Rev. 10-6-65, M.E.V., Added Work Order No. 6603
Rev. 11-12-65, M.E.V., Index, Tabulation and Standards for Work Order No. 544
(R-3) Added Sheet 21A - 3-16-66, CEM

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	ER-15(1) First Contract	1

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

PLAN AND PROFILE OF PROPOSED

FEDERAL AID PROJECT NO. ER-15 (1) First Contract

STATE HIGHWAY NO. 1

DOUGLAS, COUNTY

CONVENTIONAL SIGNS

PLAN SHEET / TITLE SHEET

- CENTER LINE (BEGIN PROJ. / END PROJ.)
- COUNTY LINE
- TOWNSHIP OR RANGE LINE
- LAND LINES (SECTION LINE / ¼ SECTION LINE / ⅛ SECTION LINE)
- CITY LIMITS
- RAILROAD (PLAN SHEET / TITLE SHEET)
- BARBED WIRE FENCE
- WOVEN WIRE - COMBINATION FENCE
- TELE & TELEG LINE
- POWER LINE
- PRESENT ROAD (PLAN SHEETS)
- RIGHT OF WAY LINE (ROW MARKER)
- ACCESS POINTS (FREEWAYS)
- C OF A LINE (CONTROL OF ACCESS) (24' OP. / OP. OPENING / 16' OP.)
- ACCESS DENIED BY DEED
- TOP OF CUTS
- TOE OF FILLS
- DETOUR

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

INDEX OF SHEETS

"M" STANDARDS

TABULATION OF LENGTH AND DESIGN DATA

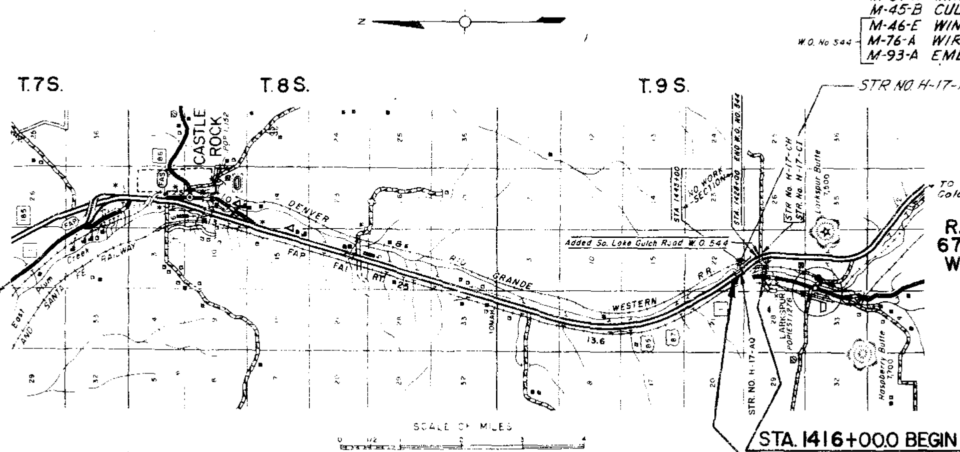
STATION *	WORK SECTION RDWY. LIN. FT.	BRIDGE LIN. FT.	BRIDGE LOADING	NO-WORK SECTION LIN. FT.
W.O. No. 544: 1416+00.0 BEGIN ER 15(1) FIRST CONTRACT = 1416+00.0 on FI 002-2(31)			HS-20-44	
	1200.0			
1428+00.0				
				307.8
1431+07.8 Bk / 1435+39.8 Ah } EQUA				
				760.2
1443+00				
	398.5			
1446+98.5 BRIDGE S.B. (STR. NO. H-17-AQ) 1448+21.9		123.4		
	278.1			
1451+00.0 END ER 15(1) FIRST CONTRACT = 1451+00.0 on FI 002-2(31)				
TOTAL	1876.6	123.4		1068.0

SUMMARY	LIN. FT.	MILES
ROADWAY (48' Divided)	1876.6	0.355
BRIDGE	123.4	0.024
TOTAL (NET LENGTH)	2000.0	0.379
NO WORK SECTION	1068.0	0.202
TOTAL (GROSS LENGTH)	3068.0	0.581

DESIGN DATA

Maximum Degree of Curve	2°00'
Maximum Grade	3.393%
Minimum S.S.D. - Horizontal	1260'
Minimum S.S.D. - Vertical	670'
Maximum Design Speed	70 MPH

* All Stations shown are on Southbound Lane



STA. 1416+00.0 BEGIN ER 15(1) First Contract = 1416+00.0 on F.I. 002-2(31) Begin W.O. No. 544

STA. 1451+00.0 END ER 15(1) First Contract = 1451+00.0 on F.I. 002-2(31)

SEE SPECIAL PROVISIONS FOR NOTICE TO BIDDERS

INAC 8/22/66

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

APPROVED: Chas. E. Shumate, CHIEF ENGINEER — DATE 7-19-65
By: J.K. Martin, Ass't. Chief Engr.

DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

APPROVED: ________ DATE ________

DIVISION ENGINEER

M.E.V.

FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	ER-15(1)	2	

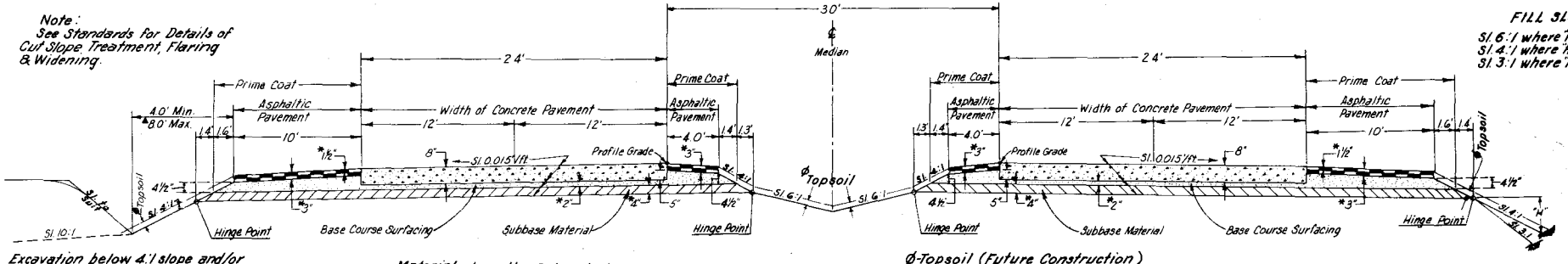
FIRST CONTRACT

TYPICAL CROSS SECTIONS

MAIN ROADWAY

NOTE: This lane only to be constructed this Project.

Note:
See Standards for Details of Cut Slope Treatment, Flaring & Widening.



FILL SLOPES:
Sl. 6:1 where "H" is 4' or less.
Sl. 4:1 where "H" is 4+ to 10'
Sl. 3:1 where "H" is over 10'

Ø-Topsoil (Future Construction)

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

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

*-Approximate thickness.

▲-Dimension used for original Quantities.

Material above the Subgrade is to be constructed of Subbase Material at locations designated in Subbase Material Tabulation. Estimated quantities involved in this operation and thickness of material required are tabulated in the Subbase Material Plan.

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

	MAIN RDWY.	RAMP
1½" Asphaltic Pavement - Tons	13	20
Base Course Surfacing - Tons	75	52

CONCRETE PAVEMENT

STATION TO STATION	SQ. YDS.
1443+ - 1446+69.8	987
1448+50.6 - 1451+	665
TOTAL	1652

The source of Subbase and Surfacing Materials for this Project is undesignated. Estimated quantities involved are shown below. Alteration of the Subbase and Surfacing Plan as here outlined will be allowed only on written permission from the Department.

SUBBASE AND SURFACING PLAN

STATION TO STATION	SUBBASE		SURFACING		
	THICKNESS INCHES	TONS	TONS		
			BASE COURSE	PLANT MIX TOP LAYER	PLANT MIX BOTTOM LAYER
1443+00 - 1446+69.8	4	352	278	48	48
1448+50.6 - 1451+00	4	237	187	33	33
TOTALS		589	465	81	81

GENERAL NOTES

This project is to be constructed in conformity with the Standard Specifications of the Colorado Department of Highways, adopted January 1, 1958.

All quantities on preliminary plans are to be considered approximate only.

Thickness of Subbase, Surfacing and Asphaltic Pavement as shown on plans, is approximate only. These materials are to be placed on the basis of tonnage shown on plans.

For preliminary plan quantities of Asphaltic Road Materials the following rates of application were used:

PRIME COAT MC @ 0.40 Gals. per Sq. Yd.

Rate of application and grade of Asphaltic Material shall be as determined by the Engineer at time of application.

Application methods for Liquid Asphaltic Road Material, which result in the discoloration of Concrete Pavement, Curbs or Gutters or Concrete Structures, will not be permitted.

Delineators to be placed as staked by the Engineer.

SUMMARY OF EARTHWORK QUANTITIES

UNCLASSIFIED EXCAVATION	
FROM STRUCTURE QUANTITIES AS EMBANKMENT	20,000 CU. YDS.
COMPACTION	22,000 CU. YDS.

STRUCTURE QUANTITIES

STATION	ITEM
1447+	BRIDGE QUANTITIES IN SUMMARY 191 SQ. YDS - CONCRETE PAVEMENT (10" TH.) 8786 LBS. - REINFORCING STEEL 116 LIN. FT. - CONCRETE COMBINATION CURB AND GUTTER (VARIABLE) 75 LIN. FT. - METAL PLATE GUARD FENCE
1443+ TO 1451+	20,000 CU. YDS. - EMBANKMENT (EXCAVATION)
1443+ TO 1446+	987 SQ. YDS. - REMOVING CONCRETE PAVEMENT
1448+ TO 1451+	665 SQ. YDS. - REMOVING CONCRETE PAVEMENT

SUMMARY OF APPROXIMATE QUANTITIES

Rev. 10-6-65, M.E.V., Added Work Order No. 6603
② Rev. 11-12-65 M.E.V., Added Work Order No. 544

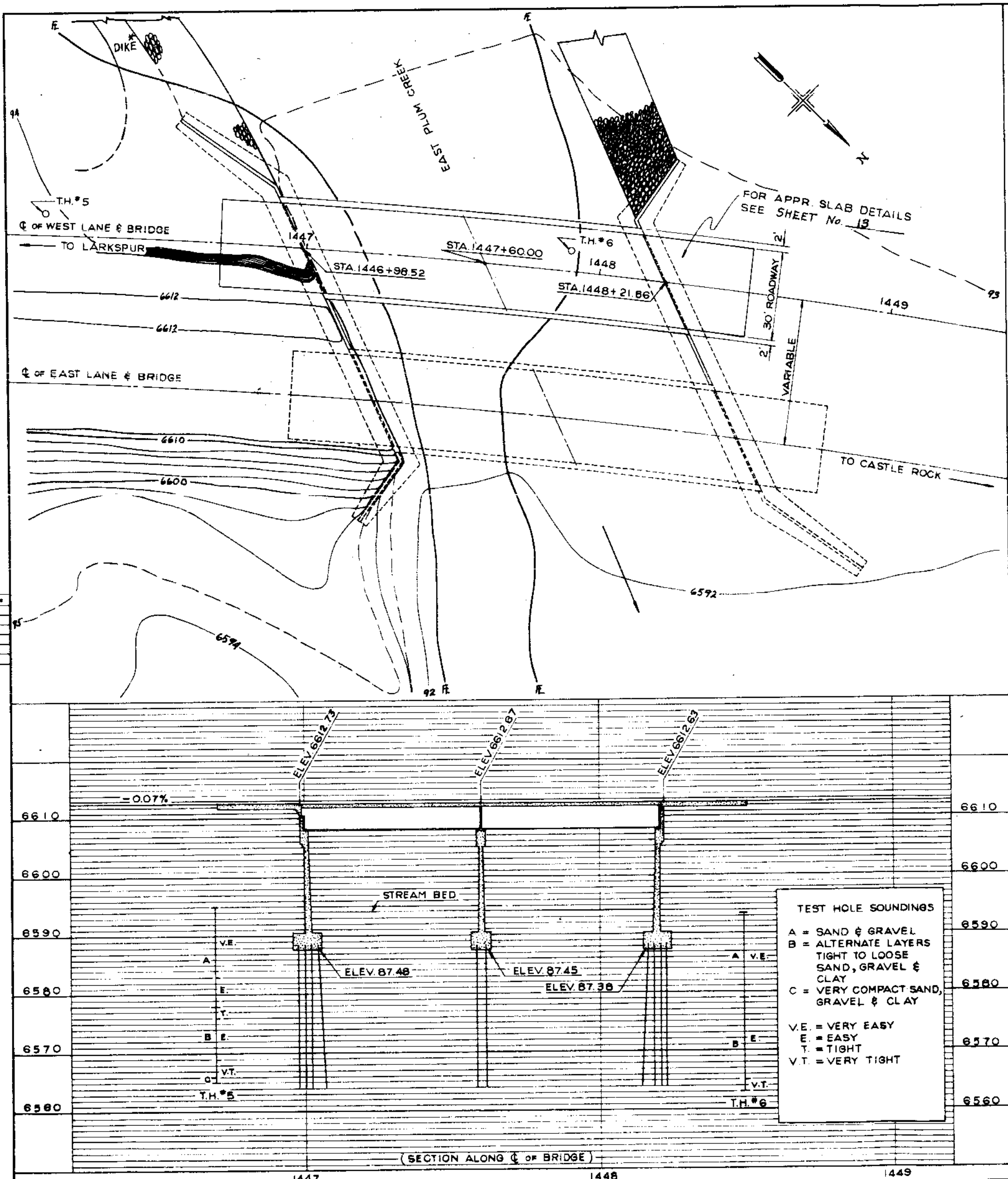
FEDERAL ROAD REGION NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	ER-15 (1) FIRST CONTRACT	3	

	SPECIFICATION ITEM NO.	ITEM	UNIT	ROADWAY 24 FT.	BRIDGE STA. 14474 STR. NO. H-17-AQ	PROJECT TOTALS △	ER-15(1) 1st Contract W.O. No. 6603	ER 15 (1) 1st Contract W.O. No. 544 ②
	4	Flagging	Hour	50		50		
	11	Removing Concrete Pavement	Sq. Yd	1,660		1,660		
②	11	Clean Culverts	Each					6
	11	Removal of Portions of Bridge	Lump Sum		•	•		
	13	Unclassified Excavation (Embankment)	Cu. Yd	20,000		20,000	10,000	
	14	Unclassified Structural Excavation - Miscellaneous	Cu. Yd.		270	270		
	14	Unclassified Structural Excavation - Bridges	Cu. Yd.		382	382	100	
	16	Structure Backfill (Class X)	Cu. Yd.		250	250	100	
	17	Compaction (Modified)	Cu. Yd.	22,000		22,000		
	17	Wetting	M Gal.	570		570		
	23	Sub-Base Material (Class 1)	Ton	600		600		
	26	Gravel or Crushed Rock Surfacing (Grading C)	Ton	500		500		900
	30	Asphaltic Road Material MC (Prime)	Gal.	400		400	1,300	500
②	32	Asphaltic Materials - Miscellaneous	Ton					70
	32	Plant Mixed Asphaltic Surfacing	Ton	170		170	600	500
	37	Concrete Pavement (8" thick)	Sq. Yd.	1,660		1,660		
	37	Concrete Pavement (10" thick)	Sq. Yd.	191		191		
	46	Prestressed Concrete Beams (55 ft. to 59 ft. - 11 in)	Each		10	10		
	46	Class "A" Concrete	Cu. Yd.		408	408	300	78
	47	Reinforcing Steel	LB.	8,800	45,600	54,400	27,600	440
	48	Structural Steel	LB.		1600	1600	78,200	
	48	Structural Steel (Galvanized)	LB.		11,800	11,800		
	53	18" Corrugated Metal Culvert Pipe	Lin. Ft.		4	4		
	53	84" Corrugated Metal Culvert Pipe	Lin. Ft.				140	
	60	Treated Timber Piling	Lin. Ft.		2808	2808	2,700	
	67	Heavy Riprap	Cu. Yd.		1,130	1,130	500	
②	65	Concrete Slope and Ditch Paving (Wire Mesh)	Cu. Yd.					100
	75	Metal Plate Guard Fence (Beam Type)	Lin. Ft.	75		75		
	79	Bridge Expansion Joint Sealer	Lin. Ft.		40	40		
	84	Concrete Combination Curb and Gutter (Variable)	Lin. Ft.	116		116		
	89	Drain Pipe (4" X 1'-6")	Each		4	4	4	
	192	Delineators (Type I)	Each	10		10		
	192	Delineators (Type III)	Each	2		2		
②		FORCE ACCOUNT Work Order No. 544 - (See Sheet No. 27 for Description)	Lump Sum					•
		STATE FORCES						
		* Signing and Striping Entire Project	Lump Sum			•		
		Identification Signs	Each	2		2		
②		* Remove and Reset Signs and Delineators	Lump Sum					•

△ Totals do not include Work Orders
* Non Federal Aid

REVISIONS

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	4	



GENERAL LAYOUT

ITEM	DESCRIPTION	UNIT	SUPER-STRUCTURE	ABUT. No. 1	PIER No. 2	ABUT. No. 3	CHANNEL IMP.	TOTAL
11	REMOVAL OF PORTIONS OF BRIDGE	L.S.						L.S.
14	UNCL. STRUCT. EXCAV. (BRIDGE)	CU. YD.			110	272		382
16	STRUCTURE BACKFILL (CLASS "X")	CU. YD.			60	190		250
46	PRESTRESSED CONCRETE BEAMS (58'-9¾")	EA.	10					10
46	CLASS "A" CONCRETE	CU. YD.	124	1	94	189		408
47	REINFORCING STEEL	LB.	30,065	52	3,328	12,114		45,559
48	STRUCTURAL STEEL	LB.		400	800	400		1600
48	STRUCTURAL STEEL (GALV.)	LB.	11,797					11,797
③ 53	18" CORRUGATED METAL CULVERT PIPE	LIN. FT.				4		4
② 60	TREATED TIMBER PILING	LIN. FT.			624	2,184		2,808
67	HEAVY RIP-RAP (2'-3" THICK)	CU. YD.					1,130	1,130
79	EXP'N JT. SEALER (2"x2" MIN.)	LIN. FT.	39					39
①	EXP'N JT. MAT'L TYPE I	SQ. FT.		39		39		78
①	EXP'N JT. MAT'L TYPE III	SQ. FT.		12		78		90
89	DRAIN PIPE (4"Ø x 1'-6" Conc. Floor)	EA.	4					4
14	UNCL. STRUCT. EXCAV. - MISCELLANEOUS	CU. YD.					263	263

① TO BE INCLUDED IN BID PRICE FOR ITEM 46.

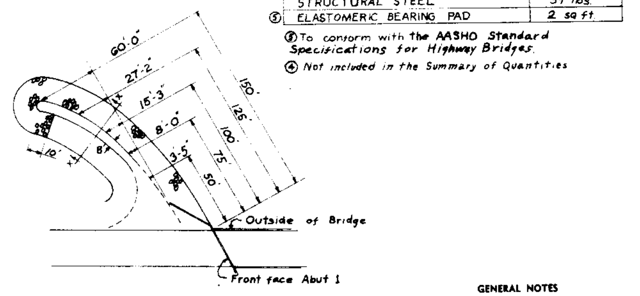
② Not to be Ordered until it is determined that the Piling in place cannot be Incorporated into new Constr.

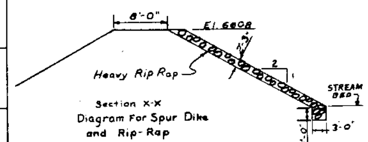
③ H = 1 foot

④ Quantities For One Girder	10 Req'd
CLASS "P" CONCRETE	9.1 cu. yds.
REINFORCING STEEL	759 lbs.
STRUCTURAL STEEL	39 lbs.
⑤ ELASTOMERIC BEARING PAD	2 sq. ft.

⑤ To conform with the AASHO Standard Specifications for Highway Bridges.

④ Not included in the Summary of Quantities.





Section X-X
Diagram For Spur Dike and Rip-Rap

*DETAILS of SPUR DIKE

GENERAL NOTES

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

ALL CONCRETE SHALL BE CLASS "A".

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE BAR DESIGNATION AND STATION NUMBER OF THE PROJECT.

IF BY PERMISSION OF THE ENGINEER PRIMARY BARS ARE SPLICED, THEY SHALL LAP A MINIMUM OF 28 DIAMETERS FOR BARS NEAR TOPS OF BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS, AND 17 DIAMETERS FOR BARS NEAR BOTTOM OF MEMBERS. SECONDARY BARS WHEN SPLICED SHALL LAP 17 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.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT IN DEPTH SHALL BE DONE BY HAND-LABOR METHODS.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURE BACKFILL, SEE STANDARD M-16-A

ALL CONCRETE SURFACES MARKED WITH THE SYMBOL / AS SHOWN ON SHEET NO. 16 SHALL RECEIVE CLASS "1" SURFACE FINISH.

ALL STRUCTURAL STEEL SHALL BE PAINTED IN ACCORDANCE WITH ITEM 88

ALL RIVETS SHALL BE ¾ INCH DIAMETER UNLESS OTHERWISE NOTED.

HIGH TENSILE BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTORS OPTION. BOLTS SHALL BE FURNISHED IN THE AMOUNT OF FIVE 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.

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

WHEN CALLED FOR IN THE SPECIAL PROVISIONS, SHOP WELDS SHALL BE INSPECTED RADIOGRAPHICALLY AND BY THE PENETRANT DYE METHOD.

WHEN TREATED TIMBER PILING IS SHOWN ON THE PLANS, THE PRESERVATIVE FOR TREATMENT SHALL BE CREOSOTE OIL.

ALL STRUCTURAL STEEL OTHERWISE NOTED SHALL BE A.S.T.M. A36-63T.

ALL CONCRETE CHAMFERS TO BE ¾" UNLESS OTHERWISE NOTED.

LOADING DATA

LIVE LOAD — A.A.S.H.O. HS 20-44

DEAD LOAD ASSUMES 15 LBS. PER SQ. FT. ADDITIONAL WEARING SURFACE WHICH INCLUDES THE ½ INCH CONCRETE MONOLITHIC WEARING SURFACE SHOWN.

DESIGNING DATA

A.A.S.H.O. UNIT STRESSES, EXCEPT AS NOTED.

A36 Struct. ₵ A7

Reinforcing Steel fs = 20000 lbs. per sq. in.

Structural Steel fs = 18000 lbs. per sq. in.

Concrete fc = 1200 lbs. per sq. in.

n = 10

STRUCTURE NO. H-17-AQ (S. BND.)

COLORADO DEPARTMENT OF HIGHWAYS

Across EAST PLUM CREEK

Sta. 1446+98.52 to 1448+21.86

Near LARKSPUR Sec. 22 T. 9 S. R. 67 W

Designed by
Made by
Checked by

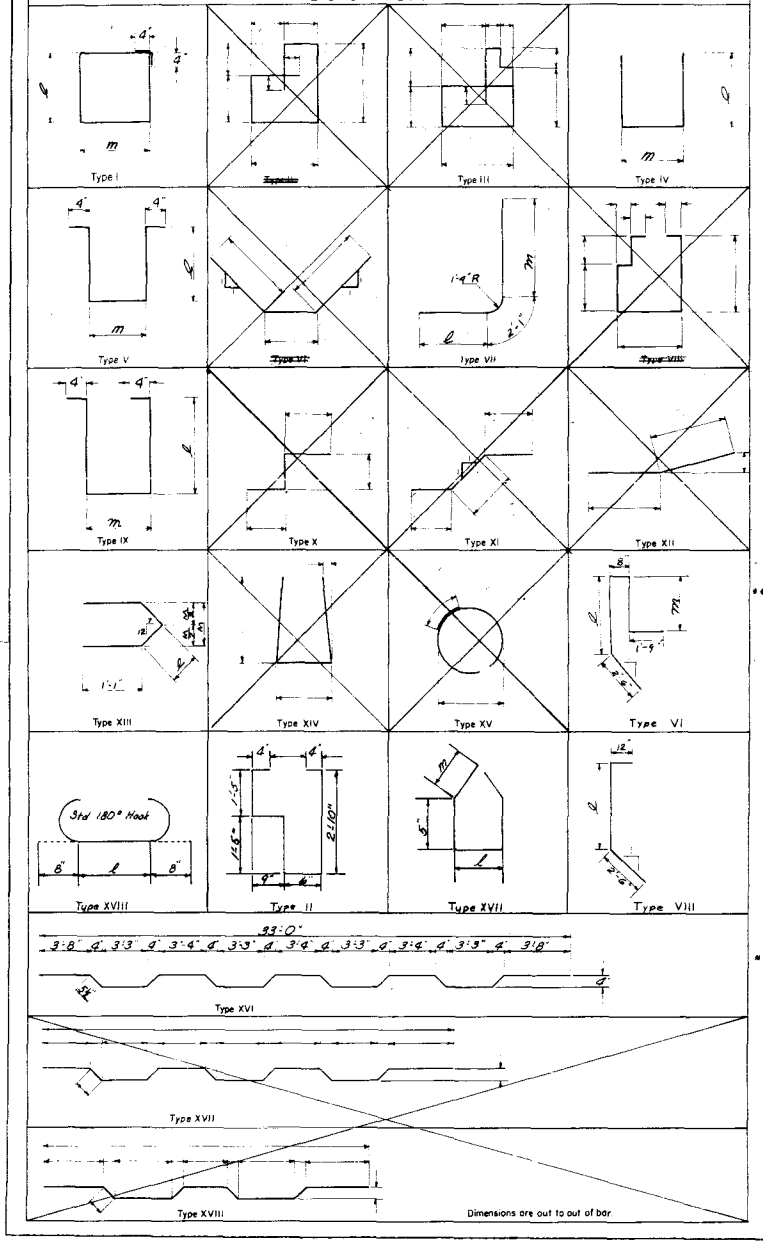
Approved by [signature]
Bridge Engineer
Date: July 12, 1965

REVISIONS

5

TRACING PLAIN

BENDING DIAGRAMS



Bar List Superstructure

Mark	Size	No Reqd	Length	Type	Dimension ℓ	Dimension m
A101	#2	248	9'-2"	IV	1'-3"	1'-8"
A102	"	72	5'-2"	I	1'-3"	1'-0"
A103	"	28	7'-7"	II		
A104	"	56	6'-10"	IX	2'-10"	6"
A105	#4	140	6'-10"	V	2'-10"	0'-6"
S101	#8	204	33'-6"	Str.		
S102	#8	102	34'-0"	XVI		
S103			31'-10"			
to	#8	4 ea.	by 8#8's to	Str.		
S137			7'-9#4"			
S138			32'-9#8"			
to	#8	4 ea.	by 8#8's to	Str.		
S172			8'-8"			
S173	#8	312	31'-0"	Str.		
S174	#8	32	11'-0"	Str.		
S175	#8	3	33'-2"	Str.		
T101	#6	32	6'-7"	Str.		
T102	#6	32	7'-6"	Str.		

Summary

2957 Lin.Ft. #4 @ 0.668 PLF = 1975 lb
26049 Lin.Ft. #8 @ 1.043 PLF = 27169 lb
951 Lin.Ft. #6 @ 2.044 PLF = 921 lb
Total = 30,065 lb

One Prestressed Beam (10 reqd)

**	A110	#4	44	9'-1"	V	4'-0½"	4"
	A111	#4	4	9'-10"	V	4'-0½"	1'-1"
	A112	#4	44	3'-3"	XVII	1'-1"	8"
	A113	#4	48	4'-5"	XVII	1'-1"	1'-0"
	S180	#8	2	40'-0"	Str.		
	G100	#6	10	2'-5"	XVIII	1'-1"	
	G101	#6	10	4'-6"	XVIII	3'-2"	

Summary

794 Lin.Ft. #4 @ 0.668 PLF = 530 lb.
120 Lin.Ft. #8 @ 1.043 PLF = 126 lb.
69 Lin.Ft. #6 @ 1.502 PLF = 104 lb.
Total = 759 lb.

** Note
If Girders are Pretensioned, Add: G110 Bars to replace G100 and G101 Bars
** 36 Lin.Ft. #4 @ 0.668 PLF = 24 lb

Bar List Pier No. 2

Mark	Size	No Reqd	Length	Type	Dimension ℓ	Dimension m
P57	#4	39	11'-0"	I	2'-3"	2'-11"
P58	#4	24	38'-9"	Str.		
P59			9'-0"		11"	1'-7"
to	#4	9 ea.	by 1#8's to	XIII	by 8#8's to	by 1#8
P64			9'-5 3/4"		1'-7 3/8"	2'-0"
P65	#4	5	96'-6"	Str.		
S17	#8	6	39'-6"	Str.		
S18	#8	80	17'-6"	Str.		
S19	#8	87	5'-6"	Str.		

Summary

1678 Lin.Ft. #4 @ 0.668 PLF = 1121 lb.
2116 Lin.Ft. #8 @ 1.043 PLF = 2207 lb.
Total = 3328 lb.

Bar List Abut No. 3

Mark	Size	No Reqd	Length	Type	Dimension ℓ	Dimension m
A01	#4	42	6'-9"	Str.		
A02	#4	22	40'-0"	Str.	Field Bend	
A03	#4	10	30'-0"	Str.		
A04			13'-0"			
to	#4	2 ea.	by 1'-6 to	Str.	Field Bend	
A08			19'-0"			
A09	#4	4	5'-6"	Str.		
A18		32	28'-6"	Str.	Field Bend	
A19		7	14'-0"	VI	5'-9"	3'-10"
A20		9	14'-2"		5'-5"	3'-10"
A21		8	14'-4"		5'-7"	3'-10"
A22		9	14'-6"		5'-9"	3'-10"
A23		6	14'-8"	VI	5'-11"	3'-10"
A24		12	10'-8"	VIII	7'-2"	
A25		5	11'-4"	VIII	7'-10"	
A26		11	40'-0"	Str.		
A27		6	5'-3"			
A28		2	4'-2"			
A29		5	11'-6"			
A30		2	10'-6"			
A35	#4	11	23'-8"	Str.		
A36			23'-2"			
to	#4	1 ea.	by 2'-6" to	Str.		
A05			2'-2"			
A74	#4	6	9'-9"	Str.		
S01	#8	4	3'-8"	Str.		
S02		6	6'-9"	Str.		
S03		4	5'-1"	Str.		
S04		5	9'-6"	Str.		
S06		11	11'-0"	Str.		
S07		2	19'-11"	VII	15'-3"	2'-7"
S08		3	18'-8"	VII	14'-0"	2'-5"
S09		9	16'-8"	VII	12'-8"	1'-11"
S10	#8	6	7'-2"	VII	4'-2"	0'-11"
G01	#6	55	6'-9"	Str.		
G02		8	9'-4"	Str.		
G03		3	9'-0"	Str.		
G04		2	22'-6"	VII	17'-9"	3'-1"
G07		3	21'-0"	VII	16'-1"	2'-10"
G08	#6	5	9'-1"	VII	5'-9"	1'-8"
T01	#8	91	5'-8"	Str.		
T02		9	5'-2"	Str.		
T03		50	23'-6"	VII	17'-0"	4'-5"
T04		2	15'-8"	VII	10'-0"	3'-7"
T05		3	14'-4"	VII	9'-0"	3'-3"
T06	#8	5	10'-4"	VII	6'-2"	2'-1"
B01	#4	5	6'-6"	Str.		
B02		50	16'-6"	VII	11'-4"	3'-1"
B03		99	10'-3"		6'-5"	1'-9"
B04		2	18'-2"		12'-0"	4'-1"
B05		3	17'-1"		11'-2"	3'-10"
B06	#4	5	11'-7"	VII	6'-10"	2'-8"
P01	#8	1	18'-5"	VII	12'-0"	4'-6"
P02	#8	3	11'-11"	VII	6'-10"	3'-0"

Summary

4261 Lin.Ft. #4 @ 0.668 PLF = 2847 lb
916 Lin.Ft. #8 @ 1.043 PLF = 956 lb
548 Lin.Ft. #6 @ 1.502 PLF = 823 lb
1863 Lin.Ft. #8 @ 2.044 PLF = 3808 lb
1505 Lin.Ft. #4 @ 2.670 PLF = 4018 lb
54 Lin.Ft. #8 @ 3.400 PLF = 184 lb
Total = 12,114 lb

Abut No. 1 only
3 No. S15 Bar #8 @ 1.043 PLF 1'-8" Long = 52 lb

FED. ROAD REG. NO.	DIVISION	PROJECT NO	SHEET NO	TOTAL SHEETS
9	COLO	ER-15(1) FIRST CONTRACT	5	

COLORADO
DEPARTMENT OF HIGHWAYS

BENDING DIAGRAMS & BAR LIST

Across East Plum Creek
Sta. 1446+98.52 to 1448+12.84
Near Larkspur Sec. 22 T. 9 S R. 67 W

Designed by
Made by J.B.
Checked by

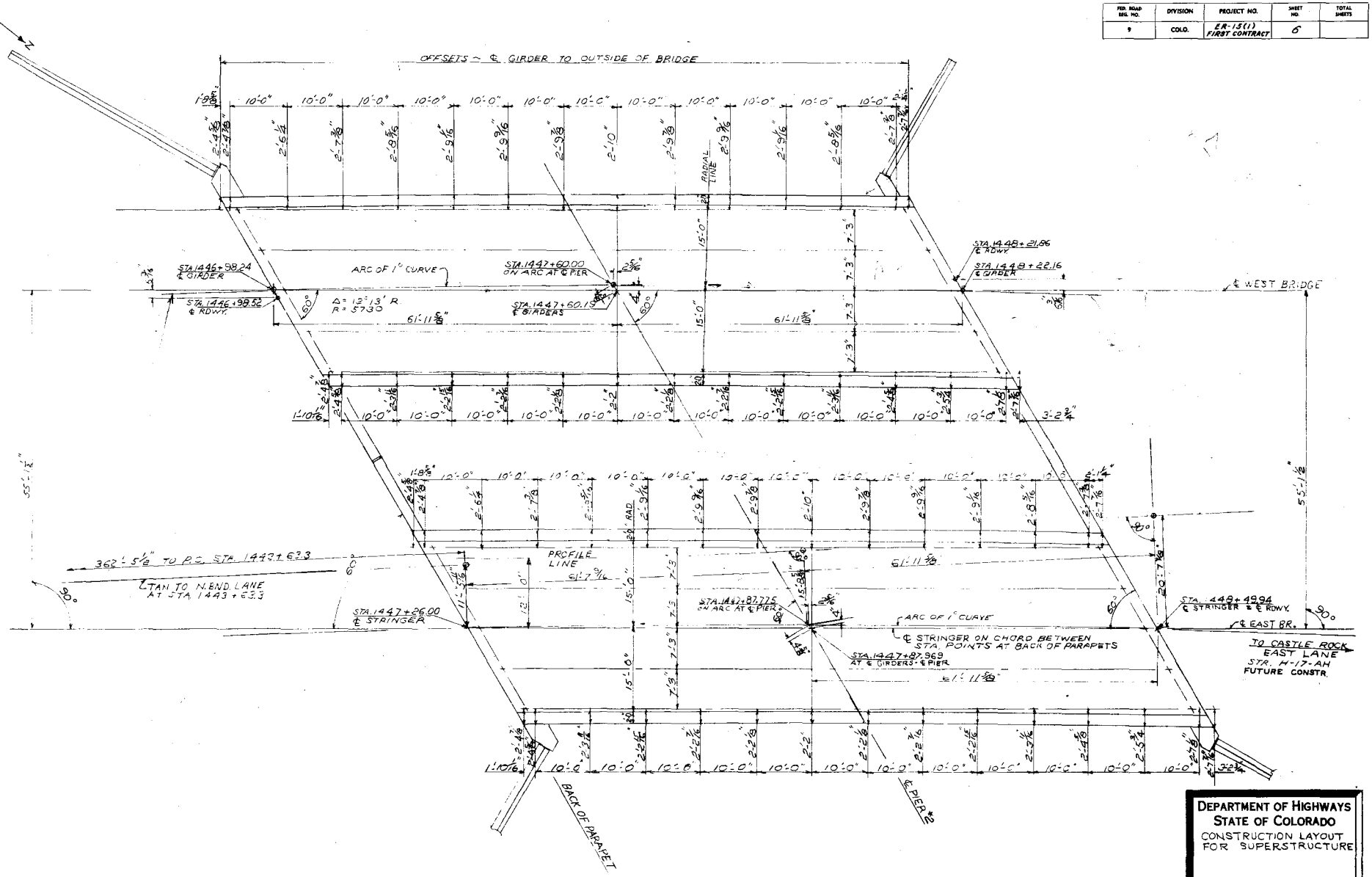
Approved by [signature]
Bridge Engineer
Date: July 12, 1965

STRUCTURE NO. H-17-AQ (S BND)

REVISIONS

C

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	6	



	Initial	Date
SIGNED BY		
CKED BY		
WN BY		
HECKED BY		
RACED BY		
HECKED BY		

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
CONSTRUCTION LAYOUT FOR SUPERSTRUCTURE

Across EAST PLUM CREEK
See ℄ SER LAYOUT
Near LARKSPUR Sec. T. R.

