S.P. 27-516-01 & 62-511-01

STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS

LEVEL BOOK

8333

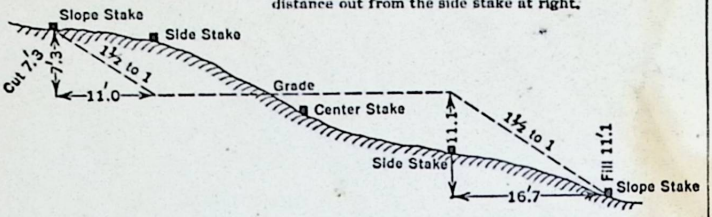
PAVEMENT STAKES

4

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

#4

Page	to Page	Sta to Sta		
2	2	0+00	0+62.8	100' R. Curve
3	3	0+20	1+30	Main Slab
4	5	1+50	9+00	Pvt. Stakes
6	6	0+40	1+30	" " 11' Lt.
10	10	9+50	12+83.77	End S.W. 27-511-01 beg. 62-511-01
16	16 (Grade Change)		0+00	
11	34	1+00	89+00	Pvt. Stakes
35	35	78+82	79+22	Rev. Grade Conn. With New Brighton Rd
35	38	89+50	103+00	Pvt. Stakes
41	41	0+00	0+62.6	42' Radius Curve Rt 79+00
42	42	0+00	0+59.4	42' Radius Curve Lt.
43	43	0+00	0+62.9	42' R. Lt N. Side
44	44	0+00	0+58.8	42' R. Rt S. Side
54	54	103+00	105+54.6	Grade Change
55	55	Tie to 50' R. Point Rt.		
59	59	Grade Change		105+16.4 - 105+54
59	63	Elev. for X-Over. Snelling Ave.		
76	76	0+00	0+94.6	50' R. Lt. Sta. 0+00
77	77	0+00	0+62.8	100' R. Rt 0+00
78	78	Reset Stakes		℄ 0+30 0+40

100' R. Curve Rt

B.M.	5.09	949.42	944.33
0+52 = 0+00			45.28
0+10			45.15
0+20			44.99
0+30			44.80
0+40			44.60
0+50			44.36
0+62.8 = 0+24.6			44.06

Sept 11 1942 (2)

414

427

443

462

482

506

534

			Lt	℄	Rt
B.M.	4.75	949.08		944.33	
0+20					44.83
0+30				45.09	44.98
0+40				45.22	45.12
0+50				45.36	45.26
0+60				45.45	45.35
0+80				45.49	45.39
/				45.39	45.29
+20				45.16	45.06
+30				45.01	44.91
				44.71	

Lt Ø Rt Sept-11-42

(3)

20" oak 50'2t. 1+00

4.25

3.89 4.10

3.86 3.96

3.72 3.82

3.63 3.73

3.59 3.69

3.49 3.79

3.82 4.02

4.07 4.07

4.37

B.M.	3.02	947.35		944.33
1+50				44.70
2+00				43.95
+50				43.20
3				42.45
+50				41.70
4				40.95
+50				40.74
T.P.	3.64	943.78	721	940.14
5				39.69
+50				39.28

Sept. 10-19 42 (4)

SPK 30" OPK 50' Ht. 1+00

2.65 2.75

3.40 3.50

4.15 4.25

4.90 5.00

5.65 5.75

6.40 6.50

7.11 7.21

4.09 4.19

4.50 4.60

		943.78			
6				39.04	
+50				38.94	
7				39.00	
+50				39.22	
8				39.59	
+50				40.11	
9				40.82	
T.P.			2.30	941.48	

474	484
484	494
478	488
456	466
419	429
367	377
296	306

Hub. 41' Lt. Sta. 10+00

B.M.	4.76	949.09		944.33
0+40				45.34
0+50				45.48
0+60				45.53
0+70				45.56
0+80				45.57
0+90				45.53
1				45.44
	4.88	949.21		944.33
0+30	100' R Rt.			44.80

11 Lt.

SPK. in 20" OAK 50' Lt. 7+00

3.78

3.61

3.54

3.51

3.52

3.56

3.65

4.41

T.P.	7.22	948.70		941.48
9+50				41.60
10				42.40
+50				43.20
11				44.00
+50				44.8
12				45.6
+50				46.4
+83.7 = 0+00				46.94
0+50				47.66

