

FIELD BOOK

350 A

101

KEUFFEL & ESSER CO.

DRAWING MATERIALS AND SURVEYING INSTRUMENTS. NEW YORK.

CHICAGO. ST. LOUIS. SAN FRANCISCO. MONTREAL.

TABLES FOR EXCAVATIONS AND EMBANKMENTS.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.
ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.
FOR SINGLE TRACK EXCAVATION.

"Copyright, 1895, by Keuffel & Esser Co."

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	0
1	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	1
2	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	2
3	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	3
4	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	4
5	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	5
6	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	6
7	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	7
8	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	8
9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	9
10	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	10
11	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	11
12	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	12
13	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	13
14	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	14
15	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	15
16	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	16
17	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	17
18	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	18
19	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	19
20	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	20
21	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	21
22	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	22
23	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	23
24	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	24
25	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	25
26	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	26
27	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	27
28	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	28
29	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	29
30	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	30
31	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	31
32	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	32
33	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	33
34	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	34
35	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	35
36	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	36

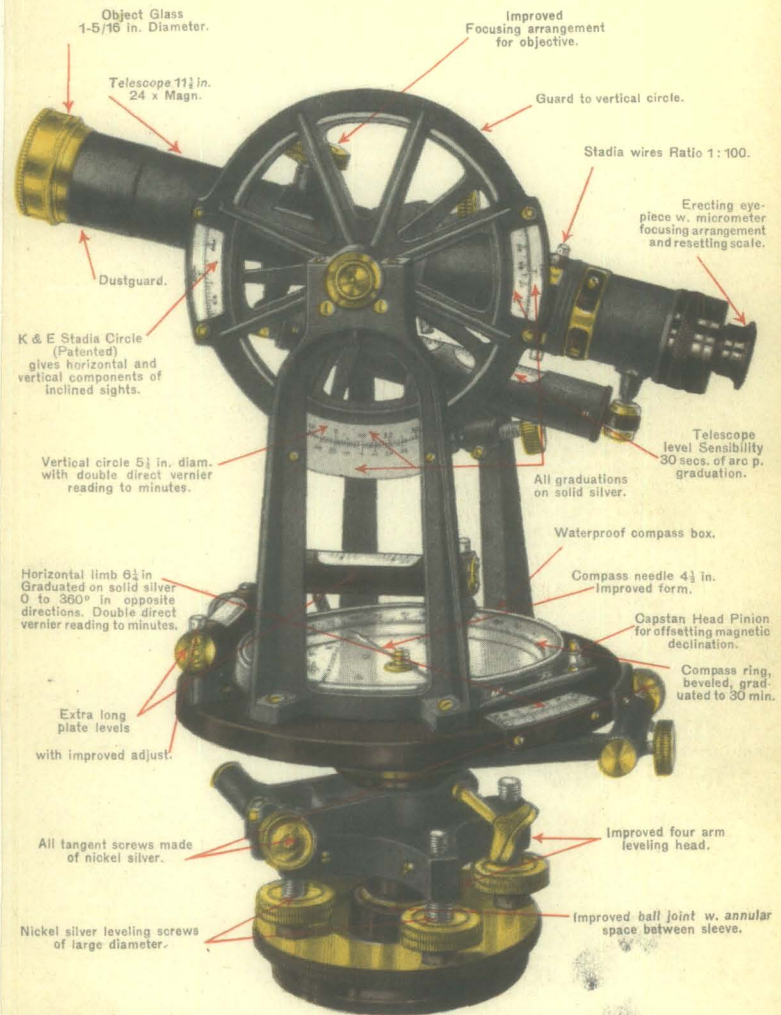
Calculated by Julien A. Hall, M. Am. Soc. C. E.

For Keith's Railroad Curve Tables see end of book.

101

BLACK HAWK COUNTY
ENGINEER'S OFFICE
COURT HOUSE
WATERLOO, IOWA 50703

EXTRA FINE ENGINEERS' TRANSIT
No. 5060 S
KEUFFEL & ESSER CO., N.Y.

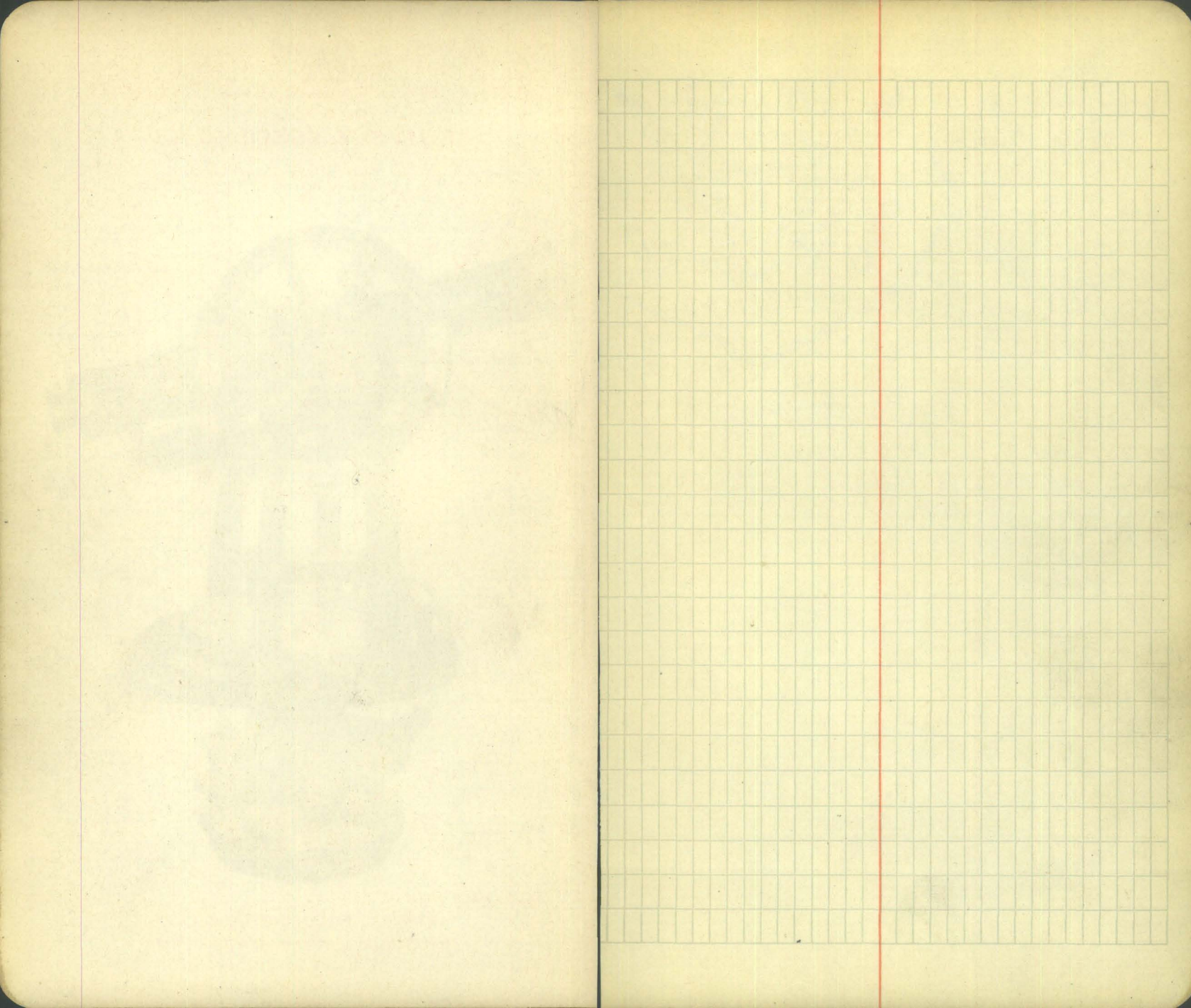


ALSO MADE WITH

INTERNAL FOCUSING TELESCOPE

PRACTICALLY DUST AND MOISTURE PROOF. —

BLACK HAWK COUNTY
 ENGINEER'S OFFICE
 COURT HOUSE
 WATERLOO, IOWA 50601



Index to Contents Pages

Transit Notes on Washington Union Local
County Road

1-24 ✓

Ties to 0+00 in sec 4 Union Twp

25 ✓

X. sec local Co. Rd. Union "

26-28 ✓

Transit Notes in Washington Twp Sec 2

29-30 ✓

X sections " " " "

31-32 ✓

Final X-sec Jamesville Winslow Local Co Rd

35-53 ✓

" " " " Borrow Pit

60 ✓

Prelim " " " "

34 ✓

Stepast. " " Local Co. Rd

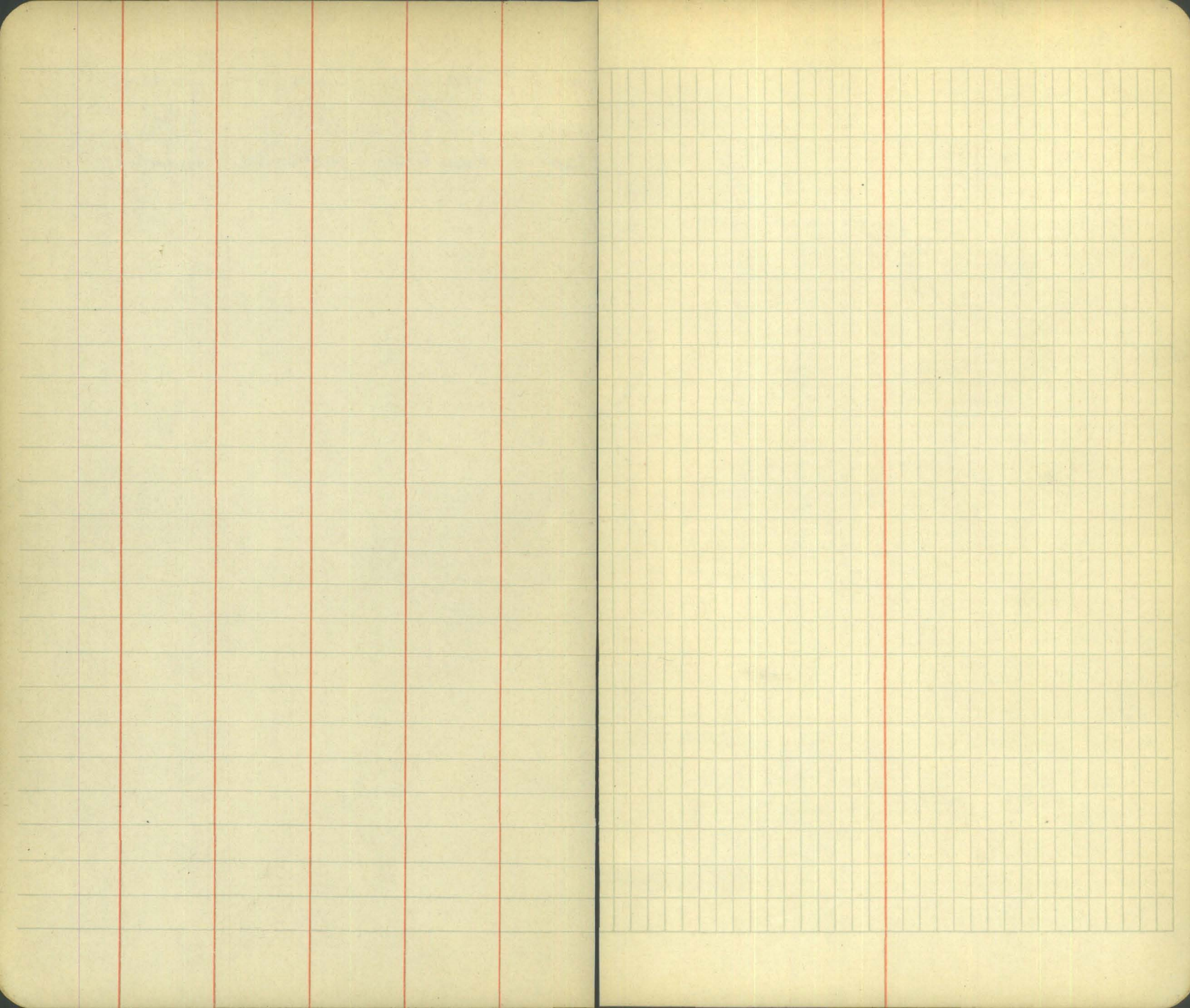
33 ✓

Final X-sec. So. of 31-32 Barclay

61-68 ✓

" " " " ³⁴
35

62-75 ✓



3/3/31 Spencer Washington-Union Local Co. Rd.
 Hay Sec. 3 Wash. Twp. & between Sec's. 4 & 9 Union Twp.
 Schmidt
 Butterfield.
 Transit Line Notes.

5+00

4+00

3+00

2+00

1+00

0+00 = N.E. Cor. of N.W.-N.W. $\frac{1}{4}$ thence W.
 Sec 2-90-14-

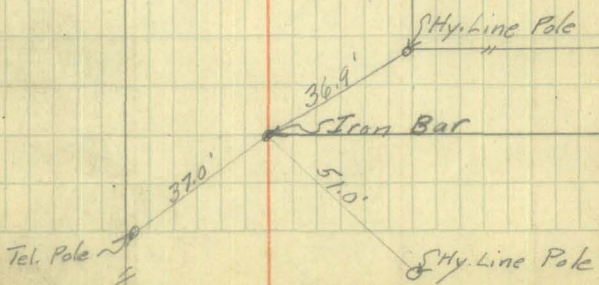
Cultivated.

Sec. 2-90-14
 B. H. County.

Tel. Line N. side Rd.
 must be moved approx 3' or 4'
 (2 wire line)

Bremer Co.

Cultivated



11+00

10+00

9+00

8+00

7+00

6+00

17+00

16+00

15+00

14+00

13+00

12+00

12+00

Cultivated

+16"

3x3

9' 12"

Flag-stone Culv.

No. Floor

Drains 30 Acres Flat

Place 30" C.P.

$$+50 = 13^{\circ} 35' \quad 9^{\circ} 51'$$

$$23+00 = 9^{\circ} 50' \quad 5^{\circ} 14'$$

$$+50 = 6^{\circ} 05' \quad 0^{\circ} 36'$$

$$PC = 22+43.5 = 0^{\circ} 00'$$

$$22+00 = 2^{\circ} 20'$$

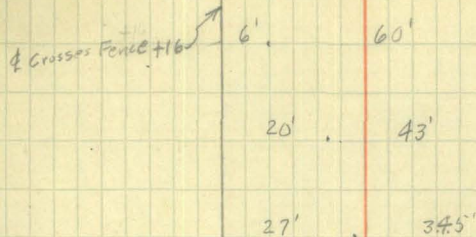
$$PC = 21+68.9 = 0^{\circ} 00'$$

$$21+00$$

$$20+00$$

$$19+00$$

$$18+00$$



NOTE:

28700

$$+ 50 = 43^{\circ} 35'$$
 $P.T. =$
$$27+00 = 39^{\circ}-50' \quad 42^{\circ}-19'$$
$$+ 50 = 36^{\circ} - 05' \quad 37^{\circ} - 36'$$

26+00-32°-20' 32°-59'

$$\Delta = 91^{\circ} 47' \text{ Lf.}$$

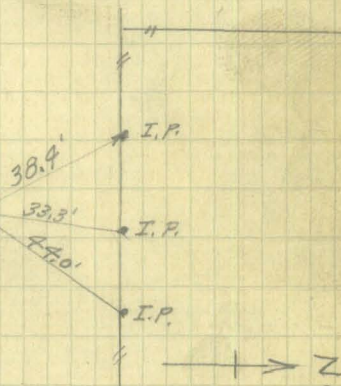
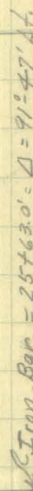
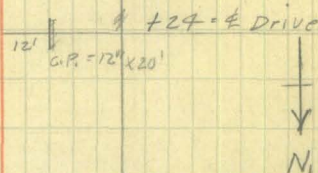
$D. = 16^{\circ}-00' \text{ Lt. } 18^{\circ}-30' \text{ Lt.}$

$$T = 394.1' \quad 319.52'$$
$$L = 611.9' \quad 496.12'$$
$$E = 146.7' \quad 135.3'$$

~~R. = 385.1'~~ 309.7'

$$25^{\circ}00' - 24^{\circ}50' = 23^{\circ}44'$$
$$+ 50 = \underline{21^{\circ}03'} \quad 19^{\circ}06'$$
$$24+00 = 17^{\circ} 20' \quad 14^{\circ} 29'$$

Equation



35+00

34+00

33+00

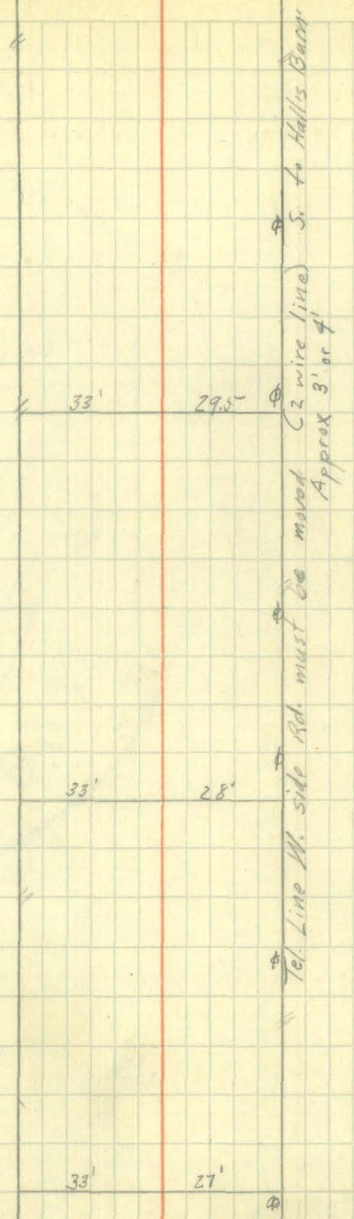
32+00

31+00

30+00

Cultivated

Cultivated



16.6
6.6
23.2

41+00

40+10.5 = 4' 2" x 2' x 23' = Drains 10 Acres Rolling
Ext'd 4' East.
40+00

39+00

Note: (4-1-65)

44 + 19.8
36 + 16.4
803.4

Actual charrage = 802.9

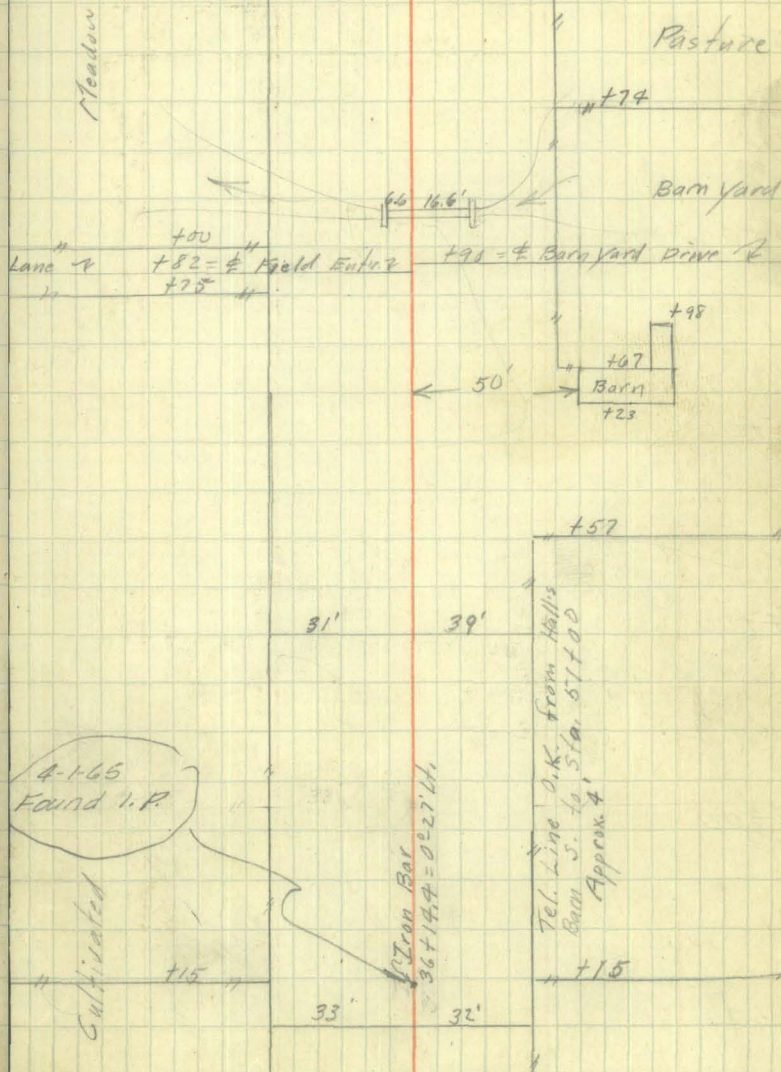
38+00

37+00

Note:
(4-1-65) $\Delta = 0^{\circ}25'40''$

PI = 36 + 17.4 = $\Delta = 0^{\circ}27'41''$

36+00



47+00

46+00

$$\begin{array}{r} 51+12.9 \\ 44+19.8 \\ \hline 693.1 \end{array}$$

45+00

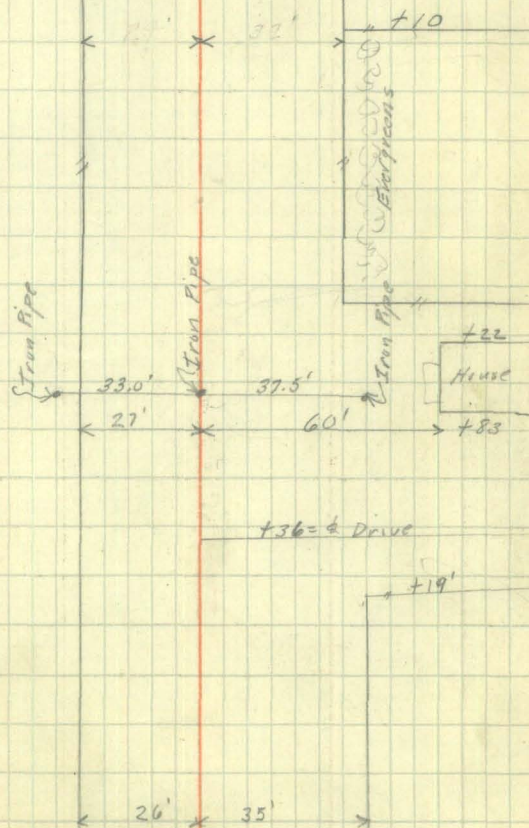
P.I. $44+19.8' = \Delta = 6^{\circ}59' \text{ Rt.}$

