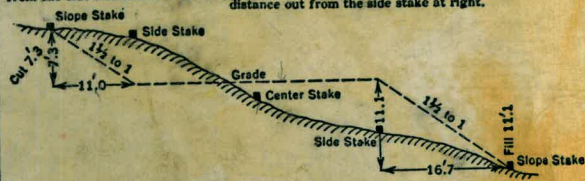


W

624

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING
 Roadway of any Width. Side Slopes 1 1/2 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	Distance out from Side or Shoulder Stake										Cut or Fill
	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
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

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 .0406
 76
 5
 30 4
 .380

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1900

U.S. GEOLOGICAL SURVEY
 WATER RESOURCES DIVISION
 WASHINGTON, D.C. 20540

10-21-71

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CHECK FORMS BLK #3

3-31-42

1

8.94 572.36

563.42

4+71

1.37

572.78

TOP OF FILLET

523 N. AXIS

ELEVATIONS for FORMS Blk #5 4-1-42

Rogers
Colo.
Talak
King
Roberts
Foster

2

TBM 1.29 512.89 511.60

TP 0.78 501.15 12.52 500.37

5+71 12.35 488.80

PROFILE OF FILLET LINE

12.3 488.8

10.0 491.1

3.3

6.5

12.79

Top Fillet

7.14 506.13 2.16 498.99

5+71 2.82 503.31 Intersection D.S. 113.22 S. Axis

8.83 512.86 2.10 504.03

TBM 0.10 511.70 1.26 511.60 = 511.60 as above

1.73 500.61 12.82 498.88 April 1 - 42

5+71 12.06 488.55 F 4.69 to Bottom Fillet 17.24 N. Axis

" " 11.83 488.78 F 14.91 to Top. " 12.13 N. "

5+71 11.91 488.70 = Bottom of copper water stop

ELEVS. FOR FORMS (CONTD) BLK #5

April 1-1942

Party Same

3

50061

061 500.0 Marked elevations For top of lift.

5+61 6.11 494.50 F5.79 to bottom fillet 12.04 N Axis

" 7.98 492.63 F18.11 to top " 11.43 N "

T.P. 12.91 511.79 1.73 498.88

5+51 10.45 501.34 F5.99 to bottom fillet 16.33 N Axis

12.05 499.74 F18.04 to top fillet 10.72 N "

T.B.M. 0.20 511.59 = 511.60 Marked Rock

CHECK FORMS BLK^e 2

April 1-42

4

TBM 387 623.45 11.51 619.58

261 614.55 10.05 611.94

TP 841 612.91 604.50

453 609.03

4120 9.25 599.78 F 5.22 to Elev 605.00 35.95 S. Axis

" 883 60.0.20 F 4.80 to " " 2.25 N. "

4706 7.10 599.93 ~~F 5.05~~ " " 1.89 N. "

3496 4.10 604.93 F 14.49 to top Fillet 4.81 N. "

" 3.71 605.32 F 7.18 to Bottom " 1.53 N. "

TP 1292 620.33 1.62 607.41

TBM 0.75 619.58

→ 612.62

599.93

F=12.69

4-2-42

Elevs. for Forms For Blk 10 8+07

5

Sta	BS	HI	FS	Elev.	
TBM	2.44	451.79		449.35	
		9.85		441.94	
		9.34		442.45	
8+07		9.36		442.43	F 10.99 out 151.90
8+07		9.29		442.50	151.9 + 8.27 = 160.17 Sof Axis
"		1.53		450.26	F 4.34 to Bottom Fillet 22.19 w/ Axis
"		1.98		449.81	F 16.59 to Top " 15.86 w/ Axis
TBM		7.19		444.60	= 444.59 Check on TBM.

Elevations for Forms Blk #1

April 1, 1942

Dickinson
Polak

6

TBM	1.51	640.73		639.42			
3441			1.39	639.54	F 396 to Bottom of Fillet	2.52	N. Axis
"			0.87	640.06	F 863 to Top of fillet	0.07	N. "
3451			9.27	631.46	F 1153 to Top of Fillet	0.34	" "
3471			10.67	630.26	F 474 to Elev. 635.00	0.75	N. "
			10.71	630.22	F 478 to " "	16.54	S. "
		1.51		639.42	Check on BM Above		

Elevs for Form - Block 10

Apr 3
Dickinson 7

T.BM 449.35

0.57 449.92

7+60.5 5.29 444.63 151.90 so. of Axis (F5.37 to Elev 450°)

7+60.5 3.80 446.12 151.90 + 5.55 = 157.45 Toe of slope

7+82° 9.21 440.71 151.90 so. of axis (F9.29 to Elev 450)

7+82° 9.06 440.86 151.90 + 9.55 = 161.45 Toe of slope

TBM 0.57 449.35

Elevs for Forms - Block # 3

APR. 4th

DICKINSON ©

T.BM	11.28	574.70	563.42	
5770		10.07	564.63	62.55 To downs (Fill 5.37 to elev 570)
5770		9.49	565.21	5.17 North to top fillet (Fill = 8.13)
Set T.BM		0.24	574.46	
TBM		11.28	563.42	

ELEVATIONS for FORMS BIK 10

April 6-1962

(9)

TBM	0.15	449.50		449.35	
7160.5			4.76	444.74	F 13.37 to top of Fillet 16.69 N. Axis
"			4.69	444.81	F 1.50 to bottom of Fillet 23.02 N "
			4.50	445.0	Paint marks to top of lift
4.45	0	0.15		449.35	

8631
42881
20

ELEVATIONS for FORMS BK #4

April 7 - 1942

Rogers
Cole
Robert 10
Foster

TBM	0.29	543.15		542.86		
5+20			7.79	535.36	F 12.12 to top of Fillet	7.75 N. Axis
5+21			4.65	538.50	F 0.0 to Bottom of Fillet	12.33 N. "
5+11			6.89	536.26	F 7.79 to " of "	11.78 N. "
"			7.10	536.05	F 16.33 to Top of "	7.26 N. "
5+01			0.62	542.53	F 15.40 to Top of Fillet	11.23 N. "
T.P.	4.45	547.31	0.29	542.86		
			2.76	544.55	F 4.95 to Bot. of Fillet	6.71 N. Axis
			7.31	540.00	85.35' S. Axis to downstream intersection	
5+20			11.22	536.09	F 3.91 to Elev. 540	" " 85.35' S. Axis
			9.35	537.96	F 7.04 to " 545	81.53 S. Axis
TBM		4.45		542.86	= 542.86	

