TITLE SHEET

See Standard M-100-A for STANDARD SYMBOLS

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS — STATE OF COLORADO

FEDERAL ROAD REGION NO	DIVISION	PROJECT NO	SHEET NO
VIII	COLORADO	RS 0009(14)	1

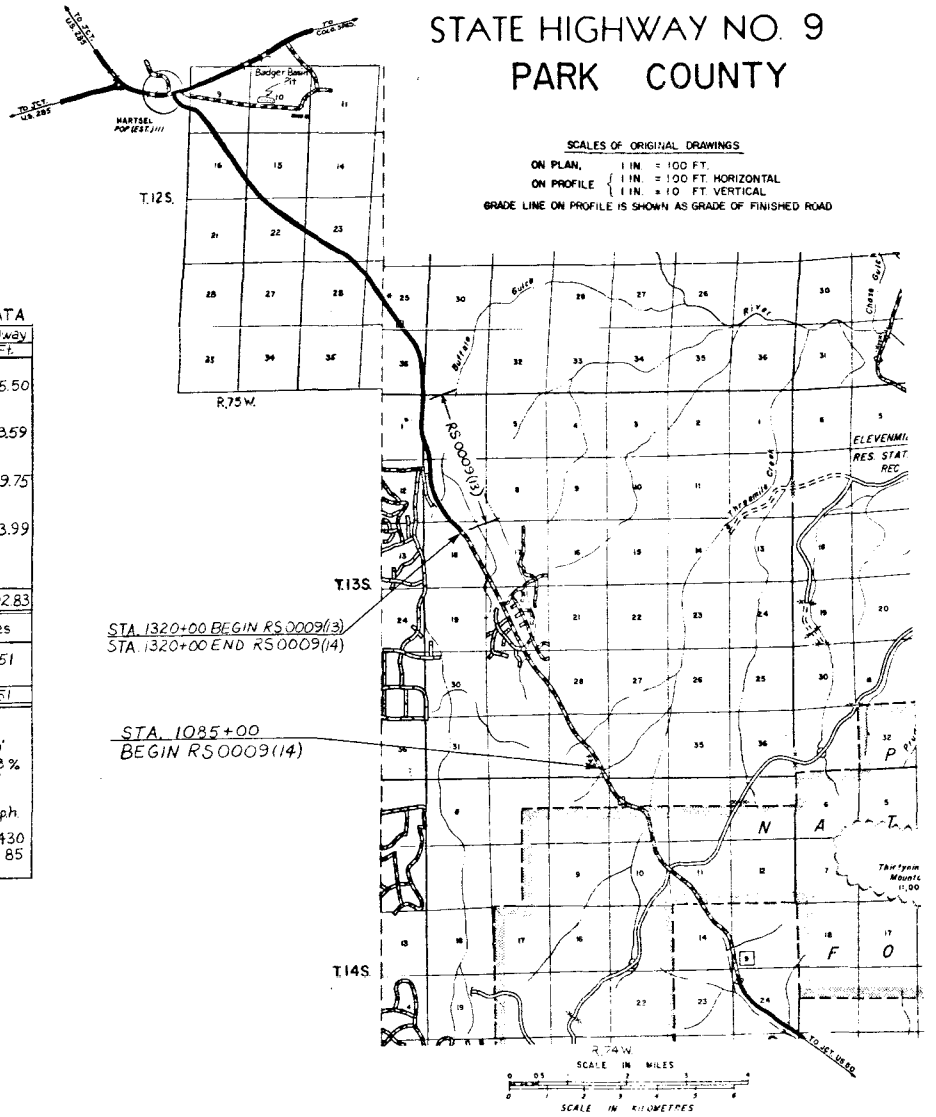
AS CONSTRUCTED
NO REVISIONS [ ] REVISED 7-31-79 VOID [ ]

PLAN AND PROFILE OF ~~PROPOSED~~

FEDERAL AID PROJECT NO. RS 0009(14)

STATE HIGHWAY NO. 9

PARK COUNTY



TABULATION of LENGTH & DESIGN DATA

STATION		Roadway Lin.Ft.
1085+00 Begin Proj RS 0009(14)		4,365.50
1128+65.50 Bk. = EQUATION 1128+60.52 Ah.		3,183.59
1160+44.11 Bk. = EQUATION 1160+47.20 Ah.		15,859.75
1319+06.95 Bk. = EQUATION 1319+06.01 Ah.		93.99
1320+00 End Proj. RS 0009(14) = 1320+00 Begin Proj RS 0009(13)		
Total		23,502.83
SUMMARY	Lin.Ft.	Miles
Roadway	23,502.83	4.451
Total (Net & Gross Length)	23,502.83	4.451

DESIGN DATA

Maximum Degree of Curve ..... 5°30'
Maximum Grade ..... 6.263 %
Minimum S.S.D. — Horizontal .... 400'
Minimum S.S.D. — Vertical 320
Maximum Design Speed ..... 45 mph
1998 Design Traffic Volume { A.D.T. .... 430 D.H.V. 85

INDEX OF SHEETS

M STANDARDS

M-100-A	STANDARD SYMBOLS		5-11-73
M-203-B	APPROACH ROADS, FLARING, CUT SLOPE TREATMENT, BRIDGE + CREST WIDENING		12-11-72
M-203-C	DITCH TYPES		7-23-68
M-203-SC	SUPERELEVATION OF CURVES-CROWNED HIGHWAYS		1-06-77
M-206-A8	EXCAVATION AND BACKFILL FOR STRUCTURES	(3 SHEETS)	5-08-78
M-601-L	HEADWALL, INTERCEPTING HEADWALL AND CULVERT OUTLET PAVING		3-31-75
M-603-MA	METAL CULVERT PIPE - H-20 LOADING		11-03-78

S STANDARDS

S-612-1A	TYPICAL DELINEATOR INSTALLATIONS	(4 SHEETS)	10-26-77
S-614-39A	TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION	(4 SHEETS)	5-08-70
S-614-52B	BARRICADES, DRUMS, CONCRETE BARRIER (TEMP) AND VERTICAL PANELS		1-10-79

Work sheet NO WS 1 Additional Unclassified Exc (Bench Removal 1141+-1145+Rt)

WS 2 Slope Flattening 1221+-1223+Lt

WS 3-4 Rd. Appr 1242+Rt

JUL 31 1979

INACTIVE

DIVISION OF HIGHWAYS
APPROVED John M. Cox 1/17/79
ASST. CHIEF ENGINEER DATE

AS CONSTRUCTED INFORMATION
CONTRACTOR Pioneer Paving Inc.
Resident ENGINEER (Project or Resident) S.T. Ungefug
PROJECT STARTED March 16, 1979
PROJECT COMPLETED July 31, 1979
AS CONSTRUCTED PLANS APPROVED Wakefield
Chief Engr 9-15-79
TITLE DATE

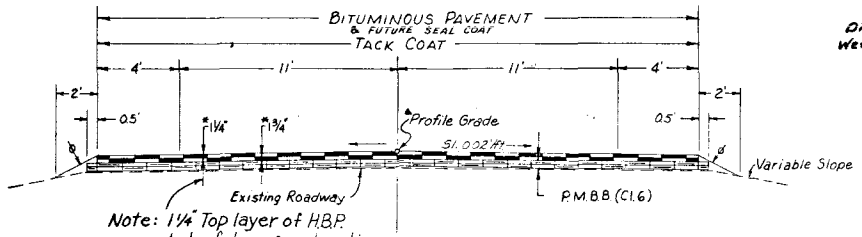
S.D.M.

STATE DEPARTMENT OF HIGHWAYS - STATE OF COLORADO
DIVISION OF HIGHWAYS
D O H FORM 126
JULY 1978

AS CONSTRUCTED				FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
NO REVISIONS	REVISED 7-31-79	VOID		VIII	COLORADO	FS 0009(14)	2	16

TYPICAL SECTIONS

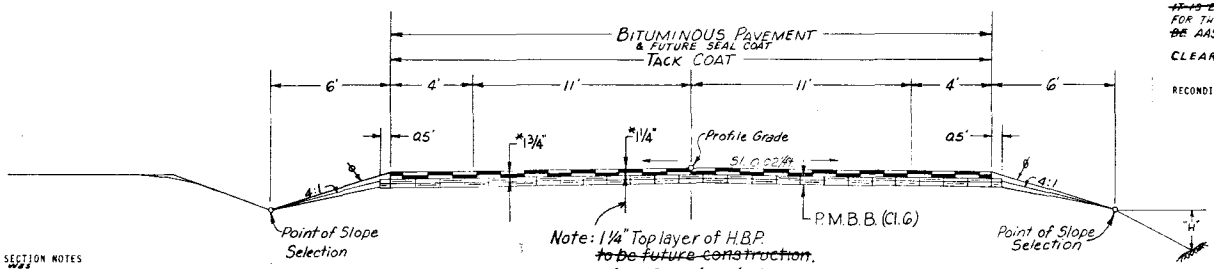
RECONDITIONING



Note: 1¼" Top layer of H.B.P. ~~to be future construction.~~ Was Constructed

*Approximate Thickness
*Profile Grade ~~Shall be~~ is the thickness of P.M.B.B. and H.B.P. above the existing road.
*P.M.B.B Rates per 100'
3" 5.6 Tons
~~¾" 6.5 Tons~~
~~1¼" 8.3 Tons~~

GRADING



TYPICAL SECTION NOTES

THE DEPTH AND WIDTH OF THE SIDE DITCH ~~SHALL BE~~ Was VARIED WHERE NECESSARY IN ORDER TO PROVIDE PROPER DRAINAGE.

MATERIAL ~~SHALL BE~~ Was PLACED IN SEPARATE COURSES AT THE FOLLOWING APPROXIMATE RATES PER 100 LIN. FT. OF ROADWAY:

BITUMINOUS PAVEMENT	TOP LAYER	23 TONS
	BOTTOM LAYER	32 TONS

*PLANT MIX BITUMINOUS BASE ~~SHALL BE~~ Was PLACED IN ONE LIFT OR AS APPROVED BY THE ENGINEER.
THE RATES SHOWN HAVE BEEN DETERMINED FROM INFORMATION AVAILABLE AT THE TIME OF DESIGN. RATES ~~SHOULD BE~~ were ADJUSTED DURING CONSTRUCTION TO OBTAIN THE REQUIRED APPROXIMATE THICKNESS.

ϕ THE CONTRACTOR ~~WILL BE~~ Was REQUIRED TO PLACE SUITABLE MATERIAL TO THIS LINE AFTER COMPLETION OF PAVING OPERATION. THIS ~~SHALL~~ Was NOT ~~BE~~ Was PAID FOR SEPARATELY, BUT INCLUDED IN THE WORK.

FILL SLOPES:

SLOPE	4:1	WHERE "H" IS 4' or LESS
SLOPE	3:1	WHERE "H" IS 4' TO 15'
SLOPE	2:1	WHERE "H" IS OVER 15'

IN SPECIAL CASES, SLOPE MAY BE STEEPENED.

BREAK POINTS ON SLOPES AND IN BOTTOMS OF DITCHES ~~SHALL BE~~ were ROUNDED ~~DURING~~ during CONSTRUCTION FOR A PLEASING APPEARANCE.

GENERAL NOTES

FOR PRELIMINARY PLAN QUANTITIES OF BITUMINOUS MATERIALS AND COVER COAT MATERIALS, THE FOLLOWING RATES OF APPLICATION WERE USED:

TACK COAT DILUTED EMUL. ASPH. (CSS-1H) @ ~~0.1~~ did 0.1 GALS. PER SQ. YD.

DILUTED EMULSIFIED ASPHALT FOR TACK COAT ~~SHALL~~ Was CONSIST OF 1 PART EMULSIFIED ASPHALT AND 1 PART/S WATER.

RATES OF APPLICATION ~~SHALL BE~~ Was AS DETERMINED BY THE ENGINEER AT THE TIME OF APPLICATION.

DILUTED EMULSIFIED ASPHALT ~~SHALL BE~~ Was USED AS A DUST PALLIATIVE WHERE REQUIRED AND ~~SHALL~~ Did CONSIST OF A DILUTION OF EMULSIFIED ASPHALT AND WATER, THE PORTIONS OF WHICH ~~SHALL BE~~ Were 9 PARTS WATER AND 1 PART EMULSIFIED ASPHALT, BASED ON VOLUME MEASUREMENT. LOCATIONS ~~SHALL BE~~ were AS ORDERED.

THE FOLLOWING ~~SHALL BE~~ Was FURNISHED WITH EACH BITUMINOUS PAVER.

A SKI TYPE DEVICE AT LEAST 30 FEET IN LENGTH AND A SHORT SKI OR SHOE.

ANY LAYER OF BITUMINOUS PAVEMENT THAT ~~IS TO HAVE~~ had A SUCCEEDING LAYER PLACED THEREON ~~SHALL BE~~ was COMPLETED FULL WIDTH BEFORE SUCCEEDING LAYER ~~IS~~ was PLACED.

~~FOR~~ any ROAD APPROACHES WHICH REQUIRE BITUMINOUS PAVEMENT A 3" THICKNESS OF PMBB AND A 2" THICKNESS OF PAVEMENT ~~SHALL BE~~ was PLACED AS FOLLOWS:

COUNTY ROAD APPROACHES ~~SHALL BE~~ was PAVED 50 FT. OUT FROM EDGE OF SHOULDER OR TO THE RIGHT OF WAY LINE WHICHEVER ~~IS~~ was LESS. OTHER APPROACHES ~~SHALL BE~~ were PAVED 4 FT. OUT FROM EDGE OF SHOULDERS.

DEPTH OF MOISTURE-DENSITY CONTROL FOR THIS PROJECT ~~SHALL BE~~ is AS FOLLOWS:

FULL DEPTH OF ALL EMBANKMENTS.

BASES OF CUTS AND FILLS .5 FOOT.

EXCAVATION REQUIRED FOR COMPACTION OF BASES OF CUTS AND FILLS ~~SHALL BE~~ was CONSIDERED AS SUBSIDIARY TO THAT OPERATION AND ~~WILL~~ was NOT ~~BE~~ was PAID FOR SEPARATELY.

~~IT IS ESTIMATED THAT~~ 2052 HOURS OF FLAGGING FOR CONTROLLING TRAFFIC ~~WILL BE~~ were REQUIRED FOR THIS PROJECT.

~~IT IS ESTIMATED THAT~~ 4 HOURS OF BLADING, WITH A MOTOR GRADER IN THE 125 TO 200 FLYWHEEL HORSEPOWER RANGE, ~~WILL BE~~ was REQUIRED FOR THIS PROJECT.

GUARD POSTS, DELINEATORS, SIGNS AND SNOW FENCE ~~WILL BE~~ were REMOVED BY STATE FORCES.

FLEXIBLE CONDUITS ON THIS PROJECT WITH HELICAL CORRUGATIONS, JOINED BY DIMPLED CONNECTING BANDS, ~~SHALL~~ did USE A SEALING COMPOUND OR GASKET WITH THE CONNECTING BAND.

~~IT IS ESTIMATED THAT~~ 3.1 MILES OF RECONDITIONING ~~WILL BE~~ was REQUIRED FOR THIS PROJECT. THE TYPE OF COMPACTION FOR RECONDITIONING ~~SHALL~~ was ~~BE~~ AASHTO T99.

CLEARING AND GRUBBING ~~TO BE~~ was SUBSIDIARY TO COST OF PROJECT.

RECONDITIONED ROADWAY ~~SHALL BE~~ was SUPERELEVATED IN ACCORDANCE WITH STANDARD M-203-SC

TABULATION OF WORK

STATION to STATION	GRADING LIN. FT.	RECONDITIONING LIN. FT.
1085+00 to 1096+50		1,150
1096+50 to 1110+50	1,400	
1110+50 to 1123+00		1,250
1123+00 to 1150+00	2,705	
1150+00 to 1161+00		1,097
1161+00 to 1172+00	1,100	
1172+00 to 1231+00		*5,900
1231+00 to 1251+00	2,000	
1251+00 to 1320+00		6,901
TOTALS	7,205	16,298

REV. MAY 1978

SUMMARY OF ~~APPROXIMATE~~ FINAL QUANTITIES

R-1 changed Quantity ~ S.D.M. 2-8-79

AS CONSTRUCTED		
NO REVISIONS	REVISED 7-31-79	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	RS 0009 (14)	3	16

INDEX BOOK	INDEX PAGE	INDEX SHEET	CONTRACT ITEM NO.	CONTRACT ITEM	UNIT							CMO #06637		CMO #06046			PROJECT TOTALS	Project Final Quantities	Over-run or Under-run	% Plan
7	1		202	Remove Structure	Each												5	6	+ 1	120
		6AX	203	Unclassified Excavation	Cu. Yd.												21,896	23,185	+1289	106
7	3		203	Stripping	Cu. Yd.												1,500	1285	-215	86
		6AX	203	Compaction (AASHTO T99)	Cu. Yd.												18,840	23,284	+4,444	124
9			203	Blading	Hour												50	4	-46	8
		6AX	204	Haul	Yd. Mi.												12,331	15,766	+3435	128
7	7		204	Haul CMO #6037	Ton Mi.							+64,416					271,756	305,149	+33,393	112
7	8		206	Structure Excavation	Cu. Yd.												98	89	-9	91
7	9		206	Structure Backfill (Cl. 2)	Cu. Yd.												104	94	-10	90
9			209	Wetting	M Gal												1354	591	-763	44
7	11		301	Plant Mix Bituminous Base (Class 6)	Ton												15,401	12325.35	-3,075.65	80
7	12		306	Reconditioning	Mile												3.1	3.1	0	100
7	13A		403	Hot Bituminous Pavement (Grading E) CMO #6037	Ton							+5406		-1166.35			7,543	12,160.05	13,326.40	177
7	138		403	Hot Bituminous Pavement (Grading E)	Ton									+1166.35				1166.35		
7	14		411	Asphalt Cement (AC-10) CMO #6037	Ton							+313					1,238	1342.02	+104.02	108
7	15		411	Emulsified Asphalt (CSS-1h)	Gal.												3,917	3163	-754.00	81

R-1

REV MAY 1978

SUMMARY OF ~~APPROXIMATE~~ FINAL QUANTITIES

AS CONSTRUCTED — NO REVISIONS [ ] REVISED [7-31-79] VOID [ ]

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	RS 0009(14)	4	16

INDEX BOOK	INDEX PAGE	INDEX SHEET	CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	PROJECT TOTALS	Project FINAL Quantities		% Plan
7	16		506	Riprap	Cu. Yd.	21	20		95
7	17		603	18 Inch Corrugated Steel Pipe	Lin. Ft.	26	26		100
7	18		603	24 Inch Corrugated Steel Pipe	Lin. Ft.	314	282		90
7	19		603	36 Inch Corrugated Steel Pipe	Lin. Ft.	84	~~84~~		100
		6	612	Delineator (Type I)	Each	164	162		99
9			614	Flagging	Hour	1,200	2052		171
		6	614	Construction Traffic Sign (Panel Size A)	Each	3	4		133
		6	614	Construction Traffic Sign (Panel Size B)	Each	10	11		110
7	24		614	Vertical Panel	Each	50	50		100
7	25		620	Field Office	Each	1	1		100
7	26		620	Field Laboratory	Each	1	1		100
7	27		620	Sanitary Facility	Each	1	1		100
7	28		626	Mobilization	Lump Sum	1	1		100
				FORCE ACCOUNT					
			F1A01	Minor Contract Revisions	F.A.	1			
				STATE FORCES (FED. AID)					
6	79		F1A02	Signing & Striping	F.A.	1	1		100

DIVISION OF HIGHWAYS STATE OF COLORADO
D.O.H. FORM NO. 625 (LINE 4)
REV. DECEMBER 1970

STRUCTURE QUANTITIES

AS CONSTRUCTED					
NO REVISIONS ☐	REVISED 7-31-79	VOID ☐	FEDERAL ROAD REG. OR NO. VIII	DIVISION COLORADO	PROJECT NO. RS 0009 (14)	SHEET NO. 5

INDEX BOOK	INDEX PAGE	INDEX SHEET	LOCATION	UNCLASSIFIED EXCAVATION CUBIC YARD EXCAV.	UNCLASSIFIED EXCAVATION CUBIC YARD EMB.*	UNCLASSIFIED EXCAVATION CUBIC YARD DITCH	STRUCTURE EXCAVATION CUBIC YARD	STRUCTURE BACKFILL CUBIC YARD CL 2	REMOVAL OF STRUCTURE EACH	P.M.B.B. SURFACING (CLASS G) TON	HOT BITUMINOUS PAVEMENT (GRADING E) TON	RIPRAP # CUBIC YARD	CONCRETE CUBIC YARD CL. A	REINFORCING STEEL LB.	CULVERT PIPE LINEAR FEET CORRUGATED METAL PIPE 18"	24"	36"	"H" OVER CULV. FT	SLOPE AND DITCH PAVING CUBIC YARD	END SECTION EACH	MISCELLANEOUS
7			1100+82				8	8 8	0 1			3 3.10				24 16 40		7			
			1111+75			~~10~~	~~6~~ 0	~~6~~ 0								18 0		4			
			1113+65							~~11~~	~~8~~										
			1128+30				6 6	7 7	X 0							24 16 38		6			
			1140+08			5	3 3	4 4								18 18		5			
			1151+35				2 2	4 4								18 18					
			1153+55							~~3~~	~~2~~										
			1155+35				8 8	7 7	1 1			3 2.37				18 18		4			
			1187+61		~~95~~		7 7	6 6				3 3.05				16 14 28		2			
			1196+55				4 4	7 7	1 1							16 14 30		3			
			1198+60							~~3~~	~~2~~										
			1198+75							~~3~~	~~2~~										
			1209+16				6 6	5 5	0 1			3 1.77				20 20		3			
			1216+81				~~5~~ 5	3 3				3 3.70				12 12		2			
			1223+20				5 5	3 3				3 2.96				12 12		2			
			1227+00							~~3~~	~~2~~										
			1240+37				8 8	9 9				3 3.00				14 26 40		5			
			1242+00							~~3~~	~~2~~										
			1255+65				8 8	9 9		~~3~~	~~2~~				26 26			1			
			1256+20							~~3~~	~~2~~										
			1271+16			~~10~~	~~X~~ 2	~~X~~ 3								~~14~~ 8		1			
			1289+54		~~47~~		~~X~~ 0	~~8~~ 0								8 0		1			
7			1304+25		~~230~~	~~10~~	17 17	19 19	2 2								84 84	3			
PROJECT TOTALS					~~360~~* ~~35~~		98 89	104 94	5 6	~~32~~	~~22~~	21 19.95			26 26	314 282	84 84				

* Quantity carried to slope ~~flattening~~ tabulation

18" Thick - 9" Stone size

D.O.H. FORM NO. 126
REV. FEB., 1977

R-1 Added tabulation, deleted note.
S.D.M. 2-8-79

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	RS 0009(14)	6	16

AS CONSTRUCTED
NO REVISIONS [ ] REVISED [7-31-79] VOID [ ]

BASE COURSE AND SURFACING PLAN

STATION TO STATION	ø PLANT MIX BITUMINOUS BASE (CLASS 6)					ø HOT BITUMINOUS PAVEMENT (GRADING E)							
	THICKNESS	TONS USED		HAUL - TON MILE		TONS USED BOTTOM LAYER		TONS USED ● TOP LAYER		HAUL - TON MILE BOTTOM LAYER		HAUL - TON MILE ● TOP LAYER	
1085+00 - 1320+00						7,521		5,406		896.8		64,416	
1085+00 - 1160+00	3"	4,203		56,449									
1160+00 - 1170+00	3" ~~3½"~~	648		8,182									
1170+00 - 1250+00	3"	4,480		52,475									
1250+00 - 1260+00	3" ~~3½"~~	650		7,099									
1260+00 - 1270+00	3"	560		6,010									
1270+00 - 1290+00	3" ~~4½"~~	1,660		17,343									
1290+00 - 1300+00	3"	560		5,692									
1300+00 - 1310+00	3" ~~3½"~~	650		6,483									
1310+00 - 1320+00	3"	561		5,489									
ESTIMATED FOR CORR. IRREG.		1,397		16,646									
FROM STR. QUANTITIES		32				22							
TOTALS		15,401	12325.35	182,138	146948	7,543	7565.95	5,406	5760.45	89,618	89883	64,416	68318

ø Source - Badger Basin Pit

● ~~Future Construction~~
CMO #6037

STABILIZATION BASED ON THE FOLLOWING:
- 18^k EDLA 9
- REGIONAL FACTOR 2.5
- SERVICEABILITY INDEX 2.0

STRENGTH COEFFICIENTS:
- PLANT MIX BITUMINOUS BASE (CLASS 6) 0.34
- HOT BITUMINOUS PAVEMENT (GRADING E) 0.44
- WSN . . . . 0.90 - 2.80
- "R" VALUE . . . . 5 - 82

R-1
WETTING QUANTITIES

Wetting	M GAL	
Embankment		~~493~~
Base Cuts & Fills		~~261~~
Reconditioning		~~600~~
Project Total	591	~~1354~~

INDEX		
Book	Page	Sheet

~~SUMMARY OF EARTHWORK QUANTITIES~~

UNCLASSIFIED EXCAVATION	CU. YD.
ROADWAY (FROM CROSS SECTIONS)	20,820
STRUCTURE QUANTITIES AS DITCH	35
EST. FOR CUT SLOPE TREATMENT	1,041
TOTAL	21,896
COMPACTION (AASHTO T99)	
EMBANKMENT (NET)	12,318
BASE OF CUTS AND FILLS	6,522
TOTAL	18,840
HAUL	YD. MI.
FROM MASS DIAGRAM	8,344
FOR FLATTENING SLOPES	3,987
TOTAL	12,331
ROADWAY QUANTITIES BALANCE (FOR INFORMATION ONLY)	CU. YD.
EXCAVATION UNCLASSIFIED (TOTAL)	20,820
EMBANKMENT NET ROADWAY (FROM CROSS SECTIONS) (TOTAL)	12,318
EMBANKMENT x FACTOR (1.2) ROADWAY (FROM CROSS SECTIONS)	14,783
EXCESS EXCAVATION	6,037
TOTAL	20,820
* EXCESS EXCAVATION TO BE DISPOSED OF AS: FLATTENING OF FILL SLOPES (TOTAL)	6,037

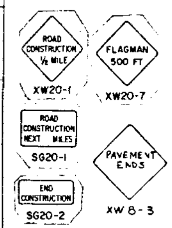
R-1

TABULATION OF DELINEATORS

STATION TO STATION	SIDE	SPACING	TYPE I DELINEATOR	Book 7 Page 20 Project Final
1085+00 ~ 1102+63.68	Rt. & Lt.	300'	12	12
1102+63.68 ~ 1111+75.10	Rt. & Lt.	183'	12	12
1111+75.10 ~ 1320+00	R/Lt.	300'	140	138
TOTAL			164	162

SCHEDULE OF CONSTRUCTION TRAFFIC SIGNS

SIGN CODE OR LEGEND	DIMENSIONS	PANEL SIZE A	PANEL SIZE B	PANEL SIZE C	QUANTITY REQUIRED
XW 20-1	48" x 48"		X		4
SG 20-1	60" x 36"		X		2
SG 20-2	60" x ~~24"~~		X		2
XW 20-7	48" x 48"		X		~~2~~ 3
"Be/Prepared/To/Stop"	36" x ~~36"~~	X			2
XW 8-3	36" x 36"	X			1
Vertical Panel					50



~~* TABULATION OF SLOPE FLATTENING~~

STATION TO STATION	SIDE	CUBIC YARDS	YARD MILE HAUL
1089+50 - 1092+50	Rt.	208	301
1113+50 - 1115+50	Rt.	206	207
1135+00 - 1141+00	Rt.	490	315
1150+00 - 1161+00	Rt.	1256	269
1193+50 - 1197+50	Lt. & Rt.	642	338
1206+50 - 1212+50	Lt. & Rt.	1134	816 {110, 706}
1215+50 - 1217+50	Rt.	228	210
1221+50 - 1231+00	Rt.	980	1067
1268+50 - 1273+50	Rt.	527	222
STR. EMB. (EST.)	Lt. & Rt.	366	242
TOTALS		6,037	3,987

Note: Compaction will not be required for slope flattening.