44+00

43+00

42+00

Shadow



53+00

$$\begin{array}{r} 57190.3 \\ 51+12.9 \\ \hline 677.4 \end{array}$$

52+00

Note:

(2-1-65) New $\Delta = 3^{\circ}36''$
 $P.I. = 51+129' = \Delta = 3^{\circ}35' L.H.$

51+00

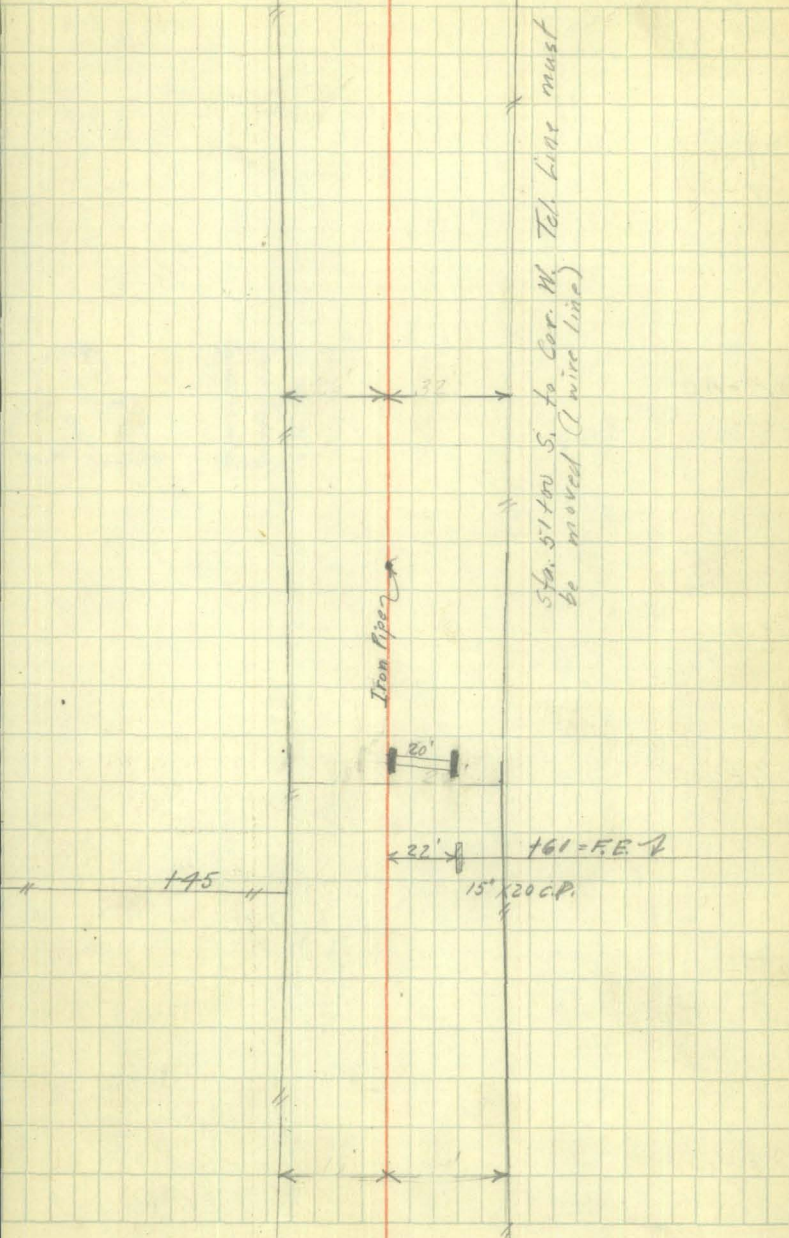
 $50+16 = \frac{1}{2}$ Conc. Culv. $2' \times 2' \times 20'$
Drains 10 Acres Rolling

50+00

Ext'd 12' East.

49+00

48+00



65+00

64+00

P.T. =
63+17.8
63+00

Curve run in with a
90' Radius.

62+00

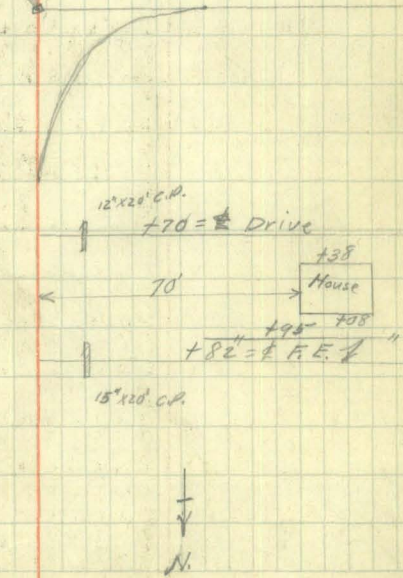
P.C.
61+78.4

61+00

62+68.4
57+90.3
478.1

60+00

15' Stone & Iron Pipe = $\Delta = 92^{\circ} 16' R$



71+00

70+00

69+00

68+00

67+00

66+00

Cultivated

Meadow

33'

+88

Cultivated

77+00

Cultivated

76+00 = $\frac{1}{2}$ Conc. Culv. 2'x2'x20'
 Ext'd. 3.3' South & 3.2' North.

9.7' 9.8'

Cultivated

75+00

+36

74+00

Meadow

73+00

72+00

83+00

82+00

81+00

80+00

79+00

78+00

1323.5
100'
Cemetery

33.0'

* $\pm 61' = \pm$ Gate to Cemetery
526.5'

Cultivated

89+00

" ± 60 "

88+00

Cultivated

87+00

Cultivated

86+00

" ± 03 "

85+00

Meadow

84+00

+50 = ~~4~~⁰02' 1042

P.C. ~~95+36.2~~ = ~~0~~⁰00'

+27.4 P.C. 0000

95+00

94+50 = Need a Culv. Outlet to
S. ditch thence W. around
corner to S.

94+00

+84

Cultivated

93+00

Cultivated

92+00

91+00

90+00

9700
96951

101+00

100+00

99+00

P.T. =
 $98+56.3 = 24^{\circ}00.5'$
 $+50 = 23^{\circ}32'$

+98.4 P.T. = $24^{\circ}04.5'$ P.I. 96+98.1

98+00 = $19^{\circ}47'$ $20^{\circ}27'$ P.I. = 97+06.3

$\Delta = 48^{\circ}01'$ Lt. $48^{\circ}09'$

+50 = $16^{\circ}02'$ $16^{\circ}42'$ P.I. = $15^{\circ}00'$ Lt.

+100.3 P.I. = $170.1'$ $170.7'$

97+00 = $12^{\circ}17'$ $12^{\circ}57'$ L. = $320.1'$ $321.0'$

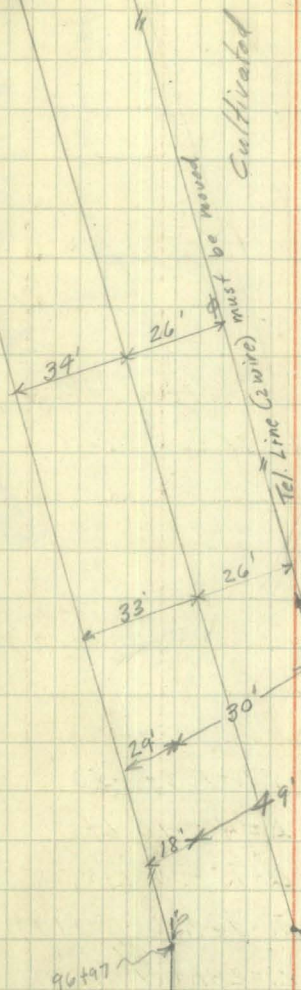
+98.1 P.I. E. = $36.1'$ $36.4'$

+50 = $8^{\circ}32'$ $9^{\circ}12'$ R. = $383.1'$

96+00 = $4^{\circ}47'$ $5^{\circ}27'$

Sta. 99+00 Approx.
 Need Culv. to Outlet W.

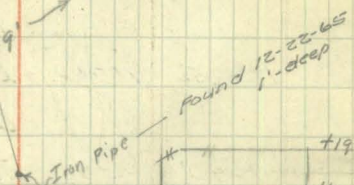
Cultivated



96+97

<17'>

<29'>



+36 = # F.E. 4

Cultivated

$$P.G. = 107+65.2 = 0^{\circ}-00'$$

107+00

106+00

105+00

$$P.T. = 104+78.8 = 21^{\circ}-05'$$

$$+50 = 18^{\circ}-55' \quad 19^{\circ}02'$$

104+00 = 15^{\circ}-40' 15^{\circ}17'

103+49.0

$$P.I. = 103+45.0$$

$$+50 = 11^{\circ}-25' \quad 11^{\circ}32' \quad A = 42^{\circ}-16' \text{ Lt. } 42^{\circ}16'$$

$$D = 15^{\circ}-00' \text{ Lt.}$$

103+00 = 7^{\circ}-40' 7^{\circ}47'

$$T_1 = 147.3' \quad 147.66$$

$$L_1 = 281.1' \quad 281.27$$

$$+50 = 3^{\circ}-55' \quad 3^{\circ}62'$$

$$R = 383.1 \quad ?$$

$$Ext. = 27.4 \quad 27.5$$

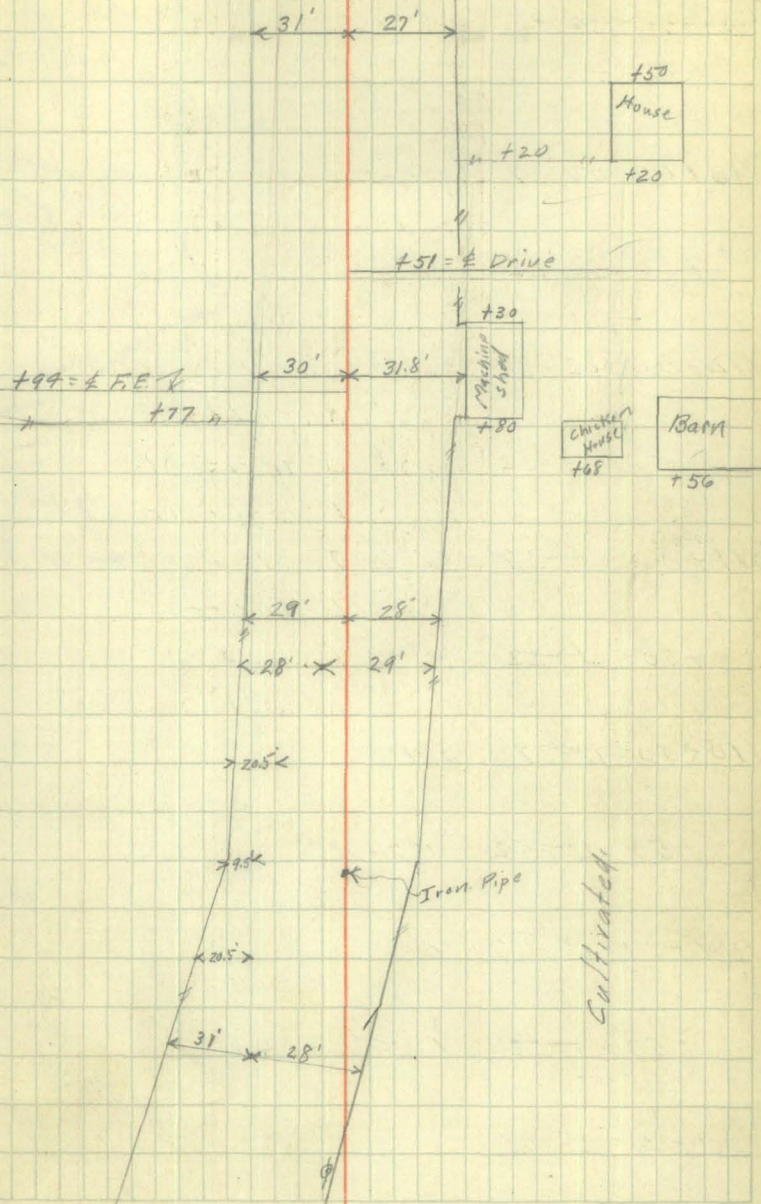
102+00 = 0^{\circ}-10' 0^{\circ}17'

$$P.C. = 101+97.9 = 0^{\circ}-00'$$

Cultivated

Cultivated

Cultivated



119+00

119+05.5 = W. End Hy. Truss

118+00

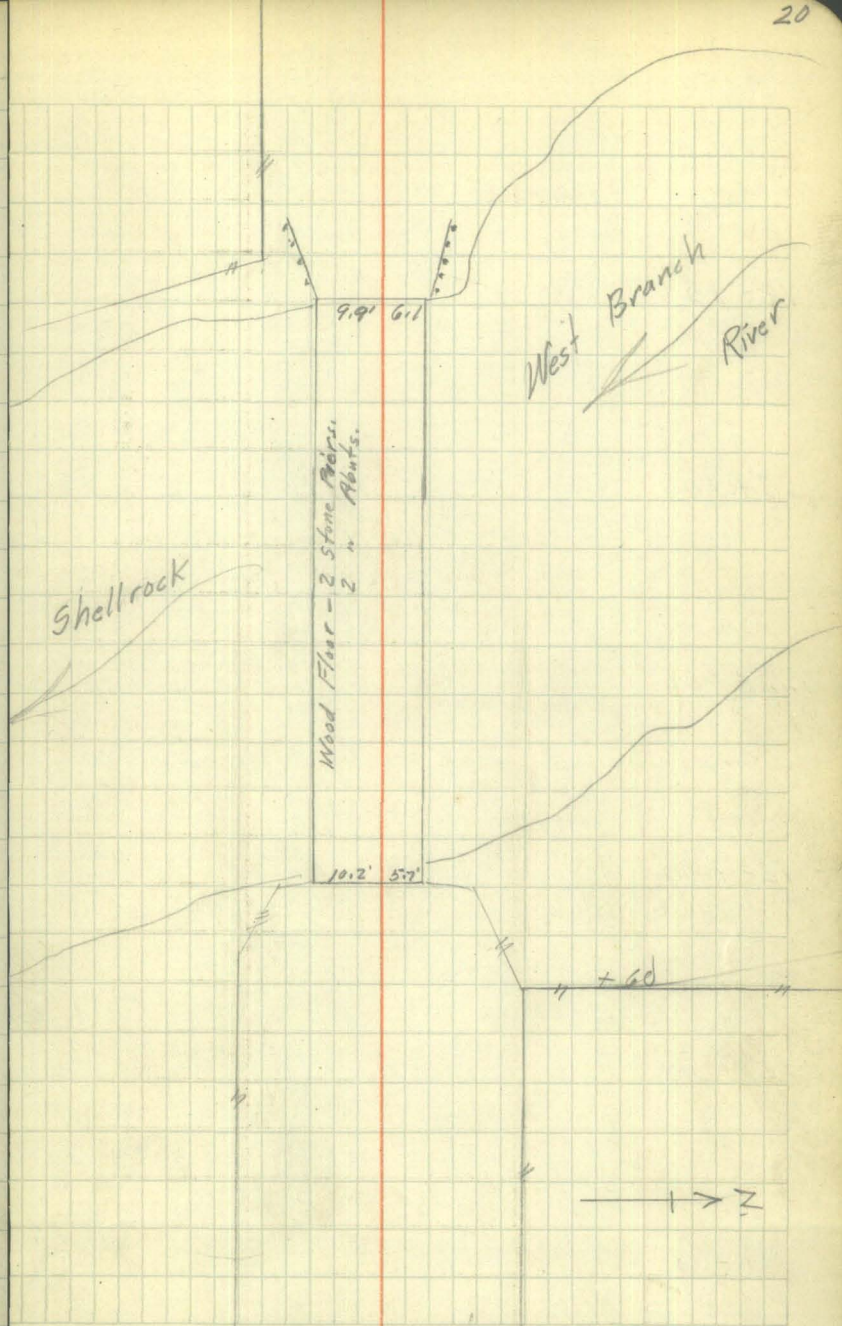
117+00

116+00

116+03 = E. End Hy. Truss - 3-100' spans

115+00

114+00



125+00

124+00

123+00

122+00

121+00

120+00

Pasture & Timber

+71

R.R.

28'

28'

33'

Stone & Iron Bar 15 Sta 122+70.7 = N 1/4 - 1/4 Cor. Sec. 9 - T20 - R4

25'

25'

33'

+79 = Lane

R.R.

+71

Pasture & Timber

+100 = E.F.E.

28'

25'

131+00

130+00

130+27.5 = W. end Wood Pile Br.

Wood Floor - Wood Hbrl.
 Stone Abuts. Fair Condition
 Over-Flow Br.

129+00

129+30 = E. end Wood Pile Br.

128+00

127+00

126+00

Pond

45 11'

5' 10.5'

28'

29'

Pasture & Timber

Pasture & Timber

T.Y.N.

28'

29'

137+00

136+00

P.I. =
 $135+58.4 = \Delta = 0^\circ 37' \text{ Lt.} = \text{N. } \frac{1}{4} \text{ Sec. 9-90-14}$

135+00

134+00

41
 135+58.4
 58.4
 58.4
 58.4

133+00

132+00

+46
 House
 +30

+79
 +59

+75

+79 = Gate

Pasture

27'

34.5'

+57
 +55 = Gate R.P.

33'

R.P.
 33'
 Iron Bar +57
 +51 = Gate

27'

32'

Cultivated

+68
 +50 = E.F.E. 2

Pasture

28'

30'

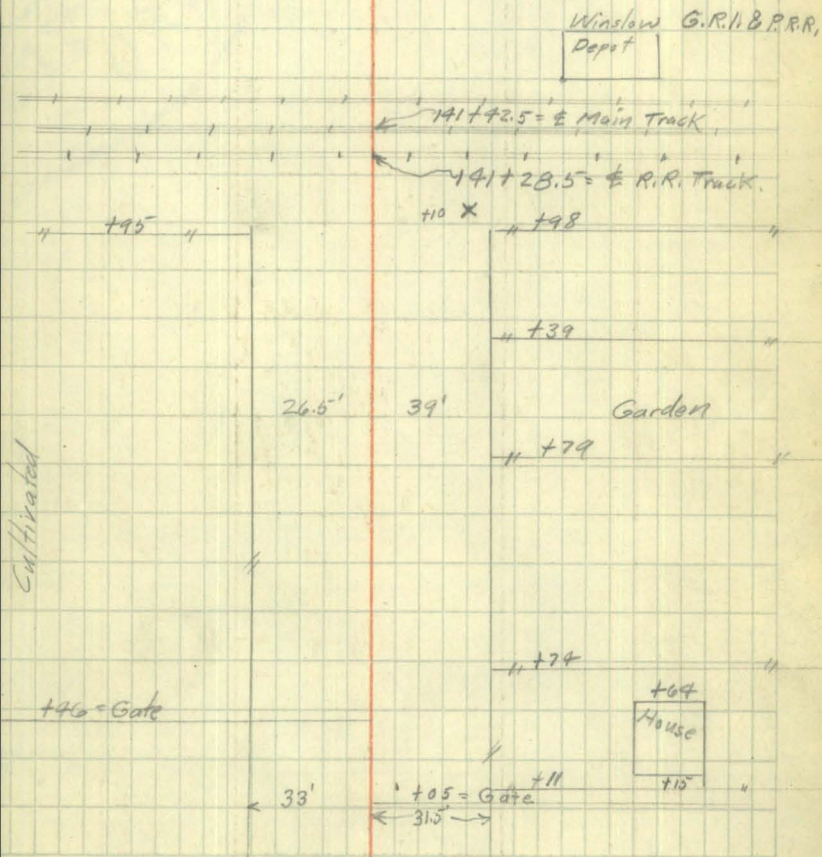
Pasture

141+00

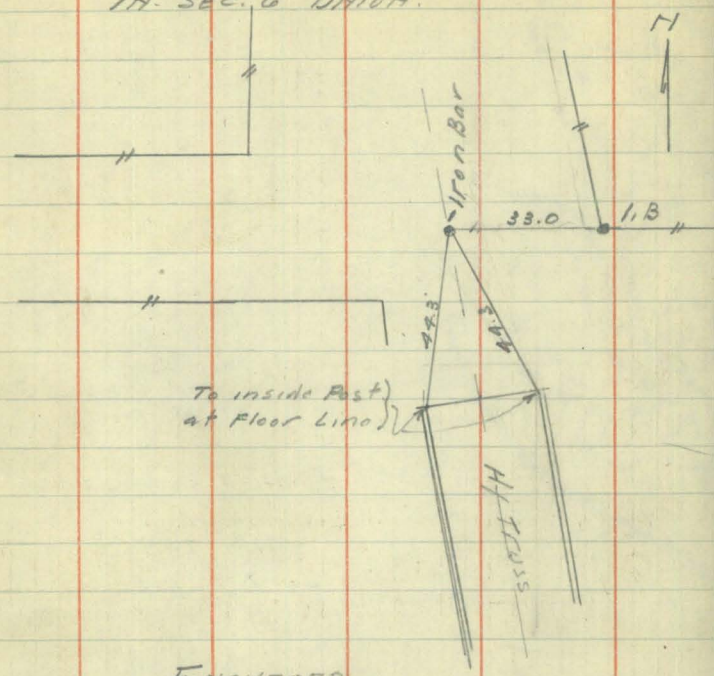
140+00

139+00

138+00



Ties To 0+00
17. SEC. 6 UNION.