Designed by EFS
Made by FL
Checked by

Approved by [signature]
Bridge Engineer
Date: July 2, 1965

STRUCTURE NO. H-17-AQ (S.BND.)(W.LANE) H-17-AH (N.BND.)(E.LANE)

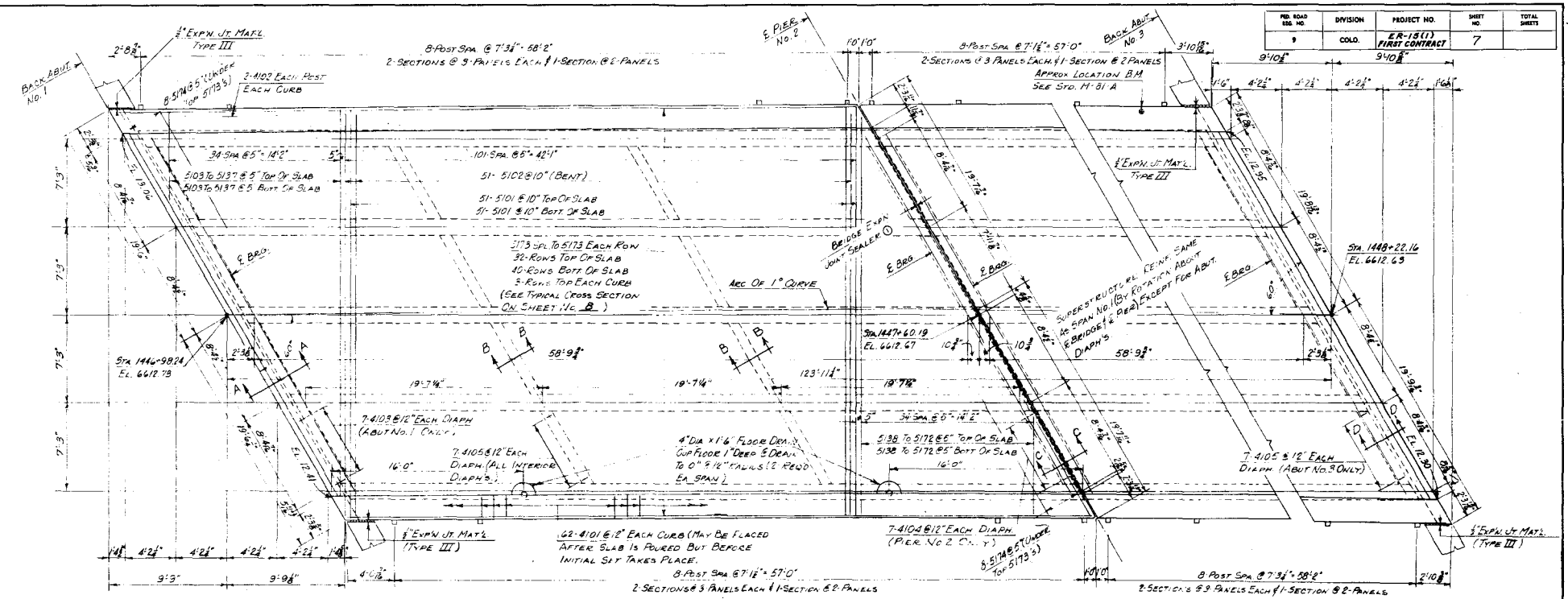
FT. OF HIGHWAYS
ATE OF COLORADO
BA. D. O. N. 117
LY 1964

REVISIONS

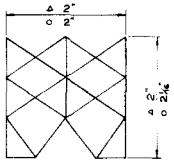
D

FED. ROAD ESS. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	7	

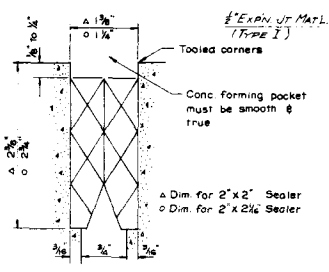
	Initial	Date
DESIGNED BY		
CHECKED BY		
DRAWN BY		
CHECKED BY		
TRACED BY		
CHECKED BY		



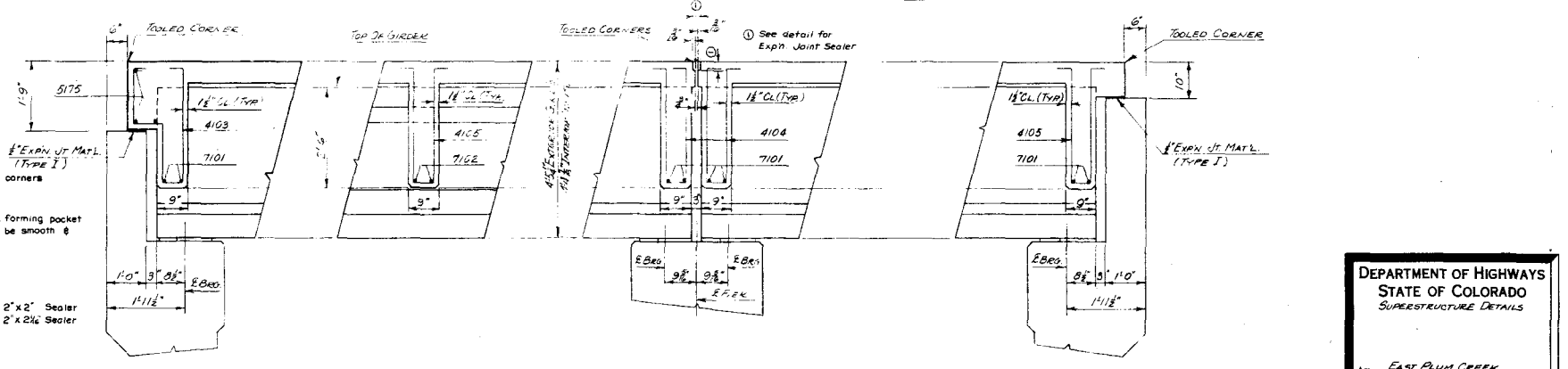
PLAN
SEE CONST. LAYOUT SHEET No. 6



CONFIGURATION OF UNCOMPRESSED JOINT SEALER



DETAIL OF EXP'N. JOINT SEALER



SECTION A-A SECTION B-B SECTION C-C SECTION D-D

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
SUPERSTRUCTURE DETAILS

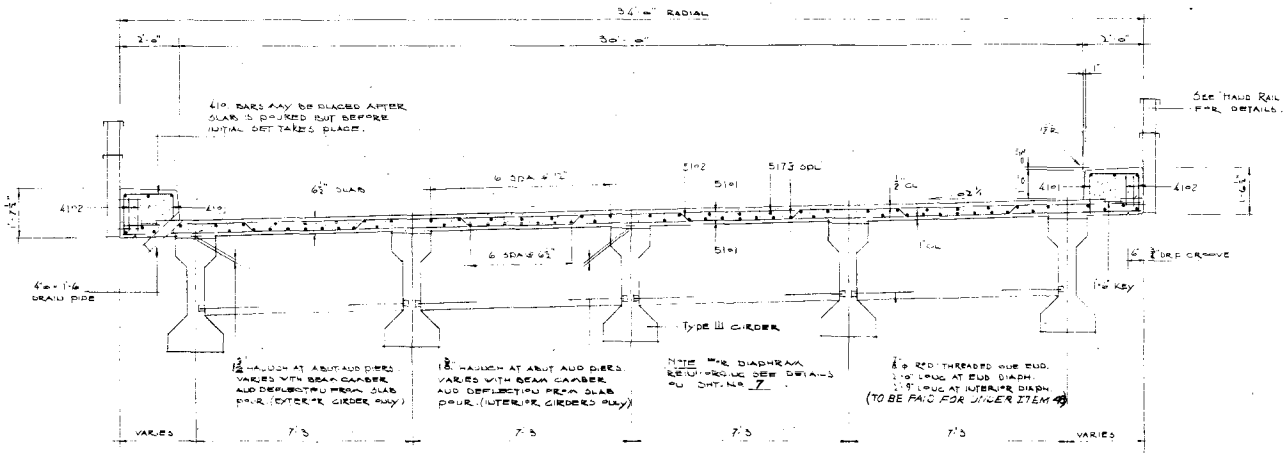
Across EAST PLUM CREEK
Sta. 1446+98.24 to 1448+21.86
Near LARKSPUR Sec. 22 T. 9S R. 67W

Designed by E.F.S.	Approved by [signature] Bridge Engineer
Made by J.R.E.	
Checked by	Date: July 2, 1965

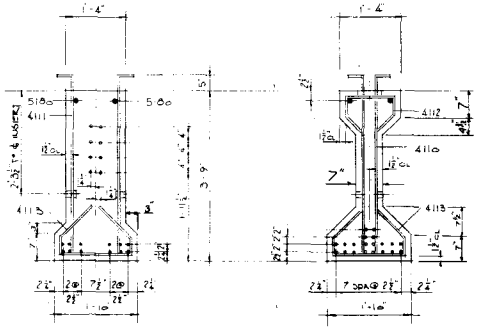
STRUCTURE NO. H-17-AQ (S.BND.)

REVISIONS

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	8	



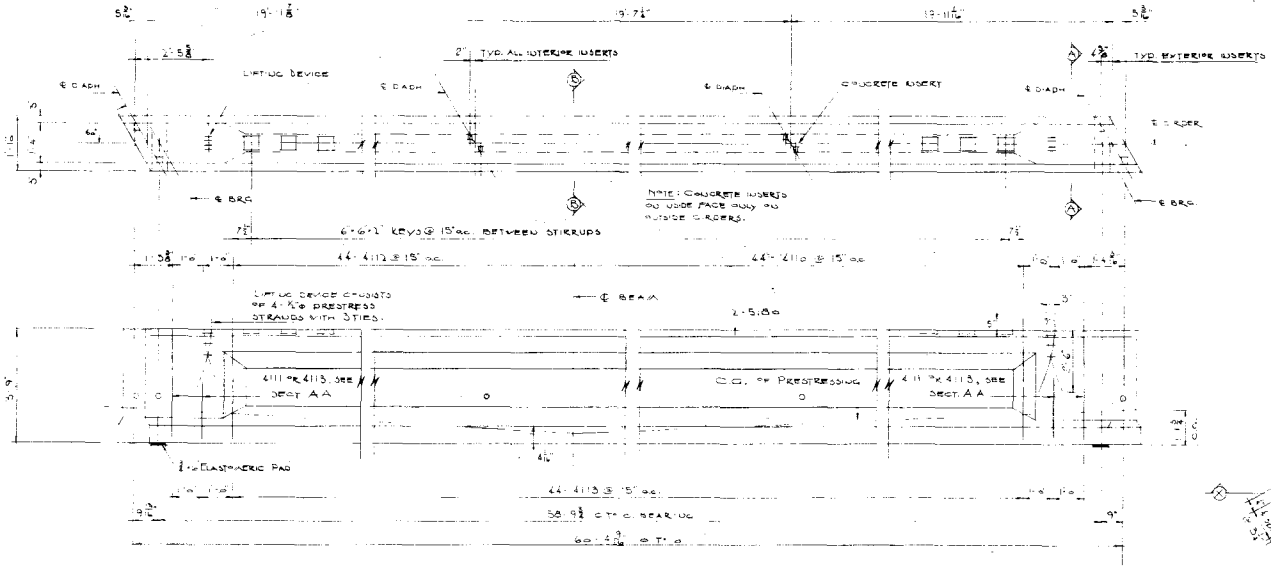
TYPICAL CROSS SECTION



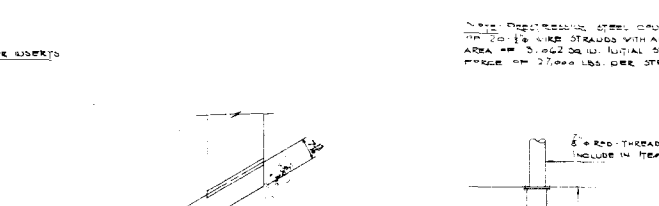
SECT A-A

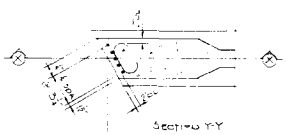
SECT B-B

Note: Prestressing steel consists of 20-⅜ø wire strands with an area of .3.462 sq. in. Initial stress force of 27,000 lbs. per strand.



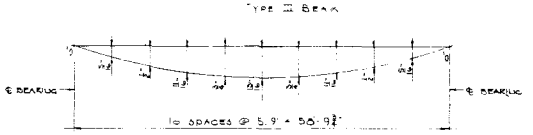
GIRDER DETAIL



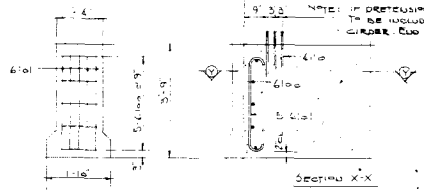


Concrete for the precast girders shall have a cylinder strength of 5000 psi at 28 days. At time of release of prestress, the concrete shall have a minimum cylinder strength of 4000 psi. High tensile wire strands for prestressing steel shall have a min. ult. strength of 270,000 p.s.i. and an elongation at rupture of not less than 3% in 10 inches. After girders are removed from the forms, they must be maintained in an upright position at all times, and must be picked up with lifting devices.

Chamfer exposed corners ¾" unless otherwise noted.



D.L. DEFLECTION FROM SLAB POUR



DETAILS OF END BLOCK REINFORCING

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

PRESTRESSED CONCRETE BEAM, TYPE III

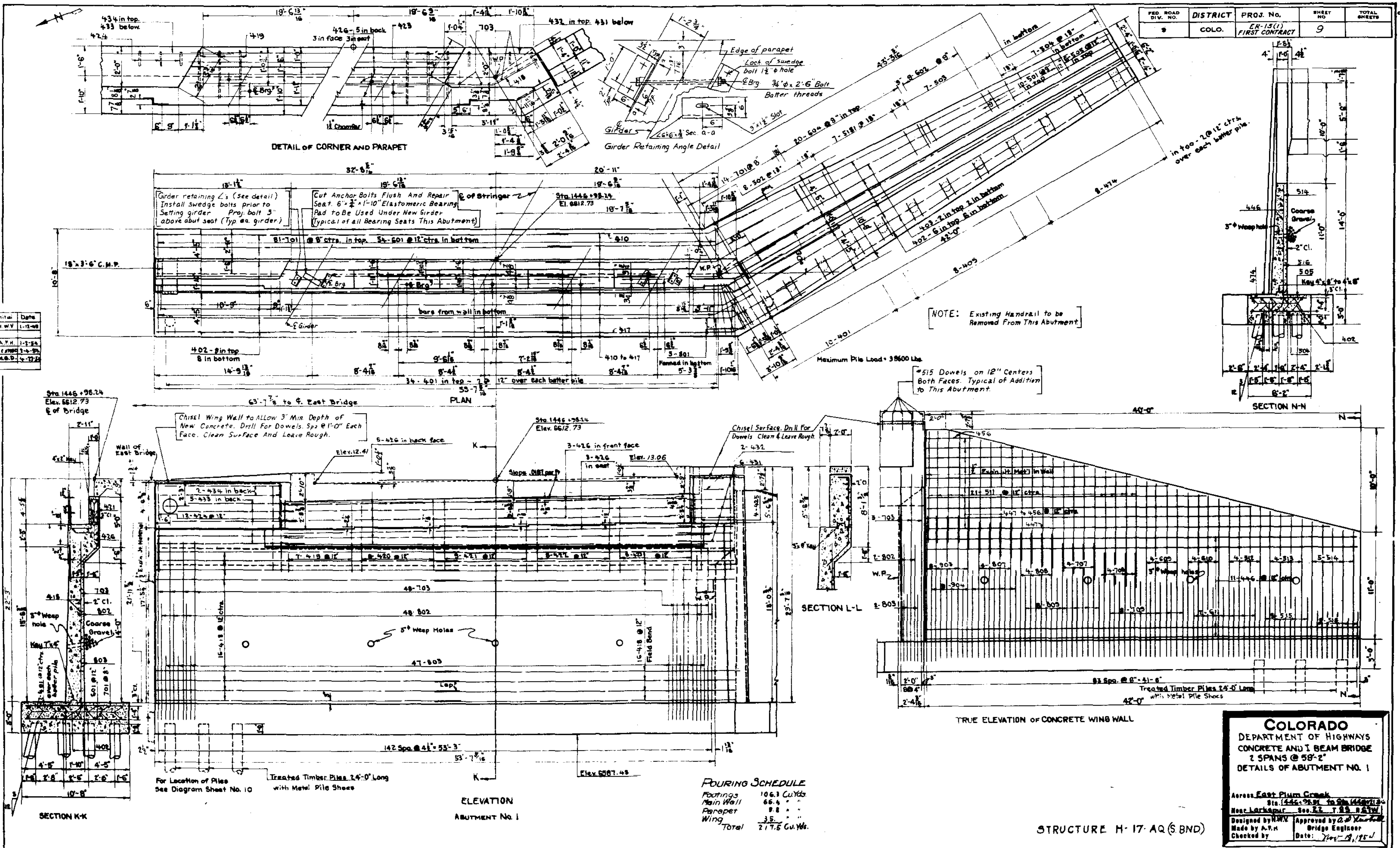
Across EAST PLUM CREEK
Sta. 446+98.52 = 1448+21.04
Near LARKSPUR Sec. 22 T. 9 S. R. 67 W.

Designed by E.F.S.
Made by O.C.L.
Checked by

Approved by _____
Bridge Engineer
Date: July 6, 1965

STRUCTURE NO. H-17-AQ (S.BNA)

FED. ROAD DIV. NO.	DISTRICT	PROJ. No.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	9	



POURING SCHEDULE

Footings	106.3 Cu.Yds.
Main Wall	66.4 " "
Parapet	9.8 " "
Wing	35. " "
Total	217.5 Cu.Yds.

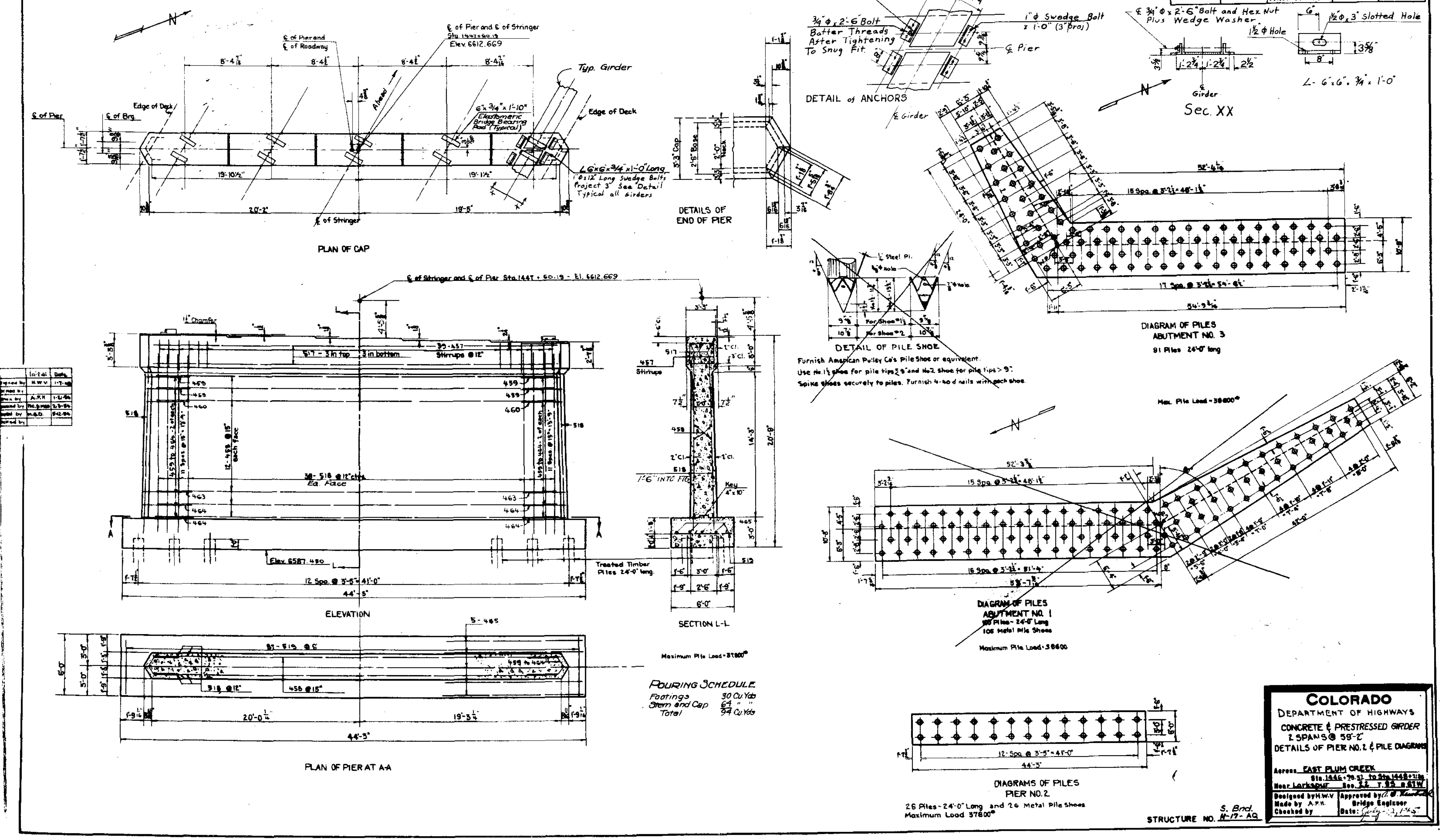
STRUCTURE H-17-AQ (S BND)

COLORADO
DEPARTMENT OF HIGHWAYS
CONCRETE AND I BEAM BRIDGE
2 SPANS @ 58'-2"
DETAILS OF ABUTMENT NO. 1

Across East Plum Creek
Sta. 1446+98.24 to Sta. 1448+14
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by H.W.V.	Approved by [signature]
Made by A.T.H.	Bridge Engineer
Checked by	Date: Nov. 19, 1954

FED. ROAD DIV. NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	10	



S. Brd.
STRUCTURE NO. H-17-AQ

COLORADO
DEPARTMENT OF HIGHWAYS

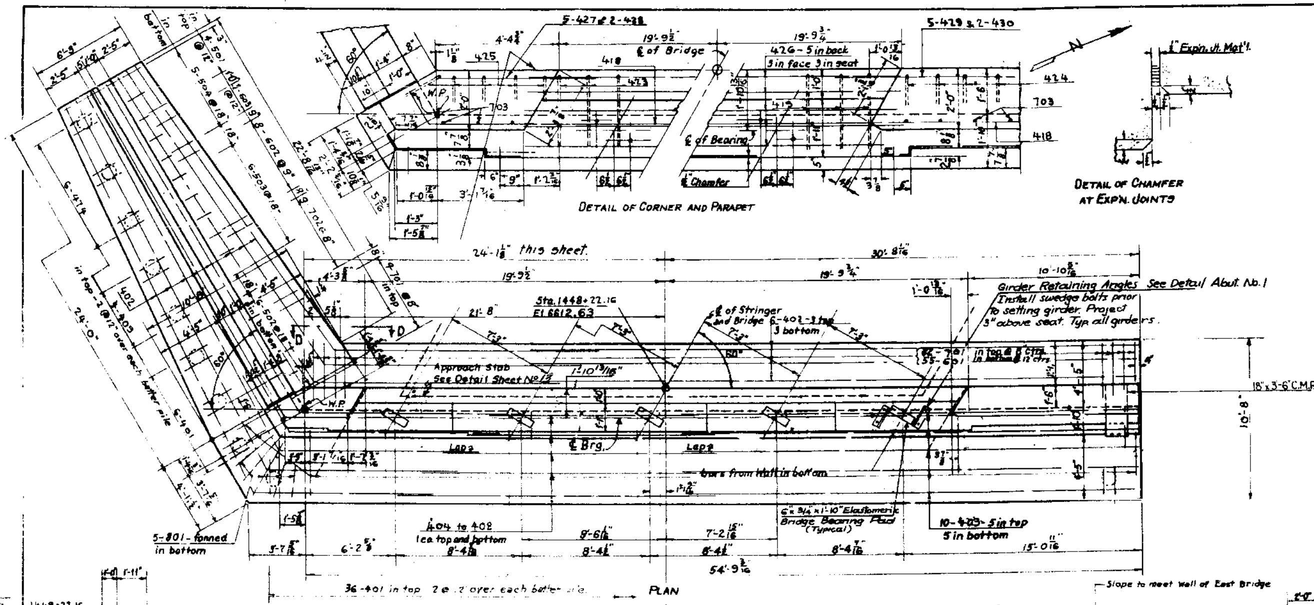
CONCRETE & PRESTRESSED GIRDER
2 SPANS @ 59'-2"
DETAILS OF PIER NO. 2 & PILE DIAGRAMS

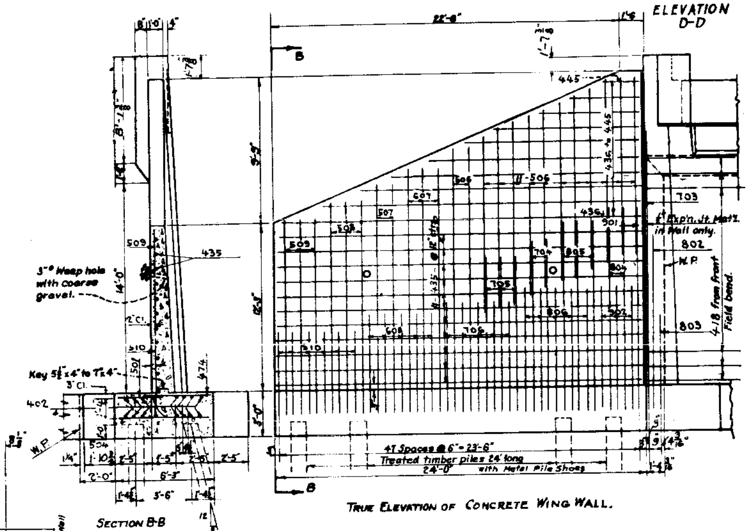
Across EAST PLUM CREEK
Sta. 1446+98.52 to Sta. 1448+18
Near Larkspur Sec. 22 T. 9S R. 67W

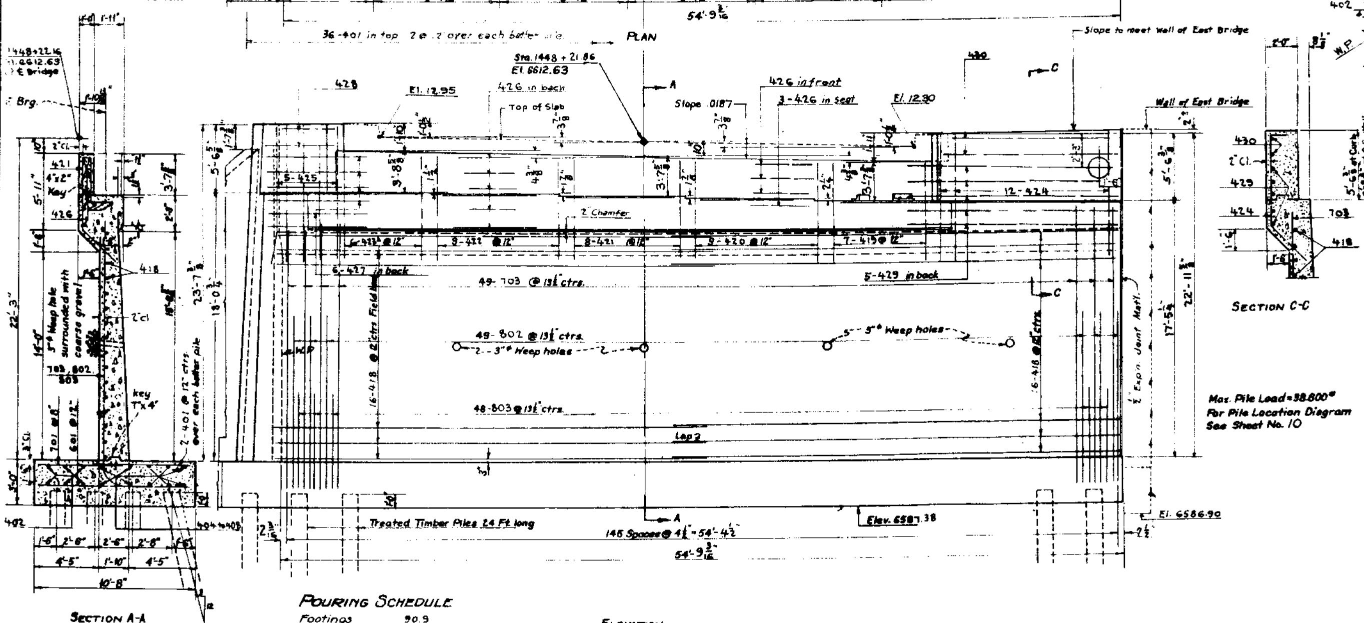
Designed by H.W.V.	Approved by [signature]
Made by A.F.H.	Bridge Engineer
Checked by	Date: July 2, 1965

FED. ROAD DIV. NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	11	

REVISIONS







Max. Pile Load = 38,800#
For Pile Location Diagram See Sheet No. 10

POURING SCHEDULE

Footings	90.9
Main Wall	65.9
Parapet	11.3
Wing	20.9
Total	189.0 Cu. Yds.

ELEVATION
ABUTMENT No. 3

LOADING DATA
LIVE LOAD A A S H O H20-S16-44
DEAD LOAD ASSUMES 15 LBS. PER SQ. FT. ADDITIONAL WEARING SURFACE WHICH INCLUDES THE 1/2 INCH CONCRETE MONOLITHIC WEARING SURFACE SHOWN.

DESIGNING DATA.
fc 1200 lbs. per sq. in.
fs 20,000 lbs. per sq. in.
n 10

COLORADO
DEPARTMENT OF HIGHWAYS

CONCRETE AND PRESTRESSED GIRDER
2-SPANS @ 59'-2"
DETAILS OF ABUTMENT No. 3

Across East Plum Creek
Sta. 1446+98.52 to Sta. 1448+21.86
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by H.W.Y.	Approved by [illegible]
Made by A.F.H.	Bridge Engineer
Checked by	Date: July 12, 1965

STRUCTURE NO. S. BND. H-17-AQ

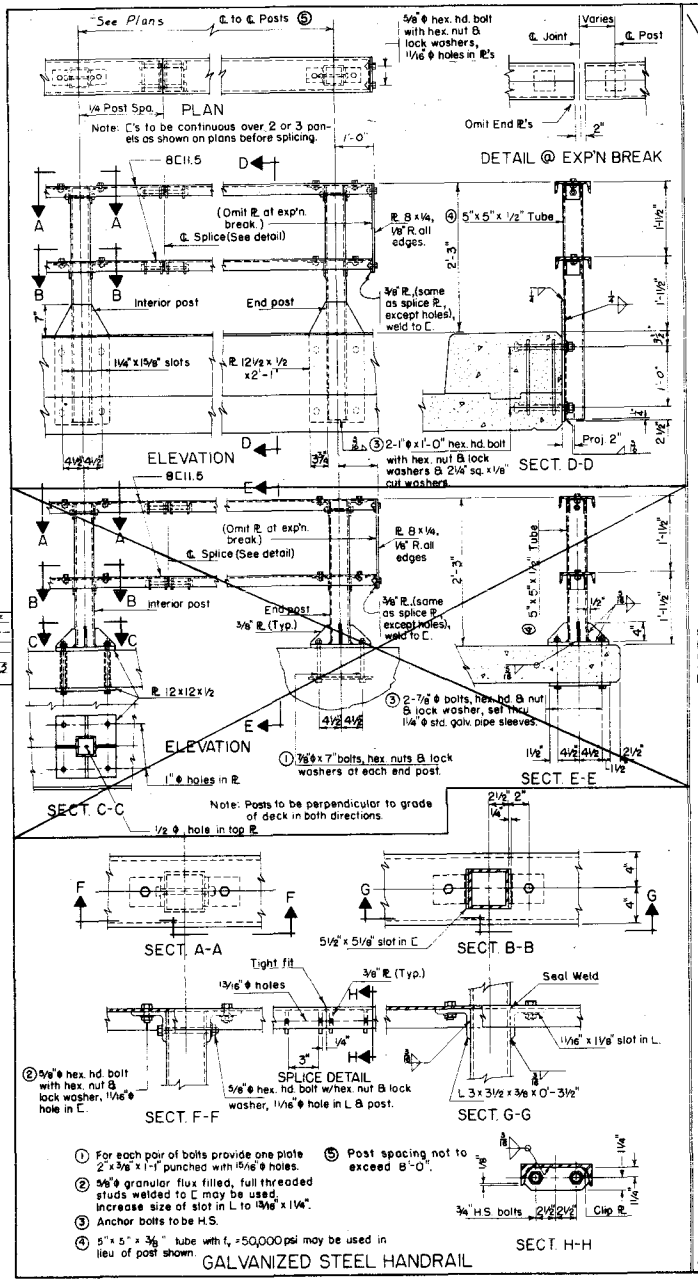
TRIM LINE

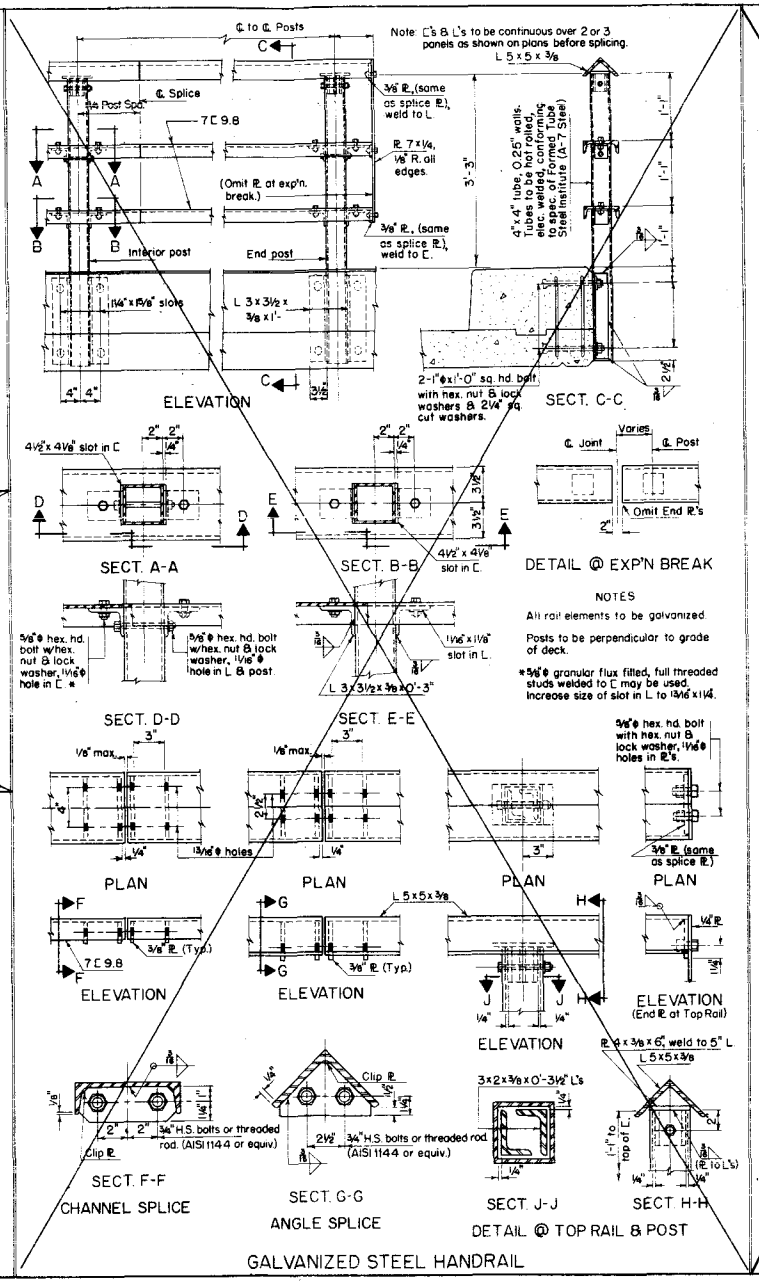
REVISIONS

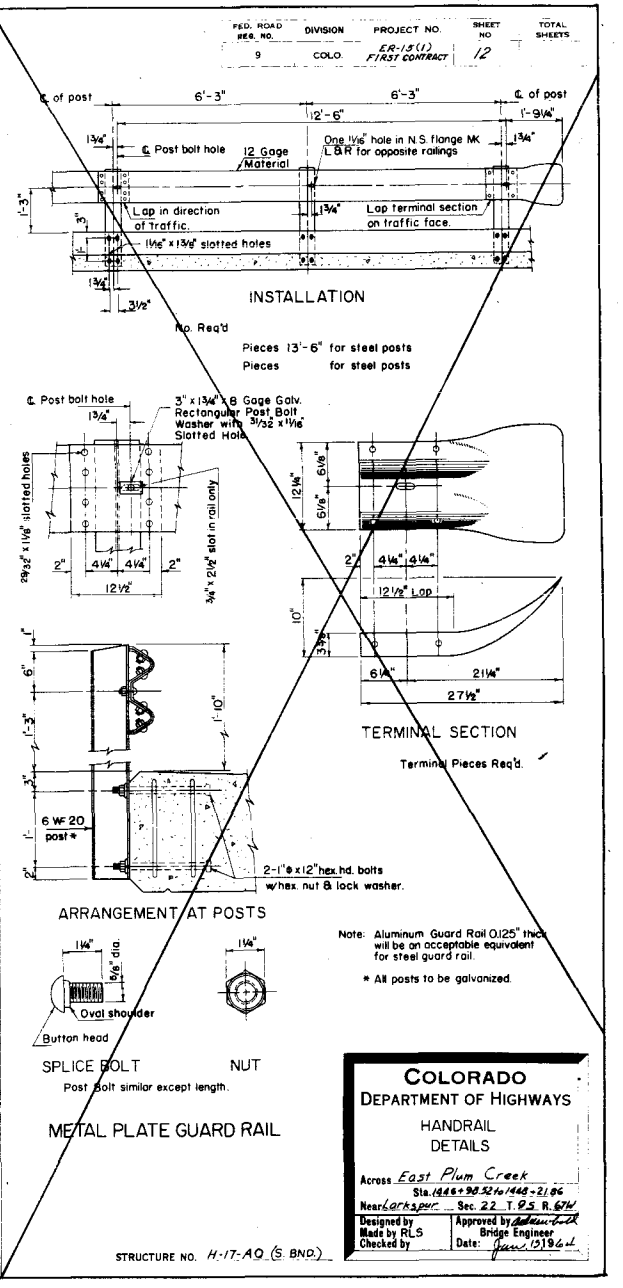
I

TRACING PLAIN

INITIAL	DATE
RMG	7-63







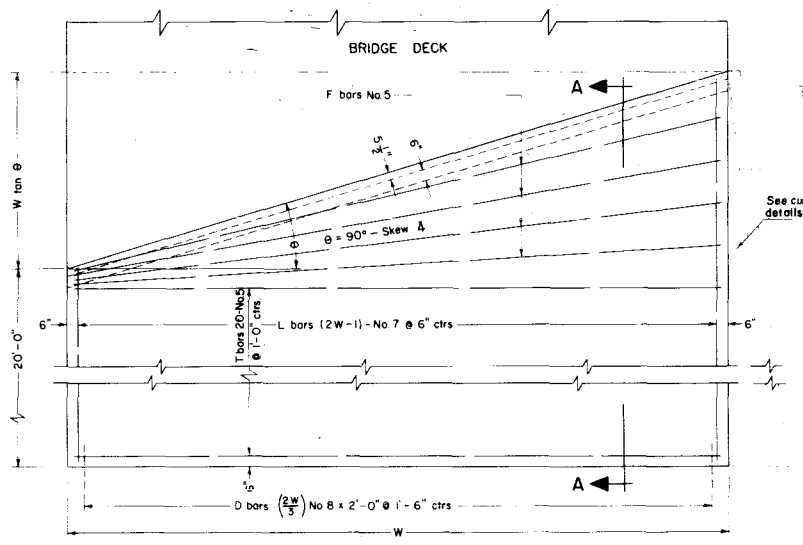
COLORADO DEPARTMENT OF HIGHWAYS
FORM C. D. H. 126
JANUARY 1963

STANDARD M-37-BA

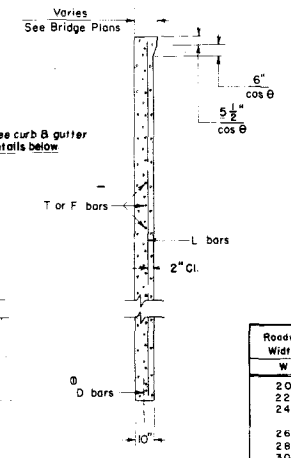
(AUGUST 24, 1964)

FEDERAL ROAD REGION NO.	DISTRICT	PROJ NO	SHEET NO.	TOTAL SHEETS
9	COLORADO	ER-18(1) FIRST CONTRACT	13	

REVISIONS			



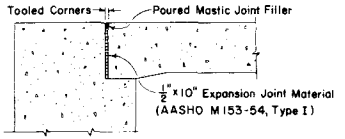
APPROACH SLAB – PLAN



SECTION A-A

Quantity of Expansion Joint Material for 1 Approach Slab (To be included in the Bid Price for Concrete Pavement)

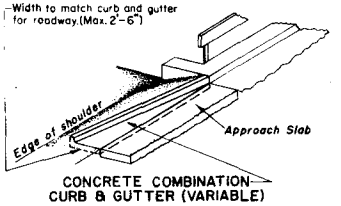
$$\frac{0.833 \times W}{\cos \theta} = \text{Sq. Ft.}$$



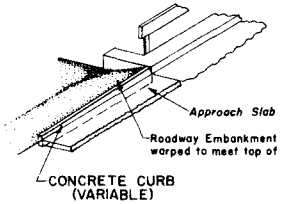
DETAIL AT BRIDGE ABUTMENT

Bar List and Quantities required for one Approach Slab

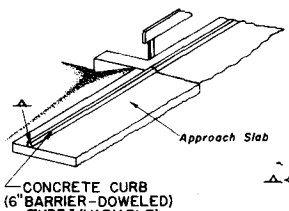
Roadway Width	T=No. 5, Str.		D=No. 8, Str.		L=No. 7, Str.		F=No. 5, Str.		Reinforcing Steel (Lbs.)			Additional Steel for Skew (Lbs.)		Concrete Pavement
W	No.	Length	No.	Length	No.	Length	No.	Length	T Bar	D Bar	L Bar	F Bar	L Bar	(Sq. Yds.)
20	20	19'-6"	13	2'-0"	39		10 tan θ	19'-6"	411	70	1570	205 tan θ	765 tan θ	44.4 + 22.2 tan θ
22		21'-6"	15		43		11 tan θ	21'-6"	452	81	1731	249 tan θ	932 tan θ	48.9 + 26.9 tan θ
24		23'-6"	16		47		12 tan θ	23'-6"	494	86	1892	297 tan θ	1116 tan θ	53.3 + 32.0 tan θ
26		25'-6"	17		51		13 tan θ	25'-6"	537	92	2053	340 tan θ	1316 tan θ	57.8 + 37.6 tan θ
28		27'-6"	19		55		14 tan θ	27'-6"	580	102	2214	406 tan θ	1533 tan θ	62.2 + 43.6 tan θ
30		29'-6"	20		59		15 tan θ	29'-6"	621	108	2375	466 tan θ	1766 tan θ	66.7 + 50.0 tan θ
32		31'-6"	21		63		16 tan θ	31'-6"	663	113	2536	531 tan θ	2016 tan θ	71.1 + 56.9 tan θ
34		33'-6"	23		67		17 tan θ	33'-6"	706	124	2697	600 tan θ	2282 tan θ	75.6 + 64.2 tan θ
36		35'-6"	24		71		18 tan θ	35'-6"	748	129	2858	673 tan θ	2565 tan θ	80.0 + 72.0 tan θ
38		37'-6"	25		75	19'-6" by (6" tan θ) to 19'-6" + [(W-1) tan θ]	19 tan θ	37'-6"	790	135	3019	751 tan θ	2864 tan θ	84.4 + 80.2 tan θ
40		39'-6"	27		79		20 tan θ	39'-6"	832	145	3180	832 tan θ	3180 tan θ	88.9 + 88.9 tan θ
42		41'-6"	28		83		21 tan θ	41'-6"	874	152	3341	918 tan θ	3513 tan θ	93.3 + 98.0 tan θ
44		43'-6"	29		87		22 tan θ	43'-6"	916	157	3502	1008 tan θ	3862 tan θ	97.8 + 107.6 tan θ
46		45'-6"	31		91		23 tan θ	45'-6"	958	168	3663	1102 tan θ	4227 tan θ	102.2 + 117.6 tan θ
48		47'-6"	32		95		24 tan θ	47'-6	1001	173	3824	1201 tan θ	4609 tan θ	106.7 + 128.0 tan θ
50		49'-6"	33		99		25 tan θ	49'-6"	1043	178	3985	1304 tan θ	5007 tan θ	111.1 + 138.9 tan θ
52		51'-6"	35		103		26 tan θ	51'-6"	1084	189	4146	1411 tan θ	5422 tan θ	115.6 + 150.2 tan θ
54	20	53'-6"	36	2'-0"	107		27 tan θ	53'-6"	1127	194	4307	1522 tan θ	5854 tan θ	120.0 + 162.0 tan θ



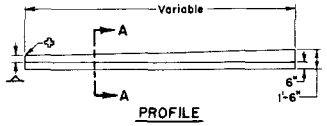
CONCRETE COMBINATION CURB & GUTTER (VARIABLE)



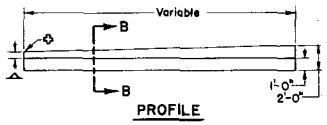
CONCRETE CURB (VARIABLE)



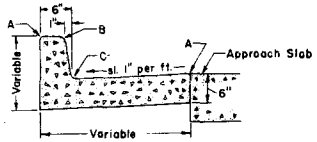
CONCRETE CURB (6" BARRIER-DOWELED) TYPE I (VARIABLE)



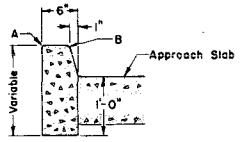
PROFILE



PROFILE



SECTION A-A



SECTION B-B

GENERAL NOTES

Class of Concrete shall be "Pavement."