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

FED. ROAD REGION	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLO.	[illegible]	6AX	16

Summary of Earthwork Quantities

Index				
Book	Page	Sheet		Cu. Yds.
			Unclassified Excavation	
6			Roadway (Computer)	21,56[illegible]
6	51		Cut Slope Flattening	1,64[illegible]
Work Sheet #1			Bench Removal [illegible]	[illegible]
			Project Total	22,15[illegible]
			Compaction (AASHTO T99)	
3			Embankment (Roadway, Computer)	[illegible]
Work Sheet 3/4			Road Appr. [illegible]	1,136
6	34		Base Course & Fill	[illegible]
			Project Total	[illegible]
			Haul Yd Mile	Yd. Mi.
3			Mass Diagram (Computer)	[illegible]
6	55		Slope Flattening	2,164
[illegible]	77		[illegible]	[illegible]
			Project Total	1[illegible],756
			Roadway Quantities Balance (Information Only)	
			Unclassified Excavation Total	22,144
			Embankment (Net)	[illegible]
			Embankment X Factor 1.2	[illegible]
			Excess Excavation *	[illegible]
			Total	[illegible]
			* Excess used as slope flattening	[illegible]

Tabulation of Slope Flattening

Station to Station	Side	Cu. Yd.	Haul Yd-Mile	Index Book	Index Page	Index Sheet
1150+00 – 1161+53	R	737	1238			
1[illegible] – 115[illegible]	Lt & Rt	256	257			
1[illegible] – 1212+50	Lt & Rt	353	266			
12[illegible] – 12[illegible]	R	74	45			
12[illegible] – 1231+00	Rt	308	130			
[illegible] CSP	Rt	31	36			
12[illegible] – 1233+35	Lt	261	30			
Total –		2039	2134	6	80	

DIVISION OF HIGHWAYS, STATE OF COLORADO
D O H FORM NO 126
REV FEB., 1977

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	RS 0009(14)	7	16

AS CONSTRUCTED

NO REVISIONS ☐ REVISED 7-31-79 VOID ☐

BADGER BASIN PIT

OWNER: BADGER BASIN GRAZING ASSOC.
HARTSEL, COLORADO

LOCATION: Part of the W1/2 Sec. 10, T. 12 S., R. 75 W., 6th. P.M.

USE: Aggregate Base Course, Bituminous Base Course, and Hot Bituminous Pavement

QUANTITY AVAILABLE: 62,500 Cu. Yds.

STRIPPING: Removed and Stockpile Overburden ~~1,500~~ 1285 Cu. Yds.

PIT AREA: 23.09 Acres

HAUL DISTANCE: 9.69 Mi. to Sta. 1320+00

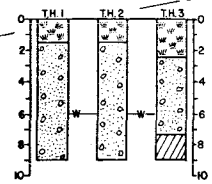
ADJACENT OWNERS: BADGER BASIN GRAZING ASSOC. ONLY

Contractor ~~will restrict~~ restricted his operations to within the pit limits and haul road.

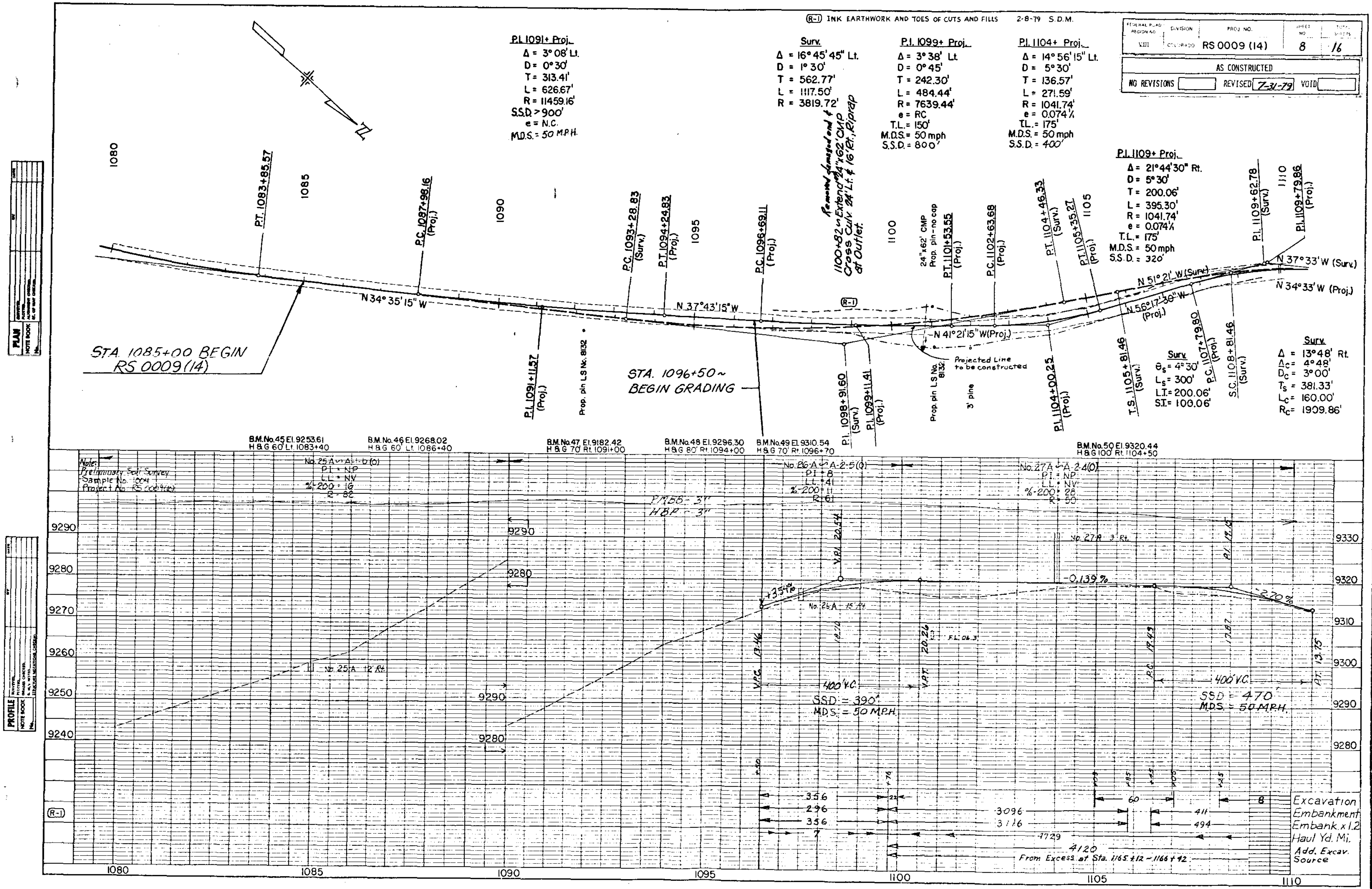
Seeding and restoration of the pit area will be done at the completion of the next project.

LOG OF PIT

Sample No. 1323

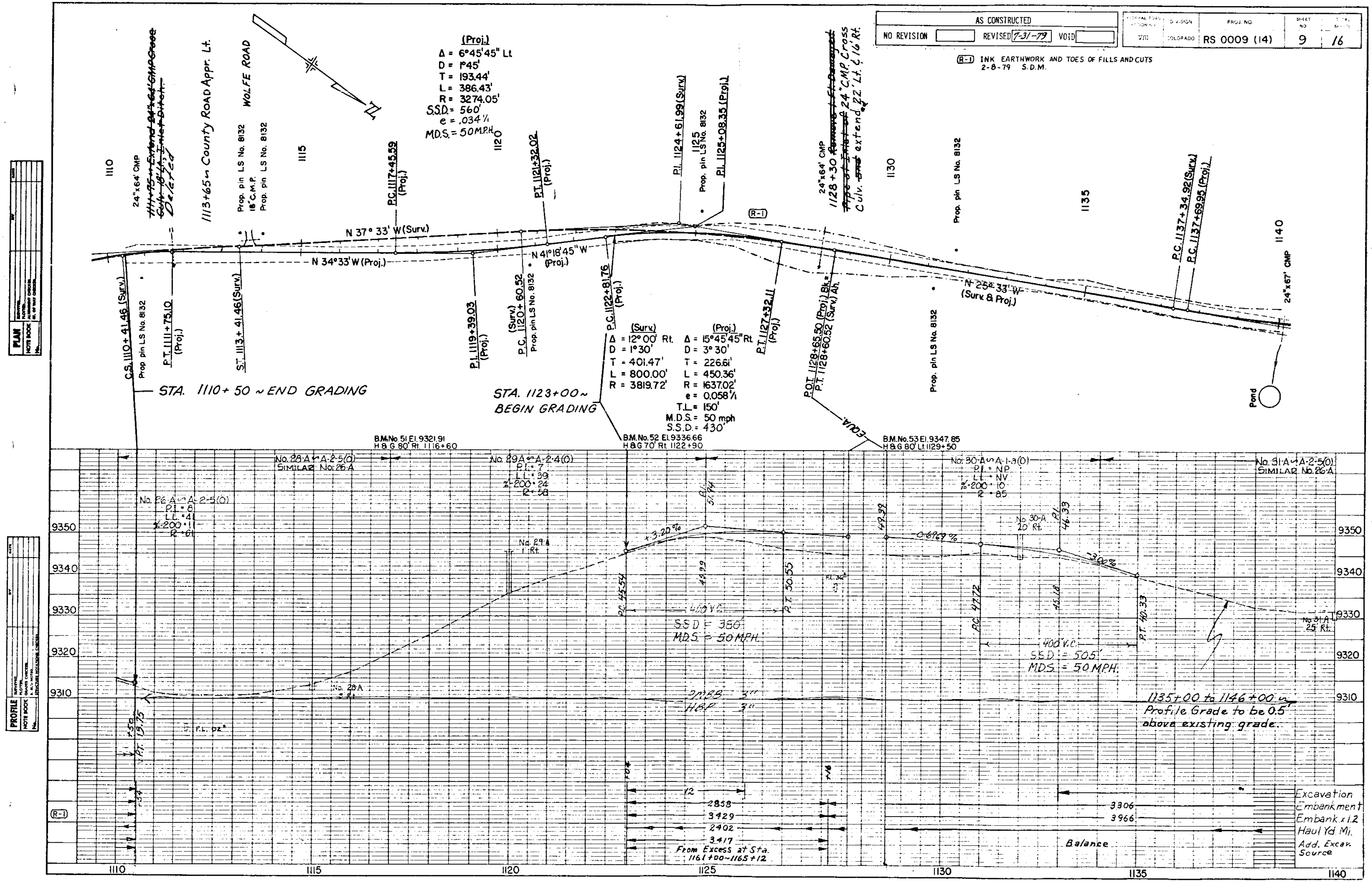


LEGEND
- Overburden
- Sand & Gravel
- Clay with rock
- W = Water (high)



FEDERAL ROAD REGION NO. VIII
DIVISION COLORADO
PROJ. NO. RS 0009 (14)
SHEET NO. 8
TOTAL SHEETS 16
AS CONSTRUCTED
NO REVISIONS
REVISED 7-31-79
VOID
(R-1) INK EARTHWORK AND TOES OF CUTS AND FILLS 2-8-79 S.D.M.
P.I. 1091+ Proj.
Δ = 3° 08' Lt.
D = 0° 30'
T = 313.41'
L = 626.67'
R = 11459.16'
S.S.D. > 900'
e = N.C.
M.D.S. = 50 M.P.H.
Surv.
Δ = 16° 45' 45" Lt.
D = 1° 30'
T = 562.77'
L = 1117.50'
R = 3819.72'
P.I. 1099+ Proj.
Δ = 3° 38' Lt.
D = 0° 45'
T = 242.30'
L = 484.44'
R = 7639.44'
e = RC
T.L. = 150'
M.D.S. = 50 mph
S.S.D. = 800'
P.I. 1104+ Proj.
Δ = 14° 56' 15" Lt.
D = 5° 30'
T = 136.57'
L = 271.59'
R = 1041.74'
e = 0.074 %
T.L. = 175'
M.D.S. = 50 mph
S.S.D. = 400'
P.I. 1109+ Proj.
Δ = 21° 44' 30" Rt.
D = 5° 30'
T = 200.06'
L = 395.30'
R = 1041.74'
e = 0.074 %
T.L. = 175'
M.D.S. = 50 mph
S.S.D. = 320'
Surv.
Δ = 13° 48' Rt.
Δc = 4° 48'
Dc = 3° 00'
Ts = 381.33'
Lc = 160.00'
Rc = 1909.86'
Surv.
θs = 4° 30'
Ls = 300'
L.T. = 200.06'
S.T. = 100.06'
1080
1085
1090
1095
1100
1105
1110
P.T. 1083+85.57
P.C. 1087+98.16 (Proj.)
P.C. 1093+28.83 (Surv.)
P.T. 1094+24.83 (Proj.)
P.C. 1096+69.11 (Proj.)
Removed damaged end & 1100+82 ~ Extend 24"x62' CMP Cross Culv. 24' Lt. ℄ 16' Rt. Riprap at Outlet.
24"x62' CMP
Prop. pin - no cap
P.T. 1101+53.55 (Proj.)
P.C. 1102+63.68 (Proj.)
P.T. 1104+46.33 (Surv.)
P.T. 1105+35.27 (Proj.)
P.I. 1109+62.78 (Surv.)
P.I. 1109+79.86 (Proj.)
N 34° 35' 15" W
N 37° 43' 15" W
N 41° 21' 15" W (Proj.)
N 51° 21' W (Surv.)
N 56° 17' 30" W (Proj.)
N 37° 33' W (Surv.)
N 34° 33' W (Proj.)
Projected Line to be constructed
STA. 1085+00 BEGIN RS 0009(14)
STA. 1096+50 ~ BEGIN GRADING
P.I. 1091+11.57 (Proj.)
Prop. pin LS No. 8132
P.I. 1098+91.60 (Surv.)
P.I. 1099+11.41 (Proj.)
Prop. pin LS No. 8132
3' pine
P.I. 1104+00.25 (Proj.)
T.S. 1105+81.46 (Surv.)
P.C. 1107+79.80 (Proj.)
S.C. 1108+81.46 (Surv.)
B.M. No. 45 El. 9253.61 H & G 60' Lt. 1083+40
B.M. No. 46 El. 9268.02 H & G 60' Lt. 1086+40
B.M. No. 47 El. 9182.42 H & G 70' Rt. 1091+00
B.M. No. 48 El. 9296.30 H & G 80' Rt. 1094+00
B.M. No. 49 El. 9310.54 H & G 70' Rt. 1096+70
B.M. No. 50 El. 9320.44 H & G 100' Rt. 1104+50
Note: Preliminary Soil Survey Sample No. 1004 Project No. RS 0009(14)
No. 25 A ~ A-1-b (0) P.I. = NP L.L. = NV %-200 = 16 R = 82
No. 26 A ~ A-2-5 (0) P.I. = 8 L.L. = 41 %-200 = 11 R = 61
No. 27 A ~ A-2-4 (0) P.I. = NP L.L. = NV %-200 = 28 R = 50
P.M.B.S. - 3"
H.B.P. - 3"
No. 27A 3' Rt.
No. 26A 15' Rt.
No. 25A 12' Rt.
V.P.I. 20.54
-0.139 %
P.I. 19.16
-2.70 %
V.P.C. 13.46
V.P.T. 20.26
P.C. 19.43
P.T. 13.75
400' V.C.
SSD = 390'
MDS. = 50 MPH.
400' V.C.
SSD = 470'
MDS. = 50 MPH.
9290
9280
9270
9260
9250
9240
9330
9320
9310
9300
9290
9280
356
296
356
7
3096
3116
1729
4120
60
411
494
8
From Excess at Sta. 1165+12 - 1166+42
Excavation
Embankment
Embank. x 1.2
Haul Yd. Mi.
Add. Excav. Source
PLAN
PROFILE
NOTE BOOK

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
D.O.H. FORM 134
MAY 1972

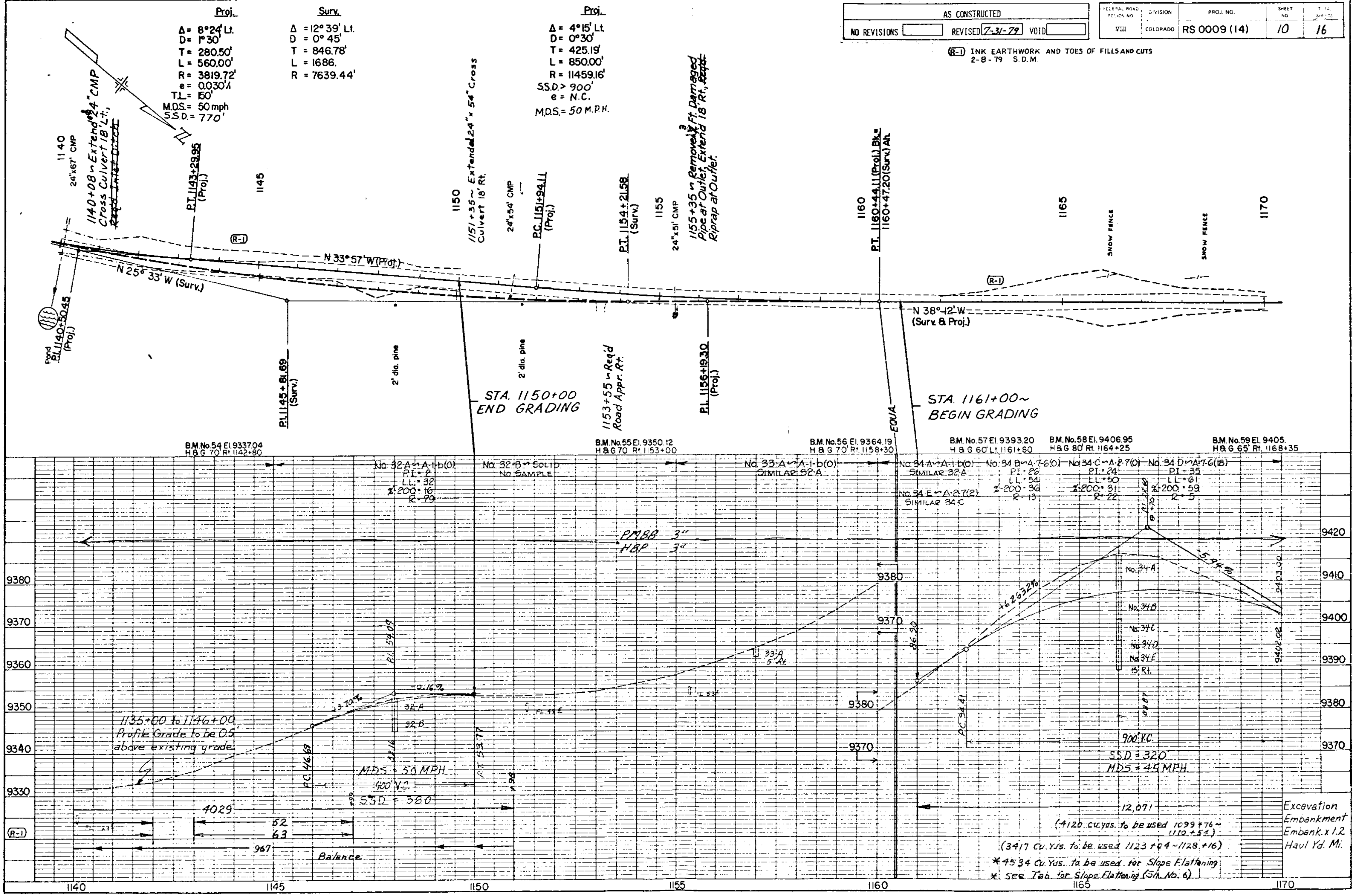


STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
D.O.H. FORM 134
MAY, 1972

AS CONSTRUCTED		
NO REVISIONS	REVISED 7-31-79	VOID

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO	RS 0009 (14)	10	16

(R-1) INK EARTHWORK AND TOES OF FILLS AND CUTS
2-8-79 S.D.M.

