORE 3:1

THE DEPTH AND WIDTH IN THE SIDE DITCH SHALL BE VARIED WHERE NECESSARY IN ORDER TO PROVIDE PROPER DRAINAGE  
 IN SLOPE WILL NOT BE PERMITTED  
 BREAK POINTS ON SLOPES AND IN BOTTOMS OF DITCHES SHALL BE ROUNDED BY CONSTRUCTION FOR A PLEASING APPEARANCE

▲ APPROXIMATE THICKNESSES  
 ✖ FUTURE CONSTRUCTION

MATERIAL SHALL BE PLACED IN SEPARATE COURSES AT THE FOLLOWING RATES PER 100 LBS. OF ROADWAY:  
 BITUMINOUS PAVEMENT - TOP LAYER 5.0 TONS  
 BITUMINOUS PAVEMENT - BOTTOM LAYER 4.5 TONS  
 BASE COURSE 5.0 TONS  
 DETAIL SURFACE 1.0 CRY YDS

HINGE POINT DATA

THICKNESS OF SUBBASE	SECTION A	
	A	A <sub>1</sub>
9"	5.1	0.9
12"	6.8	1.1

GENERAL NOTES

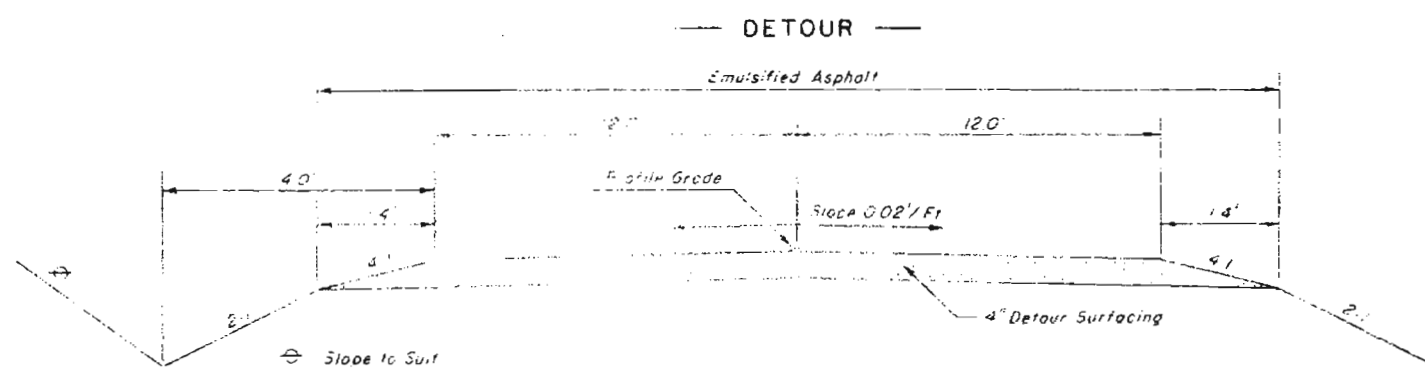
Any layer of bituminous pavement that is to have a succeeding layer placed thereon shall be completed full width before succeeding layer is placed.  
 The minimum thickness of topsoil shall be 4 inches.  
 Earth slopes shall be checked or redesigned by the approved methods for erosion protection.  
 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: Sta 129+ Rt, 154+ to 155+ Lt.

For preliminary plan quantities of Bituminous Materials the following rates of application were used:  
 Prime Coat (MC) @ 0.40 Gal / Sq. Yd.  
 Rates of application shall be as determined by the Engineer at time of application.  
 Diluted emulsified asphalt shall be used as a dust palliative where required. Location shall be as ordered.  
 Road approaches which require bituminous pavement shall be placed and 8 1/4" 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.  
 All timber guard posts conflicting with construction are to be removed by maintenance forces.

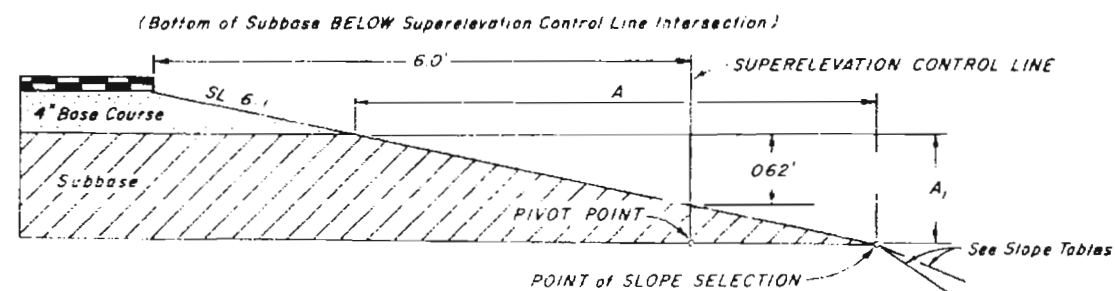
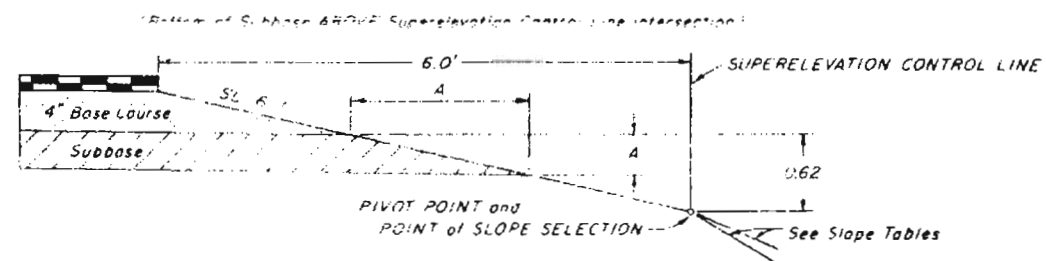
Depth of Moisture Density control for this project shall be as follows:  
 Full depth of all embankments  
 Bases of cuts 1 foot.  
 Bases of fills 1 foot  
 Full depth of embankment sections used for ditches and channel changes.  
 Excavation required for compaction of bases of cuts and fills will be 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(6)	3	



## — TYPICAL SIDE SLOPE DETAILS —







STRUCTURE QUANTITIES

FINAL CONSTRUCTION

AS CONSTRUCTED  
REVISED DATE DEC 4 1968

FEDERAL ROAD DISTRICT NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F 027-1(6)	6

LOCATION	REMOVAL OF STRUCTURE EACH	UNCLASSIFIED EXCAVATION CUBIC YARD			STRUCTURE EXCAVATION CUBIC YARD	STRUCTURE BACKFILL CUBIC YARD	AGGREGATE BASE COURSE SURFACING (CLASS 6) TON	HOT BITUMINOUS PAVEMENT (GRADING E) TON	CONCRETE CUBIC YARD	REINFORCING STEEL LB.	References BOOK PAGE SHEET	CULVERT PIPE LINEAR FEET					GSP NESTABLE LIN. FT.	"H" OVER CULV. FT.	SLOPE AND DITCH PAVING CUBIC YARD	END SECTION EACH				PLUG CULVERT EACH	MISCELLANEOUS			
		EXCAV.	EMB.	DITCH								CL. 3	CL. 4	18"	24"	30"				36"	42"	8"	24"			30"	36"	42"
ROADWAY 122 - 133+ 127+ 128+11 - 128+528 130+25 130+41		1,325 1,000 1,957								12,346	1 5 36 1 8 1 11 11 1 13 1 16														376 400 Cu. Yds. Detour Surfacing 1- Identification Sign (State Forces) 266.8 Sq. Yds. Concrete Pavement (10" Thick) 114 Lin. Ft. Compression Joint Sealer (Type A)			
130+57 131+21 132+98.4 133+ - 136+ 134+84 135+29 135+29		42 2076 1,400		32 27 26	48 41 27						1 19 1 21 1 22 1 25 37 1 28 1 31 1 30														7.22 cu yds of Concrete Slope and Ditch Paving 14 Cu Yds. of Riprap			
135+29 136+ - 140+ 36+ 136-60 140+00 139+30		107 20 439 227									1 32 1 37 1 40 1 34 1 43 1 42														378 Cu Yds of Concrete Slope and Ditch Paving 1- Retort Structure			
148+ - 152+ 151+ 152 - 156+ 153+ - 156+ 154+00 156+71		107 20 439 227		10 14	14						1 46 1 49 1 52 1 25 1 58 2 5														35 Cu Yds of Concrete Slope and Ditch Paving 15 Cu Yds of Riprap 747 Cu Yds of Concrete Slope and Ditch Paving 1- 16' Cattle Guard 10 Cu Yds of Riprap 747 Cu Yds of Concrete Slope and Ditch Paving			
157+00 157+50 157+ - 159+ 157+ - 159+ 167+50				40 37	50			1537	3,053		2 8 2 11 2 14 2 17 2 20														3310 Cu Yds. of Riprap 1224 Cu Yds. of Riprap 20 Cu Yds. of Concrete Slope and Ditch Paving 1- 16' Cattle Guard			
171+35 172+00 181+91 181-73 184+ 183+44 185+ - 187+ 187+20 187+43 40 188+00		73 17 910 570 472		54 17 54 80 21	5 8 46 210 169			1623 17	5,034 193		2 23 2 24 2 26 2 25 2 27 2 32 38 2 35 2 36 2 36														115 Cu Yds of Detour Surfacing 17 Cu Yds. of Riprap & Build. of Bed Course Material.			

\* 4:1 Wingwalls  
\* Excavation for Ditches over 10 Ft in width is shown as Unclassified Excavation



**AS CONSTRUCTED**  
**REVISED** DATE DEC 4 1968

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	COLORADO	F 027-1(6)	8	

**TABULATION OF BITUMINOUS CURBING AND EMBANKMENT PROTECTORS**

REF BK 5 pg 26 & 34

STATION	SIDE	EMBANKMENT PROTECTORS	BASE COURSE	CURB	HBP GRADING	STRUCTURE EXCAVATION	
		TYPE 5	CLASS 6	TYPE 6 (Section M)	E 13.44"	CU. YD.	
		TON	TON	LIN. FT.	TON	CU. YD.	
26+67.9 - 27+81.0	RT			250	1100		
27+81.0 - 28+82.8	RT			372	968		
128+82.8 - 178+00	RT	7.5				5.125	
131+50	RT						
153+25 - 159+50	RT	6.253		630	1515	73.582	
157+20	RT						
164+50 - 186+00	RT	2.5		388	766	5.125	
184+50	RT						
182+50 - 185+50	RT	5.127		522	1117	1.254	
184+50	RT						
216+7	RT	5.5		408	1020	5.125	
220+50 - 222+00	RT						
222+00	RT						
267+60 - 268+50	RT	1.5		338	798	5.125	
261+50	RT						
274+50 - 279+50	RT	1.0		510	1275	1.52	
274+50	RT						
283+1	RT	1.0		510	1275		
TOTAL		24.77		3125	7770	38.595	

QUANTITIES TAKEN TO SURFACE AND END OF STRUCTURE

**TOPSOIL REQUIREMENTS**

REF BK 7 pg 50 & 72

LOCATION	CU. YDS. FROM	CU. YDS. FINAL
153+25 - 159+50	1100	3809
SHOULDER	1100	3140
TOTAL		6969

**BASE COURSE AND SURFACE COURSE PLAN**

See sheet # 8B

STATION TO STATION	SOURCE	TONS USED				HAUL - TON MILE			
		AGGREGATE BASE COURSE		HOT BITUMINOUS PAVEMENT		AGGREGATE BASE COURSE		HOT BITUMINOUS PAVEMENT	
		CLASS 6		1 1/2" TOP GRADE E	1 1/2" BOTTOM GRADE E	CLASS 6		1 1/2" TOP GRADE E	1 1/2" BOTTOM GRADE E
APPROACH TO PROJECT 126+67.9 - 27+81.0 27+81.0 - 128+82.8	PIT NO. 1 R = 78	106		36	49	78		60	82
128+82.8 - 178+00 178+00 - 194+58.5 BK		4,622		1,525	2,115	5,526		1,823	2,529
198+97.1 AH - 212+80.0 BK 212+80.7 AH - 223+21.7 BK		1,400		429	595	1,526		504	699
223+24.6 AH - 232+47.2 BK 232+47.3 AH - 254+26.1 BK 254+26.7 AH - 280+00	0.73 MILES HAUL TO STA. 178+00	867		286	397	1,378		455	631
		2,048		676	937	3,859		1,274	1,766
		2,419		798	1,107	5,647		1,863	2,584
APPROACH TO PROJECT STRUCTURE QUANTITIES FROM EMB PROTECTOR TAB		47		16	22	121		41	57
		399		69	75	595		132	109
		151				225		109	
SUB-TOTAL				4,692	6,456	21,815		7,171	9,609
TOTAL		10,497		11,148		38,595			

**SUBBASE PLAN**

See sheet # 8A

STATION TO STATION	SOURCE	THICKNESS	AGGREGATE BASE COURSE	HAUL - TON MILE
			CLASS 2 TONS	CLASS 2
126+67.9 - 27+81.0 27+81.0 - 128+82.8	PIT NO. 1 R = 78	2"	368	65
128+82.8 - 129+00 129+00 - 134+00		2"	59	98
134+00 - 178+00		12"	1,715	2,762
178+00 - 184+00		9"	6,956	2,563
184+00 - 184+00		9"	1,494	1,176
184+00 - 194+58.5 BK		12"	3,631	3,427
198+97.1 AH - 212+80.0 BK		12"	4,704	5,575
212+80.7 AH - 223+21.7 BK		12"	3,571	5,016
223+24.6 AH - 232+47.2 BK 232+47.3 AH - 254+26.1 BK	0.73 MILES HAUL TO STA. 178+00	2"	3,165	5,034
		12"	7,473	14,081
254+26.7 AH - 262+00		2"	2,653	5,74
262+00 - 280+00		9"	4,482	10,790
APPROACH TO PROJECT		9"	125	322
CREST OF GRADE WIDENING FOR IRREGULARITIES			820	1,240
			4,517	6,829
TOTAL			49,793	75,305

BASED ON DESIGN CURVE D AND R VALUE OF SUBBASE MATERIAL = 70.

FINAL TABULATION

FINAL CONSTRUCTION

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	COLORADO	F 027-1(6)	8A	

SUBBASE (ABC-CL2)

Ref. - Envelopes of White Tickets

AS CONSTRUCTED  
 REVISED DATE DEC 4 1968

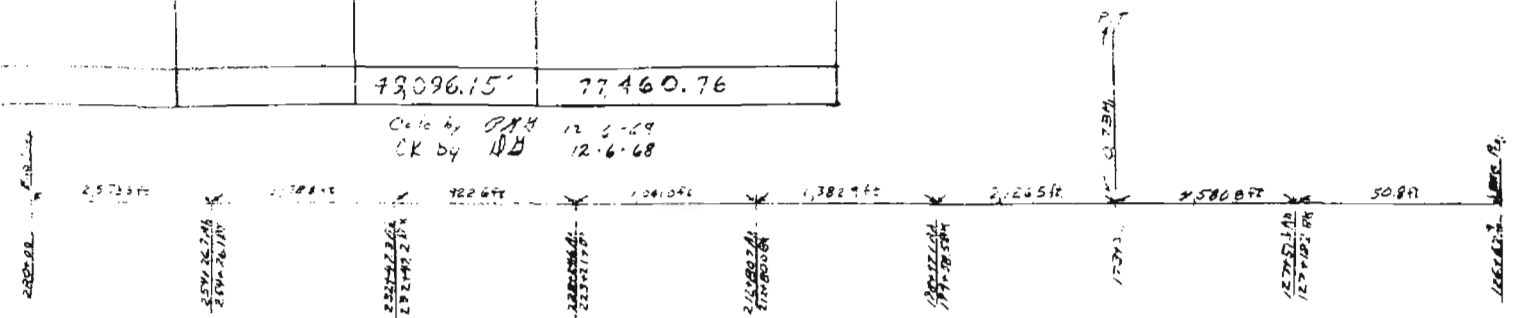
CODE	THICKNESS	STA. TO STA.	CENTER STA.	DIST. FROM* STA. 173+32	MILES (+0.73)	TONS	HAUL - TON MILES
1	9"	126+279 - 127+810	127+08.2	4591.3	1.60	270.40	592.64
2	9"	127+81 - 128+828	128+319	4500.1	1.58	---	---
3	9"	128+828 - 129+00	128+91.4	4440.5	1.57	62.20	97.65
4	9"	129+00 - 134+00	131+50	4820	1.52	1419.60	2,157.79
5	9"	134+00 - 173+32	153+66	1760	1.10	12193.50	13,412.85
6	9"	173+32 - 194+58.5W	183+95.2	1063.2	0.93	6557.20	6,098.20
7	9"	198+97.1An - 212+80 BK	205+88.5	2817.9	1.26	4062.50	5,118.75
8	9"	212+80.7An - 215+00	213+90.4	3619.1	1.42	326.00	462.92
9	12"	215+00 - 223+21.7A	219+10.9	4139.6	1.51	3939.55	5,948.72
10	12"	223+24.6An - 232+47.2BK	227+85.9	5,011.7	1.67	2591.90	4,244.97
11	12"	232+47.3An - 254+20.1D	243+36.7	6562.4	1.77	8070.60	15,780.88
12	12"	254+26.7An - 280+00	267+13.4	8938.5	2.42	8670.50	20,982.61
13		Appr. To Project (600')	283+00	10525.1	2.72	942.20	2,562.78
<b>PROJECT TOTAL</b>						<b>42,096.15</b>	<b>77,460.76</b>

Final Tab of Ton Mile Haul

ABC C12	77,461
ABC C16	25,098
HBPGRE	19,341
	121,900 TON MILE

\* Dist obtained from Diag Rt

Calc by PNH 12-6-68  
 CK by DB 12-6-68



FINAL TABULATION OF

FINAL CONSTRUCTION

FEDERAL ROAD DISTRICT NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
1	COLORADO	F027-1(6)	BB	

BASE COURSE (ABC-CL.6)

SURFACE COURSE (HBP-GRE)

AS CONSTRUCTED  
REVISED DATE DEC 4 1964

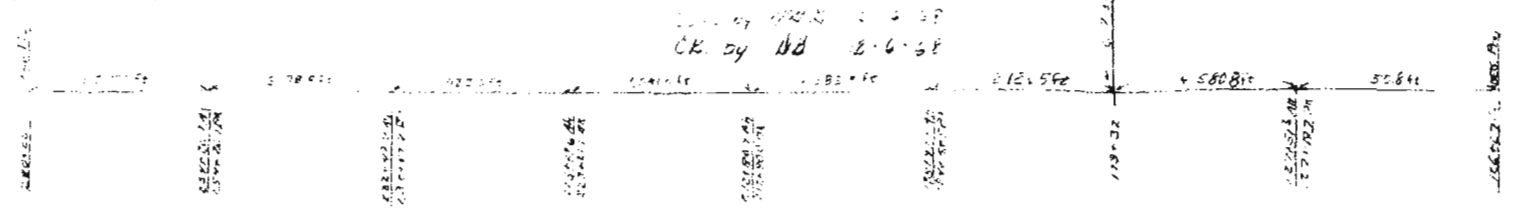
Ref. Envelopes of White Tickets

Ref. Envelopes of White Tickets

CODE	STA. TO STA.	CENTER STA.	DIST. FROM* STA. 173+32 (FY)	MILES (+0.73)	TONS	HAUL - TON MILE
1	APPROACH TO PROJECT					
2	126+579 <sup>±</sup> TO 127+81	127+082	4,591.3	1.60	206.25	329.92
3	127+81 TO 128+82.8	128+319	4,500.1	1.58		
4	128+82.8 TO 173+32	150+074	2,324.6	1.15	5,390.90	6,194.54
5	173+32 TO 194+58.5 BK	183+953	1,063.3	0.93	1,028.20	956.23
6	198+971A TO 212+800 BK	205+886	2,818.0	1.26	1,500.05	1,449.06
7	212+807A TO 223+217 BK	218+012	4,029.9	1.49	1,003.80	1,495.66
8	223+246A TO 232+472 BK	227+859	5,011.7	1.68	894.80	1,503.26
9	232+473A TO 254+261 BK	243+367	6,562.4	1.97	2,499.20	5,317.42
10	254+267A TO 280+00	267+134	8,938.5	2.42	2,139.20	2,932.26
11	APPROACH TO PROJECT	285+00	3,745.1	2.58	640.80	1,553.26
<b>PROJECT TOTAL</b>					<b>15,573.15</b>	<b>25,097.61</b>

CODE	STA. TO STA.	CENTER STA.	DIST. FROM* STA. 173+32 (FY)	MILES (+0.73)	TONS	HAUL - TON MILE
1	APPROACH TO PROJECT					
2	126+579 <sup>±</sup> TO 127+81	127+082	4,591.3	1.60	139.70	223.52
3	127+81 TO 128+82.8	128+319	4,500.1	1.58		
4	128+82.8 TO 173+32	151+074	2,224.6	1.15	3,697.55	4,252.18
5	173+32 TO 194+58.5 BK	183+953	1,063.3	0.93	1,662.20	1,545.85
6	198+971A TO 212+800 BK	205+886	2,818.0	1.26	1,104.00	1,391.04
7	212+807A TO 223+217 BK	218+012	4,029.9	1.49	840.85	1,252.87
8	223+246A TO 232+472 BK	227+859	5,011.7	1.68	714.35	1,200.11
9	232+473A TO 254+261 BK	243+367	6,562.4	1.97	1,686.30	3,322.01
10	254+267A TO 280+00	267+134	8,938.5	2.42	1,396.35	4,831.17
11	APPROACH TO PROJECT	285+00	3,745.1	2.58	464.70	1,198.93
From Top Bituminous Curbing Ref SA 8, 8x5 1/2						
Sta to Sta Side						
	31+ to 34+ Rt	32+50	4,082.0	1.50	8.68	13.02
	153+ to 159+ Rt	156+00	1,732.0	1.06	16.15	17.12
	182+ to 185+ Rt	183+50	1,018.0	0.92	8.17	7.52
	182+ to 185+ Lt	183+50	1,018.0	0.92	7.66	7.05
	216+ to 222+ Lt	219+00	4,287	1.51	15.26	23.04
	263+ to 266 Lt	264+50	8,675.1	2.37	8.58	20.33
	274+ to 279+ Lt	276+50	9,875.1	2.60	13.46	35.00
<b>PROJECT TOTAL</b>					<b>12,383.96</b>	<b>19,340.74</b>

Cost obtained from Diag Rt



Checked by *[Signature]* 12-6-64

Checked by *[Signature]* 12-6-64

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

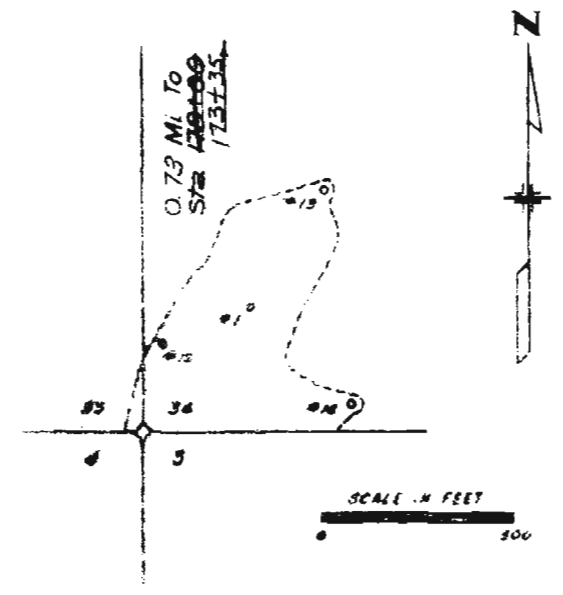
PIT NO. 1

Owner: Alexander E. and Helen M. Latuda, Trinidad, Colorado.  
 Location: Part of SW 1/4 SW 1/4 Sec. 34  
 T. 38 S., R. 63 W.  
 Use: Subbase, Base Course and Bituminous Pavement.  
 Quantity Available: Ample.  
 Striping: Removing Overburden 5,000 Cu. Yds.  
 Replacing Overburden 5,000 Cu. Yds.  
 Haul Distance: 0.73 Miles to Sta. 178+00

AS CONSTRUCTED  
 REVISED DATE

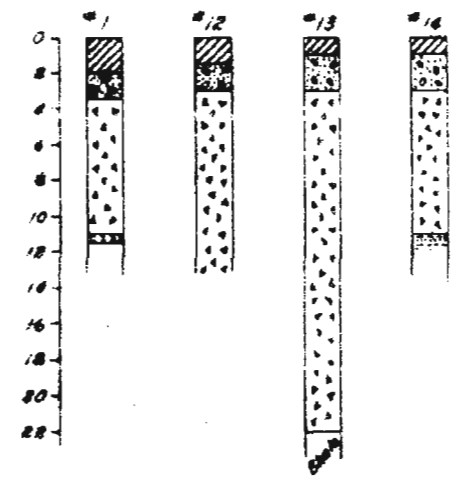
FINAL CONSTRUCTION

AS CONSTRUCTED  
 REVISIONS DATE DEC 4 1951



LOG OF TEST HOLES  
 SAMPLE NO. 2186

- LEGEND
- 2 R
  - WHITE SOIL & GRAVEL
  - SAND & GRAVEL
  - S & G W/CLAY
  - FINE & GRAVEL





FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F027-1(6)	11	

AS CONSTRUCTED  
REVISED DATE

REMOVAL OF OBSTRUCTIONS

REV BK 4 pg 5

STATION	SIDE	DESCRIPTION
211+00	LT	HANDRAIL
211+02	"	24" x 24" CMP
213+42	"	24" x 30" CMP
213+89	RT	5" x 20" CMP

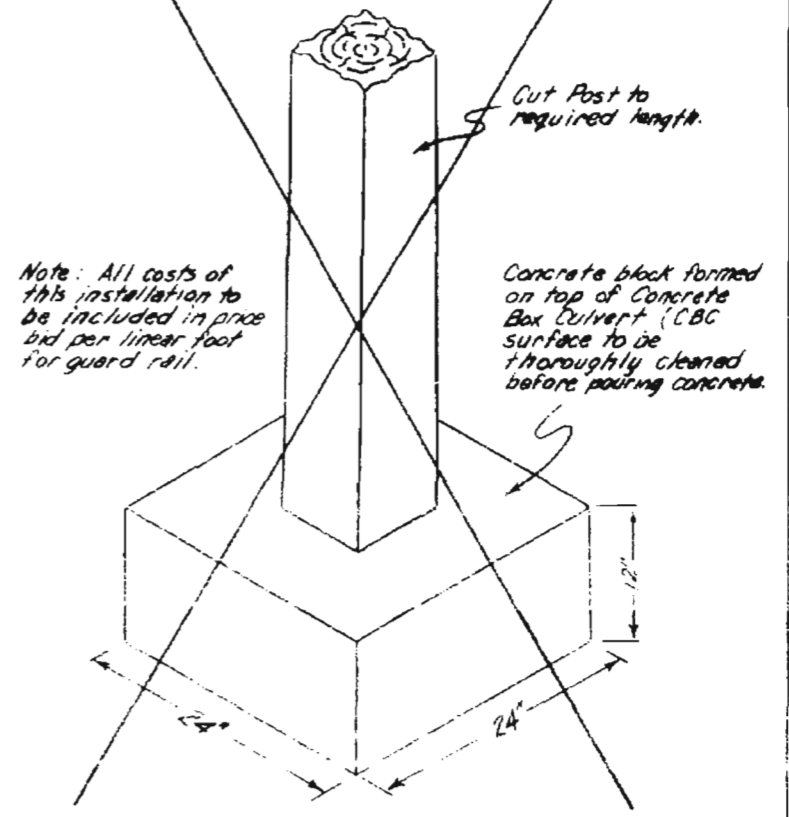
NOTE: ALL COSTS OF REMOVAL OF OBSTRUCTIONS ARE TO BE INCLUDED IN PRICE BID PER LINEAR FOOT FOR GUARD RAIL.

RESET MAILBOX STRUCTURES

REV BK 2 pg 32

STATION	SIDE	EACH
126+00	LT	2
130+60	RT	1
130+60	RT	1
246+70	RT	2
252+	RT	1
PROJECT TOTAL		38

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 BRIDGE APPROACH SLABS

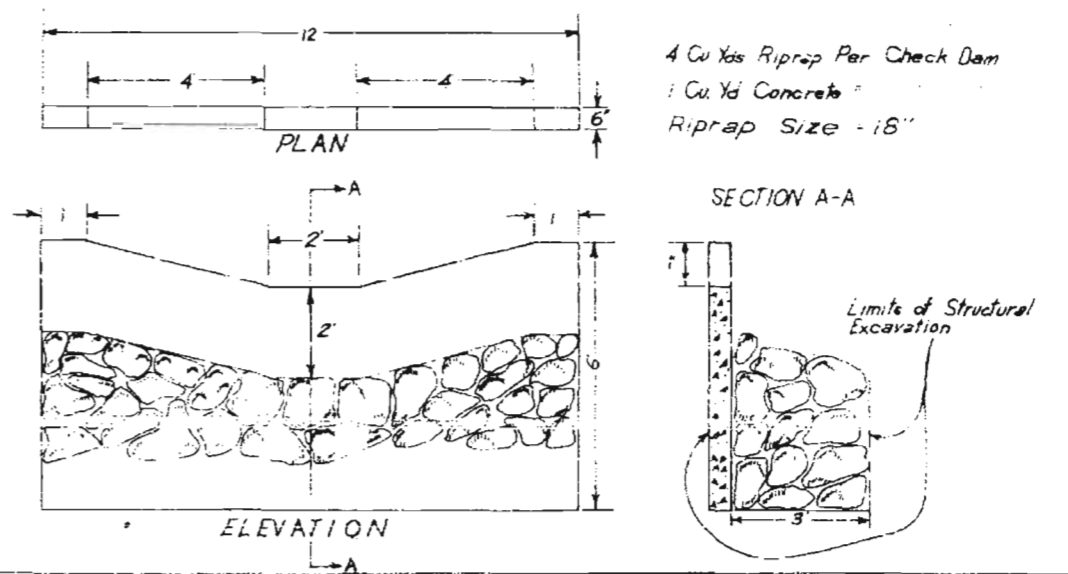
REV BK #1 Pg 11

STATION	SIDE	REINF STEEL	COMP JOINT SEALER TYPE A	10" CONCR PAVEMENT
		Lb	LIN FT.	SQ. YD.
27+00 to 27+100		2,346	4	266.6
TOTAL		2,346	4	266.6

DETAIL OF CHECK DAM

STA. 152+ to STA. 156+

REV BK #1 Pg 55  
#2 Pg 14



4 Cu Yds Riprap Per Check Dam  
1 Cu Yd Concrete  
Riprap Size - 18"

TABULATION FOR SUBGRADE EXCAVATION IN CUTS

REV BK 2

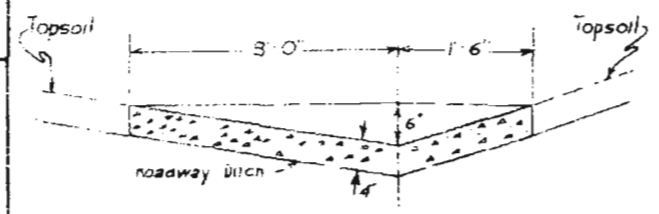
REV BK #1 Pg 48

STATION TO STATION	DEPTH	UNCLASSIFIED EXCAVATION
225+00 ~ 230+00	1.5 FT	2.045
232+00 ~ 242+00	"	2.271
255+00 ~ 274+00	"	2.134
TOTAL		6.450

CONCRETE SLOPE AND DITCH PAVING

STA. 148+ to STA. 152+

REV BK #1 Pg 12  
REV BK #2 Pg 5

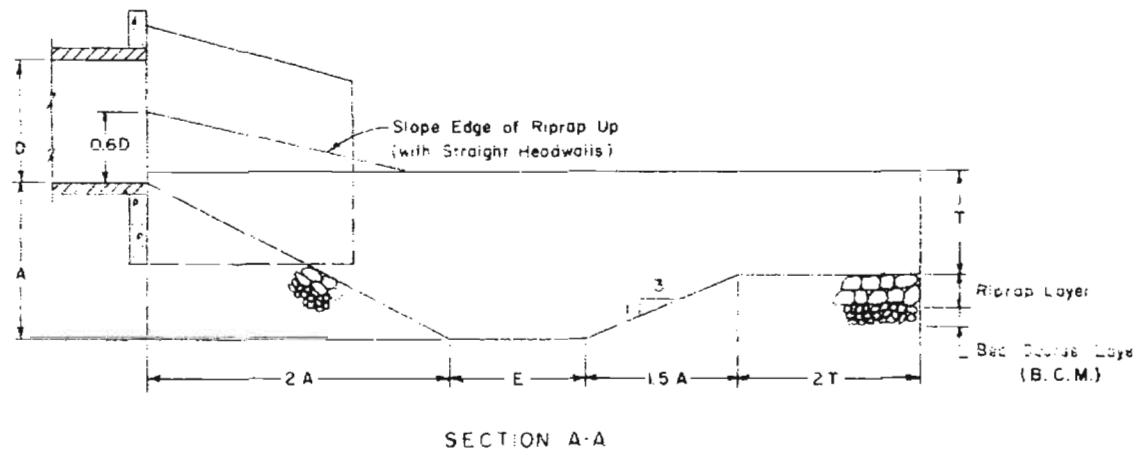
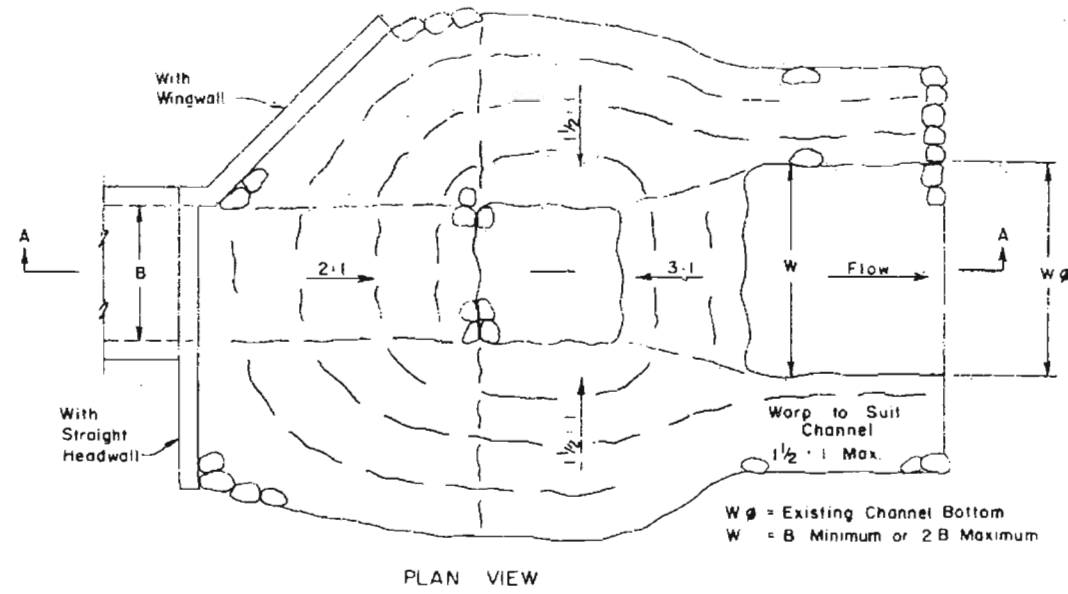


DITCH SECTION

Concrete Required = 0.077  
Cu Yds Per Lin. Ft

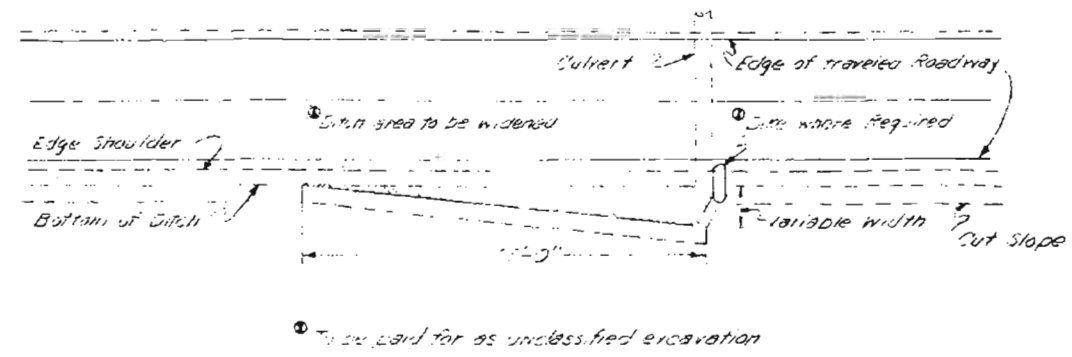
ELEVATION

# TYPICAL PLUNGE BASIN

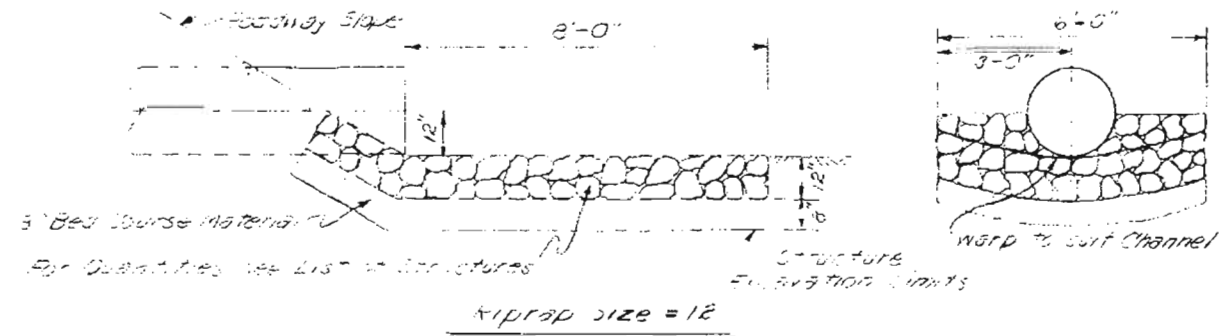


STATION	A	E	T	B.C.M.		RIPRAP		
				LAYER	CU. YD.	SIZE	LAYER	CU. YD.
156+75	5	7	5.4	2	25	12	20	50

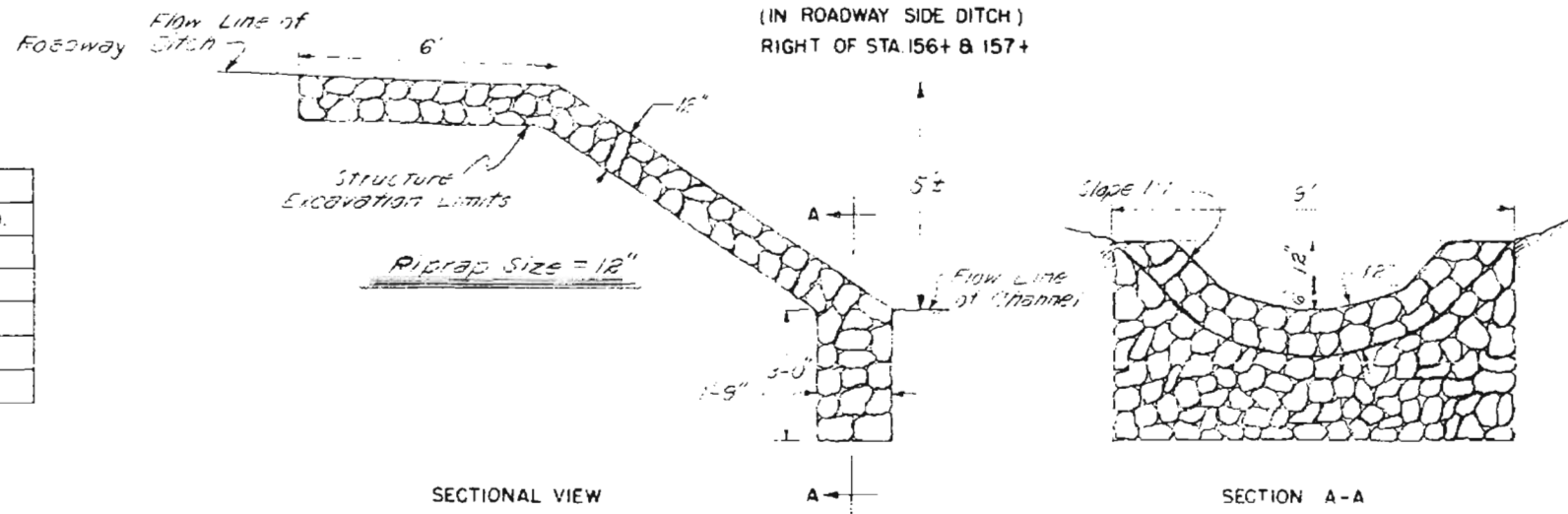
# DETAILS OF INLET BASIN



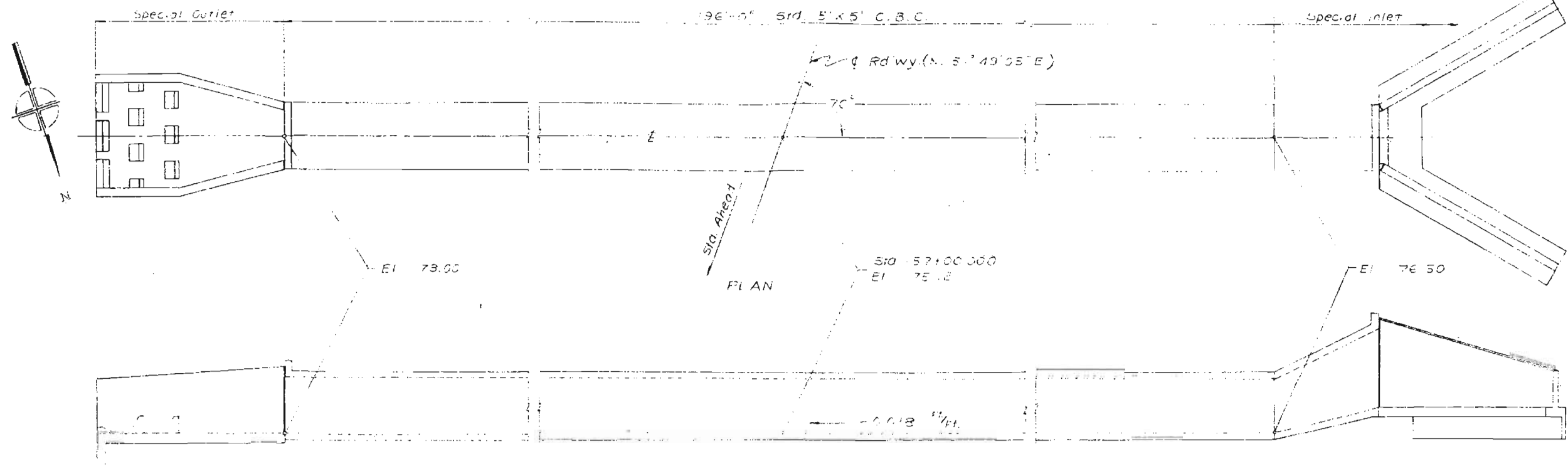
# DETAIL OF RIPRAP FOR DITCH PAVING AND CULVERT OUTLETS



# DETAIL OF RIPRAP (IN ROADWAY SIDE DITCH) RIGHT OF STA 156+ & 157+



FED. ROAD LEG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLD	F027-1(6)	13	



ELEVATION  
CONSTRUCTION LAYOUT

NOTE:  
See Div. No. 4, Type 5 B for C.B.C. details  
See M-601-C for Detail Notes

Drawn	Check
DESIGNED BY F.L. 3-68	
CHECKED BY A.T. 3-68	
DESIGNED BY DSM 3-68	
CHECKED BY	

ITEM	DESCRIPTION	UNIT	TOTAL
601	CONCRETE CLASS "A"	CUYD.	21
602	REINFORCING STEEL	LB	1662
603	1/2 EXPN. OF MATL. TYPE III	SQ.FT.	13

ITEM	DESCRIPTION	UNIT	TOTAL
601	CONCRETE CLASS "A"	CUYD.	4
602	REINFORCING STEEL	LB	155
603	1/2 EXPN. OF MATL. TYPE III	SQ.FT.	3

ITEM	DESCRIPTION	UNIT	TOTAL
601	CONCRETE CLASS "A"	CUYD.	178
602	REINFORCING STEEL	LB	10232

① TO BE INCLUDED IN BID OR DE FOR ITEM NO. 601 (CLASS A CONCRETE)

NOTE: QUANTITIES TAKEN TO LIST OF STRUCTURES

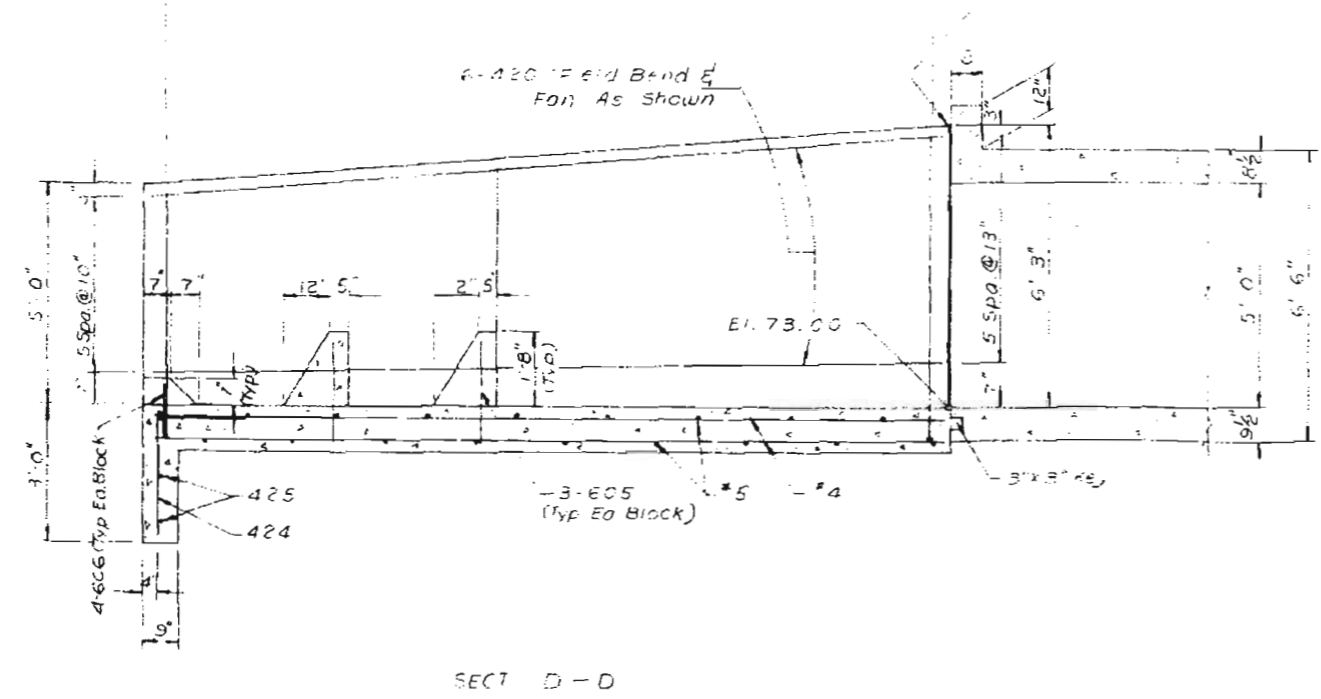
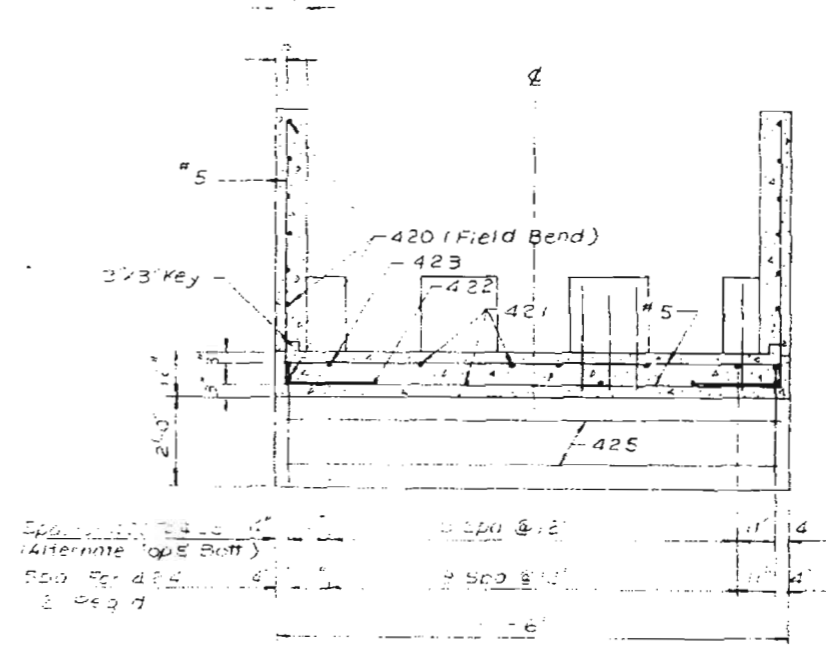
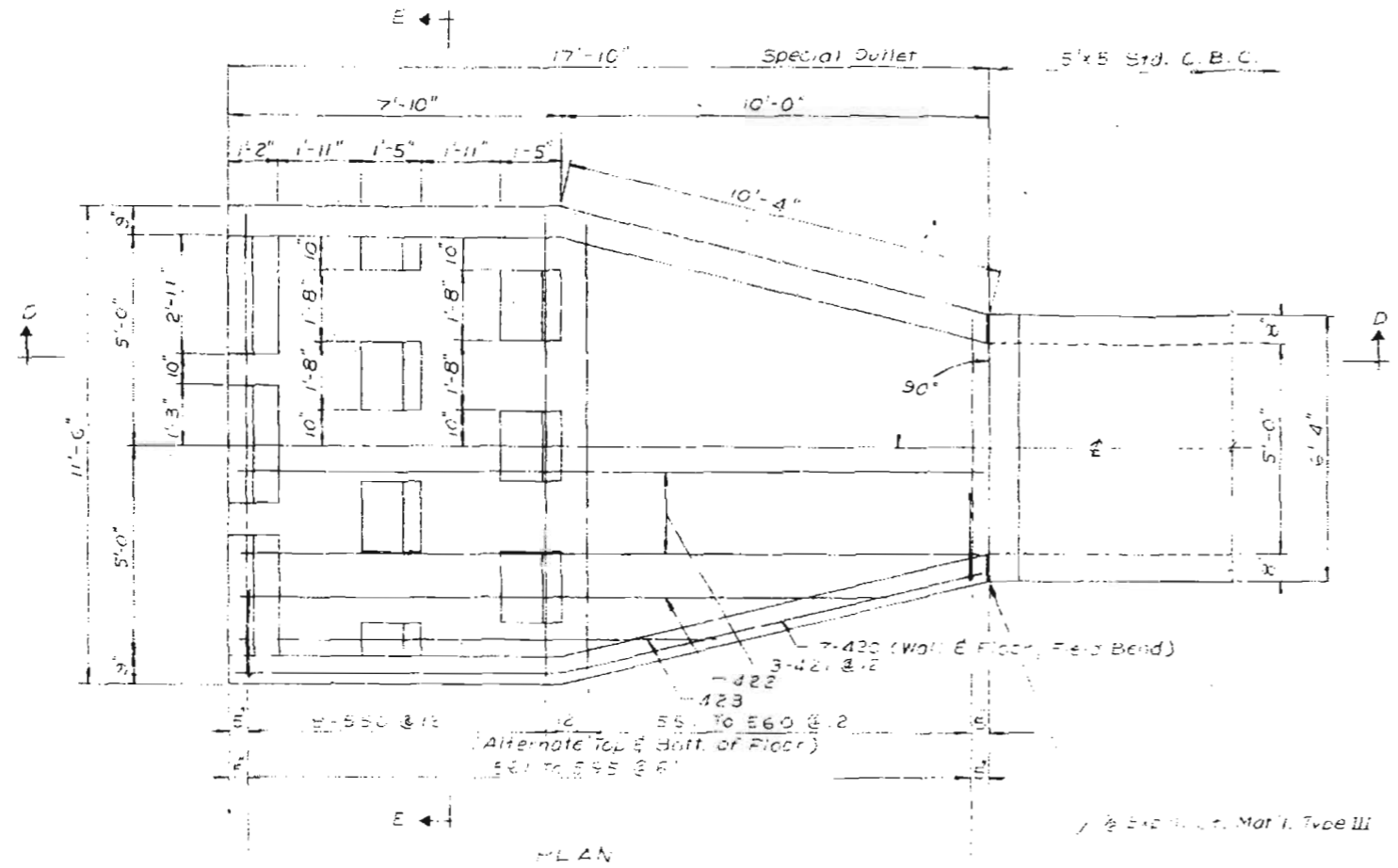
DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
CONSTRUCTION LAYOUT  
SUMMARY OF QUANTITIES

Across: Sta. 57+00.000  
Near: WYAND Sec. 22, T.25, R.69N

Designed by F.L.  
Made by A.T.  
Checked by

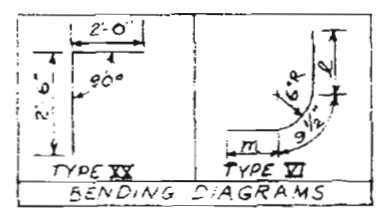
Approved by  
Bridge Engineer  
Date: 19

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F027-1(6)	14	



BAR LIST FOR SPECIAL OUTLET

Mark	Size	No. Re's	Length	Type	L	m
420	1/2" φ	14	17'-10"	Str. (Field Bend)		
421	"	6	17'-7"	Str.		
422	"	2	15'-3"	Str.		
423	"	2	11'-5"	Str.		
424	"	12	4'-6"	XX		
425	1/2" φ	2	11'-0"	Str.		
550	5/8" φ	8	11'-0"	Str.		
551	5/8" φ	1 Each	by 6" to	Str.		
560	"	"	6'-2"	"		
561	5/8" φ	2 Each	8'-7 1/2"	VI	6'-4"	
595	"	"	7'-2 1/2"	"	4'-11"	
605	3/4" φ	17	2'-3"	Str.		
606	3/4" φ	12	1'-2"	Str.		