Concrete shall be paid for under Item 37 by the Sq. Yd. as "Concrete Pavement" of the specified thickness.

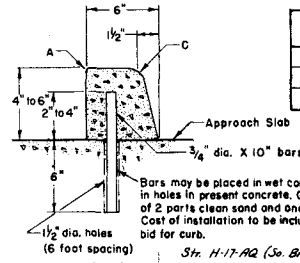
Reinforcing Steel required in Approach Slab will be paid for under Item 47.

Class "A" concrete aggregate may be used in the pavement.

6" min. curb height when no curb is used on roadway, 4" where Asphaltic Shoulder Roll is used. (Shape shoulder roll to meet concrete curb.) 6" To meet Concrete Combination Curb & Gutter.

Use 1½" R. when no asphaltic or concrete curb is to be met. No radius required when meeting asphaltic or concrete curb.

LEGEND FOR RADII
A = ⅛"
B = 1"
C = 1½"



Bars may be placed in wet concrete or grouted in holes in present concrete. Grout shall consist of 2 parts clean sand and one part cement. Cost of installation to be included in unit price bid for curb.

Str. H-17-AQ (So. Bnd.)

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

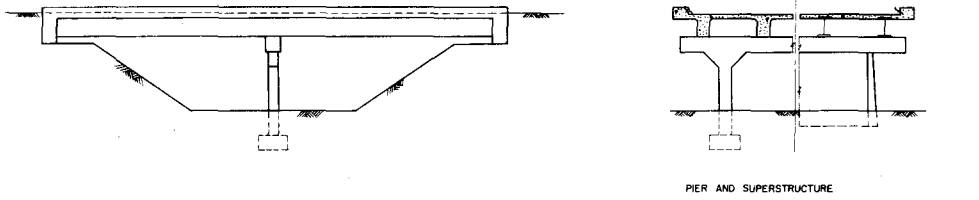
CONCRETE PAVEMENT BRIDGE APPROACH SLAB

Designed by J.G.B.
Made by T.F.
Checked by P.C.

Approved by [signature]
Bridge Engineer
Date: March 7, 1962

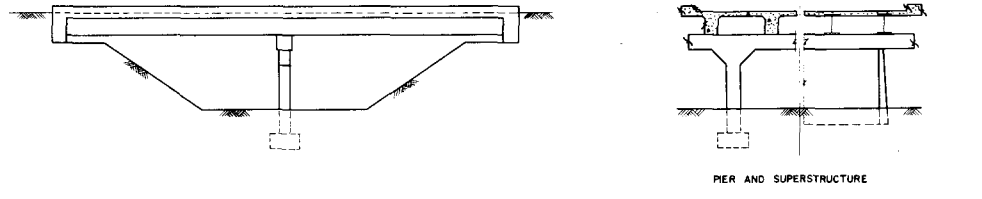
REVISIONS

FED. ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	ER-15(1) FIRST CONTRACT	14	



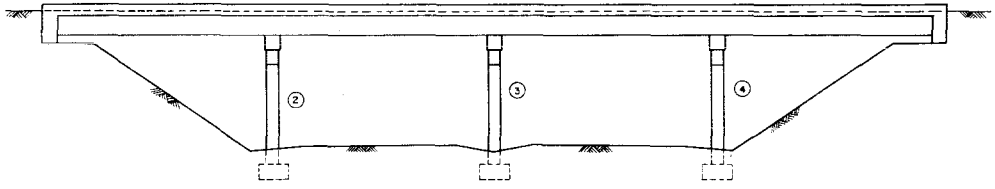
PIER AND SUPERSTRUCTURE

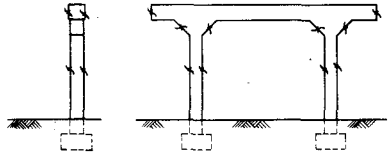
RURAL STREAM CROSSING (H-17-AQ)



PIER AND SUPERSTRUCTURE

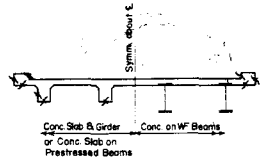
STREAM CROSSING IN OR NEAR URBAN AREA





Piers 2,3 & 4

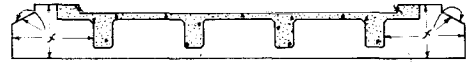
All Piers



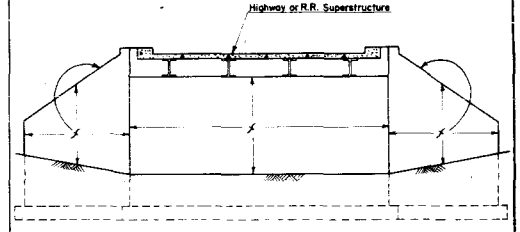
Superstructure

In case of round columns the whole column shall receive Class "I" finish on all Piers.

UNDERPASS



STUB ABUTMENTS
(Underpass Only)



CANTILEVER ABUTMENTS
(Underpass Only)

STRUCTURE NO. H-17-AQ

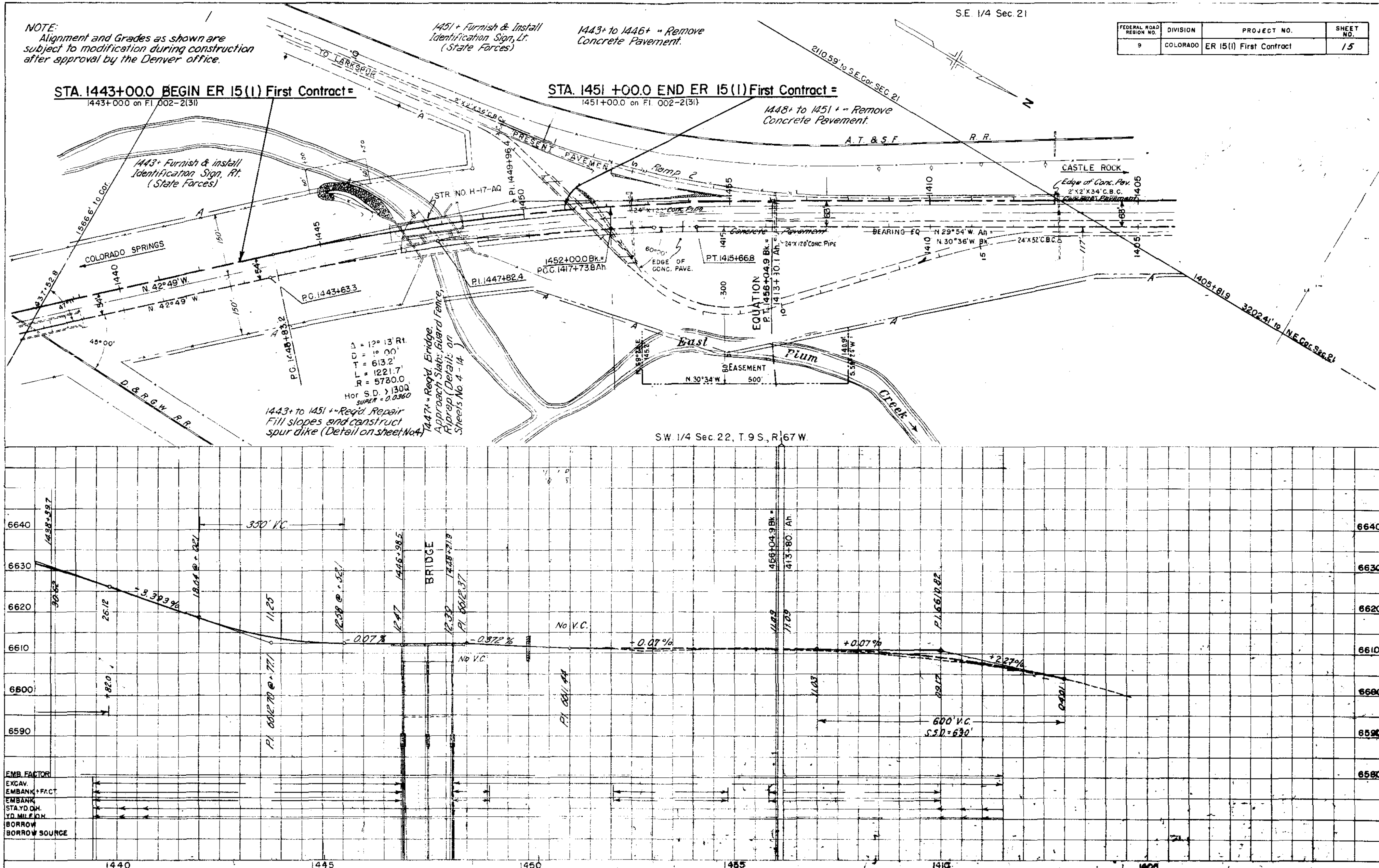
COLORADO
DEPARTMENT OF HIGHWAYS

DETAILS SHOWING PORTIONS OF STRUCTURE TO RECEIVE CLASS "I" SURFACE FINISH.

Across East Plum Cr
Sta. 1446+98.52 to 1448+21.84
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by A.D.N.	Approved by
Made by R.R.A.-J.B.	Bridge Engineer
Checked by	Date: Aug 2, 1965

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLORADO	ER 15(1) First Contract	15



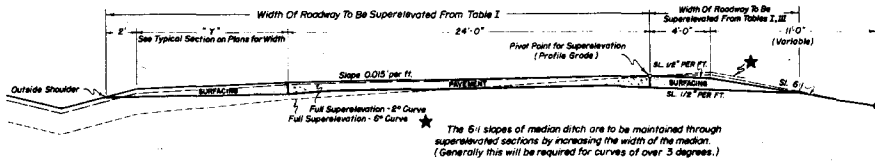
REVISIONS

STANDARD M-1-C-1

FED. ROAD REGIONS NO.	DIVISION	PROJECT NO.	SHEET NO.
9.	COLO.	ER-15(1) FIRST CONTRACT	16

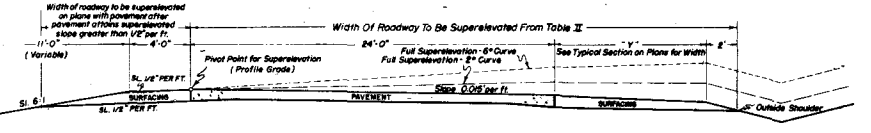
Standard Methods for Superelevating Curves on Divided Highways

Roadway On Inside Of Curve



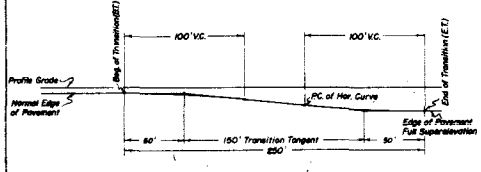
The 6:1 slopes of median ditch are to be maintained through superelevated sections by increasing the width of the median. (Generally this will be required for curves of over 3 degrees.)

Roadway On Outside Of Curve



Superelevation Tables

PROFILE VIEW SHOWING TRANSITION TO FULL SUPERELEVATION ON ROADWAY INSIDE OF CURVE



Circular Curve with Unlimited Tangent Approach

The Transition shown above illustrates the effect of Superelevation on the outside edge of the pavement by gradually lowering the outside shoulder over a distance of 250 ft. The beginning of this transition takes place at a point 150 feet back of the end of the curve and acquires full Superelevation at a point 100 feet inside of the curve.

The Transition for Superelevating the inside shoulder on roadway inside of curve shall start at a point 50 feet back of the B.T. as described above, and by using rates in Table III, shall reach a superelevation equal to the normal crown slope of 0.015 ft. per foot at the B.T. From this point the shoulder shall be raised on a plane with the roadway pavement.

TABLE I - FOR ROADWAY ON INSIDE OF CURVE

(Figures in columns are Rates of Superelevation per Foot of Roadway Width)

Percent Of Transition Distance	Distance From B.T. In Feet	DEGREE OF CURVE				
		-2°&2°	3°&3°	4°&4°	5°&5°	6°&6°
2	5	.0000	.0000	.0000	.0000	.0000
4	10	.0000	.0001	.0001	.0001	.0002
6	15	.0000	.0001	.0002	.0003	.0004
8	20	.0001	.0002	.0004	.0005	.0006
10	25	.0001	.0003	.0006	.0008	.0010
12	30	.0002	.0005	.0008	.0011	.0014
14	35	.0002	.0007	.0011	.0015	.0020
16	40	.0003	.0009	.0014	.0020	.0026
18	45	.0004	.0011	.0018	.0025	.0032
20	50	.0005	.0014	.0023	.0031	.0040
22	55	.0006	.0017	.0027	.0038	.0048
24	60	.0007	.0020	.0032	.0045	.0058
26	65	.0008	.0024	.0038	.0053	.0068
28	70	.0010	.0027	.0044	.0061	.0078
30	75	.0011	.0031	.0051	.0071	.0090
32	80	.0013	.0035	.0058	.0080	.0102
34	85	.0014	.0040	.0065	.0091	.0116
36	90	.0016	.0045	.0073	.0101	.0130
38	95	.0018	.0050	.0081	.0113	.0144
40	100	.0020	.0055	.0090	.0125	.0160
42	105	.0022	.0061	.0099	.0138	.0176
44	110	.0024	.0066	.0108	.0150	.0192
46	115	.0026	.0072	.0117	.0163	.0208
48	120	.0028	.0077	.0126	.0175	.0224
50	125	.0030	.0083	.0135	.0188	.0240
52	130	.0032	.0088	.0144	.0200	.0256
54	135	.0034	.0094	.0153	.0213	.0272
56	140	.0036	.0099	.0162	.0225	.0288
58	145	.0038	.0105	.0171	.0238	.0304
60	150	.0040	.0110	.0180	.0250	.0320
62	155	.0042	.0116	.0189	.0263	.0336
64	160	.0044	.0120	.0197	.0274	.0350
66	165	.0046	.0126	.0205	.0285	.0364
68	170	.0047	.0130	.0212	.0295	.0378
70	175	.0049	.0135	.0219	.0305	.0390
72	180	.0050	.0138	.0226	.0314	.0402
74	185	.0052	.0142	.0232	.0323	.0412
76	190	.0053	.0145	.0238	.0330	.0422
78	195	.0054	.0149	.0243	.0338	.0432
80	200	.0055	.0151	.0247	.0344	.0440
82	205	.0056	.0154	.0252	.0350	.0448
84	210	.0057	.0156	.0256	.0355	.0454
86	215	.0058	.0158	.0259	.0360	.0460
88	220	.0058	.0160	.0262	.0364	.0466
90	225	.0059	.0162	.0264	.0367	.0470
92	230	.0059	.0163	.0266	.0370	.0474
94	235	.0060	.0164	.0268	.0372	.0476
96	240	.0060	.0164	.0269	.0374	.0478
98	245	.0060	.0165	.0270	.0375	.0480
Full Super	250	.0060	.0165	.0270	.0375	.0480

TABLE III - FOR INSIDE SHOULDER OF ROADWAY INSIDE OF CURVE

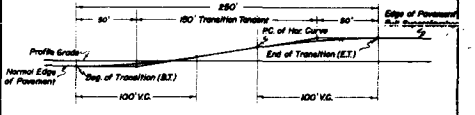
Percent Of Transition Distance	Distance Back Of B.T.	Rate Of Superelevation Per Foot Of Shoulder Width
100	B.T.	.05666
80	10	.04533
60	20	.03400
40	30	.02266
20	40	.01133
0	50	.00000

TABLE II - FOR ROADWAY ON OUTSIDE OF CURVE

(Figures in columns are Rates of Superelevation per Foot of Roadway Width)

Percent Of Transition Distance	Distance From B.T. In Feet	DEGREE OF CURVE				
		-2°&2°	3°&3°	4°&4°	5°&5°	6°&6°
2	5	.0000	.0000	.0000	.0001	.0001
4	10	.0001	.0002	.0002	.0002	.0003
6	15	.0003	.0004	.0004	.0005	.0006
8	20	.0005	.0006	.0008	.0009	.0010
10	25	.0006	.0010	.0012	.0014	.0016
12	30	.0011	.0014	.0017	.0020	.0023
14	35	.0015	.0019	.0023	.0028	.0032
16	40	.0019	.0025	.0030	.0036	.0042
18	45	.0024	.0031	.0038	.0046	.0053
20	50	.0030	.0039	.0048	.0056	.0065
22	55	.0036	.0047	.0057	.0069	.0079
24	60	.0043	.0056	.0068	.0081	.0094
26	65	.0051	.0066	.0080	.0096	.0110
28	70	.0059	.0076	.0093	.0110	.0127
30	75	.0068	.0088	.0107	.0127	.0146
32	80	.0077	.0099	.0122	.0144	.0165
34	85	.0087	.0113	.0137	.0163	.0188
36	90	.0097	.0126	.0154	.0182	.0211
38	95	.0108	.0140	.0171	.0204	.0235
40	100	.0120	.0155	.0190	.0225	.0260
42	105	.0132	.0171	.0209	.0248	.0286
44	110	.0144	.0186	.0228	.0270	.0312
46	115	.0156	.0202	.0247	.0293	.0338
48	120	.0168	.0217	.0266	.0315	.0364
50	125	.0180	.0233	.0285	.0338	.0390
52	130	.0192	.0248	.0304	.0360	.0416
54	135	.0204	.0264	.0323	.0383	.0442
56	140	.0216	.0279	.0342	.0405	.0468
58	145	.0228	.0295	.0361	.0428	.0494
60	150	.0240	.0310	.0380	.0450	.0520
62	155	.0252	.0326	.0399	.0472	.0545
64	160	.0263	.0339	.0418	.0493	.0569
66	165	.0273	.0353	.0433	.0513	.0592
68	170	.0283	.0366	.0448	.0531	.0614
70	175	.0292	.0378	.0463	.0549	.0634
72	180	.0301	.0389	.0477	.0565	.0653
74	185	.0309	.0400	.0490	.0580	.0670
76	190	.0317	.0409	.0502	.0594	.0686
78	195	.0324	.0418	.0513	.0607	.0701
80	200	.0330	.0426	.0522	.0619	.0715
82	205	.0336	.0434	.0532	.0629	.0727
84	210	.0341	.0440	.0540	.0639	.0738
86	215	.0345	.0446	.0547	.0647	.0748
88	220	.0349	.0451	.0553	.0655	.0757
90	225	.0352	.0455	.0558	.0661	.0764
92	230	.0355	.0459	.0562	.0666	.0770
94	235	.0357	.0461	.0566	.0670	.0774
96	240	.0359	.0463	.0568	.0673	.0777
98	245	.0360	.0465	.0570	.0674	.0779
Full Super	250	.0360	.0465	.0570	.0675	.0780

PROFILE VIEW SHOWING TRANSITION TO FULL SUPERELEVATION ON ROADWAY OUTSIDE OF CURVE



Circular Curve with Unlimited Tangent Approach

The Transition shown above illustrates the effect of Superelevation on the outside edge of the pavement by gradually raising the outside shoulder over a distance of 250 feet. The beginning of this transition takes place at a point 150 feet back of the end of the curve and acquires full Superelevation at a point 100 feet inside of the curve.

GENERAL NOTES

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

Special transition problems not covered by this Standard Sheet shall be covered by appropriate notes included with curve data on plans.

In cases where spiral curves are used, the transition from normal crowned section to full superelevation shall take place over the full length of spiral curve.

The use of this Standard Sheet is restricted to Divided Highways having a normal crown slope of 0.015' per foot on pavements and a normal crown slope of 1/2" per foot on the inside shoulders.

COLORADO DEPARTMENT OF HIGHWAYS

Standard Methods For Superelevating Curves On Divided Highways

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

Approved by W. Lee Hoag, Engineer, Surveys & Plans

Date: Feb. 8, 1950

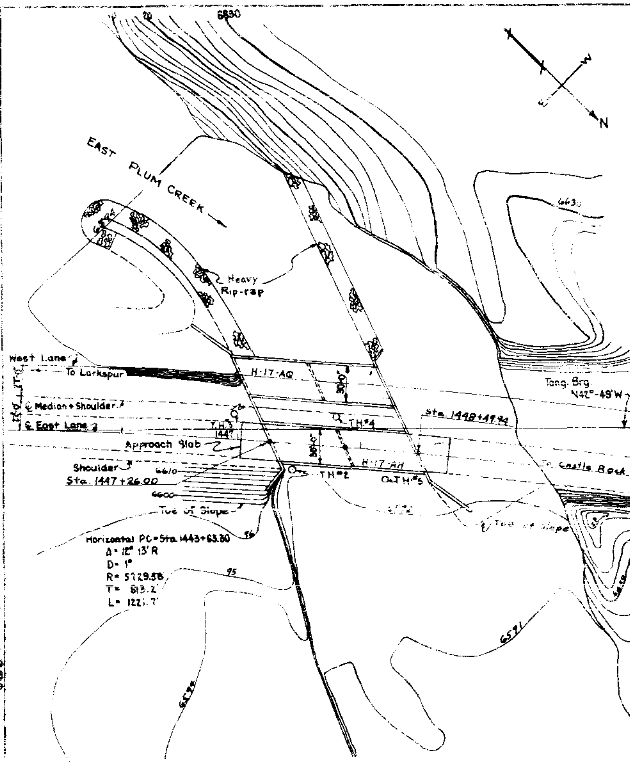
STANDARD M-1-C-1

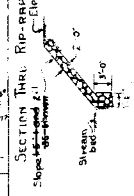
TRIM LINE

REVISIONS

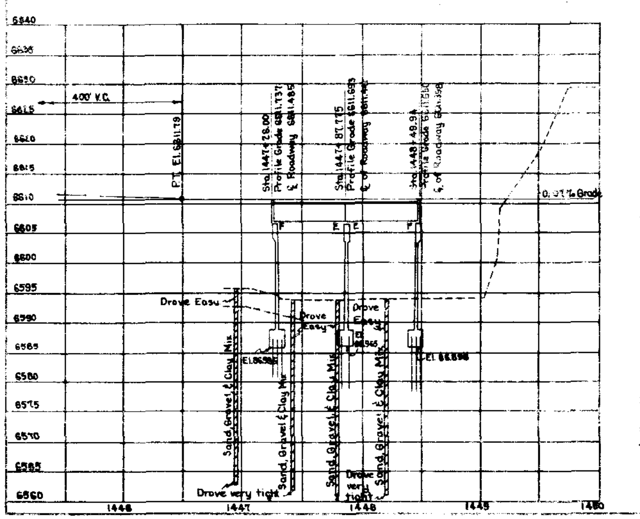
This Structure added by W.O. No. 6603. New Sheet 10/6/65

FED. ROAD DIST. NO.	STATE	PROJ. No.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-15(1) 1st Contract	17	





Not to be ordered until it is determined that the Piling in place cannot be incorporated into New Const.



SPAN 2 BAR LIST ~ SUPERSTRUCTURE								
Mark	Size	No. Req'd	Length	Type	Dimensions ℓ	m	r	t
E1	5/8"⌀	80	36'-9"	Str.	36'-7"		2½"	2"
~~E2~~	~~5/8"⌀~~	~~40~~	~~40'-0"~~	~~II~~	~~34'-8"~~		~~2½"~~	
E3	5/8"⌀	79	39'-4"	III			2½"	2"
E4	5/8"⌀	80	40'-7"	II	~~34'-10½"~~		~~2½"~~	
D1	5/8"⌀	74	40'-0"	Str.				
D2	5/8"⌀	74	23'-6"	Str.				
S1	½"⌀	6	40'-0"	Str.				
S2	½"⌀	3	22'-8"	Str.				
S3	½"⌀	3	25'-3"	Str.				
S4	½"⌀	24	3'-0"	Str.				
S5	½"⌀	24	4'-0"	IV	1'-0"	8"		
S6	½"⌀	8	5'-4"	IV	1'-0"	1'-4"		
S7	½"⌀	2	1'-0"	Str.				
S8	½"⌀	2	4'-0"	Str.				

BAR SUMMARY ~ APPROACH SLABS (crossed out)

4585 Lin. Ft. 5/8"⌀ @ 1.043# per lin. ft. = 4782
±1% Overrun = 48
Total = 4830#

BAR SUMMARY ~ SUPERSTRUCTURE

13,914 lin. ft. 5/8"⌀ @ 1.043# per lin. ft. = 14,512 Lb.
606 lin. ft. ½"⌀ @ 0.668# per lin. ft. = 405 Lb.
Total = 14,917 Lb.

BAR LIST ~ PIER NO. 2 (crossed out)

Mark	Size	No. Req'd	Length	Type	ℓ	m	r	t
P1	5/8"⌀	6	40'-8"	I	39'-0"		2½"	2"
P2	½"⌀	38	10'-4"	IX	2'-3"	2'-1"		
L1	5/8"⌀	80	18'-0"	V	11'-2"		2½"	2"
L2	½"⌀	24	38'-3"	Str.				
L3 to L8	½"⌀	4 ea.	7'-8" by 1" to 8'-1"	X	10" by ½" to 12½"	8½" by ½" to 11"		
W1	5/8"⌀	131	6'-7"	I	4'-11"		2½"	2"
W2	½"⌀	10	43'-6"	Str.				

BAR LIST ~ APPROACH SLABS (crossed out)

Mark	Size	No. Req'd	Length	Type	ℓ	m	r	t
V1	5/8"⌀	34	29'-7"	Str.				
V2 to V18	5/8"⌀	1 ea.	29'-2" by 1'-9½" to 10"	Str.				
V19 to V35	5/8"⌀	1 ea.	1'-5" by 1'-8½" to 28'-5"	Str.				
V36 to V95	5/8"⌀	1 ea.	33'-11" by 3⅜" to 17'-3⅜"	V	33'-4" by 3⅜" to 16'-5⅜"		2½"	2"
V96 to V155	5/8"⌀	1 ea.	16'-8" by 3⅜" to 34'-5⅜"	V	15'-10" by 3⅜" to 33'-7⅜"		2½"	2"

SUMMARY OF QUANTITIES

Item No.	Description	Unit	Super-structure	Abut No. 1	Pier No. 2	Abut No. 3	Appr. Slabs		Total
11	Removal Of Portions Of Bridge	L.S.	—	—	—		—	—	L.S.
14	Uncl. Struct. Excav. (Bridge)	Cu. Yd.	—	—	—		—	—	
16	Struct. Backfill (Class X)	Cu. Yd.	—	160	106		—		
			—	540	57		—	—	
			—	54	6		—	—	
~~42b~~	~~Treated Bridge Timber~~	~~MFt. B.M.~~	—	.872	—	.716	—	—	
46	Class "A" Concrete	Cu. Yd.	54	186	95	145	48		199
47	Reinforcing Steel	Lbs.	14,917	13,700	3990	10,346	4830	—	25,263
(3) 48	Structural Steel	Lbs.	79,000	—	—	—	—		
(1) 50	Treated Timber Piling	Lin. Ft.	—	2290	624	2626	—	—	
89	Drain Pipe (Conc. Floor) 4"⌀ x 2'-0"	Ea.	2	—	—	—	—	—	2
(2)	½" Exp'n. Jt. Material Type I	Sq. Ft.	30		—	30	—	—	
(2)	*16 Ga. Galv. Sheet Metal	Sq. Ft.	61	—	—	—	—	—	61

(2) Included in Bid Price Class "A" Concrete.
(3) Includes 4800 Lbs. Handrail Steel.

BAR LIST ~ ABUTMENT NO. 1 (crossed out)

Mark	Size	No. Req'd	Length	Type	ℓ	m	r	t
B1	5/8"⌀	11	12'-0"	Str.				
B2	¾"⌀	2	22'-3"	VI	16'-4"	2'-10"	3"	2½"
B3	¾"⌀	3	20'-9"	VI	15'-1"	2'-7"	3"	2½"
B4	5/8"⌀	2	19'-7"	VI	14'-3"	2'-5"	2½"	2"
B5	5/8"⌀	3	18'-0"	VI	13'-0"	2'-1"	2½"	2"
B6	5/8"⌀	3	16'-4"	VI	11'-8"	1'-9"	2½"	2"
B7	1"⌀	1	19'-5"	VI	12'-0"	4'-0"	4"	3½"
B8	1"⌀	2	19'-2"	VI	12'-0"	3'-9"	4"	3½"
B9	1"⌀	3	18'-1"	VI	11'-2"	3'-6"	4"	3½"
B10	7/8"⌀	2	16'-7"	VI	10'-0"	3'-4"	3½"	3"
B11	7/8"⌀	3	15'-3"	VI	9'-0"	3'-0"	3½"	3"
B12	1"⌀	3	12'-11"	VI	6'-10"	2'-8"	4"	3½"
B13	1"⌀	5	12'-7"	VI	6'-10"	2'-4"	4"	3½"
B14	7/8"⌀	5	11'-3"	VI	6'-2"	1'-10"	3½"	3"
B15	¾"⌀	5	9'-10"	VI	5'-4"	1'-5"	3"	2½"
B16	5/8"⌀	5	7'-10"	VI	4'-2"	9"	2½"	2"
B17	½"⌀	11	23'-8"	Str.				
B18 to B27	½"⌀	1 ea.	23'-2" by 2'-4" to 2'-2"	Str.				

WING BAR LIST ~ ABUTMENT NO. 3 (crossed out)

Mark	Size	No. Req'd	Length	Type	ℓ	m	r	t
N1	5/8"⌀	21	11'-2"	Str.				
N2	¾"⌀	4	21'-4"	VI	15'-6"	2'-9"	3"	2½"
N3	¾"⌀	4	20'-1"	VI	14'-6"	2'-6"	3"	2½"
N4	5/8"⌀	4	18'-8"	VI	13'-6"	2'-3"	2½"	2"
N5	5/8"⌀	4	17'-6"	VI	12'-6"	2'-1"	2½"	2"
N6	5/8"⌀	5	16'-0"	VI	11'-3"	1'-10"	2½"	2"
N7	1"⌀	5	20'-1"	VI	12'-9"	3'-11"	4"	3½"
N8	1"⌀	4	19'-1"	VI	12'-0"	3'-8"	4"	3½"
N9	1"⌀	4	17'-10"	VI	11'-0"	3'-5"	4"	3½"
N10	7/8"⌀	4	16'-5"	VI	10'-0"	3'-2"	3½"	3"
N11	7/8"⌀	4	15'-3"	VI	9'-0"	3'-0"	3½"	3"
N12	1"⌀	9	13'-4"	VI	7'-3"	2'-8"	4"	3½"
N13	1"⌀	8	12'-4"	VI	6'-9"	2'-2"	4"	3½"
N14	7/8"⌀	8	11'-2"	VI	6'-3"	1'-8"	3½"	3"
N15	¾"⌀	7	9'-9"	VI	5'-6"	1'-2"	3"	2½"
N16	5/8"⌀	5	8'-4"	VI	4'-6"	11"	2½"	2"
N17	5/8"⌀	5	6'-10"	VI	3'-2"	9"	2½"	2"
N18	½"⌀	11	41'-8"	Str.				
N19 to N28	½"⌀	1 ea.	40'-0" by 4'-0" to 4'-0"	Str.				

BAR LISTS ~ ABUTMENT ~~NO. 1 AND~~ NO. 3

ABUT NO. 3 Mark	No. Req'd	~~ABUT NO. 1~~ Mark	No. Req'd	Size	Length	Type	ℓ	m	r	t
R1	85	F1	81	5/8"⌀	7'-9"	Str.	~~7'-6"~~		~~3½"~~	~~3"~~
R2	85	F2	88	¾"⌀	7'-3"	Str.	~~7'-0"~~		~~3"~~	~~2½"~~
R3	38	F3	40	½"⌀	4'-0"	Str.				
R4	16	F4	22	½"⌀	40'-0"	Str.	Field	bend	where	req'd.
~~R5~~	~~4~~	~~F5~~	~~10~~	~~½"⌀~~	~~30'-0"~~	~~Str.~~				
		F6 to F10	2 ea.	½"⌀	15'-6" by 1'-6" to 21'-6"	Str.				
R11	3	F11	5	1"⌀	8'-10"	Str.	8'-6"		4"	3½"
		~~F12~~	~~8~~	~~7/8"⌀~~	~~8'-2"~~	~~Str.~~	~~7'-0"~~		~~3½"~~	~~3"~~
~~R13~~	~~3~~	~~F13~~	~~8~~	~~¾"⌀~~	~~7'-0"~~	~~Str.~~				
		~~F14~~	~~5~~	~~¾"⌀~~	~~6'-6"~~	~~Str.~~				
~~R15~~	~~24~~	~~F15~~	~~4~~	~~5/8"⌀~~	~~5'-10"~~	~~Str.~~				
		~~F16~~	~~9~~	~~5/8"⌀~~	~~6'-9"~~	~~Str.~~				
		~~F17~~	~~9~~	~~5/8"⌀~~	~~6'-9"~~	~~Str.~~				
R18	2	R18	67	½"⌀	3'-0"	Str.				
~~R6~~	~~44~~			~~¾"⌀~~	~~7'-8"~~	~~Str.~~				
~~R7~~	~~7~~			~~¾"⌀~~	~~7'-2"~~	~~Str.~~	~~6'-4"~~		~~3"~~	~~3½"~~
~~R8~~	~~13~~			~~5/8"⌀~~	~~6'-4"~~	~~Str.~~	~~5'-6"~~		~~2½"~~	~~2"~~
~~R9~~	~~6~~			~~5/8"⌀~~	~~5'-7"~~	~~Str.~~	~~4'-9"~~		~~2½"~~	~~2"~~
R19 to R26	2 ea.			½"⌀	21'-0" by 9" to 26'-3"	Str.	Field	Bend		
K1	51	~~A1~~	~~50~~	7/8"⌀	23'-4"	VI	17'-0"	4'-0"	3½"	3"
K2	50	~~A2~~	~~50~~	1"⌀	15'-7"	VI	10'-2"	3'-0"	4"	3½"
K3	50	~~A3~~	~~49~~	1"⌀	9'-1"	VI	5'-0"	1'-8"	4"	3½"
K4	34	~~A4~~	~~34~~	½"⌀	29'-3"	Str.	Field	bend	where	req'd.
K5	8	~~A5~~	~~6~~	½"⌀	12'-2"	VII	4'-8"	2'-11"	2"	2"
K6	8	~~A6~~	~~9~~	½"⌀	12'-8"	VII	4'-10"	2'-11"	2"	2"
K7	9	~~A7~~	~~8~~	½"⌀	12'-10"	VII	5'-0"	2'-11"	2"	2"
K8	8	~~A8~~	~~9~~	½"⌀	13'-0"	VII	5'-2"	2'-11"	2"	2"
K9	7	~~A9~~	~~7~~	½"⌀	13'-2"	VII	5'-4"	2'-11"	2"	2"
K10	4	~~A10~~	~~5~~	½"⌀	8'-6"	VIII	5'-10"		2"	2"
K11	13	~~A11~~	~~12~~	½"⌀	9'-2"	VIII	6'-6"		2"	2"
K12	11	~~A12~~	~~11~~	½"⌀	40'-0"	Str.				
		~~A13~~	~~5~~	½"⌀	5'-6"	Str.				
		~~A14~~	~~1~~	½"⌀	4'-2"	Str.				
		~~A15~~	~~6~~	½"⌀	13'-4"	Str.				
		~~A16~~	~~1~~	½"⌀	11'-2"	Str.				
K13	5			½"⌀	6'-0"	Str.				
K14	1			½"⌀	3'-0"	Str.				
K15	6			½"⌀	14'-6"	Str.				
K16	1			½"⌀	12'-10"	Str.				

BAR SUMMARY ~ ABUTMENT NO. 3

3409 Lin. Ft. ½"⌀ @ 0.668# Per Lin. Ft. = 2,277 Lb.
~~5/8"⌀ @ 1.043#~~
617 " " ¾"⌀ @ 1.502# " " " = 926 Lb.
1,849 " " 7/8"⌀ @ 2.044# " " " = 3,779 Lb.
1,260 " " 1"⌀ @ 2.670# " " " = 3,364 Lb.
Total = 10,346 Lb.

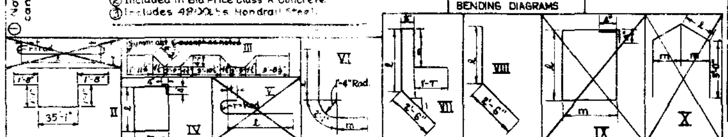
BAR SUMMARY ~ ABUTMENT NO. 1 (crossed out)

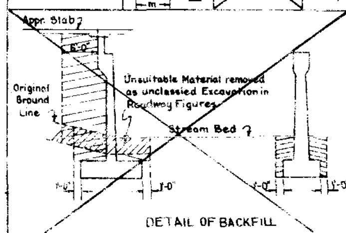
4178 Lin. Ft. ½"⌀ @ 0.668# Per Lin. Ft. = 2791
458 " " 5/8"⌀ @ 1.043# " " " = 478
999 " " ¾"⌀ @ 1.502# " " " = 1500
2210 " " 7/8"⌀ @ 2.044# " " " = 4517
1528 " " 1"⌀ @ 2.670# " " " = 4080
58 " " 1"⌀ @ 3.400# " " " = 197
±1% Overrun = 137
Total = 13,700#

BAR SUMMARY ~ PIER NO. 2 (crossed out)

2546 Lin. Ft. 5/8"⌀ @ 1.043# per lin. ft. = 2655#
1945 " " ½"⌀ @ 0.668# " " = 1299
±1% Overrun 56
Total 3,990#

BENDING DIAGRAMS





DETAIL OF BACKFILL

GENERAL NOTES (CONT'D) (crossed out)

CONTRACTORS ATTENTION IS CALLED TO SPECIFICATIONS COVERING MECHANICAL TAMPING: EARTH SHALL BE PLACED IN 6" LAYERS, SLOPING UP TO WALL ON A MINIMUM SLOPE OF 4:1. MECHANICAL TAMPING OF EACH LAYER SHALL START ALONG WALL AND CONTINUE AWAY FROM WALL. ABOVE THE ORIGINAL GROUND LINE, MECHANICAL TAMPING SHALL BE DONE TO A DISTANCE OF 6 FT. FROM THE WALL (SEE MECH. TAMPING DIAGRAM)

ROLLING EQUIPMENT SHALL NOT BE USED WITHIN 6 FT. OF WALLS.