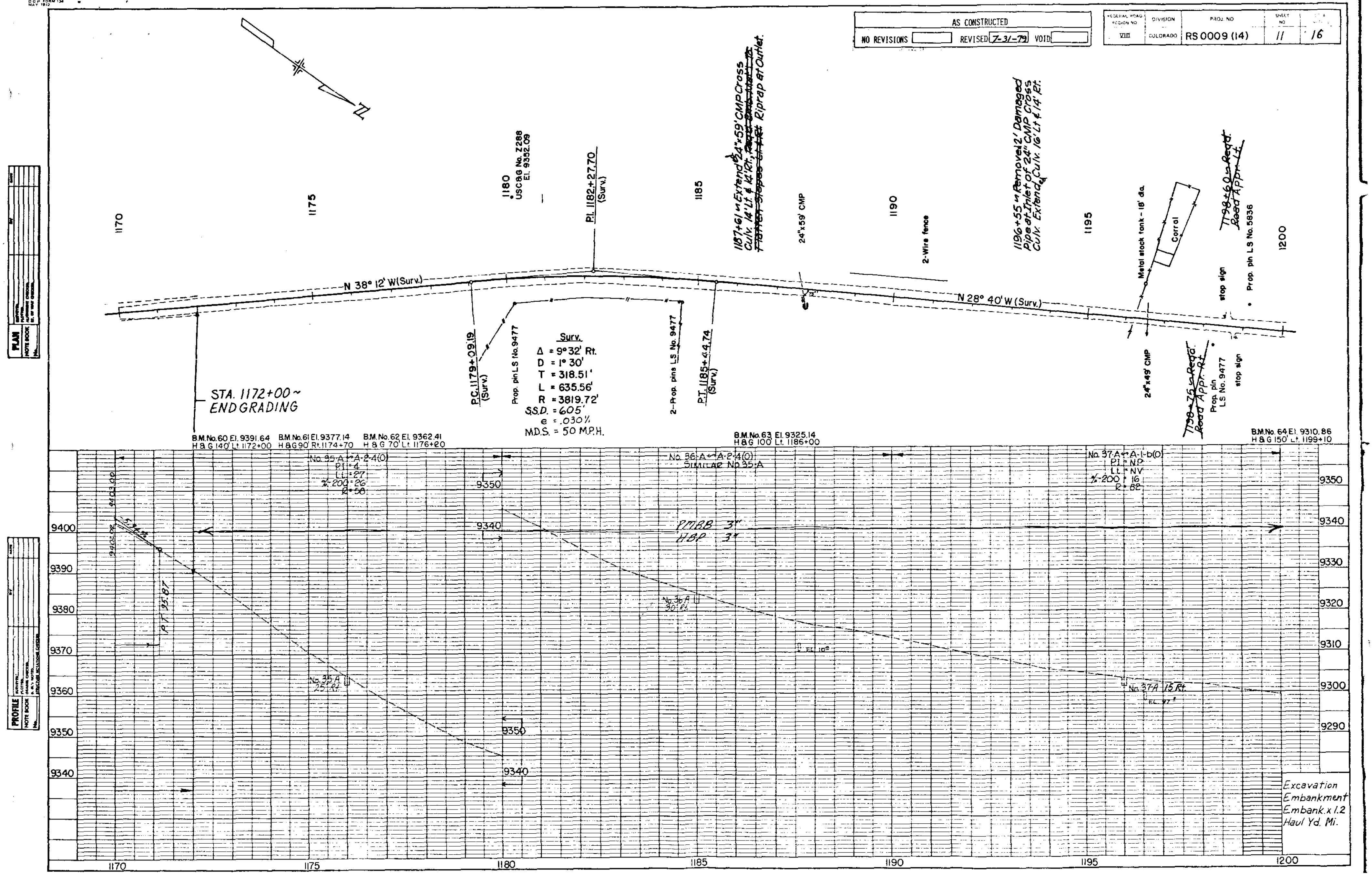


Proj.
Δ = 8°24' Lt.
D = 1°30'
T = 280.50'
L = 560.00'
R = 3819.72'
e = 0.030'/'
T.L. = 150'
M.D.S. = 50 mph
S.S.D. = 770'
Surv.
Δ = 12°39' Lt.
D = 0° 45'
T = 846.78'
L = 1686.
R = 7639.44'
Proj.
Δ = 4°15' Lt.
D = 0°30'
T = 425.19'
L = 850.00'
R = 11459.16'
S.S.D.> 900'
e = N.C.
M.D.S. = 50 M.P.H.
1140
24"x67" CMP
1140+08 ~ Extend 24" CMP Cross Culvert 18' Lt.
P.T. 1143+29.95 (Proj.)
1145
1150
1151+35 ~ Extend 24" x 54" Cross Culvert 18' Rt.
24"x54" CMP
P.C. 1151+94.11 (Proj.)
P.T. 1154+21.58 (Surv.)
1155
24"x51" CMP
1155+35 ~ Remove 3 Ft Damaged Pipe at Outlet, Extend 18' Rt. Riprap at Outlet.
1160
P.T. 1160+44.11 (Proj.) Bk.= 1160+47.20 (Surv.) Ah.
1165
SNOW FENCE
SNOW FENCE
1170
N 33° 57' W (Proj.)
N 25° 33' W (Surv.)
N 38° 42' W (Surv. & Proj.)
Pond
P.I. 1140+50.45 (Proj.)
P.I. 1145+81.69 (Surv.)
2' dia. pine
2' dia. pine
1153+55 ~ Req'd Road Appr. Rt.
P.I. 1156+19.30 (Proj.)
STA. 1150+00 END GRADING
STA. 1161+00 ~ BEGIN GRADING
EQUA.
B.M. No. 54 El. 9337.04 H & G 70' Rt. 1142+80
B.M. No. 55 El. 9350.12 H & G 70' Rt. 1153+00
B.M. No. 56 El. 9364.19 H & G 70' Rt. 1158+30
B.M. No. 57 El. 9393.20 H & G 60' Lt. 1161+80
B.M. No. 58 El. 9406.95 H & G 80' Rt. 1164+25
B.M. No. 59 El. 9405. H & G 65' Rt. 1168+35
No. 32 A ~ A-1-b(0) P.I. - 2 L.L. - 32 % -200 - 16 R - 79
No. 32 B ~ SOLID No SAMPLE
No. 33 A ~ A-1-b(0) SIMILAR 32 A
No. 34 A ~ A-1-b(0) SIMILAR 32 A
No. 34 E ~ A-2-7(2) SIMILAR 34 C
No. 34 B ~ A-7-6(0) P.I. - 26 L.L. - 54 % -200 - 36 R - 13
No. 34 C ~ A-2-7(0) P.I. - 24 L.L. - 50 % -200 - 31 R - 22
No. 34 D ~ A-7-6(18) P.I. = 35 L.L. - 61 % -200 - 59 R - 5
PMBB 3"
HBP 3"
9420
9410
9400
9390
9380
9370
9380
9370
9360
9350
9340
9330
P.I. 54.09
P.C. 46.69
P.T. 53.77
+3.70%
-0.16%
32-A
32-B
33-A 5' Rt.
1135+00 to 1146+00 Profile Grade to be 0.5' above existing grade.
M.D.S. = 50 MPH
400' V.C.
S.S.D. = 380
86.20
P.C. 94.41
+6.2632%
-5.94%
No. 34-A
No. 34B
No. 34C
No. 34D
No. 34E
15' Rt.
900' V.C.
S.S.D. = 320'
M.D.S. = 45 MPH
9403.00
9402.92
4029
52
63
967
Balance
12,071
(4126 cu. yds. to be used 1099+76 ~ 1110+54)
(3417 Cu. Yds. to be used 1123+04 ~ 1128+16)
* 4534 Cu. Yds. to be used for Slope Flattening
*: See Tab. for Slope Flattening (Sh. No. 6)
Excavation
Embankment
Embank. x 1.2
Haul Yd. Mi.
(R-1)
1140
1145
1150
1155
1160
1165
1170

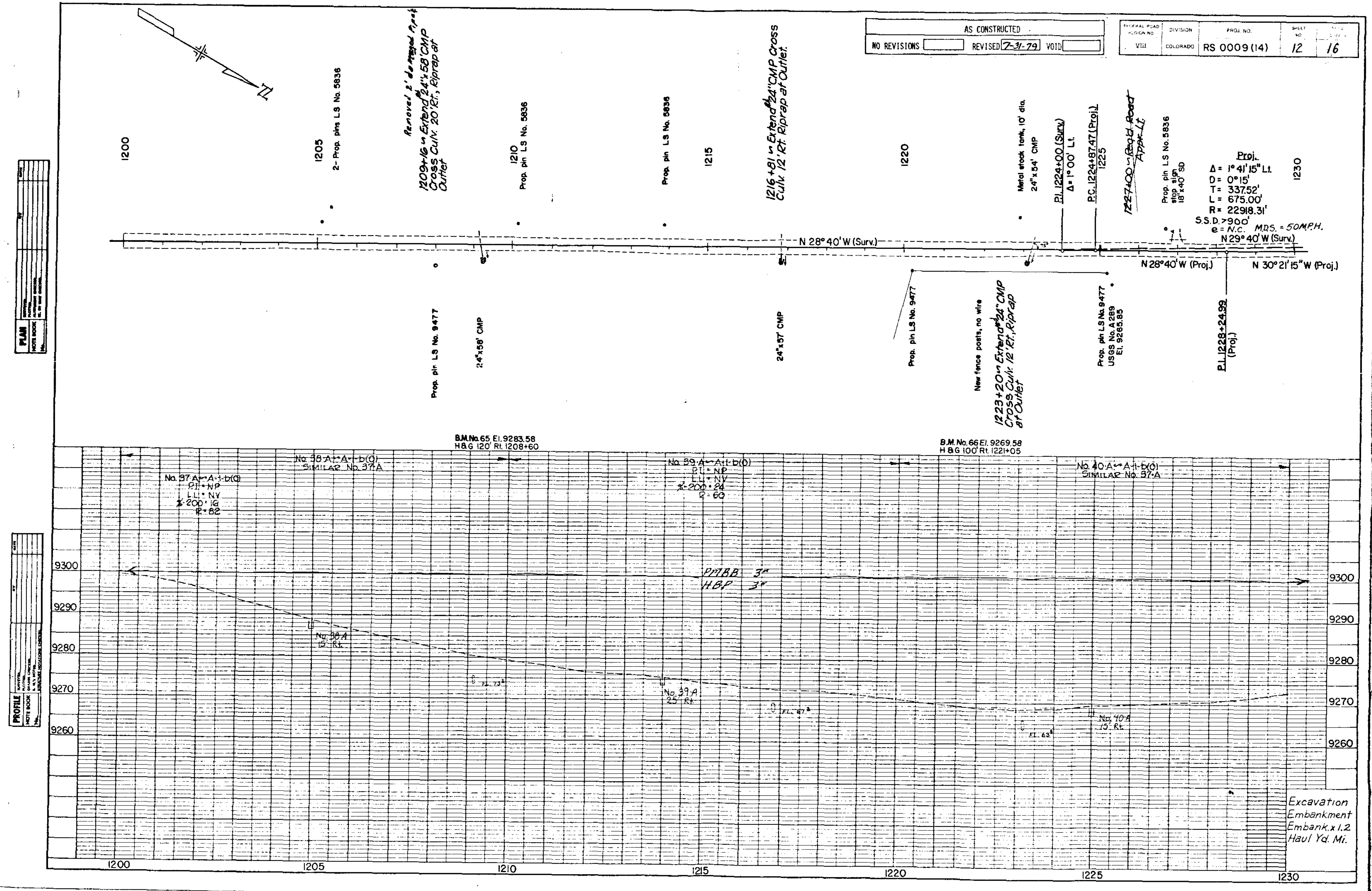
PLAN
NOTE BOOK
No.

PROFILE
NOTE BOOK
No.

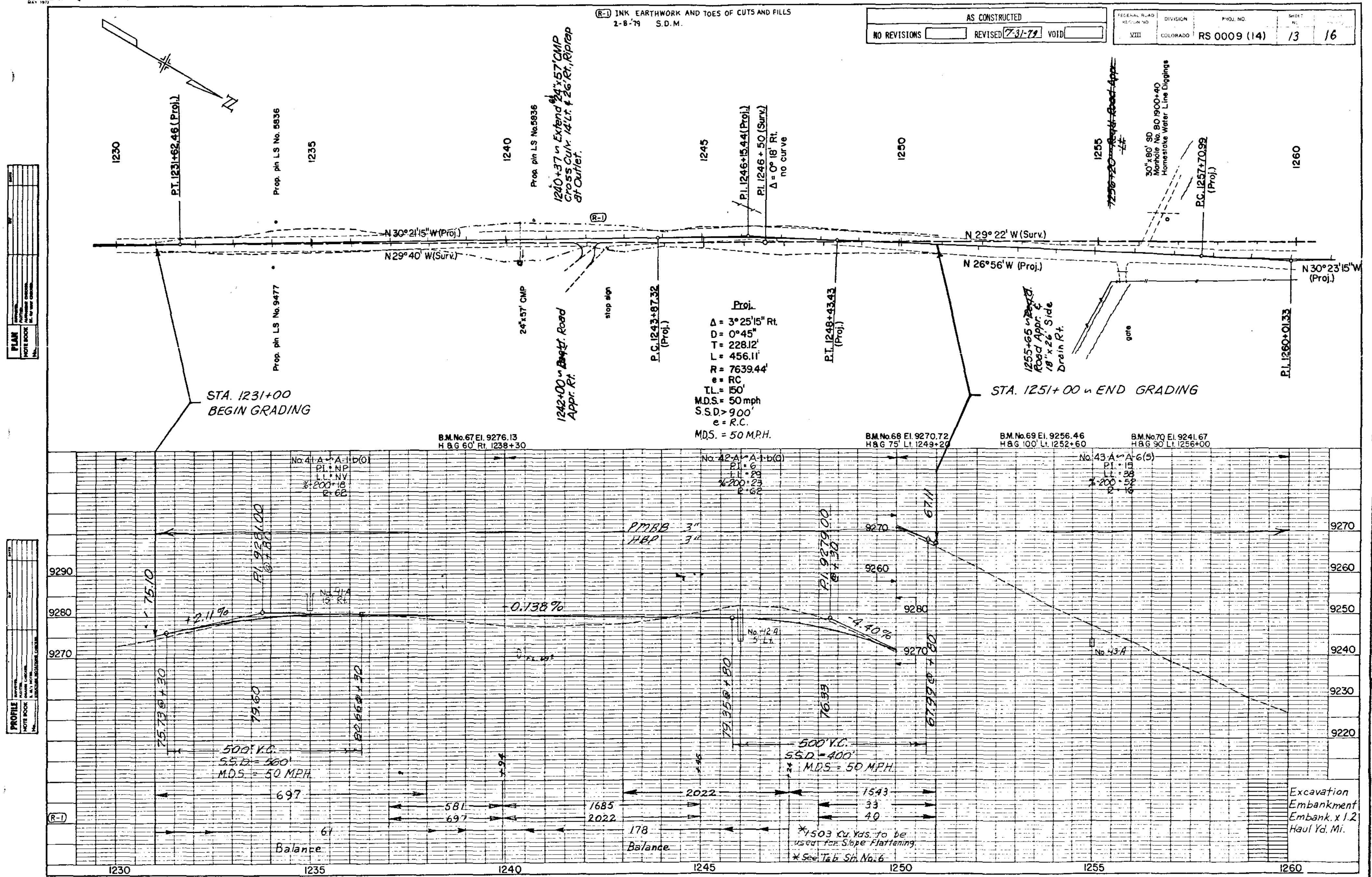
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS · STATE OF COLORADO



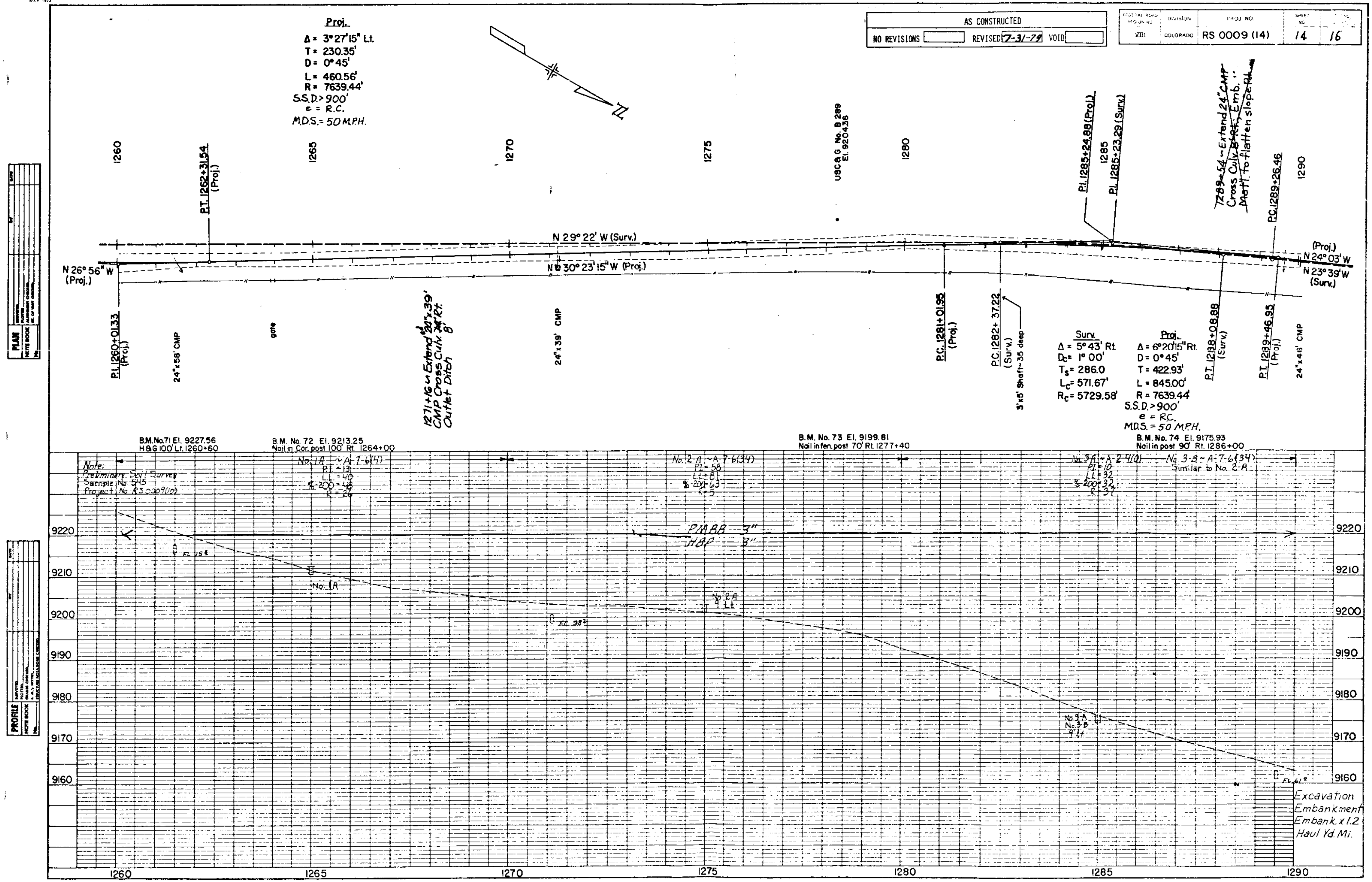
DIVISION OF HIGHWAYS - STATE OF COLORADO

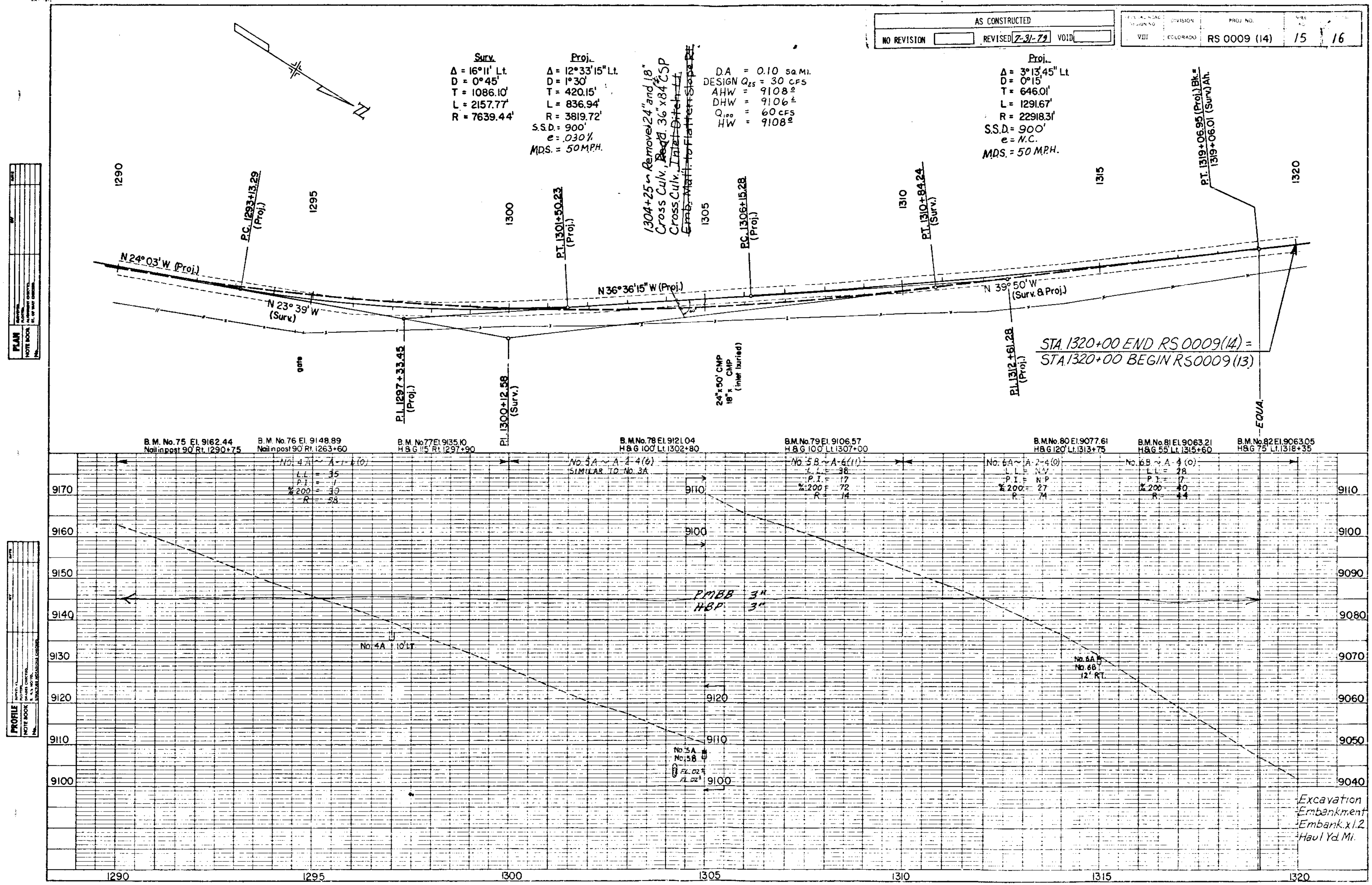


STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO



STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
D.O.H. FORM 134
MAY 1972




AS CONSTRUCTED
NO REVISION
REVISED 7-31-79
VOID
VIII
COLORADO
RS 0009 (14)
15
16
Surv.
Δ = 16°11' Lt.
D = 0°45'
T = 1086.10'
L = 2157.77'
R = 7639.44'
Proj.
Δ = 12°33'15" Lt.
D = 1°30'
T = 420.15'
L = 836.94'
R = 3819.72'
S.S.D. = 900'
e = .030%
MDS. = 50 M.P.H.
1304+25 ~ Remove 24" and 18" Cross Culv. Req'd. 36"x84" CSP Cross Culv. Inlet Ditch Lt. Emb. Mat'l. to Flatten Slope Rt.
D.A = 0.10 SQ. MI.
DESIGN Q25 = 30 CFS
AHW = 9108.0
DHW = 9106±
Q100 = 60 CFS
HW = 9108.0
Proj.
Δ = 3°13'45" Lt.
D = 0°15'
T = 646.01'
L = 1291.67'
R = 22918.31'
S.S.D. = 900'
e = N.C.
MDS. = 50 M.P.H.
P.T. 1319+06.95 (Proj.) Bk. = 1319+06.01 (Surv.) Ah.
P.C. 1293+13.29 (Proj.)
P.T. 1301+50.23 (Proj.)
P.C. 1306+15.28 (Proj.)
P.T. 1310+84.24 (Surv.)
N 24°03' W (Proj.)
N 23°39' W (Surv.)
N 36°36'15" W (Proj.)
N 39°50' W (Surv. & Proj.)
gate
P.I. 1297+33.45 (Proj.)
P.I. 1300+12.58 (Surv.)
24"x50' CMP 18"x CMP (inlet buried)
P.I. 1312+61.28 (Proj.)
STA. 1320+00 END RS 0009(14) =
STA. 1320+00 BEGIN RS 0009(13)
EQUA.
B.M. No. 75 El. 9162.44 Nail in post 90' Rt. 1290+75
B.M. No. 76 El. 9148.89 Nail in post 90' Rt. 1263+60
B.M. No 77 El. 9135.10 H&G 115' Rt. 1297+90
B.M. No. 78 El. 9121.04 H&G 100' Lt. 1302+80
B.M. No. 79 El. 9106.57 H&G 100' Lt. 1307+00
B.M. No. 80 El. 9077.61 H&G 120' Lt. 1313+75
B.M. No. 81 El. 9063.21 H&G 55' Lt. 1315+60
B.M. No. 82 El. 9063.05 H&G 75' Lt. 1318+35
No. 4A ~ A-1-b(0)
L.L. = 35
P.I. = 1
%200 = 30
R = 58
No. 5A ~ A-2-4(0)
SIMILAR TO No. 3A
No. 5B ~ A-6(11)
L.L. = 38
P.I. = 17
%200 = 72
R = 14
No. 6A ~ A-2-4(0)
L.L. = N.V.
P.I. = N.P.
%200 = 27
R = 74
No. 6B ~ A-4(0)
L.L. = 28
P.I. = 17
%200 = 40
R = 44
PMBB 3"
HBP 3"
No. 4A 10' LT
No. 5A
No. 5B
FL. 02
No. 6A
No. 6B
12' RT.
9170
9160
9150
9140
9130
9120
9110
9100
9110
9100
9120
9110
9100
9110
9100
9090
9080
9070
9060
9050
9040
Excavation
Embankment
Embank. x 1.2
Haul Yd. Mi.
1290
1295
1300
1305
1310
1315
1320
PLAN
NOTE BOOK
PROFILE
NOTE BOOK

DIVISION OF HIGHWAYS, STATE OF COLORADO
D.O.H. FORM NO. 126
Rev. October, 1972

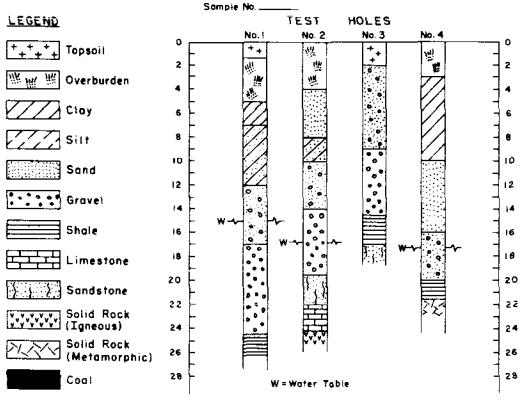
STANDARD M-100-A

(MAY 11, 1973)

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

REVISIONS		

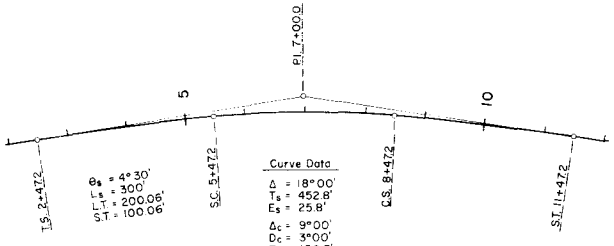
TYPICAL LOG OF PIT



Composite materials are represented by combinations of the above symbols such as:

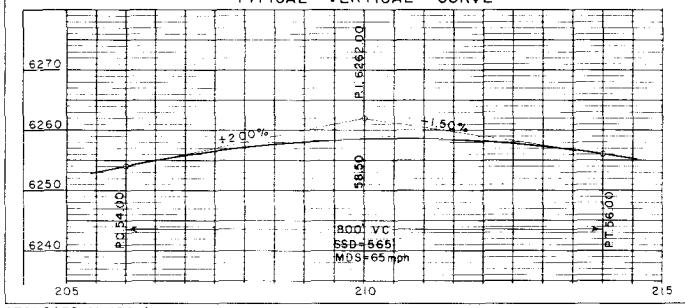
Sandy Clay

TYPICAL HORIZONTAL CURVE



Curve Data
Δ = 18°00'
Ts = 452.8'
Es = 25.8'
Δc = 9°00'
Dc = 3°00'
Tc = 150.3'
Lc = 300'
Rc = 1909.86'
e = .079 ft/ft
MDS = 60 mph
SSD = 510'

TYPICAL VERTICAL CURVE



Road Approaches — R.O.W. — New — Existing

Section Corner — 1 6 12 7

Center of Section — 12

Ties to Section Corner — Distance — Angle — Sta.

