TITLE SHEET

CONVENTIONAL SIGNS

CENTER LINE
RIGHT OF WAY LINE
COUNTY LINE — CITY LIMITS
TOWNSHIP OR RANGE LINE
LAND LINES
RAILROAD
BARBED WIRE FENCE
CHAIN LINK FENCE — WOVEN WIRE FENCE
BEAM TYPE GUARD RAIL
TELEPHONE & TELEGRAPH POLES
POWER POLES
DETOUR
PRESENT ROAD (Plan Sheets)
CONTROL OF ACCESS LINE
ACCESS DENIED BY DEED
GAS LINE
WATER LINE
TELEPHONE CONDUIT

CURB AND GUTTER (TYPE 2 SEC IB)
CURB AND GUTTER (TYPE 2 SEC IIB)
CURB AND GUTTER (TYPE 2 SEC IM)
CURB AND GUTTER (TYPE 2 SEC IIM)
GUTTER TYPE 2 (8 FOOT)
CURB TYPE 6 (SECTION M)

EXISTING CURB AND GUTTER
EXISTING SANITARY SEWERS
EXISTING STORM SEWERS
NEW STORM SEWER CONSTRUCTION
CULVERT — WITH END SECTIONS

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS—STATE OF COLORADO

(R-1) 10-21-71 POL CHG PROJ. NO.

FEDERAL ROAD REGION NO.	DIVISION	(R-1) PROJECT NO.	SHEET NO.
9	COLORADO	EHS-F 121-1(7)	1

P.E. & R.O.W. OBLIGATED UNDER F 121-1(1)

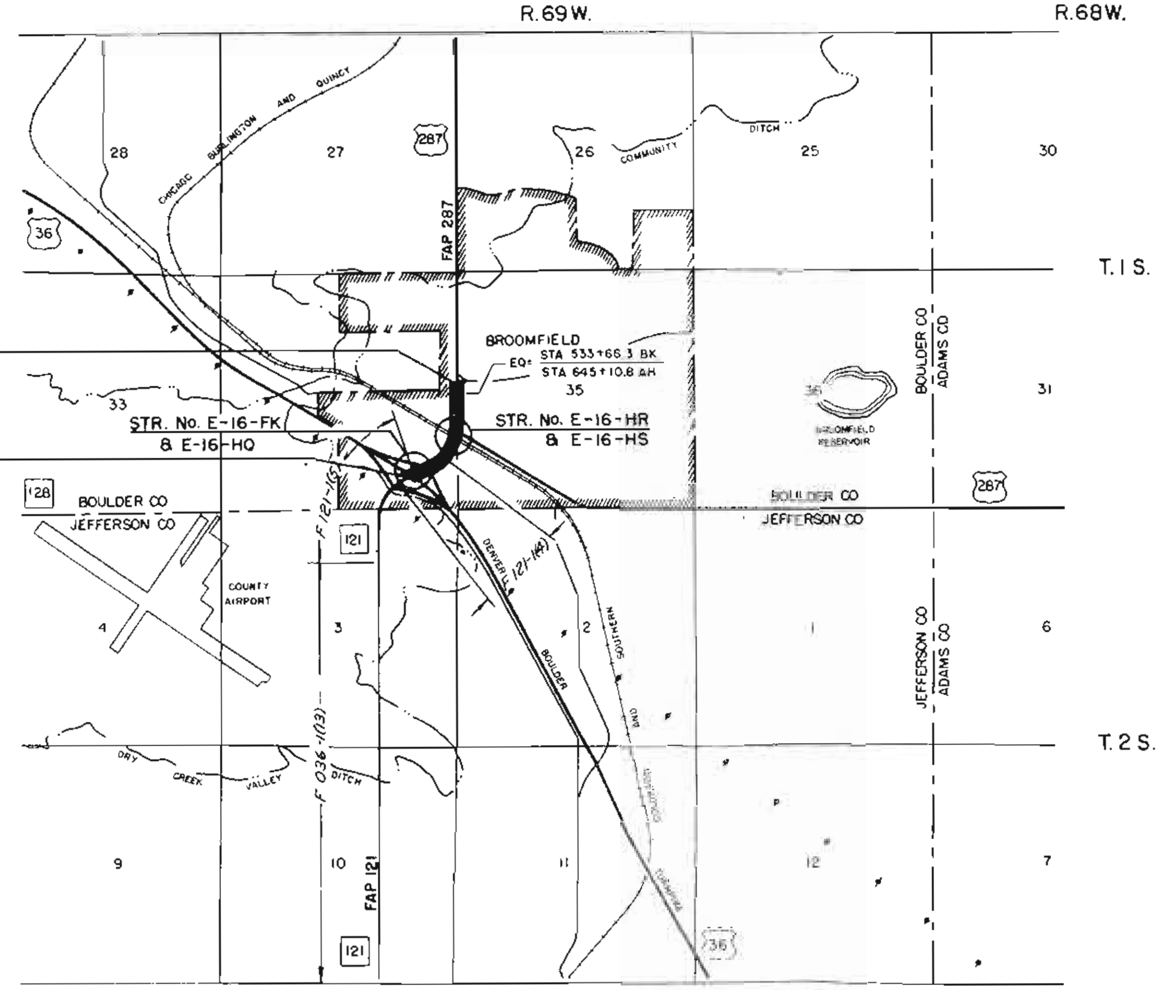
INDEX OF SHEETS: SEE SHEET No. 2

PLAN AND PROFILE OF PROPOSED
FEDERAL AID PROJECT NO. EHS-(R-1)F 121-1(7)
STATE HIGHWAY NO. 121
BOULDER COUNTY

SCALES OF ORIGINAL DRAWINGS
ON PLAN 1 IN. = 100 FT.
ON PROFILE 1 IN. = 100 FT. HORIZONTAL; 1 IN. = 10 FT. VERTICAL
GRADE LINE ON PROFILE IS SHOWN AS GRADE OF FINISHED ROAD
GROSS LENGTH OF PROJECT = 0.605 MILES
NET LENGTH OF PROJECT = 0.375 MILES

STA. 647+87.0 END PROJECT EHS-F121-1(7) (R-1)

STA. 509+74.7 BEGIN PROJECT EHS-F121-1(7) (R-1)



INACTIVE
SEP 10 1975

Contractor Siegrist Construction Company
Resident Engineer R D Sherman
Project Engineer R.L Ridell
Date Completed August 24 1973
Approved by [illegible] Dist Const Engr [illegible]

DIVISION OF HIGHWAYS
APPROVED [signature] 8-10-71
CHIEF ENGINEER DATE

PLANS PREPARED UNDER CONTRACT F121-1(1)
BY
BARTON • STODDARD • MILHOLLIN • HIGGINS
A DIVISION OF INTERNATIONAL ENGINEERING COMPANY, INC.
DENVER, COLORADO

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED ______ DATE
______
DIVISION ENGINEER

PDL

(R-1) 10-21-71 PDL
CHG PROJ NO,
GEN NOTE,
REV STD DATES

FEDERAL ROAD REGION NO.	DIVISION	PROJ. No.	SHEET NO.	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	2	

(R-1)

CONSTRUCTED
REVISIONS
Completed AUG 1 1973

TABULATION OF LENGTH

STATION	ROADWAY	MAJOR STRUCTURE
	BOULDER COUNTY	BOULDER COUNTY
	LIN. FT.	LIN. FT.
509+74.7 Begin Project		
STR. NO. E-16-FK		231.0
512+05.7	1,000.1	
522+05.8		
STR. NO. E-16-HR / E-16-HS		455.5
526+61.3	705.0	
533+66.3 Back =		
645+10.8 Ahead	276.2	
647+87.0 End Project		
TOTAL FEET	1,981.3	686.5
TOTAL MILES	0.375	0.130

SUMMARY

	LIN. FT.	MILES
Roadway - Net Length	1,981.3	0.375
Major Structures - Boulder County	686.5	0.130
Gross Length	2,667.8	0.505

DESIGN DATA

	MAINLINE
Moximum Design Speed	60 M.P.H.
Maximum Degree of Curve	5° 00'
Maximum Grade	5.96%
Minimum Stopping Sight Distance - Horiz.	> 600'
Minimum Stopping Sight Distance - Vert.	515'
Design Loading of Major Structures	HS-20-44

GENERAL NOTES

For preliminary plan quantities of bituminous materials the following rates of application were used:
Prime Coat MC 70 ~~0.40 Gal./S.Y.~~ 0.25
Emulsified Asphalt Tack Coat SS1H 0.10 Gal./S.Y.
Rates of application shall be as determined by the Engineer at the time of application.
It is estimated that ~~2,000~~ 5,668 hrs of flagging for traffic will be required for the project
All utilities encroaching on construction are to be moved by the owners.
(R-1) Wetting applications shall be at the following approximate rates:
Embankment 40 Gal./C.Y.
Subbase and Surfacing 15 Gal./Ton
Any layer of Bituminous Pavement that is to have a succeeding layer placed thereon shall be completed full width before succeeding layer is placed.
Road approaches which require Bituminous Pavement shall be primed and a 2" thickness of pavement placed
Public approaches and entrances to buildings or residences shall be paved to the R/W line.
It is estimated that the old road is to be obliterated in the location shown on the grading plans.
Full depth of all embankments and bases of cuts and fills to a depth of 6" shall be constructed with moisture and density control (T 99) Excavation required for compaction of base of cuts and fills will be considered subsidiary to that operation and will not be paid for separately.
The type of compaction for structural backfill shall be AASHO T 99
The minimum thickness of topsoil shall be 4" (~~6,100~~ 9,163 C.Y required).
Seeding will be required within R/W limits on all areas not surfaced (See Table for types).
A ski type device of at least 30' shall be furnished with each bituminous paver equipped with an automatic control system.
It is required that the top 2.0' of fills shall have a minimum R value of 25

INDEX OF SHEETS

SHEET No.	DESCRIPTION
1	Title Sheet
2	Index of Sheets, Tabulation of Length and Design Data, General Notes
3-4	Typical Sections
5-7	Summary of Approximate Quantities
8	List of Structures
9	Surface Materials Plan
10	Summary of Earthwork, Tabulation of Delineators, Seeding, Guard Rail and Fencing Quantities
11	Galvanized Steel Bridge Rail Detail - Str. No. E-16-FK
12	Existing Structure Modifications - Str. No. E-16-FK
13-29	Structure Plans - Str. Nos. E-16-HR and E-16-HS
30	Energy Dissipator Detail
31-31A	Miscelloneous Details - Guard Rail Connection and Stair Detail, Special Fence Detail
32-33	Interchange Details
34	Intersection Detail - Ramp 'C' and 'D' with Bus Ramp
35-36	Ramp Profiles
37-38	Plan - Profile Sheets
39-40	Delineators, Guard Rail and Regrading Details, Detail A
41-42	Lighting Details
43-47	Drainage Cross Sections
48-74	Cross Sections

STANDARD DRAWINGS

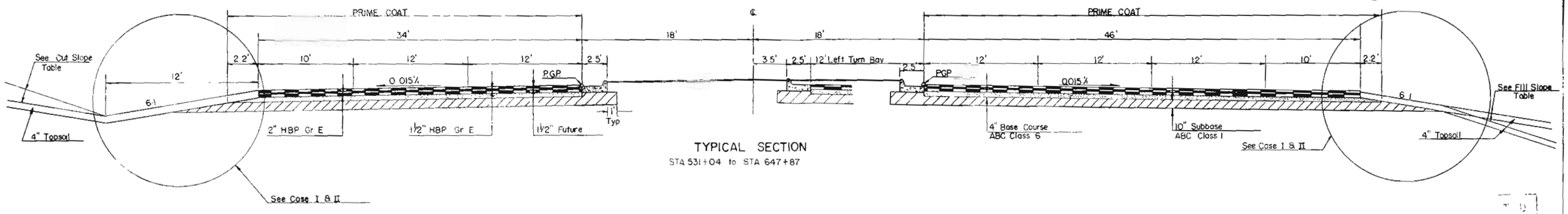
STD. No.	TITLE	DATE
M-203-A	Superelevation and Widening of Curves - Crowned Highways	7-30-68
M-203-A-1	Superelevation of Curves - Divided Highways	7-30-68
M-203-B	Approach Roads, Flaring, Cut Slope Treatment, Bridge and Crest Widening	4-27-70
M-206-AA	Excavation and Backfill for Structures (2 Sheets)	3-1-71
M-500-A	Letters and Figures for Structure Numbers	7-1-65
M-603-CA	Concrete and Metal End Sections	6-25-71
M-603-M	Metal Culvert Pipe H-20 Loading	2-11-71
M-604-AA	Concrete Inlets Types 3 and 3 Double	12-2-68
M-604-AB	Concrete Inlet Type 13	4-15-71
M-604-BA	Inlet, Type C	5-24-71
M-604-D	Steps for Manholes and Inlets	7-23-68
(R-1) M-606-AB	Guard Rail Type 3 (3 Sheets)	10-21-71
(R-1) * M-607-A	Wire Fences and Gates (2 Sheets)	8-19-71
M-609-A	Curbs and Gutters	5-7-71
M-612-A	Marker Posts and Bench Marks	6-30-71
M-612-C	Delineators (2 Sheets)	7-11-68
▲ M-614-1C	Standard Construction Identification Signs (2 Sheets)	9-25-70
M-614-TB	Traffic Signing for Highway Construction (3 Sheets)	12-24-68
M-614-R8	Standard Railroad Warning Signs	8-22-68
* M-607-8	Chain Link Fence (2 Sheets)	4-20-71
▲ M-614-A	Timber Barricades	4-23-69

TYPICAL SECTIONS

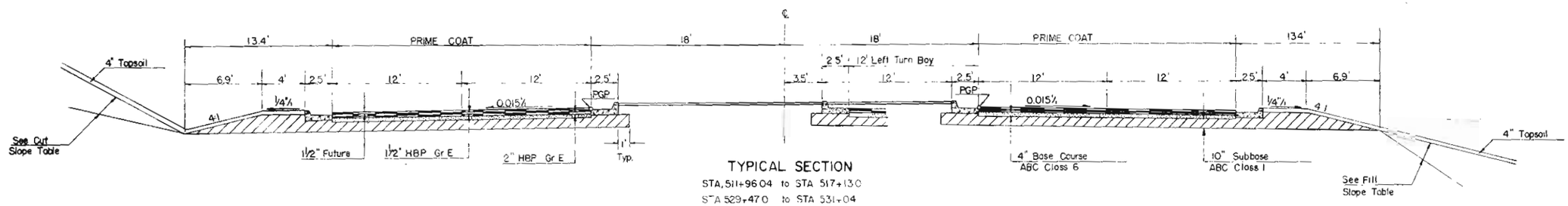
(R-1) 10-21-71 PDL
CHG PROJ NO

PROJ NO	SHEET NO	TOTAL SHEETS
EHS-F 121-1(7)	3	

(R-1)

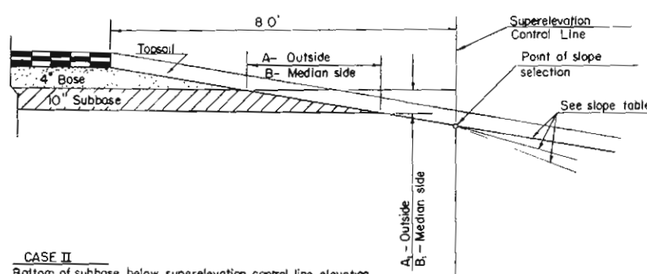


TYPICAL SECTION
STA 531+04 to STA 647+87



TYPICAL SECTION
STA. 511+96.04 to STA 517+13.0
STA 529+47.0 to STA 531+04

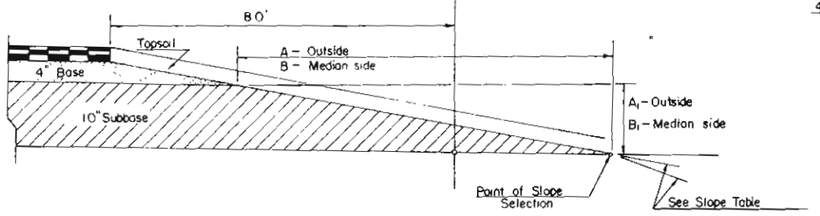
CASE I
Bottom of subbase above superelevation control line elevation



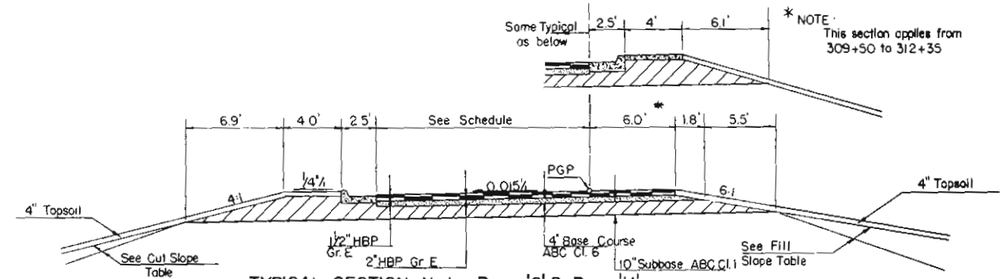
SLOPE TABLE			
CUT		FILL	
H	Slope *	H	Slope *
0 - 10'	6:1	0 - 10'	6:1
10' - 30'	4:1	10' - 25'	4:1
30' -	3:1	25 -	3:1

* Some special slopes required, see cross sections

CASE II
Bottom of subbase below superelevation control line elevation

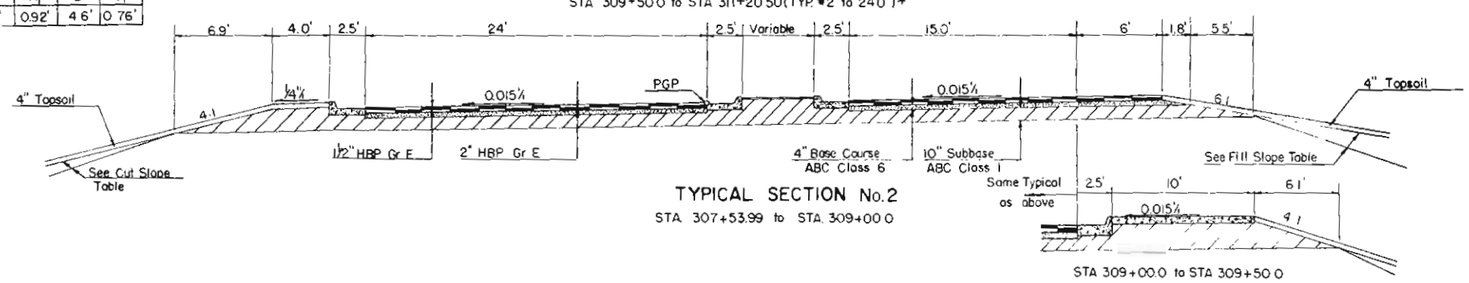


SLOPE DIMENSIONS				
'T'	A	A1	B	B1
10"	5.5'	0.92'	4.6'	0.76'



TYPICAL SECTION No.1 – Ramp 'C' & Ramp 'H'

Schedule: RAMP 'C'
STA 305+11.72 to STA 306+11.72 (Taper 15.0' to 24.0')
STA 306+11.72 to STA 306+56.59 (24.0')
STA 306+56.59 to STA 307+53.99 (24.0' to TYP #2)
STA 309+50.0 to STA 311+20.50 (TYP #2 to 24.0')*
RAMP 'H'
STA 706+60.0 to STA 708+60.0 (15.0')
STA 311+20.50 to STA 312+35.0 (24.0')*



TYPICAL SECTION No.2
STA 307+53.99 to STA 309+00.0
STA 309+00.0 to STA 309+50.0

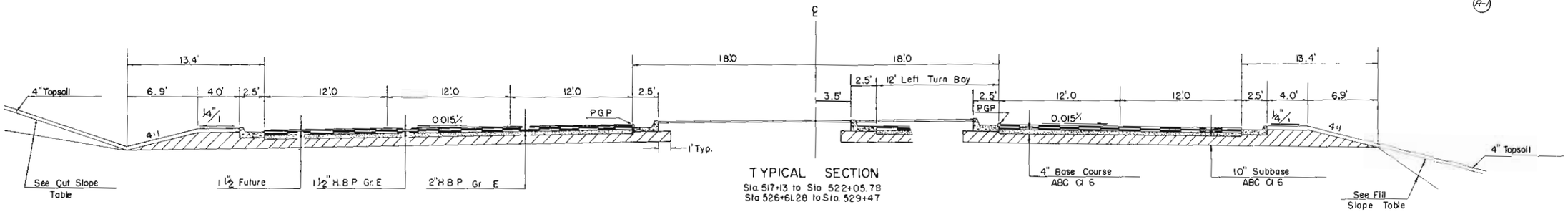
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS — STATE OF COLORADO
FORM D.O.H. 1276
JULY, 1968

TYPICAL SECTIONS

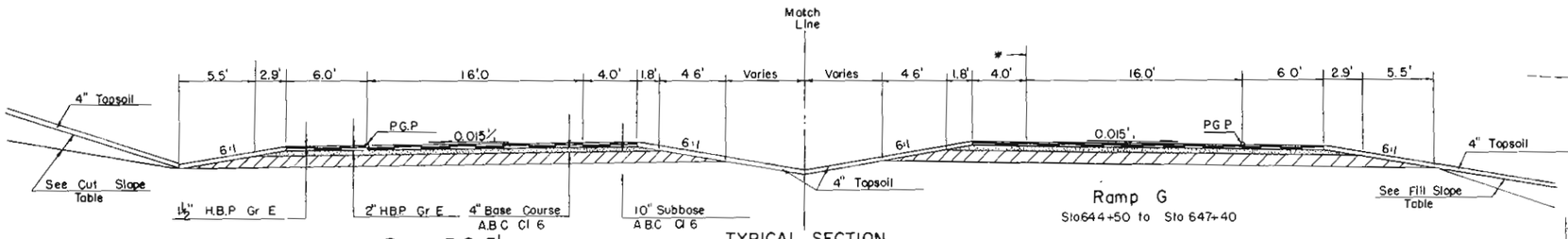
(R-1) 10-21-71 PDL
CHG PROG NO

PROJ NO	SHEET NO.	TOTAL SHEETS
EHS-F 121-1(7)	4	

(R-)



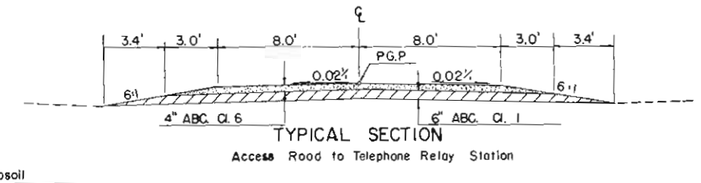
TYPICAL SECTION
Sta 517+13 to Sta 522+05.78
Sta 526+61.28 to Sta. 529+47



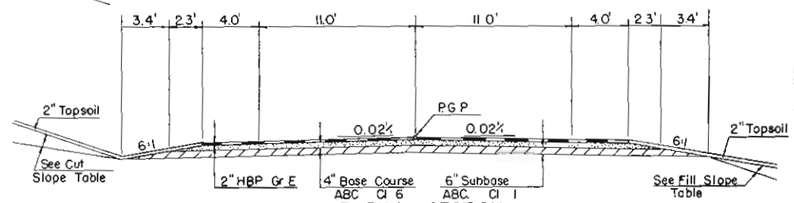
Ramps F & F'
Sta 645+50 to 649+04 F
Sta. 646+96 to 648+33.68 F'

TYPICAL SECTION
Depressed Median

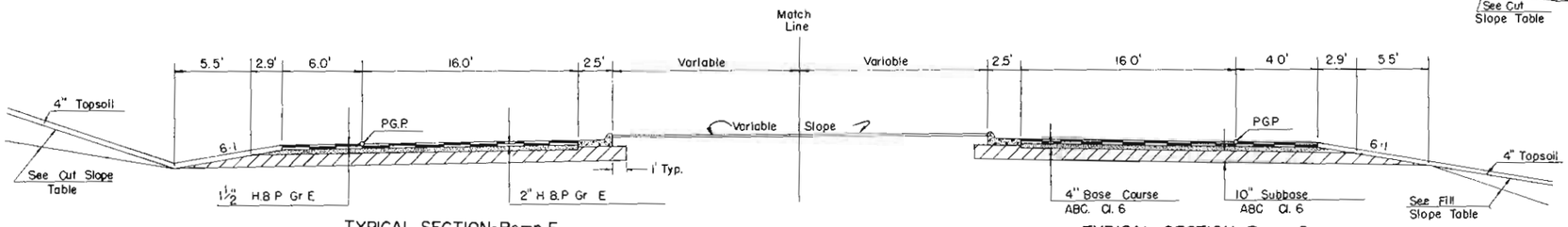
Ramp G
Sta 644+50 to Sta 647+40



TYPICAL SECTION
Access Road to Telephone Relay Station

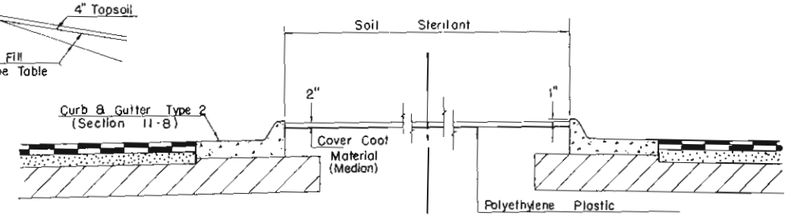


TYPICAL SECTION
Industrial Lane
Sta 9+25.0 to Sta. 11+50.0

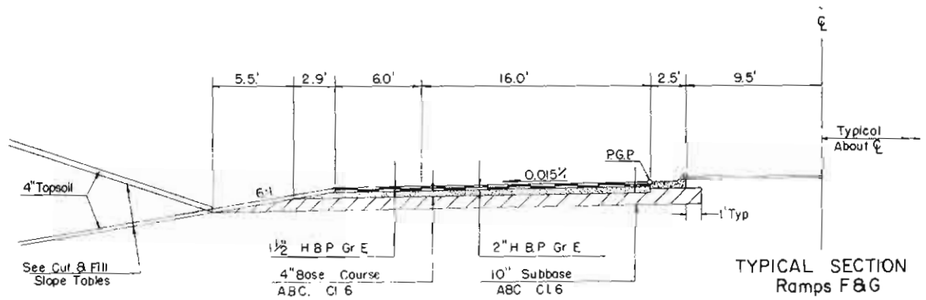


TYPICAL SECTION - Ramp F
Sta. 640+00 to 645+50

TYPICAL SECTION - Ramp G
Sta 640+00 to Sta 644+50

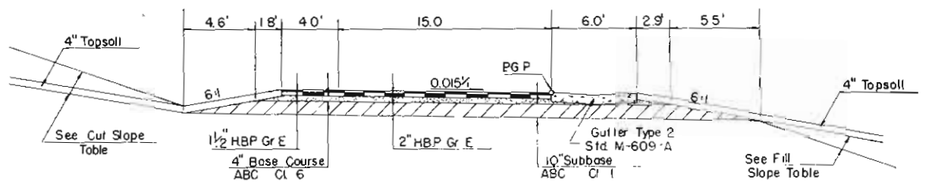


MEDIAN TREATMENT



TYPICAL SECTION
Ramps F&G
Sta 632+23* to Sta 640+00

* From 632+23 to 634+23
Width Tapers from Var. to 16.0'



TYPICAL SECTION - Romp H
Sta 701+25 to Sta 706+60

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
FORM 0.0.H 126
JULY 1968

SUMMARY OF ~~APPROXIMATE~~ QUANTITIES
FINAL

AS CONSTRUCTED
REVISED
Completed

(R-1) 10-21-71 PDL
CHG. PROJ. NO., QUANTITIES
(R-2) 11-10-71 PDL
QUANTS

FEDERAL AID PROJECT NUMBER	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	COLORADO	EHS-F 121-1(7)	5	

(R-1)

ITEM No.	ITEM	UNIT	BOULDER COUNTY – Sta. 509+74.7 – 647+87.0										PROJECT TOTALS	INDEX		
			ROADWAY (FINAL)	ROADWAY	Str. No. E-16-FK	E-16-FK (FINAL)	Str. No. E-16-HR	E16HR (FINAL)	Str. No. E-16-HS	FINAL E16HS	DIFFERENCE + OR –	FINAL PROJECT TOTALS		BOOK	PAGE	SHEET
201	Clearing and Grubbing	Lump Sum		•								•	•	1	7	
202	Removal of Structure	Each		~~32~~							-1	2	~~3~~	1	8	
202	Removal of Curb and Gutter	Lin. Ft.		~~1800~~ 1871							+71	1871	~~1800~~	1	9	
202	Removal of Concrete Pavement	Sq. Yd.		~~3070~~							+34	3.104	~~3070~~	1	10	
202	Removal of Mat from Bridge	Sq. Yd.		3104	~~720~~ 766						+46	766	~~720~~	1	11	
202	Removal of Bridge Railing	Lin. Ft.			229						0	229	~~229~~	1	12	
202	Removal of Fence	Lin. Ft.		~~640~~ 1.639							+999	1.639	~~640~~	1	13	
203	Embankment Material (Haul and Compaction)	Cu. Yd.		~~253,971~~ ~~236,000~~ 253,811							15811 +~~15,971~~	253,811 ~~253,971~~	~~238,000~~	1	14	
206	Structure Excavation	Cu. Yd.		888 ~~759~~ ~~880~~			355		326		+129	1.569	~~1,440~~	1	15	
206	Structure Backfill (Class 2)	Cu. Yd.		312 ~~284~~ ~~305~~			151		145		27 +~~21~~	608 ~~601~~	~~580~~	1	16	
207	Topsoil (Haul)	Cu. Yd.		9199 ~~6,100~~ ~~9,162~~							+ ~~3067~~ 3099	~~9,162~~ 9199	~~6,100~~	1	17	
209	Wetting	M. Gal.		~~10,380~~ 7080 ~~7,090~~							- 3300 ~~3,290~~	7080 ~~7,090~~	~~10,380~~	1	18	
212	Seeding	Acre		~~12~~ 18.21 ~~19.1~~							~~+716.21~~	18.21 ~~19.1~~	~~12~~	1	19	
213	Mulching	Acre		~~12~~ 18.21 ~~19.1~~							~~+716.21~~	18.21 ~~19.1~~	~~12~~	1	20	
217	Soil Sterilization	Sq. Yd.		~~7650~~ 7.750							+100	7.750	~~7,650~~	1	21	
304	Aggregate Base Course (Class 1) (Haul)	Ton		~~22,800~~ 28.851.90							+6.051.90	28851.90	~~22,800~~	1	22	
304	Aggregate Base Course (Class 6) (Haul)	Ton		~~6,200~~ 7.850.0							~~+1650~~ 1860.7	~~7850.00~~ 8,060.70	~~6,200~~	1	23	
(R-1) 403	Hot Bituminous Pavement (Grading DX) (Haul and Asphalt)	Ton			~~60~~ 1318.0		~~114~~		~~163~~ 208		+102.80	439.80	~~337~~	1	24	
(R-1) 403	Hot Bituminous Pavement (Grading E) (Haul and Asphalt)	Ton		~~5,863~~ ~~6,986.15~~ 6986.05	Any Field Quantity						+1123.15	~~6,986.15~~ 6986.05	~~5,863~~	1	25	
(R-2) (R-1) 411	Emulsified Asphalt (SS-1H)	Gal.		4072 ~~400~~ ~~3,559~~							~~+3,559~~ 3672	~~39.59~~ 4072	~~400~~	1	27	
(R-2) (R-1) 411	Liquid Asphaltic Material (MC-70)	Gal.		~~12,000~~ 5213 ~~5,195~~							-6.805	~~5,195~~ 5213	~~12,000~~	1	28	
(R-1) 502	Reinforcing Tip (DELETED W.O. # 19048)	Each					~~52~~ 0		~~66~~ 0		-188	0	~~118~~	1	29	
502	Steel Piling (12 BP 53)	Lin. Ft.					~~1,228~~ ~~1,428~~ 1442		~~1,574~~ ~~1,788~~ 1744		+ 414	3.216	~~2,802~~	1	~~30~~	
~~502~~	Steel Piling Cut off @ 20%	Lin. Ft.							14.2		+ 43	43.0		1	30	
507	Concrete Slope and Ditch Paving (Reinforced)	Cu. Yd.					~~245~~ 216.27 28.3 211.63		~~235~~ ~~210~~ 211.62		- ~~333~~ 57.64	~~426.77~~ 428.36	480	1	31	
508	Untreated Timber (Guard Rail Posts)	L.S.		•							0	0	•	1	32	
509	Structural Steel	Lb					468,400		588,600		0	1.057.000	~~1,057,000~~	1	33	

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
FORM D.H. 124
JULY 1968

SUMMARY OF ~~APPROXIMATE~~ FINAL QUANTITIES

(R-1) 10-21-71 PDL CHG PROJ NO., QUANTITIES
(R-2) 11-10-71 PDL QUANTS

PROJECT NO.	SHEET NO.	TOTAL SHEETS
EHS-F 121-1 (7) (R-1)	6	

ITEM No	ITEM	UNIT	BOULDER COUNTY – Sta. 509 +74.7 – 647 +87.0	ROADWAY	Str. No. E-16-FK		Str. No. E-16-HR		Str. No. E-16-HS	Final E-16 HS	Difference + or –	Final Project Totals	PROJECT TOTALS	INDEX BOOK	PAGE	SHEET
(R-2) 509	Structural Steel (Galvanized)	Lb			7,800		35,900		36,000		0	79,700	~~79,700~~	1	34	
(R-2) (R-1) 515	Waterproofing (Membrane) (WO # 01582)	Sq. Yd.			~~775~~ Δ		~~2,000~~ Δ		2,000		-2,775	2,000	~~4,775~~	1	35	
518	Bridge Expansion Device (Type 4)	Lin. Ft.					56		80		0	136	~~136~~	1	36	
519	~~Mortar (Non Federal [illegible])~~	~~BBL~~									-2	2		1	37	
519	Epoxy (Non Federal [illegible])	GAL.									-5	3		1	38	
601	Concrete Class A	Cu Yd.		~~5~~ 4.40			352		406		-0.60	762.40	~~763~~	1	39	
601	Concrete Class D	Cu.Yd.					386		524		0	910	~~910~~	1	40	
602	Reinforcing Steel	Lb		~~96~~ 8			153,245		~~218,959~~ 218,981		+ 22	~~372,322~~ 372,234	~~372,300~~	1	41	
603	18 Inch Corrugated Steel Pipe	Lin. Ft.		~~309~~ 237							-72	237	~~309~~	.	42	
603	24 Inch Corrugated Steel Pipe	Lin. Ft		~~800~~ 940							+140	940	~~800~~	1	43	
603	29 x 18 Inch Corrugated Steel Pipe Arch	Lin. Ft.		~~101~~ 103							+2	103	~~101~~	1	44	
603	18 Inch Steel End Section	Each		2							0	2	~~2~~	1	45	
603	24 Inch Steel End Section	Each		~~2~~ 5							+3	5	~~2~~	1	46	
603	29 x 18 Inch Steel End Section	Each		4							0	4	~~4~~	1	47	
604	Inlet Type C (5 Foot)	Each		2							0	2	~~2~~	1	48	
604	Inlet Type C (10 Foot)	Each		~~1~~ 3							+2	3	~~1~~	1	49	
604	Inlet Type 3 (5 Foot)	Each		6							0	6	~~6~~	1	50	
604	Inlet Type 3 (10 Foot)	Each		3							0	3	~~3~~	1	51	
604	Inlet Type 3 (15 Foot)	Each		1							0	1	~~1~~	1	52	
604	Inlet Type 13 (10 Foot)	Each		1							0	1	~~1~~	1	53	
606	End Anchorage Type 1	Each		~~7~~ 6							-1	6	~~7~~	1	54	
606	End Anchorage Type 3	Each		3							0	3	~~3~~	1	55	
606	End Anchorage Type 4	Each		~~10~~ 7							-3	7	~~10~~	1	56	
606	Guard Rail Type 3	Lin. Ft.		~~5,375~~ 5,130							-245	5,130	~~5,375~~	1	57	
606	Guard Rail Type 3 (Double)	Lin. Ft.		~~1,025~~ 920							-105	920	~~1,025~~	1	58	
607	End Post	Each		~~1~~ 7							+6	7	~~1~~	1	59	
607	Corner and Line Brace Post	Each		~~1~~ 4							+3	4	~~1~~	1	60	
607	Fence Combination Wire with Metal Posts	Lin. Ft.		~~500~~ 2253							2,253	2,753	500	2	7	
607	Fence Chain Link Special	Lin. Ft.		~~684~~ 688							+4	688	684	2	8	
607	16 Foot Gate Driveway (Deleted C.O. # 07978)	Each		~~1~~ 0							-1	0	1	2	9	
608	Concrete Sidewalk	Sq. Yd.		~~530~~ 393.32							136.68	393.32	~~530~~	2	10	
609	Curb and Gutter Type 2 (Section IIB)	Lin. Ft.		~~10,811~~ 10,921							-110	10,921	~~10,811~~	2	11	

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
FORM 0.0.A. 1.14
JULY, 1964

SUMMARY OF ~~APPROXIMATE~~ FINAL QUANTITIES

(R-1) 10-21-71 PCL CHG PROJ NO., QUANTITIES
(R-2) 11-10-71 PCL QUANTS

PROJ NO	SHEET NO	TOTAL SHEETS
EHS-F 121-1(17)	7	

(R-1)

ITEM No.	ITEM	UNIT	BOULDER COUNTY – Sta. 509+74.7 – 647+87.0						PROJECT TOTALS	INDEX		
			ROADWAY	Str. No. E-16-FK	Str. No. E-16-HR	Str. No. E-16-HS	Final Estimate	Difference	Final Project Totals		BOOK	PAGE	SHEET
609	Gutter Type 2 (6 Foot)	Lin Ft.	~~1,570~~ 2.036					1466	2.036	1,570	2	12	
610	Median Cover Material	Ton	~~760~~ 968.75					1208.75	968.75	760	2	13	
612	Delineator (Type I)	Each	18					0	18	18	2	14	
612	Delineator (Type II)	Each	72					0	72	72	2	15	
612	Delineator (Type III)	Each	4					0	4	4	2	16	
613	1½ Inch Electricol Conduit	Lin. Ft.			~~501.5~~ 580.5	23		+56	580.5	524.5	2	17	
614	Flagging	Hour	~~5,647~~ 1,800	200				+3847	5,847	2,000	2	18	
620	Field Office (Deleted W.O.# 01483)	Each	+ 0					–	0	1	2	19	
620	Field Laboratory	Each	+ 0 1					0	1	1	2	20	
620	Sanitary Facility	Each	1					0	1	1	2	21	
626	Mobilization	Lump Sum	•						•	•	2	22	
515	Waterproofing (Underdrain) (W.O.# 01478)	–		766					766		2	~~23~~	
515	Waterproofing (Underdrain) (W.O.# 01482)	–			1.400				1.400		2	24	
403	HBP (GR E) (H Asph) (W.O.# 05413)	~~Ton~~					Pd. Field Quantity		~~3.191.35~~ 3191.23		1	25	
	FORCE ACCOUNT												
	Lighting (Work by Public Service Co. of Colo.) (W.O.# 01481)	Lump Sum	•						•	•			
	Railroad Flagging (Work by C. and S. R.R. Co. Forces) (W.O. 01485)	Lump Sum	•						•	•			
(R-2)	Install Railroad Crossing (Work by C. and S. R.R. Co. Forces)	Lump Sum	•						•	•			
	Obliterating Old Road (W.O.# 01484)	Lump Sum	•						•	•			
	On-The-Job-Training (W.O.# 01479)	Each	1						1	1			
	STATE FORCES												
	Furnishing and Installing Identification Sign	Each	2						2	2			
	Furnishing and Installing R.R. Advance Warning Sign	Each	2						2	2			
	NON-FEDERAL AID												
	Signing (State Forces)	Lump Sum							•	•			
(R-2) 410	Slurry Seal Coat (Delete W.O.# 01378)	Gal.						-300	0	~~800~~	1	26	
(R-1) 519	Mortar	Bbl.						-2	2	4	1	37	
(R-1) 519	Epoxy	Gal.						5	3	8	1	38	

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
FORM 0.0.A. 1M
JULY, 1968

LIST OF STRUCTURES

(A-1) 10-21-71 PDL
CHG. PROJ. NO

Date [illegible]

FEDERAL AID PROJECT NO	DIVISION	PROJ. NO	SHEET NO	TOTAL SHEETS
	COLORADO	EHS-F 121-1(17)	8	

(A-1)

STATION	DESCRIPTION	UNCL EXC.	EMB.	STR. EXC.	STR. BKFILL. (Cl. 2)	REMOVAL OF STRUCT.	CONCRETE INLETS		CONCRETE Cl. A	CONCRETE Cl. B	REINF. STEEL	A.B.C. Cl. 1	A.B.C. Cl. 6	Ht. of FILL (H)	CORRUGATED STEEL PIPE (Lin Ft.) CSP		CORRUGATED STEEL PIPE (Lin Ft.) CSPA	STEEL END SECTION (Each) CSP		STEEL END SECTION (Each) SESA	MISCELLANEOUS
		C.Y.	C.Y.	C.Y.	C.Y.	Ea.	Type	"H"	C.Y.	C.Y.	Lb.	Ton	Ton	Ft	18"	24"	29"x18"	18"	24"	29"x18"	
515+55	Median Drain			~~17~~ 21	~~34~~ 41		3 3	5.0 5.5								~~133~~ 161					
516+47 - 522+60	Removal, Rt.																				~~3,704~~ 3,070 Sq.Yd. - Removal of Concrete Pavement
~~520+25~~	~~Removal, 24" CMP, Rt.~~ DELETED					T															
521+90	Median Droin 1-EDES REQ'D * 158' LT			~~19~~ 18	~~40~~ 38		3 3	4.0 4.5	2.2		4.1			2		~~172~~ 162					
523+05	Removal, 24" CMP, Rt.					1															
524+40	Removal, 24" RCP, Rt.					1															
528+35	Median Drain 1-EDES REQ'D 160' RT.			~~23~~ 21	~~50~~ 45		3 ~~0~~ 1/3	4.5 ~~4.5~~ 10	2.2		4.1			2		~~150~~ 134					
RAMPS:																					
305+10 'C'	Ramp Droin DELETED			~~48~~	~~15~~		~~13~~	~~8~~						4	~~73~~			+			
306+50 'C'	Ramp Droin			17	10		3	5						2		54			1		
635+50 'F & G'	Cross Drain	7		~~119~~ 93	~~28~~ 22		3 3	6.5 6.5						4.5		~~95~~ 122					
647+94 'F'	Cross Drain			307	44		C C	5.5 ~~5.0~~ 10						8.5	~~210~~ 211			1			
646+20 'G'	Cross Drain	5		~~166~~ 123	~~29~~ 25		3	13						6.0		~~156~~ 117			1		
635+50 Rt							C	5													
700+98 'H'	Side Drain	3		~~15~~ 29	~~8~~ 12		3	3.0						2.5	26			1			
702+00 'H'	Cross Drain	3		29	12									3.0		52			1		
700-702 RAMP H	DRAIN NOT SHOWN ON PLANS			70	30		C	50								126			2		
MISC.																					
~~0+40 (Access Road)~~	~~Driveway Gate, 16'~~ DELETED W.O.# 07478																				~~16 Foot Gate Driveway~~
12+50 (Industrial Lane)	Cross Droin			25	10												~~57~~ 56			2	
12+77 (Industrial Lane)	Mtn. Bell Access Road (Lt.)											480	240								
13+00 (Industrial Lane)	Cross Drain			13	8												~~46~~ 45			2	
9+25 (Industrial Lane)	Inlet not shown on plans						C	10													
	PROJECT TOTALS	18		~~755~~ 807	~~284~~ ~~298~~ 305	~~3~~ 2	~~6~~ 3 3-3 1-3 2-0 3+0 1-13	5 10 15 5 10 10	4.4		8.2	480	240			~~309000~~ 237 940		~~101~~ 103	~~2~~ 2 2	~~2~~ 5	4	

* EDES - ENERGY DISSIPATOR END SECTION

SURFACING MATERIALS PLAN

AS CONSTRUCTED WITH REVISIONS
Date Completed 5-14-1973

(R-1) 10-21-71 PDL CHG. PROJ. NO.

FED. ROAD REGION NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	EHS-F 121-1(7) (R-1)	9	

COUNTY	STATION TO STATION	LENGTH	'T'	AGGREGATE BASE COURSE				HOT BITUMINOUS PAVEMENT (GRADING E)				LIQUID ASPHALTIC MATERIAL		MEDIAN COVER MATERIAL	SOIL STERIL-IZATION	CURB & GUTTER TYPE 2 (SECTION IIB)	GUTTER TYPE 2	CONCRETE SIDEWALK
				CLASS 1		CLASS 6		BOTTOM LAYER 2"		TOP LAYER 1 1/2"		(MC-70)	EMUL. ASPH. (SS-1H)					
		STATIONS	INCHES	TONS / STA	TONS	TONS / STA.	TONS	TONS/STA.	TONS	TONS/STA.	TONS	GALLON	GALLON	TONS	SQ YD	LIN. FT.	LIN. FT.	SQ. YD.
BOULDER	511+96.04 - 517+13	5.1696	10	500	2,585	106	548	58.7	304	44.0	228	1,103		~~117~~ 152	1,178			
	Intersections, Returns, Turn Bay, Etc.				341		137		76		57	277		~~4~~ 9	40			
	517+13 - 522+06	4.93	10	566	2,791	132	651	73.4	362	55.0	271	1,315		~~168~~ 217	1,698			
	526+61 - 529+47	2.86	10	566	1,619	132	378	73.4	210	55.0	158	763		~~71~~ 81	720			
	529+47 - 531+04	1.57	10	500	785	106	167	58.7	92	44.0	69	335		~~33~~ 35	332			
	Intersections, Returns, Turn Bay, Etc.		10		337		135		75		57	273						
	531+04 - 533+61.33 = 645 + 10.80	2.5733	10	594	1,529	181	466	97.8	252	73.4	189	965		~~54~~ 57	542			~~123.33~~
	645+10.80 - 647+63	2.522	10	594	1,498	181	457	97.8	247	73.4	185	946	145	~~53~~ 56	532	6457		~~180~~
	Turn Bay		10		225		90		50		38	182						
	'C' Ramp																	
	305+12 - 306+12	1.00	10	261	261	58	58	31.2	32	23.4	24	121						
	306+12 - 306+57	0.45	10	286	129	68	31	36.7	17	27.5	13	64						
	306+57 - 307+54	0.97	10		362		82		45		34	166		~~1~~ 2	8			
	307+54 - 309+00	1.46	10	459	671	101	148	55.0	81	41.3	61	304		~~8~~ 9	81			122.11
	309+00 - 309+50	0.50	10	557	279	86	43	47.7	24	35.8	18	87		3	28			~~135~~
	309+50 - 311+20	1.70	10		745		119		66		50	240		2	16			
	311+20 - 312+39	1.19	10	319	380	53	63	29.3	35	22.0	27	127				1,493 ~~1,383~~		~~92.88~~ ~~215~~
	'D' Ramp																	
	400+45 - 401+04	0.59	10		466		142		79		60	287						
	'F & G' Ramps																	
	632+00 - 634+04 (Incl. Turn Bay)	2.04	10						156		117		172	~~21~~ 27	215			
	634+04 - 640+00	5.96	10	348	2,075	104	620	53.8	321	40.4	241	1,320		~~125~~ 202	1,258	1590		
	'F' Ramp																	
	640+00 - 645+50	5.50	10	174	957	52	286	26.9	148	20.2	112	610		~~54~~ 64	550			
	645+50 - 648+70	3.20	10	197	631	63	202	31.8	102	23.8	77	355						
	646+96 - 648+24 F'	1.28	10	197	253	63	81	31.8	41	23.8	31	142						
	Taper		10		91		37		21		16	75				540	300	
	'G' Ramp																	
	640+00 - 644+50	4.50	10	174	783	52	234	26.9	121	20.2	91	498		~~45~~ 53	450			
	644+50 - 647+00	2.50	10	197	493	63	158	31.8	80	23.8	60	277						
	Taper		10		62		26		14		11	53				655	570	
	'H' Ramp																	
	701+25 - 706+60	5.35	10	197	1,054	44	236	23.2	125	17.4	93	495						
	706+60 - 708+60	2.00	10	236	472	48	~~96~~	25.7	52	19.3	39	203			102	186		~~700~~ 1166
	Taper		10		86		35		19		15	70						
	Industrial Lane																	
	9+25 - 11+50	2.25	6	126	284	71	160	36.7	83			346						
	From List of Structures				480		240											
	18+95 Industrial Lane - 0+00 Alter St						40				30							
	PROJECT TOTAL				22,724		6,166		3,330		2,472	11,999	317	759	7,648	10,811	1,570	530
					28.851.90		7.850				6.986.15	5.195	3.959	968.75	7.750	10.921	2.036	393.17

NOTE: The estimated quantities are based on the following materials and rates of application. Actual materials and rates of application shall be as directed by the Engineer.

Aggregate Base Course (Cl. 18.6) - 132 lbs/ft³
Hot Bituminous Pavement Grade E - 146.7 lbs/ft³
Liquid Asphaltic Material Prime - ~~0.40~~ gal/S.Y. 0.25
Tack - 0.10 gal/S.Y.

NOTE. Asphaltic Surface Design Bases

Asphaltic Cement Content 5.8%
Hot Bituminous Pavement R_1 = 95
Aggregate Base Course R_1 = 78-83
SI = 2.5 RF = 1.0
R = 22 18^kEDLA = 122
Embankments - Upper 2.0' R = 25+; Below 2.0' R = 13+

FED. ROAD REGION NO.	STATE	PROJECT NO	SHEET NO.	TOTAL SHEETS
9	COLO.	EHS-F 121-1 (7)	10	

(R-1) 10-21-71 PDL CHG. PROJ. NO

(R-1)

AS CONSTRUCTED
... REVISIONS
... Completed AUG 24 1973

TABULATIONS

SEEDING

COMMON NAME	BOTANICAL NAME	Percent Purity	Percent Germ	Rate PLS Acre
Total Acres ~~12~~ 19.1				
Blue Gammo	Boutelova Curtpendula	35	60	2 lbs
Western Wheatgross	Agropy Smithii	85	75	5 lbs
Perenil Ryegrass	Loluim Perenne	90	85	3 lbs
Yellow Sweet Clover	Melitotus Officinolis	98	85	2 lbs

TABULATION OF CURB & GUTTER REMOVALS

STATION TO STATION		SIDE & DISTANCE	QUANTITY (LIN. FT.)
633 75 636 04	RAMP 'F'&'G' "	℄ 57' RT.	500'
635 90 636 20	'F'&'G' "	10' RT. 10' LT.	120'
524 87 526 40	SH 121 "	50'RT. 33'RT.	450'
525 97 529 30	SH 121 "	100' RT. 20' RT.	801 730'
PROJECT TOTALS			1,800' 1,871

TABULATION OF GUARD RAIL

STATION TO STATION	SIDE	Type 3 Lin Ft	Type 3 Final	Type 3 (Double) Lin. Ft	Type 3 (Double) Final	End Anchors TYPE I		End Anchors TYPE III	End Anchors TYPE IV
Mainline									
511+68 – 516+05	Lt	~~437.5~~	452.5						
511+87 – 513+00	Med.	~~112.5~~							1
512+00 – 513+00	Med.	~~100.0~~	280.0	226.0					
513+00 – 515+63	Med			~~262.5~~	226.0			1	
512+20 – 516+07	Rt.	~~387.5~~	388.0						
518+07 – 522+07	Lt	~~400.0~~	559.0	369.0					
516+65 – 521+03	Med			~~437.5~~	369.0			1	
521+03 – 522+03	Med	~~100.0~~	287.0						
521+03 – 522+15	Med	~~112.5~~							
518+13 – 522+00	Rt.	~~387.5~~	525.0						
526+80 – 529+44 (647+40 'G')	Lt	~~262.5~~	263.0			1			
526+42 – 529+55	Rt.	~~312.5~~	312.5						1
526+35 – 527+85	Med	~~150.0~~							
526+72 – 527+85	Med	~~112.5~~	236.0						
527+85 – 531+10	Med			~~325.0~~	325.0			1	
Ramps									
307+00 – 312+40 Ramp 'C'	Rt.	~~550.0~~	312.5			1			~~2~~
309+70 – 312+20 Ramp 'C'	Lt	~~250.0~~				~~1~~			
399+38 – 401+00 Ramp 'D'	Rt.	~~162.5~~							~~1~~
400+60 – 401+60 Ramp 'D'	Lt.	~~62.5~~							1
636+07.5 – 638+45 Ramp 'F-G'	Med	~~237.5~~	237.5			1			1
636+25 – 638+62.5 Ramp 'F-G'	Med	~~237.5~~	237.5			1			1
640+00 – 645+00 Ramp 'G'	Lt.	~~550.0~~	552.0			1			1
704+50 – 709+00 Ramp 'H'	Rt	~~450.0~~	450.5			1			1
403+25 - 403+60 Ramp H									
Repair Rail	Rt		37.0						
PROJECT TOTALS		~~5,375.0~~ 5,130.0	5130.0	~~1,025.0~~ 920.0	920.0	~~7~~ 6		3	~~10~~ 7

TABULATION OF DELINEATORS

STATION TO STATION	SIDE	SPACING	DELINEATORS Type I Each		Type II Each		Type III Each	
516+00 to 522+00	Rt - Lt						2*	
527+60 to 647+87	Rt - Lt				6		2	
Ramp 'C'	Rt - Lt				8			
Ramp 'D'	Rt		3					
Ramp 'F'			1		33			
Ramp 'G'					8			
Ramp 'F-G'			12		6			
Ramp 'H'			1		11			
Ramp 'F''			1					
PROJECT TOTALS			18		72		4	

* Type III Delineators are to be placed on both sides of roadway approaching bridge abutments. For spacing and approx location see Sheets 39 & 40

SUMMARY OF EARTHWORK

DESCRIPTION	BOULDER COUNTY
EMBANKMENT MATERIAL (Haul & Compaction) :	
From Cross Sections	237,511
From List of Structures as Embankment	—
TOTAL	~~237,511~~ ~~253,971~~ 253,811
SOURCES FOR EMBANKMENT (Info. only) :	
From Cross Sections as Excavations	21,131
From List of Structures as Ditch Excavation	—
From List of Structures as Unclassified Excavation	18
From Re-grading	10,600
From Borrow (Undesignated)	247,676
TOTAL	279,425
COMPACTION (for Info. only)	
Embankment (From cross sections)	~~237,511~~
Bases of Cuts & Fills	~~11,034~~
From List of Structures as Embankment	—
TOTAL	~~248,545~~
	~~253,971~~ 253,811

TABULATION OF FENCING QUANTITIES

STATION TO STATION	SIDE	REMOVE FENCE Lin. Ft		BUILD COMB FENCE WIRE Lin. Ft		LINE BRACE & CORNER POST Each	LINE POST Each
518+00 – 518+50 (Service Road)	Lt	230	1,543	595	2	1	
518+50 – 521+50	Rt.	410	Alter St 96				
~~518+00 – 522+00~~ SH 121 Detour US 36	~~Lt.~~			~~415~~ 255		~~1~~	~~30~~
400 409 Ramp D	LT			881	1	1	
500 + 504	LT			584	2	1	
Ramp C 302-307	LT			658	End 2 Post	1	
PROJECT TOTAL		640	1,639	415 2,753	~~1~~ 7	~~1~~ 4	*30

* For Information Only

TABULATION OF PAVEMENT MARKING PAINT QUANTITIES

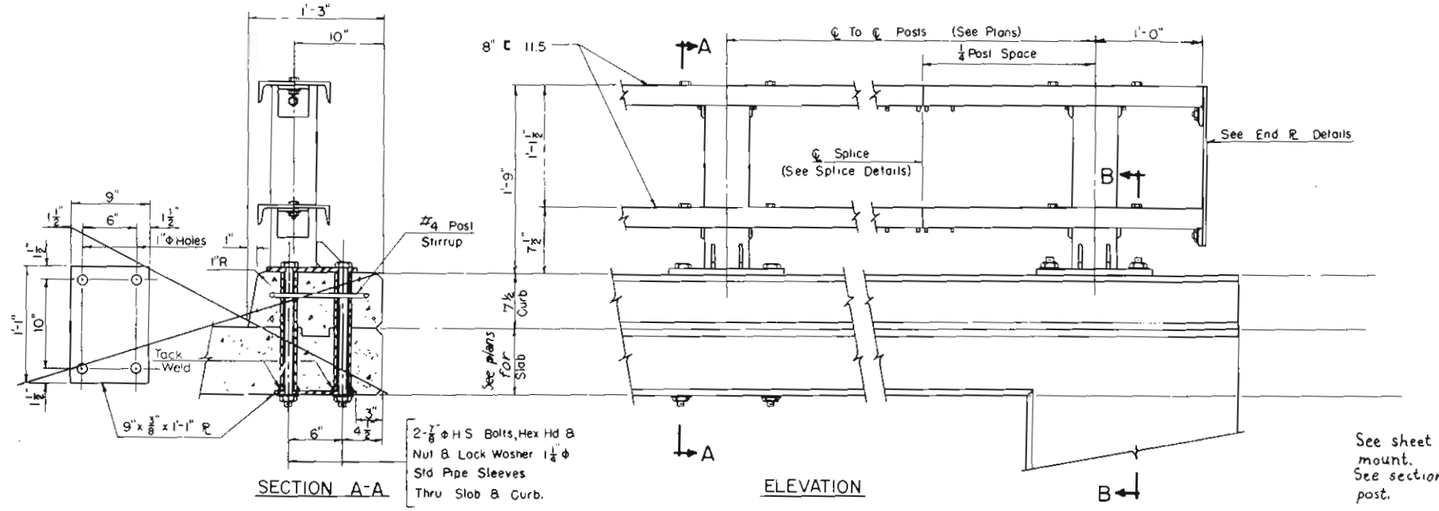
LOCATION	GAL. of Paint	LBS of BEADS
Mainline & Ramps	46	184

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
FORM D.O.H. 117
JULY 1968

FEDERAL ROAD REGION NO	DISTRICT	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	11	

REVISIONS			
R-1	11-10-71	New Sheet	MLM

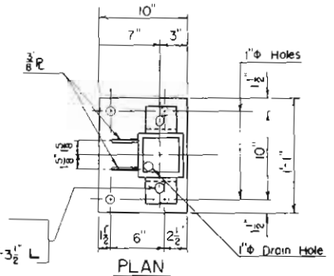
AS CONSTRUCTED
NO REVISIONS
Date Completed, AUG 2 4 1973



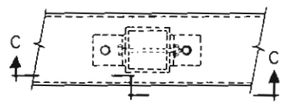
THRU SLAB MOUNTED POST
No. Req'd. 9

See sheet no. 12 for details of mount.
See section A-A for detail of post.

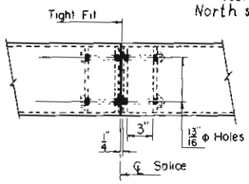
END ANCHORED POST
No. Req'd. 32
North side only.



PLAN

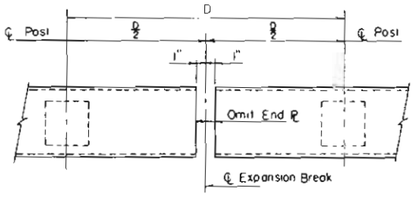


PLAN

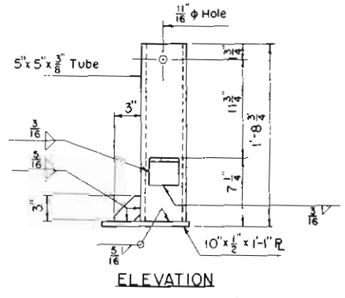


PLAN

ELEVATION

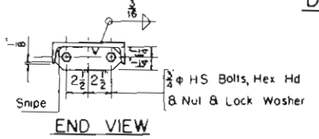


DETAIL AT EXPANSION BREAK



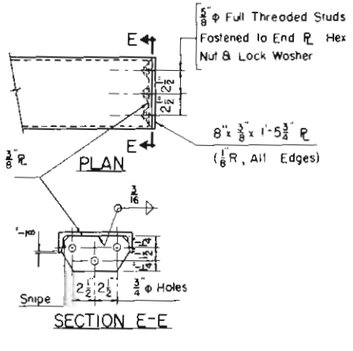
ELEVATION

POST DETAIL



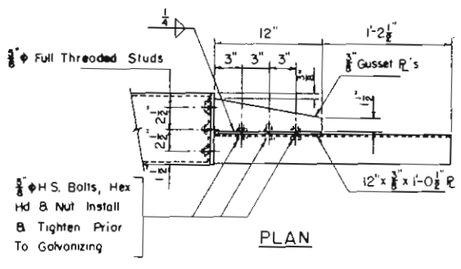
END VIEW

SPLICE DETAIL

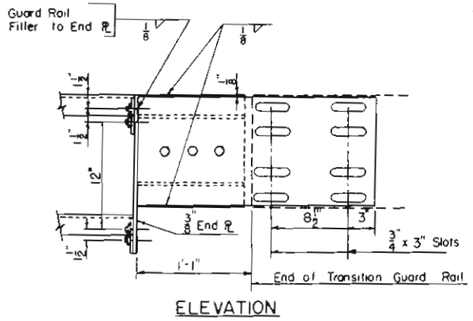


SECTION E-E

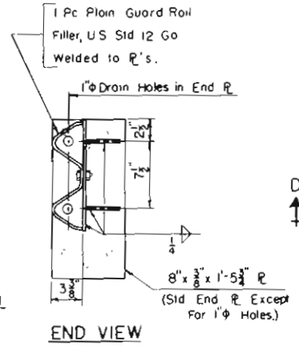
END PLATE DETAIL
No. Req'd 0



PLAN



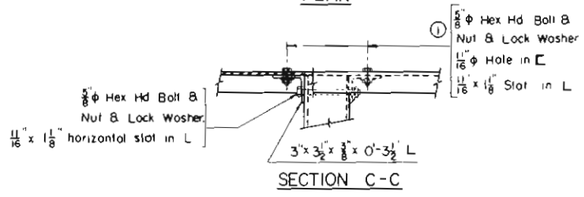
ELEVATION



END VIEW

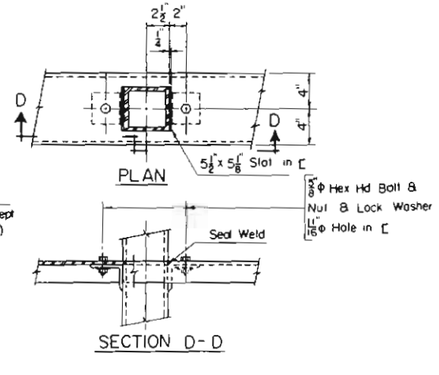
DETAIL OF END CONNECTION FOR FASTENING BRIDGE RAIL TO TRANSITION GUARD RAIL

Complete Unit Shall Be Galvanized After Fabrication
Detail Shown is For Right Hand Rail. No. Req'd 1
Opposite Hand For Left Hand Rail No Req'd 1
North side only



SECTION C-C

DETAIL AT TOP RAIL



PLAN

SECTION D-D

DETAIL AT BOTTOM RAIL

NOTES:
POSTS SHALL BE PERPENDICULAR TO GRADE AND SLOPE OF THE DECK
ALL RAIL ELEMENTS, ANCHOR ASSEMBLIES, ANCHOR BOLTS, NUTS AND WASHERS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE SPECIFICATIONS
A.I.S.I. 1160 STEEL RODS MAY BE USED IN LIEU OF H.S. BOLTS SHOWN. 10° WEDGE TEST NOT REQ. FOR EITHER BOLTS OR RODS USED IN RAIL ASSEMBLY.
(1) 5/8" Ø STANDARD FULL THREADED STUDS WELDED TO THE CHANNEL MAY BE USED. INCREASE SIZE OF SLOT IN THE ANGLE TO 13/16" X 1¼"
CHANNELS SHALL BE CONTINUOUS OVER 3 OR 4 POSTS BEFORE SPLICING
WHEN THRU SLAB MOUNTED POSTS ARE USED, PRIOR TO SETTING THE POSTS AND TIGHTENING THE NUTS & PERIMETER BEAD OF CAULKING GRADE, POLYURETHANE JOINT SEALER, SHALL BE PLACED ON THE CONCRETE 1" INSIDE THE EDGES OF THE POST BASE PLATE

DIVISION OF HIGHWAYS

DETAILS OF GALVANIZED STEEL BRIDGE RAIL

Approved	Designer B S M H	Detailer M.McMullen
Bridge Engineer	Structure Numbers	E-16-FK
Date	DWG. No. B	OF

DETAILED BY	CHECKED BY	DATE	REVISIONS	CHECKED BY	QUANTITIES BY	CHECKED BY
DETAILED BY	CHECKED BY	INITIAL		CHECKED BY	QUANTITIES BY	CHECKED BY
TGF						

REVISIONS

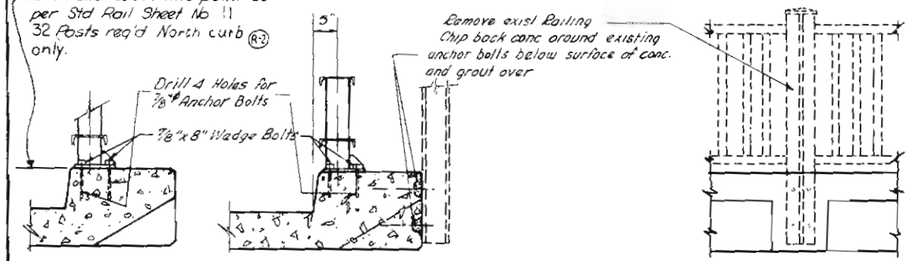
FEDERAL ROAD REGION No	DIVISION	PROJECT No	SHEET No.
9	COLORADO	EHS-F 121-1(7)	12

(R-2) 10-21-71 PDL
NOTE FOR CONSTRUCTION AND ADDED ITEMS, CHG. PROJ. NO

(R-2) 11-10-71 MLM
Revised rail note and added waterproofing (Membrane) to Quantities

(R-1)
AS CONSTRUCTED
WITH REVISIONS
Date Completed ... 19..

All details above this point as per Std Rail Sheet No 11
32 Posts req'd North curb (R-2) only.



SECTION BB

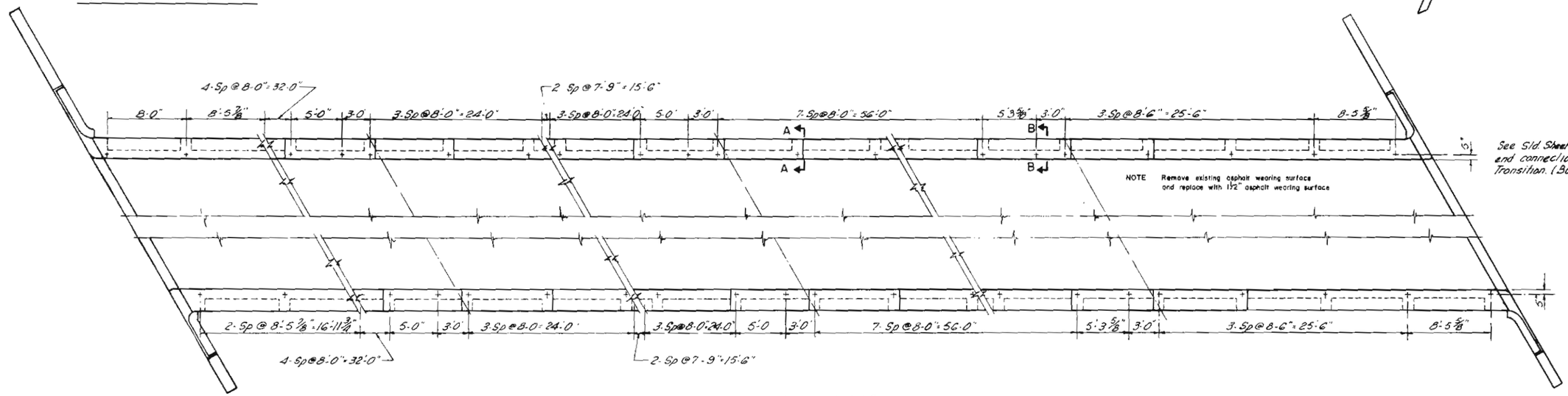
SECTION AA

EXISTING RAIL

SECTIONS AT RAIL

(R-1) Note:
Construction sequence of existing bridge (E-16-FK) for surfacing:
1. Remove existing asphalt surfacing material from bridge deck and approach slabs.
2. Repair spalls and cracks with epoxy and mortar as required.
3. Apply slurry seal coat to bridge deck.
4. Place waterproofing membrane over prepared bridge deck.
5. Construct two 3/4" courses of Hot Bituminous Pavement (DX) over the prepared deck surface.

