

U.S. DEPARTMENT OF COMMERCE
BUREAU OF PUBLIC ROADS

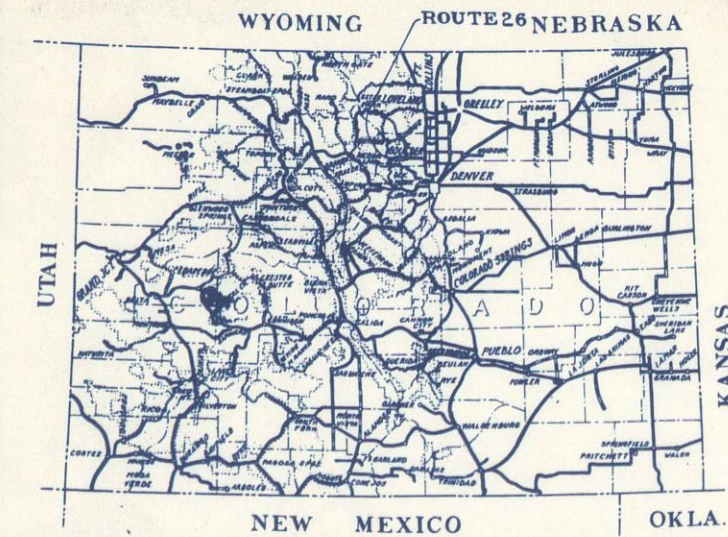
PLANS FOR PROPOSED
PROJECT 26-H4
ROUTE 26 SOUTH ST. VRAIN HIGHWAY
LYONS VIA RAYMOND TO ESTES PARK
37 MILES CLASS 2
COLORADO FOREST HIGHWAY SYSTEM

ROOSEVELT NATIONAL FOREST
BOULDER & LARIMER COUNTIES
COLORADO

DIV.	STATE	ROUTE	SECTION	SHEET	TOTAL
9	COLO.	26	H4	1	SHEETS

INDEX TO SHEETS

SHEET NO.	DESCRIPTION	STATION
1	Title Sheet	
2	Typical Sections	
3	Summary	
17-20	Plan & Profile	390+56 500+00
Rev. D3-Std. 117	Std. C.R.M. Hdws. for C.M.P. Culverts	
D3-Std. 131	" Maintenance Posts	
Rev. D3-Std. 143	Typical Construction Signs	
D3-Std. 162-A	Ref. Timber Guide Posts	
" " 163	Conc. Box Culvert 10'x10'x75'	458+30
" " 117-A	L-Type Hdws. for C.M.P. Culverts	
1-26	Cross Sections	390+56 500+00



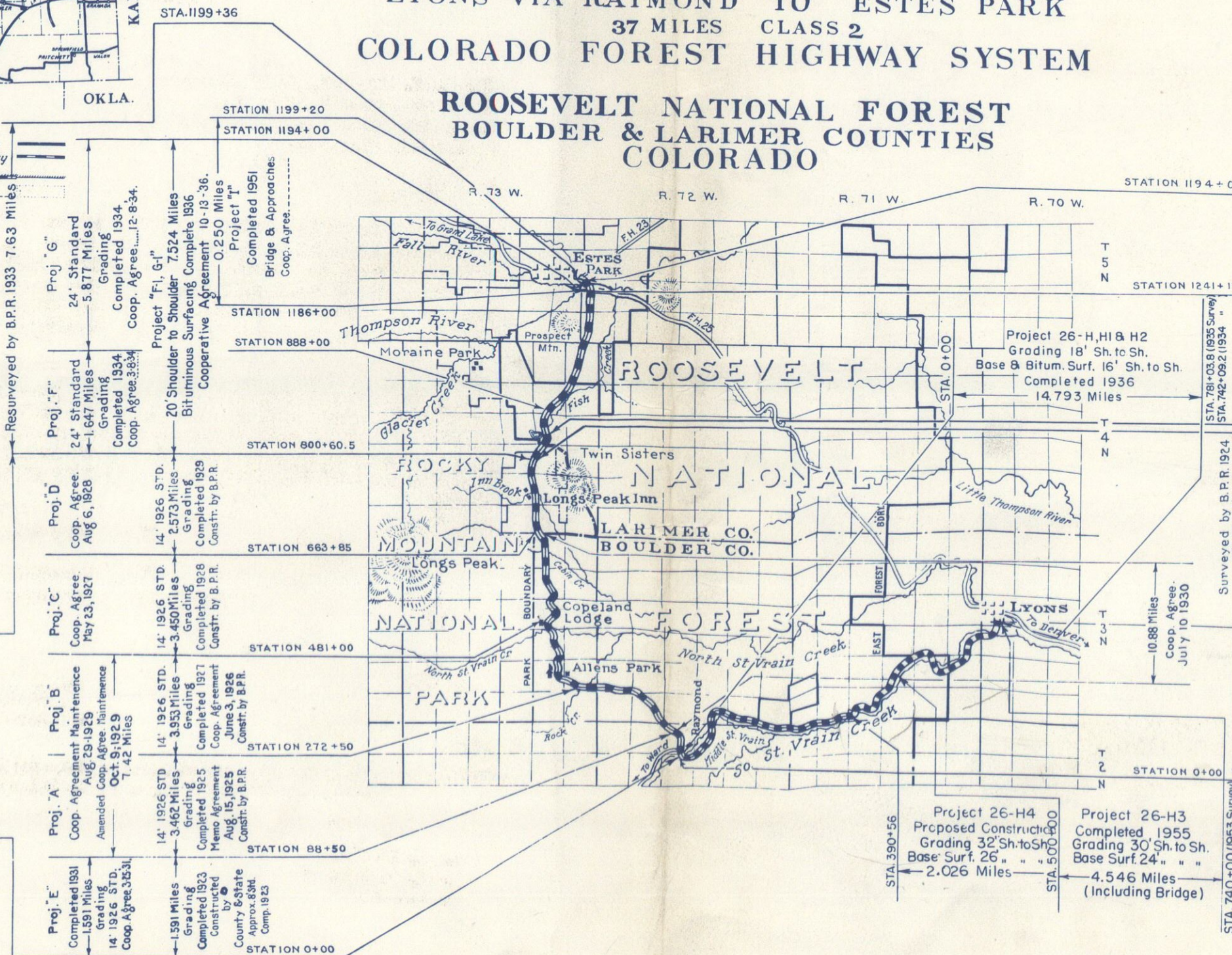
TRAFFIC VOLUME
A.D.T. (1955) - 525
A.D.T. (1972) - 1000
D.H.V. - 150
D. - 330
T. - 30%
V. - 35

INDEX MAP

Scale Miles
0 1 2 3 4 5 6

LEGEND

EXISTING ROADS	UNIMPROVED	GRADED	REINFORCED SUBGRADE	BASE COURSE	CR. ROCK GR. MACADAM	BITUMINOUS TYPES
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Maintenance Cooperative Agreement May 14, 1937 April 15, 1938

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

APPROVED **E. C. HARRINGTON** DATE **MAR 15 1938**

DIVISION ENGINEER
BY DESIGN ENGINEER

APPROVED

DISTRICT ENGINEER

APPROVED

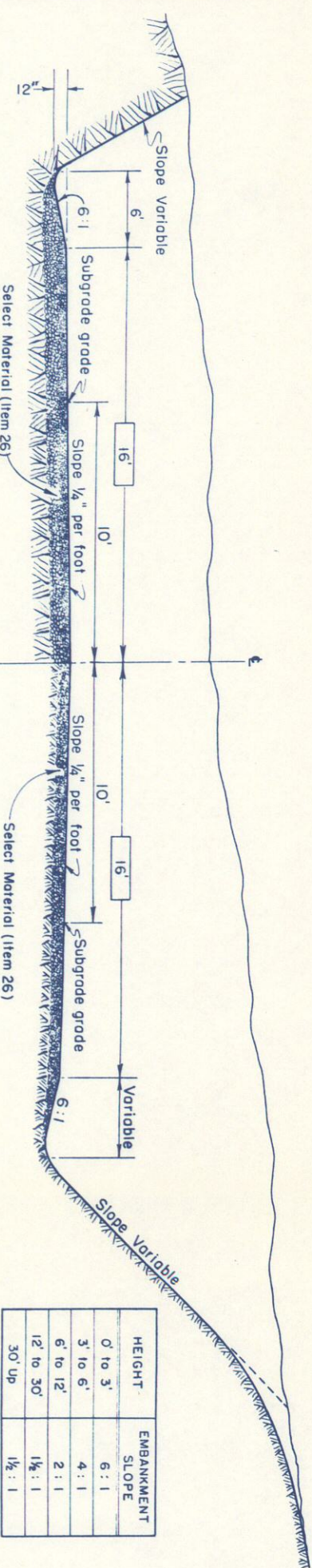
REGIONAL FORESTER

APPROVED

CHIEF ENGINEER
COLORADO DEPARTMENT OF HIGHWAYS

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

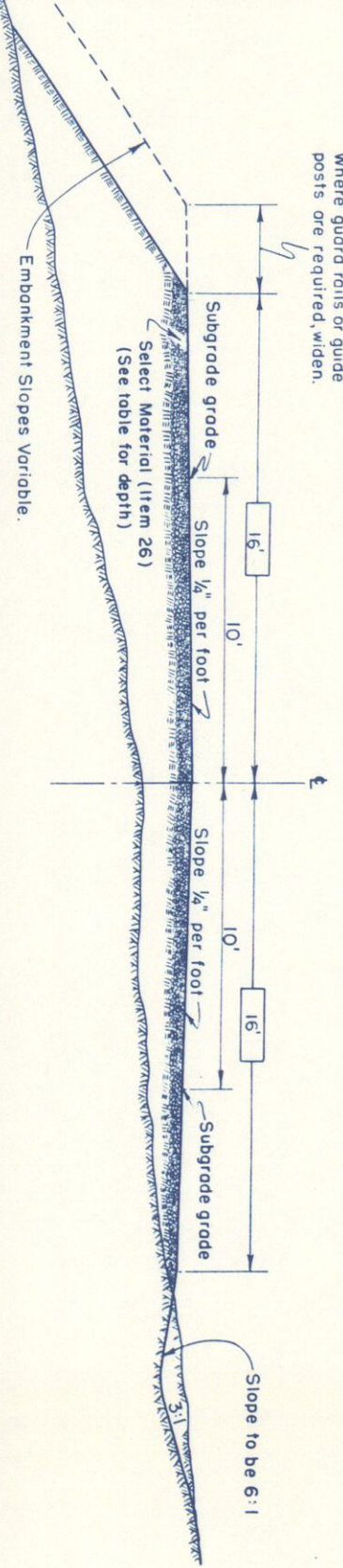
When field conditions indicate the need for slopes other than those indicated above, they shall be constructed as sloped by the Engineer.