Hob 4' Lt. Sta. 10+00

7.1 7.2

6.30 6.40

5.5 5.6

4.7 4.8

3.9 4.0

3.1 3.2

2.3 2.4

1.76 1.86

1.04 1.14

		948.70			
1				48.29	
T.P.	5.90	954.19	0.41	948.29	
+50				48.83	
2				49.29	
+50				49.65	
3				49.94	
+50				50.11	
B.M.	3.16	953.17	3.16	951.03	951.01
4				50.21	
+50				50.22	
5				50.14	

0.41 0.51

5.36 5.46

4.90 5.0

4.54 4.64

4.25 4.35

4.08 4.18

Top Rock SE Cor Porach of House 102'2" 3+45

3.98 4.08

3.97 4.07

4.03 4.13

		954.17		
5+50				49.97
T.P.	3.56	953.53	4.20	949.97
6				49.72
+50				49.46
7				49.19
+50				48.99
8				48.90
+50				48.94
9				49.10
+50				49.37

4.20	4.30
3.81	3.91
4.07	4.17
4.37	4.44
4.54	4.64
4.63	4.73
4.59	4.69
4.43	4.53
4.16	4.26

		953.53			
10				49.77	
+50				50.29	
T.P.	6.83	957.13	3.23	950.30	
11				50.93	
+50				51.63	
12				52.33	
+50				53.03	
13				53.73	
B.M.	5.64	957.12	5.64	951.49	951.48
+50				54.43	
14				55.02	

(13)

3.76 3.86

3.24 3.34

6.20 6.30

5.53 5.63

4.80 4.90

4.10 4.20

3.40 3.50

30" OAK 103' Lt 13+26

2.69 2.79

2.10 2.20

		957.12			
14+50				55.40	
15				55.56	
+50				55.50	
16				55.21	
B.M.	8.35	959.83	5.64	951.48	
+50				54.71	
17				54.00	
+50				53.06	
18				52.01	
+50				50.96	
19				49.91	
T.P.	0.82	950.63	10.02	949.81	

1.72 1.82

1.56 1.66

1.62 1.72

1.91 2.01

30" oak 103' Lt 13+26 5-pt 31 1942

5.11 5.22

5.82 5.93

6.74 6.87

7.81 7.92

8.86 8.97

9.91 10.02

		950.63		
19+50				48.86
20				47.81
+50				46.76
21				45.71
+50				44.66
22				43.55
+50				42.34
23				41.00
+50				39.56
24				~~20.11~~ ± grade
TP	0.27	942.51	8.39	942.24

1.76 1.87

2.81 2.92

3.86 3.97

11.9

4.91 5.02

6.01 6.12

7.07 7.18

8.38 8.39

9.42 9.73

11.06 11.17

Total ~~19.51~~ 12.62

14' Rt. 22+58

		942.51			
T. P.	6.31	941.90	6.92	935.59	
				3.05	
23+73.5				38.85	
				4.94	
24+50				36.96	
				5.75	
25				36.15	
				6.22	
+50				35.68	
				6.33	
+73.8				35.57	
T.P.	3.50	937.58	7.82	934.08	
B.M.			5.40	932.18	932.17

Grade Change
Changed to 200' V.C.

(16)

SPK in W. Post 25' Rt 25+80

3.24 3.15

4.93 5.04

5.69 5.80
~~5.74~~ ~~5.85~~

Edge Slab 6.24 Top Rail 6.12

6.32 6.43

T.P.	2.22	937.87		935.59	
26				35.50	
+50				35.36	
27				35.08	
+50				34.49	
28				33.77	
+50				33.04	
29				32.31	
+50				31.59	
B.M	5.63	937.80	5.63	932.18	932.17
30				30.87	

Sept. 25. 1942 (17)

