OFFICE OF
RAMSEY COUNTY ENGINEER

CONSTRUCTION NOTES

ANOKA CUT-OFF

CO. AID. P.J. NO. 26-02

FILE NO.

ENGINEERS' FIELD BOOK No. 10403

Distances from Center of Roadway for Cross-Sectioning

Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	0
1	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	1
2	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	2
3	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	3
4	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	4
5	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	5
6	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	6
7	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	7
8	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	8
9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	9
10	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	10
11	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	11
12	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	12
13	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	13
14	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	14
15	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	15
16	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	16
17	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	17
18	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	18
19	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	19
20	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	20
21	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	21
22	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	22
23	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	23
24	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	24
25	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	25
26	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	26
27	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	27
28	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	28
29	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	29
30	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	30
31	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	31
32	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	32
33	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	33
34	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	34
35	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	35
36	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	36
37	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	37
38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9	38
39	47.0	47.1	47.2	47.3	47.4	47.5	47.6	47.7	47.8	47.9	39
40	48.0	48.1	48.2	48.3	48.4	48.5	48.6	48.7	48.8	48.9	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be 30.6+(20—16)÷2 or 2 ft. added to 30.6 =32.6. For slopes of 1 on 1½ see inside of back cover.

Div "B"

Borrow Pit

Blue

475

476

1

Alignment Pages 2-6

B.M.'s " 7

Xsection

Index

266°07'
124°37'
390°41'

Sta.	P.	L.	R.	
329+01.2	P.T.			
327+15.2	P.I		7°27'	
325+29.4	P.C.			
318+60.0	P.O.T.			
		PT	310+52.07	13°-04'
310+52.07	P.T.		310+00	11°-45.2
			+50	10°-30.2
			307+00	9°-15.2
			+50	8°-00.2
307+95.4	P.I	26°08'	308+00	6°-45.1
			+50	5°-30.2
			307+00	4°-15.2
			+50	3°-00.1
305+29.36	P.C.		306+00	1°-45.2
			+50	0°-30.2
		PC	305+29.36	0°-0'

Lt ℄ Rt

329+19 = 3° 49'

329+00 = 3° 43'

+50 = 3° 12'

328+00 = 2° 42'

+50 = 2° 12'

327+00 = 1° 42'

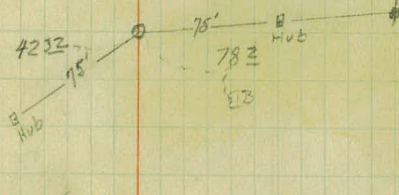
+50 = 1° 12'

326+00 = 0° 42'

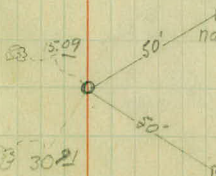
+50 = 0° 12'

325+29 = 0° 0'

Δ 79° 27'
D 2° 17'
T 186.52
L 372.72

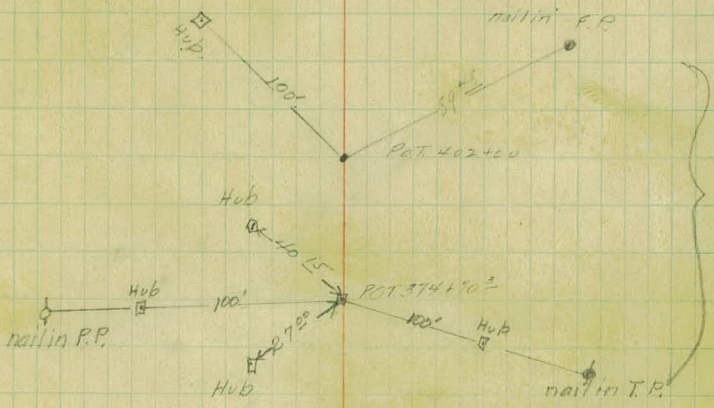


Δ = 26° 08'
D = 3° Lt.
T = 266.04
L = 522.66

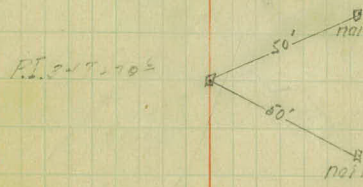


Sta.		L.	R.	
			351+40.45 =	19°-15.5'
402+00	P.O.T.		351+00 =	15°-14.8'
			+50 =	16°-59.1'
			350+00 =	16°-44.8'
1374+70.2	P.O.T.		+50 =	14°-29.8'
			349+00 =	13°-14.8'
			+50 =	11°-59.8'
370+19.8			348+00 =	10°-44.8'
1365+46.0	P.O.T.		+50 =	9°-29.8'
			347+00 =	8°-14.8'
351+40.45	P.T.		+50 =	6°-59.8'
			346+00 =	5°-44.8'
347+70.6	P.I.		+50 =	4°-29.8'
			345+00 =	3°-14.8'
			+50 =	1°-59.8'
			344+00 =	0°-44.8'
343+70.12	P.C.		343+70.12 =	0°-00

Lt ℄ Rt.



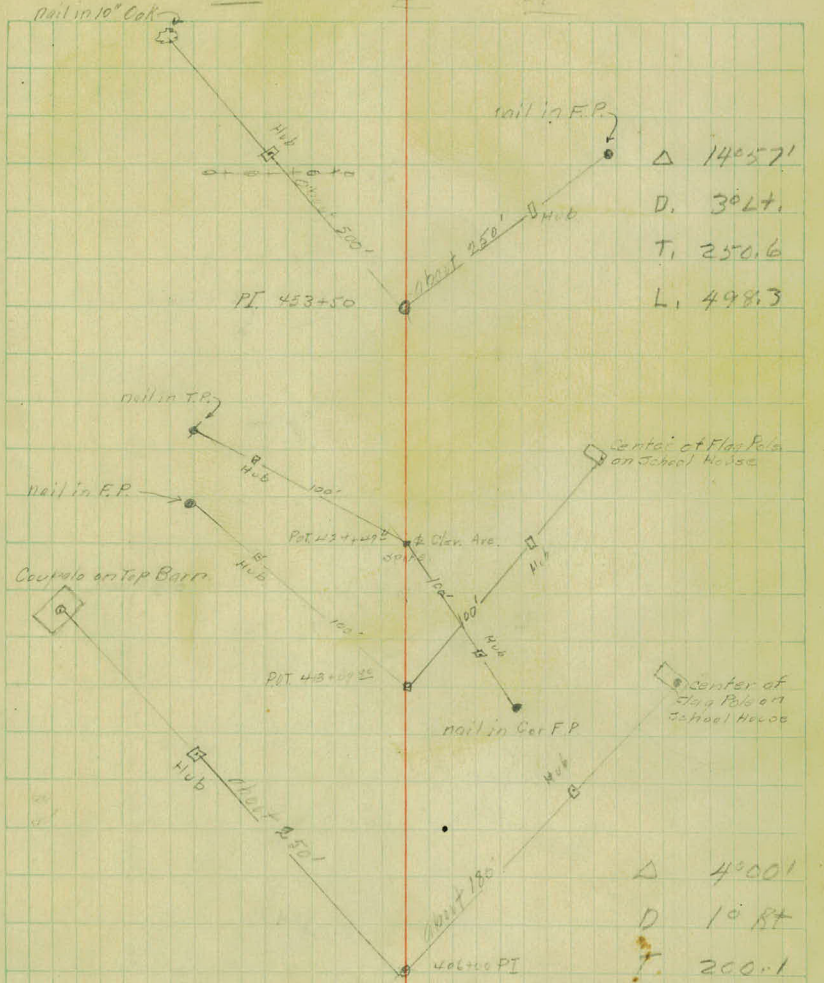
3°30'
2°42'
T 400.48
L 970.33



			R.	
			455+97½	7°-28½
5+00	P.	L.	+50	6°-45½
			455+00	6°-00½
			+50	5°-15½
455+97½	P.T.		454+00	4°-30½
			+50	3°-45½
			453+00	3°-00½
453+50	P.I	14°57'	+50	2°-15½
			452+00	1°-30½
			451+50	0°-45½
450+99½	P.C		451+00	0°-00½
			450+99½	0°-0
424+47½	P.O.T.	R Cleveland Ave		
413+09½	P.O.T.			
		409+99½ =	2°-0°	
407+99½	P.T.	+50 =	1°-45'	
		407+00 =	1°-30	
		+50 =	1°-15'	
		406 =	1°-0'	4°-0'
406+00	P.I.	+50 =	0°-45'	
		405+00 =	0°-30	
		404+50 =	0°-15'	
403+99½	P.C.	403+99½ =	0°-0'	

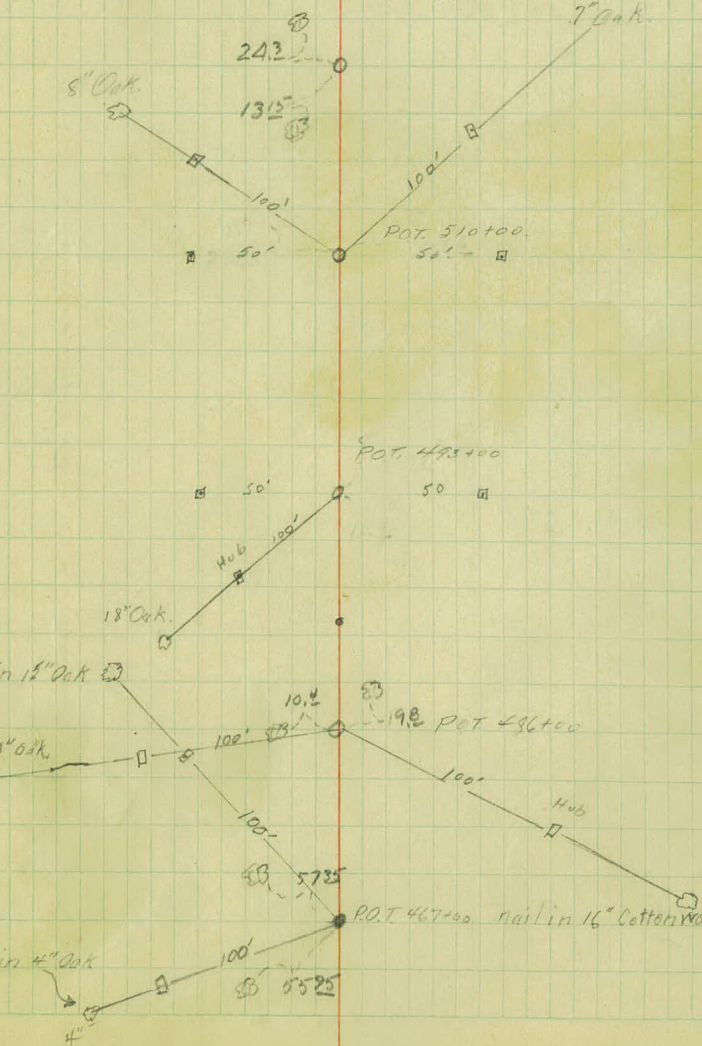
499+45
524+00

Lt. | Rt.



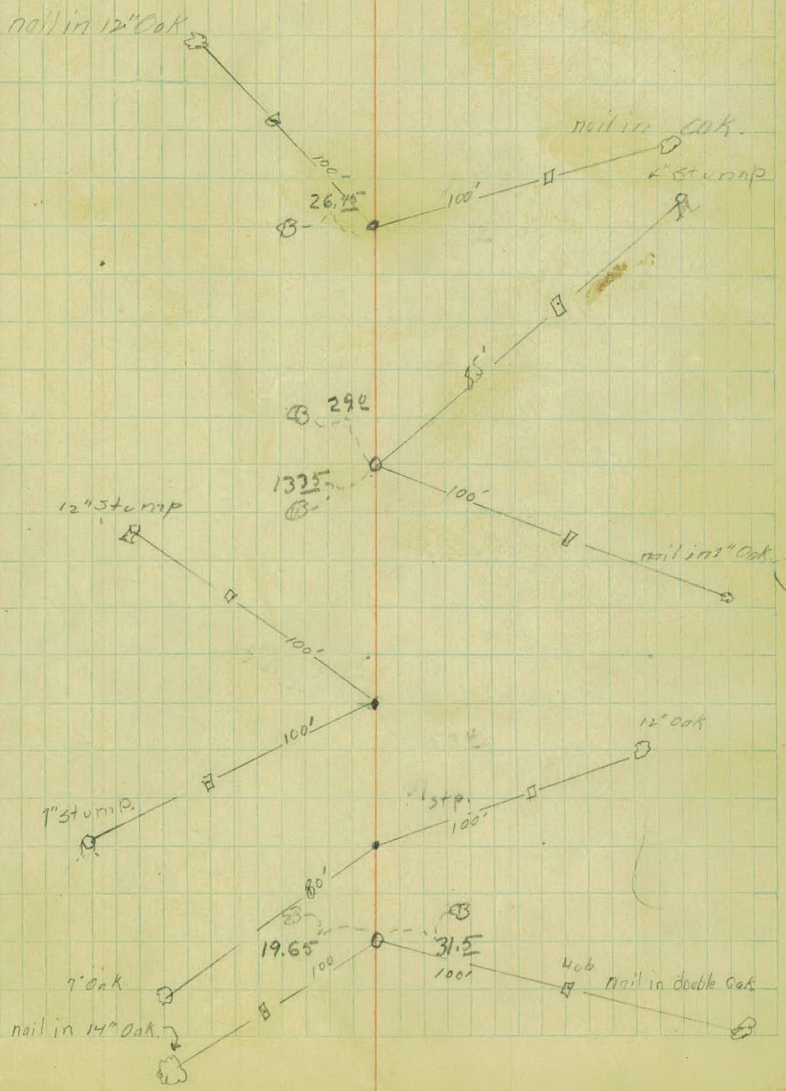
Sta	P.	L.	R.
518+18.4	P.O.T.		
510+00	P.O.T.		
493+00	P.O.T.		
486+00	P.O.T.		
467+00	P.O.T.		

Lt ℄ Rt


24.3
13.5
8" Oak.
7" Oak.
100'
100'
50'
50'
POT 510+00.
POT 493+00
50'
50
Hub
100'
18" Oak.
nail in 12" Oak
10.4
19.8
POT 496+00
nail in 4" Oak.
100'
100'
100'
Hub
57.35
POT 467+50
nail in 16" Cottonwood
nail in 4" Oak
100'
55.25
4"

Sta.	P.	L	R.
564+71.5	Ramsey-Anoka Co. Line.		
563+00	P.C.T.		
550+00	P.C.T.		
541+00	P.C.T.		
535+00	P.C.T.		
529+84	P.C.T.		

LT ℄ RT


nail in 12" Oak
100'
26.75
100'
nail in Oak
4" Stump
29°
13.75
100'
nail in 1" Oak
12" Stump
100'
100'
12" Oak
7" Stump
Stump
100'
80'
19.65
31.5
100'
9" Oak
nail in 14" Oak
Hub
nail in double Oak

B.M.'s Div B.

B.M.			893.57
B.M.			879.66
B.M.			900.23
B.M.			903.76
B.M.			896.79
B.M.			920.53
B.M.		917.34	917.44
B.M.			910.68
B.M.			906.36
B.M.			874.19
B.M.			878.01
B.M.			905.49
B.M.			914.26
B.M.			908.52
B.M.			904.23
B.M.			915.82

Spike in 12" Oak 60' Lt Sta 304+95

Spike in 6" Maple 70' Rt Sta 312+65

Spike in PP 60' Lt Sta 324+50

Spike in 10" Elder 300 Lt Sta 326+50

Spike in Fence Cor Right Sta 343+20

Spike in Fence Cor Right Sta 357+00

Spike in PP 200' Lt Sta 375+00

Spike in 12" Poplar 200 Lt Sta 398+10

On top of Reference point at PI 406+00 Lt 5+480+20

Spike in 10" Birch 400' Lt Sta 436+70

Spike in Twin Tree 175' Lt Sta 445+30

Spike in 6" Oak 100' Lt Sta 460+50

Spike in 10" Oak 60' Lt Sta 466+85

Spike in PP 85' Rt Sta 472+17

Spike in 15" Oak 70 Lt Sta 494+00

Spike in 20" Oak 82' Rt Sta 500+90

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
300					
301					
+50					
+80					
B.M.	10.35	888.37			877.62
302				882.2 881.3	6.2
T.P.	11.86	889.48			
+38				882.3 881.3	7.2
303				882.4 881.6	7.1
+36				882.5 881.7	7.0
+70				882.7 882.0	6.9
304				882.8 882.2	6.7
+16				882.8	6.7
+56				883.0 882.6	6.5 6.7
305				883.4 883.0	6.3 6.1 5.9

Inst. .....
Rod. .....
CF .....

8

G L

Right

Cont on Page 51-52-53

W. S.

+0.04
-0.16

0.15 +0.42
-0.42

Cross Sections

Sta.	B.S.	H.I.	F.S.	Grade	Gr. R.
750				83.4	6.1
	6.17	886.38	7.79		
306				83.6	83.8	2	1.9
750				83.8	84.2	2.6	1.7
307				84.0	84.6	2.4	1.5
	10.47	887.63	9.20		
728				84.1	84.8	3.0	2.6
T.P. 750	9.93	896.49	10.97	886.54	84.2	3.4	2.5
773				84.8	85.2	13.2	11.3
308				84.7	85.1	12.1	11.2
750				84.6	85.8	11.9	11.9
T.P.	1.98	898.39	0.06	896.41			
309				84.8	86.2	13.6	12.7
750				85.0		13.4	12.5
310				85.2	86.9	13.2	12.3
T.P.	5.96	892.41	11.94	886.45			
750				85.1	87.4	7.0	6.4
B.M.	10.57	890.98	12.75			879.66	?

X Sec Cont. Page 51.

Inst. .....
Rod. .....
Chain. .....

Left C L Right

W.	S.
1.6	+0.76 -0.76
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
2.0	+0.88 -0.88
1.0	+0.62 -0.62
	+0.28 -0.28

(6.1) (2.8) (2.6) 2.9 3.5 3.4 (12.3) (12.1) (11.9) (13.6) (13.4) (13.2) (7.0)

X Cont. Page 51.

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
T.P	6.43	894.32	2.34	887.89	
312				886.9	6.5
+53	9.73	889.39		886.0	6.3
+65				886.0	
+90				884.2	6.1
~~Eg 312+95~~ ~~313+00~~	X Sections on Page 54-55 from Eg 312+95 to 321+50				
313+20	2.59	892.25		888.2 / 887.66	1.2
+45				888.4	1.1
314				886.6	6.3
+56				888	6.5
315				889.0	6.7
+50				889.2	6.9
316				889.4	7.1
B.M.	3.25	892.91		889.66	
317				889.8	6.9
+50				890	7.3
318				890.2	7.3
+75				890.5	7.6
T.P.	6.22	886.76	2.37	880.54	
319				890.6	7.38

Grade Change

Grade Change X sections on Page 54-55 from 313+00 - 321+50

Inst. .....
Rod. .....
Chain. .....

/0

C L

Right

Carried on Page 54-55.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		889.26 ✓			
+50				90.8	+4.0
320				91.0	+4.2
321				91.4	+4.6
+50				91.6	+4.8
322				91.8	+5.0
+50				92.0	+5.2
323				92.2	+5.4
+50				92.4	+5.6
324				92.6	+5.8
T.P.	7.94	891.56 ✓	3.14	883.62 ✓	
+34				92.7	+1.1
+66				92.9	+1.3 1.5
325				92.9	+1.3 1.5
T.P	8.32	898.41	1.47	~~890.09~~ 898.41	
+37				93.1	5.3 5.6
+50				93.1	5.3 5.6

Inst. .....
Rod. .....
Chain. .....

11

Left C L Right

89841 Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
TP	11.07	908.37	1.11	897.30	
326				93.2	14.9 15.5 15.2
B.M.			7.11	900.26	900.23
+30				93.2	14.9 15.5 15.2
T.P.	11.60	917.40	2.57	905.80	
+75				93.3	23.8 24.1 24.4
327				93.3	23.8 24.1 24.4
+50				93.4	23.7 24.0 24.3
T.P. B	10.09	919.96	7.53	909.87	
328				93.4	26.3 26.6 26.9
TP	8.74	915.61	10.09	909.57	
+50				93.4	21.9 22.2 22.5
+75				93.4	22.2
329				93.3	22.1 22.3 22.5
T.P	6.56	911.78	10.39	905.22	
+50				93.3	18.3 18.5 18.6
330				93.2	18.6
T.P	2.27	902.86	1.14	900.64	
T.P.	8.61	905.20	6.27	896.59	
+40				93.1	12.1

Inst.
Rod.
Chain.

12

Left C L Right

						(15.2)						
+0.34	5.5	5.4	4.8	5.1	5.1		8.7	9.2	14.2	11.7		
-0.34	50	45.2	5	30	+4.3		20	31	+5.3	39.9	50	
Some	in	Pfkt	of			(15.2)						
+0.34	11.9	11.3	7.6	7.0	5.1		5.5	6.6	11.7	9.2		
-0.34	50	47.0	32	20	4.5		21	32	+2.8	+2.9	50	
						(24.1)						
+0.34	13.3	12.9	14.3	9.5	6.8		6.4	7.7	9.6	14.7		11.9
-0.34	50	41.0	31	20	-1.3		16	32	41	+2.7	50	50
						(24.1)						
+0.34		50	9.6	7.4	5.9	4.2	1.8	3.9	6.5	10.4		
-0.34		+14.2	32	18	-1.9		11	25	37	+4.0	52	
						(24.0)						
+0.34	50	2.2	1.9	1.7	2.2	3.6	5.3	2.7	11.9			
-0.34		+21.5	41	30	18	20.4	12	25	+12.5	49.1	17.5	50
Rail	in	Fence	Post			(26.6)						
+0.34	50	2.0	2.7	4.1	6.7	9.5	12.9	14.9	15.6		15.5	
-0.34		-24.3	40	30	19	-17.1	16	35	+10.3	46.5	50	
						(22.2)						
+0.34	50	2.9	3.9	5.9	7.3	5.0	10.4	11.8	12.7		13.0	
-0.34		+19.2	40	36	14	-13.2	16	36	+8.5	45.7	50	
						(22.2)						
+0.34		4.6	5.6	5.1	7.4	7.2	13.3	11.7	12.5		15.2	
-0.34		50	43	32	17		14	24	37		50	
						(22.3)						
+0.22	50	4.0	5.2	6.3	9.6	10.3	12.6	14.3	15.6	16.4	16.1	18.2
-0.22		+17.6	36	34	12	13	9.1	20	36	44	+6.4	+4.6	50
						(18.5)						
-0.1	50	0.5	1.5	2.3	6.9	9.7	14.6	13.6	15.3		17.4	
-0.16		+17.8	38	36	16	9.8	12	37	+3.3	30.9	50	
						(18.6)						
	50	3.4	4.0	4.7	8.6	11.4	14.2	16.4				
		+15.2	34	38	16	9.2	20	-2.0	34.0	17.4	20.8	
										40	50	
						(12.1)						
1.4	62.1	3.0	4.0	4.9	7.4	9.7	10.9	12.1				
5.4	10.0	40	37	33	15	30	18	00	31	13.3	14.1	
										40	50	

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
		905.20 ✓			
+80				· 93.0	12.2
331				· 93.0	12.2
+50				· 92.9	12.3
332				· 92.8	12.4
T.P	9.07	912.36 ✓	1.31	903.29 ✓	
+50				· 92.7	19.7
+85					
333				· 92.6	19.8
T.P.	2.55	905.03 ✓	9.88	902.48 ✓	
+45				· 92.5	12.5
+75				· 92.5	12.5
334				· 92.4	12.6
T.P	0.96	894.83 ✓	10.96	894.07 ✓	
+60				· 92.3	2.5
335				· 92.2	2.6
T.P	1.13	88863 ✓	7.33	887.50 ✓	
+38				· 92.2	3.6

Inst. .....
Rod: .....
Chain. .....

Pa.....