HANDRAIL BOLTS SHALL HAVE HEX HEADS HEX HEADS AND NUTS WITH LOCK WASHERS UNLESS OTHERWISE SPECIFIED.

REFERENCE DRAWINGS

Sheet No.	
	General Layout, Bar Lists & Summary of Quantities
" "	Details of Superstructure
" "	" " "
~~" 16~~	~~" " Abutment No. 1~~
" "	" " Abutment No. 3
~~" 17~~	~~" " Pier No. 2~~

When Treated Timber Piling is shown on the Plans, the preservative shall be Creosote Oil.

GENERAL NOTES

ALL WORK SHALL BE DONE ACCORDING TO THE STANDARD SPECIFICATIONS OF THE COLORADO STATE HIGHWAY DEPARTMENT, APPLICABLE TO THE *PROJECT*.

ALL CONCRETE SHALL BE CLASS "A".

HIGH TENSILE BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTORS OPTION. BOLTS SHALL BE FURNISHED IN THE AMOUNT OF FIVE PERCENT IN EXCESS OF THE NOMINAL NUMBER REQUIRED FOR EACH SIZE AND LENGTH.

CONCRETE GIRDERS, FLOOR SLABS AND CURB SHALL BE POURED MONOLITHICALLY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO THE ROCK AND NOT FORMED.

ALL REINFORCING BARS SHALL BE DEFORMED AND TAGGED WITH THE STATION NUMBER AND LETTER DESIGNATION. MAIN BARS SHALL NOT BE SPLICED.

SOUNDINGS AND DEPTH OF FOOTINGS SHOWN ARE ACCORDING TO THE BEST AVAILABLE DATA. IF ESSENTIALLY DIFFERENT CONDITIONS ARE ENCOUNTERED THE BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.

ALL RIVETS TO BE ¾ DIA. ALL RIVETS TO BE POWER DRIVEN.

ALL REINFORCING STEEL TO BE INTERMEDIATE GRADE.

FOR DETAILS OF STRUCTURAL EXCAVATION AND STRUCTURAL BACKFILL, SEE STD. M-16-A.

ALL CONCRETE SURFACES MARKED WITH THE SYMBOL *f* AS SHOWN ON SHEET No. ___ SHALL RECEIVE CLASS "I" SURFACE FINISH.

Welding shall conform to the latest edition of the AWS standard specifications for welding Highway Bridges. All Struct. Steel not otherwise noted shall be A.S.T.M. A36-62T. All Struct. Steel shall be painted in accordance with Item 38 for Alum. Paint.

STRUCTURE NO. H-17-AH

LOADING DATA.

LIVE LOAD A.A.S.H.O. HS 20-44

DEAD LOAD—ASSUMES 16 LBS. PER SQ. FT. ADDITIONAL WEARING SURFACE WHICH INCLUDES THE ½ INCH CONCRETE MONOLITHIC WEARING SURFACE SHOWN.

DESIGNING DATA.

A.A.S.H.O.

f'c = 1200 lbs. per sq. in.

A-36 fs = 20000 " " " " (Str. & Reinf.)

n = 10

Str. Stl. fs = 18000 lbs. "

COLORADO
STATE HIGHWAY DEPARTMENT

CONCRETE & I BEAM BRIDGE
2 SPANS @ 59'-2"
GENERAL LAYOUT, BAR LISTS AND SUMMARY OF QUANTITIES
REPLACE 1 SPAN @ 59'-2"

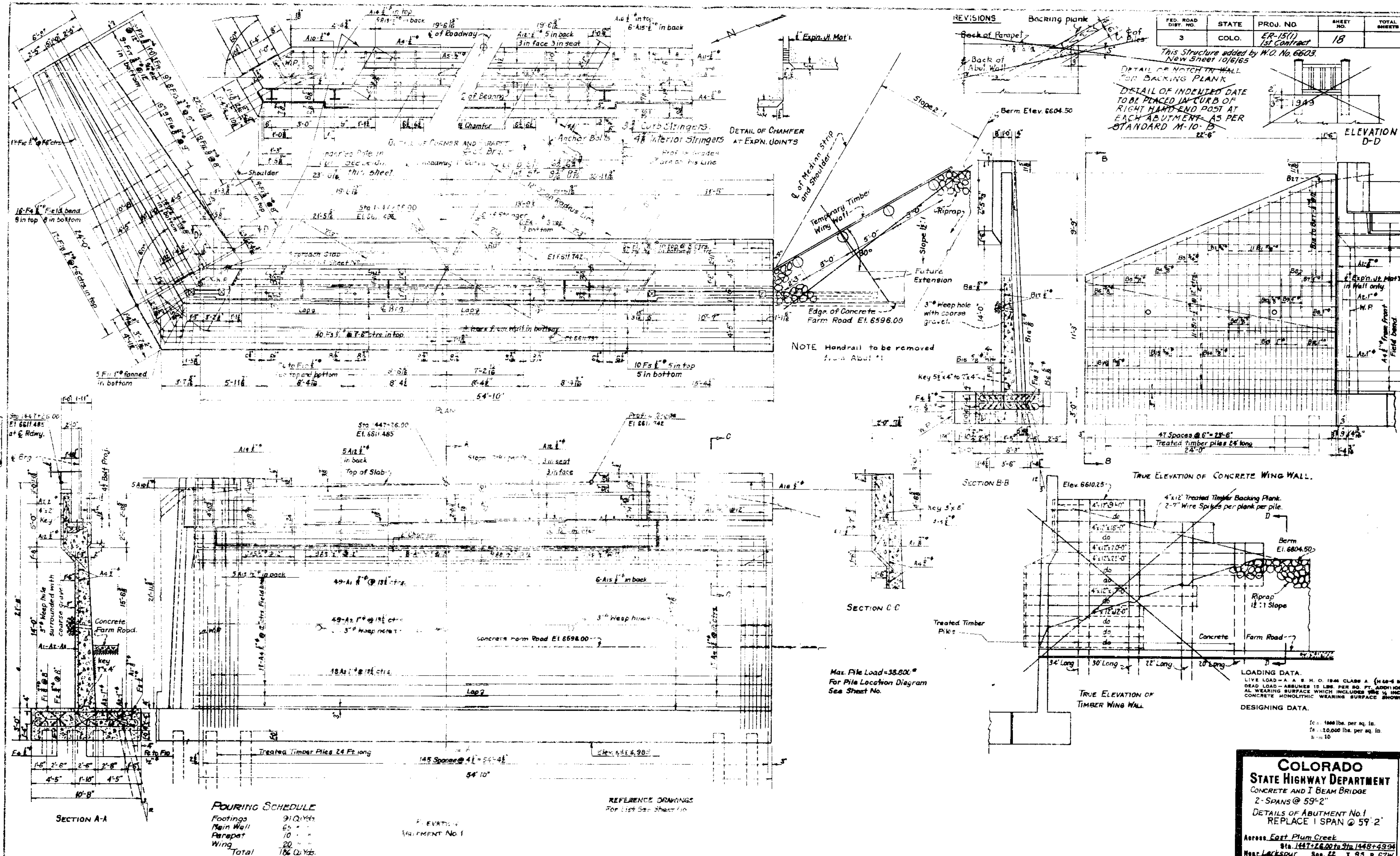
Across EAST PLUM CREEK
Sta. 1447+26.00 to Sta. 1448+49.94
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by H.W.V.	Approved by [signature] Bridge Engineer
Made by H.W.V.	
Checked by	Date: Aug. 31, 1965

TRIM LINE

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-15(1) 1st Contract	18	

This Structure added by W.O. No. 6603.
New Sheet 10/6/65



POURING SCHEDULE

Footings	91 Cu.Yds.
Main Wall	65 " "
Parapet	10 " "
Wing	20 " "
Total	186 Cu.Yds.

Max. Pile Load = 38,600#
For Pile Location Diagram See Sheet No.

REFERENCE DRAWINGS
For List See Sheet No.

LOADING DATA.
LIVE LOAD — A. A. S. H. O. 1944 CLASS A (H-20-S 16-44)
DEAD LOAD — ASSUMES 15 LBS. PER SQ. FT. ADDITIONAL WEARING SURFACE WHICH INCLUDES THE ½ INCH CONCRETE MONOLITHIC WEARING SURFACE SHOWN.

DESIGNING DATA.
fc = 1000 lbs. per sq. in.
fs = 20,000 lbs. per sq. in.
n = 10

COLORADO
STATE HIGHWAY DEPARTMENT
CONCRETE AND I BEAM BRIDGE
2-SPANS @ 59'-2"
DETAILS OF ABUTMENT No. 1
REPLACE 1 SPAN @ 59'-2"

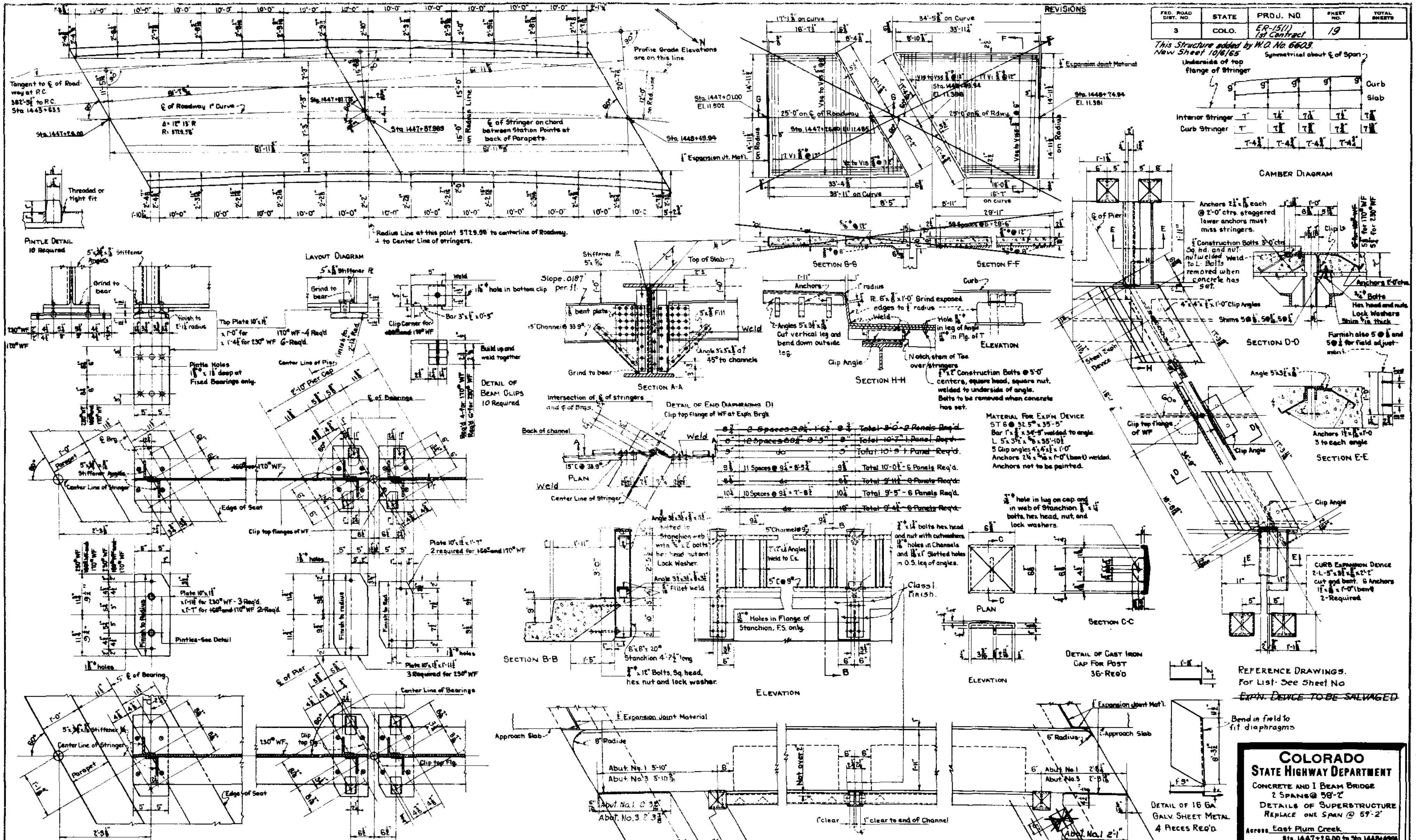
Across East Plum Creek
Sta. 1447+26.00 to Sta. 1448+49.94
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by H.W.V. | Approved by: [signature] Bridge Engineer
Made by H.W.V. | Date: Aug. 31, 1953
Checked by

STRUCTURE NO. N. Brd. H-17-RH

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-15(1) 1st Contract	19	

This Structure added by W.O. No. 6603.
New Sheet 10/6/65



DETAILS OF FIXED BEARINGS
3 Required for 230# WF
2 Required for 160# and 170# WF

DETAILS OF EXPANSION BEARINGS
3 Required for 230# WF
2 Required for 160# and 170# WF

Furnish 20 Anchor Bolts 1"⌀ x 1'-6" Square Heads, Hex Nuts.

NOTE: Sole Plates May Be Welded To WF Beams In Lieu of Rivets.

PLAN
DETAILS OF HANDRAILS-POSTS & CURB

~~HANDRAIL FOR SPAN 2 TO BE SALVAGED~~

STRUCTURE NO. N. Brnd. H-17-AH

COLORADO
STATE HIGHWAY DEPARTMENT

CONCRETE AND I BEAM BRIDGE
2 SPANS @ 58'-2"
DETAILS OF SUPERSTRUCTURE
REPLACE ONE SPAN @ 59'-2"

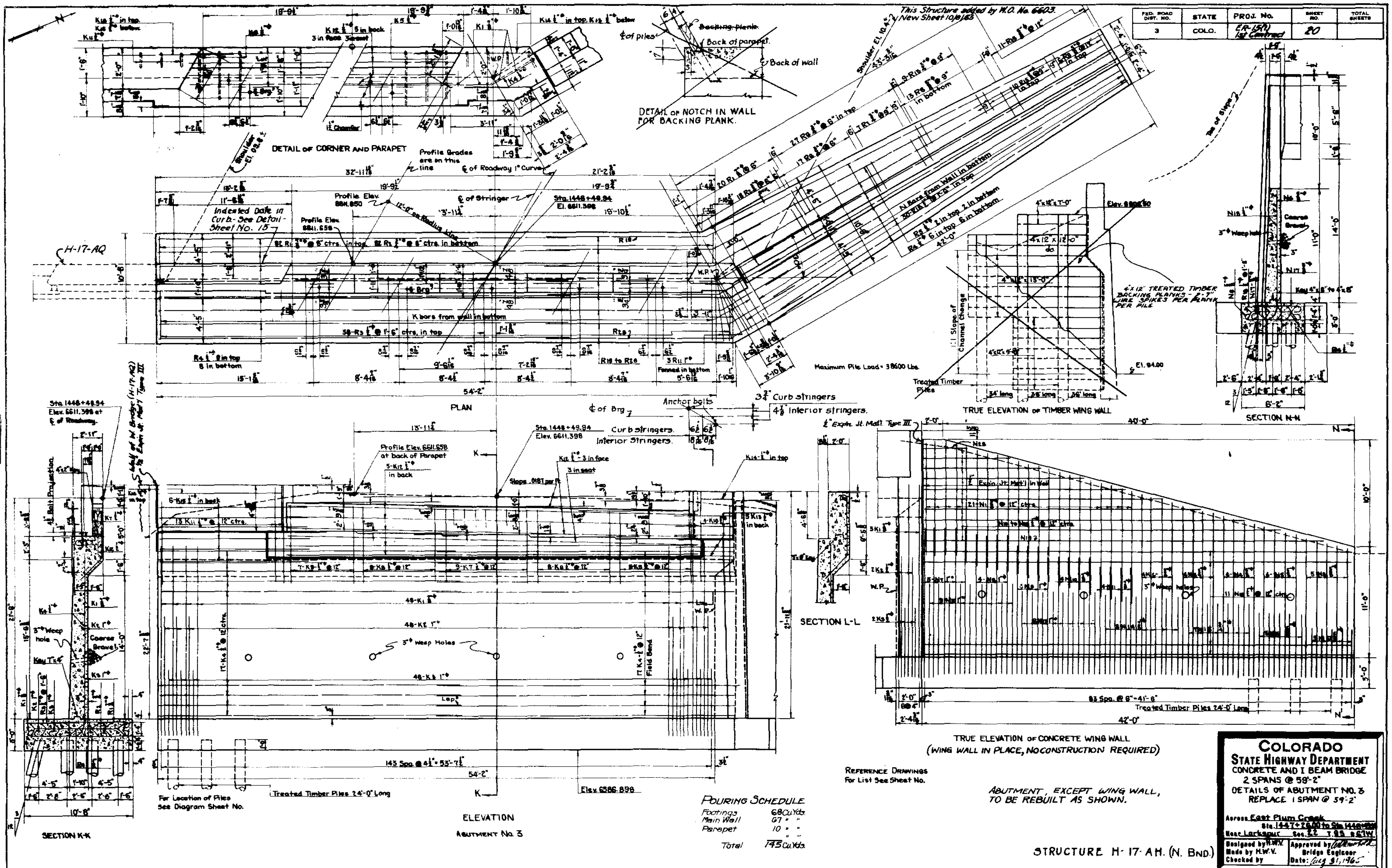
Across East Plum Creek
Sta. 1447+26.00 to Sta. 1448+49.94
Near Larkspur Sec. 22 T. 9 S. R. 67 W.

Designed by H.W.V.	Approved by [signature]
Made by H.W.V.	Bridge Engineer
Checked by	Date: Aug 31, 1965

TRIM LINE

FED. ROAD DIST. NO.	STATE	PROJ. No.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-15(1) 1st Contract	20	

This Structure added by W.O. No. 6603. New Sheet 10/8/65



POURING SCHEDULE

Footings	68 Cu.Yds.
Main Wall	67 " "
Parapet	10 " "
Total	145 Cu.Yds.

STRUCTURE H-17-AH. (N. BND.)

COLORADO
STATE HIGHWAY DEPARTMENT
CONCRETE AND I BEAM BRIDGE
2 SPANS @ 59'-2"
DETAILS OF ABUTMENT NO. 3
REPLACE 1 SPAN @ 59'-2"

Across East Plum Creek
Sta. 1447+26.00 to Sta. 1448+[illegible]
Near Larkspur Sec. 22 T. 9 S. R. 67 W.

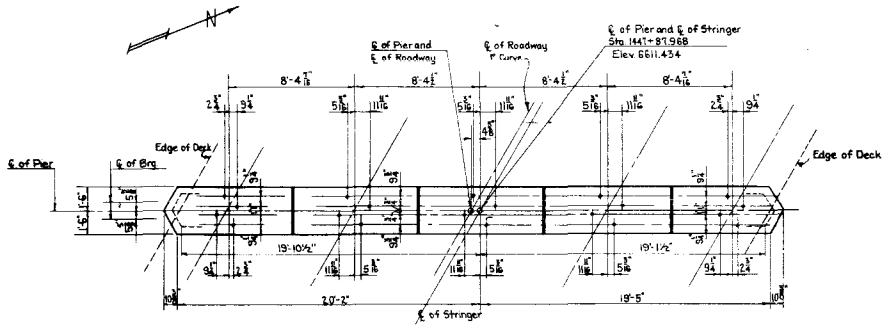
Designed by H.W.V. Approved by [signature]
Made by H.W.V. Bridge Engineer
Checked by Date: Aug 31, 1965

TRIM LINE

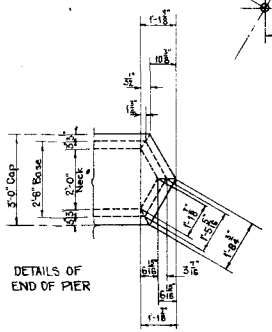
FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-151(1) 1st Contract	21	

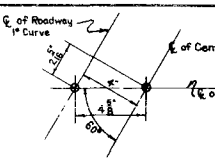
REVISIONS
Revised March 3, 1966 See sheet No 21A for Pier Cap Revision F.L.

This Structure added by W.O. No 6603. New Sheet 10/6/65



PLAN OF CAP





Note: Repair Bearing seats and anchor bolts for Span #2 girders.

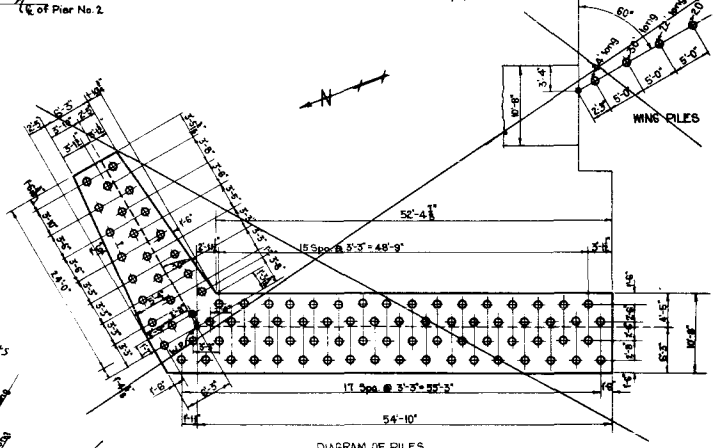
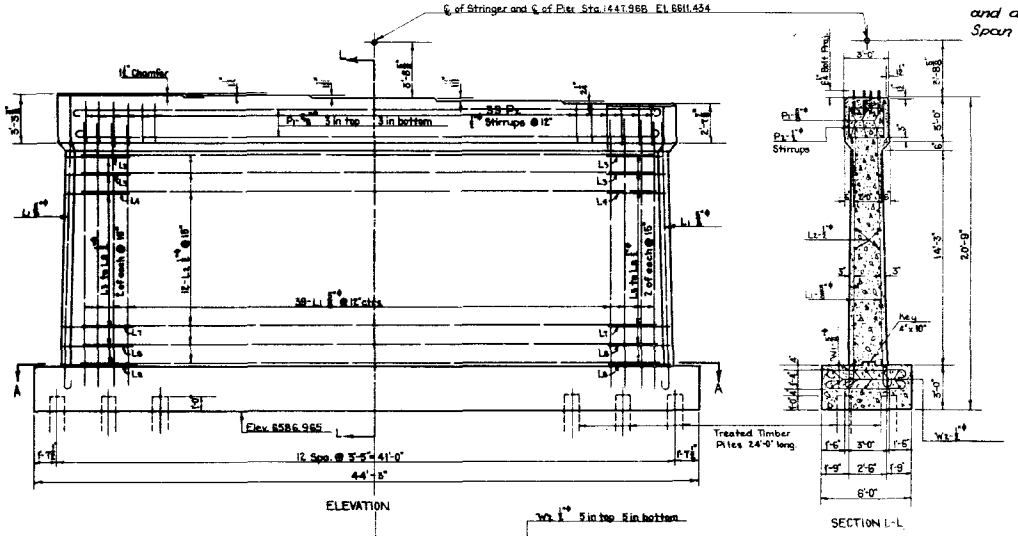


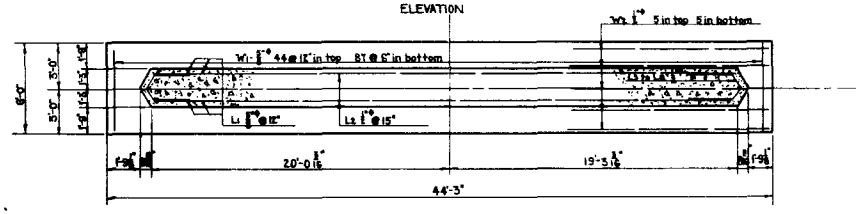
DIAGRAM OF PILES
ABUTMENT NO. 1

91 Piles 24'-0" long
1 Pile 34'-0" long
1 Pile 30'-0" long
1 Pile 22'-0" long
1 Pile 20'-0" long

Max. Pile Load = 38600#



ELEVATION



PLAN OF PIER AT A-A

Maximum Pile Load = 37800#

POURING SCHEDULE

Footings	30 Cu Yds
Stem and Cap	63 " "
Total	93 Cu Yds

REFERENCE DRAWINGS
For List See Sheet No. 12.

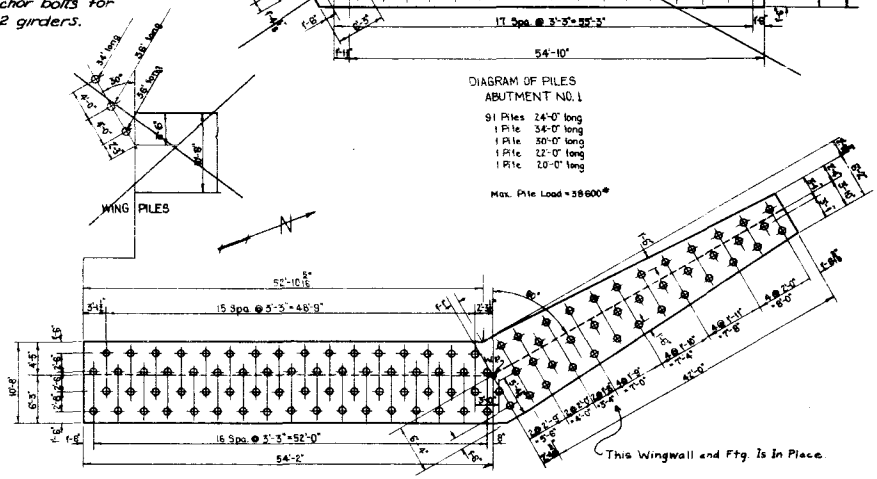
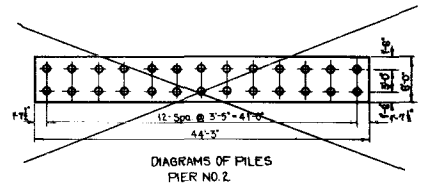


DIAGRAM OF PILES
ABUTMENT NO. 3
*105 Piles - 24'-0" Long

Maximum Pile Load = 38600

* All or Some of Abut #3 Piles Are Possibly In Place.



DIAGRAMS OF PILES
PIER NO. 2

26 Piles - 24'-0" Long
Maximum Load 37800#

COLORADO
STATE HIGHWAY DEPARTMENT

CONCRETE ℄ I BEAM BRIDGE
2 SPANS @ 59'-2"
DETAILS OF PIER NO. 2 & PILE DIAGRAMS
REPLACE 1 SPAN @ 59'-2"
Across EAST PLUM CREEK
Sta. 1447+28.00 to Sta. 1448+88.00
Near Larkspur Sec. 22, T. 9S, R. 67W

Designed by H.W.V.
Made by H.W.V.
Checked by

Approved by [signature]
Bridge Engineer
Date: Aug. 31, 1965

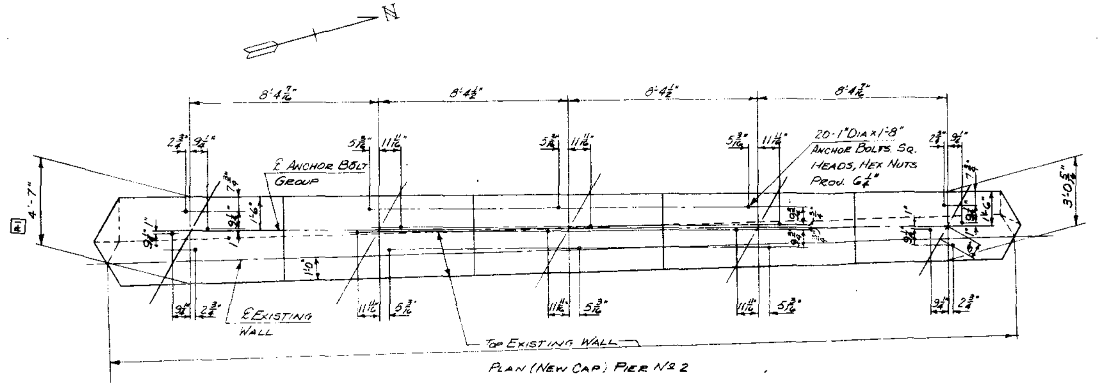
N. Brnd.
STRUCTURE NO. H-17-AH

TRIM LINE

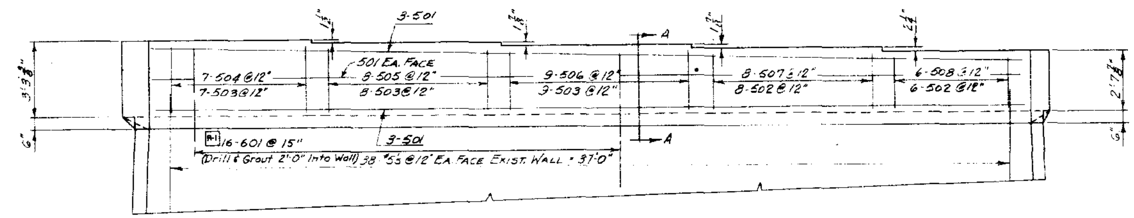
REVISIONS

New Sheet - 9-3-66 J.R.E
New Pier Cap
R-1 Revised 3-15-66 DHB
Added 509 & 601 And
Changed Dimensions

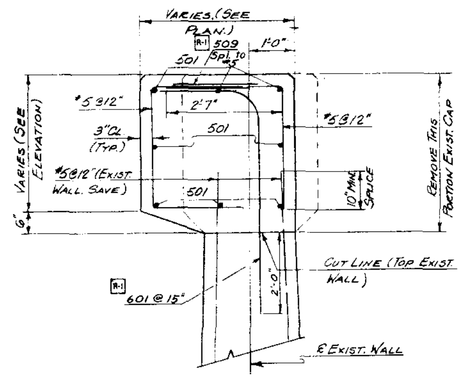
Fed. Road Reg. No.	Division	Project No.	Sheet No.	Total Sheets
9	Colo.	ER 15 (1) First Contract	21 A	



Plan (New Cap) Pier Nº 2



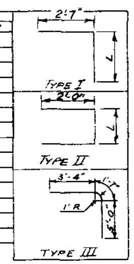
Elevation (New Cap) Pier Nº 2



Section A-A

Bar List

Mark	Size	No. Req'd.	Length	Type	Dim's. L	M	N	P
501	5/8"φ	8	39'-0"	Str.				
502		14	5'-7"	I	3'-0"			
503		24	5'-11"	I	3'-4"			
504		7	7'-0"	II	3'-0"			
505		8	6'-10"	II	2'-10"			
506		9	6'-8"	II	2'-8"			
507		8	6'-6"	II	2'-6"			
508	5/8"φ	6	6'-4"	II	2'-4"			
R-1 509	5/8"φ	20	2'-0"	Str.				
R-1 601	3/4"φ	16	9'-11"	III				



Dimensions are out to out of bars

Bar Summary

823 Lin. Ft. 5/8"φ @ 1.043 Lb./Lin. Ft. = 858 Lb.
159 Lin. Ft. 3/4"φ @ 1.502 Lb./Lin. Ft. = 239 Lb.
Total = 1097 Lb.

Item No.	Description	Unit	Quantity
11	Removal Of Portions Of Bridge	L.S.	L.S.
R-1 46	Class "A" Conc.	Cu. Yd.	19
R-1 47	Reinf. Steel	Lb.	1097
48	Struct. Steel *	Lb.	98

* 20-1" Dia. x 1'-8" Sq. Hd. Bolts With Hex. Nuts

Structure No. H-17-AH

Department of Highways
State of Colorado
Changes Pier Nº 2

Across East Plum Creek
Sta. [illegible]
Near Larkspur Sec. 22 T. 9S R. 67W

Designed by EPS
Made by JRE
Checked by

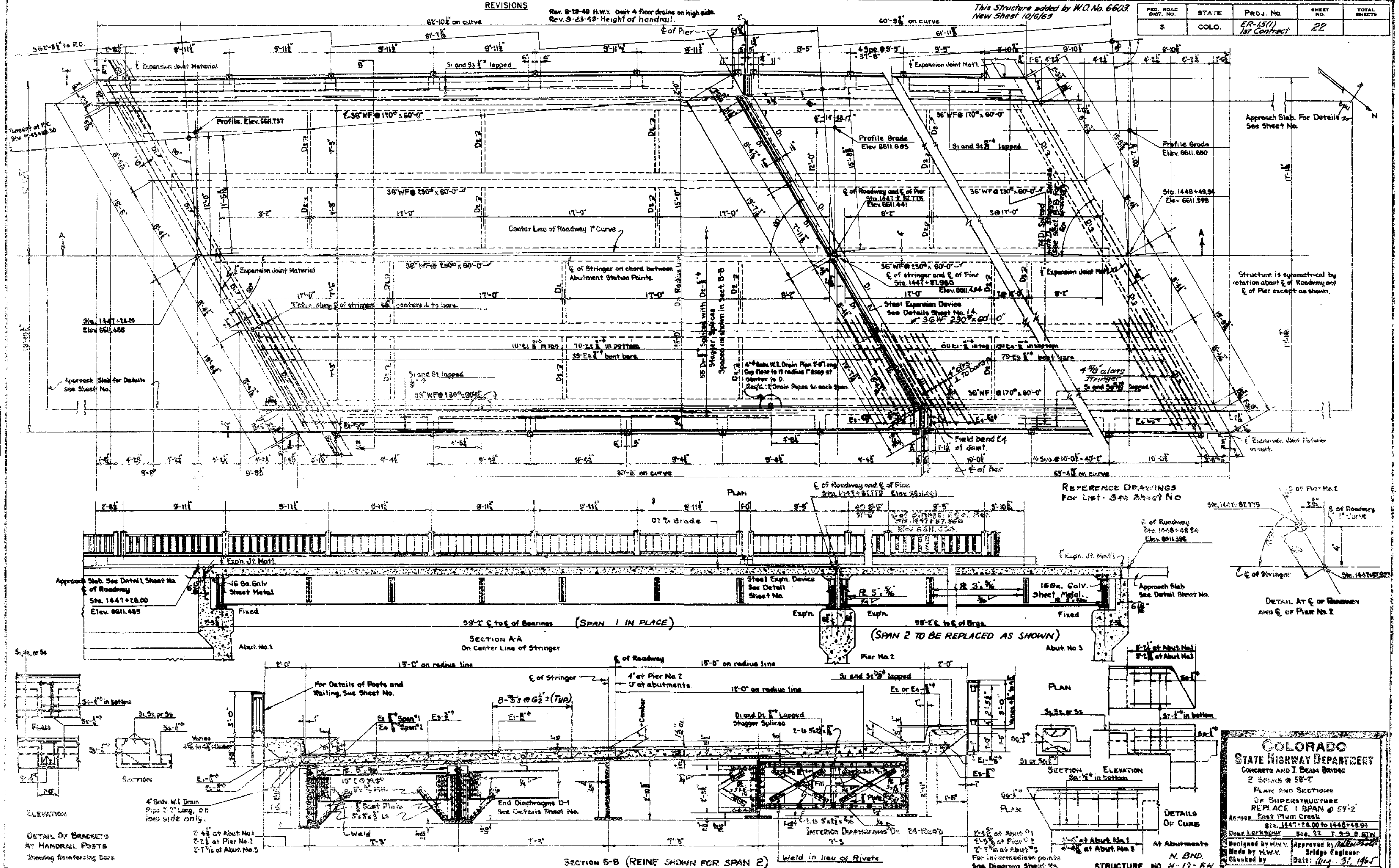
Approved by
Bridge Engineer
Date: 19

FED. ROAD DIST. NO.	STATE	PROJ. No.	SHEET NO.	TOTAL SHEETS
3	COLO.	ER-15(1) 1st Contract	22	

REVISIONS

Rev. 9-29-49 H.W.V. Omit 4 floor drains on high side.
Rev. 9-23-49 Height of handrail.

This Structure added by W.O. No. 6603. New Sheet 10/6/65



COLORADO
STATE HIGHWAY DEPARTMENT
CONCRETE AND I. BEAM BRIDGE
2 SPANS @ 58'-2"
PLAN AND SECTIONS
OF SUPERSTRUCTURE
REPLACE 1 SPAN @ 59'-2"
Across East Plum Creek
Sta. 1447+26.00 to 1448+49.94
Near Larkspur Sec. 22 T. 9-S R. 67 W

Designed by H.W.V.
Made by H.W.V.
Checked by
Approved by [signature]
Bridge Engineer
Date: Aug. 31, 1965

STRUCTURE NO. H-17-RH

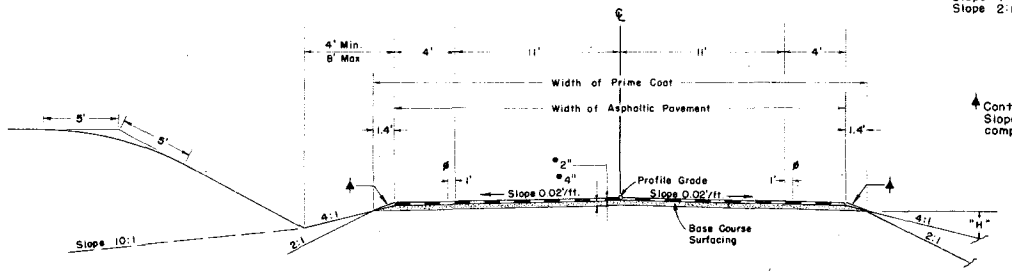
Rev. 11-12-65, M.E.V., Added this sheet (Work Order No. 544)

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	ER 15 (1) FIRST CONTRACT	23	

TYPICAL SECTIONS OF IMPROVEMENTS

NOTE:
See Standard M-2-A for detail of Cut Slope Treatment, Flaring & Widening.

SO. LAKE GULCH ROAD (County Road)



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

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

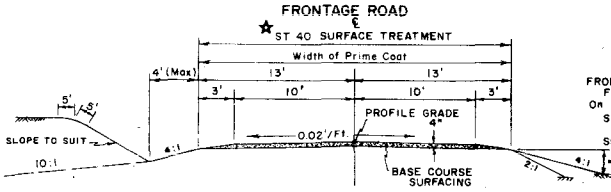
Location of 2" Wide Solid White Painted Stripe (By State Forces)

*Approximate Thickness

FILL SLOPES
ON CURVES:
Slope 4:1 where "H" is 5' or less.
Slope 2:1 where "H" is over 5'.
ON TANGENTS:
Slope 4:1 where "H" is 3' or less.
Slope 2:1 where "H" is over 3'.

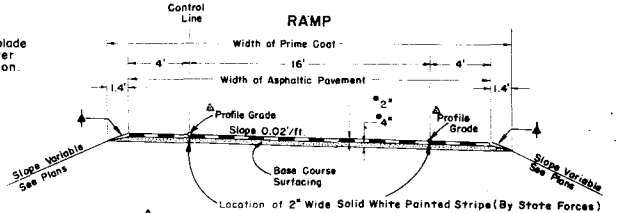
▲Contractor will be required to blade Slope Material to this line after completion of Paving Operation.

FRONTAGE ROAD



FRONTAGE ROAD FILL SLOPES
On Curves & Tangents,
Slope 4:1 where "H" is 3' or less,
Slope 2:1 where "H" is over 3'.

RAMP



▲Profile Grade is on Control Line shown on Intersection Details

*Approximate Thickness

Approximate 6" compacted thickness of gravel or crushed rock surfacing shall be placed in separate courses at the following rates per 100 lin. ft. of Road-ay

	FR. RD.	RDWY	RAMPS	
ASPHALTIC PAVEMENT		36'	29'	TONS/STA.
BASE COURSE SURFACING	51'	70'	57'	TONS/STA.

★ 957+ - 972+40 } S.E. FR. RD.
0+00 - 13+04.4 } SOUTH OF COUNTY LINE

★ 0+00 - 35+20 FR. RD. SOUTH OF GREENLAND

GENERAL NOTES

This project is to be constructed in conformity with the Standard Specifications of the Colorado Department of Highways, adopted January 1, 1958.

The seed for this Project shall consist of a combined mixture of 3 Lb. Crested Wheat grass, 2 Lb. Yellow Sweet Clover & 1 Lb. sand dropseed applied at 6 Lbs. per Acre.

Approximate location and quantities involved in construction of intercepting ditches are tabulated in Summary of Earthwork quantities Tabulation.

All quantities on preliminary plans are to be considered approximate only.

All poles encroaching on construction are to be moved by the owners.

