Field Notes

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FIELD BOOK

7/13/23

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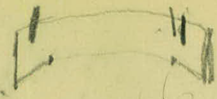
Distances from Center of Roadway for Cross-Sectioning

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)÷2 or 2 ft. added to 30.6 =32.6. For slopes of 1 on 1½ see inside of back cover.



4 | .775
.194

.1
76.7
135.8

11.84
135.8
148.9

7+76.7
7

50) 3.10
300

50) 2.10
2.00
1.0

(.42

50
.042
2.100

50
.42
21.00

236.7
3.4
240.1

216.54
3.44
219.98
3.73
223.71

1
23.1
7.1
16

7.05
3
2.35
4.7

Index

Location & Ties of points & P.I.'s

36+14.30 P.I. Δ = 0°50' L

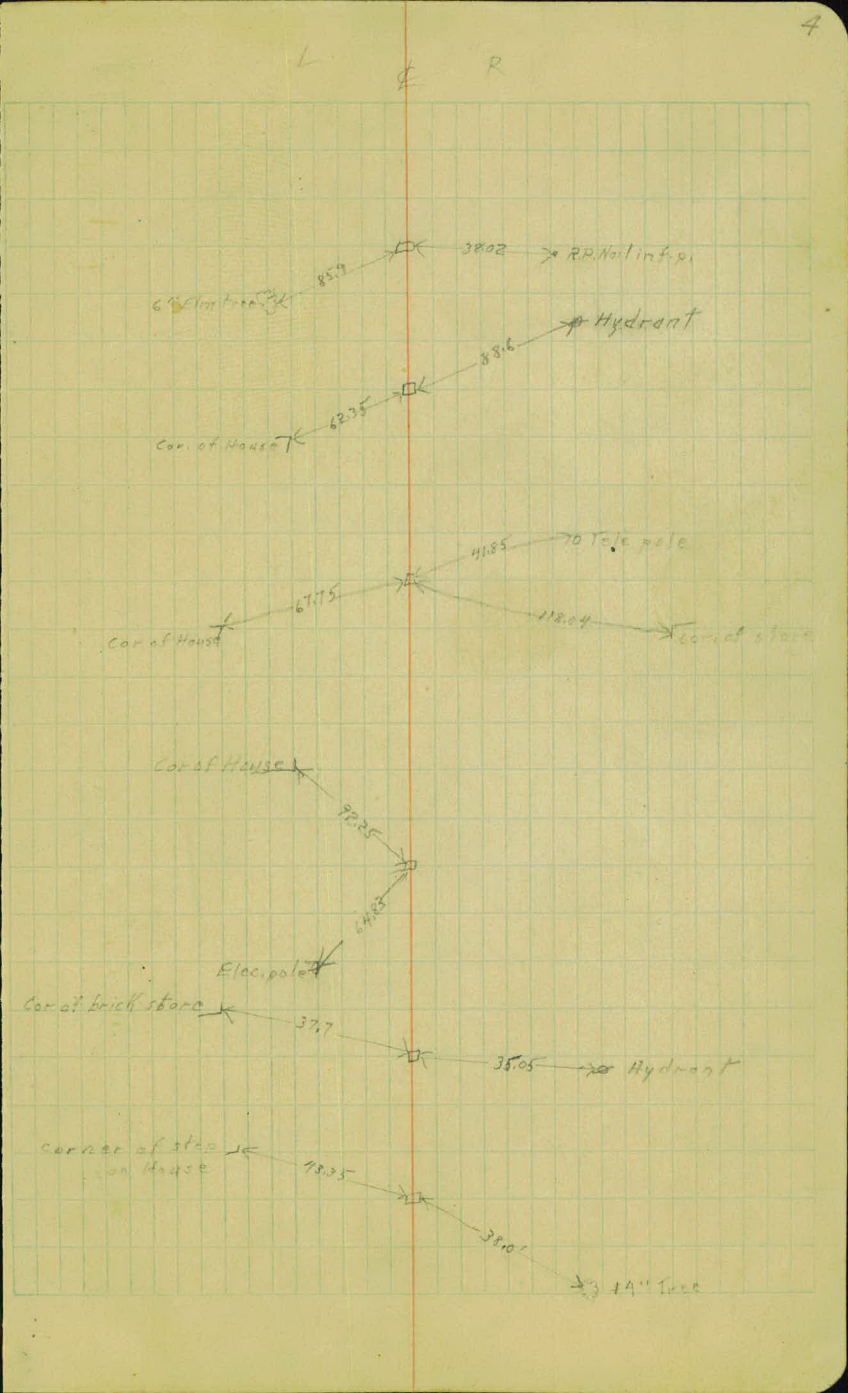
29+12.30 = 29+02.2 P.I. Δ = 5°

22+83.5 = 23+30 P.I. Δ =

18+84.8 = 18+50 P.I. Δ =

7+22° P.I. Δ = 33°-21 R

1+36.5 P.I. Δ =


L
℄
R
3802
RR Nail in t. p.
8.59
6" Elm tree
Hydrant
8.86
6235
Cor. of House
41.85
70 Tele pole
67.75
Cor of House
118.04
Cor of store
Cor of House
92.25
64.83
Elec. pole
Cor of brick store
37.7
35.05
Hydrant
Corner of step on House
43.33
38.07
3 14" Tree

Check-Levels

Sta	+	H.I.	−	Elev	old Elev
B.M.	8.45	224.99			(216.54)
T.P.	12.14	236.32	0.81	224.18 ✓	
T.P.	12.23	246.37	2.18	234.14 ✓	
B.M.			(7.56)	238.81 ✓	(238.85)
B.M.	12.16	258.43	0.10	246.27 ✓	
T.P.	10.73	268.76	0.40	258.03 ✓	
T.P.	11.75	279.46	1.05	267.71 ✓	
T.P.	12.29	290.98	0.77	278.69 ✓	
T.P.	10.30	301.03	0.25	290.73 ✓	
B.M.	6.05	300.91	6.05	294.86 ✓	(294.86)
T.P.	11.39	311.85	0.45	300.46 ✓	
T.P.	11.86	323.13	0.58	311.27 ✓	
T.P.	9.15	331.62	0.66	322.47 ✓	
T.P.	4.51	335.89	0.24	331.38 ✓	
B.M.			1.55	334.34 ✓	(334.46)

5/12/23

Corley
Parsons
Eck
Briggs

Check Levels Project # 23-51

Top of hydrant Rt of sta 1+50

Top of hydrant R of sta 7+22

Nail in power pole R of sta 11+30

Top of hydrant 24' R of sta 23+91

Top of hydrant L of sta 38+00

Sta	+	H.I.	−	Elev
BM	8.60	225.14 ✓		(R16.54)
1	+ 36.5	End of paving	13.7	211.4 ✓
1	+ 38.0	Beginning of project	13.5	211.6 ✓
2			10.2	14.9 ✓
	+67		8.6	16.5 ✓
3			7.1	18.0 ✓
4			2.8	22.3 ✓
	T.P.	11.32 234.42 ✓	2.04	223.10 ✓
	+72		10.0	24.4 ✓
5			8.9	25.5 ✓
	+73		5.3	29.1 ✓
6			3.9	30.5 ✓
	+50		1.6	32.8 ✓
	T.P.	10.92 244.38 ✓	0.96	233.46 ✓

L ℄ R

Top of Hydrant R of sta 1+38

+11.2	+4.7 F.	+1.7 S.W.	+1.6 S.W.	+0.1	13.7 -0.1	+1.2	+5.7	+5.7	
9.5/33	9.5/30	12.0/25	12.1/18	13.6/14	13.8/12	12.5/22	8.0/27	8.0/33	
+3.9	F +3.9	S.W. +1.5	S.W. +1.4	0.0	11.6 +2.2	1.0	+5.4	+5.4	
9.6/33	9.6/30	12.1/22	12.1/17	13.5/13	11.3/16	12.5/22	8.1/27	8.1/33	
+0.4	F +0.4	-0.6	-0.6	-1.1	-0.4	-0.8	-0.5		
9.8/33	9.8/29	10.8/25	10.8/17	11.3/16	10.6/16	11.0/25	10.7/33		
-6.5	-3.2	-1.6 S.W.	-0.6 S.W.	-1.0	-0.4	+1.4	-3.5	+4.3	
16.1/33	11.8/28	9.2/24	9.2/19	9.6/12	9.0/11	10.0/17	12.1/23	12.9/33	
-1.6	-2.5	-1.5 S.W.	-0.7 S.W.	-1.3	-0.4	-0.6	-1.3		
8.7/33	9.6/29	7.6/23	7.8/19	8.4/15	7.5/10	7.7/17	8.4/33		
		+0.1 S.W.	+0.2 S.W.	-0.2	-0.1	-0.6	-1.4	-1.7	
0.0/33	0.0/31	3.7/24	2.6/18	3.7/13	2.9/8	3.4/12	4.2/19	4.5/33	
+0.1	+0.6 S.W.	+0.6 S.W.	-0.4	+0.2	-0.3	-0.8	-0.1	-0.7	
9.9/33	9.4/26	9.6/22	10.4/14	9.8/12	10.3/14	10.8/17	10.1/21	10.7/33	
+0.2	+0.1	+0.2 S.W.	-0.2	-0.2	-0.7	+0.2	-0.4		
8.7/33	8.8/27	8.7/18	9.1/11	9.1/12	9.6/15	8.7/21	9.3/33		
+0.1	-0.6 S.W.	-0.7 S.W.	-1.5	-1.5	-1.0	-0.2	-0.4	-0.4	
5.2/33	5.9/26	6.0/21	6.8/17	6.8/14	6.3/13	5.5/24	5.7/31	5.7/33	
+0.2	-0.4 S.W.	-0.4 S.W.	-1.5	-0.3	-1.1	-1.6	-1.5	-0.1 S.W.	-0.1 S.W.
3.1/33	4.3/25	4.3/20	5.4/15	4.8/11	5.0/15	5.5/20	5.4/22	4.0/26	4.0/32
+1.3	+0.7	+0.1 S.W.	-0.6	-0.6	-0.7	-2.0	-1.8	-0.8	
+0.3/33	1.4/25	1.5/18	2.2/14	2.2/11	2.3/13	3.6/20	2.4/24	2.4/33	

Sta	+	H.I.	-	Elev	
	10.92	244.38			
7			8.4	236.0 ✓	
7+22 P.I			7.8	236.6 ✓	
8			5.0	239.4 ✓	
+33			4.5	239.9 ✓	
9			2.2	242.2 ✓	
T.P	6.95	249.37 ✓	1.96	242.42 ✓	
+38			6.3	243.1 ✓	
10			5.4	244.0 ✓	
+86			4.3	245.1 ✓	
11			4.1	245.3 ✓	
BM	8.31	254.58	3.12	246.25 ✓	246.27 ✓
+50			2.9	251.7 ✓	246.5 ✓
12			7.10	47.5 ✓	
13			11.6	50.0 ✓	

M. W. Conley 12

L Z R

	-0.2	-0.9	-0.9	-1.0	-0.3	-1.9	-2.5	-2.5
Stone Wall	8.6	8.8	8.8	9.4	8.7	9.8	10.9	10.9
	31	26	21	17	10	11	23	33

+0.8	+0.8	+0.6	-0.2	-0.2	-1.2	-1.2	-1.2
6.6	8.6	7.7	8.0	8.0	9.0	8.0	9.0
33	32	23	20	12	17	28	33

		+0.8	+0.4	-0.1	-0.9	-1.5	-1.2	-1.5
		4.2	4.6	5.1	5.9	6.5	6.2	6.5
		33	22	17	15	19	24	33

	+2.9	+2.8	+0.1	+0.9	-0.3	-1.1	-1.0	-0.1	-0.1
	2.1	2.7	4.4	4.1	4.8	5.6	5.5	4.6	4.6
	33	25	18	12	15	18	24	29	33

-0.5	+1.5	+1.5	-0.9	0.0	-0.6	-1.0	-0.3	+0.5
+2.7	+0.7	+0.7	2.6	2.12	2.8	3.2	3.1	1.7
33	28	23	17	15	16	19	29	33

+4.7	+2.7	+2.4	-1.1	-1.1	-0.3	-0.7	-0.7	-0.2	-0.6
1.6	3.6	3.9	6.9	6.4	7.2	7.0	7.0	6.5	6.9
33	29	22	17	11	15	21	29	31	33

+5.0	+3.9	+2.5	+2.4					-1.3		
		S.W	S.W	+2.0	-0.7	-0.3	-0.1	-1.0	-0.8	F, -1.7	-1.9
0.4	2.5	2.9	3.0	3.4	6.1	5.7	5.5	6.4	6.2	6.7	7.1	7.1
33	31	29	26	23	17	12	7	12	19	26	29	33

		+2.8	+1.8	+1.7	+1.6	-0.7	-0.6	-2.7
			S.W	S.W				E
		1.5	2.5	2.6	2.7	4.5	4.9	7.0	9.3
		33	31	27	22	18	15	22	33

	+2.8	+1.6	+1.6	+1.1	-0.3	-1.1	-0.1	-4.0	-5.4
		S.W	S.W					E	
	1.3	2.5	2.6	3.0	4.4	4.2	4.5	8.1	9.7
	33	32	29	22	19	15	12	22	33

		+0.9	+0.9	-0.1	-1.0	-0.7	-1.7	-4.7	-5.7
		S.W	S.W						
		2.9	2.5	3.0	3.9	3.6	3.6	7.6	8.5	10.1
		33	30	24	21	14	12	21	24	33

	-0.8	-0.6							
	S.W	S.W	-1.2	-1.2	-0.6	-0.7	-3.3	-6.2	-7.2	-7.2
	7.4	7.7	8.3	8.3	7.7	7.8	10.4	13.3	14.3	14.3
	35	30	26	24	14	10	18	23	30	33

	-2.5	-1.6	-1.3	-0.7	-1.2	-3.0	-6.0	-8.3
	7.1	6.2	5.9	5.3	5.8	7.6	10.6	13.5
	33	27	22	16	10	15	22	33

