

CARVER AVE.

Align. & Original X-sec,
City Limits to East Ave.

BK. 57 Dr. 16

S.A.P. 62-542-01 50-43A

Sub-grade X-sec.,

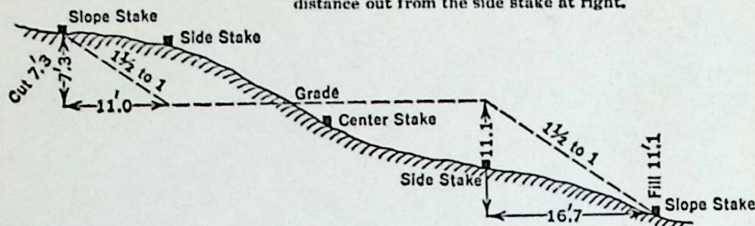
1950

DR. 16 BK. 57 D
AVE.
Align. & Orig. X-sec

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes $1\frac{1}{2}$ to 1.

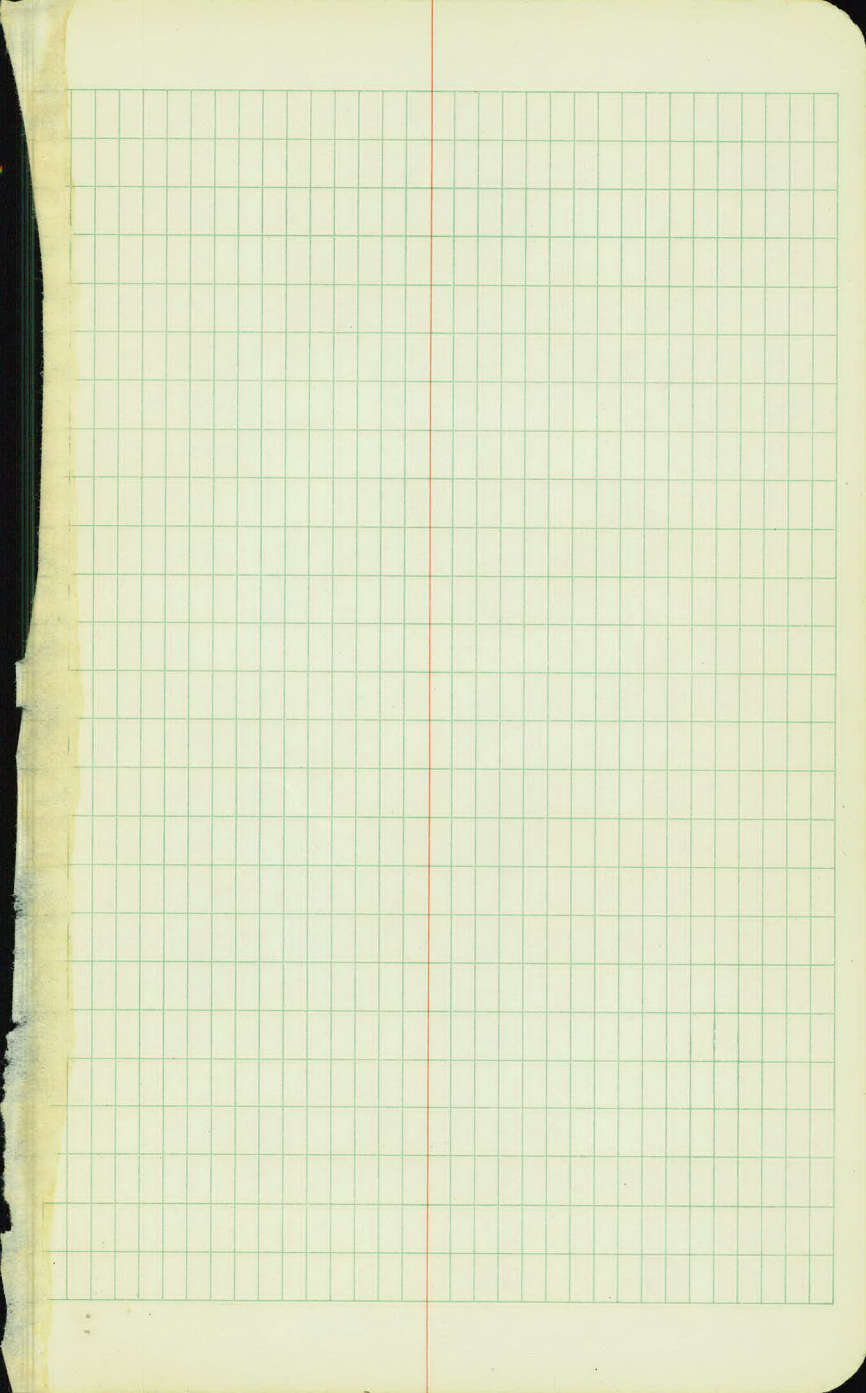
In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



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

KEUFFEL & ESSER CO., N. Y.

For Curve Tables see end of book

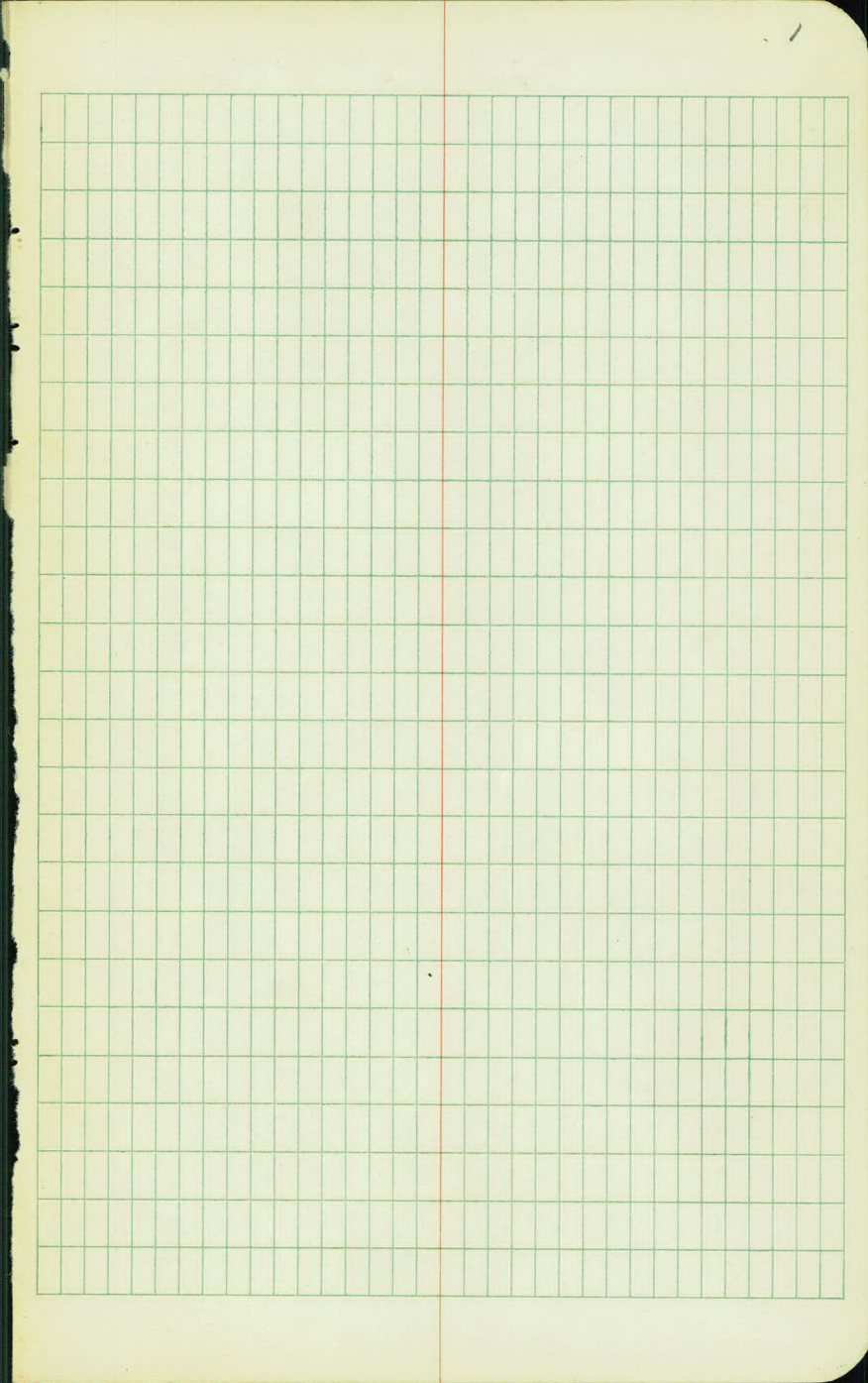


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Align.

Original X Sections

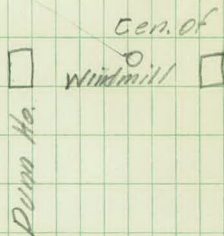
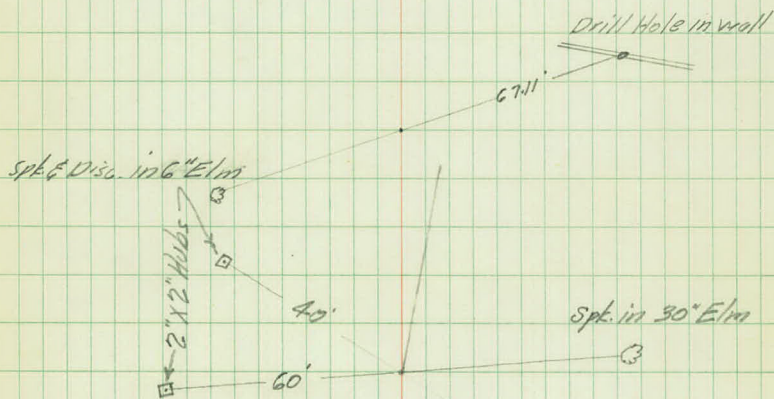
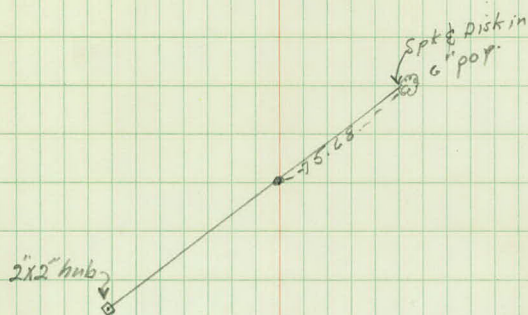


9+22.39 P.I

5 +84.72 P.I.

4 +22.6 P.I.

0 +00





Original Xsections
and
staking notes

Sta.	P.G.	P.G.R.	Sh.G.R.	Elev.
B.M.	7.15	865.18		858.03

0 +00

+26

+44	^{57.81} =chint	7.37	6.87
-----	----------------------------	------	------

+57	58.4	6.78	6.3
-----	------	------	-----

1	60.89	4.29	3.8
---	-------	------	-----

B.M.		7.15	858.03
------	--	------	--------

Sta	P.G.	P.G.P.	Sh.G.P.	Elev.
BM	11.77	869.80		858.03

1 + 50	64.93	4.87	4.37	
--------	-------	------	------	--

T.P.	5.77	874.94 874.84	0.63	869.17 +4
------	------	------------------	------	--------------

2 + 00	69.15	5.69	5.19	
--------	-------	------	------	--

+ 50	73.38	1.46	0.96	
------	-------	------	------	--

T.P.	10.23	884.09 883.99	1.08	873.86 873.76
3	77.80	6.19	5.7	

6-15-55

K.A. C.B.

A.M.

M.B.

K.E.

5

Spt. in 30' Elm of 0-35

56.4

890

57.5

57.6

57.7

57.8

57.9

58.0

58.1

58.2

58.3

58.4

58.5

58.6

58.7

58.8

58.9

59.0

59.1

59.2

59.3

59.4

59.5

59.6

59.7

77

76

61

824

803

796

821

846

81

83

85

22

145

14

12.5

8

14

280

31

40

50

57.7

58.2

58.3

57.76

57.95

57.85

57.57

58.2

58.5

58.2

57.7

57.2

75

70

69

742

723

733

761

70

67

70

75

80

25

20

9

8

6

10.3

13

17

26

30

39

50

58.4

58.9

60.2

60.2

58.9

57.8

58.4

58.5

58.3

57.6

57.6

58.7

60.4

60.0

58.9

57.9

57.3

60.0

50

50

63

74

68

67

69

76

76

65

48

52

63

73

79

22

191

16

12

96

8-7

57

63

75

85

10.7

14

19

220

29

40

62.4

62.2

61.5

60.7

60.6

61.0

61.02

60.7

60.5

60.4

61.2

62.4

62.4

62.4

61.4

60.3

28

30

27

45

46

42

41.6

4.5

4.7

4.8

40

28

28

3.8

4.9

14

105

93

8

7

6

6.2

6.4

8

10

12

16

182

23

61.4

59.8

59.5

60.0

3.8

54

57

172

22

30

P.T.

C.F.O.

509

25

58.8

64

31

L

E

R

SPK in 30" Elm @ 0-35

63.6	65.4	65.9	65.9	64.9	64.0	64.4	64.5	64.4	64.0	64.9	65.9	65.8	65.4
6.2	4.4	3.9	3.9	4.9	5.8	6.40	5.3	5.4	5.8	4.9	3.9	4.0	4.87
20.5	15.0	14	11	9.9	7.9	6.2		6	7.4	9.8	11	16	17.0

61.1	60.5	60.6
8.7	9.3	9.2
26	30	38

BT	58.7	60.3	59.7
CA-50	11.1	9.5	10.1
9.87	50	37	29
28			

69.6	69.6	68.3	67.4	67.5	67.79	67.9	67.7	67.4	67.4	68.4	69.6	69.4
5.3	5.3	6.6	7.5	7.44	7.15	7.04	7.2	7.5	7.5	6.5	5.3	5.5
15	13.5	9.9	8.1	7.0	6.2		6.1	6.7	7.7	9.8	11.5	12.5

BT	63.6	63.1	62.5
C-00	11.3	11.8	12.4
5.2	23.5	28	36
14.4			

BT	60.3	60.8	BT
C-50	14.6	14.1	C-50
10.7	50	33	238
5.2			14.1

73.1	73.7	73.6	72.1	71.0	71.2	71.6	71.79	71.5	71.2	71.2	72.2	73.0	73.0	63.4	62.7
1.8	12	13	28	39	37	33	31.5	3.4	3.7	3.7	2.7	1.9	1.9	11.5	12.2
15.4	14	12	10	8	7	6	6	7	8	10	11.5	14.2	30.5	30.4	

66.3	64.8	63.6
8.6	10.1	11.3
25.5	30	50
		14

BT	62.4
C-F11.0	12.5
12.6	50
50	

67.5	77.4	77.4	76.3	75.6	75.6	75.9	76.0	75.8	75.4	75.4	76.5	76.8	76.5	66.2
16.6	6.7	6.7	7.8	8.5	8.5	8.2	8.0	8.3	8.7	8.7	7.6	7.8	7.6	17.9
28	14	12	10	8.5	6.5	6		6	6.4	8	10	10.5	14	30

BT	65.7
C-F11.2	18.7
16.9	39.4
33.0	

BT	65.3
C-F11.0	18.8
18.8	50
50	

Sta	P.G	P.G.R. 894.09 883.99	Sh.G.R.	Elev.
3+50	82.61	1.38	0.9	
TP	717 5.77	889.27 889.17 887.77	1.99	882.10 882.00
3+75	85.19	3.98	3.5	
4	8792	1.23	0.7	
T.P.		895.68		886.73
B.M.	8.95	895.58	2.54	886.63

Sta.

P.G.

P.G.R.

Sh.G.R.

Elev.

895.68

895.58

4 +25

90.84

4.74

4.2

+40

92.7

2.88

2.4

903.89

T.P.

9.25

903.79

1.04

894.64

894.54

+70

96.43

7.36

6.9

+79.21

97.59

6.20

5.7

92.2	91.9	89.7	88.6	88.7	89.1	89.3	88.9	88.8	88.3	88.2	89.0	89.8	89.7	83.5
35	38	60	71	70	66	64	68	69	74	75	67	59	60	122
20.3	18.2	15	137	12	7.3	5	14	2.2	37	5.2	7.6	12	23	

91.8	90.4	90.0	00	474	458	42	77.2	80.5	80.7	81.9
39	53	57	265	250	175	BT	145	152	150	138
24	285	34	BT				50	360	33.5	28.6

94.7	94.1	93.3	90.4	90.5	90.9	90.9	90.7	89.9	89.9	91.0	91.9	91.9	86.2	84.4	83.1
10	1624	42	53	52	48	48	50	58	58	47	38	38	95	11.9	126
27.5	21.1	14.4	12.5	11.0	10.5	2.7	4	5.4	6.7	8.6	15	26	31.5	40	

12.8	1.9	32.5	C.C.18	1.08	24	BT	C.F.9.6	12.48	90.0	BT
------	-----	------	--------	------	----	----	---------	-------	------	----

94.7	94.5	97.5	95.5	94.9	94.1	94.1	94.6	94.64	94.8	94.8	94.2	94.1	95.4	97.3	97.8
42	44	64	84	90	98	98	93	9.25	91	91	97	98	85	66	61
19.0	18.5	11	8	6	4.8	3	15	6	12	13.5	14.8	16.4	20	20	24

90.4	90.6	C.C.40	336	26	BT	97.0	F.00	69	192	96.5	97.4	27
------	------	--------	-----	----	----	------	------	----	-----	------	------	----

BT	C.C.25	2.7	26	99.0	99.1	97.9	96.2	95.2	95.15	95.24	95.76	96.08	95.94	95.4	95.4	95.4
49	4.8	6.0	7.7	8.7	8.74	8.65	8.13	7.81	7.95	8.5	8.5	15.8	16.5	18		

902.7	1.2	33	BT	C.C.0.0	5.7	24	98.0	96.7	7.2	20
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Sta	P.G	PGR	SHGR	Elev
		89 903.79		
TP	907	910.01 909.91	2.95	94 900.84

4+90

4+98.2		9.93	10.0
5+00	99.98	2.81	39

5+03.7			
5+05.5	00.68		

05.2	05.4	08.1	08.11	05.9	01.0	99.0	98.0	97.7	96.8	96.8	97.7				
41.8	46.14	1.9	4.1	9.0	11.0	12.0	12.3	13.2	13.2	12.80	12.5	12.8			
34	25	23	21	17	8.0	2.0	0.5	2.5	3.5	4.5	13	18.5			

77.2	60.2	99.9	98.9	97.8	96.7	96.7
138	98	10.1	11.1	12.2	13.3	13.3
40	34	30	25	22.8	20.9	19.7

08.8	04.7	00.8	00.2	98.7	97.5	97.5	98.20	98.64	98.49
1.2	5.3	9.2	9.8	11.3	12.5	13.5	11.80	11.37	11.52
17	8	3		2.5	4.5	5.5	6.5	15	21

DC.13	00.8	00.3	98.9	98.0	98.0
87	87	87	87	87	87
CP 1.2	CP 0.0	9.2	9.7	11.1	12.0
8.1	8.1	30	27	24.8	23.3
34	34				22

06.5	00.5	99.2	98.4	98.4	99.0	99.33	99.25
3.5	7.5	10.8	11.6	11.6	11.0	10.68	10.76
8	3.5	5.5	6.7	7.8	16	22	
		8.3	8.4	9.6	10.5	11.3	11.3
		36	32	26	26.5	24.5	23.5

Sta	P.G	P.G.R	Sh.G.R	Elev
		910.01		
		909.91		
+18.2				
5+20	902.51	7.4	7.5	

		34		57
TP	9.77	916.24	3.44	906.47
+30				
5+31.8	03.99	12.25	12.3	

+43				
5+45.7	0596	10.28	10.4	

06.3	03.4	02.6	01.1	00.3	00.3	00.88	01.13	01.09
3.7	6.6	7.4	8.9	9.7	9.7	9.13	8.88	8.92
4		3	7	8.8	9.5	11.0	19	25
		0.32	0.07	0.04	0.07	0.05	0.05	0.05
			6.8	7.6	8.3	9.5	9.5	9.5
			33	31	29.7	28.2	27	

12' P* on Boulder @ 5+65

08.3	05.4	04.6	04.5	03.0	02.5	01.5	01.5	02.4
8.0	10.9	11.7	11.8	13.3	13.8	14.8	14.8	13.9
7	3		3	8	9.3	10.8	11.8	13.3

This section is ok K.A.