SPK. in W. Post 25' Rt. 25+80

2.30 2.41

2.44 2.55

2.72 2.83

3.31 3.42

4.03 4.14

4.76 4.87

5.49 5.60

6.29 6.39

SPK. in 18" Elm 62' Rt. 29+75

6.92 7.03

		937.80			
30+50				2.65 30.15	
T.P. B.M	0.55	932.72	5.63	932.17	
31				3.30 29.42	
+50				4.03 28.69	
32				2.73 27.97	
+50				5.50 22.22	
33				6.27 26.45	
+50				7.07 25.65	
34				7.97 24.80	
+50				8.79 23.93	
T P	1.45	925.28	8.89	923.83 1.45	

7.64 7.75

SPK. in 18' Elt 52' Rt. 29+75

3.29 3.40

4.02 4.13

4.74 4.85

5.49 5.60

6.26 6.37

7.06 7.17

7.91 8.02

8.78 8.89

		925.28			
35				2.20 23.02	
+50				319 22.09	
36				4.41 21.17	
+50				5.04 20.24	
B.M.	0.52	925.32	0.52	924.76	924.80
37				6.00 19.32	
+50				6.93 18.39	
38				7.85 17.47	
+50				8.73 16.59	
T.P.	1.25	917.84	8.73	916.59	
39				2.08 15.76	

	2.25	2.36
	3.18	3.29
	4.10	4.21
	5.03	5.14
5.96	5.96	6.07
6.89	6.91	7.02
7.81	7.84	7.95
	8.73	8.84
	2.07	2.18

		917.84			
39+50				2.81 15.03	
40				3.49 14.35	
+50				4.06 13.78	
41				4.57 13.27	
+50				5.05 12.79	
42				5.52 12.32	
+50				6.01 11.83	
43				6.52 11.32	
T.P.	2.44	913.66	6.62	911.22	
+50				2.87 10.79	

2.80 2.91

3.48 3.59

4.05 4.16

4.56 4.67

5.04 5.15

5.51 5.62

6.00 6.11

6.51 6.62

2.86 2.97

		913.66			
44				3.44 10.22	
+50				4.02 09.64	
45				3.64 09.02	
B.M	1.23	913.95	0.94	912.72	
42				1.67 12.32	
+50				2.12 11.83	
43				2.62 11.33	
+50				3.16 10.79	
44				3.73 10.22	
+50				41.31 0964	
45				4.93 09.02	

3.43 3.57

4.01 4.12

4.63 4.74

Spike in 20" oak 15' 12" 4.3+8=0

oct-1-1942

2.11 2.22

2.64 2.75

3.15 3.26

3.72 3.83

4.30 4.41

4.92 5.03

		913.95			
45+50				5.55 08.40	
46				6.18 07.77	
+50				6.71 07.24	
47				7.03 06.92	
TP	5.64	913.06	653	907.42	
+50				6.26 06.80	
48				6.22 06.84	
+50				5.96 07.10	
49				5.51 07.55	
+50				4.86 08.20	

5.54	5.61
6.17	6.28
6.70	6.81
7.02	7.13
6.25	6.36
6.21	6.32
5.95	6.06
5.50	5.61
4.85	4.96

		913.06			
50				4.02 09.04	
+50				3.10 09.96	
51				2.17 10.89	
+50				1.25 11.81	
52				0.32 12.74	
T.P.	8.03	920.52	057	912.49	
+50				6.86 13.66	
B.M	5.96	920.51	596	914.56	914.55
53				5.92 14.59	
+50				4.99 15.52	
54				4.07 16.44	

4.01 4.12

3.09 3.20

2.16 2.27

1.24 1.35

0.31 0.42

6.85 6.96

12' 00K 12S' Rt. 62+65

5.91 6.04

4.98 5.09

4.06 4.17

		920.5		
54+50				17.37
				1.85
55				18.29
				1.29
+50				19.22
				0.37
56				20.14
T.P	840	928.45	0.46	920.05
				8.18
+06.8	0.0	0.0		20.27
				7.72
+31.8		+.05		20.73
				7.25
+56.8		+.11		21.20
				6.79
+81.8 = 56+82.3 P.C.		+.16		21.66
				6.33
57+07.3		+.22		22.12

3.13	3.261
2.21	2.32
1.28	1.39
0.36	0.47
8.17	8.28
7.72	7.67
7.25	7.14
6.79	6.63
6.33	6.11

