

~~Hackensack - Longville~~
~~State Road~~

5
Ref. Point Notes.

FIELD BOOK

361

145

145

Pine River-Longville-Road

Curve No. 1

$\Delta = 86^{\circ}49' \text{ Rt.}$
 $P.I. = 23+93.6$
 $T = 186.9$
 $B.C. = 22+06.7$
 $EG. = 25+06.7$
 $EG. = 25+80.5$

R.F.S
 5
 3" Conc +
 steel Mon. 15
 for R.P.S
 6" Conc. Mon.
 Cor for Sec. 31 - Sec. Cor.
 60' -
 60' -
 East -
 60' -
 60' -
 Corner

Curve No. 2

$\Delta = 87^{\circ}23' \text{ Lt.}$
 $P.I. = 50+41.0$
 $T = 188.8$
 $B.C. = 48+52.2$
 $EG. = 51+53.5$
 $EG. = 52+29.8$

west
 3" Conc + steel Mon.
 R.F.S = 60'
 60'
 60' - North
 East -
 1/4 Cor. = 3" Iron pipe
 Sec. 31

Curve No. 3

$\Delta = 87^{\circ}25' \text{ Rt.}$
 $P.I. = 76+88.2$
 $T = 188.9$
 $B.C. = 74+99.3$
 $EG. = 78+00.7$
 $EG. = 78+77.1$

N.E. Cor Sec. 31 = Sec. Cor

60' - East
 60'
 3" Conc + Steel Mon's
 3" Above ground
 South

Curve No. 4

$\Delta = 88^{\circ}17' \text{ Lt}$
 $P.I. = 130+11.3$
 $T = 191.8$
 $B.C. = 128+19.5$
 $EG. = 131+23.9$
 $EG. = 132+03.1$

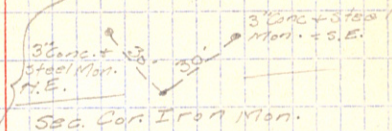
60' - North
 60'
 3" Conc + Steel
 Mon's = 1" Above
 ground
 west - 60'
 2" Iron pipe - Sec. Cor

27 | 28
 32 | 33

Curve No. 5

$\Delta = 1^{\circ}36' \text{ Lt}$
 $P.I. = 183+25.7$
 $T = 80$
 $B.C. = 182+45.7$
 $EG. = 184+05.7$

R.P.S



Curve No. 6

$\Delta = 34^{\circ}00' \text{ Rt}$
 $P.I. = 243+67.8$
 $T = 175.2$
 $B.C. = 241+92.6$
 $EG. = 245+32.6$
 $EG. = 245+43.0$

Curve No. 7

$\Delta = 16^{\circ}00' \text{ Lt}$
 $P.I. = 252+98.0$
 $T = 164.5$
 $B.C. = 251+33.5$
 $EG. = 254+60.2$

Curve No. 8

$\Delta = 25^{\circ}06' \text{ Rt}$
 $P.I. = 258+82.6$
 $T = 182.4$
 $B.C. = 257+00.2$
 $EG. = 260+58.8$

Curve No 9

R.P.S.

$\Delta = 45^{\circ}18'LT$
 $PI. = 262+66.6$
 $T = 124.4$
 $BC. = 261+42.2$
 $EC. = 263+68.7$

Curve No 10

$\Delta = 5^{\circ}21'LT$
 $PI. = 267+85.7$
 $T = 132.6$
 $BC. = 266+52.6$
 $EC. = 269+20.1$

Curve No 11

$\Delta = 18^{\circ}10'LT$
 $PI. = 277+44.2$
 $T = 130.9$
 $BC. = 276+13.3$
 $278+72.8$
 $EC. = 278+76.9$

Curve No 12

$\Delta = 32^{\circ}04'LT$
 $PI. = 283+18.1$
 $T = 137.2$
 $BC. = 281+80.9$
 $EC. = 284+48.1$
 $284+55.3$

Curve No 13

R.P.S.