SLOPE ROUNDING FACTORS		ALTERNATE ROUNDING DIMENSIONS	
NATURAL GROUND SLOPE	CUT SLOPE	SEMI-TANGENTS "B"	FRONT OF SLOPE STAKE "E"
VARIABLE	0'-5'	3:1	5'
VARIABLE	5'-10'	2:1	5'
RELATIVELY FLAT (6:1 AND FLATTER)	10'-15'	1 1/2:1	5'
MODERATELY FLATTER	15'-30'	1:1	8' **
STEEP (6:1 TO 3:1)	15'-30'	1 1/2:1	5' *
STEEP (STEEPER THAN 3:1)	OVER 30'	1:1	5' +

+ Measured on slope surface.
* Desirable
** Minimum (Wooded)
These ratios are desirable in steep terrain.

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

ROUNDING, WARPING, AND FINISHING SLOPES, AS PROVIDED IN ITEM 24 - 3.9, F.P. - 41 SPECIFICATIONS.



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EMBANKMENT SECTION

TYPICAL HALF
SHALLOW EMBANKMENT SECTION

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STATION TO STATION	DEPTH	DEPTH
390+56	500+00	9"
		None

Item 26, Unclassified Excavation for Borrow, depth as indicated in above table.

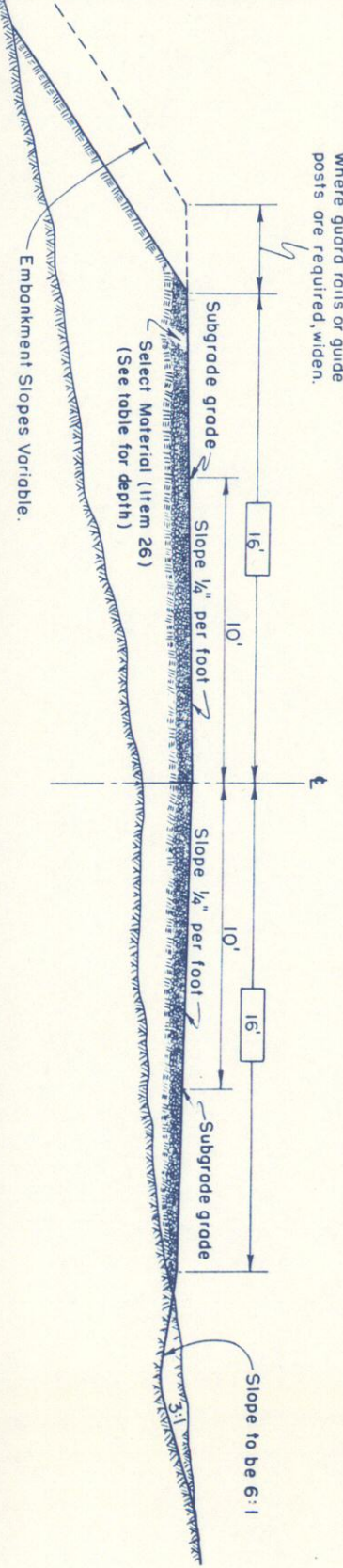
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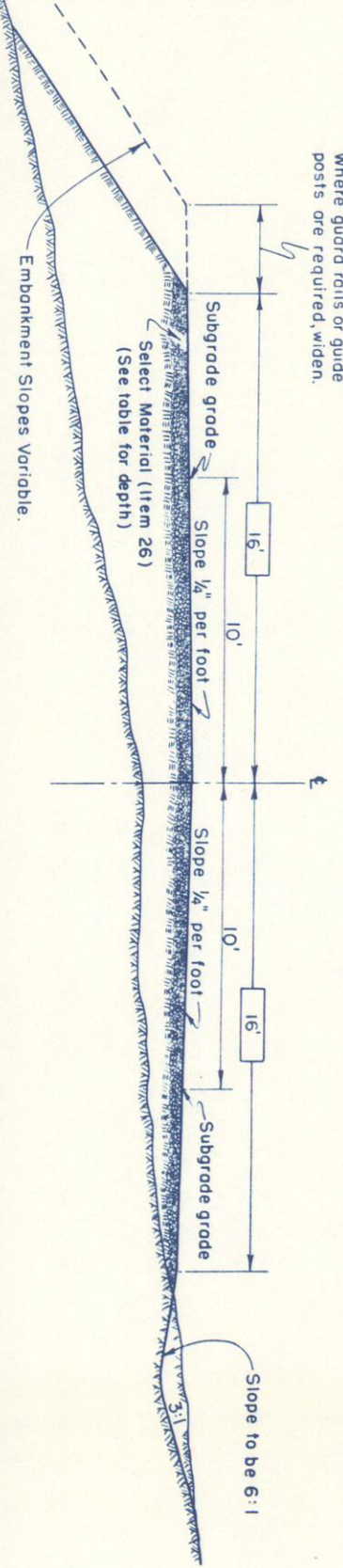
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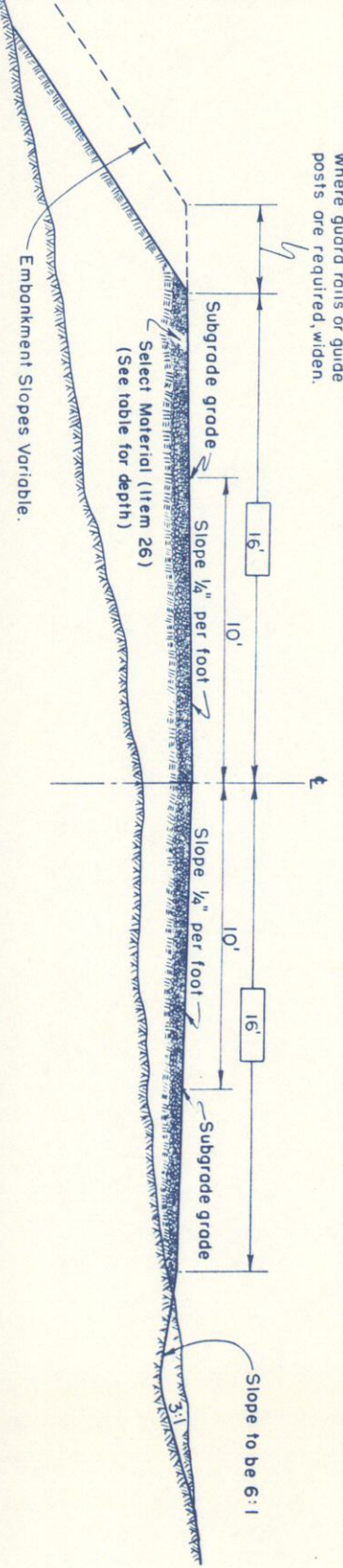