13

Left C L Right

(12.2)

1.6/50 2.7/44 3.0/40 4.8/27 8.7/23 9.5/11 10.0/2.2 11.1/14 12.4/27 13.7/38 14.8/50

(12.2)

2.3/50 4.8/30/9.2 3.2/40 5.8/30 7.0/27 7.9/12 9.3/2.9 9.3/14 11.6/0.6/31.9 13.2/46 14.4/50

2.7/50 45.1/3.9/9.4 3.3/40 4.7/36 5.0/19 4.7/7.6 4.2/13 5.2/27 7.4/4.9/38.4 10.1/50

1.4/50 46.8/1.9/10.5 2.1/40 3.5/38 4.3/29 4.3/17 4.3/8.1 3.7/15 2.6/27 1.2/11.2/41.8 1.2/50

50/5.9/13.8 4.6/41 7.9/37 8.6/27 9.1/13 8.6/7.1 7.9/12 6.5/24 4.6/35 3.0/16.7/50

5.7/50 6.0/44 6.5/31 6.5/11 6.0 5.5/10 4.0/20 1.8/38 1.3/50

50/5.8/14.0 6.2/34 6.7/16 6.5/13.3 6.0/11 4.1/23 3.0/40 2.7/17.1/50

On Top Rock 4+ 3+ 33+35

1.4/50 46.7/1.0/10.5 2.1/43 3.2/38 4.6/32 5.0/13 6.2/6.3 7.2/15 8.6/31 8.7/-3.8/36.7 8.6/50

0.5/50 1.0/41 4.1/38 4.5/33 9.5/10 11.1 12.8/12 13.8/29 14.2/50

1.4/50 4.4/1.7/12.9 2.4/41 5.1/37 6.4/32 11.4/10 13.5/0.6 15.2/15 15.4/2.8/2.6 15.8/39 16.2/50

4.5/50 4.5/40 4.8/4.9/24 4.9/24 6.6/4.1 7.2/17 7.2/4.7/2.4 6.9/43 7.9/50

7.2/50 6.8/34 7.9/7.1/45 7.7/19 7.1/12 7.1/4.5 7.4/19 8.0/22 8.2/5.2/3.2 8.9/40 9.2/50

2.0/20 2.0/43 3.2/2.3/5.9 2.3/32 2.7/16 3.0/-6.6 3.3/18 3.5/27 6.7/31 6.7/33 5.4/3.4 4.6/-8.2/9.6 3.0/40

4.6/50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		888.63			
336				92.10	+3.4
+50				91.9	+3.3
337				91.8	+3.2
+50				91.7	+3.1
338				91.6	+3.0
+50				91.6	+3.0
339				91.7	3.1
+50				92.0	+3.4
T.P.	10.42	896.72	2.33	886.30	
340				92.3	4.4
+50				92.8	3.9
341				93.3	3.4
+50				94.0	2.7
342				94.7	2.0
B.M.	1.08	896.75	1.08	895.64	895.67
+20				94.9	1.8
+50				95.4	1.3
B.M.	4.38	900.05	1.08	895.67	
+75				95.8	4.3
343				96.3	4.0 3.8 3.7
+75				96.7	3.4

Inst.
Ref.
Chain. Galvin

Cloudy
Rain

14

Left C L Right

$\frac{4.4}{50}$ $35.6/\frac{4.4}{7.8}$ $\frac{4.7}{24}$ $\frac{4.9}{14}$ $\frac{4.7}{8}$ $\frac{5.1}{15}$ $\frac{5.4}{26}$ $\frac{4.3}{-7.7}/35.4$ $\frac{3.1}{46}$ $\frac{3.9}{50}$

$\frac{5.0}{50}$ $36.4/\frac{4.9}{-8.2}$ $\frac{4.9}{33}$ $\frac{5.1}{15}$ $\frac{5.2}{8.5}$ $\frac{5.2}{16}$ $\frac{5.4}{31}$ $\frac{6.7}{33}$ $\frac{5.7}{35}$ $\frac{5.2}{8.5}/37.0$ $\frac{4.7}{43}$ $\frac{4.4}{50}$

$\frac{5.0}{50}$ $36.9/\frac{4.8}{8.0}$ $\frac{4.8}{32}$ $\frac{5.1}{16}$ $\frac{5.7}{8.3}$ $\frac{5.3}{15}$ $\frac{5.1}{28}$ $\frac{5.0}{-8.2}/36.4$ $\frac{5.0}{44}$ $\frac{6.4}{45}$ $\frac{6.3}{48}$ $\frac{5.3}{50}$

$\frac{5.0}{50}$ $\frac{5.0}{39}$ $\frac{6.0}{38}$ $\frac{4.8}{36}$ $\frac{5.2}{16}$ 5.2 $\frac{5.6}{17}$ $\frac{5.8}{32}$ $\frac{5.2}{50}$

$\frac{5.3}{50}$ $37.4/\frac{5.7}{8.7}$ $\frac{5.1}{33}$ $\frac{5.3}{15}$ $\frac{5.2}{8.0}$ $\frac{5.3}{6}$ $\frac{6.3}{8}$ $\frac{5.3}{9}$ $\frac{5.0}{17}$ $\frac{5.2}{+8.2}/36.4$ $\frac{5.6}{50}$

$\frac{4.6}{50}$ $\frac{5.2}{39}$ $35.4/\frac{4.7}{+7.7}$ $\frac{4.8}{29}$ $\frac{5.0}{21}$ $\frac{5.4}{+8.4}$ $\frac{5.0}{15}$ $\frac{5.0}{38}$ $\frac{5.0}{+8.0}/36.0$ $\frac{5.0}{50}$

$\frac{3.4}{50}$ $34.1/\frac{4.0}{7.1}$ $\frac{4.2}{31}$ $\frac{4.5}{21}$ $\frac{5.0}{+8.1}$ $\frac{5.2}{16}$ $\frac{5.5}{28}$ $\frac{5.5}{+8.6}/37.2$ $\frac{5.4}{50.}$

$\frac{2.5}{50}$ $33.2/\frac{3.2}{6.0}$ $\frac{3.4}{29}$ $\frac{4.1}{16}$ $\frac{4.6}{8.0}$ $\frac{4.9}{15}$ $\frac{5.2}{27}$ $\frac{5.3}{+8.7}/37.4$ $\frac{5.4}{50}$

$\frac{9.2}{50}$ $32.4/\frac{10.6}{+6.2}$ $\frac{10.8}{27}$ $\frac{11.2}{17}$ $\frac{11.8}{7.4}$ $\frac{13.2}{15}$ $\frac{12.8}{28}$ $\frac{13.0}{+8.6}/37.2$ $\frac{12.8}{50}$

$\frac{8.6}{50}$ $31.4/\frac{9.6}{+5.7}$ $\frac{9.7}{26}$ $\frac{10.3}{15}$ $\frac{11.0}{9.1}$ $\frac{11.2}{15}$ $\frac{11.3}{26}$ $\frac{11.2}{7.3}/34.6$ $\frac{11.5}{50}$

$\frac{6.5}{50}$ $39.8/\frac{8.3}{4.9}$ $\frac{8.6}{24}$ $\frac{9.1}{14}$ $\frac{9.6}{6.2}$ $\frac{9.9}{18}$ $\frac{12.2}{22}$ $\frac{12.0}{24}$ $\frac{10.6}{25}$ $\frac{9.7}{30}$ $\frac{9.7}{+6.3}/34.6$ $\frac{10.0}{50}$

$\frac{5.9}{50}$ $29.4/\frac{7.4}{+4.1}$ $\frac{7.9}{18}$ $\frac{8.7}{8}$ $\frac{10.4}{6}$ $\frac{8.8}{3.}$ $\frac{8.3}{+5.6}$ $\frac{8.4}{12}$ $\frac{8.5}{23}$ $\frac{8.7}{+6.0}/32.0$ $\frac{8.8}{50}$

$\frac{6.0}{50}$ $\frac{7.0}{41.}$ $30.4/\frac{7.1}{+5.1}$ $\frac{7.3}{32}$ $\frac{7.0}{15}$ $\frac{7.0}{+5.0}$ $\frac{6.6}{12}$ $\frac{5.5}{3.5}/27.0$ $\frac{4.1}{41}$ $\frac{4.7}{50.}$

$\frac{6.3}{50}$ $\frac{6.5}{38}$ $\frac{6.4}{29}$ $\frac{5.4}{21}$ 4.5 $\frac{3.7}{13}$ $\frac{1.8}{3.2}$ $\frac{1.3}{50}$

(12.0)

$\frac{4.0}{50}$ $\frac{6.1}{39}$ $\frac{5.5}{30}$ $27.2/\frac{4.9}{+3.6}$ $\frac{5.0}{29}$ $\frac{5.1}{15}$ $\frac{4.5}{3.2}$ $\frac{4.1}{10}$ $\frac{2.1}{+0.8}/21.6$ $\frac{1.3}{-2.0}/31.0$ $\frac{0.0}{47}$ $\frac{+0.3}{50}$

$\frac{9.1}{50}$ $\frac{9.1}{47}$ $\frac{8.3}{36}$ $\frac{7.5}{33}$ $\frac{7.8}{2.7}$ $\frac{6.9}{11}$ 5.2 $\frac{3.6}{13}$ $\frac{3.1}{27}$ $\frac{1.7}{50}$

+0.14
-0.16 $\frac{8.9}{50}$ $\frac{7.9}{37}$ $\frac{6.9}{33}$ $26.0/\frac{7.0}{+3.0}$ $\frac{7.1}{29}$ $\frac{6.5}{12}$ $\frac{5.0}{1.2}$ $\frac{3.4}{11}$ $\frac{2.3}{24}$ $\frac{1.9}{-1.8}/33.1$ $\frac{1.2}{50}$

+0.30
-0.30 $\frac{8.8}{50}$ $\frac{7.8}{34}$ $\frac{6.9}{30}$ $\frac{7.1}{25}$ $\frac{6.8}{14}$ 6.0 $\frac{4.3}{13}$ $\frac{2.8}{23}$ $\frac{1.7}{35}$ $\frac{0.6}{35}$

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		900.05			
+50				897.4	2.7 (3.3, 2.1)
B.M.	6.60	902.27	4.38	895.67	
344				97.9	4.4 (5.2, 3.6)
+50				98.7	3.6 (4.0, 3.8)
345				99.5	2.8 (3.4, 2.0)
+35				900.1	2.2
+50				00.3	2.0 (2.9, 1.7)
346				01.1	1.2 (2.1, 0.3)
+50				01.9	21.1 (22.0, 0.3, +0.5)
T.P.	11.32	913.52	0.07	902.20	
347				02.7	10.8 (21.2, 20.4, 9.9)
T.P.	9.66	923.09	0.11	913.41	
+38				03.3	19.5
+50				03.5	19.6 (20.5, 18.7)
+15				03.9	19.2
348				04.3	18.8 (19.7, 17.9)
B.M.	0.41	921.00	2.50	920.57	= 920.53
+50				15.2	15.8 (16.7, 14.9)

Rod. .....
Chain. .....

15

W.	S.	Left					C L				Right			
1.0	+0.62 -0.62	8.7/50	8.3/38	9.8/7.7 7.1/+4.4	7.0/14	6.5/+3.8	5.2/15		4.4/+2.8	4.6/2	3.8/3.2	3.3/50		
1.9	+0.84 -0.84	10.0/50	10.5/41	12.5/3.2 +3.8	10.1/23	9.8/12	8.8/6	9.2/+4.8	8.8/19	8.6/28	9.6/+50	8.3/8.0	7.8/41	7.8/50
2.0	+0.84 -0.84	9.2/50	9.4/3.7	9.4/4.5	9.9/24	10.1/11	9.8/+6.2	9.2/5	8.7/15	8.1/30	8.1/+5.3	30.6	6.4/50	
2.0	+0.88 -0.88	2.3/50	1.8/36	31.8/8.5 4.9	8.7/19	9.6/10	9.5/+6.7	7.4/9	8.3/17	6.9/32	6.8/+4.8	28.8	5.8/4	5.6/50
2.0	+0.88 -0.88	4.1/50	6.5/46	6.5/32	5.5/22	6.1/9	6.3	9.6/24	8.5/28	7.9/37	7.3/50			
2.0	+0.88 -0.88	8.6/50	7.1/37	30.8/7.3 4.4	7.2/31	7.9/15	8.1/+6.1	9.4/11	9.4/25	8.9/7.8	35.6	7.7/50		
2.0	+0.88 -0.88	1.5+/50	8.0/42	RC/31.6	13.0/4.1	0.1/12.4	5.1/32	7.4/+6.2	8.5/13	8.5/25	8.8/8.5	31.0	8.2/43	8.2/46	8.2/50
2.0	+0.88 -1.31	4.5 9 9.9/50	12.1/44	15.1/25	0.0/14.4	1.7/9	3.3/+3.0	4.9/13	5.6/2.6	5.1/+6.2	32.4	6.0/50		
2.0	+0.88 -0.88	(50/116.0	5.2/36	4.9/34	5.0/30)	0.0/17.	4.0/-6.8	7.6/15	9.0/26	9.9/-6.0	31.9	11.7/50		
2.0	+0.88 -0.88	3.8/50	3.5/37	2.6/25	4.1/22	5.0/10	5.9	7.9/17	9.2/34	10.0/50				
		50/16.3	4.2/3.0/31.	2.9/21	4.7/17	4.5/11	5.2/-14.4	6.3/1.4	7.1/25	8.0/37	8.5/-10.2	46.3	8.8/50	
2.0	+0.88 -0.88		8.2/50	5.2/27	2.7/13	3.3/11	3.3	3.5/13	4.6/29	5.3/50				
2.0	+0.88 -0.88	12.6/50	11.1/12.3/7.4	10.1/25	9.2/10	5.7/2.0	6.4/-12.4	6.8/10	5.1/21	4.8/44	4.8/13.1	50		
2.0	+0.88 -0.88	14.5/50	14.1/44	31.7/13.6/-2.8	13.4/31	11.3/16	10.5/-3.3	9.9/9	8.4/19	8.4/37	7.7/-6.9	41.3	7.1/50	

7320
5+4
1378

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		921.00			
349				905.9	16.0 14.2 15.1
+50				06.7	15.2 13.4 14.3
350				07.5	14.4 12.6 13.5
T.P.	2.09	922.21	0.88	920.12	
+40				08.1	15.0 13.2 14.1
351				09.1	14.0 12.2 13.1
+59.41 = +73.20	EQUATION			10.5	12.2 11.4 11.9
352				10.5	12.0 11.4 11.7
+50				11.3	10.9
353				12.1	10.1
+50				12.8	9.4
354				13.2	9.0
+50				13.5	8.7
T.P	4.83	921.71	5.33	916.88	
355				13.6	8.1

Rod.....
Chain.....

16

		Left				C L				Right			
W.	5.												
2.0	+0.88 / -0.88	15.1 / 50	39.4 / -4.3	11.7 / 10.4	10.4 / 24	10.3 / 11	9.6 / -5.5	9.1 / 17	8.6 / 30	8.0 / 42 / 40.1	8.7 / 50		
		8.6 / 50	43.8 / -7.2	DC / 8.0	7.9 / 23	6.0 / 11	5.6 / -8.7	5.3 / 19	5.1 / 31	5.1 / -7.8 / 42.8	5.6 / 50		
2.0	+0.88 / -0.88	6.1 / 50	46.3 / 8.9	5.5 / 1.8 / 30	1.9 / 20	1.6 / 10	0.9 / -12.6	0.9 / 16	1.3 / 29	2.1 / -10.5 / 44.8	2.3 / 50		
2.0	+0.88 / -0.88	4.6 / 50	48.9 / 10.6	4.4 / 2.5 / 35	1.7 / 24	1.2 / 14	1.3 / -12.8	1.9 / 10	2.7 / 19	2.8 / 30	2.4 / -10.8 / 47.7	2.6 / 50	
2.0	0.88 / -0.88	1.0 / 50	39.1 / -4.1	9.9 / 9.6	9.6 / 25	9.3 / 13	8.5 / -4.6	6.7 / 13	5.1 / 23	3.9 / 34	3.6 / -8.6 / 43.9	3.7 / 50	
0.4	+0.98 / -0.98	9.8 / 50	34.2 / -1.9	10.3 / 10.2	10.2 / 20	10.6 / 10	9.6 / -2.1	9.2 / 14	9.7 / 28	9.7 / -1.5 / 33.8	9.4 / 50		
	+0.30 / -0.30	8.7 / 50	34.9 / -2.6	9.7 / 10.0	10.0 / 25	10.2 / 11	10.6 / 4.1	11.3 / 11	11.7 / 22	11.8 / DC / 30.4	11.2 / 42	11.0 / 50	
		8.6 / 50	8.8 / 45	34.9 / 8.3 / -2.6	8.2 / 25	8.9 / 15	9.9 / 1.0	10.8 / 13	11.2 / +0.3 / 30.6	11.6 / DC / 1.3 / 29.9	12.2 / 34	12.5 / 50	
		11.2 / 50	10.7 / 40	DC / 30.5 / 10.4 / 1.7	10.1 / 25	9.3 / 13	9.3 / -0.8	9.9 / 13	10.3 / +0.2 / 30.4	11.0 / DC / -1.1 / 29.6	11.6 / 50		
		13.6 / 50	11.7 / 41	DC / 29.8 / 10.2 / -1.2	8.4 / 15	8.3 / -1.1	8.7 / 15	8.8 / 25	9.0 / -0.4 / 31.6	9.4 / 50			
		13.3 / 50	DC / 30.1 / 9.6 / -1.4	8.7 / 20	8.1 / 15	7.0 / -2.0	6.6 / 13	6.4 / 23	6.3 / 33	6.3 / -2.6 / 34.9	6.1 / 50		
		10.0 / 50	9.3 / 44	34.2 / 8.0 / -0.7	7.2 / 25	6.6 / 16	5.6 / 3.1	5.1 / 14	4.9 / 25	4.6 / 44 / 37.1	4.7 / 50		
		6.7 / 50	34.6 / -2.4	5.7 / 5.2 / 27	4.8 / 19	4.3 / 3.8	4.1 / 14	3.7 / 27	3.7 / -4.4 / 37.6	4.4 / 50	5		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
T.P.	4.89	921.97	4.83	916.88	
1+50				913.5	8.3
356				13.1	8.7
1+50				12.6	9.2
T.P.	5.30	916.48	10.59	911.18	
357				11.9	4.6
T.P.	0.36	905.36	11.48	905.00	
1+57				11.1	+5.7
358				10.3	+4.9
1+50				09.6	+4.2
359				09.0	+3.6
+50				08.7	+3.3
360				08.4	+3.0
1+60				08.4	+3.0
361				08.4	3.0
T.P.	11.97	916.43	0.90	904.46	
1+50				08.7	7.7
T.P.	6.95	921.21	1.17	915.36	
362				09.1	13.7

Inst. .....
Rod. .....
Chain. .....

C L Right

47/50	36.7/-3.8	42/30	43/20	42/-3.9	42/16	35/24	38/-4.5/37.7	45/50		
46/50	37.2/-4.2	45/30	44/27	51/16	53/32	51/15	51/26	51/-3.6/36.4	53/50	
64/50	34.5/6.8/2.4	68/32	67/24	72/13	71/-1.0	84/11	91/30	92/-2.0/DC/31.0	91/50	
67/50	39/40	26.0/7.5/+3.0	76/25	80/15	81/-3.6	83/18	79/+3.4/24.8	80/40	87/50	
32/50	38.4/3.4/+7.1	35/56	33/18	26/+8.3	27/16	28/27	28/+8.5/37.0	27/50		
(+4.9)										
62/50	43.9/6.6/+11.5	67/38	69/26	70/13	72/+12.1	71/14	72/24	68/+11.7/43.4	66/50	
(+4.2)										
77/50	44.9/8.0/+12.2	85/40	90/30	83/19	95/+13.7	92/19	89/32	84/+12.6/45.2	82/50	
(+3.6)										
92/50	47.9/9.3/+12.9	93/43	96/34	96/16	96/+13.2	91/15	90/28	88/+12.4/44.8	88/50	
(+3.5)										
98/50	46.7/7.8/+13.1	99/24	95/9	105/6	96/4	94/+12.8	94/18	94/27	91/+12.4/44.8	91/50
(+3.0)										
99/50	45.6/9.8/+12.8	100/34	98/22	98/+12.8		96/16	93/30	90/+12.0/44.0	85/50	
(+3.0)										
83/50	43.8/8.9/+11.9	89/44	91/29	92/18	91/+12.1	89/16	82/28	70/+10.0/40.0	62/50	
(+3.0)										
	58/50	38.7/6.1/9.1	62/31	63/18	58/+8.5	45/13	32/25	24/32	25/+5.5/31.0	00/44
(+1.7)										
81/50	87/44	DC/29.5/8.7/1.0	88/+1.0	85/14	72/-0.5	60/18	48/32	42/-3.5/36.7	32/50	
(13.1)										
10.0/50	35.4/9.1/-3.1	9.1/35	8.1/19	1.3/-5.1	66/15	59/27	58/36	61/-7.1/41.6	70/50	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		922.21 ~~.31~~			
+55				909.7	12.6
363				10.1	12.1
+45				10.6	11.6
364				11.1	11.1
+50				11.6	10.6
T.P	4.54	925.~~44~~ .78	0.87	921.~~57~~ 24	
365				12.1	13.7
+50				12.6	13.2
366				13.1	12.7
+50				13.6	12.2
T.P.	1.82	916.~~47~~ 79	10.81	~~915.07~~ 914.97	
367				14.1	2.7
+40				14.5	2.3
T.P.	6.69	913.~~41~~ 80	9.68	907.~~21~~ 11	
368				15.1	1.3

Inst.
Rod.
Chain.

Left					C L				Right	
					(12.5)					
4.6 / 50	4+5 / 3.6 / -9.0	3.5 / 44	3.0 / 28	2.9 / 15	3.7 / 8.9	5.7 / 12	8.6 / 28	10.0 / -3.6 / 43.9	12.1 / 50	
					(12.1)					
2.7 / 50	4+5 / 3.6 / -9.6	2.7 / 32	5.0 / 42	5.7 / 13	6.7 / -5.5	9.1 / 16	10.7 / 26	11.3 / -0.9 / 52.4	13.5 / 50	
					(11.6)					
2.5 / 50	4+5 / 2.5 / +9.4	3.1 / 28	4.4 / 16		6.6 / -5.1	8.4 / 14	9.8 / 28	10.3 / -1.4 / 33.1	11.4 / 50	
					(11.1)					
5.2 / 50	4+3 / 3.9 / 8.7	2.5 / 40	2.4 / 25	2.9 / 12	3.5 / -7.7	5.3 / 24	5.9 / -5.3	/ 38.9	6.3 / 50	
					(10.6)					
3.4 / 50	4+5 / 3.1 / 2.6	2.7 / 28	3.0 / 18		2.3 / -8.4	2.2 / 14	2.3 / 27	2.4 / -8.3 / 43.4	2.0 / 50	
					(13.7)					
7.5 / 50	4+5 / 6.8 / -7.0	5.9 / 25	5.4 / 14		5.1 / -8.7	4.0 / 17	3.4 / 27	3.1 / -10.7 / 41.0	3.1 / 50	
					(13.2)					
9.5 / 50	38.7 / 8.5 / -4.8	8.5 / 38	7.4 / 29	6.0 / 14	4.2 / -8.7	3.0 / 14	2.3 / 25	1.9 / 40	2.1 / -11.1 / 47.6	1.9 / 50
					(12.7)					
18.1 / 50	38.5 / 11.1 / -1.7	11.5 / 31	10.6 / 30	8.7 / 17	5.7 / -7.1	4.0 / 13	2.6 / 31	1.7 / 46	1.7 / 11.1 / 41.6	1.6 / 50
15.9 / 50	50 / 33.9 / 13.3 / -1.0	13.2 / 30	11.1 / 14		9.8 / -2.5	7.5 / 16	6.3 / 27	5.5 / -6.8 / 41.2	5.0 / 50	
					(2.7)					
7.9 / 50	6.6 / 3.5	3.6 / 4.6 / +1.8			2.4 / -0.4	1.4 / 17	0.8 / 30	0.6 / 32	0.5 / -2.3 / 33.4	0.6 / 50
					(7.3)					
10.3 / 50	9.2 / 40	3 / 8 / 7.3 / +5.9	7.7 / 26	6.6 / 18	5.6 / +3.6	5.5 / 16	6.0 / +3.6 / 27.2	6.4 / 40	5.8 / 50	
					(11.3)					
9.1 / 50	8.8 / 48	4 / 0 / 9.2 / +10.4	13.6 / 35	13.9 / 31	9.7 / 24	9.7 / 12	9.4 / +10.6	8.9 / 17	8.5 / 31	8.8 / +10.0 / 44.2	8.9 / 50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Cr. R.
		913.80			
+15				15.2	1.4
+21				15.3	1.5
+27				15.4	1.6
+50				15.6	+1.8
369				16.0	+2.2
+53				16.4	+2.6
T.P.	8.71	922.30	0.21	913.59	
370				16.7	5.6
+25				16.8	5.5
+55				17.0	5.3
371				17.2	5.1
T.P.	4.72	926.68	0.34	921.96	
+55				17.4	9.3
372				17.6	9.1

Inst. .....
Rod. .....
Chain. .....