		928.45			
57+32.3	+27			5.87 22.58	
+57.3	+33			5.40 23.05	
58				4.61 23.84	
+50				3.68 24.77	
~~+75~~				~~4.23~~	
59				2.87 25.67	
+50				1.93 26.50	
60				1.24 27.21	
T.P	6.45	934.04	0.86	927.59	
+50				6.22 27.82	

5.87 5.60

5.40 5.07

4.61 4.28

3.68 3.35

2.87 2.54

1.75 1.62

1.34 0.91

6.22 5.84

		934.04			
61				5.73 28.32	
+10.3	+33			5.61 28.43	
+35.3	+27			5.43 28.61	
+60.3	+23			5.25 28.79	
+85.3	P.T. +16			5.10 28.94	
62+10.3	+11			4.97 29.07	
+35.3	+05			4.89 29.15	
+60.3	0.0			4.81 29.23	
B.M.	6.28	934.03	6.28	927.75	927.75

5.72	5.39
5.61	5.28
5.43	5.16
5.25	5.03
5.10	4.94
4.97	4.86
4.89	4.84
4.80	4.91

PK. in 24" oak cs at. 63+10

		934.03			
63				4.76 29.27	
+50				4.77 29.26	
64				4.89 29.14	
+50				5.02 29.01	
65				5.15 28.88	
T.P.	3.47	932.25	5.25	928.78	
+50				3.50 28.75	
66				3.63 28.62	
+50				3.76 28.49	
67				3.89 28.36	

4.75 4.86

4.76 4.87

4.88 4.90

5.01 5.12

5.14 5.25

3.49 3.60

3.62 3.73

3.75 3.86

3.88 3.99

		932.25			
67+50				4.02 28.23	
B.M.	9.27	938.22	930	922.95	922.95
+83.6	0.0			4.08 28.14	
68+08.6	+05			4.14 28.08	
+33.6	+11			4.21 28.01	
+58.6	P.C. +17			4.27 27.95	
+83.6	+23			4.34 27.88	
69+08.6	+29.			4.40 27.82	
+23.3	P.S.T. +33			4.44 27.78	
+50	+36			4.51 27.71	
+75	+40			4.57 27.65	

Sat.

401 417 Oct. 3 1942

R. Mark T.P.R.R. C.L.F. NE-ly 65° Rt 68+80

407 418

414 429

421 442

427 454

434 467

440 479

446 487

451 487

457 487

		932.22			
69+87.8	P.T.	+17		4.61 27.61	
70		+15		4.64 27.58	
+21.6		+13		4.69 27.53	
+55.4		+11		4.78 27.44	
+80.4		+18		4.85 27.37	
71+05.4		+25		4.91 27.31	
+30.4		+33		4.98 27.24	
71+50				5.03 27.19	
72				5.16 27.06	

4.61 4.88

4.64 4.89

4.69 4.92

4.78 4.99

4.85 5.13

4.91 5.26

4.98 5.41

5.03 5.46

5.16 5.59

		932.22		
72+50				5.29 26.93
+78.7 ES.T	+33			5.96 26.86
T.P.	4.45	930.98	5.69	926.53
73+03.7	+27			4.19 26.79
+28.7	+22			4.25 26.73
+53.7 PT	+16			4.32 26.66
+78.7	+11			4.39 26.59
74+03.7	+05			4.46 26.52
+28.7 PI	0.0			4.53 26.45
+50				4.60 26.38

5.29 5.72

5.36 5.79

4.19 4.56

4.25 4.57

4.32 4.58

4.39 4.60

4.46 4.61

4.52 4.63

4.59 4.70

		930.98			
75'				4.76 26.72	
+50				4.94 26.04	
T.P.	4.40	929.43	5.95	925.03	
76				3.59 25.84	
+50				3.80 25.63	
77				4.03 25.40	
+35.7	6.0			4.19 25.24	
+60.7	+0.5			4.30 25.13	
+85.7	+0.9			4.41 25.02	
78+10.7	+1.4 P.C			4.52 24.91	

4.75 4.84

4.93 5.04

3.88 3.89

3.79 3.90

4.07 4.13

4.18 4.29

4.30 4.45

4.41 4.60

4.52 4.76

		929.43			
78+35.7	+18			24.78	
+60.7	+22			24.68	
+85.7	+14			24.56	
79	+08			24.50	
+25	0.0			24.29	
B.M.	3.06	927.81	4.68	924.75	924.75
78+85.7				24.56	
79+00				24.50	
+25					
+42	W. E. of PVT.				
+43.2	" " " "				
80				3.76 24.05	
+50				3.83	

