Fred Nesbitt

ENGINEERS' FIELD BOOK No. 10703

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.

Book No 4

Proj. 23-60

Sta	Sta.		Book	Page	Page
80+00	93+50		5	3	7
(93+75	108+00)		4	1	6
103	106		5	17	17
108+25	118		5	9	16
117+20	153+50	← Finals Sta 61 – 153+50 →	4	7	23
61	79+75		4	24	33
Mrs Betts F.E.			4	36	37
Farm Entr.			4	34	35
↓	↓		4	39	39
↓	↓		5	18	19
Barns St. Connect.			4	40	42
Culv. Inst.		↓	4	76	77
0+75	15+00	Finals	4	43	50
44+00	67+75	↓	4	51	68

Index

Sta	to	Sta	Description	Page to Page

Grades Final

Cross Sections

Sta.	B. S.	H. I.	F. S.	Elev. Grade	Gr. R.
B.M.	7.19	884.52 ✓		877.33 ✓	
93+75	876.30		8.8		9.22 ✓
94	876.7		8.1		8.35
+25			7.7		
+50	877.17		7.4		7.35
+75			7.4		
B.M.			1.41	883.09 (883.11) ✓	
95	877.00		7.7	8	7.5 ✓
+25			7.8		
+50	876.30		7.9		8.22 ✓
+75	875.86 ditch Lt		8.3		8.66
96	875.55				8.91
+15	875.40				9.12 ✓
+14	Inv. El. Rt 24" RC		7.7		

Inst. Nesbill
Rod. Alberg-Nelson
Chain. Galvin

9/24/24

Left				CL	Right			
End board Rail R93+50								
				(9.2)				
5.6 / 29	10.0 / 23	10.2 / 18.5	8.7 / 15	8.8	9.2 / 20	10.3 / 22	10.4 / 26.5	5.7 / 31
				(8.3)				
4.1 / 30	9.5 / 22.5	9.5 / 18.5	7.6 / 15	8.1	8.6 / 18	9.8 / 5.2	9.8 / 27	8.5 / 34
				(7.1)				
3.6 / 28.2	9.8 / 22.5	8.6 / 18	7.3 / 15	7.7	8.2 / 17.5	9.2 / 20	9.6 / 26	8.0 / 33
				(7.3)				
4.0 / 27.5	8.1 / 21	8.2 / 17	6.4 / 15	7.4	8.0 / 17	9.3 / 20	9.4 / 25	3.4 / 33
4.3 / 27	7.9 / 21.6	7.7 / 17.2	6.6 / 15	7.4	7.8 / 15	9.5 / 19	9.2 / 24	3.9 / 31.3
Nail 12 Oak- 93'R-9.4+75				(7.3)				
4.5 / 27	8.4 / 21.6	8.2 / 18	6.7 / 15	7.7	8.1 / 16	9.4 / 18	9.4 / 23	4.6 / 29.6
5.7 / 25.6	8.6 / 21.2	8.3 / 17.5	7.0 / 15	7.8	8.1 / 15	9.7 / 18	9.7 / 22	5.1 / 28
				(8.2)				
7.7 / 25.3	9.8 / 22.7	9.6 / 19.8	7.5 / 16	7.9	8.1 / 15.5	9.7 / 19.5	9.5 / 23.5	5.4 / 28
				(8.6)				
12.7 / 28.7	12.4 / 22.5	8.9 / 15		8.3	8.3 / 16	10.7 / 19	10.2 / 22.5	5.6 / 26.7
				(8.9)				
✓ 8.4 / 17				8.4	8.6 / 15	10.9 / 19	10.9 / 23	6.0 / 27
				(9.1)				
✓ 9.3 / 18.5				8.6	8.7 / 15	11.2 / 17.5	10.8 / 24	8.9 / 26.7

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		884.52			
96+35	875.33		8.6		9.19
+50	00 Ditch Lt.				
+65	875.30		8.9		9.22
TP	012	872.35	12.29	872.23	
96+35	875.33				-2.98
96+15	875.40				-3.05
+12	-1m Ct. Lt 24" P3		13.90		
96	875.55				-3.2
TP	12.99	885.12	0.22	872.13	
97	875.55				9.59
+25					
+50	876.30				8.8
+75					
98	877.05				8.09
+25					
+50	877.30				7.84

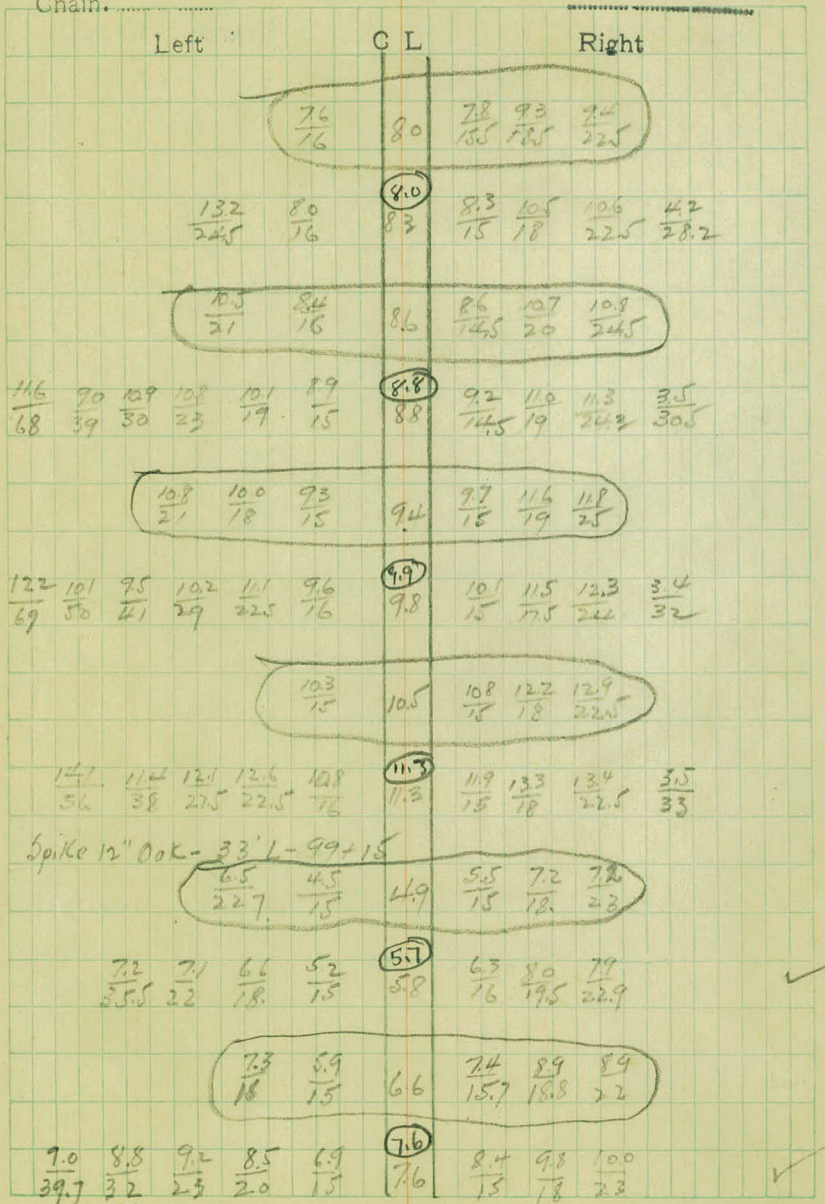
Inst. .....
Rod. .....
Chain. .....

Left				C L	Right			
		8.6 / 18.6		9.2 / 8.6	8.6 / 15	10.7 / 18	10.3 / 23	8.2 / 26.3	7.6 / 30
11.1 / 26.6	11.9 / 24.5	11.7 / 20.5	8.8 / 16	9.2 / 8.9	8.8 / 14	10.5 / 18	10.6 / 23	5.3 / 28.8	
10.5 / 30.5				-2.9					
14.6 / 48.5	8.6 / 40			-3.0					
7.6 / 35				-3.2					
7.9 / 27	10.7 / 22	10.5 / 18	9.4 / 15	9.5 / 9.3	9.2 / 15	10.7 / 17.5	10.9 / 23.5	3.0 / 32	
7.5 / 27	10.8 / 22	10.6 / 17.5	9.0 / 15	9.0	9.0 / 14.5	10.3 / 18	10.5 / 23	3.0 / 31	
7.4 / 27	10.5 / 22	10.2 / 17.5	8.8 / 15.5	8.8	8.6 / 18	9.9 / 17	9.9 / 22	3.6 / 30.5	
10.0 / 21.5	10.0 / 18	8.6 / 15		8.7	8.5 / 15	10.0 / 18	10.0 / 23		
	10.5 / 20	8.0 / 16		8.0 / 8.2	8.0 / 14.5	9.7 / 18	9.8 / 23	5.3 / 27.5	
		7.8 / 16		8.0	7.5 / 15	9.5 / 17.5	9.6 / 22.5		
	11.5 / 28	7.7 / 16		7.8 / 7.9	7.7 / 15	9.3 / 18	9.3 / 22	2.6 / 30.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		885.12			
98+75			8.0		
99	877.05 End Ditch Lt.		8.3		8.07
+25			8.6		
+50	876.30		8.8		8.8
+75			9.2		
100	875.17		9.8		9.95
+25			10.5		
+50	873.80		11.3		11.32
B.M.	3.61	877.90	10.83	874.29	
+75			11.9		
101	872.17		5.8		5.73
+25			6.6		
+50	870.30		7.6	703	7.60

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



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		877.90 ✓			
101+75			8.7		
102 ✓	868.17		9.8		9.13
+25					
PT	3.05	869.80 ✓	11.15	866.75 ✓	
+50 ✓	866.80				4.00
+75					
103 ✓	863.30		6.4	863.4	6.50
BM	12.10	886.39 ✓		874.29	
101	872.17				14.22
+50 ✓	870.30				16.09
102	868.17				18.22
+50	865.80				20.59
PT	0.26	880.94 ✓	5.71	880.68 ✓	
103	863.30				17.64
+50	860.8				20.14

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

Left					C L	Right				
			9.5 / 19.5	7.8 / 15	8.7	7.7 / 15.5	11.1 / 18.5	11.2 / 22		
11.44 / 44	11.6 / 32	11.4 / 31	10.6 / 20.44	8.8 / 15	9.7 / 9.8	10.8 / 15	12.5 / 19	12.5 / 21	9.8 / 24	↓ T.R
			12.1 / 21.5	10.3 / 15	10.8	11.6 / 14.7	13.1 / 19.4	13.1 / 22.5	10.3 / 25.4	↓ T.R
6.0 / 58	6.4 / 50	6.0 / 24.5	5.2 / 21.5	8.2 / 15	4.0 / 3.9	4.6 / 14	5.7 / 18.5	5.7 / 28	2.0 / 27.5	↓ T.R
				4.8 / 15	5.1	3.7 / 12	7.1 / 18	7.2 / 23		
7.5 / 63	7.5 / 50	7.7 / 39	7.9 / 20	5.7 / 15.5	6.5 / 6.4	6.8 / 14.5	8.1 / 18	8.3 / 23	↓ T.R	
SPK 12' Coc-33'L-997+15										
					14.2		5.0 / 35.0			
					16.1		5.1 / 36.5			
					18.2		5.6 / 39			
					20.6		7.3 / 40			
					17.6		3.1 / 42			
			6.7 / 40		20.1		4.9 / 47.2			

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		880.94 ✓			
104	858.30				22.64
+25					
+50	855.80				25.14
+75	854.55				26.39
105	853.30				27.64
TP	2.54	870.90 ✓	12.58	868.36 ✓	
105+25	852.05				18.85
+50.	850.80				20.10
P	0.96	859.86 ✓	1200	858.90 ✓	
BM.	2.25	850.88 ✓	1123	848.63 ✓	
106	846.30				7.58
+30	846.80				4.08
+50	845.81				5.07
+75					

Inst.
Rod.
Chain.

Left	C L	Right
61 / 42	226	41 / 41
67 / 23		49 / 42
89 / 41	251	74 / 43
108 / 40.5	263	10.8 / 41
139 / 39	276	15.5 / 38
71 / 37	188	41 / 32
109 / 33	201	

See Page 17 Book 5

To S.E. Cor. Lot 109 Cotto Pat. 10578

24 / 18	23	21 / 18
	26	
38 / 20	41	24 / 19
45 / 21	51	44 / 19
56 / 19	56	59 / 21

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
		850.88 ✓			
107	843.41				7.47
+25					
+50	841.26				9.62 ✓
+75					
108	839.xx ✓				
PP			11.56	839.32 ✓	11.66

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

Left	C L	Right
	7.4	
6.6 / 20	6.8	6.7 / 20
7.8 / 20	7.9	7.9 / 20
	9.6	
8.9 / 20	8.7	9.1 / 20
9.8 / 19	10.2	10.5 / 20
	11.7	
10.6 / 20	11.2	11.6 / 19.5

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM.	11.78	836.66		824.88	
117+20	827.10		8.4	828.3	9.56
+35	827.60				9.06
+50	828.20				8.46
+80	829.20				7.46
118	829.75		4.9		6.91
+20	830.41 ODITCH L		4.9	31.8	6.25
+50	831.41		3.6	33.1	5.25
+75					
119	832.99		1.4	835.3	3.67
TP	11.66	846.47	1.85	834.81	
+25	833.80				12.67
TP	9.45	844.26	11.66	834.81	
450	834.04		7.1	837.2	9.47

Inst.
Rod.
Chain.

Left C L Right

Ent Grant Rail LH 17450

9.16
6.1/28 9.8/22 9.9/18 8.5/15 8.5/14.5 10.1/18 10.2/22.5 7.8/26 T.R. 3.7/31

9.1
5.0/29 9.4/22 9.5/18 7.9/15 7.6/15 9.7/19 9.6/22.5 7.1/25.5 T.R. 2.5/32

8.5
8.6/30 9.1/24.5 8.9/17.5 7.3/15 7.2/15 9.1/19 9.1/23.5 T.R. 3.1/30.5

7.5
3.1/29 8.2/23 8.3/17.5 6.2/14.5 6.1/14 7.9/18 8.1/26.5 0.7/35.5

7.2
6.1/25 8.2/22 8.1/19.5 6.3/15 5.5 5.4/15 7.9/18.5 7.8/28.5

6.3
7.7/22 5.0/16 4.9 4.7/15 7.4/19 7.4/28

5.3
7.2/23 4.4/18 3.5/16 3.6 3.5/15 6.5/19 7.0/30

2.5/17 2.5 2.4/15

3.7
3.8/12 2.1/18 1.3/15 1.4 4.1/15 4.9/20 5.5/35.5 4.4/26.5 → 0.3/32

11.7
13.2/22 11.1/18 10.4/16 10.1 10.1/14.5 13.7/20 11.2/25.5

9.9
11.2/28 9.9/21 7.1/15 7.1 7.1/15 8.8/19 8.9/24

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		844.26 ✓			
119+70	835.10				9.16
120	835.76				8.50
+15	Beg Ivg Dolite Lt				
+25	836.40		4.6	839.7	7.86
+50	836.94		4.7	840.0	7.32 ✓
(+65 int.)	(37.27)				(7.00)
+80	837.60				6.66
121					
121+35	838.60		2.5	841.8	5.66
+65	839.17		2.0		5.09
+85	839.31		1.6		4.95
TP ⊙	8.84	849.89 ✓	3.21	841.05 ✓	
122+20	840.10				9.79
+40	840.28				9.61
+75	841.02				8.87
123	841.06		5.3	844.6	8.43

