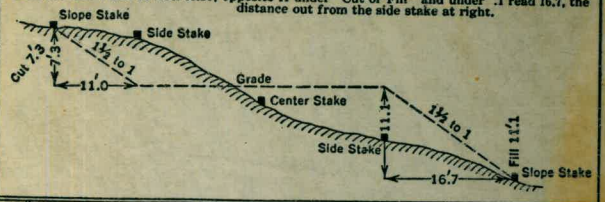
DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

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.

592

10,455. cm, h, ai. cM.

INDEX

Cross-Section for Febr Monthly Estimate 1-15

Contd from F.B # 615-Page 19

1-15

PROFILE OF HALF ROUND DRAIN

Also see revision, Sta 10+07 to 11+00 in Bk 618 16-23

Sta. 9+28 to Sta 12+83

Profile of Half Round Drain

(Supercedes Page 19) 24

Cross-Section on W Slope for Monthly Estimate (Febr.)

2/27/42 Cool - Cloudy

Jackson Polak Cote

1.

(Cont. from F.B. #615 - pg. 79)

Sta	+	H.I.	-	I.S.	Elev.
		480.99			
		6+01			
40'S.				7.1	473.9
30'S				9.2	471.8
20'S.				10.0	471.0
10'S				11.1	469.9
Axis				12.2	468.8
10'N				12.3	468.7
20'N.				14.5	466.5
30'N.				11.3	469.7
		5+91			
30'N				6.3	474.7
20'N.				6.8	474.2
10'N				6.1	474.9
Axis				5.4	475.6

PL

2/27/42
Cool - Cloudy

Sta	+	H.I	-	I.S.	Elev.
		480.99			
		5+91			
10'S				6.7	474.3
20'S				6.5	474.5
30'S				6.3	474.7
40'S				2.2	478.8
50'S				1.0	480.0
		5+81			
Axis				5.0	476.0
10'S				0.8	480.2
T.P			0.02		480.97
	1223	493.20			
		5+81			
20'S				10.9	482.3
30'S				8.3	484.9
40'S				9.4	483.8
50'S				6.5	486.7

2/27/40
Cool - Cloudy

Sta	+	H.I	-	I.S.	Elev.
		492.20			
		5+81			
60'S				4.1	489.1
70'S				3.0	490.2
80'S				0.9	492.3
		5+91			
60'S				11.6	481.6
70'S				11.4	481.8
80'S				5.6	487.6
90'S				3.7	489.5
100'S				4.2	489.0
110'S				5.2	488.0
120'S				4.6	488.6
130'S				0.1	493.1
		6+01			
90'S				8.9	484.3
100'S				10.0	483.2

2/27/42
Cool - Cloudy

Sta	+	H.I.	-	I.S.	Elev
		493.20			
		6+01			
110'S.				9.8	483.4
120'S.				10.5	482.7
130'S.				7.6	485.6
		5+81			
10'N.				13.0	480.2
20'N.				10.2	483.0
		5+71			
20'N.				2.0	491.2
10'N				5.0	488.2
Axis				3.9	489.3
10'S.				2.1	491.1
20'S.				2.6	490.6
30'S.				1.0	492.2
40'S.				0.7	492.5
T.P.			0.45		492.75
	12.03	504.78			

2/27/42
Cool - Cloudy

Sta.	+	H.I.	-	I.S.	Elev.
		504.79			
		5+71			
50's				10.4	494.4
60's				10.3	494.5
70's				11.4	493.4
80's				10.1	494.7
90's				9.2	495.6
100's				5.9	498.9
110's				1.6	503.2
117's				1.1	503.7
		5+81			
80's				12.6	492.2
90's				10.4	494.4
100's				8.8	496.0
110's				7.0	497.8
120's				6.0	498.8
130's				6.6	498.2

fl.