N



See Std Sheet 11 for Detail of end connection to Guard Rail Transition. (Both ends of bridge.)

RAIL POST SPACING FOR EXISTING STRUCTURE

Notes: Drilling and grouting holes for bridge rail bolts to be included in the bid price for Item 509 Structural Steel (Galvanized)
Externally threaded wedge expansion bolts to be installed in accordance with the manufacturer's recommendations. Drill hole tolerance -0% + 10% of nominal bolt diameter.

Str. No. E-16-FK

APPROXIMATE QUANTITIES

	ITEM	DESCRIPTION	UNIT	QUANTITY	
(R-2)	515	Waterproofing (Membrane)	Sq. Yd.	775.0	
	202	Removal of Bridge Railing	Lin. Ft	228.25 229	(R-1)
	202	Removal of Mat from Bridge	Sq. Yd	720 766	① NON-FEDERAL AID
(R-1)	403	Hot Bituminous Pavement (Gr DX) (H & A)	Ton	60	
	509	Structural Steel (Galvanized)	Lbs	7800	
(R-1)	①410	Slurry Seal Coat	Gal.	800 0	(R-2)
(R-2)					
(R-1)	①519	Mortar	Bbl	4 2	
(R-1)	①519	Epoxy	Gal.	8 3	

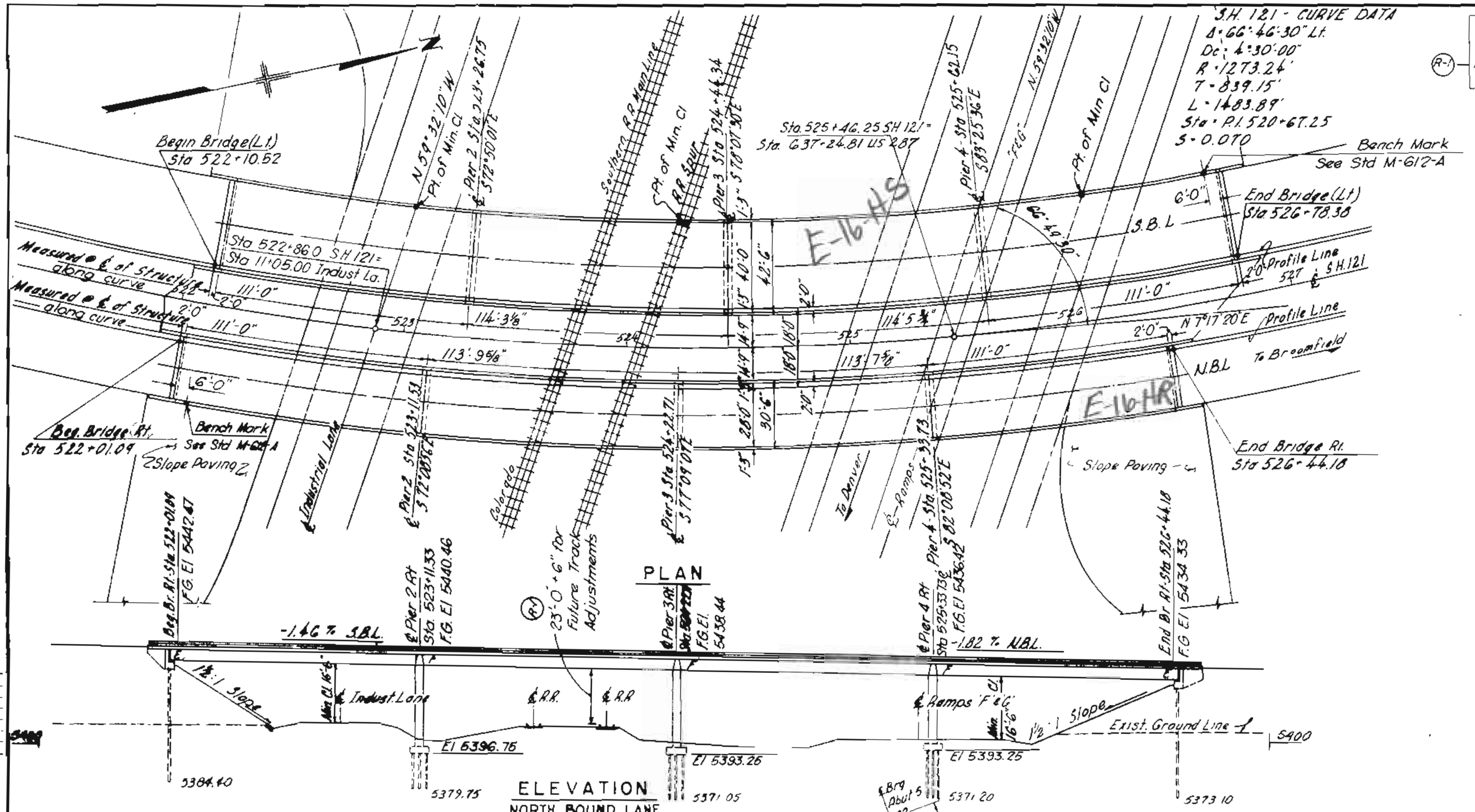
COLORADO
DEPARTMENT OF HIGHWAYS
EXISTING STRUCTURE MODIFICATIONS
Across U.S. 36
Sta. 509+74.67 to 512+06.25
Near Broomfield Sec 34 T. 1S R. 69W
Designed by BSMH
Made by P.S.
Checked by A.L.
Approved by Bridge Engineer
Date: 19

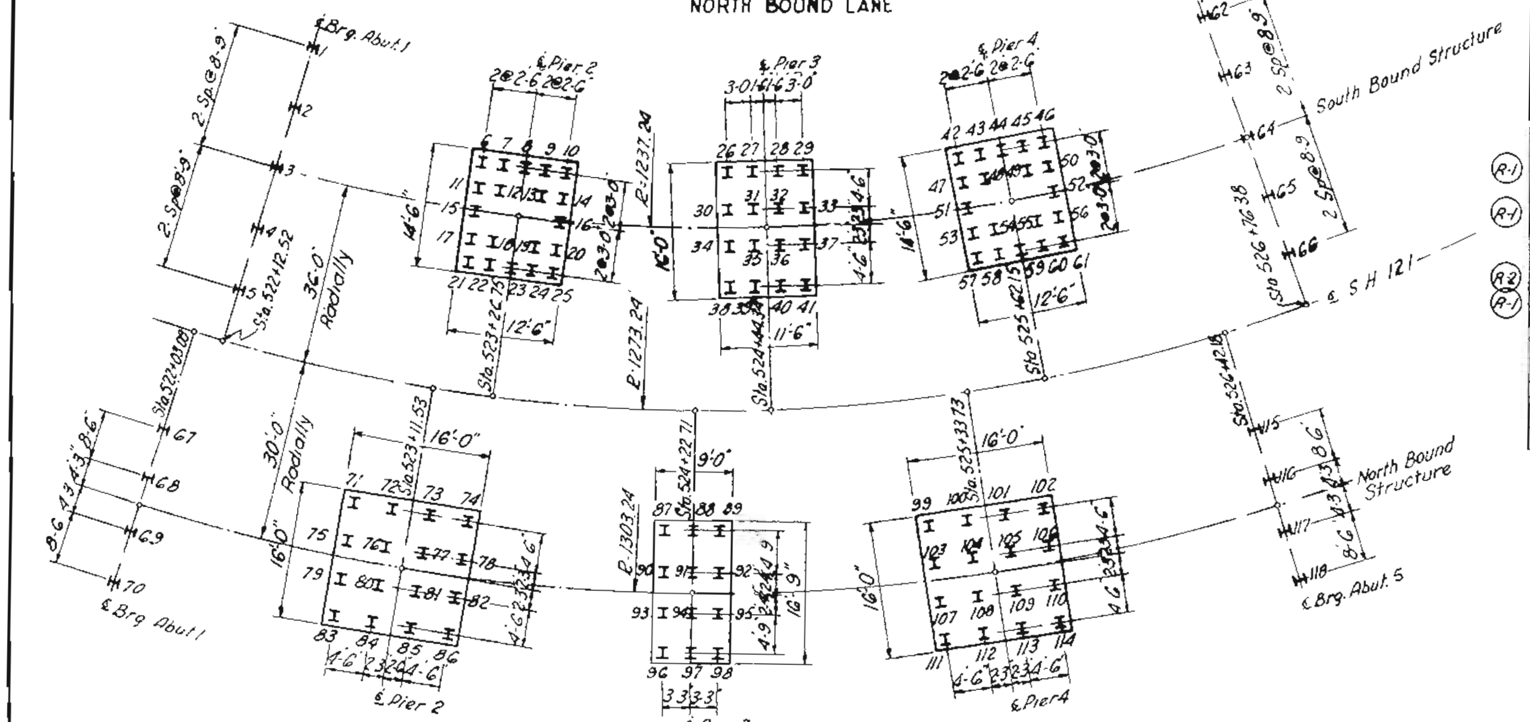
STRUCTURE NO E-16-FK

REVISIONS

(R-1) 10-21-71 P.DL	Added clearance note GLB Additional Quantities GLB CHG PROJ. NO, ADDED NOTE

FEDERAL ROAD REGION No	DIVISION	PROJECT No	SHEET No.
9	COLORADO	EHS-F 121-1(7)	13
(R-2) 11-10-71	Revised quantities		MLM





PILE & FOOTING STAKING DIAGRAM

Dimensions are at bottom of concrete

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO DEPARTMENT OF HIGHWAYS APPLICABLE TO THE PROJECT.

EXPANSION JOINT MATERIAL SHALL CONFORM TO AASHO M-213, UNLESS OTHERWISE NOTED.

ALL REINFORCING STEEL SHALL BE DEFORMED BILLET STEEL, GRADE 40,(ASTM A615). EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION, STRUCTURE NUMBER, AND STATION NUMBER OF THE PROJECT.

IF, BY PERMISSION OF THE ENGINEER, PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 40 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 24 DIAMETERS FOR BARS NEAR BOTTOM MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 24 DIAMETERS OF THE BAR.

DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTERLINE OF THE BAR.

SOUNDINGS AND DEPTH OF FOOTINGS ARE IN ACCORDANCE WITH THE BEST AVAILABLE DATA AND WHEN DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.

WHEN EXCAVATING FOR FOOTINGS THE FINAL 6 INCHES IN DEPTH SHALL BE DONE BY HAND LABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-206-A.

CONCRETE SURFACES MARKED WITH THE SYMBOL ⁄ AS SHOWN SHALL RECEIVE CLASS 2 SURFACE FINISH.

ALL STRUCTURAL STEEL SHALL BE PAINTED IN ACCORDANCE WITH ITEM 509 FOR GREEN PAINT

ALL BOLTS SHALL BE 7/8" H.S UNLESS OTHERWISE NOTED

ALL CONCRETE CHAMFERS TO BE 3/4" UNLESS OTHERWISE NOTED.

BOLTS SHALL BE FURNISHED IN THE AMOUNT OF TWO PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH

WELDING SHALL CONFORM TO THE LATEST EDITION OF THE A.W.S. STANDARD SPECIFICATIONS FOR WELDING HIGHWAY BRIDGES, AS AMENDED.

FOR WELDED GIRDERS, ALL SHOP BUTT WELDS IN FLANGES AND WEBS SHALL BE MADE BEFORE WELDING INTO GIRDER.

SHOP WELDS SHALL BE INSPECTED RADIOGRAPHICALLY OR BY THE PENETRANT DYE METHOD.

ALL STRUCTURAL STEEL NOT OTHERWISE NOTED SHALL BE A A S H O M-183

NO WELDING OF ANY KIND SHALL BE PERMITTED ON THE FLANGES OF STEEL GIRDERS UNLESS SPECIFICALLY CALLED FOR ON THE PLANS.

LOADING DATA

LIVE LOAD A A S H O HS 20-44 OR INTER. ALT.

DEAD LOAD ASSUMES 20 LBS. PER SQ. FT. AND NO PROVISION HAS BEEN MADE FOR ADDITIONAL OVERLAYS.

DESIGNING DATA

A.A.S.H.O. 1969 UNIT STRESSES.

f_c = 1,200 LBS. PER SQ. IN., n = 10

f_s = 20,000 LBS. PER SQ. IN., (A36)

SUMMARY OF QUANTITIES

	ITEM	DESCRIPTION	UNIT	SOUTH BOUND STRUCTURE SUPER STR	ABUT. 1	PIER 2	PIER 3	PIER 4	ABUT. 5	E-16-HS TOTAL	NORTH BOUND STRUCTURE SUPER STR.	ABUT. 1	PIER 2	PIER 3	PIER 4	ABUT. 5	E-16-HR TOTAL
	206	STRUCTURE EXCAVATION	CU.YD.		72	64	59	64	67	326		65	85	55	85	65	355
	206	STRUCTURE BACKFILL (CLASS 2)	CU.YD.		23	33	33	33	23	145		16	43	33	43	16	151
(R-1)	403	HOT BITUMINOUS PAVEMENT (GRAD. DX)(H BA)	TON	163	268.3	358.0	398.0	470.0	279.3	163	~~114~~	Deleted [illegible]				231.2	~~114~~
	502	STEEL PILING ~~(12BP53)~~ (10HP57) [illegible]	LIN.FT.		~~255~~	~~360~~	~~304~~	~~480~~	~~255~~	1774 ~~1594~~		268.2 ~~204~~	312 ~~200~~	285 ~~228~~	406 ~~204~~	~~204~~	1442 ~~1220~~
(R-1)	502	Reinforcing Tip (Deleted [illegible])	Ea.		5	20	16	~~20~~	~~5~~	~~66~~		~~4~~	~~78~~	~~72~~	~~78~~	~~4~~	~~52~~
	507	CONC. SLOPE & DITCH PAVING (REINF.)	CU.YD.		100.94 ~~125~~				111.58 ~~110~~	211.68 ~~235~~		100.64 ~~125~~				111.69 ~~120~~	211.[illegible] ~~245~~
	509	STRUCTURAL STEEL	LBS.	588600						588600	468400						468400
(R-2)	509	STRUCTURAL STEEL (GALVANIZED)	LBS.	36000						36000	35900						35900
(R-1)	515	Waterproofing (Membrane)	sq yd	2000						2000	~~2000~~						~~2000~~
	[illegible]8	BRIDGE EXPANSION DEVICE (TYPE 4)	LIN.FT	80						80	56						56
	[illegible]	CONCRETE CLASS "A"	CU.YD.		33	113	112	115	33	406		25	106	89	107	25	352
	601	CONCRETE CLASS "D"	CU.YD.	524						524	386						386
	602	REINFORCING STEEL	LBS.	161453 161475	2248	18621	15998	~~18391~~ 19413	2248	~~218959~~ 218981	113947	1792	14211	7344	14159	1792	153245
	502	Pile Cut off (10 HSP 57)			0	3.1	8.8	2.3	0	14.2		21	16.4	7.2	2.6	0	28.3
	613	1 1/2" Ø ELECTRICAL CONDUIT	LIN. FT			23				23	478'-6"		23				~~501'-6"~~ 580.5

(R-1) NOTES CONSTRUCTION SEQUENCE OF NEW BRIDGES (E-16-HS, E-16-HR) FOR SURFACING:

1. PLACE WATERPROOFING MEMBRANE OVER PREPARED BRIDGE DECK.
2. CONSTRUCT TWO 3/4 INCH. COURSES OF HOT BITUMINOUS PAVEMENT (GR. DX) OVER THE PREPARED DECK SURFACE.

4 SPAN CONTINUOUS

(111'-0", 114'-0", 114'-0", 111'-0")

COMPOSITE, CONCRETE SLAB AND WELDED STEEL CURVED GIRDER BRIDGE OVER U.S. 287 AND THE COLORADO & SOUTHERN RAILROAD.

E-16-HS BEGIN STA. 522+10.52
END STA. 526+78.38

E-16-HR BEGIN STA. 522+01.09
END STA. 526+44.18

STRUCTURE NO.

COLORADO DEPARTMENT OF HIGHWAYS

GENERAL LAYOUT

Across U.S 287 & Colo. & Southern R.R.
Sta. See Sheet No.
Near BROOMFIELD Sec. 34 T. 1S R. 69W

Designed by BSMH Made by DL-PS Checked by AL	Approved by Bridge Engineer Date: 19

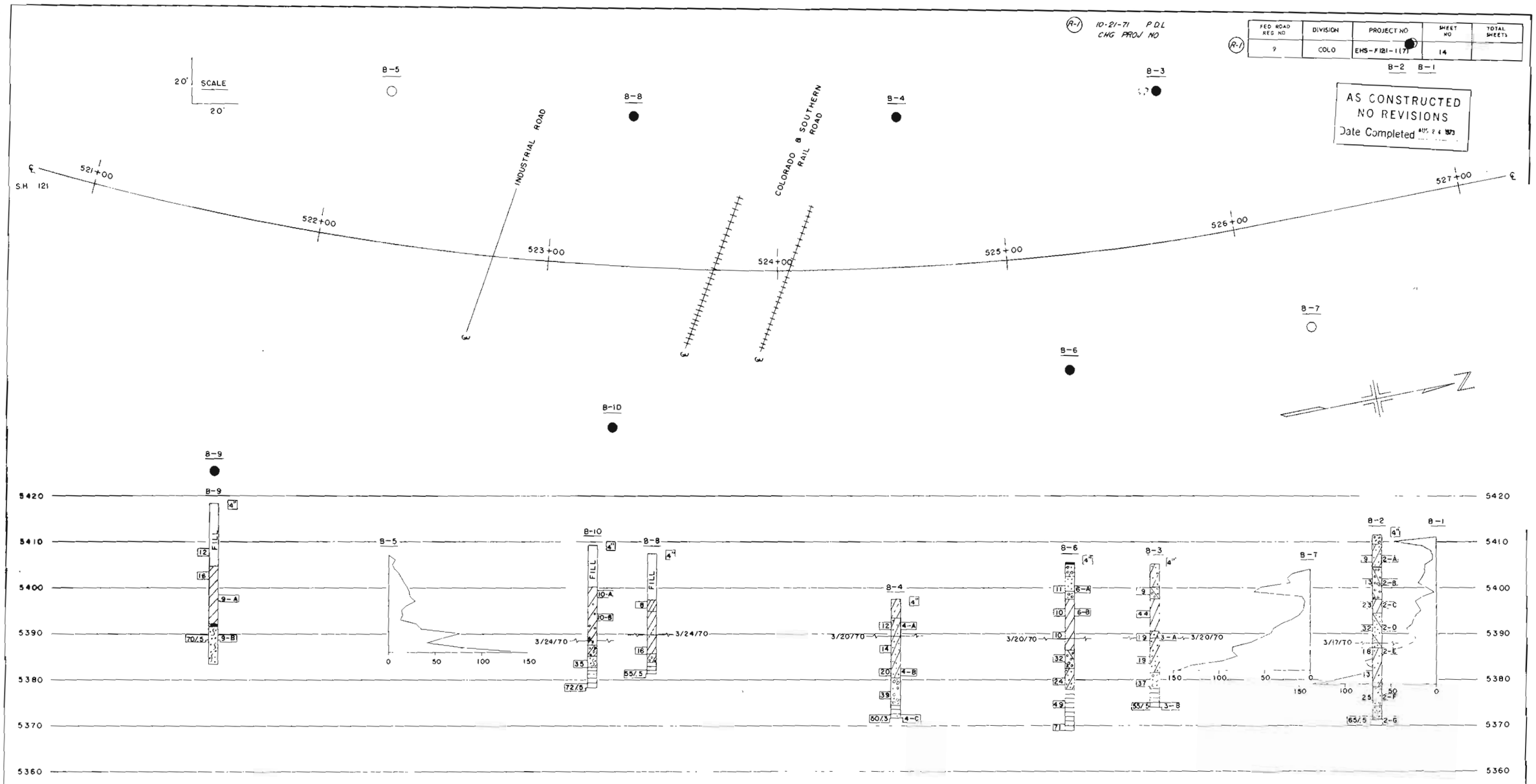
DEPT. OF HIGHWAYS
STATE OF COLORADO
FORM O.D.H 117 A
FEB. 1967

(R-1) 10-21-71 P.D.L
CHG PROJ NO

FED ROAD REG NO	DIVISION	PROJECT NO	SHEET NO	TOTAL SHEETS
(R-1) 9	COLO	EHS-F121-1(7)	14	

B-2 B-1

AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 4 1973



SUMMARY OF TEST RESULTS

Sample No	Depth	Classification: Corps of Engrs or Virmel	Classification: AASHO	Grading Analysis: Percent Gravel	Coarse Sand	Fine Sand	Silt and Clay	Atterberg Limits: Liquid Limit L_w	Plastic Limit P_w	Plastic Index I_w	Water Cont w %	Wet Unit Weight γ P.C.F	Unconfined Strength Q_u T.S.F	Triaxial Shear Strength: Unconsolidated ϕ	C T.S.F	Consolidated ϕ	C T.S.F	Time hrs	Press P.S.i.	Dia Of Sample (inches)
2-D	20.0-20.4	Sandy clay	A-6(19)	1	2	18	79	40	14	26	14.3	129.7	6.2							1.4
2-E	25.0-25.4	Sandy clay	A-7-6(22)	1	4	23	72	49	16	33	18.3	132.6	3.2							1.4
3-A	15.8-16.3	Sandy clay	A-7-6(23)	0	1	21	78	47	16	31	16.8	137.2	6.2							1.4
4-B	15.3-15.8	Sandy clay	A-6(13)	0	2	26	72	35	14	21	16.7	134.6	2.4							1.4
4-C	25.1-25.6	Shale	A-6(21)	0	0	11	89	40	16	24	12.4	135.5	6.6							1.4
6-B	10.5-11.0	Clay	A-7-6(36)	0		12	87	57	18	39	23.2	125.7	1.9							1.4
9-A	19.8-21.3	Clay	A-7-6(28)	0	1	15	84	49	16	33	16.7	118.4		36.3	0.24					2.5
9-B	28.5-29.5	Sandstone	A-6(11)	2	3	16	79	34	19	15	13.0									
10-A	9.8-11.3	Sandy clay	A-7-6(19)	1	3	22	74	45	17	28	23.3	123.7		31.0	0.37					2.5
10-B	14.8-16.3	Sandy clay	A-7-6(26)	2	2	20	76	51	16	35	19.5	129.0		53.0	0.37					2.5

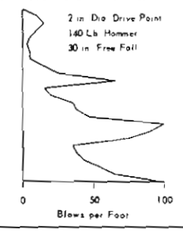
TYPE OF MATERIAL

- CLAY
- SAND
- SHALE
- CLAYEY GRAVEL
- CLAYEY SAND
- GRAVELLY CLAY
- SANDSTONE
- SAND & GRAVEL
- SANDY CLAY
- SILTY CLAY
- SANDY SHALE

LEGEND

TEST BORING

CONTINUOUS PENETRATION TEST



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

STRUCTURE NO
DWG. NO. 8 OF

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

ENGINEERING GEOLOGY

Across COL. & SOUTHERN R.R., INDUS. LANE
Sta See Sht
Near BROOMFIELD Sec T R

Geologist	K W B	Approved by	
Made by	D K D		Bridge Engineer
Checked by	G. C. P.	Date	19

REVISIONS

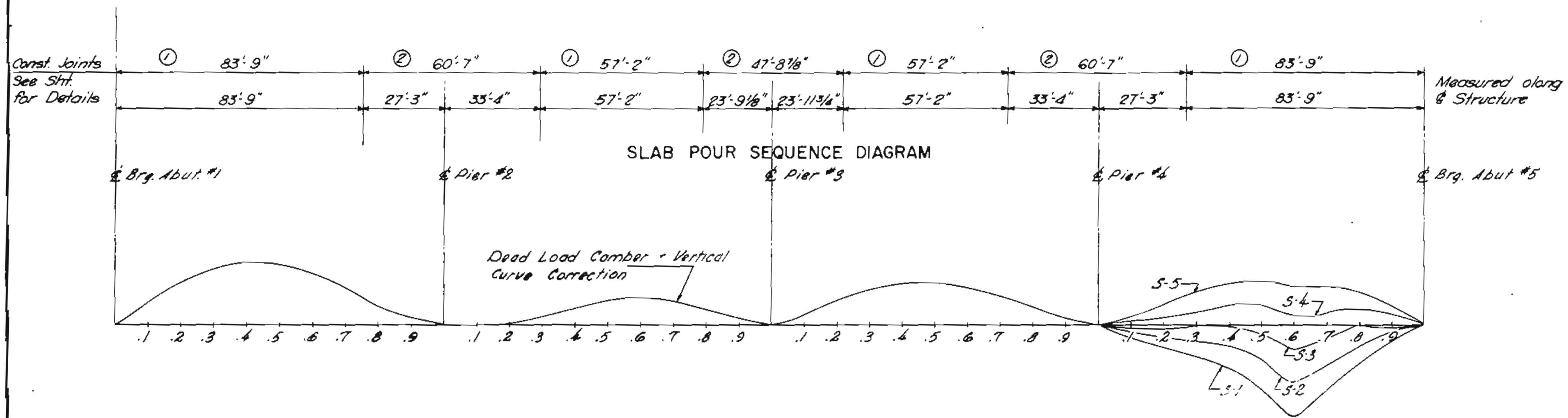
FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
9	COLORADO	EHS-F 121- . (7)	15

(R-1) Revised note GLB 10-21-71 CHG. PROJ NO - PBL.

Notes:
(R-1) Heat curving of girders will be permitted in accordance with the AASHO Interim Specifications, Interim II, 1970..

GIRDER WEBS TO REMAIN CONSTANT DEPTH.
SLAB POUR SEQUENCE SHALL BE AS SHOWN. AREAS MARKED (1) SHALL BE POURED BEFORE AREAS MARKED (2) , BUT AREAS OF THE SAME NUMBER NEED NOT BE POURED SIMULTANEOUSLY.

AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 4 1973



	.1	.2	.3	.4	.5	.6	.7	.8	.9
Span Abut. #1 – Pier #2									
Deflection Due to Slab Pour	-1/2"	-7/8"	-1 1/8"	-1 1/4"	-1 3/16"	-1"	-3/4"	-7/16"	-3/16"
Total D.L. Deflection	-11/16"	-1 5/16"	-1 11/16"	-1 7/8"	-1 13/16"	-1 1/2"	-1 1/8"	-5/8"	-1/4"
Dead Load Camber + Vertical Curve Correction	11/16"	1 5/16"	1 11/16"	1 7/8"	1 13/16"	1 1/2"	1 1/8"	5/8"	1/4"
Span Pier #2 – Pier #3									
Deflection Due to Slab Pour	+1/16"	0"	-1/8"	-1/4"	-3/8"	-5/8"	-5/16"	-3/16"	-1/16"
Total D.L. Deflection	+1/16"	0"	-3/16"	-3/8"	-9/16"	-9/16"	-7/16"	-1/4"	-1/16"
Dead Load Camber + Vertical Curve Correction	0	1/16"	5/16"	9/16"	3/4"	13/16"	3/4"	7/16"	3/16"
Span Pier #3 – Pier #4									
Deflection Due to Slab Pour	-1/16"	-3/16"	-5/16"	-3/8"	-3/8"	-5/16"	-1/8"	0"	1/16"
Total D.L. Deflection	-1/16"	-1/4"	-7/16"	-9/16"	-9/16"	-7/16"	-3/16"	0"	1/16"
Dead Load Camber + Vertical Curve Correction	5/16"	3/4"	1 1/8"	1 1/4"	1 5/16"	1 1/8"	13/16"	1/2"	3/16"
Span Pier #4 – Abut. #5									
Deflection Due to Slab Pour	-3/16"	-7/16"	-3/4"	-1"	-1 3/16"	-1 1/4"	-1 1/8"	-7/8"	-1/2"
Total D.L. Deflection	-1/4"	-5/8"	-1 1/8"	-1 1/2"	-1 13/16"	-1 7/8"	-1 11/16"	-1 5/16"	-11/16"
Dead Load Camber + Vertical Curve Correction S-1	-3/8"	-11/16"	-15/16"	-1 5/16"	-1 7/8"	-2 3/4"	-1 15/16"	-1 7/16"	-7/16"
S-2	-3/16"	-3/8"	-1/2"	-11/16"	-1 1/16"	-1 3/4"	-1 1/8"	-1/2"	-3/16"
S-3	-1/16"	-1/16"	0	-1/16"	-1/4"	-3/4"	-3/8"	0	-1/16"
S-4	1/8"	1/8"	1/2"	5/8"	9/16"	3/16"	3/8"	1/2"	3/8"
S-5	5/16"	5/8"	1"	1 1/4"	1 3/8"	1 3/16"	1 3/16"	1"	3/8"

Dead Load Camber + Vertical Curve Correction For Fabricator's use only

DEAD LOAD DEFLECTION & CAMBER DIAGRAM - SOUTH BOUND LANE

NOTE: MINUS(-) DEFLECTIONS AND CAMBER ARE DOWN
PLUS (+) DEFLECTIONS AND CAMBER ARE UP.

FINISHED GRADE ELEVATION - SOUTH BOUND LANE (TOP OF ASPHALT)

Pt.	STA.	LT. CURB Fin. Grade Elevation	S-1 Fin. Grade Elevation	S-2 Fin. Grade Elevation	S-3 Fin. Grade Elevation	S-4 Fin. Grade Elevation	S-5 Fin. Grade Elevation	RT. CURB Fin. Grade Elevation	Remarks
	52210.522	5441.476	5441.651	5442.263	5442.876	5443.488	5444.101	5444.276	Bk. Face Abut. #1
10	52212.522	5441.447	5441.622	5442.234	5442.847	5443.459	5444.072	5444.247	Cl. Brg. Abut. #1
11	52223.946	5441.280	5441.455	5442.067	5442.680	5443.292	5443.905	5444.080	
12	52235.370	5441.114	5441.289	5441.901	5442.514	5443.126	5443.739	5443.914	
13	52246.794	5440.947	5441.122	5441.734	5442.347	5442.959	5443.572	5443.747	
14	52258.218	5440.780	5440.955	5441.567	5442.180	5442.792	5443.405	5443.580	
15	52269.642	5440.613	5440.788	5441.400	5442.013	5442.625	5443.238	5443.413	
16	52281.066	5440.446	5440.621	5441.233	5441.846	5442.458	5443.071	5443.246	
17	52292.490	5440.280	5440.455	5441. 67	5441.680	5442.292	5442.905	5443.080	
18	52303.914	5440.113	5440.288	5440.900	5441.513	5442.125	5442.738	5442.913	
19	52315.338	5439.946	5440.121	5440.733	5441.346	5441.958	5442.571	5442.746	
20	52326.750	5439.779	5439.954	5440.566	5441.179	5441.791	5442.404	5442.579	Cl. Brg. Pier #2
21	52338.509	5439.608	5439.783	5440.395	5441.008	5441.620	5442.233	5442.408	
22	52350.268	5439.436	5439.611	5440.223	5440.836	5441.448	5442.061	5442.236	
23	52362.027	5439.264	5439.439	5440.051	5440.664	5441.276	5441.889	5442.064	
24	52373.786	5439.093	5439.268	5439.880	5440.493	5441.105	5441.718	5441.893	
25	52385.545	5438.921	5439.096	5439.708	5440.321	5440.933	5441.546	5441.721	
26	52397.304	5438.749	5438.924	5439.536	5440.149	5440.761	5441.374	5441.549	
27	52409.063	5438.578	5438.753	5439.365	5439.978	5440.590	5441.203	5441.378	
28	52420.822	5438.396	5438.571	5439.183	5439.796	5440.408	5441.021	5441.196	
29	52432.581	5438.214	5438.389	5439. 01	5439.614	5440.226	5440.839	5441.014	
30	52444.336	5438.029	5438.204	5438.816	5439.429	5440.041	5440.654	5440.829	Cl. Brg. Pier #3
31	52456.118	5437.832	5438.007	5438.619	5439.232	5439.844	5440.457	5440.632	
32	52467.900	5437.635	5437.810	5438.422	5439.035	5439.647	5440.260	5440.435	
33	52479.682	5437.434	5437.609	5438.221	5438.834	5439.446	5440..59	5440.234	
34	52491.464	5437.222	5437.397	5438. 09	5438.622	5439.234	5439.847	5440.022	
35	52503.246	5437.010	5437.185	5437.797	5438.410	5439.022	5439.635	5439.810	
36	52515.028	5436.789	5436.954	5437.576	5438.189	5438.801	5439.414	5439.589	
37	52526.810	5436.567	5436.742	5437.354	5437.967	5438.579	5439.192	5439.367	
38	52538.592	5436.340	5436.515	5437.127	5437.740	5438.352	5438.965	5439.140	
39	52550.374	5436.103	5436.278	5436.890	5437.503	5438.115	5438.728	5438.903	
40	52562.151	5435.867	5436.042	5436.654	5437.267	5437.879	5438.492	5438.667	Cl. Brg. Pier #4
41	52573.574	5435.631	5435.806	5436.418	5437. 31	5437.643	5438.256	5438.431	
42	52584.997	5435.386	5435.561	5436.173	5436.786	5437.398	5438.011	5438.186	
43	52596.420	5435.141	5435.316	5435.928	5436.541	5437.153	5437.766	5437.941	
44	52607.843	5434.891	5435.066	5435.678	5436.291	5436.903	5437.516	5437.691	
45	52619.266	5434.637	5434.812	5435.424	5436.037	5436.649	5437.262	5437.437	
46	52630.689	5434.377	5434.552	5435.164	5435.777	5436.389	5437.002	5437.177	
47	52642.112	5434.285	5434.451	5435.033	5435.614	5436.196	5436.777	5436.943	
48	52653.535	5434.217	5434.373	5434.920	5435.466	5436.013	5436.559	5436.715	
49	52664.958	5434.143	5434.289	5434.801	5435.312	5435.824	5436.335	5436.481	
50	52676.379	5434.063	5434.199	5434.676	5435.152	5435.629	5436.105	5436.241	Cl. Brg. Abut. #5
	52678.379	5434.051	5434.185	5434.656	5435.126	5435.597	5436.067	5436.201	Bk. Face Abut. #5

STRUCTURE NO. F-

COLORADO
DEPARTMENT OF HIGHWAYS
Finished Grade Elevations & Camber Diagram S.B.L.

Across U.S. 287; Colo. & Southern R.R.
Sta. See Sheet
Near BROOMFIELD Sec. 34 T. 1 S. R. 69 W.

Designed by BSMH
Made by PS
Checked by AL
Approved by Bridge Engineer
Date: 19

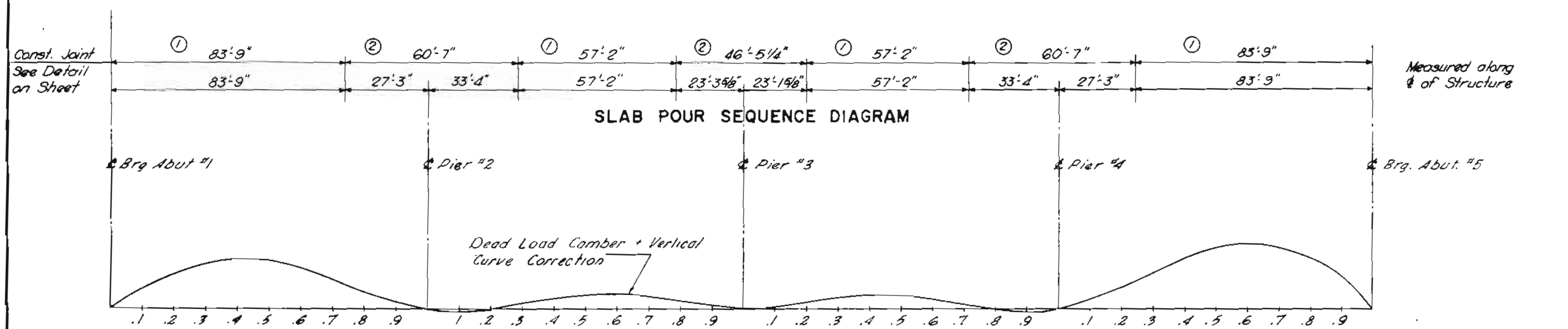
REVISIONS

(R-1) 10-21-71 PDL CHG PROJ NO

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
9	COLORADO	EHS-F 121-1 (7)	16

AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 4 1977

NOTE:
Notes on Finished Grade Elevations and Camber Diagram S.B.L. Sheet are applicable to North Bound Lanes.



SLAB POUR SEQUENCE DIAGRAM

Dead Load Deflection + Vertical Curve Correction For Fabricator's use only

Span	Gir.	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	Typ. For all Gir.	5/8"	1 1/8"	1 7/16"	1 9/16"	1 9/16"	1 5/16"	13/16"	9/16"	1/4"
2	Typ. For all Gir.	-1/16"	0	1/8"	5/16"	7/16"	1/2"	3/8"	3/16"	1/16"
3	Typ. For all Gir.	1/16"	3/16"	3/8"	7/16"	7/16"	5/16"	1/8"	0	-1/16"
4	N-1	5/16"	11/16"	1 3/16"	1 5/8"	1 7/8"	2 1/16"	1 15/16"	1 11/16"	1 1/8"
4	N-2	5/16"	3/4"	1 1/4"	1 3/4"	2 1/16"	2 1/4"	2 5/16"	1 11/16"	1 1/2"
4	N-3	3/8"	7/8"	1 3/8"	1 7/8"	2 1/4"	2 9/16"	2 11/16"	2 1/4"	1 13/16"
4	N-4	3/8"	15/16"	1 1/2"	2 1/16"	2 7/16"	2 11/16"	2 11/16"	2 9/16"	2 1/8"

Deflection due to slab pour / Total D.L. Deflection

Span	Row	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	Deflection due to slab pour	-3/8"	-11/16"	-15/16"	-1"	-15/16"	-13/16"	-9/16"	-5/16"	-1/8"
1	Total D.L. Deflection	-5/8"	-1 1/8"	-1 7/16"	-1 9/16"	-1 9/16"	-1 5/16"	-15/16"	-9/16"	-1/4"
2	Deflection due to slab pour	1/16"	0"	-1/16"	-3/16"	-5/16"	-5/16"	-1/4"	-1/8"	-1/16"
2	Total D.L. Deflection	1/16"	0"	-1/8"	-5/16"	-7/16"	-1/2"	-3/8"	-3/16"	-1/16"
3	Deflection due to slab pour	-1/16"	-1/8"	-1/4"	-5/16"	-1/4"	-3/16"	-1/16"	0"	1/16"
3	Total D.L. Deflection	-1/16"	-3/16"	-3/8"	-7/16"	-7/16"	-5/16"	-1/8"	0"	1/16"
4	Deflection due to slab pour	-1/8"	-3/8"	-5/8"	-13/16"	-1"	-1"	-15/16"	-11/16"	-3/8"
4	Total D.L. Deflection	-1/4"	-9/16"	-15/16"	-1 5/16"	-1 9/16"	-1 5/8"	-1 7/16"	-1 1/8"	-5/8"

CAMBER DIAGRAM - NORTH BOUND LANE

FINISHED GRADE ELEVATION - NORTH BOUND LANE (TOP OF ASPHALT)

LT. CURB

	STA.	FIN. GRADE ELEVATION	
	52201.039	5442.330	Bk. Face Abut. #1
10	52203.089	5442.294	Cl. Brg. Abut. #1
11	52213.934	5442.096	
12	52224.779	5441.899	
13	52235.624	5441.702	
14	52246.469	5441.504	
15	52257.314	5441.307	
16	52268.159	5441.110	
17	52279.004	5440.912	
18	52289.849	5440.715	
19	52300.694	5440.517	
20	52311.534	5440.320	Cl. Brg. Pier #2
21	52322.652	5440.118	
22	52333.770	5439.915	
23	52344.888	5439.713	
24	52356.006	5439.511	
25	52367.124	5439.308	
26	52378.242	5439.106	
27	52389.360	5438.904	
28	52400.478	5438.701	
29	52411.596	5438.499	
30	52422.713	5438.297	Cl. Brg. Pier #3
31	52433.815	5438.095	
32	52444.917	5437.893	
33	52456.019	5437.690	
34	52467.121	5437.488	
35	52478.223	5437.286	
36	52489.325	5437.084	
37	52500.427	5436.882	
38	52511.529	5436.680	
39	52522.631	5436.478	
40	52533.732	5436.276	Cl. Brg. Pier #4
41	52544.577	5436.079	
42	52555.422	5435.881	
43	52566.267	5435.684	
44	52577.112	5435.487	
45	52587.957	5435.289	
46	52598.802	5435.092	
47	52609.647	5434.893	
48	52620.492	5434.696	
49	52631.337	5434.490	
50	52642.177	5434.247	Cl. Brg. Abut. #5
	52644.177	5434.200	Bk. Face Abut. #5

N-1

	STA.	FIN. GRADE ELEVATION	
	52201.089	5442.418	Bk. Face Abut. #1
10	52203.089	5442.382	Cl. Brg. Abut. #1
11	52213.934	5442.184	
12	52224.779	5441.987	
13	52235.624	5441.790	
14	52246.469	5441.592	
15	52257.314	5441.395	
16	52268.159	5441.198	
17	52279.004	5441.000	
18	52289.849	5440.803	
19	52300.694	5440.605	
20	52311.534	5440.408	Cl. Brg. Pier #2
21	52322.652	5440.206	
22	52333.770	5440.003	
23	52344.888	5439.801	
24	52356.006	5439.599	
25	52367.124	5439.396	
26	52378.242	5439.194	
27	52389.360	5438.992	
28	52400.478	5438.789	
29	52411.596	5438.587	
30	52422.713	5438.385	Cl. Brg. Pier #3
31	52433.815	5438.183	
32	52444.917	5437.981	
33	52456.019	5437.778	
34	52467.121	5437.576	
35	52478.223	5437.374	
36	52489.325	5437.172	
37	52500.427	5436.970	
38	52511.529	5436.768	
39	52522.631	5436.566	
40	52533.732	5436.364	Cl. Brg. Pier #4
41	52544.577	5436.167	
42	52555.422	5435.969	
43	52566.267	5435.772	
44	52577.112	5435.575	
45	52587.957	5435.377	
46	52598.802	5435.180	
47	52609.647	5434.981	
48	52620.492	5434.784	
49	52631.337	5434.578	
50	52642.177	5434.330	Cl Brg. Abut. #5
	52644.177	5434.283	Bk. Face Abut. #5

N-2

	STA.	FIN. GRADE ELEVATION	
	52201.089	5443.013	Bk. Face Abut. #1
10	52203.089	5442.977	Cl. Brg. Abut. #1
11	52213.934	5442.779	
12	52224.779	5442.532	
13	52235.624	5442.385	
14	52246.469	5442.187	
15	52257.314	5441.990	
16	52268.159	5441.793	
17	52279.004	5441.595	
18	52289.849	5441.398	
19	52300.694	5441.200	
20	52311.534	5441.003	Cl. Brg. Pier #2
21	52322.652	5440.801	
22	52333.770	5440.599	
23	52344.888	5440.396	
24	52356.006	5440.194	
25	52367.124	5439.991	
26	52378.242	5439.789	
27	52389.360	5439.587	
28	52400.478	5439.384	
29	52411.596	5439.182	
30	52422.713	5438.980	Cl. Brg. Pier #3
31	52433.815	5438.778	
32	52444.917	5438.576	
33	52456.019	5438.373	
34	52467.121	5438.171	
35	52478.223	5437.969	
36	52489.325	5437.767	
37	52500.427	5437.565	
38	52511.529	5437.363	
39	52522.631	5437.161	
40	52533.732	5436.959	Cl. Brg. Pier #4
41	52544.577	5436.762	
42	52555.422	5436.564	
43	52566.267	5436.367	
44	52577.112	5436.170	
45	52587.957	5435.972	
46	52598.802	5435.775	
47	52609.647	5435.576	
48	52620.492	5435.379	
49	52631.337	5435.173	
50	52642.177	5434.895	Cl. Brg. Abut. #5
	52644.177	5434.841	Bk. Face Abut. #5

N-3

	STA.	FIN. GRADE ELEVATION	
	52201.089	5443.608	Bk. Face Abut. #1
10	52203.089	5443.572	Cl. Brg. Abut. #1
11	52213.934	5443.374	
12	52224.779	5443.177	
13	52235.624	5442.980	
14	52246.469	5442.782	
15	52257.314	5442.585	
16	52268.159	5442.388	
17	52279.004	5442.190	
18	52289.849	5441.993	
19	52300.694	5441.795	
20	52311.534	5441.598	Cl. Brg. Pier #2
21	52322.652	5441.396	
22	52333.770	5441.193	
23	52344.888	5440.991	
24	52356.006	5440.789	
25	52367.124	5440.586	
26	52378.242	5440.384	
27	52389.360	5440.182	
28	52400.478	5439.979	
29	52411.596	5439.777	
30	52422.713	5439.575	Cl. Brg. Pier #3
31	52433.815	5439.373	
32	52444.917	5439.171	
33	52456. 19	5438.968	
34	52467.121	5438.766	
35	52478.223	5438.564	
36	52489.325	5438.362	
37	52500.427	5438.160	
38	52511.529	5437.958	
39	52522.631	5437.756	
40	52533.732	5437.554	Cl. Brg. Pier #4
41	52544.577	5437.357	
42	52555.422	5437.159	
43	52566.267	5436.962	
44	52577.112	5436.765	
45	52587.957	5436.567	
46	52598.802	5436.370	
47	52609.647	5436.171	
48	52620.492	5435.974	
49	52631.337	5435.768	
50	52642.177	5435.460	Cl. Brg. Abut. #5
	52644.177	5435.400	Bk. Face Abut. #5

N-4

	STA.	FIN. GRADE ELEVATION	
	52201.089	5444.203	Bk. Face Abut. #1
10	52203.089	5444.167	Cl. Brg. Abut. #1
11	52213.934	5443.969	
12	52224.779	5443.772	
13	52235.624	5443.575	
14	52246.469	5443.377	
15	52257.314	5443.180	
16	52268.159	5442.983	
17	52279.004	5442.785	
18	52289.849	5442.588	
19	52300.694	5442.390	
20	52311.534	5442.193	Cl. Brg. Pier #2
21	52322.652	5441.991	
22	52333.770	5441.788	
23	52344.888	5441.586	
24	52356.006	5441.384	
25	52367.124	5441.181	
26	52378.242	5440.979	
27	52389.360	5440.777	
28	52400.478	5440.574	
29	52411.596	5440.372	
30	52422.713	5440.170	Cl. Brg. Pier #3
31	52433.815	5439.968	
32	52444.917	5439.766	
33	52456. 19	5439.563	
34	52467.121	5439.361	
35	52478.223	5439.159	
36	52489.325	5438.957	
37	52500.427	5438.755	
38	52511.529	5438.553	
39	52522.631	5438.351	
40	52533.732	5438.149	Cl. Brg. Pier #4
41	52544.577	5437.952	
42	52555.422	5437.754	
43	52566.267	5437.557	
44	52577.112	5437.360	
45	52587.957	5437.162	
46	52598.802	5436.965	
47	52609.647	5436.766	
48	52620.492	5436.569	
49	52631.337	5436.363	
50	52642.177	5436.024	Cl. Brg. Abut. #5
	52644.177	5435.959	Bk. Face Abut. #5

RT. CURB

	STA.	FIN. GRADE ELEVATION	
	52201.089	5444.290	Bk. Face Abut. #1
10	52203.089	5444.254	Cl. Brg. Abut. #1
11	52213.934	5444.056	
12	52224.779	5443.859	
13	52235.624	5443.662	
14	52246.469	5443.454	
15	52257.314	5443.267	
16	52268.159	5443.070	
17	52279.004	5442.872	
18	52289.849	5442.675	
19	52300.694	5442.477	
20	52311.534	5442.280	Cl. Brg. Pier #2
21	52322.652	5442.078	
22	52333.770	5441.875	
23	52344.888	5441.673	
24	52356.006	5441.471	
25	52367.124	5441.268	
26	52378.242	5441.066	
27	52389.360	5440.864	
28	52400.478	5440.661	
29	52411.596	5440.459	
30	52422.713	5440.257	Cl. Brg. Pier #3
31	52433.815	5440.055	
32	52444.917	5439.853	
33	52456.019	5439.650	
34	52467.121	5439.448	
35	52478.223	5439.246	
36	52489.325	5439.044	
37	52500.427	5438.842	
38	52511.529	5438.640	
39	52522.631	5438.438	
40	52533.732	5438.236	Cl. Brg. Pier #4
41	52544.577	5438.039	
42	52555.422	5437.841	
43	52566.267	5437.644	
44	52577.112	5437.447	
45	52587.957	5437.249	
46	52598.802	5437.052	
47	52609.647	5436.853	
48	52620.492	5436.656	
49	52631.337	5436.450	
50	52642.177	5436.108	Cl. Brg. Abut. #5
	52644.177	5436.041	Bk. Face Abut. #5

STRUCTURE NO. E-...

COLORADO
DEPARTMENT OF HIGHWAYS

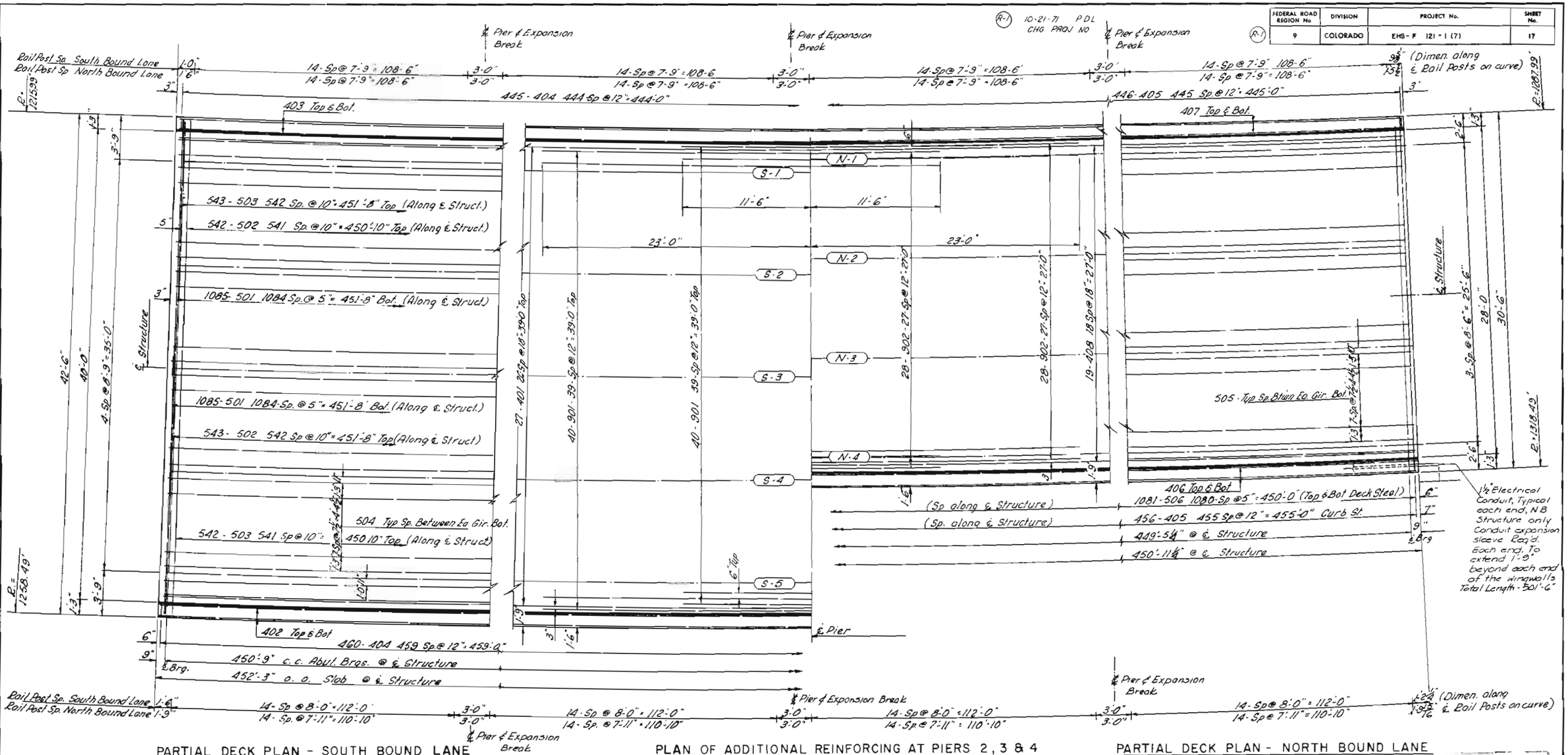
Finished Grade Elevations & Camber Diagram N.B.L.
Across U.S. 287; Colo. & Southern R.R.
Sta. See Sheet
Near BROOMFIELD Sec. 34 T. 1 S R. 69 W

Designed by BSMH
Made by P.S.
Checked by A.L.
Approved by Bridge Engineer
Date: 19

REVISIONS

(R-1) 10-21-71 PDL CHG PROJ NO

FEDERAL ROAD REGION No	DIVISION	PROJECT No.	SHEET No.
9	COLORADO	EHS-F 121-1(7)	17

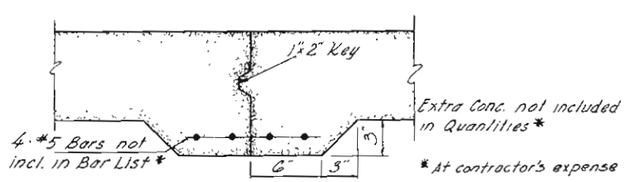


PARTIAL DECK PLAN - SOUTH BOUND LANE

PLAN OF ADDITIONAL REINFORCING AT PIERS 2, 3 & 4

PARTIAL DECK PLAN - NORTH BOUND LANE

Note: Transverse lines of reinforcing steel shall be placed 2" clear from outside edges, with varing lap.



OPTIONAL CONSTRUCTION JOINT FOR SLAB POUR

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

INSTRUCTED REVISIONS Completed AUG. 4 1972

COLORADO
DEPARTMENT OF HIGHWAYS

DECK PLAN

Across US 287, Colo. & Southern R.R.
Sta. See Sht
Near BROOMFIELD Sec. 34 T. 1S R. 69 W

Designed by BSMH	Approved by
Made by P.S	Bridge Engineer
Checked by A.L.	Date: 19

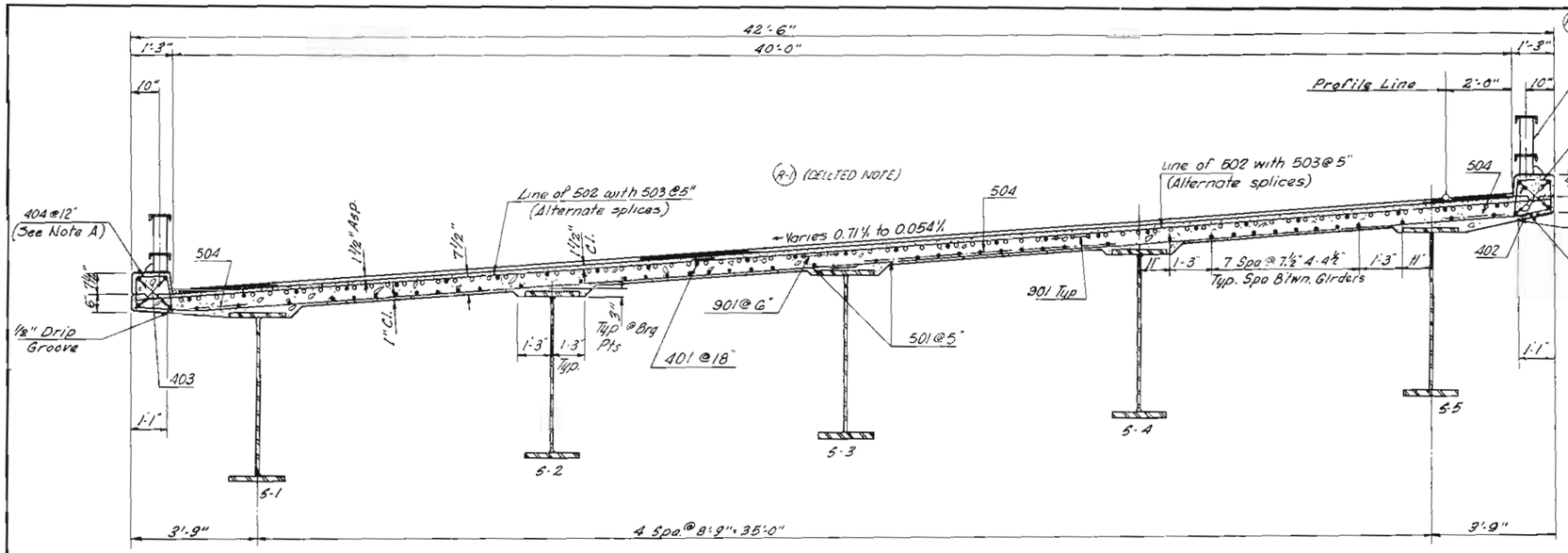
STRUCTURE NO.

REVISIONS

(R-1) 10-21-71 PDL
CHG PROJ NO, DELETED NOTE (R-1)
For Details of Galvanized Bridge Rail including reinforcing See Dwg

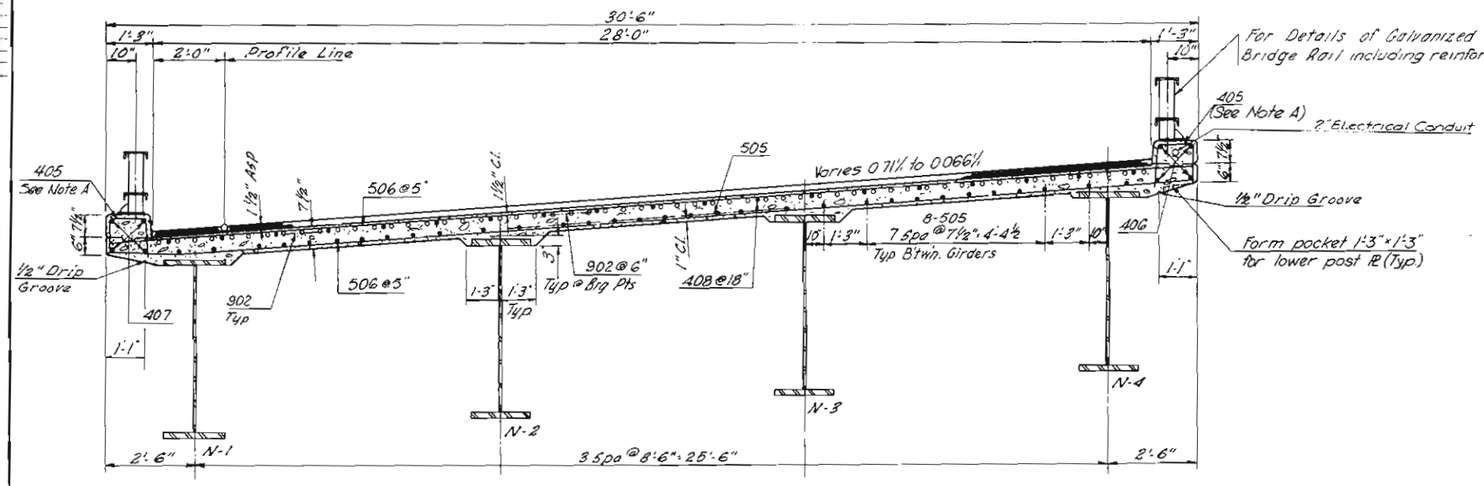
FEDERAL ROAD REGION No	DIVISION	PROJECT No	SHEET No
9	COLORADO	EHS-F (21-1(7)	18

CONSTRUCTED
REVISIONS
Date Completed

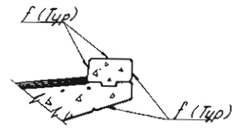


Note A: These bars may be placed after the slab is poured, but before final set

TYPICAL SECTION - SOUTH BOUND LANE
(RADIAL ~ UP STA.)



TYPICAL SECTION - NORTH BOUND LANE
(RADIAL ~ UP STA.)



SLAB FINISH DETAIL

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

COLORADO
DEPARTMENT OF HIGHWAYS

TYPICAL SECTIONS
S.B.L. & N.B.L.

Across U.S. 287; Colo. & Southern R.R.
Sta See Sht
Near BROOMFIELD Sec 34 T. 1S R. 69W.

Designed by BSMH	Approved by
Made by P.S	Bridge Engineer
Checked by A.L.	Date: 19

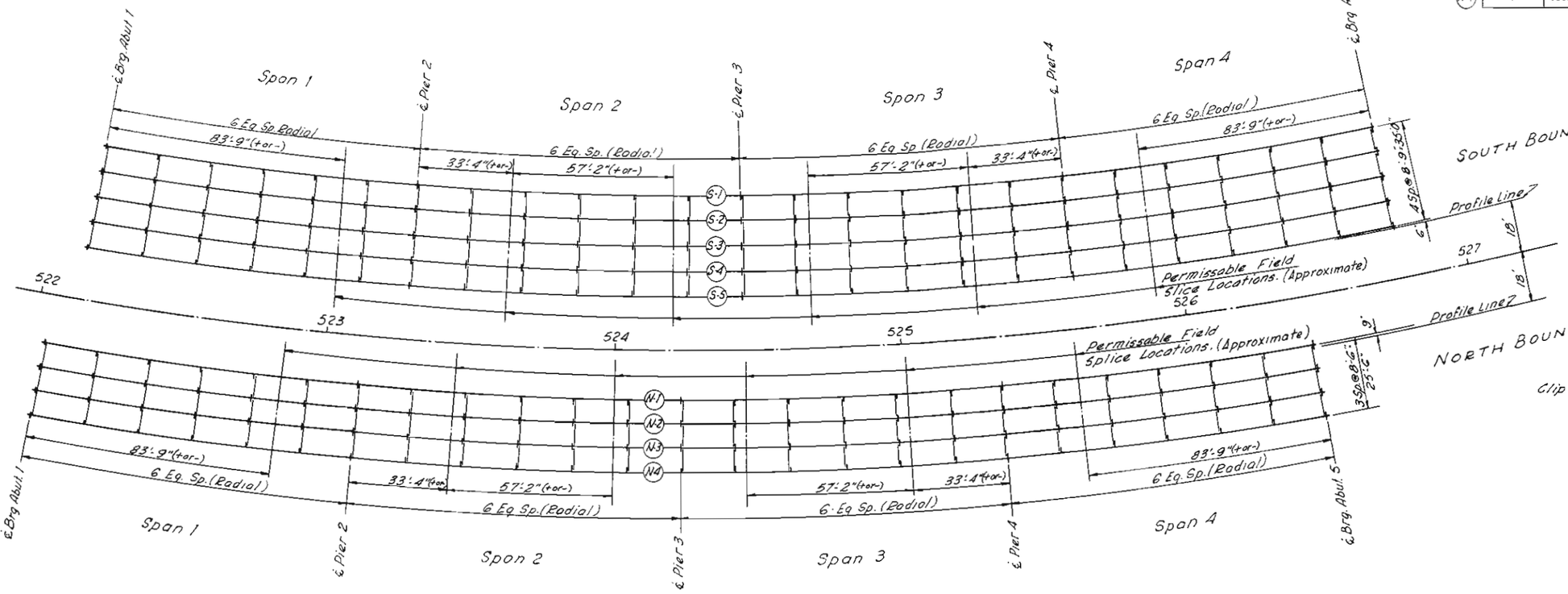
STRUCTURE NO.

REVISIONS

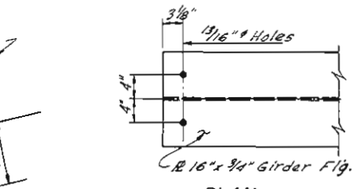
(R-1) 10-21-71 P.D.L. CHG PROJ NO

FEDERAL ROAD REGION No	DIVISION	PROJECT No.	SHEET No.
(R-1) 9	COLORADO	BHS - F 121-1 (7)	19

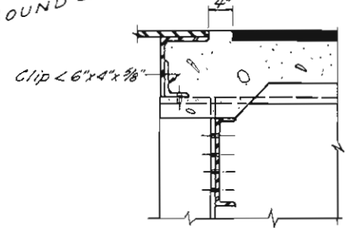
CONSTRUCTED REVISIONS to be Completed [illegible]



ERECTION DIAGRAM

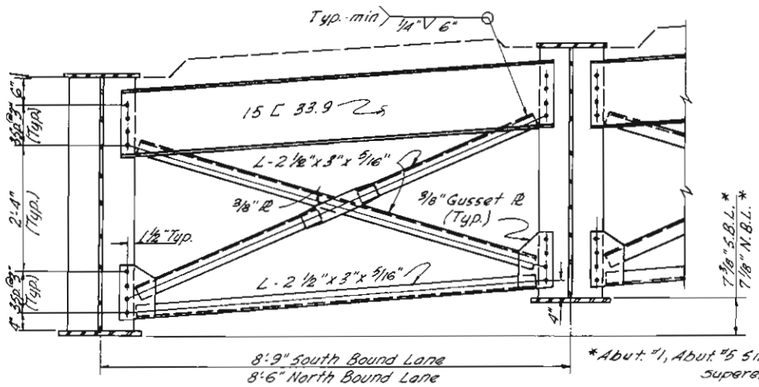


PLAN

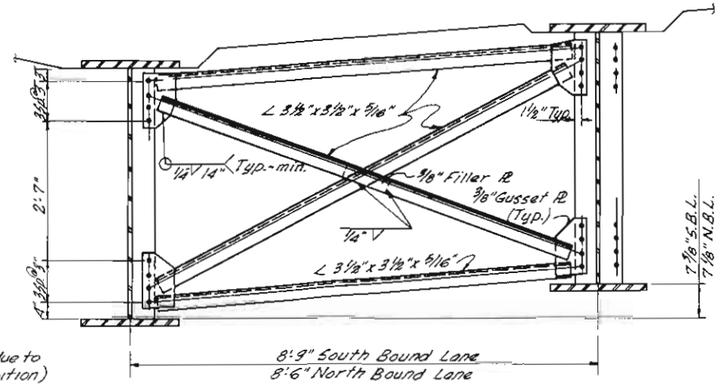


ELEVATION

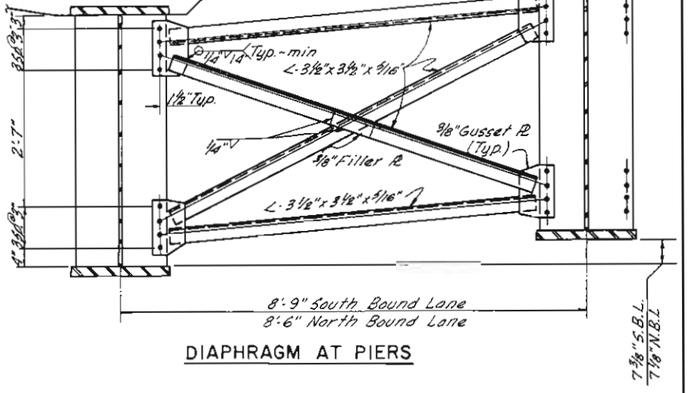
TYP. GIRDER END CLIP DETAIL



END BEAMS AT ABUTMENTS



INTERMEDIATE DIAPHRAGMS



DIAPHRAGM AT PIERS

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

COLORADO
DEPARTMENT OF HIGHWAYS

FRAMING PLAN

Across U.S. 287; Colo. & Southern R.R.
Sta. See Sht
Near BROOMFIELD Sec 34 T. 1 S. R. 69 W.