19

Left C L Right

(1.4)

8.9/50 8.9/33 8.4/21 10.7/17 13.5/12 13.2/9 9.0 9.7/12 10.3/22 10.2/37 10.3/50

(4.5)

8.4/50 8.8/22 8.1/11 10.4/8 13.1/3 13.3 13.0/4 10.5/80 9.9/16 10.5/26 10.3/50

(1.6)

7.6/50 8.4/35 9.8/23 8.8/11 8.8 10.7/6 13.0/10 13.1/13 11.1/18 10.7/22 11.2/35 10.9/50

(+1.8)

11.4/50

13/50 38.6/7.6/+9.3 8.7/22 9.8/13 14.6/+12.3 11.0/14 10.8/26 10.6/33 13.8/35 13.7/39 11.3 11.1/41+12.8/4.6

(+2.22)

5.5/50 37.2/6.8/+8.6 7.0/26 7.3/18 8.0/+10.1 8.9/19 8.8/30 8.1/+11.2/+2.4 9.0/50

+0.8/50 0.0/41 38.0/1.8/+4.0 4.4/31 2.1/18 4.0/+6.5 4.7/15 5.0/31 5.1/42 5.1/+7.6/3.4 4.7/50

(5.6)

3.4/50 34.6/3.3/-2.4 3.2/31 3.3/20 4.4/-1.3 5.9/-0.2/20.4 6.5/-1.2/DC/29.8 7.1/39 7.5/50

(5.3)

3.4/50 2.7/38 2.3/28 1.8/16 1.9/-3.8 2.4/14 3.1/26 3.7/36 4.5/50

(5.3)

4.1/50 34.0/2.4/-2.0 3.1/25 2.7/16 2.5/-3.9 2.5/16 2.7/27 2.8/33 2.8/-2.6/34.9 2.7/50

(2.1)

4.3/50 4.2/40 33.1/3.8/-1.4 3.6/25 3.8/16 3.7/-2.1 2.6/13 2.5/24 2.3/32 2.2/-3.0/35.5 1.6/50

(9.3)

7.4/50 7.4/42 34.7/6.9/-2.5 6.4/29 6.0/19 5.0/-4.4 4.6/15 4.4/27 4.0/34 3.9/-5.5/31.2 5.3/50

(9.1)

6.7/50 6.7/43 35.9/6.5/-3.1 6.5/34 5.9/19 4.8/-4.4 3.6/18 2.1/37 1.6/-7.6/42.4 1.1/50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		926.68 ~~78~~			
+50				917.8	8.9
373				18.0	8.7
+53				18.2	8.5
374				18.4	8.3
+11				18.4	8.3
+30				18.5	8.2
B.M.	10.76	928.20 ✓	9.38	917.30 917.40	= 917.44 ✓
+60				18.5	9.7
375				18.5	9.7
+50				18.3	9.9
376				18.0	10.2
+55				17.4	10.8
T.P.	6.28	922.81 ✓	11.69	916.53 ✓	
377				16.9	5.9

Mist.
Rod.
Chain.

20

Left C L Right

(8.9)

21/50 23/43 30.5/73/-1.7 28/28 74/14 22/-1.6 6.5/13 5.6/26 4.3/-4.1/38.2 3.1/50

(4.1)

99/50 98/40 DC/99/29.3/0.9 24.2/7.9/+0.5 7.7/16 7.3/+0.5 8.7/13 7.2/+1.4/33.1 6.4/42 5.4/50

(8.5)

10.1/50 9.9/39 DC/10.0/28.9/-0.6 27.8/+1.2 9.7/13 9.3/+0.7 7.1/13 8.6/00/20 7.8/+0.8/32.7 7.1/41 7.6/44 7.5/50

(8.3)

6 9.8 10.4 10.5 5.7/11.0/+2.6 10.9/16 9.7/12 9.0/6 8.4/00 7.5/9 7.8/18 7.8/28 8.1/34 7.6/39 5.5/45 2.8/50

(8.3)

9.4/50 10.3/37 11.2/29 10.9/25 22.6/9.7/+1.3 8.7/12 8.4/00 8.3/13 8.4/+0.8/20 5.0/35 4.7/+3.7/36.5 3.7/45 1.3/50

(8.2)

10.4/40 11.7/48 10.0/43 9.0/22 9.9/12 9.2/6 9.0/+0.7 8.4/4 6.7/9 5.3/21 4.3/27 1.8/35 1.1/38 0.5/+7.8/42.7 0.0/50

Double 17 DP 200 24 3-6 375 200

0 12.1 11.6 DC/10.5 8.3 7.5 5.9/-1.2 5.1/25 4.8/13 4.8/17 4.2/28 3.2/+6.5/+0.7 2.2/50

(9.7)

(9.1)

6.1/50 35.2/6.9/-2.8 6.9/31 6.8/23 6.4/11 6.1/-3.7 5.0/14 3.7/26 2.2/-2.5/42.2 1.4/50

(9.9)

9.2/50 9.3/40 32.9/8.6/-1.3 9.2/25 9.3/13 6.2/-3.7 4.9/13 3.5/25 2.2/23 2.0/-7.9/42.8 0.3/50

(10.4)

12.2/50 11.4/40 DC/10.8/30.8/-1.9 9.7/24 8.3/13 7.0/-3.2 5.7/13 4.8/24 3.8/-3.4/42.9 3.0/50

(10.5)

16.1/50 14.9/31 28.4/13.5/+2.7 13.0/15 12.6/8 12.1/+1.3 10.7/12 9.1/22 7.2/32 7.4/-3.7/36.1 6.0/50

(5.9)

13.1/50 12.1/41 31.9/11.4/+5.8 10.4/20 9.2/10 7.8/-1.9 6.1/11 4.8/17 3.6/28 2.6/3.3/35.9 1.4/44 0.9/50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		922.81 ✓			
+40				916.3	6.5
+73				159	6.9
378				15.5	7.3
+50	5.03	920.78 ✓	6.86	915.75 (14.8) ✓	6.2 ✓
379				14.1	6.9
+30				13.9	7.1
+53				13.5	7.5
+56				13.5	7.5
+61				13.4	7.6
+67				13.2	7.8
+71				13.1	7.9
+81				13.0	8.0
380				12.7	8.3
T.P	6.53	921.06 ✓	6.45	914.53 ✓	
+03				12.7	8.4
+09				12.6	8.5

Rod.
Chain.

21

Left C L Right

921.06 Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	4.88	920.72 ✓	5.22	915.84 ✓	
143				12.2	8.5
167				12.0	8.7
180				11.9	8.8
381				11.8	8.9
B.M.	4.03	919.87 ✓	4.88	915.84 ✓	
128				11.8	8.1
170				11.9	8.0
382				11.9	8.0
150				12.2	7.7
383				12.5	7.4
120				12.6	7.3
150				12.8	7.1
384 T.P.	3.84	919.68 ✓	4.03	915.84 ✓	13.1 6.6
142				13.3	6.4
385				13.7	6.0
T.P.	9.81	926.30 ✓	3.19	916.49 ✓	

Inst. .....
Rod. .....
Chain, ...

.....

Left C L Right

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		926.30 ✓			
765				914.1	12.2
386				14.3	12.0
+50				14.5	11.8
387				14.6	11.7
+50				14.4	11.9
388				14.3	12.0
+50				13.9	12.4
389				13.4	12.9
T.P	1.76	912.84 ✓	10.18	916.12 ✓	
+50				12.4	5.5
390				11.9	6.0
+61				10.8	7.1
+84				10.4	7.5
T.P	1.90	912.05 ✓	7.73	910.15 ✓	
391				10.1	2.0
+50				09.3	2.8

Left C L Right

12.05

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
T.P	6.80	906.94	11.91	900.14	
392				908.5	+1.7
+50				08.1	+1.2
T.P.	9.20	918.30	2.84	904.10	
B.M.	0.56	911.24	2.15	910.68	910.68
393				07.8	3.4
+50				07.6	3.6
394				07.6	3.6
+50				07.7	3.5
395				08.0	3.2
+30				08.3	2.9
+50				08.1	2.5
396				09.1	2.1
+50				09.5	1.4
397				10.5	0.7
T.P. +50	8.74	919.09	0.89	910.35	11.0 8.1
398				11.5	7.6
+50				11.9	7.2
399				12.2	6.9
+50				12.4	6.7

Inst:
Rod:
Chain:

Left C L Right

6" Pop 270 Rt 398 to 10

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		919.09			
400				912.6	6.5
+50				12.6	6.5
401				12.6	6.5
T.P	2.78	920.65	1.22	917.87	
+50				12.5	8.2
402				12.2	8.4
+50				12.0	8.7
403				11.7	9.0
+50				11.2	9.5 (2.3) (9.2)
404				10.7	10.6 (9.5) (10.)
+17				10.5	10.2
T.P.	1.18	911.43	10.40	910.25	
+50				10.2	1.2 (0.5) (1.)
405				09.7	1.7 (1.0) (2.)
+50				9.2	2.2 (1.5) (2.)
406				08.7	2.7 (2.0) (3.)

Inst. .....
Rod. .....
Chain. .....

	Left				C L				Right	
5	1.1 / 50	1.0 / 21	1.9 / 9	1.8 / -0.6	1.9 / 13	2.1 / 23	2.5 / -3.8	2.2 / 56.7	2.8 / 50	
	0.8 / 50	1.0 / 22	1.7 / 11	1.4 / -5.0	1.5 / 12	2.0 / 24	2.3 / -6.1	2.4 / 57.1	2.5 / 50	
	0.9 / 50	0.3 / 26	1.1 / 14	1.4 / -6.6	1.9 / 11	2.1 / 26	2.2 / -6.2	2.3 / 57.3	2.4 / 50	
	4.4 / 50	3.8 / 20	3.4 / 12	3.5 / 8	3.4 / -5.3	3.9 / 10	3.5 / 20	4.0 / 3.7	4.5 / 56.5	4.9 / 50
	6.1 / 50	6.2 / 22	6.1 / 28	5.8 / 13	5.6 / -2.8	4.9 / 10	4.8 / 22	4.6 / 24	4.9 / 55.3	5.6 / 50
	7.8 / 50	8.0 / 24	7.9 / 14	8.0 / -0.6	8.1 / 13	7.9 / 25	7.8 / -0.9	7.8 / 73.3	7.1 / 50	
	9.4 / 50	9.3 / 11	9.2 / 11	9.1 / +0.3	9.1 / +0.1	9.3 / 12	9.2 / +0.2	9.4 / 30.4	9.5 / -1.5	9.6 / 30.2	9.3 / 40	9.7 / 50
+0.14 -0.16	9.3 / 50	9.2 / -0.1	9.0 / 12	9.3 / -0.2	9.6 / 13	9.8 / +0.6	9.6 / 20.2	9.6 / -2.0	10.0 / 51.0	9.6 / 43	9.7 / 50	
+0.48 -0.48	10.1 / 50	10.1 / 42	9.9 / -1.2	10.3 / 21.4	10.3 / +0.8	10.2 / 13	10.4 / +0.2	10.8 / 8	10.6 / +0.3	11.6 / 20.6	11.3 / -0.5	11.8 / 32	12.1 / 50	
+0.6 -0.62	10.3 / 50	10.4 / 33	10.1 / 18	10.6 / 10	11.0	12.0 / 9	12.5 / 21	12.6 / 32	12.8 / 50	
+0.7 -0.7	1.1 / 50	1.3 / 48	2.4 / 36	2.5 / 22.7	3.2 / +2.7	3.7 / 13	5.5 / +2.6	4.0 / 13	4.0 / +2.1	4.2 / 24.2	4.1 / 32	4.2 / 50	
+0.7 -0.7	3.8 / 50	4.0 / 40	4.0 / 26.0	4.1.0 / +3.0	4.3 / 14	4.3 / +2.6	4.3 / 12	4.2 / +1.8	4.2 / 23.6	4.2 / -0.2	4.2 / 23.3	4.2 / 36	4.3 / 50	
+0.7 -0.7	4.1 / 50	4.3 / 37	4.2 / 26.2	4.6 / +3.1	4.8 / 11	4.8 / +2.6	4.8 / 13	4.6 / +1.7	4.4 / 23.4	4.6 / 0.3	4.4 / 29.4	4.5 / 39	4.7 / 50	
+0.7 -0.7	4.7 / 50	5.0 / 38	4.8 / 25.8	4.9 / +2.9	5.2 / 13	5.1 / +2.4	5.4 / 11	4.9 / +1.5	4.7 / 23.0	4.9 / -0.5	4.8 / 28.7	4.9 / 40	4.7 / 50	

911.43 Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Cr.	R.
406				908.	2.5 3.2	3.9
+50					3.0	4.4
407				907.7	3.7	
+50				7.2	4.2	4.9
408				06.7	4.2 4.7	5.3
+50				06.2	5.1 5.2	5.4
409 BM	3.69	910.05	5.05	906.36 906.35 05.7		4.4
+50				5.2		4.9
410				04.7		5.4
+50				04.2		5.9
411				03.7		6.4
+50				03.2		6.9
+70				03.0		7.1
412				02.7		7.4
+41				02.3		7.8
413				01.7		8.4
+11				01.6		8.5
+50	1.30	908.30	3.05	907.00 01.2		7.1
414				900.7		7.6
+50				900.2		8.1

Inst.
Rod.
Chain.

26

	Left	C L	Right
	5.8 5.8 5.4 5.8 5.8	5.8 5.7 5.2 5.9 5.7	
	5.0 3.6 2.6 +3.1 11 +2.6	12 +1.8 2.6 00 3.8 40 50	
+0.1	6.0 6.0 6.0 6.1 6.3	6.3 6.4 6.4 5.9	
-0.1	5.0 3.7 2.4 +3.6 13 +2.6	15 +2.9 2.4 33 50	
0.0	5.7 5.9 5.4 6.1 6.3 6.2	6.2 6.4 6.4 6.5 6.2	
0.1	5.0 3.6 2.1 +4.2 13 +2.0	12 1.5 2.5 +3.5 2.8 40 50	
+0.48	5.7 6.0 DC 5.9		
-0.48	5.0 4.1 2.8 4-0.3 2.2 5.8 5.8 5.5 5.8	6.4 6.2 2.8 6.2 DC 5.1 6.2	
	16 6 +1.1	16 +1.4 2.2 -1.0 +2.5 38 42	
+1.4	5.8 6.0 DC 6.2		
-1.4	5.0 4.1 2.3 0.9 2.4 +1.0 6.5 6.2 6.2	6.9 6.8 2.8 6.7 DC 6.1 6.8 6.5	
	13 +1.0	14 +1.4 2.8 -0.7 3.0 42 50	
4.8	4.8 DC 4.7		
5.0	4.0 3.2 2.5 -1.7 2.4 +0.2 5.0 4.8	5.1 5.2 3.6 5.3 DC 5.4 5.7	
	10 +0.7	10 +0.9 -0.1 2.6 40 50	
4.2	4.3 DC 4.4		
5.0	4.0 3.1 2.4 -0.5 4.2 5.1 5.1	5.5 5.8 3.8 5.8 DC 6.1 6.4	
	00 18 9 +0.2	11 +0.9 2.8 -1.1 2.96 40 50	
	4.3 4.4 4.4 5.0 5.7 5.9	5.8 5.7 5.4 5.7 6.3 5.7 5.6	
	5.0 4.3 3.4 -0.5 21 13 00	12 +0.3 2.4 -1.7 3.0 33 36 40	
	4.7 4.9 3.3 5.0 4.9 5.1	5.3 4.8 4.9 4.8	
	5.0 3.4 0.9 3.1 12 -0.8	12 -1.0 3.5 41 50	
	5.8 4.4 4.1 4.2 4.3 4.0	4.5 4.2 4.6 5.7 4.7 5.0	
	5.0 2.3 2.7 10 -2.4	10 22 -1.8 3.5 43 50	
4.0	4.0 3.9 4.3 4.4 4.9 4.6	5.5 5.8 5.9 5.9 6.2 6.1	
5.0	4.3 3.1 -2.6 20 19 15 1.4	13 25 -1.0 3.2 40 50	
	4.5 4.8 5.1 5.4 5.5	6.1 6.3 6.4 2.5 6.4	
	5.0 3.2 1.9 11	10 19 30 41 50	
	4.5 4.9 4.3 5.1 5.3	5.4 5.5 5.4 5.0 5.3 5.4 5.2	
	5.0 3.8 -2.6 21 10	-2.0 10 24 28 -2.1 4.1 44 50	
	4.4 4.2 4.2 4.0 3.9	4.2 4.4 4.4 4.6	
	5.0 3.0 3.6 22 12 -3.9	9 23 3.4 3.6 50	
4.2 2.5	2.5 2.0 1.8 2.7 3.5 3.8	3.7 3.8 4.4 5.0	
3.6 4.2	3.1 -5.9 30 27 19 9 -4.6	12 21 4.0 3.7 50	
	2.8 2.5 2.7 2.9 3.8 4.2	4.2 4.8 5.7	
	3.2 3.0 16 8 3.2 9 18 27 38 50		
1.9 1.3	1.9 1.6 1.8 2.2 2.7 2.9 3.0 3.3 3.6 3.4 4.4 4.1		
5.0 4.6	3.1 -5.5 35 25 19 -4.2 10 22 30 -2.5 3.6 42 50		
3.6	3.7 3.6 3.6 3.7 3.8 3.9 4.0 4.2 4.1 4.6 4.8		
5.0	3.3 1.9 27 15 -3.9 15 27 -2.4 3.6 42 50		
5.7	5.6 5.0 5.4 5.5 5.6 5.4 5.4 5.4 5.5 5.5 5.6		
5.0	4.0 3.0 -2.7 21 11 -2.7 13 25 -2.1 3.0 43 50		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		908.30			
415				899.7	8.6
+50				99.2	9.1
416				98.7	9.6
T.P. +50	2.86	898.44	11.75	898.58	1.2
417				97.7	1.7
+56				97.2	2.2
418				96.7	2.7
+50				96.2	3.2
419				95.7	3.7
B.M.			8.87	899.57	
+62				95.3	4.1
420				95.1	4.3
+50				95.1	4.3
T.P.	4.26	898.64	5.03	894.38	
421				95.3	4.3
+60				95.1	4.1
422				95.9	3.5
+50				96.2	3.4

Inst.
Rod.
Chain.

Left | C L | Right

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		898.64			
423				896.4	2.2
+50				96.4	2.4
424				96.2	2.4
TP	4.47	899.81	5.27	893.42	
+24				96.1	1.8
+58				95.7	2.2
425				95.5	2.4
425				95.2	2.7
426				93.5	4.4
427				91.7	6.2
+75				90.4	7.5
428				89.9	8.0
+50				89.0	8.9

Rod. .....

Chain. .....

Left C L Right

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		897.89			
429				888.1	9.9
+50 T.P.	0.42	897.32	0.99	886.9	10.1
430				86.3	11.0
+50				85.4	11.9
431				84.5	12.8
T.P.	0.96	888.14	10.14	878.0	
+50				83.6	4.5
432				82.8	5.3
+50				82.0	6.1
433				81.4	6.7
+50				880.7	7.2
434				80.5	7.6
150				80.2	7.9
T.P.	1.2	878.62	10.79	877.82	
435				80.1	+1.5
+50				80.0	+1.4
B.M.	6.76	880.94	4.44	874.18	874.17
436				80.8	0.9

Inst. .....
Rod. .....
Chain. .....

29

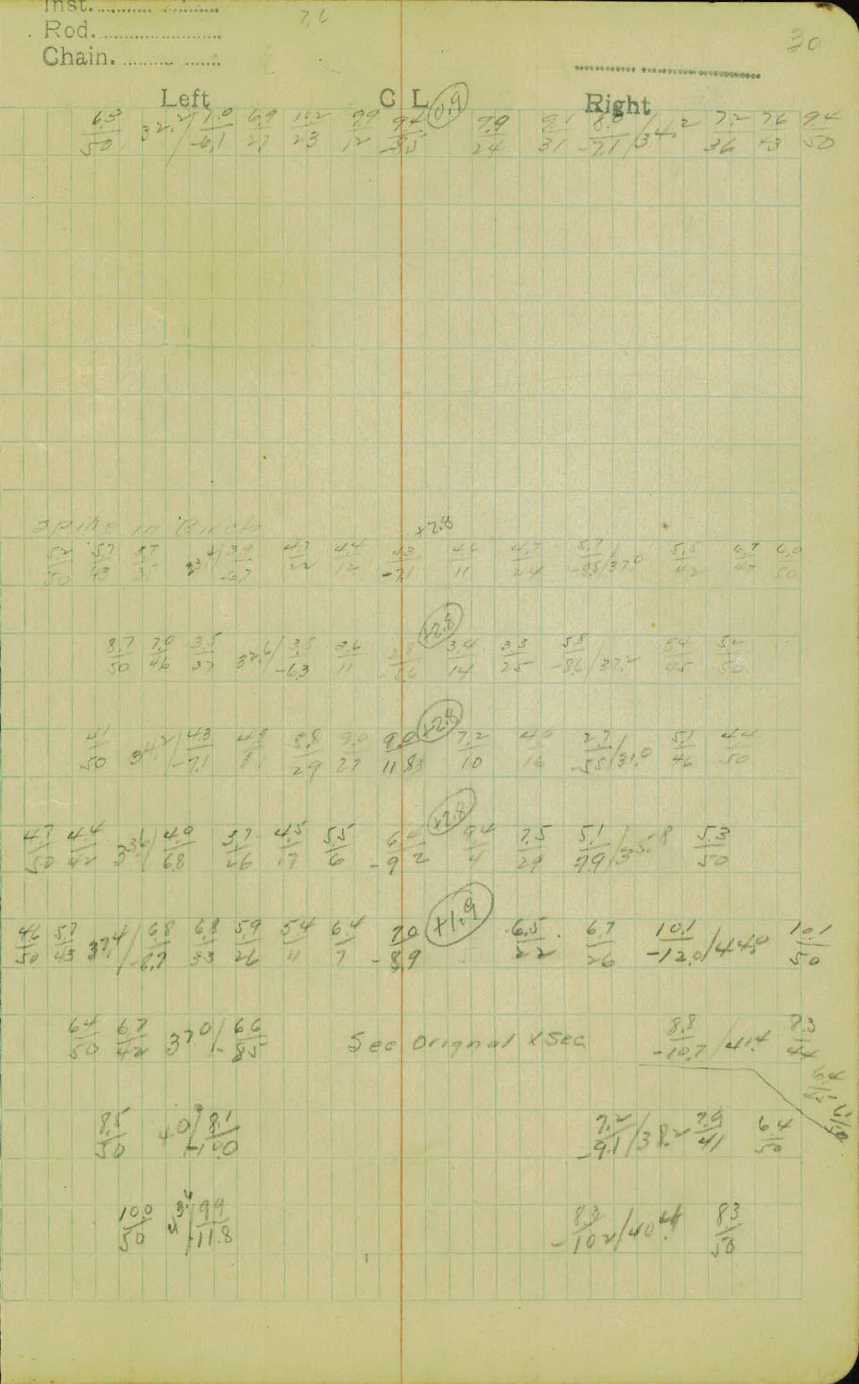
Left C L Right

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM		880.94 ✓		874.17	0.9
+50				880.0	0.9
+73				80.0	0.9
+83				80.0	0.9
437				80.0	0.9
BM	3.00	877.17 ✓	6.77	874.17 ✓	
+28				80.0	+2.8
+45				80.0	+2.8
+64				80.0	+2.8
+75				80.0	+2.8
	3.96	878.13 ✓	3.00	874.17 ✓	
438				80.0	+1.9
+45				80.0	+1.9
+70				80.0	+1.9
+94				80.0	+1.9

Inst. .....
Rod. .....
Chain. .....