4.64	4.92
4.75	5.07
4.87	5.41
4.93	5.41
5.03	5.14

SPK. 11 RA 30 21 78 433

	3.38
3.24	3.39
3.43	3.52
3.65	3.61
3.75	3.86
3.97	4.0

		927.81			
S1				421 23.60	
450				444 23.37	
S2				466 23.15	
450				485 22.96	
S3				487 22.94	
450				433 23.08	
J.P	795	930.31	545	922.36	
641				642 23.39	
450				642 23.89	
S5				642 22.57	

420 431

423 454

465 476

484 495

486 497

492 503

691 702

641 652

573 584

		9303 (			
85 +50				4.92 25.39	
86				4.10 26.21	
+50				3.27 27.04	
87				2.45 27.86	
+50				1.72 28.59	
88				1.19 29.12	
TP	4.85	933.72	1.44	928.87	
+50				4.25 29.47	
89				4.10 29.62	
B.M			0.62	933.10	

4.91 5.02

4.09 4.20

3.26 3.37

2.44 2.55

1.71 1.82

1.18 1.29

4.24 4.36

4.09 4.20

8" oak 70' Lt 91+20

				8
B.M	2.54	927.29		924.75
78+82	.13			2.81 24.48
79+02	.07			3.00 24.29
+22		Crown		3.17 24.12
B.M.	0.01	933.11		933.10
89+50				3.52 29.59
90				3.76 29.35
+50				4.19 28.92
91				4.81 28.30
+50				5.22 27.89

(35)

Revised Grade

Oct. 6-1942

SPK. 17 PP. 36 Lt. 79+33

2.81 3.04

3.00 3.17

3.17 3.27

Oct. 7-1942

Cook 70' Lt. 91+20

3.51 3.62

3.75 3.84

4.18 4.29

4.80 4.91

5.41 5.72

		933.11			
92				4.63 26.48	
T.P.	1.41	925.87	8.65	924.46	
+50				0.49 25.38	
93				1.59 24.28	
+50				2.69 23.18	
94				3.79 22.08	
B.M.	4.13	925.92	4.13	921.74	921.79
+50				4.94 20.98	
95				6.02 19.88	
+50				7.06 18.86	
96				7.91 18.01	

6.62	6.73
0.48	0.59
1.58	1.69
2.48	2.59
3.78	3.89

SPK n 12 00K 65 2F 92+25

4.90	
~~4.93~~	5.01
5.99	
~~6.03~~	6.10
7.02	
~~7.05~~	7.13
7.88	
~~7.90~~	7.99

		925.92			
96+50				3.59 1733	
T.P.	3.16	920.50	8.58	917.34	
97				3.67 1683	
+50				3.59 1651	
98				4.14 1636	
+50				4.18 1632	
99				4.23 1627	
+50				4.28 1622	
100				4.33 1617	
+50				4.38 1612	