04.5	04.0	02.7	02.3	01.6	01.6	02.4	02.62
11.8	12.3	13.4	14.0	14.7	14.7	13.9	13.72
41	34	31	30.5	29.5	28.5	27.5	21

04.6	04.8	05.9	06.4	08.6	10.2	13.4	10.2
11.7	11.5	10.4	9.9	8.7	6.1	2.9	6.1
13.3	12.5	4		9	21	33	21.2

03.2	6.1	2.9	6.1	8.7	9.9	10.4	11.5	11.7	12.3	12.5	11.52
21.3	33	21	9		7	12.3	13.3	14.3	15.2	17	

29	50	8.3	9.5	10.3	10.9	12.0	12.75	12.2	12.4	10.4	9.9
32	24.8	10	6		8	12.8	14.16	14.7	30	37	41
13.4	11.3	08.0	06.8	06.0	05.4	04.3	03.59	04.1	03.9	05.9	06.4

7.5	8.7	10.1	11.4	12.6	12.6	12.00	11.75
45	42	37	34	33	31.8	30.6	29

06.9	9.4	06.5	9.8	41.3	41.3
46					

Sto P.G. P.G.R. Sh.G.R. Elev

³⁴
916.24

~~5 + 35.2 907.14~~

5 + 54 06.99 9.25 9.3

+ 73 09.27 6.97 7.1

T.P. 5.60 921.77⁸⁷ 0.07 916.17²⁷

4 + 98.2 99.98 21.79 21.3

5 + 03.7 00.68 21.09 20.6

4.2	6.7	8.4	9.0	7.7	10.4	9.8	11.0	11.3
25	17	8	6		5	11	12	13.8
		10.5	09.5	07.8	06.2	05.7	05.3	04.8
		58	68	85	101	106	110	115
		23	17	8		8	12	139-146
						Eq.	16	29.3
							31.5	34

10.2	10.6	12.13	08.1
6.1	5.7	06.1.2	08.2
47	43	8.0	38.5
		BT	

14.6	08.6	08.0	08.4	09.1	08.4	07.7	08.2	07.38
17	7.7	8.3	7.9	7.2	7.9	8.6	8.1	8.96
15	8	6		6	9	10-11	12	26.6
						Eq.		27.7-29
								30.8

10.16	13.9	10.7	09.7
06.1.5			
55	24	56	66
38.5	43	39	36
BT		BT	

Apt in retaining wall (Lowest one)

06.5	09.8	06.8	06.6	10.4	10.4
0.59					
13.4	12.1	15.1	15.3	11.5	11.5
27.2	39	35	28	23	21

11.2	08.2	07.5	12.5	09.5
		0.62		
10.7	13.7	14.4	9.4	12.4
40	36	28.5	21-20	14

Sta	P.G	P.G.R	Sh.G.R.	Elev.
		87 921.77		

5+18.2	902.51	19.26	18.8	
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5+30	03.99	17.78	17.3	
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+43

+54	06.99	14.78	14.3	
-----	-------	-------	------	--

TP.			0.14	921.63 ⁷³
-----	--	--	------	----------------------

TP.	2.04	31 918.21	5.60	27 916.17
-----	------	--------------	------	--------------

5+90

6+00	912.51	5.70	5.8	
------	--------	------	-----	--

15.5	13.1	12.2	12.6	13.3	18.5	17.9	14.0
64	88	97	93	86	34	40	79
44	91	37	330	31	24	21	15

14.9	15.7	15.8	15.3	16.6	19.9	18.2
20	62	61	66	53	20	37
48	42	364	389	34	29	21

21.9	19.5	18.5	15.0
0.0	24	34	6.9
50	45	40	35

10.3	20.1	13.8
0-2.7	1.8	8.1
11.6	11	27

Spt on down No. of Rat wall

Top of Low Spt on Rat wall

15.2	11.9	11.2	10.4	9.7	9.7	10.45	10.28	10.0	9.2	9.2
3.1	6.4	7.1	7.9	8.6	8.1	7.84	8.03	8.3	9.1	9.1
12	4.0		4	5.3	6.6	7.2	11	22	23.2	20.7

14.5	13.4	12.2	11.7	10.7	10.7	10.7	11.26	11.21	10.91	10.3
3.8	4.9	6.1	6.6	7.6	7.6	7.85	7.10	7.40	8.0	8.0
11	5		13	2.5	3.5	4.7	11	19.5	20	20

17.2	16.8	13.4	11.5	10.3
1.1	1.5	4.9	5.8	8.0
50	35	29	26.8	21

Sta	P.G	P.G.R	Sh.G.R	Elev
		918.21 ³¹		

6+18	914.67	3.54	3.6	
------	--------	------	-----	--

+25	915.51	2.70		
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7P.			2.04	
-----	--	--	------	--

TBM	10.85	932.48 ⁵⁸		921.63 ⁷³
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5+73	09.27	23.21	22.7	
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5+90				
------	--	--	--	--

18.3	16.7	15.2	13.6	12.7	12.66	13.1	13.11	12.77	12.3	12.3	13.3
0.0	1.6	3.1	4.7	5.6	5.65	5.2	5.20	5.54	6.0	6.0	5.0
15	14	11	2.5	1		1.7	11	16	16.5	17.7	19.5

17.9	17.4	15.1
0.4	0.9	3.2
50	28	24.5

R-80
 CA-01
 3.54
 BT

17.2	15.6	14.3	13.4	13.4	13.7	13.86	13.85	13.63	14.10	15.5
1.1	2.7	4.0	4.9	4.9	4.6	4.45	4.46	4.68	4.21	2.8
13	7	3.5	2.0	10		0.2	11	14	20.5	30

16.7	16.6
1.6	1.7
50	411

Spton Lowm No of Ret. Wall

27.4	27.5	28.6	27.7	26.4	16.0
C-17.5	5.2	5.1	4.0	4.9	6.2
49.0	48	48	41	33	16

✓

29.0	31.1
3.6	1.5
56	60

34.6	32.6	29.9	30.0	32.6	29.4
+2.0	0.0	9.7	9.6	0.0	8.2
62		53	48	42	33

✓

Sta	P.G	P.G.R	Sh. Gr.	Elev
		932.48 ⁵⁸		
TBM			0.88	931.60 ⁷⁰
TBM	7.48	929.12 ²²	10.84	921.64 ⁷⁴
6+36.24	16.65	12.77	12.6	
6+43.24	17.39	11.73	11.8	
+57.48	18.81	10.31	9.9 10.4	

6-21-50

14

Spk in 6" oak 50' Lt. @ Sta 5+70

Spk in Lawn No of Ret wall

19.2	18.0	16.5	15.5	14.6	14.6	15.0	15.07	14.87	14.77	15.0	16.4
10.0	11.2	12.7	13.7	14.6	14.6	14.2	14.15	17.35	14.45	14.2	12.8
16	12	7	5.4	30	1.8	1		11	13.5	19	37
			E.G.								

21.1	18.5	17.9	16.1	15.4	15.4	15.87	15.97		16.0	15.77	16.1
8.1	10.7	11.3	13.1	12.8	13.8	13.35	13.25	13.45	13.2	13.45	13.1
19	14	9	6	4.5	3.0	1		2	5	11	14
			E.G.								

23.7	19.9	19.0	17.8	16.6	16.6	17.29	17.37	17.11	16.6	16.6	17.7	18.9
5.5	9.3	10.2	11.4	12.6	12.6	11.93	11.85	12.11	12.6	12.6	12.5	10.3
22	12	10	70	60	4.5	3.5		11	12.5	12.5	15	20
			E.G.								E.G.	

23.1	23.0	22.4	20.7	18.1
6.1	6.2	6.8	8.5	11.1
50	30	25	27	21

Sta	P.G	PGR	Sh. Gr.	Elev.
-----	-----	-----	---------	-------

929.12²²

+ 75	20.63	8.49	8.0	
------	-------	------	-----	--

7	23.19	5.43	5.5	
---	-------	------	-----	--

T B/M	13.52	945.12 ²² 935.14	921.14	931.60 ⁷⁰
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6+00	912.51	32.61	32.1	
------	--------	-------	------	--

15

50-00	24.7	24.7
55	4.5	4.5
17.8	50	30
BT		

37.8	33.4	31.7	32.0	34.7	33.4
7.4	11.8	13.5	13.2	10.5	11.8
62	57	50	45	42	35

~~C-3.5~~
~~10.6~~
~~41~~

37.8
 C-24.7
 7.4
 62

32.1
 C-19.0
 13.1
 52.0

Sta	P.G	P.G.R	Sh.G.R	Elev
-----	-----	-------	--------	------

945.12²²

6+18	914.67			
------	--------	--	--	--

6+25	915.51	29.61	29.1	
------	--------	-------	------	--

BM =	6.62	949.22 ³²	2.52	942.60 ¹⁰
------	------	----------------------	------	----------------------

+36.2	16.65	32.57	32.1	
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+43.24	17.39	31.83	31.5	
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+57.48				
--------	--	--	--	--

40.5				
4.7	10.0	10.9	9.2	12.3
62	55	47	44	33

36.1				
9.1	9.5	8.2	10.5	
51	46	43	34	
42.3	42.1	41.4	41.2	
4.9	3.1	3.1	2.0	
57	63	63	63.5	

Spt in P.P.

44.3			
43.6			
5.0	5.7	11.2	12.3
59	52	44	34
64	57	46	39

5' error in distances

4.6	5.3	5.2	10.4
5.5	4.9	4.8	3.7
6.6	5.3	4.7	4.2

44.7	44.0	44.1	38.9
------	------	------	------

41.6	5.7
64	47

44.7	43.6
------	------

Sta.	P.G.	P.G.B. 32 949.22	Sh.G.B.	Elev.
6	+75			
7				
	+25			
	+50			
TP	1.76	81 940.71	10.27	939.05 938.95
TBM			2.43	
TP.	0.05	97 929.87	10.89	92 929.82
			8.26	71 921.61 (921.61)
6+57.48	18.81	11.06	10.6	
	+75	20.63	9.24	8.7
7+00	23.19	6.68	6.2	

L				
	43.3	43.9	43.0	
	6.0	5.4	6.3	✓
	64	47	47	
45.9	43.1	43.1	43.6	
3.4	6.2	6.2	5.7	✓
61	56	50	41	
	44.6	42.9	41.9	40.5
	47	64	74	68
	59	55	50	34
	41.8	40.6	40.6	41.3
	7.5	8.7	8.7	8.0
	54	50	40	33

spt in lawn No of Ret wall sro page 14

$$\begin{array}{r}
 19.9 \\
 60.5 \\
 \hline
 10.1 \\
 \hline
 16
 \end{array}$$

$$\begin{array}{r}
 22.5 \\
 50.3.1 \\
 \hline
 7.5 \\
 \hline
 24.1
 \end{array}$$

$$\begin{array}{r}
 22.0 \\
 60.7 \\
 \hline
 8.0 \\
 \hline
 15.4
 \end{array}$$

$$\begin{array}{r}
 25.0 \\
 50 \\
 \hline
 1.2 \\
 \hline
 5.0 \\
 \hline
 16.4
 \end{array}$$

Sta PG PGR Sh. GR.

929.87⁹¹

7+25 25.75 4.12 3.6

T.P. 6.59 936.41⁵¹ 0.05 929.82⁹²

7+50 28.24 8.17 7.7
12.17 11.9

+75 30.57 5.84 5.4

TP 13.60 943.42⁵² 6.59 929.92⁹²
929.82 PT Sta 7+85.1

29.0	26.9	24.9	24.6	24.1	24.60	24.47	23.99	24.2	24.4	25.5	25.6	25.2
1.0	3.1	5.2	5.4	5.9	5.37	5.50	5.98	5.8	5.4	4.0	4.4	4.8
17	13	9.6	8.8	7	5.8		5.7	10.2	11.8	18	30	50
		EG							EG			

SC 1.5
2.1
1.5
BT

SC 1.2
1.8
16.4

29.5	27.1	26.2	26.2	26.84	26.63	26.48	26.1	26.1	27.0	27.2	27.8
7.0	9.4	10.3	10.3	9.70	9.88	10.03	10.4	10.4	9.5	9.3	8.7
16	11.4	9.7	8.5	7.8		6.3	7.3	8.6	10.2	20	80
									EG		

SC 00
2.7
14

SC 1.7
9.4
17.4

32.0	30.2	29.1	28.3	28.3	28.91	28.95	28.87	28.3	28.3	29.5	29.9	31.6	35.2
4.5	6.3	7.4	8.2	8.2	7.60	7.56	7.64	8.2	8.2	7.0	6.6	4.9	1.3
18	18	13.7	11.7	10.5	9.1		4.6	6.3	7.4	8.6	13	18	20
		EG								EG			

SC 00
5.4
16.2
BT

SC 00
5.4
16.5
BT

Sta	P.G	P.G.R	Sh.G.R.
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		943.42 ⁵²	
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7+75	30.57	12.8	12.3
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8+00	32.84	10.6	10.1
------	-------	------	------

+12	33.93	9.5	9.0
-----	-------	-----	-----

+16			
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31.28	31.32	31.30	30.6	30.6	31.6	30.6	31.6	32.7	33.1
12.24	12.20	12.22	12.9	12.9	12.9	11.9	10.8	10.4	
18	5	6	7	9	11	14			
39.1	39.0	39.3	39.1	39.0	39.3	39.1	39.0	39.3	39.1
4.21	4.5	4.2	4.2	4.5	4.2	4.2	4.5	4.2	4.2
50	35	30	50	35	30	50	35	30	50

30.6	30.6	31.5	37.1	37.4	36.3	37.6	37.6	37.6	37.6
12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9	12.9
11	12	13	22	28	34	46	46	46	46
15	11	9	6	7	5	11.14	11.26	11.6	11.6
35.4	33.9	33.0	31.9	31.9	32.3	32.38	32.26	31.9	31.9
8.1	9.6	10.5	11.6	11.6	11.2	11.14	11.26	11.6	11.6
15	11	9	6	7	5	11.14	11.26	11.6	11.6
37.6	39.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8
3.9	4.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
20	24	40	40	40	40	40	40	40	40
36.4	34.0	32.8	32.66	32.66	32.66	32.66	32.66	32.66	32.66
2.1	9.5	10.7	10.8	10.8	10.8	10.8	10.8	10.8	10.8
41	21	13	9	9	9	9	9	9	9
41.0	40.5	40.1	37.3	33.3	33.3	33.3	33.3	33.3	33.3
1.5	3.0	3.4	6.2	10.2	10.2	10.2	10.2	10.2	10.2
40	15	30	17	9	9	9	9	9	9

Sta	P.G	RGR	Sh GR	Elev
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		943.42 ⁵²		
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8+34	35.85	7.6	7.1	
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+45 ⁸⁵	36.77	6.7	6.2	
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+50	37.18			
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Sta P.G. PGR Sh GR

943.92⁵²

8+54

+63 38.51 4.91 4.6

+67

TD 9.29 949.06 848.96 3.75 939.67⁷¹

Sta	PG	PGR 949.06 848.76	SHGR	Elev
8+75	39.11	9.85	9.3	
9	40.73	8.23	7.7	
126 TP 6-24-50	6.02	949.92 849.82	5.12	943.90 843.80
+25	42.10	7.72	7.2	
+50	43.14	6.68	6.2	

7.2	110	12.0	12.0	11.58	11.86	11.42	11.9	11.9	10.8	9.9	9.3
15	9	8	7	6		8	9	10	11	14	14
EG.									EG.		BT
41.9	38.1	37.1	37.1	37.48	37.70	37.64	37.2	37.2	38.3	39.2	5000

[illegible]

0	2.1	43.5
5.6	5.8	43.3
18.2	15	
	8.0	41.1
	10	
	8.8	40.3
	6	39.5
55	9.6	38.5
5.5	9.1	39.74
4.7	8.2	39.77
3.5	2	9
56.1	95.0	39.56
	11.5	
	8.9	39.2
	9.9	39.2
	13.6	
	8.8	40.3
	15.5	
56	18	41.0
	21	42.2
	6.9	
	1.0	
45	2.5	
	28	
	17.0	
	7.7	
	50-00	
	41.4	

Handwritten data on lined paper:

Top row (left to right): 45.3, 44.6, 44.3, 43.7, 43.5, 41.7, 40.8, 40.8, 41.3, 41.2, 41.9, 42.7, 46.0, 49.1, 48.3

Second row (left to right): 42.2, 43, 23, 5.6, 18.2, 5.8, 8.0

Third row (left to right): 41.2, 41.9, 42.7, 46.0, 49.1, 48.3

Bottom row (left to right): 41.2, 41.9, 42.7, 46.0, 49.1, 48.3

Handwritten notes and calculations:

PP Pt @ Sta 7

66.20

472 46 5.19

28 34 17.83 14 10.5 5.5 2 0.5 18 16 19.5 24.4 30 36 50

PT.