Elevs for Formis - Block # 8

APR. 6th (11)

T.BM	7.05	451.64	444.59		Dickinson
7+14		4.20	447.44	151.9 South (F=5.98 to El 453.42)	
7+14		3.61	448.03	151.9 + 4.10 = 156. ⁰⁰ south to toe slope	
6+67.50		6.39	445.25	151.9 South (F=8.17 to El. 453.42)	
6+67.50		3.56	448.07	151.9 + 3.98 = 155. ⁸⁸ south to toe slope	
	7.05		444.59	BM	

Elevs for FORMS BIK #1

APR. 7 (12)

T.B.M 4.64 644.06

639.42

DICKINSON

3+70 9.04 635.02 0.50 North F=4.98 to Elev. 640

3+70 9.00 635.06 14.64 South F=4.94 " " "

3+70 9.01 635.05 15.51 " F=2.36 to Elev 637.41

3+58 9.01 635.05 15.51 " F=2.36 " " "

3+58 9.02 635.04 14.64 " F=4.96 to Elev. 640⁰

3+56 8.29 635.77 0.48 North F=4.67 (Grade=640.44)

3+41 3.98 640.08 0.07 " F=8.61 (Grade=648.69)

4.64 639.42 B.M.

Elev's For FORMS - Block #2

APR 7 (13)

T.B.M. 0.40 619.98 619.58

DICKINSON

Set T.B.M. 12.65 607.33

3.02 610.35

4+20 5.13 605.22 2.00' North F = 4.78 to Elev. 610⁰⁰

4+20 5.27 605.08 32.15 South F = 4.92 to Elev. 610⁰⁰

4+0.6 5.19 605.16 1.87 North F = 7.46 (Grade = 612⁶²)

0.34 610.01 Point set previous. 32.15' south
marked El. 610⁰⁰

ELEV. for FORMS Bk #8

April 8 - 1941

Rogers
Cole
Roberts 14
Foster

3.67 448.26

441.59

3.53 444.73

6+82⁵

2.00 441.26

F 15.98 to Top of Fillet 16.78 N. Axis

7+14

4.85 443.41

F 14.33 to Top " 16.73 N. Axis

6+67⁵

2.20 446.06

F 10.94 to " " 16.80 N. Axis

0.00 448.26

F 1'-8³/₈" to Elev. 450. Markson form's

23.13

16.78

16.80

ELEVATIONS for FORMS B/k*3

April 9 - 1942

TBM,	0.6'	575.07		574.46	
4+70			4.87	570.20	F 4.80 to Elev. 575 3.91 N. Axis
4+61			5.01	570.06	F 8.77 to Top of Fillel 4.62 N. Axis
4+51			5.33	569.74	F 15.19 to " 4.01 N. "
4+70			4.91	570.86	F 4.84 to Elev. 575 5.00 N. of Axis
"			6.01	569.06	F 5.94 to " 575 Ds. inters. 58.75 S. Axis
TP	9.15	583.61	0.6'	574.46	
4+31			0.33	583.28	F 5.42 to Both of Fillel 2.31 N. Axis
	11.23	595.21	0.13	583.48	
			10.61	584.60	F 12.53 to Top of Fillel 2.29 N. Axis
TP	6.03	600.07	1.17	594.04	
TP	0.16	589.20	11.03	589.04	
	4.79	583.47	10.52	578.68	
TBM,			9.01	574.46	= 574.46 Marked Rock

4+70
4+61
4+51
4+31
4+51
4+70
4+51
4+31
4+51
4+70
4+61
4+51

ELEVATIONS for FORMS Bk #10

April 10-1942

16

TBM, 125 450.60

449.35

7+82

742

443.18

F 17.62 to Top of Fillet 16.42 N. Axis

6.56

444.04

F 4.96 to Bot. of Fillet 22.75 N. "

8+07

0.67

449.92

F 4.67 to Bottom of " 22.19 N. "

+2.82

453.42

Elev. to top of Spillway 159

TBM

125

449.35

= 449.35

ELEV. FOR FORMS - BLOCK # 4

APR. 12 '17

				DICKINSON
T.B.M	2.32	545.18	542.86	
S720		5.14	540.04	81.55 South - F4.96 to Elev 545 ⁰⁰ ROGERS
S720		5.09	540.09	7.75 North F 7 ³⁹ to Elev 547. ⁴⁸
		4.99	540.19	F 12.24 to top Fillet 7.26 N. Axis
		0.18	545.00	D.S. Intersection 81.55 S. Axis
T.P.	8.99	551.85	542.86	
		4.30	547.55	F 15.38 to top of Fillet 6.16 N. Axis
		2.15	549.70	F. 5.30 to Bottom Fillet 10.68 N. Axis
T.B.M		8.99	542.86	= 542.86

608

CHECK FORMS BK #10

April 13 - 1992

Rogers
Polak
Cole
Roberts
Foster

13

	120	450.55		449.35	
74605			+758	458.13	16.69 N. Axis
"			426	446.29	23.02 d "
7482			+1024	450.79	-16.92 N "
"			154	449.01	22.75 N "
8407			+1585	466.40	15.88 N "
"			+906	459.61	23.20 N "
"			1.06	449.5	Elel. Bottom Copper Strip
74605			934	441.2	" "
T.B.17	120			449.35	= 449.35

ELEVATIONS for FORMS Blk # 3

April 13 - 1962

	6.28	598.70		592.42	
	2.27	595.53	5.44	593.26	
	1.52	586.91	10.14	585.39	
4+70			11.91	575.00	F 52 to Elev 580° 4.50 N. Axis
"			11.87	575.04	F 496 " 580° 54.95 S. Axis
4+61			11.90	575.01	F 499 to " 580° 4.50 N. Axis
			6.91	580.00	DS. intersection 54.95 S. Axis
4+51			11.87	575.04	F 989 to Top of Filt 4.01 N. Axis
	5.27	591.63	0.55	586.36	
T.B.M.			2.62	589.01	- 589.04 Marked Rock

