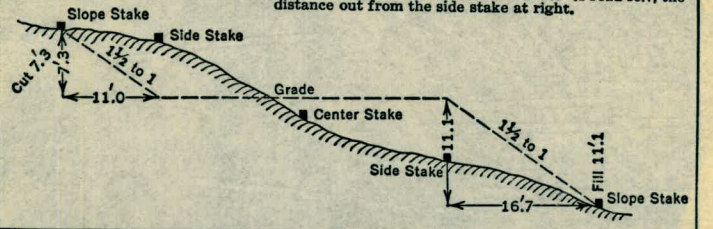
W601-A

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

KEUFFEL & ESSER CO., N. Y.

For Curve Tables see end of book.

601-A

The paper in this book **No. F363A**
is made of **50%** high grade rag stock
with a **WATER RESISTING** surface sizing.

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10,939-3. ky, c, yc. cM.

90+75 — −0.8000
.1376
91 — −0.6624
2743
+50 — −0.3881
2743
92 — −0.1138
92+50 — + 0.1605
2743
93 — + 0.4348
2743
+50 + 0.7091
2743
94 — + 0.9834
2743
+50 1.2577
2743
95 — 1.5320
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95+50 — 1.8063
2743
96 — 2.0806
2743
+50 — 2.3549
2743
97 — 2.6292
2743
+50 — 2.9035
2743
98 — 3.1778
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+50 — 3.4521
2743
99 — 3.7264
2743
+50 — 4.0007

11556
144
46224
92448
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1126304

99+50 — 4.000
76
100 — 4.76
76
+50 — 5.52
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101 — 6.28
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+50 — 7.04
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102 X — 7.80
5776
+50 8.3776
5776
103 — 8.9552
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+50 9.5328
5776
104 — 10.1104
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+50 — 10.6880
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105 — 11.2656
5776
+50 11.8432
5776
106 — 12.4208
5776
+50 12.9984
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10.11
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99+50-4.0 .5486
.2743
.1376
106+50 - 13.0 .5776
1.1556
102+00 - 7.80 1.52
.76

2743
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.1605

16.36
6.71
9.65

5.12
7.34
12.46
.281
9.68

6.53
2.28
3.81

DPW-1
11-18-41
jw B-6

selecting and providing suitable backfill from excavated material, (excepting obtaining and hauling sand), disposing of excess materials and restoring lands, roads and streets as nearly as possible and, as directed to their original condition; excepting where trench is through concrete and/or asphalt or oiled pavement, the cost of restoration will be paid for at the respective unit price bid. Backfill for structures or for trenches for small pipe shall be made of suitable materials to the lines and grades prescribed by the Owner. No extra payment will be made for such backfill, but the cost thereof shall be included in the unit prices bid for structure or small trench excavation which shall also include the cost of all labor, materials, operations and equipment used in

Page

36th St. P.L. Grades and offset cuts, 25+00 to 104+37 1-16

8/1/42
Soper
King
Davis

					Grade	Cut
B.M.	1.01	105.22		104.21		
25+00 (6' off. to left)			6.9	98.3	93.08	5.2
+25.83 Δ (6' off. to Lt)		×	7.6	97.6	92.60	5.0
25+35 (7' off. to Rt			7.9	97.3	91.54	5.8
TP	2.17	96.43	10.96	94.26		
25+80	×		6.3	90.1	86.30	3.8
26+00			6.6	89.8	86.28	3.5
26+28.07 Δ (to Back Tang)			5.5	90.9	86.25	4.6
" " (" tang Ahead)			5.7	90.7	86.25	4.4
26+50			6.8	89.6	86.23	3.4
27+00			8.2	88.2	86.18	2.0
27+50			5.4	91.0	86.14	4.9
28+00			4.1	92.3	86.09	6.2

