... DEPT OF HIGHWAYS
... D H ...
JANUARY ...

TITLE SHEET

R.O.W. obtained on F031-1(4)

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F031-1(5)	1	

COLORADO
DEPARTMENT OF HIGHWAYS

PLAN AND PROFILE OF PROPOSED
FEDERAL AID PROJECT NO. F 031-1(5)
STATE HIGHWAY NO. 115
EL PASO COUNTY

CONVENTIONAL SIGNS

- CENTER LINE (PLAN SHEET; TITLE & SHEET)
- RIGHT OF WAY LINE (R.O.W. MARKER)
- COUNTY LINE
- TOWNSHIP OR RANGE LINE
- LAND LINES (SECTION LINE; 1/4 SECTION LINE; 1/16 SECTION LINE)
- RAILROAD (TITLE SHEET; PLAN SHEET)
- BARBED WIRE FENCE
- COMBINATION WIRE FENCE
- SNOW FENCE
- TELEPHONE & TELEGRAPH LINES
- POWER LINE
- DETOUR
- PRESENT ROAD (Plan Sheets)

OP=OPENING

ACCESS DENIED BY DEED — Outside R.O.W. Line; 24'OP; 16'OP.

SCALES OF ORIGINAL DRAWINGS

ON PLAN. 1 IN. - 100 FT.
ON PROFILE. 1 IN. - 100 FT. HORIZONTAL
1 IN. - 10 FT. VERTICAL

GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD
GROSS LENGTH OF PROJECT / NET LENGTH OF PROJECT } 15,040.8 FT.- 2.849 MILES

INDEX OF SHEETS

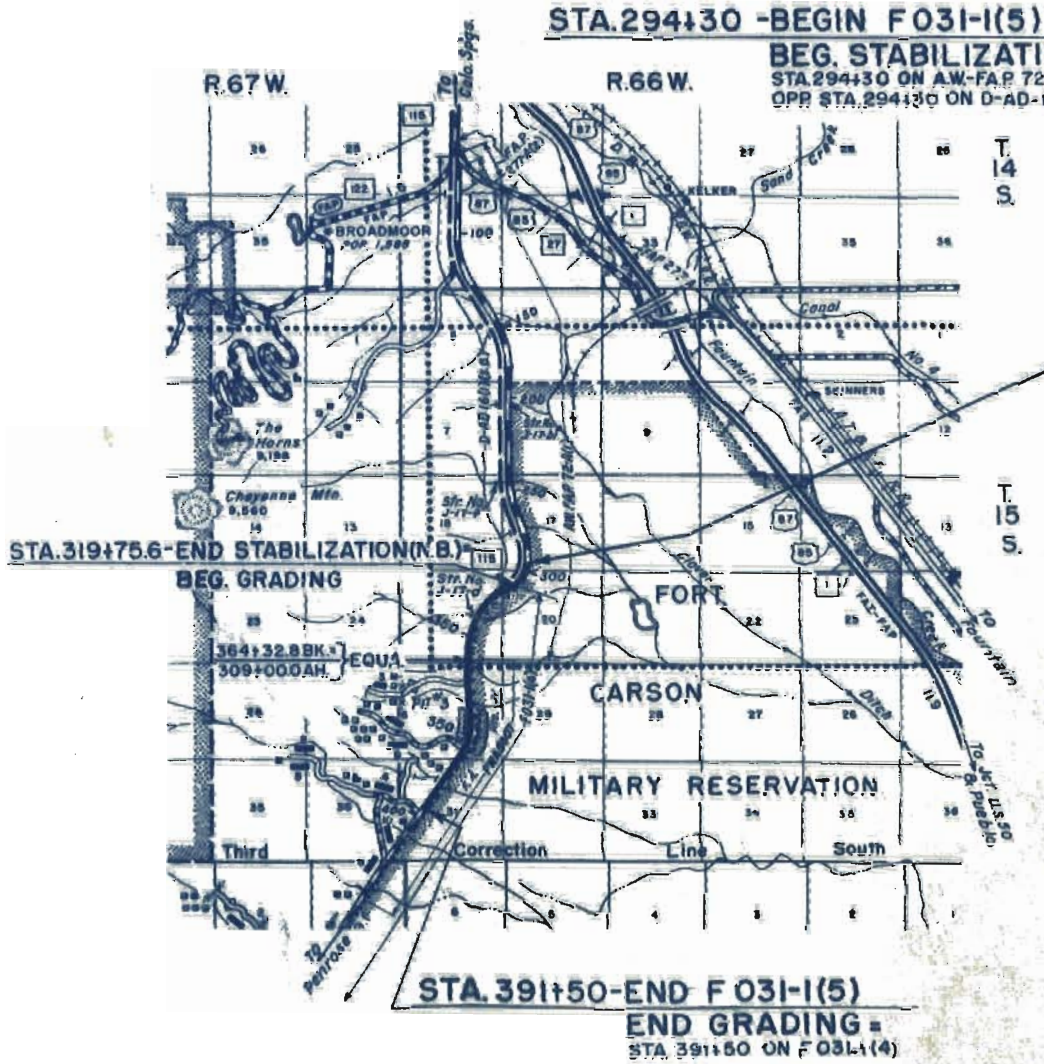
TABULATION OF LENGTH AND DESIGN DATA

	STATION	ROADWAY LIN. FT.		
STABILIZATION	294+30- BEGIN F031-1(5)= 294+30 ON A.W.-F.A.P. 72-A(1)= OPP. 294+30 ON D-AD 16 (1)	2,414.3		
	318+44.3 Bk.= 319+18.8 Ah. } EQUA.	56.8		
	319+75.6 - BEG. F031-1(4)(R.O.W.)= 318+23.6 - END D-AD-16(1)= 319+75.6 - ON A.W.-F.A.P. 72-A(1)	2,404.5		
	343+80.1 Bk.= 343+81.5 Ah. } EQUA.	1,647.4		
	360+28.9 Bk.= 360+33.0 Ah. } EQUA.	399.8		
GRADING	364+32.8 Bk.= 309+00.0 Ah. } EQUA. - END A.W.-F.A.P. 72-A(1)= BEG. P.W.A. 5007	1052.2		
	319+52.2 Bk.= 319+50.8 Ah. } EQUA.	4426.1		
	363+76.9 Bk.= 363+72.7 Ah. } EQUA.	184.7		
	365+57.4 Bk.= 366+93.0 Ah. } EQUA.	2,455.0		
	391+50- END F031-1(5)= 391+50 ON F031-1(4) (Beg. Const.)			
	TOTAL	15,040.8		

SUMMARY	LIN. FT.	MILES
Total Stabilization	2471.1	0.468
Total Grading	12,569.7	2.381
TOTAL ROADWAY (NET & GROSS)	15,040.8	2.849

DESIGN DATA

Maximum Degree of Curve	4°00'
Maximum Grade	7.00%
Minimum N.P.S.D. - Horizontal	790'
Minimum N.P.S.D. - Vertical	485'
Maximum Design Speed	60 M.P.H.



N

SCALE OF MILES

SEE SPECIAL PROVISIONS FOR NOTICE TO BIDDERS

COLORADO DEPARTMENT OF HIGHWAYS
APPROVED: Mark U. Watrous 11-20-61
CHIEF ENGINEER — DATE

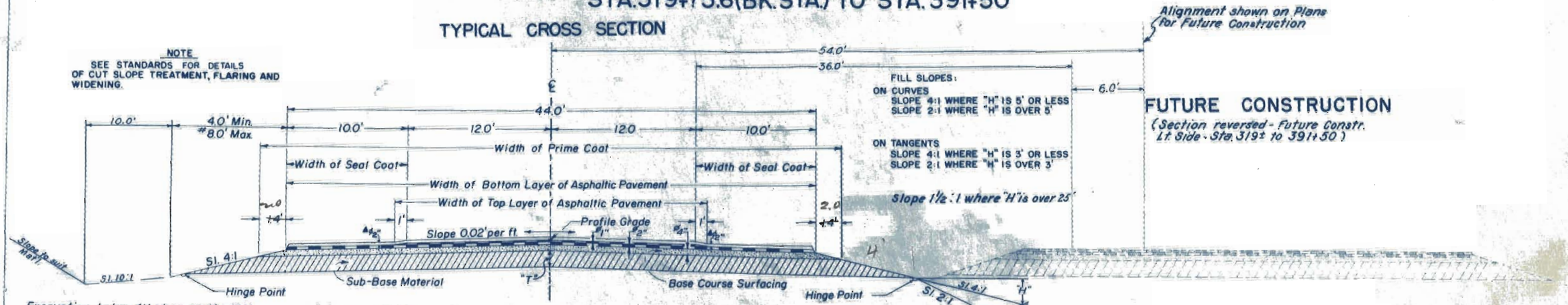
DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS
APPROVED. ________ DATE
DIVISION ENGINEER

R.S.M.

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F 031-1(5)	2	

TYPICAL CROSS SECTION OF IMPROVEMENT (GRADING)
STA. 319+75.6 (BK. STA.) TO STA. 391+50

TYPICAL CROSS SECTION



Excavation below 4:1 slope and/or 10:1 slope will not be permitted.

The depth and width of the side ditch shall be varied where necessary, in order to provide proper drainage and/or entrance to drainage structures.

Ø - Approximate Thickness

 # - Dimensions used for original quantities.

▲ - 2" Asphaltic Pavement - Future Construction

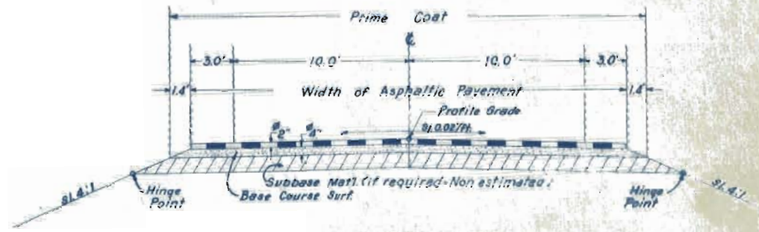
"T" - Design Thickness of Subbase Material. Material above the subgrade is to be constructed of Subbase Material. Locations designated, estimated quantities involved and thickness of material required, are tabulated in the Subbase Material Plan.

Surfacing Materials shall be placed in separate courses at the following rates per 100 lin. ft of roadway:

Plant Mixed Asphaltic Surfacing	(Top Layer)	15 tons
" " "	(Bottom Layer)	52 tons
Base Course Surfacing		101 tons

Bottom Layer of Asphaltic Surfacing shall be completed for full width before Top Layer of Asphaltic Surfacing is placed. Paving joints in Top Layer will overlap min. 1 ft. over joints in Bottom Layer.

FRONTAGE ROAD AND/OR ROAD APPROACH



GENERAL NOTES

THIS PROJECT IS TO BE CONSTRUCTED IN CONFORMITY WITH THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS, ADOPTED JANUARY 1, 1958.

ALL QUANTITIES ON PRELIMINARY PLANS ARE TO BE CONSIDERED APPROXIMATE ONLY.

ALL POLES ENCROACHING ON CONSTRUCTION ARE TO BE MOVED BY THE OWNERS.

ALL CURVES ARE TO BE SUPERELEVATED AND WIDENED AS PROVIDED BY THE STANDARD SUPERELEVATION SHEET INCLUDED WITH THE PLANS.

APPROXIMATE LOCATION AND QUANTITIES INVOLVED IN CONSTRUCTION OF INTERCEPTING DITCHES ARE TABULATED IN SUMMARY OF EARTHWORK QUANTITIES TABULATION.

ALL PIPE CROSS CULVERTS SHALL BE LAID WITHOUT HEADWALLS ON EITHER END UNLESS OTHERWISE NOTED ON THE PLANS.

ALL SIDE APPROACH ROADS SHALL BE PRIMED AND PAVED WITH 2" OF ASPHALTIC SURFACING TO A DISTANCE OUT FROM EDGE OF ASPHALTIC SURFACING AS FOLLOWS:
FIELD APPROACHES - 4 FT.
ALL OTHER APPROACHES - 50 FT. OR TO THE R.O.W. LINE, WHICHEVER IS LESS.

PRESENT GUARD POSTS AND OLD PROJECT MARKERS ARE TO BE REMOVED BY STATE FORCES.

PIPES DRAINING EMBANKMENT PROTECTORS AND BORROW DITCH DISCHARGE PIPES, SHALL BE COVERED IN ACCORDANCE WITH PARAGRAPH 453.13 OF ST'D. SPECIFICATIONS.

THICKNESS OF SUB-BASE, SURFACING AND ASPHALTIC PAVEMENT AS SHOWN ON PLANS IS APPROXIMATE ONLY. THESE MATERIALS ARE TO BE PLACED ON THE BASIS OF TONNAGE SHOWN ON PLANS.

IF EXCAVATION OPERATIONS DEVELOP MATERIALS WHICH WILL STAND ON SLOPES STEEPER THAN SLOPE STAKE LINES, THE DEPARTMENT RESERVES THE RIGHT TO CHANGE CUT SLOPES DURING THE PROGRESS OF SUCH EXCAVATIONS.

FOR PRELIMINARY PLAN QUANTITIES OF ASPHALTIC ROAD MATERIALS AND STONE SCREENINGS, THE FOLLOWING RATES OF APPLICATION WERE USED.

PRIME COAT MC	@ 0.40 GALS. PER SQ. YD.
PAVING ASPHALT	@ 6.1 % BY WEIGHT OF MIX
SEAL COAT RC	@ 0.35 GALS. PER SQ. YD.
STONE SCREENINGS TYPE	@ 23 LBS. PER SQ. YD.

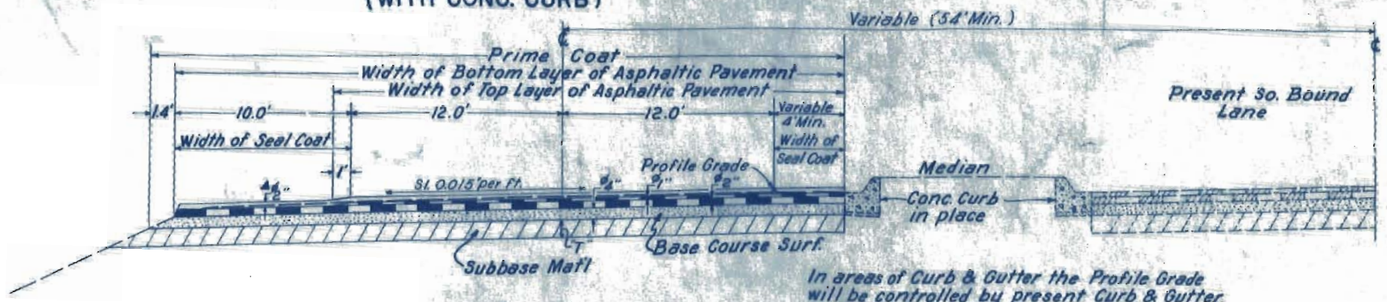
RATE OF APPLICATION AND GRADE OF ASPHALTIC MATERIAL SHALL BE AS DETERMINED BY THE ENGINEER AT TIME OF APPLICATION.

LIQUID ASPHALTIC ROAD MATERIAL APPLICATION METHODS WHICH RESULT IN DISCOLORATION OF CONCRETE STRUCTURES, WILL NOT BE PERMITTED.

DURING CONSTRUCTION OF THIS PROJECT, TRAFFIC WILL USE THE PRESENT TRAVELED ROADWAY.

TYPICAL CROSS SECTION OF IMPROVEMENT (STABILIZATION A.W.P.)
STA. 294+30 TO STA. 319+75.6 (BK. STA.)

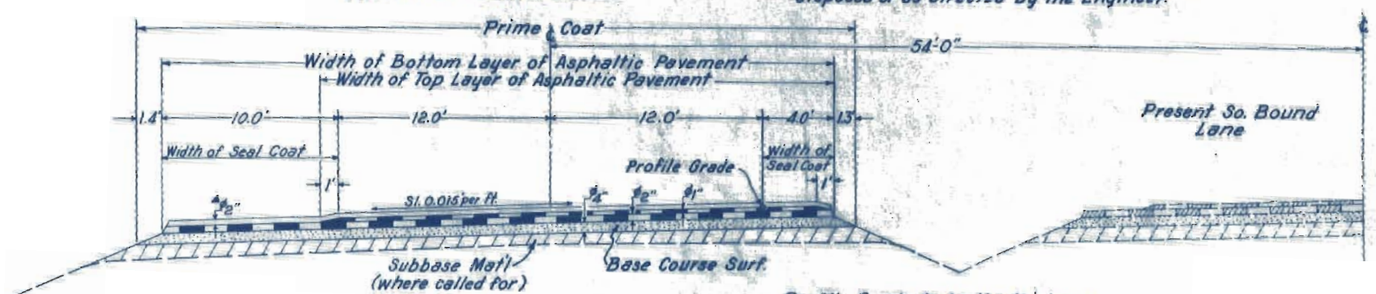
TYPICAL CROSS SECTION (WITH CONC. CURB)



In areas of Curb & Gutter the Profile Grade will be controlled by present Curb & Gutter. Material to be excavated to allow for Stabilization. For location and details of Conc. Curb. in place See Proj. D-AD 16(1).- Excavated Material to be disposed of as directed by the Engineer.

Areas of Conc. Curb & Gutter:
STA. 294+ to 299+

TYPICAL CROSS SECTION (WITHOUT CONC. CURB)



Profile Grade to be the thickness of Subbase, Base Course Surf. & Asph. Pavement, above present Mat.

Liquid Asphaltic Road Material application methods which result in discolorization of Concrete Curbs & Gutters will not be permitted.

Surfacing Materials shall be placed in separate courses at the following rates per Sq.Yd. of roadway.

Plant Mixed Asphaltic Surfacing (Top Layer)	0.054 Tons / Sq. Yd.
" " " (Bottom Layer)	0.106 Tons / Sq. Yd.
Base Course Surfacing	0.200 Tons / Sq. Yd.

Bottom Layer of Asphaltic Surfacing shall be completed for full width before Top Layer of Asphaltic Surfacing is placed. Paving joints in Top Layer will overlap min. 1 ft. over joints in Bottom Layer.

ø - Approximate Thickness
▲ - 2" Asphaltic Pavement - Future Construction

For Alignment and Grades of Stabilization Area see Projects:

A.W. F.A.P. 72-A(1)
D-AD 16(1) (for Conc. Curb & Gutters)

SUMMARY OF APPROXIMATE QUANTITIES

ITEM NO.	ITEM	UNIT							PROJECT TOTALS
10	Clearing and Grubbing Entire Project	Lump Sum							●
11	Removal of Bridge - Sta. 333+	" "							●
11	Removal of 4 Structures	" "							●
11	Reset Mail Boxes	" "							●
11	Plug Culverts	Each							1
12	Removing Fence	Lin. Ft.							24,500
12	Reset Gates	Each							2
13	Unclassified Excavation	Cu. Yd.							327,000
13	Unclassified Ditch Excavation	" "							1,000
13	Stripping	" "							5,000
14	Unclassified Structural Excavation-Miscellaneous	" "							1,020
16	Structure Backfill (Class 1)	Cu. Yd.							450
17	Compaction (Modified)	" "							352,000
17	Wetting	M Gal.							9,670
17	Water (Diluted Emulsified Asphalt)	M Gal.							230
18	Station Yard Overhaul	Sta. Yd.							1,604,000
18	Yard Mile Overhaul	Yd. Mi.							15,700
18	Ton Mile Overhaul	Ton Mi.							57,600
* 23	Subbase Material (Class 1)	Ton							41,800
26	Gravel or Crushed Rock Surfacing (Grading C)	"							16,000
* 19	Placing Topsoil	Cu. Yd.							13,000
29	Asphalt (120-150 Penetration)	Ton							760
30	Asphaltic Road Material MC (Prime)	Gal.							32,100
30	" " " RC (Seal)	"							10,200
31	Stone Screenings (Type 1)	Ton							340
32	Plant Mixed Asphaltic Surfacing	Ton							10,670
32	Plant Mixed Asphaltic Ditch Paving	"							450
32	Plant Mixed Asphaltic Shoulder Roll	"							120
51	Relaying 18" Pipe (C.M.P.)	Lin. Ft.							64
51	" 24" " "	" "							76
53	12" Corrugated Metal Culvert Pipe	Lin. Ft.							540
53	18" " " " "	" "							456
53	24" " " " "	" "							420
53	36" " " " "	" "							221
53	48" " " " "	" "							80
53	84" " " " "	" "							228
57	90" Multiple Plate Corrugated Metal Pipe Culvert	" "							74
63	Grouted Rubble Slope & Ditch Paving	Cu. Yd.							12
65	Concrete Slope & Ditch Paving	Cu. Yd.							104
71	8" Perforated Pipe Underdrain	Lin. Ft.							900
71	8" Unperforated Pipe Underdrain	Lin. Ft.							34
76	Barbed Wire Fence with Metal Posts	Lin. Ft.							26,000
76	Barbed Wire Gates	Each							1
77	Picket Snow Fence	Lin. Ft.							2,830
81	Right-of-Way Markers	Each							18
92	Timber Guard Posts	Each							156
93	Metal Embankment Protectors (Type 3)	"							11
95	18" Metal Aprons for Corrugated Metal Pipe Culverts	Each							4
95	24" " " " " " " "	"							5
95	36" " " " " " " "	"							1
	STATE FORCES (NON-FEDERAL AID)								
	Signing & Striping Entire Project	Lump Sum							●

COLORADO | F031-1(5) | 3

COLORADO STATE HIGHWAY DEPARTMENT
S H D Form 105
JANUARY 1955

LIST OF STRUCTURES

FED. ROAD DIVISION NO.	DISTRICT	PROJECT NO.	SHEET NO.	TOTAL SHEETS
8	COLO.	F031-1(5)	4	

LOCATION		REMOVE STRUCTURE	EXCAVATION (CUBIC YARDS)			UNCLASSIFIED STRUCTURAL EXCAVATION MISC. (CUBIC YARDS)	STRUCTURE BACKFILL (CUBIC YARDS)	SUB-BASE MATL. (CL. 1) (TONS)	GRAVEL OR CRUSHED ROCK SURFACING (TONS)	PL. MIX ASPH. SURF. (TONS)	CONCRETE (CUBIC YARDS)	REINFORCING STEEL (LBS.)	RELAYING PIPE (C.M.P.) (LIN. FT.)		CORRUGATED METAL CULVERT PIPE (LINEAR FEET)					PL. MIX ASPH. DITCH PAVING		8" PIPE UNDERDRAIN (LIN. FT.)		METAL APRONS FOR C.M.P. CULVERTS (NO.)			MISCELLANEOUS
		NO. KIND	UNCL.	EMB.	EXCL. DITCH						CL. "A"	CL. "B"	18"	24"	18"	24"	36"	48"	84"	TONS	PERF.	UNPERF.	18"	24"	36"	
326+22					10	5	2									12+1Δ								1		
333+00			300			15	284												114							
338+80				350		5	7		38	11			30		14+1Δ				114							Removal of Bridge Sta 333+
346+50					5	5	15							76										1		
355+40				190		2	3		29	11					30											
358+96 (Bk Sta)						3	6									26+1Δ										
320+36			65			5	8		20	10			34													
320±			⊙					ϕ	*	*																
323+15		1		90		4	5		20	10					30											
323+23				375					90	45																
325±				⊙				ϕ	*	*																
329+00					3	15	30											54+1Δ								
332+48					25	25	15											24+1Δ								
337+ to 338+						60									100Δ=			32+1Δ						1		
338+ to 352+						545												22+1Δ								104 Cu. Yds. Conc. Sl. & Ditch Paving
338+ to 347+																					900	34				
340+64						45									120									1		1- Plug Culverts
341+ to 343+																										5 Cu. Yds. of Gr. Rubble Sl. & Ditch Pav.
343+ to 352+																			71							
354±			⊙					ϕ	*	*																
355+10			850						120	30																
357+			⊙			15	10	ϕ	*	*								28+1Δ								
357+44					30																					
359+			275	5		8	6		45	11						30										
362+ to 372+																			78							
362+ to 374+																			116							
371±			⊙					ϕ	*	*																
372+ to 373+						30									100									1		
373+30			{1300			15	10		186	30					60									1		
374+75		1	{783Φ					ϕ	*	*																
376±				⊙																						
378+75		2	250			10	8																			{32 Lin. Ft. of 90° Mult. Pl. C.M.P. Culv. (86 Ga.)
378±			(Shown in Summary of Earthwork Quantities)			75																				{42 " " " " " " " (12 Ga.)
383+ to 384+																		136						1		
384+66						15	21								100									2		
384+ to 394+				170		75	13		30	11					250				80					1		5 cu. yds. Gr. Rubble Sl. & Ditch Pav.
384+50																			104							
384+ to 397+																										
	From Shoulder Roll Tabulation					38																				160 Cu. Yds. of Gr. Rubble Sl. & Ditch Pav.
	For Quantities of - Metal Emb. Protectors, 12" C.M.P.'s and Asph. Sh. Roll, see Shoulder Roll Tabulation.																									
TOTALS		4	3,040	1,180	73	1,015	445		576	169			64	76	456	420		221	80	228	449	900	34	4	5	1	

⊙ = Included in Profile Quantities.
Δ = Allowance for Connecting Band.
≠ = Internal Connecting Band.
* = Included in Surfacing Plan.
Φ = Included in Profile Quantities as Borrow.
= Includes Allowance for Underdrain Connection. (See Sheet 9)
ϕ = Included in Subbase Plan.
℄ = Includes Angle Section (See Sheet 9)

6	COLORADO	F 031-1(5)	6

It is estimated that material for Subbase and/or Surfacing for the Project is available in the vicinity of the Pit indicated in the following tabulations. Estimated quantities involved in these operations are shown below.

Alteration of the Subbase Material Plan and/or Surfacing Plan as here outlined will be allowed only on written permission from the Department.

SUBBASE PLAN

	MATERIAL TO BE PLACED	SOURCE	AVAIL. CU. YDS.	✱ "T" THICKNESS APPROX. INCHES	QUANTITY CLASS-1 TONS	OVERHAUL TON MILES
Stabilization	Appr. to Proj.	Pit No. 3 100 ft. to Sta. 350+00 (Ah. Sta.)	150,000 cu.yds.		100	211
	294+30 to 298+80	"R"= 76+		13	1,333	3,210
	308+00 to 318+44.3 Bk.			4	1,053	1,841
	319+18.8 Ah. to 319+75.6			4	53	87
Grading	319+75.6 to 333+50			6	2,254	3401
	333+50 to 343+80.1 Bk.	Pit No. 3		15	4,481	5,740
	343+81.5 Ah. to 360+28.9 Bk.	100 ft. to		15	7,166	7,363
	360+33.0 Ah. to 364+32.8 Bk.	Sta. 350+00		15	1,739	1,450
	309+00.0 Ah. to 319+52.2 Bk.	(Ah. Sta.)		15	4,577	3,186
	319+50.8 Ah. to 325+00	"R"= 76+		15	2,389	1,301
	325+00 to 344+00			6	3,116	974
	344+00 to 350+00			10	1,680	127
	350+00 to 354+00			10	1,120	64
	354+00 to 363+76.9 Bk.			6	1,602	300
	363+72.7 Ah. to 365+57.4 Bk.			6	303	90
	366+95.0 Ah. to 391+50			6	4,026	2,203
	Estimated For: Accel. & Decel. Lanes				922	365
	Crest Widening				70	11
	Irreg. in Subgrade				3,545	2,658
	TOTALS				41,751	34,582

T - Based on Curve "D" of C.D.H. Design.

SURFACING PLAN

	MATERIAL TO BE PLACED	SOURCE	AVAIL. CU. YDS.	QUANTITY TONS USED PLANT MIX	QUANTITY TONS USED BASE COURSE	OVERHAUL TON MILES PLANT MIX	OVERHAUL TON MILES BASE COURSE
Stabilization	Appr. to Proj.	Pit No. 3 100 Ft. to Sta. 350+00 (Ah. Sta.) "R"= 81+	150,000 Cu. Yds.	30	50	63	106
	294+30 to 298+80			284	355	586	733
	298+80 to 308+00			570	810	1,103	1,567
	308+00 to 318+44.3 Bk.			647	919	1,131	1,607
	319+18.8 Ah. to 319+75.6			36	50	59	82
	Estimated For: Corr. Irreg. (298+80 to 308+00)				81		158
Grading	319+75.6 to 343+80.1 Bk.	Pit No. 3		1,611	2429	2273	3428
	343+81.5 Ah. to 360+28.9 Bk.	100 Ft. to		1,104	1,664	1,134	1,710
	360+33.0 Ah. to 364+32.8 Bk.	Sta. 350+00		268	404	223	337
	309+00.0 Ah. to 319+52.2 Bk.	(Ah. Sta.)		705	1063	491	740
	319+50.8 Ah. to 350+00	"R"= 81+		2043	3080	629	948
	350+00 to 363+76.9 Bk.			923	1391	138	208
	363+72.7 Ah. to 365+57.4 Bk.			124	187	37	56
	366+95.0 Ah. to 391+50			1,645	2480	900	1,357
	Estimated For: Accel. & Decel. Lanes			500	423	179	151
	From List of Struct.			169	578	117	400
	Asphaltic Shoulder Roll			✱		80	
	Asphaltic Ditch Paving			△		183	
	TOTALS			10,659	15,964	9,326	13,588

✱ = See Asph. Sh. Roll Tab. for Quantities (This Sheet). △ - See List of Structures for Quantities.

TABULATION OF ASPHALTIC SHOULDER ROLL AND METAL EMBANKMENT PROTECTORS

LOCATION	UNCLASSIFIED STRUCTURAL EXCAVATION MISC. CU. YDS.	GROUTED RUBBLE SL. & DITCH PAVING CU. YDS. CL. "A"	CORRUGATED METAL CULVERT PIPE LIN. FT. 12"	ASPHALTIC SHOULDER ✱ ROLL LIN. FT.	METAL EMBANK. PROTECTORS TYPE "3" EA.
332+50 - 341+50 (Bk. Sta.) Lt.				900	
332+60 (Bk. Sta.)	1		12		1
356+00 (Bk. Sta.) - 310+00 (Ah. Sta.) Lt.				933	
356+10 (Bk. Sta.) Lt.	1		8		1
360+00 (Bk. Sta.) Lt.	1		18		1
323+50 (Ah. Sta.) - 337+00 Rt.				1350	
323+60 Rt.	1		16		1
329+10 Rt.	6	0.40	36		1
324+00 - 338+50 Lt.				1450	
324+10 Lt.	1		20		1
331+00 Lt.	8	0.40	74		1
340+50 - 343+50 Lt.				300	
340+60 Lt.	2		34		1
372+00 - 387+00 Lt.				1,500	
377+38.6 Lt.	8	0.40	134		1
374+00 - 384+20 Rt.				1,020	
377+38.6 Rt.	8	0.40	134		1
384+80 - 388+00 Rt.				320	
384+90 Rt.	1		14		1
TOTALS	⊖38	⊖1.60	540	7,773 = 1.15 Tons	11

✱ = See Surfacing Plan for Overhaul.
⊖ = Included in List of Structures.