50.97
25.04
7.89

ELEVS. for FORMS Blk # 5

April 13-1962

Rogers
Polak
Cook
Robert
Foster

20

	541	517.01		511.60	
5+70			12.09	504.92	F 508 to Elev 510.
5+61			11.83	505.18	F. 556
5+51			11.95	505.01	F 1272
5+70			11.65	505.36	F 4.64 (Nearest Axis)
"			11.92	505.09	F 4.91
TP	10.23	521.83	541	511.60	
5+31			2.79	519.04	F 1801 to top of Fillet 8.80 N Axis
	11.27	522.87	10.23	511.60	
5+31			0.69	522.18	F 4.42 to Bot. of Fillet 14.41 N Axis
			12.87	510.00	Marks for Top of Pour
T.B.M.		11.27		511.60	= 511.60 Marked Rock

CHECK FORMS BIK #8

April 13-1942

Rogers
Cole
Rohy
Foster 21

2.36 446.95 444.59

7+14 +10.79 457.76 1673 w/ Axis

6+67⁵ +10.05 457.00 1680 w/ Axis

" " +1.77 445.18 23.13 w/ Axis

7+14 101 445.94 2306 w/ Axis

263 447.22 2.36 444.59

7+14 6.8 440.4 Elev. Bolt. Copper strip

6+67⁵ 7.3 439.9 " " " "

TBM 263 444.59 = 444.59

457.74
49.57
13.15

457.74
44.51
0.73

57.00
4.45
1.00

44.51
1.00
1.00

ELEVATION for FORMS BIK #5

April 10, 1942

22

205 513.65

511.60

5746

825 505.40

F 15.90 to top of Fillet 10.37 N. Axis

833 505.32

F 5.53 to Bott. " 14.98 N. Axis 1" offset

21.30
505.40

15.90

10.37
505.32

5.53

ELEVS. for FORMS BIK #10

April 15 1942

Rogers
Polak
Cale 23
Roberts
Foster

10.64 455.23

444.59

0.23 455.00 Elevs on form for top of Pour

7+82

4.93 450.30 F 10.50 to top of Filled 16.42 N. Axis

7+61E

5.04 450.19 F 8.04 " " " 16.68 N. "

8+06

5.06 450.17 F 16.01 " " " 15.88 N. "

5.29 499.94 F 3.48 to top wasteway lip 15.19 S. "

10.64

444.59

451.42
49.54
3.48

450.19
16.01
466.20

460.80
5.57
1.25

ELEVATIONS FOR FORMS BIK # 86

April 15-1942

Rogers
Blak
Cole 24
Roberts
Foster

T817, 001 455.91

455.40

Marked Rock

10.77 444.64

6519

F 20.55

6.86 448.55 ✓

5739

F 9.84

4.60 450.81 ✓

6780

16.74

9.00 446.41 ✓

ELEVATIONS for FORMS Bit #2

April 15-1942

Rogers
Polak
Cote 25
Roberts
Foster

	132	620.90		619.58		
4+20			10.84	610.06	F 4.94 to Elev 615.2	28.35 S, Axis
"			10.88	610.02	F 4.98 " " "	1.75 N "
4+11			10.73	610.17	F 4.83 " " "	28.35 S. "
"			10.81	610.09	F 4.91 " " "	1.75 N. "
3+81			4.68	616.22	F 13.40 to Top of Filler	10.2 N. "
			4.33	616.57	F 6.13 to Bot.	4.30 N. "
4+01			10.65	610.25	F 5.97 to Top of Filler	1.70 N. "
3+91			10.80	610.10	F 12.72 to " "	13.6 N. "
"			10.18	610.72	F 5.18 to Bot.	4.64 N. "
TBM	132			619.58 = 619.58		

622.70 102
 629.02
 14.82
 614.18
 613.16
 12.80
 2962
 14.82
 12.80
 4602
 1211
 577

Check froms Blt #6

4-15-82

Exp
Blk
Cole
Robert
Foster

26

0.51 455.91

455.40

6.87 449.04

Bottom of Fillet 6+21

ELEV. FOR FORMS BIK #3

April 16-1942

Rogers
Blak
Roberts
Foster 27

2.33 591.37 589.04

1.66 580.34 12.69 578.68

532 575.02

4471

036 579.98

F00 to Gallery Invent

Gr 579.98

4461

527 575.07

F11.58 to Gallery invent

Gr - 586.65

11.05 590.82 0.57 579.77

8.32 597.65 1.99 589.33

T.B.M.

120

596.45

= 596.48 Marked R. c/c

6.6

8026
7998
36

500
72.07
11.58

Elev. for Forms Blk # 8

April 16-1942

Rogers
Polak
Cole 28
Roberts
Foster

	665	455.15		448.50				95200
6+68 ⁵			5.52	449.63	F 7.37	to top of Fillet	16.80 N. Axis	Gr = 45700
7+13			4.85	450.30	F 7.44	" "	16.73 N "	Gr = 45730
6+68 ⁵			5.00	450.15	F 3.27	to top of Wasteway	15.19 S. "	Gr = 95392
7+13			5.17	449.98	F 3.44	to "	" 5. "	Gr = 45342

57
49.63
7.37

57.74
50.30
7.44

457.42
50.15
7.37

514
44.96
544

ELEVATIONS FOR FORMS Bk #2

April 17-1942

Rogers
Polak
Coto
Roberts
Foster

29

0.23	621.66		621.43		
2.10	621.68		619.53		
1.25	615.44	2.49	614.19		
4+13.23			5.42	610.02	F848 to Invert of Gallery
4+21 ²			2.12	613.32	Invert of Gallery
			5.27	610.17	
			5.38	610.06	
10.43	623.01	2.86		617.58	
TBM,		3.43		619.58	= 619.58

618.50

613.32

21.66
2.10
19.56

ELEVATIONS FOR FORMS BIK# 6

April 17, 1947

Rogers
Polak
Cob 30
Roberts
Foster

T.B.M. 0.77 456.17 455.40

6+20 6.10 450.07

6+11 4.99 451.13

5+97 5.39 450.78

5+91 0.60 455.57

6+11 5.94 450.23

T.B.M. 6.82 462.22 0.77 455.40

5+97 5.21 457.01

9.65 470.29 1.58 460.64

5+91 3.40 466.89

T.B.M. 6.89 463.40

F 1106 to top of Filled 16.39 N. Axis G=461.13

F 0.76 to Bot. " Nail in N. Wall 251.94

F 1902 to Top " 15.72 N. " G=462.80

F 22.73 to " " 4.67 N. " G=478.20

F ^{13.31} 15.31 to Top " 16.19 N. " G=463.74

- 455.40

1.01 above grade 22.05 N. Axis G=455.00

0.39 above grade 21.00 N. Axis G=466.50

= 463.38 Marked Post.