For preliminary plan quantities of Asphaltic Road Materials and Stone Screenings the following rates were used:

Prime Coat MC	@ 0.40 Gal. per Sq. Yd.
Paving Asphalt (85-100 Penetration)	@ 6.82 Lbs./Sq. Yd. per inch thickness.
ST-40: 1st Application RC	@ 0.25 Gal. per Sq. Yd.
2nd Application RC	@ 0.25 Gal. per Sq. Yd.
1st Application, Stone Screenings, Type 1	@ 25 Lbs. per Sq. Yd.
2nd Application, Stone Screenings, Type 2	@ 15 Lbs. per Sq. Yd.

Rate of application and grade of Asphaltic Material shall be as determined by the Engineer at time of application.

Application methods for liquid asphaltic road materials which result in the discoloration of Combination Curb & Gutter or Concrete Sidewalk will not be permitted.

Thickness of surfacing and asphaltic pavement materials, as shown on plans is approximate only. These materials are to be placed on the basis of tonnages shown on plans or as directed by the Engineer.

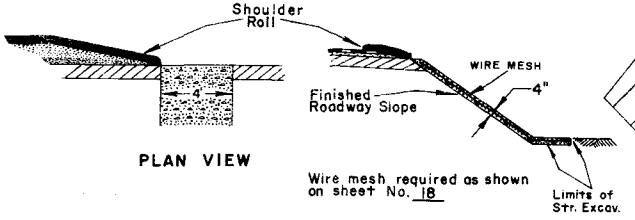
During construction of this project traffic will use the present traveled roadway except where detour is shown on plans.

Class "A" Aggregate may be substituted for Pavement Aggregate.

It is estimated that old road is to be obliterated at the following locations: Sta. 1162+ to Sta. 1169+ Rt.

DETAILS CONCRETE SLOPE & DITCH PAVING FOR EMBANKMENT PROTECTORS

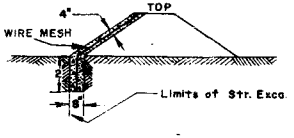
FOR LOCATION SEE TABULATION OF ASPHALTIC SHOULDER ROLL



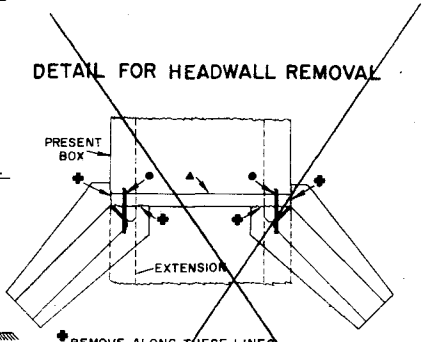
PLAN VIEW

Wire mesh required as shown on sheet No. 18

DETAIL CONCRETE SLOPE PAVING FOR FACE OF DIKE



DETAIL FOR HEADWALL REMOVAL



✚ REMOVE ALONG THESE LINES

▲ THIS HEADWALL IS TO BE REMOVED WHEN FILL OVER HEADWALL IS LESS THAN 1 FT.

●2 FT. REINFORCING BARS TO BE PLACED AT EVERY LONGITUDINAL BAR SHOWN ON THE STANDARD. SIZE TO BE SAME AS LONGITUDINAL BARS.

TIE BARS ARE TO BE GROUTED IN PLACE BY A CEMENT GROUT COMPOSED OF ONE PART CEMENT AND TWO PARTS CLEAN WELL GRADED SAND.

THE COST OF DRILLING HOLES AND PLACING TIE BARS IS TO BE INCLUDED IN PAVEMENT FOR "REMOVAL OF HEADWALLS."

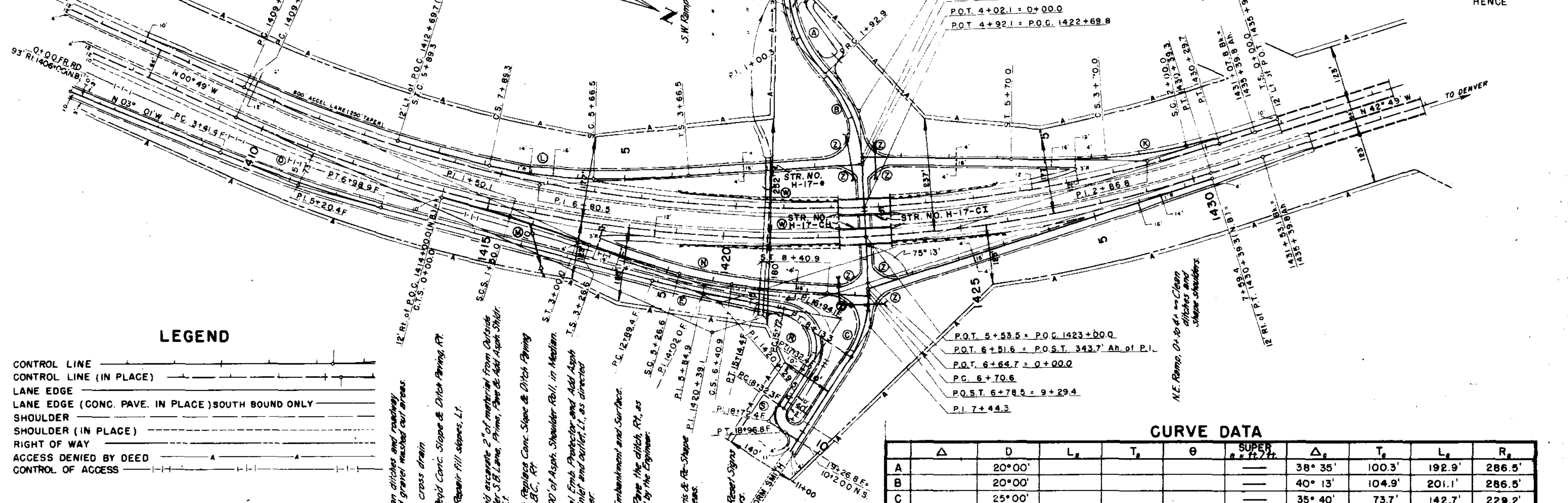
ADO DEPARTMENT OF HIGHWAYS
. D. H 126
R 1956

Rev. 11-12-65, M.E.V., Added this sheet (Work Order No. 544)

FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO	TOTAL SHEETS
9	COLORADO	ER 15 (1) 1st Contract	24	

NOTE: For main roadway grades, see Project No. I 25-2(39)163

LAYOUT & DETAILS OF INTERSECTION, STA. 1422+
SO. LAKE GULCH ROAD

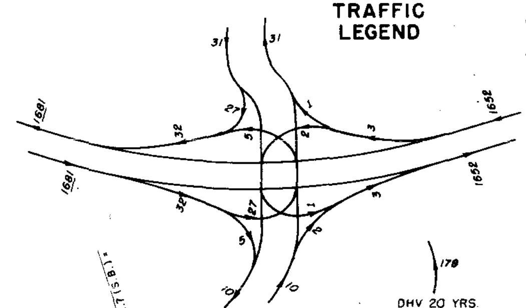


S.W. Ramp, 1+ — Extend Slope Paving 50' and Shldr. Roll 70', Rt., as directed by the Engineer.
" , 2+ — Remove & Replace Wing of C.B.C. and fill between the Wing Footers and Conc. Slope Paving, Rt.
" , 2+ — Clean Ditch, Lt.

N.W. Ramp, 4+ to 8+ — Repair slopes, clean ditches and shape the shoulders.

N.E. Ramp, 0+ to 4+ — Clean ditches and shape shoulders.

TRAFFIC LEGEND



DHV 20 YRS. HENCE

LEGEND

CONTROL LINE
CONTROL LINE (IN PLACE)
LANE EDGE
LANE EDGE (CONC. PAVE. IN PLACE) SOUTH BOUND ONLY
SHOULDER
SHOULDER (IN PLACE)
RIGHT OF WAY
ACCESS DENIED BY DEED
CONTROL OF ACCESS

Frontage Road, 0+ to 11+ — Clean ditches and roadway and gravel washed out areas.
" , 10+ — Clean cross drain.
" , 11+ to 13+ — Req'd Conc. Slope & Ditch Paving, Rt.
" , 15+ to 17+ — Repair fill slopes, Lt.

Main Line, 1416+ to 1427+ — Req'd excavate 2" of material from Outside Shoulder S.B. Lane, Prime, Pave & Add Asph. Shldr. Roll, Lt.
" , 1420+ — Remove & Replace Conc. Slope & Ditch Paving at inlet to C.B.C., Rt.
" , 1421+ — Replace 100' of Asph. Shoulder Roll in Median.
" , 1424+ — Reset Metal Emb. Protector and Add Asph. Material at inlet and outlet, Lt., as directed by the Engineer.

S.E. Ramp, 7+ to 9+ — Make Embankment and Surface.
" , 7+ to 9+ — Asph. Pave the ditch, Rt., as directed by the Engineer.

Entire Interchange — Clean Debris & Re-Shape Borrow Areas.
" State Forces — Remove & Reset Signs & Delineators.

CURVE DATA

	Δ	D	L_s	T_s	θ	SUPER e = ft./ft.	Δ_c	T_c	L_c	R_c
A		20°00'				—	38° 35'	100.3'	192.9'	286.5'
B		20°00'				—	40° 13'	104.9'	201.1'	286.5'
C		25°00'				—	35° 40'	73.7'	142.7'	229.2'
D		2° 00'					7° 09'	179.0'	357.6'	2865.0'
E		2°00'					4° 30'	112.6'	225.0'	2865.0'
K	18° 30'	5°00'	200.0'	286.8'	5°00'	0.015	8° 30'	85.2'	170.0'	1146.0'
L	21° 07'	5°00'	200.0'	314.0'	5°00'	0.015	11° 07'	111.5'	222.8'	1146.0'
M	4° 30'	3°00'	150.0'	150.1'	2° 15'	0.015				
N	15° 43'	5°00'	200.0'	258.3'	5°00'	0.044	5°43'	57.2'	114.3'	1146.0'
R		70°00'					112° 18'	122.1'	160.4'	81.9'
S		139° 45'					90°00'	41.0'	64.4'	41.0'
W		2°00'					42° 00'	1099.8'	2100.0'	2865.0'
Z										60.0'

Rev. 11-12-65, M.E.V., Added this sheet (Work Order No. 544)

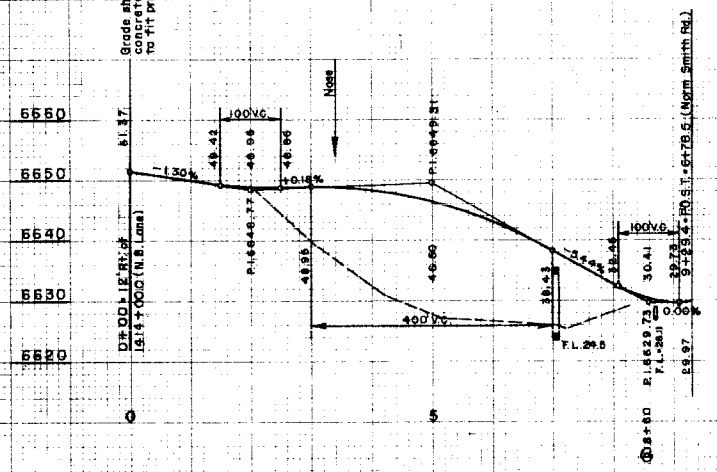
FEDERAL ROAD DIVISION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
8	COLORADO	ER 15 (1) 1st Contract	25	

SO. LAKE GULCH ROAD

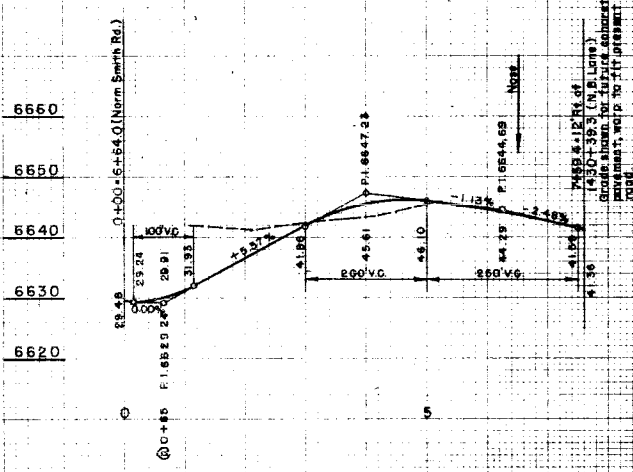
RAMP GRADES

STA. 1422+ (MAINLINE)

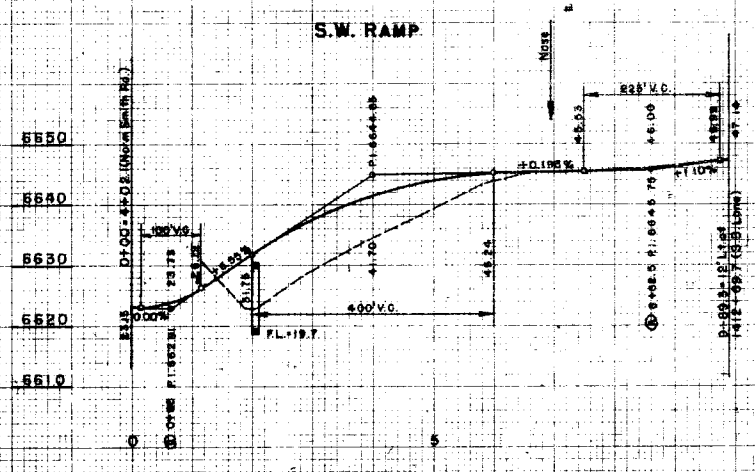
S.E. RAMP



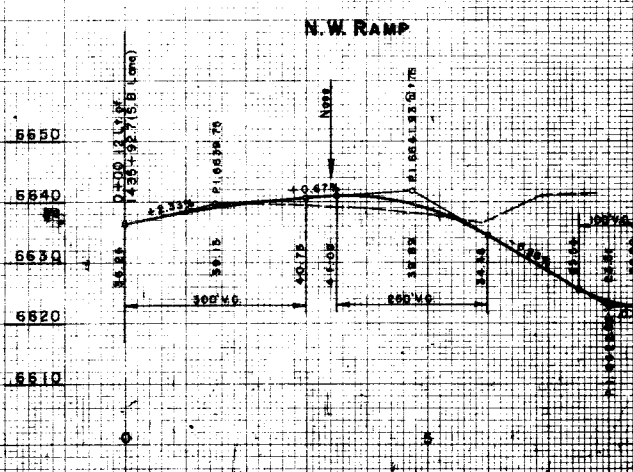
N.E. RAMP



S.W. RAMP



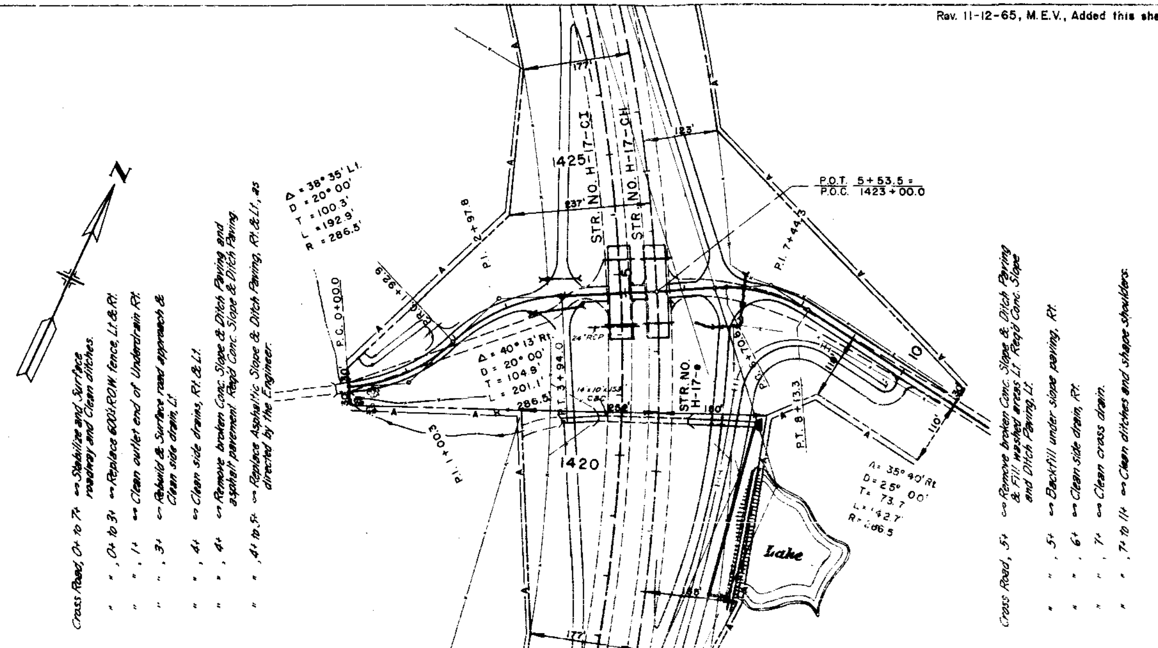
N.W. RAMP

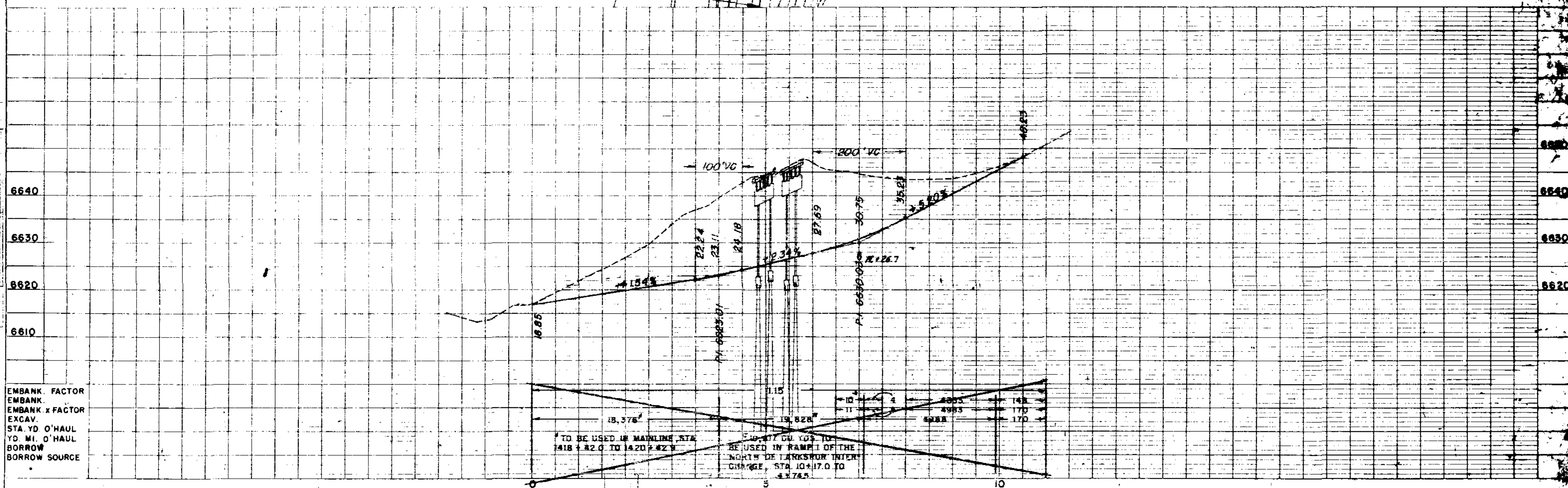


Rev. 11-12-65, M.E.V., Added this sheet (Work Order No. 544)

FED. ROAD REG. NO.	DIVISION	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLO	ER 15 (1) 1st Contract	26	

SO. LAKE GULCH ROAD





FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO	SHEET NO.	TOTAL SHEETS
9	COLORADO	E.R 15(1) 1st Contract	27	

QUANTITIES IN WORK ORDER NO. 544

Rev. 11-12-65, M.E.V., Added This Sheet (Work Order No. 544)

LOCATION	Side	Clean Culverts Ea.	Gravel or Crushed Rock Surfacing Ton	Asphaltic Road Material MC (Prime) Gal.	Plant Mixed Asphaltic Surfacing Ton	Asphaltic Material-Misc. Ton	Class "A" Concrete Cu.Yd.	Reinforcing Steel Lb.	Conc. Slope & Ditch Paving (Wire Mesh) Cu.Yd.			FORCE ACCOUNT DESCRIPTION
Main Line, 1416+ to 1427+	Lt.			100	100	15						Excavate 2" of material from Outside Shoulder S.B. Lane.
" " 1420+	Rt.								15			Remove Conc. Slope & Ditch Paving at inlet to C.B.C.
" " 1421+	Median					2						
" " 1424+	Lt.					10						Reset Metal Embankment Protector.
N.W. Ramp, 4+ to 8+	—											Repair Slopes, Clean Ditches & Shape the Shoulders.
S.W. Ramp, 1+	Rt.					3			5			
" " 2+	Rt.						7.8	440	20			Remove Wing of C.B.C. & Fill between Wing Footers & Conc. Sl. Pav.
" " 2+	Lt.											Clean Ditch.
S.E. Ramp, 7+ to 9+	—		125	100	65							Make Embankment.
" " 7+ to 9+	Rt.					20						
N.E. Ramp, 0+ to 4+	—											Clean ditches & Shape shoulders.
Cross Road, 0+ to 7+	—		660	300	325							Clean ditches.
" " 0+ to 3+	Both											Replace 600' R.O.W. Fence.
" " 1+	Rt.											Clean outlet end of Underdrain.
" " 3+	Lt.	1	15		10							Rebuild Road Approach.
" " 4+	Both	2										
" " 4+	—								15			Remove broken Conc. Sl. & Ditch Paving and asphaltic pavement.
" " 4+ to 5+	Both					20						
" " 5+	Lt.								20			Remove broken Conc. Sl. & Ditch Paving & Fill washed areas.
" " 5+	Rt.											Backfill under Slope Paving.
" " 6+	Rt.	1										
" " 7+	—	1										
" " 7+ to 11+	—											Clean ditches & Shape shoulders.
Frontage Road, 0+ to 11+	—		100									Clean ditches & roadway.
" " 10+	—	1										
" " 11+ to 13+	Rt.								25			
" " 15+ to 17+	Lt.											Repair fill slopes.
Entire Interchange	—											Clean debris & Re-shape borrow areas.
TOTALS		6	900	500	500	70	7.8	440	100			

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

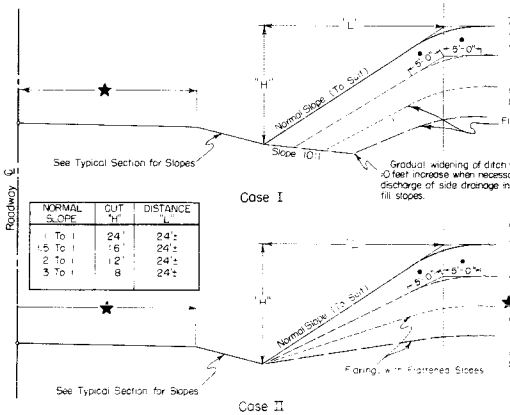
STANDARD M-2-A

(MAY 1, 1962)

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

REVISIONS		
4-22-63	Rev. Bridge Approaches	L.E.Q.
2-3-64	DEPT. NAME	M.R.H.

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



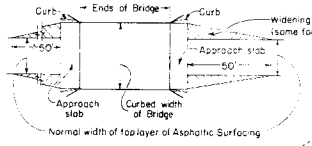
NORMAL SLOPE	CUT "H"	DISTANCE "L"
1 To 1	24'	24'±
1.5 To 1	16'	24'±
2 To 1	12'	24'±
3 To 1	8	24'±

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

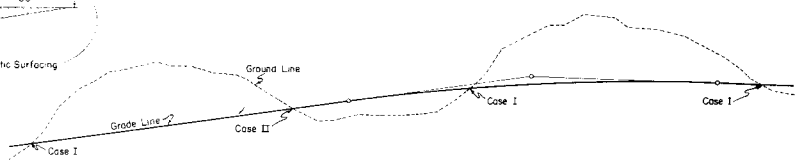
*CUT SLOPE TREATMENT IN EARTH CUTS: The intersection of cut slopes with the existing ground shall be rounded in earth cuts, beginning 5 ft. outside the slope stake and extending 5 ft. down the cut slope. Where the cut slope is less than 5 ft. reduce each of the above widths of slope treatment to the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

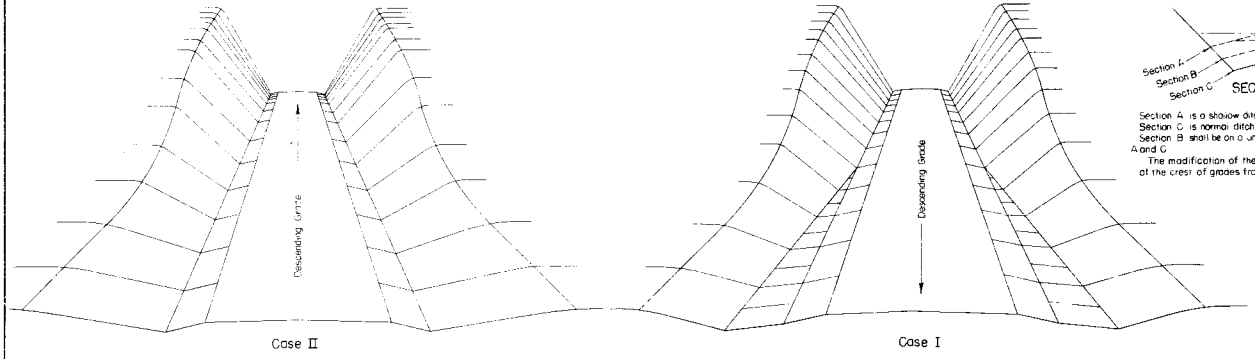
★ WIDENING AT BRIDGE APPROACHES: Roadway embankment at bridge approaches shall be so constructed that base of surfacing at shoulder point is a Min. of 2 ft. beyond the outside edge of bridge deck. Where widening of the section is necessary to achieve this result it shall take place gradually over a distance of 300 ft. The bottom layer of Asphaltic Surfacing shall be placed on widened sections to conform with dimensions shown on typical section. This is done to accomodate guard fence and/or guard posts at bridge approaches. The top layer of Asphaltic Surfacing shall be widened to meet the curbed width of the bridge or approach slab as shown in sketch, left.

PLAN OF WIDENING TOP LAYER OF ASPHALTIC SURFACING AT BRIDGE APPROACHES



PLAN OF FLARING IN EARTH CUTS

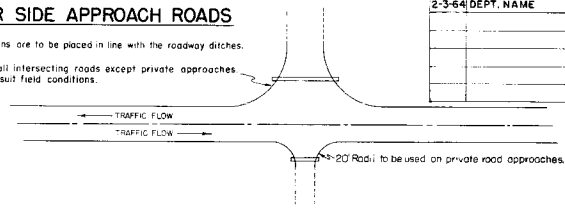




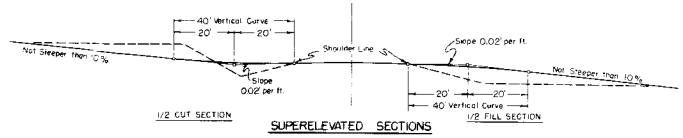
TYPICAL PLANS FOR SIDE APPROACH ROADS

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

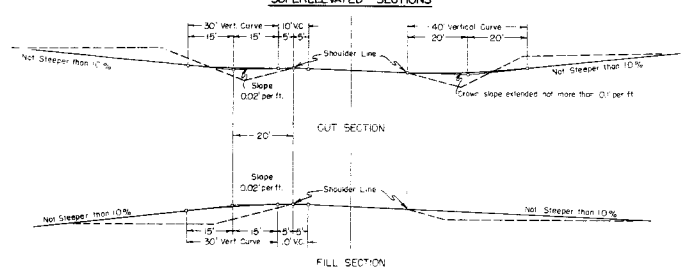
50' Radii to be used on all intersecting roads except private approaches. Radii may be varied to suit field conditions.



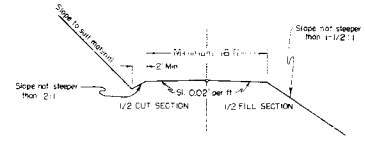
STANDARD CROWNED SECTION



SUPERELEVATED SECTIONS



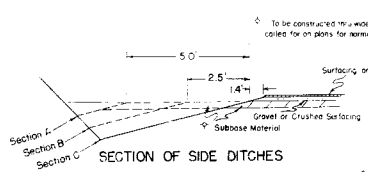
TYPICAL SECTION FOR APPROACH



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

DETAILS FOR DITCH & WIDENED SHOULDERS AT CREST OF GRADES

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



SECTION OF SIDE DITCHES

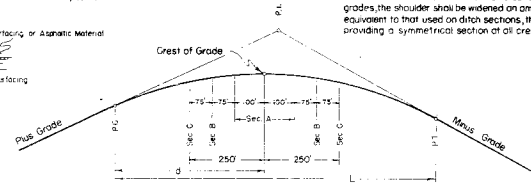
Section A is a shallow ditch section.
Section C is normal ditch section.
Section B shall be on a uniform transition between Sections A and C.
The modification of the ditch indicated shall be used only at the crest of grades from which drainage breaks both ways.

Formula for finding the Crest of Grade

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

NOTE

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



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

GENERAL NOTES

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

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

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

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

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

STANDARD M-5-A

(MAY 1, 1962) REV. 1-31-64, DEPT. NAME, M.R.H.
REV. 11-17-64, GEN. NOTES, M.R.H.

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

1 2 3 4 5 6 7 8 9 0 .

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

M N O P Q R S T U V W

a f g l J 14 K 1950

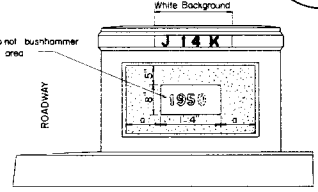
abcdefghijklmnopqrstuvwxyz

SAMPLE BRIDGE NUMBER

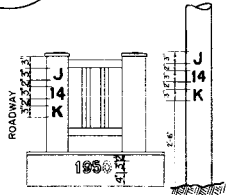
SAMPLE YEAR NUMBER

SECTION

Scale in inches 0 1 2 3

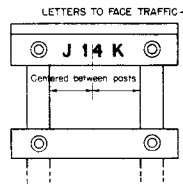


TYPICAL FOR CONCRETE ENDPOST

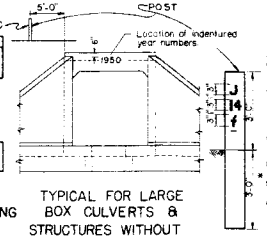


TYPICAL FOR STEEL HANDRAIL END POST

TYPICAL FOR SIGN POSTS



TYPICAL FOR TIMBER WING HANDRAIL



TYPICAL FOR LARGE BOX CULVERTS & STRUCTURES WITHOUT END POSTS

GENERAL NOTES

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

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

THE YEAR NUMBERS ARE RECESSED IN CONCRETE 3/4" MINIMUM AS SHOWN INTO THE PANEL OF THE ENDPOST ON THE RIGHT HAND SIDE OF EACH BRIDGE END AND INTO THE FACE OF THE DOWNSTREAM HEADWALL OF CULVERTS AS SHOWN ON PLAN DETAILS. NUMBERS TO BE MADE OF WOOD, METAL OR OTHER SUITABLE MATERIAL AND ATTACHED TO THE FORMS BEFORE CONCRETE IS POURED. THE YEAR NUMBER OF EACH STRUCTURE SHALL CORRESPOND WITH THE YEAR IN WHICH THE CONCRETE IS POURED.

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

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

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

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

AFTER THE WHITE BACKGROUND HAS DRIED SUFFICIENTLY, THE CORRECT STRUCTURE NUMBER SHALL BE CAREFULLY STENCILED ON IT, WITH TWO COATS OF "SECOND FIELD COATS-DARK" OR "EXTERIOR BLACK PAINT (MAINT)" AS SPECIFIED UNDER ITEM 38 "PAINTS AND PAINTING". THE BRACES OF THE STENCILED LETTERS AND FIGURES SHALL BE CAREFULLY FILLED IN BY HAND TO MAKE SOLID FIGURES.

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

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

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

IN ADDITION TO THE REQUIREMENTS STATED ABOVE, STRUCTURE NUMBERS, FOR HIGHWAYS PASSING UNDER CROSSROADS, 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. _____

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

LETTERS AND FIGURES
FOR
STRUCTURE NUMBERS

Designed by	Approved by: L. D. Turnbull
Made by	Bridge Engineer
Checked by	Date: Oct 17, 1958

STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

STANDARD M-6-B

(SHEET 1 OF 2 SHEETS)

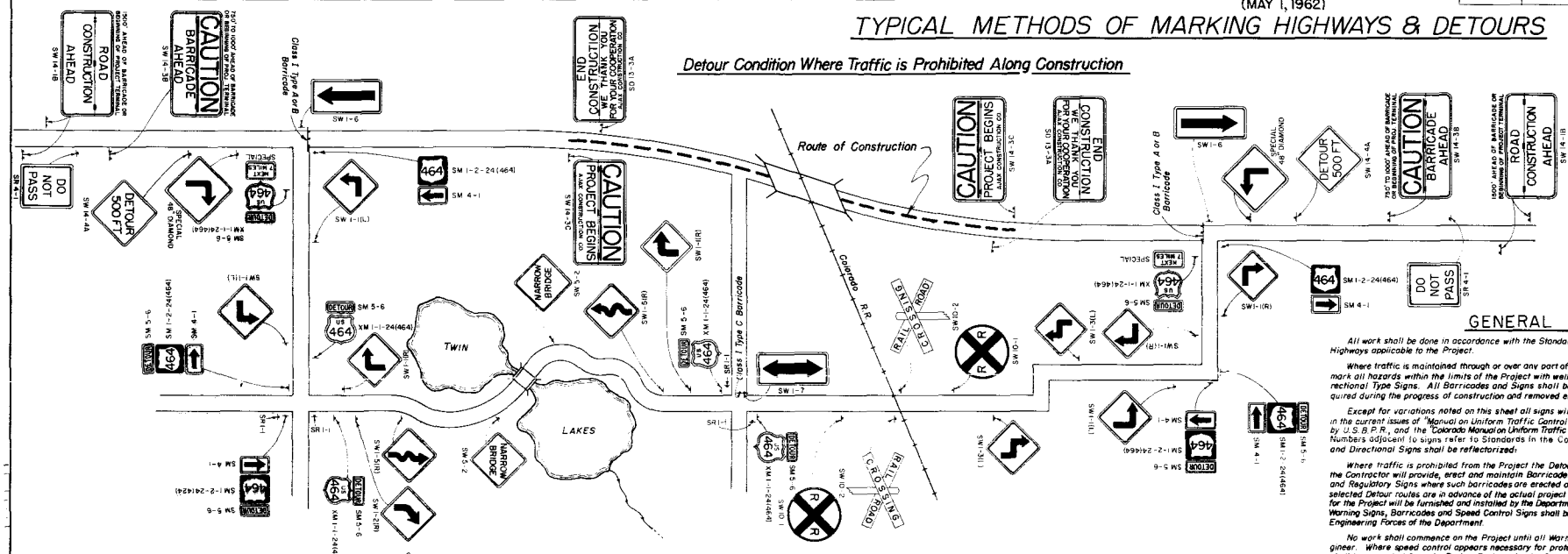
(MAY 1, 1962)

FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	[redacted]	[redacted]

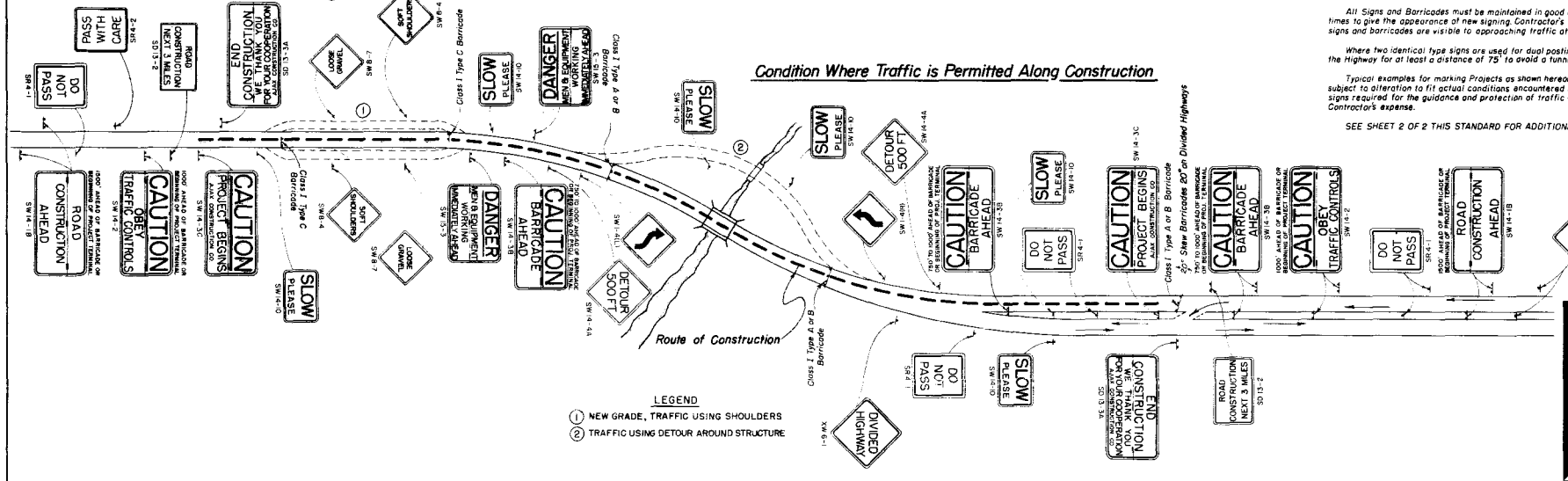
REVISIONS		
I-1443	GENERAL REV.	C.E.D.
I-31-64	DEPT. NAME	M.R.H.

TYPICAL METHODS OF MARKING HIGHWAYS & DETOURS

Detour Condition Where Traffic is Prohibited Along Construction



Condition Where Traffic is Permitted Along Construction



LEGEND

(1) NEW GRADE, TRAFFIC USING SHOULDERS

(2) TRAFFIC USING DETOUR AROUND STRUCTURE

GENERAL NOTES

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

Where traffic is maintained through or over any part of the Project, the Contractor will be required to mark all hazards within the limits of the Project with well maintained Barricades, Warning Signs and Directional Type Signs. All Barricades and Signs shall be moved, added to, changed or removed as required during the progress of construction and removed entirely when project is completed.

Except for variations noted on this sheet all signs will be in conformity with the specification outlined in the current issues of "Manual on Uniform Traffic Control Devices for Streets & Highways," issued by U.S.B.P.R., and the "Colorado Manual on Uniform Traffic Control Devices for Streets & Highways." Numbers adjacent to signs refer to Standards in the Colorado manual. Standard Warning, Regulatory and Directional Signs shall be reflectorized.

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

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

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

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

Typical examples for marking Projects as shown hereon constitute a minimum of signs required and are subject to alteration to fit actual conditions encountered in the field. Additional markings and any special signs required for the guidance and protection of traffic will be placed as required on the project at the Contractor's expense.

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

Construction Traffic Signs

Designed by J.C.R.	Approved by L. Julian
Made by J.C.R.	Engineer, Surveys & Plans
Checked by	Date: July 22, 1955

STANDARD ROADWAY CONSTRUCTION TRAFFIC SIGNS

STANDARD M-6-B

(SHEET 2 OF 2 SHEETS)

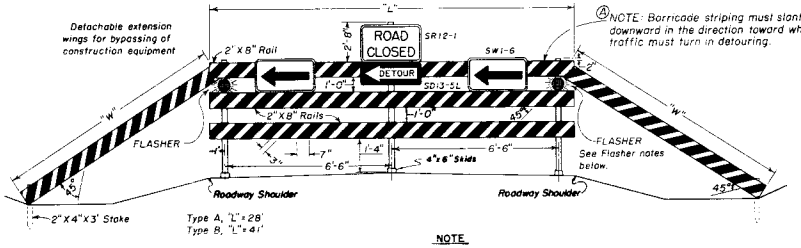
(MAY 1, 1962)

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

REVISIONS		
5-16-62	Rev. Margin & Border Color	L.E.O.
1-14-63	General Rev.	L.E.O.
1-31-64	DEPT. NAME	M.R.H.
8-24-64	Flashers and Striping Notes	M.R.H.

