



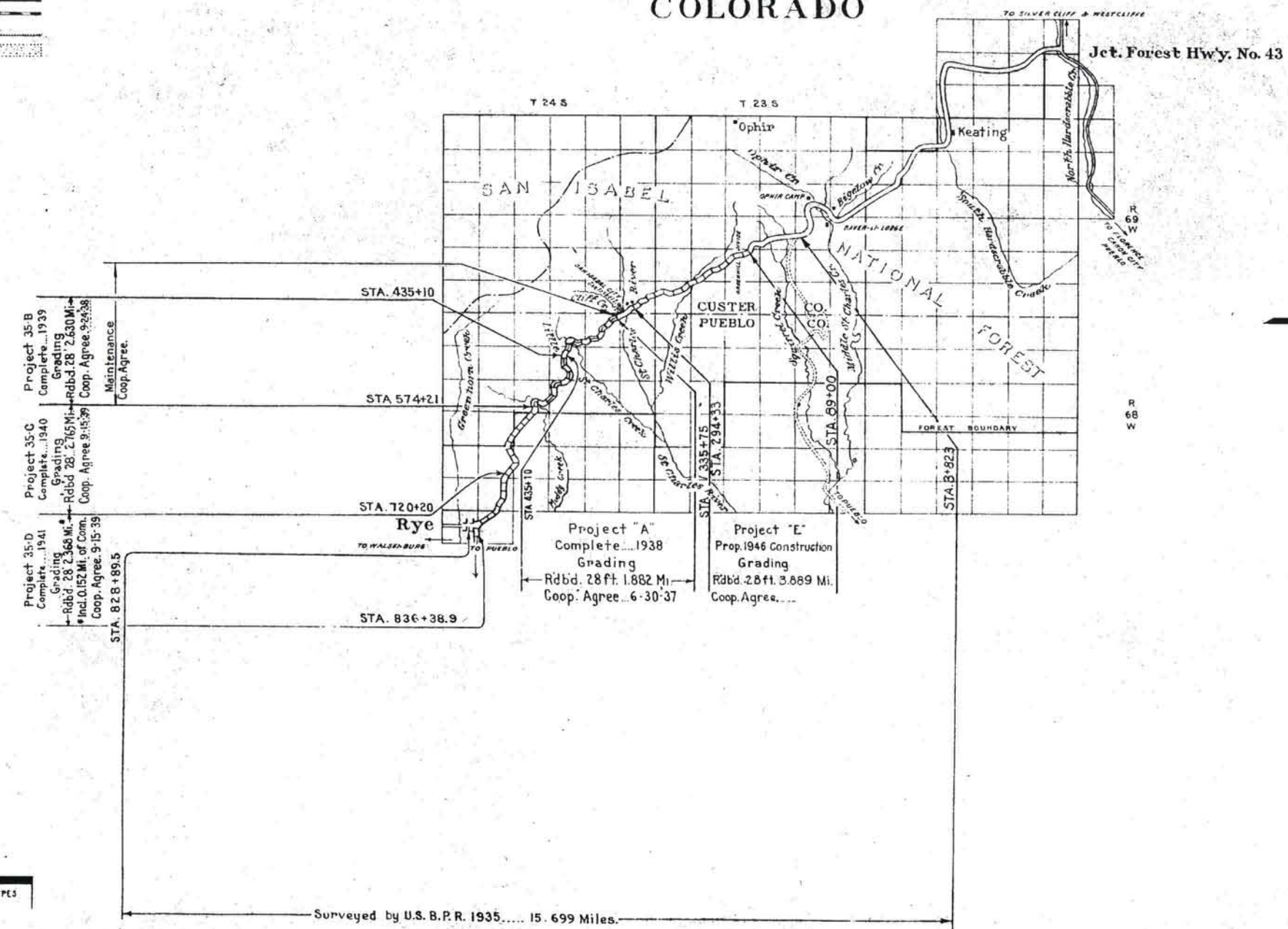
# FEDERAL WORKS AGENCY PUBLIC ROADS ADMINISTRATION

## PLANS FOR PROPOSED PROJECT 35-E ROUTE 35 GREENHORN HIGHWAY RYE TO A JCT. WITH NORTH HARDCRABBLE FOREST HIGHWAY NO. 43 33 MILES CLASS 2 COLORADO FOREST HIGHWAY SYSTEM SAN ISABEL NATIONAL FOREST CUSTER & PUEBLO COUNTIES COLORADO

DIV.	STATE	ROUTE NO.	SECTION	SHEET NO.	TOTAL SHEETS
9	COLO.	35	E	1	

INDEX TO SHEETS		
SHEET NO.	DESCRIPTION	STATION+STATION
1	Title Sheet	
2	Typical Sections	
3	Summary	
6-13	Plan & Profile	89+00 294+33
Rev. D3-38117	C.R. Masonry Roadways & Inlets	
	Grouted Rubber Curbs	
Rev. D3-38123	Std. Miscellaneous Structures	
D3-38131	Std. Maintenance Posts	
Rev. D3-38135	Std. Barbed Wire Fence	
D3-38142	Std. Masonry Holes for large dia. Pipe	
Rev. D3-38143	Typical Construction Signs	
Rev. D3-38144	Std. Embankment Inlets & Drains	
D3-38145A	Std. Cable Guard (24" Rdwy)	252+00
Rev. D3-38162	Ref. Timber Guide Posts	
D3-38309	Timber Truss	183+00
12-36	Cross Sections	89+00 294+33

Federal Aid Highway System  
 Primary Secondary   
 Forest Highway System   
 National Forests



INDEX MAP

Scale Miles  
0 1 2 3 4

LEGEND

EXISTING ROADS	UNIMPROVED	GRADED	REINFORCED SUPERGRADE	BASE COURSE	CR. ROCK GRAN. MACADAM	BITUMINOUS TYPES
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Surveyed by U.S. B.P.R. 1935..... 15. 699 Miles.

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DIVISION 9 DENVER, COLORADO

APPROVED **C. E. LEARNED** DATE **DEC 5 1945**

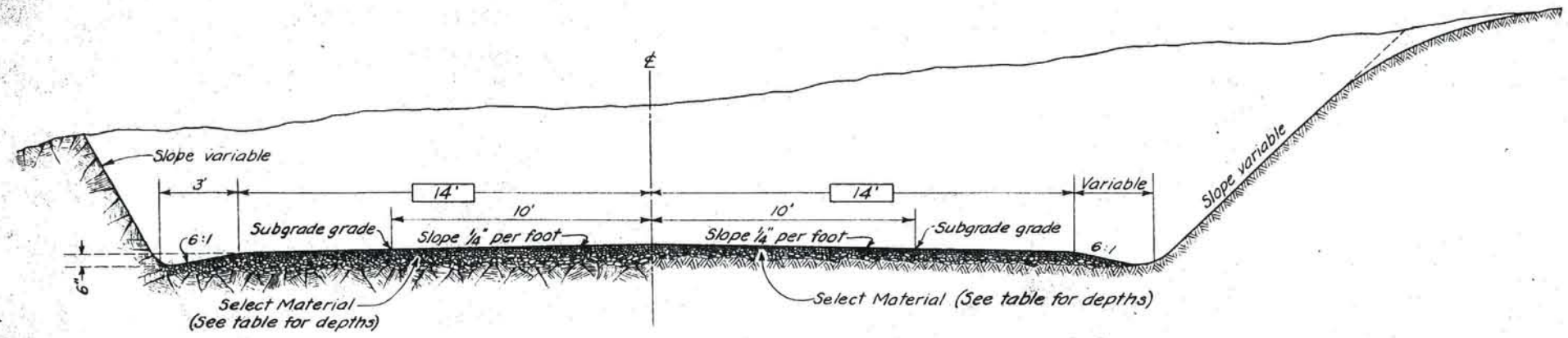
DIVISION ENGINEER  
BY DESIGN ENGINEER

APPROVED \_\_\_\_\_ DATE \_\_\_\_\_ 19\_\_

REGIONAL FORESTER

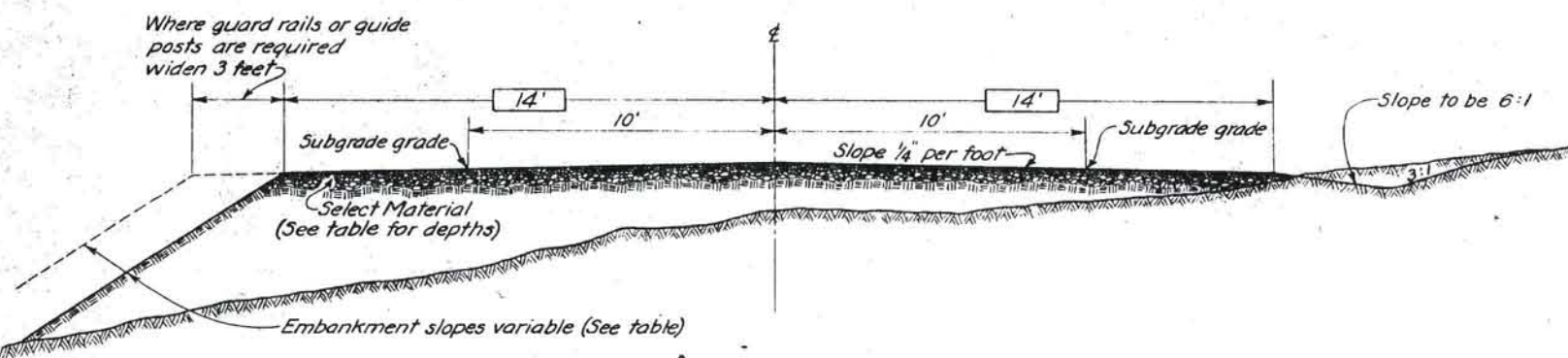
APPROVED DATE **7/20 1946**

STATE HIGHWAY ENGINEER  
STATE OF COLORADO



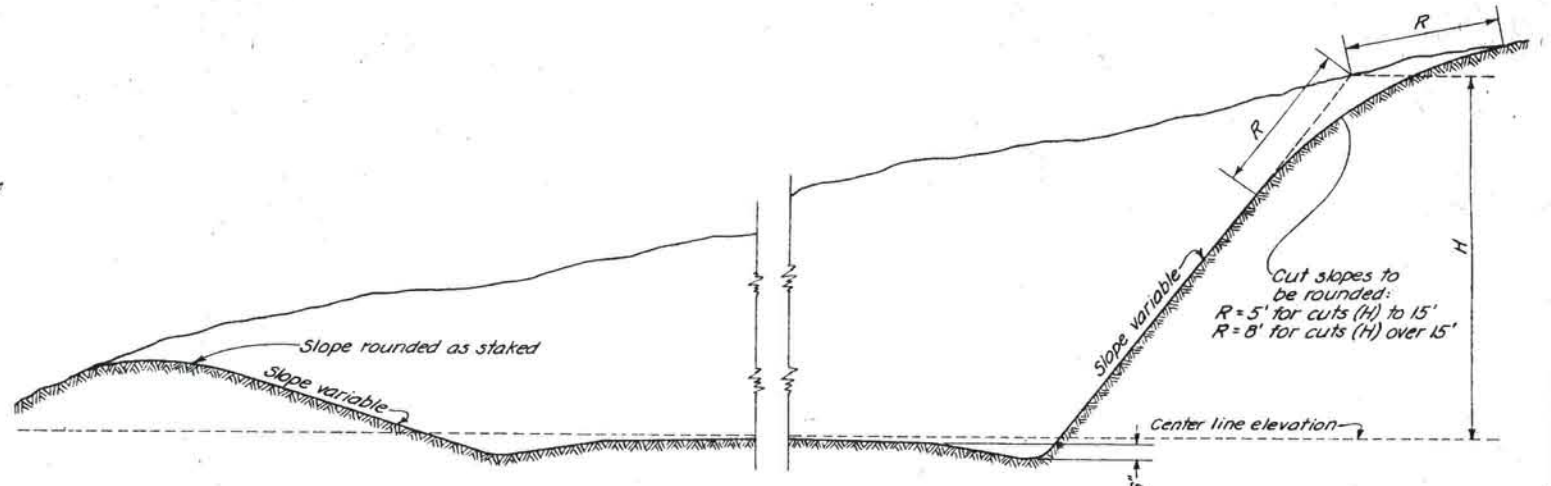
**TYPICAL HALF CUT SECTION IN ROCK**

**TYPICAL HALF CUT SECTION IN COMMON**

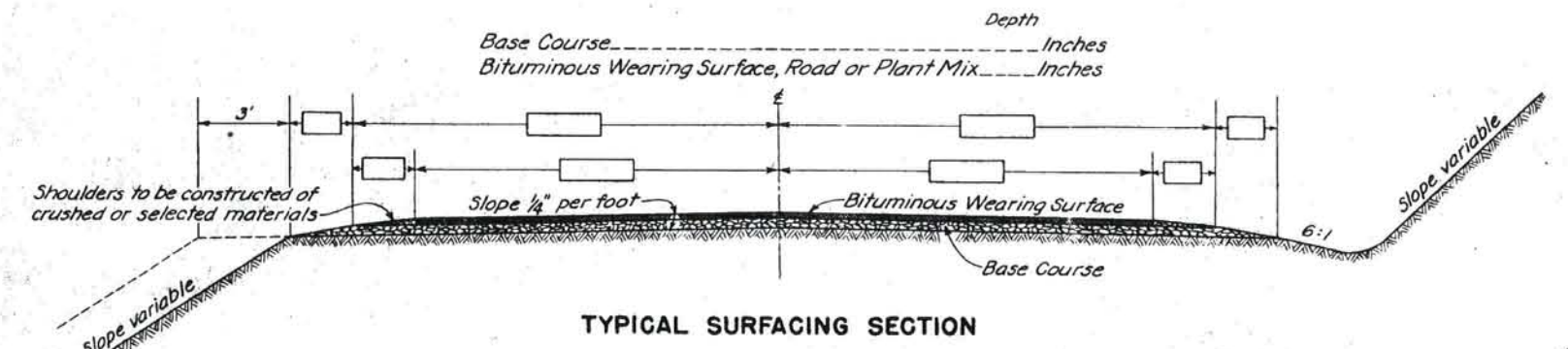


**TYPICAL HALF EMBANKMENT SECTION**

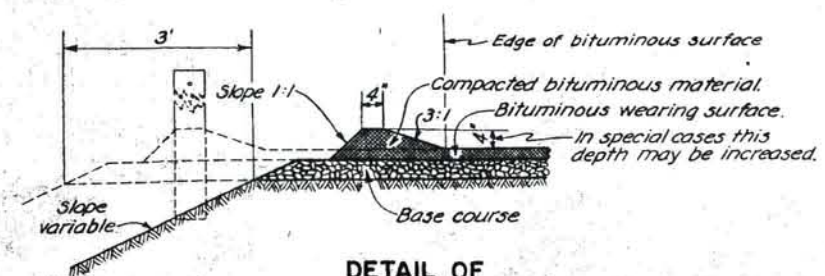
**TYPICAL HALF SHALLOW EMBANKMENT SECTION**



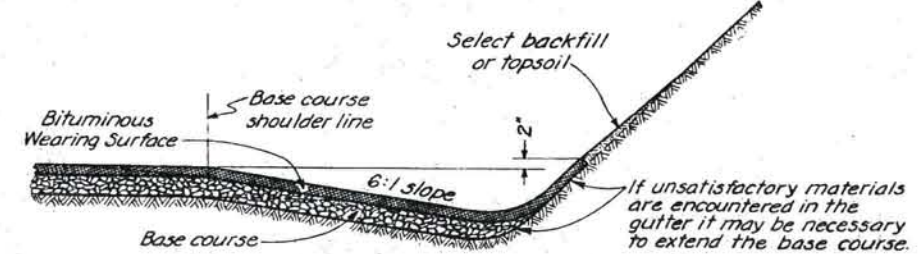
**SLOPE TREATMENT IN EARTH CUTS**



**TYPICAL SURFACING SECTION**



**DETAIL OF RAISED BITUMINOUS SHOULDER**



**DETAIL OF BITUMINOUS GUTTER**

**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 Unclassified Excavation and reduce the Unclassified Excavation for Borrow. 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 at the ends of all cuts shall be flattened and flared to improve appearance. Furrow ditches shall be constructed on approximate one per cent 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 at 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 rate 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. Public Roads Administration book of "Transition Curves for Highways" shall be used to determine superelevation and transition lengths (Table I) and widening of curves (Table IX).

**SELECT MATERIAL**

STATION TO STATION	DEPTH
89+00 145+00	{ 9" Cuts 6" Embt
145+00 149+50	{ 12" Cuts 12" Embt
149+50 154+00	{ 9" Cuts 6" Embt
154+00 161+00	{ 12" Cuts 12" Embt
161+00 216+00	{ 9" Cuts 6" Embt
216+00 220+00	{ 12" Cuts 12" Embt
220+00 294+33	{ 9" Cuts 6" Embt

**SLOPES**

HEIGHT	EMBANKMENT SLOPE	EARTH CUT SLOPE	ROCK CUT SLOPE
0' to 3'	6:1	3:1	1/4:1 to 1:1
3' to 6'	4:1	3:1	
6' to 12'	2:1	2:1	
12' to 30'	1 1/2:1	1 1/2:1	
30' Up	1 1/2:1	1:1	

When field conditions indicate the need for slopes other than those indicated above they shall be constructed as staked by the Engineer. In cases where the height of cuts are in excess of 30 feet and in material which erodes readily use slopes of 1 1/2 to 1 or flatter if practical.