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

Left				C L	Right			
10.6 / 31	10.5 / 27	8.5 / 19.5	6.4 / 15	9.2 / 6.2	6.0 / 15	7.2 / 18	7.0 / 22	3.0 / 29
7.9 / 22	8.4 / 19	5.8 / 15		8.5 / 5.5	5.2 / 15	6.5 / 19.5	6.5 / 24.5	1.4 / 31.5
7.2 / 33	6.5 / 19	5.7 / 17.5	5.2 / 15	7.9 / 4.6	4.6 / 16	5.8 / 20	5.9 / 24	0.8 / 32
	7.1 / 37	6.6 / 22	4.5 / 15.5	7.4 / 4.3	4.0 / 16	5.4 / 18.5	5.2 / 23.5	1.8 / 26
(	6.7 / 39	6.3 / 21.5	4.1 / 16.0	4.0	3.6 / 15.5	5.0 / 18	4.9 / 22	1.0 / 26)(int.)
	6.4 / 40.5	6.0 / 21	3.8 / 16.5	6.7 / 3.7	3.2 / 15	4.7 / 18	4.6 / 20	0.2 / 26
	6.5 / 42	5.6 / 20.5	3.4 / 15	3.4	2.7 / 15.5	4.2 / 18.5	4.1 / 21.5	0.1 / 24.5
5.2 / 41	5.6 / 37	4.5 / 19	2.8 / 14.5	5.7 / 2.8	2.3 / 15	3.5 / 18	3.5 / 21	0.4 / 24.5
4.8 / 47	5.0 / 39	4.3 / 20	2.1 / 15.5	5.1 / 2.0	1.6 / 16	2.5 / 18.5	2.8 / 20.5	1.4 / 22
4.7 / 50	4.4 / 37	3.7 / 20	1.9 / 15.5	4.8 / 1.6	1.2 / 17	2.4 / 19.5	2.4 / 22.5	
Rock 50'L +122+								
8.7 / 39	8.8 / 33	8.2 / 18	6.8 / 14	9.8 / 6.2	5.9 / 15.5	7.0 / 19	7.0 / 23	1.5 / 31
8.2 / 43	9.4 / 42.5	8.3 / 29	7.8 / 19	9.4 / 6.0	5.7 / 16	6.4 / 18.5	6.3 / 21.5	0.3 / 31
	9.8 / 38	11.0 / 35	10.8 / 28	9.4 / 22	5.9 / 15	8.9 / 5.0	5.0 / 16	6.2 / 19	5.5 / 21.5	0.7 / 32
✓				5.4 / 17	8.9 / 5.3	4.8 / 15	6.2 / 18.5	5.5 / 21.6	0.3 / 32

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM	1178	836.66		82488	
TP	12.00	846.81	1.85	83481	
117+20	827.10				19.71
+35	827.60				19.21
+50	828.20				18.61
118	829.75				17.06
+20	830.41				16.40
+50	831.41				15.40
+75					
119	832.99				13.82
TP	1200	858.62	0.19	846.62	
119	832.99				25.63
TP	10.42	868.66	0.38	858.24	
+25	833.80				34.86
+50	834.44				34.22

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

Left	C L	Right
Rod Guard Rail L 117+50		
19.7		8.5 / 36
19.2		7.5 / 36
18.6		8.3 / 35
17.0		19.1 / 37.5
16.4		8.9 / 38
15.4		4.8 / 37.8
		0.1 / 42.5
13.8	10.9 / 35	4.7 / 36
25.6		3.8 / 54
34.9	14.5 / 51	8.6 / 58
34.3	17.3 / 52	7.9 / 59

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
		868.66 ✓			
119+70	835.10				33.56
120	835.76				32.90
+25	836.40				32.26
+50	836.94				31.72
+80	837.60				31.06
TP	9.08	872.68 ✓	5.11	863.58 ✓	
121+35	838.60				34.08
121 +65	839.17				33.46
121 +85	839.31				33.32
122+20	840.10				32.53
+40	840.28				32.35
TP	2.99	866.38 ✓	9.22	863.39 ✓	
+75	841.02				25.36
123	841.46				24.92

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

Left	C L	Right		
	33.6	10.3 / 51	5.8 / 58	
	32.9	4.3 / 57		
	32.3	14.0 / 44	11.2 / 46	8.8 / 49	5.0 / 55
	31.8		6.0 / 48	6.0 / 51	2.5 / 54
	31.1		11.5 / 42	4.8 / 50	0.3 / 58
	34.0		12.7 / 46	8.6 / 51	5.4 / 54
	33.4		12.0 / 46	7.1 / 54	4.3 / 53
	33.1		12.8 / 45	7.1 / 54	3.8 / 56
	32.5			11.2 / 46	5.2 / 53
	32.3			7.7 / 52	4.3 / 54
	25.4			4.4 / 47	1.6 / 46
	24.9			10.2 / 40	6.8 / 43

Cross Sections

Sta.	B.S.	H.I.	F.S.	Grade	Gr. R.
		866.38 ✓			
TP	0.91	855.49 ✓	11.80	854.58 ✓	
123+50	842.44				13.06
~~+75~~					
TP	7.10	852.45 ✓	10.17	845.35 ✓	
123+75	842.97				9.48
124+07	843.71				8.74
+25	844.23				8.22
+41	844.60				7.85
+50	844.94				7.51
+75	845.70				6.75
125	846.51				5.94
BM			1.30	851.15 ✓	
TP	0.84	46.19	7.10	45.35	
123+75	842.97				
124+07	843.71				
124+50	End Ditch Rt				

Inst.
Rod.
Chain.

Left	C L	Right
10.1 / 18	13.1 / 10.3	10.1 / 15
12.2 / 18	13.0 / 26	9.1 / 30
6.8 / 19.5	9.3 / 6.9	6.8 / 15
6.7 / 20	8.8 / 6.2	6.2 / 16
6.0 / 20	8.3 / 6.0	5.7 / 16
5.7 / 20	7.9 / 5.6	5.5 / 17
5.4 / 20	7.6 / 5.2	5.3 / 17
4.8 / 19.5	6.8 / 4.8	4.7 / 18
4.2 / 19	6.0 / 4.1	4.1 / 18

Cattle Pass 12 ft

	6.7	5.6 / 23	5.6 / 25	6.2 / 30	3.8 / 32
	2.5	11.1 / 35	7.9 / 40	10.4 / 48	7.6 / 48

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.-	6.05	857.86		851.81	
125+00					
+25					
+50					
+75					
126					
+25					
+50					
T.P.	Rt.		12.51	845.35	
T.P.	Lt.		11.66	846.20	
+75					
127					
+25.					
+50					
T.P.			0.28	857.58	

Inst. Galvin 10-6-24 - P.M. 12
Rod. Staag
Chain. Attaberg

	Left			C L			Right			
BM cattle pass (marked 851.81)										
T	9.2			8.0 (11.4)			8.8			✓
	19.0			00			18.0			
				(10.5)						
T	8.5			8.5			8.4			✓
	19.0			00			18.0			
				(9.6)						
T	7.9			7.9			7.9			
	18.0			00			18.0			✓
				(8.6)						
T	7.2			7.4			7.4			
	17.0			00			18.0			✓
				(7.6)						
T	7.0			6.6			6.6			
	16.0			00			17.0			✓
				(6.6)						
	3.6	11.7	12.0				5.9	10.9	14.4	10.8
	43.0	37.0	24.0	6.6.0			1.6.0	25.0	47.0	50.0
				(5.4)						
	00	7.4	8.4	5.2	4.8		4.9	8.4	10.3	7.8
	30.0	22.0	20.0	14.0	00		17.0	23.0	37.0	43.0
				(4.3)						
T	4.7	5.3	3.8	3.8			4.0	7.6	5.7	
	2.2.0	16.5	14.0	00			17.0	35.0	39.0	
				(3.0)						
T		4.0	2.6	2.7	2.7		5.7	3.9		
		19.0	15	00	21.0		30.0	32		
T	2.5	2.5	1.6	1.6			1.0			
	20	17.0	10.0	00			17.0	FE	RT	
				(0.15)						
T	1.4	1.4	0.3	0.3			00	0.7	1.1	
	22.0	17.0	15.0	00			17.0	18	24.0	✓

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
T.P.	1.36	846.71		845.35	
126					
125+75					
125+50					
T.P.	0.01	834.87	11.85	834.86	
125+25					
125					
TP	0.02	846.22		846.20 carried	
126					
125+75					
125+50					
125+25					
125					
T.P.	1.02	867.80		857.78 carried	
126+75					
127					

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

10-6-24-P.M.

Left	C L	Right
	(-3.6) 3.8 5.2 5.7 7.3 6.8 4.0 / 31.0 41.0 57.0 59.0 64.0 66.0	
	(-6.9) 8.2 9.7 10.3 9.5 / 37.0 52.0 55.0 60.0	
	(-1.6) 11.3 12.4 12.7 / 40.0 52.0 60.0	
	(-12.5) 3.0 / 46.0	
	(-11.6) 5.4 / 45.0	
+1.3 / 34.0	1.3 2.4 1.5 / 40.0 33.0 27.0 (-4.1)	
	3.2 6.4 4.3 4.4 / 43.0 38.0 36.0 32.0 (-3.1)	
	7.6 / 36.0 (-2.1)	
	9.9 / 40.0 (-1.2)	
	12.4 11.7 / 46.0 41.0 (-0.3)	
	5.6 / 31.0 (14.2)	
	1.7 / 33.0 (12.9)	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
127+15		867.80			
+50					
+75					
128					
+25					
+50					
+75					
129					
+25					
+50					
T.P.	11.82	879.07	0.55	867.25	
128					
+25					
+50					

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

10-6-24 - PM.

14.

Left				CL				Right
				0.0 35.0				
				(10.4)				
5.5 30.5	11.3 22	11.4 17.5	10.2 15.0	10.2 0.0	10.0 16	10.6 18	11.0 24.0	5.5 31.0
				(9.2)				
2.5 31.5	10.1 23.0	10.0 18.0	9.3 16.0	9.1 0.0	8.9 14.0	9.6 15.0	9.6 23.5	1.8 32.0
				(7.9)				
0.7 33	9.3 23.0	9.2 18.0	8.0 15.0	7.7 0.0	7.4 15	8.7 17.0	8.7 23.5	✓
				(6.7)				
↓	8.0 24	8.1 16.5	6.8 13.5	6.7 0.0	6.3 16.0	7.6 18.0	7.7 23.5	✓
				(5.4)				
↓	6.9 20.5	6.9 17.0	5.4 14.0	5.3 0.0	4.9 16.0	6.3 18.5	6.1 23.0	✓
↓	5.2 22	5.5 17.0	4.1 14.5	4.0 0.0	3.4 15.0	4.3 18.0	4.4 23.0	✓
				(2.9)				
↓	4.0 21.5	4.2 17.0	3.0 15.0	2.7 0.0	2.3 16.5	3.2 18.5	3.2 23.0	✓
↓	3.4 21.0	3.3 17.5	1.7 15	1.5 0.0	1.0 15	2.3 17.0	2.3 23.5	✓
				(0.4)				
	2.1 21.0	1.9 17.5	0.4 15.0	0.2 0.0	0.0 15.0	1.2 17.0	1.1 24.0	✓
				(19.2)		8.0 37.5		
				(18.0)		3.9 40.0		
				(16.7)		2.0 40.5		STK

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
129		879.07			
+50					
128+25					
+50					
129					
+50					
+75					
130					
+25					
+50					
T.P.	9.87	886.18	2.76	876.31	
130+50					
+75					
131					
+25					

Inst.
Rod.
Chain.

10-6-24 - P.M.

15

Left	C L	Right
	14.2	0.9 stk 39.0
	11.7	1.2 stk 36
10.5 33.5	18.0	
6.7 34.5	16.7	
stk 5.0 34.5	14.2	
3.4 33.0	11.4	
12.3 12.3 10.2 10.3 10.1 11.3 11.3 21.0 18.0 15.0 00 14.5 16.5 24.0		
stk 2.6 11.1 11.2 9.2 9.2 9.0 10.3 10.1 0.7 30.5 20.0 17.0 14.5 9.0 15.5 17.0 24.0 33.0 00		
9.4 9.5 7.3 7.5 7.4 9.3 9.3 22 19.0 15.5 00 15.5 18.0 24.0		
	6.7	
1.6 8.2 8.1 6.6 6.2 6.4 7.9 7.7 30.0 22.5 20.0 15.5 00 15.0 18.0 23.0		L
	13.8	8.6 32
14.1 14.3 12.2 12.1 12.0 14.0 13.8 24.5 21.0 16.0 00 14.0 19.0 21.0		
	11.3	
7.8 12.6 12.4 11.1 11.1 11.1 13.2 12.6 3.1 29.5 23.5 20.0 16.0 00 14.5 17.5 22.0 33		
11.7 11.2 10.0 10.1 10.0 11.9 11.6 23.0 19.5 15.5 00 14.5 18.0 23.5		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
131+50		886.18			
+75					
132					
+25					
+50					
+75					
133					
+25					
+50					
+75					
134					
T.P.	hub PC		1.10	885.08	

Inst.
Rod.
Chain.

10-6-24 - P.M.

Left				C L		Right		
6.8	10.5	10.2	8.7	9.2 (8.9)	8.9	10.5	10.6	3.4
27.0	22.5	19.5	15.5	00	14.5	17.5	22.5	30.5
		9.6	9.3	7.9	7.9	7.8	9.9	9.9
		22.0	18.0	15.0	00	13.5	18.0	22.5
				(6.8)				
5.8	9.0	8.2	6.9	7.8	6.9	9.2	9.3	2.8
26.0	22.0	17.5	15.0	00	15.0	19.0	23.0	29.0
		8.0	7.7	6.0	6.0	6.0	8.2	8.4
		22.5	19.0	15.0	00	14.5	18.0	22
				(5.10)				
5.3	6.9	6.7	5.1	5.2	5.1	7.5	7.6	2.7
25.5	23.0	18.5	15.0	00	14.0	18.5	22.0	27.0
		5.9	5.6	4.2	4.2	4.4	6.5	6.9
		22.0	18.5	15.0	00	14.5	19.0	22
				(3.4)				
4.7	5.2	4.9	3.1	3.5	3.8	5.7	5.8	3.0
24.0	21.0	19.0	15.0	00	15.0	18.5	21.5	25.0
		4.1	2.5	2.9	3.1	5.0	5.3	
		18.5	13.5	00	15	18.5	22.0	
				(2.2)				
		3.8	1.6	2.3	2.7	4.7	4.8	2.4
		18.5	14.0	00	16.0	20.0	22.6	25.5
		4.0	1.0	1.8	2.4	4.8	4.3	
		20.0	15.0	00	16.0	20.0	23.0	
				(1.3)				
		3.4	0.5	1.2	1.9	4.0	3.8	2.0
		21.0	16.0	00	16.0	22.0	25.5	27.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
	7.00	892.08		885.08	
134+25					
+50					
+75					
135					
+25					
+50					
+75					
136					
+25					
+50					
+75					
137					

Inst. Skoglund Cincy. 10-7-24 AM.
Rod. Galvin
Chain. Hibbard

Left			C L			Right
9.0	6.0	6.8	7.7	9.3	9.6	
22.0	16.5	00	16.0	19.5	25.0	
		(6.5)				
8.6	5.4	6.5	7.6	9.4	9.5	7.6
20.0	15.0	00	17.0	21.0	25.5	28.0
8.2	5.3	6.3	7.3	8.9	9.1	
20.5	16.0	00	17.0	20.5	27.0	
		(6.2)				
F.E. 8.1	5.2	6.0	7.2	9.3	9.3	6.6
21.5	15.0	00	17.5	22.0	25.0	29.5 F.E.
7.7	4.9	5.8	7.0	7.8	7.7	
20.0	16.0	00	17.0	19.0	33.5	
		(5.9)				
7.5	4.8	5.6	6.9	7.7	7.4	4.4
20.0	15.8	00	18.0	19.5	34.0	35.5
7.3	5.1	5.6	6.7	7.4	7.3	
19.0	16.5	00	17.0	19.0	32.0	
		(5.5)				
6.8	4.9	5.5	6.4	7.2	6.9	2.7
19.0	16.0	00	17.0	18.5	25.0	33.0
6.9	5.1	5.5	6.4	6.8	6.7	
19.0	16.9	00	18.0	20.0	25.5	
		(5.6)				
6.4	5.0	5.5	6.1	6.8	7.0	0.3
18.0	16	00	18.5	21.5	25.0	33.5
6.4	6.4 5.0	5.4	6.0	6.7	7.0	
24.0	18.0 15.6	00	19.5	21.5	35.5	
		(5.5)				
3.0	6.0 6.1	4.8 5.3	5.7	7.0	7.0	✓
27.5	23.0 20.0	16 00	18.0	21.0	24.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
137+25		892.08			
+50					
+75					
138					
+25					
+50					
+75					
T.P.	12.22	899.72	4.58	887.50	*
137					
+50					
138					
+50					
T.P.	7.79	895.29	12.22	887.50	*
139					