$\Delta = 58^{\circ}08'RT$
 $PI. = 289+83.1$
 $T = 159.2$
 $BC. = 288+23.9$
 $291+14.6$
 $EC. = 291+42.3$

Curve No 14

$\Delta = 3^{\circ}03'RT$
 $PI. = 296+65.9$
 $T = 152.5$
 $BC. = 295+12.5$
 $EC. = 298+17.5$

Curve No 15

$\Delta = 2^{\circ}56'LT$
 $PI. = 303+23.9$
 $T = 146.7$
 $BC. = 301+77.2$
 $EC. = 304+70.5$
 $= 304+70.6$

Curve No 16

$\Delta = 1^{\circ}36'LT$
 $PI. = 321+00$
 $T = 80.0$
 $BC. = 320+20.0$
 $EC. = 321+90.0$

Curve No 17 R.P.s

$$\Delta = 28^{\circ}00' \text{ RT}$$

$$P.I. = 327+48.9$$

$$T = 204.1$$

$$B.C. = 325+44.9$$

$$E.C. = 329+44.9$$

Curve No 18

$$\Delta = 21^{\circ}20' \text{ LT}$$

$$P.I. = 338+91.5$$

$$T = 269.8$$

$$B.C. = 336+21.7$$

$$E.C. = 341+55.2$$

Curve No 19

$$\Delta = 43^{\circ}17' \text{ RT}$$

$$P.I. = 355+75.1$$

$$T = 324.7$$

$$B.C. = 352+46.4$$

$$E.C. = 358+64.5$$

$$= 356+33.7$$

Curve No 20

$$\Delta = 1^{\circ}34' \text{ LT}$$

$$P.I. = 403+62.2$$

$$T = 79.3$$

$$B.C. = 401+83.9$$

$$E.C. = 403+40.6$$

Side Ditch on F.A.P. 172141
From Sta. 215 - 234.

0	+ S	π	- S	Grade.	Elev.
B.M.	2.36	1385.99			1383.63
T.P.	4.06	1383.37	6.70		1379.29
234				76.4	
+50				76.2	
233				76.0	
+50				75.8	
232				75.6	
+50				75.4	
231				75.2	
+50				75.1	
230				74.9	
T.P.	4.49	1382.16	5.70		1377.67
+50				74.7	
229				74.6	
+50				74.4	
228				74.2	
+50				74.0	
227				73.9	
+50				73.7	
226				73.5	
+50				73.4	
225				73.2	
T.P.	4.20	1380.81	5.55		1376.61
+50				73.0	
224				72.8	

Center Line of Ditch = 20 feet from Road &
3' Bottom
1:15 slope.

RT.	±	LT.
Spid. Tel. Pole.		
on stake		
-0.3		-0.8
1.8	-1.0	2.3
-0.2		-1.0
1.7	-1.0	2.3
-0.5		-1.0
2.0	-1.0	2.8
-0.7		-1.6
2.2	-1.3	3.1
-0.8		-1.8
2.0	-1.9	3.3
-1.0		-2.3
2.5	-2.5	3.8
-1.0		-1.6
2.5	-1.8	3.1
-1.0		-1.3
2.5	-1.7	2.8
-0.9		-1.5
2.4	-1.7	3.0
on stake		
-1.1		-2.0
2.6	-2.2	3.5
-0.9		-2.4
2.4	-1.5	3.9
-1.5		-1.6
3.0	-1.5	3.1
-1.5		-3.0
3.0	-1.6	4.5
-1.6		-3.3
3.1	-2.0	4.8
-1.6		-3.1
3.1	-1.6	4.4
-1.7		-3.5
3.2	-1.7	5.0
-1.9		-2.1
3.4	-2.2	3.6
-2.3		-2.1
3.8	-2.3	5.6
-2.0		-2.3
3.5	-2.7	3.8
on stake		
-2.4		-2.3
3.9	-2.9	3.8
-2.2		-2.9
3.7	-2.9	4.4

Side Ditch = F.A.P #141

0	+S	T	-S	Grade	Elev.
223+50		1380.81			
223+50				72.7	
223				72.5	
+50				72.3	
222				72.1	
+50				71.9	
221				71.8	
+50				71.6	
220				71.4	
+50				71.3	
219				71.1	
T.P.	463	1378.05	7.39		1373.42
218				70.7	
217				70.4	
216				70.0	
215				69.6	

R+ ±L LT

-2.1		-4.2
3.6	-2.2	5.7
-1.7		-3.7
3.2	-2.7	2.0
-1.4		-5.5
2.9	-3.3	2.0
-2.4		-1.1
3.9	-1.1	2.6
-1.4		-1.0
2.9	-1.0	2.5
-1.1		-0.7
2.6	-0.7	2.2
-0.8		-0.8
2.3	-0.8	2.3
-0.7		-2.8
2.2	-0.7	4.3
0.7		-0.6
2.2	-0.6	2.1
-0.6		-0.6
2.1	-0.6	2.1

On Stakes

-0.5		-0.5
2.0	-0.5	2.0
-0.3		-1.0
1.8	-0.3	2.5
-0.2		-0.2
1.7	-0.2	1.7
0.0		0.0
1.5	0.0	1.5

