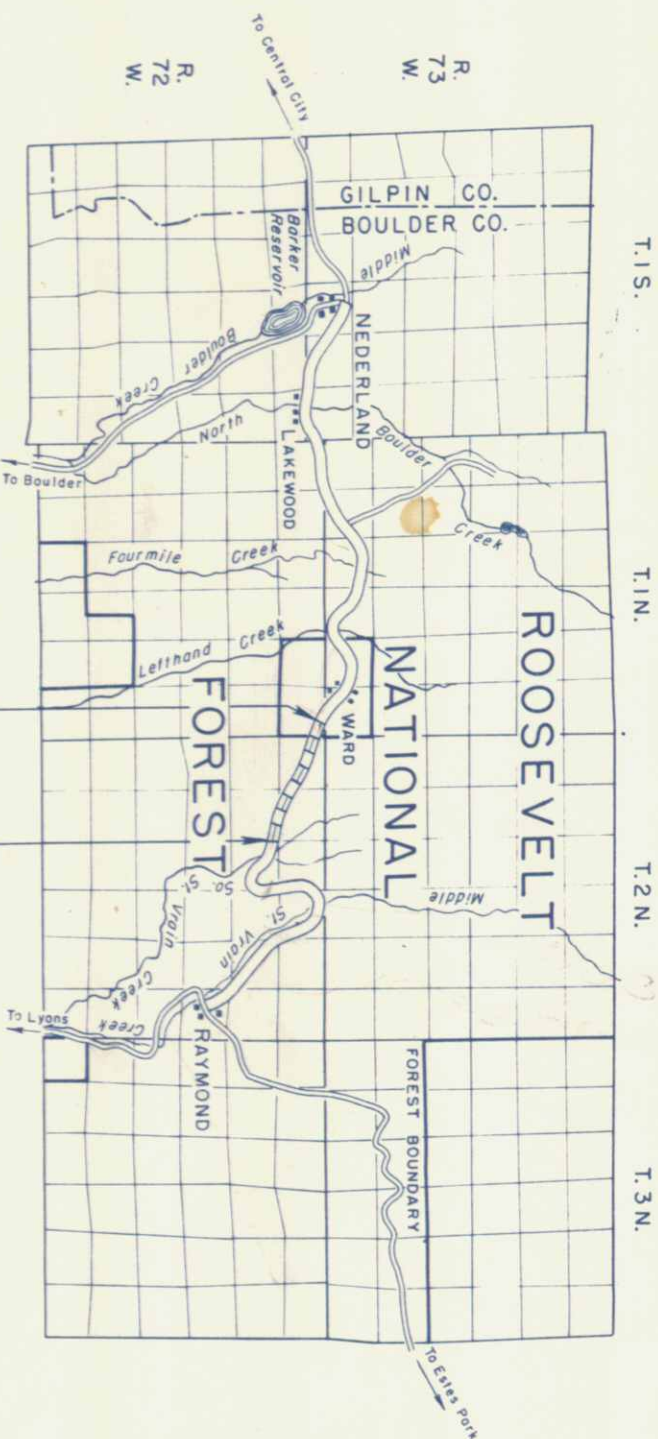


U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS

PLANS FOR PROPOSED  
COLORADO FOREST HIGHWAY PROJECT 27-CI

NEDERLAND - RAYMOND  
LENGTH 3.396 MILES  
CLASS 2

ROOSEVELT NATIONAL FOREST  
BOULDER COUNTY



Begin Proj. 27-CI  
Sta. 22+00

Sta. 237+00  
End Proj. 27-CI



REGION 9 STATE COLORADO  
PROJECT 27-CI, Nederland - Raymond  
SHEET 1 OF SHEETS

INDEX TO SHEETS

SHEET No	DESCRIPTION	STATION TO STATION
1	Title Sheet	
2	Typical Sections	
3 (2 Sh.)	Summary	
4 - 11	Plan & Profile	22+00 237+00
D3 - Sid. 117A	Conc. End Sec. Hdws. & Inlets	
Rev D3 - Sid. 129	Sid. Miscellaneous Structures	
Rev D3 - Sid. 129A	"	
D3 - Sid. 131	Sid. Maintenance Posts	
Rev D3 - Sid. 135	Sid. Barbed Wire Fence	
Rev D3 - Sid. 143	Typical Constr. Signs	
D3 - Sid. 166	Requirements for Placing C.M.P. Culverts	
D3 - Sid. 168	Straight Type Conc. Hdws.	
D3 - Sid. 163	10' x 6' x 84'-0" Conc. Box Culv.	89+00
D3 - Sid. 163	6' x 7' x 65'-0" " " "	118+00
D3 - Sid. 164	Del. 10' x 6' x 48'-0" " " "	175+64
D3 - Sid. 167B	Timber Stringer Bridge	Rd. Appr.
D3 - Sid. 167E	Conc. Abut. for Timber Stringer Bridge	Lt. 165+50
1 - 38	Cross Sections	22+00 237+00

Plans Prepared by B.P.R.  
Date: Feb. 5, 1958

Description of Project

Improvement: Grading  
Roadbed Width: 32'  
Code Type: QOIL  
Bridges: 1 Conc. Box Culv.  
Code Type: X028

ADT (1957): 150  
ADT (1977): 1000  
D.V.V.: 15%  
D: 65%  
T: 20%  
V: 35%

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLORADO

APPROVED: \_\_\_\_\_ DATE: 19\_\_\_\_  
REGIONAL ENGINEER



SUMMARY OF ESTIMATED QUANTITIES

The following is an approximate estimate of quantities and no responsibility for their accuracy is assumed. No allowance will be made for anticipated profit or loss incurred due to the increase, decrease or elimination of any of the quantities shown that may be found necessary during construction.

SUMMARY OF QUANTITIES

ITEM No.	100(1)	106	102(1)		102(5)	104(2)	105(1)	108(1)	109(1)	590(2)	
STATION TO STATION	Clearing and Grubbing	Reinforcement From Item 104	Prism	Unclassified Excavation Channel Changes	Strippling and Storing Topsoil	Borrow Subbase from Case 2	Special Graveling	Overall Prism	Water	Rolling	Placing Topsoil
Temporary Connection	Acres	Cu.Yd.	Cu.Yd.	Cu.Yd.	Cu.Yd.	Cu.Yd.	Ton	Sq.Yd.	Unit	Hour	Cu.Yd.
22+00 to 28+70	0.42	30	200								67
28+70 to 34+10	0.42	448	1978								107
34+10 to 39+05	0.42	359	2377								119
39+05 to 46+55	0.49	268	2947								154
46+55 to 69+24	0.72	570	6282								691
69+24 to 72+55.5 Bk. =	3.66	1417	23965								132
72+55.5 to 82+00	0.78	223	7722								262
82+00 to 89+10	1.20	598	10579								202
89+10 to 94+50	0.70	401	3395								247
94+50 to 108+85	1.44	435	14772								640
108+85 to 118+50	1.01	621	11053								471
118+50 to 123+00	1.17	290	2199								222
123+00 to 131+00	1.83	510	2545								407
131+00 to 139+00	1.05	534	4801								359
139+00 to 144+20	1.67	343	7357								347
144+20 to 146+50 Bk. =	1.79	450	11575								249
146+50 to 156+61.8 Bk. =	2.17	2097	24771								989
156+61.8 to 213+00	0.03	632	5921								296
213+00 to 237+00		346	4797								176
Temporary Connection		244	2442								121
		30	200								
ROAD APPROACHES											
26+00 R & L		60	10	150							
34+00 R		90	120	140							
37+00 L		30	150								
39+00 L		30	50								
50+00 R		30	150								
56+00 R		70	2300	300							
66+00 L		30	50								
67+50 R & L		60	150	300							
78+00 L		30	50								
90+30 R		30	150								
104+00 R		60	400								
128+75 L		30	720	100							
158+00 L		60	120								
168+50 L		30	300								
170+50 R & L		60	100								
176+10 L		30									
225+50 R		30									
SUBTOTALS		12,604	174,119	160,618	2,469	18,711					
LENGTH OF PROJECT		Feet	Miles								
22+00 to 72+55.5 Bk.		5065.5									
72+55.5 to 109+24.2 Bk.		3616.2									
109+24.2 to 146+50.0 Bk.		3651.2									
146+50.0 to 156+61.8 Bk.		3351.1									
156+61.8 to 213+00		2282.4									
213+00 to 237+00											
TOTAL		17,929.6	3.396								
SUMMARY UNCLASSIFIED EXCAVATION											
Prism			160,618								
Overbreak and Slides			5,000								
Channel Changes			2,469								
Strippling and Storing Topsoil			18,711								
Graveling Inlet and Outlet			1,574								
Reconditioning Mine Shovel			1,000								
TOTAL			189,332								
TOTALS	21.64		189,332								
Use	22		190,000								

The Areas for clearing and grubbing as noted include areas between stations designated extending 5' on either side of the excavation and within the limits of the proposed new connection. The area of the road shown is not to be cleared and the area of the old road shown is to be cleared with the new construction.

Project:

Station: 22+00 to 237+00

Length: 3.396 miles

Roadbed: 32 feet (No Curve Widening)

Special Subbase, Graveling B. Depth 6"

Weight: 140 #/cu. ft.

Code Type: 0011

Bridge:

Station: 175+00 - Double

20' x 6' x 18' Concrete Box Culvert

Code Type: 2021

Length: 0.024 mile

SUMMARY OF QUANTITIES

Project: 27-01 ROUTE: 27

STATE: Colorado COUNTY: Boulder

NATIONAL: Forest: Roosevelt



The following is an approximate estimate of quantities and no responsibility for their accuracy is assumed. No allowance will be made for anticipated profit or loss incurred due to the increase, decrease or elimination of any of the quantities shown that may be found necessary during construction.

SUMMARY OF STRUCTURE QUANTITIES

ITEM No	STATION TO STATION	102(1)	103(1)	106(1)	107(1)	130(2)	153(1)	160(2)	520(4)	530(7)	560(2)	564(1)	564(2)	565(1)			
		Unclasp, Excav. for Culvert Inlets and Outlets	Excav. for Culvert Structures	Head- walls For L Type	Class A Concrete	Reinforced Cement Steel (Creosote Preserv- ative)	Galvanized Corrugated Metal Pipe A 18"	B 24"	D 36"	F 48"	Metal End Sections for Corrug. Metal Pipe Under- drain	Perf. Metal Pipe Under- drain	Forma Backfill Material	Heats, Holes, Posts	Barbed Wire Fence, Type 2	Gates 12-foot	Woven Wire Fence
29+50		Q&D, 37	Q&D, 36	Q&D, 1-L-I 1.83	Lb, 27.4	H B H	Lin.Ft. 62	Lin.Ft. 62	Lin.Ft. 62	Q&D, 22-01	Es, 30	Lin.Ft. 30	Es, 30	Lin.Ft. 30			
32+00		31	34	1-L-I 3.66	51.8		56										
38+00		5	70	1-L-I 1.83	27.4		112										
42+80		82	20	1-L-I 3.66	51.8		58										
50+25		120	55	1-L-I 3.66	51.8		68										
54+50		45	20	1-L-I 1.83	27.4		52										
62+80		18	20	1-L-I 3.66	51.8		70										
69+44		--	85				--	136									
80+00		150	85				100										
84+00		150	80	--			66										
89+00		150	70	113+9	15310		--										
91+50		5	--	1.83	27.4		110										
101+70		31	75	1-L-I 61.2	5790.		72										
118+00		135+00	50	1-L-I 3.66	51.8		--										
127+80		35	35	1-L-I 3.66	51.8		68										
136+00		30	15	--			56										
138+00		40	20	1-L-I 3.66	51.8		54										
146+50		--	10	--			--	R2									
152+75		10	15	1-L-I 3.66	51.8		50										
154+25		10	15	1-L-I 3.66	51.8		60										
165+50		200	20	58.0	7820.		280										
175+64		500	75	106.1	11380.		237										
215+50		20	25	5.65	82+2		54										
232+00		--	10				76										
232+50		--	10				59										
Underdrain (As required)			600				1800										
Concrete slab over							600										
Wine Shaft 52+90			20	8.00	800.												
ROAD APPROACHES																	
62+00		--	10				24										
62+00		--	10				30										
37+00		--	20				34										
67+50			10				24										
74+00			10				32										
170+50			5				32										
170+50			5				32										
224+50			5				32										
BARBED WIRE FENCE																	
91+90		L															
104+95.8		L															
152+16.7		L															
92+10		R															
102+99.8		R															
104+60		L															
214+52		L															
167+00		R															
214+57.6		R															
Connections																	
GATES																	
176+10		L															
23+90		R															
WATER WIRE FENCE																	
104+00		R															
104+30		R															
104+30 to 107+17.2																	
Totals		1274	1850	386.53	11605.4	3.865	138	1516	82	136	10	12	1800	600	21	18,500	
Use				397	41600	3.9	138	1516	82	136	10	14	1800	600	21	18,500	

RECAPITULATION OF ITEMS

ITEM No	NAME	UNIT	QUANTITY
10	Macellannous Force Account	Contingent Sum	22
100(1)	Clearing and Grubbing	Acres	22
102(1)	UNCLASSIFIED EXCAVATION	Cu. Yd.	130,000
102(1)	Borrow Excavation, Class 2	Cu. Yd.	27,000
103(1)	Excavation for Structures	Cu. Yd.	1,850
104(1)	Special Subbase, Grading B	Ton	24,000
105(1)	Overhaul	Sta. Yd.	100,000
106(1)	Water	Unit	2,120
108(1)	Prox. and Maint. Water Plant or Plants	Lump Sum	1,000
109(1)	Boiling	Hour	307
111(2)	Operation of Old Roadways	Force Account	307
108(1)	GLASS W. CONCRETE	Cu. Yd.	41,600
107(1)	Reinforcement Steel	Lb.	39
143(1)	Treated Timber (Creosote Preservative)	M.B.M.	138
143(1)	18" Galv. Corrugated Metal Pipe	Lin. Ft.	1516
143(1)	24" Galv. Corrugated Metal Pipe	Lin. Ft.	82
143(1)	36" Galv. Corrugated Metal Pipe	Lin. Ft.	136
143(1)	48" Galv. Corrugated Metal Pipe	Lin. Ft.	10
146(1)	Metal End Sections for 18" Pipe Outlets	Each	14
146(1)	Metal End Sections for 24" Pipe Outlets	Each	14
520(1)	Perforated Corrug. Metal Pipe Underdrain	Cu. Yd.	1,800
520(1)	Perforated Corrug. Metal Pipe Underdrain	Cu. Yd.	600
520(1)	Perforated Corrug. Metal Pipe Underdrain	Cu. Yd.	21
560(1)	Maintenance Worker Posts	Each	18,500
564(1)	Barbed Wire Fence, Type 2	Each	2
565(1)	Gates, 12-foot	Each	1,000
565(1)	Woven Wire Fence	Each	7,000
592(2)	Flashing Topsoil	Each	7,000

SUMMARY OF QUANTITIES

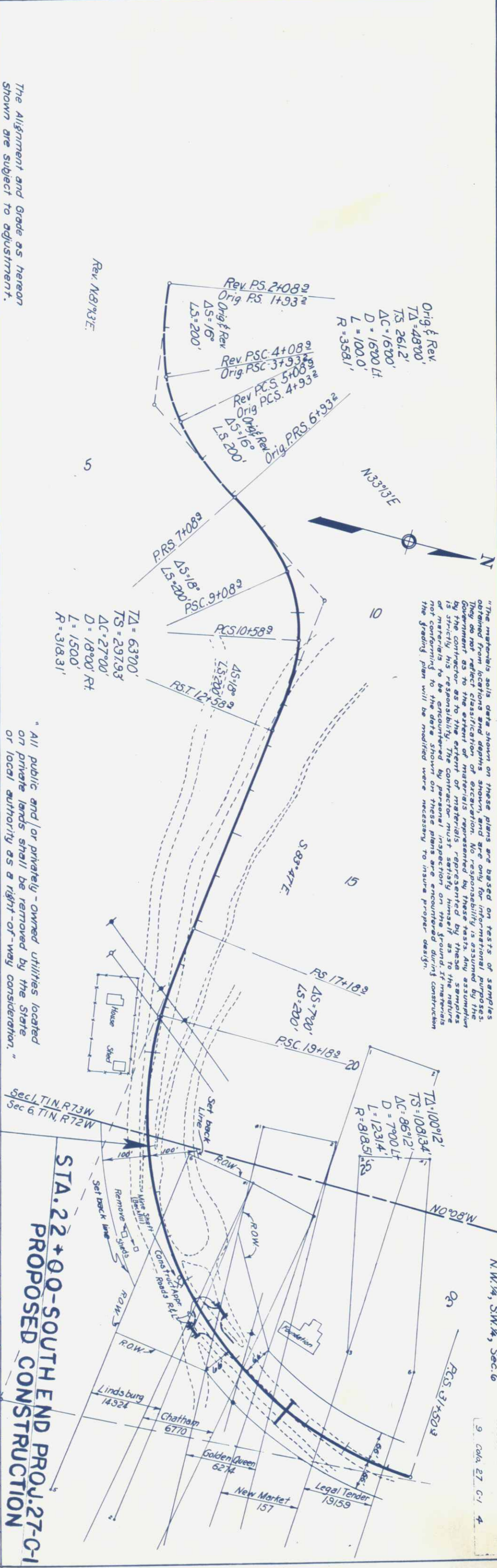
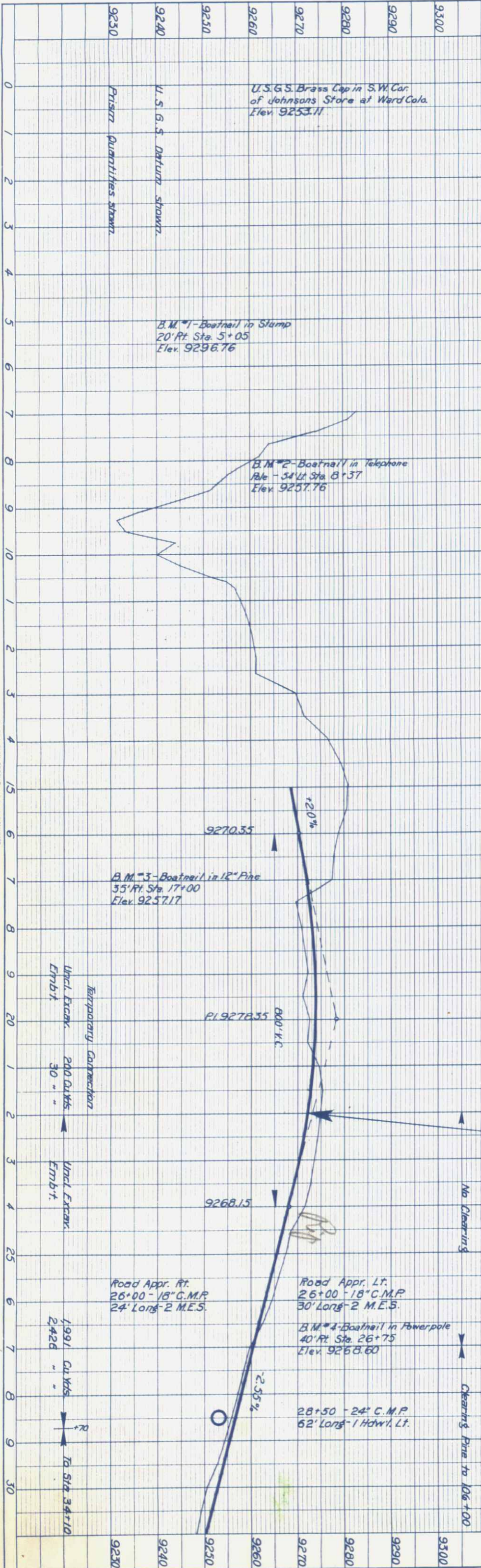
ROUTE: 27

PROJECT: 27-01  
STATE: Colorado  
COUNTY: Boulder  
NATIONAL: Forests, Rangelands



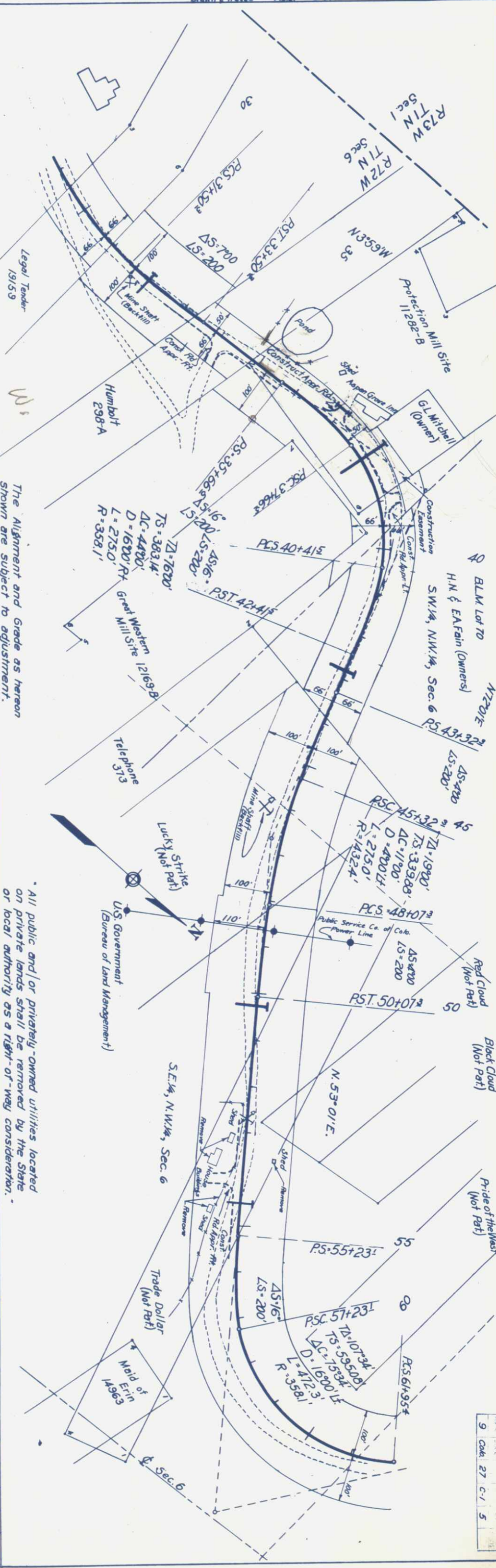
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NOTE BOOK	PLOTTED		
NO.	GRADES CHECKED		
	B.M.'S NOTED		
	STRUCTURE NOTATIONS CH KD		

PLAN	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED	WGW	1956
NO.	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		
	Drawn & Traced	AES	5-57





PLAN		BY	DATE
	SURVEYED	W.S.W.	1956
NOTE BOOK NO.	PLOTTED		
	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		

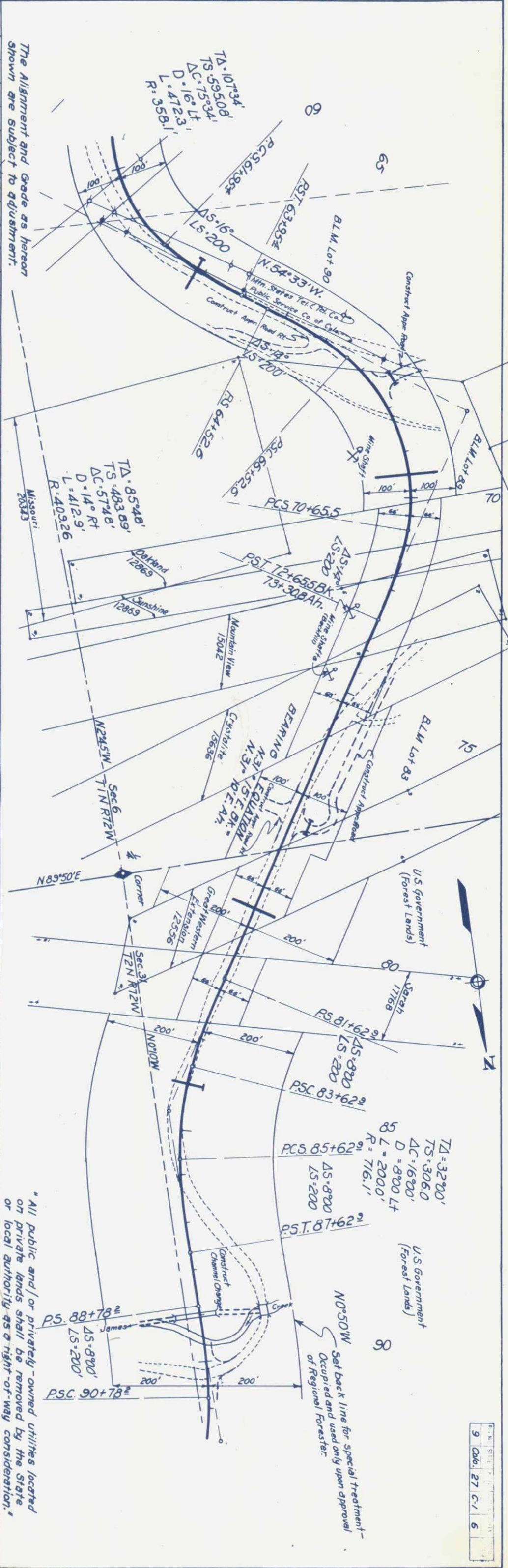
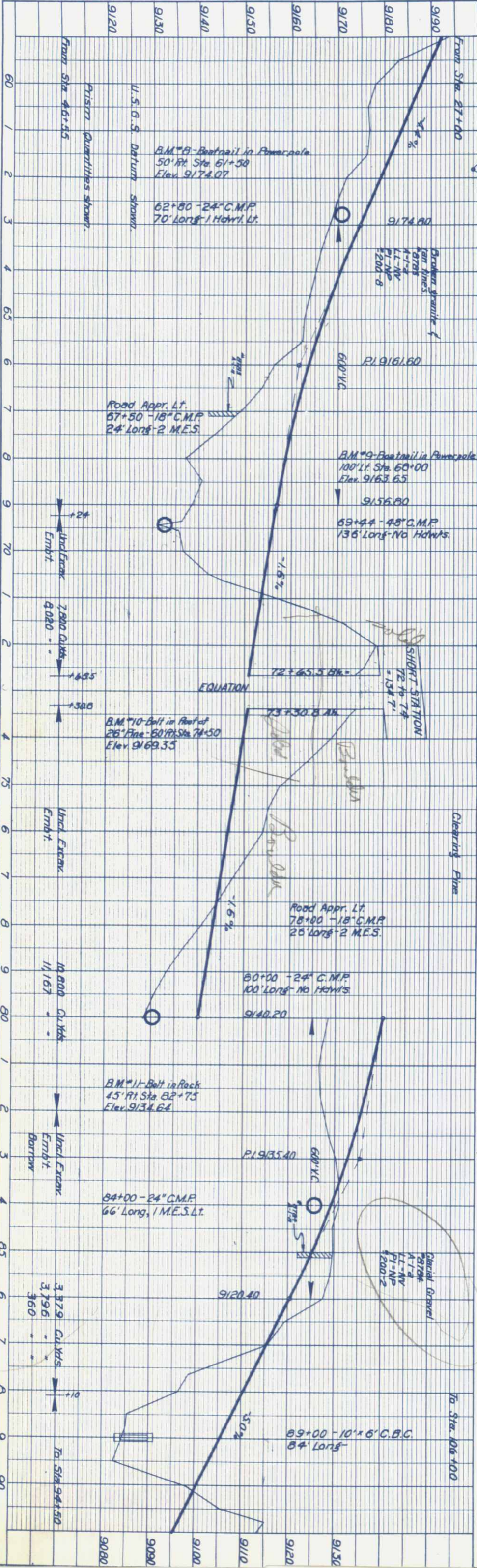


\* All public and/or privately-owned utilities located on private lands shall be removed by the State or local authority as a right-of-way consideration.