Culverts & Drains — Proposed — Exist. — No Hdwl. — 1 Hdwl. — 2 Hdwls — End Sections — Proposed — Exist. (To be dashed) — Siphon — CBC

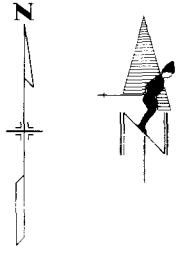
Bridges — Exist. (To be dashed)

Water — River — Lake — Creek — Ditch — Proposed Ditch

Mountains

Trees — Single Trees — Deciduous — Coniferous — Groves of Trees — Pine — Aspen

NORTH ARROWS



County Line

Township or Range Line

Land Lines — Section Line — 1/4 Section Line — 1/16 Section Line

Property or Tract Line

City Limits

Railroad

Existing Road

New Road

Control of Access

Access denied by Deed — OP OPENING — 24' OP — 16' OP — E.O.A.

Right of Way Line — R.O.W. MARKER

Protected By Freeway Law (Virgin Location)

Top of Cuts

Toe of Fills

Barbed Wire Fence

Chain Link Fence

Barrier Fence

Woven Wire - Combination Fence

Snow Fence

Wood Fence

Deer Fence

Guard Rail — TYPE — EXIST. — TYPE — NEW

Guard Post — EXIST. — NEW

Delineators — Type I — II — III — IV — V

Sidewalk — TYPE — EXIST. — TYPE — NEW

Curb and Gutter — TYPE — EXIST. — TYPE — NEW

Gutter — TYPE — EXIST. — TYPE — NEW

Tel. & Teleg. Lines — Exist. — To be Removed — Relocated

Electric Lines

Elec. Trans. Tower

Buried Tel. Cable — EXIST. — NEW

Buried Electric Cable — EXIST. — NEW

Gas Main — 6" EXIST. — 8" NEW

Oil Main — 10" EXIST. — 10" NEW

Water Main — 4" EXIST. — 4" NEW

Sanitary Sewers — 12" EXIST. — 12" NEW

Storm Sewers — M.H. — 18" EXIST. — M.H. — 18" NEW — INLET

Light Standard - Existing

Light Standard - To be Removed

Light Standard - Relocated

Light Standard - Clear Luminaire

Light Standard - Amber Luminaire

Bridge Wall Luminaire

Bridge Ceiling Luminaire

High Mast Light Standard — N = Number of Luminaires

GENERAL NOTES

THESE SYMBOLS ARE INTENDED TO EXPLAIN THE VARIOUS TOPOGRAPHIC FEATURES INVOLVED ON THE ROADWAY PLAN SHEETS WHICH ARE PREPARED AT SCALES OF 1 INCH = 50 FEET OR 1 INCH = 100 FEET. NOTES ARE ADDED WHERE NECESSARY TO CLARIFY THE SYMBOL. IF THESE SYMBOLS ARE NOT APPROPRIATE FOR USE WITH OTHER SCALES, A LEGEND IS PROVIDED IN THE PLANS TO EXPLAIN THE SYMBOLS THAT ARE USED.

GUARD RAIL, CURB & GUTTER, ETC. ARE REPRESENTED BY A SYMBOL WITH TYPE GIVEN BY NOTE. SEE THE APPROPRIATE DIVISION M-STANDARD FOR EXPLANATION OF THE VARIOUS TYPES.

EXISTING BUILDINGS AND OTHER MAN MADE TOPOGRAPHICAL FEATURES NOT SYMBOLED HERE ARE SHOWN BY DASHED LINES WITH EXPLANATORY NOTES AS NECESSARY. NEW FEATURES TO BE CONSTRUCTED ARE SHOWN BY SOLID LINES.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

STANDARD SYMBOLS

Designed by R.L.M.	Approved by Staff Design Engr.
Made by H.P.S.	Date: May 11, 1973
Checked by D.W.D.	

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

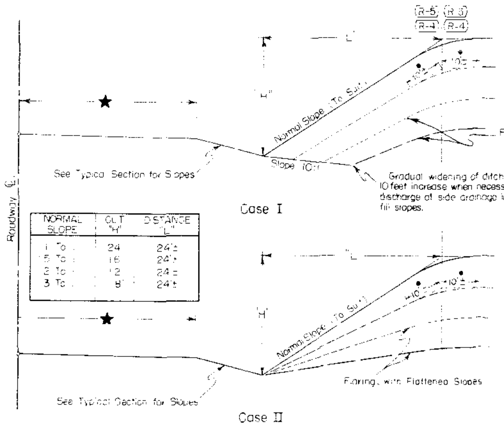
STANDARD M-203-B

(JULY 1, 1965)

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

REVISIONS			
(R-1)	2-6-68	Median Cross Over	MRH
(R-2)	7-30-68	Dept. Name	MRH
(R-3)	4-1-69	Widening for Guard Rail	M.R.H.
(R-4)	4-27-70	Cut Slope and Note	M.R.H.
(R-5)	12-1-72	Cut Slope Tr. Dimension	M.R.H.

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



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

FLARING OF EARTH CUTS: The backslopes of ends of all earth cuts shall be flattened & where necessary the ditch shall be widened gradually to discharge side ditch drainage away from the nose 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 outside the slope stake and extending down the cut slope. The exact dimension will be determined by the Engineer based on the type of material encountered.

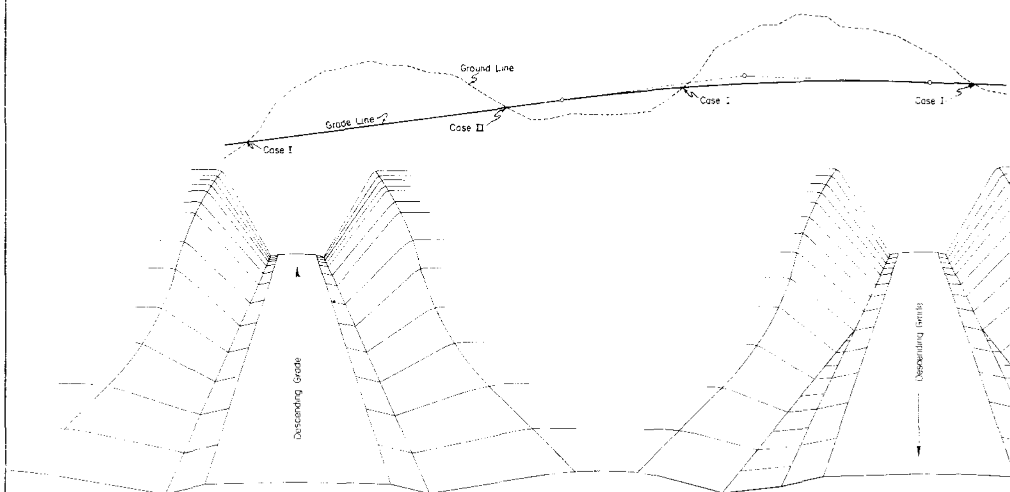
Quantities shall be included in "Unclassified Excavation".

★ WIDENING AT BRIDGE APPROACHES: Roadway embankment at bridge approaches shall be so constructed that base of surfacing at shoulder point is a minimum of 2 ft. beyond the edge of bridge deck. Where widening is necessary to achieve this result it shall take place gradually over a distance of 30.0 ft. (R-4)

WIDENING FOR BITUMINOUS CURB (Only where Guard Rail is required); See appropriate M-Standard for Guard Rail. (R-3)

(R-4)

PLAN OF FLARING IN EARTH CUTS

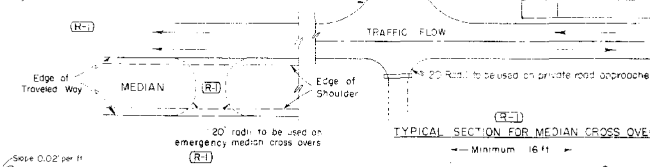


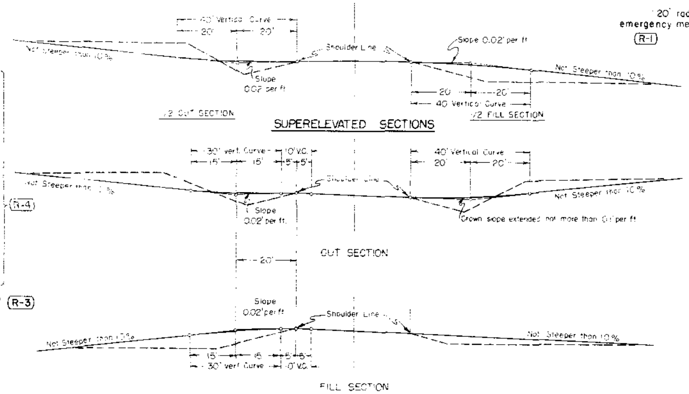
(R-1)

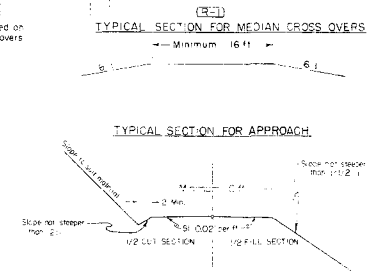
TYPICAL PLANS FOR SIDE APPROACH ROADS AND EMERGENCY MEDIAN CROSS OVERS

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.



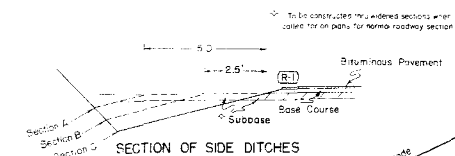




NOTE:
Road Approaches shall conform to the above details unless otherwise indicated on plans. The width of the crowned section shall not be less than the width of the crowned section of the existing approach road and the new construction shall not be less than 16 feet in width.

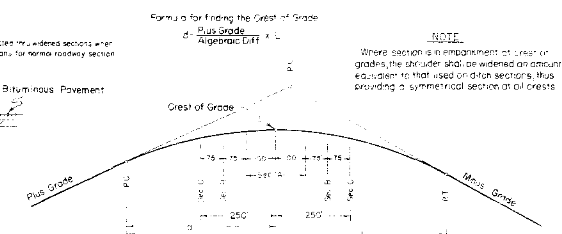
DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES

(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



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 applicable to the Project. (R-2)

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

The maximum grades shown are to be the limiting grades for all road approaches. Modifications of grades will be permitted where adherence to the grades as shown would cause damage to property or create other unsatisfactory conditions. Grades flatter than the maximum shown are to be used wherever feasible. (R-4)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

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

Designed by	Approved by
Made by S.J.M.	Staff Design Engr.
Checked by C.R.S.	Date: July 1, 1965

STANDARD TYPES of DITCHES and CONSTRUCTION METHODS

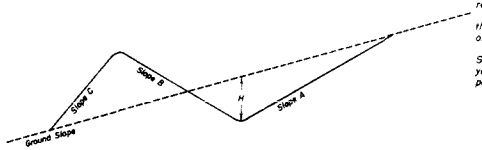
STANDARD M-203-C

(JULY 1, 1965)

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

DETAILS for CONTOUR INTERCEPTING DITCHES

Typical Section for Contour Intercepting Ditches



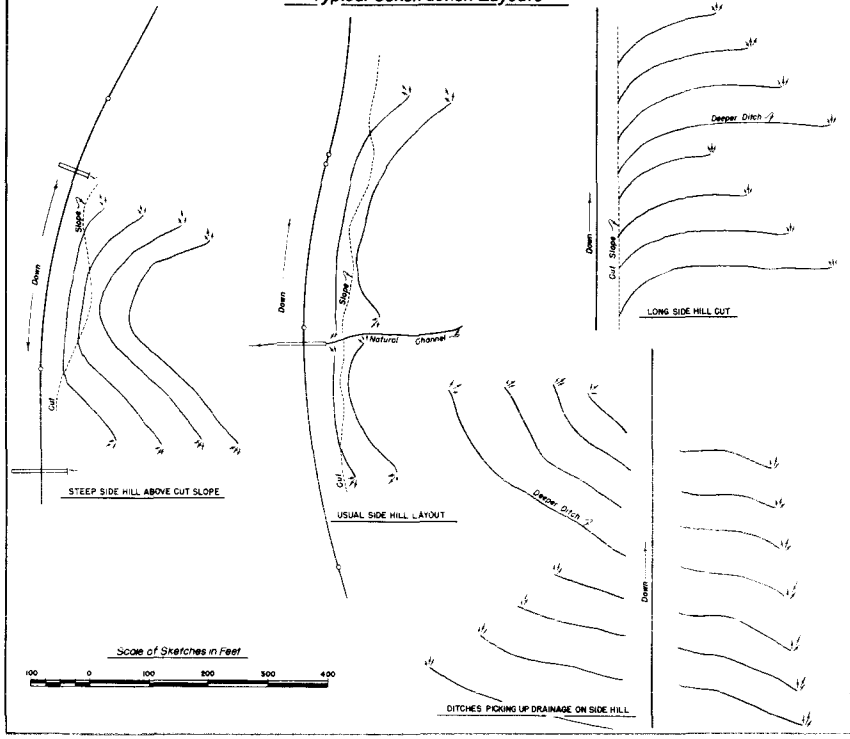
PURPOSE & USE OF THE TABLE

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

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

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

Typical Construction Layouts



Scale of Sketches in Feet

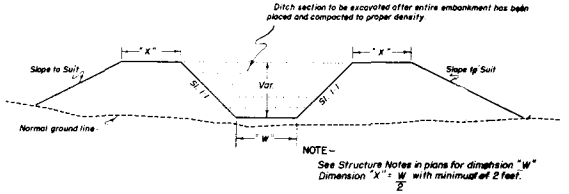
100 0 100 200 300 400

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
		2:1		15"	9
				18"	13
				21"	17
		1-1/2:1		15"	8
				18"	12
				21"	16
1-1/2:1		1-1/2:1		15"	11
				18"	16
				21"	21

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

TYPICAL SECTIONS for DRAINAGE, IRRIGATION DITCHES and CHANNEL CHANGES



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

For Embankment Sections

(Generally for use in Irrigation Ditches & Channel Changes)

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

For Cut Sections

REVISIONS

R-1	7-23-68	Dept. Name	M.P.H.

GENERAL NOTES

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

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

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

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

The following horizontal spacing of ditches is recommended:

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

R-1

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

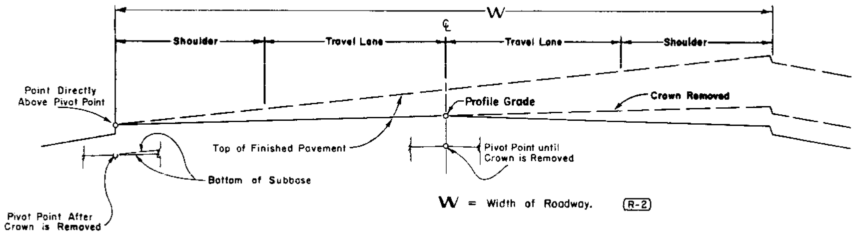
DITCH TYPES

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

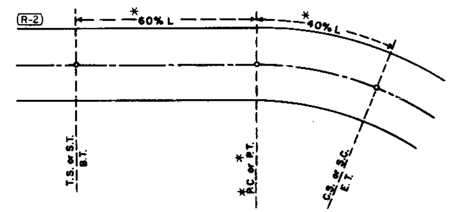
ADO DEPARTMENT OF HIGHWAYS
C. D. H. 126
RY 1960

STANDARD M-203-SC
(OCTOBER 22, 1971)

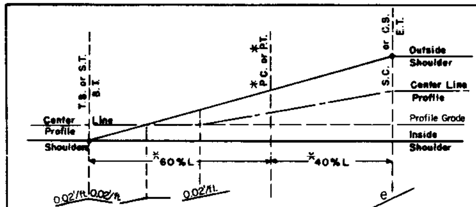
FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
VIII	COLORADO		



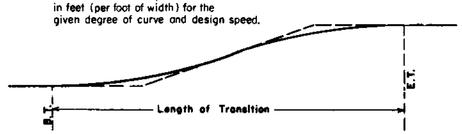
W = Width of Roadway. (R-2)



(R-2)



e = Maximum rate of superelevation in feet (per foot of width) for the given degree of curve and design speed.



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.

*When Curve is not Spiralled.

REVISIONS			
(R-1)	3-24-75	Revise "L".	M.R.H.
(R-2)	1-6-77	Clarify definitions.	T.A.L.

SUPERELEVATION RATES

VALUES FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED AND HORIZONTAL CURVATURE

Use in Mountainous Areas and Areas where Icing Conditions Frequently Exist

D	R	V = 30 MPH		V = 40 MPH		V = 50 MPH		V = 60 MPH		V = 65 MPH		V = 70 MPH		V = 75 MPH		V = 80 MPH	
		e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET
0° 15'	22918'	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	RC	240
0° 30'	11459'	NC	0	NC	0	NC	0	RC	175	RC	190	RC	200	.022	220	.024	240
0° 45'	7639'	NC	0	NC	0	RC	150	.022	175	.025	190	.029	200	.032	220	.036	240
1° 00'	5730'	NC	0	RC	125	.021	150	.029	175	.033	190	.038	200	.043	220	.047	240
1° 30'	3820'	RC	100	.021	125	.030	150	.040	175	.046	190	.053	200	.060	220	.065	240
2° 00'	2865'	RC	100	.027	125	.038	150	.051	175	.057	190	.065	200	.072	230	.076	250
2° 30'	2292'	.021	100	.033	125	.046	150	.060	175	.066	190	.073	220	.078	250	.080	260
3° 00'	1910'	.025	100	.038	125	.053	150	.067	180	.073	210	.078	230	.080	250	.080	260
3° 30'	1637'	.028	100	.043	125	.058	150	.073	200	.077	220	.080	240	.080	250	D max = 2.5°	
4° 00'	1432'	.032	100	.047	125	.063	150	.077	210	.079	230	.080	240	D max = 3.0°			
5° 00'	1146'	.038	100	.055	125	.071	170	.080	220	.080	230	D max = 3.5°					
6° 00'	955'	.043	100	.061	130	.077	180	.080	220	D max = 4.5°							
7° 00'	819'	.048	100	.067	140	.079	190	D max = 5.0°									
8° 00'	716'	.052	100	.071	150	.080	190										
9° 00'	637'	.056	100	.075	160	D max = 7.5°											
10° 00'	573'	.059	110	.077	160												
11° 00'	521'	.063	110	.079	170												
12° 00'	477'	.066	120	.080	170												
13° 00'	441'	.068	120	.080	170												
14° 00'	409'	.070	130	D max = 12.5°													
16° 00'	358'	.074	130														
18° 00'	318'	.077	140														
20° 00'	286'	.079	140														
22° 00'	260	.080	140														
		.080	140														
		D max = 23.0°															

$e_{max} = 0.08$

Use in Rolling Areas and Areas where Icing Conditions Occasionally Exist

D	R	V = 30 MPH		V = 40 MPH		V = 50 MPH		V = 60 MPH		V = 65 MPH		V = 70 MPH		V = 75 MPH		V = 80 MPH	
		e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET
0° 15'	22918'	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	RC	240
0° 30'	11459'	NC	0	NC	0	NC	0	RC	175	RC	190	RC	200	.022	220	.024	240
0° 45'	7639'	NC	0	NC	0	RC	150	.024	175	.027	190	.029	200	.032	220	.036	240
1° 00'	5730'	NC	0	RC	125	.029	150	[illegible]	175	.035	190	.039	200	.044	220	.048	240
1° 30'	3820'	RC	100	.021	125	.033	150	[illegible]	175	.052	190	.058	200	[illegible]	220	[illegible]	240
2° 00'	2865'	RC	100	.028	125	.042	150	[illegible]	175	.066	190	.074	220	.082	260	.089	290
2° 30'	2292'	.021	100	.034	125	.051	150	.069	[illegible]	.077	220	.088	260	.094	300	.099	330
3° 00'	1910'	.025	100	.040	125	.059	150	.074	[illegible]	.087	250	.094	280	.100	300	.100	330
3° 30'	1637'	.029	100	.046	125	.067	160	[illegible]	[illegible]	.093	270	.099	300	.100	320	.100	330
4° 00'	1432'	.033	100	.051	125	.073	180	[illegible]	[illegible]	.098	280	.100	300	D max=3.0°		D max=3.0°	
5° 00'	1146'	.040	100	.061	130	.084	200	[illegible]	[illegible]	.100	290	.100	300				
6° 00'	955'	.046	100	.070	150	.093	220	.100	270	D max=4.5°		D max=4.0°					
7° 00'	819'	.053	100	.077	160	.098	240	D max=[illegible]									
8° 00'	716'	.059	110	.084	180	.100	240										
9° 00'	637'	.064	120	.089	190	.100	240										
10° 00'	573'	.068	120	.093	200	D max=8.5°											
11° 00'	521'	.072	130	.097	200												
12° 00'	477'	.077	140	.099	210												
13° 00'	441'	.080	140	.100	210												
14° 00'	409'	.083	150	.100	210												
16° 00'	358'	.089	160	D max=13.5°													
18° 00'	318'	.093	170														
20° 00'	286'	.097	170														
22° 00'	260'	.099	180														
24° 00'	239'	.100	180														
		.100	180														
		D max=25.0°															

$e_{max} = 0.10$

Use in Plains Areas and Areas where Icing Conditions Seldom Exist
or Where Roadways are Well Sanded during Icing Conditions

D	R	V = 30 MPH		V = 40 MPH		V = 50 MPH		V = 60 MPH		V = 65 MPH		V = 70 MPH		V = 75 MPH		V = 80 MPH	
		e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET	e	L-FEET
0° 15'	22918'	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	NC	0	RC	240
0° 30'	11459'	NC	0	NC	0	NC	0	RC	175	RC	190	RC	200	.022	220	.024	240
0° 45'	7639'	NC	0	NC	0	RC	150	.024	175	.026	190	.029	200	.033	220	.036	240
1° 00'	5730'	NC	0	RC	125	.028	150	.031	175	.035	190	.039	200	.043	220	.048	240
1° 30'	3820'	RC	100	.032	125	.034	150	.047	175	.053	190	.059	200	.065	220	.072	240
2° 00'	2865'	RC	100	.030	125	.045	150	.062	175	.070	200	.078	230	.087	280	.095	310
2° 30'	2292'	.022	100	.037	125	.055	150	.078	210	.085	240	.095	290	.105	330	.113	370
3° 00'	1910'	.026	100	.044	125	.063	160	.088	240	.097	240	.108	320	.117	370	.120	400
3° 30'	1637'	.030	100	.050	125	.074	180	.098	260	[illegible]	310	.116	350	.120	380	.120	400
4° 00'	1432'	.034	100	.057	125	.082	200	.106	290	.114	330	.120	360	.120	380	D max=3.0°	
5° 00'	1146'	.042	100	.068	140	.096	235	.117	320	.120	350	.120	360	D max=3.5°			
6° 00'	955'	.049	100	.079	170	.107	260	.120	320	.120	350	D max=4.0°					
7° 00'	819'	.055	100	.088	180	.114	270	.120	320	D max=5.0°							
8° 00'	716'	.062	110	.096	200	.119	290	D max=6.0°									
9° 00'	637'	.068	120	.103	220	.120	290										
10° 00'	573'	.074	130	.108	230	.120	290										
11° 00'	521'	.079	140	.113	240	D max=9.0°											
12° 00'	477'	.084	150	.116	240												
13° 00'	441'	.089	160	.119	250												
14° 00'	409'	.093	170	.120	250												
16° 00'	358'	.101	180	.120	250												
18° 00'	318'	.108	190	D max=14.5°													
20° 00'	286'	.113	200														
22° 00'	260'	.117	210														
26° 00'	220'	.120	220														
		.120	220														
		D max=26.5°															

$e_{max} = 0.12$

D – DEGREE OF CURVE
R – RADIUS OF CURVATURE
V – ASSUMED DESIGN SPEED
(R-2)

(R-2) (R-1) L – LENGTH OF SUPERELEVATION TRANSITION.
NC – NORMAL CROWN SECTION
RC – REMOVE ADVERSE CROWN, SUPERELEVATE AT NORMAL CROWN SLOPE

SPIRALS DESIRABLE BUT NOT AS ESSENTIAL ABOVE THE UPPERMOST HEAVY LINE. LENGTHS ROUNDED IN MULTIPLES OF 25 OR 50 FEET PERMIT SIMPLER CALCULATIONS.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

SUPERELEVATION OF CURVES CROWNED HIGHWAYS

Designed by	J W K	Approved by	[signature]
Made by	R L M	Staff Design Engr.	
Checked by	D L V	Date:	October 22, 1971

STANDARD M-203-SC

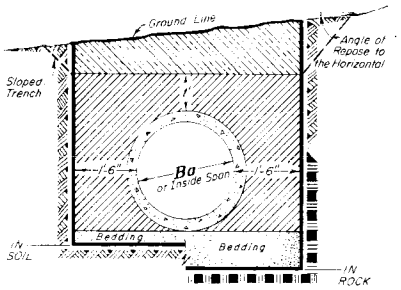
STANDARD M-206-AB

(MARCH 4, 1976)
(SHEET 1 OF 3)

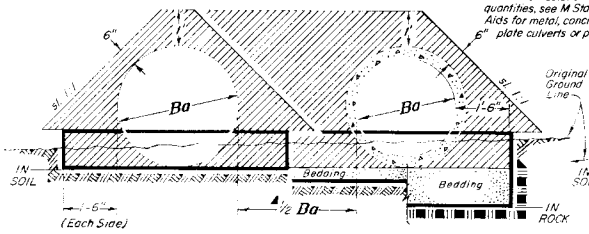
FEDERAL ROAD REGION NO	DIVISION	PROJ. NO.	SHEET NO	TOTAL SHEETS
VIII	COLORADO			

REVISIONS			
R-1	3-26-76	Gen. Note, footing in rock	T.A.L.
R-2	4-16-76	Limit of Str. Excav. in Box Culv. detail.	T.A.L.
R-3	5-8-76	Backfill for Wingwall.	T.A.L.