Sta.	+	H.I.	−	Elev
	8.31	R54.58		
14			1.2	253.4
T.P.	7.86	R61.91	0.53	R54.05
+50			6.0	55.9
15			3.5	58.4
+50			1.3	60.6
T.P.	10.20	R71.54	0.57	R61.34
16			8.5	63.0
+60			5.1	66.4
TP	5.72	R 71.43	2.83	R68.71
17			6.2	68.2
T.P.	6.30	279.93	0.80	273.63
18			6.4	73.5
+15			4.3	75.6
Equation 1848+8=1850			2.6	77.3
T.P.	9.72	R 8,32	0.83	279.10
19			9.0	77.3
20			5.1	83.2

L & R

-6.1	-5.0	-0.3	0.0	+0.2	-0.3	-3.0	-2.9
7.3	6.2	2.1	1.2	1.0	2.1	4.2	4.1
33	26	18	13	12	18	26	33

-9.7	-6.9	-6.8	-0.3	-6.0	-5.0
13.7	12.8	6.8	6.3	12.0	13.0
33	29	17	15	27	33

		-6.5	-6.6	-0.5	-5.2	-5.4	-6.3	-7.1
		10.0	4.1	4.0	8.7	9.1	10.4	10.6
		33	20	16	27	30	32	33

		-9.0	-0.0	-0.8	-5.3	-5.8
		8.3	2.2	2.1	6.6	7.1
		33	19	17	27	33

	-4.3	-4.2	0.0	-0.7	-8.5	-3.6
	13.4	12.7	8.5	9.2	12.0	12.1
	33	28	19	17	24	33

	-0.3	-0.6	-1.0	-0.8	+1.9
	6.0	5.7	6.1	8.9	3.7
	33	19	18	26	33

		0.0	+0.5	-0.3	-0.8	+6.2
		6.2	5.7	6.5	7.0	0.0
		33	19	15	22	32

		-0.5	0.0	-0.7	-0.5	+3.9
		6.9	6.4	7.1	6.9	+2.8
		33	19	13	23	33

		+0.1	0.0	-0.9	+1.4	-4.3	+0.8
		4.2	4.3	4.7	2.9	0.0	+3.8
		35	19	16	26	29	33

		-0.8	0.0	0.0	+0.1
		3.4	2.6	2.6	2.5
		33	22	18	33

		+0.3	+0.3			
	+0.9	S.W.	S.W.	+0.6	-0.3	-0.4
	8.1	8.1	8.1	8.4	9.3	9.4
	33	31	27	17	13	33

						+0.1	+0.1
-0.8	-0.5	-0.5			-0.2	S.W.	S.W.
	S.W.	S.W.	-0.5	-0.5			
5.9	5.6	5.6	5.6	5.6	5.3	5.0	5.0
33	30	26	22	13	13	29	33

Sta	+	H.I.	−	Elev.	
	9.22	288.32			
21			2.6	285.7 ·	
T.P.	9.90	295.90 ·	2.32	286,00	
22			7.1	288.8 ·	
Equation 22+83.5 = 23+30			3.5	292.4 ·	
B.M.			0.86	295,04	294.98
24			0.8	295.1 ·	
B.M.	9.14	301,12			294.98
+36			7.3	296.8 ·	
25			4.6	299.5 ·	
T.P.	10.92	311,51 ·	0.53	303.59 ·	
26			10.0	304.5 ·	
27			5.4	309.1 ·	
6/21/23 T.P.	8.40	322.35	0.56	(313.95) ·	
28			8.6	313.8 ·	
29			4.6	317.8 ·	
Equation 29+12.3 = 29+02.2			4.1	318.3 ·	
T.P.	6.97	328,37	0.95	321,40	
30			6.8	321.6 ·	

L & R

-1.0	-0.2 S.W.	-0.1 S.W.	+0.1	-0.6	-0.5	-0.4 S.W.	-0.4 S.W.	0.0
3.6	2.7	2.7	2.5	3.2	3.1	3.0	3.0	2.6
33	30	26	23	15	13	27	29	33

		-0.3	-0.3					
-1.0	S.W.	S.W.	-0.9	+0.9	-0.9	+0.5		
8.1	7.4	7.4	8.0	8.0	7.5	6.6		
33	30	26	14	15	27	33		

-1.4	S.W.	S.W.	-0.8	-0.8	+0.7	-0.5 S.W.	-0.8	
4.9	4.1	4.1	4.3	4.3	4.2	4.0	4.3	
33	30	26	20	14	14	24	33	

Top of L -0.1 -0.9 -0.5 -0.7

	S.W.	S.W.		+0.9	-0.3	-1.2		
0.9	0.8	0.8	1.1	1.2	1.7	2.0		
33	30	26	21	13	15	33		

-0.8	-0.7 S.W.	-0.3 S.W.	-0.7	-1.5	+0.8	-0.3	+0.0	-0.4	-0.9
8.1	7.5	7.6	8.0	8.8	8.1	8.2	8.5	7.7	7.7
33	29	25	20	11	14	21	24	27	33

	-0.2	+0.6							
+0.6	S.W.	S.W.	+0.7	-0.4	-0.9	-0.6	+3.3	+4.2	+4.6
4.0	4.0	4.0	4.4	5.0	5.0	5.2	1.3	0.4	0.0
33	29	25	23	14	13	19	24	30	33

		+1.7	+1.5						
+4.5	+4.8	S.W.	S.W.	+2.3	-0.8	-0.3	+0.8	+4.7	+4.2
5.5	5.5	8.3	8.5	9.1	10.8	12.9	9.2	5.3	2.8
33	31	28	24	20	11	17	23	30	33

		+1.9						
+1.1		S.W.	+1.8 S.W.	+1.3	-0.6	-0.7	-1.5	+0.6	
4.3		3.5	3.6	4.1	6.0	6.1	5.9	4.8	
33		27	24	21	14	16	25	33	

	+4.1								
On sidewalk		+2.4 S.W.	+2.4 S.W.	+2.4	+1.1	-0.5	-0.8	-1.0	-0.9
4.5		6.2	6.2	4.7	9.1	9.1	9.6	9.9	
33		27	24	20	15	12	14	23	33

		+1.2	+1.1						
+1.0		S.W.	S.W.	+0.9	-0.3	-0.1	-0.2	-0.3	-1.3	+0.3	0.0
3.6		3.1	3.5	4.2	4.9	4.7	4.8	5.5	5.9	4.3	4.6
33		30	26	22	21	14	12	17	20	23	33

	+1.1	+1.0							
+1.1	S.W.	S.W.	+0.9	-0.5	0.0	-0.3	-1.5	+0.1	+0.1
3.9	3.0	3.1	3.2	4.6	4.1	4.4	5.6	4.0	4.0
33	31	27	23	21	14	10	17	20	30

	+0.3	+0.8							
+1.5	S.W.	S.W.	+0.3	-0.3	-0.3	-0.2	-1.0	+0.9	+3.0	+3.0
5.3	5.9	6.0	5.9	7.1	7.1	7.9	7.8	6.4	3.8	3.8
33	29	25	21	19	12	14	16	22	30	33

Sta.	+	H.I.	−	Elev	
	6.97	328.37			
31			5.1	323.3	
32			3.5	224.9	
T.P.	8.07	334.07	2.37	326.00	
33			7.0	327.1	
34			5.5	328.6	
35			3.9	330.2	
T.P.	5.73	336.66	3.14	330.93	
36			5.3	331.4	
+12			5.0	331.7	
37			4.7	332.0	
38			5.5	331.2	
+28.68			5.4	331.3	
B.M.	2.12	336.58	2.12	334.54	334.46
B.M.			5.15	331.43	

L & R

-1.8	S.W. -0.7	-1.6	-0.5	+0.3	-1.2	-0.3	+0.1
6.9	5.8	6.7	5.6	4.8	6.3	5.4	5.0
33	29	18	12	11	18	26	33

S.W. -0.1	S.W. -0.1	-0.5	-1.3	-1.5	0.0	-1.0	-0.5	0.0
3.6	3.6	4.0	4.8	4.0	3.5	4.5	4.0	3.5
33	29	22	19	15	11	17	26	33

-1.2	S.W.	S.W. -0.2	-0.5	-1.5	-0.9	-0.8	-1.5	-0.3	+2.8
7.2	7.2	7.2	7.5	8.5	7.9	7.8	8.5	7.3	4.2
33	32	29	23	21	15	12	20	28	33

-0.3	S.W. -0.3	S.W. -0.4	-1.3	-1.6	-1.0	-0.3	-1.9	-0.8	-0.8	+0.9
5.8	5.8	5.9	6.8	7.1	6.5	5.8	6.9	6.3	5.8	4.6
33	32	29	24	20	15	13	18	23	29	33

-0.3	S.W. -0.2	S.W. -0.2	-0.8	-1.4	-0.9	-0.1	-1.5	-0.7	+1.1	+2.6
4.7	4.1	4.1	4.7	5.6	4.8	4.0	5.4	4.6	2.8	1.3
33	32	28	23	20	14	12	17	22	27	33

+0.5	+0.3	+0.3	-0.9	-0.5	-0.5
4.8	5.0	5.0	5.7	5.8	5.8
33	28	19	13	22	33

+2.9	+0.8	+0.9	-0.1	-0.9	-0.1	-0.6	-0.7
2.1	4.2	4.2	5.1	5.4	5.1	5.6	5.7
33	28	25	22	17	18	28	33

+4.3	+1.3	+1.1					
0.4	S.W.	S.W.	-0.7	-0.3	-0.5	-0.9	-1.7
33	3.4	3.6	5.4	5.0	5.2	5.6	6.4
	26	23	20	15	12	20	33

	+1.5	+1.9	+0.7	-0.2	+0.2	+0.1 Pave	+1.0 Pave
	4.0	3.6	4.8	5.7	5.3	5.4	6.5
	33	24	18	14	10	12	34

+2.2	+0.9	-0.5	-1.2 Parking
3.2	5.0	5.9	6.6
33	24	13	R4

Top of Hydrant

Moved across road opposite garage tele pole

Stakes for grading

Project 14.I

Sta	+			Fill	Grade
BM	5.16	336.39			(331.43)
38			5.4	31.2	31.0
37			4.7	31.9	31.6
36			5.1	31.5	31.2
35			6.5	30.1	29.8
34			8.1	28.5	28.0
Contr.					
36 + 5.93			5.9	30.7	30.6
37 + 37.3					29.2
33			9.6	27.0	26.2
TR	1.20	328.11	9.68	326.91	
32			3.4	24.7	24.4
31			4.9	23.2	22.6
30			6.7	21.4	20.4

6/29/23
Warm
Calm

Corley - Transit
Persons - Level - Rod
Eck - Head - chain
Briggs - Rear - chain

L | R

Spike in tele pole R of sta 39

F.O.B.
15

Road connecting 23-51 to Jefferson Highway

Sta	+	H.I		Elev	Grade
	1.20	328.11			
29			10.3	317.8	16.6
TP	3.23	319.87	11.47	316.64	
28			6.2	13.7	12.5
27			10.7	09.2	18.1
TP	0.58	308.80	11.65	308,22	
26			4.3	04.5	04.3
25			9.2	99.6	00.2
TP	3.06	300,54	11.32	97.48	
24			5.7	94.8	96.1
BM	0.29	295.21	5.62	294.92	94.98
22+835=23+30			3.0	92.2	93.2
22			6.5	88.7	89.8
21			9.5	85.7	85.1
TP	0.83	286.32	9.72	285.49	
20			3.0	83.3	81.6
19			7.0	79.3	77.5
TP	1.70	279.45	8.57	277.75	
18			6.1	73.4	72.0

L & R

C2.2 $\frac{93}{27.2}$

C1.8 / 28.8

C3.8 / 28.8

C2.8 / 27.8

C1.1 / 26.1

C1.1 / 26.1

C2.4 / 27.4

C1.4 / 26.4

C1.5 / 26.5

C3.0 / 27.3 D.G

Sta	+	H.I.	−	Elev	Grade
	1.70	279.45		68.5	
17			11.0	78.5	67.7
T.P.	1.21	268.83	11.83	267.62	
16			5.8	63.1	63.1
T.P.	0.93	259.92	9.84	258.99	
15			1.7	58.2	58.1
14			6.6	53.3	53.1
13			10.1	49.8	49.0
T.P.	0.00	249.61	10.31	249.61	
12			2.2	47.4	46.6
11			4.5	45.1	45.1
10			5.7	43.9	43.6
T.P.	3.42	249.69	3.42	246.19	246.27
9			7.5	42.2	41.9
8					38.9

L ℄ R

<20.8 / 23.8

<2.1 / 23 P.C.