PROFILE		BY		DATE	
SURVEYED					
PLOTTED					
GRADES CHECKED					
NO. 1					
STRUCTURE NOTATIONS CHKD.					

PLAN		BY		DATE	
SURVEYED					
PLOTTED					
ALIGNMENT CHECKED					
NO. 1					
Drawn & Traced AES 5-57					



"All public and/or privately-owned utilities located on private lands shall be removed by the State or local authority as a right-of-way consideration."

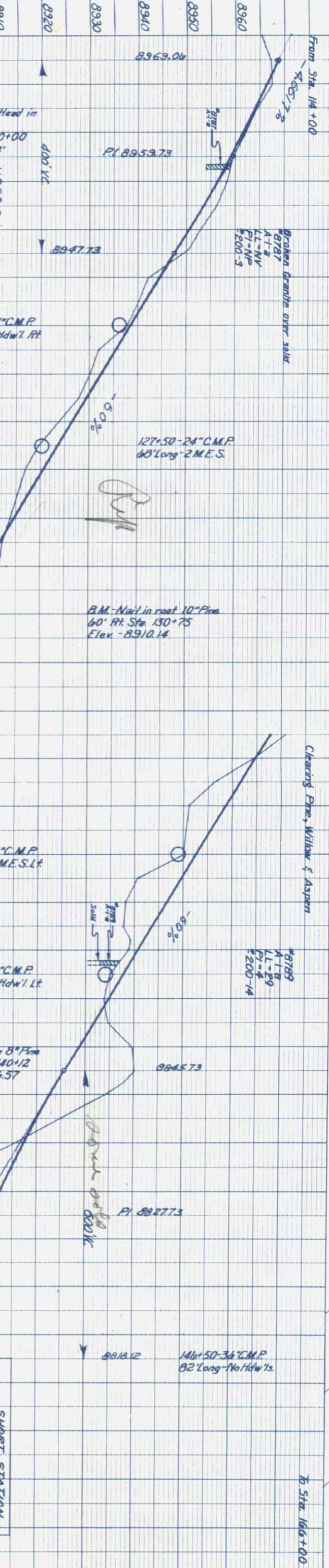


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NOTE BOOK	ALIGNMENT CHECKED		
NO.	RT. OF WAY CHECKED		





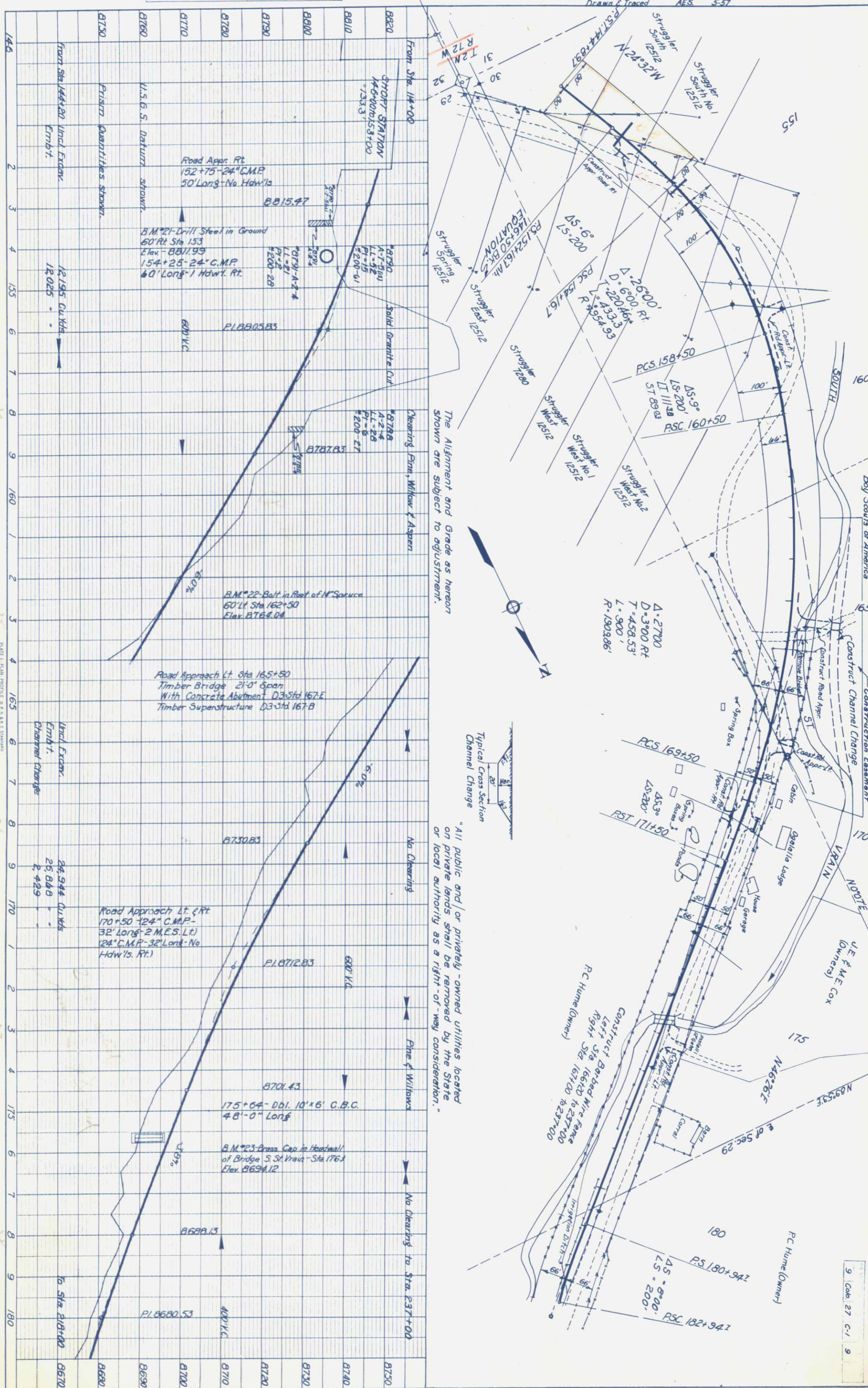
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NOTE BOOK	GRADES CHECKED		
NO.	B. M.'S NOTED		
	STRUCTURE NOTATIONS CH'KD.		



SUBST STATION

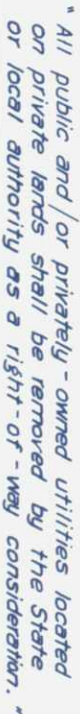


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NOTE BOOK	ALIGNMENT CHECKED		
NO	RT. OF WAY CHECKED		





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NOTE BOOK	GRACES CHECKED		
NO	B M'S NOTED		
	STRUCTURE NOTATIONS CH'KD.		



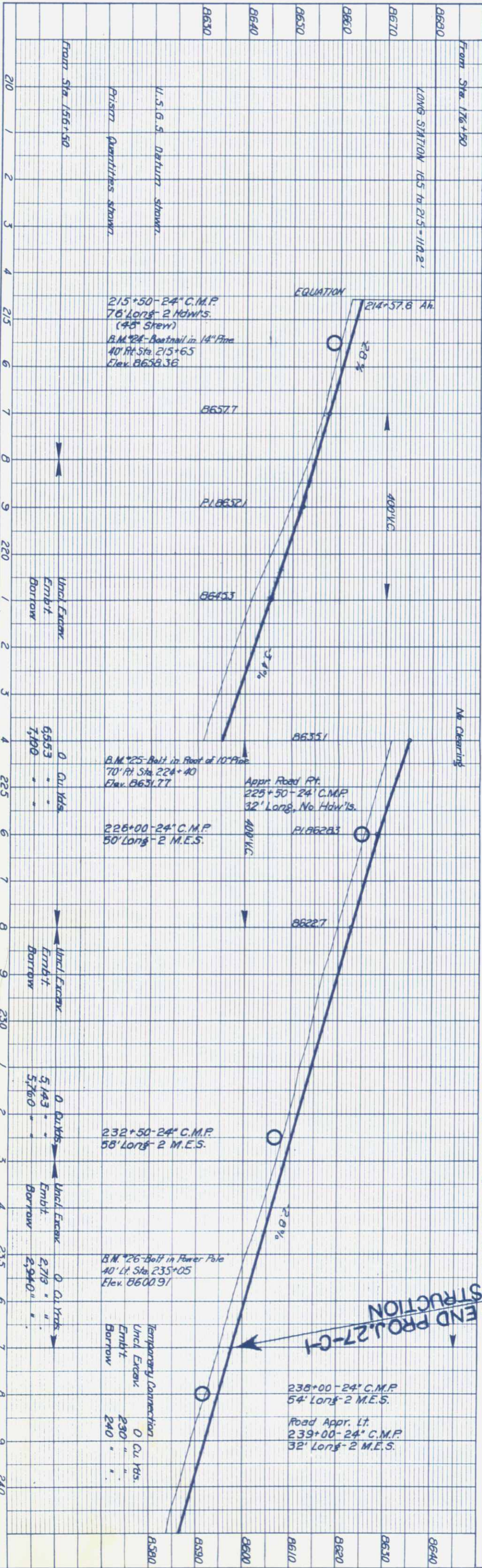
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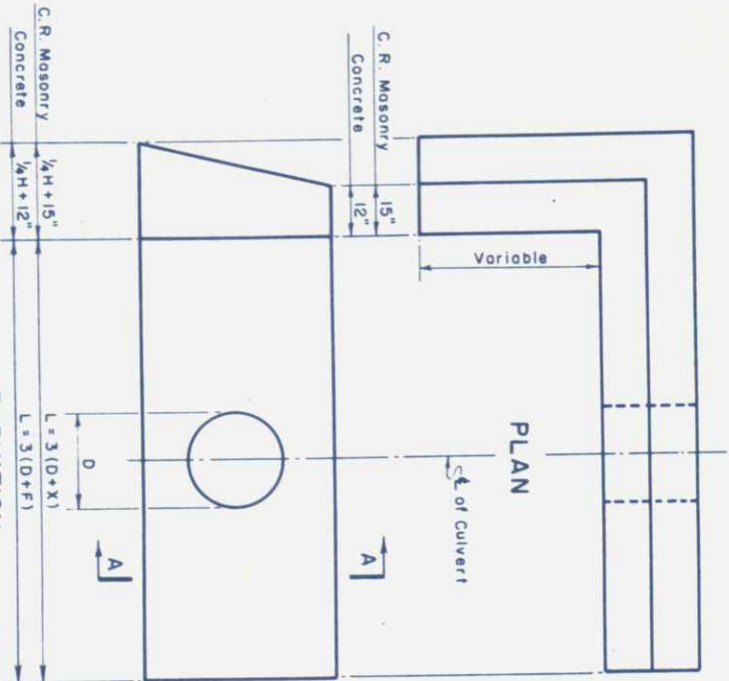
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	RT. OF WAY CHECKED		

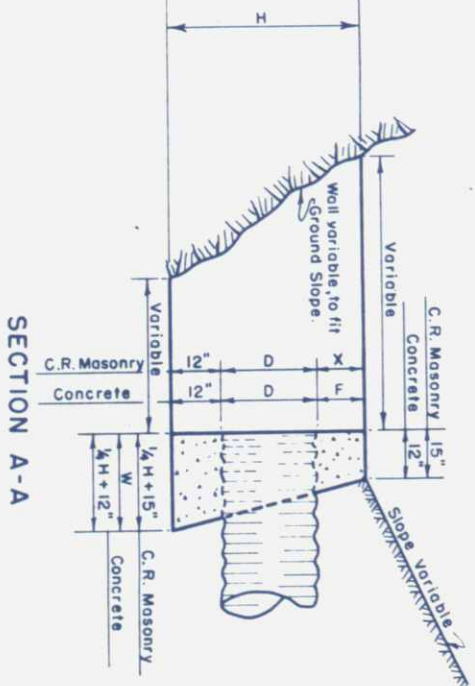
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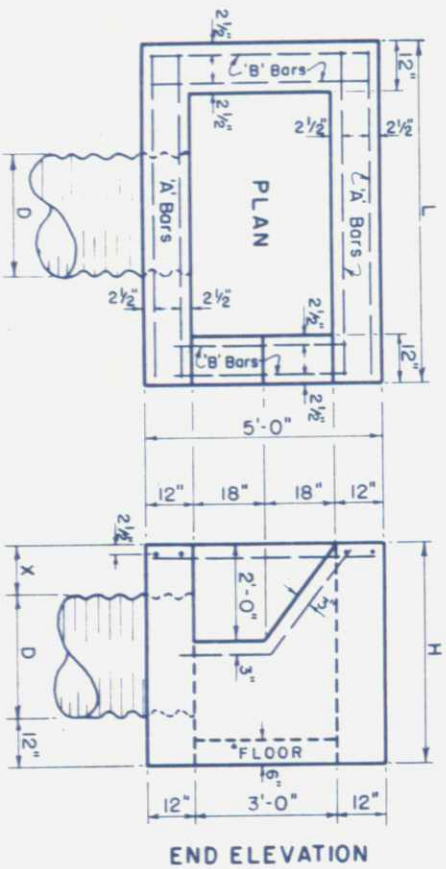




NOTE:  
For the Dimensions of the Cement Rubble  
Masonry Headwalls, see Rev. D3-Std. 117.  
For the Dimensions and Steel Bar Reinforcement  
Details for Concrete Headwalls, see D3-Std. 168.  
Amount of Bar Reinforcement for Wing Wall  
varies according to length.



### ANGLE TYPE - CONCRETE OR CEMENT RUBBLE MASONRY HEADWALLS



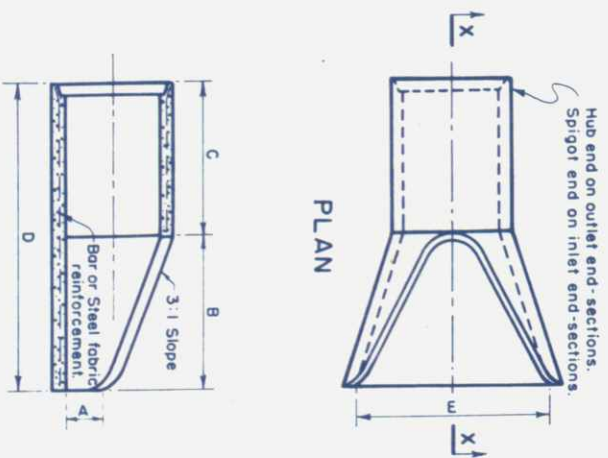
QUANTITIES IN ONE HEADWALL AND INLET

Dimensions		Class 'A' Concrete				Reinforcing Steel			
D	L	X = 1'-0"	X = 1'-6"	X = 2'-0"	Floor	A Bars	B Bars	Total	
18"	6'-0"	3.6	2.10	4.0	2.43	4'-6"	2'-7"	4	27.3
24"	6'-6"	4.0	2.53	4.6	2.88	5'-0"	3'-2"	4	28.6
30"	7'-0"	4.6	2.98	5.0	3.36	5'-6"	3'-7"	4	29.9
36"	7'-6"	5.0	3.46	5.6	3.85	6'-0"	4'-23"	4	31.3

\* Floor to be constructed where required.

### TYPE 2

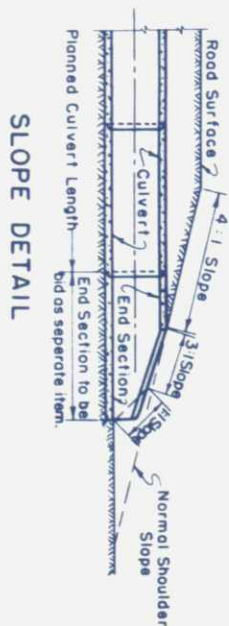
HEADWALL & INLET USED FOR SIDE HILL SECTION  
INLET WITH FRONT, SIDE & BACKWALL TOPS ALL IN THE SAME PLANE



### CONCRETE END SECTION

### GENERAL NOTES

Specifications: Bureau of Public Roads F.R. 57  
Concrete: All concrete to be Class 'A', made with Type II (Low Alkali)  
Portland Cement, with an air-entraining admixture. Concrete to be  
poured monolithically. All exposed edges shall be chamfered 1". All  
exposed surfaces to be given a "Rubbed Finish".  
Reinforcing Steel: To be 1/2" round bars, and placed as shown in drawings.  
Dimensions are to the center of bar.  
Foundations: If foundation materials under headwalls are found unsuitable,  
either remove and replace with satisfactory material, or  
extend the concrete to provide a satisfactory footing.  
Construction Methods: The minimum earth cover on top of the pipe shall  
not be less than 1/2 D, with a minimum cover of one foot. Headwalls in  
all cases to be built parallel to the center line of the road.



END-SECTION DIMENSIONS									
DIAM.	A	B	C	D	E				
12"	4"	2'-0"	4'-0"	6'-0"	2'-0"				
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"				
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"				
24"	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"				
30"	1'-0"	4'-6"	1'-7 1/2"	6'-1 1/2"	5'-0"				
36"	1'-3"	5'-3"	2'-10 3/4"	8'-1 1/2"	6'-0"				
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"				
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"				

Note: Design of end-section shall conform  
to Standard Reinforced Sectional  
Concrete Culvert Pipe.

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

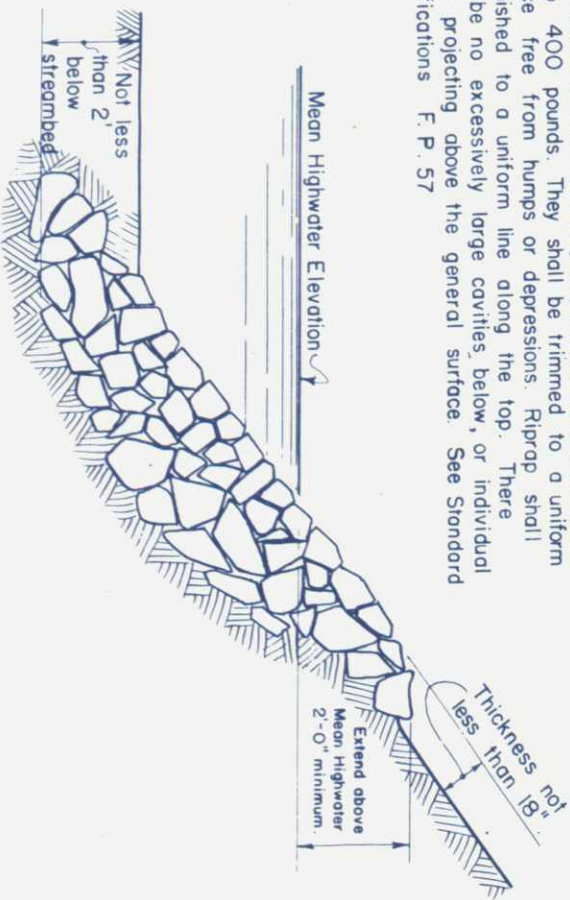
### CONCRETE END SECTIONS HEADWALLS AND INLETS FOR PIPE CULVERTS

APPROVED: *W. A. G. Thompson*  
Federal Highway Projects Engineer

DATE: *3/24/53*

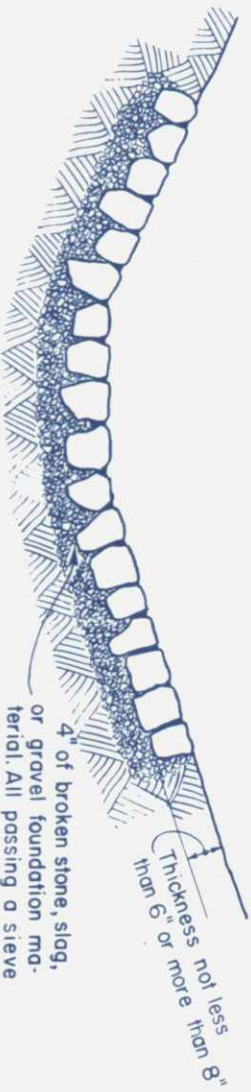


Stones shall be hard and angular, varying in weight from 20 to 400 pounds. They shall be trimmed to a uniform surface free from humps or depressions. Riprap shall be finished to a uniform line along the top. There shall be no excessively large cavities, below, or individual stones projecting above the general surface. See Standard Specifications F. P. 57



### LOOSE RIPRAP

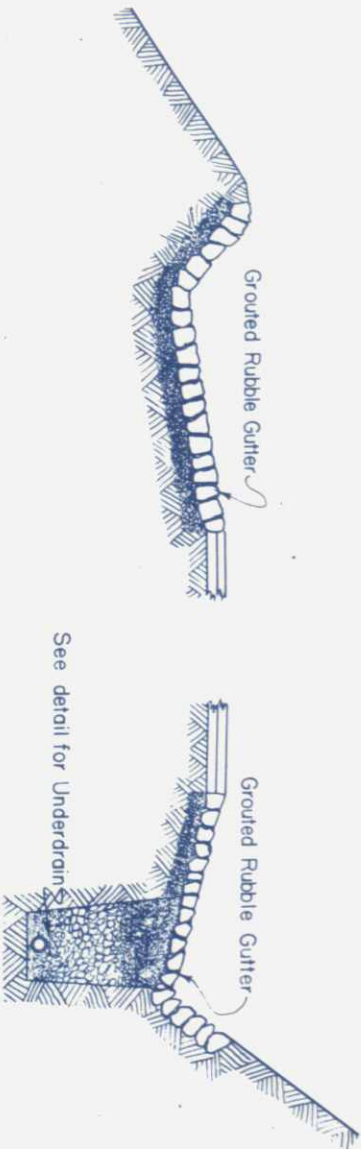
Paving to be constructed of sound, durable rubble stone, being rectangular in shape and extending entirely through the paving. The stones shall be placed with the flat surfaces up in straight rows, with the longest dimension at right angles to the centerline of the gutter and in close contact. They shall break joints satisfactorily and no intersices exceeding one inch in width shall exist.



4" of broken stone, slag, or gravel foundation material. All passing a sieve with  $\frac{3}{8}$ " square openings.

Each stone shall be carried by the underlying material and not by the adjacent stones. The surface of the rocks shall not vary more than one inch from the required finished section. The spaces or voids between and around the stones shall be filled with broken stone, slag, or gravel to within four inches of the surface, after which a cement grout, composed of one part of Portland Cement and two parts of fine aggregate, shall be poured and broomed into the spaces between the stones; this operation being continued until the grout fills the joints. See Standard Specifications F.P. 57

### GROUTED RUBBLE GUTTER



### TYPICAL SECTIONS IN CUTS AND EMBANKMENTS

Impervious material shall contain sufficient granular material to be stable when wet and shall be compacted in place. (When trench is under roadbed, paved ditch or other structure, carry pervious backfill to top of trench.)

Pervious, granular backfill (as coarse, clean concrete sand):

Pass #3 sieve —	100%
Pass #4 sieve —	50% min.