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

Left			C L		Right	
5.8	5.9	4.8	5.0	5.2	6.8	6.7
22.5	18.0	16.0	00	17.0	20.0	24.0

(5.3)

1.4	5.4	5.6	4.8	5.0	5.0	6.5	6.6
28.0	22.0	18.5	16.5	00	16.0	19.5	22.5 ✓

5.7	5.7	4.7	5.0	5.2	6.7	6.9
22.0	18.0	15.0	00	15.0	18.5	23.0

(5.2)

1.8	6.0	6.1	4.8	5.1	5.1	6.2	6.6
28.0	22.0	17.5	15.0	00	15.0	17.5	23.5 ✓

6.4	6.5	5.1	5.0	4.9	6.4	6.4
22.5	17.0	14.5	00	15.5	19.0	23.0

(5.10)

2.8	6.6	6.8	5.0	4.8	4.7	6.2	5.9
27.5	22.5	18.0	15.5	00	15.5	19.0	22.5 ✓

6.6	6.5	5.1	4.8	4.6	5.7	5.6
23.0	18.0	15.0	00	14.5	18.0	23.5

(13.1)

4.5
36.0

(12.9)

4.2
34.0

(12.8)

5.0
33.5

(12.6)

6.2
32.0

7.0

11.0	10.2	9.8	8.6	(7.8) 11.8	(8.1)	7.5	8.5	8.2	3.3
27.0	23.0	19.0	15.0	00		16.0	19.0	34.5	30.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
+35		895.29			
+50					
+75					
140					
+25					
+50					
+75					
141					
+25					
+50					
+70					
142					
+25					

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

Left			C L	Right		
10.5	10.0	8.8	8.0	11.7	8.6	8.5
24.5	19.0	17.0	00	16.0	18.5	24.5
			(7.9)			
8.4	10.2	10.1	9.0	8.1	7.4	8.4	8.2	5.0
28.5	25.0	19.5	17.0	00	15.5	18.0	24.0	27.5
10.4	10.1	8.7	8.0	7.2	8.3	8.2		
25.5	20.5	17.7	00	16.0	19.5	24.5		
			(7.8)					
9.6	10.3	9.8	9.0	7.9	6.7	7.9	7.9	6.0
27.5	25.5	19.0	18.0	00	15.5	18.5	23.5	26.0
10.3	10.0	9.0	7.8	6.5	7.6	7.7		
25.0	19.5	17.5	00	15.0	18.0	23.0		
			(7.6)					
9.0	10.2	10.0	8.8	7.8	6.6	7.6	7.7	6.0
27.5	25.0	21.0	18.5	00	15.5	18.0	24.0	26.0
10.5	10.2	8.9	7.6	6.7	7.9	7.9	6.1	
26.0	21.5	18.5	00	15.5	18.5	24.0	26.0	
			(7.5)					
9.8	10.8	10.2	9.1	7.7	6.8	8.2	8.1	6.4
30.0	27.5	22.0	19.5	00	16.0	18.5	22.5	25.0
11.3	10.9	9.0	7.8	7.2	8.3	8.3		
28.0	24.0	20.0	00	16.0	19.0	24.0		
			(7.3)				10-7-24 RM.	
14.0	13.0	12.2	9.6	8.1	7.4	8.4	8.7	6.7
50.0	31.0	25	19.5	00	18.5	22.0	25.5	28.5
			(7.3)					
15.4	13.3	10.0	9.0	7.5	8.6	9.0	7.2	
50.0	28.0	22.0	00	22.5	27.5	32	36.0	
			(7.2)					
13.0		10.2	8.4	7.6	7.0			
50.0		27.0	00	30.0	50.0			
			(7.1)					
12.6		10.0	8.7	7.6	7.1			
50.0		25.0	00	30.0	50.0			

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
142+50		895.29			
BM			6.36	888.93	888.89
T.P.	4.07	893.98	5.34	889.95	889.91
+75					
143					
+25					
+50					
+75					
144					
+25					
+50					
+75					
145					
+25					

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

Left				C L (7.0)		Right			
8.6	12.0	12.0	10.5	8.8	7.7	7.0			
42.5	39.0	36.0	32	00	28.0	50.0			
				(5.7)					
8.3	10.0	9.5	8.5	7.5	5.9	8.1	8.1	5.9	
33.0	27.0	23.0	20.0	00	4.00	47.0	49.0	51.0	
				(5.6)					
6.2	9.7	9.6	8.3	7.2	6.5	7.8	7.6	2.5	
30.0	26.0	21.0	17.0	00	19.0	22.0	25.0	33.0	
	9.4	9.2	7.9	7.0	6.2	7.8	7.8		
	25.0	21.0	18.0	00	15.5	19.0	22.5		
				(5.5)					
6.8	9.2	9.0	7.7	6.5	6.0	7.4	7.5	4.0	
27.0	24.0	20.0	16.5	00	17.0	19.0	23.0	27.0	
	8.6	8.6	7.2	6.0	5.3	6.6	6.7		
	25.0	21.5	17.5	00	16.0	18.5	23.0		
				(5.4)					
6.9	8.3	7.8	7.0	5.6	5.0	6.4	6.4	5.2	
27.0	25.0	21.0	18.5	00	17.0	19.5	22.5	25.0	
	8.1	7.7	6.9	5.4	5.0	6.4	6.8		
	25.5	21.5	19.0	00	16.0	18.5	22.0		
				(5.3)					
7.4	8.2	7.6	6.7	5.3	5.0	6.4	6.9	5.7	
27.0	25.5	20.5	19.0	00	15.5	18.5	22.0	24.0	
	8.0	7.6	6.3	5.3	4.8	6.7	6.7		
	25.0	20.5	18.0	00	14.5	18.5	22.0		
				(5.2)					
6.3	7.7	7.3	6.1	5.2	4.8	6.6	6.7	5.9	
25.0	23.5	19.0	16.5	00	15.5	19.0	23.0	24.0	
	7.6	7.3	6.0	5.3	4.9	6.6	6.6		
	23.0	18.5	16.0	00	16.0	19.0	23.5		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
145+50		893.98			
+75					
146					
+25					
+50					
+75					
147					
+25					
+50					
+75					
148					
+25					

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

Left				C L (5.1)		Right			
5.5	7.5	7.1	5.6	5.2	4.9	6.8	7.0	5.4	
25.0	19.0	18.5	15.5	00	16.0	19.5	23.5	25.0	
	7.0	6.9	5.5	5.0 (5.0)	4.9	6.6	6.8		
	23.0	18.0	15.0	00	15.5	19.0	24.0		
				(5.0)					
4.8	6.9	6.6	5.4	4.8	5.0	6.5	6.6	4.7	
25.5	23.5	17.5	15.0	00	15.5	19.0	24.0	26.0	
	7.1	6.7	5.2	5.0	4.9	6.8	6.7		
	24.0	18.0	15.0	00	15.5	19.0	24.0		
				(4.9)					
5.2	6.9	6.7	5.2	5.0	4.8	6.4	7.0	5.1	
26.0	24.0	18.5	15.5	00	16.0	19.0	24.0	25.5	
	6.7	6.4	5.1	4.8	4.7	6.3	6.6	5.3	
	24.0	18.5	15.0	00	15.0	18.5	24.0	25.0	
				(4.8)					
5.9	6.4	6.1	5.1	4.7	4.8	6.3	6.5	5.3	
25.0	24.0	19.0	16.5	00	15.5	19.0	23.0	24.0	
	6.4	6.2	5.0	4.7	4.7	6.2	6.3		
	24.0	20.0	16.0	00	15.5	19.0	23.0		
				(4.7)					
6.2	6.6	6.0	5.0	4.5	4.8	6.2	6.5	6.0	
24.5	23.5	18.0	15.5	00	16.0	19.0	23.0	24.0	
	6.8	6.3	5.0	4.6	4.9	6.4	6.7	6.2	
	32.5	18.0	15.0	00	15.0	19.0	22	30.0	
				(4.7)					
FE		6.7	4.9	4.8	4.8	6.8		FE	
		20.5	15.5	00	15.5	19.5			
7.2	7.6	6.6	5.0	4.9	5.0	6.6	6.7		
33	28.0	18.0	14.0	00	15.5	19.0	29.0		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
148+50		893.98			
+75					
T.P.	0.51	889.32	5.17	888.81	
149					
+25					
+50					
+75					
150					
+25					
+50					
+75					
151					
T.P.	4.16	882.97	10.51	878.81	
+25					
+50					

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

Left				C L (4.0)		Right			
	6.8	5.3		5.0	5.2	6.7	7.1	6.6	
	19.0	15.0		00	16.0	19.0	23.0	24.0	
	7.3	7.0	5.6	5.2	5.7	7.1	7.5		
	23.0	19.0	16.0	00	15.0	19.0	22.0		
				(1.0)					
2.6	3.0	2.7	1.3	1.0	1.3	2.6	3.1	2.3	
24.0	23.0	19.0	16	00	16.0	19.0	23.0	24.0	
	3.7	3.5	2.0	1.7	2.0	3.4	3.7		
	23.0	19.0	16.0	00	17.0	20.5	23.0		
				(2.4)					
3.1	4.6	4.0	2.6	2.1	2.6	4.2	4.4	2.8	
25.0	23.0	18.0	15.5	00	17.0	21.0	23.0	25.0	
	5.5	5.0	3.4	3.0	3.4	4.3	4.6		
	23.0	18.5	16.0	00	15.0	17.0	23.0		
				(4.0)					
3.9	6.2	5.6	4.2	3.9	4.1	5.4	5.2	3.6	
25.0	23.0	18.0	15.0	00	15.0	18.0	24.0	25.5	
	6.8	6.7	5.1	4.9	4.8	6.5	7.3		
	23.0	18.5	15.0	00	14.5	17.5	24.0		
				(6.1)					
5.9	8.6	7.0	6.0	6.1	5.9	7.6	8.3	6.8	
26.0	24.0	19.0	16.0	00	14.5	17.0	23.0	24.5	
	9.5	8.9	7.3	7.2	7.7	8.6	9.2		
	25.0	20.0	15.5	00	15.5	18.0	23.5		
				(8.6)					
11.5	8.3			8.1	8.4	10.6	9.0		
22.0	16.0			00	15.0	22.0	24.0		
		6.0	3.1	3.1	(3.4) 3.2	5.5	5.8		
		21.0	16.0	00	14.5	20.0	24.5		
					(4.8)				
5.7	6.4	6.1	4.5	4.2	4.3	6.7	6.6	0.6	
23.0	24.0	18.0	14.0	00	14.0	20.0	24.0	29.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
151+75		882.97			
152					
+21				875.9	7.1
+50				875.7	7.3
+75				875.0	8.0
153				875.4	7.6
+18				876.4	6.6
+37				869.3	13.7
T.P.	1.97	876.38	8.56	874.41	
152+75				875.0	1.4
153				875.4	1.0
+18				876.4	00
+37				869.3	7.1
153+50 = Zero		Excav.		874.41	
T.P.	2.90	877.31			
Bm.			4.28	873.03	872.86

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

Left				C L		Right	
8.0	7.5	5.6	5.5	5.6	7.6	7.7	
22.5	18.5	15.0	00	15.5	21.0	24.5	
			(7.3)				
7.3	9.5	8.9	7.2	6.8	6.6	7.7	8.5	2.8
25.5	23.0	19.0	15.5	00	14.0	17.0	26.0	30.0
			(7.1)				
9.0	11.2	10.6	8.6	7.4	8.0	9.3	9.3	3.3
25.0	24.0	20.0	16.0	00	14.5	17.5	24.5	30.0
			(7.8)				
11.4	12.3	12.3	10.0	9.5	9.4	10.4	10.5	4.0
26.0	25.0	22.0	17.0	00	15.0	17.0	25.0	30.0
				(8.0)				4.5
								31.0
				(7.6)				4.7
								31.0
				(6.6)				4.4
								33.5
								2.0
								60.0
				(11.7)				
5.1	6.8	6.6	4.4	4.0	(11.4) 3.8	5.0	5.1	
29.0	26.5	22.5	18.0	00	14.5	19.0	23.0	
				(11.0)				
5.4	7.6	7.0	5.3	4.8	4.7	6.4	6.3	
34.0	29.0	23.0	19.0	00	15.0	19.5	23.0	
		6.0	5.1	(10.0)		4.9	6.6	6.3
		22.0	00			16.0	23.0	27.0
				(7.1)				
		8.0	7.0	5.8	3.7	4.6	4.3	
		45.0	20.0	6.0	35.0	38.0	50.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
Bm	11.19	848.90		837.71	
61				841.2	
+25				842.1	6.8
+50				843.0	5.9
+75				844.0	
62				844.9	4.0
+25				845.8	
+50				846.7	2.2
+75				847.6	
T.P.	7.73	156.03	0.60	848.30	
63				848.5	7.5
+20				849.2	6.8
+50				850.2	
+75				851.0	
T.P. (6)			3.00	853.03	

Inst. Galvin
Rod. Staaglum Conner
Chain. Fritz

10-15-24

Left	C L	Right
Sta 60 + 60 TL.		
4.8 22.2 ✓	4.2 3.8 00 14.4	✓
(See page 26) 4.5 21.8	3.9 (6.8) 3.5 00 15.2	(See page 25)
4.4 20.2 ✓	3.5 (5.9) 2.8 00 16.8	✓
4.0 19.0 ✓	3.2 3.4 00 16.6	✓
3.6 19.0 ✓	2.6 (4.0) 2.2 00 16.6	✓
2.9 19.8 ✓	2.2 2.0 00 16.4	✓
2.0 19.0 ✓	1.7 (2.2) 1.3 00 15.0	✓
1.0 18.6 ✓	0.8 0.4 00 14.4	✓
(See page 27) 7.6 19.6	7.0 (7.8) 6.9 00 14.4	✓
6.8 19.0 ✓	6.4 (6.8) 6.0 00 16.0	✓
6.0 16.6 ✓	5.6 (5.8) 5.2 5.7 6.5 2.9 00 15.0 20.0 22.6 26.6	
8.7 8.0 7.3 5.2 27.0 23.2 20.0 15.4	4.7 (5.1) 4.5 5.9 6.0 00 15.0 19.4 21.8	✓

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	1.84	839.55		837.71	
61				841.2	
+15					
+25				842.1	-2.5
+50				843.0	-3.4
62				844.9	-5.3
T.P.	11.98	849.89	1.64	837.91	
+50				846.7	3.2
63				848.5	1.4
T.P.	12.97	862.17	0.69	849.20	
+20				849.2	13.0
+75				851.0	
T.P.	9.72	871.26	0.63	861.54	
64					
+10					
+50					

Inst.
Rod.
Chain.

10-15-24

15

Left	C L	Right
	11.8 39.0	
culvert	16.8 47.0	
-2.5	11.5 37.0	
-3.4	5.7 33	
-5.3	2.5 31.4	
3.2	10.0 28.0	11.0 31.0	9.4 35.0
1.7	5.2 23.2	6.3 27.4	3.0 30.4
13.0	15.4 21.4	15.2 25.8	13.0 29.4
11.3	3.8 30.4	
	7.4 35.4	
19.1	5.7 37.6	
17.7	4.6 37.6	

8.0 / 30.4 ?