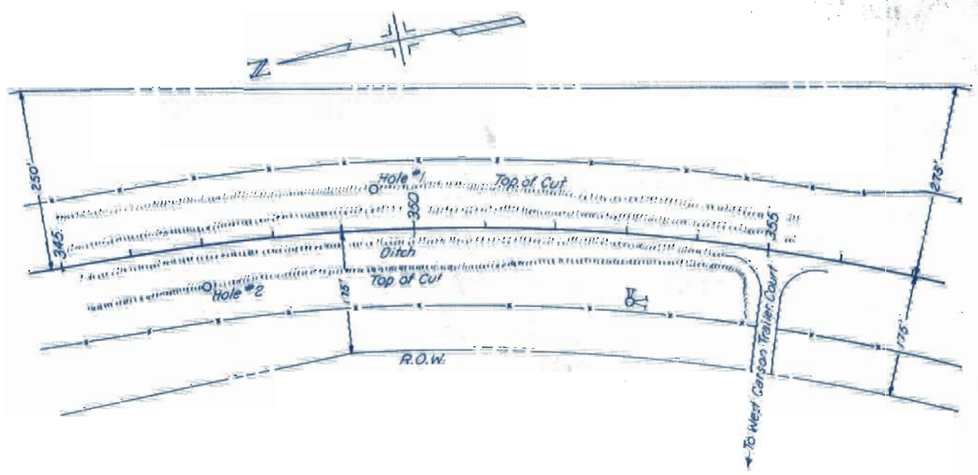
COLORADO DEPARTMENT OF HIGHWAYS
Form C. D. H. 126
JANUARY 1960

PIT LOCATION

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F031-1(5)	6	

PIT NO. 3

LOCATION	Within R.O.W. Sta. 350 ± (Mn. Stations) S.E. 1/4, Sec. 30, T. 15 S., R. 66 W.
OWNER	Colorado Department of Highways
QUANTITY AVAILABLE	150,000 Cu. Yds.
PROPOSED USE	Subbase & Surfacing
HAUL DISTANCE	100' to Sta. 350+00
SAMPLE NO.	2084
ESTIMATED FOR STRIPPING	5,000 Cu. Yds.



LOG OF PIT - SAMPLE NO. 2084

TEST NO.	DEPTH IN FEET	DESCRIPTION OF TEST HOLE MATERIAL
1	0.0'-5.0'	Overburden
1A	5.0'-20.0'	Sand & Gravel
2	0.0'-5.0'	Overburden
2A	5.0'-25.0'	Sand & Gravel

REGION NO.	DISTRICT			
9	COLORADO	FO31-1(5)	7	

SUMMARY OF SOIL PROFILE

Soil data shown is obtained from the best available testing laboratory information. This information is shown for the convenience of the Contractor and the Department does not guarantee the accuracy of these tests. If materials not conforming to the data shown are encountered during construction, the stabilization plan will be modified where necessary to secure dense stable embankments.

TEST NO.	LOCATION	DEPTH FT.	%-200	L.L.	P.I.	SOIL CLASS	REPRESENTS	C.B.R.	"R" VALUE
–	Comp. Surf.		10	23	5	A-1-b (0)	Sta. 41+00 to 66+00		76
4	Comp. Surf.		16	29	12	A-2-6 (0)	Sta. 66+00 to 150+00		49
3	" "		12	26	7	A-2-4 (0)	Sta. 150+00 to 200+00		62
2	" "		13	24	5	A-1-b (0)	Sta. 200+00 to 260+00		59
1	" "		14	25	6	A-1-b (0)	Sta. 260+00 to 318+07		73
26	42+00	0.0 - 0.4				O.M.	Sta. 40+50 to 46+00		
26A		0.4 - 0.8				Surf.			
26B		0.8 - 3.5	45	25	6	A-4 (2)			
25	52+00	0.0 - 0.2				O.M.	Sta. 46+00 to 56+00		
25A		0.2 - 1.2				Surf.			
25B		1.2 - 3.0	Sim. to #18 B			A-7-6 (17)		2.2	
24	62+00	0.0 - 0.2				O.M.	Sta. 56+00 to 66+00		
24A		0.2 - 1.4				Surf.			
24B		1.4 - 3.0	Sim. to #18 B			A-7-6 (17)		2.2	
23	72+00	0.0 - 0.2				O.M.	Sta. 66+00 to 80+00		
23A		0.2 - 1.4				Surf.			49
23B		1.4 - 4.0	Sim. to #18 B			A-7-6 (17)		2.2	
22	84+00	0.0 - 0.2				O.M.	Sta. 80+00 to 90+00		
22A		0.2 - 1.4				Surf.			49
22B		1.4 - 4.0	Sim. to #18 B			A-7-6 (17)		2.2	
21	94+00	0.0 - 0.2				O.M.	Sta. 90+00 to 100+00		
21A		0.2 - 1.4				Surf.			49
21B		1.4 - 3.0	Sim. to #18 B			A-7-6 (17)		2.2	
20	104+00	0.0 - 0.2				O.M.	Sta. 100+00 to 115+00		
20A		0.2 - 1.2				Surf.			49
20B		1.2 - 3.5	Sim. to #18 B			A-7-6 (17)		2.2	
19	117+00	0.0 - 0.2				O.M.	Sta. 115+00 to 126+00		
19A		0.2 - 1.2				Surf.			49
19B		1.2 - 3.0	Sim. to #18 B			A-7-6 (17)		2.2	
18	127+00	0.0 - 0.2				O.M.	Sta. 126+00 to 136+00		
18A		0.2 - 1.2				Surf.			49
18B		1.2 - 3.5	99	51	27	A-7-6 (17)		2.2	
17	138+00	0.0 - 0.2				O.M.	Sta. 136+00 to 146+00		
17A		0.2 - 1.2				Surf.			49
17B		1.2 - 3.0	Sim. to #13 B			A-7-6 (12)		2.7	
16	148+00	0.0 - 0.2				O.M.	Sta. 146+00 to 156+00		
16A		0.2 - 1.2				Surf.			
16B		1.2 - 3.0	Sim. to #13 B			A-7-6 (12)		2.7	
15	160+00	0.0 - 0.2				O.M.	Sta. 156+00 to 166+00		
15A		0.2 - 1.2				Surf.			62
15B		1.2 - 3.0	Sim. to #13 B			A-7-6 (12)		2.7	
14	170+00	0.0 - 0.2				O.M.	Sta. 166+00 to 177+00		
14A		0.2 - 1.2				Surf.			62
14B		1.2 - 3.0	Sim. to #13 B			A-7-6 (12)		2.7	
13	181+00	0.0 - 0.2				O.M.	Sta. 177+00 to 189+00		
13A		0.2 - 1.2				Surf.			62
13B		1.2 - 3.5	99	42	20	A-7-6 (12)		2.7	
12	190+00	0.0 - 0.2				O.M.	Sta. 189+00 to 197+00		
12A		0.2 - 1.2				Surf.			62
12B		1.2 - 3.0	Sim. to #8 B			A-7-6 (12)		2.7	
11	200+00	0.0 - 0.2				O.M.	Sta. 197+00 to 207+00		
11A		0.2 - 1.2				Surf.			
11B		1.2 - 3.0	Sim. to #8 B			A-7-6 (12)		2.7	
10	210+00	0.0 - 0.2				O.M.	Sta. 207+00 to 217+00		
10A		0.2 - 1.4				Surf.			59
10B		1.4 - 3.5	Sim. to #8 B			A-7-6 (12)		2.7	

TEST NO.	LOCATION	DEPTH FT.	%-200	L.L.	P.I.	SOIL CLASS	REPRESENTS	C.B.R.	"R" VALUE
9	222+00	0.0 - 0.2				O.M.	Sta. 217+00 to 228+00		
9A		0.2 - 1.2				Surf.			59
9B		1.2 - 3.5	Sim. to #8 B			A-7-6 (12)		2.7	
8	234+00	0.0 - 0.2				O.M.	Sta. 228+00 to 238+00		
8A		0.2 - 1.4				Surf.			59
8B		1.4 - 3.0	98	43	19	A-7-6 (12)		2.7	
7	240+00	0.0 - 0.2				O.M.	Sta. 238+00 to 252+00		
7A		0.2 - 1.2				Surf.			59
7B		1.2 - 3.0	Sim. to #5 B			A-7-6 (16)		2.3	
6	253+00	0.0 - 0.2				O.M.	Sta. 252+00 to 262+00		260+00
6A		0.2 - 1.2				Surf.			
6B		1.2 - 3.0	Sim. to #5 B			A-7-6 (16)		2.3	
5	264+00	0.0 - 0.2				O.M.	Sta. 262+00 to 272+00		
5A		0.2 - 1.2				Surf.			73
5B		1.2 - 4.0	100	50	26	A-7-6 (16)		2.3	
4	275+00	0.0 - 0.2				O.M.	Sta. 272+00 to 283+00		
4A		0.2 - 1.4				Surf.			73
4B		1.4 - 4.0	42	37	19	A-6 (4)		4.3	
3	288+00	0.0 - 0.2				O.M.	Sta. 283+00 to 298+00		
3A		0.2 - 1.1				Surf.			73
3B		1.1 - 3.0	Sim. to #1 B			A-7-6 (12)		2.7	
2	303+00	0.0 - 0.2				O.M.	Sta. 298+00 to 308+00		
2A		0.2 - 1.1				Surf.			73
2B		1.1 - 3.0	Sim. to #1 B			A-7-6 (12)		2.7	
1	310+00	0.0 - 0.2				O.M.	Sta. 308+00 to 318+07		
1A		0.2 - 0.8				Surf.			73
1B		0.8 - 3.0	99	43	19	A-7-6 (12)		2.7	

FENCING REQUIREMENTS

STATION	SIDE	REMOVE FENCE	BUILD FENCE	GATES	
			BARBED WIRE	BARBED WIRE	RESET
		LIN. FT.	LIN. FT.	EACH	EACH
ON APPR. TO PROJECT 305+34.3 to 318+23.6 Bk.	Lt.	1,420	1,440		
319+75.6 Ah. to 364+32.8 Bk.	Lt.	4,370			
309+00 Ah. to 382+00	Lt.	7,390			
320+60 to 364+32.8 Bk.	Rt.	4,450			
309+00 Ah. to 320+03	Rt.	1,100			
320+55 to 322+00	Rt.	150			
324+27 to 354+60	Rt.	3,050			
355+62 to 382+00	Rt.	2,500			
319+75.6 Ah. to 364+32.8 Bk.	Lt.		4,300		
309+00 Ah. to 382+00	Lt.		8,990		
320+60 to 364+32.8 Bk.	Rt.		4,470		
309+00 Ah. to 320+03	Rt.		145		
320+55 to 321+98	Rt.		1,135		
324+27 to 354+95	Rt.		3,050		
355+25 to 359+45	Rt.		400		
359+85 to 382+00	Rt.		2,070		
338+80 (Bk. Sta.) 323+23 (Ah. Sta.)	Rt. Lt.				1 1
375+00	Rt.			1	
From Snow Fencing Tabulation		35			
TOTAL		24,465	26,000'	1	2

TIMBER GUARD POSTS

STATION	SIDE	SPACING	NO.
321+50 to 345+40	Rt.	3° Curve	24
332+35 to 339+40	Lt.	3° Curve	9
346+50	Lt. & Rt.	Culvert	2
347+40 (Bk. Sta.) to 310+55 (Ah. Sta.)	Rt.	3° Curve	18
356+80 (Bk. Sta.) to 310+55 (Ah. Sta.)	Lt.	3° Curve	8
322+50 to 324+50	Lt.	200'	2
326+00 to 328+00	Lt.	100'	3
328+50 to 338+00	Lt.	50'	20
324+00 to 326+00	Rt.	200'	2
327+00 to 338+00	Rt.	50'	12
338+90 to 342+90	Lt.	2° Curve	3
353+25 to 360+60	Lt.	2° Curve	8
356+40 to 358+50	Rt.	2° Curve	3
371+50 to 373+50	Lt.	100'	3
374+50 to 383+00	Lt.	50'	18
384+00 to 385+00	Lt.	100'	2
374+50 to 375+50	Rt.	100'	2
376+00 to 384+00	Rt.	50'	17
TOTAL			156

SNOW FENCING

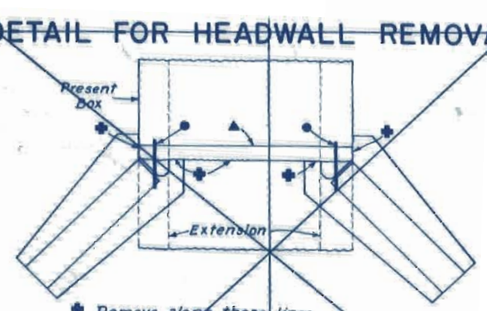
STATION	SIDE	REMOVE FENCE	BUILD FENCE
		LIN. FT.	LIN. FT.
339+00 to 339+35 (Ah. Sta.)	Rt.	35	
345+ to 354+ (Ah. Sta.)	Rt.		900
359+ to 374+ (Ah. Sta.)	Rt.		1,380
386+ to 391+ (Ah. Sta.)	Rt.		550
TOTAL		Ø 35	2,830

Ø: Add to Fence Removal.

R.O.W. MARKERS

STATION	SIDE	NO.
T.S. 327+06.8	Lt. & Rt.	2
S.T. 343+80.1	" "	2
T.S. 348+93.9	Lt. & Rt.	2
S.T. 360+28.9	" "	2
P.C. 314+48.9	Lt. & Rt.	2
P.T. 319+52.2	" "	2
T.S. 344+82.7	Lt. & Rt.	2
S.T. 363+76.9	" "	2
390+00	Lt. & Rt.	2
TOTAL		18

DETAIL FOR HEADWALL REMOVAL



✤ Remove along these lines.

▲ Headwall is to be removed when Fill over Headwall is less than 1 ft.

● 2 ft. Reinforcing Bars to be placed at every Longitudinal Bar shown on the Standard. Size to be same as Longitudinal Bars. Tie Bars are to be grouted in place by a Cement Grout composed of one part Cement and two parts clean well graded sand.

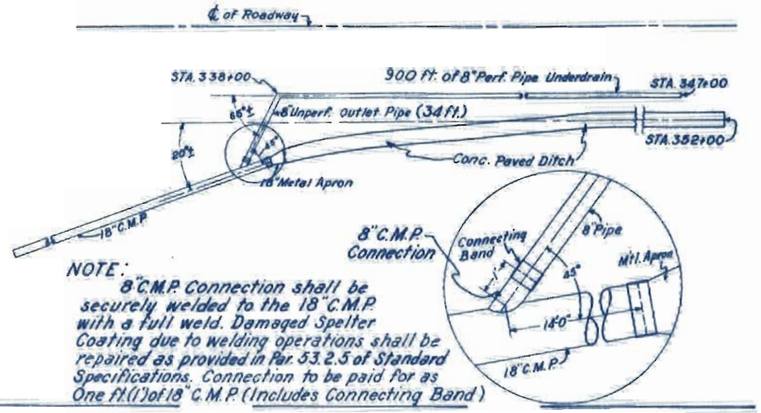
The Cost of drilling Holes and placing Tie Bars is to be included in payment for "Removal of Headwalls".

COLORADO DEPARTMENT OF HIGHWAYS
Form C. D. H. 126
APRIL 1959

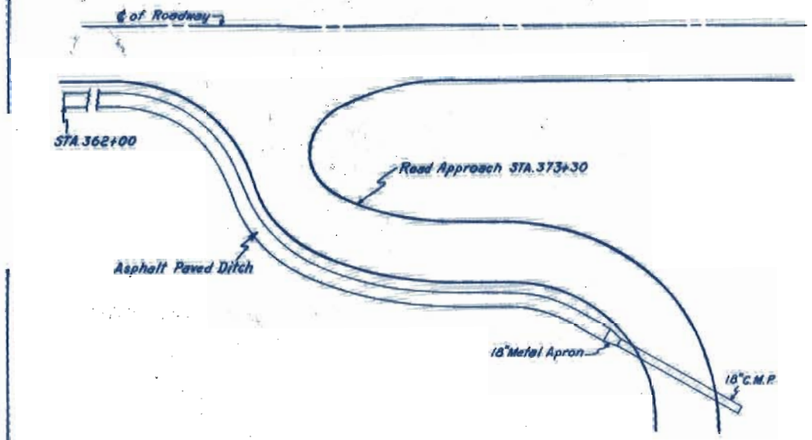
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	F031-1(6)	9	

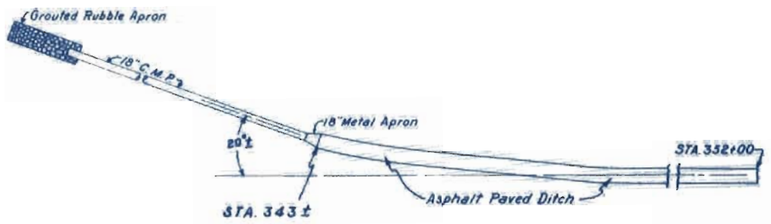
PERFORATED UNDERDRAIN & BORROW DITCH PAVING

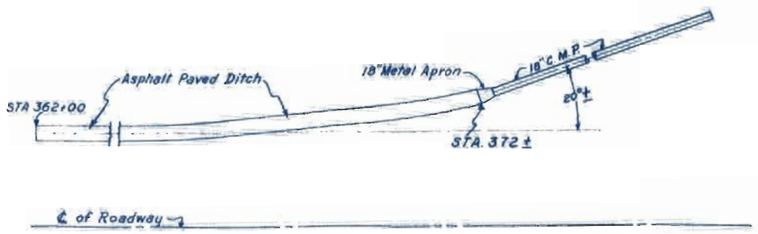
LOCATIONS

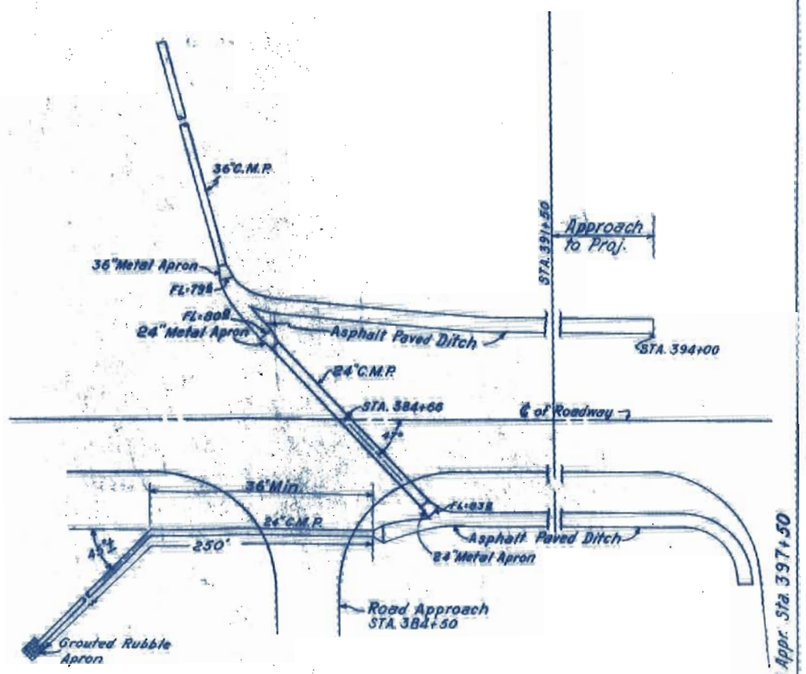


NOTE:
8" C.M.P. Connection shall be securely welded to the 18" C.M.P. with a full weld. Damaged Spelter Coating due to welding operations shall be repaired as provided in Par. 53.2.5 of Standard Specifications. Connection to be paid for as One ft.(1) of 18" C.M.P. (Includes Connecting Band)



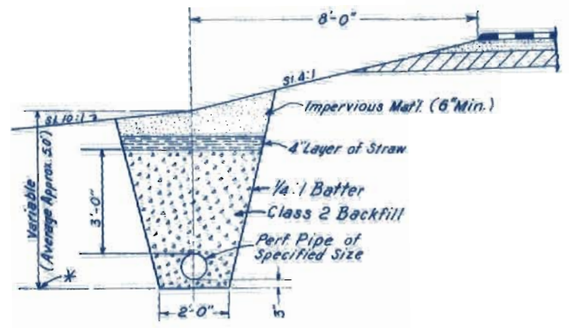






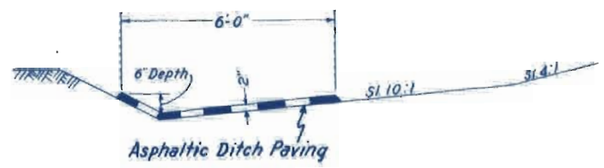
TYPICAL SECTIONS

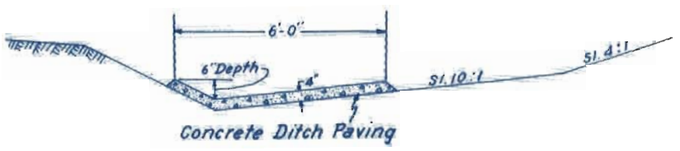
PERFORATED UNDERDRAIN



*-Sta 384+ to 391+ to be in Shale

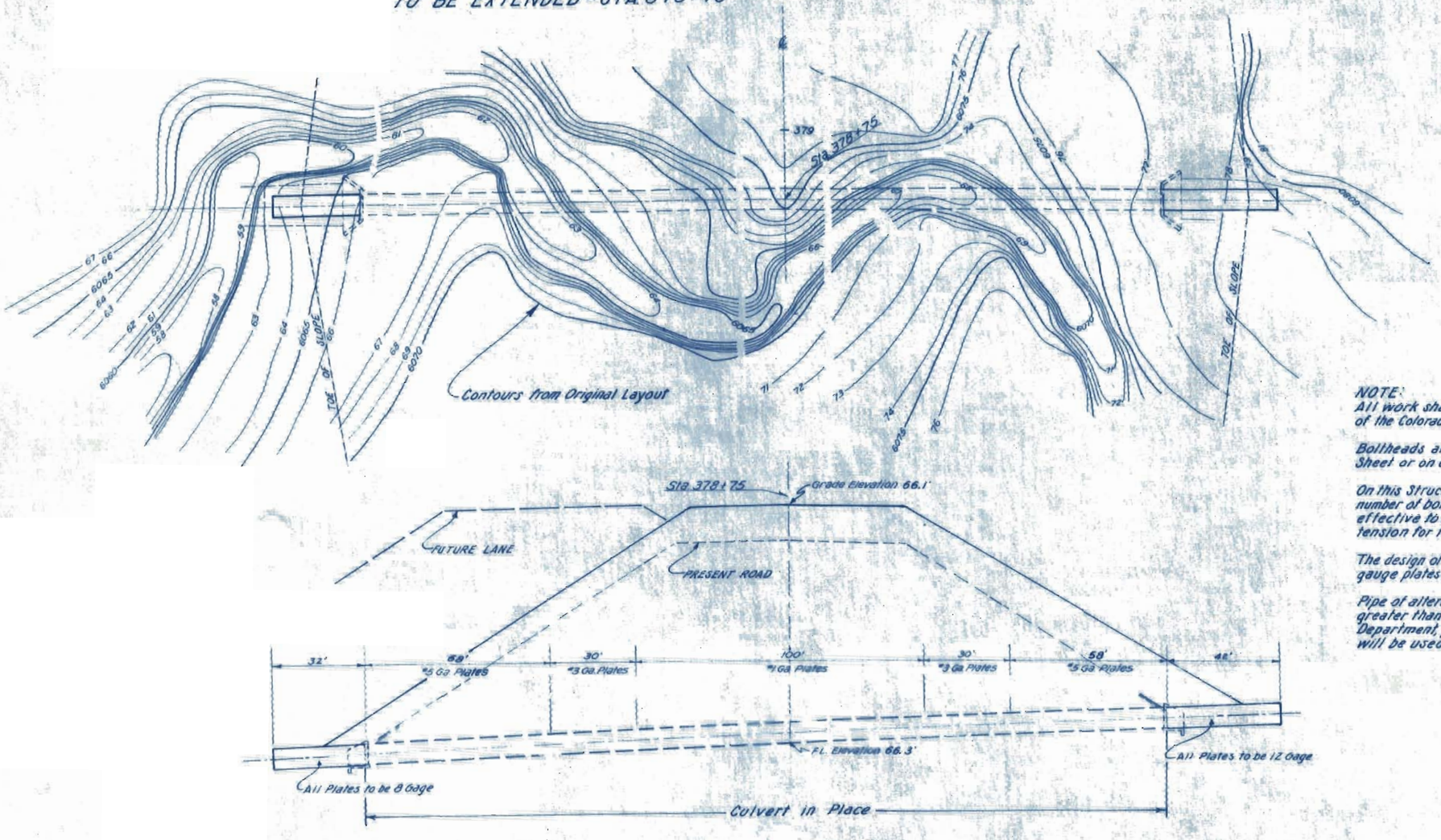
BORROW DITCH PAVING





	COLO.	F031-1(5)	10

DETAILS AND LAYOUT OF 90" MULTIPLE PLATE CULVERT TO BE EXTENDED at STA. 378+75



NOTE:
All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to this project.

Boltheads and washers shall be of the type designated on Standard Sheet or on equivalent type subject to the approval of the Department.

On this structure the longitudinal joint shall be secured with a sufficient number of bolts of adequate strength to develop a joint which will be effective to an ultimate strength of 90,000 lbs. per linear foot in shear tension for the 8 Gage and 36,000 lbs. for the 12 Gage.

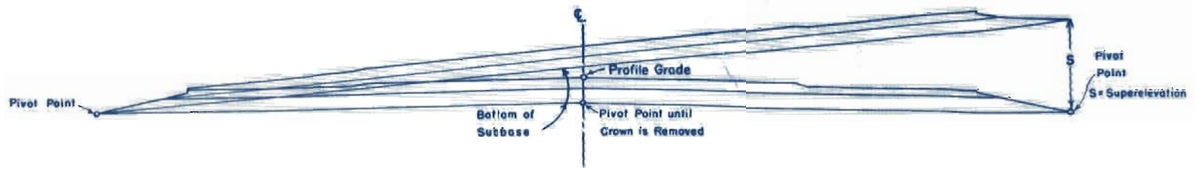
The design of plates is based on a section modulus of 0.0888 for No.8 gauge plates and 0.0574 for No.12 gauge plates.

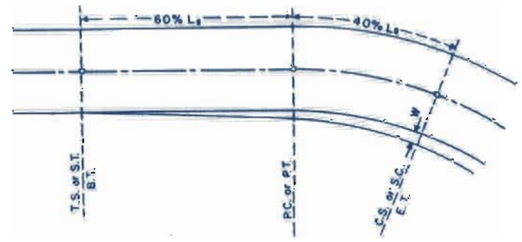
Pipe of alternate design having a section modulus equivalent to or greater than that shown above may be used, after approval by the Department, provided that no plates lighter than those shown will be used.

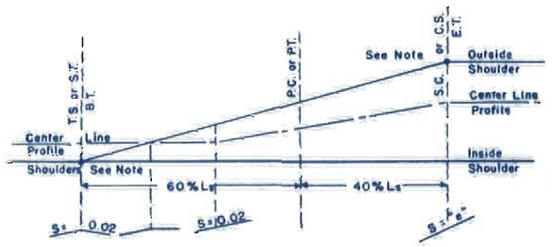
Form C. D. H. 128
JANUARY 1960

STANDARD M-1-D

FEDERAL ROAD REGION NO.	DISTRICT	PROJECT NO.	SHEET NO.
9	COLORADO	F031-1 (5)	11







● 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 superelevation 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°	5.5 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 superelevation.

REVISIONS		
4-20-60	e=0.10 & GENERAL	S.B.L.
5-1-61	GENERAL	S.B.L.

SUPERELEVATION RATES FOR TWO LANE CROWNED SECTION
TABLE 1

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

NOTES—Plains Areas use 0.10 Maximum Superelevation Rate.
Mountainous Areas & areas where icing conditions frequently exist, use 0.08 Maximum Superelevation 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 Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition or Spiral	
	0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		
0°15'	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	0°15'
0°30'	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	R C	R C	150'	R C	R C	200'	R C	R C	200'	0°30'
0°45'	N C	N C	0	N C	N C	0	R C	R C	150'	R C	R C	150'	R C	R C	150'	R C	R C	200'	R C	R C	200'	0°45'
1°00'	N C	N C	0	R C	R C	150'	R C	R C	150'	R C	R C	150'	R C	R C	150'	.021	.021	200'	.022	.022	200'	1°00'
1°30'	R C	R C	100'	R C	R C	150'	R C	R C	150'	.023	.024	150'	.027	.027	150'	.031	.031	200'	.035	.034	200'	1°30'
2°00'	R C	R C	100'	R C	.021	150'	.025	.027	150'	.030	.032	150'	.035	.036	150'	.041	.042	200'	.047	.046	200'	2°00'
2°30'	R C	R C	100'	.025	.026	150'	.030	.033	150'	.036	.039	150'	.043	.045	150'	.050	.052	200'	.057	.059	200'	2°30'
3°00'	.023	.024	100'	.029	.031	150'	.035	.038	150'	.042	.046	150'	.050	.054	150'	.057	.062	200'	.066	.070	200'	3°00'
3°30'	.026	.027	100'	.033	.035	150'	.040	.045	150'	.048	.053	150'	.056	.063	150'	.064	.072	200'	.072	.081	250'	3°30'
4°	.029	.030	100'	.037	.040	150'	.044	.050	150'	.053	.060	150'	.062	.070	200'	.069	.079	200'	.076	.090	250'	4°
5°	.035	.038	100'	.044	.048	150'	.053	.060	150'	.062	.071	200'	.070	.083	200'	.077	.091	250'	.080	.099	300'	5°
6°	.041	.044	100'	.050	.056	150'	.060	.068	150'	.069	.080	200'	.076	.093	250'	.080	.098	250'		.100	300'	6°
7°	.045	.050	100'	.056	.063	150'	.066	.076	150'	.074	.088	200'	.079	.097	250'		.100	250'				7°
8°	.050	.055	100'	.061	.069	150'	.071	.084	200'	.078	.094	200'	.080	.100	250'							8°
9°	.054	.061	100'	.065	.075	150'	.074	.089	200'	.080	.097	250'										9°
10°	.058	.065	150'	.069	.081	150'	.077	.093	200'	.080	.100	250'										10°
11°	.061	.070	150'	.072	.085	200'	.079	.096	200'													11°
12°	.065	.074	150'	.075	.089	200'	.080	.098	200'													12°
13°	.067	.078	150'	.077	.092	200'		.100	200'													13°
14°	.070	.082	150'	.078	.095	200'																
15°	.072	.085	150'	.079	.097	200'																
16°	.074	.087	150'	.080	.099	200'																
17°	.076	.090	150'		.100	200'																
18°	.077	.093	200'		.100	200'																
19°	.078	.095	200'																			
20°	.079	.096	200'																			
21°	.080	.098	200'																			
22°	.080	.099	200'																			
23°	.080	.099	200'																			
24°		.100	200'																			
25°		.100	200'																			

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

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.
" 4 " " " " " 1.5 " " " " " " " "
Width of Crowned Highway to be figured for Superelevation—left pivot point to right pivot point.