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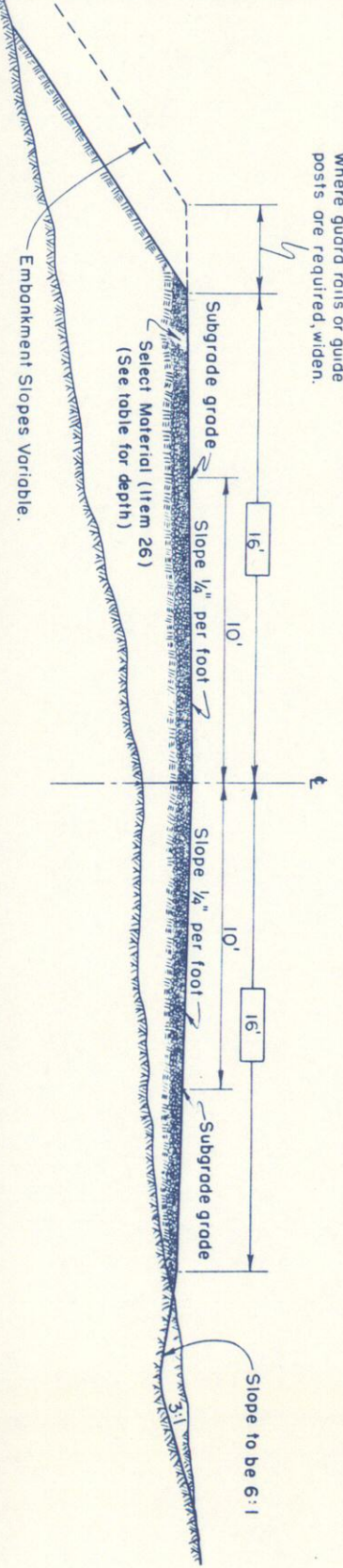
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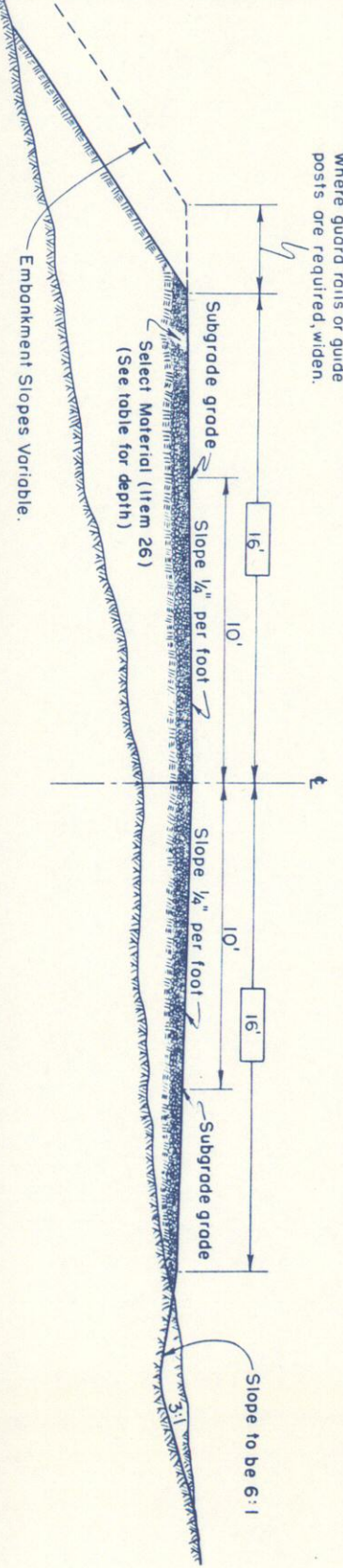
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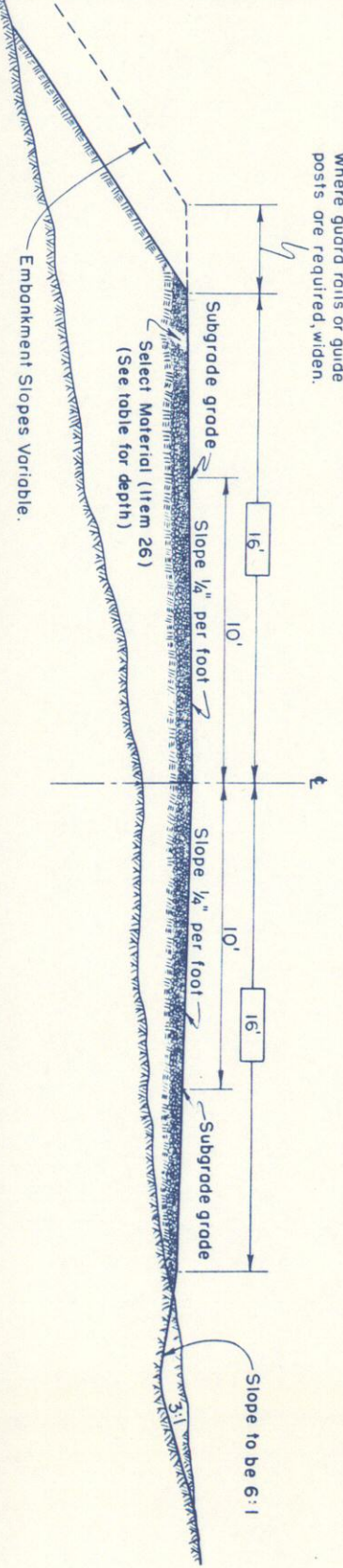
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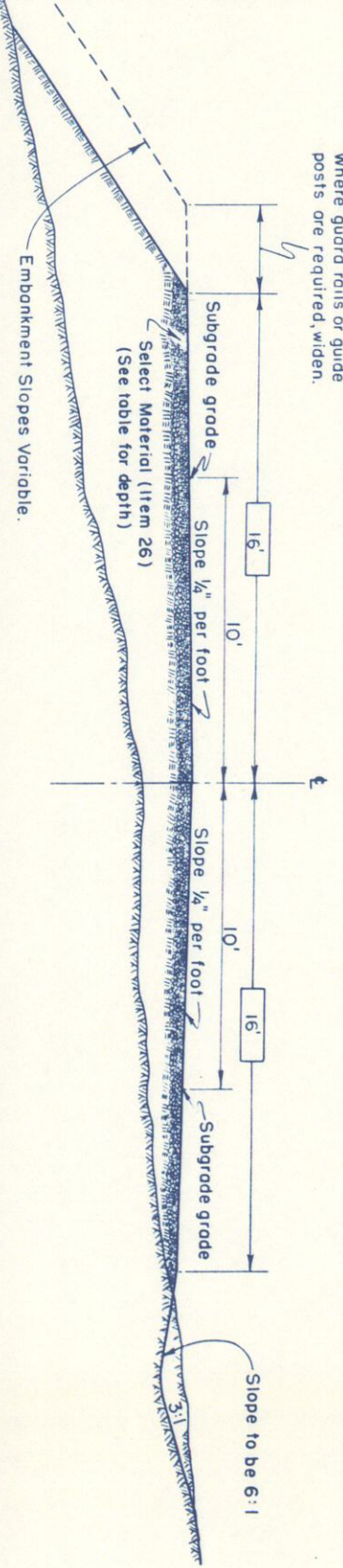
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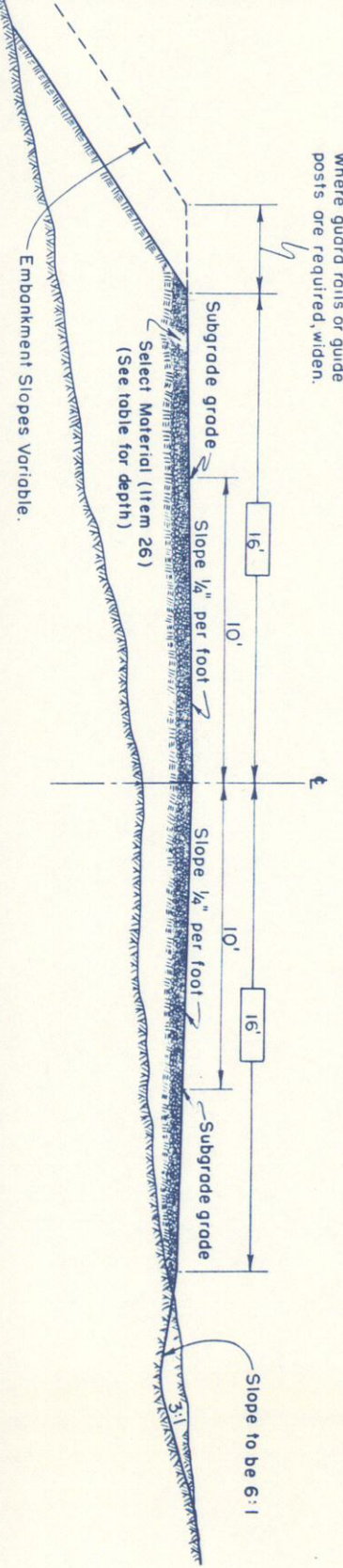
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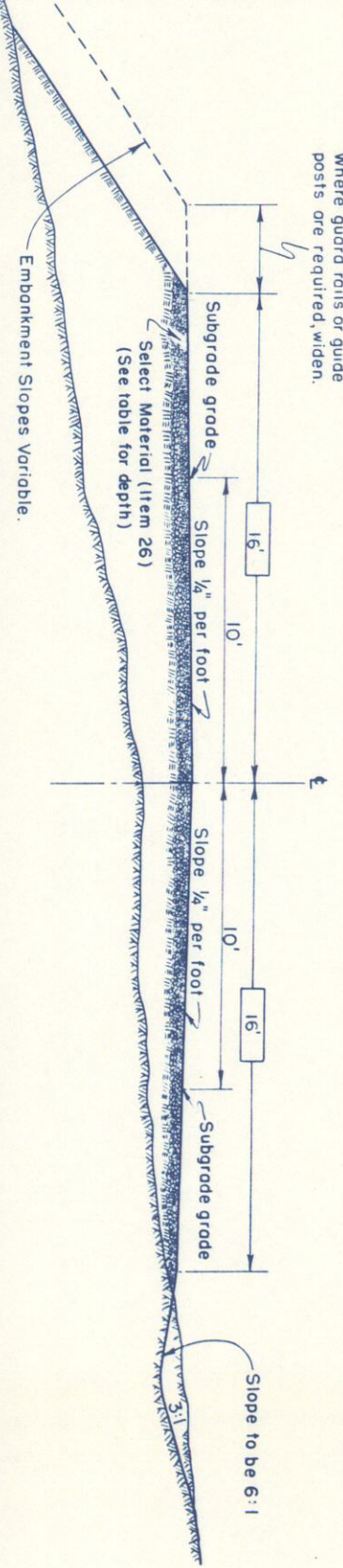
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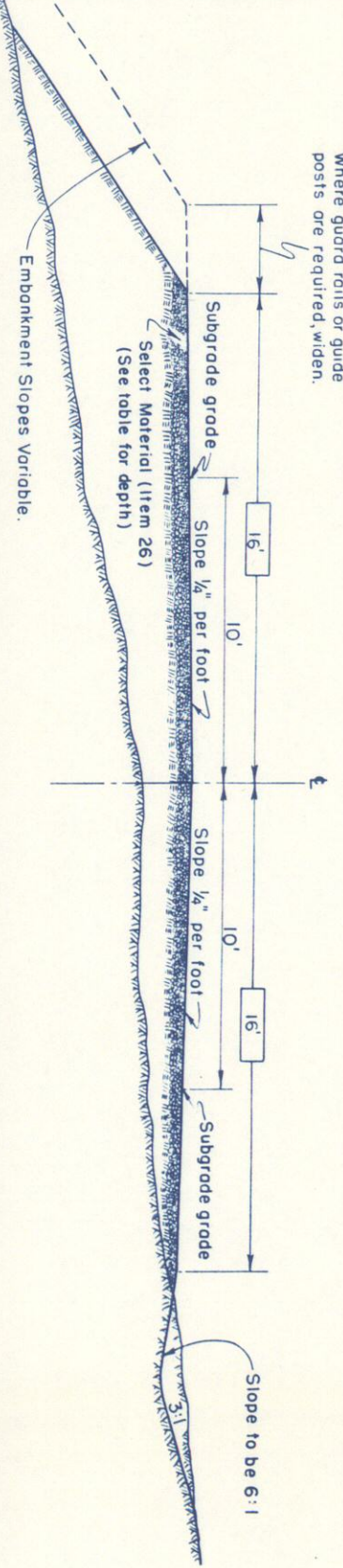
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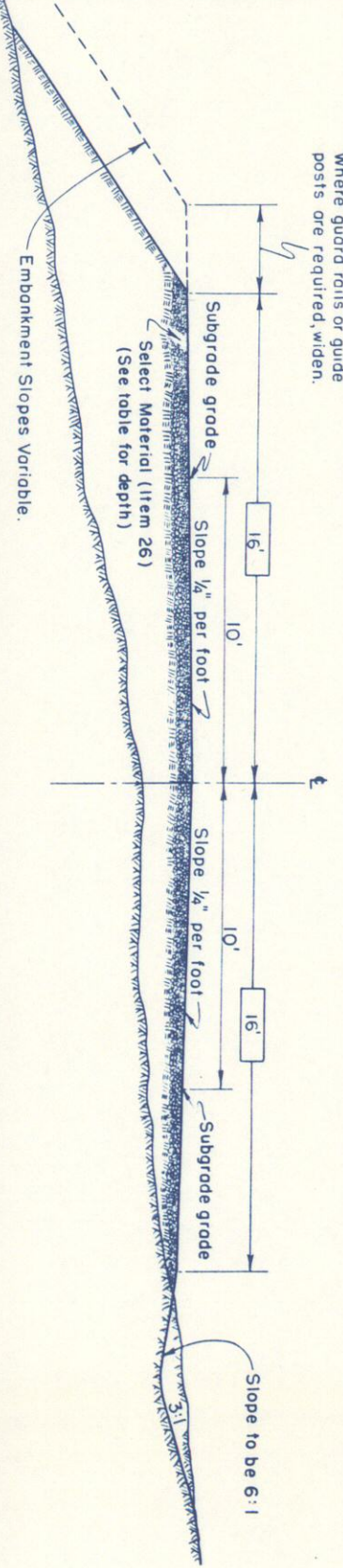
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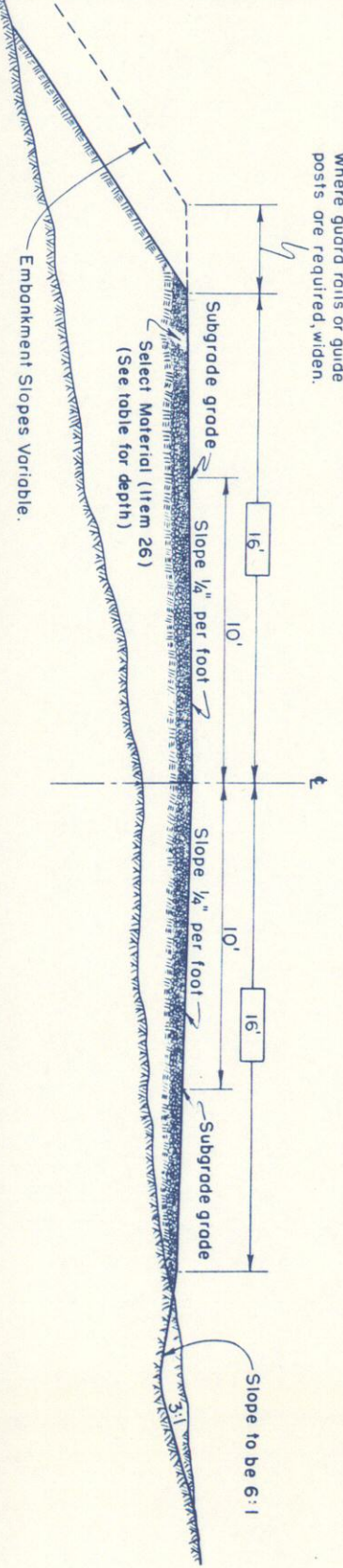
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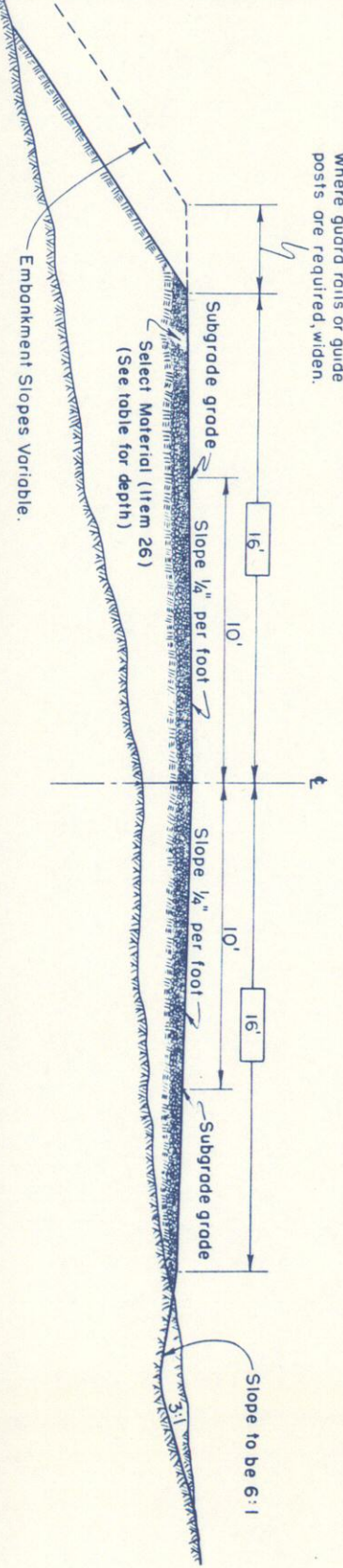
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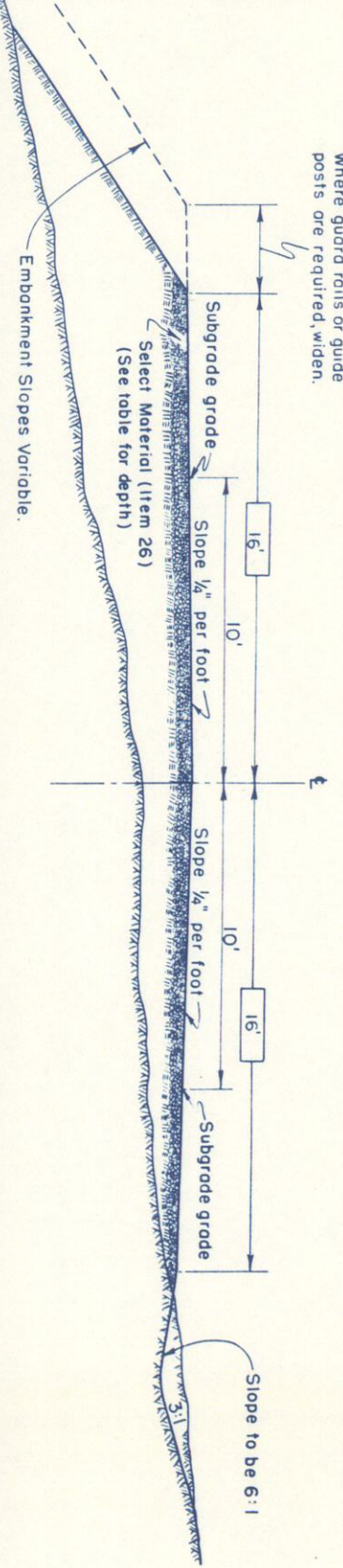
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SUMMARY OF QUANTITIES