Left C L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	+5	877.24	5.40	872.73	
439				880.0	
+30				80.0	
440				80.0	
+50				80.0	
441				80.0	
+64				80.0	
442				80.0	
+50				80.0	
T.P.	10.31	883.68	20.7	873.37	
443				80.0	
+30				80.0	
+73				80.1	
B.M.	4.72	882.73	5.95	877.01	
444				80.2	
+40				80.5	

Left C L Right

+2.8

+2.8

+2.8

+2.8

+2.8

+2.8

+2.8

+2.5

4.0

4.0

3.9

2.5

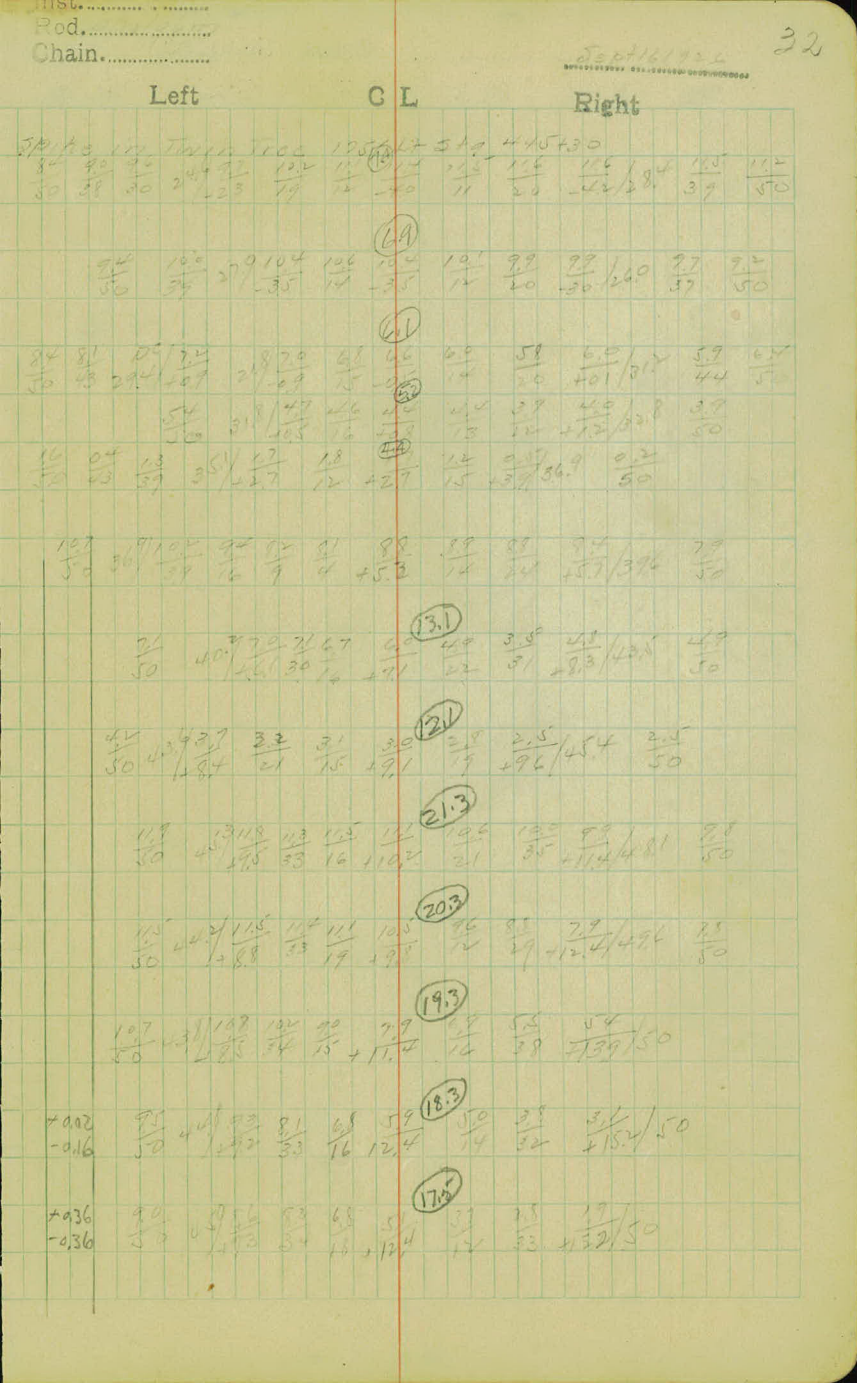
2.2

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. E.
B.M.	10.39	888.40 ✓	4.72 ?	878.01 ✓	
445				881.0	7.4 •
+50				81.5	6.9 •
446				82.3	6.1 •
+50				83.2	5.2 •
447				84.0	4.4 •
T.P.	11.69	899.06 ✓	1.03	887.37 ✓	
+50				85.0	14.1 •
448				86.0	13.1 •
+50				87.0	12.1 •
T.P.	10.74	909.34 ✓	0.46	898.60 ✓	
449				88.0	21.3 •
+50				89.0	20.3 •
450				90.0	19.3 •
+50				91.0	18.5 18.3 18.3
451				91.8	17.5 17.5

Inst.
Rod.
Chain.

Left C L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		909.34			
450				892.6	16.7
452				93.3	
T.P. +50	5.64	906.73	8.25	901.09	12.7
453				94.4	12.3
+50				94.8	11.9
454 T.P.	2.30	897.20	11.82	95.2	2.0
+50				95.5	1.7
455				95.8	1.4
+50				96.1	1.1
456				96.5	0.7
+50				97.0	0.2
457				97.5	+0.3
T.P.	10.71	907.01	3.90	893.30	
+50				98.1	5.9
458				98.7	5.3
			4.05		

Inst. .....
Rod. .....
Chain. .....

BM Endof Cattle Pass Road W. of Cor. 22

Left	C L	Right
	(16.7)	
+.052 / -.052		
	(16.0)	
+.052 / -.052		
	(12.9)	
+.052 / -.052	(12.3)	
	(11.9)	
+.052 / -.052	(2.0)	
	(1.7)	
+.052 / -.052		
	(1.4)	
+.052 / -.052		
	(1.1)	
+.052 / -.052		
	(0.7)	
+.036 / -.036		
	(0.2)	
+.00 / -.16		
	(+0.3)	
	(5.9)	
	(5.3)	

Marker Ends at Cor. 22

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	1.69.	907.18.	905.49.		
450				899.4	7.8.
459				900.2	7.0.
470				01.3	5.9.
460				01.8	5.4
450				02.6	4.6.
461				03.4	3.8.
450				04.2	3.0.
462				05.0	2.2.
T.P.	9.63	915.48.	1.33	905.85.	
450				05.8	9.7.
463				06.6	8.9.
450				07.4	8.1.
464				08.2	7.3.

Inst. .....
Rod. .....
Chain. .....

4/4/27

34

Left					C L			Right		
3.4/50	3.8 8/+3.3	4.5/	5.7	2.8	2.3/13	8.6/-0.8	(7.8) 10.1/15	11.0/-3.2	26.4	11.7/34	13.1/50
4.0/50	3.7 3/+2.3	4.7	5.6	2.8	6.7/14	7.7/-0.7	8.7/13	9.7/-2.7	25.4	10.3/39	11.1/50
5.0/50	4.6	6.2	3.9 6.9/+2.2	-1.0	7.9/14	9.0/-3.1	(5.9) 10.0/12	7.7/-3.8	37.6	9.2/39	8.9/50
4.8/50	4.6 32.9	6.0/1.9	2.3 6.8/-1.1		7.0/16	7.2/-1.8	(5.4) 7.7/15	7.4/-2.0	26.0	7.6/+0.3	4.6/30.5	7.5/50
3.7/50	3.4 0/+0.1	4.5/	2.0/	4.6/00	4.7/17	4.0/+0.2	(4.6) 4.5/15	4.4/26	4.6/+0.0	33.8	4.8/50	
2.3/50	3.5.3	2.8/+1.0	2.7/17		2.5/+1.3	(3.8) 2.4/18	2.5/+1.3	35.8	3.1/50			
2.4/50	3.4.3	2.7/+0.3	2.6/17		2.4/+0.6	(3.0) 2.6/15	2.0/+1.0	35.3	2.5/50			
1.8/50	3.4.3	1.8/+0.3	1.9/15		1.7/+0.5	(2.2) 1.4/14	1.4/+0.8	35.0	1.8/50			
6.6/50	3.8.3	6.7/+3.0	6.4/15		6.7/+3.0	(4.7) 6.6/15	7.5/2.8	7.3/+2.4	18.4	8.1/50		
3.8/50	4.1.4	3.8/5.1	3.9/17		4.2/+4.7	(8.9) 4.8/16	6.2/+2.7	37.9	7.3/50			
3.1/56	4.1.3	3.1/4.0	3.1/18		3.5/+4.1	4.2/16	6.1/2.0	36.8	7.5/50			
3.7/50	3.1.4	3.6/43.7	3.6/18		3.9/3.4	(7.3) 5.1/20	6.6/+0.7	34.9	8.6/50			

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. Rod
		915.48			
+50				908.9	6.6
465				09.6	5.9
+50				10.1	5.4
466				10.4	5.1
+50				10.6	4.9
467				10.9	4.6
+50				10.9	4.6
468				10.8	4.7
BM	2.40	916.66	1.23	914.25	914.26
+50				10.6	6.1
469				10.5	6.2
+50				10.3	6.4
470				10.2	6.5
+50				10.0	6.7
471				09.9	6.8
+50				09.7	7.0
472				09.6	7.1
+50				09.4	7.3
473				09.3	7.4
T.P.	6.88	914.07	9.47	917.19	
+50				09.1	5.0
474				090	5.1

Rod. ...
Chain. ...

4/5/27

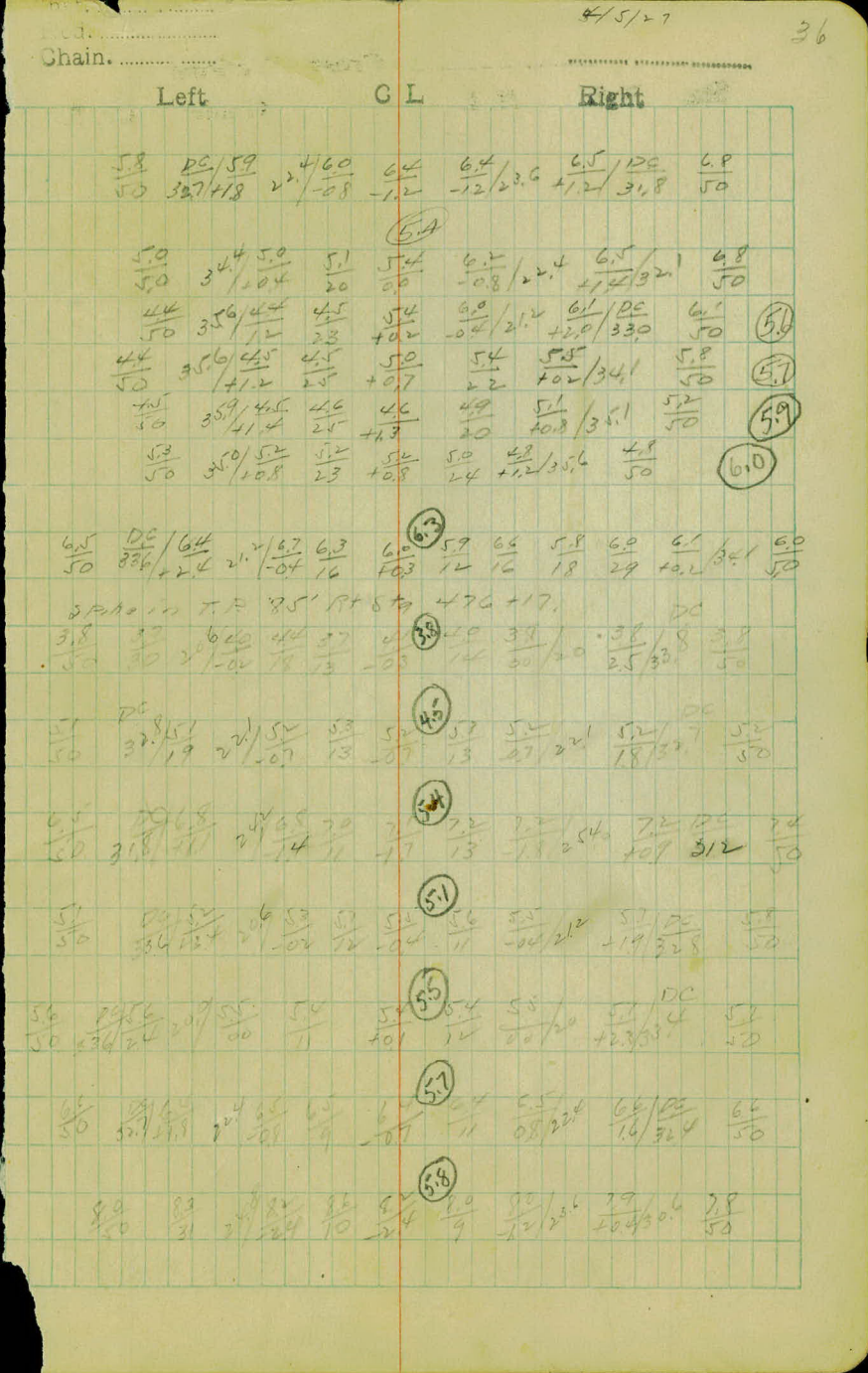
35

Left	C L	Right
4.3/50 37.7/+2.6 4.0 4.2 17 4.8/1.8 (6.6)	6.8/20 7.4/+1.7/32.5 9.3/50	
5.9/50 37.1/+2.2 5.7 4/14 4.8/+2.1 (5.9)	6.2/17 6.7/-0.8/33.4 7.4/+1.0/32.5 9.7/50	
2.7/50 37.3/+2.6 3.5 3.2/21 4.1/+1.3	5.0/16 6.3/+1.6/32.4 7.9/50	
2.5/50 37.7/+2.6 2.5 2.6/17 2.8/+2.3 (5.1)	3.4/16 4.4/+0.9/35.1 5.0/50	
1.6/50 39.1/+3.5 1.4 1.3/19 1.7/+3.2	1.7/20 2.2/+2.7/37.9 2.4/50	(4.9)
1.7/50 38.5/+3.1 1.5 0.7/16 0.8/+3.8	0.6/20 0.9/+4.6/40.7 0.3/50	(4.6)
2.4/50 37.4/+2.4 3.2/22 1.8/+3.6 1.6/+3.6	0.7/22 0.9/+4.2/40.1 0.0/50	(4.6)
3.5/50 38.9/+2.4 3.0/22 2.1/+2.6	1.4/20 1.0/+3.7/39.4 0.3/50	(4.7)
6.7/50 34.1/5.9/+0.2 5.3 4.6/7.5/+4.2	3.9/19 5.4/+2.3/37.9 3.0/30	(6.1)
→ Spike in road Cart 6.0 L + 4.2 = 4.6 + 1.5.		
7.6/50 DC/32.7/+1.8 6.9 2.6/6.4/-0.2 5.7/+0.5	5.0/21 4.5/+1.7/36.4 4.4/50	(6.2)
8.4/50 DC/31.8/+1.7 7.7 2.3/7.4/-1.0 6.8/-0.4	6.2/23 6.0/+0.4/34.4 5.6/50	(6.4)
8.9/50 DC/30.9/+0.6 8.3 2.5/8.2/-1.7 7.5/-1.0	7.3/-0.8/32.4 6.9/+2.0/33.0 6.8/50	(6.5)
8.0/50 30.9/8.6/0.6 8.4 2.5/8.5/-1.8 8.3/-1.6	7.9/-1.2/33.6 8.0/+1.2/31.8 7.8/50	(6.7)
9.2/50 DC/30.1/+0.3 9.0 2.6/9.0/-2.2 8.1/-2.3	9.0/-2.3/26.9 8.0/+0.3/30.5 8.9/50	(6.8)
9.7/50 25.0/9.5/2.5 9.7/-2.7	9.7/-2.7/25.4 9.6/50	(7.0)
10.1/50 26.2/10.2/-3.1 10.2/-3.1	10.1/-3.1/26.2 10.2/50	(7.1)
10.1/50 26.0/10.3/-3.0 10.4/-3.1	10.0/-3.1/26.6 10.1/50	(7.3)
10.2/50 26.0/10.4/-3.0 10.4/-3.0	10.0/-3.2/26.4 10.5/50	(7.4)
7.3/50 24.9/7.4/-2.4 7.4/-2.4	7.9/+2.9/25.8 7.8/50	(5.0)
6.9/50 DC/31.7/+1.1 6.5 24.4/6.6/-1.5 7.1/-2.0	7.6/-2.5/27.0 7.4/50	(5.1)

Cross Sections

Sta.	B. S.	H. I.		Grade	Gr. R.
		914.07			
+50				908.9	5.2 (5.7)
475				08.7	5.4 (5.9)
+50				08.5	5.6 (8.1)
476				08.4	5.7 (8.2)
+50				08.2	5.9 (8.4)
477				08.1	6.0
+62				07.8	6.3 (8.9)
	2.59	911.41	518	908.89 =	908.82
478				07.6	3.8
479				06.9	4.5
480				06.0	5.4
	1.38	910.20		908.82	
481				05.1	5.1
+50				04.7	5.5
482				04.5	5.7
+50				04.4	5.8

Left G L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		910.20			
483				904.3	5.9
+50				04.3	5.9
T.P.	4.47	908.31	.036	903.84	
484				04.4	6.9
+50				04.4	6.9
485				04.5	6.8
+50				04.5	6.8
486				04.6	6.7
	6.27	911.28	3.30	905.01	
+50				04.6	6.7
487				04.6	6.7
150				04.5	6.8
488				04.4	6.9
+50				4.2	7.1
489				04.1	7.2

Inst. .....
Rod. .....
Chain. .....

4/6/27

37

Left C L Right

5.9

5.9

3.9

3.9

3.8

3.8

3.7

6.7

6.7

6.8

6.9

7.1

7.2

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. F.
		911.28			
490				903.8	7.5
50				03.7	7.6
BM	3.57	907.80	7.02	904.26	904.23
491				03.6	4.2 (4.7)
50				03.6	4.2 (4.7)
492				03.6	4.2
50				03.7	4.1 (4.6)
493				03.8	4.0 (4.5)
50				04.0	3.8 (4.3)
494				04.2	3.6
50				04.5	3.3
495				04.7	3.1 (5.6)
50				05.0	2.8 (5.3)
T.P.	1.69	910.62	4.87	902.93	

Inst. .....
Rod. .....
Chain. .....

4/6/27

38

Left C L Right

7.5

7.7/50 34.9/72/01 7.4/18 7.5/00 7.4/16 7.4/01/340 7.5/50

7.6

7.6/50 33.5/7.6/00 20/7.6/00 7.6/00 7.6/00/+0 7.6/00/33.8 7.8/50

3.0, 4.2 in 15' 3.3, 4.2 +2 4.9 +00

5.0/50 32.4/5.1/+16 31.8/4.8/-06 5.1/-09 4.2 5.0/18 4.9/-07/27 4.9/+1.8/32.7 4.8/50

4.7

6.6/50 6.2/30.3/40.2 24.6/6.5/-23 6.4/-22 6.7 6.2/-2.0/26.0 5.5/+1.2/31.8 5.3/34 6.7/36 5.7/38 5.1/50

4.2

9.2/50 29.8/9.1/-4.9 8.5/-4.3 7.2/-3.0/26.0 5.2/50

4.1

9.0/50 31.2/9.7/-5.6 9.2/15 8.4/-4.3 7.2/19 6.5/-2.4/24.8 6.0/+0.4/30.9 4.7/50

4.0

8.2/50 28.4/8.2/-4.2 6.8/13 6.3/-2.3 5.1/15 4.7/-0.7/22.1 4.2/+2.3/31.5 3.5/50

3.8

5.5/50 6.1/5.4/3.1.4/09 23.6/5.0/-1.2 4.5/17 3.9/-0.1 3.0/22 2.5/+1.3/35.8 2.1/50

3.6

4.1/50 34.3/3.3/+0.3 2.5/14 2.3/+1.3 1.8/25 1.8/+1.8/36.5 1.7/48 1.6/50

3.3

3.2/50 34.3/3.0/+0.3 2.7/16 2.2/+0.9 2.2/16 2.1/+1.2/35.6 1.9/50

3.1

4.2/50 6.0/4.0/32.4/+1.6 22.7/4.0/+0.9 3.9/17 3.4/-0.3 3.4/17 3.4/-0.3/30.9 3.3/28 6.0/33 3.3/50

2.8

5.1/50 6.2/5.0/30.5/10.8 24.0/4.7/+2.1 4.3/14 4.8/-2.0 4.7/17 4.8/+2.0/36.0 4.7/10.6/34.9 4.4/50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		910.62			
496				905.4	5.2
+50				05.9	4.7
497				06.5	4.1 (4.6)
			2.65	7.2	3.4 (3.9)
498				07.9	2.7 (3.2)
+50				08.8	1.8 (2.3)
T. P.	8.53	917.78	1.37	909.25	
499				09.7	8.1 (10.6)
+50			11.5 (9.3 7.9)	10.6	7.2 (9.7)
500				11.6	6.2
+50				12.4	5.4
+70				12.6	5.2
+95				12.9	4.9
501				13.0	4.8
1.1				13.2	4.6

Inst. .....
Rod. .....
Chain. .....

4/6/27

39

Left C L Right

(5.2)

(4.7)

(4.1)

(2.7)

(1.8)

(8.1)

(5.4)

(5.2)

(4.9)

(4.8)

(4.6)

Cross Sections.