Grade / 19.0

F5.8 / 23.7

<10.7 / 26.7

F4.4 / 22.6

<2.7 / 27.7

<2.7 / 27.7

B.M. (238,36)

B.M. (216,54)

New elev. of Top of Hydrant R of sta 7+22
Reset July 10, 1923

New elev. of Top of hydrant R of sta 1+38
Reset July 10, 1923

Sta	+	H.I	-	Elev	Grade
BM.	4.36	242.72			238.36
8+00			3.3	39.4	238.9
curb opposite sta 8+					238.85
curb opposite Hydrant					235.5

Top of hydrant

3.42

39.30

7/18/23 Xsections of grade change sta 21 to 24+50

Sta	+	H.I.	−	Elev	Grade
BM	0.84	295.82			294.98
21			10.0	85.8	
22			6.1	89.7	
+83.5 = 23+30			2.4	93.4	
T.P.	12.22	306.67	1.37	294.45	
24			10.8	95.9	
+86			10.0	96.7	
25					
26					

Fair - warm

Carley - Transit 21
Persons - Level - Rod.
Eck - Lead - chain
Briggs - Rear - chain

10.7 / 15	10.4 / 7	10.0 / 8	10.9 / 15	
7.8 / 15	6.6 / 13	6.1 / 8	6.12 / 13	7.6 / 15
4.6 / 15	3.0 / 12	3.1 / 11	4.1 / 15	
12.9 / 15	11.7 / 12	11.6 / 10	11.0 / 12	12.6 / 15
11.1 / 15	10.6 / 11	9.6 / 12	10.7 / 15	

New fill beginning at sta 21 runs out at 24+50

7/26/23 Water-board's notes for 5 to 37+38

23-51

Sta	+	H.I.	−	Elev	Grade
BM	4.87	336.30			331.43
37			4.3	32.0	32.0
38			5.0	31.3	31.4
BM	4.65	336.08			331.43
36+60					331.3
37+00					330.5

Dodd-road

Connection

Fair

Carley - Transit R.L.
Persons - Level - Rod
Eck - Head - chain
Briggs - Rear - chain

720
28.88

7/27/23 Grade stakes top of form

23-61

Sta	+	H.I.	−	Elev	Grade
B.M.	12.00	258.27			246.27
	10.43	266.40	2.30	255.97	
15			8.1	58.3	58.5
+50			5.8	60.6	61.0
G.B. +75			4.4	62.0	62.15
16			3.3	63.1	63.5
T.P.	11.97	276.17	2.20	264.20	
+50			10.5	65.7	65.9
17			8.1	68.1	68.1
+50			5.8	70.4	70.4
G.B. +75			4.7	71.5	71.25
18			6.4		72.4
T.P.	6.12	279.15	3.14	273.03	
+50			4.2	75.0	74.5
+848			3.2	76.0	75.85
B.M.	8.05	285.23	1.97	277.18	
19			7.2	88.0	77.9
+50			5.2	80.0	80.0
20 G.B.			2.9	82.1	82.0

Nail in tele pole R of sta 11+50

Top of large blue rock Lt. of sta 17+75

Nail in tele pole R of sta 18+50

7/25/23 Grade stakes 23-51

Sta	+	H.I.	−	Elev	Grade
	8.05	285.23			
20+50			1.1	84.1	83.9
TP	10.84	295.57	0.50	284.73	
21			9.6	86.0	86.0
+50			7.7	87.9	87.9
22 G.B.			5.7	89.9	89.8
+50			3.9	91.7	91.7
+87.5 = 23+30					92.9
BM	9.32	304,32	0.55	295.02	295.00
23+50			10.5	93.8	93.6
24 G.B.			8.4	95.9	95.6
+50			6.7	97.6	97.9
25			4.6	299.7	300.1
G.B. +50			2.0	02.3	02.4
TP	10.34	313.16	1.50	302.82	
26			8.1	04.6	04.6

Four - cool

Corley - Transit
Persons - Level - Rod
Eck - Head - chain
Briggs - Rear - chain

Sta	+	H.I.	−	Elev	Grade
	10.34	313.16			
26+50			6.3	06.9	06.8
27			4.1	09.1	08.8
G.B. +50			2.1	11.1	10.8
T.P.	11.88	324.01	1.03	312.13	
28			10.8	13.2	12.9
+50			8.6	15.4	14.9 (9.1)
29			6.5	17.5	17.0

7/30/23 Grade stakes proj. 23-51

Sta	+	H.I.	−	Elev	Grade
B.M.	4.38	335.81			331.43
38 +20 08					31.2
38					31.4
37 +50					31.7
37					32.0
36 +60					32.0
T.P.	3.65	336.08	3.38	332.43	
36					31.6
35 +50					30.9
G.B. +10					30.4
35					30.2
+50					29.3
34					28.4
+50					27.5
T.P.	1.32	328.80	8.60	327.48	
33					26.6

Fair - warm

Carley - Transit
Persons - Level - Rod
Eck - Head - chain
Briggs - Rear - chain.

Sta	+	H.I.	−	Elev	Grade
		328.80			
32+50					25.7
32					24.8
+50					23.9
31					23.0
G.B.	+89.9				22.75
+50					22.1
30					20.8
B.M.			4.45	324.35	

8/13/73 Grade stakes sta 8 to 15

Top of Form

Sta	+	H.I.	−	Elev	
B.M.	6.40	244.76		(238.36)	246.6 Grade
8					238.90
G.B. +46					240.52
9					241.90
G.B. +46					242.80
TP	7.56	250.64	1.68	243.08	
10					243.60
+50					244.34
11					245.09
BM			4.39	246.25	246.27
+50					245.84
12					246.59
+50					247.76
13					249.00
TP	8.64	258.03	1.25	249.39	
+50					250.88

Fair. - Hot

Carley - Transit 28
Persons - Level - Rod
Eck " Head - chain
Briggs " Rear - chain

Pave - grade.

Top of hydrant Rt. of sta 7+22

239.304

240.809

242.305

243.104

244.004

244.743

245.494

Nail in tele. pole Rt. of sta 11+30

246.243

246.793

248.165

249.404

251.285

Sta	+	H.I.	−	Elev	Sub. Grade
℄		258.03			
14					253.101
	+50				255.601

Paving Grade.

253.504

256.004

8/4/23

Grade sta Hts sta 35+10 – 29+50

Sta	+	H.I.	–	Elev	Sub. Grade
B.M.	4.82	336.25			331.43
35+10					330.001
35					329.803
+75					329.353
+50					328.903
+25					328.453
34					328.003
T.P.	2.30	330.65	7.90	328.35	
+75					327.853
+50					327.103
+25					326.653
33					326.203
+75					325.753
+50					325.303

Cloudy - Cool

Carley - Transit
Persons - Level-Rod.
Eck - Head-chain
Briggs - Rear-chain.

130

Pavement:
Grade:

spike in tele. pole at end of project,

330.404 ✓

330.206 ✓

329.756 ✓

329.306 ✓

328.856 ✓

328.406 ✓

327.956 ✓

327.506 ✓

327.056 ✓

326.606 ✓

326.156 ✓

325.703 ✓

Sta	+	H.I.	−	Elev	Sub. Grade
	2.30	330.65			
32+25					324.853
32					324.403
+75					323.953
+50					323.503
+25					323.053
31					322.603
+87					322.350
T.P.	1.81	324.81	7.65	323.00	
+50					321.391
+25					320.828
30					320.401
+75					320.001
B.M.	0.71	325.06	0.50	324.31	324.35
+50					318.666
+23					317.002

Paving Grade

325.256 ✓

324.806 ✓

324.356 ✓

323.906 ✓

323.456 ✓

323.006 ✓

322.753 ✓

321.794 ✓

321.231 ✓

320.804 ✓

320.404 ✓

top of hydrant Rt. of sta 29+90

319.069 ✓

317.405 ✓

Sta	+	H.I.	−	Elev	Sub. Grade
	0.71	325.06			
28+87	6.18				315.617
+50					314.592
+25					313.567
T.P.	11.85	315.52	11.39	313.67	
28					312.542
+75					311.417
+50					310.392
+25					309.367
27					308.362
+75					307.617
+50					306.592
+25					305.442
26					304.292

Pavement Grade

316.020 ✓

314.995 ✓

313.970 ✓

312.945 ✓

311.820 ✓

310.795 ✓

309.770 ✓

308.765 ✓

308.020 ✓

306.995 ✓

305.845 ✓

304.695 ✓

Sta	+	H.I.	−	Elev	Sub. Grade
	1.85	315.52			
25 + 75					303.142
TP1	0.92	304.37	12.07	303.45	
+50					301.992
+25					300.842
25					299.692
B.M.1	5.59	300.59	9.37	295.00	295.00
+75					298.542
+50					297.392
+25					296.242
24					295.092
+75					294.166
23 +50					293.241
Equal 22 +83.5					292.501
22 +50					291.248

Pavement Grade.

303.545

302.395

301.245

300.095

Top of hydrant RH of sta 23+50

98.945

sta 25+00 to sta 18+50

set 8/10/23 (Carley Pearsons Eck)

97.795

96.645

95.495

94.569

93.644

92.904

91.651

Sta	+	H.I.	−	Elev	Sub. Grade
	5.59	300.59			
22+25					290.323
22					289.398
T.P.	0.38	289.89	11.08	289.51	
+75					288.473
+50					287.548
+25					286.573
21					285.598
+75					284.623
+50					283.648
+25					282.623
20					281.598
+75					280.573
T.P.	3.29	285.26	7.92	281.97	
+50					279.548

rement
Grade

90.726 ⌐

87.801 ⌐

88.876 ⌐

87.951 ⌐

86.976 ⌐

86.001 ⌐

85.026 ⌐

84.051 ⌐

83.026 ⌐

82.001 ⌐

80.976 ⌐

79.951 ⌐

Sta.	+	H.I.	−	Elev	Sub. Grade
		3.29	285.26		
	+25				278.523
19					277.498
	+75				276.473
18+54.8 = 18+50					275.450
B.M. 1	+50			8.09	277.17 274.051
	+25				273.056
18					272.001
G.B. 1	+73				270.850
	+50				270.001
	+25				269.082
					267.701
17					~~266.975~~
	+73				266.520
	+50				265.401
	+25				264.302
16					263.101
G.B. 1	+73				261.750
	+50				260.601
	+25				259.601
15					258.101
	+75				256.851
	+50				255.601
	+25				254.351
14					253.101
	+75				252.132
	+50				250.882

Grade

78.926
77.901
76.876
75.853
Nail in tele. pole

68.104
267.375

265.804

263.504

261.004

258.504

256.004

253.504

251.285

Sta.	+	H.I.	−	Elev	Subi Grade
13+25					249.613
13					249.001
+75					248.287
+50					247.762
+25					247.258
12 G.B.					246.590
+75					246.215
+50					245.840
+25					245.465
11					245.090
+75					244.715
+50					244.340
+25					243.975
10					243.601
+75					243.235
G.B. +46					242.801
+25					242.227
9					241.901
+75					241.217
G.B. +46					240.525
+25					239.765
8					238.90

Pavement Grade:

249.404

248.165

246.993

7/8/23 Superelevation sta. 8 - 9+58.3

Sta	+	H.I.	-	Elev	
BM.	7.37	245.73			238.36
9+58.3					
9+33.3					
9+08.3					
8+83.3					
8+58.3					
8+33.3					
8+02.4					

Fair - Warm.

Carley Persons Eck

Grade Elev 15' Left.	℄	Grade Elev 15' Right.	
Top of hydrant R of sta 7+22			
43.39		43.39	L
42.98		42.80	L
42.68		42.32	L
42.13		41.49	L
41.79		40.79	L
41.12		39.76	L
40.53		38.81	L

5.20

6.92

8/18/23 Superelevation -23-3

Sta	+	H.I.	−	Elev	C
BM	0.89	239.25		238.36	
4+85 I					
T.P.	11.65	232.88	11.02	228.23	
5+10 I					
+35 I					
+60 I					
+85 I					
6+10 I					
P.C. +35 I					
T.P.	9.64	241.24	1.28	231.60	
+60 I					
+85 I					
7+02 I					
+27 I					
+52 I					

Fair - Hot

Carley
Persons
Eck.
Briggs.

Top of Hydrant Rt of sta 7+22.

Lt.	℄	Rt.
	24.86 ✓	
26.25 ✓ / 0.8	26.22 ✓	
26.81 ✓ / 1.6	26.79 ✓	
27.81 ✓ / 2.4	27.77 ✓	
28.81 ✓ / 3.2	28.75 ✓	
30.21 ✓ / 4.0	30.13 ✓	X
31.61 ✓ / 4.8	31.51 ✓	
33.71 ✓ / 6.8	33.40 ✓	
34.58 ✓ / 11.2	34.15 ✓	
35.78 ✓ / 16	35.20 ✓	
37.48 ✓ / 24	35.88 ✓	
37.33 ✓ / 35	37.04 ✓	

Sta.	+	H.I.	−	Elev.	
	9.64	241.24			
7+77½					
T.P.	7.08	245.92	2.40	238.84	
8+02½ P.T. =8+08.3					
+33⅓					
+58⅓					
+83⅓					
9+08⅓					
B.M.			7.55	238.37	238.36

Lt.	℄	Rt
41.28 / 50	38.36	37.77 / 10
40.9 / 10	37.5	38.91 / 10
40.78 / 10	40.4	40.02 / 10
41.38 / 10	41.2	41.02 / 10
41.78 / 10	41.8	41.58.1 / 10
42.08 / 10	42.3	42.08 / 10 = Normal Section

Top of hydrant Rt of sta 7+22

6/24/23 Paving stakes

Sta	+	H.I.	−	Elev	E Grade
BM.	5.27	221.81			216.54
1+36					211.59
+50					210.83
+75					212.83
2					213.63
+25					214.40
+50					215.10
+75					216.10
3					217.10
+25					218.11
+50					219.12
+75					220.15
T.P.	5.41	226.61	16.1	221.20	
4 G.B.					221.19
+25					222.24
+50					223.29
+85					224.86

Carter
Persons
Eck
Briggs

Gutter
Grade

Top of Hydrant Rt of Sta 1+36

214.09
214.53
212.33

Grade = +3.2%

213.10
213.90
214.60

215.60

216.60
217.61
218.62
219.65

Grade = +4.0%

220.69
221.74
222.79
224.36

Grade = 4.2

8/29/23 Pavement stakes

Sta	+	H.I.	−	Elev.	
B.M.	6.25	228.79			216.54
T.P.	9.61	231.85	0.55	222.24	
4+85.7					
5+10.7					
+35.7					
+60.7					
+85.7					
6+10.7					
P.C. +35.7					

Fair - Warm

Party { Carley, Persons, Briggs, Eck.

Lt. ℄

Top of hydrant Rt. of sta 1+36

High point

Elev. and offset Dist.

Grade Rod	Elev. and offset Dist.	℄
		224.86
✓ 5.60	26.25 / 0.8	26.22
✓ 5.04	26.81 / 1.6	26.79
✓ 4.04	27.81 / 2.4	27.79
✓ 3.04	28.81 / 3.2	28.75
✓ 1.64	30.21 / 4.0	30.13
✓ 0.24	31.61 / 4.8	31.57

9/8/23 Pavement stakes

Sta	+	H.I.	−	Elev	Sub. Grade
BM	4.85	243.21			238.36
8+02.4 =8+08.3 P.T.					
8+33.3					
+58.3					
+83.3					
9+08.3					
T.P.	5.17	247.44	0.94	242.27	
9+33.3					
9+58.3					
+75					243.235
10					43.601
+25					43.975
+50					44.340
+75					44.715
11					45.090
BM	6.23	252.50	1.19	246.25	246.27

Fair - Hot

Party { Carley / Parsons / Briggs / Eck }

Paving Grade | Grade Rod. | Lt. | ℄ | Rt.