SUMMARY

485 L.F. 1/2" φ @ 0.668 #/Ft. = 324 #
726 L.F. 5/8" φ @ 1.043 #/Ft. = 757 #
52 L.F. 3/4" φ @ 1.502 #/Ft. = 78 #
<b>Total = 1159 #</b>

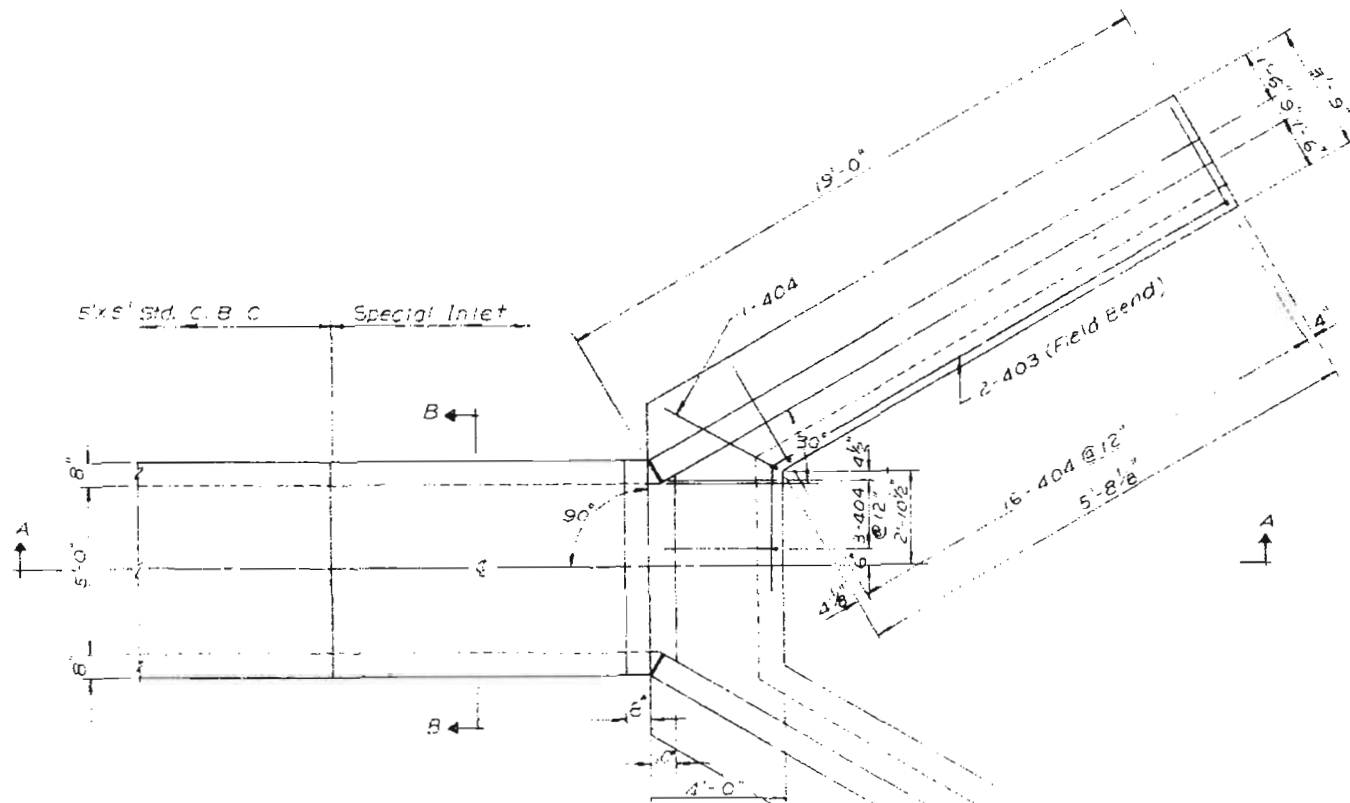
DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
SPECIAL OUTLET DETAILS

Across Sta. 157130.000  
Near TRINIDAD Sec. 33 T.32S. R.63W

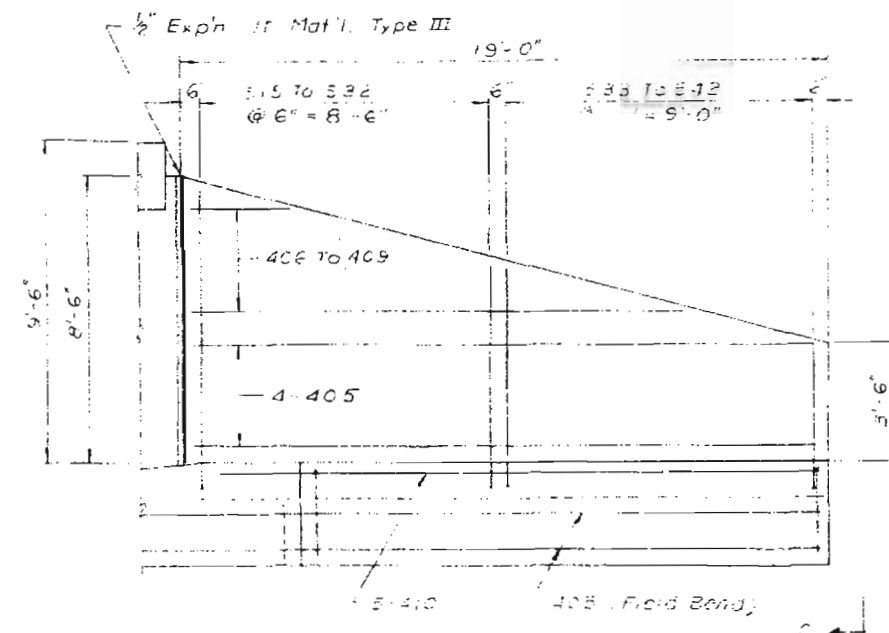
Designed by FL Approved by  
Made by AIT Bridge Engineer  
Checked by Date: 19

Checked By	Date
FL	12-13-68
AIT	1-8-69
OSM	2-68

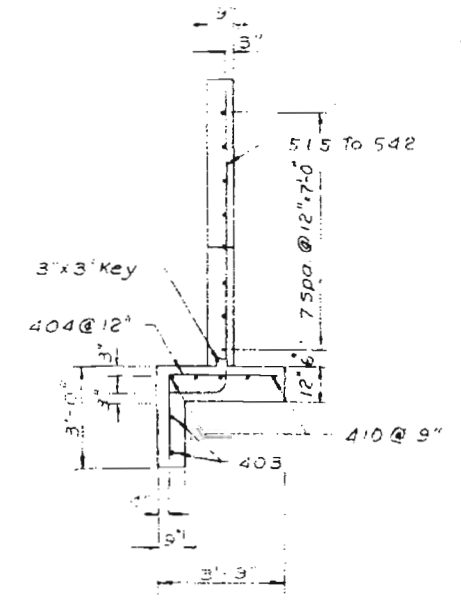
FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F027-1(6)	15	



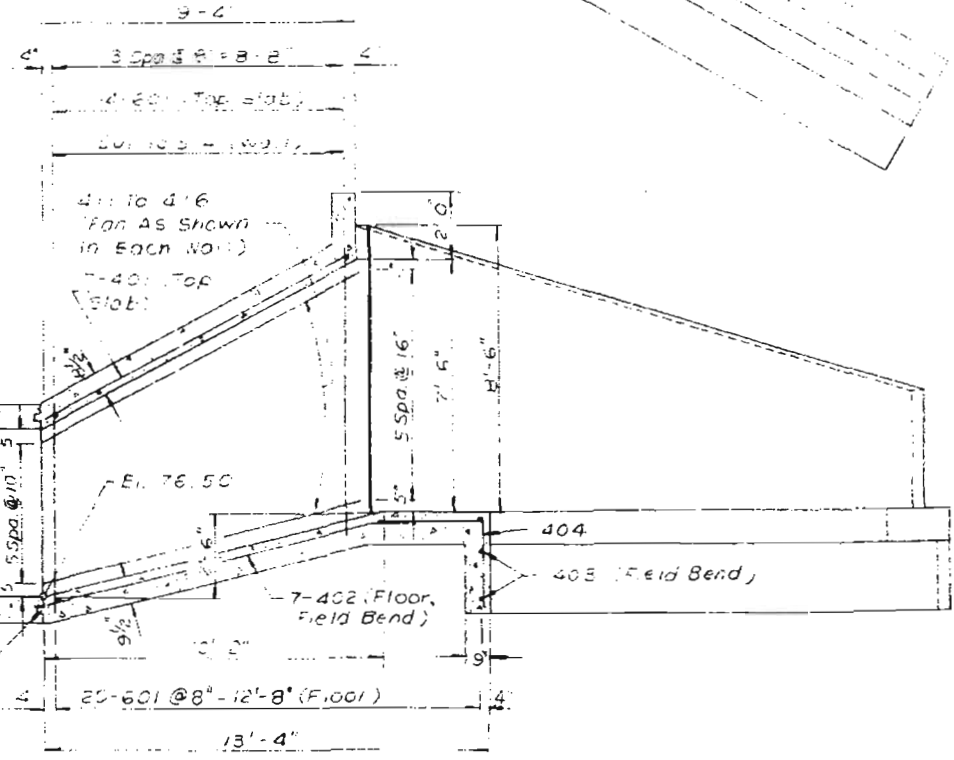
PLAN



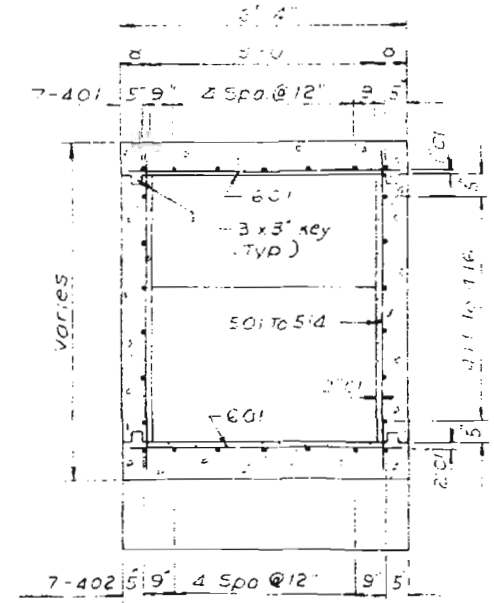
ELEVATION  
10 members 5' Reinforcing Bars (see Bar Wages)



Rev.	Date	By	Check
1	3-68	DSM	4-68

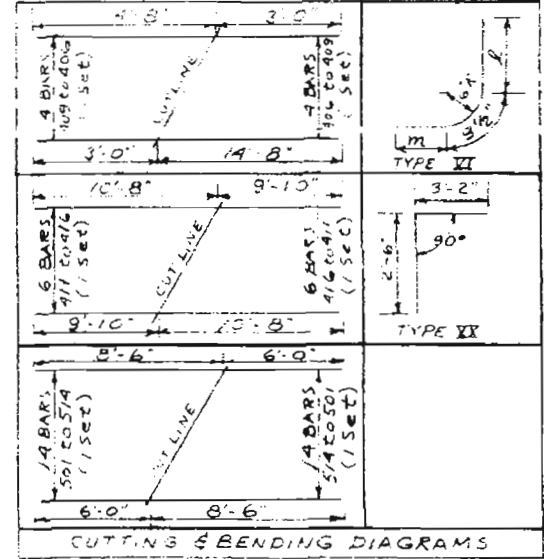


SECT A - A



SECT B - B

Bar No.	Length	Quantity	Notes
402	7'-0"	2	Str. Field Bend
403	19'-0"	4	Str. Field Bend
404	5'-8"	40	Str.
405	18'-6"	8	Str.
406	35'-4"	2	Sees
409	7'-0"	6	Str.
410	61'-6"	2	Sees
416	101'-6"	2	Sees
501	10'-4 1/2"	8	5
514	8'-3"	2	Each
532	6'-3"	2	Each
533	6'-0"	2	Each
542	5'-6 1/4"	2	Each
7-401	5'-9"	2	501 to 514
7-402	5'-9"	4	501 to 514
7-403	5'-9"	4	501 to 514
7-404	5'-9"	4	501 to 514
7-405	5'-9"	4	501 to 514
7-406	5'-9"	4	501 to 514
7-407	5'-9"	4	501 to 514
7-408	5'-9"	4	501 to 514
7-409	5'-9"	4	501 to 514
7-410	5'-9"	4	501 to 514
7-411	5'-9"	4	501 to 514
7-412	5'-9"	4	501 to 514
7-413	5'-9"	4	501 to 514
7-414	5'-9"	4	501 to 514
7-415	5'-9"	4	501 to 514
7-416	5'-9"	4	501 to 514
7-417	5'-9"	4	501 to 514
7-418	5'-9"	4	501 to 514
7-419	5'-9"	4	501 to 514
7-420	5'-9"	4	501 to 514
7-421	5'-9"	4	501 to 514
7-422	5'-9"	4	501 to 514
7-423	5'-9"	4	501 to 514
7-424	5'-9"	4	501 to 514
7-425	5'-9"	4	501 to 514
7-426	5'-9"	4	501 to 514
7-427	5'-9"	4	501 to 514
7-428	5'-9"	4	501 to 514
7-429	5'-9"	4	501 to 514
7-430	5'-9"	4	501 to 514
7-431	5'-9"	4	501 to 514
7-432	5'-9"	4	501 to 514
7-433	5'-9"	4	501 to 514
7-434	5'-9"	4	501 to 514
7-435	5'-9"	4	501 to 514
7-436	5'-9"	4	501 to 514
7-437	5'-9"	4	501 to 514
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7-452	5'-9"	4	501 to 514
7-453	5'-9"	4	501 to 514
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7-468	5'-9"	4	501 to 514
7-469	5'-9"	4	501 to 514
7-470	5'-9"	4	501 to 514
7-471	5'-9"	4	501 to 514
7-472	5'-9"	4	501 to 514
7-473	5'-9"	4	501 to 514
7-474	5'-9"	4	501 to 514
7-475	5'-9"	4	501 to 514
7-476	5'-9"	4	501 to 514
7-477	5'-9"	4	501 to 514
7-478	5'-9"	4	501 to 514
7-479	5'-9"	4	501 to 514
7-480	5'-9"	4	501 to 514
7-481	5'-9"	4	501 to 514
7-482	5'-9"	4	501 to 514
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7-488	5'-9"	4	501 to 514
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7-494	5'-9"	4	501 to 514
7-495	5'-9"	4	501 to 514
7-496	5'-9"	4	501 to 514
7-497	5'-9"	4	501 to 514
7-498	5'-9"	4	501 to 514
7-499	5'-9"	4	501 to 514
7-500	5'-9"	4	501 to 514



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

SPECIAL INLET DETAIL

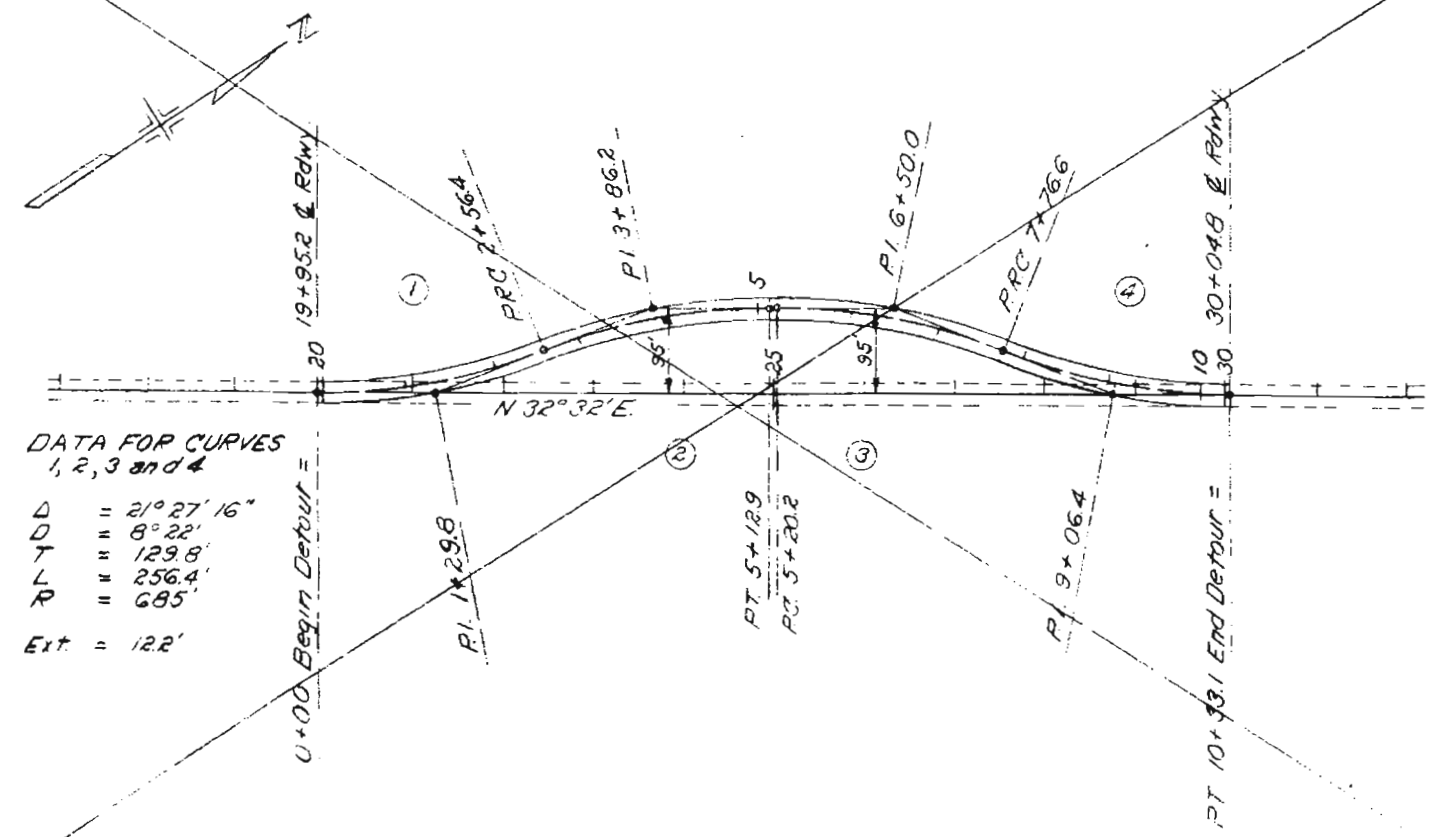
Across 50' 0" ± 0.000  
Near TRINIDAD Sec 33 T.32S R.69E

Designed by F.I. Approved by  
Made by A.I.T. Bridge Engineer  
Checked by Date: 19

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F 027-1(6)	17

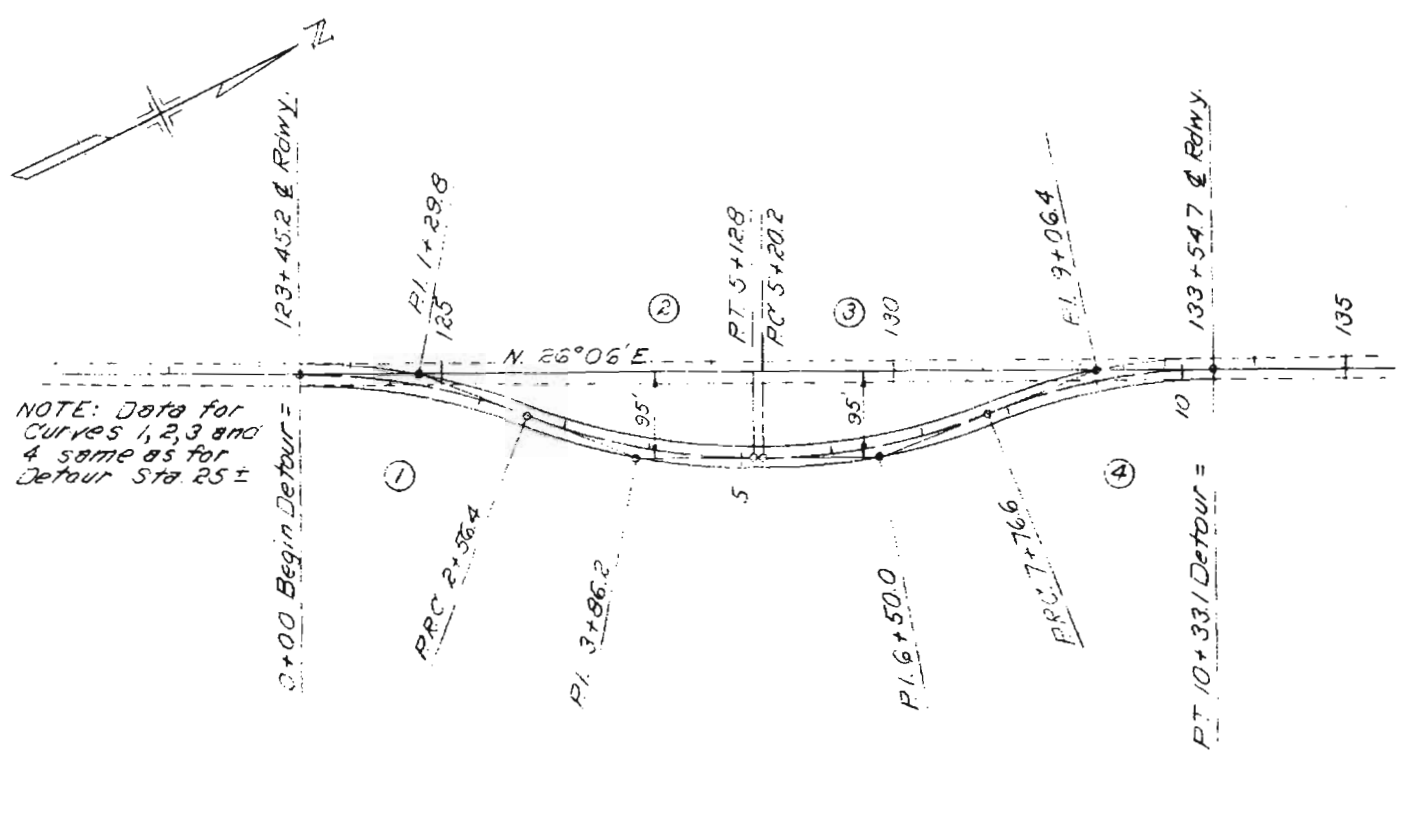
DETOUR LT. STA. 25 ±

DETOUR RT. STA. 128 ±



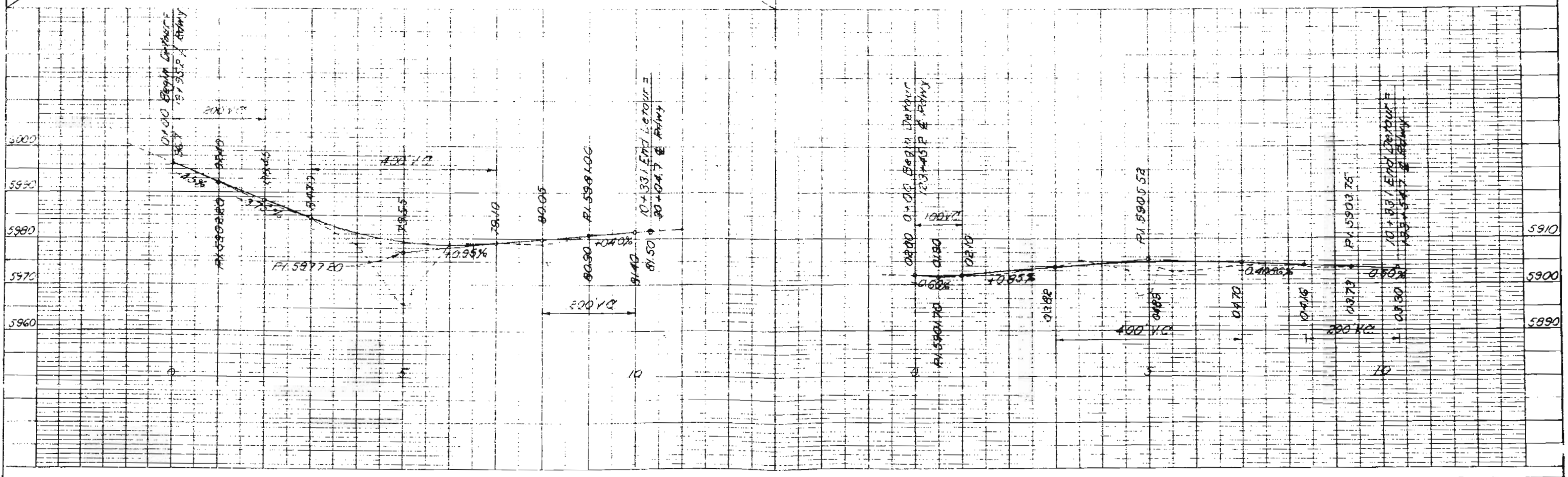
DATA FOR CURVES 1, 2, 3 and 4

D	= 21° 27' 16"
Y	= 8° 22'
L	= 129.8'
R	= 256.4'
Ext.	= 122'



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

PLAN	DATE	BY

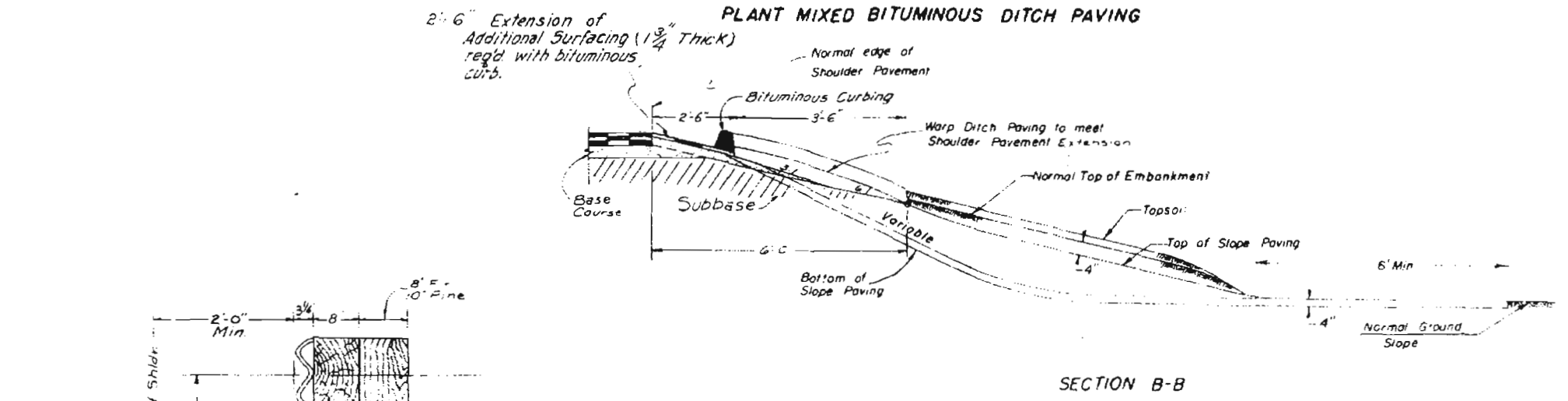


PROFILE	DATE	BY

FEDERAL ROAD REG. OR NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
4	COLORADO	F027-1(6)	18	

REVISIONS	

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

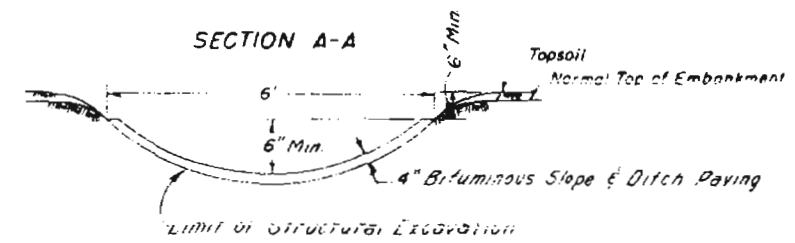
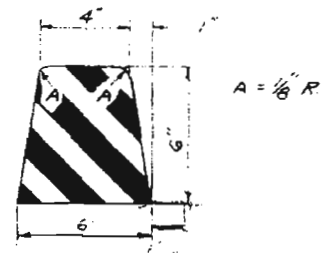
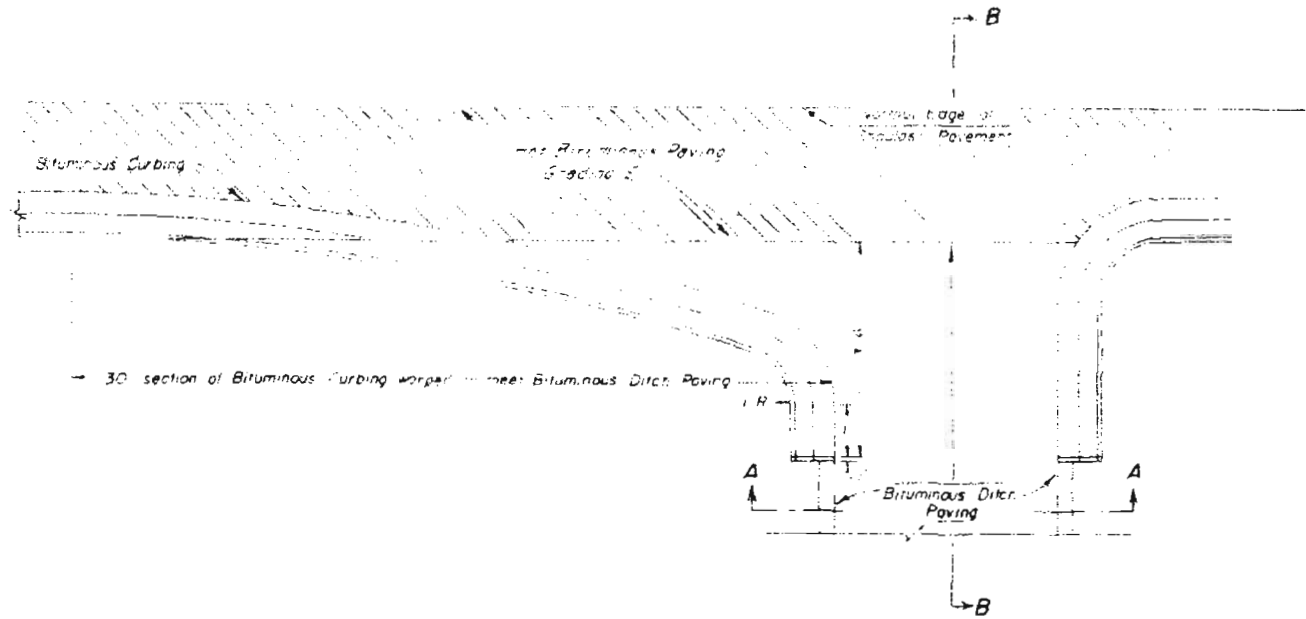
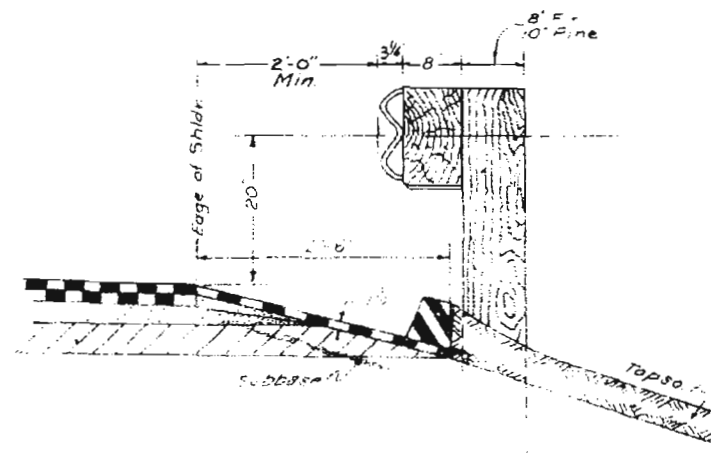


**GENERAL NOTES**

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 rundown 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.

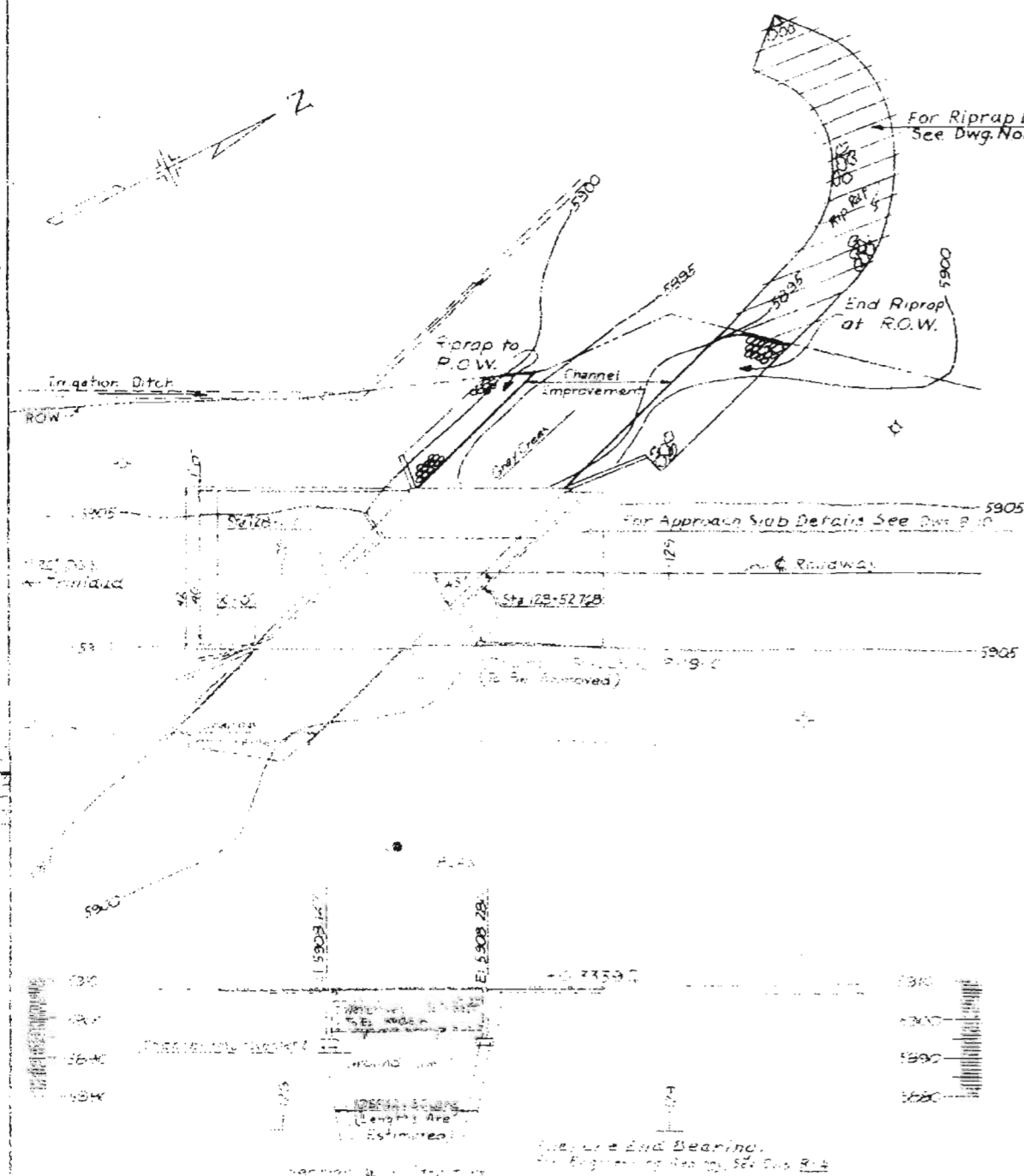


**AS CONSTRUCTED**  
**REVISED DATE** DEC 4 1968

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	FO27-1(6)	19	

GENERAL NOTES

- ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE DEPARTMENT OF HIGHWAYS, STATE OF COLORADO, APPLICABLE TO THE PROJECT.
- ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION, STRUCTURE NUMBER, AND STATION OF THE PROJECT.
- IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 40 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 24 DIAMETERS FOR BARS NEAR THE BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 24 DIAMETERS.
- DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.
- ALL CONCRETE SURFACES MARKED WITH THE SYMBOL AS SHOWN ON DWG NO. B-9 SHALL RECEIVE CLASS 2 SURFACE FINISH.
- ALL CONCRETE CHAMFERS TO BE 3/4" UNLESS OTHERWISE NOTED.
- EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPEC. M-153-S4 UNLESS OTHERWISE NOTED.
- SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA. WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED, THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.
- WHEN TREATED TIMBER PILING IS SHOWN ON THE PLANS, THE PRESERVATIVE FOR TREATMENT SHALL BE CREOSOTE OIL.
- WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND LABOR METHODS.
- FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-206-A.
- ALL STRUCTURAL STEEL UNLESS OTHERWISE NOTED SHALL BE AASHTO M-183.
- WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A. W. S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES AS AMENDED.
- ALL STRUCTURAL STEEL SHALL BE PAINTED IN ACCORDANCE WITH SECTION 509 FOR ALUMINUM PAINT.
- BOLTS SHALL BE TURNED IN THE AMOUNT OF TWO PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH.



SUMMARY OF QUANTITIES

Item No.	Description	Unit	Quantity
102	Less clear	Sq. Yds.	14.00
103	Reinforcing steel	Lbs.	24,866
104	Concrete Class C	Cu. Yds.	880.00
105	Concrete Class B	Cu. Yds.	14.00
106	Reinforcing steel	Lbs.	3,480
107	Concrete Class C	Cu. Yds.	14.00
108	Concrete Class B	Cu. Yds.	14.00
109	Reinforcing steel	Lbs.	3,480
110	Concrete Class C	Cu. Yds.	14.00
111	Concrete Class B	Cu. Yds.	14.00
112	Reinforcing steel	Lbs.	3,480
113	Concrete Class C	Cu. Yds.	14.00
114	Concrete Class B	Cu. Yds.	14.00
115	Reinforcing steel	Lbs.	3,480
116	Concrete Class C	Cu. Yds.	14.00
117	Concrete Class B	Cu. Yds.	14.00
118	Reinforcing steel	Lbs.	3,480
119	Concrete Class C	Cu. Yds.	14.00
120	Concrete Class B	Cu. Yds.	14.00
121	Reinforcing steel	Lbs.	3,480
122	Concrete Class C	Cu. Yds.	14.00
123	Concrete Class B	Cu. Yds.	14.00
124	Reinforcing steel	Lbs.	3,480
125	Concrete Class C	Cu. Yds.	14.00
126	Concrete Class B	Cu. Yds.	14.00
127	Reinforcing steel	Lbs.	3,480
128	Concrete Class C	Cu. Yds.	14.00
129	Concrete Class B	Cu. Yds.	14.00
130	Reinforcing steel	Lbs.	3,480
131	Concrete Class C	Cu. Yds.	14.00
132	Concrete Class B	Cu. Yds.	14.00
133	Reinforcing steel	Lbs.	3,480
134	Concrete Class C	Cu. Yds.	14.00
135	Concrete Class B	Cu. Yds.	14.00
136	Reinforcing steel	Lbs.	3,480
137	Concrete Class C	Cu. Yds.	14.00
138	Concrete Class B	Cu. Yds.	14.00
139	Reinforcing steel	Lbs.	3,480
140	Concrete Class C	Cu. Yds.	14.00
141	Concrete Class B	Cu. Yds.	14.00
142	Reinforcing steel	Lbs.	3,480
143	Concrete Class C	Cu. Yds.	14.00
144	Concrete Class B	Cu. Yds.	14.00
145	Reinforcing steel	Lbs.	3,480
146	Concrete Class C	Cu. Yds.	14.00
147	Concrete Class B	Cu. Yds.	14.00
148	Reinforcing steel	Lbs.	3,480
149	Concrete Class C	Cu. Yds.	14.00
150	Concrete Class B	Cu. Yds.	14.00

- ① Design weight = 3,480 lbs.
- ② Includes 270 Sq Yds for Approach Slab.
- ③ To Be Included In Bid Price For Item 100 Concrete, Class A
- ④ 10W45 may be used in lieu of 10BP42.

DRAINAGE AREA = 14 SQ. MILES  
 Q50 = 1500 cfs  
 DISCHARGE AT EL. 5901.0 = 1464 cfs.

LOADING DATA  
 Live Load = A.A.S.H.O. HS-20-44  
 Dead Load Assumed to be 150 lbs. per Sq. Ft. plus 10 lbs. wearing surface which includes the 1/2" thick surface course. Total wearing surface shown.

DESIGNING DATA  
 A.A.S.H.O. Unit Stresses except as noted.  
 Reinforcing Steel  $f_s = 20000$  Lbs. per Sq. Inch  
 Structural Steel  $f_s = 18000$  Lbs. per Sq. Inch  
 Concrete  $f_c = 2000$  Lbs. per Sq. Inch

1 (NO. 20 67)

**DEPARTMENT OF HIGHWAYS**  
**STATE OF COLORADO**  
 1 SPAN 40' CONC. SLAB GIRDER  
 BRIDGE - 40' ROADWAY - NO CURBS  
 40" DEPTH - GENERAL LAYOUT  
 NOTES & SUMMARY OF QUANTITIES.

Across Gray Creek  
 Sta. 128+11.000 to 128+52.76B  
 Near Trinidad Sec. 4 T. 33S. R. 63W.

Designed by KS  
 Made by EPA  
 Checked by

Approved by [Signature]  
 Bridge Engineer  
 Date: Jan. 2, 1969

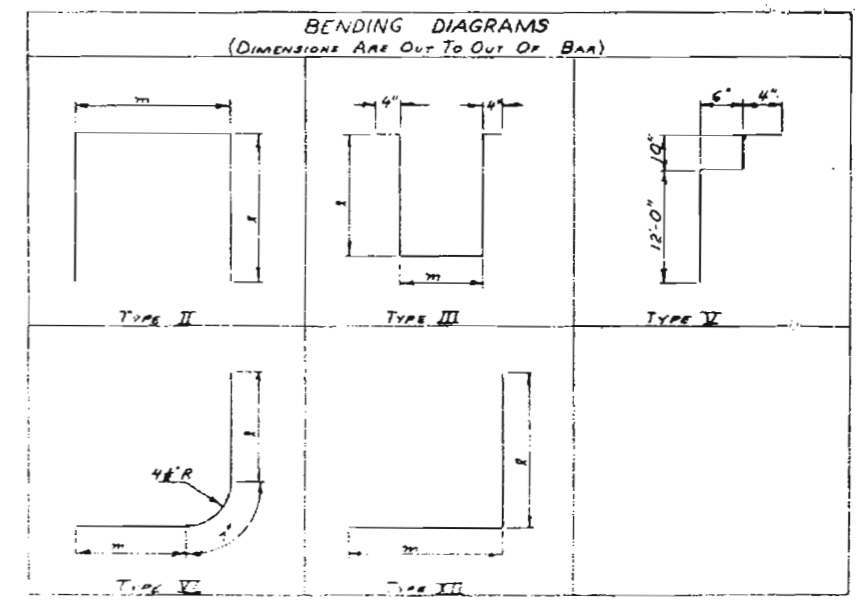
FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	FD27-1(6)	20	

**BAR LIST - SUPERSTRUCTURE**

MARK SIZE	NO REOD	LENGTH	TYPE	DIMENSIONS	
				f	m
401	1/2" Ø	223	7-3"	III	2'-10" 0'-11"
402	1/2" Ø	32	5-7"	III	2'-2 1/2" 0'-6"
403	1/2" Ø	10	40'-0"	STR	
501	5/8" Ø		40'-5"		
TO		4 EA.	BY 4" TO STR		
5108			4'-9"		
5109		2	40'-8"		
5110		6	5'-0"		
5111		94	40'-0"		
5112		96	2'-0"	STR	
5113	3/8" Ø	12	4'-7"	II	9' 11"
801	1" Ø	8	9'-4"	STR	
901	1/2" Ø	10	32'-0"	STR	
902	1/2" Ø				
1101	1/2" Ø	20	41'-5"	STR	
1102	1/2" Ø	10	32'-0"		
1103	1/2" Ø	20	40'-0"	STR	
<b>BAR SUMMARY</b>					
2210	Lin Ft	1/2" Ø @ 0.668 #/ft	1476	Lbs	
3754	Lin Ft	5/8" Ø @ 1.043 #/ft	14345	Lbs	
75	Lin Ft	1" Ø @ 2.670 #/ft	200	Lbs	
495	Lin Ft	1 1/8" Ø @ 3.400 #/ft	1689	Lbs	
1378	Lin Ft	1 3/8" Ø @ 5.33 #/ft	7162	Lbs	
Total			24866	Lbs	

**BAR LIST - ABUT NO 1 (ABUT 2 SIMILAR)**

MARK SIZE	NO REOD	LENGTH	TYPE	DIMENSIONS	
				f	m
410	1/2" Ø	8	34'-0"	STR	
411		27	2'-0"		
412		30	2'-9"		
413			11'-0"		
TO		1 EA.	BY 1" TO		
433			12'-8"		
434		2	15'-0"		
435		22	20'-9"		
436		22	8'-0"		
437		2	6'-0"		
438			12'-8"		
TO		1 EA.	BY 2 1/2" TO		
446			11'-0"		
447		27	40'-0"		
448	1/2" Ø	27	24'-0"	STR	
5120	3/8" Ø	59	4'-0"	STR	
5121		67	4'-11"	III	3'-3" 1'-8"
5122		57	5'-2"	III	3'-9" 1'-5"
5123		4	22'-6"	STR	
5124		7	2'-0"		
5125			20'-0"		
5126			24'-0"		
5127			8'-6"		
5128			9'-6"		
5129			10'-5"		
TO		1 EA.	BY 1" TO		
5133			8'-3"		
5134		6	13'-6"		
5135	3/8" Ø	2	2'-0"	STR	
910	1/2" Ø	23	9'-6"	VII	3'-0 1/2" 5'-2 1/2"
911		8	8'-0"	VII	3'-0 1/2" 3'-8 1/2"
912			8'-3"	VII	3'-2 1/2" 5'-1/2"
913			5'-3"	VII	3'-8 1/2" 5'-11 1/2"
914					
915					
TO		1 EA.	BY 1" TO		
935			12'-9"		
936			6'-4"		
TO		1 EA.	BY 1" TO		
955			7'-11"		
957			12'-9"		
TO		1 EA.	BY 2 1/2" TO		
965			11'-1"		
966			7'-0"		
TO		1 EA.	BY 2 1/2" TO		
973	1 1/8" Ø		6'-4 1/2"	STR	
<b>BAR SUMMARY</b>					
3166	Lin Ft	1/2" Ø @ 0.668 #/ft	2115	Lbs	
2904	Lin Ft	5/8" Ø @ 1.043 #/ft	3029	Lbs	
1077	Lin Ft	1 1/8" Ø @ 3.400 #/ft	3662	Lbs	
Total			8806	Lbs	



**DEPARTMENT OF HIGHWAYS**  
**STATE OF COLORADO**  
BAR LIST &  
BENDING DIAGRAMS

Across - GRAY CREEK  
Sta. 128+1.000 to 128+52.768

Neat TRAINIDAD Sec. 4 T. 33 S. R. 63 W.

Designed by KS Approved by [Signature] Bridge Engineer  
Made by MEP  
Checked by CFK Date: Jan 2, 1968

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F-027-1(6)	21	

PROJECT NO. F027-1  
 STRUCTURE NO. P-19-C  
 ACROSS GRAY CREEK  
 DESIGNED BY K.S.  
 DETAILED BY H.E.P.