		96.43			Grade	Cut
28+50			4.9	91.5	86.04	5.4
28+90	x		6.0	90.4	86.00	4.4
29+00	x		6.2	90.2	85.70	4.5
29+50			7.7	88.7	84.22	4.5
30+00			8.5	87.9	82.74	5.2
TP	1.28	89.22	8.49	87.94		
30+25	x		2.3	86.9	82.00	4.9
+50			3.6	85.6	80.57	5.0
31+00			6.5	82.7	77.72	5.0
+50			9.5	79.7	74.86	4.8
32			12.4	76.8	72.01	4.8
TP	0.37	77.21	12.38	76.84		
32+50			3.1	74.1	69.16	4.9
33+00	x		6.1	71.1	66.30	4.8

		77.21				
33+50			8.5	68.7	63.90	4.8
+75	×		9.5	67.7	62.70	5.0
34+00	× 7' Rt		11.0	66.2	61.20	5.0
			9.6	67.6		Chan rim of sewer M.H. rim. Rec. 67.5
Set B.M.			9.76	67.45		Nail in power pole 19' Rt 34+08
	1.39	68.84				
34+00	7' Lt ×		2.8	66.0	61.20	4.8
34+25	" ×		3.8	65.0	58.90	6.1
+50	" ×		4.9	63.9	55.70	8.2
35+00	"		10.1	58.7	47.95	10.7
TP	0.50	56.27	13.67	55.77		
35+50	×		10.8	45.5	40.20	5.3
+75	" ×		13.3	43.0	37.20	5.8
TP			12.16	44.11		Nail in tie 28' Lt 35+58

					Grade	Cut
TP	2.07	46.18		44.11		
36+00	x		4.8	41.4	35.10	6.3
36+25	x		8.2	38.0	33.90	4.1
36+75	x		10.0	36.2	33.10	3.1
37+25			6.9	39.3	34.57	4.7
37+75			5.9	40.3	36.03	4.3
38+25	x		3.4	42.8	37.50	5.3
TP	13.00	59.14	0.04	46.14		
38+75	x		2.8	56.3	51.00	5.3
TP	12.82	71.84	0.12	59.02		
39+00	x		8.9	62.9	57.00	5.9
39+25	x		3.8	68.0	62.10	5.9
TP	11.39	82.97	0.26	71.58		

		82.97				
39+60 ×			10.5	72.5	67.90	4.6
40+00 7' Lt			3.1	79.9	73.20	6.7
Set T.P.	12.33	94.70	0.60	82.37		
40+00'-7' Rt			11.9	82.8	73.20	Nail in pow. pole 9.6
40+40 ×			10.2	84.5	78.50	6.0
40+70			8.1	86.6	81.33	5.3
41+01 40° ∆ (R+L to back tang ×			1.6	93.1	84.30	8.8
" R+L to tang ahead			1.7	93.0	84.30	8.7
41+25 ×			3.2	91.5	85.90	5.6
41+75			2.0	92.7	88.06	4.6
PI	8.85	101.74	1.81	92.89		
42+08.55 ∆ (split of ∠)			7.2	94.5	89.51	5.0

		101.74				
42+50	x		6.0	95.7	91.30	4.4
43	x		5.1	96.6	91.80	4.8
+50			5.0	96.7	92.00	4.7
44			4.6	97.1	92.20	4.9
+50			4.5	97.2	92.40	4.8
45	x		4.6	97.1	92.60	4.5
+50	x		5.2	96.5	92.40	4.1
46			4.6	97.1	91.86	5.2
+50			3.8	97.9	91.32	6.6
47			5.3	96.4	90.78	5.6
+50			6.8	94.9	90.24	4.7
TP	2.44	98.86	5.32	96.42		

		98.86				
48+00	×			4.6	94.3	89.70
+50				4.0	94.9	89.32
49				3.1	95.8	88.95
+50				4.0	94.9	88.57
50	×			5.5	93.4	88.20
+50	×			6.8	92.1	87.20
51	×			9.4	89.5	85.40
+50				11.6	87.3	83.20
TP		0.97	87.27	12.56	86.30	
52	×			2.5	84.8	81.00
+50	×			5.1	82.2	78.00
53	×			8.2	79.1	73.30
+25	×			11.7	75.6	70.10

