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Notes

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FIELD BOOK

381 S.

KEUFFEL & ESSER CO.

DRAWING MATERIALS AND SURVEYING INSTRUMENTS. NEW YORK.

CHICAGO. ST. LOUIS. SAN FRANCISCO. MONTREAL.

TABLES FOR EXCAVATIONS AND EMBANKMENTS.

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

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

Calculated by Julius H. Hall, M. Am. Soc. C. E.

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

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Feb 22-19
M.J.B.

Continued from Book 7

Rt. Abut. U.S. Face Check on Forms 439.31

G-5 047 439.78

Top Forms 8.34 431.44

440.20 - 431.44 = 8.78 Set nails 0.88 out

Lt. Abut. G-19 453 431.76 427.23

Top Forms S. 440.20 440.20 6.91 24.85

" " N. 29.85 30.16 6.60 25.16

2/24/19

M-J-B U.S. Face Dam

G 5 057 439.88 439.31

Top Forms 440.20 440.20 8.42 431.46

Top " 36.46 36.77 8.11 431.77

2/26/19 M.J.B.

Downstream Face Overflow Sect

Radius - 230.99 Ele. = 373.00

	2.39	375.66		373.21
0+00	Fills 5'-5 1/2"		8.12	67.54
+10	5'-8 1/2"		8.36	67.30
+20	6'-6 1/2"		9.20	66.46
+30	5'-8"		8.32	67.34

Downstream Face Overflow Sect

Ele. 373.00 Radius 230.99

Arcs. Deflections

1' = 0° 7' 26.4" Point on Rock =

10' = 1° 14' 24.4" 239.62 R

20' = 2° 28' 48.8" 230.99

30' = 3° 43' 13.2" 8.63

40' = 4° 57' 37.6" Measure East 8.63

50' = 6° 12' 02.0"

5' = 37.2'

15' = 1° 51.6'

25' = 3° 6.0'

Check on Forms Left Abut. M.J.B. 2-27-19

C-18 11.43 423.54 412.11

Top Forms 440.20 422.54

Top Forms 440.20 424.21

Downstream Overflow Section

Elev 433.00 Radius 278.26'

Measure 46.74 from 325' Radius

Dist. Defl. 30' = 3° - 5.1'

1' = 6.17" 40' = 4° - 6.8'

5' = 30.86" +41.9 = 4° 18.5'

10' = 1° - 1.71'

20' = 2° - 3.42'

Downstream Overflow Section
 Ele. 433⁰⁰ R = 278²⁶

D-20	12.42	433.40	420.98
0	Grade Rod = 0.4		
	Fill 8.14 = 8'-1 3/4"	8.54	24.86
10	" 6.74 = 6'-9"	7.14	26.26
20	" 8.63 = 8'-7 1/2"	9.03	24.37
30	" 7.87 = 7'-10 1/2"	8.27	25.13
41.9	" 4.72 = 4'-8 3/4"	5.12	28.28

Levels & Dist. to forms U.S. Face O. flow

D-20	Dist. to forms	10.39	431.37	420.98
Top Forms H.	1.23 - 5 = .73	3.97	27.90	
" "	1.19 - 5 = .70	3.12	28.25	
" "	1.095 - 5 = .60	2.12	29.25	
" "	1.03 - 5 = .53	1.52	29.85	
" "	1.06 - 5 = .51	1.23	30.14	

Grades 16" drain pipe through dam

Present end				
Pipe 0+35 ⁷⁶		356	371.60	356
0+46 ⁷⁶				367
0+58 ⁷⁶				379
0+70 ⁷⁶	Pipe .06 thick			3.91
0+82 ⁷⁶				4.03
0+94 ⁷⁶				4.15
FP		5.50	74.40	2.70
1+12 ³⁸	Trail in forms.			7.11

67.29 + .67 + .06 = 68.02 = E.L. Pipe

Downstream Face Overflow Section
 El. 435⁰⁰ Radius 279.80'

Arc	Defl.
1'	= 0° 6.14'
5'	= 0° 30.7'
10'	= 1° 1.4'
20'	= 2° 2.9'
30'	= 3° 4.3'
40'	= 4° 5.7'
42.3'	= 4° 19.8'

Ele. of points on 279.80' R.

95	0.66	39.97	439.31
00	Fill 4.74 = 4'-9"	9.71	30.26
+10	4.73 = 4'-8 3/4"	9.70	30.27
+20	4.53 = 4'-6 1/2"	9.50	30.47
+30	4.78 = 4'-9 1/2"	9.75	30.22
+42 ³	forms 2.83 = 2'-10"	7.80	32.17

3/7/18 Overflow Section

Downstream Face Lt Abut.