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DIVISION NO. 9 DENVER, COLORADO

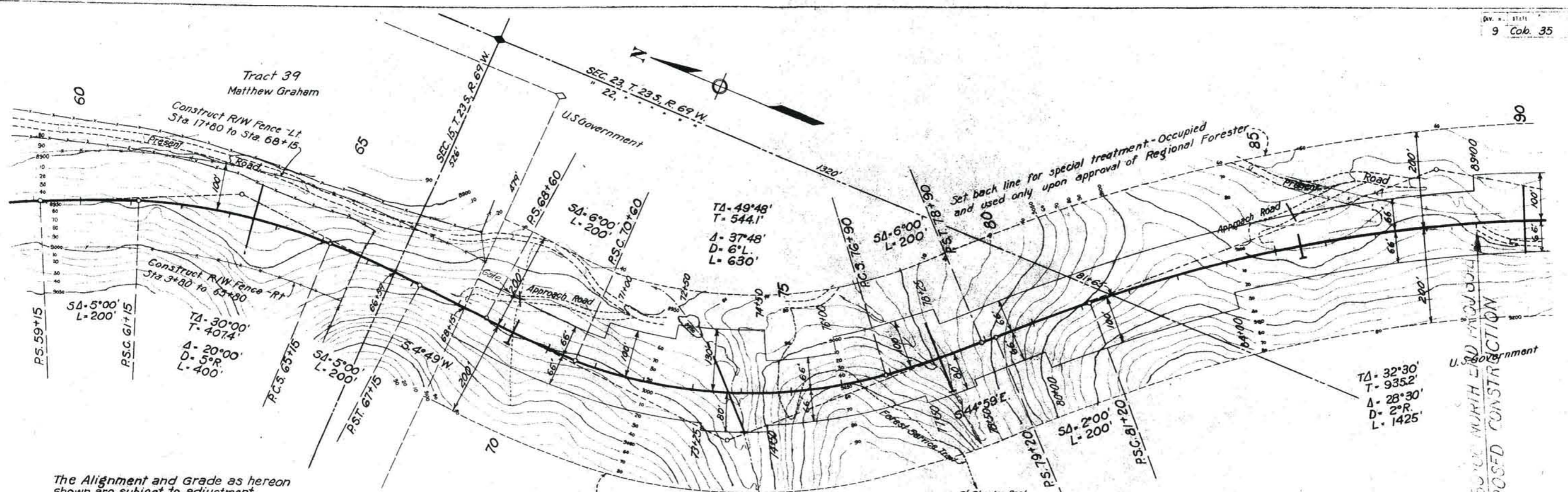
**TYPICAL CROSS SECTIONS  
NATIONAL FOREST & PARK HIGHWAYS**

DIVISION No. 9 STANDARD ROADBED: GRADED 20' Shoulder to Shoulder  
PROJECT: Colo. 35-E Greenhorn Highway  
NATIONAL Forest: San Isabel  
COUNTY: Custer  
STATE: Colorado  
BASE COURSE: Not included in this contract  
BITUMINOUS WEARING SURFACE

APPROVED \_\_\_\_\_ DATE \_\_\_\_\_ 19\_\_  
DISTRICT ENGINEER



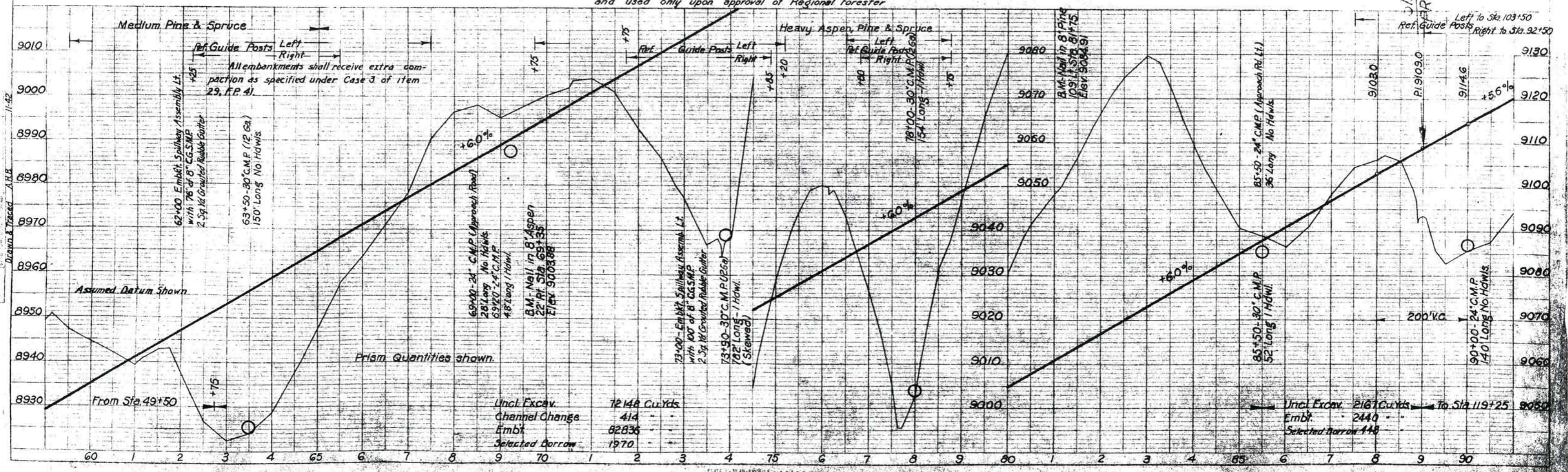
Sheet No. 6  
 Drawn & Traced A.H.B.  
 11-42

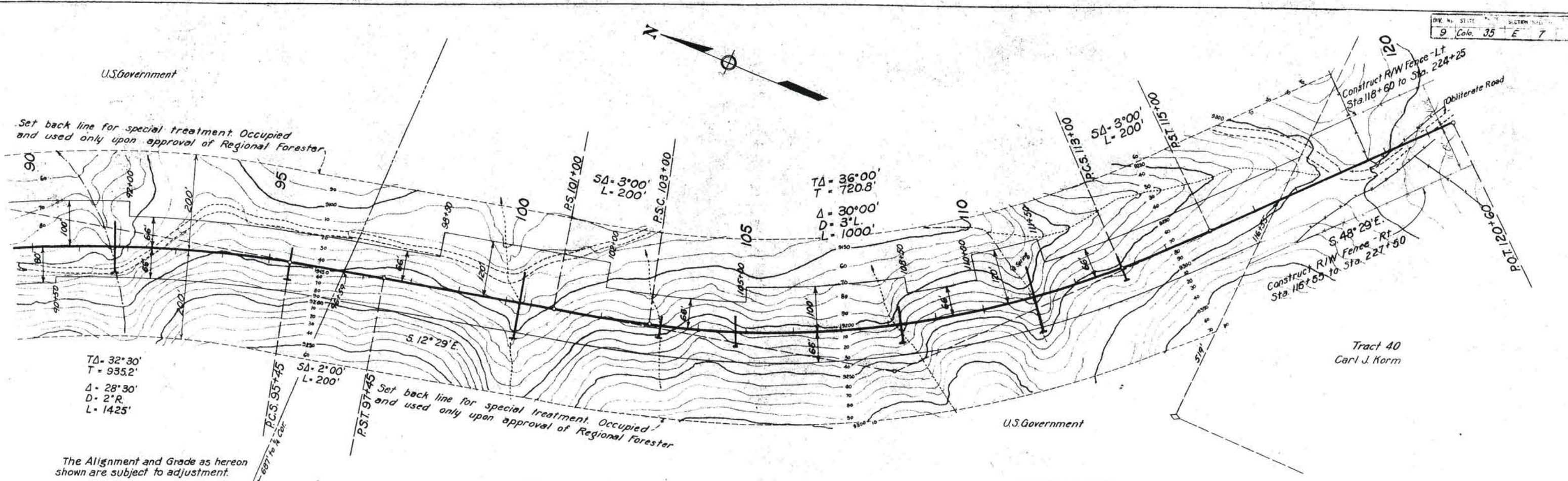


The Alignment and Grade as hereon shown are subject to adjustment.

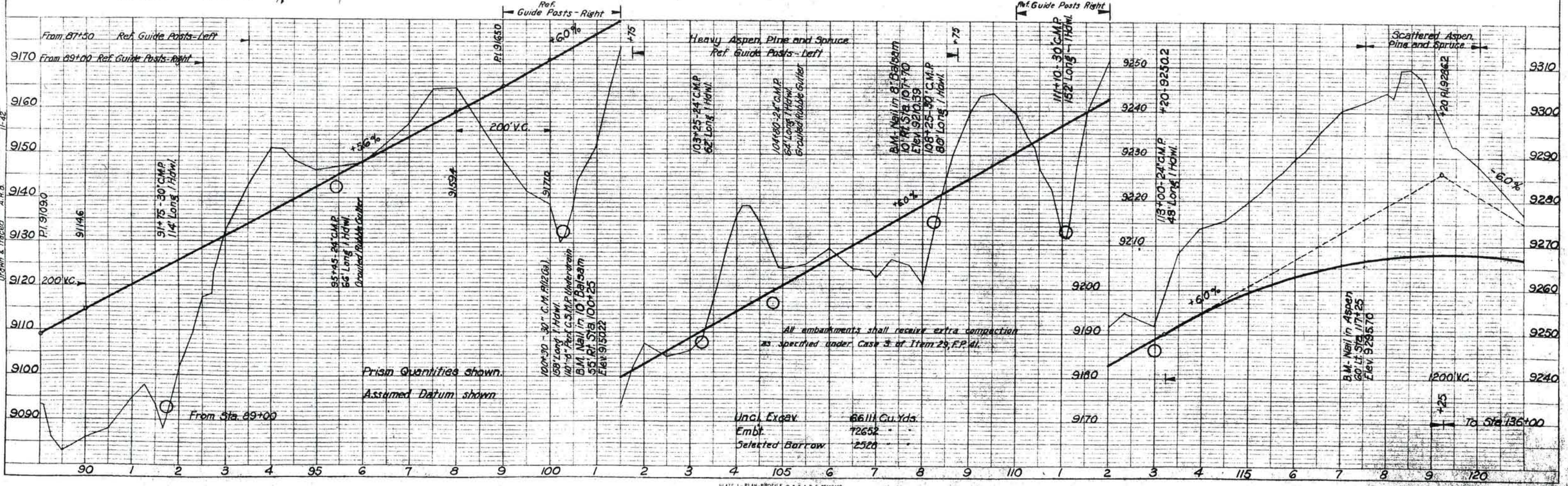
Set back line for special treatment - Occupied and used only upon approval of Regional Forester

U.S. GOVERNMENT  
 PROPOSED CONSTRUCTION





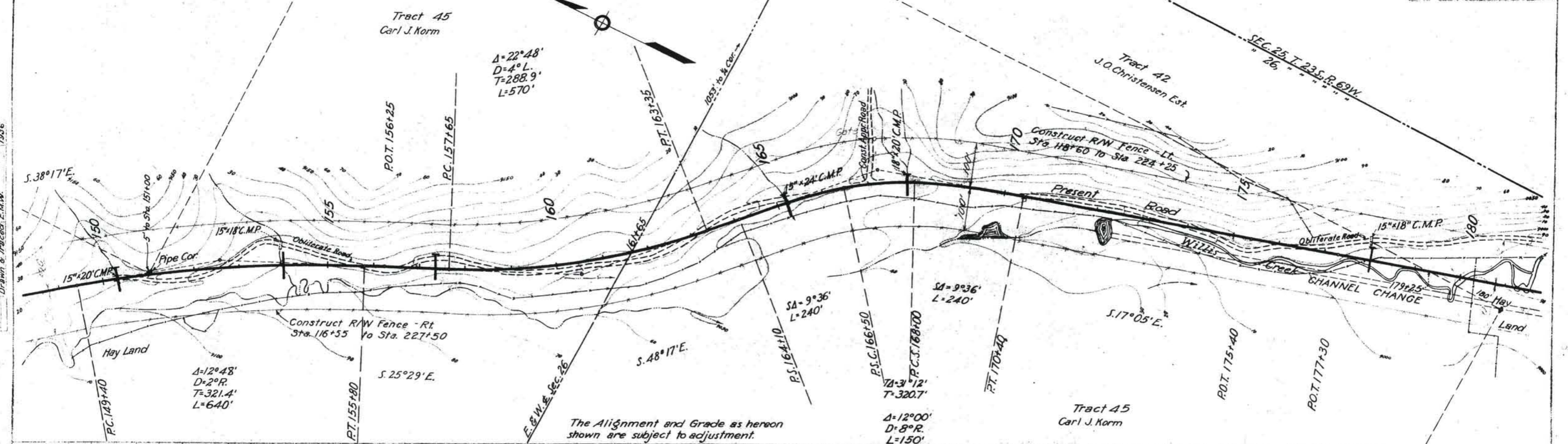
The Alignment and Grade as hereon shown are subject to adjustment.



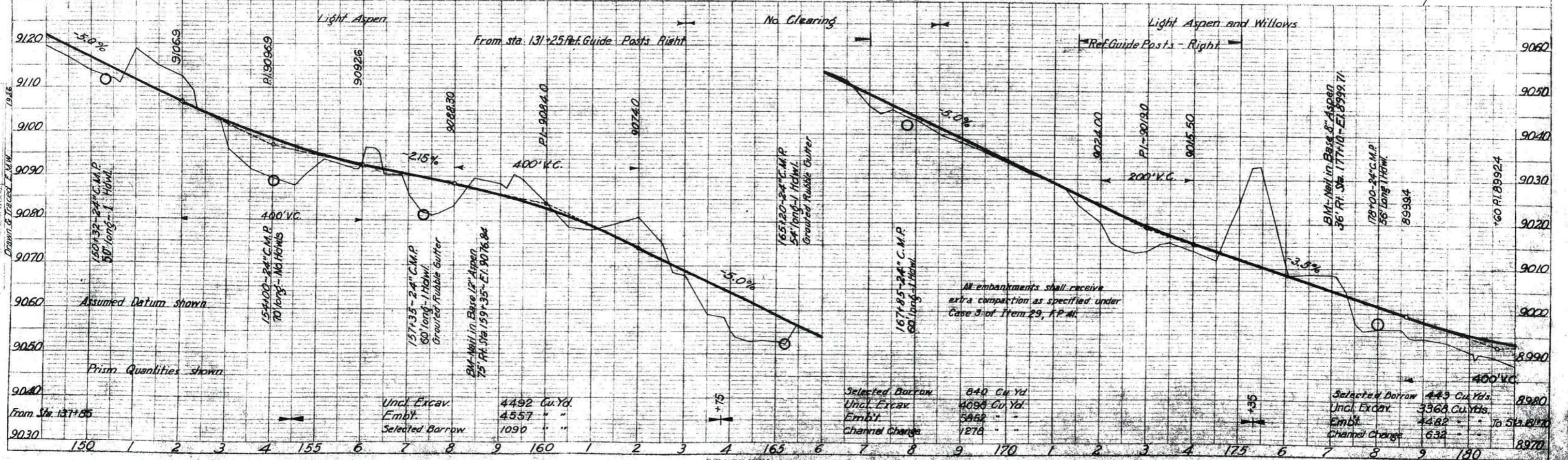


Drawn & Traced E.M.W. 7/25/36

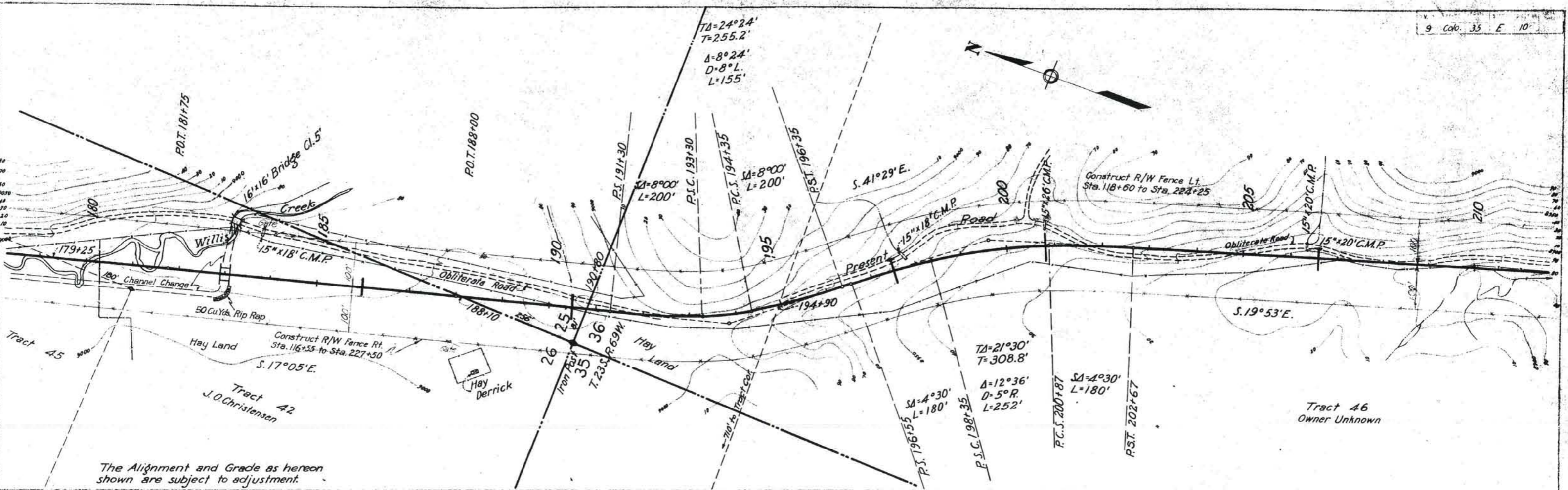
Drawn & Traced E.M.W. 7/25/36



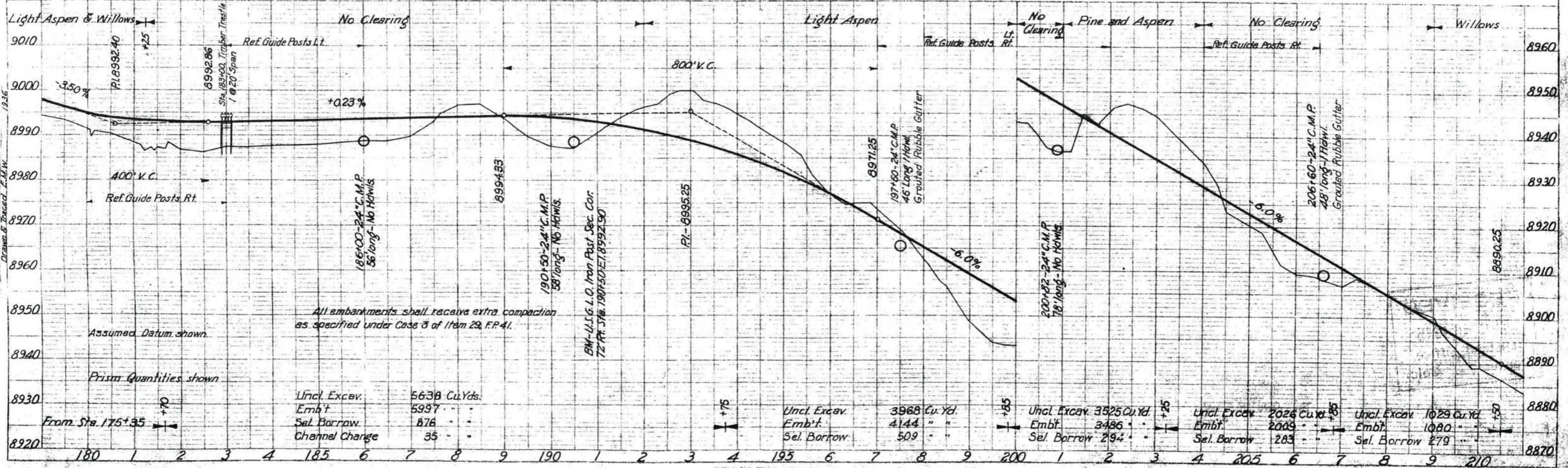
The Alignment and Grade as hereon shown are subject to adjustment.



W.H.C. 1936  
 Drawn & Traced L.M.W.  
 NOTE: EMBANKMENT CHECKED BY W.H.C.

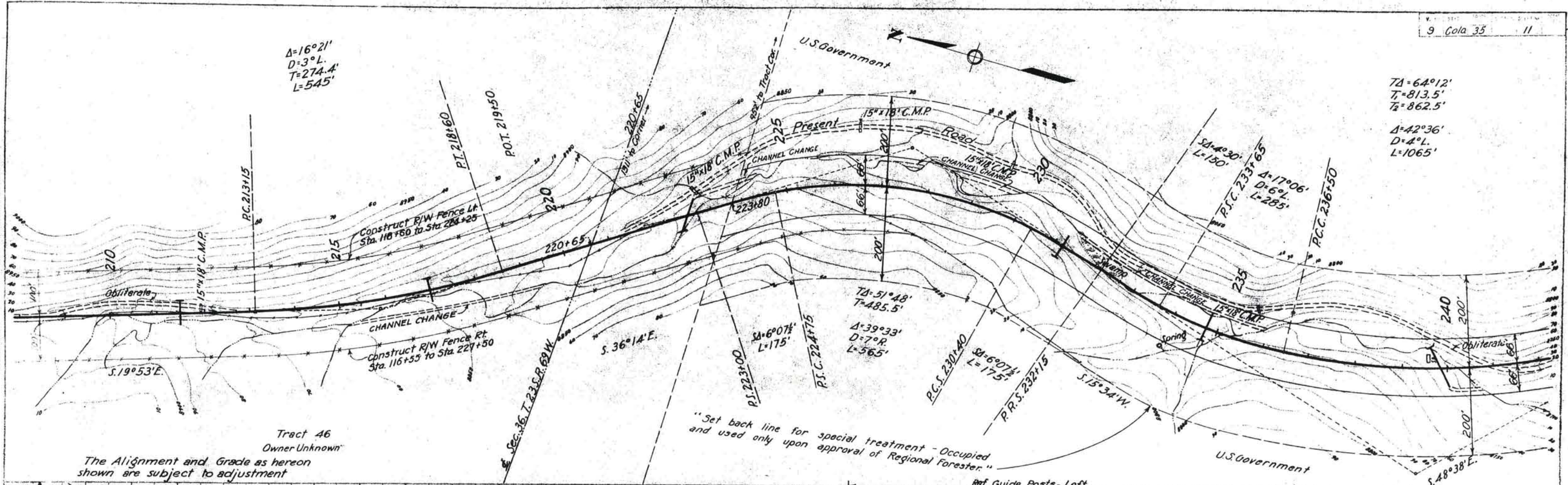


The Alignment and Grade as hereon shown are subject to adjustment.