April 18th
Dickinson 31

ELEV'S FOR FORMS - BLOCK # 5

T.BM	3.52	515.12	511.6	
5770		5 ¹⁹	509.93	11° North F = 5 ⁰⁷ To Elev 515 ⁰⁰
5770		5 ⁰⁵	510 ⁰⁷	104 ³⁵ South F = 4 ⁹³ " " "
5756		5 ⁰⁵	510.07	11° North F = 4 ¹⁹ To Grade = 514 ²⁶
5746		4 ⁷³	510.39	10 ³⁷ " F = 10 ⁹¹ " " = 521 ³⁰
5752		0.12	515 ⁰⁰	104 ³⁵ South - Toe of Slope
TP		0.02	515.10	
	8.93	524.03		
Hole #	5-12.5	12.0	512.0	Sta 5+33.5 ~ 7° south of Axis
5731		4.99	519.04	8 ⁰⁰ North F = 18 ⁰¹ To Grade = 537.05
5731		1.84	522.19	14 ⁴¹ " F = 4 ⁴¹ " " = 526.60
T.BM		1.94	522.09	
	11.92	534.01		
T.P.		10.61	523.40	
A -	9.98	533.38		
BM		6.10	527.28	Marked 527.25

ELEV. FOR FORMS ~ Block #4

APR 18th

DICKINSON
32

BM	0.77	564.19		563.42	
T.P.			13.00	551.19	
	5.24	564.3			
		11.39			
5+20		11.39	545.04	7.50 N - F = 4 ⁹⁶	Elev 550
5+20		11.53	544.90	77.75 S - F = 5 ¹⁰	" "
5+11		11.20	545.23	7.26 N ~ F = 7 ²⁰	To Grade = 552.43
5+01		11.14	545.29	6.71 N ~ F = 12 ⁶⁴	" " = 557.93
4+91		8.87	547.56	6.16 N ~ F = 15 ⁸⁷	" " = 563.43
4+91		6.77	549.66	10.68 N ~ F = 5 ³⁴	" " = 555 ⁰⁰
5+10		11.38	545.05	77.75 South F = 4 ⁹⁵	To Elev 550
Hole #4-12.5		3.7	552.7	STA 4+83.5 ~ 7° South of AXIS	
T.BM			5.04	551.39	
	12.69	564.08			
4+81		7.73	556.35	5 ⁶¹ North F = 12 ⁵⁸	To Grade = 568.93
4+81		7.35	556.73	10.13 " F = 3 ⁷⁷	" " 560.50
BM			0.66	563.42	ok

ELEV'S FOR FORMS - BLOCK #10

Apr 18th 33

BM 2.34 464.18

461.84

DICKINSON

TP

8.94

455.74

4.88 460.12

8+06

15.88 North F = To Grade = 466¹⁸

7+82

16.42 " F = " " = 460.80

7+61.5

16.68 " F = " " = 458.23

CHECK FORMS Blk #6

TBM 0.86 45626

455.40

6+21

+4.55

460.81

Elev. to bottom fillet

Gr-460.81

6+01

1.37

459.44

0.86

455.40

= 455.40

CHECK FORMS BIL# 5

April 20-1947

Rogers 35

TBM, 336 514.96

511.60

57.96

6.37

521.28

G = 521.30

10.37 N. Axis

57.56

0.70

514.26

G = 514.26

11.07 N. "

57.70

+0.04

515.00

Top of Power

11.01 N. "

"

+0.04

515.00

" "

105.11 S. "

TBM,

3.36

511.60

= 511.60

ELEVATIONS FOR FORMS BIK # 10

April 20

Rogers 36

CHECK FORMS

TBM,	0.99	462.83		461.84			
7+82			7.86	454.97	F 5.83 to top Fillet	16.42 N. Axis	Gr = 460.80
7+61 ^E			7.80	455.03	F 4.97 to Elev. 460		Gr = 458.23
8+06			7.49	455.34	F 10.84 to top Fillet	15.88 N. Axis	Gr = 466.18
"			7.78	455.05	F 4.95 to elev. 460	150.9 S. Axis	
			7.80	455.07	F 4.97 " "	150.9 S "	
T.P.	1.47	463.31	0.99	461.84			
	5.01	460.51	7.81	455.50			
8+06			5.71	466.22	Top of Fillet	15.89 N. Axis	Gr = 466.18
7+61 ^E			0.61	460.0	Top of Lift	16.51 N. "	
7+82			+0.29	460.80	Top of Fillet	16.42 N. "	Gr = 460.80
T.P.							960

1.77

CHECK FORMS Blk #3

April 20-1942

Rogers 37

T.B.M. 154 580.22

578.68

4+70

0.21

580.01

4.50 N. Axis

Gr. = 580.00

4+51

+4.69

584.91

4.01 N. "

Gr. = 584.93

4+61

0.23

579.99

4.01 N. "

Gr. = 580.1

T.B.M.

154

578.68 = 578.68

158 580.26

578.68

April 28-1942

963

CHECK FORMS Blk #4

April 20-1942

Rogers 38

T.B.M. 1019 561.58 551.39

6.58 555.0

6.88 554.70

1.58 560.00

0.65 552.04 1019 551.39

5+21 1.73 550.31

1.52 550.52

5+21 2.11 549.93

5+20 2.05 549.99

5+11 7.035 552.39

15.92 557.96

T.B.M. 065 551.39

X-on D.S. intersection 74.18 S. Axis

X " " " 70.15 S. "

Top of D.S. Form 77.52 S. Axis

" " D.S. " 77.34 S. "

