

OFFICE OF
HARSEY COUNTY ENGINEER
CONSTRUCTION NOTES
FROST AVE.
CO. ROAD NO 26-05
FILE NO 10

ENGINEER'S
FIELD BOOK
No. 10403

2-14-25

10

EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and
SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

Distances from Center of Roadway for Cross-Sectioning
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	0
1	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	1
2	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	2
3	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	3
4	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	4
5	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	5
6	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	6
7	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	7
8	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	8
9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	9
10	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	10
11	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	11
12	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	12
13	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	13
14	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	14
15	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	15
16	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	16
17	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	17
18	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	18
19	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	19
20	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	20
21	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	21
22	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	22
23	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	23
24	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	24
25	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	25
26	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	26
27	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	27
28	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	28
29	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	29
30	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	30
31	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	31
32	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	32
33	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	33
34	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	34
35	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	35
36	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	36
37	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	37
38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	38
39	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	39
40	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be $30.6 + (20 - 16) \times 2$ or 2 ft. added to $30.6 = 32.6$. For slopes of 1 on $1\frac{1}{2}$ see inside of back cover.

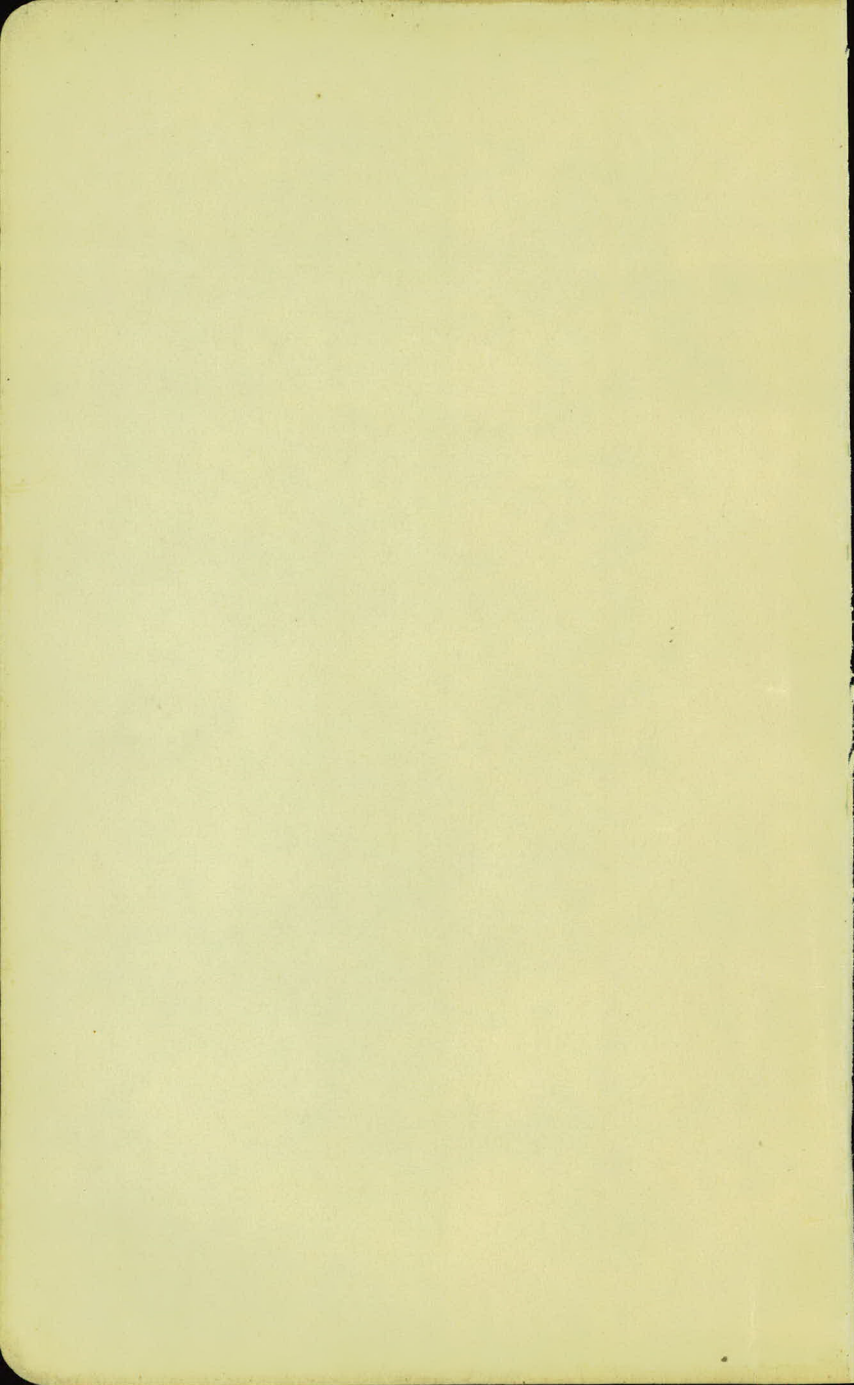
Copyright, 1914, by Eugene Dietzgen Co.

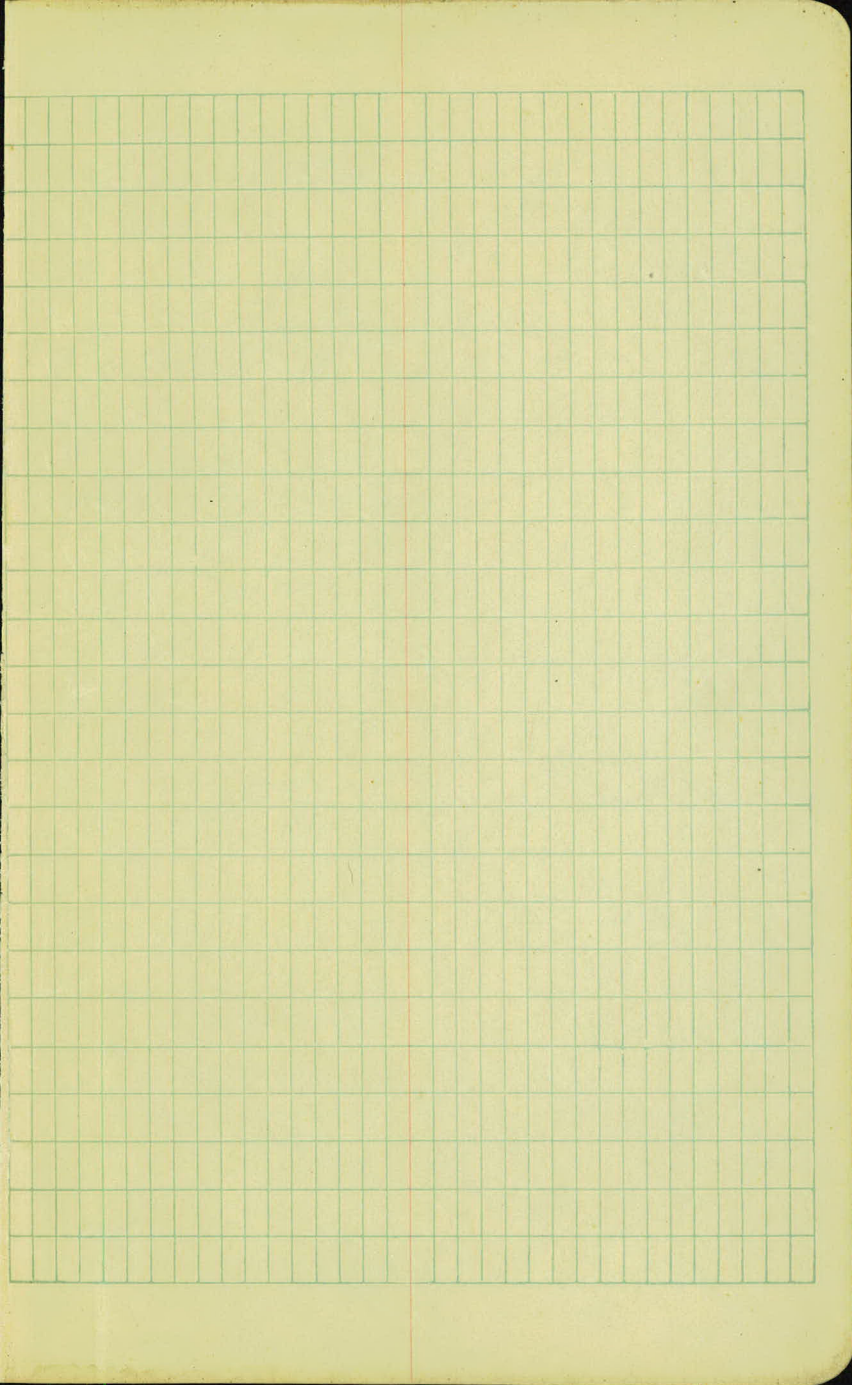
837

80

R.R. spike Arc Lt. Pole. #58

86360





INDEX

Sta.	to Sta.	Description	Page
0+00	97+146	Alignment	1-5
0+00	97+145	X-sections	7-26
94+50	97+145	X-sec. Borrow Pit	27
39-	50-	Grade Change	28-29
0-		Bench Levels	30
95	97	X-sec. for Est. Borrow Pit	31
0	97	Pavement stakes	32-47
90	95	Elev. to determine fill settlement	77-78
90	95	✓ ✓ ✓ ✓ ✓	76

Station	Point	Lt.	Δ	Rt.	Bear.
---------	-------	-----	---	-----	-------

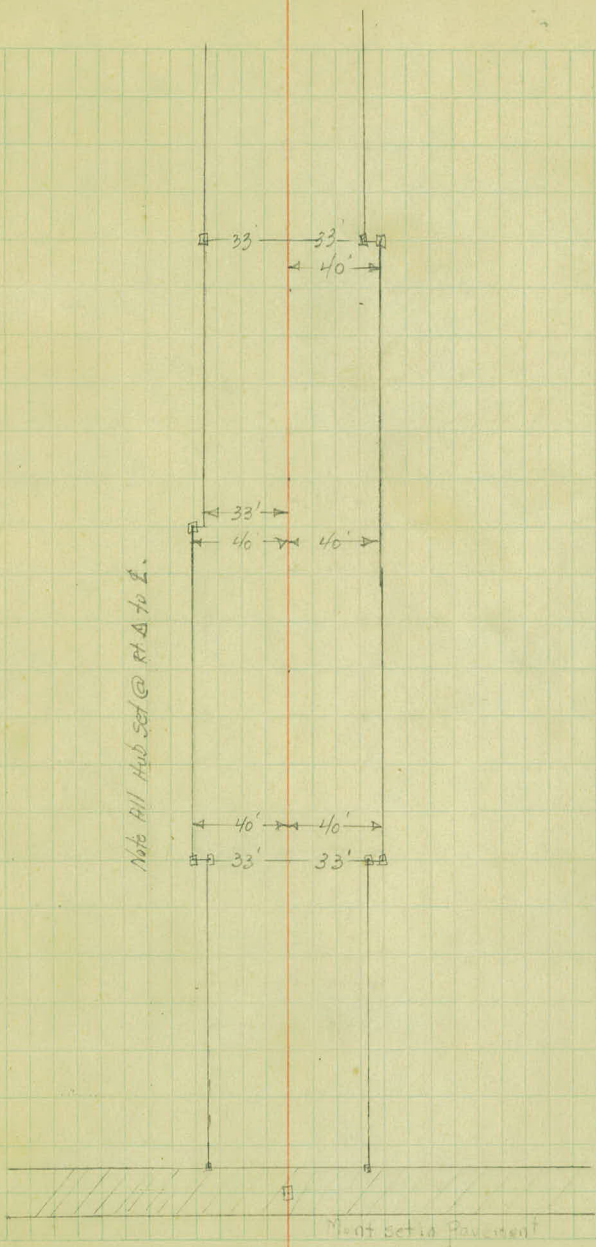
13+00	P.O.T.				
-------	--------	--	--	--	--

9+00	P.O.T.				
------	--------	--	--	--	--

5+00	P.O.T.				
------	--------	--	--	--	--

0+00	Mont.				
------	-------	--	--	--	--

Note: Fill Hub Set @ RT Δ to L.



Station	Point	Lt.	Δ	Rt.	Bear.
---------	-------	-----	---	-----	-------

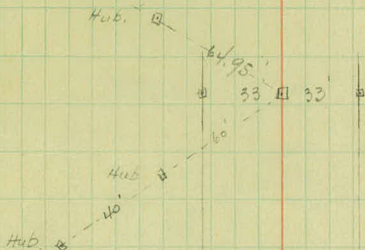
E4 26+55.5 26+52.8	Mont.				
--------------------------	-------	--	--	--	--

22+15. ⁰⁰	P.O.T.				
----------------------	--------	--	--	--	--

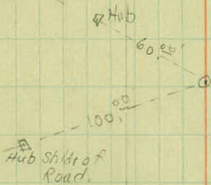
19+00	P.O.T.				
-------	--------	--	--	--	--

16+00	P.O.T.				
-------	--------	--	--	--	--

Top of Wind Mill.



Nail in 2" Oak



White Bear Rd.

Nail in 10" Oak

2"x2" Hub



2"x2" Hubs

300'

2"x2" Hub



2"x2" Hubs

Station Point Lt. Δ Rt.

53+06.1 Mont.

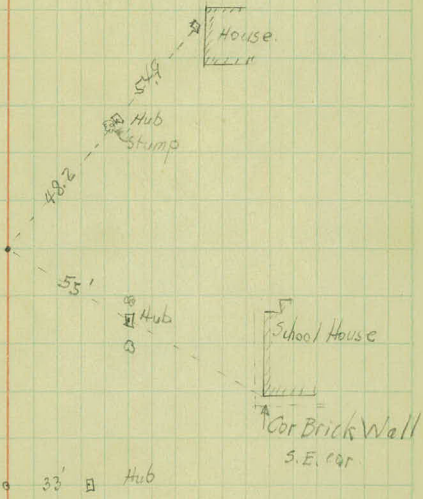
Eq. $\left. \begin{array}{l} 47+56.0 \\ 47+54.7 \end{array} \right\}$ End Pav. E of Tracks.

39+72.75 P.O.T.

36+00 P.O.T.

Top I Water
P.R. Tank.

3



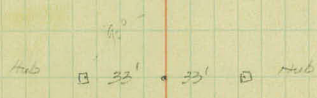
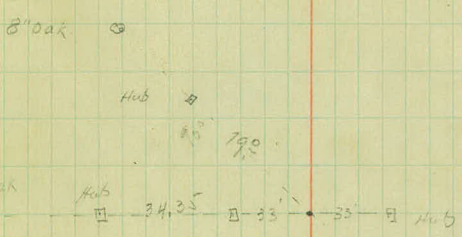
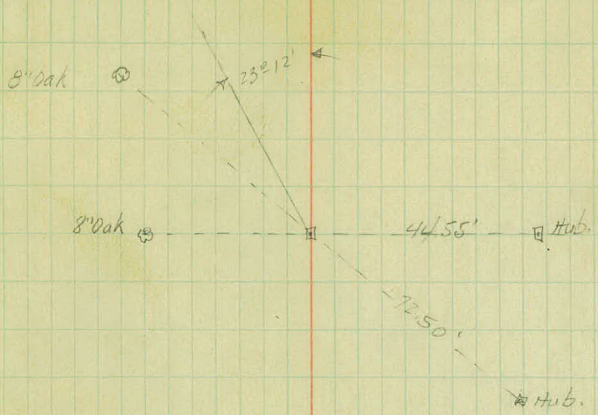
Station	Point	Lt.	Δ Rt	Bear
85+54.94	P.T.	11° 36'		
+25	+50 -	11° 21.2'		
		10° 06.2'		
85		8° 51.2'		
+75		7° 36.2'		10° C Lt.
+50		6° 21.2'		Δ 23° 12'
+25		5° 06.2'		P.I. 24+40.7
84		3° 51.2'		T. 117.76
+75		2° 36.2'		L. 232.00
+50		1° 21.2'		R. 573.69
83+22.94	P.C.	0° 00'	3° 06.2'	

79+48.5
 Eq = 79+47.7

P.O.T.

65+00

P.O.T.



station	Point	Lt.	Δ	Rt.	Beaf.
---------	-------	-----	---	-----	-------

P.O.T.

97+14.6 End of Proj

93+17.7	P.T.	9°-02'			
93		8°-07.6		45' 7440	10°-C.Lt.
+50		5°-39.6			Δ 18°-04'
92		3°-09.6			PI. 92+28.00
+50		0°-39.6			T. 91.2
91+36.8	P.C.	0°-10'			L. 180.67 R. 573.69
89+21.37	P.T.	5°-22.0			
89		3°-02.8		240.3'	3°-C.Lt.
+50		2°-17.8		1255.3'	Δ 6°-14'
88+00		1°-32.8		R 103	PI. 88+09
+50		0°-47.8		0225.3'	T. 112.37
87+00		0°-02.8			L. 224.44
86+96.93	P.C.	0°-20'			R. 1110.08

conc. G.R. Post



Nail in Forewent.

Top of G.R. Post



49.35



Hub



100

Slope of Post

Hub

50

100

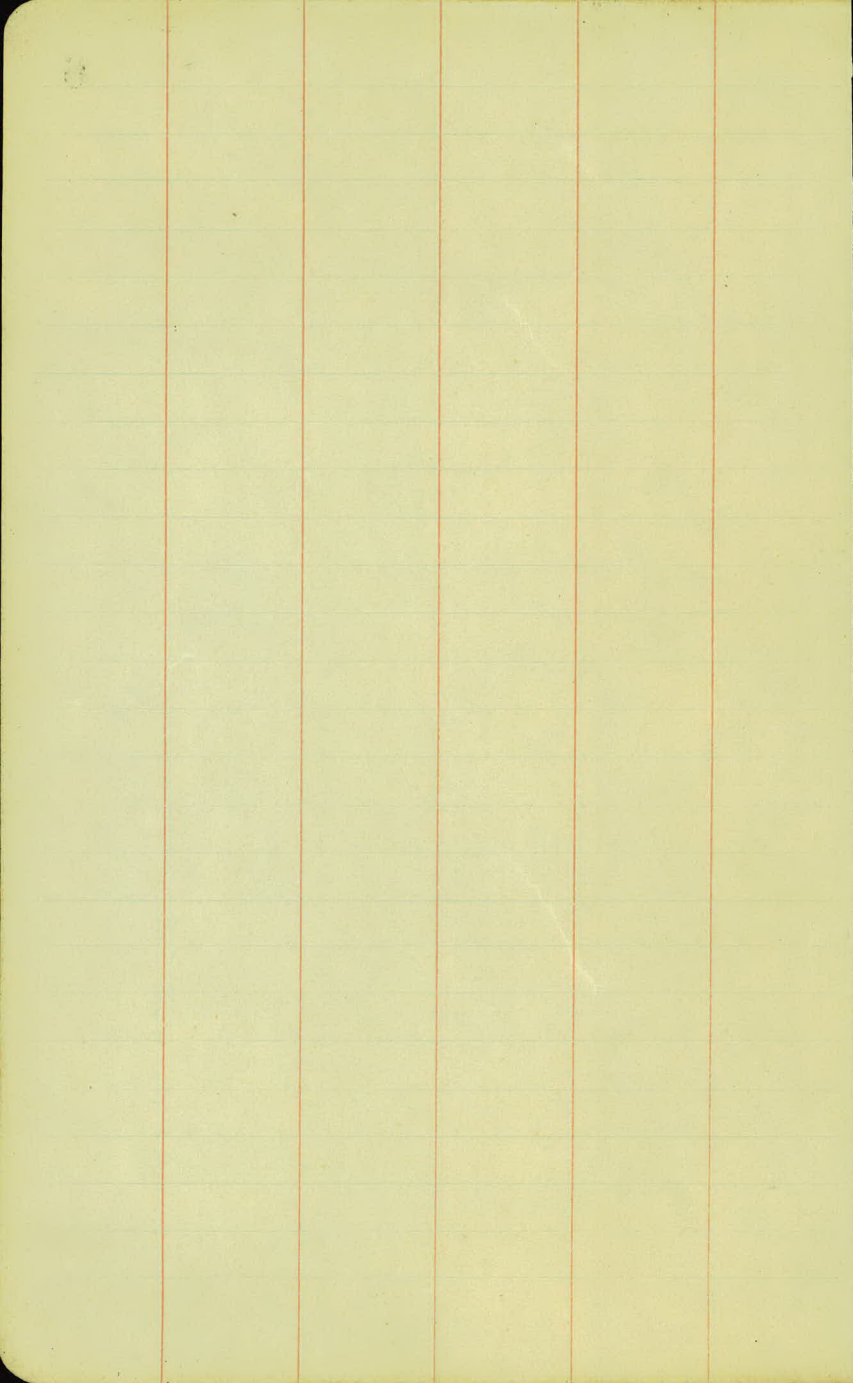
Hub

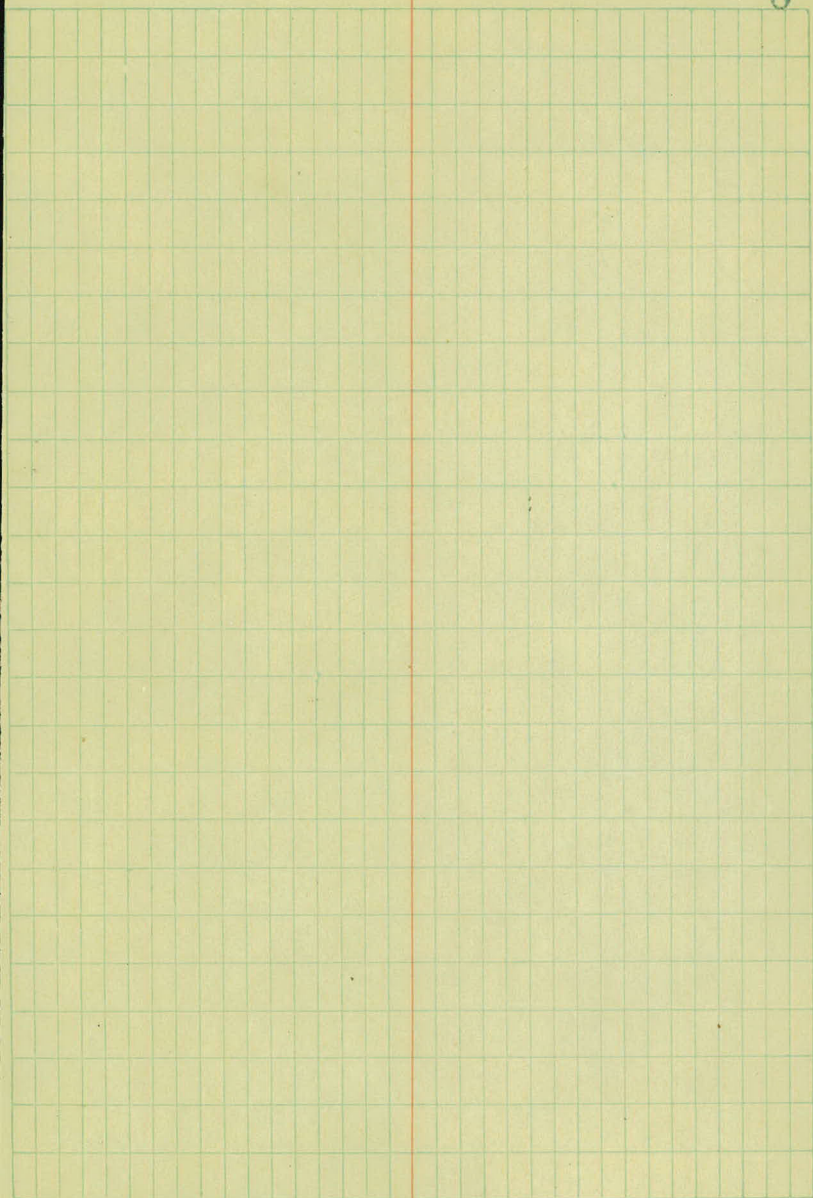
10" Oak



E. H. ...

...





Sta.	B. S.	H. I.	I. S.	Grade	Gr. R.
B.M	579	972.66		966.87	
0+00				966.2	6.5
0+12				66.2	6.5
0+22				66.2	6.5
0+30				66.1	6.6
0+50				66.0	6.7
0+77				65.7	7.0
1+00				65.5	7.2
+40				64.6	8.1
+70				63.9	8.8
2+00				62.9	9.8
T.P.	2.47	965.69	9.44		962.22
+50				60.8	4.9
3+00				59.4	7.3

Inst. W. H. C.
 A. L. P.
 Chain: MG. 10. 100.

May 17, 1926 17

Left C L Right

Top + 4 Stone Man. White Bear + Col Road A2 Sta. 0+00

$\frac{4.50}{60}$ $\frac{5.05}{30}$ $\frac{5.74}{11}$ $\frac{6.6}{30}$ $\frac{7.6}{60}$

$\frac{4.58}{60}$ $\frac{5.10}{30}$ $\frac{5.84}{11}$ $\frac{6.72}{30}$ $\frac{7.66}{60}$

$\frac{5.5}{60}$ $\frac{5.8}{61}$ $\frac{4.9}{41}$ $\frac{5.2}{73}$ $\frac{5.3}{112}$ $\frac{6.1}{28}$ $\frac{7.0}{41}$ $\frac{8.2}{48}$ $\frac{8.6}{60}$
 $\frac{3.3}{60}$ $\frac{4.7}{27}$ $\frac{5.0}{25}$ $\frac{5.0}{116}$ $\frac{5.6}{13}$ $\frac{6.0}{32}$ $\frac{7.4}{26}$ $\frac{7.4}{43}$ $\frac{5.0}{44}$ $\frac{5.2}{60}$
 $\frac{2.5}{60}$ $\frac{4.6}{22}$ $\frac{4.2}{125}$ $\frac{4.7}{22}$ $\frac{6.1}{28}$ $\frac{5.9}{30}$ $\frac{3.8}{32}$ $\frac{3.9}{50}$

$\frac{3.0}{33}$ $\frac{3.16}{33}$ $\frac{3.3}{33}$ $\frac{4.2}{33}$ $\frac{5.3}{19}$ $\frac{5.3}{15}$ $\frac{5.1}{14}$ $\frac{4.4}{126}$ $\frac{4.5}{13}$ $\frac{5.31}{15}$ $\frac{5.4}{17}$ $\frac{3.7}{21}$ $\frac{3.3}{127}$ $\frac{3.6}{316}$

$\frac{3.6}{33}$ $\frac{3.11}{33}$ $\frac{3.8}{33}$ $\frac{4.7}{33}$ $\frac{6.1}{19}$ $\frac{6.1}{16}$ $\frac{5.8}{13}$ $\frac{5.1}{121}$ $\frac{4.7}{12}$ $\frac{5.9}{14}$ $\frac{5.9}{17}$ $\frac{4.4}{20}$ $\frac{4.0}{132}$ $\frac{3.9}{33}$

$\frac{3.46}{33}$ $\frac{3.0}{33}$ $\frac{6.2}{33}$ $\frac{7.1}{33}$ $\frac{2.9}{18}$ $\frac{2.0}{16}$ $\frac{4.6}{12}$ $\frac{6.2}{119}$ $\frac{6.3}{10}$ $\frac{7.3}{13}$ $\frac{7.3}{16}$ $\frac{6.2}{18}$ $\frac{4.6}{20}$ $\frac{2.8}{21.5}$ $\frac{2.9}{25.5}$ $\frac{3.8}{33}$

$\frac{3.7}{33}$ $\frac{4.3}{33}$ $\frac{4.4}{33}$ $\frac{5.2}{33}$ $\frac{5.1}{19}$ $\frac{6.9}{10}$ $\frac{7.0}{15}$ $\frac{8.0}{12}$ $\frac{7.5}{113}$ $\frac{7.8}{10}$ $\frac{8.2}{12}$ $\frac{8.6}{15}$ $\frac{5.3}{20}$ $\frac{5.3}{125}$ $\frac{3.4}{313}$ $\frac{3.4}{33}$

$\frac{6.0}{33}$ $\frac{6.0}{33}$ $\frac{4.9}{43}$ $\frac{5.6}{31}$ $\frac{5.6}{24}$ $\frac{10.8}{17}$ $\frac{10.8}{10}$ $\frac{9.1}{13}$ $\frac{9.0}{108}$ $\frac{8.2}{9}$ $\frac{10.4}{12}$ $\frac{9.5}{14}$ $\frac{2.0}{19}$ $\frac{2.1}{100}$ $\frac{7.1}{100}$ $\frac{3.3}{33}$

not in AC at Sta + 35

$\frac{5.4}{33}$ $\frac{0.6}{33}$ $\frac{5.4}{33}$ $\frac{5.7}{33}$ $\frac{6.0}{19}$ $\frac{6.0}{17}$ $\frac{4.8}{12}$ $\frac{4.1}{105}$ $\frac{4.7}{10}$ $\frac{5.8}{13}$ $\frac{5.8}{15}$ $\frac{3.1}{19}$ $\frac{3.1}{24}$ $\frac{2.5}{29}$ $\frac{2.7}{21}$ $\frac{2.4}{191}$ $\frac{3.3}{33}$

$\frac{3.4}{33}$ $\frac{0.73}{33}$ $\frac{3.3}{33}$ $\frac{3.3}{14}$ $\frac{3.3}{10}$ $\frac{7.0}{103}$ $\frac{7.3}{11}$ $\frac{8.1}{14}$ $\frac{7.3}{00}$ $\frac{7.0}{16}$ $\frac{6.3}{24}$ $\frac{6.3}{10}$ $\frac{2.75}{275}$ $\frac{4.1}{33}$

Original..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		965.69			
3+50				55.9	9.8
4+00				53.4	12.3
T.P.	2.47	955.47	12.69		953.00
+50				50.9	4.6
5+00				48.4	7.1
+50				45.9	9.6
6+00				43.4	12.1
T.P.	5.28	948.08	12.67		942.80
+50				40.9	7.2
7+00				38.4	9.7
+50				35.9	12.2
T.P.	6.43	939.88	12.63		935.45
8+00				33.4	6.5
+50				30.9	9.0
+65				30.1	2.8
+70				29.8	10.0

~~Original~~ Cross Sections

Sta.	B. S.	H.I.	I.S.	Grade	Gr. R.
T.P.	6.14	939.88 935.36 135.34	10.68		929.72 829.20
9+00				25.4	7.0
+15				27.7	1.7
+43				26.3	9.1
T.P.	1.18	926.18	10.36		925.00
+68				25.0	1.2
10+00				23.4	2.8
+50				20.8	5.3
X T.P.	0.58	918.54	8.22		917.96
11+00				18.4	0.1
+50				15.9	2.6
12+00				13.4	5.1
B.M.	2.29	910.93	11.50		907.04
+50				10.9	0.0
+84				09.2	1.7
+93				05.8	2.1

Inc. W.H.C.