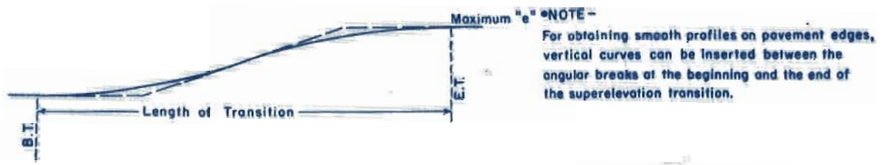
COLORADO DEPARTMENT OF HIGHWAYS
METHODS FOR SUPERELEVATION & WIDENING OF CURVES CROWNED HIGHWAYS

Designed by S.B.L.	Approved by
Made by S.B.L.	
Checked by L.E.O.	Date: 5-4-61

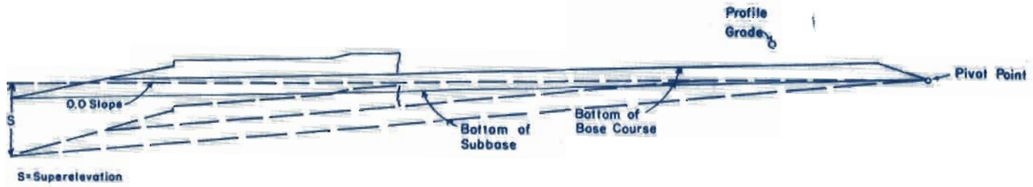
APRIL 1959

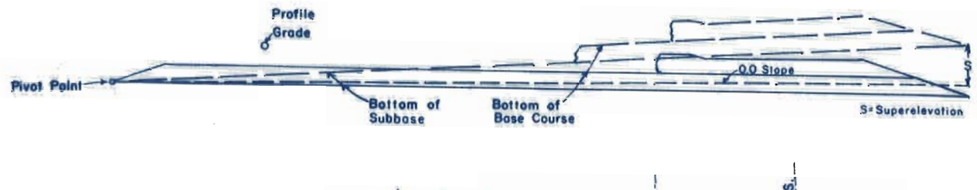
STANDARD M-1-D-1

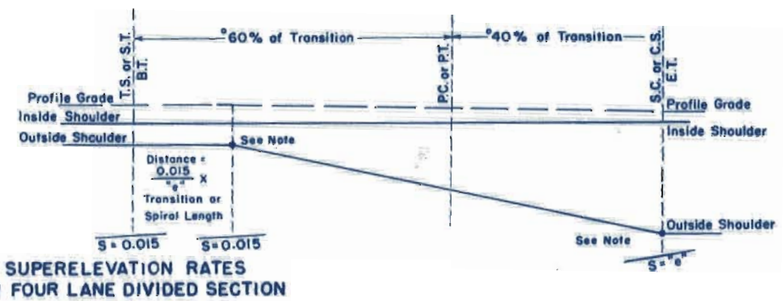
FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F031-1(5)	11a



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 superelevation transition.







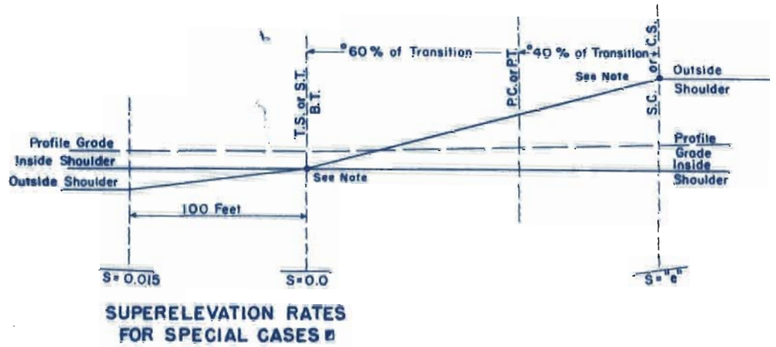
SUPERELEVATION RATES FOR FOUR LANE DIVIDED SECTION

TABLE 1

Degree of Curve	Maximum Superelevation = 0.08			Maximum Superelevation = 0.10		
	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length
0° 15'	RC	70	200'	RC	70	200'
0° 30'	RC	70	200'	RC	70	200'
0° 45'	.021	70	200'	.020	70	200'
1° 00'	.028	70	200'	.028	70	200'
1° 30'	.042	70	200'	.042	70	200'
2° 00'	.056	70	250'	.055	70	250'
2° 30'	.069	70	250'	.069	70	250'
3° 00'	.077	70	250'	.083	70	300'
3° 30'	.080	70	300'	.096	70	350'
4°	.080	65	300'	.100	70	350'
5°	.080	60	300'	.100	65	350'
6°	.080	55	250'	.100	55	300'
7°	.080	50	250'	.100	55	300'
8°	.080	50	250'	.100	50	300'
9°	.080	45	250'	.100	45	300'
10°	.080	45	250'	.100	45	300'
11°	.080	40	200'	.100	40	250'
12°	.080	40	200'	.100	40	250'
13°	.080	35	200'	.100	40	250'
14°	.080	35	200'	.100	35	200'
15°	.080	35	150'	.100	35	200'
16°	.080	35	150'	.100	35	200'
17°	.080	30	150'	.100	35	200'
18°	.080	30	150'	.100	35	200'
19°	.080	30	150'	.100	30	200'
20°	.080	30	150'	.100	30	200'
21°	.080	30	150'	.100	30	200'
22°	.080	30	150'	.100	30	200'
23°	.080	30	150'	.100	30	200'
24°				.100	30	200'
25°				.100	30	200'

NOTES – Plains Areas use 0.10 Maximum Superelevation Rate.
Mountainous Areas & areas where icing conditions frequently exist, use 0.08 Maximum Superelevation Rate.

* When Curve is Not Spiralled



SUPERELEVATION RATES FOR SPECIAL CASES ■

TABLE 2

Degree of Curve	25 M.P.H.			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. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	Required Super. Rate Ft./Ft.		Minimum Length of Transition or Spiral	
	0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		0.08	0.10		
0° 15'	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	0° 15'
0° 30'	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	R C	R C	150'	R C	R C	200'	R C	R C	200'	0° 30'
0° 45'	N S	N S	0	N S	N S	0	N S	N S	0	R C	R C	150'	R C	R C	150'	R C	R C	150'	.016	.016	200'	.018	.018	200'	0° 45'
1° 00'	N S	N S	0	N S	N S	0	R C	R C	150'	R C	R C	150'	.016	.016	150'	.018	.018	150'	.021	.021	200'	.022	.022	200'	1° 00'
1° 30'	N S	N S	0	R C	R C	100'	R C	.016	150'	.019	.020	150'	.023	.024	150'	.027	.027	150'	.031	.031	200'	.035	.034	200'	1° 30'
2° 00'	R C	R C	100'	.016	.016	100'	.020	.021	150'	.025	.027	150'	.030	.032	150'	.035	.036	150'	.041	.042	200'	.047	.046	200'	2° 00'
2° 30'	R C	R C	100'	.020	.020	100'	.025	.026	150'	.030	.033	150'	.036	.039	150'	.043	.045	150'	.050	.052	200'	.057	.059	200'	2° 30'
3° 00'	.016	.017	100'	.023	.024	100'	.029	.031	150'	.035	.038	150'	.042	.046	150'	.050	.054	150'	.057	.062	200'	.066	.070	250'	3° 00'
3° 30'	.019	.019	100'	.026	.027	100'	.033	.035	150'	.040	.045	150'	.048	.053	150'	.056	.063	200'	.064	.072	250'	.072	.081	300'	3° 30'
4°	.021	.021	100'	.029	.030	100'	.037	.040	150'	.044	.050	150'	.053	.060	150'	.062	.070	200'	.069	.079	250'	.076	.090	300'	4°
5°	.026	.026	100'	.035	.038	100'	.044	.048	150'	.053	.060	150'	.062	.071	200'	.070	.083	250'	.077	.091	300'	.080	.099	350'	5°
6°	.031	.031	100'	.041	.044	100'	.050	.056	150'	.060	.068	150'	.069	.080	200'	.076	.093	250'	.080	.098	300'		.100	350'	6°
7°	.035	.035	100'	.045	.050	100'	.056	.063	150'	.066	.076	200'	.074	.088	250'	.079	.097	300'							7°
8°	.039	.040	100'	.050	.055	100'	.061	.069	150'	.071	.084	200'	.078	.094	250'	.080	.100	300'							8°
9°	.043	.044	100'	.054	.061	100'	.068	.075	150'	.074	.089	200'	.080	.097	300'										9°
10°	.046	.048	100'	.058	.065	150'	.069	.081	150'	.077	.093	200'		.100	300'										10°
11°	.049	.052	100'	.061	.070	150'	.072	.085	200'	.079	.096	250'													11°
12°	.052	.056	100'	.065	.074	150'	.075	.089	200'	.080	.098	250'													12°
13°	.054	.060	100'	.067	.078	150'	.077	.092	200'		.100	250'													13°
14°	.057	.063	100'	.070	.082	150'	.078	.095	200'																14°
15°	.059	.067	100'	.072	.085	150'	.079	.097	200'																
16°	.061	.070	100'	.074	.087	150'	.080	.099	200'																
17°	.063	.073	100'	.076	.090	150'		.100	200'																
18°	.065	.076	100'	.077	.093	200'																			
19°	.067	.078	100'	.078	.095	200'																			
20°	.069	.081	100'	.079	.096	200'																			
21°	.070	.083	100'	.080	.098	200'																			
22°	.072	.086	100'	.080	.099	200'																			
23°	.073	.088	100'		.099	200'																			
24°	.075	.090	100'		.100	200'																			
25°	.076	.091	100'																						
26°	.077	.093	150'																						
27°	.078	.094	150'																						
28°	.079	.096	150'																						
29°	.079	.097	150'																						
30°	.080	.098	150'																						
32°	.080	.099	150'																						
35°		.100	150'																						

■ Table 2 data may be used for City Streets & Interchanges.
NS = Normal Slope section.
RC = Remove adverse crown, superelevate at normal section slope.

NOTES – A Minimum 50 Foot Tangent Runout is required for all outside parts of Divided Highways on curve.
Transition or Spiral Lengths are shown in the tables for 4 Lane Divided Highways.
For 6 Lane Divided Highways use 1.2 times the lengths shown, rounded to the nearest 50 feet.
Width of Roadway to be figured for Superelevation = Length at base of subbase.

REVISIONS		
4-20-60	e=0.10 & GENERAL	S.B.L.
5-1-61	GENERAL	S.B.L.

COLORADO DEPARTMENT OF HIGHWAYS

METHODS FOR SUPERELEVATION OF CURVES DIVIDED HIGHWAYS

Designed by S.B.L. Made by S.B.L. Checked by L.E.O.	Approved by [signature] Date 5-4-61

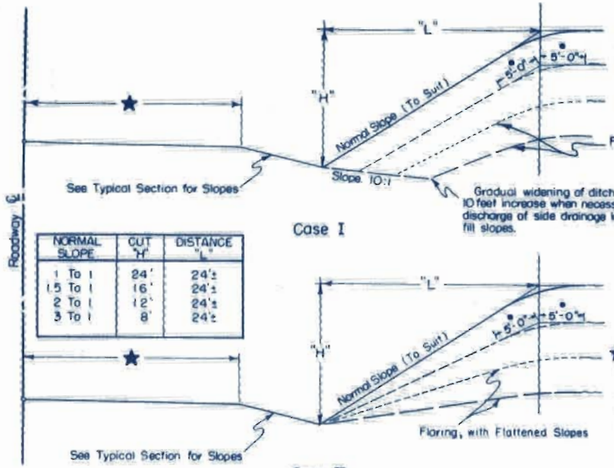
STANDARD SIDE APPROACH ROADS, FLARING, CUT SLOPE TREATMENT & WIDENING AT BRIDGES AND AT CREST OF GRADES

STANDARD M-2-EN

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(5)	12

REVISIONS		
11-1-61	General	

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



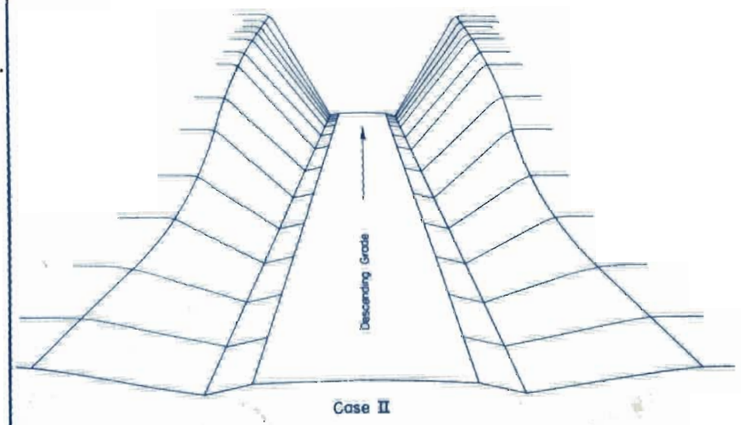
NORMAL SLOPE	CUT "H"	DISTANCE "L"
1 To 1	24'	24'±
1.5 To 1	16'	24'±
2 To 1	12'	24'±
3 To 1	8'	24'±

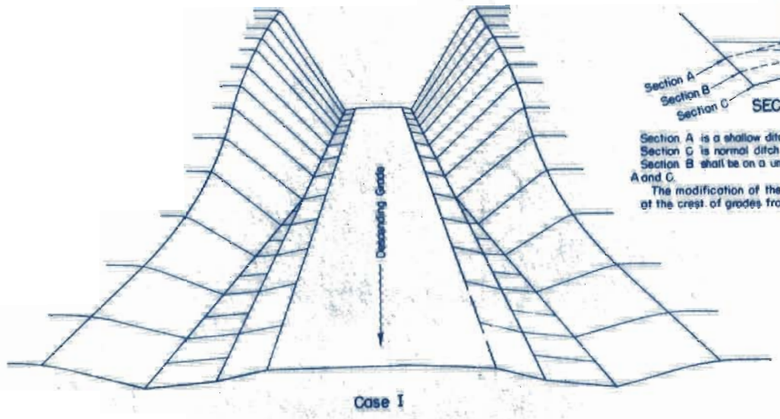
FLARING OF EARTH CUTS: The backslopes at ends of all earth cuts shall be flattened & where necessary the ditch shall be widened gradually to discharge side ditch drainage away from the base of adjacent fill slopes in order to avoid erosion & to improve appearance. The transition of flattened backslopes & widened ditch shall be constructed in such a manner that a uniform appearance of slope & ditch results. Backslopes 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 stake 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 "Unclassified Excavation".

★ WIDENING AT BRIDGE APPROACHES: Roadway embankment at bridge approaches shall be so constructed that base of surfacing at shoulder point is ℄ Min. 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. This is done to accomodate guard fence and/or guard posts at bridge approaches.

PLAN OF FLARING IN EARTH CUTS

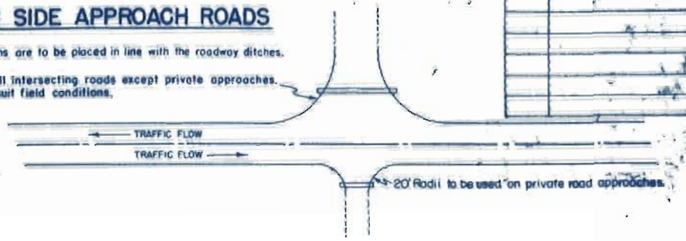




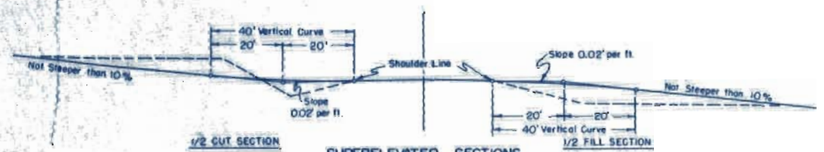
TYPICAL PLANS FOR SIDE APPROACH ROADS

Where practical Side Drains are to be placed in line with the roadway ditches.

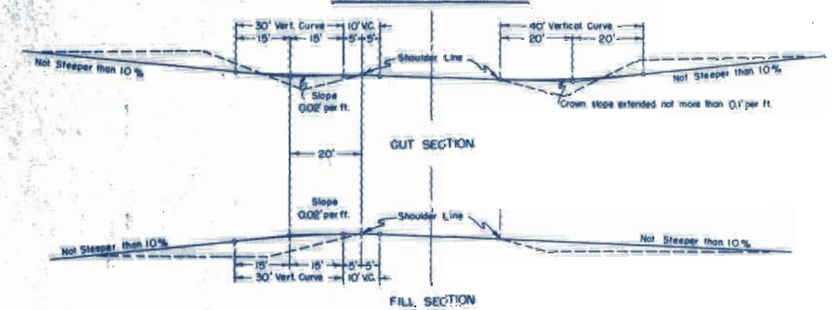
50' Radii to be used on all intersecting roads except private approaches. Radii may be varied to suit field conditions.



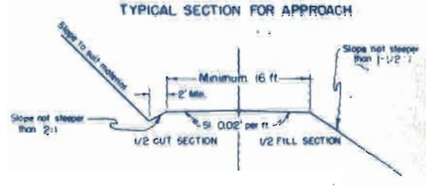
STANDARD CROWNED SECTION



SUPERELEVATED SECTIONS



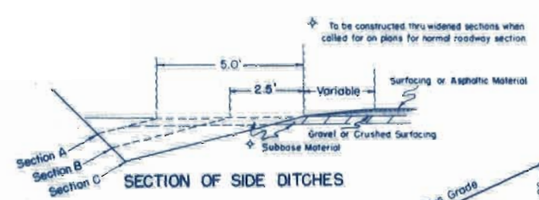
TYPICAL SECTION FOR APPROACH



NOTE:
ROAD APPROACHES: To conform to the above details unless otherwise indicated on plans by Special Details. The width of the crowned section shall be not less than the width of the crowned section of the existing approach road and in no case shall the new construction be less than sixteen (16) feet in width.

DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES

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



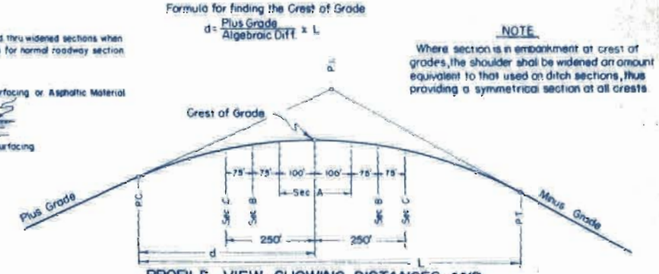
SECTION OF SIDE DITCHES

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

Formula for finding the Crest of Grade

$d = \frac{\text{Plus Grade}}{\text{Algebraic Diff.}} \times L$

NOTE
Where section is in embankment at crest of grades, the shoulder shall be widened an amount equivalent to that used on ditch sections, thus providing a symmetrical section at all crests.



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

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.

All side approach roads to the Project shall be Gravel Surfaced with a four (4) inch thickness of "Gravel or Crushed Rock Surfacing" extending approximately to the Right of Way Line. Estimated tonnage & type of material required for this operation are shown in the Surfacing Plan.

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

COLORADO
DEPARTMENT OF HIGHWAYS

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

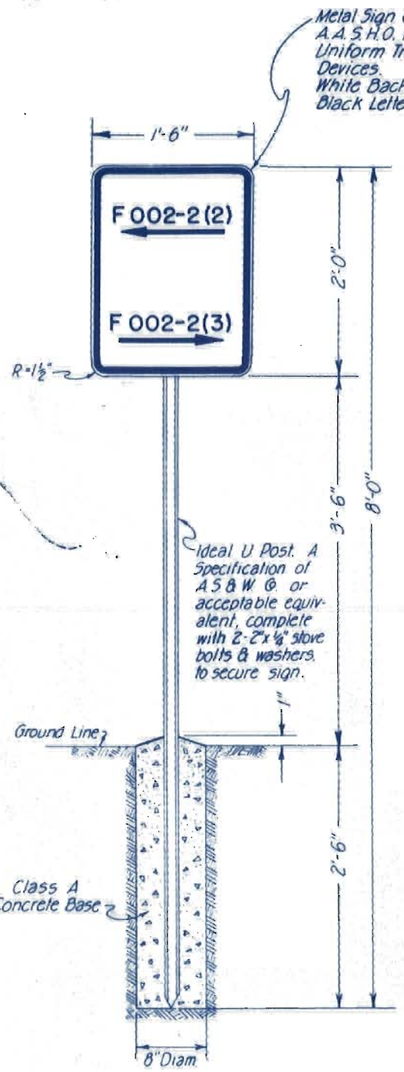
Designed by A.Z.	Approved by A. Zuliani
Made by R.J.M & A.B.H.	
Checked by C.R.S.	Date: November 1, 1953

	Initial	Date
Designed By		
Checked By		
Drawn By		
Checked By		
Issued By		
Checked By		

FEDERAL ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F031-1(5)	13

STANDARD M-7-D

PROJECT MARKER POST



NOTES FOR PROJECT MARKER POSTS

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to this project.

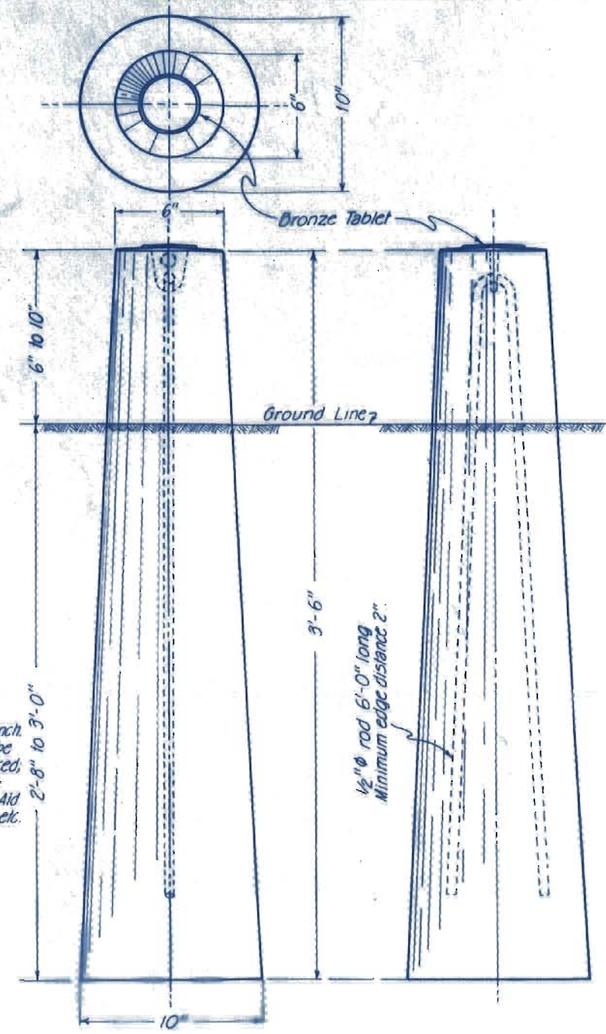
Numbers and arrows shall show the proper numbers and directions of the projects each way from where the post is placed. Post is to be set with sign facing the road at the end of the project, two feet inside the R.O.W. line or at a point amply protected from traffic in such a position that the sign will indicate properly the projects to which it refers.

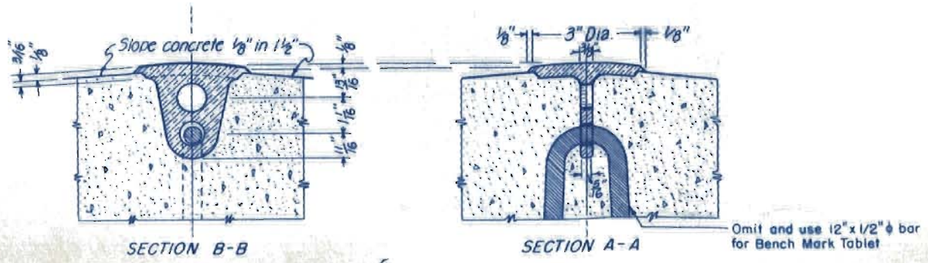
NOTES FOR R.O.W. MARKER POSTS

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways 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.

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.)

RIGHT OF WAY MARKER POST





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

BENCH MARK

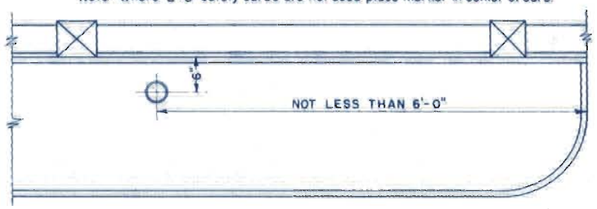
All work shall be done in accordance with Standard Specifications of the Colorado Department of Highways applicable to the project.

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).

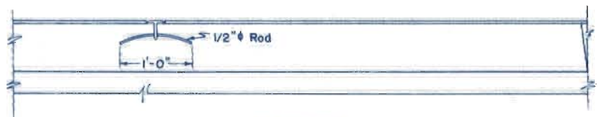
Bronze Bench Mark Tablets will be furnished by the Department at no expense to the Contractor.

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

Note: Where 2'-0" safety curbs are not used place marker in center of curb.



PLAN



ELEVATION

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

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD
MARKER POSTS
AND
BENCH MARKS

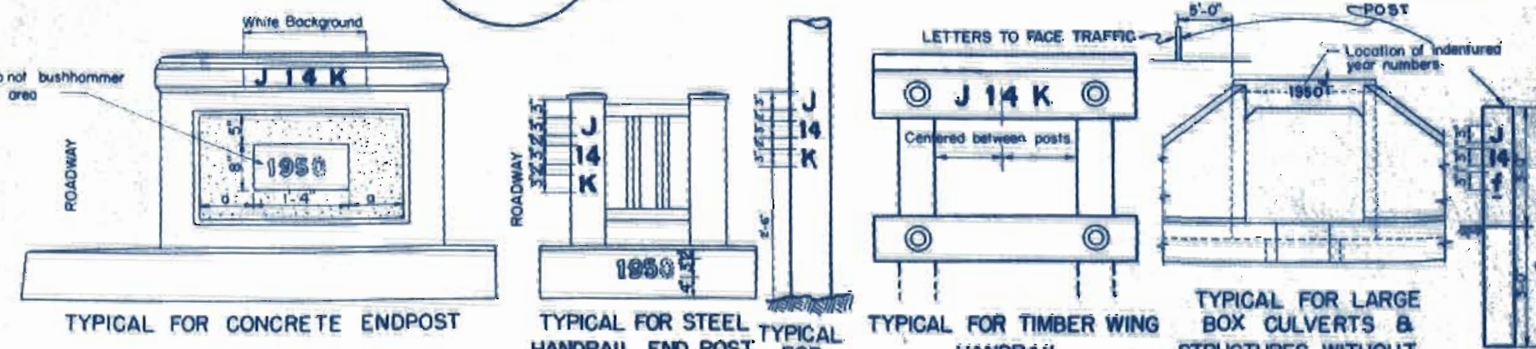
Designed by R.E.L.	Approved by A. Julian
Made by E.E.O.	
Checked by R.E.L.	Date: Nov. 12, 1953

COLO. DEPT. OF HIGHWAYS
FORM C.D.H. 137
MAR. 1953
BRIDGE TRACING
SHEETS—PLAIN

STANDARD M-10-D

REV. 9-9-59 ADD NOTE ON MEASUREMENT (D.G.S.)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(8)	14



TYPICAL FOR CONCRETE ENDPOST

TYPICAL FOR STEEL HANDRAIL END POST

TYPICAL FOR SIGN POSTS

TYPICAL FOR TIMBER WING HANDRAIL

TYPICAL FOR LARGE BOX CULVERTS & STRUCTURES WITHOUT END POSTS

GENERAL NOTES

ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS 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. ADDITIONAL COPIES OF THIS FULL SIZE SHEET CAN BE OBTAINED FROM THE DEPARTMENT WITHOUT CHARGE.

THE YEAR NUMBERS ARE RECESSED IN CONCRETE 3/8" MINIMUM AS SHOWN INTO THE PANEL OF THE ENDPOST ON THE RIGHT HAND SIDE OF EACH BRIDGE END AND INTO THE FACE OF THE DOWNSTREAM HEADWALL OF CULVERTS AS SHOWN ON PLAN DETAILS. NUMBERS TO BE MADE OF WOOD, METAL OR OTHER SUITABLE MATERIAL AND ATTACHED TO THE FORMS BEFORE CONCRETE IS POURED. THE YEAR NUMBER OF EACH STRUCTURE SHALL CORRESPOND WITH THE YEAR IN WHICH THE CONCRETE IS POURED.

THE STRUCTURE NUMBER SHALL BE STENCILED ON THE RIGHT HAND SIDE OF EACH BRIDGE END AS SHOWN ON THIS STANDARD AND AS SPECIFIED WHERE THE STRUCTURE HAS NO END POSTS THE NUMBER SHALL BE PLACED ON A POST ON THE RIGHT HAND SIDE OF THE ROAD AS SHOWN. FOR SIGNS THE NUMBER SHALL BE PLACED ON SIGN POSTS ON THE RIGHT HAND SIDE OF THE ROADWAY.

THE CORRECT NUMBER FOR EACH BRIDGE OR SIGN IS SHOWN ON THE PLANS.