EG.

FOO

7.2

24.4

3.9 0.8 1.6

EG

[illegible]

Sta	P.G.	P.G.P. 949.92 848.52	Sh.G.R.	Elev.
7 +75	43.96	5.96	5.4	
10	44.40	5.42	4.9	
+10				
+93	44.80	5.0	5.5	
End Conc. +39	44.91	4.9	5.4	
+50				
+54	45.1	4.7	5.2	

6-29-50

K.H.

P.M.

14.12

23

P.C.

Q

P

48.50	46.6	46.6	46.5	45.2	45.6	44.8	44.5	43.5	42.9	43.2	43.0	43.4	44.2	44.9	
CC.26	326	33	CC.20	34	47	43	51	54	64	70	67	69	65	57	50
300	30		180	7	35		15	3	67	14	20	246	262	33	
							EG					EG			
48.3	47.8	47.3	46.4	46.0	45.3	44.7	43.9	43.6	44.0	43.7	43.3	44.2	44.2	44.2	
CC.40	142	16	CC.23	26	35	39	46	52	60	63	59	62	66	57	
30	30	26	186	14	35		25	35	70	15	212	225	253	253	
							EG					EG			

48.8	44.7
51	503
33	52
	315

48.4	47.3	46.5	46.0	45.6	45.1	44.2	43.9	44.2	44.1	44.0	44.5	44.7	45.3
15	26	34	39	43	48	57	60	57	58	59	54	52	46
30	21	14	3		2	44	72	153	213	23	252	30	43
						EG					EG		
48.4	48.3	47.5	46.4	46.1	45.8	45.1	44.7	44.8	44.6	44.9	45.1		
CC.35	15	16	CC.31	24	35	38	41	48	52	51	53	50	48
30	30	212	9		15	32	7	15	213	25	30		
						EG				EG			

48.4	47.9	47.1	45.6	44.9	45.0	44.8	45.0	44.7	44.8	45.3	44.9
15	20	28	43	50	49	51	49	52	51	46	50
38	32	23	10		9	7	16.0	24	254	39	50
					EG				EG		

49.3	47.6	45.8	45.5	45.1	45.1	45.1	44.8	45.0	44.6
06	23	41	44	48	48	48	51	49	53
41	25	6	7	14	23	25	33	50	

49.7	47.6	49.0	47.9	46.9	46.2	45.3	45.2	45.2	45.1	44.8	45.0	44.6		
CC.50	02	03	CC.43	09	20	30	37	46	47	47	48	51	49	53
30	30	234	10.5	45	2	8	16.0	23	24	26	46			

Sto	P.G.	P.G.B. 949.92 849.82	Sh.G.B.	
11 +00	45.9	3.9 ²³	4.4	
T.P.	6.88	9.54.13 857.13	2.57	9 ³⁵ 847.25
T.P.	9.87	50 957.40	6.60	63 947.53
+20	46.48	10.92	11.42	
+50	47.50	9.9	10.4	
+80	48.52	8.98	9.5	
12	49.20	8.20	8.7	
+30	50.14	7.24	7.8	
+63	51.30	6.10	6.6	

Sta	P.G	P.G.R	ditch GR	Elev
		50 95740		
13+00	52.05	5.35	5.9	
13+25	52.62	4.8	5.2	
+50	53.20	4.20	4.7	
Sta 11+00	45.90	11.5	12.0	

Sta	P.G	P.G.R	ditch G.R.	
B.M.	6.22	953.57	947.35	947.35
T.P.	6.27	959.49	0.35	953.22

13 + 66.01	PI @ City Limits	54.25
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14		54.8
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55.6

150

15		56.7
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B.M.	4.88	954.61
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top door sill front of Turpin Ho.

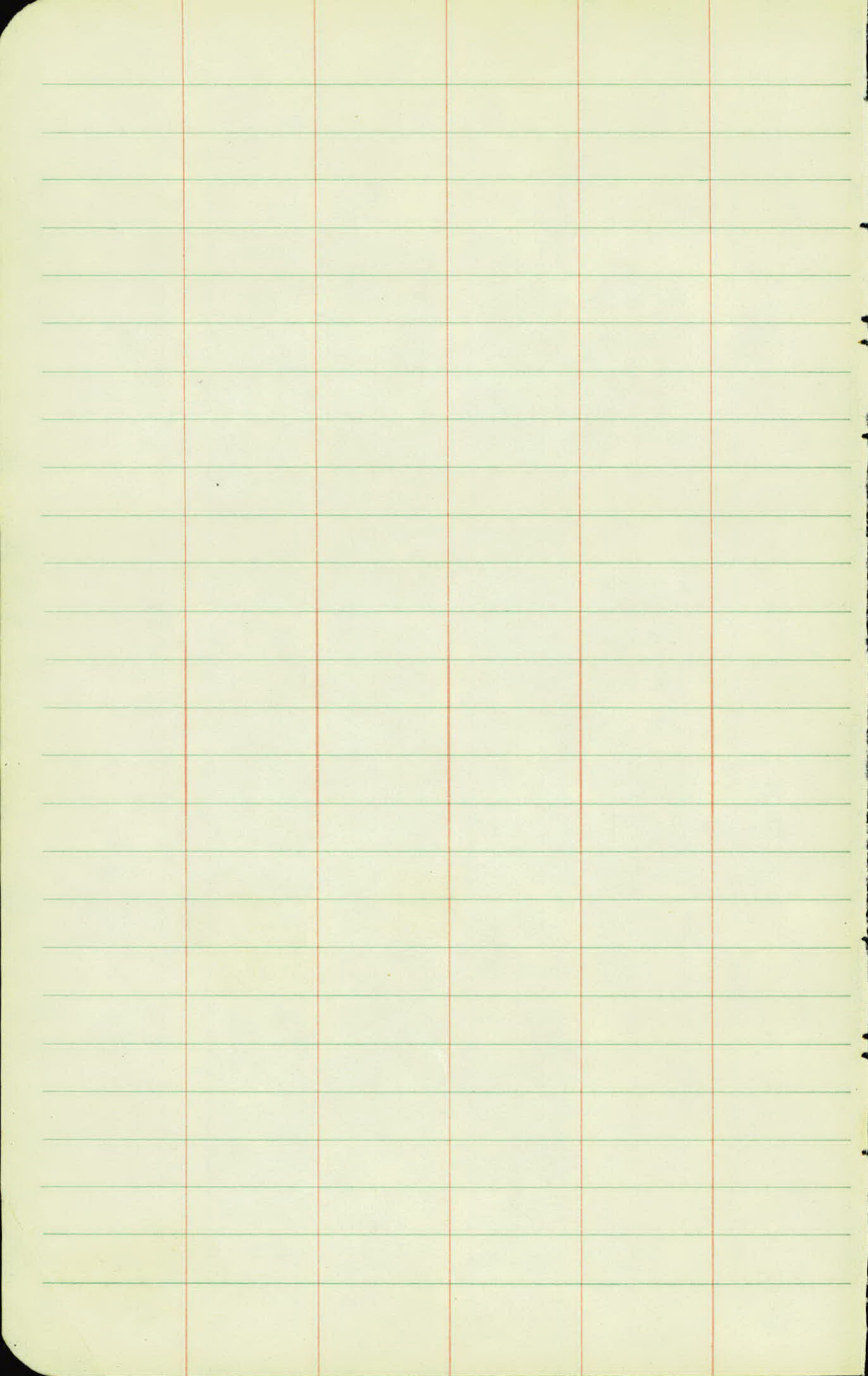
54.7									
4.8	54.0	53.5	54.1	54.24	54.2	53.7	53.0	53.0	56.3
50	39	22	9	5.25	5.3	5.8	6.5	6.5	3.2
					8	19	24	26	31
									50

54.6									
53.6	53.6	53.6	52.7	54.3	54.7	54.3	53.1	53.1	54.5
4.9	5.9	5.9	6.8	5.2	4.8	5.2	6.4	6.4	5.0
50	31	23	20	11	7	17	22	24	27
				5					40
									50

54.3									
53.9	53.9	53.5	54.8	55.2	55.6	54.9	55.0	53.8	53.8
5.2	5.6	6.0	4.7	4.3	3.9	4.0	4.5	5.7	5.7
50	26	20	16	11		12	19	24	21
									26
									35
									50

54.0									
53.8	53.3	53.8	56.3	56.7	56.8	56.3	55.2	55.2	54.7
5.5	5.7	6.2	5.7	3.2	2.7	3.2	4.3	4.3	4.8
50	35	26	19	10	11	19	22	29	40
									50

Spk in PP 26' Lt, @ City Limits + 16' East.



Staking Notes - Pavement

Sta.	P.G.	Form G.M.C.	Form G.R.	
B.M.	13.19	932.81		924.62
8	+00	32.84	32.74	5.07
	+25	35.10	35.00	2.81
	+50	36.96	36.86	0.95
TP	10.55	947.41	0.95	36.86
	+75	39.11	39.01	8.40
9		40.73	40.63	6.78
	+25	42.10	42.00	5.41
	+50	43.14	43.04	4.37
	+75	43.96	43.86	3.55
10		44.40	44.30	3.11
TP			0.14	947.25
				47.25

Top

Top NE Cor Conc. Door Step #22.04

C-00
8.40C-00
8.46C-00
6.78C-00
5.41C-00
5.41C-00
4.37C-0.0
4.37C-0.0
3.55C-00
3.55C-00
3.11

3.11

Sta	P.G	Form Grade		
BM	650	931.12		924.62
6 + 50	18.07	12.97	13.15	
+ 75	20.63	20.53	10.59	
7	23.19	23.09	8.03	
+ 25	25.75	25.65	5.47	
+ 50	28.24	28.14	2.98	
+ 75	30.57	30.47	0.15	
TP	8.02	38.49	0.65	30.47
8	32.84	32.74	5.75	

13' Rt

13' Rt

32

C-0.0
13.15C-0.0
13.15C-0.0
10.59C-0.0
10.59C-0.0
8.03C-0.0
8.03C-0.0
5.47C-0.0
5.47C-0.0
2.98C-0.0
2.98C-0.0
0.65

Elev. Check only.

C-0.0
5.75

Sta	P.G	Form Grade		
	13.27	899.90		886.63
	13.18	912.02	1.06	898.84
5+00	00.21	00.11	11.91	
+25	03.36	03.26	8.76	
+50	06.51	06.41	5.61	
+75	09.51	09.41	2.61	
		920.04		909.41
TP	10.63	920.14	2.61	909.51
			7.63	
6	12.51	12.41	7.73	
+25	15.51	15.41	4.73	
+50	18.07	17.97	2.07	
BM			3.86	916.18 916.17
BM				

Lt

Q

Rt

C-00
11.91C-00
11.91

8.76

C-0.0
8.76C-00
5.61C-00
5.61C-00
2.61C-00
2.61C-00
2.73C-00
2.73C-00
4.73C-00
4.73

Elev. check only

Top of Lowest A pt. on Ret. wall

Sta	P.G	Form Grade	Form GR	
	9.82	96.45		886.63
3+50	82.61	82.51	13.94	
3+64.6	84.10	84.00	12.45	
3+75	85.19	85.09	11.36	
4	87.92	87.82	8.63	
+25	90.84	90.74	5.71	
+50	93.91	93.81	2.64	
TP	6.68	900.49	2.64	93.81
+79.2				
+25	97.59	97.49	3.00	
+75	97.06	96.96	3.53	
5	00.21	00.11	00.48	

7-7-50

GB

MM

RR

13' L

②

13' R

34

C-00

13.94

13

13.94

C-00

12.45

C-00

12.45

C-00

11.36

C-00

11.36

C-00

8.63

C-00

8.63

C-00

5.71

C-00

5.71

C-00

2.64

C-00

2.64

C-00

3.53

C-00

3.53

checked as B.M. OK

Sta	P.G	Form Grade	Form G.R.	
BM	11.06	869.09		858.03
0+25	57.22	57.12		
+50	58.12	58.02	11.07	
+75	59.31	59.21	9.88	
1	60.89	60.79	8.30 8.74	
+25	62.82	62.81	6.28	
+50	64.93	64.83	4.26	
+75	67.04	66.94	2.15	
2	69.15	69.05	0.05	
TP			0.05	69.04

13' Lt

2

13' Rt

0-00
11.07

7.58

8.30
~~8.70~~

Sta	P.G	Form Grade	Form GR	Elev
2 + 00	69.15	875.61	6.66 = Reading 6.56	
2 + 25	71.26	4.35	4.45 4.51	
+ 50	73.38	2.23	2.36 2.33	
TP	1180	887.24	0.17	875.44
+ 75	75.54	75.44	11.80	
3	77.80	77.70	9.54	
+ 25	80.16	80.06	7.18	
+ 50	82.61 81.31	82.51	4.73 0.61 0.60	
B.M.				886.63
+				

13' Lt

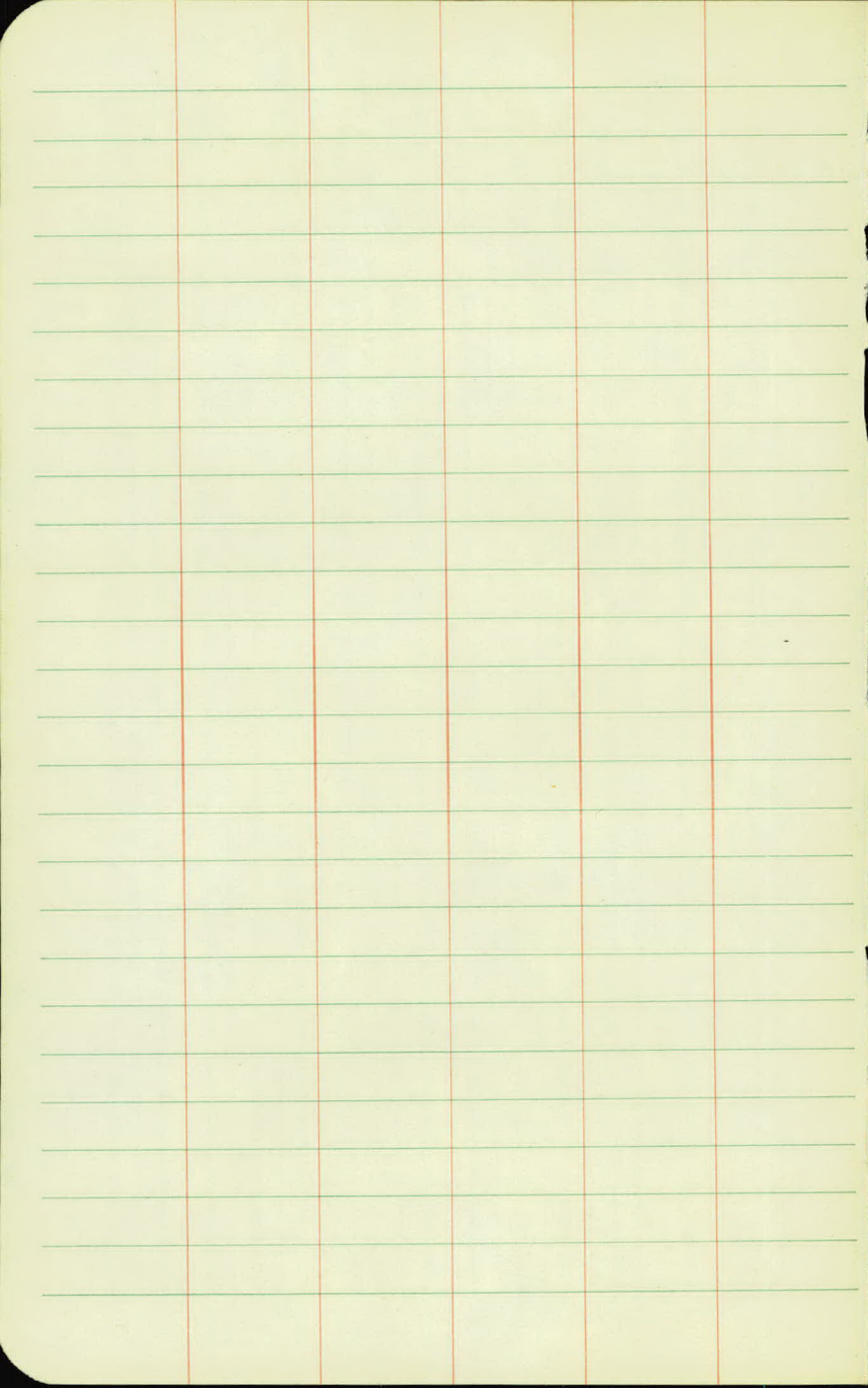
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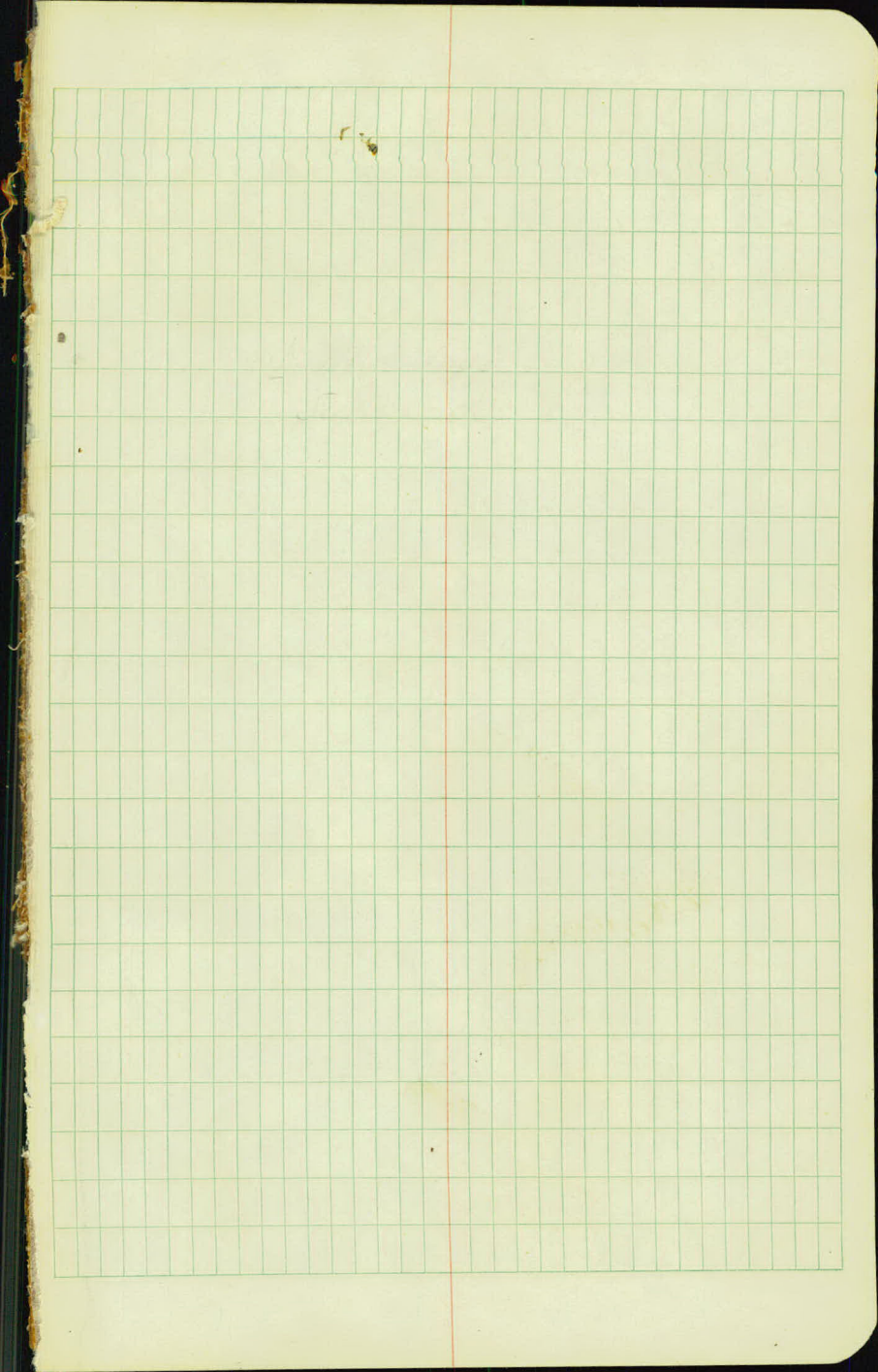
13' Rt