FINCHFORD

Apr. 3-1931
 Chris
 E.W.
 Burton
 15 ft

26

X-SECTIONS - LOCAL ROAD - FINCH FOR WEST THRU SEC. No - 30-14

±

6.46 106.46

100.00

Belt on Bridge NW. Cor NW. Abut.

1+0

$\frac{67}{33}$ $\frac{57}{19}$ $\frac{62}{11}$ $\frac{73}{9}$ $\frac{75}{6}$ $\frac{66}{2}$ $\frac{100.1}{64}$ $\frac{67}{17}$ $\frac{63}{35}$ $\frac{64}{33}$

2+0

$\frac{44}{33}$ $\frac{48}{21}$ $\frac{48}{10}$ $\frac{58}{9}$ $\frac{63}{7}$ $\frac{57}{4}$ $\frac{100.9}{56}$ $\frac{55}{10}$ $\frac{58}{15}$ $\frac{62}{16}$ $\frac{54}{20}$ $\frac{54}{33}$

3+0

$\frac{35}{33}$ $\frac{31}{28}$ $\frac{33}{21}$ $\frac{51}{9}$ $\frac{47}{6}$ $\frac{101.9}{46}$ $\frac{51}{13}$ $\frac{54}{18}$ $\frac{44}{22}$ $\frac{41}{33}$

4+0

$\frac{97}{33}$ $\frac{94}{23}$ $\frac{103}{21}$ $\frac{103}{12}$ $\frac{88}{7}$ $\frac{98.1}{84}$ $\frac{87}{9}$ $\frac{84}{15}$ $\frac{89}{17}$ $\frac{48}{24}$ $\frac{43}{28}$ $\frac{45}{33}$

5+0

$\frac{122}{33}$ $\frac{123}{23}$ $\frac{139}{18}$ $\frac{138}{11}$ $\frac{130}{7}$ $\frac{73.8}{127}$ $\frac{127}{7}$ $\frac{136}{19}$ $\frac{136}{31}$ $\frac{134}{30}$

6+0

$\frac{124}{33}$ $\frac{125}{26}$ $\frac{134}{18}$ $\frac{134}{13}$ $\frac{128}{7}$ $\frac{93.9}{126}$ $\frac{128}{11}$ $\frac{130}{15}$ $\frac{125}{19}$ $\frac{134}{33}$

7+0

$\frac{117}{33}$ $\frac{117}{27}$ $\frac{121}{23}$ $\frac{131}{21}$ $\frac{132}{16}$ $\frac{125}{7}$ $\frac{94.4}{121}$ $\frac{124}{11}$ $\frac{134}{15}$ $\frac{134}{17}$ $\frac{131}{20}$ $\frac{130}{33}$

8+0

$\frac{127}{33}$ $\frac{125}{27}$ $\frac{121}{18}$ $\frac{142}{15}$ $\frac{138}{13}$ $\frac{128}{7}$ $\frac{94.1}{124}$ $\frac{124}{9}$ $\frac{128}{12}$ $\frac{133}{16}$ $\frac{131}{21}$ $\frac{128}{33}$

① 7.14 101.57 12.03 94.43

9+0

$\frac{81}{33} \frac{83}{30} \frac{100}{27} \frac{102}{24} \frac{95}{21} \frac{77}{15} \frac{94.1}{75} \frac{76}{8} \frac{86}{10} \frac{85}{13} \frac{75}{22} \frac{83}{27} \frac{86}{33}$

10+0

$\frac{54}{37} \frac{54}{31} \frac{98}{31} \frac{99}{27} \frac{65}{23} \frac{69}{4} \frac{92.3}{93} \frac{98}{8} \frac{97}{10} \frac{95}{16} \frac{73}{21} \frac{53}{23} \frac{52}{33}$

11+0

$\frac{51}{33} \frac{51}{32} \frac{95}{32} \frac{97}{27} \frac{63}{24} \frac{62}{18} \frac{81}{3} \frac{92.3}{93} \frac{97}{6} \frac{98}{15} \frac{90}{23} \frac{48}{26} \frac{45}{30} \frac{56}{33}$

12+0

$\frac{57}{33} \frac{57}{32} \frac{106}{30} \frac{102}{26} \frac{60}{22} \frac{58}{9} \frac{69}{3} \frac{93.1}{85} \frac{95}{4} \frac{102}{13} \frac{25}{20} \frac{67}{24} \frac{52}{29} \frac{58}{33}$

13+0

$\frac{53}{33} \frac{53}{29} \frac{20}{27} \frac{67}{25} \frac{50}{21} \frac{95.9}{57} \frac{85}{4} \frac{94}{15} \frac{94}{23} \frac{68}{21} \frac{50}{33}$

14+0

$\frac{52}{33} \frac{52}{28} \frac{34}{22} \frac{42}{17} \frac{60}{13} \frac{67}{10} \frac{57}{8} \frac{96.0}{56} \frac{54}{9} \frac{64}{11} \frac{83}{18} \frac{92}{25} \frac{68}{29} \frac{44}{33}$

15+0

$\frac{64}{26} \frac{45}{21} \frac{40}{18} \frac{59}{13} \frac{61}{11} \frac{60}{7} \frac{57}{4} \frac{96.2}{54} \frac{54}{10} \frac{59}{15} \frac{58}{19} \frac{51}{24} \frac{45}{26} \frac{41}{31} \frac{45}{33}$

16+0

$\frac{46}{14} \frac{52}{16} \frac{55}{11} \frac{49}{5} \frac{97.2}{44} \frac{47}{8} \frac{50}{12} \frac{55}{18} \frac{44}{24} \frac{43}{33}$

101.57

17+0

$$\begin{array}{cccccccccccc} 38 & 39 & 50 & 50 & 43 & 97.7 & 42 & 45 & 52 & 38 & 38 \\ 33 & 20 & 15 & 12 & 9 & 39 & 8 & 12 & 16 & 21 & 33 \end{array}$$

18+0

$$\begin{array}{cccccccccccc} 37 & 37 & 35 & 42 & 45 & 40 & 96.3 & 40 & 42 & 43 & 35 & 32 & 33 \\ 33 & 24 & 18 & 16 & 12 & 10 & 33 & 9 & 13 & 18 & 21 & 29 & 33 \end{array}$$

BM.

3.08

98.49

Spike in F.C.P. S. of Sta. 17+06

NORTH OF SEC. 2-WASHINGTON 90-14

-570

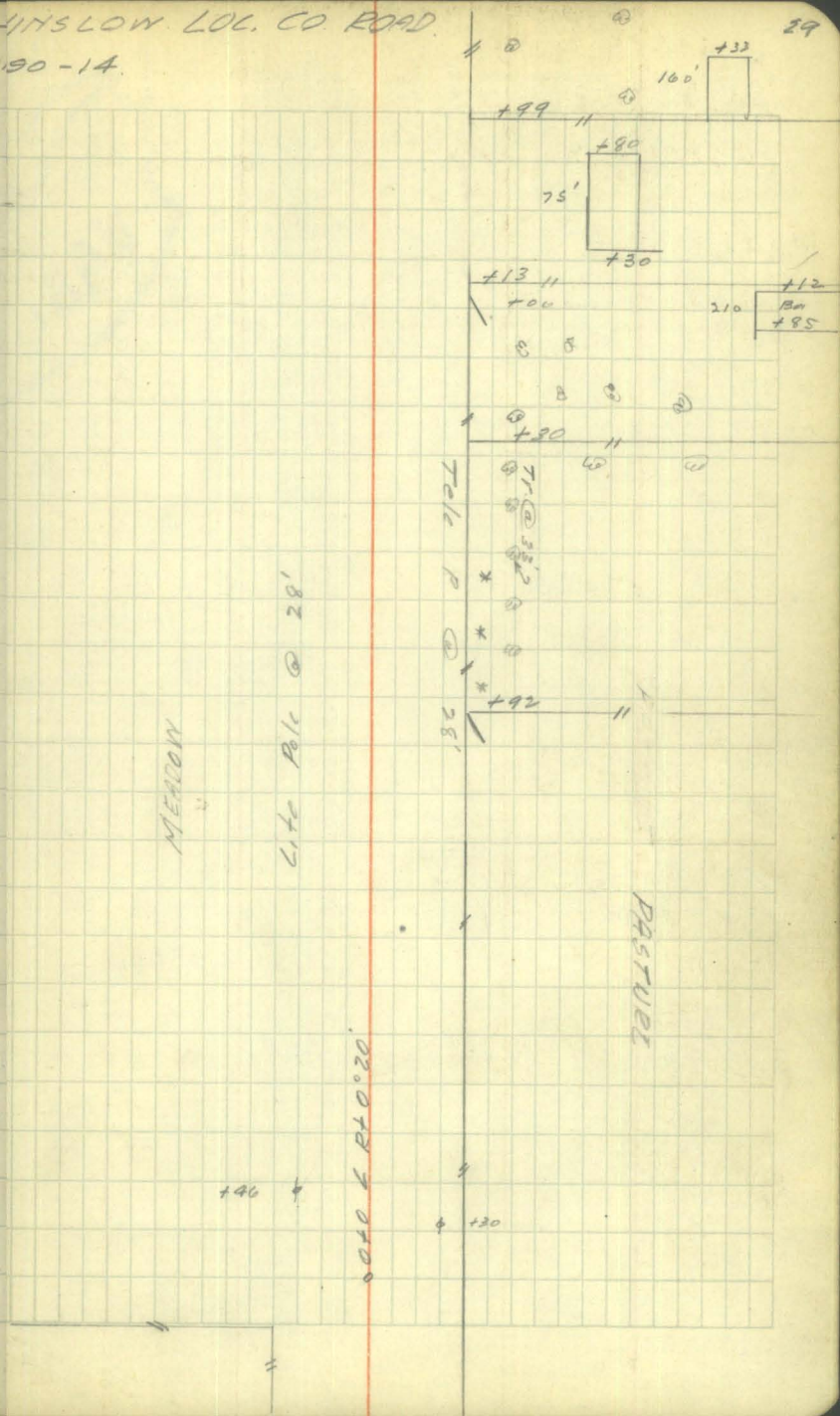
$$-4+0$$

-3+0

- 240

- 140

$0+0$



- +32.8 PAVZ.

- 8

- 710

PASTURE

780

710

PRELIM X-SEC. JAMESVILLE-WINDSLOW LOCAL CO. RD. MINUS FROM 0+0 TO CONNECT WITH PAVEMENT

31
April 3-51
CHRIS
EW.
Burton
K. L. C.
Approx. 125' N.

B.M. 3.50 887.83 884.23

Mike in 1st Hy. line Pole N. of Cor.

-1+0

883.9
 $\frac{31}{33} \frac{30}{29} \frac{36}{27} \frac{36}{21} \frac{40}{18} \frac{42}{15} \frac{39}{14} \frac{39}{9} \frac{43}{9} \frac{35}{14} \frac{23}{27} \frac{28}{30} \frac{32}{33}$

-2

882.0
 $\frac{51}{33} \frac{25}{30} \frac{45}{24} \frac{57}{20} \frac{57}{15} \frac{52}{13} \frac{58}{5} \frac{58}{5} \frac{64}{7} \frac{67}{13} \frac{62}{17} \frac{60}{27} \frac{58}{33}$

-3

881.3
 $\frac{59}{33} \frac{58}{30} \frac{64}{20} \frac{65}{18} \frac{64}{18} \frac{59}{24} \frac{57}{33}$

-4

882.3
 $\frac{67}{33} \frac{65}{26} \frac{56}{21} \frac{55}{17} \frac{52}{17} \frac{45}{19} \frac{38}{33}$

-5

883.9
 $\frac{66}{33} \frac{66}{31} \frac{70}{21} \frac{39}{39} \frac{35}{33}$

-6

884.4
 $\frac{56}{33} \frac{54}{26} \frac{44}{18} \frac{31}{14} \frac{34}{29} \frac{33}{33}$

-7

884.7
 $\frac{3.0}{28.0} \frac{27}{13} \frac{31}{20} \frac{33}{23} \frac{41}{27} \frac{35}{30} \frac{33}{33}$
Pave

- 8+

$$\begin{array}{r}
 884.2 \\
 \hline
 35 \quad 36 \quad 36 \quad 70 \quad 72 \\
 5.1 \quad 13 \quad 21 \quad 33 \\
 \hline
 \text{Power}
 \end{array}$$

- 8+32.9

$$\begin{array}{r}
 884.0 \\
 \hline
 3.8
 \end{array}$$

- 9

$$\begin{array}{r}
 893.5 \\
 \hline
 4.3 \quad \text{On Port}
 \end{array}$$

- 10

$$\begin{array}{r}
 883.0 \\
 \hline
 4.8 \quad \text{On Port}
 \end{array}$$

June 13th 1931P.S. 18.
D.T. 6
C. Clay

Janesville-Winslow Rd. Barrow S. of Prim, #218.

33

Sta. B.S. H.I. F.S. Elev. Grade

B.M. 432 883.65 884.33 like in 1st Hy. Line Pole N. of Cor. Approx. 125'

1+00 885.

0+00 887.

0-1	$\frac{C.31}{32}$	$\frac{F.10}{8}$	$\frac{C.310}{32}$	$\frac{C.0.8}{5}$	^{3.8} 887.1	$\frac{3.7}{32}$	$\frac{4.8}{8}$	$\frac{3.8}{32}$	$\frac{3.0}{5}$
-----	-------------------	------------------	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

0-2	$\frac{C.0.9}{32}$		$\frac{C.0.2}{32}$	$\frac{F.2.1}{5}$	^{3.9} 887.1	$\frac{6.0}{32}$	$\frac{6.4}{8}$	$\frac{6.7}{32}$	$\frac{6.0}{5}$
-----	--------------------	--	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

0-3	$\frac{C.0.2}{32}$		$\frac{C.0.5}{32}$	$\frac{F.2.0}{5}$	^{3.7} 887.1	$\frac{6.7}{32}$	$\frac{7.1}{8}$	$\frac{6.4}{32}$	$\frac{5.9}{5}$
-----	--------------------	--	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

0-4	$\frac{0.0}{32}$		$\frac{C.2.4}{32}$	$\frac{F.0.1}{5}$	^{4.0} 887.1	$\frac{7.4}{32}$	$\frac{6.1}{8}$	$\frac{7.6}{32}$	$\frac{7.1}{5}$
-----	------------------	--	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

0-5	$\frac{0.0}{32}$		$\frac{C.3.0}{32}$	$\frac{C.0.6}{5}$	^{4.1} 887.1	$\frac{7.1}{32}$	$\frac{4.5}{8}$	$\frac{4.1}{32}$	$\frac{3.5}{5}$
-----	------------------	--	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

0-6	$\frac{0.0}{32}$		$\frac{C.3.3}{32}$	$\frac{C.0.7}{5}$	^{4.1} 887.1	$\frac{6.3}{32}$	$\frac{4.0}{8}$	$\frac{3.8}{32}$	$\frac{3.3}{5}$
-----	------------------	--	--------------------	-------------------	----------------------	------------------	-----------------	------------------	-----------------

June 13th 1931

Janesville-Winslow Rd. Borrow Pit along Prim. #218
Pavement S.W. side of curve just N. of Janesville

34

Sta. B.S. H.I. F.S. Elev.
B.M. 432 888.65 884.33

0+00 = Prim. #218 Sta. 26+00 ^{S.W.} edge pavement

81.7

70 71 72 6.9 7.1
22 54 74 84 100

✓

1+00

82.0

6.7 7.1 6.8 7.6 7.3 7.2 6.8 6.3
22 32 42 64 82 100 130 150

✓

2+00

82.2

6.5 7.0 6.5 6.4 7.0 5.8 5.8 6.5
23 34 43 60 75 93 124 145

✓

3+00

82.8

5.9 6.1 5.7 6.0 5.3 5.7 6.2
23 38 60 78 100 127 137

✓

4+00

82.4

6.3 6.7 6.2 6.2 6.1 5.7 5.8
28 43 60 78 100 121 132

✓

5+00 = Sta. 31+00 at ^{S.W.} edge Pavement Prim. #218

82.6

6.1 6.4 6.8 6.9 6.9 6.0 5.9
27 60 72 78 91 100 133

✓

A89

JUNE 30 - 31 - 1931 35
 K.K.
 C.F.G.
 E.V.
 E.W.

FINAL X-SECS. JAMESVILLE - WINSLOW LOCAL RD.

North of Sec 2 - Thru Sec. 3 + between sec. $\frac{4}{9}$ WASHINGTON - UNION.

S.12.

889.45

884.33

0-1

84.8
 $\frac{47}{34}$ $\frac{82}{28}$ $\frac{73}{17}$ $\frac{50}{12}$ 47 $\frac{50}{12}$ $\frac{75}{17}$ $\frac{83}{28}$ $\frac{46}{32}$

0-2

84.4
 $\frac{67}{32}$ $\frac{89}{29}$ $\frac{89}{17}$ $\frac{53}{12}$ 51 $\frac{53}{12}$ $\frac{86}{18}$ $\frac{88}{30}$ $\frac{75}{31}$

0-3

ENTR. 18' X 13' X 1.4'

84.5
 $\frac{76}{32}$ $\frac{83}{29}$ $\frac{87}{17}$ $\frac{55}{12}$ 52 $\frac{51}{13}$ $\frac{87}{18}$ $\frac{86}{22}$ $\frac{74}{23}$

0-4

84.7
 $\frac{82}{33}$ $\frac{83}{18}$ $\frac{51}{12}$ 48 $\frac{51}{11}$ $\frac{79}{16}$ $\frac{81}{21}$ $\frac{58}{24}$

0-5

84.8
 $\frac{52}{14}$ $\frac{49}{12}$ 47 $\frac{48}{12}$ $\frac{50}{14}$

0-6

84.9
 $\frac{49}{16}$ $\frac{25}{14}$ 46 $\frac{46}{12}$ $\frac{49}{16}$

0-7

0-8

882.45

0+0

84.8

$\frac{57}{32}$ $\frac{83}{29}$ $\frac{74}{17}$ $\frac{50}{13}$ 47 $\frac{47}{13}$ $\frac{55}{33}$ $\frac{70}{50}$

+70

85.2

$\frac{63}{31}$ $\frac{84}{28}$ $\frac{81}{17}$ $\frac{46}{12}$ 43 $\frac{46}{13}$ $\frac{71}{18}$ $\frac{80}{28}$ $\frac{20}{30}$

1

85.1

$\frac{61}{32}$ $\frac{85}{30}$ $\frac{79}{19}$ $\frac{74}{13}$ 44 $\frac{45}{12}$ $\frac{72}{17}$ $\frac{82}{29}$ $\frac{72}{31}$

2

⊙

4.04

890.79

2.70

886.75

85.6

$\frac{57}{31}$ $\frac{79}{30}$ $\frac{75}{18}$ $\frac{41}{12}$ 39 $\frac{41}{12}$ $\frac{67}{16}$ $\frac{77}{28}$ $\frac{46}{31}$

3

85.9

$\frac{50}{31}$ $\frac{82}{28}$ $\frac{77}{20}$ $\frac{46}{11}$ 49 $\frac{47}{12}$ $\frac{77}{17}$ $\frac{83}{28}$ $\frac{46}{31}$

4

85.8

$\frac{52}{31}$ $\frac{85}{29}$ $\frac{74}{17}$ $\frac{49}{11}$ 50 $\frac{51}{12}$ $\frac{76}{17}$ $\frac{84}{29}$ $\frac{49}{32}$

5

85.7

$\frac{54}{31}$ $\frac{87}{29}$ $\frac{80}{16}$ $\frac{51}{11}$ 51 $\frac{52}{12}$ $\frac{79}{17}$ $\frac{89}{28}$ $\frac{54}{32}$

6

85.5

$\frac{55}{32}$ $\frac{90}{28}$ $\frac{81}{17}$ $\frac{55}{12}$ 53 $\frac{54}{12}$ $\frac{77}{17}$ $\frac{89}{28}$ $\frac{55}{32}$

7

85.6

$\frac{60}{32}$ $\frac{93}{28}$ $\frac{81}{16}$ $\frac{51}{11}$ 54 $\frac{55}{12}$ $\frac{79}{16}$ $\frac{92}{28}$ $\frac{49}{32}$