Grading of fraction passing #4

Pass #50 —	10-30%
Pass #100 —	0-10%
Pass #200 —	0-2%

Tamp backfill into place where trench is under roadbed or structure. If necessary to prevent segregation, dampen before placing.

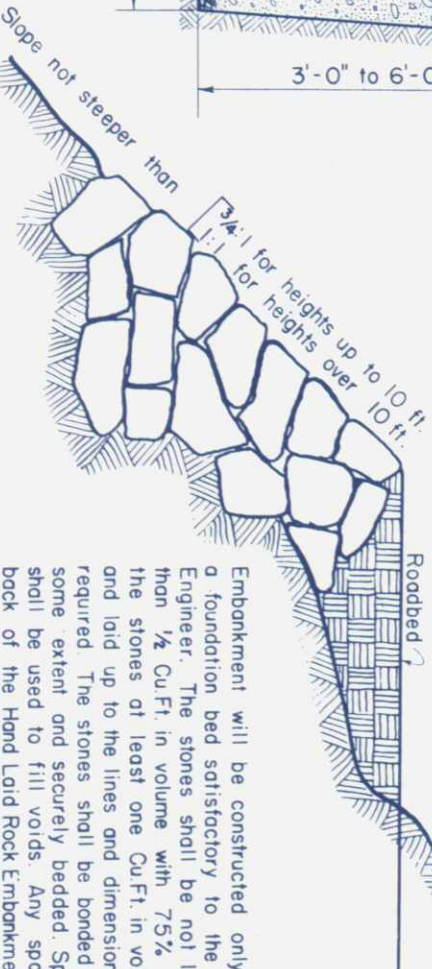
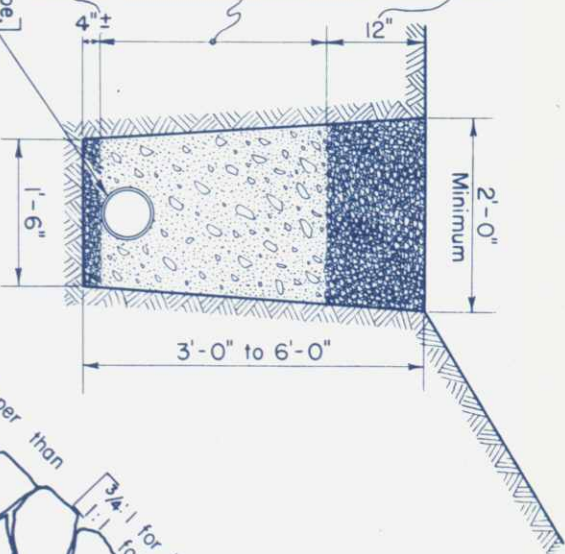
Bedding of pervious backfill, or where directed by Engineer to confine flow to pipe, a bedding of tamped, impervious material.

Tile drain, Bell & Spigot type, or Perforated Metal Pipe.

Work granular material into soft, mucky trench bottoms for stabilization prior to placing bedding material

### PIPE UNDERDRAIN

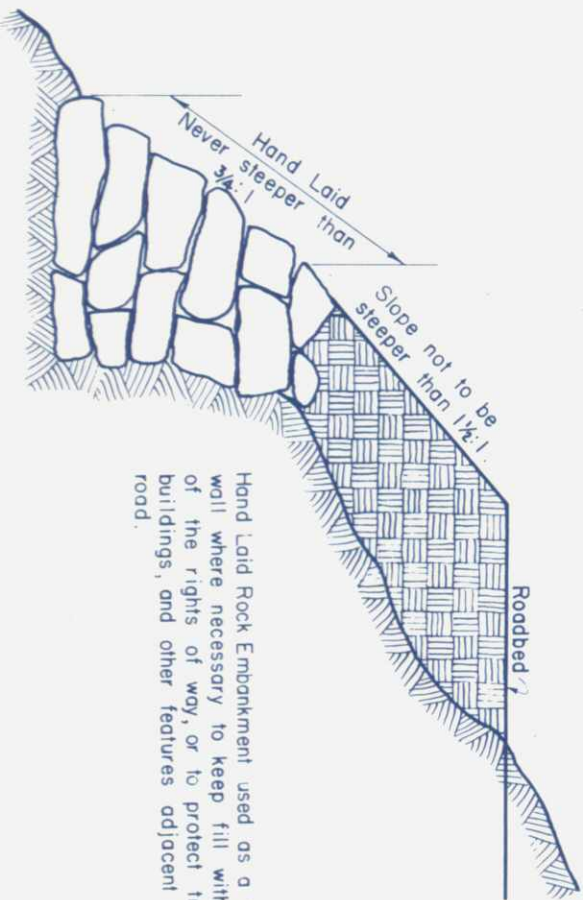
USE



Embankment will be constructed only on a foundation bed satisfactory to the Engineer. The stones shall be not less than  $\frac{1}{2}$  Cu Ft. in volume with 75% of the stones at least one Cu Ft. in volume and laid up to the lines and dimensions required. The stones shall be bonded to some extent and securely bedded. Spoils shall be used to fill voids. Any spaces back of the Hand Laid Rock Embankment shall be filled entirely with compacted material.

### HAND LAID ROCK EMBANKMENT

FULL HEIGHT



Hand Laid Rock Embankment used as a toe-wall where necessary to keep fill within limits of the rights of way, or to protect trees, buildings, and other features adjacent to the road.

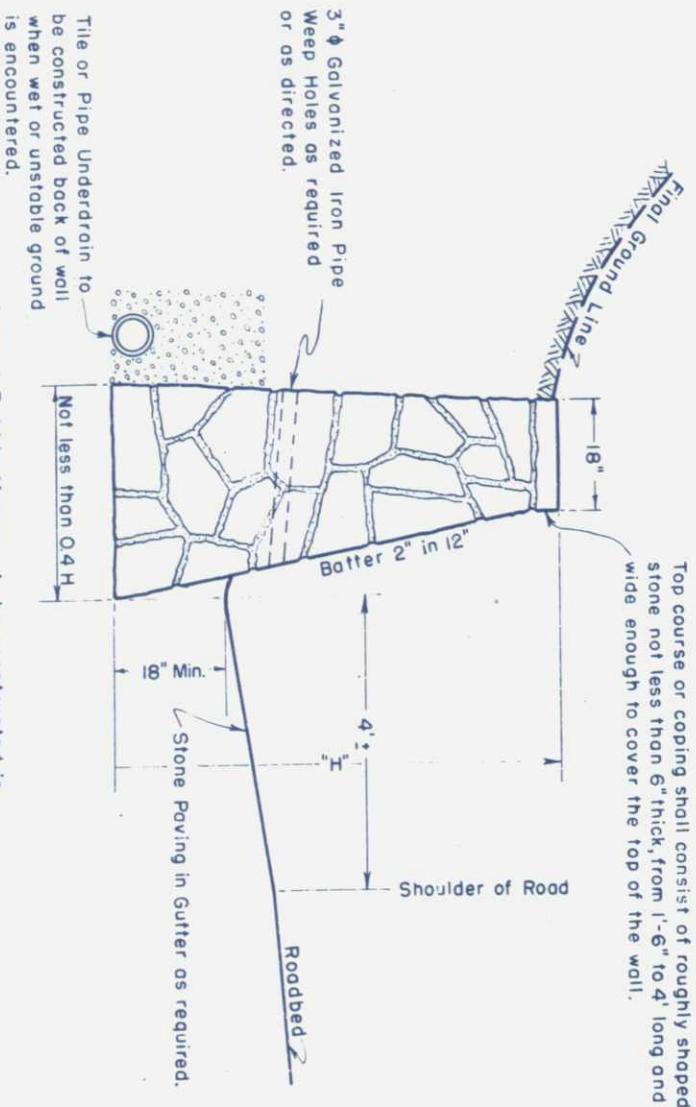
### HAND LAID ROCK EMBANKMENT

WHEN USED FOR TOE WALL ONLY

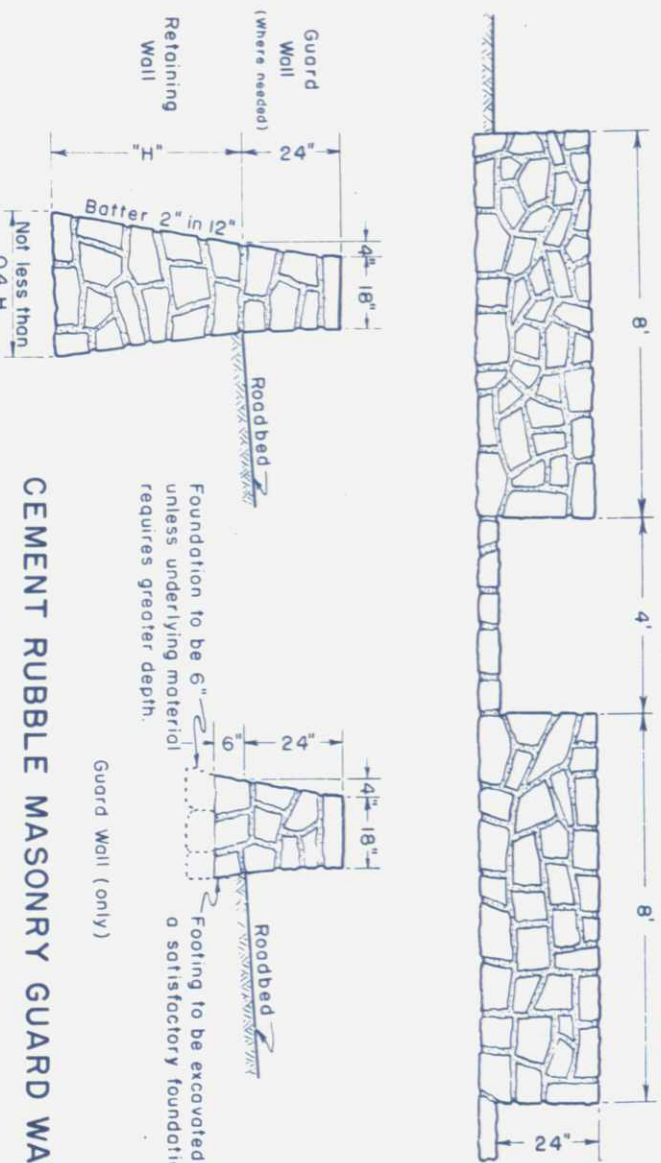
U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

### STANDARD MISCELLANEOUS STRUCTURES

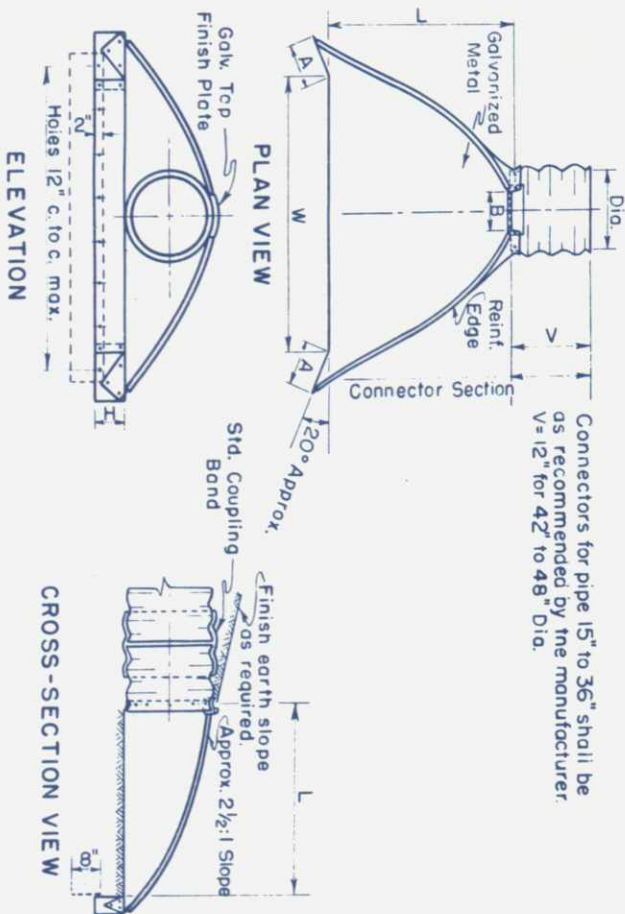




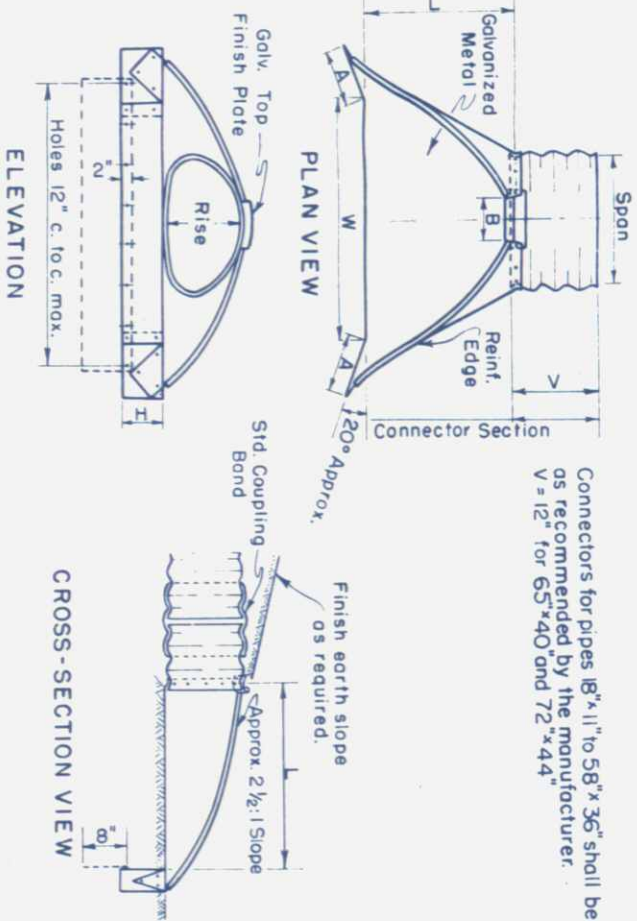
### CEMENT RUBBLE MASONRY RETAINING WALL



### CEMENT RUBBLE MASONRY GUARD WALL



### STANDARD END SECTION FOR CORRUGATED METAL PIPE CULVERTS



### STANDARD END SECTION FOR CORRUGATED METAL PIPE ARCH CULVERTS

Pipe Gage	DIMENSIONS				
	A	B	H	L	W
15"	6"	8"	6"	26"	30"
18"	6"	7"	9"	6"	31"
24"	14"	9 1/2"	12"	6"	42"
30"	14"	12"	15"	7 1/2"	52 1/2"
36"	12"	14"	18"	9"	63"
42"	12"	16"	21"	10 1/2"	73 1/2"
48"	12"	18"	27"	12"	84"

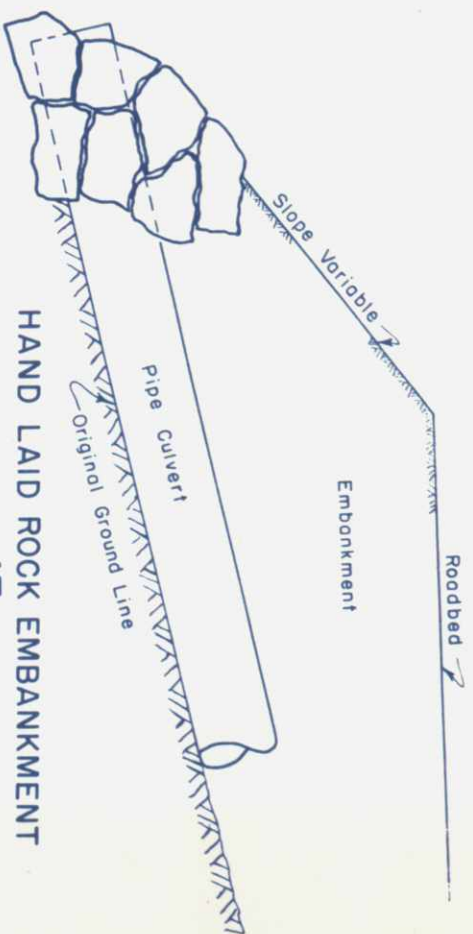
### GENERAL NOTES

Toe plate, where needed, to be punched to match holes in skirt lip. 3/8" galvanized bolts to be furnished. Length of toe plate is W+10" for 12" to 30" dia. pipe incl. and W+22" for 36" to 48" dia. pipe incl.

Skirt section for 12" to 24" dia. pipe incl. to be made in one piece.

Skirt section for 30" to 48" dia. pipe incl. may be made from two sheet joined by riveting or bolting on center line.

Connector Section, Corner Plate and Toe Plate to be same gage as skirt and each to be galvanized.



### HAND LAID ROCK EMBANKMENT AT END OF PIPE CULVERTS

### GENERAL NOTES

Toe plate, where needed, to be punched to match holes in skirt lip. 3/8" galv. bolts to be furnished. Length of toe plate is W+10" for Pipe-Archs with Rise of 11" to 27" incl. and W+18" min. for Pipe-Archs with Rise of 31" to 44" incl.

Skirt Section for Pipe-Archs with Rise of 11" to 22" incl. to be made in one piece.

Skirt Section for Pipe-Archs with Rise of 27" to 36" incl. may be made from two sheets joined by riveting or bolting on center line.

Skirt Section for Pipe-Archs with Rise of 40" to 44" incl. may be made from three sheets joined by riveting or bolting at equal distances from center line.

Connector Section, Corner Plate and Toe Plate to be same gage as Skirt and each to be galvanized.

Norm. Arch Dimen.	Span	Rise	DIMENSIONS				
			A	B	H	L	W
15"	18"	11"	16"	4 1/2"	9"	6"	19"
18"	22"	13"	16"	5 1/4"	10"	6"	23"
24"	29"	18"	14"	7"	14"	6"	31 1/2"
30"	36"	22"	14"	8 3/4"	16"	6"	38 1/2"
36"	43"	27"	12"	10 1/2"	17 1/2"	7 1/2"	47"
42"	50"	31"	12"	12 1/2"	20"	9 1/2"	54"
48"	58"	36"	12"	14"	26"	10 1/2"	63"
54"	65"	40"	12"	15 1/4"	23"	10 3/8"	70"
60"	72"	44"	10"	17 1/4"	24"	12 1/8"	77"

### STANDARD

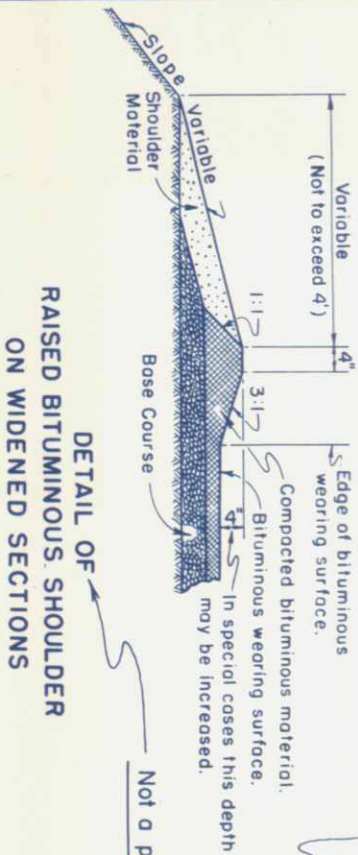
### MISCELLANEOUS STRUCTURES

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

APPROVED: *W. H. C.* DATE: *7/26/58*

Federal Highway Projects Engineer

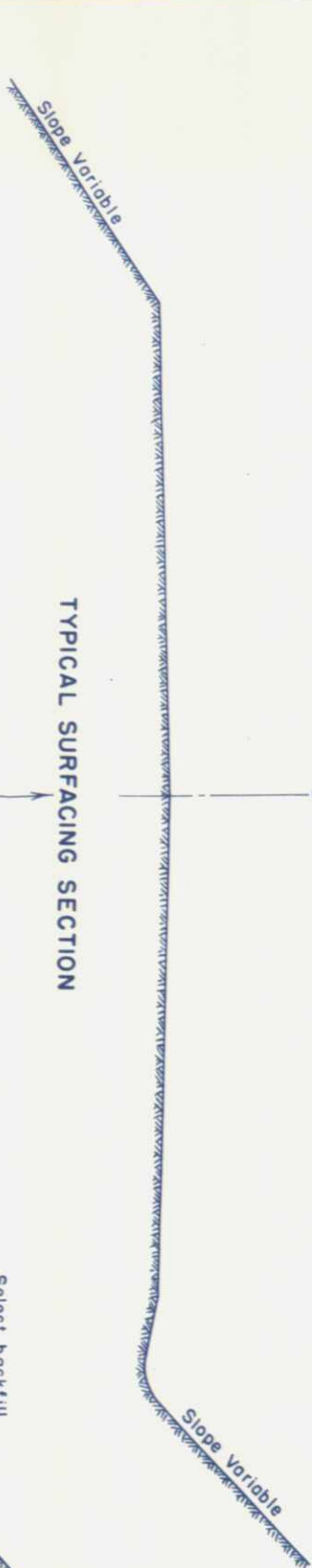




RAISED BITUMINOUS SHOULDER ON WIDENED SECTIONS

APPROVED: *W.A.G.* Federal Highway Projects Engineer

Date: *3/10/54*



DETAIL OF BITUMINOUS GUTTER

APPROVED: *W.A.G.* Federal Highway Projects Engineer

Date: *3/10/54*

TYPICAL HALF EMBANKMENT SECTION

TYPICAL HALF SHALLOW EMBANKMENT SECTION

SPECIAL SUBBASE MATERIAL			
STATION TO STATION	DEPTH (104(2))	DEPTH	
22+00	237+00	6"	

Any materials encountered in the Roadway and Borrow Excavation Section 102, which are, in the opinion of the engineer, equal in quality to the above Item 104(2) shall be used in place thereof and Item 104(2) reduced accordingly.

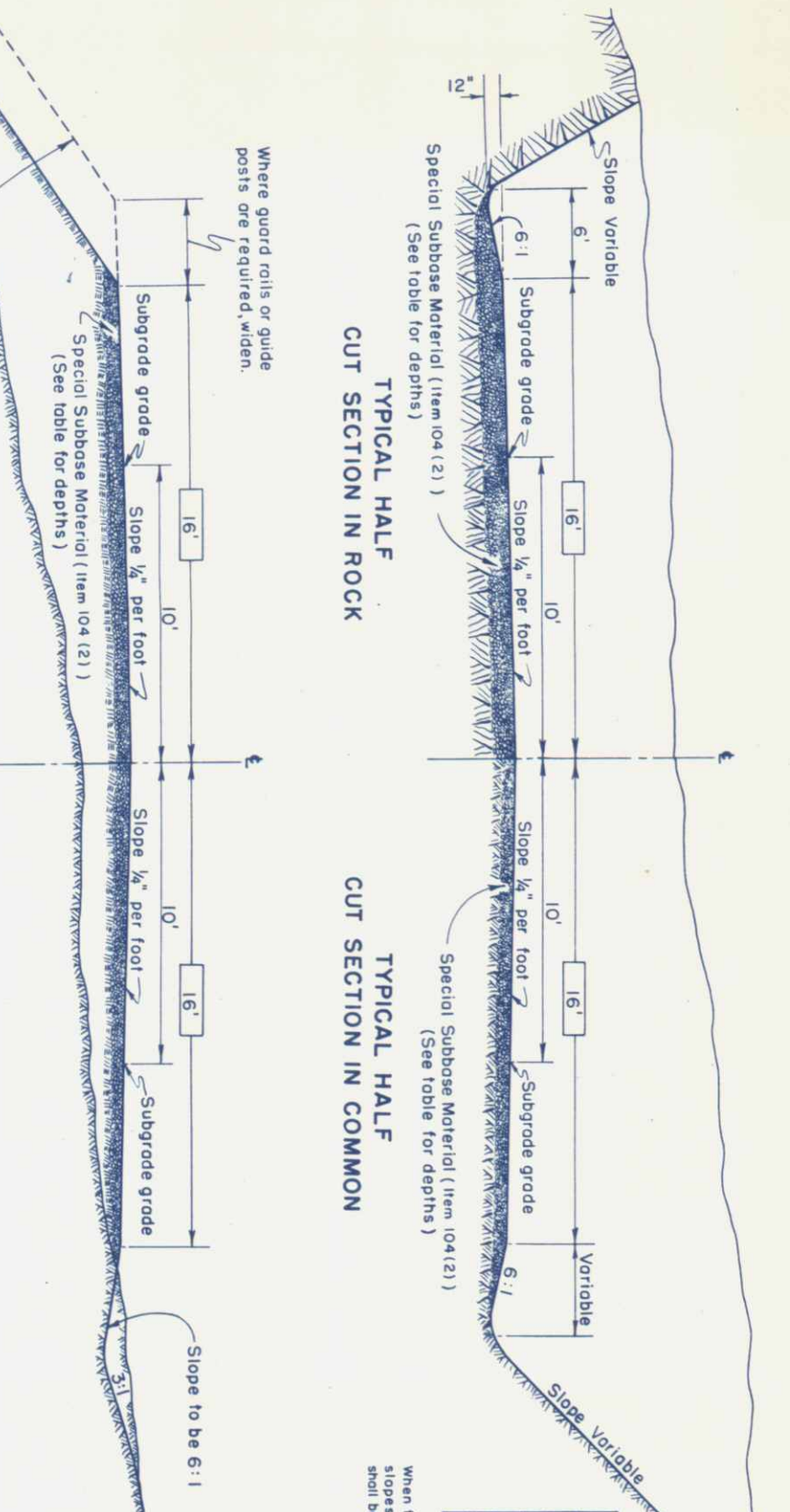
GENERAL NOTES

Where Borrow is specified in the contract and satisfactory material is found in the roadway excavation, the right is reserved to increase the amount of Undersized Excavation and reduce the Borrow Excavation. When additional material is needed for completing embankments, stabilizing the subgrade, or for selected cushion or topping, it may be secured by uniformly widening thru or sidehill cuts or flattening cut slopes where satisfactory material is available. The slopes of the ends of all cuts shall be flattened and flared to improve appearance. Furrow ditches shall be constructed on approximate one percent grades following the ground contour and when possible shall be so constructed that the direction of flow will be away from the roadway. Topsoil shall be conserved and either placed in stockpiles or spread over cut and embankment slopes as directed and in accordance with the specifications. Roadway ditches of the ends of cuts shall be constructed so as to carry the flow away from the adjacent embankment slopes. Embankment slopes shall be uniformly warped between one side of slope and another. The transition shall cover a distance of not less than fifty feet. Subgrade grade to be on the surface of stabilized graded road and located ten feet from center line on tangents and insides of curves. Bureau of Public Roads book of "Transition Curves for Highways" shall be used to determine superelevation and transition lengths (Table I), and widening of curves (Table IX).