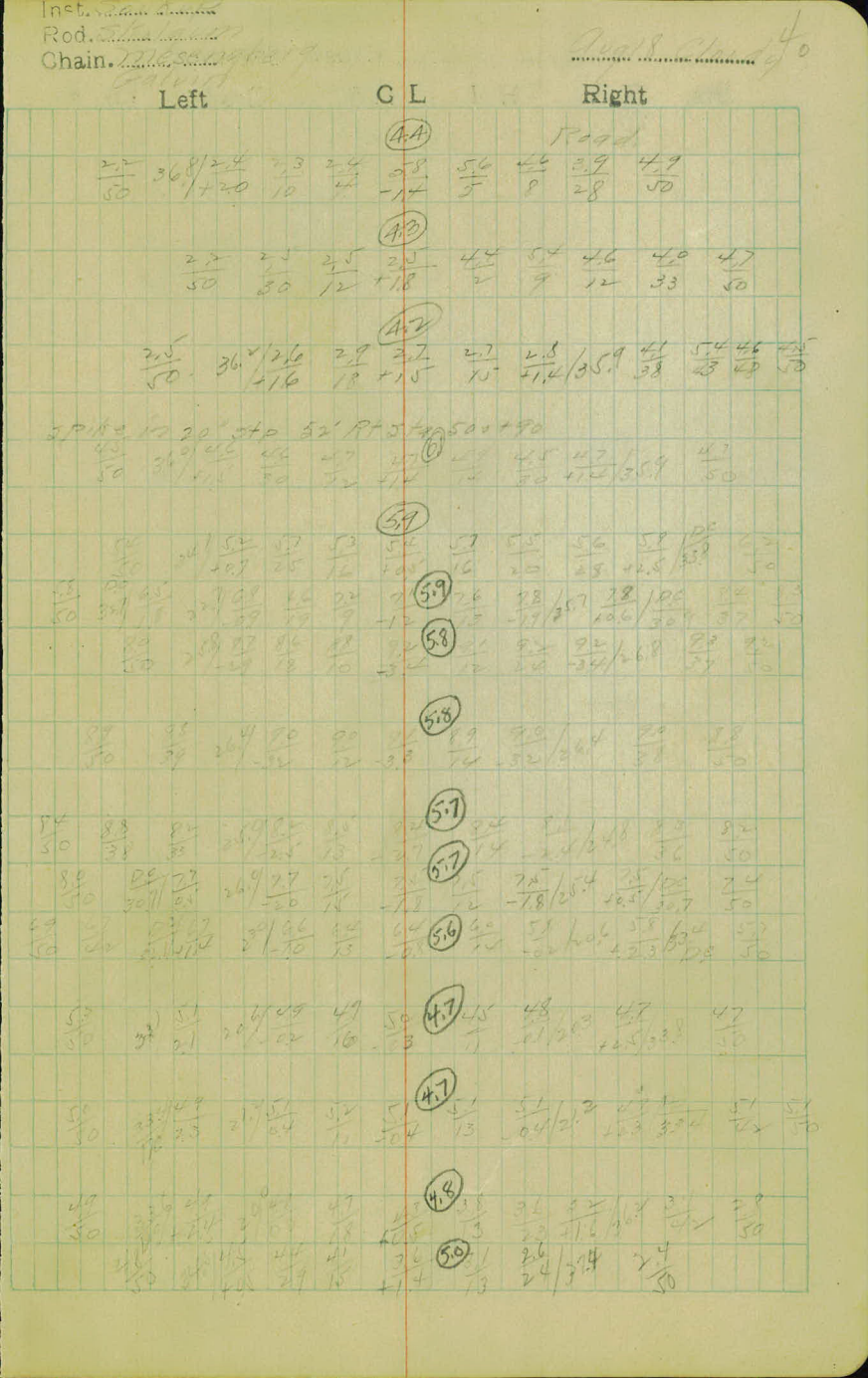
Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		917.78.			
744				913.4	4.4.
748				13.5	4.3.
778				13.6	4.2.
B.M.	4.01	917.93.	1.99	915.79=	915.82
502				13.7	6.1.
503				13.9	5.9.
+50				3.9	5.9.
504				14.0	5.8.
+50				14.0	5.8.
505				14.1	5.7.
+50				14.1	5.7.
506				14.2	5.6.
T.P.	2.82	918.86.	3.77	916.04.	
+50				14.2	4.7.
507				14.2	4.7.
508				14.1	4.6.
+50				13.9	5.0.

Inst. .....

Rod. .....

Chain. .....

Left C L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		918.86			
509				913.8	8.1
+50				13.6	8.3
510				13.4	8.5
BM	3.62	919.55	1.10	915.93	8.93
511				12.9	8.7
+50				12.6	7.0
512				12.4	7.2
	1.36	917.29		915.93	
+50				12.2	5.1
513				11.9	8.4
+50				11.7	5.6
514				11.4	5.9
+50				11.1	6.2
515				10.9	6.4
+23				10.8	6.5
516				10.4	6.9
T.P.	3.47	913.40	7.36	909.93	
+45				10.2	8.2

Inst. .....
Rod. .....
Chain. .....

Left C L Right

5.1
5.3
5.5
3 spike in 15" Oak 70' Lt Sta 509+90
6.1
7.0
7.2
3 spike in 15" Oak 70' Lt Sta 509+90
5.1
5.4
5.6
5.9
6.3
6.7
6.5
6.9
3.2

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		913.40.			
517				909.9	3.5 6.0
+50				09.5	3.9 6.4
+85				09.5	3.9
518				09.4	4.0 6.5
+10				09.4	4.0 6.5
+25				09.3	4.1
+30				09.3	4.1 6.6
+36				09.2	4.2
+77				09.1	4.3 6.8
~~+84~~				~~09.0~~	
519				08.9	4.5 7.0
+50				9087	4.7 7.2
T.P.	2.13	911.00.	4.53	908.87.	
B.M.			1.49	909.51.	

Inst. .....
Rod. .....
Chain. .....

4/7/27

42

Left	C L	Right
4.6 / 50	3.5	5.5 / 50
6.3 / 50	3.9	4.9 / 50
2.4 / 50	3.9	4.9 / 50
2.8 / 20	4.0	4.9 / 50
2.5 / 50	4.0	5.3 / 50
8.1 / 50	4.1	5.0 / 50
8.3 / 50	4.1	4.8 / 50
8.1 / 50	4.2	4.8 / 50
8.4 / 50	4.3	5.4 / 50
8.2 / 50	4.5	6.2 / 50
6.6 / 50	4.7	7.3 / 50

Spike in 7" Twin Willow 135' Rt of Sta 2+9 519+00

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B M	0.49	910.00.		909.51.	
520				08.5	1.5.
521				08.2	1.8.
+50				08.1	1.9
522				08.1	1.9.
523				08.1	1.9.
524				08.3	1.7.
+50				8.4	1.6
525				08.6	1.4.
T.P.	5.78	913.82.	2.96	908.04	
+50				08.8	4.0.
526				09.0	3.8.
+50				09.2	3.6.
527				09.4	3.4.
+50				9.7	3.1.

Inst.
Rod.
Chain.

43

Left C L Right

1.5

1.8

1.9

1.9

1.9

1.7

1.6

1.4

4.0

3.8

3.6

3.4

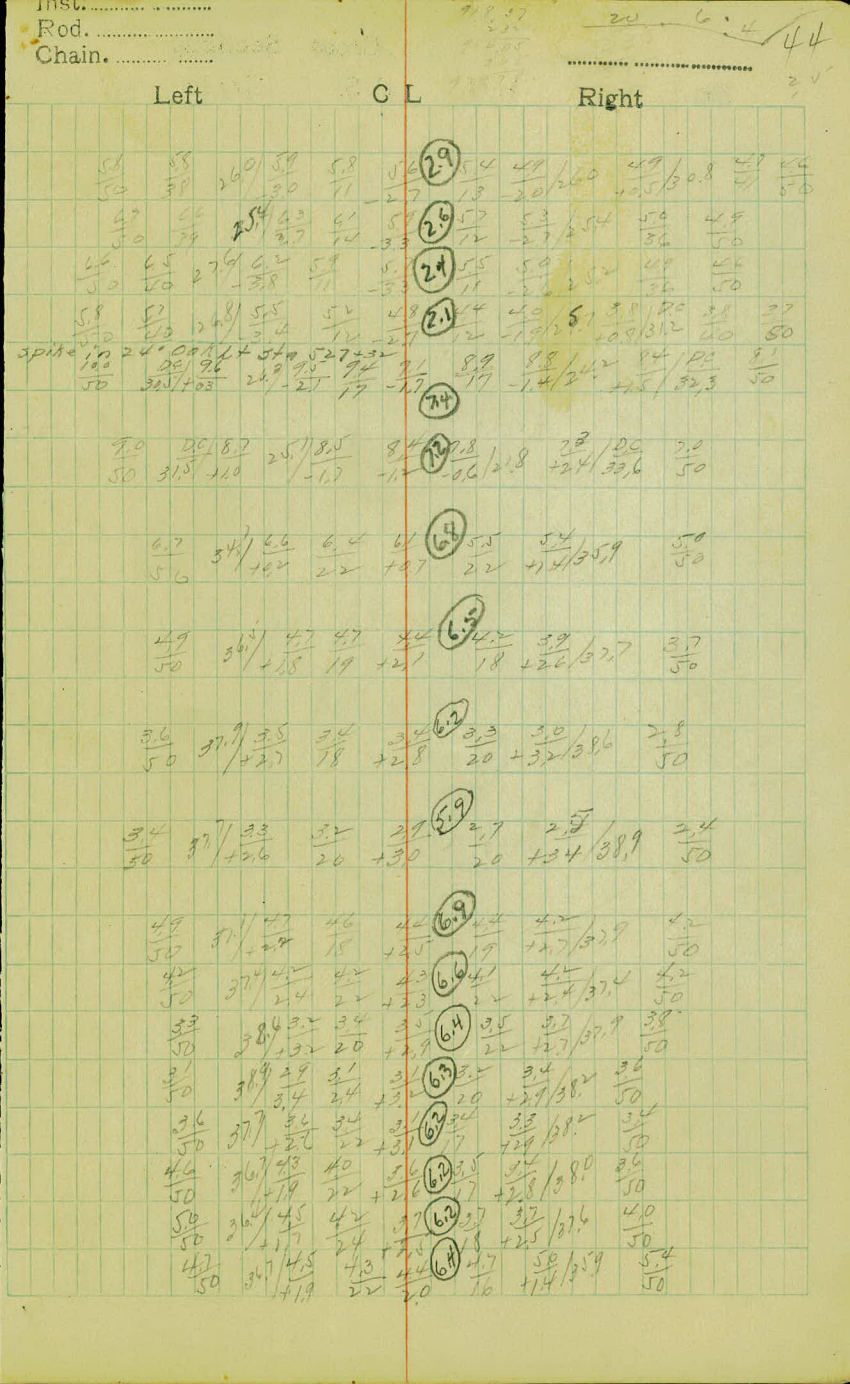
3.1

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		928.82.			
528				909.9	2.7.
+50				10.2	2.6.
529				10.4	2.4.
+50				10.7	2.1.
BM.	8.31	918.37.		910.06	
530				11.0	7.4. 7.9
BM.					
+40				11.2	7.2. 7.7
531				11.6	6.8.
+50				11.9	6.5.
532				12.2	6.2.
+50				12.5	6.9.
T.P.	3.65	919.70.	2.32	916.05.	
533				12.8	6.9.
+50				13.1	6.6.
534				13.3	6.4.
+50				13.4	6.3.
535				13.5	6.2.
+50				13.5	6.2.
536				13.5	6.2.
+50				13.3	6.4.

Inst. .....
Rod. .....
Chain. .....

Left C L Right



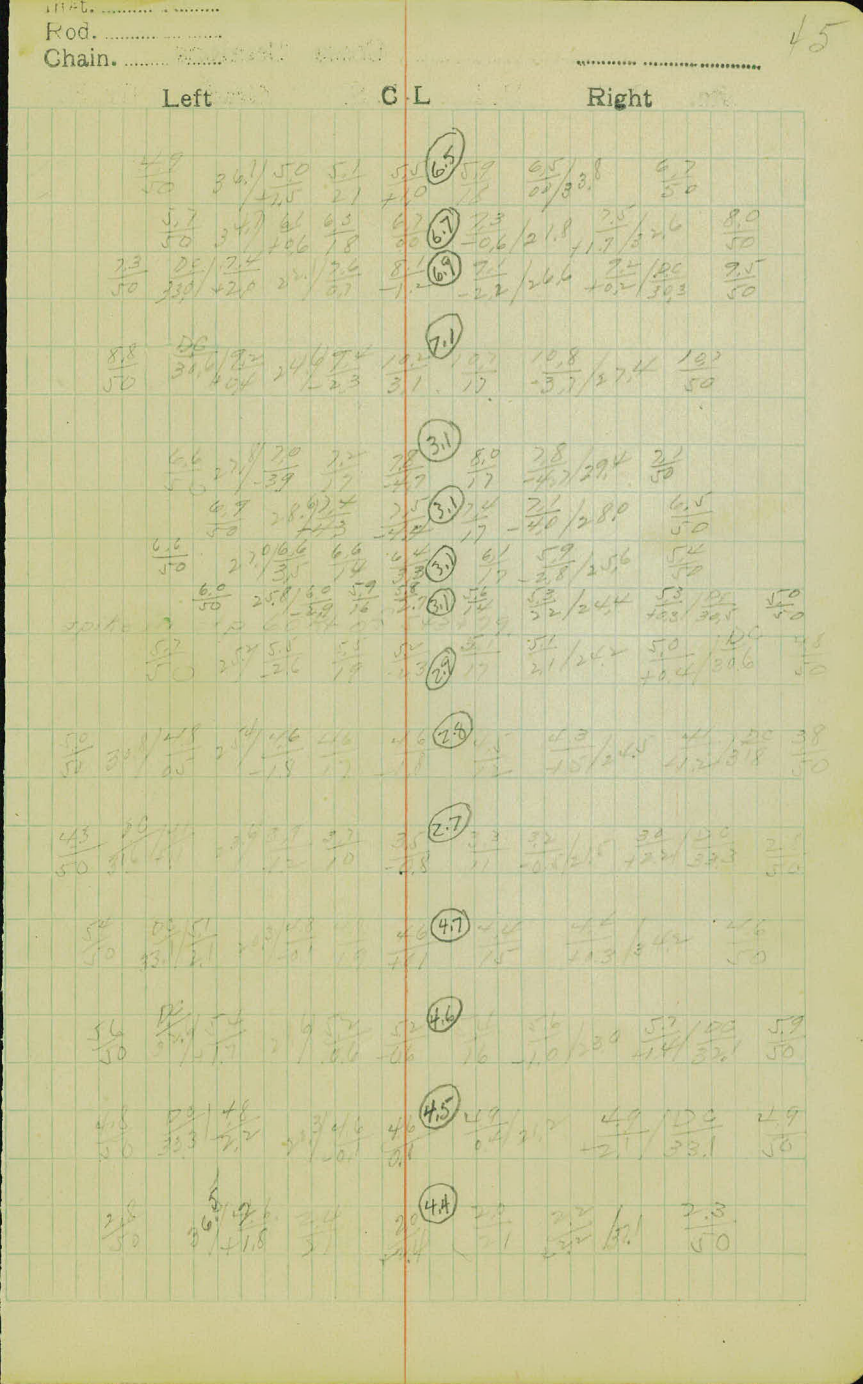
Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		919.70.			
537				913.2	6.5.
+50				13.0	6.7. 9.2
538				12.8	6.9. 9.4
+50				12.6	7.1. 9.6
T.P.	2.22	915.56	11.36	908.34	
539				12.5	3.1.
+50				12.5	3.1.
540 +50				12.5	3.1.
BM	1.55	915.52.	1.01	913.95 12.5	3.1. 5.6 913.97
541				12.6	2.9.
542				12.7	2.8.
543				12.8	2.7.
T.P	3.61	917.58	1.55	913.97	
544				12.9	4.7.
545				13.0	4.6.
546				13.1	4.5.
547				13.2	4.4.
BM	6.68	920.65.		913.97.	

Rod. .....
Chain. .....

15

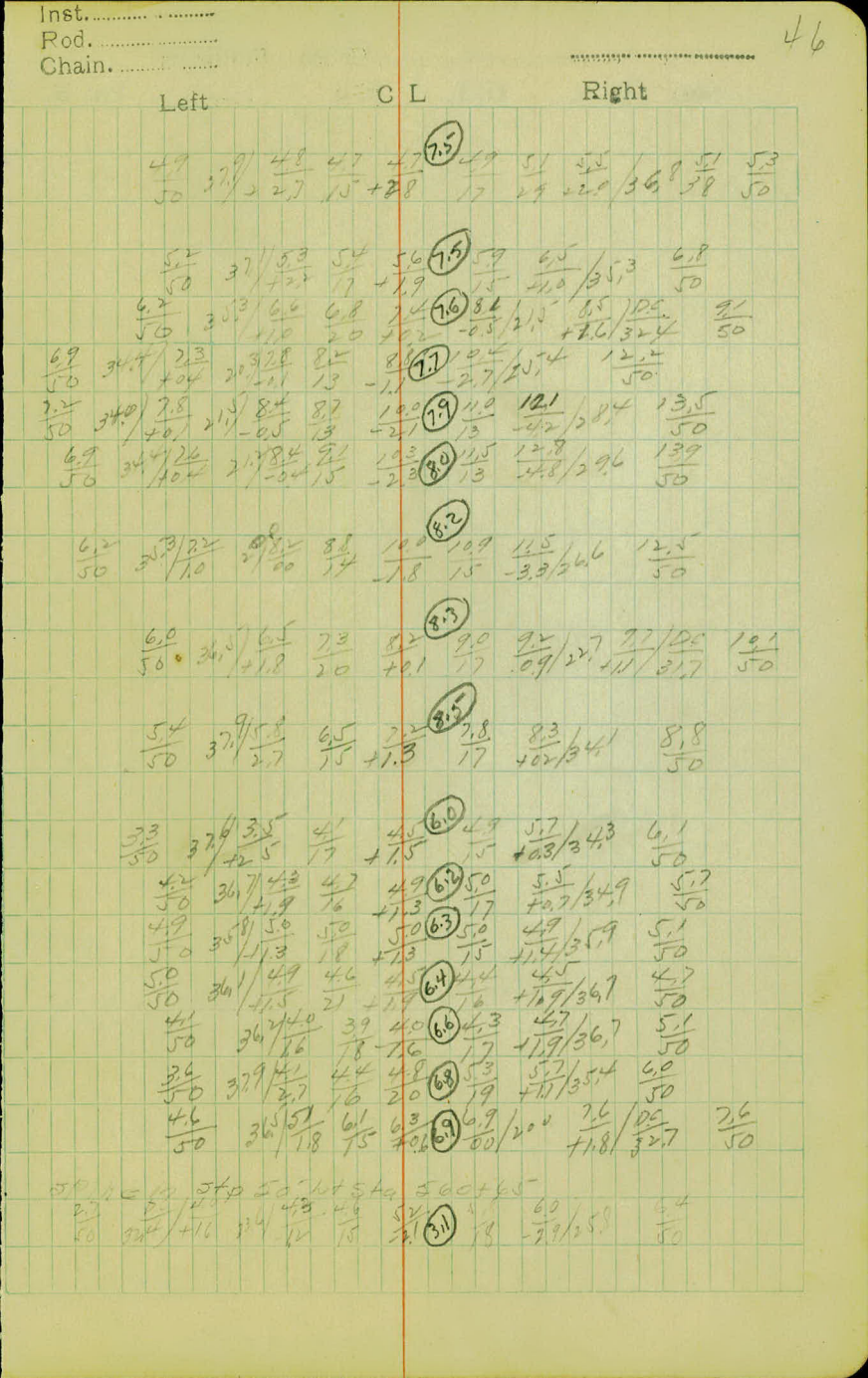
Left C L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		920.65			
+50				913.2	7.5
548				913.2	7.5
+50				13.1	7.6 (10.5)
549				13.0	7.7
+50				12.8	7.9
550				12.7	8.0
+50				12.5	8.2
551				12.4	8.3 (10.8)
+50				12.2	8.5 (11.0)
T.P.	3.85	918.10	6.40	914.25	
552				12.1	6.0
+50				11.9	6.2
553				11.8	6.3
+50				11.7	6.4
554				11.5	6.6
+50				11.3	6.8
555				11.2	6.9 (9.4)
B.M.	0.55	913.95		913.40	
556				10.9	3.1

Left C L Right



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		912.55			
557				910.8	2.4
558				11.1	2.3
+35				11.3	2.7
559				11.6	2.4
+50				11.8	2.2
560				12.1	1.9
T.P +50	5.03	919.43	0.55	913.40 (12.4)	6.0
561				12.6	5.8
+50				12.8	5.6
562				13.1	5.3
563				13.5	
564				13.7	
565				13.8	

Date. .....
Rod. .....
Chain. .....

Left	C L	Right
	3.2	
	2.9	
	2.7	
	2.4	
	2.2	
	1.9	
	6.0	
3.3 / 50	2.9 / +2.7	2.5 / 50
2.8 / 50	3.9 / +2.3	3.5 / 50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
750				913.7	
566				13.7	
567					
750					
568					
569					
763					
570					
750					

Inst. ....
Rod. ....
Chain. ....

.... 48

Left C L Right

Winter Xsection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B M.	4.09	917.49		913.40	
559+50					
560					
+50					
561					
+43					

Inst. .....
Rod. .....
Chain. .....

J 9

Left C L Right

+12 =

85/50	88/25	58/20	59	89/20	96/29	100/50	
63/50	68/31	80/29	81/26	60/20	51	56/50	80/29	81/50
55/50	53/33	96/29	72/25	51/20	47	52/23	76/26	78/29	50/33	45/50
40/50	40/37	25/32	20/27	52/20	50	50/20	78/26	80/30	30/36	30/50
29/50	27/38	28/32	27/27	54/20	51	60/21	74/28	75/33	43/41	24/50

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
	11.12	905.05	0.39	893.93	18.0
311+00				87.4	17.7
+50				87.6	17.5
312+00				87.8	17.3
T. P.	8.60	911.67	1.98	903.07	
+53				88.0	23.7
65					
	1.72	901.54	11.85	899.82	
B.M.	1.50	891.72	11.32	890.22	
	10.95	890.61	12.06	879.66	
	8.75	898.14	0.62	889.39	
+90					
Equ. 312+95 = 313+00				88.7	10.7

Void

Rod. .....
Chain. .....

50

Left C L Right

50/ 4.9 / -13.1 | 8.5 / 3.1 | 10.4 / 3.2 | 12.0 / 1.3

50/ 2.8 / -14.7 | 5.2 / 3.4 | 7.3 / 3.1 | 9.8 / 2.1 | 12.5 / 1.1

50/ +1.0 / 18.3 | 0.0 / 4.4 | 3.2 / 3.3 | 5.5 / 2.6 | 8.2 / 1.7 | 11.0 / 1.8

0/ +10.4 / +24.0 | 0.4 / 4.9 / 4.0 | 1.8 / 3.8 / 3.3 | 5.6 / 4.2 / 2.8 | 9.2 / 2.2 / 1.7 | 12.9 / 1.9

0.4 / 50 | 1.7 / 4.3 | 3.5 / 3.8 | 6.2 / 3.0 | 9.0 / 2.3 | 12.0 / 1.5 | 16.3 / 1.0

on Page 56

1.6 / 50 | 4.7 / 4.1 | 5.9 / 5.2 / 3.1 | 7.4 / 2.2 | 7.3 / 2.4 | 9.6 / 2.0 | 13.1 / 1.1 | 16.7

1.5 / 50 | 4.6 / 4.5 | 5.9 / 5.4 / 3.1 | 5.5 / -5.4 | 7.6 / 3.6 | 9.2 / 3.0 | 11.8 / 2.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		892.44			
311+00				85.6	6.8
TPBM	7.28	892.44	7.25	885.16	
+50				85.8	6.6
312+00				86.0	6.4
	8.02	893.18	?	885.16	
+53				87.2	7.0
+65				86.3	6.9
+90				86.4	6.8
Sym 312+95 -313+00				86.4	6.8
T.P.	9.14	897.73	4.59	888.59	
B.M.			4.30	893.43	87.66
B.M.	7.90	901.43		893.53	
T.P.	6.70	905.70	2.43	899.00	
313+00				82.2	23.5
+31				82.3	23.4
313+00				82.4	23.3

Inst. .....
Rod. .....
Chain. .....

Left C L Right

Cont from Page 8-9

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		905.20			
T.P	2.68	896.18	11.40	894.30	
+36				894.5	
+70				894.3	14.3
304				894.8	14.7
BM	0.11	893.68	3.40	893.58	893.57
+46				893.8	10.9
+50				893.0	10.7
305+00				893.2	10.9 10.8
TP	6.96	889.90	10.94	892.74	
+50				894.4	7.1 6.3
306				896	7.0 6.1
+50				898	6.8 5.9
307+73				899	5.4 4.5
308+00				899.4	5.3 4.4

Inst. .....
Rod. .....
Chain. .....

52

Left C L Right

14.5

14.3

14.2

10.9

10.7

10.5

6.3

6.1

5.9

5.4

5.3

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		884.20			
T.P.	1009	897.87	1.92	887.78	15.7 13.9
307+00				890	
					15.6 13.8
+28				891	
+50				892	13.7
T.P.	1238	909.70	0.45	899.42	26.6
+28				898	26.7
					26.5
+50				894	25.6
					26.3
+73				894	25.6
					26.2
309				894	25.2
					26
+50				896	25.1
					25.1
309				894	24.9
	1204	909.46	12.28	897.42	
					25.4
+50				895	24.5
					25.2
310				892	24.3
					24.7
+50				894	24.1
T.P.	7.37	906.05	10.79	898.68	
B.M.	2.09	907.67	0.47	905.58	
					22.4
311+00				895	22.1
+50				898	21.9
312+00				896	21.7
+53				896	21.5

Cont'd on Page 56

Inst. .....
Rod. .....
Chain. .....