Prod. A.L.P.

Chain W.S.A. & H.T.P.

May 18, 1926

9

Left		C.L.					Right						
53	253	7.5	68	24	14	38	6.5	1.0	8.4	8.5	28	47	47
		4.5	17.5	10.5	15	13	+0.5	12	16.5	16.5	21	28	19
53	269	7.8	82	100	100	100	7.4	7.7	8.5	10.5	25	20	25
		4.7	17	11	-2.5	16	10.3	13	16	16	17.5	2.0	7.1
46	120	12.6	12.4	8.6	2.8	3.7	3.7	12.8	12.6	13.0	11.0	11.8	
33	25	27.2	-3.6	18.5	12.5	+0.1	16.5	2.1	3.6	2.2	2.7	2.8	3.3
33	31	2.5	7.0	1.5	1.2	2.0	2.8	16.6	6.5	7.7	4.3	2.4	
53	278	9.1	8.6	3.1	2.9	3.7	3.7	19.5	11.0	11.0	11.6	11.2	
		2.4	2.2	12.5	0.1	1.5	2.5	8.3	3.1	3.6	3.3	3.3	
12.7	2.2	13.0	12.0	5.8	5.5	6.3	6.3	14.6	16.4	16.4	17.4	17.4	
33	31.8	30.6	-7.8	2.3	1.3	-0.2	14.5	2.7	-11.2	-11.2	3.7	3.7	
7.2	29.0	2.1	6.8	0.8	0.5	1.0	1.0	12.1	13.1	13.1	14.0	14.0	
33	29.0	-7.0	2.5	13.5	-0.4	1.1	3.4	3.4	-13.0	-13.0	4.0	4.0	
8.6	27.0	8.6	8.9	3.7	3.2	3.8	3.8	13.1	14.1	14.1	14.9	14.9	
33	27.0	-6.0	2.2	13.5	-0.6	13.5	2.8	2.8	3.4	3.4	-12.3	3.9	
11.9	28.4	11.8	11.3	6.3	5.8	5.9	5.9	15.0	16.9	16.9	16.9	16.9	
33	28.4	-6.7	7.2	14	-0.7	12.5	2.6	3.3	3.3	3.3	-11.8	13.6	
6.5	27.4	6.2	5.3	6.0	0.7	1.4	1.4	7.7	8.6	8.6	8.6	8.6	
33	27.4	-6.2	7.0	14	-0.7	12	2.1	2.6	2.6	2.6	2.6	2.6	
8.0	26.0	7.3	7.0	6.1	2.7	2.5	2.8	7.3	7.7	7.7	7.7	7.7	
33	26.0	-5.6	2.4	18	12	-0.8	12	18.5	2.7	2.0	2.0	2.0	
7.8	6.4	3.0	3.8	5.3	6.4	9.3	13.4	13.4	9.7	9.7	9.7	9.7	
33	6.4	1.7	-0.8	11	15	17	21	21	21	21	21	21	

Original Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		910.93			
13+00				085.	2.4
B.M.	3.89	910.94 910.93	3.89	907.05 907.04	
+27				07.4	3.2
+33				07.2	3.7
+53				06.4	4.5
14+00				05.4	5.5
T.P.	9.69	914.18	6.45		904.49 ✓
+50				04.9	9.3
15+00				04.9	9.3
+50				5.0	9.2
16+00				5.2	9.0
+50				5.3	8.9
17+00				5.5	8.7

3.5

Left		CL		Right					
8.1 33	78 54	7.0 19	3.5 10	3.2 -0.8	3.6 1.5	28 21	28 24	278	81 33

RR spike in RR 12' Lt 34, 13+05 (Removed) ^{loop 30}

28 33	8.2 50	8.0 17.5	4.5 10	4.4 -1.2	4.7 12	8.9 20	9.0 33
----------	-----------	-------------	-----------	-------------	-----------	-----------	-----------

8.0 33	8.7 32	8.5 26	8.4 18	8.2 16.5	4.8 10	4.6 -0.9	5.7 12.5	8.5 19.5	8.5 22.5	8.8 51	257	88 33
-----------	-----------	-----------	-----------	-------------	-----------	-------------	-------------	-------------	-------------	-----------	-----	----------

8.1 33	8.7 30	2.4 -4.7	8.6 17	5.6 11	4.1 -0.6	5.4 12	7.5 18	6.3 14.5	8.3 21	3.3 -3.8	22.6 27	8.3 7.3 33
-----------	-----------	-------------	-----------	-----------	-------------	-----------	-----------	-------------	-----------	-------------	------------	------------------

7.5 33	8.0 31	2.2 -3.5	8.7 17	6.4 12	6.0 -0.8	6.2 12	8.0 18	8.0 -2.8	20.0	6.8 2.5	6.6 +0.9	7.0 24.4	8.6 2.1 29 33
-----------	-----------	-------------	-----------	-----------	-------------	-----------	-----------	-------------	------	------------	-------------	-------------	------------------------

7.1 33	1.9 30	4.0 2.3	4.0 10.3	18.0 7.5	10.1 13.5	9.4 -0.1	9.7 12	11.2 13.5	11.3 -2.0	MP	2.8 2.5	5.1 +4.2	5.1 2.3 33
-----------	-----------	------------	-------------	-------------	--------------	-------------	-----------	--------------	--------------	----	------------	-------------	------------------

10.1 33	10.7 28	11.3 26	19.0 -2.0	11.3 12	9.8 -0.2	9.5 -0.2	10.0 12	10.4 -1.1	10.2 17.2	10.2 +1.0	12.4 24.5	10.4 33
------------	------------	------------	--------------	------------	-------------	-------------	------------	--------------	--------------	--------------	--------------	------------

13.4 33	22.7	13.0 -3.8	12.7 17	19.5 12	9.8 -0.6	10.1 12	12.0 17	12.0 -2.8	20.6	11.7 2.9	10.2 33
------------	------	--------------	------------	------------	-------------	------------	------------	--------------	------	-------------	------------

14.0 33	14.0 25.0	13.5 17	10.4 12	9.7 9	9.4 -0.4	9.6 12	10.4 1.5	10.6 1.6	18.0	10.7 +0.1	10.2 10.2	10.3 2.8	7.8 33
------------	--------------	------------	------------	----------	-------------	-----------	-------------	-------------	------	--------------	--------------	-------------	-----------

13.7 33	18.6	12.2 -3.3	12.0 17	9.6 11.5	8.1 +0.2	9.0 13	9.4 1.4	9.4 -0.5	16.0	8.3 1.7	8.9 0.0	26.0 26.0	5.4 33
------------	------	--------------	------------	-------------	-------------	-----------	------------	-------------	------	------------	------------	--------------	-----------

9.0 33	9.1 +1.6	8.3 1.5	9.0 12.5	9.0 13	8.4 10.5	8.0 +0.7	8.2 12	8.7 0.0	15	8.1 1.6	7.0 1.8	6.6 2.6	7.2 3.3	2.1 +6.8	36.2
-----------	-------------	------------	-------------	-----------	-------------	-------------	-----------	------------	----	------------	------------	------------	------------	-------------	------

Original..... Cross Sections

Sta.	B. S.	H. I.	E. S.	Grade	Gr. R.
17+50		914.18		5.6	8.6
18+00				5.8	8.4
T.P.	3.53	910.36	7.35		906.83 ✓
+50				5.9	4.5
19+00				6.1	4.3
+50				6.2	4.2
20+00				6.4	4.0
+50				6.5	3.9
21+00				6.7	3.7
+50				6.6	3.8
+75				6.5	3.9
+89				6.4	4.0
22+00				6.2	4.2
+15				6.1	4.3

x Left				C L		Right									
25 33	27.5 +10	7.6 16	68 15	84 15	84 10.5	2.8 +1.0	2.6 12.5	3.3 17	3.3 16	5.4 20.5	5.0 24.5	1.3 32	1.3 27.0	1.4 26.5	
20 33	20.5 +8.5	7.8 16	81 14.5	89 14	81 11	3.5 +0.9	2.7 12.5	2.9 16	5.8 19	5.0 27.5	2.0 21.5	3.1 25		3.4 24.0	
18 33	22.5 +8	5.7 17.5	5.3 15.5	4.5 10	4.0 10.5	3.5 +1.0	3.7 11.5	5.0 14	4.0 16	3.2 18	3.2 +1.2	1.2 28.0	1.2 32	1.2 33	
	5.4 33	19.0 -2.0	6.3 15	5.1 9	4.1 9	3.8 +0.5	4.3 12	4.6 13.5	4.5 -0.2	1.5 15.4	4.0 16.5	4.3 25	1.0 30	1.0 32	1.1 33
17 33	21.0 +3.0	7.2 15	6.8 13	5.5 13	4.7 9.5	4.3 -0.1	5.0 11.5	5.3 -1.1	17.2	6.2 0.0	5.9 23	3.9 27	3.9 21.5	3.9 32	
8.0 33	24.2 -4.6	8.6 17	8.4 17	5.8 12	4.5 -0.5	4.8 12	7.2 16.5	7.7 -3.1	22.4	6.9 33					
9.1 33	25.4 -5.2	9.1 18	8.7 18	5.5 12	4.7 -0.8	5.1 12	7.5 17	7.9 -2.0	23.0	2.9 33					
9.1 33	25.8 -5.4	9.1 17	8.8 17	5.6 12	4.7 -1.0	5.0 12	7.5 18.5	7.3 -3.6	22.2	7.4 33					
5.0 33	21.6 -3.0	7.1 17	6.9 17	5.2 14	4.5 -0.5	4.8 13	5.9 2.1	19.2	6.3 30	4.8 33					
4.8 33	20.2 -2.6	6.5 17	6.4 17	4.7 13	4.0 -0.1	4.4 13	5.4 -1.5	18.0	5.5 +0.4	19.0 23.8	5.4 27	2.6 33			
6.3 33	29 -2.9	5.4 21	4.4 17	4.0 15	3.6 +0.4	4.1 14	5.0 19.5	5.0 26.5	3.2 33						
		3.9 33		3.8 20	3.3 +0.9	3.7 14	3.8 19	4.6 24	4.9 33						
		3.2 33		3.1 15	3.0 +1.8	3.1 15			3.1 33						

..... Cross Sections

Sta.	B. S.	H. I.	E. S.	Grade	Gr. R.
		910.36			
22+40				5.6	4.8
B.M.	0.48	906.17 906.16	4.68	905.69 905.68	
+67				5.0	1.2
23+00				4.2	2.0
+50				2.8	3.4
24+00				1.4	4.8
T.P.	6.12	903.86	8.43		897.74
+50				0.2	5.7
25+00				899.3	4.6
+45				98.8	5.1
26+00				98.7	5.2
+35				98.7	5.2
Eq. {				95.5	5.1
				+55.5	
+10				98.8	5.1
27+00				98.8	5.1

W.H.C.
 Red A.L.P.
 Chain W.A.Y. H.T.P.

May 19, 1926 12

Left		x	C L			Right	
20 33	20 23	68 00	174 -11-	53 14	38 70	41 12	51 33

L.I.B.M. 30A Light P.10 Lt 579 22+43.

908N		x				x		x		
25 32	38 24	42 -2.0	42 18	11 9	08 +07	07 9	12 05	15 15	21 +11	247 33

906N		x				x		x		
40 33	60 40	62 105	14 175	16 9	14 +06	20 00	15 15	24 105	32 +24	34 33

92		x				x		x		
33	27	35 -61	30 20	34 8	28 +06	37 14	82 24	82 -48	240 +40	910 33

250		x				x		x		
148 33	147 -10.0	151 33	50 23	43 9	43 +05	43 8	49 13	130 28	130 -85	320 33

Nail in P.P. Ho Sta. 4492		x				x		x		
37.8 33	51 -11.5	100 24	39 9	32 +05	37 13	119 28	119 -8.2	214 214	119 33	

134		x				x		x		
33	32	10.1 -7.5	128 20	11.7 21	49 +05	44 +02	53 14.5	98 24.5	9.8 -5.2	20.4 33

194		x				x		x		
33	250	104 -5.0	95 22	53 9.5	50 +01	55 13	65 15.5	6.2 -1.7	184 +07	20.65 33

32		x				x		x		
33	315	29 -4.7	9.9 19	9.2 19	5.0 +01	51 +01	56 13	65 16	6.8 -1.2	100 +04

3.6		x				x		x		
33	40	32 -2.6	21 17	21 17	5.0 +0.5	46 +0.5	49 15.5	13 28	5.5 5.3	5.3 33

1.4		x				x		x		
33	29	29 -1.6	20 15	6.5 11.5	5.1 +0.5	44 +0.5	47 12	49 18.5	56 26	51 28

1.0		x				x		x		
33	27	29 -2.6	20 20	8.0 11.5	4.5 +0.6	51 +0.5	58 14.5	62 -0.7	57 14	5.8 +1.3

Alt. 644.11.94 Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		903.86			
27+50				98.9	5.0
28+00				98.9	5.0
+50				99.1	4.8
29+00				99.4	4.5
T.P.	7.34	906.45	4.75		899.11
+50				900.0	6.5
30+00				100.6	5.9
+50				14.	5.1
31+00				2.2	4.3
+50				3.0	3.5
T.P.	6.56	910.72	2.29		904.16
32+00				38.	6.9
+50				44.	6.3
33+00				50	5.7

W.H.C.
 Rod A-L.P.
 Chain C.F.B. & H.T.P.

May 19, 1926 13

Left				C L				Right						
$\frac{74}{33}$	$\frac{88}{29}$	$\frac{228}{19}$	$\frac{89}{-39}$	$\frac{88}{20}$	$\frac{54}{11}$	$\frac{49}{101}$	$\frac{5.3}{14}$	$\frac{66}{18}$	$\frac{67}{-17}$	$\frac{184}{184}$	$\frac{67}{103}$	$\frac{64}{285}$	$\frac{62}{30}$	$\frac{49}{33}$
	$\frac{90}{23}$	$\frac{230}{-40}$	$\frac{87}{17}$	$\frac{53}{10}$	$\frac{50}{00}$	$\frac{55}{13}$	$\frac{70}{17}$	$\frac{13}{-22}$	$\frac{196}{196}$	$\frac{76}{28}$	$\frac{53}{33}$			
$\frac{96}{33}$	$\frac{96}{315}$	$\frac{84}{275}$	$\frac{88}{285}$	$\frac{289}{-40}$	$\frac{85}{16}$	$\frac{50}{95}$	$\frac{48}{00}$	$\frac{51}{13.5}$	$\frac{72}{135}$	$\frac{10}{-21}$	$\frac{120}{204}$	$\frac{73}{26}$	$\frac{66}{33}$	
$\frac{83}{33}$	$\frac{33}{24}$	$\frac{27}{27}$	$\frac{76}{26}$	$\frac{81}{245}$	$\frac{220}{-35}$	$\frac{76}{16}$	$\frac{48}{10}$	$\frac{43}{102}$	$\frac{46}{13}$	$\frac{21}{135}$	$\frac{72}{-21}$	$\frac{120}{204}$	$\frac{67}{27}$	$\frac{64}{33}$
$\frac{28}{35}$	$\frac{90}{25}$	$\frac{98}{235}$	$\frac{98}{235}$	$\frac{216}{-33}$	$\frac{94}{16}$	$\frac{67}{10}$	$\frac{63}{102}$	$\frac{65}{13}$	$\frac{68}{18}$	$\frac{18}{-23}$	$\frac{18}{196}$		$\frac{84}{33}$	
$\frac{74}{33}$	$\frac{72}{31}$	$\frac{83}{24}$	$\frac{83}{24}$	$\frac{206}{-28}$	$\frac{80}{155}$	$\frac{58}{10}$	$\frac{56}{103}$	$\frac{60}{48}$	$\frac{61}{-02}$	$\frac{1154}{1154}$	$\frac{67}{11.7}$	$\frac{67}{1056}$	$\frac{6.5}{33}$	
$\frac{51}{33}$	$\frac{50}{35}$	$\frac{60}{25}$	$\frac{57}{113}$	$\frac{58}{225}$	$\frac{178}{-14}$	$\frac{63}{17}$	$\frac{50}{10}$	$\frac{47}{104}$	$\frac{50}{11}$	$\frac{51}{00}$	$\frac{15}{15}$	$\frac{51}{02}$	$\frac{15}{26}$	$\frac{15}{33}$
$\frac{45}{33}$	$\frac{45}{26}$	$\frac{43}{00}$	$\frac{45}{19}$	$\frac{166}{-08}$	$\frac{51}{10}$	$\frac{43}{10}$	$\frac{41}{102}$	$\frac{45}{13}$	$\frac{44}{-01}$	$\frac{152}{152}$	$\frac{45}{11.8}$	$\frac{40}{17}$	$\frac{41}{29}$	$\frac{3.2}{33}$
$\frac{76}{33}$	$\frac{30}{285}$	$\frac{35}{260}$	$\frac{35}{00}$	$\frac{1524}{-02}$	$\frac{37}{11}$	$\frac{37}{10}$	$\frac{34}{101}$	$\frac{37}{125}$	$\frac{35}{00}$	$\frac{15}{15}$	$\frac{30}{19}$	$\frac{30}{26}$	$\frac{20}{11.5}$	$\frac{17}{283}$
$\frac{50}{33}$	$\frac{54}{285}$	$\frac{269}{185}$	$\frac{63}{106}$	$\frac{61}{17}$	$\frac{66}{11}$	$\frac{68}{10}$	$\frac{66}{103}$	$\frac{69}{00}$	$\frac{15}{15}$	$\frac{64}{22}$	$\frac{59}{245}$	$\frac{57}{27}$	$\frac{45}{31}$	$\frac{54}{145}$
$\frac{40}{33}$	$\frac{40}{315}$	$\frac{44}{29}$	$\frac{275}{-10}$	$\frac{53}{19}$	$\frac{51}{16}$	$\frac{60}{10}$	$\frac{56}{107}$	$\frac{61}{12}$	$\frac{60}{20}$	$\frac{55}{225}$	$\frac{53}{265}$	$\frac{46}{11.7}$	$\frac{32}{286}$	$\frac{32}{31}$
	$\frac{58}{33}$	$\frac{266}{104}$	$\frac{53}{104}$	$\frac{50}{25}$	$\frac{53}{14}$	$\frac{53}{104}$	$\frac{54}{14}$	$\frac{45}{19}$	$\frac{50}{19}$	$\frac{45}{19}$	$\frac{50}{19}$	$\frac{41}{17.1}$	$\frac{41}{33}$	

Account..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		910.72			
33+20				905.2	5.5
+53				5.5	5.2
D.M.	3.16	910.72	3.16		907.56 ✓
34+00				5.6	5.1
+50				6.4	4.3
35+00				6.9	3.8
+50				7.3	3.4
36+00				7.8	2.9
T.P.	4.71	913.33	2.10		908.62 ✓
+30				8.1	5.2
+50				8.2	5.1
+70				8.3	5.0
37+00				8.5	4.8
+50				8.7	4.6
38+00				8.9	4.4
+50				909.0	4.3

Change Sections.



W.H.C.

Ref: A.L.P.

Chain: C.F.B. + H.T.P

May 19, 1926 14

Left

C L

Right

$\frac{44}{33}$	$\frac{44}{277}$	$\frac{44}{18}$	$\frac{49}{17}$	$\frac{53}{13}$	$\frac{51}{104}$	$\frac{51}{13}$	$\frac{46}{22}$	$\frac{46}{33}$
	$\frac{57}{33}$	$\frac{51}{26}$	$\frac{50}{15}$	$\frac{51}{9}$	$\frac{47}{95}$	$\frac{49}{15}$	$\frac{49}{20}$	$\frac{46}{22}$
							$\frac{47}{105}$	$\frac{48}{268}$

R.R. spike in 10" Tree 60' at Sta. 53+52 (north side of tree)

$\frac{65}{33}$	$\frac{59}{248}$	$\frac{59}{47}$	$\frac{56}{160}$	$\frac{61}{15}$	$\frac{48}{11}$	$\frac{42}{129}$	$\frac{45}{14}$	$\frac{56}{17}$	$\frac{50}{23}$	$\frac{51}{00}$	$\frac{53}{26}$	$\frac{53}{33}$
-----------------	------------------	-----------------	------------------	-----------------	-----------------	------------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------

$\frac{50}{33}$	$\frac{75}{30}$	$\frac{64}{26}$	$\frac{62}{21}$	$\frac{196}{23}$	$\frac{66}{14}$	$\frac{65}{11}$	$\frac{45}{103}$	$\frac{43}{13}$	$\frac{59}{16}$	$\frac{60}{17}$	$\frac{58}{174}$	$\frac{56}{19}$	$\frac{63}{00}$	$\frac{63}{23}$	$\frac{60}{31}$	$\frac{60}{33}$
-----------------	-----------------	-----------------	-----------------	------------------	-----------------	-----------------	------------------	-----------------	-----------------	-----------------	------------------	-----------------	-----------------	-----------------	-----------------	-----------------

$\frac{7.7}{33}$	$\frac{82}{29}$	$\frac{61}{26}$	$\frac{199}{19}$	$\frac{58}{220}$	$\frac{67}{19}$	$\frac{67}{15}$	$\frac{39}{10}$	$\frac{35}{103}$	$\frac{39}{13}$	$\frac{62}{17}$	$\frac{64}{18}$	$\frac{57}{20}$	$\frac{64}{24}$	$\frac{63}{29}$	$\frac{57}{32}$	$\frac{57}{32}$
------------------	-----------------	-----------------	------------------	------------------	-----------------	-----------------	-----------------	------------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	-----------------

$\frac{62}{33}$	$\frac{61}{30}$	$\frac{18}{26}$	$\frac{46}{19}$	$\frac{50}{120}$	$\frac{5.8}{17}$	$\frac{5.8}{15}$	$\frac{3.4}{10}$	$\frac{2.8}{106}$	$\frac{32}{13}$	$\frac{5.0}{17}$	$\frac{5.2}{186}$	$\frac{5.7}{28}$	$\frac{4.4}{31}$	$\frac{4.4}{33}$
-----------------	-----------------	-----------------	-----------------	------------------	------------------	------------------	------------------	-------------------	-----------------	------------------	-------------------	------------------	------------------	------------------

$\frac{21}{33}$	$\frac{25}{26}$	$\frac{29}{104}$	$\frac{3.8}{20}$	$\frac{17.0}{19}$	$\frac{39}{10}$	$\frac{39}{15}$	$\frac{26}{11}$	$\frac{22}{107}$	$\frac{26}{13}$	$\frac{45}{16}$	$\frac{42}{182}$	$\frac{42}{26}$	$\frac{10.0}{299}$	$\frac{29}{30}$	$\frac{21}{33}$
-----------------	-----------------	------------------	------------------	-------------------	-----------------	-----------------	-----------------	------------------	-----------------	-----------------	------------------	-----------------	--------------------	-----------------	-----------------

$\frac{5.2}{33}$	$\frac{26.0}{00}$	$\frac{5.2}{00}$	$\frac{4.8}{12}$	$\frac{4.4}{108}$	$\frac{4.8}{140}$	$\frac{4.4}{00}$	$\frac{4.2}{15}$	$\frac{4.2}{17}$	$\frac{5.8}{7.4}$	$\frac{6.2}{251}$	$\frac{5.8}{251}$	$\frac{5.4}{33}$
------------------	-------------------	------------------	------------------	-------------------	-------------------	------------------	------------------	------------------	-------------------	-------------------	-------------------	------------------

$\frac{5.2}{38}$	$\frac{46}{33}$	$\frac{4.5}{21}$	$\frac{15}{15}$	$\frac{5.0}{00}$	$\frac{4.2}{10}$	$\frac{3.9}{11}$	$\frac{4.4}{10.7}$	$\frac{4.4}{13}$	$\frac{5.4}{16}$	$\frac{5.6}{0.6}$	$\frac{4.6}{114}$	$\frac{4.5}{20}$	$\frac{4.3}{27.0}$	$\frac{4.3}{33}$
------------------	-----------------	------------------	-----------------	------------------	------------------	------------------	--------------------	------------------	------------------	-------------------	-------------------	------------------	--------------------	------------------

$\frac{4.8}{33}$	$\frac{5.8}{101}$	$\frac{4.7}{20}$	$\frac{5.0}{182}$	$\frac{5.6}{0.8}$	$\frac{5.9}{14.5}$	$\frac{4.4}{11}$	$\frac{4.1}{10.7}$	$\frac{4.5}{13}$	$\frac{4.9}{16}$	$\frac{5.7}{0.9}$	$\frac{5.4}{186}$	$\frac{5.4}{20}$	$\frac{5.5}{20}$	$\frac{5.5}{26}$	$\frac{4.5}{29}$	$\frac{4.5}{33}$
------------------	-------------------	------------------	-------------------	-------------------	--------------------	------------------	--------------------	------------------	------------------	-------------------	-------------------	------------------	------------------	------------------	------------------	------------------

$\frac{7.0}{33}$	$\frac{33.0}{20}$	$\frac{6.4}{20.5}$	$\frac{7.2}{17}$	$\frac{4.7}{12}$	$\frac{4.1}{10.3}$	$\frac{4.7}{14}$	$\frac{6.1}{17}$	$\frac{6.4}{20}$	$\frac{6.0}{25}$	$\frac{5.5}{28}$	$\frac{5.2}{33}$
------------------	-------------------	--------------------	------------------	------------------	--------------------	------------------	------------------	------------------	------------------	------------------	------------------

$\frac{2.1}{33}$	$\frac{7.1}{28}$	$\frac{25.8}{27}$	$\frac{7.0}{21.5}$	$\frac{7.2}{16}$	$\frac{4.6}{12}$	$\frac{4.1}{10.2}$	$\frac{4.8}{13.5}$	$\frac{6.0}{16.5}$	$\frac{6.3}{2.0}$	$\frac{5.4}{23.0}$	$\frac{4.6}{25}$	$\frac{4.6}{33}$
------------------	------------------	-------------------	--------------------	------------------	------------------	--------------------	--------------------	--------------------	-------------------	--------------------	------------------	------------------

~~Original~~ Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		913.33			
39+00				909.0	43
T.P.	4.02	913.40	3.95		909.38
+50				8.8	46
+79				8.8	46
40+00				8.7	47
Done B.M.	3.07	913.39 913.40	3.07	910.32 910.33	
+50				8.3	5.1
41+00				7.85	5.5
+50				7.4	6.0
42+00				6.9	6.5
+50				6.4	7.0
T.P.	1.89	908.06	7.22		906.17
43+00				5.9	2.2
+50				5.4	2.7

Inst.
 Rod.
 Chain.