THE NUMBERS FOR MAJOR STRUCTURES OF OVER 20 FEET CLEAR SPAN SHALL BE UPPER CASE LETTERS. THE NUMBERS FOR MINOR STRUCTURES OF 12 TO 20 FEET CLEAR SPAN SHALL BE LOWER CASE LETTERS. SIGN BRIDGES SHALL BE CONSIDERED AS MAJOR STRUCTURES. *

A PROPER WHITE BACKGROUND RECTANGULAR IN SHAPE AND EXTENDING THREE INCHES BEYOND THE LIMITS OF THE NUMBER SHALL BE PAINTED WITH TWO COATS OF ACCEPTABLE WHITE PAINT UNLESS AN APPROVED WHITE CONCRETE PAINT IS USED. BEFORE PAINTING THE SURFACE MUST BE THOROLY DRIED, CLEANED AND PROPERLY SIZED. ON TIMBER HANDRAILS THE WHITE PAINT USED ON THE BRIDGE WILL BE SATISFACTORY.

AFTER THE WHITE BACKGROUND HAS DRIED SUFFICIENTLY, THE CORRECT STRUCTURE NUMBER SHALL BE CAREFULLY STENCILED ON IT, WITH TWO COATS OF "SECOND FIELD COATS-DARK" OR "EXTERIOR BLACK PAINT (MAINT)" AS SPECIFIED UNDER ITEM 58 "PAINTS AND PAINTING". THE BRACES OF THE STENCILED LETTERS AND FIGURES SHALL BE CAREFULLY FILLED IN BY HAND TO MAKE SOLID FIGURES.

SUFFICIENT TIME BETWEEN SUCCESSIVE COATS SHALL BE ALLOWED TO PERMIT THORO DRYING.

THE COST OF PAINTING OF STRUCTURE NUMBERS AND FURNISHING AND PLACING POSTS FOR STRUCTURE NUMBERS SHALL BE CONSIDERED SUBSIDIARY WORK AND SHALL BE INCLUDED IN THE ORIGINAL CONTRACT ITEMS AND WILL NOT PAID FOR AS A SEPERATE ITEM.

* THE LENGTH OF SPAN OF STRUCTURE SHALL BE MEASURED ALONG CENTER LINE OF ROADWAY. IN CASE OF DOUBLE OR MULTIPLE BOX CULVERTS THE CENTER WALL OR WALLS SHALL BE DISREGARDED AND CLEAR SPAN MEASURED FROM INSIDE OF END WALLS.

STRUCTURE NO.

COLORADO
DEPARTMENT OF HIGHWAYS

STANDARD
LETTERS AND FIGURES
FOR
YEAR NUMBERS AND
STRUCTURE NUMBERS

Designed by Made by Checked by	Approved by A.P. Mitchell Bridge Engineer Date: Feb. 17, 1950

	Initial	Date
Designed By		
Checked By		
Drawn By		
Checked By		
Traced By		
Checked By		

STANDARD M-13-C

FED. ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(5)	15

REVISIONS		
7-17-59	GENERAL - TYPE NO. 1	M.E.P.
10-27-59	NOTE ON TYPE NO.1	E.E.O.
11-13-59	REV. TYPE NO. 3	E.E.O.
10-11-60	GENERAL	D.R.S.

GENERAL NOTES

All work shall be done according to the Standard Specifications of the Colorado Department of Highways applicable to the Project.

All concrete for inlets and drains shall be Class "A".

All exposed corners shall be beveled

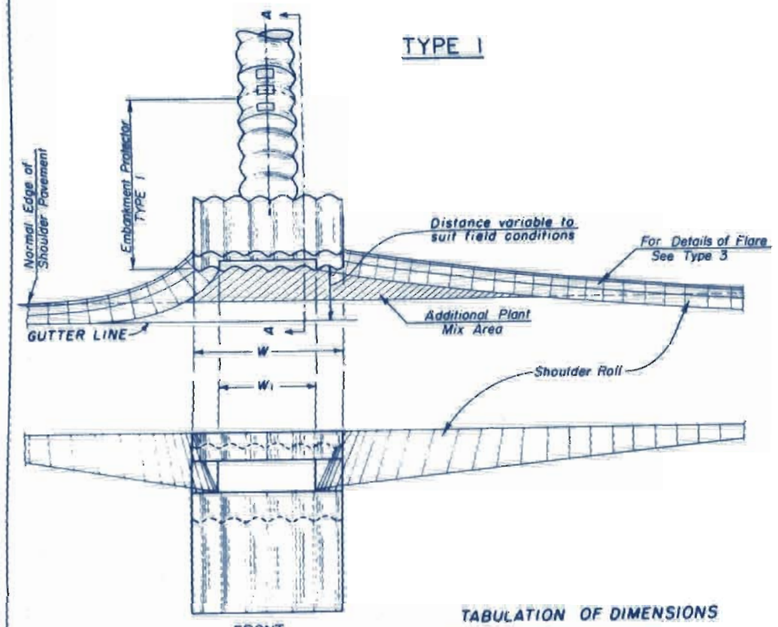
All construction joints shall be thoroughly cleaned before fresh concrete is poured.

All walls shall have forms on both sides.

For size and location of protectors, see List of Structures.

Structure backfill material is not to be used in connection with these Structures. Embankment material shall be used for backfilling and shall be included in price bid for these Structures.

TYPE 1

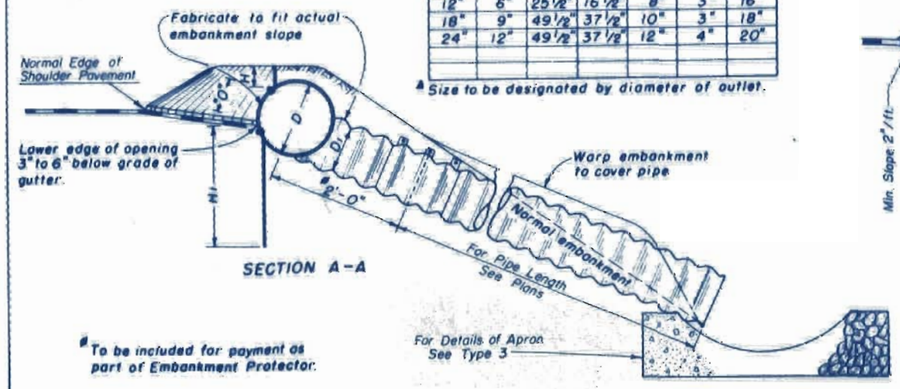


FRONT ELEVATION

TABULATION OF DIMENSIONS

D	O	W	W1	▲ D1	H	H1
12"	6"	25 1/2"	16 1/2"	8"	3"	16"
18"	9"	49 1/2"	37 1/2"	10"	3"	18"
24"	12"	49 1/2"	37 1/2"	12"	4"	20"

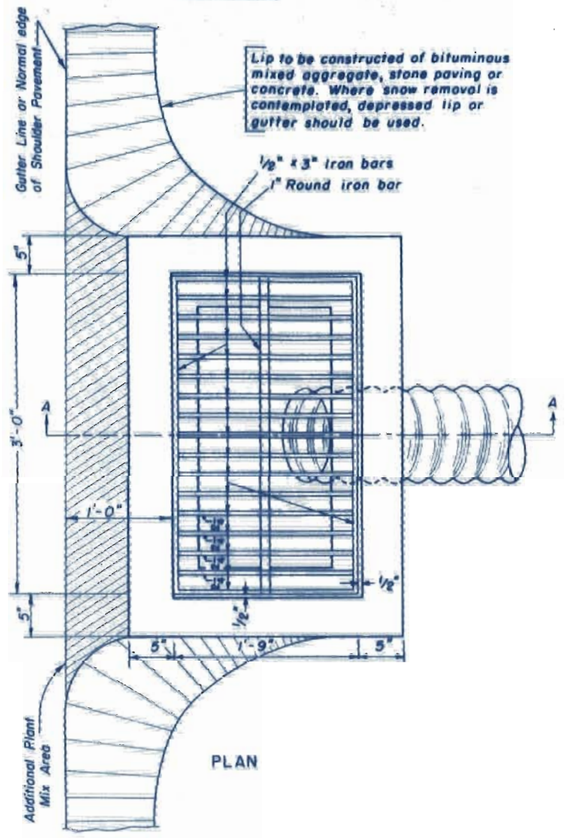
▲ Size to be designated by diameter of outlet.



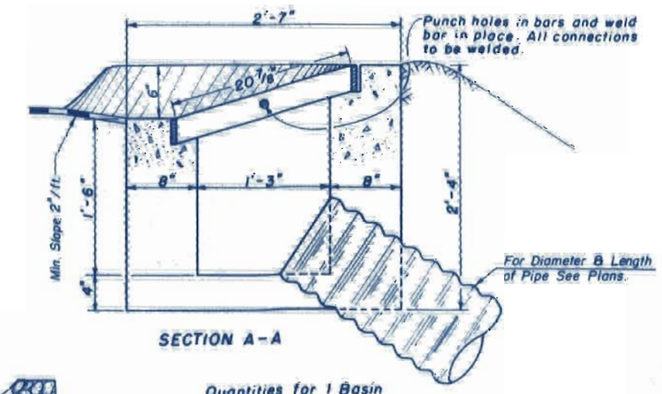
SECTION A-A

To be included for payment as part of Embankment Protector.

TYPE 2



PLAN

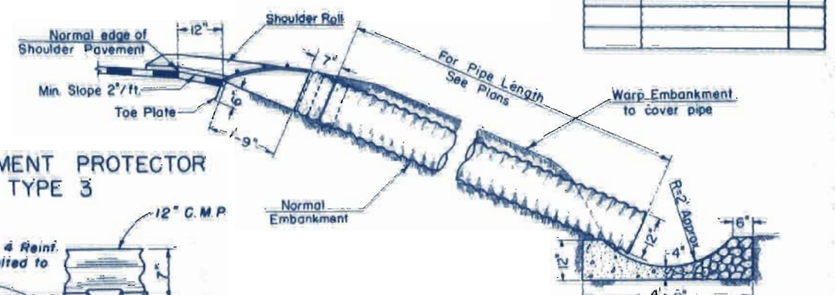


SECTION A-A

Quantities for 1 Basin

Class "A" Concrete = 0.54 Cu. Yds.
Inlet Grating = 1

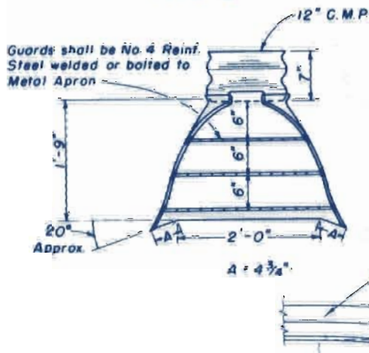
TYPE 3



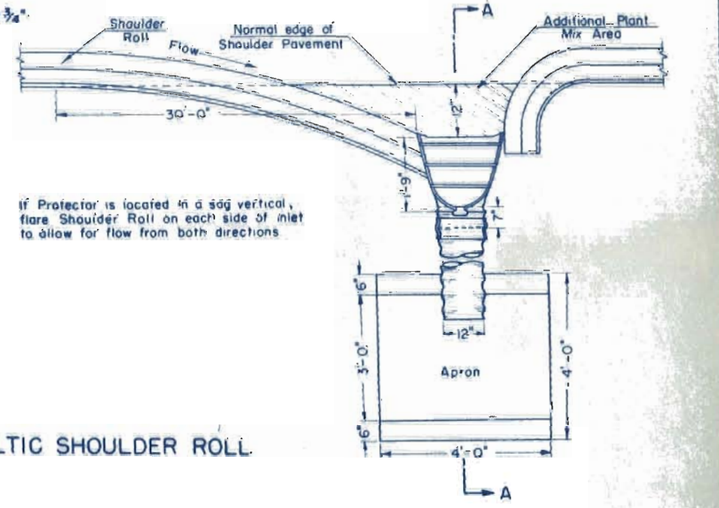
4'x4'x1' ▲ Class "A" Concrete or Grouted Rubble Slope & Ditch Paving for Apron where required on plans
Quantity = 0.40 Cu. Yd.

▲ On Concrete Pavement Projects, Pavement Concrete may be used in lieu of Class "A".

EMBANKMENT PROTECTOR TYPE 3



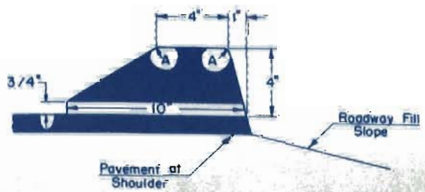
SECTION "A-A"



If Protector is located in a sag vertical, flare Shoulder Roll on each side of inlet to allow for flow from both directions

PLAN

ASPHALTIC SHOULDER ROLL



A = 1/8" Radius

NOTE: 0.647 X Specific Gravity of Briquette = Tons per Station

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD EMBANKMENT PROTECTORS

Designed by	Approved by
Made by T.E.F.	
Checked by E.E.O.	Date: November 1959

STANDARD TIMBER GUARD POSTS

STANDARD M-19-E

FED. ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
8	COLO.	F031-1 (5)	16

REVISION		
10-9-59	Added Spacing Table	J.C.R.
2-24-61	Spacing	C.L.S.
10-4-61	Ed. Post Location	S.B.L.

(Work By Contractor)

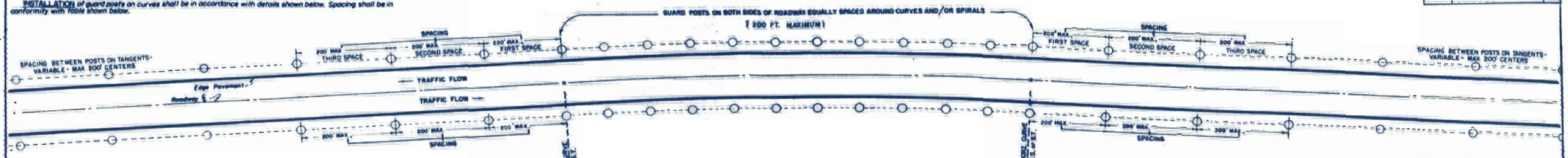
PAINTING - Posts shall be painted with aluminum paint and a black band placed around each post as per details on this sheet. Number of coats and type of paint applied shall be in accordance with specifications.

(Work By State Forces)

REFLECTIVE SHEETING - In accordance with the details hereon, State Forces will furnish and place the required 2"x 6" smooth surfaced reflective delineators fabricated from 3s - H14 aluminum alloy, minimum thickness 0.025", reflectorized with reflective sheeting strips or other approved reflective materials. Strips shall be suitable for placement around a curved surface.

Typical Installation on Curves & Tangents

INSTALLATION of guard posts on curves shall be in accordance with details shown below. Spacing shall be in conformity with table shown below.



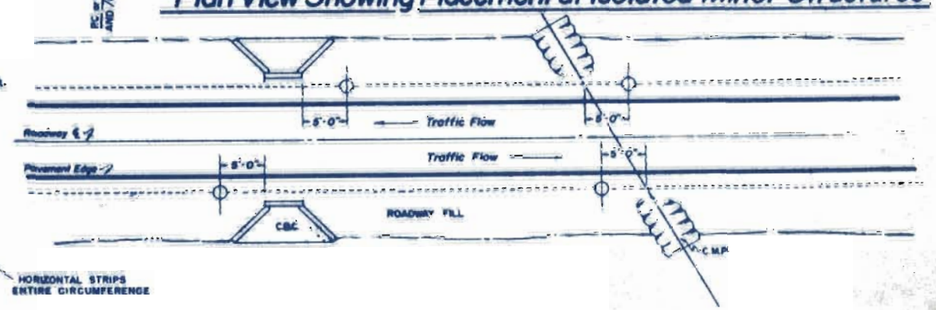
SPACING FOR DELINEATORS ON HORIZONTAL CURVES

DEGREE OF CURVE	RADIUS	⊙ SPACING ON CURVE	SPACING IN ADVANCE OF AND BEYOND CURVE			DEGREE OF CURVE	RADIUS	⊙ SPACING ON CURVE	SPACING IN ADVANCE OF AND BEYOND CURVE		
			FIRST SPACE	SECOND SPACE	THIRD SPACE				FIRST SPACE	SECOND SPACE	THIRD SPACE
		FEET	FEET	FEET	FEET			FEET	FEET	FEET	FEET
0°30'	11460.0'	200	200	200	200	8°00'	716.3'	52	94	156	200
1°00'	5730.0'	151	200	200	200	8°30'	674.1'	50	90	150	200
1°30'	3820.0'	123	200	200	200	9°00'	636.7'	48	86	144	200
2°00'	2865.0'	106	191	200	200	9°30'	603.2'	47	85	141	200
2°30'	2292.0'	95	171	200	200	10°00'	573.0'	46	83	138	200
3°00'	1910.0'	86	155	200	200	10°30'	545.7'	45	81	135	200
3°30'	1637.1'	80	144	200	200	11°00'	520.9'	43	77	129	200
4°00'	1432.5'	74	133	200	200	11°30'	498.3'	42	76	126	200
4°30'	1273.3'	70	126	200	200	12°00'	477.5'	41	74	123	200
5°00'	1146.0'	66	119	198	200	15°00'	382.0'	36	65	108	200
5°30'	1041.6'	63	113	189	200	18°00'	318.3'	33	59	99	198
6°00'	955.0'	60	108	180	200	21°00'	272.9'	30	54	90	180
6°30'	881.5'	58	104	174	200	25°00'	229.2'	27	49	81	162
7°00'	818.6'	55	99	165	200	30°00'	191.0'	24	43	72	144
7°30'	764.0'	53	95	159	200						

⊙ $S = 2\sqrt{R-50}$ 1-ST. SPACE = 1.8S 2-ND. SPACE = 3S 3-RD. SPACE = 6S

NO SPACES TO EXCEED 200 FT.

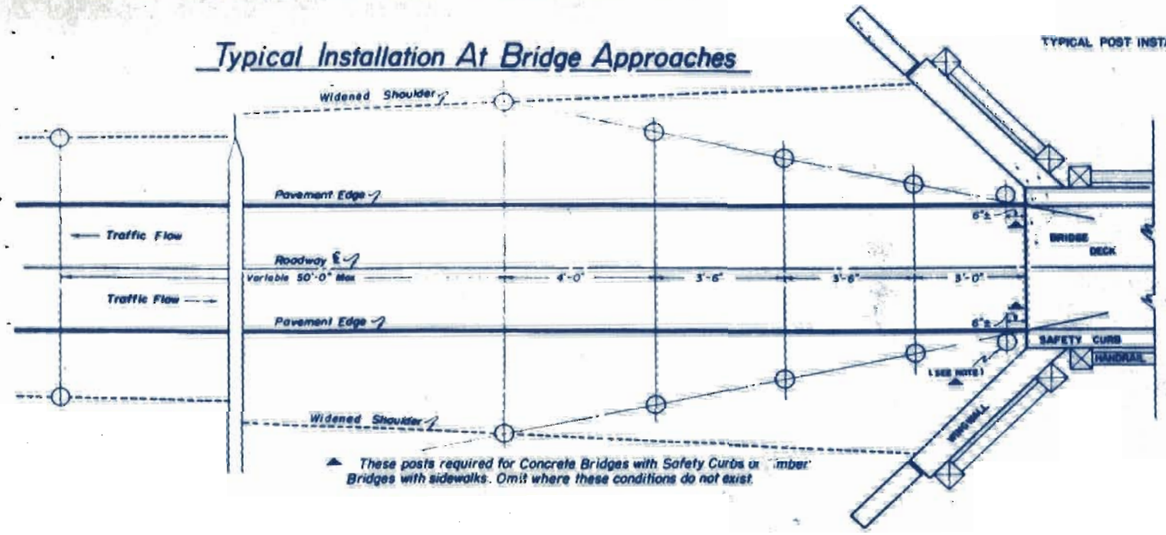
Plan View Showing Placement at Isolated Minor Structures



(Work By State Forces)

INSTALLATION DETAILS OF REFLECTORIZED STRIPS

Typical Installation At Bridge Approaches



▲ These posts required for Concrete Bridges with Safety Curbs or Timber Bridges with sidewalks. Omit where these conditions do not exist.

Pictorial View Showing Location at Isolated Minor Structures

GENERAL NOTES

(Work By Contractor)

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the project

All posts shall be set and tamped in, plumb and firm, to the line and grades established by the Engineer.

INSTALLATION of Timber Guard Posts on Tangents, Curves and at Bridge Approaches shall be in conformity with details on this sheet. The number, location and spacing of Timber Guard Posts is shown on plans.

(Work By State Forces)

Reflective delineators shall be furnished and installed by State Forces after the Contractor has finished his operations.

Installation of reflective delineators shall be in accordance with the following: Wrap Around Reflective Sheeting Strips shall be installed horizontally one (1) sheet on all posts. Island posts shall have Wrap Around Reflective Sheeting Strips placed horizontally to cover entire circumference of Post.

On Divided Highways and Islands, Reflective Sheeting Strips shall be placed in a manner to obtain maximum visibility for the primary direction of travel. In all instances tests shall be made to insure the maximum effectiveness of reflective delineators

All Traffic Islands shall be marked with Island Posts as indicated hereon.

COLORADO DEPARTMENT OF HIGHWAYS

STANDARD TIMBER GUARD POSTS

Designed by	Approved by: [illegible]
Made by	Engineer, Surveys & Plans
Checked by	Date: March 25, 1963

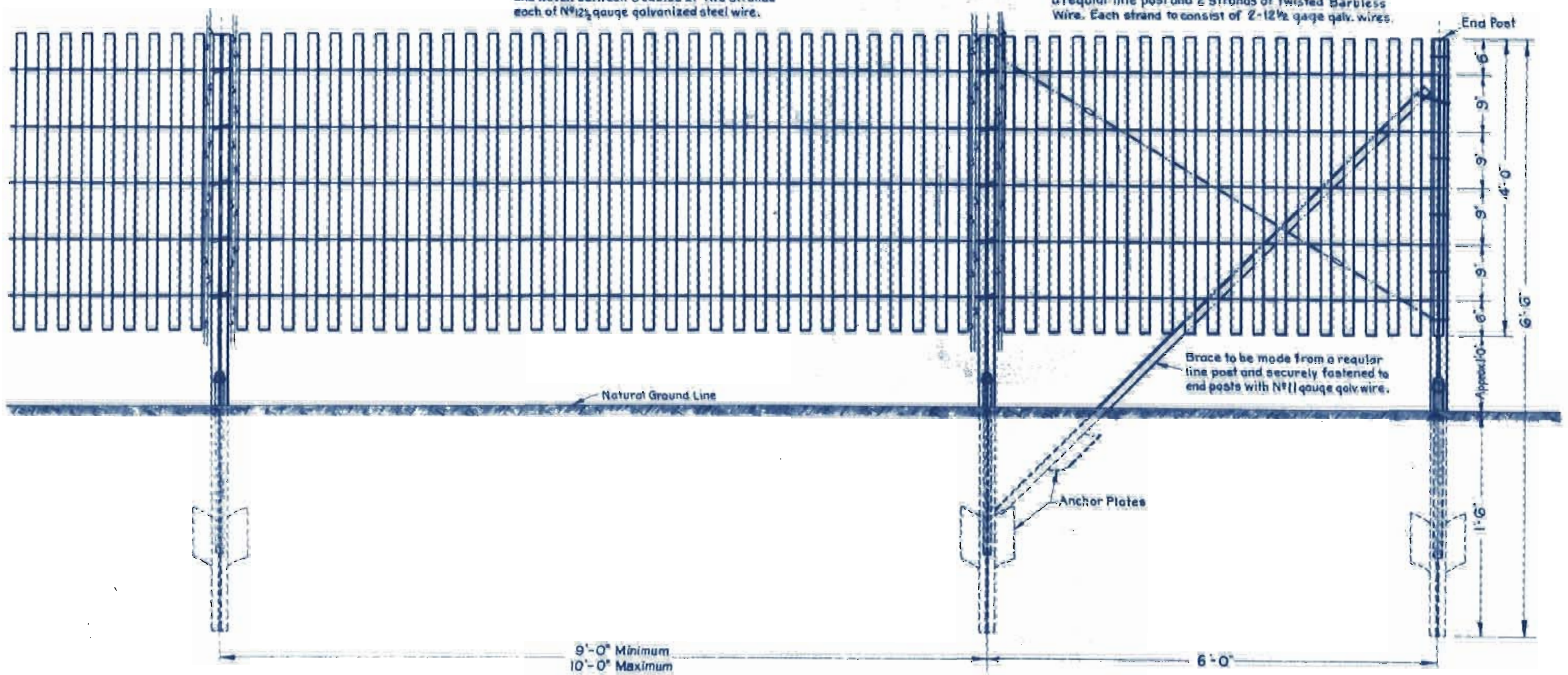
STANDARD M-25-C

[redacted]

FED. ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1 (5)	17

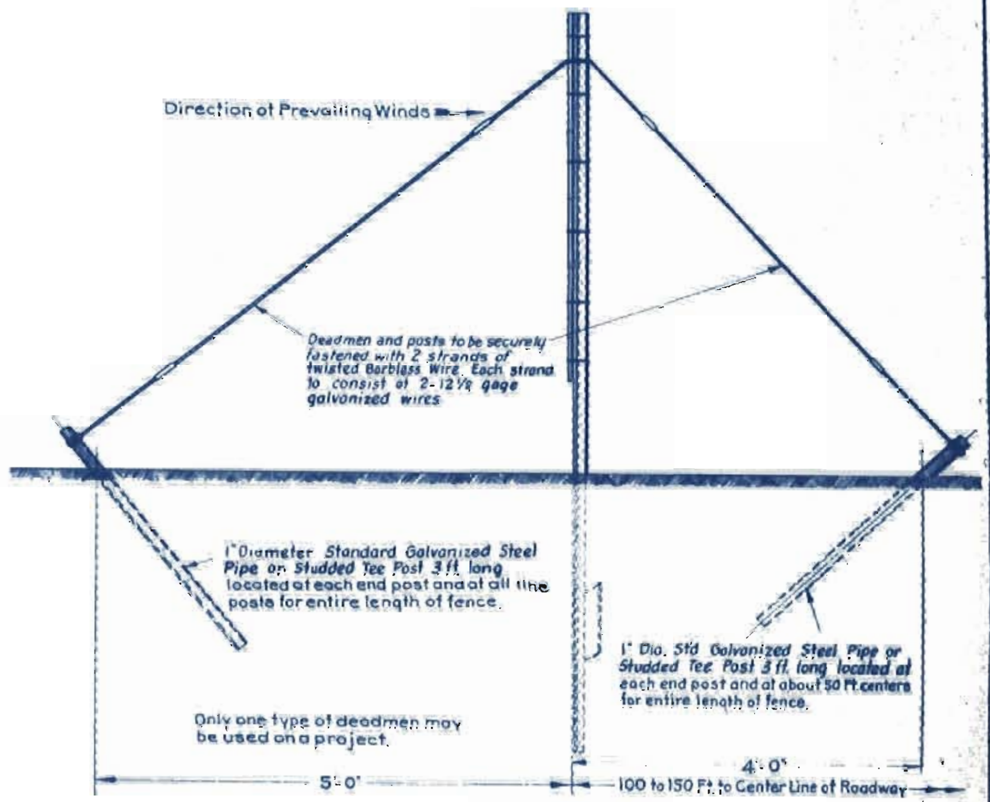
REVISIONS

1-28-59	General Notes	W.E.W.
10-3061	Rev. Posts and Anchor	E.E.O.

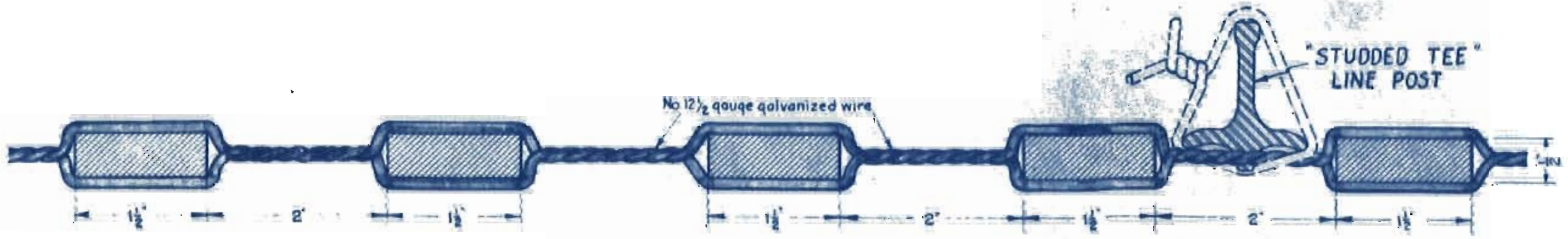


FRONT ELEVATION OF PICKET SNOW FENCE

ITEM Nº 77



END ELEVATION



TYPICAL SECTIONS THROUGH SNOW FENCE POST AND PICKETS

Note!
Other sections of steel posts having equal weight and equivalent strength may be used in lieu of this section.

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of The Colorado Department of Highways applicable to the Project.
Picket Fence is to be stretched tight and securely fastened to all posts with galvanized clips or Nº11 galvanized steel wire.

All fence posts, complete with anchor plate, shall be hot dipped galvanized or painted with an approved asphalt or mineral paint and shall weigh not less than 1.28 lbs. per lin. ft. (without anchor) Suitable anchor plates shall be securely fastened to each line post *and shall weigh a minimum of 0.57 lb.*

COLORADO
DEPARTMENT OF HIGHWAYS

STANDARD
PICKET SNOW FENCE
WITH STEEL POSTS

Designed by A.G.K.	Approved by P.S. Bailey
Made by A.G.K.	Bridge Engineer
Checked by	Date: December 3, 1931

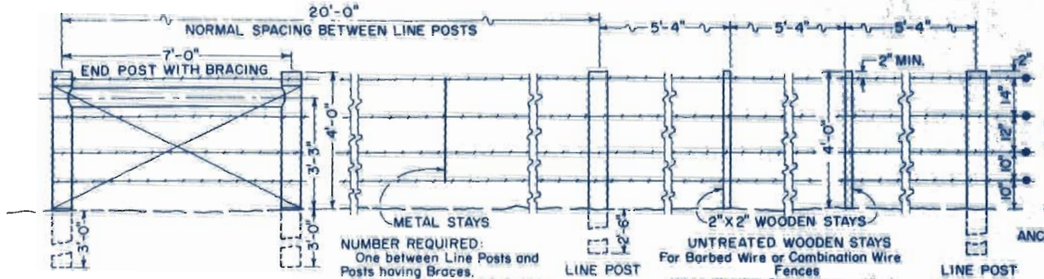
M-25-C

STANDARD M-27-E
(SHEET 1 OF 2 SHEETS)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(5)	18

REVISIONS		
9-1-61	Squared ends of Line Posts	J.C.R.