SIPHON OR CONDUIT IN TRENCH

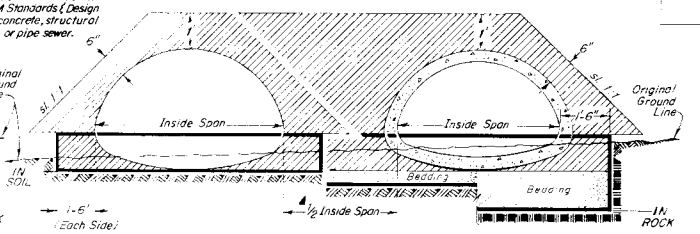


CIRCULAR CONDUIT

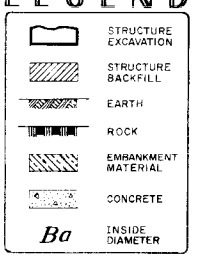


NOTE: For additional Culvert installation details and for Backfill quantities, see M Standards & Design Aids for metal, concrete, structural plate culverts or pipe sewer.

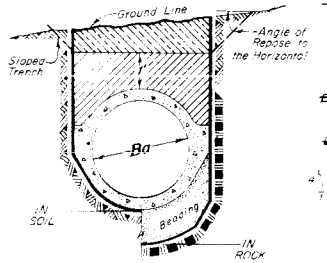
ELLIPTICAL OR ARCH CONDUIT



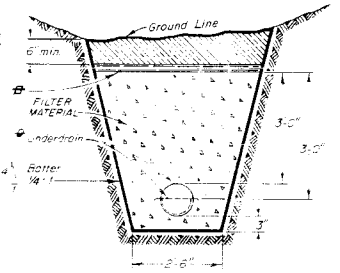
LEGEND



CAST IN PLACE CONDUIT

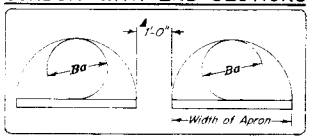


TRENCH FOR PIPE UNDERDRAIN

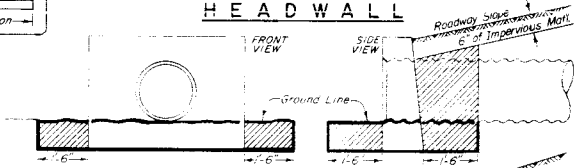


▲ When 2 or more conduits are laid side by side they shall be placed so that the adjacent pipes will be ½ Inside Diameter or ½ Inside Span or 3 feet apart (including wall thickness) whichever is less. Minimum spacing shall be not less than one foot between outside walls of pipe or End Section.

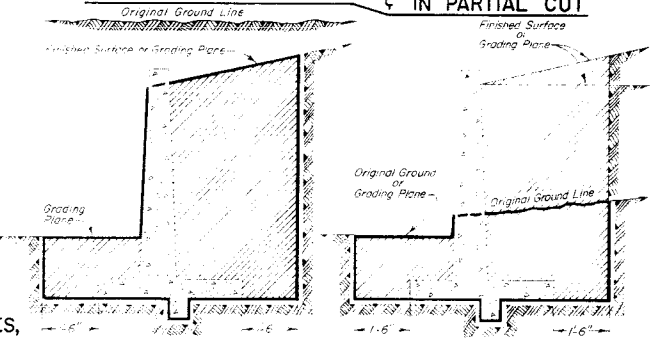
CONDUIT WITH END SECTIONS



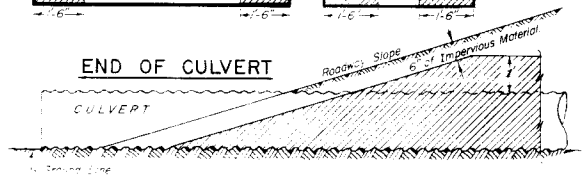
HEADWALL



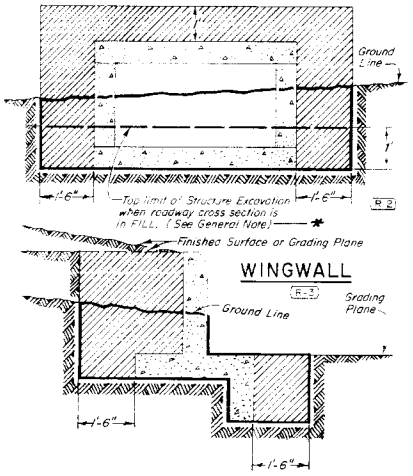
RETAINING WALL IN CUT & IN PARTIAL CUT



END OF CULVERT



CONCRETE BOX CULVERT

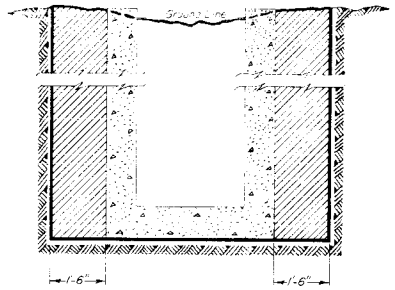


▲ One thickness of Building Paper (30 weight) or Plastic Sheeting (10 mil.) or 4" layer of loose straw or acceptable equivalent.

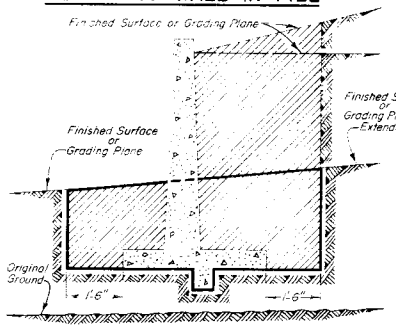
▲ The highest nominal thickness for Underdrain shall be:

TYPE III PIPE	CLASS I & II	CLASS III
STEEL	.052"	.064"
ALUMINUM	.048"	.060"

DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS, ETC.



RETAINING WALL IN FILL



GENERAL NOTES (R-1)

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

* Where the roadway cross section is in FILL, excavation for box culverts shall be done as follows:

1. Embankment shall be built up to one foot above the bottom of the box culvert.
2. The trench shall then be excavated to accommodate construction of the box culvert.

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

Excavation for structure installation shall be classified as "Structure Excavation" unless otherwise shown on the Plans.

Structure footings which are located in rock shall be poured out to undisturbed rock without forming.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

EXCAVATION & BACKFILL FOR STRUCTURES

Designed by	M R H	Approved by	E. L. Larson
Made by	J A B	Staff Design Engineer	
Checked by	D L S	Date:	March 4, 1976

DEPT OF HIGHWAYS-STATE OF COLORADO
D. H. 126
964

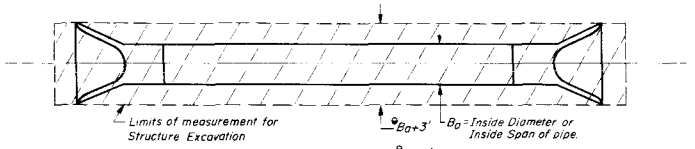
STANDARD M-206-AB

(MARCH 4, 1976)
(SHEET 2)

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

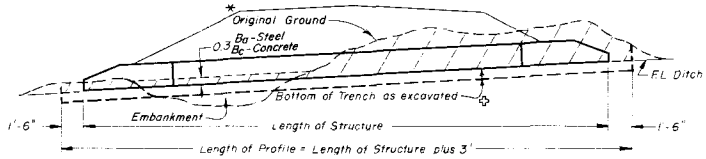
	REVISIONS:		
R-1	3-26-76	Revision date only.	T. A. L.
R-2	4-16-76	" " "	T. A. L.
R-3	5-8-78	" " "	T. A. L.

STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



PLAN

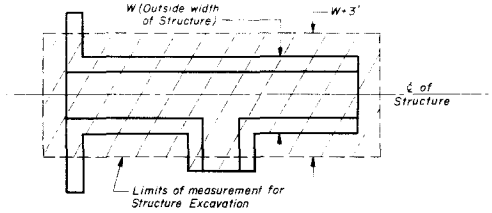
*Ba+6' for structural plate pipe culverts.



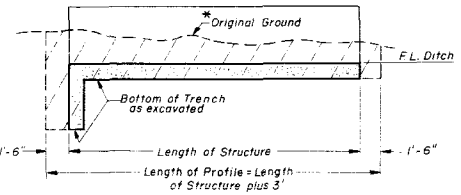
PROFILE

✣ For applicable limits of Structure Excavation, see bedding details on standards for metal, reinforced concrete and structural plate pipe culverts.

STRUCTURE EXCAVATION MEASUREMENT FOR DIVERSION OR DIVISION BOXES

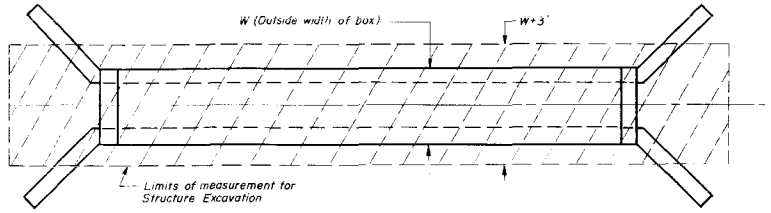


PLAN



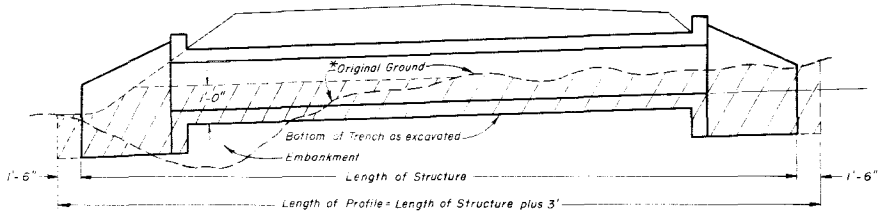
PROFILE

STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS



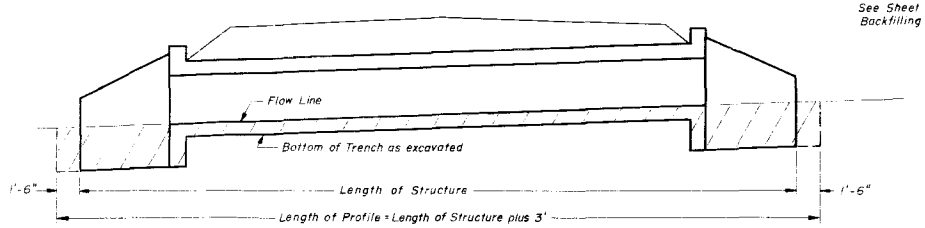
PLAN

Without Channel Change or Channel Improvement



PROFILE

With Channel Change or Channel Improvement



PROFILE

* Along ℄ of Structure

Areas to be used for Structure Excavation computations.

GENERAL NOTES (Continued)

TRENCH INSTALLATION:

Trenches over 5 feet in depth shall be either shored or the trench walls shall be sloped to the angle of repose. If sloped, the bottom of the slope shall be a minimum of 1 foot above the top of the pipe.

Shoring will be required when the bottom of the slope is more than 3 feet above the bottom of the trench. Shoring shall extend a minimum of one foot above the bottom of the slope.

Timber sheeting or shoring may be cut off 1 foot above the top of the pipe after backfilling is complete.

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

EXCAVATION AND BACKFILL FOR STRUCTURES

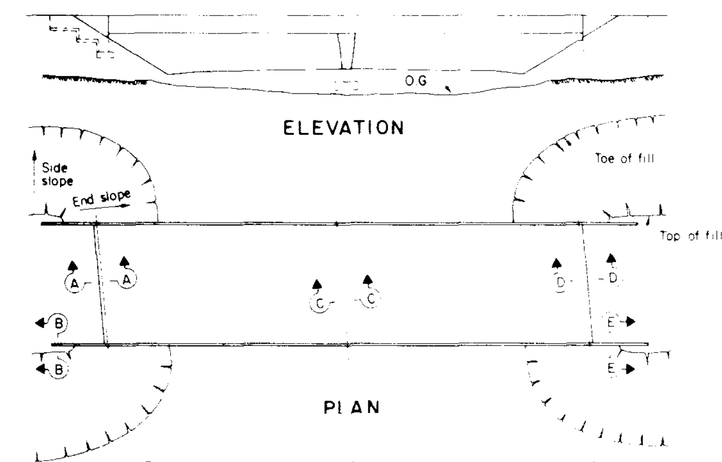
Designed by	M.R.H.	Approved by	R. C. Varner
Made by	H.P.B.	Staff Design Engr.	
Checked by		Date	March 4, 1976

STANDARD M-206-AB
(MARCH 4, 1976)
(SHEET 3)

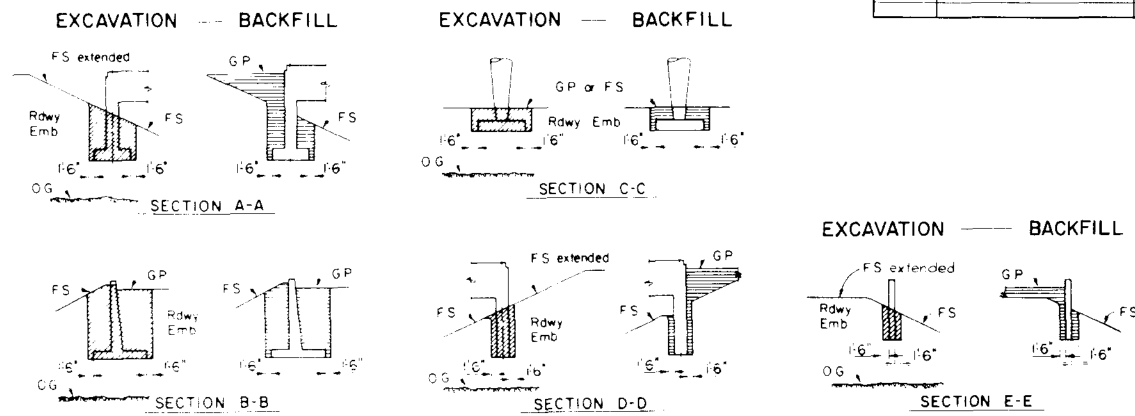
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	COLORADO			

	REVISIONS	
R-1 3-26-76	Revision date only	T.A.L.
R-2 4-16-76	" " "	T.A.L.
R-3 5-8-78	" " "	T.A.L.

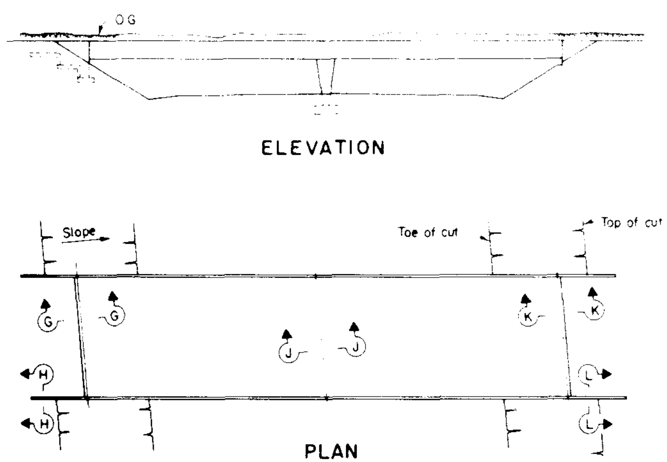
IN FILL



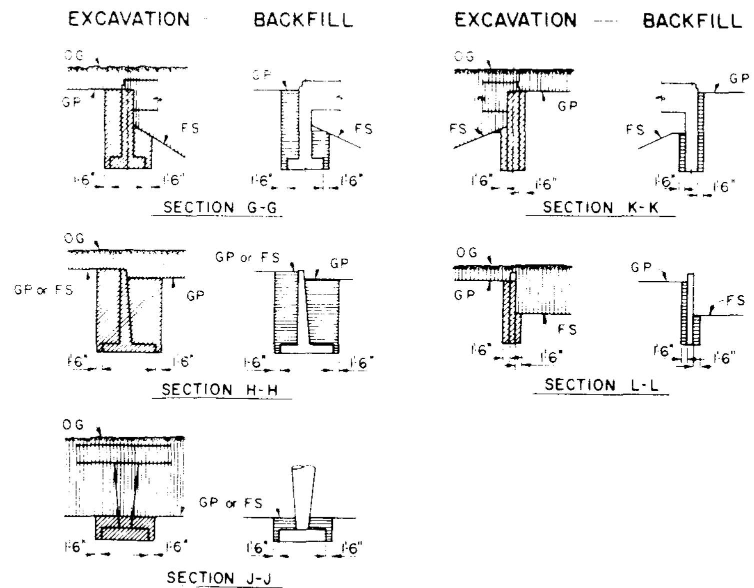
Notes: Roadway embankment is not delineated on excavation drawings for clarity. Embankment must be in place before structure excavation is made.



IN CUT



Note: If no roadway excavation is involved at bridge, structure excavation is measured from original ground.



ABBREVIATIONS

O.G. Original Ground
F.S. Planned Finished Surface
G.P. Planned Grading Plane

LEGEND

Structure Excavation
Structure Backfill
Roadway Excavation

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

EXCAVATION & BACKFILL FOR STRUCTURES
(BRIDGE)

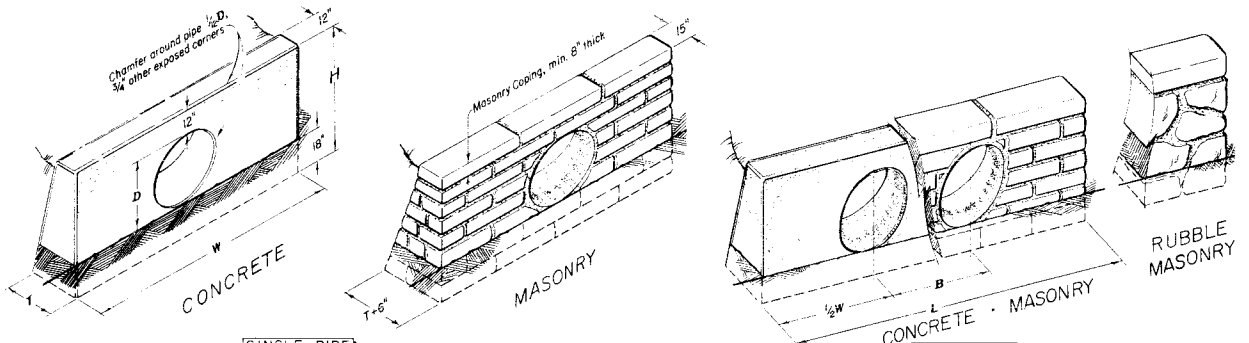
Designed by M.R.H.	Accepted by [signature]
Made by J.R.B.	Staff Design Engineer
Checked by O.L.S.	Date: March 4, 1976

STANDARD M-601-L

(JANUARY 8, 1969)

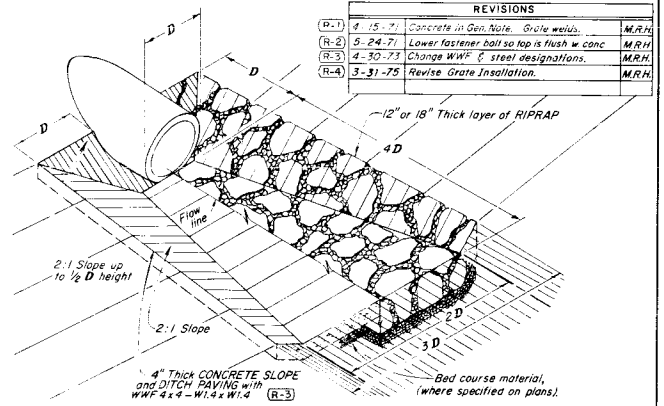
FEDERAL ROAD REGION NO	DISTRICT	PROJ. NO	SHEET NO	TOTAL SHEETS
VIII	COLORADO			

REVISIONS			
R-1	4-15-71	Concrete in Gen. Note. Grate welds.	M.R.H.
R-2	5-24-71	Lower fastener bolt so top is flush w. conc	M.R.H.
R-3	4-30-73	Change WWF & steel designations.	M.R.H.
R-4	3-31-75	Revise Grate Installation.	M.R.H.



SINGLE PIPE — DOUBLE PIPE

HEADWALL INSTALLATIONS



CULVERT OUTLET PAVING

QUANTITIES FOR **ONE** CONCRETE HEADWALL (Cubic Yards)

DIAMETER (AND EQUIVALENT DIAMETER) Inches (S = Span) (R = Rise)												
PIPE		18		24		30		36		42		48	
TYPE	MAT'L	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE	SINGLE	DOUBLE
C	RCP	1.0	1.3	1.5	2.0	2.0	2.7	2.8	3.6	3.6	4.6	4.6	6.0
	CSP	1.1	1.4	1.6	2.1	2.2	3.0	3.0	4.0	3.9	5.3	5.0	6.8
A	RCP	0.9	1.2	1.3	1.8	1.7	2.3	2.3	3.1	2.9	3.9	3.1	4.4
	CSP	0.9	1.3	1.4	1.9	1.8	2.4	2.4	3.4	3.2	4.4	3.4	5.0
		S	R	S	R	S	R	S	R	S	R	S	R
		22	13	29	18	36	22	43	27	50	31	58	36

QUANTITIES FOR **ONE** MASONRY HEADWALL (Cubic Yards)

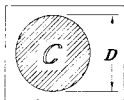
TYPE	MAT'L	SGL 18	DBL.	SGL. 24	DBL.	SGL 30	DBL.	SGL 36	DBL.	SGL 42	DBL.	SGL 48	DBL.
C	RCP	1.3	1.7	1.9	2.5	2.6	3.4	3.5	4.5	4.4	6.1	5.6	7.2
	CSP	1.4	1.8	2.0	2.7	2.8	3.7	3.8	5.0	4.8	6.8	6.1	8.2
A	RCP	1.4	1.9	2.1	2.8	2.9	3.9	3.9	5.3	5.0	7.2	6.4	8.8
	CSP	1.4	1.9	2.1	2.9	3.0	4.1	4.0	5.5	5.2	7.6	6.6	9.2
		S	R	S	R	S	R	S	R	S	R	S	R
		22	13	29	18	36	22	43	27	50	31	58	36

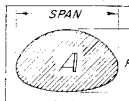
CONCRETE FOR INTERCEPTING HEADWALL (Cubic Yards)

TYPE	MAT'L	18	24	30	36	42	48
C	RCP	1.6	1.9	2.2	2.5	2.8	3.1
	CSP	1.7	2.0	2.3	2.6	2.9	3.3

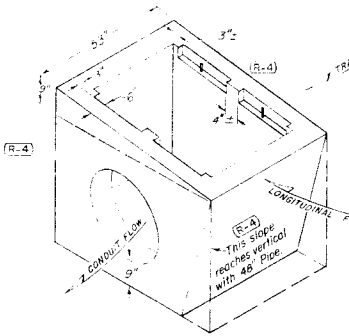
PAVING FOR CULVERT OUTLET (Cubic Yards)

Thick-Material	18	24	30	36	42	48
4" CONCRETE	0.4	0.8	1.2	1.7	2.4	3.1
12" RIPRAP	1.3	2.3	3.6	5.2	7.1	9.3
18" RIPRAP	2.0	3.5	5.4	7.8	10.7	13.9

TYPE OF PIPE	HEADWALL DIMENSIONS
 Circular	D = Pipe diameter H = D + 30" W = 3D + 18" T = 0.4H (nearest inch) B = 1.5D (30" minimum) L = W + B

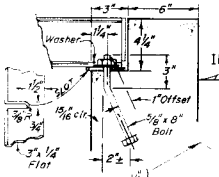
TYPE OF PIPE	HEADWALL DIMENSIONS
 Arch	D = Equivalent circular diameter H = Rise + 30" W = 3D + 18" T = 0.4H (nearest inch) B = 1.5D (30" minimum) L = W + B

NOTE: Volume occupied by pipe has been deducted.