Top of hydrant Rt of 7+32

	40.53 ⌐		38.81 ⌐
	41.12		39.76 ⌐
	41.79 ⌐		40.79 ⌐
	42.13 ⌐		41.49 ⌐
	42.68 ⌐		42.32 ⌐
	42.98 ⌐		42.80 ⌐
406	43.39 ⌐		43.34 ⌐

Superelevated sections

43.638 3.81 ⌐

44.004 3.44 ⌐

44.378 3.07 ⌐

44.743 2.70 ⌐

45.118 2.33 ⌐

45.478 1.95 ⌐

Sta	+	H.I.	−	Elev	Sub. Grade
		252.50			
11+25					245.465
+50					245.840
+75					246.215
12 G.B.					246.590
+25					247.258
+50					247.762
+75					248.287
13					249.001
+25					249.613
+50					250.882
+75					252.132
T.P.	11.31	263.10	0.71	251.79	
14					253.101
+25					254.351
+50					255.601
+75					256.851
15					258.101
+25					259.601
+50					260.601
G.B. +73					261.750
T.P.	11.61	273.75	0.96	262.14	

Paving Grade	Grade Pad
45.868	6.64
46.243	6.26
46.618	5.89
46.793	5.51
47.661	4.84
48.165	4.34
48.690	3.81
49.404	3.10
50.016	2.49
51.285	1.22
52.535	10.57
	Manhole lower side
53.504	9.60
54.754	8.35
56.004	7.10
57.254	5.85
58.504	4.60
60.004	3.10
61.004	2.10
62.154	.95

9/13/23 Pavement Grade sta 165

Sta	+	H.I.	−	Elev	Sub. Grade
		273.75			
16					263.10
+25					264.30
+50					265.40
+73					266.52
17					267.70
T.P. +25	7.04	279.84	0.95	272.80	269.08
+50					270.00
G.B. +73					270.85
18					272.00
+25					273.05
+50					274.05
BM1			2.68	277.16	277.17
+75					

Fair – cool
A.M.

Paving Grade	Party: Carley, Parsons, Bruce, Erik
263.504	10.25 ✓
264.705	9.05 ✓
265.804	7.95 ✓
266.923	6.83 ✓
268.104	5.65 ✓
269.485	4.27 ✓
70.404	9.44 ✓
271.253	8.59 ✓
272.404	7.44 ✓
73.459	6.39 ✓
74.454	4.39 ✓
76.874	2.97

Final x Sections from Sta. 1+27 to Sta. 87

Sta	+	H.I.	−	Elev.	
B.M.	5.82	222.36		214.54	Grade
1+27			11.1	211.3	
+30			11.1	11.3	
+36.5			10.75	11.61	
+38	Beginning of Pavement		10.70	11.66	
+43			10.58	11.78	
2			8.82	13.54	
+67			6.48	15.88	
+74	Station Arch				
3			5.32	17.04	
4			1.15	21.21	
T.P.	11.75	233.54	0.25	222.11	
+72			7.31	24.25	
5			8.10	25.46	
+73			5.17	28.37	

L. R.

Gr. R.

Tar at ...yd. R St. 2 11.27 ~~(11.0)~~

6.5/33 6.6/30 7.9/27 10.7/18 | 10.7/20 5.5/27 5.5/33

6.5/33 6.6/30 10.8/29 11.0/19 11.2/19 | 10.7/20 5.5/27 5.5/33

(11.0)

6.7/33 6.7/31 10.6/31 10.8/19 11.15/19 | 10.6/18 5.5/27 5.5/33

(10.8)

6.7/33 6.7/31 10.6/31 10.8/19 11.1/19 | 10.6/18 5.5/27 5.5/33

6.8/33 6.8/31 10.3/31 10.49/19 10.89/19 | 10.91/19 10.57/19 10.0/22 5.5/26 4.6/33

(7.5)

7.1/33 7.1/31 8.5/31 8.77/19 9.22/19 | 9.07/19 8.7/19 8.4/33 6.6/33

(5.9)

6.1/33 6.2/31 6.75/19 6.85/19 | 6.85/19 6.5/19 6.4/33

bottom Col. 13.1/34 | 11.7/35 bottom Col.

(4.4)

4.7/33 4.7/31 4.95/19 5.57/19 | 5.37/22 4.95/22 4.7/33

(0.1)

+1.8/33 +1.8/31 0.1/31 0.67/19 1.42/19 | 1.50/19 1.07/19 0.7/33

(9.2)

8.0/33 8.5/31 8.97/20 9.6/19 | 9.70/19 9.15/19 8.9/33

(8.1)

7.7/33 7.98/31 | 8.54/19 8.12/19 7.8/33

(4.5)

2.3/33 2.3/31 4.8/31 5.15/19 5.68/19 | 5.66/19 5.20/19 4.8/33

Sta.	+	H.I.	−	Elev.	Grade
		233.50			
6			3.90	29.66	
+50			1.12	32.44	
T.P.	12.38	245.22	0.72	232.84	
7			10.00	35.22	
+22			8.80	36.42	
	41.7 South of 7+22		Tangent Extended		
783.7	End of Paving		5.45	39.77	
7+80			4.75	38.47	
8			6.60	39.22	
7+10.7			5.60	39.62	
B.M.	10.80	249.19	6.83	238.37	238.35
B.M.			2.70	246.29	246.27

r. R. L R.

(3.1)

2.1	2.2	3.7	4.05	4.55	4.31	3.85	3.6
33	32	30	10	19	17	20	33

(0.8)

0.0	0.6	0.8	1.40	1.60	1.30	1.1
33	31	25	19	23	23	33

(9.2)

2.4	3.9	9.4	9.7	10.25	11.05	10.6
33	31.4	31	19	19	32	33

(8.6)

2.9	2.9	8.3	8.65	9.15	10.05	9.6	9.4
33	31.6	31	19	19	30	30	33

0.2	4.6	5.27	5.60	5.91	6.10	6.30
33	33	19	19	20	41	57

5.0	5.95	8.05	7.55	8.0
33	19	19	19	30

(5.8)

4.5	5.60	7.05	6.35	7.1
33	10	18	18	33

4.2	5.30	6.00	7.0	7.0
33	10	10	20	33

Top of Hyd. R. of 7+12 Moved

Nail in power pole R. Sta. 11+30

Final Xsections -23-57

Sta	+	H.I.	−	Elev	
B.M.	2.01	248.28 ✓			246.27
9			5.9	42.4	
+38			5.1	43.2	
10			4.1	44.2	
+86			2.8	45.5	
11			2.6	45.7	
B.M.			2.01	246.27 ✓	246.27
+50			1.9	46.4	
T.P.	11.55	258.11 ✓	1.72	246.56 ✓	
12			10.9	47.2	
13			8.5	49.6	
14			4.5	53.6	
+50			2.0	56.1	
T.P.	8.29	265.86 ✓	0.54	257.57 ✓	
15			7.2	58.7	
+50			4.7	61.2	

Continued on page 59

10-18-23
Cloudy-cold

Lt ℄ Rt

Party { Carley, Parsons, Briggs, Eck }

Spike in telo. pole Rt of sta 11+30

(6.1)
8.3/20 6.8/19 8.3/17 5.8/18 5.5/10 6.2/10 6.6/16 7.0/20 6.4/24 7.0/28

(5.2)
3.0/20 5.4/19 5.2/15 5.2/10 8.3/80 5.5/15 5.9/17 5.8/21 5.6/30 5.3/32

(4.3)
3.3/21 4.5/19 4.1/15 4.3/10 4.3/10 4.5/17 5.0/21

(3.2)
1.7/22 3.6/20 3.0/16 3.0/10 3.1/10 3.2/16 6.8/23

(3.9)
1.8/22 3.6/20 2.8/15 2.8/10 2.8/10 3.1/16 7.4/24

(1.8)
2.0/25 2.9/20 2.2/17 2.1/10 2.1/10 2.1/16 5.4/20 8.3/26

(10.6)
11.5/37 12.1/20 11.3/17 11.1/10 11.0/10 11.1/16 (240.8/26)

(1)
10.0/25 9.2/24 9.8/23 9.7/20 8.6/17 8.6/10 8.6/10 8.5/15 (241.3/29 240.0/32)

(4.7)
10.1/27 8.2/23 4.7/16 4.7/10 4.7/10 4.5/17 6.2/24 7.5/29 7.2/31

(2.2)
9.9/32 8.2/27 2.2/17 2.1/10 2.2/10 2.2/16 7.8/26

(2.5)
12.1/29 7.5/18 7.5/10 7.3/10 7.4/17 12.5/26 (252.5/29)

(5.3)
11.3/30 5.5/22 4.9/17 4.9/10 4.9/10 5.0/17 10.4/25

Art. Topog. from Sta. 1+30 to Sta. 8+25

2+74 Stone Arch 69' Long 37' Lt and 35' Rt

2+75 12" Catch Basin 19' Rt.

2+77 12" Catch Basin 19' Lt. Cast iron grate Cover.

2+85 Private Ent Lt.

2+14 Power Pole 20.5' Lt

1+44 Private Ent. Lt

1+53.4 Hydrant 21' Rt

1+49 Beg. of Side Walk on Rt 6' Wide Concrete Walk

1+45 Beginning of Pavement on Rt.

1+38.0 Beginning of Pavement ℄

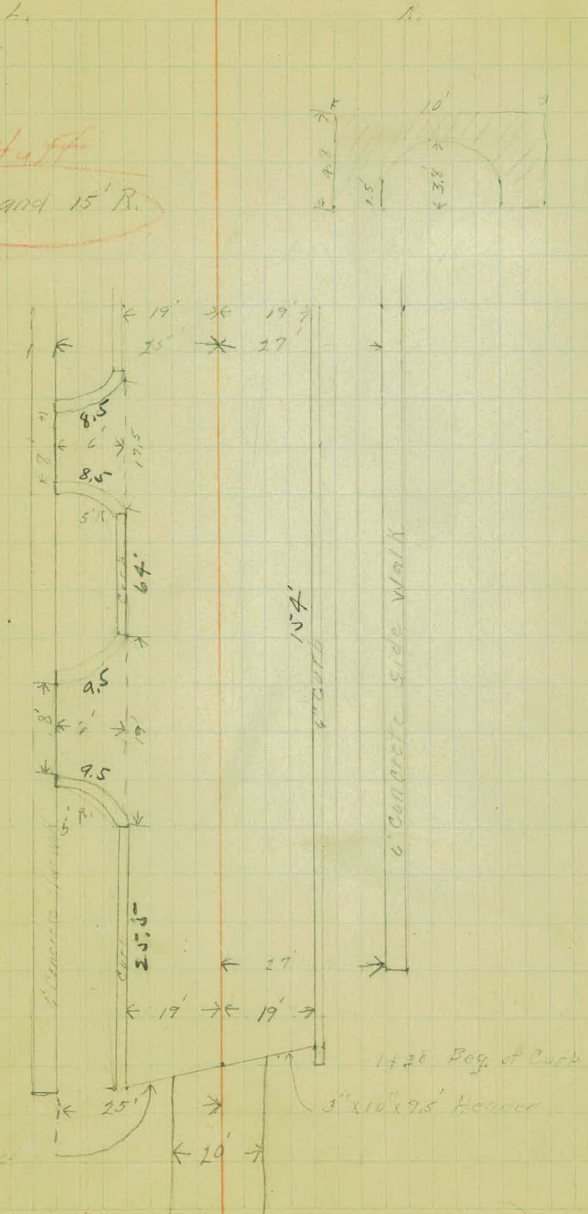
1+30 Beginning of Pavement on Lt

1+30 " " Side Walk 4' Wide

1+30 " " Curb on Lt

Old Staff

Lenthen 5' Lt. and 15' R.



3+96 Tel. pole 20' R.

3+98 Private Ent. Lt.

3+47 Man. Hole 23' Rt

3+39 End of R. on the Rt.

3+36 Private Ent. Lt.