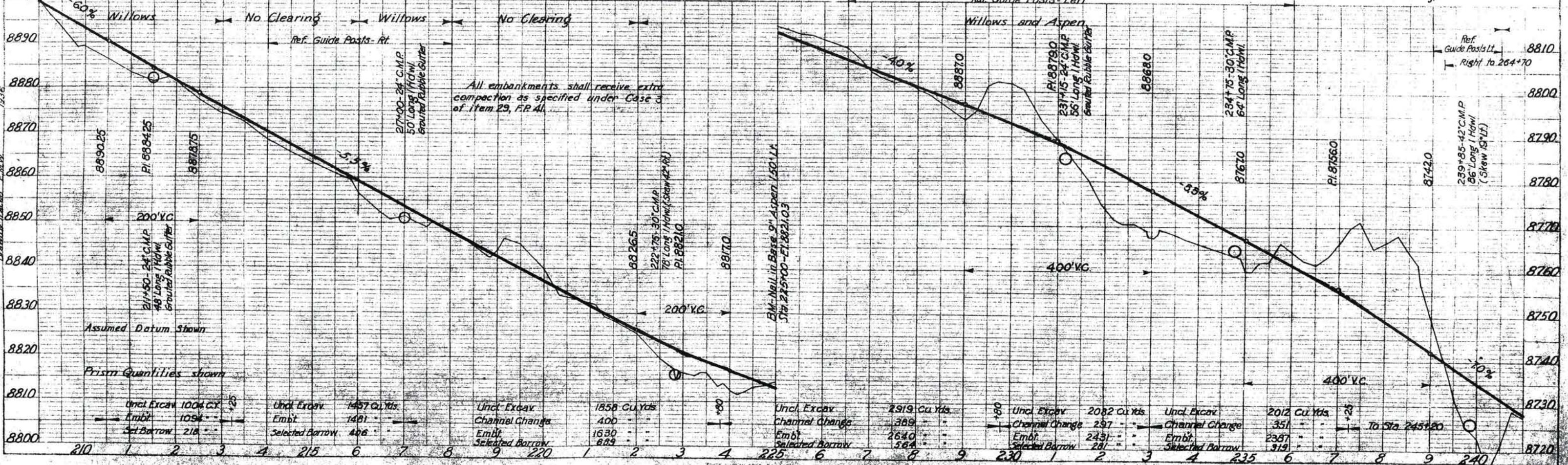
$\Delta=16^{\circ}21'$   
 $D=3^{\circ}L$   
 $T=274.4'$   
 $L=545'$

$T\Delta=64^{\circ}12'$   
 $T=813.5'$   
 $T_2=862.5'$   
 $\Delta=42^{\circ}36'$   
 $D=4^{\circ}L$   
 $L=1065'$



Tract 46  
 Owner Unknown  
 The Alignment and Grade as hereon shown are subject to adjustment

"Set back line for special treatment - Occupied and used only upon approval of Regional Forester."



All embankments shall receive extra compaction as specified under Case 3 of item 29, F.P.M.

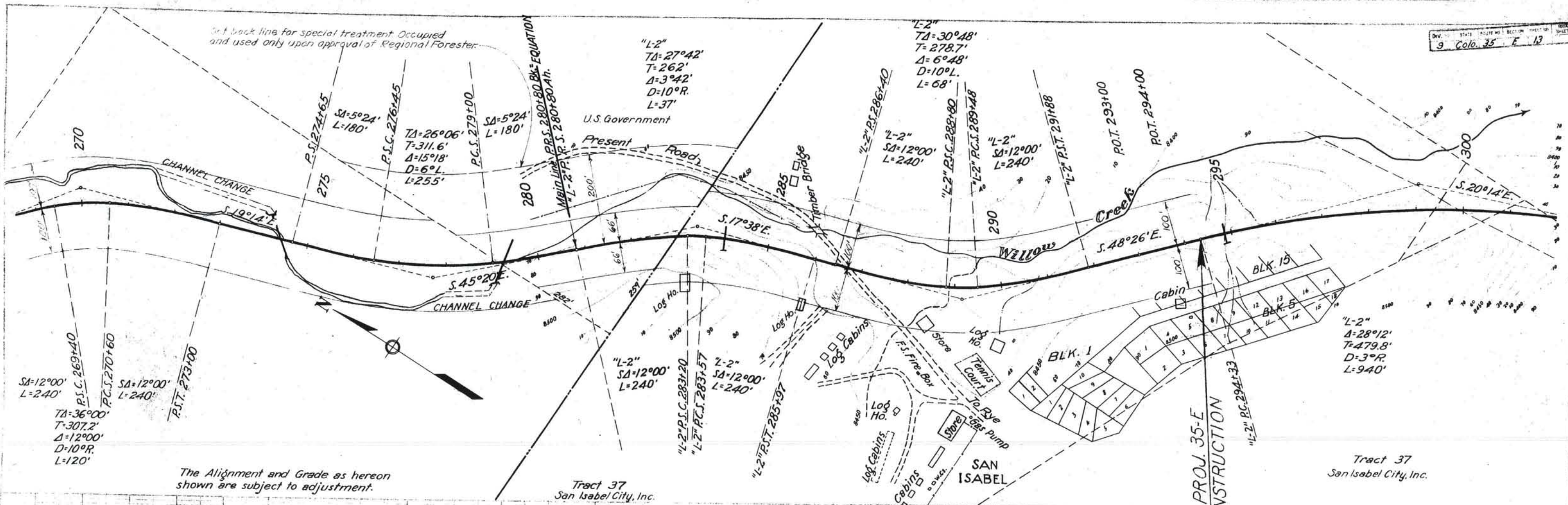
Station	Uncl. Excav	Embt.	Set Borrow	Uncl. Excav	Embt.	Selected Borrow	Uncl. Excav	Embt.	Channel Change	Uncl. Excav	Embt.	Selected Borrow	Uncl. Excav	Embt.	Channel Change	Uncl. Excav	Embt.	Selected Borrow
210																		
215	1006	1094	218	1457	1481	406	1858	1630	400	2919	2640	564	2082	2431	351	2012	2387	319
220																		
225																		
230																		
235																		
240																		



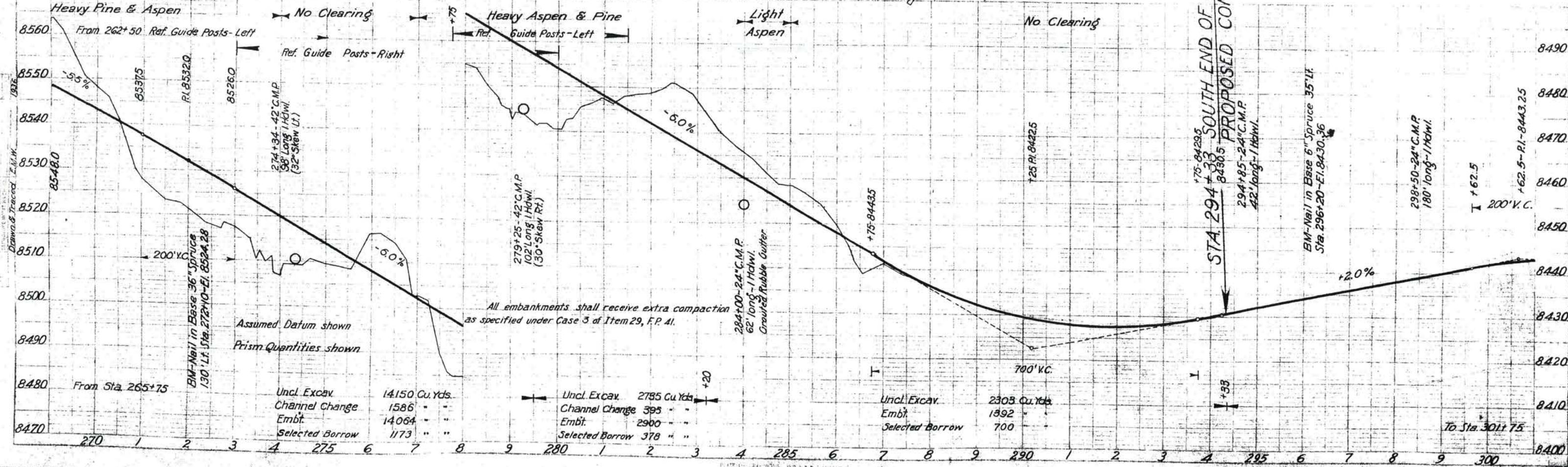
Drawn & Traced, E. M. Warner 1936

Drawn & Traced, E. M. Warner 1936

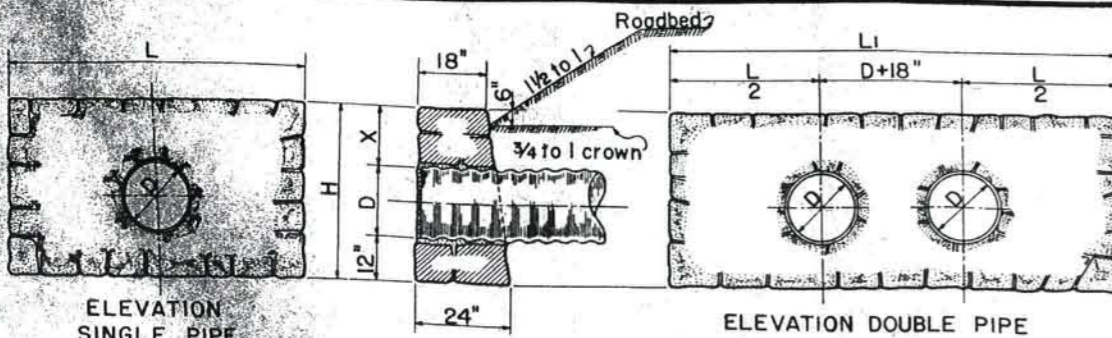
Set back line for special treatment. Occupied and used only upon approval of Regional Forester.



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

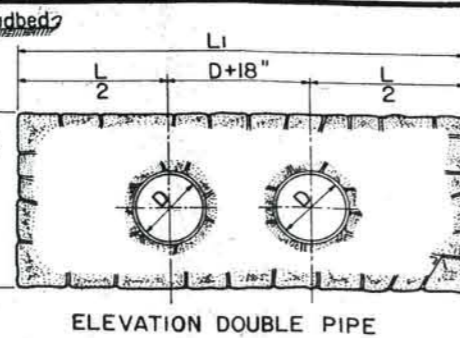


STA 294+33 SOUTH END OF PROJ. 35-E PROPOSED CONSTRUCTION



ELEVATION SINGLE PIPE

SECTION



ELEVATION DOUBLE PIPE

Note: Headwalls are to be constructed to conform in all cases with the fill slope adjacent to the headwall. Tabulated quantities are based on 1 1/2:1 fill slopes. Where 3:1 or flatter slopes are used, X shall be reduced to 6".

SINGLE PIPE

C.Y. QUANTITIES IN ONE HDWL						
D	L	X=1'-0"	X=1'-6"	X=2'-0"	X=2'-6"	X=3'-0"
15"	6'-3"	1.32	1.52	1.72	1.93	2.13
18"	6'-6"	1.48	1.69	1.90	2.11	2.32
24"	7'-0"	1.61	1.84	2.07	2.29	2.52
30"	7'-6"	1.87	2.11	2.36	2.60	2.84
36"	8'-0"	2.14	2.39	2.65	2.91	3.17

DOUBLE PIPE

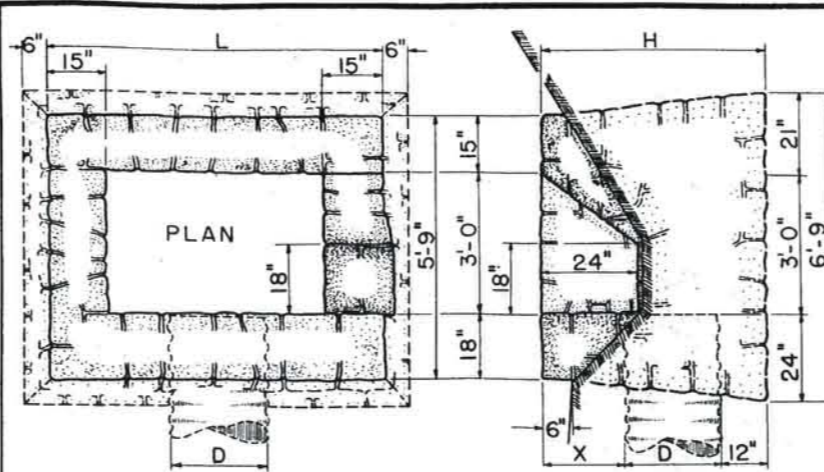
C.Y. QUANTITIES IN ONE HDWL						
D	L	X=1'-0"	X=1'-6"	X=2'-0"	X=2'-6"	X=3'-0"
18"	9'-6"	2.16	2.46	2.77	3.08	3.39
24"	10'-6"	2.32	2.66	3.00	3.34	3.68
30"	11'-6"	2.72	3.09	3.46	3.84	4.21
36"	12'-6"	3.12	3.54	3.94	4.35	4.75

Note-  
H=12"+D+X

USE

\*15" C.M.P. to be used for ranch entrances and ditch crossings.

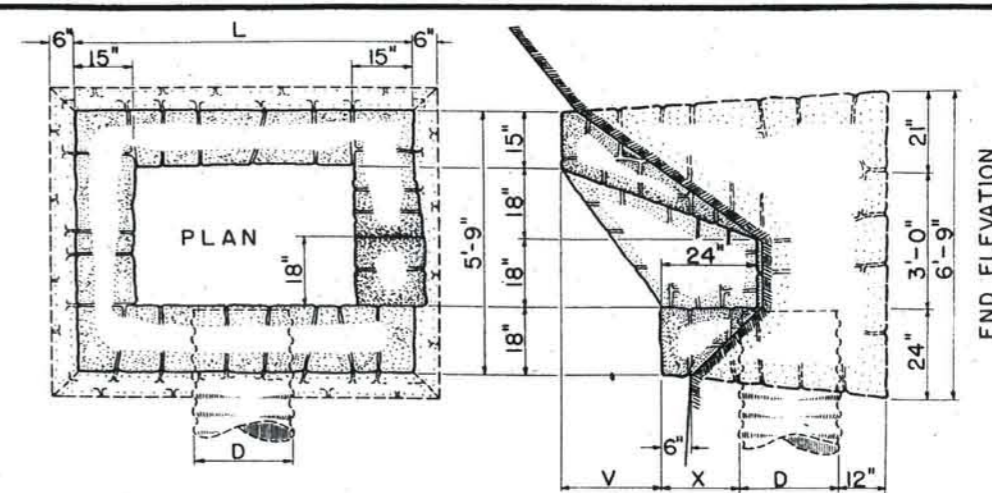
TYPE 1  
REGULAR HEADWALLS FOR FILL SECTIONS



C.U. YD. QUANTITIES IN ONE HEADWALL AND INLET

D	L	X=1'-6"		X=2'-0"		X=2'-6"		X=3'-0"		X=3'-6"	
		H	C.Y.	H	C.Y.	H	C.Y.	H	C.Y.	H	C.Y.
18"	6'-6"	4'-0"	4.37	4'-6"	4.96	5'-0"	5.55	5'-6"	6.14	6'-0"	6.73
24"	7'-0"	4'-6"	5.14	5'-0"	5.76	5'-6"	6.38	6'-0"	7.00	6'-6"	7.62
30"	7'-6"	5'-0"	5.95	5'-6"	6.59	6'-0"	7.23	6'-6"	7.87	7'-0"	8.51
36"	8'-0"	5'-6"	6.78	6'-0"	7.46	6'-6"	8.14	7'-0"	8.82	7'-6"	9.50

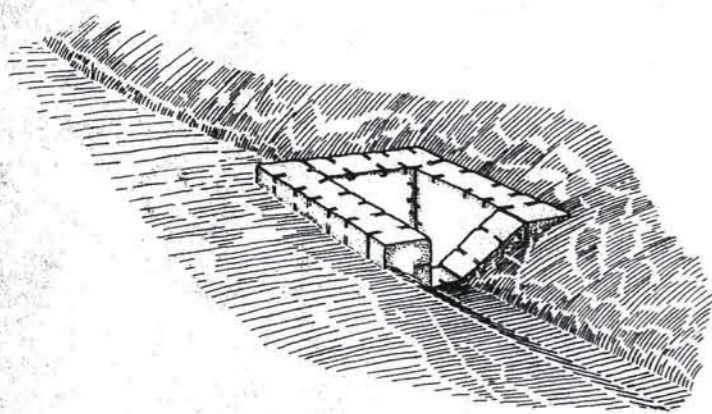
TYPE 2  
HEADWALL & INLET USED FOR SIDE HILL SECTION  
INLET WITH HEAD, SIDES & BACKWALL TOPS ALL IN THE SAME PLANE



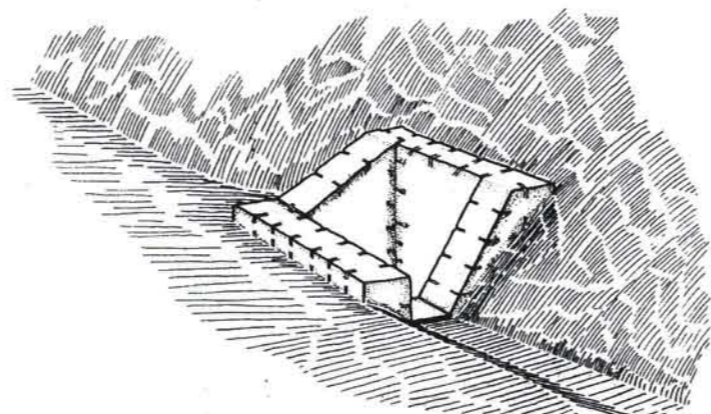
C.U. YD. QUANTITIES IN ONE HEADWALL AND INLET

D	L	X=1'-6"		X=2'-0"		X=2'-6"		X=3'-0"		X=3'-6"	
		V=6", 12", 18", 24"	V=6", 12", 18", 24"	V=6", 12", 18", 24"	V=6", 12", 18", 24"	V=6", 12", 18", 24"	V=6", 12", 18", 24"				
18"	6'-6"	4.63	4.89	5.15	5.41	5.22	5.48	5.74	6.00	5.81	6.06
24"	7'-0"	5.41	5.69	5.96	6.23	6.03	6.30	6.57	6.84	6.65	6.92
30"	7'-6"	6.23	6.52	6.80	7.10	6.88	7.17	7.46	7.75	7.53	7.81
36"	8'-0"	7.09	7.39	7.69	7.99	7.76	8.06	8.36	8.66	8.44	8.74

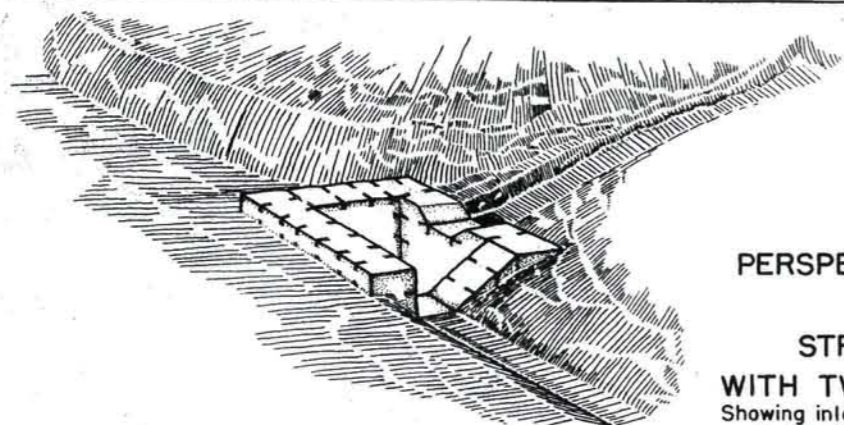
TYPE 3  
HEADWALL & INLET USED FOR SIDE HILL SECTION  
INLET WITH VARIABLE HEIGHT BACK & SIDEWALLS BUILT TO RETAIN HIGH CUT BANKS



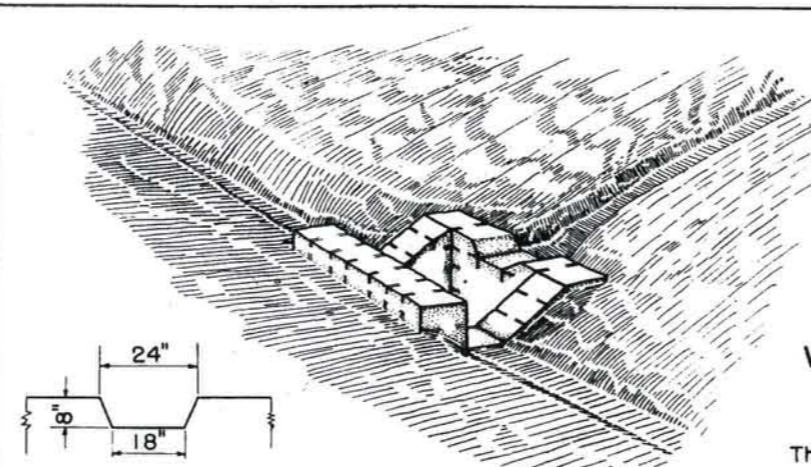
PERSPECTIVE VIEW OF STRUCTURE WITH ONE WAY INLET  
Use for all ordinary cases with moderate cut slopes.