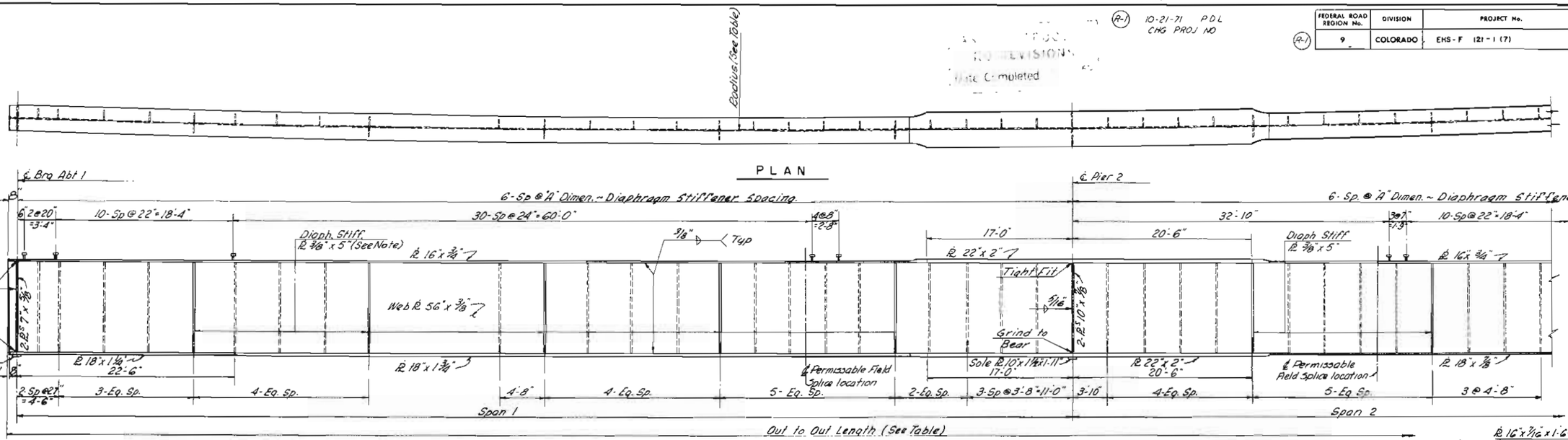
Designed by BSMH	Approved by
Made by P.S.	Bridge Engineer
Checked by A.L.	Date: 19

STRUCTURE NO

REVISIONS

(R-1) 10-21-71 PDL CHG PROJ NO

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
(R-1) 9	COLORADO	EHS-F (21-1(7))	20

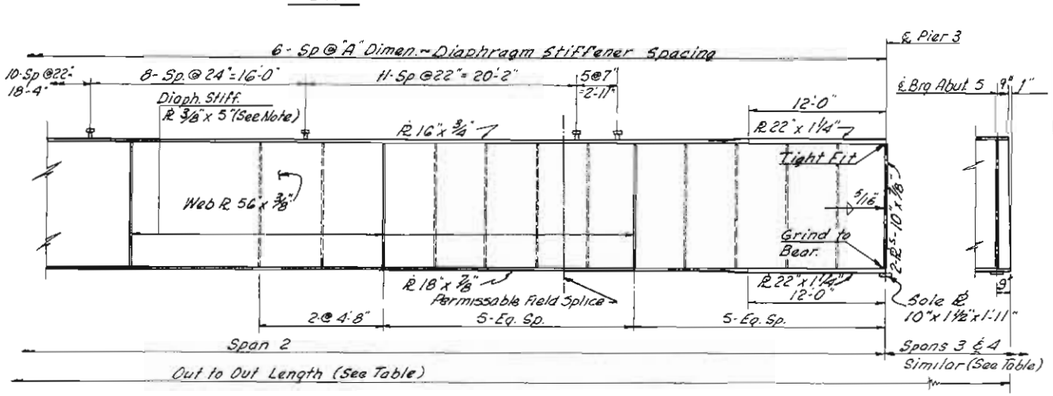


ELEVATION OF GIRDER

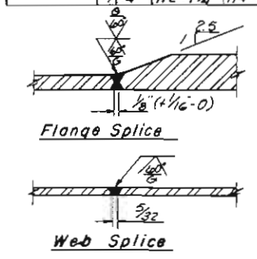
Note: Bearing stiffeners shall be plumb with girder in erected position.

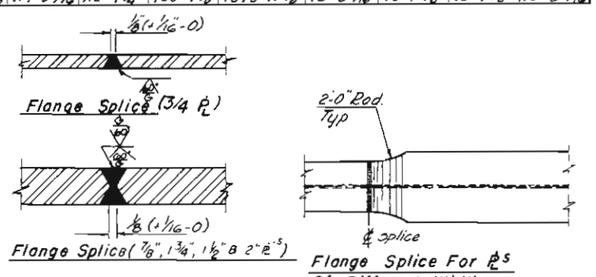
TABLE OF LENGTHS AND SPACING NOTE Diaph Stiff PLs inside only on S-1 & S-5, N-1 & N-4. Both sides on all other girders.

	GIRDER	"L" (SPAN LENGTHS) C.C. BRG. SPAN 1	SPAN 2	SPAN 3	SPAN 4	OUT-OUT LENGTH	℄ RADIUS	"A" (DIAPHRAGM STIFF. SP.) @ (L/6) SPAN 1	SPAN 2	SPAN 3	SPAN 4
South Bound Lane	S-1	109'-5 3/16"	112'-7 5/16"	112'-10 3/8"	109'-5 1/8"	445'-11 3/8"	1219'-8 3/8"	18'-2 1/8"	18'-9 5/16"	18'-9 3/4"	18'-2 15/16"
	S-2	110'-2 3/4"	113'-5 3/16"	113'-8 5/16"	110'-2 15/16"	449'-1 7/8"	1228'-5 7/8"	18'-4 7/16"	18'-10 5/16"	18'-11 3/16"	18'-4 1/2"
	S-3	111'-0 1/8"	114'-3 5/16"	114'-6 1/16"	111'-0 3/8"	452'-3 7/8"	1237'-2 7/8"	18'-6"	19'-0 3/16"	19'-1"	18'-6 1/16"
	S-4	111'-9 5/16"	115'-1"	115'-3 3/8"	111'-9 3/4"	455'-6 1/16"	1245'-11 7/8"	18'-7 3/16"	19'-2 3/16"	19'-2 5/8"	18'-7 5/8"
	S-5	112'-7"	115'-10 5/16"	116'-1 1/2"	112'-7 7/16"	456'-8 5/8"	1254'-8 1/8"	18'-9 1/16"	19'-3 3/4"	19'-4 1/4"	18'-9 5/16"
North Bound Lane	N-1	109'-11 3/16"	112'-8 5/16"	112'-6 1/4"	109'-11 3/16"	446'-7 5/16"	1290'-5 5/8"	18'-3 1/8"	18'-9 3/8"	18'-9 1/16"	18'-3 1/8"
	N-2	110'-7 1/8"	113'-5 3/8"	113'-3 3/8"	110'-7 1/8"	449'-6 1/4"	1298'-11 1/8"	18'-5 5/16"	18'-10 1/8"	18'-10 1/16"	18'-5 5/16"
	N-3	111'-4 3/16"	114'-2 1/4"	114'-0 1/4"	111'-4 1/16"	452'-5 5/8"	1307'-5 1/8"	18'-6 3/4"	19'-0 1/8"	19'-0 1/16"	18'-6 3/4"
	N-4	112'-1 1/2"	114'-11 3/16"	114'-9 7/16"	112'-1 1/2"	455'-4 1/8"	1315'-11 1/8"	18'-8 3/16"	19'-1 7/8"	19'-1 1/2"	18'-8 3/16"

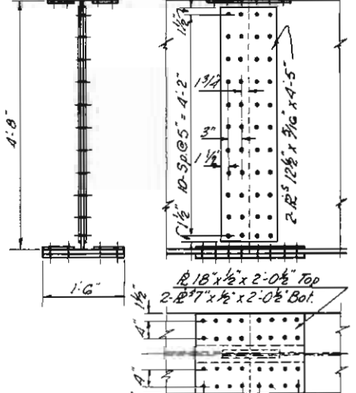


ELEVATION OF GIRDERS
(See Note above)

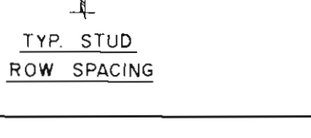




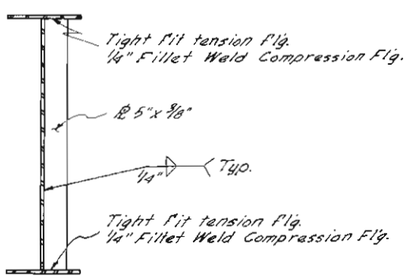
SHOP SPLICE DETAILS



TYPICAL FIELD SPLICE
(See Erection Diagram for Locations of Field Splice Pts.)



TYP. STUD ROW SPACING



INTERMEDIATE STIFFENER
Diaphragm Stiffener Conn. Similar

Note: For compression flange welding, the compression area is defined as the area of shear connectors.

COLORADO
DEPARTMENT OF HIGHWAYS

GIRDER DETAILS

Across U.S. 287; Colo. & Southern R.R.
Sta See Sht
Near BROOMFIELD Sec. 34 T. 1S. R. 69W

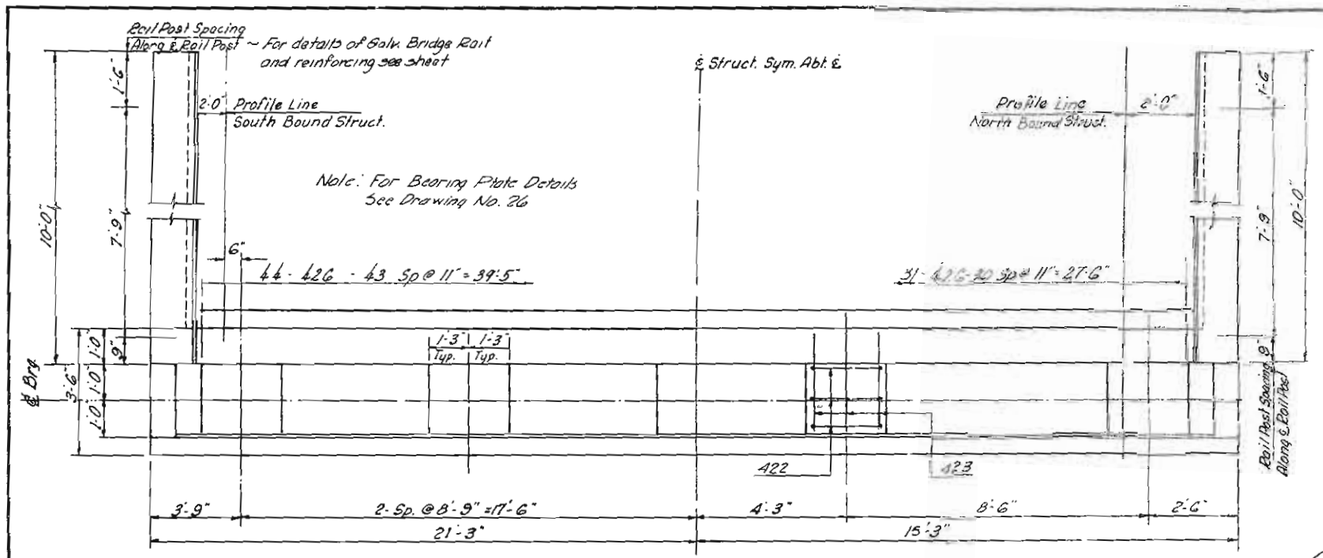
Designed by BSMH | Approved by
Made by P.S. | Bridge Engineer
Checked by A.L. | Date: 19

STRUCTURE NO

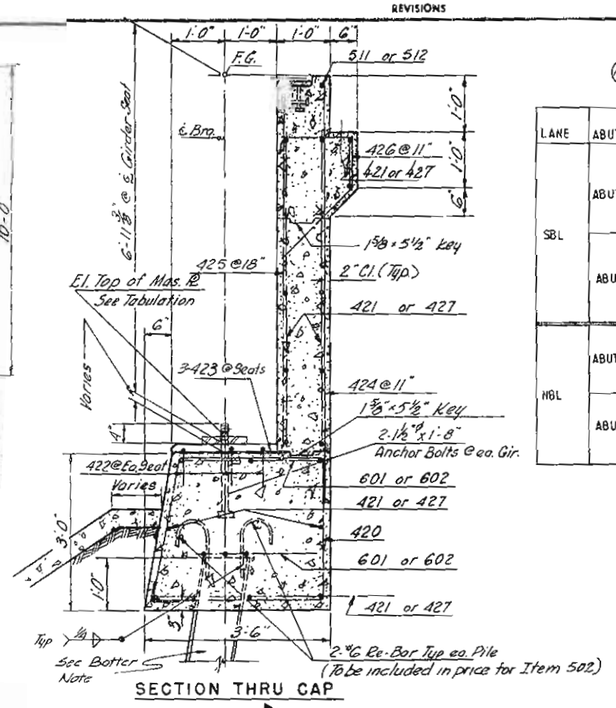
REVISIONS

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
9	COLORADO	EHS - F 181-1 (7)	81

(R-1) 10-8-71 CHG. PROJ NO. - ADL
(R-1) Revised note GLB



PLAN



SECTION THRU CAP

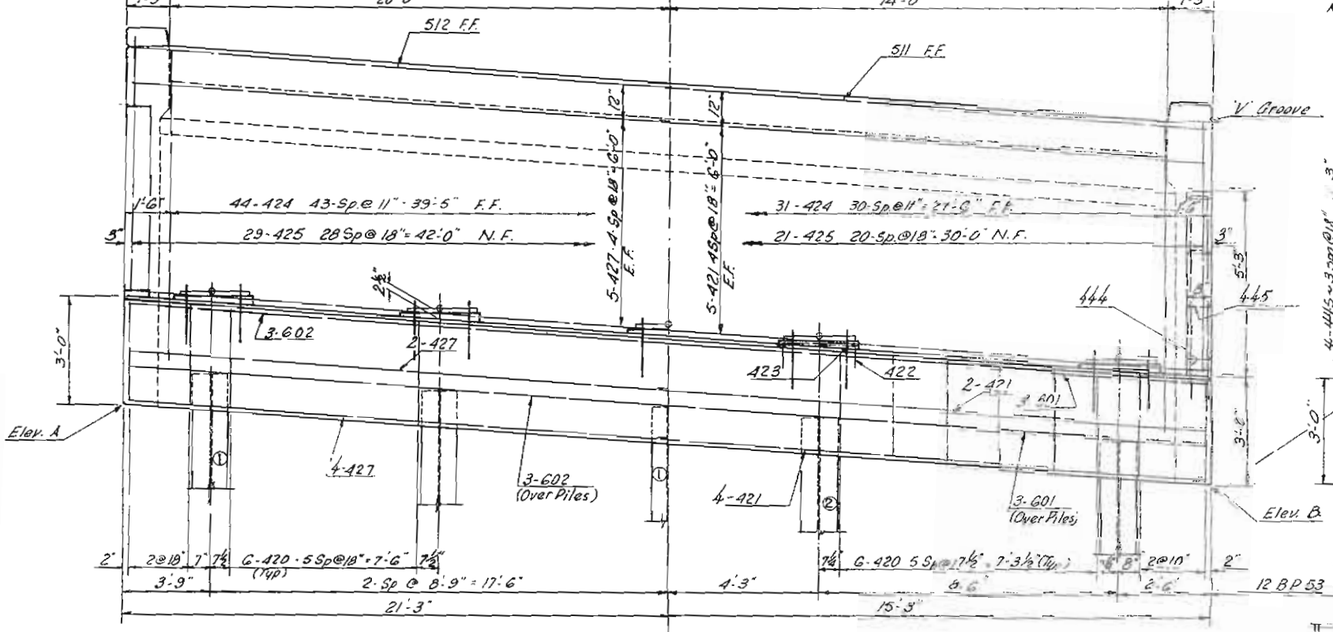
LANE	ABUT	GIR. NO.	ELEV. @ TOP OF MASONRY ℞	ELEV. A	ELEV. B
SBL	ABUT 1	S-1	5434.80	5434.18	5431.20
		S-2	5435.41		
		S-3	5436.02		
		S-4	5436.64		
		S-5	5437.25		
	ABUT 5	S-1	5427.36	5423.82	5426.15
		S-2	5427.85		
		S-3	5428.33		
		S-4	5428.81		
		S-5	5429.26		
NBL	ABUT 1	N-1	5435.56	5434.18	5432.05
		N-2	5436.15		
		N-3	5436.75		
		N-4	5437.34		
	ABUT 5	N-1	5427.51	5424.01	5426.03
		N-2	5428.07		
		N-3	5428.64		
		N-4	5429.20		

Note: Abutment cap, parapet and wing walls shall be poured monolithically to each const. jt.

AS CONSTRUCTED
NO REVISIONS
Date Completed 8-4-72

SOUTH BOUND STRUCT. ABUT. No. 5
(ABUT. No. 1 SIMILAR)

NORTH BOUND STRUCT. ABUT. No. 1
(ABUT. No. 5 SIMILAR)

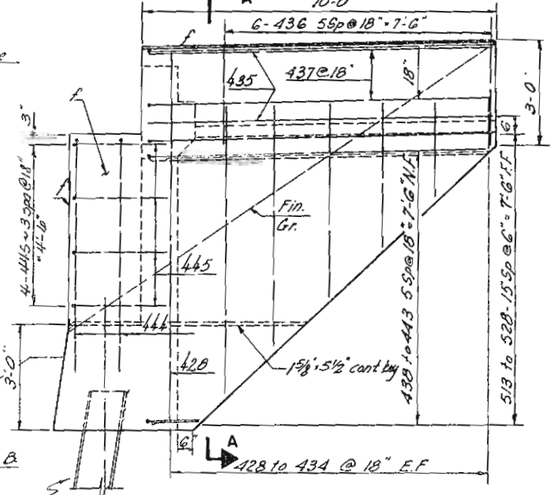


SOUTH BOUND STRUCT. ABUT. No. 5
(ABUT. No. 1 SIMILAR)

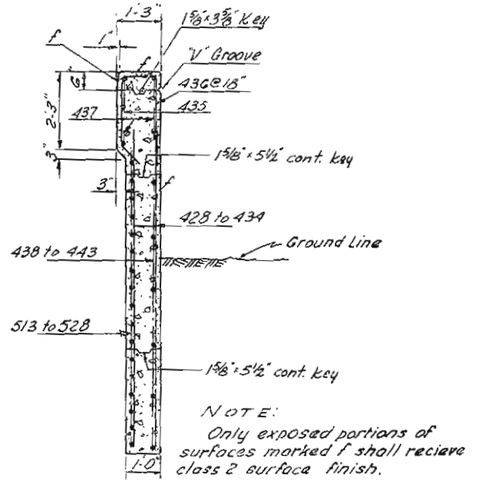
NORTH BOUND STRUCT. ABUT. No. 1
(ABUT. No. 5 SIMILAR.)

Notes:
All piles to be end bearing piles
Estimated pile length is 51 ft at all Abuts.
N.F. = Near Face. F.F. = For Face. E.F. = Each Face

NOTE: ① S.B. Lanes, both Abuts N. & S. Batter Center and Outer 2 piles @ 4:12
② N.B. Lanes, both Abuts N. & S. Batter Center 2 piles @ 4:12

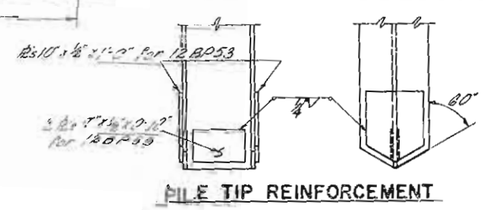


ELEVATION OF WING



NOTE:
Only exposed portions of surfaces marked f shall recieve class 2 surface finish.

SECTION A-A



PILE TIP REINFORCEMENT

(R-1)

STRUCTURE NO.

COLORADO
DEPARTMENT OF HIGHWAYS
ABUTMENT DETAILS
S.B.L. & N.B.L.
Across U.S. 287 & Colo. & Southern R.R. Sta. See Shl.
Near BROOMFIELD Sec. 34 T. 1 S. R. 69 W

Designed by BSMH	Approved by
Made by F.S.	Bridge Engineer
Checked by A.L.	Date: 19

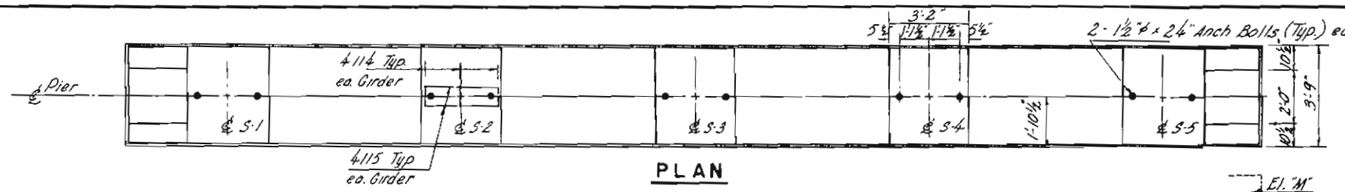
	Initial	Date
Designed By		
Checked By		
Drawn By		
Checked By		
Traced By		
Used By		

REVISIONS

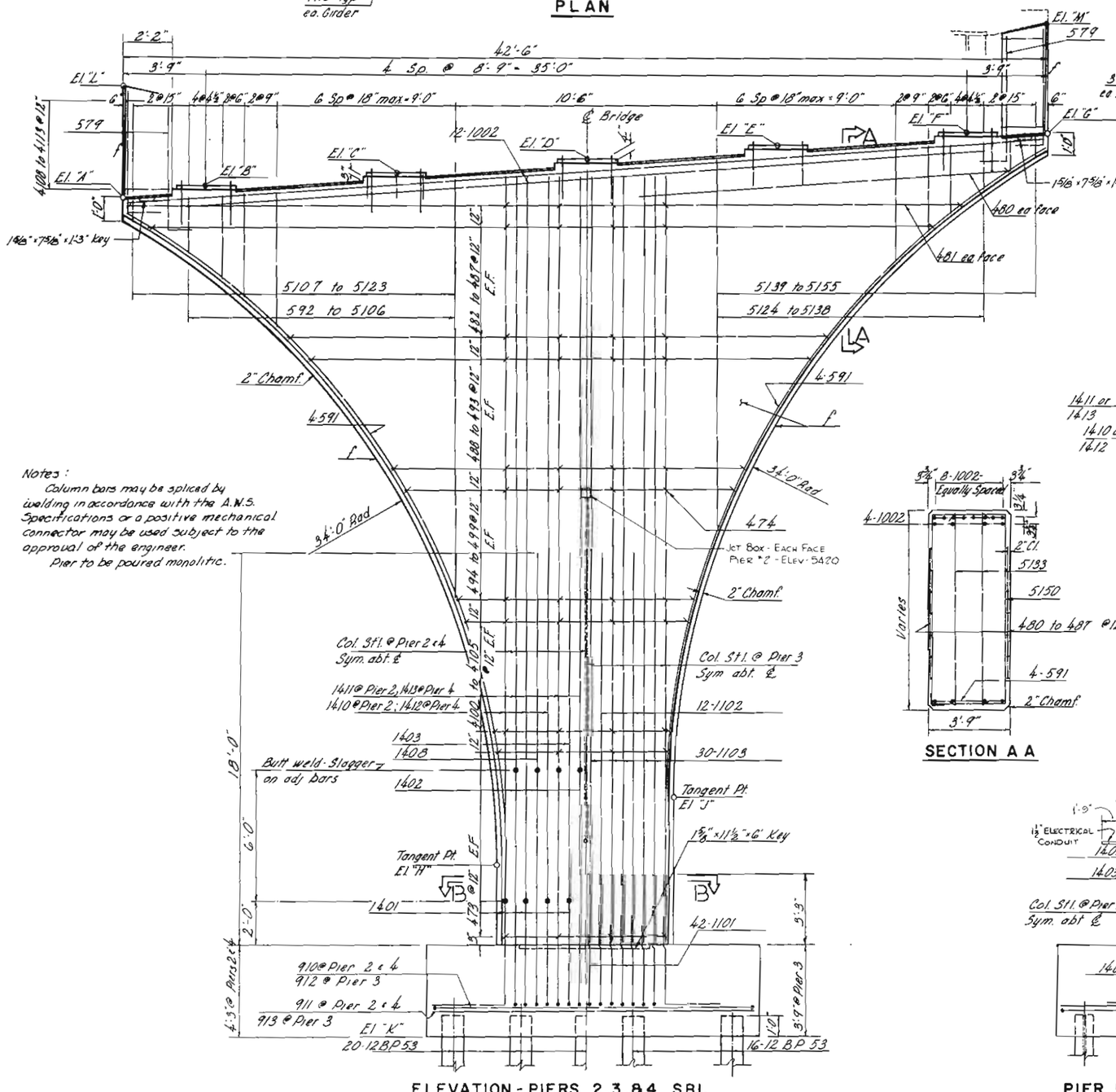
(R-1) 10-21-71 PDL CHG. PROJ. NO

CONSTRUCTED AS REVISION Date Completed

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
(R-1) 9	COLORADO	EHS-F 121-1(7)	22



PLAN

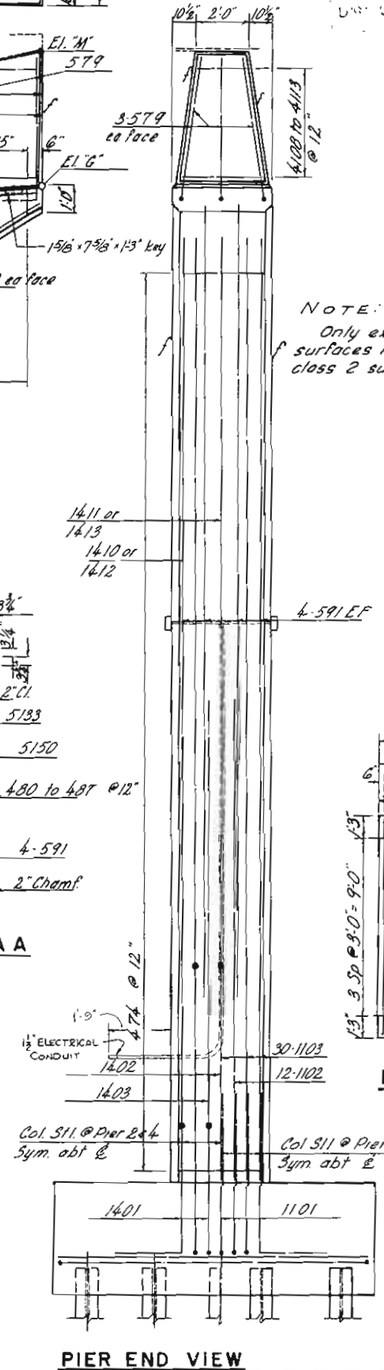


ELEVATION - PIERS 2,3,&4 SBL

Notes:

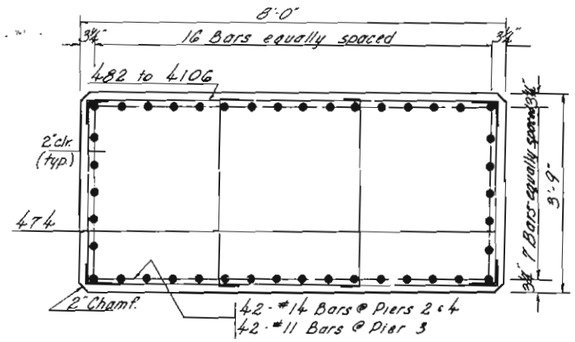
Column bars may be spliced by welding in accordance with the A.W.S. Specifications or a positive mechanical connector may be used subject to the approval of the engineer.

Pier to be poured monolitic.



PIER END VIEW

SECTION A A

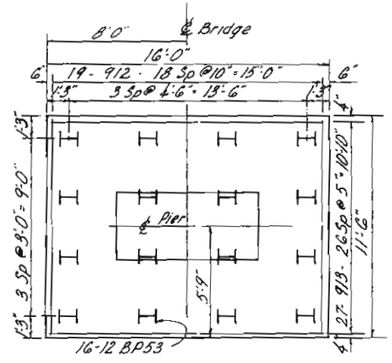


NOTE:
Only exposed portion of f surfaces marked f shall recieve class 2 surface finish.

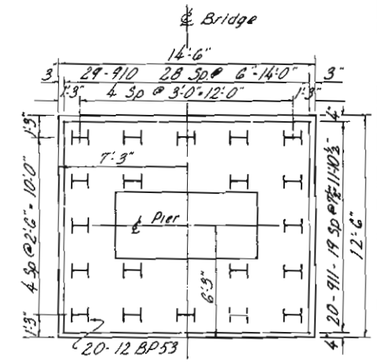
SECTION B B

DESCRIPTION	PIER 2	PIER 3	PIER 4
EL. "A"	5433.44	5431.75	5429.53
EL. "B" S-1	5433.99	5432.31	5430.08
EL. "C" S-2	5434.61	5432.92	5430.70
EL. "D" S-3	5435.22	5433.53	5431.31
EL. "E" S-4	5435.83	5434.15	5431.92
EL. "F" S-5	5436.45	5434.76	5432.53
EL. "G"	5436.42	5434.73	5432.50
EL. "H"	5402.85	5401.17	5398.94
EL. "J"	5405.83	5404.14	5401.92
EL. "K"	5396.75	5393.25	5393.75
EL. "L"	5438.98	5437.23	5435.01
EL. "M"	5441.78	5440.03	5437.87

TOP OF MASON. ℄ ELEVATION



FOOTING PLAN-PIER 3



FOOTING PLAN-PIER 2&4

Note: All Piles to be End Bearing Piles
Estimated Av. Length: 18' Pier 2
19' Pier 3
20' Pier 4

E.F. = Each Face

COLORADO
DEPARTMENT OF HIGHWAYS
PIERS 2, 3 & 4
S.B.L.

Across U.S 287; Colo. & Southern R.R.
Sta. See Sht.
Near BROOMFIELD Sec. 34 T. 1 S R. 69 W.

Designed by B.S.M.H	Approved by
Made by D.L.	Bridge Engineer
Checked by A.L	Date: 19

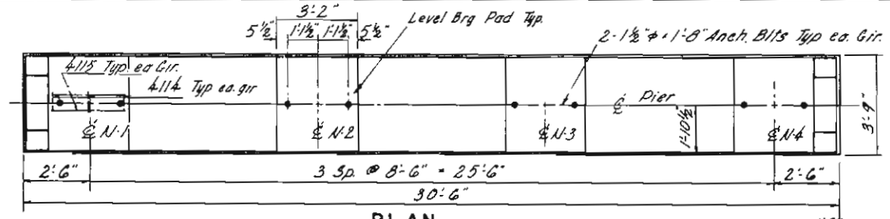
STRUCTURE NO.

Developed By	Ledged	Date
Checked By		
Drawn By		
Checked By		
Traced By		
Checked By		

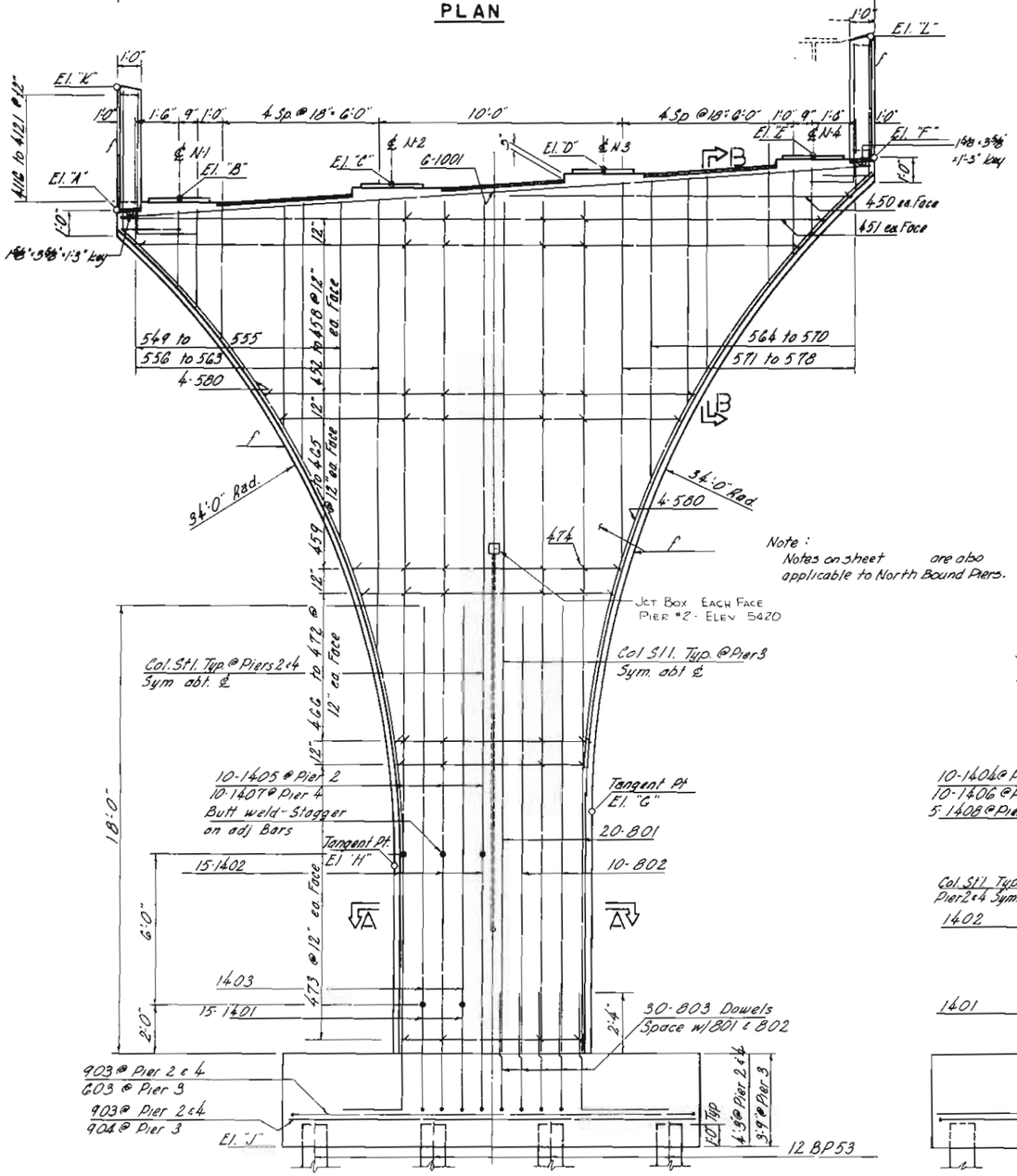
REVISIONS

(R-1) 10-21-71 PDL CHG. PROJ NO

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
(R-1) 9	COLORADO	EHS-F 121-1(7)	23

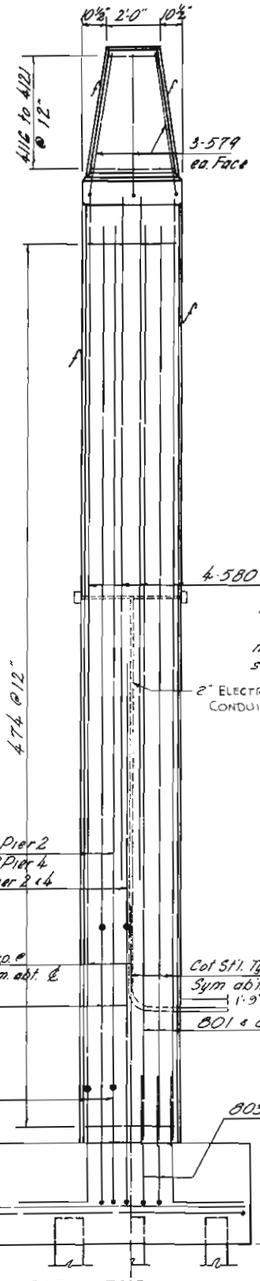


PLAN



ELEVATION - PIERS 2, 3, & 4 NBL

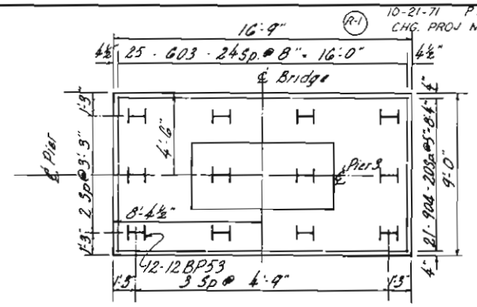
Note:
Notes on sheet are also applicable to North Bound Piers.



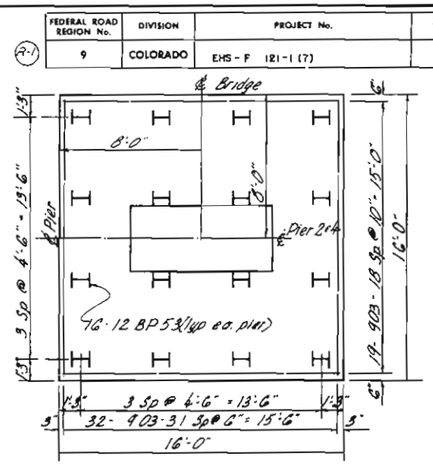
PIER END

NOTE:
Only exposed portion of surfaces marked f shall recieve class 2 surface finish

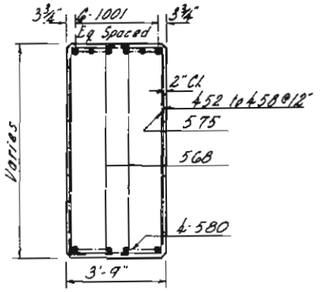
2" ELECTRICAL CONDUIT



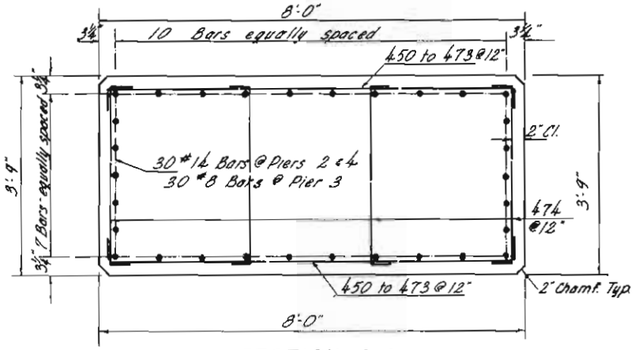
FOOTING PLAN - PIER 3 NBL



FOOTING PLAN - PIER 2 & 4 NBL



SECTION B-B



SECTION A-A

Notes: All Pile to be end bearing piles
Estimated av. length: 18 ft. - Pier 2
19 ft. - Pier 3
19 ft. - Pier 4

DESCRIPTION	PIER 2	PIER 3	PIER 4
TOP OF MASON & ELEVATION N-1 ELEV. "A"	5433.98	5432.02	5429.94
N-2 ELEV. "B"	5434.45	5432.49	5430.41
N-3 ELEV. "C"	5435.04	5433.08	5431.00
N-4 ELEV. "D"	5435.64	5433.68	5431.59
ELEV. "E"	5436.23	5434.27	5432.19
ELEV. "F"	5436.12	5434.16	5432.07
ELEV. "G"	5409.85	5407.89	5405.81
ELEV. "H"	5407.71	5405.75	5403.67
ELEV. "J"	5396.75	5393.25	5393.25
ELEV. "K"	5439.52	5437.50	5435.48
ELEV. "L"	5441.48	5439.46	5437.44

NOT CONSTRUCTED
NO REVISIONS
Date Completed 19

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

STRUCTURE NO

COLORADO
DEPARTMENT OF HIGHWAYS

PIER 2, 3 & 4
N. B. L.

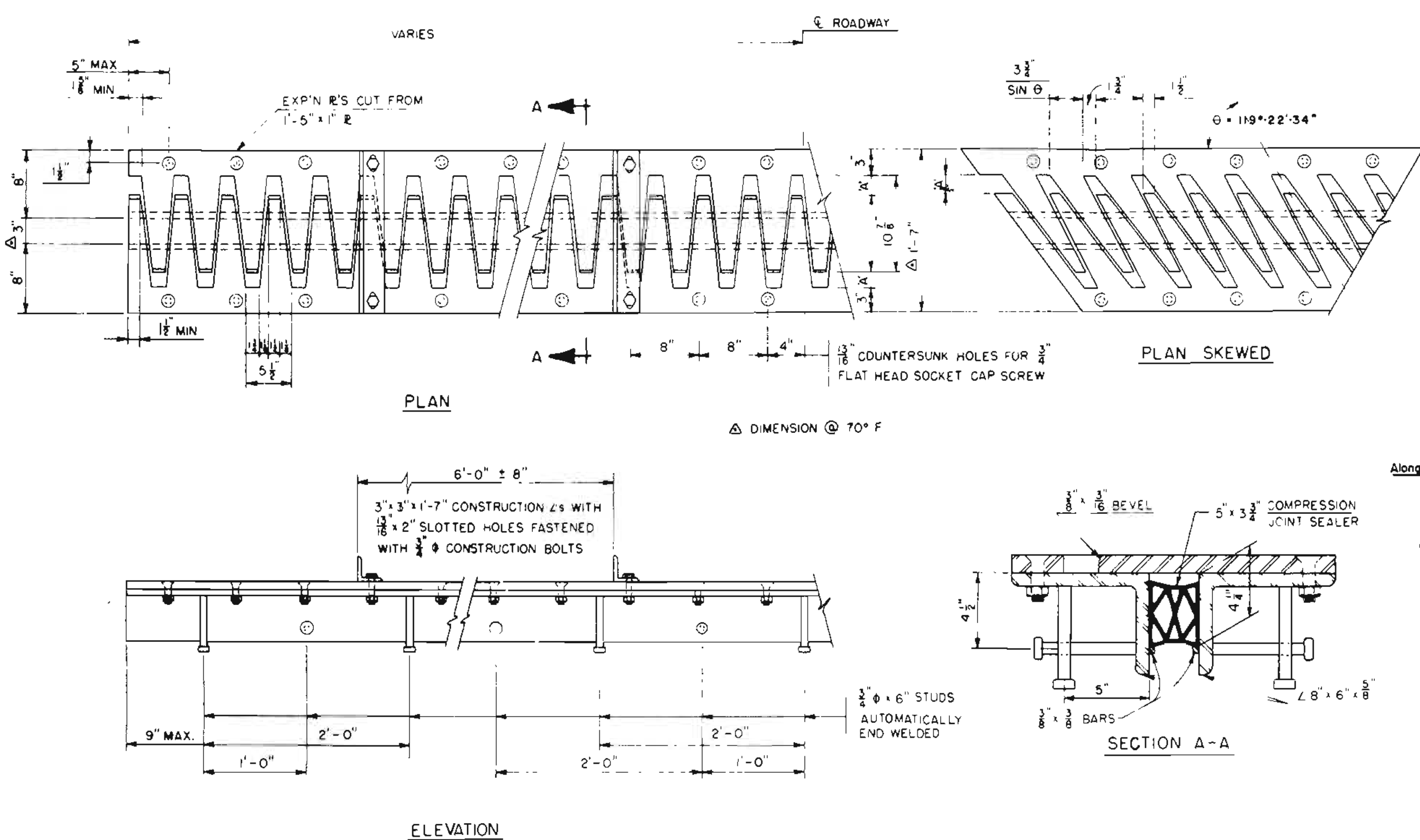
Across U.S. 287; Colo. & Southern R.R.
Sta See Sht
Near BROOMFIELD Sec 34 T. 1 S. R. 69 W.

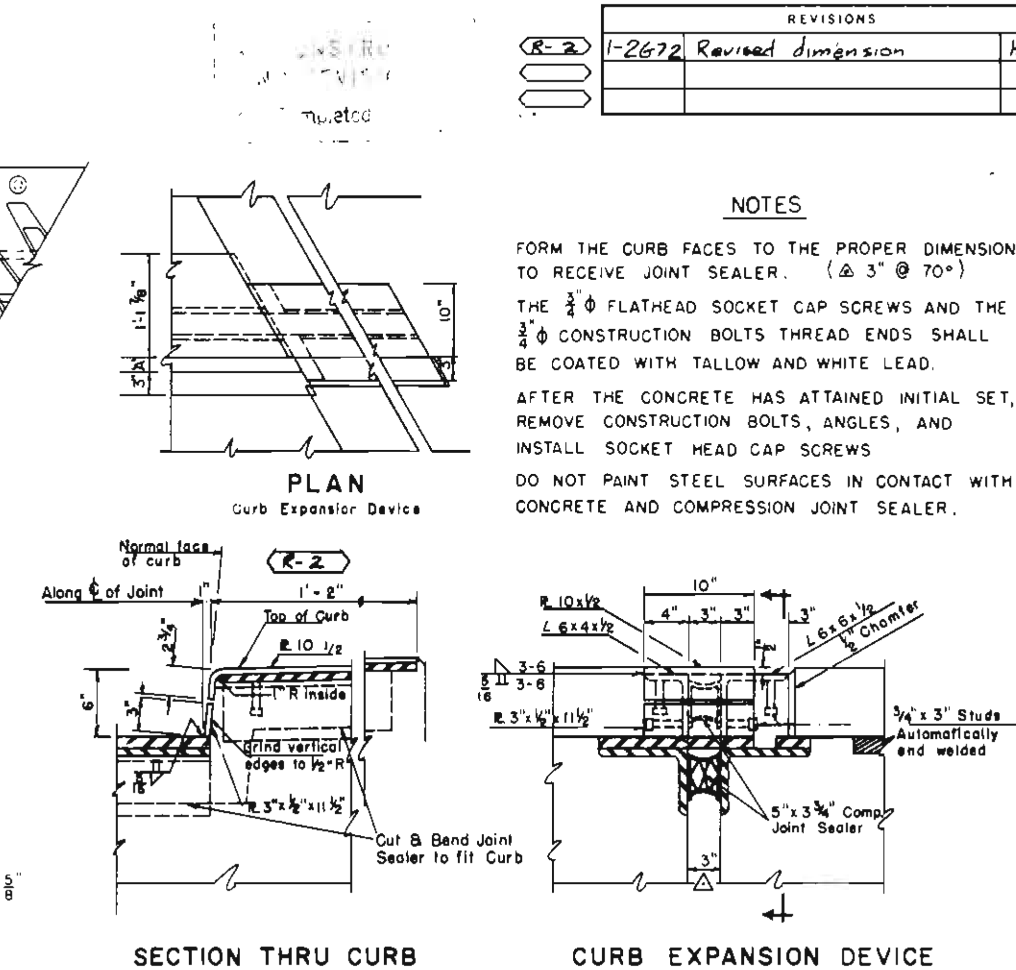
Designed by B SMH	Approved by
Made by D. L.	Bridge Engineer
Checked by A. L.	Date: 19

FEDERAL ROAD REGION NO	DISTRICT	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	BHF 121-1(7)	24	

R-1 10-21-71 P.D.L. CHG. PROJ NO

REVISIONS		
R-2 1-26-72	Revised dimension	HHH





DETAILS of EXPANSION DEVICE - Concrete Slab & Steel Girders

NOTES

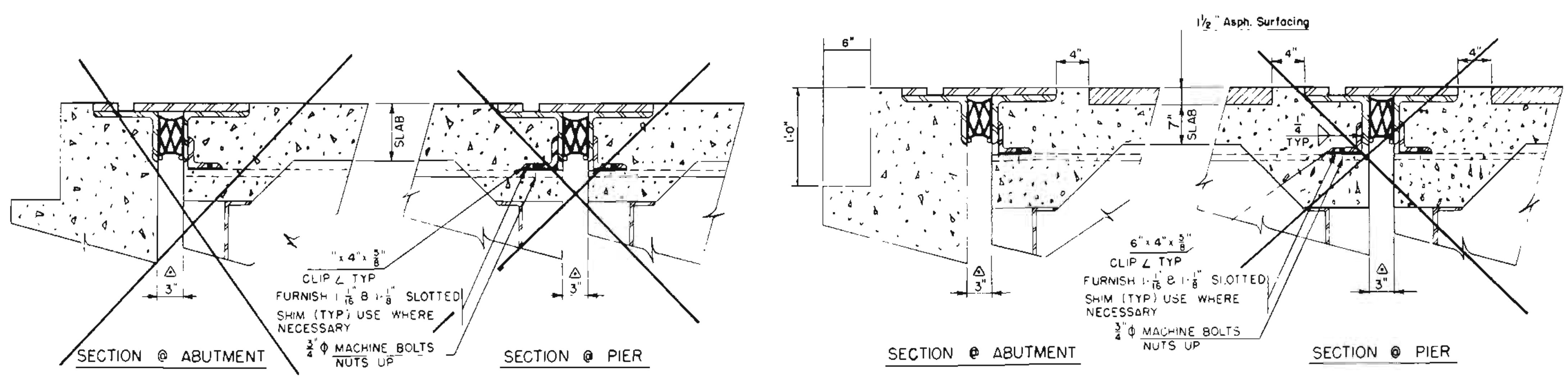
FORM THE CURB FACES TO THE PROPER DIMENSION TO RECEIVE JOINT SEALER. (△ 3" @ 70°)

THE 3/4 ϕ FLATHEAD SOCKET CAP SCREWS AND THE 3/4 ϕ CONSTRUCTION BOLTS THREAD ENDS SHALL BE COATED WITH TALLOW AND WHITE LEAD.

AFTER THE CONCRETE HAS ATTAINED INITIAL SET, REMOVE CONSTRUCTION BOLTS, ANGLES, AND INSTALL SOCKET HEAD CAP SCREWS.

DO NOT PAINT STEEL SURFACES IN CONTACT WITH CONCRETE AND COMPRESSION JOINT SEALER.

OUTSIDE TEMP	ABUT # 1 DIM 'A'	ABUT. # 5 DIM 'A'	DIM 'A'
40°	2 5/8"	2 5/8"	
50°	2 1/2"	2 1/2"	
60°	2 5/16"	2 5/16"	
70°	2 1/8"	2 1/8"	2 1/8"
80°	1 15/16"	1 15/16"	
90°	1 3/4"	1 3/4"	
100°	1 5/8"	1 5/8"	



DIVISION OF HIGHWAYS

BRIDGE EXPANSION DEVICE FABRICATED (TYPE IV)

Approved:
Bridge Engineer
Date:
Designer BSMH Detailer
Structure Numbers E-16-HR E-16-HS
DWG. No. B____ OF____

33(1-1-70)

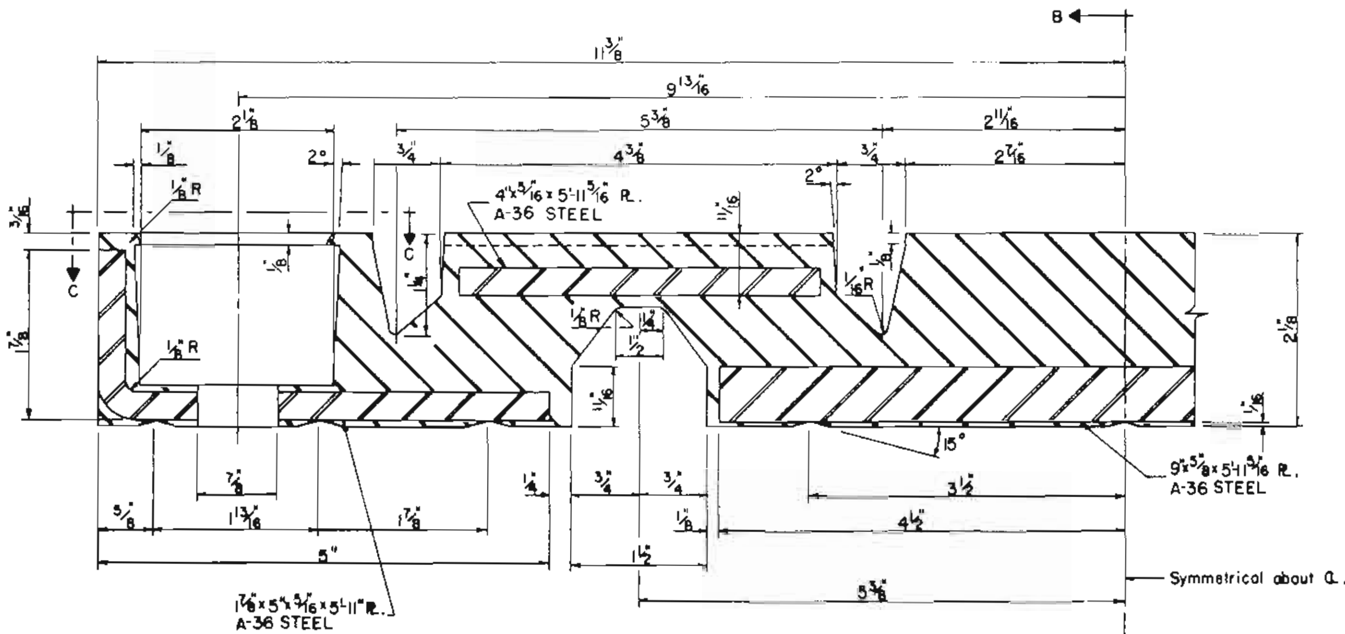
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
D.O.H. FORM NO. 1??
JULY 1964

(R-1) 10-21-71 PDL CHG PROJ NO

FEDERAL ROAD REGION NO	DISTRICT	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	25	

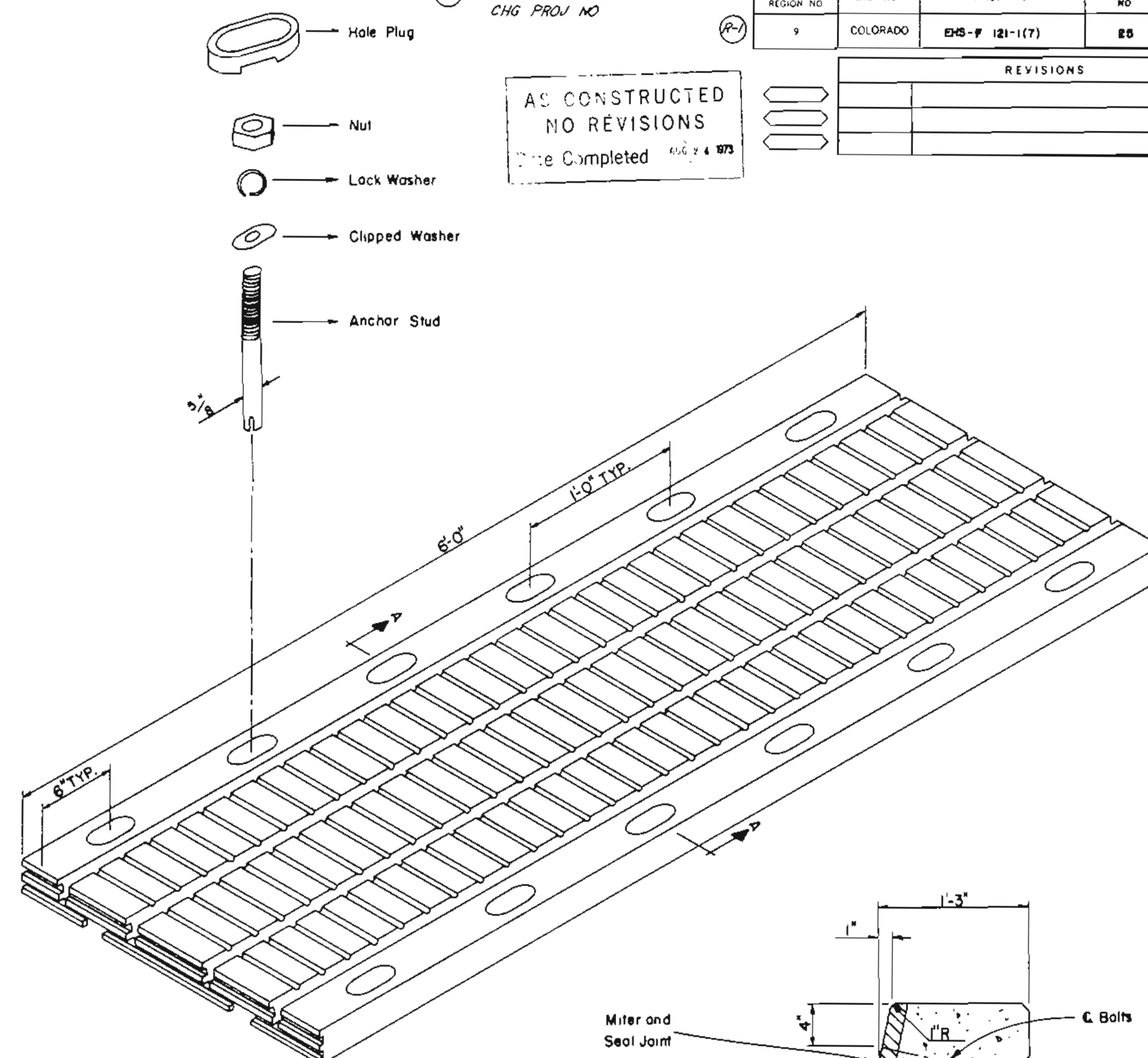
AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 4 1973

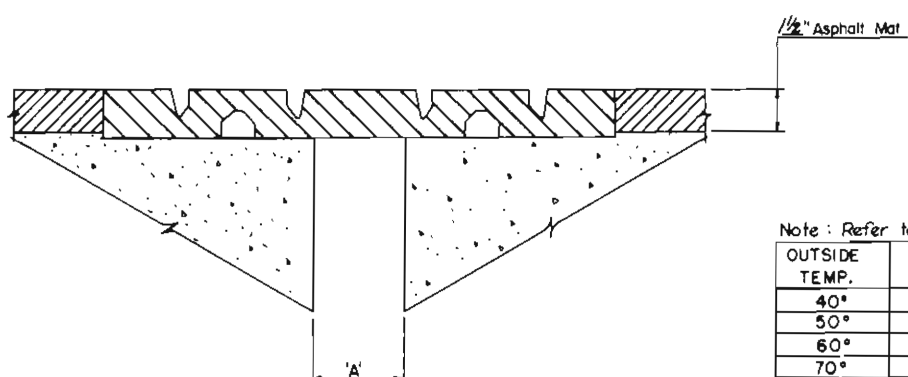
REVISIONS



HALF SECTION A-A

Note : Contractor to make all necessary adjustments in slab and abutment details if this expansion device is selected. Slab and abutment details as shown are for the Bridge Expansion Device ~ Fabricated (Type IV).

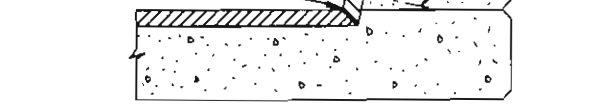




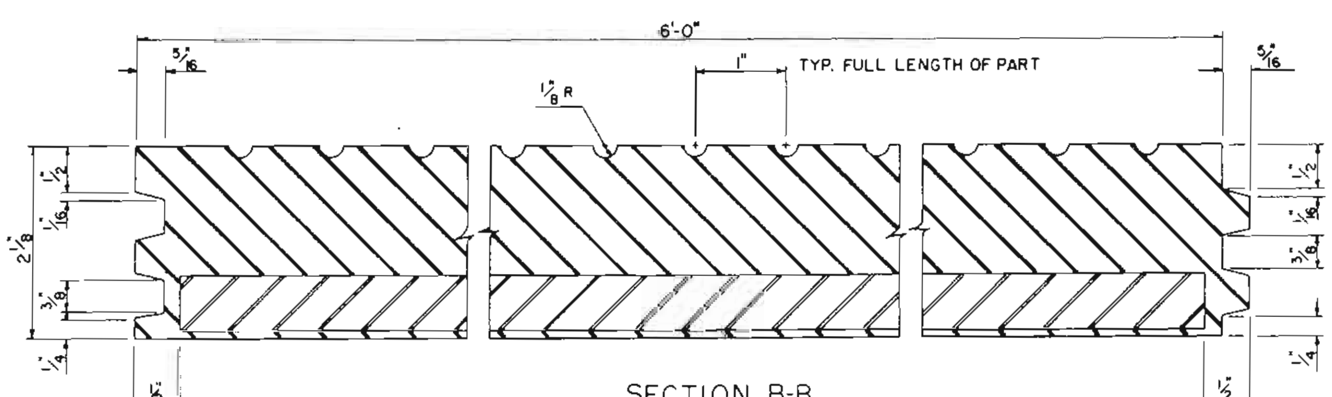
SECTION @ PIER OR ABUTMENT

Note : Refer to Sht. No. 38 for dimension A

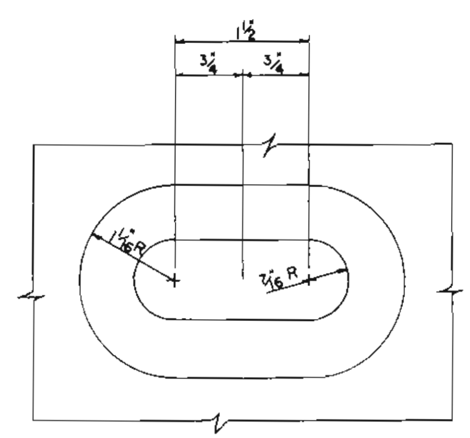
OUTSIDE TEMP.	DIM 'A' (MIN.)	DIM 'A' (MIN.)	DIM 'A' (MIN.)
40°	3 1/2"		
50°	3 5/16"		
60°	3 3/16"		
70°	3"		
80°	2 13/16"		
90°	2 5/8"		
100°	2 1/2"		



TYPICAL SECTION @ CURB



SECTION B-B



SECTION C-C

DIVISION OF HIGHWAYS

BRIDGE EXPANSION DEVICE

PREMOLDED (TYPE IV)

Approved	Designer BSMH	Detailer
Bridge Engineer	Structure Numbers	E-16-HR
Date		E-16-HS
	DWG. No. B ______ OF ______	

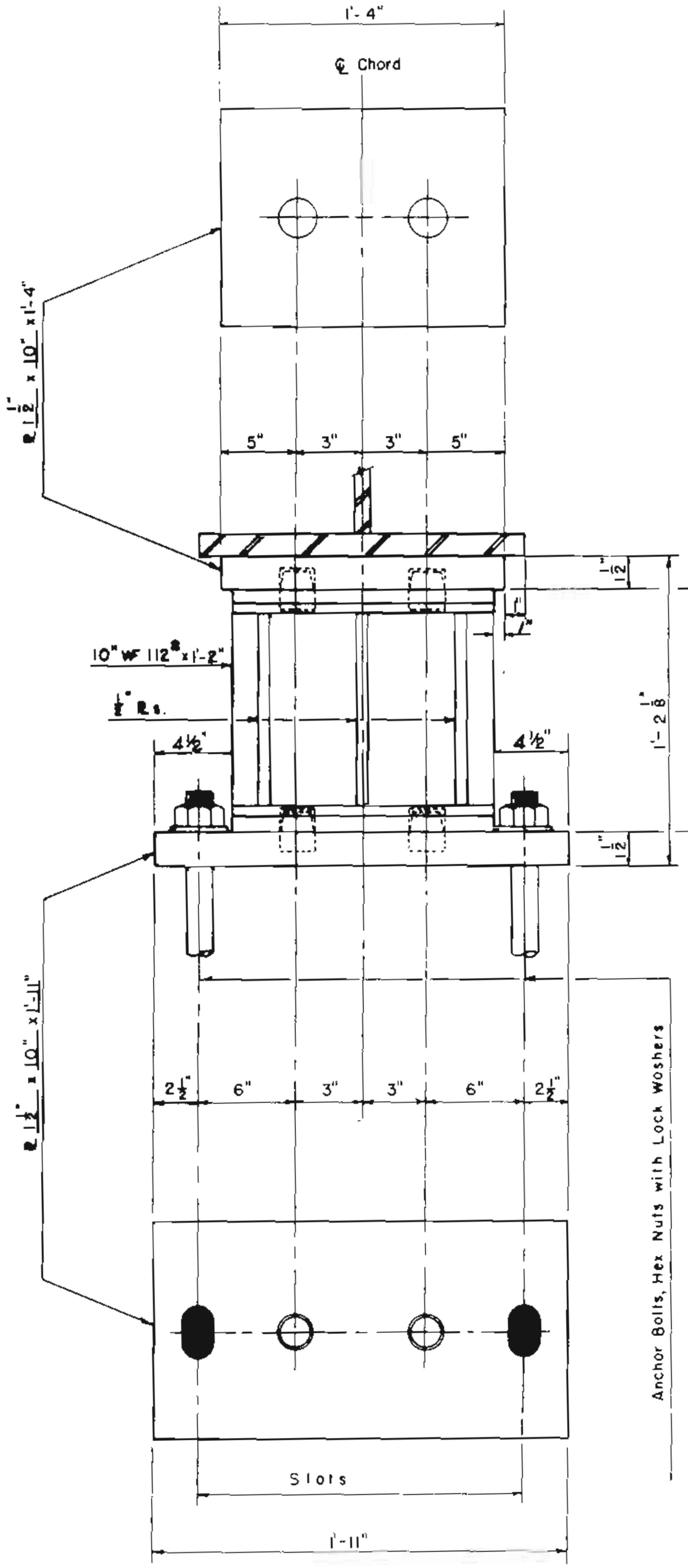
35(4-1-70)

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS - STATE OF COLORADO
FORM B.O.H. 117
JULY 1960

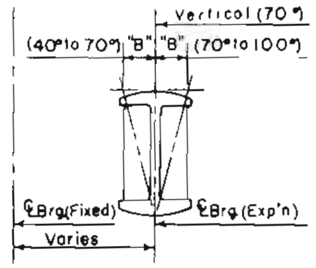
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	26	

	REVISIONS	
(R-1) 10-21-71	Added Bearing Plate Det	GLB
	CHG PROJ NO	PDL

AS CONSTRUCTED
NO REVISIONS
Date Completed

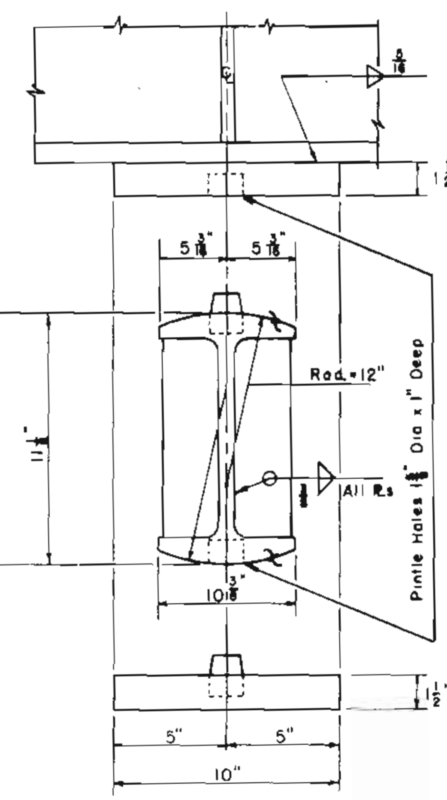


EXPANSION BEARING
18 Req'd

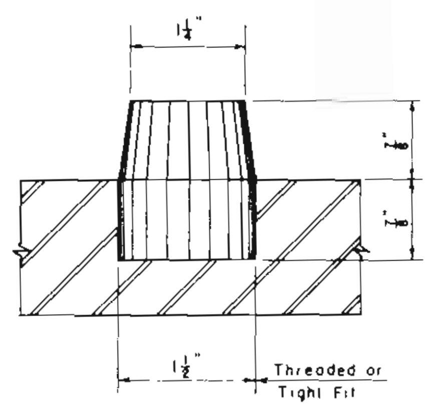


Outside Temp	"B" Abut No. 1	"B" Abut No. 5
40°	1/2"	1/2"
50°	3/8"	3/8"
60°	3/16"	3/16"
70°	Vertical	
80°	3/16"	3/16"
90°	3/8"	3/8"
100°	1/2"	1/2"

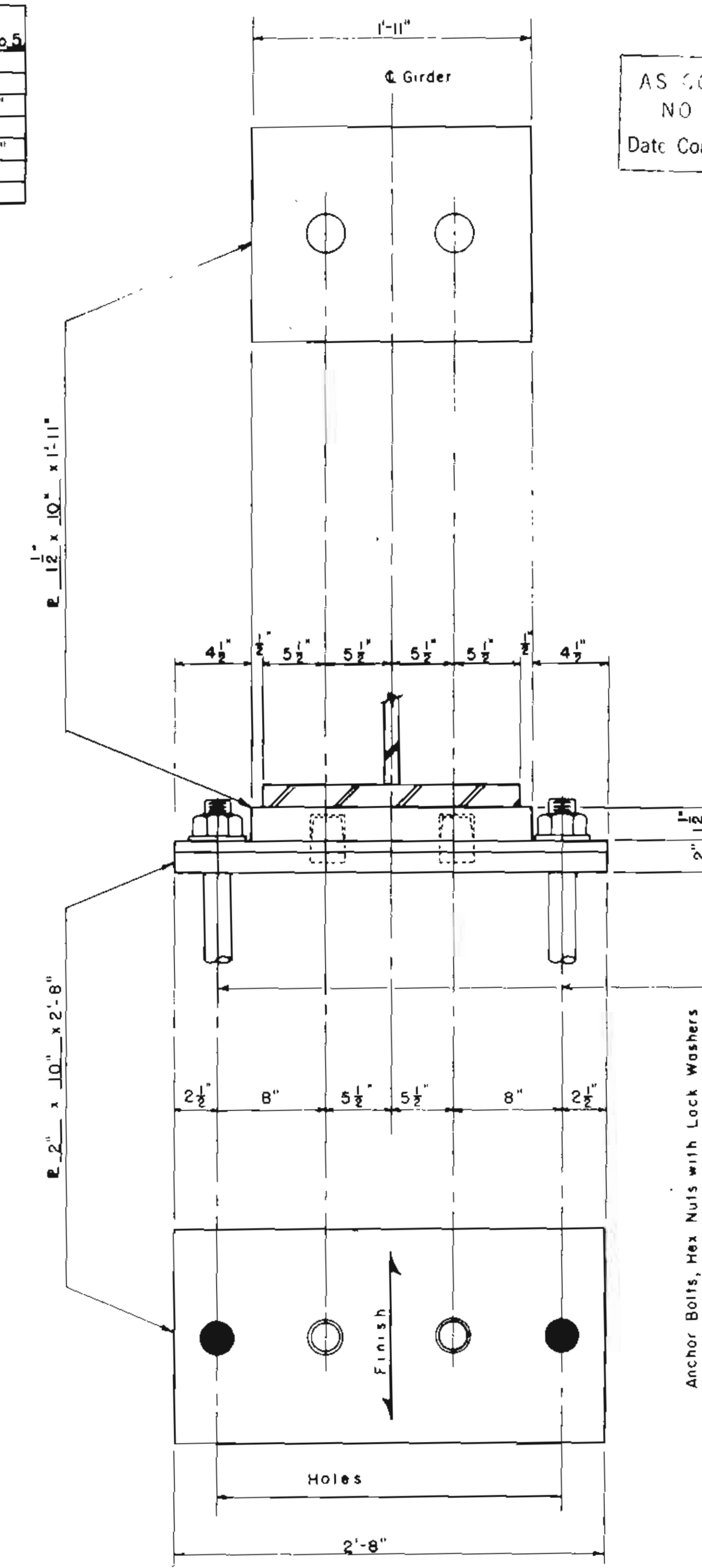
ROCKER SETTING DIAGRAM



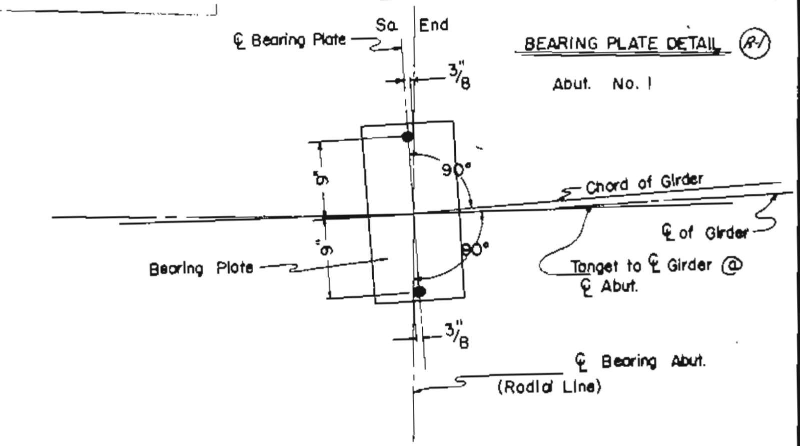
TYPICAL ELEVATIONS



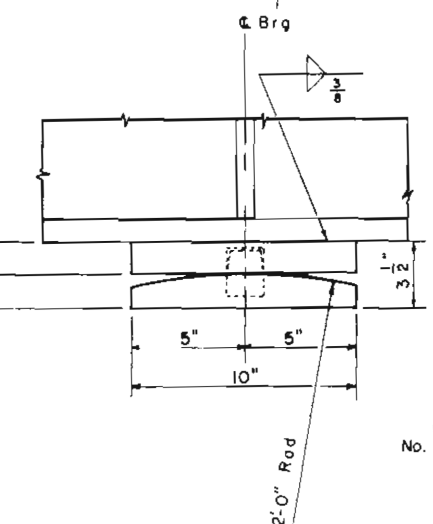
PINTLE DETAIL

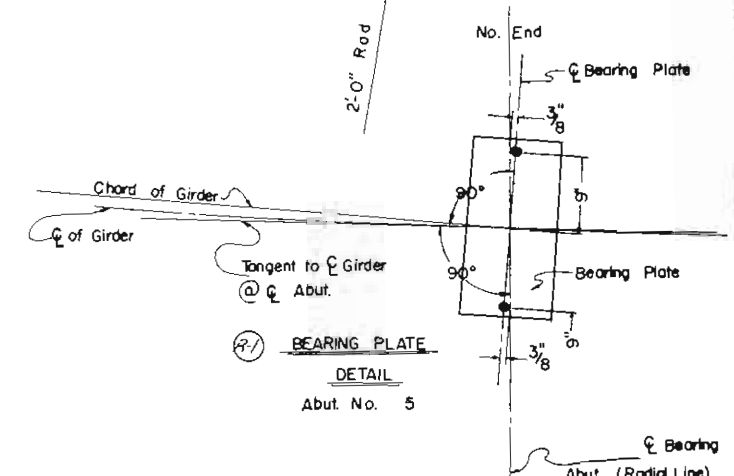


FIXED BEARING
27 Req'd.