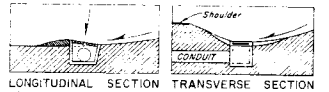


INTERCEPTING HEADWALL DIMENSIONS

SYMBOL - FORMULA	DIMENSION IN INCHES					
D = Pipe Diam"	18	24	30	36	42	48
E = D + 25.5"	43.5	49.5	55.5	61.5	67.5	73.5
F = D + 16.5"	34.5	40.5	46.5	52.5	58.5	64.5
G = (D/1+5"	6.5	7.0	7.5	8.0	8.5	9.0
J = D + 26	31.0	38.0	45.0	52.0	59.0	66.0

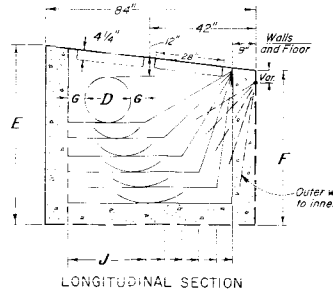


(R-4) GRATE INSTALLATION DETAIL

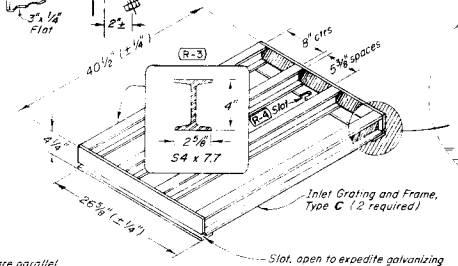


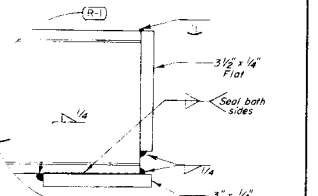
LONGITUDINAL SECTION Viewed from Roadway

TRANSVERSE SECTION Viewed from Upstream



LONGITUDINAL SECTION





STEEL FOR **ONE** GRATE (2 required)

	NO. PIECES	DESCRIPTION	LENGTH	LB./FT.	WEIGHT (Lb.)
(R-3)	4	5⅜ x 7.7	40"	7.70	103
	2	3½" x ¼" Flat	26⅜"	2.98	13
(R-1)	2	3" x ¼" Flat	26⅝"	2.55	12
(R-4)				TOTAL =	128 lbs. each

INTERCEPTING HEADWALL AND GRATE

GENERAL NOTES (R-1)

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

For size and location of culverts, see plans.

All concrete shall be Class A, B or D.

All exposed concrete surfaces shall receive Class 1 finish.

Footings in rock shall be poured out to rock and not formed.

Inlet Grating shall be galvanized as described for Frames, Grates, Covers and Steps in Section 712.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

HEADWALL, INTERCEPTING HEADWALL AND CULVERT OUTLET PAVING

Designed by M.R.H.	Approved by
Made by J.R.B.	Staff Design Engineer
Checked by R.S.M.	Date January 8, 1969

STANDARD M-603-MA

(JANUARY 11, 1974)

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

REVISIONS		
R-1	8-20-75 Gen'l. Notes & Table IV.	M.R.H.
R-2	11-3-76 " " " "	T.A.L.

FILL HEIGHT & THICKNESS TABLES FOR METAL CULVERT PIPE

TABLE I CORRUGATED STEEL PIPE

2 2/3-inch by 1/2-inch Corrugations

Riveted, Welded or Helical Fabrication

Pipe Diameter (inches)	Minimum Cover, Top of Pipe to Top of Subgrade (inches)	Maximum Fill Heights above Top of Pipe in Feet — Minimum Thickness Required (Decimal inches)				
		0.064	0.079	0.109	0.138	0.168
12	12	84	91	——	——	——
15	12	67	73	——	——	——
18	12	56	61	——	——	——
24	12	42	46	59	——	——
30	12	34	36	47	——	——
36	12	28	30	39	41	——
42	12	31	43	46 (67)	48 (70)	50 (73)
48	12	27	37	45 (58)	46 (61)	47 (64)
54	12	——	33	43 (52)	44 (54)	45 (57)
60	12	——	——	43 (47)	43 (49)	44 (51)
66	12	——	——	42	43	43 (47)
72	12	——	——	——	41	43
78	12	——	——	——	——	39
84	12	——	——	——	——	35

Values for elongated pipe are shown in parentheses.

TABLE II CORRUGATED STEEL PIPE ARCH

2 2/3-inch by 1/2-inch Corrugations

Riveted, Welded or Helical Fabrication

Pipe Dimensions Span x Rise (inches)	Equiv. Diameter (inches)	Min. Corner Radius (inches)	Minimum Cover, Top of Pipe to Top of Subgrade for 2 Tons per sq. ft (inches)	Minimum Thickness Required (Decimal inches)	Maximum Fill Heights above Top of Pipe in Feet — Corner Bearing Pressure in Tons per Square Foot	
					*2 Tons	3 Tons*
17 x 13	15	3	18	0.064	13	15+
21 x 15	18	3	18	0.064	12	15+
24 x 18	21	3	18	0.064	10	15+
28 x 20	24	3	18	0.064	10	15
35 x 24	30	3	18	0.064	9	14
42 x 29	36	3 1/2	18	0.064	9	13
49 x 33	42	4	18	0.079	8	12
57 x 38	48	5	18	0.109	8	12
64 x 43	54	6	18	0.109	8	12
71 x 47	60	7	18	0.138	8	12
77 x 52	66	8	18	0.168	8	12
83 x 57	72	9	18	0.168	9	13

TABLE III CORRUGATED STEEL PIPE

3-inch by 1-inch Corrugations

Riveted, Welded, Helical or Bolted Fabrication

Pipe Diameter (inches)	Minimum Cover, Top of Pipe to Top of Subgrade (inches)	Maximum Fill Heights above Top of Pipe in Feet[2/] — Minimum Thickness Required (Decimal inches)				
		0.064	0.079	0.109	0.138	0.168
36	12	48	60	78 (68)	88 (106)	101 (118)
42	12	41	51	64 (76)	71 (91)	79 (101)
48	12	36	45	57 (66)	61 (80)	66 (88)
54	12	32	40	52 (59)	55 (71)	59 (79)
60	12	29	36	49 (53)	51 (64)	54 (71)
66	12	26	33	47	49 (58)	51 (64)
72	12	24	30	44	47 (53)	49 (59)
78	12	22	28	41	46 (49)	47 (54)
84	12	21	26	38	45	46 (51)
90	12	19	24	35	43	45
96	12	18	22	33	40	44
102	24	17	21	31	38	42
108	24	——	20	30	35	39
114	24	——	19	28	34	37
120	24	——	——	27	32	35

[2/] *Fill heights greater than 90' shall be used only after thorough investigation of foundation material.*

TABLE IV CORRUGATED STEEL PIPE ARCH

3-inch by 1-inch Corrugations

Riveted, Welded or Helical Fabrication

Pipe Dimensions Span x Rise (inches)	Equiv. Diameter (inches)	Min. Corner Radius (inches)	Minimum Cover, Top of Pipe to Top of Subgrade for 2 Tons per sq. ft. (inches)	Minimum Thickness Required (Decimal inches)	Maximum Fill Heights above Top of Pipe in Feet — Corner Bearing Pressure in Tons per Square Foot	
					*2 Tons	3 Tons*
40 x 31	36	5	18	0.064	12	15+
46 x 36	42	6	18	0.064	12	15+
53 x 41	48	7	18	0.064	12	15+
61 x 46	54	8	18	0.064	12	15+
68 x 51	60	9	18	0.064	12	15+
73 x 55	66	12	18	0.064	15+	-------
81 x 59	72	14	18	0.079	15	-------
87 x 63	78	14	18	0.079	14	15+
95 x 67	84	16	18	0.109	13	15+
103 x 71	90	16	24	0.109	12	15+
112 x 75	96	18	24	0.109	11	15+
117 x 79	102	18	24	0.109	10	15
128 x 83	108	18	24	0.138	9	14

R-2

TABLE V CORRUGATED ALUMINUM PIPE

2 2/3-inch by 1/2-inch Corrugations

Riveted, Helical or Spot Welded Fabrication

Pipe Diameter (inches)	Minimum Cover, Top of Pipe to Top of Subgrade (inches)	Maximum Fill Heights above Top of Pipe in Feet — Riveted or Helical Fabrication — Minimum Thickness Required (Decimal inches)					Spot Welded Fabrication	
		0.060	0.075	0.105	0.135	0.164	0.060	0.075
12	12	45	45	78	81	84	26	33
18	12	30	30	52	54	56	18	22
24	12	22	22	39	41	42	14	16
30	12	18	18	31	32	34	11	13
36	12	15	15	26	27	28	9	11
42	12	——	26	43	43	44	——	——
48	12	——	——	40	41	43	——	——
54	12	——	——	35	37	38	——	——
60	12	——	——	——	33	34	——	——
66	12	——	——	——	30	31	——	——
72	12	——	——	——	——	29	——	——

TABLE VI CORRUGATED ALUMINUM PIPE ARCH

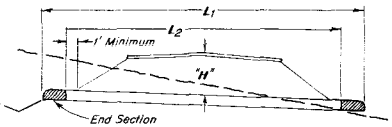
2 2/3-inch by 1/2-inch Corrugations

Riveted, Welded or Helical Fabrication

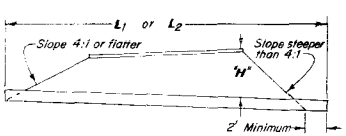
Pipe Dimensions Span x Rise (inches)	Equiv. Diameter (inches)	Corner Radius (inches)	Minimum Cover, Top of Pipe to Top of Subgrade for 2 Tons per sq.ft. (inches)	Minimum Thickness Required (Decimal inches)	Maximum Heights of Fill above Top of Pipe in Feet — Corner Bearing Pressure in Tons per Square Foot	
					*2 Tons	3 Tons*
18 x 11	15	4	18	0.060	15	-------
22 x 13	18	4	18	0.060	14	-------
25 x 16	21	4	18	0.060	12	15+
29 x 18	24	4 1/2	18	0.060	10	15+
36 x 22	30	5	18	0.060	9	14
43 x 27	36	5 1/2	18	0.075	9	13
50 x 31	42	6	18	0.105	8	12
58 x 36	48	7	18	0.135	8	12
65 x 40	54	8	18	0.135	8	12
72 x 44	60	9	18	0.164	8	12

** In the absence of a Bearing Pressure Report use fill heights listed under "2 Tons". Where bearing pressures exceeding 2 tons per square foot are required for given fill heights, the foundation material shall be investigated to determine its bearing capacity.*

METAL CULVERT **WITH** END SECTIONS



METAL CULVERT **WITHOUT** END SECTIONS

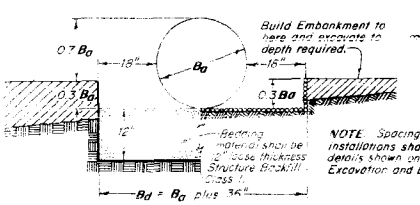


"H" = Maximum height of fill over top of Culvert, including pavement.

L_1 = Length of Culvert to be measured when placed in accordance with Section 617.

L_2 = Length of pipe to be measured when placed in accordance with Section 603. Length of extension, when placed in accordance with Section 617, shall be the actual number of feet of new culvert required.

INSTALLATION OF METAL CULVERT PIPE



= Limits of Structure Excavation in ROCK.

= Limits of Structure Excavation in SOIL.

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

R-2

GENERAL NOTES

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

The tables on this sheet show minimum thickness for structural requirements only. They are intended for use only where corrosive and/or abrasive conditions are negligible. Heavier metal and/or protective coatings shall be used where site investigations indicate corrosive and/or abrasive conditions.

Pipe arch with equal periphery and with span and rise dimensions approximately equal to those required by plans will be permitted.

During construction, adequate cover shall be provided to protect the structure from damage.

Pipe shall be placed with longitudinal seams at the sides or quarter points but not along top of vertical axis.

When a culvert is to be extended with pipe of different material, the connection shall conform to the details on plans or be approved.

Structural plate pipes of equal or larger diameter, conforming to Section 510 of the Standard Specifications, may be substituted for the pipes shown on this sheet at no additional cost to the State.

Variations from corner radii shown will be acceptable provided the pipe is of sufficient strength to support it's designated fill height.

The minimum depth of fill excluding pavement over corrugated metal pipe culvert shall be as staked by the Engineer, but shall not be less than shown in the Fill Height Tables.

Extensions for CSP Arch Culvert shall match the corrugations and the span & rise dimensions of the culvert shown on plans.

Backfill and compaction shall be in accordance with Section 206.

TRENCH INSTALLATION

Installation and Maximum Fill Heights shall conform to the M Standard for "Pipe Sewer in Trench."

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

METAL CULVERT PIPE
H-20 LOADING

Designed by	M.R.H.	Approved by	Tom M. Cox
Made by	J.R.B.	Staff Design Engineer	
Checked by	O.L.S.	Date:	January 11, 1974

STANDARD M-603-MA

ORIGINAL

F HIGHWAYS, STATE OF COLORADO
RM NO. 126
1972

STANDARD S-612-IA

(SHEET I OF 4 SHEETS)

OCTOBER 28, 1977

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

REVISIONS

SPACING FOR DELINEATOR POSTS ON HORIZONTAL CURVES

'D' DEGREE OF CURVE	'R' RADIUS (FEET)	*–● SPACING ON CURVE (FEET)	* SPACING IN ADVANCE OF AND BEYOND CURVE (FEET)		
			FIRST SPACE	SECOND SPACE	THIRD SPACE
0° 30'	11460.0	300	300	300	300
1° 00'	5730.0	226	300	300	300
1° 30'	3820.0	184	300	300	300
2° 00'	2865.0	159	300	300	300
2° 30'	2292.0	142	284	300	300
3° 00'	1910.0	129	259	300	300
3° 30'	1637.1	120	239	300	300
4° 00'	1432.5	112	223	300	300
4° 30'	1273.3	105	210	300	300
5° 00'	1146.0	99	199	298	300
5° 30'	1041.8	94	189	283	300
6° 00'	955.0	90	181	271	300
6° 30'	881.5	87	173	260	300
7° 00'	818.6	83	166	250	300
7° 30'	764.0	80	160	240	300
8° 00'	716.3	77	155	232	300
8° 30'	674.1	75	150	225	300
9° 00'	636.7	73	145	218	300
9° 30'	603.2	71	141	212	300
10° 00	573.0	69	137	206	300
10° 30'	545.7	67	134	200	300
11° 00'	520.9	65	130	195	300
11° 30'	498.3	64	127	191	300
12° 00'	477.5	62	124	186	300
15° 00'	382.0	55	109	164	300
18° 00'	318.3	49	98	147	295
21° 00'	272.9	45	90	134	269
25° 00'	229.2	40	80	120	241
30° 00'	191.0	36	71	107	214
40° 00'	143.2	29	58	87	174
50° 00'	114.6	24	48	72	145
60° 00'	95.0	20	40	61	121

* ON CONVENTIONAL ROADWAYS OMIT THE "THIRD SPACE" AND DOUBLE THE SPACING "ON THE CURVE" AND "IN ADVANCE OF AND BEYOND THE CURVE" (300' MAX.)

$R = \frac{5730}{D}$

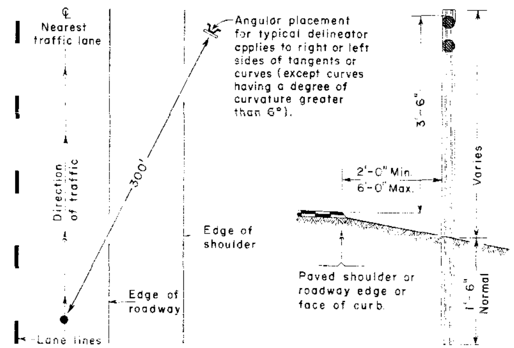
● SPACING FOR CURVES NOT SHOWN MAY BE COMPUTED FROM THE FORMULA: $S = 3\sqrt{R - 50}$

SPACING IN ADVANCE OF AND BEYOND CURVE IS: FIRST SPACE = 2S, SECOND SPACE = 3S, AND THIRD SPACE = 6S. SPACES SHOULD NOT BE LESS THAN 20 FEET NOR MORE THAN 300 FEET.

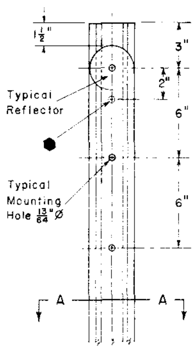
GENERAL NOTES

1. All work shall be done in accordance with the Standard Specifications applicable to the Project.
2. See the Tabulation of Quantities included in the Plans for the numbers and locations of delineators required.
3. The color of delineators shall, in all cases, conform to the color of Edge Lines stipulated in the latest edition of the Manual on Uniform Traffic Control Devices and the Colorado Supplement thereto, except:
   a. Red delineators.
   b. Type III delineators (Yellow Hazard Marker)
4. The color of delineator posts and all special mounting brackets shall be Interstate Green.
5. Type I (Crystal) delineators are optional for all conventional roadways.
6. Type I (Crystal) delineators shall be installed on the right side of expressway roadways (Except Note No. 9).
7. Type I (Yellow) delineators are optional on the left side of expressway roadways. They may be placed in the median or attached to median barriers.
8. Red delineators may be installed on the reverse side of any delineator and / or a separate post on one-way roadways or ramps where investigation shows a need for wrong way movement protection.
9. Delineation shall be optional on sections of roadway between interchanges where fixed-source lighting is in operation.
10. Interchange ramps shall be delineated on the right side, the left side, or both sides with Type I (Crystal or Yellow) delineators of the appropriate color as illustrated on sheet number 3.
11. Frontage road delineators are not to be installed where they might be misleading to mainline traffic.
12. Spacing of delineators for tunnels and snow sheds shall be as directed by the Engineer.
13. Normal spacing will be 528 feet for tangent sections and a 200 foot minimum will apply to a "last space". (Maximum spacing is also 528 feet.) At all other locations, such as A & D lanes, Ramps, Width Transitions and Turn Lanes a "last space" should not be less than 50 % of the spacing shown for that location.
14. Type II delineators shall be installed at 100 foot spaces on all acceleration lanes, deceleration lanes, and lane transitions involving pavement width changes.
15. Type I delineators shall be installed at 100 foot spaces on interchange ramp tangent sections and by the spacing table on ramp curves. Spacing "in advance of and beyond curve" does not apply to ramp curves.
16. For spacing on a curve that follows a tangent section with spaces shorter than those shown in the curve table: modify the table so that the curve spacing is no greater than the tangent spacing.
17. Where guard rail intrudes into the space between the pavement edge and the line of delineators, place the delineators immediately above or behind the rail face.
18. When normal spacing falls on an intersecting roadway, driveway, etc. the delineator may be moved either direction a distance not exceeding one-quarter of the normal spacing.
19. The angular placement for all delineators should be by the "traffic orienting" method: aim the face of the delineator at the centerline of the nearest lane of approaching traffic at a point 300 feet away (or as directed by the Engineer for special or hazardous locations and curves having a degree of curvature greater than 6°).
20. Where practicable the approach ends of islands and medians should be delineated.

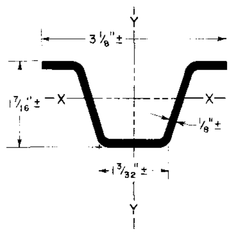
TYPICAL DELINEATOR PLACEMENT



TYPICAL U-2 DELINEATOR POST



SECTION A-A



POST NOTES

Steel posts shall be hot-rolled steel or re-rolled rail steel.

Posts are to weigh 2 lbs./ft. with a mill tolerance of minus 3½ % of the weight of any one post being allowed.

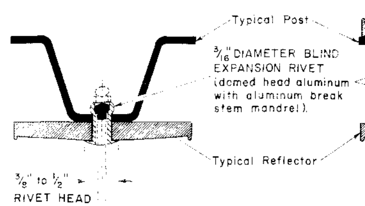
Alternate post is acceptable if section modulus is at least 0.200 in.^{3} about the X-X axis and at least 0.250 in.^{3} about the Y-Y axis.

Posts shall be set in drilled or excavated holes, placed plumb and firmly tamped in place; or may be driven plumb.

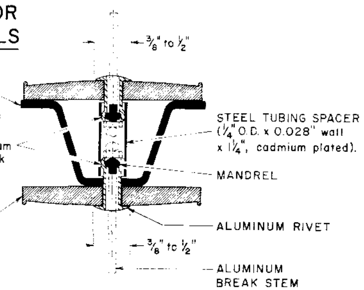
A minimum of 5 holes of 13/64" diameter, spaced as shown, are required for all delineator posts.

● An additional hole is required when the Adjustable Reflector Bracket is used.

TYPICAL DELINEATOR FABRICATION DETAILS



TYPICAL INSTALLATION
SINGLE DIRECTION



TYPICAL INSTALLATION
BACK - TO - BACK

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TYPICAL DELINEATOR INSTALLATIONS

Designed By: F. J. B. Approved By: [illegible]
Made By: F. J. B. Staff Traffic Engineer
Checked By: J. C. S. Date OCT. 28, 19 77

DIVISION OF HIGHWAYS, STATE OF COLORADO
O. H. FORM NO. 126
October 1972

STANDARD S-612-IA

(SHEET 2 OF 4 SHEETS)
OCTOBER 28, 1977

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO	SHEET NO.	TOTAL SHEETS
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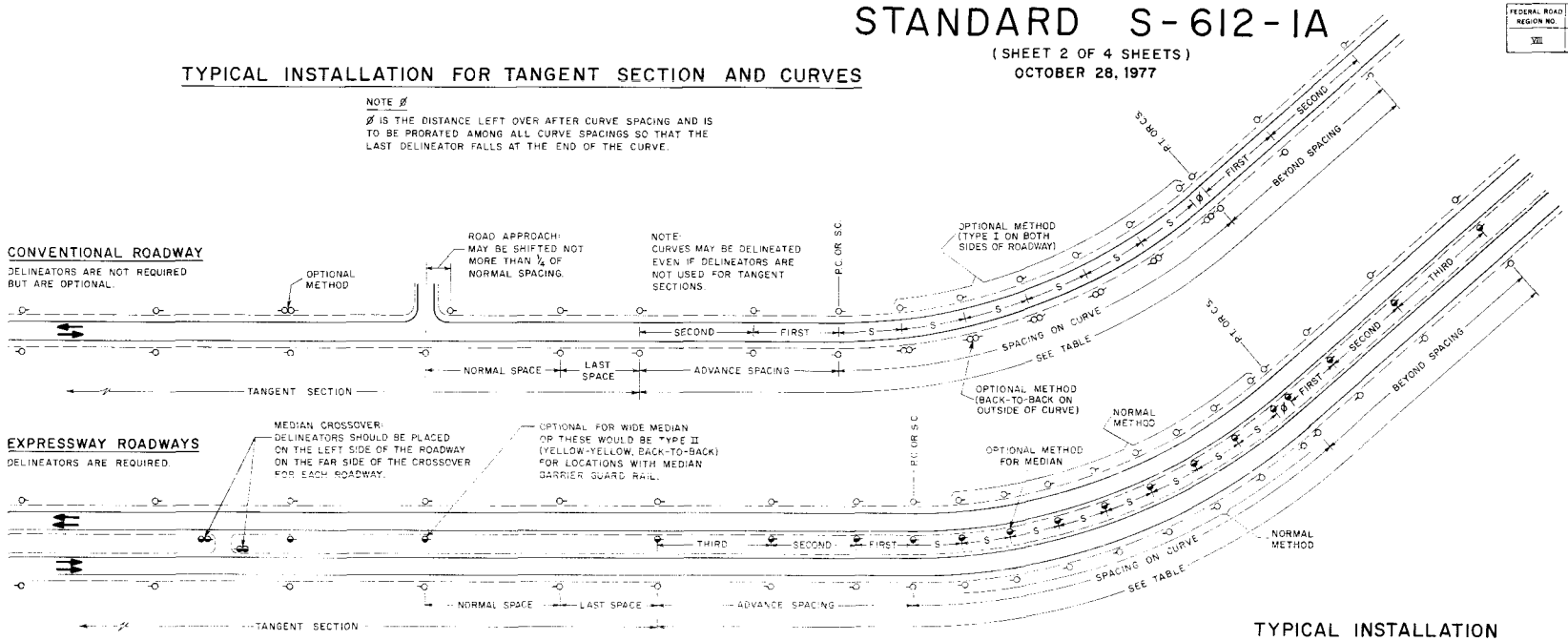
TYPICAL INSTALLATION FOR TANGENT SECTION AND CURVES

NOTE Ø
Ø IS THE DISTANCE LEFT OVER AFTER CURVE SPACING AND IS TO BE PRORATED AMONG ALL CURVE SPACINGS SO THAT THE LAST DELINEATOR FALLS AT THE END OF THE CURVE.

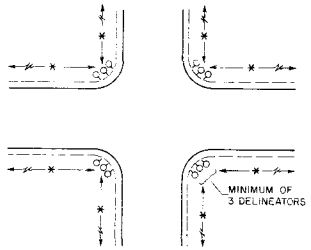


DELINEATOR SYMBOLS

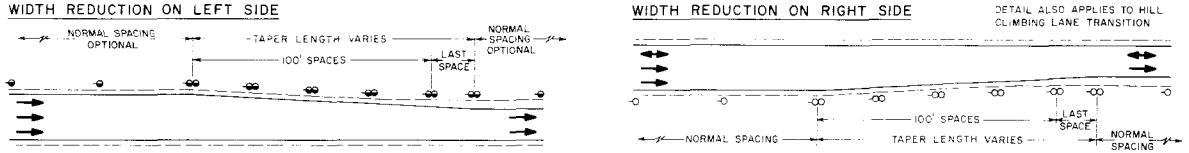
○	TYPE I	(CRYSTAL)
●	TYPE I	(YELLOW)
●	TYPE I	(RED)
○○	TYPE II	(2 CRYSTAL)
●●	TYPE II	(2 YELLOW)
○●	TYPE II	(CRYSTAL-CRYSTAL, BACK-TO-BACK)
●●	TYPE II	(YELLOW-YELLOW, BACK-TO-BACK)
○●	TYPE II	(CRYSTAL-RED, BACK-TO-BACK)
●●	TYPE II	(YELLOW-RED, BACK-TO-BACK)
●●●	TYPE III	(3 YELLOW, HAZARD MARKER)
○●●	TYPE III	(2 CRYSTAL-RED, BACK-TO-BACK)
●●●	TYPE III	(2 YELLOW-RED, BACK-TO-BACK)

TYPICAL INSTALLATION FOR MINOR INTERSECTION

* = NORMAL SPACING IF THIS ROADWAY IS DELINEATED.