890.79

8

9

9

+50

✓
10

① 7.53 890.40 7.72 883.07

11

12

36' X 30 CC at E

+58

Ent. 15' X 21 X 2.3

18" X 20 C.C

13

Ent. 16" X 21 X 2.0

12" X 20' C.C

7.83 890.62 7.83 882.79

14

85.2

70	94	89	77	54	56	59	81	92	68
32	29	20	16	11		13	17	28	31

85.2

50	95	90	61	56	61	88	93	84	43
32	27	17	11		13	18	25	28	32

84.9

52	93	89	64	59	62	88	92	41
32	27	17	10		11	17	26	32

84.9

59	98	89	61	59	65	93	97	40
31	27	16	11		12	17	27	32

84.2

67	104	98	91	67	64	67	87	94	88	59
32	29	26	17	12		12	18	23	29	32

83.7

98	106	102	97	74	69	74	96	103	76
31	29	26	17	12		12	18	29	32

84.3

100	107	100	68	63	64	103	106	82
29	28	18	13		13	19	30	32

84.4

99	106	105	62	62	65	108	108	85
31	30	16	11		12	18	30	32

84.6

99	102	97	63	60	69	107	107	98
32	30	11	12		13	19	30	32

890.62

15

$$\frac{54}{32} \frac{96}{30} \frac{90}{16} \frac{56}{11} 54 \frac{58}{12} \frac{92}{18} \frac{105}{30} \frac{95}{34} \quad 85.0$$

16

$$\frac{32}{32} \frac{87}{26} \frac{78}{16} \frac{50}{11} 47 \frac{49}{13} \frac{75}{17} \frac{86}{30} \frac{46}{32} \quad 85.9$$

+60

$$\frac{27}{31} \frac{73}{27} \frac{71}{17} \frac{43}{12} 44 \frac{43}{12} \frac{66}{17} \frac{71}{28} \frac{29}{32} \quad 86.2$$

17

$$\frac{27}{32} \frac{71}{27} \frac{68}{17} \frac{37}{12} 40 \frac{42}{12} \frac{64}{16} \frac{73}{28} \frac{29}{32} \quad 86.6$$

18

$$\ominus \quad 7.07 \quad \underline{894.99} \quad 2.70 \quad 887.92$$

$$\frac{27}{32} \frac{67}{27} \frac{59}{17} \frac{32}{12} 32 \frac{28}{12} \frac{53}{16} \frac{68}{28} \frac{30}{32} \quad 87.4$$

19

Ent. 16' x 20' x 2.8

15" x 20' C.C

$$\frac{77}{34} \frac{104}{28} \frac{49}{16} \frac{73}{11} 68 \frac{73}{12} \frac{103}{21} \frac{105}{29} \frac{78}{31} \quad 88.2$$

20

$$\frac{80}{32} \frac{76}{30} \frac{92}{15} \frac{66}{10} 68 \frac{68}{13} \frac{93}{18} \frac{106}{30} \frac{86}{32} \quad 88.2$$

21

$$\frac{94}{34} \frac{90}{31} \frac{92}{17} \frac{64}{12} 64 \frac{65}{13} \frac{96}{17} \frac{101}{30} \frac{91}{31} \quad 88.6$$

22

$$\frac{63}{32} \frac{91}{30} \frac{90}{17} \frac{61}{13} 59 \frac{90}{11} \frac{88}{16} \frac{94}{29} \frac{59}{32} \quad 89.1$$

894.99

+50

23

89.6
 $\frac{56}{32}$ $\frac{86}{29}$ $\frac{81}{18}$ $\frac{56}{12}$ 59 $\frac{54}{11}$ $\frac{82}{16}$ $\frac{90}{28}$ $\frac{54}{32}$ ✓
 90.1
 $\frac{55}{32}$ $\frac{87}{29}$ $\frac{84}{27}$ $\frac{74}{17}$ $\frac{53}{13}$ 49 $\frac{46}{15}$ $\frac{72}{20}$ $\frac{81}{29}$ $\frac{115}{32}$ ✓

+50

24

90.2
 $\frac{52}{31}$ $\frac{81}{27}$ $\frac{75}{16}$ $\frac{51}{10}$ 48 $\frac{43}{14}$ $\frac{44}{29}$ $\frac{72}{37}$ End Ditch Cut ✓

895.01

90.4
 $\frac{55}{32}$ $\frac{83}{29}$ $\frac{70}{16}$ $\frac{51}{12}$ 46 $\frac{40}{15}$ $\frac{70}{20}$ $\frac{67}{28}$ $\frac{55}{33}$ Begin Ditch Cut ✓

+50

25

90.4
 $\frac{55}{32}$ $\frac{81}{29}$ $\frac{75}{17}$ $\frac{56}{12}$ 46 $\frac{43}{12}$ $\frac{77}{17}$ $\frac{79}{30}$ $\frac{50}{32}$ ✓

90.4
 $\frac{53}{32}$ $\frac{82}{29}$ $\frac{72}{16}$ $\frac{55}{13}$ 46 $\frac{40}{13}$ $\frac{72}{17}$ $\frac{82}{25}$ $\frac{83}{30}$ $\frac{54}{32}$ ✓

+50

90.6
 $\frac{59}{32}$ $\frac{81}{29}$ $\frac{68}{17}$ $\frac{51}{13}$ 44 $\frac{41}{12}$ $\frac{69}{18}$ $\frac{78}{30}$ $\frac{52}{32}$ End Ditch ✓

26

90.8
 $\frac{48}{32}$ $\frac{76}{29}$ $\frac{67}{17}$ $\frac{48}{14}$ 42 $\frac{36}{17}$ $\frac{38}{20}$ $\frac{65}{46}$ Begin Ditch ✓

890.64+ 12.
01

+50

91.1
 $\frac{48}{32}$ $\frac{77}{28}$ $\frac{69}{16}$ $\frac{46}{12}$ 39 $\frac{32}{20}$ $\frac{57}{25}$ $\frac{64}{33}$ $\frac{57}{34}$ ✓

47

6.14 897.09 4.06 890.95

27

91.3
 $\frac{69}{31}$ $\frac{94}{29}$ $\frac{85}{16}$ $\frac{62}{12}$ 58 $\frac{58}{13}$ $\frac{81}{17}$ $\frac{85}{29}$ $\frac{68}{31}$

+50

91.4
 $\frac{70}{31}$ $\frac{90}{30}$ $\frac{86}{25}$ $\frac{82}{16}$ $\frac{62}{13}$ 57 $\frac{59}{12}$ $\frac{82}{16}$ $\frac{89}{17}$ $\frac{67}{30}$

28

91.5
 $\frac{72}{31}$ $\frac{91}{30}$ $\frac{87}{18}$ $\frac{56}{13}$ 56 $\frac{55}{12}$ $\frac{85}{17}$ $\frac{87}{30}$ $\frac{71}{32}$

29

Entr. 19X17X 1.4

12" X 20' C.C. old.

91.6
 $\frac{74}{31}$ $\frac{89}{29}$ $\frac{88}{17}$ $\frac{59}{12}$ 55 $\frac{57}{12}$ $\frac{79}{16}$ $\frac{86}{30}$ $\frac{71}{32}$

30

91.7
 $\frac{72}{31}$ $\frac{91}{30}$ $\frac{85}{17}$ $\frac{56}{13}$ 54 $\frac{57}{12}$ $\frac{88}{17}$ $\frac{87}{30}$ $\frac{71}{32}$

31

91.8
 $\frac{74}{32}$ $\frac{92}{29}$ $\frac{87}{19}$ $\frac{56}{13}$ 53 $\frac{51}{12}$ $\frac{88}{17}$ $\frac{92}{29}$ $\frac{71}{32}$

32

91.7
 $\frac{78}{32}$ $\frac{93}{30}$ $\frac{88}{18}$ $\frac{52}{13}$ 54 $\frac{54}{12}$ $\frac{92}{18}$ $\frac{90}{30}$ $\frac{115}{32}$

33

92.2
 $\frac{75}{32}$ $\frac{93}{30}$ $\frac{91}{20}$ $\frac{50}{14}$ 49 $\frac{52}{13}$ $\frac{88}{18}$ $\frac{92}{29}$ $\frac{69}{32}$

34

92.6
 $\frac{74}{32}$ $\frac{85}{29}$ $\frac{84}{19}$ $\frac{45}{13}$ 46 $\frac{37}{11}$ $\frac{84}{18}$ $\frac{87}{29}$ $\frac{53}{32}$

897.09

⑤ 14.12 30476 6.45 890.64
35

93.4
 $\frac{118}{31}$ $\frac{156}{30}$ $\frac{145}{18}$ $\frac{114}{12}$ 114 $\frac{113}{10}$ $\frac{147}{15}$ $\frac{150}{25}$ $\frac{95}{29}$

36

94.9
 $\frac{121}{31}$ $\frac{134}{30}$ $\frac{119}{17}$ $\frac{101}{14}$ 99 $\frac{96}{10}$ $\frac{118}{13}$ $\frac{121}{23}$ $\frac{22}{32}$

37

97.0
 $\frac{87}{50}$ $\frac{106}{29}$ $\frac{99}{20}$ $\frac{81}{14}$ 78 $\frac{79}{10}$ $\frac{103}{16}$ $\frac{99}{22}$ $\frac{115}{32}$

38

99.0
 $\frac{61}{30}$ $\frac{82}{28}$ $\frac{76}{18}$ $\frac{57}{13}$ 58 $\frac{57}{11}$ $\frac{79}{15}$ $\frac{77}{19}$ $\frac{115}{32}$

+66

99.7
 $\frac{46}{29}$ $\frac{76}{27}$ $\frac{66}{15}$ $\frac{52}{12}$ 51 $\frac{51}{11}$ $\frac{75}{15}$ $\frac{75}{23}$ $\frac{115}{33}$

+72

99.8
 $\frac{15}{29}$ $\frac{25}{26}$ $\frac{68}{15}$ $\frac{52}{12}$ 50 $\frac{50}{11}$ $\frac{73}{15}$ $\frac{74}{23}$ $\frac{115}{32}$

Entr. 105 x 13 x 11

Entr. 22 x 14 x 1.3

39

904.64

0.3
 $\frac{36}{28}$ $\frac{73}{25}$ $\frac{69}{16}$ $\frac{50}{12}$ 45 $\frac{45}{12}$ $\frac{66}{16}$ $\frac{62}{20}$ $\frac{29}{32}$ End Ditch

+70

0.2
 $\frac{62}{27}$ $\frac{29}{25}$ $\frac{72}{15}$ $\frac{52}{12}$ 44 $\frac{45}{13}$ $\frac{52}{18}$

40

0.3
 $\frac{79}{28}$ $\frac{88}{27}$ $\frac{92}{22}$ $\frac{73}{14}$ $\frac{45}{10}$ 43 $\frac{43}{12}$ $\frac{14}{30}$ $\frac{64}{31}$ Begin Ditch

904.64

+10

$$\begin{array}{ccccccc} & & & & 0.3 & & \\ 80 & 92 & 90 & 45 & 43 & 37 & 80 & 78 & 60 \\ 29 & 28 & 19 & 11 & & 14 & 18 & 31 & 33 \end{array}$$

+16

$$\begin{array}{ccccccc} & & & & 0.4 & & \\ 80 & 92 & 86 & 52 & 45 & 42 & 37 & 81 & 78 & 60 \\ 29 & 28 & 13 & 12 & 11 & & 14 & 14 & 31 & 33 \\ & & & 13 & & & 15 & & & \end{array}$$

+21

900.95

$$\begin{array}{ccccccc} & & & & 0.3 & & \\ 80 & 92 & 90 & 45 & 43 & 39 & 80 & 78 & 60 \\ 29 & 28 & 19 & 11 & & 14 & 19 & 31 & 33 \\ & & & & & & & & & \downarrow 10' \end{array}$$

41

$$\textcircled{B} \quad 11.92 \quad \underline{914.99} \quad 1.57 \quad 903.07$$

$$\begin{array}{ccccccc} & & & & 1.8 & & \\ 59 & 28 & 28 & 23 & 51 & 61 & 72 \\ 17 & 12 & & 13 & 17 & 29 & 31 \end{array}$$

42

$$\begin{array}{ccccccc} & & & & 5.7 & & \\ 115 & 135 & 127 & 98 & 93 & 92 & 117 & 129 & 122 & 93 \\ 32 & 29 & 17 & 12 & & 12 & 17 & 24 & 30 & 32 \end{array}$$

+50

$$\begin{array}{ccccccc} & & & & 8.0 & & \\ 60 & 108 & 95 & 29 & 70 & 74 & 99 & 101 & 62 \\ 32 & 28 & 17 & 12 & & 11 & 17 & 27 & 31 \end{array}$$

43

Entf. 15' x 21' x 3.3

18" x 20' CC.

$$\begin{array}{ccccccc} & & & & 10.1 & & \\ 21 & 81 & 75 & 51 & 49 & 50 & 72 & 75 & 18 \\ 32 & 25 & 17 & 12 & & 12 & 17 & 25 & 32 \end{array}$$

+75

$$\begin{array}{ccccccc} & & & & 11.5 & & \\ 115 & 64 & 56 & 35 & 36 & 33 & 80 & 57 & 15 \\ 32 & 25 & 18 & 13 & & 11 & 14 & 20 & 32 \end{array}$$

44

$$\begin{array}{ccccccc} & & & & 11.6 & & \\ 115 & 64 & 57 & 35 & 34 & 32 & 57 & 57 & 15 \\ 32 & 25 & 16 & 12 & & 13 & 17 & 22 & 32 \end{array}$$

914.99

+35

$$\begin{array}{cccccccc} 21 & 23 & 69 & 44 & 39 & 40 & 68 & 68 & 11.1 \\ 32 & 25 & 19 & 12 & & 11 & 15 & 20 & 32 \end{array}$$

45

⊙

1.17

908.26

7.90

907.09

$$\begin{array}{r} 11.1 \\ 908.26 \\ \hline 906.86 \end{array}$$

$$\begin{array}{cccccccc} 72 & 90 & 81 & 60 & 9.3 & 57 & 80 & 90 & 1.8 \\ 32 & 25 & 18 & 12 & & 11 & 16 & 23 & 32 \end{array}$$

+50

$$\begin{array}{cccccccc} 44 & 09 & 7.6 & 08 & 30 & 48 & 0.3 \\ 18 & 13 & & 10 & 14 & 25 & 32 \end{array}$$

46

$$\begin{array}{cccccccc} 8.3 & 2.8 & 5.5 & 31 & 59 & 64 & 50 \\ 20 & 13 & & 12 & 17 & 30 & 31 \end{array}$$

47

$$\begin{array}{cccccccc} 76 & 96 & 83 & 60 & 2.4 & 59 & 57 & 80 & 88 & 85 \\ 32 & 31 & 16 & 12 & & 12 & 16 & 24 & 28 \end{array}$$

48

Entr. 10' x 14' x 1.9

12" x 20' CC old

$$\begin{array}{cccccccc} 67 & 107 & 102 & 85 & 99.9 & 84 & 105 & 102 & 50 \\ 31 & 27 & 15 & 11 & & 13 & 16 & 24 & 31 \end{array}$$

49

⊙

19.19 906.00

$$\begin{array}{r} 896.81 \\ 906.00 \\ \hline \end{array}$$

$$\begin{array}{cccccccc} 71.8 & 136 & 137 & 131 & 108 & 106 & 103 & 125 & 130 & 98 \\ 32 & 30 & 21 & 12 & 6 & & 16 & 19 & 27 & 31 \end{array}$$

50

$$\begin{array}{cccccccc} 127 & 96 & 96.7 & 89 & 121 & 123 & 109 \\ 12 & 7 & & 16 & 16 & 29 & 30 \end{array}$$

+11

$$\begin{array}{cccccccc} 129 & 91 & 96.8 & 92 & 130 & 129 & 114 \\ 14 & 9 & & 17 & 22 & 28 & 30 \end{array}$$

206.00

+16

96.8

$\frac{140}{12}$	$\frac{105}{14}$	$\frac{111}{13}$	$\frac{95}{9}$	92	$\frac{92}{18}$	$\frac{98}{19}$	$\frac{92}{19}$	$\frac{130}{20}$	$\frac{127}{28}$	$\frac{214}{30}$
------------------	------------------	------------------	----------------	----	-----------------	-----------------	-----------------	------------------	------------------	------------------

+22

96.8

$\frac{140}{18}$	$\frac{95}{9}$	92	$\frac{92}{17}$	$\frac{130}{24}$	$\frac{128}{28}$	$\frac{114}{30}$
------------------	----------------	----	-----------------	------------------	------------------	------------------

51

97.8

$\frac{123}{17}$	$\frac{84}{11}$	82	$\frac{84}{14}$	$\frac{107}{18}$	$\frac{120}{25}$	$\frac{119}{29}$	$\frac{104}{31}$
------------------	-----------------	----	-----------------	------------------	------------------	------------------	------------------

52

35 ↑

99.1

$\frac{97}{31}$	$\frac{105}{30}$	$\frac{100}{16}$	$\frac{70}{11}$	69	$\frac{69}{13}$	$\frac{94}{17}$	$\frac{101}{22}$	$\frac{100}{29}$	$\frac{62}{32}$
-----------------	------------------	------------------	-----------------	----	-----------------	-----------------	------------------	------------------	-----------------

53

90.8

$\frac{43}{32}$	$\frac{23}{29}$	$\frac{23}{18}$	$\frac{44}{12}$	42	$\frac{44}{13}$	$\frac{23}{17}$	$\frac{75}{25}$	$\frac{04}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

~~70.5~~

+65

903.0

$\frac{50}{32}$	$\frac{64}{30}$	$\frac{58}{17}$	$\frac{31}{12}$	30	$\frac{29}{12}$	$\frac{54}{16}$	$\frac{58}{26}$	$\frac{05}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

54

903.7

$\frac{55}{32}$	$\frac{59}{31}$	$\frac{52}{17}$	$\frac{25}{13}$	23	$\frac{20}{12}$	$\frac{52}{17}$	$\frac{52}{27}$	$\frac{07}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

55

905.2

$\frac{34}{32}$	$\frac{46}{31}$	$\frac{41}{18}$	$\frac{09}{12}$	08	$\frac{09}{13}$	$\frac{36}{17}$	$\frac{36}{24}$	$\frac{15}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

①

13.14

218.18

0.20

205.04

56

06.6

$\frac{137}{32}$	$\frac{155}{31}$	$\frac{168}{25}$	$\frac{147}{17}$	$\frac{117}{12}$	116	$\frac{117}{11}$	$\frac{148}{16}$	$\frac{147}{24}$	$\frac{116}{32}$
------------------	------------------	------------------	------------------	------------------	-----	------------------	------------------	------------------	------------------

919.08

918.18

57

Entr. 15' x 23' x 2.7

18" x 20' CC

+50

Entr. 15' x 30' x 2.1

74' x 18" C.C.

58

7.27

918.15

910.88

Entr. 13' x 22' x 2.8

18" x 20' CC

59

Entr. 14' x 22' x 3.0

18" x 20' CC

60

Entr. 22' x 16' x 2.1

18" x 20'

61

62

④ 3.15

918.29

915.74

+50

Entr. 22' x 16' x 2.4

15" x 20' CC.

102 125 124 96 085 97 9.5 125 123 100
 30 28 17 12 97 12 17 29 32

092
 97 121 118 91 90 85 113 113 72
 29 27 17 12 12 17 28 33

10.8
 87 110 104 77 74 99 100 61
 31 29 19 17 12 17 28 32

12.4
 69 92 92 79 61 54 60 86 88 47
 32 29 23 17 13 12 18 29 32

12.3
 66 91 87 59 59 54 86 92 61
 32 30 18 12 12 16 29 33

12.5
 84 89 87 58 57 58 85 80 66
 32 31 17 12 12 12 16 27 29

12.8
 77 85 85 51 54 52 74 75 65
 32 31 19 13 11 16 24 26 30

12.8
 88 64 50 55 60 87 87 69
 70 65 26 55 11 16 30 32

918.29

63

915.14
31.5
918.29

64

65

66

+30

67

Ent 21 x 16 x 3.0

15" x 20' C.C.

68

①

1.62 907.97 11.94 906.35

69

70

40' ↑

13.2
 $\frac{65}{32} \frac{86}{31} \frac{80}{16} \frac{52}{12} 51 \frac{60}{11} \frac{81}{15} \frac{87}{21} \frac{93}{24} \frac{66}{32}$

13.0
 $\frac{80}{32} \frac{92}{30} \frac{88}{16} \frac{53}{12} 53 \frac{51}{12} \frac{86}{17} \frac{87}{24} \frac{79}{31} \frac{64}{32}$

13.7
 $\frac{84}{32} \frac{96}{31} \frac{89}{17} \frac{54}{12} 46 \frac{46}{11} \frac{78}{16} \frac{80}{28} \frac{52}{32}$

13.2
 $\frac{58}{32} \frac{88}{30} \frac{84}{17} \frac{49}{12} 51 \frac{51}{11} \frac{77}{15} \frac{81}{28} \frac{44}{32}$

13.2
 $\frac{54}{32} \frac{93}{28} \frac{83}{16} \frac{55}{11} 51 \frac{52}{10} \frac{79}{16} \frac{83}{28} \frac{41}{32}$

11.9
 $\frac{70}{32} \frac{98}{29} \frac{97}{16} \frac{64}{11} 64 \frac{62}{11} \frac{94}{17} \frac{99}{28} \frac{57}{32}$

09.6
 $\frac{104}{32} \frac{121}{30} \frac{120}{16} \frac{85}{12} \frac{87}{12} \frac{94}{12} \frac{119}{16} \frac{121}{19} \frac{94}{32}$

08.0
 $\frac{23}{31} \frac{35}{30} \frac{34}{17} \frac{00}{11} 00 \frac{02}{13} \frac{33}{17} \frac{36}{30} \frac{24}{32}$

06.5
 $\frac{13}{32} \frac{47}{29} \frac{48}{16} \frac{14}{12} 15 \frac{15}{11} \frac{47}{16} \frac{49}{30} \frac{33}{32}$

907.97

+50

71

72

73

⊖ 3.90 900.29 11.58 896.39

74

ENT. 23' x 19' x 3.2

18' x 20' C.C.