9.54

7.18

4.73





Sta	P.G	P.G.R	Sub. Gr	Elev
			GR	
BM	9.74	67.77		858.03
0 + 50	58.12	9.7	$\frac{11.2}{8.2}$	
1	60.89	6.9	$\frac{8.4}{5.4}$	
+ 50	64.93	2.9	$\frac{4.4}{1.4}$	
2	69.15	+1.37	0.10	

6-22-50

Spt in 30" Elm @ 0-30

Gr.
11.2

QR.
8.4

Gr.
4.4

Sta	PG	PGR	$\frac{1}{2}$ Sub Gr. GR	Sub Gr. Sh. GR Elev
B.M.	10.97	869.00		858.03
0 + 50	58.12	10.88	12.38	12.73
1	60.89	8.11	9.61	9.96
+ 50	64.93	4.07	5.57	5.92
2	69.15	+ 0.15 + 0.85	1.35	1.70
B.M.			10.97	858.03
+ 50	73.38			
3	77.80			
+ 50	82.61			
4	87.92			

6-26-50

13' L+

Φ

13' Rt

Spt in 30" Elm @ 0-30

C-0.0
12.73C-0.0
12.40C-0.0
11.73
12.73C-0.0
9.96C-0.0
9.61C-0.0
9.96C-0.0
5.92C-0.0
5.57C-0.0
5.92C-1.0
0.7C-0.1
125C-1.0
0.7

Sta	P.G	P.GR	[±] Sub Gr G.R.	Sh. Sub.Gr GR	Elev
	12.75	899.38			886.63
4+79.2	97.59	1.79	3.29	3.64	
TP	12.47	911.85	0.00		899.38
5	00.21	71.64	13.49	13.14	
+25	03.36	8.51	10.14	10.36	
+50	06.51	5.34	6.84	7.19	
+75	09.51	2.24	3.84	4.19	
6	12.51	+0.66	0.84	1.19	
TP	13.27	924.26	0.86		910.99
+25	15.51	8.75	10.25	10.60	
+50	18.07	6.19	7.69	8.04	

5-27-50

LT

C

RT

C-2.0
16.4C-0.0
3.29C-2.00
8.36C-0.0
10.14C-2.0
5.19C-0.0
6.84C-1.0
3.19C-0.0
3.84C-1.0
0.19C-0.0
0.84C-1.0
~~10.60~~ 9.60C-1.0
7.04

Sta	P.G	P.GR	Sub.Gr GR	Sub.Gr GR	Elev
		924.26			
6 + 75	20.63	3.63	5.13	3.48	
7	23.19	1.07		2.92	
T.P.	7.91	29.24	2.91		921.35
+25	25.15	3.49		5.34	
B.M.			4.62	924.62	
TP	13.74	942.13	0.85		928.39
8 + 50	37.18				
+75	39.11	3.02	4.52	4.87	
9	40.73	1.40	2.90	3.25	
T.P.	8.46	948.32	2.27		39.86
+25	42.10	6.22 .03	7.77 7.53	8.07 7.68	

C-1.0
4.48

C-0.0
2.92

C-0.0
4.34

Top NE cor conc Door Step *2204 Carver.

C-2.0
2.87

4.52

C-2.0
2.87

C-2.0
1.25

C-0.0
2.96

C-1.0
2.25

C-2.0
6.07

C-0.0
7.77

C-0.0
8.07

Sta	P.G.	P.G.R	^f Sub.Gr. GR	^{sh} Sub.Gr GR	Elev.
		948.32			
+50	43.14	518	6.68	703	
+75	43.96	436	5.86	6.21	
10	44.40	3.92	5.42	5.77	
+25	44.74	3.58	4.88	5.43	
+33	44.80	3.52			
+50	45.09	3.13	4.73	5.08	
B.M			1.10		(47.25) 947.22

2+

Q

R+

C 0 0
6.68C-00
7.03C-2.0
4.21C 0 0
5.86C 1.00
5.21C 2.00
3.77C-00
5.42C 1.0
4.77C 2.0
3.43

4.88

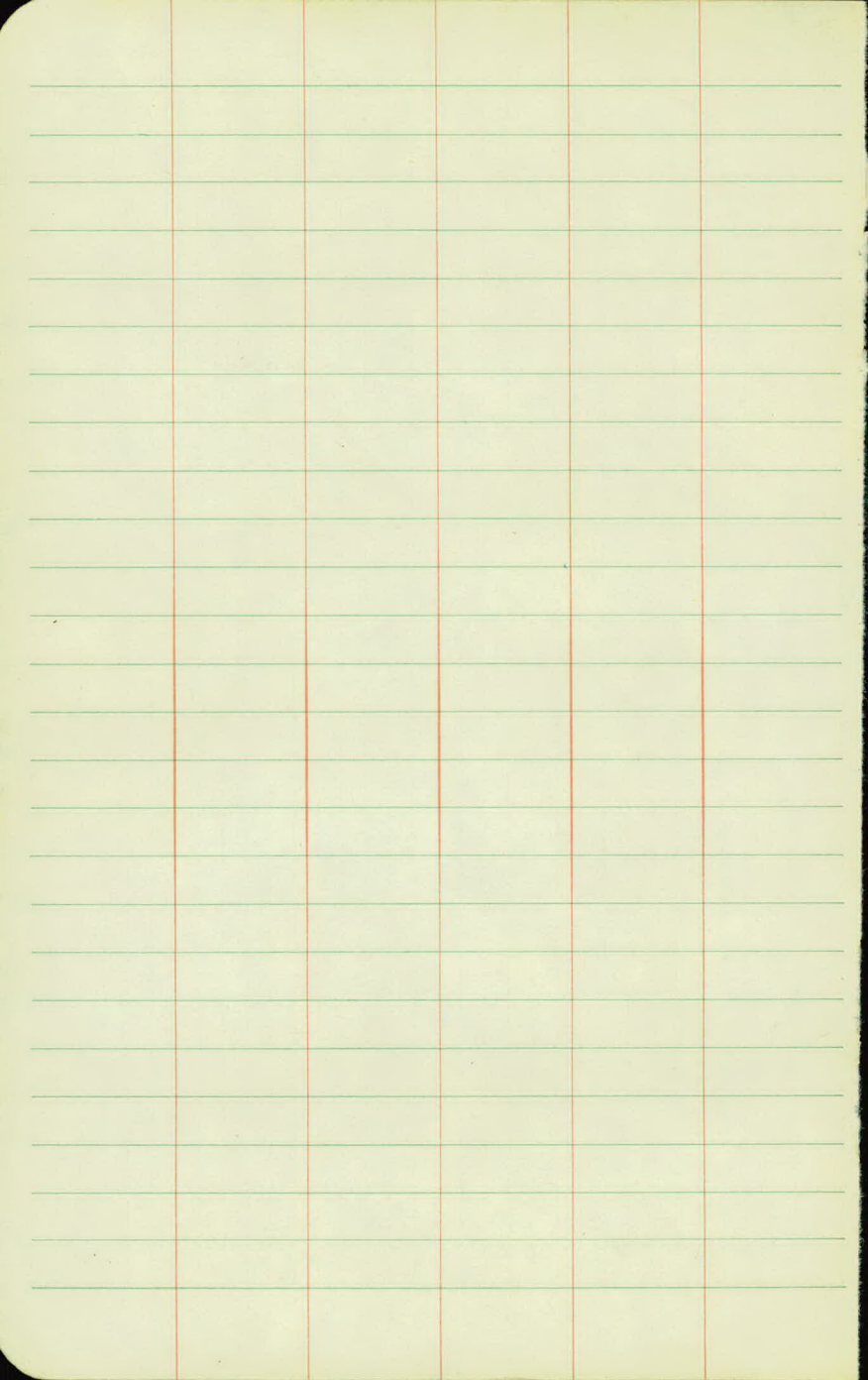
4.43

C 1.00
4.08

4.73

C 1.00
4.08

Top Door Sill Front Turpin Ho.



Subgrade X Sections

Sta	P.G	P.G.R	$\frac{e}{\text{Sub.Gr.}}$ GR	13° RT & LT Sub grade
B.M	0.63	947.88		947.25
8+75	39.11	8.77	10.27	10.62
9	40.73	7.15	8.65	9.0
+25	42.10	5.78	7.28	7.63
+50	43.14	4.74	6.24	6.59
+75	43.96	3.92	5.42	5.77
10	44.40	3.48	4.98	5.33
+25	44.74	3.14	4.64	4.99
+50	45.09	2.79	4.29	4.64

Top door sill front of Turpin Ho.

87 32.3	87 39.3						
860	860	10.2	10.3	10.3	10.4	10.6	10.7
13	15	10	9	9	9	8	11

87 42.3							
5.53	42.7	40.9	40.7	40.5	40.4	40.3	40.3
13	12	11	6	7	7	13	15

40	41.7						
13	11	6	6	6	6	6	13

87 44.1	44.0	42.4	42.4	42.3	42.1	42.1	43.1
37.88	3.9	5.5	5.5	5.6	5.8	5.8	4.8
13	12	11	6	6	11	13	13

44.6	44.9	43.2	43.1	43.0	42.8	42.7	43.6
331	30	47	48	49	51	52	52
13	12	11	6	7	7	12	13

44.8	44.3	44.0	43.9	43.8	42.1	
3.1	3.6	3.9	4.0	4.1	5.8	
13						

Sta	P.G	PGR	² Sub Gr		
BM	13.32	899.95		886.63	
4+ 19.2	97.57	2.38	3.88	4.23	
+90					
+98.2	99.98	10.02	1.48	1.83	
TP	12.82	911.75	1.02	898.93	
5+03.7	00.68	11.07	12.57	12.92	
+18.2	01.51	9.24	10.74	11.09	
+30	03.99	7.76	9.26	9.61	
+43	05.96	5.79	7.29	7.64	
+54	06.99	4.76	6.26	6.81	

L+

E

R+

Spk 1130" Elm Rt @ Sta 4+68

5.0 13	5.06.8	6.2 13	05.6	8.03.2 13	10.1 13	01.7	12.1 13	99.7	0.99.6 13	1.4 13	98.6	97.72 BT 3.23 13
6.6 11	8.5.2	8.0 10	03.8	9.6 11	11.1 6	00.7	12.8 12	99.0	1.2 12	2.4 11	97.6	3.8 11
6.8 13	05.5	7.7 6	03.6	8.6 6	11.0 7	00.8	12.8 6	99.0	1.4 8	2.4 6	97.6	3.9 5
6.2 7	05.6	7.8 7	04.0	9.4 7	11.0 7	00.8	12.6 7	99.2	1.4 6	2.4 6	97.6	3.8 5
6.1 12	05.7	7.7 12	04.1	9.3 12	10.8 12	01.0	12.7 7	99.1	1.5 11	2.5 11	97.5	4.0 5
5.6 13	06.2	7.2 13	04.6	8.7 13	10.4 13	01.4	12.5 11	99.2	0.7 13	2.0 13	98.0	4.9 13
							11.5 13	00.3				

✓

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✓

Sta	P.G	P.G.R			
		911.75			
5+73	09.27	2.48	398	4.33	
+90					
6	912.51				
TP	9.90	921.54	0.11	911.64	
+18	14.67	6.81		8.72	
+25	15.51				
TBM	8.76	924.93	5.38	916.16	16.17
6+36.2	16.65	8.28	9.78	10.13	
+43.2	17.39	7.54	9.04	9.39	
+57.5	18.81	6.12	7.62	7.97	

9.7 13	4.3 12	4.1 6.5	8.9 6	3.8 8.8	3.8 8.8	3.6 13
10.3 1.5 13	9.6 2.2 12	9.7 2.1 6	10.1 1.7 11	10.1 1.7 11	10.2 1.6 13	12.8 1.0 13
11.7 0.1 13	10.5 1.3 12	11.1 0.7 6	11.2 0.6 11	11.2 0.6 11	11.2 0.6 11	12.8 1.0 13
13.4 8.1 13	12.6 8.9 12	12.8 8.7 6	13.0 8.5 10	13.1 8.4 10	14.8 6.7 13	15.4 6.1 11
14.6 6.9 13	13.3 8.2 11	13.4 8.1 9	13.8 7.7 6	13.9 7.6 6	13.9 7.6 11	15.4 6.1 11

Low Apert in Ret. Wall

15.6 9.3 13	14.4 10.5 11	14.4 10.5 6	14.9 10.9 10.9	14.9 10.0 7	15.0 9.9 11	15.8 9.1 9.1
17.3 7.6 13	15.5 9.4 12	15.6 9.3 7	15.8 9.1 9.1	15.8 9.1 11	16.9 8.0 13	18.7 6.2 13
17.0 2.9 13	17.0 2.9 8	17.2 2.7 7.7	17.3 2.6 9	17.3 2.6 9	17.2 2.7 10	18.7 6.2 13

Sta	P.G	P.G.R	Σ Sub.Gr GR	Sh SubGr GR
		924.93		
6 + 75	20.63	4.30	580	6.15 7.65
7	23.19	1.74	3.24	3.59
T.P.	13.13	936.77	1.29	923.64
+25	25.25	11.02	11.52	12.87
+50	28.24	8.53		10.38
+75	30.57	6.20	2.70	8.05
8	32.84	3.93		5.78
+12	33.93	2.84		4.69
+16				

19.78

5.15
13

4.2
12

4.0
7

5.9
19.0

6.0
9

3.9
13

21.35
13

21.4
13

21.5
8

21.6
9

21.7
9

23.3
13

24.9
13

24.4
12

24.5
9

24.4
13

24.3
9

24.1
9

25.8
13

27.4
13

26.8
12

26.7
7

26.6
10.2

26.3
6

26.8
13

29.2
13

28.9
8

28.9
7

28.8
6

29.0
11

29.5
13

31.4
13

31.4
6

31.3
9

31.3
4

31.5
13

32.8
13

32.5
12

32.3
4

32.2
4

32.4
12

34.3
13

33.3
13

33.0
11

32.8
40

32.7
4

32.7
12

33.9
13

✓

✓

✓

✓

✓

✓

✓

✓

Sta	P.G	P.G.P.	² Sub. Gr. Gr.	Sh. Sub. Gr. Gr.
		936.77		
8+34	35.85	.92	2.42	2.77
+45.8	36.77	0.00	1.50	1.85
+50	37.18	+0.41	1.09	1.44
T.P.	9.08	944.38	1.47	935.30
+54				
+63	38.51	5.87	7.37	7.72
+67				
BM 8+75	39.11	5.27	6.77	7.12

PL

7.09 L+

7.11 R+

Sta	PG	PGR	Sub. Gr. GR	Sh. Sub. Gr GR
BM	10.86	868.89		858.03
TP	1.57	869.20	1.26	867.63
0+26				
+44	57.91	11.39	12.89	13.24
+57	58.40	10.80	12.30	12.65
1				
1	60.89	8.31	9.81	10.16
+50	64.23	4.27	5.77	6.12
+75				
2	69.15	.05	1.55	1.90
+25				
TP	13.63	881.30	1.53	867.67
+50	73.38	7.92	9.42	9.77
3	77.80	2.50	5.00	5.35

47

4

Rt

[illegible]

Sta	P.G	P.G.R	² Sub Gr GR	Sh. Sub Gr GR	Elev
		881.30			
3+50	82.61	+1.31	0.19	0.54	
BM Sta 2+50 BT Sh.Gr.			7.39	73.91	(73.88)
BM	9.23	95.84			86.63
+75	85.19	10.67	^{12.17} 12.52	12.52	9.20
4	87.92	7.94	9.44	9.79	
+25	90.84	5.02	6.52	6.87	
+40	92.70	3.16	4.66	5.01	
+70	96.43	4.57	.93	1.28	

1+

B

pt.