TYPICAL CROSS SECTIONS NATIONAL FOREST & PARK HIGHWAYS

U.S. DEPARTMENT OF COMMERCE  
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REGION NO. 9 DENVER, COLO.

REGION NO. 9 STANDARD ROADBED - BITUMINOUS WEARING SURFACE  
PROJECT 27-CL, Nederland - Roymond  
NATIONAL FOREST - Roosevelt  
COUNTY - Boulder  
STATE - Colorado



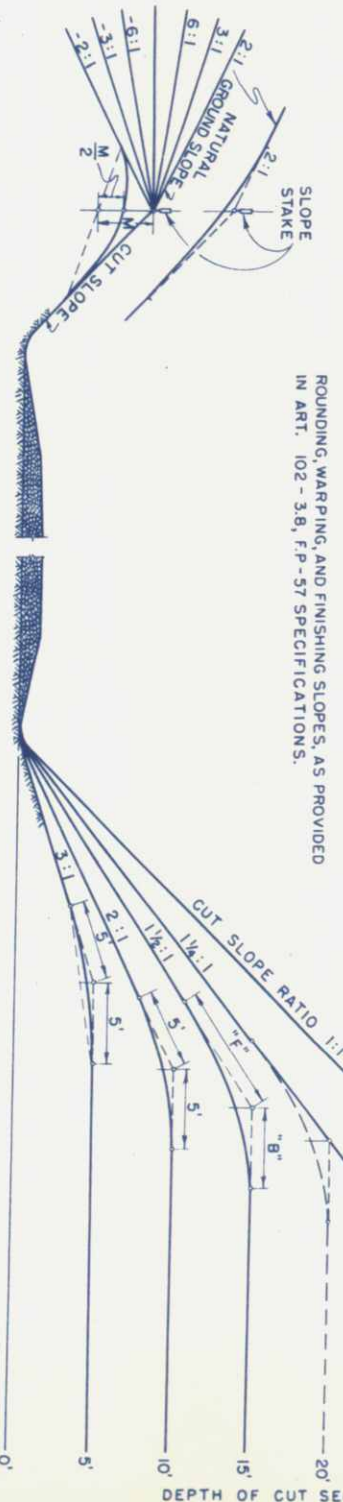
TYPICAL HALF CUT SECTION IN ROCK

TYPICAL HALF CUT SECTION IN COMMON

HEIGHT	EMBANKMENT SLOPE
0' to 3'	6:1
3' to 6'	4:1
6' to 12'	2:1
12' to 30'	1 1/2:1
30' up	1 1/2:1

When field conditions indicate the need for slopes other than those indicated above, they shall be constructed as sloped by the Engineer.

CUT SLOPE ROUNDING



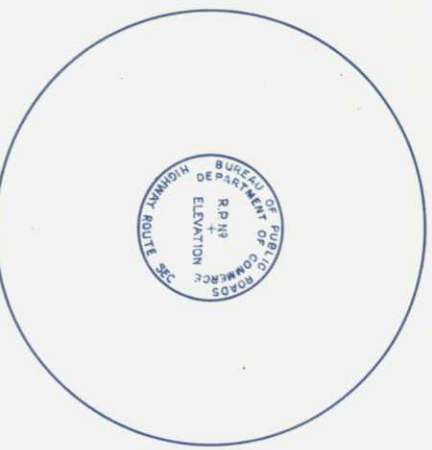
ROUNDING, WARPING, AND FINISHING SLOPES, AS PROVIDED IN ART. 102 - 3.8, F.P. - 57 SPECIFICATIONS.

SLOPE ROUNDING FACTORS		ALTERNATE ROUNDING DIMENSIONS	
NATURAL GROUND SLOPE	CUT SLOPE	SEMI-TANGENTS "B"	FRONT OF SLOPE STAKE "F"
0-5'	3:1	5'	5'
5-10'	2:1	5'	5'
10-15'	1 1/2:1	5'	5'
15-30'	1:1	5'	5'
30' up	1:1	5'	5'

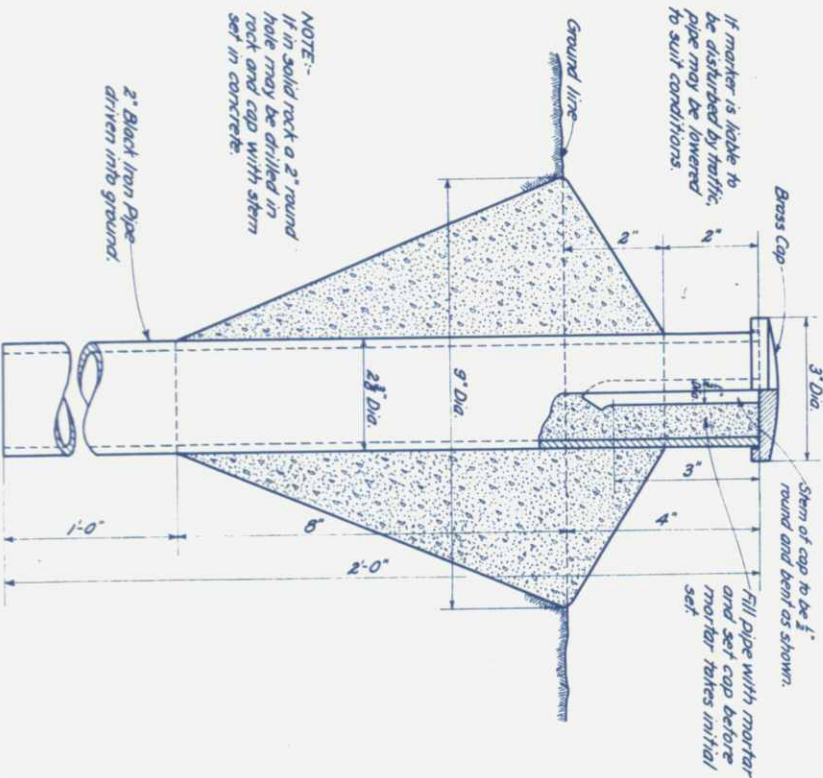
NOTE: In areas where existing conditions permit, use more liberal rounding with unequal semi-tangents. (Approximating a parabolic curve.)

For Rounding Dimensions "B" and "F", See Table.

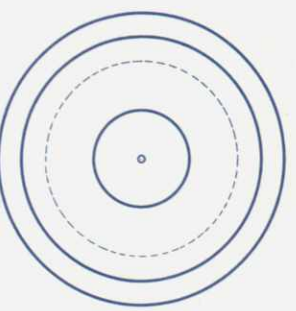




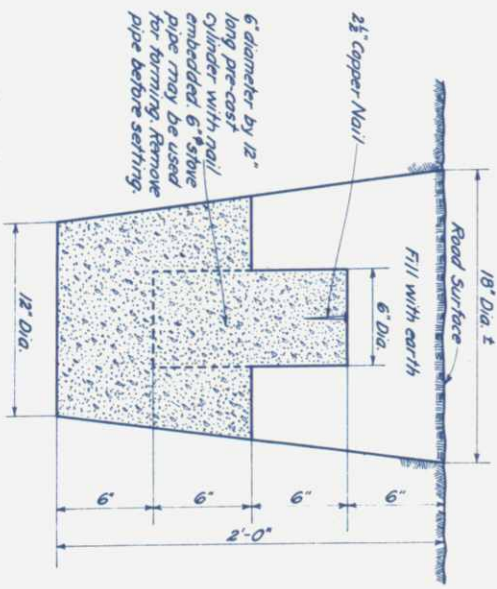
TOP VIEW



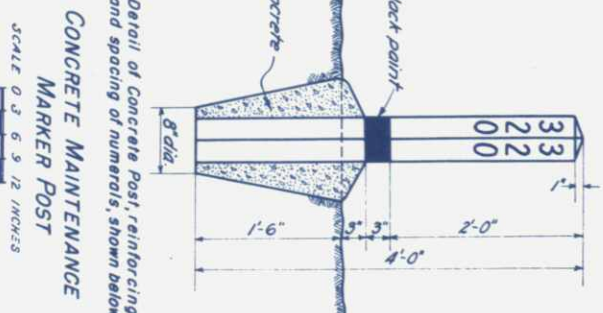
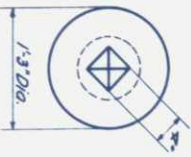
REFERENCE POINT MONUMENT  
SCALE 0 1 2 3 4 INCHES



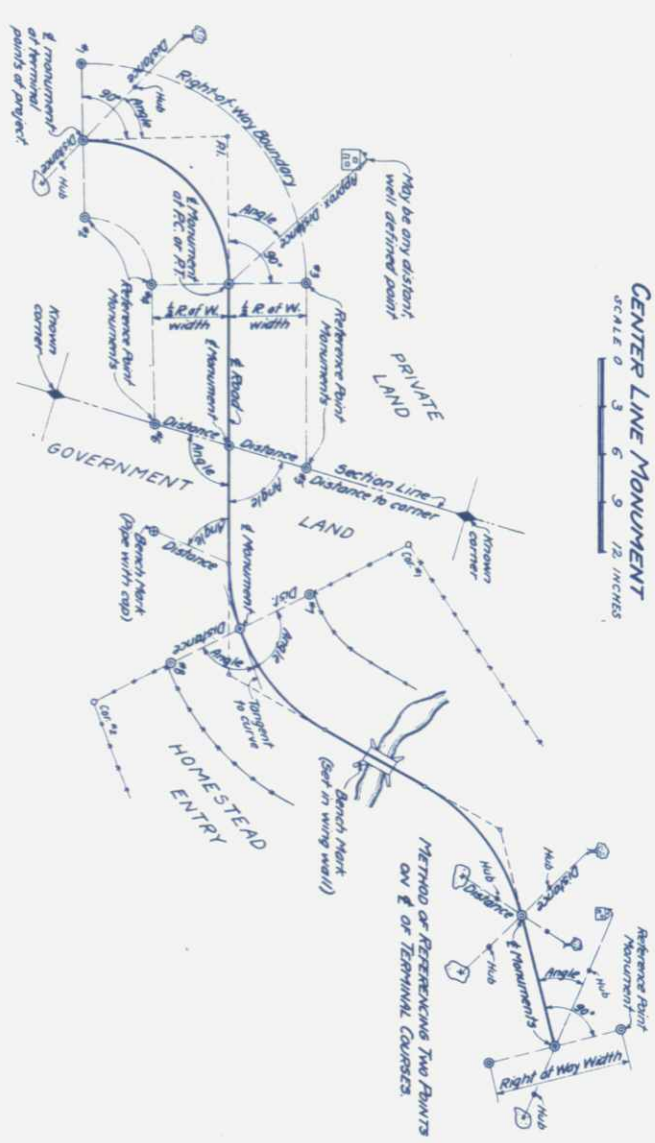
TOP VIEW



CENTER LINE MONUMENT  
SCALE 0 3 6 9 12 INCHES



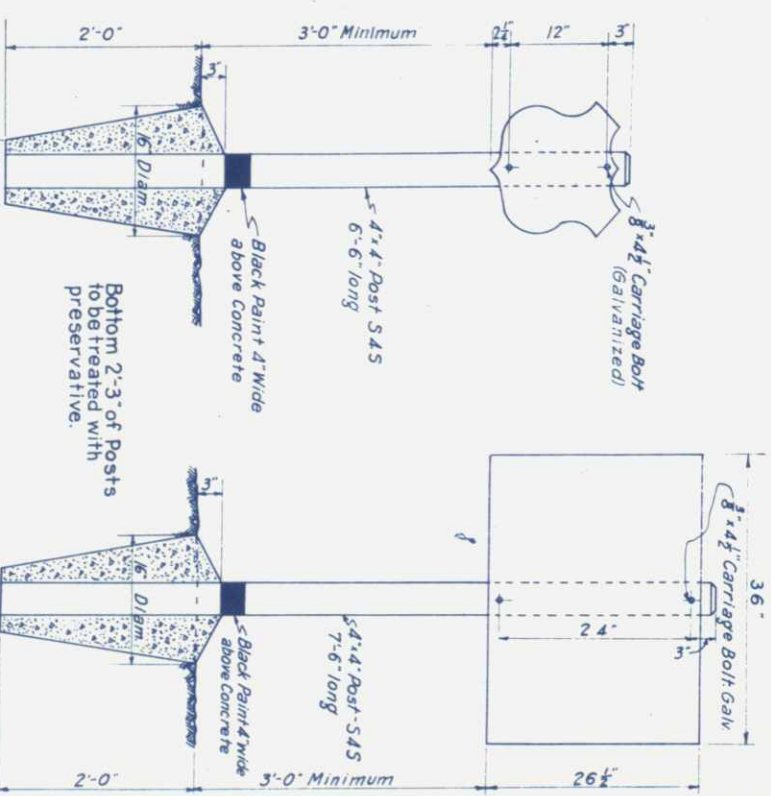
CONCRETE MAINTENANCE MARKER POST  
SCALE 0 3 6 9 12 INCHES



METHODS OF PLACING REFERENCE MONUMENTS

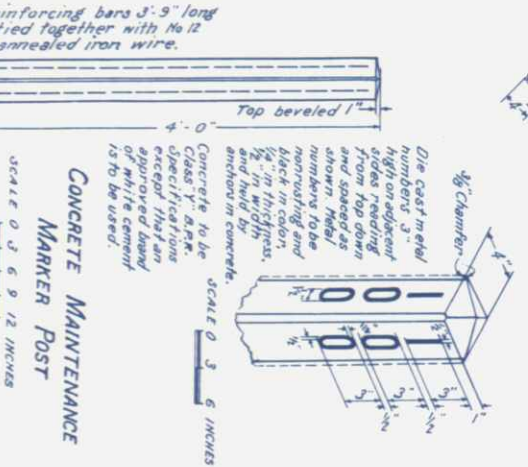
NOTES:-

The center line shall be monumented at mile and half-mile intervals or intersections of public land lines, and of two points on the terminal courses, including initial point and end of survey. On all projects not located on Government land, right-of-way boundaries shall be permanently marked with brass capped pipes or which the point number, the route, and the section of project are stamped. These should be set at terminal points of survey, on all public land lines crossing E or survey, and at other points necessary to define right-of-way boundaries. When placed on curves they shall be located on radial lines, except when on public land lines. Permanent bench marks shall be set at intervals of approximately one mile. They shall be set on conspicuous permanent objects such as top of wing wall of bridge abutments, headwalls suitable rock surfaces, or a brass capped pipe marker, may be set in ground. All markers shall be accurately located with reference to the center line and an accurate record made of distances and angles to the various points, which shall be shown on the 'As Constructed' plans.



STANDARD U.S. MARKER  
SCALE 0 3 6 9 12 INCHES

STANDARD TWO LINE DIRECTIONAL SIGN  
SCALE 0 3 6 9 12 INCHES



CONCRETE MAINTENANCE MARKER POST  
SCALE 0 3 6 9 12 INCHES

NOTE: Posts to be painted 3 Coats of Approved White Paint.



DETAIL OF MOUNTING  
SCALE 1 1/2" = 1'-0"  
SCALE 0 3 6 9 12 INCHES

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BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

STANDARD  
MAINTENANCE POSTS  
AND REFERENCE MONUMENTS

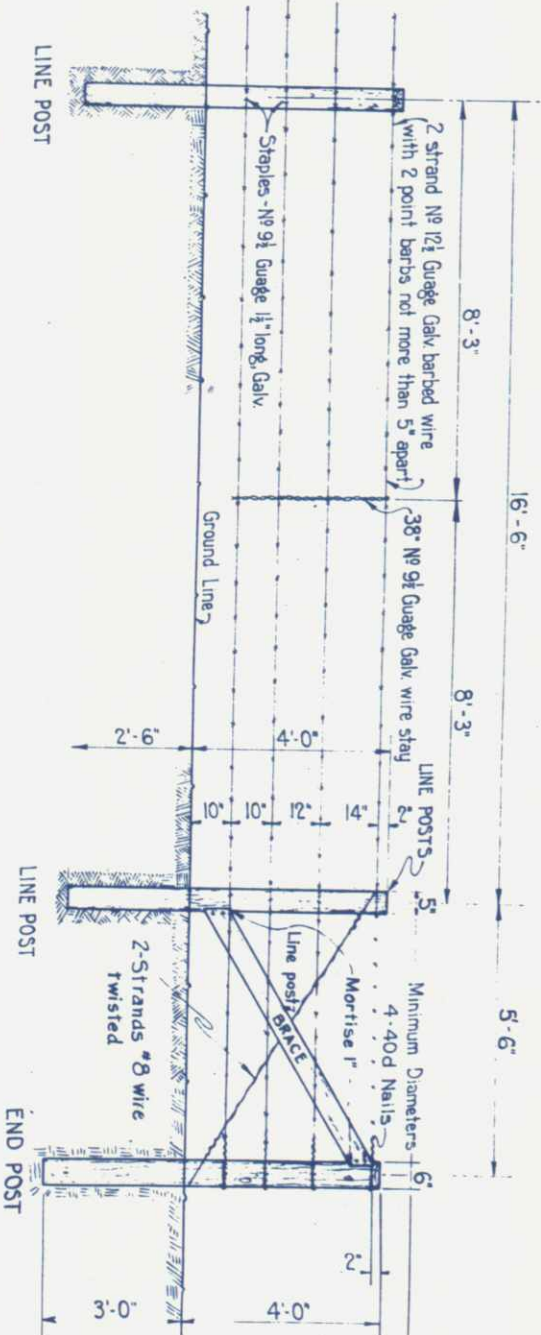
APPROVED  
May 7, 1930  
Acting District Engineer

APRIL, 1930  
JUNE, 1934



# STANDARD BARBED WIRE FENCE & END BRACE

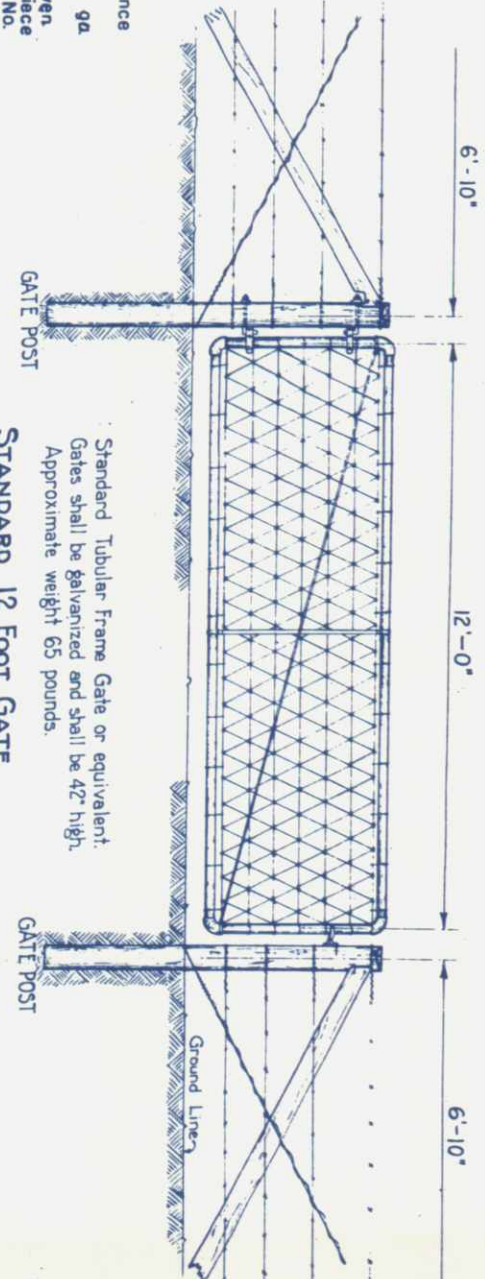
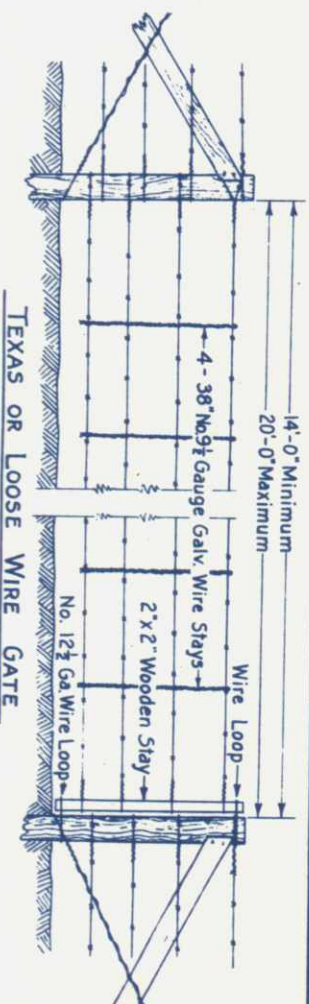
NOTE:  
Texas or Loose Wire Gates are not to be paid for separately. These gates shall be paid for at the same price per lineal foot as the Barbed Wire Fence.



Dimensions  
END, GATE, &  
CORNER POSTS

## USE WOVEN WIRE FENCE

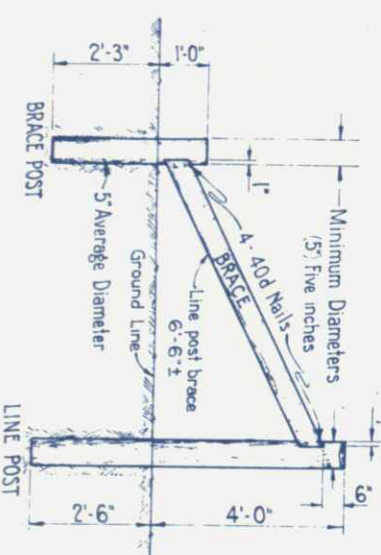
Stations 100+00 to 104+00 and 104+30 to 110+00. Lower three lines of barbed wire to be omitted and replaced with 42" wire mesh fence.  
Specifications for 4"x4" wire mesh fence  
Width: 42 inches.  
Horizontal wires: 2 strands No.12 1/2 ga.  
Cross wires: 1 strand 14 ga.  
Construction: Cross wires to be woven with horizontal wires making a one piece fabric. To be fastened to posts with No. 9 1/2 ga. staples, 1 1/4" long. All wire and staples to be galvanized.