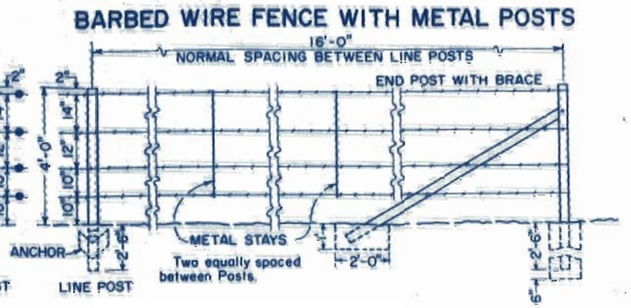
BARBED WIRE FENCE WITH WOODEN POSTS



NUMBER REQUIRED:
One between Line Posts and Posts having Braces.
Two equally spaced between Line Posts.

UNTREATED WOODEN STAYS
For Barbed Wire or Combination Wire Fences
When Wooden Stays are specified on Plans, Line Posts will be spaced 16'-0" C. to C. in lieu of 20'-0" normal spacing. Wooden Stays will rest on the natural ground and will be stapled as indicated for Line Posts.

BARBED WIRE FENCE WITH METAL POSTS

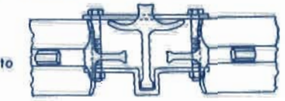


Two equally spaced between Posts.

CROSS BRACE DOWELING DETAIL

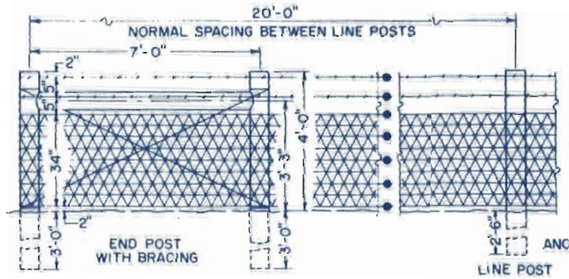
Bore a 3/8" X 2" Hole in each Post and Brace to receive the Pins. Wrap the ends of the Braces tightly with several turns of 12 1/2 ga. smooth Galv. Wire to prevent splitting or Notch Post and Nail with 40 d Common Nails.

*BRACE ATTACHMENT DETAIL

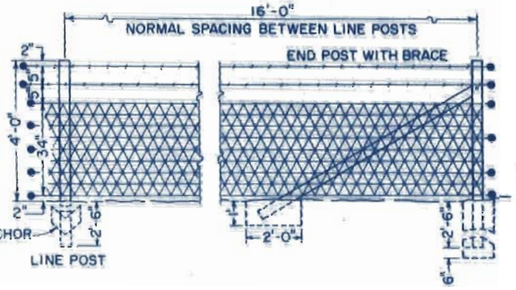


*Alternate Clamps, acceptable to the Engineer, may be used.

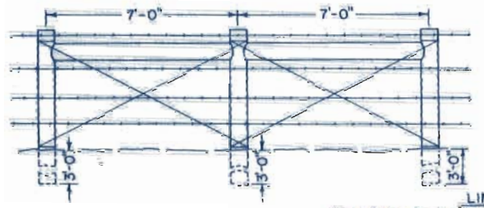
COMBINATION WIRE FENCE WITH WOODEN POSTS

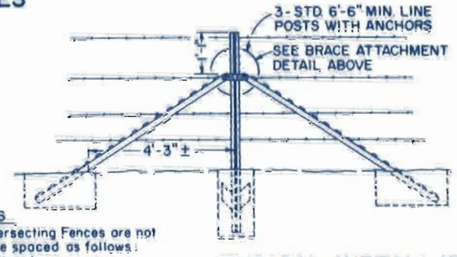


COMBINATION WIRE FENCE WITH METAL POSTS



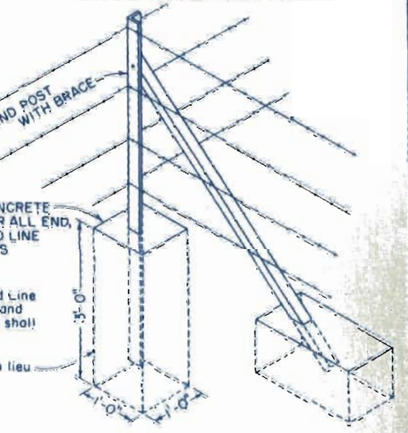
LINE BRACES





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

TYPICAL INSTALLATION AT FENCE INTERSECTIONS

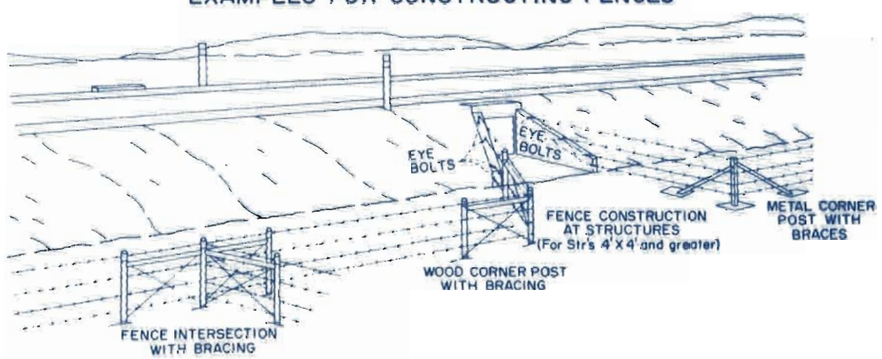


TYPICAL CORNER POST INSTALLATION

NOTE:
All Footings or Bases for End, Corner and Line Brace Posts shall be of Class "A" Concrete and shall have Crowned Tops. The Cost involved shall be included in the Bid Price for the Fence.

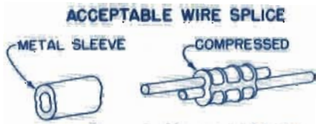
1' Diameter Circular Holes may be used in lieu of Square Holes.

ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES



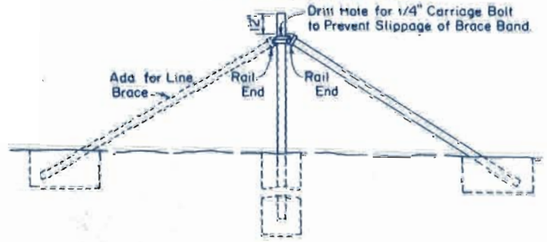
NOTE:
At all structures of 4'x4' and over, the fence shall be ended at eye-bolts in the wings of the structure. Where the type of structure prohibits the use of eye-bolts, an end post with brace shall be used.
Eye-bolts shall be made of 1/2" round bars with a minimum of six (6) inches of body length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

ACCEPTABLE WIRE SPLICE



Splicing Sleeve shall be approved by the Department Materials Laboratory before use.

ALTERNATE POST
(FOR END, CORNER OR LINE BRACE POSTS)



COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD WIRE FENCES AND GATES

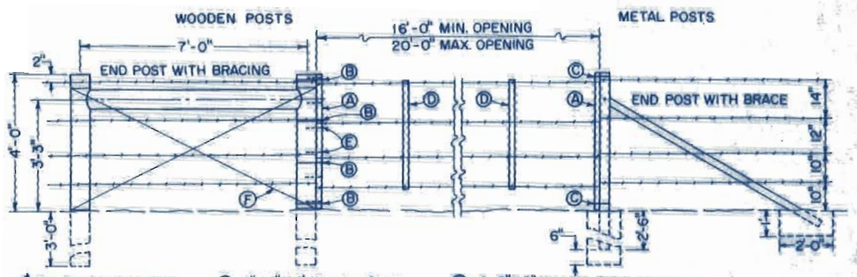
Designed by	L.E.O.	Approved by	[illegible]
Made by	T.E.F.	Engr. Surveys & Plans	
Checked by	E.E.O.	Date:	6-12-1961

STANDARD M-27-E
(SHEET 2 OF 2 SHEETS)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(5)	18a

REVISIONS		
7-13-61	Notes & Wire Clamp	E.E.O.
9-1-61	Post Weights	J.C.R.

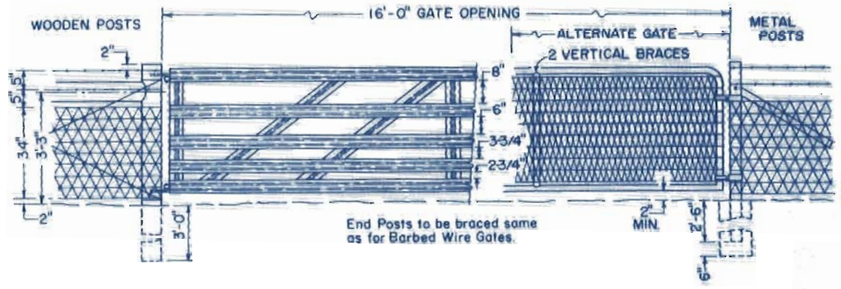
▲BARBED WIRE GATE



▲ For Combination Wire Gate use 34" Mesh and 2 strands of Barbed Wire. Extend Wooden Stays to Ground.

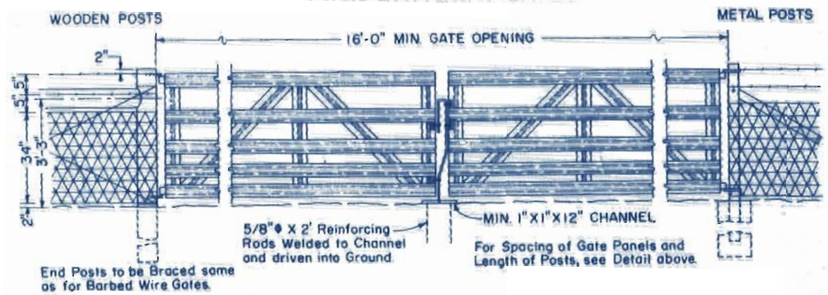
Ⓐ 2"X4"X4' Wooden Stays.
Ⓑ No. 12 1/2 Ga. Wire Loops to act as Hinges.
Ⓒ No. 12 1/2 Ga. Wire Loops.
Ⓓ 2-2"X2" Wooden Stays equally spaced.
Ⓔ 6-No. 40d Nails (On Metal Posts use 4-3/8"ϕ Bolts in lieu of Nails and Wire Loops used on Wooden Posts.)
Ⓕ No. 12 1/2 Ga. Brace Wire.

DRIVEWAY GATES



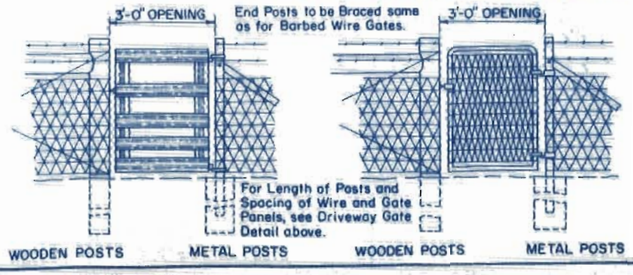
End Posts to be braced same as for Barbed Wire Gates.

TWIN DRIVEWAY GATES

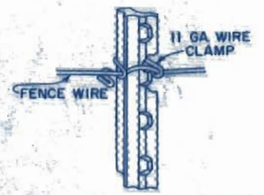


End Posts to be Braced same as for Barbed Wire Gates.

WALK GATE — ALTERNATE WALK GATE



FENCE WIRE TIES



TIES FOR "STUDDED TEE" OR "U" POSTS

TIES FOR ANGLE POSTS

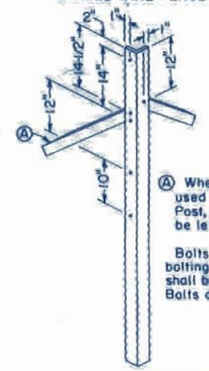
"STUDDED TEE" LINE POST

TYPICAL METAL POSTS

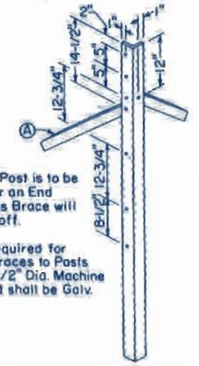
ALTERNATE LINE POST ("U" POST)

ANGLE CORNER POSTS

BARBED WIRE FENCE



COMBINATION FENCE



Ⓐ When Post is to be used for an End Post, this Brace will be left off.

Bolts required for bolting Braces to Posts shall be 1/2" Dia. Machine Bolts and shall be Galv.

HOLE SPACING FOR FASTENING BRACES AND FENCE WIRE TO METAL END, CORNER AND LINE BRACE POSTS

NOTE
All holes for wire to be 1/4" diameter. Fence wire to be securely fastened with No. 12 1/2 Ga. (Min.) galvanized wire bound around fence wire and passed through hole in post.
Holes may be in either leg of angle post. For convenience, the Department will approve the use of angle posts with holes spaced for barbed wire fence on one leg and combination wire fence on the other leg.

POST POINTING DETAILS

Where field conditions permit, Wooden Posts may be pointed 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.

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.

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

WOOD POSTS:
All line posts shall have a min. dia. of four (4) inches & be 6'-6" long.
All end, corner, intersection and brace posts shall have a minimum diameter of five (5) inches and be 7'-0" long.
Fence wire will be stapled to wooden posts or tied to metal posts as shown marked ● on barbed wire or combination wire fence details.

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

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

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

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

BRACES: (For Corner or End 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 US Dept. of Commerce Commercial Standard 184-51.

GENERAL NOTES

ALTERNATES:
END, CORNER AND LINE BRACE POSTS
Type - 2 1/2" O.D. Galvanized Tubular Steel.
Weight - 3.47 lbs./lin. ft. Min.

BRACES:
Type - 1 3/8" O.D. Tubular Steel with 2 1/2" Brace Band, Hinge Bolt and 1 3/8" I.D. Rail End; all Galvanized.
Weight - 1.6 lbs./lin. ft. Min.
Length - 6'-6" Min.

BARBED WIRE:
Barbed wire shall conform to Standard Specifications and shall have No. 14 Gauge Galvanized double wrapped barbs. 80 rod reels shall weigh a min. of 78 lbs. net & shall meet ASTM A121-57, Class 1.

4"X4" WIRE MESH:
Wire mesh used in combination wire fence as shown shall be galvanized and conform to the following:
Width - 34"
Weight - 0.76 lbs./lin. ft. Min.
Horizontal Wires - 2 strands, No. 12 1/2 ga. wire.
Cross Wires - 1 strand, No. 14 ga. wire.
Construction - cross wires to be woven with horizontal wires making a one piece fabric.
Shall meet ASTM A116-57, Class 1.

GATES:
DRIVEWAY GATES:
Height - approximately 42" (5 panels)
Weight - (Galvanized Steel, 90 lbs. Min. / Tempered Aluminum, 45 lbs. Min.)
Width of gate opening - 16'-0"

ALTERNATE DRIVEWAY GATES:
Height - 42"
Weight - Not less than 79 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"X4" wire mesh except it shall be 2"X4" mesh 42" high.

WALK GATES:
Height - approx. 42" (5 panels)
Weight - (Galvanized Steel, 18 lbs. Min. / Tempered Aluminum, 10 lbs. Min.)
Width of gate opening - 3'-0"

ALTERNATE WALK GATES:
Height - 42"
Weight - Not less than 16 lbs. complete with latch and hinges.
Width of gate opening - 3'-0"
Gate Frame - 3/4" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction.
Mesh to be of same construction as shown for Driveway Gate.

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

In lieu of galvanized finish on gate frames, Cadmium Plated pipe or Aluminum painting with Zinc Chromate Primer as per Specifications will be considered to be equivalent.

LATCHES AND HINGES:
Galvanized steel or Aluminum of standard make.

In lieu of standard make latches it will be permissible to use an electro-galvanized chain, eyebolt and snaphook type latch. Eyebolt, chain and snaphook assembly to be secured to latch side of gate. Gate closure effected by wrapping chain around end post and snapping hook into chain.

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD WIRE FENCES AND GATES

Designed by	E.E.O.	Approved by	C. H. Sullivan
Made by	T.E.F.	Engr. Surveys & Plans	
Checked by	E.E.O.	Date:	4-12-1961

STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

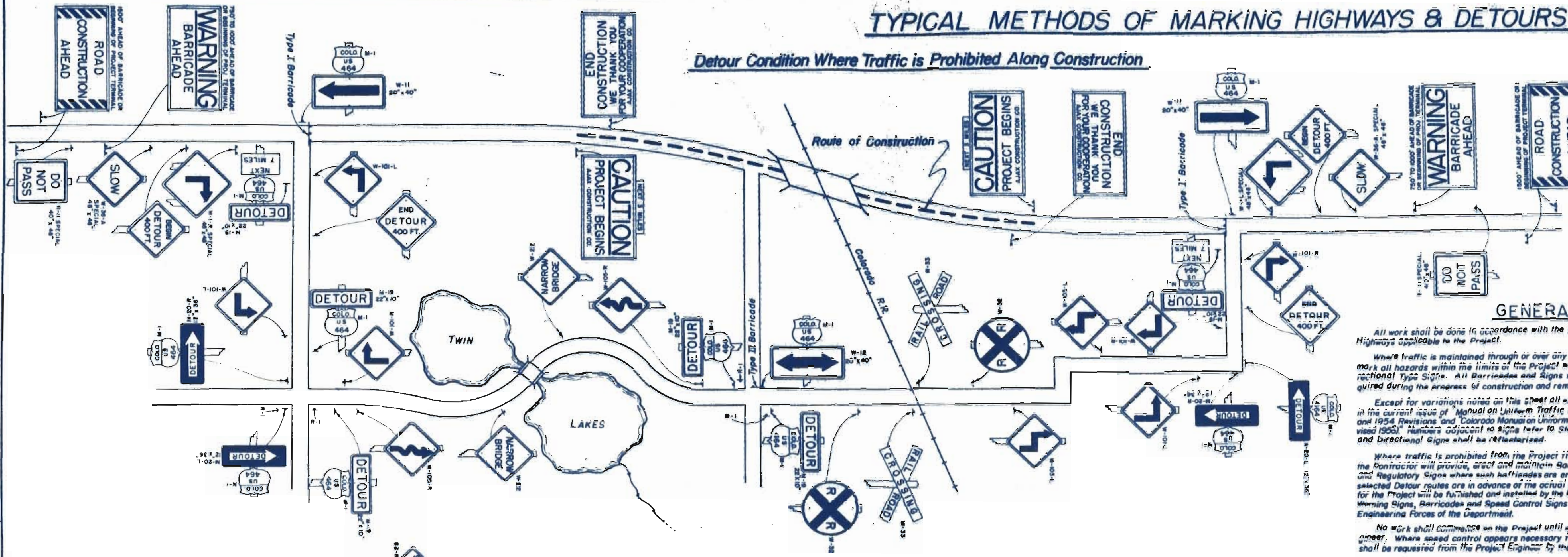
STANDARD M-29-C
(SHEET 1 OF 2 SHEETS)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	F031-1(5)	17

REVISIONS: 10-29-58 General JCR

TYPICAL METHODS OF MARKING HIGHWAYS & DETOURS

Detour Condition Where Traffic is Prohibited Along Construction



GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.

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 with well maintained Barricades, Warning Signs and Directional Type Signs. All Barricades and Signs shall be moved, added to, changed or removed as required during the progress of construction and removed entirely when project is completed.

Except for variations noted on this sheet all signs will be in conformity with the specification outlined in the current issue of "Manual on Uniform Traffic Control Devices for Streets & Highways, PRA August 1948 and 1954 Revisions" and "Colorado Manual on Uniform Traffic Control Devices for Streets & Highways CDOH 1952 (Revised 1956)." Numbers adjacent to signs refer to Standards in the manual. Standard Warning, Regulatory and Directional Signs shall be reflectorized.

Where traffic is prohibited from the Project the Detour will be marked by the Department except that the Contractor will provide, erect and maintain Barricades complete with approved Directional Arrows and Regulatory Signs where such barricades are erected and maintained at the ends of the Project or where selected Detour routes are in advance of the actual project terminal. U.S. or State Route Markers required for the Project will be furnished and installed by the Department. The location and positioning of Advance Warning Signs, Barricades and Speed Control Signs shall be as recommended by the appropriate District Engineering Forces of the Department.

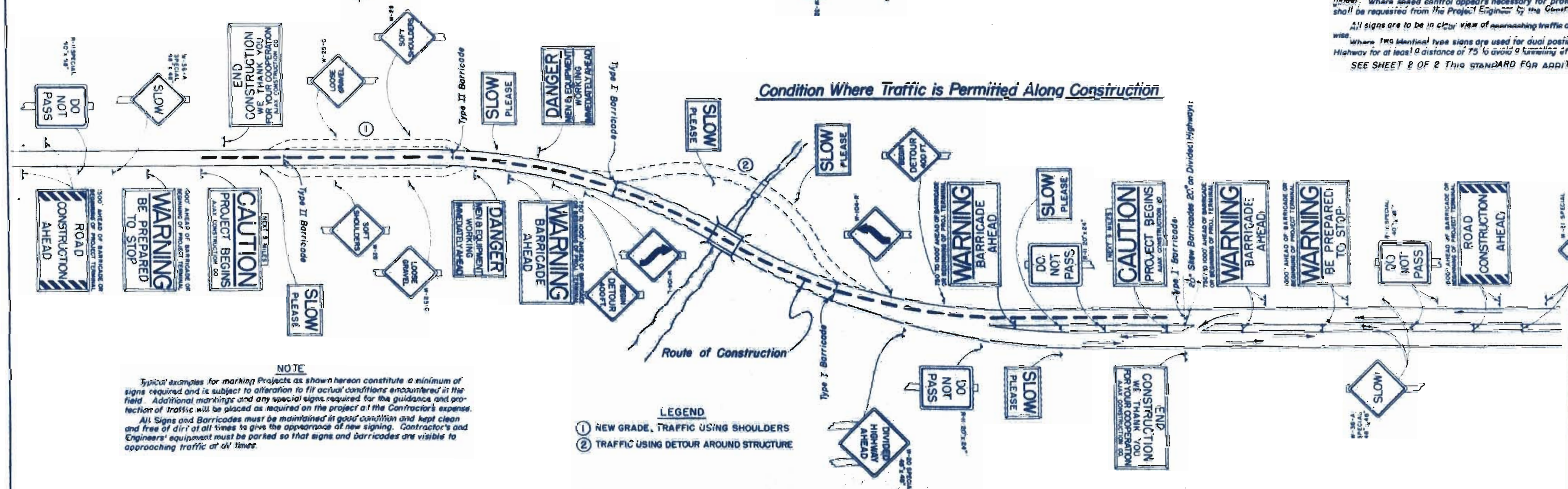
No work shall commence on the Project until all Warning Signs are in place and approved by the Engineer. Where speed control appears necessary for protection of the travelling public, such speed control shall be requested from the Project Engineer by the Contractor.

All signs are to be in clear view of approaching traffic and are not to be obstructed by equipment, weeds or otherwise.

Where two identical type signs are used for dual posting they are to be staggered on the two sides of the Highway for at least a distance of 75' to avoid a tunneling effect.

SEE SHEET 2 OF 2 THIS STANDARD FOR ADDITIONAL NOTES AND DETAILS.

Condition Where Traffic is Permitted Along Construction



NOTE

Typical examples for marking Projects as shown hereon constitute a minimum of signs required and is subject to alteration to fit actual conditions encountered in the field. 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.

All Signs and Barricades must be maintained in good condition and kept clean and free of dirt at all times to give the appearance of new signing. Contractor's and Engineers' equipment must be parked so that signs and barricades are visible to approaching traffic at all times.

LEGEND

① NEW GRADE, TRAFFIC USING SHOULDERS

② TRAFFIC USING DETOUR AROUND STRUCTURE

COLORADO DEPARTMENT OF HIGHWAYS

Standard Roadway Construction Traffic Signs

Designed by J.G.R. Made by J.G.R. Checked by

Approved by A. Julian, Engineer, Surveys & Plans. Date: July 22, 1958

STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

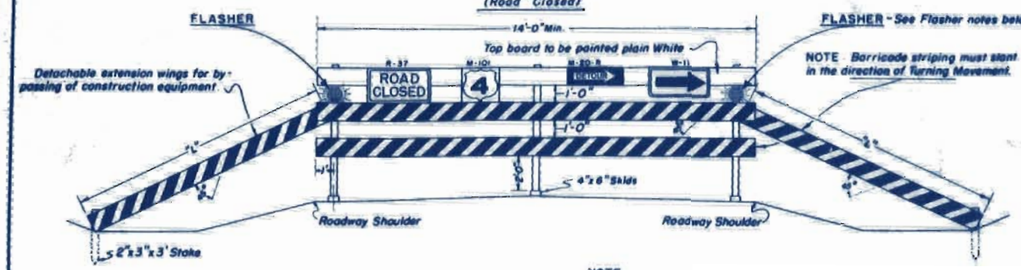
STANDARD M-29-C
(SHEET 2 OF 2 SHEETS)
(ORIGINAL SHEET)

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F031-1 (5)	20

Rev. 10-23-58 ↔ J.C.R.
Rev. 12-12-60 ↔ C.J.S.

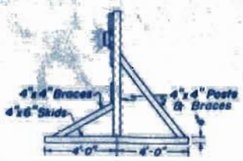
DETAILS OF BARRICADES

Type I
(Road Closed)



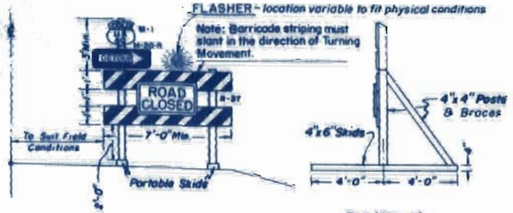
"L" Variable, length to be adequate to provide closing of borrow pit and shoulder.

NOTE
The various types & combinations of approved Signs and Beacons for Barricades required for each project will be governed by field conditions and subject to approval by the Engineer.



End View of Type I Portable Barricade
(Optional)

Type II
(Beg. of Detour, By-Pass Areas within Proj; Extreme Hazards, etc.)



End View of Type II Portable Barricade
(Optional)

NOTE: Alternate materials or other reflective elements on Construction Traffic Signs and Barricades will be permitted only after approval of such material by the Department.

DETAILS OF CONSTRUCTION SIGNS

DETAILS OF SIGN AND BEACON FABRICATION AND USAGE

Construction Signs "A" through and including "G" shall be made of ⅜" Plywood or other material after approval by the Department, and as per details above. Signs shall be reflectorized with reflective sheeting or other reflective materials of types approved by the Department.

CONSTRUCTION SIGN "A" - Wide Angle White background with painted Black lettering. Barricade stripes of 4" Wide Angle White placed over Black painted vertical stripe spaced as shown above. This sign is the First advance warning sign and shall be placed 1500 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way in all cases.

CONSTRUCTION SIGN "B" - Apply top 23" strip of Flat Top Silver, reversed screened or sprayed with Transparent Red Paint allowing the words "WARNING" and 1-inch Underline to remain as Flat Top Silver. Balance of lettering painted Black on a 22" strip of Wide Angle White. This sign is the Second advance warning sign and shall be placed 1000 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way on divided highways and singly on two-lane highways.

CONSTRUCTION SIGN "C" - Apply top 23" strip of Flat Top Silver, reversed screened or sprayed with Transparent Red Paint allowing the words "WARNING" and 1-inch Underline to remain as Flat Top Silver. Balance of lettering painted Black on a 22" strip of Wide Angle White. This sign is the Third advance warning sign in cases where barricades are used and shall be placed 750 to 1000 feet ahead of barricade or beginning of project terminal and on both sides of the travelled way on divided highways and singly on two-lane highways.

REVERSE SIDES OF SIGNS "A", "B" and "C" - The word "SLOW" shall be painted Black and superimposed over a Yellow miniature W-36-A background panel. Balance of lettering shall be painted Black on a White background.

CONSTRUCTION SIGN "D" - Apply top 24½" strip of Flat Top Silver, reversed screened or sprayed with Transparent Red Paint allowing the words "CAUTION" and 1½-inch Underline to remain as Flat Top Silver. Balance of lettering painted Black on a 20½" strip of Wide Angle White. This sign will be provided with a detachable 1" material board mounted on back of sign with 2-⅜"x 2" bolts. This board shall be painted White with Black lettering. (Indicate to the nearest Mile). This sign shall be placed to mark the Beginning of the Project. To be placed singly and may be placed opposite barricade if desirable.

CONSTRUCTION SIGN "E" - Apply top 17½" strip of Flat Top Silver, reversed screened or sprayed with Transparent Red Paint allowing the words "DANGER" and 1-inch Underline to remain as Flat Top Silver. Balance of lettering painted Black on a 27½" strip of Wide Angle White. The sign is of the hinged and fold type to facilitate the closing down of sign when the need is not prevalent. This sign shall be placed 500 feet ahead of the situation on hand.

CONSTRUCTION SIGN "F" - The words "END CONSTRUCTION" and "CONTRACTORS NAME" shall be painted Black on strips 22" and 6½" respectively of Wide Angle White. For balance of lettering, apply 15½" strip of Flat Top Silver, reversed screened or sprayed with Transparent Red Paint allowing "WE THANK YOU FOR YOUR COOPERATION" remaining in Flat Top Silver. This sign shall be placed to mark the Ending of the Project. To be placed singly and may be placed opposite barricade if desirable.

CONSTRUCTION SIGN "G" - The words "SLOW" and "PLEASE" shall be painted Black on a background of Wide Angle Yellow. This sign shall be used frequently within the limits of the Project.

All of the preceding signs shall be fastened to 2-4"x4" posts set 4 feet in the ground with a minimum of 3-1"x4" nailing strips on the back. Bottom of sign to be not less than 36" above the ground.

FLAGMAN WARNING SIGN "H" - This sign shall be made of Plastic or other lightweight material, painted Red background with White lettering on the "STOP" side and painted Green background with White lettering on the "GO" side. Handle to be grooved on one side to indicate reading of sign to flagman. This sign will be used whenever flagmen are necessary. Sign to be reflectorized if used to stop traffic at night.

DETOUR WARNING SIGN "I" - To be of ⅜"(Min.) plywood or No. 16 (Min.) gauge metal with Black painted letters on a Wide Angle Yellow Background.

CONSTRUCTION SIGN "J" - ¾"x 9" metal slides to be placed between "NEXT ___ MILES," spaced so as to accommodate appropriate size numerals. Required numerals to be furnished by the Department and to be installed by the Contractor. Numerals calculated to the nearest Mile.

All material shall be sound and durable. Barricades, signs, symbols and lettering conforming to styles noted hereon will be of good workmanship and well maintained. Uneven lettering will not be accepted.

FLARES AND TORCHES shall be either of the oil burning or electrical type approved by the Department and shall be placed 3 feet to 5 feet ahead of the object to be illuminated. Particular care shall be taken to protect all signs and barricades from smoke and smudge arising from the use thereof.