BEARING PLATE DETAIL (R-1)
Abut. No. 1





(R-1) BEARING PLATE DETAIL
Abut. No. 5

DETAILS OF BEARINGS

Rocker may be built from plates equal in thickness to designated WF Section or may be made from Cast Steel

DIVISION OF HIGHWAYS

BEARING DETAIL

Approved	Designer B.S.M.H.	Detailer
Bridge Engineer	Structure Numbers E-16-HS S.B.L. / E-16-HR N.B.L.	
Date	DWG. No. B ___ OF ___	

20(1-1-70)

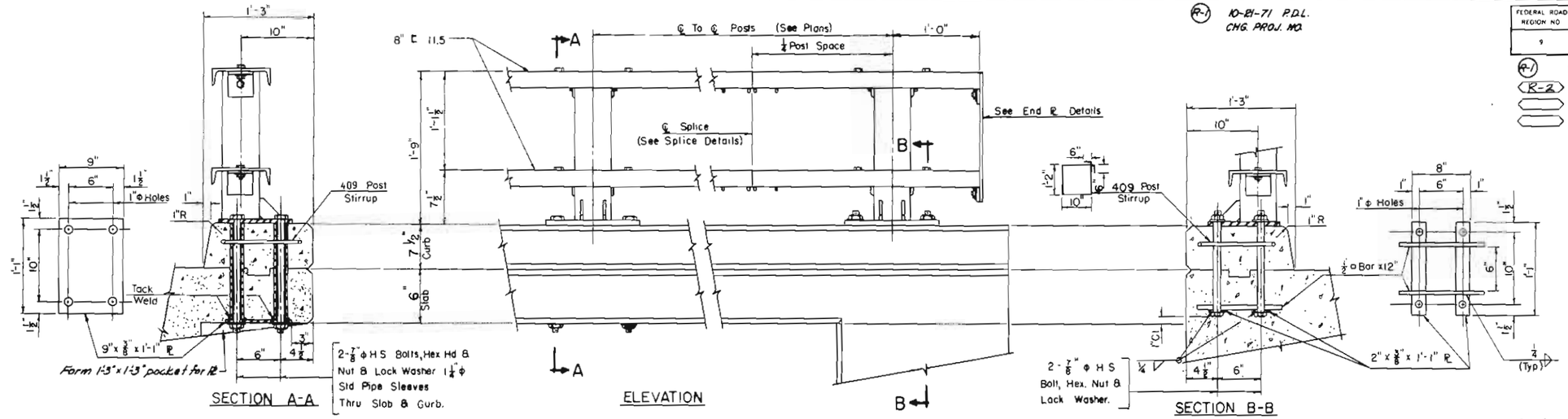
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS — STATE OF COLORADO
FORM A.B.R. 117
JULY, 1968

(R-1) 10-21-71 P.D.L.
CHG. PROJ. NO.

FEDERAL ROAD REGION NO	DISTRICT	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	27	

(R-1)	REVISIONS		
(R-2)	1-2672	Revised note	HHH

AS CONSTRUCTED
NO REVISIONS
Date Completed 2 4 1973

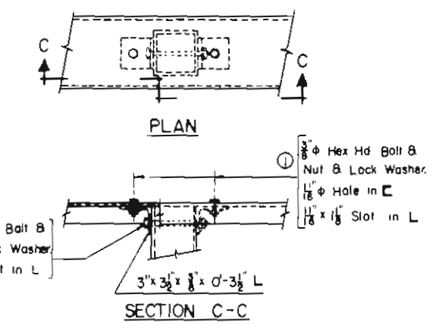


THRU SLAB MOUNTED POST

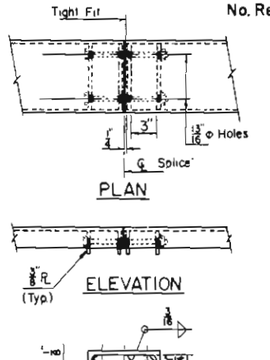
No. Req'd 120 S.B. Struct.
No. Req'd 120 N.B. Struct.

END ANCHORED POST

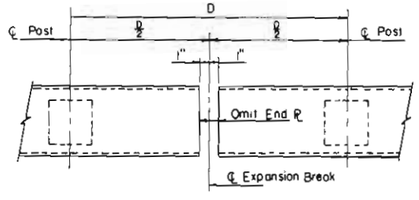
No. Req'd 8 S.B. Struct.
No. Req'd 8 N.B. Struct.



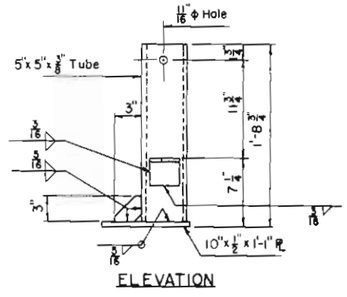
DETAIL AT TOP RAIL



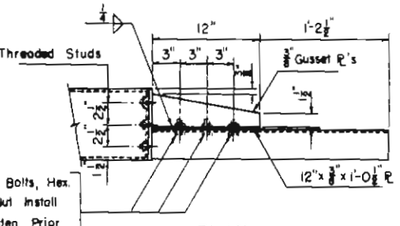
SPLICE DETAIL

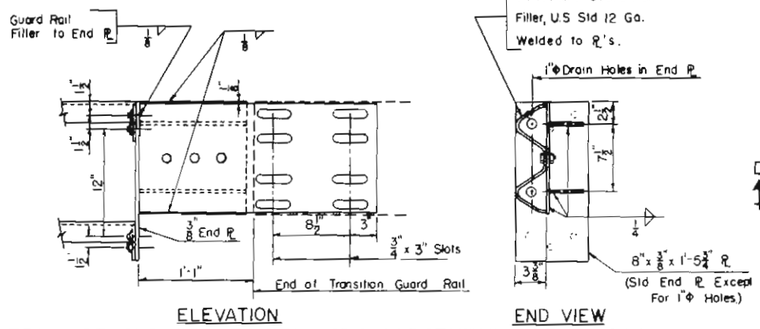


DETAIL AT EXPANSION BREAK



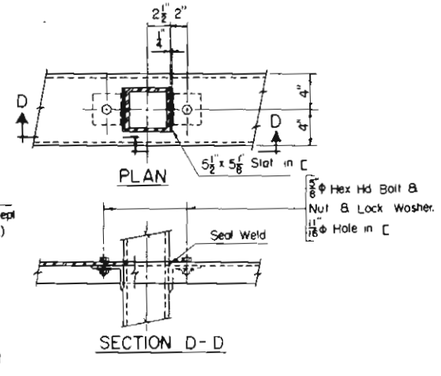
POST DETAIL



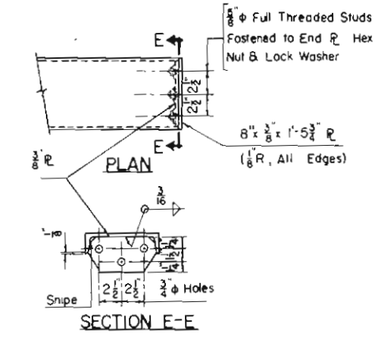


DETAIL OF END CONNECTION FOR FASTENING BRIDGE RAIL TO TRANSITION GUARD RAIL

Complete Unit Shall Be Galvanized After Fabrication
Detail Shown is For Right Hand Rail. No. Req'd 2 S. B. Struct. & 2 N.B. Struct
Opposite Hand For Left Hand Rail No Req'd 2 S.B. Struct. & 2 N.B. Struct.



DETAIL AT BOTTOM RAIL



END PLATE DETAIL

No. Req'd 8 S.B. Struct.
No. Req'd. 8 N.B. Struct.

NOTES:

(R-2) Posts shall be perpendicular to grade and slope of the top of curb.

All rail elements, anchor assemblies, anchor bolts, nuts and washers shall be galvanized after fabrication in accordance with the specifications.

AISI 1144 Steel Rods May Be Used In Lieu Of H.S Bolts Shown 10° Wedge Test Not Req. For Either Bolts Or Rods Used In Rail Assembly.

① ⅞" Φ Standard Full Threaded Studs Welded To The Channel May Be Used Increase Size Of Slot In The Angle To 13/16" x 1¼"

Channels Shall Be Continuous Over 3 Or 4 Posts Before Splicing

When thru slab mounted posts are used, prior to setting the posts and tightening the bolts a perimeter bead of caulking, grade polyurethane joint sealer, shall be placed on the concrete 1" inside the edges of the post base plate

DIVISION OF HIGHWAYS

DETAILS OF GALVANIZED STEEL BRIDGE RAIL

Approved	Designer B.S.M.H.	Detailer	
Bridge Engineer	Structure Numbers E-16-HS		S.B.L.
Date	E-16-HR		N.B.L.
	DWG. No. 8	OF	

10 (1-1-70)

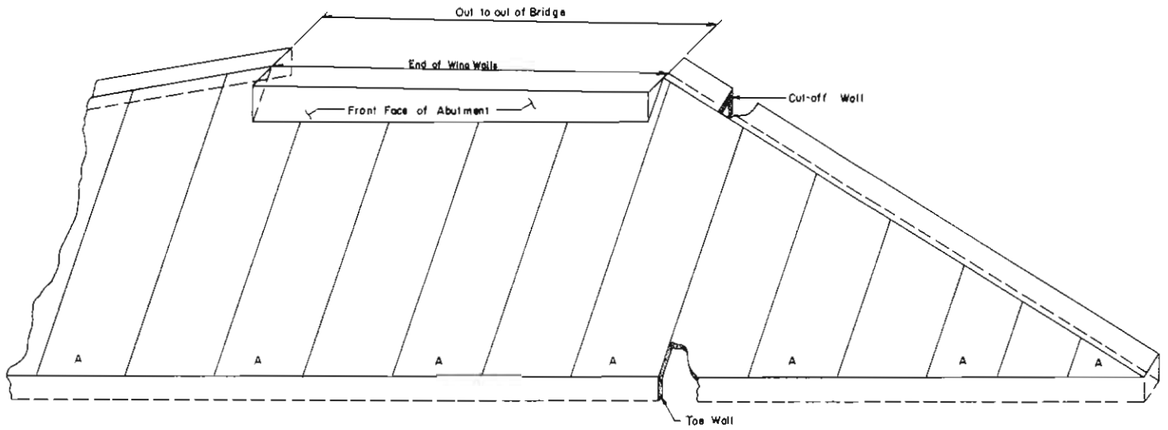
(R-1) 10-21-71 P.D.L.
CHG. PROJ. NO

FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	EHS- F 121-1(7)	28	

CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 6 1975

(R-1)

REVISIONS		



ELEVATION

NOTES

SLOPE PAVING SHALL BE POURED IN 10-FT. TRANSVERSE SECTIONS WITH A TOOLED CONSTRUCTION JOINT AT EACH SECTION.

WIRE FABRIC SHALL BE 2" FROM THE END OF JOINTS AND SHALL LAP 4" AT SPLICES.

WHERE SLOPE OR BERM PAVING BUTTS AGAINST STRUCTURAL CONCRETE, SEPARATE WITH 1/2" EXPANSION JOINT MATERIAL. (INCLUDE IN BID PRICE FOR ITEM 507.)

TRANSITION ENDS OF SLOPE PAVING MAY BE MODIFIED BY THE ENGINEER TO FIT CONDITIONS ENCOUNTERED IN THE FIELD.

CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF SECTION 601, (CONCRETE SHALL BE CLASS "B".)

ALL WORK NECESSARY BY THESE REQUIREMENTS SHALL BE INCLUDED IN THE BID PRICE FOR ITEM NUMBER 507.

PANELS MARKED THUS, "A", ARE TO RECEIVE AN EXPOSED AGGREGATE FINISH. AFTER THE CONCRETE IS STRUCK TO GRADE, THE SURFACE SHALL BE SPRAYED WITH AN APPROVED RETARDER. THE AMOUNT OF RETARDER SPRAYED ON THE SURFACE SHALL BE AS RECOMMENDED BY THE MANUFACTURER.

IN ALL CASES, THE EXPOSED AGGREGATE FINISH SHALL BE STARTED ON THE FIRST PANEL FACING ON-COMING TRAFFIC.

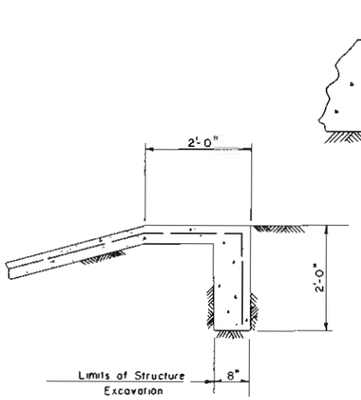
THE CONCRETE SHALL THEN BE ALLOWED TO SET, SETTING TIME SHALL BE DETERMINED BY THE ENGINEER. AFTER SETTING THE PRESCRIBED TIME, THE SURFACE SHALL BE BROOMED AND WASHED WITH WATER TO EXPOSE THE AGGREGATE.

THE EXPOSED AGGREGATE FINISH SHALL THEN BE SPRAYED WITH A CLEAR CURING COMPOUND.

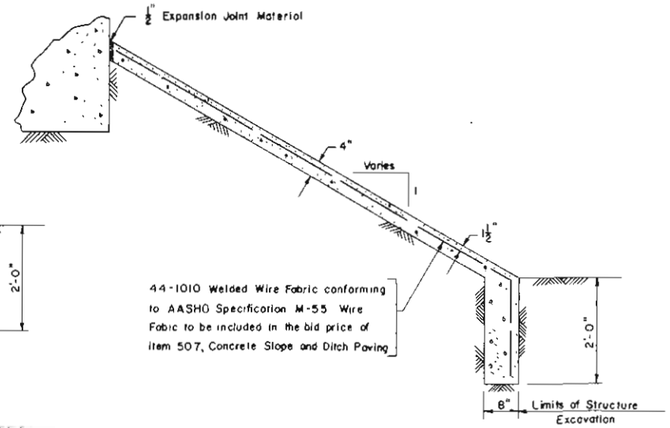
COARSE AGGREGATE USED IN EXPOSED AGGREGATE PANELS SHALL BE COMPOSED PREDOMINANTLY OF STONE CONTRASTING IN COLOR TO THAT OF NORMAL CONCRETE IN ADJACENT PANELS.

COARSE AGGREGATE SHALL MEET THE REQUIREMENTS OF AASHO DESIGNATION M 43 SIZE NUMBER 6.

	INITIAL	DATE	CHECKED BY
DESIGNED BY			
CHECKED BY			QUANTITIES BY
DETAILED BY	DLJR	8-70	CHECKED BY



SECTION THRU CUT-OFF WALL



SECTION THRU SLOPE PAVING

DIVISION OF HIGHWAYS

SLOPE PAVING DETAILS

Approved	Designer: B.S.M.H.	Detailer:
Bridge Engineer	Structure Numbers	
Date:	DWG. No. B ____ OF ____	

REVISIONS

(R-1) 10-21-71 R.D.L. CHG. PROJ. NO.

(R-1)

FEDERAL ROAD REGION No.	DIVISION	PROJECT No.	SHEET No.
9	COLORADO	EMS-F 121-1(7)	29

Note: Bars 5100 to 5106, 5117 to 5123, 5132 to 5138 and 5149 to 5155 have been set in incremental groups by which to approximate the curved pier sides.

BAR LIST - SUPERSTRUCTURE

MARK	NO. REQ'D. S.B.STR E-16-HS	N.B.STR E-16-HR	LENGTH	TYPE	DIMENSIONS ℓ	m
401	432		29'-8"	STR.		
402	64		29'-8"	STR.		
403	64		28'-9"	STR.		
404	905		2'-8"	I		
405		902	2'-8"	I		
406		64	28'-5"	STR.		
407		64	28'-8"	STR.		
408		304	29'-6"	STR.		
409	120	120	5'-0"	II	10"	1'-2"
501	2170		21'-9"	STR.		
502	1085		17'-5"	STR.		
503	1085		25'-1"	STR.		
504	572		36'-6"	STR.		
505		418	35'-3"	STR.		
506		2152	30'-2"	STR.		
512	2			STR.		
901	340		34'-6"	STR.		
902		188	34'-6"	STR.		

BAR LIST - ABUT. No.1 (ABUT. No.5 Similar)

MARK	NO. REQ'D. S.B.STR E-16-HS	N.B.STR E-16-HR	LENGTH	TYPE	DIMENSIONS ℓ	m
420	30	24	11'-9"	III		
421		18	30'-2"	STR.		
422	15	12	3'-2"	IV	8"	2'-2"
423	15	12	2'-8"	STR.		
424	44	31	8'-2"	STR.		
425	29	21	8'-10"	STR.		
426	44	31	4'-0"	X		
427	98		21'-7"	STR.		
428	4	4	9'-10"	STR.		
429			7'-10"			
TO	4 EA.	4 EA.	B.E.I.	STR.		
434			1'-6"			
435	4	4	9'-2"	STR.		
436	12	12	8'-2"	VI		
437	8	8	10'-8"	VII	9'-8"	1'-0"
438			10'-6		9'-6"	1'-0"
TO	2 EA.	2 EA.	B.E.I.	VII		
443			1'-7"		7"	1'-0"
444	4	4	12'-6"	IV	5'-1"	4"
445	8	8	5'-8"	IV	2'-8"	4"
511		1	30'-2"	STR.		
512	1		21'-7"	STR.		
513	2	2	10'-8"	VII	9'-8"	1'-0"
514			10'-6		9'-6"	1'-0"
TO	2 EA.	2 EA.	B.E.I.	VII		
528			1'-7"		7"	1'-0"
601		6	30'-2"	STR.		
602	6		42'-2"	STR.		

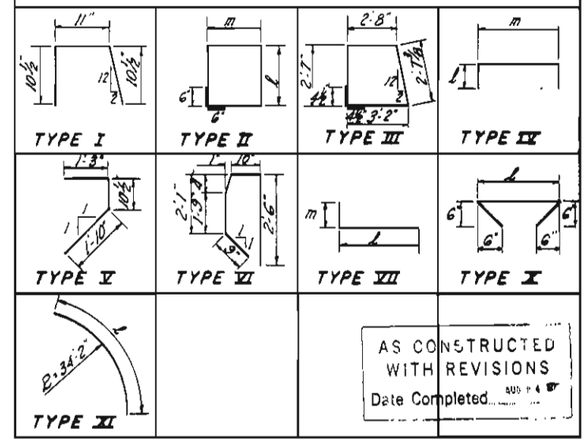
BAR LIST - PIERS

MARK	NUMBER REQUIRED S.B.STR.E-16-HS PIER 2	PIER 3	PIER 4	N.B.STR.E-16-HR PIER 2	PIER 3	PIER 4	LENGTH	TYPE	DIMENSIONS ℓ	m
450				2	2	2	14'-6"	VII	14'-0"	6"
451				2	2	2	29'-6"	X	28'-5"	
452							28'-2"		27'-2"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.		B.E.I.	
458							18'-8"		17'-8"	
459							17'-8"		16'-8"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.		B.E.I.	
465							12'-2"		11'-2"	
466							11'-6"		10'-6"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.		B.E.I.	
472							9'-0"		8'-0"	
473	16	22	16	22	28	24	8'-8"		7'-8"	
474	190	200	190	176	188	180	4'-5"	X	3'-5"	
480	2	2	2				17'-6"	VII	17'-0"	6"
481	2	2	2				39'-8"	X	38'-8"	
482							37'-11"		36'-11"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.		B.E.I.	
487							26'-4"		25'-4"	
488							24'-7"		23'-7"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.		B.E.I.	
493							17'-8"		16'-8"	
494							16'-4"		15'-4"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.		B.E.I.	
499							12'-2"		11'-2"	
4100							11'-8"		10'-8"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.		B.E.I.	1'-10"
4105							9'-4"	X	8'-4"	
4108							11'-6"		3'-5"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	II	B.E.I.	8"
4113							8'-0"		1'-8"	
4114	15	15	15	12	12	12	2'-0"	X	1'-0"	
4115	10	10	10	8	8	8	2'-10"	STR.		
4116							8'-2"		3'-5"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.	II	B.E.I.	
4121							5'-8"		1'-8"	
512										
548				2	2	2	2'-6"	X	1'-6"	
550							4'-4"		3'-4"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.	X	B.E.I.	
554							11'-4"		10'-4"	
555				2	2	2	14'-8"	X	13'-8"	
556				1	1	1	10'-10"	II	1'-5"	3'-5"
557							14'-6"		3'-4"	
TO				1 EA.	1 EA.	1 EA.	B.E.I.	II	B.E.I.	3'-5"
561							26'-8"		10'-4"	
562				1	1	1	35'-2"	II	13'-8"	3'-5"
563				1	1	1	44'-6"	II	18'-4"	"
564							2'-4"		1'-4"	
TO				2 EA.	2 EA.	2 EA.	B.E.I.	X	B.E.I.	
568							7'-11"		6'-11"	
569				2	2	2	10'-4"	X	9'-4"	
570				2	2	2	13'-4"	X	12'-4"	
571							10'-6"		1'-4"	
TO				1 EA.	1 EA.	1 EA.	B.E.I.	II	B.E.I.	3'-5"
575							21'-8"		6'-11"	
576				1	1	1	26'-8"	II	9'-4"	3'-5"
577				1	1	1	32'-6"	II	12'-4"	"
578				1	1	1	41'-2	II	16'-8"	"
579	16	16	16	12	12	12	8'-2"	VII	6'-2"	2'-0"
580				6	6	6	28'-7"	X	28'-7"	
591	6	6	6				36'-0"	II	36'-0"	
592							3'-8"		2'-8"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
596							5'-0"		4'-0"	
597	2	2	2				5'-8"	X	4'-8"	
598	2	2	2				6'-2"	X	5'-2"	
599	2	2	2				6'-8"	X	5'-8"	
5100							7'-7"		6'-7"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
5103							13'-2"		12'-2"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
5106							23'-5"		22'-5"	
5107	1	1	1				9'-10"	II	1'-0"	3'-5"

BAR LIST - PIERS (CONT'D.)

MARK	NUMBER REQUIRED S.B.STR.E-16-HS PIER2	PIER 3	PIER 4	N.B.STR.E-16-HR PIER 2	PIER 3	PIER 4	LENGTH	TYPE	DIMENSIONS ℓ	m
5108	1	1	1				11'-8"	II	1'-11"	3'-5"
5109							13'-8"		2'-11"	
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	3'-5"
5113							15'-10"		4'-0"	
5114	1	1	1				19'-2"	II	4'-8"	3'-5"
5115	1	1	1				18'-2"	II	5'-2"	"
5116	1	1	1				19'-2"	II	5'-8"	"
5117							21'-0"		6'-9"	
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	3'-5"
5120							32'-2"		12'-2"	
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	3'-5"
5123							52'-8"		22'-5"	
5124							3'-5"		2'-5"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
5128							4'-9"		3'-5"	
5129	2	2	2				4'-11"	X	3'-11"	
5130	2	2	2				5'-2"	X	4'-2"	
5131	2	2	2				5'-11"	X	4'-11"	
5132							6'-5"		5'-5"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
5135							11'-8"		10'-8"	
TO	2 EA.	2 EA.	2 EA.				B.E.I.	X	B.E.I.	
5138							21'-2"		20'-2"	
5139	1	1	1				9'-10"	II	1'-0"	3'-5"
5140	1	1	1				11'-2"	II	1'-8"	"
5141							12'-6"		2'-6"	
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	3'-5"
5145							14'-8"		3'-6"	
5146	1	1	1				15'-8"	II	3'-11"	"
5147	1	1	1				16'-4"	IV	4'-3"	"
5148	1	1	1				17'-8"	IV	4'-11"	"
5149							19'-0"		5'-7"	"
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	3'-5"
5152							20'-2"		10'-8"	
TO	1 EA.	1 EA.	1 EA.				B.E.I.	II	B.E.I.	
5155							48'-2"		20'-2"	"
603					25		8'-8"	STR.		
801					20		35'-0"	STR.		
802					10		18'-0"	STR.		
803					30		6'-3"	VII	4'-11"	1'-4"
903				51		51	15'-8"	STR.		
904					21		16'-5"	STR.		
910	29		29				12'-2"	STR.		
911	20		20				14'-2"	STR.		
912		19					11'-2"	STR.		
913		26					15'-8"	STR.		
1001				6	6	6	30'-2"	STR.		
1002	12	12	12				42'-2"	STR.		
1101		42					7'-10"	VII	5'-10"	2'-0"
1102		12					18'-0"	STR.		
1103		30					35'-0"	STR.		
1401	21		21	15		15	7'-8"	VII	5'-1"	2'-7"
1402	21		21	15		15	13'-8"	VII	11'-1"	"
1403	6		6	15		15	16'-0"	STR.		
1404				10			31'-0"	STR.		
1405				10			25'-0"	STR.		
1406						10	30'-6"	STR		
1407						10	24'-6"	STR.		
1408	6		6				10'-0"	STR.		
1410	15						31'-3"	STR.		
1411	15						25'-3"	STR.		
1412			15				30'-3"	STR.		
1413			15				24'-3"	STR		

BENDING DIAGRAMS - DIMENSIONS ARE OUT TO OUT OF BAR



BAR SUMMARIES -

SUPERSTRUCTURE- STR.E-16-HS BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	19568.00	.668	13071
5	15273.00	1.043	20230
9	8280.00	3.400	28152
#5 = 35163. TOTAL			161453

SUPERSTRUCTURE-STR.E-16-HR BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	5701.33	.668	10488
5	80300.33	1.043	83753
9	5798.00	3.400	19706
TOTAL			113947

ABUTMENT 1 (ABUTMENT 5 SIM.) STR.E-16-HS BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	2444.83	.668	1633
5	225.42	1.043	235
9	253.00	1.502	380
TOTAL			2248

ABUTMENT 1 (ABUTMENT 5 SIM.) STR.E-16-HR BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	1910.00	.668	1276
5	234.00	1.043	244
6	181.00	1.502	272
TOTAL			1792

PIER NO.2 STR.E-16-HS BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	2204.50	.668	1473
5	1633.67	1.043	1704
9	636.17	3.400	2163
10	506.00	4.303	2177
14	1421.50	7.650	10874
TOTAL			18391

PIER NO.3 STR.E-16-HS BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	2300.67	.668	1537
5	1633.67	1.043	1704
9	618.50	3.400	2106
10	506.00	4.303	2177
14	1451.50	7.650	11104
TOTAL			18628

PIER NO.4 STR.E-16-HS BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	2204.50	.668	1473
5	1633.67	1.043	1704
9	636.17	3.400	2163
10	506.00	4.303	2177
14	1421.50	7.650	10874
TOTAL			18391

PIER NO.2 STR.E-16-HR BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	1891.83	.668	1250
5	859.75	1.043	897
9	799.00	3.400	2717
10	181.00	4.303	779
14	3120.00	7.650	9568
TOTAL			14211

PIER NO.3 STR.E-16-HR BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	1896.83	.668	1321
5	859.75	1.043	897
6	216.67	1.502	325
8	1089.50	2.890	3850
9	344.75	3.400	1172
10	181.00	4.303	779
TOTAL			7344

PIER NO.4 STR.E-16-HR BAR NO.	LIN.FT.	LB/FT.	TOTAL
4	1906.83	.668	1274
5	859.75	1.043	897
9	799.00	3.400	2717
10	181.00	4.303	779
14	1110.00	7.650	8492
TOTAL			14159

NOTE:
B.E.I. = BY EQUAL INCREMENTS
SOUTH BOUND STR.NO.E-16-HS
NORTH BOUND STR.NO.E-16-HR

NOTE: THE FIRST DIGIT OR DIGITS, 4-14, OF THE REINFORCING BAR DESIGNATION INDICATES THE BAR SIZE.

STRUCTURE NO.

COLORADO DEPARTMENT OF HIGHWAYS

BAR LISTS, SUMMARIES & BENDING DIAGRAMS

Across U.S. 287; Colo. & Southern R.R.
Sta., Sec Sht.
Near Broomfield Sec. 34 T. 1S. R. 69W

Designed by BSMH	Approved by
Made by PHS	Bridge Engineer
Checked by A.L.	Date: 19

	Initial	Date
Designed By		
Checked By		
Made By		
Checked By		
Typed By		
Checked By		

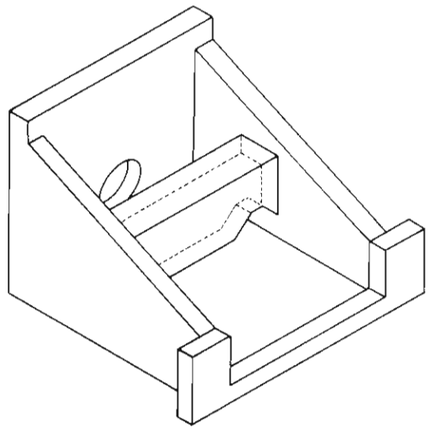
DEPARTMENT OF HIGHWAYS—STATE OF COLORADO
FORM D. O. H. 136
MARCH 1964

(R-1) 10-21-71 P.D.L.
CHG. PROJ. NO.

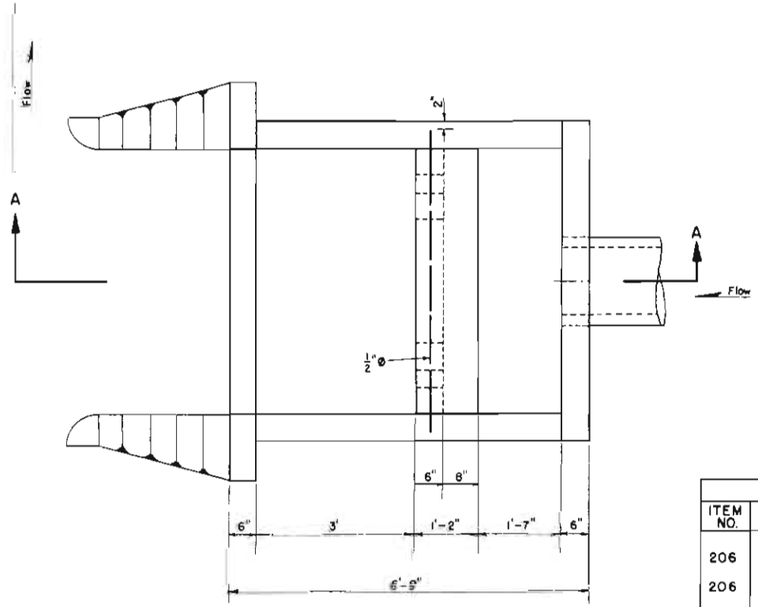
FEDERAL ROAD REGION NO	DISTRICT	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS- F 121-1(7)	30	

(R-1)

AS CONSTRUCTED
NO REVISIONS
Date Completed. Aug. 3 1973

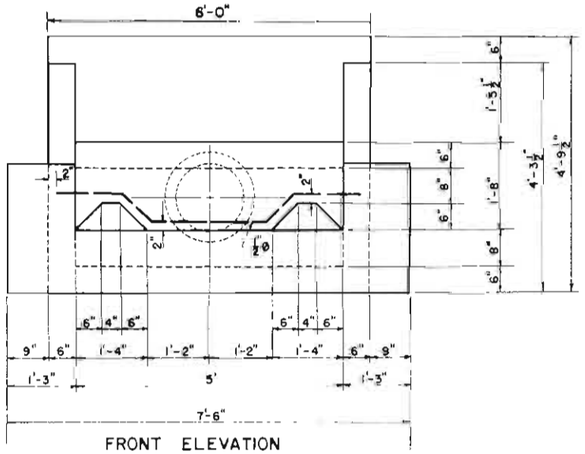


ISOMETRIC VIEW

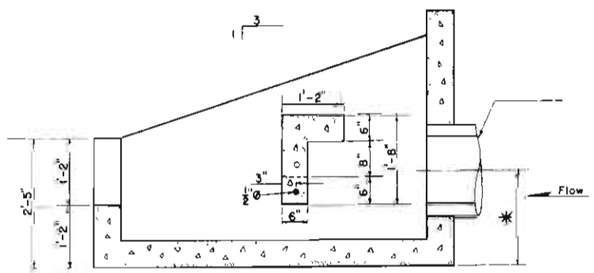


PLAN

SUMMARY OF APPROXIMATE QUANTITIES			
ITEM NO.	ITEM	UNIT	QUANTITY (Ea.)
206	Str. Excav.	Cu Yds.	10.0
206	Str. Backfill (Class 3)	Cu Yds.	3.7
601	Class "A" Concrete	Cu. Yds.	2.2
602	Reinforcing Steel	lbs.	4.1



FRONT ELEVATION



SECTION A-A

* 18" Pipe - 1'-11"
24" Pipe - 2'-2"

ENERGY DISSIPATOR END SECTIONS		
STATION	SIDE	QUANTITY
Mainline:		
521+60	Lt	1
528+35	Rt	1

ENERGY DISSIPATOR DETAIL

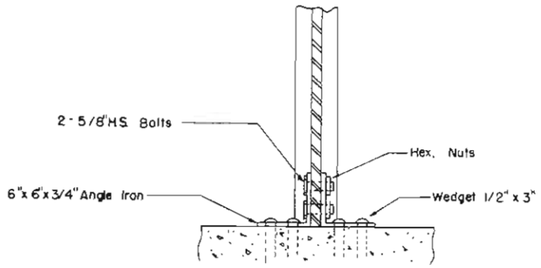
ORIG SCALE ¾" = 1'-0"

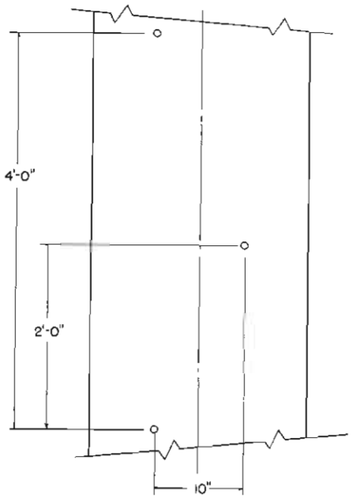
(R-1) 10-21-71 P.D.L.
CHG. PROJ. NO.

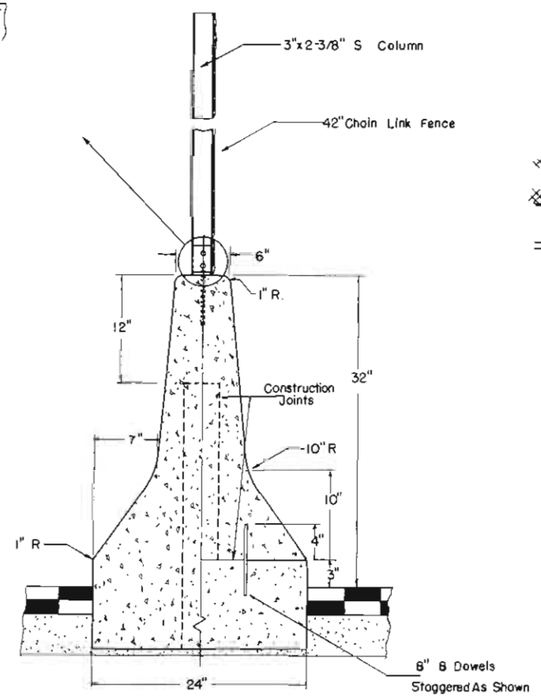
FEDERAL ROAD REGION NO.	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	31A	

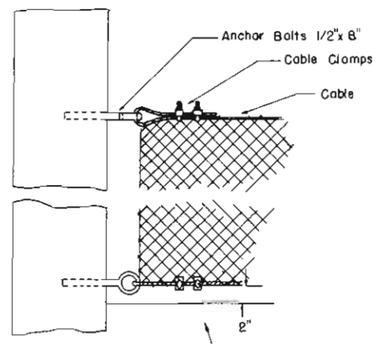
(R-1)

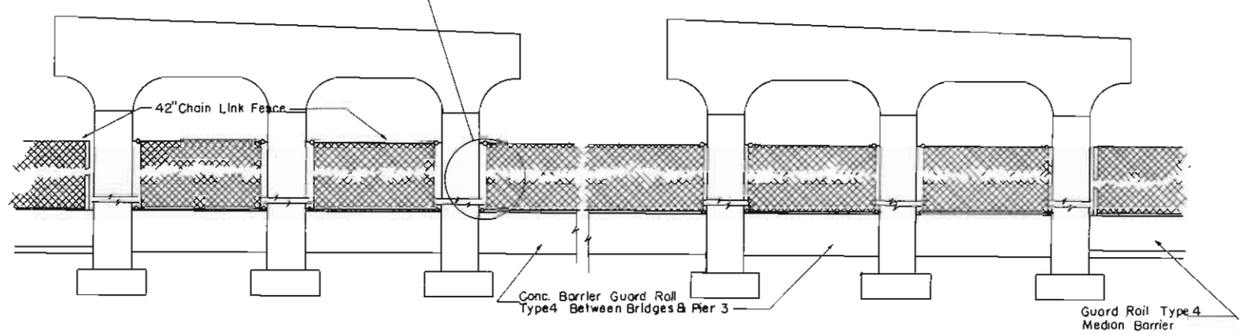
CONSTRUCTED
WITH REVISIONS
Date Completed











POST	60 ea
∠ IRON	120 ea.
BOLTS 5/8"	120 ea
WEDGET	240 ea
LINK FENCE	684 ft
EYE BOLTS	20 ea.
CABLE	168 ft

688

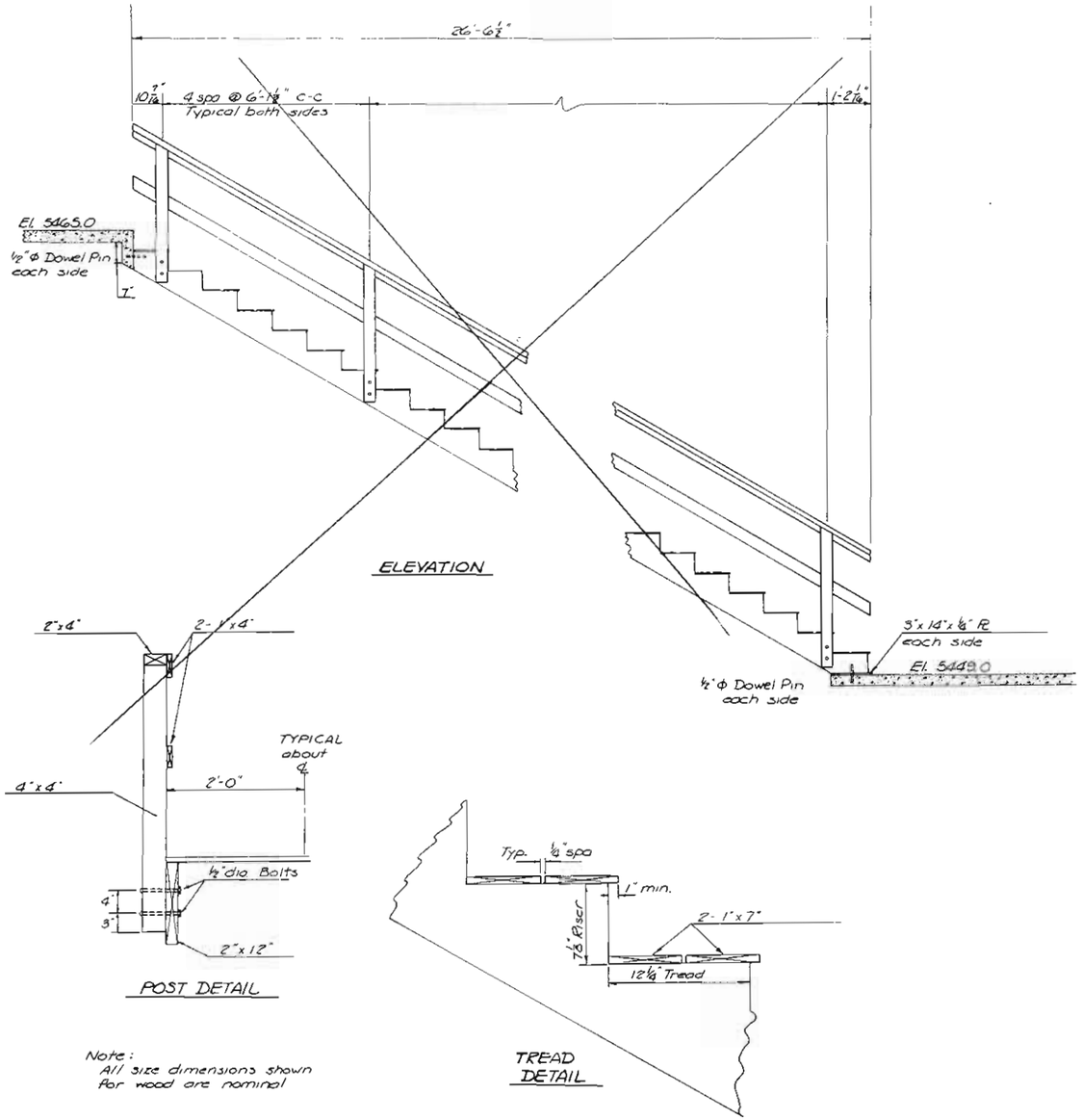
CHAIN LINK FENCE DETAIL

STA 653+00 TO STA 650+00 on U.S. 36

FED. ROAD REGION NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	EHS-F 121-1 (7)	34	

(R-1) 10-21-71 P.D.L. CHG. PROJ NO.

(R-1)

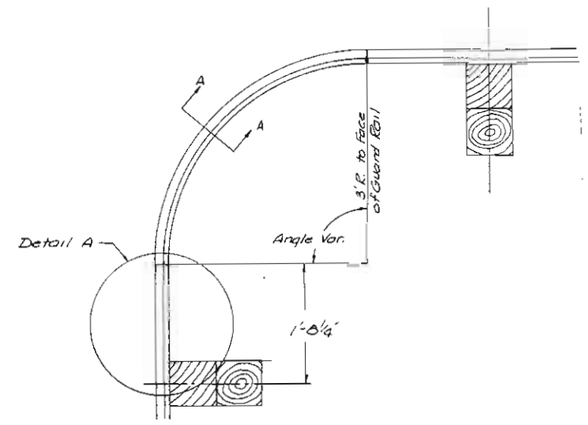


Note:
All size dimensions shown for wood are nominal

Deleted CO 09418

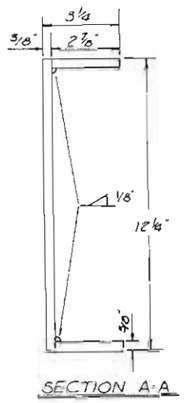
BILL OF MATERIALS		
ITEM	UNIT	QUANTITY
½"Φx6" Dowel Pins	Each	4
½"Φx6" Bolts	Each	20
3"x14"x⅜" PL	Each	2
2"x4"x30'-3 Hand Rail	Each	2
1"x4"x30'-3" Facing Strip	Each	4
4"x4"x8'-1" Post	Each	10
2"x12"x30'-3"	Each	2
1"x7"x4'-0" Treads	Each	52

STAIR DETAIL
Ramp 'C'

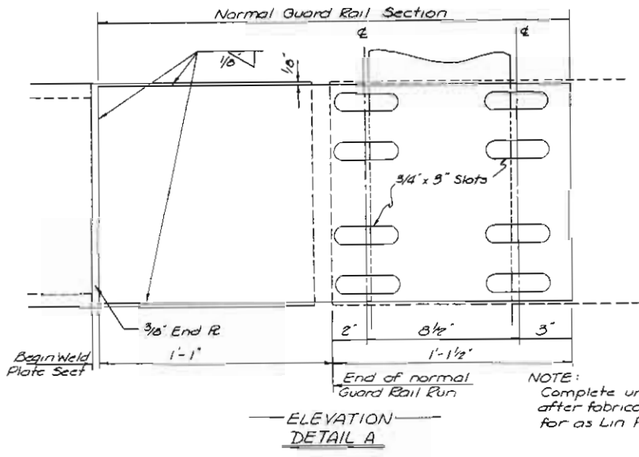


DETAIL
GUARD RAIL CONNECTION

AS CONSTRUCTED
REVISIONS
Date Completed

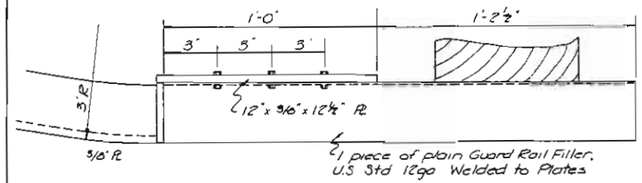


SECTION A-A



NOTE:
Complete unit shall be galvanized after fabrication. Shall be paid for as Lin Ft of guard rail, Type 3.

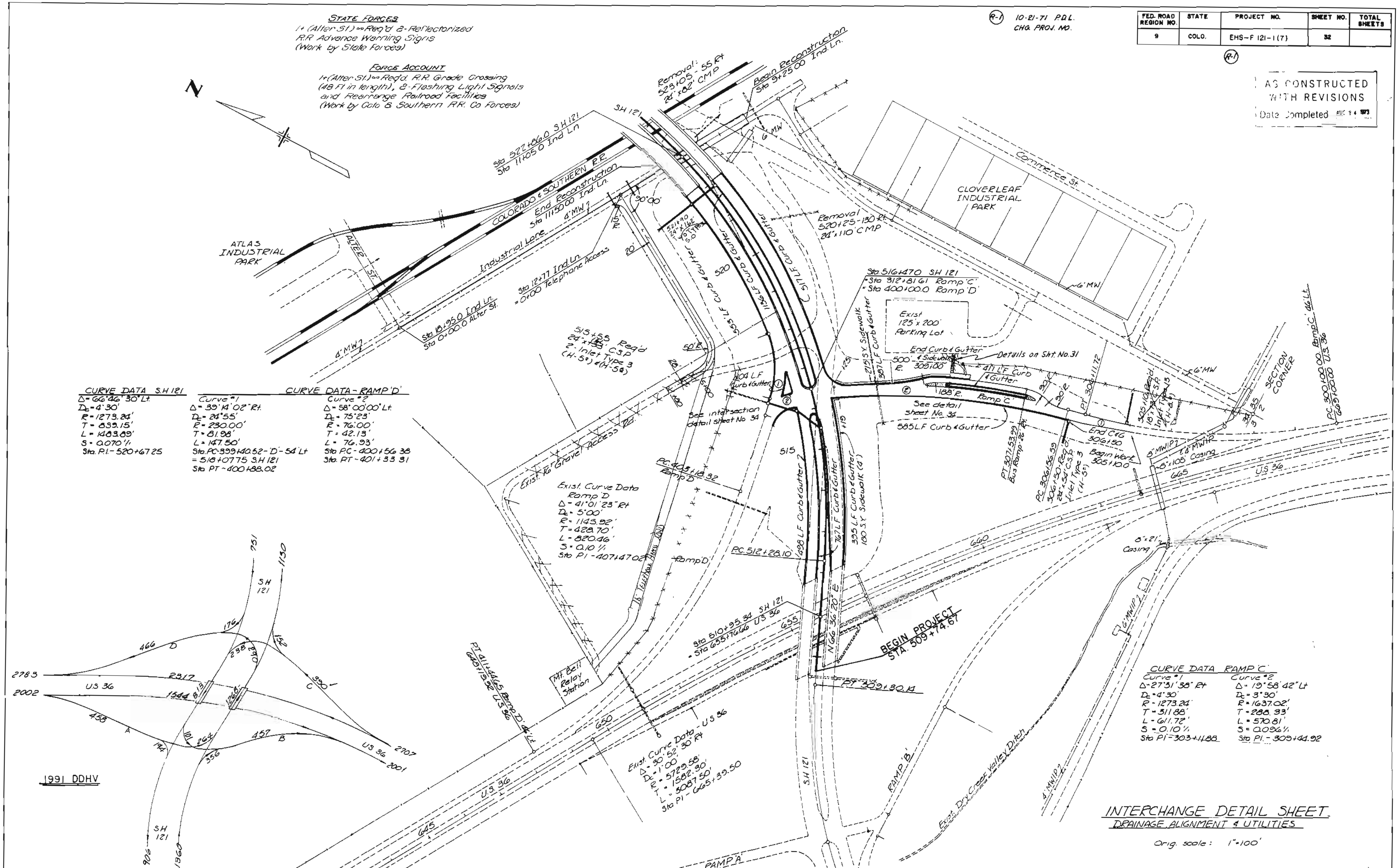
ELEVATION
DETAIL A



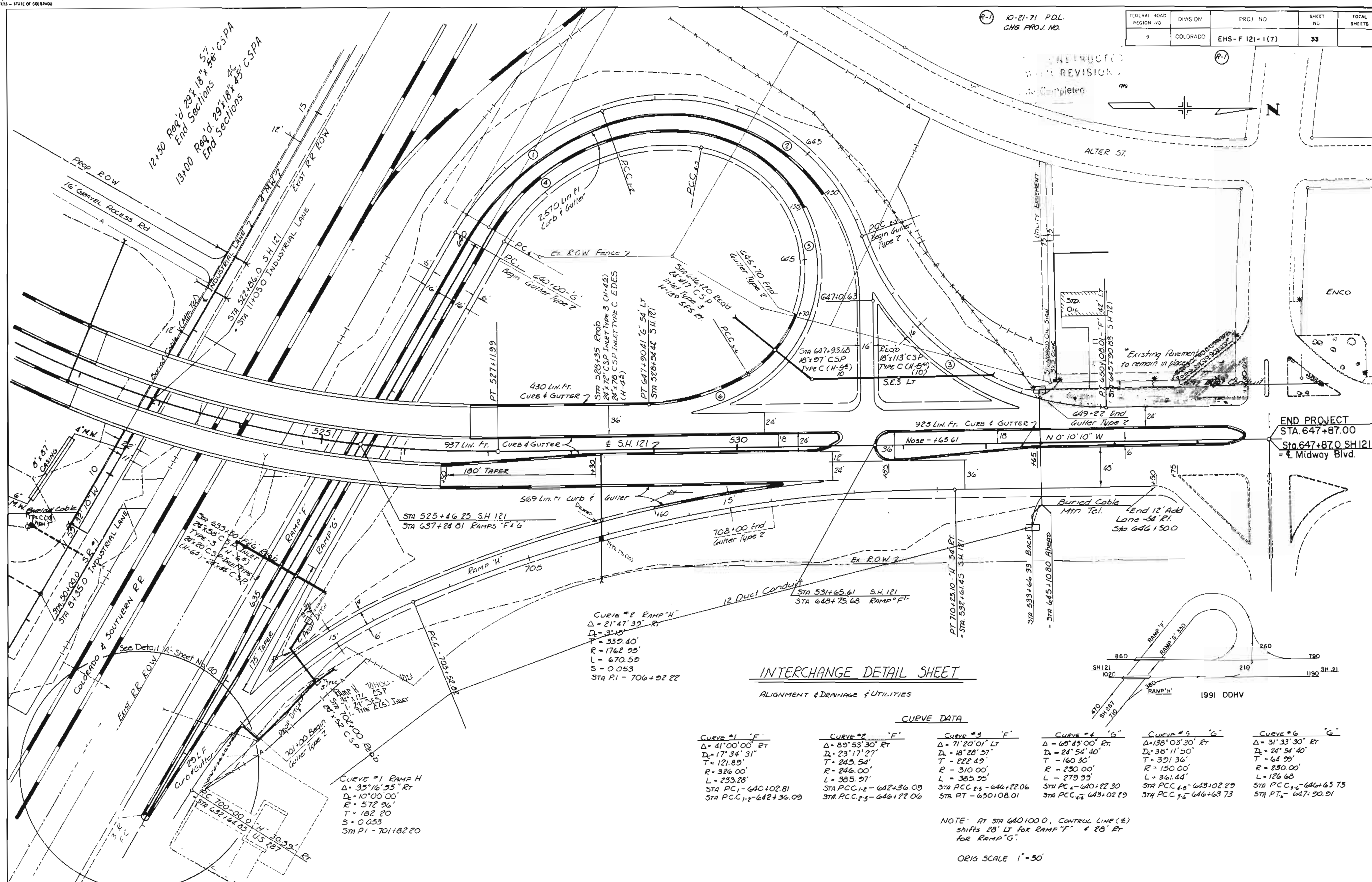
PLAN
DETAIL A

MISCELLANEOUS DETAILS

FED. ROAD REGION NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	EHS-F 121-1(7)	32	



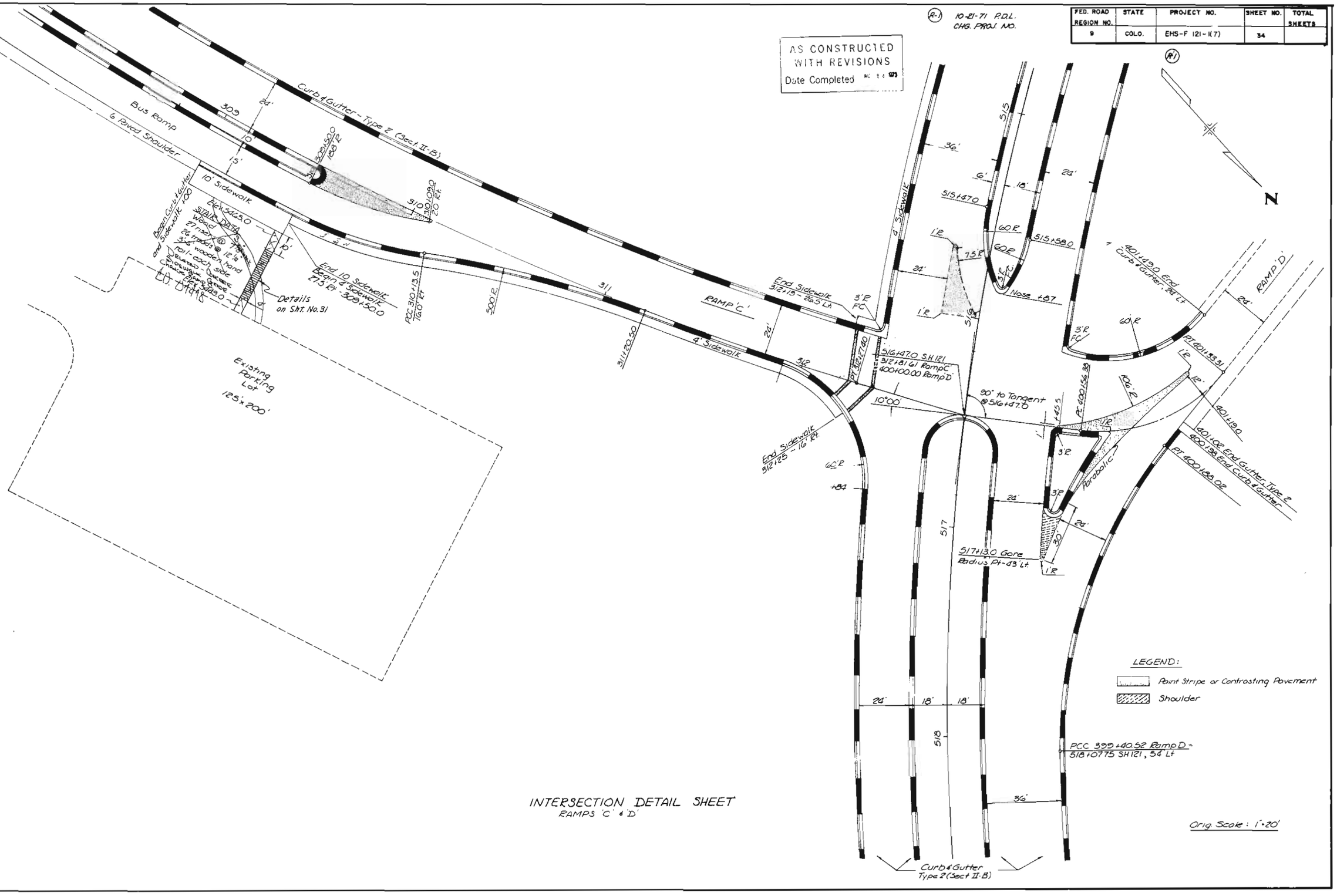
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
FORM D.O.H. 125
JULY 1968



FED. ROAD REGION NO.	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	EHS-F 121-1(7)	34	

(R-1) 10-21-71 P.D.L. CHG. PROJ. NO.

AS CONSTRUCTED WITH REVISIONS
Date Completed NOV 24 1975

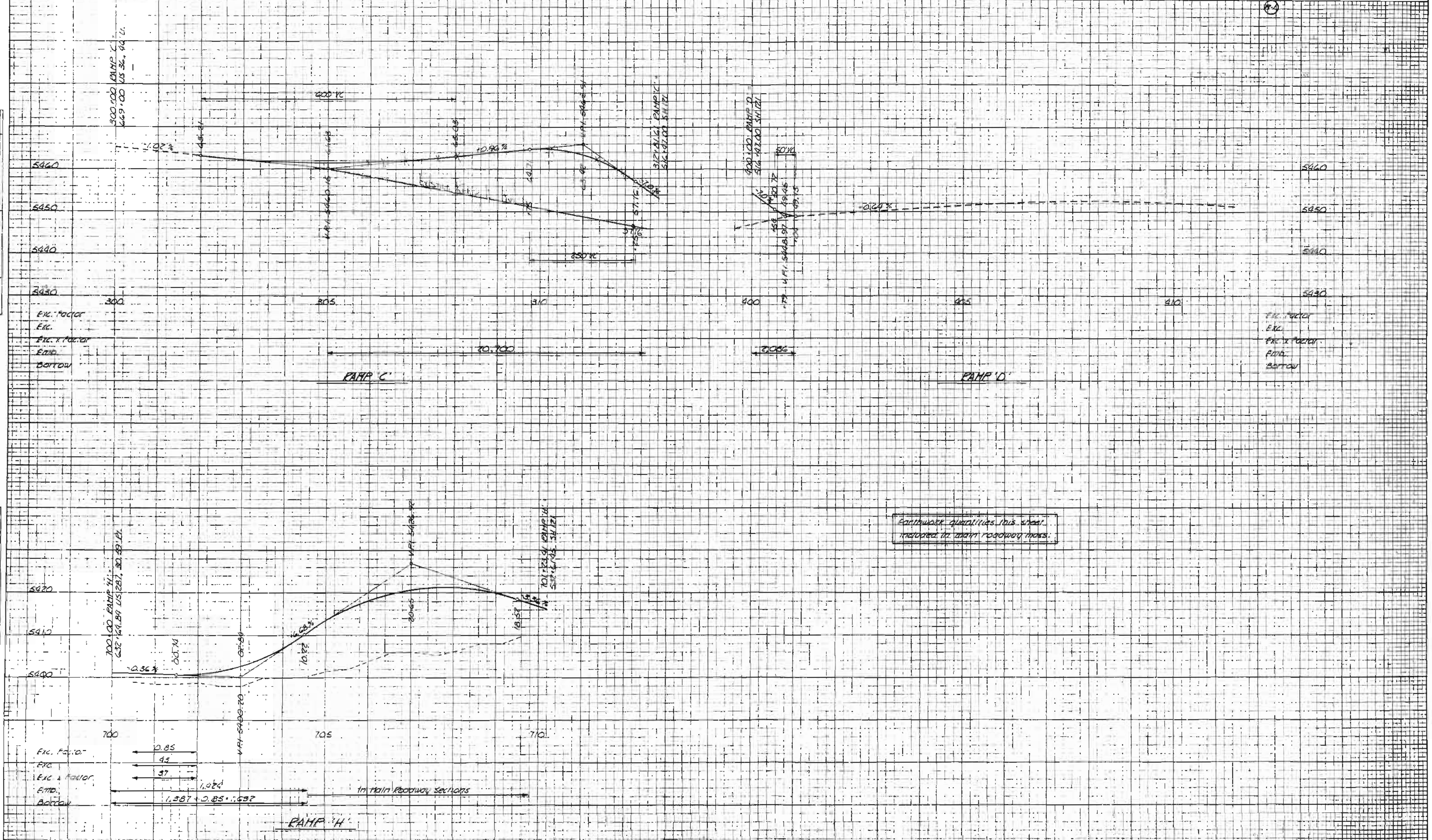


INTERSECTION DETAIL SHEET
RAMPS 'C' & 'D'

BROOMFIELD AND US 36 INTERCHANGE RAMP PROFILES

10-21-71 R.D.L.
CHD PROJ. NO.

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	36	



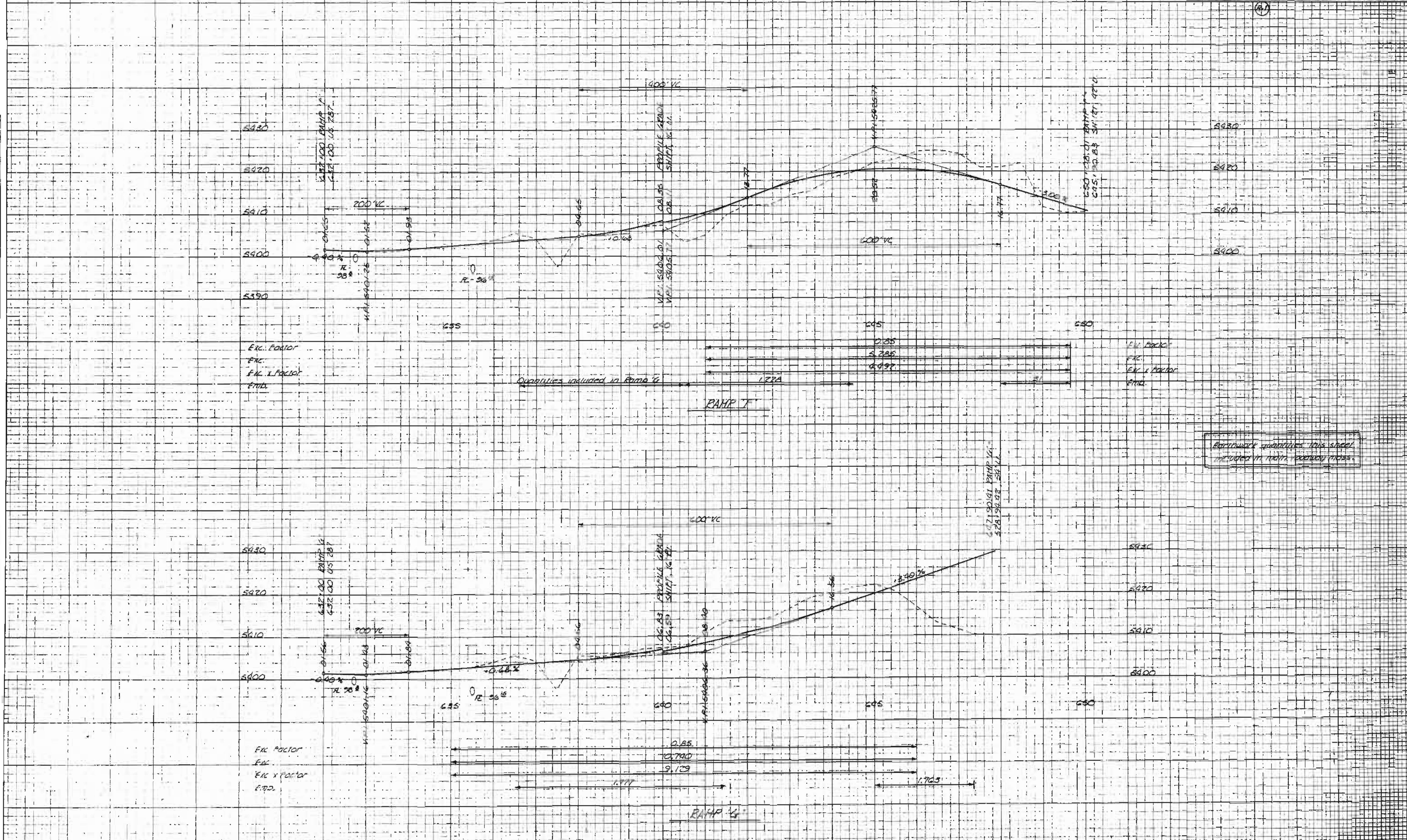
ORIGINAL SURVEY	NOTE BOOK	NO.	SURVEYED	PLOTTED	TEMPLATE	AREAS	AREAS CHECKED	BY	DATE

FINAL SURVEY	NOTE BOOK	NO.	SURVEYED	PLOTTED	TEMPLATE	AREAS	AREAS CHECKED	BY	DATE

BROOMFIELD AND US 36 INTERCHANGE RAMP PROFILES

(R-1) 10-21-71 P.D.L. CHG PROJ. NO.