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
65		871.26			
+50					
+90					
66					
(+25 see p. 38)					
+30 P.T.					
T.P.			10.75	860.51	
Bm	6.00	843.71		837.71	
T.P.	0.66	831.99	12.38	831.33	
61				841.2	
+10					
+25				842.1	(-10.1)
T.P.	11.39	842.79	0.59	831.40	
+50				843.0	(-0.2)
62				849	(-2.1)
+50				867	(-3.9)

Inst.
Rod.
Chain.

10-15-24

Left	C L	Right
	16.0	5.3 3 7.2
	14.3	4.9 33.5
	13.0	6.2 31.2
		6.0 31.2
	6.5 31.0	5.8 37.8
		3.1 43.0

SW cor. capping Cattle pass Sta. 67+10

60+60 Rk

12.7
3.8 culvert

14.9
61.0

7.0
12.0 -10.1

9.5
38.2 -0.2

5.5
30.8 -2.1

5.4
33.0 -3.9

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
63		842.79		848.5	-5.7
T.P.	5.21	835.92	12.08	830.71	
+20				849.2	-13.3
+50				850.2	
T.P.	12.23	847.62	0.53	835.39	
T.P.	12.62	859.69	0.55	47.07	
T.P. (top stake @ 64+00)			6.70	52.99	0.1-
64					
+25					
+50					
+75					
65					
+25					
+50					
+75					
66					

In .....
Rod. .....
Chain. .....

10-15-24

27

Left	C L	Right
12.2 45.6	-5.4	
15.0 62.2	-13.3	
2.6 42.8	-14.3	
	7.5	
7.8 9.4 9.2 8.2 7.5 7.2 8.7 24.8 21.8 18.4 15.5 00 14.5 20.5		✓
3.3 8.8 8.5 7.5 6.8 6.5 7.8 7.6 27.2 22.2 18.0 16.0 00 13.8 17.6 19.8		✓
	6.1	
3.9 7.7 7.7 6.5 6.9 5.6 7.1 7.0 27.8 23.2 18.0 16.0 00 15.0 18.2 21.8		✓
6.9 6.8 5.8 5.3 4.8 6.3 6.0 22.8 17.8 15.2 00 14.6 17.8 22.0		✓
	4.4	
3.5 6.7 6.7 5.0 4.3 3.9 5.4 5.4 26.6 21.0 17.4 15.4 00 14.6 17.4 22.6		✓
1.3 6.8 5.9 4.3 3.6 3.0 4.4 4.4 26.6 22.2 16.8 14.4 00 13.8 18.0 20.0		✓
	2.7	
0.9 5.0 5.0 3.4 2.6 2.1 3.9 3.6 26.8 21.9 17.3 15.2 00 14.4 17.4 20.7		✓
1.4 4.3 3.9 2.3 1.5 1.3 2.9 2.8 26.0 20.7 16.2 15.2 00 14.6 17.2 21.2		
	1.4	
1.7 3.2 3.2 1.4 0.7 0.5 1.8 1.5 24.8 21.3 18.4 15.8 00 14.8 17.9 22.4		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		159.69			
T.P.	9.33	168.81	0.21	159.48	
66+30 P.T.					
+50					
+75					
67					
+25					
B.M.			8.38	160.43	
+50					
+75					
68					
+25					
+50					
+75					
69					

Inst.
Rod.
Chain.

10-15-24

28

Left C L Right

8.2 11.7 11.5 9.4 9.1
24.8 21.0 18.4 14.6 00

(8.8)

8.5 11.1 11.1 8.9 8.7 8.9 10.0 9.6 6.2 5.8 00
27.0 22.8 18.7 15.0 00 15.8 19.0 23.6 30.4 40.8 47.2
9.2 10.7 10.8 8.2 8.0 8.1 9.8 10.2 9.5 8.4
26.0 21.9 19.0 14.4 00 14.4 19.0 25.6 29.3 41.8

(7.0)

16.5 13.9 7.4 7.0 7.4 13.0 12.1
34.8 24.0 13.0 00 13.8 23.0 34.6

13.6 11.9 6.8 6.4 6.8 8.6 9.2
40.4 22.8 13.8 00 15.0 19.2 33.0

S.W. Co. Cattle Pass

(5.7)

9.9 8.4 7.9 8.4 6.2 5.7 5.9 7.3 7.9
42.7 39.4 28.7 20.2 14.6 00 15.4 18.5 21.8

7.6 6.5 6.5 7.5 5.2 5.0 5.1 6.5 6.5
41.8 36.2 26.0 21.6 14.8 00 16.5 19.8 32.4

(4.4)

5.7 5.0 5.9 5.8 4.5 4.5 4.5 5.9 5.6
39.1 28.0 24.0 20.4 14.9 00 15.0 18.5 32.8

7.9 5.3 5.1 4.0 3.9 3.8 5.1 4.5
30.4 25.7 18.0 15.0 00 14.1 17.2 22.3

(3.3)

1.5 4.5 4.4 3.3 3.1 3.4 4.4 4.4
27.2 22.7 19.1 15.3 00 14.7 18.1 21.1

2.0 4.4 4.4 2.7 2.3 2.5 3.3 3.5
27.0 22.3 17.6 14.4 00 15.3 18.5 21.3

(2.1)

2.0 4.0 4.0 2.0 2.0 1.9 2.8 2.6
26.1 21.8 17.6 14.3 00 15.3 19.0 21.7

Cross Sections

Sta.	B. S.	H I	F S	Grade	Gr. R.
69+25		868.81			
+30	(see p. 38)				
+50					
T.P.	9.52	877.15	1.18	867.63	
67					
+25					
+50					
+75					
68					
+50					
69					
+25					
69+50					
+75					

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

10-15-24

29

Left			C L			Right		
1.0	3.2	3.1	1.6	1.4	1.5	2.5	2.1	
25.2	21.0	17.7	13.8	0.0	15.0	18.2	30.9	
			(1.0)					
	2.4	2.9	1.2	0.8	1.0	2.3	2.1	
	21.7	17.8	13.3	0.0	14.4	17.3	21.1	
			(15.4)			6.3		
						30.0		
						8.7		
						33.0		
			(14.2)			8.7		
						31.0		
						2.5		
						33.0		
			(12.8)			7.7		
						31.2		
			(11.7)			5.5		
						31.0		
			(10.5)			4.6		
						31.3		
						4.8		
						30.2		
			(9.4)					
4.7	7.1	11.1	9.5	9.2	9.3	10.6	10.5	4.7
28.6	20.6	17.3	13.0	0.0	14.4	18.0	21.4	29.8
6.0	10.2	10.3	8.9	8.7	8.9	10.4	10.1	4.9
24.2	19.0	17.1	13.6	0.0	13.1	18.0	22.0	27.6

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. E.
70		877.15			
+25					
+50					
+75					
71					
+25					
+50					
T.P.	7.70	881.93	2.92	874.23	
+75					
72					
+25					
+50					
+75					

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

10-15-24

30

Left				C L				Right	
4.1	9.7	8.3	8.	(8.2)	8.1	9.9	10.0	5.5	
25.8	18.0	14.5	0.0		15.1	18.8	21.6	27.4	
5.0	8.1	8.3	7.3	7.4	7.6	9.2	9.0	4.9	
28.5	22.6	19.8	14.2	0.0	16.0	19.5	24.4	26.8	
				(7.0)					
2.5	8.0	8.1	7.1	6.5	6.6	7.5	7.8	6.4	
28.7	21.8	18.0	15.7	0.0	16.0	19.8	23.2	26.7	
7.5	7.7	7.8	6.3	6.2	6.7	7.6	7.1	5.3	
30.5	22.8	18.3	15.2	0.0	15.4	20.5	24.0	28.1	
				(5.9)					
7.2	6.9	6.8	6.0	5.6	5.6	6.8	6.7	4.9	
31.4	24.6	18.4	16.0	0.0	16.0	19.5	23.3	27.0	
7.0	6.4	6.3	5.7	5.3	5.3	6.5	6.4	4.3	
30.4	24.5	17.8	15.5	0.0	16.1	18.7	23.0	26.3	
				(4.7)					
1.7	6.1	6.1	5.0	4.7	4.8	5.6	6.0	3.7	
29.4	23.5	17.4	15.0	0.0	14.3	15.1	21.8	26.6	
5.9	10.6	10.5	9.5	9.3	9.4	10.4	10.6	8.6	
29.1	23.6	17.4	14.6	0.0	16.2	19.0	23.6	26.3	
				(8.3)					
5.5	10.2	10.2	9.0	8.6	8.8	10.1	10.2	8.2	
28.6	22.6	17.0	14.4	0.0	15.9	19.3	23.9	27.2	
5.5	9.5	9.9	8.2	8.1	8.3	9.7	9.6	7.5	
27.0	22.0	17.7	14.6	0.0	15.6	19.5	23.5	28.0	
				(7.2)					
5.1	9.0	8.9	7.8	7.6	7.8	9.1	9.2	5.7	
27.2	22.4	18.0	15.2	0.0	15.6	19.5	23.2	26.8	
4.9	8.2	9.2	7.5	7.2	7.4	8.5	8.6	5.4	
26.9	22.9	18.1	16.0	0.0	15.5	18.8	23.0	27.1	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
73		881.93			
+25					
+50					
+75					
74					
+25					
+50					
+75					
75					
+25					
+50					
75					

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

10-15-24

31

Left					G L (6.2)		Right		
5.0	7.5	7.6	6.9	6.7	6.1	8.2	8.2	5.2	
26.3	23.2	19.5	17.0	0.0	14.5	17.4	21.7	26.3	
5.4	7.2	7.0	6.5	6.2	6.2	7.8	4.7		
25.3	22.5	19.0	17.2	0.0	15.5	19.6	24.8		
5.7	6.7	6.6	5.6	5.7	5.5	6.8	6.9	5.9	
25.9	23.3	19.2	16.8	0.0	15.7	18.4	21.3	24.4	
5.8	6.5	6.3	5.5	5.3	5.4	6.5	6.6	5.0	
25.8	22.8	19.7	16.5	0.0	16.0	18.3	22.0	24.5	
(4.6)									
5.4	6.2	6.0	5.3	4.9	5.2	6.3	6.4	5.1	
24.3	22.3	19.0	16.8	0.0	15.5	18.0	21.4	24.1	
5.1	6.1	5.7	4.8	4.7	5.0	6.2	6.4	5.4	
20.6	23.0	18.4	15.8	0.0	15.3	19.0	23.2	24.3	
(4.1)									
5.3	5.9	5.7	4.5	4.5	4.5	5.7	6.0	5.3	
25.8	24.5	19.0	15.4	0.0	15.0	18.7	23.3	25.9	
5.1	5.9	5.6	4.2	4.2	4.2	5.8	6.2	5.4	
26.6	24.0	19.0	16.1	0.0	14.7	19.8	24.0	25.9	
(3.7)									
5.5	5.7	5.5	4.1	3.9	4.0	5.3	6.2	5.5	
27.4	22.8	19.0	16.5	0.0	14.9	17.7	23.6	25.9	
	6.0	5.4	3.9	3.8	3.8	5.3	5.8		
	28.0	19.4	15.3	0.0	15.5	18.7	26.5		
(3.4)									
	6.1	5.5	3.8	3.7	3.8	5.4	5.5		
	31.2	19.0	15.5	0.0	15.3	19.2	33.5		
	6.4	6.1	3.8	3.7	3.8	5.7	5.6		
	34.5	20.4	15.6	0.0	15.4	19.8	33.0		

Cross Sections

Sta.	B. S.	H I	F. S.	Grade	Gr. R.
76		881.93			
+25					
+50					
+75					
77					
T.P.	4.88	883.28	3.53	878.40	
+25					
+50					
+75					
78					
+25					
(+40	see p 38)				
+50					
+75					

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

10-15-24

32

Left			C & L		Right	
6.1	3.7	3.7 (3.3)		3.6	5.8	
21.0	14.8	00		16.0	20.0	
6.3	3.6	3.7		3.6	6.1	
21.4	14.7	00		15.6	21.4	
6.8	3.8	3.8 (3.3)		3.8	6.4	
21.7	15.2	00		16.3	21.6	
6.3	3.8	3.7		3.5	5.7	
24.8	15.0	00		15.6	22.0	
5.8	3.6	3.8 (3.3)		3.6	5.8	
20.3	14.7	00		14.4	19.8	
8.1	4.8	4.8		5.9	7.9	
22.1	16.5	00		15.0	21.4	
8.6	4.7	4.7 (4.7)		4.9	8.5	
22.1	15.4	00		15.8	21.8	
9.2	4.8	4.6		4.8	8.5	
23.8	15.9	00		16.0	21.6	
9.5	4.7	4.7 (4.7)		4.9	8.9	
23.6	16.0	00		16.1	22.9	
10.2	4.5	4.6		4.7	9.2	
23.0	15.2	00		16.2	23.7	
11.2	11.2	9.8	4.9	4.8	5.0	9.7	10.0	9.3
42.0	28.0	24.6	16.0	00	16.7	24.8	30.5	31.3
10.6	11.3	10.1	9.4	4.9	4.9	5.0	10.4	8.5
43.8	44.9	26.0	24.8	15.2	00	16.5	27.0	29.6

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
79		883.28			
+25					
(+30 +40 see p. 38)					
+50					
+75					
BM.			11.53	871.75	

Finals Cont. Book No 5 page 3

BM	11.53	883.52		871.99	
T.P.	0.97	877.08	7.41	876.11	
T.P.	1.07	866.05	12.10	864.98	
B.M.			5.44	860.61	860.46
T.P.	0.95	854.10	12.90	853.15	853.00
T.P.	2.26	847.52	9.14	844.96	
B.M.			9.66	837.86	837.71
BM	9.25	869.71		860.46	
T.P.	8.88	876.93	1.66	868.05	
	6.51	882.48	0.99	875.97	
	4.97	883.51	3.94	878.54	
	4.55	879.28	8.81	874.73	
BM			7.42	871.86	

Inst.
Rod.
Chain.

10-15-24

Left				C L (4.7)		Right		
9.9 / 43.6	10.3 / 42.0	9.3 / 23.7	4.8 / 15.0	4.7 / 00	4.8 / 14.9	10.8 / 26.0	10.6 / 28.4	7.6 / 32.0
		6.5 / 20.3	5.0 / 13.7	4.9 / 00	5.2 / 14.2	6.8 / 19.8	11.2 / 25.0	11.1 / 29.1	6.5 / 33.0
		6.6 / 18.3	5.0 / 14.7	4.9 (4.7) / 00	5.1 / 14.1	9.3 / 22.7	8.3 / 31.8	6.2 / 33.5
		7.7 / 21.4	4.9 / 14.7	4.8 / 00	5.0 / 15.0	7.2 / 20.8	7.4 / 23.6	6.4 / 27.7

spike 36" tree 65 ft. Lt. 79+50 El. 871.99

Cattle pass 67+10 S.W. Cor.
Top of stake to 66+40

RH. 60+60 Nail in tree
10-16-24 AM corrected from yesterdays work

spike 36" tree Lt 79+50

Farm Entrances cont.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Farm Entrances

148 4.8

16 ft. Rt = 0+00

0+00 = Zero Embank.

0+04

0+08 = Zero Embankment.

16 ft Lt = 0+00

0+00 = Zero Embankment.

0+05

0+13 = Zero Embankment.

Inst. Galvin
Rod. Skooglun
Chain. Fritz

Connet

10-20-24

Left			G L			Right
west	6.8 / 11.0	5.8 / 7.0	5.6 / 00	6.0 / 10	6.8 / 12	(East)
west	7.0 / 15.0	6.0 / 12.0	5.7 / 00	5.7 / 5	6.8 / 8	(East)

Farm Entrances Ect.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
135	5.7				
18 ft Rt = 0+00					
0+00 = Zero Embankment.					
0+05					
0+10 = Zero Embank					
135 – 16 ft Lt = 00					
0+00 = Zero Emb.					
0+05					
0+16 = Zero Embankment.					
127					
127+26	18 Rt = 0+00				
0+05					
0+13 = Zero Exc & Emb.					
0+25					
0+46					
0+60 = Zero Exc.					