[illegible]

RECAPITULATION OF ITEMS		ITEMS	QUANTITY
ITEM#	NAME	UNIT	
20(2)	Clearing and Grubbing	Lump Sum	
24(1)	Undersized Retention	Cu.Yd.	139,000
25(1)	Undersized Retention for Structures	Cu.Yd.	660
26(1)	Undersized Retention for Borrow, Class 1	Cu.Yd.	16,000
27(2)	Overhaul (1,000 Ft. Free Haul)	Stra.Yd.	420,000
28(2)	Special Overhaul of Borrow (1,000 Ft. Free Haul)	C.Y.M.	24,000
34(2)	Disturbance of Old Roadways to be paid for as earned	Contingent Sum	
45(1)	Watering of Subgrade	Unit	1,550
45(3)	Watering of Base Courses	Unit	240
45(5)	Providing and Maintaining Water Plant or Plants	Lump Sum	
46(1)	Rolling of Subgrade	Sq.Yd.	770
46(3)	Rolling of Base Course	Sq.Yd.	70
52(2)	Crushed Gravel or Crushed Stone Base Course, Class 2, Opening 3/4"	Ton	8,200
52(4)	Prepacked Bituminous Base	Sq.Yd.	43,000
52(5)	H.C. Crushed Asphalt, Grade 0, 1/2", or 3/4"	Sq.Yd.	50,000
52(6)	H.C. Crushed Asphalt, Grade 0 or 1	Sq.Yd.	5,000
206(1)	Concrete Class A (Air-entrained Concrete, Low-alkal Cement)	Cu.Yd.	142
207(1)	Reinforcing Steel	Lb.	17,500
246(1)	Cement, Mobile Economy	Cu.Yd.	76
253(1)	2 1/2-Inch O.D. Culvert Pipe	Linn.Ft.	3,648
361(1)	Concrete Maintenance Marker Posts	Each	11
381(3)	Plaster Outside Posts with Marker Strips (Treated), Type 1	Each	220