Grade to Gallery Invert Grade 549.93

Top of Pour 74.8 N. Axis

Top of Fillet 72.6 N. Axis

" " " 67.2 N. " G. 557.93

= 551.39

52.04

2.11

2.11

Apr 21

DICKINSON³⁹ELEV. FOR FORMS - BLOCK # 8BM 4¹³ 46597 461.84

T.P. 498 46030 1065 45532

6+67.5 5.99 454.31 16.50 N - F = 5⁶⁹ To Elev 460.006+93 5.46 454.84 16.50 N - F = 5¹⁶ " " 460⁰⁰7+14 5.21 455.09 16.50 N - F = 4⁹¹ " " 460⁰⁰7+14 5.30 455.00 150.90 South F = 5⁰⁰ " " 460⁰⁰6+67⁵ 5.40 454.90 150.90 " F = 5¹⁰ " " 460⁵⁰

T.P. 10.87 46603 5.14 455.16

BM 418 461.85 Marked El = 461.84

ELEV S FOR FORMS - BLOCK 7

Apr. 21st
Dickinson 40

TBM	2.37	465.75	463.38	
TP	0.69	453.72	12.72	453.08
6+57.5	7.07	446.65	151.90	South F=6 ⁷⁷ To Grade=453.42
6+57.5	5.09	448.63	155.54	" = Toe of slope
6+46 ⁰	4.78	448.94	151.90	South F=4 ⁴⁸ to Grade=453.42
6+46 ⁰	4.82	448.90	155.34	" = Toe of slope
6+35	0.30	453.42		Toe of Slope
TP	12.95	465.98	0.69	453.03
BM		4.13	461.85	Marked EI = 461.85

ELEVATIONS for FORMS BIK #7

April 22-1942 41

TBM	263	466.01		463.38		
TP	639	460.09	12.31	453.70		
TP	296	450.51	12.54	447.55		
6+46			9.38	441.13	F 17.65 to top Fillet	16.63 x 1.4 in Gr = 958.78
Drill Hole # 7-116			3.55	446.96		Gr = 969.8
Hole # 7-349			2.1	443.4		
			9.7	440.8		
TP	612	454.05	2.58	447.93		
	7.71	460.15	1.61	452.44		
B.M.		4.77		455.38	= 455.40	

ELEVATIONS for FORMS Bk #6

April 22-1942

Rogers

42

BM	4.77	460.17		455.40		
6+20			5.03	455.14	F 5.99 to top of Filled	16.39 N. Axis Gr = 461.13
6+11			4.97	455.20	F 8.54 to "	16.13 N. Axis Gr = 463.74
5+97			4.92	455.25	F 12.55 to "	15.72 N. Axis Gr = 462.80
6+01						15.84 N. Axis Gr = 466.54

$$\begin{array}{r} 463.74 \\ 55.99 \\ \hline 85.75 \end{array}$$

$$\begin{array}{r} 462.80 \\ 55.99 \\ \hline 86.81 \end{array}$$

ELEV FOR FORMS Bit #6

April 23-1942

Rogers

43

April 24-1942

B.M. 1226 475.64 463.38

5+84 24' 473.23 F 5.52 to Bot of Fillet 1978 N. Axis Gr = 478.75

" 533 470.31 F 20.20 to top " 13.45 N. " Gr = 490.55

B.M. 1226 463.38 = 463.38

493 460.33 455.90

April 24-1942

5+91 475 455.58 F 22.22 to top of Fillet 1467 N. Axis Gr = 478.30

033 460.00 Marks to top of Pour

478.75	7870
22.25	5553
<hr/>	22.72
5.52	
9051	
7031	
<hr/>	
2020	

ELEVATIONS FOR FORMS BIK #10

April 23-1992

Rogers

44

324	465.08	461.84				
7+61 ^E		5.04	460.04	F4.96 to top of Pour ⁴⁶⁵	16 ⁰⁰ N. Axis	Gr=465.00
"		5.06	460.02	F4.92 to " "	151 ⁹ S. "	"
7+82		5.14	459.94	F5.06 to " "	16 ⁰⁰ N. Axis	G=465.00
8+06		5.08	460.00	F6.18 to top of Filled	1588 ^N "	Gr=466.18
"		5.13	459.95	F5.05 to top of Pour	151.9 S. "	

62.08

492

ELEVATIONS FOR FORMS BIK #5

April 24, 1982

Rogers

45

BM, 1.33 523.42 522.09

BM, 8.36 530.45 522.09

5.45 525.00 Painted X D.S. intersection 96.75 S. Axis

0.45 530.00 " " " 92.95 S. "

8.36 522.09

BM, 0.19 522.28 522.09

2.40 519.88 Grade to Gallery Invert 11° S. Axis Gr. 519.88

0.19 522.09

2.72
19.89
2.70

Elev. of Grout Holes

April 24 - 1942

46

	0.38	581.52	581.14
Grout Hole # 18-25		11.7	569.8
	0.38		581.14

sta 11 + 75

ELEVATION FOR FORMS Bk # 7

April 24, 1942

47

	232	465.70		463.38	
T.P.			10.70	455.00	Mark in Bk # 8
T.P.	151	455.21	12.00	453.70	
			5.10	450.11	F 3.31 to top spillway 151.9 Axis Gr = 453.92
			0.21	455.00	Marks to top of Pour

$$\begin{array}{r} 5.702 \\ 0.011 \\ \hline 3.31 \end{array}$$

CHECK FORMS BIK # 8

April 29-1942

Rogers

48

5.53 460.53

455.00

6.23 454.30 F 5.70 to Elev 460' marked

5.70 454.83 F 5.17 Marked F 5.16 16.50 n/Axis

5.95 455.08 F 4.92 marked F 4.91

IP, 12.08 467.17 5.44

455.09

BM, 531

561.86 = 561.84

ELEVATIONS FOR FORMS B/K #6

April 25-1942

Rogers

49

B.M. 491 460.31

455.90

5.15

455.16

F 984 to Point on curve 1486 w/ Axis Gr- 460.00

+ 7.44

467.98

5.08

455.78

F 1257

Gr- 467.80

B.M.