Left C L Right

13.9
13.8
13.7
25.7
25.6
25.4
25.3
25.1
24.9
24.5
24.3
24.1
22.1
21.9
21.7
21.5

Contin Page 56

Cont. from Page 10-11-

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
Bk. M.	5.32	254.12			
Fr. 312+25					
313+00					
+20					
+25					
314					
+50					
315					
+50					
316+00					
+50					
317					
+50					
318					
+50					

Inst.
Rod.
Chain.

Left C L Right

+3.0

+3.2

+3.5

+3.7

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		89+98			
318+75				88.8	+3.8
319+00				89.0	+4.0
T.P.	9.28	98.06 ✓	6.20	91.78 ✓	
+50				89.3	+3.2
320+00				89.6	+2.5
+50				89.7	+2.8
321+00				90.2	+3.1
+50				90.5	+3.4
			6.63		
322				90.8	+3.7
+50				91.1	
323+00				91.4	
+50				91.7	
324+00				92.0	

Inst. .....
Rod. .....
Chain. .....

55

Left | C L | Right

(+3.8)

+4.0

+2.2

+2.5

+2.8

+3.1

+

Cont from Page 50

		907.67			
T.P.	6.16	913.61	0.22	907.45	
312 +83				86.2	27.4
+65				86.3	27.3
T.P.	0.44	902.41	11.64	901.97	
+90				86.4	16.0
312+95					
-313+00				86.4	16.0
T.P.	1.41	891.82	12.00	890.41	
B.M.			12.18	879.64	879.66

27.4

27.3

16.0

16.0

X Sections

Drive LTB 25+50

B.M.	2.48	900.23
0+00		
+06		
+20		
+40		
+70		

6.5/15	7.9/10	6.8/5	6.9	7.3/5	8.1/10	8.5/15
6.2/15	7.4/10	6.2/5	5.5	5.7/5	5.6/10	5.8/15
7.0/15	6.8/10	5.7/5	5.0	4.4/5	4.5/10	4.5/15
6.0/15	5.4/10	4.4/5	4.1	3.7/5	3.0/10	3.3/15
4.0/15	3.3/10	2.4/5	2.8	2.2/5	1.7/10	2.0/15

Sta.	+	Cross Section	−	Borrow Pit	311-
B.M.	7.77	913.35		905.58	
311+00				885.6	27.8
+50				85.8	27.6
312+00				86.0	27.4
T.P.	8.40	918.49	3.26	910.09	
311+00				885.6	32.9
+50				85.8	32.7
312+00				86.0	32.5
T.P.	8.82	926.61	0.70	917.79	
+50				886.2	40.4
+65				86.3	40.3
+90				86.4	40.2
Equ. 312+95 = 313+00				86.4	40.2
+20				86.4	40.2
T.P.	1.04	916.11	11.54	915.07	
T.P.	2.57	915.07	1.61	914.50	

314+50

Notch in 10' Bank Lt sta

$\frac{2.5}{125}$ $\frac{5.8}{100}$ $\frac{9.4}{75}$ $\frac{12.3}{55}$

$\frac{4.0}{100}$ $\frac{5.9}{75}$ $\frac{9.7}{55}$

$\frac{1.6}{75}$ $\frac{5.1}{55}$

$\frac{3.1}{200}$ $\frac{4.6}{175}$ $\frac{6.6}{150}$

$\frac{3.4}{200}$ $\frac{3.8}{175}$ $\frac{6.4}{150}$ $\frac{7.9}{125}$

$\frac{4.2}{200}$ $\frac{4.5}{175}$ $\frac{4.2}{150}$ $\frac{3.4}{125}$ $\frac{3.3}{100}$

$\frac{2.5}{200}$ $\frac{2.6}{175}$ $\frac{4.4}{150}$ $\frac{2.0}{125}$ $\frac{5.7}{100}$ $\frac{7.4}{75}$ $\frac{12.9}{55}$

$\frac{3.2}{200}$ $\frac{5.2}{175}$ $\frac{2.7}{150}$ $\frac{3.0}{125}$ $\frac{5.2}{100}$ $\frac{9.3}{75}$ $\frac{13.0}{55}$

$\frac{4.6}{200}$ $\frac{1.2}{175}$ $\frac{1.3}{150}$ $\frac{3.8}{125}$ $\frac{8.0}{100}$

$\frac{3.8}{200}$ $\frac{1.1}{175}$ $\frac{1.3}{150}$ $\frac{4.5}{125}$ $\frac{7.2}{100}$ $\frac{12.3}{85}$

$\frac{1.7}{200}$ $\frac{1.0}{190}$ $\frac{1.6}{175}$ $\frac{4.8}{150}$ $\frac{9.6}{125}$

Sta	+	H.I.	−	Elev	
		915.07			
312+90				886.4	28.7
Equal 312+95 313+00				86.4	28.7
+20				86.4	28.7
T.P.	9.54	924.21	0.40	914.67	
+54				886.6	37.6
T.P.	0.26	912.82	11.65	912.56	
+54				886.6	26.2
314+00					
T.P.	2.77	903.81	11.78	901.04	
313+45				886.6	17.2
314+00					
314+50					
T.P.	1.39	893.03	12.17	891.64	
313+45				886.6	6.4
314+00					

$\frac{13^{5}}{75}$ $\frac{46}{67}$ $\frac{145^{5}}{55}$

$\frac{2.7}{75}$ $\frac{64}{67}$ $\frac{120}{55}$

$\frac{2.9}{160}$ $\frac{83}{85}$ $\frac{120}{75}$ $\frac{157}{67}$ $\frac{21.3}{55}$

$\frac{06}{200}$ $\frac{55}{125}$ $\frac{57.5}{150}$ $\frac{135}{125}$

$\frac{105}{100}$

$\frac{30}{200}$ $\frac{85}{175}$

$\frac{74}{89}$ $\frac{128}{75}$

$\frac{27}{150}$ $\frac{120}{139}$

$\frac{46}{200}$ $\frac{120}{180}$

$\frac{27}{55}$

$\frac{72}{125}$ $\frac{114}{100}$ $\frac{128}{75}$ $\frac{129}{55}$

		893.03			
314+50					
T.P	1.23	884.35	9.41	883.12	
314+50					
T.P.	6.58	889.02	1.91	882.44	
B.M.			9.35	879.67	879.66

$\frac{6.0}{170}$ $\frac{10.9}{161}$ $\frac{11.6}{150}$

$\frac{33}{125}$ $\frac{45}{160}$ $\frac{53}{75}$ $\frac{64}{55}$

Spike in 6" Poplar 70° Lt 312 ↓ 65'

Winter Xsections

Sta	+	HI	−	Elev	
BM	3.04	913.72 ✓		910.68	
394+50					6.0
395					5.1
+50					5.1
+50					5.0
396					4.6
+50					(3.9)
397					(3.2)
+50					2.9
T.P.	10.92	921.77 ✓	2.87	911.05 ✓	
398					(10.3)
+50					(9.9)
399					(9.6)
+50					(9.4)

Spike in 6" Pop 270 Rt Sta 298+10

144/53 144/41 64/20 65/14 55/11 60 70/11 66/20 13.2/32 12.8/50

Acg D

110/50 126/37 64/20 52/13 56 4.8/10 64/20 12.3/37 12.6/50

95/50 95/32 104/35 106/32 57/20 54 56/20 103/31 107/50

87/50 8.8/35 87/32 94/30 85/36 55/20 52 55/20 74/35 102/50

65/54 65/31 73/29 74/27 46/20 40/9 42 47/20 72/27 75/50

5.8/50 5.8/27 6.6/28 5.8/24 3.8/18 3.7 4.1/14 5.4/19 5.8/50

End D [illegible]

5.7/5[illegible] 5.5/25 4.4/22 4.3 3.6/18 3.8/35 3.3/50

3.7/30 3.2/21 3.8/25 2.7 3.2/18 2.2/19 1.7/33 1.1/50

10.2/50 10.4/35 10.3/33 10.2 10.4/16 9.5/17 9.2/33 8.6/32 8.2/37 7.6/50

86/30 86/32 94/32 95/31 95/27 105/24 95 100/16 9.0/17 8.8/32 7.6/34 7.2/27 7.0/50

75/50 7.2/36 7.7/33 94/29 104/23 94 10.1/17 9.0/19 8.7/32 7.0/35 6.6/58 66/50

54/50 57/40 64/34 83/30 93/23 100/22 95 96/19 91/20 90/30 6.2/36 5.5/40 5.8/50

Sta	+	HI	-	Elev	
		92177 ✓			
400+00					9.2
+50					9.2
401					9.3
+50					9.3
402					9.5
+50					9.3
403					10.1
+50					10.6
404					11
TP	2.24	912.91 ✓	11.10	910.67 ✓	
417					2.4
+50					3.7
405					3.2

37/50 37/43 42/36 34/31 41/41 30/ 94/19 98/20 85/30 60/37 53/40 54/50

33/50 35/42 40/39 38/31 32/21 32/20 88/ 94/19 89/20 94/31 85/37 80/40 84/50

20/50 27/43 32/39 31/31 24/24 28/ 88/ 93/19 83/20 87/31 84/37 80/40 80/50

51/50 53/40 57/36 87/31 85/33 95/22 92/ 94/19 86/20 87/31 82/36 87/39 82/50

20/50 27/39 27/34 30/31 28/23 92/ 100/20 93/21 94/31 66/36 63/39 67/50

92/50 90/34 95/31 100/29 97/ 97/32 92/33 90/36 83/50

106/50 105/38 110/28 117/27 115/22 104/19 102/ 107/22 113/26 112/29 107/31 105/34 101/50

106/50 103/34 108/29 118/28 115/24 104/21 109/ 109/21 119/24 125/29 122/31 107/34 107/50

112/50 113/33 120/30 128/28 123/23 102/21 112/ 118/20 120/23 130/28 128/29 126/31 132/50

26/50 28/33 30/31 40/29 42/25 16/20 22/ 28/19 27/26 38/50

25/50 39/38 38/32 43/29 43/26 20/24 27/ 33/20 32/26 36/50

32/50 33/23 26/20 34/ 37/20 40/25 43/27 32/23 32/50

Sta	+	HI	-	Elev	
		912.31 ✓			
405+50					3.7
406 ✓					4.2
+50 ✓					4.1
407 ✓					5.2
+50 ✓					5.1
408 ✓					6.2
+50 ✓					6.7
409 ✓					7.2
+50 ✓					7.7
410 ✓					8.2
+50 ✓					8.7
411 ✓					9.2
B.M			6.58	906.23 ✓	906.36

5.0/50	6.8/27	9.0/20	4.0	4.4/26	6.4/25	6.5/27	6.0/28	5.7/50	
6.0/50	6.7/27	5.6/20	4.4	4.8/20	6.4/24	6.8/26	6.0/27	6.0/50	
7.0/50	7.0/28	4.9/20	4.7	5.8/20	7.3/26	7.0/50			
7.5/50	7.4/28	4.4/20	5.1	6.0/20	7.2/25	7.3/50			
7.2/50	7.3/26	4.8/20	5.3	6.2/20	8.0/26	7.5/50			
7.1/50	7.4/30	7.8/29	7.5/26	5.4/20	6.0	6.6/20	8.2 8.3/29	7.3/31	7.0/39
7.8/44	7.8/43	6.8/46	7.0/50						
7.4/50	7.7/31	8.2/30	8.2/26	6.4/20	6.5	7.0/28	8.5/24	8.7/29	8.2/31	8.1/50
7.8/50	7.5/31	8.7/28	8.6/24	7.5/20	7.2	7.5/20	7.9/25	9.2/29	8.2/31	8.6/50	
7.3/50	7.7/34	9.1/29	9.3/25	8.4/20	8.0	8.7/22	9.5/21	9.6/29	8.8/31	9.0/50	
7.1/50	7.8/32	10.0/28	9.5/23	8.7/20	8.4	8.7/20	9.7/23	9.8/28	8.7/31	8.4/50	
7.7/50	8.1/33	10.2/29	10.6/24	9.0/20	8.7	9.0/20	10.6/23	10.4/29	8.7/31	7.6/50	
6.7/50	7.7/33	10.8/28	10.6/22	9.9/20	9.0	10.0/20	11.8/24	11.0/29	7.5/35	7.8/50	

On Tp of reference point of PI 40C+00 | 45+00 | 48+20

Sta	+	HI	-	Elev	
BM	2.60	908.96 ✓		906.36	
411+50					5.8
+70					6.0
412					6.3
+41					6.7
+13					7.1
+11					7.4
+50					7.8
414					8.3
+50					8.8
415					9.3
T.P.	1.26	900.00 ✓	10.22	898.74 ✓	
+50					0.8
416					1.3

On the Reference

21/50	32/35	92/28	73/24	58/18	97	60/20	70/23	74/24	90/30	77/30	
83/50	87/35	80/29	74/24	62/19	98	62/20	74/23	74/24	80/31	52/33	52/50
92/50	97/34	70/25	76/23	64/19	60	61/20	74/24	74/24	43/34	43/50	
29/50	32/36	80/29	80/24	70/20	64	68/19	82/24	78/25	92/37	31/50	
48/50	45/39	81/21	85/24	77/20	69	72/20	85/23	81/27	85/38	37/50	
16/50	13/39	86/29	86/23	73/17	71	73/20	83/33	84/28	87/37	46/50	
26/50	28/28	91/28	88/21	78/18	76	78/18	92/23	88/29	45/37	50	49/50
43/50	45/34	78/28	98/23	85/20	82	88/18	97/22	88/27	52/36	54/50	
66/50	64/35	102/27	88/22	90/18	88	95/17	107/22	103/27	62/35	46/50	
79/50	77/34	106/29	108/23	95/19	96	97/20	107/21	112/28	88/33	90/50	
101/50	108/34	118/29	121/25	117/20	96	123/19	125/25	128/29	135/31	96/50	
100/50	107/31	130/28	124/23	113/20	118	120/19	140/28	54/50			

Sta	+	HI	-	Elev	
		90.00 ✓			
416+50					(1.8)
417					(2.3)
+50					(2.8)
418					(3.3)
+50					(3.8)
419					(4.3)
			9.20	89.80 ✓	
+62					(4.9)
420					(4.9)
+50					(4.9)
421					(4.7)
+60					(4.3)
422					(4.1)

25/50	38/37	42/23	42/24	24/19	26	26/20	65/29	76/50	
55/50	40/36	38/35	36/28	40/23	44	50/25	92/33	97/50	
		74/50	86/34	58/23	60	90/20	101/30	106/50	
		92/50	94/40	98/39	93/33	55/21	57	72/15	77/28	105/36	103/50
		96/53	96/38	93/37	94/30	56/20	55	60/23	103/33	103/50	
		92/50	94/36	87/35	84/30	50/20	55	52/20	85/31	86/50	
		84/50	87/36	87/35	82/28	50/20	49	48/20	94/30	94/50	
		70/50	71/34	74/31	77/25	70/23	55/19	50	50/19	78/26	84/50
		57/50	56/30	70/29	72/24	50/20	49	47/19	68/33	74/29	68/31	85/50
		47/50	54/30	67/29	64/33	48/20	48	48/20	72/26	77/34	68/33	77/50
		55/50	70/33	80/32	77/27	44/20	43	44/20	94/32	96/50	
		64/50	89/35	88/34	88/30	70/33	30/16	62	46/4	48/21	100/35	100/50	

Sta	+	HI	-	Elev	
T.P	6.70	898.55 ✓	7.85	892.15 ✓	
422+50					2.4
423					2.2
+50					2.2
424					3.1
+24					3.5
+58					2.9
+75					3.1
425					3.1
426					5.1
427					6.9
+75					8.2
428					8.7

48/50	69/37	68/34	70/29	55/23	55	68/17	88/22	88/27	77/31	87/34	88/50
87/50	82/34	42/23	62/29	67/7	38	28/20	87/34	88/50			
16/50	17/35	50/29	47/11	28/6	25	24/21	76/34	28/50			
20/50	26/28		24/3		30	28/20	26/29	72/50			
			32/50	27/32	23	24/14	32/16	32/20	28/30	27/50	
68/50	27/30	43/24	37/20	24/11	25	26/13	28/37	33/50			
28/50	82/31	46/28	43/5	27/4	27	28/25	30/50				
	90/50	97/34	50/22	45	45/6	50/8	76/9	30/13	30/38	30/50	
	95/50	78/30	77/19	60	69/12	95/25	98/32	96/50			
	103/50	107/28	78/21	98	82/23	100/28	97/50				
97/50	95/30	104/29	100/26	95/23	87	52/22	83/30	75/31	66/50		
93/50	90/29	100/28	93/44	86/20	80	82/31	69/36	52/50			

Sta	+	HI	-	El	
		891.55 ✓			
428+50					(9.6)
429					(10.5)
+50					(11.4)
430					(12.3)
+50					(13.2)
431					(14.1)
T.P.	0.58	889.78 ✓	1.35	889.20 ✓	
T.P.	0.16	892.01 ✓	7.93	881.85 ✓	
BM			7.81	874.20 ✓	874.17
	Winter X Sections.				
BM.	2.88	896.45 ✓		893.57	
T.P.	3.05	887.42 ✓	12.05	884.40 ✓	
301+80					
302				82.2	
+38				82.5	

55/50	54/36	88/30	33	84/32	28/—	25/50
22/50	20/43	88/36	85	87/30	35/42	36/50
46/50	46/44	80/34	94	94/33	53/40	51/50
60/50	60/40	109/33	109	107/33	73/34	73/50
80/50	85/37	105/33	105	110/33	102/35	103/50
100/50	104/36	114/34	112	130/30	138/50	

Strike in 10" Binch 70'47 5+9 W36+30

2 Dibe in 12"cm. 60 Rt 34 30 4+25

74/30	72/25	56/19	53	50/19	82/29	100/50

54

97/29	66/23	55/19	52	52/20	80/26	98/50

51

78/30	72/23	55/20	49	48/20	72/25	92/50

Sta	+ Winter	HI Section 887.47	-	Elev	
303				83.7	
+36				82.5	
+70				82.7	
304					
+16					
+50					
305					
+50					3.0
306					3.4
+50					3.6
307					3.4
+28					3.
+50					3.2
+73					3.1
308 T.P.	5.27	891.08 ✓	1.61	885.81 ✓	3.0
+50					3.2 ✓
309					6.2
+50					(6.1)
310					5.7

50

49

48

47

46

45

44

43

42

41

40

39

38

37

36

35

34

33

32

31

30

29

28

27

26

Sta	+	HI	−	Elev	
		891.08 ✓			
+ 50					(5.1)
311.+00					(5.5)
BM.			11.40	879.68 ✓	879.66
BM.	11.54	905.09 ✓		893.57	
301+80					
302+00					
+38					
303					
+36					
+70					
304					
+16					
+50					
305					
T.P.	10.85	907.74 ✓	8.20	896.89 ✓	
307					
+78					
T.P.	7.83	912.99 ✓	2.58	905.16 ✓	
+50					
+13					
308					
+50					
309					
+50					

Cont on Page 78

63 50 58 55 47 58 66 69 74
37 / 8 / 20 23 27 29 50
48 57 50 45 77 97
31 20 20 27 50

Spike in 6" Maple 70 Ft Sta 312 - 6 ℄.

Spike in 12" Oak 60 Ft Sta 304 - 95

123 / 50 128 / 50

315 / 50
18 / 50
99 / 50
124 / 50
127 / 50
130 / 50
123 / 50
120 / 50
128 / 30
97 / 50
64 / 50
64 / 50
50 / 50
44 / 50
48 / 50
54 / 50
64 / 50

(2.9)
3.2.8)
3.2.7)
3.2.6)
3.2.1
3.2.0)
3.1.9)
3.1.8)
3.1.7)
3.1.6)
3.1.5)
3.1.4)
3.1.3)
3.1.2)
3.1.1)
3.1.0)
3.0.9)
3.0.8)
3.0.7)
3.0.6)
3.0.5)

313+70

Overflow Valentine lake 876.5

BM1	7.53	884.19	876.66

+28

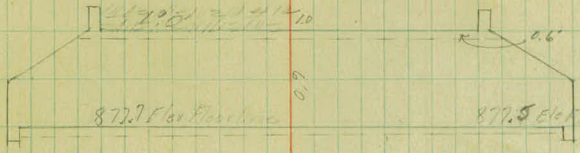
+20

= 0.00
313+70

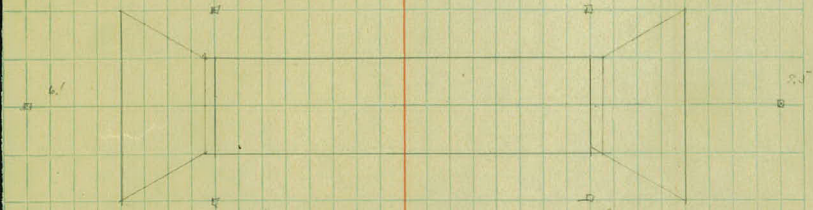
+20

+28

Grade Elev 886.7



Splice in 6" Pipe for 70'Lt Sta 31+65



46

31 / 4 — 30 — 29 / 4

27 / 4 — 26 — 25 / 4

40 / 4 — 40 — 41 / 4

40 / 4 — 40 — 40 / 4

456+00

E.M 1.08 998.24 997.16

+28

+20

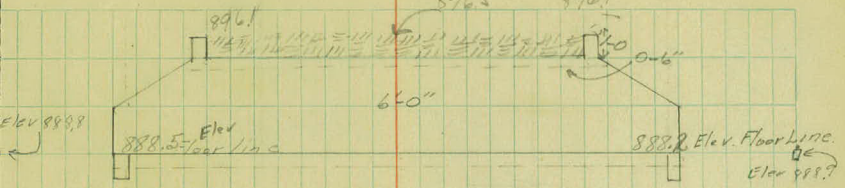
= 0+00
456+00

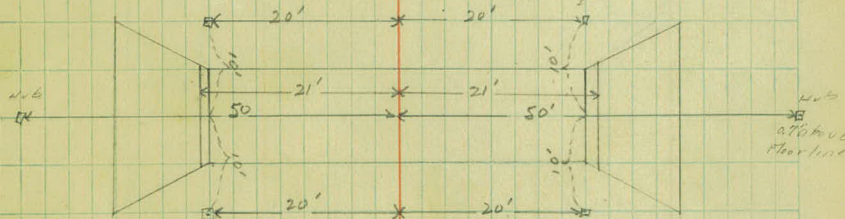
+20

+28

West

Right





nail in Fence Post LH 15" Sta 457+40.