PERSPECTIVE VIEW OF STRUCTURE WITH ONE WAY INLET  
Use with high cut slopes



PERSPECTIVE VIEW OF STRUCTURE WITH TWO WAY INLET  
Showing inlet on upgrade side with inlet notch in backwall.



DETAIL OF NOTCH IN BACKWALL

PERSPECTIVE VIEW OF STRUCTURE WITH THREE WAY INLET  
Showing ditch inlet at each side and notch inlet in backwall.

This type used where grades are nearly flat and it is advisable to make an inlet on lower side.

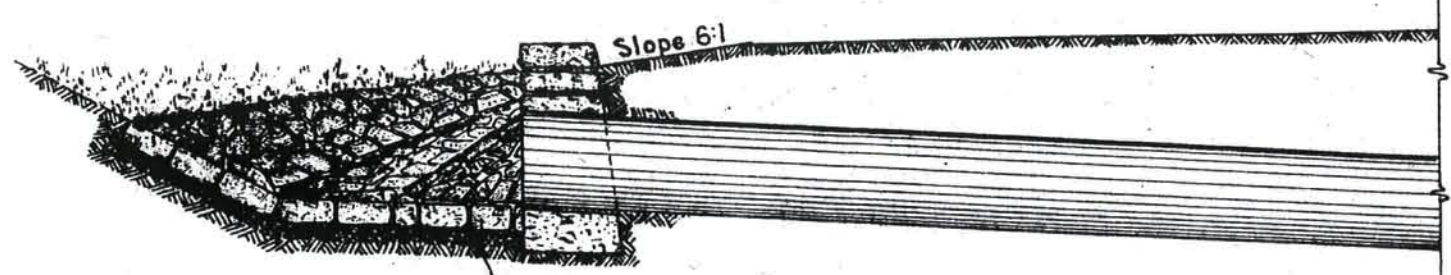
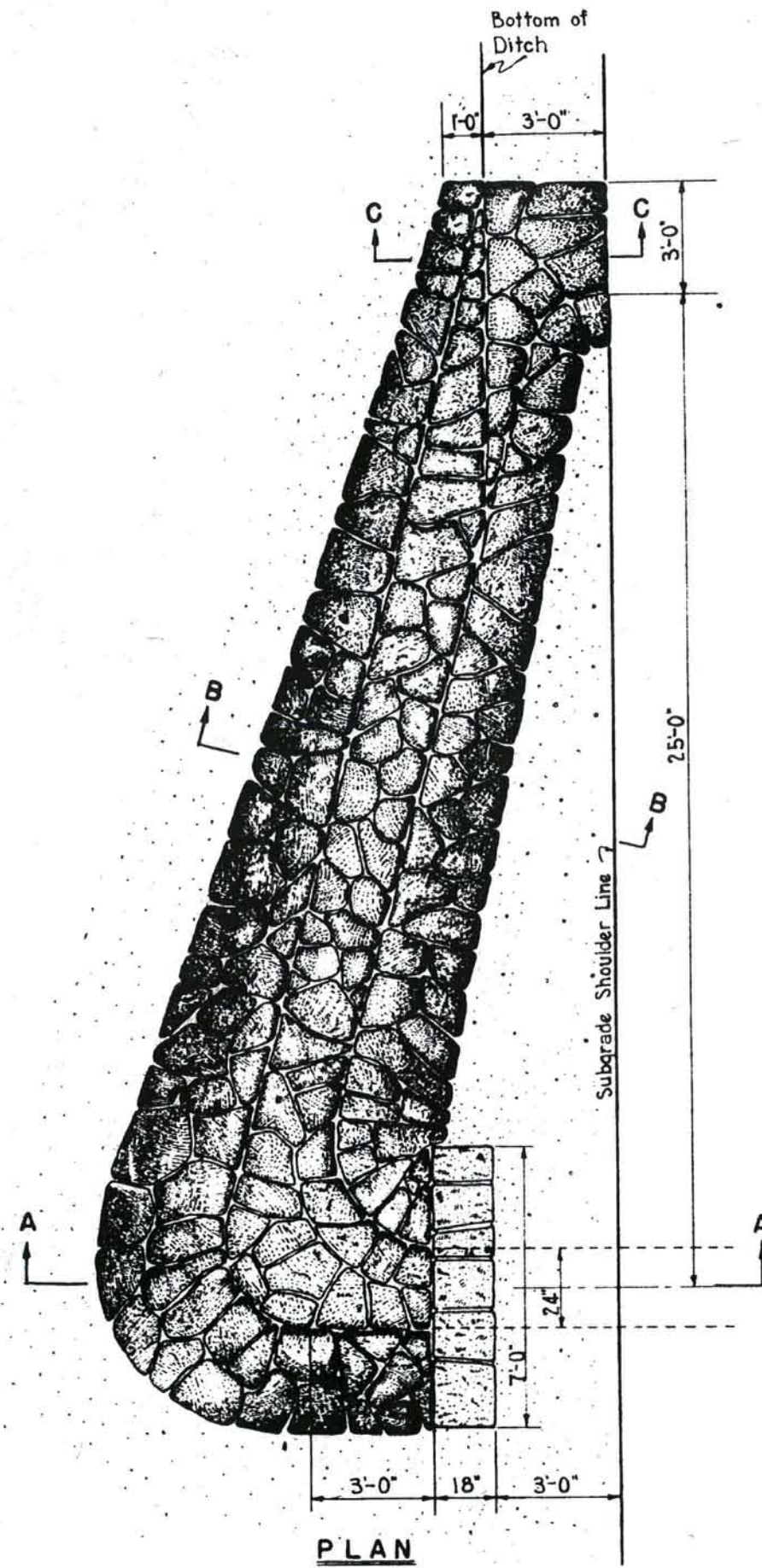
GENERAL NOTES

SPECIFICATIONS: Public Roads Administration, F.P. 41.  
CONSTRUCTION: The minimum earth cover on top of the pipe shall not be less than 1/2 the diameter of the pipe with a minimum of one foot. Headwalls in all cases to be built parallel to the center line of the road. On side hill sections the height of the backwall will vary in accordance with the height and class of material in the bank slopes back of the culvert inlet. The road side edge of the headwall to be on or back of the line of the adjacent ditch bottom. If solid rock is encountered the backwall may be omitted or modified to suit the actual field conditions. If foundation materials under headwalls and inlets are found unsuitable either remove and replace with satisfactory selected materials or extend stone masonry to provide a satisfactory footing. Joints shall be either flush or raked as directed by the engineer.

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DISTRICT NO. 3 DENVER, COLO.

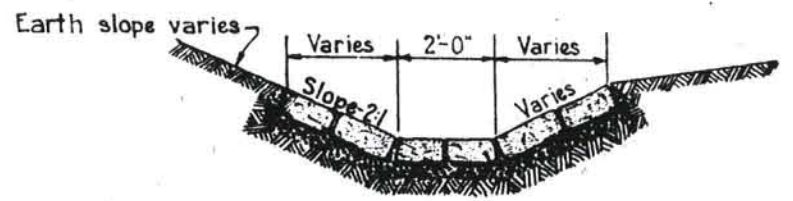
CEMENT RUBBLE MASONRY  
HEADWALLS AND INLETS  
FOR PIPE CULVERTS

APPROVED \_\_\_\_\_ October, 1941  
Sr. Highway Bridge Engineer

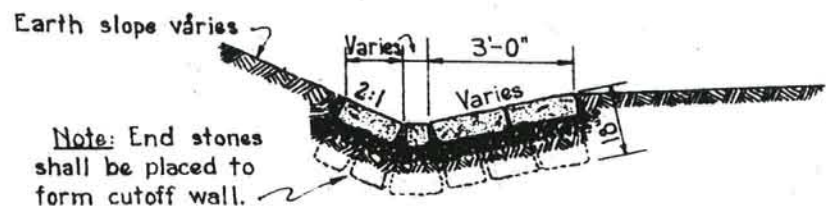


Note: 4" of broken stone, slag, or gravel foundation material. All passing a sieve with 3/8" square openings.

**SECTION A-A**



**SECTION B-B**



**SECTION C-C**

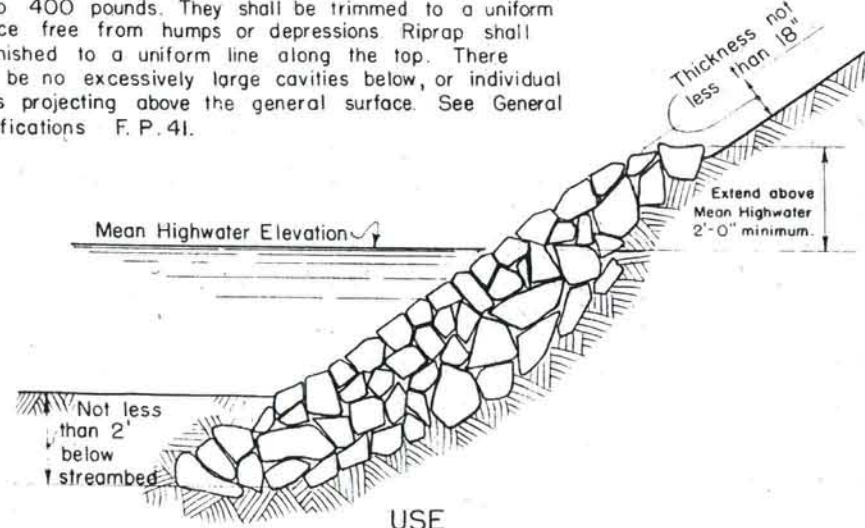
**QUANTITIES**

Grouted Rubble Gutter	25 Sq. Yds.
<del>Class A Concrete (4" thick)</del>	<del>3.60 Yds.</del>

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DISTRICT 3, DENVER, COLO.

**GRouted RUBBLE ~~OR CONCRETE~~ GUTTER  
FOR PIPE CULVERT INLETS**

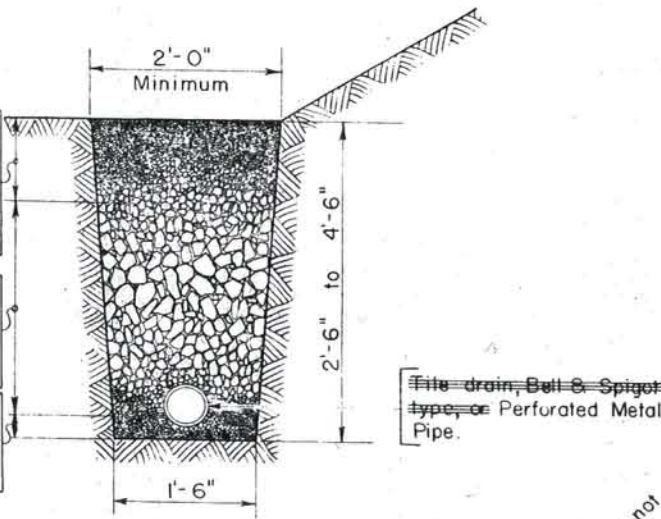
Stones shall be hard and angular, varying in weight from 20 to 400 pounds. They shall be trimmed to a uniform surface free from humps or depressions. Riprap shall be finished to a uniform line along the top. There shall be no excessively large cavities below, or individual stones projecting above the general surface. See General Specifications F. P. 41.



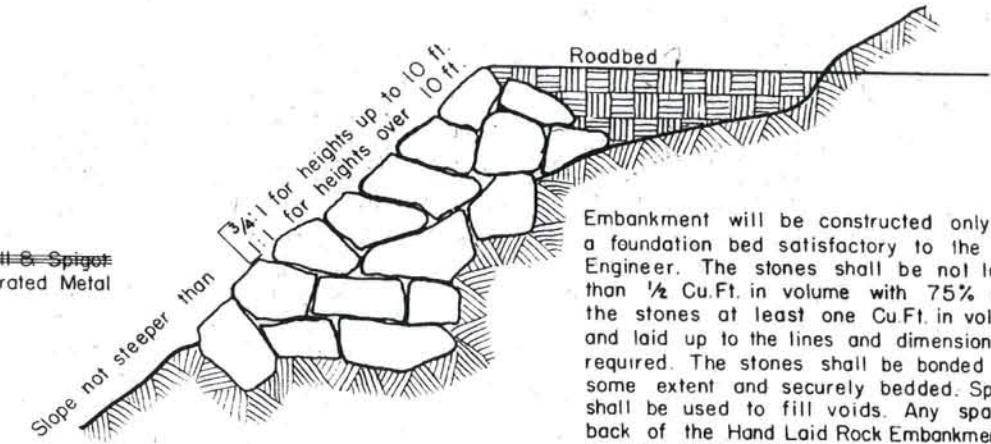
USE  
**LOOSE RIPRAP**

The upper 12" of trench backfilled with crushed stone or clean gravel all passing 1" sieve; or an impervious material as directed by the Engineer.

Backfill over pipe with crushed stone or clean gravel all passing a 3" sieve and retained on a 3/4" sieve.  
Place 2" bedding layer of crushed stone or clean gravel all passing 1" sieve and retained on No 4 sieve.



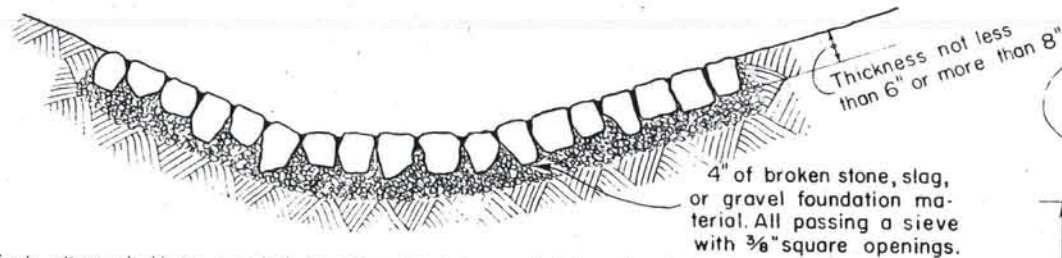
USE  
**TILE OR PIPE UNDERDRAIN**



Embankment will be constructed only on a foundation bed satisfactory to the Engineer. The stones shall be not less than 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. Spalls shall be used to fill voids. Any spaces back of the Hand Laid Rock Embankment shall be filled entirely with compacted material.

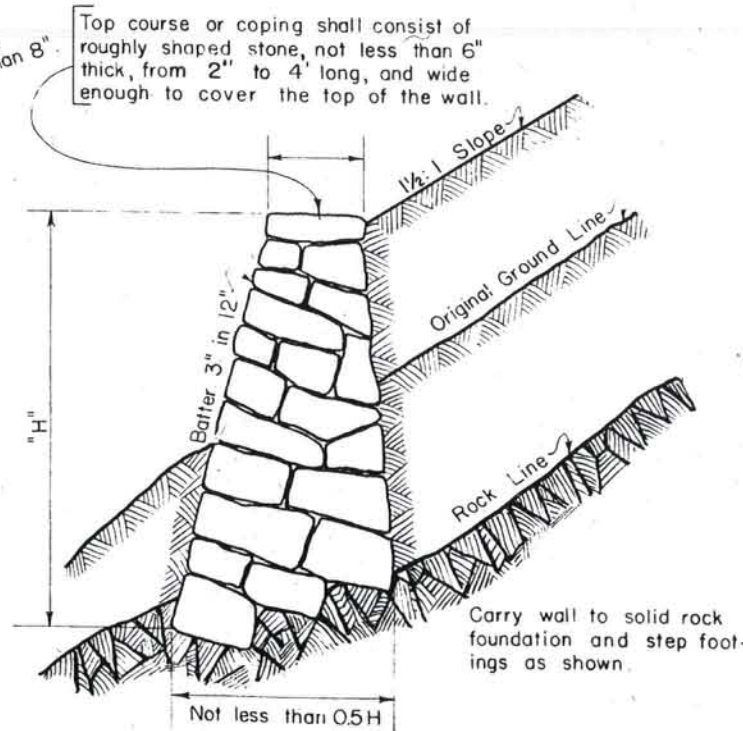
**HAND LAID ROCK EMBANKMENT**  
FULL HEIGHT

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 interstices exceeding one inch in width shall exist.



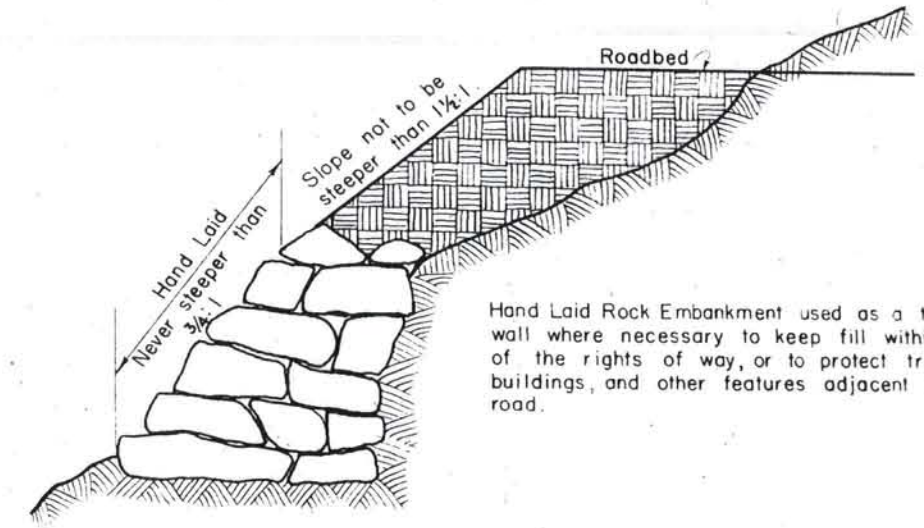
Each stone shall be carried by the underlying material and not by the adjacent stones. The surface of the rocks shall not vary more than one inch from the required finished section. The spaces or voids between and around the stones shall be filled with broken stone, slag, or gravel to within four inches 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 General Specifications F.P. 41.

USE  
**GROUTED RUBBLE GUTTER**



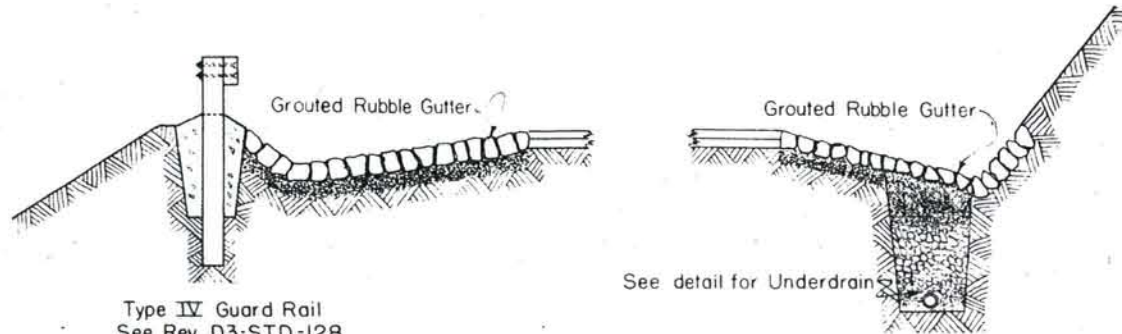
Stone shall be sound, durable, and free from structural defects. No stone shall be less than 6" in thickness, 12" in width, 15" in length or less than 1/2 cu. ft. in volume. The bottom course shall consist of stone not less than one Cu.Ft. in volume. Break joints at least six inches.