491

455.40

= 455.40

B.M. 1200 475.38

463.38

4.24

471.14

F 11.61 to Point on curve 16.19 w/ Axis Gr- 482.75

5.08 +

470.30

F 20.25 to top Fillet 1345 w/ Axis Gr- 490.55

2.17

473.21

F 554 = F 552 to Bull Fillet Gr- 478.75

1200

463.38

484.58
 84.9
 453.08
 2.01
 451.07

6750
 533
 1257
 507
 7875
 772
 4.58
 8275
 21.15
 11.51

CHECK FORMS BIK #6

April 25-1942

Repts
Coles
Roberts 50

439 459.79

455.40

+0.21

460.00

Elev to top of lift

439

455.40

ELEV. FOR GALLERY INVERT BIK#10

April 25-1948

Papers

51

903 470.87

461.84

7+60⁵

5.15

465.72

Gr-465.72

8+07

4.68

466.19

Gr-466.19

70.87
65.72

4.15

470.68

66.19

4.49

70.87

65.72

5.15

70.87

466.19

4.68

ELEVATIONS FOR FORMS BIE#11

April 27-1942

Rogers

52

BM 049 462.33 461.84

T.P. 3.35 454.40 11.28 451.05

8.05 446.35 F 3.65 to Elev 450^e 154.50 S Axis

8.21 446.19 D.S. intersection 157.40 S Axis

ELEV. FOR FORMS Blk 4

April 27-1982

Rogers

53

	0.40	563.82		563.42		
	1.88	555.06	10.64	553.18		
5+20			499	550.07	F 493 to Elev 555 ^e	23.95 S. Axis
"			505	550.01	F 499 " " "	39.08 S. "
"			493	550.13	F 487 " " "	7 ^e N. Axis
5+01			497	550.09	F 784 to top of fillet	6.71 N. " Gr=557.93
5+11			500	550.06	F 494 to Elev. 555 ^e	7 ^e N. "
"			488	550.16	F 642 to Gallery invert	11 ^e S. " Gr=556.60
5+21			513	549.93	to Gallery invert	11 S. Axis
4+91			499	550.07	F 1336 to top fillet	6.16 N. Axis Gr=563.43
	11.26	564.28	2.04	553.00		
B.M.			0.87	564.41	= 564.41	

555.06

497

550.09

55.06
549.93

8.03

50.90
39.08

514.8

500.5

6.88

BM 167 465.05 463.38

459 465.21 443 460.62

5491

1741 N Axis GR = 470.50

5497

603 459.18

F862 to top of fill 1572 N " GR = 467.80

6411

530 459.91

F509 to elev. 4652 1600 N " GR = 466.64

6401

561 459.60

F704 to top of fill 1584 N " GR = 466.64

6420

527 459.94

F506 to elev. 4652

"

533 459.88

E 512 " "

502 450.19

F481 " "

508 450.13

F487 " "

TP

624 468.92 253

462.68

BM

552 463.40

= 463.38

FORMS Blk #7

April 28-1942

Rogers

55

191 465.29

463.38

529 460.00

X on rock 151.9 5 Axis

April 28-1947

56

	2.90	620.52		619.58		
4+21						
4+1785						Gr-613.32
4+20			2.52	615.00	Top of Pour	1.74 N Axis
4+11			2.54	614.98	" "	1.73 N "
4+01			6.52	616.20	" "	1.68 N "
TP	2.70	614.79	10.43	612.09		
4+21			1.49	613.30	Gr-613.23	Invert
			+0.21	615.00	28.35	Top of Pour 615.00
			2.83	611.96		
TP	9.40	622.66	1.53	613.26		22.52
B.M.			3.09	619.57	-619.58	7.00

FORMS OK

6.30

CHECK FORMS Blk 11

April 28-1942

Roops

57

B.M. 129 463.13 461.84

TP 241 254.30 11.24 451.89

4.29 450.01

4.04 450.26

TP 7.69 462.91 1.08 453.22

B.M. 1.07 461.84 = 461.84

D.S. intersect: 154.49 S Axis

Point on battered Wall 154.28 S Axis

FORMS O.K.

278
157
121

ELEV. FOR FORMS. Blk #8

April 29-1942

Raps

58

	2.29	465.67		463.38			
6+68 ^s			5.69	459.98	F 502	to Elev. 465 ^o	150 ^o S. of Axis
7+13			5.60	460.07	F 493	" "	" " "
"			5.66	460.07	F 499	" "	16 ^o N. Axis
6+68 ^E			5.69	459.98	F 502	" "	16 ^o " "
			5.52	460.15	F 485	" "	16 ^o N "
	2.29			463.38			

y

$$\begin{array}{r} 65.67 \\ 5.60 \\ \hline 60.07 \end{array}$$
 F 493

CHECK FORMS Blk # 5

April 29-1992

Rogers

59

BM, 0.48 522.57 522.09

5+70 2.55 520.02

5+51 2.56 520.01

5+46 1.27 522.30

4.06 518.51

2.37 520.20

10.50 N. Axis

10.49 N "

10.34 N "

Top of fillet

Bottom of Drain Box-

Top of FORM 100.40.5, Axis

Gr = 521.30

Gr = 518.55

FORMS OK

519.88

1.37

518.55

CHECK FORMS Bk #6

April 29-1942

Rogers

60

2.43 465.81

463.38

6+20

0.79

465.02

Grade strip top of Pour

16° N Axis

+06

0.75

465.06

15.98 N

5+97

+1.99

467.80

Top of fillet

15.70 N Axis

Ar- 467.80

BM,

2.43

463.38

= 463.38

FORMS DE

860

661

1.79

CHECK FORMS Blk # 1

April 29-1947

Pages

61

0.20 651.62

651.42

3+70

6.60 645.02

Top of Pour 0.25 N. Axis

3+56

6.60 645.02

" " 0.24 N. "

3+70

6.62 645.00

" " 14.02 S. "

3+56

6.61 645.01

" " 13.98 S. "

3+26±

6.61 645.01

" " 13.99 S. "

1.65 459.97

1.62 460.00

Top of Fillet on Axis.

6.62 645.00

Marks for top of Pour

FORMS O.