Inst. 9
Rod. S
Chain. F

C

10-20-24

	Left		C L	Right		
						Note ditch Exc. & refilled
(West)	8.0 / 12.0	6.7 / 10.0	6.9 / 0.0	7.3 / 11.0	9.0 / 13.0	East
(West)	7.8 / 13.0	6.1 / 10.0	5.9 / 0.0	6.2 / 9.0	8.1 / 12.0	(East)
(West)	12.3 / 12.0	10.3 / 9.0	11.0 / 0.0	11.9 / 11.0	14.0 / 14.0	East
✓	6.5 / 8.0	7.6 / 6.0	7.4 / 0.0	7.9 / 5.0	6.3 / 7.0	✓
✓	3.0 / 7.0	3.7 / 6.0	3.7 / 0.0	3.4 / 6.0	2.2 / 8.0	✓

Mc Baths F.E.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
Sta	124+50 Rt				at end B3 46 left
"	" "	Lt	" "	B3 None	
BM4	3.51	836.49		832.98	
0+16					
+25					
+50					
+75					
1					
T.P.	1.02	836.49	1.02	835.47	✓
+25					
+50					
+75					
2					
+25					
+50					✓
T.P.	2.14	816.08	1.53	813.96	

Inst. S
Rod. S
Chain. F

10-20-24

Left	GL	Right
Refrap		
Trail in 12' Dalt Lt Sta 110+00		
4.6 7.0	4.6 0.0 (6.4)	4.7 5.0
0.6 5.1 6.4 6.4 5.6 4.2 10.0 8 5.2	5.2 0.0 (8.2)	5.6 6.5 12.5 16.0
0.8 6.7 7.8 6.9 1.5 11.5 8.0	7.3 0.0 (10.0)	7.4 8.3 7.0 10.0
9.0 8.8 10.0 8.0	9.7 0.0 (11.2)	9.3 10.2 8.0 11.0
11.5 10.7 11.1 10.0 7.5	11.1 0.0	11.1 12.6 8.0 11.0
5.6 3.6 10.5 7.0	3.6 0.0 (5.4)	3.4 5.9 8.4 12.0
7.0 5.2 11.0 7.0	5.3 0.0	5.6 7.8 7.0 12.0
7.7 7.0 10.0 7.0	6.9 0.0 (9.9)	7.2 11.0 7.5 12.0
9.5 8.2 9.5 7.0	8.4 0.0 (10.0)	8.7 9.5 6.0 9.5
10.4 9.5 9.5 7.5	9.6 0.0	9.9 10.7 7.5 9.5
13.2 11.2 9.5 6.5	11.2 0.0	11.2 11.9 6.5 9.0

McBetts F.E.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
2+75		816.08			
3					
+25					
+35	Zero Exc.				
			3.95	870.23	0.67
Connelly FE Lt. 104 ±			Copied from B.3 P54		
BM	2.69	876.90		874.21	
T.P.	8.35	874.94	10.31	866.59	
0+00	= Zero Exc.				
0+07					
0+25					
0+50					
0+75					
1+00					
1+15	Zero Exc.				

Left | C L | Right

3.9 2.6 2.1 2.3 3.2
8.5 6.0 6.0 6.5 8.5

5.1 3.8 3.6 3.3 3.9
9.8 6.0 6.0 6.5 9.5

4.8 3.7 3.6 4.0
7.5 6.0 6.0 6.0

Slopes taken Lt F 0.8 / 8.9 (Sta 3+00) F1 Rod 3

9-30-24

Spt 12" oak 33' Lt 99+15

O.G. → 12.5 / 8 — 12.1 12.4 3.1 ← O.G.
00 6.0 19.0

O.G. → 10.4 / 6.0 — 10.8 10.9 2.9 ← O.G.
00 6.0 18.0

O.G. → 7.7 / 8.0 — 7.7 7.7 8.8 1.6 ← O.G.
00 6.0 8.0 15.0

O.G. → 4.7 4.7 5.6 1.0 ← O.G.
00 6.0 8.0 14.0

O.G. → 3.4 / 00 — 3.5 / 8.0 1.0 ← O.G.
10.0

Add. X Sect. for finals

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM	11.44	883.43		871.99	
78+40					
79+30					
79+40	wet				
B.M.	9.45	870.02		860.57	
T.P.	6.93	874.40	2.55	867.47	
69+30					
Bm	8.32	868.89		860.57	
66+25					

Inst. 9
Rod. S
Chain. E

10-20-24 38

Left C L Right

(4.8)

10.2 4.7 4.6 4.7 9.2
24.8 16.1 00 16.0 23.7

(4.8)

6.3 4.9 4.7 4.9 6.5 11.4 11.7 6.0
18.5 13.7 00 14.3 18.0 24.4 28.1 32.6

(4.8)

13.5 13.1 4.9 4.7 4.9 12.2 11.3 8.6 6.4 9@
37.0 24.0 14.6 00 13.7 21.8 27.9 33.4 43.0

Top S.W. cor coping Cattle Pass 8¼ 67 HO
EOG

(7.0)

3.0 4.7 8.6 8.4 7.0 6.7 6.7 8.3 7.7 1.9
19.2 25.8 21.1 17.3 13.4 00 15.6 19.0 22.7 30.8

(9.4)

8.8 11.8 11.8 9.5 9.2 8.8 9.9 9.5 3.8 2.2 0.8
25.0 22.0 18.7 15.0 00 16.4 20.0 24.0 31.2 39.0 42.4

F.E. oct.

Cross Sections

Sta.	B. S.	H. I	F. S.	Grade	Gr. R.
70+25	7.4				
70+25	Lt 14 ft. = 0+00			ditch filled over curv.	
0+6.3	= Zero Exc & Emb.				
0+14.3					
0+45	= Zero Exc				
70+50	Rt. Ditch has been filled over curb				
77+00	4.9				
76+85	Lt. 16 ft. = 00			Zero Emb.	
0+07					
0+21	= Zero Emb.				
76+85	Rt. 16.0 ft = 00			Zero Emb.	
0+07					
0+30	= Zero Emb.				
Prm	12.56			860.57	
67+87	- 16 ft RT = 0.0				
0+06					
0+12	Zero Exc.				
0+16					
0+41					
0+50	= Zero Exc				

Inst. E
Rod. S
Chain. E

10-20-24

Left . C L Right

East.	3.6 19.0	6.7 13.5	5.7 6.5	6.3 0.0	6.3 6.5	5.9 10.0	7.6 18.5	West
East.		7.5 16.0	5.9 14.0	5.5 0.0	5.8 8.5	7.5 11.5		West
East.		6.7 12.5	5.1 8.5	5.0 0.0	5.0 16.0	7.1 19.5		West.
West	10.5 8.0	8.6 5.5	8.5 0.0		8.6 4.5	10.7 7.0		East
"	3.6 14.0	7.9 5.0	7.5 0.0	7.7 6.0	3.3 10.5			"
"	1.7 9.0	3.7 6.0	3.3 0.0	4.0 8.0	1.7 10.0			

Burris St. Connection Final

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	9.31	753.10		743.79	
0+58					
1+00					
+25					
T.P.	5.87	758.85	3.12	749.78	
+50					
+75					
2					
+25					
+50					
T.P.	3.64	754.54	9.95	748.90	
+86					
3					
+50					
4					

Inst. 9
Rod. 5
Chain. F

10-21-24

40

Left C L Right

(10.4)

(8.4)

(7.3)

(12.1)

(11.3)

(10.7)

(10.2)

(9.9)

(3.4)

(3.5)

(3.8)

(4.1)

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
4+50		752.54			
5					
+50					
6					
+50					
T.P.	9.82	759.91	2.45	750.09	
7					
+50					
+75					
8					
T.P. +25	8.63	766.46	2.08	757.83	
+50					
+75					
+88.5					

Inst. 9
Rod. 5
Chain. F

10-21-24

Left				C L	Right		
5.3	6.6	6.5	4.9	4.5 (4.3)	4.3	4.7	7.2
16.7	14.4	9.7	7.3	00	5.7	16.3	21.0
5.3	6.3	6.7	5.2	4.5 (4.3)	4.5	5.0	8.0
18.2	16.2	11.0	7.6	00	6.0	17.4	22.0
4.6	5.7	5.5	4.5	4.1 (4.6)	3.8	4.5	7.3
16.8	15.3	11.6	8.6	00	9.2	16.0	20.2
2.9	4.7	4.5	3.8	3.5 (3.X)	3.3	3.7	5.7
15.6	13.1	9.6	6.9	00	5.0	13.4	17.1
1.3	3.2	3.2	2.7	2.3 (2.7)	2.4	4.9	
15.0	12.5	8.7	6.4	00	11.0	15.7	
6.7	9.0	9.2	8.1	8.0 (8.7)	7.8	10.4	
17.7	15.8	12.0	9.0	00	11.0	14.3	
4.6	6.5	6.6	6.1	5.8 (5.9)	5.9	9.3	
21.0	19.1	15.2	11.8	00	10.4	14.6	
3.2	5.4	5.6	4.7	4.4 (4.2)	4.5	9.1	
18.5	16.0	12.8	10.7	00	11.0	19.2	
1.9	2.8	2.8	2.6	2.4 (2.4)	2.6	6.6	
18.3	16.3	12.8	9.9	00	12.4	20.6	
6.6	7.0	7.3	6.9	7.0 (7.3)	7.2	8.2	9.0	11.6
17.6	16.5	12.8	10.6	00	3.4	9.7	12.0	25.0
5.5	6.0	5.9	5.5	5.2 (5.5)	5.2	6.6		
20.2	19.2	14.0	12.6	00	8.4	12.0		
4.5	3.9	3.5	3.1	4.0	4.4			
15.2	11.7	4.4	00	3.0	5.7			
2.5	3.9	3.0	2.6	2.9 (2.8)	3.1	3.2	3.2	
18.4	16.4	13.4	4.8	00	7.3	4.4	6.0	

Cross Sections

Sta.	B.S.	H.I.	F.S.	Grade	Gr. R.
		766.46			
T.P.	0.74	754.87	12.33	754.13	
T.P.	0.30	743.48	11.69	743.18	
Bm			5.48	738.00	738.0

Inst. 9
Rod. 3
Chain. F

10-21-24

42

Left C L Right

Spike in Stump 10ft Sta 30 + 0.10-

Final Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
B.M.	2.61	701.86		699.25	
0+75					
1+00					
+50	(End of Rip Rap Lt.)				
2+00					
+50					
3+00					
T.P.	8.13	708.80	1.19	700.67	
+50					
4+00					
+50					
5+00					
+50					
6+00					
T.P.	6.15	709.93	5.12	703.68	

Inst. Galvin
Rod. S. Keenan
Chain. Foltz

11-10-24

Left	C L	Right	
Rail in T-P near bridge 150' Lt. Sta. 1+50			
7.8 / 57.3	27.0	(Br. 10 / Br. 10)	
7.8 / 52.2	29.0	(G.R. 17.0 / G.R. 16.4)	+11.6
5.3 / 47.2	26.0	(G.R. 17.9 / G.R. 15.6)	+10.8
4.4 / 46.3	27.7	(G.R. 18.7 / G.R. 14.7)	+10.0
3.3 / 45.6	28.6	(G.R. 19.6 / G.R. 13.7)	+9.3
2.5 / 45.1	29.2	(G.R. 20.8 / G.R. 13.9)	+8.8
8.4 / 42.7	28.3	(G.R. 21.7 / G.R. 13.6)	+1.6
8.1 / 40.0	28.4	(G.R. 21.6 / G.R. 14.1)	+1.4
7.6 / 40.7	27.5	(G.R. 21.3 / G.R. 14.2)	+1.4
7.5 / 38.4	26.8	(G.R. 21.4 / G.R. 15.2)	+1.3
7.5 / 38.3	25.8	(G.R. 21.3 / G.R. 16.9)	+1.3
7.0 / 36.0	25.0	(G.R. 21.0 / G.R. 17.9)	+1.2

Final Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
6+50 P.T.		709.83			
7+00					
+50					
8+00					
+50					
9+00					
+50					
10+00					
T.P.			0.48	709.35	

Inst. G
Rod. S
Chain. F

11-10-24

Left			C L		Right
8.0 36.2	24.4	G.R. 21.0	G.R. 17.2		+0.2
7.8 36.2	25.4	GR 21.0	GR 17.4		+0.2
7.6 35.9	24.9	G.R. 20.9	GR 17.6		
7.6 35.6	24.5	G.R. 20.8	GR 17.8		+0.2
7.7 36.9	25.1	G.R. 20.6	GR 17.9		
7.8 37.9	26.6	G.R. 20.9	GR 17.2	.	+0.2
8.3 39.4	28.4	G.R. 20.8	GR 16.8		0.1
8.1 38.3	26.7	G.R. 20.7	GR. 16.4		+0.2

Rock 10+15 Lt.

Final Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM	0.34	699.59		699.25	
TP	6.34	698.89	7.04	692.55	
0+75					
1+00					
+50					
T.P	7.11	705.62	0.38	698.51	
2+00					
+50					
3+00					
+50	(End of R.P. Rajo R+)				
T.P.	1.92	705.07	2.47	703.15	
4+00					
+50					
5+00					
+50					
T.P.	10.16	713.09	1.14	703.93	
6+00					

Inst. E
Rod. S
Chain. E

11-10-24

45

Left		C L	Right
Nail in T.P. Near Bridge Ex. 150' of Sta. 14+50		Br. 10.2 23.0	5.3 48.4
+14.6		G.R. 16.4 25.0	4.4 48.4
+13.8		G.R. 15.6 24.6	0.8 47.6
+6.4		G.R. 14.7 20.3	6.8 39.3
+5.6		G.R. 13.7 18.2	5.4 33.2
+5.1		G.R. 13.9 16.4	5.4 33.4
+4.8		G.R. 13.6 16.6	5.4 28.6
+5.1		G.R. 14.1 17.1	4.3 29.1
+5.1		G.R. 14.2 16.8	3.6 28.4
+5.0		G.R. 15.2 22.8	3.7 34.2
+5.10		G.R. 16.9 25.9	3.5 36.2
4.1		G.R. 17.9 25.7	14.6 35.3

Final Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
6+40		714.09			
7					
+50	✓				
8					
+50	✓				
9					
+50					
10					
T.P.	4.84	714.13	4.80	709.29	
10+50					
11					
+50					
12					

Inst. 9
Rod. 5
Chain. F

11-10-24

Left		C L		Right
	(4.1)	G.R. 17.2	23.5	12.6 32.9
	(4.1)	G.R. 17.4	20.0	11.8 29.0
		GR 17.6	20.9	12.2 30.9
	(4.2)	G.R. 17.8	22.0	12.2 33.0
		G.R. 17.9	21.9	11.1 31.5
	(4.4)	GR. 17.2	20.8	10.8 29.6
	(4.4)	G.R. 16.8	19.4	10.6 27.2
	(4.5)	G.R. 16.4	19.4	10.8 28.1

Rock 10+15 Lt.