0.0
13

84.1
11.8
13

0.80.5
13

83.0
12.9
7

0.80.5
6.9

83.3
12.6
7

0.80.6
0.7

83.1
12.8
6

0.80.5
0.8

82.8
13.1
6

0.80.0
1.3

82.5
13.4
13

0.80.8
0.5
13

82.5
13.4
13

86.3
9.6
13

86.2
9.7
8

85.9
10.0
6

85.7
10.2
6

85.6
10.3
11

86.8
9.1
13

89.4
6.5
13

89.2
6.7
8

89.0
6.9
9

88.6
7.3
9

88.6
7.3
9

89.1
6.8
11

90.5
6.4
13

91.5
4.4
13

91.3
4.6
11

90.9
5.0
7

90.5
5.4
9

90.9
5.0
13

91.5
4.4
13

96.1
10.2
13

95.0
0.9
12

94.9
1.0
6

94.9
1.0
6

95.0
0.9
12

95.0
0.9
12

96.2
10.3
13

✓

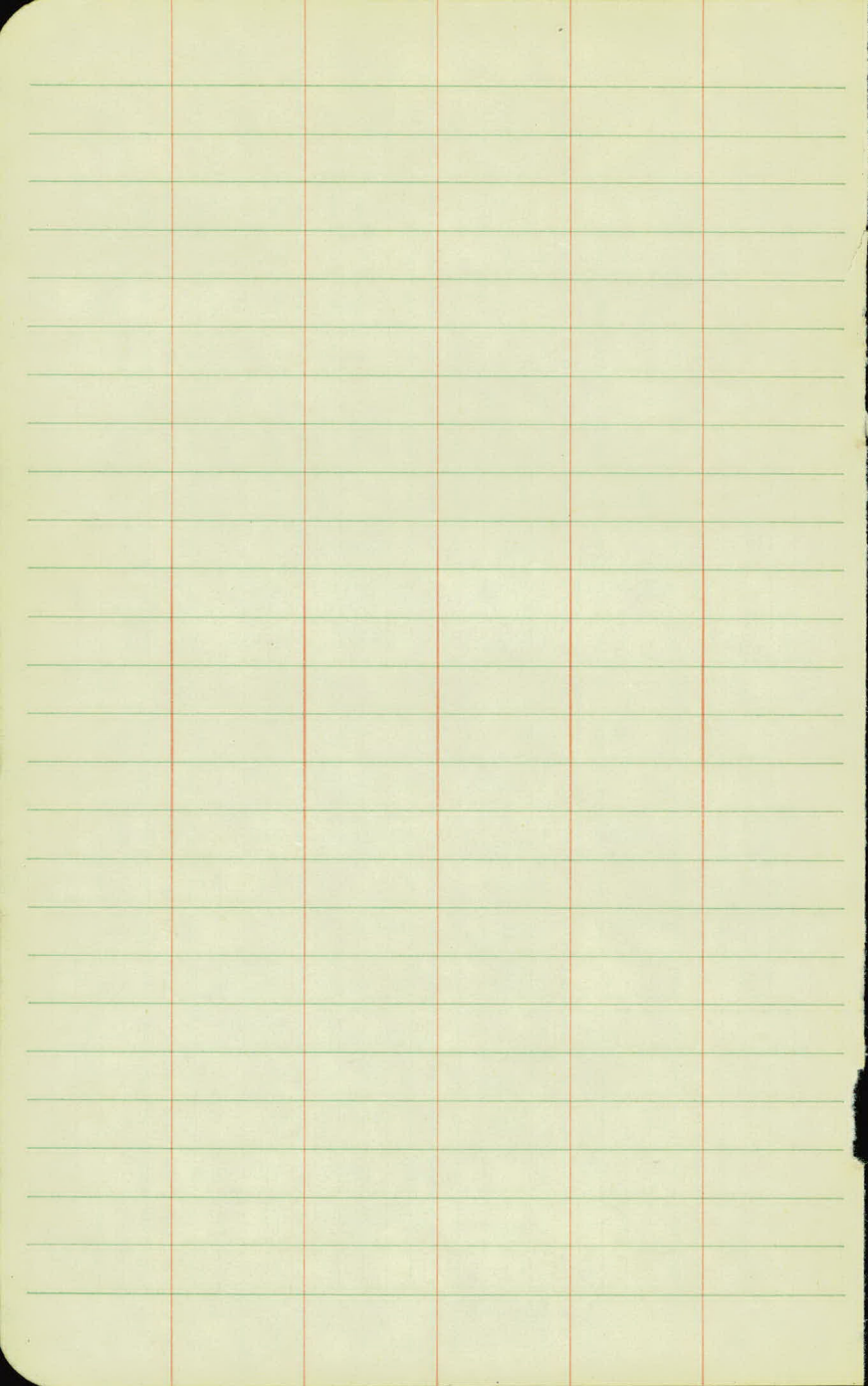
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✓

✓

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✓



Miscellaneous Structures

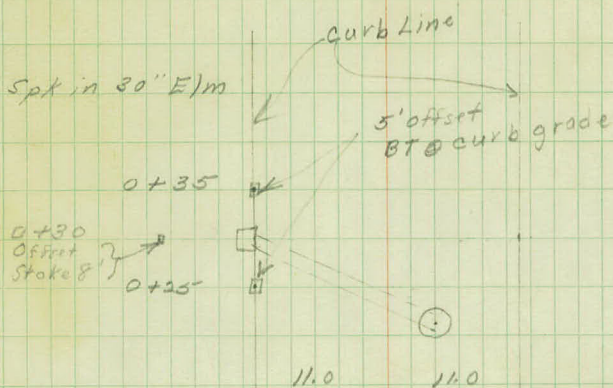
Sto	P6	P6R	-	FLGR
G.B. Lt. Sto. 0+30				
B.M.	42.0	862.23		858.03
Curb Grade	57.38			
FL C.B.	53.8		8.43	4.5
Inv. at M.H.	52.8		9.43	C 4.38 5.05 FL @ M.H.
Curb. Gr 0+25	57.25	4.98	4.5	C 0.0 4.5
Curb. Gr 0+35	57.55	4.68	4.2	4.2

C.B. Rt & Lt @ Sta 10+10

B.M.	2.88	950.13		947.25
Curb Grade FL	44.0	6.13	Top C.B. 5.53	
10' to C.B. Lt.	40.7	10.43		
FL C.B. 15' Lt.	40.6	9.53	C 5.2 (To 433 FL)	C 1.8 Top 433 C.B.
FL C.B. 15 Rt.	40.3	9.83	C 4.3 (To 553 FL)	C 0.6 Top 553 C.B.
FL 18" Sc 40' Rt	40.05	10.08	C 5.0 5.08	
FL 18" Sc 65' Rt	39.80	10.33	C 5.0 5.33	
FL 18" Sc 90' Rt	39.55	10.58	C 1.0 9.58	

6-22-50

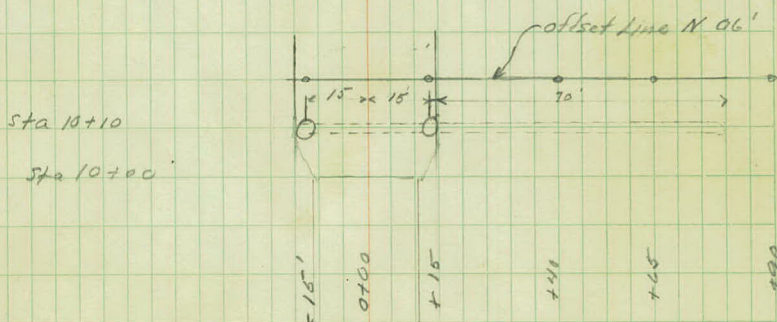
2



C-3.93
FL @ CB.

C 4.23
FL @ CB.

6-30-50



Ground Profile for

0+100 = ϕ Carver @ 10+10

0+25

+32

+45

+55

+64

+70

+80

+85

+96

6-30-50

~~Survey~~ Line Rt @ Sta 10+10

5.8

5.2

4.9

4.7

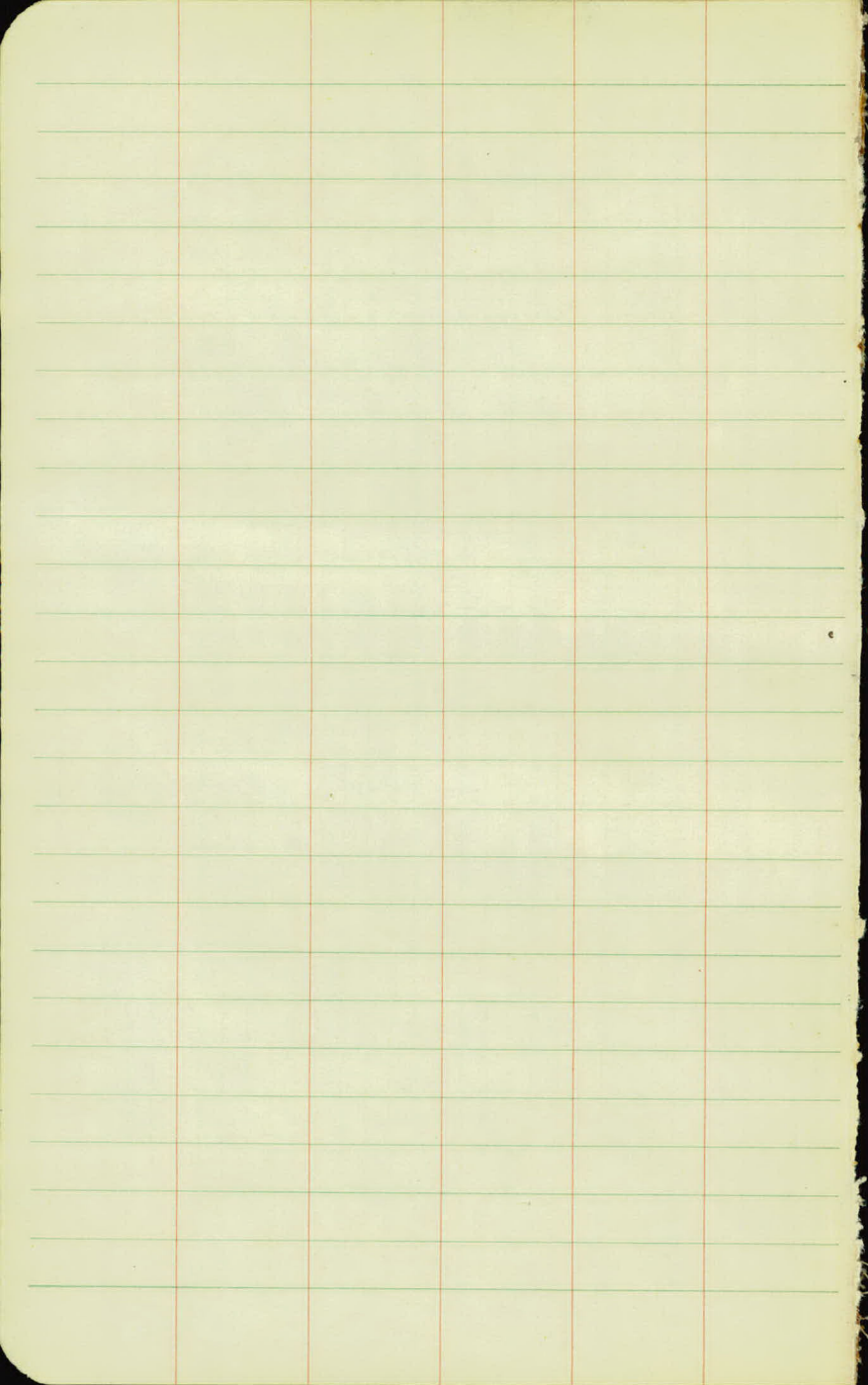
5.4

7.4

7.6

10.1

12.0



Final Blue Tops

Sta 10+00 to 14+00

Sta	RG	RGR	² Sub. Gr. GR	Gutter GR	Elev
BM	6.88	954.23			947.35
10	44.40	9.83			
+10	44.54	9.69	9.75	10.19	
+25	44.74	9.49	9.65	9.99	
+50	45.08	9.15	9.31	9.65	
11	45.93	8.30	8.46	8.85	
+50	47.50	6.73	6.89	7.23	
12	49.20	5.03	5.19	5.53	
+50	50.77	3.46	3.62	3.96	

15' Lt

Φ

15' Rt

Top door sill front of Turpin Ho.

9.70

C1.0
8.99

9.65

~~8.99~~ 9.99C1.0
8.65

9.31

C-2.00
6.85

8.46

C1.00
7.85C3.00
4.23

6.89

C1.00
6.23C2.00
3.53

5.19

C1.00
4.53C1.00
2.96C0.00
3.96

15' Lt

Q

15' Rt,

C-0.00
2.68

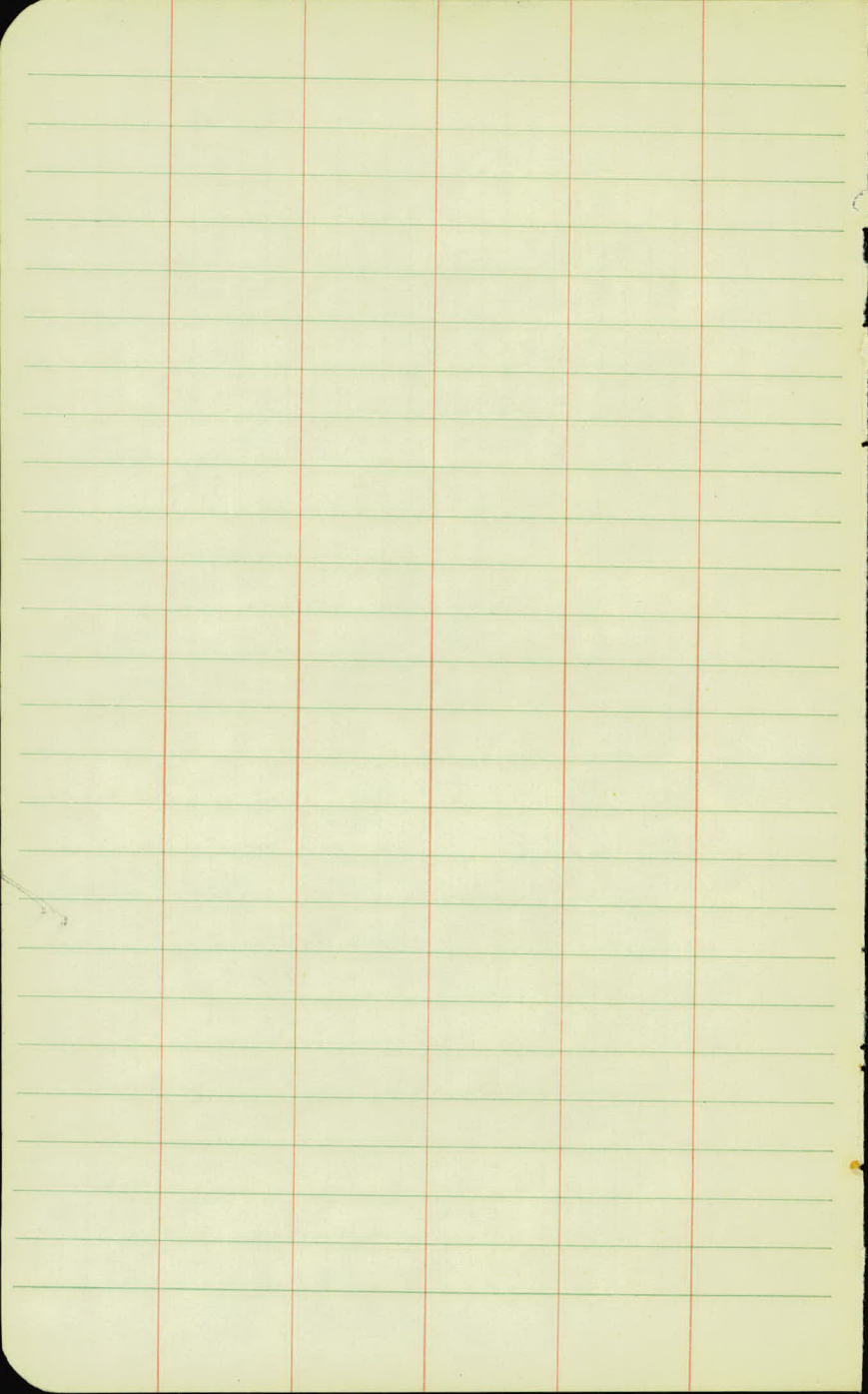
2.34

C1.0
1.68C-0.0
15301.00
0.19C1.00
0.533.9
15C0.4
3.52

39

C.00
2.7

1.5



CURVE TABLES.

Published by KEUFFEL & ESSER CO.

HOW TO USE CURVE TABLES.

Table I. contains Tangents and Externals to a 1° curve. Tan. and Ext. to any other radius may be found nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and External: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table I.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

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. I opposite $23^\circ 20' = 120.87$

$120.87 \div 12 = 10.07$. Say a 10° Curve.

Tan. in Tab. I opp. $23^\circ 20' = 1183.1$

$1183.1 \div 10 = 118.31$.

Correction for A. $23^\circ 20'$ for a 10° Cur. = 0.16

$118.31 + 0.16 = 118.47 =$ corrected Tangent.

(If corrected Ext. is required find in same way)

Ang. $23^\circ 20' = 23.33^\circ \div 10 = 2.3333 =$ L. C.

$2^\circ 19\frac{1}{2}' =$ def. for sta.	542	I. P. = sta.	542+72
$4^\circ 49\frac{1}{2}' =$ " " "	+50	Tan. =	1 18.47
$7^\circ 19\frac{1}{2}' =$ " " "	543	B. C. = sta.	541+53.53
$9^\circ 49\frac{1}{2}' =$ " " "	+50	L. C. =	2 33.33
$11^\circ 40' =$ " " "	543+	E. C. = Sta.	543+86.86
	86.86		

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

$2^\circ 19\frac{1}{2}' =$ 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.