= Beginning of ditch

$P.I. = 285 + 00$ $A = 25^{\circ} 51' \text{ LT}$
 $P.C. = 283 + 12.2$ $D. 7^{\circ}$
 $P.T. = 286 + 81.5$ $Lc = 369.3$
 $\quad = 286 + 87.8$ $T = 187.8$

$B.C. = 283 + 12.2 = 0^{\circ} 00'$
 $\quad + 50 = 1^{\circ} 19' \checkmark$
 $284 = 3^{\circ} 04' \checkmark$
 $\quad + 50 = 4^{\circ} 49' \checkmark$
 $285 = 6^{\circ} 34' \checkmark$
 $\quad + 50 = 8^{\circ} 19' \checkmark$
 $286 = 10^{\circ} 04' \checkmark$
 $\quad + 50 = 11^{\circ} 49' \checkmark$
 $E.C. = 286 + 81.5 = 12^{\circ} 55' \checkmark$
 $286 + 87.8 =$

KEITH'S RAILROAD CURVE TABLES.

Published by KEUFFEL & ESSER CO., New York.

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HOW TO USE KEITH'S TABLES.

EXAMPLE.

Wanted a Curve with an Ext. of about 12 ft. Angle
of Intersection or I. P. = $23^{\circ} 20'$ to the R. at Station
542+72.

Ext. in Tab. IV opposite $23^{\circ} 20' = 120.87$
 $120.87 + 12 = 10.07$. Say a 10° Curve.

Tan. in Tab. IV opp. $23^{\circ} 20' = 1183.1$
 $1183.1 + 10 = 118.31$.

Tab. V. correction for A. $23^{\circ} 20'$ for a 10° Cur. = 0.16
 $118.31 + 0.16 = 118.47 = \text{corrected Tangent}$.

(If corrected Ext. is required find in same way)
Ang. $23^{\circ} 20' = 23.33^{\circ} + 10 = 2.3333 = \text{L. C.}$

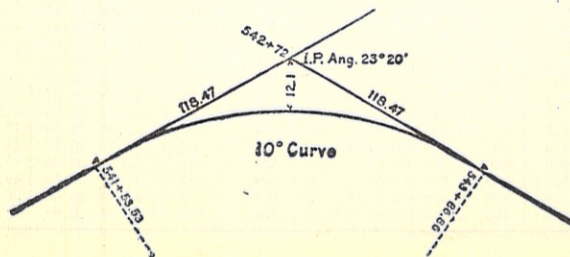
$2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542$	I. P. = sta.	542+72
$4^{\circ} 49\frac{1}{2}' = \text{" " " } + 50$	Tan. =	118.47
$7^{\circ} 19\frac{1}{2}' = \text{" " " } 543$	B. C. = sta.	541+53.53
$9^{\circ} 49\frac{1}{2}' = \text{" " " } + 50$	L. C. =	2.33.33
$11^{\circ} 40' = \text{" " " } 543+$	E. C. = sta.	543+86.86
86.86		

$100 - 53.53 = 46.47 \times 3' (\text{def. for 1 ft. of } 10^{\circ} \text{ Cur.}) = 139.41' =$
 $2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542.$

Def. for 50 ft. = $2^{\circ} 30'$ for a 10° Curve.

Def. for 36.86 ft. = $1^{\circ} 50\frac{1}{2}'$ for a 10° Curve

(These tables are published in Field Books of
KEUFFEL & ESSER Co., New York, N. Y.)



Natural Tangents

sec.	0'	10'	20'	30'	40'	50'	sec.	0'	10'	20'	30'	40'	50'	sec.
0	0000	0029	0058	0087	0116	0145	0040	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	8841	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	8742	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	8643	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	8544	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	8445	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	8346	1.0355	1.0416	1.0477	1.0533	1.0599	1.0661	43
7	1228	1257	1287	1317	1346	1376	8247	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	8148	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	8049	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	7950	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	7851	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	7752	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
13	2309	2339	2370	2401	2432	2462	7653	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	7554	1.3704	1.3848	1.3934	1.4019	1.4106	1.4193	35
15	2679	2711	2742	2773	2805	2836	7455	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	7356	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	7257	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	7158	1.6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	7059	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	6960	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	6861	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	6762	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	6663	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4452	4487	4522	4557	4592	4628	6564	2.0503	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	6465	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	6366	2.2400	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	6267	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	6168	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	6069	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	5970	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	5871	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	5772	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	5673	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	5574	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	5475	3.7321	3.7760	3.8208	3.8657	3.9136	3.9617	14
36	7265	7310	7355	7400	7445	7490	5376	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
37	7536	7581	7627	7673	7720	7766	5277	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	5178	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	5079	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10

sec.	60'	50'	40'	30'	20'	10'	sec.	60'	50'	40'	30'	20'	10'	sec.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9							
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8							
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7							
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6							
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5							
85	11.430	11.826	12.250	12.706	13.197	13.724	4							
86	14.300	14.924	15.605	16.350	17.169	18.075	3							
87	19.081	20.206	21.470	22.903	24.542	26.432	2							
88	28.636	31.242	34.368	38.189	42.964	49.104	1							
89	57.290	68.750	85.940	114.588	171.885	343.770	0							