**DRY RUBBLE MASONRY**  
NOT TO BE USED FOR HEIGHTS OVER 8 FEET



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



Type IV Guard Rail  
See Rev D3-STD-128

See detail for Underdrain

**TYPICAL SECTIONS IN CUTS AND EMBANKMENTS**

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DISTRICT NO. 3 DENVER, COLORADO

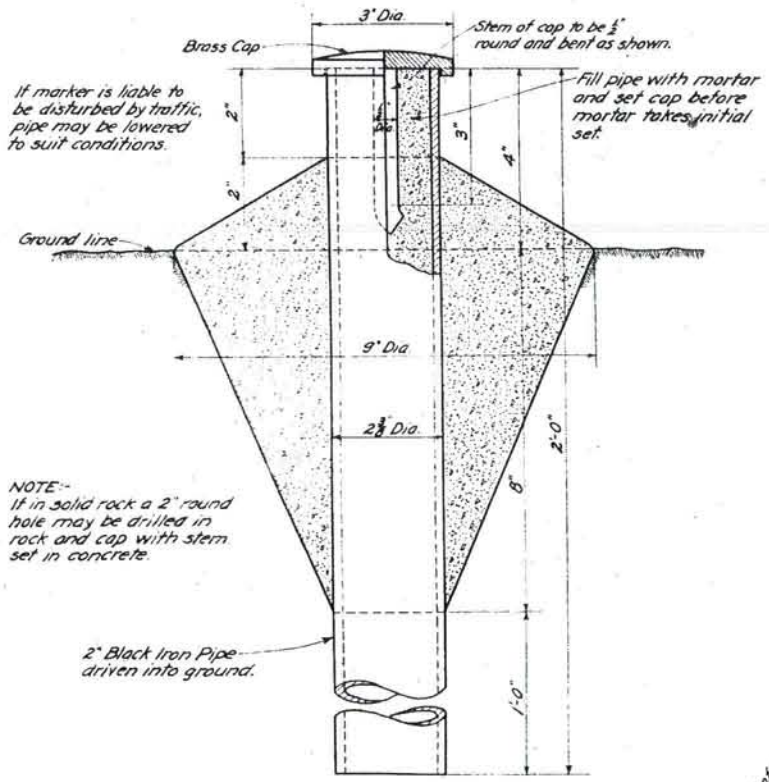
**STANDARD  
MISCELLANEOUS STRUCTURES**

Approved 1939

District Engineer



TOP VIEW

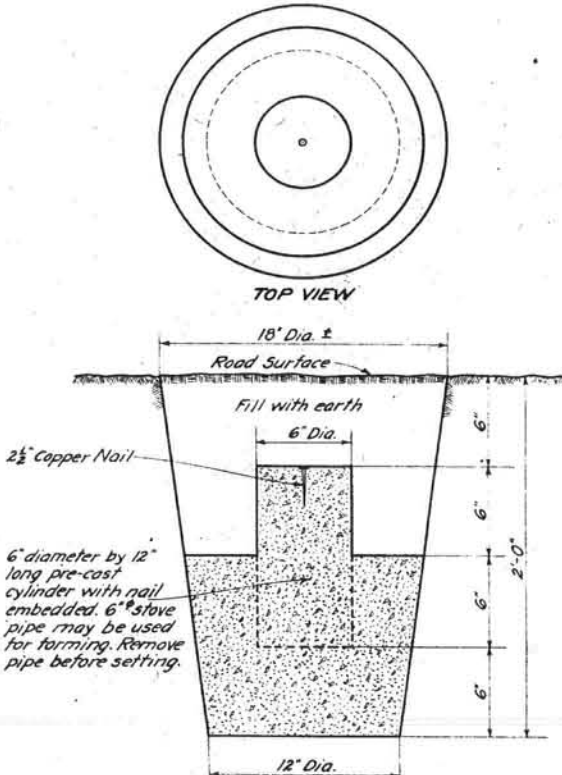


REFERENCE POINT MONUMENT  
SCALE 0 1 2 3 4 INCHES

If marker is liable to be disturbed by traffic, pipe may be lowered to suit conditions.

NOTE- If in solid rock a 2" round hole may be drilled in rock and cap with stem set in concrete.

2" Black Iron Pipe driven into ground.

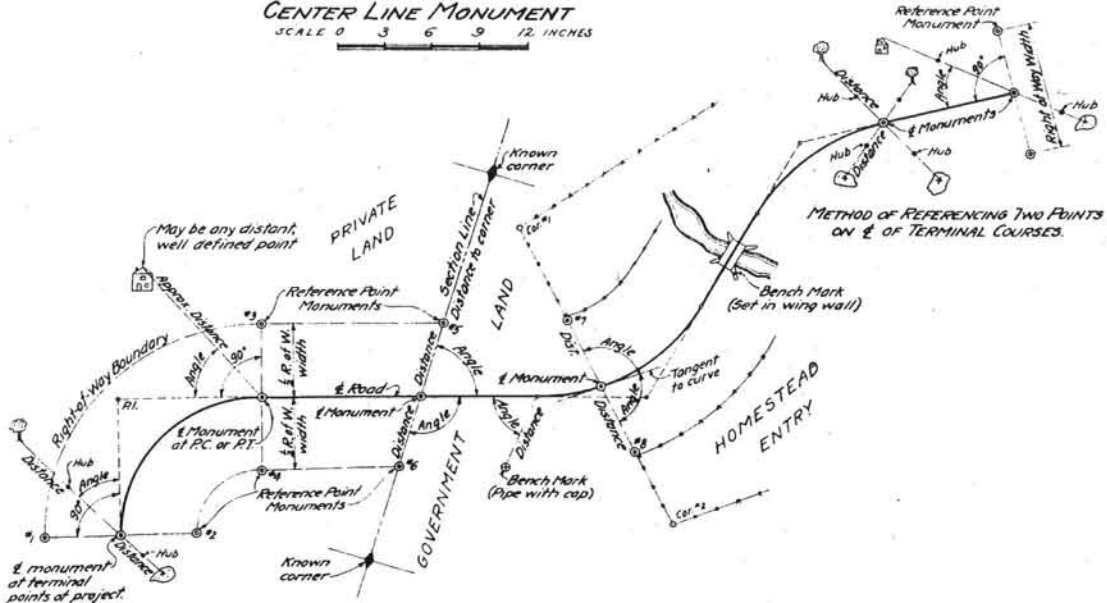


CENTER LINE MONUMENT  
SCALE 0 3 6 9 12 INCHES

Pre-cast cylinder to be set in concrete with top 6" below finished road surface and adjusted to proper position. Fill balance of hole to level of road surface with earth.

6" diameter by 12" long pre-cast cylinder with nail embedded. 6" stove pipe may be used for forming. Remove pipe before setting.

2 1/2" Copper Nail

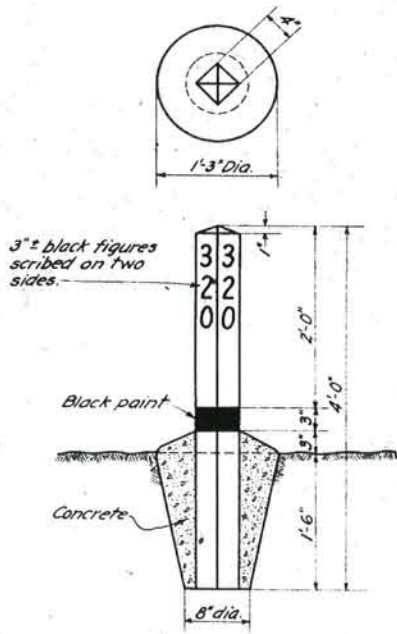


METHODS OF PLACING REFERENCE MONUMENTS

NOTES:-  
The center line shall be monumented at mile and half-mile intervals or intersections of public land lines, and at 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 on 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 & of 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.

Designed by C.E. Leonard, 11/10/30 Date Mar. 1930  
Drawn by E.W. Martin Date Mar. 1930  
Traced by E.W. Martin Date Mar. 1930  
Checked by C.E. Leonard & J. Miller Date Apr. 1930



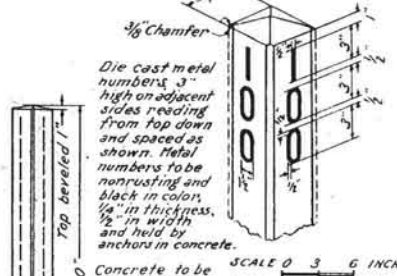
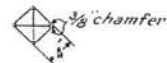
MAINTENANCE MARKER POST  
SCALE 0 3 6 9 12 INCHES

Post to be 4" square timber, S-4-S, painted with 3 coats of approved white paint above the ground line. Bevel top 1"

3" x black figures scribed on two sides.

Black paint

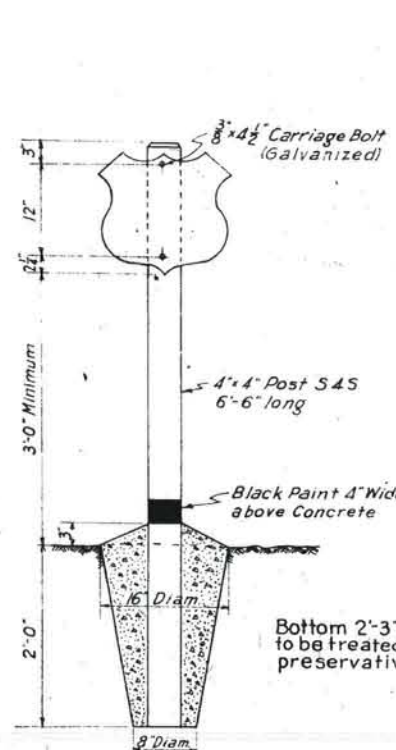
Concrete



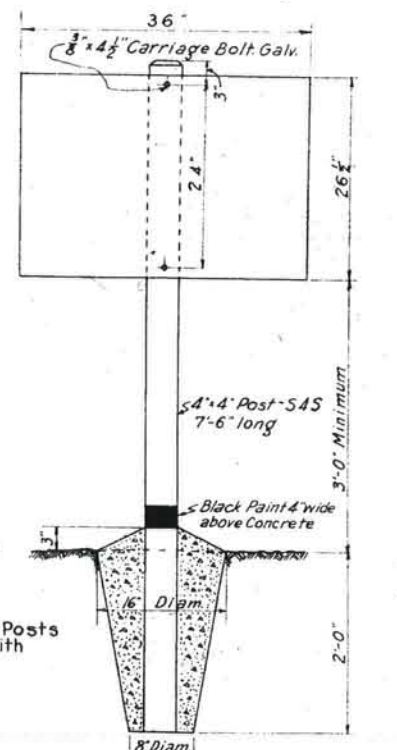
USE  
CONCRETE MAINTENANCE MARKER POST  
SCALE 0 3 6 9 12 INCHES

Concrete to be Class 'Y' P.A.A. Specifications except that an approved brand of white cement is to be used.

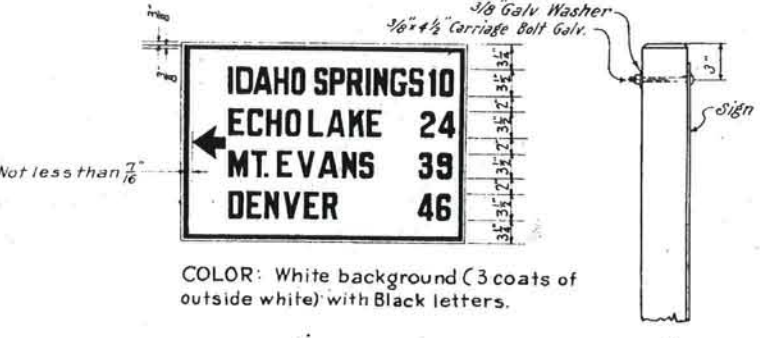
4 #3 reinforcing bars 3-9" long and tied together with #12 soft annealed iron wire.



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



STANDARD DIRECTIONAL SIGN  
STANDARD TWO-LINE DIRECTIONAL SIGN SIZE  
THREE " 36" x 14 1/2" - 18 Ga.  
FOUR " 36" x 20 1/2" - "  
36" x 26 1/2" - "  
SCALE 0 3 6 9 12 INCHES



COLOR: White background (3 coats of outside white) with Black letters.

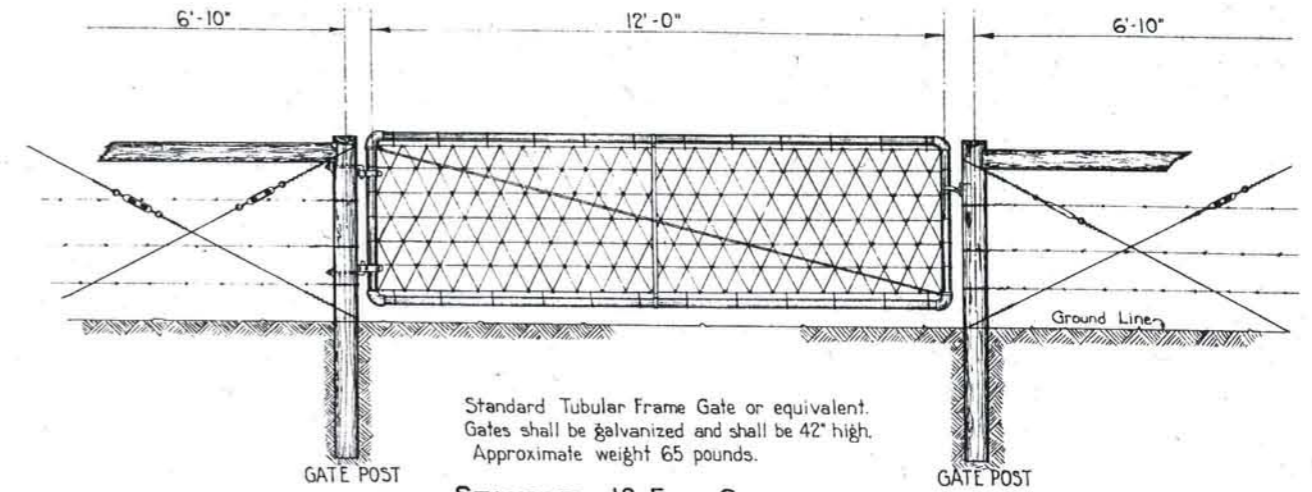
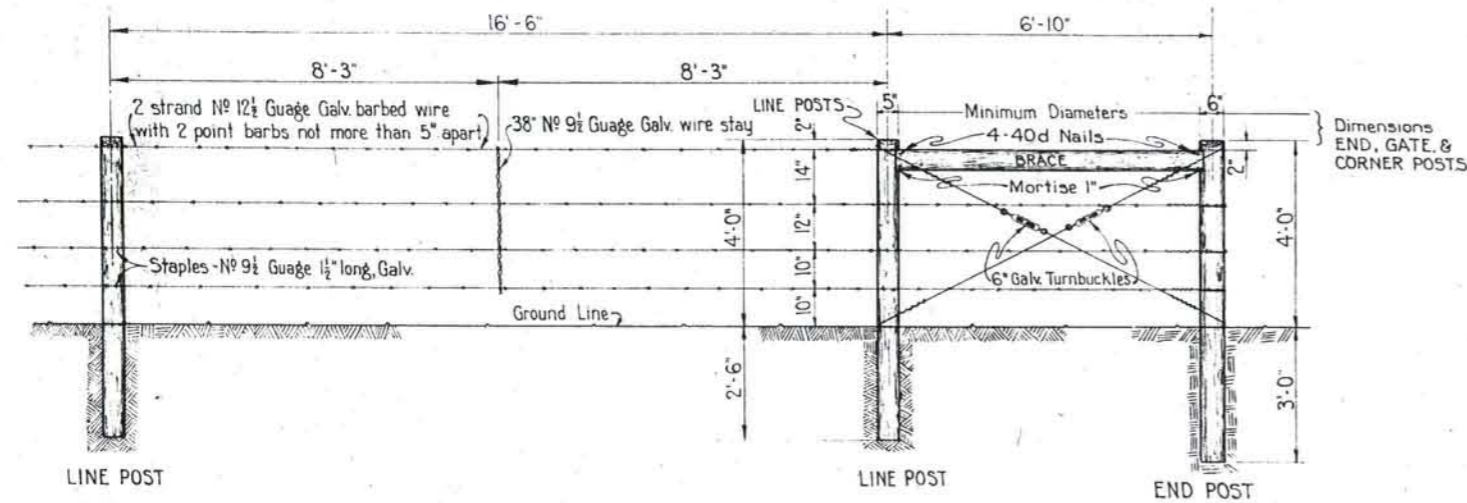
DETAIL OF MOUNTING  
SCALE 1 1/2" = 1'-0"  
SCALE 0 3 6 INCHES

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

APPROVED Max. T. 1930  
Acting District Engineer

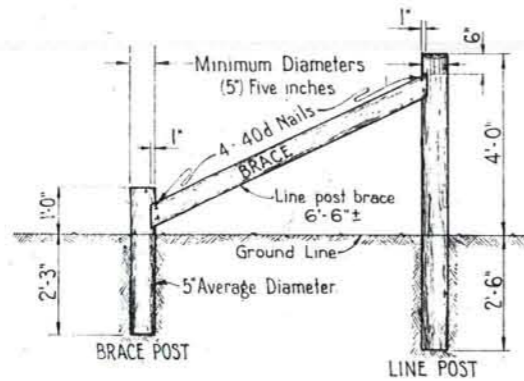
FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DIVISION NO. 9 DENVER, COLO.  
STANDARD  
MAINTENANCE POSTS  
AND REFERENCE MONUMENTS  
APRIL, 1930  
JUNE, 1934  
D3-STD-131

STANDARD BARBED WIRE FENCE & END BRACE

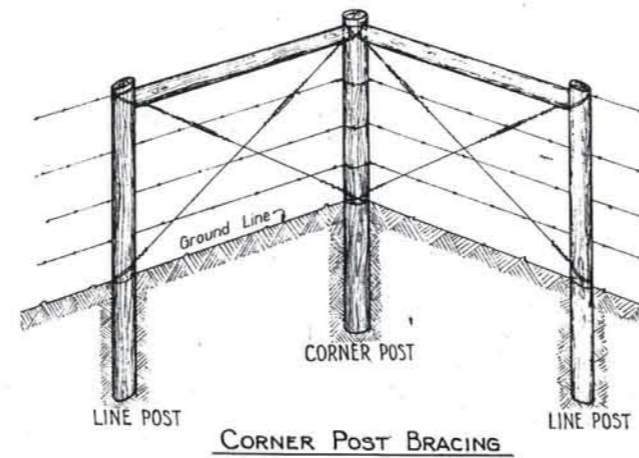


STANDARD 12 FOOT GATE

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



BRACE POST DETAIL



CORNER POST BRACING

USE

TYPE 1

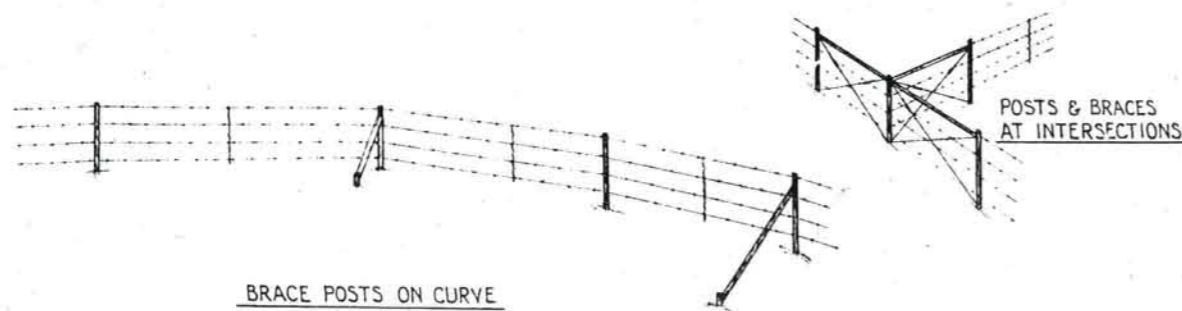
UNTREATED FENCE POSTS

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.

TYPE 2

TREATED FENCE POSTS

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") five inches and shall be (6 1/2') six and one half feet in length. Treatment of posts shall be in accordance with General Specifications as amended by Special Provisions.



BRACE POSTS ON CURVE

POSTS & BRACES AT INTERSECTIONS

APPROVED: \_\_\_\_\_  
 DISTRICT ENGINEER

STANDARD BARBED WIRE FENCE WITH WOOD POSTS & BRACES

Scale: 1" = 0 1 2 3 feet

FEDERAL WORKS AGENCY  
 PUBLIC ROADS ADMINISTRATION  
 DISTRICT No. 3 - DENVER, COLO.