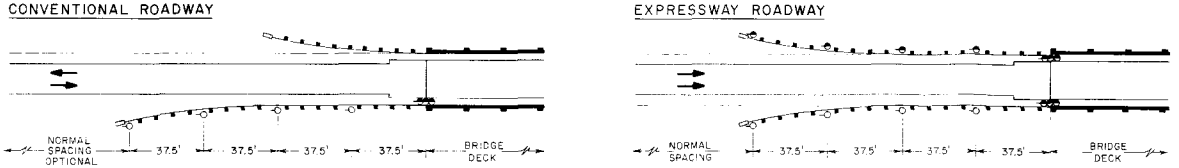


TYPICAL INSTALLATION FOR LANE TRANSITION



NOTE: THIS DELINEATOR TREATMENT IS ALSO REQUIRED FOR PAVEMENT WIDTH INCREASE.

TYPICAL INSTALLATION FOR BRIDGE APPROACHES



BRIDGE NOTES

WHERE CURB TO CURB WIDTH OF BRIDGE IS EQUAL TO OR GREATER THAN ROADWAY WIDTH PLUS USABLE SHOULDER WIDTH, USE THE TYPE III DELINEATOR HAZARD MARKER ONLY AND OMIT ALL THE TYPE I DELINEATORS.

FOR GUARD RAIL INSTALLATIONS WHERE APPROACH END IS NOT FLARED, PLACE A TYPE III DELINEATOR HAZARD MARKER IMMEDIATELY IN ADVANCE OF APPROACH END.

ALL TYPE I DELINEATORS ARE TO BE MOUNTED ABOVE OR IMMEDIATELY BEHIND GUARD RAIL AND ARE NOT A CONSTANT DISTANCE FROM THE ROADWAY.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TYPICAL DELINEATOR INSTALLATIONS

Designed By F. J. B. Approved By [signature] Chief
Made By F. J. B. Staff Traffic Engineer
Checked By J. D. S. Date OCT. 28, 1977

STANDARD S-612-IA

STANDARD S-612-1A

(SHEET 3 OF 4 SHEETS)

OCTOBER 28, 1977

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

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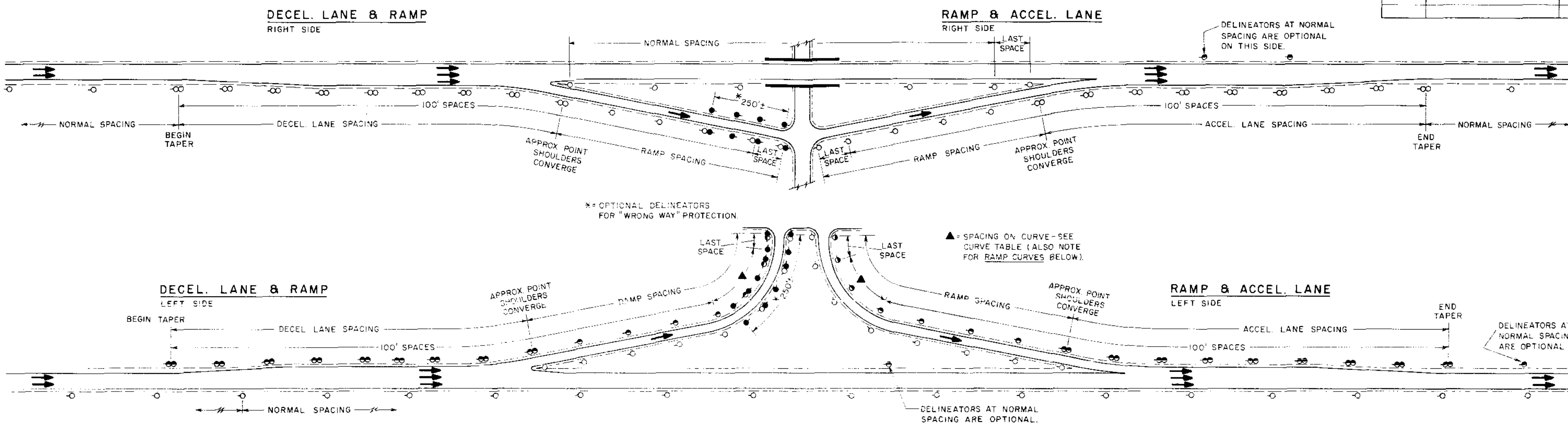
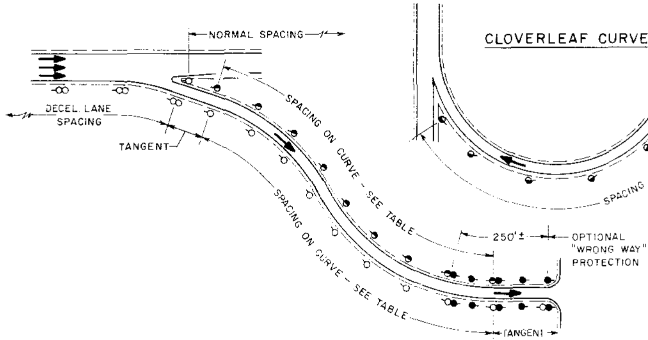
TYPICAL INSTALLATION FOR INTERCHANGES

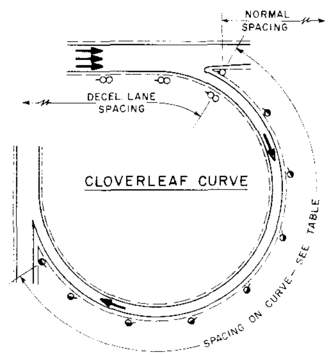


TYPICAL INSTALLATION FOR RAMP CURVES

NOTE:
"SPACING IN ADVANCE OF AND BEYOND CURVE" (1st, 2nd, & 3rd Spaces) AS SHOWN IN THE SPACING TABLE SHALL NOT APPLY TO RAMP CURVES.

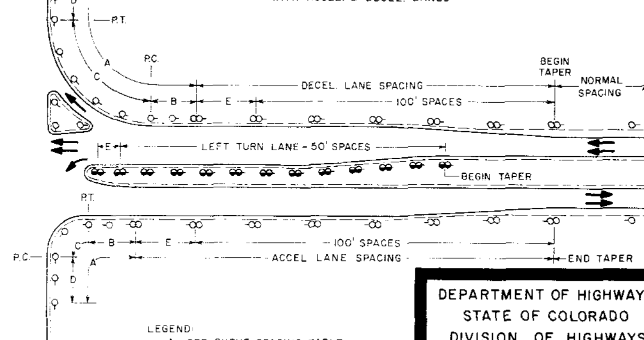
CURVE & REVERSE CURVE





TYPICAL INSTALLATION FOR INTERSECTIONS

WITH ACCEL. & DECEL. LANES



LEGEND:
- A = SEE CURVE SPACING TABLE
- B = ADVANCE SPACES (FIRST & SECOND)
- C = SPACING ON CURVE
- D = BEYOND SPACES (FIRST & SECOND)
- E = LAST SPACE

NOTE:
DELINEATORS MAY BE INSTALLED IF NECESSARY FOR "WRONG WAY" PROTECTION. SEE OTHER TYPICAL INSTALLATIONS.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TYPICAL DELINEATOR INSTALLATIONS

Designed By: F. J. B.	Approved By: [signature]	
Made By: F. J. B.	Staff Traffic Engineer	
Checked By: J. D. S.	Date: OCT. 26, 1977	

STANDARD S-612-IA

(SHEET 4 OF 4 SHEETS)

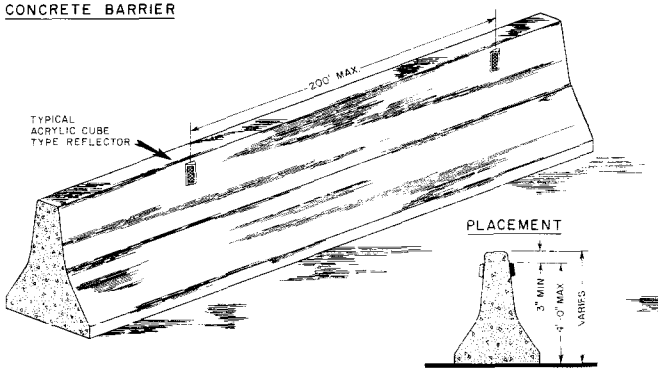
OCTOBER 28, 1977

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

REVISIONS			

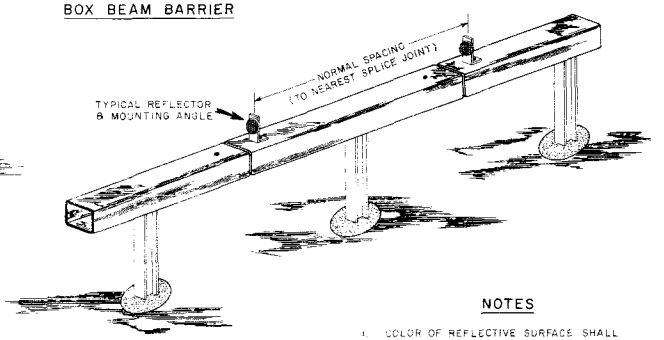
TYPICAL INSTALLATION FOR GUARD RAIL

CONCRETE BARRIER

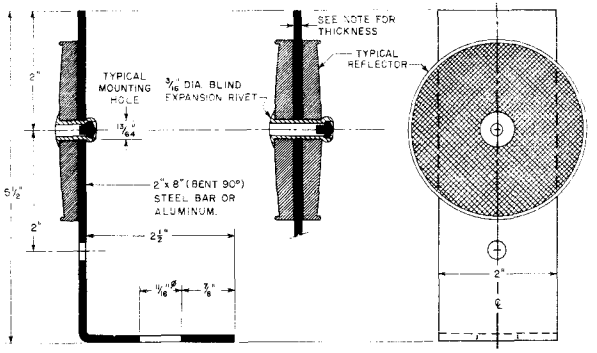


PLACEMENT

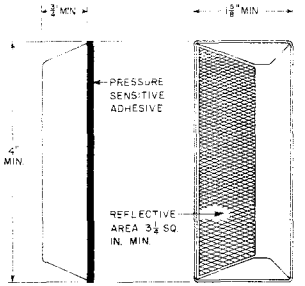
BOX BEAM BARRIER



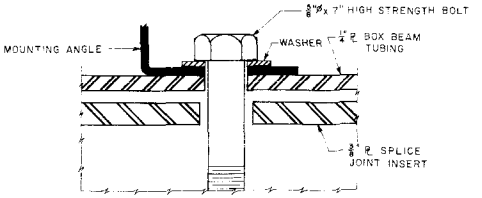
TYPICAL MOUNTING ANGLE



TYPICAL ACRYLIC CUBE TYPE REFLECTOR



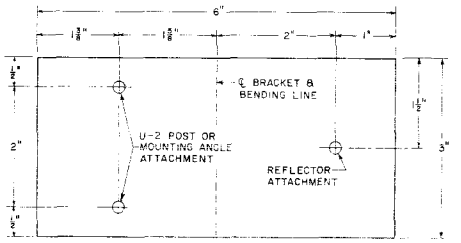
BOX BEAM BARRIER ATTACHMENT



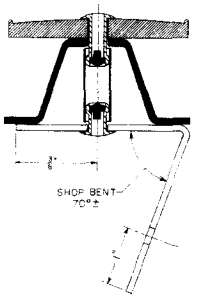
NOTES

1. COLOR OF REFLECTIVE SURFACE SHALL MATCH COLOR OF ADJACENT EDGE LINE.
2. REFLECTOR AND MOUNTING ANGLE ARE TO BE "TRAFFIC ORIENTED".
3. UNLESS OTHERWISE NOTED IN THE PLANS OR DIRECTED BY THE ENGINEER, NORMAL TANGENT AND CURVE SPACING APPLIES TO THE REFLECTOR & MOUNTING ANGLE AND A 200' MAXIMUM TANGENT & CURVE SPACING APPLIES TO THE ACRYLIC CUBE REFLECTOR.
4. MOUNTING ANGLES SHALL BE FABRICATED FROM EITHER GALVANIZED STEEL NOT LESS THAN 10 GAGE, OR ALUMINUM NOT LESS THAN 0.125 INCH.

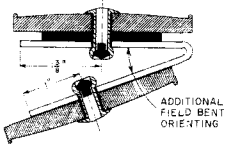
TYPICAL ADJUSTABLE REFLECTOR BRACKET



BRACKET & U-2 POST



BRACKET & MOUNTING ANGLE



NOTES

REFLECTOR BRACKETS SHALL BE FABRICATED FROM EITHER GALVANIZED STEEL NOT LESS THAN 16 GAGE, OR ALUMINUM NOT LESS THAN 0.100 INCH. ALL HOLES ARE 15/64" DIAMETER.

SHOP BEND BRACKET APPROX. 70° AS SHOWN AND FIELD BEND AS NECESSARY TO TRAFFIC ORIENT. AFTER INSTALLING AND TRAFFIC ORIENTING THE BRACKET THE REFLECTOR CAN BE ATTACHED. U-2 POSTS REQUIRE AN ADDITIONAL 29/64" HOLE 2" BELOW THE TOP HOLE PROVIDED IN THE POST.

THE ADJUSTABLE REFLECTOR BRACKET IS TO BE USED TO "TRAFFIC ORIENT" BACK-TO-BACK DELINEATORS USED ON CURVES.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TYPICAL DELINEATOR INSTALLATIONS

Designed By:	F.J.B.	Approved By:	Staff Traffic Engineer
Made By:	F.J.B.		
Checked By:	J.D.S.	Date:	OCT 28, 1977

STANDARD S-612-IA

STANDARD S-614-39A

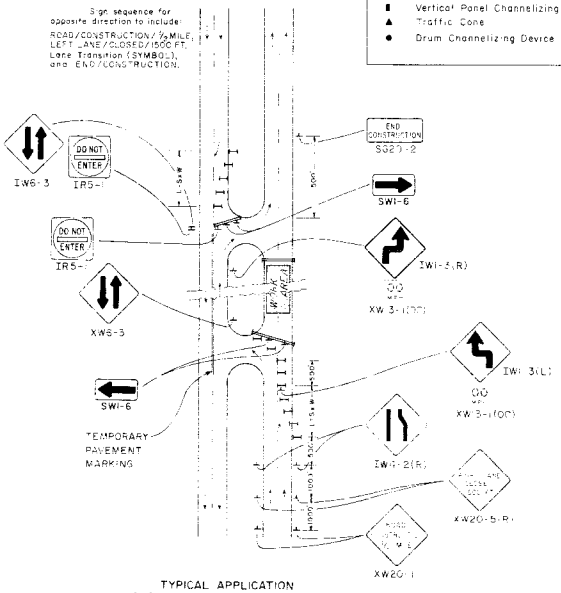
SHEET 1 OF 4 SHEETS
MAY 17, 1977

NOTE: See sheet No 4 for typical Construction Traffic Sign and Channelizing Device requirements for each Case.

LEGEND
- Type 3 Barricade
- Type 1 or 2 Barricade
- Concrete Barrier (Temporary)
- Flagman
- Vertical Panel Channelizing Device
- Traffic Cone
- Drum Channelizing Device

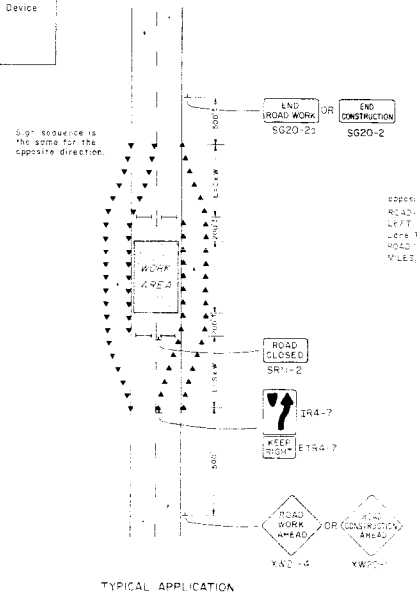
REVISIONS		
R-1	5-8-78	Rev. Date Only

CASE I



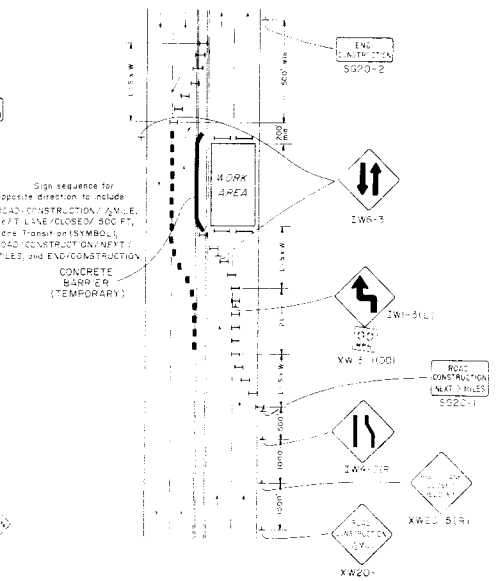
TYPICAL APPLICATION
CLOSURE OF ONE ROADWAY,
4-LANE DIVIDED HIGHWAY

CASE II



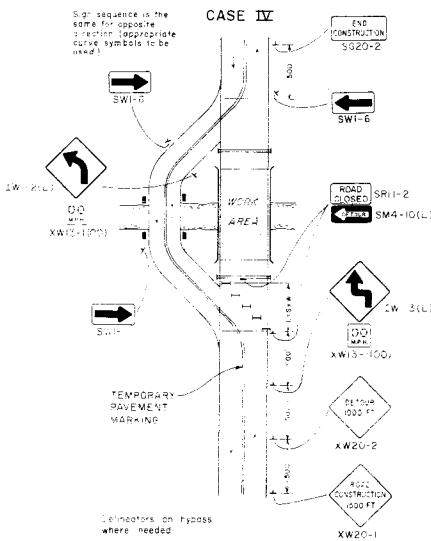
TYPICAL APPLICATION
ROAD CLOSURE, USE OF
ADJACENT SHOULDERS

CASE III



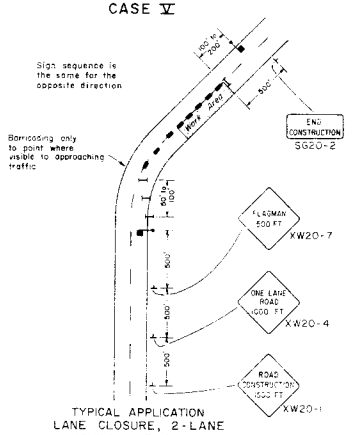
TYPICAL APPLICATION
CLOSURE OF HALF OF 4-LANE
HIGHWAY, NOT PHYSICALLY DIVIDED

CASE IV



TYPICAL APPLICATION
ROAD CLOSURE, BYPASS
DETOUR PROVIDED

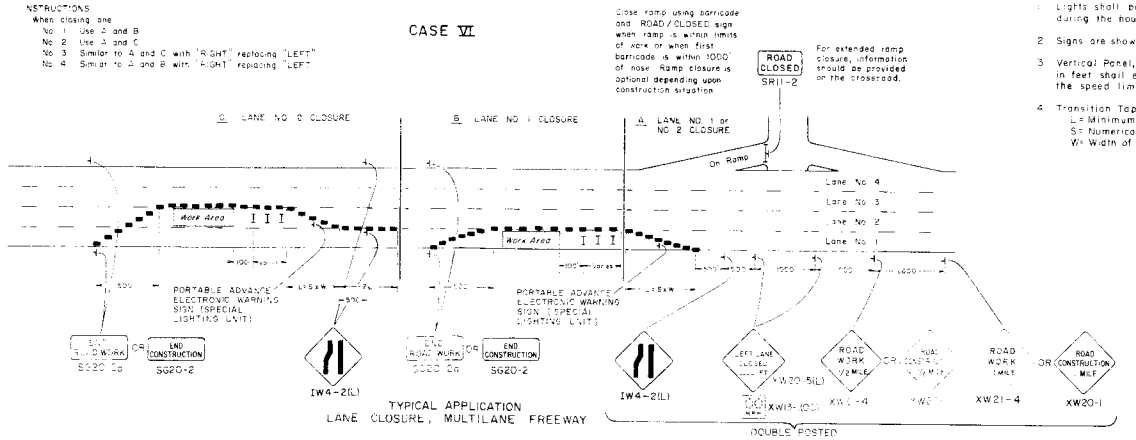
CASE V



TYPICAL APPLICATION
LANE CLOSURE, 2-LANE
HIGHWAY, AT CURVE

CASE VI

INSTRUCTIONS
When closing one
No 1 Use 2 and B
No 2 Use A and C
No 3 Similar to A and C with "RIGHT" replacing "LEFT"
No 4 Similar to A and B with "RIGHT" replacing "LEFT"



TYPICAL APPLICATION
LANE CLOSURE, MULTILANE FREEWAY

NOTES

1. Lights shall be used to mark flagman stations during the hours of darkness.
2. Signs are shown for one direction of travel only.
3. Vertical Panel, Traffic Cone, and Drum spacing in feet shall equal the numerical value of the speed limit (eg. 45mph = 45ft spacing).
4. Transition Taper: L = S x W.
   L = Minimum length of taper.
   S = Numerical value of speed limit or 85 percentile speed.
   W = Width of offset.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

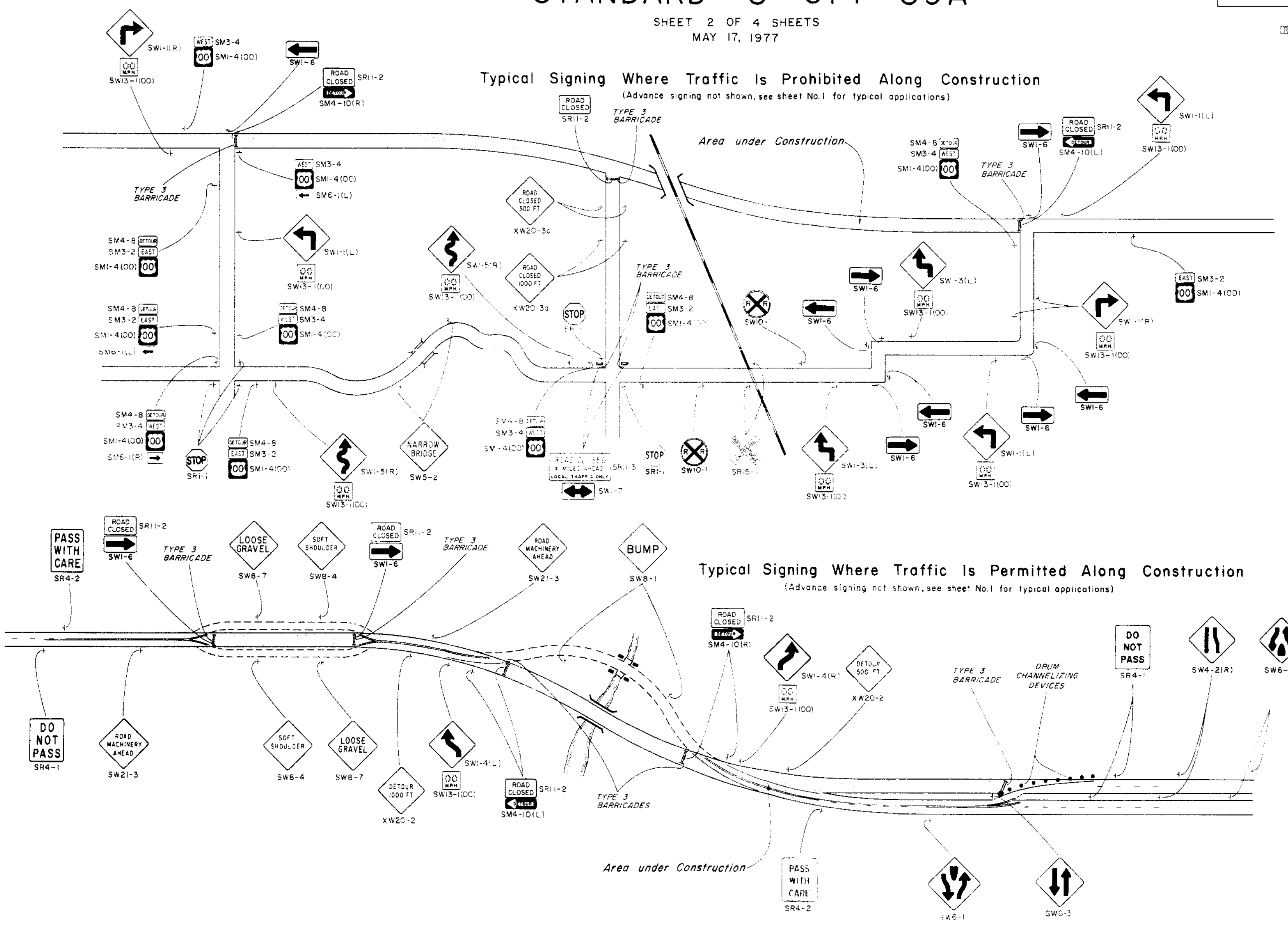
TRAFFIC SIGNING
FOR HIGHWAY
CONSTRUCTION

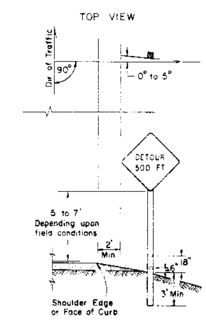
Designed By	J.V.N.	Approved By	[signature]
Made By	J.E.M.	Staff Traffic Engineer	
Checked By	J.D.S.	Date	May 17, 1977

STANDARD S-614-39A

SHEET 2 OF 4 SHEETS
MAY 17, 1977

REVISIONS			
R-1	5-8-78	Rev. Date Only	J.D.S.