8.58 8.69

3.66 3.77

3.98 4.09

4.13 4.24

4.17 4.28

4.22 4.33

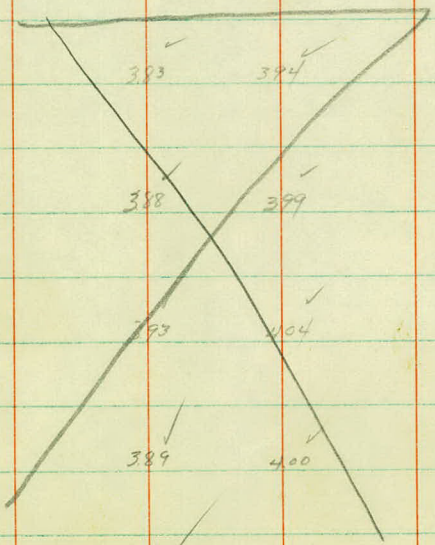
4.27 4.38

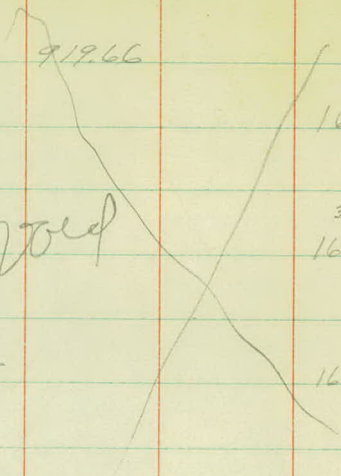
4.32 4.43

4.37 4.48

		920.50		
				4.43
101				16.07
				4.48
750				16.02
T.P.	3.63	919.66	4.97	916.03
				3.69
102				15.97
				3.74
750				15.92
				3.79
103				15.87
				3.84
750				15.82
	Void			
	See Page			3.89
104	54 for Grade			15.77
	Change			3.94
750				15.72
				3.90
775				15.76
				3.74
105				15.92

442	453
447	458
368	379
373	384
378	389
383	394
388	399
393	404
389	400
373	384



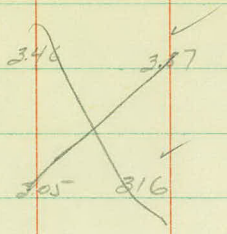


		919.66		
105+25			3.47 16.19	
+50			3.06 16.60	
~~+54~~	+54.55		16.68	
B.M.		1.79	917.87	917.91
B.M.		9.80	909.86	

105+02.5=04 beg. 50' R. Lt.

0+60.3 End 50' of Lt

105+04.8 beg. 50' R Rt.



SOK. in Tel.D 3' Rt 108+19 (old)

SOK. in Tel.D 32' Rt 105+25 (New)

1961

42'
~~50~~ Radius Curve Rt.

13.14	3.61	928.36		924.75	
79+00 = 0+00			4.25		24.11
0+10			4.31 ~~4.30~~	Form 4.28	24.05
0+20	PC		4.35 ✓		24.01
0+30			4.37 ~~4.40~~	P.T. 4.31	23.99 ~~4.15~~ 24.06 4.12
0+40			4.30 ✓		24.16 4.08
0+50			4.20 ✓		
0+62.6			4.09 ✓		24.27

79+00 = beg 42' R. Lt
0+00

6+59.4 = End 42' R. Lt

80+02 beg 42' R. Lt } North
0+62.9 End 42' R. Lt. }

90+02.5=00 beg 42' R. } South

0+55.8

Oct. 7-1942

P.P. 36'2t. 79+33

on slab

on slab

on slab

on "

BM	3.90	928.65	924.75	
0+00 = Bk. 79+00			24.11	
0+10			4.66 24.05	
0+20			4.64 24.01	4.63
0+30			4.66 23.99	4.44
0+40			4.59 24.06	4.40
0+50			4.49 24.16	4.38
0+62.6			4.38 24.27	

(91)

NOV. 16-1942

P.P. 36' at 79+33

4.60

4.70
~~4.65~~

4.62
~~4.66~~

4.54
~~4.59~~

4.46
~~4.49~~

4.39

42' R. Curve Lt.

928.65

0+00 = 79+00

0+13

0+20	23.98	4.67
0+30	23.85	4.80
0+40	23.80	4.85
0+50	23.85	4.80
0+59.4	23.90	4.75

42' R.Lt. N. Side

928.65

0+00 = 80+02				
0+10			4.74	23.91
0+20			4.90	23.75
0+30			4.92	23.73
0+40			4.85	23.80
0+50			4.75	23.90
0+62.9			4.68	23.97

			42' R Rt	S. Side	
		928.65			
0+00 = 80+02.5					
0+10			4.69		23.96
0+20		4.74	4.63	4.84	23.81
0+30		4.73	4.67		23.85
0+40		4.38	4.81	24.37	24.0
0+50		4.43	4.45	24.22	24.15
0+58.8			4.41		24.24

4.69

4.84

4.80

4.65

4.50

4.41

B.M	11.78	921.64		909.86 11.78	
B.M.	8.63			913.01	913.71
119+64.7				917.53	
119+75.7				917.61	
104+94.4					
105+14.6					
105+34.6					