FEDERAL ROAD REGION NO	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	36	



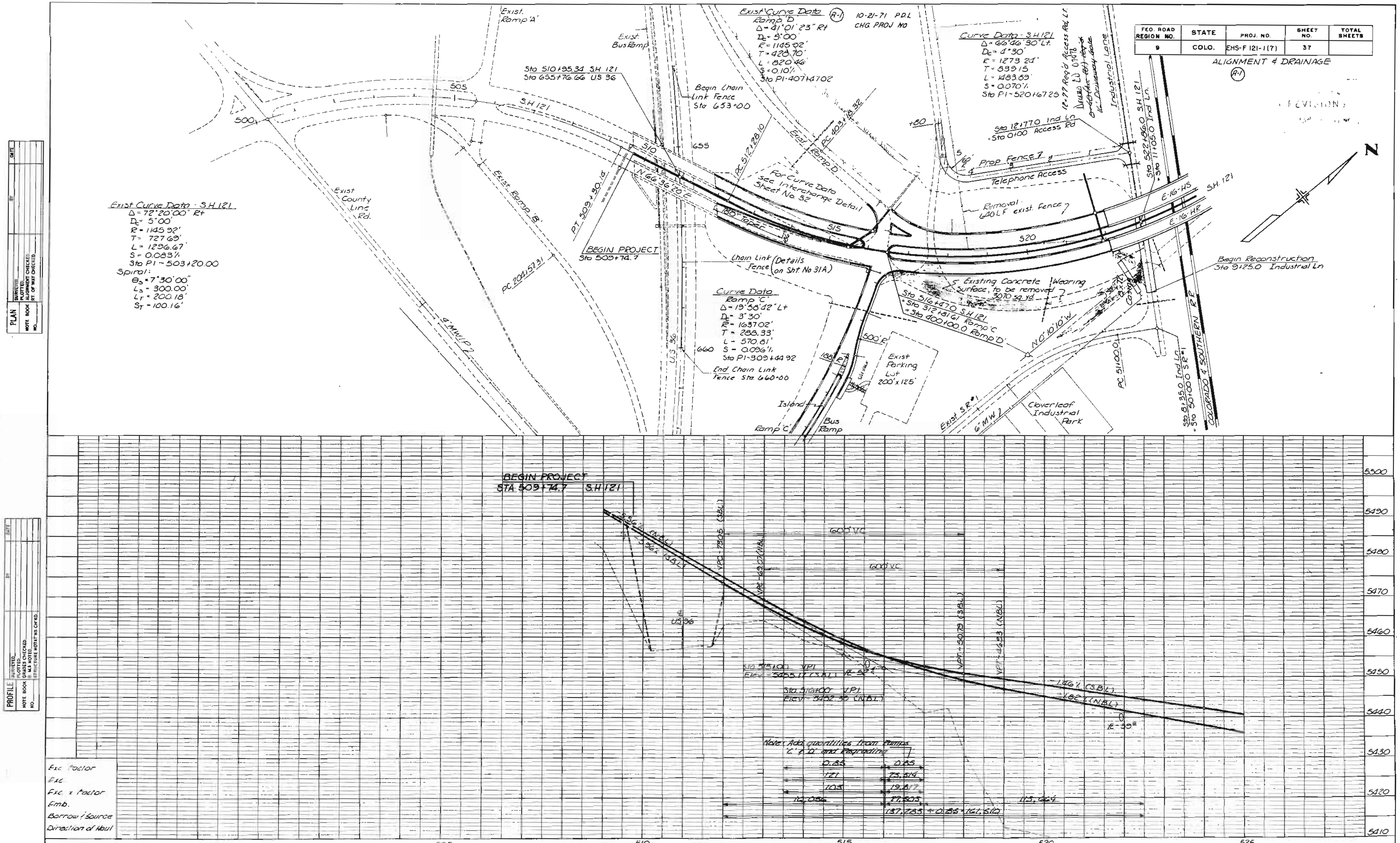
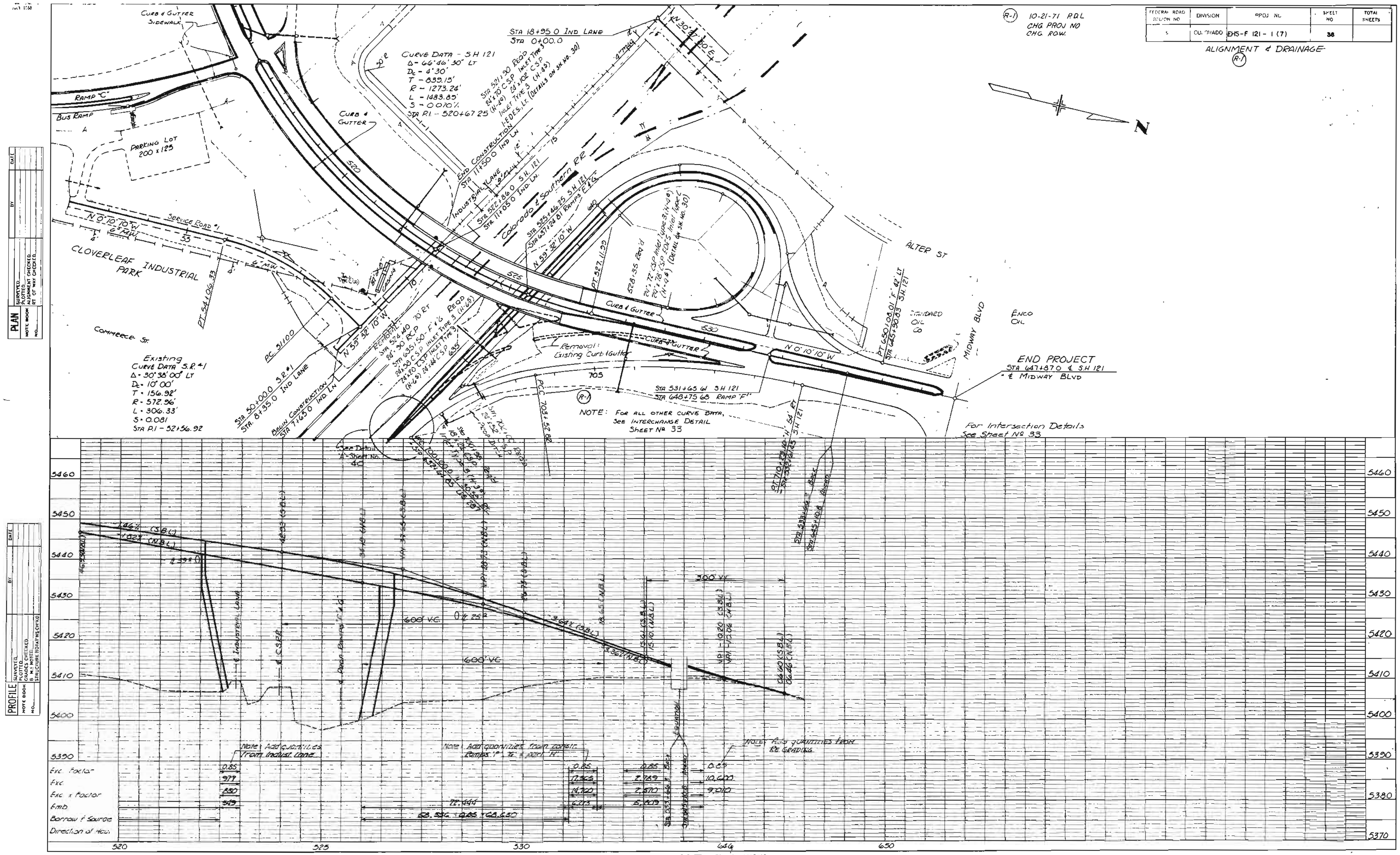
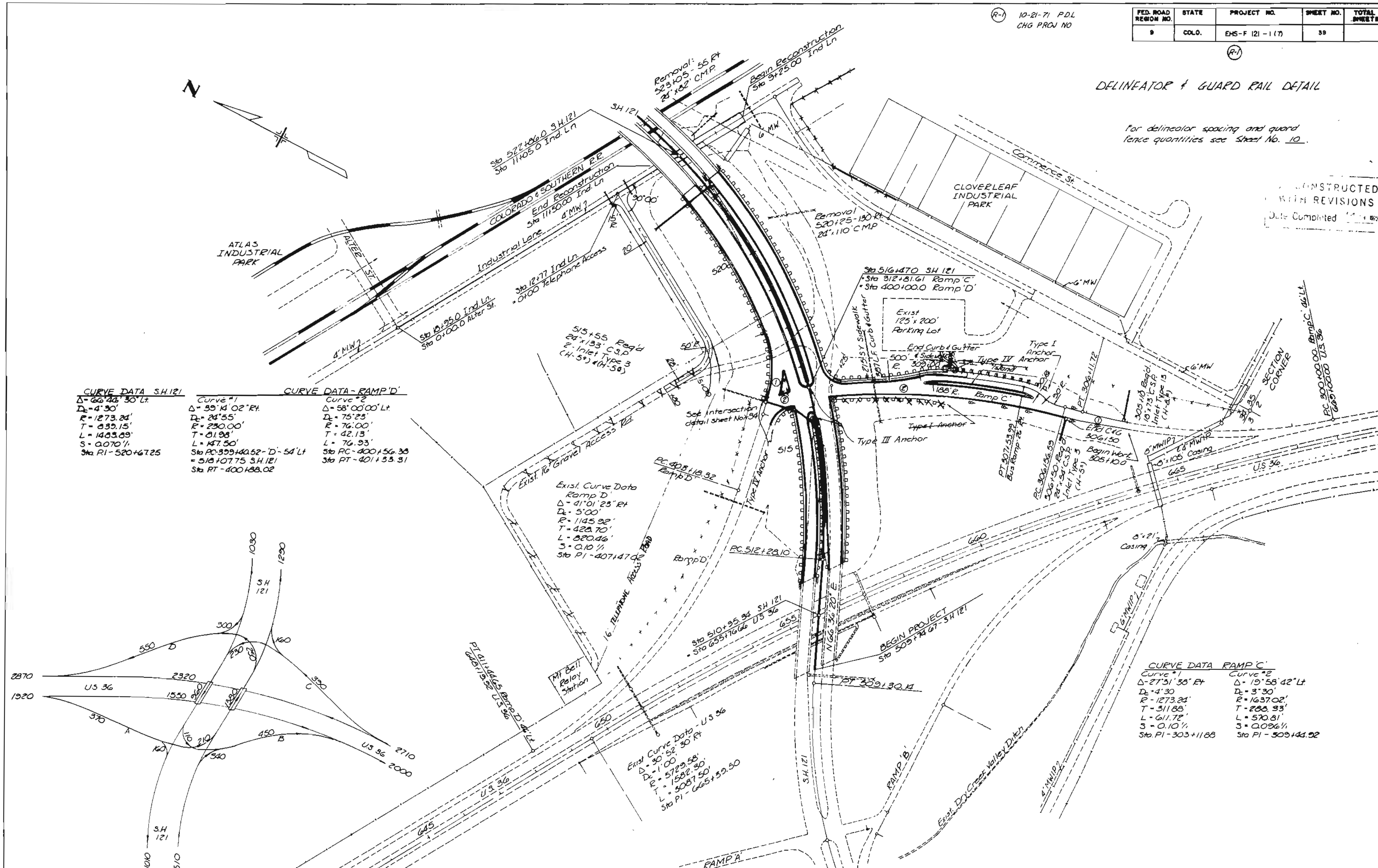


PLATE 1 - PLAN-PROFILE
KEUFFEL & ESSER CO., NEW YORK



K+E PLATE 1, PLAN-PROFILE KEUFFEL & ESSER CO.



FED. ROAD REGION NO. 9
STATE COLO.
PROJECT NO. EHS-F 121-1(7)
SHEET NO. 39
TOTAL SHEETS
R-1 10-21-71 P.D.L. CHG PROJ NO
DELINEATOR & GUARD RAIL DETAIL
For delineator spacing and guard fence quantities see Sheet No. 10.
CONSTRUCTED WITH REVISIONS
Date Completed
N
ATLAS INDUSTRIAL PARK
CLOVERLEAF INDUSTRIAL PARK
Commerce St.
Industrial Lane
ALTER ST.
COLORADO & SOUTHERN R.R.
S.H. 121
U.S. 36
Removal: 523+05 - 55 Rt 24"x82' C.M.P.
Begin Reconstruction Sta 9+25.00 Ind Ln
Sta 527+86.0 S.H. 121 Sta 11+05.0 Ind. Ln
End Reconstruction Sta 11+50.00 Ind. Ln
Removal 520+25 - 130 Rt. 24"x110' CMP
Sta 516+70 S.H. 121 = Sta 312+81.61 Ramp 'C' = Sta 400+00.0 Ramp 'D'
Exist 125' x 200' Parking Lot
End Curb & Gutter
Type I Anchor
Type IV Anchor
Type III Anchor
See Intersection detail Sheet No. 34
515+55 Req'd 24"x133' C.S.P. 2 Inlet Type 3
Exist. to Gravel Access Rd.
16' Telephone Access Road
Sta 12+77 Ind Ln = 0+00 Telephone Access
Sta 13+95.0 Ind Ln Sta 0+00.0 Alter St.
CURVE DATA S.H. 121
Δ - 66°44'30" Lt.
Dc - 4°30'
R - 1273.24'
T - 835.15'
L - 1483.89'
S - 0.070%
Sta P.I. - 520+67.25
CURVE DATA - RAMP 'D'
Curve #1
Δ - 33°14'02" Rt.
Dc - 24°55'
R - 230.00'
T - 81.98'
L - 147.50'
Sta PC-399+40.52 - 'D' - 54' Lt = 518+07.75 S.H. 121
Sta. PT - 400+88.02
Curve #2
Δ - 58°00'00" Lt.
Dc - 75°25'
R - 76.00'
T - 42.13'
L - 76.93'
Sta PC - 400+56.38
Sta PT - 401+33.31
Exist. Curve Data Ramp 'D'
Δ - 41°01'23" Rt
Dc - 5°00'
R - 1145.92'
T - 428.70'
L - 820.46'
S - 0.10%
Sta P.I. - 407+47.02
PC 408+18.32 Ramp 'D'
PC 512+28.10
Sta 510+95.34 S.H. 121 = Sta 655+76.66 U.S. 36
BEGIN PROJECT Sta 505+74.67 - S.H. 121
PT 509+30.14
Mt Bell Relay Station
PT 411+46.65 Ramp 'D' 46' Lt. 660+19.52 U.S. 36
Exist Curve Data - U.S. 36
Δ - 30°52'30" Rt
Dc - 1°00'
R - 5729.58'
T - 1582.30'
L - 3087.50'
Sta P.I. - 665+53.50
Ramp 'B'
RAMP 'A'
Ramp 'C'
Exist. Dry Creek Valley Ditch
PT 307+53.99 Bus Ramp 'C' 26' Rt.
PC 306+36.59
306+50 Req'd 24"x54' C.S.P. Inlet Type 3
PT 306+11.72
305+18 Req'd 18"x73' C.S.P. Inlet Type 13
End C&G 306+50
Begin Work 305+10.0
SECTION CORNER
PC 300+00.00 Ramp 'C' 26' Lt. (665+00.00 U.S. 36)
6"x105' Casing
8"x21' Casing
CURVE DATA RAMP 'C'
Curve #1
Δ - 27°31'38" Rt
Dc - 4°30'
R - 1273.24'
T - 311.88'
L - 611.72'
S - 0.10%
Sta. P.I. - 303+11.88
Curve #2
Δ - 19°58'42" Lt.
Dc - 3°30'
R - 1637.02'
T - 288.33'
L - 570.81'
S - 0.096%
Sta P.I. - 303+44.52

STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS — STATE OF COLORADO
FORM D.O.H. 126
JULY, 1956

(R-1) 10-21-71 P.D.L
CHG. PROJ. NO.

FEDERAL ROAD REGION NO.	DIVISION	PROJ NO	SHEET NO.	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	40	

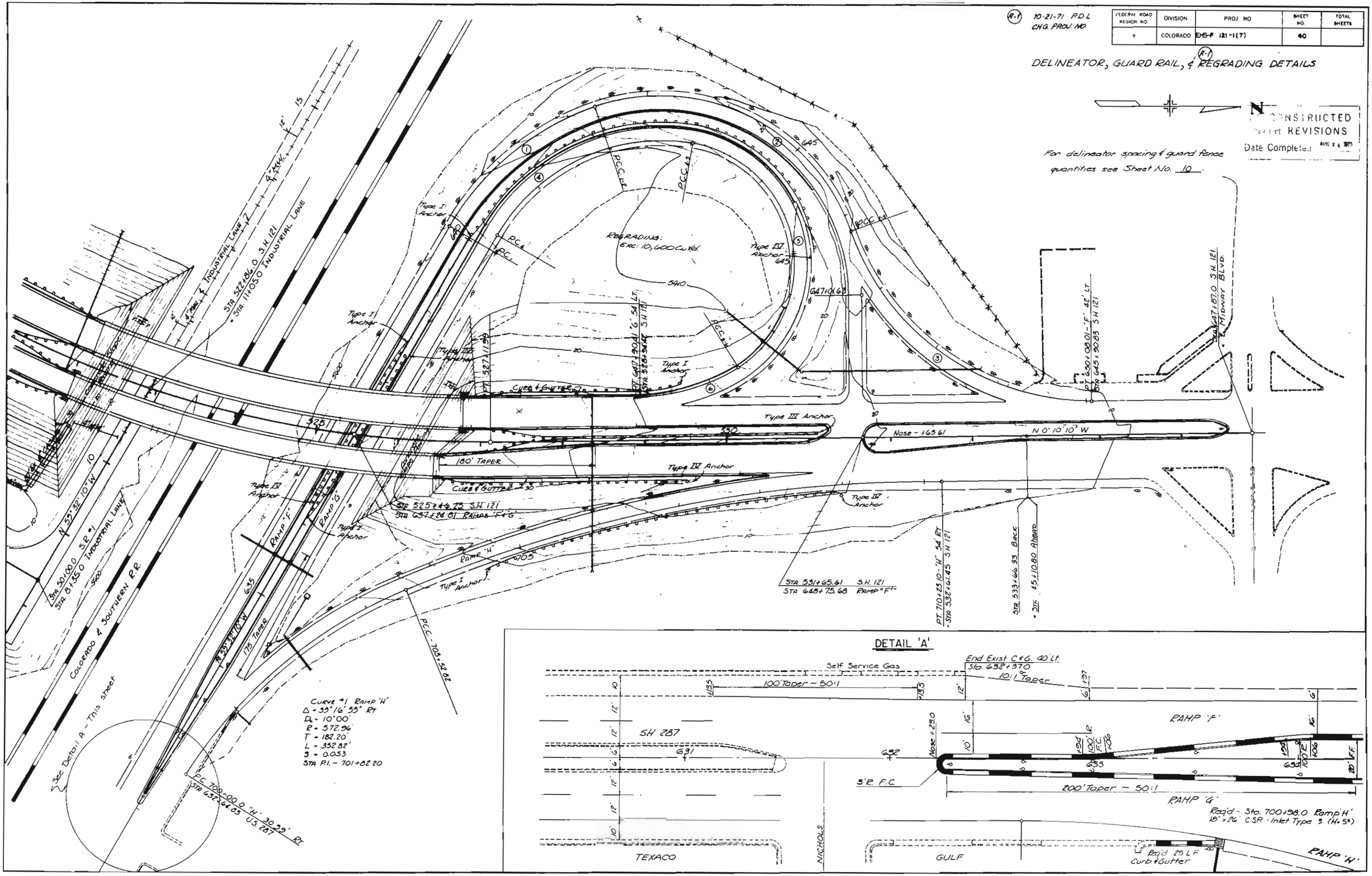
(R-1)

DELINEATOR, GUARD RAIL, & REGRADING DETAILS

N

CONSTRUCTED
WITH REVISIONS
Date Completed AUG 9 & 1973

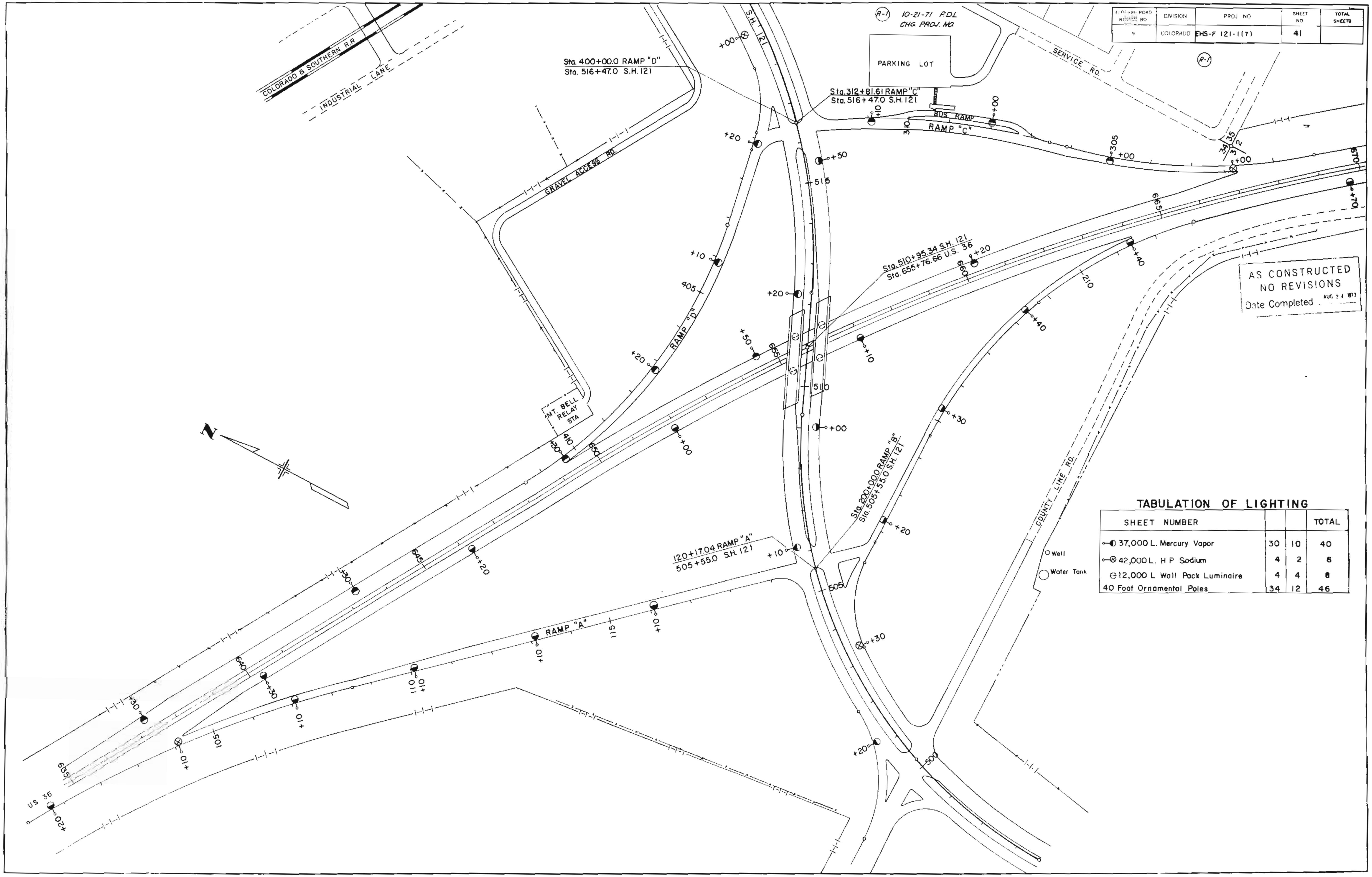
For delineator spacing & guard fence quantities see Sheet No. 10.



DETAIL 'A'

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

FEDERAL ROAD REGION NO	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	41	



AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 4 1973

TABULATION OF LIGHTING

SHEET NUMBER			TOTAL
37,000 L. Mercury Vapor	30	10	40
42,000 L. H P Sodium	4	2	6
12,000 L Wall Pack Luminaire	4	4	8
40 Foot Ornamental Poles	34	12	46

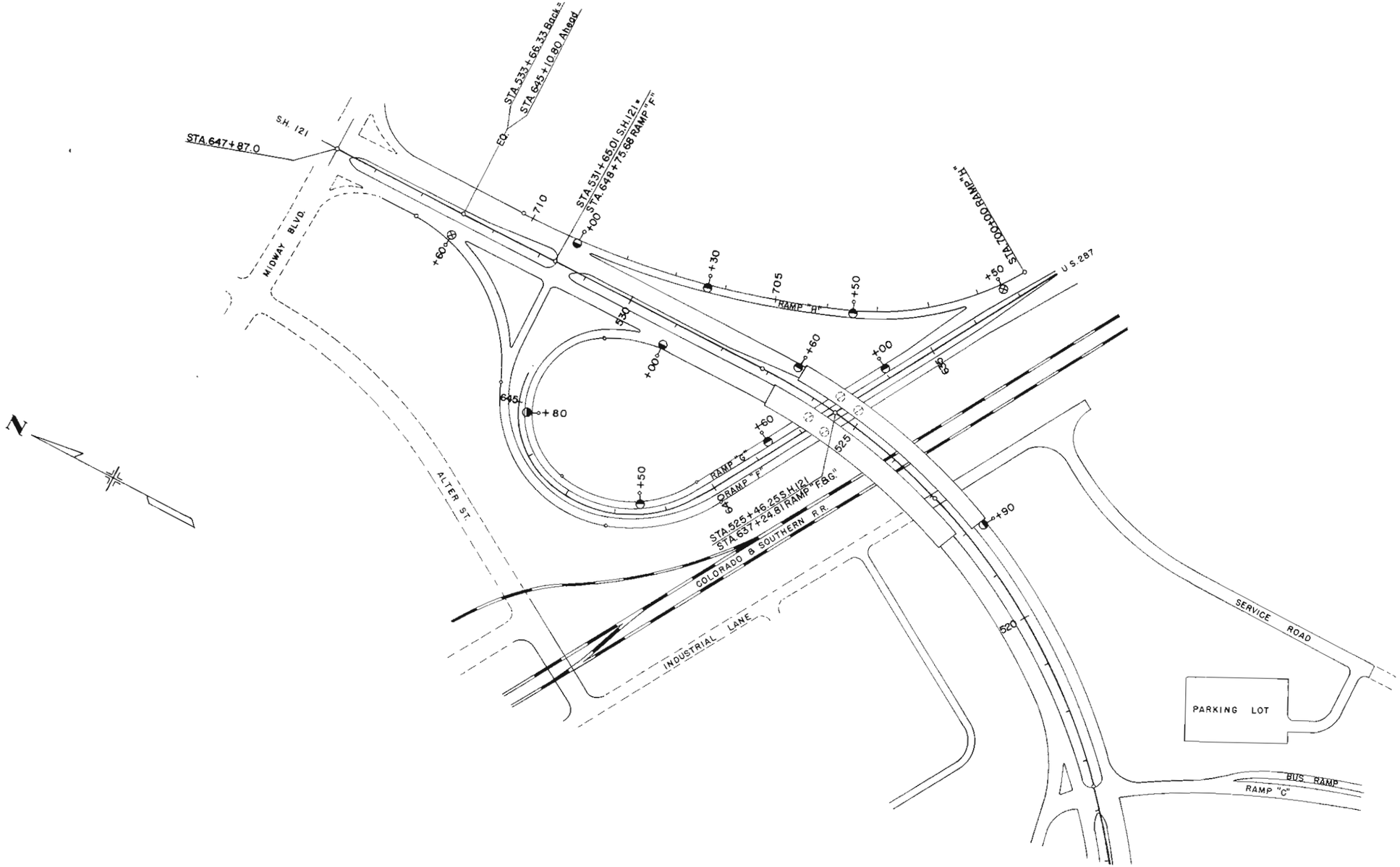
STATE DEPARTMENT OF HIGHWAYS
DIVISION OF HIGHWAYS – STATE OF COLORADO
FORM D.O.H. 1.76
JULY, 1953

(R-1) 10-21-71 P.O.L.
CHG. PROJ. NO

FEDERAL ROAD REGION NO	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO	EHS-F 121-1(7)	42	

(R-1)

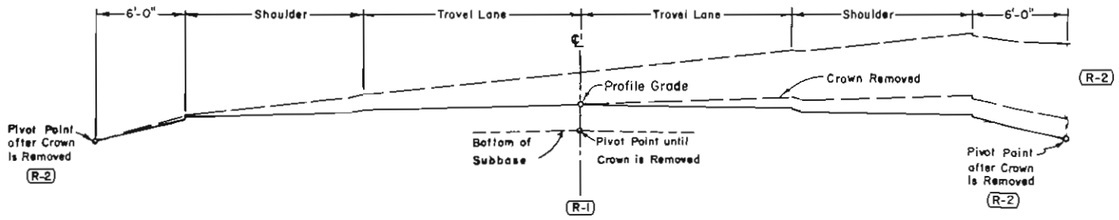
AS CONSTRUCTED
NO REVISIONS
Date Completed AUG 2 1 1973

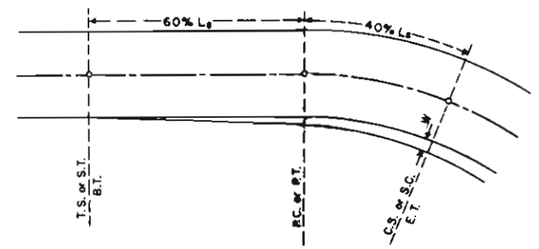


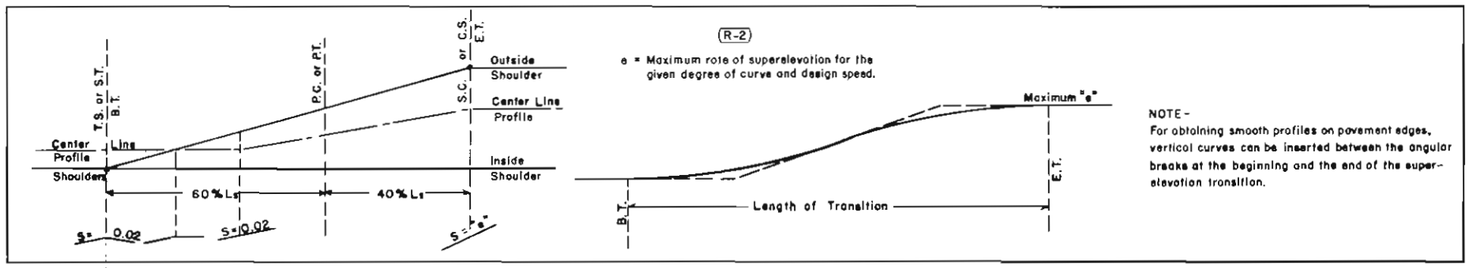
STANDARD M-203-A

(JULY 1, 1965)

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







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

PAVEMENT WIDENING

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

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

REVISIONS			
R-1	5-26-67	Supered Template	M.R.H.
R-2	7-30-68	Template, Rate Tables and Dept. Name.	M.R.H.

(R-2)

TABLE 1
SUPERELEVATION RATES FOR TWO LANE CROWNED HIGHWAYS

Degree of Curve	Maximum Superelevation = 0.08			Maximum Superelevation = 0.10		
	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length
0°15'	.020	70	200'	.020	70	200'
0°30'	.020	70	200'	.020	70	200'
0°45'	.021	70	200'	.021	70	200'
1°00'	.028	70	200'	.028	70	200'
1°30'	.042	70	200'	.042	70	200'
2°00'	.056	70	200'	.055	70	200'
2°30'	.069	70	200'	.069	70	200'
3°00'	.078	70	250'	.083	70	250'
3°30'	.080	70	250'	.096	70	300'
4°	.080	65	250'	.100	65	300'
5°	.080	60	250'	.100	60	300'
6°	.080	55	200'	.100	55	250'
7°	.080	50	200'	.100	50	250'
8°	.080	45	200'	.100	50	250'
9°	.080	45	200'	.100	45	250'
10°	.080	40	200'	.100	45	250'
11°	.080	40	200'	.100	40	200'
12°	.080	40	200'	.100	40	200'
13°	.080	35	150'	.100	40	200'
14°	.080	35	150'	.100	35	200'
15°	.080	35	150'	.100	35	200'
16°	.080	35	150'	.100	35	200'
17°	.080	30	150'	.100	35	200'
18°	.080	30	150'	.100	30	200'
19°	.080	30	150'	.100	30	200'
20°	.080	30	150'	.100	30	200'
21°	.080	30	150'	.100	30	200'
22°	.080	30	150'	.100	30	200'
23°	.080	30	150'	.100	30	200'
24°				.100	30	200'
25°				.100	30	200'

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

(R-2)

TABLE 2
SUPERELEVATION RATES FOR SPECIAL CASES ■

Degree of Curve	30 M.P.H.			35 M.P.H.			40 M.P.H.			45 M.P.H.			50 M.P.H.			55 M.P.H.			60 M.P.H.			Degree of Curve
	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	Required Superelevation Rate Ft./Ft.		Minimum Length of Transition	
	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	
0°15'	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	0°15'
0°30'	N C	N C	0	N C	N C	0	N C	N C	0	N C	N C	0	.020	.020	150'	.020	.020	200'	.020	.020	200'	0°30'
0°45'	N C	N C	0	N C	N C	0	.020	.020	150'	.020	.020	150'	.020	.020	150'	.020	.020	200'	.020	.020	200'	0°45'
1°00'	N C	N C	0	.020	.020	150'	.020	.020	150'	.020	.020	150'	.020	.020	150'	.021	.021	200'	.022	.022	200'	1°00'
1°30'	.020	.020	100'	.020	.020	150'	.020	.020	150'	.023	.024	150'	.027	.027	150'	.031	.031	200'	.035	.034	200'	1°30'
2°00'	.020	.020	100'	.020	.021	150'	.025	.027	150'	.030	.032	150'	.035	.036	150'	.041	.042	200'	.042	.046	200'	2°00'
2°30'	.020	.020	100'	.025	.026	150'	.030	.035	150'	.036	.039	150'	.043	.045	150'	.050	.052	200'	.057	.059	200'	2°30'
3°00'	.023	.024	100'	.029	.031	150'	.036	.038	150'	.042	.046	150'	.050	.054	150'	.057	.062	200'	.066	.070	200'	3°00'
3°30'	.026	.027	100'	.033	.035	150'	.040	.045	150'	.048	.053	150'	.056	.063	150'	.064	.072	200'	.072	.081	250'	3°30'
4°	.029	.030	100'	.037	.040	150'	.044	.050	150'	.053	.060	150'	.062	.070	200'	.069	.079	200'	.076	.090	250'	4°
5°	.035	.038	100'	.044	.048	150'	.053	.060	150'	.062	.071	200'	.070	.083	200'	.077	.091	250'	.080	.099	300'	5°
6°	.041	.044	100'	.050	.056	150'	.060	.068	150'	.069	.080	200'	.076	.093	250'	.080	.098	250'		.100	300'	6°
7°	.045	.050	100'	.056	.063	150'	.066	.076	150'	.074	.088	200'	.079	.097	250'		.100	250'				7°
8°	.050	.055	100'	.061	.069	150'	.071	.084	200'	.078	.094	200'	.080	.100	250'							8°
9°	.054	.061	100'	.065	.075	150'	.074	.089	200'	.080	.097	250'										9°
10°	.058	.065	150'	.069	.081	150'	.077	.093	200'	.080	.100	250'										10°
11°	.061	.070	150'	.072	.085	200'	.079	.096	200'													11°
12°	.065	.074	150'	.075	.089	200'	.080	.098	200'													12°
13°	.067	.078	150'	.077	.092	200'		.100	200'													13°
14°	.070	.082	150'	.078	.095	200'																
15°	.072	.085	150'	.079	.097	200'																
16°	.074	.087	150'	.080	.099	200'																
17°	.076	.090	150'		.100	200'																
18°	.077	.093	200'		.100	200'																
19°	.078	.095	200'																			
20°	.079	.096	200'																			
21°	.080	.098	200'																			
22°	.080	.099	200'																			
23°	.080	.099	200'																			
24°		.100	200'																			
25°		.100	200'																			

■ Table 2 data may be used for City Streets & Interchanges.
NC = Normal Crown section.

NOTES—Transition or Spiral Lengths are shown in the tables for 2 Lane Crowned Highways.
For 3 Lane Crowned Highways use 1.2 times the lengths shown, rounded to the nearest 50 feet.
" 4 " " " " 1.5 " " " " " " " " " "
Width of Crowned Highway to be figured for Superelevation—left pivot point to right pivot point.

(R-2)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

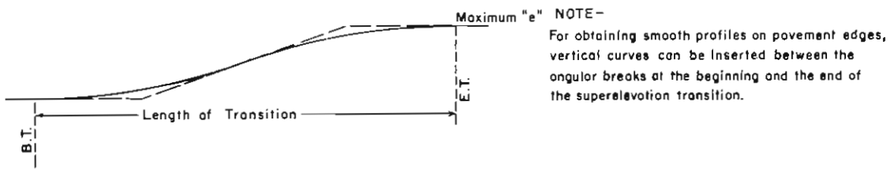
SUPERELEVATION & WIDENING OF CURVES CROWNED HIGHWAYS

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

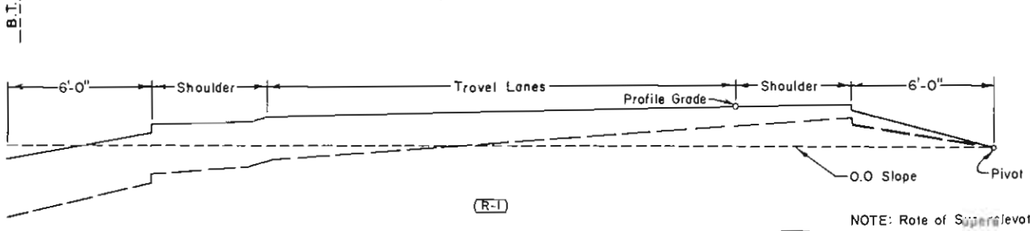
STANDARD M-203-A-1

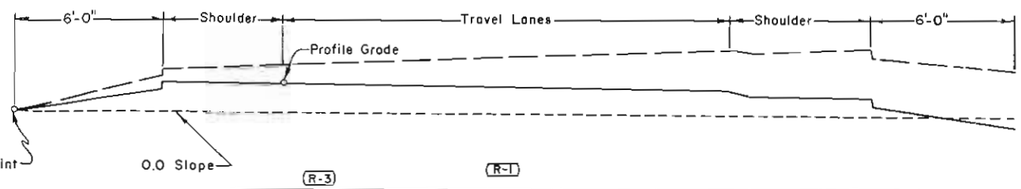
(JULY 1, 1965)

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



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



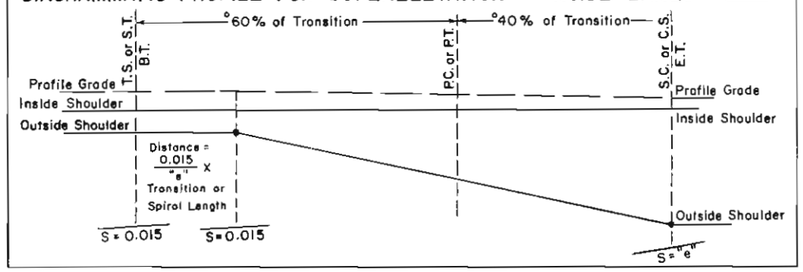


(R-1)

NOTE: Rate of Superelevation is applied from 0.0 slope line.
In case of narrow (non-depressed) median, the normal location of pivot point will be at the centerline of the median.

(R-3) (R-2)

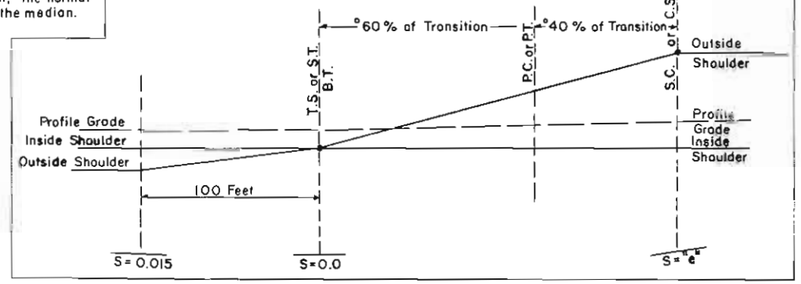
DIAGRAMMATIC PROFILE FOR SUPERELEVATION ~ INSIDE LANES



° When Curve is Not Spiralled

(R-3)

DIAGRAMMATIC PROFILE FOR SUPERELEVATION ~ OUTSIDE LANES



(R-3)
e = Maximum rate of superelevation for the given degree of curve and design speed.

REVISIONS			
(R-1)	5-26-67	Superelevation Template	M.R.H.
(R-2)	7-26-67	Median note	R.S.M.
(R-3)	7-30-68	Dpt. Name, Tables, Note	M.R.H.

(R-3)

TABLE 1
SUPERELEVATION RATES FOR FOUR LANE DIVIDED HIGHWAYS

Degree of Curve	Maximum Superelevation = 0.08			Maximum Superelevation = 0.10		
	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length	Super. Rate Ft./Ft.	Maximum Design Speed M.P.H.	Minimum Transition or Spiral Length
0° 15'	►.015	70	200'	►.015	70	200'
0° 30'	►.015	70	200'	►.015	70	200'
0° 45'	.021	70	200'	.020	70	200'
1° 00'	.028	70	200'	.028	70	200'
1° 30'	.042	70	200'	.042	70	200'
2° 00'	.056	70	250'	.055	70	250'
2° 30'	.069	70	250'	.069	70	250'
3° 00'	.077	70	250'	.083	70	300'
3° 30'	.080	70	500'	.096	70	550'
4°	.080	65	300'	.100	70	350'
5°	.080	60	300'	.100	65	350'
6°	.080	55	250'	.100	55	300'
7°	.080	50	250'	.100	55	300'
8°	.080	50	250'	.100	50	300'
9°	.080	45	250'	.100	45	300'
10°	.080	45	250'	.100	45	300'
11°	.080	40	200'	.100	40	250'
12°	.080	40	200'	.100	40	250'
13°	.080	35	200'	.100	40	250'
14°	.080	35	200'	.100	35	200'
15°	.080	35	150'	.100	35	200'
16°	.080	35	150'	.100	35	200'
17°	.080	30	150'	.100	35	200'
18°	.080	30	150'	.100	35	200'
19°	.080	30	150'	.100	30	200'
20°	.080	30	150'	.100	30	200'
21°	.080	30	150'	.100	30	200'
22°	.080	30	150'	.100	30	200'
23°	.080	30	150'	.100	30	200'
24°				.100	30	200'
25°				.100	30	200'

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

(R-3)

TABLE 2 ~ SUPERELEVATION RATES FOR SPECIAL CASES ◪

Degree of Curve	25 M.P.H.			30 M.P.H.			35 M.P.H.			40 M.P.H.			45 M.P.H.			50 M.P.H.			55 M.P.H.			60 M.P.H.			Degree of Curve
	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	Required Super. Rate Ft./Ft.		Minimum Length of Transition	
	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	0.08	0.10	or Spiral	
0° 15'	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	0° 15'
0° 30'	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	N S	N S	0	►.015	►.015	150'	►.015	►.015	200'	►.015	►.015	200'	0° 30'
0° 45'	N S	N S	0	N S	N S	0	N S	N S	0	►.015	►.015	150'	►.015	►.015	150'	►.015	►.015	150'	.016	.016	200'	.018	.018	200'	0° 45'
1° 00'	N S	N S	0	N S	N S	0	►.015	►.015	150'	►.015	►.015	150'	.016	.016	150'	.018	.018	150'	.021	.021	200'	.022	.022	200'	1° 00'
1° 30'	N S	N S	0	►.015	►.015	100'	►.015	.016	150'	.019	.020	150'	.023	.024	150'	.027	.027	150'	.031	.031	200'	.035	.034	200'	1° 30'
2° 00'	►.015	►.015	100'	.016	.016	100'	.020	.021	150'	.025	.027	150'	.030	.032	150'	.035	.036	150'	.041	.042	200'	.047	.046	200'	2° 00'
2° 30'	►.015	►.015	100'	.020	.020	100'	.025	.026	150'	.030	.033	150'	.036	.039	150'	.043	.045	150'	.050	.052	200'	.057	.059	200'	2° 30'
3° 00'	.016	.017	100'	.023	.024	100'	.029	.031	150'	.035	.038	150'	.042	.046	150'	.050	.054	150'	.057	.052	200'	.066	.070	250'	3° 00'
3° 30'	.019	.019	100'	.026	.027	100'	.033	.035	150'	.040	.045	150'	.048	.053	150'	.056	.063	200'	.064	.072	250'	.072	.081	300'	3° 30'
4°	.021	.021	100'	.029	.030	100'	.037	.040	150'	.044	.050	150'	.053	.060	150'	.062	.070	200'	.069	.079	250'	.076	.090	300'	4°
5°	.026	.026	100'	.035	.038	100'	.044	.048	150'	.053	.060	150'	.062	.071	200'	.070	.083	250'	.077	.091	300'	.080	.099	350'	5°
6°	.031	.031	100'	.041	.044	100'	.050	.056	150'	.060	.068	150'	.069	.080	200'	.076	.093	250'	.080	.098	300'		.100	350'	6°
7°	.035	.035	100'	.045	.050	100'	.056	.063	150'	.066	.076	200'	.074	.088	250'	.079	.097	300'		.100	300'				7°
8°	.039	.040	100'	.050	.055	100'	.061	.069	150'	.071	.084	200'	.078	.094	250'	.080	.100	300'							8°
9°	.043	.044	100'	.054	.061	100'	.065	.075	150'	.074	.089	200'	.080	.097	300'										9°
10°	.046	.048	100'	.058	.065	150'	.069	.081	150'	.077	.093	200'		.100	300'										10°
11°	.049	.052	100'	.061	.070	150'	.072	.085	200'	.079	.096	250'													11°
12°	.052	.056	100'	.065	.074	150'	.075	.089	200'	.080	.098	250'													12°
13°	.054	.060	100'	.067	.078	150'	.077	.092	200'		.100	250'													13°
14°	.057	.063	100'	.070	.082	150'	.078	.095	200'																14°
15°	.059	.067	100'	.072	.085	150'	.079	.097	200'																15°
16°	.061	.070	100'	.074	.087	150'	.080	.099	200'																16°
17°	.063	.073	100'	.076	.090	150'		.100	200'																17°
18°	.065	.076	100'	.077	.093	200'																			18°
19°	.067	.078	100'	.078	.095	200'																			19°
20°	.069	.081	100'	.079	.096	200'																			20°
21°	.070	.083	100'	.080	.098	200'																			21°
22°	.072	.086	100'	.080	.099	200'																			22°
23°	.073	.088	100'		.099	200'																			23°
24°	.075	.090	100'		.100	200'																			24°
25°	.076	.091	100'																						25°
26°	.077	.093	150'																						26°
27°	.078	.094	150'																						27°
28°	.079	.096	150'																						28°
29°	.079	.097	150'																						29°
30°	.080	.098	150'																						30°
32°	.080	.099	150'																						32°
35°		.100	150'																						35°

◪ Table 2 data may be used for City Streets & Interchanges.
NS = Normal Slope section.

► Do nothing to inside lanes. Superelevate outside lanes at rate shown in tables.

NOTES –
Transition or Spiral Lengths are shown in the tables for 4 Lane Divided Highways.
For 6 Lane Divided Highways use 1.2 times the lengths shown, rounded to the nearest 50 feet.

(R-3)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

SUPERELEVATION OF CURVES DIVIDED HIGHWAYS

Designed by S.B.L.	Approved by L.E. Wasm
Made by S.B.L.	Staff Design Engr
Checked by L.E.O.	Date July 6 1965

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

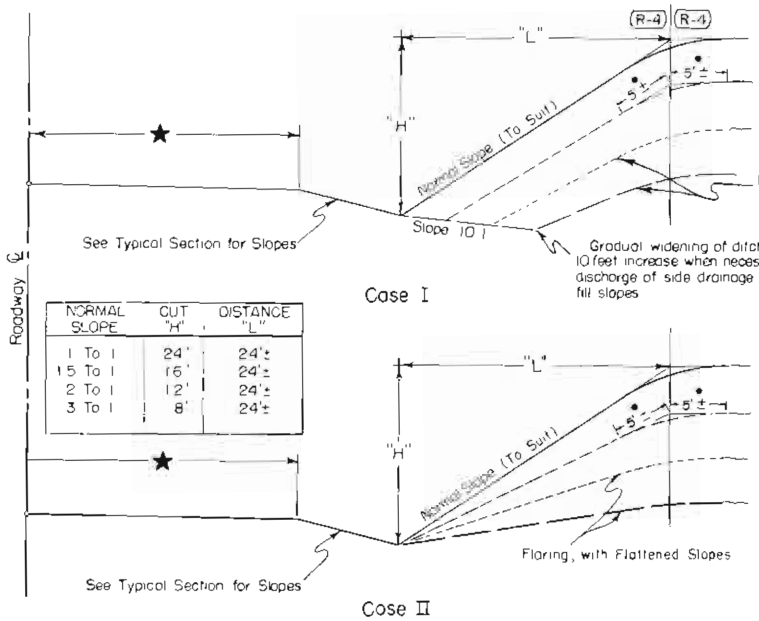
STANDARD M-203-B

(JULY 1, 1965)

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

	REVISIONS		
(R-1)	2-6-66	Median Cross Over	MRH
(R-2)	7-30-68	Dept Name	MRH
(R-3)	4-1-69	Widening for Guard Rail	MRK
(R-4)	4-27-70	Cut Slope and Note	MRH

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



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

FLARING OF EARTH CUTS The backslopes at ends of all earth cuts shall be flattened & where necessary the ditch shall be widened gradually to discharge side ditch drainage away from the base of adjacent fill slopes in order to avoid erosion & to improve appearance The transition of flattened backslopes & widened ditch shall be constructed in such a manner that a uniform appearance of slope & ditch results. Backslopes shall be flared to the approximate "L" distance shown on Slope Table included with this detail. Rock cuts shall not be flared.

● CUT SLOPE TREATMENT IN EARTH CUTS The intersection of cut slopes with the existing ground shall be rounded in earth cuts, beginning 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.

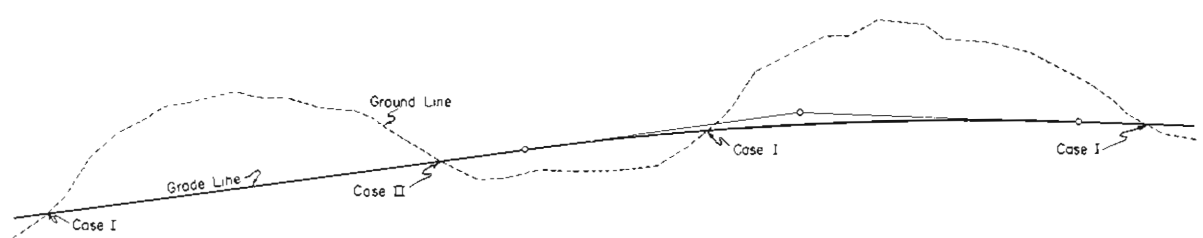
Quantities shall be included in "Unclassified Excavation"

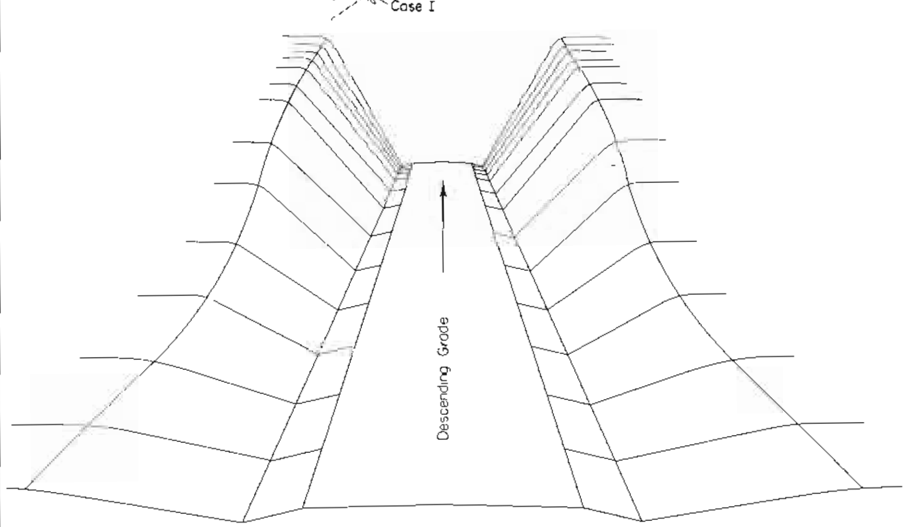
★ WIDENING AT BRIDGE APPROACHES: Roadway embankment at bridge approaches shall be so constructed that base of surfacing at shoulder point is a minimum of 2 ft. beyond the edge of bridge deck Where widening is necessary to achieve this result it shall take place gradually over a distance of 300 ft (R-4)

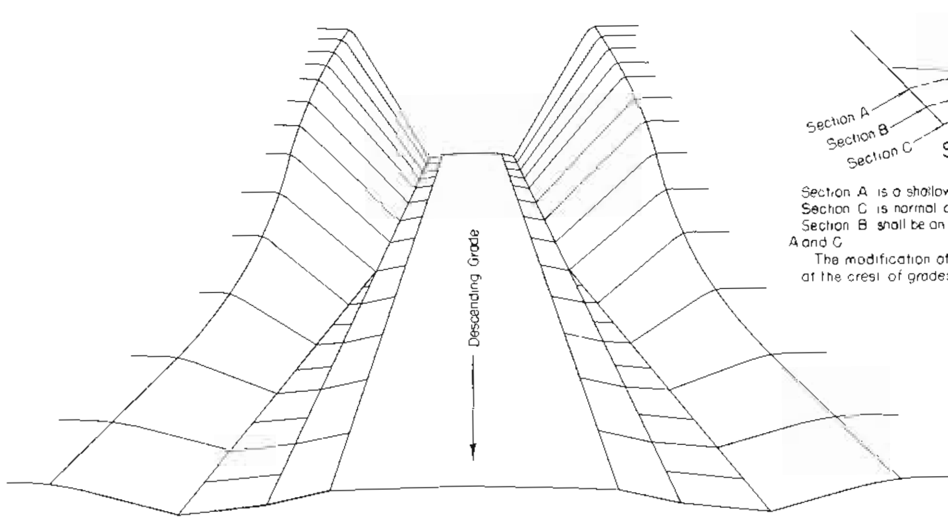
WIDENING FOR BITUMINOUS CURB (Only where Guard Rail is required); See appropriate M-Standard for Guard Rail. (R-3)

(R-4)

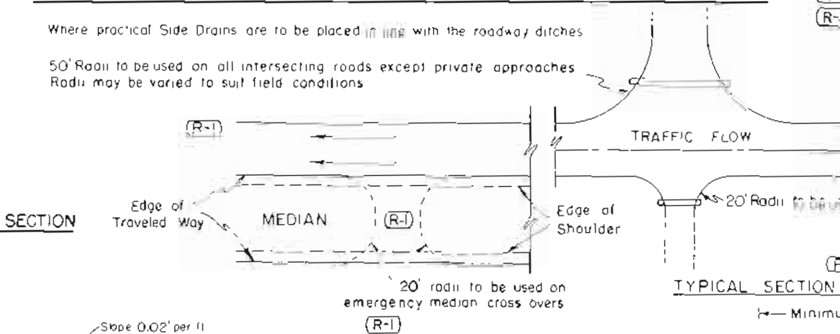
PLAN OF FLARING IN EARTH CUTS

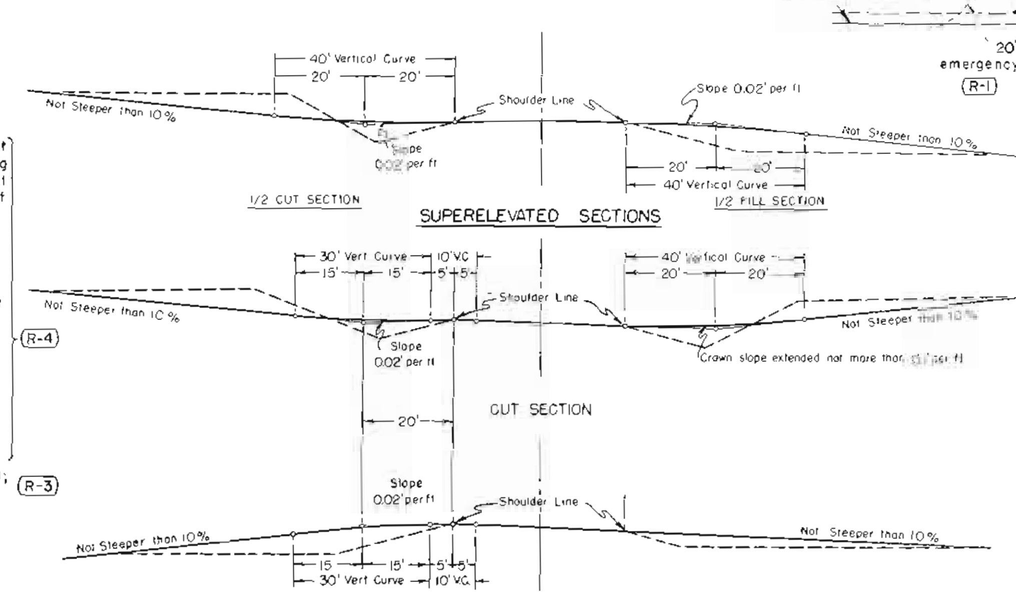






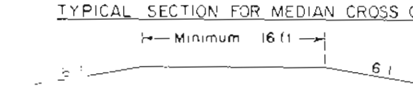
(R-1) TYPICAL PLANS FOR SIDE APPROACH ROADS AND EMERGENCY MEDIAN CROSS OVERS



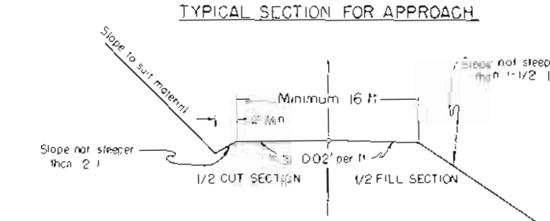


(R-1)

TYPICAL SECTION FOR MEDIAN CROSS OVERS



TYPICAL SECTION FOR APPROACH

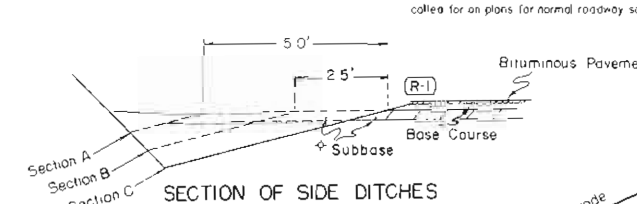


NOTE
Road Approaches shall conform to the above details unless otherwise indicated on plans The width of the crowned section shall not be less than the width of the crowned section of the existing approach road and the new construction shall not be less than 16 feet in width.

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)

✧ To be constructed thru widened sections when called for on plans for normal roadway section



SECTION OF SIDE DITCHES

Section A is a shallow ditch section
Section C is normal ditch section
Section B shall be on a uniform transition between Sections A and C

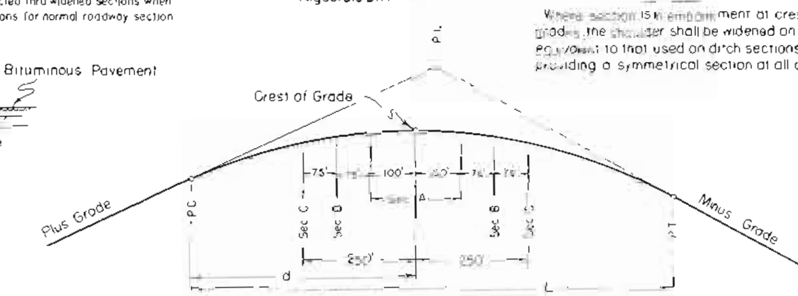
The modification of the ditch indicated shall be used only at the crest of grades from which drainage breaks both ways

Formula for finding the Crest of Grade

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

NOTE

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



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

GENERAL NOTES

(R-2)

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

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

(R-4) 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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

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

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

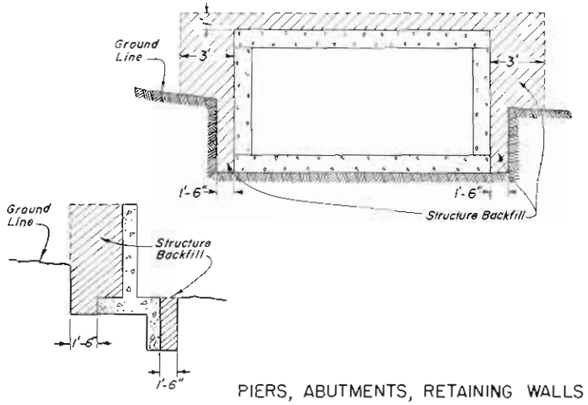
STANDARD M-206-AA

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

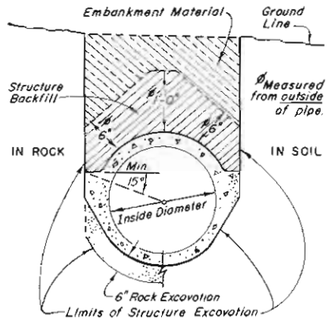
FED. ROAD REGION NO.	DIVISION	PROJECT NO	SHEET NO.
8	COLO.		

REVISION		

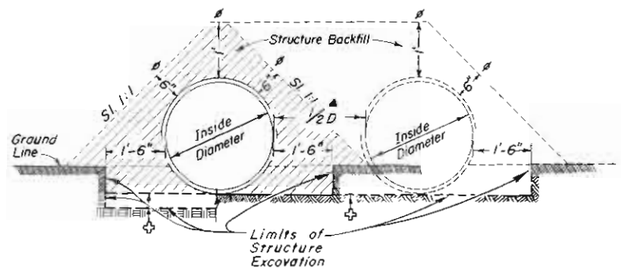
CONCRETE BOX CULVERTS & WINGWALLS



CAST IN PLACE CONDUIT

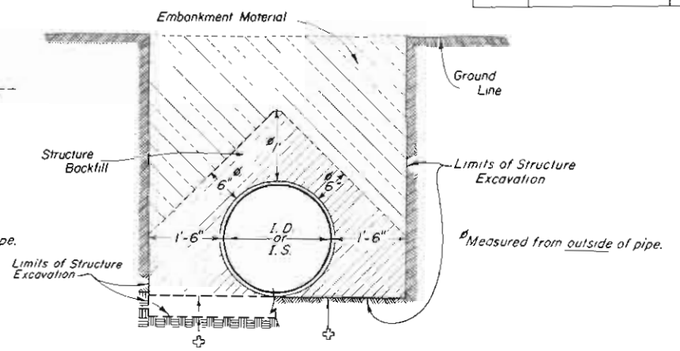


CIRCULAR CONDUIT



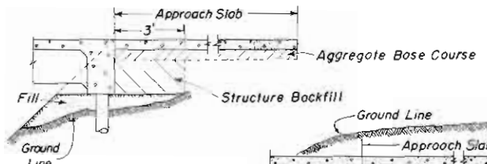
Ø Measured from outside of pipe.

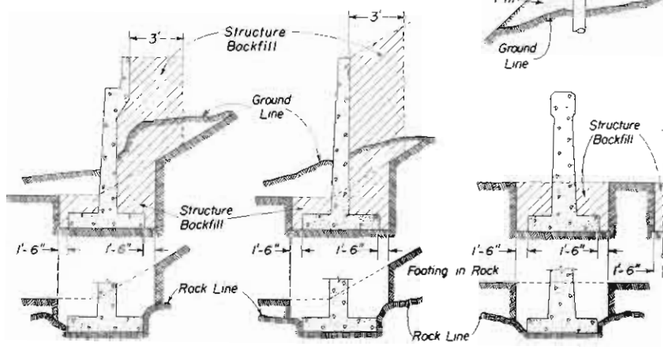
SIPHONS OR CONDUIT IN TRENCH

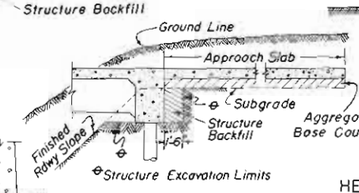


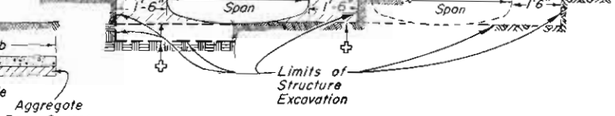
PIERS, ABUTMENTS, RETAINING WALLS ETC.

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



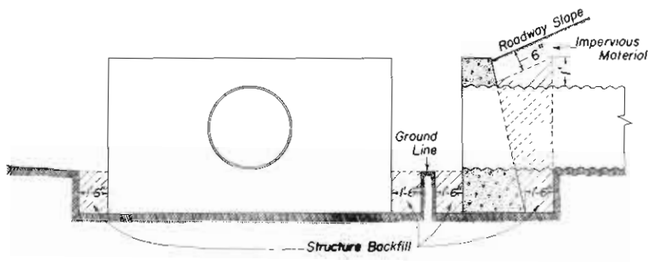




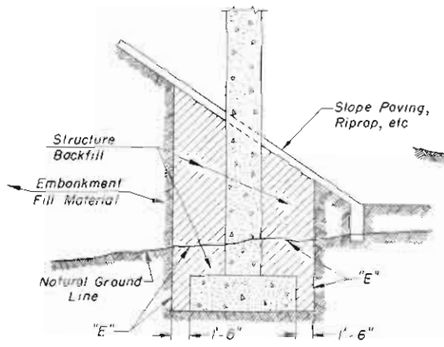


ELLIPTICAL OR ARCH CONDUIT

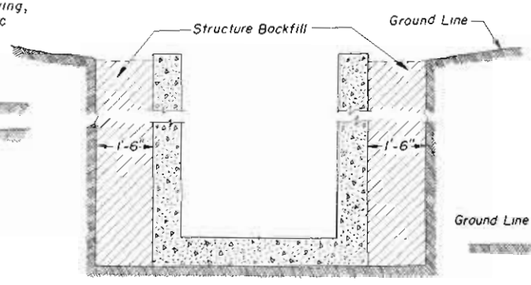
HEADWALLS AND END OF CULVERTS

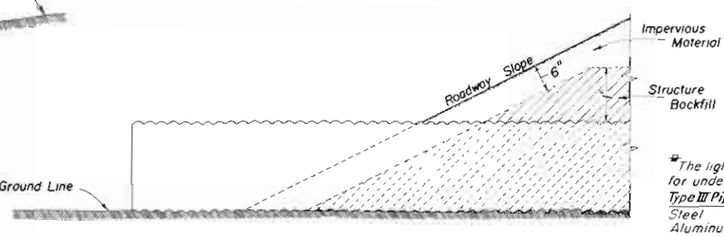


DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS, ETC.