Sign Placement

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

Designed By F.J.B. Made By J.E.M. Checked By J.D.S.
Approved By W. E. Tucker, Staff Traffic Engineer, Date: May 17, 1977

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS · STATE OF COLORADO
D.O.H. FORM 126
JULY, 1968

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

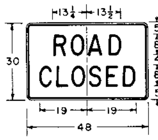
STANDARD S-614-39A

SHEET 3 OF 4 SHEETS
MAY 17, 1977

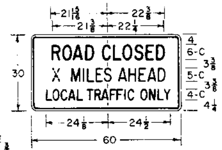
REVISIONS			
(R-1)	5-8-78	Rev. Date Only	J.D.S.

REGULATORY SIGNS

See Note No. 9



SR11-2

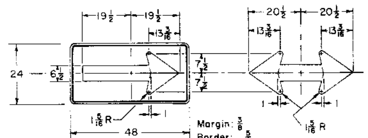


SR11-3

Margin: 1/2
Border: 3/4
Corner Radius: 1 7/8

WARNING SIGNS

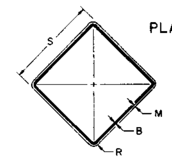
See Note No. 10



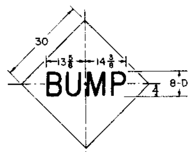
SW1-6 SW1-7

Margin: 5/8
Border: 7/8
Corner Radius: 1 1/2

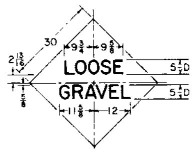
PLATE DETAILS



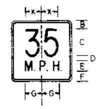
S	M	B	R
30	1/2	3/4	1 7/8
36	5/8	7/8	2 1/4
48	3/4	1 1/4	3



SW8-1



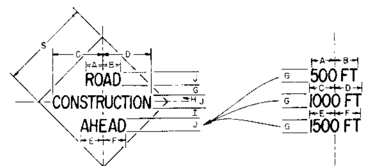
SW8-7



Margin: 3/8
Border: A
Corner Radius: 1 1/2

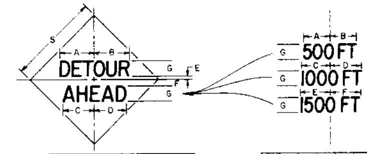
	Panel	A	B	C	D	E	F	G
SW13-1(00)	18"x18"	5/8	2 1/2	8E	2	3E	2 1/2	5 5/16
XW13-1(00)	24"x24"	5/8	3 5/8	10E	2 3/4	4E	3 5/8	7 1/16

x · Req'd digits to be visually centered



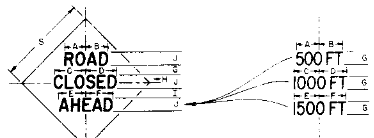
	S	A	B	C	D	E	F	G	H	I	J
XW20-1	48	9 1/2	9 13/16	26	25 1/2	12 1/4	12 1/4	4 3/4	3 1/2	4 3/4	7-C
SW20-1	36	6 7/8	7 1/8	20 5/8	20 1/4	8 3/4	8 3/4	3 5/8	2 1/2	3 5/8	5-C

S	A	B	C	D	E	F	G
48	12	12 3/16	13 1/8	14	13 1/8	14	7-C
36	8 3/4	8 13/16	9 3/8	10	9 3/8	10	5-C



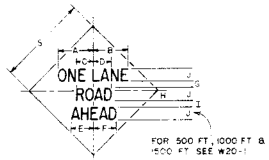
	S	A	B	C	D	E	F	G
XW20-2	48	18	18 7/16	17 7/16	17 7/16	1 1/4	3 1/2	8-D
SW20-2	36	13 1/2	13 3/4	13 1/8	13 1/8	7/8	2 5/8	6-D

S	A	B	C	D	E	F	G
48	16 1/4	17 1/4	17	18	17	18	8D
36	12 3/16	12 15/16	12 3/4	13 1/2	12 3/4	13 1/2	6D



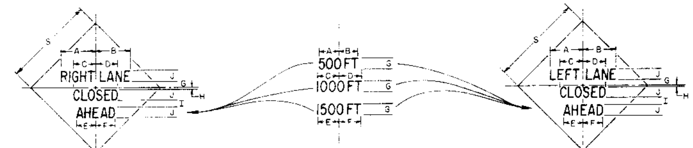
	S	A	B	C	D	E	F	G	H	I	J
XW20-3a	48	11 11/16	12 7/16	17 1/4	17 1/4	15 1/2	15 1/2	4 3/4	4 1/2	5 1/4	7-D
SW20-3a	36	8 3/8	8 7/8	12 5/16	12 5/16	10 7/8	10 7/8	3 1/2	3 1/4	3 3/4	5-D

S	A	B	C	D	E	F	G
48	14 1/4	15 1/8	14 7/8	15 3/4	14 7/8	15 3/4	7D
36	10 3/16	10 13/16	11 5/8	11 1/4	11 5/8	11 1/4	5D



FOR 500 FT, 1000 FT & 1500 FT SEE W20-1

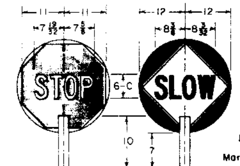
	S	A	B	C	D	E	F	G	H	I	J
XW20-4	48	18 1/2	17 3/4	9 11/16	9 11/16	12 1/4	12 1/4	3 1/8	5 1/4	3 1/8	7-C
SW20-4	36	13 1/8	12 5/8	7	7	8 3/4	8 3/4	2 1/4	3 3/4	2 1/4	5-C



	S	A	B	C	D	E	F	G	H	I	J
XW20-5(R)	48	19	19	14 3/4	14 3/4	10 1/2	10 1/2	2 7/8	1/2	3 3/8	6-C
SW20-5(R)	36	15 3/4	15 3/4	12 5/16	12 5/16	8 3/4	8 3/4	2 3/8	3/8	2 3/4	5-C

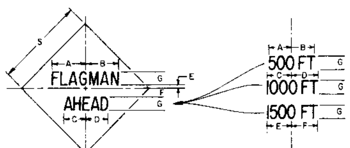
S	A	B	C	D	E	F	G
48	10 3/8	10 1/2	11 1/4	12	11 1/4	12	6-C
36	8 3/4	8 13/16	9 3/8	10	9 3/8	10	5-C

	S	A	B	C	D	E	F	G	H	I	J
XW20-5(L)	48	17 7/16	17 7/16	14 3/4	14 3/4	10 1/2	10 1/2	2 7/8	1/2	3 3/8	6-C
SW20-5(L)	36	14 1/2	14 1/2	12 5/16	12 5/16	8 3/4	8 3/4	2 3/8	3/8	2 3/4	5-C



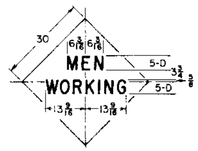
Diamond:
Margin: 1/4
Border: 1/4
Corner Radius: 1 1/4

FLAGMAN SIGN
See Notes No. 21 and No. 23

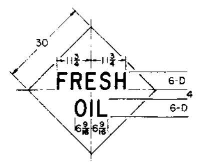


	S	A	B	C	D	E	F	G
XW20-7	48	17 1/4	17 1/4	12 1/4	12 1/4	1 1/2	4 3/4	7-C
SW20-7	36	12 5/16	12 5/16	8 3/4	8 3/4	1	3 1/2	5-C

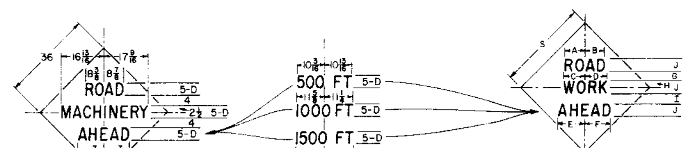
S	A	B	C	D	E	F	G
48	12	12 3/16	13 1/8	14	13 1/8	14	7-C
36	8 3/4	8 13/16	9 3/8	10	9 3/8	10	5-C



SW21-1

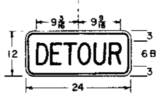


SW21-2



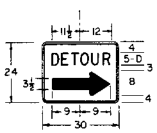
SW21-3

	S	A	B	C	D	E	F	G	H	I	J
SW21-4	36	8 3/8	8 7/8	9	9	10 7/8	10 7/8	3 1/2	3 1/4	3 1/2	5-D



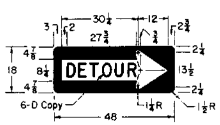
SM4-8

Margin: 3/8
Border: 5/8
Corner Radius: 1 1/2



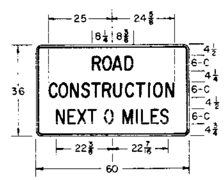
SM4-9 (R or L)

Margin: 3/8
Border: 5/8
Corner Radius: 1 1/2



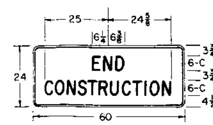
SM4-10 (R or L)

Reverse dimensions for Left designation



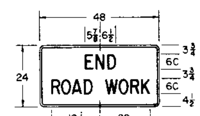
SG20-1

Margin: 5/8
Border: 7/8
Corner Radius: 2 1/4



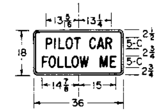
SG20-2

Margin: 3/8
Border: 5/8
Corner Radius: 1 1/2



SG20-2a

Margin: 3/8
Border: 5/8
Corner Radius: 1 1/2



SG20-4

Margin: 3/8
Border: 5/8
Corner Radius: 1 1/2

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

Designed By: J.E.M.
Made By: J.E.M.
Checked By: J.D.S.
Approved By: [signature]
Staff Traffic Engineer
Date: May 17, 1977

STANDARD S-614-39A

SHEET 4 OF 4 SHEETS
MAY 17, 1977

		PROJ. NO.	SHEET NO.	TOTAL SHEETS
VIII	SIGNING			

REVISIONS			
(R-1)	5-8-78	Rev. Note No. 7	J.D.S.

GENERAL NOTES

1. All work shall be done in accordance with the "Standard Specifications" applicable to the Project and the "Manual on Uniform Traffic Control Devices for Streets and Highways" (adopted by the Federal Highway Administration) and the related "Colorado Supplement".

2. Where traffic is maintained through or over any part of the Project the Contractor will be required to mark all hazards within the limits of the Project (including connecting roads) with well-maintained Barricades, Warning, Regulatory, and Guide signs. All barricades and signs shall be moved, added to, changed or removed as required during the progress of construction and removed entirely when the Project is completed.

3. Where traffic must be diverted from the Project by road closure, the Detour will be marked by the Division except that the Contractor shall provide, erect and maintain Barricades (when required) at the ends of the Project, ends of the Detour and connecting roads. All U.S. or State Route Markers required for the Project will be furnished and installed by the Division. The location and positioning of Barricades, Warning and Regulatory signs shall be as recommended by the Engineer.

4. Work on the Project shall not be started until all required signs are in place and approved by the Engineer. Where speed limit reduction appears necessary such speed limit reduction shall be requested from the Engineer by the Contractor. Advisory Speed plates may be used in conjunction with Warning Signs (SW13-1 for use with 30" Diamond signs and XW13-1 for use with 36" and 48" Diamond signs), where the safe speed is lower than the imposed Regulatory speed limit.

5. All Barricades and Signs shall be placed for best visibility and legibility, maintained in good condition, and kept clean and free of dirt at all times. Contractor's and Engineer's vehicles and equipment must be parked so that barricades and signs are visible to approaching traffic at all times.

6. Where two identical signs are used for dual posting they are to be staggered on the two sides of the roadway for a minimum distance of 75' to avoid a tunneling effect.

(R-1) 7. Examples for signing Projects, as illustrated on Sheets 1 and 2, are typical of signs required and are subject to alteration to fit actual conditions encountered in the field. In all cases Warning signs are to be placed well in advance of the hazard, the distance depending on topography and existing approach speeds.

8. Desirable sizes for signs are shown on Sheets 1 and 2 of this Standard. Larger or smaller signs shall be used where warranted. Detailed dimensions for signs normally used in connection with construction are shown on Sheet 3 of this Standard. For information on standard roadway signs not detailed on this Standard see the "Manual on Uniform Traffic Control Devices for Streets and Highways" (adopted by the Federal Highway Administration) and the related "Colorado Supplement". Detailed layouts for these signs will be furnished in the plans or on request.

9. Signs with the prefix "R" in the sign code are Regulatory signs, and as such they impose legal restrictions on drivers and shall only be used as authorized by the Engineer.

10. Signs with the prefix "W" in the sign code are Warning signs, and are used to alert traffic to existing or potentially hazardous conditions.

11. Signs with the prefix "D", "G" or "M" in the sign code are Guide signs. Those with the prefix "D" or "G" convey general information and those with the prefix "M" are used to mark the traffic route.

12. All Warning and Regulatory signs shall be posted on both sides of the roadway on divided highways. Dual posting is required where warranted on two-lane, two-way highways.

13. Guide sign SG20-1 shall be placed to mark the beginning of all Projects more than 2 miles in extent, where traffic is maintained through the project. It shall be placed singly and near the beginning of construction.
Guide sign SG20-2 shall be placed to mark the end of the Project. It shall be placed singly and may be placed opposite barricade if desirable.

14. Inapplicable pavement markings that could be confusing to motorists shall be removed by a method approved by the Engineer. Temporary markings shall be used as necessary to define vehicle paths. Refer to the appropriate Division Standard (Typical Pavement Markings) for marking details.
Adhesive pavement marking tape and raised pavement markers may be used with the approval of the Engineer.

15. Lanterns and Torches: Lanterns shall be used only in low speed urban areas and Open-Flame Torches shall not be used under any circumstances.

16. Barricades, Flashing Beacons and Flashers: refer to appropriate Division Standard for details.

17. Traffic Cones shall be orange, at least 18" in height, and not weighted to an extent that would be hazardous to traffic. They shall not be used during the hours of darkness.

18. If closure is for extended period, including nighttime operations, barricade warning lights and temporary pavement markings are to be installed through-out the construction zone and inapplicable pavement markings are to be removed.

19. Sign panels furnished by the Contractor for use only during construction may be fabricated from plywood, aluminum, steel or other suitable material but shall be stable and durable enough to meet other requirements of this Standard.

20. All signs shall be reflectorized unless otherwise specified on plans. All reflective sheeting shall be non-exposed lens type.

21. When Flags are used in lieu of the Flagman Sign, they shall be a minimum of 24"x 24", made of a good grade of bright red material, and fastened securely to a staff of approximately 3 feet in length. The free edge should be weighted to insure that the flag will hang vertically, even in heavy winds.

22. All material shall be sound and durable. Barricades, signs, symbols and lettering shall be of good workmanship. Uneven lettering will not be accepted.

23. Flagman Sign: The background of the STOP face shall be reflectorized red with white reflectorized letters and border. The background of the SLOW face shall be reflectorized orange with black letters and border.

24. Painting for all wood surfaces shall conform with the "Standard Specifications".

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

26. Posts for regulatory, warning and guide signs shall conform with the "Standard Specifications" for Timber Sign Posts.

27. Diamond warning signs shall have a standard size of 48"x 48". Where speeds and volumes are relatively low, a minimum size of 36"x 36" may be used for Construction Approach Warning Signs, provided that a minimum letter size of 5" can be accommodated on this size with the appropriate legend.

TYPICAL CONSTRUCTION TRAFFIC SIGN AND CHANNELIZING DEVICE REQUIREMENTS

CASE	Construction Traffic Signs Each — Panel Size ▲ A	B	C	Channelizing Devices per 100' — Barricades	Cones	Vertical Panels	Drums
I	11	11	*	2	3	2	2
II	6	4	*	2	3	2	2
III	4	9	*	2	3	2	2
IV	16	8	*	2	3	2	2
V	0	8	*	2	3	2	2
VI	6	11-13	*	2	3	2	2

* As directed by the Engineer

▲ PANEL SIZE		
	A	2.01 to 9.00 sq ft including Type 1 and Type 2 Barricades
	B	9.01 to 16.00 sq ft
	C	16.01 sq ft and over

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

Designed By	F.J.B.	Approved By	M. E. Parker
Made By	F.J.B.		Staff Traffic Engineer
Checked By	J.D.S.	Date	May 17, 1977

STANDARD S-614-39A

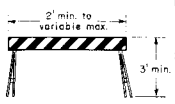
STANDARD S-614-52B

JANUARY 10, 1979

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

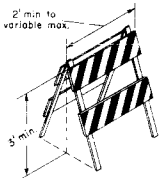
REVISIONS		

TYPICAL TYPE 1 BARRICADE



1. May be fabricated of lumber, aluminum or other suitable light weight materials of structural soundness.
2. Stands may be detachable for mobility.
3. Type 1 Barricade has 2 reflectorized rail faces (one each direction).

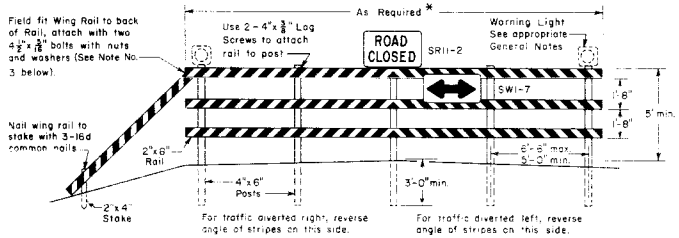
TYPICAL TYPE 2 BARRICADE



1. May be fabricated of lumber, aluminum or other suitable light weight materials of structural soundness.
2. Type 2 Barricade has 4 reflectorized rail faces (two each direction).

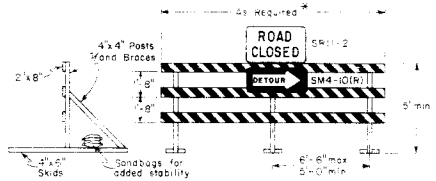
TYPICAL TYPE 3 BARRICADES (Timber)

FIXED

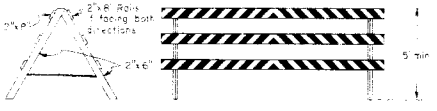


RAIL LENGTH TABLE *		
TYPE 3 BARRICADE		LENGTH
FIXED	MOVABLE	
F - A	M - A	8' - 14'
F - B	M - B	15' - 24'
F - C	M - C	25' - 35'
F - D	M - D	> 35'

MOVABLE-RIGID



MOVABLE-HINGED

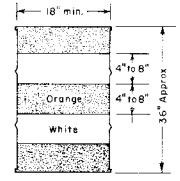


1. Type 3 Barricades have 3 reflectorized rail faces if facing traffic in one direction and 6 if facing traffic in two directions.
2. When fixed barricades are designated on the plans, the portion of the posts below the ground line shall be dipped or hot creosote oil. The portion of the post above the ground line shall be painted in accordance with the appropriate General Note.
3. Detachable extension wing rails for bypassing of construction equipment are permitted, when necessary, on Fixed or Movable Type 3 Barricades. The length shall be adequate to close the borrow pit and/or shoulder as required.

GENERAL NOTES

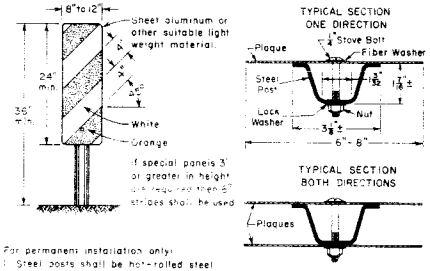
1. All work shall be done in accordance with the Standard Specifications applicable to the Project.
2. All signs, sign materials, beacons and barricade warning lights shall conform to the standards set forth in the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways and the Colorado Supplement thereto.
3. The various types, combinations and applications of signs and beacons for barricades required for each project shall be:
   a. governed by field conditions.
   b. as shown in appropriate typical illustrations or specified or detailed in the plans.
   c. when called for by, and subject to approval by the Engineer.
4. Alternate materials or other reflective elements on signs or barricades will be permitted only after approval of such material by the Division in writing.
5. All painting shall conform with:
   a. the applicable Subsections of 508 and 614 of the Standard Specifications.
   b. all skids, braces and posts shall be painted with 2 coats of "Exterior White Paint"
   c. the backsides of rails and vertical panel channelizing devices facing one direction of traffic only shall be painted with "Exterior White Paint".
6. All striped surfaces, except on concrete, shall conform with:
   a. the entire area of orange and white stripes shall be reflectorized.
   b. all reflective surfaces shall be "Smooth Surface Type Reflective Sheeting".
   c. horizontal rails, wing rails and vertical panel channelizing devices shall have orange and white stripes on the face side(s) slanting downward at a 45° angle toward the side(s) to which traffic is to pass or turn.
   d. permanent barricades shall be reflectorized red and white stripes. They may be used at locations to mark the end of a road, street or highway where there is no crossroad or outlet.
7. For all wooden barricade components:
   a. nominal lumber dimensions are satisfactory.
   b. all skids, braces, rails and posts shall be nailed together with No. 20d nails.
   c. all timber shall be Grade No. 2 or better, S4S, Douglas Fir or Larch, as described in the current Standard Grading Rules published by the Western Wood Products Association, and shall conform to applicable paragraphs for the rails and posts.
8. All screws, bolts, nuts and washers shall be galvanized or cadmium plated.
9. Stability of barricades and channelizing devices shall conform with:
   a. skids (bases) of movable barricades shall be weighted with sandbags only where necessary to provide stability.
   b. no movable or portable device shall be weighted by any method or material to the extent that would make them hazardous to motorists.
10. Flashing beacons or warning lights used with barricades, drums and vertical panels shall conform with:
    a. use flashing warning lights when devices are used singly and steady burn lights when they are used in a series for channelization.
    b. they shall be positioned above the top rail of barricades or on top of drums and vertical panels.

TYPICAL DRUM



1. Drums shall never be placed in the roadway without appropriate advance warning signs.
2. There shall be at least two orange and two white horizontal, circumferential, reflective stripes on each drum.

TYPICAL VERTICAL PANEL

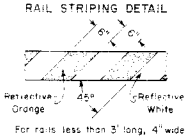


For permanent installation only:
1. Steel posts shall be hot-rolled steel or re-rolled rail steel.
2. Posts are to weigh 2 lbs./ft. with a mill tolerance of minus 5% of the weight of any one post being allowed.
3. Reflectorized Yellow shall replace Orange and Black shall replace White.
4. Panel shall conform to "Class I Signs"

TYPICAL BARRICADE CHARACTERISTICS

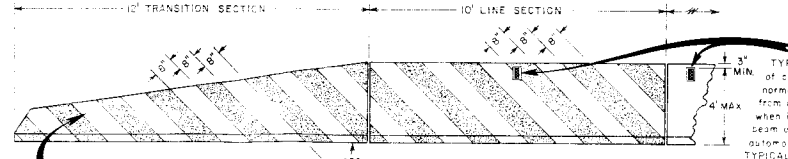
	BARRICADE DESIGNATIONS		
	TYPE 1	TYPE 2	TYPE 3
Rail Width	8" min. - 12" max.	8" min. - 12" max.	8" min. - 12" max.
Rail Length	2' min. to variable max.	2' min. to variable max.	As required. See Table *
Height	3' min.	3' min.	5' min.
Stripes	See Detail of Barricade Striping and appropriate General Notes.		
Use	Temporary	Temporary	Temporary or Permanent

RAIL STRIPING DETAIL



For rails less than 3' long, 4" wide reflective orange and white stripes are to be used.

TYPICAL CONCRETE BARRIER (TEMPORARY)



ORANGE AND WHITE REFLECTORIZED STRIPES SHALL BE 8" WIDE AT 45° ON SIDE OF BARRIER FACING APPROACHING TRAFFIC, AND SLOPING DOWNWARD IN THE SAME DIRECTION TRAFFIC IS TO PASS. (APPLY FOR 32' - TRANSITION SECTION AND FIRST TWO LINE SECTIONS.)

CONCRETE BARRIER (TEMPORARY) SHALL CONFORM TO GUARD RAIL TYPE 4 (PRECAST-PORTABLE)" DESCRIBED IN THE "STANDARD SPECIFICATIONS" AND SHOWN ON THE APPROPRIATE "M-STANDARD". REFLECTORS ARE INCLUDED IN THE COST OF CONCRETE BARRIER (TEMPORARY).

TYPICAL ACRYLIC CUBE TYPE REFLECTOR (Capable of clearly reflecting light under normal atmospheric condition from a distance of 500 feet when illuminated by the upper beam of approaching standard automobile headlights). THE TYPICAL ACRYLIC CUBE TYPE REFLECTORS SHALL BE MOUNTED ON THE FIRST LINE SECTION AND THEN AT 50 FOOT INTERVALS FACING TRAFFIC, APPLY ON SIDE(S) OF BARRIER ADJACENT TO TRAFFIC LANE. THEY SHALL BE YELLOW FOR BARRIER REQUIRED ON THE LEFT SIDE OF THE ROAD AND CRYSTAL FOR BARRIER REQUIRED ON THE RIGHT SIDE.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS
BARRICADES, DRUMS, CONCRETE BARRIER (TEMP) & VERTICAL PANELS

Designed By	F.J.B.	Approved By	Staff Traffic & Safety Projects Engineer
Made By	F.J.B.		
Checked By	J.D.S.	Date	January 10, 1979

STANDARD S-614-52B