5PK. in Tel P 32' Ht. 105+25

4.21

4.13

		921.64	5.75		
			5.76	5.86	
103+50			15.88		
			5.50		
			5.51	5.61	
104			16.13		
			5.06		
			5.07	5.17	
+50			16.57		
			4.61		
			4.62	4.72	
105			17.02		
			4.13	4.23	Rt Edge
+54.6			17.51		N 9464.7
	℄ 1st Rail		4.65		
	℄ 2nd Rail		4.64		
	11' Lt. 2nd Rail		4.64	917.00	
B.M.	8.63	921.34			912.71
			4.11	4.21	
			917.23		
			4.64		

5.75 5.86

5.50 5.61

5.06 5.17

.41

		921.64		
			5.76	
			5.77	5.87
103+00			15.87	
			5.81	
			5.82	5.92
103+50			15.82	
			5.86	
			5.87	5.97
104			15.77	
			5.89	
			5.90	6.00
150			15.74	
			5.58	
			5.59	5.69
105			16.05	
			4.56	
			4.55	4.65
154.6			17.09	

5.76	5.87
5.81	5.92
5.86	5.97
5.89	6.00
5.58	5.69
4.54	4.65

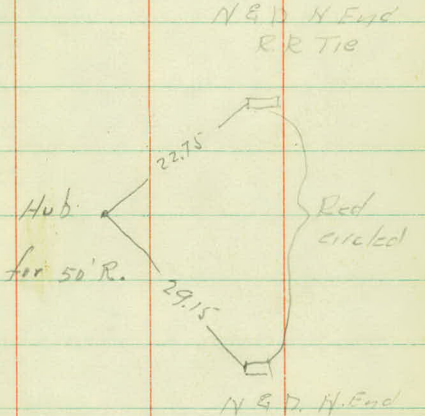
105+03.4 Deg 35° R

105+17 = 0+00 R. Rt

0+52 Set w/ Hdg W. Edge Snelling Ave S. Bound

105+17 = 0+00 R. Lt.

0+47.5 Set with w. Edge Snelling Ave S. Bound


N & D. N. End
R. R. Tie
22.75
Hub
for 50' R.
29.15
Red
circled
N & D. N. End
R. R.

Co. Rd. C

			11' Lt	℄	11' Rt
B.M	8.32	921.03		912.71	
105+16.4 End Slab Nov. 18. 1942			4.35	4.82	4.89
105+26.4			16.18	16.21	16.14
			4.63	4.66	4.70
105+36.4			16.40	16.37	16.33
			4.47	4.49	4.53
105+46.4			16.56	16.54	16.50
105+54.0 End SA 62.511.01					
119+25	Snelling Ave		4.42 16.57	4.37 16.70	4.30 16.73
			4.43	4.30	4.23
119+50			16.56	16.73	16.80
			4.40	4.28	4.18
75			16.63	16.75	16.85
			4.36	4.25	4.16
120			16.67	16.78	16.87
			4.31	4.22	4.15
+25			16.72	16.81	16.88

4.85 4.82 4.89

4.63 4.66 4.70

4.47 4.49 4.58

4.46 4.33 4.30

4.45 4.30 4.23

4.40 4.28 4.18

4.36 4.25 4.16

4.31 4.22 4.15

X-over ℄ island
Snelling Ave.

B.M	8.39	921.10		913.71
119+34				4.28 16.82
+40				4.27 16.83
+50				4.23 16.87
+60				4.20 16.90
+70.1				4.15 16.95
+80				4.12 16.98
+90				4.10 17.00
120				4.09 17.01
+06				4.08 17.02

4.28

4.27

4.23

4.20

4.15

4.12

4.10

4.09

4.08

X- over Snelling Ave.

			12' Lt	℄	12' Rt
B.M	8.32	921.03		912.71	
119+29			4.30 16.73	4.32	4.27 16.76
+34				4.21 16.82	
+40				4.20 16.83	
+50				4.16 16.87	
+60				4.19 16.90	
+70.1	℄ X. over			4.08 16.95	
+80				4.05 16.98	
+90				4.03 17.00	
120				4.02 17.01	

4.30 4.27

4.21

4.20

4.15

4.13

4.08

4.05

4.03

4.02

		X-over Snelling & Island		
		921.03	12' Lt	12' Rt
120+06			4.01 17.02	
+11			4.12 16.91	3.84 17.19

Nov. 19-1942

4.01

4.12

3.84

Reset S. Bound Line
11' Rt.