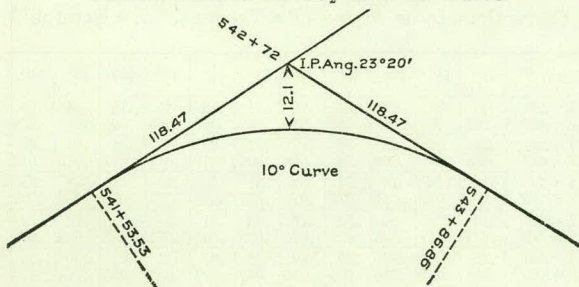


TABLE I. — Tangents and External to a 1° Curve.

Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
1°	50.00	.22	8°	400.66	13.99	15°	754.32	49.44
10'	58.34	.30	10'	409.03	14.58	10'	762.80	50.55
20	66.67	.39	20	417.41	15.18	20	771.29	51.68
30	75.01	.49	30	425.79	15.80	30	779.77	52.82
40	83.34	.61	40	434.17	16.43	40	788.26	53.97
50	91.68	.73	50	442.55	17.07	50	796.75	55.13
2	100.01	.87	9	450.93	17.72	16	805.25	56.31
10	108.35	1.02	10	459.32	18.38	10	813.75	57.50
20	116.68	1.19	20	467.71	19.06	20	822.25	58.70
30	125.02	1.36	30	476.10	19.75	30	830.76	59.91
40	133.36	1.55	40	484.49	20.45	40	839.27	61.14
50	141.70	1.75	50	492.88	21.16	50	847.78	62.38
3	150.04	1.96	10	501.28	21.89	17	856.30	63.63
10	158.38	2.19	10	509.68	22.62	10	864.82	64.90
20	166.72	2.43	20	518.08	23.38	20	873.35	66.18
30	175.06	2.67	30	526.48	24.14	30	881.88	67.47
40	183.40	2.93	40	534.89	24.91	40	890.41	68.77
50	191.74	3.21	50	543.29	25.70	50	898.95	70.09
4	200.08	3.49	11	551.70	26.50	18	907.49	71.42
10	208.43	3.79	10	560.11	27.31	10	916.03	72.76
20	216.77	4.10	20	568.53	28.14	20	924.58	74.12
30	225.12	4.42	30	576.95	28.97	30	933.13	75.49
40	233.47	4.76	40	585.36	29.82	40	941.69	76.86
50	241.81	5.10	50	593.79	30.68	50	950.25	78.26
5	250.16	5.46	12	602.21	31.56	19	958.81	79.67
10	258.51	5.83	10	610.64	32.45	10	967.38	81.09
20	266.86	6.21	20	619.07	33.35	20	975.96	82.53
30	275.21	6.61	30	627.50	34.26	30	984.53	83.97
40	283.57	7.01	40	635.93	35.18	40	993.12	85.43
50	291.92	7.43	50	644.37	36.12	50	1001.7	86.90
6	300.28	7.88	13	652.81	37.07	20	1010.3	88.39
10	308.64	8.31	10	661.25	38.03	10	1018.9	89.89
20	316.99	8.76	20	669.70	39.01	20	1027.5	91.40
30	325.35	9.23	30	678.15	39.99	30	1036.1	92.92
40	333.71	9.71	40	686.60	40.99	40	1044.7	94.46
50	342.08	10.20	50	695.06	42.00	50	1053.3	96.01
7	350.44	10.71	14	703.51	43.03	21	1061.9	97.57
10	358.81	11.22	10	711.97	44.07	10	1070.6	99.16
20	367.17	11.75	20	720.44	45.12	20	1079.2	100.75
30	375.54	12.29	30	728.90	46.18	30	1087.8	102.35
40	383.91	12.85	40	737.37	47.25	40	1096.4	103.97
50	392.28	13.41	50	745.85	48.34	50	1105.1	105.60

Corrections to be Added (T=Tangent. E=External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
5°	T=.02 E=.000	.03 .000	.05 .001	.06 .001	.08 .002	.10 .002	.11 .002	.13 .003	.15 .003	.16 .004	.18 .004	.20 .004	.21 .005	.23 .005
10°	T=.03 E=.001	.06 .003	.09 .004	.13 .006	.16 .007	.19 .008	.22 .009	.25 .011	.28 .012	.31 .014	.34 .015	.38 .017	.42 .018	.46 .020
15°	T=.04 E=.003	.10 .007	.14 .010	.19 .014	.24 .018	.29 .023	.34 .027	.39 .029	.45 .032	.51 .035	.55 .039	.58 .043	.63 .047	.68 .051
20°	T=.06 E=.006	.13 .011	.19 .017	.26 .022	.32 .028	.39 .034	.45 .038	.51 .045	.58 .051	.65 .057	.72 .063	.79 .070	.84 .076	.90 .083
25°	T=.08 E=.009	.16 .018	.24 .027	.33 .036	.40 .046	.49 .056	.58 .065	.67 .074	.75 .083	.83 .093	.90 .106	.99 .120	1.06 .127	1.14 .135

TABLE I. — Tangents and External to a 1° Curve.
Chord = 100 ft.

III

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
22°	1113.7	107.24	29°	1481.8	188.51	36°	1861.7	294.9
10'	1122.4	108.90	10'	1490.7	190.74	10'	1870.9	297.7
20	1131.0	110.57	20	1499.6	192.99	20	1880.1	300.6
30	1139.7	112.25	30	1508.5	195.25	30	1889.4	303.5
40	1148.4	113.95	40	1517.4	197.53	40	1898.6	306.4
50	1157.0	115.66	50	1526.3	199.82	50	1907.9	309.3
23	1165.7	117.38	30	1535.3	202.12	37	1917.1	312.2
10	1174.4	119.12	10	1544.2	204.44	10	1926.4	315.2
20	1183.1	120.87	20	1553.1	206.77	20	1935.7	318.1
30	1191.8	122.63	30	1562.1	209.12	30	1945.0	321.1
40	1200.5	124.41	40	1571.0	211.48	40	1954.3	324.1
50	1209.2	126.20	50	1580.0	213.86	50	1963.6	327.1
24	1217.9	128.00	31	1589.0	216.3	38	1972.9	330.2
10	1226.6	129.82	10	1598.0	218.7	10	1982.2	333.2
20	1235.3	131.65	20	1606.9	221.1	20	1991.5	336.3
30	1244.0	133.50	30	1615.9	223.5	30	2000.9	339.3
40	1252.8	135.35	40	1624.9	226.0	40	2010.2	342.4
50	1261.5	137.23	50	1633.9	228.4	50	2019.6	345.5
25	1270.2	139.11	32	1643.0	230.9	39	2029.0	348.6
10	1279.0	141.01	10	1652.0	233.4	10	2038.4	351.8
20	1287.7	142.93	20	1661.0	235.9	20	2047.8	354.9
30	1296.5	144.85	30	1670.0	238.4	30	2057.2	358.1
40	1305.3	146.79	40	1679.1	241.0	40	2066.6	361.3
50	1314.0	148.75	50	1688.1	243.5	50	2076.0	364.5
26	1322.8	150.71	33	1697.2	246.1	40	2085.4	367.7
10	1331.6	152.69	10	1706.3	248.7	10	2094.9	371.0
20	1340.4	154.69	20	1715.3	251.3	20	2104.3	374.2
30	1349.2	156.70	30	1724.4	253.9	30	2113.8	377.5
40	1358.0	158.72	40	1733.5	256.5	40	2123.3	380.8
50	1366.8	160.76	50	1742.6	259.1	50	2132.7	384.1
27	1375.6	162.81	34	1751.7	261.8	41	2142.2	387.4
10	1384.4	164.86	10	1760.8	264.5	10	2151.7	390.7
20	1393.2	166.95	20	1770.0	267.2	20	2161.2	394.1
30	1402.0	169.04	30	1779.1	269.9	30	2170.8	397.4
40	1410.9	171.15	40	1788.2	272.6	40	2180.3	400.8
50	1419.7	173.27	50	1797.4	275.3	50	2189.9	404.2
28	1428.6	175.41	35	1806.6	278.1	42	2199.4	407.6
10	1437.4	177.55	10	1815.7	280.8	10	2209.0	411.1
20	1446.3	179.72	20	1824.9	283.6	20	2218.6	414.5
30	1455.1	181.89	30	1834.1	286.4	30	2228.1	418.0
40	1464.0	184.08	40	1843.3	289.2	40	2237.7	421.4
50	1472.9	186.29	50	1852.5	292.0	50	2247.3	425.0

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
20°	T=.06 E=.006	.13 .011	.19 .017	.26 .022	.32 .028	.39 .034	.45 .038	.51 .045	.58 .051	.65 .057	.72 .063	.79 .070	.84 .076	.90 .083
25°	T=.08 E=.009	.16 .018	.21 .027	.33 .036	.40 .046	.49 .056	.58 .065	.67 .074	.75 .083	.83 .093	.90 .106	.99 .120	1.06 .127	1.14 .135
30°	T=.10 E=.013	.19 .025	.29 .038	.39 .051	.49 .065	.59 .078	.69 .090	.79 .103	.89 .116	.99 .129	1.09 .149	1.20 .170	1.29 .179	1.39 .188
35°	T=.11 E=.018	.22 .035	.34 .054	.47 .072	.58 .086	.69 .109	.80 .131	.93 .153	1.05 .175	1.17 .197	1.29 .213	1.42 .230	1.54 .247	1.66 .264
40°	T=.13 E=.023	.26 .046	.40 .070	.53 .093	.67 .117	.80 .141	.93 .172	1.06 .203	1.20 .234	1.34 .265	1.49 .277	1.64 .290	1.79 .315	1.94 .341
45°	T=.15 E=.030	.30 .060	.44 .093	.60 .119	.76 .153	.91 .184	1.06 .216	1.21 .254	1.37 .289	1.52 .325	1.70 .351	1.87 .378	2.04 .411	2.21 .445

TABLE I. — Tangents and External to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
43°	2257.0	428.5	50°	2671.8	592.3	57°	3110.9	790.1
10'	2266.6	432.0	10'	2681.9	596.6	10'	3121.7	795.2
20	2276.2	435.6	20	2692.1	600.9	20	3132.6	800.4
30	2285.9	439.2	30	2702.3	605.3	30	3143.4	805.6
40	2295.6	442.8	40	2712.5	609.6	40	3154.2	810.9
50	2305.2	446.4	50	2722.7	614.0	50	3165.1	816.1
44	2314.9	450.0	51	2732.9	618.4	58	3176.0	821.4
10	2324.6	453.6	10	2743.1	622.8	10	3186.9	826.7
20	2334.3	457.3	20	2753.4	627.2	20	3197.8	832.0
30	2344.1	461.0	30	2763.7	631.7	30	3208.8	837.3
40	2353.8	464.6	40	2773.9	636.2	40	3219.7	842.7
50	2363.5	468.4	50	2784.2	640.7	50	3230.7	848.1
45	2373.3	472.1	52	2794.5	645.2	59	3241.7	853.5
10	2383.1	475.8	10	2804.9	649.7	10	3252.7	858.9
20	2392.8	479.6	20	2815.2	654.3	20	3263.7	864.3
30	2402.6	483.4	30	2825.6	658.8	30	3274.8	869.8
40	2412.4	487.2	40	2835.9	663.4	40	3285.8	875.3
50	2422.3	491.0	50	2846.3	668.0	50	3296.9	880.8
46	2432.1	494.8	53	2856.7	672.7	60	3308.0	886.4
10	2441.9	498.7	10	2867.1	677.3	10	3319.1	892.0
20	2451.8	502.5	20	2877.5	682.0	20	3330.3	897.5
30	2461.7	506.4	30	2888.0	686.7	30	3341.4	903.2
40	2471.5	510.3	40	2898.4	691.4	40	3352.6	908.8
50	2481.4	514.3	50	2908.9	696.1	50	3363.8	914.5
47	2491.3	518.2	54	2919.4	700.9	61	3375.0	920.2
10	2501.2	522.2	10	2929.9	705.7	10	3386.3	925.9
20	2511.2	526.1	20	2940.4	710.5	20	3397.5	931.6
30	2521.1	530.1	30	2951.0	715.3	30	3408.8	937.3
40	2531.1	534.2	40	2961.5	720.1	40	3420.1	943.1
50	2541.0	538.2	50	2972.1	725.0	50	3431.4	948.9
48	2551.0	542.2	55	2982.7	729.9	62	3442.7	954.8
10	2561.0	546.3	10	2993.3	734.8	10	3454.1	960.6
20	2571.0	550.4	20	3003.9	739.7	20	3465.4	966.5
30	2581.0	554.5	30	3014.5	744.6	30	3476.8	972.4
40	2591.0	558.6	40	3025.2	749.6	40	3488.3	978.3
50	2601.1	562.8	50	3035.8	754.6	50	3499.7	984.3
49	2611.2	566.9	56	3046.5	759.6	63	3511.1	990.2
10	2621.2	571.1	10	3057.2	764.6	10	3522.6	996.2
20	2631.3	575.3	20	3067.9	769.7	20	3534.1	1002.3
30	2641.4	579.5	30	3078.7	774.7	30	3545.6	1008.3
40	2651.5	583.8	40	3089.4	779.8	40	3557.2	1014.4
50	2661.6	588.0	50	3100.2	784.9	50	3568.7	1020.5

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
40°	T=.13 E=.023	.26 .046	.40 .070	.53 .093	.67 .117	.80 .141	.93 .172	1.06 .203	1.20 .234	1.34 .265	1.49 .277	1.64 .290	1.79 .315	1.94 .341
45°	T=.15 E=.030	.30 .060	.44 .093	.60 .119	.76 .153	.91 .184	1.06 .216	1.21 .254	1.37 .289	1.52 .325	1.70 .351	1.87 .378	2.04 .411	2.21 .445
50°	T=.17 E=.037	.34 .075	.51 .116	.68 .151	.85 .189	1.02 .227	1.19 .266	1.36 .305	1.54 .345	1.72 .384	1.91 .425	2.10 .467	2.29 .508	2.48 .550
55°	T=.19 E=.046	.38 .093	.57 .142	.76 .188	.95 .236	1.14 .283	1.32 .332	1.52 .381	1.72 .420	1.92 .479	2.14 .530	2.35 .582	2.56 .641	2.77 .700
60°	T=.21 E=.056	.42 .112	.63 .168	.84 .225	1.05 .283	1.27 .340	1.49 .398	1.71 .457	1.94 .516	2.17 .575	2.38 .636	2.60 .697	2.83 .774	3.07 .851
65°	T=.23 E=.067	.46 .135	.69 .204	.93 .273	1.16 .343	1.40 .412	1.64 .483	1.88 .554	2.13 .625	2.38 .697	2.63 .771	2.88 .845	3.13 .922	3.39 1.01

TABLE I. — Tangents and External to a 1° Curve.
Chord = 100 ft.

V

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
64°	3580.3	1026.6	71°	4086.9	1308.2	78°	4639.8	1643.0
10'	3591.9	1032.8	10'	4099.5	1315.6	10'	4653.6	1651.7
20	3603.5	1039.0	20	4112.1	1322.9	20	4667.4	1660.5
30	3615.1	1045.2	30	4124.8	1330.3	30	4681.3	1669.2
40	3626.8	1051.4	40	4137.4	1337.7	40	4695.2	1678.1
50	3638.5	1057.7	50	4150.1	1345.1	50	4709.2	1686.9
65	3650.2	1063.9	72	4162.8	1352.6	79	4723.2	1695.8
10	3661.9	1070.2	10	4175.6	1360.1	10	4737.2	1704.7
20	3673.7	1076.6	20	4188.5	1367.6	20	4751.2	1713.7
30	3685.4	1082.9	30	4201.2	1375.2	30	4765.3	1722.7
40	3697.2	1089.3	40	4214.0	1382.8	40	4779.4	1731.7
50	3709.0	1095.7	50	4226.8	1390.4	50	4793.6	1740.8
66	3720.9	1102.2	73	4239.7	1398.0	80	4807.7	1749.9
10	3732.7	1108.6	10	4252.6	1405.7	10	4822.0	1759.0
20	3744.6	1115.1	20	4265.6	1413.5	20	4836.2	1768.2
30	3756.5	1121.7	30	4278.5	1421.2	30	4850.5	1777.4
40	3768.5	1128.2	40	4291.5	1429.0	40	4864.8	1786.7
50	3780.4	1134.8	50	4304.6	1436.8	50	4879.2	1796.0
67	3792.4	1141.4	74	4317.6	1444.6	81	4893.6	1805.3
10	3804.4	1148.0	10	4330.7	1452.5	10	4908.0	1814.7
20	3816.4	1154.7	20	4343.8	1460.4	20	4922.5	1824.1
30	3828.4	1161.3	30	4356.9	1468.4	30	4937.0	1833.6
40	3840.5	1168.1	40	4370.1	1476.4	40	4951.5	1843.1
50	3852.6	1174.8	50	4383.3	1484.4	50	4966.1	1852.6
68	3864.7	1181.6	75	4396.5	1492.4	82	4980.7	1862.2
10	3876.8	1188.4	10	4409.8	1500.5	10	4995.4	1871.8
20	3889.0	1195.2	20	4423.1	1508.6	20	5010.0	1881.5
30	3901.2	1202.0	30	4436.4	1516.7	30	5024.8	1891.2
40	3913.4	1208.9	40	4449.7	1524.9	40	5039.5	1900.9
50	3925.6	1215.8	50	4463.1	1533.1	50	5054.3	1910.7
69	3937.9	1222.7	76	4476.5	1541.4	83	5069.2	1920.5
10	3950.2	1229.7	10	4489.9	1549.7	10	5084.0	1930.4
20	3962.5	1236.7	20	4503.4	1558.0	20	5099.0	1940.3
30	3974.8	1243.7	30	4516.9	1566.3	30	5113.9	1950.3
40	3987.2	1250.8	40	4530.4	1574.7	40	5128.9	1960.2
50	3999.5	1257.9	50	4544.0	1583.1	50	5143.9	1970.3
70	4011.9	1265.0	77	4557.6	1591.6	84	5159.0	1980.4
10	4024.4	1272.1	10	4571.2	1600.1	10	5174.1	1990.5
20	4036.8	1279.3	20	4584.8	1608.6	20	5189.3	2000.6
30	4049.3	1286.5	30	4598.5	1617.1	30	5204.4	2010.8
40	4061.8	1293.6	40	4612.2	1625.7	40	5219.7	2021.1
50	4074.4	1300.9	50	4626.0	1634.4	50	5234.9	2031.4