INPUT DATA FOR BRIDGE P-19-C  
 POT = 0128+11.0000 ALPHA = 45.00 00.00 RDMY = 42.0000 GBR = 0.0000  
 P1 = 0125+00.0000 EPI = 5907.1085 YC = 00100.00 GAH = 0.3339  
 SLOTT = 02 SLOPE = .0700

CL BEARING ABUT NO 1  
 CL BEARING ABUT NO 2

WEST OUT	STATION	ELEVATION
STA BACK	128+32.8839	5907.8000
1 TENTH	128+36.8839	5907.8134
2 TENTH	128+40.8839	5907.8267
3 TENTH	128+44.8839	5907.8401
4 TENTH	128+48.8840	5907.8534
5 TENTH	128+52.8840	5907.8668
6 TENTH	128+56.8840	5907.8801
7 TENTH	128+60.8840	5907.8935
8 TENTH	128+64.8840	5907.9068
9 TENTH	128+68.8840	5907.9202
STA AHEAD	128+72.8841	5907.9336

GIRDER NO 1	STATION	ELEVATION
STA BACK	128+28.8839	5907.8666
1 TENTH	128+32.8839	5907.8800
2 TENTH	128+36.8839	5907.8934
3 TENTH	128+40.8839	5907.9067
4 TENTH	128+44.8840	5907.9201
5 TENTH	128+48.8840	5907.9334
6 TENTH	128+52.8840	5907.9468
7 TENTH	128+56.8840	5907.9601
8 TENTH	128+60.8840	5907.9735
9 TENTH	128+64.8840	5907.9868
STA AHEAD	128+68.8841	5908.0002

GIRDER NO 2	STATION	ELEVATION
STA BACK	128+20.3839	5908.0083
1 TENTH	128+24.3839	5908.0216
2 TENTH	128+28.3839	5908.0350
3 TENTH	128+32.3839	5908.0483
4 TENTH	128+36.3840	5908.0617
5 TENTH	128+40.3840	5908.0750
6 TENTH	128+44.3840	5908.0884
7 TENTH	128+48.3840	5908.1018
8 TENTH	128+52.3840	5908.1151
9 TENTH	128+56.3840	5908.1285
STA AHEAD	128+60.3841	5908.1418

GIRDER NO 3	STATION	ELEVATION
STA BACK	128+11.8839	5908.1499
1 TENTH	128+15.8839	5908.1632
2 TENTH	128+19.8839	5908.1766
3 TENTH	128+23.8839	5908.1899
4 TENTH	128+27.8840	5908.2033
5 TENTH	128+31.8840	5908.2167
6 TENTH	128+35.8840	5908.2300
7 TENTH	128+39.8840	5908.2434
8 TENTH	128+43.8840	5908.2567
9 TENTH	128+47.8840	5908.2701
STA AHEAD	128+51.8841	5908.2834

GIRDER NO 4	STATION	ELEVATION
STA BACK	128+03.3839	5907.9515
1 TENTH	128+07.3839	5907.9648
2 TENTH	128+11.3839	5907.9782
3 TENTH	128+15.3839	5907.9915
4 TENTH	128+19.3840	5908.0049
5 TENTH	128+23.3840	5908.0182
6 TENTH	128+27.3840	5908.0316
7 TENTH	128+31.3840	5908.0449
8 TENTH	128+35.3840	5908.0583
9 TENTH	128+39.3840	5908.0717
STA AHEAD	128+43.3841	5908.0851

GIRDER NO 5	STATION	ELEVATION
STA BACK	127+94.8839	5907.7531
1 TENTH	127+98.8839	5907.7665
2 TENTH	128+02.8839	5907.7798
3 TENTH	128+06.8839	5907.7932
4 TENTH	128+10.8840	5907.8065
5 TENTH	128+14.8840	5907.8199
6 TENTH	128+18.8840	5907.8333
7 TENTH	128+22.8840	5907.8466
8 TENTH	128+26.8840	5907.8600
9 TENTH	128+30.8840	5907.8733
STA AHEAD	128+34.8841	5907.8867

EAST OUT	STATION	ELEVATION
STA BACK	127+90.8839	5907.6598
1 TENTH	127+94.8839	5907.6731
2 TENTH	127+98.8839	5907.6865
3 TENTH	128+02.8839	5907.6998
4 TENTH	128+06.8840	5907.7132
5 TENTH	128+10.8840	5907.7265
6 TENTH	128+14.8840	5907.7399
7 TENTH	128+18.8840	5907.7533
8 TENTH	128+22.8840	5907.7666
9 TENTH	128+26.8840	5907.7800
STA AHEAD	128+30.8841	5907.7933

1 HIGHWAYS  
 OF COLORADO  
 D 11-67

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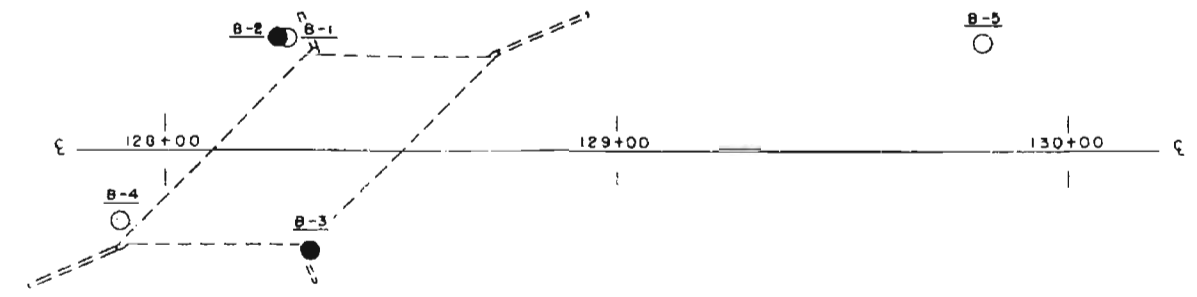
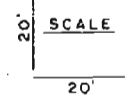
DEPARTMENT OF HIGHWAYS  
 STATE OF COLORADO

Across GRAY CREEK  
 Sta. 128+11.0000 to 128+52.7668  
 Near TRINIDAD Sec. 4 T. 33 S. R. 63 W.

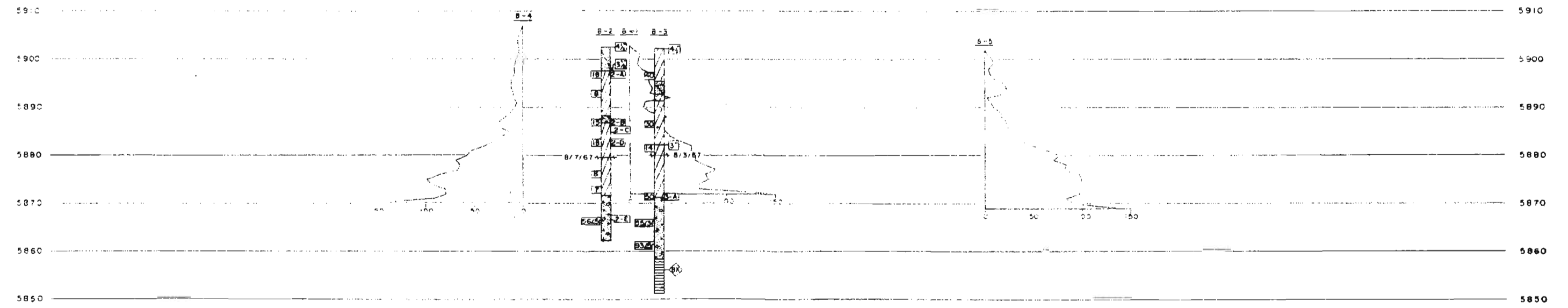
Designed by [Signature]  
 Made by [Signature]  
 Checked by [Signature]

Approved by [Signature]  
 Bridge Engineer  
 Date: 2/24/68

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F027-1(6)	22	



127+90 128+25 128+27 128+32 129+81  
16 RT. 25' LT. 25' LT. 22.5 RT. 24' LT.



**SUMMARY OF TEST RESULTS**

Sample No.	Description	Soil Analysis		Atterberg Limits		Liquid Limit		Plasticity Index		Triaxial Shear Strength		C <sub>u</sub> or C <sub>l</sub> Sample
		Moisture Content (%)	Shrinkage (%)	LL (%)	PL (%)	PI (%)	q <sub>u</sub> (lb/ft <sup>2</sup> )	σ <sub>v</sub> (lb/ft <sup>2</sup> )	τ (lb/ft <sup>2</sup> )	φ (degrees)		
2-B-15.0-16.5	Clay	44.5	1.5	95	67	28	23	44	23.8			
2-C-16.5-17.7	Clay	47.6	1.9	96	57	20	37	25.0				
2-D-19.2-20.7	Clay	47.6	2.0	99	59	21	38	25.0	25.4	3.1		1.4
2-E-35.0-36.0	Gravelly Sand A-1-b(10)	24	51	16	9	NV	NP	NP	9.2			
3-A-30.0-31.5	Clayey Sandy Gravel A-2-a(10)	44	29	13	14	25	18	7	12.7			

**TYPE OF MATERIAL**

- SAND, SILTY
- SAND, CLAYEY, BROWN
- CLAY, BROWN TO GRAY
- SILT, SANDY, W/ORGANIC MATERIAL, DARK GRAY
- SAND, GRAVELLY, COBBLES, LT. BROWN
- SHALE, HARD, W/FEW BENTONITE LAYERS, BLACK

**LEGEND**

**TEST BORING**

**CONTINUOUS PENETRATION TEST**

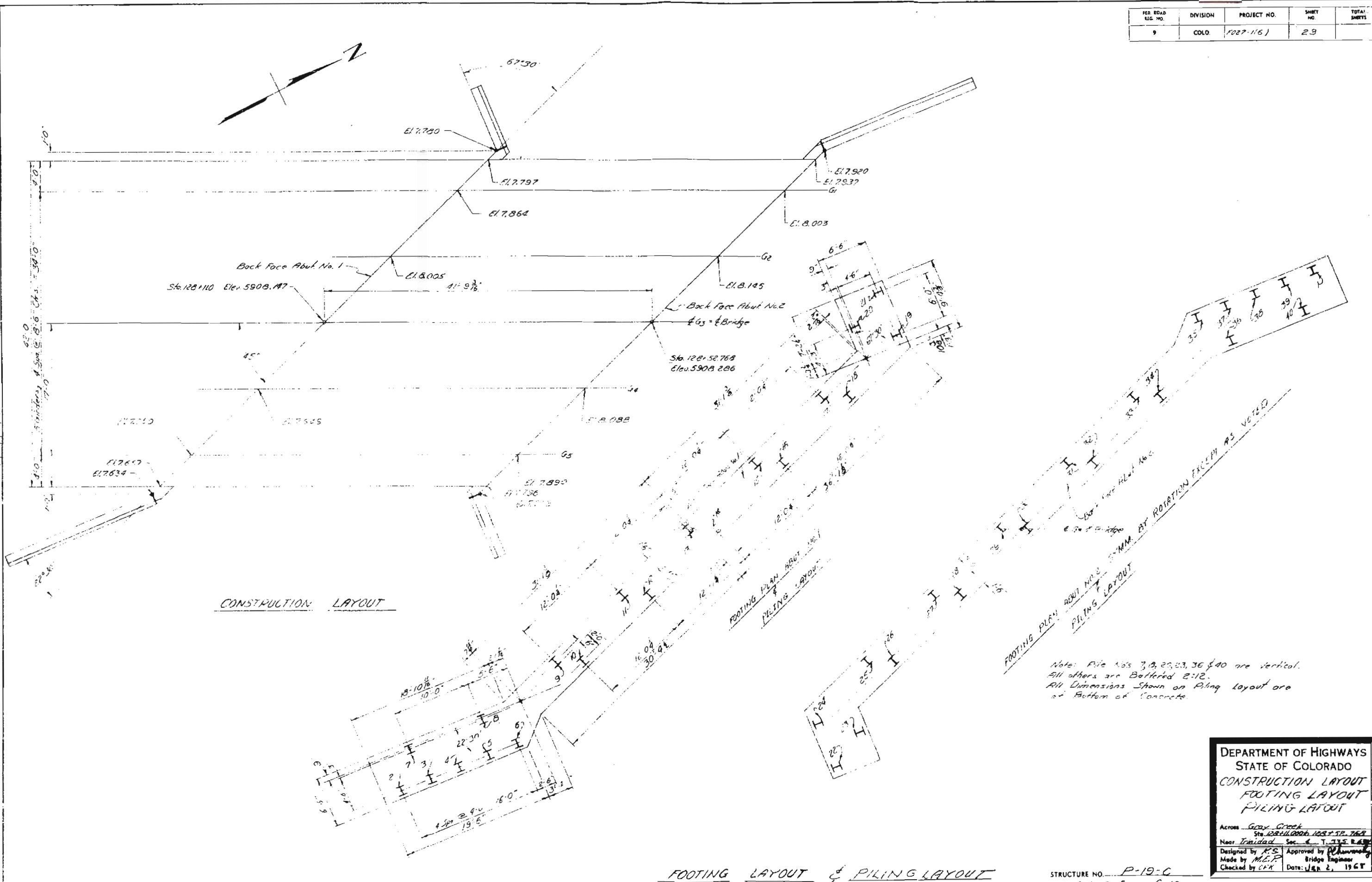
- Location of Test Boring
- Location of Continuous Penetration Test
- Rotary Boring
- Auger Boring
- Case Boring

**DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO**

**ENGINEERING GEOLOGY**

Across GRAY CREEK  
Sta. 128+11.000 to 128+52.700  
Near TRINIDAD Sec. 4 T. 33S R. 63W  
Geologist: G.C.P. Approved by: [Signature]  
Made by: G.C.P. Bridge Engineer  
Checked by: J.B.G. Date: JAN. 2 1967

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	1027-1161	23	



DATE	BY	REVISION
10/27/67	MEP	1
11/2/67	MEP	2
11/15/67	MEP	3
11/22/67	MEP	4
12/1/67	MEP	5
12/11/67	MEP	6
12/18/67	MEP	7
12/25/67	MEP	8
1/1/68	MEP	9
1/8/68	MEP	10
1/15/68	MEP	11
1/22/68	MEP	12
1/29/68	MEP	13
2/5/68	MEP	14
2/12/68	MEP	15
2/19/68	MEP	16
2/26/68	MEP	17
3/5/68	MEP	18
3/12/68	MEP	19
3/19/68	MEP	20
3/26/68	MEP	21
4/2/68	MEP	22
4/9/68	MEP	23
4/16/68	MEP	24
4/23/68	MEP	25
4/30/68	MEP	26
5/7/68	MEP	27
5/14/68	MEP	28
5/21/68	MEP	29
5/28/68	MEP	30
6/4/68	MEP	31
6/11/68	MEP	32
6/18/68	MEP	33
6/25/68	MEP	34
7/2/68	MEP	35
7/9/68	MEP	36
7/16/68	MEP	37
7/23/68	MEP	38
7/30/68	MEP	39
8/6/68	MEP	40
8/13/68	MEP	41
8/20/68	MEP	42
8/27/68	MEP	43
9/3/68	MEP	44
9/10/68	MEP	45
9/17/68	MEP	46
9/24/68	MEP	47
10/1/68	MEP	48
10/8/68	MEP	49
10/15/68	MEP	50
10/22/68	MEP	51
10/29/68	MEP	52
11/5/68	MEP	53
11/12/68	MEP	54
11/19/68	MEP	55
11/26/68	MEP	56
12/3/68	MEP	57
12/10/68	MEP	58
12/17/68	MEP	59
12/24/68	MEP	60
1/7/69	MEP	61
1/14/69	MEP	62
1/21/69	MEP	63
1/28/69	MEP	64
2/4/69	MEP	65
2/11/69	MEP	66
2/18/69	MEP	67
2/25/69	MEP	68
3/4/69	MEP	69
3/11/69	MEP	70
3/18/69	MEP	71
3/25/69	MEP	72
4/1/69	MEP	73
4/8/69	MEP	74
4/15/69	MEP	75
4/22/69	MEP	76
4/29/69	MEP	77
5/6/69	MEP	78
5/13/69	MEP	79
5/20/69	MEP	80
5/27/69	MEP	81
6/3/69	MEP	82
6/10/69	MEP	83
6/17/69	MEP	84
6/24/69	MEP	85
7/1/69	MEP	86
7/8/69	MEP	87
7/15/69	MEP	88
7/22/69	MEP	89
7/29/69	MEP	90
8/5/69	MEP	91
8/12/69	MEP	92
8/19/69	MEP	93
8/26/69	MEP	94
9/2/69	MEP	95
9/9/69	MEP	96
9/16/69	MEP	97
9/23/69	MEP	98
9/30/69	MEP	99
10/7/69	MEP	100

CONSTRUCTION LAYOUT

FOOTING LAYOUT & PILING LAYOUT

Note: Pile Nos 3, 9, 22, 23, 36 & 40 are vertical.  
All others are Battered 2:12.  
All Dimensions Shown on Piling Layout are at Bottom of Concrete.

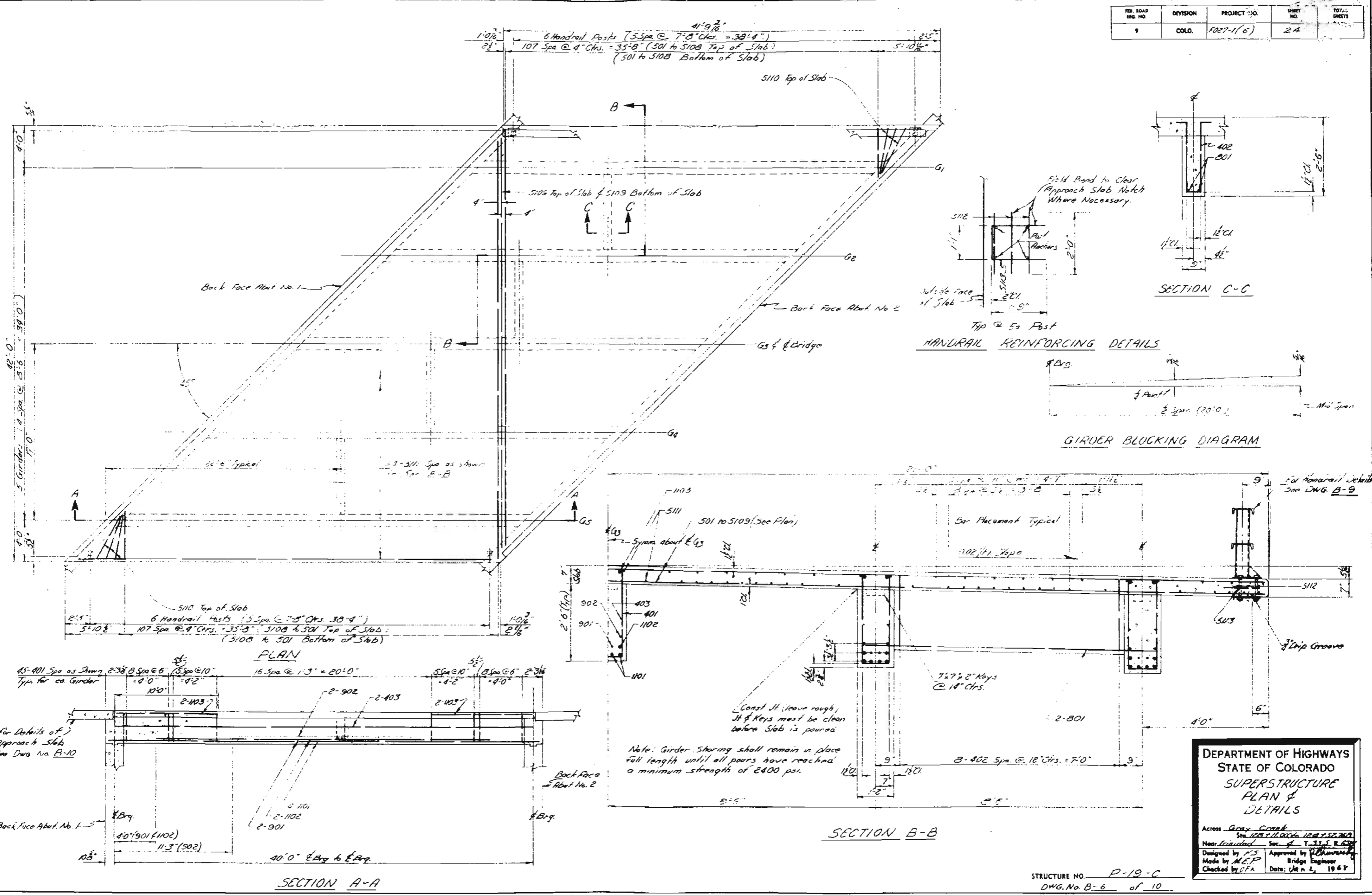
DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
CONSTRUCTION LAYOUT  
FOOTING LAYOUT  
PILING LAYOUT

Across Gray Creek  
Sta. 128+110.00 to 128+52.768  
Near Trinidad Sec. 4 T. 33S R. 6E

Designed by R.S. Approved by W. J. R. R. R.  
Made by M.E.P. Bridge Engineer  
Checked by C.F.K. Date: Jan 2, 1968

STRUCTURE NO. P-19-C  
DWG. No. B-5 of 10

FED. ROAD DIST. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	FOOT-1(6)	24	



Date	By	Description
1/16/67	ES	DESIGNED
1/16/67	MEP	CHECKED
	AKT	APPROVED

**DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
SUPERSTRUCTURE  
PLAN &  
DETAILS**

Across Gray Creek  
Sta. 128+11.000 to 128+52.760  
Near Trinidad - Sec. 4, T. 33, S. R. 67

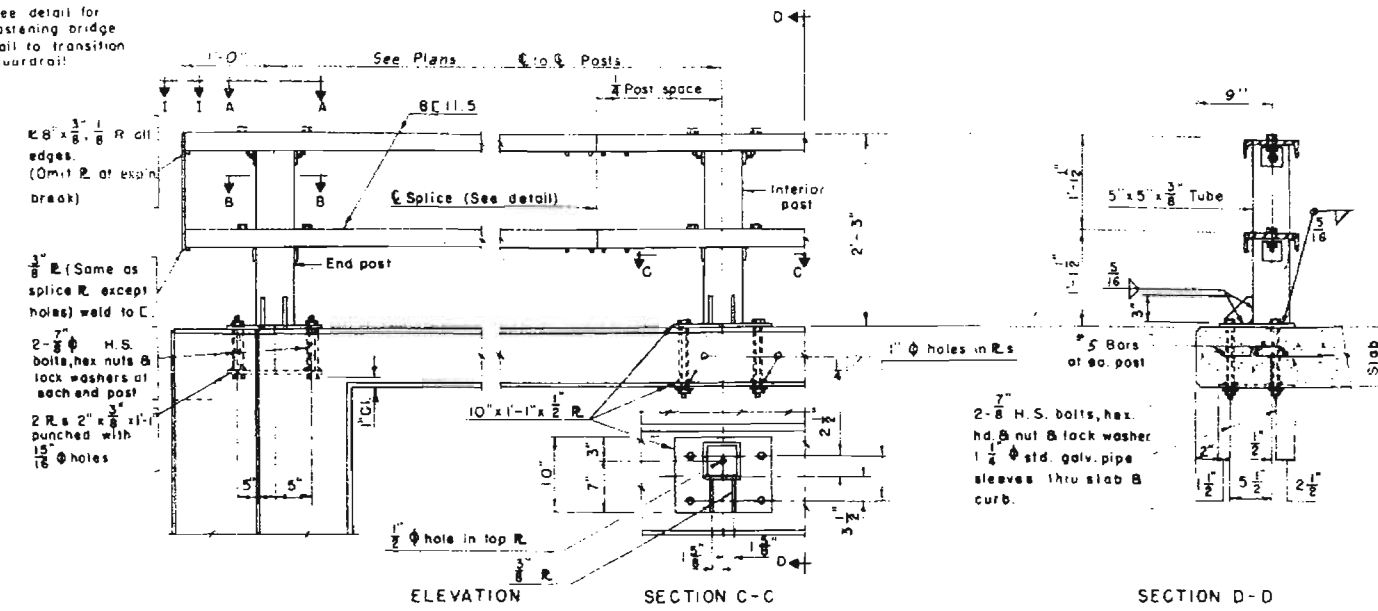
Designed by M.S. Approved by [Signature]  
Made by M.E.P. Bridge Engineer  
Checked by [Signature] Date: Mar. 2, 1967





RD. ROAD LEG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F027-1(6)	27	

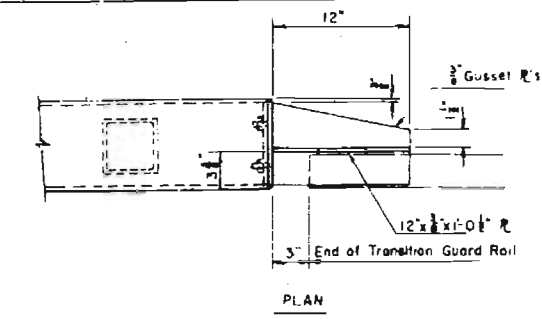
See detail for fastening rail to transition guardrail



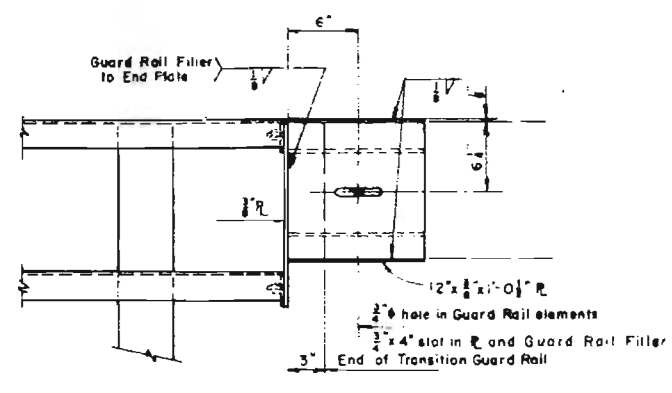
ELEVATION

SECTION C-C

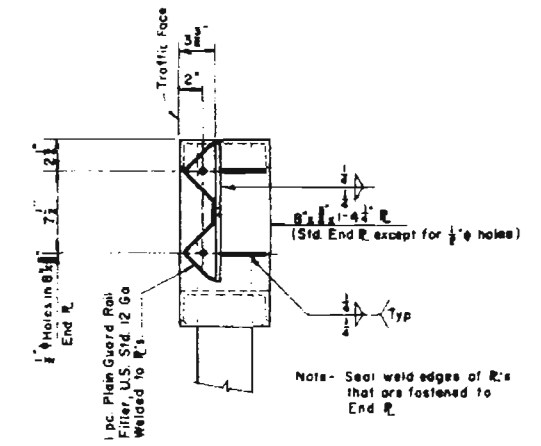
SECTION D-D



PLAN



ELEVATION

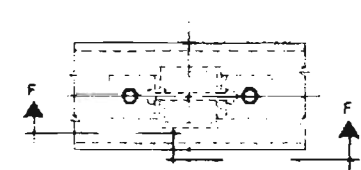


END VIEW  
(Studs not shown)

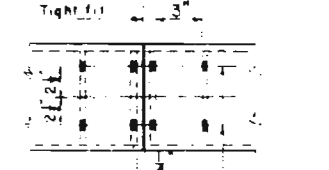
Number Required  
2 Righthand & 2 Lefthand

DETAILS OF END CONNECTION FOR FASTENING BRIDGE RAIL TO TRANSITION GUARD RAIL

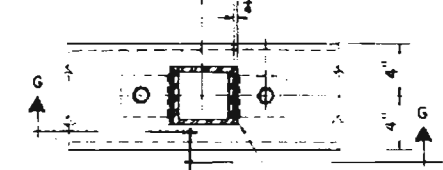
(Complete Unit to be Galvanized after fabrication)  
Detail Shown is For Right Hand Rail  
Opposite Hand For Left Hand Rail



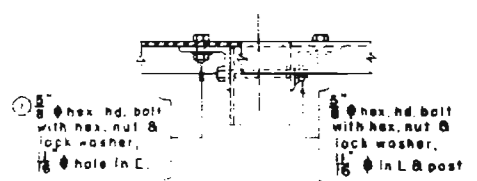
SECTION A-A



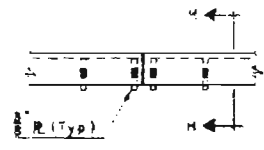
SPICE PLAN



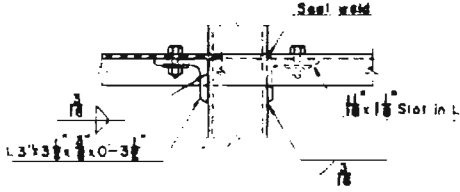
SECTION B-B



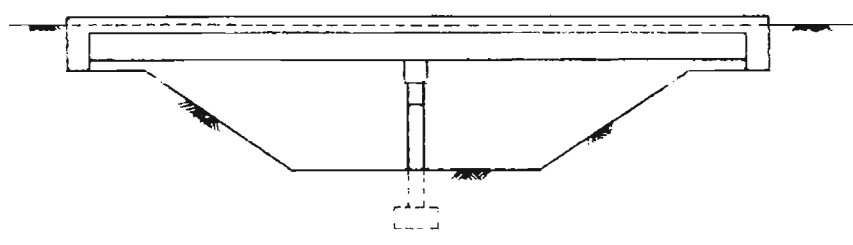
SECTION F-F



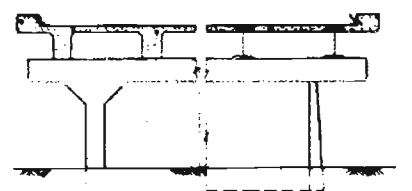
SPICE DETAIL



SECTION G-G



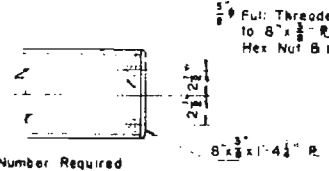
RURAL STREAM CROSSING



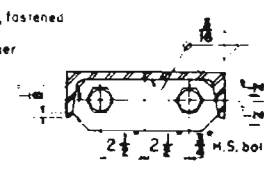
PIER AND SUPERSTRUCTURE

DETAILS SHOWING PORTIONS OF STRUCTURE TO RECEIVE CLASS 2 SURFACE FINISH

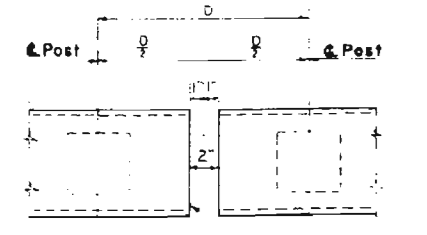
1/2" R (Same as Rail Splice R.)  
Ream hole or Drill Oversize to accommodate shoulder on the Studs



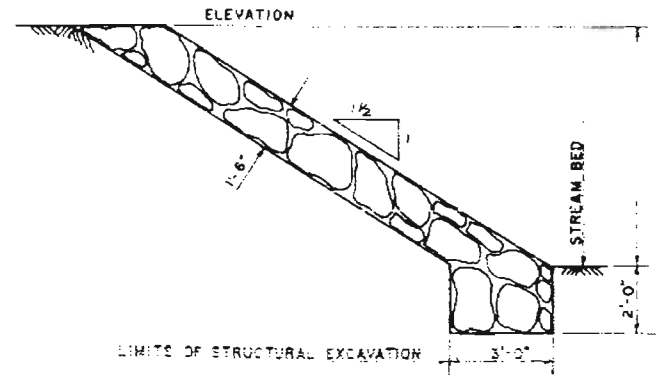
SECTION I-I



SECTION H-H



DETAIL AT EXP'N. BREAK



DETAIL OF RIPRAP WITH TOE

NOTES:  
TRANSITION ENDS OF RIPRAP MAY BE MODIFIED BY THE ENGINEER TO FIT CONDITIONS ENCOUNTERED IN THE FIELD.

- Notes
- Posts to be perpendicular to the grade and slope of deck.
  - All rail elements to be galvanized after fabrication in accordance with specifications.
  - A.I.S.I. 1144 steel rods may be used in lieu of H.S. bolts shown. 10° wedge test not required for either bolts or rods used in rail assembly.
  - 5/8" standard full threaded studs welded to the channel may be used. Increase size of slot in the angle to 13/16" x 1/4".
  - Channels to be continuous over 3 or 4 posts before splicing.

GALVANIZED STEEL HANDRAIL DETAILS

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
DETAILS

HANDRAIL & TRANSITION GUARD RAIL  
1 1/2" HAP  
SURFACE FINISH

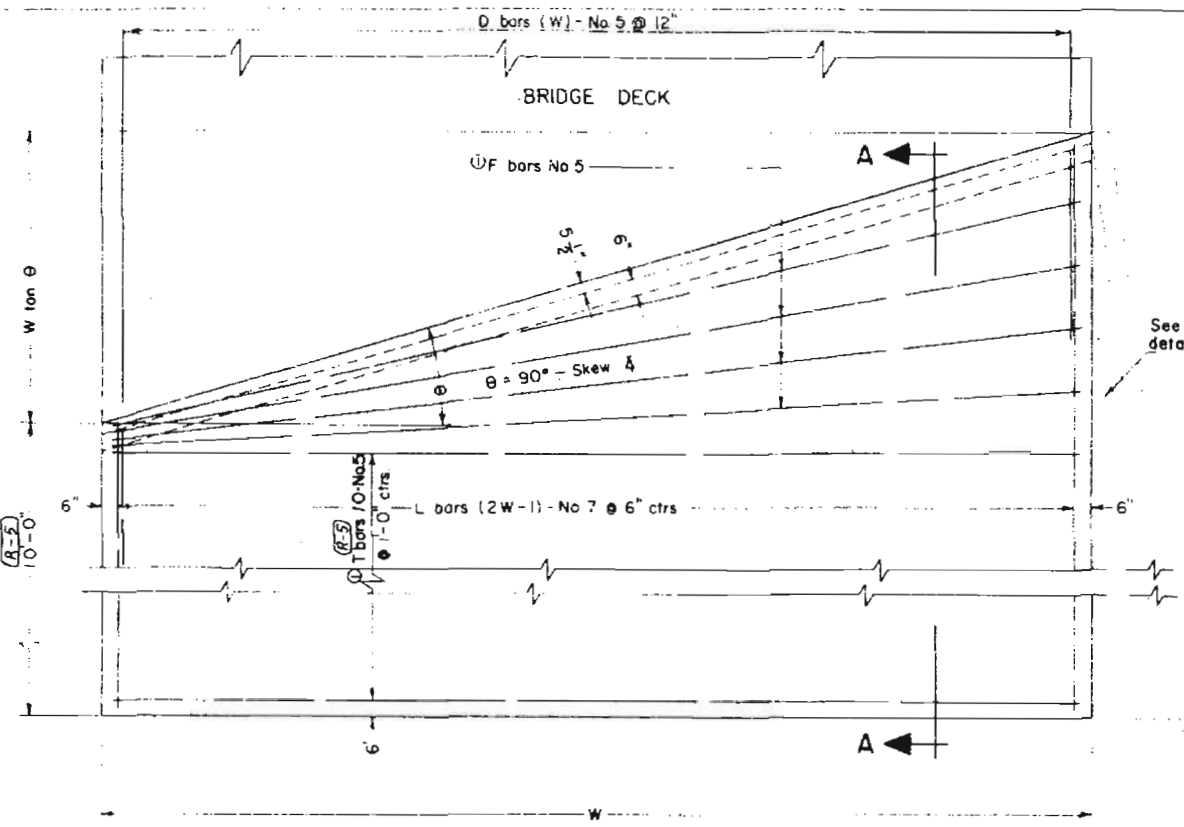
Across GRAY CREEK  
Sta 128+11.000 to 128+52.768  
Near TRINIDAD, Sec. 4, T.33S. R.63W.

Designed by K.S. Approved by R. J. [Signature]  
Made by M.E.P. Bridge Engineer  
Checked by [Signature] Date Jan 2, 1968

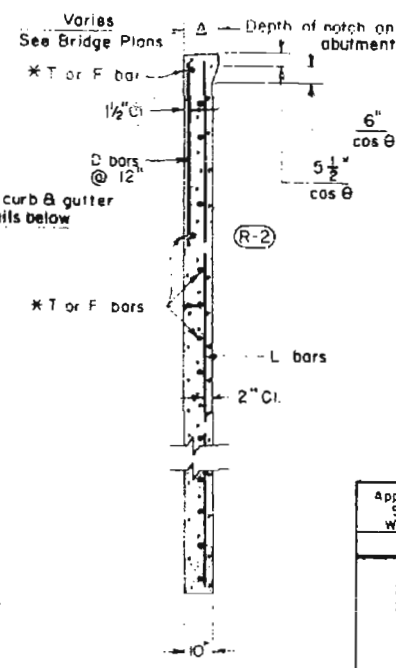
STRUCTURE NO. P-19-C  
Dwg. No. B-9 OF 10

(R-5) 11-28-67 Special, This Project Only C.F.K.

FEDERAL ROAD DISTRICT NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F 027-1(6)	28	

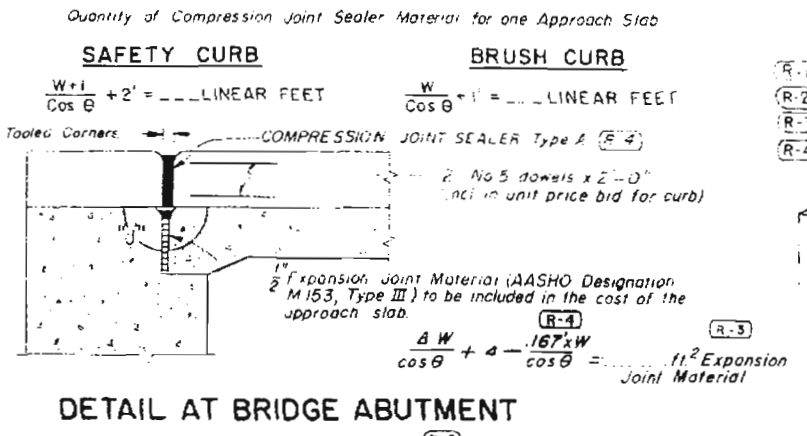


APPROACH SLAB - PLAN



SECTION A-A

\* Includes 2 T or F bars placed in top of slab as shown.

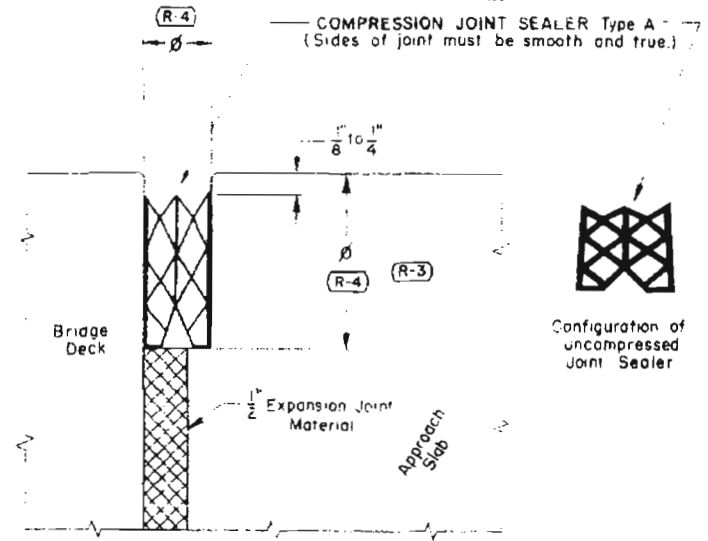


DETAIL AT BRIDGE ABUTMENT

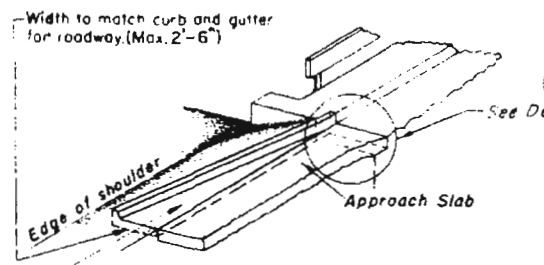
Bar List and Quantities required for one Approach Slab

Approach Slab Width	T-No. 5; Str.		D-No. 5; Str.		L-No. 7; Str.		F-No. 5; Str.		Reinforcing Steel (Lbs.)			Additional Steel for Skew (Lbs.)		Concrete Pavement (Sq. Yds.)
	W	*No.	No.	Length	No.	Length	*No.	Length	T Bar	D Bar	L Bar	F Bar	L Bar	
20	20	19'-6"	20	5'-0"	39		10 tan θ	19'-6"	411	105	1570	205 tan θ	765 tan θ	4.4 + 22.2 tan θ
22	20	21'-6"	22		43		11 tan θ	21'-6"	452	116	1731	249 tan θ	932 tan θ	4.4 + 26.9 tan θ
24	20	23'-6"	24		47		12 tan θ	23'-6"	494	126	1892	297 tan θ	1116 tan θ	53.3 + 32.0 tan θ
26	20	25'-6"	26		51		13 tan θ	25'-6"	537	137	2053	345 tan θ	1316 tan θ	57.8 + 37.6 tan θ
28	20	27'-6"	28		55		14 tan θ	27'-6"	580	147	2214	406 tan θ	1533 tan θ	62.2 + 43.6 tan θ
30	20	29'-6"	30		59		15 tan θ	29'-6"	621	158	2375	466 tan θ	1766 tan θ	66.7 + 50.0 tan θ
32	20	31'-6"	32		63		16 tan θ	31'-6"	663	169	2536	531 tan θ	2018 tan θ	71.1 + 56.9 tan θ
34	20	33'-6"	34		67		17 tan θ	33'-6"	706	179	2697	600 tan θ	2282 tan θ	75.6 + 64.2 tan θ
36	20	35'-6"	36		71		18 tan θ	35'-6"	748	190	2858	673 tan θ	2565 tan θ	80.0 + 72.0 tan θ
38	20	37'-6"	38		75		19 tan θ	37'-6"	790	200	3019	751 tan θ	2864 tan θ	84.4 + 80.2 tan θ
40	20	39'-6"	40		79		20 tan θ	39'-6"	834	211	3180	832 tan θ	3180 tan θ	88.9 + 88.9 tan θ
42	20	41'-6"	42		83		21 tan θ	41'-6"	874	221	3341	918 tan θ	3513 tan θ	93.3 + 98.0 tan θ
44	20	43'-6"	44		87		22 tan θ	43'-6"	916	232	3502	1008 tan θ	3862 tan θ	97.8 + 107.6 tan θ
46	20	45'-6"	46		91		23 tan θ	45'-6"	958	242	3663	1107 tan θ	4227 tan θ	102.2 + 117.6 tan θ
48	20	47'-6"	48		95		24 tan θ	47'-6"	1001	253	3824	1207 tan θ	4609 tan θ	106.7 + 128.0 tan θ
50	20	49'-6"	50		99		25 tan θ	49'-6"	1043	263	3985	1307 tan θ	5007 tan θ	111.1 + 138.9 tan θ
52	20	51'-6"	52		103		26 tan θ	51'-6"	1084	274	4146	1407 tan θ	5422 tan θ	115.6 + 150.2 tan θ
54	20	53'-6"	54		107		27 tan θ	53'-6"	1127	284	4307	1507 tan θ	5854 tan θ	120.0 + 162.0 tan θ

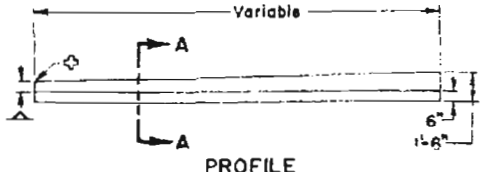
(R-4) Lengths shown include 1 percent for overrun.



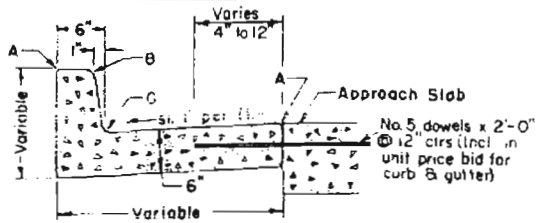
DETAIL "J"



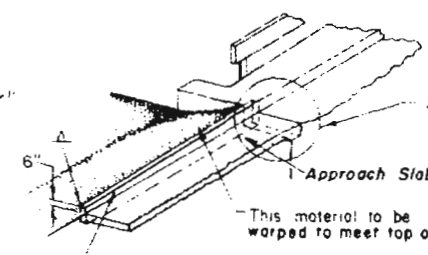
CURB & GUTTER Type 2 (Section-Variable)



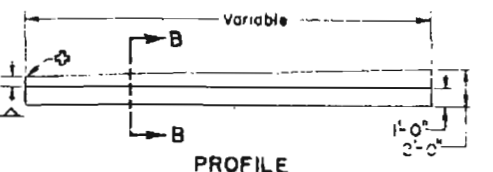
PROFILE



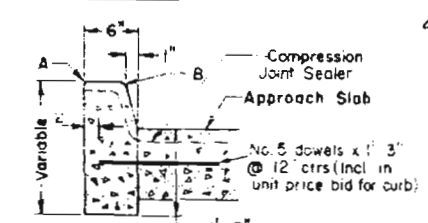
SECTION A-A



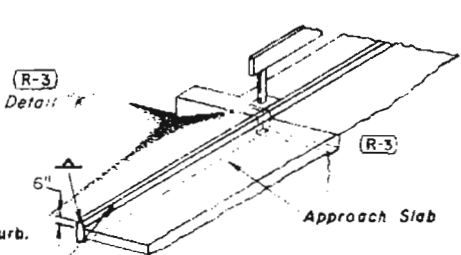
CURB Type 2 (Section-Variable)



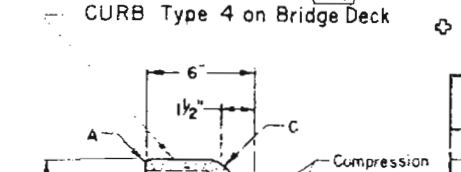
PROFILE



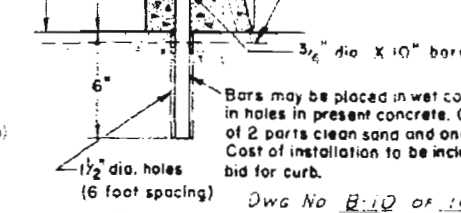
SECTION B-B



CURB Type 2 (Section-Variable)



PROFILE



CURB Type 4 on Bridge Deck

GENERAL NOTES

- Concrete for Approach slabs shall be Class "A" (R-1)
- Approach slabs shall be paid for under Section 412 as "Concrete Pavement" of the specified thickness.
- Reinforcing Steel required in Approach Slab will be paid for under Section 602
- Class "A" concrete aggregate may be used in the pavement.
- 6" min. curb height when no curb is used on abutting roadway (R-1)
- 4" where Bituminous Curbing is used (Shape bituminous curb to meet concrete curb.)
- 6" To meet concrete Curb or Curb and Gutter. (R-1)
- Use 1/2" R. when no bituminous or concrete curb is to be met. No radius required when meeting bituminous or concrete curb.

LEGEND FOR RADII

A	= 1/2"
B	= 1"
C	= 1 1/2"

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
CONCRETE PAVEMENT  
BRIDGE APPROACH  
SLAB

Designed by J.A.B.  
Made by P.C.  
Checked by P.C.

Approved by [Signature]  
Bridge Engineer  
Date: July 1, 1965



**PROJECTED LINE**

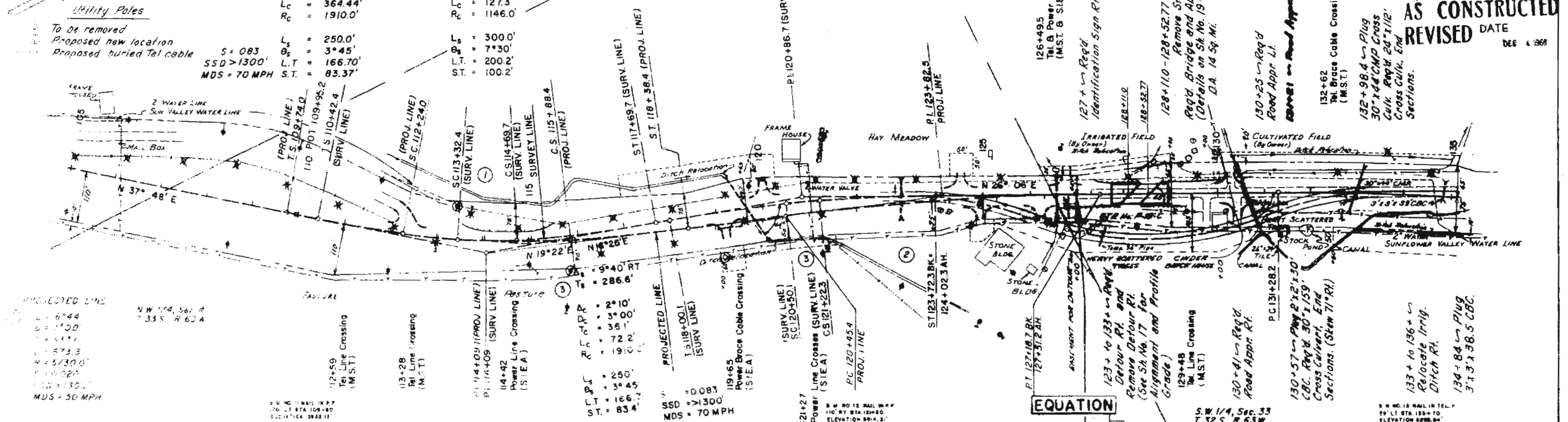
$\Delta_s = 18^\circ 26' \text{ LT}$	$\Delta_c = 21^\circ 22' \text{ LT}$
$T_s = 435.12'$	$T_c = 366.7'$
$D_c = 10^\circ 56'$	$D_c = 6^\circ 22'$
$D_c = 3^\circ 00'$	$D_c = 5^\circ 00'$
$L_c = 182.80'$	$L_c = 63.7'$
$L_c = 364.44'$	$L_c = 127.3'$
$R_c = 1910.0'$	$R_c = 1146.0'$
$L_s = 250.0'$	$L_s = 300.0'$
$\theta_s = 3^\circ 45'$	$\theta_s = 7^\circ 30'$
$L.T. = 166.70'$	$L.T. = 200.2'$
$S.T. = 83.37'$	$S.T. = 100.2'$

$S = 0.83$   
 $SSD > 1300'$   
 $MDS = 70 \text{ MPH}$

Clearing & Grubbing  
 Sta. 128+ to 129+ - Trees, Lt.  
 127+ to 130+ - Trees, Rt.