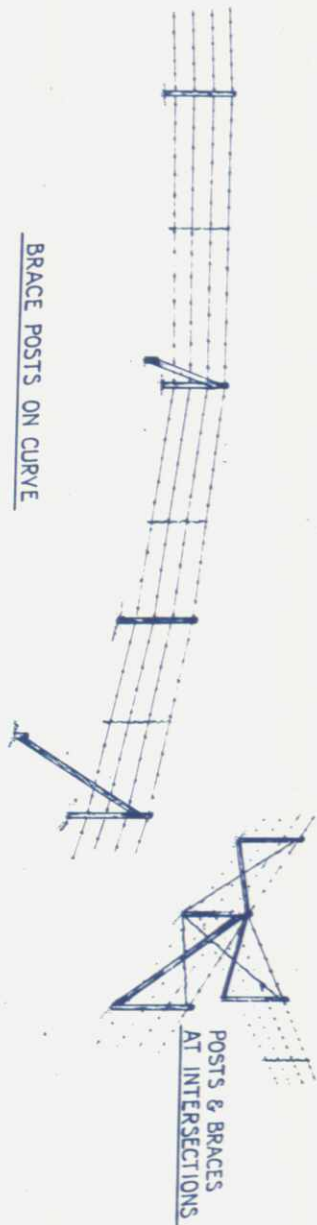
## STANDARD 12 FOOT GATE

SPACING OF BRACE POSTS AROUND CURVE  
2" to 6" curve - every seventh post  
6" to 12" " " fifth " "  
12" & up " " other "

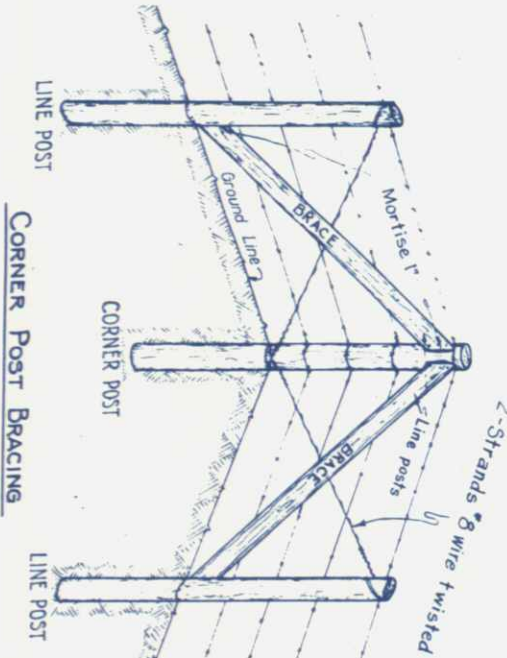
## BRACE POST DETAIL



## BRACE POSTS ON CURVE



## CORNER POST BRACING



## UNTREATED FENCE POSTS

### TYPE 1

Posts shall be made from well seasoned, straight, sound Native Red Cedar or Southern Red Cedar. Knots will be permitted if trimmed. Posts with sweep of over 4" in one direction will not be accepted. The posts shall be set vertically to the depth shown on the plans. They shall be maintained in accurate alignment while the post holes are backfilled with suitable material thoroughly tamped in layers. Corner, Gate, and end posts shall have a minimum diameter of (6") six inches and shall be (7") seven feet in length. Line posts shall have a minimum diameter of (5") five inches and shall be (6 1/2") six and one half feet in length. SPLIT POSTS will be permitted for line posts. If used the circumference at the small end of the posts shall be not less than 17 inches. Diameters of posts shall be determined by measuring circumference and dividing by 3.14.

## JUNIPER POSTS

### TYPE 3

Posts shall be cut from sound durable native juniper trees. Knots will be permitted if trimmed. Posts with sweep of over 6" in one direction will not be accepted. The posts shall be set vertically to the depth shown on the plans with the butt end down and sweeps shall be set in the direction of the fence. Corner, Gate, and End posts shall have a minimum diameter of (5") five inches, and shall be (7") seven feet in length. Line posts shall have a minimum diameter of (4") four inches, and shall be (6 1/2") six and one half feet in length. Diameters of posts shall be determined by measuring the circumference and dividing by 3.14.

## TREATED FENCE POSTS

### TYPE 2

Posts shall be made from well seasoned, straight, sound Southern Yellow Pine, West Coast Douglas Fir, or Lodgepole Pine. The posts shall be set vertically to the depth shown on the plans. They shall be maintained in accurate alignment while the post holes are backfilled with suitable material thoroughly tamped in layers. Corner, Gate, and end posts shall have a minimum diameter of (6") six inches and shall be (7") seven feet in length. Line posts shall have a minimum diameter of (5 1/2") five inches and shall be (6 1/2") six and one half feet in length. Treatment of posts shall be in accordance with Standard Specifications, Section 430, Timber Structures except that treatment shall be either Creosote or Pentachlorophenol and the minimum absorption of preservative shall be 5 pounds per cubic foot of wood. Diameters of posts shall be determined by measuring circumference and dividing by 3.14.

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REGION NO.9 DENVER, COLO.

## STANDARD BARBED WIRE FENCE WITH WOOD POSTS & BRACES

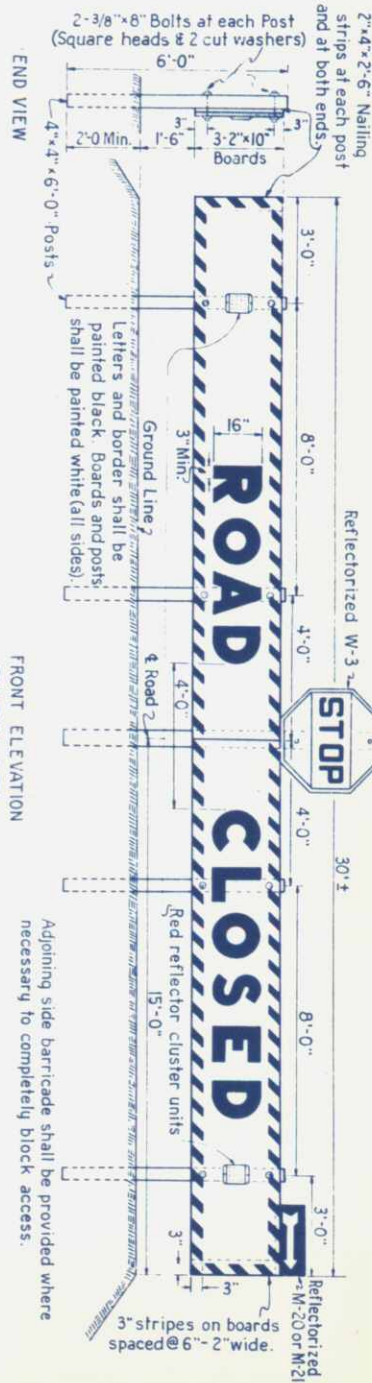
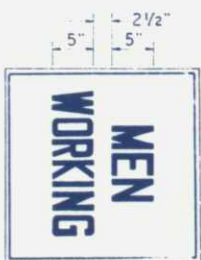
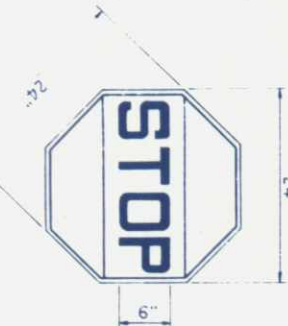
Scale 1" = 10' 0" 1" = 20' 0" 1" = 30' 0"

APPROVED *[Signature]* Date: 5-7-57  
Engineer of Federal Domain Operations

DESIGNED BY: R.E. Fincher March  
DRAWN BY: W.E. Westfall  
TRACED BY: J.A. Seibert  
CHECKED BY: R.H. Naylor

Revised Mar. 1946





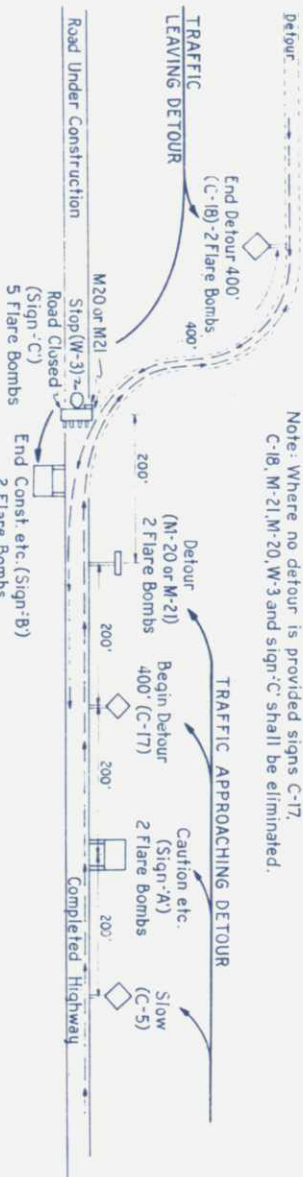
W-3  
(Reflectorized)

C-5  
(Reflectorized)

C-29

M-21  
(Reflectorized)

Note: Where no detour is provided signs C-17, C-18, M-21, M-20, W-3 and sign C shall be eliminated.



### TYPICAL SIGN LAYOUT FOR DETOUR

#### STANDARD SIGNS:

**DESIGN:** (From Manual and Specifications for U.S. Standard Road Markers and Signs)  
This set of designs is based on definite principles calculated to produce uniformity of significance in the signs themselves, and make familiarity with them easy to acquire on the part of the most casual driver. These principles are a set of shapes each having its own significance; a set of color combinations, each having its own significance; a few obvious symbols and uniformity of erection and application.  
Standard Signs not shown are: C-8 (Fresh Oil), C-13 (Loose Gravel), C-17 (Begin Detour 400 Ft.), and C-18 (End Detour 400 Ft.). These signs are from "Manual and Specifications for U.S. Standard Road Markers and Signs".

#### SHAPE:

The Octagonal sign is used to indicate "Stop". The Diamond shaped signs, commonly called "Slow" signs, are used to indicate any condition inherent in the road itself requiring slow speed and caution on the part of the driver. The Square shaped signs, commonly called "Caution" signs are used to indicate any condition requiring caution that is not inherent in the road itself, but which is due to contiguous or adjacent conditions which often are also intermittent. Rectangular signs of various dimensions are used to carry directions, information and restrictions of use or benefit to the driver.

#### COLOR:

All standard signs of a precautionary character, including the octagonal stop sign, the diamond slow sign, and the square caution sign have black designs on a yellow background.  
All direction, information and restriction signs are black on a white background.

#### SPECIAL SIGNS: SIGNS 'A', 'B' & 'C':

**MATERIAL:**  
First grade lumber, reasonably free from knots and other defects shall be used. All dimensions shall be in accordance with working drawings.

#### FABRICATION:

These signs shall be securely nailed and bolted to withstand high wind pressures. Bolts shall be used where shown on working drawings. The finished sign shall be free from all defects and made in a neat and workman like manner.

#### FINISH:

These signs shall have black letters on a white background. The number of coats and quality of paint used, shall be sufficient to give a neat and finished sign that will withstand weather without cracking or peeling. The back of the sign shall be painted white.

#### GENERAL NOTES:

##### ERECTION AND DISPLAY OF SIGNS:

The signs are to be erected for the purpose of directing traffic over a specific route and shall be so located as to be conspicuously visible day and night. They shall be set facing, and on the right hand side of approaching traffic. They shall be so located that they will be seen at all times by approaching traffic with the minimum of effort.

Signs shall be fastened with 2-3/8" carriage bolts to substantial posts when they are necessary for an extended period. Portable supports, such as tripods are permitted for short periods, provided the construction is such that wind or other agents can not readily upset the sign.

All signs required shall be furnished, installed, and maintained in good order by the contractor. Payment will not be direct but will be considered included in the price bid for the regular construction items.

##### USE:

Sign C-5 shall be used separately or in conjunction with other signs. C-5 slow sign to precede by at least 100' whenever the condition of the road requires a reduction of speed. Signs M-20 and M-21 shall be erected at the beginning of detour, at intervals of 1/4 mile, and at junctions with other roads, also when necessary shall be attached to sign C.

Sign W-3 shall be erected from 25 to 50 feet in advance of the point where a full stop is required, and shall be preceded at approximately 500 feet by a slow sign. Sign C shall be erected where it is necessary to completely block access to the new construction. Under special conditions, where local traffic must pass through barrier, special provision may be made to provide restricted access by gate. This sign shall be preceded by the cautionary sign shown in the above sketch.

##### LIGHTS:

Lights shall be kept burning from sunset to sunrise at all points considered dangerous. In general, the lights shall be torch bombs, unless there is a danger from fire, when lanterns shall be substituted.

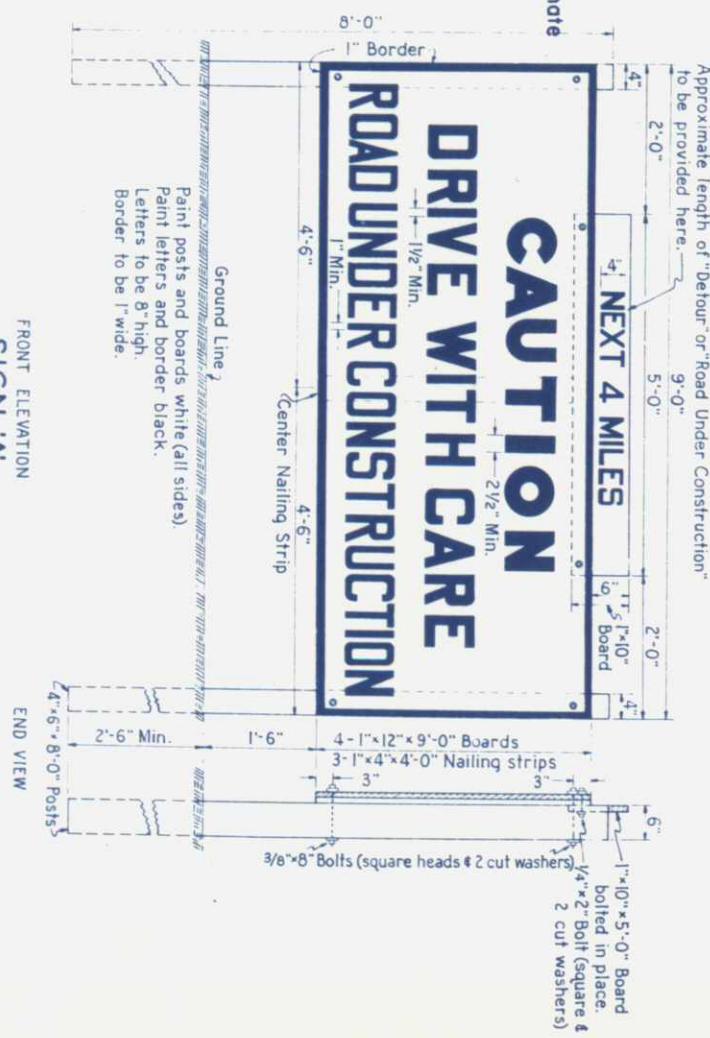
Some specific points where lights must be under way, placed so as to illuminate the warning signs.

2. At all points where particular caution is required, as at turns or sharp curves, temporary bridge approaches, and sudden or large grade changes, placed so as to illuminate the corresponding signs.

3. Sign C shall be furnished with 2 red reflector cluster units, each unit having a minimum of 15 red reflector buttons, each of a diameter not less than 5/8 inch. These units shall be securely fastened on the sign in locations as shown in the sketch. In addition to these reflectors a minimum of five torch bombs or similar lights shall be placed in front of the barrier.

##### GENERAL:

Selection and placement of signs shall be subject to approval of the engineer. Where signs other than those on the plans are required, they shall conform to the standards for the same class of signs as shown on the plans. The use of special signs shall be limited. Upon opening the work to the public, all construction signs must be removed immediately, so that there will be no confusion.



FRONT ELEVATION  
SIGN 'A'



FRONT ELEVATION  
SIGN 'B'

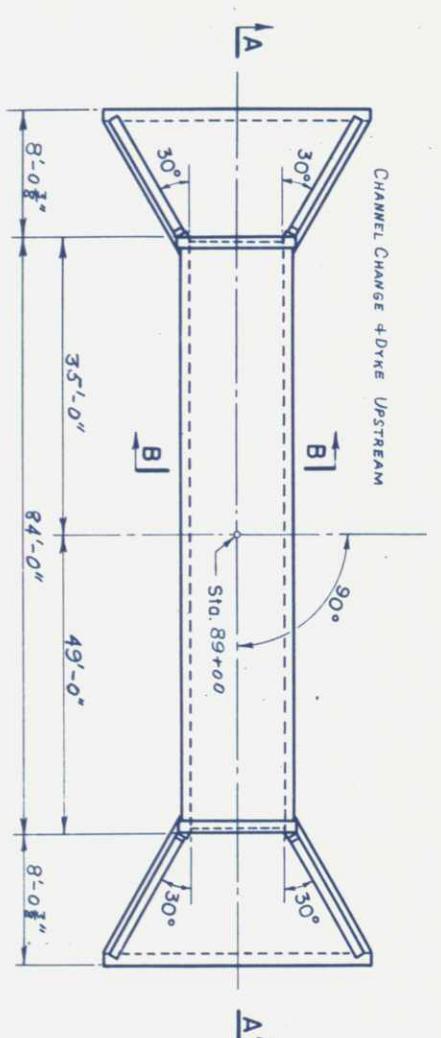
### TYPICAL SIGNS FOR USE ON CONSTRUCTION

NOTE: This sign is the same size and of the same construction as sign A shown above, and requires the same supports.

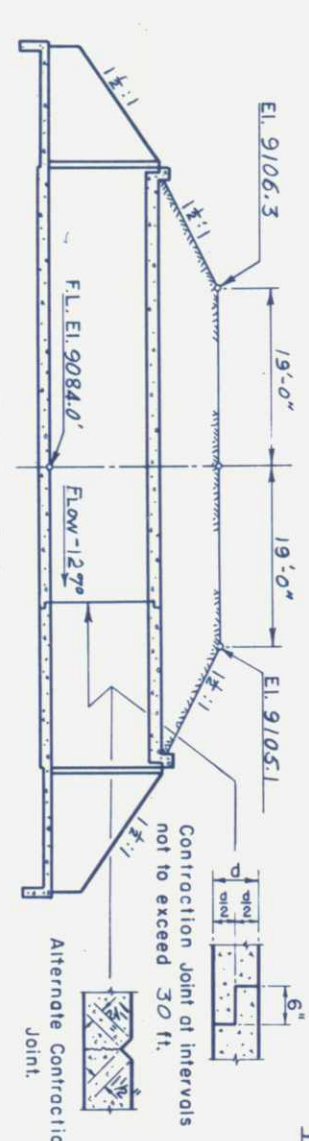
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BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.



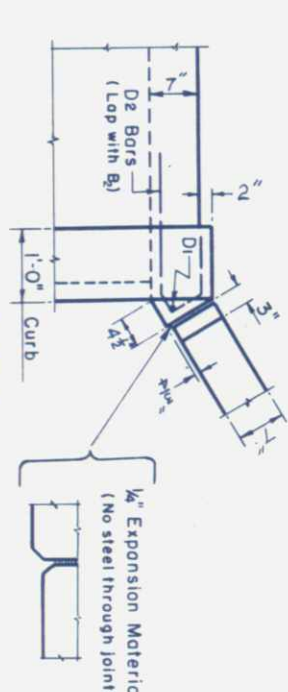
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Checked: O.L.H. Date: 3-57  
Traced: Date:



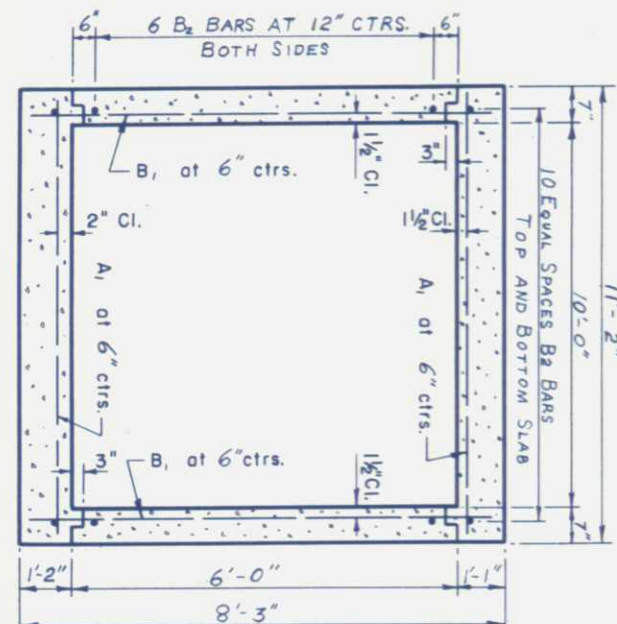
PLAN



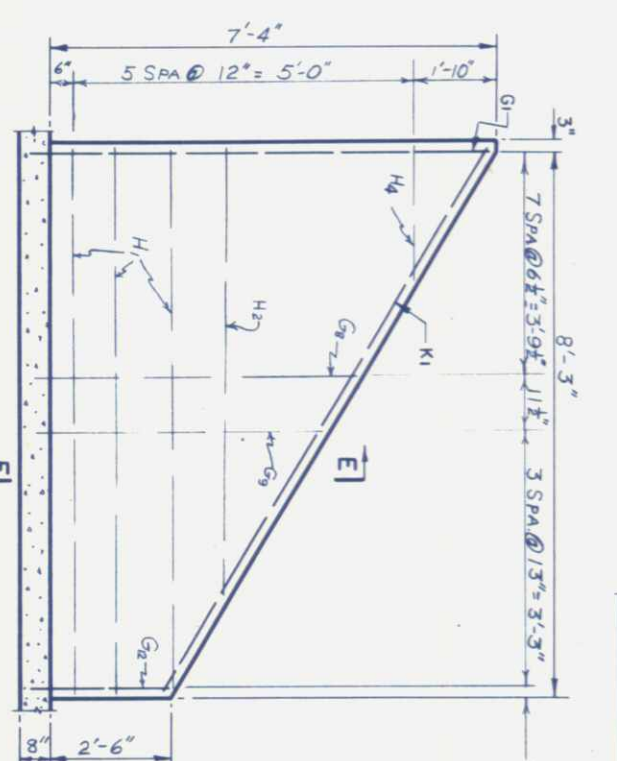
SECTION A-A



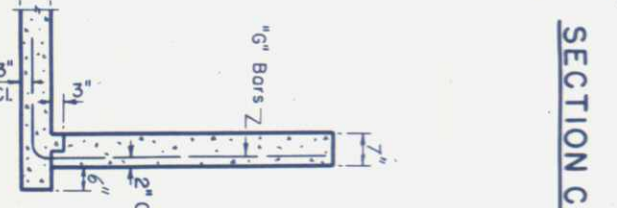
WING WALL CONNECTION



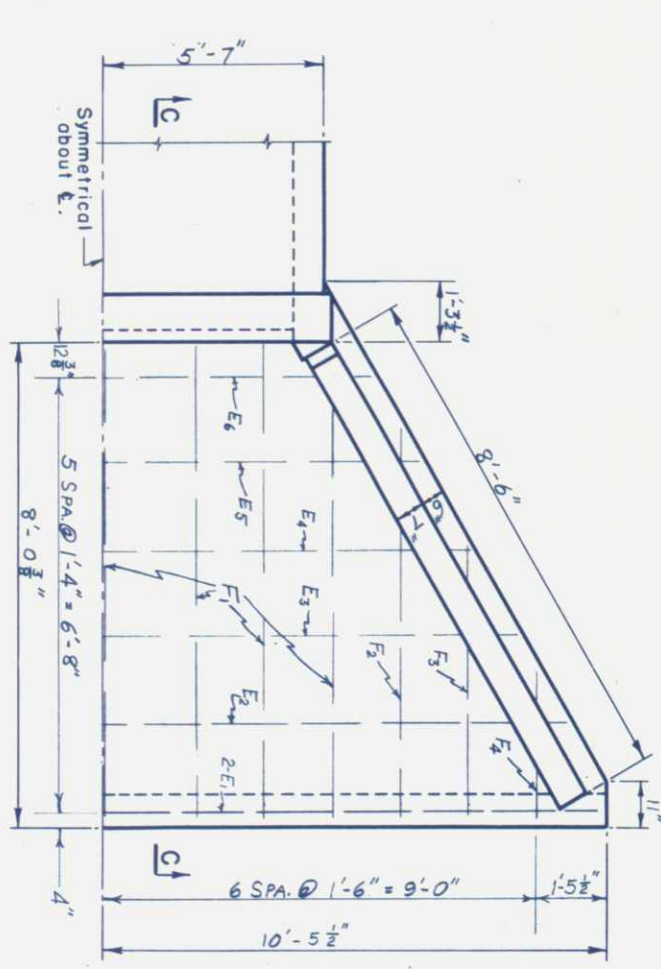
SECTION B-B



SECTION C-C

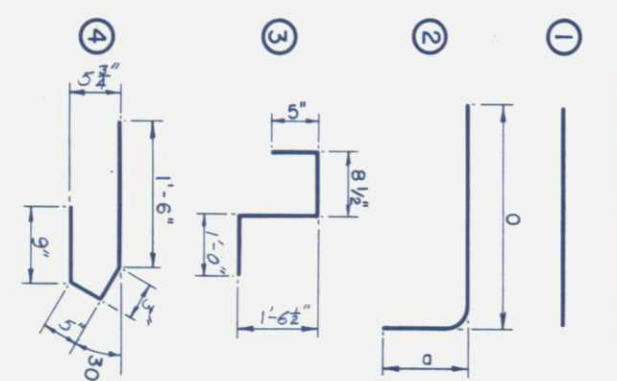


SECTION E-E



PART PLAN

BAR DIAGRAMS



NOTE: All dimensions are "Out to Out."

BAR LIST					
Bar	Type	Location	No.	Size	Length
A1			336	#8	10'-10"
B1		Barrel	336	#5	7'-11"
B2			102	#4	28'-7"
C1		Curbs	4	#4	11'-2"
C2			2	#4	3'-8"
D1		Wing Wall	4	#4	7'-2"
D2		Connections	28	#4	2'-11"
E1			4	#4	20'-6"
E2			2	#4	19'-4"
F1		Aprons	14	#4	13'-2"
F2			4	#4	10'-8"
G1			4	#4	8'-9"
H1			4	#4	9'-10"
I1			4	#4	7'-11"
J1			4	#4	7'-11"
K1			4	#4	7'-11"
L1			4	#4	7'-11"
M1			4	#4	7'-11"
N1			4	#4	7'-11"
O1			4	#4	7'-11"
P1			4	#4	7'-11"
Q1			4	#4	7'-11"
R1			4	#4	7'-11"
S1			4	#4	7'-11"
T1			4	#4	7'-11"
U1			4	#4	7'-11"
V1			4	#4	7'-11"
W1			4	#4	7'-11"
X1			4	#4	7'-11"
Y1			4	#4	7'-11"
Z1			4	#4	7'-11"

ESTIMATED QUANTITIES

Class	"A" Concrete	113.9 Cu. Yds.
Reinforcing Steel	15,310 Lbs.	
Excavation for Bridges	70 Cu. Yds.	