2/27/42
Cool - Cloudy

Sta	+	H.I.	−	I.S.	Elev.	
		504.78				
		5+61				
90'S				2.5	502.3	✓
80'S.				3.8	501.0	✓
70'S.				5.3	499.5	✓
60'S.				6.9	497.9	✓
50'S				7.7	497.1	✓
40'S				6.1	498.7	✓
30'S.				6.5	498.3	✓
20'S.				9.0	495.8	✓
10'S				8.2	496.6	✓
Axis				8.2	496.6	✓
10'N				10.0	494.8	✓
20'N.				9.8	495.0	✓
		5+51				
20'N.				4.7	500.1	✓
10'N				5.2	499.6	✓

Sta	+	H.I.	-	I.S.	Elev.
		504.78			
		5+51			
Axis				5.6	499.2
10'S				4.9	499.9
20'S				3.1	501.7
30'S				2.8	502.0
40'S				1.3	503.5
50'S				1.0	503.8
60'S				0.7	504.1
T.P.			0.24		504.54
	12.29	516.83			
		5+41			
20'N				7.5	509.3
10'N				11.0	505.8
Axis				11.5	505.3
10'S				11.2	505.6
20'S				11.4	505.4

2/27/42
Cool - Cloudy

Jackson
Polak
Cole

2/27/42
Cool-Cloudy

Sta.	+	H.I.	-	I.S.	Elev.
		516.83			
		5+41			
30'S.				9.0	507.8
40'S.				8.9	507.9
50'S.				7.0	509.8
60'S.				3.5	513.3
70'S.				3.7	513.1
		5+61			
115'S				8.0	508.8
110'S				8.5	508.3
100'S				10.6	506.2
		5+51			
80'S				5.2	511.6
90'S.				3.2	513.6
100'S				1.2	515.6
107'S.				0.0	516.8
T.P			0.18		516.65
	6.67	523.32			

Sta	+	H.I.	-	I.S.	Elev.
		523.32			
		5+41			
80'S				5.4	517.9
90'S				4.3	519.0
100'S				0.0	523.3
T.B.M			11.60		511.72
T.B.M.					511.60
	10.05	521.65			
T.P.			0.83		520.82
	12.30	533.12			
90'S		5+21		+3.0	536.1
80'S.				0.0	533.1
70'S.				3.1	530.0
60'S.				5.2	527.9
50'S.				4.3	528.8
40'S.				6.1	527.0

2/27/42
Cool - Cloudy

Jackson
Polak
Cole

El = 511.60

2/28/42

Jackson
Cole

2/28/42
Cool - Cloudy

Sta.	+	H.I.	-	I.S.	Elev	
		533.12				
30'S		5+21		5.6	527.5	
20'S				6.9	526.2	
10'S				5.3	527.8	
Axis				5.8	527.3	
10'N				3.9	529.2	
T.P.			0.89		532.23	
	11.35	543.58				
T.P.			1.03		542.55	
	11.28	553.83				
T.P.			0.63		553.20	
	11.23	564.43				
T.B.M.			1.00		563.43	563.42
	1.00	564.42				
		5+21				
120'S				0.5	563.9	
		5+21				
30'N				12.5	551.9	

2/28/42
Cool - Cloudy

Sta.	+	H.I.	-	1.5	Elev
		564.42			
		5+31			
120'S				4.3	560.1
		5+41			
120'S				13.6	550.8
T.P			13.03		551.39
	0.56	551.95			
		5+51			
120'S				7.5	544.4
		5+31			
20'N				14.9	537.0
30'N				4.8	537.1
T.P			13.05		538.90
	2.50	541.40			
		5+41			
20'N				10.6	530.8
30'N		5+61		6.7	534.7
130'S				8.6	532.8
140'S				4.8	536.6

Sta	+	H.I.	-	I.S.	Elev.
		541.40			
		5+51			
20'N				10.3	530.1
30'N				11.1	530.3
T.P.			12.13		529.27
	0.86	530.13			
		5+71			
130'S				1.9	528.2
140'S				0.4	529.7
150'S				1.7	528.4
		5+61			
30'N				5.7	524.4
40'N				5.5	524.6
		5+81			
140'S				11.7	528.4
150'S				8.8	521.3
		5+71			
50'N				12.6	517.5