12.2 / 36.5 — 27.5 (G.R. 20.8 (4.5) G.R. 16.6) — 20.9 — 10.6 / 29.9

12.2 / 35.9 — 26.9 (G.R. 20.7 (4.6) G.R. 16.7) — 23.1 — 10.7 / 29.1

12.3 / 36.2 — 26.6 (G.R. 20.8 (4.6) G.R. 16.8) — 26.4 — 10.7 / 33.0

12.0 / 33.3 — 24.8 (G.R. 20.8 (4.7) G.R. 17.5) — 26.5 — 10.7 / 34.5

Final Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
12+50		714.13			
13					
+50					
14					
+50					
15					
T.P.	5.78	713.75	6.16	707.97	
BM			8.57	705.24	705.14

Inst. G
Rod. S
Chain. F

11-10-24

Left		C L		Right	
11.5		G.R. 4.7 G.R.			10.3
32.4	24.4	20.7 18.1		28.9	36.6
11.5		G.R. 4.8 G.R.			10.1
32.8	23.8	20.2 18.7		30.4	35.7
11.7		G.R. 4.8 G.R.			9.6
32.3	23.3	19.8 19.0		28.0	34.5
10.8		G.R. 4.9 G.R.			9.8
31.1	22.1	19.1 19.7		26.9	33.6
10.4		G.R. 4.9 G.R.			10.0
30.6	23.1	18.7 19.9		26.5	33.5
10.0		G.R. 5.0 G.R.			10.1
28.6	22.2	18.2 19.5		25.5	32.5

Rock Rt. 10' + 15'

Cottonwood tree 48" Rt Sta 2+1.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
BM	12.51	711.76		699.25	
T.P.	5.50	716.68	0.58	711.18	
0+75					
1					
+50					
2					
+50					
3					
+50					
4					
+50					
5					
+50					
T.P.	5.24	714.75	7.17	709.51	
6					

Inst. GSF
Rod.
Chain.

11-20-24

Left			C L		Right		
			– Outer bridge				
3.6			3.0				3.2
1.0			00				23.0
			(3.2)				
4.2			3.4	3.6	3.6		3.2
9.0	18.0	17.0	11.6	00	11.0	16.6	25.0
			(4.0)				
4.3		4.0	4.2		4.7	4.6	4.8
6.0		18.0	00		15.8	16.0	24.6
			(4.8)				
4.8		4.4	5.2	5.5			5.5
7.7		18.7	00	14.8			20.3
			(5.5)				
5.1		5.0	4.8 6.0		6.2		6.6
8.6		19.6	14.8 00		13.7		18.2
			(6.0)				
5.6	5.6	5.3	6.5	7.0			7.0
9.2	20.8	19.0	00	13.9			16.4
			(6.3)				
5.7	5.8	5.5	6.8		7.3		7.5
8.3	21.7	20.7	00		13.6		16.6
			(6.5)				
6.0	5.9	5.8	6.9		7.3		7.8
8.4	21.6	20.0	00		14.1		17.1
			(6.5)				
5.8	6.1	5.8	7.0	7.3	7.0		8.1
7.5	21.3	19.8	00	8.8	14.2		16.8
			(6.6)				
5.8	6.0	5.8	7.0		7.7		7.5
7.8	21.4	19.5	00		15.2		22.8
			(6.6)				
5.7	6.4	4.9	7.0	7.4	7.7		7.8
5.8	21.3	19.9	00	10.2	16.9		25.9
			(4.8)				
	4.2	3.9	5.1	5.4	5.9		5.9
5.0	21.0	19.6	00	13.0	17.9		25.7

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
6+40.5 P.T.		714.75			
7					
+50	✓				
8					
+50	✓				
9					
+50					
10					
T.P.	4.95	714.26	5.44	709.31	
+50					
11					
+50					
12					

Inst. G S C
Rod.
Chain. F

11-20-24

Left				C L		Right		
4.2	× 4.2	4.3	(4.9)	5.2	5.4	5.8		5.8
24.4	21.0	14.7		00	11.2	17.2		22.5
4.8	× 4.4		(4.8)	5.1	5.0	5.5	×	6.4
25.4	21.0			00	12.2	17.4		20.0
4.7	× 4.6	4.9	4.8		5.0	5.3	×	5.7
24.9	20.9	10.0	00		9.5	17.8		20.9
4.7	× 4.8	4.9	(5.0) 4.9	4.9	4.5	4.9	×	4.8
24.5	20.8	12.8	00	8.0	15.3	17.8		22.0
5.0	× 5.0	4.9	4.9	5.1	4.8	5.1	×	5.1
25.1	20.6	16.8	00		8.8	14.0	17.9	21.9
5.3	× 5.0		(5.1) 4.8		4.6	5.0	×	5.7
26.6	20.9		00		12.8	17.2		20.8
6.2	× 5.0	5.0	(5.1) 4.9		4.9	×		6.0
28.4	20.8	11.3	00		16.8			19.4
5.5	× 5.2		(5.2) 4.8	4.8	4.9	×		5.8
26.7	20.7		00		12.2	16.4		19.4
4.7	× 4.7	4.5	(4.7) 4.4			4.4	×	5.1
27.5	20.8	16.0	00			16.6		20.9
4.8	× 4.7		(4.8) 4.5			4.7	×	4.8
26.9	20.7		00			16.7		23.1
5.4	× 4.8		(4.9) 4.8		4.6	5.0	×	5.2
26.6	20.8		00		11.2	16.8		26.4
5.1	× 4.9	5.0	(4.9) 4.9		4.7	5.0	×	5.2
24.8	20.8	11.7	00		15.6	17.5		26.5

Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
12 + 50		714.26			
13					
+ 50					
14					
+ 50					
15					
T.P.			6.27	707.99	

Inst. ..... S
Rod. ..... S
Chain. ..... E

11-20-24

	Left		C L		Right	
5.5	5.0	4.7	4.9 (4.9)		4.7	5.6
24.4	20.7	13.0	00		18.1	28.9
5.6		5.0	4.7	4.9 (5.0)	4.9	5.4
23.8		20.2	12.8	00	18.4	30.4
5.3	5.2	5.1	5.0 (5.0)	4.8	5.0	5.2
23.3	19.8	11.0	00	12.3	19.0	28.0
5.5		5.2	5.0	5.1 (5.1)	4.7	5.0	5.9
22.1		19.1	10.2	00	13.3	19.7	26.9
5.6	5.0	4.8	5.0 (5.1)	4.9	5.0	5.6
23.1	18.7	13.2	00	11.2	19.9	26.5
5.0	4.6		4.8 (5.2)	4.8	5.1	5.2
22.2	18.2		00	12.0	19.5	25.5

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	3.00	795.34		792.34	
T.P.	0.70	784.26	11.78	783.56	
44+00					
+50					
45+00					
+50					
T.P.	8.73	782.46	10.53	773.73	*
46+00					
+50					
47	End of Humason's HE				
T.P.	11.80	785.53		773.73	*
+50					
48					
+25					
+45					

W46

Inst. Galvin Conner 11-18-24. S-1
Rod. Straughn
Chain.

Left	C L	Right

Sta 45+90 Top of Eng. & Rail Post, Lt.

14.0	11.9	(11.8) 11.8	11.8	12.9	12.9	7.4
21.5	18.0	00	15.0	15.0	18.7	21.5
		(9.4)				
11.7	9.4	9.3	9.4	10.4	10.2	4.5
19.6	16.3	00	15.0	15.0	18.6	22.3
		(7.0)				
11.0	7.1	7.0	7.0	7.4	7.0	2.7
23.4	18.0	00	15.4	16.8	18.2	21.0
		(4.6)				
13.6	4.5	4.8	4.6	5.2	4.5	0.0
38.3	26.3	00	15.0	16.2	18.7	21.4

Top of end CIC Post Planum F.E. Sta 47+00 Lt.

11.8	2.0	1.2	00	
46.6	33.2	19.0	14.5	(0.4)
12.8	7.4	6.5	7.3	
53.4	45.5	31.5	28.3	(+2.0)
14.0	10.7	9.9	8.6	
65.0	58.0	42.0	35.0	(+4.4)
		9.5		
		37.0		(+3.8)
		7.6		
		37.6		(+6.2)
	7.6	5.5		
	41.0	36.0		(+7.4)
		4.8		
		34.0		(+8.0)

Cross Sections

Sta.	B.S.	H I.	F S.	Grade	Gr. R.
48+62		785.53			
+75					
T.P.	3.69	776.35	12.87	772.66	
+88					
49+00					
+10					
T.P.	11.93	788.09	0.19	776.16	
+25					
+38					
T.P.	8.52	796.28	0.33	787.76	
+50					
T.P.	10.63	806.70	0.21	796.07	
+75					
50+00					
+25					
+50					
T.P.	4.29	798.78	1.21	794.49	

Inst. G
Rod. S
Chain. F

11-18-24

J-2

Left	C L	Right
7.9 45.0	+8.5	
12.9 58.0	+9.8	
Bottom of Creek → 16.0 73.0	+19.5	
16.0 73.0	+20.1	
1.6 59.0	+20.7	
4.6 47.0	+9.5	
0.0 44.0	+10.0	
OG → 6.4 41.7	+2.3	
OG → 7.0 33.7	5.0 30.0	7.0
OG → 8.8 41.6	4.3 35.0	6.0
OG → 12.1 44.6	3.8 33.0	5.0
OG → 13.3 41.4		4.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
50+75		798.78			
51+00					
+25					
+50					
B.M.			9.29	789.49	789.49
+75					
T.P.	6.21	792.05	12.94	785.84	
52+00					
+15					
B.M.				789.50	789.49
B.M.	6.46	798.80		792.34	
46+00					
+50					
47+00					
+50					

Inst. G
Rod. S
Chain. F

11-18-

S-3

Left	C L	Right
8.6 43.0	+4.8	
9.4 44.4	+5.7	
6.6 40.3	+6.6	
6.0 40.3	+7.5	
Page 65 ck O.K.		
15.1 50.3	+8.5	
9.7 54.0	+16.1	
5.9 49.0	+16.6	

Cattle guard 48+50 S.E. Cor. parapet wall

(16.7)	16.5	16.6	17.9	17.9	12.3	
	00	14.0	16.2	18.6	22.0	
(14.3)						
14.5	14.6		14.4	15.9	15.9	9.8
17.3	00		14.5	16.8	18.9	23.5
(11.9)						
12.0	11.8	11.6	13.2	13.2	7.2	
17.0	00	14.6	17.2	20.0	24.0	
(9.3)						
9.2	9.3		9.4	10.6	10.7	6.2
19.3	00		15.0	17.0	18.9	22.0
(7.1)						
6.6	7.4	7.6	9.0	8.8	3.5	
18.0	00	14.4	17.0	19.3	22.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
48+25		798.80			
+45					
+62					
+75					
+88					
49+00					
+10					
T.P.	12.04	810.82	0.02	798.78	
48+62					
+75					
+88					
49					
+10					
T.P.			0.37	810.45	

Inst. S
Rod. S
Chain. F

11-18-24

54

Left				C L				Right	
5.6				(5.9) 6.3	6.7	8.1	7.6	9.3	
20.0				0.0	14.1	17.7	21.4	26.0	
		4.1		(6.3) 5.3	5.8	7.2	6.6	0.0	
		16.0		0.0	14.5	17.6	22.2	27.0	
	3.4			(4.8) Cattle pass					
	17.0			4.3	4.9	8.0	10.7	10.7	
				0.0	15.1	22.3	25.4	32.3	
	3.7	2.9		(8.5) 3.8		4.4	5.2	6.5	6.0
	24.0	18.2		0.0		15.5	24.2	34.4	44.4
2.7	1.9			(2.9) 3.2	3.8	4.7	4.5		
25.4	20.3			0.0	14.5	30.2	48.0		
	1.4	1.2		(2.3) 2.6	3.4	3.8	3.7	2.3	
	26.0	21.6		0.0	14.0	30.0	50.0	59.0	
0.2	0.6			(1.7) 2.0	2.8	3.0	5.8	6.8	1.8 0.8
26.0	22.3			0.0	14.8	30.4	43.7	53.6	59.6 48.8
				(16.8)				8.0 38.0	O.G.
				(15.5)				5.3 47.3	O.G.
				(14.9)				4.3 54.2	O.G.
				(14.3)				3.8 63.5	O.G.
				(13.7)				4.4 67.3	O.G.

Zero S.R. Exc. Sta. 15 ft. more or less appr. to Cattle pass

Top of rock Rt. Sta 49+

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
T.P.	12.98	823.43		810.45	
49+50					
+75					
50+00					
+25					
+50					
T.P.	6.08	829.17	0.34	823.09	
+75					
51+00					
+25					
+50					
+75					
52+00					
52+15					
52+60					

Inst. Galuna
Rod. Stooglun Conner
Chain. Fritz

11-19-24

V-J

Left	C L	Right
	(24.8)	16.4 26.0 OG
	(23.7)	10.4 26.0 0.G
	(22.7)	6.1 28.2 0.G
	(21.7)	4.0 28.9 0.G
	(20.7)	1.7 29.5 OG
	(25.6)	6.6 29.0 OG
	(24.7)	7.3 28.8 OG
	(23.8)	7.9 31.0 OG
	(22.9)	9.0 32.0 OG
	(21.9)	7.1 38.0 OG
	(21.0)	5.2 40.0 OG
	(20.5)	4.3 39.0 OG
	(18.9)	2.0 39.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		829.17			
52+75					
T.P.	9.08	837.44	0.81	828.36	
53+00					
53+25					
53+50					
53+75					
54+00					
54+25					
T.P.	2.77	827.30	12.91	824.53	
54+55					
54+75					
54+90					
55+00					

Inst. B
Rod. S
Chain. F

11-19-24

56

Left	C L	Right
	3.7	7.0
18.5	36.0	39.0 OG
		2.9
25.8		34.5 OG
		5.4
24.9		37.5 OG
		4.6
24.0		36.0 OG
		6.0
23.0		32.5 OG
		10.5
22.1		27.0
		14.0
21.2		25.0
		8.4
10.0		25.0
		8.1
9.3		26.0
		5.1
8.9		23.0
		4.2
8.3		23.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		827.30			
55+25					
T. P.	1.67	816.17	12.80	814.50	
T. P.	6.64	810.56	12.25	803.92	
55+50					
55+68					
55+80					
T. P.	12.97	823.31	0.22	810.34	
56+00					
T. P.	12.52	835.61	0.22	823.09	
56+25					
T. P.	11.48	846.84	0.25	835.36	
56+50					
T. P.	10.71	857.55	1.00	846.84	
+75					
57					
+25					

Inst. G
Rod. S
Chain. F

11-19-24

57

Left	C L	Right
	(7.4)	12.0 27.6
	(+10.2)	8.1 49.0
	(+10.9)	14.3 57.0
	(+11.4)	7.0 47.0
	(0.6)	10.6 33.0
	(12.0)	4.0 43.0
	(22.3)	3.2 46.0
	(31.2)	13.6 44.0 — 4.6 OG 51.0
	(30.2)	13.8 37.0 — 3.8 49.0
	(29.2)	11.7 39.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
57+50		856.55			
+75					
58					
+30					
T.P.	10.98	866.79	0.74	855.81	
57+25					
57+50					
+75					
58+00					
+30					
+60					
+85					
59+05					
59+25					

Inst. G.S.F.
Rod.
Chain.