\*Excavation above flow line to be paid for as unclassified Excavation.

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REGION NO. 9 DENVER, COLO.

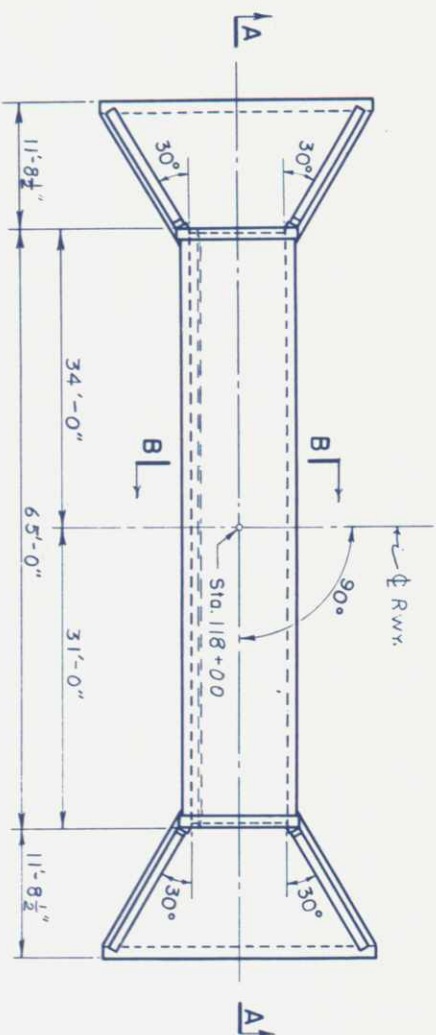
CONCRETE BOX CULVERT

STATION: 89+00  
PROJECT: NEDERLAND-RAYMOND 27-C1  
STATE: COLORADO

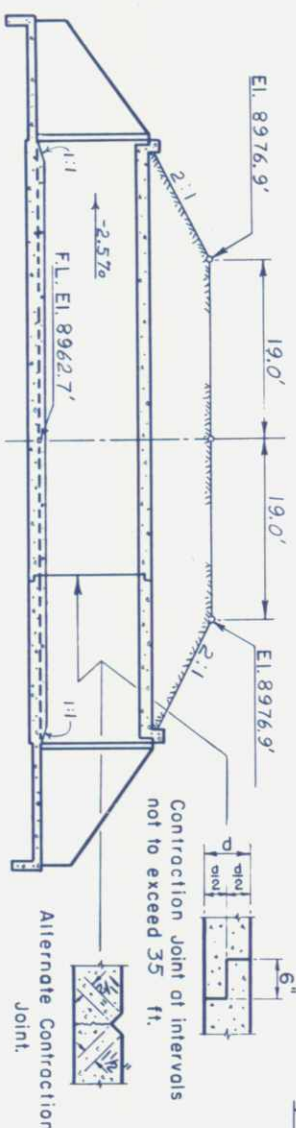
APPROVED: *W. J. J. J.* Date: 9 May 1957  
Division Bridge Engineer



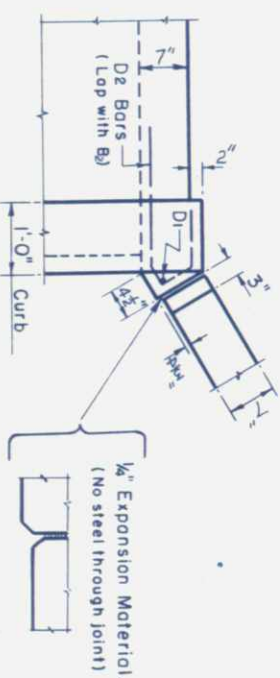
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Traced: Date:



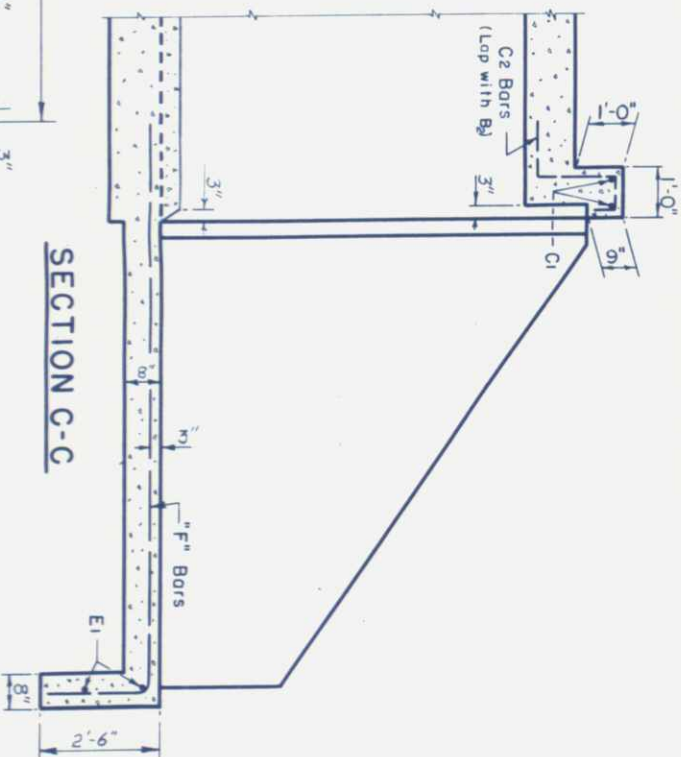
## PLAN



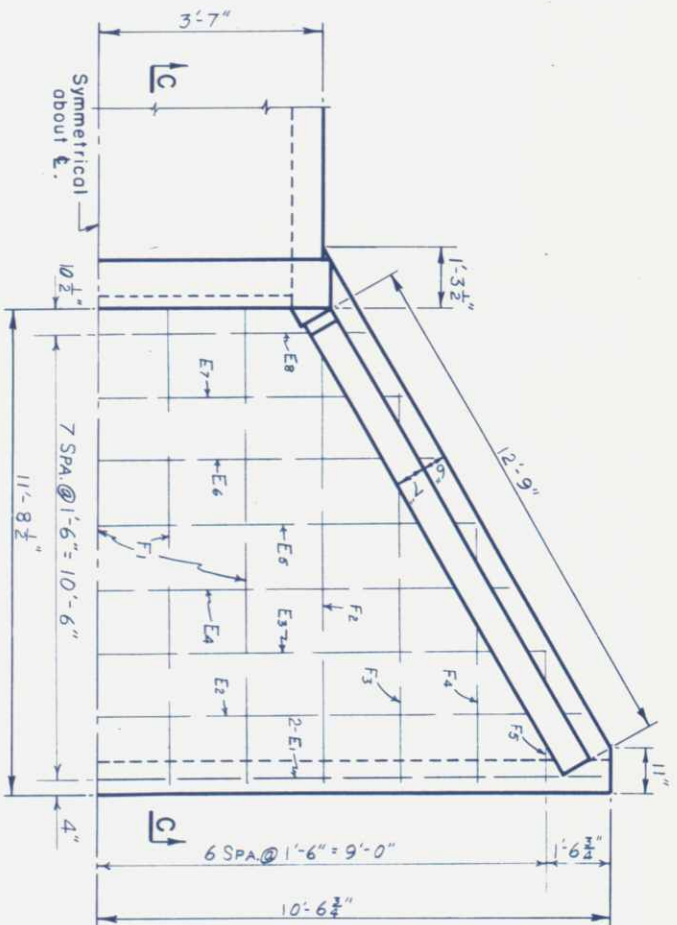
## SECTION A-A



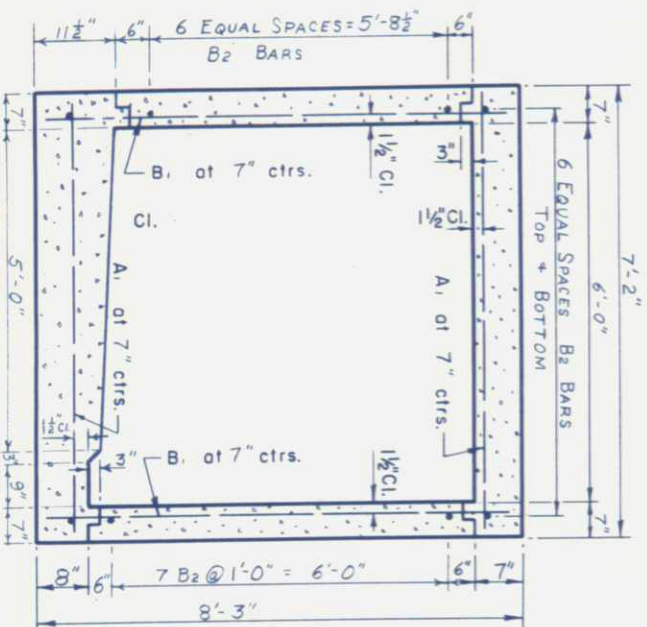
## WING WALL CONNECTION



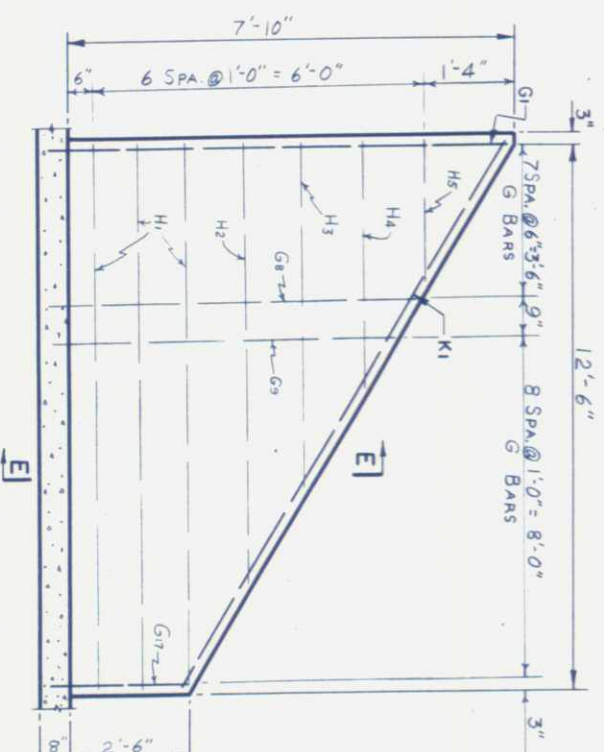
## SECTION C-C



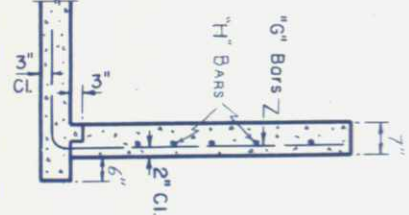
## PART PLAN



## SECTION B-B

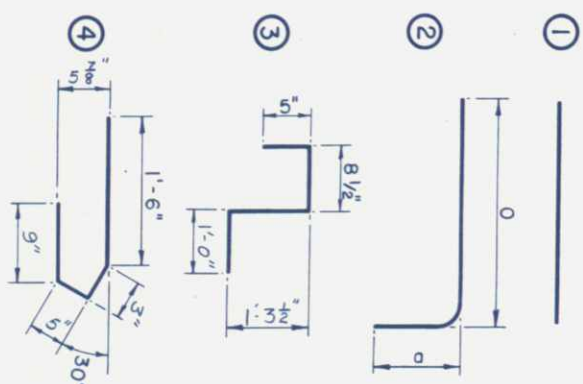


## WING WALL DETAILS



## SECTION E-E

## BAR DIAGRAMS



**NOTE:** All dimensions are "Out to Out."

BAR LIST						
Bar	Type	Location	No.	Size	Length	O
A1	1		222	#6	6'-10"	0
B1		Barrel	222	#4	7'-11"	
B2	1		56	#4	32'-9"	
C1	1	Curbs	4	#4	7'-3"	
C2	3		14	#4	3'-3"	
D1	1	Wing Wall	4	#4	7'-8"	
D2	4	Connections	32	#4	2'-11"	
E1			4		20'-9"	
E2			2		19'-9"	
F1			OF	#4	TO	
F2		Aprons	EACH			
G1			10		9'-4"	
T0					14'-4"	12'-5"
G2					12'-10"	10'-11"
G3	2		4	#4	TO	2'-0"
T0			EACH			
G4					5'-0"	3'-1"
T0					10'-6"	8'-1"
G5			4		TO	TO
T0			OF	#4	9'-0"	6'-7"
G6	2		EACH		8'-9"	6'-4"
T0					TO	TO
G7					5'-3"	2'-10"
H1		Wing Walls	12		12'-5"	
H2					9'-10"	
T0	1		4	#4	TO	
H5			OF			
K1			EACH		2'-11"	
	1		4	#4	13'-6"	

### ESTIMATED QUANTITIES

Class "A" Concrete	61.9	Cu.Yds
Reinforcing Steel	5,780	Lbs.
<sup>th</sup> Excavation for Bridges	50	Cu.Yds

④ EXCAVATION ABOVE FLOW LINE TO BE PAID FOR AS UNCLASSIFIED EXCAVATION

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

6' x 7' x 65'-0"

## CONCRETE BOX CULVERT

STATION: 118+00  
PROJECT: NEDERLAND-RAYMOND 27-CR  
STATE: GEORGIA

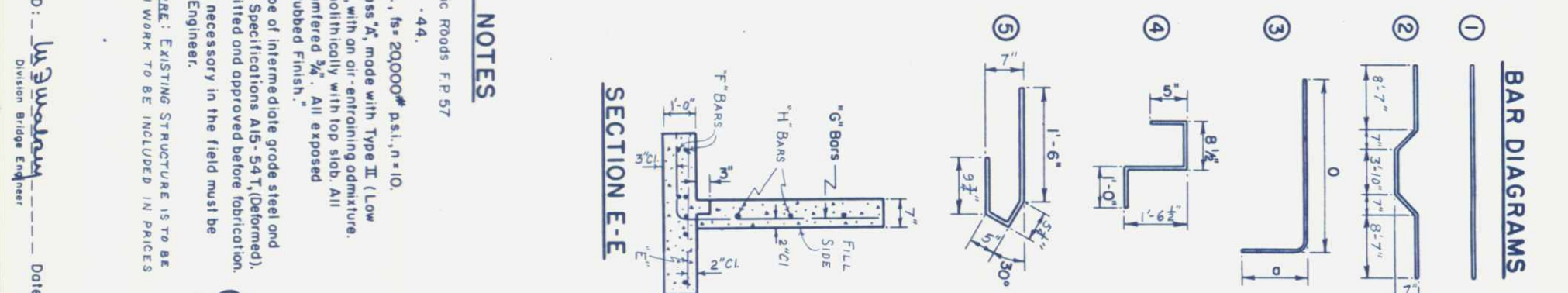
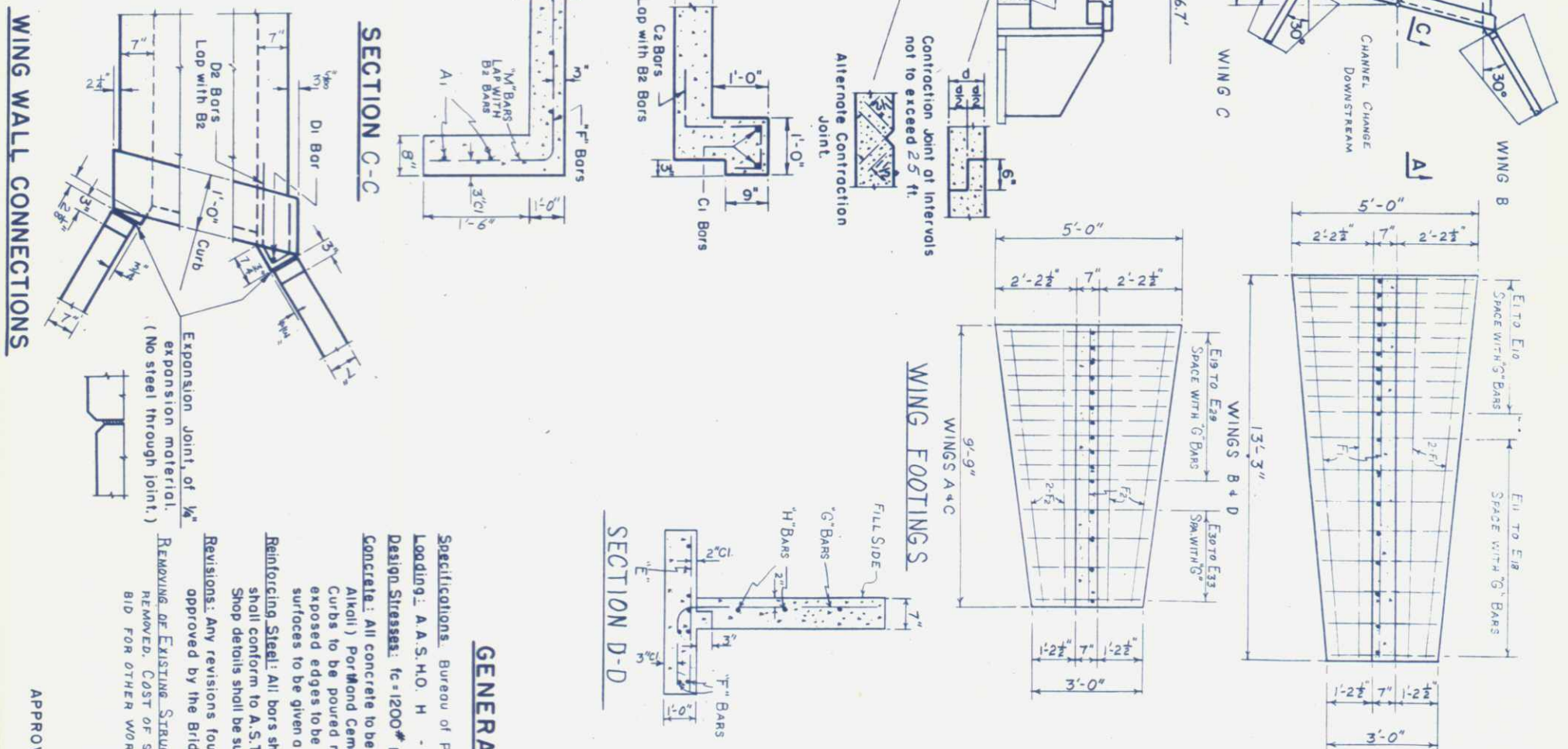
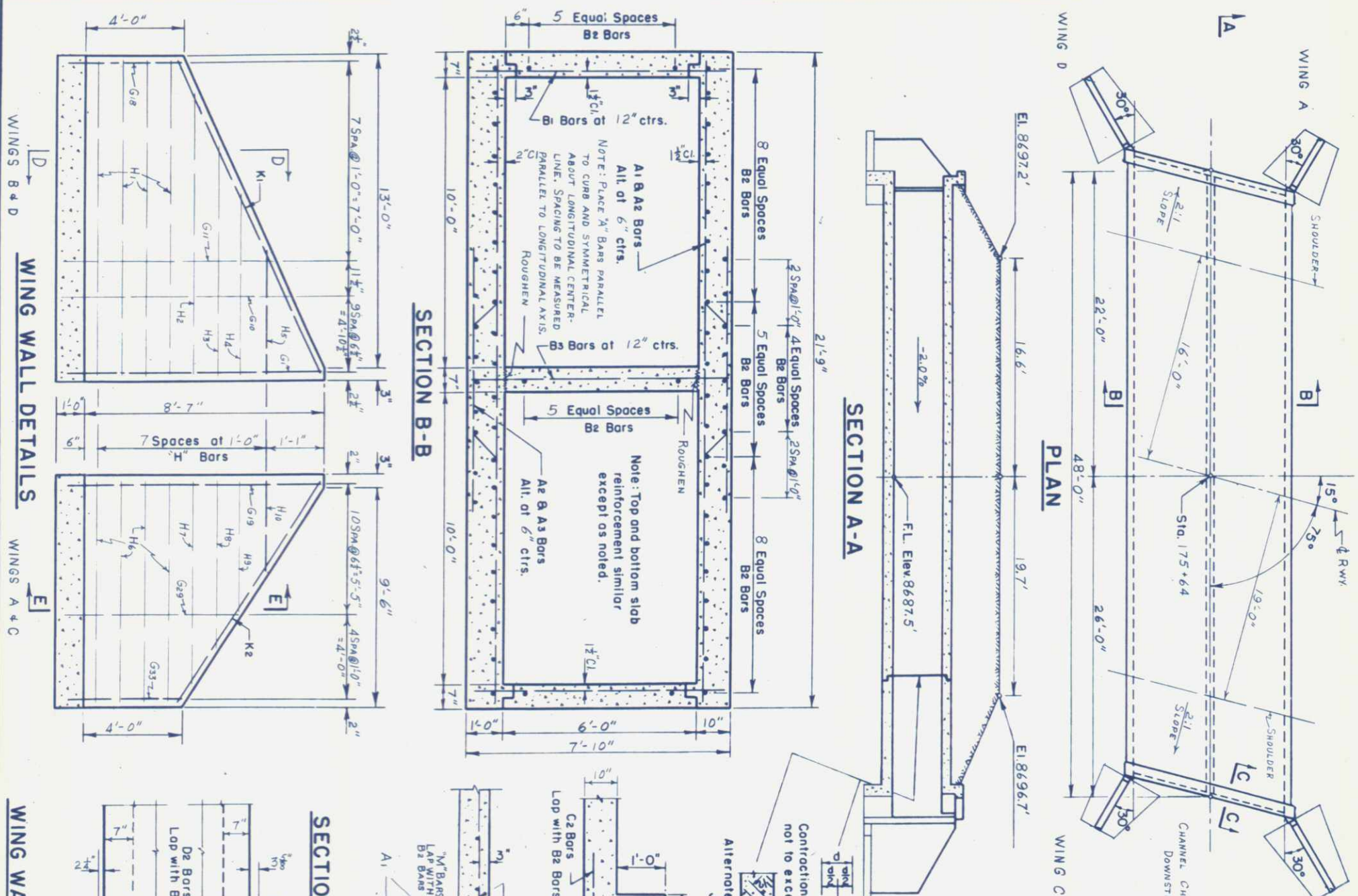
APPROVED

Division Bridge Engineer

Date: 9 May 1957

D3-STD.163





Bar	Type	Location	No.	Size	Length	Ø	Ø
A1	1	Barrel	102	#4	22'-2"		
A2	2		96	#6	22'-8"		
A3	1		98	#6	9'-6"		
B1	1		96	#5	7'-6"		
B2	1		160	#4	24'-6"		
B3	1		48	#4	7'-6"		
C1	1	Curbs	4	#4	22'-7"		
C2	4		44	#4	3'-8"		
D1	1	Wing Wall Connections	2	#4	9'-2"		
D2	5		14	#4	3'-2"		
E1		Footings	2	#4	4'-8"		
E10	1		0F				
E11			EACH				
E18			2	#4	3'-11"		
E19			2	#4	3'-9"		
T0			0F				
E29			EACH				
E30	1		2	#4	3'-6"		
T0			0F				
E33			2	#4	3'-4"		
F1		EACH					
F2	1	14	#4	2'-8"			
		14	#4	12'-11"			
G1		2	#5	11'-6"	9'-2"	2'-5"	
T0		0F			T0	T0	
G10		EACH		9'-5"	7'-5"	2'-11"	
G11		2	#5	9'-11"	7'-2"	2'-0"	
T0		0F		T0	T0	T0	
G18	3	EACH		5'-11"	4'-7"	1'-5"	
G19		2	#5	11'-6"	9'-2"	2'-5"	
T0		0F		T0	T0	T0	
G29		EACH		8'-4"	6'-7"	1'-10"	
G30		2	#5	7'-9"	6'-11"	1'-9"	
T0		0F		T0	T0	T0	
G33		EACH		5'-11"	4'-7"	1'-5"	
H1	Wing Walls	8	#4	12'-11"			
H2			2	#4	8'-8"		
H3			0F		5'-10"		
H4			EACH		3'-0"		
H5		1	8	#4	9'-5"		
H6			2	#4	8'-5"		
H7			0F		6'-4"		
H8			EACH		4'-3"		
H9			2	#4	2'-2"		
H10			2	#4	13'-9"		
K1	1	2	#4	10'-6"			
K2		2	#4	3'-5"	1'-6"	2'-0"	
M	3	CUT-OFF WALL	44	#4	3'-5"		

ESTIMATED QUANTITIES	
Class "A" Concrete	1061 - - Cu. Yds.
Reinforcing Steel	11320 - - lbs.
Excavation for Bridges	75 - - Cu Yds.