ELEV. FOR GALLERY FORMS Blk[#]10

April 29-1942

884 470.68

461.84

7+60^S

496 465.92

= Gr. Gallery invert 11° S. Axis

449 466.19

= " " "

70.68
66.19
4.49

Gallery Forms BIK #10

April 30 - 1942

63

B.M. 836 470.20 461.84

Grades to top of Gallery Pipes

7+97.7 5.01 465.19 F 491 to top of Gallery Pipe Gr-470.10

7+88.4 4.84 465.36 F 469 " " " Gr-470.00

7+79.1 5.01 465.19 F 472 " " " Gr-469.91

7+69.8 5.28 464.92 F 490 " " " Gr-469.82

Grades to Gallery Invert

7+61.5 5.17 465.03 F 070 to invert Gr-465.23

7+79' 4.94 465.26 F 0.65 " " Gr-465.91

7+90.3 5.00 465.20 F 0.82 " " Gr-466.02

8+06 5.07 465.13 F 1.05 " " Gr-466.18

B.M. 836 461.84 = 461.84

ELEV. FOR FORMS BIK #10

April 30-1942

Rogers

64

Lift to 470^e

810 469.94

461.84

8+06

495

464.99

F 501 to Elev. 470^e

150^g S. Axis

7+61^s

487

465.02

F 493 to Elev. 470

150^g S. Axis

"

494

465.02

F 500 to " "

15^s N. Axis

8+06

493

465.01

F 499 " " "

15^s N. Axis

7+90^s

15^s N. "

CHECK FORMS Bk # 1

Rogers
April 30, 1942 65

	2.08	555.26	553.18		
5720			0.27	459.99	698 N Axis
5711			0.28	554.98	699 N "
5701			72.65	557.91	670 N. "
57928			70.19	555.45	Invert of Gallery 11 ^o 5 Axis Gr = 555.45
BM.		2.08	553.18	= 553.18	
					Gr = 557.93

CHECK FORMS BIL # 8

Elev 465

Rogers
April 30 - 1992 66

6.93 468.77

461.84

6+68^s

3.80 464.97

16.02 N. Axis

6+92^s

16.00 N "

7+13

3.77

16.00 N "

7+13

3.78 464.99 -158.9 S Axis

3.78

6+68^s

3.78

3.65 465.12

7+14

4.36 464.41 Elev. to bottom of box 11° S. Gr = 464.41

6.93
6.94

8.36

ELEV. FOR FORMS BIK #1

Rogers

May 1-1948 67

B.M. 066 652.08

651.42

3438.61

2.08 650.00

F 00 to top of Fillet on Axis Gr = 650.00

"

6.90 645.18

F 432 to " " " " "

3446

6.97 645.11

F 489 to Elev. 650° " "

"

6.98 645.10

F 490 to " " 14' S Axis

3470

7.15 644.93

F 507 to " " on Axis

"

7.08 645.00

F 500 " " 14' S Axis

066

651.42

= 651.42

B.M. 081 650.36

649.55

ELEV. FOR FORMS Bk # 2

Rogers
May 1-1942 68

Pour to 620.

0.79 620.37

619.58

4+20

5.39

614.98

F 5.02 to top of Pour

1.50 N Axis

"

5.30

615.07

F 4.93 to " "

29.79 S Axis

4+01

5.27

615.10

F 4.90 to Elev 620[±]

1.50 N Axis

3+91

5.04

615.33

F ^{7.49}~~5.59~~ to top of Fillet

1.36 N " Gr = 622.82

1.00 620.58 0.79

619.58

4+11

5.53

615.05

F 3.95 to Gallery Invert

Gr = 618.50

+13.32

5.55

615.03

F 3.47 to " "

" "

4+11

5.48

615.10

F 3.17 to " " Adit

Gr = 618.27

82.82
15.33
749
1827
1570

1850
1500
350

ELEV'S FOR FORMS - BLOCK # 6

2.51 477.77

475.26

6+21

7.02

470.75

137.98 South of AXIS

MAY 2
DICKINSON 69
BLAK

ELEV'S FOR FORMS - BLOCK #11

TBM	0.5546239	461.84
8+53.5	10.94	451.45
8+53.5	11.75	450.64
8+45	12.39	450.00
8+45	11.99	450.40
8+25 ²	11.96	450.43
	0.55	462.39

May 2nd

DICKINSON 70

151.90 South F=1.97 To EL 453.42
 154.01 " Toe of slope
 151.9 South F=3.42 To EL 453.42
 154.20 " Toe of slope
 151.90 South F=2.99 To ELEV 453.42

76
908
38
870
900

89.92
48.08
138.00

M 4261
 9.25
 142.54
 13.6
 214.8

5721.0
 375
 835

46.5 12.8
 25
 8+070
 465

17.8
 125
 62710
 754

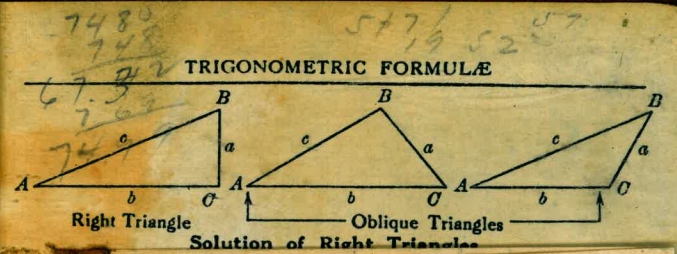
8+070
 465
 6956
 53.42
 46.12

7460.50
 27.04
 730
 76

7487.54
 82
 4380
 5110

7190.50
 82
 151.90
 55480

798
 137.79
 38
 138
 373

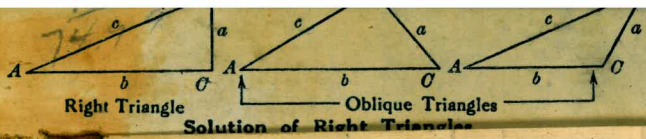


For	8	9	
G			.76
			.75
			380
			53.2
			570.0
A	4.00	14.00	
A	5.27	14.93	
A	9.97	19.44	
G	6.16	25.46	
A	3.67	32.91	
A	1.27	40.51	
a	8.87	48.11	
a	6.47	55.71	
a	4.07	63.31	
a	1.67	70.91	
a	9.27	78.51	
a	6.87	86.11	
a	4.47	93.71	
A	2.07	101.31	
A	9.67	108.91	
A, B	7.27	116.51	
	4.87	124.11	
	2.47	131.71	
	0.07	139.31	

Horizontal distance = slope distance minus slope distance (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. 318.4 x .0041 = 1.31. 318.4 - 1.31 = 317.09 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.