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
60°	T=.21 E=.056	.42 .112	.63 .168	.84 .225	1.05 .283	1.27 .340	1.49 .398	1.71 .457	1.94 .516	2.17 .575	2.38 .636	2.60 .697	2.83 .774	3.07 .851
65°	T=.23 E=.067	.46 .135	.69 .204	.93 .273	1.16 .343	1.40 .412	1.64 .483	1.88 .554	2.13 .625	2.38 .697	2.63 .771	2.88 .845	3.13 .922	3.39 1.01
70°	T=.25 E=.080	.51 .159	.76 .240	1.02 .321	1.28 .403	1.54 .485	1.80 .568	2.06 .652	2.33 .735	2.60 .819	2.88 .906	3.16 .994	3.44 1.08	3.72 1.17
75°	T=.27 E=.095	.56 .182	.83 .286	1.12 .383	1.40 .480	1.69 .578	1.98 .678	2.27 .777	2.57 .877	2.87 .977	3.16 1.07	3.47 1.18	3.78 1.29	4.09 1.39
80°	T=.30 E=.110	.61 .220	.91 .332	1.22 .445	1.53 .558	1.84 .671	2.15 .787	2.46 .903	2.78 1.02	3.10 1.13	3.44 1.25	3.78 1.38	4.12 1.50	4.46 1.62
85°	T=.33 E=.128	.66 .259	1.00 .391	1.33 .524	1.68 .657	2.02 .790	2.36 .926	2.70 1.06	3.05 1.20	3.40 1.34	3.77 1.47	4.14 1.62	4.55 1.76	4.89 1.91

TABLE I. — Tangents and Externals to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
85°	5250.3	2041.7	92°	5933.2	2518.5	99°	6708.6	3092.7
10'	5265.6	2052.1	10'	5950.5	2531.0	10'	6728.4	3107.7
20	5281.0	2062.5	20	5967.9	2543.5	20	6748.2	3122.9
30	5296.4	2073.0	30	5985.3	2556.0	30	6768.1	3138.1
40	5311.9	2083.5	40	6002.7	2568.6	40	6788.1	3153.3
50	5327.4	2094.1	50	6020.2	2581.3	50	6808.2	3168.7
86	5343.0	2104.7	93	6037.8	2594.0	100	6828.3	3184.1
10	5358.6	2115.3	10	6055.4	2606.8	10	6848.5	3199.6
20	5374.2	2126.0	20	6073.1	2619.7	20	6868.8	3215.1
30	5389.9	2136.7	30	6090.8	2632.6	30	6889.2	3230.8
40	5405.6	2147.5	40	6108.6	2645.5	40	6909.6	3246.5
50	5421.4	2158.4	50	6126.4	2658.5	50	6930.1	3262.3
87	5437.2	2169.2	94	6144.3	2671.6	101	6950.6	3278.1
10	5453.1	2180.2	10	6162.6	2684.7	10	6971.3	3294.1
20	5469.0	2191.1	20	6180.2	2697.9	20	6992.0	3310.1
30	5484.9	2202.2	30	6198.3	2711.2	30	7012.7	3326.1
40	5500.9	2213.2	40	6216.4	2724.5	40	7033.6	3342.3
50	5517.0	2224.3	50	6234.6	2737.9	50	7054.5	3358.5
88	5533.1	2235.5	95	6252.8	2751.3	102	7075.5	3374.9
10	5549.2	2246.7	10	6271.1	2764.8	10	7096.6	3391.2
20	5565.4	2258.0	20	6289.4	2778.3	20	7117.8	3407.7
30	5581.6	2269.3	30	6307.9	2792.0	30	7139.0	3424.3
40	5597.8	2280.6	40	6326.3	2805.6	40	7160.3	3440.9
50	5614.2	2292.0	50	6344.8	2819.4	50	7181.7	3457.6
89	5630.5	2303.5	96	6363.4	2833.2	103	7203.2	3474.4
10	5646.9	2315.0	10	6382.1	2847.0	10	7224.7	3491.3
20	5663.4	2326.6	20	6400.8	2861.0	20	7246.3	3508.2
30	5679.9	2338.2	30	6419.5	2875.0	30	7268.0	3525.2
40	5696.4	2349.8	40	6438.4	2889.0	40	7289.8	3542.4
50	5713.0	2361.5	50	6457.3	2903.1	50	7311.7	3559.6
90	5729.7	2373.3	97	6476.2	2917.3	104	7333.6	3576.8
10	5746.3	2385.1	10	6495.2	2931.6	10	7355.6	3594.2
20	5763.1	2397.0	20	6514.3	2945.9	20	7377.8	3611.7
30	5779.9	2408.9	30	6533.4	2960.3	30	7399.9	3629.2
40	5796.7	2420.9	40	6552.6	2974.7	40	7422.2	3646.8
50	5813.6	2432.9	50	6571.9	2989.2	50	7444.6	3664.5
91	5830.5	2444.9	98	6591.2	3003.8	105	7467.0	3682.3
10	5847.5	2457.1	10	6610.6	3018.4	10	7489.6	3700.2
20	5864.6	2469.3	20	6630.1	3033.1	20	7512.2	3718.2
30	5881.7	2481.5	30	6649.6	3047.9	30	7534.9	3736.2
40	5898.8	2493.8	40	6669.2	3062.8	40	7557.7	3754.4
50	5916.0	2506.1	50	6688.8	3077.7	50	7580.5	3772.6

Corrections to be Added (T = Tangent. E. = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
85°	T=.33 E=.128	.66 .259	1.00 .391	1.33 .524	1.68 .657	2.02 .790	2.36 .926	2.70 1.06	3.05 1.20	3.40 1.34	3.77 1.47	4.14 1.62	4.55 1.76	4.89 1.91
90°	T=.36 E=.149	.72 .299	1.09 .450	1.45 .603	1.83 .756	2.20 .910	2.57 1.07	2.94 1.22	3.32 1.38	3.70 1.54	4.10 1.70	4.50 1.87	4.91 2.03	5.32 2.20
95°	T=.39 E=.174	.79 .350	1.19 .522	1.55 .706	2.00 .985	2.40 1.06	2.80 1.25	3.20 1.43	3.61 1.62	4.02 1.80	4.49 1.99	4.98 2.18	5.38 2.38	5.83 2.58
100°	T=.43 E=.200	.86 .401	1.30 .604	1.74 .809	2.18 1.01	2.62 1.22	3.06 1.43	3.50 1.64	3.95 1.85	4.40 2.06	4.88 2.28	5.37 2.50	5.85 2.73	6.34 2.96
105°	T=.46 E=.230	.94 .470	1.42 .700	1.90 .938	2.38 1.17	2.87 1.42	3.34 1.65	3.84 1.90	4.35 2.14	4.84 2.39	5.35 2.64	5.87 2.90	6.40 3.16	6.93 3.41

TABLE I. — Tangents and External to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
106°	7603.5	3791.0	111°	8336.7	4386.1	116°	9169.4	5082.7
10'	7626.6	3809.4	10'	8362.7	4407.6	10'	9199.1	5107.9
20	7649.7	3827.9	20	8388.9	4429.2	20	9229.0	5133.3
30	7672.9	3846.5	30	8415.1	4450.9	30	9259.0	5158.8
40	7696.3	3865.2	40	8441.5	4472.7	40	9289.2	5184.5
50	7719.7	3884.0	50	8468.0	4494.6	50	9319.5	5210.3
107	7743.2	3902.9	112	8494.6	4516.6	117	9349.9	5236.2
10	7766.8	3921.9	10	8521.3	4538.8	10	9380.5	5262.3
20	7790.5	3940.9	20	8548.1	4561.1	20	9411.3	5288.6
30	7814.3	3960.1	30	8575.0	4583.4	30	9442.2	5315.0
40	7838.1	3979.4	40	8602.1	4606.0	40	9473.2	5341.5
50	7862.1	3998.7	50	8629.3	4628.6	50	9504.4	5368.2
108	7886.2	4018.2	113	8656.6	4651.3	118	9535.7	5395.1
10	7910.4	4037.8	10	8684.0	4674.2	10	9567.2	5422.1
20	7934.6	4057.4	20	8711.5	4697.2	20	9598.9	5449.2
30	7959.0	4077.2	30	8739.2	4720.3	30	9630.7	5476.5
40	7983.5	4097.1	40	8767.0	4743.6	40	9662.6	5504.0
50	8008.0	4117.0	50	8794.9	4766.9	50	9694.7	5531.7
109	8032.7	4137.1	114	8822.9	4790.4	119	9727.0	5559.4
10	8057.4	4157.3	10	8851.0	4814.1	10	9759.4	5587.4
20	8082.3	4177.5	20	8879.3	4837.8	20	9792.0	5615.5
30	8107.3	4197.9	30	8907.7	4861.7	30	9824.8	5643.8
40	8132.3	4218.4	40	8936.3	4885.7	40	9857.7	5672.3
50	8157.5	4239.0	50	8965.0	4909.9	50	9890.8	5700.9
110	8182.8	4259.7	115	8993.8	4934.1	120	9924.0	5729.7
10	8208.2	4280.5	10	9022.7	4958.6	10	9957.5	5758.6
20	8233.7	4301.4	20	9051.7	4983.1	20	9991.0	5787.7
30	8259.3	4322.4	30	9080.9	5007.8	30	10025.0	5817.0
40	8285.0	4343.6	40	9110.3	5032.6	40	10059.0	5846.5
50	8310.8	4364.8	50	9139.8	5057.6	50	10093.0	5876.1

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
100°	T=.43 E=.200	.86 .401	1.30 .604	1.74 .809	2.18 1.01	2.62 1.22	3.06 1.43	3.50 1.64	3.95 1.85	4.40 2.06	4.88 2.28	5.37 2.50	5.85 2.73	6.34 2.96
105°	T=.46 E=.230	.94 .470	1.42 .700	1.90 .938	2.38 1.17	2.87 1.42	3.34 1.65	3.84 1.90	4.35 2.14	4.84 2.39	5.35 2.64	5.87 2.90	6.40 3.16	6.93 3.41
110°	T=.50 E=.260	1.03 .535	1.55 .808	2.08 1.08	2.60 1.36	3.14 1.63	3.66 1.91	4.21 2.19	4.76 2.49	5.31 2.61	5.86 3.05	6.43 3.35	7.01 3.65	7.59 3.95
115°	T=.54 E=.307	1.13 .624	1.70 .939	2.29 1.26	2.86 1.57	3.45 1.89	4.03 2.21	4.63 2.54	5.23 2.87	5.83 3.20	6.44 3.53	7.07 3.88	7.70 4.23	8.35 4.58
120°	T=.61 E=.339	1.25 .720	1.89 1.08	2.52 1.45	3.16 1.82	3.81 2.20	4.44 2.56	5.11 2.95	5.78 3.33	6.44 3.72	7.11 4.10	7.80 4.50	8.51 4.91	9.21 5.32

TABLE II. — Radii, Ordinates and Deflections. Chord = 100 ft.

Deg.	Radius	Mid. Ord.	Tan. Dist.	Def. Dist.	Def. for 1 Ft.	Deg.	Radius	Mid. Ord.	Tan. Dist.	Def. Dist.	Def. for 1 Ft.
	ft.	ft.	ft.	ft.	/		ft.	ft.	ft.	ft.	/
0° 10'	34377.	.036	.145	.291	0.05	7°	819.0	1.528	6.105	12.21	2.10
20	17189.	.073	.291	.582	0.10	20'	781.8	1.600	6.395	12.79	2.20
30	11459.	.109	.436	.873	0.15	30	764.5	1.637	6.540	13.08	2.25
40	8594.4	.145	.582	1.164	0.20	40	747.9	1.673	6.685	13.37	2.30
50	6875.5	.182	.727	1.454	0.25	8	716.8	1.746	6.976	13.95	2.40
1	5729.6	.218	.873	1.745	0.30	20	688.2	1.819	7.266	14.53	2.50
10	4911.2	.255	1.018	2.036	0.35	30	674.7	1.855	7.411	14.82	2.55
20	4297.3	.291	1.164	2.327	0.40	40	661.7	1.892	7.556	15.11	2.60
30	3819.8	.327	1.309	2.618	0.45	9	637.3	1.965	7.846	15.69	2.70
40	3437.9	.364	1.454	2.909	0.50	20	614.6	2.037	8.136	16.27	2.80
50	3125.4	.400	1.600	3.200	0.55	30	603.8	2.074	8.281	16.56	2.85
2	2864.9	.436	1.745	3.490	0.60	40	593.4	2.110	8.426	16.85	2.90
10	2644.6	.473	1.891	3.781	0.65	10	573.7	2.183	8.716	17.43	3.00
20	2455.7	.509	2.036	4.072	0.70	30	546.4	2.292	9.150	18.30	3.15
30	2292.0	.545	2.181	4.363	0.75	11	521.7	2.402	9.585	19.16	3.30
40	2148.8	.582	2.327	4.654	0.80	30	499.1	2.511	10.02	20.04	3.45
50	2022.4	.618	2.472	4.945	0.85	12	478.3	2.620	10.45	20.91	3.60
3	1910.1	.655	2.618	5.235	0.90	30	459.3	2.730	10.89	21.77	3.75
10	1809.6	.691	2.763	5.526	0.95	13	441.7	2.839	11.32	22.64	3.90
20	1719.1	.727	2.908	5.817	1.00	30	425.4	2.949	11.75	23.51	4.05
30	1637.3	.764	3.054	6.108	1.05	14	410.3	3.058	12.18	24.37	4.20
40	1562.9	.800	3.199	6.398	1.10	30	396.2	3.168	12.62	25.24	4.35
50	1495.0	.836	3.345	6.689	1.15	15	383.1	3.277	13.05	26.11	4.50
4	1432.7	.873	3.490	6.980	1.20	30	370.8	3.387	13.49	26.97	4.65
10	1375.4	.909	3.635	7.271	1.25	16	359.3	3.496	13.92	27.84	4.80
20	1322.5	.945	3.718	7.561	1.30	30	348.5	3.606	14.35	28.70	4.95
30	1273.6	.982	3.926	7.852	1.35	17	338.3	3.716	14.78	29.56	5.10
40	1228.1	1.018	4.071	8.143	1.40	18	319.6	3.935	15.64	31.29	5.40
50	1185.8	1.055	4.217	8.433	1.45	19	302.9	4.155	16.51	33.01	5.70
5	1146.3	1.091	4.362	8.724	1.50	20	287.9	4.374	17.37	34.73	6.00
10	1109.3	1.127	4.507	9.014	1.55	21	274.4	4.594	18.22	36.44	6.30
20	1074.7	1.164	4.653	9.305	1.60	22	262.0	4.814	19.08	38.16	6.60
30	1042.1	1.200	4.798	9.596	1.65	23	250.8	5.035	19.94	39.87	6.90
40	1011.5	1.237	4.943	9.886	1.70	24	240.5	5.255	20.79	41.58	7.20
50	982.6	1.273	5.088	10.18	1.75	25	231.0	5.476	21.64	43.28	7.50
6	955.4	1.309	5.234	10.47	1.80	26	222.3	5.697	22.50	44.99	7.80
10	929.6	1.346	5.379	10.76	1.85	27	214.2	5.918	23.35	46.69	8.10
20	905.1	1.382	5.524	11.05	1.90	28	206.7	6.139	24.19	48.38	8.40
30	881.9	1.418	5.669	11.34	1.95	29	199.7	6.360	25.04	50.07	8.70
40	859.9	1.455	5.814	11.63	2.00	30	193.2	6.583	25.88	51.76	9.00

The middle ordinate in inches for any cord of length (C) is equal to .0012 C² multiplied by the middle ordinate taken from the above table. Thus, if it desired to bend a 30 ft. rail to fit a 10 degree curve, its middle ordinate should be .0012×900×2.183 or 2.36 inches.

TABLE III. Deflections for Sub Chords for Short Radius Curves.

Degree of Curve	Radius 50	$\frac{1}{2}$ sub chord R = sin of $\frac{1}{2}$ def. angle				Length of arc for 100 ft.
	sin. $\frac{1}{2}$ def. ang.	12.5 Ft.	15 Ft.	20 Ft.	25 Ft.	
30°	193.18	1° 51'	2° 17'	2° 58'	3° 43'	101.15
32°	181.39	1° 59'	2° 25'	3° 10'	3° 58'	101.33
34°	171.01	2° 06'	2° 33'	3° 21'	4° 12'	101.48
36°	161.80	2° 13'	2° 41'	3° 33'	4° 26'	101.66
38°	153.58	2° 20'	2° 49'	3° 44'	4° 40'	101.85
40°	146.19	2° 27'	2° 57'	3° 55'	4° 54'	102.06
42°	139.52	2° 34'	3° 05'	4° 07'	5° 08'	102.29
44°	133.47	2° 41'	3° 13'	4° 18'	5° 22'	102.53
46°	127.97	2° 48'	3° 21'	4° 29'	5° 36'	102.76
48°	122.92	2° 55'	3° 29'	4° 40'	5° 50'	103.00
50°	118.31	3° 02'	3° 38'	4° 51'	6° 04'	103.24
52°	114.06	3° 09'	3° 46'	5° 02'	6° 17'	103.54
54°	110.11	3° 16'	3° 54'	5° 13'	6° 31'	103.84
56°	106.50	3° 22'	4° 02'	5° 23'	6° 44'	104.14
58°	103.14	3° 29'	4° 10'	5° 34'	6° 57'	104.43
60°	100.00	3° 35'	4° 18'	5° 44'	7° 11'	104.72

CURVE FORMULAS

$T = R \tan \frac{1}{2} I$	$R = T \cot. \frac{1}{2} I$	Chord def. = $\frac{\text{chord}^2}{R}$
$T = \frac{50 \tan \frac{1}{2} I}{\text{Sin. } \frac{1}{2} D}$	$R = \frac{50}{\text{Sin. } \frac{1}{2} D}$	No. chords = $\frac{I}{D}$
$\text{Sin. } \frac{1}{2} D = \frac{50}{R}$	$E = R \text{ ex. sec } \frac{1}{2} I$	Tan. def. = $\frac{1}{2} \text{ chord def.}$
$\text{Sin. } \frac{1}{2} D = \frac{50 \tan \frac{1}{2} I}{T}$	$E = T \tan \frac{1}{4} I$	

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft. see Table II.), and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

GENERAL DATA

RIGHT ANGLE TRIANGLES. Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt. $10.10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. $25.25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875 = \text{Base}$.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

LEVELING. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574 d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{1}{3} d^2$. The combined correction is negative.