Natural Cotangents

Handwritten calculations on the right page:

- 9.0. 80.8 / 72.3 = 8.5
- 8.4 / 6.7 = 3.19
- 8.6 / 8.9 = 8.21
- 8.08 / 72.1 = 8.3
- 8.08 / 72.7 = 8.1
- 8.08 / 71.9 = 8.9
- 8.08 / 71.6 = 9.2
- 78.0 / 70.7 = 7.3
- 78.0 / 70.4 = 7.6
- 8.08 / 72.1 = 8.3
- 8.08 / 72.7 = 8.1
- 8.08 / 71.9 = 8.9
- 8.08 / 71.6 = 9.2
- 78.0 / 70.7 = 7.3
- 78.0 / 70.4 = 7.6

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1 1/2 TO 1.

FOR SINGLE TRACK EMBANKMENT.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	7.0	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	0
1	8.5	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.7	9.9	1
2	10.0	10.2	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	2
3	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	3
4	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.1	14.2	14.4	4
5	14.5	14.7	14.8	15.0	15.1	15.3	15.4	15.6	15.7	15.9	5
6	16.0	16.2	16.3	16.5	16.6	16.8	16.9	17.1	17.2	17.4	6
7	17.5	17.7	17.8	18.0	18.1	18.3	18.4	18.6	18.7	18.9	7
8	19.0	19.2	19.3	19.5	19.6	19.8	19.9	20.1	20.2	20.4	8
9	20.5	20.7	20.8	21.0	21.1	21.3	21.4	21.6	21.7	21.9	9
10	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1	23.2	23.4	10
11	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6	24.7	24.9	11
12	25.0	25.2	25.3	25.5	25.6	25.8	25.9	26.1	26.2	26.4	12
13	26.5	26.7	26.8	27.0	27.1	27.3	27.4	27.6	27.7	27.9	13
14	28.0	28.2	28.3	28.5	28.6	28.8	28.9	29.1	29.2	29.4	14
15	29.5	29.7	29.8	30.0	30.1	30.3	30.4	30.6	30.7	30.9	15
16	31.0	31.2	31.3	31.5	31.6	31.8	31.9	32.1	32.2	32.4	16
17	32.5	32.7	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9	17
18	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4	18
19	35.5	35.7	35.8	36.0	36.1	36.3	36.4	36.6	36.7	36.9	19
20	37.0	37.2	37.3	37.5	37.6	37.8	37.9	38.1	38.2	38.4	20
21	38.5	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	21
22	40.0	40.2	40.3	40.5	40.6	40.8	40.9	41.1	41.2	41.4	22
23	41.5	41.7	41.8	42.0	42.1	42.3	42.4	42.6	42.7	42.9	23
24	43.0	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	24
25	44.5	44.7	44.8	45.0	45.1	45.3	45.4	45.6	45.7	45.9	25
26	46.0	46.2	46.3	46.5	46.6	46.8	46.9	47.1	47.2	47.4	26
27	47.5	47.7	47.8	48.0	48.1	48.3	48.4	48.6	48.7	48.9	27
28	49.0	49.2	49.3	49.5	49.6	49.8	49.9	50.1	50.2	50.4	28
29	50.5	50.7	50.8	51.0	51.1	51.3	51.4	51.6	51.7	51.9	29
30	52.0	52.2	52.3	52.5	52.6	52.8	52.9	53.1	53.2	53.4	30
31	53.5	53.7	53.8	54.0	54.1	54.3	54.4	54.6	54.7	54.9	31
32	55.0	55.2	55.3	55.5	55.6	55.8	55.9	56.1	56.2	56.4	32
33	56.5	56.7	56.8	57.0	57.1	57.3	57.4	57.6	57.7	57.9	33
34	58.0	58.2	58.3	58.5	58.6	58.8	58.9	59.1	59.2	59.4	34
35	59.5	59.7	59.8	60.0	60.1	60.3	60.4	60.6	60.7	60.9	35
36	61.0	61.2	61.3	61.5	61.6	61.8	61.9	62.1	62.2	62.4	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.

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