4.6

5.6

6.8

6.3

5.2

4.9

4.1

4.1

3.8

4.2

5.8

5.5

		87.27				
TP	0.11	74.45	12.93	74.34		
53+50			2.5	72.0	66.07	5.9
54+00 ×			10.2	64.3	58.00	6.3
B.M.			12.55	61.90	Rec 61.88	on 7' point S.E. Cor Ocean View Blvd & 36th
B.M	2.48	64.36		61.88		
54+50			1.9	62.5	58.00	4.5
+75 ×			2.4	62.0	58.00	4.0
55+00 ×			2.2	62.2	57.20	5.0
+50			3.3	61.1	54.17	6.9
56			5.3	59.1	51.13	8.0
+50			8.9	55.5	48.16	7.4
57			12.7	51.7	45.07	6.6
TP	0.38	52.09	12.65	51.71		

		52.09				
57+50			4.7	47.4	42.03	5.4
58	x		8.2	43.9	39.02	4.9
+50			13.2	38.9	37.50	1.4
PI			11.67	40.42		Nail in pole 21' Rt 58+40
	6.30	46.72				
59+00	x		8.2	38.5	36.00	2.5
+50			7.0	39.7	35.40	4.3
60			6.6	40.1	34.80	5.3
+50			6.9	39.8	34.20	5.6
61			3.7	43.0	33.60	9.4
+50	x		7.6	39.1	33.00	6.1
62+00	x		9.1	37.6	33.00	4.6
+25	x		9.2	37.5	33.80	3.7

		46.72				
62+50			7.8	38.9	35.53	3.4
63+00			1.6	45.1	39.00	6.1
TP	12.52	57.66	1.58	45.14		
63+50			8.3	49.4	41.50	7.9
64			5.9	51.8	44.00	7.8
+50			5.4	52.3	45.75	6.5
65			4.4	53.3	47.50	5.8
+50			3.0	54.7	48.75	5.9
66			3.1	54.6	50.00	4.6
+50			2.1	55.6	51.00	4.6
67			1.5	56.2	51.40	4.8
+50			2.0	55.7	50.70	5.0
68			2.7	55.0	49.50	5.5

		57.66				
TP			1.22	56.44		Nail in guy pole
	1.86	58.30				
68+50			44	53.9	48.10	5.8
69+00			6.8	51.5	46.70	4.8
+50	x		8.6	49.7	45.30	4.4
70+00	x		9.9	48.4	44.70	3.7
+50	x		11.7	46.6	43.00	3.4
TP	0.91	46.14	13.07	45.23		
71+00			2.6	43.5	40.25	3.2
+50	x		4.5	41.6	37.50	4.1
72			6.2	39.9	36.33	3.6
+50			7.2	38.9	35.17	3.7
73	x		7.5	38.6	34.00	4.6
+50			7.8	38.3	33.79	4.5
74			8.1	38.0	33.58	4.4

		46.14				
~~74+20~~ ×			7.0	~~39.1~~	~~33.50~~	5.6
~~+50~~			4.7	~~41.4~~		
B.M.			6.81	39.33	Rec. 39.30	Top of F.H. S.E. Cor 36th & National
B.M.	8.18	47.48		39.30		
74+00			9.5	38.0	33.58	4.4
+20 ×			8.4	39.1	33.50	5.6
+50			6.3	41.2	34.30	6.9
75			2.4	45.1	35.64	9.5
+50			2.3	45.2	36.98	8.2
76			2.8	44.7	38.32	6.4
+50			2.9	44.6	39.66	4.9
77 ×			0.2	47.3	41.00	2.3
TP	5.96	53.26	0.18	47.30		
77+50			4.6	48.7	41.50	7.2
78			4.8	48.5	42.00	6.5
+50 ×			4.9	48.4	42.58	5.9
79			4.8	48.5	42.45	6.0