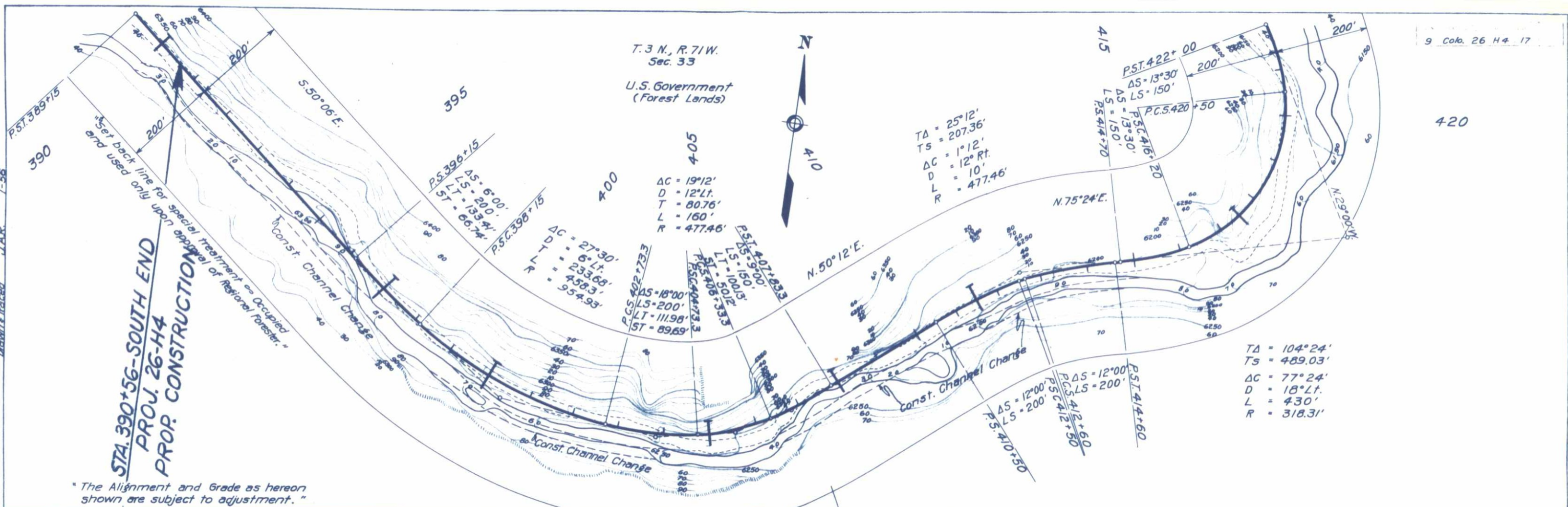
Project Stations 350+56 to 500+00
Length of project: 2,006 miles
Gravel: 35-ft. roadbed
Base course material: Crushed Gravel, or Crushed Stone Base Course,
Class 2, opening 2-in., width 28", depth 4", weight 135 lbs. per cu. ft.
Bitumens stabilization of base: 1% depth
H.C. Asphalt Asphalt, Grade 0, 1, 2, or 3, for Prime, 0.3 gal. per
sq.yd., Stabilization 0.8 gal. per sq.yd.
H.C. Asphalt Asphalt for Top Coat, 0.2 gal. per sq.yd., Grade 0 or 1
Severe Traffic Roadway, ~~0.3 gal. per sq.yd.~~ ~~0.4 gal. per sq.yd.~~ ~~0.5 gal. per sq.yd.~~ ~~0.6 gal. per sq.yd.~~ ~~0.7 gal. per sq.yd.~~ ~~0.8 gal. per sq.yd.~~ ~~0.9 gal. per sq.yd.~~ ~~1.0 gal. per sq.yd.~~ ~~1.1 gal. per sq.yd.~~ ~~1.2 gal. per sq.yd.~~ ~~1.3 gal. per sq.yd.~~ ~~1.4 gal. per sq.yd.~~ ~~1.5 gal. per sq.yd.~~ ~~1.6 gal. per sq.yd.~~ ~~1.7 gal. per sq.yd.~~ ~~1.8 gal. per sq.yd.~~ ~~1.9 gal. per sq.yd.~~ ~~2.0 gal. per sq.yd.~~ ~~2.1 gal. per sq.yd.~~ ~~2.2 gal. per sq.yd.~~ ~~2.3 gal. per sq.yd.~~ ~~2.4 gal. per sq.yd.~~ ~~2.5 gal. per sq.yd.~~ ~~2.6 gal. per sq.yd.~~ ~~2.7 gal. per sq.yd.~~ ~~2.8 gal. per sq.yd.~~ ~~2.9 gal. per sq.yd.~~ ~~3.0 gal. per sq.yd.~~ ~~3.1 gal. per sq.yd.~~ ~~3.2 gal. per sq.yd.~~ ~~3.3 gal. per sq.yd.~~ ~~3.4 gal. per sq.yd.~~ ~~3.5 gal. per sq.yd.~~ ~~3.6 gal. per sq.yd.~~ ~~3.7 gal. per sq.yd.~~ ~~3.8 gal. per sq.yd.~~ ~~3.9 gal. per sq.yd.~~ ~~4.0 gal. per sq.yd.~~ ~~4.1 gal. per sq.yd.~~ ~~4.2 gal. per sq.yd.~~ ~~4.3 gal. per 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sq.yd.~~ ~~20.6 gal. per sq.yd.~~ ~~20.7 gal. per sq.yd.~~ ~~20.8 gal. per sq.yd.~~ ~~20.9 gal. per sq.yd.~~ ~~21.0 gal. per sq.yd.~~ ~~21.1 gal. per sq.yd.~~ ~~21.2 gal. per sq.yd.~~ ~~21.3 gal. per sq.yd.~~ ~~21.4 gal. per sq.yd.~~ ~~21.5 gal. per sq.yd.~~ ~~21.6 gal. per sq.yd.~~ ~~21.7 gal. per sq.yd.~~ ~~21.8 gal. per sq.yd.~~ ~~21.9 gal. per sq.yd.~~ ~~22.0 gal. per sq.yd.~~ ~~22.1 gal. per sq.yd.~~ ~~22.2 gal. per sq.yd.~~ ~~22.3 gal. per sq.yd.~~ ~~22.4 gal. per sq.yd.~~ ~~22.5 gal. per sq.yd.~~ ~~22.6 gal. per sq.yd.~~ ~~22.7 gal. per sq.yd.~~ ~~22.8 gal. per sq.yd.~~ ~~22.9 gal. per sq.yd.~~ ~~23.0 gal. per sq.yd.~~ ~~23.1 gal. per sq.yd.~~ ~~23.2 gal. per sq.yd.~~ ~~23.3 gal. per sq.yd.~~ ~~23.4 gal. per sq.yd.~~ ~~23.5 gal. per sq.yd.~~ ~~23.6 gal. per sq.yd.~~ ~~23.7 gal. per sq.yd.~~ ~~23.8 gal. per sq.yd.~~ ~~23.9 gal. per sq.yd.~~ ~~24.0 gal. per sq.yd.~~ ~~24.1 gal. per sq.yd.~~ ~~24.2 gal. per sq.yd.~~ ~~24.3 gal. per sq.yd.~~ ~~24.4 gal. per sq.yd.~~ ~~24.5 gal. per sq.yd.~~ ~~24.6 gal. per sq.yd.~~ ~~24.7 gal. per sq.yd.~~ ~~24.8 gal. per sq.yd.~~ ~~24.9 gal. per sq.yd.~~ ~~25.0 gal. per sq.yd.~~ ~~25.1 gal. per sq.yd.~~ ~~25.2 gal. per sq.yd.~~

PLAN	DATE	BY	CHKD.
DESIGNED	1965	BEI	
PLOTTED			
NOTES			
NO.			

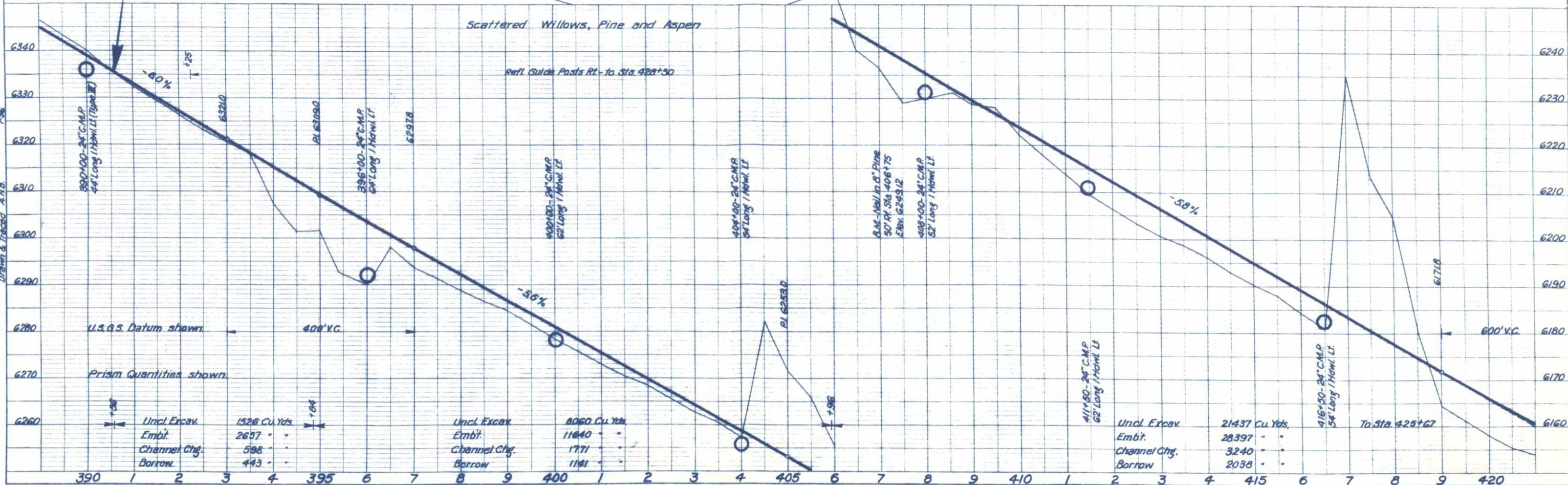
Drawn & Traced A.H.B.