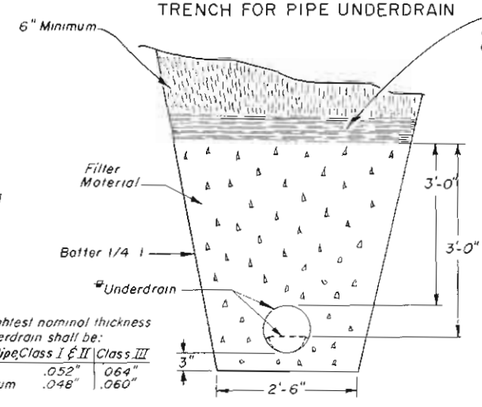


Note
"E" = Limits of Structure Excavation





TRENCH FOR PIPE UNDERDRAIN



NOTES:

▲ When two or more conduits are laid side by side they shall be spaced so that the adjacent pipes will be 1/2 I.D., 1/2 I.S. or 3 feet apart (including wall thickness), whichever is less. Minimum spacing shall be not less than 1 foot between outside walls of pipe.
For additional culvert installation details see M Standards for metal, concrete, or structural plate pipe culverts.

✣ Bottom of trench as excavated. For applicable limits of Structure Excavation, see bedding details on standards for culverts.

GENERAL NOTES

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

Where the roadway cross section is in fill, excavation for concrete footings (except those in rock or those on piles) and for box culverts shall be done according to the following.
Embankment shall be built up and compacted to a point one foot above the bottom of the box or one foot above the bottom of the footing. The trench shall then be excavated to accommodate construction of the box or footing

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

Excavation for structure installation shall be classified as "Structure Excavation" unless otherwise shown on plans

● The lightest nominal thickness for underdrain shall be:

Type III Pipe	Class I & II	Class III
Steel	.052"	.064"
Aluminum	.048"	.060"

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

EXCAVATION AND BACKFILL FOR STRUCTURES

Designed by H.E.P.	Approved by L.E. O'Donnell
Made by D.M.E.	Staff Design Engr.
Checked by L.E.O.	Date: March 1, 1971

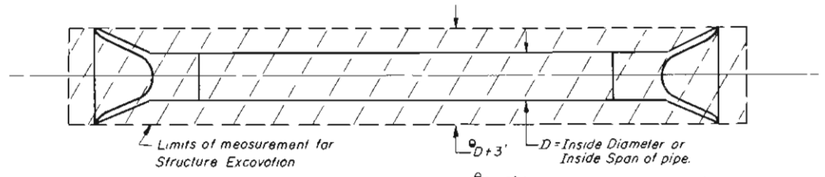
STANDARD M-206-AA

(MARCH 1, 1971)
(SHEET 2)

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

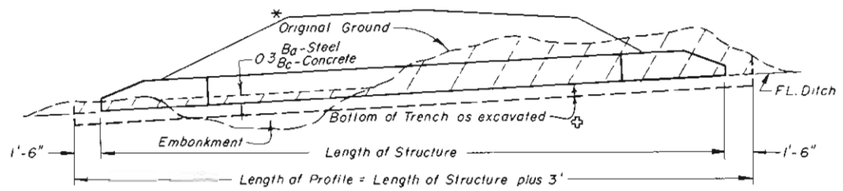
	REVISIONS	

STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS



PLAN

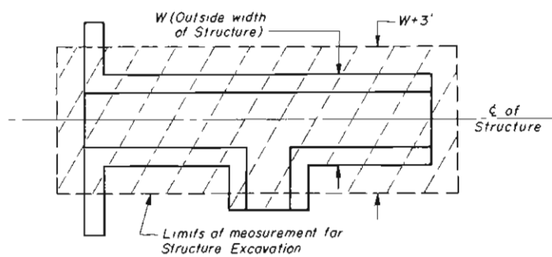
*D+6' for structural plate pipe culverts.



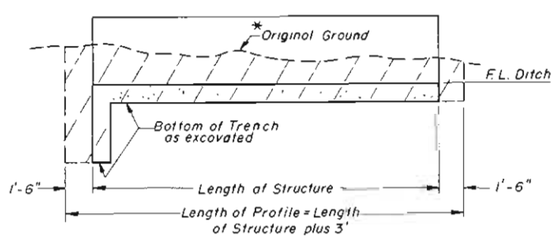
PROFILE

✣ 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

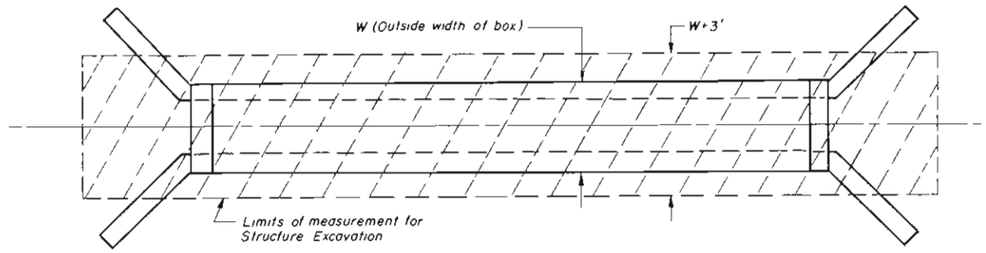


PLAN



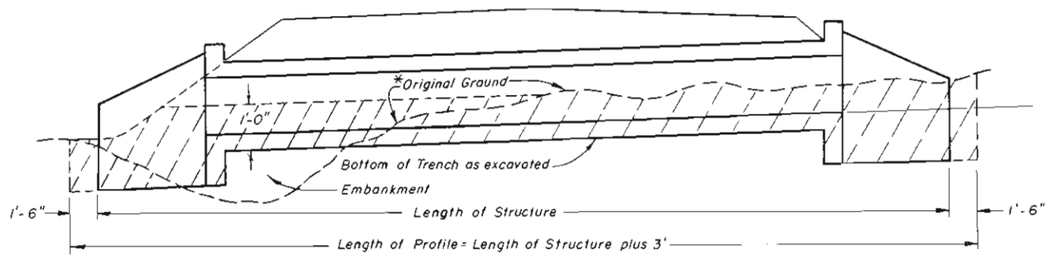
PROFILE

STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS



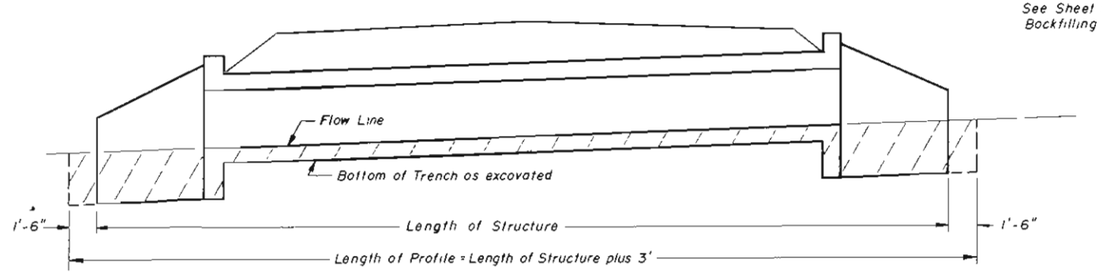
PLAN

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

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 L E Olson
Made by H P B.	Staff Design Engr
Checked by	Date March 1, 1971

STANDARD M-500-A

(JULY 1, 1965)

FED. ROAD REQ. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	500.		

1 2 3 4 5 6 7 8 9 0 .

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

M N O P Q R S T U V W

a f g l J 14 K 1 9 5 0

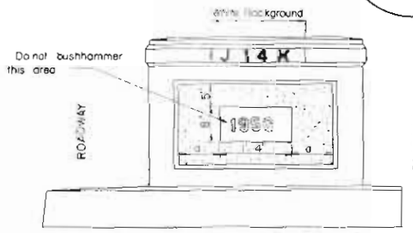
abcdefghijklmnopqrstuvwxyz

Scale in inches

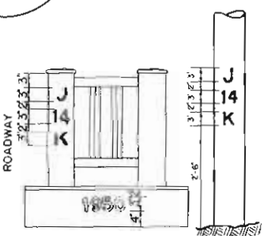
SECTION

SAMPLE BRIDGE NUMBER

SAMPLE YEAR NUMBER

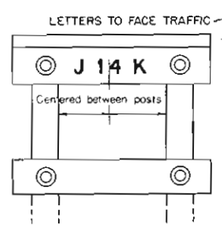


TYPICAL FOR CONCRETE END POST

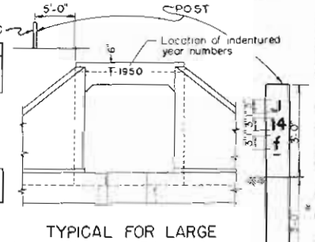


TYPICAL FOR STEEL HANDRAIL END POST

TYPICAL FOR SIGN POSTS



TYPICAL FOR TIMBER WING HANDRAIL



TYPICAL FOR LARGE BOX CULVERTS & STRUCTURES WITHOUT END POSTS

GENERAL NOTES

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

THE SIZE, SHAPE AND SPACING OF THE LETTERS AND FIGURES SHALL BE IN ACCORDANCE WITH THE FULL SIZE SHOWN ON THIS SHEET. ADDITIONAL COPIES OF THIS FULL SIZE SHEET CAN BE OBTAINED FROM THE DEPARTMENT WITHOUT CHARGE.

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

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

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

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

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

AFTER THE WHITE BACKGROUND HAS DRIED SUFFICIENTLY, THE CORRECT STRUCTURE NUMBER SHALL BE CAREFULLY STENCILED WITH "EXTERIOR BLACK PAINT" AS SPECIFIED IN SECTION 708 - PAINTS, OR AN ACCEPTABLE EQUIVALENT. THE BRACES OF THE STENCILED LETTERS AND FIGURES SHALL BE CAREFULLY FILLED IN BY HAND TO MAKE SOLID STRIPES.

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

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

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

IN ADDITION TO THE REQUIREMENTS STATED ABOVE, STRUCTURE NUMBERS FOR HIGHWAYS PASSING UNDER OVERPASSES ARE TO BE PLACED AT THE FOLLOWING POINTS:

(A) FOR STRUCTURES OF 3 OR MORE SPANS, THE STRUCTURE NUMBER SHALL BE STENCILED, FACING TRAFFIC, ON THE OUTSIDE FACE OF THE END COLUMN OF THE RIGHT-HAND PIER.

(B) FOR 2-SPAN STRUCTURES, THE STRUCTURE NUMBER SHALL BE STENCILED, FACING TRAFFIC, ON THE OUTSIDE FACE OF EACH END COLUMN IN THE CENTER PIER.

STRUCTURE NO. _____

REVISIONS

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

LETTERS AND FIGURES FOR STRUCTURE NUMBERS

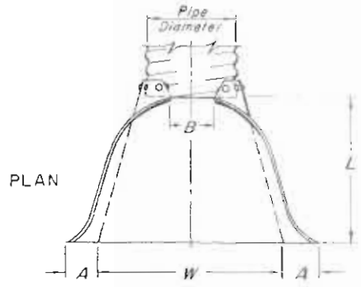
Designed by	Approved by C. D. Thornton
Made by	Bridge Engineer
Checked by	Date: July 1, 1965

STANDARD M-603-CA

(NOVEMBER 10, 1967)

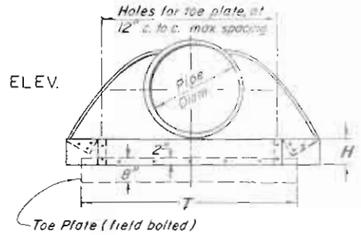
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

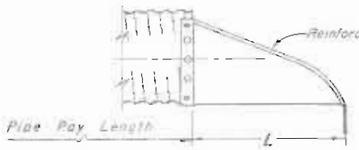
REVISIONS			
R-1	4-19-68	Welding—Conc. Arch, Ellipt.—Gen. Notes	M.R.H.
R-2	7-23-68	Dept. Name	M.R.H.
R-3	3-10-71	Change all gage to thickness.	M.R.H.
R-4	6-25-71	General Note for Joint Fasters.	M.R.H.

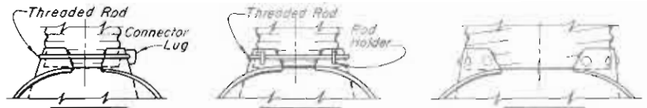


(R-3)

PIPE DIAM. in.	THICKNESS in.	DIMENSIONS A (1" ±) in.	B (Max.) in.	H (1" ±) in.	L (1½" ±) in.	W (2" ±) in.	T in.
12	.064	6	6	6	21	24	34
15	.064	7	8	6	26	30	40
18	.064	8	10	6	31	36	46
21	.064	9	12	6	36	42	52
24	.064	10	13	6	41	48	58
30	.079	12	16	9	51	60	70
36	.079	14	19	9	60	72	94
42	.109	16	22	11	69	84	106
48	.109	18	27	12	78	90	112
54	.109	18	30	12	84	102	124
60	.109	18	33	12	87	114	136
66	.109	18	36	12	87	120	142
72	.109	18	39	12	87	126	148
78	.109	18	42	12	87	132	154
84	.109	18	45	12	87	138	160







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

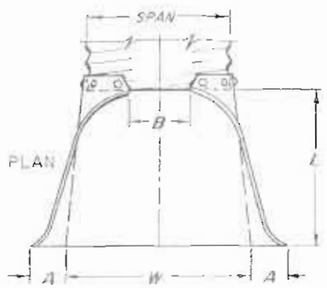
TYPE 2 — For 30" thru 36" pipe with Annular corrugations. Not to be used on helically formed pipe.

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

NOTE: Type 3 connections shall consist of an end section shop attached to a minimum 2 ft. of pipe with galvanized rivets or bolts, or by welding. (R-1)

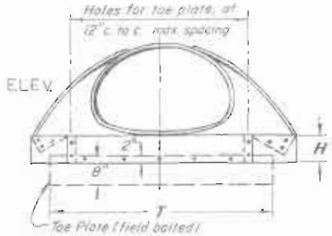
TYPICAL CONNECTIONS

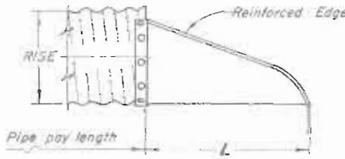
END SECTION AND CONNECTION DETAILS FOR ROUND CORRUGATED STEEL PIPE CULVERTS

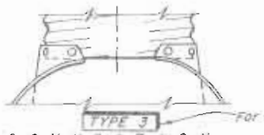


(R-3)

PIPE ARCH SPAN x RISE in.	in.	THICKNESS in.	DIMENSIONS A (1" ±) in.	B (Max.) in.	H (1" ±) in.	L (1½" ±) in.	W (2" ±) in.	T in.
18 x 11		.064	7	9	6	19	30	40
22 x 13		.064	7	10	6	23	36	46
25 x 16		.064	8	12	6	28	42	52
29 x 18		.064	9	14	6	32	48	58
36 x 22		.079	10	16	6	39	60	70
43 x 27		.079	12	18	8	46	75	85
50 x 31		.109	13	21	9	53	85	103
58 x 36		.109	16	26	12	63	90	108
65 x 40		.109	18	30	12	70	102	120
72 x 44		.109	18	33	12	77	114	132







NOTE: End sections for pipe arches shall be shop attached to a minimum 2 ft. of pipe with galvanized rivets or bolts, or by welding. (R-1)

For all sizes of pipe with Annular or Helical corrugations.

CONNECTION

END SECTION AND CONNECTION DETAIL FOR CORRUGATED STEEL PIPE ARCH CULVERT

GENERAL NOTES

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

Concrete End Sections are to be furnished with tongue or groove as req'd.

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

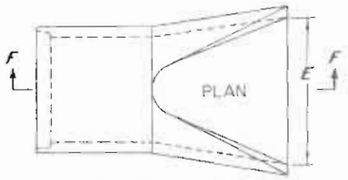
Other sizes of concrete pipe and end sections may be available upon request, however, the designer should contact supplier prior to calling for sizes other than those shown on this standard.

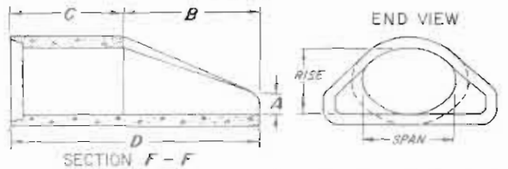
Inside configuration and joint of concrete end section and pipe shall match.

Galvanized Toe Plate as shown will be required on End Sections for corrugated steel pipe and shall be same thickness as End Sections. Toe Plate shall be field bolted to End Section with ⅝" galvanized bolts, nuts and washers.

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

Concrete Pipe Joint Fasteners, where shown on plans, shall be installed so that a minimum of 15 linear feet of the outlet end of the pipe are mechanically locked together. End Section lengths, when used, will be included in the 15 L.F. requirement.



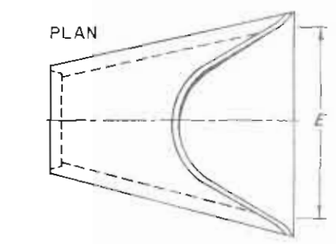


(R-4)

EQUIVALENT CIRCULAR DIAM. (inches)	NOMINAL (in) SPAN	RISE	DIMENSIONS (Inches) A	B	C	D	E
24	30	19	8½	39	33	72	48
30	38	24	9½	54	18	72	60
36	45	29	11⅞	60	24	84	72
42	53	34	15¾	60	36	96	78
48	60	38	21	60	36	96	84
54	68	43	25½	60	36	96	90
60	76	48	30	60	36	96	96

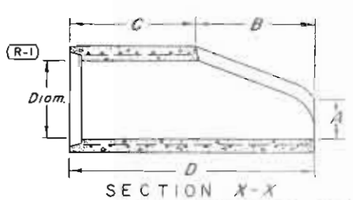
END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE

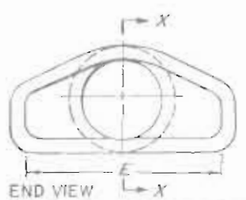
(R-1)



PIPE I.D. in.	DIMENSIONS A in.	B in.	C in.	D in.	E in.
12	3½	23	49	72	24
15	7	26	47	73	29
18	11½	26	46	74	36
24	12	43	54	97	48
30	17	53	45	96	60
36	18	60	37	97	71
42	24	61	36	97	78
48	28	70	28	98	84
54	27	65	35	100	90
60	36	53	40	98	96
72	34½	75	21	96	108

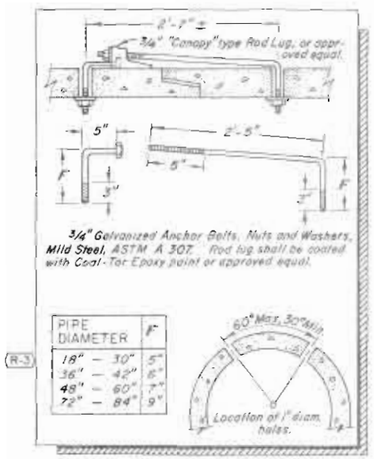
(R-1)





(R-1)

END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE

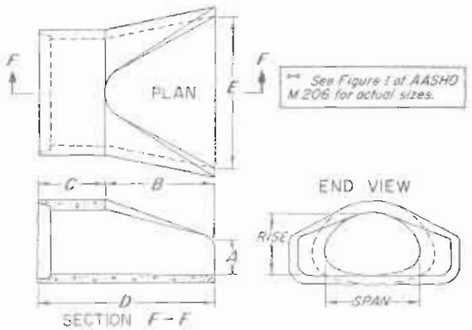


(R-3)

PIPE DIAMETER	F
18" – 30"	5"
36" – 42"	6"
48" – 60"	7"
72" – 84"	9"

CONCRETE JOINT FASTENER

(R-4)



EQUIVALENT CIRCULAR DIAM (inches)	NOMINAL (in) SPAN	RISE	DIMENSIONS (Inches) A	B	C	D	E
24	29	18	8½	39	33	72	48
30	36	22	9½	50	46	96	60
36	43	27	11⅞	60	36	96	72
42	50	31	15¾	60	36	96	78
48	58	36	21	60	36	96	84
54	65	40	25½	60	36	96	90
60	72	44	31	60	36	96	96
72	88	54	31	60	39	99	120

END SECTION FOR REINFORCED CONCRETE ARCH PIPE

(R-1)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

CONCRETE AND METAL END SECTIONS

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

(R-2)

STANDARD M-603-M

(MARCH 20, 1967)

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

REVISIONS			
R-1	4-5-68	Added notes.	M.R.H.
R-2	7-23-68	Dept. Nome. B Ø Note	M.R.H.
R-3	2-11-71	Thickness Tables, General Notes	M.R.H.

FILL HEIGHT & THICKNESS TABLES FOR METAL CULVERT PIPE (RIVETED, WELDED OR HELICAL FABRICATION)

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

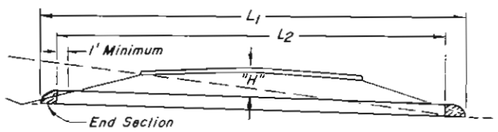
PIPE SIZE (B_d) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100
		THICKNESS IN INCHES														
12	0.8	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.079	.109
15	1.2	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.064	.079	.109	.109	.138
18	1.8	.064	.064	.064	.064	.064	.064	.064	.064	.079	.079	.109	.109	.138	.168	
24	3.1	.064	.064	.064	.064	.064	.079	.109	.109	.138	.138	.168				
30	4.9	.064	.064	.064	.064	.079	.079	.109	.109	.138	.168					
36	7.1	.064	.064	.064	.064	.079	.109	.138	.168							
42	9.6	.064	.064	.064	.064	.064	.079	.079	.109							
48	12.6	.064	.064	.064	.064	.079	.079	.109	.168							
54	15.9	.079	.079	.079	.079	.079	.109	.109								
60	19.6	.109	.109	.109	.109	.109	.109	.138								
66	23.8	.109	.109	.109	.109	.138	.138	.168								
72	28.3	.138	.138	.138	.138	.168										
78	33.0	.168	.168	.168	.168											
84	38.0	.168	.168	.168												

---- See General Note.

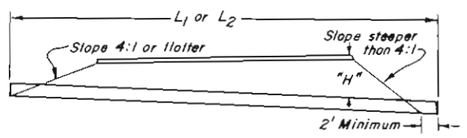
TABLE II
CORRUGATED STEEL PIPE ARCH (2" x 1/2") OR (2·2/3" x 1/2") CORRUGATIONS

PIPE SIZE Span-Rise (Inches)	AREA (Sq.Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1.5 to 7	7+ to 8	8+ to 9	9+ to 10	10+ to 12	12+ to 13
			THICKNESS IN INCHES					
18 x 11	1.1	3 1/2	.064	.064	.064	.064	.064	.064
22 x 13	1.6	4	.064	.064	.064	.064	.064	
25 x 16	2.2	4	.064	.064	.064	.064		
29 x 18	2.8	4 1/2	.064	.064	.064			
36 x 22	4.4	5	.064	.064	.064			
43 x 27	6.4	5 1/2	.064					
50 x 31	8.7	6	.079					
58 x 36	11.4	7	.109					
65 x 40	14.3	8	.109					
72 x 44	17.6	9	.138					

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.

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

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

PIPE SIZE (B_d) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80
		THICKNESS IN INCHES												
36	7.1	.064	.064	.064	.064	.064	.079	.079	.109	.109	.109	.109	.138	.168
42	9.6	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.109	.168	
48	12.6	.064	.064	.064	.079	.079	.079	.109	.109	.109	.138	.168		
54	15.9	.064	.064	.064	.079	.079	.109	.109	.138	.168				
60	19.6	.064	.064	.064	.079	.109	.109	.109	.138					
66	23.8	.064	.064	.079	.079	.109	.109	.138						
72	28.3	.064	.064	.079	.109	.109	.109	.138						
78	33.0	.064	.064	.079	.109	.138	.168							
84	38.0	.079	.079	.079	.109	.109								
90	44.0	.079	.079	.109	.109	.109								
96	50.3	.109	.109	.109	.109	.138								
102	57.0	.109	.109	.109	.109									
108	64.0	.109	.109	.109	.138									
114	70.9	.138	.138	.138	.168									
120	78.6	.138	.138	.138	.168									

---- See General Note.

5/16" rivets or helical fabrication shall be used on pipes with thickness to the left of or above the heavy solid line.

3/8" rivets or helical fabrication shall be used on pipes with thickness to the right of or below the heavy solid line.

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

PIPE SIZE (B_d) Inches	AREA (Sq.Ft)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80	80+ to 90	90+ to 100
		THICKNESS IN INCHES														
36	7.1	.064	.064	.064	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.109	.138
42	9.6	.064	.064	.064	.064	.064	.064	.064	.079	.079	.109	.109	.109	.138	.168	
48	12.6	.064	.064	.064	.064	.064	.064	.079	.079	.079	.109	.109	.109	.138	.168	
54	15.9	.064	.064	.064	.064	.064	.079	.079	.109	.109	.138	.138				
60	19.6	.064	.064	.064	.064	.079	.079	.109	.109	.138	.168					
66	23.8	.064	.064	.064	.079	.079	.109	.109	.138	.168						
72	28.3	.064	.064	.064	.079	.079	.109	.109	.138							
78	33.0	.064	.064	.064	.079	.109	.109	.138	.168							
84	38.0	.079	.079	.079	.079	.109	.109	.138								
90	44.0	.079	.079	.079	.079	.109	.109	.138								
96	50.3	.109	.109	.109	.109	.109	.138	.168								
102	57.0	.109	.109	.109	.109	.109	.138	.168								
108	64.0	.109	.109	.109	.109	.109	.138									
114	70.9	.138	.138	.138	.138	.138	.168									
120	78.6	.138	.138	.138	.138	.138										

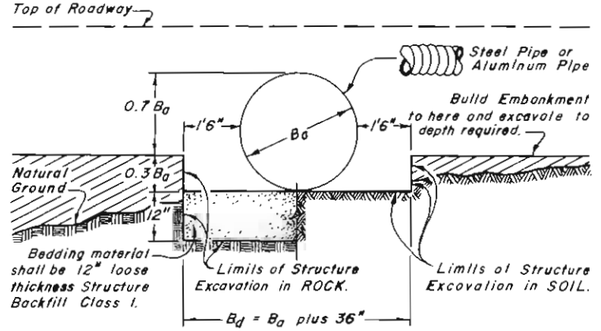
---- See General Note.

3/8" rivets may be used on pipes with thickness to left of or above the heavy solid line.
7/16" rivets may be used on pipes with thickness to right of or below the heavy solid line.

TABLE V
CORRUGATED STEEL PIPE ARCH 3" x 1" CORRUGATIONS (R-2)

PIPE SIZE Span-Rise (Inches)	AREA (Sq.Ft.)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1.5 to 10	10+ to 11	11+ to 12	12+ to 14	14+ to 15
			THICKNESS IN INCHES				
43 x 27	6.4	7 3/4	.064	.064	.064		
50 x 31	8.7	9	.064	.064	.064		
58 x 36	11.4	10 1/2	.064	.064	.064		
65 x 40	14.3	12	.064	.064	.064		
72 x 44	17.6	13 1/4	.064	.064	.064		
73 x 55	22.0	18	.064	.064	.064	.064	.064
81 x 59	26.0	18	.079	.079	.079	.079	.079
Ø 87 x 63	31.0	18	.079	.079	.079	.079	
Ø 95 x 67	35.0	18	.109	.109	.109		
Ø 103 x 71	41.0	18	.109	.109			

INSTALLATION OF METAL CULVERT PIPE



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

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

PIPE SIZE (B_d) Inches	AREA (Sq.Ft.)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 45	45+ to 50	50+ to 55	55+ to 60	60+ to 70	70+ to 80
		THICKNESS IN INCHES												
12	0.8	.060	.060	.060	.060	.060	.060	.060	.075	.105	.105	.105	.105	.105
18	1.8	.060	.060	.060	.060	.075	.105	.135	.164	.164				
24	3.1	.060	.060	.060	.075	.135								
30	4.9	.060	.060	.060	.105	.105	.164							
36	7.1	.060	.060	.075	.105	.164								
42	9.6	.075	.075	.105	.075	.105	.105	.164						
48	12.6	.105	.105	.105	.105	.135	.164	.164						
54	15.9	.105	.105	.135	.164	.164								
60	19.6	.135	.135	.164										
66	23.8	.135	.164											
72	28.3	.164												

---- See General Note.

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

PIPE SIZE Span-Rise (Inches)	AREA (Sq.Ft)	CORNER RADIUS (Inches)	HEIGHT OF FILL OVER TOP OF PIPE IN FEET: 1.5 to 7	7+ to 9	9+ to 11	11+ to 13	13+ to 14	14+ to 15
			THICKNESS IN INCHES					
18 x 11	1.1	4 3/4	.060	.060	.060	.060	.060	.060
22 x 13	1.6	4 3/4	.060	.060	.060	.060	.060	
25 x 16	2.2	4 1/2	.060	.060	.060	.060		
29 x 18	2.8	4 1/2	.060	.060	.060			
36 x 22	4.4	5	.060	.060				
43 x 27	6.4	5 1/2	.075					
50 x 31	8.7	6	.105					
58 x 36	11.4	7	.135					
65 x 40	14.3	8	.135					
72 x 44	17.6	9	.164					

GENERAL NOTES (R-3)

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

The tables on this sheet show minimum gages 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 (4') 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.

The minimum depth of fill excluding pavement over corrugated metal pipe culverts shall be as staked by the Engineer but in no case shall it be less than shown in the following tabulation:

Diameter of Culvert (B_d)	Minimum Allowable Cover
96" and smaller	1 foot
102" and larger	2 feet
Pipe Arch	1.5 feet

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.

NOTES FOR TABLES

---- Pipes with thickness to right of or below the heavy dashed line shown in the tables on this sheet, shall be elongated 5 percent on the vertical axis as installed. (Tables I, III, IV and VI)

Maximum fill heights shown are for bearing pressures of 2 tons per square foot. (Tables II, V and VII)

Fill heights greater than 90' shall be used only after thorough investigation of foundation material. (Tables I and IV)

Variations from corner radii shown will be acceptable provided the pipe is of sufficient strength to support it's designated fill height. (Tables II, V, and VII)

GENERAL NOTES (Continued) (R-1)

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

Ø May not be available. The designer should (R-2) contact supplier before calling for the sizes denoted by this symbol.

(R-2)
DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

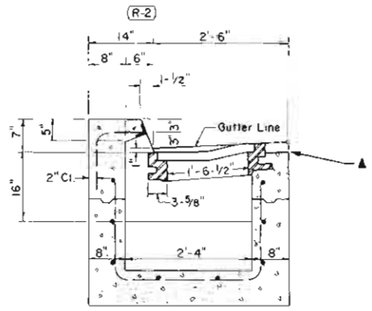
METAL CULVERT PIPE
H-20 LOADING

Designed by M.R.H.	Approved by L. E. O.
Made by J.R.B.	Staff Design Engineer
Checked by R.S.M.	Date: March 20, 1967

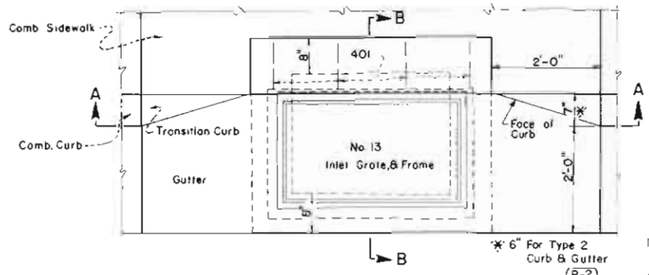
STANDARD M-604-AA

(APRIL 21, 1967)

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



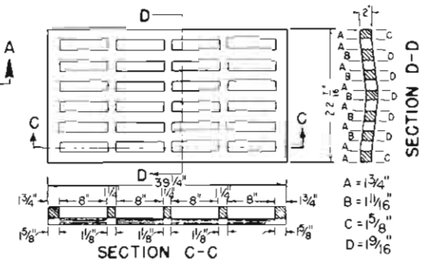
SECTION B-B

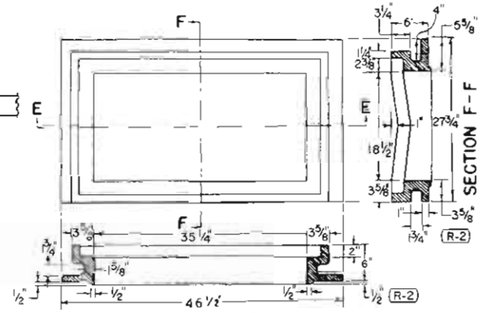


PLAN - (For Comb. Curb, Gutter & Sidewalk or Type 2 Curb & Gutter)

NO. 13 GRATING & FRAMES

Approx Weight 680 lbs





QUANTITIES

H	NO. OF 402 BARS REQ'D.	TYPE 3 INLET CLASS A CONCRETE ℄ CU. YD	TYPE 3 INLET REINFORCING STEEL Θ LB.	TYPE 3 DOUBLE INLET CLASS A CONCRETE ℄ CU. YD.	TYPE 3 DOUBLE INLET REINFORCING STEEL Θ LB.
3'-0"	3	1.30	64.29	2.20	110.77
3'-6"	4	1.47	78.35	2.51	132.47
4'-0"	4	1.64	82.40	2.82	139.22
4'-6"	5	1.81	96.46	3.13	160.92
5'-0"	6	1.98	110.51	3.44	182.63
5'-6"	6	2.15	114.56	3.75	189.38
6'-0"	7	2.32	128.62	4.06	211.08
6'-6"	8	2.49	142.68	4.37	232.78
7'-0"	8	2.66	146.73	4.68	239.53
7'-6"	9	2.83	160.79	4.99	261.24
8'-0"	10	3.00	174.85	5.30	282.94
8'-6"	10	3.17	178.90	5.61	289.69
9'-0"	11	3.34	192.96	5.92	311.39
9'-6"	12	3.51	207.02	6.23	333.10
10'-0"	12	3.68	211.07	6.54	339.84

Θ Includes 1% for overrun

(R-2) ℄ Includes volume occupied by pipes

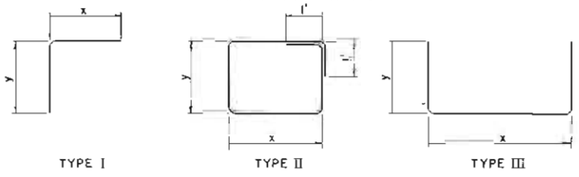
BAR LIST FOR H = 3'-0"

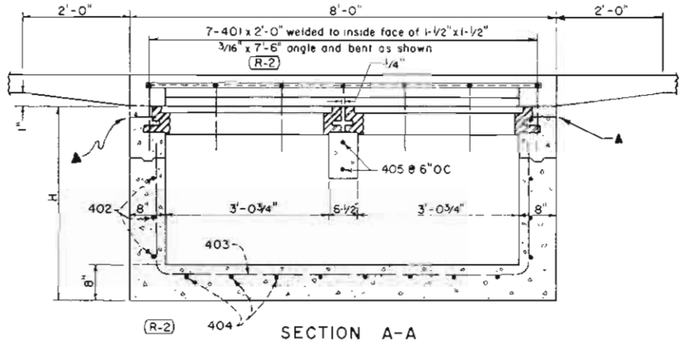
MARK	TYPE	NO. REQ'D.	TYPE 3 INLET DIMENSIONS x	TYPE 3 INLET DIMENSIONS y	TYPE 3 INLET LENGTH	TYPE 3 DOUBLE INLET NO. REQ'D.	TYPE 3 DOUBLE INLET DIMENSIONS x	TYPE 3 DOUBLE INLET DIMENSIONS y	TYPE 3 DOUBLE INLET LENGTH
401	I	4	1'-0"	1'-0"	2'-0"	7	1'-0"	1'-0"	2'-0"
402	II	3	3'-7-1/4"	2'-10-1/2"	14'-11-1/2"	3	7'-2-1/2"	2'-10-1/2"	22'-2"
403	III	2	3'-5-3/4"	* 2'-0-1/2"	7'-6-3/4"	2	7'-1"	* 2'-0-1/2"	11'-2"
404	II	4	2'-9"	* 2'-1"	6'-11"	8	2'-9"	* 2'-1"	6'-11"
405	STR					2			3'-0"

* Add 6" to this dimension for each 6" increase in "H" above 3'-0".

BENDING DIAGRAM

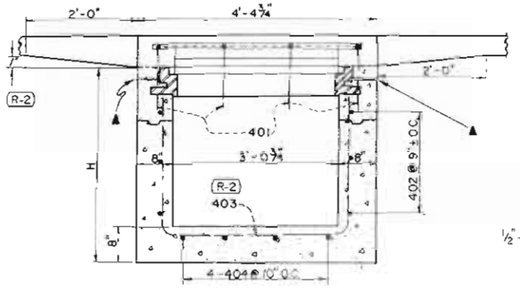
All dimensions are out to out of bar





SECTION A-A

DOUBLE INLET
TYPE 3



SECTON A-A (For Comb Curb, Gutter, & Sidewalk or Type 2 Curb & Gutter)

SECTION B-B
Use with Type 2 Curb & Gutter

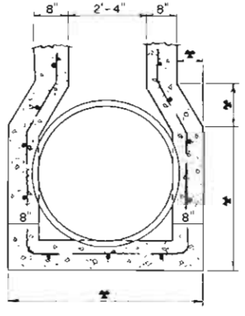
SECTION B-B
Use with Comb Curb, Gutter, & Sidewalk

INLET TYPE 3

No 13 Grate and Frame to be used with Type 3 Inlet

DETAILS OF INLET ALTERATION

For Larger Size or Skewed Pipes



NOTE:
Vary steel shape and quantity as required.

* Variable - to suit pipe size or skew angle

▲ — When bituminous material is to extend to the edge of the grating frame, concrete may be depressed.

NOTE: Use steps for all inlets with H = 3'-6" or more Start 2'-0" below gutter line and space equally at Minimum of 18"

Details of Steps on Standard M-604-D

GENERAL NOTES

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

All concrete shall be class "A".
All concrete walls shall be formed on both sides
All exposed concrete corners shall be beveled to a 1" face
All reinforcing bars shall be tagged with bar designation and station number
All dimensions not shown as clear are to ℄ of bar.
All gratings, rings and covers shall be cast iron.

REVISIONS			
(R-1)	7-19-68	Dept. Name	M.R.H.
(R-2)	12-2-68	Delete All. Frame, Note & Details	M.R.H.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

CONCRETE INLETS
TYPES 3 & 3 DOUBLE

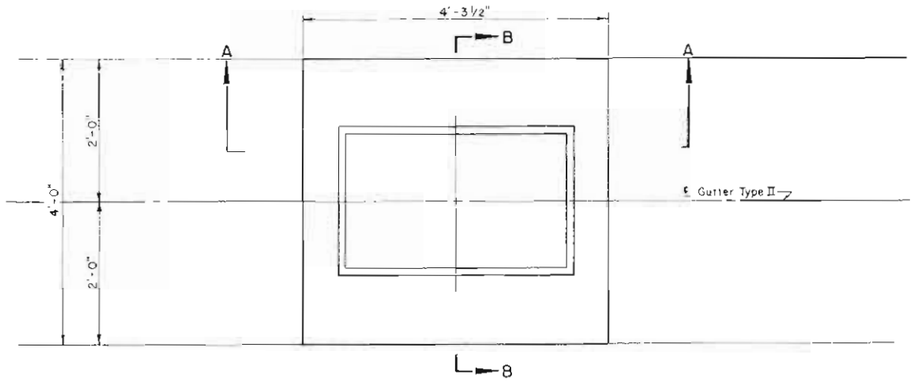
Designed by H.L.P. Approved by
Made by J.R.B. Staff Design Engr.
Checked by M.R.H. Date APRIL 21, 1967

STANDARD M-604-AB

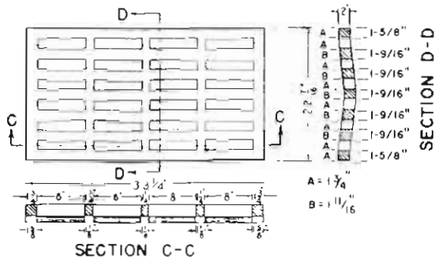
(APRIL 21, 1967)

FEDERAL ROAD PROJECT NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	COLORADO			

REVISIONS			
(R-1)	7-19-58	Dept. Name	M.R.H.
(R-2)	4-15-71	Concrete in Gen. Note & Quant. table	M.R.H.

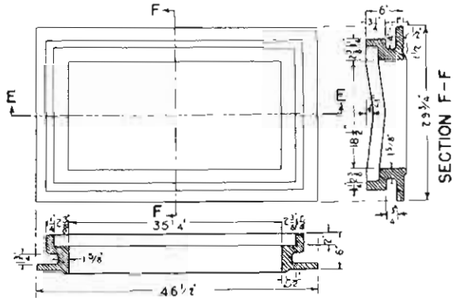


PLAN OF TYPE 13 INLET FOR GUTTER TYPE II



SECTION C-C

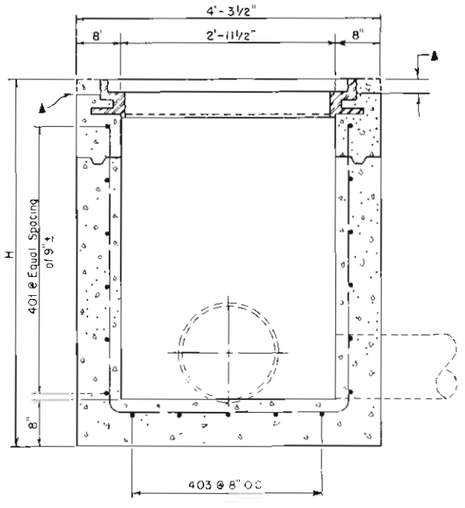
SECTION D-D



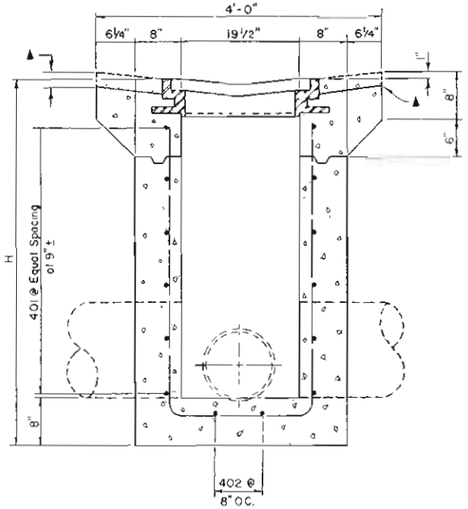
SECTION E-E

SECTION F-F

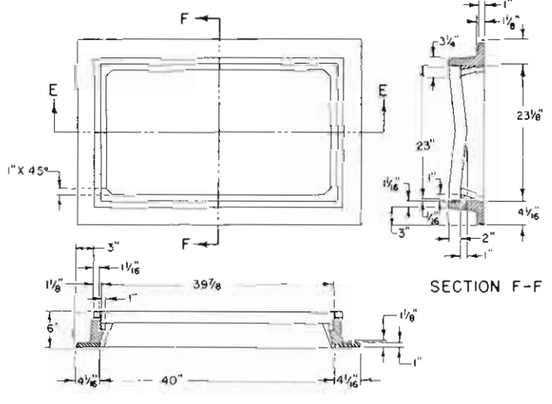
ALTERNATE NO. 13 FRAME



SECTION A-A



SECTION B-B



SECTION E-E

SECTION F-F

NO. 13 GRATING & FRAMES
Approx. Weight 680 lbs

NOTE:
See plan details for location and size of pipe.

♦ — When bituminous material is to extend to the edge of the grating frame, concrete may be depressed.

(R-2)

GENERAL NOTES

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

All concrete shall be class A, B or D.
All concrete walls shall be formed on both sides.
All exposed concrete corners shall be beveled to a 1" face.
All reinforcing bars shall be deformed, of intermediate grade, and shall be tagged with bar designation and station number.

Details of Steps on Standard M-604-D

All dimensions not shown as clear are to ℄ of bar

All gratings, rings and covers shall be cast iron

Use steps for all inlets with H = 3'-6" or more. Start 2'-0" below gutter line and space equally at Minimum of 18"

QUANTITIES

(R-2)

H	CONCRETE CU. YD	REINFORCING STEEL θ LB.	NO. OF 401 BARS REQ'D.
3'-0"	1.13	56.42	3
3'-6"	1.28	70.14	4
4'-0"	1.42	74.87	4
4'-6"	1.57	88.60	5
5'-0"	1.72	102.31	6
5'-6"	1.86	107.04	6
6'-0"	2.01	120.77	7
6'-6"	2.15	134.49	8
7'-0"	2.30	139.22	8
7'-6"	2.45	152.93	9
8'-0"	2.59	166.66	10
8'-6"	2.74	171.39	10
9'-0"	2.88	185.11	11
9'-6"	3.03	198.83	12
10'-0"	3.18	203.56	12

θ Includes 1% for overrun

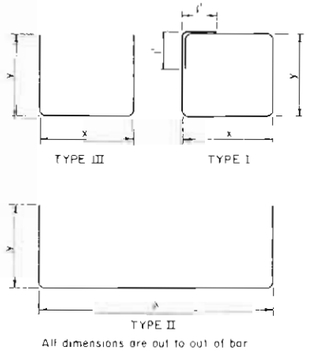
(R-2) *Note: Concrete quantities include volume occupied by pipe*

BAR LIST FOR H = 3'-0"

MARK	TYPE	NO. REQ'D	DIMENSIONS x	DIMENSIONS y	LENGTH
401	I	3	3'-6"	2'-2"	13'-4"
402	II	2	3'-4½"	* 1'-10½"	7'-1½"
403	III	5	2'-0½"	* 1'-11"	5'-10½"

* Add 6" to this dimension for each 6" increase of "H" over 3'-0"

BENDING DIAGRAM



All dimensions are out to out of bar

(R-1)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

CONCRETE INLET
TYPE 13

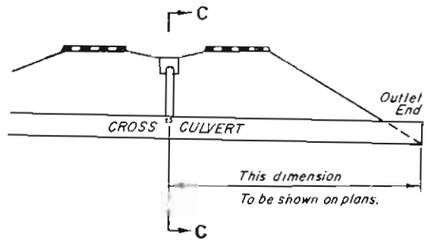
Designed by H.E.P.	Approved by
Made by J.R.B.	Staff Design Engr.
Checked by M.R.H.	Date: APRIL 21, 1967

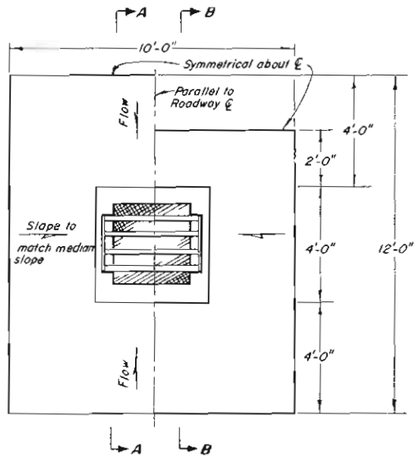
STANDARD M-604-BA

(JUNE 1, 1967)

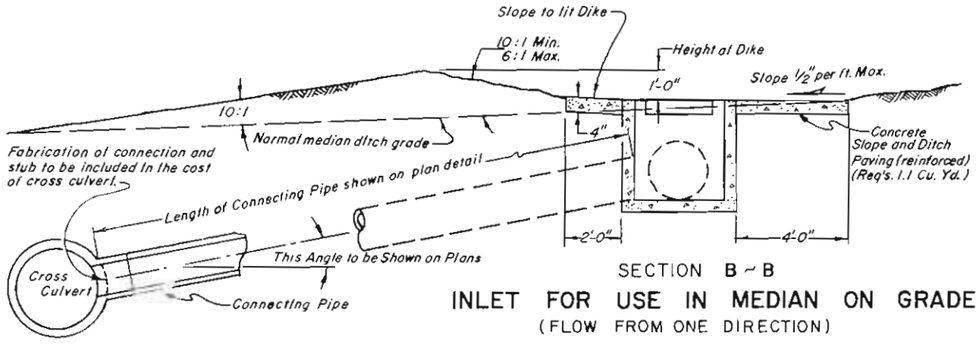
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS			
R-1	9-13-67	Grate Detail & Quants.	M.R.H.
R-2	12-18-67	Connect to skewed culvert, General Note	M.R.H.
R-3	7-19-68	Note B Dept. Name	M.R.H.
R-4	4-15-71	Conc. in G Note and table. Re-do grate welds	M.R.H.
R-5	5-24-71	Lower fastener bolt so top is flush w. conc.	M.R.H.





LAYOUT OF INLET IN MEDIAN DITCH



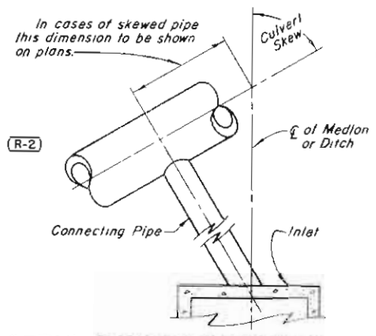
SECTION C ~ C

DETAIL SHOWING MEDIAN INLET CONNECTED TO A CROSS CULVERT

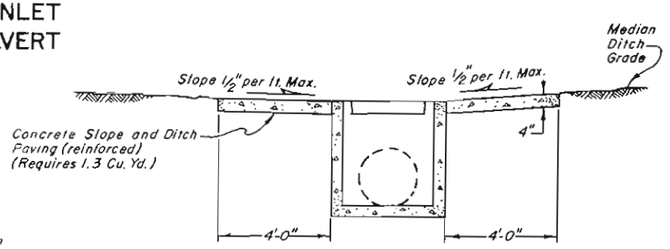
SECTION B ~ B

INLET FOR USE IN MEDIAN ON GRADE

(FLOW FROM ONE DIRECTION)

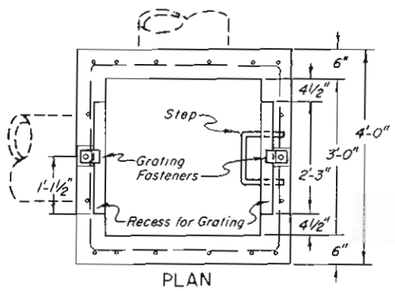


DETAIL SHOWING MEDIAN INLET CONNECTED TO A SKEWED CROSS CULVERT

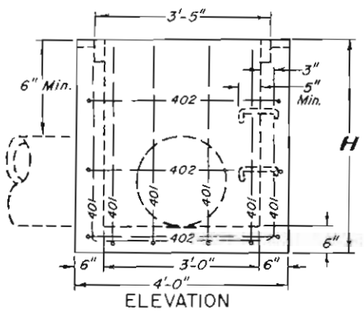


SECTION A ~ A

INLET FOR USE IN MEDIAN AT BOTTOM OF VERTICAL CURVE

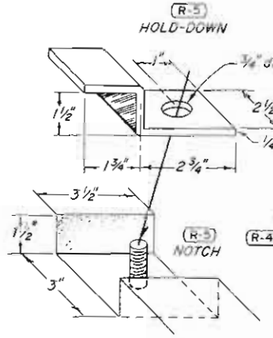


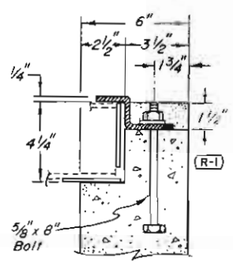
PLAN



ELEVATION

CONCRETE INLET





SECTION D-D R-5

DETAIL OF RECESS AND GRATING FASTENER

(2 REQUIRED)

R-4

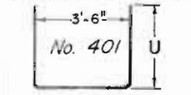
QUANTITIES FOR ONE INLET

H	CONCRETE *(CU. YDS.)	REINF. STEEL (LBS.)	NO. STEPS REQ'D.
3'-0"	1.0	83	0
3'-6"	1.1	89	0
4'-0"	1.2	105	0
4'-6"	1.4	111	1
5'-0"	1.5	127	2
5'-6"	1.6	134	2
6'-0"	1.7	150	2
6'-6"	1.9	157	3
7'-0"	2.0	172	3
7'-6"	2.1	178	3
8'-0"	2.3	194	4
8'-6"	2.4	201	4
9'-0"	2.5	217	4
9'-6"	2.7	223	5
10'-0"	2.8	239	5
11'-0"	3.0	261	6
12'-0"	3.3	283	6

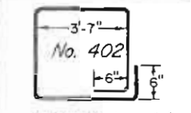
* **Note:** Includes Volume occupied by pipes. R-3

BAR LIST FOR H=3' AND BENDING DIAGRAM

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



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



Add one bar for each foot increase of H above 3'-0".

All bars to be ½" Dia. ~ Cut or bend around pipes as required.

R-4

GENERAL NOTES

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

All concrete shall be Class A, B or D.

For detail of Inlet Step, see M-Standard "Steps for Manholes and Inlets".

All reinforcing bars shall be deformed, of intermediate grade, and shall be tagged with the station number and bar designation.

All edge distances not marked "clear" are to ℄ of bar.

Concrete slope and ditch paving shall conform to Section 507. Reinforcement for concrete slope paving shall be 4 x 4, 10/10.

Grating shall conform to Section 604.

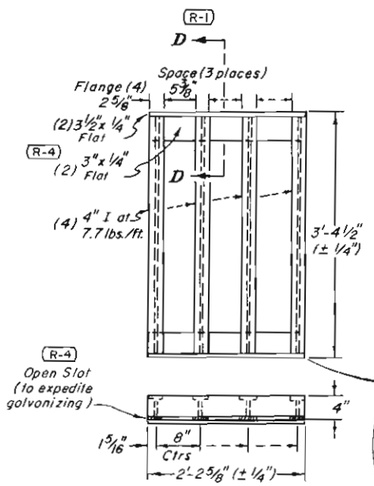
Inlet grating shall be galvanized as described for Frames, Grates, Covers and Steps in Section 712.

Steps or ladder will be required when Inlet depth exceeds 3'-6".

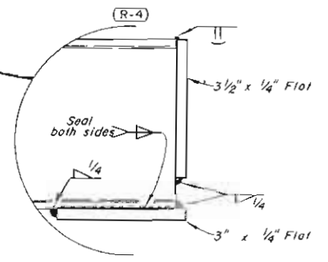
MATERIAL LIST FOR GRATING, FASTENERS

PART	NO. REQ'D	SIZE	LBS. PER UNIT	WEIGHT ~ LBS.
Flat R-4	2	3/2"x1/4"x2'-2⅝"	2.98/ft.	13
Flat	2	3"x1/4"x2'-2⅝"	2.6/ft.	12
Beam	4	4I 7.7 x 3'-4"	7.7/ft.	103
Fastener	2	6"x1/4"x2 1/2"	1.0 ea.	
Bolt	2	5/8" x 8"	0.8 ea.	4
Washer	2		0.1 ea.	
		TOTAL WEIGHT		132

R-4



DETAIL OF GRATING



R-3

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

INLET, TYPE C

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

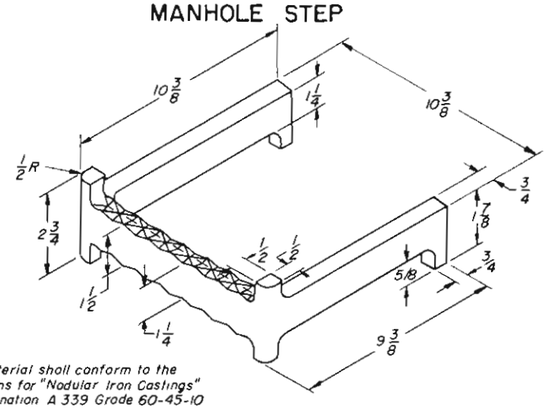
STANDARD M-604-D

(JULY 1, 1965)

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

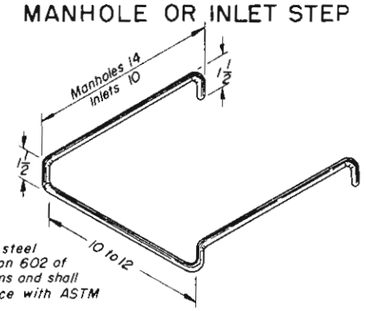
REVISIONS			
(R-1)	7-23-68	Dept. Name.	M.R.H.

CAST IRON MANHOLE STEP



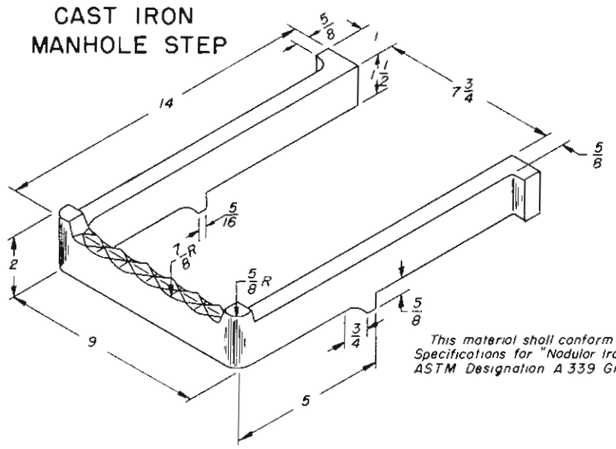
This material shall conform to the Specifications for "Nodular Iron Castings" ASTM Designation A 339 Grade 60-45-10

MILD STEEL MANHOLE OR INLET STEP



Step shall be 3/4 Dia steel bars conforming to Section 602 of the Standard Specifications and shall be galvanized in accordance with ASTM Designation A 123.

CAST IRON MANHOLE STEP



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

GENERAL NOTES

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

Steps shall be included in the cost of "Manholes" or "Inlets".

All dimensions shown in inches

(R-1)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

STEPS FOR MANHOLES AND INLETS

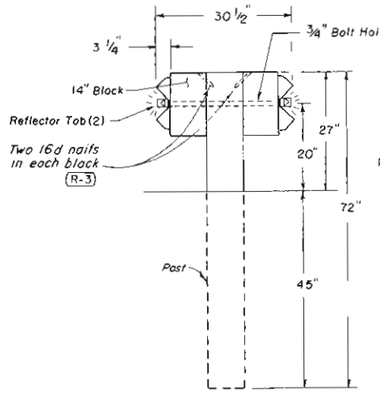
Designed by M.R.H.	Approved by: E.G. Shaw
Made by: H.P.B.	Staff Design Engr.
Checked by.	Date: July 1, 1965

FEDERAL ROAD REGION NO	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
8	COLORADO			

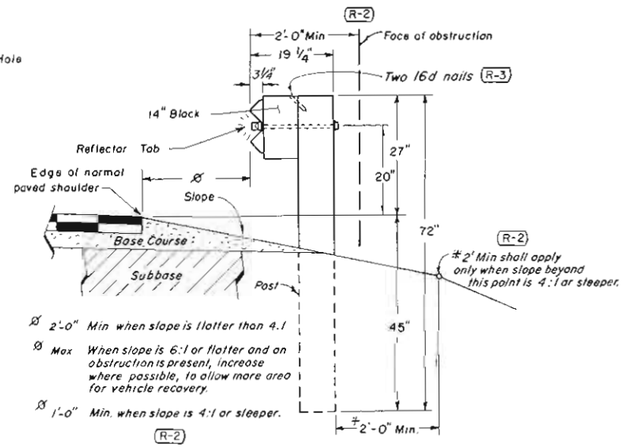
REVISIONS		
R-7	10-21-71	Replace post spacing Gen. Note with table. M.R.H.

STANDARD M-606-AB

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



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



Ø 2'-0" Min when slope is flatter than 4:1

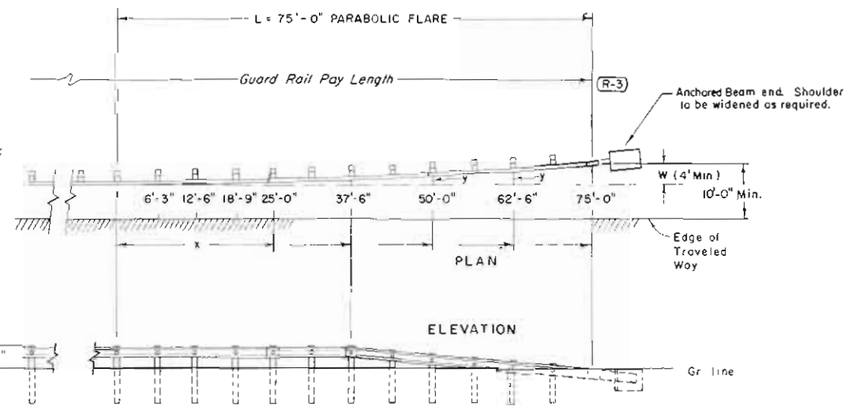
Ø Max When slope is 6:1 or flatter and an obstruction is present, increase where possible, to allow more area for vehicle recovery.

Ø 1'-0" Min. when slope is 4:1 or steeper.

R-2

TYPICAL POST INSTALLATIONS (R-4)

(See Table for Post & Block Cross Section)



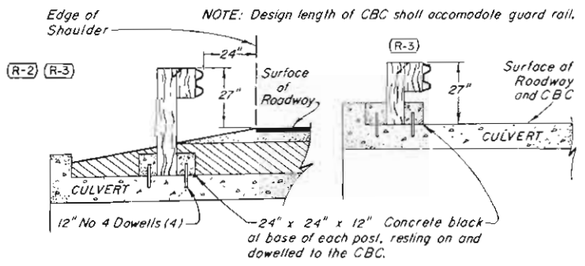
PARABOLIC TRANSITION & END TREATMENT

TABLE OF OFFSETS FOR 75' PARABOLIC FLARES

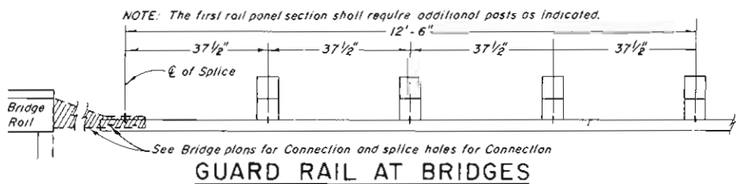
	y					
x	W=4'	W=5'	W=10'	W=12'	W=14'	W=16'
12'-6"	0.11	0.14	0.28	0.33	0.39	0.44
25'-0"	0.44	0.55	1.11	1.33	1.56	1.78
37'-6"	1.00	1.25	2.50	3.00	3.50	4.00
50'-0"	1.78	2.22	4.44	5.33	6.23	7.11
62'-6"	2.78	3.48	6.95	8.34	9.73	11.11
75'-0"	4.00	5.00	10.00	12.00	14.00	16.00

LEGEND

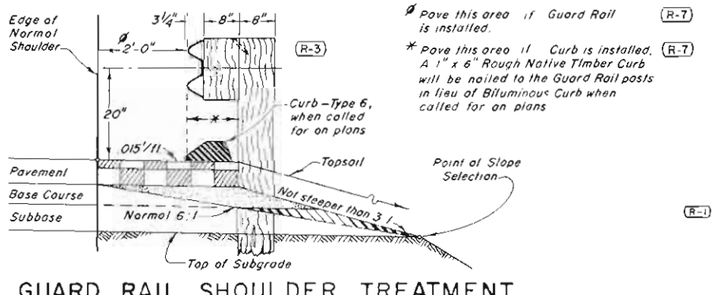
W = Full parabolic offset.
L = Length of parabolic transition.
x = Longitudinal dist from beginning of flare.
y = Offset = $W \cdot x^2/L^2$



GUARD RAIL ACROSS CONCRETE BOX CULVERT



GUARD RAIL AT BRIDGES

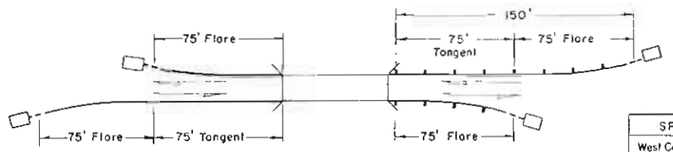


Ø Pave this area if Guard Rail is installed. (R-7)

* Pave this area if Curb is installed. A 1" x 6" Rough Native Timber Curb will be nailed to the Guard Rail posts in lieu of Bituminous Curb when called for on plans (R-7)

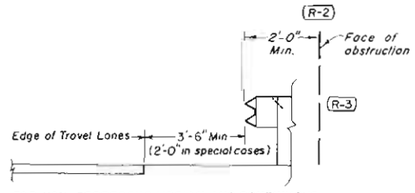
GUARD RAIL SHOULDER TREATMENT (R-6)

(Showing Typical Shoulder Widening)

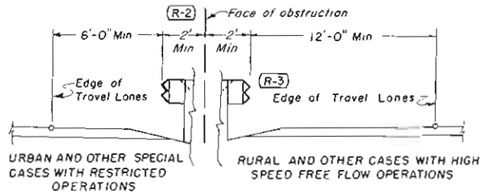


2-LANE HIGHWAY BRIDGE APPROACH GUARD RAIL

NOTE. For divided highways see Sheet No. 2



FOR NON-DEPRESSED MEDIAN AND CONTINUOUS GUARD RAIL



URBAN AND OTHER SPECIAL CASES WITH RESTRICTED OPERATIONS

RURAL AND OTHER CASES WITH HIGH SPEED FREE FLOW OPERATIONS

R-1 GUARD RAIL FOR OBSTRUCTIONS IN MEDIAN

(See Sheet No 3)

(R-7)

GENERAL NOTES

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

All timber shall be close grained Douglas Fir of the Coast Region, Dense Longleaf or Shortleaf Southern Pine, Lodgepole Pine, Ponderosa Pine, Western Hemlock, or Larch, and shall conform to the following grading specifications and requirements:

SPECIES	SIZE	FOHC	GRADING RULES		
West Coast Douglas Fir	6"x8"	Yes	WCLB #16	Par	131 b
West Coast Hemlock	6"x8"	Yes	WCLB #16	Par	131 a
Larch	6"x8"	Yes	WWP 1970	Par	80.11
Southern Pine	6"x8"	No	SPIB 1970	Par	285
Lodgepole Pine	8"x8"	No	WWP 1970	Par	80.10
Ponderosa Pine	8"x8"	No	WWP 1970	Par	8010
West Coast Hemlock	8"x8"	Yes	WCLB #16	Par	131 b

Post & block cross section

WCLB # 16 — "Standard Grading Rules #16 for West Coast Lumber" Published by the West Coast Lumber Inspection Bureau. Effective Sept. 1, 1970

WWP 1970 — "1970 Standard Grading Rules for Southern Pine Lumber" Published by the Western Wood Products Association. Effective Sept. 1, 1970.

SPIB 1970 — "1970 Standard Grading Rules for Southern Pine Lumber" Published by the Southern Pine Inspection Bureau. Effective Sept 1, 1970.

FOHC — Free of Heart Centers. See paragraph 714 c of WCLB.

NOTE — 6"x 8" Posts and Blocks shall be installed with the 6" dimension parallel to the roadway.

All timber shall be rough, free of wane, square cut and full sawn.

At the time the post or block is installed, any seasoning check which extends the full length of the piece shall not exceed one-quarter inch in width at its maximum width.

Blocks shall be cut from timber of the same cross section, species and grade as the posts and recieve the same treatment.

Timber shall be incised and pressure treated in accordance with AASHO Designation M133, except that blocks need not be incised. Post bolt holes are to be drilled before treatment is applied

The preservative shall be either (a) Creosote or (b) Pentachlorophenol in a petroleum carrier (liquid or L.P. gas). Unless otherwise permitted by the Engineer, only one preservative shall be used on the project.

Where pedestrian hazard exists and sidewalk is constructed on the roadway shoulder, guard rail shall be placed between the sidewalk and the edge of traffic lane.

Guard rail plate shall not be lighter than No. 12 U.S. Standard Gage 25' length of rail panels will be permitted.

Metal plate guard rail shall be painted in accordance with standard specifications or shall be galvanized in accordance with AASHO Designation M-111 or with ASTM Designation A 525, Coating Class 2.50

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

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

Concrete shall be Class A, B or D.