FLASHERS used on Type I or II Barricade shall be of the Battery or Electrical Type and shall have no less than 12.566 sq. inches of light area (4" dia. lens). The illuminating element in a flashing amber beacon or signal shall be flashed continuously at a rate between 50 or 60 flashes per minute which will be clearly distinguishable to traffic. The duration in which Flashers will be left in operation will be governed by field conditions and subject to approval by the Engineer.

Alternate methods of processing signs or the substitution of symbols or other reflecting elements for painted symbols will be permitted only after approval of such methods or materials by the Department.

The Department shall furnish and install the following as required OUTSIDE THE LIMITS of the Project:

1.	"ROAD CONSTRUCTION AHEAD"	Minimum 4
2.	"WARNING BE PREPARED TO STOP"	Minimum 2
3.	"WARNING BARRICADE AHEAD"	As Required
4. ■	Standard Warning & Directional Signs	As Required

The Contractor shall furnish and install the following as required WITHIN THE LIMITS of the Project:

1.	All Barricades		As Required
2.	"CAUTION PROJECT BEGINS"		Minimum 2
3.	"DANGER MEN & EQUIPMENT WORKING IMMEDIATELY AHEAD"		As Required
4.	"END CONSTRUCTION WE THANK YOU FOR YOUR COOPERATION"		Minimum 2
5.	"SLOW PLEASE"		As Required
6.	Standard Warning & Directional Signs		As Required
7.	Approved Directional Arrows & Regulatory Signs for Barricades		As Required
8.	Torches and Flares as follows:	Type I Barricade	Minimum 3
		Type II Barricade	Minimum 1
9	Flashers - Type I Barricade		2 Required
	Type II Barricade		As Required

■ To be installed on Type I Barricade located immediately inside of Project terminal points.

SPECIFICATIONS

PAINT - All paint and methods of painting shall be in conformity with the Standard Specifications of the Colorado Department of Highways for painting of Timber Structures.

STRIPING - Planking and Wings shall be painted with Maintenance Flat Black on both sides before adding any one of the following acceptable Reflective Strips:
(a) Wide Angle White, 7" strip, spaced 8" apart.
(b) Flat Top Silver, 3" strip, spaced 7" apart.
▲(c) Direct Process of Glass Beads on Paint, 3" strip, spaced 7" apart.

Stripes shall be applied on both front and back of barricades for opposite direction use. Diversion of traffic will be accomplished as follows:
1- Stripes for barricades diverting traffic to the left shall start on the right hand side of the lower plank and progress up to the left. Traffic diversion to the right will be just the opposite.
2- Stripes on barricades diverting traffic in both directions shall begin at the center of the lower plank and progress up in both directions.

TIMBER - All timber used shall conform to the Standard Specifications for Miscellaneous Untreated Timber.

Planking	1"x12" or 2"x12"	S4S
Posts (Barricades)	6"x 6"	S4S
Posts (Signs)	4"x 4"	S4S

The Reflectorized Stripes on planking & wings on all barricades shall be reflectorized with White or Silver Reflective Material of a type acceptable to the Department.

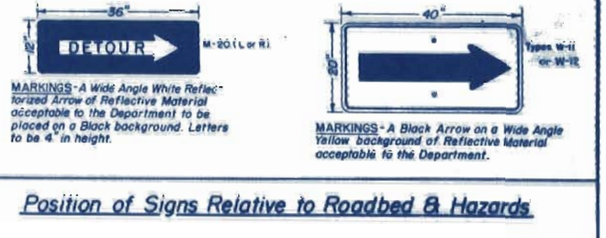
Barricades may be either portable as shown or fixed with posts set into the ground.

All skids, braces and posts to be painted white and nailed together with No. 20d nails.

Bases to be weighted where necessary to provide stability.

▲ When this method is used as described above or when white binder and beads are applied to planking and wings, alternate black stripes using Maintenance Flat Black paint shall be applied over the reflective material in the prescribed pattern. All measurements for striping are to be made along the horizontal axis of the board.

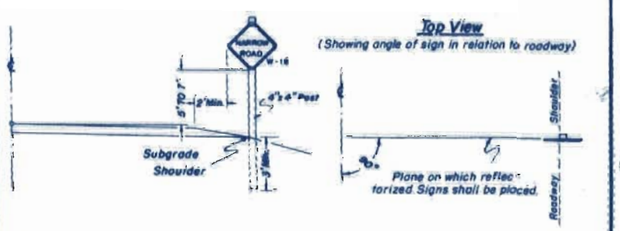
Details of Reflectorized Arrows



MARKINGS - A Wide Angle White Reflectorized Arrow of Reflective Material acceptable to the Department to be placed on a Black background. Letters to be 4" in height.

MARKINGS - A Black Arrow on a Wide Angle Yellow background of Reflective Material acceptable to the Department.

Position of Signs Relative to Roadbed & Hazards



NOTE:
Warning Signs to be made of 3/8"(Min.) plywood or No. 16 Gauge (Min.) metal and shall be reflectorized.

Location to be governed by field conditions. Exact location to be staked by the Engineer. In all cases warning signs are to be placed well in advance of hazard, the distance depending on topography, and existing approach speeds.

COLORADO DEPARTMENT OF HIGHWAYS

Standard Roadway Construction Traffic Signs

Designed by J.C.R.	Approved by [illegible] Engineer, Bridges & Plans
Made by J.C.R.	
Checked by	Date: July 22, 1955

BRIDGE TRACING SHEETS — PLAIN

	INITIAL	DATE
DESIGNED BY		
CHECKED BY		
DRAWN BY		
CHECKED BY		
TRACED BY		
CHECKED BY		

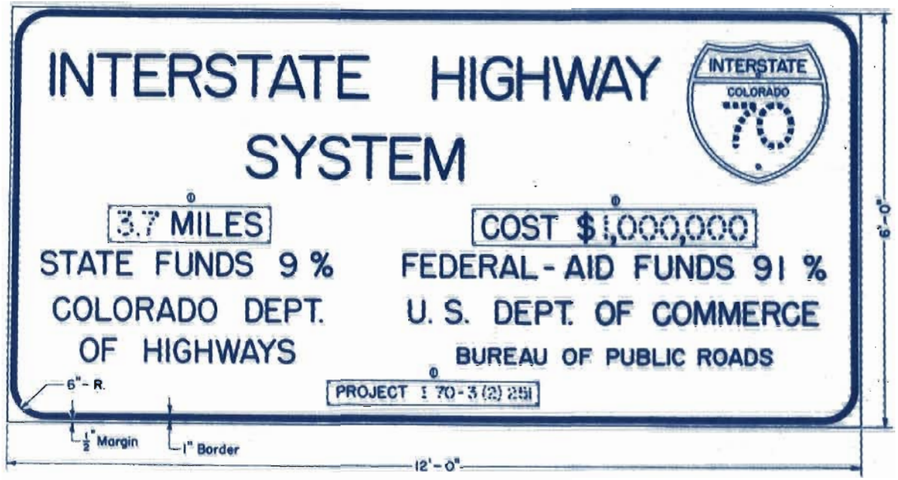
TYPICAL SIGNS

STANDARD M-31-A

FED. ROAD DES. NO.	DIVISION	PROJECT NO.	SHEET NO.
8	COLO.	F031-1(5)	21

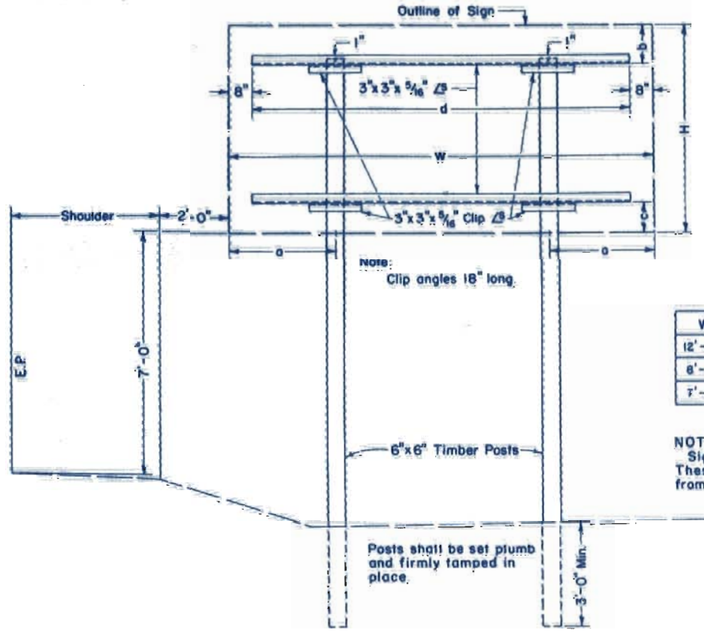
REVISIONS		
1-9-61	GENERAL	E.E.O.
1-27-61	GEN. NOTES	E.E.O.

INTERSTATE SYSTEM



① Plaque length variable, as determined by message.
24" Standard Interstate Shield, for dimensions see "Interstate Signing Manual." Background, letters and numerals plain (nonreflective - Red, White and Blue). (Removable Plaque)

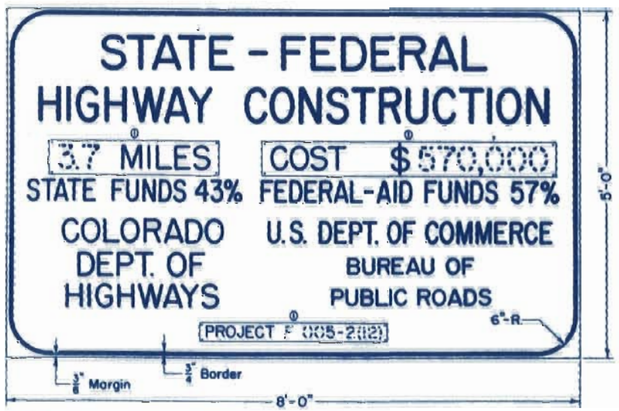
INSTALLATION DETAIL



W	H	a	b	c	d
12'-0"	6'-0"	3'-0"	1'-1½"	0'-10½"	10'-8"
8'-0"	5'-0"	2'-0"	1'-1½"	0'-10½"	6'-8"
7'-0"	4'-0"	1'-9"	1'-1½"	0'-10½"	5'-8"

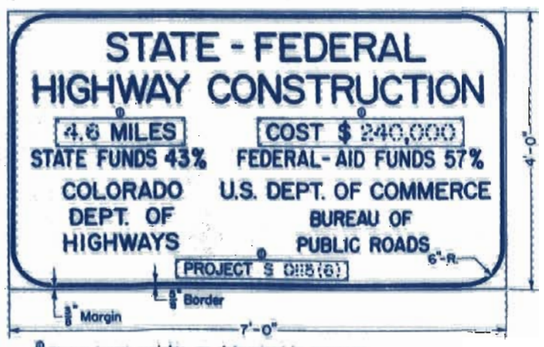
NOTE:
Signs are to be placed facing traffic approaching the work. These signs should be located so as not to obscure or detract from the effectiveness of other official signs.

PRIMARY SYSTEM



① Plaque length variable, as determined by message.

SECONDARY SYSTEM



① Plaque length variable, as determined by message.

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways, applicable to the Project.

Signs shall be made of ¾" Plywood or other material approved by the Department.

Background to be painted plain white with stencil black letters, numerals and border.

Posts shall be 6"X6" S4S timber or other material approved by the Department and shall be painted white.

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

Figure for cost of project to be furnished contractor by Department.

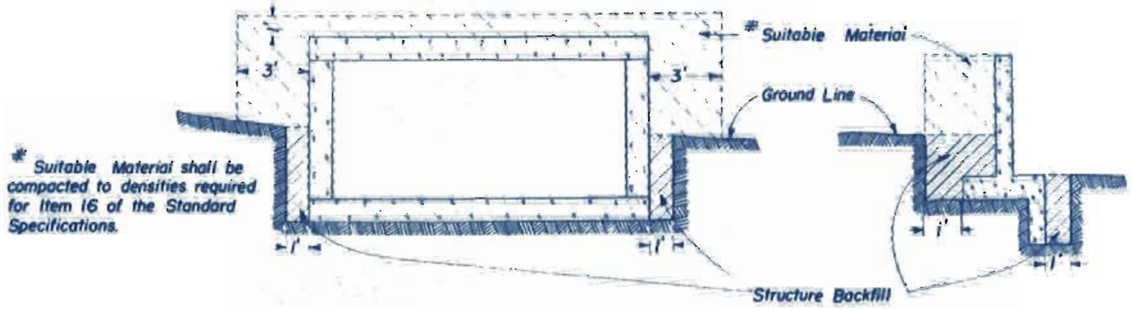
If signs are for a single structure or interchange, name will be used in lieu of mileage. Such as: COLORADO RIVER BRIDGE or ARAPAHOE INTERCHANGE.

COLORADO
DEPARTMENT OF HIGHWAYS

STANDARD IDENTIFICATION SIGNS

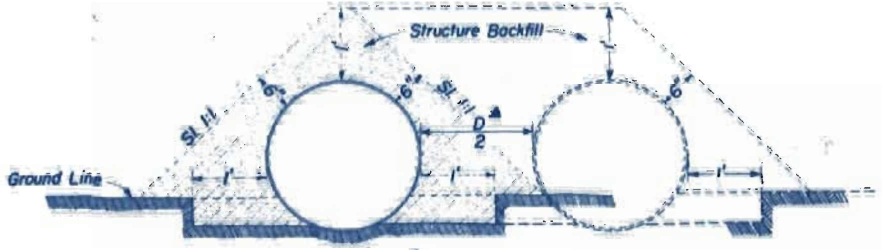
Designed by V.H.	Approved by C. J. Wilson
Made by D.M.E.	Engr. Surveys & Plans
Checked by E.E.O.	Date: Dec. 15 1960

CONCRETE BOX CULVERTS & WINGWALLS



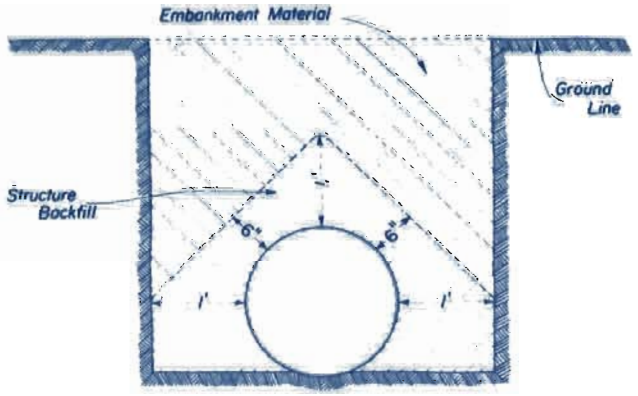
* Suitable Material shall be compacted to densities required for Item 16 of the Standard Specifications.

CIRCULAR CONDUIT



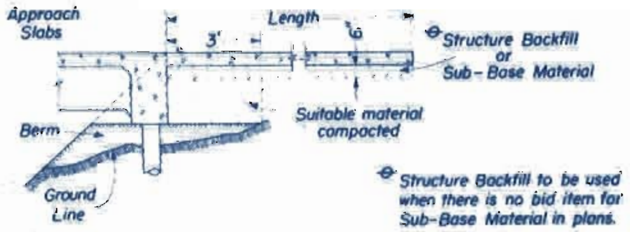
* When two or more conduits are layed side by side, the distance between conduits shall be 1/2 the conduit diameter but not less than 2'-0".

SIPHONS OR CONDUIT IN TRENCH

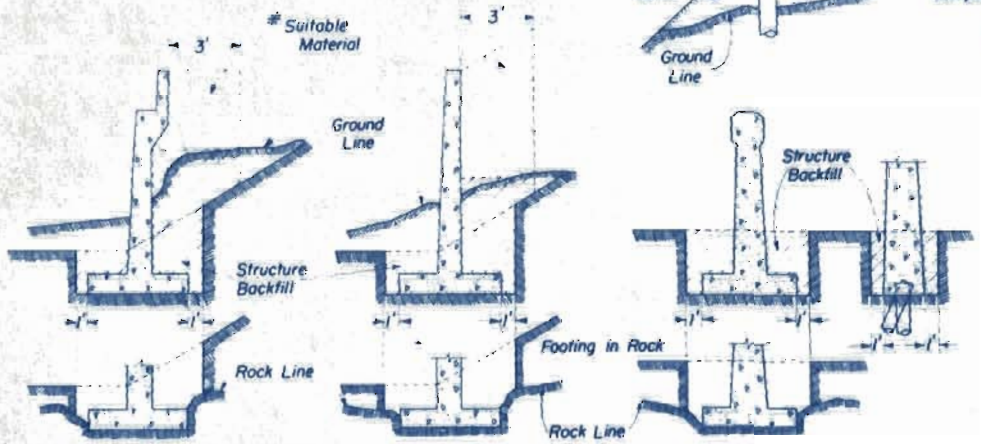


PIERS, ABUTMENTS, RETAINING WALLS ETC.

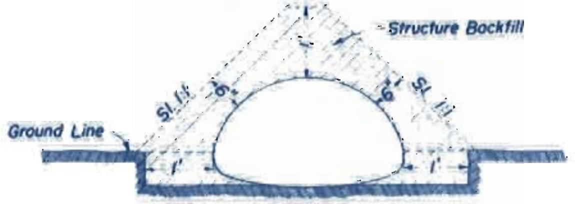
All material that is to be compacted shall be placed in horizontal layers not more than 6" inches in depth and compacted before the next layer is placed. For Arches, Rigid Frames and Box Culverts the fill shall be brought up uniformly on both sides of the center of structure to avoid stresses in the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



⊕ Structure Backfill to be used when there is no bid item for Sub-Base Material in plans.



ELLIPTICAL OR ARCH CONDUIT



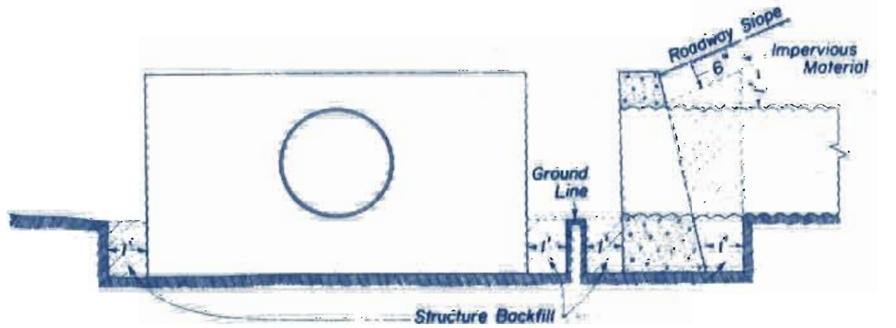
GENERAL NOTES

All work shall be done according to the Standard Specifications of the Colorado Department of Highways applicable to the Project.

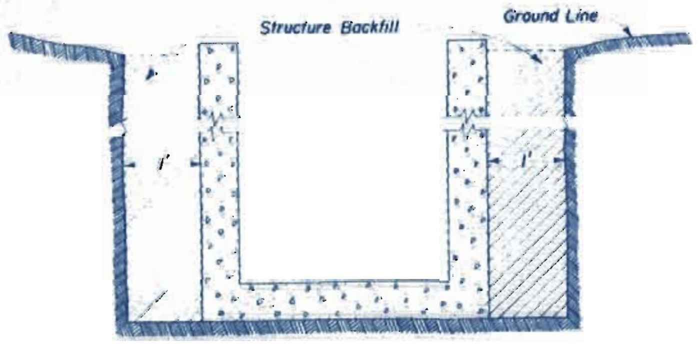
If, in the opinion of the Engineer, the material beneath the Structure is of such character as to cause unequal settlement along the length of the Structure, the material shall be removed to such a depth ordered, and backfilled with gravel or other suitable material and compacted in accordance with Item 16 of the Standard Specifications.

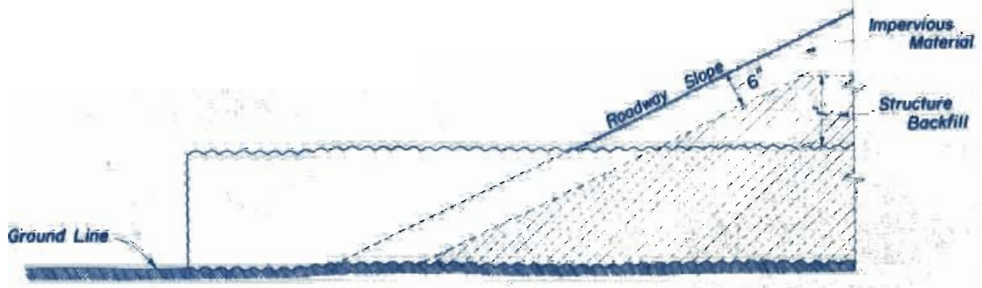
Suitable Material shall be any "Unclassified Excavation" material developed on the project except large rock, boulders or other materials considered by the Engineer to be undesirable for backfill around culverts, boxes etc.

HEADWALLS AND END OF CULVERTS



DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS ETC.





COLORADO DEPARTMENT OF HIGHWAYS

STANDARD METHODS OF BACKFILL AROUND STRUCTURES

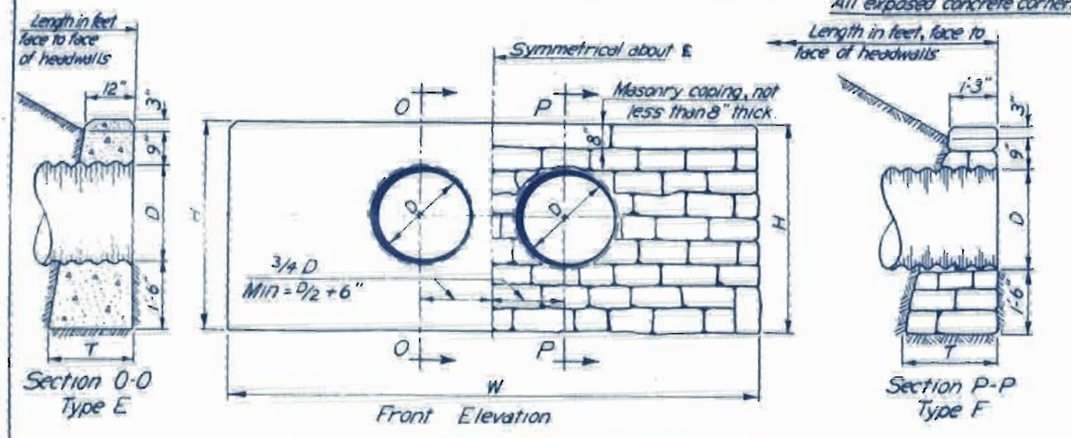
Designed by H.E.P. Made by D.M.E. Checked by L.E.O.	Approved by [signature] Bridge Engineer Date: May 2, 1958

STANDARD M-102-J

FEDERAL ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	F031-1(5)	23

REVISIONS		
2-17-60	Conc. Classification	A.B.H.
11-3-61	Deleted Gages	J.W.K.

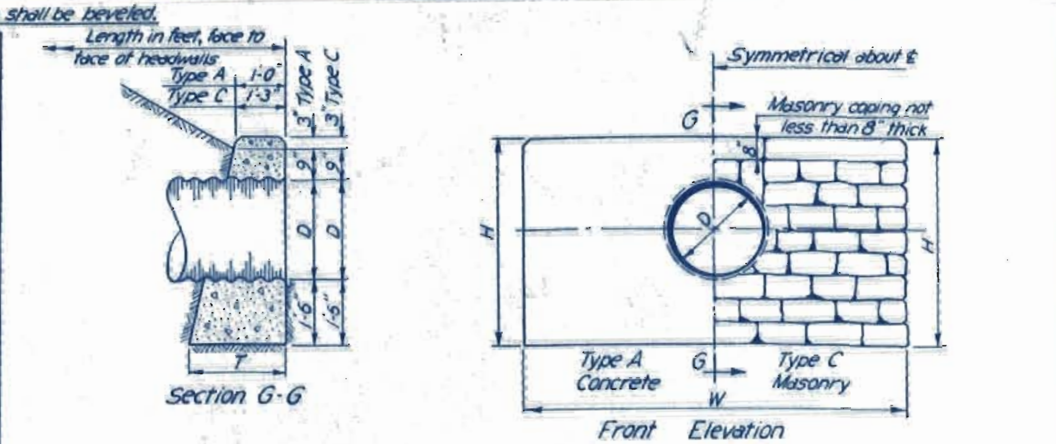
All exposed concrete corners shall be beveled.



STANDARD HEADWALLS FOR DOUBLE CORRUGATED METAL PIPE CULVERTS

Table of Dimensions and Quantities

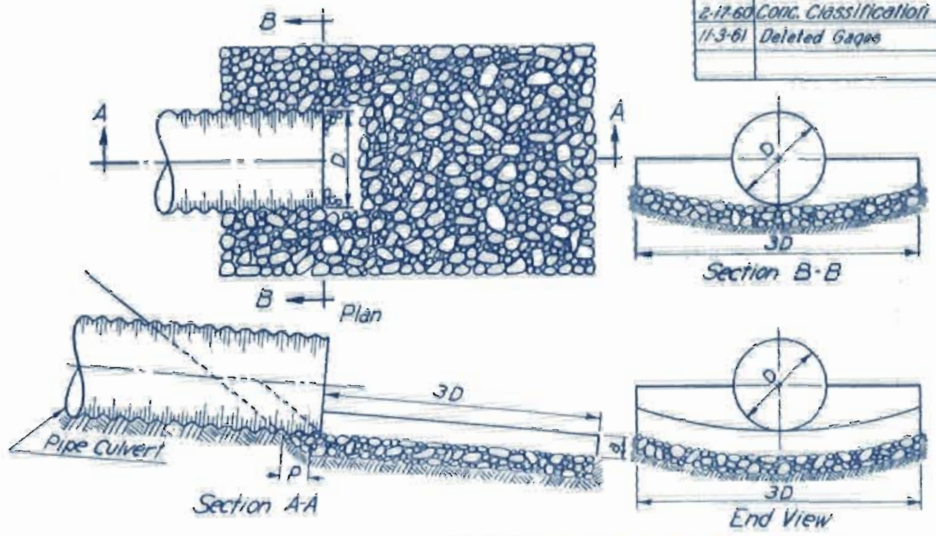
Type E			Both Types				Type F		
D Diam.	T	* Concrete in two Headwalls	W	H			Cement Rubble Masonry in two Headwalls	T	D Diam.
15"	1'-6"	2.4 Cu. Yds.	7'-6"	3'-9"			3.1 Cu. Yds.	2'-0"	15"
18"	1'-7"	3.0 DO	8'-6"	4'-0"			3.8 DO	2'-1"	18"
24"	1'-10"	4.4 DO	10'-6"	4'-6"			5.5 DO	2'-4"	24"
30"	2'-0"	6.1 DO	12'-9"	5'-0"			7.5 DO	2'-6"	30"
36"	2'-2"	8.1 DO	15'-0"	5'-6"			10.0 DO	2'-8	36"
42"	2'-5"	10.8 DO	17'-3"	6'-0"			12.8 DO	2'-10"	42"
48"	2'-7"	13.6 DO	19'-6"	6'-6"			16.3 DO	3'-0"	48"



STANDARD HEADWALLS FOR SINGLE CORRUGATED METAL PIPE CULVERTS

Table of Dimensions and Quantities

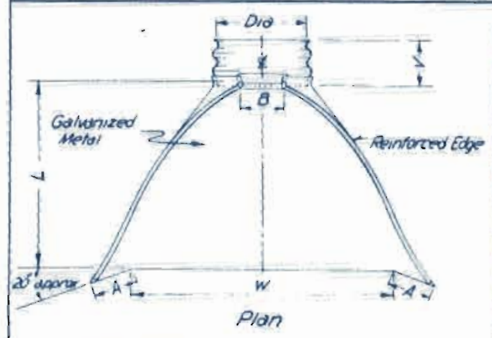
Type A			Both Types				Type C		
D Diam.	T	* Concrete in two Headwalls	W	H			Cement Rubble Masonry in two Headwalls	T	D Diam.
15"	1'-6"	1.8 Cu. Yds.	5'-3"	3'-9"			2.2 Cu. Yds.	2'-0"	15"
18"	1'-7"	2.2 DO	6'-0"	4'-0"			2.8 Do	2'-1"	18"
24"	1'-10"	3.3 DO	7'-6"	4'-6"			4.1 Do	2'-4"	24"
30"	2'-0"	4.5 DO	9'-0"	5'-0"			5.6 Do	2'-6"	30"
36"	2'-2"	6.0 DO	10'-6"	5'-6"			7.4 Do	2'-8"	36"
42"	2'-5"	8.0 DO	12'-0"	6'-0"			9.2 Do	2'-10"	42"
48"	2'-7"	10.0 DO	13'-6"	6'-6"			11.5 DO	3'-0"	48"



STANDARD GROUTED RUBBLE APRON FOR PIPE CULVERT

Square Yards Grouted Rubble Slope and Ditch Paving One Foot Thick

Fill Slope	D	15"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"
	p \ d	7½	9"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"	12"
1½:1	2'-0"	3	4	6	9	12	17	21	27	33	39	46	54	62
2:1	2'-0"	3	4	7	10	13	18	22	28	34	41	49	57	66
3:1	3'-0"	3	4	7	11	15	20	25	31	38	45	54	63	72
4:1	4'-0"	3	5	8	12	16	22	28	34	42	50	59	69	79



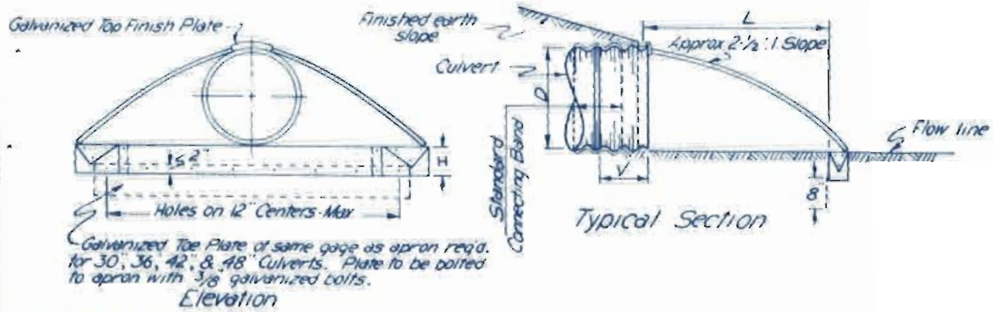
V = 7" for 12" D. to 30" D
V = 12" for 36" D. to 48" D

Type K

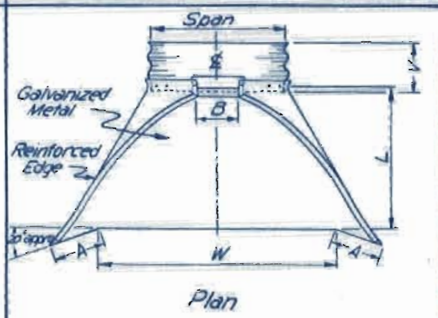
Culv Diam D▲		A 1" Tol	B Max.		L 1½" Tol	W 2" Tol	H 1" Tol		Remarks
12"		4¾	6"		21"	24"	6"		One piece skirt
15"		6"	8"		26"	30"	6"		One piece skirt
18"		7"	9"		31"	36"	6"		One piece skirt
21"		8¼	11"		36"	42"	6"		One piece skirt
24"		9½	12"		42"	48"	6"		One piece skirt
30"		12"	15"		52½	60"	7½"		Two piece skirt ⊖
36"		14"	18"		63"	72"	9"		Two piece skirt ⊖
42"		16"	21"		73½	84"	10½		Two piece skirt ⊖
48"		18"	27"		84"	90"	12"		Two piece skirt ⊖

Splices to be the lap riveted type.
⊖ One splice on ℄ made by either riveting or bolting. Galvanized Connector Section, Corner Plate & Toe Plate to be same gage as skirt section.
▲ Culvert diameter is equal to dimension D of connector section.