2/28/42
Fair-Warm

Sta	+	H.I.	−	I.S.	Elev.
		530.13			
T.P.			12.70		517.43
	2.10	519.53			
		5+91			
150'S.				10.8	508.7
160'S.				7.9	511.6
170'S.				6.3	513.2
		5+81			
50'N				11.7	507.8
60'N.				11.1	508.4
T.P			12.86		506.67
	0.02	506.69			
		5+91			
50'N				8.1	498.6
60'N				3.5	503.2
		6+01			
160'S				6.5	500.2
170'S				3.3	503.4

2/28/42
Fair - Warm

Sta	+	H.I.	-	I.S.	Elev
		506.65			
		6+01			
60'N				12.6	594.0
		6+11			
170'S				9.4	497.2
180'S				7.8	498.8
T.P.		12.65			494.00
	1.16	495.76			
		6+11			
60'N.				5.8	489.4
		6+21			
60'N				8.3	486.9
		6+31			
60'N				12.1	483.1
		6+41			
60'N.				13.0	482.2
		6+51			
60'N.				13.0	482.2

2/28/42
Fair - Warm

Jackson
Polak
Cole

Sta.	+	H.I.	-	I.S.	Elev.
		495.16 (20)			
		6+21			
180'S				3.2	492.0
190'S				4.2	491.0
		6+31			
200'S				9.8	485.4
T.P.		12.29			482.87 (.91)
	0.26	483.13 (17)			
		6+31			
190'S				4.2	478.9 (9.0)
		6+41			
190'S				8.7	474.7 (.5)
200'S				7.6	475.5 (.6)
T.B.M.		7.92			475.21 (.25)

475.23 = Rec. E-1.

4/14/42
Soper
King
Boutlin
Davis

Profile of half-round drain 9+28 to 12+83

Contd From Page 25

T.B.M.	0.29	483.90			483.61
TP	12.21	490.39	5.72		478.18
9+28				8.2	482.2
9+30				5.8	84.6
9+34				1.8	488.6
9+35				0.2	490.2
TP	11.28	501.15	0.52		489.87
9+40				6.9	494.2
9+48				2.2	498.9
TP	11.99	512.72	0.42		500.73
9+48				11.2	501.5
9+49				10.9	501.8
9+50				8.0	504.7
9+51				9.0	505.7 ~~504.7~~
9+58				4.6	508.1
9+61				2.6	510.1

Riser

Revised figure 503.9 at Riser { See FB #618 Page 42

		512.72			
9+63				2.0	510.7
9+67				0.2	512.5
9+72				0.7	512.0
PI	12.20	524.67	0.25		512.47
9+79				9.7	515.0
+84				9.3	515.4
9+85				7.6	517.1
9+90				5.8	518.9
9+90				4.2	520.5
PI	12.95	537.41	0.21		524.46
9+95				11.9	525.5
9+96				11.4	526.0
9+96				10.3	527.1
10+00				5.9	531.5
10+07				1.4	536.0
PI	12.45	549.25	0.61	0.6	536.80
10+07				11.6	537.6

		549.25			
	10+10			9.7	539.5
T	10+12			9.5	539.7
	10+15			7.3	541.9
	10+21			5.4	543.8
L	10+22			3.1	546.1
I	10+30			0.5	548.7
I	10+34			0.7	548.5
	TP	8.48	556.90	0.83	548.42
	10+35			5.9	551.0
G	10+40			5.6	551.3
	10+49			4.5	552.4
	10+53			2.2	554.7
	10+61			2.8	554.1
	10+74			2.4	554.5
G	10+85			1.2	555.7
	10+96			2.5	554.4
	~~10+90~~ (Void - See Page 24)			~~1.4~~	~~555.5~~

Profile Revised
See F.B. #618 - Pages (48) (49)
Final

Void - See pg. 24

		556.90			
10+95			1.6	1.8	555.1
10+99				4.1	552.8
11+11				5.8	551.1
11+23				3.4	553.5
11+30	PROFILE Retaken See Page #24			1.6	555.3
11+43				0.0	556.9
PI	12.70	569.48	0.12	0.12	556.78
11+50				9.8	559.7
11+57				6.9	562.6
11+63				2.4	567.1
PI	12.65	581.98	0.15		569.33
11+67				11.4	570.6
11+71				10.3	571.7
11+77				8.0	574.0
11+84				6.2	575.8
11+90				2.4	579.6
11+94				1.0	581.0