DETAILS OF BARRICADES

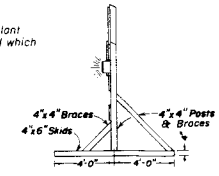
Class I
Type A or B
(Road Closed)



Ⓐ NOTE: Barricade striping must slant downward in the direction toward which traffic must turn in detouring.

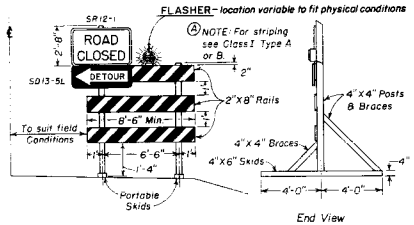
"W" Variable, length to be adequate to provide closing of borrow pit and shoulder.

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



End View

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



End View

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

SPECIFICATIONS

PAINT - All paint and methods of painting shall be in conformity with Item 38 of the Standard Specifications.

STRIPING - Planking and Wings on all Barricades shall be painted with Maintenance Flat Black on both sides. Reflective Strips shall then be added to the face sides.
Reflective Strips shall be Cutout Smooth Surface Yellow, of a type approved by the Department, 3" wide and spaced 7" apart as shown in the detail.

Diversion of traffic will be accomplished as follows:
1- Stripes for Barricades diverting traffic to the left shall start on the left hand side of the lower plank and progress up to the right with the stripes making an angle of 45 degrees with the horizontal axis of the board as shown in the detail. Traffic diversion to the right will be just the opposite.
2- Stripes on Barricades diverting traffic in both directions shall begin at the center of the lower plank and progress down in both directions.

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

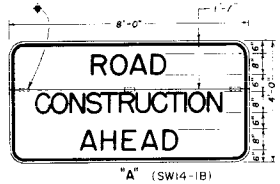
Planking	2"x8" S4S
Posts (Barricades)	4"x4" S4S
Posts (Signs)	4"x4" or 6"x6" S4S

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

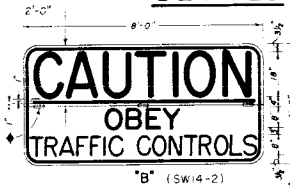
All skids, braces and posts to be painted yellow and nailed together with No. 20d nails.

Bases to be weighted where necessary to provide stability

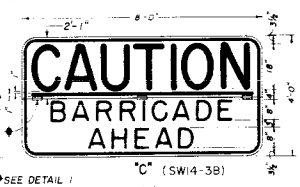
DETAILS OF CONSTRUCTION SIGNS



"A" (SW14-1B)



"B" (SW14-2)



"C" (SW14-3B)

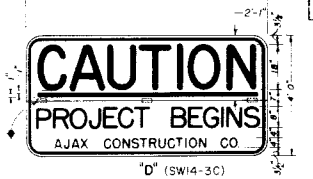
SEE DETAIL I

MARGIN AND BORDER COLOR

Signs "A" through "F"
Upper Portion - Margin - Same as Background; Border - Same as Legend
Lower Portion - Margin - Same as Background; Border - Same as Legend

Signs "G" and "I"
Margin - Reflectorized "Smooth Surface Yellow"
Border - Painted Black

Signs "J" and "K"
Margin - Reflectorized White
Border - Painted Black



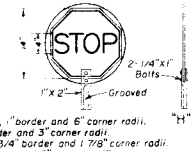
"D" (SW14-3C)

"E" (SW15-3)

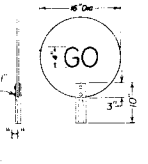
"F" (SD13-3A)

"G" (SW14-1O)

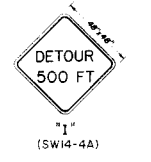
Signs "A" through "E" shall have 1" margin, 1" border and 6" corner radii.
Sign "F" shall have 3/4" margin, 7/8" border and 3" corner radii.
Signs "G" and "K" shall have 1/2" margin, 3/4" border and 1 7/8" corner radii.
Sign "I" shall have 3/4" margin, 1/4" border and 3" corner radii.



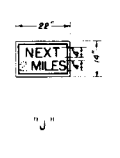
"H"

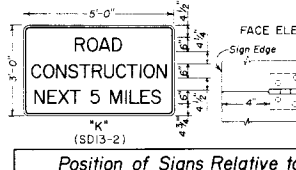


"J"



"I" (SW14-4A)

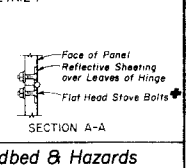




"K" (SD13-2)

DETAIL I

FACE ELEV.



NOTES

1. Signs "A" through "F" shall be of the hinge and fold type to facilitate the closing down of the sign when the need is not prevalent. These signs shall be hinged with 3-4" Butt Hinges (tight pin) mortised into the face surface of the sign.
2. The reflective sheeting used on the sign background shall be placed over the leaves of the hinges.
3. Hinges shall be fastened to the sign with flat head stove bolts having a flat washer under the nut on back of sign.
4. All hinges, bolts, nuts and washers to be rust resistant.
5. Sign panels to be held in the open position with hooks and eyes or other approved fastening devices.

✚ 90° Countersunk Steel or Aluminum Lock Bolt Fasteners with Collars suitable for use on wood may be used in lieu of stove bolts.

DETAILS OF SIGN AND BEACON FABRICATION AND USAGE

Construction Signs "A" through "G" and "K" shall be made of 5/8" Plywood or other material approved by the Department and as per details above.

Signs having reflectorized Yellow or Red surfaces shall be fabricated from "Flexible Reflective Sheeting" of the "Non-Exposed Lens" type approved by the Department. Signs having reflectorized White surfaces shall be fabricated from "Flexible Reflective Sheeting" of the "Exposed Lens" type approved by the Department.

Construction Sign "A" - Reflectorized Yellow background with painted Black lettering.

Construction Signs "B" through "D" - Top background to be reflectorized "Smooth Surface Red" with the legend and "I" underline to be a White process paint. Balance of lettering to be painted Black over a reflectorized Yellow background.

Construction Sign "E" - The word "DANGER" and the "I" Underline only are to be of a White process paint over a reflectorized "Smooth Surface Red." Balance of lettering to be painted Black over a reflectorized Yellow background.

Construction Sign "F" - The words "End Construction" and "Contractors Name" shall be painted Black over a reflectorized White background. Balance of lettering to be applied with a White process paint over a reflectorized "Smooth Surface Red" background.

Construction Sign "G" - The legend to be painted Black over a reflectorized "Smooth Surface Yellow" background.

Flagman Warning Sign "H" - This sign shall be made of Plastic or other lightweight material, approved by the Department, having a painted Red background with White lettering on the "Stop" side and a painted Green background with White lettering on the "Go" side. Handle to be grooved on one side to indicate reading of sign to Flagman. This sign will be used whenever Flagmen are necessary. Sign to be reflectorized if used to stop traffic at night.

Detour Warning Sign "I" - This sign shall be made of 3/8" (Min.) Plywood or other material suitable to the Department. Legend to be painted Black on a reflectorized "Smooth Surface Yellow" background.

Construction Sign "J" - This sign shall be made of 3/8" (Min.) Plywood or other suitable material. Legend to be painted Black on a reflectorized White background. 3/4" X 9" metal slides to be placed between "NEXT ... MILES," spaced so as to accommodate appropriate sized numerals. Numerals calculated to the nearest Mile.

Construction Sign "K" - Reflectorized White background with painted Black lettering.

Signs "A" through "E" and "G" shall be painted on the backside with one coat of white primer and one coat of yellow enamel.

Signs "F," "J" and "K" shall be given 2 coats of white paint on the backside.

Construction Signs shall be placed as follows:

Sign "A" - This is the first advance warning sign and shall be placed 1,500 feet ahead of barricade or beginning of project terminal and on both sides of the traveled way in all cases.

Sign "B" - This is the second advance warning sign and shall be placed 1,000 feet ahead of barricade or beginning of project terminal and on both sides of the traveled way on divided highways and singly on two-lane highways.

Sign "C" - This is the third advance warning sign in cases where barricades are used and shall be placed 750 to 1,000 feet ahead of barricade or beginning of project terminal and on both sides of the traveled way on divided highways and singly on two-lane highways.

Sign "D" - This sign shall be placed to mark the beginning of the Project. It shall be placed singly and may be placed opposite barricade if desirable.

Sign "E" - This sign shall be placed 500 feet ahead of the situation being advised of.

Sign "F" - 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 "G" - This sign shall be used frequently within the limits of the Project.

Sign "K" - This sign shall be erected at the limits of any project more than 2 miles in extent, where traffic is maintained through the job.

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

Flashers used on the barricades shall be of the battery or electrical type. The lens for this type flasher shall be at least 8 in. in dia. The illuminating element in a flashing yellow beacon or signal shall be flashed continuously at a rate of 50 to 60 flashes per min. with the "on" time being at least 25 % of the cycle. Each element, complete, shall be of such design as to render the lens when illuminated clearly visible for 1,000 ft. under all atmospheric conditions except dense fog. The color of the lens shall be in accordance with "Technical Report No.1 of the Institute of Traffic Engineers."

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

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

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

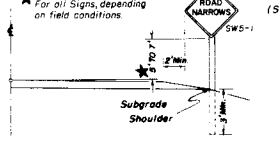
1	"ROAD CONSTRUCTION AHEAD"	Minimum 4
2	"CAUTION OBEY TRAFFIC CONTROLS"	Minimum 2
3	"CAUTION BARRICADE AHEAD"	As Required
4	Standard Warning, Guide & Directional Signs	As Required
5	"ROAD CONSTRUCTION NEXT 5 MILES"	As Required

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

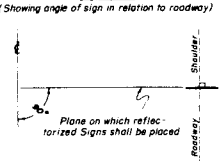
1	All Barricades	As Required
2	"CAUTION PROJECT BEGINS"	Minimum 2
3	"DANGER MEN & EQUIPMENT WORKING IMMEDIATELY AHEAD"	As Required
4	"END CONSTRUCTION WE THANK YOU FOR YOUR COOPERATION"	Minimum 2
5	"SLOW PLEASE"	As Required
6	Standard Warning & Directional Signs	As Required
7	Approved Directional Arrows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

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

Position of Signs Relative to Roadbed & Hazards



Top View
(Showing angle of sign in relation to roadway)



NOTE
Warning Signs to be made of 3/8" (Min.) plywood or other material suitable to the Department and shall be reflectorized.
Location to be governed by field conditions. Exact location to be staked by the Engineer in all cases warning signs are to be placed well in advance of hazard, the distance depending on topography, and existing approach speeds.
For all signs prefixed with the letters "R," "M" or "W" refer to the Colorado Manual on Uniform Traffic Control Devices for Streets and Highways" of current issue.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

Construction Traffic Signs

Designed by J.C.R.	Approved by J. Juhan
Made by J.C.R.	Engineer, Surveys & Plans
Checked by	Date: July 22, 1955

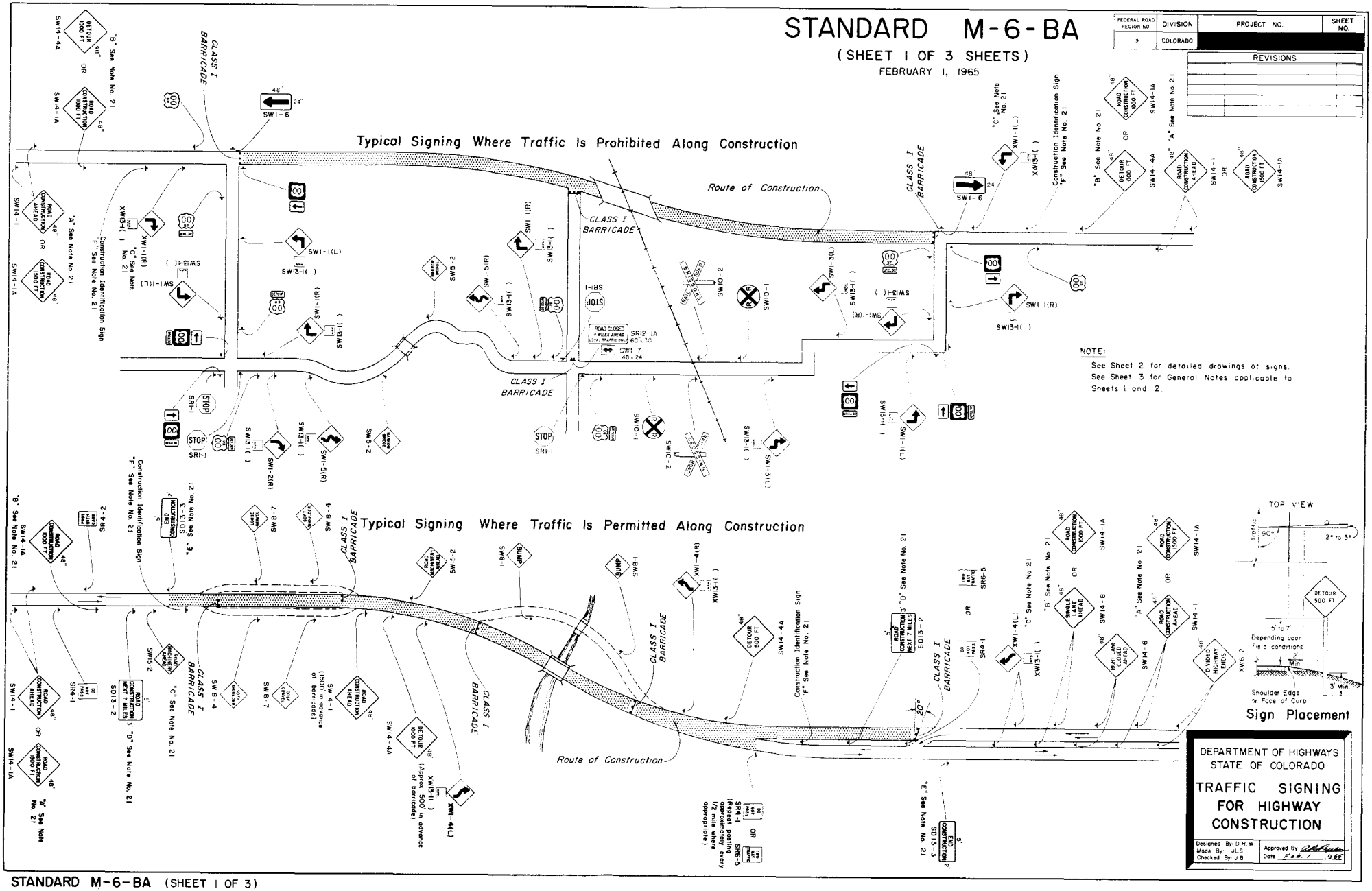
STANDARD M-6-BA

(SHEET 1 OF 3 SHEETS)

FEBRUARY 1, 1965

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

REVISIONS



NOTE

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

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

Approved By: [signature]
Date Feb. 1 1965

STANDARD M-6-BA

(SHEET 2 OF 3 SHEETS)

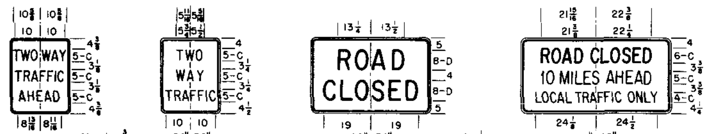
FEBRUARY 1, 1965

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

REVISIONS		

REGULATORY SIGNS

See Note No. 9

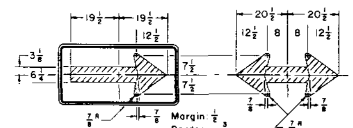


24"x30" SR6-3 — Margin: 3/8, Border: 5/8, Corner Radius: 1½ — 24"x30" SR6-5

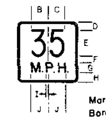
48"x30" SR12-1 — Margin: ½, Border: ¾, Corner Radius: 1 7/8 — 60"x30" SR12-1A

WARNING SIGNS

See Note No. 10



48"x24" SW1-6 — Margin: ½, Border: ¾, Corner Radius: 1 7/8 — 48"x24" SW1-7

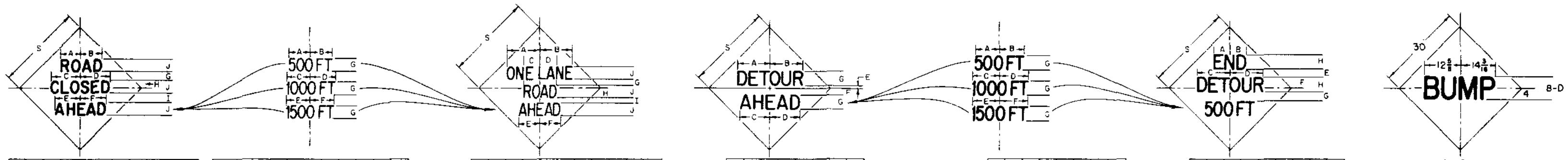


	Panel	A	B	C	D	E	F	G	H	I	J
SW13-1	18"x18"	3/8	5½	5 5/16	2¼	8-C	2	3-E	2¾	¾	5 3/16
XW13-1	24"x24"	5/8	6 5/8	6 9/16	3¼	10-C	2¾	4-E	4	15/16	6 7/8

Margin: 3/8
Border: A
Corner Radius: 1½

WARNING SIGNS

See Note No. 10



	S	A	B	C	D	E	F	G	H	I	J
SW14-3	48	11¼	12 1/16	16 3/16	16 5/8	14 5/8	14 5/8	4¾	4 9/16	5 3/16	7-D
CW14-3	36	8 1/16	8 5/8	11 13/16	11 7/8	10½	10½	3 3/8	3¼	3¾	5-D

SW14-3A	S	A	B	C	D	E	F	G
SW14-5A	48	12	12 1/16	13¼	14 1/8	13¾	13 5/8	7-C
CW14-3A	36	8 9/16	8 5/8	9 3/8	10 1/8	9½	9¾	5-C
CW14-5A								

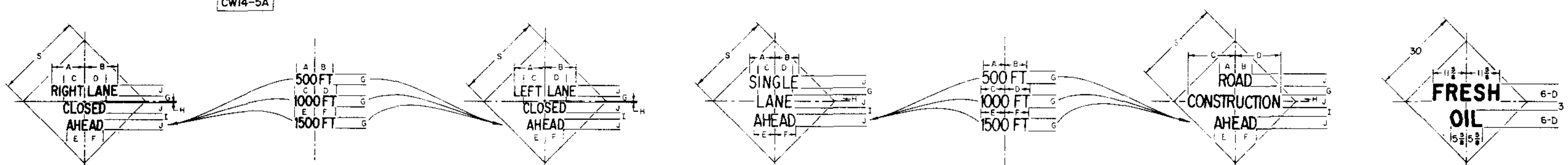
	S	A	B	C	D	E	F	G	H	I	J
SW14-5	48	18½	17 7/8	9 3/16	9 3/8	11 7/8	11 7/8	3 1/8	5¼	3 1/8	7-C
CW14-5	36	13 3/16	12¾	6 9/16	6½	8½	8½	2¼	3¾	2¼	5-C

	S	A	B	C	D	E	F	G
SW14-4	48	18 3/16	18 5/16	16¾	16¾	1¼	3½	8-D
CW14-4	36	13 5/8	13¾	12 9/16	12 9/16	15/16	2 5/8	6-D

	S	A	B	C	D	E	F	G
SW14-4A, SW14-4B	48	13¾	13¾	15	16 3/16	15 1/8	15 9/16	8-C
CW14-4A, CW14-4B	36	10 5/16	10 5/16	11¼	12 1/8	11 3/8	11 11/16	6-C

	S	A	B	C	D	E	F	G	H
SW14-4B	48	9 1/8	9	18 3/16	18 5/16	4½	6	5	8-D
CW14-4B	36	6 7/8	6¾	13 5/8	13¾	3 3/8	4½	3¾	6-D

SW8-1



	S	A	B	C	D	E	F	G	H	I	J
SW14-6	48	18 3/16	18 7/16	11¾	11¾	10¼	10¼	2 7/8	7/16	3 5/16	6-C
CW14-6	36	15 3/16	15 3/8	9 13/16	9 13/16	8 9/16	8 9/16	2 3/8	3/8	2¾	5-C

SW14-6A	S	A	B	C	D	E	F	G
SW14-7A	48	10 5/16	10 3/8	11¼	12 1/8	11 3/8	11 11/16	6-C
CW14-6A	36	8 5/8	8 5/8	9 3/8	10 1/8	9½	9¾	5-C
CW14-7A								

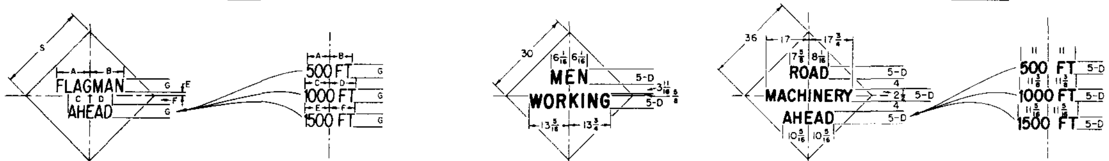
	S	A	B	C	D	E	F	G	H	I	J
SW14-7	48	17 1/8	17 1/8	11¾	11¾	10¼	10¼	2 7/8	7/16	3 5/16	6-C
CW14-7	36	14¼	14¼	9 13/16	9 13/16	8 9/16	8 9/16	2 3/8	3/8	2¾	5-C

	S	A	B	C	D	E	F	G	H	I	J
SW14-8	48	13 13/16	13 9/16	9 7/16	10 1/16	11 7/8	11 7/8	3 11/16	3½	3 9/16	7-C
CW14-8	36	11	10¾	8	8¼	10 7/8	10 7/8	2 5/8	2½	2 9/16	5-D

SW14-1A	S	A	B	C	D	E	F	G
SW14-8A	48	12	12 1/16	13 1/8	14 1/8	13¼	13 5/8	7-C
CW14-1A	36	8 9/16	8 5/8	9 3/8	10 1/8	9½	9¾	5-C
CW14-8A								

	S	A	B	C	D	E	F	G	H	I	J
SW14-1	48	9	9 3/16	26	25 9/16	11 7/8	11 7/8	4 13/16	3½	4 13/16	7-C
CW14-1	36	6¾	6 7/8	19	18½	8½	8½	3¾	2½	3¾	5-C

SW8-6

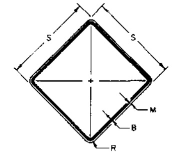


SW15-1 — SW15-2 — SW15-2A

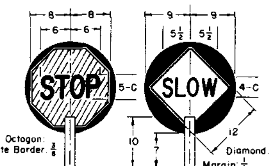
	S	A	B	C	D	E	F	G
SW14-9	48	18	18	11 7/8	11 7/8	1½	4¾	7-C
CW14-9	36	15 7/16	15 7/16	10 3/16	10 3/16	1 5/16	4 1/16	6-C

	S	A	B	C	D	E	F	G
SW14-9A	48	12	12 1/16	13 1/8	14 1/8	13¼	13 5/8	7-C
CW14-9A	36	10 5/16	10 3/8	11¼	12 1/8	11 3/8	11 11/16	6-C

PLATE DETAILS



S	M	B	R
30	½	¾	1 7/8
36	5/8	7/8	2¼
48	¾	1¼	3



Octagon: White Border: 3/8

FLAGMAN SIGN
See Note No. 19

Diamond: Margin: ¼, Border: ¼, Corner Radius: ¾

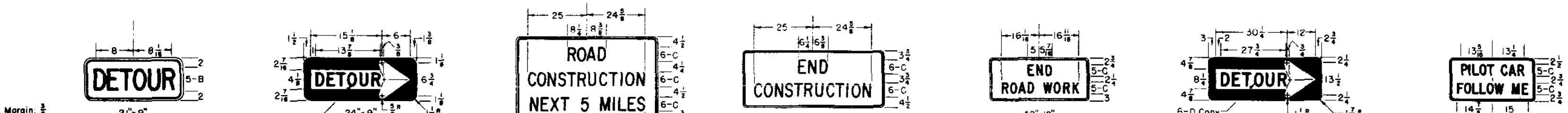
NOTES:

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: 3/8, Border: 3/8, Corner Radius: 1½ — 21"x9" SM5-6

3-D Copy — 24"x9" SM5-7R SM5-7L

Margin: ½, Border: ¾, Corner Radius: 1 7/8 — 60"x36" SD13-2

Margin: 3/8, Border 5/8, Corner Radius: 1½ — 60"x24" SD13-3

Margin: 3/8, Border: 5/8, Corner Radius: 1½ — 42"x18" SD13-3A

6-D Copy — 48"x18" SD13-5(R) SD13-5(L)

Margin: 3/8, Border: 5/8, Corner Radius: 1½ — 36"x18" SD13-6

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

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

Approved By [illegible]
Date Feb. 1, 1965

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

REVISIONS		

STANDARD M-6-BA

(SHEET 3 OF 3 SHEETS)

FEBRUARY 1, 1965

GENERAL NOTES

1. All work shall be done in accordance with: (a) the Standard Specifications of the Department of Highways 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. Where warranted larger or smaller signs shall be used. 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.

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. All paint and methods of painting shall conform with Item 38 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 Miscellaneous Untreated Timber S4S. Timber shall conform to Construction grade Paragraph 123B or 125B of Standard No. 15 Grading & Dressing Rules for West Coast Douglas Fir (1956) or Dense Structural 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 Primer for Wood" 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. Torches and Lanterns shall be either of the fuel-burning or battery-powered type approved by the Department. Particular care shall be taken to protect all signs and barricades from smoke and smudge.

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": SD13-2 - This sign shall be placed to mark the beginning of a Project of more than 2 miles in extent, where traffic is maintained through the project. It shall be placed singly and near the beginning of construction.
Sign "E": SD13-3 - This sign shall be placed to mark the end of the Project. It shall be placed singly and may be placed opposite barricade if desirable.
Sign "F": Construction identification signs shall be furnished and installed by the Department on all Federal-Aid and Forest Highway Projects where actual construction is in progress and visible to highway users. These signs should be located so as not to obscure or detract from the effectiveness of other official signs. Where two or more projects are contiguous the appropriate data may be included in one set of signs. Refer to appropriate "M" Standard (Identification Signs) for sign details.
Signs A through F shall be furnished, installed and maintained by the Department.

SPECIAL NOTE: Requirements of this Standard are optional to those of Standard M-6-B through 12-31-65. Following that date Standard M-6-B will be obsolete.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

TRAFFIC SIGNING FOR HIGHWAY CONSTRUCTION

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

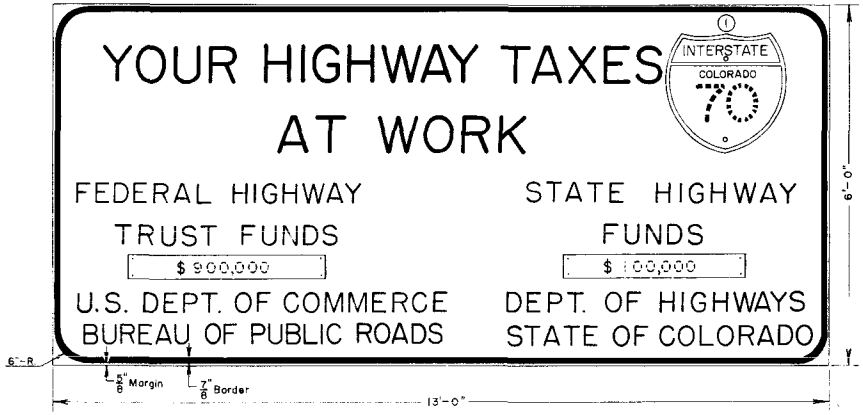
TYPICAL SIGNS

STANDARD M-6-CA
(JAN. 31, 1964)

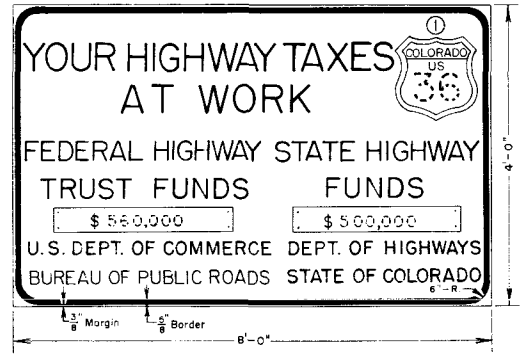
FEDERAL ROAD REGION NO.	DISTRICT	PROJ. NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO			

REVISIONS		
6-26-64	GENERAL NOTES	M.R.H.

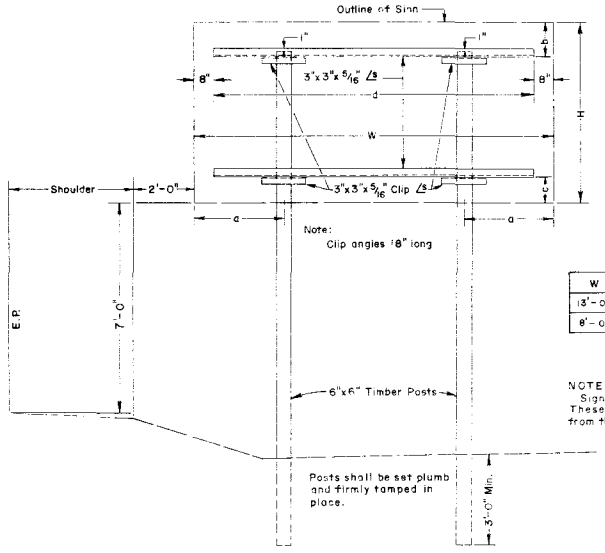
INTERSTATE SYSTEM



PRIMARY & SECONDARY SYSTEM



INSTALLATION DETAIL



W	H	a	b	c	d
13'-0"	6'-0"	2'-6"	1'-1½"	0'-10¾"	11'-8"
8'-0"	4'-0"	1'-6"	1'-1½"	0'-10¾"	6'-8"

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

GENERAL NOTES

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

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

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

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

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

Signs are to be non-reflectorized, black legend on plain white background. Route Marker plaques to be the appropriate standard colors, non-reflectorized.

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

These signs will be furnished and installed by State Forces.

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

IDENTIFICATION SIGNS

Designed by B.F.R. Approved by [illegible]
Made by D.J.B. Staff Design Engr.
Checked by M.R.H. Date: 8-5-64

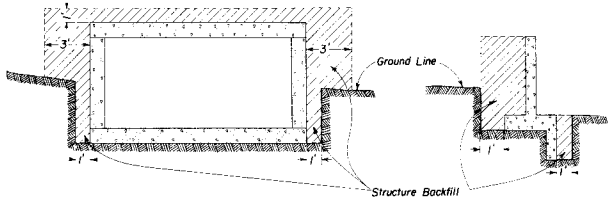
STANDARD M-16-A

(MAY 1, 1962)

FED. ROAD REGION NO	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.	[redacted]	[redacted]

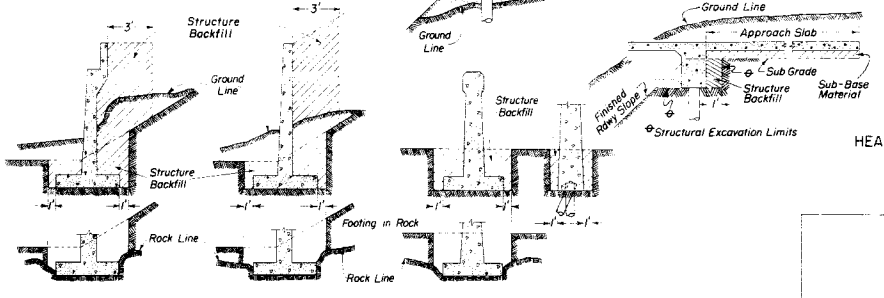
REVISION		
5-2-63	Rev. Backfill	L.E.O.
1-31-64	DEPT. NAME	M.R.H.

CONCRETE BOX CULVERTS & WINGWALLS

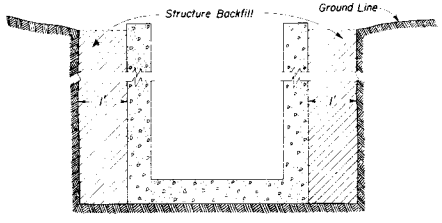


PIERS, ABUTMENTS, RETAINING WALLS ETC.

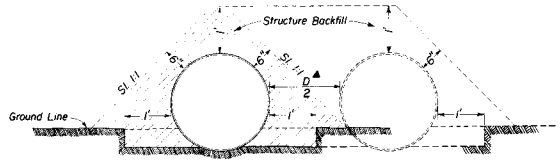
All material that is to be compacted shall be placed in horizontal layers not more than 6" inches in depth and compacted before the next layer is placed. For Arches, Rigid Frames and Box Culverts the fill shall be brought up uniformly on both sides of the center of structure to avoid stresses in the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



DROP INLETS, DIVISION BOXES, INTERCEPTING HEADWALLS ETC.



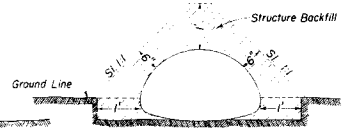
♦CIRCULAR CONDUIT



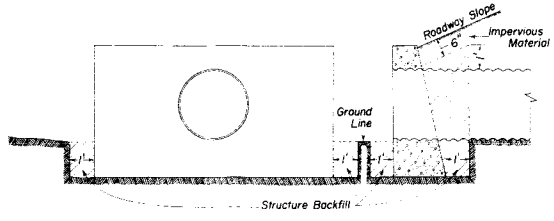
▲*When two or more conduits are layed side by side, the distance between conduits shall be 1/2 the conduit diameter but not less than 1'-0"*

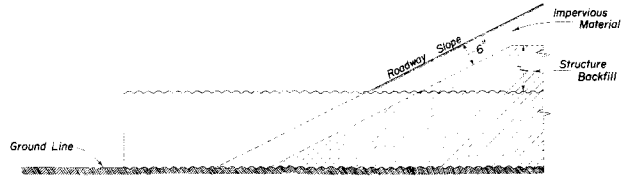
♦*See Design Aid No. 16, 16a or 16b for computation of quantities.*

♦ELLIPTICAL OR ARCH CONDUIT

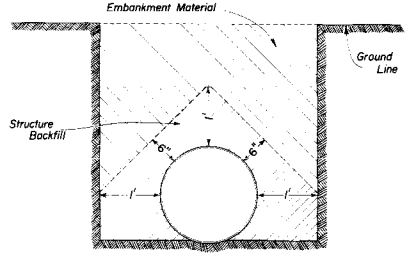


HEADWALLS AND END OF CULVERTS

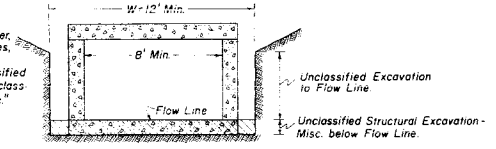




♦SIPHONS OR CONDUIT IN TRENCH



On all structures of 8' span or over, including extensions of old structures, excavation for structures shall be classified and paid for as "Unclassified Excavation" to Flow Line and "Unclassified Structural Excavation - Misc." below the Flow Line of box.



GENERAL NOTES

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

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

For concrete box culverts located where roadway cross section is in Fill, embankment shall be built up and compacted to a point one (1) ft. above flow line of box. The trench shall then be excavated as shown to accommodate construction of the box.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

BACKFILL AROUND STRUCTURES

Designed by H.E.P.	Approved by [signature]
Made by D.M.E.	Bridge Engineer
Checked by L.E.O.	Date: May 3, 1958

STANDARD CONCRETE PAVEMENT JOINT DETAILS

STANDARD M-37-A

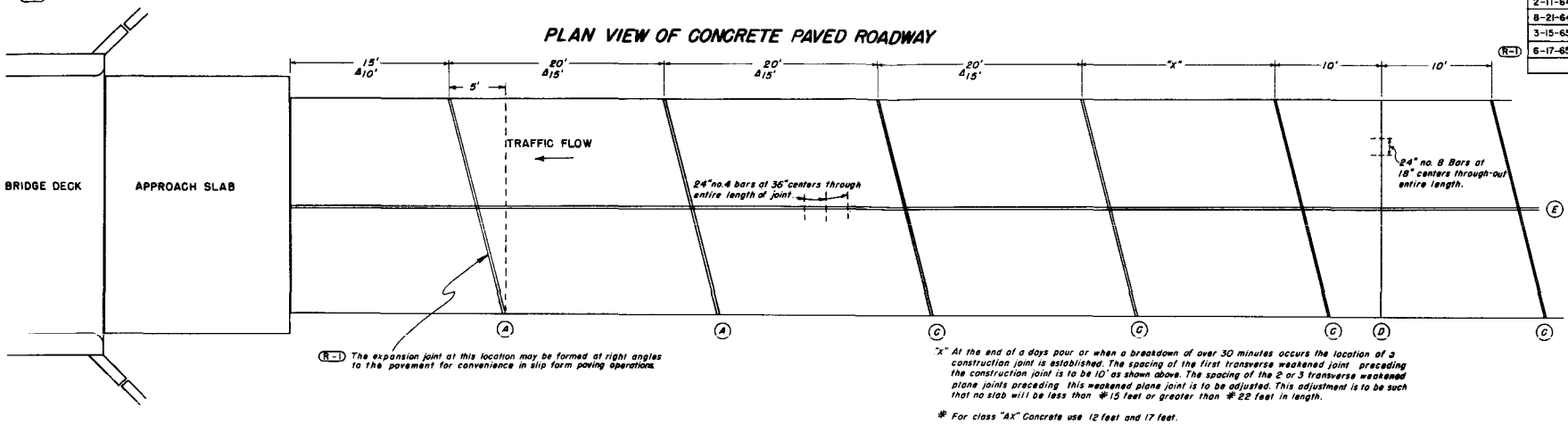
(MAY 1, 1962)

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

REVISIONS		
4-8-63	Rev. Joint	L.E.O.
2-11-64	DEPT. NAME	M.R.H.
8-21-64	Const. Joint & Added Slab	M.R.H.
3-15-65	Removed (F)	M.R.H.
6-17-65	Notes	M.R.H.

(R-1)

PLAN VIEW OF CONCRETE PAVED ROADWAY



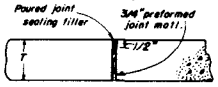
(R-1) The expansion joint at this location may be formed at right angles to the pavement for convenience in slip form paving operations.

"X" At the end of a days pour or when a breakdown of over 30 minutes occurs the location of a construction joint is established. The spacing of the first transverse weakened joint preceding the construction joint is to be 10' as shown above. The spacing of the 2 or 3 transverse weakened plane joints preceding this weakened plane joint is to be adjusted. This adjustment is to be such that no slab will be less than * 15 feet or greater than * 22 feet in length.

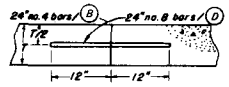
* For class "AX" Concrete use 12 feet and 17 feet.

(R-1) Δ Spacing when class "AX" Concrete is used.

(A)
EXPANSION JOINT

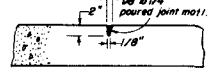


(B) & (D)
CONSTRUCTION JOINT



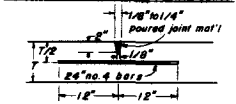
X Required when pour has been interrupted more than 30 minutes, at the end of a days pour and when traffic lane is to be added and poured separately.

(C)
TRANSVERSE WEAKENED PLANE JOINT



Normal spacing for Transverse Weakened Plane Joints shall be 20 feet.
Normal spacing when class "AX" Concrete is used is 15 feet.

(E)
LONGITUDINAL WEAKENED PLANE JOINT



GENERAL NOTES

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

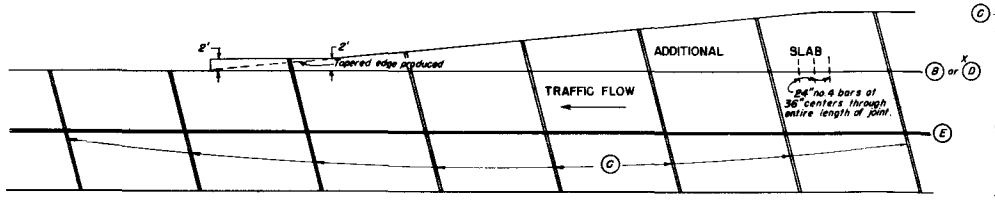
Bars designated by number i.e. "no.4 bars" are deformed reinforcing bars, intermediate grade.

The cost of all bars and joint material shown on this sheet is to be included in the bid price for Concrete Pavement.