Rev. D3-STD-135

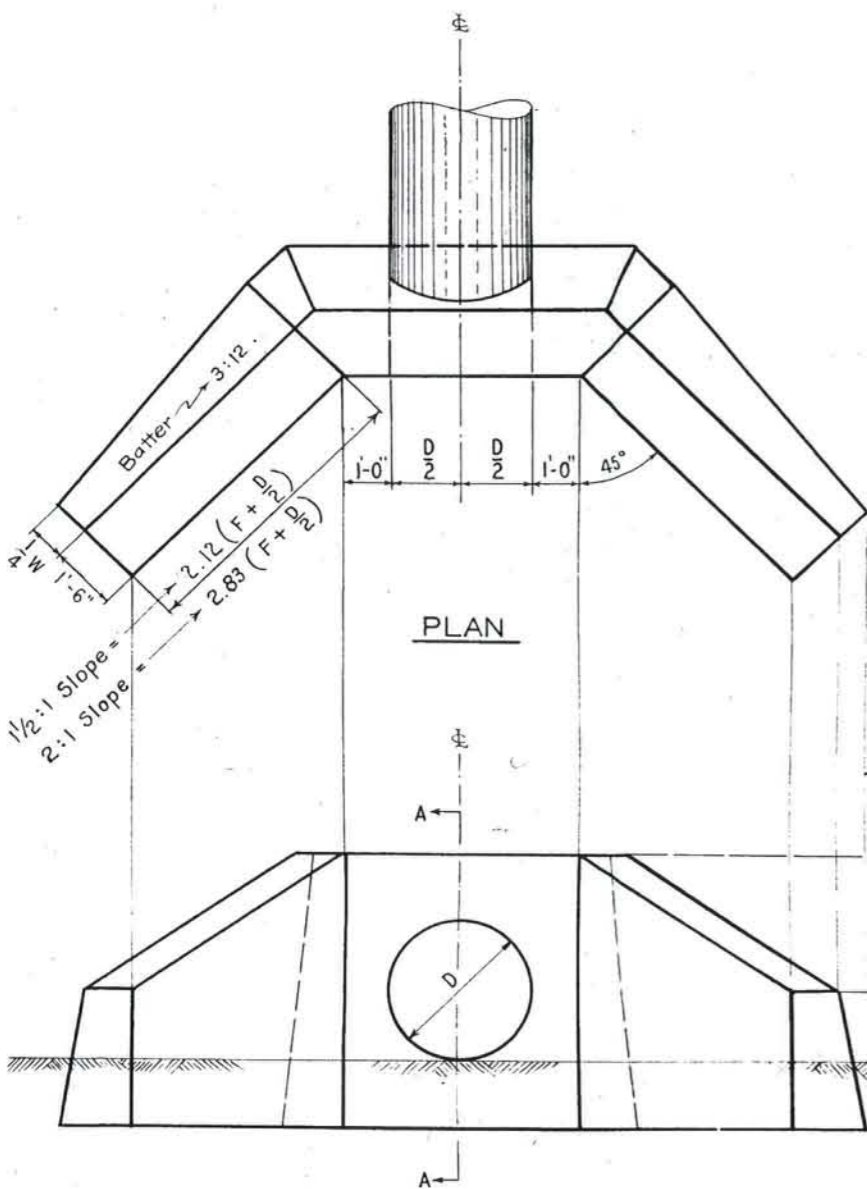
TRACED BY: J. A. Selbert  
 CHECKED BY: R. H. Naylor

**SPECIFICATIONS:** Public Roads Administration, Form F.P. 41.

**CONSTRUCTION:** The minimum earth cover on top of pipe shall not be less than 1/2 the diameter of the pipe, with a minimum of one foot. Headwalls in all cases to be built parallel to the center line of the road. If foundation materials under headwalls are found unsuitable, either remove and replace with satisfactory selected materials or extend stone or cement stone masonry to provide a satisfactory footing.

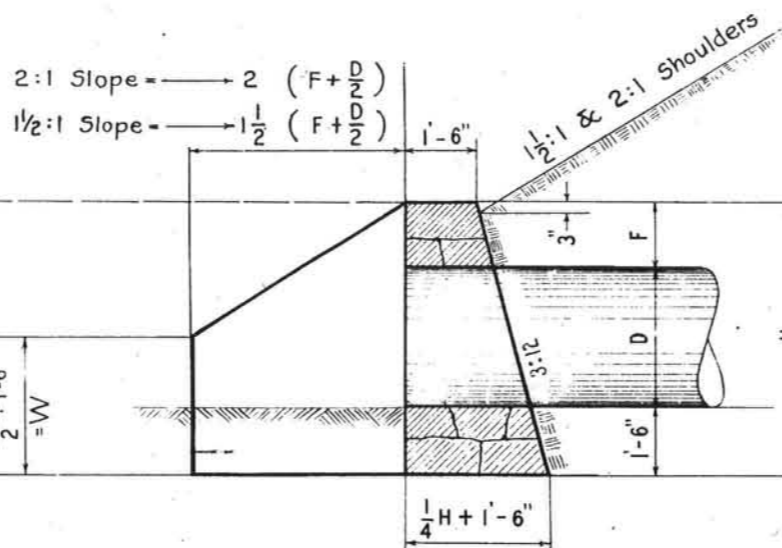
**METHOD OF MEASUREMENT:** The quantities in the tables are based on the deduction of the pipe openings.

**BASIS OF PAYMENT:** Payment shall be as provided in the Public Roads Administration Form F.P. 41.

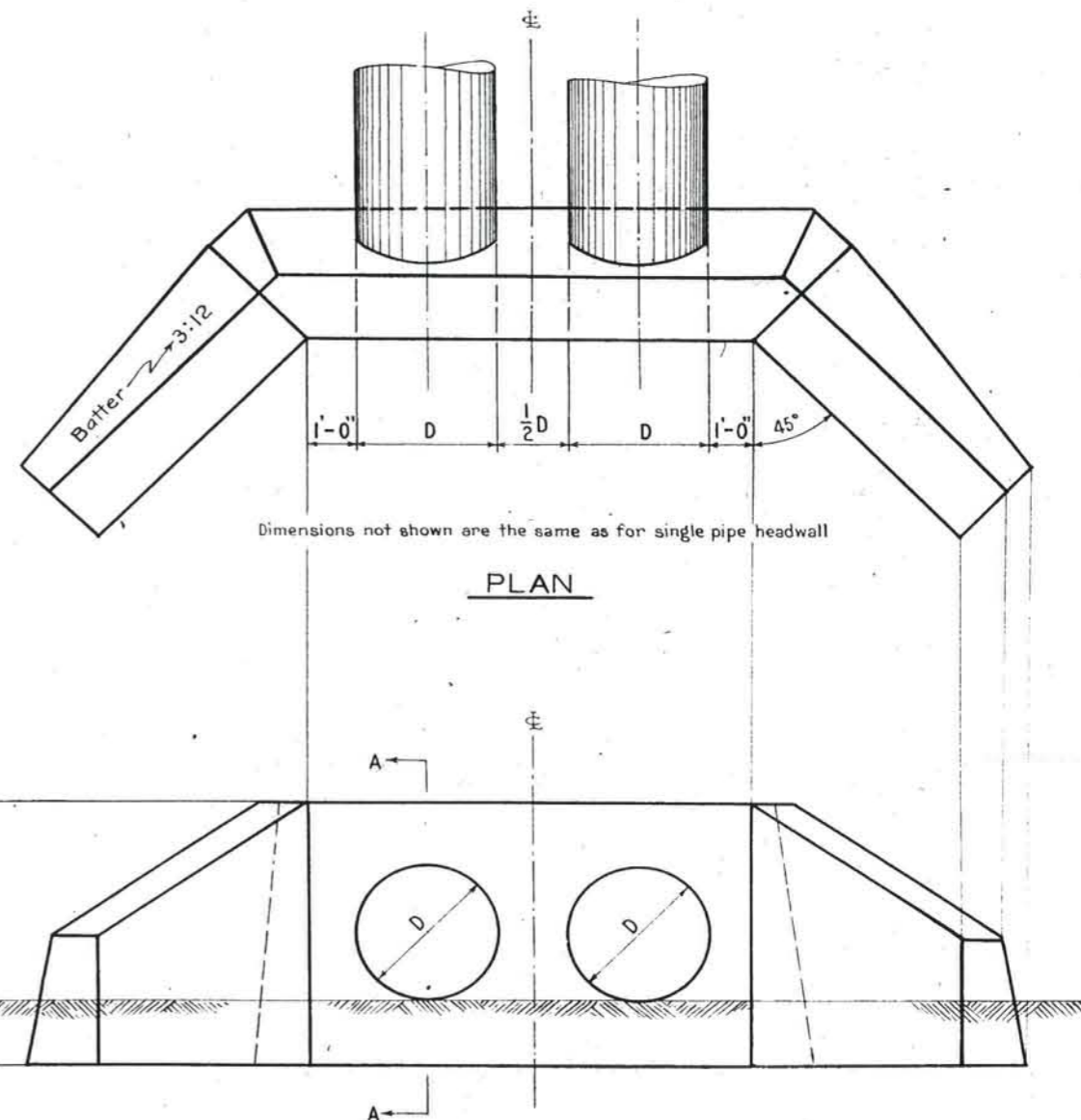


PLAN

ELEVATION



SECTION A-A



PLAN

ELEVATION

Dimensions not shown are the same as for single pipe headwall

SHOULDER	QUANTITIES FOR ONE SINGLE HEADWALL								QUANTITIES FOR ONE DOUBLE HEADWALL										
	D	F=1'-0"		F=1'-6"		F=2'-0"		F=2'-6"		D	F=1'-0"		F=1'-6"		F=2'-0"		F=2'-6"		
	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	H	Cu.Yds.	
2:1 Slope	36"	5'-6"	7.07	6'-0"	8.77	6'-6"	10.67	7'-0"	12.75	5'-6"	8.52	6'-0"	10.43	6'-6"	12.55	7'-0"	14.86		
	42"	6'-0"	8.53	6'-6"	10.44	7'-0"	12.53	7'-6"	14.82	6'-0"	10.37	6'-6"	12.54	7'-0"	14.89	7'-6"	17.46		
	48"	6'-6"	10.15	7'-0"	12.26	7'-6"	14.57	8'-0"	17.07	6'-6"	12.44	7'-0"	14.84	7'-6"	17.47	8'-0"	20.30		
	54"	7'-0"	11.94	7'-6"	14.26	8'-0"	16.79	8'-6"	19.52	7'-0"	14.73	7'-6"	17.39	8'-0"	20.28	8'-6"	23.37		
1/2:1 Slope	36"	5'-6"	5.92	6'-0"	7.29	6'-6"	8.81	7'-0"	10.47	5'-6"	7.37	6'-0"	8.95	6'-6"	10.69	7'-0"	12.59		
	42"	6'-0"	7.12	6'-6"	8.65	7'-0"	10.34	7'-6"	12.16	6'-0"	8.97	6'-6"	10.75	7'-0"	12.70	7'-6"	14.80		
	48"	6'-6"	8.46	7'-0"	10.15	7'-6"	12.00	8'-0"	14.01	6'-6"	10.75	7'-0"	12.74	7'-6"	14.90	8'-0"	17.23		
	54"	7'-0"	9.92	7'-6"	11.78	8'-0"	13.81	8'-6"	15.92	7'-0"	12.72	7'-6"	14.92	8'-0"	17.30	8'-6"	19.77		
	60"	7'-6"	11.53	8'-0"	13.57	8'-6"	15.78	9'-0"	18.15	7'-6"	14.88	8'-0"	17.31	8'-6"	19.92	9'-0"	22.71		

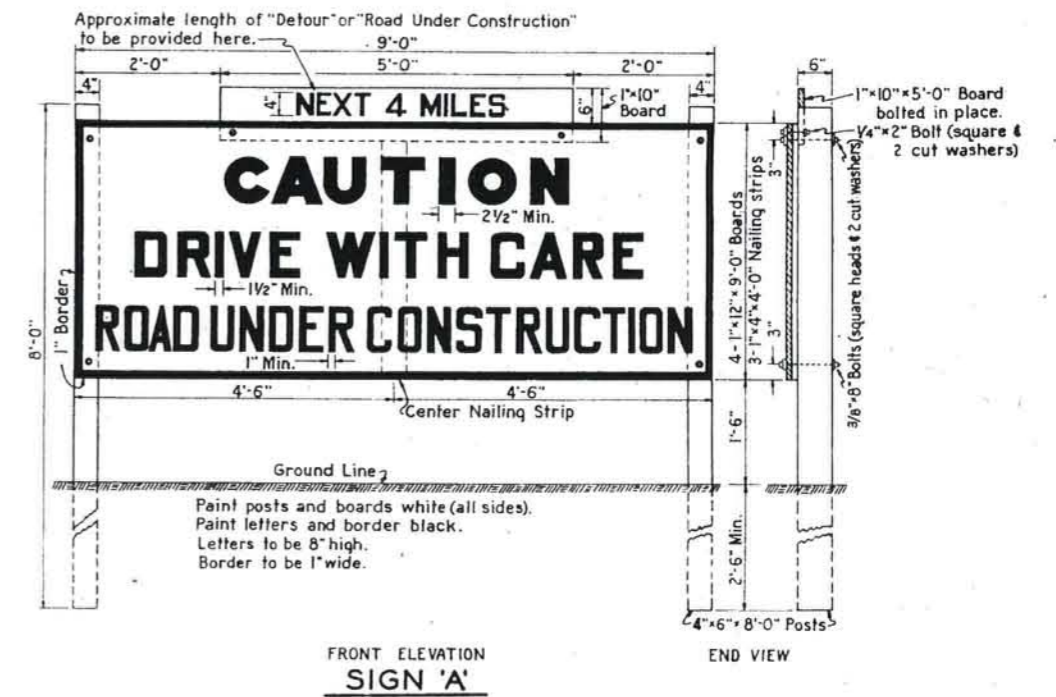
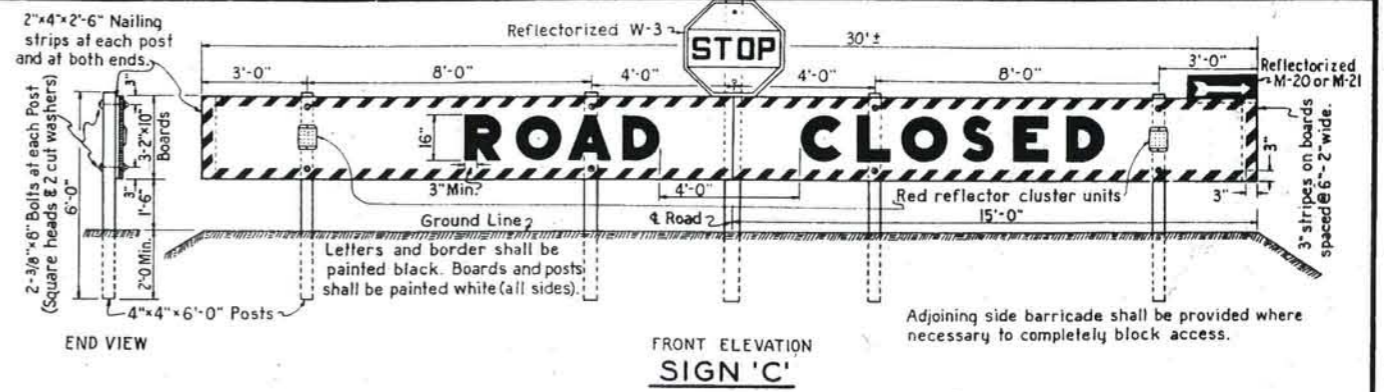
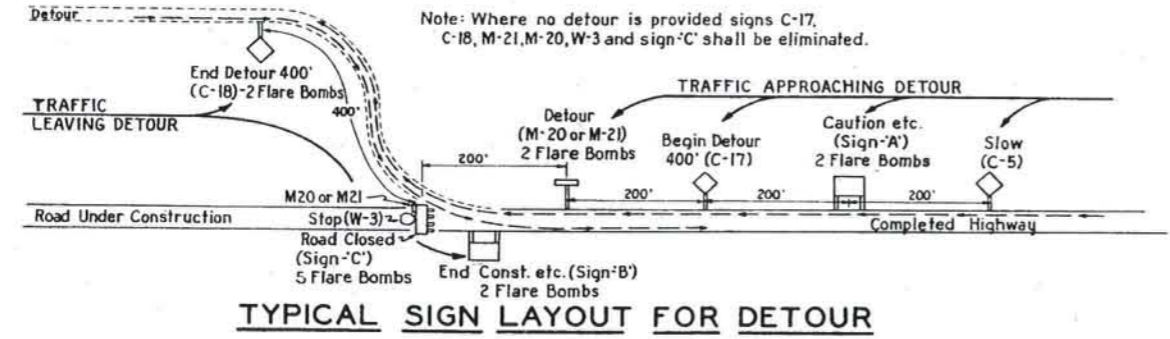
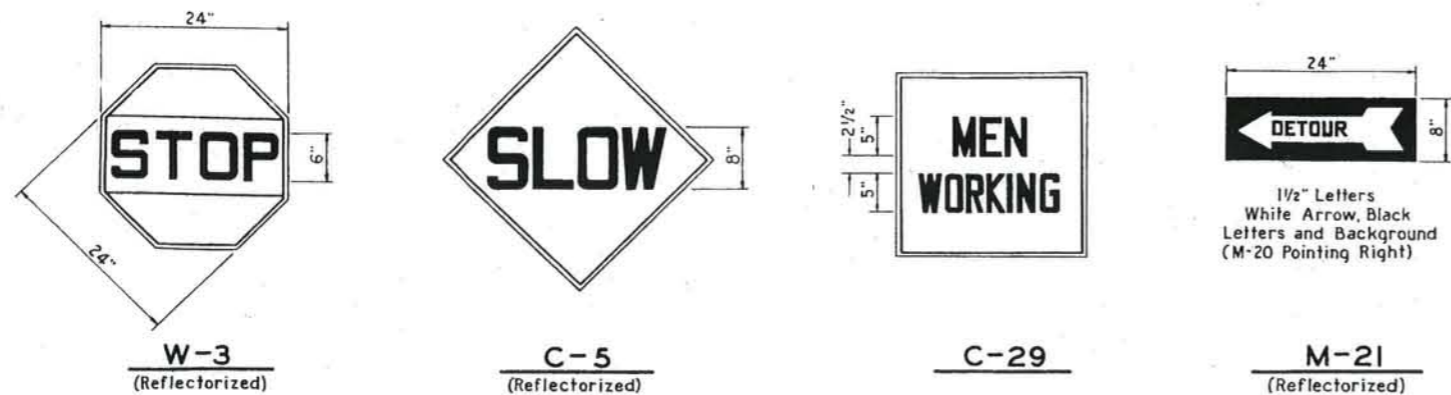
Note: Wing walls are to be constructed to conform in all cases with the fill slope adjacent to the headwall.

APPROVED *R. E. Copeland* DATE July 1935  
SENIOR HIGHWAY BRIDGE ENGINEER  
 APPROVED *J. H. Bennett* DATE 7-24-1935  
DISTRICT ENGINEER

FEDERAL WORKS AGENCY  
 PUBLIC ROADS ADMINISTRATION  
 DIVISION NO. 9 DENVER COLORADO

**STANDARD  
 MASONRY HEADWALLS  
 FOR  
 LARGE DIAMETER METAL PIPE CULVERTS**

Scale  
 INCHES 0 3 6 9 12 2 3 FEET



**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 signs 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 placed:  
1. At the end of the section where work is 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.