FED. ROAD DIST. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F 027-1(6)	29	

FINAL CONSTRUCTION  
**AS CONSTRUCTED**  
 REVISED DATE  
 DEC 4 1968



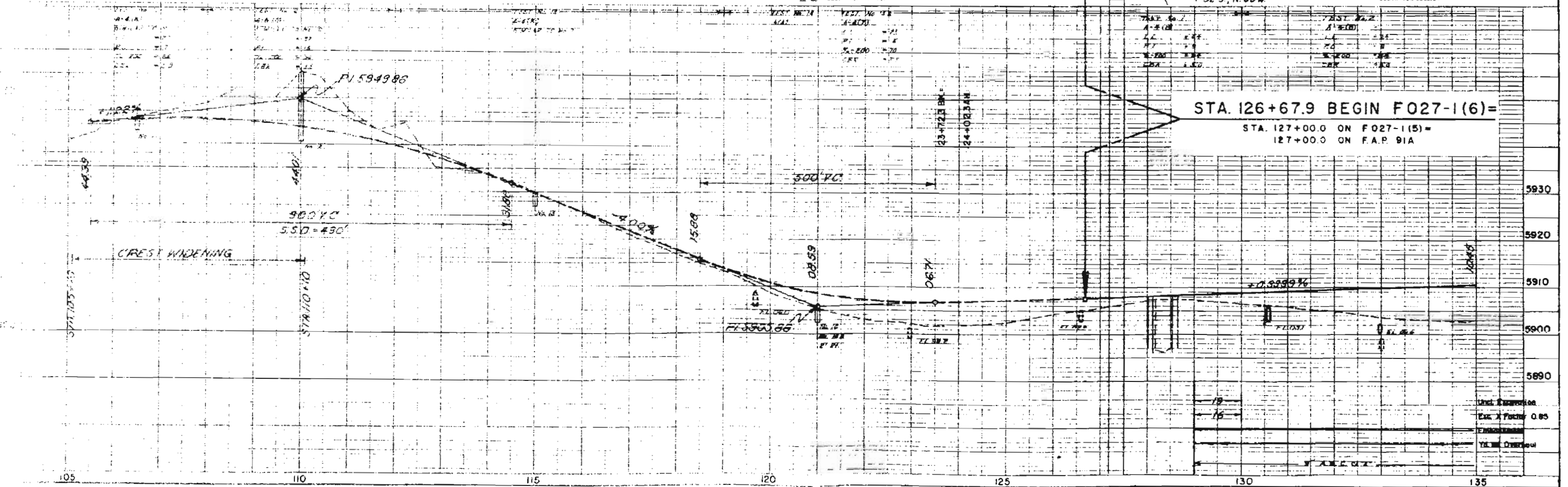
**PROJECTED LINE**

$L = 6^\circ 44'$	N.W. 1/4, Sec. 8
$L = 1^\circ 00'$	T. 33 S., R. 63 W.
$L = 1^\circ 30'$	
$L = 1^\circ 57.5'$	
$L = 2^\circ 30.0'$	
$L = 3^\circ 02.0'$	
$L = 3^\circ 35.0'$	
$MDS = 50 \text{ MPH}$	

**EQUATION**

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

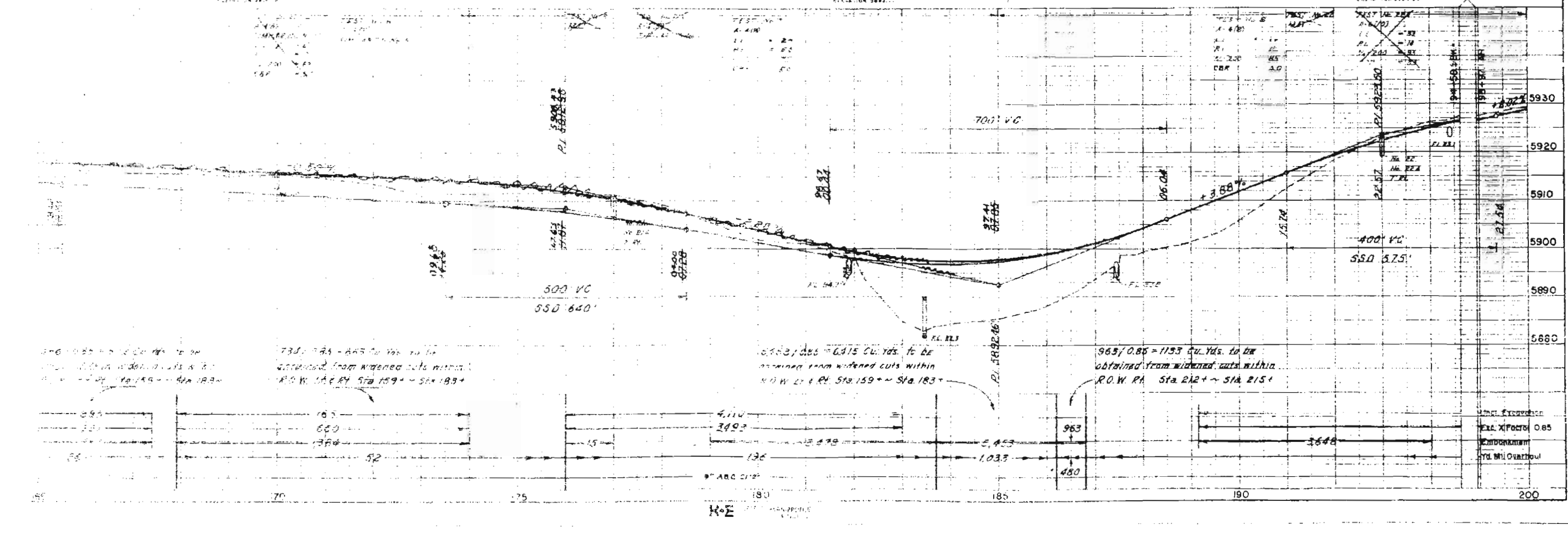
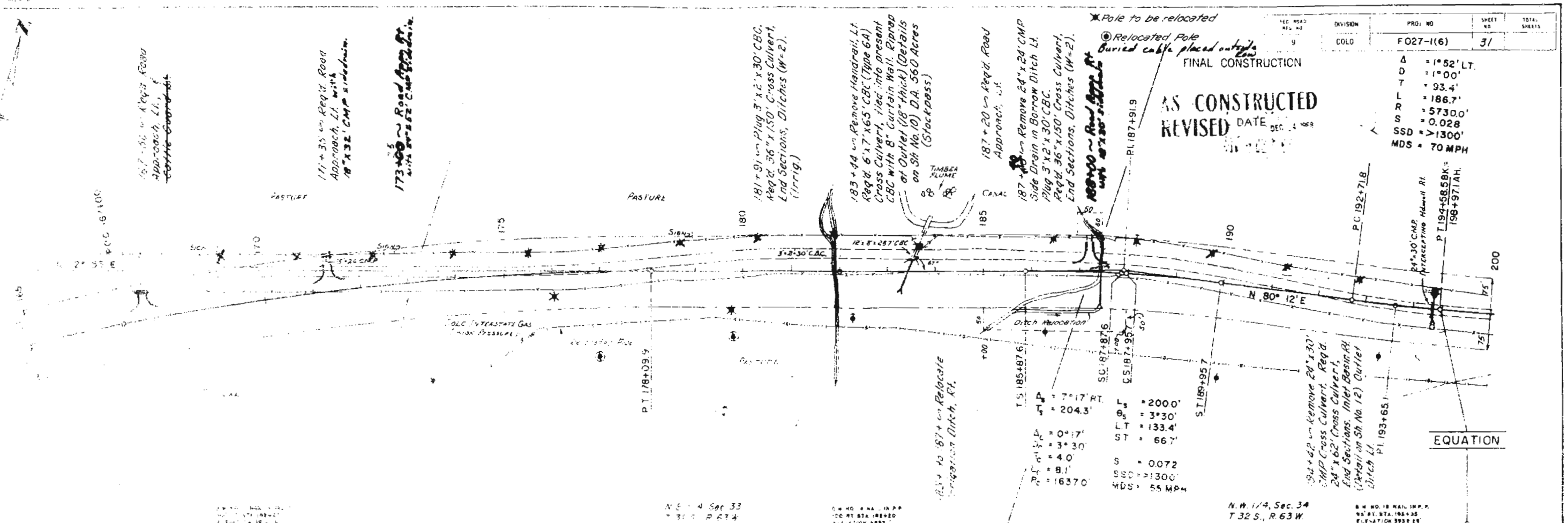
STA. 126+67.9 BEGIN F027-1(6)=  
 STA. 127+00.0 ON F027-1(5)=  
 127+00.0 ON F.A.P. 91A



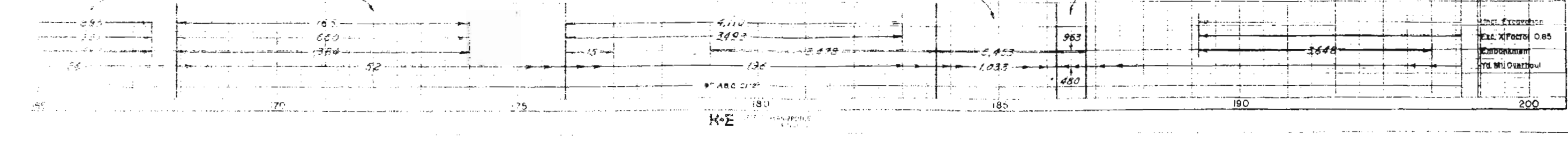


AS CONSTRUCTED  
REVISED DATE DEC 1 1968

Δ = 1° 52' LT.  
D = 1° 00'  
T = 93.4'  
L = 186.7'  
R = 5730.0'  
S = 0.028  
SSD > 1300'  
MDS = 70 MPH



735' ± 43' - 465' Cu. Yds. to be obtained from widened cuts within R.O.W. RA Sta 159+ ~ Sta 183+  
 6583' ± 465' = 6415 Cu. Yds. to be obtained from widened cuts within R.O.W. RA Sta 159+ ~ Sta 183+  
 965' ± 0.85' = 1133 Cu. Yds. to be obtained from widened cuts within R.O.W. RA Sta 212+ ~ Sta 215+



EQUATION



FED. ROAD DIST. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F027-116	32	

\* Pole to be relocated  
 Relocated Pole Buried Cable Placed outside Row

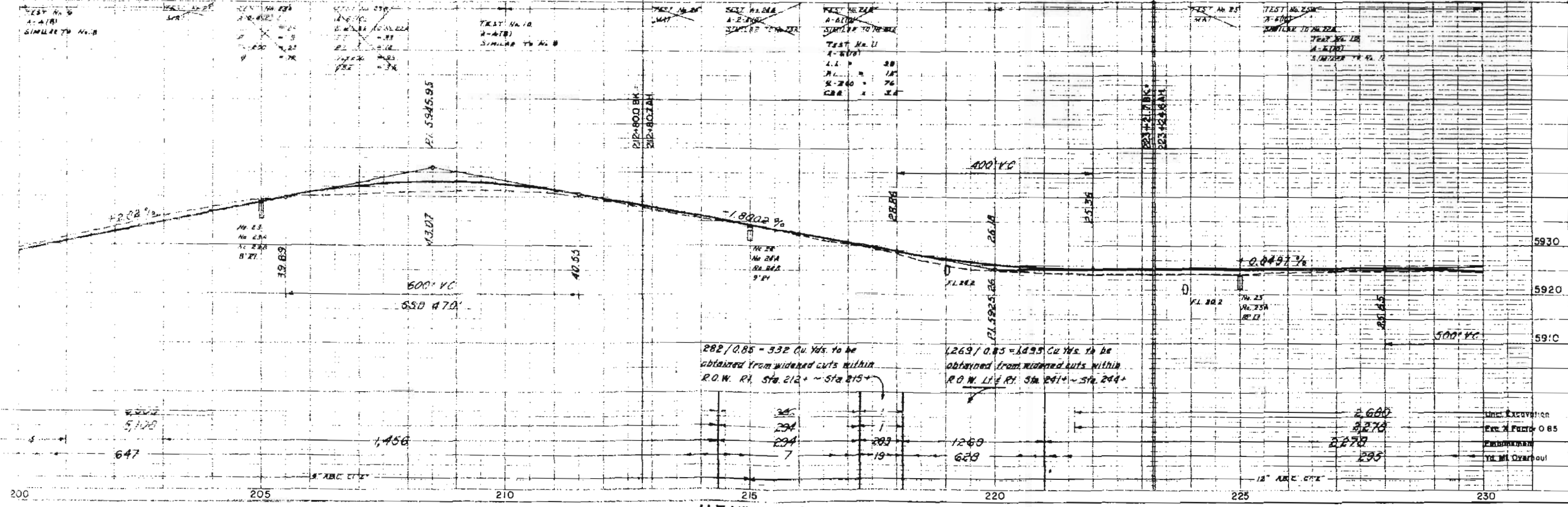
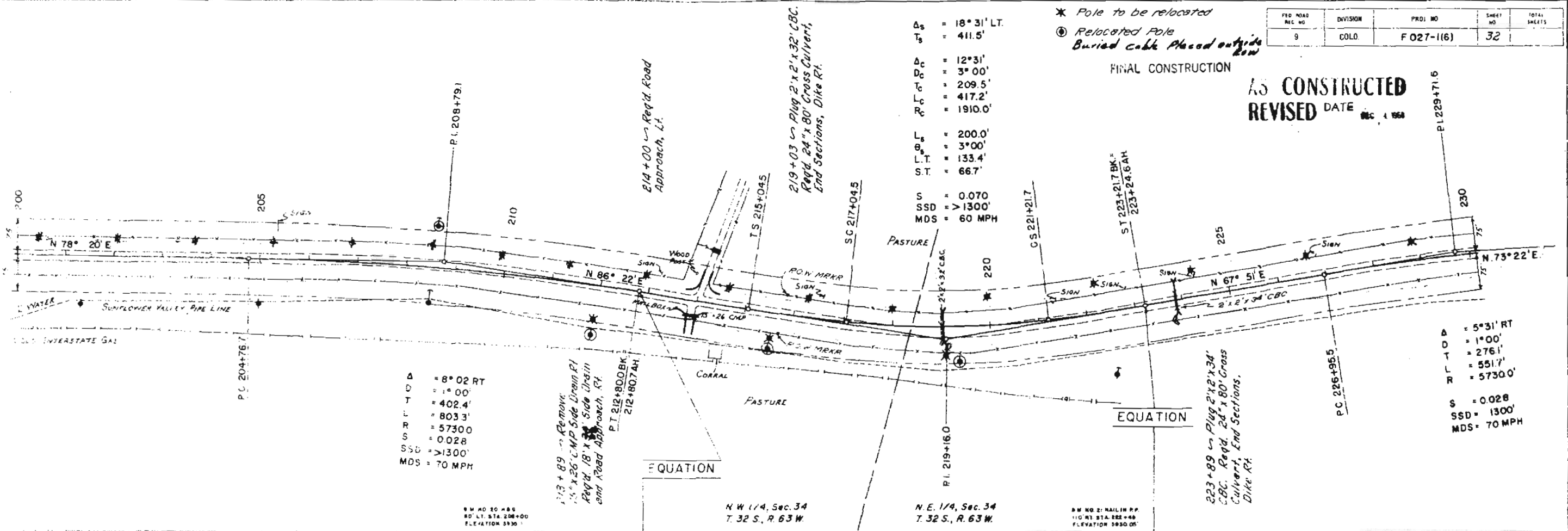
FINAL CONSTRUCTION

AS CONSTRUCTED  
 REVISED DATE DEC 1 1968

$\Delta_s = 18^\circ 31' \text{ LT.}$   
 $T_s = 411.5'$   
 $\Delta_c = 12^\circ 31'$   
 $D_c = 3^\circ 00'$   
 $L_c = 209.5'$   
 $R_c = 417.2'$   
 $R = 1910.0'$   
 $L_s = 200.0'$   
 $\theta_s = 3^\circ 00'$   
 $L.T. = 133.4'$   
 $S.T. = 66.7'$   
 $S = 0.070$   
 $SSD = > 1300'$   
 $MDS = 60 \text{ MPH}$

$\Delta = 5^\circ 31' \text{ RT}$   
 $D = 1^\circ 00'$   
 $L = 276.1'$   
 $R = 551.7'$   
 $S = 0.028$   
 $SSD = 1300'$   
 $MDS = 70 \text{ MPH}$

$\Delta = 8^\circ 02' \text{ RT}$   
 $D = 1^\circ 00'$   
 $T = 402.4'$   
 $R = 803.3'$   
 $S = 57300$   
 $SSD = 0.028$   
 $SSD = > 1300'$   
 $MDS = 70 \text{ MPH}$



S.E. 1/4, Sec. 27  
T. 32 S., R. 63 W.

FED. ROAD DIST. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLD	F 027-1(6)	33	

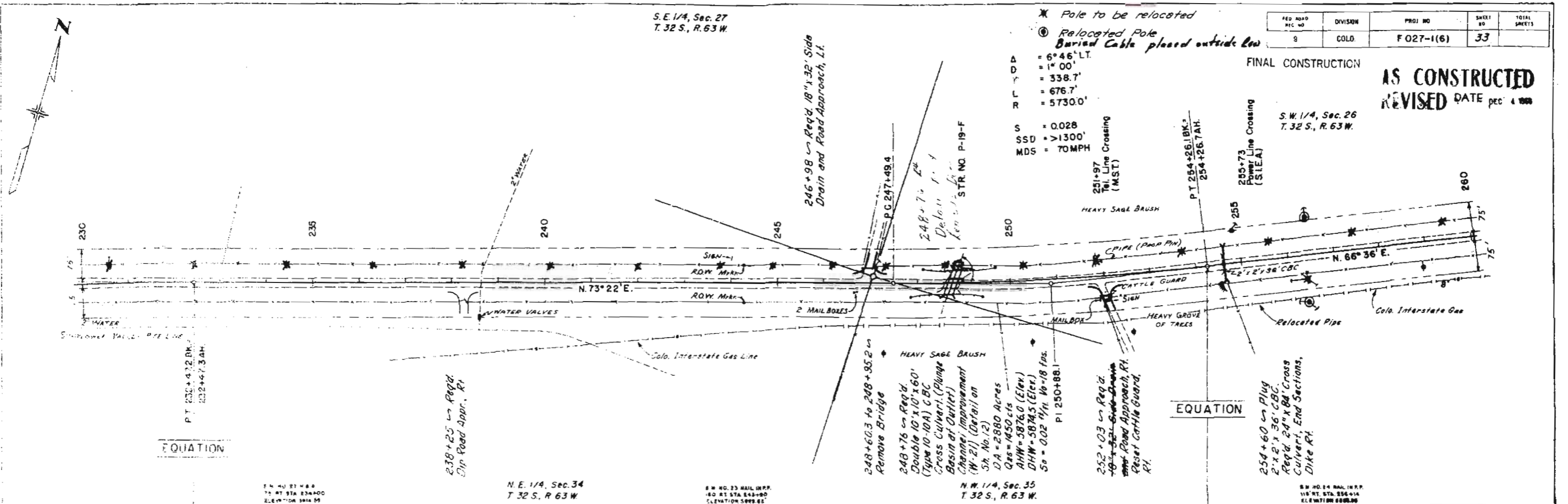
\* Pole to be relocated  
 Ⓞ Relocated Pole  
 Buried Cable placed outside Row

ADD  
 L  
 R  
 S = 0.028  
 SSD = >1300'  
 MDS = 70MPH

FINAL CONSTRUCTION

AS CONSTRUCTED  
 REVISED DATE per 4 000

S.W. 1/4, Sec. 26  
 T. 32 S., R. 63 W.

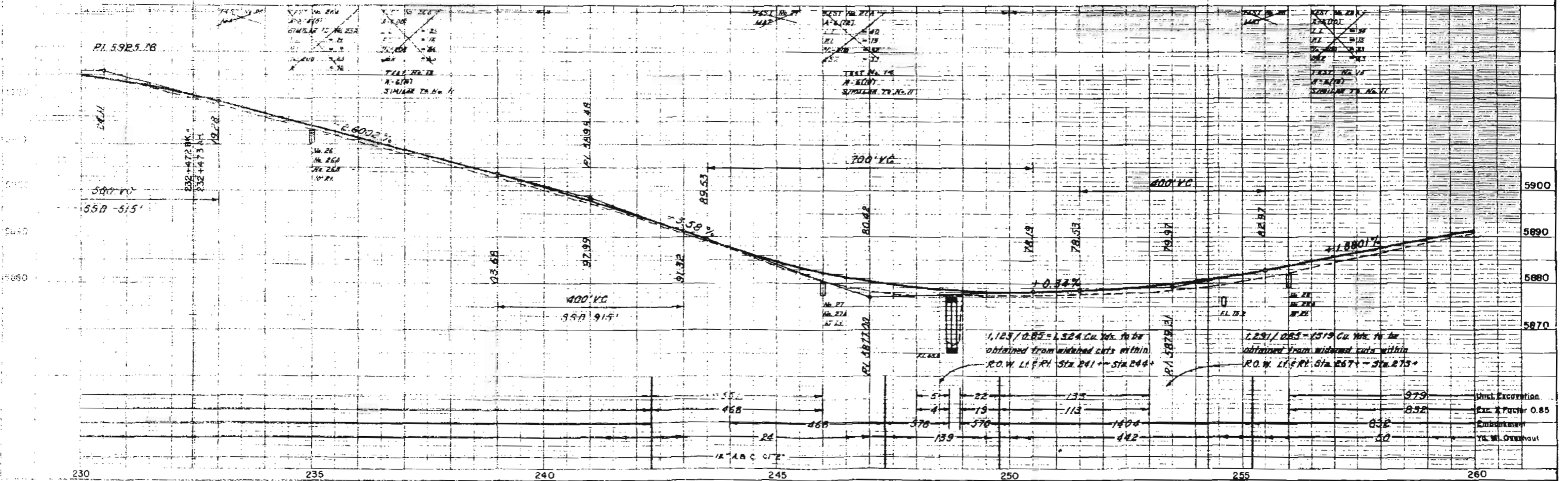


EQUATION

EQUATION

N.E. 1/4, Sec. 34  
 T. 32 S., R. 63 W.

N.W. 1/4, Sec. 35  
 T. 32 S., R. 63 W.



K-E DATE PLAN PROFILE

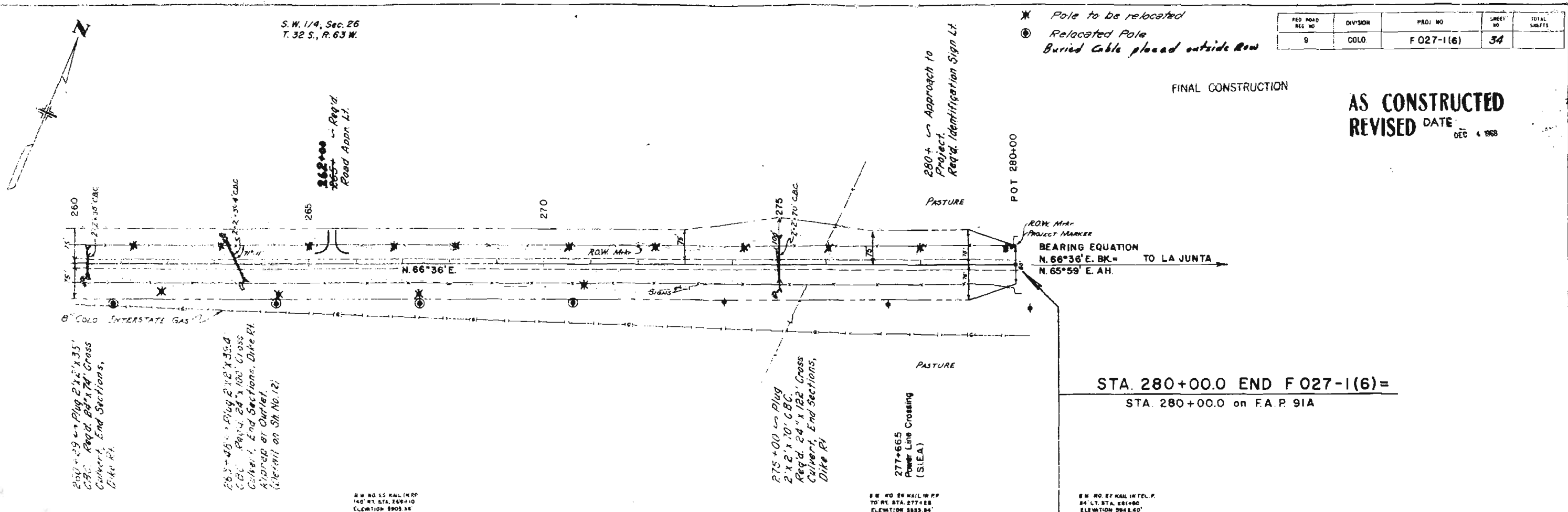
S.W. 1/4, Sec. 26  
T. 32 S., R. 63 W.

FED. ROAD REG. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F 027-1(6)	34	

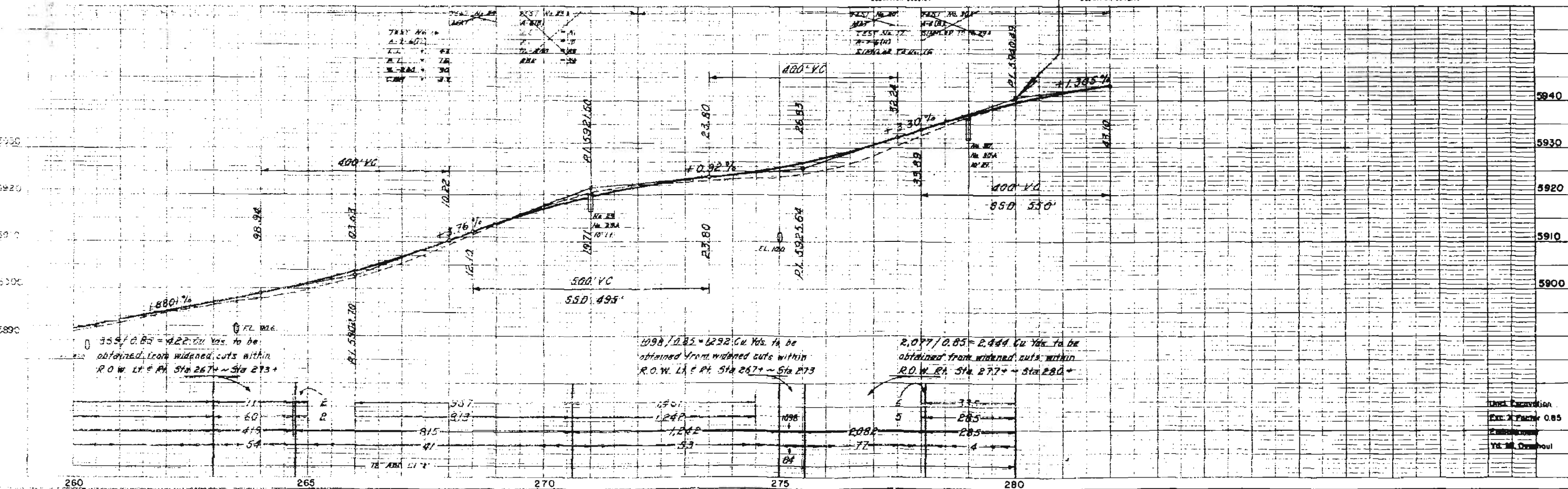
- \* Pole to be relocated
- ⊙ Relocated Pole
- ⊙ Buried Cable placed outside Row

FINAL CONSTRUCTION

**AS CONSTRUCTED**  
REVISED DATE DEC 4 1968



STA. 280+00.0 END F 027-1(6) =  
STA. 280+00.0 on F.A.P. 91A



Excavation		Embankment		Excavation		Embankment
Cu. Yds.	Area	Area	Cu. Yds.	Cu. Yds.	Area	Cu. Yds.

FED. ROAD REGION	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	0000	F 027-1(6)	35	

## SUMMARY OF EARTHWORK QUANTITIES

### UNCLASSIFIED EXCAVATION

ROADWAY (FROM ELECTRONIC COMPUTER)	39,377	Cu. Yds
WIDENED CUTS	24,413	"
ESTIMATED FOR SUBSIDENCE	6,379	"
STRUCTURE QUANTITIES AS EMBANKMENT	6,200	"
STRUCTURE QUANTITIES AS EXCAVATION	1,425	"
STRUCTURE QUANTITIES AS DITCH EXCAVATION	2,540	"
ESTIMATED FOR CUT SLOPE TREATMENT	550	"
EXCAVATION FOR TOPSOIL	11,747	"
EMBANKMENT TO REPLACE TOPSOIL	11,747	"
STRIPPING (REMOVING OVERBURDEN)	5,000	"
STRIPPING (REPLACING OVERBURDEN)	5,000	"
SUB-EXCAVATION	<u>22,684</u>	"

### EMBANKMENT (STANDARD)

(MOISTURE AND DENSITY CONTROL)	TOTAL	137,062	Cu. Yds
--------------------------------	-------	---------	---------

STRUCTURE QUANTITIES AS EMBANKMENT + TOPSOIL	17,947	Cu. Yds
EMBANKMENT	<u>54,221</u>	"
BASE OF CUTS AND FILLS	13,799	"
SUB-EXCAVATION (1 1/2 Ft.)	22,684	"
1/2 Ft. BELOW SUB-EXCAVATION	<u>8,459</u>	"

TOTAL 117,110 CU. YDS.

### HAUL

FROM MASS DIAGRAM	9,549	YD MILES
ESTIMATED FOR SUBSIDENCE	<u>955</u>	"

TOTAL 10,504 YD. MILES

### EXCAVATION X FACTOR (INFORMATION ONLY)

UNCLASSIFIED	33,470	CU. YDS.
WIDENED CUTS	20,751	"

TOTAL 54,221 CU. YDS.

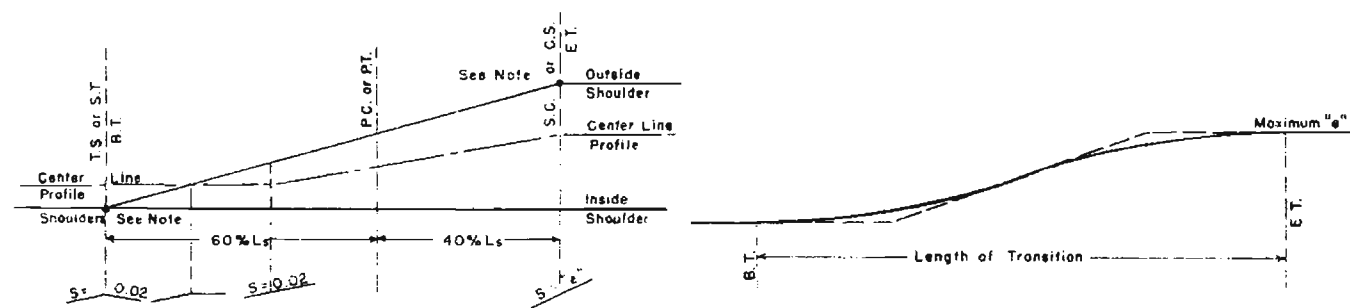
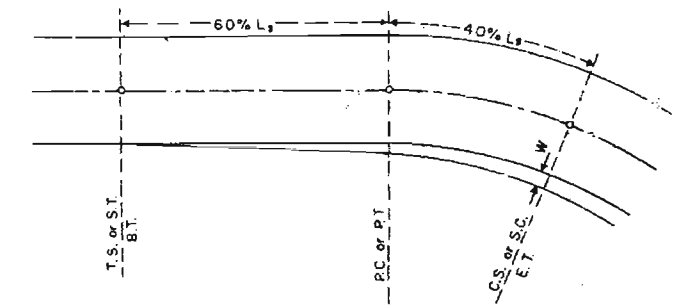
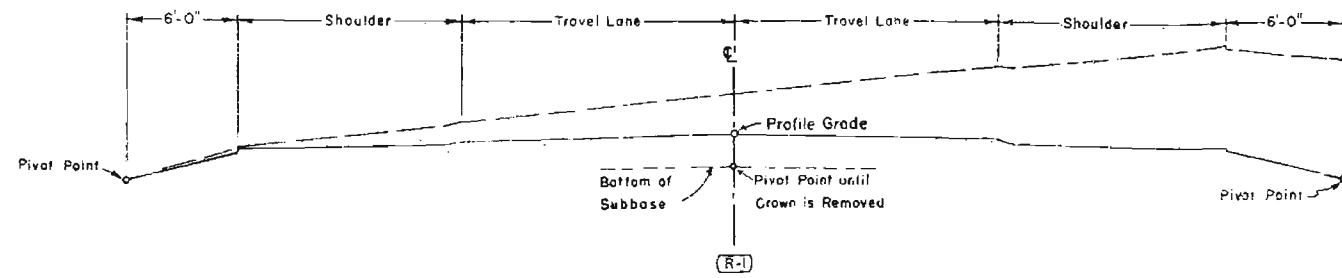
### EMBANKMENT (ROADWAY FROM ELECTRONIC COMPUTER)

TOTAL 54,221 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	Superelev 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°30'	0.02	70	200'	0.02	70	200'
0°45'	0.021	70	200'	0.021	70	200'
1°00'	0.028	70	200'	0.028	70	200'
1°30'	0.042	70	200'	0.042	70	200'
2°00'	0.056	70	200'	0.055	70	200'
2°30'	0.069	70	200'	0.069	70	200'
3°00'	0.076	70	250'	0.083	70	250'
3°30'	0.080	70	250'	0.096	70	300'
4°	0.080	65	250'	0.100	65	300'
5°	0.080	60	250'	0.100	60	300'
6°	0.080	55	200'	0.100	55	250'
7°	0.080	50	200'	0.100	50	250'
8°	0.080	45	200'	0.100	50	250'
9°	0.080	45	200'	0.100	45	250'
10°	0.080	40	200'	0.100	45	250'
11°	0.080	40	200'	0.100	40	200'
12°	0.080	40	200'	0.100	40	200'
13°	0.080	35	150'	0.100	40	200'
14°	0.080	35	150'	0.100	35	200'
15°	0.080	35	150'	0.100	35	200'
16°	0.080	35	150'	0.100	35	200'
17°	0.080	30	150'	0.100	35	200'
18°	0.080	30	150'	0.100	30	200'
19°	0.080	30	150'	0.100	30	200'
20°	0.080	30	150'	0.100	30	200'
21°	0.080	30	150'	0.100	30	200'
22°	0.080	30	150'	0.100	30	200'
23°	0.080	30	150'	0.100	30	200'
24°	0.080	30	150'	0.100	30	200'
25°	0.080	30	150'	0.100	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 Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	Required Super-elevation Rate Ft./Ft.		Minimum Transition Length	
	U.O.B.	O.I.U.	or Spiral	U.O.B.	O.I.U.	or Spiral	U.O.B.	O.I.U.	or Spiral	U.O.B.	O.I.U.	or Spiral	U.O.B.	O.I.U.	or Spirals	U.O.B.	O.I.U.	or Spirals	U.O.B.	O.I.U.	or Spirals	
0°15'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	0°15'
0°30'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	0°30'
0°45'	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	NC	NC	0	0°45'
1°00'	NC	NC	0	NC	NC	0	NC	NC	150'	NC	NC	150'	NC	NC	150'	NC	NC	150'	NC	NC	150'	1°00'
1°30'	RC	RC	100'	RC	RC	150'	RC	RC	150'	RC	RC	150'	0.027	0.027	150'	0.031	0.031	200'	0.025	0.034	200'	1°30'
2°00'	RC	RC	100'	RC	RC	150'	RC	RC	150'	0.025	0.027	150'	0.030	0.032	150'	0.035	0.042	200'	0.047	0.046	200'	2°00'
2°30'	RC	RC	100'	0.025	0.026	150'	0.030	0.033	150'	0.036	0.039	150'	0.043	0.045	150'	0.050	0.052	200'	0.057	0.059	200'	2°30'
3°00'	0.025	0.024	100'	0.029	0.031	150'	0.035	0.038	150'	0.042	0.046	150'	0.050	0.054	150'	0.057	0.062	200'	0.066	0.070	200'	3°00'
3°30'	0.026	0.027	100'	0.033	0.035	150'	0.040	0.045	150'	0.048	0.053	150'	0.056	0.063	150'	0.064	0.072	200'	0.072	0.081	250'	3°30'
4°	0.029	0.030	100'	0.037	0.040	150'	0.044	0.050	150'	0.053	0.060	150'	0.062	0.070	200'	0.069	0.079	200'	0.076	0.090	250'	4°
5°	0.035	0.038	100'	0.044	0.048	150'	0.053	0.060	150'	0.062	0.071	200'	0.070	0.083	200'	0.077	0.091	250'	0.080	0.099	300'	5°
6°	0.041	0.044	100'	0.050	0.056	150'	0.060	0.068	150'	0.069	0.080	200'	0.076	0.093	250'	0.080	0.098	250'	0.100	0.100	300'	6°
7°	0.045	0.050	100'	0.056	0.063	150'	0.066	0.075	150'	0.074	0.088	200'	0.079	0.097	250'	0.080	0.100	250'				7°
8°	0.050	0.055	100'	0.061	0.069	150'	0.071	0.084	200'	0.078	0.094	200'	0.080	0.097	250'							8°
9°	0.054	0.061	100'	0.065	0.075	150'	0.074	0.089	200'	0.080	0.097	200'										9°
10°	0.058	0.065	150'	0.069	0.081	150'	0.077	0.093	200'	0.080	0.100	250'										10°
11°	0.061	0.070	150'	0.072	0.085	200'	0.079	0.096	200'													11°
12°	0.065	0.074	150'	0.075	0.089	200'	0.080	0.098	200'													12°
13°	0.067	0.078	150'	0.077	0.092	200'																13°
14°	0.070	0.082	150'	0.078	0.095	200'																
15°	0.072	0.085	150'	0.079	0.097	200'																
16°	0.074	0.087	150'	0.080	0.099	200'																
17°	0.076	0.090	150'		0.100	200'																
18°	0.077	0.093	200'		0.100	200'																
19°	0.078	0.095	200'																			
20°	0.079	0.096	200'																			
21°	0.080	0.098	200'																			
22°	0.080	0.099	200'																			
23°	0.080	0.099	200'																			
24°		0.100	200'																			
25°		0.100	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 [Signature]  
Made by S.B.L. Staff Design Engr.  
Checked by L.E.D. Date July 1, 1965

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

# STANDARD M-203-B

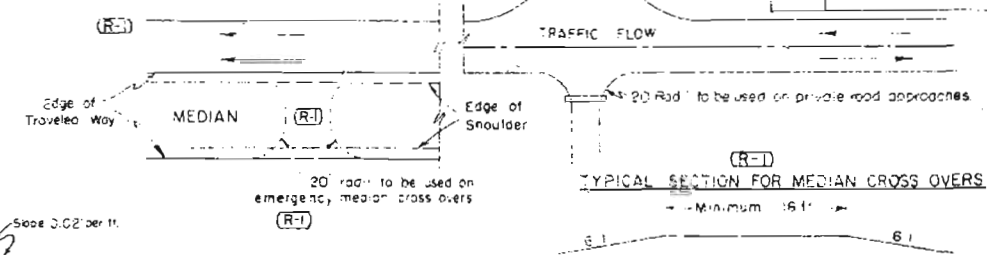
(JULY 1, 1965)

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

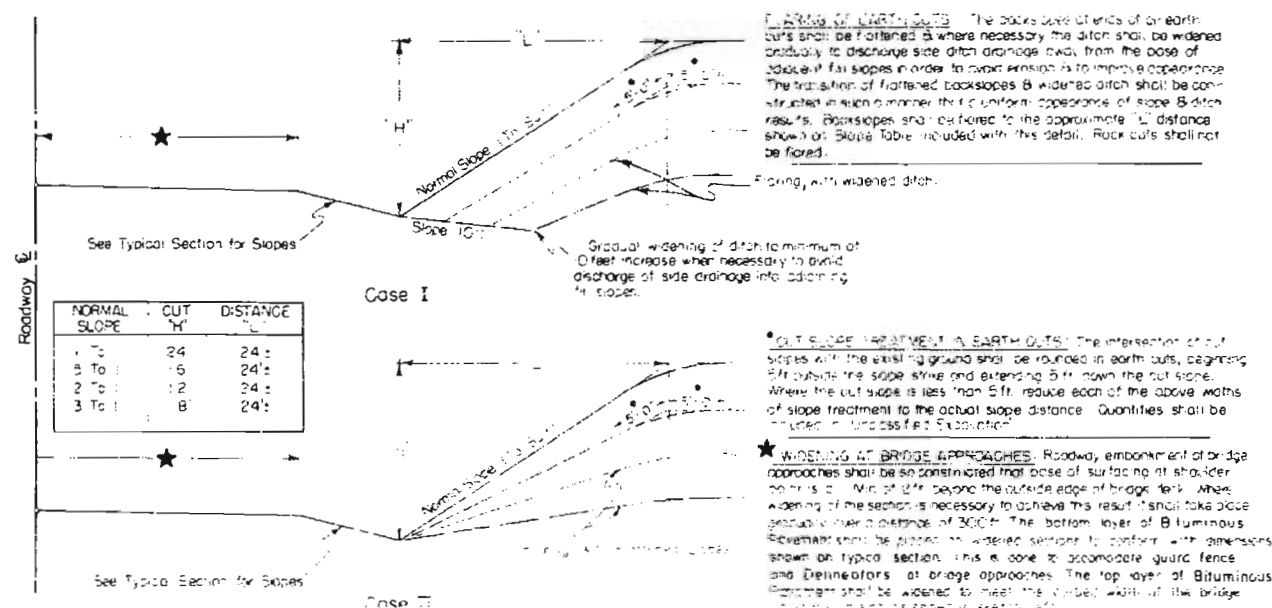
REVISIONS	
(R-1)	2-23-66 Median Cross Over

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

Where critical Side Drains are to be placed inside the roadway ditches.  
50' R.O.W. to be used on all intersecting roads except private approaches.  
Roadway to be varied to suit field conditions.



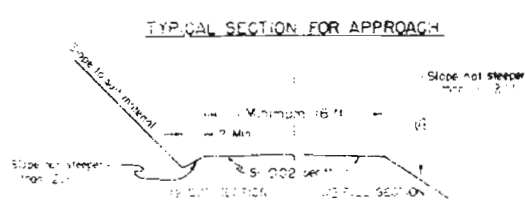
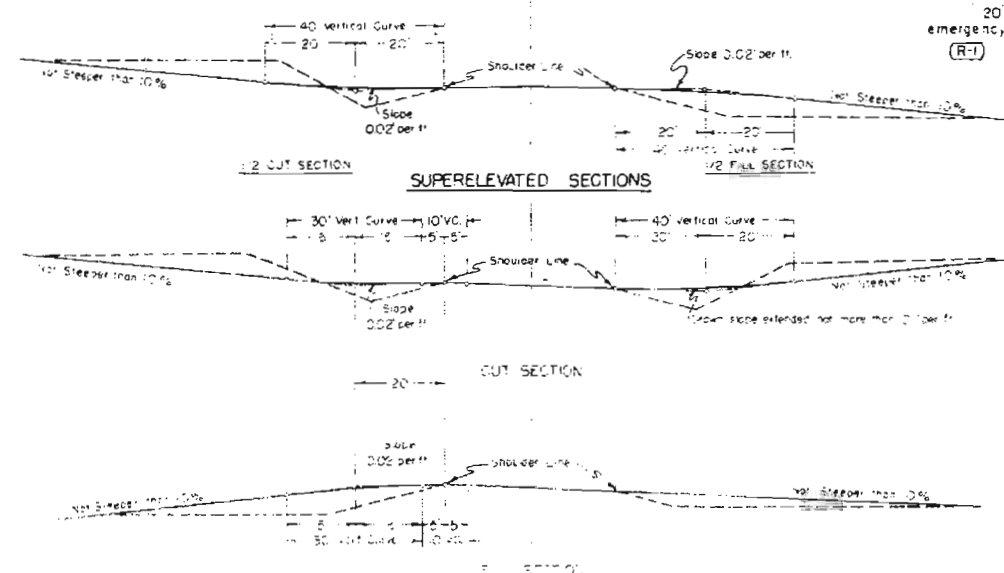
## GENERAL DETAILS FOR FLARING OF EARTH CUTS, CUT SLOPE TREATMENT & WIDENING AT BRIDGES



**FLARING OF EARTH CUTS:** The back slope of ends of an earth cut shall be flared. Where necessary the ditch shall be widened gradually to discharge side ditch drainage away from the base of slope. If fall slopes in order to avoid erosion is to improve appearance. The transition of flared back slopes & widened ditch shall be constructed in such manner that uniform appearance of slope & ditch results. Back slopes shall be flared to the approximate "L" distance shown on Slope Table included with this detail. Rock cuts shall not be flared.

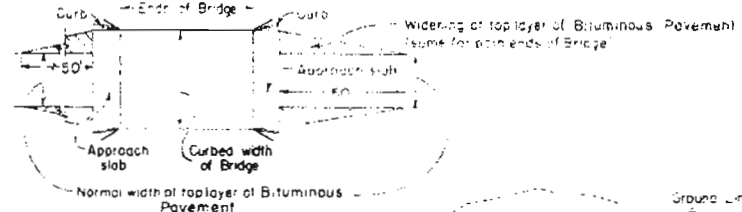
**CUT SLOPE TREATMENT IN EARTH CUTS:** The intersection of cut slopes with the existing ground shall be rounded in earth cuts, beginning 5 ft outside the slope line and extending 5 ft down the cut slope. Where the cut slope is less than 5 ft, reduce each of the above widths of slope treatment to the actual slope distance. Quantities shall be included in the classified Excavation.

**WIDENING AT BRIDGE APPROACHES:** Roadway, embankment of bridge approaches shall be constructed that base of surfacing at shoulder points is a minimum of 2 ft beyond the outside edge of bridge deck. Where widening of the section is necessary to achieve this result, it shall take place gradually over a distance of 300 ft. The bottom layer of Bituminous Pavement shall be placed in widened section in conformity with dimensions shown on typical section. This is done to accommodate guard fences and delineators at bridge approaches. The top layer of Bituminous Pavement shall be widened to meet the widened width of the bridge approach on each side of approach.



**NOTE:** Road Approaches shall conform to the above design unless otherwise indicated. The width of the crowned section shall not be less than the width of the approach section of the existing approach and the new construction shall not be less than 16 feet in width.

## WIDENING OF TOP LAYER OF BITUMINOUS PAVEMENT AT BRIDGE APPROACHES

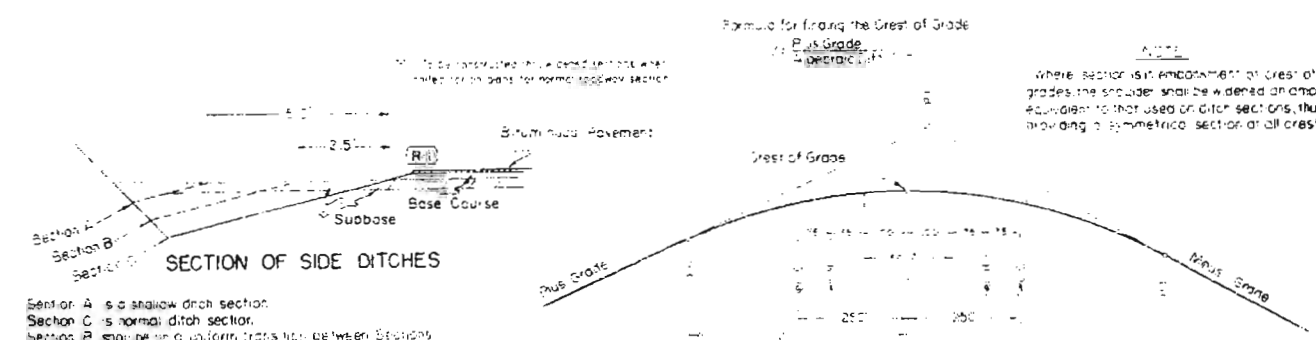


## PLAN OF FLARING IN EARTH CUTS



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

(TO BE USED ONLY WHERE RIGHT-OF-WAY AT CREST OF GRADE IS 500 FT OR LESS)



Section A is a shallow ditch section.  
Section B is normal ditch section.  
Section C shall be a uniform transition between Sections A and B.  
The modification of the ditch indicated shall be used only at the crest of grades from which drainage breaks both ways.

PROFILE VIEW SHOWING DISTANCES AND RELATIVE POSITIONS OF DITCH-TREATMENT SECTIONS

## GENERAL NOTES

- Work shall be done in accordance with the standard Specifications applicable to the Project.
- 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 drainage and water quantities shall be determined by the Engineer. The aggregate base course shall be placed in accordance with the maximum grades for road approaches. Maximum grades at 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 shall not be used wherever feasible.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

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

Designed by: [Signature]  
Made by: S.M.S.  
Checked by: [Signature]

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

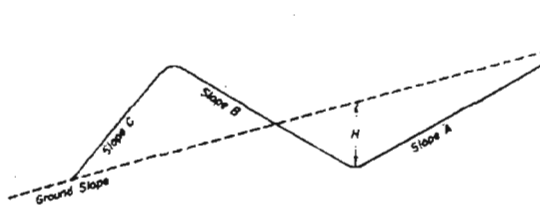
# STANDARD TYPES of DITCHES and CONSTRUCTION METHODS

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

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

### DETAILS for CONTOUR INTERCEPTING DITCHES

Typical Section for Contour Intercepting Ditches



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

Typical Construction Layouts

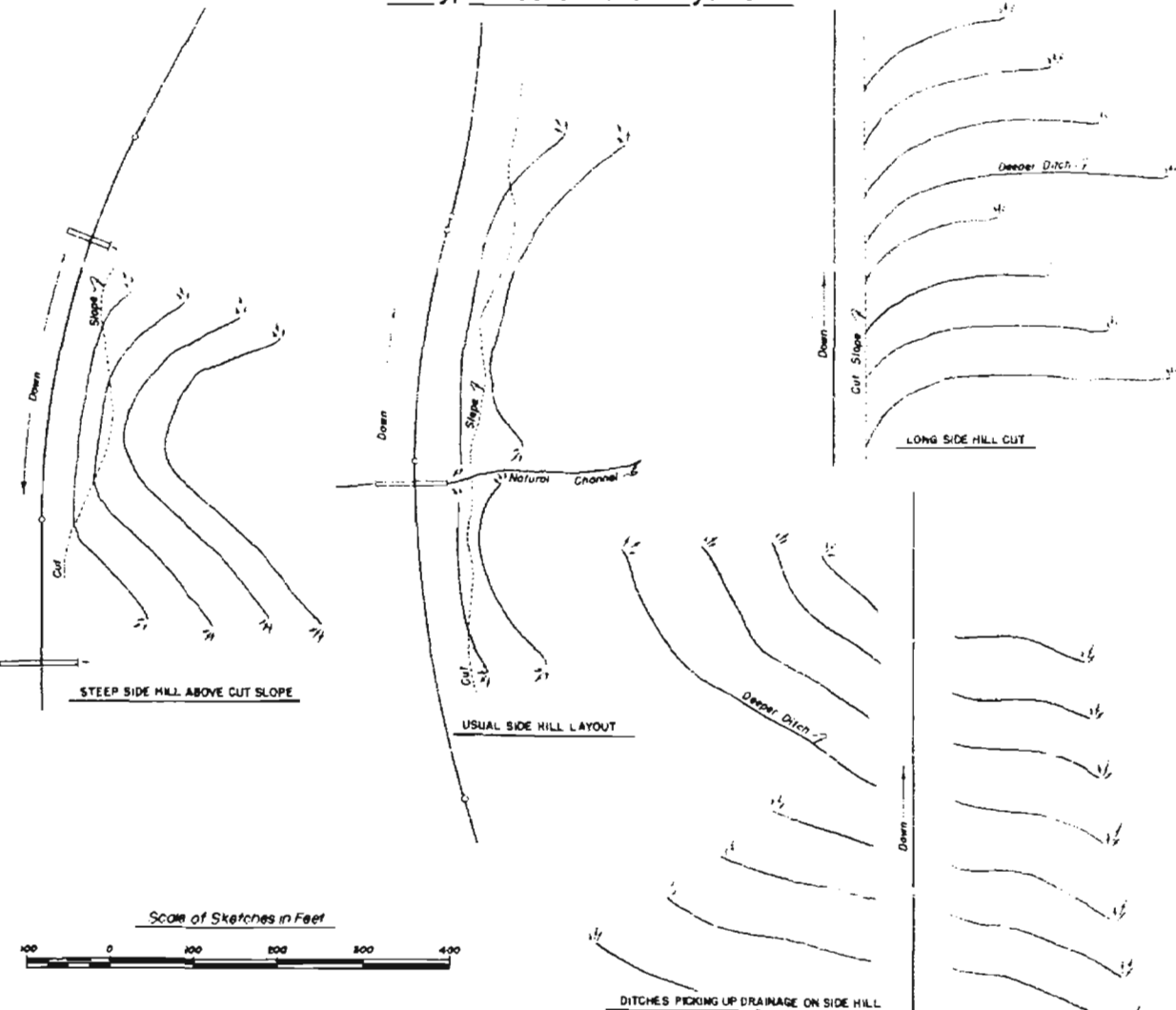
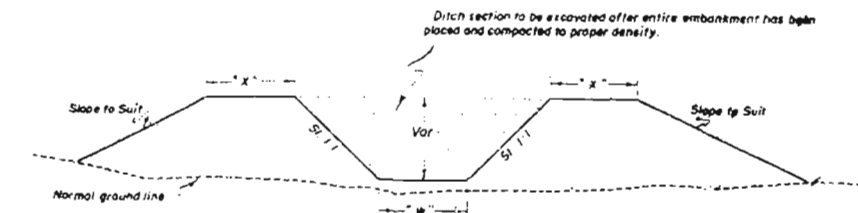


Table of Slopes and Yardages

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		
		15"	15		
		18"	22		
		21"	30		
	1-1/2:1	2:1	2:1	15"	14
				18"	20
		21"	27		
		15"	13		
		18"	19		
		21"	25		
4:1	1-1/2:1	4:1	1-1/2:1	15"	18
				18"	25
		21"	25		
		15"	12		
		18"	17		
		21"	23		
	2:1	3:1	2:1	15"	10
				18"	15
		21"	20		
		15"	14		
		18"	19		
		21"	25		
3:1	2:1	4:1	2:1	15"	17
				18"	25
		21"	34		
		15"	17		
		18"	24		
		21"	32		
	1-1/2:1	2:1	2:1	15"	15
				18"	22
		21"	30		
		15"	15		
		18"	21		
		21"	29		
2:1	1-1/2:1	4:1	1-1/2:1	15"	13
				18"	18
		21"	25		
		15"	12		
		18"	17		
		21"	23		
	1-1/2:1	3:1	2:1	15"	11
				18"	16
		21"	21		
		15"	10		
		18"	14		
		21"	20		
3:1	2:1	3:1	2:1	15"	22
				18"	31
		21"	43		
		15"	21		
		18"	30		
		21"	41		
	1-1/2:1	2:1	1-1/2:1	15"	20
				18"	29
		21"	40		
		15"	13		
		18"	19		
		21"	26		
2:1	1-1/2:1	2:1	1-1/2:1	15"	12
				18"	17
		21"	24		
		15"	12		
		18"	17		
		21"	23		
	1-1/2:1	3:1	1-1/2:1	15"	13
				18"	19
		21"	26		
		15"	12		
		18"	17		
		21"	24		
1-1/2:1	1-1/2:1	2:1	1-1/2:1	15"	17
				18"	24
		21"	30		
		15"	15		
		18"	20		
		21"	27		
	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			

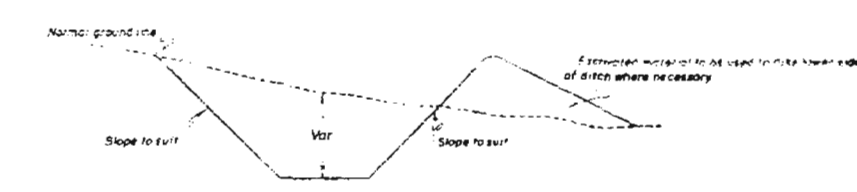
▲ Slopes are approximate and may be varied to suit conditions encountered during construction

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



NOTE—  
 See Structure Notes in plans for dimension "W".  
 Dimension "X" =  $\frac{W}{2}$  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 stated 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

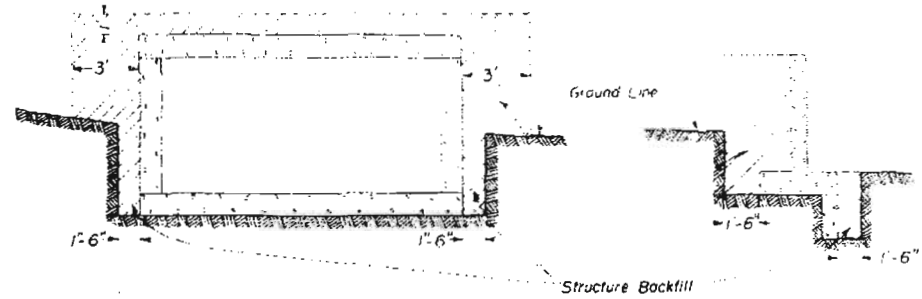
Where ditch checks are required the intervening ditch between one set of ditch checks shall not exceed a grade of 1.0%. Details of checks will be shown on plans when required.

**DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO**

**DITCH TYPES**

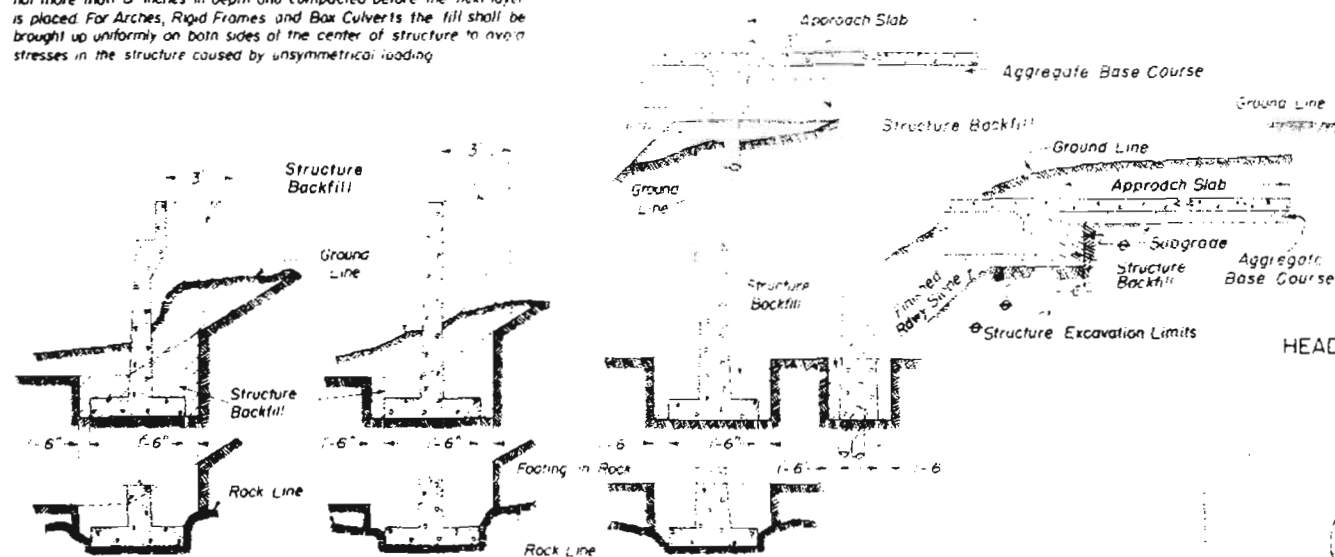
Designed by C.G.M.	Approved by <i>[Signature]</i>
Made by C.G.M.	Staff Design Engr.
Checked by	Date: July 1, 1965

CONCRETE BOX CULVERTS & WINGWALLS

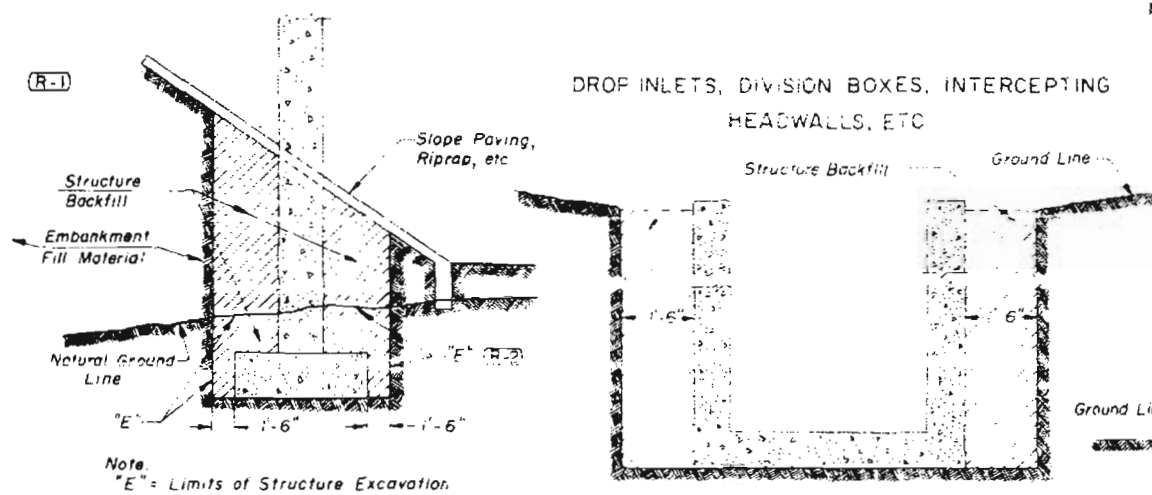


PIERS, ABUTMENTS, RETAINING WALLS ETC

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



STANDARD M-206-A

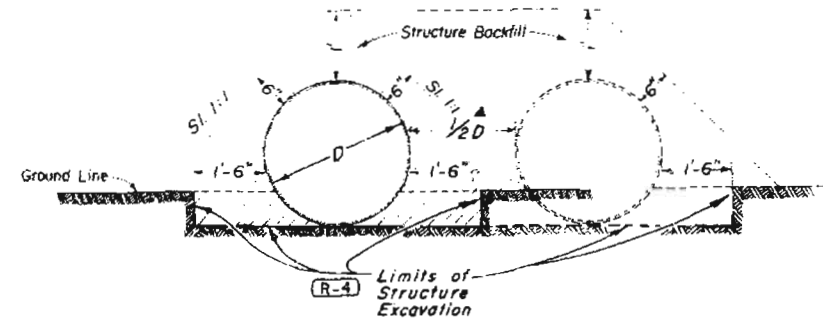
(JULY 1, 1965)  
(SHEET 1 OF 2 SHEETS)

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

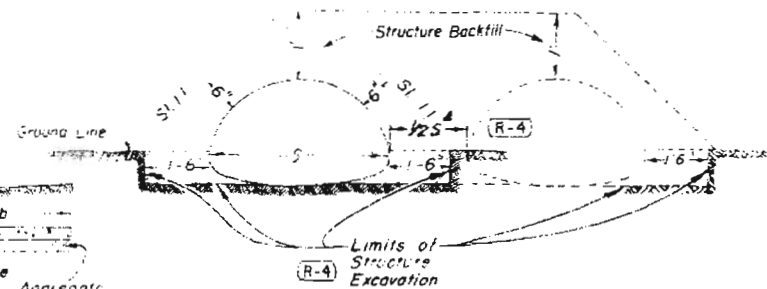
  

REVISION		
(R-1)	10-20-65; ADDED PIER VIEW	M.R.H.
(R-2)	12-7-65; STR. EXCV.	M.R.H.
(R-3)	4-25-66; Class 2 Backfill (Trench)	M.R.H.
(R-4)	3-17-67; Conduit, Underdr'n, Box	M.R.H.
(R-5)	4-26-68; Limit Str. Excavation	M.R.H.

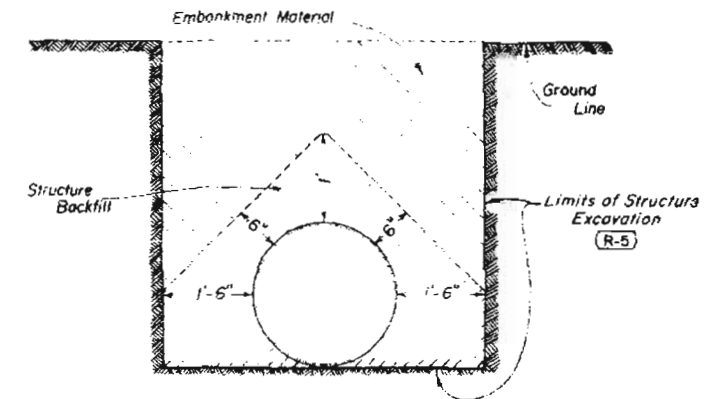
CIRCULAR CONDUIT



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  $\frac{1}{2}$  the Diameter or Span or 3 feet apart whichever is less. Minimum spacing shall not be less than 1 foot. For additional conduit installation details see M Standards for metal, concrete, or structural plate pipe culverts.

(R-4)

GENERAL NOTES

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

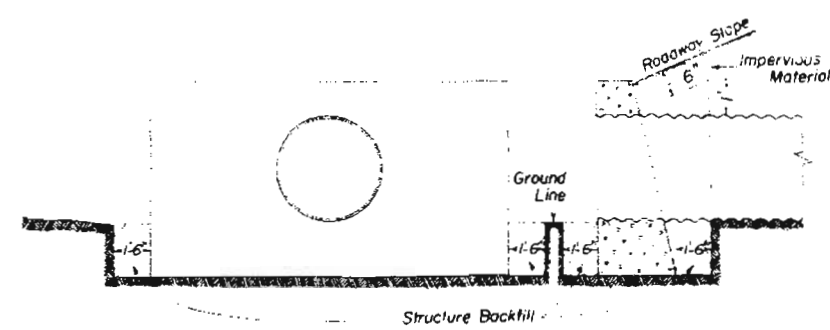
Where the roadway cross section is in fill, excavation for concrete footings (except those in rock or those on piles) and for box culverts shall be done according to the following:

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

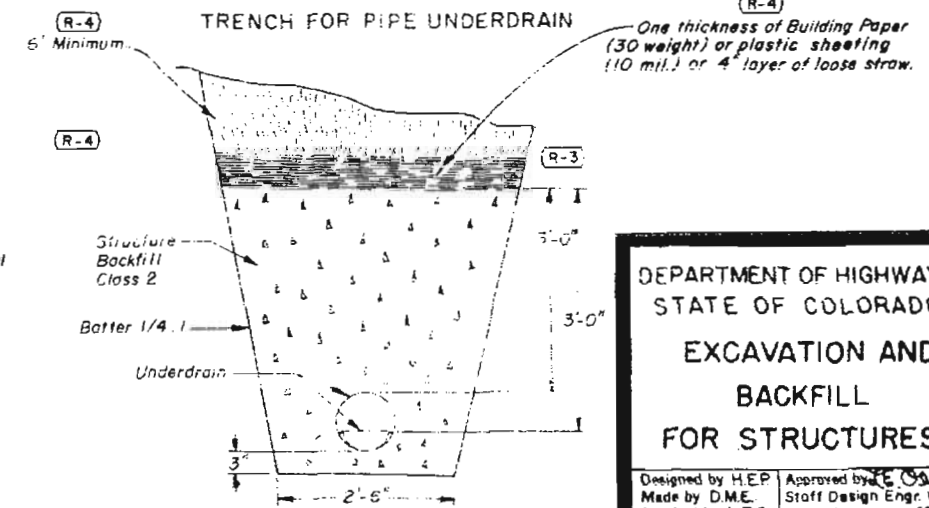
Excavation and backfill patterns different from those indicated on these sheets will be shown elsewhere on the plans.

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

HEADWALLS AND END OF CULVERTS



TRENCH FOR PIPE UNDERDRAIN



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
EXCAVATION AND  
BACKFILL  
FOR STRUCTURES

Designed by H.E.P. Approved by E. Osborn  
Made by D.M.E. Staff Design Engr. 1.  
Checked by L.E.G. Date: July 1, 1965

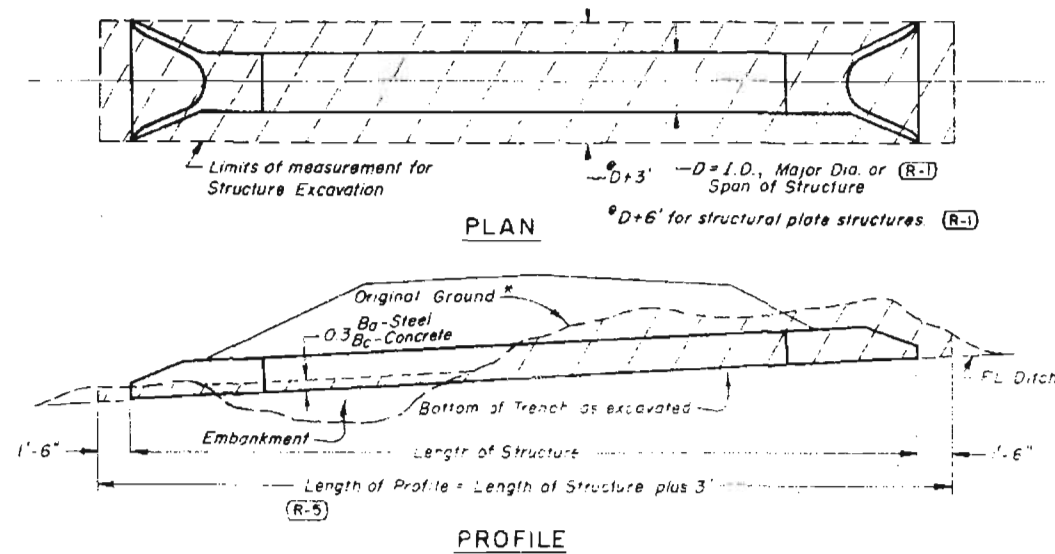
# STANDARD M-206-A

(SHEET 2)  
(JULY 1, 1965)

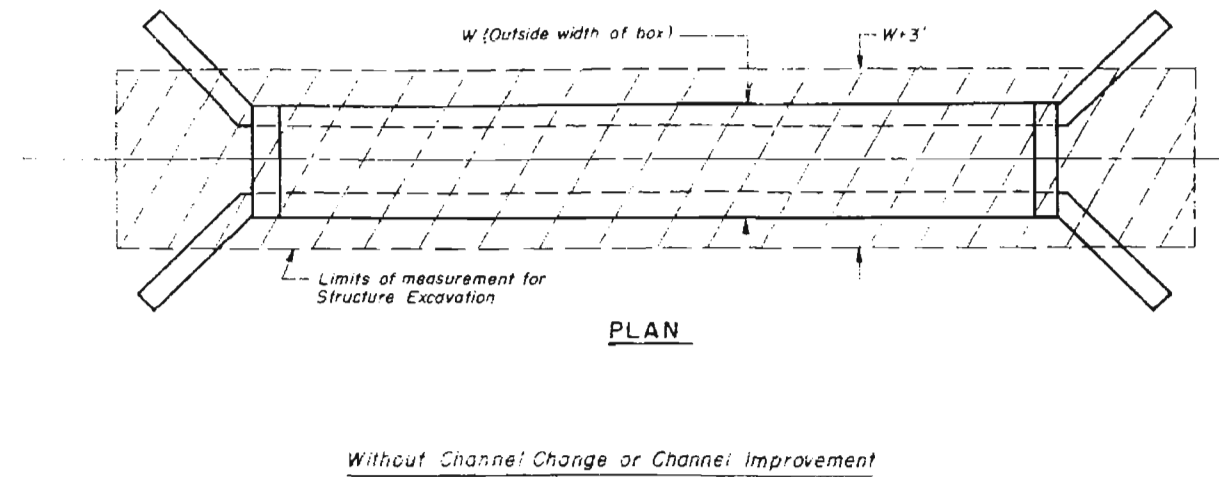
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS:				
(R-1)	3-17-67	I. D. on Pipe Culvert Span or D.	M. R. H.	
(R-5)	4-26-68	Structure Excavation in Fill	M. R. H.	

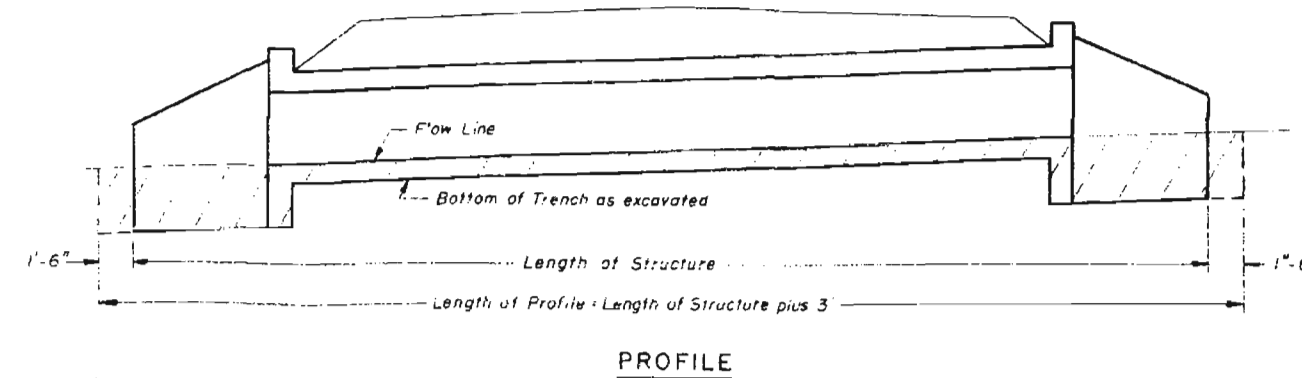
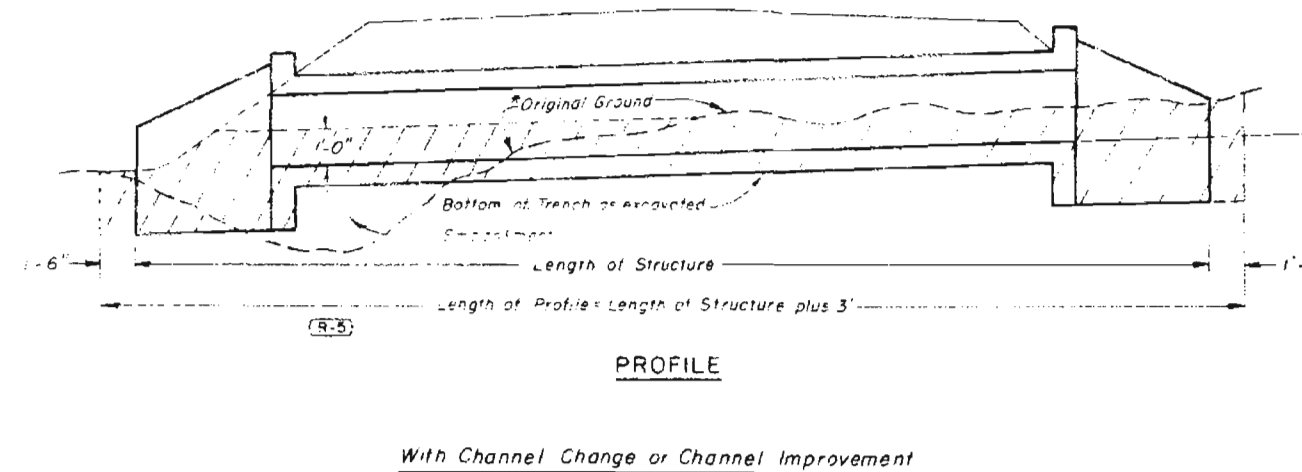
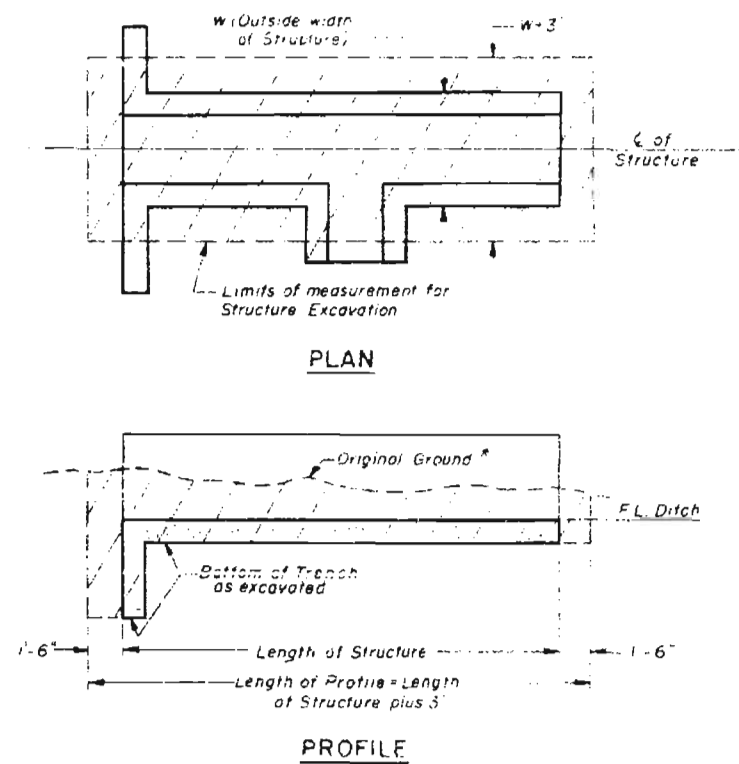
## STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



## 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

# STANDARD M-500-A

(JULY 1, 1965)

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

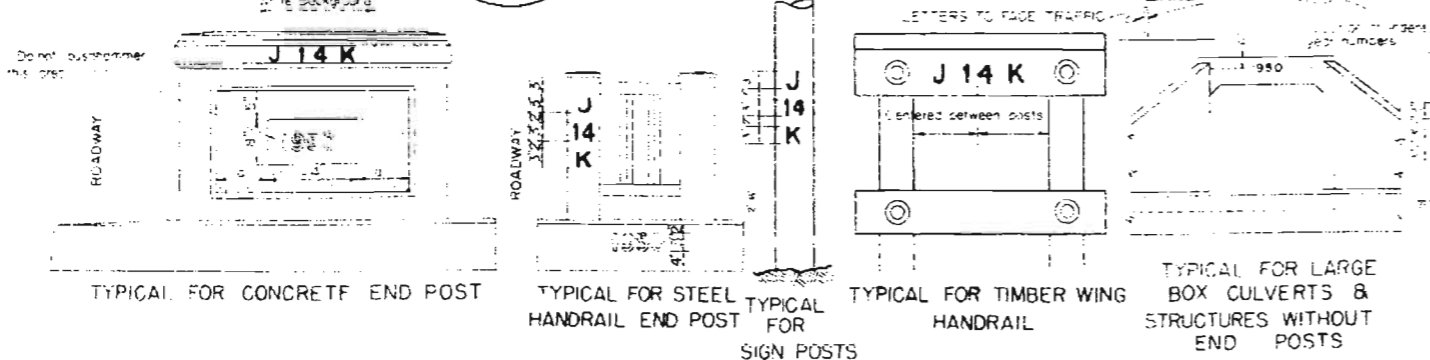
1 2 3 4 5 6 7 8 9 0.

A B C D E F G H I J K L

M N O P Q R S T U V W

a f g l J 1 4 K 1 9 5 0

abcdefghijklmnopqrstuvwxyz



**GENERAL NOTES**

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.

THE SIZE, SHAPE AND SPACING OF THE LETTERS AND FIGURES SHALL BE IN ACCORDANCE WITH THE FULL SIZE SHOWN ON THIS SHEET. SECTIONAL VIEWS OF THE FULL SIZE SHOWN ON THIS SHEET SHALL BE OBTAINED FROM THE DEPARTMENT OF HIGHWAYS.

THE YEAR NUMBERS ARE FURNISHED IN CONCRETE OR MANUFACTURED MATERIAL. THE NUMBERS FOR MINOR STRUCTURES OR STRUCTURES OF 10 FEET OR LESS SHALL BE MADE OF WOOD, METAL OR OTHER SUITABLE MATERIAL AND ATTACHED TO THE FORMS BY THE CONCRETE. THE LETTERS AND FIGURES SHALL BE MADE OF WOOD, METAL OR OTHER SUITABLE MATERIAL AND ATTACHED TO THE FORMS BY THE CONCRETE. THE YEAR NUMBERS SHALL BE STENCILED ON THE RIGHT HAND SIDE OF EACH BRIDGE END AS SHOWN ON THIS STANDARD AND AS SPECIFIED UNLESS THE STRUCTURE HAS AN END POST. THE NUMBER SHALL BE PLACED ON THE POST AND SIDE OF THE ROAD AS SHOWN FOR BRIDGE NUMBER. THE NUMBER SHALL BE PLACED ON THE RIGHT HAND SIDE OF THE ROAD.

THE NUMBER FOR EACH BRIDGE OR SIGN SHALL BE SHOWN ON THE PLANS.

THE NUMBERS FOR MAJOR STRUCTURES OF OVER 10 FEET CLEAR SPAN SHALL BE UNDER LARGE LETTERS. THE NUMBERS FOR MINOR STRUCTURES OF 10 FEET OR LESS SHALL BE UNDER SMALLER LETTERS. SIGN BRIDGES SHALL BE CONSIDERED AS MAJOR STRUCTURES.

THE LETTERS AND FIGURES SHALL BE PLACED IN THE CENTER OF THE SPAN. THE LETTERS SHALL BE PLACED WITH TWO SPACES OF ACCEPTABLE WHITE PAINT. PAINT OR APPROXIMATE WHITE PAINT SHALL BE USED TO FILL THE SPACES BETWEEN THE LETTERS AND FIGURES. THE PAINT SHALL BE THOROUGHLY CLEANED AND PROPERLY APPLIED TO THE WHITE BACKGROUND. THE WHITE PAINT USED ON THE BRIDGE WILL BE SUPPLIED BY THE CONTRACTOR.

THE LETTERS AND FIGURES SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE.

THE LETTERS AND FIGURES SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE.

THE LETTERS AND FIGURES SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE. THE LETTERS SHALL BE PLACED ON THE BRIDGE.

REVISIONS


DESIGNED BY: [Signature]

MADE BY: [Signature]

CHECKED BY: [Signature]

APPROVED BY: [Signature]

BRIDGE ENGINEER

DATE: July 1, 1965

STRUCTURE NO. \_\_\_\_\_

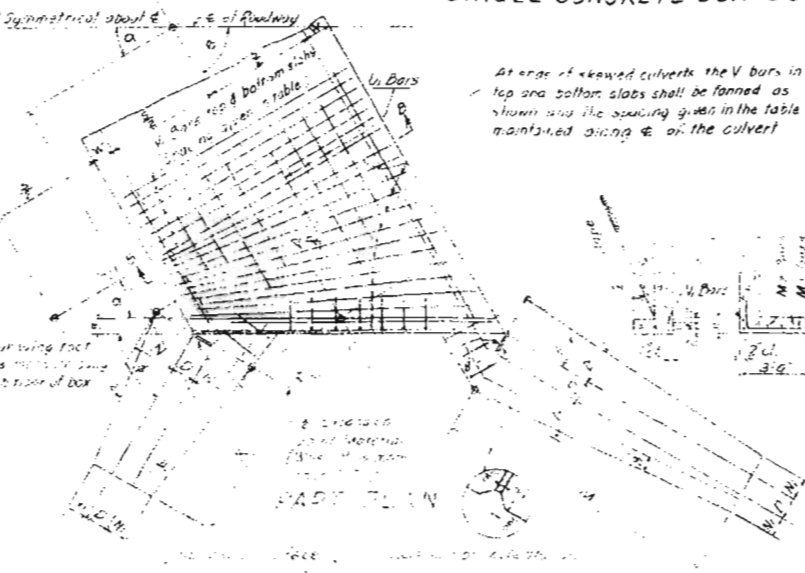
SINGLE CONCRETE BOX CULVERT

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)

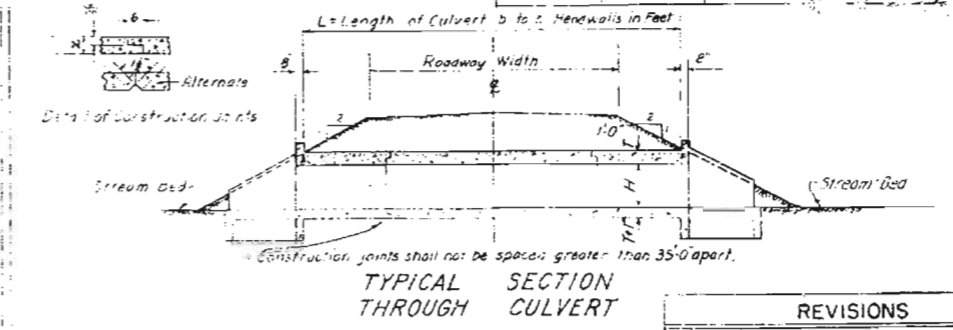
Height Allowed	Type	Span S	Height H	Sub. 7	Wall W	Bar size & spacing	No. bars required	Quantities for concrete	Quantities for steel reinforcement	Quantities for formwork	
U	V	W	U	V	W	U	V	W	U	V	W
35'-0"	2A	2'-0"	2'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
30'-0"	3A	3'-0"	3'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	4A	4'-0"	4'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
16'-0"	5A	5'-0"	5'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	5B	5'-0"	4'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
14'-0"	6A	6'-0"	6'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	6B	6'-0"	5'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
12'-0"	7A	7'-0"	7'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
15'-0"	7B	7'-0"	6'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	7C	7'-0"	7'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8A	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
4'-0"	8B	8'-0"	7'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8C	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
10'-0"	8D	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
4'-0"	8E	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8F	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8G	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8H	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8I	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8J	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8K	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8L	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8M	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8N	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8O	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8P	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8Q	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8R	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8S	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8T	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8U	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8V	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8W	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8X	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8Y	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	
20'-0"	8Z	8'-0"	8'-0"	8"	8"	3#4 @ 12"	8	1.21	1.10	1.0	



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

Mark	Size	No. Req'd	Type	Length
V	See table 61	24L	I	5'-2 1/2'-6
U	See table 61	24L	I	5'-2 1/2'-6
W	See table 61	24L	I	5'-2 1/2'-6

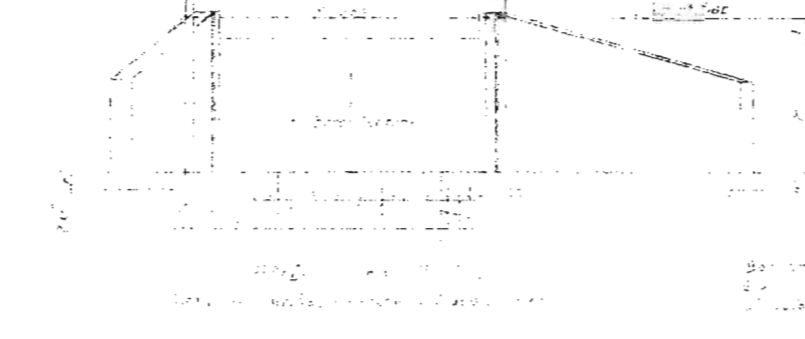
Bar dimensions are out to out of bar.



REVISIONS

No.	Description

Quantities for one culvert shall be multiplied by the number of culverts and by the number of headwalls. Plus quantities for four wings.



Post-tensioning Combinations, Span & Height

Span	Height	U	V	W
2'-0"	2'-0"	2	2	2
2'-6"	2'-6"	2	2	2
3'-0"	3'-0"	2	2	2
3'-6"	3'-6"	2	2	2
4'-0"	4'-0"	2	2	2
4'-6"	4'-6"	2	2	2
5'-0"	5'-0"	2	2	2
5'-6"	5'-6"	2	2	2
6'-0"	6'-0"	2	2	2
6'-6"	6'-6"	2	2	2
7'-0"	7'-0"	2	2	2
7'-6"	7'-6"	2	2	2
8'-0"	8'-0"	2	2	2
8'-6"	8'-6"	2	2	2
9'-0"	9'-0"	2	2	2
9'-6"	9'-6"	2	2	2
10'-0"	10'-0"	2	2	2
10'-6"	10'-6"	2	2	2
11'-0"	11'-0"	2	2	2
11'-6"	11'-6"	2	2	2
12'-0"	12'-0"	2	2	2
12'-6"	12'-6"	2	2	2
13'-0"	13'-0"	2	2	2
13'-6"	13'-6"	2	2	2
14'-0"	14'-0"	2	2	2
14'-6"	14'-6"	2	2	2
15'-0"	15'-0"	2	2	2
15'-6"	15'-6"	2	2	2
16'-0"	16'-0"	2	2	2
16'-6"	16'-6"	2	2	2
17'-0"	17'-0"	2	2	2
17'-6"	17'-6"	2	2	2
18'-0"	18'-0"	2	2	2
18'-6"	18'-6"	2	2	2
19'-0"	19'-0"	2	2	2
19'-6"	19'-6"	2	2	2
20'-0"	20'-0"	2	2	2
20'-6"	20'-6"	2	2	2
21'-0"	21'-0"	2	2	2
21'-6"	21'-6"	2	2	2
22'-0"	22'-0"	2	2	2
22'-6"	22'-6"	2	2	2
23'-0"	23'-0"	2	2	2
23'-6"	23'-6"	2	2	2
24'-0"	24'-0"	2	2	2
24'-6"	24'-6"	2	2	2
25'-0"	25'-0"	2	2	2
25'-6"	25'-6"	2	2	2
26'-0"	26'-0"	2	2	2
26'-6"	26'-6"	2	2	2
27'-0"	27'-0"	2	2	2
27'-6"	27'-6"	2	2	2
28'-0"	28'-0"	2	2	2
28'-6"	28'-6"	2	2	2
29'-0"	29'-0"	2	2	2
29'-6"	29'-6"	2	2	2
30'-0"	30'-0"	2	2	2
30'-6"	30'-6"	2	2	2
31'-0"	31'-0"	2	2	2
31'-6"	31'-6"	2	2	2
32'-0"	32'-0"	2	2	2
32'-6"	32'-6"	2	2	2
33'-0"	33'-0"	2	2	2
33'-6"	33'-6"	2	2	2
34'-0"	34'-0"	2	2	2
34'-6"	34'-6"	2	2	2
35'-0"	35'-0"	2	2	2
35'-6"	35'-6"	2	2	2
36'-0"	36'-0"	2	2	2
36'-6"	36'-6"	2	2	2
37'-0"	37'-0"	2	2	2
37'-6"	37'-6"	2	2	2
38'-0"	38'-0"	2	2	2
38'-6"	38'-6"	2	2	2
39'-0"	39'-0"	2	2	2
39'-6"	39'-6"	2	2	2
40'-0"	40'-0"	2	2	2
40'-6"	40'-6"	2	2	2
41'-0"	41'-0"	2	2	2
41'-6"	41'-6"	2	2	2
42'-0"	42'-0"	2	2	2
42'-6"	42'-6"	2	2	2
43'-0"	43'-0"	2	2	2
43'-6"	43'-6"	2	2	2
44'-0"	44'-0"	2	2	2
44'-6"	44'-6"	2	2	2
45'-0"	45'-0"	2	2	2
45'-6"	45'-6"	2	2	2
46'-0"	46'-0"	2	2	2
46'-6"	46'-6"	2	2	2
47'-0"	47'-0"	2	2	2
47'-6"	47'-6"	2	2	2
48'-0"	48'-0"	2	2	2
48'-6"	48'-6"	2	2	2
49'-0"	49'-0"	2	2	2
49'-6"	49'-6"	2	2	2
50'-0"	50'-0"	2	2	2
50'-6"	50'-6"	2	2	2
51'-0"	51'-0"	2	2	2
51'-6"	51'-6"	2	2	2
52'-0"	52'-0"	2	2	2
52'-6"	52'-6"	2	2	2
53'-0"	53'-0"	2	2	2
53'-6"	53'-6"	2	2	2
54'-0"	54'-0"	2	2	2
54'-6"	54'-6"	2	2	2
55'-0"	55'-0"	2	2	2
55'-6"	55'-6"	2	2	2
56'-0"	56'-0"	2	2	2
56'-6"	56'-6"	2	2	2
57'-0"	57'-0"	2	2	2
57'-6"	57'-6"	2	2	2
58'-0"	58'-0"	2	2	2
58'-6"	58'-6"	2	2	2
59'-0"	59'-0"	2	2	2
59'-6"	59'-6"	2	2	2
60'-0"	60'-0"	2	2	2
60'-6"	60'-6"	2	2	2
61'-0"	61'-0"	2	2	2
61'-6"	61'-6"	2	2	2
62'-0"	62'-0"	2	2	2
62'-6"	62'-6"	2	2	2
63'-0"	63'-0"	2	2	2
63'-6"	63'-6"	2	2	2
64'-0"	64'-0"	2	2	2
64'-6"	64'-6"	2	2	2
65'-0"	65'-0"	2	2	2
65'-6"	65'-6"	2	2	2
66'-0"	66'-0"	2	2	2
66'-6"	66'-6"	2	2	2
67'-0"	67'-0"	2	2	2
67'-6"	67'-6"	2	2	2
68'-0"	68'-0"	2	2	2
68'-6"	68'-6"	2	2	2
69'-0"	69'-0"	2	2	2
69'-6"	69'-6"	2	2	2
70'-0"	70'-0"	2	2	2
70'-6"	70'-6"	2	2	2
71'-0"	71'-0"	2	2	2
71'-6"	71'-6"	2	2	2
72'-0"	72'-0"	2	2	2
72'-6"	72'-6"	2	2	2
73'-0"	73'-0"	2	2	2
73'-6"	73'-6"	2	2	2
74'-0"	74'-0"	2	2	2
74'-6"	74'-6"	2	2	2
75'-0"	75'-0"	2	2	2
75'-6"	75'-6"	2	2	2
76'-0"	76'-0"	2	2	2
76'-6"	76'-6"			

# STANDARD M-601-C

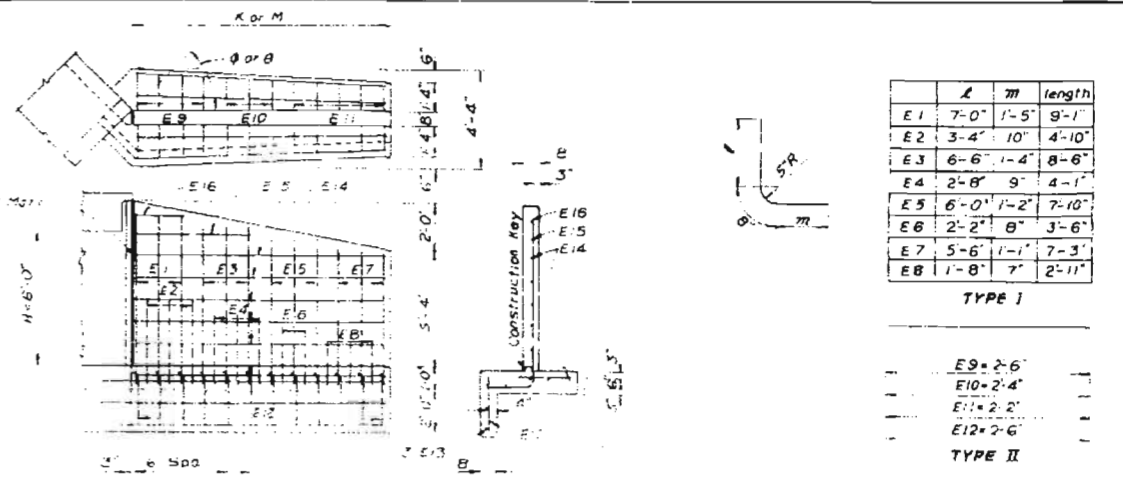
(SHEET 1 OF 2 SHEETS)  
(JULY 1, 1965)

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

TABLE SHOWING VALUES OF K & M WHEN  $\alpha$ ,  $\beta$  & H ARE GIVEN

$\beta$	$\alpha$	$\phi$	$\theta$	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'	3-3	0-0	4-0	1-0	6-0	1-4	7-6	1-8	8-9	2-0
60°	30°	50°	33°	3-8	6-0	5-3	8-6	6-6	3-3	8-0	4-0	9-3	16-0
75°	5°	52°30'	37°30'	3-9	8-0	5-6	7-5	7-3	9-3	8-9	1-6	10-0	13-3
90°	0°	45°	45°	4-3	4-3	6-0	6-0	8-0	8-0	10-0	0-0	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	11-3	6-6	14-0	8-0	16-0	9-3
135°	45°	22°30'	67°30'	8-0	2-3	11-0	4-6	14-9	6-0	18-0	7-6	21-0	8-9

$\beta$  equals the angle between  $\phi$  of culvert &  $\phi$  of roadway.  $\alpha$  equals the angle between  $\phi$  of culvert and a normal to  $\phi$  of roadway.  $\theta$  and  $\phi$  are angles between the wingwall and a line parallel with the  $\phi$  of roadway.  
EXAMPLE FOR USING ABOVE TABLE: Suppose a stream makes an angle of  $\beta=65^\circ$  with the  $\phi$  of roadway, then from the table select the nearest angle  $\beta=60^\circ$ , then  $\alpha, \phi$  equal  $30^\circ, 60^\circ$  respectively. If the desired height 'H' of culvert is 6-0', then K & M will be 9-3' and 6-0'. Locate the WING DETAIL WHEN H=6-0' on this sheet.



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

When $\phi$ equals	Number of bars required												Length of bars		Quantities for One Wing	
	K1	K2	K3	K4	K5	K6	K7	K8	E9	E10	E11	E12	Concrete Cu.Yd.	Steel 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	5-1'	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							

LOADING DATA INTERSTATE ALTERNATE  
LIVE LOAD AASHTO HS 20-44  
DEAD LOAD CONCRETE 150 POUNDS PER CUBIC FOOT  
EARTH 100 POUNDS PER CUBIC FOOT

DESIGNING DATA  
AASHTO DESIGN STRESS EXCEPT AS NOTED  
REINFORCING STEEL 60000 PSI  
STEEL 60000 PSI  
12000 PSI PER SQ. IN.  
n = 10

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

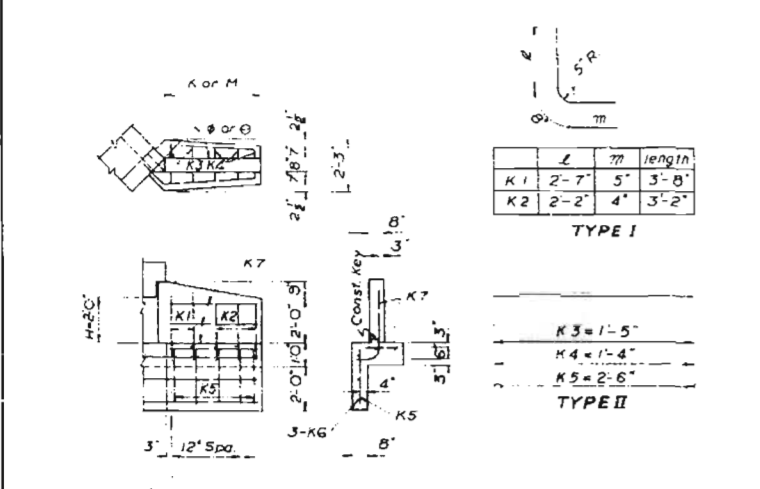
GENERAL NOTES  
ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT  
ALL CONCRETE SHALL BE CLASS A  
ALL WING SURFACES TO RECEIVE CLASS 1 FINISH  
WING FOOTINGS & FLOOR OF BOX SHALL BE POURED MONOLITHICALLY  
FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED  
SOUNDING AND DEPTH OF FOOTING SHOWN ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REVISION 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 17 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'

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

Designed by D.P. [Signature]  
Made by J.M. [Signature]  
Checked by A.T. [Signature]

Approved by [Signature] Bridge Engineer  
Date: July 1, 1965

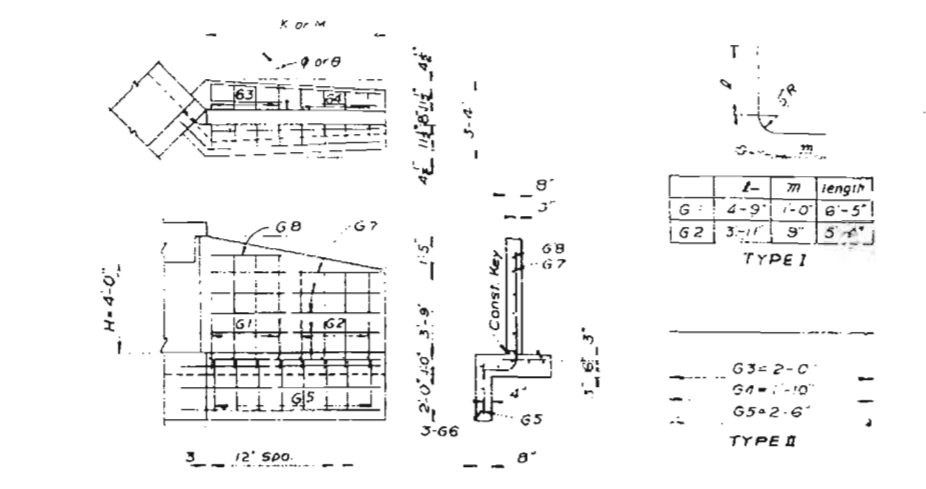
STRUCTURE NO.