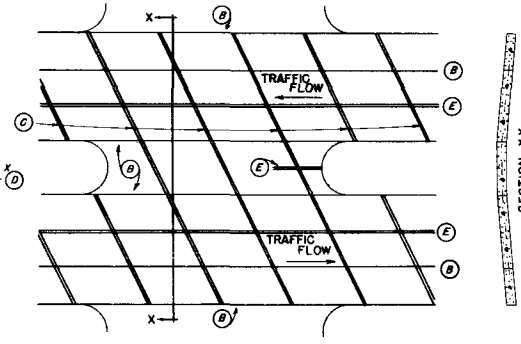
See plans for dimension "T"

To be used for the following:
1. To divide lanes as shown in plan view above.
2. Along centerline of four lane project between medians at intersections where median is over 15'

DETAILS FOR CONSTRUCTION OF ACCELERATION LANE, DECELERATION LANE OR ADDITIONAL TRAFFIC LANE.



TYPICAL STREET INTERSECTION



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

CONCRETE PAVEMENT JOINTS

Designed by T.C.R.	Approved by [signature]
Made by K.K.	Engineer, Surveys & Plans
Checked by [signature]	Date: March 7, 1962

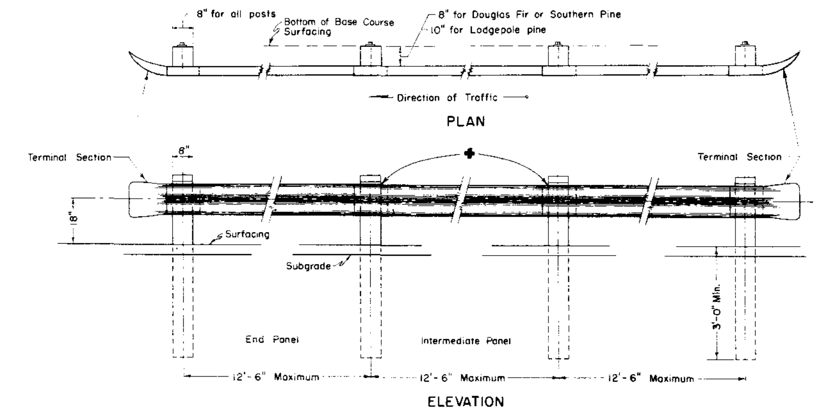
REVISIONS

STANDARD M-75-A

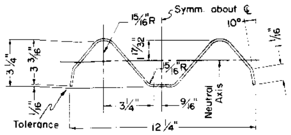
(MAY 1, 1962)

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

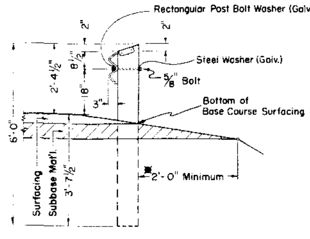
REVISIONS		
1-3-63	Add 25' Sect. & Rect. Washer	L.E.O.
7-1-63	Add. Coating Class	L.E.O.
6-7-63	Rev. General Note	L.E.O.
2-3-64	DEPT. NAME	M.R.H.
12-9-64	Rev. at Br. & Gen. Notes	M.R.H.



TYPICAL METAL PLATE GUARD FENCE

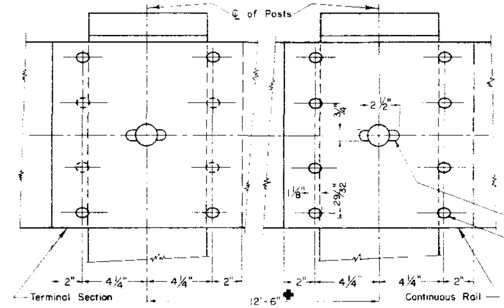


SECTION THRU RAIL ELEMENT



✱ Where Subbase width does not give the two feet, subgrade shall be widened for lateral support.

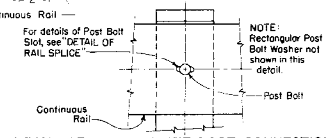
DETAIL SHOWING TYPICAL LOCATION OF GUARD FENCE



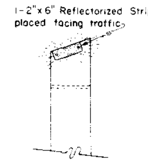
✚ When a 25'-0" section of Rail is used, fasten to the intermediate Post as shown below.

DETAIL OF RAIL SPLICE

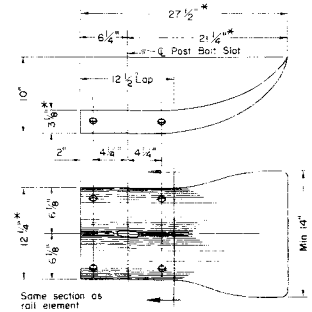
(Rectangular Post Bolt Washer not shown in this detail)



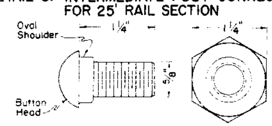
DETAIL OF INTERMEDIATE POST CONNECTION FOR 25' RAIL SECTION



INSTALLATION DETAILS OF REFLECTORIZED STRIP (Work by State Forces)



DETAIL OF TERMINAL SECTION

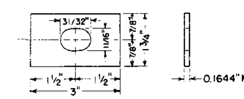


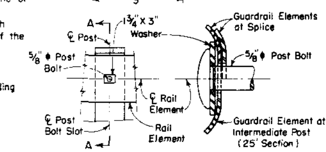
SPLICE BOLT — 8 Req'd per splice, 4 Req'd per terminal

NUT

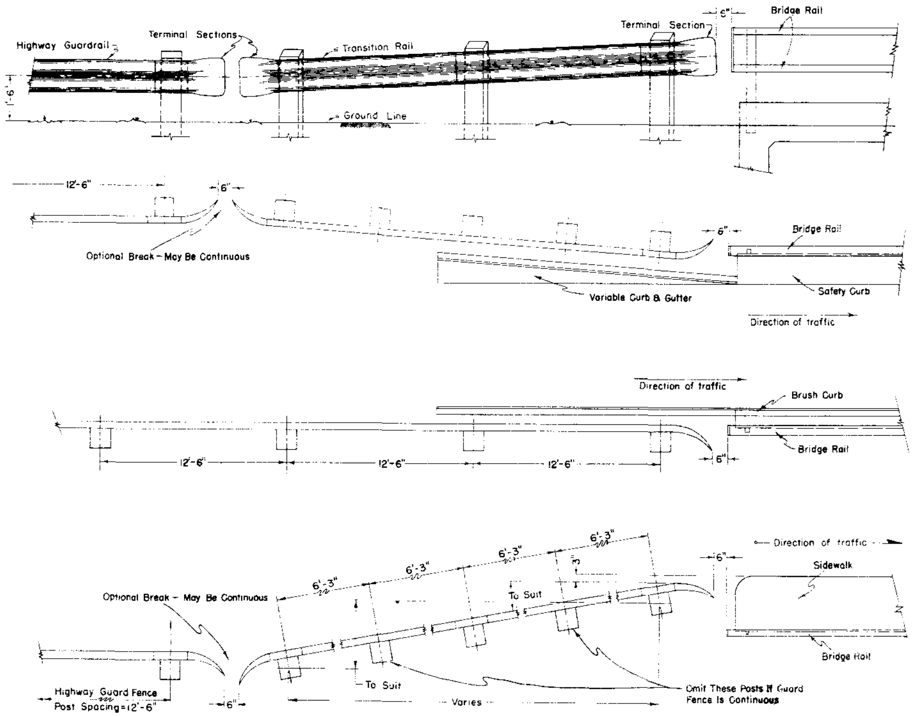
RECTANGULAR POST BOLT WASHER

MIN. 8 GAGE (GALV.)
(REQUIRED AT ALL POSTS)





POST CONNECTION — SECTION A-A



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

TRANSITION FENCE AT BRIDGES ONLY

GENERAL NOTES

All work shall be done according to the Standard Specifications of the Colorado Department of Highways, applicable to the project

All wood posts shall be close grained Douglas Fir of the Coast Region, Dense Longleaf or Shortleaf Southern Pine or Lodgepole Pine.

All wood posts shall be square edged, full sawn, with tops beveled as shown. All bolt holes are to be drilled 1/16 inch larger than diameter of bolt before treatment is applied. All wood posts shall be pressure treated for the full length of the posts with "Creosote Oil" as provided for in the Specifications.

Timber posts fabricated from Douglas Fir or Southern Pine shall be 8" x 8" square. Timber posts fabricated from Lodgepole Pine shall be 8" x 10" and shall be installed with the 8" face parallel to the center line of the roadway.

Timber shall be free of heart centers and shall conform to Construction Grade Paragraph 125B of Standard No. 15 Grading & Dressing Rules of West Coast Douglas Fir (1956) or Dense Structural 58 and LL Structural 58 Paragraph 285 of 1956 Grading Rules for Southern Pine.

All wood posts shall be set and tamped in plumb and firm to the lines and grades as directed by the Engineer.

Where sidewalks are to be constructed on the roadway shoulder, guard fence shall be placed between the sidewalk and the edge of traffic lane.

METAL PLATE GUARD FENCE (STEEL) SPECIFICATIONS

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

Metal plate guard rail galvanized in accordance with ASTM Designation A-123 or with Coating Class 2.50 of Table I of ASTM Designation A-93 may be furnished in lieu of painting requirements.

Metal plates shall not be lighter than No. 12 U.S. standard gauge.

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

METAL PLATE GUARD FENCE (ALUMINUM) SPECIFICATIONS

Aluminum plates shall have a nominal thickness of not less than 0.125 inches.

No painting of the aluminum guard rail elements, end sections or fasteners will be required.

MATERIAL SPECIFICATIONS: The following members shall be of the alloy and temper specified, and shall conform to the ASTM specification listed below.

Member	▲ Alloy	ASTM Specification
Rail elements	2024-T3	B 209
Terminal Sections	2024-T42	B 209
Bolts	2024-T4	B 211
Nuts	6061-T6	B 211
Washers	2024-T4	B 211

Dimensions marked by (✱) may vary by no more than ½ inch.

▲ All rail elements, terminal sections and appurtenances shall be treated to prevent oxidation.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

METAL PLATE GUARD FENCE

Designed by
Made by J.R.
Checked by

Approved by A.R. Newbold
Bridge Engineer
Date: May 15, 1956

STANDARD M-75-A

STANDARD M-142-AA

FEBRUARY 1, 1965

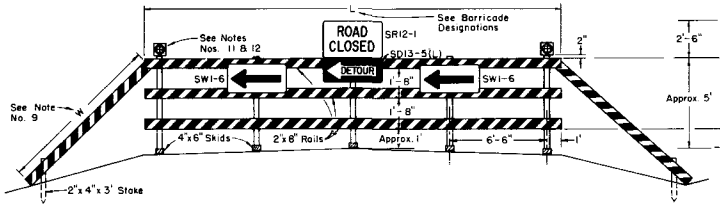
FEDERAL ROAD REGION NO.	DISTRICT	PROJECT NO.	SHEET NO.
9	COLORADO		

REVISIONS		

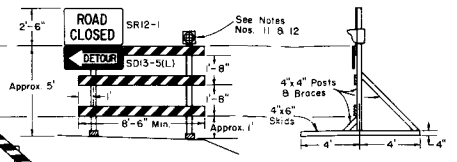
CLASS I BARRICADES (3 RAILS)

MOVABLE

TYPES M-1, M-2, & M-3

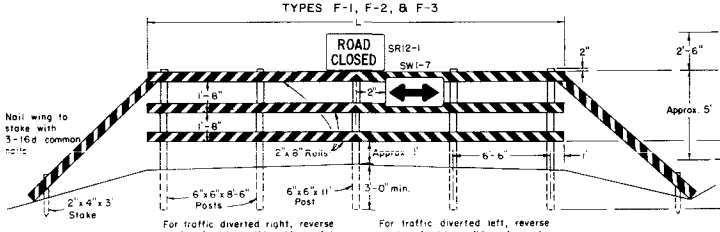


TYPE M-4

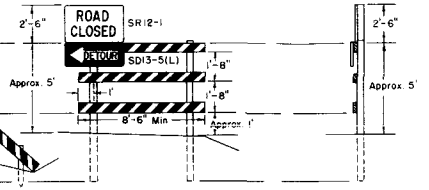


FIXED

TYPES F-1, F-2, & F-3



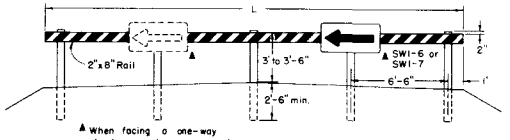
TYPE F-4

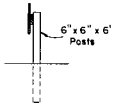


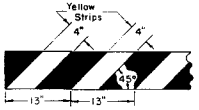
CLASS II BARRICADE (1 RAIL)

FIXED

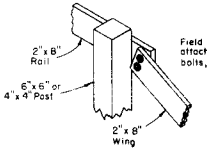
TYPE F-6



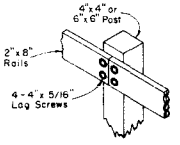




DETAIL OF RAIL AND WING STRIPING

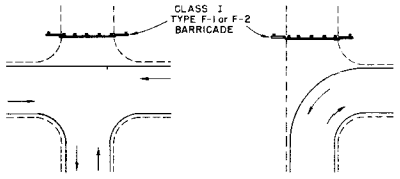


REAR VIEW OF BARRICADE SHOWING WING ATTACHED (See Note No. 9)

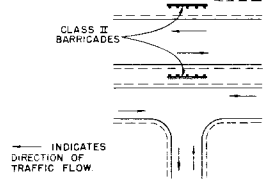


METHOD OF ATTACHING PLANKING TO POSTS AT JOINTS

SITUATION A



SITUATION B



SITUATION C

GENERAL NOTES

1. All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the Project.
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 Department 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.
4. All paint and methods of painting shall be in conformity with Item 38 of the Standard Specifications. All skids, braces, and posts shall be painted with 2 coats of "Exterior Black Paint." Planking and wings on all barricades shall be painted with 2 coats of "Exterior Black Paint" on all sides before adding reflective strips. Reflective strips shall be "cut from smooth surface yellow reflective sheeting" of a type approved by the Department.
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 fixed barricades are designated on plans as a bid item 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.
8. All timber used shall conform to the Standard Specifications for Miscellaneous Untreated Timber S4S. Timber shall conform to Construction grade Paragraph 123B or 125B of Standard No. 15 Grading & Dressing Rule for West Coast Douglas Fir (1956) or Dense Structural 58 and LL Structural 58 Paragraph 284 or 285 of 1956 Grading Rules for Southern Pine.
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.
10. Alternate materials or other reflective elements on Traffic signs or Barricades will be permitted only after approval of such material by the Department in writing.
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. Class I or Class II fixed barricades will be paid for separately when designated on plans as bid item.
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 VI, published by the U.S. Department of Commerce, Bureau of Public Roads, June, 1961 (or latest revision).

BARRICADE DESIGNATIONS

Class	Type		Roadway Width	L	Description
	Movable	Fixed			
I	M-1	F-1	26'-34'	28'	Barricade complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-2	F-2	35'-44'	41'	Barricade complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-3	F-3	Variable	28'	Barricade (without extension wings) complete with SR12-1 sign and SW1-6 or SW1-7 signs as required.
I	M-4	F-4	Variable	Variable 8'-6" min.	Wing Barricade (signs only as appropriate).
II	—	F-6	Variable	28'	Barricade complete with appropriate signs.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

TIMBER BARRICADES

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

Approved By: [signature]
Date: Feb. 1, 1965

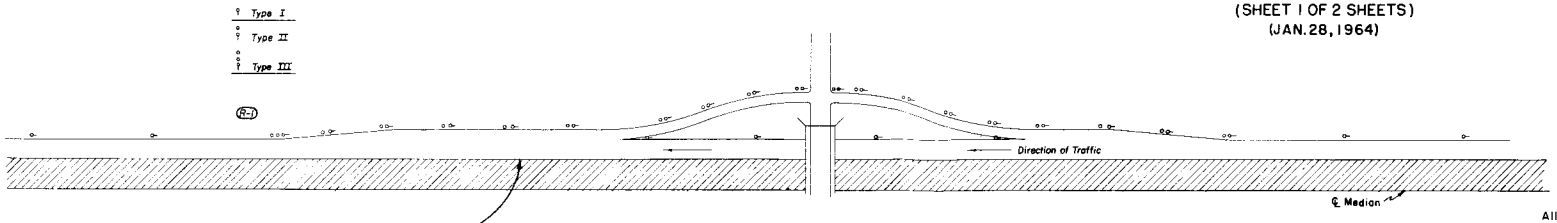
STANDARD M-192-AA

(SHEET 1 OF 2 SHEETS)

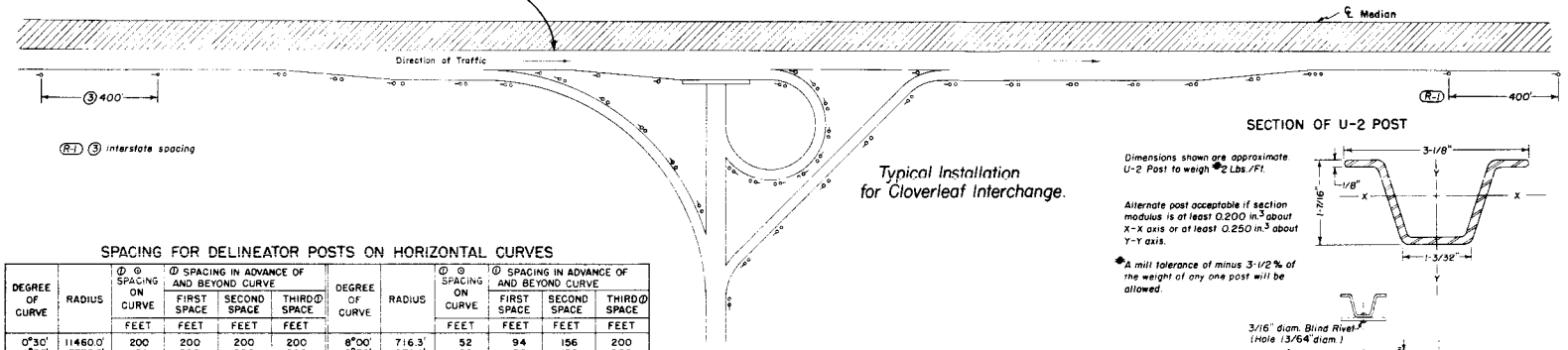
(JAN. 28, 1964)

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

REVISIONS			
	10-27-64	Delete (2), (4) & Tangent spacing	M.R.H.
(R-1)	7-14-65	Post height & delete (5)	M.R.H.



Typical Installation for Diamond Interchange.



(R-1) (3) Interstate spacing

Typical Installation for Cloverleaf Interchange.

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						

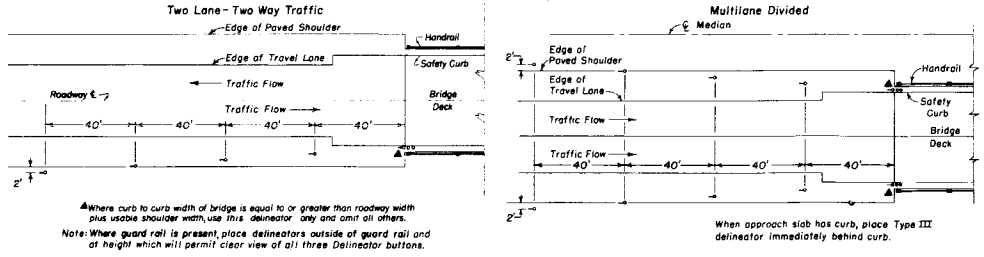
⊙ $S = 2\sqrt{R-50}$ 1-ST. SPACE = 1.8S 2-ND. SPACE = 3S 3-RD. SPACE = 6S

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.

(R-1) For curves less than 2 degrees on Interstate through roadways use Interstate tangent spacing.

Typical Installation at Bridge Approaches



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

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

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

GENERAL NOTES

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

See tabulation in plans for delineator post requirements.

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

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

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

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

Delineator Posts are not to be placed along Frontage Roads.

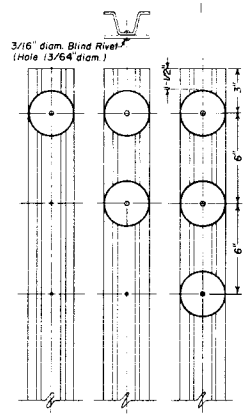
Color of Posts shall be Interstate Green.

SECTION OF U-2 POST

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

Alternate post acceptable if section modulus is at least 0.200 in.^{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.

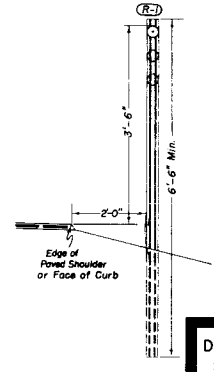


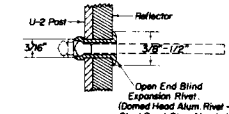
TYPE I — 1-3" diam. Crystal Reflector on U-2 Post

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

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

Min. 3 holes in all posts required as shown.





DETAIL
RIVETING REFLECTOR TO POST

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

DELINEATORS

Designed by CKM Made by WNC Checked by LEO	Approved by C. E. Wilson Engineer, Surveys & Plans Date: October 19, 1962

STANDARD M-192-AA

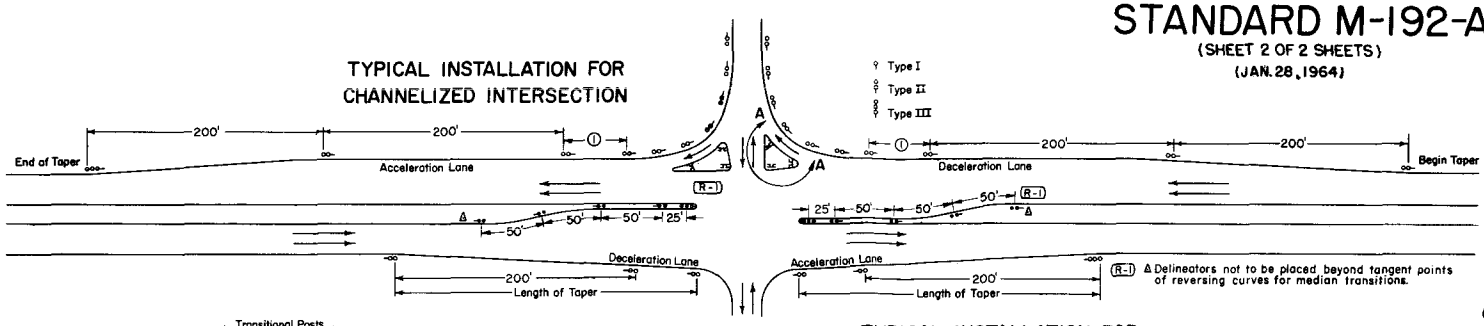
(SHEET 2 OF 2 SHEETS)

(JAN. 28, 1964)

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

REVISIONS			
	10-27-64	Add. note & culvert marking	M.R.H.
R-1	7-14-65	Spacing & Add. note.	M.R.H.

TYPICAL INSTALLATION FOR CHANNELIZED INTERSECTION



(R-1) Δ Delineators not to be placed beyond tangent points of reversing curves for median transitions.

GENERAL NOTES

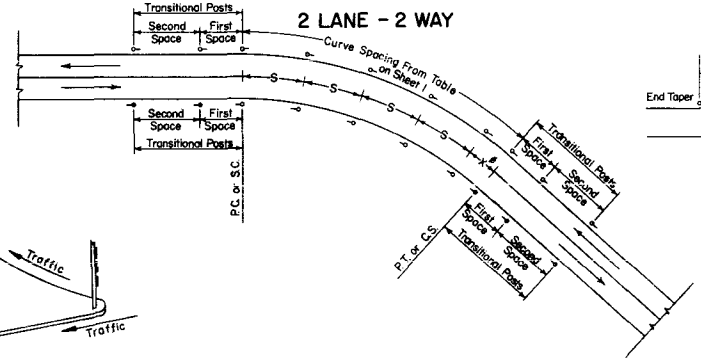
For Radii greater than 200 Feet, use spacing from Table included on Sheet 1 of this Standard.

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

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

(R-1) Lengths of speed change lanes including tapers shall be as shown on plans.

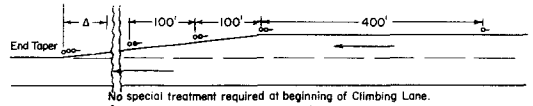
2 LANE - 2 WAY



VIEW A-A

(R-1)

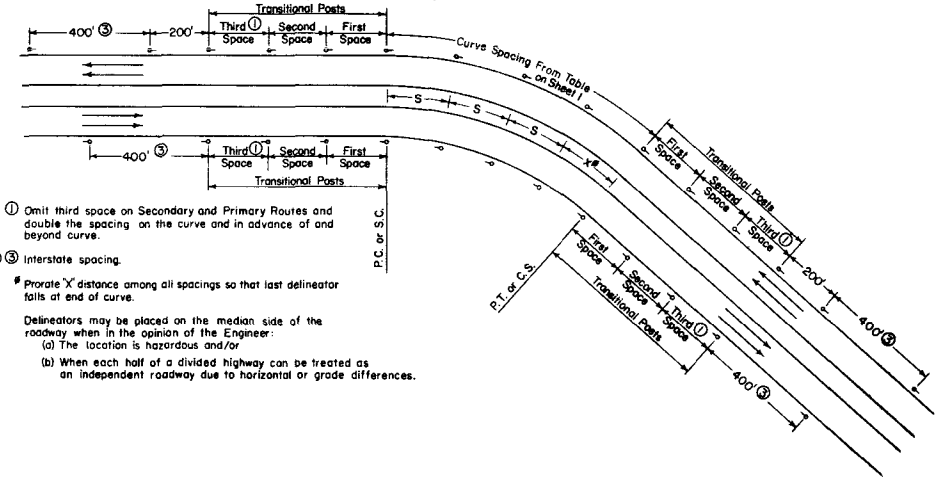
TYPICAL INSTALLATION FOR CLIMBING LANE TRANSITION



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.

(R-1) ③ Interstate spacing.

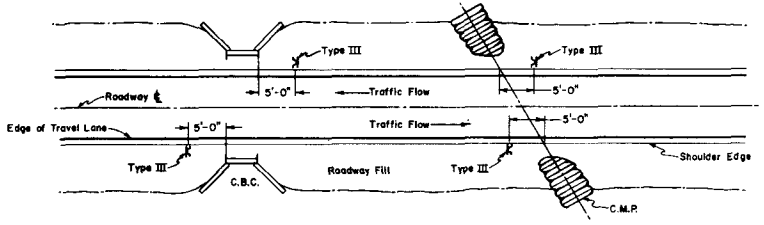
* Prorate 'X' distance among all spacings so that last delineator falls at end of curve.

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

(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.

DELINEATOR PLACEMENT AT ISOLATED MINOR STRUCTURES



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

DELINEATORS

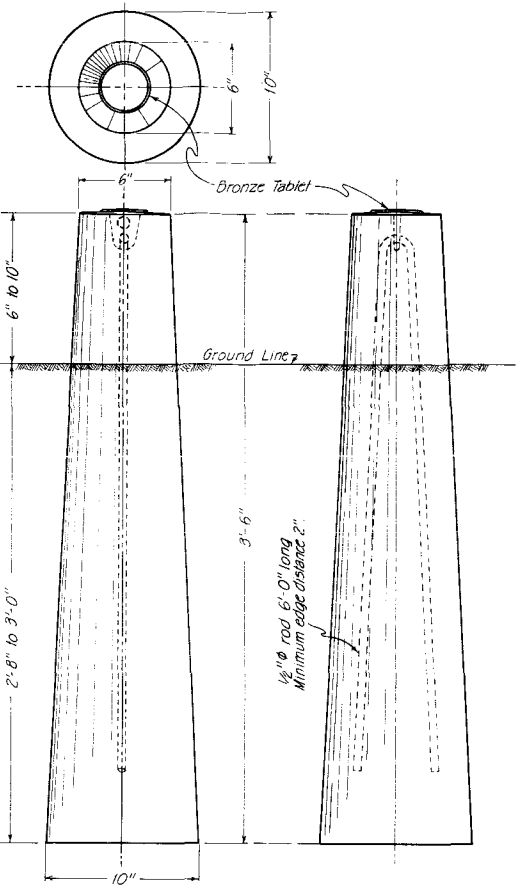
Designed by C.K.M.	Approved by [illegible]
Made by T.E.F.	Engineer of Design & Plans
Checked by L.E.O.	Date: Jan. 28, 1964

RIGHT OF WAY MARKER POST STANDARD M-81-A

(MAY 1, 1962)

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

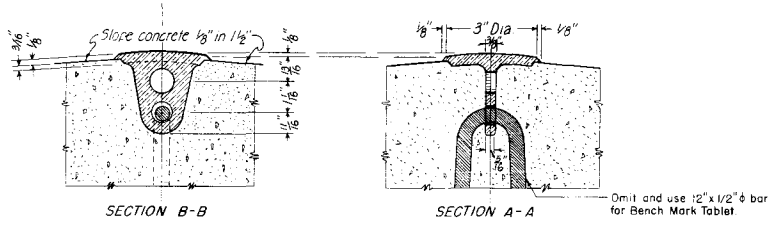
REVISIONS		
1-31-64	DEPT. NAME	M.R.H.



NOTES FOR R.O.W. MARKER POSTS

All work shall be done in accordance with the Standard Specifications of the Colorado Department of Highways applicable to the project. Posts shall be made of Class 'A' Concrete. The upper 12 inches of marker posts shall be rubbed free of form marks, and the top surface of the post must be constructed to drain thoroughly.

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



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

BENCH MARK

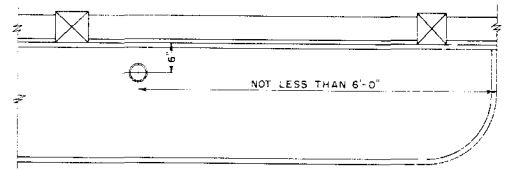
All work shall be done in accordance with Standard Specifications of the Colorado Department of Highways applicable to the project.

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

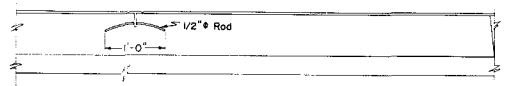
Bronze Bench Mark Tablets will be furnished by the Department at no expense to the Contractor.

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

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



PLAN



ELEVATION

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

MARKER POSTS AND BENCH MARKS

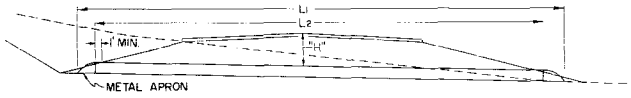
Designed by R.E.L.	Approved by: C. Julian
Mo'ls by E.E.O.	
Ch'ked by R.E.L.	Date: Nov. 12, 1953

STANDARD M-45-B

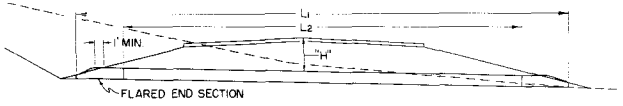
(April 12, 1965)

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

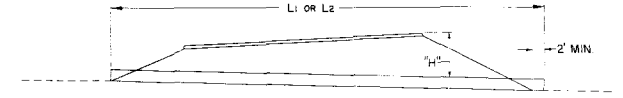
METAL CULVERT WITH END SECTIONS



CONCRETE CULVERT WITH END SECTIONS



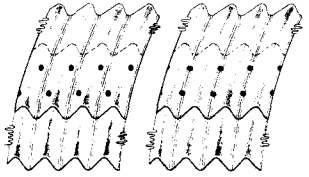
CULVERT WITHOUT END SECTIONS



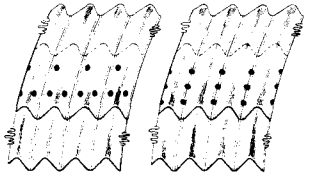
"H" = MAXIMUM HEIGHT OF FILL OVER TOP OF CULVERT, INCLUDING PAVEMENT.
L1 = LENGTH OF CULVERT TO BE MEASURED UNDER ITEM 45
L2 = LENGTH OF PIPE TO BE MEASURED UNDER ITEM 52 AND 53
FOR CLASS OF CONCRETE PIPE SEE STANDARD FOR REINFORCED CONCRETE PIPE
ON DIVIDED HIGHWAY SECTIONS AND SUPERELEVATED SECTIONS, THE "H" DIMENSION SHALL BE THE MAXIMUM DEPTH OF OVERFILL INCLUDING THE PAVEMENT THICKNESS OVER THE TOP OF THE CULVERT.

DETAILS OF SPOT WELDED LONGITUDINAL SEAM

3" x 1" CORRUGATIONS



TYPE II SEAM
TWO WELDS PER CORRUGATION



TYPE III SEAM
THREE WELDS PER CORRUGATION

GENERAL NOTES

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

Gages shown are U.S. Standard and are minimum requirements for use with adequate bedding and backfill, in accordance with the Standard Specifications.

Gages shown are for finished construction. During construction adequate cover shall be provided to protect the structure from damage.

FILL HEIGHTS & GAGE TABLES

TABLE III — CORRUGATED ALUMINUM ALLOY PIPE

DIAMETER IN INCHES	AREA IN SQ. FT.	HEIGHT OF FILL OVER TOP OF PIPE							
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 50
		GAGE							
8	.3	16	16	16	16	16	16	16	16
10	.5	16	16	16	16	16	16	16	16
12	.8	16	16	16	16	16	16	14	12
15	1.2	16	16	16	16	16	14	12	
18	1.8	16	16	16	16	14	12		
21	2.4	16	16	16	14	12	10		
24	3.1	16	14	14	14	12	10		
30	4.9	14	14	14	12	10*	10*		
36	7.1	14	12	12	–	–	–		
36	7.1	–	–	–	12*	10*	10*		
42	9.6	12	12	10	–	–			
42	9.6	–	–	12*	10*	8*			
48	12.6	12	12	10	–	–			
48	12.6	–	–	12*	10*	8*			
54	15.9	12	12	10	–	–			
54	15.9	–	–	12*	10*	8*			
60	19.6	10	8	–	–				
60	19.6	–	10*	8*	8*				
66	23.8	10	8	–					
66	23.8	–	10*	8*					
72	28.3	10	8	–					
72	28.3	–	10*	8*					
78	33.0	10*	10*						
84	38.0	8*							

* To be 5% elongated

TABLE I — CORRUGATED STEEL PIPE & PIPE ARCHES

$2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATIONS (ANNULAR & HELICAL)

DIAMETER IN INCHES #	AREA IN SQ. FT.	HEIGHT OF FILL OVER TOP OF PIPE									
		1 to 10	10+ to 15	15+ to 20	20+ to 25	25+ to 30	30+ to 35	35+ to 40	40+ to 50	50+ to 60	60+ to 70	70+ to 80
		GAGE										
12	.8	16	16	16	16	16	16	14	14	14	12	
15	1.2	16	16	16	16	16	16	14	14	12	12	12
18	1.8	16	16	16	16	16	14	14	12	12	12	
21	2.4	16	16	16	16	14	14	14	12	12	10	8
24	3.1	16	16	14	14	14	14	12	10	8	8	
30	4.9	16	16	14	14	12	12	12*	12*	10*	10*	
36	7.1	14	14	14	12	12	12*	12*	10*	8*		
42	9.6	14	14	12	12	12*	12*	10*	8*			
48	12.6	14	14	12	12*	12*	12*	10*	8*			
54	15.9	12	12	12	12*	12*	10*	8*				
60	19.6	12	12	12	12*	12*	10*	8*				
66	23.8	10	10	10	10*	8*	8*	8*				
72	28.3	10	8	8	8*	8*	8*					
78	33.0	8	8	8	8*	8*	8*					
84	38.0	8	8	8	8*	8*						

*Round Pipe to be 5% elongated

#For Pipe Arches, use nominal span dimension

TABLE II — CORRUGATED STEEL PIPE

1" x 3" CORRUGATIONS (WELDED)

DIAMETER IN INCHES	AREA IN SQ FT	HEIGHT OF FILL OVER TOP OF PIPE											
		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 60	60+ to 70	70+ to 80	80+ to 100
		GAGE												
30	4.9	16	16	16	16	16	16	16	16	14	14*	14*	12*	12*
36	7.1	16	16	16	16	16	16	14	14	14*	14*	12*	12*	12*
42	9.6	16	16	16	16	16	14	14	14*	14*	12*	12*	12*	10*
48	12.6	14	14	14	14	12	12	12*	12*	12*	10*	8*		
54	15.9	14	14	14	14	12	12*	12*	12*	12*	10*	8*		
60	19.6	14	14	14	12	12*	12*	12*	12*	10*	8*			
66	23.8	12	12	12	12	12*	12*	12*	10*	8*				
72	28.3	12	12	12	12*	12*	12*	10*	8*					
78	33.0	12	12	12	10*	8*	8*	8*						
84	38.0	12	12	10	10*	8*								
90	44.0	12	10	8	8*									
96	50.0	10	10	8										
102	57.0	10	8											
108	64.0	8												

* To be 5% elongated

(2) Type 2 Seam

(3) Type 3 Seam

REVISIONS		
(R-I) 4/16/65	Alum. Ga. & Type 3 Seam Line	M.R.H.

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

CULVERT PIPE

H-20 LOADING

Designed by ____ Approved by ____
Made by J.P. ____ Staff Design Engineer
Checked by M.R.H. Date April 12, 1965

STANDARD M-46-E

(MAY 1, 1962)

REV. 2-11-64, DEPT. NAME, M.R.H.
REV 9-24-64 Title Block–2:1 Sl. M.R.H.

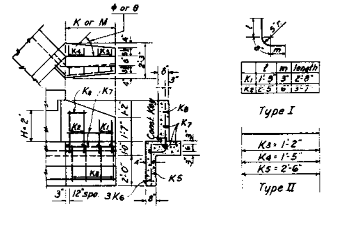
FED. ROAD REG. NO.	DIVISION	PROJECT NO.	SHEET NO.
9	COLO.		

TABLE SHOWING VALUES OF K AND M WHEN "β" AND "H" ARE GIVEN

β	α	φ	θ	H = 2'-0" K	H = 2'-0" M	H = 3'-0" K	H = 3'-0" M	H = 4'-0" K	H = 4'-0" M	H = 5'-0" K	H = 5'-0" M	H = 6'-0" K	H = 6'-0" M	H = 7'-0" K	H = 7'-0" M	H = 8'-0" K	H = 8'-0" M	H = 9'-0" K	H = 9'-0" M	H = 10'-0" K	H = 10'-0" M
45°	45°	67°30'	22°30'	2'-4"	6'-2"	3'-7"	8'-7"	4'-10"	11'-7"	5'-11"	14'-2"	6'-10"	16'-5"	7'-9"	18'-8"	8'-8"	20'-10"	9'-8"	23'-2"	10'-7"	25'-5"
60°	30°	60°	30°	2'-9"	4'-9"	3'-10"	6'-7"	5'-2"	8'-10"	6'-3"	10'-10"	7'-3"	12'-7"	8'-3"	14'-5"	9'-3"	16'-0"	10'-3"	17'-9"	11'-3"	19'-6"
75°	15°	52°30'	37°30'	3'-0"	3'-11"	4'-2"	5'-5"	5'-7"	7'-3"	6'-10"	8'-11"	7'-11"	10'-4"	9'-0"	11'-9"	10'-1"	13'-2"	11'-2"	14'-7"	12'-3"	16'-0"
90°	0°	45°	45°	3'-4"	3'-4"	4'-8"	4'-8"	6'-3"	6'-3"	7'-8"	7'-8"	8'-11"	8'-11"	10'-2"	10'-2"	11'-4"	11'-4"	12'-7"	12'-7"	13'-9"	13'-9"
105°	15°	37°30'	52°30'	3'-11"	3'-0	5'-5"	4'-2"	7'-3"	5'-7"	8'-11"	6'-10"	10'-4"	7'-11"	11'-9"	9'-0"	13'-2"	10'-1"	14'-7"	11'-2"	16'-0"	12'-3"
120°	30°	30°	60°	4'-9"	2'-9"	6'-7"	3'-10"	8'-10"	5'-2"	10'-10"	6'-3"	12'-7"	7'-3"	14'-5"	8'-3"	16'-0"	9'-3"	17'-9"	10'-3"	19'-6"	11'-3"
135°	45°	22°30'	67°30'	6'-2"	2'-4"	8'-7"	3'-7"	11'-7"	4'-10"	14'-2"	5'-11"	16'-5"	6'-10"	18'-8"	7'-9"	20'-10"	8'-8"	23'-2"	9'-8"	25'-5"	10'-7"

β EQUALS THE ANGLE BETWEEN ℄ OF CULVERT AND ℄ OF ROADWAY. α EQUALS THE ANGLE BETWEEN ℄ OF CULVERT AND A NORMAL TO ℄ OF ROADWAY. φ AND θ ARE ANGLES BETWEEN THE WINGWALL AND A LINE PARALLEL WITH THE CENTER LINE OF ROADWAY.