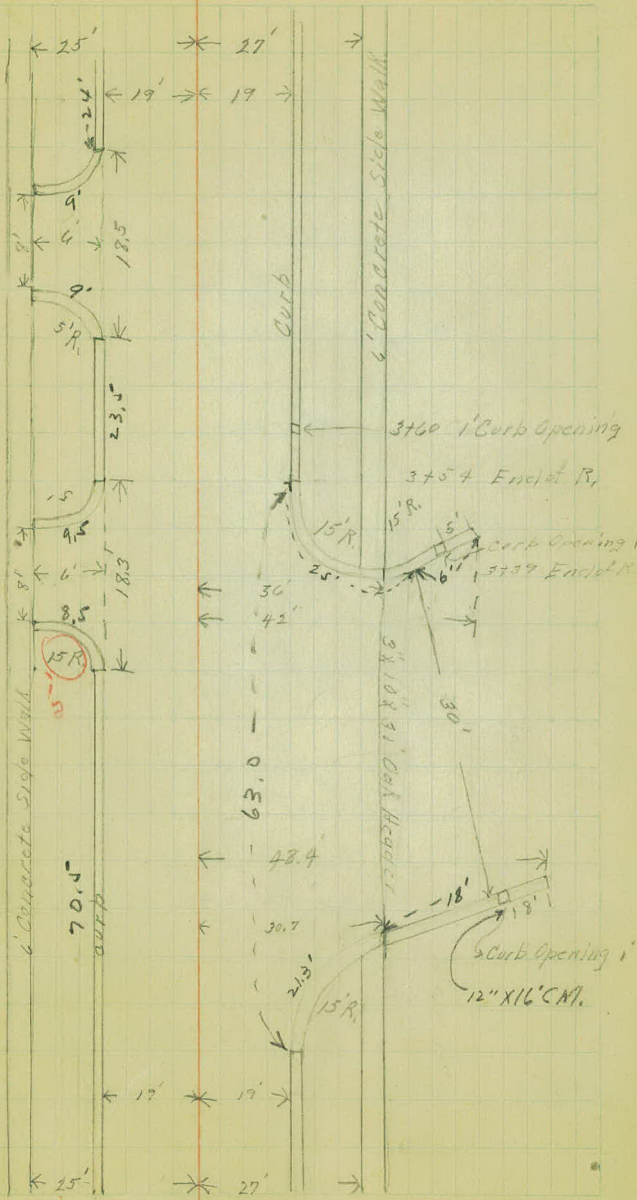
3+12.5 Tel. pole 20.6' Lt

3+12 End of Curb 48.4 Rt

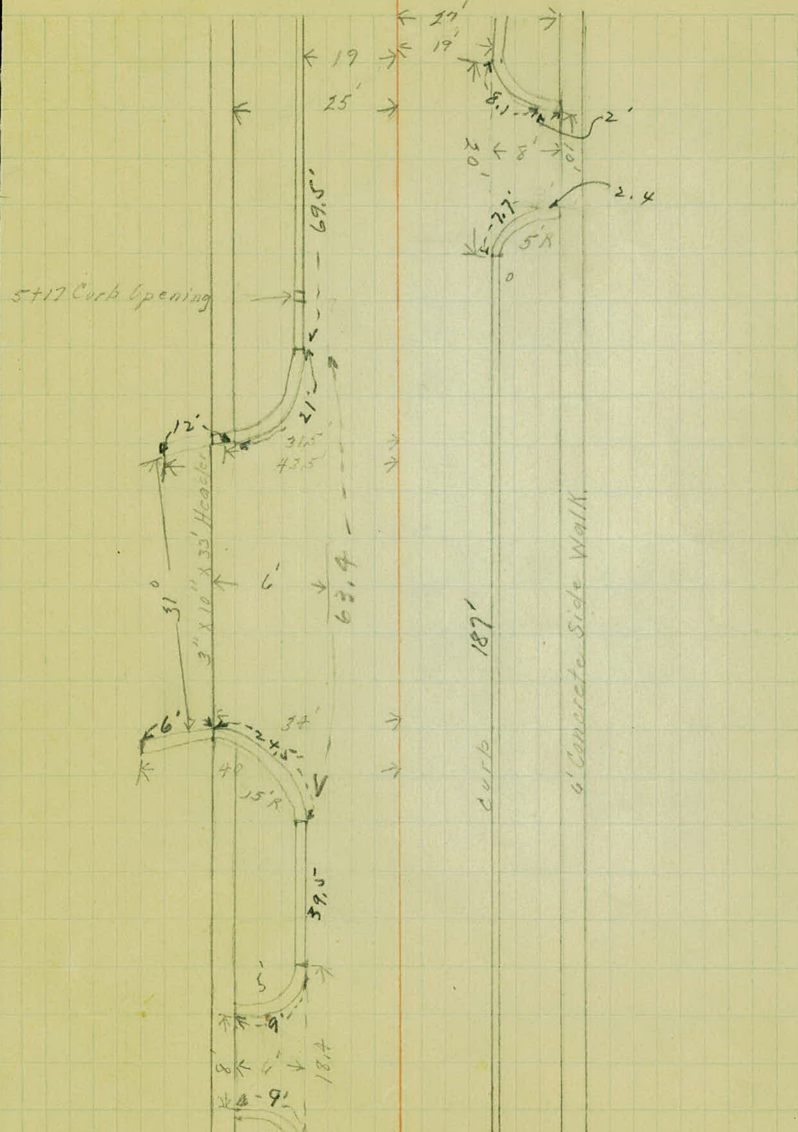
3+73 End of R.

3+02.8 M.H. 1' R.

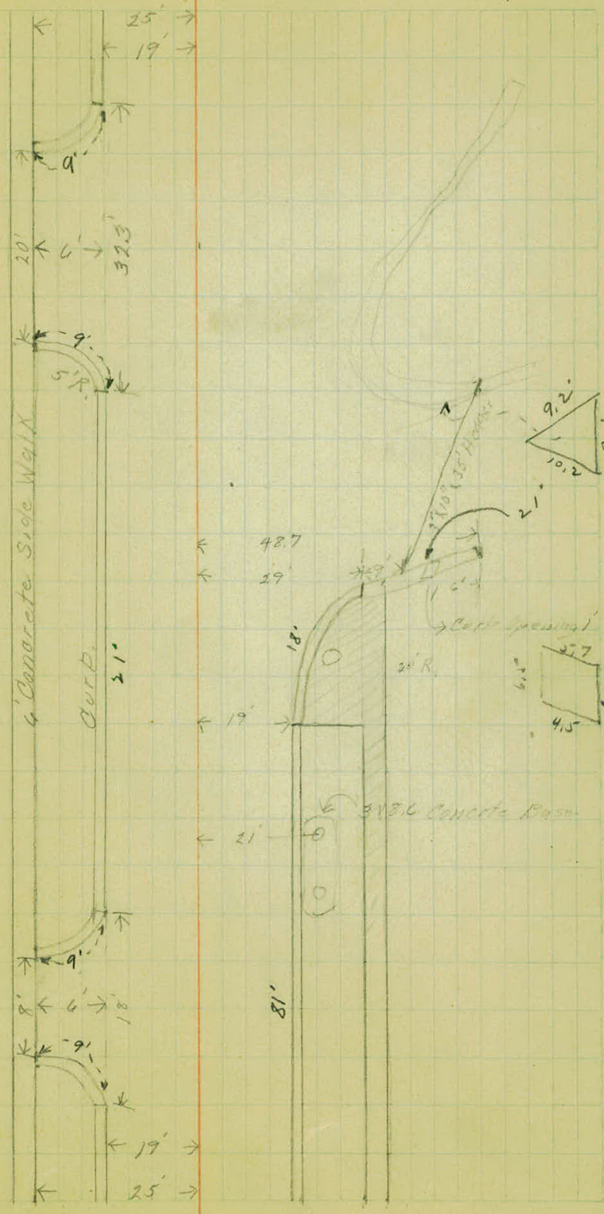
2+91 Beginning of R.


25'
27'
19'
19'
24'
9'
6'
8'
18.5
9'
5' R.
23.5'
5'
9.5'
6'
8'
18.3'
8.5'
15' R.
70.5'
6' Concrete Side Walk
Curb
6' Concrete Side Walk
3760 1' Curb Opening
3754 Encl'd R.
15' R.
15' R.
5'
Curb Opening 1'
3739 Encl'd R.
6"
2.5'
36'
42'
30'
63.0
48.4
30.7
21.3'
15' R.
18'
18'
6' Curb Opening 1'
12" X 16" C.M.P.
19'
19'
25'
27'

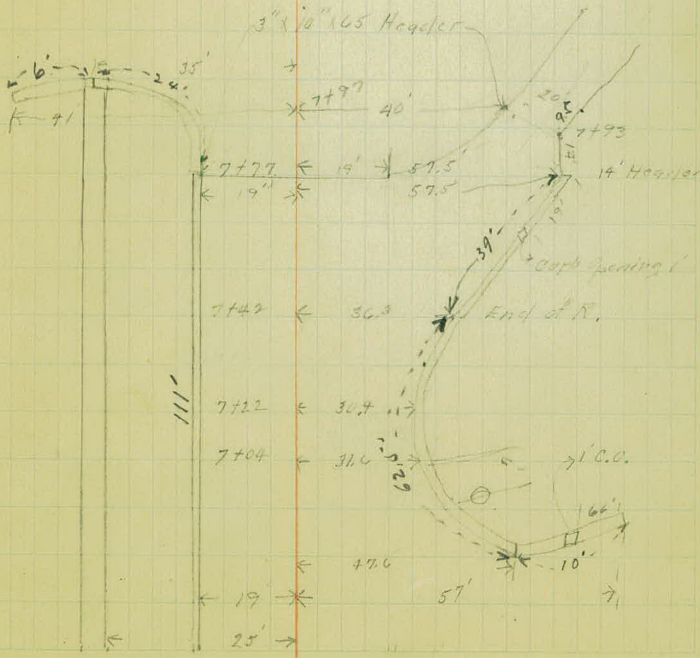
5+30	Private Ent. Rt.
5+19.6	P. Pole 20' Rt.
5+12.4	End of R.
4+97	End of R.
4+95	End of Curb
4+79	Manhole 0.5 Rt.
4+66	End of R.
4+65	End of Curb
4+49	Begr. of R.
4+21	Private Ent. Lt.


5+17 Curb Opening
3" X 10" X 33' Header
6' Concrete Side Walk
Curb
187'
69.5'
63.4
39.5'
15'R
5'R
19
25'
27'
19'

6+56	Double privat Ent. Lt.	
6+44	End of Curb.	
6+44	Water gate vaule	37' Rt.
6+40	Manhole	12' Rt.
6+36	End of R.	
6+42	Beg. of R.	
6+50	Man Hole	23' Rt.
6+41	P. Pole	25 Rt.
6+37	Iron Road Sign	16' Rt.
6+19	Gasoline pumps	21' R.
6+13	" "	21 R.
6+10.6	Private Ent Lt.	


25'
19'
9'
20'
6'
32.3'
9'
5'R.
6' Concrete Side Walk
Curb.
21'
9'
8'
6'
18'
9'
19'
25'
48.7
29'
19'
21'
18'
81'
9'
20'R.
Curb opening 1'
2'
9.2'
9.0'
10.2
5.7
6.6
4.5
3 W.B.C. Concrete Base

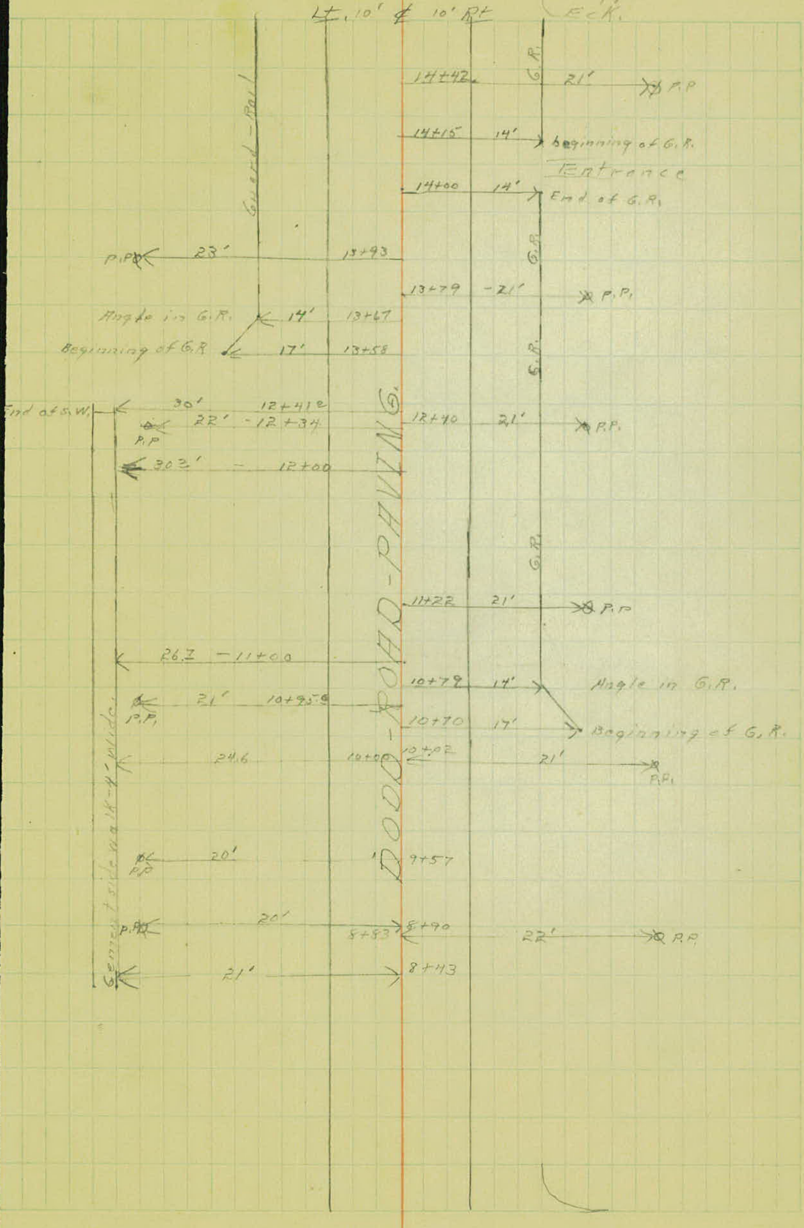
5+25	Catch Basin 39' Rt.
8+06.5	Catch Basin 39' Rt.
7+97.5	Catch Basin 39' Lt.
7+95.5	End of Curb
7+98.5	End of R.
7+37	P. Pole 20' Lt.
7+83.5	End of Pavement on Tangent Extended
7+53.5	Beg. of R.
7+43	P. Pole 42' Rt.
7+24	Man Hole 2' Rt. ✓ Tangent Extended
7+13	P. Pole 34' Rt.
7+00	Man Hole 40' Rt. ✓
6+95	End of Curb
6+91	End of R.