PROFILE	DATE	BY	CHKD.
DESIGNED	1965	BEI	
PLOTTED			
NOTES			
NO.			

Drawn & Traced A.H.B.



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

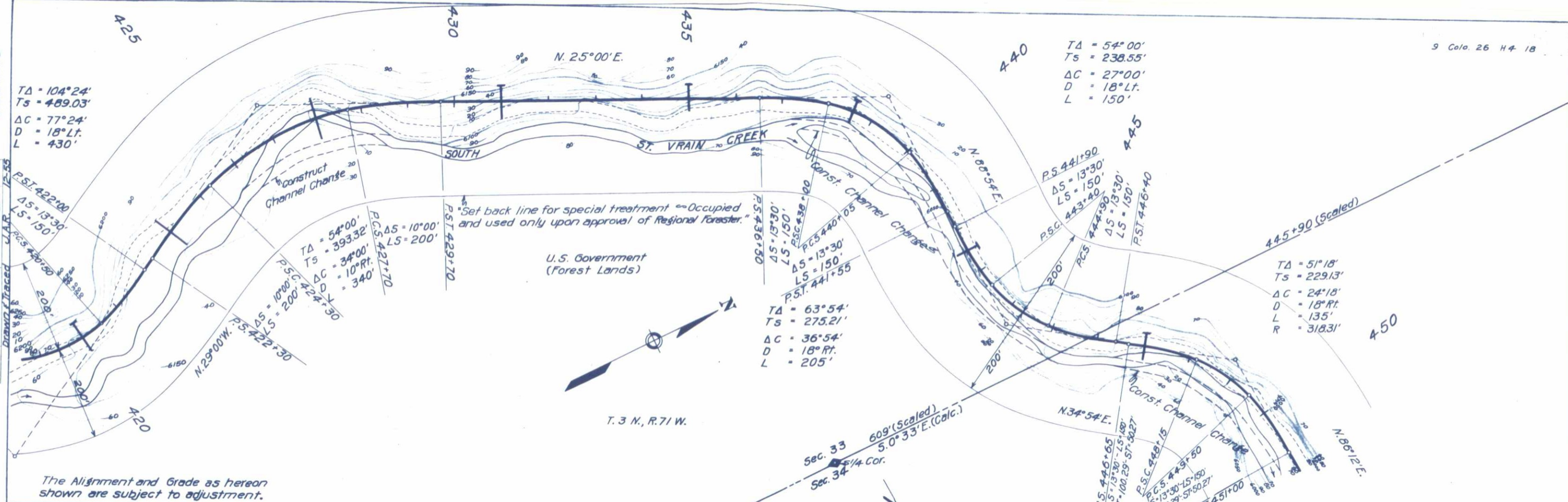


DATE	1955
BY	B.F.T.
PROFILE	
SURVEYED	
PLOTTED	
NOTE BOOK	
NO	
GRADES CHECKED	
B. M'S NOTED	
STRUCTURE NOTATIONS CHECKED	

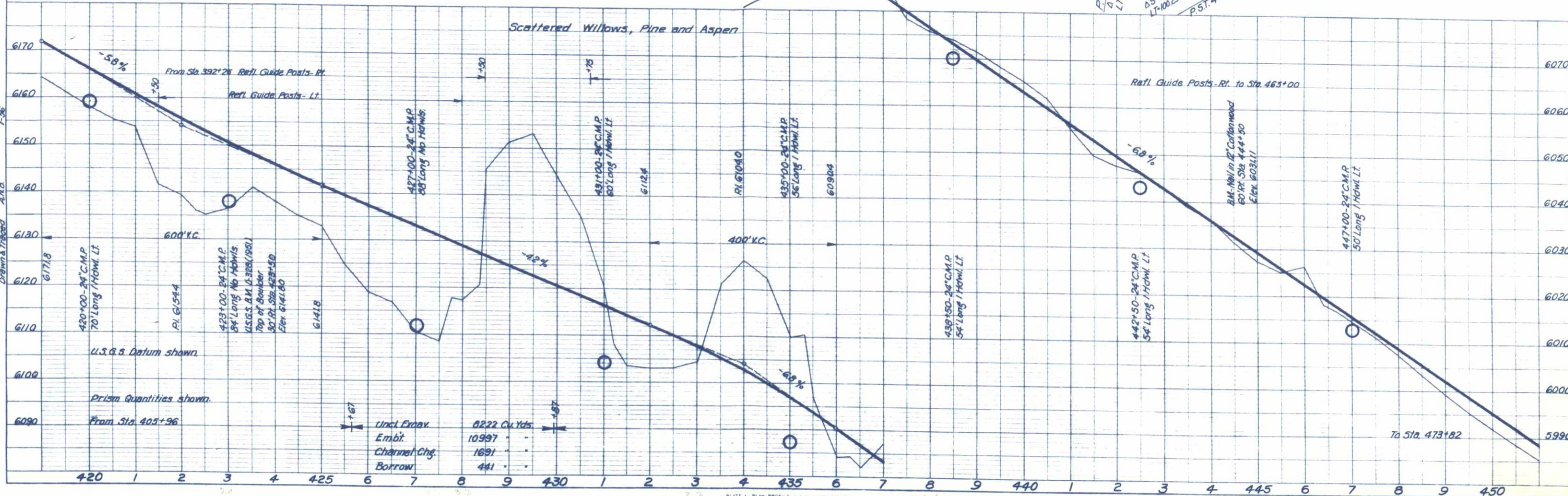
$T\Delta = 104^{\circ}24'$
 $Ts = 489.03'$
 $\Delta C = 77^{\circ}24'$
 $D = 18^{\circ}Lt.$
 $L = 430'$

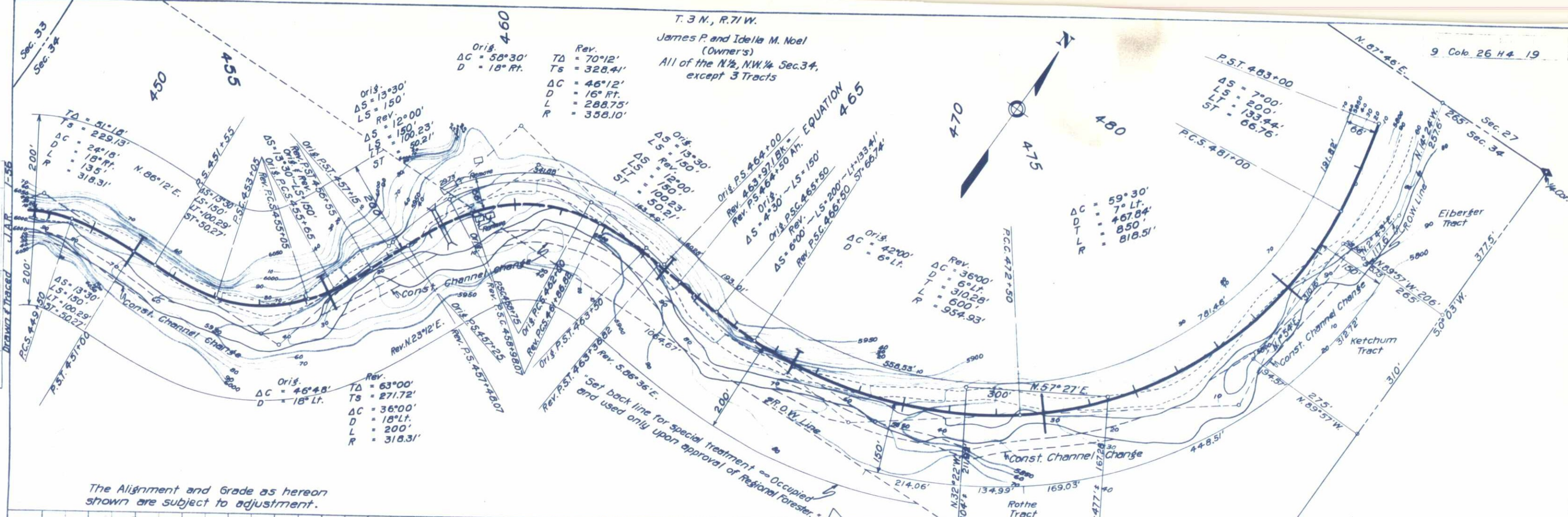
$$\begin{aligned} T\Delta &= 54^{\circ}00' \\ T\delta &= 238.55' \\ \Delta C &= 27^{\circ}00' \\ D &= 18^{\circ}Lt. \\ L &= 150' \end{aligned}$$