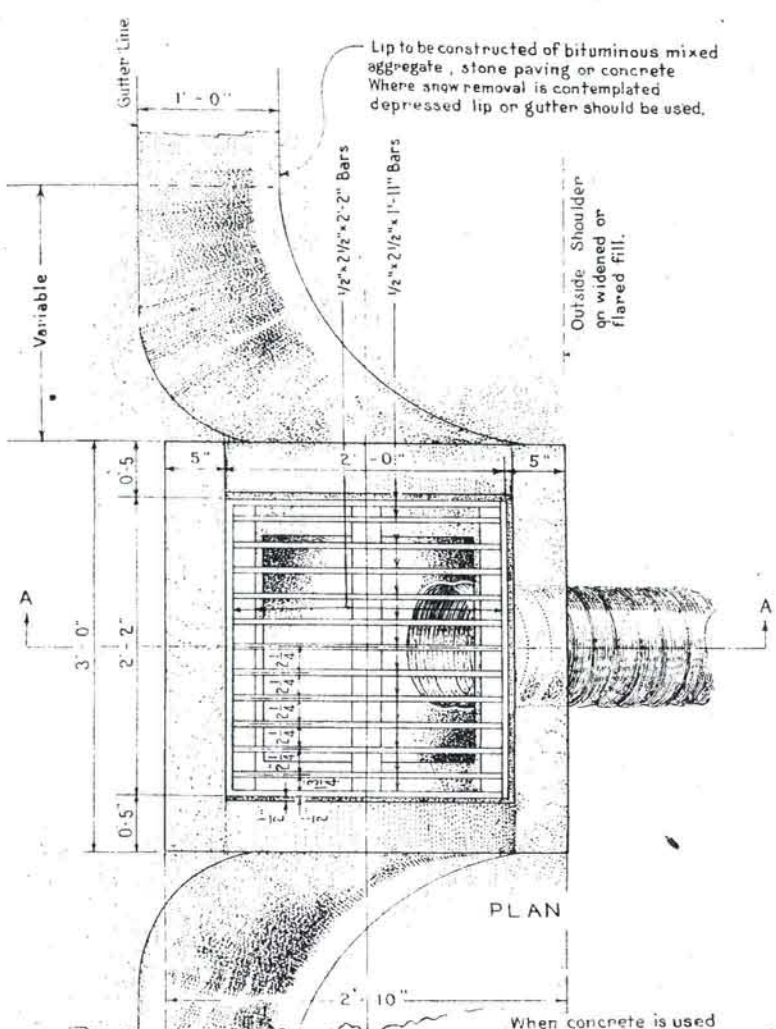
**GENERAL:**  
Selection and placement of signs shall be subject to approval of the engineer. Where signs other than those on the plans are required, they shall conform to the standards for the same class of signs as shown on the plans. The use of special signs shall be limited. Upon opening the work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



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

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DISTRICT NO. 3 DENVER, COLO.  
**TYPICAL SIGNS  
FOR USE  
ON CONSTRUCTION**

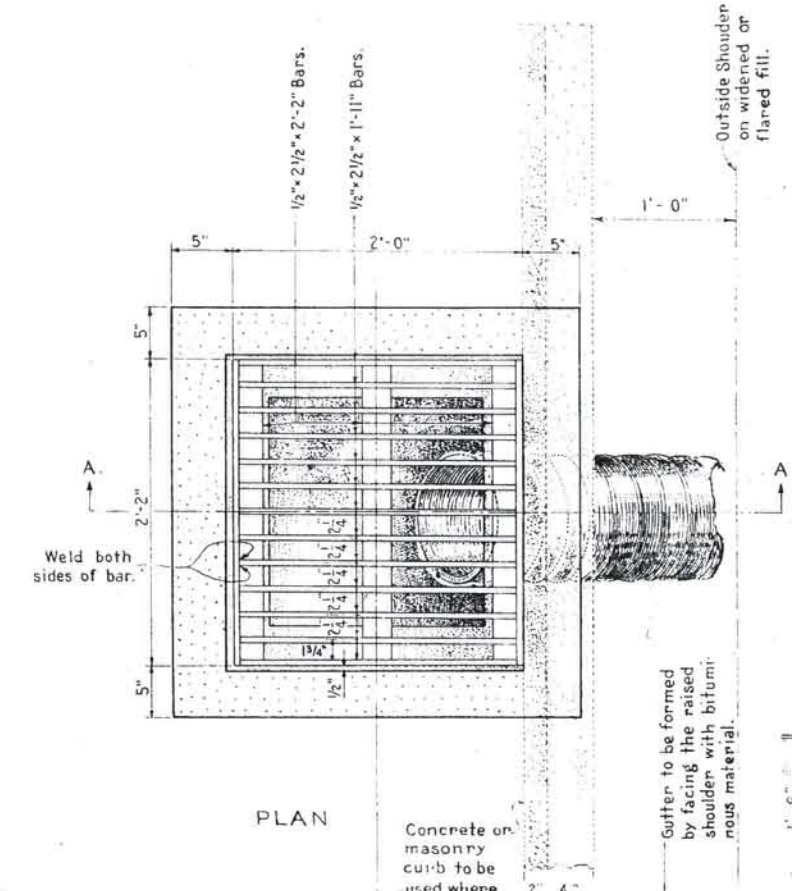
P. R. A. DIST. 3 DENVER COLO. JUNE 1 1935. REV. 7-141 M.W.W.



**TYPE 1**

SCALE 0 3 6 9 12 INCHES

Yardage .1 Basin, 0.47 Cu. Yds.



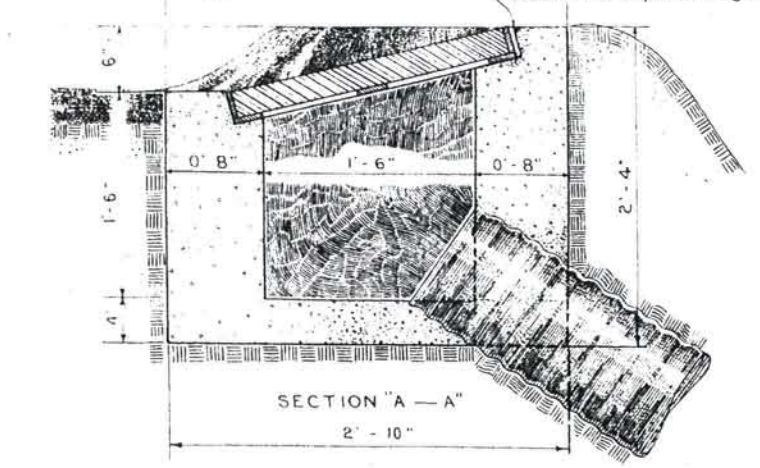
**TYPE 2**

SCALE 0 3 6 9 12 INCHES

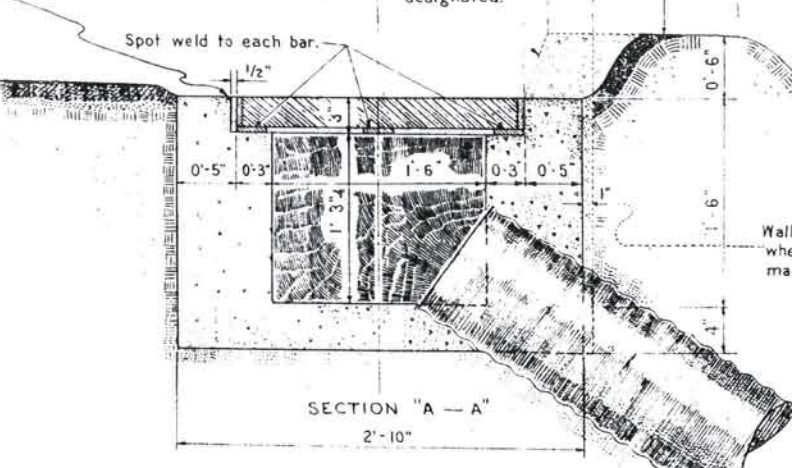
Yardage 1 Basin, 0.42 Cu. Yds.

**TYPE NO 1 & 2**

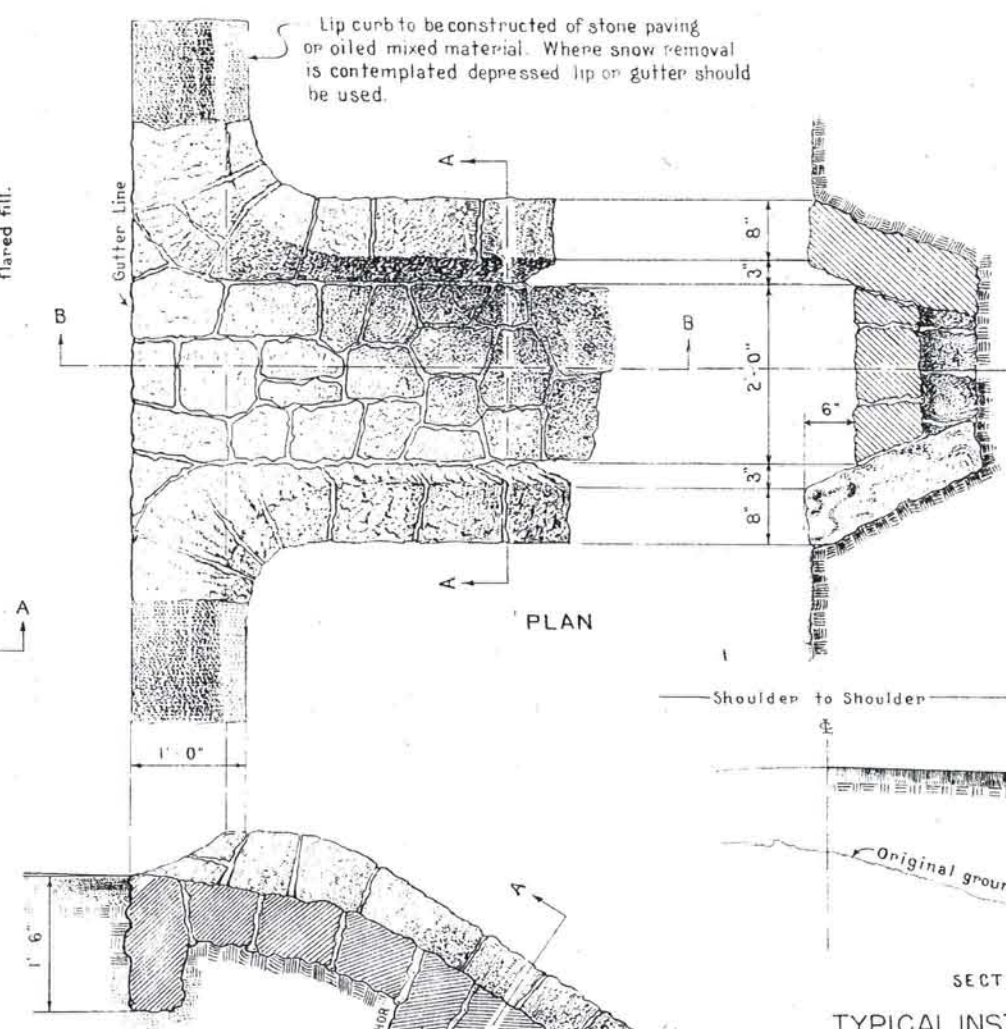
**EMBANKMENT INLETS** To be constructed of either class "A" concrete or stone masonry. Size of C.M.P. outlet culvert to be varied from 12" to 18" depending upon run off and area served.



**SECTION "A - A"**



**SECTION "A - A"**



**TYPE 3**

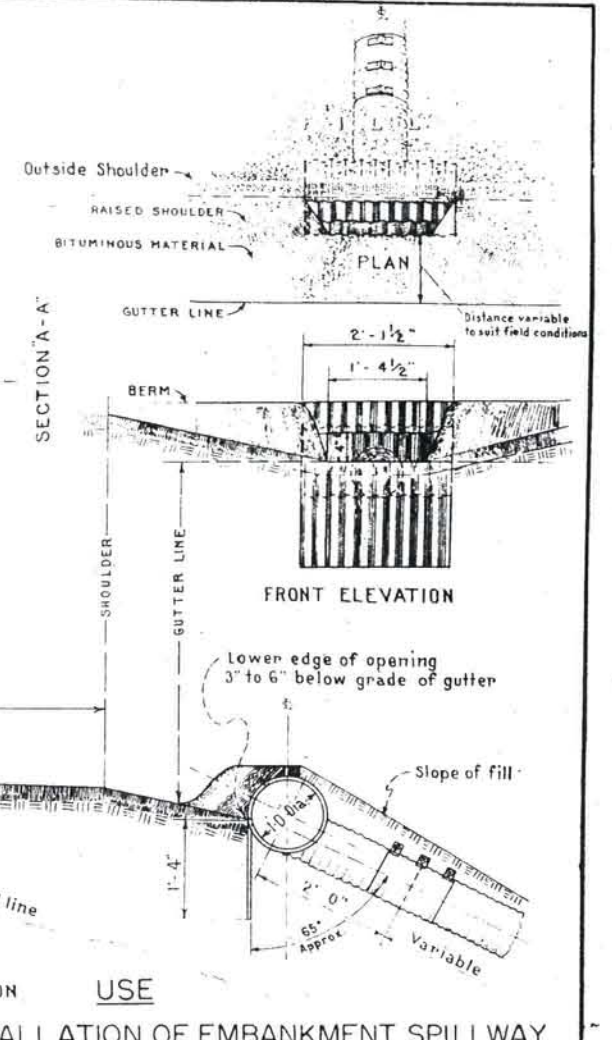
SCALE 0 1 2 FEET  
0 3 6 9 12 INCHES

Embankment Drain to be constructed to fit shoulder of roadway

**TYPE NO 3**

**EMBANKMENT DRAINS (Open Type)** To be constructed of class "A" concrete or a combination of stone masonry and stone paving. Where stone paving is used the joints are to be filled with 1-2 mortar or a 1-2-4 concrete. See special provisions for stone paving.

APPROVED February 7 1936  
*J. Elliott*  
DISTRICT ENGINEER



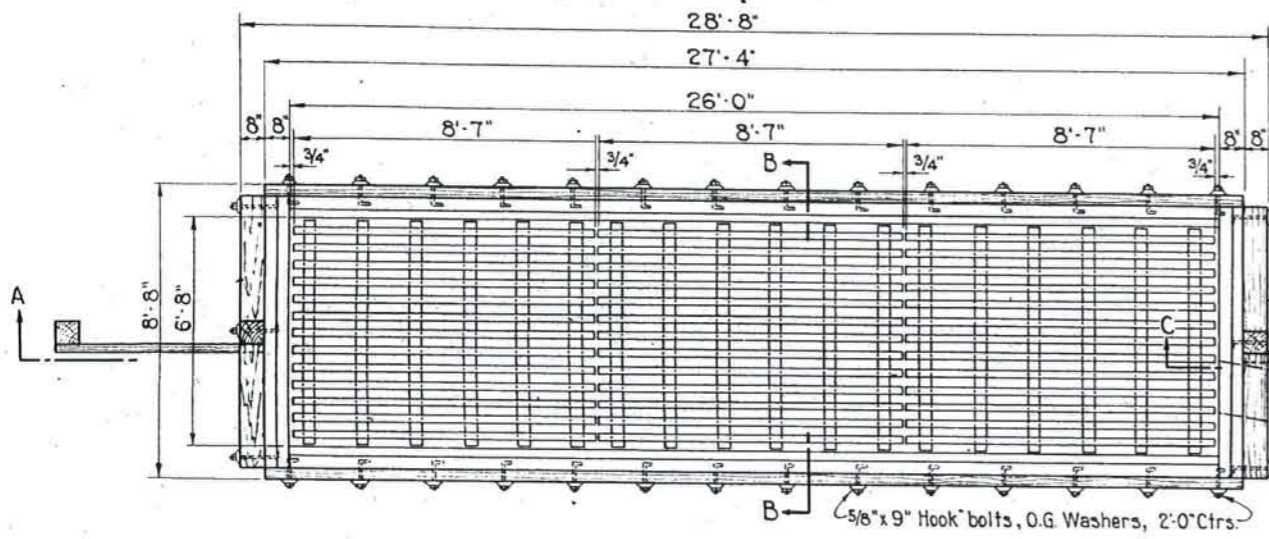
**SECTION USE**  
**TYPICAL INSTALLATION OF EMBANKMENT SPILLWAY IN EARTH GRADED ROAD**

**TYPE 4**

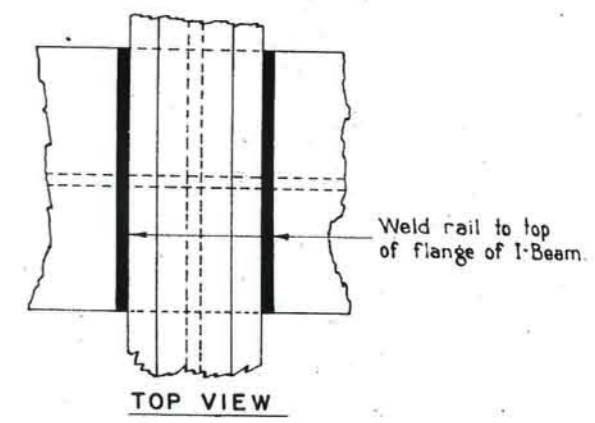
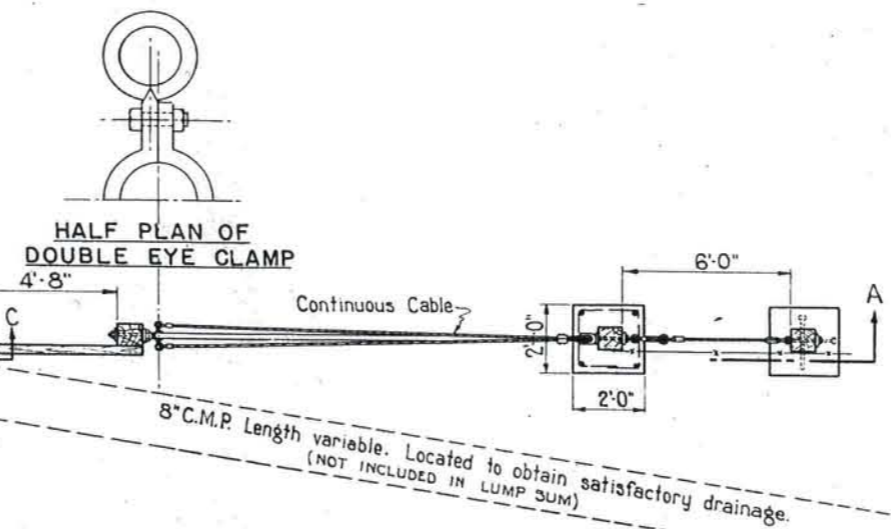
SCALE 0 1 2 FEET  
0 3 6 9 12 INCHES

**SPECIFICATIONS**  
Public Roads Administration Form F.P. 41.

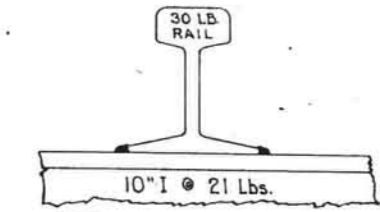
**STANDARD**  
**EMBANKMENT INLETS & DRAINS**  
SCALES AS NOTED