3" x 10" x 65 Header
6'
24'
35'
41
7+97
40'
20'
9.5'
7+93
14' Header
7+77
19'
57.5
57.5
19'
39'
Curb Opening 1'
7+42
30.3
End of R.
111'
7+22
30.4
7+04
31.6
62.5'
1' C.O.
66'
10'
47.6
19'
57'
25'

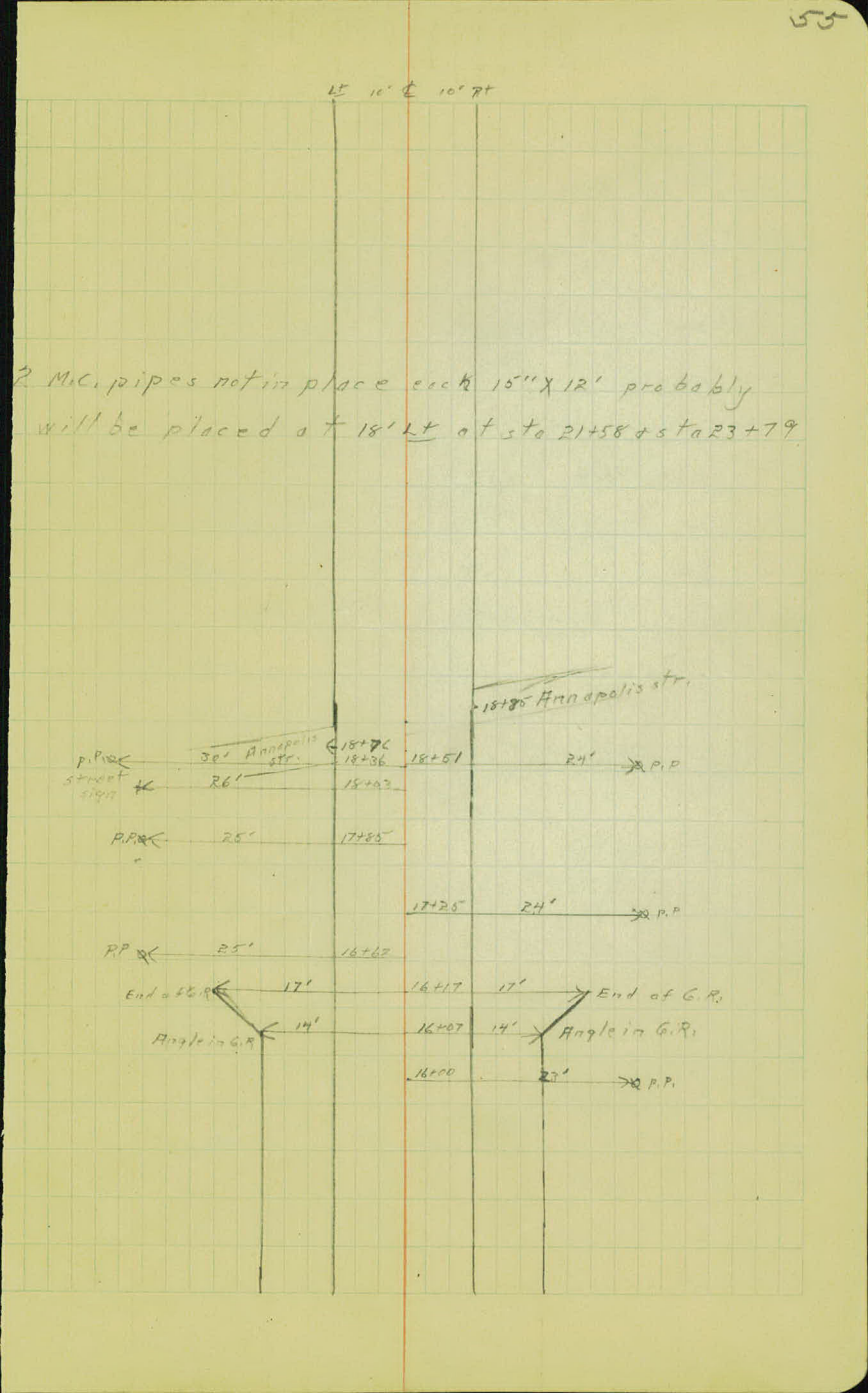
Sta	— Remarks —			
15				
14				
13	+57	Manhole	1'	Rt
12				
11				
10				
9				
8	+43	Beginning of side walk		Lt

10-13-23 - Fair Pool

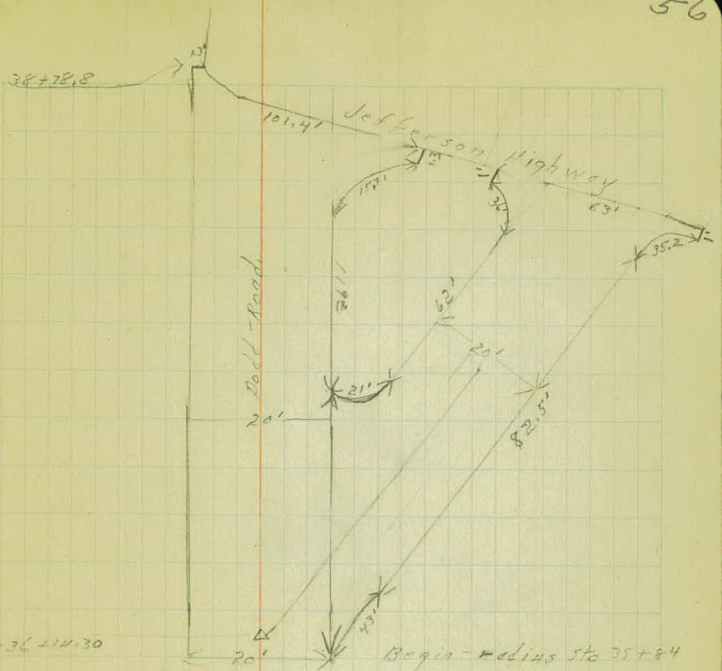
Party { Carley, Persons, Briggs, Eck.



Sta.	Descript.	Dist out	Rt	Lt	
25 +53±	C.M. pipe	17'		Lt	15" X 13"
24+65	P. Pole	22±		Lt	
24+07	Man-hole	0.6'	Rt		
23+91±	C.M. pipe	19'	Rt		18" X 35"
23+45	Hydrant	21.6		Lt	
Equation 22+83± = 23+30					
22+50					
22+45	Mail Box	23.5		Lt	
21+39	Powr. pole	23±		Lt	
21+35	Man-hole	1.0'	Rt		
21+22	Mail Box	20±		Lt	
20+17	Powr. pole	23±		Lt	
19+41	"	24'	Rt		
19+15	Power pole	24'		Lt	
	18+90 — C.M.P. 45° X 15" — 20' Rt				
18+86	Man-hole	2'	Rt		
Equation 18+84.8 = 18+50					
18					
17					
16+42	Man hole	1.5'	Rt		
15					


16' ℄ 10' Rt
2 M.C. pipes not in place each 15" X 12' probably will be placed at 18' Lt at sta 21+58 & sta 23+79.
18+86 Annapolis str.
P.P
street sign
36' Annapolis str.
18+36
18+51
24'
P.P
26'
18+43
P.P
25'
17+85
17+25
24'
P.P
P.P
25'
16+62
End of G.R.
17'
16+17
17'
End of G.R.
Angle in G.R.
14'
16+07
14'
Angle in G.R.
16+00
23'
P.P.

Sta	Descript	Pist out	Rt	Lt	
36+99	P. Pole	20'		Lt	
36+91	Hydrant	18		Lt	
37+76±	Man-hole	1'	Rt		
35+60	P. Pole	21	Rt		
35+29	P. Pole	21	1	Lt	
34+41	P. Pole	21.3	Rt		
34+15	Man-hole	℄			
34+01	P. Pole	21 6		Lt	
33+20	"	21	Rt		
32+72	"	21'		Lt	
32+02	"	21'	Rt		
31+29	"	21		Lt	
30+91	P. Pole	20.5		Lt	
30+77	P. Pole	18	Rt.		
30+47	Man-hole	2.2		Lt	
29+90	P. Pole	21'	Rt		
29+86	Hydrant	21	Rt		
29+76	P. Pole	21		Lt	
Equation 29+123 = 29+02 Bk					
28+42	P. Pole	22		Lt	
28+19	Nail/Box	19'		Lt	
28+18	Conc. steps	19'		Lt	
27+63	P. Pole	21'		Lt	
27+34	Man Hole	℄			
26+84	P. Pole	22'		Lt	
26+68	C.M. Pipe	18		Lt.	15"X13"
25+89	P. Pole	22		Lt	



P.I. Sta 36+14.30

Title drain Rt L sta 15 to sta 36

Sta	+	H.I.	−	Flev	Grade
BM.	4.88	336.31			331.43
36					31.6
+50					30.9
G.B. +10					30.4
35					30.2
+50					29.3
34					28.4
+50					27.5
33					26.6
+50					25.7
T.P.	2.82	328.23	10.90	325.41	
32			3.5	24.7	24.8
+50			4.5	23.7	23.9
31			5.3	22.9	23.0
G.B. +89.9			5.1	23.1	22.75
+50			6.2	22.0	22.1

Carlop - Transit
Parsons - Level - Rod
Eck - Head - chain
Briggs - Rear - chain

57

Nail in tele pole opposite garage on Soft. H.S.W.

Sta	+	H.I.	−	Elev	Grade
	2.82	328.23			
30			7.2	21.0	20.8
+50			8.7	19.5	19.1
+12.3			10.5	17.7	17.4
G.S. 29					17.0
TP			3.90		324.33

Top of Hydrant Rt. of sta 29+88

Final Xsections

Continued from page 48

Sta	+	H.I.	−	Elev
	8.29	265.86		
16			2.2	63.7
T.P.	10.74	275.98	0.62	265.24
+60			9.5	66.5
17			7.6	68.4
18			3.3	72.7
T.P.	6.74	281.26	1.46	274.52
+45			1.5	74.5
Equation 18+84.2 = 18+50			5.2	76.1
19			3.1	78.2
B.M.	4.14	281.31	4.14	277.12 277.17
T.P.	10.33	291.55	0.09	281.22
20			9.3	82.3
21			5.4	86.2
22			1.6	90.0
T.P.	9.61	300.74	0.42	291.13
Equation 22+84.2 = 23+30			7.7	93.0
B.M.			5.76	294.98 294.98
T.P.	8.37	305.49	3.62	297.12
24			9.7	95.8
+36			8.1	97.4

10-18-23
cloudy-cold.

Party: Corley, Persons, Briggs, Eck

Lt ℄ Rt

	Lt						℄	Rt				
(2.9)		9.4/38	2.5/23	2.4/17	2.5/10		2.4/10	2.7/17	6.0/23			
(9.6)		10.0/25	10.0/18	9.6/14	9.7/10		9.7/10	9.9/16	10.5/17	10.2/24		
(7.8)	7.3/33	7.2/22	8.0/19	7.6/14	7.9/10		7.8/10	7.8/16	8.8/17	8.7/21	8.2/22	7.7/24
[illegible]	1.9/33	2.5/26	3.0/20	3.6/19	3.3/14	3.5/10	3.5/10	3.5/16	4.1/19	3.5/20		
(0.4)			1.2/33	1.5/19	1.6/10		1.6/10	1.6/15	2.0/19	1.1/20	0.0/22	
(4.0)			4.5/30	4.9/19	5.3/10		5.4/10	5.5/17	6.2/19	5.9/21	5.2/24	5.5/26
(2.0)		1.1/22	3.6/19	3.2/15	3.3/10		3.3/10	2.8/14	2.4/27			

Nail in tele pole Rt sta 18+50

	Lt						℄	Rt				
(8.4)		8.3/21	10.1/20	9.4/15	9.5/10		9.5/10	9.4/16	9.9/20	8.8/21		
5.9		6.4/20	6.7/18	5.6/14	5.6/10		5.6/10	5.6/14	6.5/20	6.6/24		
2.8	3.0/24	2.9/20	3.3/19	3.3/17	2.1/13	1.8/10	1.8/10	2.6/22	2.9/27			
(8.3)		9.0/22	9.3/19	7.9/14	7.8/10		7.9/10	8.0/19	8.7/25	9.1/33		

Top of hydrant Rt of sta 23+30

	Lt					℄	Rt				
(10.4)	10.8/30	11.0/17	10.3/14	9.9/10		10.0/10	9.9/16	10.0/27	11.5/35		
(8.7)	9.4/21	9.8/18	8.8/15	8.3/10		8.4/10	8.4/14	10.0/17	9.3/19	9.9/24	

Sta	+	H.I.	−	Elev	
	8.37	303.49			
25			5.2	300.3	
26			0.6	04.9	
T.P.	11.86	316.55	0.80	304.69	
27			7.6	09.0	
28			3.4	13.2	
T.P.	12.07	327.33	1.29	315.26	
29			10.0	17.3	
Equation 29+12.2 = 29+02.2			9.6	17.7	
B.M.	3.02	327.37	3.02	324.31	324.35
30			6.4	21.0	
31			4.1	23.3	
32			2.3	25.1	
33			0.5	26.9	
T.P.	9.83	336.59	0.61	326.76	
34			8.0	28.6	
35			6.1	30.5	

℄

(6.0) 5.5/25 6.5/21 6.6/18 5.6/14 5.4/10 | 5.4/10 5.5/15 6.2/19 2.8/22

(1.0) (30 5.8/20) 1.1/18 0.8/15 0.7/10 | 0.7/10 0.7/16 0.6/21 0.0/23

(7.5) 6.5/19 8.2/18 7.9/14 7.8/10 | 7.7/10 7.7/14 8.1/18 7.1/21 7.3/33

(2.8) 3.5/20 4.2/16 3.7/13 3.6/10 | 3.6/10 3.6/15 4.1/18 3.4/20 3.1/27

(9.5) 9.3/22 10.9/20 10.5/15 10.2/10 | 10.2/10 10.3/16 10.9/19 9.3/23 9.5/27

(9.0) 8.5/22 10.2/20 9.9/15 9.8/10 | 9.7/10 9.7/14 10.3/19 8.9/22

Top of hydrant Rt. of sta 29+90

(5.8) 5.0/21 6.8/14 6.7/14 6.6/10 | 6.6/10 6.5/15 6.6/19 5.4/21 5.4/23

(4.) 5.3/22 4.9/20 5.2/18 4.7/14 4.3/10 | 4.3/10 4.3/16 5.0/20 4.5/21 4.6/23

(2.5) 3.0/22 2.9/21 3.3/19 2.5/14 2.4/10 | 2.5/10 2.7/16 2.8/20 2.5/22 2.9/28

(0.3) 1.0/22 1.5/19 0.5/14 0.6/10 | 0.6/10 0.8/15 1.1/19 0.2/22 0.3/29

(8.0) 9.0/24 9.0/20 8.5/15 8.2/10 | 8.2/10 8.2/15 8.6/19 7.9/21 8.0/26 8.5/28

(6.8) 7.3/23 7.7/21 7.6/18 6.8/14 6.3/10 | 6.3/10 6.7/15 6.8/20 6.1/22 6.5/25

Sta	+	H.I.	−	Elev
	9.83	336.59		
36			4.8	31.8
+42			4.4	32.2
37			4.5	32.1
38			5.0	31.6
38+28.2			5.3	31.3
B.M.			5.13	331.46 331.43

Section taken on end of connecting strip at Jefferson Highway.