B.M	882	921.53		912.71
				8.82
119+25				4.80
				1673
120+25				4.65
				1688

11' Rt

4.80

4.65

B.M	5.62	949.95		944.33
0+40			4.21	945.74
0+50			4.47	945.48
0+60			4.40	945.55
0+70			4.37	945.58
0+80			4.38	945.57
0+90			4.42	945.53
1+00			4.51	945.44
	4.47			

11' 27.

75

Oct. 6. 1942

4.61

4.07

4.40

4.37

4.38

4.12

4.51

50' R. Curve Lt.

B.M.	5.19	949.52	944.33
1+32 = 0+00			4.61 44.91
0+20			4.53 45.19
0+40			4.03 45.49
0+50			3.89 45.67
0+60			3.76 45.76
0+70			3.66 45.86
0+80			3.57 45.95
0+94.6			

Oct. 5 - 1942

30" OK	50' Lt.	1+00	4.66 ✓		
			4.64		
			4.38		6
			4.33		5
			4.08 ✓		
			4.03		
			3.93 ✓		
			3.89		
			3.79 ✓		
			3.76		
			3.66 ✓		
			3.57 ✓		
			3.44 ✓		

	527	949.60	100' R. Curve Reset	944.33
0+00				45.28
0+10				45.15
0+20				44.99
0+30				44.80
0+40				44.60
0+50				44.36
0+628				44.06

Mon. Sept. 28-1942

4.38

4.45

4.61

4.80

5.00

5.24

5.54

		Reset stakes		
B.M.	5:27	949.60		914.33
0+30				4.51 45.09
0+40				4.38 45.22
0+50				4.24 45.36
0+60				4.15 45.45
		Rt.		
0+20				44.83
0+30				44.98
0+40				45.12
0+50				45.26

Mon. Sept 28. 1942

20" Oak 50' Lt 1+00

4.77

4.62 ✓

4.48 ✓

4.34 ✓

Radius Curve
to Gt Lakes R. Line

BM	7.33	9795.0	932.17
			5.36
25+01.5			36.14

Oct 5-1942

SPK in 18" Elm 52' Rt. 29+75

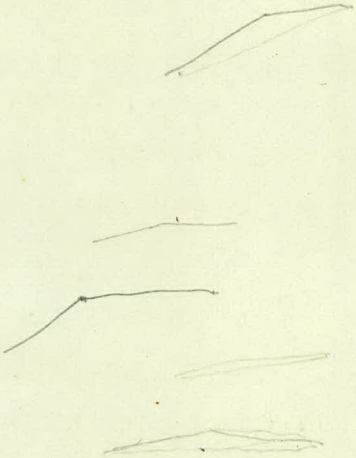
End Slab
3.60

3.40 3.30
3.46 3.35

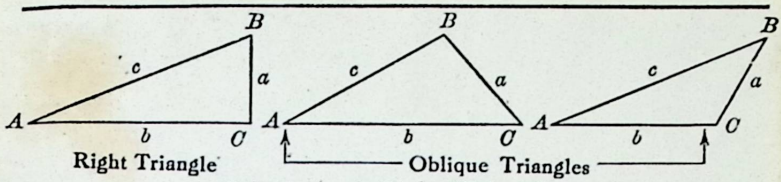
3.40

	5.45	949.78		944.33	
0760			45.48	4.33	4.43
0760			4.79 48.49		
B.M.	349	928.30		924.75	
7975				408 2416	

407 4.18



TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

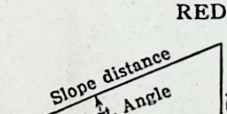
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B, c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B, b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$
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	$B = 90° - A, a = c \sin A, b = c \cos A,$

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180° - (A + B)$, $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180° - (A + B)$, $c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180° - C$, $\tan \frac{1}{2}(A - B) = \frac{(a-b)\tan \frac{1}{2}(A+B)}{a+b}$, $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2}$, $\sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$, $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}$, $C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{b\,c \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft.

Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle) With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance $= 302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.

MADE IN U. S. A.