Left C L Right

74 64 237 63 70 30 59 41 47 53 12 19 53 46 46 40 42
 33 29.5 20 12 12 10.2 13.5 16 13 19 22 25 17 24 78 33

5.0 46 46 4.8 4.1 4.3 4.2 3.9 3.0
 33 20 20 10.2 10.5 13 18 10.7 17.6 33

47 53 41 4.1 4.0
 33 15 10.5 15 33

4.0 26.4 44 47 4.5 4.4
 33 10.3 11 10.5 15 33

R.R. Spike in P.P. 50' ht Sta 41 + 00

40 27 44 51 52 55 15 51 48 43 44 45 48
 33 32 10.6 22.5 21.5 17 15 10.0 14 10.8 12 10.15 17.5 20.5 10.6 17.3 33

3.2 2.8 4.4 4.5 5.5 5.6 5.1 4.7 5.3 5.7 5.2 5.0 3.5
 33 4.1 25 21.5 17 14 10.8 13.5 10.2 15.8 20 10.5 17.5 33

2.9 2.1 4.8 5.3 5.5 5.3 5.7 6.3 6.4 6.0 6.0 4.1
 33 11 25 17 13 10.7 13 15 10.4 10.6 19 10.0 10.5 33

2.5 1.8 6.3 6.6 1.5 4.5 5.4 4.7 7.3 7.3 6.4 7.2 2.6 6.1 6.1
 33 10.6 10.7 22.5 21 15 10.0 14.6 13 15.5 18.2 19 10.8 10.4 33 33

4.7 7.2 10.0 10.7 11.0 11.2 8.2 7.2 4.7 7.2 8.9 8.7 8.3 9.2 9.1
 33 28.5 10.4 10.8 11.0 11.2 17 13.5 10.3 12.5 16 19.5 17.3 29.2 26 33

2.5 3.4 2.0 4.2 4.1 2.5 4.1 2.6 5.2 5.7 4.8 5.2 5.8
 33 15 12 12 12 10.1 13 17 20 21 20 17.0 33

4.0 3.9 22.4 4.8 5.0 3.3 3.0 3.4 6.0 5.5 5.9 6.0 6.4
 33 28.5 21 17 12.5 10.3 13 18 20 22 33 28.2 33

Original..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		908.06			
44+00				904.9	3.2
+50				4.4	3.7
45+00				3.9	4.2
T B M.	4.43	907.95	4.54		
+50				903.4	4.6
46+00				2.9	5.1
+36				2.5	5.5
+69				2.2	5.8
47+00				1.9	5.9 6.1
+50				1.4	6.6
48+00				0.9	7.1
+50				0.4	7.6
49+00				899.8	8.2

$$\begin{array}{r} \times \\ 40 \quad 45 \\ 33 \quad 25 \end{array} \quad \begin{array}{r} 234 \\ -21 \\ \hline 213 \end{array} \quad \begin{array}{r} 58 \\ 16 \end{array} \quad \begin{array}{r} 52 \\ 16 \end{array} \quad \begin{array}{r} 3.6 \\ 12 \end{array} \quad \begin{array}{r} 3.2 \\ 12 \end{array} \quad \begin{array}{r} 5.6 \\ 12.5 \end{array} \quad \begin{array}{r} 6.6 \\ 18.5 \end{array} \quad \begin{array}{r} 6.1 \\ 20 \end{array} \quad \begin{array}{r} 6.4 \\ 20 \end{array} \quad \begin{array}{r} 6.4 \\ 27.8 \end{array} \quad \begin{array}{r} 6.4 \\ 23 \end{array}$$

(3.2)

Right

$$\begin{array}{r} \times \\ 46 \quad 49 \\ 33 \quad 26 \end{array} \quad \begin{array}{r} 234 \\ -21 \\ \hline 213 \end{array} \quad \begin{array}{r} 58 \\ 28 \end{array} \quad \begin{array}{r} 6.1 \\ 17 \end{array} \quad \begin{array}{r} 4.1 \\ 12 \end{array} \quad \begin{array}{r} 3.7 \\ 12 \end{array} \quad \begin{array}{r} 4.1 \\ 12 \end{array} \quad \begin{array}{r} 6.9 \\ 18.5 \end{array} \quad \begin{array}{r} 6.4 \\ 20.5 \end{array} \quad \begin{array}{r} 6.7 \\ 21.0 \end{array} \quad \begin{array}{r} 6.6 \\ 33 \end{array}$$

(3.7)

x

$$\begin{array}{r} \times \\ 50 \quad 53 \\ 33 \quad 28.5 \end{array} \quad \begin{array}{r} 234 \\ -21 \\ \hline 213 \end{array} \quad \begin{array}{r} 63 \\ 20 \end{array} \quad \begin{array}{r} 6.1 \\ 18 \end{array} \quad \begin{array}{r} 5.5 \\ 12 \end{array} \quad \begin{array}{r} 4.2 \\ 12 \end{array} \quad \begin{array}{r} 4.7 \\ 13 \end{array} \quad \begin{array}{r} 6.2 \\ 13.5 \end{array} \quad \begin{array}{r} 4.4 \\ 13.2 \end{array} \quad \begin{array}{r} 4.4 \\ 23.8 \end{array} \quad \begin{array}{r} 6.5 \\ 33 \end{array}$$

(4.2)

x

$$\begin{array}{r} \times \\ 54 \quad 55 \\ 33 \quad 27 \end{array} \quad \begin{array}{r} 64 \\ 20 \end{array} \quad \begin{array}{r} 230 \\ -2.0 \\ \hline 228 \end{array} \quad \begin{array}{r} 66 \\ 17 \end{array} \quad \begin{array}{r} 5.2 \\ 13 \end{array} \quad \begin{array}{r} 4.5 \\ 12.5 \end{array} \quad \begin{array}{r} 5.1 \\ 12.5 \end{array} \quad \begin{array}{r} 6.6 \\ 19 \end{array} \quad \begin{array}{r} 6.4 \\ 18 \end{array} \quad \begin{array}{r} 6.5 \\ 22.2 \end{array} \quad \begin{array}{r} 6.4 \\ 33 \end{array}$$

(4.6)

x

$$\begin{array}{r} 5.0 \\ 33 \end{array} \quad \begin{array}{r} 5.4 \\ 18 \end{array} \quad \begin{array}{r} 4.9 \\ 15 \end{array} \quad \begin{array}{r} 4.8 \\ 10.5 \end{array} \quad \begin{array}{r} 5.4 \\ 13 \end{array} \quad \begin{array}{r} 6.8 \\ 17.5 \end{array} \quad \begin{array}{r} 6.8 \\ 19.5 \end{array} \quad \begin{array}{r} 6.5 \\ 14 \end{array} \quad \begin{array}{r} 6.5 \\ 20.6 \end{array} \quad \begin{array}{r} 6.5 \\ 33 \end{array}$$

(5.1)

x

$$\begin{array}{r} 4.8 \\ 33 \end{array} \quad \begin{array}{r} 5.1 \\ 20 \end{array} \quad \begin{array}{r} 5.0 \\ 10.5 \end{array} \quad \begin{array}{r} 5.6 \\ 13 \end{array} \quad \begin{array}{r} 6.4 \\ 18 \end{array} \quad \begin{array}{r} 7.5 \\ 33 \end{array}$$

(5.5)

$$\begin{array}{r} 7.1 \\ 33 \end{array} \quad \begin{array}{r} 20 \\ 13 \end{array} \quad \begin{array}{r} 2.1 \\ 19 \end{array} \quad \begin{array}{r} 4.9 \\ 14 \end{array} \quad \begin{array}{r} 5.4 \\ 10.4 \end{array} \quad \begin{array}{r} 6.5 \\ 13 \end{array} \quad \begin{array}{r} 3.5 \\ 18.5 \end{array} \quad \begin{array}{r} 7.1 \\ 13 \end{array} \quad \begin{array}{r} 7.1 \\ 20.2 \end{array} \quad \begin{array}{r} 7.1 \\ 33 \end{array}$$

(5.8)

x

$$\begin{array}{r} 7.9 \\ 33 \end{array} \quad \begin{array}{r} 24.6 \\ 20 \end{array} \quad \begin{array}{r} 8.3 \\ 19.5 \end{array} \quad \begin{array}{r} 5.1 \\ 14 \end{array} \quad \begin{array}{r} 7.2 \\ 14 \end{array} \quad \begin{array}{r} 6.5 \\ 13 \end{array} \quad \begin{array}{r} 5.8 \\ 10.1 \end{array} \quad \begin{array}{r} 6.5 \\ 11 \end{array} \quad \begin{array}{r} 7.2 \\ 19 \end{array} \quad \begin{array}{r} 7.2 \\ 13 \end{array} \quad \begin{array}{r} 7.3 \\ 20.2 \end{array} \quad \begin{array}{r} 7.3 \\ 33 \end{array}$$

(6.1)

x

$$\begin{array}{r} 7.8 \\ 33 \end{array} \quad \begin{array}{r} 20.6 \\ 10 \end{array} \quad \begin{array}{r} 8.0 \\ 10.5 \end{array} \quad \begin{array}{r} 6.8 \\ 13 \end{array} \quad \begin{array}{r} 4.3 \\ 13 \end{array} \quad \begin{array}{r} 7.0 \\ 12.5 \end{array} \quad \begin{array}{r} 7.7 \\ 11 \end{array} \quad \begin{array}{r} 7.5 \\ 19.4 \end{array} \quad \begin{array}{r} 7.5 \\ 33 \end{array}$$

(6.6)

x

$$\begin{array}{r} 6.4 \\ 33 \end{array} \quad \begin{array}{r} 6.7 \\ 24.5 \end{array} \quad \begin{array}{r} 8.6 \\ 26 \end{array} \quad \begin{array}{r} 20.6 \\ 10 \end{array} \quad \begin{array}{r} 8.5 \\ 14 \end{array} \quad \begin{array}{r} 8.4 \\ 16 \end{array} \quad \begin{array}{r} 7.4 \\ 13 \end{array} \quad \begin{array}{r} 6.9 \\ 10.2 \end{array} \quad \begin{array}{r} 7.7 \\ 14.5 \end{array} \quad \begin{array}{r} 8.7 \\ 18 \end{array} \quad \begin{array}{r} 8.6 \\ 10 \end{array} \quad \begin{array}{r} 8.6 \\ 21.0 \end{array} \quad \begin{array}{r} 7.9 \\ 22 \end{array} \quad \begin{array}{r} 7.9 \\ 33 \end{array}$$

(7.1)

x

$$\begin{array}{r} 8.8 \\ 33 \end{array} \quad \begin{array}{r} 8.8 \\ 30 \end{array} \quad \begin{array}{r} 7.4 \\ 27 \end{array} \quad \begin{array}{r} 21.0 \\ 10 \end{array} \quad \begin{array}{r} 9.1 \\ 15 \end{array} \quad \begin{array}{r} 8.7 \\ 16 \end{array} \quad \begin{array}{r} 7.9 \\ 13 \end{array} \quad \begin{array}{r} 7.4 \\ 10.2 \end{array} \quad \begin{array}{r} 8.0 \\ 14 \end{array} \quad \begin{array}{r} 9.0 \\ 17.5 \end{array} \quad \begin{array}{r} 9.0 \\ 10 \end{array} \quad \begin{array}{r} 9.0 \\ 20.6 \end{array} \quad \begin{array}{r} 8.4 \\ 25 \end{array} \quad \begin{array}{r} 8.5 \\ 33 \end{array}$$

(7.6)

y

$$\begin{array}{r} 9.0 \\ 33 \end{array} \quad \begin{array}{r} 9.0 \\ 30.5 \end{array} \quad \begin{array}{r} 10.2 \\ 28 \end{array} \quad \begin{array}{r} 23.0 \\ 10 \end{array} \quad \begin{array}{r} 10.2 \\ 10 \end{array} \quad \begin{array}{r} 9.0 \\ 14 \end{array} \quad \begin{array}{r} 8.1 \\ 13.5 \end{array} \quad \begin{array}{r} 7.8 \\ 10.4 \end{array} \quad \begin{array}{r} 8.2 \\ 10.5 \end{array} \quad \begin{array}{r} 8.1 \\ 20 \end{array} \quad \begin{array}{r} 8.4 \\ 24 \end{array} \quad \begin{array}{r} 7.7 \\ 27 \end{array} \quad \begin{array}{r} 8.1 \\ 33 \end{array}$$

(8.2)

Original Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		907.95			
B.M.	1.91	902.47.	1.39	900.56.	
49+40				899.4	3.1.
Eg. {	49 +54.5				
	+56			99.2	3.3.
50+00				898.7	3.8
+05.3				886.	3.9.
+50				881.	44.
51+00				975.	5.0
+25				972.	5.3
+40				970.	5.5
+80				965.	6.0
52+00				963.	6.2
+35				957.	6.6
B.M.				897.13	

June 6 1926

L.G.B.M. 111 230-B Lt. Sta 44+15

(3.1)

$$\begin{array}{r} 34 \\ 33 \end{array} \times \begin{array}{r} 31 \\ 00 \end{array} \begin{array}{r} 2.8 \\ 13 \end{array} \begin{array}{r} 2.5 \\ 14 \end{array} \begin{array}{r} 2.4 \\ 20 \end{array} \begin{array}{r} 2.3 \\ 33 \end{array}$$

(3.3)

$$\begin{array}{r} 34 \\ 33 \end{array} \begin{array}{r} 30 \\ 15 \end{array} \begin{array}{r} 2.8 \\ 13 \end{array} \begin{array}{r} 2.5 \\ 14 \end{array} \begin{array}{r} 2.4 \\ 20 \end{array} \begin{array}{r} 2.3 \\ 33 \end{array}$$

RR-Exception

(3.9)

$$\begin{array}{r} 32 \\ 33 \end{array} \begin{array}{r} 3.3 \\ 15 \end{array} \begin{array}{r} 3.0 \\ 100 \end{array} \begin{array}{r} 3.2 \\ 15 \end{array} \begin{array}{r} 3.7 \\ 33 \end{array}$$

(4.4)

$$\begin{array}{r} 64 \\ 33 \end{array} \times \begin{array}{r} 78 \\ 24 \end{array} \begin{array}{r} 80 \\ 19 \end{array} \begin{array}{r} 7.5 \\ 16.5 \end{array} \begin{array}{r} 4.8 \\ 11 \end{array} \begin{array}{r} 4.0 \\ 104 \end{array} \begin{array}{r} 4.4 \\ 00 \end{array} \begin{array}{r} 4.4 \\ 17.5 \end{array} \begin{array}{r} 8.0 \\ 23 \end{array} \begin{array}{r} 7.0 \\ 33 \end{array}$$

(5.0)

$$\begin{array}{r} 66 \\ 33 \end{array} \times \begin{array}{r} 54 \\ 04 \end{array} \begin{array}{r} 5.0 \\ 9 \end{array} \begin{array}{r} 4.9 \\ 101 \end{array} \begin{array}{r} 5.2 \\ 0.2 \end{array} \begin{array}{r} 5.5 \\ 20 \end{array} \begin{array}{r} 5.4 \\ 33 \end{array}$$

(5.3)

$$\begin{array}{r} 65 \\ 33 \end{array} \times \begin{array}{r} 68 \\ 15 \end{array} \begin{array}{r} 70 \\ 12.5 \end{array} \begin{array}{r} 5.3 \\ 10 \end{array} \begin{array}{r} 5.0 \\ 00 \end{array} \begin{array}{r} 5.0 \\ 16 \end{array} \begin{array}{r} 8.0 \\ 23 \end{array} \begin{array}{r} 8.3 \\ 30 \end{array} \begin{array}{r} 2.0 \\ 270 \end{array} \begin{array}{r} 8.0 \\ 33 \end{array}$$

(5.5)

$$\begin{array}{r} 89 \\ 33 \end{array} \times \begin{array}{r} 89 \\ 34 \end{array} \begin{array}{r} 8.1 \\ 18 \end{array} \begin{array}{r} 5.7 \\ 11.5 \end{array} \begin{array}{r} 5.4 \\ 10.1 \end{array} \begin{array}{r} 6.0 \\ 15 \end{array} \begin{array}{r} 6.0 \\ 17 \end{array} \begin{array}{r} 7.5 \\ 21 \end{array} \begin{array}{r} 2.5 \\ 20 \end{array} \begin{array}{r} 2.5 \\ 23 \end{array} \begin{array}{r} 7.0 \\ 33 \end{array} \begin{array}{r} 4.4 \\ 33 \end{array}$$

(6.0)

$$\begin{array}{r} 74 \\ 33 \end{array} \times \begin{array}{r} 9.8 \\ 38 \end{array} \begin{array}{r} 8.7 \\ 18.5 \end{array} \begin{array}{r} 6.6 \\ 12 \end{array} \begin{array}{r} 6.0 \\ 20 \end{array} \begin{array}{r} 6.4 \\ 13 \end{array} \begin{array}{r} 7.0 \\ 10 \end{array} \begin{array}{r} 7.0 \\ 19.0 \end{array} \begin{array}{r} 7.3 \\ 33 \end{array}$$

(6.2)

$$\begin{array}{r} 7.7 \\ 33 \end{array} \times \begin{array}{r} 7.1 \\ 0.9 \end{array} \begin{array}{r} 6.3 \\ 11 \end{array} \begin{array}{r} 6.2 \\ 00 \end{array} \begin{array}{r} 7.0 \\ 15 \end{array} \begin{array}{r} 8.3 \\ 20 \end{array} \begin{array}{r} 8.5 \\ 21 \end{array} \begin{array}{r} 8.5 \\ 23.4 \end{array} \begin{array}{r} 8.6 \\ 33 \end{array}$$

(6.6)

$$\begin{array}{r} 6.8 \\ 33 \end{array} \begin{array}{r} 8.0 \\ 18 \end{array} \times \begin{array}{r} 8.2 \\ 14 \end{array} \begin{array}{r} 7.1 \\ 14 \end{array} \begin{array}{r} 6.6 \\ 00 \end{array} \begin{array}{r} 7.4 \\ 13 \end{array} \begin{array}{r} 8.6 \\ 19 \end{array} \begin{array}{r} 8.9 \\ 20 \end{array} \begin{array}{r} 9.1 \\ 33 \end{array}$$

R.R. Spike in Root Maple 125 Rt. Sta. 52+70

Original..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		902.47			
52+80				895.4	7.1
53+00				953	7.2
+06.1				952	7.3
T.O.M.	4.74	899.62.	7.59		894.88.
+30				950	4.6
+66				949	4.7
54+00				949	4.9
+50				945	5.1
55+00				943	5.3
+50				941	5.5
56+00				939	5.7
+50				937	5.9
57+00				936	6.1

Original

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		899.62			
57+50				893.4	6.2
58+00				934	6.2
T.P.	6.33	899.43	6.52		893.10
+50				935	5.9
59+00				938	5.6
+50				942	5.2
60+00				945	4.9
T.P.	12.32	905.05	6.70		892.73
+50				949	10.2
61+00				952	9.9
+50				955	9.6
62+00				958	9.3
+50				960	9.1
63+00				961	9.0

$$\begin{array}{r} 112 \\ 33 \end{array} \times \begin{array}{r} 23.8 \\ 23.8 \\ -44 \\ \hline 104 \\ 23 \\ \hline 69 \\ 15 \end{array} \quad \begin{array}{r} 62 \\ 90 \end{array} \times \begin{array}{r} 64 \\ 13 \\ \hline 108 \\ 22 \\ \hline 140 \\ 58 \\ \hline 266 \\ 33 \end{array}$$

(6.2)

$$\begin{array}{r} 114 \\ 33 \end{array} \times \begin{array}{r} 24.6 \\ 24.6 \\ -48 \\ \hline 110 \\ 23 \\ \hline 67 \\ 16 \end{array} \quad \begin{array}{r} 66 \\ 90 \end{array} \times \begin{array}{r} 110 \\ 14 \\ \hline 120 \\ 17 \\ \hline 268 \\ 33 \end{array}$$

(6.2)

$$\begin{array}{r} 108 \\ 33 \end{array} \times \begin{array}{r} 23.6 \\ 23.6 \\ -4.3 \\ \hline 102 \\ 22 \\ \hline 67 \\ 15 \end{array} \quad \begin{array}{r} 60 \\ 90 \end{array} \times \begin{array}{r} 67 \\ 13 \\ \hline 97 \\ 17 \\ \hline 23.6 \\ 3.8 \\ \hline 47 \\ 29 \\ \hline 118 \\ 33 \end{array}$$

(5.9)

$$\begin{array}{r} 97 \\ 33 \end{array} \times \begin{array}{r} 21.8 \\ 21.8 \\ -2.0 \\ \hline 20 \\ 20 \\ \hline 61 \\ 16 \end{array} \quad \begin{array}{r} 60 \\ 90 \end{array} \times \begin{array}{r} 92 \\ 16 \\ \hline 23.4 \\ 23.4 \\ \hline 107 \\ 33 \end{array}$$

(5.6)

$$\begin{array}{r} 27 \\ 33 \end{array} \times \begin{array}{r} 24 \\ 24 \\ -1.8 \\ \hline 2.0 \\ 15 \\ \hline 54 \\ 15 \end{array} \quad \begin{array}{r} 40 \\ 90 \end{array} \times \begin{array}{r} 54 \\ 15 \\ \hline 29 \\ 22 \\ \hline 9.3 \\ 33 \end{array}$$

(5.2)

$$\begin{array}{r} 7.2 \\ 33 \end{array} \times \begin{array}{r} 23.0 \\ 23.0 \\ -3.0 \\ \hline 6.9 \\ 17 \end{array} \quad \begin{array}{r} 24 \\ 90 \end{array} \times \begin{array}{r} 41 \\ 15 \\ \hline 5.1 \\ 19 \\ \hline 7.5 \\ 24 \\ \hline 2.1 \\ 33 \end{array}$$

(4.9)

Top R.W. Stake Lt. Sta. 60+00

$$\begin{array}{r} 114 \\ 33 \end{array} \times \begin{array}{r} 24.6 \\ 24.6 \\ -4.4 \\ \hline 104 \\ 20 \\ \hline 15 \\ 18 \end{array} \quad \begin{array}{r} 97 \\ 90 \end{array} \times \begin{array}{r} 102 \\ 20 \\ \hline 114 \\ 23 \\ \hline 117 \\ 22 \\ \hline 140 \\ 22 \\ \hline 114 \\ 33 \end{array}$$

(10.2)

$$\begin{array}{r} 112 \\ 33 \end{array} \times \begin{array}{r} 23.8 \\ 23.8 \\ -4.4 \\ \hline 110 \\ 22 \\ \hline 15 \\ 19 \end{array} \quad \begin{array}{r} 97 \\ 90 \end{array} \times \begin{array}{r} 97 \\ 16 \\ \hline 107 \\ 19 \\ \hline 106 \\ 22 \\ \hline 95 \\ 24 \\ \hline 93 \\ 20 \\ \hline 93 \\ 20 \\ \hline 76 \\ 76 \\ \hline 33 \end{array}$$

(9.9)

$$\begin{array}{r} 96 \\ 33 \end{array} \times \begin{array}{r} 25 \\ 25 \\ -1.5 \\ \hline 2.5 \\ 15 \end{array} \quad \begin{array}{r} 90 \\ 90 \end{array} \times \begin{array}{r} 94 \\ 17 \\ \hline 100 \\ 19 \\ \hline 25 \\ 21 \\ \hline 28.1 \\ 28.1 \\ \hline 7.2 \\ 33 \end{array}$$

(9.6)

$$\begin{array}{r} 76 \\ 33 \end{array} \times \begin{array}{r} 26.5 \\ 26.5 \\ -4.3 \\ \hline 22 \\ 19 \end{array} \quad \begin{array}{r} 99 \\ 90 \end{array} \times \begin{array}{r} 94 \\ 15 \\ \hline 23 \\ 22 \\ \hline 23 \\ 20 \\ \hline 23 \\ 20 \\ \hline 23 \\ 20 \\ \hline 66 \\ 33 \end{array}$$

(9.3)

$$\begin{array}{r} 89 \\ 33 \end{array} \times \begin{array}{r} 26.9 \\ 26.9 \\ -4.6 \\ \hline 20 \\ 20 \end{array} \quad \begin{array}{r} 94 \\ 90 \end{array} \times \begin{array}{r} 92 \\ 15 \\ \hline 29 \\ 20 \\ \hline 61 \\ 20 \\ \hline 30.5 \\ 30.5 \\ \hline 59 \\ 33 \end{array}$$

(9.1)

$$\begin{array}{r} 118 \\ 33 \end{array} \times \begin{array}{r} 20 \\ 20 \\ -1.8 \\ \hline 18 \\ 21 \end{array} \quad \begin{array}{r} 92 \\ 90 \end{array} \times \begin{array}{r} 92 \\ 15 \\ \hline 27 \\ 20 \\ \hline 89 \\ 22 \\ \hline 7.0 \\ 20 \\ \hline 70 \\ 20 \\ \hline 62 \\ 33 \end{array}$$

(9.0)

Sta.	Original		Cross Sections		Gr. R.
	B. S.	H. I.	F. S.	Grade	
		905.05			
63+50				896.2	8.9
T.P.	4.20	900.97	8.28		896.77 ✓
64+00				96.2	4.8
+50				96.2	2.8
65+00				96.1	4.9
+50				96.0	5.0
+75				95.8	5.2
66+00				95.7	5.3
B.M.	3.11	898.35	5.72	(895.25) 895.24 = Orig.	
+50				95.5	2.9
67+00				95.2	3.2
68+00				95.0	3.4
69+00				895.3	3.1

Left

(8.9)

Right

$12 \rightarrow$	$\frac{11.4}{20}$	$\frac{8.9}{18}$	$\frac{2.7}{15}$	$\frac{7.4}{10.5}$	$\frac{8.9}{0.0/15}$	$\frac{9.3}{20}$	$\frac{7.7}{+1.2/27.8}$	$\frac{5.5}{33}$
------------------	-------------------	------------------	------------------	--------------------	----------------------	------------------	-------------------------	------------------

$\frac{2.9}{33}$	$\frac{4.0}{23} \times$	$\frac{5.5}{19}$	$\frac{4.8}{10} \times$	$\frac{4.3}{10.5}$	$\frac{4.1}{16}$	$\frac{5.0}{19}$	$\frac{2.1}{+2.7/30.1}$	$\frac{4.1}{33}$
------------------	-------------------------	------------------	-------------------------	--------------------	------------------	------------------	-------------------------	------------------

$\frac{8.0}{33}$	$\frac{7.9}{27}$	$\frac{2.9}{20.1}$	$\frac{6.2}{10.6} \times$	$\frac{5.4}{20}$	$\frac{4.8}{15} \times$	$\frac{4.3}{10.5}$	$\frac{4.8}{0.0/15}$	$\frac{5.0}{20}$	$\frac{3.7}{+1.1/27.6}$	$\frac{0.6}{33}$
------------------	------------------	--------------------	---------------------------	------------------	-------------------------	--------------------	----------------------	------------------	-------------------------	------------------

$\frac{8.5}{33}$	$\frac{2.4}{28}$	$\frac{2.4}{22}$	$\frac{4.9}{15} \times$	$\frac{4.5}{10.4}$	$\frac{4.1}{16}$	$\frac{5.5}{18}$	$\frac{5.0}{21}$	$\frac{5.3}{+1.6/25.4}$	$\frac{7.27}{33}$
------------------	------------------	------------------	-------------------------	--------------------	------------------	------------------	------------------	-------------------------	-------------------

$\frac{9.1}{33}$	$\frac{2.6}{24}$	$\frac{5.1}{17}$	$\frac{11.0}{15} \times$	$\frac{4.3}{10.7}$	$\frac{5.0}{18}$	$\frac{6.4}{22}$	$\frac{6.0}{+1.0/24.5}$	$\frac{4.0}{33}$
------------------	------------------	------------------	--------------------------	--------------------	------------------	------------------	-------------------------	------------------

$\frac{9.3}{33}$	$\frac{7.5}{21}$	$\frac{4.8}{15}$	$\frac{4.4}{10.8}$	$\frac{4.9}{17}$	$\frac{7.0}{22}$	$\frac{1.2}{-2.0/23}$	$\frac{10.7}{23}$	$\frac{7.2}{33}$
------------------	------------------	------------------	--------------------	------------------	------------------	-----------------------	-------------------	------------------

$\frac{11.7}{33}$	$\frac{9.1}{22}$	$\frac{10.3}{15} \times$	$\frac{4.5}{10.8}$	$\frac{5.3}{0.0/15}$	$\frac{8.9}{22}$	$\frac{10.9}{33}$
-------------------	------------------	--------------------------	--------------------	----------------------	------------------	-------------------

RR. 19 spike (arc by Pole #15) Lt Sta 66+27

$\frac{35.2}{33}$	$\frac{13.0}{-10.1} \times$	$\frac{12.0}{27}$	$\frac{2.9}{14}$	$\frac{2.9}{10.4}$	$\frac{3.1}{-0.2/15.4}$	$\frac{2.0}{31}$	$\frac{12.2}{33}$	95.7
-------------------	-----------------------------	-------------------	------------------	--------------------	-------------------------	------------------	-------------------	------

$\frac{41.9}{33}$	$\frac{16.2}{-13.0} \times$	$\frac{15.0}{33}$	$\frac{3.4}{14}$	$\frac{2.7}{10.5}$	$\frac{3.3}{13}$	$\frac{12.7}{32}$	$\frac{14.2}{33}$	$\frac{12.8}{-10.4/25.8}$	95.7
-------------------	-----------------------------	-------------------	------------------	--------------------	------------------	-------------------	-------------------	---------------------------	------

$\frac{37}{33}$	$\frac{14.4}{-11.0} \times$	$\frac{12.7}{30}$	$\frac{4.0}{16}$	$\frac{3}{10.3}$	$\frac{3.7}{14}$	$\frac{15.0}{33}$	$\frac{16.5}{-10.1/41.7}$	95.3
-----------------	-----------------------------	-------------------	------------------	------------------	------------------	-------------------	---------------------------	------

$\frac{9.4}{33}$	$\frac{26.1}{-5.1} \times$	$\frac{8.2}{24}$	$\frac{3.1}{11}$	$\frac{3.1}{10}$	$\frac{3.4}{14}$	$\frac{9.5}{26}$	$\frac{10.5}{-7.4/28.8}$	$\frac{10.7}{33}$	95.5
------------------	----------------------------	------------------	------------------	------------------	------------------	------------------	--------------------------	-------------------	------

Original

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		898.35			
69+50				895.7	2.7
70+00				96.1	2.3
+50				96.7	1.7
T.P.	742	905.23	0.54		897.81 ✓
71+00				97.2	8.0
+50				97.8	7.4
72+00				98.3	6.9
+50				98.9	6.3
73+00				99.4	5.8
+50				900.0	5.2
74+00				00.5	4.7
+50				01.1	4.1
75+00				01.7	2.5
T.P.	680	908.81	3.22		902.01 ✓

Inst. W.H.C.
 Prof. H.L.P.
 M.C. & W.A.