9 Colo. 26 H4 18

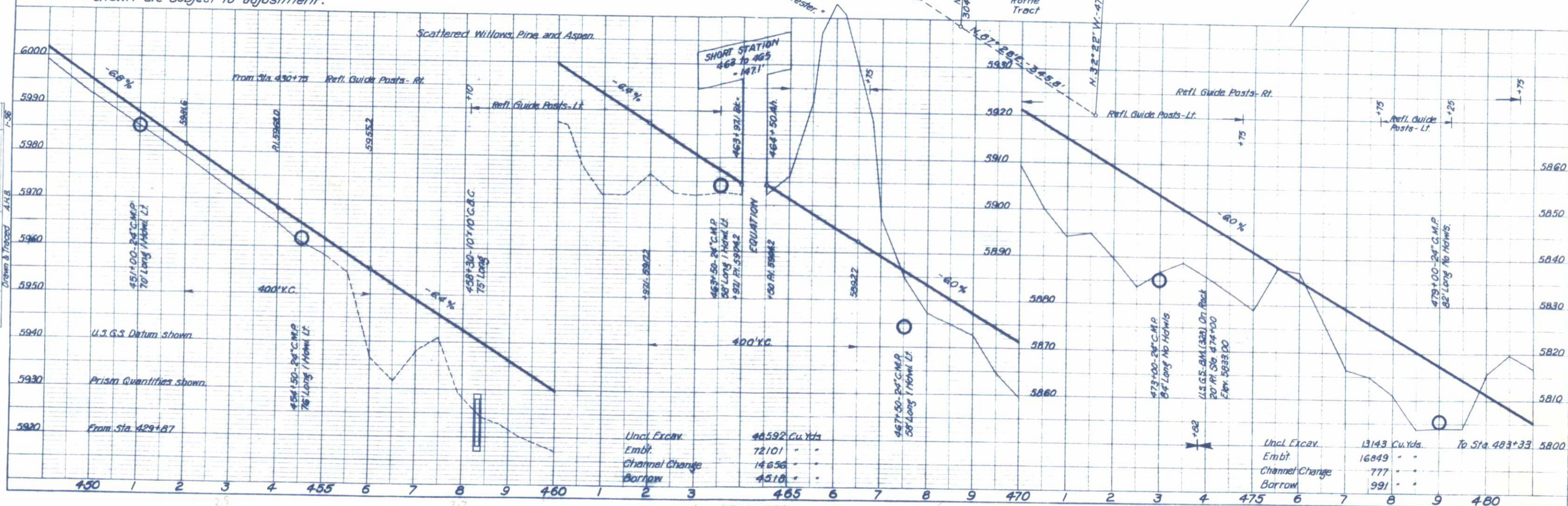


The Alignment and Grade as hereon shown are subject to adjustment.

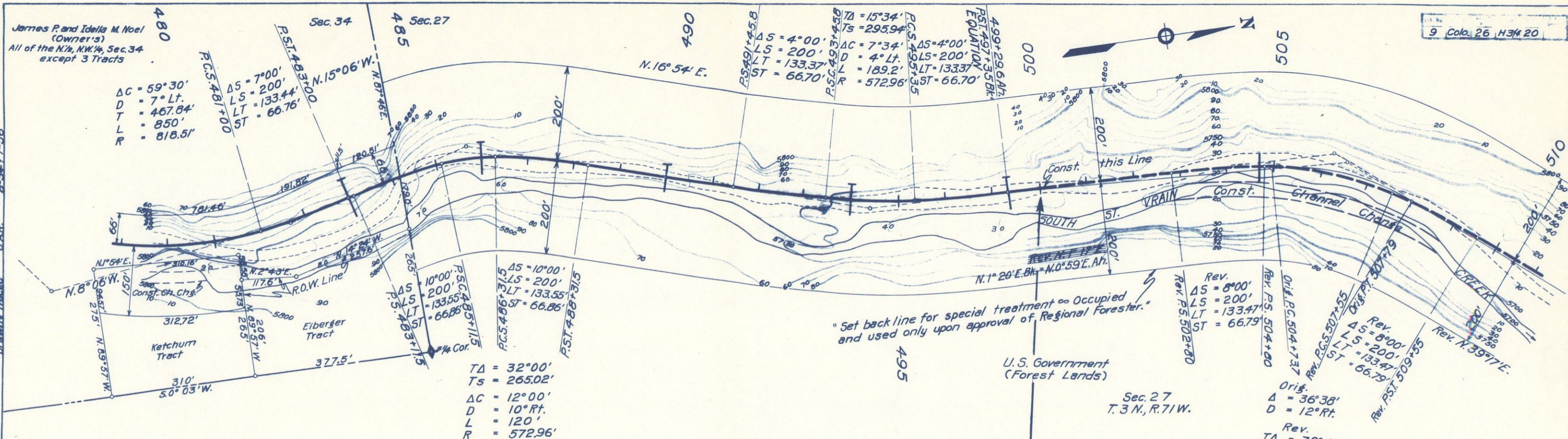




The Alignment and Grade as hereon shown are subject to adjustment.

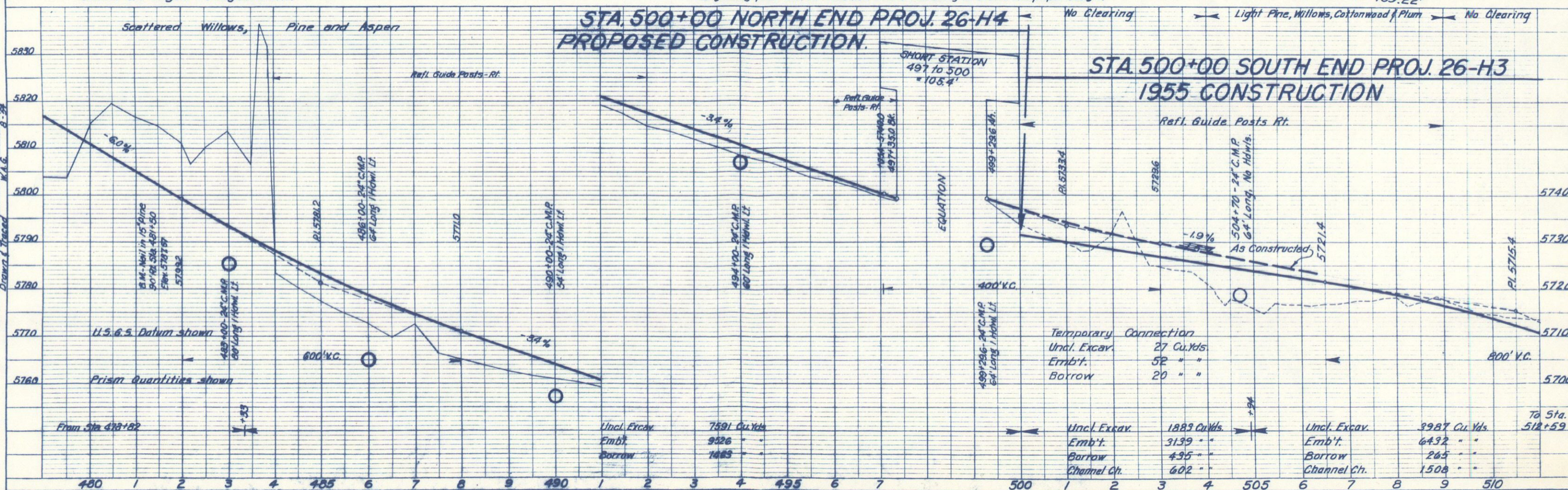


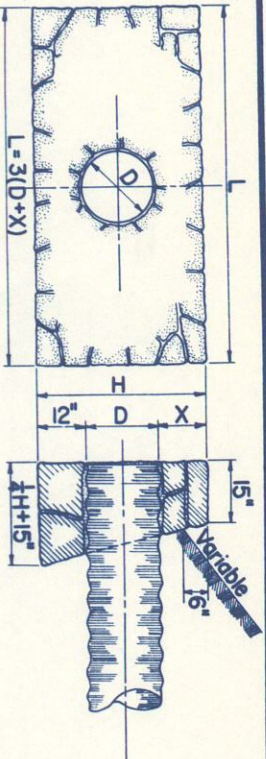
PLAN	SURVEYED _____	DATE _____
NOTE BOOK	PLOTTED _____	BY <i>R.W.D.</i>
NO. _____	ALIGNMENT CHECKED _____	DATE <i>1933</i>
	RT. OF WAY CHECKED _____	



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

The Materials data shown on these plans have been secured from available information and are shown for the convenience of the Project Engineer and the Contractor. The Government neither guarantees nor assumes any responsibility as to the extent, character, or classification of the material. If materials not conforming to the data as shown on the plans are encountered during construction, the grading plan will be modified where necessary to secure the proper design.

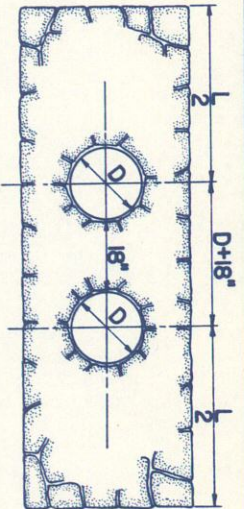




ELEVATION SINGLE PIPE SECTION

QUANTITIES IN ONE HEADWALL-SINGLE PIPE

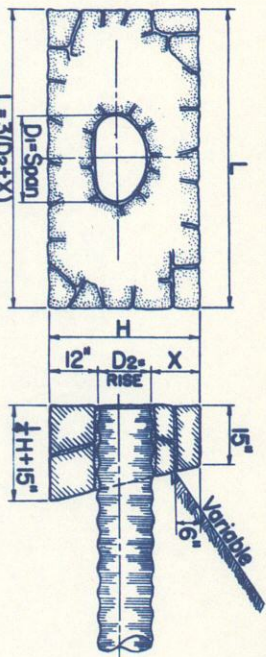
SIZE	AREA	D	L	H	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W
AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA
15"	1.23	5'-3"	2'-9"	0.85	6'-9"	3'-3"	1.35	8'-3"	3'-9"	1.97
18"	1.77	6'-0"	3'-0"	1.08	7'-6"	3'-6"	1.64	9'-0"	4'-0"	2.33
24"	3.14	7'-6"	3'-6"	1.45	9'-0"	4'-0"	2.13	10'-6"	5'-0"	2.96
30"	4.91	9'-0"	4'-0"	2.02	10'-6"	4'-6"	2.84	12'-0"	5'-0"	3.84
36"	7.07	10'-6"	4'-6"	2.69	12'-0"	5'-0"	3.69	13'-6"	6'-0"	4.83
42"	9.62	12'-0"	5'-0"	3.51	13'-6"	5'-6"	4.64	15'-0"	6'-0"	5.95
48"	12.57	13'-6"	5'-6"	4.43	15'-0"	6'-0"	5.74	16'-6"	6'-6"	7.22
54"	16.00	15'-0"	6'-0"	5.49	16'-6"	6'-6"	6.97	18'-0"	7'-0"	8.64
60"	19.64	16'-6"	6'-6"	6.69	18'-0"	7'-0"	8.35	19'-6"	7'-6"	10.27
72"	28.27	19'-6"	7'-6"	9.57	21'-0"	8'-0"	11.64	22'-6"	8'-6"	13.94