10.0/7 10.1 9.9/7

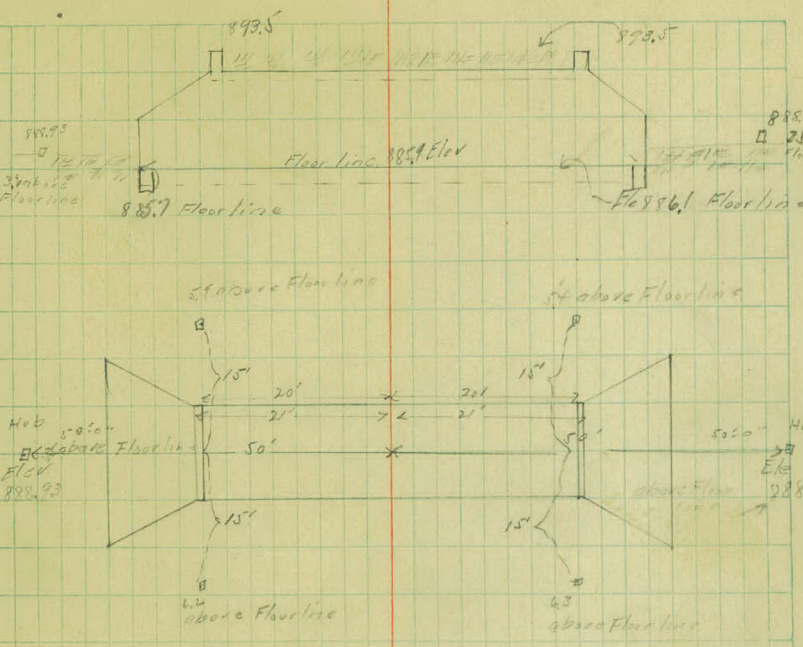
10.2/4 10.1 10.0/4

10.1/4 10.1 10.1/4

10.3/4 10.3 10.2/4

9.6/7 10.2 10.0/7

		426+00	Sept 27 1926		C.J. D.S T.M M.G.
B.M					
B.M.	3.71	897.13		893.42	
+28					
+20					
426+00 = 0+00					
+20					
+28					



Cen. 30'

Marlin Ferneau Post Lt. 5th 4 24 x 48'

7.8 / 0.7	7.8	7.8 / 0.7
5.4 / 0.4	5.4	5.4 / 0.4
5.4 / 0.4	5.4	5.4 / 0.4
5.4 / 4	5.4	5.3 / 4
7.7 / 0.7	7.7	7.5 / 0.7

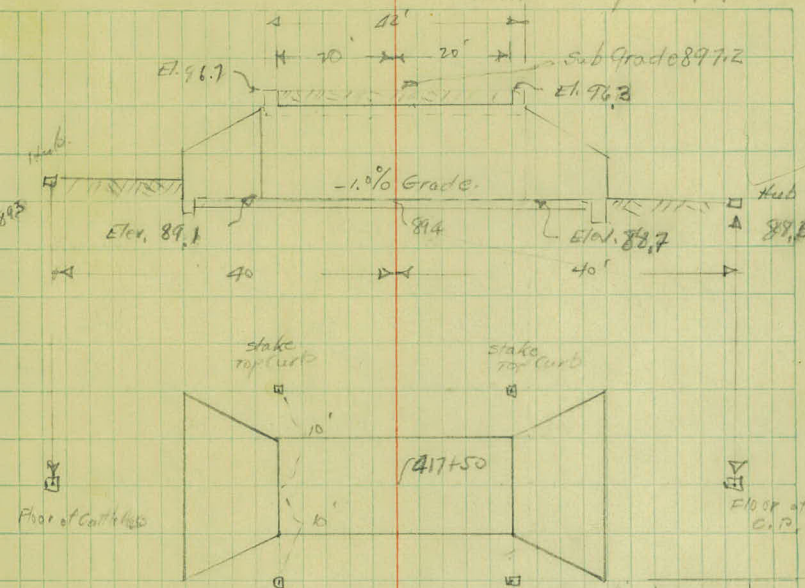
Cattle Pass 417+50

	+	H.I	−	Elev.	
	1.1	99.8		98.7	- BlueTop Style
	0.1	99.8		99.7	- Sta. 15

		Grade Top Floor	G.R.
0+28		98.7	
0+20		98.7	
417+50+00		89.4	
0+10		89.1	
0+28		89.0	

W.H.C
A.L.P
W.A
H.T.P

Sept 23, 1926



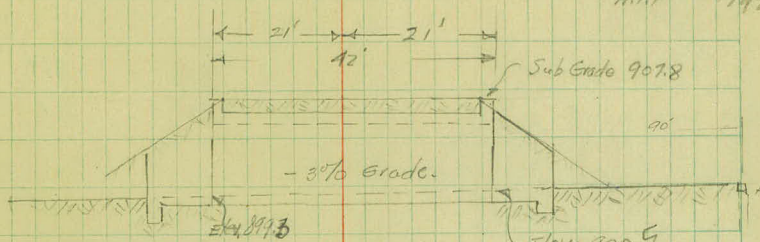
7.0 / 7
8.0
8.0 / 7.0
7.0 / 4
7.0
7.0 / 4
5.0 / 4.0
5.0
5.0 / 4.0
8.1 / 7
8.2
8.1 / 7

Cattle Pass 394+70

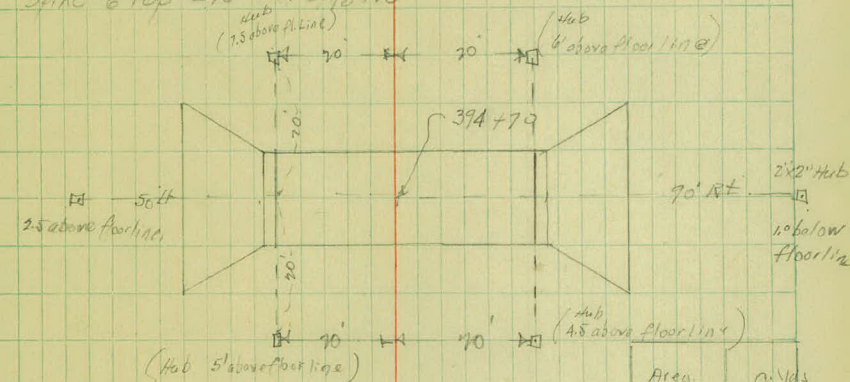
394+70	W. 46'				
B.M.	4.42	915.10		910.68	
T.P.	3.27	911.02	7.35	907.75	
				Grade Top Rail	G.R.
0+28				900.7	
0+20				900.5	
0+17				900.4	
0+12				900.2	
394+70=0+00				99.6	
0+05				99.5	
0+20				899.3	
0+28				99.0	

H. ℄ Rt.

W.H.C.
R.L.R.
W.A.
H.T.P.
Sept 22, 1926



Spike 6" Pop 270' Lt. 398+10



Area
Sq. Ft.
Cu. Yds.

10.4 / 7.0	10.4	10.4 / 7.0
10.5 / 7.0	10.5	10.5 / 7.0
10.8 / 7.0	10.8	10.8 / 7.0
11.1 / 7.0	11.1 / 0	11.1 / 7.0
11.4 / 7.0	11.4 / 0	11.4 / 7.0
11.0 / 7.0	11.9	11.0 / 7.0
11.4 / 7.0	11.4 / 0	11.4 / 7.0
11.2 / 7.0	11.2 / 0	11.2 / 7.0

East

West

Channel Change

B.M.	3.89	876.62	872.73	
C+00			67	4.5
+50			67.1	4.5
+71			67.1	4.5
+79			67.1	4.5
1+00			67.1	4.5
+28			67.1	4.5
+50			67.1	4.5
+72			67.1	4.5
+88			67.1	4.5
2+00			67.1	4.5
+15			67.1	4.5

Creek Creek

Creek Creek Creek Creek

Creek Creek Creek Bank Bank

Creek Creek Creek Creek

Creek

Channel Change

-0.3

B.M.	4.01	876.74	872.73
0+00			866.1
+50			865.9 10.8
+71			65.9 10.8
+79			65.9 10.8
1+00			65.8 10.9
+28			65.7 11.0
+50			65.6 11.1
+72			65.6 11.1
+88			865.5 11.2
2+00			65.5 11.2
+15.			

b

$\frac{3.2}{22}$ 19.3/ $\frac{4.4}{-6.2}$ $\frac{5.4}{12}$ $\frac{9.6}{10}$ $\frac{10.6}{0.0}$

$\frac{5.2}{25}$ $\frac{5.3}{14.5}$ $\frac{7.5}{16}$ $\frac{7.0}{14}$ $\frac{9.4}{11}$ $\frac{9.3}{7}$ $\frac{9.3}{-1.5}$ $\frac{8.6}{4}$ $\frac{6.8}{11}$ $\frac{6.2}{14}$ $\frac{5.2}{16}$ $\frac{4.6}{-6.2}$/19.3 $\frac{4.7}{25}$

$\frac{5.4}{27}$ $\frac{5.4}{24}$ 19.0/ $\frac{4.8}{-6.0}$ $\frac{4.8}{15}$ $\frac{4.8}{10}$ $\frac{5.1}{4.5}$ $\frac{7.0}{4}$ $\frac{6.8}{-4.0}$ $\frac{6.6}{2}$ $\frac{10.0}{2.5}$ $\frac{10.4}{15}$ $\frac{10.5}{25}$

$\frac{6.5}{25}$ $\frac{6.1}{22}$ 18.5/ $\frac{5.1}{-5.7}$ $\frac{5.2}{15}$ $\frac{5.2}{8}$ $\frac{4.9}{5.9}$ $\frac{5.9}{5}$ $\frac{4.7}{13}$ $\frac{4.7}{6.1}$/19.1 $\frac{4.8}{25}$

$\frac{7.1}{25}$ 16.1/ $\frac{6.4}{4.5}$ $\frac{6.0}{15}$ $\frac{4.9}{12}$ $\frac{4.8}{5}$ $\frac{4.4}{-6.5}$ $\frac{4.2}{9}$ $\frac{4.5}{14}$ $\frac{4.9}{-6.0}$/19.0 $\frac{4.9}{25}$

$\frac{6.1}{25}$ 16.9/ $\frac{6.4}{4.6}$ $\frac{6.0}{13}$ $\frac{5.7}{5.3}$ $\frac{5.7}{10}$ $\frac{5.2}{-5.8}$/18.7 $\frac{5.0}{25}$

$\frac{4.7}{25}$ 20.3/ $\frac{4.2}{-6.9}$ $\frac{4.4}{13}$ $\frac{5.0}{6.1}$ $\frac{5.4}{11}$ $\frac{5.5}{-5.6}$/18.4 $\frac{5.8}{22}$ $\frac{8.0}{23.5}$ $\frac{9.0}{25}$

$\frac{4.6}{25}$ 20.3/ $\frac{4.2}{6.9}$ $\frac{4.1}{16}$ $\frac{4.2}{7}$ $\frac{4.5}{6.6}$ $\frac{4.8}{2}$ $\frac{7.1}{3}$ $\frac{8.8}{4}$ $\frac{9.7}{7}$ $\frac{10.6}{11}$ $\frac{10.7}{20}$

$\frac{3.6}{25}$ 21.4/ $\frac{3.6}{-7.6}$ $\frac{3.6}{12}$ $\frac{4.1}{9}$ $\frac{6.6}{2}$ $\frac{8.6}{-2.6}$ $\frac{8.7}{4}$ $\frac{9.9}{10}$ $\frac{10.3}{12}$

$\frac{4.6}{25}$ 20.6/ $\frac{4.1}{7.1}$ $\frac{4.1}{20}$ $\frac{4.1}{10}$ $\frac{8.7}{4}$ $\frac{9.4}{1.8}$ $\frac{9.5}{4}$ $\frac{8.7}{14}$ $\frac{6.8}{16}$ $\frac{6.4}{20}$

	Culv		P_2		
345+5	36"	90 P_3			
338+60	78" x 24"	P_2			
359 +30	90" x 24"	P_2			
348+20	24" x 108	B_3			
350+11	24" x 102	P_3			
350+67	24" x 90°	P_2			
	Cost from Page 69				
	712.99 ✓				
310					
+50					
311.					
BM	3.89	912.99 ✓	3.89	909.10 ✓	
T.P	0.69	905.85 ✓	7.83	905.16 ✓	
BM			12.28	893.57 ✓	893.57

Winter Xsections.

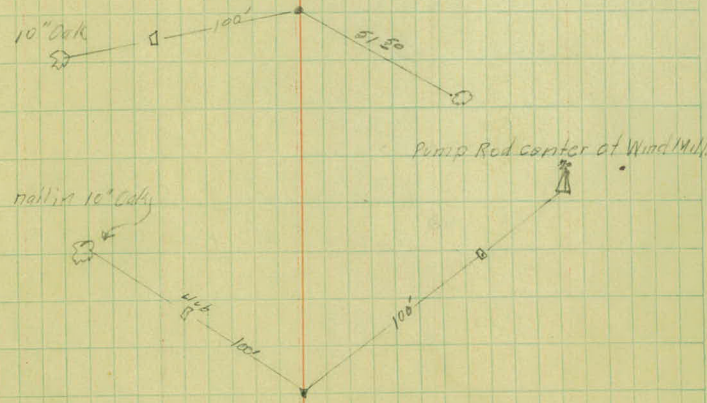
11.4/50	29.8
13.0/50	29.6
12.8/50	29.9

Nail in 10" Oak 80' Rt Rt Sta 310+20

Spike in 12" Oak 60' Rt Sta 304+75

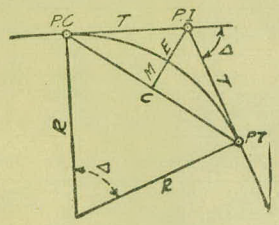
501+00 P.O.T.

439+00 P.O.T.


10" Oak
100'
S 71 E
Pump Rod center of Windmill
nail in 10" Oak
N
W 4 S
100'
100'

			7.4
			50
44434	24" x 60 P2		5.2
			86

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

Radius=R=$\frac{50}{\text{sin. } D/2}$ (1) Degree of Curve=D and sin. $\frac{D}{2}=\frac{50}{R}$ (2)

Tangent=T=R tan $\frac{\Delta}{2}$ (3) Length of Curve=L=$100\frac{\Delta}{D}$ (4)

Middle ordinate=M= R(1—cos. $\frac{\Delta}{2}$) (5) =Rvers $\frac{\Delta}{2}$ (6)

External=E=T tan $\frac{\Delta}{4}$ (7) =R÷cos. $\frac{\Delta}{2}$—R (8)=R exsec $\frac{\Delta}{2}$ (9)

Long Chord=C=2 R sin. $\frac{\Delta}{2}$ (10) Δ=Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161+60.35 to find Sta. of P. C. and P. T. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and ÷8⅓=414.49 ft. From Table V correction=.36 or T=414.85 ft. P. C.=Sta. P.I.—T=157+45.50. Also from (4) L=746.00 and P. T.=Sta. P. C.+L=164+91.50.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft.=7.27 ft. Distance=158—Sta. P. C.=54.50, hence offset=7.27 $(54.50\div100)^2$=2.16 ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2\div(2\times688.26)$=2.16 ft.

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′ +8° 20′ ÷2=6° 26.2′, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve E=960.6 for 8° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and ÷42=5.5 or D=5° 30′.

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	1/8	3–16	1/4	5–16	3/8	1/2	5/8	3/4	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. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan Offset	Def. for 1 Foot
0° 10′	34377.5	.036	.145	0.05′	7°	819.02	1.528	6.105	2.10′
20	17188.8	.073	.291	0.10	20′	781.84	1.600	6.395	2.20
30	11459.2	.109	.436	0.15	30	764.49	1.637	6.540	2.25
40	8594.42	.145	.582	0.20	40	747.89	1.673	6.685	2.30
50	6875.55	.182	.727	0.25					
					8	716.78	1.746	6.976	2.40
1	5729.65	.218	.873	0.30	20	688.16	1.819	7.266	2.50
10	4911.15	.255	1.018	0.35	30	674.69	1.855	7.411	2.55
20	4297.28	.291	1.164	0.40	40	661.74	1.892	7.556	2.60
30	3819.83	.327	1.309	0.45					
40	3437.87	.364	1.454	0.50	9	637.28	1.965	7.846	2.70
50	3125.36	.400	1.600	0.55	20	614.56	2.037	8.136	2.80
					30	603.80	2.074	8.281	2.85
2	2864.93	.436	1.745	0.60	40	593.42	2.110	8.426	2.90
10	2644.58	.473	1.891	0.65					
20	2455.70	.509	2.036	0.70	10	573.69	2.183	8.716	3.00
30	2292.01	.545	2.181	0.75	30	546.44	2.292	9.150	3.15
40	2148.79	.582	2.327	0.80	11	521.67	2.402	9.585	3.30
50	2022.41	.618	2.472	0.85	30	499.06	2.511	10.02	3.45
					12	478.34	2.620	10.45	3.60
3	1910.08	.655	2.618	0.90	30	459.28	2.730	10.89	3.75
10	1809.57	.691	2.763	0.95	13	441.68	2.839	11.32	3.90
20	1719.12	.727	2.908	1.00	30	425.40	2.949	11.75	4.05
30	1637.28	.764	3.054	1.05	14	410.28	3.058	12.18	4.20
40	1562.88	.800	3.199	1.10	30	396.20	3.168	12.62	4.35
50	1494.95	.836	3.345	1.15					
					15	383.07	3.277	13.05	4.50
4	1432.69	.873	3.490	1.20	30	370.78	3.387	13.49	4.65
10	1375.40	.909	3.635	1.25	16	359.27	3.496	13.92	4.80
20	1322.53	.945	3.718	1.30	30	348.45	3.606	14.35	4.95
30	1273.57	.982	3.926	1.35	17	338.27	3.716	14.78	5.10
40	1228.11	1.018	4.071	1.40	18	319.62	3.935	15.64	5.40
50	1185.78	1.055	4.217	1.45	19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.362	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1.75					
					25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	859.92	1.455	5.814	2.00	30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central 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.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central 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	2763.7	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	483.8	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.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central 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.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central 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	5808.2	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 TANGENTS AND EXTERNALS.

These corrections are to be added to the approximate values, found by dividing the tangent, or external, for a 1° curve (Table IV) by the degree of curve, in order to obtain the true tangents, or externals. Intermediate values may be obtained by interpolation.

FOR TANGENTS ADD

Central Angle	DEGREE OF 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	.70	.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	4.40	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
110°	.51	1.03	1.56	2.08	2.61	3.14	3.67	4.21	4.76	5.31	5.86	6.43	7.01	7.60
120°	.62	1.25	1.93	2.52	3.16	3.81	4.45	5.11	5.77	6.44	7.12	7.80	8.50	9.22

FOR EXTERNALS ADD

Central Angle.	DEGREE OF 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	.172	.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	.711	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.07	1.18	1.29	1.39
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	.985	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
110°	.263	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96
120°	.360	.721	1.08	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32

Table VI.—Corrections for Sub-Chords and Long Chords.

FOR SUB-CHORDS ADD										Excess of arc per 100 ft.	LONG CHORDS				
D	10	20	30	40	50	60	70	80	90		D	200	300	400	500
4°	.00	.00	.01	.01	.01	.01	.01	.01	.00	.02	1	199.99	299.97	399.92	499.85
6	.00	.01	.01	.02	.02	.02	.02	.01	01	.05	2	199.97	299.88	399.70	499.39
8	.01	.02	.02	.03	.03	.03	.03	.02	.01	.08	3	199.93	299.73	399.32	498.63
10	.01	.02	.03	.04	.05	.05	.05	.04	.02	.13	4	199.88	299.51	398.78	497.57
12	.02	.04	.05	.06	.07	.07	.07	.05	.03	.18	5	199.81	299.24	398.10	496.20
14	.02	.05	.07	.08	.09	.10	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
16	.03	.06	.09	.11	.12	.12	.12	.09	.05	.33	7	199.63	298.51	396.28	492.57
18	.04	.08	.11	.14	.15	.16	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.18	.15	.09	.51	9	199.38	297.54	393.86	487.75
22	.06	.12	.17	.21	.23	.24	.22	.18	.10	.62	10	199.24	296.96	392.42	484.90
24	.07	.14	.20	.25	.28	.28	.26	.21	.12	.74	12	198.90	295.63	389.12	478.34
26	.09	.17	.24	.29	.32	.33	.31	.25	.15	.86	14	198.51	294.06	385.22	470.65
28	.10	.19	.27	.34	.37	.38	.36	.29	.17	1.00	16	198.05	292.25	380.76	461.86
30	.11	.22	.31	.39	.43	.44	.41	.33	.19	1.15	18	197.54	290.21	375.74	452.02
32	.13	.25	.36	.44	.49	.50	.47	.38	.22	1.31	20	196.96	287.94	370.17	441.15
34	.15	.28	.40	.50	.55	.57	.53	.43	.25	1.48	22	196.32	285.44	364.06	429.30
36	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.63	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.86	26	194.87	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.06	276.59	342.69	388.43
42	.23	.44	.62	.76	.85	.87	.81	.65	.38	2.28	30	193.18	273.20	334.61	373.20
44	.25	.48	.68	.84	.94	.96	.89	.72	.42	2.50	32	192.25	269.61	326.08	357.28
46	.27	.52	.75	.92	1.02	1.05	.98	.78	.46	2.74	34	191.26	265.81	317.12	340.73
48	.30	.57	.81	1.00	1.12	1.14	1.06	.86	.50	2.99	36	190.21	261.80	307.77	323.61
50	.32	.62	.89	1.09	1.21	1.24	1.15	.93	.55	3.24	38	189.10	257.60	298.03	305.99
52	.35	.67	.96	1.18	1.31	1.35	1.25	1.01	.59	3.52	40	187.94	253.21	287.94	287.94
54	.38	.73	1.04	1.28	1.42	1.46	1.35	1.09	.64	3.80	42	186.72	248.63	277.51	269.54
56	.41	.78	1.12	1.38	1.53	1.57	1.46	1.17	.69	4.09	44	185.44	243.87	266.78	250.85
58	.44	.84	1.20	1.48	1.65	1.69	1.57	1.26	.74	4.40	46	184.10	239.93	255.78	231.95
60	.47	.91	1.29	1.59	1.76	1.81	1.68	1.35	.80	4.72	48	182.71	233.83	244.51	212.92

Note.—When a chord of less than 100 ft. is used the corrections given in the above table should be added to the nominal length of chord to get the length which should be used in order that the 100 ft. points will check with those obtained by using the standard 100 ft. chord. Thus in locating a 14° curve by 25 ft. chords measure 25′.06 for each chord. Long chords are useful in passing obstacles.

Table VII.—Middle Ordinates for Rails in Feet.

Deg. of Curve	LENGTH OF RAILS							Deg. of Curve	LENGTH OF RAILS.						
	32	30	28	26	24	22	20		32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.037	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.486	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424	.361	.303	.250
15	.334	.295	.257	.223	.188	.159	.131	30	.660	.583	.508	.438	.374	.313	.259

SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:—subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction$=15^2 \div 2 \times 250.3 = .45$ (by slide rule) or horizontal distance$=250.3 - .45 = 249.85$. When vertical angle=V. A. is measured horizontal distance=slope distance—slope distance (1—Cos. V. A.). Thus for slope distance of 248.7 ft. and V. A. of 4° 20′ from Table VIII Cos=.99714 and correction=1—.99714=.00286 per foot or total of $.286 \times 2\frac{1}{2}$ (near enough)=.57 and horizontal distance=248.7—.57=248.13 ft.

TRIGONOMETRICAL FORMULAS.

See fig. (a).

sin. $A = \frac{a}{c}$

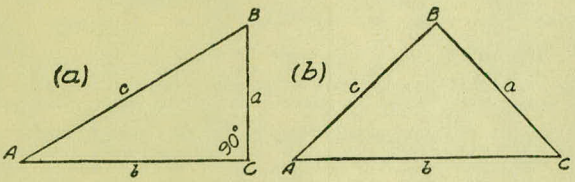
cos. $A = \frac{b}{c}$

tan. $A = \frac{a}{b}$

cot. $A = \frac{b}{a}$

sec. $A = \frac{c}{b}$

cosec. $A = \frac{c}{a}$



Formula for Solving Triangles.