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

When $\phi$ equals	Number of bars required					Length of bars		Quantities for One Wing	
	K1	K2	K3	K4	K5	3-K6	4-K7	Concrete Cu.Yd.	Steel 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	5-1'	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

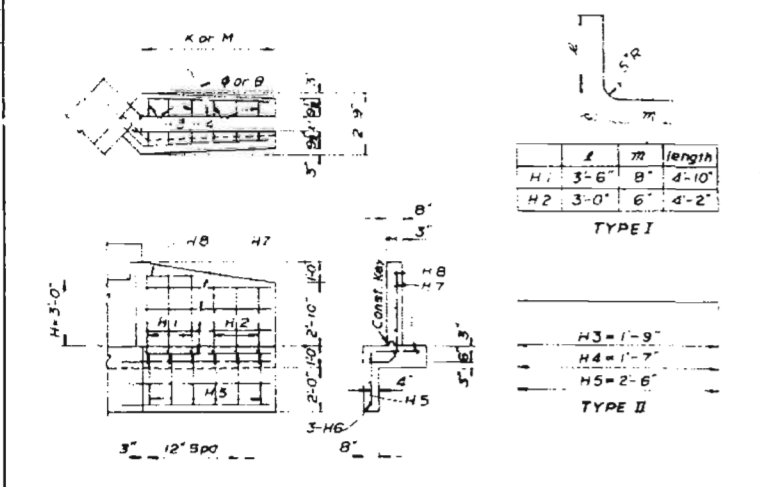
WING DETAIL WHEN H=2-0'



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

When $\phi$ equals	Number of bars required					Length of bars			Quantities for One Wing	
	G1	G2	G3	G4	G5	3-G6	4-G7	5-G8	Concrete Cu.Yd.	Steel Lb.
22°30'	6	9	6	9	5	17-4'	14-5'	5-2'	3.97	219
30°	5	7	5	7	12	13-2'	10-11'	4-2'	3.03	170
37°30'	4	6	4	6	10	10-10'	8-11'	3-2'	2.49	161
45°	4	4	4	4	8	9-4'	7-8'	3-2'	2.15	118
52°30'	3	5	3	5	8	9-0'	6-11'	2-2'	.95	12
60°	3	4	3	4	7	7-0'	6-2'	2-2'	1.75	99
67°30'	3	3	3	3	6	7-0'	5-4'	2-2'	.61	88

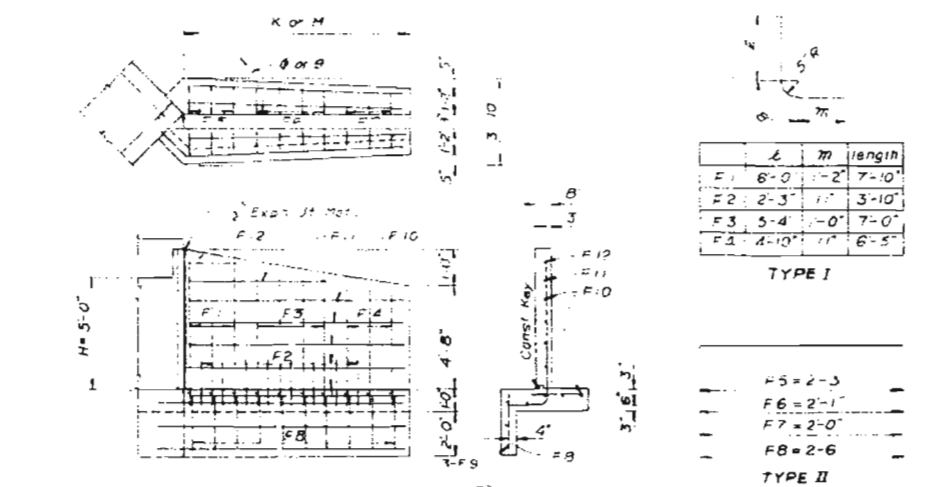
WING DETAIL WHEN H=4-0'



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

When $\phi$ equals	Number of bars required					Length of bars			Quantities for One Wing	
	H1	H2	H3	H4	H5	4-H6	5-H7	1-H8	Concrete Cu.Yd.	Steel Lb.
22°30'	6	5	6	5	11	13-2'	10-8'	5-2'	2.47	131
30°	5	4	5	4	9	10-2'	8-2'	4-2'	1.91	104
37°30'	4	3	4	3	7	8-4'	6-8'	3-2'	1.57	82
45°	3	3	3	3	6	7-1'	5-8'	2-2'	1.35	70
52°30'	3	3	3	3	6	7-0'	5-2'	2-2'	1.23	66
60°	3	2	3	2	5	6-2'	4-8'	2-2'	1.12	59
67°30'	3	2	3	2	5	5-4'	4-2'	2-2'	1.01	56

WING DETAIL WHEN H=3-0'



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

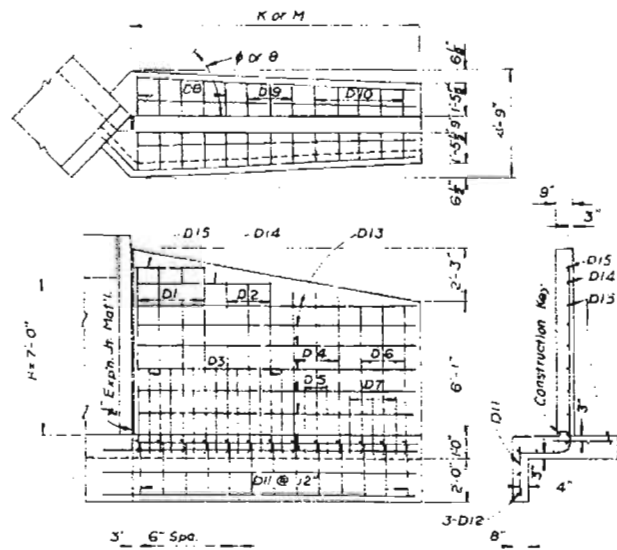
When $\phi$ equals	Number of bars required								Length of bars				Quantities for One Wing	
	F1	F2	F3	F4	F5	F6	F7	F8	3-F9	4-F10	5-F11	6-F12	Concrete Cu.Yd.	Steel Lb.
22°30'	6	14	7	5	6	7	5	18	20-11'	17-8'	12-2'	5-2'	5.61	328
30°	5	11	5	2	5	4	4	14	16-2'	13-8'	9-2'	4-2'	4.36	254
37°30'	4	9	4	4	4	4	4	2	13-3'	11-2'	7-2'	3-2'	3.58	211
45°	3	7	3	3	3	3	3	1	11-5'	9-9'	6-2'	5-2'	3	182
52°30'	3	7	3	3	3	3	3	9	10-8'	8-5'	5-2'	2-2'	2.77	160
60°	3	6	2	3	3	2	3	8	9-6'	7-8'	4-2'	2-2'	2.49	143
67°30'	3	6	2	3	3	2	4	8	8-7'	7-2'	5-2'	2-2'	2.33	140

WING DETAIL WHEN H=5-0'

# STANDARD M-60I-C

(SHEET 2)  
(JULY 1, 1965)

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



D	ℓ	m	length
D1	7'-11"	1'-8"	10'-3"
D2	7'-4"	1'-6"	9'-6"
D3	5'-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

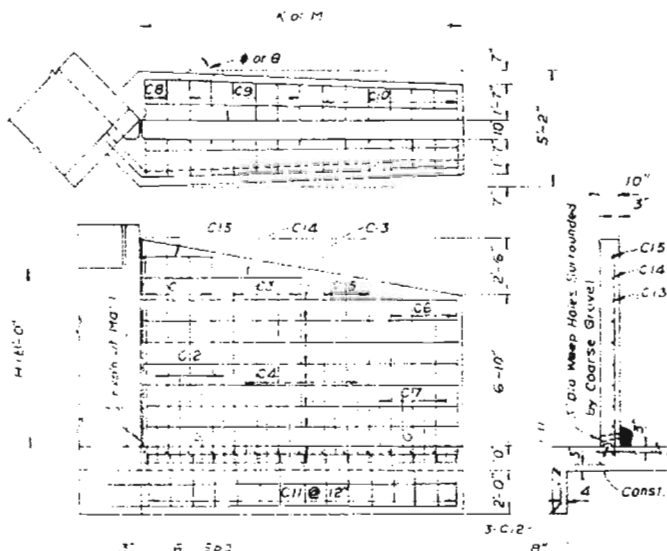
D8 = 2'-8"

D9 = 2'-6"

D10 = 2'-4"

D11 = 2'-6"

WING DETAIL 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'-7"	5'-1"
C5	7'-8"	1'-8"	10'-0"
C6	7'-0"	0'-3"	7'-2"
C7	2'-7"	11"	4'-2"

TYPE I

C8 = 2'-9"

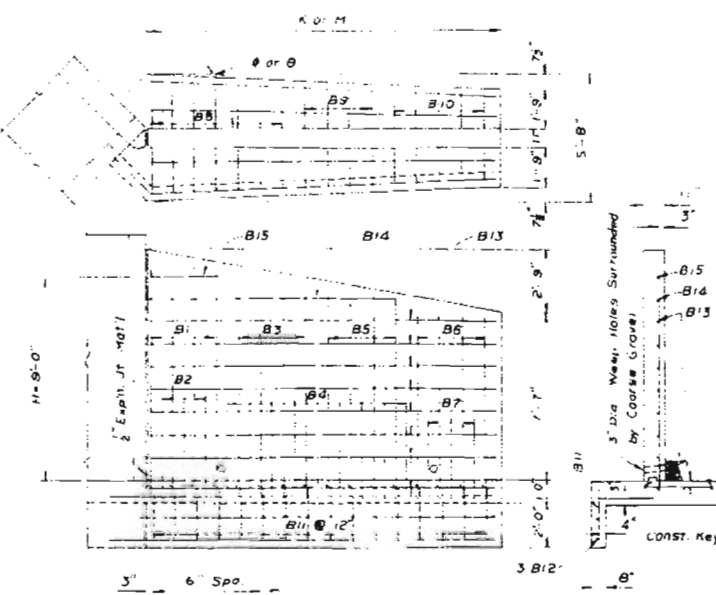
C9 = 2'-6"

C10 = 2'-6"

C11 = 2'-6"

C12 = 2'-6"

WING DETAIL WHEN H = 8'-0"



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

TYPE I

B8 = 3'-3"

B9 = 2'-7"

B10 = 2'-7"

B11 = 2'-6"

B12 = 2'-6"

WING DETAIL WHEN H = 9'-0"

When α or θ equals	Number of bars required														Length of bars		Quantities for One Wing	
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	Concrete	Steel	
22°30'	7	6	12	6	6	5	5	8	7	9	24	27	23	12	6	2	9.62	592
30°	5	5	9	5	5	4	4	6	6	7	19	20	17	9	2	2	7.39	451
37°30'	4	4	8	4	3	3	3	5	5	5	15	17	14	7	2	3	6.07	368
45°	4	3	7	3	2	3	3	5	3	5	13	14	12	6	2	3	5.26	321
52°30'	3	3	6	3	2	3	3	4	4	4	12	13	11	5	2	2	4.66	287
60°	3	3	5	3	2	2	2	4	3	4	11	12	10	5	2	2	4.25	262
67°30'	3	3	5	2	2	2	2	4	3	3	10	11	9	5	2	2	4.05	245

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

When α or θ equals	Number of bars required														Length of bars		Quantities for One Wing	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	Concrete	Steel	
22°30'	9	16	8	8	16	8	10	12	11	33	36	10	3	16	2	19.74	224	
30°	7	2	6	6	12	6	7	10	8	25	28	2	2	6	2	15.14	930	
37°30'	6	10	5	5	10	5	6	8	7	21	23	19	11	5	2	12.39	775	
45°	5	9	4	5	9	4	5	7	6	18	19	17	9	4	2	10.71	665	
52°30'	5	8	3	4	7	4	5	6	5	16	18	15	7	4	2	9.63	597	
60°	4	7	4	3	7	4	4	6	5	14	16	13	7	3	2	8.72	543	
67°30'	4	7	3	4	6	3	4	5	4	13	15	12	6	3	2	8.16	515	

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

When α or θ equals	Number of bars required														Length of bars		Quantities for One Wing	
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	Concrete	Steel	
22°30'	8	7	6	12	6	7	7	5	12	27	30	8	3	2	2	25.1	113	
30°	6	5	5	10	4	6	4	4	4	23	25	2	2	5	2	19.67	107	
37°30'	5	4	4	9	4	4	4	3	6	21	23	2	2	4	2	18.4	97	
45°	4	4	4	8	4	4	4	3	5	18	19	2	2	4	2	17.3	92	
52°30'	4	3	3	7	3	3	3	3	4	16	17	2	2	3	2	16.4	87	
60°	4	3	2	6	3	3	3	3	4	14	15	2	2	3	2	15.4	81	
67°30'	3	3	3	5	3	3	3	3	4	13	14	2	2	3	2	14.5	75	

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

When α 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	Concrete	Steel	
22°30'	7	6	6	16	6	7	7	3	8	5	30	33	9	2	2	15.93	933	
30°	5	5	7	13	6	6	5	10	7	24	27	9	2	2	2	12.92	742	
37°30'	4	4	5	10	5	5	4	8	5	21	24	8	2	2	2	11.98	580	
45°	4	3	4	9	4	4	4	3	7	4	18	20	8	2	2	10.63	495	
52°30'	3	3	4	8	4	4	4	3	6	4	15	17	7	2	2	9.69	453	
60°	3	3	4	7	3	3	3	3	4	13	15	6	2	2	2	8.71	406	
67°30'	3	3	3	6	3	3	3	3	4	12	14	5	2	2	2	8.06	386	

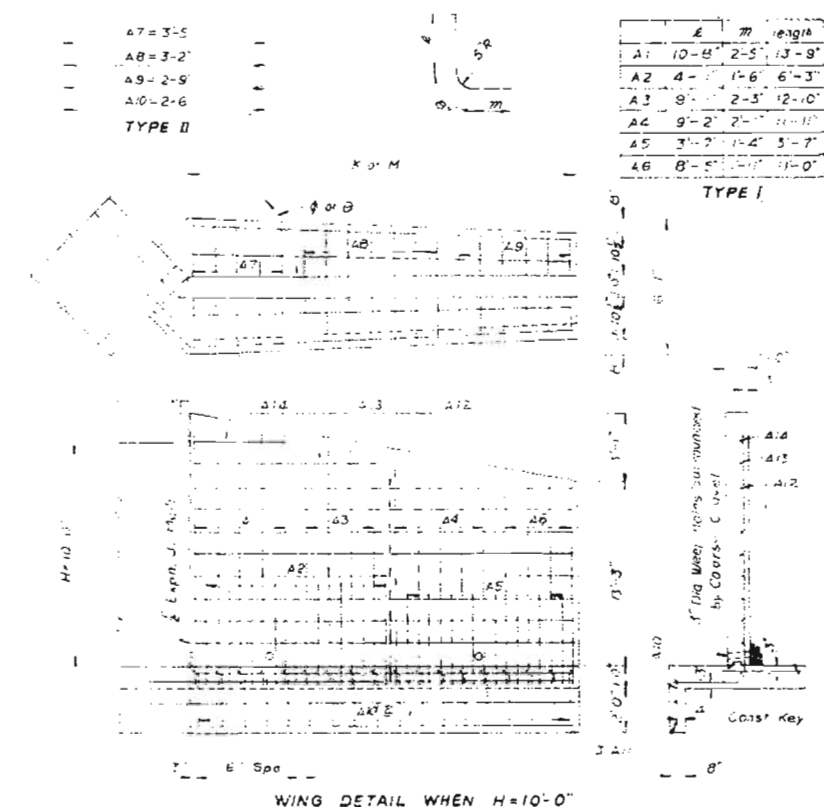
BAR LIST & QUANTITIES FOR ONE WING WHEN H = 9'-0"

TABLE SHOWING VALUES OF K & M WHEN β & φ ARE GIVEN

β	α	φ	θ	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"	25'-9"	14'-3"	24'-0"
75°	15°	52°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"	15'-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"

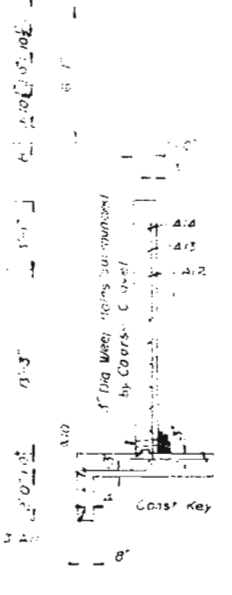
β equals the angle between the % of culvert and % of roadway. α equals the angle between % of culvert and a normal to % of roadway. φ and θ are angles between the wingwall and a line parallel with the % of roadway.

EXAMPLE FOR USING THE ABOVE TABLE: Suppose a stream makes an angle of β = 65° with % of roadway. Then from the table, select the nearest angle β = 60°. Then α, φ, θ equal 30°, 60°, & 30° 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.



A	ℓ	m	length
A1	10'-8"	2'-5"	13'-8"
A2	4'-2"	1'-6"	6'-3"
A3	9'-1"	2'-3"	12'-0"
A4	9'-2"	2'-11"	11'-11"
A5	3'-7"	1'-4"	5'-7"
A6	8'-5"	1'-0"	11'-0"

TYPE I



WING DETAIL WHEN H = 10'-0"

REVISIONS

No.	Description

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

WINGWALLS FOR  
CONCRETE BOX CULVERTS  
4:1 SIDE SLOPES

Sta. \_\_\_\_\_

Designed by C. O. \_\_\_\_\_ Approved by \_\_\_\_\_  
Made by W.M.C.S. \_\_\_\_\_  
Checked by J.L.G.S.A. \_\_\_\_\_ Date: July 1, 1965

STRUCTURE NO. \_\_\_\_\_

# STANDARD M-603-CA

(NOVEMBER 10, 1967)

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

REVISIONS				
(R-1)	4-19-68	Welding - Conc. Arch, Ellipt. - Gen. Notes	M.R.H.	

## 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 req'd.

Alternate equivalent designs for Concrete End Sections may be submitted to the Department for approval. Design length of culvert is based on length of End Section shown in table. Additional pipe required to provide the design length of the culvert shall be furnished by and at the expense of the Contractor.

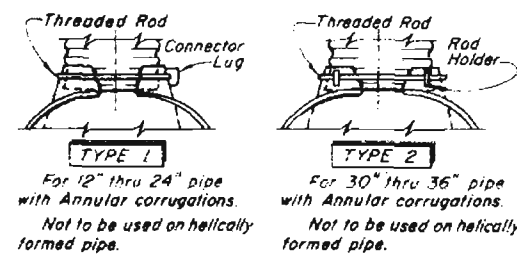
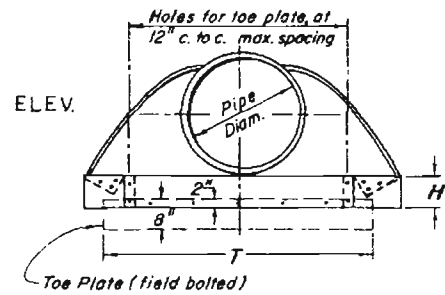
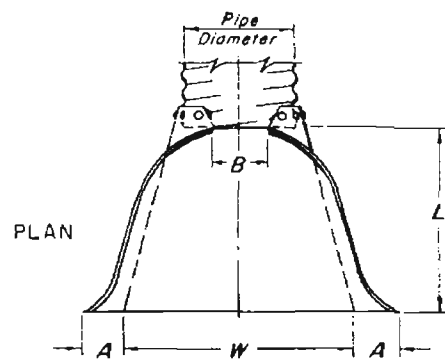
Other sizes of concrete pipe and end sections may be available upon request; however, the designer should contact supplier prior to calling for sizes other than those shown on this standard.

Inside configuration and joint of concrete end section and pipe shall match.

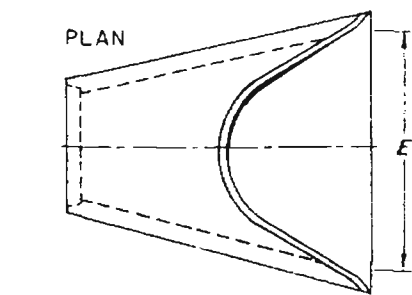
Galvanized Toe Plate as shown will be required on End Sections for corrugated steel pipe and shall be the same gage as the End Sections. Toe Plate shall be field bolted to End Section with  $\frac{3}{8}$ " galvanized bolts, nuts and washers.

Designs for Aluminum End Sections for use on aluminum culverts shall be submitted to the Department for approval prior to use.

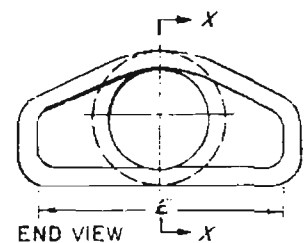
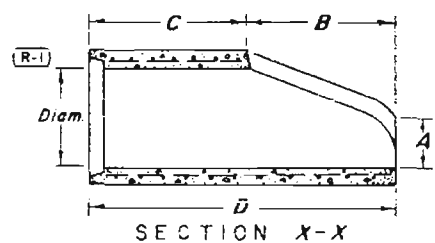
PIPE DIAM. in.	GAGE	D I M E N S I O N S						
		A (1"±) in.	B (Max.) in.	H (1"±) in.	L (1 1/2"±) in.	W (2"±) in.	T in.	
12	16	6	6	6	21	24	34	
15	16	7	8	6	26	30	40	
18	16	8	10	6	31	36	46	
21	16	9	12	6	36	42	52	
24	16	10	13	6	41	48	58	
30	14	12	16	8	51	60	70	
36	14	14	19	9	60	72	84	
42	12	16	22	11	69	84	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	



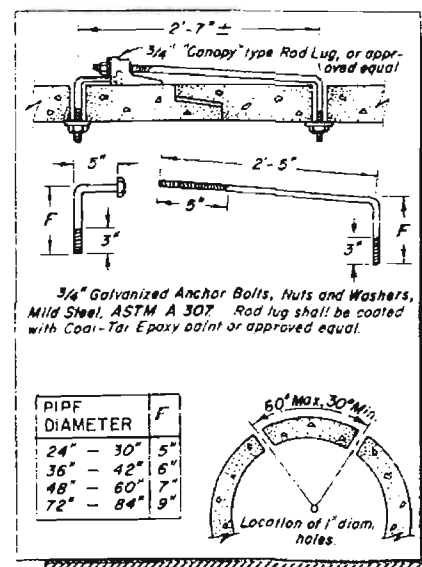
### TYPICAL CONNECTIONS END SECTION AND CONNECTION DETAILS FOR ROUND CORRUGATED STEEL PIPE CULVERTS



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



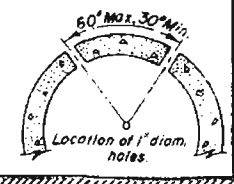
### END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE



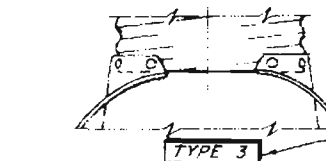
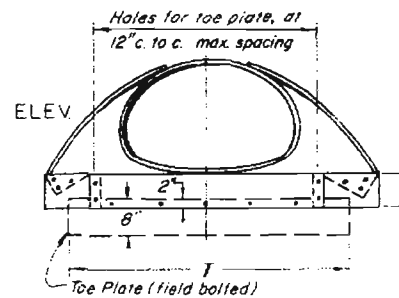
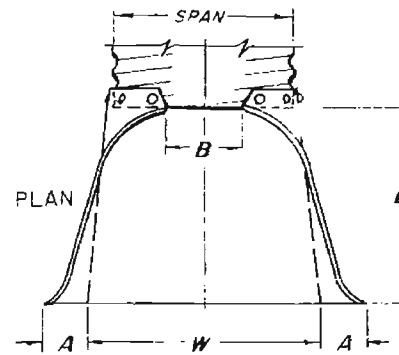
### CONCRETE JOINT FASTENER

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

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



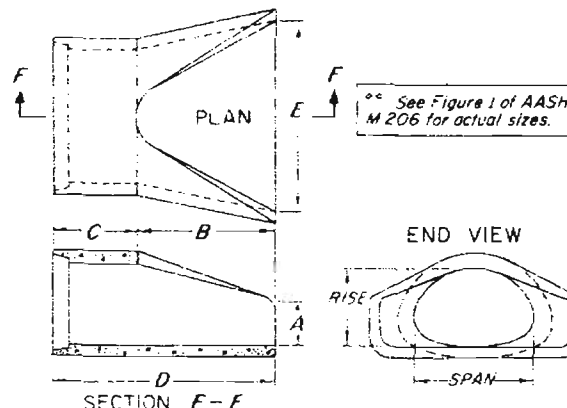
### END SECTION AND CONNECTION DETAIL FOR CORRUGATED STEEL PIPE ARCH CULVERT



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

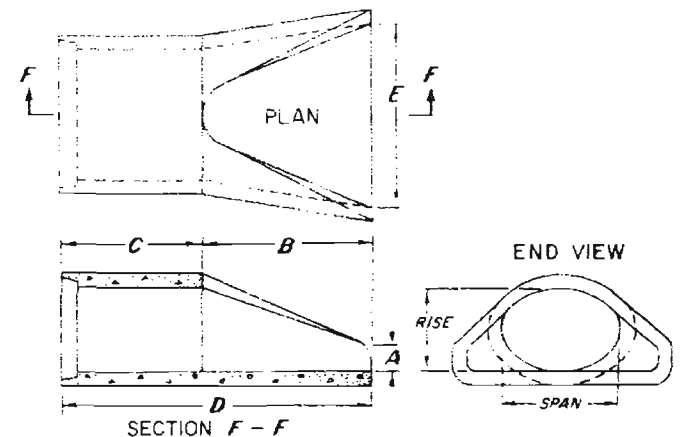
For all sizes of pipe with Annular or Helical corrugations.

PIPE ARCH SPAN x 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	20	9	53	85	103	
58 x 36	12	14	22	12	63	90	108	
65 x 40	12	18	30	12	70	102	120	
72 x 44	12	18	33	12	77	114	132	



EQUIVALENT CIRCULAR DIAM. (Inches)	NOMINAL (in.)		D I M E N S I O N S (Inches)				
	SPAN	RISE	A	B	C	D	E
24	29	18	8 1/2	39	33	72	48
30	36	22	9 1/2	50	46	96	60
36	43	27	11 1/8	60	36	96	72
42	50	31	15 1/16	60	36	96	78
48	58	36	21	60	36	96	84
54	65	40	25 1/2	60	36	96	90
60	72	44	31	60	36	96	96
72	88	54	31	60	39	99	120

### END SECTION FOR REINFORCED CONCRETE ARCH PIPE



EQUIVALENT CIRCULAR DIAM. (Inches)	NOMINAL (in.)		D I M E N S I O N S (Inches)				
	SPAN	RISE	A	B	C	D	E
24	30	19	8 1/2	39	33	72	48
30	38	24	9 1/2	54	46	96	60
36	45	29	11 1/8	60	36	96	72
42	53	34	15 1/4	60	36	96	78
48	60	38	21	60	36	96	84
54	68	43	25 1/2	60	36	96	90
60	76	48	30	60	36	96	96

### END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE

## DEPARTMENT OF HIGHWAYS STATE OF COLORADO CONCRETE AND METAL END SECTIONS

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



# STANDARD M-603-RC

(MARCH 20, 1967)

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

REVISIONS		
4-19-68	Added Arch and Elliptical Pipe. See Notes.	M.R.H.

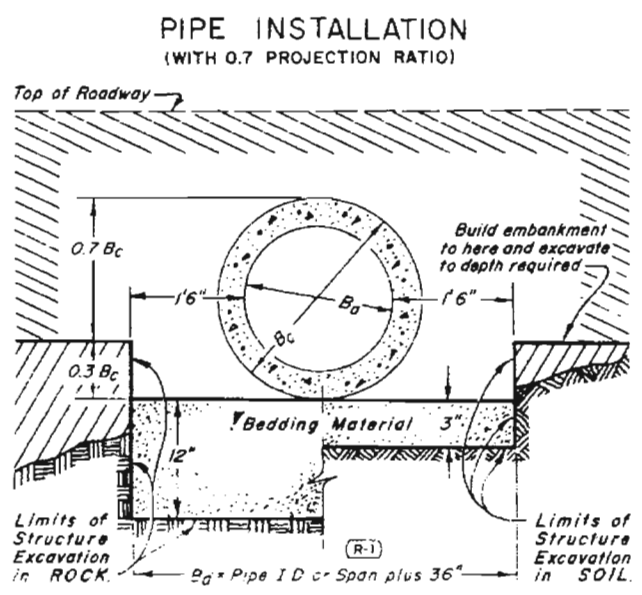
(R-1) NOTE:  $B_c$  is the outside dimension for diameter, span or rise.

## DIMENSIONS FOR REINFORCED CONCRETE PIPE

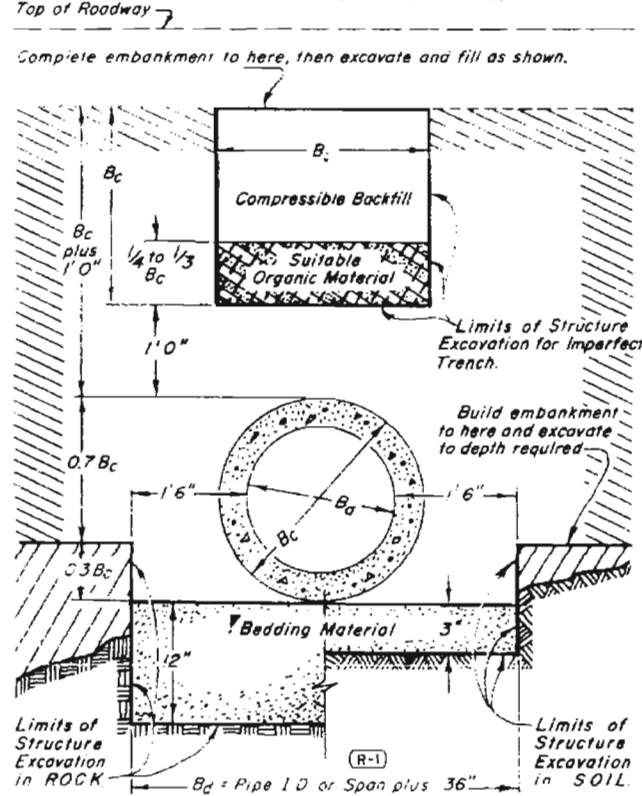
(For Information Only)

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

▲ Also equivalent round dimension for Arch and Elliptical pipe.  
 † Sizes shown are for identification purposes only. Actual sizes shall conform to those listed in Fig. 1 of ASTM Spec. C 506.



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



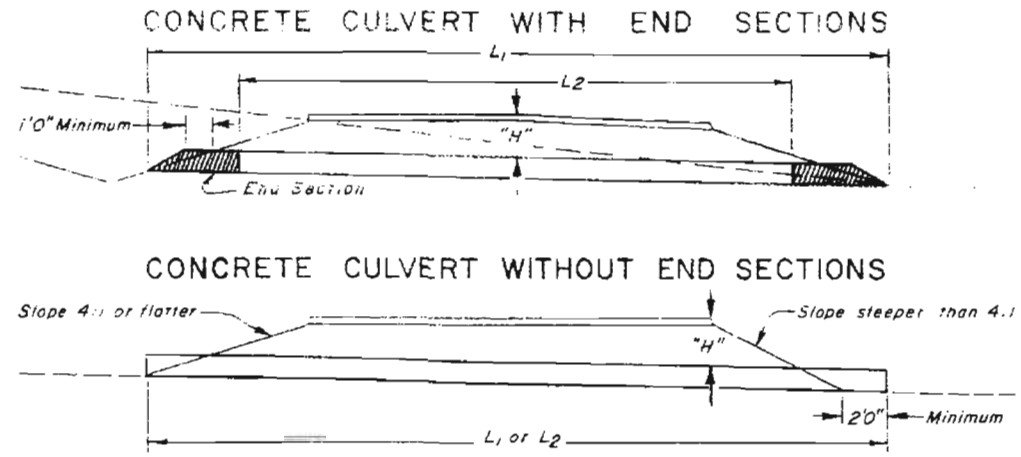
† Bedding Material for SOIL shall be 3" loose thickness Structure Backfill Class 3. Bedding Material for ROCK shall be 12" loose thickness Structure Backfill Class 1.

### HEIGHTS OF FILL OVER REINFORCED CONCRETE PIPE — ALL SIZES —

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

### GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the project. Minimum cover, excluding pavement shall be 1 foot.  
 Fill heights greater than maximum allowed in the Heights of Fill Table on this sheet will require special design of structure.  
 Pipe design is based on safety factor of 1.33 on ultimate strength.  
 The heights of fill over top of pipe are based on unit weight of soil at 120 lbs per cubic foot.  
 Pipe Class is determined from 0.01 inch crack D-load.  
 Class II pipe shall not be used on main roadway but is permissible on ramps, road approaches and other areas not subject to repeated traffic loads.  
 Changes in design factors will require compensating change in pipe design.  
 Minimum wall thickness dimensions are based on AASHTO Designation M 170 (Wall B) for Circular Pipe, AASHTO Designation M 206 for Arch Pipe and AASHTO Designation M 207 for Elliptical Pipe.  
 Spacing for multiple pipe installations shall conform to the details shown on M Standard for Excavation and Backfill for Structures.  
 When a culvert is to be extended with pipe of different material, the connection shall conform to the detail on plans or be approved.



"H" = Maximum height of fill over top of Culvert, including pavement.  
 $L_1$  = Length of Culvert to be measured when placed in accordance with Section 617.  
 $L_2$  = Length of Pipe to be measured when placed in accordance with Section 603.  
 (R-1) Length of extension, when placed in accordance with Section 617, shall be the actual number of feet of new culvert required.

DEPARTMENT OF HIGHWAYS  
 STATE OF COLORADO

REINFORCED CONCRETE PIPE

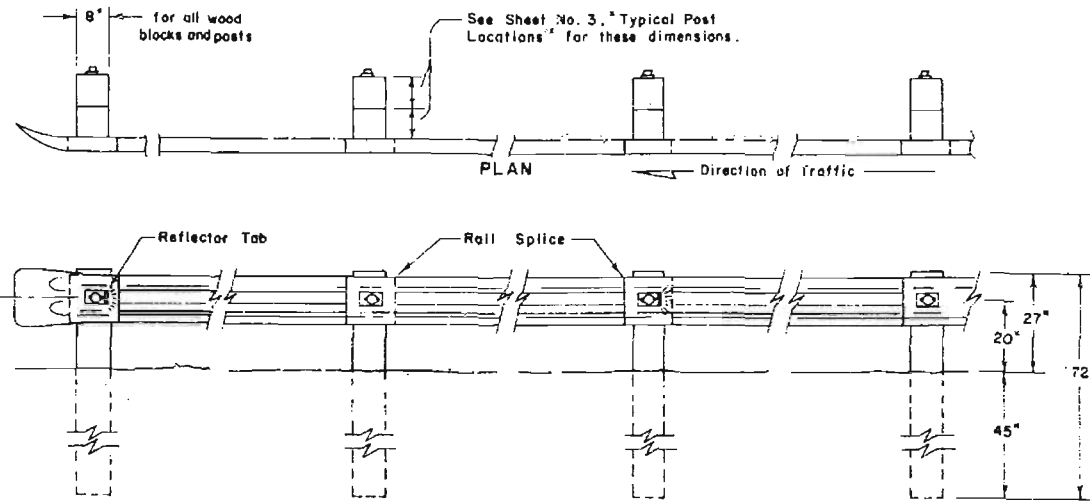
Designed by M.R.H. Approved by J.B. Staff Design Engr.  
 Made by J.R.B. Staff Design Engr.  
 Checked by R.S.M. Date: 4-19-68

# STANDARD M-606-AB

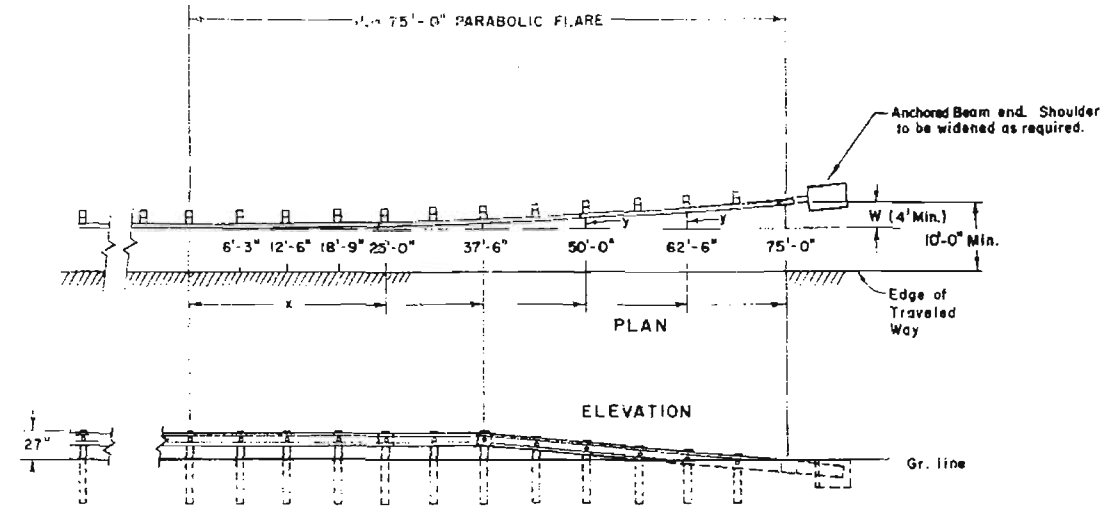
(MARCH 1, 1968)  
(SHEET 1 OF 3)

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

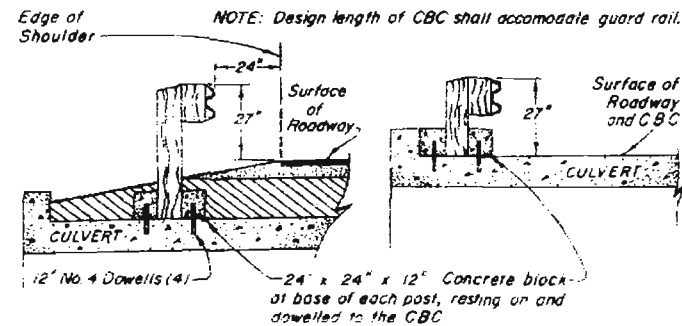
REVISIONS	



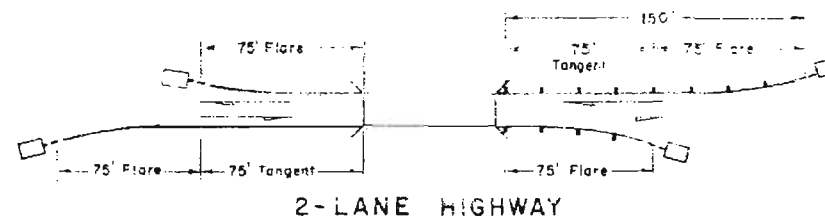
**TYPICAL GUARD RAIL FOR ROADWAYS**



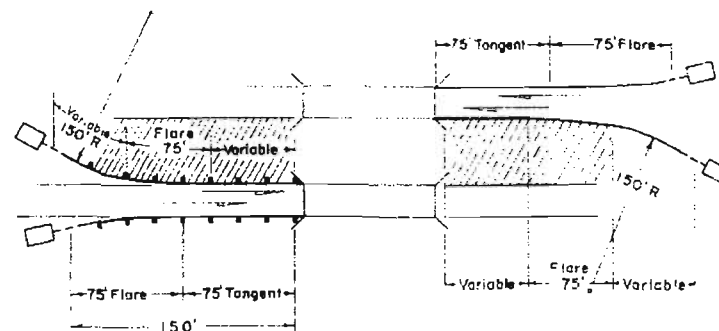
**PARABOLIC TRANSITION & END TREATMENT**



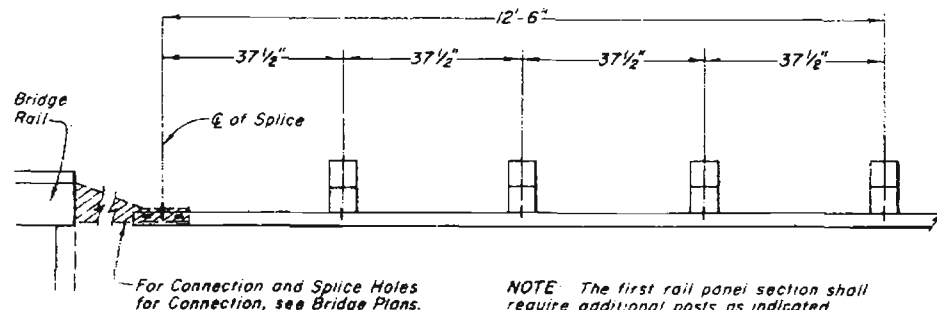
**GUARD RAIL ACROSS CONCRETE BOX CULVERT**



**2-LANE HIGHWAY**



**MULTI-LANE HIGHWAY**



For Connection and Splice Holes for Connection, see Bridge Plans.

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

**GUARD RAIL AT BRIDGES**

NOTE: For installation details of various median widths, see Sheet No. 2.

**BRIDGE APPROACH GUARD RAIL**

## 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 125B 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.

All 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" installed 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 on the Standard or in the guardrail tabulation on the plans.

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 or shall be galvanized in accordance with AASHC Designation M-111 or with coating Class 2.50 of Table 1 of ASTM Designation A 525.

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

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

Concrete shall be Class "A" or Class "D".

## LEGEND

- W = Full Parabolic Offset
- L = Length of Parabolic Transition
- x = Longitudinal Distance from beginning of flare
- y = Offset =  $W \cdot \frac{x^2}{L^2}$

TABLE OF OFFSETS FOR 75' PARABOLIC FLARES

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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

GUARD RAIL  
TYPE 3

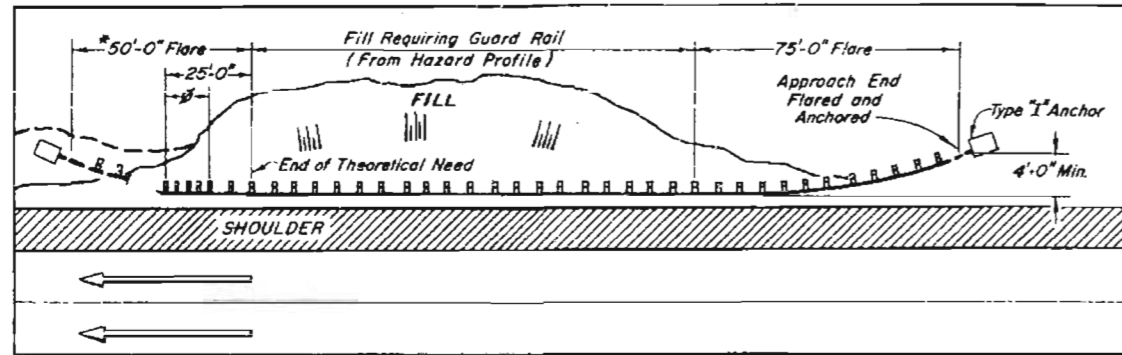
Designed by M.R.H. Approved by R.B. by Staff Design Engineer  
Made by R.B. Checked by R.S.M. Date: March 1, 1968

# STANDARD M-606-AB

(MARCH 1, 1968)  
(SHEET 2)

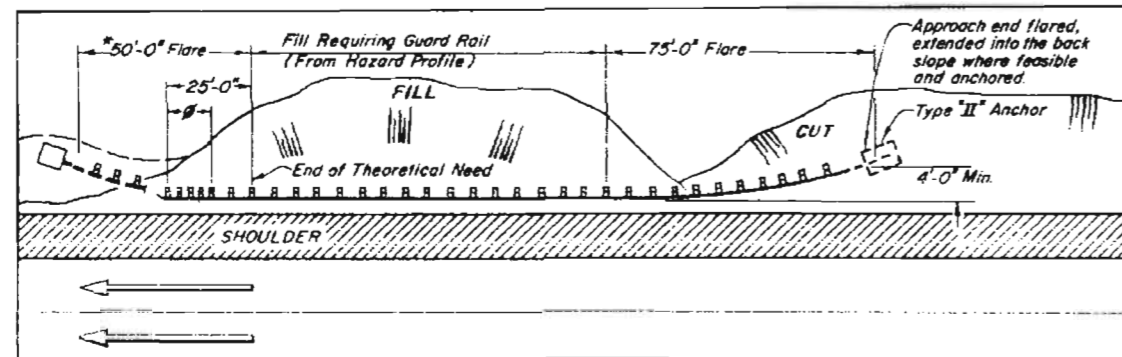
FEDERAL ROAD DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO		

REVISIONS	

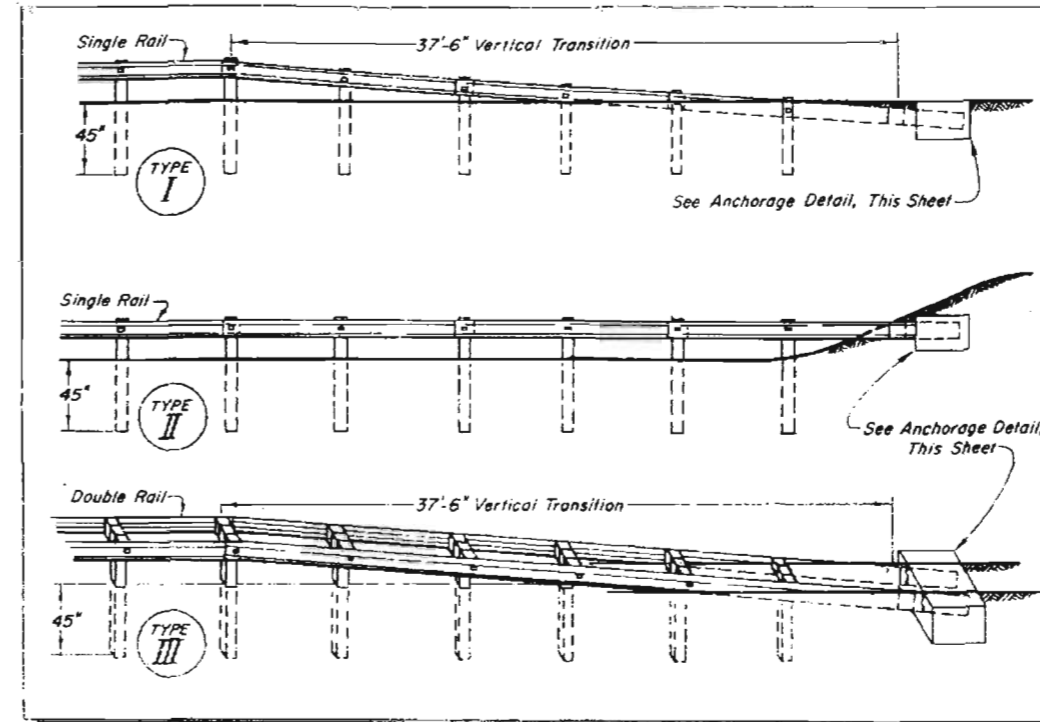


GUARD RAIL INSTALLATION ——— ROADSIDE FILL CONDITION

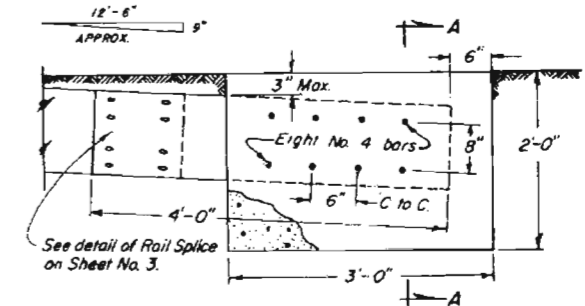
NOTES:  
 \* 2-Lane Highways — The exit end of Guard Rail shall extend 50 feet past the end of theoretical need and shall be flared and anchored.  
 † Posts for the last 12'-6" panel shall be spaced at 3'-1 1/2" c. to c.



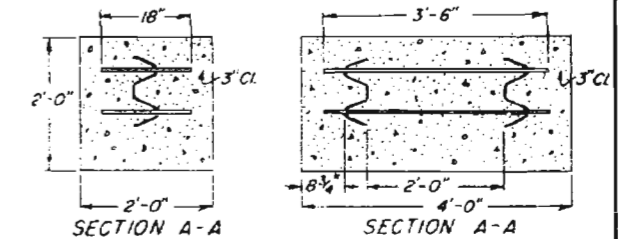
GUARD RAIL INSTALLATION ——— ROADSIDE CUT TO FILL CONDITION



TYPICAL END ANCHORAGE

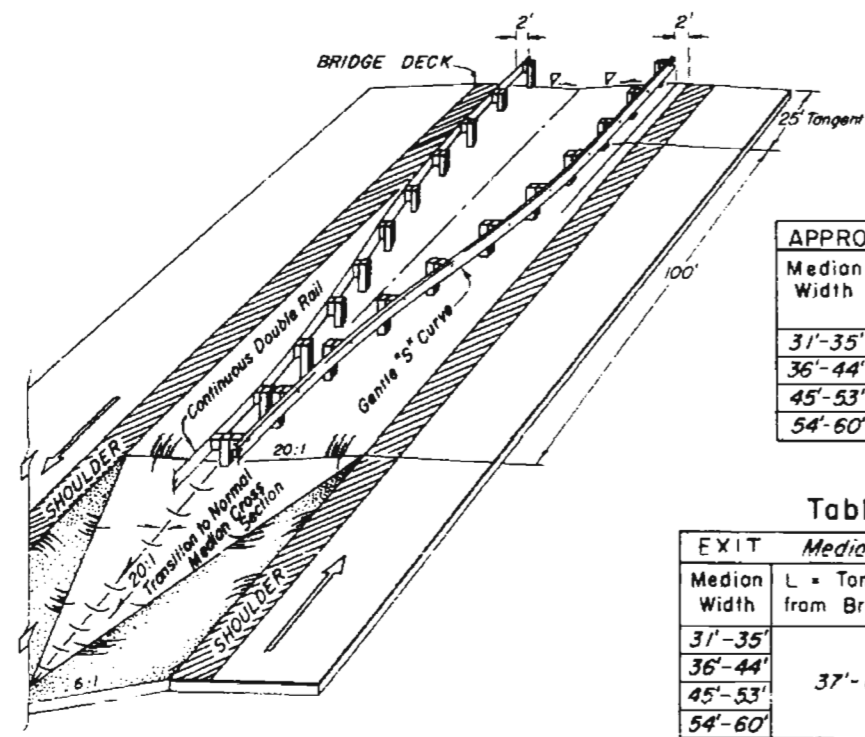


ANCHORAGE FOR TYPES I, II & III



ANCHORAGE FOR TYPES I & II

ANCHORAGE FOR TYPE III



21' to 30' MEDIAN

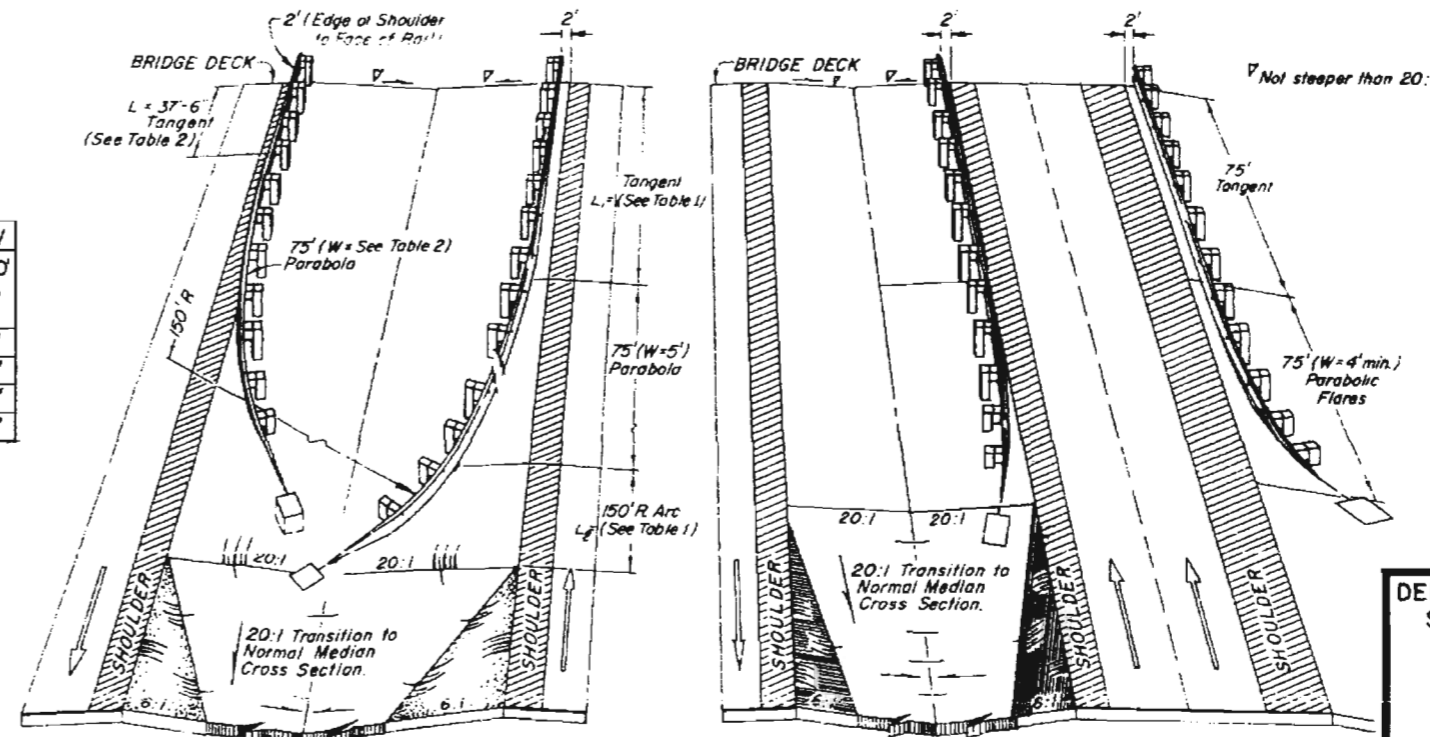
Table 1

APPROACH Median Guard Rail				
Median Width	$L_1$ = Tangent from Bridge	75' Parabolic Flare	$L_2$ = 150' Radius Arc	
31'-35'	50'-0"	then	then	25'-0"
36'-44'	25'-0"	W = 5'		50'-0"
45'-53'	12'-6"		62'-6"	
54'-60'	0'-0"			75'-0"

Table 2

EXIT Median Guard Rail		
Median Width	L = Tangent from Bridge	75' Parabolic Flare, W =
31'-35'	37'-6"	10'
36'-44'		12'
45'-53'		14'
54'-60'		16'

GUARD RAIL AT BRIDGE APPROACH



31' to 60' MEDIAN

MEDIAN OVER 60' (Install Guard Rail as for separate roadways — see Sheet No. 1.)