PROBABLE ERROR. If d_1, d_2, d_3 , etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean = $\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

SOLAR EPHEMERIS. Attention is called to the Solar Ephemeris for the current year, published by Keuffel & Esser Co., and furnished free of charge upon request, which is $3\frac{1}{4} \times 5\frac{1}{8}$ in., with about 90 pages of data very useful to the Surveyor; such as the adjustments of transits, levels and solar attachments; directions and tables for determining the meridian and the latitude from observations on the sun and Polaris; stadia measurements; magnetic declination; arithmetic constants; English and Metric conversions; trigonometric formulas; Natural and Logarithmic Functions; and Logarithms of Numbers.

TABLE IV. — Minutes in Decimals of a Degree.

1'	.0167	11'	.1833	21'	.3500	31'	.5167	41'	.6833	51'	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

TABLE V. — Inches in Decimals of a Foot.

1-16	3-32	$\frac{1}{8}$	3-16	$\frac{1}{4}$	5-16	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729
1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

Natural Trigonometrical Functions

Angle. Sin. Tan. Sec. Cosec. Cotg. Cosin.							Angle. Sin. Tan. Sec. Cosec. Cotg. Cosin.						
0°	0	0	1.	∞	∞	1.	90	0°					
10	.0029	.0029		343.8	343.8	1.	50	10	.1421	.1435	1.0102	7.040	6.968
20	.0058	.0058		171.9	171.9	.99998	40	20	.1449	.1465	1.0107	6.900	6.827
30	.0087	.0087		114.6	114.6	.99996	30	30	.1478	.1495	1.0111	6.766	6.691
40	.0116	.0116	1.0001	85.94	85.94	.99993	20	40	.1507	.1524	1.0115	6.636	6.561
50	.0145	.0145	1.0001	68.76	68.75	.99989	10	50	.1536	.1554	1.0120	6.512	6.435
1	.0175	.0175	1.0002	57.30	57.29	.99985	89	9	.1564	.1584	1.0125	6.394	6.314
10	.0204	.0204	1.0002	49.11	49.10	.99979	50	10	.1593	.1614	1.0129	6.277	6.197
20	.0233	.0233	1.0003	42.98	42.96	.99973	40	20	.1622	.1644	1.0134	6.166	6.084
30	.0262	.0262	1.0003	38.20	38.19	.99966	30	30	.1650	.1673	1.0139	6.059	5.976
40	.0291	.0291	1.0004	34.38	34.37	.99958	20	40	.1679	.1703	1.0144	5.955	5.871
50	.0320	.0320	1.0005	31.26	31.24	.99949	10	50	.1708	.1733	1.0149	5.855	5.769
2	.0349	.0349	1.0006	28.65	28.64	.99939	88	10	.1736	.1763	1.0154	5.759	5.671
10	.0378	.0378	1.0007	26.45	26.43	.99929	50	10	.1765	.1793	1.0160	5.665	5.576
20	.0407	.0407	1.0008	24.56	24.54	.99917	40	20	.1794	.1823	1.0165	5.575	5.485
30	.0436	.0437	1.0010	22.93	22.90	.99905	30	30	.1822	.1853	1.0170	5.488	5.396
40	.0465	.0466	1.0011	21.49	21.47	.99892	20	40	.1851	.1883	1.0176	5.403	5.309
50	.0494	.0495	1.0012	20.23	20.21	.99878	10	50	.1880	.1914	1.0181	5.320	5.226
3	.0523	.0524	1.0014	19.11	19.08	.99863	87	11	.1908	.1944	1.0187	5.241	5.145
10	.0552	.0553	1.0015	18.10	18.07	.99847	50	10	.1937	.1974	1.0193	5.164	5.066
20	.0581	.0582	1.0017	17.20	17.17	.99831	40	20	.1965	.2004	1.0199	5.089	4.989
30	.0610	.0612	1.0019	16.38	16.35	.99813	30	30	.1994	.2035	1.0205	5.016	4.915
40	.0640	.0641	1.0020	15.64	15.60	.99795	20	40	.2022	.2065	1.0211	4.945	4.843
50	.0669	.0670	1.0022	14.96	14.92	.99776	10	50	.2051	.2095	1.0217	4.877	4.773
4	.0698	.0699	1.0024	14.34	14.30	.99756	86	12	.2079	.2126	1.0223	4.810	4.705
10	.0727	.0729	1.0027	13.76	13.73	.99736	50	10	.2108	.2156	1.0230	4.745	4.638
20	.0756	.0758	1.0029	13.23	13.20	.99714	40	20	.2136	.2186	1.0236	4.682	4.574
30	.0785	.0787	1.0031	12.75	12.71	.99692	30	30	.2164	.2217	1.0243	4.620	4.511
40	.0814	.0816	1.0033	12.29	12.25	.99668	20	40	.2193	.2247	1.0249	4.560	4.449
50	.0843	.0846	1.0036	11.87	11.83	.99644	10	50	.2221	.2278	1.0256	4.502	4.390
5	.0872	.0875	1.0038	11.47	11.43	.99619	85	13	.2250	.2309	1.0263	4.445	4.331
10	.0901	.0904	1.0041	11.10	11.06	.99594	50	10	.2278	.2339	1.0270	4.390	4.275
20	.0929	.0934	1.0043	10.76	10.71	.99567	40	20	.2306	.2370	1.0277	4.336	4.219
30	.0958	.0963	1.0046	10.43	10.39	.99540	30	30	.2334	.2401	1.0284	4.284	4.165
40	.0987	.0992	1.0049	10.13	10.08	.99511	20	40	.2363	.2432	1.0291	4.232	4.113
50	.1016	.1022	1.0052	9.839	9.788	.99482	10	50	.2391	.2462	1.0299	4.182	4.061
6	.1045	.1051	1.0055	9.567	9.514	.99452	84	14	.2419	.2493	1.0306	4.133	4.011
10	.1074	.1080	1.0058	9.309	9.255	.99421	50	10	.2447	.2524	1.0314	4.086	3.962
20	.1103	.1110	1.0061	9.065	9.010	.99390	40	20	.2476	.2555	1.0321	4.039	3.914
30	.1132	.1139	1.0065	8.834	8.777	.99357	30	30	.2504	.2586	1.0329	3.994	3.867
40	.1161	.1169	1.0068	8.614	8.556	.99324	20	40	.2532	.2617	1.0337	3.949	3.821
50	.1190	.1198	1.0072	8.405	8.345	.99290	10	50	.2560	.2648	1.0345	3.906	3.776
7	.1219	.1228	1.0075	8.206	8.144	.99255	83	15	.2588	.2679	1.0353	3.864	3.732
10	.1248	.1257	1.0079	8.016	7.953	.99219	50	10	.2616	.2711	1.0361	3.822	3.689
20	.1276	.1287	1.0082	7.834	7.770	.99182	40	20	.2644	.2742	1.0369	3.782	3.647
30	.1305	.1317	1.0086	7.661	7.596	.99144	30	30	.2672	.2773	1.0377	3.742	3.606
40	.1334	.1346	1.0090	7.496	7.429	.99106	20	40	.2700	.2805	1.0386	3.703	3.566
50	.1363	.1376	1.0094	7.337	7.269	.99067	10	50	.2728	.2836	1.0394	3.665	3.526

Cosin. Cotg. Cosec. Sec. Tan. Sin. Angle

Cosin. Cotg. Cosec. Sec. Tan. Sin. Angle

Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	Angle
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Natural Trigonometrical Functions

Angle. Sin. Tan. Sec. Cosec. Cotg. Cosin.

°							°
32	.5299	.6249	1.1792	1.887	1.600	.84805	58
10	.5324	.6289	1.1813	1.878	1.590	.84650	50
20	.5348	.6330	1.1835	1.870	1.580	.84495	40
30	.5373	.6371	1.1857	1.861	1.570	.84339	30
40	.5398	.6412	1.1879	1.853	1.560	.84182	20
50	.5422	.6453	1.1901	1.844	1.550	.84025	10
33	.5446	.6494	1.1924	1.836	1.540	.83867	57
10	.5471	.6536	1.1946	1.828	1.530	.83708	50
20	.5495	.6577	1.1969	1.820	1.520	.83549	40
30	.5519	.6619	1.1992	1.812	1.511	.83389	30
40	.5544	.6661	1.2015	1.804	1.501	.83228	20
50	.5568	.6703	1.2039	1.796	1.492	.83066	10
34	.5592	.6745	1.2062	1.788	1.483	.82904	56
10	.5616	.6787	1.2086	1.781	1.473	.82741	50
20	.5640	.6830	1.2110	1.773	1.464	.82577	40
30	.5664	.6873	1.2134	1.766	1.455	.82413	30
40	.5688	.6916	1.2158	1.758	1.446	.82248	20
50	.5712	.6959	1.2183	1.751	1.437	.82082	10
35	.5736	.7002	1.2208	1.743	1.428	.81915	55
10	.5760	.7046	1.2233	1.736	1.419	.81748	50
20	.5783	.7089	1.2258	1.729	1.411	.81580	40
30	.5807	.7133	1.2283	1.722	1.402	.81412	30
40	.5831	.7177	1.2309	1.715	1.393	.81242	20
50	.5854	.7221	1.2335	1.708	1.385	.81072	10
36	.5878	.7265	1.2361	1.701	1.376	.80902	54
10	.5901	.7310	1.2387	1.695	1.368	.80730	50
20	.5925	.7355	1.2413	1.688	1.360	.80558	40
30	.5948	.7400	1.2440	1.681	1.351	.80386	30
40	.5972	.7445	1.2466	1.675	1.343	.80212	20
50	.5995	.7490	1.2494	1.668	1.335	.80038	10
37	.6018	.7536	1.2521	1.662	1.327	.79864	53
10	.6041	.7581	1.2549	1.655	1.319	.79688	50
20	.6065	.7627	1.2577	1.649	1.311	.79512	40
30	.6088	.7673	1.2605	1.643	1.303	.79335	30
40	.6111	.7720	1.2633	1.636	1.295	.79158	20
50	.6134	.7766	1.2661	1.630	1.288	.78980	10
38	.6157	.7813	1.2690	1.624	1.280	.78801	52
10	.6180	.7860	1.2719	1.618	1.272	.78622	50
20	.6202	.7907	1.2748	1.612	1.265	.78442	40
30	.6225	.7954	1.2778	1.606	1.257	.78261	30
40	.6248	.8002	1.2808	1.601	1.250	.78079	20
50	.6271	.8050	1.2838	1.595	1.242	.77897	10

Cosin. Cotg. Cosec. Sec. Tan. Sin. Angle

Angle. Sin. Tan. Sec. Cosec. Cotg. Cosin.

°							°
39	.6293	.8098	1.2868	1.589	1.235	.77715	51
10	.6316	.8146	1.2898	1.583	1.228	.77531	50
20	.6338	.8195	1.2929	1.578	1.220	.77347	40
30	.6361	.8243	1.2959	1.572	1.213	.77162	30
40	.6383	.8292	1.2991	1.567	1.206	.76977	20
50	.6406	.8342	1.3022	1.561	1.199	.76791	10
40	.6428	.8391	1.3054	1.556	1.192	.76604	50
10	.6450	.8441	1.3086	1.550	1.185	.76417	50
20	.6472	.8491	1.3118	1.545	1.178	.76229	40
30	.6494	.8541	1.3151	1.540	1.171	.76041	30
40	.6517	.8591	1.3184	1.535	1.164	.75851	20
50	.6539	.8642	1.3217	1.529	1.157	.75661	10
41	.6561	.8693	1.3251	1.524	1.150	.75471	49
10	.6583	.8744	1.3284	1.519	1.144	.75280	50
20	.6604	.8796	1.3318	1.514	1.137	.75088	40
30	.6626	.8847	1.3352	1.509	1.130	.74896	30
40	.6648	.8899	1.3386	1.504	1.124	.74703	20
50	.6670	.8952	1.3421	1.499	1.117	.74509	10
42	.6691	.9004	1.3456	1.494	1.111	.74314	48
10	.6713	.9057	1.3492	1.490	1.104	.74120	50
20	.6734	.9110	1.3527	1.485	1.098	.73924	40
30	.6756	.9163	1.3563	1.480	1.091	.73728	30
40	.6777	.9217	1.3600	1.476	1.085	.73531	20
50	.6799	.9271	1.3636	1.471	1.079	.73333	10
43	.6820	.9325	1.3673	1.466	1.072	.73135	47
10	.6841	.9380	1.3711	1.462	1.066	.72937	50
20	.6862	.9435	1.3748	1.457	1.060	.72737	40
30	.6884	.9490	1.3786	1.453	1.054	.72537	30
40	.6905	.9545	1.3824	1.448	1.048	.72337	20
50	.6926	.9601	1.3863	1.444	1.042	.72136	10
44	.6947	.9657	1.3902	1.440	1.036	.71934	46
10	.6967	.9713	1.3941	1.435	1.030	.71732	50
20	.6988	.9770	1.3980	1.431	1.024	.71529	40
30	.7009	.9827	1.4020	1.427	1.018	.71325	30
40	.7030	.9884	1.4061	1.422	1.012	.71121	20
50	.7050	.9942	1.4101	1.418	1.006	.70916	10
	.7071	1.	1.414	1.414	1.	.70711	45

Cosin. Cotg. Cosec. Sec. Tan. Sin. Angle

886.63

37

887.00

11.00

905.27

5.18

00.09

87.00

73.38

13.62

110.00

8.00

118.00

$$\begin{array}{r} 922.39 \\ 76.54 \\ \hline 998.93 \end{array}$$

259

$$\begin{array}{r} 427 \\ 259 \\ \hline 1.68 \end{array}$$

$$\begin{array}{r} 108 \\ 30 \\ \hline \end{array}$$

$$\begin{array}{r} 942.60 \\ 662 \\ \hline 949.22 \end{array}$$

$$\begin{array}{r} 4922 \\ 15.51 \\ \hline 33.71 \end{array}$$

$$\begin{array}{r} 33.2 \\ 20.0 \\ \hline 7.2 \end{array} \quad 63.5$$

$$\begin{array}{r} 33.2 \\ 36.1 \\ \hline 27.1 \end{array}$$

$$\begin{array}{r} 33.2 \\ 14.1 \\ \hline 17.1 \end{array}$$

$$\begin{array}{r} 359 \\ 11 \\ \hline 348 \end{array}$$

$$\begin{array}{r} 12.24 \\ 30 \\ 900.21 \\ 3.6720 \\ \hline 96.54 \end{array}$$

$$\begin{array}{r} 12.6 \\ 30 \\ 600.21 \\ 3780 \\ \hline 96.43 \end{array}$$

$$\begin{array}{r} 4922 \\ 12.51 \\ \hline 36.11 \\ 0651 \\ 2.26 \\ \hline \end{array}$$

$$\begin{array}{r} 09.27 \\ 36.71 \\ 36.2 \\ 247 \\ \hline 11.5 \end{array}$$

$$\begin{array}{r} 4922 \\ -16.65 \\ \hline 32.57 \end{array}$$

$$\begin{array}{r} 4922 \\ 12.51 \\ \hline 36.71 \\ -0.5 \\ \hline 36.2 \\ 17.5 \\ \hline 6.18.7 \end{array}$$

$$\begin{array}{r} 57.4 \\ 13 \\ \hline \end{array}$$

$$\begin{array}{r} 57.53 \\ 57.58 \\ 23 \\ \hline \end{array}$$

$$\begin{array}{r} 57.81 \end{array}$$

$$\begin{array}{r} 4.74 \\ 3.88 \\ \hline .86 \end{array}$$

909.91

$$\begin{array}{r} 16.24 \\ 13.12 \\ \hline \end{array}$$

$$\begin{array}{r} 99.91 \\ 03.12 \\ \hline 6.79 \end{array}$$

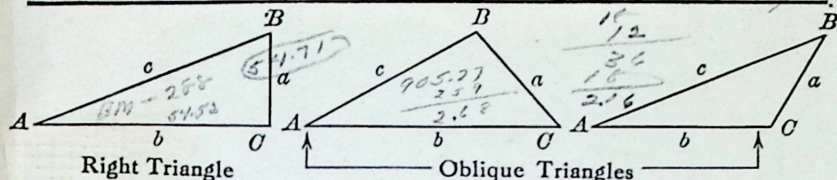
$$\begin{array}{r} 49.22 \\ 17.39 \\ \hline 31.83 \end{array}$$

49.22

17.4

30.2

TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

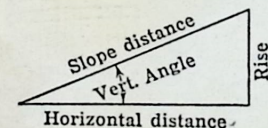
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

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	$B = 90^\circ - A, b = a \cot A, c = \frac{a}{\sin A}$
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	
A, 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, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}, C = 180^\circ - (A + B), c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180^\circ - C, \tan \frac{1}{2}(A - B) = \frac{(a - b) \tan \frac{1}{2}(A + B)}{a + b}$ $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a + b + c}{2}, \sin \frac{1}{2}A = \sqrt{\frac{(s - b)(s - c)}{bc}}$ $\sin \frac{1}{2}B = \sqrt{\frac{(s - a)(s - c)}{ac}}, C = 180^\circ - (A + B)$
a, b, c	Area	$s = \frac{a + b + c}{2}, \text{area} = \sqrt{s(s - a)(s - b)(s - c)}$
A, b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
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 = $5^\circ 10'$. From Table, Page IX. $\cos 5^\circ 10' = .9959$. Horizontal distance = $319.4 \times .9959 = 318.09$ 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. $\cos 5^\circ 10' = .9959, 1 - .9959 = .0041, 319.4 \times .0041 = 1.31, 319.4 - 1.31 = 318.09$ 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.