7.7 28.9

Lt ℄ Rt

5.2		4.7/27	4.8/19	4.9/10	5.0/10	5.2/15	5.4/19	5.8/28	11.5
4.9	5.5/19	5.4/17	5.0/14	4.8/10	Paving – Rt				
4.6	5.5/19	5.5/16	4.8/15	4.7/10	4.7/10	4.7/15	5.3/17		
5.4		5.1/18	5.5/15	5.2/16	(5.3/14	6.0/23	Paving)		13'
5.3	5.5/18	5.3/14	5.4/8		(6.0/18	5.4	Paving)		6'

Nail in tele pole Rt 39+00

7.1/21 8.2/31

7/18/23 AM. Sta	Curb +	opposite Hydrant at 7+22 H.I	−	Flow	Grade
B.M.	3.53	241.89			238.36
stake oppo. Hydrant					235.5

Fair — 4 st

Carley
Parsons
Eck
Briggs

Top of Hydrant.

5 ft at .04 per foot.

2nd Grade Linecon Curb, wly-side

Sta	+	H.I.		Elev.
BM.	4.28	220.82		216.54
1+38				211.6
1+50				212.1
2+00				213.6
2+50				215.2
3+00				217.25
3+50				219.3
T.P.	8.67	228.90	0.59	220.23
4+00				221.35
4+50				223.4
5+00				225.45
5+50				227.5
T.P.	10.82	238.97	6.75	228.15
5+75				228.5
T.P.	3.95	242.16	0.76	238.21
6+00				229.7

Top of Hydrant

Sta	+	H.I.	−		Grade
		242.16			
7+57			3.5	238.76	

L & R

Section at sta 7+57 curb grade - break

SW	SW												
3.38	3.6	4.4	4.4	4.1	4.1	3.9	3.9	4.3	4.5	4.2	4.1	4.3	4.2
29.7	20.7	17	12	10	9.2	6.1	9.7	16.8	18.3	21.4	26.7	30.15	33

Ely - side 2nd Grade Line on Curb

BM.	3.99	220.53		216.54
1+38				211.6
1+50				212.1
2+00				213.6
2+50				215.2
3+00				217.4
3+50				219.6
TP	9.77	229.70	0.60	219.13
4+00				221.8
4+50				223.7
5+00				225.6
5+50				227.5
5+75		242.16		228.5
6+42				232.0
6+50				232.6
7+00				235.4
7+50				238.2
7+57				238.6
7+82.25				240.0

Top of Hydrant R of sta 1+38

Edge of W = 6

ELY - Side

Sta	+	H.I			Elevation of Top of Curb
BM1	5.27	226.81			(216.54)
1+38					211.8
1+50					212.16
2+00					213.66
2+50					215.2
3+00					217.55
3+50					219.40
TP	11.42	231.33	1.90	219.91	
4+00					222.30
4+50					224.05
5+00					225.80
5+50					227.55
5+75					228.3
6+00					229.73
TP1	9.52	239.23	1.62	229.71	

Top of hydrant R of sta. 1+50

Ely - Side

Sta	+	H.I.	−		Elevation of Top of Curb
		239.23			
6+42					238.0
6+50					238.1
7+00					234.9
7+50					237.5
7+82.5					238.8
B.M.			0.89	238.39	

Top of hydrant

Curb - Wly - side

Sta	+	H.I	-		Elevat Top
1+38 to sta 5+75 = same as Ely-side					
		239.23			
6+00					229.55
6+42					231.65
6+50					231.75
7+20					235.15
T.P.	8.45	247.04	0.64	238.59	
B.M.			0.76	246.28	246.27

BC ✓

opposite Hydrant 11½ ✓

6/21/23 Storm-water-sewer 1st Sewer Grade

Sta	+	H.I.	−	Ground-elev.	Sewer-Gr.
B.M.	7.19	223.73		(216.54)	
2+75					211.12
3			6.6	217.1	211.1
3+50			4.6	219.1	213.4
4			2.7	221.0	215.8
4+50			0.3	223.4	218.6
T.P.	10.62	234.27	0.08	223.65	
5			8.5	225.8	219.3
5+50			2.2		221.1
5+75			1.0	229.3	222.0
6			3.7	230.6	223.2
6+42					225.25
6+45			2.2	232.1	225.5
6+93			1.0	233.3	229.0
B.M.	6.66	245.05		(238.39)	

Top of hydrant Rod etc 1+38

C 6.0

C 5.7

C 5.2

C 4.8

C 6.5

C 5.8

C 7.3

C 7.4

C 6.6

C 4.3

Top of Hydrant

Sta	+	H.I.	−	Ground elev	sewer el
		245.05			
7+50			7.8		231.0
8+00					233.0
8+22.5			3.4		234.4
R 8+56			1.8		236.4
L 8+56			0.2		337.4
L 8+36.5			0.9	344.2	337.7

c 6.7

c 7.3

c 6.9

c 7.05

c 6.5

Location of Storm Sewer

5+0

8+56

8+36.5

8+22.5

6+93

6+45

3+46.3

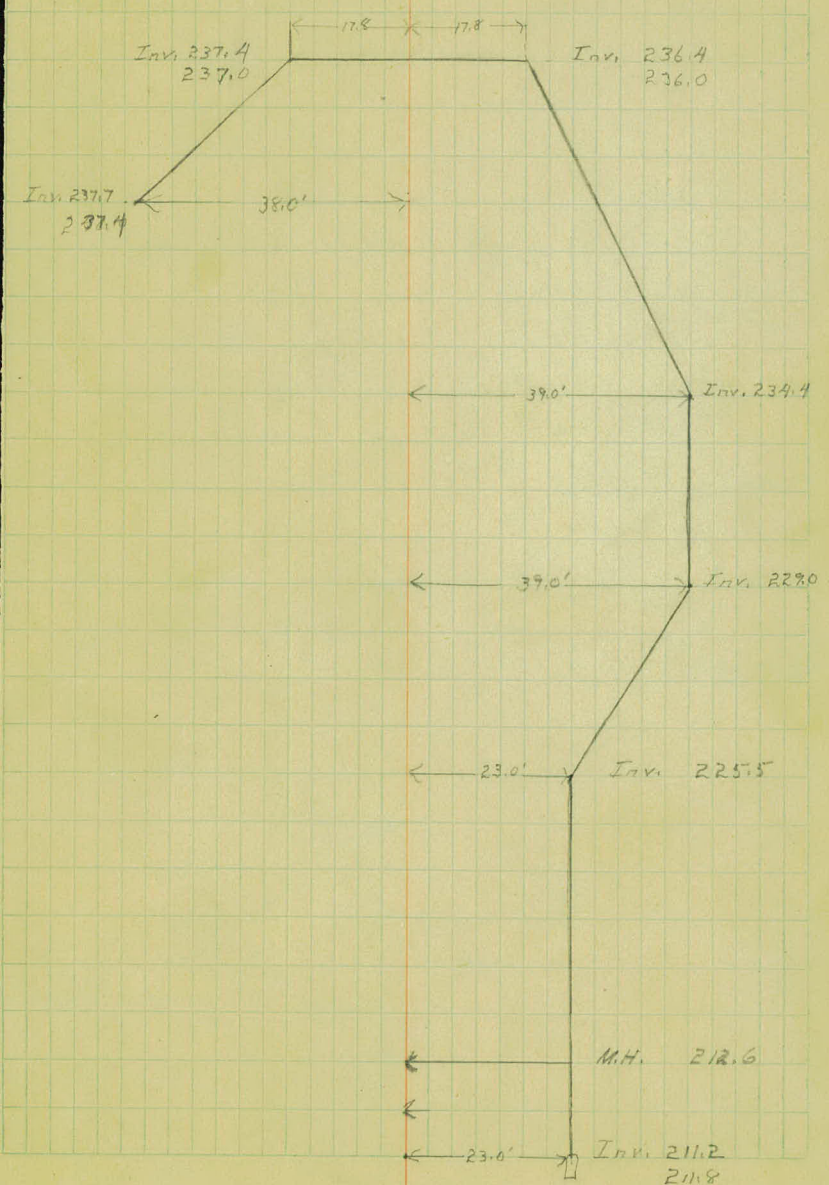
2+75

M.W. Conley - 6/20/23

75

L ℄ R

All stakes offset 4'



2nd sewer Grade Line

Sta	+	H.I.	−		Grade
BM.	5.23	221.77		(216.54)	
2+75					211.8
3+00			4.6		212.1
M.H 3+46.3					
3+50			2.6		212.8
T.P.	10.38	231.62	0.53	221.24	
4+00			10.6		214.9
4+50			8.2		216.9
5+00			5.8		219.0
T.P.	10.09	239.72	2.49	229.13	
5+50					221.0
5+75			10.0	29.2	222.0
6+00			8.7	30.5	223.1
6+45			7.1	32.1	225.5
6+93			5.9	233.3	229.0
T.P.	6.66	245.03	0.85	238.37	

Top of hydrant, Ref sta Ref 1+38

211.8 212.4

C 5+1 212.0 212.4

+46.3 212.6

C6+4 C5+4 212.8

C6+1 C5+1

C6+8

C6+8

C8+2

C7+2 17+

C7+4

C6+6

C4+3

Sta	+	H.I.		Grade
	6.66	245.03		
7+50			7.8	231.0
8+22.5			3.3	234.4
R 8+56			1.8	236.0
L 8+56			0.2	237.0
L 8+36.5			0.8	237.4

C6.2

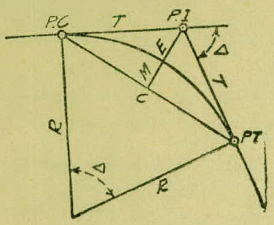
C7.3

C7.2

C7.8

C6.8

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

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

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

Middle ordinate=M= R(1—cos. $\frac{\Delta}{2}$) (5) =Rvers $\frac{\Delta}{2}$ (6)

External=E=Ttan$\frac{\Delta}{4}$- (7) =R÷cos.$\frac{\Delta}{2}$—R(8)=Rexsec$\frac{\Delta}{2}$(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. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and÷8⅓=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÷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÷(2 x 688.26)=2.16 ft.

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′ +8° 20′÷2=6° 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° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and÷42=5.5 or D=5° 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	8	716.78	1.746	6.976	2.40
1	5729.65	.218	.873	0.30	20	688.16	1.819	7.266	2.50
10	4911.15	.255	1.018	0.35	30	674.69	1.855	7.411	2.55
20	4297.28	.291	1.164	0.40	40	661.74	1.892	7.556	2.60
30	3819.83	.327	1.309	0.45					
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
					30	603.80	2.074	8.281	2.85
2	2864.93	.436	1.745	0.60	40	593.42	2.110	8.426	2.90
10	2644.58	.473	1.891	0.65					
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
					12	478.34	2.620	10.45	3.60
3	1910.08	.655	2.618	0.90	30	459.28	2.730	10.89	3.75
10	1809.57	.691	2.763	0.95	13	441.68	2.839	11.32	3.90
20	1719.12	.727	2.908	1.00	30	425.40	2.949	11.75	4.05
30	1637.28	.764	3.054	1.05	14	410.28	3.058	12.18	4.20
40	1562.88	.800	3.199	1.10	30	396.20	3.168	12.62	4.35
50	1494.95	.836	3.345	1.15					
					15	383.07	3.277	13.05	4.50
4	1432.69	.873	3.490	1.20	30	370.78	3.387	13.49	4.65
10	1375.40	.909	3.635	1.25	16	359.27	3.496	13.92	4.80
20	1322.53	.945	3.718	1.30	30	348.45	3.606	14.35	4.95
30	1273.57	.982	3.926	1.35	17	338.27	3.716	14.78	5.10
40	1228.11	1.018	4.071	1.40	18	319.62	3.935	15.64	5.40
50	1185.78	1.055	4.217	1.45	19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.362	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1.75					
					25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	859.92	1.455	5.814	2.00	30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

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

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°	4086.9	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	5808.2	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	.70	.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	.106	.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	.711	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	095	.182	.286	.383	.480	.578	.678	.777	.877	.977	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	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.985	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	1.08	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=slope distance—slope distance (1—Cos. V. A.). Thus for slope distance of 248.7 ft. and V. A. of 4° 20′ from Table VIII Cos=.99714 and correction=1—.99714=.00286 per foot or total of .286× 2½ (near enough)=.57 and horizontal distance=248.7—.57=248.13 ft.

TRIGONOMETRICAL FORMULAS.