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

## GUARD RAIL TYPE 3

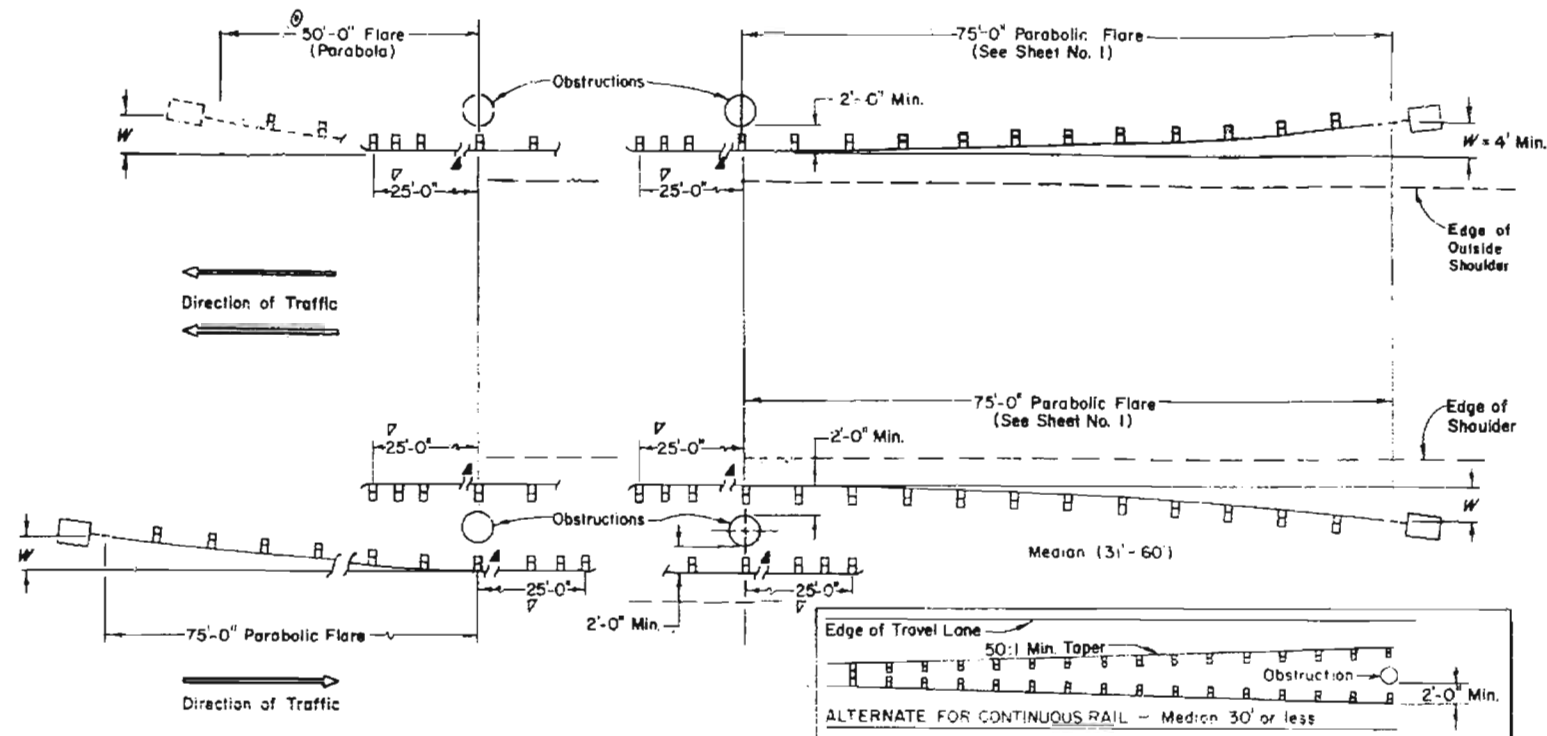
Designed by M.R.H. Approved by J.R.B.  
 Made by J.R.B. Staff Design Engineer  
 Checked by R.S.M. Date: March 1, 1968

# STANDARD M-606-AB

(MARCH 1, 1968)  
(SHEET 3)

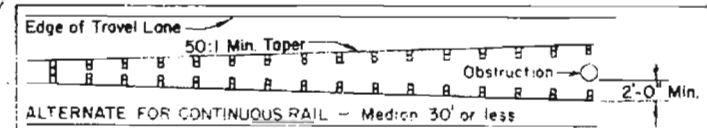
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS:	

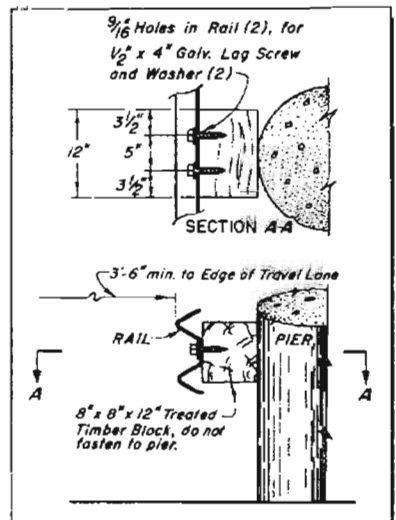


TYPICAL GUARD RAIL FOR OBSTRUCTIONS

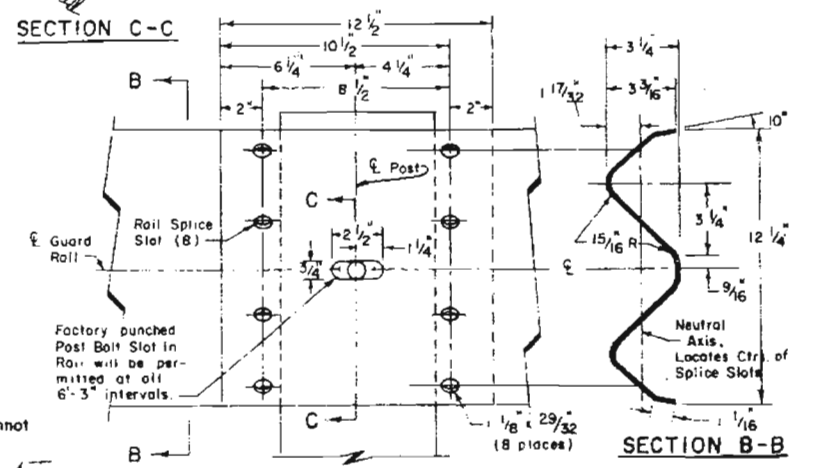
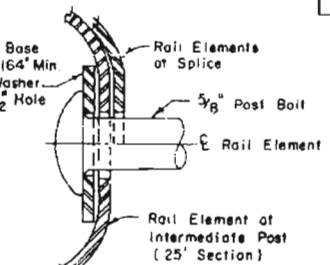
- NOTES:
- ▲ Additional 12'-6" rail panels when obstruction length exceeds 2'-0".
  - Ⓢ 2-Lane Highways - The exit end of guard rail shall extend 50 feet past the end of theoretical need and shall be flared and anchored.
  - † Posts for the last 12'-6" rail panel shall be spaced at 3'-1/2" c. to c.



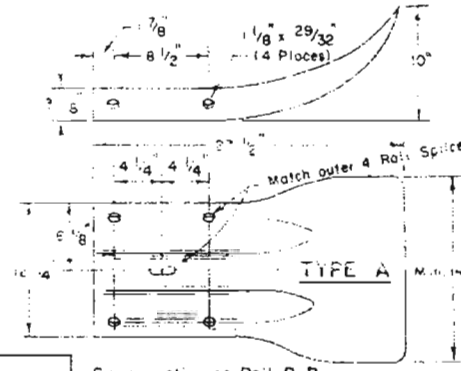
ALTERNATE FOR CONTINUOUS RAIL - Median 30' or less



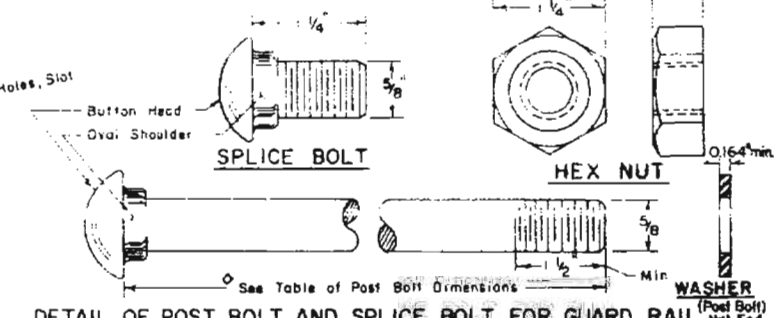
ALTERNATE FOR NARROW MEDIANS  
(To be used only when 2'-0" min clearance to pier cannot be obtained.)



DETAIL OF RAIL SPLICE (Reflector Tab, Bolts Not Shown)



Same section as Rail B-B

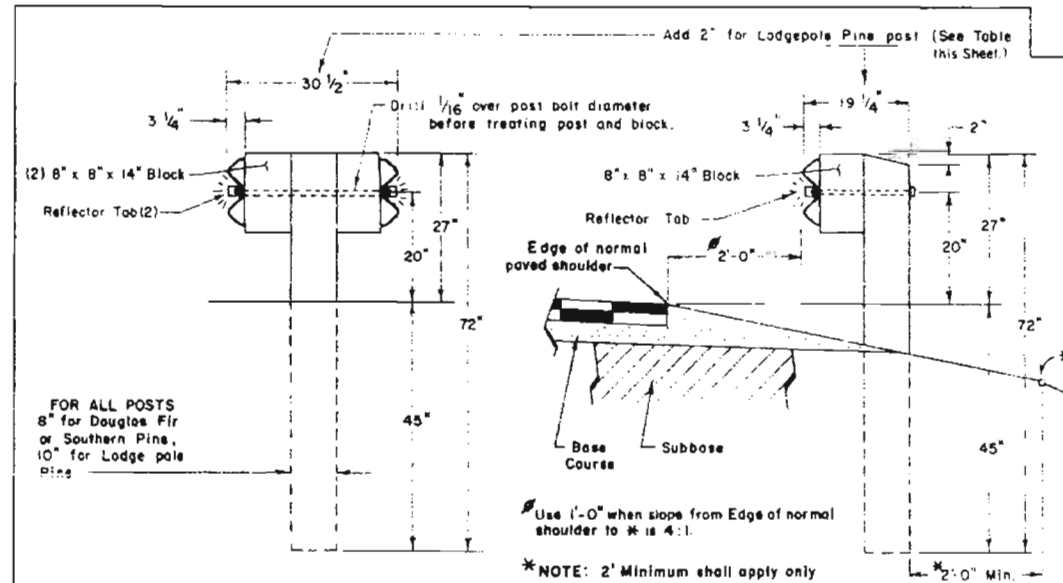


DETAIL OF POST BOLT AND SPLICE BOLT FOR GUARD RAIL

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

Number Splice Bolts Required:  
8 per Splice or 'B' Terminal, 4 per 'A' or 'C' Term.

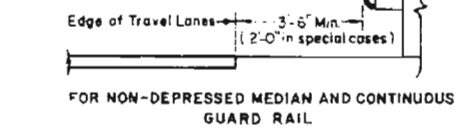
TABLE OF POST BOLT DIMENSIONS



NOTE: Guard Rail height shall be measured from a point 2 feet in front of the rail face.

Use 1'-0" when slope from Edge of normal shoulder to \* is 4:1.

\*NOTE: 2' Minimum shall apply only when slope beyond this point is 4:1 or steeper.

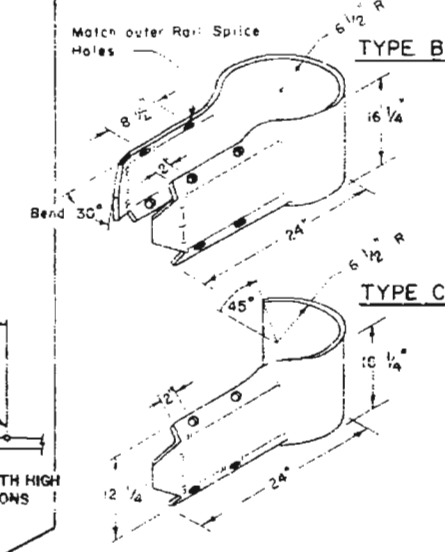


FOR NON-DEPRESSED MEDIAN AND CONTINUOUS GUARD RAIL

URBAN AND OTHER SPECIAL CASES WITH RESTRICTED OPERATIONS

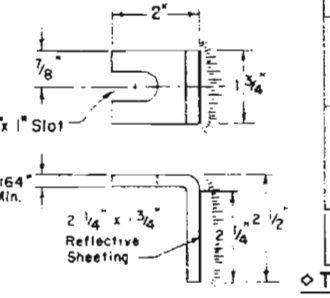
RURAL AND OTHER CASES WITH HIGH SPEED FREE FLOW OPERATIONS

GUARD RAIL FOR OBSTRUCTIONS IN MEDIAN



DETAILS OF TERMINAL SECTIONS

NOTE: Unless otherwise designated on plans all terminal sections shall be Type A.



INSTALLATION DETAILS OF REFLECTOR TAB

Reflector Tabs shall be installed on alternate posts or at max. 12'-6" spacing.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

GUARD RAIL  
TYPE 3

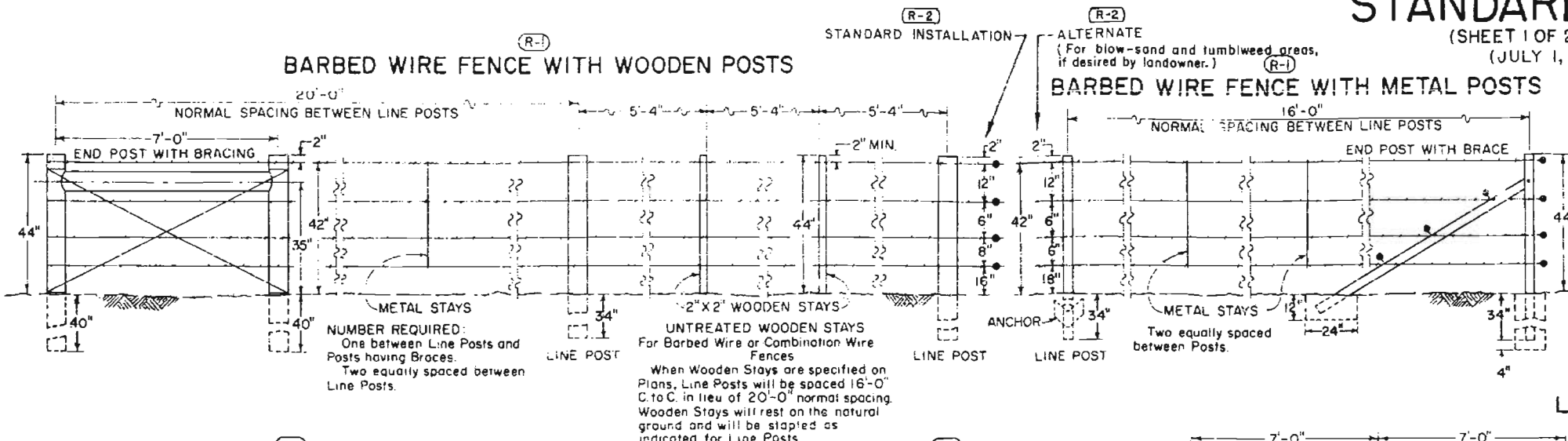
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Approved by [Signature]  
Made by [Signature] Staff Design Engineer  
Checked by R.S.M. Date: March 1, 1968

# STANDARD M-607-A

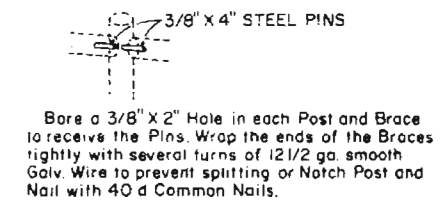
(SHEET 1 OF 2 SHEETS)  
(JULY 1, 1965)

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

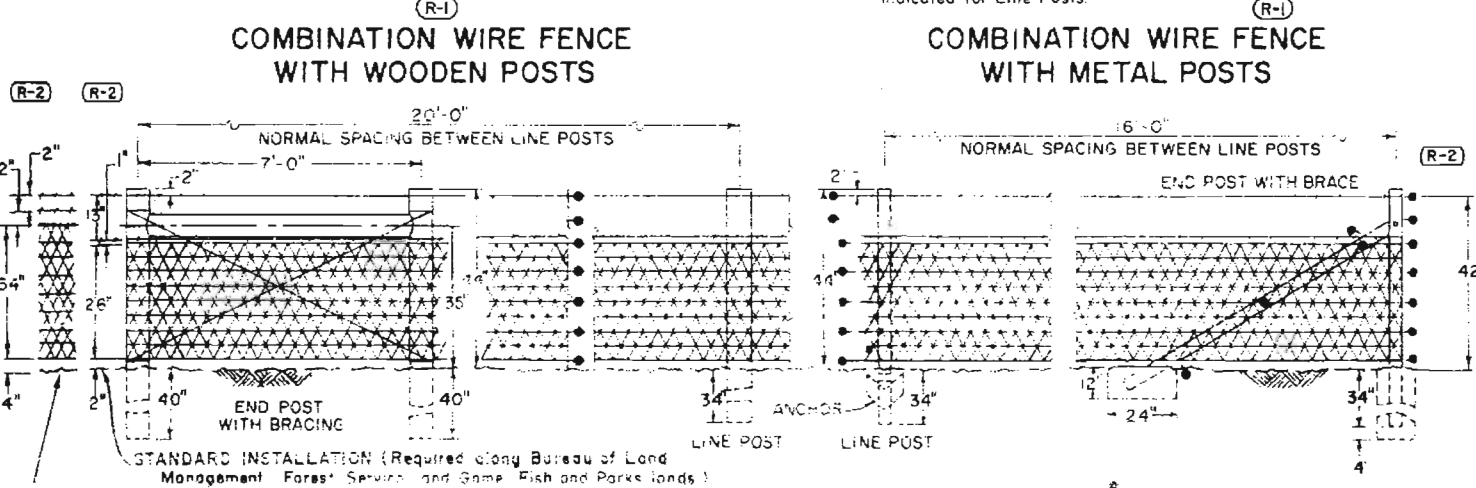
REVISIONS		
8-2-66	Vertical Dimensions and Note	M.R.H.
12-8-66	Vert. Dims., Std. and Alternate	M.R.M.



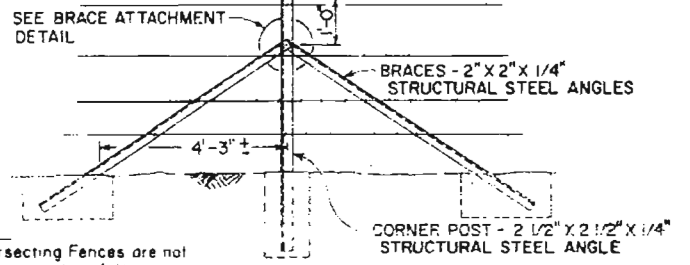
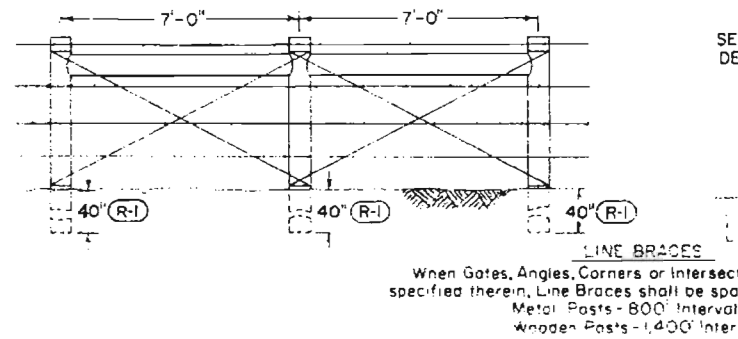
### CROSS BRACE DOWELING DETAIL



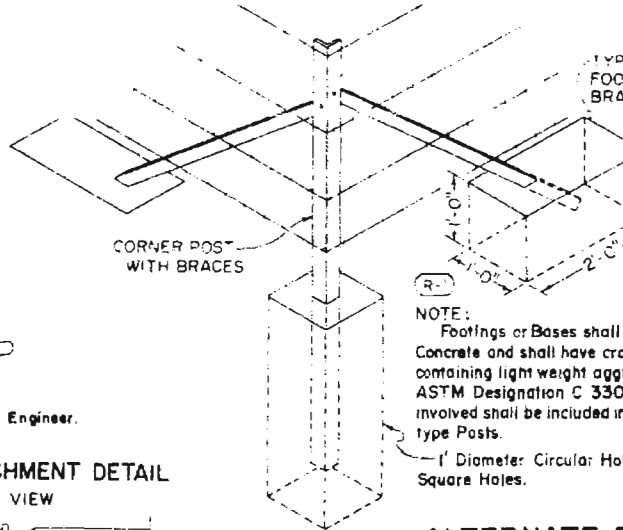
(R-1) NOTE:  
See Sheet 2  
for General Notes.



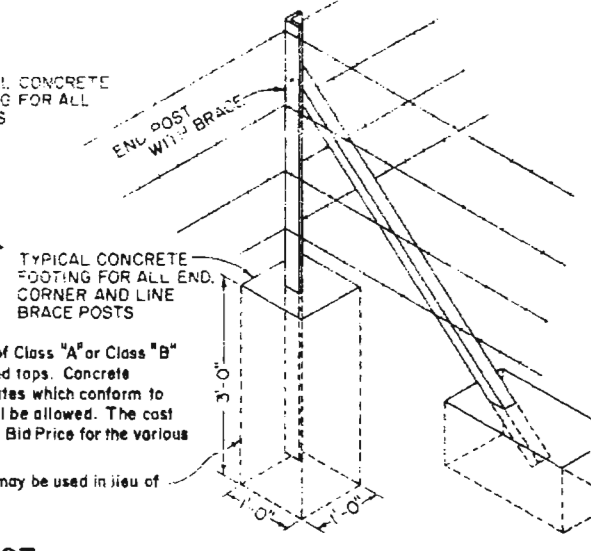
### LINE BRACES



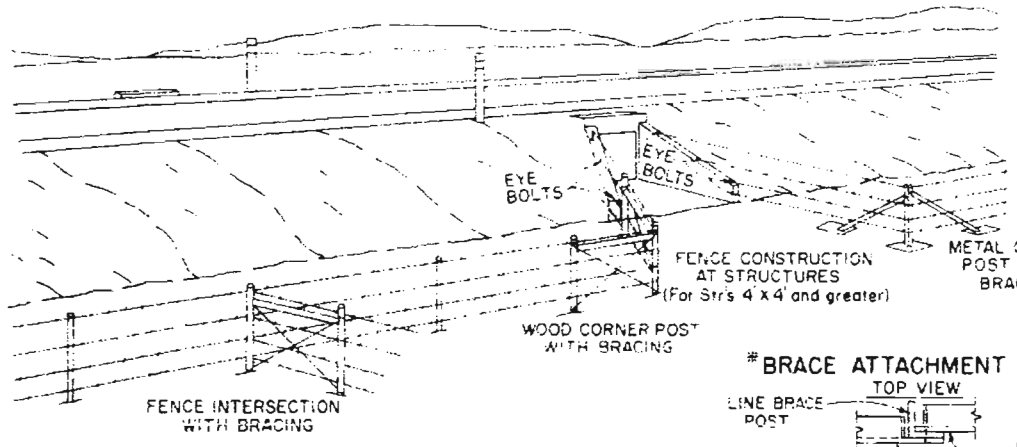
### TYPICAL CORNER POST INSTALLATION



### TYPICAL INSTALLATION AT FENCE INTERSECTIONS

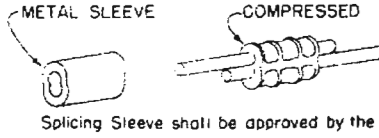


### ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES

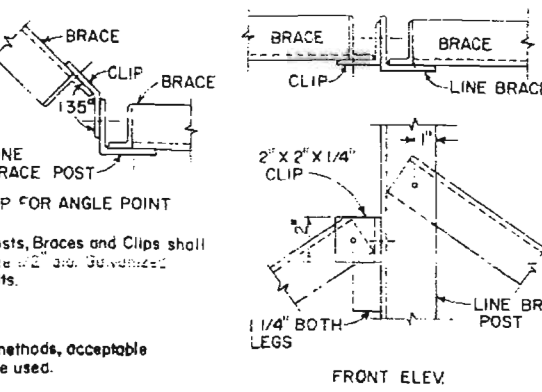


NOTE:  
At all structures of 4"x4" and over, the fence shall be ended at eye-bolts in the wings of the structure. Where the type of structure prohibits the use of eye-bolts, an end post with brace shall be used. Eye-bolts shall be made of 1/2" round bars with a minimum of six (6) inches of body length embedded in the concrete and a minimum of 1" inside eye diameter. Eye-bolts shall be furnished and installed by the Contractor. Cost of eye bolts will be included in the contract price for fencing.

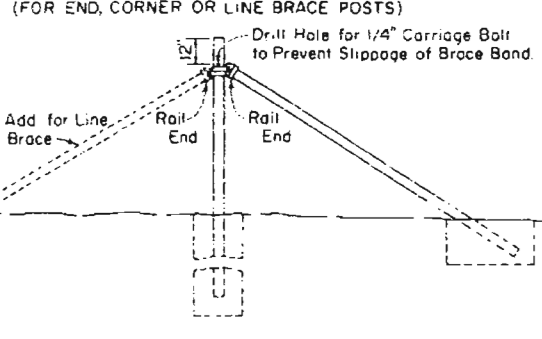
### ACCEPTABLE WIRE SPLICE



### \* ALTERNATE BRACE ATTACHMENT DETAIL



### ALTERNATE POST



DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
WIRE FENCES  
AND  
GATES

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

# STANDARD M-607-A

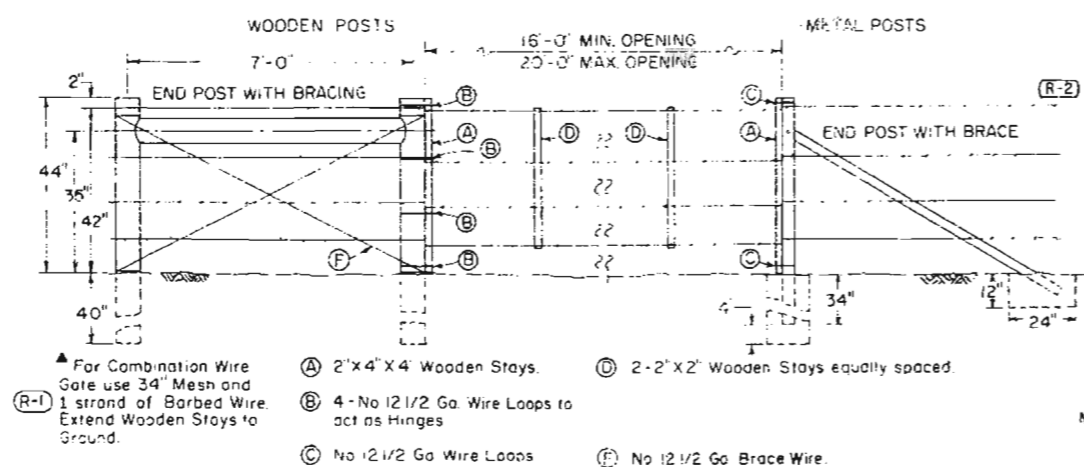
(SHEET 2)  
(JULY 1, 1965)

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

### REVISIONS

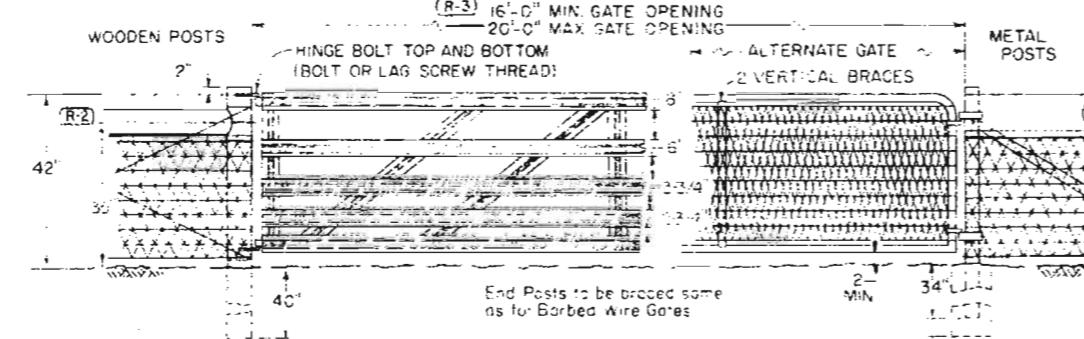
(R-1)	8-2-66	Vert. Dims. & Gen'l. Notes	M.R.H.
(R-2)	12-8-66	Vert. Dims., Std. and Alternate	M.R.H.
(R-3)	2-6-67	Gate and General Notes	M.R.H.

## BARBED WIRE GATE

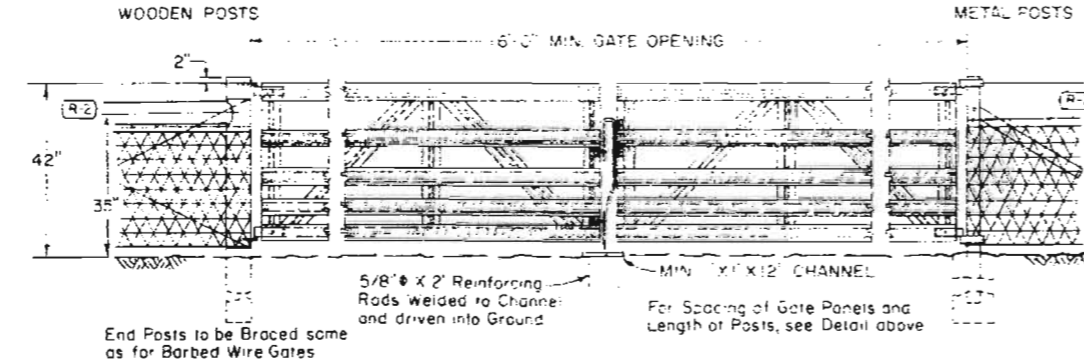


- ▲ For Combination Wire Gate use 3/4" Mesh and 1 strand of Barbed Wire. Extend Wooden Stays to Ground.
- (A) 2"x4"x4" Wooden Stays.
- (B) 4-No 12 1/2 Ga. Wire Loops to act as Hinges.
- (C) No 12 1/2 Ga. Wire Loops.
- (D) 2-2"x2" Wooden Stays equally spaced.
- (E) No 12 1/2 Ga. Brace Wire.
- (F) No 12 1/2 Ga. Wire Loops.

## DRIVEWAY GATES

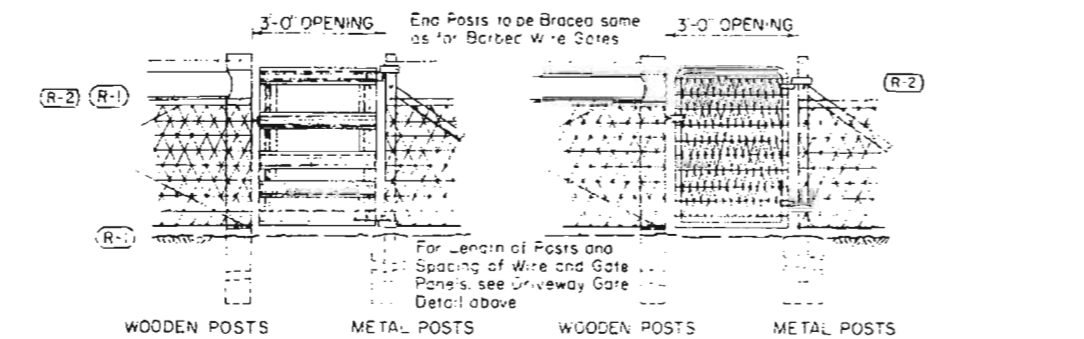


## TWIN DRIVEWAY GATES

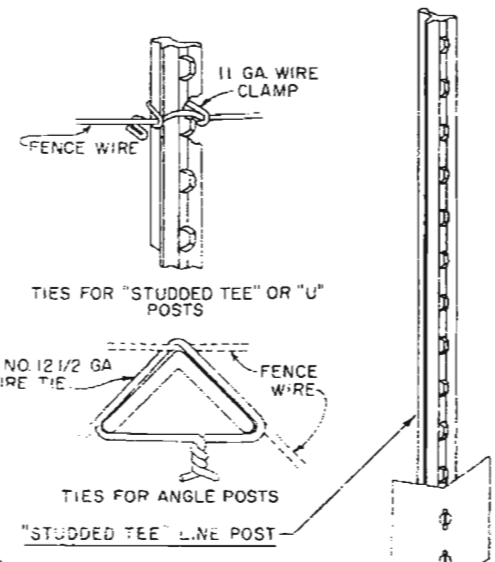


## WALK GATE

## ALTERNATE WALK GATE



## FENCE WIRE TIES



## GENERAL NOTES

- All work shall be done in accordance with the Standard Specifications applicable to the Project.
- (R-1) At each location where an electric transmission, distribution or secondary line crosses a wood post fence the Contractor shall furnish and install a ground conforming to Section 9 of the National Electric Safety Code.
- (R-2) Dimensions shown for "Standard" and "Alternate" apply for both wooden and metal post fence.
- Fence wire shall be ended, double wrapped and tied off at end posts. Posts shall be braced. Fence to be continued straight then be restaired 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 with a dot on barbed wire or combination wire fence details. Staples shall be No. 9 wire min. or least 1/2" long. B shall be galvanized.

### METAL POSTS

All posts and braces shall be of the types and weights shown or acceptable equivalents. Notes to be provided in end, corner and gate posts as detailed.

### CORNER POSTS

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

### LINE POSTS

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

### END POSTS

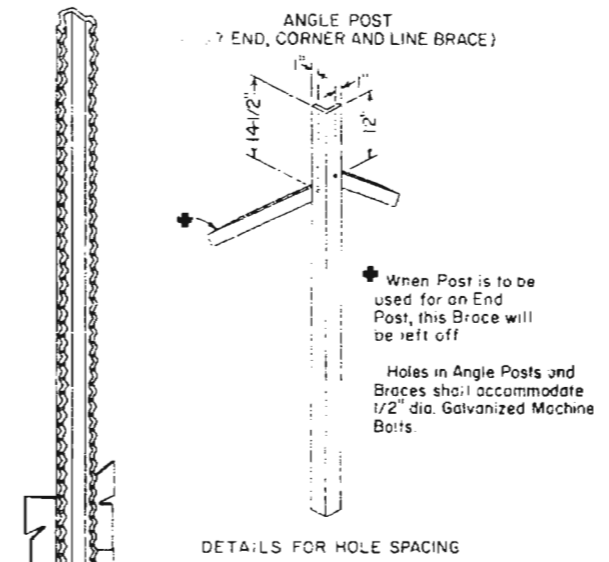
Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles  
Weight - 3.81 lbs./lin. ft. Min.  
Length - 6'-6" Min.  
No. of Braces - 2

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

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

Posts shall meet requirements of Par. 4.5 of U.S. Dept. of Commerce Commercial Standard 184-51. 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" I.D. Rail End, all Galvanized.  
Weight - 1.6 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.	1 Strand, No. 14 gage.
Cross Wires	1 Strand, No. 14 gage.	1 Strand, No. 14 gage.

### GATES

#### DRIVEWAY GATES

(R-3) Height - approximately 42" (5 panels) --- Width of gate opening - 16'-0" Min.  
(R-1) Weight - Galvanized Steel, 75 lbs. Min. --- Tempered Aluminum, 45 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

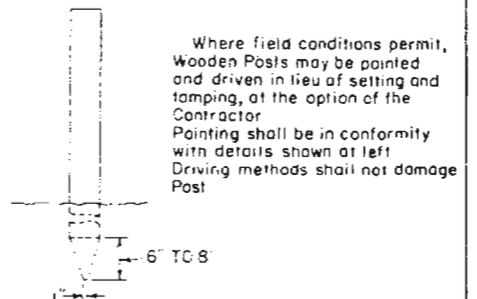
(R-1) Height - 42"  
Weight - Not less than 90 lbs. complete with latch and hinges  
Width of gate opening - 16'-0"  
Gate Frame - 1" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction.

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

#### WALK GATES

(R-1) 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



Where field conditions permit, Wooden Posts may be painted and driven in lieu of setting and tamping, at the option of the Contractor. Pointing shall be in conformity with details shown at left. Driving methods shall not damage Post.

**DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
WIRE FENCES  
AND  
GATES**

(R-1)

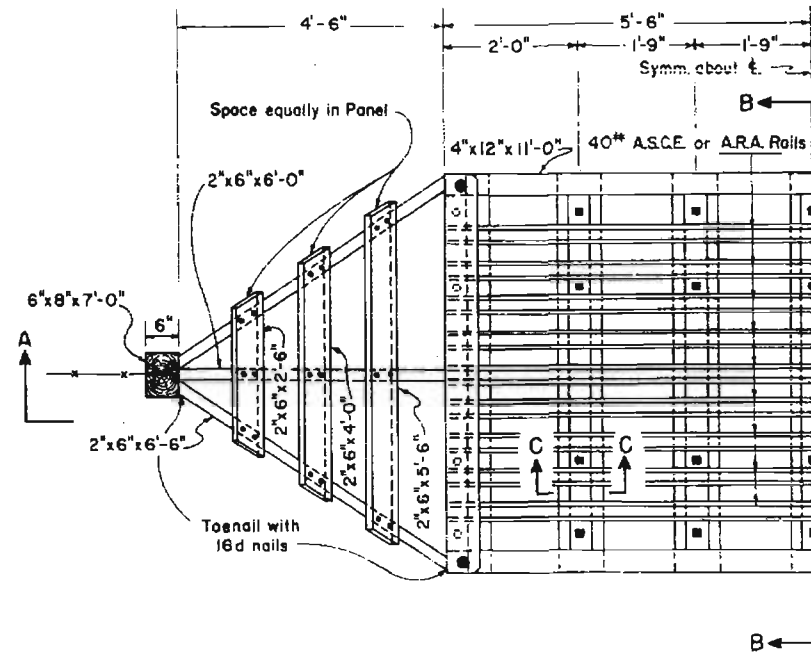
Designed by L.E.O. Approved by E.E.O.  
Made by T.E.P. Staff Des. Eng.  
Checked by E.E.O. Date: July 1, 1965

# STANDARD M-611-A

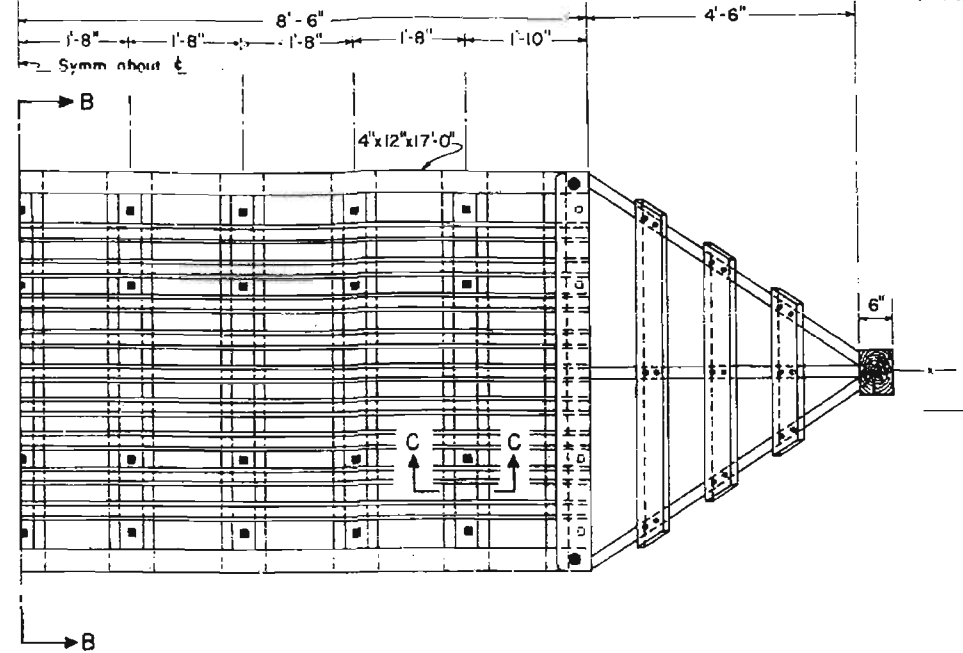
(JULY 1, 1965)

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

REVISIONS		
(R-1)	10-17-66	Timber surface treatment M.R.H.

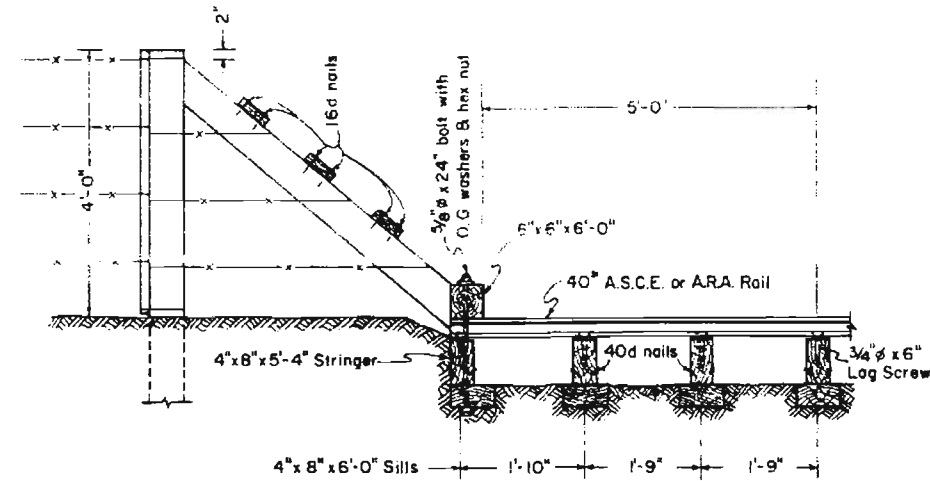


HALF PLAN ~ 10'-0" ROADWAY

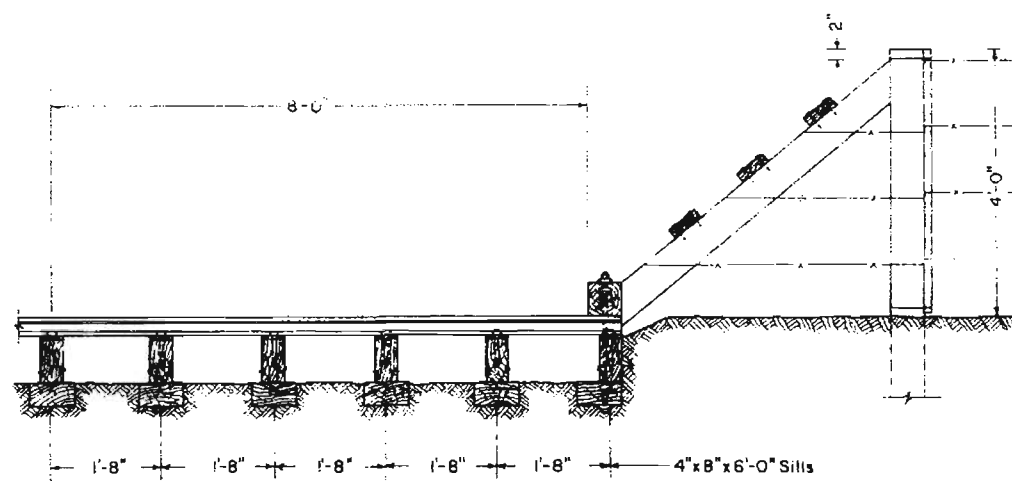


HALF PLAN ~ 16'-0" ROADWAY  
Similar to 10'-0" Roadway except as noted

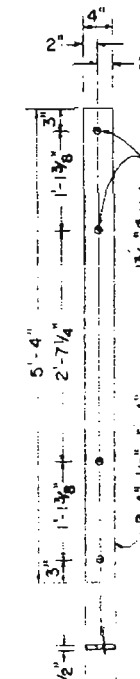
When gate is not required attach fence wire to post.



SECTION A-A

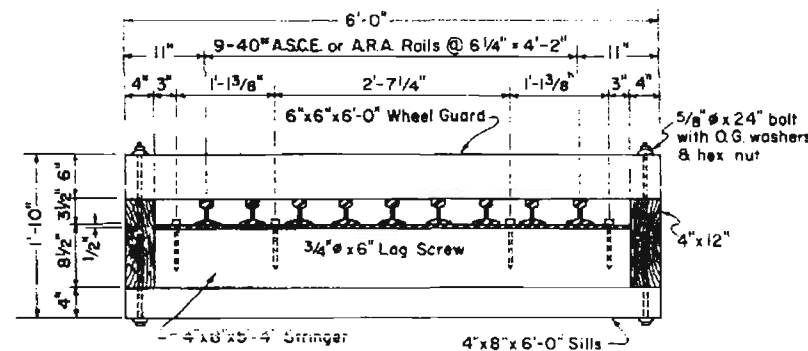


SECTION B-B  
Similar to 10'-0" Roadway except as noted

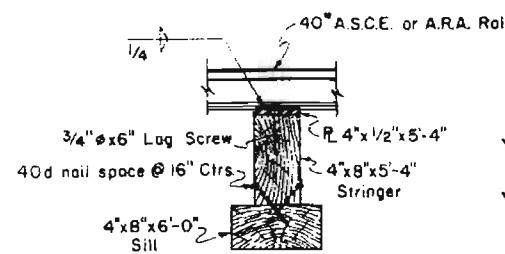


BILL of MATERIALS for ONE 10'-0" CATTLE GUARD			
NUMBER REQ'D	DESCRIPTION	(R-1)	
2 pieces	2'x6'x2'-6"	treated timber	S-4-S
2 pieces	2'x6'x4'-0"	treated timber	S-4-S
2 pieces	2'x6'x5'-6"	treated timber	S-4-S
4 pieces	2'x6'x6'-6"	treated timber	S-4-S
2 pieces	2'x6'x6'-0"	treated timber	S-4-S
7 pieces	4'x8'x6'-0"	treated timber	R
7 pieces	4'x8'x5'-4"	treated timber	R
2 pieces	6'x6'x6'-0"	treated timber	R
2 pieces	6'x8'x7'-0"	treated timber	R
2 pieces	4'x12'x17'-0"	treated timber	R
7 pieces	R 4'x1/2'x5'-4"		
28	3/4" x 6" Lag screw		
4	5/8" x 24" Bolt with hex head and nut		
9	40" ASCE Rails 11'-0" long (or ARA)		
2 pounds	16d Nails		
4 pounds	40d Nails		
5 pounds	7" Wire Spikes		
8	C I O.G. washers		

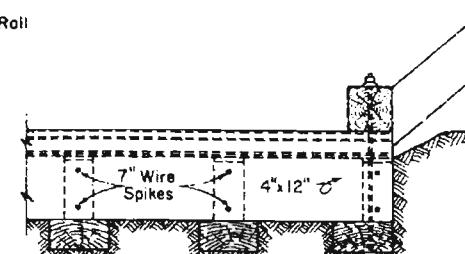
BILL of MATERIALS for ONE 16'-0" CATTLE GUARD			
NUMBER REQ'D	DESCRIPTION	(R-1)	
2 pieces	2'x6'x2'-6"	treated timber	S-4-S
2 pieces	2'x6'x4'-0"	treated timber	S-4-S
2 pieces	2'x6'x5'-6"	treated timber	S-4-S
4 pieces	2'x6'x6'-6"	treated timber	S-4-S
2 pieces	2'x6'x6'-0"	treated timber	S-4-S
2 pieces	6'x6'x6'-0"	treated timber	R
11 pieces	4'x8'x6'-0"	treated timber	R
11 pieces	4'x8'x5'-4"	treated timber	R
2 pieces	4'x12'x17'-0"	treated timber	R
2 pieces	6'x8'x7'-0"	treated timber	R
11 pieces	R 4'x1/2'x5'-4"		
44	3/4" x 6" Lag screw		
4	5/8" x 24" Bolt with hex head and nut		
8	C I O.G. washers		
9	40" ASCE Rails 17'-0" long (or ARA)		
2 pounds	16d Nails		
7 pounds	40d Nails		
8 pounds	7" Wire Spikes		



SECTION ~ B-B



SECTION ~ C-C



PART ELEVATION

### GENERAL NOTES

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

The preservative for treatment of timber shall be creosote oil and all timber shall be fabricated before treatment.

All cut surfaces or bored holes in treated timber shall be thoroughly saturated with hot creosote oil.

All hardware shall be galvanized. Holes for lag screws shall be subsized to 1/2" diameter.

Welding shall conform to the latest edition of the AWS Standard Specifications for Welding Highway Bridges. Low hydrogen electrodes shall be used for welding the rails to the plate.

Secondhand rails may be used provided they are clean, reasonably free from rust, of uniform cross section and weight, and weigh at least 95% of the original nominal weight.

All structural steel shall be painted with aluminum paint in accordance with Section 509.

Timber shall conform to Construction Grade Paragraph 123 B or 125 B 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.