ELEVATION DOUBLE PIPE SECTION

QUANTITIES IN ONE HEADWALL-DOUBLE PIPE

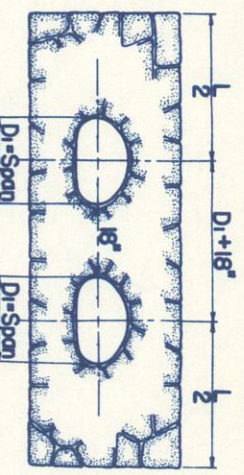
SIZE	AREA	D	L	H	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W
AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA
15"	2.46	8'-0"	2'-9"	1.30	9'-6"	3'-3"	1.90	11'-0"	3'-9"	2.63
18"	3.54	9'-0"	3'-0"	1.63	10'-6"	3'-6"	2.30	12'-0"	4'-0"	3.11
24"	6.28	11'-0"	3'-6"	2.02	12'-6"	4'-0"	2.83	14'-0"	4'-6"	3.82
30"	9.82	13'-0"	4'-0"	2.73	14'-6"	4'-6"	3.74	16'-0"	5'-0"	4.89
36"	14.14	15'-0"	4'-6"	3.60	16'-6"	5'-0"	4.76	18'-0"	5'-6"	6.10
42"	19.24	17'-0"	5'-0"	4.58	18'-6"	5'-6"	5.93	20'-0"	6'-0"	7.46
48"	25.14	19'-0"	5'-6"	5.70	20'-6"	6'-0"	7.25	22'-0"	6'-6"	9.04
60"	39.27	23'-0"	6'-6"	8.51	24'-6"	7'-0"	10.41	26'-0"	7'-6"	12.53



ELEVATION SINGLE PIPE SECTION

QUANTITIES IN ONE HEADWALL-SINGLE PIPE

SIZE	AREA	D	L	H	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W
AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA
15"	1.87	11'	1'-10"	1.10	4'-3"	2'-5"	0.59	5'-9"	2'-11"	1.00
18"	2.27	13'	1'-10"	1.60	4'-9"	2'-7"	0.71	6'-3"	3'-1"	1.17
24"	2.97	18'	1'-10"	2.20	6'-0"	3'-0"	0.92	7'-6"	3'-6"	1.47
30"	3.67	24'	1'-10"	2.80	6'-0"	3'-4"	1.17	8'-6"	3'-10"	1.81
36"	4.37	30'	1'-10"	3.40	6'-0"	3'-9"	1.36	9'-9"	4'-3"	2.31
42"	5.07	36'	1'-10"	4.00	6'-0"	4'-1"	1.55	10'-9"	4'-7"	2.75
48"	5.77	42'	1'-10"	4.60	6'-0"	4'-6"	1.74	12'-0"	5'-0"	3.19
54"	6.47	48'	1'-10"	5.20	6'-0"	5'-0"	1.93	13'-0"	5'-4"	3.63
60"	7.17	54'	1'-10"	5.80	6'-0"	5'-6"	2.12	14'-0"	5'-8"	4.07



ELEVATION DOUBLE PIPE SECTION

QUANTITIES IN ONE HEADWALL-DOUBLE PIPE

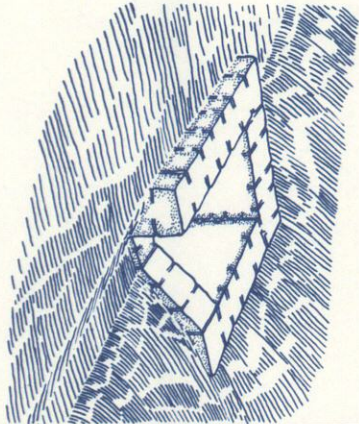
SIZE	AREA	D	L	H	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W
AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA
15"	1.87	11'	1'-10"	1.10	4'-3"	2'-5"	0.59	5'-9"	2'-11"	1.00
18"	2.27	13'	1'-10"	1.60	4'-9"	2'-7"	0.71	6'-3"	3'-1"	1.17
24"	2.97	18'	1'-10"	2.20	6'-0"	3'-0"	0.92	7'-6"	3'-6"	1.47
30"	3.67	24'	1'-10"	2.80	6'-0"	3'-4"	1.17	8'-6"	3'-10"	1.81
36"	4.37	30'	1'-10"	3.40	6'-0"	3'-9"	1.36	9'-9"	4'-3"	2.31
42"	5.07	36'	1'-10"	4.00	6'-0"	4'-1"	1.55	10'-9"	4'-7"	2.75
48"	5.77	42'	1'-10"	4.60	6'-0"	4'-6"	1.74	12'-0"	5'-0"	3.19
54"	6.47	48'	1'-10"	5.20	6'-0"	5'-0"	1.93	13'-0"	5'-4"	3.63
60"	7.17	54'	1'-10"	5.80	6'-0"	5'-6"	2.12	14'-0"	5'-8"	4.07

REGULAR HEADWALLS FOR FILL SECTIONS

TYPE 1

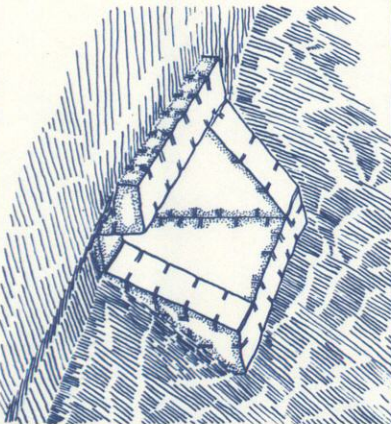
PERSPECTIVE VIEW OF STRUCTURE WITH ONE WAY INLET

Use for all ordinary cases with moderate cut slopes.



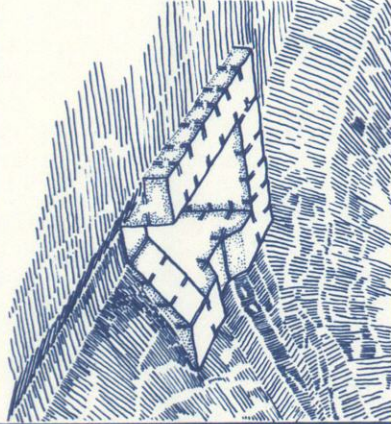
PERSPECTIVE VIEW OF STRUCTURE WITH ONE WAY INLET

Use with high cut slopes



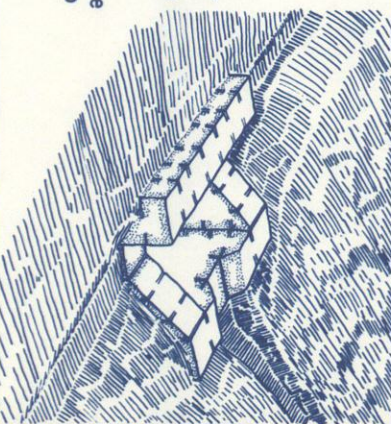
PERSPECTIVE VIEW OF STRUCTURE WITH TWO WAY INLET

Showing inlet on upgrade side with inlet notch in backwall.



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.R. 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.

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

CEMENT RUBBLE STONE MASONRY HEADWALLS AND INLETS FOR PIPE CULVERTS

APPROVED: *John E. Learned* DATE: *Oct 23 1946*
Design Engineer

REV. D3-STD.-117

QUANTITIES IN ONE HEADWALL AND INLET

D	L	X=1'-6"		X=2'-0"		X=2'-6"		X=3'-0"		X=3'-6"	
		H	Q _W	H	Q _W	H	Q _W	H	Q _W	H	Q _W
18"	6'-6"	4'-0"	4.23	4'-6"	4.79	5'-0"	5.35	5'-6"	5.91	6'-0"	6.46
24"	7'-0"	4'-6"	4.86	5'-0"	5.45	5'-6"	6.03	6'-0"	6.61	6'-6"	7.20
30"	7'-6"	5'-0"	5.63	5'-6"	6.24	6'-0"	6.85	6'-6"	7.46	7'-0"	8.07
36"	8'-0"	5'-6"	6.42	6'-0"	7.06	6'-6"	7.70	7'-0"	8.34	7'-6"	8.97

TYPE 2

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

QUANTITIES IN ONE HEADWALL AND INLET

D	L	H	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W	Q _W	
AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	AREA	
15"	6'-6"	4'-0"	4.23	4'-6"	4.79	5'-0"	5.35	5'-6"	5.91	6'-0"	6.46
18"	7'-0"	4'-6"	4.86	5'-0"	5.45	5'-6"	6.03	6'-0"	6.61	6'-6"	7.20
24"	7'-6"	5'-0"	5.63	5'-6"	6.24	6'-0"	6.85	6'-6"	7.46	7'-0"	8.07
30"	8'-0"	5'-6"	6.42	6'-0"	7.06	6'-6"	7.70	7'-0"	8.34	7'-6"	8.97

TYPE 3

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