• EXCAVATION ABOVE FLOW LINE TO  
FOR AS UNCLASSIFIED EXCAVATION

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO.9 DENVER, COLO

**DOUBLE 10'x6'x48'-0"**  
**CONCRETE BOX CULVERT**

STATION:-- 175+64 --  
PROJECT: NEDERLAND-RAYMOND-2  
STATE:-- COLORADO --

APPROVED: W. E. Wadsworth Date: 9 May 1957  
Division Bridge Engineer

D3-STD.164



Table 1.--Specifications FP-57, Corrugated Metal Pipe Culverts  
Gages, Weight, and Fabrication Data

Nominal diameter	Length of sheet before forming	Minimum width of lap	Gage	Computed weight per foot	Connecting bands
inches	inches	inches		pounds	Gage Width
8	28½	1½	16	7.3	16 7"
10	35	1½	16	9.0	16 7"
12	41	1½	16	10.5	16 7"
15	50½	1½	16	12.9	16 7"
18	60	1½	16	15.3	16 7"
21	69½	1½	16	17.7	16 7"
24	80	2	14	25.2	16 7"
30	98	2	14	30.9	16 7"
36	117	2	12	51.0	14 12"
*½2	137	3	12	59.5	14 12"
*½8	156	3	12	68.0	14 12"
¾4	1-80	3	12	77.8	14 12"
1-98					
2-98					
2-117					
2-137					

\*Two sheets may be used by allowing sufficient total sheet lengths to provide for an additional standard lap.

Table 3.--Corrugated Metal Pipe-Arches

Span	Height	Gage Table and Height of Cover					Connecting bands	
		1-2 Gage	2-4 Gage	5-9 Gage	10-15 Gage	16-20 Gage	Gage	Width
22"	13"	16	16	16	16	16	16	7"
29"	18"	14	14	14	14	14	16	7"
36"	22"	14	14	14	14	14	16	7"
43"	27"	12	12	12	12	12	14	12"
50"	31"	12	12	12	12	12	14	12"
58"	36"	10	12	12	12	10	14	12"
65"	40"	10	12	12	10	8	14	12"
72"	44"	8	10	10	8	-	12	12"

DETAIL FOR STRUTTING

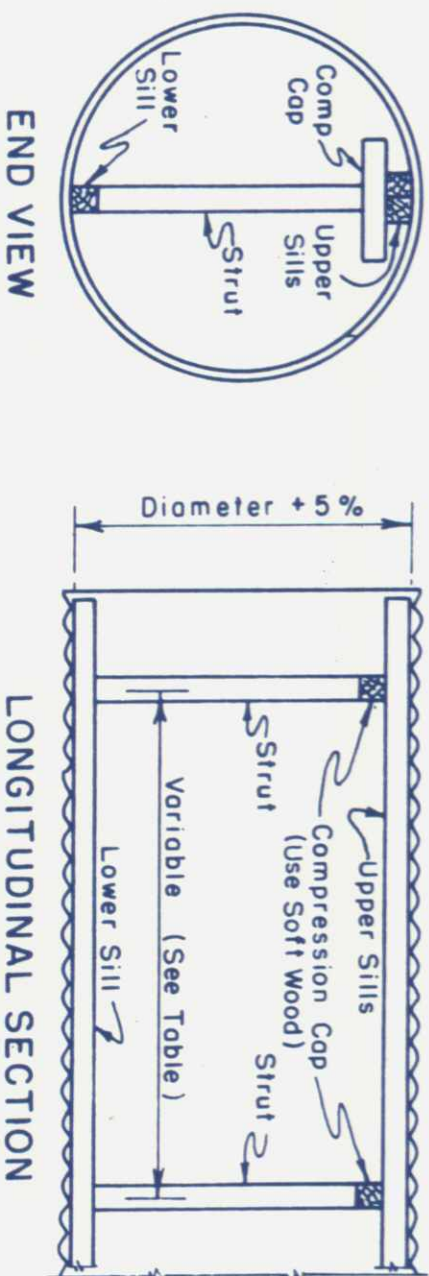


Table 2.--Gage Required for Corrugated Metal Pipe Placed under Various Heights of Embankments

Diam. in	Area in Sq. Ft.	Height of Cover above Top of Culvert--in Feet															
		1-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-60	61-70	71-80	81-100			
15	1.2	16	16	16	16	16	16	16	16	16	14	14	12	12			
18	1.8	16	16	16	16	16	16	16	16	16	14	12	12	12			
21	2.4	16	16	16	16	16	16	16	16	16	14	12	12	12			
24	3.1	14	14	14	14	14	14	14	14	14	12	12	10	10			
30	4.9	14	14	14	14	14	14	14	14	14	12	12	10	10			
36	7.1	12	12	12	12	12	12	12	12	12	10	10	8	8			
42	9.6	12	12	12	12	12	12	12	12	12	10	10	8	8			
48	12.6	12	12	12	12	12	12	12	12	12	10	10	8	8			
54	15.9	12	12	12	12	12	12	12	12	12	10	10	8	8			
60	19.6	10	10	10	10	10	10	10	10	10	8	8	8	8			
66	23.8	10	10	10	10	10	10	10	10	10	8	8	8	8			
72	28.3	10	10	10	10	10	10	10	10	10	8	8	8	8			
78	33.2	8	8	8	8	8	8	8	8	8	8	8	8	8			
84	38.5	8	8	8	8	8	8	8	8	8	8	8	8	8			

\*When pipes of 30-, 36-, and 42-inch diameters are placed under fills as indicated above, the pipes shall be factory-formed to produce a 5 percent elongation of the vertical axis.

GENERAL NOTES

The gages indicated above the dashed line in Tables 2 and 3 are gages supported by Specifications FP-57. The gages below and to right of the dashed line are in excess of Specifications FP-57 and, when used, will require payment based on the heavier gage.

All full-circle corrugated metal culvert pipe of 48- to 84-inch diameters shall be factory-formed to produce a 5 percent elongation of the vertical axis. Where such pipes are placed under embankments up to 30 feet in depth, no strutting will be required. Where such pipes are placed under embankments in excess of 30 feet, strutting will be required as shown.

These tables are supplemental to Specification Items 453 and 454 of FP-57.

Table 4.--Spacing and Size of Timber Struts											
Pipe Diam.	Strut Size	Height of Cover (Feet)									
		30	40	50	60	70	80	100			
48"	4" x 4"	5.0	3.5								
	4" x 6"	6.0	5.0	4.0	3.5	3.0	4.0	3.5			
	6" x 6"			6.0	5.0	4.5	4.0	3.5			
60"	4" x 4"	4.0	3.0								
	4" x 6"	6.0	4.5	3.5	3.0	2.5	3.5	3.0			
	6" x 6"			5.5	4.5	4.0	3.5	3.0			
72"	4" x 4"	3.0									
	4" x 6"	5.0	3.5	3.0	2.5	2.0	3.5	3.0			
	6" x 6"		6.0	4.5	4.0	3.5	3.0	2.5			
84"	6" x 6"	6.0	5.0	4.0	3.5	3.0	4.0	3.5			
	6" x 8"			5.0	4.5	4.0	3.5	3.0			
	8" x 8"				4.5	4.0	3.5	3.0			

Traverse caps and sills should be of same size timber as struts and placed with least dimension vertically.

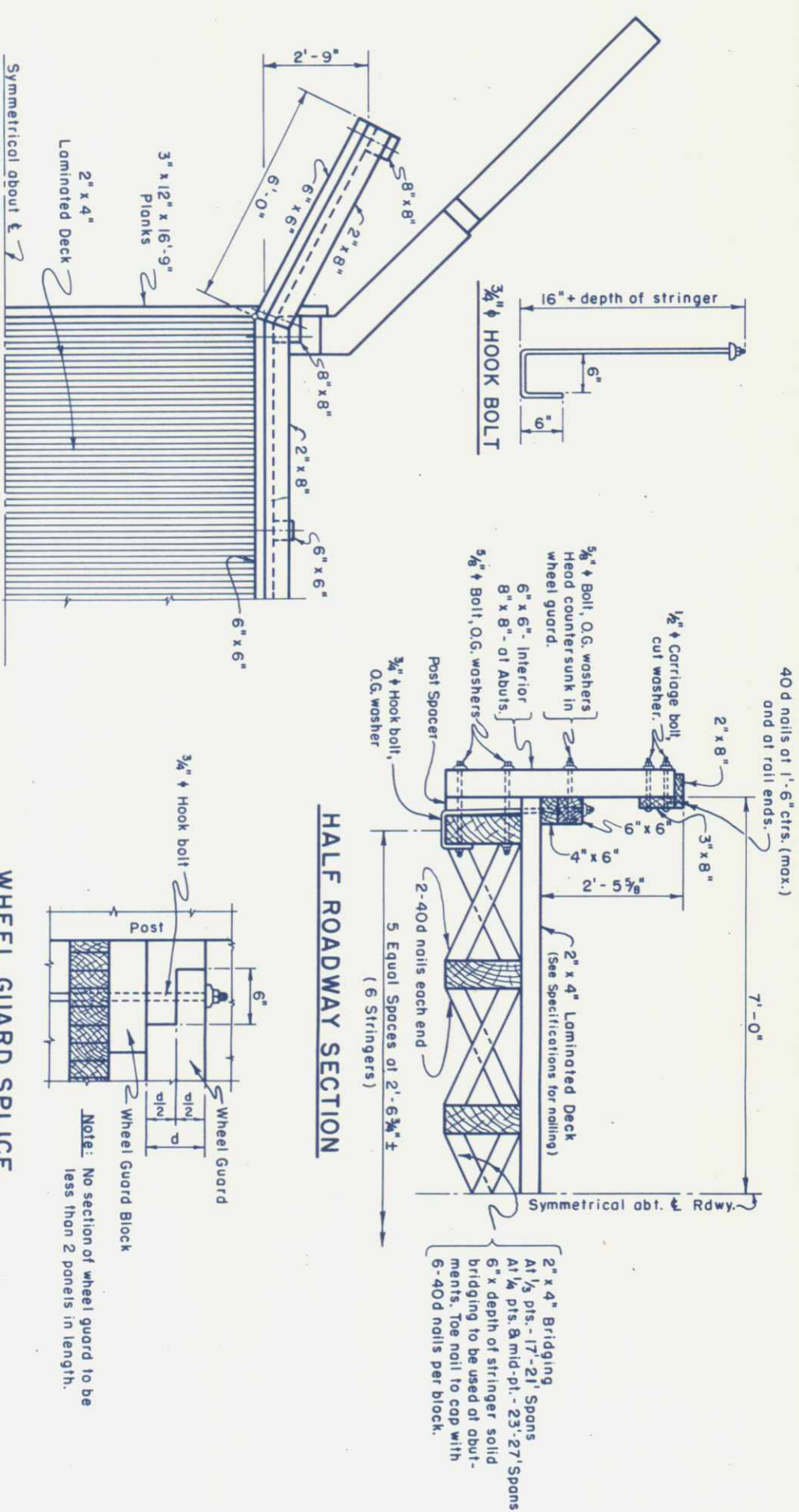
U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.

REQUIREMENTS FOR PLACING  
CORRUGATED METAL PIPE CULVERTS

APPROVED:  FEDERAL HIGHWAY PROJECTS ENGINEER

Date: 11/13/57

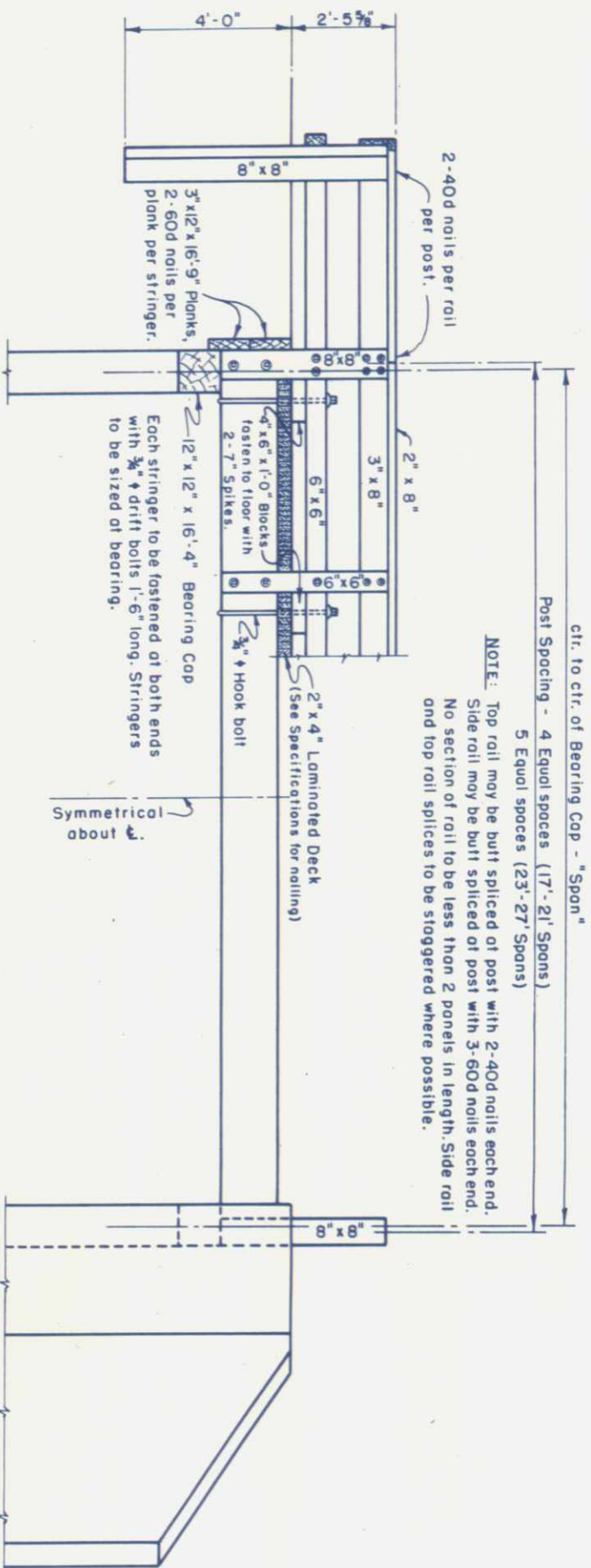




## PART PLAN

## WHEEL GUARD SPLICE

(When Required)



## ELEVATION

BILL OF MATERIAL - TREATED TIMBER													
Description	Size	17' Spn		19' Spn		21' Spn		23' Spn		25' Spn		27' Spn	
		No.	Mt.b.m.	No.	Mt.b.m.	No.	Mt.b.m.	No.	Mt.b.m.	No.	Mt.b.m.	No.	Mt.b.m.
Flooring, laminated	2"x4"x14'-0" (S1E)	108	1,008	120	1,120	132	1,232	144	1,344	156	1,456	168	1,568
Posts (End)	8"x8"x6'-4" (S4S)	4	.135	4	.135	4	.135	4	.135	4	.135	4	.135
Posts (End)	8"x8"x4'-2" (S4S)	4	.085	4	.085	4	.085						
Posts (End)	8"x8"x4'-2" (S4S)							4	.089	4	.089	4	.089
Posts (Interior)	6"x6"x4'-0" (S4S)	6	.072	6	.072	6	.072						
Posts (Interior)	6"x6"x4'-2" (S4S)							8	.100	8	.100	8	.100
Top Rail	2"x8" (S4S)		.080		.085		.091		.096		.101		.107
Side Rail	3"x8" (S4S)		.120		.128		.136		.144		.152		.160
Wheel Guard	6"x6" (S4S)		.180		.192		.204		.216		.228		.240
Wheel Guard Blocks	4"x6"x1'-0" (S4S)	10	.020	10	.020	10	.020	12	.024	12	.024	12	.024
Block (Post Spacer)	4"x6"x1'-4"	6	.016	6	.016	6	.016						
Block (Post Spacer)	4"x6"x1'-6"							8	.024	8	.024	8	.024
Block (Post Spacer)	4"x8"x1'-4"	4	.014	4	.014	4	.014						
Block (Post Spacer)	4"x8"x1'-6"							4	.016	4	.016	4	.016
Bridging	2"x4"x13'-0"	4	.035	4	.035	4	.035						
Bridging	2"x4"x16'-0"							5	.053	5	.053	5	.053
Bridging	6"x16"x11'-0"	2	.176	2	.176	2	.176						
Bridging	6"x18"x11'-0"							2	.198	2	.198	2	.198
Stringers	6"x16"x18'-0"	6	.864										
Stringers	6"x16"x20'-0"			6	.960								
Stringers	6"x16"x22'-0"					6	1,056						
Stringers	6"x18"x24'-0"							6	1,296				
Stringers	6"x18"x26'-0"									6	1,404		
Stringers	6"x18"x28'-0"											6	1,512
Bearing Cap	12"x12"x16'-4"	2	.392	2	.392	2	.392	2	.392	2	.392	2	.392
Backing Planks	3"x12"x16'-9"	4	.201	4	.201	4	.201	4	.201	4	.201	4	.201
Total	M.F.B.M.	3,398		3,631		3,865		4,328		4,573		4,819	

## GENERAL NOTES

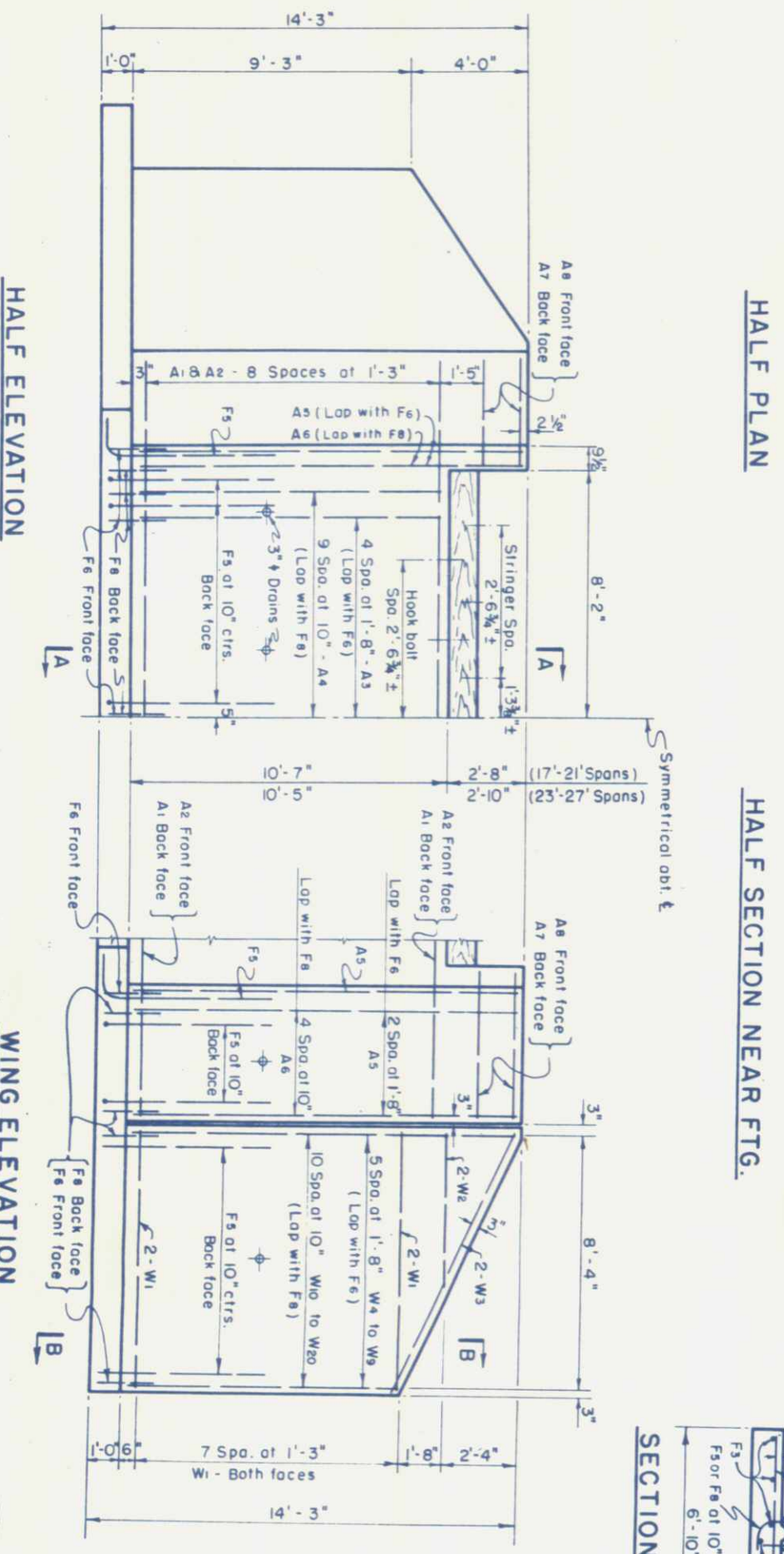
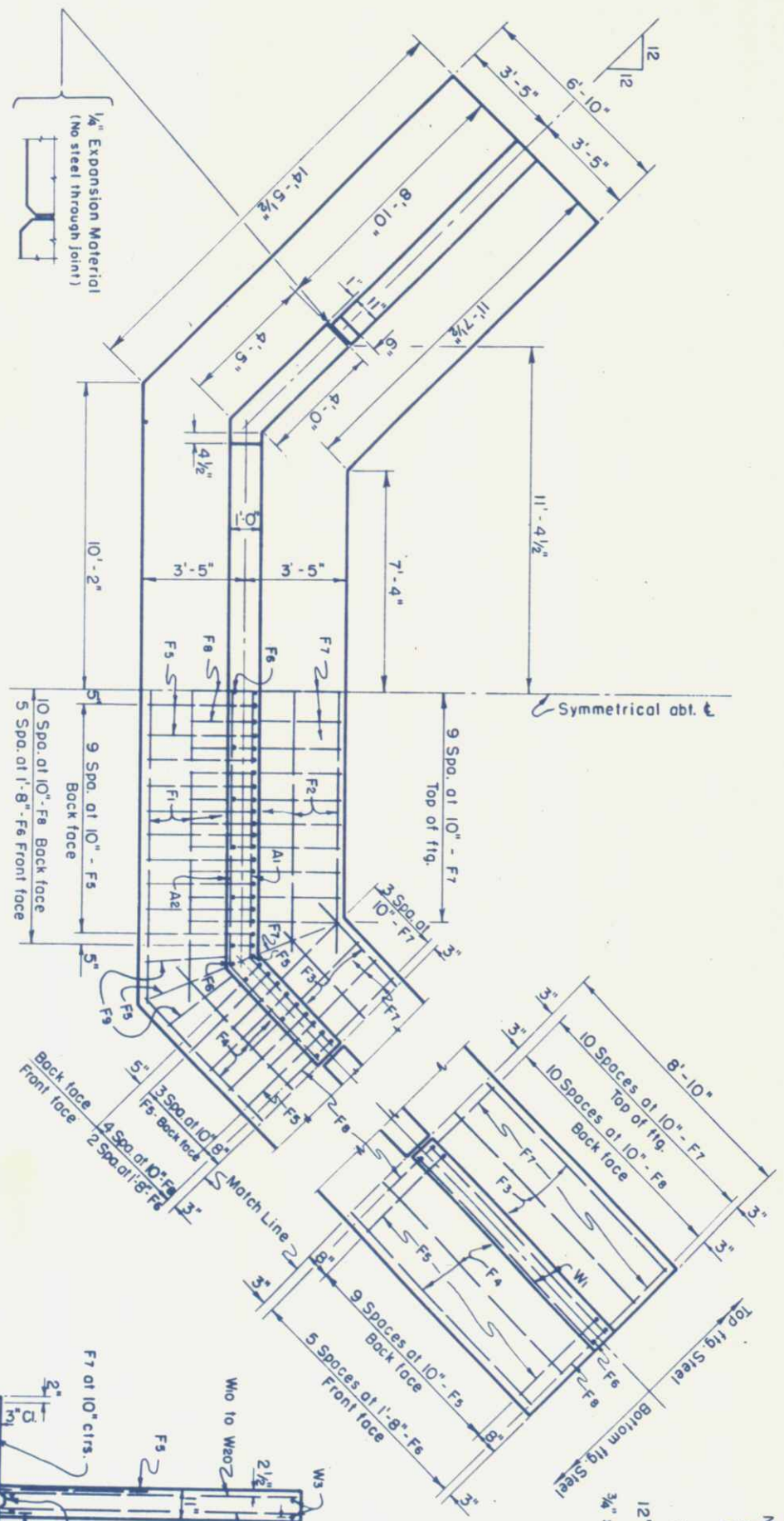
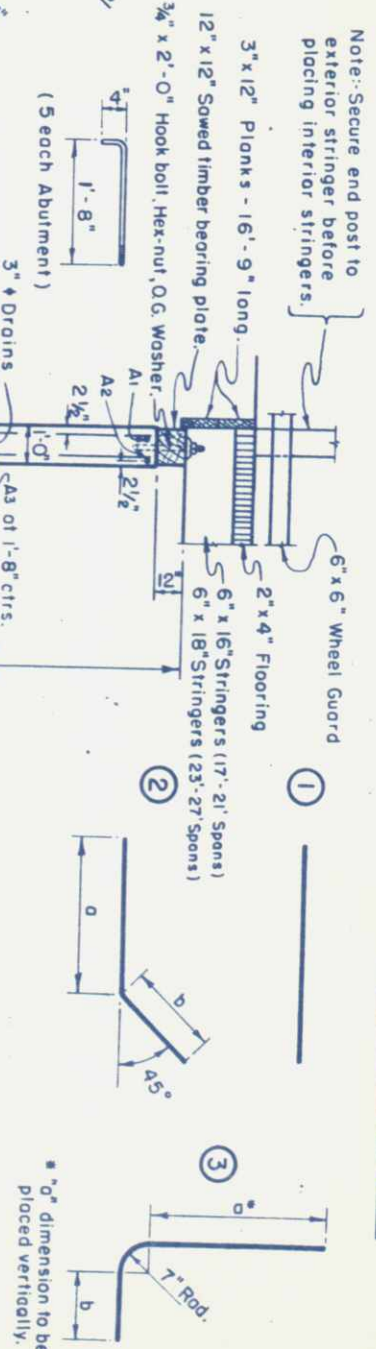
**SPECIFICATIONS:** Construction - Bureau of Public Roads F-557  
Design - AASHTO Standard Specifications for Highway Bridges 1953  
**LIVE LOAD:** AASHTO H10 - 44.  
**UNIT STRESSES:** Flexure 1450# p.s.i., Horizontal Shear 95# p.s.i.  
**TIMBER:** All timber shall be creosote treated stress grade lumber meeting AASHTO requirements for the above unit stresses.  
**REVISIONS:** Any revisions found necessary in the field must be approved by the Bridge Engineer.