75

+93

76

06.7
 $\frac{21}{32}$ $\frac{58}{28}$ $\frac{54}{16}$ $\frac{25}{12}$ 23 $\frac{22}{12}$ $\frac{53}{16}$ $\frac{60}{29}$ $\frac{32}{32}$

04.0
 $\frac{39}{32}$ $\frac{76}{28}$ $\frac{71}{17}$ $\frac{70}{13}$ 20 $\frac{39}{11}$ $\frac{66}{19}$ $\frac{73}{29}$ $\frac{34}{32}$

0.03
 $\frac{100}{32}$ $\frac{118}{30}$ $\frac{113}{17}$ $\frac{78}{12}$ 77 $\frac{74}{12}$ $\frac{106}{17}$ $\frac{113}{29}$ $\frac{86}{31}$

97.5
 $\frac{140}{32}$ $\frac{155}{30}$ $\frac{144}{17}$ $\frac{108}{12}$ 10.5 $\frac{102}{12}$ $\frac{134}{17}$ $\frac{140}{29}$ $\frac{117}{31}$

96.0
 $\frac{80}{32}$ $\frac{87}{30}$ $\frac{76}{17}$ $\frac{45}{13}$ 43 $\frac{42}{13}$ $\frac{70}{17}$ $\frac{78}{29}$ $\frac{45}{31}$

95.4
 $\frac{79}{32}$ $\frac{95}{30}$ $\frac{80}{17}$ $\frac{49}{12}$ 49 $\frac{48}{12}$ $\frac{74}{17}$ $\frac{84}{29}$ $\frac{54}{32}$

95.1
 $\frac{57}{32}$ $\frac{103}{30}$ $\frac{101}{17}$ $\frac{52}{12}$ 52 $\frac{51}{12}$ $\frac{9.0}{17}$ $\frac{88}{29}$ $\frac{64}{31}$

95.2
 $\frac{82}{32}$ $\frac{103}{30}$ $\frac{101}{14}$ $\frac{67}{14}$ $\frac{52}{12}$ 51 $\frac{50}{12}$ $\frac{63}{14}$ $\frac{96}{14}$ $\frac{88}{29}$ $\frac{66}{31}$

900.29

+05

B.M.

6.61

893.68

77

78

79

80

81

②

7.40

903.08

4.61

895.68 ✓

82 ✓

83

$$\begin{array}{ccccccc} & & & & 95.1 & & \\ \frac{87}{34} & \frac{103}{30} & \frac{101}{17} & \frac{52}{12} & 52 & \frac{53}{12} & \frac{90}{17} & \frac{91}{29} & \frac{66}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 95.3 & & \\ \frac{86}{32} & \frac{104}{30} & \frac{92}{19} & \frac{51}{13} & 50 & \frac{50}{12} & \frac{89}{18} & \frac{92}{30} & \frac{74}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 95.0 & & \\ \frac{85}{32} & \frac{103}{30} & \frac{92}{19} & \frac{53}{13} & 53 & \frac{53}{13} & \frac{93}{19} & \frac{95}{30} & \frac{74}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 95.3 & & \\ \frac{74}{31} & \frac{97}{29} & \frac{90}{19} & \frac{52}{13} & 50 & \frac{47}{12} & \frac{87}{18} & \frac{95}{30} & \frac{70}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 95.6 & & \\ \frac{62}{33} & \frac{86}{29} & \frac{82}{18} & \frac{46}{13} & 47.44 & \frac{81}{12} & \frac{87}{17} & \frac{91}{21} & \frac{62}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 97.0 & & \\ \frac{18}{32} & \frac{62}{28} & \frac{59}{18} & \frac{33}{14} & 33 & \frac{33}{11} & \frac{65}{16} & \frac{73}{29} & \frac{53}{31} \end{array}$$

$$\begin{array}{ccccccc} & & & & 99.3 & & \\ \frac{23}{32} & \frac{67}{27} & \frac{71}{17} & \frac{40}{12} & 38 & \frac{35}{10} & \frac{64}{17} & \frac{80}{28} & \frac{59}{30} \end{array}$$

$$\begin{array}{ccccccc} & & & & 900.7 & & \\ \frac{04}{7} & \frac{40}{10} & \frac{44}{17} & \frac{21}{11} & 24 & \frac{21}{11} & \frac{49}{17} & \frac{55}{28} & \frac{16}{31} \end{array}$$

203.08

+50

01.2

$\frac{02}{31} \frac{47}{27} \frac{40}{15} \frac{17}{11} \frac{19}{12} \frac{43}{17} \frac{47}{28} \frac{05}{31}$

84

90.0

$\frac{24}{31} \frac{62}{28} \frac{50}{16} \frac{29}{11} \frac{31}{12} \frac{33}{12} \frac{52}{16} \frac{53}{27} \frac{08}{31}$

85

96.9

$\frac{80}{32} \frac{96}{50} \frac{89}{18} \frac{59}{12} \frac{62}{11} \frac{60}{17} \frac{28}{17} \frac{86}{28} \frac{39}{32}$

Entr. 22 x 17 x 3.2

18" x 20' C.C.

86

95.4

$\frac{106}{34} \frac{125}{30} \frac{121}{19} \frac{28}{11} \frac{77}{13} \frac{76}{13} \frac{120}{18} \frac{123}{29} \frac{96}{31}$

894.07

87

94.6

$\frac{110}{32} \frac{138}{30} \frac{130}{18} \frac{85}{11} \frac{85}{12} \frac{84}{12} \frac{131}{19} \frac{137}{29} \frac{113}{32}$

88

93.8

$\frac{119}{32} \frac{142}{28} \frac{138}{18} \frac{92}{11} \frac{93}{14} \frac{96}{14} \frac{138}{18} \frac{144}{30} \frac{124}{32}$

89

93.5

$\frac{114}{31} \frac{138}{29} \frac{135}{19} \frac{101}{12} \frac{96}{13} \frac{104}{13} \frac{139}{19} \frac{102}{29} \frac{123}{32}$

⊙ 0.78 893.40 10.46 892.62

+50

92.7

$\frac{09}{32} \frac{41}{26} \frac{36}{18} \frac{07}{11} \frac{07}{13} \frac{08}{13} \frac{31}{19} \frac{40}{29} \frac{25}{32}$

893.40

90

E

Ente. 21 x 19 x 2.9

15" x 20 CC

+60

$$\begin{array}{cccccccc} 45 & 39 & 34 & 13 & 92.6 & 08 & 11 & 36 & 37 & 16 \\ 32 & 37 & 18 & 13 & & & 12 & 17 & 19 & 32 \end{array}$$

$$\begin{array}{cccccccc} 45 & 46 & 39 & 26 & 91.8 & 16 & 15 & 21 & 43 & 43 \\ 32 & 26 & 17 & 11 & & & 13 & 18 & 19 & 32 \end{array}$$

91

$$\begin{array}{cccccccc} 45 & 54 & 49 & 23 & 91.1 & 23 & 25 & 53 & 57 & 23 \\ 32 & 27 & 17 & 12 & & & 12 & 18 & 19 & 32 \end{array}$$

92

$$\begin{array}{cccccccc} 68 & 85 & 74 & 45 & 99.0 & 44 & 41 & 20 & 29 & 51 \\ 32 & 30 & 17 & 11 & & & 13 & 18 & 32 & 32 \end{array}$$

93

$$\begin{array}{cccccccc} 71 & 97 & 88 & 52 & 88.0 & 54 & 52 & 95 & 100 & 72 \\ 32 & 29 & 18 & 12 & & & 11 & 19 & 29 & 32 \end{array}$$

94

$$\begin{array}{cccccccc} 90 & 109 & 101 & 62 & 87.0 & 64 & 62 & 109 & 114 & 90 \\ 32 & 29 & 18 & 11 & & & 12 & 19 & 30 & 32 \end{array}$$

+70

$$\begin{array}{cccccccc} 102 & 117 & 105 & 69 & 86.6 & 68 & 71 & 112 & 120 & 96 \\ 32 & 30 & 18 & 12 & & & 11 & 18 & 29 & 32 \end{array}$$

95

$$\begin{array}{cccccccc} 93 & 117 & 107 & 71 & 86.5 & 69 & 71 & 110 & 120 & 94 \\ 32 & 29 & 18 & 11 & & & 12 & 18 & 30 & 32 \end{array}$$

893.40

+50

96

+50

①

1.48

886.50

885.02

97

+50

98

99

100

$$\begin{array}{ccccccc} 76 & 111 & 102 & 74 & 86.1 & 73 & 101 & 104 & 25 \\ 32 & 30 & 17 & 13 & & 10 & 16 & 28 & 30 \end{array}$$

$$\begin{array}{ccccccc} 78 & 114 & 108 & 100 & 82 & 85.4 & 77 & 91 & 101 & 103 & 74 \\ 32 & 29 & 23 & 17 & 11 & 5 & 11 & 15 & 21 & 29 & 32 \\ & & & & & & & & & \downarrow 30' \end{array}$$

$$\begin{array}{ccccccc} 93 & 123 & 116 & 86 & 87 & 84.7 & 82 & 88 \\ 32 & 27 & 16 & 10 & & & 12 & 19 \\ & & & & & & & 31 \end{array}$$

$$\begin{array}{ccccccc} 49 & 73 & 60 & 30 & 29 & 83.6 & 27 & 29 & 29 \\ 32 & 29 & 17 & 10 & & & 12 & 16 & 24 & 40 \end{array}$$

$$\begin{array}{ccccccc} 52 & 84 & 27 & 67 & 43 & 82.6 & 35 & 64 & 24 & 25' \\ 32 & 29 & 22 & 13 & 10 & 39 & 14 & 19 & 29 & 32 \end{array}$$

$$\begin{array}{ccccccc} 61 & 88 & 25 & 45 & 46 & 81.9 & 42 & 25 & 87 & 61 \\ 32 & 29 & 18 & 11 & & & 14 & 18 & 29 & 32 \end{array}$$

$$\begin{array}{ccccccc} 91 & 98 & 94 & 54 & 52 & 81.3 & 53 & 90 & 96 & 90 \\ 31 & 30 & 17 & 12 & & & 13 & 18 & 30 & 32 \end{array}$$

$$\begin{array}{ccccccc} 108 & 86 & 78 & 51 & 51 & 81.4 & 50 & 84 & 12 & 64 \\ 32 & 29 & 16 & 12 & & & 12 & 18 & 14 & 32 \end{array}$$

886.50

101

+50

102

+50

103

①

4.15

890.32

0.33

886.17

+50

104

+50

$$82.2$$

$$\frac{54}{32} \frac{78}{29} \frac{21}{17} \frac{43}{13} \frac{42}{12} \frac{78}{18} \frac{83}{29} \frac{58}{32}$$

$$82.6$$

$$\frac{55}{32} \frac{21}{29} \frac{63}{18} \frac{38}{12} \frac{39}{11} \frac{66}{17} \frac{29}{27} \frac{62}{29}$$

$$88.5$$

$$\frac{36}{32} \frac{64}{28} \frac{60}{18} \frac{37}{14} \frac{30}{12} \frac{31}{16} \frac{58}{28} \frac{48}{31} \frac{32}{31}$$

$$84.0$$

$$\frac{13}{33} \frac{52}{27} \frac{46}{16} \frac{28}{12} \frac{25}{10} \frac{20}{16} \frac{46}{28} \frac{55}{28} \frac{17}{32}$$

$$84.8$$

$$\frac{12}{32} \frac{45}{28} \frac{40}{27} \frac{21}{12} \frac{17}{12} \frac{14}{12} \frac{39}{17} \frac{42}{27} \frac{13}{30}$$

$$85.3$$

$$\frac{50}{32} \frac{82}{29} \frac{78}{17} \frac{58}{14} \frac{50}{13} \frac{52}{17} \frac{24}{27} \frac{83}{27} \frac{42}{32}$$

$$85.3$$

$$\frac{45}{28} \frac{84}{28} \frac{25}{17} \frac{48}{12} \frac{50}{11} \frac{45}{18} \frac{76}{27} \frac{85}{27} \frac{61}{31}$$

$$86.0$$

$$\frac{48}{32} \frac{63}{28} \frac{76}{18} \frac{52}{13} \frac{43}{11} \frac{47}{18} \frac{76}{27} \frac{84}{29} \frac{84}{32}$$

890.59

105

86.1

$\frac{48}{32}$	$\frac{82}{27}$	$\frac{72}{17}$	$\frac{48}{12}$	45	$\frac{44}{12}$	$\frac{74}{19}$	$\frac{85}{29}$	$\frac{52}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

106

2-Ent 44' x 17' x 2.9

18" x 40' cc

86.2

$\frac{52}{52}$	$\frac{78}{50}$	$\frac{84}{23}$	$\frac{64}{15}$	$\frac{45}{12}$	44	$\frac{51}{12}$	$\frac{73}{16}$	$\frac{88}{29}$	$\frac{66}{32}$
-----------------	-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

107

E 40

884.90
569
—
59

85.8

$\frac{54}{32}$	$\frac{84}{29}$	$\frac{71}{17}$	$\frac{47}{12}$	48	$\frac{49}{12}$	$\frac{81}{16}$	$\frac{83}{27}$	$\frac{66}{32}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

108

85.8

$\frac{75}{32}$	$\frac{89}{29}$	$\frac{79}{16}$	$\frac{48}{12}$	48	$\frac{49}{12}$	$\frac{81}{17}$	$\frac{91}{27}$	$\frac{66}{30}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

+50

85.9

$\frac{58}{32}$	$\frac{87}{29}$	$\frac{77}{17}$	$\frac{48}{13}$	47	$\frac{49}{12}$	$\frac{79}{17}$	$\frac{85}{28}$	$\frac{63}{30}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

109

85.9

$\frac{67}{33}$	$\frac{78}{30}$	$\frac{81}{23}$	$\frac{44}{17}$	47	$\frac{45}{10}$	$\frac{74}{16}$	$\frac{84}{28}$	$\frac{52}{31}$
-----------------	-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

+50

85.9

$\frac{71}{40}$	$\frac{79}{39}$	$\frac{81}{38}$	$\frac{56}{33}$	$\frac{45}{24}$	$\frac{43}{15}$	47	$\frac{52}{9}$	$\frac{70}{14}$	$\frac{77}{28}$	$\frac{42}{31}$
-----------------	-----------------	-----------------	-----------------	-----------------	-----------------	----	----------------	-----------------	-----------------	-----------------

110

Begin Ditch

85.7

$\frac{66}{29}$	$\frac{63}{19}$	$\frac{46}{14}$	47	$\frac{51}{10}$	$\frac{67}{14}$	$\frac{84}{25}$	$\frac{876}{31}$
-----------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	------------------

890.59

+50

$$\begin{array}{ccccccccc} & 86.2 & & & & & & & \\ \frac{30}{52} & \frac{25}{26} & \frac{67}{16} & \frac{44}{11} & 44 & \frac{46}{12} & \frac{61}{14} & \frac{75}{26} & \frac{113}{32} \end{array}$$

111

 ② 0.65 808.73 2.51 888.08

$$\begin{array}{ccccccccc} & 86.1 & & & & & & & \\ \frac{27}{32} & \frac{27}{59} & \frac{66}{14} & \frac{48}{10} & 45 & \frac{50}{11} & \frac{68}{16} & \frac{82}{26} & \frac{25}{32} \end{array}$$

+50

$$\begin{array}{ccccccccc} & 85.4 & & & & & & & \\ \frac{14}{32} & \frac{60}{27} & \frac{55}{16} & \frac{32}{11} & 35 & \frac{38}{11} & \frac{57}{15} & \frac{71}{26} & \frac{14}{32} \end{array}$$

112

$$\begin{array}{ccccccccc} & 84.6 & & & & & & & \\ \text{Ind. Dif} & \frac{39}{25} & \frac{52}{23} & \frac{53}{14} & \frac{40}{11} & 41 & \frac{44}{11} & \frac{69}{16} & \frac{80}{27} & \frac{32}{32} \end{array}$$

+50

$$\begin{array}{ccccccccc} & 82.982 & & & & & & & \\ \frac{801}{86} & \frac{57}{22} & 59 & \frac{65}{12} & \frac{80.7}{16} & \frac{791}{28} & \frac{82.7}{32} & & \end{array}$$

113

$$\begin{array}{ccccccccc} & 79.1 & 81.6 & 81.7 & 79.6 & 78.5 & 79.0 & 78.8 & \\ \frac{76}{15} & \frac{71}{11} & 76 & \frac{82.9}{14} & \frac{91}{16} & \frac{102}{21} & \frac{107}{30} & \frac{100}{32} & \end{array}$$

Ent. 22 x 20 x 3.6

+50

18" x 20' CC

114

 ② 2.66 881.65 9.74 878.99

$$\begin{array}{ccccccccc} & 79.0 & & & & & & & \\ \frac{120}{29} & \frac{147}{26} & \frac{141}{17} & \frac{100}{12} & 97 & \frac{98}{12} & \frac{129}{17} & \frac{135}{30} & \frac{123}{32} \end{array}$$

115

881.65

724

83.91

+70

+97

116

116

+03 BW

874.01

7.26

1.03

875.91

874.88

119+06 BW

+28

+65

77.0
 $\frac{65}{29} \quad \frac{90}{16} \quad \frac{87}{17} \quad \frac{49}{12} \quad 47 \quad \frac{53}{12} \quad \frac{90}{19} \quad \frac{94}{31} \quad \frac{87}{32}$

74.1
 $\frac{113}{18} \quad \frac{61}{12} \quad 56 \quad \frac{58}{11} \quad \frac{109}{19}$

75.7
 $\frac{102}{14} \quad \frac{62}{9} \quad 60 \quad \frac{65}{9} \quad \frac{78}{12}$

60 60 60

60 60 60

02 02 02

74.9
 $\frac{54}{24} \quad \frac{23}{18} \quad \frac{09}{9} \quad 10 \quad \frac{12}{11} \quad \frac{43}{14}$

Bottom 3

65.9 67.7 67.9 66.2 67.1
 $\frac{100}{124} \quad \frac{82}{100} \quad \frac{80}{80} \quad \frac{87}{40} \quad \frac{78}{25} \quad \frac{59}{17} \quad \frac{24}{11} \quad 20 \quad \frac{20}{14} \quad \frac{40}{16}$

67.1

875.91

120

65.9	66.2	66.9	67.3	66.8	66.4	67.3	72.9
100	97	90	80	91	95	80	98
170	100	93	85	79	44	24	17
						23	11
							20
							22
							12
							17
							29
							31

+60

68.6	66.7	65.7	65.6	66.4	65.3	65.8	67.5	72.0
74	92	101	103	95	106	101	84	90
185	180	147	130	119	74	49	34	27
					100			17
								11
								39
								11
								80
								81
								17
								29
								32

121

68.6	65.5	66.2	65.7	64.7	65.0	66.8	71.4
73	109	97	102	112	109	91	93
191	130	115	100	69	49	37	29
	90						17
							12
							42
							23
							43
							11
							17
							83
							86
							29
							31

122

Bottom Ends
122 + 35

93	65.3	65.4	66.4	65.7	66.1	67	66.3	65.3	66.1	68.4	68.1	70.9
106	105	95	102	98	92	96	106	98	75	78	96	87
197	146	181	164	153	135	80	84	52	43	36	30	29
										43	45	17
												51
												12
												50
												12
												17
												85
												92
												28
												31

123

2- Entr. 45 x 16 x 2.4

40' - 15" C.C.

66	96	87	55	52	54	80	89	63
31	28	17	12		12	18	28	31

124

79	102	102	93	55	53	54	102	103	76
32	29	20	17	12	12	12	19	28	31

125

85	106	96	53	50	53	98	102	92
32	29	19	12		12	18	27	30

126

6.87 875.47 7.31 868.60

96	106	100	51	49	54	103	106	81
31	29	17	10		12	18	30	31

875.47

127

128

+50

129

+31 BW.

130+27 BW.