May 4 1929

(2.7) λ

$$\begin{array}{r} 78 \quad 28 \quad 72 \quad 15 \quad 27 \\ 33 \quad 30 \quad 76 \quad 15 \quad 00 \end{array} \quad \begin{array}{r} 30 \\ +02 \end{array} \quad \begin{array}{r} 32 \quad 72 \\ 15 \quad 20 \end{array} \quad \begin{array}{r} 24 \\ -57 \end{array} \quad \begin{array}{r} 264 \\ 87 \end{array} \quad \begin{array}{r} 106 \\ 30 \\ 33 \end{array}$$

(2.5) λ

$$\begin{array}{r} 78 \quad 20 \quad 15 \quad 23 \\ 33 \quad 29 \quad 15 \quad 00 \end{array} \quad \begin{array}{r} 20 \\ +03 \end{array} \quad \begin{array}{r} 23 \\ 120 \end{array} \quad \begin{array}{r} 15 \\ 18 \end{array} \quad \begin{array}{r} 27 \\ 26 \end{array} \quad \begin{array}{r} 83 \\ 30 \\ 33 \end{array} \quad \begin{array}{r} 75 \\ 30 \\ 33 \end{array}$$

(1.7) λ

$$\begin{array}{r} 76 \quad 60 \quad 20 \quad 15 \quad 17 \\ 33 \quad 76 \quad 17 \quad 15 \quad 00 \end{array} \quad \begin{array}{r} 15 \\ +04 \end{array} \quad \begin{array}{r} 19 \\ 15 \end{array} \quad \begin{array}{r} 51 \\ 21 \end{array} \quad \begin{array}{r} 55 \\ -38 \end{array} \quad \begin{array}{r} 21 \\ 226 \end{array} \quad \begin{array}{r} 71 \\ 20 \\ 33 \end{array}$$

(6.0) λ

$$\begin{array}{r} 88 \quad 24 \quad 98 \quad 27 \quad 83 \\ 33 \quad 26 \quad 23 \quad 18 \end{array} \quad \begin{array}{r} 21 \\ -01 \end{array} \quad \begin{array}{r} 28 \\ 702 \end{array} \quad \begin{array}{r} 81 \\ 15 \end{array} \quad \begin{array}{r} 120 \\ -40 \end{array} \quad \begin{array}{r} 23 \\ 126 \\ 33 \end{array}$$

(7.4) λ

$$\begin{array}{r} 73 \quad 60 \quad 92 \quad 20 \quad 90 \quad 27 \\ 33 \quad 31 \quad 30 \quad 236 \quad 104 \quad 19 \end{array} \quad \begin{array}{r} 74 \\ 15 \end{array} \quad \begin{array}{r} 21 \\ 703 \end{array} \quad \begin{array}{r} 24 \\ 80 \end{array} \quad \begin{array}{r} 15 \\ 19 \end{array} \quad \begin{array}{r} 84 \\ 108 \end{array} \quad \begin{array}{r} 26 \\ 212 \end{array} \quad \begin{array}{r} 24 \\ 26 \\ 33 \end{array}$$

(6.4) λ

$$\begin{array}{r} 57 \quad 20 \quad 77 \\ 33 \quad 247 \quad 711 \end{array} \quad \begin{array}{r} 21 \\ 158 \end{array} \quad \begin{array}{r} 16 \\ +03 \end{array} \quad \begin{array}{r} 73 \\ -04 \end{array} \quad \begin{array}{r} 166 \\ 711 \end{array} \quad \begin{array}{r} 77 \\ 247 \end{array} \quad \begin{array}{r} 74 \\ 33 \end{array}$$

(6.3) λ

$$\begin{array}{r} 68 \quad 153 \quad 68 \quad 65 \\ 33 \quad 153 \quad 115 \quad 18 \end{array} \quad \begin{array}{r} 63 \\ 15 \end{array} \quad \begin{array}{r} 60 \\ +03 \end{array} \quad \begin{array}{r} 67 \\ 14 \end{array} \quad \begin{array}{r} 72 \\ -09 \end{array} \quad \begin{array}{r} 186 \\ 113 \end{array} \quad \begin{array}{r} 70 \\ 257 \end{array} \quad \begin{array}{r} 56 \\ 30 \\ 33 \end{array} \quad \begin{array}{r} 46 \\ 30 \\ 33 \end{array}$$

(5.8) λ

$$\begin{array}{r} 58 \quad 00 \quad 62 \quad 68 \\ 33 \quad 254 \quad 216 \quad 21 \end{array} \quad \begin{array}{r} 60 \\ 15.8 \end{array} \quad \begin{array}{r} 60 \\ +0.1 \end{array} \quad \begin{array}{r} 51 \\ 40.1 \end{array} \quad \begin{array}{r} 68 \\ -10 \end{array} \quad \begin{array}{r} 190 \\ 761 \end{array} \quad \begin{array}{r} 67 \\ 247 \end{array} \quad \begin{array}{r} 35 \\ 33 \end{array}$$

(5.7) λ

$$\begin{array}{r} 72 \quad 72 \quad 170 \quad 62 \\ 33 \quad 20 \quad 170 \quad -10 \end{array} \quad \begin{array}{r} 45 \\ -03 \end{array} \quad \begin{array}{r} 57 \\ 15 \end{array} \quad \begin{array}{r} 67 \\ 18 \end{array} \quad \begin{array}{r} 69 \\ -17 \end{array} \quad \begin{array}{r} 218 \\ 404 \end{array} \quad \begin{array}{r} 68 \\ 286 \end{array} \quad \begin{array}{r} 51 \\ 31 \\ 33 \end{array}$$

(4.7) λ

$$\begin{array}{r} 75 \quad 70 \quad 172 \quad 58 \\ 33 \quad 21 \quad 172 \quad -11 \end{array} \quad \begin{array}{r} 50 \\ -03 \end{array} \quad \begin{array}{r} 55 \\ 15 \end{array} \quad \begin{array}{r} 64 \\ 18 \end{array} \quad \begin{array}{r} 65 \\ -18 \end{array} \quad \begin{array}{r} 186 \\ 707 \end{array} \quad \begin{array}{r} 60 \\ 24.1 \end{array} \quad \begin{array}{r} 58 \\ 28 \end{array} \quad \begin{array}{r} 48 \\ 33 \end{array}$$

(4.1) λ

$$\begin{array}{r} 10 \quad 65 \quad 25 \quad 49 \\ 33 \quad 29 \quad 248 \quad 42 \end{array} \quad \begin{array}{r} 48 \\ 178 \end{array} \quad \begin{array}{r} 41 \\ 00 \end{array} \quad \begin{array}{r} 46 \\ 15 \end{array} \quad \begin{array}{r} 51 \\ -10 \end{array} \quad \begin{array}{r} 170 \\ 76 \end{array} \quad \begin{array}{r} 59 \\ 24 \end{array} \quad \begin{array}{r} 56 \\ 29 \end{array} \quad \begin{array}{r} 44 \\ 33 \end{array}$$

(3.1) λ

$$\begin{array}{r} 3.3 \quad 24 \quad 49 \\ 33 \quad 24 \quad 106 \end{array} \quad \begin{array}{r} 47 \\ 158 \end{array} \quad \begin{array}{r} 37 \\ +02 \end{array} \quad \begin{array}{r} 39 \\ 15 \end{array} \quad \begin{array}{r} 40 \\ -05 \end{array} \quad \begin{array}{r} 160 \\ 70 \end{array} \quad \begin{array}{r} 55 \\ 22 \end{array} \quad \begin{array}{r} 39 \\ 25 \end{array} \quad \begin{array}{r} 44 \\ 33 \end{array}$$

Original

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
------	------	-------	-------	-------	--------

908.81

75+50				902.3	6.5
-------	--	--	--	-------	-----

76+00				029.	59
-------	--	--	--	------	----

+50				03.5	53
-----	--	--	--	------	----

77+00				04.1	47
-------	--	--	--	------	----

+50				04.7	41
-----	--	--	--	------	----

78+00				05.3	35
-------	--	--	--	------	----

+50				05.7	31
-----	--	--	--	------	----

T.P.	4.90	910.26	3.45		905.36
------	------	--------	------	--	--------

79+00				05.8	45
-------	--	--	--	------	----

Eq = +77.7 +48.5				05.6	47
---------------------	--	--	--	------	----

80+00				49. 44.1	54
-------	--	--	--	-------------	----

B.M.	4.07	911.55 911.56	2.77	907.49 907.49	
------	------	------------------	------	------------------	--

+50				04.0	26
-----	--	--	--	------	----

Inst. W.H.C.
 Rod. A.L.D.
 Date. M.E.Y.W.A.

May 4 1926 22

Left				O.L.			Right		
33	$\frac{150}{-8.5}$	$\frac{143}{27}$	$\frac{72}{15}$	$\frac{65.65}{00}$	$\frac{70}{4}$	$\frac{125}{21}$	$\frac{133}{-58/286}$	$\frac{13.6}{33}$	

$\frac{147}{33}$	$\frac{138}{28}$	$\frac{6.6}{14/-0.7}$	$\frac{6.0}{-0.1}$	$\frac{64}{10}$	$\frac{9.5}{21}$	$\frac{9.6}{-37/224}$	$\frac{7.0}{33}$
------------------	------------------	-----------------------	--------------------	-----------------	------------------	-----------------------	------------------

$\frac{84}{33}$	$\frac{8.0}{30}$	$\frac{84}{29}$	$\frac{7.8}{22}$	$\frac{5.8}{16.2/-0.5}$	$\frac{5.2}{70.1}$	$\frac{5.7}{-0.4/64}$	$\frac{14}{19}$	$\frac{42}{+14/24.7}$	$\frac{18}{33}$
-----------------	------------------	-----------------	------------------	-------------------------	--------------------	-----------------------	-----------------	-----------------------	-----------------

$\frac{53}{31}$	$\frac{61}{29}$	$\frac{46}{25}$	$\frac{6.7}{0.8}$	$\frac{64}{21}$	$\frac{5.0}{18}$	$\frac{5.0}{16.2/-0.3}$	$\frac{45}{+0.2}$	$\frac{5.1}{-0.4/164}$	$\frac{5.8}{20}$	$\frac{47}{25.5}$	$\frac{40}{32}$	$\frac{50}{+47/33.1}$
-----------------	-----------------	-----------------	-------------------	-----------------	------------------	-------------------------	-------------------	------------------------	------------------	-------------------	-----------------	-----------------------

$\frac{65}{29}$	$\frac{68}{24}$	$\frac{74}{28}$	$\frac{7.1}{22}$	$\frac{5.1}{17.9/-1.0}$	$\frac{4.3}{-0.2}$	$\frac{4.8}{16}$	$\frac{5.5}{-1.4/20.6}$	$\frac{5.3}{+0.8/24.2}$	$\frac{5.3}{33}$
-----------------	-----------------	-----------------	------------------	-------------------------	--------------------	------------------	-------------------------	-------------------------	------------------

$\frac{7.1}{33}$	$\frac{20.6}{20.6}$	$\frac{6.3}{-3.8}$	$\frac{6.3}{21}$	$\frac{4.6}{16}$	$\frac{4.1}{-0.6}$	$\frac{4.9}{16}$	$\frac{7.5}{21}$	$\frac{4.4}{-4.4/23.8}$	$\frac{7.7}{33}$
------------------	---------------------	--------------------	------------------	------------------	--------------------	------------------	------------------	-------------------------	------------------

$\frac{3.8}{33}$	$\frac{4.8}{27}$	$\frac{4.6}{23}$	$\frac{4.7}{19}$	$\frac{4.0}{16.0/-0.5}$	$\frac{3.3}{-0.2}$	$\frac{3.2}{16}$	$\frac{6.2}{-3.1/21.2}$	$\frac{6.9}{26}$	$\frac{7.0}{33}$
------------------	------------------	------------------	------------------	-------------------------	--------------------	------------------	-------------------------	------------------	------------------

$\frac{0.8}{33}$	$\frac{3.8}{20.8}$	$\frac{1.3}{+3.2}$	$\frac{5.1}{24}$	$\frac{5.2}{18}$	$\frac{4.2}{16}$	$\frac{3.9}{+0.6}$	$\frac{4.5}{60/15}$	$\frac{4.7}{29}$	$\frac{5.3}{26}$	$\frac{5.4}{+1.0}$	$\frac{4.5}{+4.5/27}$	$\frac{3.4}{33}$
------------------	--------------------	--------------------	------------------	------------------	------------------	--------------------	---------------------	------------------	------------------	--------------------	-----------------------	------------------

$\frac{3.8}{33}$	$\frac{26.5}{26.5}$	$\frac{4.4}{+0.3}$	$\frac{5.0}{18}$	$\frac{4.2}{16}$	$\frac{3.6}{+1.1}$	$\frac{4.2}{19}$	$\frac{4.9}{21}$	$\frac{4.3}{+0.4/26.6}$	$\frac{1.4}{33}$
------------------	---------------------	--------------------	------------------	------------------	--------------------	------------------	------------------	-------------------------	------------------

$\frac{4.4}{33}$	$\frac{5.7}{25.6/+1.7}$	$\frac{6.0}{24}$	$\frac{5.9}{18}$	$\frac{4.9}{14}$	$\frac{4.4}{2.0}$	$\frac{4.8}{19}$	$\frac{4.9}{26.8}$	$\frac{3.2}{+3.0/31.0}$	$\frac{2.6}{33}$
------------------	-------------------------	------------------	------------------	------------------	-------------------	------------------	--------------------	-------------------------	------------------

R.R. in spike Root 20" O.K. 50' wt 54 80405

$\frac{4.2}{33}$	$\frac{2.3}{2.3}$	$\frac{6.7}{10.9}$	$\frac{7.6}{26}$	$\frac{7.0}{13}$	$\frac{6.7}{10.9}$	$\frac{7.4}{16}$	$\frac{6.0}{21}$	$\frac{7.1}{+0.2/24.3}$	$\frac{7.5}{18}$	$\frac{4.5}{33}$
------------------	-------------------	--------------------	------------------	------------------	--------------------	------------------	------------------	-------------------------	------------------	------------------

August 1901 Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		911.55			
81+00				902.7	2.9
+50				901.0	10.6
+72.94 - 85.7					
82+00				899.1	^{12.6} 12.5 ^{12.3}
T.P.	1.68	900.90	12.33		899.22 ✓
+50				97.0	^{4.2} 3.9 ^{3.6}
83+00				94.8	^{6.7} 6.1 ^{5.6}
+23				93.8	^{7.9} 7.1 ^{6.4}
+50				92.7	^{9.1} 8.2 ^{7.4}
T.P.	1.92	892.66	10.16		890.74 ✓
84+00				90.5	^{3.3} 2.2 ^{1.3}
+50				88.4	^{5.4} 4.3 ^{3.4}
85+00				86.2	^{7.0} 6.5 ^{6.0}
T.P.	2.67	884.92 ✓	2.41		884.25 ✓
+54.94				83.9	^{1.9} 1.0 ^{0.2}
86+00				82.2	^{3.5} 2.7 ^{2.0}

W.H.C.

A.L.P.

M.G. - C.F.B.

May 2, 1926 23

Super. Lt	Wider Rt	Left Lt	G L						Right				
		5.1 3.3	7.9 3.0	16.0 10.9	8.9 0.0	8.5 1.4	7.5 11.0	8.6 2.0	2.1 2.2	8.1 10.1	6.1 26.0	5.5 2.9	3.3 3.3
		5.1 3.3	7.9 3.1	16.0 10.9	8.9 2.6	8.5 1.6	7.5 11.1	8.6 1.6	2.1 2.5	8.1 10.1	6.1 26.0	5.5 2.9	3.3 3.3
-12	-12												
-13	+0.6	11.1 3.3	11.2 4.4	12.2 2.7	12.6 1.7	12.0 1.5	11.9 10.6	12.3 11.6	12.4 10.0	12.2 10.0	10.3 3.0	10.3 3.3	
-27	127	12.1 3.3	12.2 4.4	12.2 1.6	12.6 1.7	12.0 1.5	11.9 10.6	12.3 11.6	12.4 10.0	12.2 10.0	10.3 3.0	10.3 3.3	
-61	+54 0.4	5.3 3.3	5.4 1.3	6.6 3.6	5.9 1.7	6.4 1.6	5.3 10.8	6.1 1.2	8.0 1.7	7.1 2.3	5.0 2.8	5.1 3.3	
-76	+66 1.1		7.8 3.3	7.5 1.9	7.9 1.7	7.3 1.5	6.2 10.9	6.8 1.3	7.9 1.7	7.8 2.3	5.6 2.9	5.6 3.3	
-90	+81 2.3	10.5 3.3	10.1 12.1	9.5 1.7	8.0 1.5	7.6 1.5	8.4 10.6	9.0 1.3	10.0 1.6	10.0 2.6	9.5 2.5	2.0 3.1	2.0 3.3
-107	+93 2.3	4.5 3.3	3.1 1.8	4.0 1.7	3.0 1.6	2.7 1.5	1.8 10.4	2.6 1.2	4.5 1.6	4.8 1.8	5.1 2.0	2.4 3.3	
-107	+93 2.3	2.1 3.3	2.0 1.7	2.1 1.8	2.2 1.5	2.2 1.5	2.8 10.5	4.9 1.4	5.7 1.6	5.6 2.4	4.7 2.5	1.2 3.1	1.1 3.3
-107	+93 2.3	10.0 3.3	10.0 1.7	9.7 1.5	6.9 1.5	6.0 1.5	6.0 10.5	6.0 1.2	9.2 1.5	6.6 2.4	7.0 2.5	2.4 3.3	
-90	+79 1.1	3.4 3.3	3.1 1.1	3.4 1.5	2.5 1.4	1.3 1.4	0.7 10.3	1.2 1.0	10.7 2.2	1.2 3.3	11.2 11.0	1.1 1.1	3.3 3.3
-77	+69	10.1 3.3	10.1 1.7	10.0 1.5	5.5 1.3	2.9 1.3	3.6 10.4	1.9 1.0	11.9 2.4	12.6 10.6	12.6 10.6	2.4 3.3	

Original Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		284.92			
86+50				890.5	5.0 5.9 4.4
87+00				78.8	4.6 5.7 6.1
B.M.	10.17	284.92	10.17		874.75
+50				77.4	2.9 7.1 1.5
88+00				76.0	9.3 9.5 8.1
+50				74.8	10.5 9.7 10.1
T.P.	5.94	280.70	10.16		874.76
89+00				73.5	7.6 6.8 7.2
+50				72.3	4.5 5.0 2.1
+80				71.5	5.3 6.1 9.2
T.P.	1.61	272.59	9.72		870.98
90+00				71.0	1.7 1.6 1.5
+50				69.1	3.0 1.9 2.8
91+00				68.5	4.6 3.6 4.1
T.P.	1.85	267.11	7.33		865.26
+50				67.8	4.7 4.0 4.0

Super. Lt	Wid. Rt	Left Lt	C L						Right					
-61	+56	92 33	278 60	114 22	113 22	52 125	44 00	52 12	117 23	12.6/32.6 -88/32.6				
-46	+114	114 33	112 30	126 -60	114 20	62 115	60 101	64 12	104 24	107 250	10.6 33			
<p>RR Spike in 14" dia 40' Lt. Sta. 87+15 (new)</p>														
-39	+39	151 33	297 -71	150 43	143 12	81 109	73 13	79 20	102 24	23 214	101 25	59 33		
-39	+39	128 33	246 -48	144 23	141 13	90 108	24 108	21 15	71 114	23 28.1	66 33			
-39	+39	111 33	133 27	125 19	104 20	25 14	106 106	16 14	21 20	64 22.8	30 33			
-39	+39	53 33	90 26	241 11	85 21	94 15	74 06	75 14	68 104	71 12	64 18	48 20	48 29	47 33
-12	+12	94 33	241 107	98 16	123 -28	90 13	82 102	82 11	78 13	8.8 00	34 23	23 160	33	
-12	+12	111 33	172 -11	104 -11	97 12	90 102	97 13	106 16	107 -16	107 133	97 20	91 20	7.5 263	
-12	+12	89 33	264 -57	24 21	62 21	24 12	17 -21	210 13	60 21	62 -48	146 24	6.3 28	54 30	5.1 33
-21	+21	362 -106	126 -106	118 22	48 195	39 -11	46 14	99 20	100 -74	100 298	9.5 33			
-53	+48	138 -94	140 -94	127 23	60 11	56 -15	62 14	12.3 26	11.6 -8.0	11.6 31.0	11.2 33			
-87	+75	59 33	378 -81	84 20	27 10	18 -20	24 14	24 24	80 -90	30 30				

Original

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		867.11			
92+00				866.1	2.1 2.1 1.0
+55				65.0	3.0 1.2 2.1
+90				64.6	2.5 1.7 2.5
93+00				64.4	2.6 1.9 2.7
+50				63.8	2.8 2.8 2.2
94+00				62.4	3.9 2.5 3.7
+50				62.2	4.0 3.8 3.9
95+00				62.1	4.0
+25				62.1	4.0
+42				63.0	4.1
T.P.	337	867.78	2.70		264.41
+75				62.0	4.3
96+00				62.7	4.9

Inst. W.H.C.
 Rod. H.L.P.
 Chain. M.E. C.F.B.

May 3 26 25

Super.	LT	RT	LT	Left	X	CL	X	Right						
-1.07	7.93	2.3		9.0 23	30.1 / 9.0 -6.9 / 17	4.3 8	3.5 -2.5	41 16	26 26	26 / 32.0 -2.5 / 33	26 33			
-1.07	7.93	2.3		9.0 33	28.9 / 2.0 -5.9 / 11	2.9 9	4.8 -2.7	42 17	4.5 -3.2	48 / 21.6 2.6	5.0 33			
-9.5	7.81	2.0		8.1 33	27.8 / 2.9 -5.4 / 18	2.7 18	2.8 -2.0	5.1 10	4.7 2.5		5.0 38			
-8.8	7.25	6.4	1.8	8.1 33	27.8 / 1.1 -5.5		2.6 -5.9	7.6 5	5.1 12	4.2 2.3	19.6 39			
-5.4	4.48	0.2		8.8 33	25.2 / 8.8 -5.0		8.5 -5.2	2.7 21	7.2 -4.7	22.8	5.2 28	4.5 33	4.2 5.0	
-2.2	2.21			8.8 33	23.8 / 2.3 -4.4		2.1 -4.4		9.0 -4.8	24.0	2.5 25	5.2 39	3.7 5.0	
-1.2	-0.1			8.4 33	23.4 / 8.2 -4.2		2.1 -4.2		7.8 -4.0	22.0	7.0 32	4.6 38	3.0 5.0	
				8.1 33	23.2 / 8.1 -4.1		7.9 -3.9	2.1 15	5.7 -1.7	18.1	4.2 22	3.1 35	3.7 5.0	
				8.1 33	23.2 / 8.1 -4.1		6.6 -2.6	2.4 9	3.0 22	5.9 7.1	5.0 4.7	5.0 5.0	- cont'd	
				7.6 33	21.6 / 7.4 -3.0	7.1 16	4.7 7	3.3 10.8	2.9 21	3.6 3.4	1.4 4.5		- cont'd	
				top of stake Lt 76.75 + 75										
				28 33	28 31	28.5 26.0	1.5 0.6	4.8 1.2	1.0 1.4	3.4 1.4	4.1 2.0	2.3 1.5	1.8 2.0	- cont'd
				7.0 33	25.3 / 5.4 -4.5	5.3 20	4.0 17	3.4 1.6	4.0 1.8	2.2 4.1	30.1	0.6 3.4	- cont'd	

See Sec. A borrow on left p. 27

Sta.	Original		Cross Sections		
	B. S.	H. I.	F. S.	Grade	Gr. R.
		867.78			
96+35				862.8	5.0
+55				62.8	5.0
+65				62.8	5.0
97+00				62.7	5.1
+14.5				62.7	5.1
B.M.			4.17	863.61	

W.H.C.

A.L.P.

M.E. - C.F.B.

May 3, 1926 26

					C L			Right
	15'	$\frac{26}{33}$	$\frac{23.9}{20.6} \times \frac{5.1}{18}$	$\frac{4.8}{18}$	$\frac{4.3}{10.7}$	$\frac{5.2}{12}$	$\frac{5.3}{15.6}$	$\frac{5.0}{28}$ - cont'd
Widen It. S.P.T.	16'	$\frac{3.0}{33}$	$\frac{2.4}{3.4} \times \frac{4.0}{17.0}$	$\frac{1.0}{11.0}$	$\frac{4.7}{10.3}$	$\frac{6.2}{13}$	$\frac{5.0}{12}$	$\frac{5.7}{33}$ - cont'd
	20'	$\frac{9.3}{33}$	$\frac{8.6}{33} \times \frac{6.0}{18}$	$\frac{4.9}{9}$	$\frac{4.9}{10.4}$	$\frac{5.8}{13}$	$\frac{6.2}{32}$	$\frac{6.7}{50}$ - cont'd
	21'	$\frac{7.3}{30}$	$\frac{6.5}{26} \times \frac{5.7}{21.9}$	$\frac{4.0}{16}$	$\frac{4.6}{14}$	$\frac{4.9}{14}$	$\frac{4.8}{16}$	$\frac{5.2}{50}$ - cont'd

RR in (Crech Palo 458) - R+ Sta 97+40 = (Profile 3.64)

Original Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
<u>Borrow Pit.</u>					
	7.70	872.11			264.4
94+50				63.2	8.9
95+00				63.1	9.0
T.P.	2.82	880.71	0.20		871.91 ✓
+25		880.73		63.1	17.6
+42				63.0	17.7
+75				63.0	17.7
96+00				62.9	17.8
96+35				62.8	17.9
96+55				62.8	17.9
T.P.	1.34	869.46	12.59		268.12 ✓
96+65				62.8	6.7
97+00				62.7	6.8
97+14.5				62.7	6.8
B.M.			5.25		262.60

Inst. W.H.C.
 Rod. A.L.P.
 Chain. M.G. + W.A.

May 4, 1926 27

Right

Top stake	Lt. Sta.	95+75									
		7.5	7.9	7.6	4.5	4.3					
		<u>81</u>	<u>84</u>	<u>88</u>	<u>95</u>	<u>101</u>					
		3.8	6.4	4.1	5.4	4.5	2.0	0.0			
		<u>55</u>	<u>61</u>	<u>76</u>	<u>80</u>	<u>103</u>	<u>108</u>	<u>117</u>			
		12.1	9.9	2.6	12.2	11.5	10.2	10.6	7.2	6.8	
		<u>54</u>	<u>59</u>	<u>77</u>	<u>82</u>	<u>92</u>	<u>109</u>	<u>113</u>	<u>119</u>	<u>124</u>	
		7.6	5.6	5.7	10.8	9.8	9.2	4.9	4.2		
		<u>53</u>	<u>74</u>	<u>85</u>	<u>92</u>	<u>95</u>	<u>118</u>	<u>126</u>	<u>129</u>		
		3.7	2.3	2.5	7.7	6.1	5.7	6.4	2.2	1.6	
		<u>50</u>	<u>72</u>	<u>90</u>	<u>100</u>	<u>102</u>	<u>125</u>	<u>128</u>	<u>136</u>	<u>140</u>	
		6.0	2.7	2.6	2.1	2.7	5.7	3.7	2.6		
		<u>42</u>	<u>44</u>	<u>48</u>	<u>70</u>	<u>103</u>	<u>109</u>	<u>120</u>	<u>141</u>		
		10.3	6.4	3.9	4.8	4.8	1.3	1.0			
		<u>29</u>	<u>50</u>	<u>69</u>	<u>100</u>	<u>127</u>	<u>142</u>	<u>150</u>			
		12.1	8.8	11.6	2.7	3.7	1.2				
		<u>74</u>	<u>87</u>	<u>100</u>	<u>120</u>	<u>138</u>	<u>160</u>				
		5.7	2.0	2.3	2.6	0.5					
		<u>77</u>	<u>100</u>	<u>113</u>	<u>127</u>	<u>140</u>					
		7.0	6.4	2.2	6.3	6.0					
		<u>75</u>	<u>86</u>	<u>100</u>	<u>118</u>	<u>144</u>					
		7.0	7.2	8.3	7.0	7.5					
		<u>75</u>	<u>100</u>	<u>118</u>	<u>127</u>	<u>150</u>					

continue d from preceded page

S & Location.