Blocks shall be toenailed to posts with two 16 penny galvanized nails in the top of each block

If posts are cut in the field, cut ends shall receive 2 coats of hot creosote

NORMAL CENTER-TO-CENTER POST SPACING (R-7)

LOCATION	DESIGN SPEED Less Than 50mph and ADT < 750	DESIGN SPEED 50mph and Over
Tangents	12'-6"	6'-3"
Curves with Radius Over 200'	12'-6"	6'-3"
Curves with Radius of 200' or Less	6'-3"	6'-3"
Flares and Obstructions	6'-3"	6'-3"

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

GUARD RAIL TYPE 3

Designed by M.R.H.
Mode by J.R.B. by
Checked by R.S.M.
Approved by
Staff Design Engineer
Date March 1968

STANDARD M-606-AB

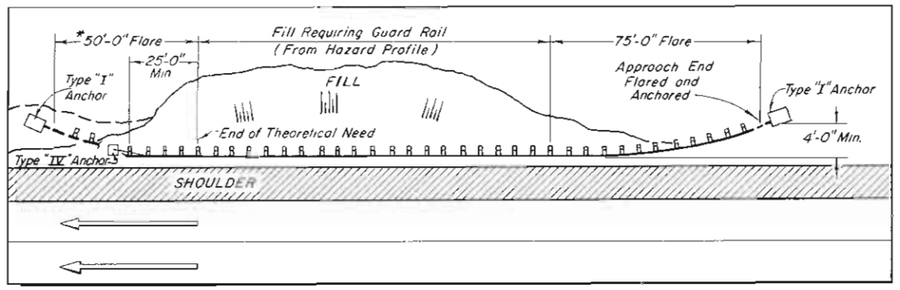
(MARCH 1, 1968)

(SHEET 2)

FEDERAL AID PROJECT NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
	COLORADO			

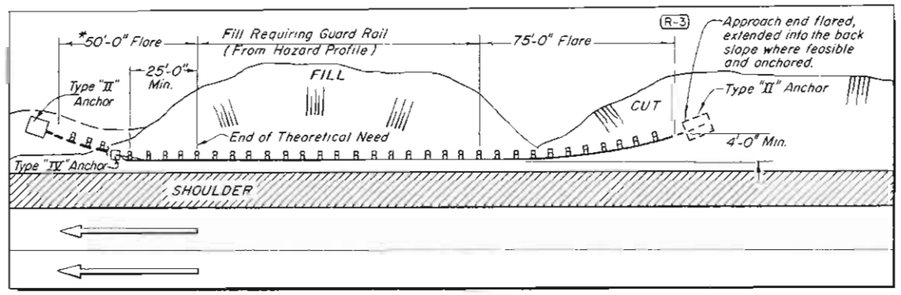
REVISIONS

R-7	10-21-71	Revision date only	M R H

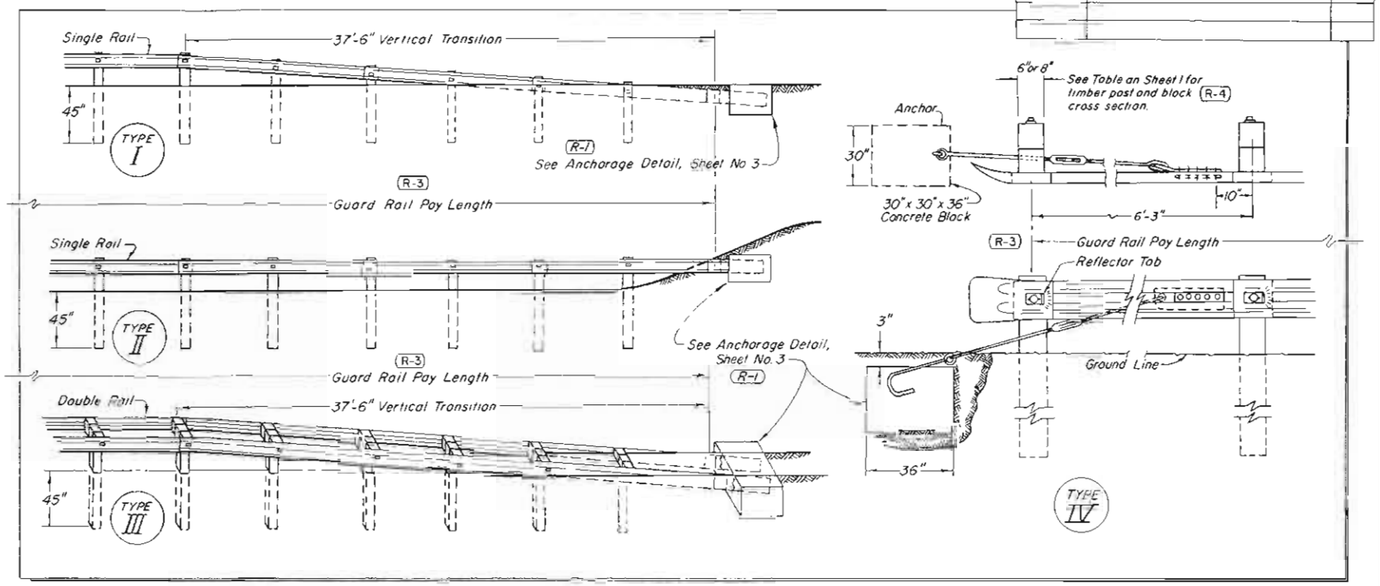


GUARD RAIL INSTALLATION — ROADSIDE FILL CONDITION

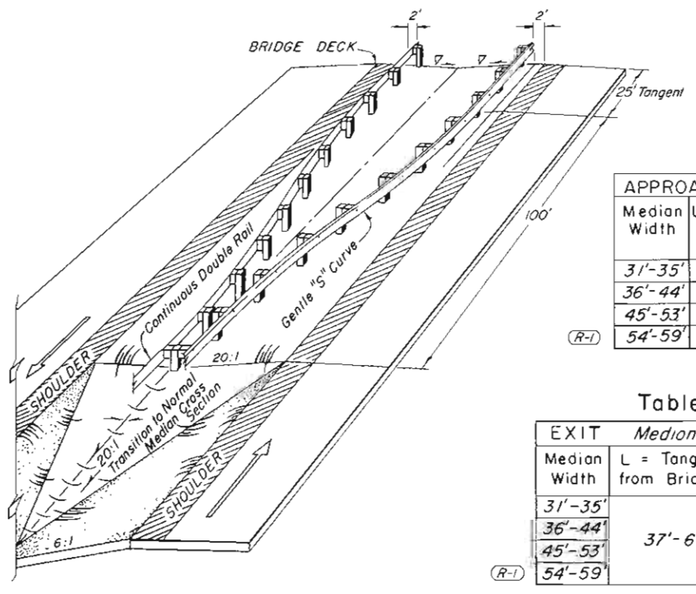
NOTES:
* 2-Lane Highways — The exit end of Guard Rail shall extend 50 feet past the end of theoretical need and shall be flared and anchored.



GUARD RAIL INSTALLATION — ROADSIDE CUT TO FILL CONDITION



TYPICAL END ANCHORAGE



21' to 30' MEDIAN

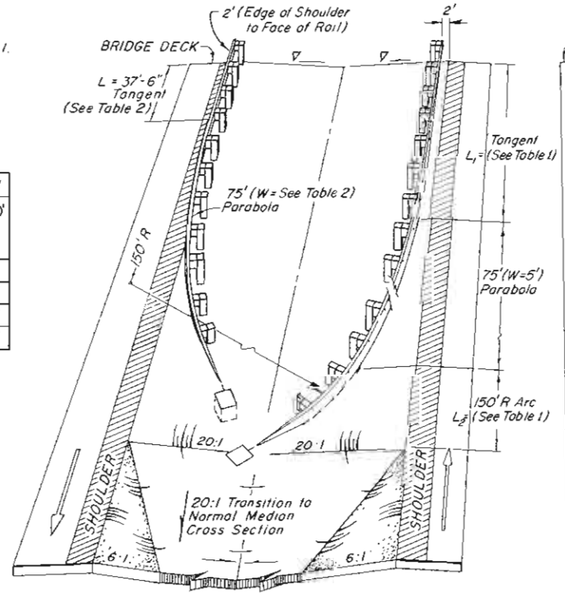
R-2 ▽Not steeper than 20:1.

Table 1

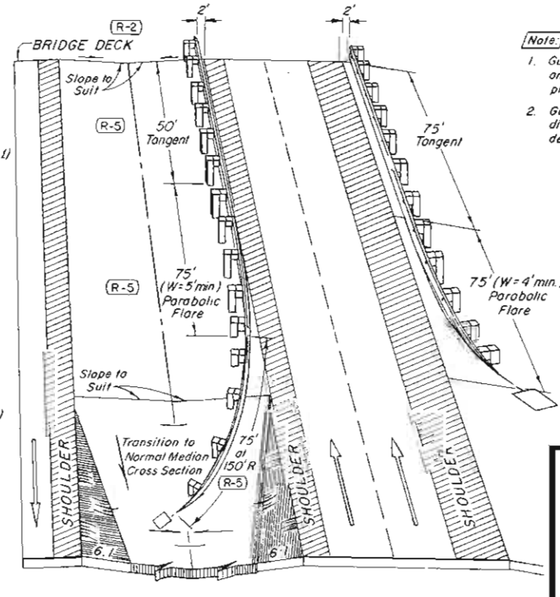
APPROACH Median Guard Rail			
Median Width	L_1=Tangent from Bridge	75' Parabolic Flare	L_2 = 150' Radius Arc
	then	W = 5'	then
31'-35'	50'-0"		25'-0"
36'-44'	25'-0"		50'-0"
45'-53'	12'-6"		62'-6"
R-1 54'-59'	0'-0"		75'-0"

Table 2

EXIT Median Guard Rail		
Median Width	L = Tangent from Bridge	75' Parabolic Flare, W=
	then	then
31'-35'	37'-6"	10'
36'-44'		12'
45'-53'		14'
R-1 54'-59'		16'



R-1 31' to 59' MEDIAN



R-1 MEDIAN 60' AND OVER

R-2

Note: EXIT FROM BRIDGES:

1. Guard rail for OUTSIDE shoulders at exit end of bridges on divided highways to be determined from hazard profile.
2. Guard rail for INSIDE shoulders at exit end of bridges on divided highways with medians 60' and over to be determined from hazard profile.

GUARD RAIL AT BRIDGE APPROACH

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

GUARD RAIL
TYPE 3

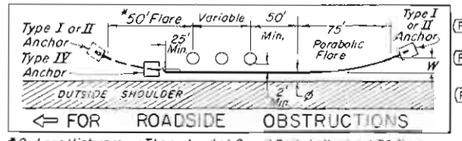
Designed by M.R.H.	Approved by [signature]
Mode by J.R.B.	Staff Design Engineer
Checked by R.S.M.	Date: March 1, 1968

STANDARD M-606-AB

(MARCH 1, 1968)
(SHEET 3)

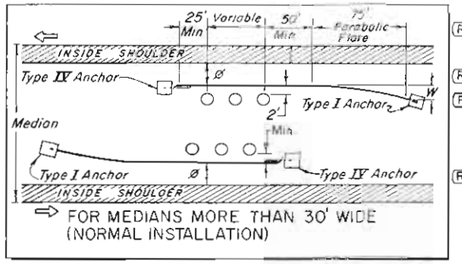
FEDERAL ROAD REGION NO	DIVISION	PROJ NO	SHEET NO	TOTAL SHEETS
9	COLORADO			

REVISIONS		
10-21-71	Revision date only	M.R.H.

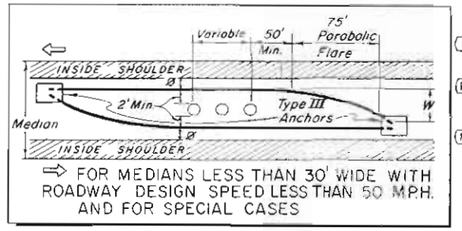


⇦ FOR ROADSIDE OBSTRUCTIONS

*2-Lane Highways — The exit end of Guard Rail shall extend 50 ft past the end of theoretical need and shall be flared and anchored.

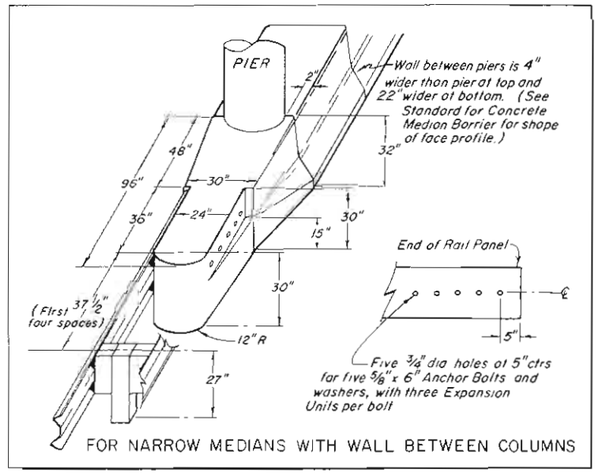


⇨ FOR MEDIANS MORE THAN 30' WIDE (NORMAL INSTALLATION)

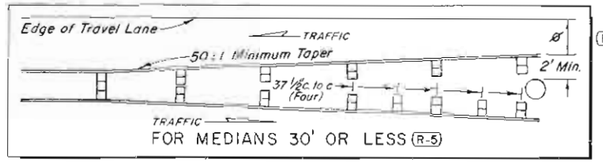


⇨ FOR MEDIANS LESS THAN 30' WIDE WITH ROADWAY DESIGN SPEED LESS THAN 50 M.P.H. AND FOR SPECIAL CASES

NON-CONTINUOUS RAIL



FOR NARROW MEDIANS WITH WALL BETWEEN COLUMNS

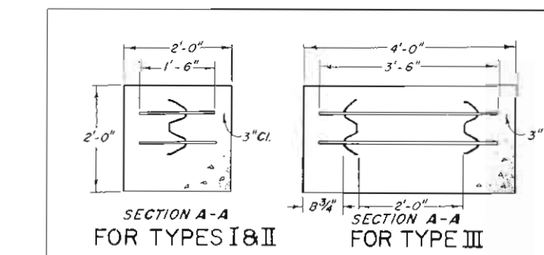


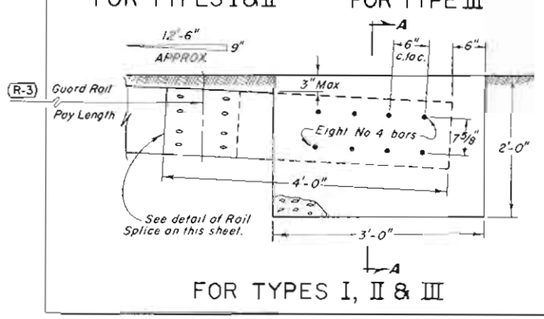
FOR MEDIANS 30' OR LESS (R-5)

CONTINUOUS RAIL

Ø When slope is 6:1 or flatter and an obstruction is present, increase where possible, to allow more area for vehicle recovery. (R-2)

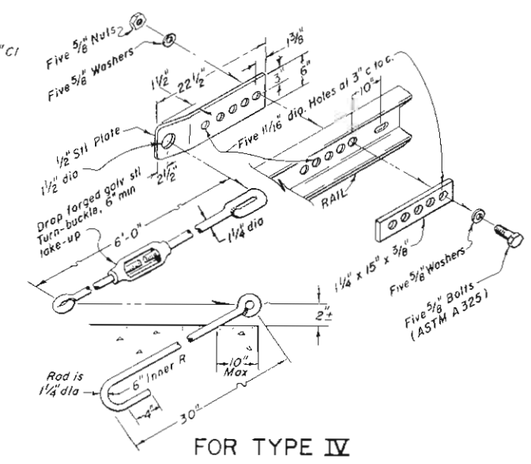
TYPICAL GUARD RAIL FOR OBSTRUCTIONS





FOR TYPES I, II & III

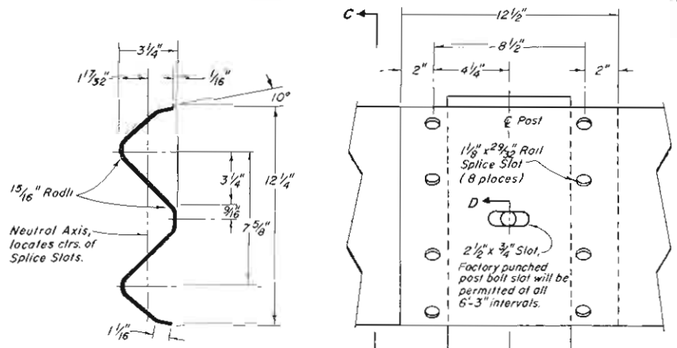
NOTE: All components other than turn-buckle shall be steel conforming to ASTM A 36 and entire assembly shall be galvanized.
Anchor rod and bolt eyes shall be closed by welding after assembly.

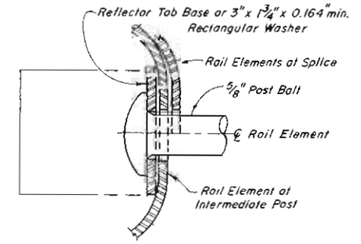


FOR TYPE IV

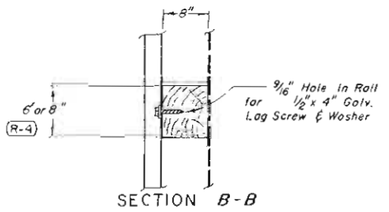
DETAILS FOR TYPICAL END ANCHORAGE

DETAIL OF RAIL AND SPLICE

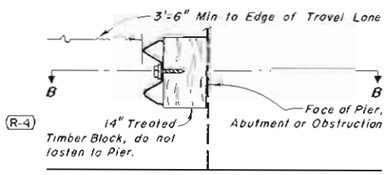




SECTION D-D



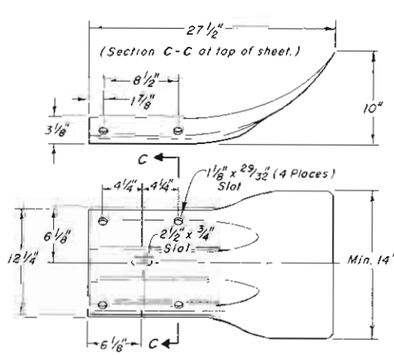
SECTION B-B



FOR NARROW MEDIANS
(To be used only when 2' min clearance cannot be obtained.)

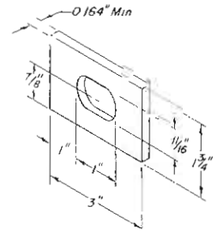
(R-4) SEE TABLE ON SHEET 1 FOR TIMBER CROSS SECTION

(R-5) NOTE: Four 37½" post spaces shall be used at obstruction approach. Posts between piers shall be evenly spaced at 37½" c to c or less. Timber blocks fastened to abutments or obstructions shall be spaced 37½" c to c. or less.

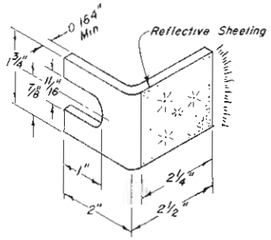


NOTE. Slots shown shall match outer 4 and center Rail end slots.

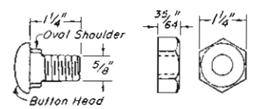
DETAIL OF TERMINAL SECTION



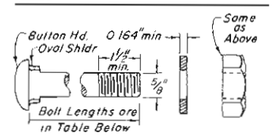
RECTANGULAR WASHER DETAIL



REFLECTOR TAB DETAIL



SPLICE BOLT & HEX NUT
(NEED 8 PER SPLICE, 4 PER TERMINAL)

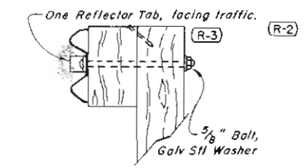


POST BOLT, WASHER & HEX NUT

TABLE OF POST BOLT SIZES

Block / Post	RAIL	BOLT SIZE
8"8"8"	Double	⅝" x 25¾"
8"8"	Single	⅝" x 17½"

(R-4) NOTE: When 6" x 8" timber is used, the 8" dimension shall be perpendicular to the roadway.



NOTE: Reflector Tab shall be installed on alternate posts or at max. 12'-6" spacing, beginning at the 3rd post from the buried anchor. (R-2)

INSTALLATION DETAIL OF REFLECTOR TAB

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

GUARD RAIL
TYPE 3

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

STANDARD M-607-A

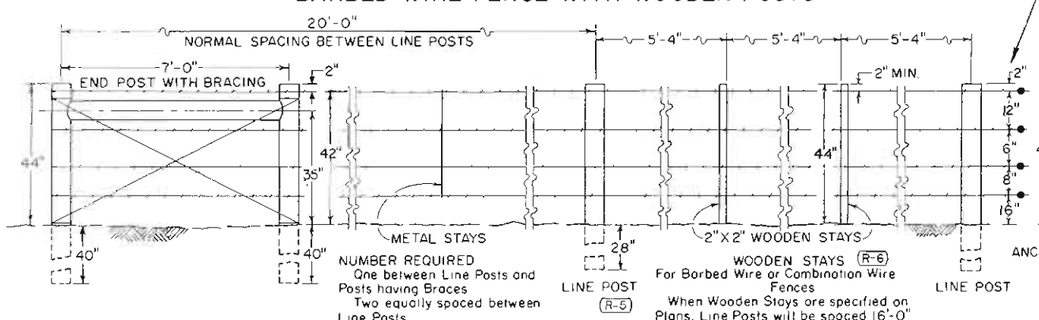
(SHEET 1 OF 2 SHEETS)
(JULY 1, 1965)

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

	REVISIONS		
R-1	8-2-66	Vertical Dimensions and Note	M.R.H.
R-2	12-8-66	Vert. Dims., Std. and Alternate	M.R.H.
R-4	5-6-68	Eyebolt Note and Title Block	M.R.H.
R-5	7-25-69	Revise post lengths	M.R.H.
R-6	9-15-69	Stays	M.R.H.
R-7	8-19-71	Delete corner post concrete note	M.R.H.

BARBED WIRE FENCE WITH WOODEN POSTS

(R-1)



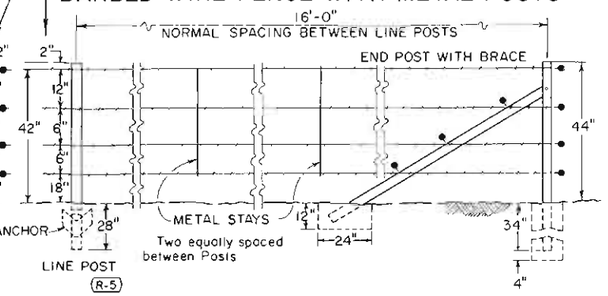
NUMBER REQUIRED
One between Line Posts and Posts having Braces
Two equally spaced between Line Posts

WOODEN STAYS (R-6)
For Barbed Wire or Combination Wire Fences
When Wooden Stays are specified on Plans, Line Posts will be spaced 16'-0" C to C in lieu of 20'-0" normal spacing. Wooden Stays will rest on the natural ground and will be stapled as indicated for Line Posts

(R-2) STANDARD INSTALLATION

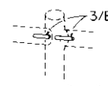
(R-2) ALTERNATE
(For blow-sand and tumbleweed areas, if desired by landowner.) (R-1)

BARBED WIRE FENCE WITH METAL POSTS



Two equally spaced between Posts

CROSS BRACE DOWELING DETAIL

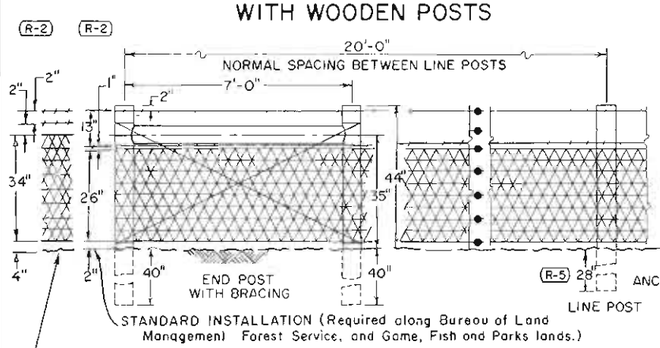


Bore a 3/8" X 2" Hole in each Post and Brace to receive the Pins. Wrap the ends of the Braces tightly with several turns of 12 1/2 ga. smooth Galv. Wire to prevent splitting or Notch Post and Nail with 40 d Common Nails.

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

COMBINATION WIRE FENCE WITH WOODEN POSTS

(R-1)

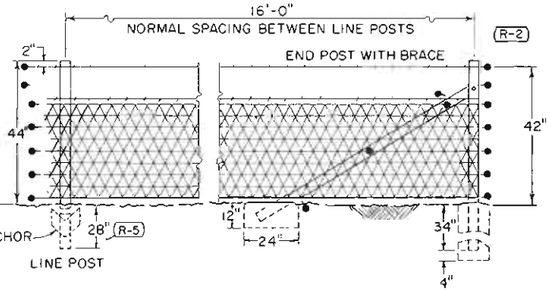


STANDARD INSTALLATION (Required along Bureau of Land Management Forest Service, and Game, Fish and Parks lands.)

ALTERNATE (Where 26" mesh is not acceptable to landowner.)

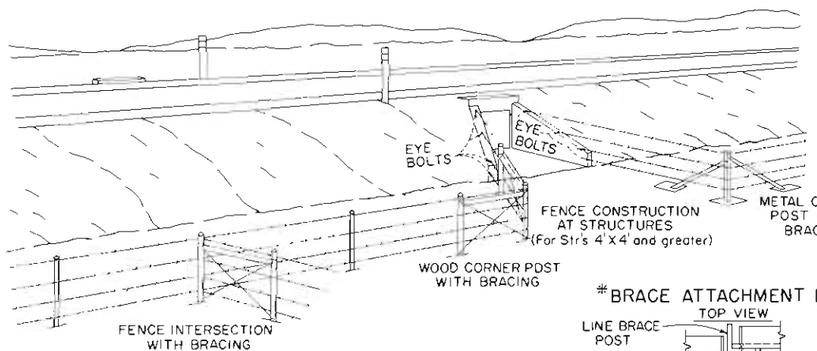
COMBINATION WIRE FENCE WITH METAL POSTS

(R-1)



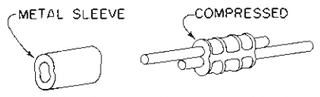
● Fence wire will be stapled to wooden posts or tied to metal posts as shown marked ● on barbed wire or combination wire fence details.

ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES



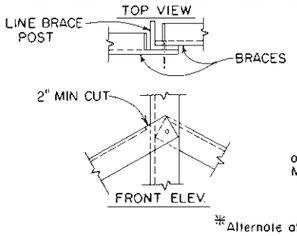
NOTE
At all structures of 4'x4' and over, the fence shall be ended at eye-bolts in the wings of the structure. Where the type of structure prohibits the use of eye-bolts, an end post with brace shall be used.
Eye-bolts shall be made of 1/2" round bars with a minimum of six (6) inches of body length embedded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

ACCEPTABLE WIRE SPLICE

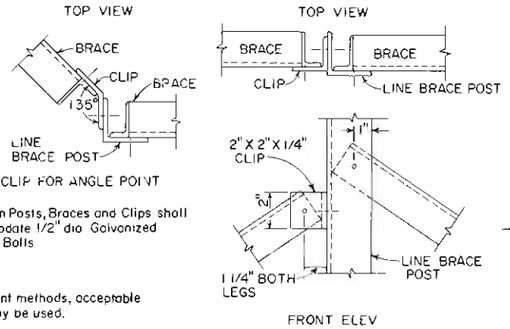


Splicing Sleeve shall be approved by the Engineer.

*BRACE ATTACHMENT DETAIL



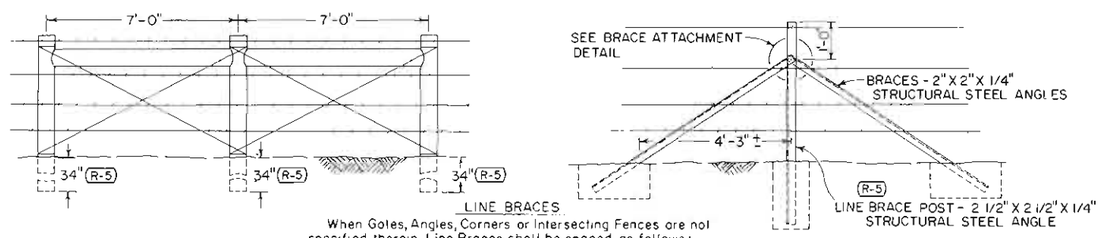
*ALTERNATE BRACE ATTACHMENT DETAIL



Holes in Posts, Braces and Clips shall accommodate 1/2" dia. Galvanized Machine Bolts

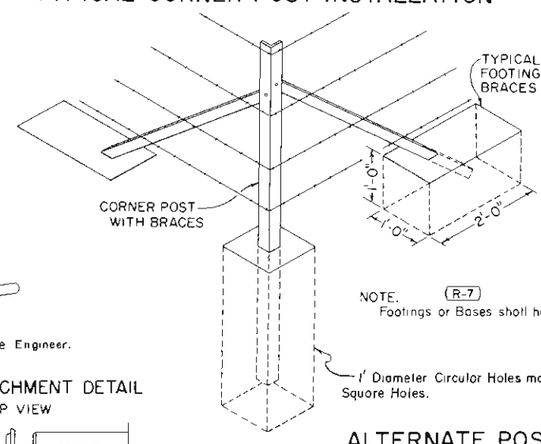
*Alternate attachment methods, acceptable to the Engineer, may be used.

LINE BRACES

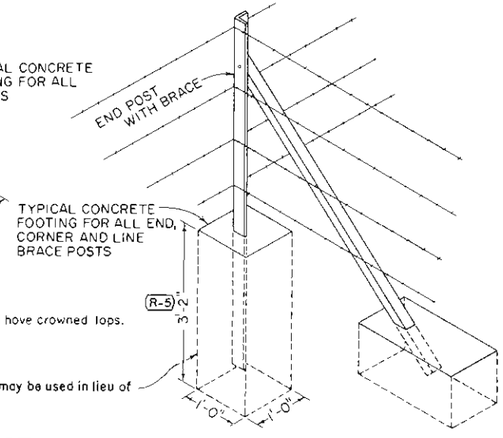


LINE BRACES
When Gates, Angles, Corners or Intersecting Fences are not specified therein, Line Braces shall be spaced as follows:
Metal Posts - 800' Intervals
Wooden Posts - 1,400' Intervals

TYPICAL CORNER POST INSTALLATION



TYPICAL INSTALLATION AT FENCE INTERSECTIONS

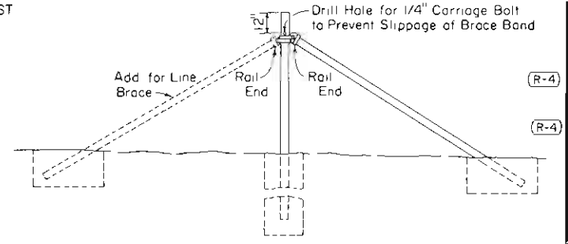


NOTE. (R-7)
Footings or Bases shall have crowned tops.

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

ALTERNATE POST

(FOR END, CORNER OR LINE BRACE POSTS)



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

WIRE FENCES AND GATES

(R-1)

Designed by	L E O	Approved by	L E Olson
Made by	T E F	Staff Des. Engr.	
Checked by	E E O	Date:	July 1, 1965

STANDARD M-607-A

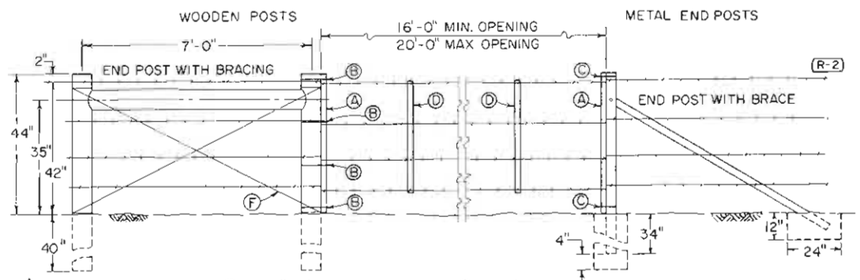
(SHEET 2)

(JULY 1, 1965)

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

	REVISIONS		
R-1	8-2-66	Vert. Dims. & Gen'l. Notes	M.R.H.
R-2	12-8-66	Vert. Dims., Std and Alternate	M.R.H.
R-3	2-6-67	Gate and General Notes	M.R.H.
R-4	5-6-68	General Notes and Title Block	M.R.H.
R-5	7-25-69	Revise post lengths, Gen. notes	M.R.H.
R-6	9-15-69	General Notes	M.R.H.
R-7	8-19-71	Gen Note, Panel Drwy Gate & Post	M.R.H.

▲BARBED WIRE GATE (R-1)



▲For Combination Wire Gate use 34" Mesh and 1 strand of Barbed Wire Extend Wooden Stays to Ground (R-1)

Ⓐ 2"X4"X4' Wooden Stays

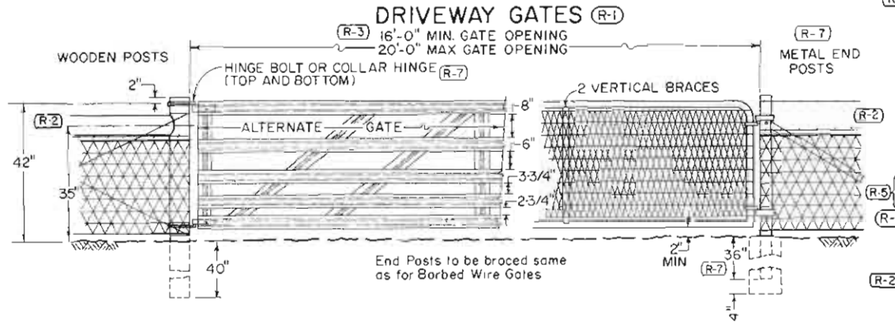
Ⓑ 4-No 12 1/2 Ga Wire Loops to act as Hinges

Ⓒ No 12 1/2 Ga Wire Loops

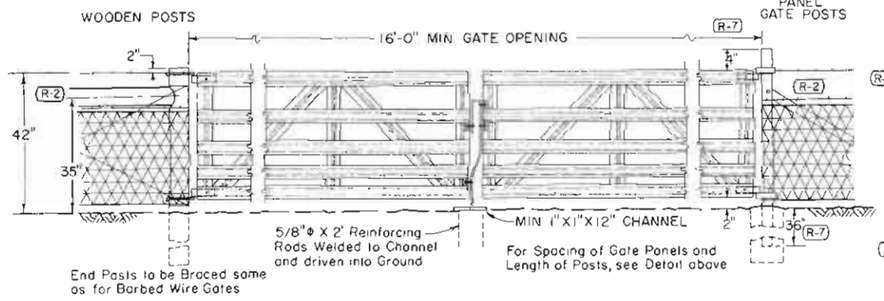
Ⓓ 2-2"X2" Wooden Stays equally spaced

Ⓕ No 12 1/2 Ga Brace Wire.

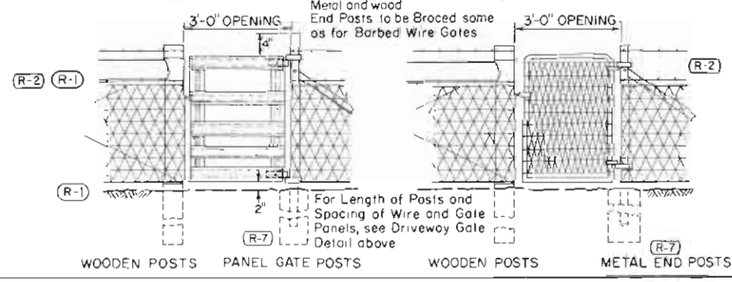
DRIVEWAY GATES (R-1)



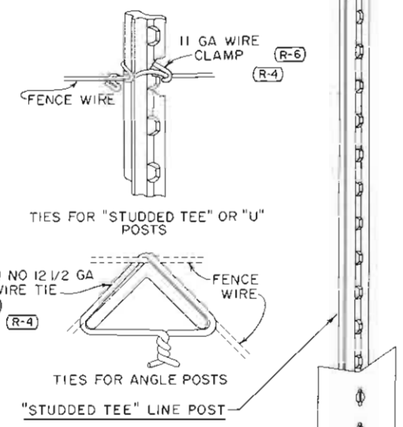
TWIN DRIVEWAY GATES (R-1)



WALK GATE (R-7) ALTERNATE WALK GATE



FENCE WIRE TIES



GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the Project All material dimensions and weights on this standard are nominal unless otherwise indicated. (R-5)

(R-1) At each location where an electric transmission, distribution or secondary line crosses a wood post fence the Contractor shall furnish and install a ground conforming to Section 9 of the National Electric Safety Code.

(R-2) Dimensions shown for "Standard" and "Alternate" apply for both wooden and metal post fence

Fence wire shall be ended, double wrapped and tied off at end posts, angle posts and line brace posts Fence to be continued shall then be restarted in like manner

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

(R-6) WOOD POSTS

All line posts shall have a min dia of four (4) inches & be 6'-0" long Min

All end, corner, intersection and brace posts shall have a minimum diameter of five (5) inches and be 7'-0" long

Fence wire will be stapled to wooden posts or tied to metal posts as shown marked ● on barbed wire or combination wire fence details Staples shall be No 9 wire min. at least 1 1/2 inches long.

METAL POSTS

All posts and braces shall be of the types and weights shown or acceptable equivalents

Holes to be provided in end, corner and gate posts as detailed

(R-5) CORNER AND LINE BRACE POSTS:
- Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles
- Weight - 3.81 lbs./lin ft
- Length - 6'-6" Min
- No of Braces - 2

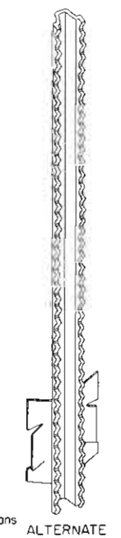
(R-5) LINE POSTS:
- Type - "Studded Tee" or "U"
- Weight - 1.28 lbs /lin ft (without Anchor)
- Length - 6'-0" Min.
- Anchor - Securely fastened, with bearing surface sufficient to resist movement of post Weight - 0.57 lb Min.

(R-7) METAL END POSTS AND GATE POSTS:
- Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles
- Weight - 3.81 lbs /lin ft
- Length - End, 6'-6" Min.; Panel Gate, 7'-0" Min.
- No of Braces - 1

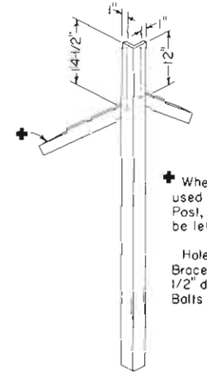
(R-5) BRACES (For Corner, End or Line Brace Posts)
- Type - 2"X 2"X 1/4" Structural Steel Angles
- Weight - 3.08 lbs /lin ft
- Length - Same as corner and end posts used.

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

TYPICAL METAL POSTS



ALTERNATE LINE POST ("U" POST) (R-7)



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

Holes in Angle Posts and Braces shall accommodate 1/2" dia Galvanized Machine Bolts

DETAILS FOR HOLE SPACING

FOOTINGS OR BASES

Concrete shall be Class **A**, **B** or **D** Concrete with light weight aggregates conforming to ASTM C 330 will be permitted.

ALTERNATES:

(R-4) END, CORNER AND LINE BRACE POSTS
- Type - 2 1/2" Std. Galvanized Pipe
- Weight - 5.79 lbs /lin ft. ± 5%

(R-4) BRACES
- Type - 1 3/8" O.D. Tubular Steel with 2 1/2" Brace Band, Hinge Bolt and 1 3/8" I.D. Rail End; all Galvanized.
- Weight - 1.6 lbs/lin ft. ± 5%
- Length - 6'-6" Min.

(R-1) BARBED WIRE

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

Aluminum barbed wire shall conform to ASTM Designation B 211, with alloy 5052-O for the line wire and alloy 5052-H38 for the barbs

(R-5) 4" x 4" WIRE MESH

Wire mesh used in combination wire fence as shown shall be galvanized and conform to the following

	STANDARD	ALTERNATE
Width	26"	34"
Weight - Lbs/Lin Ft	0.54	0.76
Horizontal Wires	2 Strands, No. 12 1/2 gage.	
Cross Wires	1 Strand, No. 14 1/2 gage Min.	

Fabrication; cross wires to be woven with horizontal wires making a one piece fabric.

GATES

(R-7) DRIVEWAY GATES (PANEL) (ALTERNATE)
- Height - approximately 42" (5 panels) --- Width of gate opening - 16'-0" Min.
- Weight - Galvanized Steel, 75 lbs

(1) Gates to be of Riveted construction as follows Min. 4 No 10 rivets at each right angle connection and where diagonal braces connect to horizontal panels; Min 3 No 10 rivets where diagonal braces connect to top and bottom panels

(R-7) DRIVEWAY GATES:
- Height - 42"
- Weight - Not less than 90 lbs complete with latch and hinges
- Width of gate opening - 16'-0"
- Gate Frame - 1" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction
- Mesh to be of same construction as shown for 4" x 4" wire mesh except it shall be 2" x 4" mesh

(R-5)(1) WALK GATES
- Height - approx 42" (5 panels)
- Weight - Galvanized Steel, 16 lbs. / Tempered Aluminum, 10 lbs
- Width of gate opening - 3'-0"

(R-6) All fence wire ties, clips, clamps, staples and other wire appurtenances shall be galvanized in accordance with ASTM Designation A 116, Class 1.

(R-1) ALTERNATE WALK GATES.
- Height - 42"
- Weight - Not less than 18 lbs complete with latch and hinges
- Width of gate opening - 3'-0"
- Gate Frame - 3/4" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction
- Mesh to be of same construction as shown for Driveway Gate

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

In lieu of galvanized finish on gate frames, Cadmium Plated pipe or Aluminum painting will be considered to be equivalent

LATCHES AND HINGES

Galvanized steel or Aluminum of standard make

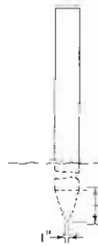
Hinges shall be placed as shown, to prevent theft.

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

(R-6) WOODEN STAYS

Wooden stays shall be untreated native timber Stay dimensions, including length, shall have a tolerance of ± 1/4".

POST POINTING DETAILS



Where field conditions permit, Wooden Posts may be pointed and driven in lieu of setting and tamping, at the option of the Contractor

Pointing shall be in conformity with details shown at left

Driving methods shall not damage Post

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

(R-4) (R-4)

WIRE FENCES AND GATES

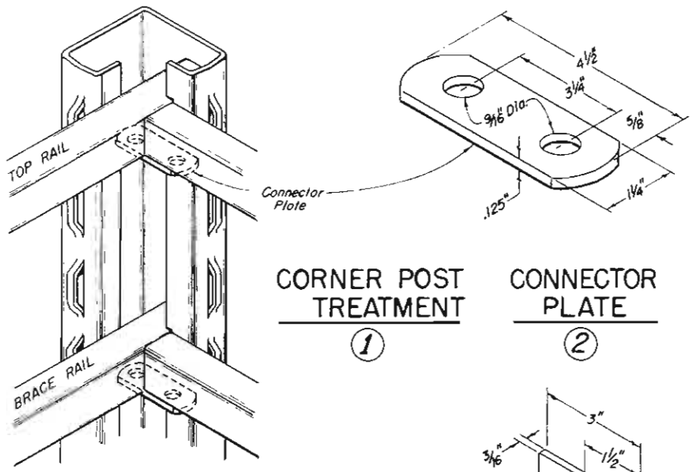
(R-1)

Designed by	L E O	Approved by	L E Olson
Made by	T E F	Staff Des. Engr.	
Checked by	E E O	Date:	July 1, 1965

STANDARD M-607-B

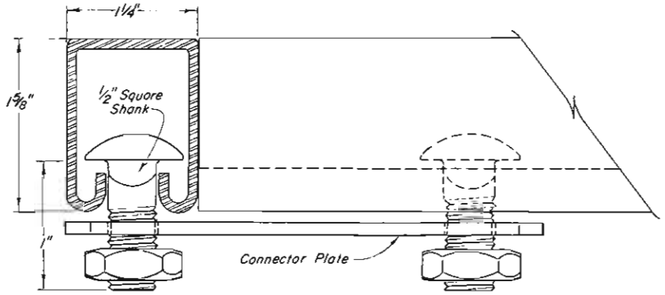
(SHEET 2)
(JULY 13, 1970)

REVISIONS			
R-5	7-13-70	Revise sheet	M.R.H.
R-6	12-11-70	Add details 60 and 13	M.R.H.
R-7	4-20-71	Line brace, tension wire clamp	M.R.H.



CORNER POST TREATMENT ①

CONNECTOR PLATE ②

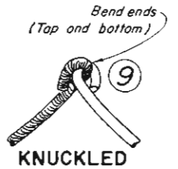


RAIL *(Showing Corner Assembly)* ③

14 GAGE ROLL FORMED STEEL, 20' LENGTHS, 1.35 LB. PER LIN. FT.

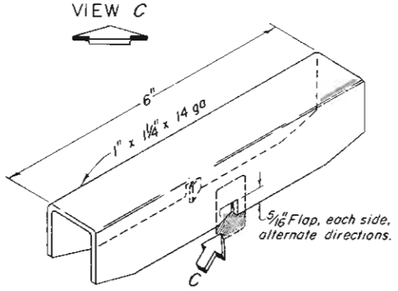
BARBED SELVAGE

VIEW C



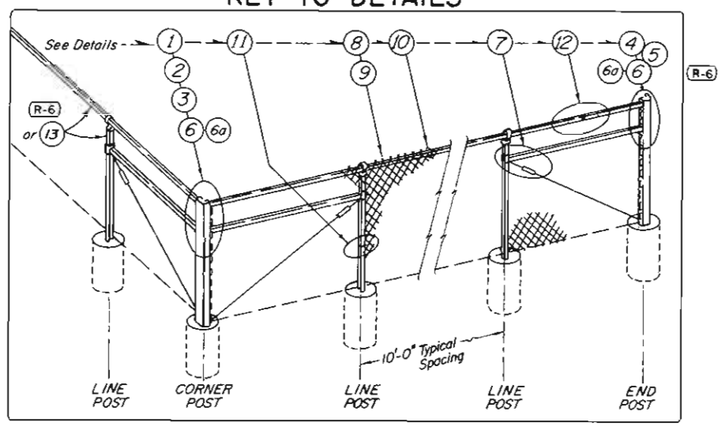
KNUCKLED SELVAGE

Alternate, use only when called for on plans.

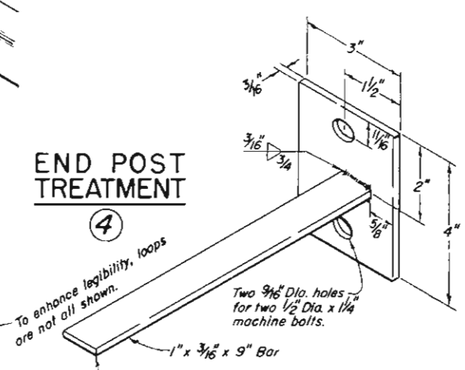


RAIL SPLICE INSERT ⑫

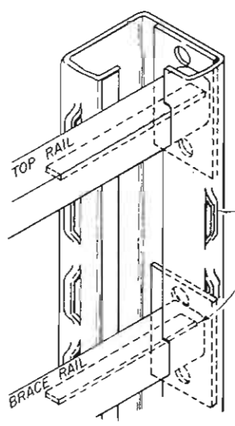
KEY TO DETAILS

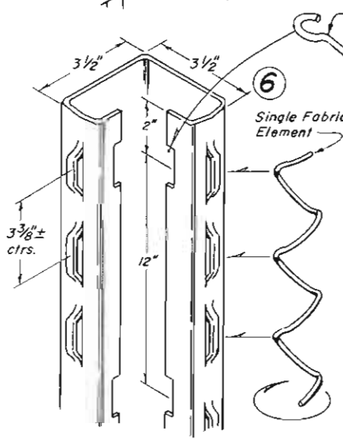


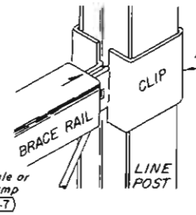
END POST TREATMENT ④



TORQUE BAR ⑤

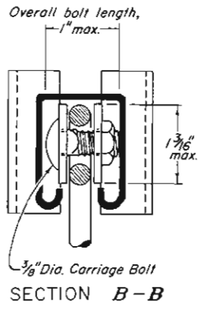






6a Tension Wire (& Knee Brace) R-6

ALTERNATE FOR TOP RAIL

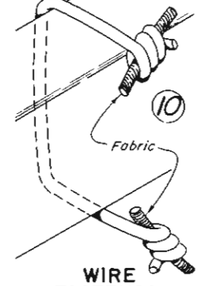


SECTION *B–B*

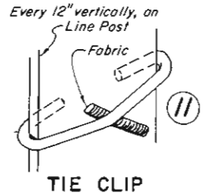
END POST OR CORNER POST

10 GAGE ROLL FORMED STEEL, 5.14 LB. PER LINEAR FOOT

TYPICAL BRACING ⑦

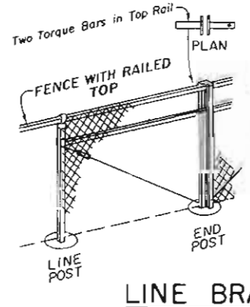


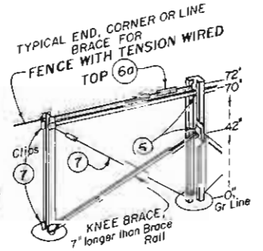
WIRE FASTENER



TIE CLIP

WIRE WORK





13

LINE BRACE (½ shown)

400 FT. INTERVALS R-7

R-6

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

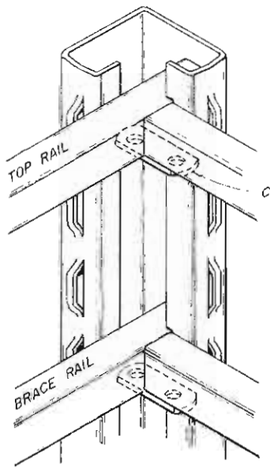
CHAIN LINK FENCE
(ALTERNATE)

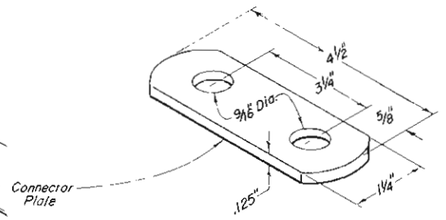
Designed by	M.R.H.	Approved by	
Made by	J.R.B.	Staff Design Engineer	
Checked by	R.S.M.	Date	July 13, 1970

STANDARD M-607-B

(SHEET 2)
(JULY 13, 1970)

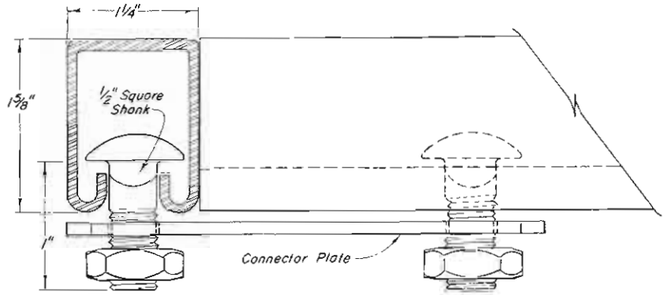
REVISIONS			
R-5	7-13-70	Entire sheet	M R H
R-6	12-11-70	Add details 6a and 13	M R H
R-7	9-20-71	Line brace title, Tension wire clamp	M R H



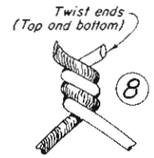


CORNER POST TREATMENT
(1)

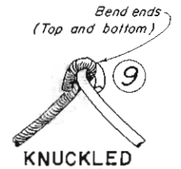
CONNECTOR PLATE
(2)



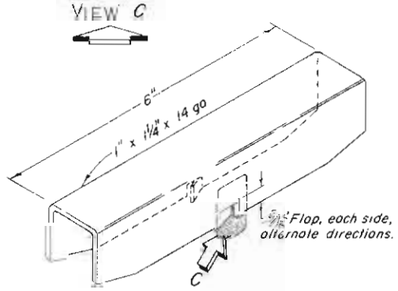
RAIL *(Showing Corner Assembly)*
14 GAGE ROLL FORMED STEEL, 20' LENGTHS, 1.35 LB. PER LIN. FT.
(3)



BARBED SELVAGE

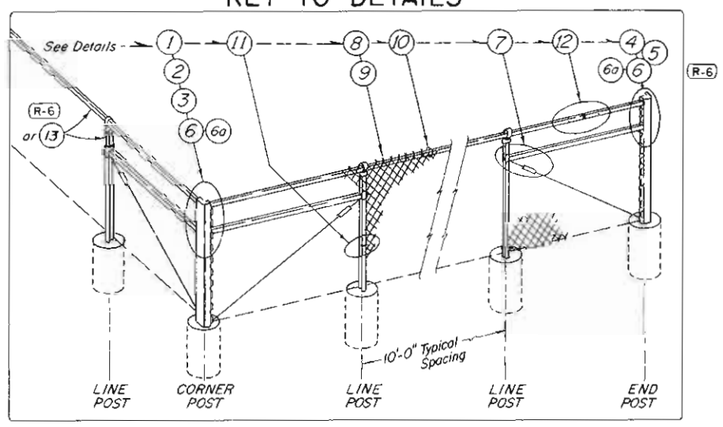


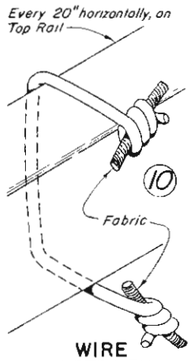
KNUCKLED SELVAGE
Alternate, use only when called for on plans.



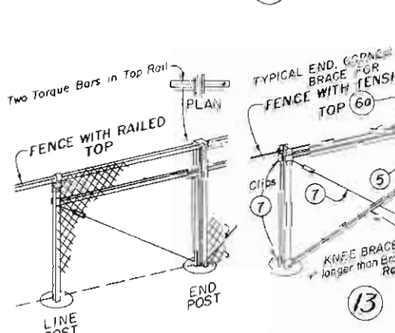
RAIL SPLICE INSERT
(12)

KEY TO DETAILS

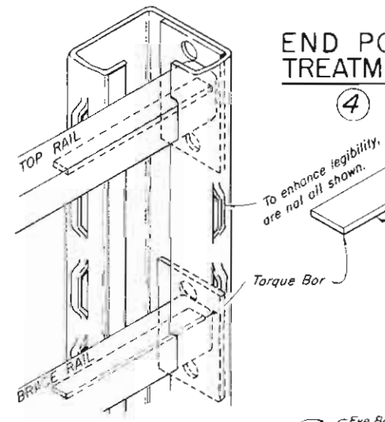


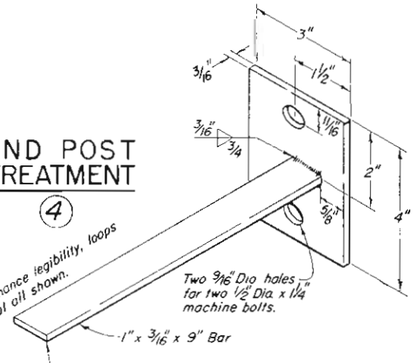


WIRE FASTENER



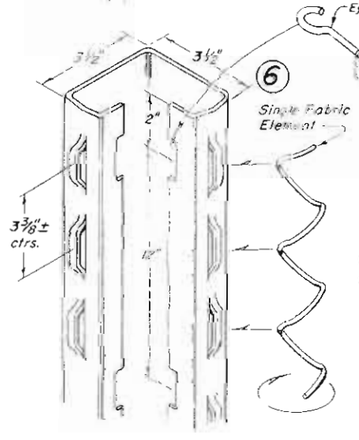
LINE BRACE (½ shown)
400 FT. INTERVALS
R-6

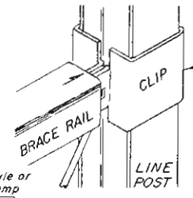


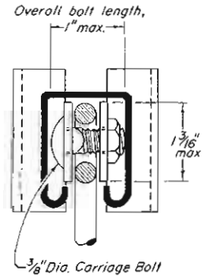


END POST TREATMENT
(4)

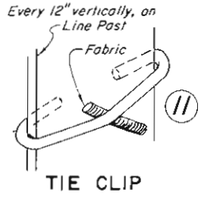
TORQUE BAR
(5)







SECTION B–B



TIE CLIP

END POST OR CORNER POST
10 GAGE ROLL FORMED STEEL, 5.14 LB. PER LINEAR FOOT

(7)
TYPICAL BRACING

WIRE WORK

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

CHAIN LINK FENCE
(ALTERNATE)

Designed by	M. R. H.	Approved by	
Made by	J. N. B.	Staff Design Engineer	
Checked by	R. S. M.	Date	July 13, 1970

STANDARD CURBS AND GUTTERS

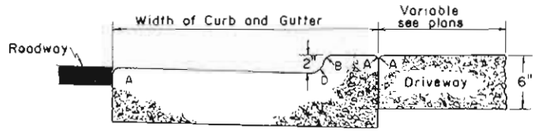
STANDARD M-609-A

(JULY 1, 1965)

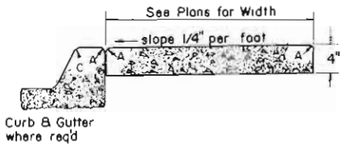
FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO		

REVISIONS			
(R-1)	11-16-65	Subtitles.	M.R.H.
(R-2)	2-14-66	General Notes.	M.R.H.
(R-3)	7-19-68	Dept Name and Rev. Gen'l Note.	M.R.H.
(R-4)	5-21-69	Provide variable width on conc gtr.	M.R.H.
(R-5)	5-7-71	Add class B to conc. in Gen. Note.	M.R.H.

CONCRETE PAVEMENT (DRIVEWAYS)

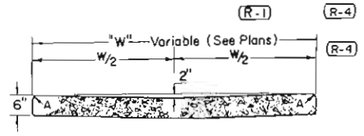


CONCRETE SIDEWALK

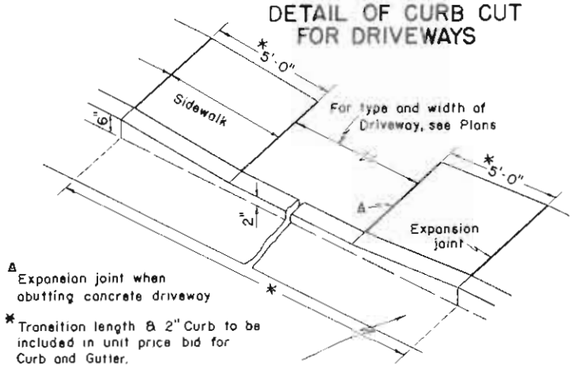


GUTTER Type 2

(R-1) (R-4)



DETAIL OF CURB CUT FOR DRIVEWAYS

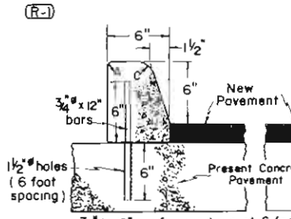


Δ Expansion joint when abutting concrete driveway

* Transition length & 2" Curb to be included in unit price bid for Curb and Gutter.

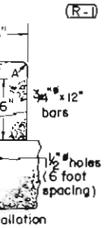
CURB Type 4 (6" Borrier) (Section B)

(R-1)



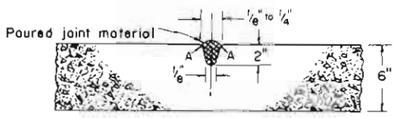
CURB Type 4 (6" Mountable) (Section M)

(R-1)



¾"ø x 12" reinforcing bars at 6 foot spacing. Cost of installation to be included in unit price bid for Curb. Bars to be grouted in 1½"ø holes in present concrete. Grout to consist of 2 parts clean sand and 1 part cement.

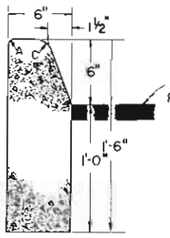
TRANSVERSE CONTRACTION JOINT FOR CONCRETE PAVEMENT (DRIVEWAYS)



This joint required where length of slab exceeds 15 feet.

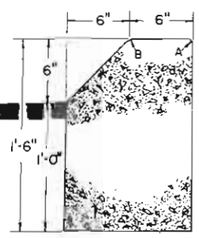
CURB Type 2 (6" Barrier) (Section B)

(R-1)

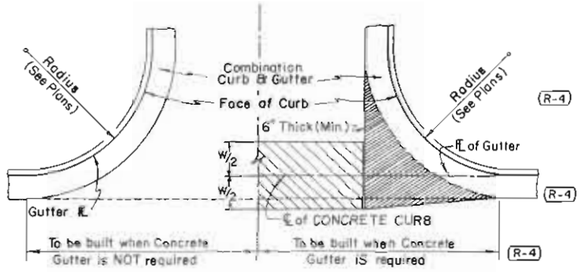


CURB Type 2 (6" Mountable) (Section M)

(R-1)



CONSTRUCTION OF CONCRETE GUTTERS AT INTERSECTIONS



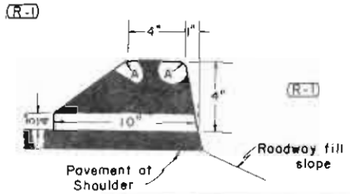
(R-4)

▨ This area shall be poured monolithically with curb and gutter and paid for as Concrete Pavement of specified thickness.

(R-4)

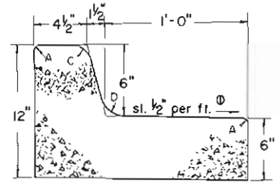
CURB Type 6 (4" Mountable) (Section M)

(R-1)



(R-1)

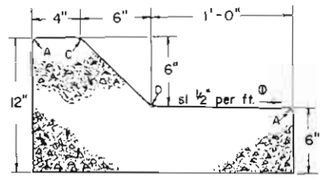
CURB AND GUTTER Type 2 (6" Barrier - 1' Gutter) (Section 1B)



LEGEND FOR RADII
A = ⅛"
B = 1"
C = 1½"
D = 1½" to 2"

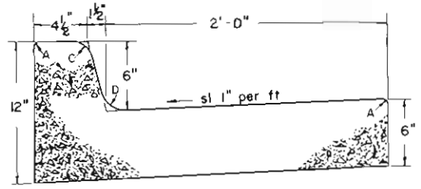
CURB AND GUTTER Type 2 (6" Mountable - 1' Gutter) (Section 1M)

(R-1)

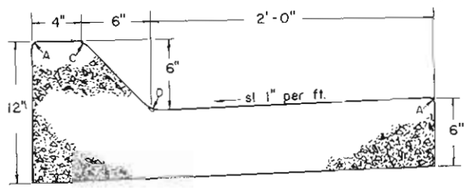


Φ Slope in opposite direction when required to fit field conditions.

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

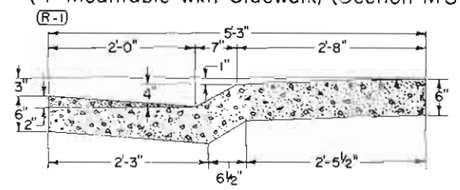


(R-1) CURB AND GUTTER Type 2 (6" Mountable - 2' Gutter) (Section 2M)

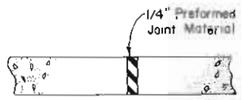


CURB AND GUTTER (Type 2) (4" Mountable with Sidewalk) (Section MS)

(R-1)



SIDEWALK EXPANSION JOIT



(R-5) GENERAL NOTES

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

On Curves 3 degrees and sharper, Curbs and/or Gutters are to be placed on the Arc of the Curve unless otherwise noted on plans. A maximum chord length of 10 feet may be used when the degree of curve is less than 3 degrees.

Expansion joints shall be installed between concrete curb and any fixed structure, sidewalk or bridge. Expansion joint material shall be ½" thick and shall extend the full depth of contact surface.

Concrete shall be Class A, B or D.

(R-3)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

CURBS AND GUTTERS

Designed by	Approved by
Made by	Staff Design Engr
Checked by	Date: July 1, 1969

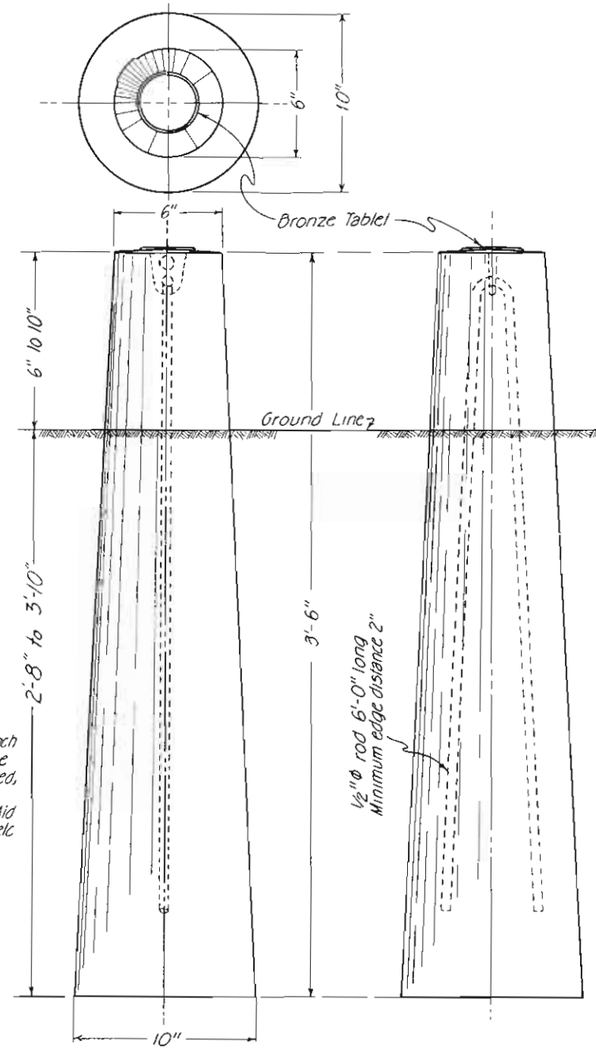
STANDARD M-612-A

(JULY 1, 1965)

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

REVISIONS			
R-1	5-2-66	R.O.W. Marker Note	M.R.H.
R-2	7-24-68	Dept Name	M.R.H.
R-3	5-7-71	Add note on concrete	M.R.H.
R-4	6-30-71	Bronze Tab dims. Rev all Dept to Div	M.R.H.

RIGHT OF WAY MARKER POST



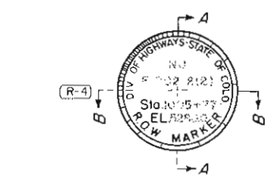
NOTES FOR R.O.W. MARKER POSTS

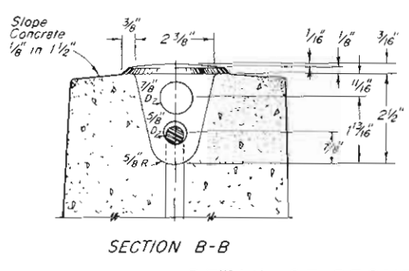
All work shall be done in accordance with the Standard Specifications applicable to the project.

(R-3) Posts shall be Class A, B or D concrete. The upper 12 inches of marker posts shall be rubbed free of form marks, and the top surface of the post must be constructed to drain thoroughly.

(R-1) Light weight aggregate conforming to ASTM C 330 will be allowed.

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





BENCH MARK

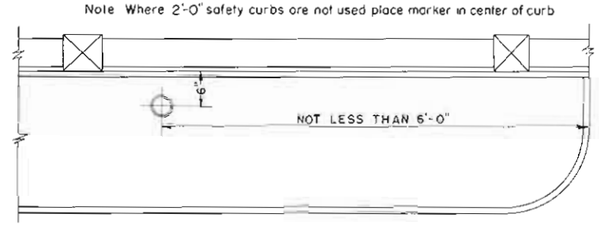
All work shall be done in accordance with Standard Specifications applicable to the project.

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

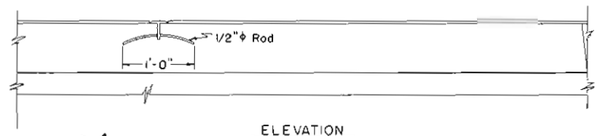
(R-4) Bronze Bench Mark Tablets will be furnished by the Division at no expense to the Contractor.