(cont'd on page 21)

Void - See pg. 24

Also See Bk #618
Pages 48-49.
Final
Sta 10+00
to 11+00

Profile continued here
after revisions noted above

		581.98			
TP			0.81		581.17
T.B.M	12.84	593.98 ✓			581.14
11+99				9.1	584.9 ✓
12+00				7.0	587.0 ✓
12+01				6.1	587.9 ✓
12+02				4.9	589.1 ~~588.1~~
12+03				1.4	592.6 ✓
12+05				0.6	593.4 ✓
TP	6.11	600.03 ✓	0.06		593.92
12+07				0.9	599.1 ✓
TP	12.70	612.63 ✓	0.10		599.93
12+10				11.1	601.5 ✓
12+14				8.9	603.7 ✓
12+18				3.6	609.0 ✓
12+20				2.3	610.3 ✓
12+25				0.1	612.5 ✓
TP	10.37	622.95 ✓	0.05	"	612.58

T.B.M. Marked 581.14

		622.95			
12+32				4.5	618.4
12+37				1.2	621.7
TP	13.06	634.69	1.32		621.63
12+40				9.9	624.8
12+44				8.0	626.7
12+45				8.6	626.1
12+50				3.8	630.9
12+51				2.3	632.4
TP	12.66	647.03	0.32		634.37
12+59				9.7	637.3
12+66				4.0	643.0
12+71				1.4	645.6
TP	12.87	659.67	0.33		646.80
12+76				6.2	653.5
12+79				5.5	654.2
12+80				3.1	656.6
12+83				0.8	658.9

659.67

TP	10.04	665.97	3.74		655.93
			2.87		663.10

T.B.M. B-31 marked 663.16

July 2 1942

PROFILE - HALF BOUND DRAIN

STA. 8+56 to STA. 8+76

BM	4.19	466.03			461.84
8+56			6.7		459.3
+60			4.4		461.6
+63			4.2		461.8
+66			2.2		463.8
8+76			+1.1		467.1
				4.19	461.84

(cont'd on page 25)

NOTE Cont'd from Bk. #619, page 18

Rogers

PROFILE HALF-ROUND DRAIN

Sta 10+90 – 11+60 J. L. 28-12 20

(Supercedes Page 19)

BM.	6.24	562.10		555.86	
10+90			8.2	553.9	Riser
+95			7.1	555.0	[Revised Elev. 554.8 – (FB# 618 Page 49)]
+98			9.6	552.5	[Revised Elev. 552.7 – (FB# 618 Page 49)]
11+00			9.5	552.6	Riser
+05			9.9	552.2	
+09			11.8	550.3	
+10			11.6	550.5	Riser
+20			10.1	552.0	"
+26			7.8	554.3	
+30			7.2	554.9	"
+40			5.8	556.3	"
+43			5.3	556.8	
+50			2.4	559.7	Riser
+54			1.2	560.9	
+60			+2.5	564.6	"
B.M.	(Contd on	6.24 PAGE 19)		555.86	= 555.86

Riser
11+80 = 574.2
11+70 = 571.6

(cont'd from page 23)

PROFILE OF HALF ROUND CK. PIPE

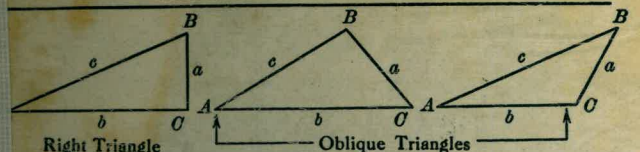
AUG. 1942 25

DRAIN

BM	2.31	485.92	483.61	
8+80		17.4	468.5	
+81.4		15.8	70.1	
+85		13.9	72.0	
+90.7		12.7	73.2	River
+95.0		11.7	74.2	
9+00		12.0	73.9	"
+03		11.0	74.9	
+08		10.2	75.7	"
+13		9.7	76.2	
+17		7.2	78.7	
+19		7.6	78.3	River
+23		5.6	80.3	
+26		5.4	80.5	
9+28		3.8	82.1	
BM			484.65	ok

(cont'd on page 16)

TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

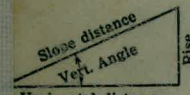
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

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