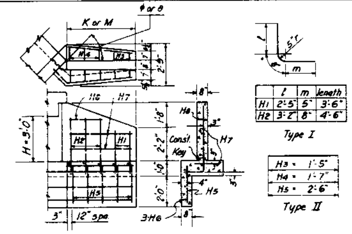
EXAMPLE FOR USING THE ABOVE TABLE. SUPPOSE A STREAM MAKES AN ANGLE OF β = 65° WITH THE CENTER LINE OF ROADWAY, THEN, FROM THE TABLE, SELECT THE NEAREST ANGLE β = 60°, THEN α, φ AND θ EQUAL 30°, 60° AND 30° RESPECTIVELY. IF THE DESIRED HEIGHT "H" OF CULVERT IS 8'-0", THEN "K" AND "M" WILL BE 9'-3" AND 16'-0". LOCATE THE WING DETAIL WHEN H = 8'-0" ON THIS SHEET.



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

When φ or θ equals	K1 ½"φ Type I	K2 ½"φ Type I	K3 ½"φ Type II	K4 ½"φ Type II	K5 ½"φ Type II	3-K6 ½"φ Type II	3-K7 ½"φ Type II	1-K8 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	4	3	4	3	8	8'-3"	5'-10"	2'-2"	1.07	64
30°	3	2	3	2	6	6'-2"	4'-5"	1'-2"	0.82	47
37°30'	2	2	2	2	6	5'-0"	3'-7"	1'-2"	0.68	40
45°	2	2	2	2	5	4'-4"	3'-0"	1'-2"	0.57	36
52°30'	2	2	2	2	4	4'-0"	2'-8"	1'-2"	0.52	33
60°	2	1	2	1	4	3'-6"	2'-5"	1'-0"	0.48	28
67°30'	2	1	2	1	4	3'-0"	2'-0"	1'-0"	0.40	26

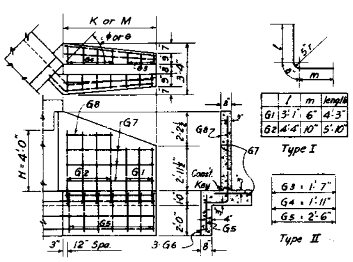
WING DETAIL WHEN H = 2'-0"



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

When φ or θ equals	H1 ½"φ Type I	H2 ½"φ Type I	H3 ½"φ Type II	H4 ½"φ Type II	H5 ½"φ Type II	3-H6 ½"φ Type II	4-H7 ½"φ Type II	1-H8 ½"φ Type II	Concrete Cu. Yds.	Steel lbs.
22°30'	4	5	4	5	11	10'-10"	8'-3"	4'-2"	1.78	99
30°	3	4	3	4	8	8'-4"	6'-3"	3'-2"	1.36	76
37°30'	3	3	3	3	7	6'-8"	5'-1"	2'-2"	1.12	63
45°	2	3	2	3	6	5'-10"	4'-4"	2'-2"	0.97	54
52°30'	2	3	2	3	6	5'-4"	3'-10"	2'-2"	0.86	52
60°	2	2	2	2	5	4'-10"	3'-6"	1'-2"	0.79	44
67°30'	2	2	2	2	5	4'-8"	3'-3"	1'-2"	0.74	43

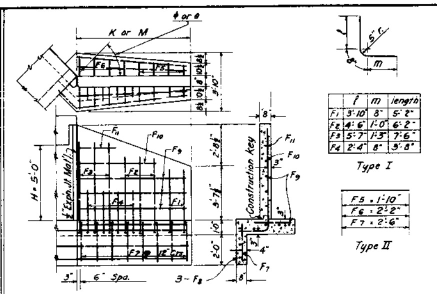
WING DETAIL WHEN H = 3'-0"



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

When φ or θ equals	G1 ½"φ Type I	G2 ½"φ Type I	G3 ½"φ Type II	G4 ½"φ Type II	G5 ½"φ Type II	3-G6 ½"φ Type II	7-G7 ½"φ Type II	1-G8 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	6	6	6	6	14	14'-3"	11'-3"	5'-2"	2.89	164
30°	4	5	4	5	11	10'-9"	8'-6"	4'-2"	2.21	125
37°30'	3	4	3	4	9	8'-9"	6'-11"	3'-2"	1.81	101
45°	3	4	3	4	8	7'-8"	5'-11"	3'-2"	1.56	92
52°30'	3	3	3	3	7	6'-9"	5'-3"	2'-2"	1.40	79
60°	3	3	3	3	7	6'-4"	4'-10"	2'-2"	1.29	77
67°30'	2	3	2	3	6	6'-0"	4'-6"	2'-2"	1.21	69

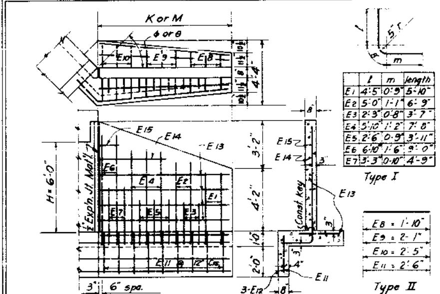
WING DETAIL WHEN H = 4'-0"



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

When φ or θ equals	F1 ½"φ Type I	F2 ½"φ Type I	F3 ½"φ Type I	F4 ½"φ Type I	F5 ½"φ Type II	F6 ½"φ Type II	F7 ½"φ Type II	3-F8 ½"φ Type II	7-F9 ½"φ Type II	1-F10 ½"φ Type II	1-F11 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	5	5	5	6	7	8	17	17'-3"	13'-10"	9'-2"	4'-2"	4.06	237
30°	3	4	4	5	5	6	13	13'-3"	10'-6"	7'-2"	3'-2"	3.10	180
37°30'	3	3	3	4	4	5	11	11'-0"	8'-7"	5'-2"	2'-2"	2.55	147
45°	2	3	3	4	4	4	9	9'-6"	7'-4"	5'-2"	2'-2"	2.20	130
52°30'	2	2	3	3	3	4	8	8'-6"	6'-6"	4'-2"	2'-2"	1.96	113
60°	2	2	3	3	3	4	8	7'-9"	5'-11"	4'-2"	2'-2"	1.79	109
67°30'	2	2	2	3	3	3	7	7'-3"	5'-7"	3'-2"	1'-2"	1.69	97

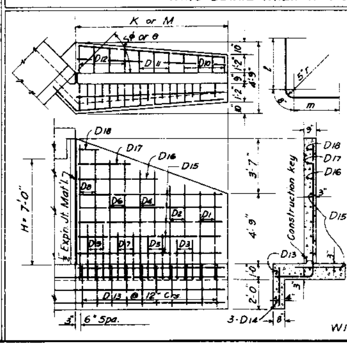
WING DETAIL WHEN H = 5'-0"



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

When φ or θ equals	E1 ½"φ Type I	E2 ½"φ Type I	E3 ½"φ Type I	E4 ½"φ Type I	E5 ½"φ Type I	E6 ½"φ Type I	E7 ⅝"φ Type I	E8 ½"φ Type II	E9 ½"φ Type II	E10 ½"φ Type II	E11 ½"φ Type II	3-E12 ½"φ Type II	8-E13 ½"φ Type II	1-E14 ½"φ Type II	1-E15 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	4	4	4	5	4	4	4	5	6	6	20	19'-9"	16'-1"	8'-2"	3'-2"	5.21	317
30°	3	3	3	4	4	3	3	5	4	4	15	15'-0"	12'-3"	6'-2"	2'-2"	3.99	243
37°30'	2	3	3	3	3	3	2	3	4	4	13	12'-6"	10'-0"	5'-2"	2'-2"	3.28	203
45°	2	2	2	3	3	2	2	3	3	3	11	10'-9"	8'-7"	4'-2"	1'-2"	2.83	171
52°30'	1	2	2	3	3	2	2	2	3	3	10	9'-8"	7'-7"	4'-2"	1'-2"	2.51	156
60°	2	2	2	2	2	2	2	2	3	3	9	8'-9"	6'-11"	3'-2"	1'-2"	2.30	145
67°30'	1	2	2	2	2	2	2	2	3	2	8	8'-3"	6'-6"	3'-2"	1'-2"	2.17	134

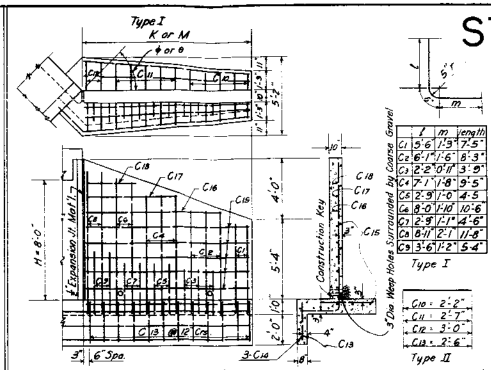
WING DETAIL WHEN H = 6'-0"



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

When φ or θ equals	D1 ½"φ Type I	D2 ½"φ Type I	D3 ½"φ Type I	D4 ½"φ Type I	D5 ½"φ Type I	D6 ⅝"φ Type I	D7 ⅝"φ Type I	D8 ⅝"φ Type I	D9 ⅝"φ Type I	D10 ½"φ Type II	D11 ½"φ Type II	D12 ½"φ Type II	D13 ½"φ Type II	3-D14 ½"φ Type II	10-D15 ½"φ Type II	1-D16 ½"φ Type II	1-D17 ½"φ Type II	1-D18 ½"φ Type II	Concrete Cu. Yd.	Steel Lbs.
22°30'	4	4	5	4	4	4	3	3	3	6	6	7	22	22'-3"	18'-4"	10'-2"	6'-2"	2'-2"	7.01	436
30°	3	3	4	4	3	3	3	2	2	5	5	5	18	17'-6"	14'-1"	8'-2"	4'-2"	1'-2"	5.42	339
37°30'	3	2	2	3	3	2	2	2	2	4	4	4	14	14'-0"	11'-5"	6'-2"	3'-2"	1'-2"	4.41	267
45°	2	2	2	2	2	2	2	2	2	4	3	4	12	12'-3"	9'-10"	5'-2"	3'-2"	1'-2"	3.82	238
52°30'	2	1	2	2	2	2	2	2	1	3	3	3	11	10'-9"	8'-8"	5'-2"	3'-2"	1'-2"	3.38	212
60°	2	1	2	2	2	2	2	1	1	3	3	3	10	10'-0"	7'-11"	4'-2"	2'-2"	1'-2"	3.10	191
67°30'	2	1	2	2	2	2	2	1	1	2	3	3	9	9'-6"	7'-5"	4'-2"	2'-2"	1'-2"	2.91	184

WING DETAIL WHEN H = 7'-0"



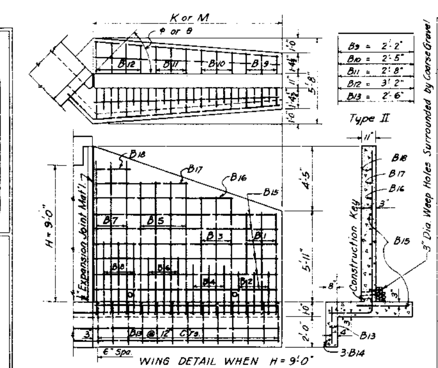
BAR LIST & QUANTITIES FOR ONE WING WHEN H = 8'-0"

When φ or θ equals	C1 ½"φ Type I	C2 ½"φ Type I	C3 ½"φ Type I	C4 ½"φ Type I	C5 ½"φ Type I	C6 ⅝"φ Type I	C7 ⅝"φ Type I	C8 ⅝"φ Type I	C9 ⅝"φ Type I	C10 ½"φ Type II	C11 ½"φ Type II	C12 ⅝"φ Type II	C13 ½"φ Type II	3-C14 ½"φ Type II	10-C15 ½"φ Type II	1-C16 ½"φ Type II	1-C17 ½"φ Type II	1-C18 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	4	4	5	5	4	4	4	4	4	9	9	3	25	24'-8"	20'-6"	16'-2"	12'-2"	7'-2"	9.00	526
30°	3	3	4	4	3	3	3	3	3	7	6	3	19	19'-0"	15'-8"	12'-2"	9'-2"	5'-2"	6.91	402
37°30'	2	3	3	3	3	3	3	2	2	6	5	2	16	16'-0"	12'-10"	10'-2"	7'-2"	4'-2"	5.69	330
45°	2	3	3	3	2	2	2	2	2	5	5	2	14	13'-8"	11'-0"	9'-2"	6'-2"	3'-2"	4.89	287
52°30'	2	2	3	2	2	2	2	2	2	4	4	2	13	12'-2"	9'-9"	7'-2"	5'-2"	3'-2"	4.35	257
60°	1	2	3	2	2	2	2	2	2	4	4	2	12	11'-0"	8'-11"	7'-2"	5'-2"	3'-2"	3.99	242
67°30'	1	2	2	2	2	2	2	2	2	4	3	2	10	10'-3"	8'-4"	6'-3"	4'-6"	2'-4"	3.74	228

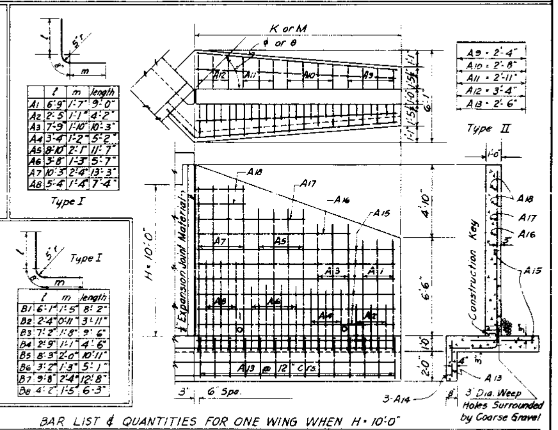
WING DETAIL WHEN H = 8'-0"

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

When φ or θ equals	B1 ½"φ Type I	B2 ½"φ Type I	B3 ½"φ Type I	B4 ½"φ Type I	B5 ⅝"φ Type I	B6 ⅝"φ Type I	B7 ⅝"φ Type I	B8 ¾"φ Type I	B9 ½"φ Type II	B10 ½"φ Type II	B11 ½"φ Type II	B12 ⅝"φ Type II	B13 ½"φ Type II	3-B14 ½"φ Type II	11-B15 ½"φ Type II	1-B16 ½"φ Type II	1-B17 ½"φ Type II	1-B18 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	5	6	6	6	7	6	5	5	5	5	6	7	25	27'-7"	22'-10"	17'-2"	11'-2"	4'-2"	11.56	666
30°	4	4	5	4	5	6	4	3	3	4	5	6	20	21'-2"	17'-5"	13'-2"	8'-2"	3'-2"	8.86	510
37°30'	3	3	4	4	5	4	3	3	3	3	4	5	17	17'-4"	14'-3"	11'-2"	7'-2"	2'-2"	7.27	427
45°	3	3	3	3	4	3	3	3	3	3	3	4	15	15'-0"	12'-3"	9'-2"	6'-2"	2'-2"	6.28	370
52°30'	3	3	2	3	3	3	3	2	2	2	3	4	14	13'-4"	10'-10"	7'-2"	5'-2"	2'-2"	5.57	322
60°	3	3	2	2	3	3	2	2	2	2	3	3	13	12'-3"	9'-11"	6'-2"	4'-2"	1'-2"	5.11	294
67°30'	3	2	2	2	3	3	2	2	2	2	3	3	12	11'-6"	9'-4"	6'-2"	4'-2"	1'-2"	4.82	279



WING DETAIL WHEN H = 9'-0"



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

When φ or θ equals	A1 ½"φ Type I	A2 ½"φ Type I	A3 ½"φ Type I	A4 ½"φ Type I	A5 ⅝"φ Type I	A6 ⅝"φ Type I	A7 ⅝"φ Type I	A8 ⅞"φ Type I	A9 ½"φ Type II	A10 ½"φ Type II	A11 ⅝"φ Type II	A12 ⅝"φ Type II	A13 ½"φ Type II	3-A14 ½"φ Type II	11-A15 ½"φ Type II	1-A16 ½"φ Type II	1-A17 ½"φ Type II	2-A18 ½"φ Type II	Concrete Cu. Yds.	Steel Lbs.
22°30'	6	6	5	5	8	8	7	6	8	7	5	6	30	30'-0"	25'-1"	19'-2"	14'-2"	6'-2"	14.35	830
30°	5	4	4	4	5	6	6	5	6	6	4	4	23	23'-0"	19'-2"	14'-2"	10'-2"	5'-2"	11.01	636
37°30'	3	4	4	3	4	5	5	4	4	4	4	4	19	19'-0"	15'-8"	12'-2"	8'-2"	4'-2"	9.03	523
45°	3	3	3	3	4	4	4	3	4	4	3	3	16	16'-3"	13'-5"	10'-2"	7'-2"	3'-2"	7.76	440
52°30'	3	3	2	3	3	3	4	3	4	3	3	3	14	14'-9"	11'-11"	8'-2"	6'-2"	3'-2"	6.92	394
60°	2	2	3	3	3	3	3	3	3	3	3	3	13	13'-6"	10'-11"	8'-2"	5'-2"	2'-2"	6.35	363
67°30'	2	2	3	2	3	3	3	3	3	3	3	2	12	12'-10"	10'-3"	8'-2"	5'-2"	2'-2"	5.97	348

WING DETAIL WHEN H = 10'-0"

GENERAL NOTES

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

ALL CONCRETE SHALL BE CLASS "A".

ALL WING SURFACES TO RECEIVE ORDINARY SURFACE FINISH.

WING FOOTINGS AND FLOOR OF BOX SHALL BE POURED MONOLITHICALLY.

FOOTINGS IN ROCK SHALL BE POURED OUT TO ROCK AND NOT FORMED.

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

ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE STEEL OF A DEFORMED TYPE. EACH BAR SHALL BE TAGGED WITH THE NUMBER DESIGNATION AND THE STATION NUMBER OF THE PROJECT. SECONDARY BARS WHEN SPLICED SHALL LAP 17 DIAMETERS OF THE BAR. DIMENSIONS FOR REINFORCING STEEL NOT SHOWN AS CLEAR SHALL BE TO THE CENTER LINE OF THE BAR. OUT TO OUT DIMENSIONS SHALL BE USED ON BAR BENDING DETAILS.

SUPPORTING SOILS FOR ALL CULVERTS MUST BE COMPOSED OF FIRM AND UNIFORM MATERIAL THROUGHOUT.

HORIZONTAL CONSTRUCTION KEYS ARE NOT REQUIRED WHEN FOOTINGS AND WALL ARE POURED MONOLITHICALLY.

ALL CONSTRUCTION KEYS SHOWN BETWEEN FOOTINGS AND WALLS ARE 3" X 3".

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

STEEL WEIGHTS INCLUDE 1% ± FOR OVERRUN.
EXPANSION JOINT MATERIAL IS TO BE INCLUDED IN THE PRICE OF CLASS "A" CONCRETE AND SHALL CONFORM TO A.A.S.H.O. SPECIFICATION M-153-52 TYPE III.
FOR CULVERTS REQUIRED AND GOVERNING DIMENSIONS SEE "LIST OF STRUCTURES".

LOADING DATA INTERSTATE ALTERNATE

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

DESIGNING DATA

A.A.S.H.O. 1953 UNIT STRESSES, EXCEPT AS NOTED.

Reinforcing Steel fs — 20000 lbs. per sq. in.
Structural Steel fs — 18000 lbs. per sq. in.
fc — 1200 lbs. per sq. in.
n — 10

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

WINGWALLS FOR

CONCRETE BOX CULVERTS
2:1 SIDE SLOPES

Designed by: W.W.D.	Approved by: A. K. Neubold
Made by W.W.D.	Bridge Engineer
Checked by T.J.M.	Date: Aug. 30, 1954

STANDARD M-76-A

(SHEET 1 OF 2 SHEETS)

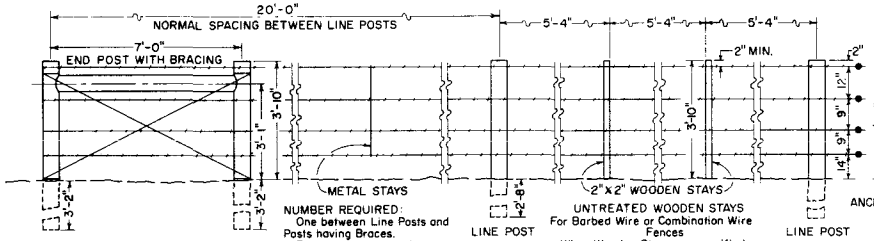
(SEPTEMBER 24, 1964)

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

REVISIONS		
4-8-65	Conc. Ftgs. & Eye bolts	M.R.H.

(R-1)

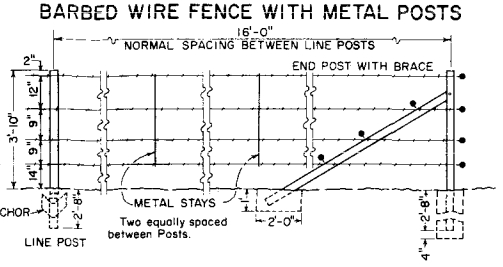
BARBED WIRE FENCE WITH WOODEN POSTS



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

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

BARBED WIRE FENCE WITH METAL POSTS

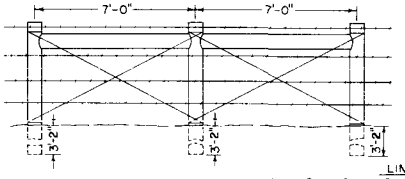


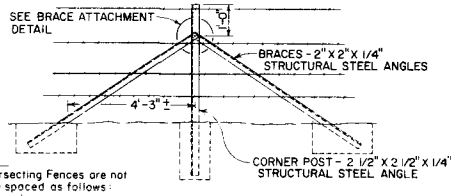
Two equally spaced between Posts.

CROSS BRACE DOWELING DETAIL

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

LINE BRACES

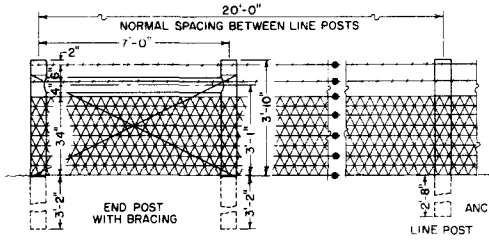




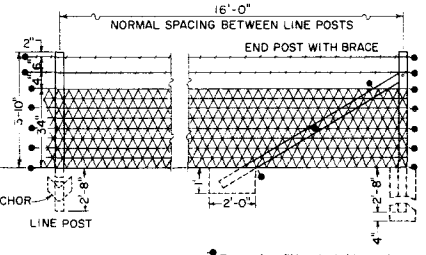
LINE BRACES

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

COMBINATION WIRE FENCE WITH WOODEN POSTS

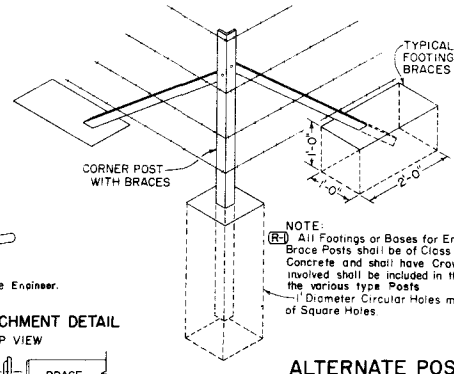


COMBINATION WIRE FENCE WITH METAL POSTS

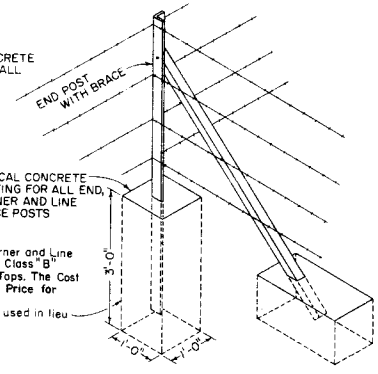


● Fence wire will be stapled to wooden posts or tied to metal posts as shown marked ● on barbed wire or combination wire fence details.

TYPICAL CORNER POST INSTALLATION

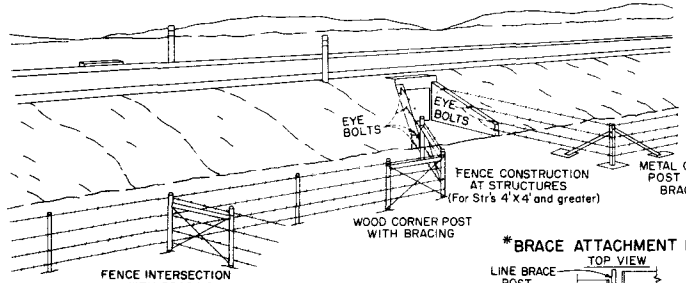


TYPICAL INSTALLATION AT FENCE INTERSECTIONS



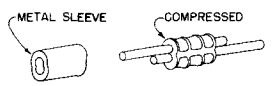
(R-1) NOTE:
All Footings or Bases for End, Corner and Line Brace Posts shall be of Class "A" or Class "B" Concrete and shall have Crowned Tops. The Cost involved shall be included in the Bid Price for the various type Posts
1" Diameter Circular Holes may be used in lieu of Square Holes.

ILLUSTRATIVE SKETCH SHOWING TYPICAL EXAMPLES FOR CONSTRUCTING FENCES



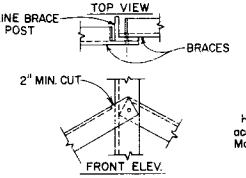
NOTE:
At all structures of 4'x4' and over, the fence shall be ended at eye-bolts in the wings of the structure. Where the type of structure prohibits the use of eye-bolts, an end post with brace shall be used.
Eye-bolts shall be made of 1/2" round bars with a minimum of six (6) inches of body length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

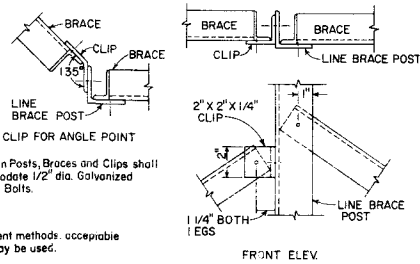


Splicing Sleeve shall be approved by the Engineer.

*BRACE ATTACHMENT DETAIL



*ALTERNATE BRACE ATTACHMENT DETAIL

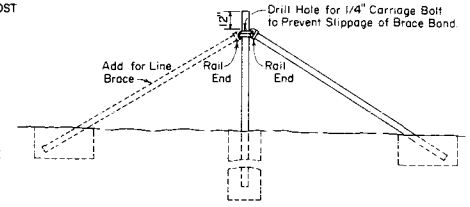


Holes in Posts, Braces and Clips shall accommodate 1/2" dia. Galvanized Machine Bolts.

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

ALTERNATE POST

(FOR END, CORNER OR LINE BRACE POSTS)



DEPARTMENT OF HIGHWAYS
STATE OF COLORADO
WIRE FENCES
AND
GATES

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

STANDARD M-76-A

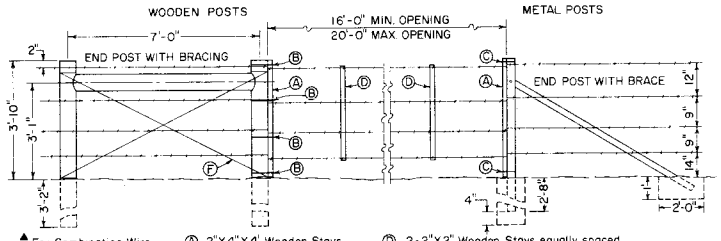
(SHEET 2 OF 2 SHEETS)

(SEPTEMBER 24, 1964)

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

REVISIONS			
(R-1)	4-8-65	Fence Wire & General Notes	M.R.H.

▲BARBED WIRE GATE



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

Ⓐ 2"X4"X4' Wooden Stays.

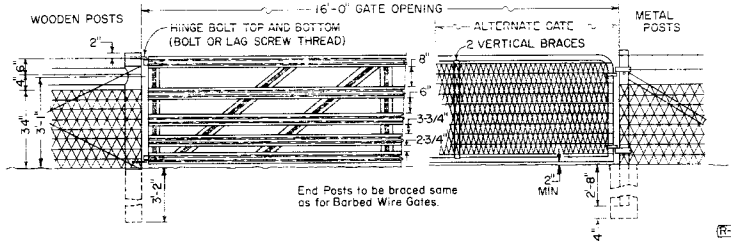
Ⓑ 4 - No 12 1/2 Ga. Wire Loops to act as Hinges.

Ⓒ No. 12 1/2 Ga. Wire Loops.

Ⓓ 2-2"X2" Wooden Stays equally spaced.

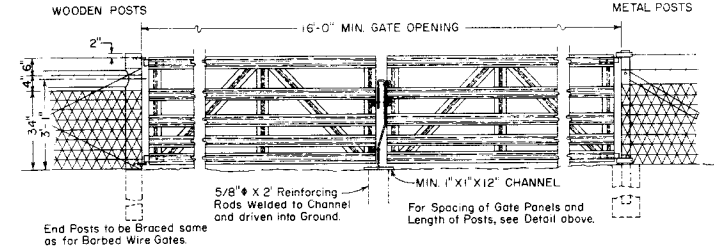
Ⓕ No. 12 1/2 Ga. Brace Wire.

DRIVEWAY GATES

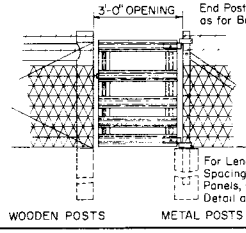


End Posts to be braced same as for Barbed Wire Gates.

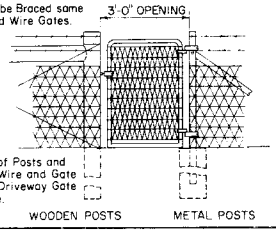
TWIN DRIVEWAY GATES



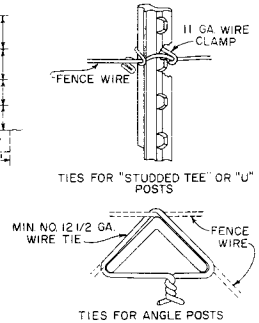
WALK GATE

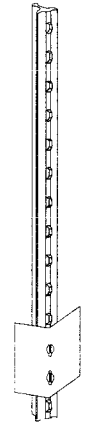


ALTERNATE WALK GATE



FENCE WIRE TIES





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

(R-1) Fence wire shall be ended, double wrapped and tied off at end posts, angle posts and line brace posts. Fence to be continued snug, then be restarted in like manner.

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

WOOD POSTS:

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

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

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

METAL POSTS:

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

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

CORNER POSTS:

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

LINE POSTS:

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

END POSTS:

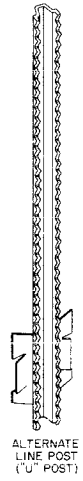
Type - 2 1/2" X 2 1/2" X 1/4" Structural Steel Angles.
Weight - 3.81 lbs./lin. ft. Min.
Length - 6'-6" Min.
No. of Braces - 1

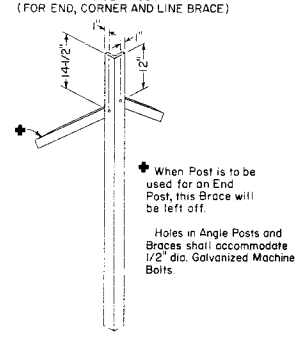
BRACES: (For Corner, End or Line Brace Posts)

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

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

TYPICAL METAL POSTS





GENERAL NOTES

ALTERNATES:

END, CORNER AND LINE BRACE POSTS

(R-1) Type - 2 1/2" Std. Galvanized Pipe.
Weight - 3.65 lbs./lin. ft. Min.

BRACES:

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

BARBED WIRE:

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

4"X4" WIRE MESH:

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

GATES:

DRIVEWAY GATES:

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

ALTERNATE DRIVEWAY GATES:

Height - 42"
Weight - Not less than 79 lbs. complete with latch and hinges.
Width of gate opening - 16'-0"
Gate Frame - 1" I.D. Standard Galvanized Pipe or acceptable equivalent and shall be of all welded construction.
Mesh to be of same construction as shown for 4"X4" wire mesh except it shall be 2"X4" mesh 42" high.

① WALK GATES:

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

ALTERNATE WALK GATES

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

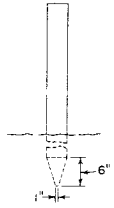
Alternate equivalent standard metal gates other than shown will be acceptable subject to the Engineer's approval.

(R-1) 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.

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
WIRE FENCES
AND
GATES

Designed by	L.E.O.	Approved by	
Made by	T.E.F.	Engr. Surveys & Plans	
Checked by	E.E.O.	Date:	6-12-1964

STANDARD M-93-A

(MAY 1, 1962)

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

REVISIONS		
2-14-64	DEPT. NAME	M.R.H.

GENERAL NOTES

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

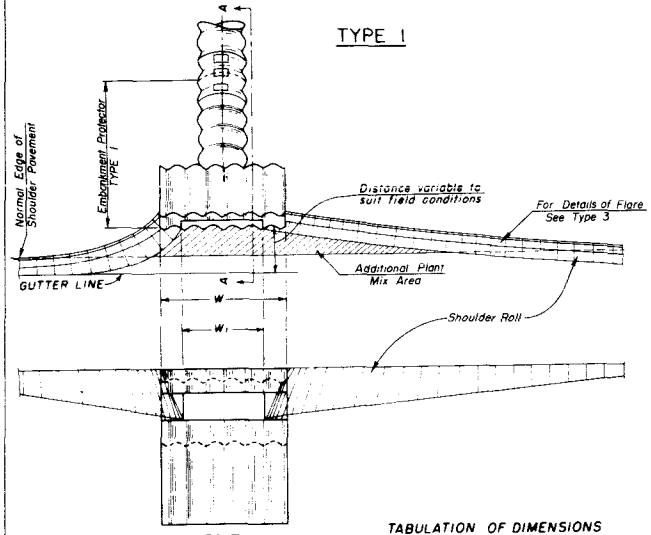
* All exposed corners shall be beveled
* All construction joints shall be thoroughly cleaned before fresh concrete is poured.
* All walls shall have forms on both sides.

For size and location of protectors, see plans.

Structure backfill material is not to be used in connection with these structures. Embankment material shall be used for backfilling. This embankment, and compaction shall be included in price bid for these structures.

* Type 2 Embankment Protector only.

TYPE 1

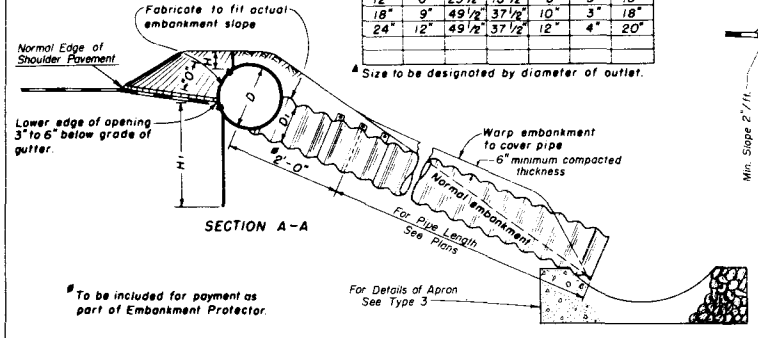


FRONT ELEVATION

TABULATION OF DIMENSIONS

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

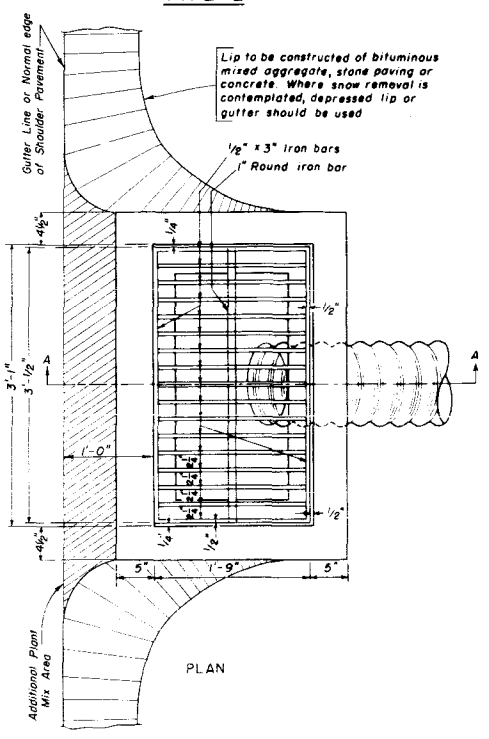
▲ Size to be designated by diameter of outlet.



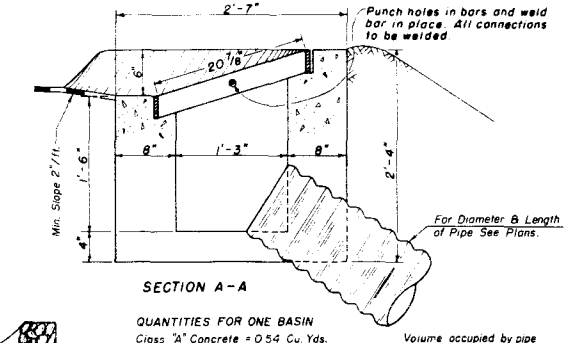
SECTION A-A

* To be included for payment as part of Embankment Protector.

TYPE 2



PLAN

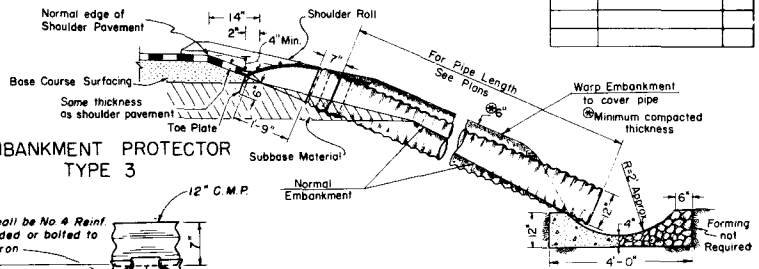


SECTION A-A

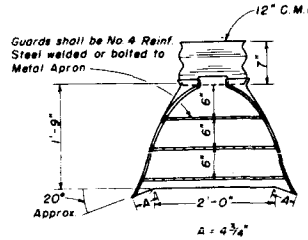
QUANTITIES FOR ONE BASIN
Class "A" Concrete = 0.54 Cu. Yds.
Inlet Grating = 1

Volume occupied by pipe not to be deducted from Concrete Quantities.

TYPE 3

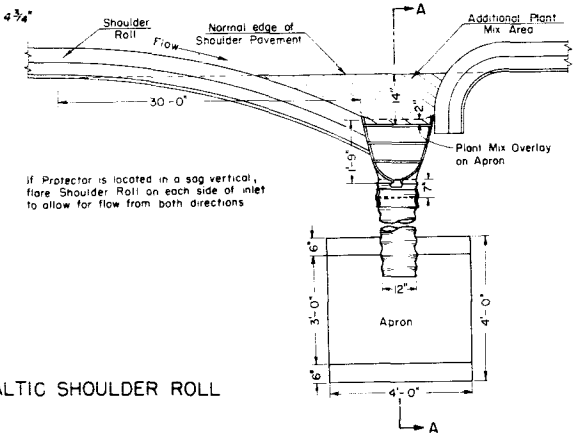


EMBANKMENT PROTECTOR TYPE 3



SECTION "A-A"

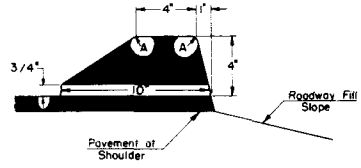
4'x4'x1' Apron where required, see plans for type of material. Material to be placed to neat lines of trench.
Quantities = 0.40 Cu. Yd.
On concrete pavement projects, pavement concrete may be used.



PLAN

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

ASPHALTIC SHOULDER ROLL



A = 1/8" Radius

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

DEPARTMENT OF HIGHWAYS
STATE OF COLORADO

EMBANKMENT PROTECTORS

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