131

132

70.8

$\frac{70}{32}$	$\frac{101}{29}$	$\frac{98}{18}$	$\frac{51}{12}$	47	$\frac{50}{12}$	$\frac{94}{18}$	$\frac{103}{28}$	$\frac{85}{31}$
-----------------	------------------	-----------------	-----------------	----	-----------------	-----------------	------------------	-----------------

71.0

$\frac{102}{29}$	$\frac{80}{18}$	$\frac{51}{12}$	45	$\frac{47}{12}$	$\frac{83}{18}$	$\frac{94}{29}$	$\frac{54}{32}$
------------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

40' ↓

70.9

$\frac{95}{21}$	$\frac{99}{12}$	46	$\frac{98}{11}$	$\frac{99}{18}$	$\frac{93}{27}$	$\frac{72}{31}$
-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

reverse →

70.8

$\frac{109}{26}$	$\frac{90}{19}$	$\frac{98}{11}$	47	$\frac{47}{12}$	$\frac{67}{16}$	$\frac{101}{21}$
------------------	-----------------	-----------------	----	-----------------	-----------------	------------------

48 48 48

70.7

50

60' ↑

75' ↑

70.4

$\frac{100}{32}$	$\frac{110}{30}$	$\frac{102}{25}$	$\frac{96}{18}$	$\frac{48}{11}$	51	$\frac{49}{11}$	$\frac{90}{18}$	$\frac{99}{29}$	$\frac{78}{32}$
------------------	------------------	------------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

70.9

$\frac{80}{32}$	$\frac{102}{30}$	$\frac{95}{18}$	$\frac{51}{12}$	46	$\frac{46}{12}$	$\frac{87}{18}$	$\frac{93}{29}$	$\frac{70}{32}$
-----------------	------------------	-----------------	-----------------	----	-----------------	-----------------	-----------------	-----------------

875.47

133

$$\frac{68}{32} \frac{92}{31} \frac{92}{22} \frac{81}{17} \frac{47}{12} 45 \frac{45}{12} \frac{82}{18} \frac{94}{29} \frac{66}{31}$$

134

$$\frac{63}{32} \frac{84}{29} \frac{84}{19} \frac{70}{15} \frac{42}{11} \frac{42}{12} \frac{74}{16} \frac{87}{22} \frac{88}{29} \frac{62}{32}$$

135

⊖

7.23 877.76 4.94 870.53
$$\frac{59}{32} \frac{71}{30} \frac{80}{25} \frac{75}{18} \frac{36}{12} 38 \frac{40}{12} \frac{67}{16} \frac{78}{20} \frac{82}{29} \frac{92}{32}$$

136

Entr. 22' x 17' x 30' 870.53
15" x 20' C.C.
$$\frac{80}{32} \frac{101}{21} \frac{90}{16} \frac{66}{12} 67 \frac{62}{12} \frac{90}{17} \frac{101}{30} \frac{78}{32}$$

137

Entr. 15' x 17' x 2.7
24" x 14' C.C.
$$\frac{47}{32} \frac{80}{27} \frac{85}{22} \frac{78}{15} \frac{54}{11} 53 \frac{54}{12} \frac{77}{16} \frac{92}{25} \frac{74}{32}$$

+40

Entr. 19' x 16' x 3.3
24" x 18' C.C.
$$\frac{45}{32} \frac{66}{24} \frac{68}{14} \frac{49}{11} 45 \frac{46}{11} \frac{75}{17} \frac{80}{29} \frac{48}{32}$$

138

Entr. 18' x 26' x 3.6
18" x 24' C.C.
$$\frac{45}{32} \frac{44}{24} \frac{50}{16} \frac{29}{12} 24 \frac{28}{12} \frac{55}{17} \frac{58}{29} \frac{45}{32}$$
⊖ 11.47 889.24 +0.01 877.77

+60

$$\frac{105}{32} \frac{144}{28} \frac{148}{23} \frac{135}{16} \frac{121}{13} 118 \frac{119}{12} \frac{139}{16} \frac{148}{20} \frac{154}{28} \frac{113}{32}$$

889.24

139

$$\begin{array}{ccccccc}
 101 & 137 & 127 & 105 & 107 & 110 & 134 & 143 & 112 \\
 \frac{32}{28} & \frac{78}{75} & \frac{11}{11} & & & \frac{13}{18} & \frac{29}{29} & \frac{32}{32} \\
 & & & & & & & \downarrow 90'
 \end{array}$$

140

$$\begin{array}{ccccccc}
 97 & 101 & 95 & 70 & 67 & 68 & 112 \\
 \frac{31}{31} & \frac{31}{31} & \frac{17}{17} & \frac{12}{12} & & \frac{12}{12} & \frac{19}{19}
 \end{array}$$

+50

$$\begin{array}{ccccccc}
 85 & 85 & 46 & & 44 & 44 & 98 \\
 \frac{79}{79} & \frac{17}{17} & \frac{11}{11} & & & \frac{11}{11} & \frac{19}{19}
 \end{array}$$

+80

$$\begin{array}{ccccccc}
 21 & 25 & 25 & 26 & 22 & 26 & 22 \\
 \frac{28}{28} & \frac{26}{26} & \frac{18}{18} & \frac{11}{11} & & \frac{12}{12} & \frac{19}{19}
 \end{array}$$

141

$$\begin{array}{ccccccc}
 47 & 62 & 60 & 89 & 89 & 12 & 53 \\
 \frac{28}{28} & \frac{26}{26} & \frac{20}{20} & \frac{12}{12} & & \frac{12}{12} & \frac{18}{18}
 \end{array}$$

+23

888.15

JUNE 31-1931 60
Schmidt
W30.
K K

FINAL X-SECTS. LANESVILLE-WINSLOW BORROW SOUTH OF PAVEMENT

2.50 886.53 884.33

0+50

Taper out

1+0

81.1
 $\frac{54}{83} \quad \frac{63}{87} \quad \frac{46}{97} \quad \frac{59}{111} \quad \frac{62}{121} \quad \frac{58}{133} \quad \frac{45}{137}$

2+0

82.3
 $\frac{42}{89} \quad \frac{54}{96} \quad \frac{53}{109} \quad \frac{48}{118} \quad \frac{52}{129} \quad \frac{53}{141} \quad \frac{46}{148}$

3+0

82.6
 $\frac{39}{88} \quad \frac{51}{96} \quad \frac{49}{108} \quad \frac{44}{118} \quad \frac{47}{128} \quad \frac{50}{140} \quad \frac{41}{150}$

4+0

82.1
 $\frac{44}{86} \quad \frac{56}{93} \quad \frac{54}{100} \quad \frac{45}{114} \quad \frac{45}{119} \quad \frac{50}{125} \quad \frac{52}{136} \quad \frac{41}{142}$

4+40

Taper out

Aug. 27-1931

61

K. K.
W. S.
Schmitt.

FINAL X-SECS. SOUTH OF SECS 312 BARCLAY.

6.69 106.69 100.00

0 = S. 1/4 Sec. 31-89-11 thence East

1

2

3

4

5

6

7

① 5.84 110.45 2.08 104.61

8

9

10

A²⁰A³⁰

106 28	130 22	134 19	109 13	96.1 106	104 12	129 17	126 25	84 29
-----------	-----------	-----------	-----------	-------------	-----------	-----------	-----------	----------

112 30	122 27	114 18	89 13	97.5 92	92 13	108 17	112 27	79 31
-----------	-----------	-----------	----------	------------	----------	-----------	-----------	----------

97 31	111 28	109 20	82 14	99.1 76	76 10	95 16	94 25	63 30
----------	-----------	-----------	----------	------------	----------	----------	----------	----------

88 32	104 28	95 19	66 13	100.3 64	64 11	91 16	88 23	52 28
----------	-----------	----------	----------	-------------	----------	----------	----------	----------

83 30	95 27	86 18	56 12	1.2 55	51 11	80 17	83 24	48 30
----------	----------	----------	----------	-----------	----------	----------	----------	----------

46 31	73 26	67 17	38 11	3.9 33	34 11	63 17	66 25	30 31
----------	----------	----------	----------	-----------	----------	----------	----------	----------

27 30	47 26	48 17	18 12	5.2 15	15 12	42 18	47 26	06 31
----------	----------	----------	----------	-----------	----------	----------	----------	----------

28 31	43 27	37 19	08 12	6.2 05	05 12	31 17	33 25	00 31
----------	----------	----------	----------	-----------	----------	----------	----------	----------

53 29	74 24	68 18	38 12	2.1 34	33 12	59 17	63 26	34 31
----------	----------	----------	----------	-----------	----------	----------	----------	----------

41 31	56 26	50 19	35 15	7.3 32	28 11	50 15	52 25	29 30
----------	----------	----------	----------	-----------	----------	----------	----------	----------

58 30	75 25	78 19	44 14	6.5 20	37 12	68 16	73 25	35 32
----------	----------	----------	----------	-----------	----------	----------	----------	----------

110.45

11

15" x 20' C.C.

12

13

14

⊖

11.13

110.95

99.82

+59

±

15

16

17

18

19

⊖

11.55

121.97

0.53

110.42

20

15" x 20' C.C.

$$\begin{array}{ccccccc} 71 & 89 & 80 & 52 & 5.4 & 51 & 51 \\ 31 & 26 & 19 & 13 & 51 & 12 & 83 \end{array}$$

$$\begin{array}{ccccccc} 89 & 113 & 103 & 70 & 3.0 & 75 & 105 \\ 32 & 26 & 19 & 13 & 75 & 10 & 16 \end{array}$$

$$\begin{array}{ccccccc} 131 & 138 & 133 & 100 & 109.9 & 100 & 136 \\ 32 & 28 & 17 & 12 & 96 & 11 & 17 \end{array}$$

$$\begin{array}{ccccccc} 154 & 160 & 144 & 114 & 99.8 & 111 & 145 \\ 30 & 29 & 17 & 12 & 107 & 12 & 18 \end{array}$$

$$\begin{array}{ccccccc} 174 & 164 & 112 & 112 & 99.6 & 116 & 173 \\ 30 & 12 & 12 & 12 & 114 & 15 & 16 \end{array}$$

$$\begin{array}{ccccccc} 149 & 152 & 143 & 117 & 99.6 & 115 & 145 \\ 29 & 28 & 15 & 10 & 114 & 12 & 18 \end{array}$$

$$\begin{array}{ccccccc} 113 & 137 & 126 & 94 & 1.3 & 101 & 133 \\ 31 & 27 & 17 & 12 & 97 & 13 & 18 \end{array}$$

$$\begin{array}{ccccccc} 69 & 104 & 100 & 74 & 3.6 & 77 & 106 \\ 31 & 26 & 18 & 13 & 74 & 12 & 17 \end{array}$$

$$\begin{array}{ccccccc} 28 & 63 & 62 & 37 & 7.2 & 40 & 70 \\ 31 & 26 & 18 & 12 & 38 & 12 & 18 \end{array}$$

$$\begin{array}{ccccccc} 103 & 36 & 30 & 05 & 10.6 & 03 & 33 \\ 32 & 26 & 19 & 14 & 04 & 11 & 16 \end{array}$$

$$\begin{array}{ccccccc} 87 & 114 & 112 & 102 & 13.0 & 88 & 116 \\ 32 & 27 & 22 & 18 & 90 & 11 & 16 \end{array}$$

121.27

21

10" x 30' CC ±

$$\frac{65}{32} \frac{99}{27} \frac{97}{20} \frac{71}{14} \frac{15.3}{67} \frac{68}{11} \frac{94}{16} \frac{102}{26} \frac{72}{30}$$

22

$$\frac{47}{32} \frac{76}{28} \frac{73}{20} \frac{51}{15} \frac{17.2}{48} \frac{46}{10} \frac{72}{15} \frac{78}{27} \frac{55}{30}$$

23

$$\frac{26}{32} \frac{60}{27} \frac{53}{19} \frac{30}{14} \frac{19.4}{26} \frac{26}{11} \frac{53}{16} \frac{64}{26} \frac{38}{31}$$

24

 ① 13.06 132.11 2.92 119.05

$$\frac{12}{31} \frac{45}{27} \frac{35}{19} \frac{06}{12} \frac{21.3}{07} \frac{08}{10} \frac{39}{16} \frac{46}{25} \frac{17}{30}$$

25

$$\frac{107}{31} \frac{134}{27} \frac{125}{17} \frac{94}{13} \frac{22.8}{93} \frac{97}{12} \frac{124}{18} \frac{132}{27} \frac{104}{31}$$

26

$$\frac{102}{31} \frac{118}{28} \frac{110}{17} \frac{81}{12} \frac{24.1}{80} \frac{86}{13} \frac{113}{17} \frac{120}{27} \frac{93}{32}$$

+41

$$\frac{96}{50} \frac{90}{33} \frac{29}{11} \frac{29.5}{26} \frac{78}{13} \frac{106}{18} \frac{112}{27} \frac{88}{31}$$

27

 7.16 132.06 124.90
716

$$\frac{89}{31} \frac{106}{27} \frac{102}{17} \frac{20}{12} \frac{25.3}{68} \frac{71}{11} \frac{94}{17} \frac{103}{27} \frac{79}{31}$$

28

$$\frac{28}{31} \frac{95}{27} \frac{91}{18} \frac{58}{12} \frac{26.6}{55} \frac{55}{12} \frac{96}{17} \frac{91}{27} \frac{64}{32}$$

29

$$\frac{57}{31} \frac{83}{27} \frac{79}{19} \frac{45}{13} \frac{28.1}{40} \frac{42}{11} \frac{73}{16} \frac{76}{27} \frac{50}{31}$$

30

15" x 20' CC

$$\frac{37}{32} \frac{68}{27} \frac{66}{19} \frac{28}{13} \frac{29.1}{27} \frac{29}{11} \frac{55}{16} \frac{61}{26} \frac{34}{30}$$

31

$$\frac{19}{31} \frac{51}{26} \frac{46}{19} \frac{10}{13} \frac{31.2}{29} \frac{11}{12} \frac{40}{18} \frac{44}{26} \frac{14}{31}$$

132.06

①

6.13

137.66

0.53

131.53

32

$$\frac{66}{32} \frac{98}{27} \frac{89}{19} \frac{51}{12} \frac{32.6}{51} \frac{54}{12} \frac{86}{18} \frac{88}{27} \frac{61}{32}$$

33

$$\frac{60}{32} \frac{89}{27} \frac{77}{18} \frac{43}{12} \frac{39.4}{43} \frac{46}{12} \frac{76}{17} \frac{84}{27} \frac{52}{31}$$

34

$$\frac{55}{31} \frac{80}{27} \frac{70}{17} \frac{41}{12} \frac{33.8}{39} \frac{38}{11} \frac{62}{16} \frac{72}{27} \frac{47}{32}$$

35

$$\frac{54}{31} \frac{82}{27} \frac{74}{19} \frac{40}{14} \frac{32.8}{39} \frac{41}{11} \frac{74}{17} \frac{83}{25} \frac{48}{30}$$

36

$$\frac{61}{31} \frac{92}{27} \frac{83}{19} \frac{53}{14} \frac{32.6}{51} \frac{53}{11} \frac{56}{13} \frac{81}{17} \frac{89}{26} \frac{45}{30}$$

37

$$\frac{70}{32} \frac{103}{27} \frac{93}{19} \frac{63}{13} \frac{31.2}{65} \frac{64}{11} \frac{94}{16} \frac{105}{26} \frac{77}{31}$$

38

$$\frac{82}{32} \frac{119}{27} \frac{106}{17} \frac{77}{12} \frac{30.0}{27} \frac{79}{11} \frac{109}{17} \frac{117}{27} \frac{91}{31}$$

39

$$\frac{95}{32} \frac{130}{28} \frac{118}{18} \frac{89}{13} \frac{28.8}{89} \frac{90}{11} \frac{124}{19} \frac{133}{27} \frac{105}{32}$$

①

1.48

130.07

128.59

ch. 0.0

40

$$\frac{32}{32} \frac{63}{27} \frac{53}{17} \frac{24}{13} \frac{27.7}{24} \frac{24}{11} \frac{54}{16} \frac{67}{27} \frac{41}{31}$$

41

$$\frac{41}{31} \frac{75}{27} \frac{66}{17} \frac{32}{12} \frac{26.4}{37} \frac{37}{11} \frac{69}{17} \frac{77}{27} \frac{53}{31}$$

42

$$\frac{53}{31} \frac{86}{26} \frac{77}{17} \frac{47}{13} \frac{25.7}{44} \frac{49}{11} \frac{91}{17} \frac{90}{26} \frac{44}{31}$$

130.07

43

44

45

46

⊙

1.46

118.44

13.09

116.98

47

48

49

50

15" X 20' CC.

51

52

⊙

6.67

113.88

107.15

CK 0.0

53

24.4
 $\frac{64}{31} \frac{99}{26} \frac{88}{16} \frac{60}{12} 57 \frac{60}{12} \frac{93}{16} \frac{102}{27} \frac{75}{31}$

22.7
 $\frac{77}{32} \frac{108}{27} \frac{102}{17} \frac{70}{12} 74 \frac{74}{12} \frac{105}{16} \frac{114}{26} \frac{89}{31}$

21.5
 $\frac{94}{32} \frac{121}{27} \frac{118}{17} \frac{91}{12} 88 \frac{93}{12} \frac{121}{18} \frac{126}{26} \frac{102}{31}$

19.3
 $\frac{110}{31} \frac{138}{27} \frac{130}{16} \frac{109}{12} 108 \frac{111}{11} \frac{133}{16} \frac{124}{26} \frac{114}{31}$

17.0
 $\frac{14}{31} \frac{47}{27} \frac{42}{16} \frac{13}{12} 14 \frac{14}{11} \frac{40}{16} \frac{48}{26} \frac{11}{30}$

14.8
 $\frac{52}{32} \frac{78}{27} \frac{72}{18} \frac{40}{12} 36 \frac{42}{11} \frac{69}{16} \frac{72}{26} \frac{38}{30}$

11.9
 $\frac{80}{31} \frac{102}{27} \frac{95}{17} \frac{65}{12} 65 \frac{63}{11} \frac{93}{16} \frac{97}{26} \frac{72}{30}$

10.1
 $\frac{103}{31} \frac{116}{27} \frac{113}{19} \frac{83}{13} 83 \frac{82}{11} \frac{109}{16} \frac{118}{26} \frac{105}{30}$

8.8
 $\frac{126}{32} \frac{141}{28} \frac{127}{18} \frac{97}{13} 96 \frac{99}{11} \frac{133}{18} \frac{136}{26} \frac{110}{31}$

7.9
 $\frac{135}{32} \frac{150}{29} \frac{139}{18} \frac{105}{13} 105 \frac{107}{12} \frac{134}{18} \frac{138}{26} \frac{110}{31}$

8.5
 $\frac{101}{31} \frac{105}{29} \frac{95}{19} \frac{62}{12} 83 \frac{61}{10} \frac{85}{16} \frac{91}{27} \frac{61}{34}$

113.82

+24

54

15" x 20' CC.

55

56

+75

57

58

59

⊖ 0.62 100.14 14.30 99.52

60

61

62

18" x 20' CC

104 30	109 28	104 14	66 13	59 13	85 53	54 11	60 12	97 12	95 28	59 31
92 31	105 28	92 17	60 12	83 55	54 12	90 18	92 27	84 31		
61 31	83 27	73 16	57 13	10.0 38	40 11	70 16	74 29	32 30		
33 31	42 28	63 26	57 17	11.1 27	28 12	48 16	56 25	06 30		
29 31	59 26	52 16	27 13	11.1 27	26 11	46 16	50 23	00 28		
30 31	48 26	62 25	54 15	10.8 30	24 12	56 24	06 29			
52 31	87 25	81 17	54 12	8.3 55	54 11	75 15	84 24	39 29		
91 30	135 26	125 16	88 10	8.8 90	91 12	125 18	132 26	83 31		
09 30	38 26	39 16	08 10	99.4 07	06 11	33 16	32 25	15 31		
68 31	96 27	83 16	48 11	95.4 47	50 12	79 17	82 26	46 31		
115 30	126 26	118 18	77 10	92.5 70	77 13	104 19	116 27	94 31		

100.14

63

+93 Back Wall

64+14

"

"

⑤

6.17

97.19

9.12

91.02

65

9.09

97.21

9.09

88.12 CL 90.2

66

67

68

69

⑤

13.93

111.10

0.04

97.17

70

71

72

$$\begin{array}{ccccccc} 132 & 138 & 136 & 96 & 91.1 & 96 & 135 \\ 24 & 23 & 15 & 10 & 90 & 13 & 19 \end{array}$$

20' ↓

$$\begin{array}{ccccccc} 191 & 91 & 91.2 & 97 & 154 & & \\ 11 & 10 & 89 & 10 & 11 & & \end{array}$$

W 100'

$$\begin{array}{ccccccc} 152 & 92 & 91.1 & 94 & 164 & & \\ 11 & 10 & 90 & 10 & 11 & & \end{array}$$

$$\begin{array}{ccccccc} 108 & 72 & 90.1 & 76 & 106 & 126 & 12.2 \\ 18 & 10 & 71 & 11 & 17 & 27 & 28 \end{array}$$

f 40

$$\begin{array}{ccccccc} 87 & 112 & 102 & 72 & 90.2 & 75 & 111 \\ 31 & 26 & 16 & 11 & 70 & 13 & 19 \end{array}$$

$$\begin{array}{ccccccc} 79 & 105 & 97 & 60 & 91.0 & 62 & 65 \\ 31 & 27 & 18 & 12 & 62 & 12 & 19 \end{array}$$

$$\begin{array}{ccccccc} 59 & 90 & 75 & 43 & 92.6 & 51 & 81 \\ 31 & 26 & 17 & 11 & 46 & 14 & 20 \end{array}$$

$$\begin{array}{ccccccc} 21 & 56 & 50 & 14 & 96.1 & 15 & 49 \\ 31 & 26 & 18 & 12 & 11 & 12 & 17 \end{array}$$

$$\begin{array}{ccccccc} 122 & 152 & 138 & 118 & 119 & 121 & 142 \\ 30 & 29 & 17 & 13 & 12 & 17 & 24 \end{array}$$

$$\begin{array}{ccccccc} 83 & 117 & 110 & 81 & 77 & 77 & 102 \\ 30 & 26 & 18 & 13 & 13 & 13 & 17 \end{array}$$

$$\begin{array}{ccccccc} 61 & 87 & 73 & 52 & 54 & 54 & 27 \\ 31 & 26 & 17 & 13 & 52 & 14 & 19 \end{array}$$

111.10

73

$$\begin{array}{ccccccc} 46 & 67 & 64 & 36 & 33 & 33 & 56 & 57 & 18 \\ 31 & 27 & 20 & 14 & 13 & 17 & 26 & 30 \end{array}$$

74

$$\ominus \quad 7.35 \quad \underline{116.70} \quad 1.75 \quad 109.35$$

$$\begin{array}{ccccccc} 38 & 58 & 49 & 23 & 21 & 51 & 54 & 08 \\ 30 & 26 & 18 & 14 & 12 & 18 & 25 & 30 \end{array}$$

75

$$\begin{array}{ccccccc} 86 & 107 & 99 & 23 & 70 & 69 & 95 & 95 & 51 \\ 29 & 20 & 18 & 14 & 13 & 18 & 24 & 29 \end{array}$$

76

$$\begin{array}{ccccccc} 25 & 93 & 80 & 55 & 59 & 56 & 80 & 83 & 40 \\ 29 & 24 & 16 & 12 & 14 & 18 & 26 & 30 \end{array}$$

77

$$\begin{array}{ccccccc} 68 & 87 & 72 & 51 & 46 & 47 & 71 & 76 & 13 \\ 19 & 26 & 17 & 14 & 13 & 18 & 24 & 30 \end{array}$$

78

$$\begin{array}{ccccccc} 24 & 95 & 81 & 43 & 42 & 45 & 68 & 77 & 38 \\ 29 & 26 & 16 & 11 & 11 & 17 & 26 & 30 \end{array}$$

+60

4.62

ck +0.

$$\begin{array}{ccccccc} 27 & 94 & 85 & 46 & 40 & 34 & 38 & 80 & 76 & 44 \\ 31 & 28 & 13 & 12 & 11 & 11 & 12 & 12 & 26 & 31 \end{array}$$

79

$$\begin{array}{ccccccc} 23 & 86 & 27 & 44 & 38 & 36 & 21 & 42 & 47 \\ 32 & 30 & 19 & 12 & 10 & 17 & 26 & 31 \end{array}$$

+32

$$\begin{array}{ccccccc} 58 & 40 & 36 & 36 & 66 & 67 & 47 \\ 33 & 13 & 10 & 17 & 27 & 31 \end{array}$$

80

$$\begin{array}{ccccccc} 47 & 24 & 65 & 38 & 31 & 32 & 55 & 61 & 32 \\ 32 & 28 & 19 & 13 & 10 & 18 & 27 & 30 \end{array}$$
V₆₀V₄₀

FINAL X-SECS. BETW. SECS. $\frac{34}{35}$ BARCLAY TWP.