2.8
25
8+07
465
7605
62710
752
619.56
53.42
46.12
50
04
54
4380
5110
55480
5190
748
137.79
38
138
373



Right Triangle
Oblique Triangles
Solution of Right Triangles

OFFSET DOWNSTREAM

	Elev.	0	1	2	3	4	5	6	7	8	9
Given	650	14.00									
A	640	14.64	14.41	14.23	14.10	14.03	14.00	14.00	14.00	14.00	14.00
A	630	18.92	18.42	17.93	17.45	16.99	16.54	16.10	15.68	15.27	14.93
A	620	24.79	24.13	23.49	22.88	22.25	21.66	21.08	20.52	19.97	19.44
A	610	32.15	31.39	30.63	29.87	29.11	28.35	27.60	26.87	26.16	25.46
Given	600	39.75	38.99	38.23	37.47	36.71	35.95	35.19	34.43	33.67	32.91
A, B	590	47.35	46.59	45.83	45.07	44.31	43.55	42.79	42.03	41.27	40.51
A, B	580	54.95	54.19	53.43	52.67	51.91	51.15	50.39	49.63	48.87	48.11
a	570	62.55	61.79	61.03	60.27	59.51	58.75	57.99	57.23	56.47	55.71
a	560	70.15	69.39	68.63	67.87	67.11	66.35	65.59	64.83	64.07	63.31
a	550	77.75	76.99	76.23	75.47	74.71	73.95	73.19	72.43	71.67	70.91
a	540	85.35	84.59	83.83	83.07	82.31	81.55	80.79	80.03	79.27	78.51
a	530	92.95	92.19	91.43	90.67	89.91	89.15	88.39	87.63	86.87	86.11
a	520	100.55	99.79	99.03	98.27	97.51	96.75	95.99	95.23	94.47	93.71
a	510	108.15	107.39	106.63	105.87	105.11	104.35	103.59	102.83	102.07	101.31
A	500	115.75	114.99	114.23	113.47	112.71	111.95	111.19	110.43	109.67	108.91
A	490	123.35	122.59	121.83	121.07	120.31	119.55	118.79	118.03	117.27	116.51
A, B, C	480	130.95	130.19	129.43	128.67	127.91	127.15	126.39	125.63	124.87	124.11
	470	138.55	137.79	137.03	136.27	135.51	134.75	133.99	133.23	132.47	131.71
	460	146.15	145.39	144.63	143.87	143.11	142.35	141.59	140.83	140.07	139.31

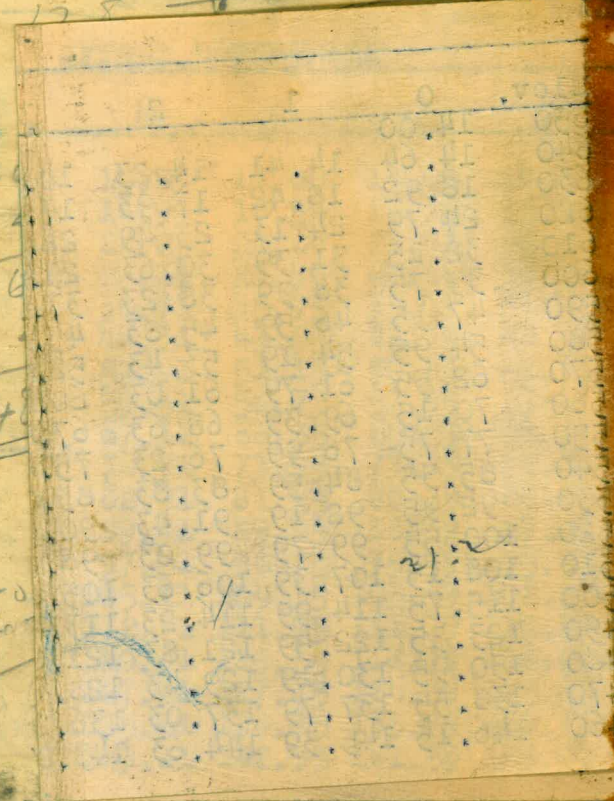


Horizontal distance
When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise=14 ft., slope distance=302.6 ft. Horizontal distance=302.6 - $\frac{14 \times 14}{2 \times 302.6}$ = 302.6 - 0.32 = 302.28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

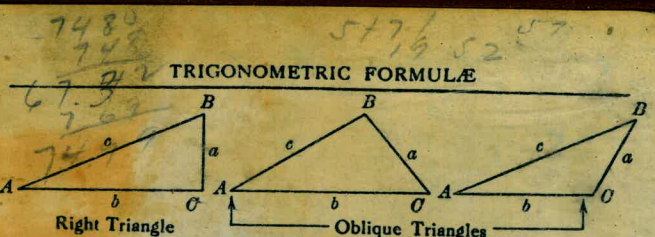
Horizontal distance also = Slope distance minus slope distance times (1-cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10' = .9956. 1 - .9956 = .0044. 319.4 x .0044 = 1.31. 319.4 - 1.31 = 318.09 ft.

9.25 M 4261
 192.54
 13.6
 214
 8
 46.5
 128
 25
 8+07
 46.5
 5+27.0
 37
 83.5

8+
 7+
 7+
 7+90.50
 82
 12



38
 373



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	Formulas
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	$B = 90^\circ - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90^\circ - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90^\circ - A$, $a = c \sin A$, $b = c \cos A$

Solution of Oblique Triangles

Given	Required	Formulas
B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
b, C	A, B, c	$A + B = 180^\circ - C$, $\tan \frac{1}{2}(A - B) = \frac{(a - b) \tan \frac{1}{2}(A + B)}{a + b}$ $c = \frac{a \sin C}{\sin A}$
b, c	A, B, C	$s = \frac{a + b + c}{2}$, $\sin \frac{1}{2}A = \sqrt{\frac{(s - b)(s - c)}{bc}}$ $\sin \frac{1}{2}B = \sqrt{\frac{(s - a)(s - c)}{ac}}$, $C = 180^\circ - (A + B)$
b, c	Area	$s = \frac{a + b + c}{2}$, $\text{area} = \sqrt{s(s - a)(s - b)(s - c)}$
b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
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 = 318.4 ft. Vert. angle = $5^\circ 10'$. From Table, Page IX. $\cos 5^\circ 10' = .9959$. Horizontal distance = $318.4 \times .9959 = 318.09$ 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. $\cos 5^\circ 10' = .9959$. $1 - .9959 = .0041$. $318.4 \times .0041 = 1.31$. $318.4 - 1.31 = 318.09$ 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.