		53.26				
79+50	×		4.9	48.4	42.40	6.0
80+00			5.7	47.6	41.15	6.4
+36.65	Δ		6.1	47.2	40.23	7.0 (bisect of Δ)
+50			6.5	46.8	39.90	6.9
81+00			9.4	43.9	38.65	5.2
Π		1.00	47.11	7.15	46.11	
81+22.9'	Δ		4.2	42.9	38.08	4.8 (bisect of Δ)
81+50	×		5.9	41.2	37.40	3.8
82+00			8.7	38.4	35.82	2.6
+50			8.8	38.3	34.23	4.1
83			9.7	37.4	32.65	4.7
+50			11.5	35.6	31.07	4.5
Π		1.22	36.81	11.52	35.59	
84			2.1	34.7	29.48	5.2
+50	×		4.2	32.6	27.90	4.7

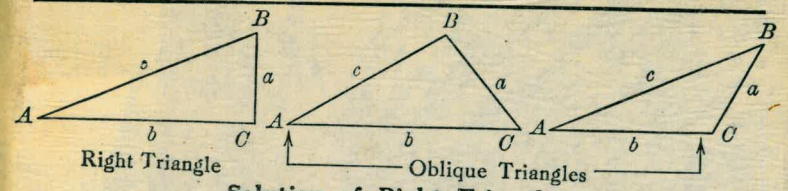
		36.81				
85+00			5.3	31.5	26.48	5.0
+50			6.6	30.2	25.07	5.1
86			8.3	28.5	23.65	4.8
+50			9.8	27.0	22.24	4.8
87			10.4	26.4	20.82	5.6
+50			11.7	25.1	19.41	5.7
+75	×		12.6	24.2	18.70	5.5
TP		1.18	25.37	12.62	24.19	
88+00	×		3.7	21.7	17.00	4.7
+25	×		6.3	19.1	14.40	4.7
+50	×		9.4	16.0	11.00	5.0
+75	×		12.0	13.4	8.6	4.8
TP		3.68	15.93	13.12	12.25	
89+00 = 88+99.36	×		4.8	11.1	6.8	4.3
89+50	×		6.8	9.4	4.0	5.1
90+00	×		9.6	6.3	+1.8	4.5

		15.93				
90+50			10.0	5.9	+0.07	5.8
90+75			11.1	4.8	-0.80	5.6
91+00			10.3	5.6	-0.66	6.3
PI	4.98	10.59	10.32	5.61		
91+50			4.7	5.9	-0.39	6.3
92			5.0	5.6	-0.11	5.7
+50			4.5	6.1	+0.16	5.9
93			4.7	5.9	+0.43	5.5
+50 95 Δ			5.1	5.5	+0.70	4.8 Δ to back tang
+50 95 Δ			5.1	5.5	+0.70	4.8 " " " tang ahead
PI	5.12	11.83	3.88	6.71		
94			7.4	4.4	0.98	3.4
+50			6.8	5.0	1.26	3.7
95			5.9	5.9	1.53	4.4
+50			5.7	6.1	1.81	4.3
96			5.5	6.3	2.08	4.2
+50			5.2	6.6	2.36	4.2

		11.83				
97+00						
			4.9	6.9	2.63	4.3
+50			4.7	7.1	2.90	4.2
98						
			4.4	7.4	3.18	4.2
+50			4.1	7.7	3.45	4.2
99						
			3.7	8.1	3.73	4.4
+50	X		3.3	8.5	4.00	4.5
100						
			2.8	9.0	4.76	4.2
+50			2.3	9.5	5.52	4.0
π	7.34	16.89	2.28	9.55		
101						
			6.7	10.2	6.28	3.9
+50			6.0	10.9	7.04	3.9
102	X					
			5.1	11.8	7.86	4.0
+50			4.5	12.4	8.38	4.0
103						
			4.0	12.9	8.96	3.9
+50			3.5	13.4	9.53	3.9
104						
			2.9	14.0	10.11	3.9
+31.6			2.5	14.4	10.48	3.9
Set B.M.			0.53	16.36		

Rod in point 32' Lt 104+65

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

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.

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