### LOADING DATA

Live Load = AASHO H20-44

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO  
CATTLE GUARD  
10 Ft RDWY and 16 Ft RDWY

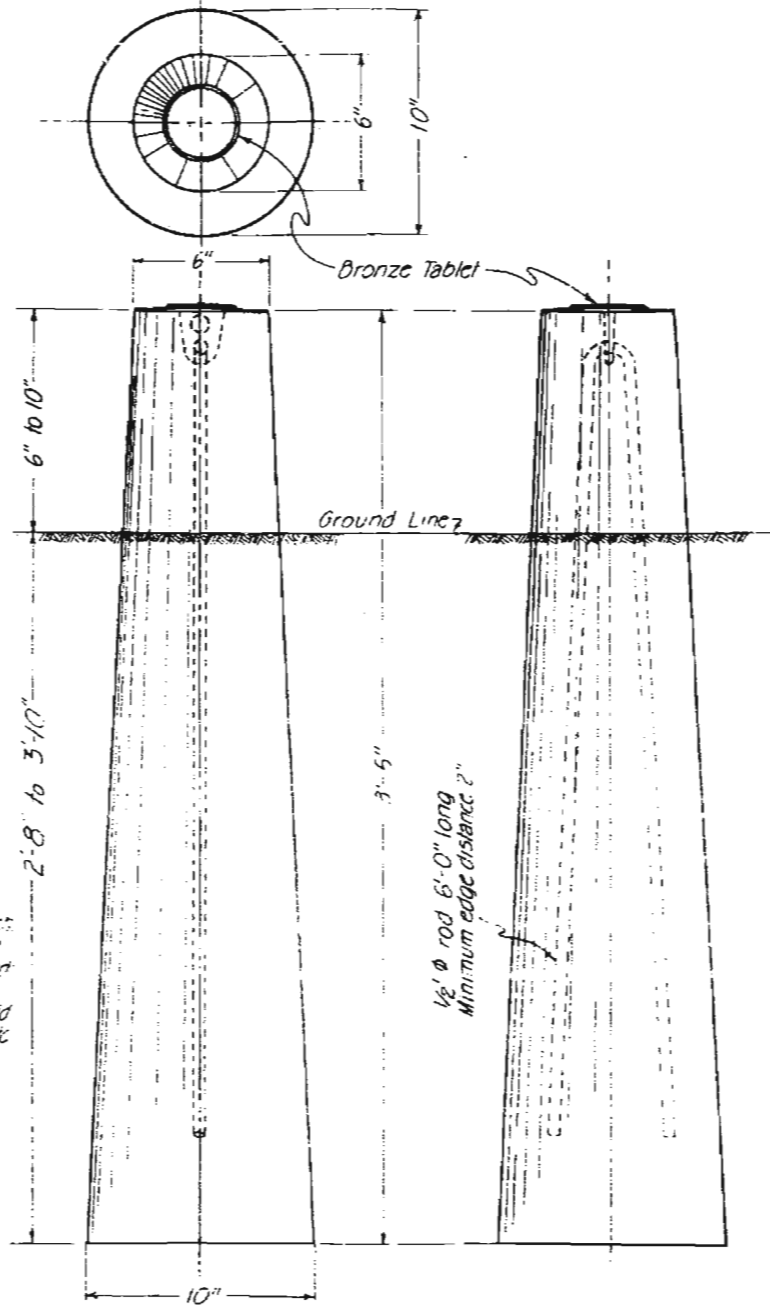
Designed by PC Approved by [Signature] Bridge Engineer  
Made by S.S. AMSP  
Checked by [Signature] Date: July 1, 1965

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

(JULY 1, 1965)

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

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



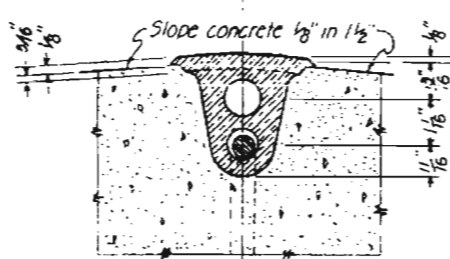
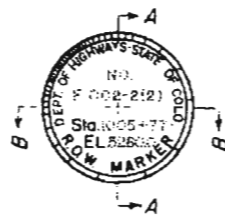
### NOTES FOR R.O.W. MARKER POSTS

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

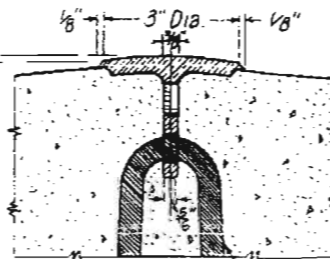
Posts shall be made of class 'A' Concrete. The upper 12 inches of marker posts shall be rubbed free of form marks, and the top surface of the post must be constructed to drain thoroughly.

(R-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 post 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. & C for State Projects. See detail below.)



SECTION B-B



SECTION A-A

Use and use 12' x 1/2" bar for Bench Mark Tablet

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

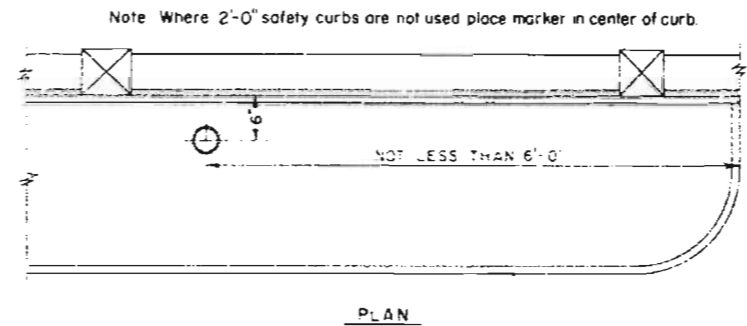
### BENCH MARK

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

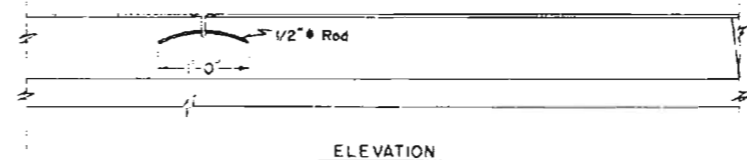
All exposed surfaces of the bronze tablet are to be ground to a smooth surface. All letters are to be depressed a minimum of 1/16 inch. Information on the bronze tablet indicated by pin lines is to be stamped in field by the engineering party after marker is placed. 3/16 inch letters and figures to be 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. & C for State Projects. See details below.)

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 centerline stationing directly opposite the marker.

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

### MARKER POSTS AND BENCH MARKS

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

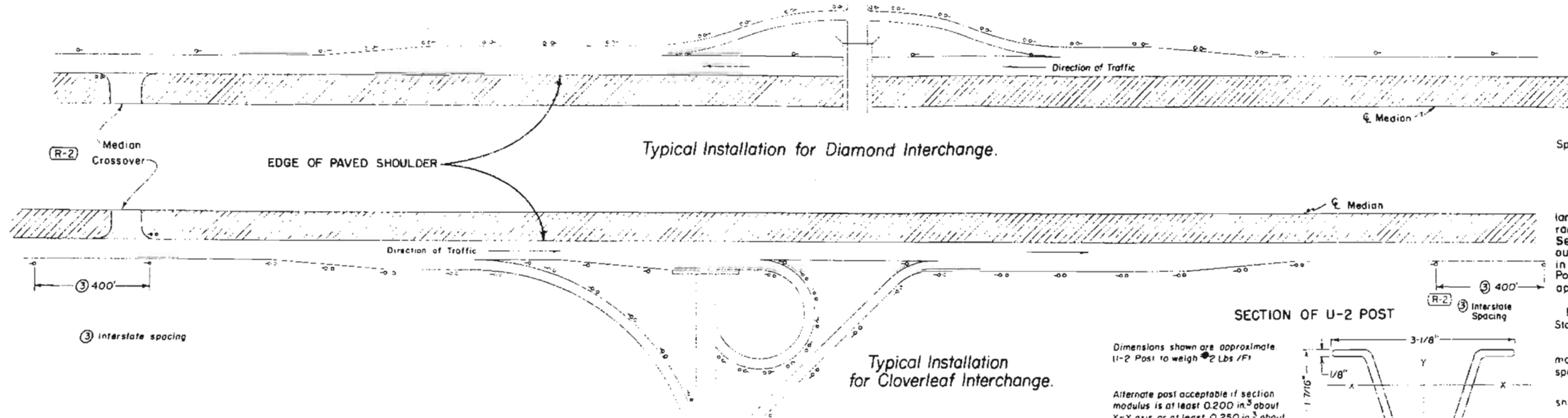
# STANDARD M-612-C

(SHEET 1 OF 2 SHEETS)  
JULY 1, 1965

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

REVISIONS			
(R-2)	1-9-68	Median Crossover, Gen'l. Note	M.R.H.

- 1 Type I
- 2 Type II
- 3 Type III



## 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 (B4-5). 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.

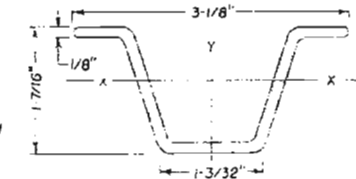
(R-2) Delineators will not be required on tangents for Primary and Secondary roadways.

## SECTION OF U-2 POST

Dimensions shown are approximate (U-2 Post to weigh 42 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.



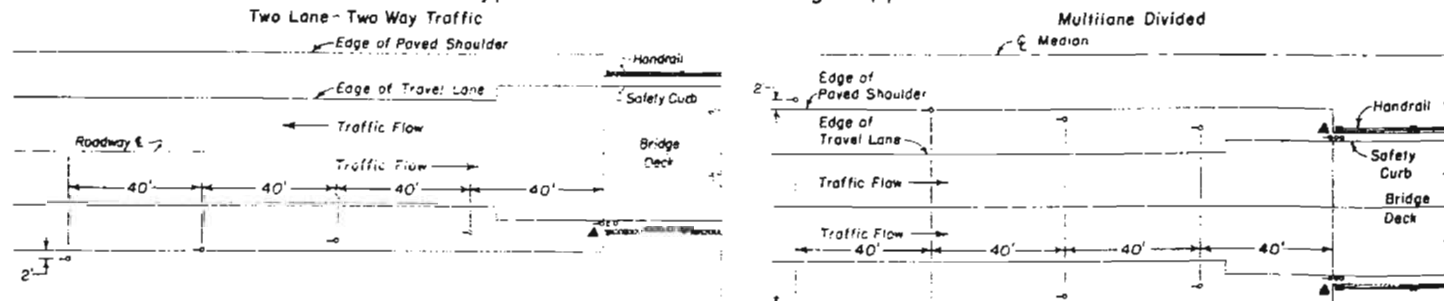
## SPACING FOR DELINEATOR POSTS ON HORIZONTAL CURVES

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'	11460.0'	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	129	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						

① S = 2    R = 50    1-ST. SPACE = 185    2-ND. SPACE = 35    3-RD. SPACE = 65  
 NO SPACES TO EXCEED 200 FT.

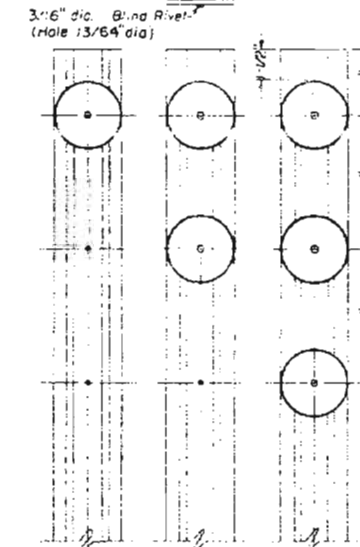
① Omit third space on Secondary and Primary Routes and double the distance on the curve and in advance of and beyond curve. For curves less than 2 degrees on interstate through roadways use interstate tangent spacing.

## Typical Installation at Bridge Approaches



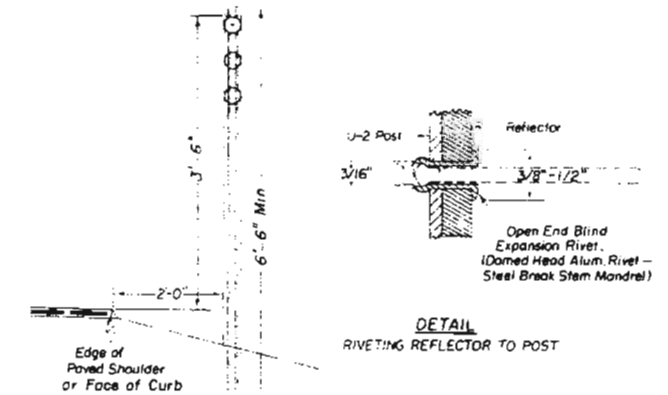
Where curb to side of edge is equal to or greater than roadway width plus usable shoulder width, use this delineator only and omit all others. Note: where guard rail is present, place delineators outside of guard rail and at height which will permit clear view of all three Delineator buttons.

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 Reflector on U-2 Post
- TYPE III  
3-3" dia. Yellow Reflector 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 [Signature]  
Staff Design Engr.  
Date July 1, 1965

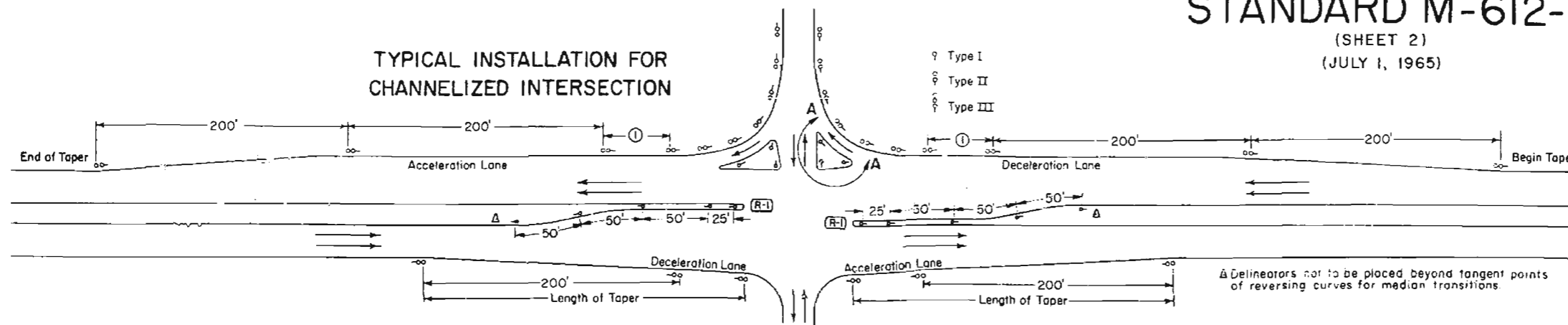
# STANDARD M-612-C

(SHEET 2)  
(JULY 1, 1965)

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

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

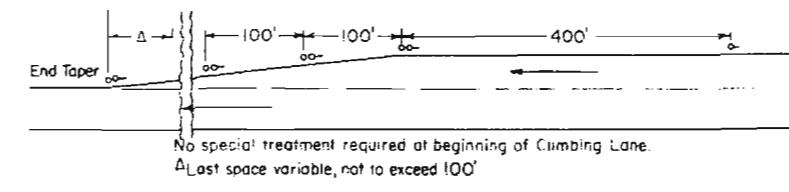
## TYPICAL INSTALLATION FOR CHANNELIZED INTERSECTION



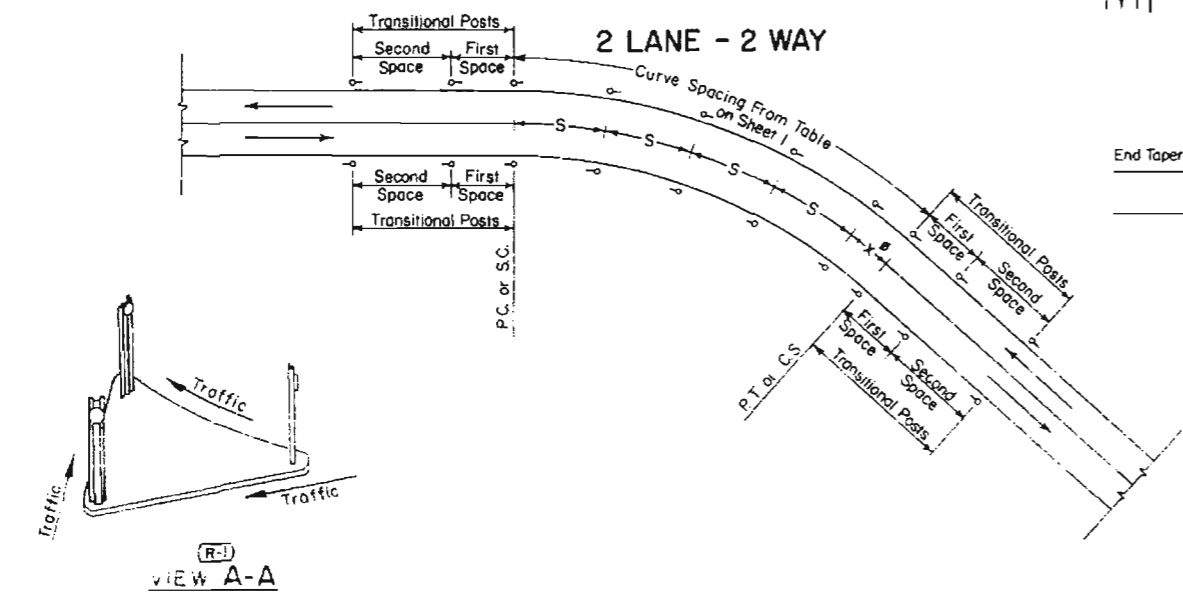
## GENERAL NOTES

- 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  $\dot{C}$  at roadway.
- Lengths of speed change lanes including tapers shall be as shown on plans.

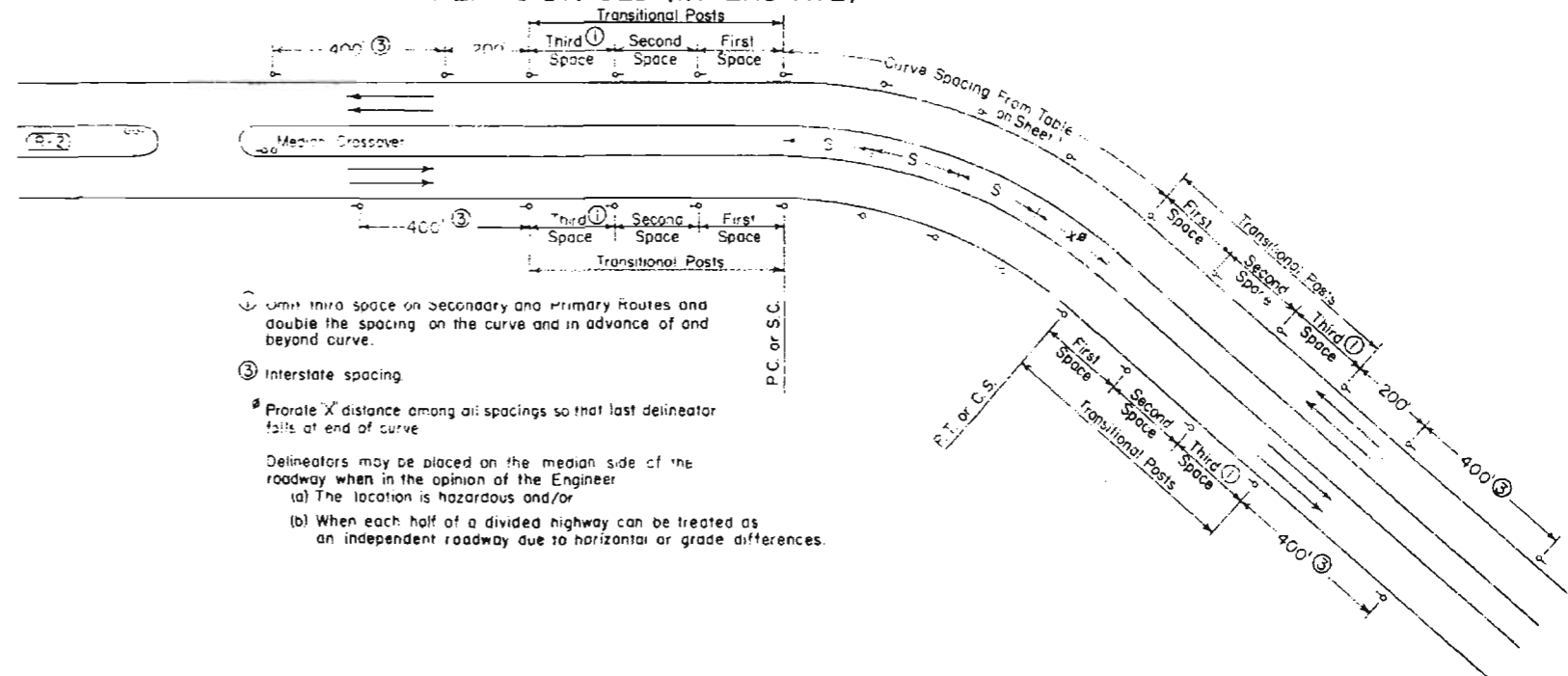
## TYPICAL INSTALLATION FOR CLIMBING LANE TRANSITION



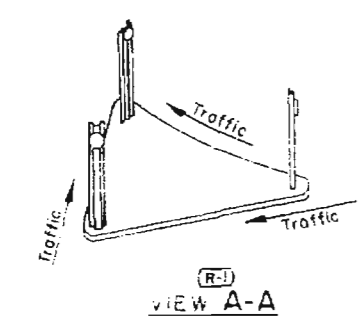
## 2 LANE - 2 WAY



## 4 LANE DIVIDED (INTERSTATE)



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



(R-2)

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

**DELINEATORS**

Designed by C.K.M. | Approved by J.E. Olson  
 Made by T.E.F. | Staff Design Engr.  
 Checked by L.E.G. | Date: July 1, 1965

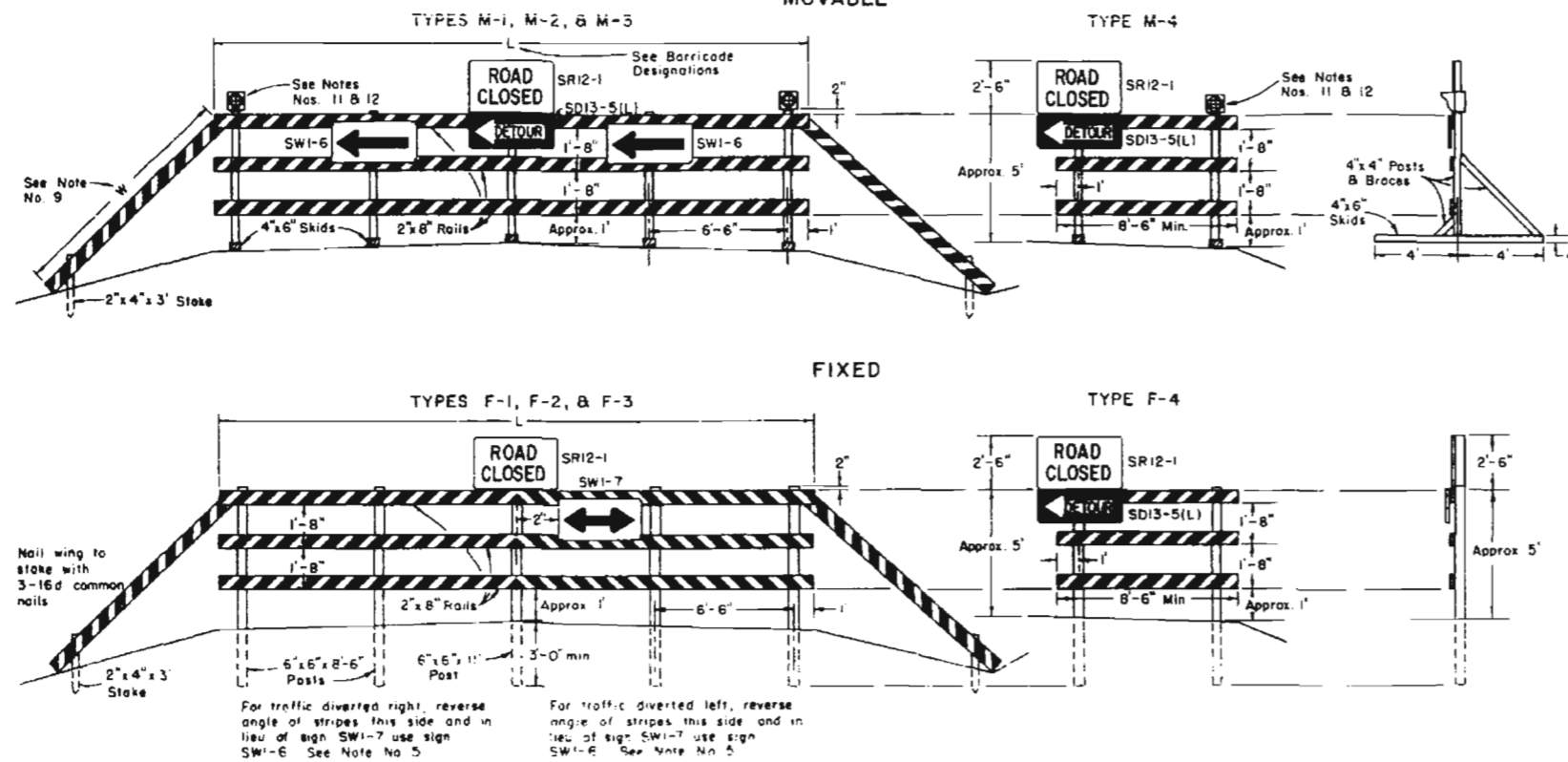
# STANDARD M-614-A

(JULY 1, 1965)

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

REVISIONS	

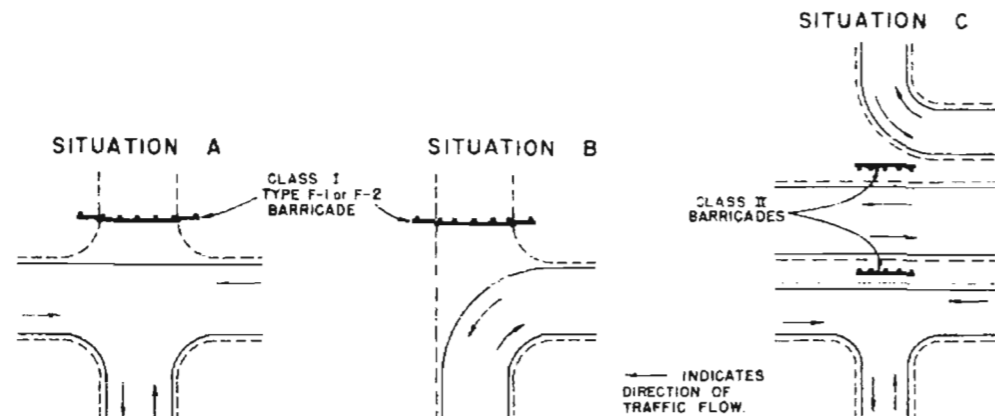
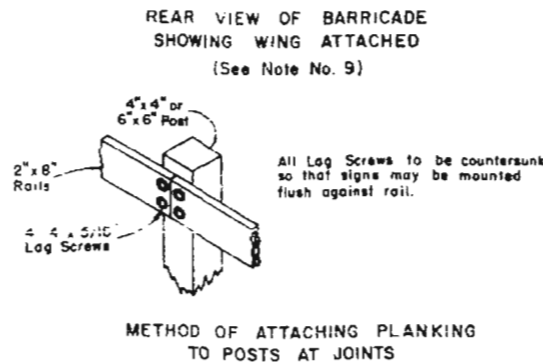
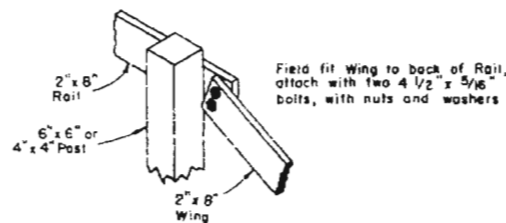
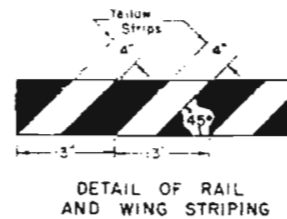
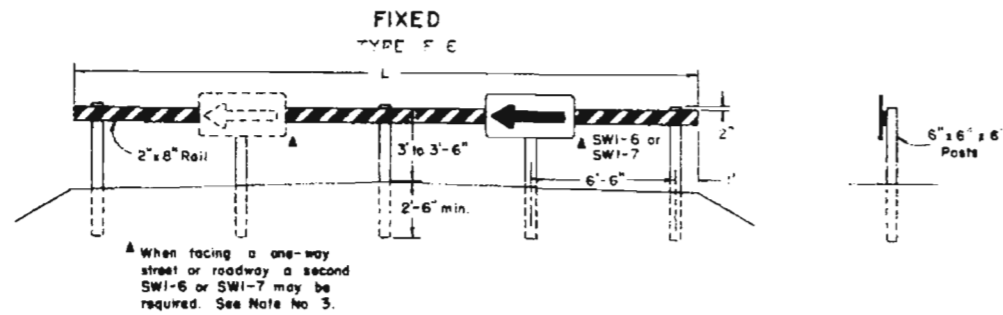
## CLASS I BARRICADES (3 RAILS)



## 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 5B and LL Structural 5B Paragraph 284 or 285 of 1956 Grading Rules for Southern Pine.
- Detachable extension wings for bypassing of construction equipment are permitted. "W" is variable, length shall be adequate to provide closing of borrow pit and/or shoulder as required.
- Alternate materials or other reflective elements on Traffic signs or Barricades will be permitted only after approval of such material by the Department in writing.
- A Flashing Beacon for use on Barricades is a section of a standard traffic signal head or a similar-type device having a yellow lens in the face, which is illuminated by intermittent flashes. Where commercial power is not available, the beacon may be adapted to operate from storage batteries. Each signal unit lens shall have a visible diameter of not less than 8 inches. Each unit complete shall be of such design as to render the lens when illuminated clearly visible to traffic facing the signal at all distances up to 1000 feet under all atmospheric conditions except dense fog. The color of the yellow lens for caution shall be in accordance with Technical Report No. 1 of the Institute of Traffic Engineers. All beacon flashers shall be equipped with filters for suppression of radio interference. The illuminating element in a flashing yellow beacon shall be flashed at a rate of not less than 50 times nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total cycle. The use of Flashing Beacons will be governed by field conditions. Flashing Beacons when warranted generally should be operated continuously throughout the 24 hours of the day. Warrant for Flashing Beacons may be found in Sec 3G of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).
- Flashers are portable, power-operated, lens-directed, enclosed lights, illuminated by rapid intermittent flashes of short duration. Flashers may be used in connection with barricades when approved by the Engineer. An array of random flashers which tends to obscure rather than delineate the traveled way will not be permitted. The use of flashers on a job will be governed by Sec. 5D of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision). The color of the light emitted by a flasher shall be yellow.
- Flashing Beacons and Flashers, when used, shall be positioned above the top rail of the barricades to produce the most effective results.
- Barricades used as "Traffic Controls for Highway Construction" are not to be paid for separately.
- Barricades will be paid for separately when designated on plans as bid items.
- For additional general information on control of traffic through work areas refer to the "Manual on Uniform Traffic Control Devices for Streets and Highway", Part V, published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

## CLASS II BARRICADE (1 RAIL)



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

DEPARTMENT OF HIGHWAYS  
STATE OF COLORADO

TIMBER  
BARRICADES

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

# TYPICAL SIGNS STANDARD M-614-IA

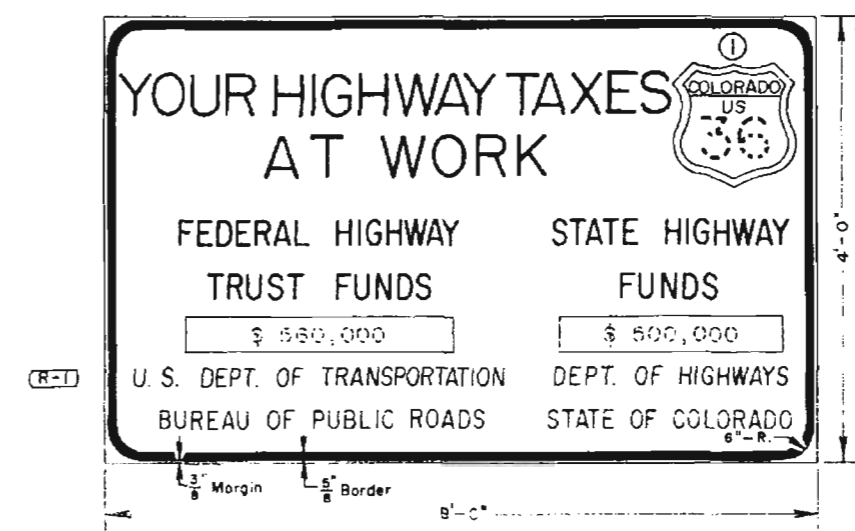
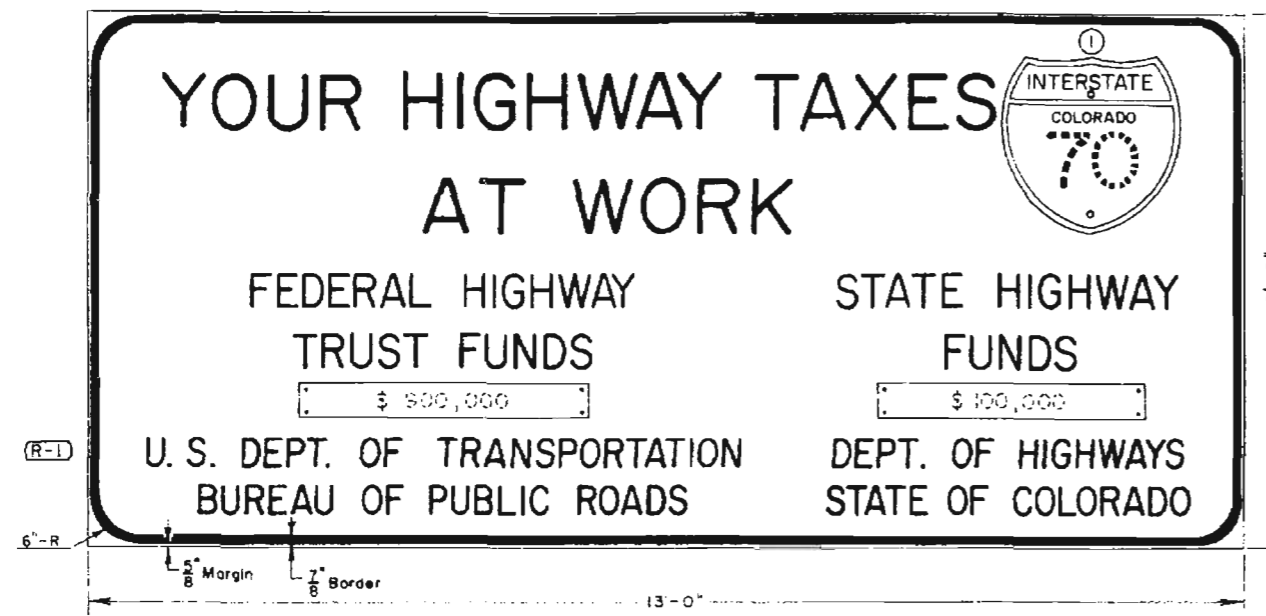
(JULY 1, 1965)

INTERSTATE SYSTEM

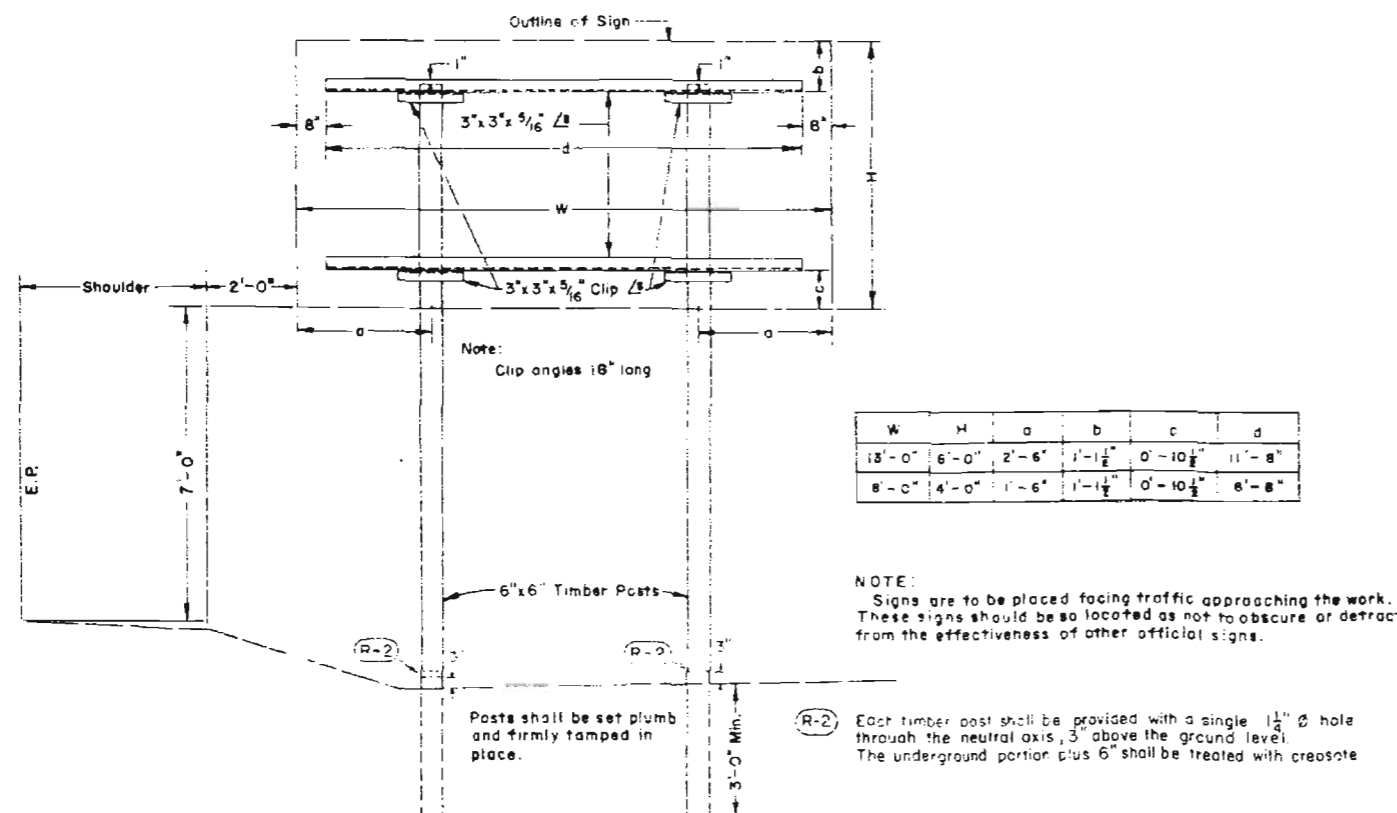
PRIMARY & SECONDARY SYSTEM

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

REVISIONS				
(R-1)	5-25-67	Rev Gen Note B	Sign Legend	G.W.F.
(R-2)	6-19-67	Note regarding timber posts		G.W.F.



## 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.
- Posts shall be 6" X 6" S 4 S 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)

① Applicable Interstate, U.S. Shield or State Route Shield.

DEPARTMENT OF HIGHWAYS  
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

# STANDARD M-614-TB

(SHEET 1 OF 3 SHEETS)

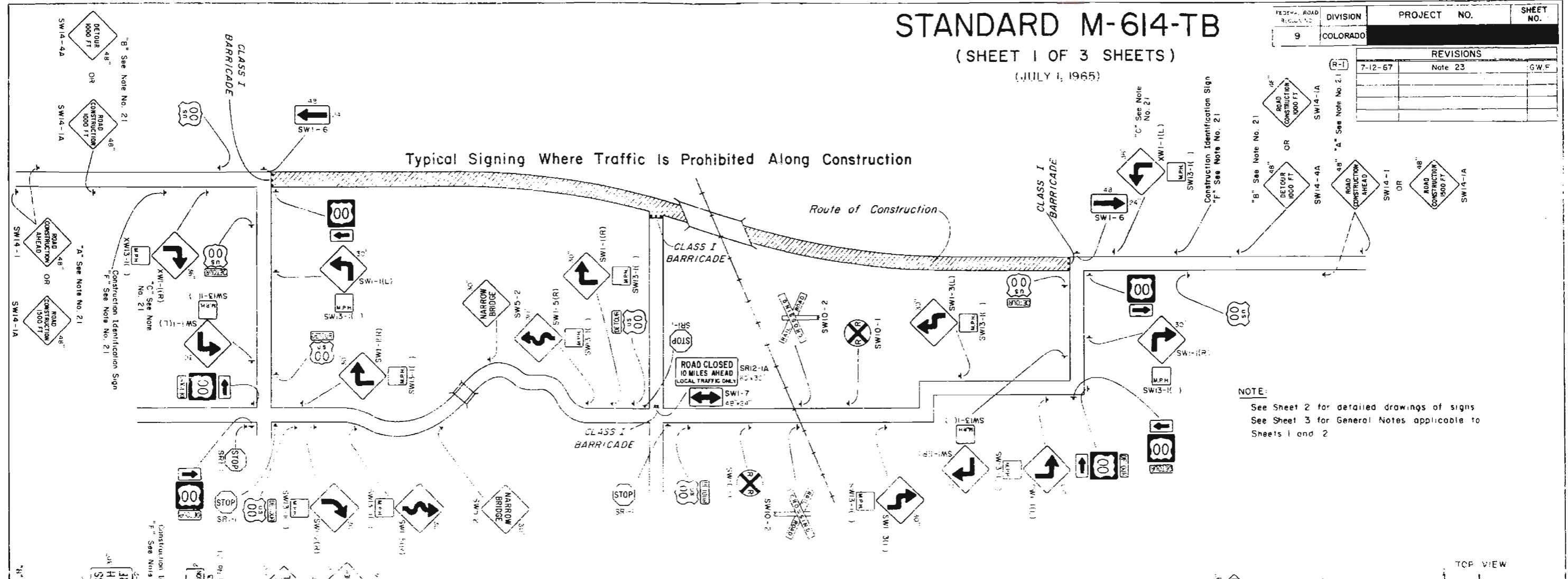
(JULY 1, 1965)

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

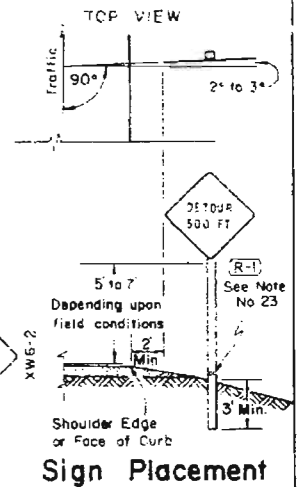
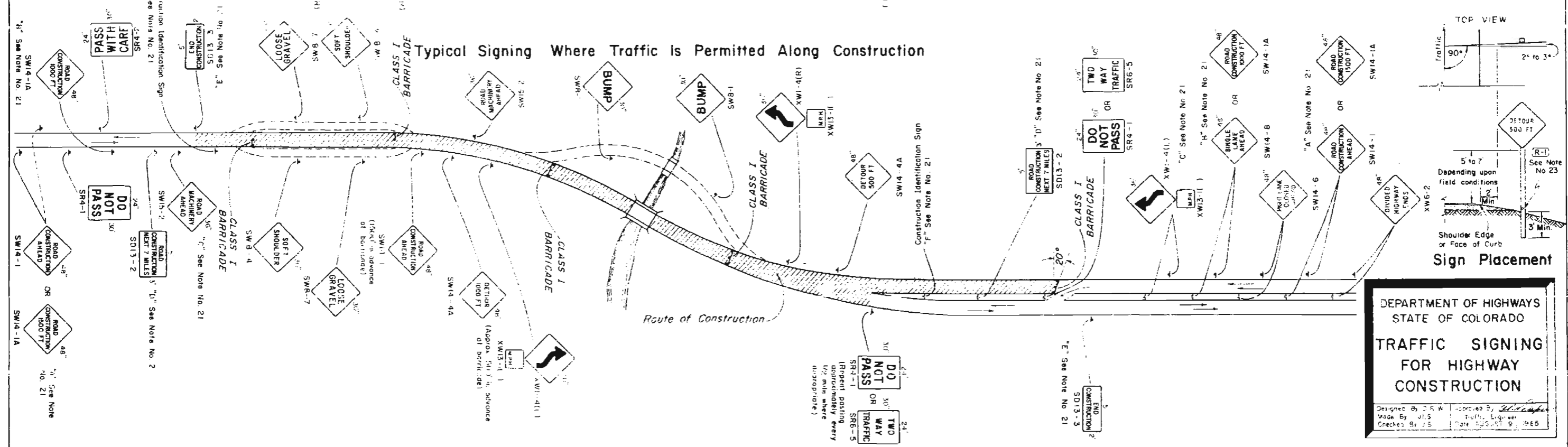
REVISIONS		
7-12-67	Note 23	G.W.F.

## 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: J.R.W.      Drawn By: J.L.S.  
 Made By: J.L.S.      Checked By: J.S.  
 Date: 5-23-65      1965

# STANDARD M-614-TB

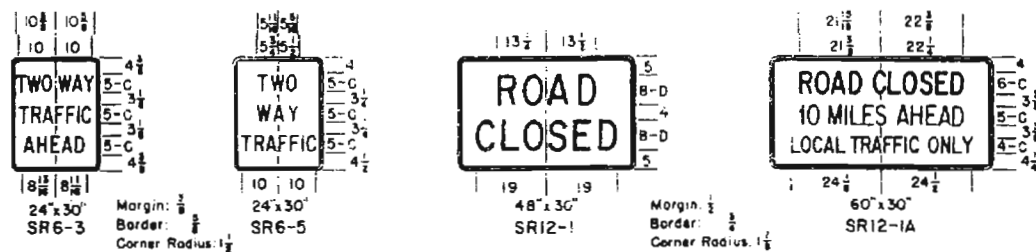
(SHEET 2 OF 3 SHEETS)

(JULY 1, 1965)

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

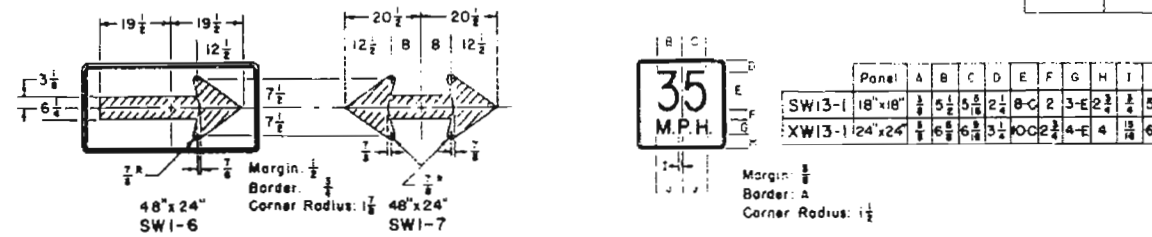
## REGULATORY SIGNS

See Note No. 9



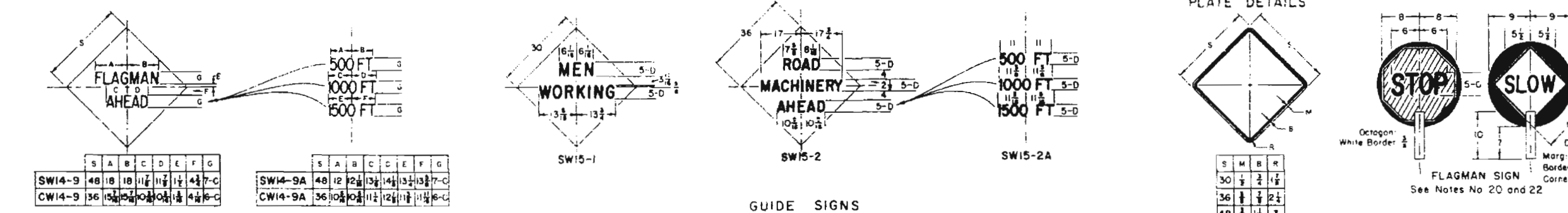
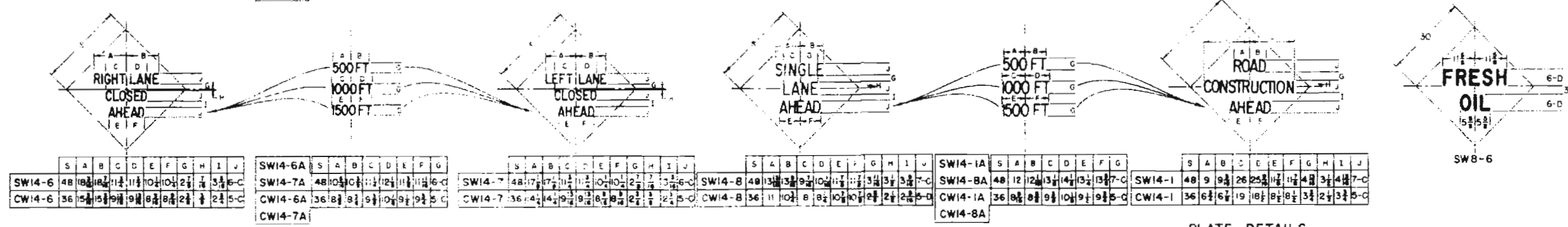
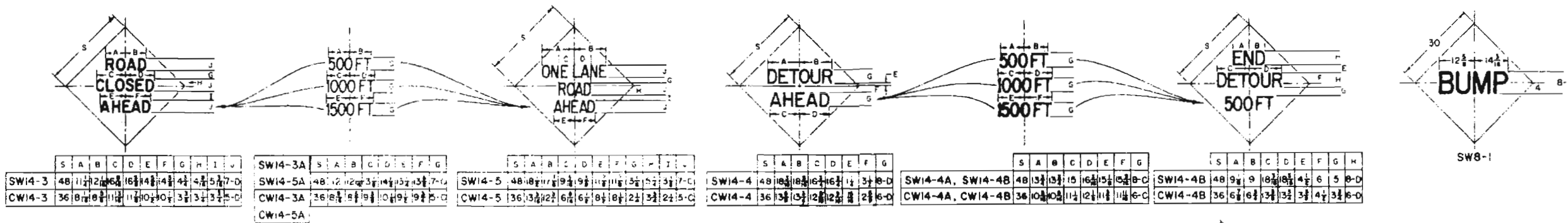
## WARNING SIGNS

See Note No. 10



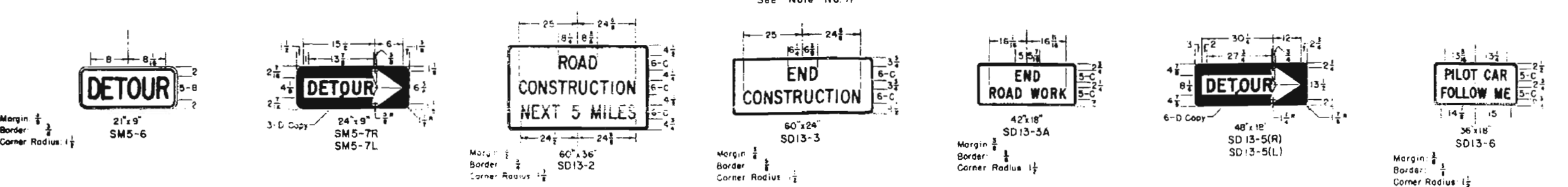
## WARNING SIGNS

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: T.H.A.  
Made By: H.B.D.  
Checked by: J.B.

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

# STANDARD M-614-TB

(SHEET 3 OF 3 SHEETS)

(JULY 1, 1965)

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
5	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. Contractors 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 506 of the Standard Specifications.
- Posts for regulatory, warning, and guide signs will normally be 4" x 4" or 6" x 6" 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 divided highways. Dual posting is required where warranted on two-lane, two-way highways. Sign "B" - This is the second advance warning sign and shall be placed 1,000 feet ahead of barricade or project terminal. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways. Sign "C" - This is the third advance warning sign in cases where barricades are used and shall be placed 500 to 750 feet ahead of barricade or potentially hazardous condition. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways. Sign "D" - SD13-2 - This sign shall be placed to mark the beginning of a Project of more than 2 miles in extent, where traffic is maintained through the project. It shall be placed singly and near the beginning of construction. Sign "E" - SD13-3 - This sign shall be placed to mark the end of the Project. It shall be placed singly and may be placed opposite barricade if desirable. Sign "F" - Construction identification signs shall be furnished and installed by the Department on all Federal-Aid and Forest Highway Projects where actual construction is in progress and visible to highway users. These signs should be located so as not to obscure or detract from the effectiveness of other official signs. Where two or more projects are contiguous the appropriate data may be included in one set of signs. Refer to appropriate "M" Standard (Identification Signs) for sign details. Signs A through F shall be furnished, installed and maintained by the Department.
- When Flags are used in lieu of the Flagman Sign, they shall be a minimum of 18"x18", made of a good grade of bright red material, and fastened securely to a staff of approximately 3 foot length. The free edge should be weighted to insure that the flag will hang vertically, even in heavy winds.
- (R-1) Each timber post shall be provided with a single hole drilled through the neutral axis normal to the roadway 3" above the ground level. The holes shall be  $\frac{1}{4}$ "  $\emptyset$  for 6"x6" and 1"  $\emptyset$  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.