See fig. (a).

sin. $A=\frac{a}{c}$

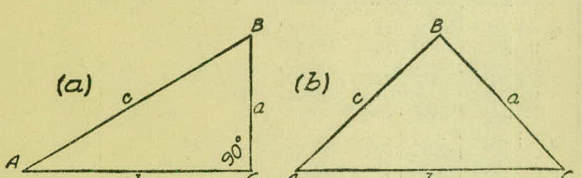
cos. $A=\frac{b}{c}$

tan. $A=\frac{a}{b}$

cot. $A=\frac{b}{a}$

sec. $A=\frac{c}{b}$

cosec. $A=\frac{c}{a}$



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	$B=90°-A$, $b=a \cot. A$, $c=\frac{a}{\sin. A}$.
A, b	B, a, c	$B=90°-A$, $a=b \tan. A$, $c=\frac{b}{\cos. A}$.
A, c	B, a, b	$B=90°-A$, $a=c \sin. A$, $b=c \cos. A$
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	If $s=\frac{1}{2}(a+b+c)$, $\sin. \frac{1}{2}A=\sqrt{\frac{(s-b)\,(s-c)}{b\,c}}$; $\cos. \frac{1}{2}A=\sqrt{\frac{s\,(s-a)}{b\,c}}$, $\tan. \frac{1}{2}A=\sqrt{\frac{(s-b)\,(s-c)}{s\,(s-a)}}$; $\sin. A=\frac{2\sqrt{(s-a)\,(s-b)\,(s-c)\,s}}{b\,c}$
A, B, C, a	area	$\text{area}=\frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area}=\frac{1}{2} b\,c \sin. A$
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	00	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.	
o′						o′					
16	.2756	.2867	3.487	.96126	**74**	**24**	.4067	.4452	2.246	.91355	**66**
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229	.91236	50
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211	.91116	40
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194	.90996	30
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177	.90875	20
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161	.90753	10
17	.2924	.3057	3.271	.95615	**73**	**25**	.4226	.4663	2.145	.90631	**65**
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128	.90507	50
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112	.90383	40
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097	.90259	30
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081	.90133	20
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066	.90007	10
18	.3090	.3249	3.078	.95106	**72**	**26**	.4384	.4877	2.050	.89879	**64**
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035	.89752	50
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020	.89623	40
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006	.89493	30
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991	.89363	20
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977	.89232	10
19	.3256	.3443	2.904	.94552	**71**	**27**	.4540	.5095	1.963	.89101	**63**
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949	.88968	50
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935	.88835	40
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921	.88701	30
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907	.88566	20
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894	.88431	10
20	.3420	.3640	2.747	.93969	**70**	**28**	.4695	.5317	1.881	.88295	**62**
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868	.88158	50
20	.3475	.3706	2.669	.93769	40	20	.4746	.5392	1.855	.88020	40
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842	.87882	30
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829	.87743	20
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816	.87603	10
21	.3584	.3839	2.605	.93358	**69**	**29**	.4848	.5543	1.804	.87462	**61**
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792	.87321	50
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780	.87178	40
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767	.87036	30
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756	.86892	20
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744	.86748	10
22	.3746	.4040	2.475	.92718	**68**	**30**	.5000	.5774	1.732	.86603	**60**
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720	.86457	50
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709	.86310	40
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698	.86163	30
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686	.86015	20
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675	.85866	10
23	.3907	.4245	2.356	.92050	**67**	**31**	.5150	.6009	1.664	.85717	**59**
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653	.85567	50
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643	.85416	40
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632	.85264	30
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621	.85112	20
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611	.84959	10
					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.	
° /						° /					
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						
40	.5398	.6412	1.560	.84182	20	39	.6293	.8098	1.235	.77715	51
50	.5422	.6453	1.550	.84025	10	10	.6316	.8146	1.228	.77531	50
						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	.5544	.6661	1.501	.83228	20	40	.6428	.8391	1.192	.76604	50
50	.5568	.6703	1.492	.83066	10	10	.6450	.8441	1.185	.76417	50
						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						
40	.5688	.6916	1.446	.82248	20	41	.6561	.8693	1.150	.75471	49
50	.5712	.6959	1.437	.82082	10	10	.6583	.8744	1.144	.75280	50
						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						
40	.5831	.7177	1.393	.81242	20	42	.6691	.9004	1.111	.74314	48
50	.5854	.7221	1.385	.81072	10	10	.6713	.9057	1.104	.74120	50
						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						
40	.5972	.7445	1.343	.80212	20	43	.6820	.9325	1.072	.73135	47
50	.5995	.7490	1.335	.80038	10	10	.6841	.9380	1.066	.72937	50
						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						
40	.6111	.7720	1.295	.79158	20	44	.6947	.9657	1.036	.71934	46
50	.6134	.7766	1.288	.78980	10	10	.6967	.6713	1.030	.71732	50
						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
											°
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

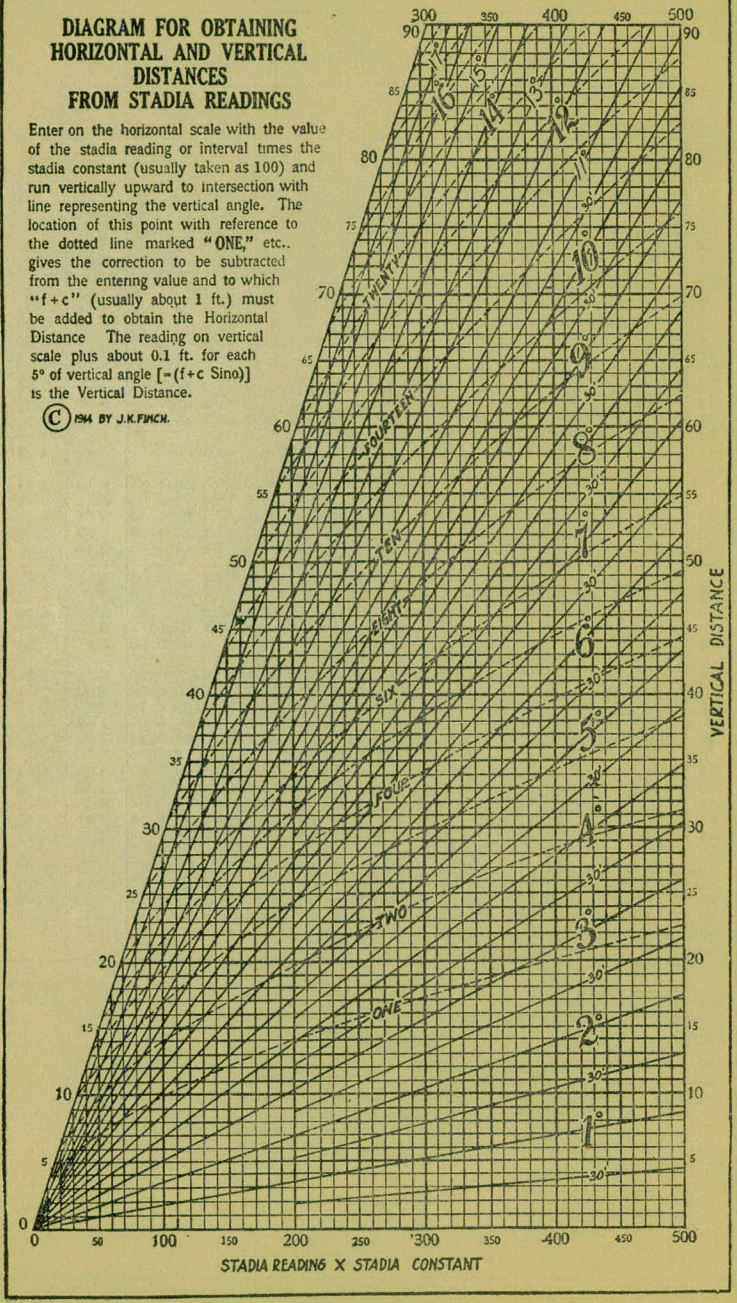
Table IX.—Calculation of Earthwork.

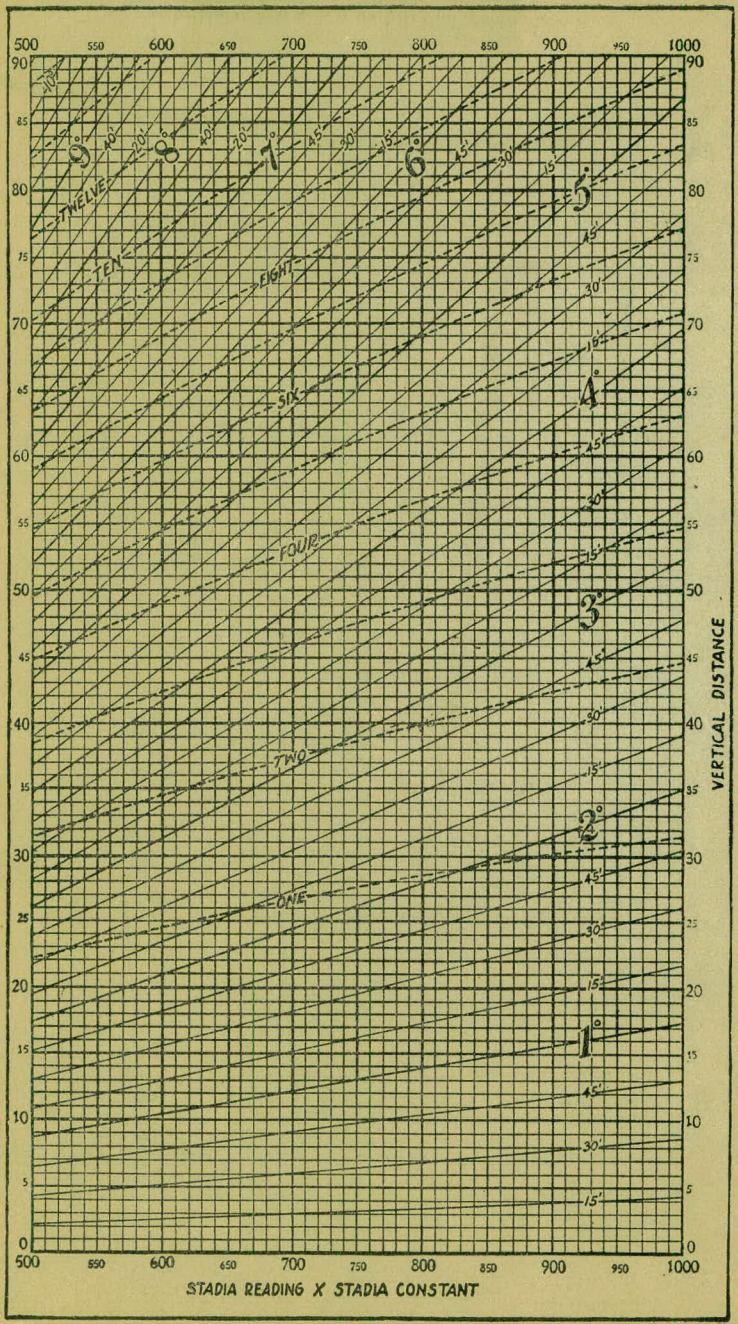
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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

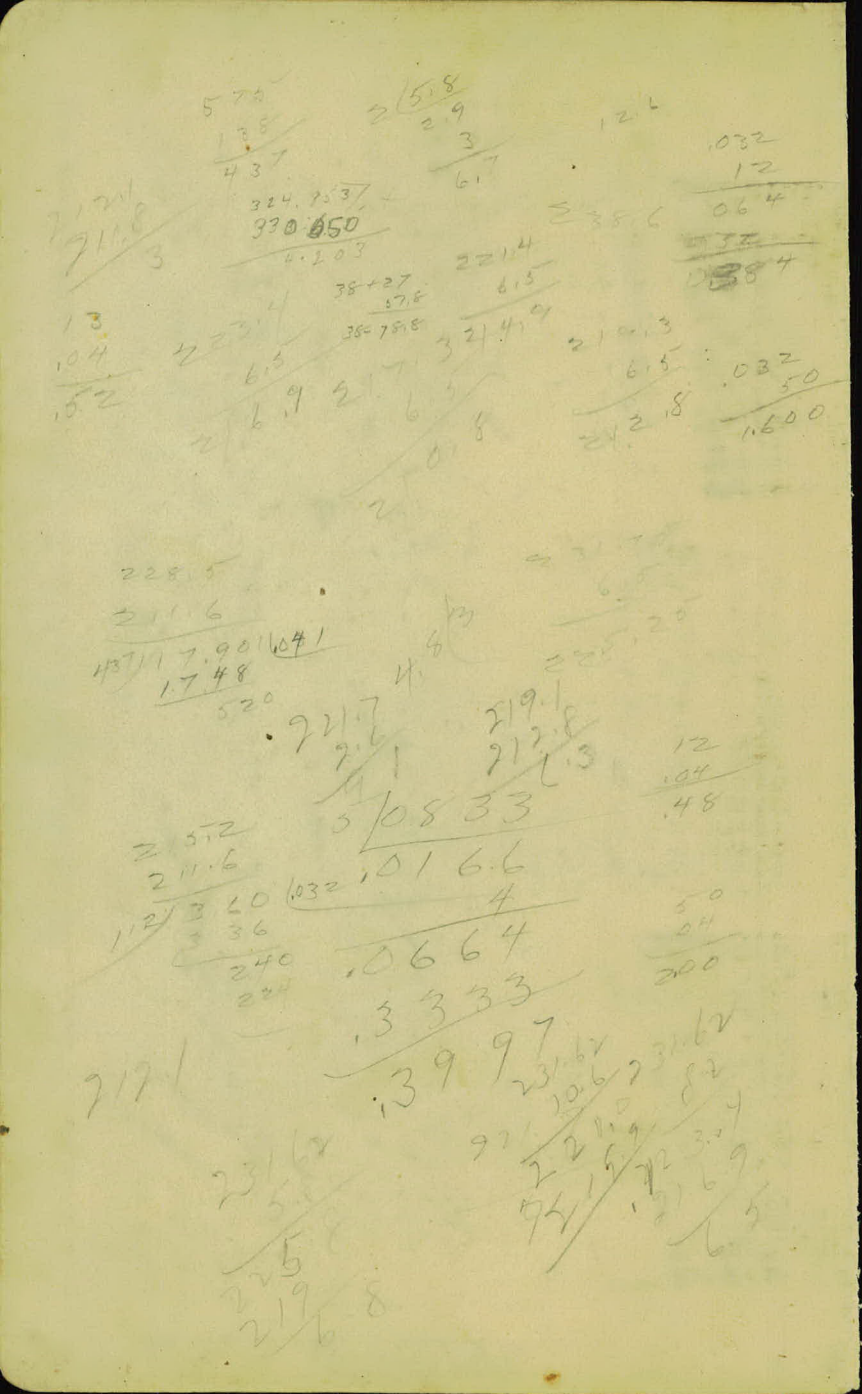
Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering 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 ½ the roadbed =w, add the triangles formed by taking the distance out to each break in turn (=w's) 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 Sino)] is the Vertical Distance.




500 550 600 650 700 750 800 850 900 950 1000
90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
10'
9° 40' 20' 8° 40' 20' 7° 45' 30' 15' 6° 45' 30' 15' 5° 45' 30' 15' 4° 45' 30' 15' 3° 45' 30' 15' 2° 45' 30' 15' 1° 45' 30' 15'
TWELVE
TEN
EIGHT
SIX
FOUR
TWO
ONE
VERTICAL DISTANCE
STADIA READING X STADIA CONSTANT



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	H
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	26.2	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)÷2 or 2 ft. added to 41.9 =43.9. For slopes of 1 on 1 see inside of front cover.

Made in Germany.