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

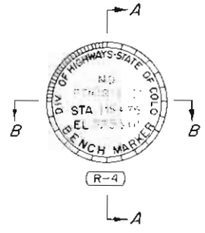
Note: Where 2'-0" safety curbs are not used place marker in center of curb



PLAN



ELEVATION



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

DETAIL OF BRONZE TABLET (R-4)
FOR RIGHT OF WAY MARKER POST AND BENCH MARK

(R-2)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

MARKER POSTS AND BENCH MARKS

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

STANDARD M-612-C

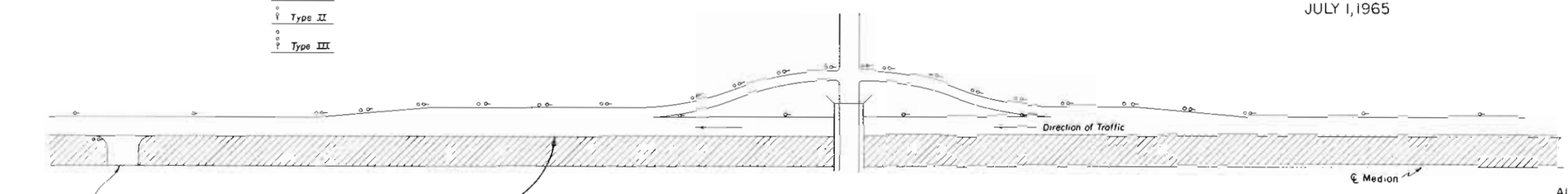
(SHEET 1 OF 2 SHEETS)
JULY 1, 1965

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

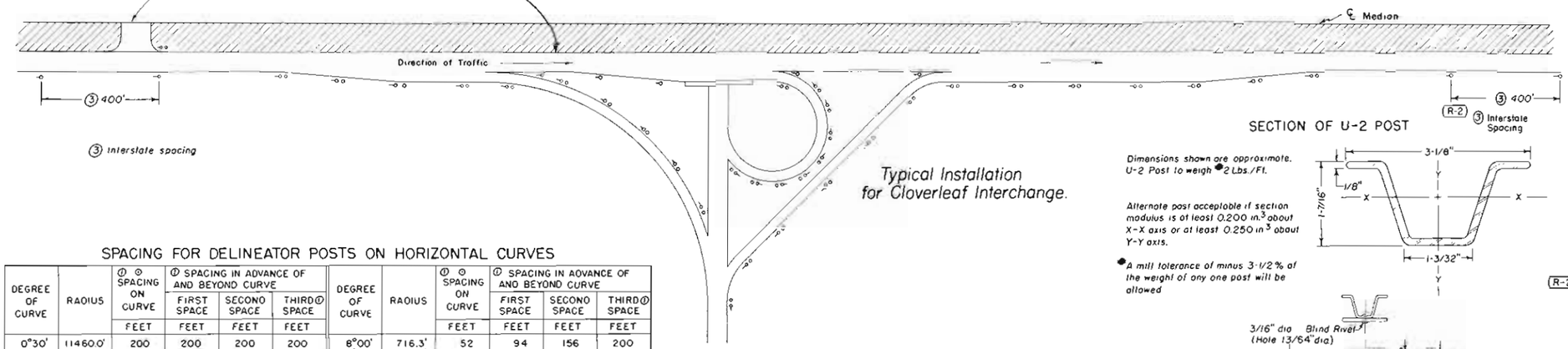
REVISIONS

R-2	1-9-68	Median Crossover, Genl Note	M.R.H.
R-3	7-11-68	Division Name	M.R.H.

Type I
Type II
Type III



Typical Installation for Diamond Interchange.



Typical Installation for Cloverleaf Interchange.

GENERAL NOTES

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

See tabulation in plans for delineator post requirements.

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

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

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

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

Delineator Posts are not to be placed along Frontage Roads.

Color of Posts shall be Interstate Green.

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

SPACING FOR DELINEATOR POSTS ON HORIZONTAL CURVES

DEGREE OF CURVE	RADIUS	① ⊙ SPACING ON CURVE	① SPACING IN ADVANCE OF AND BEYOND CURVE			DEGREE OF CURVE	RADIUS	① ⊙ SPACING ON CURVE	① SPACING IN ADVANCE OF AND BEYOND CURVE		
			FIRST SPACE	SECOND SPACE	THIRD① SPACE				FIRST SPACE	SECOND SPACE	THIRD① SPACE
		FEET	FEET	FEET	FEET			FEET	FEET	FEET	FEET
0°30'	11460.0'	200	200	200	200	8°00'	716.3'	52	94	156	200
1°00'	5730.0'	151	200	200	200	8°30'	674.1'	50	90	150	200
1°30'	3820.0'	123	200	200	200	9°00'	636.7'	48	86	144	200
2°00'	2865.0'	106	191	200	200	9°30'	603.2'	47	85	141	200
2°30'	2292.0'	95	171	200	200	10°00'	573.0'	46	83	138	200
3°00'	1910.0'	86	155	200	200	10°30'	545.7'	45	81	135	200
3°30'	1637.1'	80	144	200	200	11°00'	520.9'	43	77	129	200
4°00'	1432.5'	74	133	200	200	11°30'	498.3'	42	76	126	200
4°30'	1273.3'	70	126	200	200	12°00'	477.5'	41	74	123	200
5°00'	1146.0'	66	119	198	200	15°00'	382.0'	36	65	108	200
5°30'	1041.8'	63	113	189	200	18°00'	318.3'	33	59	99	198
6°00'	955.0'	60	108	180	200	21°00'	272.9'	30	54	90	180
6°30'	881.5'	58	104	174	200	25°00'	229.2'	27	49	81	162
7°00'	818.6'	55	99	165	200	30°00'	191.0'	24	43	72	144
7°30'	764.0'	53	95	159	200						

⊙ $S = 2\sqrt{R-50}$ 1-ST SPACE = 1.8S 2-ND. SPACE = 3S 3-RD. SPACE = 6S
NO SPACES TO EXCEED 200 FT.

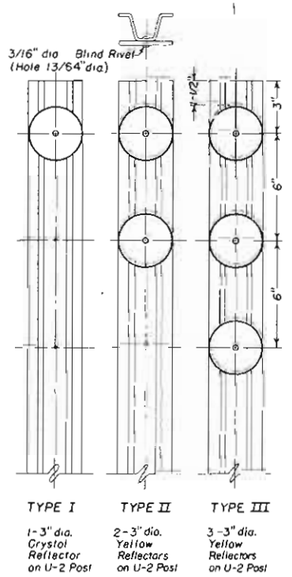
① Omit third space on Secondary and Primary Routes and double the distance on the curve and in advance of and beyond curve. For curves less than 2 degrees on Interstate through roadways use Interstate tangent spacing.

SECTION OF U-2 POST

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

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

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

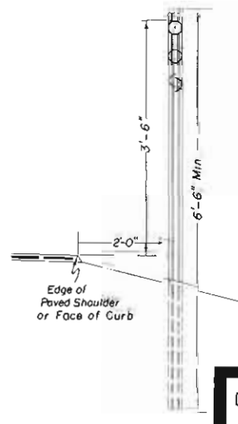


TYPE I — 1-3" dia. Crystal Reflector on U-2 Post

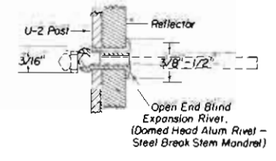
TYPE II — 2-3" dia. Yellow Reflectors on U-2 Post

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

Min. 3 holes in all posts required as shown.



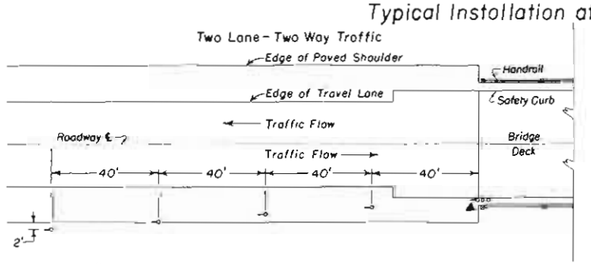
(R-3)



DETAIL
RIVETING REFLECTOR TO POST

Typical Installation at Bridge Approaches

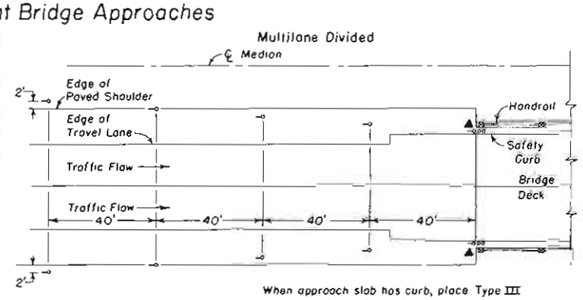
Two Lane – Two Way Traffic



▲Where curb to curb width of bridge is equal to or greater than roadway width plus usable shoulder width, use this delineator only and omit all others.

Note: Where guard rail is present, place delineators outside of guard rail and at height which will permit clear view of all three Delineator buttons.

Multilane Divided



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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

DELINEATORS

Designed by CKM	Approved by E. Olson
Made by WNC	Staff Design Engr.
Checked by LEO	Date July 1, 1965

STANDARD M-612-C

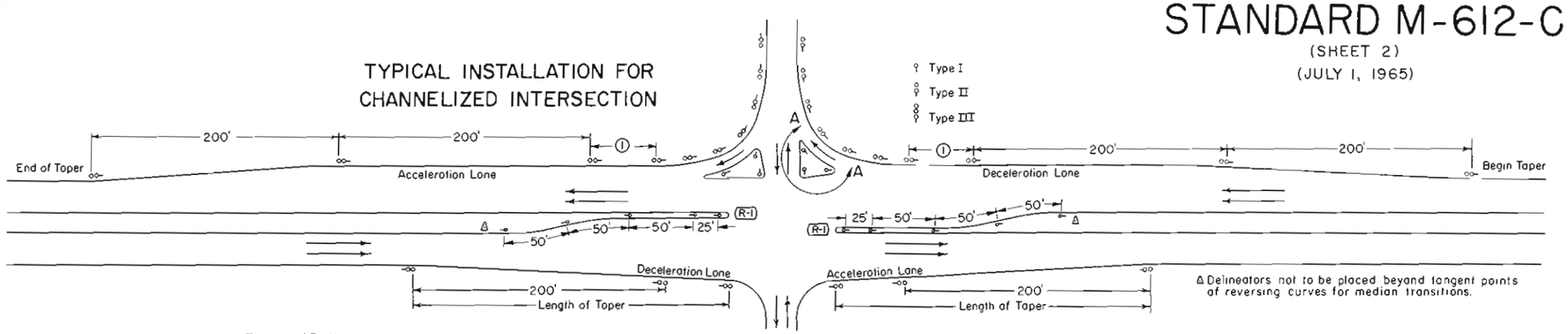
(SHEET 2)

(JULY 1, 1965)

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

REVISIONS			
R-1	5-4-67	Median and Island Delineators	M.R.H.
R-2	1-9-68	Median Crossover	M.R.H.
R-3	7-11-68	Division Name	M.R.H.

TYPICAL INSTALLATION FOR CHANNELIZED INTERSECTION



Δ Delineators not to be placed beyond tangent points of reversing curves for median transitions.

GENERAL NOTES

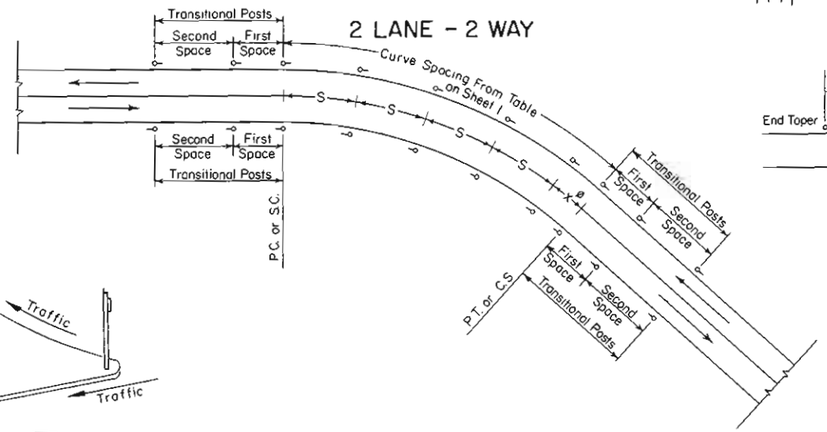
For Radii greater than 200 Feet, use spacing from Table included on Sheet 1 of this Standard

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

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

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

2 LANE - 2 WAY

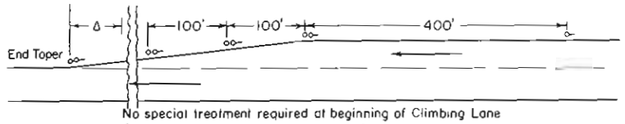


R-1

VIEW A-A

R-2

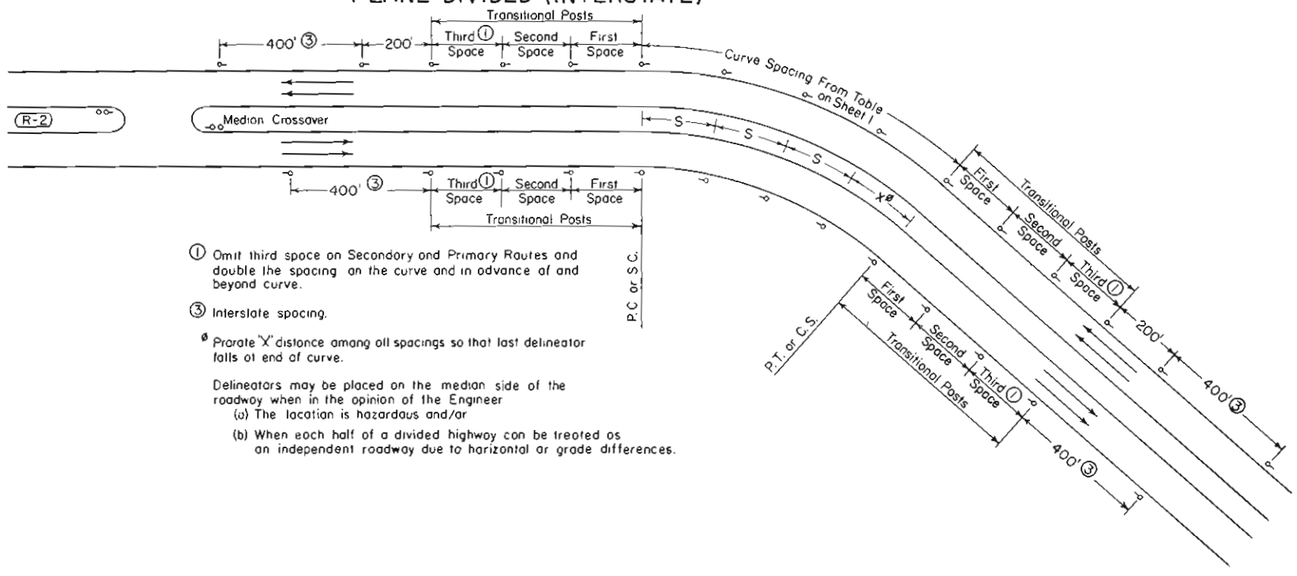
TYPICAL INSTALLATION FOR CLIMBING LANE TRANSITION



No special treatment required at beginning of Climbing Lane

Δ Last space variable, not to exceed 100'

4 LANE DIVIDED (INTERSTATE)



① Omit third space on Secondary and Primary Routes and double the spacing on the curve and in advance of and beyond curve.

③ Interstate spacing.

ø Prorate 'X' distance among all spacings so that last delineator falls at end of curve.

Delineators may be placed on the median side of the roadway when in the opinion of the Engineer

(a) The location is hazardous and/or

(b) When each half of a divided highway can be treated as an independent roadway due to horizontal or grade differences.

R-2

R-3

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

DELINEATORS

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

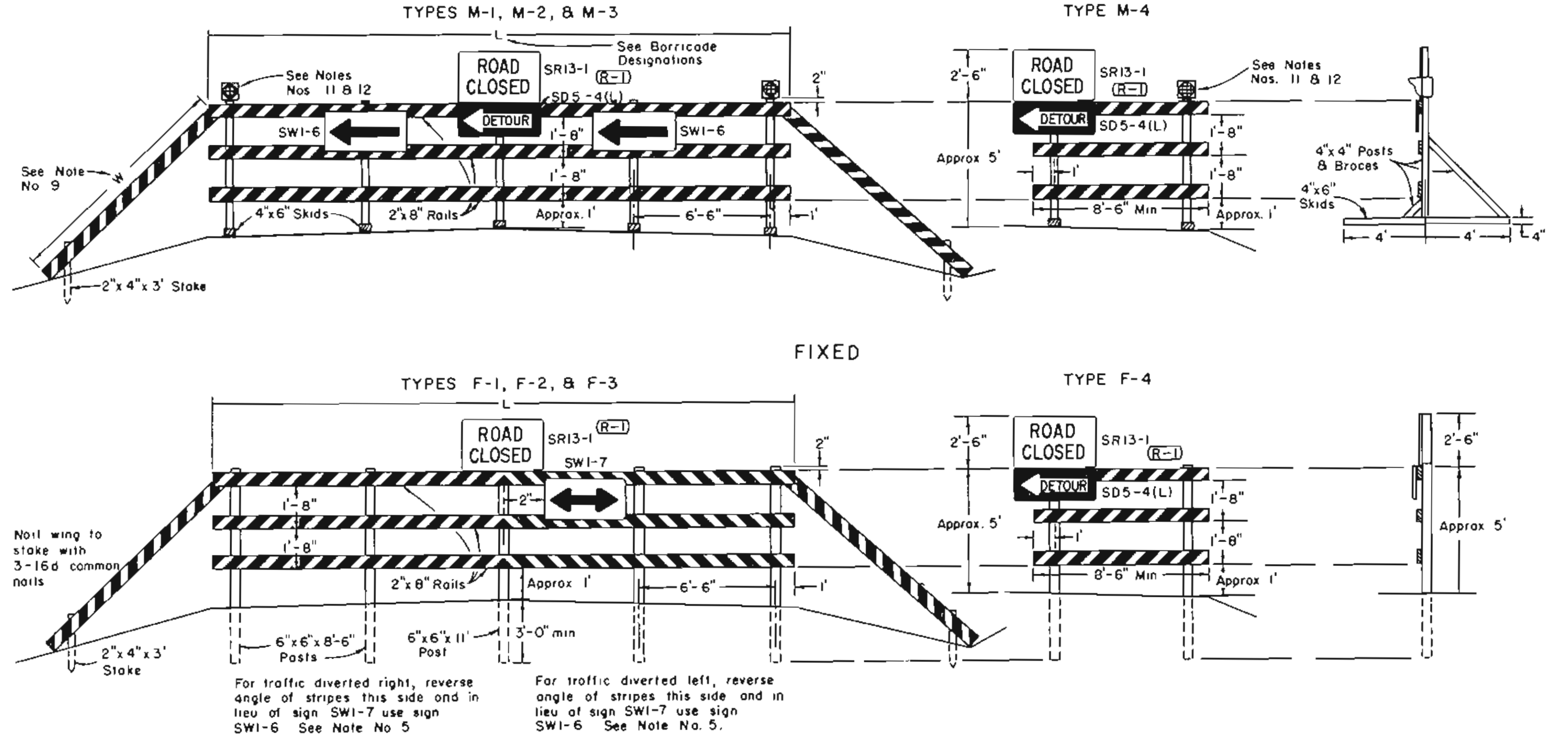
STANDARD M-614-A

(JULY 1, 1965)

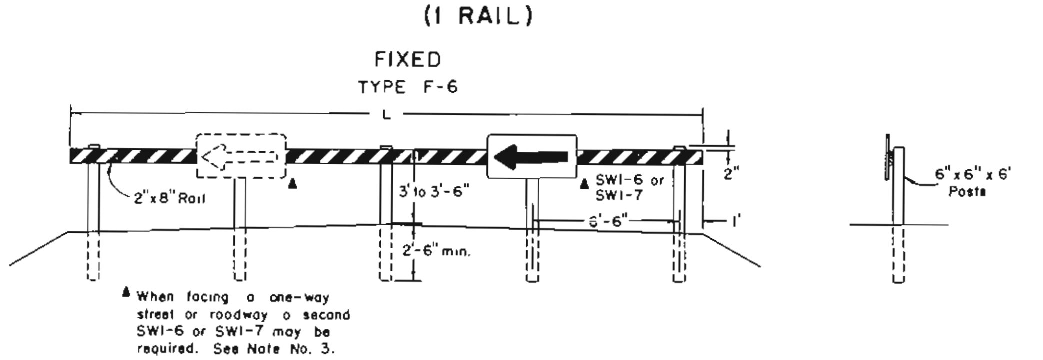
FEDERAL ROAD REGION NO.	DISTRICT	PROJECT NO.	SHEET NO.
9	COLORADO		

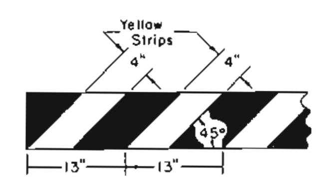
REVISIONS			
(R-1)	11-15-68	Rev. Dept. Route & Code Nos.	JLS
(R-2)	4-23-69	Rev. Code No. & Notes	JLS

CLASS I BARRICADES (3 RAILS)

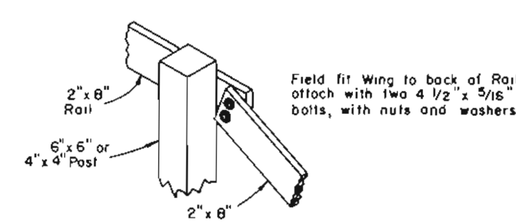


CLASS II BARRICADE (1 RAIL)

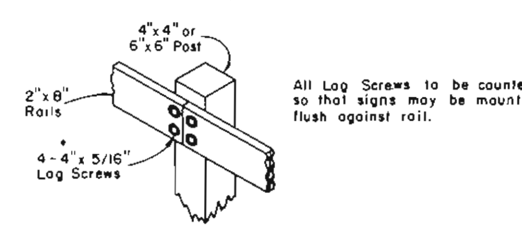




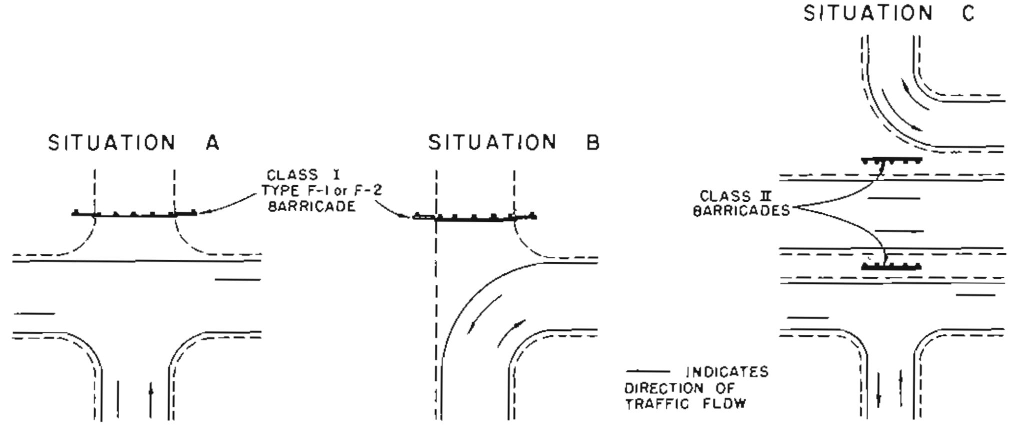
DETAIL OF RAIL AND WING STRIPING



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



METHOD OF ATTACHING PLANKING TO POSTS AT JOINTS



GENERAL NOTES

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

(R-2) 2. All signs and sign materials shall conform to the standards set forth in the "Manual on Uniform Traffic Control Devices for All Classes of Streets and Highways" published by the Division of Highways and this standard.

3. The various types and combinations of approved Signs and Beacons for Barricades required for each project shall be governed by field conditions and subject to approval by the Engineer. All traffic controls shall be placed for best visibility and legibility and maintained in good condition at all times. Oversigning is to be avoided.

(R-2) 4. Painting shall conform with Subsection 508.08 of the Standard Specifications. All skids, braces, and posts shall be painted with 2 coats of "Exterior Black Paint." Planking and wings on all barricades shall be painted with 2 coats of "Exterior Black Paint" on all sides before adding reflective strips. Reflective strips shall be "cut from smooth surface yellow reflective sheeting" of a type approved by the Division.

5. Each barricade rail shall be striped on the face side only with reflective yellow strips slanting downward at a 45° angle toward the side to which traffic is to turn or pass. See "DETAIL OF RAIL AND WING STRIPING."

6. When barricades are designated on plans the portion of the posts below ground line shall either be dipped in or painted with hot creosote oil. The portion of the post above ground line shall be painted with 2 coats of "Exterior Black Paint."

7. All skids, braces, and posts shall be nailed together with No 20d nails. All screws, bolts, nuts, and washers shall be galvanized or cadmium plated. Skids (bases) of movable barricades shall be weighted where necessary to provide stability.

(R-2) 8. All timber shall be Standard Grade or better, S4S, Douglas Fir or Larch, as described in the 1965 Standard Grading Rules published by the Western Wood Products Association, and shall conform to paragraph 123c for the rails and paragraphs 122c and 125c for the posts.

9. Detachable extension wings for bypassing of construction equipment are permitted. "W" is variable, length shall be adequate to provide closing of borrow pit and/or shoulder as required.

(R-2) 10. Alternate materials or other reflective elements on Traffic signs or Barricades will be permitted only after approval of such material by the Division in writing.

11. A Flashing Beacon for use on Barricades is a section of a standard traffic signal head or a similar-type device having a yellow lens in the face, which is illuminated by intermittent flashes. Where commercial power is not available, the beacon may be adapted to operate from storage batteries. Each signal unit lens shall have a visible diameter of not less than 8 inches. Each unit complete shall be of such design as to render the lens when illuminated clearly visible to traffic facing the signal at all distances up to 1000 feet under all atmospheric conditions except dense fog. The color of the yellow lens for caution shall be in accordance with Technical Report No. 1 of the Institute of Traffic Engineers. All beacon flashers shall be equipped with filters for suppression of radio interference. The illuminating element in a flashing yellow beacon shall be flashed at a rate of not less than 50 times nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total cycle. The use of Flashing Beacons will be governed by field conditions. Flashing Beacons when warranted generally should be operated continuously throughout the 24 hours of the day. Warrant for Flashing Beacons may be found in Sec. 3G of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

12. Flashers are portable, power-operated, lens-directed, enclosed lights, illuminated by rapid intermittent flashes of short duration. Flashers may be used in connection with barricades when approved by the Engineer. An array of random flashers which tends to obscure rather than delineate the traveled way will not be permitted. The use of flashers on a job will be governed by Sec. 5D of the "Manual on Uniform Traffic Control Devices for Streets and Highways" published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision). The color of the light emitted by a flasher shall be yellow.

13. Flashing Beacons and Flashers, when used, shall be positioned above the top rail of the barricades to produce the most effective results.

14. Barricades used as "Traffic Controls for Highway Construction" are not to be paid for separately.

15. Barricades will be paid for separately when designated on plans as bid items.

16. For additional general information on control of traffic through work areas refer to the "Manual on Uniform Traffic Control Devices for Streets and Highway", Part V, published by the U S Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

BARRICADE DESIGNATIONS

	Class	Type: Movable	Type: Fixed	Roadway Width	L	Description
(R-1)	I	M-1	F-1	26'-34'	28'	Barricade complete with SR13-1 sign and SW1-6 or SW1-7 signs as required
(R-2)	I	M-2	F-2	35'-44'	41'	Barricade complete with SR13-1 sign and SW1-6 or SW1-7 signs as required
(R-1)	I	M-3	F-3	Variable	28'	Barricade (without extension wings) complete with SR13-1 sign and SW1-6 or SW1-7 signs as required
	I	M-4	F-4	Variable	Variable 8'-6" min.	Wing Barricade (signs only as appropriate).
	II	–	F-6	Variable	28'	Barricade complete with appropriate signs

(R-1) DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TIMBER BARRICADES

Designed By D.R.W. | Made By J.S | Checked By F.B | Approved By: [signature] | Date JULY 1, 1965

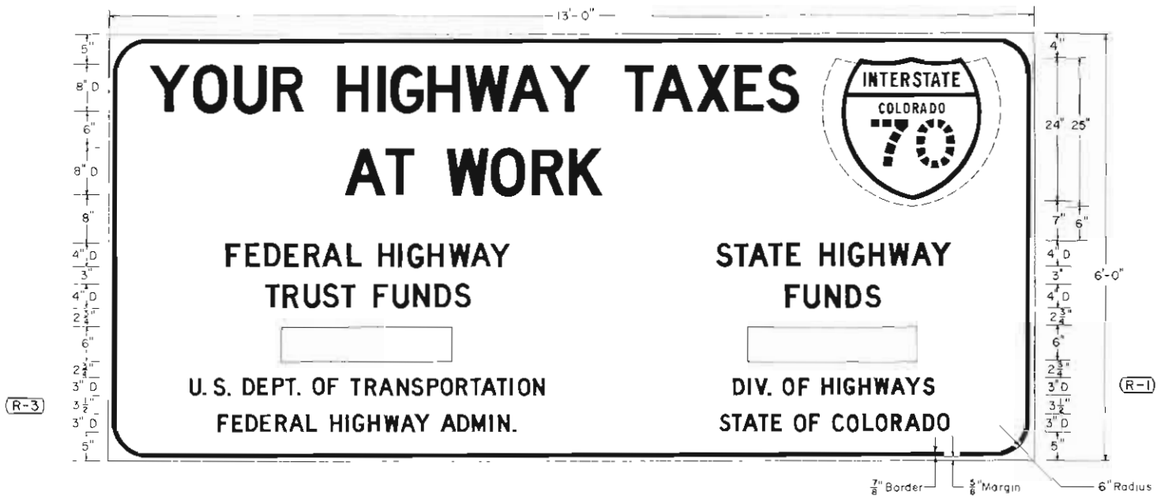
STANDARD M-614-IC

JULY 5, 1968

(SHEET 1 OF 2 SHEETS)

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

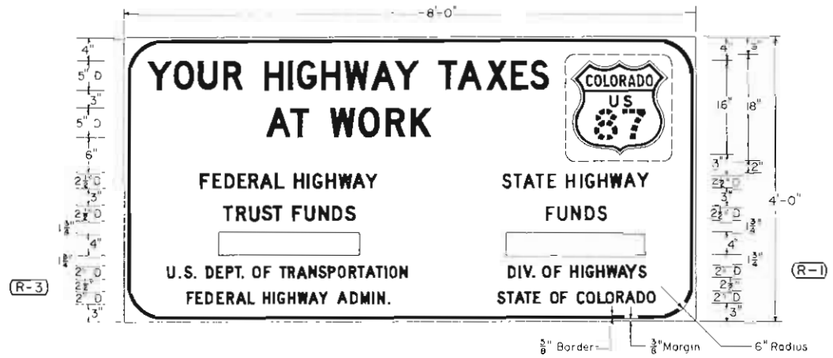
REVISIONS			
R-1	7-26-68	Rev Legend and Notes	G.W.F.
R-2	5-20-69	Rev. Lateral Placement	J.J.B.
R-3	9-25-70	Rev Legend	J.J.B.



ALTERNATE LEGEND

4" D FEDERAL

4" D FUNDS

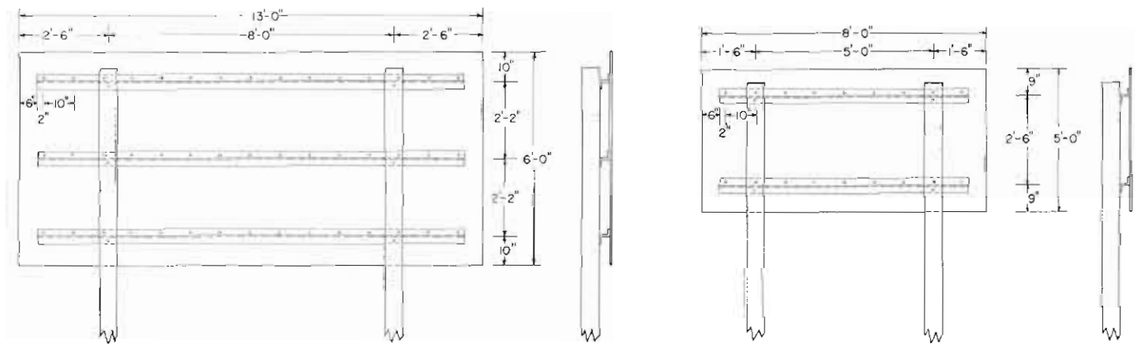


ALTERNATE LEGEND

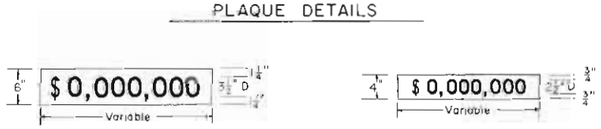
2½" D FEDERAL

2½" D FUNDS

FABRICATION DETAILS



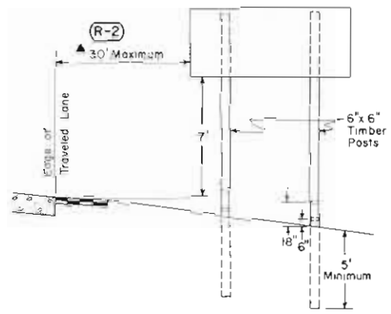
"AMOUNT OF FUNDS" PLAQUE DETAILS



GENERAL NOTES

1. These signs shall be furnished and installed by state forces
2. All work shall be done in accordance with Standard Specifications applicable to the Project.
3. Signs are to be placed facing traffic approaching the Project. They shall be installed at a location where they will not obscure or detract from the effectiveness of other official signs.
4. ▲ The lateral placement may be reduced to a minimum of 2 ft outside of the shoulder edge where necessary to fit field conditions.
5. When these signs are used on Beautification Projects, the words "HIGHWAY" and "TRUST" in lines 3 and 4 shall be deleted and the words "FEDERAL" and "FUNDS" shall be used in accordance with the spacing as shown under "Alternate Legend".
6. Sign panel shall be fabricated with ¾" plywood.
7. Route Marker plaques and "Amount of Funds" plaques shall be sheet aluminum 0.080" min. thickness.
8. Signs shall have a screen processed black legend and border on a plain white background. "Amount of Funds" plaques shall have a screen processed black legend on a plain white background.
9. Route Marker plaques shall be plain as indicated on the applicable standards.
10. Backing zees shall be 3" x 2¾" x ¼". Steel zees shall weigh 6.7 lbs per ft and aluminum zees shall be of 6061-T6 alloy weighing 2.33 lbs. per ft.
11. Posts shall be 6"x 6", S4S timber, painted white.
12. Each timber post shall be provided with two 2" diameter holes through the neutral axis, one at 6" and one at 18" above the ground level. The inside portion of each 2" diameter hole shall be painted white.
13. Panels shall be fastened to backing zees with ¼" thrust head lockbolt fasteners.
14. Backing zees shall be fastened to posts with ⅜" machine bolts.
15. Route Marker plaques and "Amount of Funds" plaques shall be fastened to the sign panels with ⅝" # 9 round head wood screws.
16. Exposed lockbolt fastener heads and wood screw heads on the face of the sign shall be dipped or painted to match the surrounding color.
17. The underground portion of each timber post shall be treated with creosote
18. Where a third governmental agency is shown as participating, its official name should be included centrally in lines 6, 7, and 8
- (R-1) 19. It will not be necessary to change DEPT. to DIV. on any existing signs.

INSTALLATION DETAIL



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

STANDARD CONSTRUCTION IDENTIFICATION SIGNS

Designed By C.L.S. Approved By
Made By J.J.B. Traffic Engineer
Checked By Date July 5, 19 68

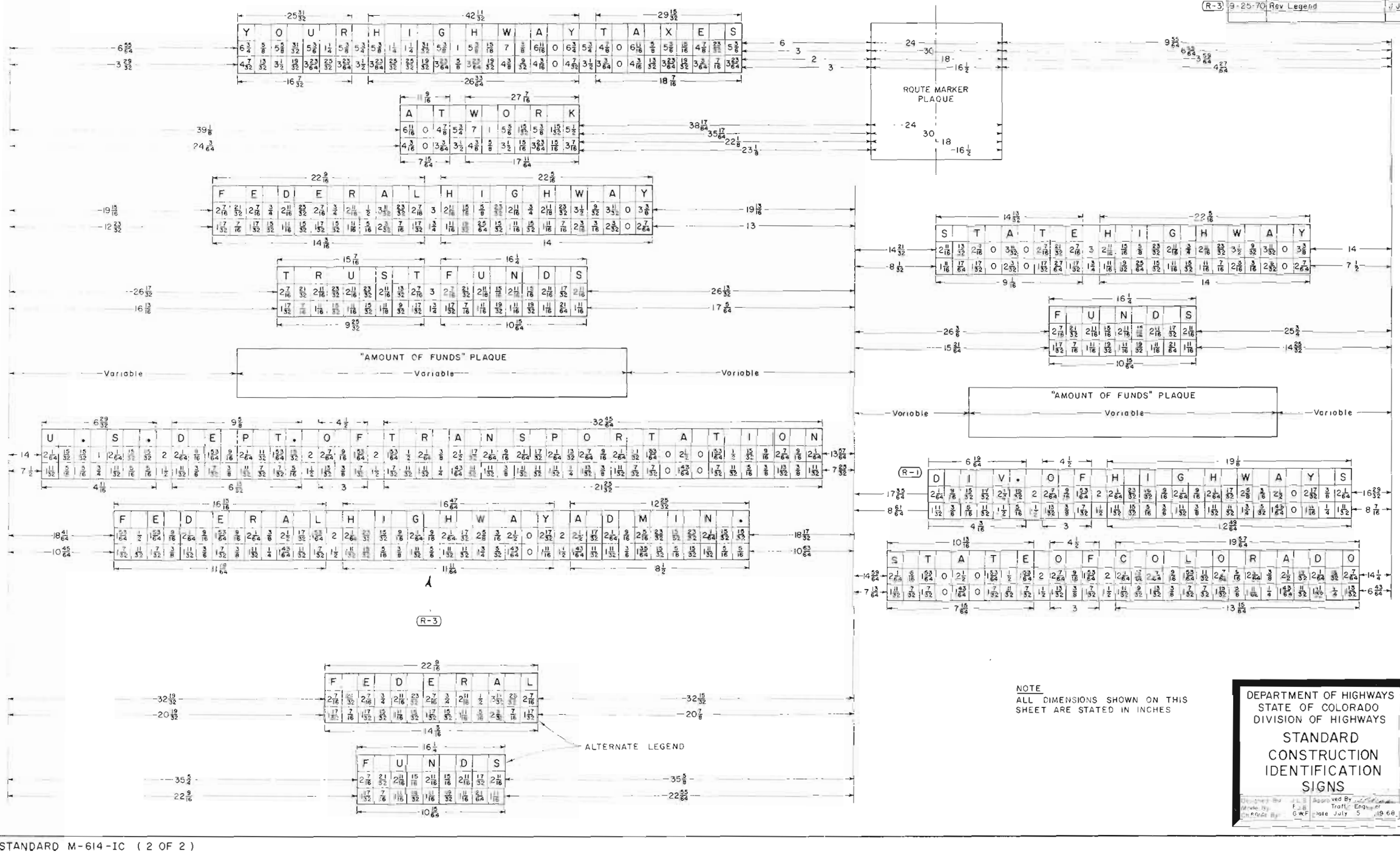
STANDARD M-614-IC

JULY 5, 1968

(SHEET 2 OF 2 SHEETS)

FEDER. ROAD PROJECT NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	[redacted]		

REVISIONS			
R-1	7-20-00	Rev. Legend	G.W.F.
R-2	5-20-69	Rev. Lateral Placement	J.J.B.
R-3	9-25-70	Rev. Legend	J.J.B.



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

STANDARD CONSTRUCTION IDENTIFICATION SIGNS

Designed By	J.J.B.	Approved By	[redacted]
Drawn By	F.J.B.	Traffic Engineer	
Checked By	G.W.F.	Date July 5	1968

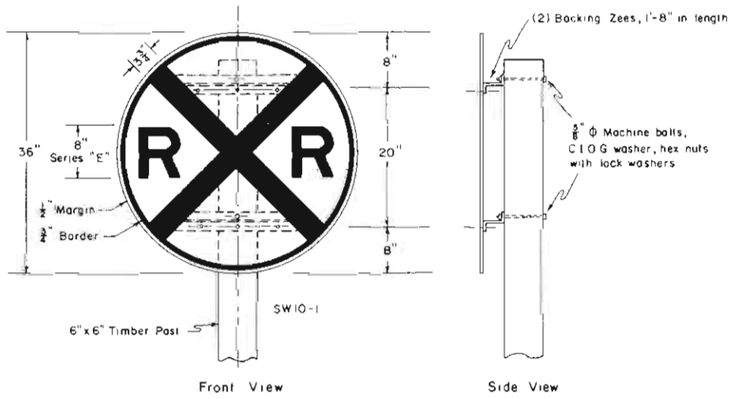
STANDARD M-614-RB

(AUGUST 22, 1968)

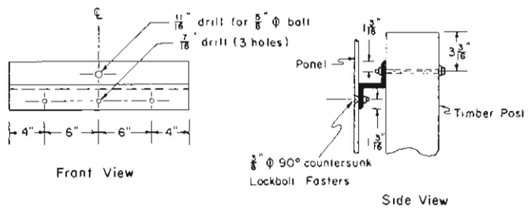
FEDERAL ROAD REGION NO.	DIVISION	PROJ NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS		

RAILROAD ADVANCE WARNING SIGN



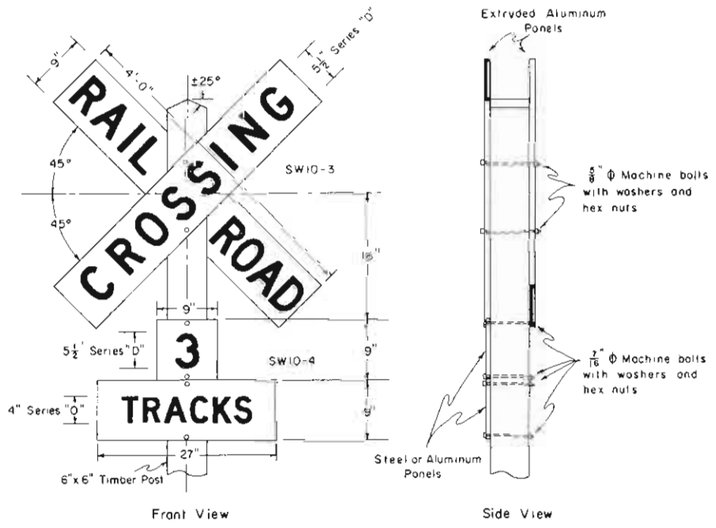
BACKING ZEE MOUNTING DETAILS



NOTES:

1. Panel to be either sheet steel 0.0598" minimum thickness or 6061-T6 sheet aluminum 0.100" minimum thickness and shall have backing zees
2. Legend and Border are black process paint on a "Highway Yellow" reflective sheeting background.
3. Backing zees are 3" x 2 3/4" x 1/4" at 6.7 lbs per ft. for steel or 2.33 lbs per ft. for 6061-T6 Aluminum

RAILROAD CROSSBUCK SIGN



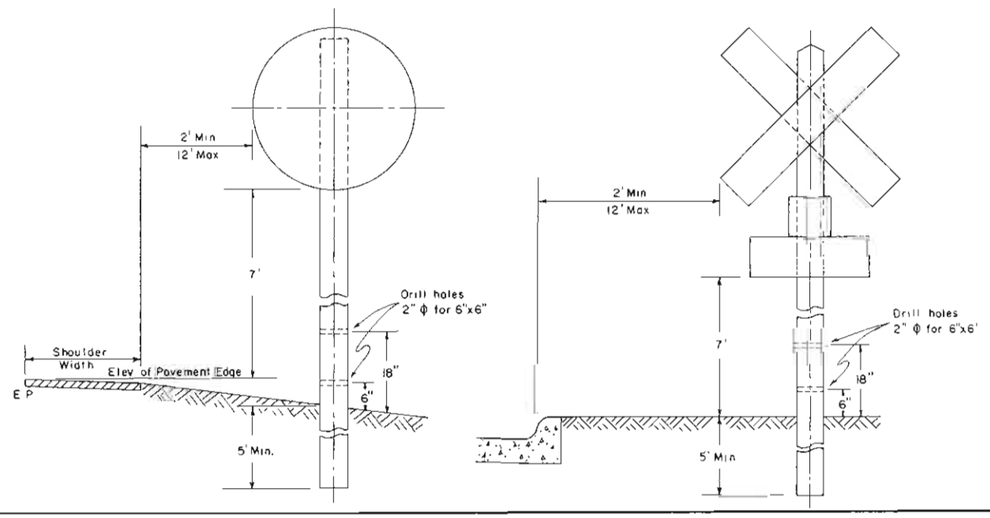
NOTES:

1. Crossbucks shall be 6063-T6 aluminum alloy with a minimum section modulus of 0.068 in.^{3} Panels shall weigh 1.194 lbs per foot
2. Track Signs shall be either sheet steel 0.0598" minimum thickness or 6061-T6 sheet aluminum 0.100" minimum thickness
3. Crossbucks and Track Signs shall have a black process paint legend on a wide angle silver reflective sheeting background
4. The distance that should be assumed to separate track before an additional crossing sign is considered necessary is 100 ft., unless local conditions require otherwise.

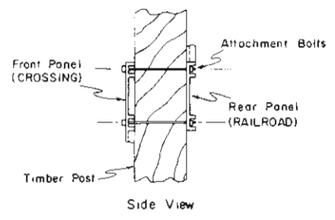
GENERAL NOTES

1. All work shall be done in accordance with the Standard Specifications applicable to the Project.
2. All Crossbuck and Advance Warning Signs shall be fabricated and installed in accordance with details as shown on this sheet and in the following publications:
   (a) "Uniform Traffic Control Devices for all Classes of Streets and Highways", Colorado Department of Highways, Planning and Research Division, 1968 (or latest revision).
   (b) "Bulletin No 6, Railroad-Highway Grade Crossing Protection", Association of American Railroads, 1966 (or latest revision)
3. Details shown on this sheet take precedence over those shown in Bulletin No 6, AAR, referred to in 2 (b) above.
4. Postings of R.R. Warning Signs are required on both sides of each roadway on divided highways.
5. On sign installations where roadway grades are not level, it may be desirable to place signs out of plumb so as to keep the angle of view close to 90°.
6. All posts shall conform to Section 614 of the Standard Specifications.
7. Posts shall be painted white to conform to Section 508 of the Standard Specifications.
8. Length of Posts shall be determined by local conditions or from a cross-section of the roadway at the sign location
9. All reflective sheeting shall be wide angle Non-Exposed Lens Type
10. Panels made from alternate materials are acceptable if approved by the Engineer prior to their use on the Project
11. The exposed bolt heads on the face of the crossbuck sign shall be dipped or painted to match the surrounding color. Exposed countersunk lockbolt heads on the face of the advance warning sign shall be covered with a patch made from the same reflective sheeting material as the background and shall be the same diameter as the bolt head.
12. 6"x6" Timber posts shall be provided with two (2) 2" diameter holes drilled through the neutral axis. One shall be 6" and one shall 18" above the ground level. The inside portion of the drilled holes shall be pointed.

TYPICAL SIGN PLACEMENT



CROSSBUCK MOUNTING DETAILS



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

STANDARD
RAILROAD WARNING
SIGNS

Designed By J.L.S	Approved By [signature]
Made By J.V.N.	Traffic Engineer
Checked By G.W.F.	Date August 22, 1968

STANDARD M-614-TB

(SHEET 1 OF 3 SHEETS)

(JULY 1, 1965)

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

REVISIONS			
R-1	7-12-67	Note 23	G.W.F.
R-2	7-8-68	Rev. Break-away, Placement,	
		Code Nos, & Dept. Name	G.W.F.
R-3	12-24-68	Rev. U.S. Shields	J.L.S.

Typical Signing Where Traffic Is Prohibited Along Construction

Typical Signing Where Traffic Is Permitted Along Construction

NOTE:

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

TOP VIEW

Sign Placement

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

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

Approved By
Traffic Engineer
Date AUGUST 9, 1965

STANDARD M-614-TB

(SHEET 2 OF 3 SHEETS)

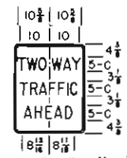
(JULY 1, 1965)

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

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

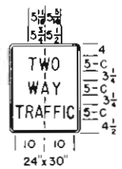
REGULATORY SIGNS

See Note No. 9



24"x30" SR6-3

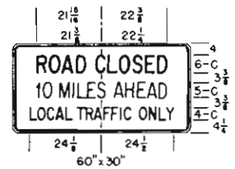
Margin $\frac{3}{8}$ Border $\frac{5}{8}$ Corner Radius $1\frac{1}{2}$



24"x30" SR6-5

48"x30" SR13-1

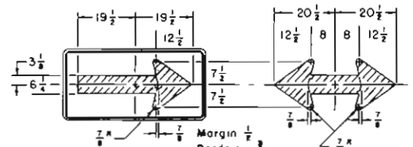
Margin $\frac{1}{2}$ Border $\frac{3}{4}$ Corner Radius $1\frac{7}{8}$



60"x30" SR13-1A

WARNING SIGNS

See Note No 10



48"x24" SW1-6

Margin $\frac{1}{4}$ Border: $\frac{3}{4}$ Corner Radius. $1\frac{7}{8}$

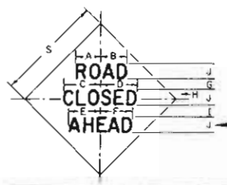
48"x24" SW1-7

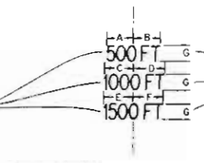
Margin. $\frac{1}{8}$ Border A Corner Radius. $1\frac{1}{2}$

	Panel	A	B	C	D	E	F	G	H	I	J
SW13-1	18"x18"	$\frac{3}{8}$	$5\frac{1}{2}$	$5\frac{3}{16}$	$2\frac{1}{2}$	8-C	2	3-E	$2\frac{3}{4}$	$\frac{3}{4}$	$5\frac{3}{16}$
XW13-1	24"x24"	$\frac{3}{8}$	$6\frac{1}{8}$	$6\frac{3}{16}$	$3\frac{1}{4}$	10-C	$2\frac{3}{4}$	4-E	4	$\frac{15}{16}$	$6\frac{7}{8}$

WARNING SIGNS

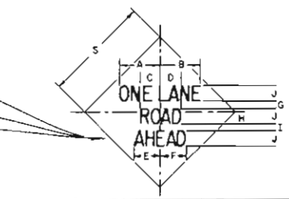
See Note No. 10



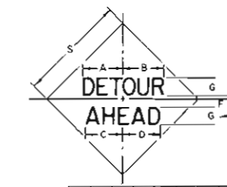


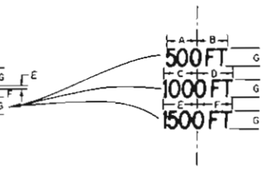
	S	A	B	C	D	E	F	G	H	I	J
SW14-3	48	$11\frac{1}{2}$	$12\frac{1}{16}$	$6\frac{3}{16}$	$16\frac{3}{16}$	$14\frac{3}{8}$	$14\frac{3}{8}$	$4\frac{3}{4}$	$4\frac{3}{16}$	$5\frac{3}{16}$	7-0
CW14-3	36	$8\frac{7}{16}$	$8\frac{3}{4}$	$11\frac{7}{16}$	$11\frac{7}{16}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$3\frac{3}{4}$	$3\frac{3}{4}$	$3\frac{3}{4}$	5-0

	S	A	B	C	D	E	F	G
SW14-3A	48	12	$12\frac{1}{16}$	$13\frac{1}{4}$	$14\frac{1}{8}$	$13\frac{1}{4}$	$13\frac{3}{8}$	7-C
SW14-4A	48	12	$12\frac{1}{16}$	$13\frac{1}{4}$	$14\frac{1}{8}$	$13\frac{1}{4}$	$13\frac{3}{8}$	7-C
CW14-3A	36	$8\frac{7}{16}$	$8\frac{3}{4}$	$9\frac{7}{8}$	$10\frac{1}{2}$	$9\frac{1}{2}$	$9\frac{3}{4}$	5-C
CW14-4A								



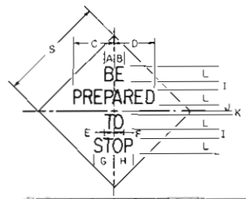
	S	A	B	C	D	E	F	G	H	I	J
SW14-4	48	$18\frac{1}{2}$	$17\frac{7}{8}$	$9\frac{3}{8}$	$9\frac{3}{8}$	$11\frac{7}{8}$	$11\frac{7}{8}$	$3\frac{1}{2}$	$5\frac{1}{4}$	$3\frac{1}{2}$	7-C
CW14-4	36	$13\frac{13}{16}$	$12\frac{1}{4}$	$6\frac{7}{16}$	$6\frac{1}{2}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{4}$	5-C



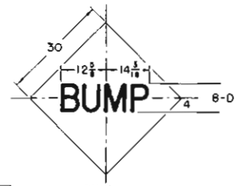


	S	A	B	C	D	E	F	G
SW14-2	48	$18\frac{3}{8}$	$18\frac{3}{16}$	$16\frac{1}{2}$	$16\frac{1}{2}$	$1\frac{1}{4}$	$3\frac{1}{4}$	8-D
CW14-2	36	$13\frac{3}{8}$	$13\frac{1}{2}$	$12\frac{3}{8}$	$12\frac{3}{8}$	$\frac{29}{32}$	$2\frac{3}{8}$	6-D

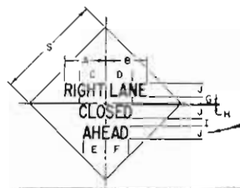
	S	A	B	C	D	E	F	G
SW14-2A	48	$13\frac{1}{2}$	$13\frac{3}{8}$	15	$16\frac{1}{16}$	$15\frac{1}{2}$	$15\frac{5}{8}$	8-C
CW14-2A	36	$10\frac{3}{8}$	$10\frac{3}{8}$	$11\frac{1}{4}$	$12\frac{1}{8}$	$11\frac{3}{8}$	$11\frac{11}{16}$	6-C

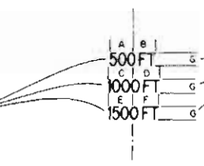


	S	A	B	C	D	E	F	G	H	I	J	K	L
SW14-78	36	$2\frac{1}{8}$	$3\frac{3}{4}$	$3\frac{1}{32}$	$3\frac{23}{64}$	$2\frac{3}{32}$	$2\frac{21}{64}$	$6\frac{23}{64}$	$6\frac{21}{64}$	3	2	1	5-C



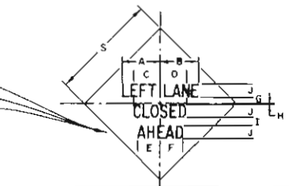
SW8-1



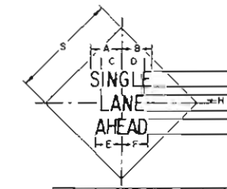


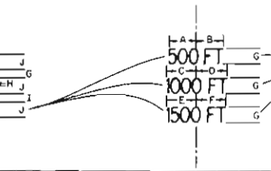
	S	A	B	C	D	E	F	G	H	I	J
SW14-6(R)	48	$18\frac{3}{8}$	$18\frac{7}{16}$	$11\frac{1}{2}$	$11\frac{1}{2}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$2\frac{7}{16}$	$3\frac{3}{8}$	6-C
CW14-6(R)	36	$13\frac{3}{4}$	$13\frac{13}{16}$	$9\frac{1}{8}$	$9\frac{1}{8}$	$8\frac{3}{8}$	$8\frac{3}{8}$	$2\frac{1}{8}$	$2\frac{1}{2}$	5-C

	S	A	B	C	D	E	F	G
SW14-6A(R)	48	$10\frac{3}{8}$	$10\frac{3}{8}$	$11\frac{1}{2}$	$12\frac{3}{16}$	$11\frac{1}{2}$	$11\frac{11}{16}$	6-C
SW14-6A(L)	48	$10\frac{3}{8}$	$10\frac{3}{8}$	$11\frac{1}{2}$	$12\frac{3}{16}$	$11\frac{1}{2}$	$11\frac{11}{16}$	6-C
CW14-6A(R)	36	$8\frac{1}{8}$	$8\frac{5}{8}$	$9\frac{1}{2}$	$10\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{1}{2}$	5-C
CW14-6A(L)								



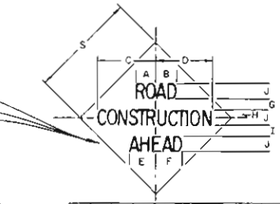
	S	A	B	C	D	E	F	G	H	I	J
SW14-6(L)	48	$17\frac{7}{8}$	$17\frac{7}{8}$	$11\frac{3}{4}$	$11\frac{3}{4}$	$10\frac{1}{2}$	$10\frac{1}{2}$	$2\frac{7}{16}$	$3\frac{5}{16}$	6-C
CW14-6(L)	36	$14\frac{1}{4}$	$14\frac{1}{4}$	$9\frac{13}{16}$	$9\frac{13}{16}$	$8\frac{7}{8}$	$8\frac{7}{8}$	$2\frac{3}{8}$	$2\frac{5}{8}$	5-C



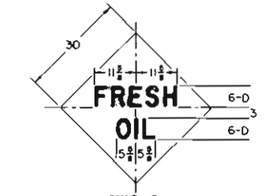


	S	A	B	C	D	E	F	G	H	I	J
SW14-5	48	$13\frac{3}{8}$	$13\frac{3}{8}$	$9\frac{7}{16}$	$10\frac{1}{16}$	$11\frac{1}{2}$	$11\frac{1}{2}$	$3\frac{11}{16}$	$3\frac{1}{2}$	$3\frac{3}{8}$	7-C
CW14-5	36	11	$10\frac{1}{4}$	8	$8\frac{1}{4}$	$10\frac{1}{8}$	$10\frac{1}{8}$	$2\frac{7}{8}$	$2\frac{1}{2}$	$2\frac{3}{8}$	5-D

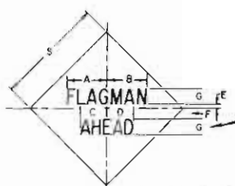
	S	A	B	C	D	E	F	G
SW14-1A	48	12	$12\frac{1}{4}$	$13\frac{1}{2}$	$14\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{5}{8}$	7-C
SW14-5A	48	12	$12\frac{1}{4}$	$13\frac{1}{2}$	$14\frac{1}{2}$	$13\frac{1}{2}$	$13\frac{5}{8}$	7-C
CW14-1A	36	$8\frac{7}{8}$	$8\frac{7}{8}$	$9\frac{1}{2}$	$10\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{1}{2}$	5-C
CW14-5A								

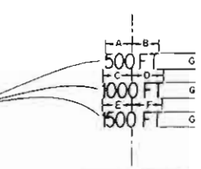


	S	A	B	C	D	E	F	G	H	I	J
SW14-1	48	9	$9\frac{1}{2}$	26	$25\frac{3}{16}$	$11\frac{7}{8}$	$11\frac{7}{8}$	$4\frac{1}{16}$	$3\frac{1}{2}$	$4\frac{1}{16}$	7-C
CW14-1	36	$6\frac{3}{4}$	$6\frac{7}{8}$	19	$18\frac{7}{8}$	$8\frac{1}{2}$	$8\frac{1}{2}$	$3\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{4}$	5-C



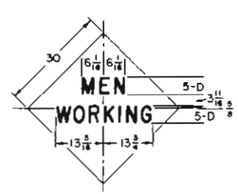
SW8-6



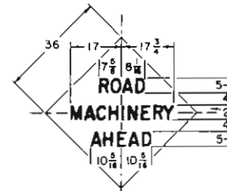


	S	A	B	C	D	E	F	G
SW14-7	48	18	18	$11\frac{7}{8}$	$11\frac{7}{8}$	$1\frac{1}{4}$	$4\frac{1}{4}$	7-C
CW14-7	36	$15\frac{3}{16}$	$15\frac{3}{16}$	$10\frac{1}{16}$	$10\frac{1}{16}$	$1\frac{1}{16}$	$4\frac{1}{16}$	6-C

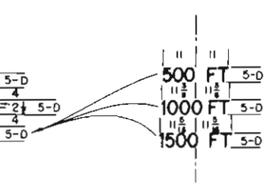
	S	A	B	C	D	E	F	G
SW14-7A	48	12	$2\frac{1}{16}$	$13\frac{1}{4}$	$14\frac{1}{8}$	$13\frac{1}{4}$	$13\frac{3}{8}$	7-C
CW14-7A	36	$10\frac{7}{16}$	$10\frac{7}{16}$	$11\frac{1}{2}$	$12\frac{3}{16}$	$11\frac{1}{2}$	$11\frac{11}{16}$	6-C



SW15-1

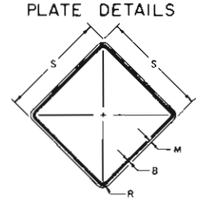


SW15-2

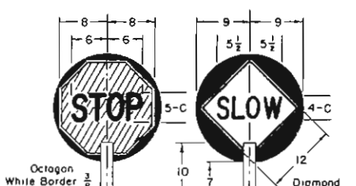


SW15-2A

PLATE DETAILS



S	M	B	R
30	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{7}{8}$
36	$\frac{5}{8}$	$\frac{7}{8}$	$2\frac{1}{4}$
48	$\frac{3}{4}$	$1\frac{1}{4}$	3



FLAGMAN SIGN

See Notes No. 20 and 22

NOTES:

SEE SHEET 1 FOR TYPICAL SIGNING AND SIGN PLACEMENT. SEE SHEET 3 FOR GENERAL NOTES APPLICABLE TO SHEETS 1 AND 2.

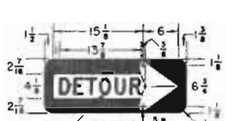
ALL DIMENSIONS THAT ARE NOT LABELED ARE IN INCHES.

GUIDE SIGNS

See Note No. 11

Margin $\frac{3}{8}$ Border $\frac{3}{8}$ Corner Radius $1\frac{1}{2}$

21"x9" SM5-6



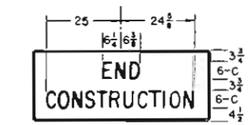
3-D Copy

24"x9" SM5-7(R) SM5-7(L)

(R-3) Reverse Dimensions for Left Designation

Margin: $\frac{1}{2}$ Border $\frac{3}{4}$ Corner Radius $1\frac{7}{8}$

60"x36" SD5-2

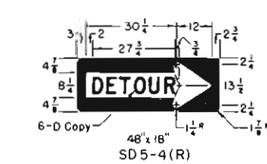


60"x24" SD5-3

Margin $\frac{3}{8}$ Border $\frac{5}{8}$ Corner Radius $1\frac{1}{2}$

42"x18" SD5-3A

Margin $\frac{3}{8}$ Border $\frac{5}{8}$ Corner Radius $1\frac{1}{2}$



6-D Copy

48"x18" SD5-4(R) SD5-4(L)

(R-3) Reverse Dimensions for Left Designation

(R-2)

Margin: $\frac{3}{8}$ Border $\frac{5}{8}$ Corner Radius $1\frac{1}{2}$

36"x24" SD5-5

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
DIVISION OF HIGHWAYS

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

Designed By D.R.W.
Made By H.B.D.
Checked By J.B.

Approved By _____ Traffic Engineer
Date AUGUST 9, 1965

FEDERAL ROAD REGION NO	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	[redacted]	

REVISIONS			
	7-12-67	Added Note 23	G.W.F.
R-2	7-5-68	Rev. Note 23 & Dept. Name - Deleted Note	G.W.F.
R-3	12-24-68	Rev. Note No. 18	J.L.S.

STANDARD M-614-TB

(SHEET 3 OF 3 SHEETS)

(JULY 1, 1965)

GENERAL NOTES

1. All work shall be done in accordance with: (a) the Standard Specifications applicable to the Project, and (b) the "Manual on Uniform Traffic Control Devices for all Classes of Streets and Highways" published by the Department of Highways.

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, 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 is prohibited from the Project the Detour will be marked by the Department except that the Contractor shall provide, erect and maintain Barricades, complete, (when required) at the ends of the Project, ends of the Detour and connecting roads. All U.S. or State Route Markers required for the Project will be furnished and installed by the Department. The location and positioning of Warning Signs, Barricades, and Regulatory Signs shall be as recommended by the appropriate District Engineering Forces of the Department.

4. Work on the Project shall not be started until all required signs are in place and approved by the Engineer. Where speed control appears necessary such speed control shall be requested from the Engineer by the Contractor. Control of speed through a construction zone may be achieved by Advisory Speed plates in conjunction with Warning Signs (SW13-1 for use with 30" Warning Signs and XW13-1 for use with 36" and 48" Warning Signs). The Advisory Speed plate is to be posted only at those locations where the safe speed is lower than the imposed Regulatory speed limit.

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

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.

7. Examples for marking Projects, as shown on Sheet 1, are typical of signs required and are subject to alteration to fit actual conditions encountered in the field. Locations for control devices are to be staked by the Engineer. In all cases Warning signs are to be placed well in advance of the hazard, the distance depending on topography and existing approach speeds. Additional markings and any special signs required for the guidance and protection of traffic will be placed as required on the Project at the Contractor's expense.

8. Desirable sizes for signs are shown on Sheet 1 of this Standard. Larger or smaller signs shall be used where warranted. Detailed dimensions for signs normally used in connection with construction are shown on Sheet 2 of this Standard. For information on standard roadway signs not detailed on this Standard see the "Manual on Uniform Traffic Control Devices for all Classes of Streets and Highways" published by the Department of Highways.

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

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" or "M" in the sign code are Guide signs. Those with the prefix "D" convey general information and those with the prefix "M" are used for marking the traffic route. (R-1) (R-2)

12. All signs shall be reflectorized unless otherwise specified on plans. Regulatory and Guide signs (unless otherwise specified) shall have a screen processed black legend and border on a white flexible reflective sheeting, non-exposed lens background. The back side of Regulatory and Guide signs shall be painted with two coats of "Exterior Sign White Paint." Warning signs shall have a screen processed black legend and border on a highway yellow flexible reflective sheeting, non-exposed lens background. The back side of Warning signs shall be painted with two coats of "Federal Yellow Synthetic Sign Enamel."

13. Painting for wood surfaces shall conform with Section 508 of the Standard Specifications.

14. Posts for regulatory, warning, and guide signs will normally be 4" x 4" or 6" x 6" and shall conform to the Standard Specifications for Untreated Timber-S4S. Timber shall conform to Construction grade Paragraph 1238 or 1258 of Standard No. 15 Grading & Dressing Rules for West Coast Douglas Fir (1956) or Dense Structural 58 and LL Structural 58 Paragraph 284 or 285 of 1956 Grading Rules for Southern Pine. Posts shall be painted with one coat of "White Wood Primer" and one coat of "Outside White Paint."

15. 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.

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

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

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

19. Barricades, Flashing Beacons and Flashers - Refer to appropriate "M" Standard (Timber Barricades) for details.

20. Flagman Sign - This sign shall have a black painted background on both sides to form a contrast for the octagonal Stop sign and the diamond Warning sign. The "STOP" sign shall be fabricated by reverse screen process using transparent red paint on smooth surface silver reflective sheeting. The "SLOW" side of the Flagman Sign shall be black process paint on smooth surface yellow reflective sheeting. Handle to be grooved on one side to indicate reading of sign to Flagman.

21. Sign "A": This is the first advance warning sign and shall be placed 1,500 feet ahead of Barricade or project terminal. Postings are required on both sides of the roadway on divided highways. Dual posting is required where warranted on two-lane, two-way highways.
Sign "B": This is the second advance warning sign and shall be placed 1,000 feet ahead of barricade or project terminal. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways.
Sign "C": This is the third advance warning sign in cases where barricades are used and shall be placed 500 to 750 feet ahead of barricade or potentially hazardous condition. Postings are required on both sides of the roadway on divided highways and singly on two-lane, two-way highways.
Sign "D": SD5-2 - This sign shall be placed to mark the beginning of a Project of more than 2 miles in extent, where traffic is maintained through the project. It shall be placed singly and near the beginning of construction.
Sign "E": SD5-3 - This sign shall be placed to mark the end of the Project. It shall be placed singly and may be placed opposite barricade if desirable.
Sign "F": Construction identification signs shall be furnished and installed by the Department on all Federal-Aid and Forest Highway Projects where actual construction is in progress and visible to highway users. These signs should be located so as not to obscure or detract from the effectiveness of other official signs. Where two or more projects are contiguous the appropriate data may be included in one set of signs. Refer to appropriate "M" Standard (Identification Signs) for sign details.
Signs A through F shall be furnished, installed and maintained by the Department.

22. When Flags are used in lieu of the Flagman Sign, they shall be a minimum of 18"x18", made of a good grade of bright red material, and fastened securely to a staff of approximately 3 foot length. The free edge should be weighted to insure that the flag will hang vertically, even in heavy winds.

23. (R-1) (R-2) Each 6"x6" timber sign post shall be provided with two 2" diameter holes through the neutral axis normal to the roadway, one hole at 6" and one hole at 18" above the ground level. The 4"x4" timber posts shall not be provided with any type of break-away device. The inside portion of each 2" diameter hole shall be painted white. The underground portion of each timber post shall be treated with creosote.

(R-2)

(R-2)

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

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