## TIMBER STRINGER BRIDGE

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO. 9 DENVER, COLO.



BAR DIAGRAMS



GENERAL NOTES

Specifications: Bureau of Public Roads F.R.57  
Loading: H 10-44.  
Design Stresses:  $f_c=1200$  p.s.i.,  $f_s=20,000$  p.s.i.,  $n=10$ .  
Concrete: All concrete to be Class "A" made with Type II (Low Alkali) Portland Cement, with an air-entraining admixture. All exposed edges to be chamfered 3/4". All exposed surfaces to be given a "Rubbed Finish." Vibrated concrete.  
Reinforcing Steel: All bars shall be of intermediate grade steel and shall conform to A.S.T.M. Specifications A 15-54 T (Deformed). Shop details shall be submitted and approved before fabrication. All dimensions refer to centers of bars unless otherwise indicated.  
Revisions: Any revisions found necessary in the field must be approved by the Bridge Engineer.

BAR LIST (2 Abut.)

Bar	Type	Location	No.	Size	Length	a	b
A1	2	Abut. Wall (Horiz.)	36	#5	13'-2"	9'-3"	3'-11"
A2	2	Abut. Wall (Horiz.)	36	#5	13'-8"	9'-6"	4'-2"
A3	1	Abut. Wall (Vert.)	18	#4	10'-3"		
A4	1	Abut. Wall (Vert.)	38	#6	10'-3"		
A5	1	Abut. Wall (Vert.)	20	#4	13'-1"		
A6	2	Abut. Wall (Horiz.)	24	#6	13'-1"		
A7	2	Abut. Wall (Horiz.)	8	#5	4'-3"	0'-4"	3'-11"
A8	2	Abut. Wall (Horiz.)	8	#5	4'-9"	0'-7"	4'-2"
F1	1	Footling (Bottom)	6		20'-4"		
F2	1	Footling (Top)	6		18'-0"		
F3	1	Footling (Bottom)	12	#4	13'-4"		
F4	3	Fig. 8 Wolls	12		14'-4"		
F5	1	Fig. 8 Wolls	100	#7	8'-11"	5'-0"	2'-11 1/2"
F6	1	Fig. 8 Wolls	62	#4	1'-8"		
F7	1	Footling (Top)	102	#7	4'-9"		
F8	3	Fig. 8 Wolls	106	#6	4'-1"	1'-8"	1'-6"
F9	1	Footling (Bottom)	8	#7	4'-9"		
W1	1	Wing Walls (Horiz.)	64		8'-6"		
W2	1	Wing Walls (Horiz.)	8	#4	4'-10"		
W3	1	Wing Walls (Diag.)	8		9'-3"		
W4	1	Wing Walls (Vert.)	4		13'-1"		
W5	1	Wing Walls (Vert.)	4	#4	9'-2"		
W6	1	Wing Walls (Vert.)	4		13'-1"		
W7	1	Wing Walls (Vert.)	4	#6	9'-2"		

\*ESTIMATED QUANTITIES

Class "A" Concrete (17'-21' Spans)	58.0 Cu. Yds.
Class A Concrete (23'-27' Spans)	57.8 Cu. Yds.
Reinforcing Steel	7820 Lbs.

\*Includes weight of Bearing Plate Hook bolts.  
\*Estimated Quantities are for two abutments.

CONCRETE ABUTMENTS

TIMBER STRINGER BRIDGE

APPROVED: *W. J. Quast* Date: Oct. 4, 1956  
Division Bridge Engineer

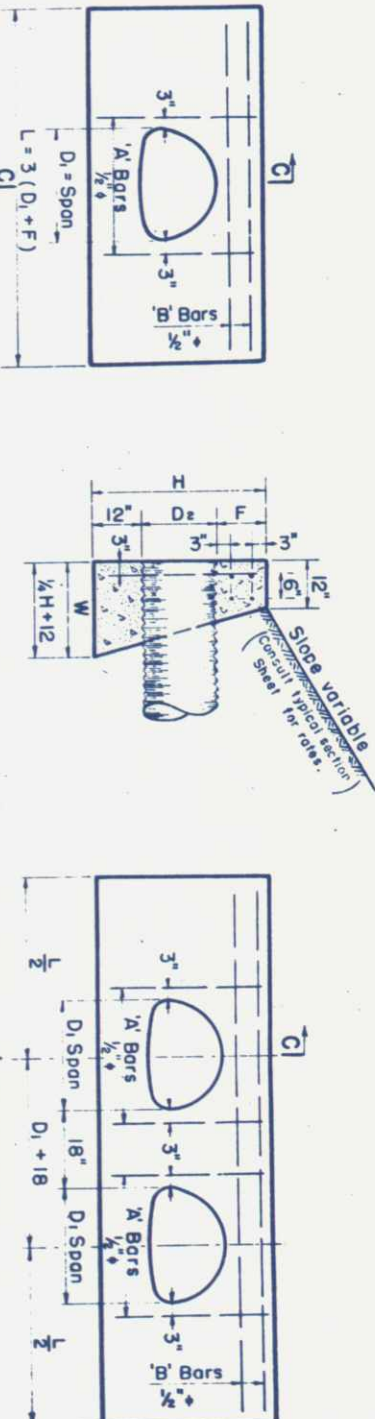
HALF ELEVATION

WING ELEVATION

Designed: \_\_\_\_\_ Date: \_\_\_\_\_  
Checked: \_\_\_\_\_ Date: \_\_\_\_\_  
Traced: \_\_\_\_\_ Date: \_\_\_\_\_



HEADWALLS FOR ARCH PIPE CULVERTS



ELEVATION

SECTION C-C

ELEVATION

QUANTITIES IN ONE HEADWALL - SINGLE PIPE (ARCH)

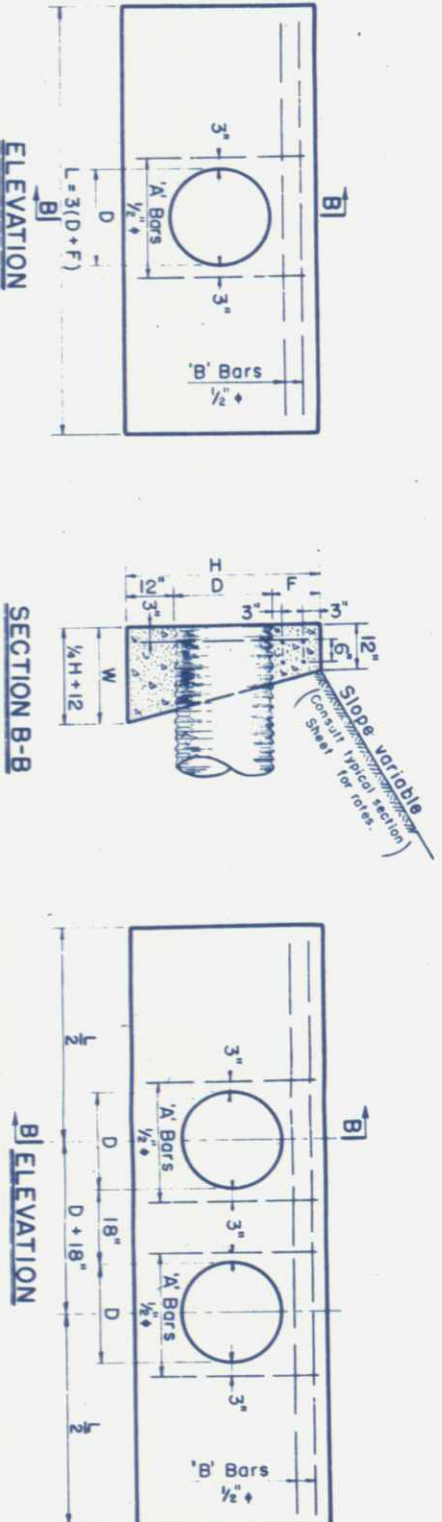
QUANTITIES IN ONE HEADWALL  
DOUBLE PIPE (ARCH)

EQUIV D	PIPE ARCH Span - Rise D1 - D2	F = 9"										F = 12"										F = 15"										F = 18"																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
		Dimensions			A' Bars	B' Bars	Lbs. Reinf. Conc.	Cu Yds. Steel	Dimensions			A' Bars	B' Bars	Lbs. Reinf. Conc.	Cu Yds. Steel	Dimensions			A' Bars	B' Bars	Lbs. Reinf. Conc.	Cu Yds. Steel	Dimensions			A' Bars	B' Bars	Lbs. Reinf. Conc.	Cu Yds. Steel																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W	No. Length	No. Length	Reinf. Conc.	L	H	W

GENERAL NOTES

Specifications: Bureau of Public Roads, Form F.P. 57  
Concrete: All to be Class "A" with Portland Cement, Type II (Low Alkali) with an Air-Entraining Admixture. Concrete to be poured monolithically. All exposed edges and corners shall be chamfered 1". All Exposed surfaces to be given a "Rubbed Finish".  
Reinforcing Steel: To be 1/2" round bars, placed 3" from surface of concrete. Dimensions are to the center of bar.  
Foundations: If foundation materials under headwalls are found unsuitable, either remove and replace with satisfactory selected material, or extend the concrete to provide a satisfactory footing.  
Construction Methods: The minimum earth cover on top of the pipe shall not be less than 1/2 D or 1/2 Ds (vertical diameter of the pipe) with a minimum cover of one foot. Head- walls in all cases to be built parallel to the center line of the road.

HEADWALLS FOR CIRCULAR PIPE CULVERTS



ELEVATION

SECTION B-B

ELEVATION

QUANTITIES IN ONE HEADWALL - SINGLE PIPE (CIRCULAR)

QUANTITIES IN ONE HEADWALL  
DOUBLE PIPE (CIRCULAR)

D	F = 9"										F = 12"										F = 18"										F = 24"										F = 9"		F = 12"		F = 18"		F = 24"	
	Dimensions			A' Bars	B' Bars	Lbs. Reinft.	Cu Yds. Conc.	Dimensions			A' Bars	B' Bars	Lbs. Reinft.	Cu Yds. Conc.	Dimensions			A' Bars	B' Bars	Lbs. Reinft.	Cu Yds. Conc.	Dimensions			A' Bars	B' Bars	Lbs. Reinft.	Cu Yds. Conc.	Lbs. Reinft.	Cu Yds. Conc.	Lbs. Reinft.	Cu Yds. Conc.	Lbs. Reinft.	Cu Yds. Conc.	Lbs. Reinft.	Cu Yds. Conc.	Lbs. Reinft.	Cu Yds. Conc.										
L	H	W	No. Length	Length	Length	Class	L	H	W	No. Length	Length	Length	Class	L	H	W	No. Length	Length	Length	Class	L	H	W	No. Length	Length	Length	Class	L	H	W	No. Length	Length	Length	Class	L	H	W	No. Length	Length	Length	Class							
15"	6'-0"	3'-0"	21"	2	2-6"	4	5'-6"	18.0	0.86	6'-9"	3'-3"	21 1/4"	2	2-9"	4	6'-3"	20.4	1.08	8'-3"	3'-9"	23 1/2"	2	3-3"	4	7'-9"	25.1	1.61	9'-9"	4'-3"	24 1/4"	2	3-9"	4	9'-3"	29.7	2.28	28.7	1.22	31.4	1.48	36.7	2.10	42.1	2.86				
18"	6'-9"	3'-3"	21 1/4"	2	2-9"	4	6'-3"	20.4	1.05	7'-6"	3'-6"	22 1/2"	2	3-0"	4	7'-0"	22.7	1.30	9'-0"	4'-0"	24"	2	3-6"	4	8'-6"	27.4	1.90	10'-6"	4'-6"	25 1/2"	2	4-0"	4	10'-0"	32.1	2.62	32.1	1.47	34.7	1.77	40.1	2.46	45.4	3.30				
24"	8'-3"	3'-9"	23 1/4"	2	3-3"	4	7-9"	25.1	1.52	9'-0"	4'-0"	24"	2	3-6"	4	8'-6"	27.4	1.83	10'-6"	4'-6"	25 1/2"	2	4-0"	4	10'-0"	32.1	2.55	12'-0"	5'-0"	27"	2	4-6"	4	11'-6"	36.7	3.41	45.4	2.77	48.1	3.21	53.4	4.20	58.8	5.36				
30"	9'-9"	4'-3"	24 3/4"	2	3-9"	4	9-3"	29.7	2.08	10'-6"	4'-6"	25 1/2"	2	4-0"	4	10'-0"	32.1	2.45	12'-0"	5'-0"	27"	2	4-6"	4	11'-6"	36.7	3.30	13'-6"	5'-6"	28 1/2"	2	5-0"	4	13'-0"	41.4	4.31	52.1	3.60	54.8	4.12	60.1	5.27	65.5	6.60				
36"	11'-3"	4'-9"	26 1/4"	2	4-3"	4	10-9"	34.4	2.75	12'-0"	5'-0"	27"	2	4-6"	4	11'-6"	36.7	3.19	13'-6"	5'-6"	28 1/2"	2	5-0"	4	13'-0"	41.4	4.18	15'-0"	6'-0"	30"	2	5-6"	4	14'-6"	46.1	5.34	58.8	4.56	61.5	5.16	66.8	6.49	72.1	8.00				
42"	12'-9"	5'-3"	27 1/4"	2	4-9"	4	12-3"	39.1	3.53	13'-6"	5'-6"	28 1/2"	2	5-0"	4	13'-0"	41.4	4.04	15'-0"	6'-0"	30"	2	5-6"	4	14'-6"	46.1	5.19	16'-6"	6'-6"	31 1/2"	2	6-0"	4	16'-0"	50.8	6.51	65.5	5.66	68.1	6.34	73.5	7.85	78.8	9.56				
48"	14'-3"	5'-9"	29 1/4"	2	5-3"	4	13-9"	43.8	4.43	15'-0"	6'-0"	30"	2	5-6"	4	14'-6"	46.1	5.02	16'-6"	6'-6"	31 1/2"	2	6-0"	4	16'-0"	50.8	6.33	18'-0"	7'-0"	33"	2	6-6"	4	17'-6"	55.4	7.82	72.1	6.91	74.8	7.68	80.2	9.38	85.5	11.29				
54"	15'-9"	6'-3"	30 3/4"	2	5-9"	4	15-3"	48.4	5.46	16'-6"	6'-6"	31 1/2"	2	6-0"	4	16'-0"	50.8	6.13	18'-0"	7'-0"	33"	2	6-6"	4	17'-6"	55.4	7.61	19'-6"	7'-6"	34 1/2"	2	7-0"	4	19'-0"	60.1	9.28	78.8	8.31	81.5	9.18	86.8	11.08	92.2	13.21				
60"	17'-3"	6'-9"	32 1/4"	2	6-3"	4	16-9"	53.1	6.63	18'-0"	7'-0"	33"	2	6-6"	4	17'-6"	55.4	7.39	19'-6"	7'-6"	34 1/2"	2	7-0"	4	19'-0"	60.1	9.04	21'-0"	8'-0"	36"	2	7-6"	4	20'-6"	64.8	10.90												

STRAIGHT TYPE HEADWALLS  
FOR PIPE CULVERTS

APPROVED: DATE: 5-7-57

U.S. DEPARTMENT OF COMMERCE  
BUREAU OF PUBLIC ROADS  
REGION NO.9 DENVER, COLO.



PROFILE			BY	DATE
	SURVEYED			
	PLOTTED			
NOTE BOOK	GRACES CHECKED			
NO	B.M.S NOTED			
	STRUCTURE NOTATIONS CH KD			



The material-stress data shown on these plans are based on tests of samples obtained from locations shown, and are only for informational purposes. They do not reflect classification of excavation. No responsibility is assumed by the Government as to the extent of materials represented by these tests and assuming the classification as to the extent of materials represented by these samples. The excavation is to be conducted by personnel inspection on the ground. If materials not conforming to the data shown on these plans are encountered during construction the grading plan will be modified were necessary to insure proper design.

N.W. 1/4, S.W. 1/4, Sec. 6

9 Colo. 27 C-1 4

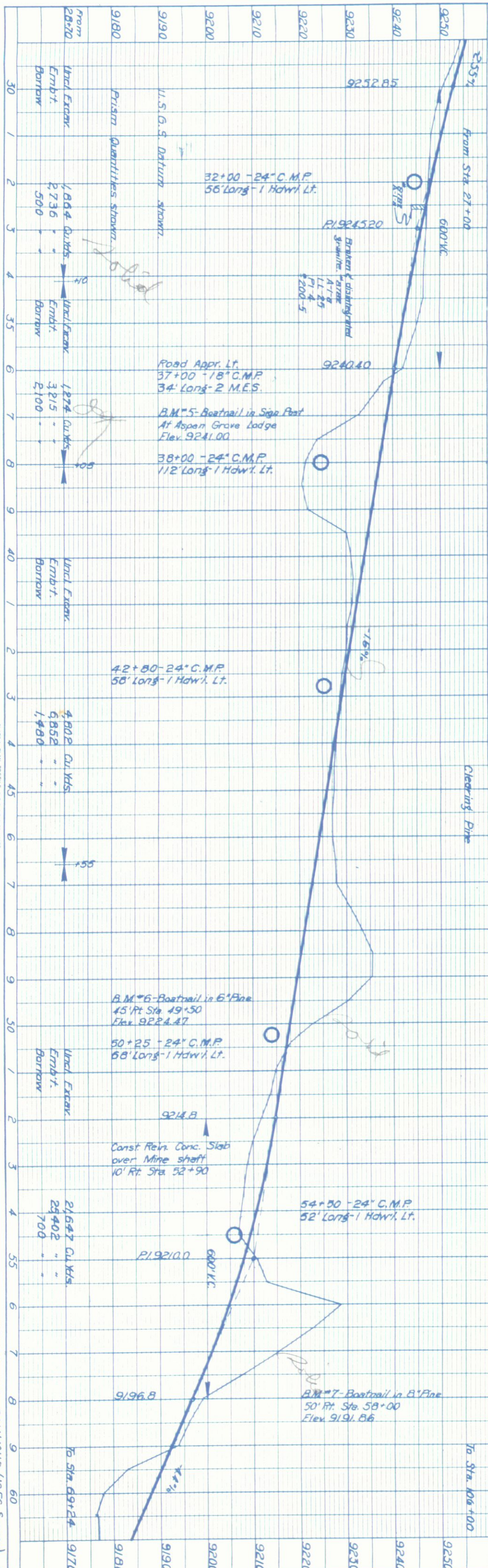
NEDERLAND-RAYMOND (1956 Surve.



PROFILE	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
	GRADES CHECKED		
	W & L NOTED		
	STRUCTURE NOTATIONS CHECKED		

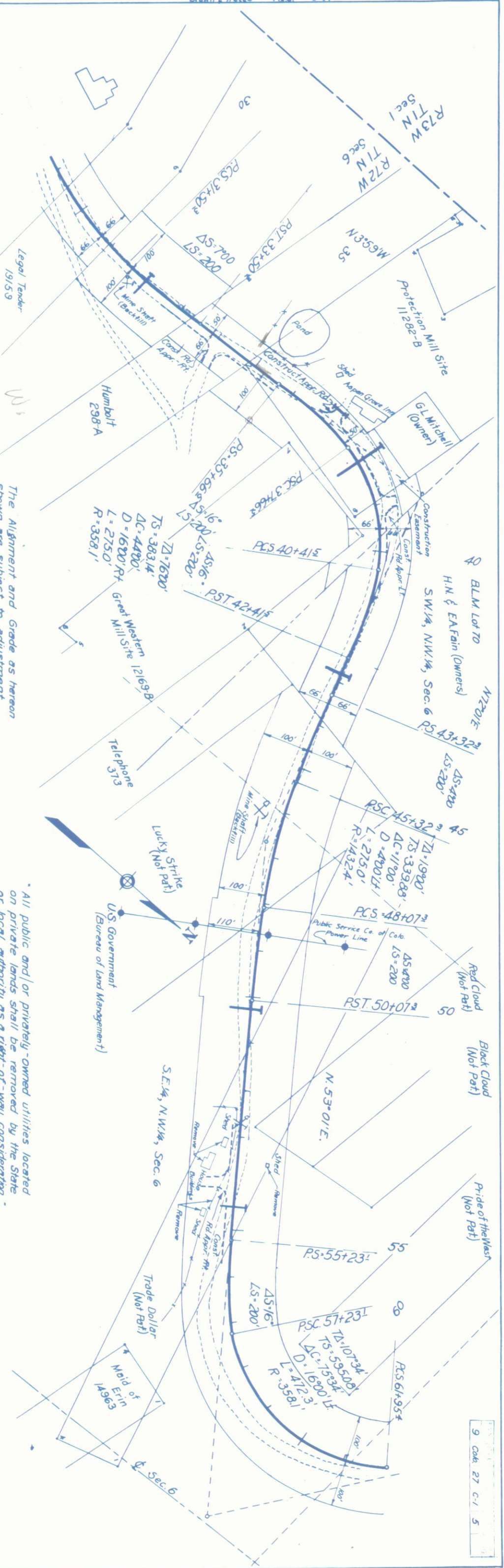
PLAN	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED	W.S.W.	1856
	ALIGNMENT CHECKED		
	RT. OF WAY CHECKED		

Drawn & Traced A.E.S. 5-57



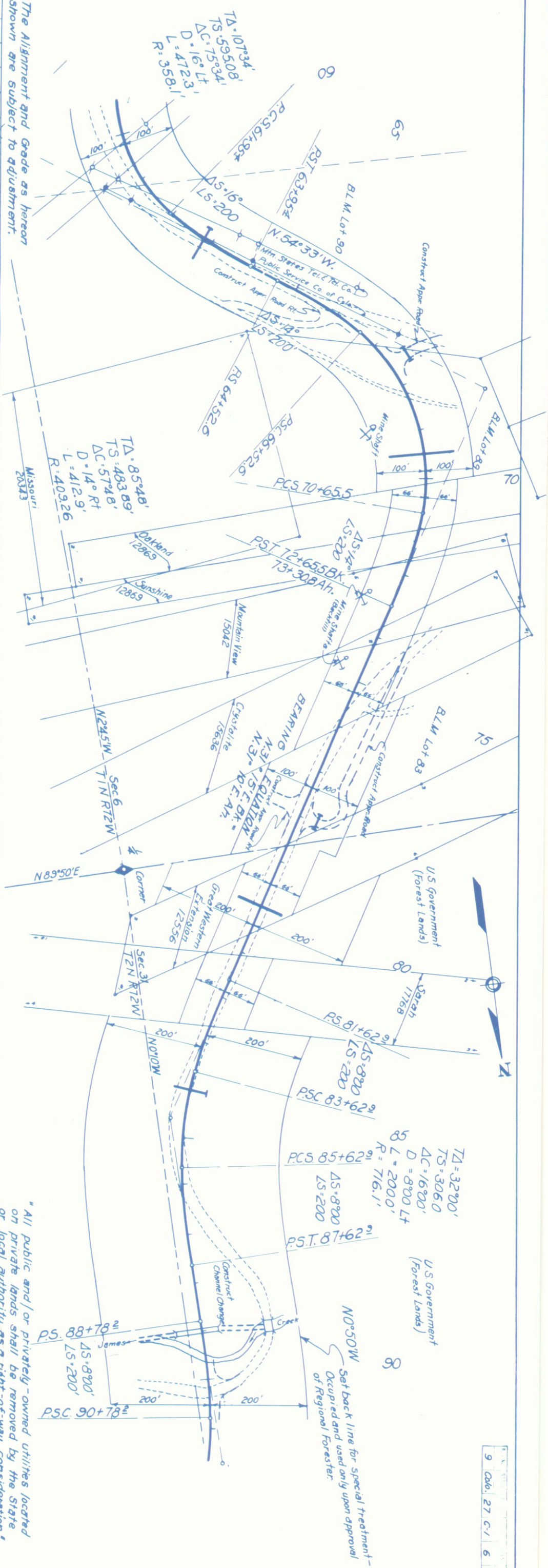
The Alignment and Grade as hereon shown are subject to adjustment.

All public and/or privately-owned utilities located on private lands shall be removed by the State or local authority as a right-of-way consideration.





PLAN	SURVEYED	BY W.G.W.	DATE 1/3/56
NOTE BOOK NO	ALIGNED RT. OF WAY CHECKED		
Drawn & Traced		AES	5-57



"All public and/or privately-owned utilities located on private lands shall be removed by the State or local authority as a right-of-way consideration."