Note: Length of Toe Plate for Culverts 15" to 30" Dia incl = "W" + 10"
36" to 48" Dia incl = "W" + 22"



STANDARD METAL APRONS FOR CORRUGATED METAL PIPE CULVERTS TYPE K



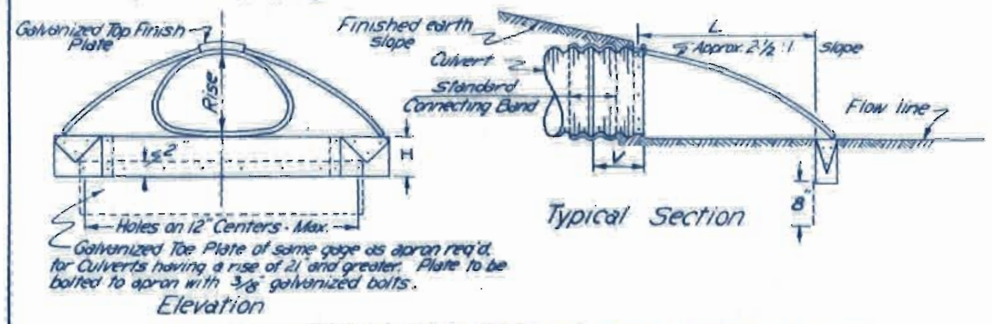
V = 7" for 18" x 11" to 36" x 22" Pipe-Arches
V = 12" for 43" x 27" to 72" x 44" Pipe-Arches

Type L

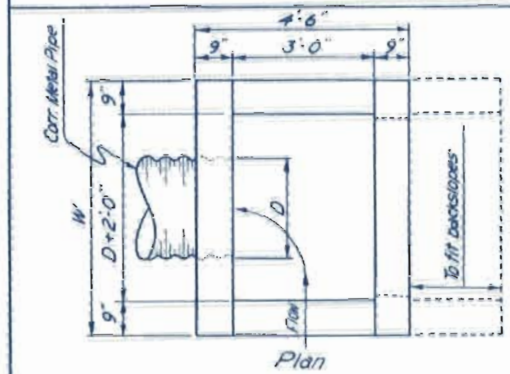
Normal Culvert Diam.	Arch Dimensions Span	Rise		A 1" Tol.	B Max.		L 1½" Tol	W 2" Tol	H 1" Tol		Remarks
15"	18"	11"		4½	9"		19"	30"	6"		One piece skirt
18"	22"	13"		5¼	10"		23"	36"	6"		One piece skirt
24"	29"	18"		7"	14"		31½	48"	6"		One piece skirt
30"	36"	22"		8¾	16"		38½	60"	6"		One piece skirt
36"	43"	27"		10¾	17½		47"	75"	7⅝		Two piece skirt ▲
42"	50"	31"		12¼	20"		54"	85"	9⅛		Two piece skirt ▲
48"	58"	36"		14"	26"		63"	96"	10⅝		Two piece skirt ▲
54"	65"	40"		15¾	23"		70"	112"	10⅝		Three piece skirt ϕ
60"	72"	44"		17¼	24"		77"	128"	12⅛		Three piece skirt ϕ

▲ Splices to be the lap riveted or bolted on ℄
ϕ Sections to be joined by riveting or bolting equal distance from ℄. Galvanized Connector Section, Corner Plate & Toe Plate to be same gage as skirt section.

Note: Length of Toe Plate for Pipe-Arch Culverts with rise of 11" to 27" incl. = "W" + 10"
31" to 44" incl. = "W" + 18"



STANDARD METAL APRONS FOR CORRUGATED METAL PIPE ARCH CULVERTS TYPE L



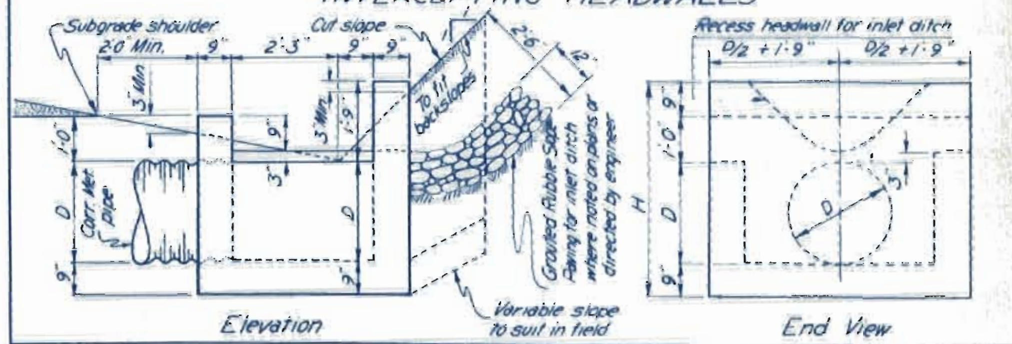
Quantities of *Concrete or Cement Rubble Masonry

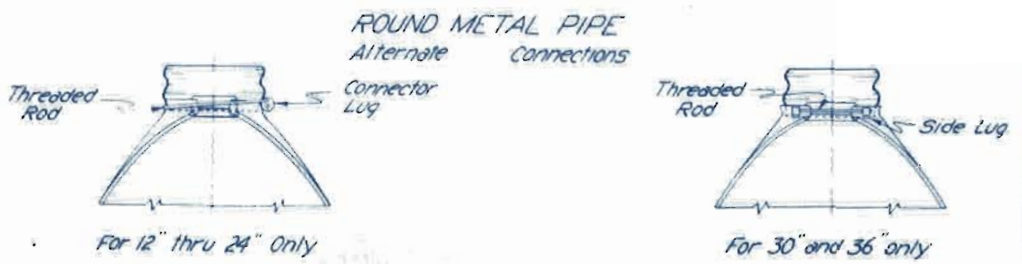
Size of Pipe	Width of Wall	Height of Wall	Quantities in One Headwall
D	W	H	Cu. Yds.
15"	4'-9"	3'-9"	1.48
18"	5'-0"	4'-0"	1.64
24"	5'-6"	4'-6"	1.99
30"	6'-0"	5'-0"	2.34
36"	6'-6"	5'-6"	2.72

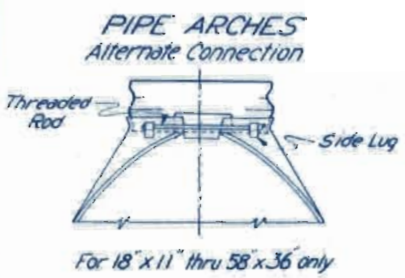
Note: Backwall to be eliminated and end walls connected to back slope where ordered by the Engineer. Floor slab is to be extended with side walls if in common material and is to be omitted when inlet is in rock. Actual quantities involved in such operation shall be allowed and paid for. Increases in plan quantities must be covered by work order.

* See plan sheets for concrete classification.

INTERCEPTING HEADWALLS







General Notes for All Structures

All work shall be done according to the standard specifications of the Colorado Department of Highways applicable to the Project.

All construction joints shall be thoroughly cleaned before fresh concrete is poured.

The gage of material used in Metal Aprons shall conform to A.A.S.H.O. specification M-36.

When culvert is skewed, headwalls shall be placed parallel to ℄ of roadway.

Minimum grade of pipe shall be 1%

COLORADO
DEPARTMENT OF HIGHWAYS
STANDARD HEADWALLS
INTERCEPTING HEADWALLS
GALVANIZED METAL APRONS
GROUTED RUBBLE APRONS
FOR CORR. METAL PIPE CULVERT

Designed by PSB-6110	Approved by A.L. Newbold, Bridge Engineer
Made by H.G.P.	
Checked by M.W.M.	Date June 1, 1958

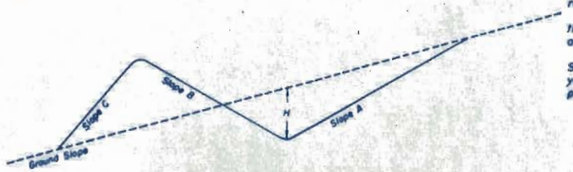
STANDARD TYPES of DITCHES and CONSTRUCTION METHODS

STANDARD M-107-D

REG. NO. | DIVISION | COLO. | F031-1 (5) | 24

DETAILS for CONTOUR INTERCEPTING DITCHES

Typical Section for Contour Intercepting Ditches



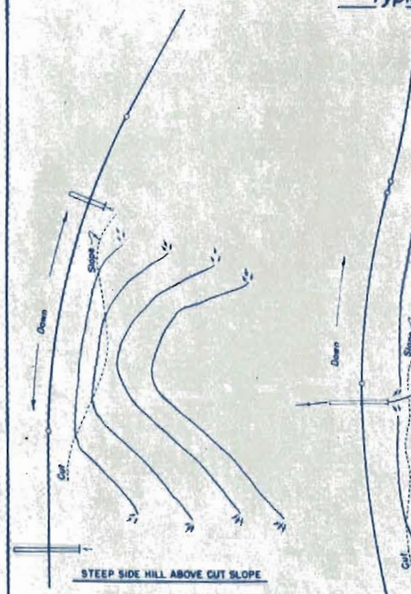
PURPOSE & USE OF THE TABLE

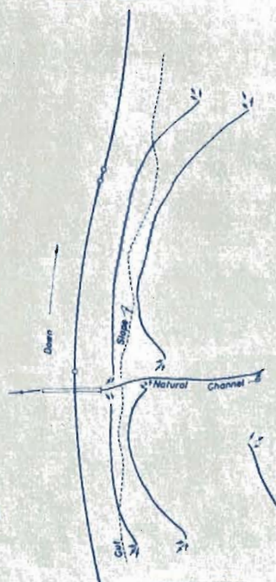
The primary purpose of the information for Contour and Intercepting Ditches shown on this sheet is to serve as a guide in construction and to readily arrive at yardages of excavation involved.

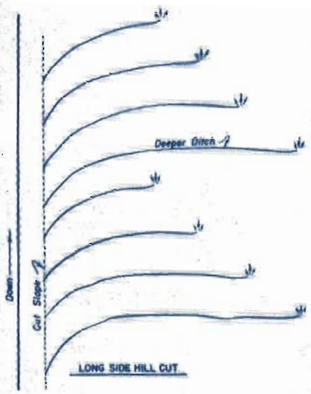
Foremost consideration in constructing these ditches is given first to the natural ground line slope confronted in construction, thence to the other values shown on the Typical Section.

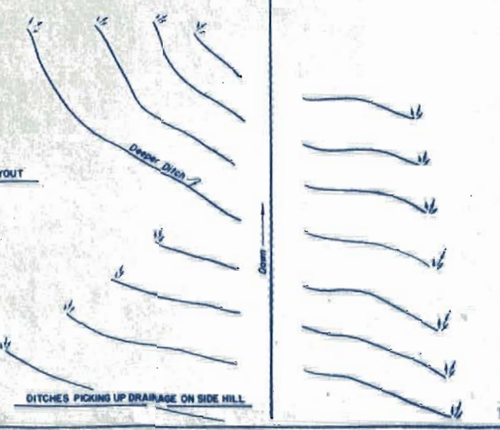
By properly arriving at the combination of values shown on the Typical Section and in the Table for a specified condition, the number of cubic yards of excavation per 100 lin. ft. of ditch may be read under the appropriate column for this item.

Typical Construction Layouts









Scale of Sketches in Feet

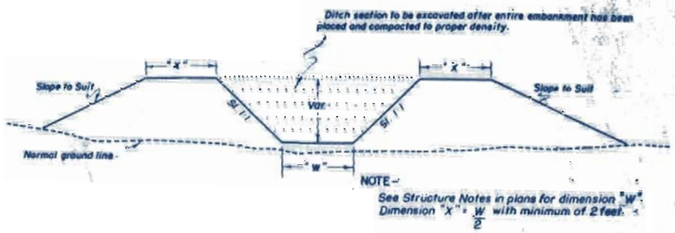
100 0 100 200 300 400

Table of Slopes and Yardages

▲ SLOPES				H	Cubic Yards per 100 lin. ft. of Ditch
Ground	A	B	C		
5:1 Or Flatter	2:1	4:1	2:1	15"	16
				18"	23
				21"	32
		3:1		15"	15
				18"	22
				21"	30
		2:1		15"	14
				18"	20
				21"	27
		1-1/2:1		15"	13
				18"	19
				21"	25
	1-1/2:1	4:1	1-1/2:1	15"	12
				18"	18
				21"	25
		3:1		15"	12
				18"	17
				21"	23
		2:1		15"	10
				18"	15
				21"	20
		1-1/2:1		15"	10
				18"	14
				21"	19
4:1	2:1	4:1	2:1	15"	17
				18"	25
				21"	34
		3:1		15"	17
				18"	24
				21"	32
		2:1		15"	15
				18"	22
				21"	30
		1-1/2:1		15"	15
				18"	21
				21"	29
	1-1/2:1	4:1	1-1/2:1	15"	13
				18"	18
				21"	25
		3:1		15"	12
				18"	17
				21"	23
		2:1		15"	11
				18"	16
				21"	21
		1-1/2:1		15"	10
				18"	14
				21"	20
3:1	2:1	3:1	2:1	15"	22
				18"	31
				21"	43
		2:1		15"	21
				18"	30
				21"	41
		1-1/2:1		15"	20
				18"	29
				21"	40
	1-1/2:1	3:1	1-1/2:1	15"	13
				18"	19
				21"	26
		2:1		15"	12
				18"	17
				21"	24
		1-1/2:1		15"	12
				18"	17
				21"	23
2:1	1-1/2:1	2:1	1-1/2:1	15"	20
				18"	29
				21"	40
		1-1/2:1		15"	20
				18"	28
				21"	39
	1:1	2:1	1:1	15"	9
				18"	13
				21"	17
		1-1/2:1		15"	8
				18"	12
				21"	16
1-1/2:1	1:1	1-1/2:1	1:1	15"	11
				18"	16
				21"	21

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

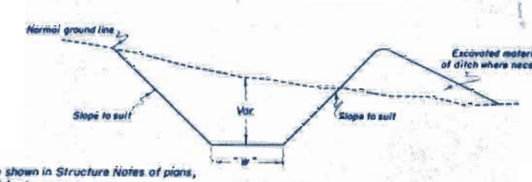
TYPICAL SECTIONS for DRAINAGE, IRRIGATION DITCHES and CHANNEL CHANGES



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

GENERAL NOTES

All work shall be done in accordance with the Standard Specifications of the Colorado State Highway Department applicable to the Project.

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

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

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

The following horizontal spacing of ditches is recommended:

4% to 6%	Approximately 70' Centers
6% 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.

COLORADO DEPARTMENT OF HIGHWAYS

Standard Types of Ditches and Construction Methods

Designed by C.G.M.
Made by C.G.M.
Checked by

Approved by H. Marshall
Engineer, Surveys & Plans
Date: Aug. 18, 1950

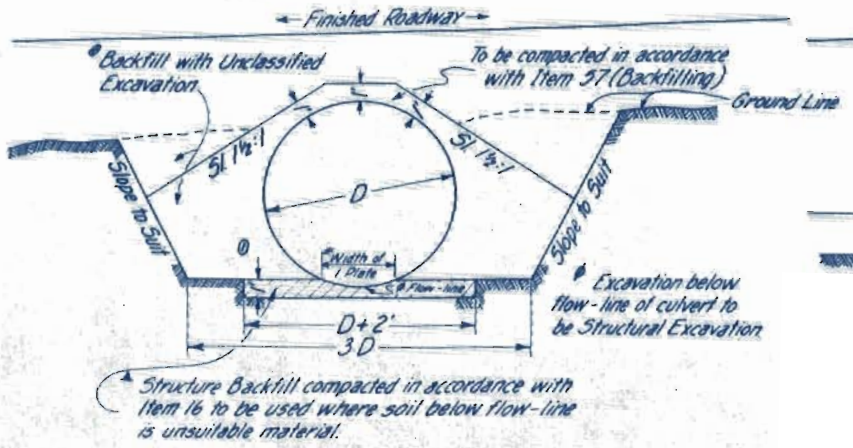
FORM C.D.H. 117
MAR. 1953
BRIDGE TRACING
SHEETS—PLAIN

STANDARD M-113-D

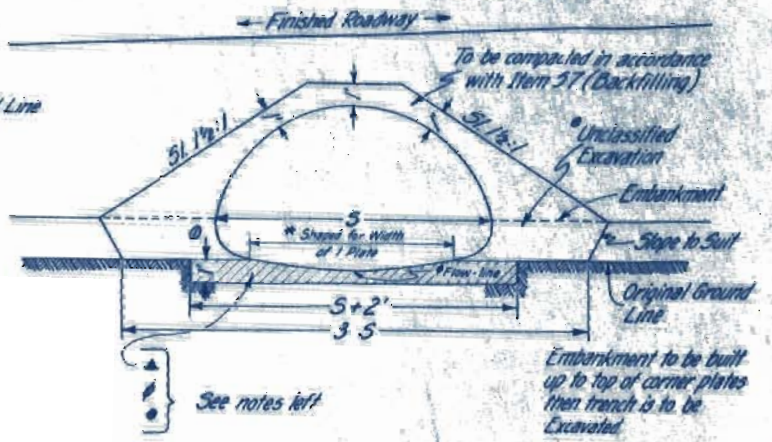
FED. ROAD DIV. NO.	DISTRICT	PROJECT NO.	NO.
9	COLO.	F031-1(5)	25

TYPICAL CROSS SECTIONS SHOWING EXCAVATION AND BACKFILL FOR MULTIPLE PLATE CULVERTS

PIPE IN TRENCH



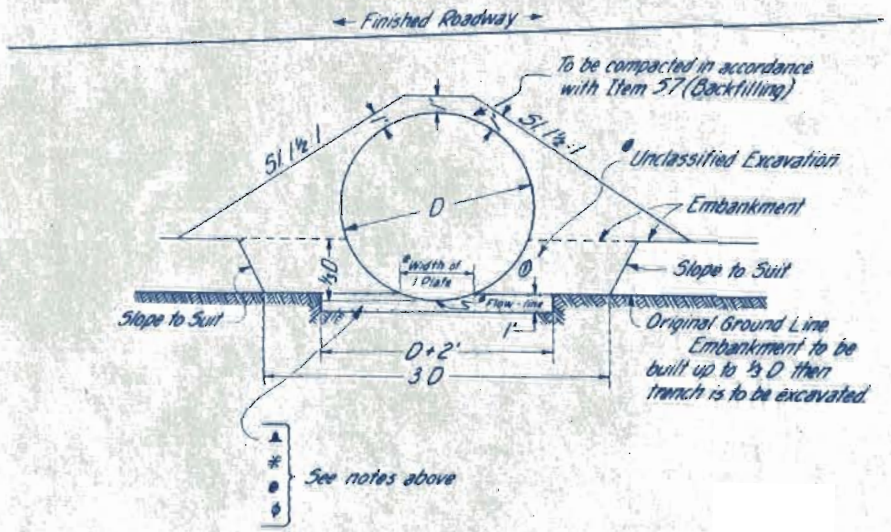
MULTIPLE PLATE PIPE ARCH CULVERT



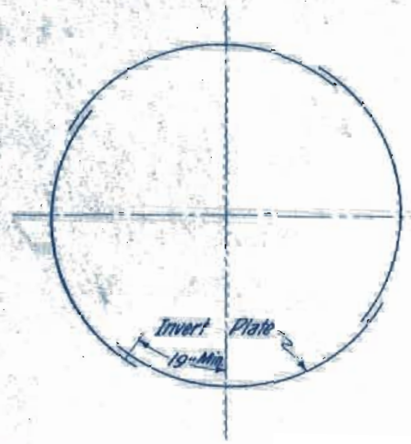
* Shaped for width of 1 plate (Structural Excavation)
• If unclassified excavation material developed adjacent to structure is considered by the Engineer to be unsuitable for backfill, adjustment for obtaining suitable material will be made in accordance with paragraph 4.5 "Extra Work" of the Standard Specifications

⊘ Minimum of 8" when trench is in Solid Rock

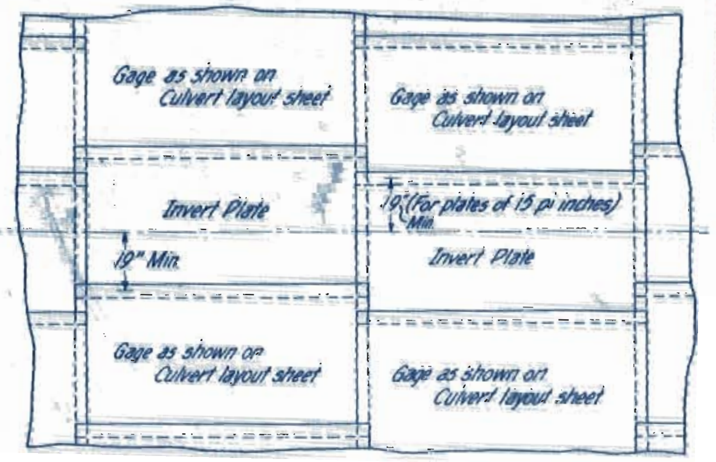
PIPE IN FILL



DETAILS OF MULTIPLE PLATE CORRUGATED METAL CULVERT PIPE



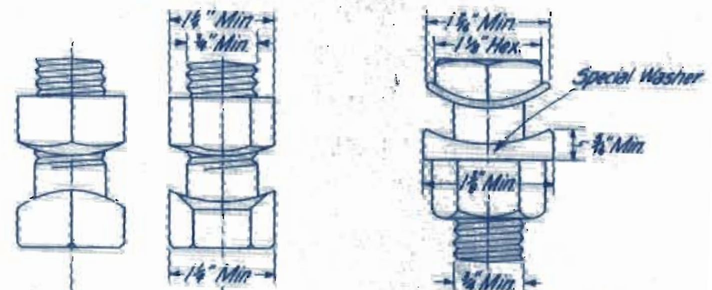
Note: Invert Plate shall extend a minimum of 19" on either side of centerline



PLAN OF PLATE ARRANGEMENT

REVISIONS		
3-20-59	Nuts, Anchors, & Excav.	MRH
6-12-63	Deleted Note	E.E.O.
1-17-61	General	E.E.O.

TYPICAL SECTIONAL PLATE BOLTS, NUTS & WASHER ASSEMBLIES



HEXAGON OR SQUARE HEAD BOLT WITH HALF ROUND BEARING SURFACE

INTEGRALLY FORGED BOLTHEAD & WASHER WITH HALF ROUND BEARING SURFACE

GENERAL NOTES

Culverts requiring beveled or mitered ends for skew angles will be as shown for the individual structures.

For multiple plate pipe arch culverts the plates shall be staggered as recommend by the manufacturer.

Plates must be placed in conformity with the diagrams shown on this sheet.

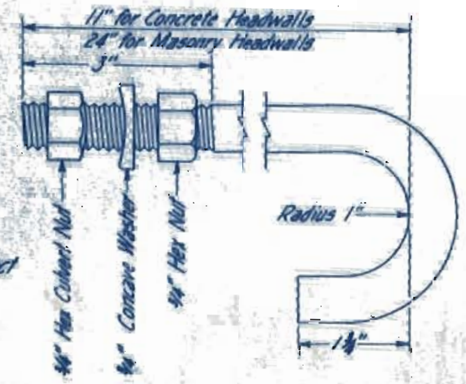
Bolts in longitudinal seams shall be placed in conformity with information given on the layouts for the individual structures.

Boltheads & Washers are to be curved to fit corrugation of pipe, and shall be as shown on this sheet.

DETAILS OF ANCHOR BOLTS
(WHERE REQUIRED BY PLANS)

Holes for Anchor Bolts to be punched at not more than two (2) foot centers depending upon the circumference of the pipe. All Anchor Bolts, Nuts & Washers are to be hot dip galvanized. Anchor Bolts are to be furnished with the pipe. Cost of Anchor Bolts to be included in bid price per linear foot of pipe.

Anchor bolts, nuts and washers shall be of the type designated, or an acceptable equivalent, subject to approval by the Department.



Designed By	Initial	Date
Checked By		
Drawn By		
Checked By		
Traced By		
Checked By		

COLORADO
DEPARTMENT OF HIGHWAYS

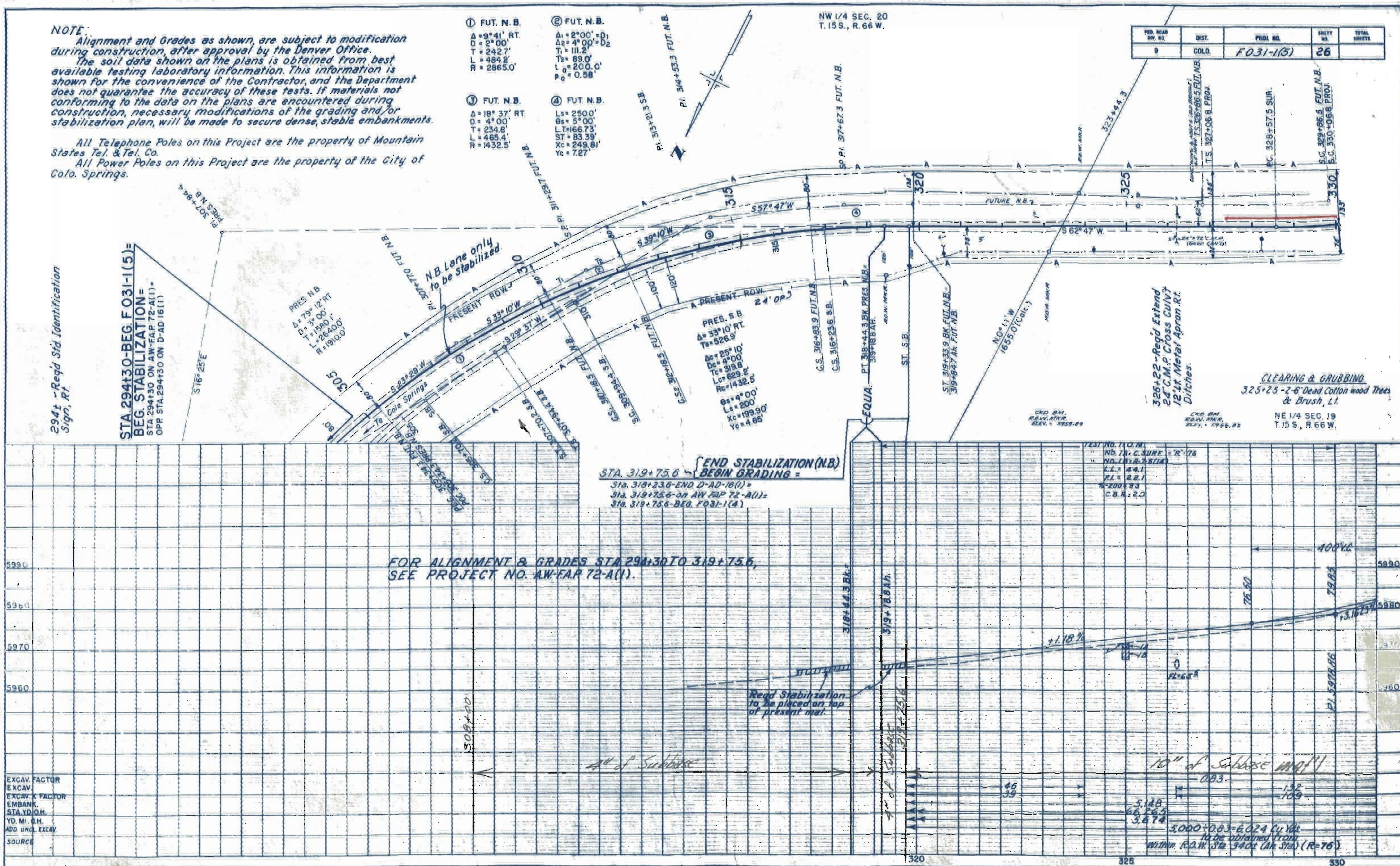
MULTIPLE PLATE CULVERT DETAILS

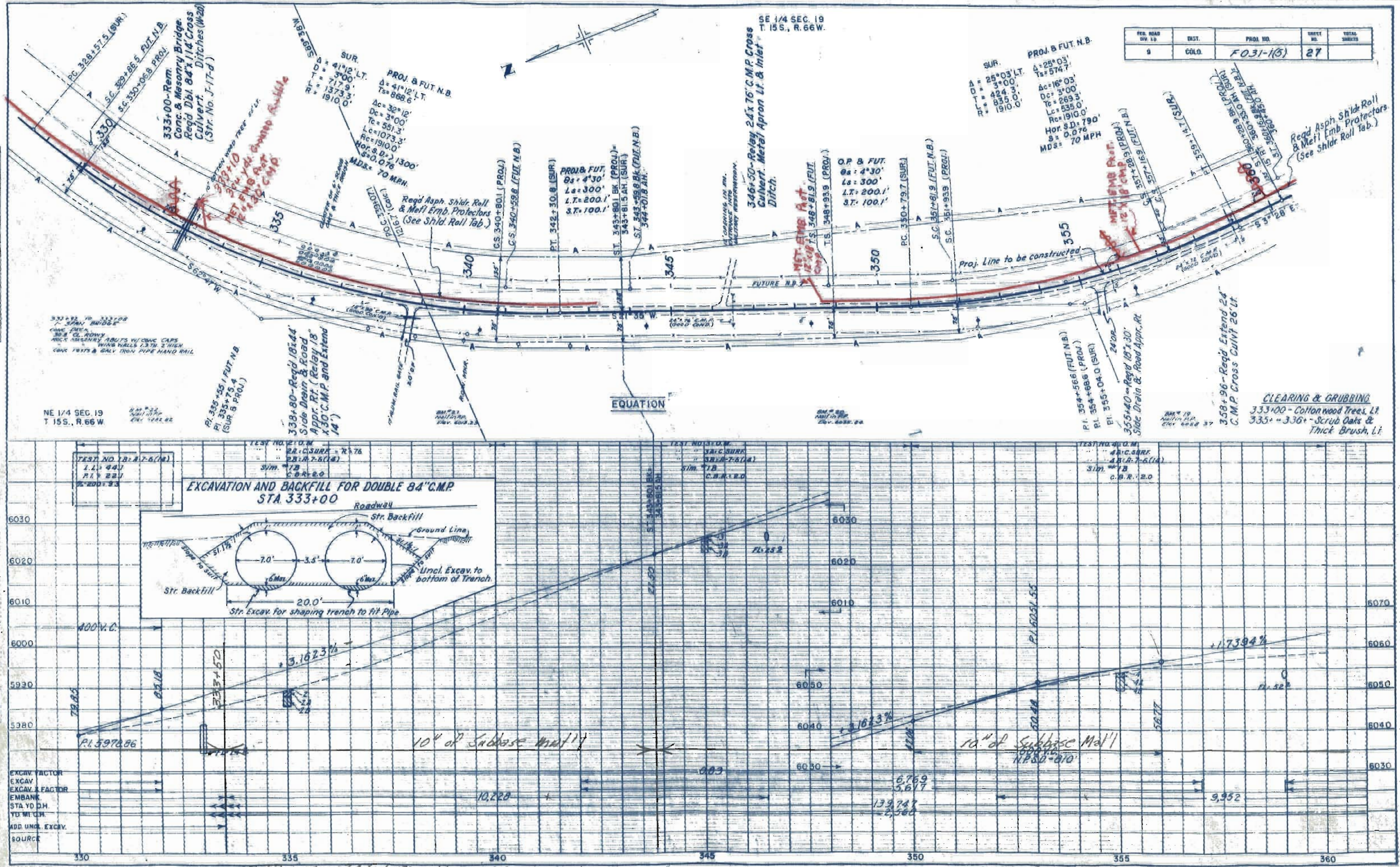
Designed by M.R.H. Made by D.M.E. Checked by L.E.O. Approved by [signature] Bridge Engineer Date: Feb. 18, 1959

FED. ROAD DIV. NO.	DIST.	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F031-1(5)	26	

NOTE:
Alignment and Grades as shown, are subject to modification during construction, after approval by the Denver Office.
The soil data shown on the plans is obtained from best available testing laboratory information. This information is shown for the convenience of the Contractor, and the Department does not guarantee the accuracy of these tests. If materials not conforming to the data on the plans are encountered during construction, necessary modifications of the grading and/or stabilization plan, will be made to secure dense, stable embankments.