1.85

101.85

100.00

NE. C. FP.

Sept 4 1931
K.K.
Wise.
Schnit.

69

0 = S.E. Cor. Sec. 34-89-11 thence North.

SARRO.

1

192
99.5
 $\frac{48}{31}$ $\frac{67}{24}$ $\frac{62}{19}$ $\frac{28}{12}$ 24 $\frac{20}{12}$ $\frac{49}{16}$ $\frac{57}{30}$ $\frac{38}{32}$ ✓

2

99.7
 $\frac{45}{31}$ $\frac{71}{27}$ $\frac{59}{18}$ $\frac{25}{12}$ 22 $\frac{21}{13}$ $\frac{53}{19}$ $\frac{59}{26}$ $\frac{36}{32}$ ✓

3

99.3
 $\frac{44}{31}$ $\frac{71}{29}$ $\frac{60}{19}$ $\frac{23}{12}$ 26 $\frac{24}{13}$ $\frac{47}{19}$ $\frac{59}{27}$ $\frac{34}{32}$ ✓

4

97.7
 $\frac{60}{31}$ $\frac{89}{27}$ $\frac{79}{18}$ $\frac{45}{12}$ 42 $\frac{43}{14}$ $\frac{67}{19}$ $\frac{75}{28}$ $\frac{54}{32}$ ✓

5

96.9
 $\frac{85}{31}$ $\frac{101}{29}$ $\frac{101}{19}$ $\frac{63}{12}$ 60 $\frac{59}{12}$ $\frac{84}{18}$ $\frac{91}{27}$ $\frac{68}{32}$ ✓

6

96.4
 $\frac{45}{32}$ $\frac{102}{30}$ $\frac{90}{17}$ $\frac{56}{11}$ 66 $\frac{55}{11}$ $\frac{85}{18}$ $\frac{98}{28}$ $\frac{76}{32}$ ✓

+20

5.90

101.90

96.00

96.6
 $\frac{45}{32}$ $\frac{100}{30}$ $\frac{10.0}{10}$ $\frac{54}{13}$ 54 $\frac{49}{19}$ $\frac{97}{12}$ $\frac{95}{28}$ $\frac{78}{32}$ ✓

96.00

V. HAWK.

101.90

7

$$\frac{70}{30} \frac{96}{27} \frac{89}{18} \frac{52}{12} \overset{97.1}{48} \frac{50}{11} \frac{75}{17} \frac{84}{27} \frac{52}{31} \checkmark$$

8

$$\frac{52}{31} \frac{78}{27} \frac{67}{17} \frac{32}{11} \overset{98.6}{33} \frac{30}{14} \frac{61}{19} \frac{68}{27} \frac{45}{31} \checkmark$$

9

$$\odot \quad 6.70 \quad \underline{107.89} \quad 0.71 \quad 101.19$$

$$\frac{41}{32} \frac{62}{28} \frac{53}{19} \frac{21}{13} \overset{99.9}{20} \frac{21}{13} \frac{51}{19} \frac{57}{26} \frac{30}{31} \checkmark$$

10

$$\frac{78}{32} \frac{101}{27} \frac{90}{18} \frac{60}{12} \overset{102.0}{59} \frac{65}{14} \frac{92}{18} \frac{96}{27} \frac{74}{32} \checkmark$$

11

$$\frac{51}{32} \frac{84}{27} \frac{76}{19} \frac{45}{13} \overset{103.4}{45} \frac{45}{13} \frac{69}{17} \frac{77}{26} \frac{50}{30} \checkmark$$

12

$$\frac{32}{32} \frac{67}{27} \frac{60}{18} \frac{29}{12} \overset{104.9}{30} \frac{29}{13} \frac{57}{19} \frac{63}{27} \frac{32}{31} \checkmark$$

13

$$\frac{39}{31} \frac{74}{27} \frac{68}{18} \frac{39}{13} \overset{103.9}{40} \frac{40}{12} \frac{68}{18} \frac{75}{26} \frac{42}{31} \checkmark$$

14

$$\frac{70}{31} \frac{98}{27} \frac{92}{18} \frac{61}{13} \overset{101.6}{63} \frac{62}{12} \frac{90}{18} \frac{97}{28} \frac{68}{32} \checkmark$$

15

$$\frac{95}{31} \frac{120}{27} \frac{111}{19} \frac{85}{14} \overset{94.7}{42} \frac{81}{12} \frac{109}{17} \frac{116}{26} \frac{90}{32} \checkmark$$

107.89

16

$$\frac{110}{31} \quad \frac{134}{27} \quad \frac{125}{17} \quad \frac{97}{13} \quad 95 \quad \frac{94}{11} \quad \frac{124}{16} \quad \frac{129}{24} \quad \frac{97}{29} \quad 98.1$$

17

$$\frac{112}{32} \quad \frac{135}{28} \quad \frac{130}{19} \quad \frac{101}{14} \quad 102 \quad \frac{101}{10} \quad \frac{127}{14} \quad \frac{131}{22} \quad \frac{104}{26} \quad 99.7$$

18

(x)

1.58

27.40

12.07

95.82

$$\frac{121}{31} \quad \frac{143}{27} \quad \frac{133}{18} \quad \frac{108}{13} \quad 110 \quad \frac{108}{10} \quad \frac{132}{14} \quad \frac{132}{22} \quad \frac{109}{24} \quad 96.9$$

19

98.57

$$\frac{24}{31} \quad \frac{49}{28} \quad \frac{46}{19} \quad \frac{22}{15} \quad 24 \quad \frac{24}{8} \quad \frac{50}{13} \quad \frac{51}{20} \quad \frac{22}{23} \quad 95.0$$

+70

$$\frac{51}{32} \quad \frac{60}{30} \quad \frac{57}{21} \quad \frac{38}{17} \quad 38 \quad \frac{42}{9} \quad \frac{61}{14} \quad \frac{61}{19} \quad \frac{51}{21} \quad 97.6$$

End Ditch

End Ditch

+95

20+50

$$\frac{93}{21} \quad \frac{49}{12} \quad 50 \quad \frac{51}{8} \quad \frac{80}{14} \quad \frac{83}{23} \quad \frac{26}{24} \quad 809. \text{Ditch} \quad 97.1$$

21

$$\frac{107}{19} \quad \frac{50}{12} \quad 52 \quad \frac{54}{10} \quad \frac{104}{17} \quad \frac{106}{23} \quad \frac{89}{24} \quad 97.2$$

+74

Beg Ditch

$$\frac{95}{26} \quad \frac{105}{24} \quad \frac{107}{14} \quad \frac{51}{13} \quad 45 \quad 99.9$$

$$\frac{483}{13} \quad \frac{105}{19} \quad \frac{106}{25} \quad \frac{95}{21} \quad 97.9$$

4.83 97.46

22.63

14.11

22

$$\frac{100}{25} \quad \frac{105}{23} \quad \frac{106}{19} \quad \frac{58}{12} \quad 58 \quad \frac{57}{12} \quad \frac{102}{19} \quad \frac{104}{23} \quad \frac{96}{24}$$

✓

23

$$\frac{96}{28} \quad \frac{115}{25} \quad \frac{110}{18} \quad \frac{72}{12} \quad 90.6 \quad \frac{67}{12} \quad \frac{112}{19} \quad \frac{114}{29} \quad \frac{43}{29}$$

✓

24

$$\frac{94}{27} \quad \frac{113}{26} \quad \frac{107}{19} \quad \frac{68}{13} \quad 91.9 \quad \frac{66}{13} \quad \frac{99}{17} \quad \frac{112}{21} \quad \frac{114}{28} \quad \frac{94}{31}$$

✓

25

$$\frac{24}{16} \quad \frac{96}{25} \quad \frac{91}{17} \quad \frac{60}{12} \quad 91.6 \quad \frac{59}{13} \quad \frac{93}{19} \quad \frac{100}{28} \quad \frac{93}{32}$$

✓

26

$$\ominus \quad 10.20 \quad \underline{\underline{106.01}} \quad 1.65 \quad 95.81$$

$$\frac{40}{28} \quad \frac{76}{25} \quad \frac{77}{19} \quad \frac{62}{14} \quad \frac{39}{10} \quad 93.4 \quad \frac{50}{13} \quad \frac{84}{19} \quad \frac{89}{27} \quad \frac{63}{31}$$

✓

27

$$\frac{109}{29} \quad \frac{137}{26} \quad \frac{133}{18} \quad \frac{101}{12} \quad 98.7 \quad \frac{103}{12} \quad \frac{143}{28} \quad \frac{151}{26} \quad \frac{121}{29}$$

✓

28

$$\frac{97}{30} \quad \frac{123}{26} \quad \frac{116}{17} \quad \frac{86}{12} \quad 97.1 \quad \frac{89}{11} \quad \frac{125}{18} \quad \frac{136}{26} \quad \frac{108}{30}$$

✓

29

$$\frac{91}{30} \quad \frac{113}{27} \quad \frac{108}{19} \quad \frac{78}{14} \quad 98.4 \quad \frac{79}{10} \quad \frac{116}{18} \quad \frac{119}{25} \quad \frac{94}{30}$$

✓

30

$$\frac{72}{30} \quad \frac{96}{27} \quad \frac{92}{19} \quad \frac{60}{13} \quad 100.1 \quad \frac{59}{13} \quad \frac{61}{10} \quad \frac{101}{18} \quad \frac{105}{26} \quad \frac{70}{28}$$

✓

31

106.01

32

⑦ 7.49 112.88 0.60 105.41

33

3.40

108.98 ck 906

34

108.98
3.40
112.88

reverse

35

36

37

38

39

102.8
40 64 62 37 32 34 62 66 33
32 27 19 14 32 13 19 26 30

105.4
04 35 20 00 02 01 31 38 14
32 26 19 12 13 18 26 32

108.0
50 79 73 47 49 47 79 86 64
32 27 18 12 11 18 27 32

109.1
48 25 68 41 38 36 65 71 47
32 26 18 13 38 12 18 27 31

110.1
45 69 59 31 28 34 59 64 34
32 27 19 14 13 13 18 27 32

109.8
51 71 63 34 31 28 58 64 29
33 27 20 14 31 12 17 27 31

109.5
65 82 76 45 44 40 72 76 42
33 28 20 14 11 11 18 27 31

107.7
70 92 85 54 52 53 81 85 52
32 27 19 12 11 11 17 26 31

107.3
77 95 86 57 56 55 83 88 54
32 27 19 14 11 11 18 25 31

112.88

40

41

42

① 2.50 110.65 11.73 101.15

43

44

45

46

7.48

110.82

103.34

46

108.0
 $\frac{66}{32} \frac{89}{27} \frac{81}{19} \frac{49}{13} 49 \frac{47}{12} \frac{79}{18} \frac{80}{27} \frac{47}{32}$ ✓

107.9
 $\frac{75}{32} \frac{95}{28} \frac{86}{20} \frac{56}{14} 52 \frac{54}{12} \frac{82}{18} \frac{88}{25} \frac{49}{31}$ ✓

106.4
 $\frac{100}{33} \frac{120}{30} \frac{112}{21} \frac{77}{14} 75 \frac{75}{12} \frac{102}{19} \frac{106}{27} \frac{74}{31}$ ✓

103.7
 $\frac{104}{33} \frac{122}{28} \frac{110}{19} \frac{71}{12} 70 \frac{69}{11} \frac{107}{19} \frac{111}{27} \frac{80}{32}$ ✓

103.4
 $\frac{102}{33} \frac{127}{28} \frac{114}{18} \frac{75}{11} 73 \frac{73}{11} \frac{110}{16} \frac{119}{26} \frac{94}{32}$ ✓

103.6
 $\frac{117}{30} \frac{131}{29} \frac{125}{20} \frac{72}{12} 71 \frac{73}{12} \frac{118}{19} \frac{125}{27} \frac{100}{30}$ ✓

103.6
 $\frac{132}{29} \frac{133}{14} \frac{77}{14} \frac{73}{13} 70 \frac{70}{13} \frac{75}{14} \frac{131}{14} \frac{134}{28} \frac{125}{30}$ ✓

E. HO MI

103.9
 $\frac{87}{32} \frac{112}{27} \frac{103}{19} \frac{69}{13} 69 \frac{67}{10} \frac{107}{17} \frac{111}{26} \frac{88}{30}$ ✓

110.82

47

^{105.5}
 $\frac{69}{33} \frac{93}{29} \frac{88}{21} \frac{56}{14} 53 \frac{60}{11} \frac{90}{16} \frac{97}{26} \frac{69}{30}$

48

^{107.7}
 $\frac{48}{33} \frac{74}{28} \frac{69}{20} \frac{37}{14} 36 \frac{37}{10} \frac{68}{17} \frac{74}{27} \frac{48}{32}$

49

^{108.6}
 $\frac{35}{33} \frac{61}{28} \frac{54}{20} \frac{25}{14} 22 \frac{22}{12} \frac{59}{18} \frac{66}{26} \frac{38}{31}$

50

⊙ 9.84 116.58 4.08 106.74
 236
 1222

^{109.3}
 $\frac{26}{33} \frac{53}{28} \frac{43}{20} \frac{16}{14} 15 \frac{12}{12} \frac{50}{19} \frac{59}{28} \frac{33}{33}$

51

^{110.7}
 $\frac{79}{32} \frac{105}{28} \frac{100}{20} \frac{66}{14} 64 \frac{66}{11} \frac{99}{19} \frac{105}{28} \frac{83}{33}$

52

^{111.4}
 $\frac{70}{32} \frac{97}{28} \frac{88}{19} \frac{57}{13} 52 \frac{56}{11} \frac{87}{16} \frac{100}{22} \frac{101}{26} \frac{70}{32}$

154 x 20' C.C.

53

^{112.9}
 $\frac{53}{31} \frac{77}{27} \frac{72}{18} \frac{36}{11} 37 \frac{35}{12} \frac{64}{18} \frac{65}{25} \frac{45}{28}$

+36 Intersection

^{114.1}
 $\frac{31}{33} 25 \frac{22}{33}$

2.36

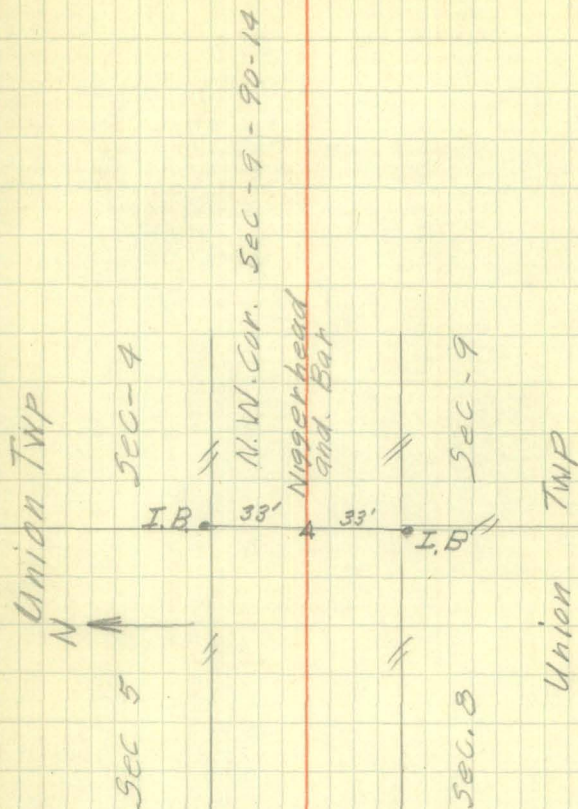
114.18

x-3. H.W.

7-22

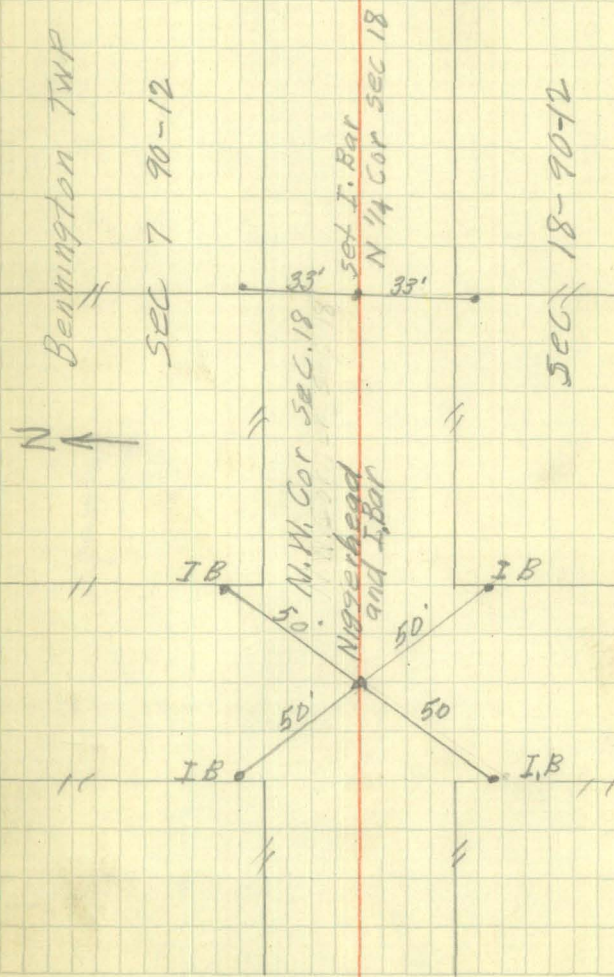
D.T.G

C.J.C



7-22

C. J. C.



KEITH'S RAILROAD CURVE TABLES.

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HOW TO USE KEITH'S TABLES.

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. IV opposite $23^{\circ} 20'$ =120.87
 $120.87 \div 12 = 10.07$. Say a 10° Curve.

Tan. in Tab. IV opp. $23^{\circ} 20'$ =1183.1
 $1183.1 \div 10 = 118.31$.

Tab. V. 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.=	118.47
$7^{\circ} 19\frac{1}{2}'$ = " " "	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		

$100 - 53.53 = 46.47 \times 3'$ (def. for 1 ft. of 10° 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 86.86 ft.= $1^{\circ} 50\frac{1}{2}'$ for a 10° Curve

(These tables are published in Field Books of
KEUFFEL & ESSER Co., New York, N. Y.)

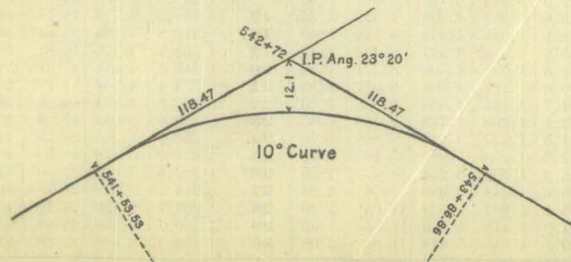


TABLE I. — Minutes in Decimals of a Degree.

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 II. — Inches in Decimals of a Foot.

1-16	3-32	$\frac{1}{8}$	3-16	$\frac{1}{4}$	5-16	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{8}$
.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

TABLE III. — Radii, Ordinates and Deflections.

Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot
0° 10'	84377.	.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	50'	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	50	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	50	573.7	2.183	8.716	17.43	3.00
20	2455.7	.509	2.036	4.072	0.70	20	546.4	2.292	9.150	18.30	3.15
30	2292.0	.545	2.181	4.363	0.75	30	521.7	2.402	9.585	19.16	3.30
40	2148.8	.582	2.327	4.654	0.80	40	499.1	2.511	10.02	20.04	3.45
50	2022.4	.618	2.472	4.945	0.85	50	478.3	2.620	10.45	20.91	3.60
3	1910.1	.655	2.618	5.235	0.90	20	459.3	2.730	10.89	21.77	3.75
10	1809.6	.691	2.763	5.526	0.95	30	441.7	2.839	11.32	22.64	3.90
20	1719.1	.727	2.908	5.817	1.00	40	425.4	2.949	11.75	23.51	4.05
30	1637.3	.764	3.054	6.108	1.05	50	410.3	3.058	12.18	24.37	4.20
40	1562.9	.800	3.199	6.398	1.10	20	396.2	3.168	12.62	25.24	4.35
50	1495.0	.836	3.345	6.689	1.15	30	383.1	3.277	13.05	26.11	4.50
4	1432.7	.873	3.490	6.980	1.20	40	370.8	3.387	13.49	26.97	4.65
10	1375.4	.909	3.635	7.271	1.25	50	359.3	3.496	13.92	27.84	4.80
20	1322.5	.945	3.781	7.561	1.30	20	348.5	3.606	14.35	28.70	4.95
30	1273.6	.982	3.926	7.852	1.35	30	338.3	3.716	14.78	29.56	5.10
40	1228.1	1.018	4.071	8.143	1.40	40	319.6	3.835	15.64	31.29	5.40
50	1185.8	1.055	4.217	8.433	1.45	50	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	30	274.4	4.594	18.22	36.44	6.30
20	1074.7	1.164	4.653	9.305	1.60	40	262.0	4.814	19.08	38.16	6.60
30	1042.1	1.200	4.798	9.596	1.65	50	250.8	5.035	19.94	39.87	6.90
40	1011.5	1.237	4.943	9.886	1.70	20	240.5	5.255	20.79	41.58	7.20
50	982.6	1.273	5.088	10.18	1.75	30	231.0	5.476	21.64	43.28	7.50
6	955.4	1.309	5.234	10.47	1.80	40	222.3	5.697	22.50	44.99	7.80
10	929.6	1.346	5.379	10.76	1.85	50	214.2	5.918	23.35	46.69	8.10
20	905.1	1.382	5.524	11.05	1.90	20	206.7	6.138	24.19	48.38	8.40
30	881.9	1.418	5.669	11.34	1.95	30	199.7	6.360	25.04	50.07	8.70
40	859.9	1.455	5.814	11.63	2.00	40	193.2	6.583	25.88	51.76	9.00

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10'	58.34	.30	10'	560.11	27.31	10'	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.9	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32	1643.0	230.9	42	2199.4	407.6	52	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	43	2257.0	428.5	53	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	44	2314.9	450.0	54	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	45	2373.3	472.1	55	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.4	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	46	2432.1	494.8	56	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	47	2491.3	518.2	57	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	48	2551.0	542.2	58	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	49	2611.2	566.9	59	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	50	2671.8	592.3	60	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
61°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1315.6	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62	3442.7	954.8	72	4162.8	1352.6	82	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63	3511.1	990.2	73	4239.7	1398.0	83	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64	3580.3	1026.6	74	4317.6	1444.6	84	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65	3650.2	1063.9	75	4396.5	1492.4	85	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66	3720.9	1102.2	76	4476.5	1541.4	86	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67	3792.4	1141.4	77	4557.6	1591.6	87	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68	3864.7	1181.6	78	4639.8	1643.0	88	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69	3937.9	1222.7	79	4723.2	1695.8	89	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70	4011.9	1265.0	80	4807.7	1749.9	90	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10'	5847.5	2457.1	10'	6971.3	3294.1	10'	8362.7	4407.6
20'	5864.6	2469.3	20'	6992.0	3310.1	20'	8388.9	4429.2
30'	5881.7	2481.5	30'	7012.7	3326.1	30'	8415.1	4450.9
40'	5898.8	2493.8	40'	7033.6	3342.3	40'	8441.5	4472.7
50'	5916.0	2506.1	50'	7054.5	3358.5	50'	8468.0	4494.6
92°	5933.2	2518.5	102°	7075.5	3374.9	112°	8494.6	4516.6
10'	5950.5	2531.0	10'	7096.6	3391.2	10'	8521.3	4538.8
20'	5967.9	2543.5	20'	7117.8	3407.7	20'	8548.1	4561.1
30'	5985.3	2556.0	30'	7139.0	3424.3	30'	8575.0	4583.4
40'	6002.7	2568.6	40'	7160.3	3440.9	40'	8602.1	4606.0
50'	6020.2	2581.3	50'	7181.7	3457.6	50'	8629.3	4628.6
93°	6037.8	2594.0	103°	7203.2	3474.4	113°	8656.6	4651.3
10'	6055.4	2606.8	10'	7224.7	3491.3	10'	8684.0	4674.2
20'	6073.1	2619.7	20'	7246.3	3508.2	20'	8711.5	4697.2
30'	6090.8	2632.6	30'	7268.0	3525.2	30'	8739.2	4720.3
40'	6108.6	2645.5	40'	7289.8	3542.4	40'	8767.0	4743.6
50'	6126.4	2658.5	50'	7311.7	3559.6	50'	8794.9	4766.9
94°	6144.3	2671.6	104°	7333.6	3576.8	114°	8822.9	4790.4
10'	6162.6	2684.7	10'	7355.6	3594.2	10'	8851.0	4814.1
20'	6180.2	2697.9	20'	7377.8	3611.7	20'	8879.3	4837.8
30'	6198.3	2711.2	30'	7399.9	3629.2	30'	8907.7	4861.7
40'	6216.4	2724.5	40'	7422.2	3646.8	40'	8936.3	4885.7
50'	6234.6	2737.9	50'	7444.6	3664.5	50'	8965.0	4909.9
95°	6252.8	2751.3	105°	7467.0	3682.3	115°	8993.8	4934.1
10'	6271.1	2764.8	10'	7489.6	3700.2	10'	9022.7	4958.6
20'	6289.4	2778.3	20'	7512.2	3718.2	20'	9051.7	4983.1
30'	6307.9	2792.0	30'	7534.9	3736.2	30'	9080.9	5007.8
40'	6326.3	2805.6	40'	7557.7	3754.4	40'	9110.3	5032.6
50'	6344.8	2819.4	50'	7580.5	3772.6	50'	9139.8	5057.6
96°	6363.4	2833.2	106°	7603.5	3791.0	116°	9169.4	5082.7
10'	6382.1	2847.0	10'	7626.6	3809.4	10'	9199.1	5107.9
20'	6400.8	2861.0	20'	7649.7	3827.9	20'	9229.0	5133.3
30'	6419.5	2875.0	30'	7672.9	3846.5	30'	9259.0	5158.8
40'	6438.4	2889.0	40'	7696.3	3865.2	40'	9289.2	5184.5
50'	6457.3	2903.1	50'	7719.7	3884.0	50'	9319.5	5210.3
97°	6476.2	2917.3	107°	7743.2	3902.9	117°	9349.9	5236.2
10'	6495.2	2931.6	10'	7766.8	3921.9	10'	9380.5	5262.3
20'	6514.3	2945.9	20'	7790.5	3940.9	20'	9411.3	5288.6
30'	6533.4	2960.3	30'	7814.3	3960.1	30'	9442.2	5315.0
40'	6552.6	2974.7	40'	7838.1	3979.4	40'	9473.2	5341.5
50'	6571.9	2989.2	50'	7862.1	3998.7	50'	9504.4	5368.2
98°	6591.2	3003.8	108°	7886.2	4018.2	118°	9535.7	5395.1
10'	6610.6	3018.4	10'	7910.4	4037.8	10'	9567.2	5422.1
20'	6630.1	3033.1	20'	7934.6	4057.4	20'	9598.9	5449.2
30'	6649.6	3047.9	30'	7959.0	4077.2	30'	9630.7	5476.5
40'	6669.2	3062.8	40'	7983.5	4097.1	40'	9662.6	5504.0
50'	6688.8	3077.7	50'	8008.0	4117.0	50'	9694.7	5531.7
99°	6708.6	3092.7	109°	8032.7	4137.1	119°	9727.0	5559.4
10'	6728.4	3107.7	10'	8057.4	4157.3	10'	9759.4	5587.4
20'	6748.2	3122.9	20'	8082.3	4177.5	20'	9792.0	5615.5
30'	6768.1	3138.1	30'	8107.3	4197.9	30'	9824.8	5643.8
40'	6788.1	3153.3	40'	8132.3	4218.4	40'	9857.7	5672.3
50'	6808.2	3168.7	50'	8157.5	4239.0	50'	9890.8	5700.9
100°	6828.3	3184.1	110°	8182.8	4259.7	120°	9924.0	5729.7
10'	6848.5	3199.6	10'	8208.2	4280.5	10'	9957.5	5758.6
20'	6868.8	3215.1	20'	8233.7	4301.4	20'	9991.0	5787.7
30'	6889.2	3230.8	30'	8259.3	4322.4	30'	10025.0	5817.0
40'	6909.6	3246.5	40'	8285.0	4343.6	40'	10059.0	5846.5
50'	6930.1	3262.3	50'	8310.8	4364.8	50'	10093.0	5876.1

Table V. Corrections for use with table IV.

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		For Tangents Add													
ANGLE	CURVE	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°		.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°		.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°		.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°		.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°		.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°		.11	.22	.34	.47	.58	.69	.79	.81	.92	1.04	1.29	1.42	1.54	1.66
40°		.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°		.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°		.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°		.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°		.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°		.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°		.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°		.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°		.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°		.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°		.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°		.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.49	4.98	5.38	5.83
100°		.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6.34

For Externals Add

ANGLE	CURVE	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°		.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°		.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°		.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°		.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135
30°		.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°		.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°		.023	.046	.070	.093	.117	.141	.171	.203	.234	.265	.277	.290	.315	.341
45°		.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°		.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°		.046	.093	.142	.188	.236	.283	.332	.381	.420	.479	.530	.582	.641	.700
60°		.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°		.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.771	.845	.922	1.01
70°		.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°		.095	.182	.266	.353	.440	.528	.618	.707	.797	.887	.977	1.07	1.18	1.29
80°		.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°		.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°		.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°		.174	.350	.522	.706	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°		.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96

Table VI. Deflections for Sub Chords for Short Radius Curves.

Degree of Curve	Radius 50 sin. def. ang.	$\frac{1}{2}$ sub chord R = sin of def. angle				Length of arc for 100 ft.
		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. = $\frac{\text{chord}}{R}$
$T = 50 \tan. \frac{1}{2} I$	$R = 50$	
$\text{Sin. D} = \frac{\text{Sin. D}}{50}$	Sin. D	No. chords = $\frac{1}{2} I$
$\text{Sin. D} = \frac{R}{50 \tan. \frac{1}{2} I}$	$E = R \text{ ex. sec. } \frac{1}{2} I$	Tan. def. = $\frac{1}{2} \text{ chord de}$
	$E = T \tan \frac{1}{2} I$	

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

Table IV. contains Tangents and External to a 1° curve. Tan. and Ex to any other radius may be found nearly enough, by dividing the Tan. c 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 Tangent: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table IV.: 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.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.), 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.

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.

Natural Sines

deg.	0'	10'	20'	30'	40'	50'	deg.	0'	10'	20'	30'	40'	50'	deg.
0	0000	0029	0058	0087	0116	0145	89	40	6428	6450	6472	6494	6517	6539
1	0175	0204	0233	0262	0291	0320	88	41	6561	6583	6604	6626	6648	6670
2	0349	0378	0407	0436	0465	0494	87	42	6691	6713	6734	6756	6777	6799
3	0523	0552	0581	0610	0640	0669	86	43	6820	6841	6862	6884	6905	6926
4	0698	0727	0756	0785	0814	0843	85	44	6947	6967	6988	7009	7030	7050
5	0872	0901	0929	0958	0987	1016	84	45	7071	7092	7112	7133	7153	7174
6	1045	1074	1103	1132	1161	1190	83	46	7193	7214	7234	7254	7274	7294
7	1219	1248	1276	1305	1334	1363	82	47	7314	7333	7353	7373	7392	7412
8	1392	1421	1449	1478	1507	1536	81	48	7431	7451	7470	7490	7509	7528
9	1564	1593	1622	1650	1679	1708	80	49	7547	7566	7585	7604	7623	7642
10	1736	1765	1794	1822	1851	1880	79	50	7660	7679	7698	7716	7735	7753
11	1908	1937	1965	1994	2022	2051	78	51	7771	7790	7808	7826	7844	7862
12	2079	2108	2136	2164	2193	2221	77	52	7880	7898	7916	7934	7951	7969
13	2250	2278	2306	2334	2363	2391	76	53	7986	8004	8021	8039	8056	8073
14	2419	2447	2476	2504	2532	2560	75	54	8090	8107	8124	8141	8158	8175
15	2588	2616	2644	2672	2700	2728	74	55	8192	8208	8225	8241	8258	8274
16	2756	2784	2812	2840	2868	2896	73	56	8290	8307	8323	8339	8355	8371
17	2924	2952	2979	3007	3035	3062	72	57	8387	8403	8418	8434	8450	8465
18	3090	3118	3145	3173	3201	3228	71	58	8480	8496	8511	8526	8542	8557
19	3256	3283	3311	3338	3365	3393	70	59	8572	8587	8601	8616	8631	8646
20	3420	3448	3475	3502	3529	3557	69	60	8660	8675	8689	8704	8718	8732
21	3581	3611	3638	3665	3692	3719	68	61	8746	8760	8774	8788	8802	8816
22	3746	3773	3800	3827	3854	3881	67	62	8829	8843	8857	8870	8884	8897
23	3907	3934	3961	3987	4014	4041	66	63	8910	8923	8936	8949	8962	8975
24	4067	4094	4120	4147	4173	4200	65	64	8988	9001	9013	9026	9038	9051
25	4226	4253	4279	4305	4331	4358	64	65	9063	9075	9088	9100	9112	9124
26	4384	4410	4436	4462	4488	4514	63	66	9135	9147	9159	9171	9182	9194
27	4540	4566	4592	4617	4643	4669	62	67	9205	9216	9228	9239	9250	9261
28	4695	4720	4746	4772	4797	4823	61	68	9272	9283	9293	9304	9315	9325
29	4848	4874	4899	4924	4950	4975	60	69	9336	9346	9356	9367	9377	9387
30	5000	5025	5050	5075	5100	5125	59	70	9397	9407	9417	9426	9436	9446
31	5150	5175	5200	5225	5250	5275	58	71	9455	9465	9474	9483	9492	9502
32	5299	5324	5348	5373	5398	5422	57	72	9511	9520	9528	9537	9546	9555
33	5440	5471	5495	5519	5544	5568	56	73	9563	9572	9580	9588	9596	9605
34	5592	5616	5640	5664	5688	5712	55	74	9611	9621	9628	9636	9644	9652
35	5736	5760	5783	5807	5831	5854	54	75	9659	9667	9674	9681	9689	9696
36	5878	5901	5925	5948	5972	5995	53	76	9703	9710	9717	9724	9730	9737
37	6018	6041	6065	6088	6111	6134	52	77	9744	9750	9757	9763	9769	9775
38	6157	6180	6202	6225	6248	6271	51	78	9781	9787	9793	9799	9805	9811
39	6293	6316	6338	6361	6383	6406	50	79	9816	9822	9827	9833	9838	9843

deg.	0'	10'	20'	30'	40'	50'	deg.
80	9848	9853	9858	9863	9868	9872	9
81	9877	9881	9886	9890	9894	9898	8
82	9903	9907	9911	9914	9918	9922	7
83	9925	9929	9932	9936	9939	9942	6
84	9945	9948	9951	9954	9957	9959	5
85	9962	9964	9967	9969	9971	9974	4
86	9976	9978	9980	9981	9983	9985	3
87	9986	9988	9989	9990	9992	9993	2
88	9994	9995	9996	9997	9997	9998	1
89	9998	9999	9999	9999	1.0000	1.0000	0
deg.	60'	50'	40'	30'	20'	10'	deg.

Natural Cosines

Natural Tangents

deg.	0'	10'	20'	30'	40'	50'	deg.	0'	10'	20'	30'	40'	50'	deg.	
0	0000	0029	0058	0087	0116	0145	89	40	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	88	41	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	87	42	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	86	43	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	85	44	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	84	45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	83	46	1.0355	1.0416	1.0477	1.0533	1.0599	1.0661	43
7	1228	1257	1287	1317	1346	1376	82	47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	81	48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	80	49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	79	50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	78	51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	77	52	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
13	2309	2339	2370	2401	2432	2462	76	53	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	75	54	1.3764	1.3848	1.3934	1.4019	1.4106	1.4193	35
15	2679	2711	2742	2773	2805	2836	74	55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	73	56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	72	57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	71	58	1.6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	70	59	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	69	60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	68	61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	67	62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	66	63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4452	4487	4522	4557	4592	4628	65	64	2.0593	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	64	65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	63	66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	62	67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	61	68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	60	69	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	59	70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	58	71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	57	72	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	56	73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	55	74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	54	75	3.7321	3.7760	3.8208	3.8667	3.9130	3.9617	14
36	7265	7310	7355	7400	7445	7490	53	76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
37	7536	7581	7627	7673	7720	7766	52	77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	51	78	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	50	79	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10
deg.	60'	50'	40'	30'	20'	10'	deg.	60'	50'	40'	30'	20'	10'	deg.	

deg.	0'	10'	20'	30'	40'	50'	deg.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5
85	11.430	11.826	12.250	12.706	13.197	13.727	4
86	14.300	14.924	15.605	16.350	17.169	18.075	3
87	19.081	20.206	21.470	22.903	24.542	26.432	2
88	28.636	31.242	34.368	38.189	42.964	49.104	1
89	57.290	68.750	85.940	114.588	171.885	343.770	0

Natural Cotangents

deg.	0'	10'	20'	30'	40'	50'	deg.
80	0.1736	0.1700	0.1664	0.1628	0.1593	0.1558	9
81	0.1511	0.1477	0.1443	0.1409	0.1376	0.1343	8
82	0.1219	0.1187	0.1155	0.1123	0.1092	0.1061	7
83	0.1000	0.0970	0.0940	0.0910	0.0881	0.0852	6
84	0.0833	0.0805	0.0777	0.0750	0.0723	0.0696	5
85	0.0670	0.0644	0.0618	0.0593	0.0568	0.0543	4
86	0.0520	0.0496	0.0472	0.0448	0.0425	0.0402	3
87	0.0380	0.0358	0.0336	0.0314	0.0293	0.0272	2
88	0.0252	0.0232	0.0212	0.0192	0.0173	0.0154	1
89	0.0136	0.0118	0.0101	0.0084	0.0068	0.0052	0

00-27-21

122+70.7
 12+78
 134+58.7
 122+70.7
 12+87.7

2 - 1' 2.05 - 2.28

3 - 1' 2.15 - 1.95

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1 1/2 TO 1.

FOR SINGLE TRACK EMBANKMENT.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	7.0	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	0
1	8.5	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.7	9.9	1
2	10.0	10.2	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	2
3	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	3
4	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.1	14.2	14.4	4
5	14.5	14.7	14.8	15.0	15.1	15.3	15.4	15.6	15.7	15.9	5
6	16.0	16.2	16.3	16.5	16.6	16.8	16.9	17.1	17.2	17.4	6
7	17.5	17.7	17.8	18.0	18.1	18.3	18.4	18.6	18.7	18.9	7
8	19.0	19.2	19.3	19.5	19.6	19.8	19.9	20.1	20.2	20.4	8
9	20.5	20.7	20.8	21.0	21.1	21.3	21.4	21.6	21.7	21.9	9
10	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1	23.2	23.4	10
11	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6	24.7	24.9	11
12	25.0	25.2	25.3	25.5	25.6	25.8	25.9	26.1	26.2	26.4	12
13	26.5	26.7	26.8	27.0	27.1	27.3	27.4	27.6	27.7	27.9	13
14	28.0	28.2	28.3	28.5	28.6	28.8	28.9	29.1	29.2	29.4	14
15	29.5	29.7	29.8	30.0	30.1	30.3	30.4	30.6	30.7	30.9	15
16	31.0	31.2	31.3	31.5	31.6	31.8	31.9	32.1	32.2	32.4	16
17	32.5	32.7	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9	17
18	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4	18
19	35.5	35.7	35.8	36.0	36.1	36.3	36.4	36.6	36.7	36.9	19
20	37.0	37.2	37.3	37.5	37.6	37.8	37.9	38.1	38.2	38.4	20
21	38.5	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	21
22	40.0	40.2	40.3	40.5	40.6	40.8	40.9	41.1	41.2	41.4	22
23	41.5	41.7	41.8	42.0	42.1	42.3	42.4	42.6	42.7	42.9	23
24	43.0	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	24
25	44.5	44.7	44.8	45.0	45.1	45.3	45.4	45.6	45.7	45.9	25
26	46.0	46.2	46.3	46.5	46.6	46.8	46.9	47.1	47.2	47.4	26
27	47.5	47.7	47.8	48.0	48.1	48.3	48.4	48.6	48.7	48.9	27
28	49.0	49.2	49.3	49.5	49.6	49.8	49.9	50.1	50.2	50.4	28
29	50.5	50.7	50.8	51.0	51.1	51.3	51.4	51.6	51.7	51.9	29
30	52.0	52.2	52.3	52.5	52.6	52.8	52.9	53.1	53.2	53.4	30
31	53.5	53.7	53.8	54.0	54.1	54.3	54.4	54.6	54.7	54.9	31
32	55.0	55.2	55.3	55.5	55.6	55.8	55.9	56.1	56.2	56.4	32
33	56.5	56.7	56.8	57.0	57.1	57.3	57.4	57.6	57.7	57.9	33
34	58.0	58.2	58.3	58.5	58.6	58.8	58.9	59.1	59.2	59.4	34
35	59.5	59.7	59.8	60.0	60.1	60.3	60.4	60.6	60.7	60.9	35
36	61.0	61.2	61.3	61.5	61.6	61.8	61.9	62.1	62.2	62.4	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.

MADE IN GERMANY.