Given	Sought.	Right triangles. See fig. (a).
a, c	A, B, b	$\sin. A = \frac{a}{c}$, $\cos. B = \frac{a}{c}$, $b = \sqrt{(c+a)(c-a)}$
a, b	A, B, c	$\tan. A = \frac{a}{b}$, $\cot. B = \frac{a}{b}$, $c = \sqrt{a^2+b^2}$.
A, a	B, b, c	$B = 90° - A$, $b = a \cot. A$, $c = \frac{a}{\sin. A}$.
A, b	B, a, c	$B = 90° - A$, $a = b \tan. A$, $c = \frac{b}{\cos. A}$.
A, c	B, a, b	$B = 90° - A$, $a = c \sin. A$, $b = c \cos. A$
Given	Sought.	Oblique triangles. See fig. (b).
A, B, a	b	$b = \frac{a \sin. B}{\sin. A}$
A, a, b	B	$\sin. B = \frac{b \sin. A}{a}$
a, b, C	$A - B$	$\tan. \frac{1}{2}(A-B) = \frac{(a-b) \tan. \frac{1}{2}(A+B)}{a+b}$
a, b, c	A	If $s = \frac{1}{2}(a+b+c)$, $\sin. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{b\,c}}$, $\cos. \frac{1}{2} A = \sqrt{\frac{s(s-a)}{b\,c}}$, $\tan. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$, $\sin. A = \frac{2\sqrt{(s-a)(s-b)(s-c)\,s}}{b\,c}$
A, B, C, a	area	$\text{area} = \frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area} = \frac{1}{2} b\,c \sin. A$
a, b, c	area	$s = \frac{1}{2}(a+b+c)$, $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.	
°					
0	0	0	∞	1	90
10	.0029	.0029	343.8	1	50
20	.0058	.0058	171.9	.99998	40
30	.0087	.0087	114.6	.99996	30
40	.0116	.0116	85.94	.99993	20
50	.0145	.0145	68.75	.99989	10
1	.0175	.0175	57.29	.99985	89
10	.0204	.0204	49.10	.99979	50
20	.0233	.0233	42.96	.99973	40
30	.0262	.0262	38.19	.99966	30
40	.0291	.0291	34.37	.99958	20
50	.0320	.0320	31.24	.99949	10
2	.0349	.0349	28.64	.99939	88
10	.0378	.0378	26.43	.99929	50
20	.0407	.0407	24.54	.99917	40
30	.0436	.0437	22.90	.99905	30
40	.0465	.0466	21.47	.99892	20
50	.0494	.0495	20.21	.99878	10
3	.0523	.0524	19.08	.99863	87
10	.0552	.0553	18.07	.99847	50
20	.0581	.0582	17.17	.99831	40
30	.0610	.0612	16.35	.99813	30
40	.0640	.0641	15.60	.99795	20
50	.0669	.0670	14.92	.99776	10
4	.0698	.0699	14.30	.99756	86
10	.0727	.0729	13.73	.99736	50
20	.0756	.0758	13.20	.99714	40
30	.0785	.0787	12.71	.99692	30
40	.0814	.0816	12.25	.99668	20
50	.0843	.0846	11.83	.99644	10
5	.0872	.0875	11.43	.99619	85
10	.0901	.0904	11.06	.99594	50
20	.0929	.0934	10.71	.99567	40
30	.0958	.0963	10.39	.99540	30
40	.0987	.0992	10.08	.99511	20
50	.1016	.1022	9.788	.99482	10
6	.1045	.1051	9.514	.99452	84
10	.1074	.1080	9.255	.99421	50
20	.1103	.1110	9.010	.99390	40
30	.1132	.1139	8.777	.99357	30
40	.1161	.1169	8.556	.99324	20
50	.1190	.1198	8.345	.99290	10
7	.1219	.1228	8.144	.99255	83
10	.1248	.1257	7.953	.99219	50
20	.1276	.1287	7.770	.99182	40
30	.1305	.1317	7.596	.99144	30
40	.1334	.1346	7.429	.99106	20
50	.1363	.1376	7.269	.99067	10
					82
	Cosin.	Cotg.	Tan.	Sine.	Angle.

Angle	Sine.	Tan.	Cotg.	Cosin.	
°					
8	.1392	.1405	7.115	.99027	82
10	.1421	.1435	6.968	.98986	50
20	.1449	.1465	6.827	.98944	40
30	.1478	.1495	6.691	.98902	30
40	.1507	.1524	6.561	.98858	20
50	.1536	.1554	6.435	.98814	10
9	.1564	.1584	6.314	.98769	81
10	.1593	.1614	6.197	.98723	50
20	.1622	.1644	6.084	.98676	40
30	.1650	.1673	5.976	.98629	30
40	.1679	.1703	5.871	.98580	20
50	.1708	.1738	5.769	.98531	10
10	.1736	.1763	5.671	.98481	80
10	.1765	.1793	5.576	.98430	50
20	.1794	.1823	5.485	.98378	40
30	.1822	.1853	5.396	.98325	30
40	.1851	.1883	5.309	.98272	20
50	.1880	.1914	5.226	.98218	10
11	.1908	.1944	5.145	.98163	79
10	.1937	.1974	5.066	.98107	50
20	.1965	.2004	4.989	.98050	40
30	.1994	.2035	4.915	.97992	30
40	.2022	.2065	4.843	.97934	20
50	.2051	.2095	4.773	.97875	10
12	.2079	.2126	4.705	.97815	78
10	.2108	.2156	4.638	.97754	50
20	.2136	.2186	4.574	.97692	40
30	.2164	.2217	4.511	.97630	30
40	.2193	.2247	4.449	.97566	20
50	.2221	.2278	4.390	.97502	10
13	.2250	.2309	4.331	.97437	77
10	.2278	.2339	4.275	.97371	50
20	.2306	.2370	4.219	.97304	40
30	.2334	.2401	4.165	.97237	30
40	.2363	.2432	4.113	.97169	20
50	.2391	.2462	4.061	.97100	10
14	.2419	.2493	4.011	.97030	76
10	.2447	.2524	3.962	.96959	50
20	.2476	.2555	3.914	.96887	40
30	.2504	.2586	3.867	.96815	30
40	.2532	.2617	3.821	.96742	20
50	.2560	.2648	3.776	.96667	10
15	.2588	.2679	3.732	.96593	75
10	.2616	.2711	3.689	.96517	50
20	.2644	.2742	3.647	.96440	40
30	.2672	.2773	3.606	.96363	30
40	.2700	.2805	3.566	.96285	20
50	.2728	.2836	3.526	.96206	10
					74
	Cosin.	Cotg.	Tan.	Sine.	Angle.

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
o/						o/					
16	.2756	.2867	3.487	.96126	74	24	.4067	.4452	2.246	.91355	66
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229	.91236	50
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211	.91116	40
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194	.90996	30
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177	.90875	20
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161	.90753	10
17	.2924	.3057	3.271	.95615	73	25	.4226	.4663	2.145	.90631	65
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128	.90507	50
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112	.90383	40
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097	.90259	30
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081	.90133	20
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066	.90007	10
18	.3090	.3249	3.078	.95106	72	26	.4384	.4877	2.050	.89879	64
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035	.89752	50
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020	.89623	40
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006	.89493	30
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991	.89363	20
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977	.89232	10
19	.3256	.3443	2.904	.94552	71	27	.4540	.5095	1.963	.89101	63
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949	.88968	50
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935	.88835	40
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921	.88701	30
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907	.88566	20
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894	.88431	10
20	.3420	.3640	2.747	.93969	70	28	.4695	.5317	1.881	.88295	62
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868	.88158	50
20	.3475	.3706	2.669	.93769	40	20	.4746	.5392	1.855	.88020	40
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842	.87882	30
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829	.87743	20
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816	.87603	10
21	.3584	.3839	2.605	.93358	69	29	.4848	.5543	1.804	.87462	61
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792	.87321	50
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780	.87178	40
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767	.87036	30
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756	.86892	20
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744	.86748	10
22	.3746	.4040	2.475	.92718	68	30	.5000	.5774	1.732	.86603	60
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720	.86457	50
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709	.86310	40
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698	.86163	30
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686	.86015	20
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675	.85866	10
23	.3907	.4245	2.356	.92050	67	31	.5150	.6009	1.664	.85717	59
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653	.85567	50
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643	.85416	40
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632	.85264	30
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621	.85112	20
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611	.84959	10
					66						58
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
° ′						° ′					
32	.5299	.6249	1.600	.84805	58	30	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30						
40	.5398	.6412	1.560	.84182	20	39	.6293	.8098	1.235	.77715	51
50	.5422	.6453	1.550	.84025	10	10	.6316	.8146	1.228	.77531	50
						20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30						
40	.5544	.6661	1.501	.83228	20	40	.6428	.8391	1.192	.76604	50
50	.5568	.6703	1.492	.83066	10	10	.6450	.8441	1.185	.76417	50
						20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30						
40	.5688	.6916	1.446	.82248	20	41	.6561	.8693	1.150	.75471	49
50	.5712	.6959	1.437	.82082	10	10	.6583	.8744	1.144	.75280	50
						20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30						
40	.5831	.7177	1.393	.81242	20	42	.6691	.9004	1.111	.74314	48
50	.5854	.7221	1.385	.81072	10	10	.6713	.9057	1.104	.74120	50
						20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30						
40	.5972	.7445	1.343	.80212	20	43	.6820	.9325	1.072	.73135	47
50	.5995	.7490	1.335	.80038	10	10	.6841	.9380	1.066	.72937	50
						20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30						
40	.6111	.7720	1.295	.79158	20	44	.6947	.9657	1.036	.71934	46
50	.6134	.7766	1.288	.78980	10	10	.6967	.6713	1.030	.71732	50
						20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											°
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

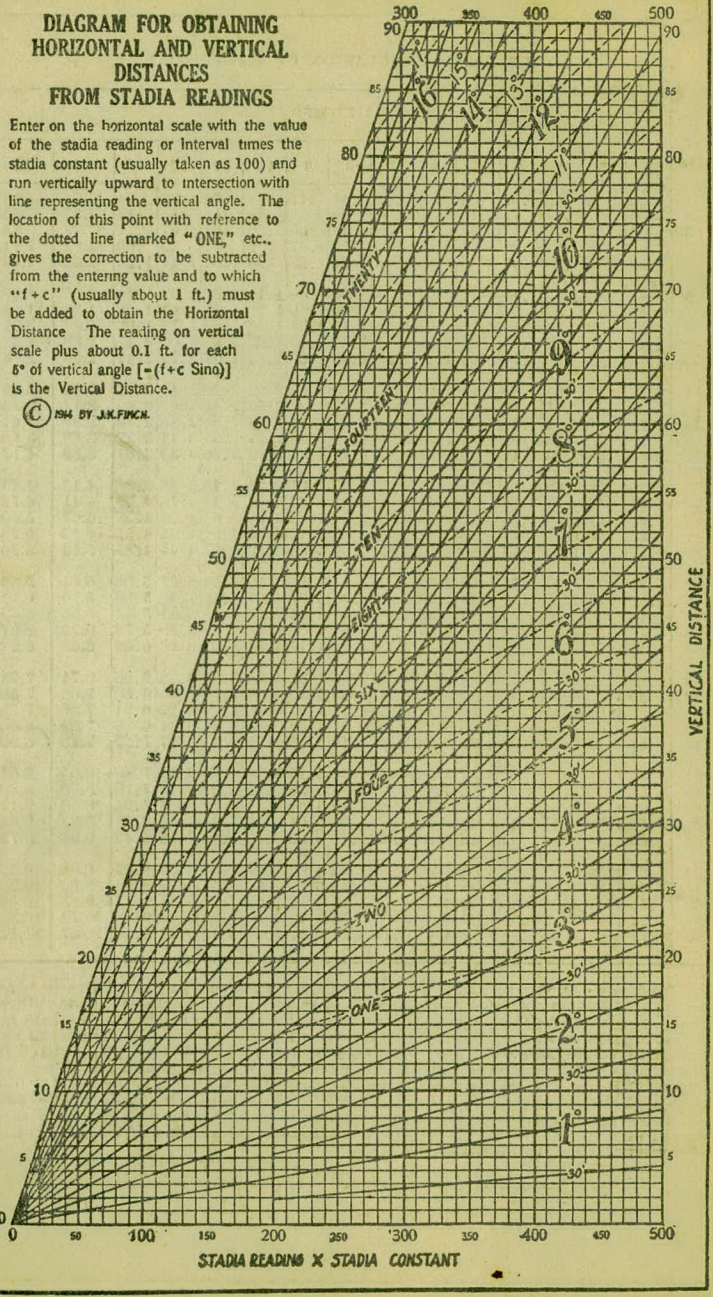
Table IX.—Calculation of Earthwork.

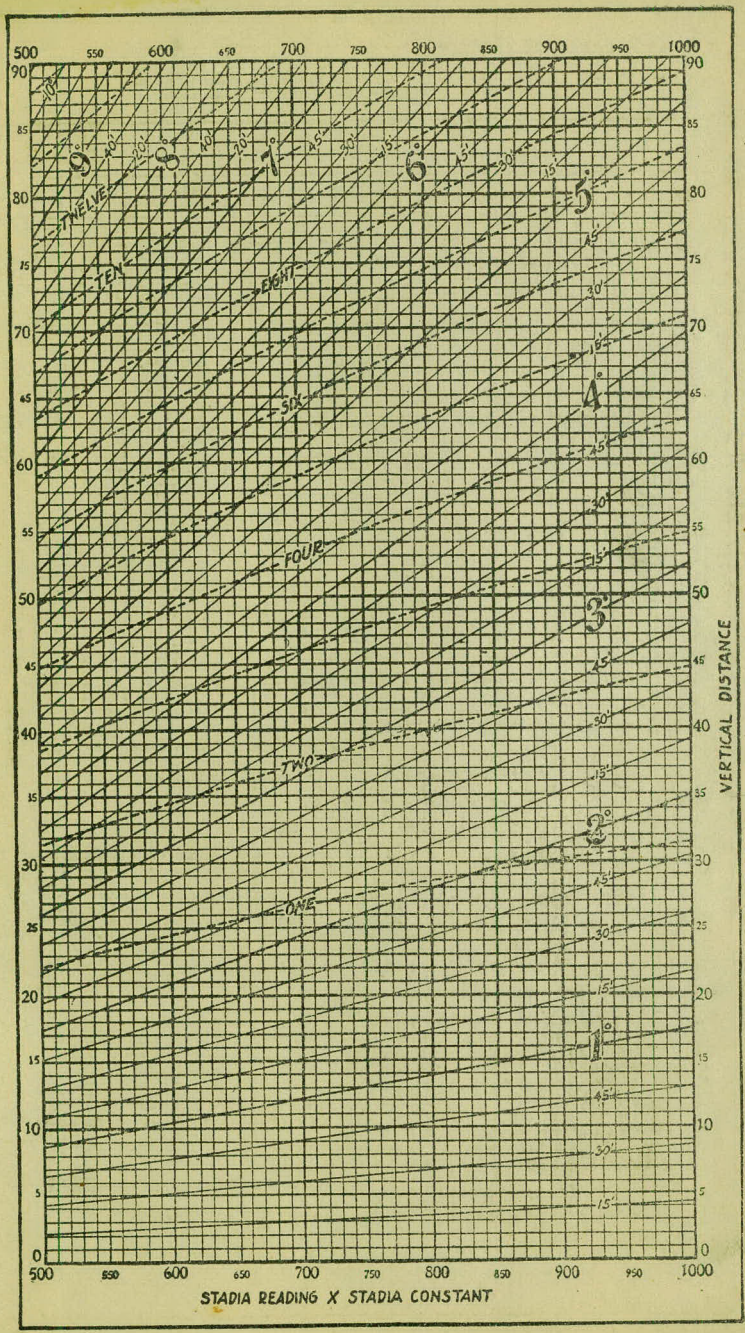
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	1.04	1.11
5	.09	.19	.28	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
6	.11	.22	.33	.44	.56	.67	.78	.89	1.00	1.11	1.22	1.33	1.44	1.55	1.67
7	.13	.26	.39	.52	.65	.78	.91	1.04	1.16	1.30	1.42	1.55	1.68	1.81	1.94
8	.15	.30	.44	.59	.74	.89	1.04	1.19	1.33	1.48	1.63	1.78	1.92	2.08	2.22
9	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50
10	.18	.37	.56	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
11	.20	.41	.61	.82	1.02	1.22	1.43	1.63	1.83	2.04	2.24	2.44	2.65	2.85	3.06
12	.22	.44	.67	.89	1.11	1.33	1.56	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33
13	.24	.48	.72	.96	1.20	1.44	1.68	1.92	2.16	2.41	2.65	2.89	3.13	3.37	3.61
14	.26	.52	.78	1.04	1.30	1.55	1.81	2.08	2.33	2.59	2.85	3.11	3.37	3.63	3.89
15	.28	.56	.83	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17
16	.30	.59	.89	1.18	1.48	1.78	2.07	2.37	2.67	2.96	3.26	3.56	3.85	4.15	4.44
17	.31	.63	.94	1.26	1.57	1.89	2.20	2.52	2.83	3.15	3.46	3.78	4.09	4.41	4.72
18	.33	.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00
19	.35	.70	1.06	1.41	1.76	2.11	2.46	2.82	3.17	3.52	3.87	4.22	4.57	4.92	5.28
20	.37	.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33	3.70	4.07	4.44	4.81	5.18	5.56
21	.39	.78	1.17	1.55	1.94	2.33	2.72	3.11	3.50	3.89	4.28	4.67	5.06	5.44	5.83
22	.41	.81	1.22	1.63	2.04	2.44	2.85	3.26	3.67	4.07	4.48	4.89	5.30	5.70	6.11
23	.43	.85	1.28	1.70	2.13	2.56	2.98	3.41	3.83	4.26	4.68	5.11	5.54	5.96	6.39
24	.44	.89	1.33	1.78	2.22	2.67	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67
25	.46	.92	1.39	1.85	2.31	2.78	3.24	3.70	4.17	4.63	5.09	5.56	6.02	6.48	6.94
26	.48	.96	1.44	1.92	2.41	2.89	3.37	3.85	4.33	4.82	5.30	5.78	6.26	6.74	7.24
27	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
28	.52	1.04	1.55	2.07	2.59	3.11	3.63	4.15	4.67	5.18	5.70	6.22	6.74	7.26	7.78
29	.54	1.07	1.61	2.15	2.68	3.22	3.76	4.30	4.83	5.37	5.91	6.44	6.98	7.52	8.06
30	.56	1.11	1.67	2.22	2.78	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
31	.57	1.15	1.72	2.30	2.87	3.44	4.02	4.59	5.17	5.74	6.32	6.89	7.46	8.04	8.61
32	.59	1.18	1.78	2.37	2.96	3.56	4.15	4.74	5.33	5.92	6.52	7.11	7.70	8.30	8.89
33	.61	1.22	1.83	2.44	3.05	3.67	4.28	4.89	5.50	6.11	6.72	7.33	7.94	8.55	9.17
34	.63	1.26	1.89	2.52	3.15	3.78	4.40	5.04	5.67	6.29	6.93	7.56	8.18	8.81	9.44
35	.65	1.30	1.94	2.59	3.24	3.89	4.53	5.18	5.83	6.48	7.13	7.78	8.42	9.08	9.72
36	.67	1.33	2.00	2.67	3.33	4.00	4.66	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00
37	.68	1.37	2.06	2.74	3.42	4.11	4.79	5.48	6.17	6.85	7.54	8.22	8.91	9.59	10.28
38	.70	1.41	2.11	2.82	3.52	4.22	4.92	5.63	6.33	7.03	7.74	8.44	9.15	9.85	10.56
39	.72	1.44	2.17	2.89	3.61	4.33	5.05	5.78	6.50	7.22	7.95	8.67	9.39	10.11	10.83
40	.74	1.48	2.22	2.96	3.70	4.44	5.18	5.92	6.67	7.41	8.15	8.89	9.63	10.37	11.11

Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths. Thus if w =16.2 and h =5.3, cu. yds. =1.48+.028+.089 =1.597 cu. yds. or practically 160 cu. yds. per 100 ft. If w exceeds 40 ft., use one half and multiply result by 2, if both w and h are large use one half of each and multiply result by 4. Any cross-section may be divided into triangles by the following rule. To the triangle of the sum of the outside cuts (or fills) =h, and ½ the roadbed =w, add the triangles formed by taking the distance out to each break in turn (=w's) by the difference between the cuts (or fills) on each side of it (=h's) always subtracting the outer from the inner.

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which "f+c" (usually about 1 ft.) must be added to obtain the Horizontal Distance The reading on vertical scale plus about 0.1 ft. for each 5° of vertical angle [=(f+c Sin α)] is the Vertical Distance.




500 550 600 650 700 750 800 850 900 950 1000
90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
TWELVE
TEN
EIGHT
FOUR
TWO
ONE
9°
8°
7°
6°
5°
4°
3°
2°
1°
10'
20'
40'
30'
45'
15'
VERTICAL DISTANCE
STADIA READING X STADIA CONSTANT

Waldock + Cmeil

Topography of Cornfields
and
Potato Patch.

26-62
B

390

389

388+50

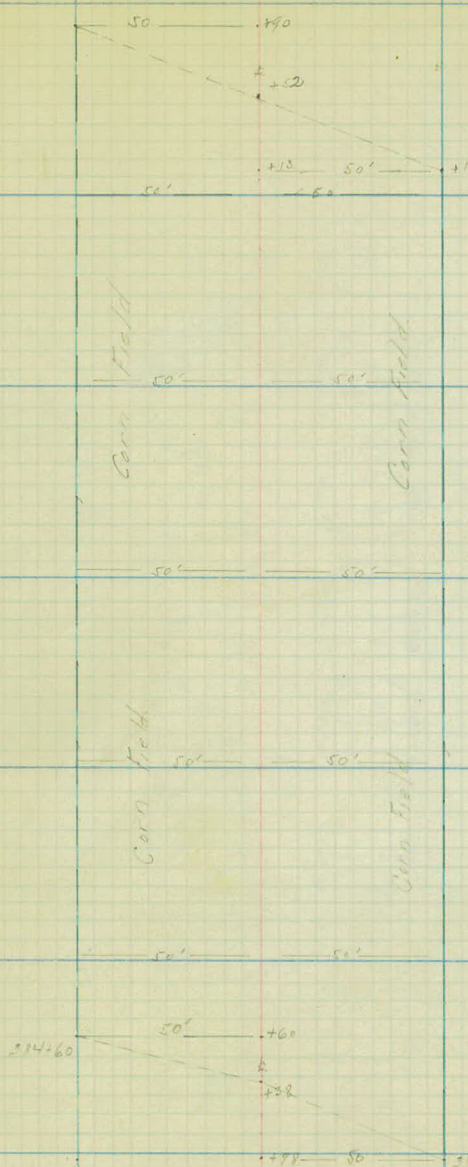
387

386

385

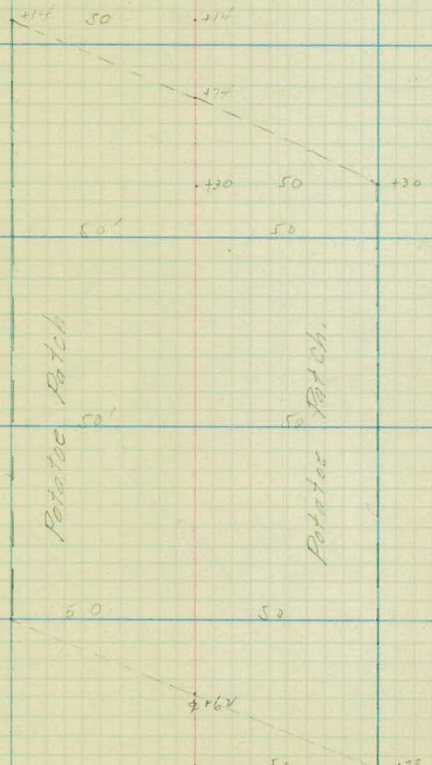
384+00

383+00



MIKE WALDOCK !

Topography of Corn Field.

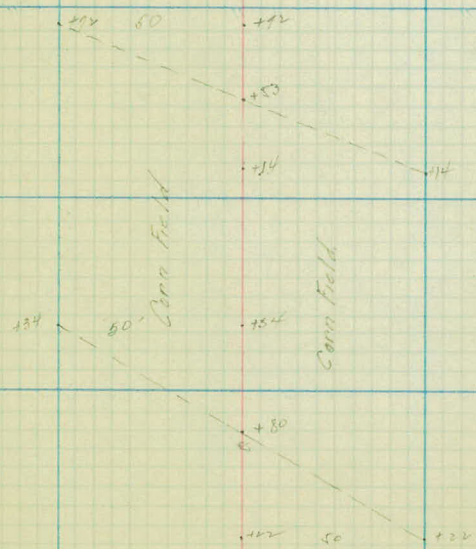


Topography Potato Patch 2

382+00

381+00

380+00



Cmeil

Topography Corn Field.

894.81
2.27
903.08
3.14
899.92
3.75
907.69
2.61
905.08
10.35
915.43
1.11
914.32
1.15
915.47

914.26
1.19
915.41
6.16
909.25
3.99
913.24
4.63
908.61
4.44
912.10
7.56
905.54
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4.27
905.04
4.47
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914.26

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5.33
904.18
8.91
913.09
2.41
910.67
7.36
918.03
2.23
915.80

710.84
8.60
902.24
5.79
908.03
9.63
898.40
5.27
903.67
7.79
895.88
4.51
900.20
5.55
894.55

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.

For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	25.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be 41.9+(20—16)÷2 or 2 ft. added to 41.9 =43.9. For slopes of 1 on 1 see inside of front cover.

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