R.R. Spire Arc d. Pole #58 Lt. Sta. 97+40

Grade Change Cross Sections

Sta.	B. S.	I. I.	E. S.	Grade	Gr. R.
B.M.	3.35	913.68			
39				909.00	
+50				08.88	
+79				08.76	
40				08.62	5.1
+50				08.23	5.5
41				07.7	6.0
+50				07.1	6.6
42				06.5	7.2
+50				05.9	7.8
43				05.3	8.4
T.P.	2.72	908.70	7.70		
+50				04.72	4.0
44				04.17	4.5

Inst. W.H.C.
 Pod. A.L.P.
 Ch. G.F.B - H.T.P.

June 19, 1926

Left

C L

Right

910.33 - R.P. spike in P.P. - 50' Lt. Sta. 40+00

$$\begin{array}{r} \times \\ 270 / 46 \\ +05 \\ \hline 276 / 48 \\ +07 \end{array}$$

$$\begin{array}{r} \times \\ 157 / 55 \\ +00 \end{array}$$

$$\begin{array}{r} 45 \\ +06 \\ \hline 46 \\ +09 \end{array}$$

$$\begin{array}{r} \times \\ 43 / 29.1 \\ +1.2 \end{array}$$

$$\begin{array}{r} \times \\ 294 / 42 \\ +13 \end{array}$$

$$\begin{array}{r} 50 \\ +1.0 \end{array}$$

$$\begin{array}{r} \times \\ 47 / 29.4 \\ +1.3 \end{array}$$

$$\begin{array}{r} 57 \\ +09 \end{array}$$

$$\begin{array}{r} \times \\ 62 / 26.4 \\ +0.3 \end{array}$$

$$\begin{array}{r} 63 \\ +09 \end{array}$$

$$\begin{array}{r} \times \\ 74 / 24.9 \\ +1.3 \end{array}$$

$$\begin{array}{r} \times \\ 15 / 7.8 \\ +00 \end{array}$$

$$\begin{array}{r} 70 \\ +0.8 \end{array}$$

$$\begin{array}{r} \times \\ 78 / 15 \\ +0.0 \end{array}$$

$$\begin{array}{r} \times \\ 214 / 102 \\ -16 \end{array}$$

$$\begin{array}{r} 77 \\ +0.7 \end{array}$$

$$\begin{array}{r} \times \\ 110 / 25.4 \\ -2.6 \end{array}$$

905.98

$$\begin{array}{r} \times \\ 222 / 58 \\ -7.8 \end{array}$$

$$\begin{array}{r} 36 \\ +0.4 \end{array}$$

$$\begin{array}{r} \times \\ 67 / 25.8 \\ -2.7 \end{array}$$

$$\begin{array}{r} \times \\ 222 / 63 \\ -7.8 \end{array}$$

$$\begin{array}{r} 40 \\ +0.5 \end{array}$$

$$\begin{array}{r} \times \\ 72 / 25.8 \\ -2.7 \end{array}$$

Grade Change Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
44+50		908.7		903.65	50
45				03.17	55
T.B.M.	3.80	907.32	5.18		
+50				02.72	46
46				02.3	50
+36				02.0	53
+68				01.75	56
47				01.5	58
+50				01.1	62
48				00.7	66
+50				900.32	70
x					
49				899.8	
+40				99.38	
+56				99.21	
B.M.			6.75		

In-l.
 Rod.
 Chain.

Left

CL

Right

$$\begin{array}{r} \times \\ 230 \overline{) 170} \\ \underline{-120} \\ 50 \end{array}$$

$$\begin{array}{r} 41 \\ +0.6 \end{array}$$

$$\begin{array}{r} \times \\ 7.3 \overline{) 54.9} \\ \underline{-23} \\ 31.9 \end{array}$$

$$\begin{array}{r} \times \\ 21.8 \overline{) 7.2} \\ \underline{-1.7} \\ 5.5 \end{array}$$

$$\begin{array}{r} 48 \\ +0.7 \end{array}$$

$$\begin{array}{r} \times \\ 6.1 \overline{) 17.4} \\ \underline{-2.6} \\ 14.8 \end{array}$$

903.52 Nail in N.E. Cor. Town Hall

$$\begin{array}{r} \times \\ 21.9 \overline{) 6.5} \\ \underline{-2.0} \\ 4.5 \end{array}$$

$$\begin{array}{r} 38 \\ +0.8 \end{array}$$

$$\begin{array}{r} \times \\ 5.8 \overline{) 19.8} \\ \underline{-1.2} \\ 18.6 \end{array}$$

$$\begin{array}{r} \times \\ 27.6 \overline{) 43} \\ \underline{-10.7} \\ 32.3 \end{array}$$

$$\begin{array}{r} 40 \\ +1.0 \end{array}$$

$$\begin{array}{r} 6.1 \overline{) 19.4} \\ \underline{-1.1} \\ 18.3 \end{array}$$

$$\begin{array}{r} 41 \\ +0.9 \end{array}$$

$$\begin{array}{r} 5.6 \\ 15 \end{array}$$

$$\begin{array}{r} 18 \\ +0.8 \end{array}$$

$$\begin{array}{r} \times \\ 6.6 \overline{) 19.0} \\ \underline{-1.0} \\ 18.0 \end{array}$$

$$\begin{array}{r} \times \\ 22.1 \overline{) 7.6} \\ \underline{-1.8} \\ 5.8 \end{array}$$

$$\begin{array}{r} 5.2 \\ +0.6 \end{array}$$

$$\begin{array}{r} \times \\ 6.5 \overline{) 17.8} \\ \underline{-0.7} \\ 17.1 \end{array}$$

$$\begin{array}{r} \times \\ 19.8 \overline{) 7.4} \\ \underline{-1.2} \\ 6.2 \end{array}$$

$$\begin{array}{r} 5.7 \\ +0.5 \end{array}$$

$$\begin{array}{r} \times \\ 6.9 \overline{) 17.8} \\ \underline{-0.7} \\ 17.1 \end{array}$$

$$\begin{array}{r} \times \\ 19.0 \overline{) 7.6} \\ \underline{-1.0} \\ 6.6 \end{array}$$

$$\begin{array}{r} 6.2 \\ +0.4 \end{array}$$

$$\begin{array}{r} \times \\ 8.0 \overline{) 20.6} \\ \underline{-1.4} \\ 19.2 \end{array}$$

$$\begin{array}{r} \times \\ 21.0 \overline{) 8.5} \\ \underline{-1.5} \\ 7.0 \end{array}$$

$$\begin{array}{r} 6.8 \\ +0.2 \end{array}$$

$$\begin{array}{r} \times \\ 8.5 \overline{) 20.6} \\ \underline{-1.1} \\ 19.5 \end{array}$$

900.56 L.I. BM in #30-B Lt. Sta. 49+15

Bench Levels

B.M.	1.92	968.79	
T.P.	1.03	957.92	11.90
✓	2.52	948.96	11.54
✓	0.02	935.69	13.23
B.M.	0.33	935.69	0.33
T.P.	0.18	924.22	11.65
✓	0.05	911.44	12.83
✓	4.34	910.43	5.35
B.M.	3.11	910.89	2.65
T.P.	4.35	903.64	11.60
T.B.M	7.58	909.67	1.55
T.P.			

WAB
ALP
G.F.B.-H.T.P.

June 18, 1926 30

966.87 - Mon 0700

956.89

946.38

935.67

(935.36) Nail 4"
Oak Stump, 25' Rt. Sta 8+45

924.04

911.09

906.09

907.78 Nail in 14' Oak 42' Lt. Sta 21+75.

899.29

902.09 Nail in T.P. Rt. Sta 30+65

Sta.	+	H.I.	-	± Grade	G.R.
B.M.	4.37	867.98			
Borrow Pit					
X-Sec. for monthly Estimate.					
95+00					
95+25				63.1	4.9
95+42				63.0	5.0
+75				63.0	5.0
96+00				62.9	5.1
+35				62.8	5.2
+55				62.8	5.2
96+65					

June 18, 1926

31

863.61 R.R. Spike Arc Lt. Pole # 58 St. Sta. 97+40

2

same as original = O. D - Exc.

Approx. of Old Road

39	42	39	34	1.8	E. Bank	
<u>25</u>	37	50	69	80	<u>881</u>	
38	40	42	27	26	E. Bank	
<u>20</u>	35	50	58	80	<u>90'</u>	
36	41	32	26	E. Bank,		
<u>6</u>	30	50	72	<u>100</u>		
37	39	34	28	24	23	E. Bank
<u>20</u>	34	50	70	96	<u>108'</u>	
43	47	41	3.8	1.9	1.2	2.8
<u>20</u>	40	63	68	82	81	107
						118
48	66	42	45	3.3	1.3	2.5
<u>192</u>	30	115	79	82	100	114
						125

Same as original = O. D. Exc.

Station	±	H.I	-	Top Pav Grade	Gr. Rod ±.	
B.M.	3.61	970.48				
				By R. Lt.	68.08	
				By R. Rt.	64.98	
				H. on R. Lt.	67.80	
				Rt.	65.43	
				Lt.	67.30	
				Rt.	65.80	
				Lt.	66.66	
				Rt.	66.40	
0+25				± Pav.	66.77	3.71
0+50				± Pav.	66.66	3.82
0+75					66.43	4.05
1+00					66.00	4.48
1+25					65.61	4.87
T.P.	1.48	968.35	3.61	(966.87)		
1+50					65.02	3.33
1+75					64.31	4.04
2+00					63.48	4.87
+25					62.53	5.82
+50					61.46	6.89
+75					60.27	8.08
3+00					59.02	9.33
3+50					56.52	11.83
T.P.	0.39	956.83	11.91	(956.44)		
4+00					54.02	2.81
4+50					51.52	5.31
5+00					49.02	7.81

(96687) Top Mon.			Left	2	Right			
Width	+ or -	Gr. Rod	X-sections		Gr. Rod	+ or -	Width	
		2.40			5.50			
		2.80			5.05			
		3.18			4.68			
		3.22			4.08			
10.00	-0.08	4.13			4.13	-0.08	10.00	
✓	-0.08	4.56			4.56	-0.08	✓	
✓	-0.08	4.95			4.95	-0.08	✓	
		3.41						250 K.C.
		4.12						
		4.95						
		5.93						
		6.97						
		8.16						
		9.41						
		11.91						
		2.89						
		5.39						
		7.89						

Sta.	+	H.I	-	Top Pave & Grade	G. Rod &
		956.83			
5+50				46.52	10.31
6+00				44.02	12.81
T.P.	0.29	944.23	12.89	(943.94)	
6+50				41.52	2.71
7+00				39.02	5.21
7+50				36.52	7.71
8+00				34.02	10.21
T.P.	2.12	936.05	10.30	(933.93)	
8+50				31.52	4.53
9+00				29.02	7.03
9+50				26.52	9.53
10+00				24.02	12.03
T.P.	0.78	924.83	12.00	(924.05)	
10+50				21.52	3.31
11+00				19.02	5.81
11+50				16.52	8.31
12+00				14.02	10.81
T.B.M.	1.44	919.11	7.16	(917.67)	
12+25				12.77	6.34
+50				11.52	7.59
+75				10.27	8.84
13+00				09.09	10.02
13+25				08.07	11.04

		Left	±	Right	
Width	+ or -	Gr. Rod	X-Sections	Gr. Rod	+ or - Width
10.00	-0.08	10.29			
	✓	12.89			
	-0.28	2.79			
	✓	5.29			
	✓	7.79			
	✓	10.29			
	✓	4.61			
	✓	7.11			
	✓	9.61			
	✓	12.11			
	✓	3.39			
	✓	5.89			
	✓	8.39			
	✓	10.89			
(Nad T.P. R4.10+80)					
	-0.08	6.42			
	✓	7.67			
	✓	8.92			
		10.10			
		11.12			

10.5% Grade

✓ +11.26

Sta	+	H.I	-	Top Pave ± Grade	Gr. Rod ±
		919.11			
T.P.	0.09	908.98	10.22		(908.89)
13+50				907.22	1.76
13+75				06.53	2.45
14+00				06.02	2.96
+25				05.67	3.31
+50				05.47	3.51
+77. ³⁶				05.45	3.53
15+00				05.52	3.46
+50				05.67	3.31
16+00				05.82	3.16
+50				05.97	3.01
17+00				06.12	2.86
+50				06.27	2.71
18+00				06.42	2.56
T.P.	4.20	910.45	2.73		(906.25)
+50				06.57	2.88
19+00				06.72	3.73
+50				06.87	3.58
20+00				07.02	3.43
+50				07.17	3.28
21+00				07.32	3.13
+25				07.35	3.10
+50				07.28	3.17

Width.	$\frac{-\sigma}{\sigma}$	Left	9	Right	Grid	$\frac{+m}{m}$	Width.
		X-sections					
	-0.08	1.84					
	✓	2.53					
	✓	3.04					
	✓	3.39					
	✓	3.07					
	✓	3.61			3.61	-0.08	
	✓	3.54					
	✓	3.39					
	✓	3.24					
	✓	3.09					
	✓	2.94					
	✓	2.79					
	✓	2.64					
	-0.08	3.96					
	✓	3.81					
	✓	3.66					
	✓	3.51					
	✓	3.36					
	✓	3.21					
	✓	3.18					
	✓	3.05					

200' V.C.
M-1375

① 1472.6

+0.30%

200' V.C.
M-775

Station	+	H.I	-	Top E Grade	Gr. Rod ±
		910.45			
21+75				907.11	3.34
B.M.	1.24	909.02	2.67		(907.78)
22+00				06.84	2.18
+25				06.59	2.43
+50				06.03	2.99
+75				05.48	3.54
23+00				04.82	4.20
+25				04.12	4.90
+50				03.42	5.60
+75				02.72	6.30
24+00				02.02	7.00
+25				01.37	7.65
+50				00.80	8.22
+75				00.33	8.69
25+00				99.95	9.07
+25				99.65	9.37
+50				99.56	9.46
+75				99.34	6.62
26+00				99.32	9.70
T.P.	4.50	905.02	8.50		(900.52)
+50				99.37	5.65
27+00				99.42	5.60

Left		Z	Right		
Width	$\pm .05$	Grnd	X-section	Grnd $\pm .05$	Width
10.00	+0.08	3.42		3.42 +0.08	10.00
		2.26			
		2.51			
		3.07			
		3.62			
		4.28			
		4.98			
		5.68			
		6.38			
		7.08			
		7.73			
		8.30			
		8.77			
		9.15			
		9.45			
		9.54			
		9.76			
		9.78			
Nail at T.P. Rt. 76+					
		5.73			
		5.68			

Station	+	H.I	-	Top Pave ± Grade	E. Rod ±
		705.02			
27+50				99.47	5.55
28				99.52	5.50
+25				99.57	5.45
+50				99.66	5.36
+75				99.81	5.21
29				900.00	5.02
+25				00.24	4.78
+50				00.51	4.51
+75				00.84	4.18
30				01.22	3.80
+50				02.02	3.00
T.P.			2.92		(902.10)
31+00				02.82	2.20
+50				03.62	1.40
+75				04.01	1.01
32+00				04.38	0.64
T.P.	7.59	909.69	2.92		902.10
+25				04.72	0.97
+50				05.04	0.65
+75				05.35	0.34
33				05.74	0.95
+25				05.88	0.81
+50				06.12	0.57

Width	+ or -	Left	Z	Right	+ or -	Width
		Gr. Pct		X-sections		
10.00	0.08	5.63			0.08	10.00
		5.58				0
		5.53				
		5.44				
		5.29				
		5.10				
		4.86				
		4.59				
		4.26				
		3.88				
		3.08				
Nail in T.P. Rt. Sta. 30+65						
		2.28				
		1.48				
		1.09				
		0.72				
Nail in T.P. Rt. Sta. 30+65						
	-0.08	5.05				
		4.73				
		4.42				
		4.03				
		3.89				
		3.65				

Ver. Curve
 M. 375

station	+	H.I	-	100 Fav. Elev	Gr. Rod E
BM 1			2.16		707.53
		909.69			
34+00				06.57	3.12
+50				07.02	2.67
35				07.47	2.22
+50				07.92	1.77
36				08.42	1.27
T.P.	4.54	913.50	0.73		908.96
+25				08.63	4.87
+50				08.83	4.67
+75				09.01	4.49
37+00				09.15	4.35
+25				09.27	4.23
+50				09.40	4.10
+75				09.47	4.03
38				09.55	3.95
+25				09.58	3.93
+50				09.63	3.87
+75				09.64	3.86
39+00				09.62	3.88
T.P.	2.54	912.54	3.50		910.00
+25				09.58	2.96
+50				09.50	3.04
+75				09.39	3.15

July 14, 1926 37

Width ^{for} Gr. Rod

10- -0.08 3.70

2.75

2.30

1.85

1.35

60' Rt. 36 + 27 - Pa Pole

-0.08 4.75

4.75

4.57

4.43

4.31

4.18

4.11

4.03

4.01

3.95

3.94

3.96

road in P. P. Lt. Sta 40 +

-0.08 3.04

3.12

3.23

station	+	H.I	-	Top Face ± Grade	Gr. Rod ±
		912.54			
40+00				09.24	3.30
+25				09.07	3.47
+50				08.85	3.69
+75				08.60	3.94
41+00				908.32	4.22
+50				07.72	4.82
42				07.12	5.42
+50				06.52	6.02
43+00				05.92	6.62
+25				05.62	6.92
+50				05.34	7.20
+75				05.06	7.48
44+00				04.79	7.75
+25				04.52	8.02
+50				04.27	8.27
T.P.	2.30	906.49	8.35		904.19
+75				04.02	2.47
45+00				03.79	2.70
+25				03.06	2.93
B.M.		906.49	2.98		903.51
+50				03.34	3.15
+75				03.12	3.37

Width.	\pm or Encl.
10 -	-0.08 3.38
	3.53
	3.77
	4.02
	4.30
	4.90
	5.50
	6.10
	6.70
	7.00
	7.28
	7.58
	7.83
	8.10
	8.35
	7.53
	7.78
	3.01
Nail N 2. Cor. Town Hall	
	3.23
	3.45

Sta	+	H.I	-	Top Ave ± Grade	Gr. Rod ±
		906.49			
46+00				902.92	3.57
+50				02.52	3.97
47+00				02.12	4.37
+50				01.72	4.77
48+00				01.32	5.17
T.P.	6.14	906.49	6.14		900.35
+25				01.11	5.38
+50				00.90	5.59
+75				00.66	5.83
49+00				00.42	6.07
+25				900.16	6.33
-50				899.90	6.59
455.4		2'E. of Rail Rt.			
456.4		✓ ✓ Lt.			
T.P.	3.00	906.11	8.38		898.11
50+05.7		2' W. of Rail Rt.			
50+06.8		✓ ✓ Lt.			
50+25				97.02	2.09
50+50				98.72	2.39
51+00				98.12	2.99
51+50				97.52	3.59

Sta	+	H. I.	-	Top. Pav. Grade	Gr. Rod ↓
		901.11			
52+00				96.92	4.19
+25				96.63	4.48
+50				96.31	4.74
+75				96.13	4.98
53+00				95.92	5.19
B.M.	1.79	898.90	4.00		897.11
+25				95.23	3.17
+50				95.57	3.33
+75				95.43	3.47
54				95.32	3.58
+50				95.12	3.78
55+00				94.92	3.98
+50				94.72	4.18
56				94.52	4.38
+50				94.32	4.58
57				94.12	4.78
+25				94.04	4.86
+50				93.99	4.91
+75				93.97	4.93
58				94.00	4.90
T.P.	5.90	899.80	5.00		893.90
+75				94.05	5.75

Width.

In

Gr. Rd.

Gr. Rd.

In

0.68

4.27

4.57

4.82

5.06

5.27

R.R. Spike in Root of Maple. 125 ft. to 52170

0.08

3.25

3.41

3.55

3.66

3.86

4.06

4.26

4.46

4.66

4.86

4.94

4.99

5.01

4.98

5.83

Sta.	+	M.S.	-	Top Bev & Grade	Gr. Rod &
		899.80			
58+50				94.17	5.63
	+75			94.27	5.53
59+00				94.42	5.36
	+50			94.77	5.03
60				95.12	4.68
	+50			95.47	4.33
61+00				95.82	3.98
	+25			95.99	3.81
	+50			96.14	3.66
	+75			96.28	3.52
62+00				96.40	3.40
	+25			96.49	3.31
	+50			96.60	3.20
	+75			96.68	3.12
63+00				96.74	3.06
	+25			96.79	3.01
	+50			96.82	2.98
T.P.	3.41	900.15	3.06		896.74
	+75			96.84	3.31
64				96.84	3.31
	+25			96.83	3.32
	+50			96.80	3.35

July 19, 1926 41

Width

$\frac{10x}{-}$ Gr. Red

Gr. Red $\frac{10x}{-}$

5.71

5.61

5.44

5.11

4.76

4.41

4.06

3.97

3.74

3.60

3.48

3.39

3.28

3.20

3.14

3.09

3.06

3.39

3.39

3.40

3.43

Sta.	+	H.I	-	Top Pav. ± Grade	Gr. Rod ±
		900.15			
64+75				96.76	3.39
65				96.70	3.55
	+25			96.63	3.52
	+50			96.54	3.61
	+75			96.44	3.71
66+00				96.32	3.83
	+50			96.07	4.08
67				95.82	4.33
	+25			95.72	4.43
	+50			95.64	4.51
	+75			95.60	4.55
68+00				95.59	4.56
	+25			95.62	4.53
	+50			95.67	4.48
	+75			95.76	4.39
69				95.89	4.26
	+25			96.04	4.11
	+50			96.24	3.91
T.P.	7.24	903.39	4.00		896.15
	+75			96.46	6.93
70				96.72	6.67
	+50			97.27	6.12
71+00				97.82	5.57

width	$\frac{1}{2}$ or $\frac{1}{4}$	ex. rd.	ex. rd.	$\frac{1}{2}$ or $\frac{1}{4}$
10-	-0.08	3.47		
		3.53		
		3.60		
		3.69		
		3.79		
		3.91		
		4.16		
		4.41		
		4.57		
		4.59		
		4.63		
		4.64		
		4.61		
		4.56		
		4.47		
		4.34		
		4.19		
		3.99		
		7.01		
		6.75		
		6.20		
		5.65		

Sta.	+	H.I	-	Top Paw Grade	Gr. Rod E
		903.39			
71				98.37	5.00
72				98.92	4.47
	+50			99.47	3.92
73				900.02	3.37
	+50			00.57	2.82
74				01.12	2.27
	+50			01.72	1.67
75				02.32	1.07
	+50			02.92	0.47
T.P.	7.80	910.64	0.55		902.84
76				03.52	7.12
	+50			04.12	6.52
77				04.72	5.92
	+50			05.32	5.32
78				05.92	4.72
	+25			06.18	4.46
	+50			06.35	4.29
	+75			06.43	4.21
79				06.43	4.21
T.P.	2.62	909.01			906.39
	+25			06.35	2.66
	+50			06.17	2.84

Width

7.00

Sn. Rod.

0.08 5.10

✓ 4.55

✓ 4.00

3.45

2.90

2.35

1.75

1.15

0.55

7.20

6.60

6.00

5.40

4.80

4.54

4.37

4.29

4.29

2.74

2.92

Sta.	+	H. I	—	Top Five Grade	G. Rod ↓
		909.01			
79+75				905.92	3.09
80				05.57	3.44
B.M.	1.53	909.01	1.53		907.48
+25				05.15	3.86
+50				04.62	4.39
+75				04.03	4.98
81+00				03.33	5.68
+25				02.56	6.45
+50				01.70	7.31
+75				900.76	8.25
82+00				99.72	9.29
T.P.	2.18	901.82	9.27	(899.64)	
+25				98.65	3.17
+50				97.57	4.25
+75				96.50	5.32
83				95.42	6.40

901.82

cutd next p.

Width	$+rr$	ϵ_{red}	$\epsilon_{red} + rr$	Width
10^{00}				10^{-}
✓	-0.08	3.17		✓
10^{00}	✓	3.52		✓
R.R. 20' 00" K 50' Lt - 80+05				
10^{00}	-0.08	3.94		10^{00}
✓		4.47		
✓		5.06		
✓		5.76		
✓		6.53		
✓		7.39		
	-0.08	8.33		
	-0.08	9.37		
			$7.39 - 0.08$	
			$8.33 - 0.08$	
			$9.31 - 0.02$	
				10^{00}
✓	-0.09	3.26		$3.08 + 0.09$ ✓
10^{-}	-0.19	4.41		$4.07 + 0.18$ ✓
$10^{0.5}$	-0.30	5.62		$5.06 + 0.26$ ✓
10.40	-0.44	6.84		$6.04 + 0.36$ 10^{-}

St.	+	H. 5	-	TOP F.V. t.	£ Curd
1		901.82			
T.B.M.	1.62	898.03	5.41		896.41
83+25				94.35	3.68
83+50				93.27	4.76
83+75				72.20	5.83
8400				91.12	6.91
+25				90.05	7.98
+50				88.97	9.06
+75				87.90	10.13
85+00				86.82	11.21
T.P.	0.84	886.90	11.97		(886.06)
+25				85.77	1.13
+50				84.75	2.15
+75				83.77	3.13
86+00				82.82	4.08
T.P.	2.54	883.27	6.17		(880.73)
+25				81.92	1.35
+50				81.05	2.22
+75				80.22	3.05
87+00				79.42	3.85
B.M.	8.52	883.27	8.52		874.75
+25				78.67	4.60
+50				77.95	5.32
87+75				77.27	6.00

July 1926 45

Width (ft)	Cor	Gr. Rod	Gr. Rod	Cor	Width (ft)
11.20	0.57	4.25	3.23	0.45	10.00
12.05	0.68	5.44	4.22	0.54	10.00
12.30	0.76	6.59	5.21	0.62	✓
12.30	0.76	7.67	6.29	0.60	✓
12.30	0.76	8.74	7.36	0.62	✓
12.30	0.76	9.82	8.44	0.62	✓
12.30	0.76	10.89	9.51	0.62	✓
12.30	0.76	11.97	10.59	0.62	✓
12.10	0.70	1.83	0.58	0.55	✓
11.35	0.58	2.73	1.69	0.46	✓
10.45	0.44	3.57	2.77	0.36	✓
10.05	0.32	4.40	3.80	0.28	✓
86 to 5 = B.M.T. Lt					
Nail P.P.	Rt Sta	86 + 40			
10.00	0.00	1.55	1.16	0.19	10.00
✓	0.10	2.32	2.12	0.10	✓
✓	0.20	3.15	2.95	0.10	✓
86 to 6.93 = P.P. ✓	0.20	4.05	3.65	0.20	✓
R.R. to the 14' Cor 40' Lt. Sta. 87 + 15					
10.00	0.00	4.86	4.34	0.26	10.00
10.00	0.00	5.58	5.06	0.26	10.00
✓	0.00	6.26	5.74	0.26	✓

Sta	+	H.I	-		
		883.27			
88+00				876.62	6.65
+25				76.00	7.27
+50				75.37	7.90
+75				74.75	8.52
89+00				74.12	9.15
+25				73.50	9.77
+50				72.87	10.40
+75				72.25	11.02
90+00				71.62	11.65
T.P.	1.18	877.54	6.91	876.36	
+25				71.00	6.54
+50				70.37	7.17
+75				69.75	7.79
91				69.12	8.42
+25				68.50	9.04
T.P.	2.40	870.42	9.52	868.02	
+50				67.87	2.55
+75				67.27	3.15
92				66.72	3.70
+25				66.22	4.20
+50				65.75	4.67
+75				65.36	5.06
93				64.98	5.44

	+	Gr. Red		Gr. Red	+	
	-			-		
10.25	-0.26	6.91		6.39	+0.26	10.25
✓	-0.26	7.53		7.01	+0.26	✓
✓	-0.26	8.16		7.64	+0.26	✓
✓	-0.26	8.78		8.26	+0.26	✓
✓	-0.26	9.39		8.91	+0.26	✓
8/21/87 = 8.7	-0.18	9.95		7.27	+0.10	
	-0.08	10.28		10.36	+0.04	
	-0.08	11.10		11.02	+0.0	
	-0.08	11.73		11.69	-0.04	

10.110 7.15 Rt. Sta. 89442

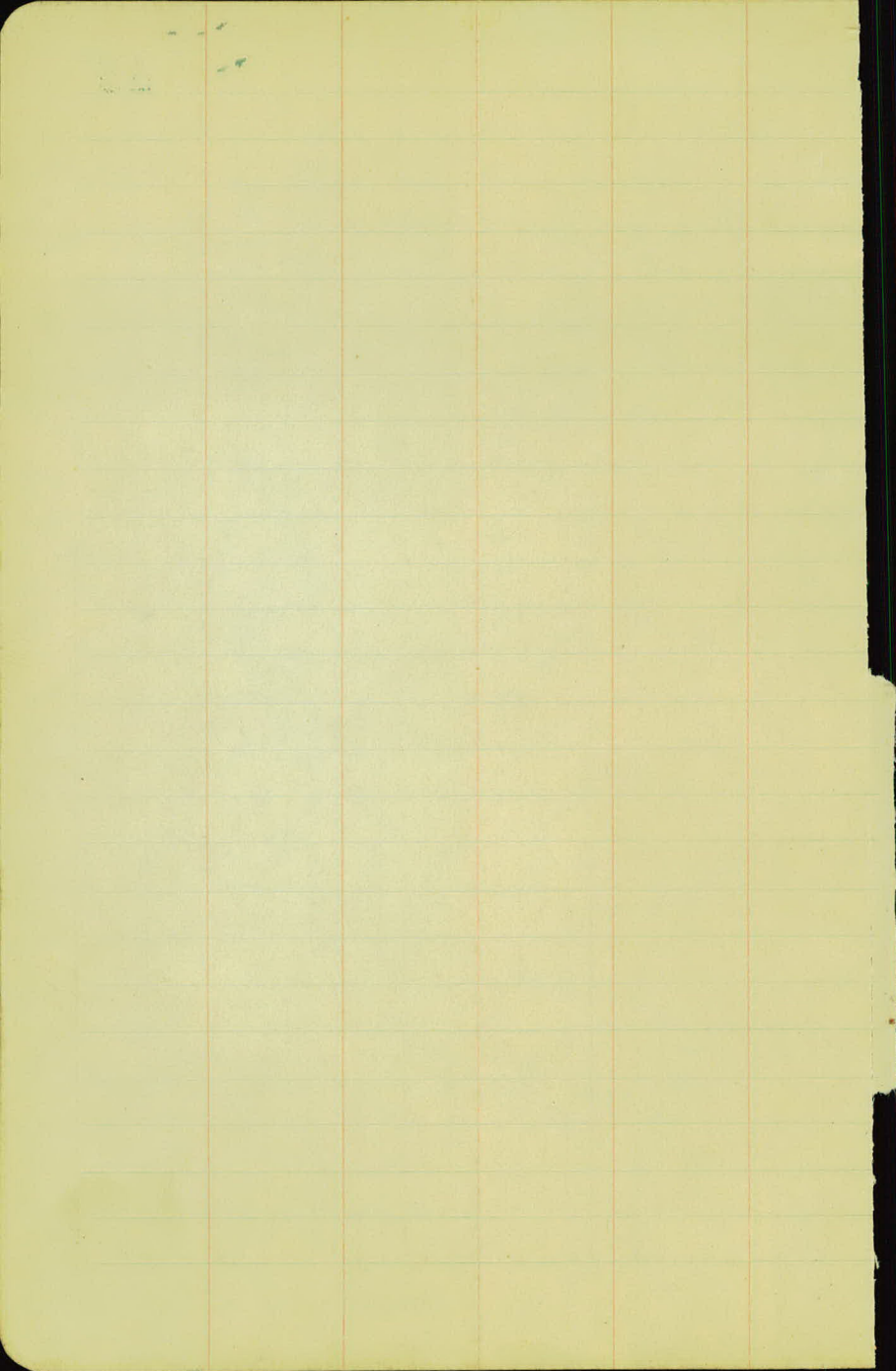
	-0.03	6.62		6.50	+0.04	
	-0.13	7.30		7.04	+0.13	
	-0.24	8.03		7.57	+0.22	
196.8 - B.W.T.	-0.36	8.78		8.12	+0.30	
10.8	-0.48	9.52		8.65	+0.39	

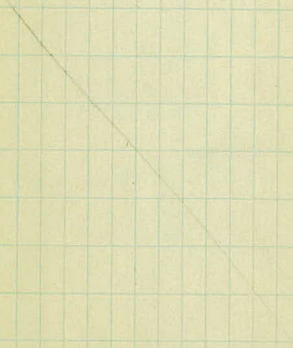
+36.8 P.C.