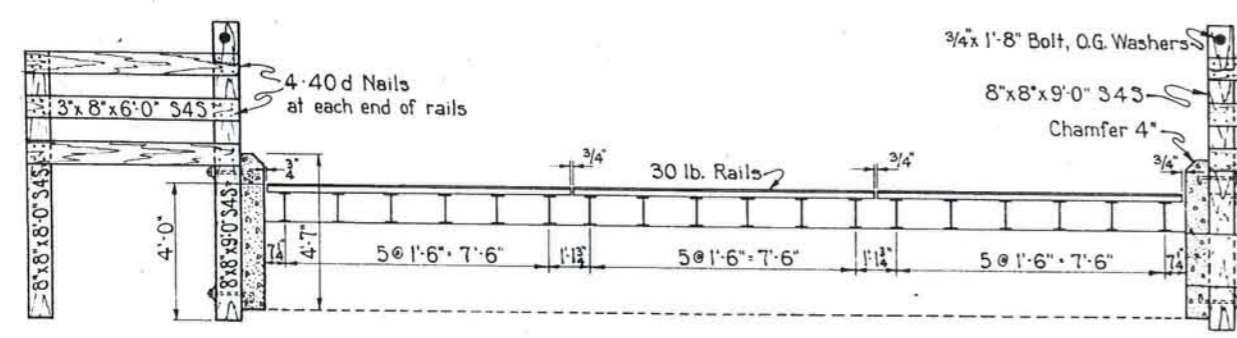
PLAN



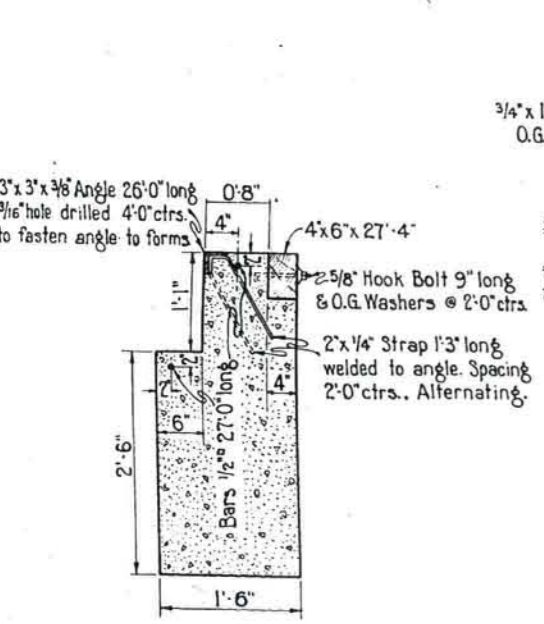
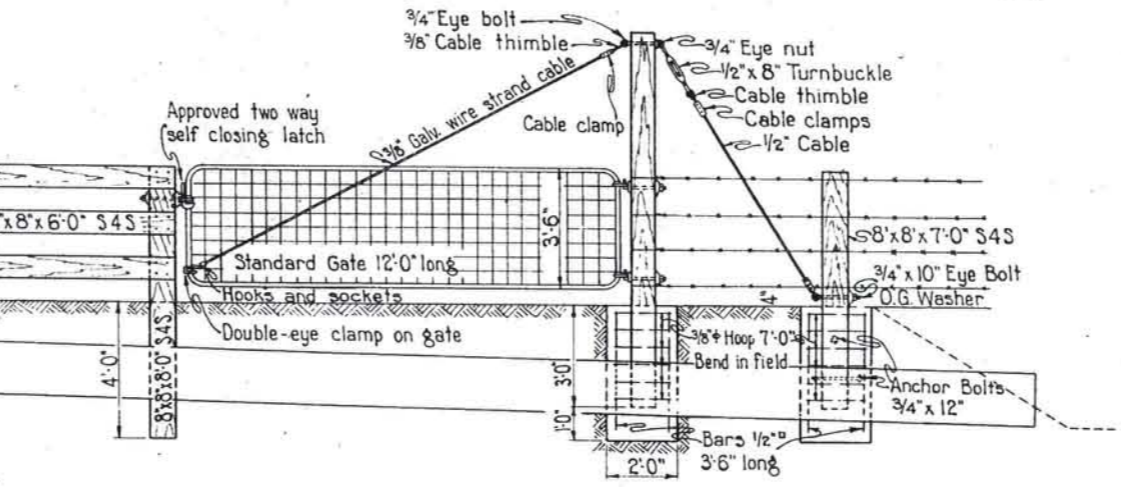
TOP VIEW



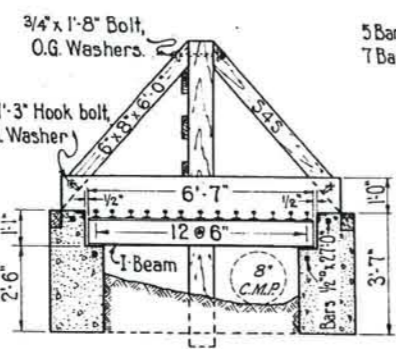
END VIEW OF RAIL  
DETAIL OF WELD  
(RAILS TO I-BEAMS)



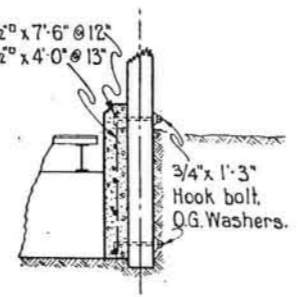
ELEVATION SECTION A-A



CROSS SECTION



SECTION B-B



SECTION C-C

LUMBER				HARDWARE			
PIECE	SIZE	FINISH	QUANTITY	PIECE & DESCRIPTION	SIZE	QUANTITY	LOCATION
Header	4'x6'x27'-4"		2	*Metal Gate Complete	Galv. 42"x12'-0"	1	Gate
Post	8'x8'x8'-0"	S4S	2	Cable Socket and Hook	" 3/8"	2	"
"	8'x8'x9'-0"	S4S	2	Double Eye Clamp with bolts	"	1	"
"	8'x8'x11'-0"	S4S	1	Wire Strand Cable	" 3/8"	30ft.	"
Fence Rail	3'x8'x6'-0"	S4S	6	Cable Clamps	" 3/8"	1	"
Brace	6'x8'x6'-0"	S4S	4	Cable Thimbles	" 3/8"	1	"
Anchor Post	8'x8'x7'-0"	S4S	1	Hook Bolts with nuts & O.G. washers	5/8"x9"	28	Headers
STEEL				Hook Bolts	" " " "	8	Curbs
Angle Iron	3/8" 3'x3'x26'-0"		2	Bolts with 2 O.G. washers & nut	3/4"x20"	2	Posts & Braces
Strap	1/4" 2'x1'-3"		26	Eye Bolt	" " " "	1	Post (Fence)
Bars	1/2" 27'-0"		4	Eye Bolt with eye nut & O.G.s	3/4"x10"	1	(Gate)
"	1/2" 4'-0"		14	Turnbuckle	1/2"x8"	1	Guy
"	1/2" 7'-6"		10	Cable Thimbles	" 1/2"	2	"
"	1/2" 3'-6"		8	Cable Clamps	" 1/2"	6	"
"	3/8" 7'-0"		12	Cable	" 1/2"	10 ft.	"
Rails	30* 8'-7"		39	Bolts	3/4"x12"	2	Anchor Post
I-Beams	21*(10)		18	Nails	40d	3 lbs.	Fence Rails

CONCRETE: 11.91 Cu.Yds. Class "A" (Pipe & posts deducted)

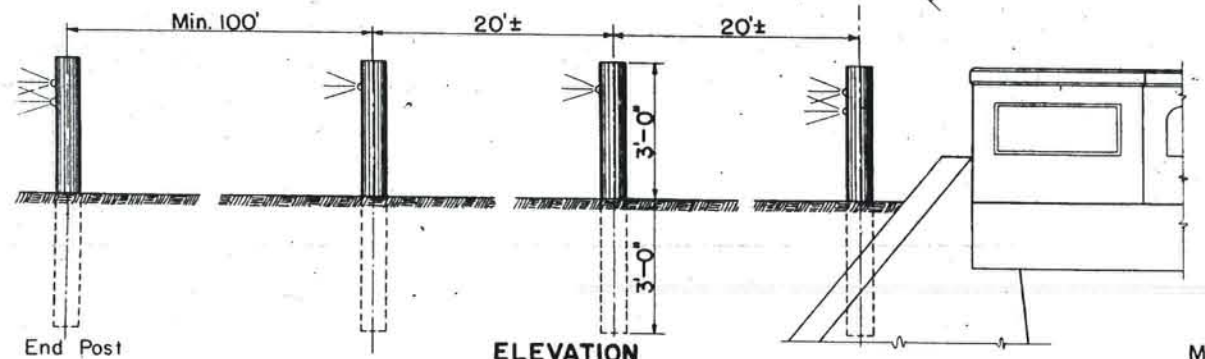
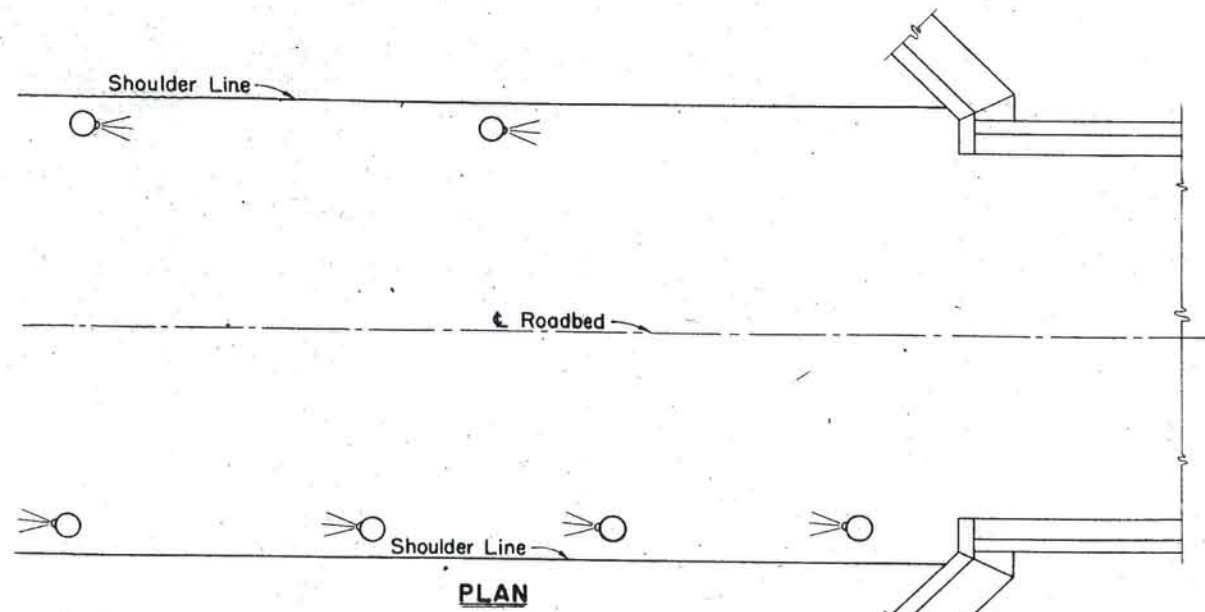
\*Metal Gate: Includes latch, hinges, all bolts, washers, nuts, etc.  
NOTE: All hardware to be galvanized except rails, I-beams and O.G. washers.

**GENERAL NOTES**  
**SPECIFICATION:** Public Roads Administration Form F.P. 41.  
**CONCRETE:** To be Class "A" with Portland Cement, Type II (Low Alkali) with an Air-Entraining Admixture.  
**TIMBER:** To be either Coast Region Douglas Fir or Southern Yellow Pine.  
**TREATMENT OF TIMBER:** Posts and Headers are to be treated in accordance with Item 230-2.3(a), F.P.41 Specifications. Horizontal fence rails and braces shall be painted with one primer coat and two coats of white lead and oil.  
**HARDWARE:** All bolts, clamps, and washers as noted to be Galvanized.  
**I-BEAMS & RAILS:** To be given two coats of red lead paint and one final field coat of approved paint after welding.  
**WELDS:** All welds to be continuous and all fillets 1/4". All welds to be shop welds unless special permission is given in writing by the Engineer, A.A.S.H.O. Standard Specifications for Arc Welding Metal Bridge Structures shall govern for all welding. Rails to be welded to I-Beams at each intersection.  
**BASIS OF PAYMENT:** To be lump sum for Cattle Guard Complete in place except as noted, including all labor and necessary materials.

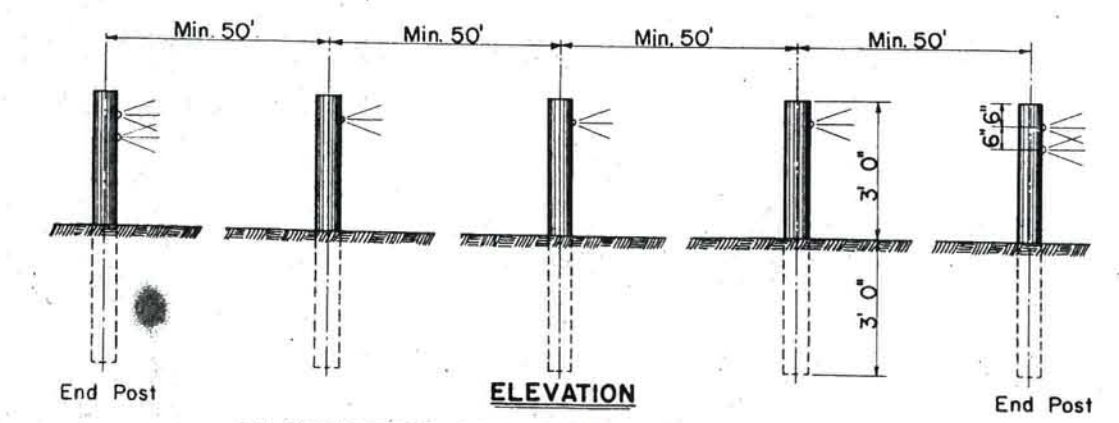
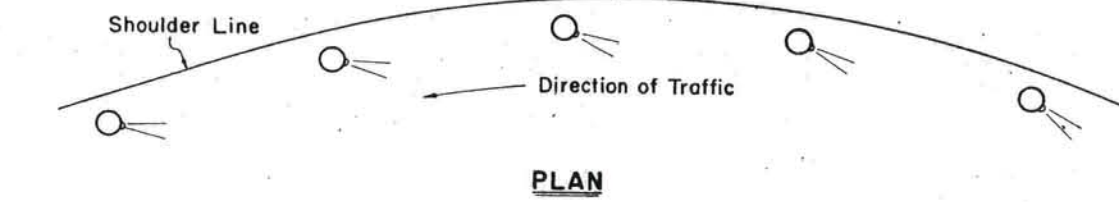
APPROVED: *R.F. Coland* 1938  
SENIOR HIGHWAY BRIDGE ENGINEER

FEDERAL WORKS AGENCY  
PUBLIC ROADS ADMINISTRATION  
DIVISION No. 9 DENVER, COLO.

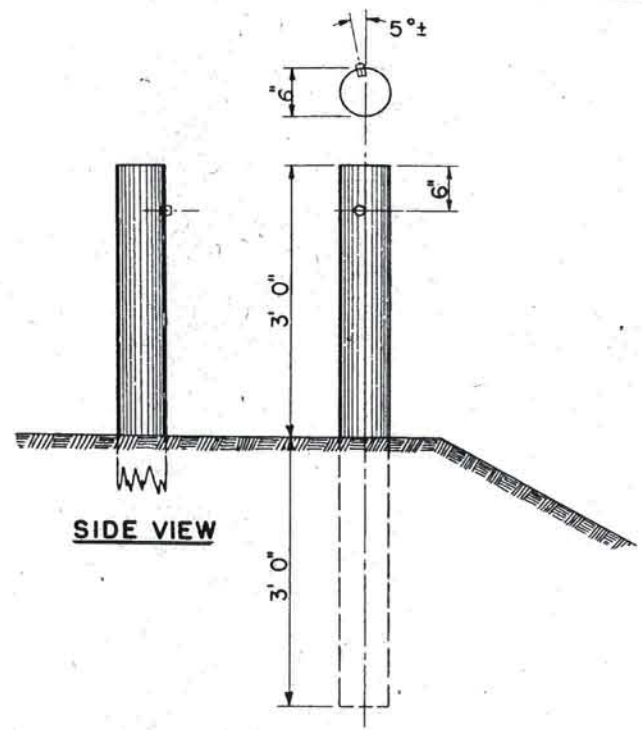
STANDARD  
CATTLE GUARD  
26 FT. ROADWAY



PLACEMENT AT BRIDGE APPROACHES AND ON TANGENTS



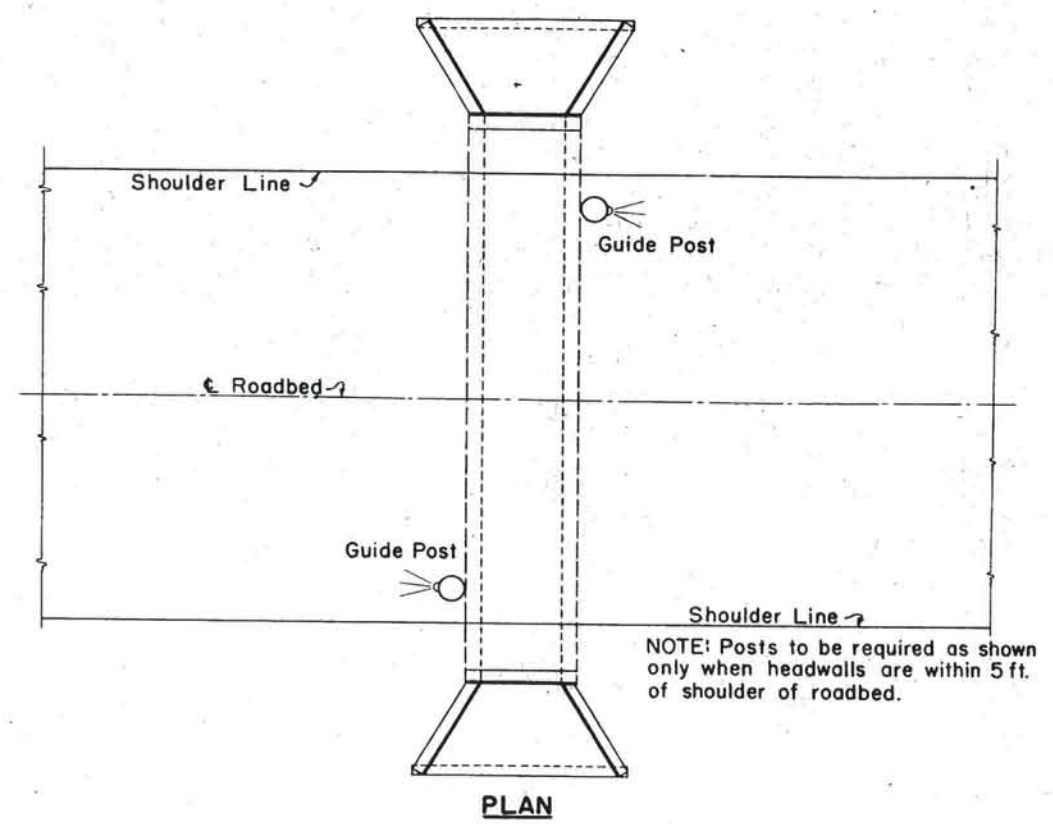
PLACEMENT ON HORIZONTAL CURVES



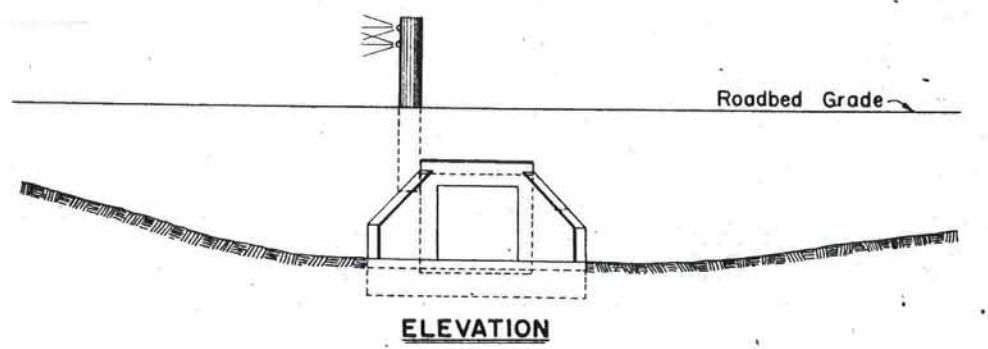
POST DETAIL

**GENERAL NOTES**

**Materials:** All posts shall be seasoned, straight, sound Southern Yellow Pine, West Coast Douglas Fir, or Lodge Pole Pine.  
 No section of post shall be less than 6" in diameter. All posts shall be entirely peeled and shaved, thoroughly seasoned and dry.  
 Reflector Units shall be "Signal Service" No. ALA-II (White Crystal) as manufactured by the Signal Service Corporation of New Jersey, or an acceptable equivalent.  
**Treatment:** All posts shall be treated as provided for in the Special Provisions.  
**Construction Methods:** Reflector Units in all posts shall be placed in such position that the units will function at a distance of 500 feet. On tangents, the Reflector Units shall be placed at an angle of approximately five degrees to a line parallel to the centerline of the highway. In all instances a test shall be made to assure the position of the Reflector Units to be the most effective possible. A flared clip or other acceptable device is to be used for holding the Reflector Units in place. The Engineer will determine the spacing and location of all Timber Guide Posts with reference to the curvature and height of fill.  
 The holes are to be center drilled to a size that will provide a snug fit for the type of reflector and locking devices furnished. The depth shall be sufficient to permit the setting of the tip of the reflector lens flush with the surface of the post.



NOTE: Posts to be required as shown only when headwalls are within 5 ft. of shoulder of roadbed.



PLACEMENT AT MINOR STRUCTURES

FEDERAL WORKS AGENCY  
 PUBLIC ROADS ADMINISTRATION  
 DIVISION NO. 9, DENVER, COLORADO

**TIMBER GUIDE POSTS WITH REFLECTORS**