11-19-24

Left	C L	Right
(28.3)	11.7 37.0	
(27.4)	14.0 33.0	
(26.5)	10.1 36.0	
(25.4)	7.7 37.0	
(39.4)		8.7 42.0
(38.5)		11.9 47.0
(37.6)		12.6 45.0
(36.7)		9.7 47.0
(35.6)		6.8 48.0
(34.5)		10.4 4.4 44.0 46.0
(33.6)		10.2 3.6 42.0 45.0
(32.8)		10.1 3.7 40.0 43.5
(32.1)		10.0 4.9 41.0 43.7

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
59+50		866.19			
T.P.	6.67	860.49	12.97	853.82	*
58+30					
+60					
+85					
59+05					
+25					
+50					
T.P.	2.64	856.46		853.82	
+75					
60+00					
T.P.	1.57	845.65	12.38	844.08	
B.M.			7.93	837.72	837.71

Inst. G
Rod. S
Chain. E

11-19-24

5-9

Left	C L	Right
	31.2	8.3 40.7
	29.3	5.1 46.0
	28.2	11.5 33.0
	27.3	9.2 34.5
	26.5	7.3 34.5
	25.8	11.2 37.0
	24.9	11.8 33.0
	20.0	4.1 35.7
	19.0	8.2 43.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
Bm 49+25	12.43	804.77		792.34	
+38					
+75					
50+00					
+25					
T.P.	9.03	813.17	0.63	804.14	
+50					
+75					
51+00					
+25					
+50					
+75					
52+00					

Inst. 9 Conder 11-20-24 6.0
Rod. S
Chain. F

Left			C L	Right			
S.E. Cor. Apple Farm 8+50			(7.9)				
6.3	6.1	6.7	7.4	7.7	7.7	10.0	10.3	4.2
28.0	24.5	10.0	0.0	9.5	19.0	24.0	27.0	32.0
			(6.7)					
5.1	4.8	6.0	6.7	7.7	8.6	8.6		0.3
27.5	26.0	10.0	0.0	14.0	15.5	17.5		26.0
			(5.1)					
3.2	3.2	3.3	4.3	5.1	6.2	6.9	6.9	4.7
31.0	27.5	22.0	18.0	0.0	15.0	16.2	18.5	20.0
			(4.1)					
2.6	2.8	3.3	3.2	3.9	4.8	5.2	5.2	3.0
35.5	27.8	25.0	10.0	0.0	15.0	16.0	18.0	20.0
			(3.1)					
2.0	1.7	2.1	3.0	3.8	4.3	4.2	2.2	
33.0	26.6	10.0	0.0	15.3	16.6	18.7	21.0	
			(10.5)					
9.4	8.9	8.7	9.8	10.5	11.4	12.4	12.0	
27.8	25.0	20.0	10.0	0.0	14.3	16.0	19.7	
			(9.6)					
8.8	8.2	8.9	9.6	10.4	11.3	11.0		
23.0	21.4	10.0	0.0	15.2	17.1	22.0		
			(8.7)					
8.1	7.7	7.9	8.5	9.2	10.0	9.9		
22.2	19.3	10.0	0.0	14.2	16.3	21.0		
			(7.8)					
6.9	6.9	7.4	7.9	8.2	9.2	9.1		
19.8	17.0	10.0	0.0	13.0	15.5	21.0		
			(6.9)					
6.5	6.6	6.7	7.0	7.4	8.5	8.5		
20.0	16.0	10.0	0.0	13.7	15.8	22.0		
			(5.9)					
6.0	5.6	6.0	6.0	6.7	7.6	7.5		
20.0	14.5	10.0	0.0	14.6	15.0	24.0		
			(5.0)					
5.2	5.2	5.1	5.3	5.3	6.6	6.1		
20.0	14.0	10.0	0.0	15.0	18.6	26.0		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
52 +15		813.17			
Equation					
+60					
+75					
53 +00					
+25					
+50					
T.P.	10.96	823.33	0.80	812.37	
+75					
54					
+25					
+50					
+75					
+90					
55 +00					

Rod. G
Chain. S

11-20-24

Left				Right			
			(4.5)				
4.4	4.6	4.7	4.8	4.8	7.5	6.7	
20.0	14.0	10.0	00	15.0	18.4	25.4	
			(2.9)				
3.5	3.7	3.7	3.6	3.6	5.1	5.0	
20.3	13.8	10.0	00	15.2	18.4	24.0	
			(2.5)				
3.2	3.2	3.2	3.1	3.1	4.4	4.4	
20.0	13.8	10.0	00	16.0	19.3	23.7	
			(1.6)				
2.8	2.5	2.4	2.3	1.9	3.4	3.4	
23.0	13.9	10.0	0.0	15.0	17.7	22.6	
			(0.7)				
1.5	1.6	1.7	1.7	2.8	2.6		
23.0	14.0	00	14.2	17.4	21.7		
			(+0.2)				
1.0	0.9	0.7	0.3	1.6	1.6		
22.6	13.7	00	16.0	18.0	21.0		
			(1.9)				
10.1	10.3	10.0	9.4	10.8	10.7		
20.8	14.0	00	16.5	17.5	20.1		
			(8.9)				
9.5	9.3		8.8	8.3	9.4	9.4	
20.0	13.6		00	15.3	17.3	19.6	
			(7.1)				
8.5	8.2		7.9	7.4	8.9	8.8	
19.0	13.6		00	15.0	17.7	20.8	
			(6.0)				
7.0	7.0		6.7	6.1	7.5	7.5	4.7
19.1	13.7		00	15.9	18.0	23.0	25.0
			(5.3)				
6.2	6.3		5.8	5.1	6.8	6.5	4.1
19.0	13.9		00	16.5	19.4	24.6	26.5
			(4.9)				
5.6	5.6		5.1	4.3	5.4	5.3	1.3
19.8	13.5		00	15.4	17.5	21.0	23.0
			(4.3)				
5.4	5.0	4.6		3.7	4.7	4.3	0.3
21.0	13.7	00		15.5	17.9	21.0	23.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
55+25		823.33			
+50					
T.P.	10.70	833.01	1.02	822.31	
+68					
+80					
56					
+25					
+50					
+75					
57+00					
+25					
+50					
+75					
T.P.	10.86	843.61	0.26	832.75	

Inst. G
Rod. S
Chain. F

11-20-24

62

Left		C L (3.4)	Right	
4.7	4.1	3.6	2.7	2.5
23.8	14.0	00	13.9	18.0
		(2.5)		
3.4	3.0	3.5	1.7	1.4
24.0	13.8	00	14.0	22.3
		(11.5)		
11.9	11.7	11.2	10.5	10.2
24.2	14.2	00	13.7	20.6
		(11.0)		
11.2	11.1	10.6	9.9	9.7
24.0	14.2	00	13.9	19.0
		(10.3)		
10.7	10.1	9.5	8.9	8.9
23.2	14.2	00	13.8	19.0
		(9.4)		
9.3	9.1	8.3 7.6 7.5	10.5 10.6 6.8	6.2
22.0	14.2	00 13.9 17.0	22.2 29.1 34.9	41.6
		(6.5)		
(10.9) 8.0	7.8	7.0 6.4	6.4 8.5 8.9	4.8 1.6
25.0 20.0	14.0	00 13.7	16.7 20.8 28.6	34.6 41.2
		(7.6)		
6.6	6.5	5.9	5.0	6.3 6.4
17.6	14.0	00	16.2	19.2 26.0
		(6.4)		
5.2	5.2	4.8	3.8 4.8	5.0
17.5	14.0	00	17.0 18.3	26.0
		(5.6)		
4.6	4.3	3.4	2.9 3.8	3.7
19.0	14.2	00	15.9 18.0	23.0
		(4.7)		
3.3	3.0	2.4	1.6	3.0 3.0
24.0	14.2	00	15.0	18.0 23.4
		(3.8)		
2.8	1.8	1.1	0.7 1.9	1.8
23	14.2	00	15.7 18.0	24.0

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
58+00		843.61			
+30	Zero	borrow	Lt.		
+60			Row 79.0	OG→	9.0 / 71.5
+85			Row 78	OG→ 3.2 / 8.0	14.3 / 74.0
59+05			Row 77.5	OG→ 3.8 / 90.0	14.2 / 78.0	14.5 / 54.0
+25			Row 78.0	OG→ 4.3 / 92.5	13.7 / 82.0	13.8 / 56.5
+50			Row 79.0	OG 8.8 / 87.2	13.2 / 80.2	12.5 / 55.2
+75			OG→ 13.4 / 89.0	11.1 / 85.0	13.0 / 80.0	10.8 / 52.5
60+00				OG→ 12.9 / 64.2	5.8 / 50.5
B.M.			5.98	837.63 ✓	
+25	Zero	borrow	Lt.		
+50					
+75					
B.M.	8.7	846.43 ✓		837.71 ✓	
60+75					

Inst. G
Rod. 5, S 11-20-24
Chain. F

Left				C L	Right			
				(12.3)				
12.3	11.1			10.5		9.9	10.9	10.6
22.6	14.0			00		15.5	18.0	24.5
				(12.4)				
12.4	11.0	9.9		9.4	8.7	9.9	10.9	
33.0	16.3	14.0		00	15.2	17.7	23.7	
				(11.3)				
13.7	12.6	12.0	9.4	8.5	7.8	7.4	8.2	8.2
42.0	21.5	20.8	18.6	14.0	00	17.0	18.2	23.3
				(10.4)				
13.4	11.5	11.2	7.6	7.6	6.9	6.3	7.3	7.2
48.0	42.0	23.5	17.8	14.0	00	16.0	18.0	24.2
				(9.6)				
10.2	10.0	6.3	5.6	5.5	5.2	6.3	6.4	
47.5	29.5	23.7	14.0	00	14.0	17.5	23.5	
				(8.9)				
9.6	9.5	4.9	4.4	4.7	4.2	5.7	5.7	
50.2	34.5	26.0	14.0	00	14.0	17.5	24.0	
				(8.0)				
8.8	8.7	5.4	3.8	3.7	3.4	5.7	5.5	
49.8	36.0	31.2	14.0	00	14.5	18.5	25.5	
				(7.1)				
8.6	7.5	3.9	3.1	2.8	2.5	4.8	4.6	
46.8	32.6	27.8	14.0	00	15.0	19.0	33.8	
				(6.1)				
6.4	4.5	2.7	2.4	1.8	1.4	3.8	3.8	3.8
42.7	25.5	17.8	14.0	00	15.0	18.5	28.0	33.5
Ea.	8.3	7.1	2.5					
	4.6	1.9	1.5	1.1	0.6	2.6	3.6	1.0 0.6
	21.0	16.5	14.0	00	14.4	20.0	37.0	40.7
				(4.2)				
9.8	0.9	0.5		0.2	00	0.2	6.6	
30.0	16.5	14.0		00	14.2	15.4	24.8	
28.0				(3.0)				12.8
50.0								34.0
				(5.8)				
3.0	2.8			2.3	1.8	2.0		
19.4	13.8			00	14.2	16		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	11.1	871.69		860.57	
67+75		Zero Borrow Rt.			
67+50					
67+00					
66+50					
+25					
66+00					
+50					
65					
+50					
64					
63+50					
T.P.	1.6	860.96	12.35	859.34	
63+00		Zero borrow Rt.			

Cont. on page 68

Inst. G Comm'd 11-20-24
Rod. S
Chain. E

Left	C L	Right
SW Cor. Coping Cattle pass 67 +10		
(8.6)	8.5 10.6 10.4 7.6 2.3	
	14.0 20.5 29.0 34.5 38.0	
	10.1 15.5 14.8 6.3 1.2	
	14.0 24.0 33.5 45.6 50.0	
	11.2 13.0 13.0 9.5 8.1 2.6	
	14.0 20.5 24.2 29.0 43.0 47.8	
(12.2)	11.5 12.7 12.3 6.4 5.4 3.4	
	16.0 20.0 23.8 31.7 39.0 41.9	
(13.3)	12.2 13.9 13.6 5.6	
	16.5 20.0 34.1 41.3	
(14.7)	4.0 7.2	
	46.0 45.5	
(16.4)		11.1 4.5
		43.5 45.8
(18.1)		11.0 3.8
		48.0 49.0
(19.5)		14.3 6.6
		45.5 47.8
(21.5)		12.4
		48.5

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	9.97	802.31		792.34	
T.P.	7.07	796.78	12.60	789.71	
BM			7.29	789.49	
T.P.	3.36	787.39	12.75	784.03	
52+60					
+75					
T.P.	12.54	799.81	0.12	787.27	
T.P.	7.29	805.66	1.44	798.37	
53					
+25					
+50					
T.P.	1.55	794.68	12.53	793.13	
+75					
54					
+25					
T.P.			8.39	786.29	
T.P.	8.43	801.96	1.15	793.53	
+55					
+90					

Inst. Galvin — Conner
Rod. Skooglun
Chain. Fritz

11-17-24

65

Left	C L	Right
Rock 50 ft Lt Sta 7+25		
10.2 61.0	+22.9	
1.1 55.0	+23.3	
4.6 35.0	+5.9	
0.6 33.0	+6.8	
4.6 36.0	+7.7	
10.0 60.0	+19.7	
13.0 62.0	+20.6	
6.9 61.3	+21.5	
Tw 6 100 ft Lt Sta 7+50		
7.0 44.3	+15.3	
5.4 50.0	+16.4	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		801.96			
T.P.	1.72	790.79	12.89	789.07	
55+00					
T.P.	2.81	780.75	12.85	777.94	
55+50					
55+68					
T.P.			0.12	780.63	*
T.P.	3.16	771.23	12.68	768.07	
55+75					
T.P.	12.65	793.28		780.63	*
55+80					
T.P.	12.68	805.55	0.41	792.87	
56+00					
56+25					
T.P.	11.44	816.81	0.18	805.37	
T.P.	12.05	828.69	0.17	816.64	
56+50					
56+75					
57+00					

Inst. G
Rod. S
Chain. F

11-17-24

Left	C L	Right
4.0 67.0		
11.0 67.0	+28.2	
6.7 92	+40.0	
0.0 77	+40.7	
13.8 113.0	5.3 96.0	+48.7
6.0 70.0		+28.7
9.1 61.0		+17.1
0.0 47.0		+18.0
0.6 11.5 75 40.0	7.4 47.0	6.7 25.0 +4.2
0.6 8.1 75 25.0	6.1 32.2	6.0 36.0 5.8 23.0 +3.3
0.6 4.2 75 56.0	5.1 49.0	4.4 24.0 +2.3

Cross Sections

Sta.	B.S.	H.I	F.S.	Grade	Gr. R.
57+25		828.69			
T.P.	0.18	816.24	12.63	816.06	
57+50					
57+75					
58+00					
T.P.	10.86	826.42	0.68	815.56	
58+30					
T.P.	12.68	837.99	1.11	825.31	
T.P.	9.47	844.76	2.70	835.29	
BM			7.08	837.68	837.71

Inst. E
Rod. S
Chain. F

11-17-24

Left	C	Right
OG → 38.0 (6.7, 30.0)	21.4 (7.0)	(1.3)
OG → 47.0 (2.6, 43.0)	(00)	(+12.1)
	9.0 / 6.0	(+13.0)
	4.7 / 0.0	(+13.9)
OG → 46.0 (4.4)		(+4.8)

Cont. from page 64

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
63+50		860.96			
+75	Zero borrow Lt.				
64					
+50					
65					
+50					
+75					
66					
+25					
+50					
67+00	Zero borrow Lt.				
T.P.	5.99	866.47	0.48	860.48	
B.M. 67+00			5.88	860.59	860.57

Inst. G
Rod. S
Chain. F

11-20-24

Left	C L	Right
	(10.8)	10.1 11.7 11.5 15.2 20.8 41.0
13.1 10.1 10.5 10.1 9.5 8.5 10.9 11.0 40.2 34.7 29.0 17.2 15.1 15.3 21.2 34.3	(8.8)	
11.4 9.1 10.6 10.3 7.6 6.8 10.0 9.9 48.5 45.0 42.5 23.4 15.0 14.5 22.0 35.6	(7.4)	
9.3 8.1 10.3 10.0 5.8 4.8 7.4 6.8 47.5 44.5 41.5 22.4 14.0 15.4 19.7 34.5	(6.7)	
5.7 4.7 8.4 8.2 4.4 3.0 5.4 5.3 46.5 41.3 38.0 20.8 15.3 15.0 19.5 33.5	(4.0)	
9.3 7.2 7.1 3.1 45.4 41.2 20.2 14.0	(3.7)	
4.6 6.9 5.4 2.6 2.8 46.7 43.0 22.4 17.6 14.0	(1.5)	
5.3 6.0 2.2 1.4 45.0 23.0 17.2 14.0	(0.7)	
7.9 5.0 4.8 1.0 0.9 44.5 39.5 22.0 16.8 14.0		
7.8 5.5 6.9 6.3 39.3 33.0 30.0 25.7		
ok.		
	5.1 14.0	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

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

Left | Right

.... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod.
Chain.

70

Left	C L	Right

..... Cross Sections .....

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod.
Chain.