11.7	-0.62	3.17		2.07	+0.48	
12.2	-0.73	3.88		2.57	+0.58	✓
12.3	-0.78	4.48		3.08	+0.62	✓
12.3	-0.78	4.98		3.58	+0.62	✓
12.3	-0.78	5.45		4.05	+0.62	✓
12.3	-0.78	5.84		4.44	+0.62	✓
11.8	+0.64	6.08		4.94	+0.50	✓

Sta.	+	H.I	-	Top part ± Grade	± G.R.
		870.42			
93+25				64.68	5.74
+50				64.40	6.02
+75				64.19	6.23
94				64.02	6.40
+25				63.89	6.53
+50				63.82	6.60
T.P.	4.52	868.29	6.65	863.77	
+75				63.77	4.52
95				63.72	4.57
+25				63.67	4.62
+50				63.62	4.67
+75				63.57	4.72
96				63.52	4.77
+14.6				63.49	4.80
+34.6				63.45	4.84
+54.6				63.41	4.88
+74.6				63.37	4.92
+94.6				63.33	4.96
97+14.6				63.29	5.00
T.P.	6.32	869.30	5.31	862.98	
			5.66	863.64	

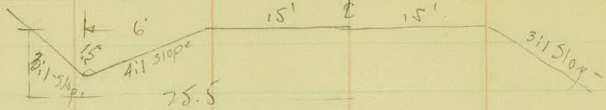
Width	+ or -	Gr. Rad	Gr. Rad	+ or -
#17.47-P.C.				
10.8	-0.52	6.26	5.33	+0.41
10.2	-0.39	6.41	5.70	+0.32
#67.47-B.W.T.				
10	-0.24	6.47	6.00	+0.23
10	-0.14	6.54	6.26	+0.14
	-0.08	6.61	6.48	+0.05
#67.47-E.S.T.				
	-0.08	6.68	6.63	-0.03
	-0.08	4.60	-0.08	
	-0.08	4.65	-0.08	
	-0.08	4.70	-0.08	
	-0.08	4.75	-0.08	
	-0.08	4.80	-0.08	
	-0.08	4.85	-0.08	
10	-0.08	4.88	-0.08	10
10.24	-0.08	4.92	-0.08	10.24
10.91	-0.08	4.96	-0.08	10.91
12.94	-0.08	5.00	-0.08	12.94
13.84	-0.08	5.04	-0.08	13.84
16.0	-0.08	5.08	-0.08	16.0





change of Grading Section

Sta. 30 to 36+50



T.P	8.75	910.85	902.10	
30+60			900.6	10.3
+50			901.4	9.5
31			02.2	8.7
+50			03.0	7.9
32			03.8	7.1
+50			04.4	6.5
33			05.0	5.9
+50			05.5	5.4
34			05.6	5.3
+50			64	4.5

Nail in T.P. Rt. Sta. 30+65

$$\begin{array}{r} 12.8 \\ 280 \overline{) 35} \end{array}$$

$$\begin{array}{r} 12.6 \\ -0.3 \overline{) 6.7} \end{array}$$

$$\begin{array}{r} 108 \\ 710 \overline{) 240} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 10.0 \\ 295 \overline{) 11.0} \end{array}$$

$$\begin{array}{r} 2.5 \\ 0.0 \overline{) 25.5} \end{array}$$

$$\begin{array}{r} 9.1 \\ 24.3 \overline{) 11} \end{array}$$

$$\begin{array}{r} 8.7 \\ 0.0 \overline{) 25.5} \end{array}$$

$$\begin{array}{r} 8.2 \\ 21.6 \overline{) 11.2} \end{array}$$

$$\begin{array}{r} 6.4 \\ 710 \overline{) 27.0} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 6.6 \\ 27.0 \overline{) 20} \end{array}$$

$$\begin{array}{r} 4.6 \\ 14.0 \overline{) 33} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 4.0 \\ 33.0 \overline{) 140} \end{array}$$

$$\begin{array}{r} 3.2 \\ 49.0 \overline{) 33} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 5.7 \\ 27.1 \overline{) 117} \end{array}$$

$$\begin{array}{r} 19 \\ 728 \overline{) 28.5} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 5.3 \\ 25.8 \overline{) 16} \end{array}$$

$$\begin{array}{r} 19 \\ 12.0 \overline{) 27.0} \end{array}$$

$$\begin{array}{r} 6.2 \\ 22.8 \overline{) 106} \end{array}$$

$$\begin{array}{r} 5.3 \\ 11.5 \overline{) 25.5} \end{array} \text{ D.C.}$$

$$\begin{array}{r} 6.5 \\ 23.0 \overline{) 70} \end{array}$$

$$\begin{array}{r} 6.5 \\ 2.0 \overline{) 23.0} \end{array}$$

910.85

35700

906.9

4.0

+50

7.3

3.6

36100

7.8

3.1

B.M.

3.31

907.56

$$\begin{array}{r} \times \\ 19A \overline{) 64} \\ \underline{-21} \\ \end{array}$$

$$\begin{array}{r} \times \\ 66 \overline{) 254} \\ \underline{-20} \\ \end{array}$$

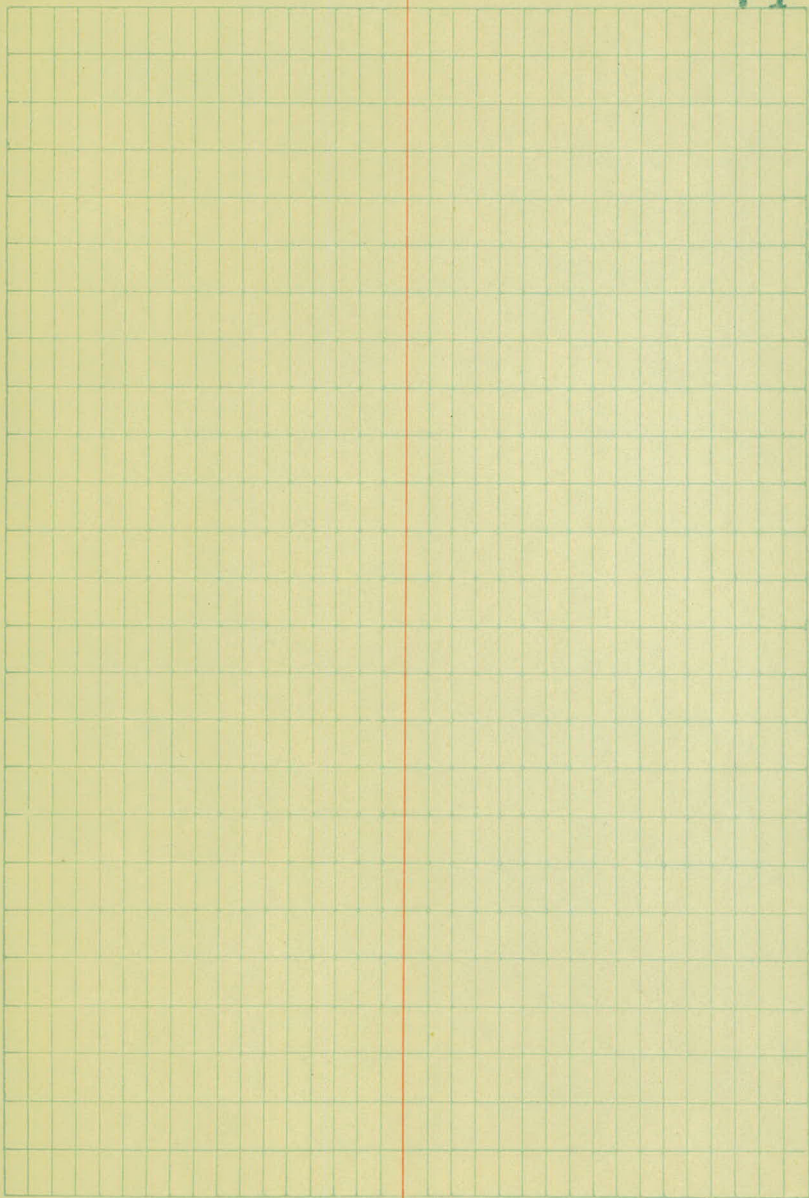
$$\begin{array}{r} \times \\ 2C \overline{) 11A} \\ \underline{216} \\ \end{array}$$

$$\begin{array}{r} \times \\ 51 \overline{) 292} \\ \underline{-23} \\ \end{array}$$

$$\begin{array}{r} \times \\ 2G \overline{) 28} \\ \underline{26A} \\ \end{array}$$

$$\begin{array}{r} \times \\ 13 \overline{) 0.C} \\ \underline{+03} \\ \end{array}$$

P.R. 20, ke Lt 33+52



Read on Top of stakes to
determine fill settlement

Sta	+	H. I	-	Elev.
B.M.	4.63	868.24		863.61
95				
	+75			
	+50			
	+25			
94				
	+75			
	+50			
	+25			
93				
	+75			
	+50			
T.P.	11.75	877.46	2.53	865.71
	+25			
92				
	+75			
	+50			
	+25			
91				
	+75			
	+50			
	+25			
90+00				

(Original on Page 77)
taken July 17, 1926

Lt.

2

Rt.

W.H.C.
A.L.P.
H.T.P.
W.A.

July 28, 1926

75

$\frac{5.24}{63.00}$

$\frac{5.22}{63.02}$

$\frac{5.18}{63.06}$

$\frac{5.18}{63.06}$

$\frac{5.17}{63.07}$

$\frac{5.08}{63.16}$

$\frac{5.10}{63.14}$

$\frac{4.92}{63.31}$

$\frac{5.05}{63.19}$

$\frac{4.73}{63.51}$

$\frac{5.02}{63.22}$

$\frac{4.40}{63.84}$

$\frac{4.96}{63.28}$

$\frac{4.21}{64.03}$

$\frac{4.81}{63.43}$

$\frac{3.91}{64.33}$

$\frac{4.67}{63.57}$

$\frac{3.40}{64.84}$

$\frac{4.42}{63.82}$

$\frac{2.86}{65.38}$

$\frac{4.05}{64.19}$

$\frac{2.53}{65.71}$

(stake
gone)
 $\frac{12.28}{65.18}$

$\frac{11.27}{66.19}$

$\frac{10.80}{66.66}$

$\frac{11.65}{67.81}$

$\frac{10.30}{67.16}$

$\frac{10.91}{66.55}$

$\frac{7.77}{67.69}$

$\frac{10.13}{67.33}$

$\frac{9.22}{66.24}$

$\frac{9.38}{68.08}$

$\frac{8.69}{68.77}$

$\frac{8.60}{68.86}$

stake
gone.

$\frac{7.87}{69.59}$

$\frac{7.61}{69.85}$

$\frac{7.14}{70.27}$

$\frac{7.06}{70.40}$

Stakes Gone.

Readings on Top stakes to determine fill settlement

Sta	+	H.I	-	Elev.
B.M.	4.61	868.22		863.61
75+00				
+75				
+50				
+25				
94+00				
+75				
+50				
+25				
93+00				
+75				
+50				
T.P	10.34	876.08	2.42	865.74
92+25				
92+00				
+75				
+50				
+25				
91				
+75				
+50				
+25				
90+00				

(Originals on following Page)
 taken July 17, 1926 4

W.H.C.
 A.L.P. + H.T.P.
 W.A.
 Rt July 20, 1926 76

521
 863.01
 515
 63.07
 513
 63.67
 505
 63.17
 499
 63.23
 494
 63.28
 488
 63.34
 473
 63.49
 456
 63.66
 432
 63.90
 395
 64.27

519
 863.03
 515
 63.07
 504
 63.18
 490
 63.32
 468
 63.54
 434
 63.88
 418
 64.07
 380
 64.42
 336
 64.86
 285
 65.37
 248
 65.74

(Take Same)
 1085
 65.23
 1073
 65.85
 950
 66.58
 872
 67.36
 798
 68.10
 722
 68.86
 648
 69.60
 580
 70.28
 Take Same

787
 66.20
 939
 66.69
 890
 67.8
 837
 67.71
 783
 68.25
 731
 68.77
 Take Same
 622
 69.86
 568
 70.40
 514
 70.94

Sub Grade stakes to Determine fill settlement.

B.M.				Gr. Rod
	4.54	868.15	263.61	4. d 21
75+00				5.13 5.13
94+95				5.05
94+67.41	E.S.T.			5.08 5.08
94+50				5.00
94+25				5.05 4.98
94+00				4.95
+75				4.96 4.83
+67.41	B.W.T.			4.88
+50				4.81 4.61
+25				4.75
93+17.41	P.C.			4.82 4.25
93+00				4.58
+75				4.76 4.05
92+50				4.37
T.P.	7.39	873.14	2.40	4.61 3.68
92+25				4.09
92+00				4.03 3.79
+75				3.79
91+50				4.19 3.79
				3.41
				3.80 2.40
				3.02
				7.32 6.72
				7.54
				7.82 6.42
				7.04
				7.22 5.71
				6.49
				6.51 5.41
				5.89
91+36.8	P.C.			5.74 4.87
+25				5.06
91+00				5.00 4.34
				4.64
90+86.8	B.W.T.			

60' - Stake set
5' off set.

W.H.C.
A.L.P.
E.H.F.
A.T.P.

77

L. L. Rt.

OK spike line of B.C. #5 x 14. Sta. 97440 July, 12, 1926

Grades in black O.K. but elev. of
 stakes as shown in red taken
 G.P. used.

Elev. crown Subgrade Elev. Elev.
 edge super E Super edge
 sub grade 55900

10 ²	62.02	-0.08	62.10	-0.08	63.02
	63.07	-0.08	63.15	-0.08	63.07
			B.S.T.		
	63.10				
	63.12	-0.08	63.20	-0.03	63.17
	63.19	-0.08	63.27	+0.05	63.32
	63.36	-0.14	63.40	+0.14	63.54
	63.35	-0.14	63.57	+0.23	63.79
10 ²			B.W.T.		
10 ²	63.37	-0.39	63.78	+0.32	64.10
10.8	63.54	-0.52	64.06	+0.41	64.47
11.15			B.T.		
11.8	63.72	-0.64	64.36	+0.50	64.86
12.3	63.96	-0.72	64.74	+0.62	65.36
12.3	64.35	0.73	65.13	+0.62	65.75
12.3	64.82	-0.78	65.60	+0.62	66.22
12.3	65.82	-0.78	66.10	+0.62	66.72
12.7	65.92	-0.73	66.65	+0.58	67.23
12.7	66.63				
	66.61	-0.62	67.25	+0.43	67.73
11.5		+0.56	P.C.	+0.46	
10.8	67.40	-0.43	67.88	+0.39	68.27
10.1	68.14	-0.30	68.50	+0.30	68.80
10 ²			B.W.T.		

?

873.14

90775

+50

+75

90+00

4.75 3.79

4.01

3.52 3.26

3.39

2.84 2.72

2.76

2.22 2.18

2.14

July, 12, 1926 78

	Elev. at top Adv.	corr to surf	Substratum L	corr to surf	Elev. at Adv.
10°	68.87	+0.24	69.13	+0.22	69.35
10°	69.62	+0.13	69.75	+0.13	69.88
10°	70.30	+0.08	70.38	+0.04	70.42
10°	70.92	+0.08	71.00	+0.04	71.04 70.96

5.66 86 9.30

863.64

94+75

^(4.0)
10.3 - 5.8 - 8.9

93+80

^(2.2)
10.6 - 5.7 - 10.0

93+00

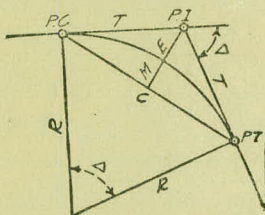
10.7 - 4.8 - old road

92+25

11.0 - 3.7 - old road

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

Copyright, 1914, by Eugene Dietzgen Co., New York City



CURVE FORMULAS

Radius = $R = \frac{50}{\sin. \frac{D}{2}}$ (1) Degree of Curve = D and $\sin. \frac{D}{2} = \frac{50}{R}$ (2)

Tangent = $T = R \tan \frac{\Delta}{2}$ (3) Length of Curve = $L = 100 \frac{\Delta}{D}$ (4)

Middle ordinate = $M = R(1 - \cos. \frac{\Delta}{2})$ (5) = $R \text{vers} \frac{\Delta}{2}$ (6)

External = $E = T \tan \frac{\Delta}{4}$ (7) = $R \div \cos. \frac{\Delta}{2} - R$ (8) = $R \text{exsec} \frac{\Delta}{2}$ (9)

Long Chord = $C = 2 R \sin. \frac{\Delta}{2}$ (10) Δ = Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I. = Sta. 161 + 60.35 to find Sta. of P. C. and P. T. $\Delta = 62^\circ 10'$ $D = 8^\circ 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{3} = 414.49$ ft. From Table V correction = .36 or $T = 414.85$ ft. P. C. = Sta. P. I. - $T = 157 + 45.50$. Also from (4) $L = 746.00$ and P. T. = Sta. P. C. + $L = 164 + 91.50$.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft. = 7.27 ft. Distance = 158 - Sta. P. C. = 54.50, hence offset = $7.27 (54.50 \div 100)^2 = 2.16$ ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2 \div (2 \times 688.26) = 2.16$ ft.

Deflections.—Deflection angle = $\frac{1}{2} D$ for 100 ft., $\frac{1}{4} D$ for 50 ft., etc. For c ft. = (in minutes) $.3 \times C \times D^\circ$ or = defl. for 1 ft. from Table III $\times C$. For Sta. 158 of above curve = $.3 \times 54.5 \times 8\frac{1}{3} = 136.2'$ or $2^\circ 16.2'$, or = $2.50 \times 54.5 = 136.2'$ from Table III. For Sta. 159 deflection angle = $2^\circ 16.2' + 8^\circ 20' \div 2 = 6^\circ 26.2'$, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve $E = 960.6$ for $8^\circ 20' = 960.6 \div 8\frac{1}{3} = 91.27$ and from Table V correction = .10 or $E = 91.37$ ft. Or suppose $\Delta = 32^\circ$ and E is measured and found to be 42 ft. What is D? From Table IV $E = 230.9$ and $\div 42 = 5.5$ or $D = 5^\circ 30'$.

TABLE I.—MINUTES IN DECIMALS OF A DEGREE.

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

TABLE II.—INCHES IN DECIMALS OF A FOOT.

1-16	3-32	1/8	3-16	1/4	5-16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

TABLE III.—RADII, ORDINATES AND DEFLECTIONS.

Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot
0° 10'	34377.5	.036	.145	0.05'	7°	819.02	1.528	6.105	2.10'
20	17188.8	.073	.291	0.10	20'	781.84	1.600	6.395	2.20
30	11459.2	.109	.436	0.15	30	764.49	1.637	6.540	2.25
40	8594.42	.145	.582	0.20	40	747.89	1.673	6.685	2.30
50	6875.55	.182	.727	0.25					
1	5729.65	.218	.873	0.30	8	716.78	1.746	6.976	2.40
10	4911.15	.255	1.018	0.35	20	688.16	1.819	7.266	2.50
20	4297.28	.291	1.164	0.40	30	674.69	1.855	7.411	2.55
30	3819.83	.327	1.309	0.45	40	661.74	1.892	7.556	2.60
40	3437.87	.364	1.454	0.50	9	637.28	1.965	7.846	2.70
50	3125.36	.400	1.600	0.55	20	614.56	2.037	8.136	2.80
2	2864.93	.436	1.745	0.60	30	603.80	2.074	8.281	2.85
10	2644.58	.473	1.891	0.65	40	593.42	2.110	8.426	2.90
20	2455.70	.509	2.036	0.70	10	573.69	2.183	8.716	3.00
30	2292.01	.545	2.181	0.75	30	546.44	2.292	9.150	3.15
40	2148.79	.582	2.327	0.80	11	521.67	2.402	9.585	3.30
50	2022.41	.618	2.472	0.85	30	499.06	2.511	10.02	3.45
3	1910.08	.655	2.618	0.90	12	478.34	2.620	10.45	3.60
10	1809.57	.691	2.763	0.95	30	459.28	2.730	10.89	3.75
20	1719.12	.727	2.908	1.00	13	441.68	2.839	11.32	3.90
30	1637.28	.764	3.054	1.05	30	425.40	2.949	11.75	4.05
40	1562.88	.800	3.199	1.10	14	410.28	3.058	12.18	4.20
50	1494.95	.836	3.345	1.15	30	396.20	3.168	12.62	4.35
4	1432.69	.873	3.490	1.20	15	383.07	3.277	13.05	4.50
10	1375.40	.909	3.635	1.25	30	370.78	3.387	13.49	4.65
20	1322.53	.945	3.718	1.30	16	359.27	3.496	13.92	4.80
30	1273.57	.982	3.926	1.35	30	348.45	3.606	14.35	4.95
40	1228.11	1.018	4.071	1.40	17	338.27	3.716	14.78	5.10
50	1185.78	1.055	4.217	1.45	18	319.62	3.935	15.64	5.40
5	1146.28	1.091	4.362	1.50	19	302.94	4.155	16.51	5.70
10	1109.33	1.127	4.507	1.55	20	287.94	4.374	17.37	6.00
20	1074.68	1.164	4.653	1.60	21	274.37	4.594	18.22	6.30
30	1042.14	1.200	4.798	1.65	22	262.04	4.814	19.08	6.60
40	1011.51	1.237	4.943	1.70	23	250.79	5.035	19.94	6.90
50	982.64	1.273	5.088	1.75	24	240.49	5.255	20.79	7.20
6	955.37	1.309	5.234	1.80	25	231.01	5.476	21.64	7.50
10	929.57	1.346	5.379	1.85	26	222.27	5.697	22.50	7.80
20	905.13	1.382	5.524	1.90	27	214.18	5.918	23.35	8.10
30	881.95	1.418	5.669	1.95	28	206.68	6.139	24.19	8.40
40	859.92	1.455	5.814	2.00	29	199.70	6.360	25.04	8.70
					30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

5833
24
10780

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10'	58.34	.30	10'	560.11	27.31	10'	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

IV

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32	1643.0	230.9	42	2199.4	407.6	52	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	43	2257.0	428.5	53	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	44	2314.9	450.0	54	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	45	2373.3	472.1	55	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.8	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	46	2432.1	494.8	56	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	47	2491.3	518.2	57	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	48	2551.0	542.2	58	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	49	2611.2	566.9	59	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	50	2671.8	592.3	60	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
61°	3375.0	920.2	71°	4036.9	1308.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1315.6	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62	3442.7	954.8	72	4162.8	1352.6	82	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63	3511.1	990.2	73	4239.7	1398.0	83	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64	3580.3	1026.6	74	4317.6	1444.6	84	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65	3650.2	1063.9	75	4396.5	1492.4	85	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66	3720.9	1102.2	76	4476.5	1541.4	86	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67	3792.4	1141.4	77	4557.6	1591.6	87	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68	3864.7	1181.6	78	4639.8	1643.0	88	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69	3937.9	1222.7	79	4723.2	1695.8	89	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70	4011.9	1265.0	80	4807.7	1749.9	90	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10'	5847.5	2457.1	10'	6971.3	3294.1	10'	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	102	7075.5	3374.9	112	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

TABLE V.—CORRECTIONS FOR TANGENTS AND EXTERNALS.

These corrections are to be added to the approximate values, found by dividing the tangent, or external, for a 1° curve (Table IV) by the degree of curve, in order to obtain the true tangents, or externals. Intermediate values may be obtained by interpolation.

FOR TANGENTS ADD

Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°	.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.79	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.40	4.98	5.38	5.83
100°	.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6.34
110°	.51	1.03	1.56	2.08	2.61	3.14	3.67	4.21	4.76	5.31	5.86	6.43	7.01	7.60
120°	.62	1.25	1.93	2.52	3.16	3.81	4.45	5.11	5.77	6.44	7.12	7.80	8.50	9.22

FOR EXTERNALS ADD

Central Angle.	DEGREE OF CURVE														
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020	
15°	.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051	
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083	
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.103	.120	.127	.135	
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188	
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264	
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341	
45°	.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445	
50°	.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550	
55°	.046	.093	.142	.188	.236	.283	.332	.381	.420	.479	.530	.582	.641	.700	
60°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851	
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.771	.845	.922	1.01	
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17	
75°	.095	.182	.266	.353	.440	.528	.618	.707	.797	.877	.971	1.07	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62	
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91	
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.64	1.70	1.87	2.03	2.20	
95°	.174	.350	.522	.706	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58	
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96	
110°	.268	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96	
120°	.360	.721	1.03	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32	

TABLE VI.—CORRECTIONS FOR SUB-CHORDS AND LONG CHORDS.