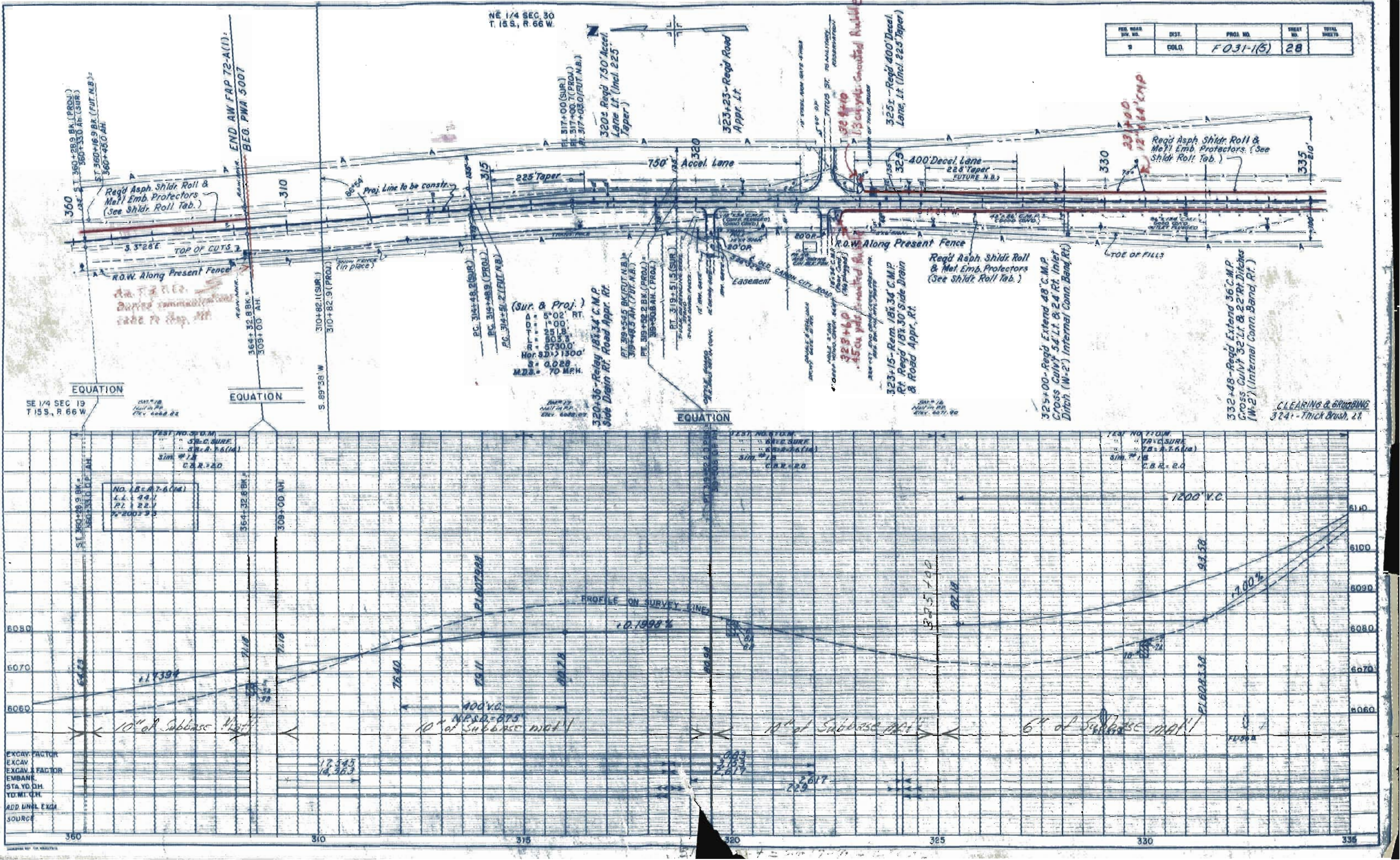
All Telephone Poles on this Project are the property of Mountain States Tel. & Tel. Co.
All Power Poles on this Project are the property of the City of Colo. Springs.





FED. ROAD DIV. NO. 9
DIST. COLO.
PROJ. NO. F031-1(5)
SHEET NO. 27
TOTAL SHEETS
SE 1/4 SEC. 19
T. 15 S., R. 66 W.
NE 1/4 SEC. 19
T 15 S., R. 66 W.
N
PLAN
PROFILE
P.C. 328+57.5 (SUR.)
S.C. 329+86.5 FUT. N.B.
S.C. 330+06.8 PROJ.
333+00-Rem. Conc. & Masonry Bridge. Req'd Dbl. 84"x 114' Cross Culvert. Ditches (W-20) (Str. No. J-17-d)
333+10 30 cu yds. Grouted Rubble
MET EMB Prot. 12"x 30' CMP
SUR. Δ = 41°12' LT. D = 3°00' T = 717.9' L = 1373.3' R = 1910.0'
PROJ. & FUT. N.B. Δ = 41°12' LT. Ts = 868.6'
Δc = 32°12' Dc = 3°00' Tc = 551.3' Lc = 1073.3' Rc = 1910.0' Hor. S.D. = 1300' S = 0.076 M.D.S. = 70 M.P.H.
P.O.C. 339+07.1 (Calc.) 1216.7'
Req'd Asph. Shldr. Roll & Met'l Emb. Protectors (See Shld. Roll Tab.)
C.S. 340+80.1 (PROJ.)
C.S. 340+59.8 (FUT. N.B.)
P.T. 342+30.8 (SUR.)
PROJ. & FUT. θs = 4°30' Ls = 300' L.T. = 200.1' S.T. = 100.1'
S.T. 343+80.1 BK. (PROJ.) = 343+81.5 AH. (SUR.)
S.T. 343+59.8 BK. (FUT. N.B.) 344+01.8 AH.
346+50-Relay 24"x 76' C.M.P. Cross Culvert. Metal Apron Lt. & Inlet Ditch.
MET. EMB. Prot. 12"x 18' CMP
T.S. 348+81.9 (FUT.
T.S. 348+93.9 (PROJ.)
O.P. & FUT. θs = 4°30' Ls = 300' L.T. = 200.1' S.T. = 100.1'
P.C. 350+79.7 (SUR.)
S.C. 351+81.9 (FUT. N.B.)
S.C. 351+93.9 (PROJ.)
Proj. Line to be constructed
FUTURE N.B.
S 62° 47' W.
S 21° 35' W.
S 3° 28' E.
SUR. Δ = 25°03' LT. D = 3°00' T = 424.3' L = 835.0' R = 1910.0'
PROJ. & FUT. N.B. Δ = 25°03' Ts = 574.7'
Δc = 16°03' Dc = 3°00' Tc = 269.3' Lc = 535.0' Rc = 1910.0' Hor. S.D. = 790' S = 0.076 MDS = 70 MPH
MET. EMB. Prot. 12"x 18' C.M.P.
C.S. 357+28.9 (PROJ.)
C.S. 357+16.9 (FUT. N.B.)
P.T. 359+14.7 (SUR.)
S.T. 360+28.9 BK. (PROJ.) 360+33.0 AH. (SUR.)
S.T. 360+16.9 BK. (FUT. N.B.) 360+45.0 AH.
Req'd Asph. Shldr. Roll & Met'l Emb. Protectors (See Shldr. Roll Tab.)
24"x 72' C.M.P. (GOOD COND.)
24"x 76' C.M.P. (GOOD COND.)
18"x 30' C.M.P. (GOOD CON'D)
330
335
340
345
350
355
360
332+92 TO 333+08 1-SPAN BRIDGE CONC. DECK 30.8' CL. RDWY. ROCK MASONRY ABUTS W/ CONC. CAPS WING WALLS 1.3 TH. 2' HIGH CONC. POSTS & GALV. IRON PIPE HAND RAIL
P.I. 335+55.1 FUT. N.B.
P.I. 335+75.4 (SUR. & PROJ.)
338+80-Req'd 18"x 44' Side Drain & Road Appr. Rt. (Relay 18"x 30' C.M.P. and Extend 14')
20' OP
EQUATION
P.I. 354+56.6 (FUT. N.B.)
P.I. 354+68.6 (PROJ.)
P.I. 355+04.0 (SUR.)
24' OP
355+40-Req'd 18"x 30' Side Drain & Road Appr. Rt.
358+96-Req'd Extend 24" C.M.P. Cross Culvt. 26' Lt.
CLEARING & GRUBBING
333+00 - Cottonwood Trees, Lt.
335+ - 336+ - Scrub Oaks & Thick Brush, Lt.
TEST NO. 1B: A-7-6(14) L.L. = 44 P.I. = 22 % -200 = 93
TEST NO. 2: O.M. 2A: C. SURF. = R = 76 2B: A-7-6(14) Sim. #1B C.B.R. = 2.0
TEST NO. 3: O.M. 3A: C. SURF. 3B: A-7-6(14) Sim. #1B C.B.R. = 2.0
TEST NO. 4: O.M. 4A: C. SURF. 4B: A-7-6(14) Sim. #1B C.B.R. = 2.0
EXCAVATION AND BACKFILL FOR DOUBLE 84" C.M.P.
STA. 333+00
Roadway
Str. Backfill
Ground Line
Sl. 1½:1
Slope to suit
7.0'
3.5'
6" Max.
Uncl. Excav. to bottom of Trench.
20.0'
Str. Excav. for shaping trench to fit Pipe
400' V.C.
+3.1623%
P.I. 5978.86
78.85
85.18
333+50
ST. 343+80.1 BK. = 343+81.5 AH.
27.50
FL. 25.2
10" of Subbase Mat'l
+3.1623%
47.06
P.I. 6051.55
50.48
56.77
+1.7394%
600' V.C. N.P.S.D. = 810'
FL. 52
6030
6020
6010
6000
5990
5980
6050
6040
6070
6060
EXCAV. FACTOR
EXCAV.
EXCAV. X FACTOR
EMBANK.
STA. YD. O.H.
YD. MI. O.H.
ADD. UNCL. EXCAV.
SOURCE
0.83
10,228
6,769
5,617
139,747
2,560
9,952
333+50 - 346+50 = 10,228 CY. = 5 Tests.

FED. ROAD DIV. NO.	DIST.	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	F 031-1(5)	28	



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

SUMMARY OF EARTHWORK QUANTITIES

EXCAVATION

* FROM CROSS SECTION	225,064	CU.YDS.
* ADDITIONAL UNCL. EXCAV.	41,726	" "
* ESTIMATED FOR SUBSIDENCE	26,679	" "
* FROM LIST OF STRUCTURES AS EXCAVATION	3,040	" "
* FROM LIST OF STRUCTURES AS EMBANKMENT	1,180	" "
ESTIMATED FOR CUT SLOPE TREATMENT	644	" "
FROM STABILIZATION SEC.	1,212	" "
EST. REMOVE TOPSOIL	13,000	" "
* EST. REPLACE TOPSOIL	13,000	" "
EST. REMOVE UNSUITABLE MATERIAL	500	" "
* EST. REPLACE UNSUITABLE MATERIAL	500	" "
TOTAL	326,545	CU. YDS.

EXCAVATION X FACTOR

	186,803	CU. YDS.
ADD. UNCL. EXCAV. X FACTOR	34,633	" "
TOTAL	221,436	CU. YDS.

EMBANKMENT

FROM CROSS SECTIONS	221,436	CU.YDS.

STATION YARD OVERHAUL

FROM MASS DIAGRAM	1,381,617	STA.YDS.
ESTIMATED FOR SUBSIDENCE	138,162	" "
ESTIMATED FOR EXCAV. FROM STABIL. SECTION	13,332	" "
ESTIMATED FOR REPLACING TOPSOIL	67,322	" "
ESTIMATED FOR REPLACING UNSUITABLE MATERIAL	2,589	" "
TOTAL	1,603,022	STA.YDS.

YARD MILE OVERHAUL

FROM MASS DIAGRAM	12,871	YD.MI.
ESTIMATED FOR SUBSIDENCE	1,287	" "
ESTIMATED FOR EXCAV. FROM STABIL. SECTION	845	" "
ESTIMATED FOR REPLACING TOPSOIL	627	" "
ESTIMATED FOR REPLACING UNSUITABLE MATERIAL	24	" "
TOTAL	15,654	YD.MI.

COMPACTION (MODIFIED)

* AS EXCAVATION	311,189	CU.YDS.
ESTIMATED FOR BASE OF CUTS AND FILLS	40,617	" "
TOTAL	351,806	CU.YDS.

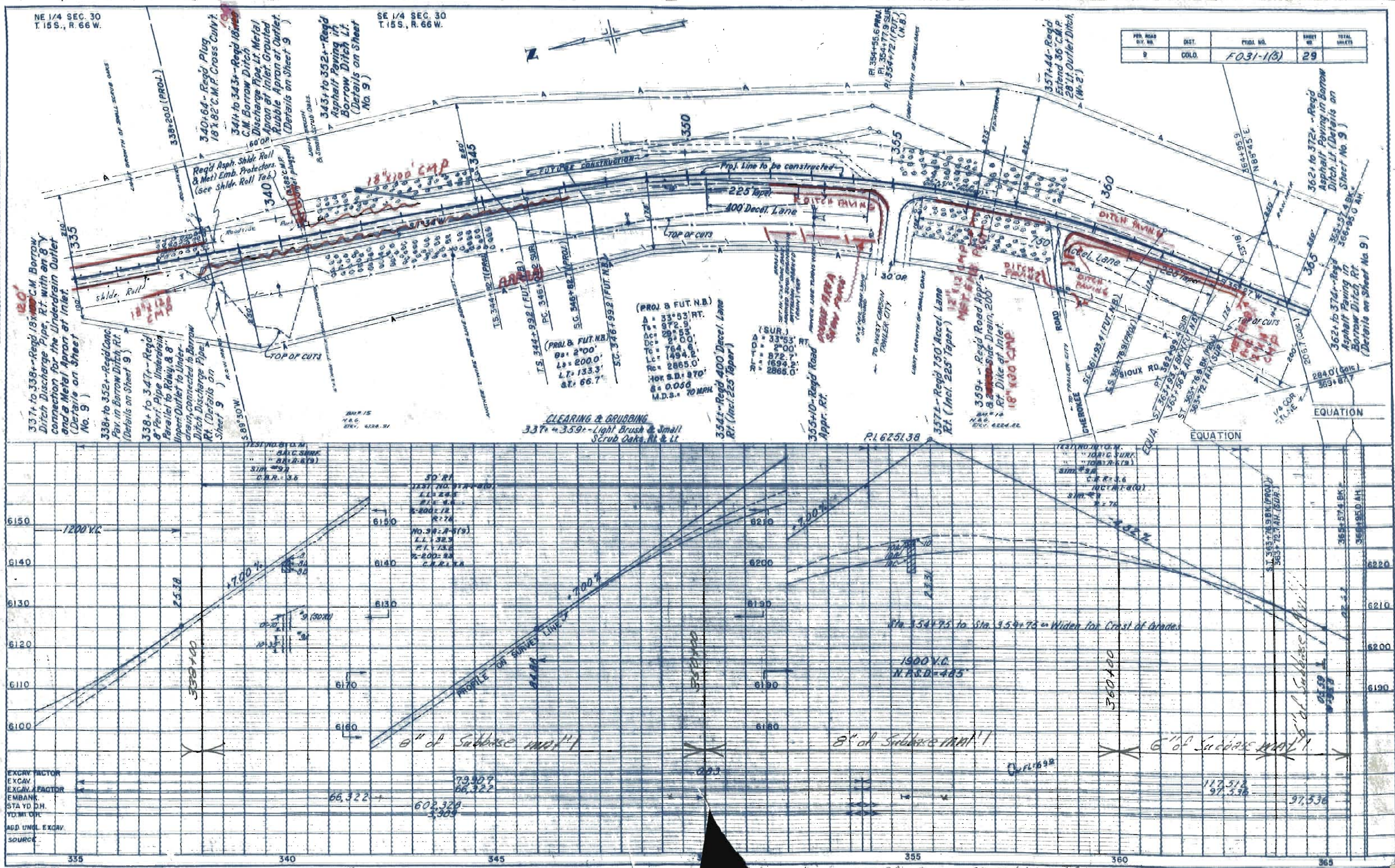
UNCLASSIFIED DITCH EXCAVATION

INTERCEPTING DITCHES

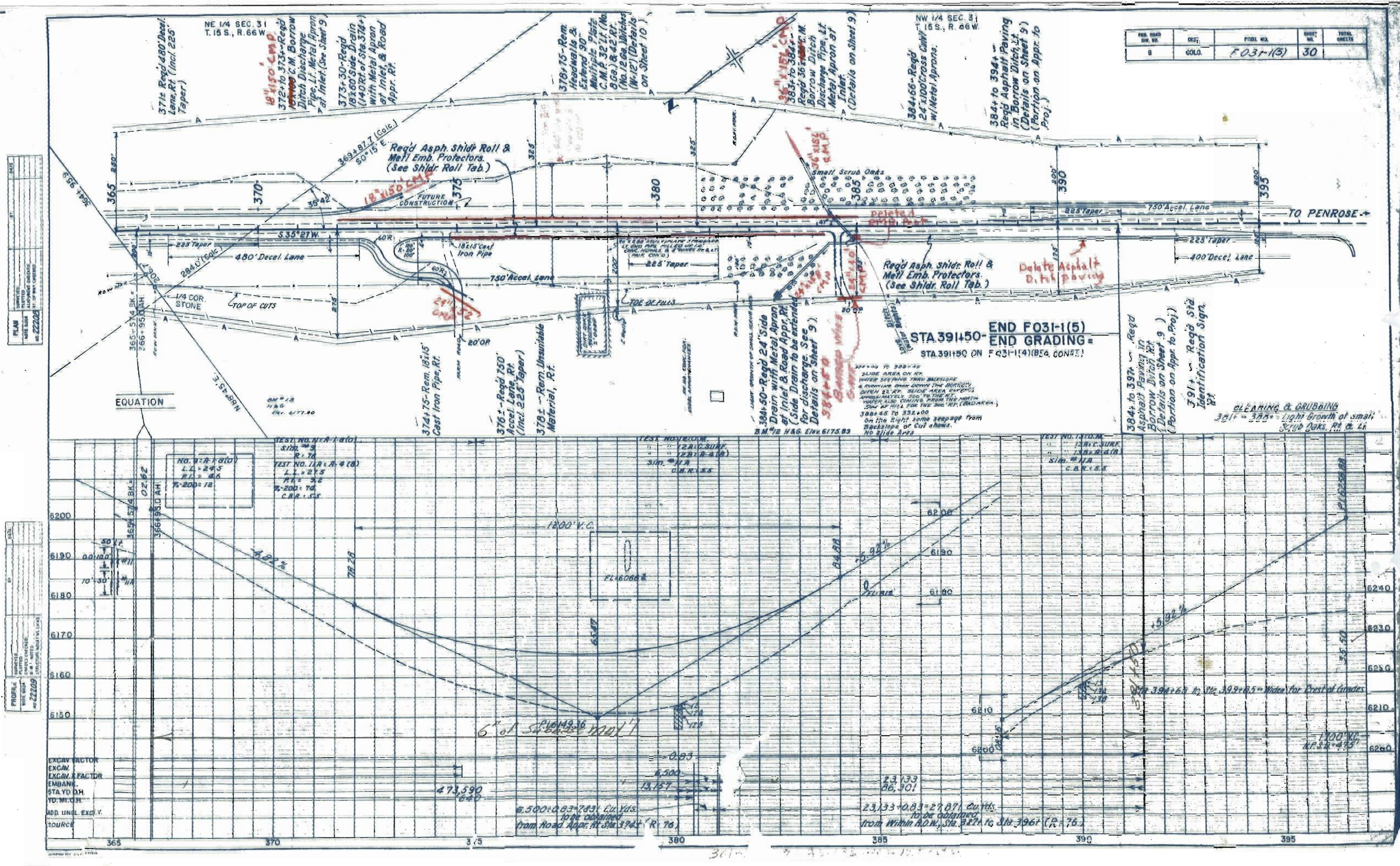
△ STATION			SIDE	CU.YDS.
346+BK.	∽	357+BK.	L.T.	165
310+	∽	324+	R.T.	210
340+	∽	356+	R.T.	240
350+	∽	353+	L.T.	45
359+	∽	374+	R.T.	225
		SUB-TOTAL		885
		FROM LIST OF STRUCTURES		73
		TOTAL		958

△ APPROXIMATE LOCATIONS ∽ MAY BE CHANGED DURING CONSTRUCTION.

SHEET TOTALS: EXCAVATION / EMBANKMENT



NE 1/4 SEC. 30 T. 15 S., R. 66 W.
SE 1/4 SEC. 30 T. 15 S., R. 66 W.
FED. ROAD DIV. NO. 9
DIST. COLO.
PROJ. NO. F031-1(5)
SHEET NO. 29
340+64 - Req'd Plug 18"x 82' C.M.P. Cross Culv't.
341+ to 343+ - Req'd 18" C.M. Borrow Ditch Discharge Pipe, Lt. Metal Apron at Inlet. Grouted Rubble Apron at Outlet. (Details on Sheet 9)
343+ to 352+ - Req'd Asphalt Paving in Borrow Ditch, Lt. (Details on Sheet No. 9)
357+44 - Req'd Extend 36" C.M.P. 28' Lt. Outlet Ditch. (W-2)
362+ to 372+ - Req'd Asphalt Paving in Borrow Ditch, Lt. (Details on Sheet No. 9)
362+ to 374+ - Req'd Asphalt Paving in Borrow Ditch, Rt. (Details on Sheet No. 9)
337+ to 338+ - Req'd 18" C.M. Borrow Ditch Discharge Pipe, Rt. with an 8" connection for the Underdrain Outlet and a Metal Apron at Inlet. (Details on Sheet No. 9)
338+ to 352+ - Req'd Conc. Pav. in Borrow Ditch, Rt. (Details on Sheet 9)
338+ to 347+ - Req'd 8" Perf. Pipe Underdrain Parallel to Rdwy. & 8" Unperf. Outlet to Underdrain, connected to Borrow Ditch Discharge Pipe, Rt. (Details on Sheet 9)
Req'd Asph. Shldr. Roll & Met. Emb. Protectors. (see Shldr. Roll Tab.)
Future construction
Proj. Line to be constructed
225' Taper
400' Decel. Lane
Accel. Lane
TOP OF CUTS
Shldr. Roll
DITCH PAVING
18" x 100' CMP
(PROJ. & FUT. N.B.) A = 33°53' RT. Ts = 872.9' Ac = 29°53' Dc = 2°00' Tc = 764.1' Lc = 1494.1' Rc = 2865.0' Hor. S.D. = 970' e = 0.056 M.D.S. = 70 MPH
(SUR.) A = 33°53' RT. D = 2°00' T = 872.9' L = 1694.0' R = 2865.0'
(PROJ. & FUT. N.B.) Bs = 2°00' Ls = 200.0' L.T. = 133.3' S.T. = 66.7'
T.S. 344+99.2 (FUT. N.B.)
P.C. 346+82.7 (SUR.)
S.C. 346+99.2 (FUT. N.B.)
CLEARING & GRUBBING 337+ to 359+ - Light Brush & Small Scrub Oaks, Rt. & Lt.
343+ - Req'd 400' Decel. Lane Rt. (Incl. 225' Taper)
355+10 - Req'd Road Appr. Rt.
357+ - Req'd 750' Accel. Lane Rt. (Incl. 225' Taper)
359+ - Req'd Road Appr. & Side Drain, 200' Rt. Dike at Inlet.
TO WEST CARSON TRAILER CITY
CHEROKEE
SIOUX RD.
EQUATION
1/4 COR. STONE
P.I. 6251.38
1200' V.C.
1900' V.C. N.P.S.D. = 485'
+7.00%
-3.32%
PROFILE ON SURVEY LINE
Sta. 354+75 to Sta. 359+75 - Widen for Crest of Grade
8" of Subbase mat'l
6" of Subbase mat'l
EXCAV. FACTOR
EXCAV.
EXCAV. X FACTOR
EMBANK.
STA. YD. O.H.
YD. MI. O.H.
ADD. UNCL. EXCAV.
SOURCE
66,322
79,907
602,329
117,512
97,336
335
340
345
355
360
365


FED. ROAD DIV. NO. | DIST. | PROJ. NO. | SHEET NO. | TOTAL SHEETS
8 | COLO. | F031-1(5) | 30 |
NE 1/4 SEC. 31 T. 15 S., R. 66 W.
NW 1/4 SEC. 31 T. 15 S., R. 66 W.
371± Reqd 480' Decel. Lane, Rt. (Incl. 225' Taper)
372+ to 373+ Reqd C.M. Borrow Ditch Discharge Pipe, Lt. Metal Apron at Inlet. (See Sheet 9)
18" x 150' CMP
373+30 Reqd 18" x 60' Side Drain (140' Rt. of Sta. 374+) with Metal Apron at Inlet & Road Appr. Rt.
378+75 Rem. Headwalls & Extend 90" Multiple Plate C.M.P. 32 Lf. (No. 8 Ga.) & 42' Rt. (No. 12 Ga.) Wiches (W-12') (Details on Sheet 10)
383+ to 384+ Reqd 36" C.M. Borrow Ditch Discharge Pipe, Lt. Metal Apron at Inlet. (Details on Sheet 9)
36" x 156' CMP
384+66 Reqd 24" x 100' Cross Culv. w/ Metal Aprons.
384+ to 394+ Reqd Asphalt Paving in Borrow Ditch, Lt. (Details on Sheet 9) (Portion on Appr. to Proj.)
369+87.7 (Calc.) S0°15' E.
Reqd Asph. Shldr. Roll & Metl Emb. Protectors. (See Shldr. Roll Tab.)
FUTURE CONSTRUCTION
Small Scrub Oaks
S. 35°27' W.
225' Taper
480' Decel. Lane
750' Accel. Lane
225' Taper
750' Accel. Lane
225' Taper
400' Decel. Lane
TO PENROSE
18" x 15' Cast Iron Pipe
Deleted
Delete Asphalt Ditch Paving
1/4 COR. STONE
TOP OF CUTS
TOE OF FILLS
284.0' (Calc.)
STA. 391+50 - END F031-1(5) END GRADING = STA. 391+50 ON F031-1(4)(BEG. CONST.)
EQUATION
365+57.4 BK. = 366+95.0 AH.
374+75 Rem. 18" x 15' Cast Iron Pipe, Rt.
376± Reqd 750' Accel. Lane, Rt. (Incl. 225' Taper)
378± Rem. Unsuitable Material, Rt.
384+50 Reqd 24" Side Drain with Metal Apron at Inlet & Road Appr. Rt. (Side Drain to be extended for discharge. See Details on Sheet 9)
B.M. 12 H&G Elev. 6175.83
384+ to 397+ Reqd Asphalt Paving in Borrow Ditch, Rt. (Details on Sheet 9) (Portion on Appr. to Proj.)
391+ Reqd Std. Identification Sign. Rt.
CLEARING & GRUBBING 381+ - 388+ Light Growth of Small Scrub Oaks, Rt. & Lt.
1200' V.C.
-4.82%
+5.92%
P.I. 6149.36
6" of Subbase Mat'l
Sta. 394+65 to Sta. 399+65 Widen for Crest of Grades
1100' V.C.
EXCAV. FACTOR
EXCAV.
EXCAV. X FACTOR
EMBANK.
STA. YD. O.H.
YD. MI. O.H.
ADD. UNCL. EXCAV.
SOURCE
0.83
6,500
13,157
473,590
640
23,133
86,301
6,500 ÷ 0.83 = 7,831 Cu. Yds. to be obtained from Road Appr. Rt. Sta. 374± (R = 76)
23,133 ÷ 0.83 = 27,871 Cu. Yds. to be obtained from Within R.O.W., Sta. 387± to Sta. 396± (R = 76)
6200
6190
6180
6170
6160
6150
6240
6230
6220
6210
6200
365
370
375
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