Left	C L	Right

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod
Chain.

Left C L Right

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

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

Left C L Right

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod.
Chain.

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Left	℄ L	Right

Final Guard Rail Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
105-110		Lt		462	
105-110		Rt.		480	
110	117	Rt		704	
110	117	Lt		697	
118	120	Lt		224	
123	127	Lt		400	
123	127	Rt.		385	
134	138	Lt		177	
136	137	Lt.		151	
142		Lt		96	
barricade		142		32	
142		Rt		135	
143		Rt		176	
143		Lt		159	
barricade				32	
153		Rt		65	
153		Lt		72	
barricade				32	
				4481	
				9258	
				13739	

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

Holmes Corner 11-11-24
Johnson

Left C L Right

Cont. from page 77

12 15 18 24

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
142 Rt			30	30	
135 Rt	24				
135 Lt.	24				
127+75 Rt.			24		
117+50 Rt	24				
104 Lt.	20				
96+20 Rt	24				
91+00 Lt.	24				
87+80 Rt.	24				
76+75 Lt.	24				
70+25 Lt	24				
70+50 Rt			24		
67+90 Rt.			12		
67+90 Lt	24				

Inst.
Rod.
Chain.

Left C L Right

Final Guard Rail

0+70	18+60	Lt	1771	LL
"	"	Rt	1790	L
26	27	Rt	72	L
26	27	Lt	140	L
41	43	Rt	104	L
41	43	Lt	64	L
Intersection FE 45-48		Lt	240	L
Barracks 46			32	L
48	49	Rt	89	L
55	57	Rt	160	L
60	63	Rt	304	L
46	68	Lt	2165	L
Barracks 68			32	L
69	68	Rt	104	L
77	Barracks		32	L
77	90	Lt	289	L
"	"	Rt	280	L
83+50	84+50	Rt	97	L
83	86	Lt	240	L
87	89	Lt	216	L
89	94	Rt	345	L
91+50	94+50	Lt	296	L
95+50	96+50	Rt	49	L
95	97	Lt	169	L
97+50	99+50	Lt	178	L
			9258	

Holmes Conner
Johnson 11-11-24

Cont on page 75

Sta					old G.R.
BM	12.54	850.25		837.71	11.86
60+00			Zero class. Mat. Elev 37.05		12.7
	10.90	859.66	1.49	848.76	
59+75				836.50	23.2
59+50				835.60	24.1
T.P.	7.73	867.01	0.38	859.28	
59+05				834.00	33.0
T.P.	1.35	856.06	12.30	854.71	
T.P.	3.93	847.83	12.16	843.90	
59+75				836.5	11.3
59+50				835.6	12.2
59+25				834.70	13.1
BM.			10.15	837.68	

Zero class. Mat. = Sta 59+05

Class. Mat. Common Galvin Scroeglund 10/2/24.

Nail in tree 60+80 Ft.

10.0
0.0

2.2
30.5 (+5.5 30.5)

R.
25.0

R
13.7
15.0

10.6 R
7.6
35.7 (+10.7 35.7)

(+8.9 38.3)

30.0 R.

4.9 R
25.5

4.0 R.
43.1 (+18.1 43.1)

(+13.6 38.6)

21.0 4.0 48 (+25.0 48.0)

7.5 R
25.0

66 R
30.0

4.5 R
10.0

2.7 R
6.0

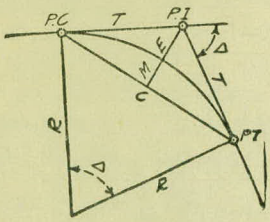
6.0 R
0.0

2.7 R
0.0

5.1 R
6.5

Concreted Rock

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) =R vers $\frac{\Delta}{2}$ (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÷100)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÷(2 x 688.26)=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	3.18	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°	.268	.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× 2½ (near enough)=.57 and horizontal distance=248.7—.57=248.13 ft.

TRIGONOMETRICAL FORMULAS.

See fig. (a).

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

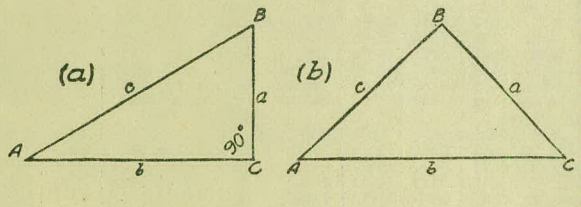
cos. $A=\frac{b}{c}$

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.		Angle	Sine.	Tan.	Cotg.	Cosin.	
°						°					
0	0	0	00	1	90	8	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	I	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99998	40	20	.1449	.1465	6.827	.98944	40
30	.0087	.0087	114.6	.99996	30	30	.1478	.1495	6.691	.98902	30
40	.0116	.0116	85.94	.99993	20	40	.1507	.1524	6.561	.98858	20
50	.0145	.0145	68.75	.99989	10	50	.1536	.1554	6.435	.98814	10
1	.0175	.0175	57.29	.99985	89	9	.1564	.1584	6.314	.98769	81
10	.0204	.0204	49.10	.99979	50	10	.1593	.1614	6.197	.98723	50
20	.0233	.0233	42.96	.99973	40	20	.1622	.1644	6.084	.98676	40
30	.0262	.0262	38.19	.99966	30	30	.1650	.1673	5.976	.98629	30
40	.0291	.0291	34.37	.99958	20	40	.1679	.1703	5.871	.98580	20
50	.0320	.0320	31.24	.99949	10	50	.1708	.1733	5.769	.98531	10
2	.0349	.0349	28.64	.99939	88	10	.1736	.1763	5.671	.98481	80
10	.0378	.0378	26.43	.99929	50	10	.1765	.1793	5.576	.98430	50
20	.0407	.0407	24.54	.99917	40	20	.1794	.1823	5.485	.98378	40
30	.0436	.0437	22.90	.99905	30	30	.1822	.1853	5.396	.98325	30
40	.0465	.0466	21.47	.99892	20	40	.1851	.1883	5.309	.98272	20
50	.0494	.0495	20.21	.99878	10	50	.1880	.1914	5.226	.98218	10
3	.0523	.0524	19.08	.99863	87	11	.1908	.1944	5.145	.98163	79
10	.0552	.0553	18.07	.99847	50	10	.1937	.1974	5.066	.98107	50
20	.0581	.0582	17.17	.99831	40	20	.1965	.2004	4.989	.98050	40
30	.0610	.0612	16.35	.99813	30	30	.1994	.2035	4.915	.97992	30
40	.0640	.0641	15.60	.99795	20	40	.2022	.2065	4.843	.97934	20
50	.0669	.0670	14.92	.99776	10	50	.2051	.2095	4.773	.97875	10
4	.0698	.0699	14.30	.99756	86	12	.2079	.2126	4.705	.97815	78
10	.0727	.0729	13.73	.99736	50	10	.2108	.2156	4.638	.97754	50
20	.0756	.0758	13.20	.99714	40	20	.2136	.2186	4.574	.97692	40
30	.0785	.0787	12.71	.99692	30	30	.2164	.2217	4.511	.97630	30
40	.0814	.0816	12.25	.99668	20	40	.2193	.2247	4.449	.97566	20
50	.0843	.0846	11.83	.99644	10	50	.2221	.2278	4.390	.97502	10
5	.0872	.0875	11.43	.99619	85	13	.2250	.2309	4.331	.97437	77
10	.0901	.0904	11.06	.99594	50	10	.2278	.2339	4.275	.97371	50
20	.0929	.0934	10.71	.99567	40	20	.2306	.2370	4.219	.97304	40
30	.0958	.0963	10.39	.99540	30	30	.2334	.2401	4.165	.97237	30
40	.0987	.0992	10.08	.99511	20	40	.2363	.2432	4.113	.97169	20
50	.1016	.1022	9.788	.99482	10	50	.2391	.2462	4.061	.97100	10
6	.1045	.1051	9.514	.99452	84	14	.2419	.2493	4.011	.97030	76
10	.1074	.1080	9.255	.99421	50	10	.2447	.2524	3.962	.96959	50
20	.1103	.1110	9.010	.99390	40	20	.2476	.2555	3.914	.96887	40
30	.1132	.1139	8.777	.99357	30	30	.2504	.2586	3.867	.96815	30
40	.1161	.1169	8.556	.99324	20	40	.2532	.2617	3.821	.96742	20
50	.1190	.1198	8.345	.99290	10	50	.2560	.2648	3.776	.96667	10
7	.1219	.1228	8.144	.99255	83	15	.2588	.2679	3.732	.96593	75
10	.1248	.1257	7.953	.99219	50	10	.2616	.2711	3.689	.96517	50
20	.1276	.1287	7.770	.99182	40	20	.2644	.2742	3.647	.96440	40
30	.1305	.1317	7.596	.99144	30	30	.2672	.2773	3.606	.96363	30
40	.1334	.1346	7.429	.99106	20	40	.2700	.2805	3.566	.96285	20
50	.1363	.1376	7.269	.99067	10	50	.2728	.2836	3.526	.96206	10
					82						74
	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.	
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.

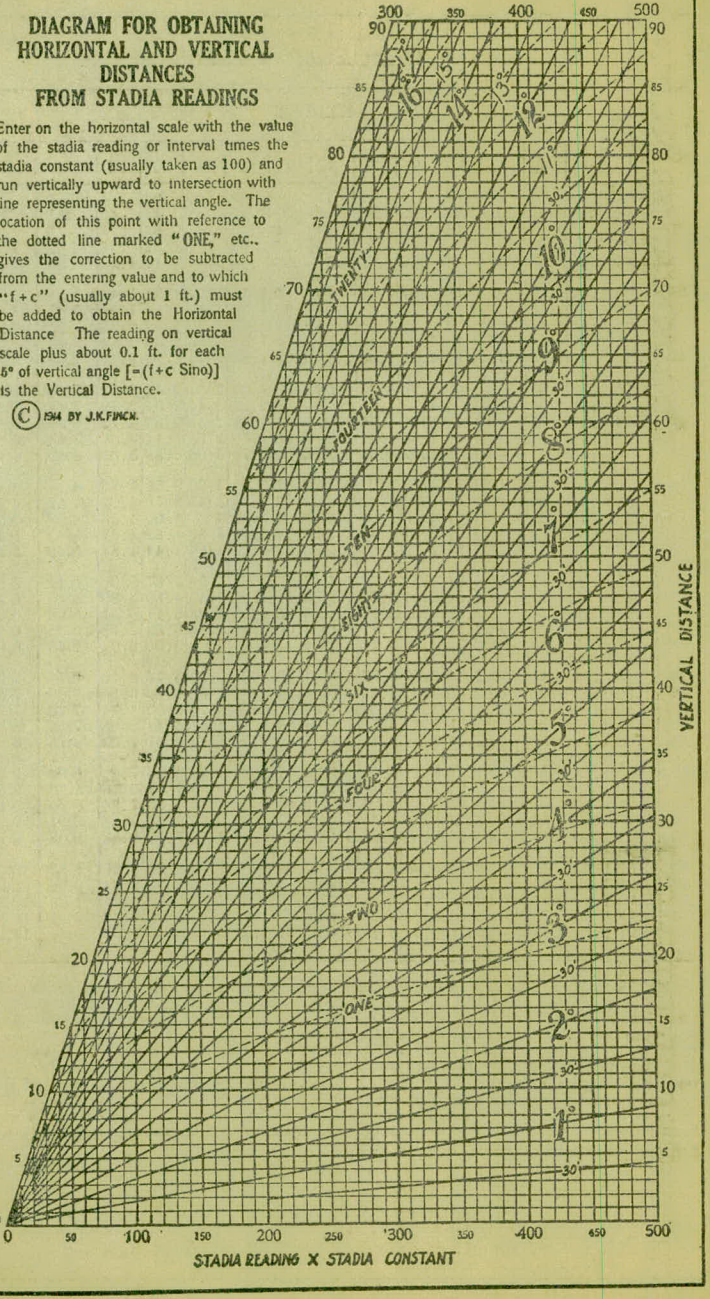
Table IX.—Calculation of Earthwork.

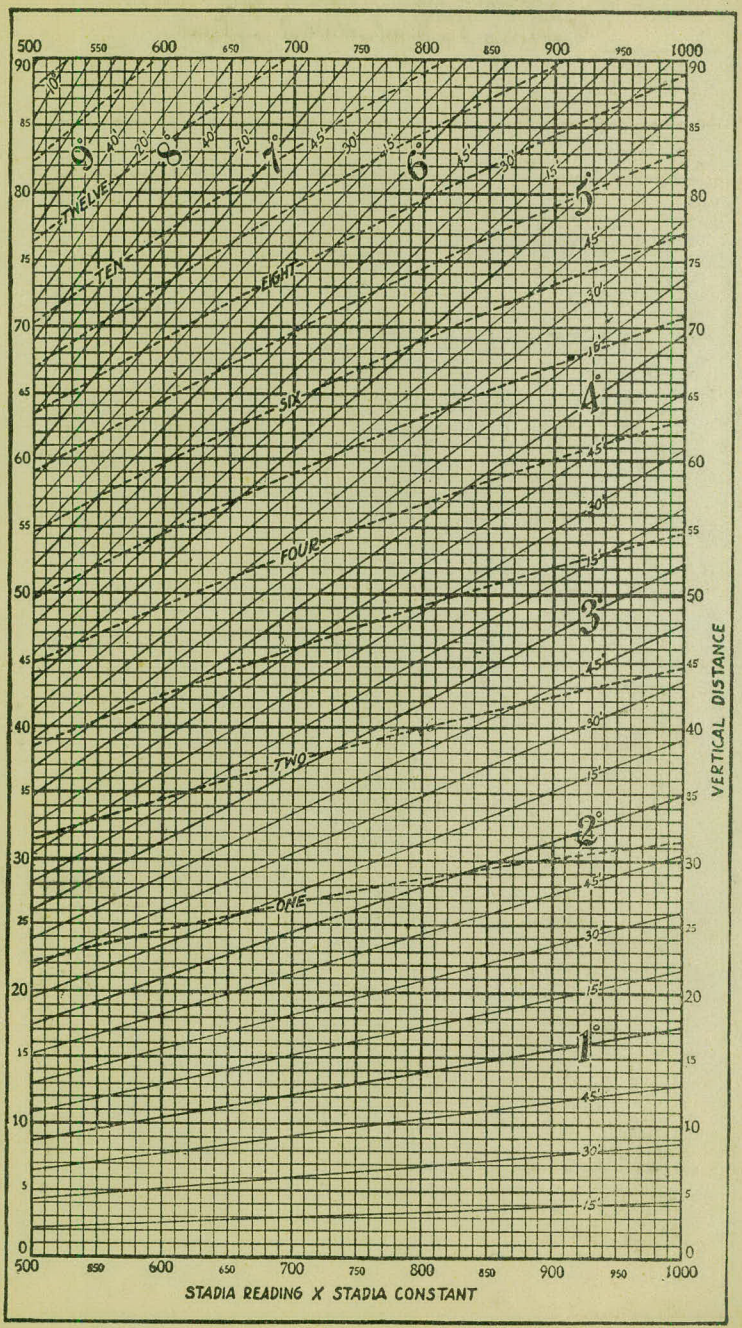
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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 Sino)] 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
9° 8° 7° 6° 5° 4° 3° 2° 1°
40' 20' 40' 20' 45' 30' 15' 45' 30' 15' 45' 30' 15' 45' 30' 15' 45' 30' 15'
TWELVE
TEN
EIGHT
SIX
FOUR
TWO
ONE
VERTICAL DISTANCE
STADIA READING X STADIA CONSTANT

79574
12.87 +

808.61 A
0.23 –
808.38 P
12.32 +
820.70 A
0.35
820.35 P
9.20
829.55
5.04
824.51
38

.18

Sta 96 — 18" — 12' CMP

Comp. 2 - 12" cmp 12'
1 - 15" cmp 12'

63+50 1 - 18" - CMP 12'

Stewart

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.

Made in Germany.

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