FOR SUB-CHORDS ADD										Excess of arc per 100 ft.	LONG CHORDS				
D	10	20	30	40	50	60	70	80	90		D	200	300	400	500
4°	.00	.00	.01	.01	.01	.01	.01	.01	.00	.02	1	199.99	299.97	399.92	499.85
6	.00	.01	.01	.02	.02	.02	.02	.01	.01	.05	2	199.97	299.88	399.70	499.39
8	.01	.02	.02	.03	.03	.03	.03	.02	.01	.08	3	199.93	299.73	399.32	498.63
10	.01	.02	.03	.04	.05	.05	.05	.04	.02	.13	4	199.88	299.51	398.78	497.57
12	.02	.04	.05	.06	.07	.07	.07	.05	.03	.18	5	199.81	299.24	398.10	496.20
14	.02	.05	.07	.08	.09	.10	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
16	.03	.06	.09	.11	.12	.12	.12	.09	.05	.33	7	199.63	298.51	396.28	492.57
18	.04	.08	.11	.14	.15	.16	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.18	.15	.09	.51	9	199.38	297.54	393.86	487.75
22	.06	.12	.17	.21	.23	.24	.22	.18	.10	.62	10	199.24	296.96	392.42	484.90
24	.07	.14	.20	.25	.28	.28	.26	.21	.12	.74	12	198.90	295.63	389.12	478.34
26	.09	.17	.24	.29	.32	.33	.31	.25	.15	.86	14	198.51	294.06	385.22	470.65
28	.10	.19	.27	.34	.37	.38	.36	.29	.17	1.00	16	198.05	292.25	380.76	461.86
30	.11	.22	.31	.39	.43	.44	.41	.33	.19	1.15	18	197.54	290.21	375.74	452.02
32	.13	.25	.36	.44	.49	.50	.47	.38	.22	1.31	20	196.96	287.94	370.17	441.15
34	.15	.28	.40	.50	.55	.57	.53	.43	.25	1.48	22	196.32	285.44	364.06	429.30
36	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.63	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.86	26	194.87	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.06	276.59	342.69	388.43
42	.23	.44	.62	.76	.85	.87	.81	.65	.38	2.28	30	193.18	273.20	334.61	373.20
44	.25	.48	.68	.84	.94	.96	.89	.72	.42	2.50	32	192.25	269.61	326.08	357.28
46	.27	.52	.75	.92	1.02	1.05	.98	.78	.46	2.74	34	191.26	265.81	317.12	340.73
48	.30	.57	.81	1.00	1.12	1.14	1.06	.86	.50	2.99	36	190.21	261.80	307.77	323.61
50	.32	.62	.89	1.09	1.21	1.24	1.15	.93	.55	3.24	38	189.10	257.60	298.03	305.99
52	.35	.67	.96	1.18	1.31	1.35	1.25	1.01	.59	3.52	40	187.94	253.21	287.94	287.94
54	.38	.73	1.04	1.28	1.42	1.46	1.35	1.09	.64	3.80	42	186.72	248.63	277.51	269.54
56	.41	.78	1.12	1.38	1.53	1.57	1.46	1.17	.69	4.09	44	185.44	243.87	266.78	250.85
58	.44	.84	1.20	1.48	1.65	1.69	1.57	1.26	.74	4.40	46	184.10	239.93	255.78	231.95
60	.47	.91	1.29	1.59	1.76	1.81	1.68	1.35	.80	4.72	48	182.71	233.83	244.51	212.92

NOTE.—When a chord of less than 100 ft. is used the corrections given in the above table should be added to the nominal length of chord to get the length which should be used in order that the 100 ft. points will check with those obtained by using the standard 100 ft. chord. Thus in locating a 14° curve by 25 ft. chords measure 25'.06 for each chord. Long chords are useful in passing obstacles.

TABLE VII.—MIDDLE ORDINATES FOR RAILS IN FEET.

Deg. of Curve	LENGTH OF RAILS							Deg. of Curve	LENGTH OF RAILS.						
	32	30	28	26	24	22	20		32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.037	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.486	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424	.361	.303	.250
15	.334	.295	.257	.223	.188	.159	.131	30	.660	.583	.508	.438	.374	.313	.259

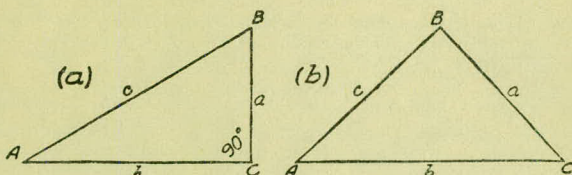
SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:— subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction= $15^2 \div 2 \times 250.3 = .45$ (by slide rule) or horizontal distance= $250.3 - .45 = 249.85$. When vertical angle= $V. A.$ is measured horizontal distance= $\text{slope distance} \times \cos V. A.$ Thus for slope distance of 248.7 ft. and $V. A.$ of $4^\circ 20'$ from Table VIII $\cos = .99714$ and correction= $1 - .99714 = .00286$ per foot or total of $.286 \times 2\frac{1}{2}$ (near enough) = .57 and horizontal distance= $248.7 - .57 = 248.13$ ft.

See fig. (a).

TRIGONOMETRICAL FORMULAS.

$$\begin{aligned} \sin. & A = \frac{a}{c} \\ \cos. & A = \frac{b}{c} \\ \tan. & A = \frac{a}{b} \\ \cot. & A = \frac{b}{a} \\ \sec. & A = \frac{c}{b} \\ \text{cosec.} & A = \frac{c}{a} \end{aligned}$$



FORMULA FOR SOLVING TRIANGLES.

Given	Sought.	Right triangles. See fig. (a).
a, c	A, B, b	$\sin. A = \frac{a}{c}, \cos. B = \frac{a}{c}, b = \sqrt{(c+a)(c-a)}$
a, b	A, B, c	$\tan. A = \frac{a}{b}, \cot. B = \frac{a}{b}, c = \sqrt{a^2 + b^2}$
A, a	B, b, c	$B = 90^\circ - A, b = a \cot. A, c = \frac{a}{\sin. A}$
A, b	B, a, c	$B = 90^\circ - A, a = b \tan. A, c = \frac{b}{\cos. A}$
A, c	B, a, b	$B = 90^\circ - A, a = c \sin. A, b = c \cos. A$
Given	Sought.	Oblique triangles. See fig. (b).
A, B, a	b	$b = \frac{a \sin. B}{\sin. A}$
A, a, b	B	$\sin. B = \frac{b \sin. A}{a}$
a, b, C	$A - B$	$\tan. \frac{1}{2}(A - B) = \frac{(a - b) \tan. \frac{1}{2}(A + B)}{a + b}$
a, b, c	A	$\left\{ \begin{aligned} &\text{If } s = \frac{1}{2}(a + b + c), \sin. \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{bc}} \\ &\cos. \frac{1}{2} A = \sqrt{\frac{s(s - a)}{bc}}, \tan. \frac{1}{2} A = \sqrt{\frac{(s - b)(s - c)}{s(s - a)}}, \\ &\sin. A = \frac{2\sqrt{s(s - a)(s - b)(s - c)}}{bc} \end{aligned} \right.$
A, B, C, a	area	$\text{area} = \frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area} = \frac{1}{2} bc \sin. A$
a, b, c	area	$s = \frac{1}{2}(a + b + c), \text{area} = \sqrt{s(s - a)(s - b)(s - c)}$

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
0	0	0	∞	1	90	8	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	1	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99998	40	20	.1449	.1465	6.827	.98944	40
30	.0087	.0087	114.6	.99996	30	30	.1478	.1495	6.691	.98902	30
40	.0116	.0116	85.94	.99993	20	40	.1507	.1524	6.561	.98858	20
50	.0145	.0145	68.75	.99989	10	50	.1536	.1554	6.435	.98814	10
1	.0175	.0175	57.29	.99985	89	9	.1564	.1584	6.314	.98769	81
10	.0204	.0204	49.10	.99979	50	10	.1593	.1614	6.197	.98723	50
20	.0233	.0233	42.96	.99973	40	20	.1622	.1644	6.084	.98676	40
30	.0262	.0262	38.19	.99966	30	30	.1650	.1673	5.976	.98629	30
40	.0291	.0291	34.37	.99958	20	40	.1679	.1703	5.871	.98580	20
50	.0320	.0320	31.24	.99949	10	50	.1708	.1733	5.769	.98531	10
2	.0349	.0349	28.64	.99939	88	10	.1736	.1763	5.671	.98481	80
10	.0378	.0378	26.43	.99929	50	10	.1765	.1793	5.576	.98430	50
20	.0407	.0407	24.54	.99917	40	20	.1794	.1823	5.485	.98378	40
30	.0436	.0437	22.90	.99905	30	30	.1822	.1853	5.396	.98325	30
40	.0465	.0466	21.47	.99892	20	40	.1851	.1883	5.309	.98272	20
50	.0494	.0495	20.21	.99878	10	50	.1880	.1914	5.226	.98218	10
3	.0523	.0524	19.08	.99863	87	11	.1908	.1944	5.145	.98163	79
10	.0552	.0553	18.07	.99847	50	10	.1937	.1974	5.066	.98107	50
20	.0581	.0582	17.17	.99831	40	20	.1965	.2004	4.989	.98050	40
30	.0610	.0612	16.35	.99813	30	30	.1994	.2035	4.915	.97992	30
40	.0640	.0641	15.60	.99795	20	40	.2022	.2065	4.843	.97934	20
50	.0669	.0670	14.92	.99776	10	50	.2051	.2095	4.773	.97875	10
4	.0698	.0699	14.30	.99756	86	12	.2079	.2126	4.705	.97815	78
10	.0727	.0729	13.73	.99736	50	10	.2108	.2156	4.638	.97754	50
20	.0756	.0758	13.20	.99714	40	20	.2136	.2186	4.574	.97692	40
30	.0785	.0787	12.71	.99692	30	30	.2164	.2217	4.511	.97630	30
40	.0814	.0816	12.25	.99668	20	40	.2193	.2247	4.449	.97566	20
50	.0843	.0846	11.83	.99644	10	50	.2221	.2278	4.390	.97502	10
5	.0872	.0875	11.43	.99619	85	13	.2250	.2309	4.331	.97437	77
10	.0901	.0904	11.06	.99594	50	10	.2278	.2339	4.275	.97371	50
20	.0929	.0934	10.71	.99567	40	20	.2306	.2370	4.219	.97304	40
30	.0958	.0963	10.39	.99540	30	30	.2334	.2401	4.165	.97237	30
40	.0987	.0992	10.08	.99511	20	40	.2363	.2432	4.113	.97169	20
50	.1016	.1022	9.788	.99482	10	50	.2391	.2462	4.061	.97100	10
6	.1045	.1051	9.514	.99452	84	14	.2419	.2493	4.011	.97030	76
10	.1074	.1080	9.255	.99421	50	10	.2447	.2524	3.962	.96959	50
20	.1103	.1110	9.010	.99390	40	20	.2476	.2555	3.914	.96887	40
30	.1132	.1139	8.777	.99357	30	30	.2504	.2586	3.867	.96815	30
40	.1161	.1169	8.556	.99324	20	40	.2532	.2617	3.821	.96742	20
50	.1190	.1198	8.345	.99290	10	50	.2560	.2648	3.776	.96667	10
7	.1219	.1228	8.144	.99255	83	15	.2588	.2679	3.732	.96593	75
10	.1248	.1257	7.953	.99219	50	10	.2616	.2711	3.689	.96517	50
20	.1276	.1287	7.770	.99182	40	20	.2644	.2742	3.647	.96440	40
30	.1305	.1317	7.596	.99144	30	30	.2672	.2773	3.606	.96363	30
40	.1334	.1346	7.429	.99106	20	40	.2700	.2805	3.566	.96285	20
50	.1363	.1376	7.269	.99067	10	50	.2728	.2836	3.526	.96206	10
					82						74
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.	Angle	Sine.	Tan.	Cotg.	Cosin.	
<i>or</i>					<i>or</i>					
16	.2756	.2887	3.487	.96126	74	.4067	.4452	2.246	.91355	
10	.2784	.2899	3.450	.96046	50	.4094	.4487	2.229	.91236	
20	.2812	.2931	3.412	.95964	40	.4120	.4522	2.211	.91116	
30	.2840	.2962	3.376	.95882	30	.4147	.4557	2.194	.90996	
40	.2868	.2994	3.340	.95799	20	.4173	.4592	2.177	.90875	
50	.2896	.3026	3.305	.95715	10	.4200	.4628	2.161	.90753	
17	.2924	.3057	3.271	.95615	73	.4226	.4663	2.145	.90631	
10	.2952	.3089	3.237	.95545	50	.4253	.4699	2.128	.90507	
20	.2979	.3121	3.204	.95459	40	.4279	.4734	2.112	.90383	
30	.3007	.3153	3.172	.95372	30	.4305	.4770	2.097	.90259	
40	.3035	.3185	3.140	.95284	20	.4331	.4806	2.081	.90133	
50	.3062	.3217	3.108	.95195	10	.4358	.4841	2.066	.90007	
18	.3090	.3249	3.078	.95106	72	.4384	.4877	2.050	.89879	
10	.3118	.3281	3.048	.95015	50	.4410	.4913	2.035	.89752	
20	.3145	.3314	3.018	.94924	40	.4436	.4950	2.020	.89623	
30	.3173	.3346	2.989	.94832	30	.4462	.4986	2.006	.89493	
40	.3201	.3378	2.960	.94740	20	.4488	.5022	1.991	.89363	
50	.3228	.3411	2.932	.94646	10	.4514	.5059	1.977	.89232	
19	.3256	.3443	2.904	.94552	71	.4540	.5095	1.963	.89101	
10	.3283	.3476	2.877	.94457	50	.4566	.5132	1.949	.88968	
20	.3311	.3508	2.850	.94361	40	.4592	.5169	1.935	.88835	
30	.3338	.3541	2.824	.94264	30	.4617	.5206	1.921	.88701	
40	.3365	.3574	2.798	.94167	20	.4643	.5243	1.907	.88566	
50	.3393	.3607	2.773	.94068	10	.4669	.5280	1.894	.88431	
20	.3420	.3640	2.747	.93969	70	.4695	.5317	1.881	.88295	
10	.3448	.3673	2.723	.93869	50	.4720	.5354	1.868	.88158	
20	.3475	.3706	2.699	.93769	40	.4746	.5392	1.855	.88020	
30	.3502	.3739	2.675	.93667	30	.4772	.5430	1.842	.87882	
40	.3529	.3772	2.651	.93565	20	.4797	.5467	1.829	.87743	
50	.3557	.3805	2.628	.93462	10	.4823	.5505	1.816	.87603	
21	.3584	.3839	2.605	.93358	69	.4848	.5543	1.804	.87462	
10	.3611	.3872	2.583	.93253	50	.4874	.5581	1.792	.87321	
20	.3638	.3906	2.560	.93148	40	.4899	.5619	1.780	.87178	
30	.3665	.3939	2.539	.93042	30	.4924	.5658	1.767	.87036	
40	.3692	.3973	2.517	.92935	20	.4950	.5696	1.755	.86892	
50	.3719	.4006	2.496	.92827	10	.4975	.5735	1.744	.86748	
22	.3746	.4040	2.475	.92718	68	.5000	.5774	1.732	.86603	
10	.3773	.4074	2.455	.92609	50	.5025	.5812	1.720	.86457	
20	.3800	.4108	2.434	.92499	40	.5050	.5851	1.709	.86310	
30	.3827	.4142	2.414	.92388	30	.5075	.5890	1.698	.86163	
40	.3854	.4176	2.394	.92276	20	.5100	.5930	1.686	.86015	
50	.3881	.4210	2.375	.92164	10	.5125	.5969	1.675	.85866	
23	.3907	.4245	2.356	.92050	67	.5150	.6009	1.664	.85717	
10	.3934	.4279	2.337	.91936	50	.5175	.6048	1.653	.85567	
20	.3961	.4314	2.318	.91822	40	.5200	.6088	1.643	.85416	
30	.3987	.4348	2.300	.91706	30	.5225	.6128	1.632	.85264	
40	.4014	.4383	2.282	.91590	20	.5250	.6168	1.621	.85112	
50	.4041	.4417	2.264	.91472	10	.5275	.6208	1.611	.84959	
				66					58	
	Cosin.	Cotg.	Tan.	Sine.	Angle.	Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
<i>or</i>						<i>or</i>					
32	.5299	.6249	1.600	.84805	58	30	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30	39	.6293	.8098	1.235	.77715	51
40	.5398	.6412	1.560	.84182	20	10	.6316	.8146	1.228	.77531	50
50	.5422	.6453	1.550	.84025	10	20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30	40	.6428	.8391	1.192	.76604	50
40	.5544	.6661	1.501	.83228	20	10	.6450	.8441	1.185	.76417	50
50	.5568	.6703	1.492	.83066	10	20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30	41	.6561	.8693	1.150	.75471	49
40	.5688	.6916	1.446	.82248	20	10	.6583	.8744	1.144	.75280	50
50	.5712	.6959	1.437	.82082	10	20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30	42	.6691	.9004	1.111	.74314	48
40	.5831	.7177	1.393	.81242	20	10	.6713	.9057	1.104	.74120	50
50	.5854	.7221	1.385	.81072	10	20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30	43	.6820	.9325	1.072	.73135	47
40	.5972	.7445	1.343	.80212	20	10	.6841	.9380	1.066	.72937	50
50	.5995	.7490	1.335	.80038	10	20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30	44	.6947	.9657	1.036	.71934	46
40	.6111	.7720	1.295	.79158	20	10	.6967	.9713	1.030	.71732	50
50	.6134	.7766	1.288	.78980	10	20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											<i>or</i>
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE IX.—CALCULATION OF EARTHWORK.

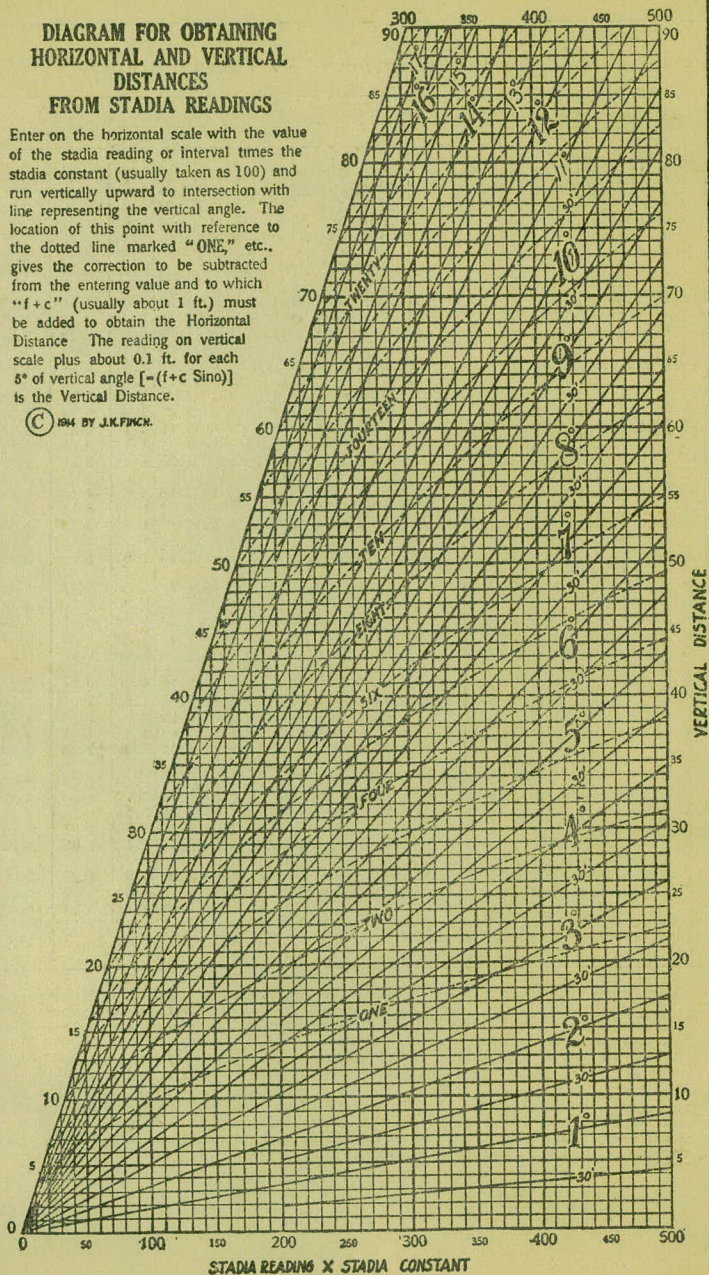
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	1.04	1.11
5	.09	.19	.28	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
6	.11	.22	.33	.44	.56	.67	.78	.89	1.00	1.11	1.22	1.33	1.44	1.55	1.67
7	.13	.26	.39	.52	.65	.78	.91	1.04	1.16	1.30	1.42	1.55	1.68	1.81	1.94
8	.15	.30	.44	.59	.74	.89	1.04	1.19	1.33	1.48	1.63	1.78	1.92	2.08	2.22
9	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50
10	.18	.37	.56	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
11	.20	.41	.61	.82	1.02	1.22	1.43	1.63	1.83	2.04	2.24	2.44	2.65	2.85	3.06
12	.22	.44	.67	.89	1.11	1.33	1.56	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33
13	.24	.48	.72	.96	1.20	1.44	1.68	1.92	2.16	2.41	2.65	2.89	3.13	3.37	3.61
14	.26	.52	.78	1.04	1.30	1.55	1.81	2.08	2.33	2.59	2.85	3.11	3.37	3.63	3.89
15	.28	.56	.83	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17
16	.30	.59	.89	1.18	1.48	1.78	2.07	2.37	2.67	2.96	3.26	3.56	3.85	4.15	4.44
17	.31	.63	.94	1.26	1.57	1.89	2.20	2.52	2.83	3.15	3.46	3.78	4.09	4.41	4.72
18	.33	.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00
19	.35	.70	1.06	1.41	1.76	2.11	2.46	2.82	3.17	3.52	3.87	4.22	4.57	4.92	5.28
20	.37	.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33	3.70	4.07	4.44	4.81	5.18	5.56
21	.39	.78	1.17	1.55	1.94	2.33	2.72	3.11	3.50	3.89	4.28	4.67	5.06	5.44	5.83
22	.41	.81	1.22	1.63	2.04	2.44	2.85	3.26	3.67	4.07	4.48	4.89	5.30	5.70	6.11
23	.43	.85	1.28	1.70	2.13	2.56	2.98	3.41	3.83	4.26	4.68	5.11	5.54	5.96	6.39
24	.44	.89	1.33	1.78	2.22	2.67	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67
25	.46	.92	1.39	1.85	2.31	2.78	3.24	3.70	4.17	4.63	5.09	5.56	6.02	6.48	6.94
26	.48	.96	1.44	1.92	2.41	2.89	3.37	3.85	4.33	4.82	5.30	5.78	6.26	6.74	7.24
27	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
28	.52	1.04	1.55	2.07	2.59	3.11	3.63	4.15	4.67	5.18	5.70	6.22	6.74	7.26	7.78
29	.54	1.07	1.61	2.15	2.68	3.22	3.76	4.30	4.83	5.37	5.91	6.44	6.98	7.52	8.06
30	.56	1.11	1.67	2.22	2.78	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
31	.57	1.15	1.72	2.30	2.87	3.44	4.02	4.59	5.17	5.74	6.32	6.89	7.46	8.04	8.61
32	.59	1.18	1.78	2.37	2.96	3.56	4.15	4.74	5.33	5.92	6.52	7.11	7.70	8.30	8.89
33	.61	1.22	1.83	2.44	3.05	3.67	4.28	4.89	5.50	6.11	6.72	7.33	7.94	8.55	9.17
34	.63	1.26	1.89	2.52	3.15	3.78	4.40	5.04	5.67	6.29	6.93	7.56	8.18	8.81	9.44
35	.65	1.30	1.94	2.59	3.24	3.89	4.53	5.18	5.83	6.48	7.13	7.78	8.42	9.08	9.72
36	.67	1.33	2.00	2.67	3.33	4.00	4.66	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00
37	.68	1.37	2.06	2.74	3.42	4.11	4.79	5.48	6.17	6.85	7.54	8.22	8.91	9.59	10.28
38	.70	1.41	2.11	2.82	3.52	4.22	4.92	5.63	6.33	7.03	7.74	8.44	9.15	9.85	10.56
39	.72	1.44	2.17	2.89	3.61	4.33	5.05	5.78	6.50	7.22	7.95	8.67	9.39	10.11	10.83
40	.74	1.48	2.22	2.96	3.70	4.44	5.18	5.92	6.67	7.41	8.15	8.89	9.63	10.37	11.11

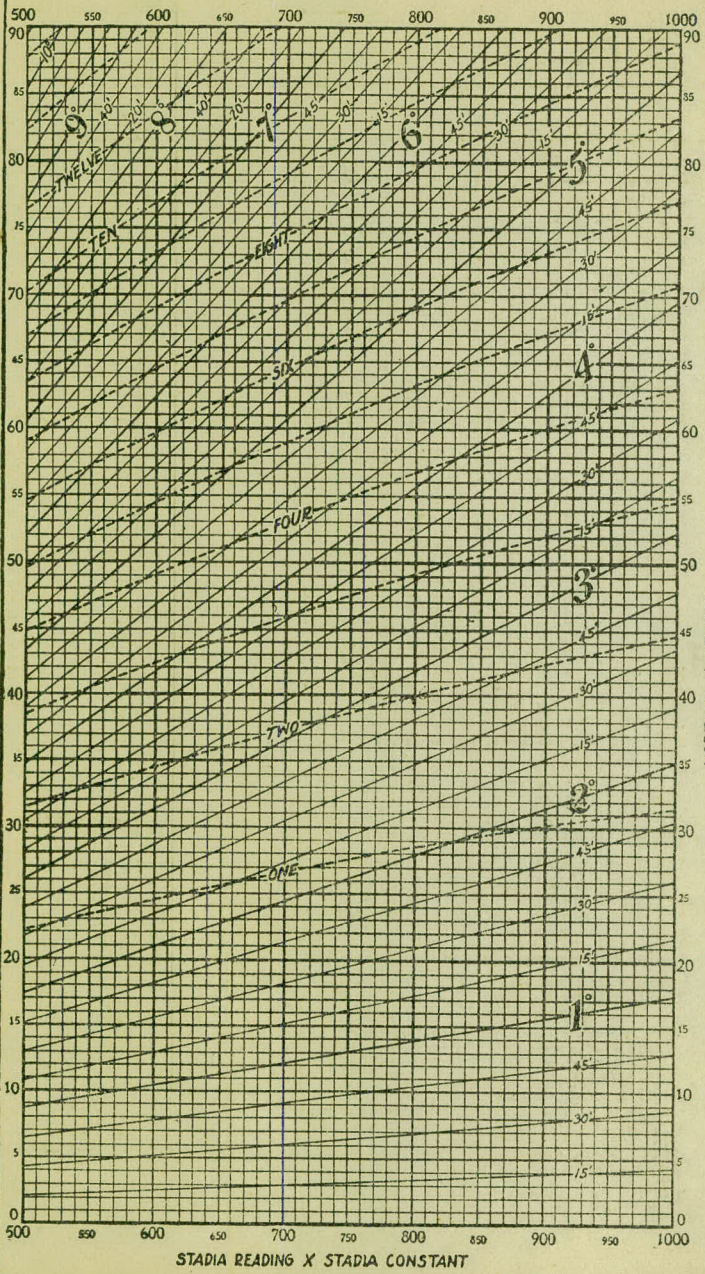
Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths. Thus if $w = 16.2$ and $h = 5.3$, cu. yds. $= 1.48 + .028 + .089 = 1.597$ cu. yds. or practically 160 cu. yds. per 100 ft. If w exceeds 40 ft., use one half and multiply result by 2, if both w and h are large use one half of each and multiply result by 4. Any cross-section may be divided into triangles by the following rule. To the triangle of the sum of the outside cuts (or fills) $= h$, and $\frac{1}{2}$ the roadbed $= w$, add the triangles formed by taking the distance out to each break in turn ($= w$) by the difference between the cuts (or fills) on each side of it ($= h$'s) always subtracting the outer from the inner.

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which " $f+c$ " (usually about 1 ft.) must be added to obtain the Horizontal Distance. The reading on vertical scale plus about 0.1 ft. for each 5° of vertical angle [$-(f+c \text{ Sino})$] is the Vertical Distance.

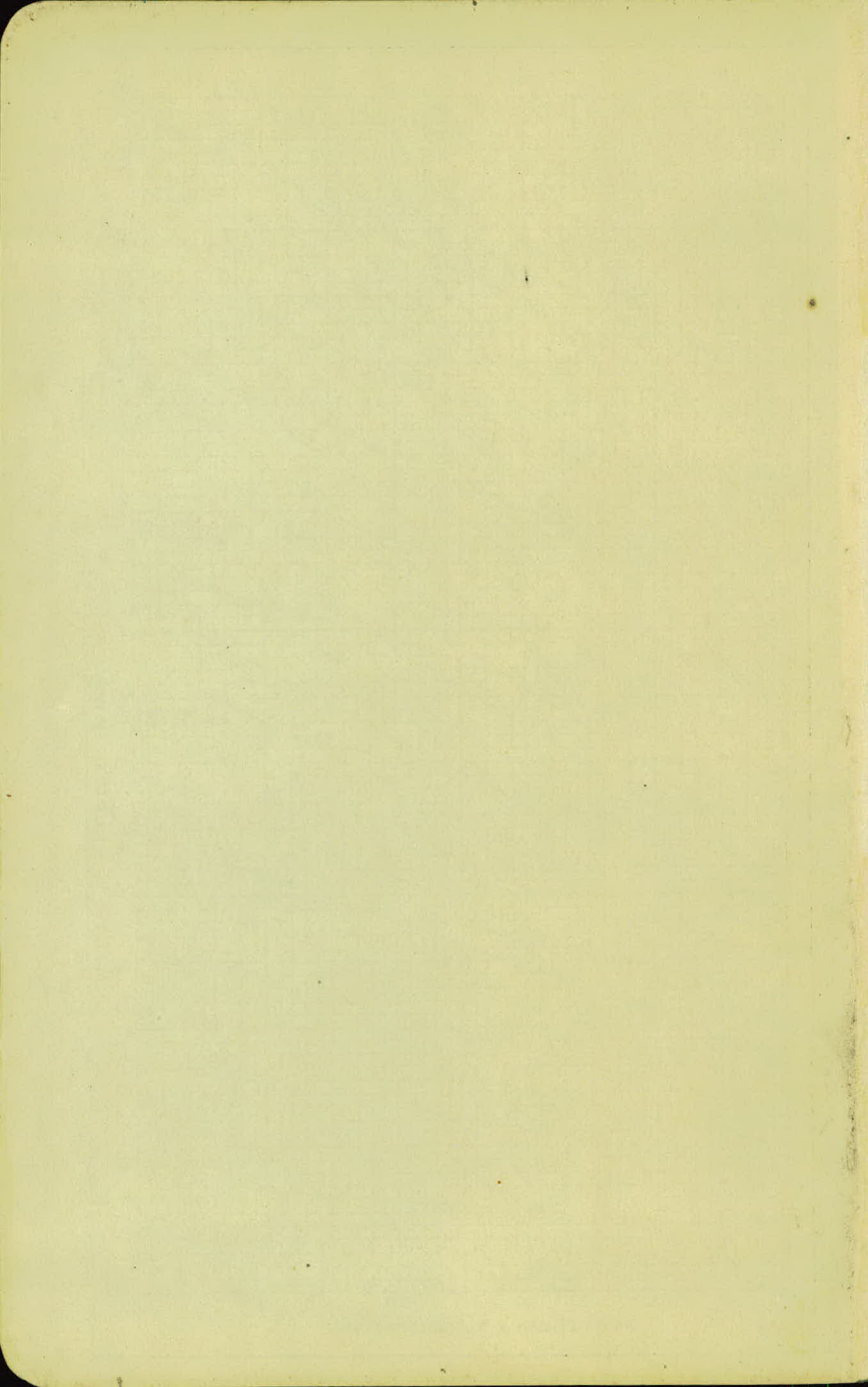
© 1914 BY J.K. FINCK.

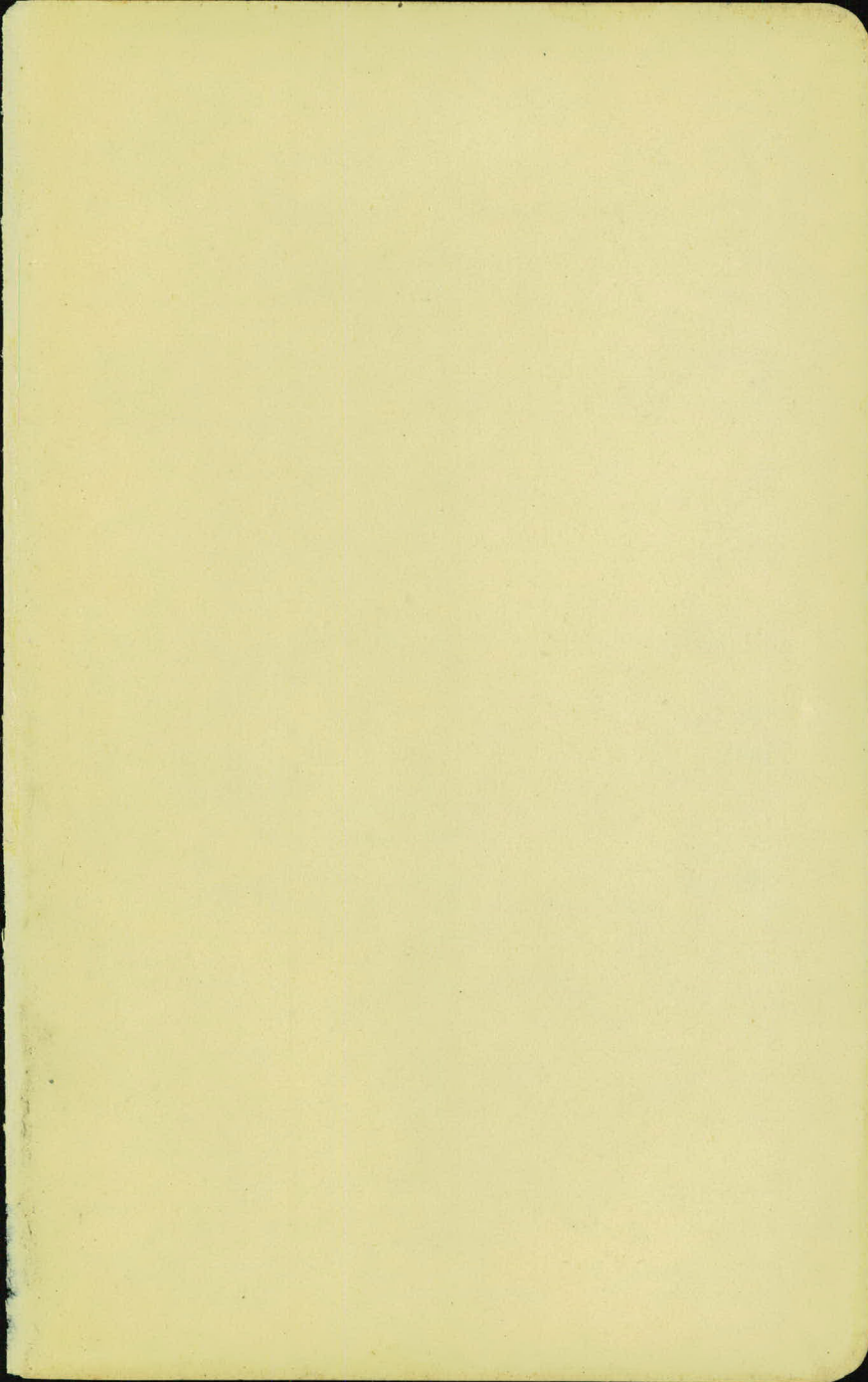




STADIA READING X STADIA CONSTANT

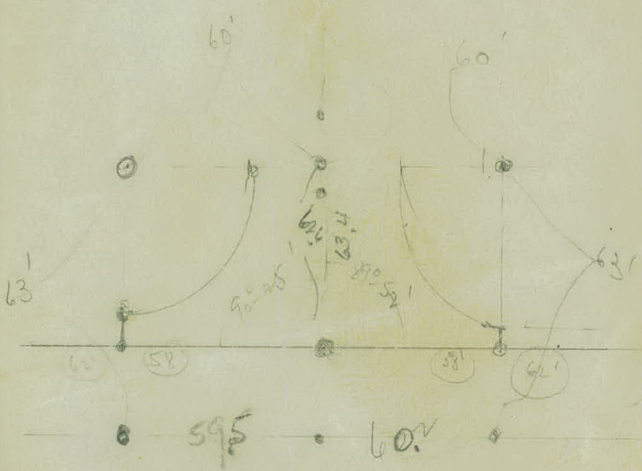
VERTICAL DISTANCE

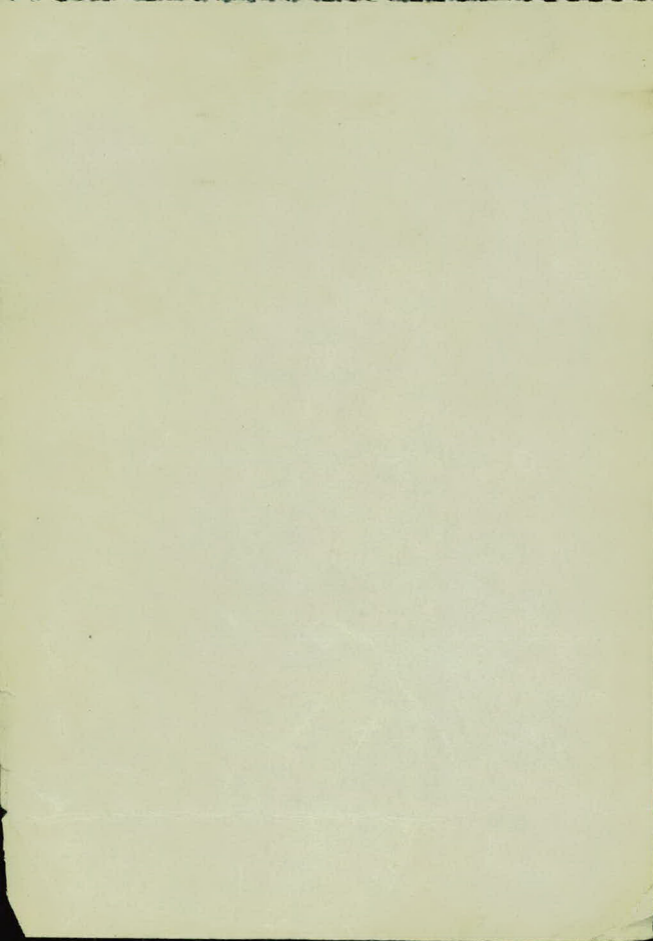




94128 - 4.5'

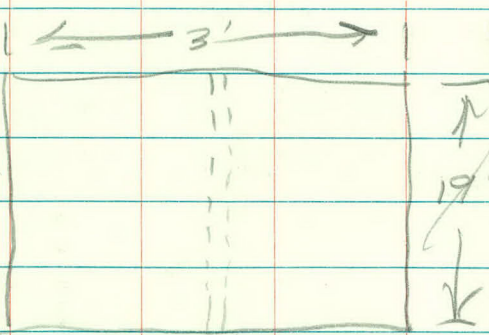
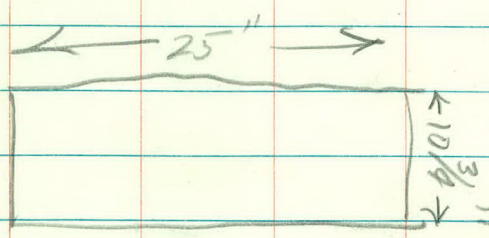
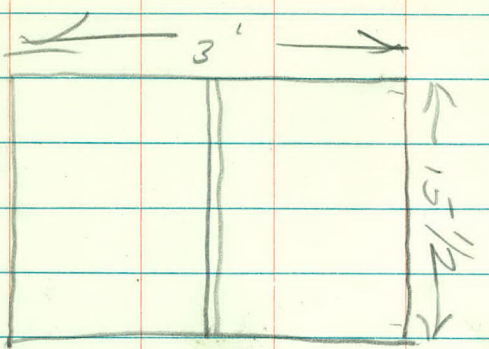
West. North.



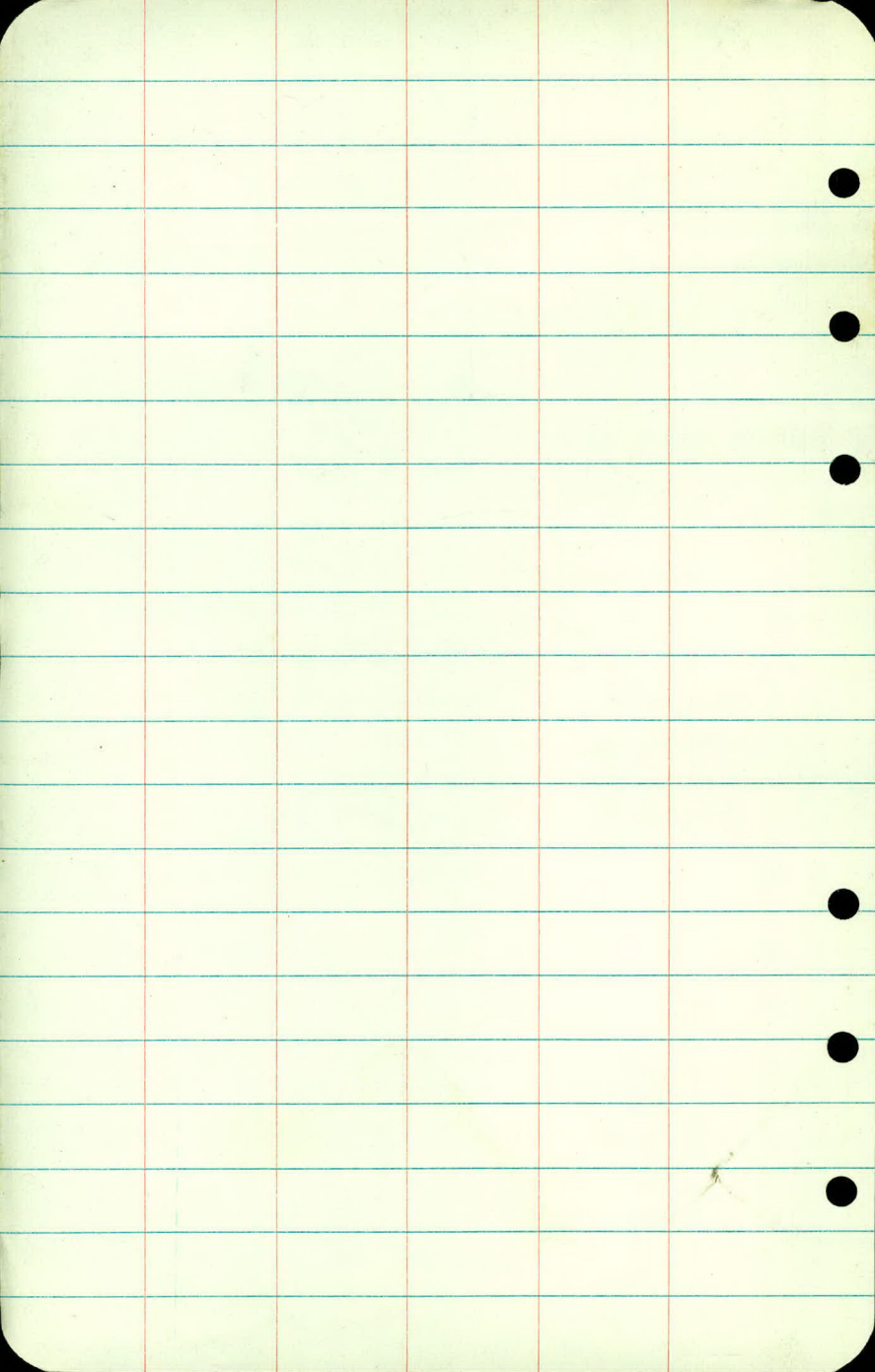


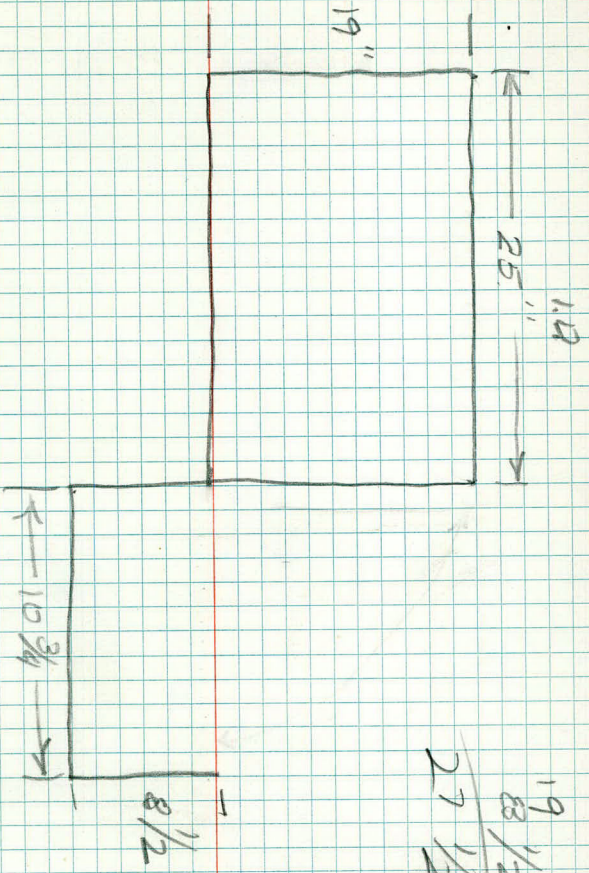
$15\frac{1}{2}$
 $1\frac{1}{2}$

 14



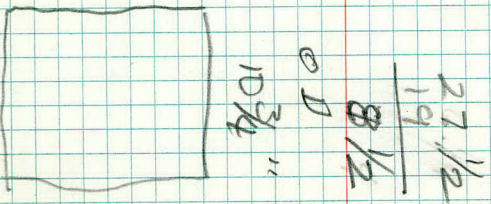
$18\frac{1}{4}$



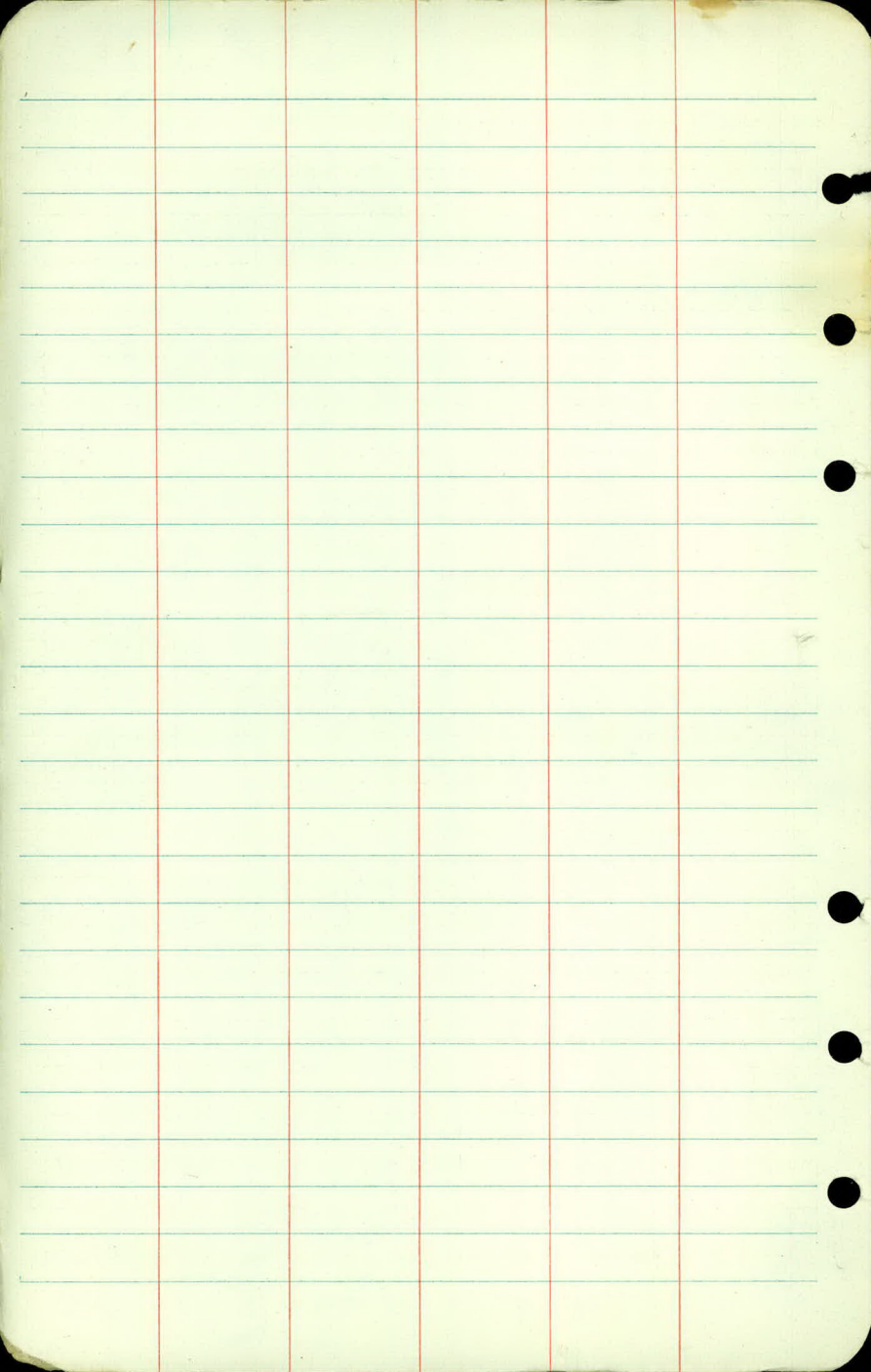


$$\begin{array}{r} 19 \\ 8 \frac{1}{2} \\ \hline 27 \frac{1}{2} \end{array}$$

$$\begin{array}{r} 11 \frac{3}{4} \\ 11 \\ 24 \\ \hline 55 \frac{3}{4} \\ 20 \\ \hline 103 \frac{3}{4} \end{array}$$



$$\begin{array}{r} 27 \frac{1}{2} \\ 19 \\ \hline 8 \frac{1}{2} \end{array}$$



925.61

2.78

928.39

2.77

926.168

10/11/11

$$\begin{array}{r} 12.8 \\ 2 \overline{) 25.6} \\ \underline{2} \\ 2 \\ \underline{2} \\ 0 \\ 0 \\ \hline 640.0 \end{array}$$

$$A = \pi R^2$$

$$\begin{array}{r} 24 \\ 14 \\ \hline 96 \\ 24 \\ \hline 336 \end{array}$$

$$A = 3.14 \times 49$$

$$A = 3.14 \times 49$$

$$\begin{array}{r} 3.14 \\ 49 \\ \hline 2826 \end{array}$$

$$\begin{array}{r} 24 \\ 7 \\ \hline 168 \end{array}$$

$$2826$$

$$168$$

$$1256$$

$$153.86$$

$$2 \overline{) 256}$$

$$\begin{array}{r} 12 \\ 31 \end{array}$$

$$A = \frac{1}{2}(A+B) \times H$$

$$A = \frac{1}{2}(14 + 11.6) \times 50$$

$$A = \frac{1}{2}(25.6) 50$$

$$A = 12.8 \times 50$$

$$A = \frac{1}{2}(A+B)H$$

$$A = \frac{1}{2}(11,6 + 8,6) 50$$

$$A = \frac{1}{2}(20,2) 50$$

11,6

8,6

20,2

10,1

30

505,0

$$A = \frac{1}{2}(4,3 + 2,8) 50$$

n

$$A = \frac{1}{2}(8,6 + 5,6) \times 50$$

$$A = \frac{1}{2}(14,2) 50$$

8,6

14,2

7,1

30

335,0

8,1

4,05

49

370,5

1660
203,05

$$A = \frac{1}{2}(5,6 + 2,5) 49$$

$$\begin{array}{r} 33 \\ 3,75 \\ \hline \end{array}$$

$$\begin{array}{r} 1875 \\ 1500 \\ \hline 1468,75 \end{array} \quad 3$$

$$\begin{array}{r} 405 \\ 245 \\ \hline \end{array}$$

$$\begin{array}{r} 1960 \\ 198,45 \\ \hline \end{array}$$

$$\begin{array}{r} 8,25 \\ 50 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ 6,7 \\ 50 \\ \hline 335,0 \end{array}$$

$$\begin{array}{r} 2 \\ 12,5 \\ 50 \\ \hline \end{array}$$

$$412,50$$

$$\begin{array}{r} 3 \\ 9,7625,0 \\ 50 \\ \hline \end{array}$$

$$\begin{array}{r} 4,05 \\ 49 \\ \hline \end{array}$$

$$485,0$$

$$\begin{array}{r} 3645 \\ 1420 \\ \hline 198,45 \end{array}$$

$$\begin{array}{r} 3 \\ 3,75 \\ \hline \end{array}$$

$$\begin{array}{r} 27 \\ 2625 \\ \hline \end{array}$$

$$\begin{array}{r} 750 \\ 101,25 \end{array}$$

²
2153,86

336,00

640,00

505,00

355,00

188,45

2188,31

²³¹¹
701,25

412,50

625,00

625,00

485,00

335,00

168,75

2752,50

² 12.4

49

) 116

496

607.6

³ 7.7

50

365.0

10.8

50

590.0

⁴ 10.8

50

5900

² 76.93

² 607.60

465.00

315.00

170.00

1634.53

¹ 9.3

50

465.0

¹ 6.3

50

315.0

12

54

27

32.4

10.8

50
590.00

10.8
50
540

10.8

50

5400

² 3.4

50

170.0

4.8

50

2.7 240.0

12.9	13.2	11.25
20	<u>30</u>	50
<u>258.0</u>	396.0	562.50

6.25	32.40
<u>50</u>	240.

312.50

2.5
<u>8</u>
27.0

385.
540.
258.
396.
562.50
312.50
20.

2746.40

22'111.38

2752.50

1634.53

2746.40

9244.81

2.
4 32.40

240.

385.

540

258

396

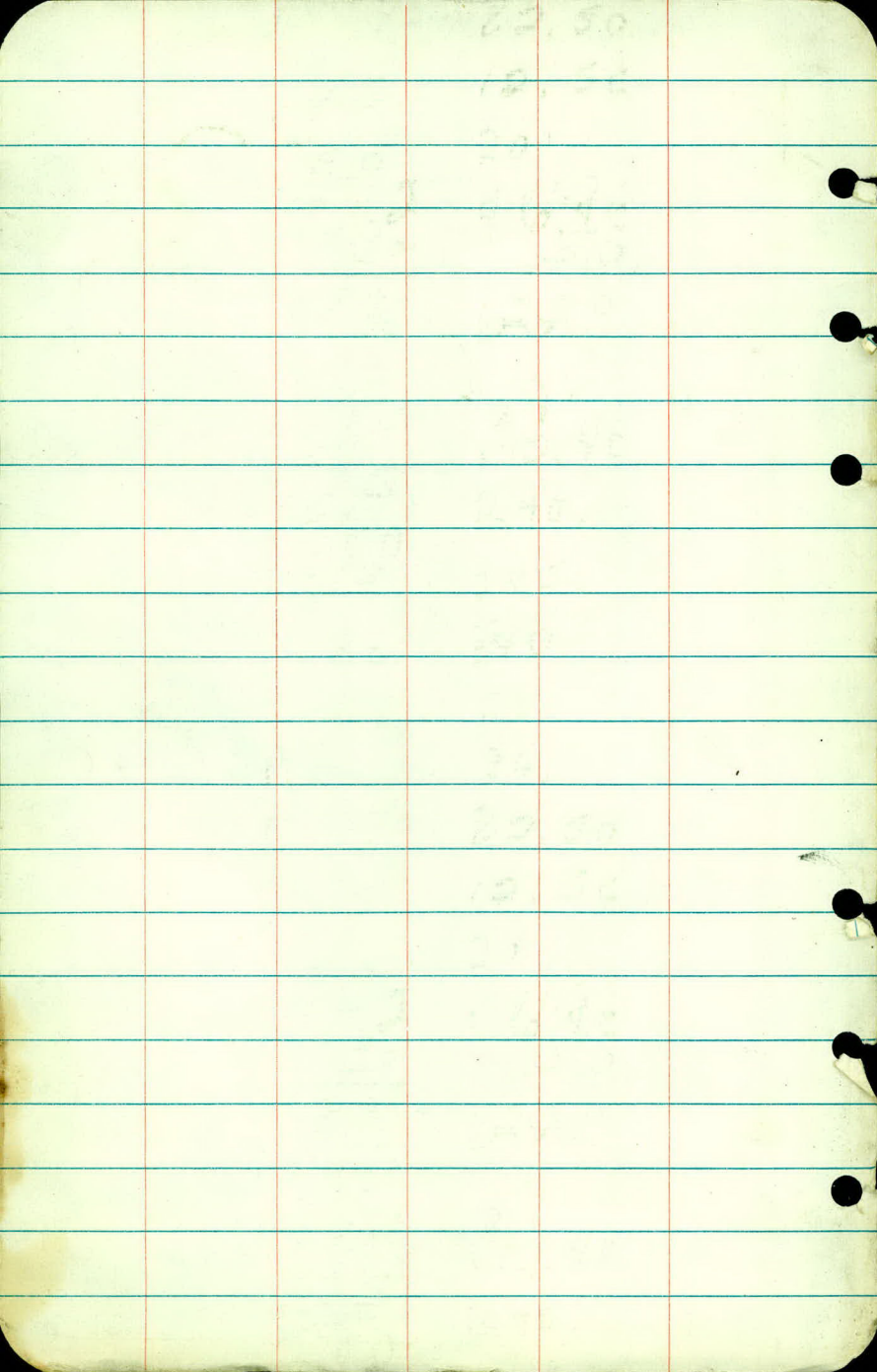
562.50

312.50

20

2746.40

11250
5250
5



7607
216
187

DISTANCES FROM CENTER OF ROADWAY FOR
CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	II
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	25.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be $41.9 + (20 - 16) \div 2$ or 2 ft. added to 41.9 = 43.9. For slopes of 1 on 1 see inside of front cover.

Made in Germany.

U2487