Radius 235.85 Ele = 379.00

1' = 0° - 7' - 17.3"	235.85	R.P. of PT Radius
5' = 0° - 36' - 26.5"		
10' = 1° - 12' - 53"	228.05	
	7.80	
20' = 2° - 25' - 45.8"		
30' = 3° - 38' - 38.8"		
40' = 4° - 51' - 31.7"		
50' = 6° 04' 24.7"		
60' = 7° 17' 17.7"		
70' = 8° 30' 10.7"		
80' = 9° 43' 03.7"		
87.4' = 9° 36' 58"		

Grades

0-17	Fill	3.86	81.50	77.64
+50	4.17 = 4'-2"		6.67	74.83
+60	6.21 = 6'-2 1/2"		8.71	72.79
+70	6.20 = 6'-2 1/4"		8.70	72.80
+80	4.94 = 4'-11 1/4"		7.46	74.04
+87	Forms 3.62 = 3'-7 1/2"		6.12	75.38

0-17		4.92	82.56	77.64
	4.56 = 4'-7"		8.12	74.44
	6.37 = 6'-4 1/2"		9.93	72.63
	5.29 = 5'-3 1/2"		8.85	73.71
	5.76 = 5'-9"		9.32	73.24
	3.63 = 3'-7 1/2"		7.19	75.37

3/8/19 M-J-B.

Downstream Face Overflow Section 3

Ele. 384.00 Radius 239.89

1' = 0° - 7' - 9.92"	239.89
5' = 0° - 35' - 50"	
10' = 1° - 11' - 39.6"	235.85
	4.04
20' = 2° - 23' - 18.3"	
30' = 3° - 34' - 47.5"	
40' = 4° - 46' - 26.7"	
50' = 5° - 58' - 05.9"	
60' = 7° - 09' - 45.1"	
70' = 8° - 21' - 24.3"	

Grades.

0-17	Fills	10.64	88.28	77.64
	1.85 = 1'-10"		6.13	82.15
	7.02 = 7'-0 1/4"		11.13	77.15
	6.62 = 6'-7 1/4"		10.90	77.38
	7.43 = 7'-5"		11.71	76.57
	9.03 = 9'-0 1/4"		13.31	74.97
	9.32 = 9'-4"		13.60	74.68
	3.64 = 3'-7 1/2"		7.90	80.38

3/11/19 M.J.B.

Downstream Face Overflow Section

Ele 389.00 - Radius 243.94'

1'	0° - 7'
5'	0° - 35.2'
10'	1° - 10.5'
20'	2° - 20.9'
30'	3° - 31.4'
40'	4° - 41.9'
50'	5° - 52.3'
60'	7° - 2.8'
70'	8° - 13.2'
80'	9° - 23.7'
90'	10° - 34.2'
100'	11° - 44.6'

Ele. 391.00
Grades Radius 245.56'

1717	20.2	92.41	90.39
384 = 3'-10"	5.25	87.16	
8.01 = 8'-0"	9.42	82.99	
7.83 = 7'-10"	9.24	83.17	
7.86 = 7'-10 1/4"	9.27	83.14	
6.60 = 6'-7 1/4"	8.01	84.40	
6.74 = 6'-9"	8.15	84.26	
5.65 = 5'-8"	7.06	85.35	

M.J.B.

Downstream Face Gravity Section

Ele 426.00 Radius 276.12

1'	= 0° - 6.2'
5'	= 0° - 31.1'
10'	= 1° - 22.2'
20'	= 2° - 45'
30'	= 3° - 5.7'
40'	= 4° - 9.0'
50'	= 5° - 11.2'
60'	= 6° - 13.5'
70'	= 7° - 15.7'
80'	= 8° - 18.0'
90'	= 9° - 20.2'
100'	= 10° - 22.5'

Grades

1717	20.2	92.41	90.39	48-377	Fills 981	25.61	15.80
-8'	3.61				= 3'-7 1/4"	3.22	22.39
0'	7.12				= 7'-1 1/2"	6.73	18.88
10'	6.71				= 6'-8 1/2"	6.32	19.29
20'	5.94				= 5'-11 1/4"	5.55	20.06
30'	6.59				= 6'-7 1/4"	6.20	19.41
40'	6.70				= 6'-8 1/2"	6.31	19.20

3/13/19 M.J.B.

Downstream Face Overflow Section

Elevation 397⁰⁰ R = 250.41

1' = 0° - 6.86'
 5' = 0° - 34.3'
 10' = 1° - 8.6'
 20' = 2° - 17.3'
 30' = 3° - 25.9'
 40' = 4° - 34.6'
 50' = 5° - 43.2'
 60' = 6° - 51.9'
 70' = 8° - 0.5'
 80' = 9° - 9.2'
 90' = 10° - 17.8'
 100' = 11° - 35.0'

250.41 R.
 243.94 R.
 6.47

Grades El 397⁰⁰

H-17	Fills	8.67	99.06	90.39
	7.48' = 7'-6"	GR = 2.06	9.54	89.52
	10.15' = 10'-2"		12.21	86.85
	10.01' = 10'		12.07	86.99
	9.60' = 9'-7"		11.66	87.40
	9.89' = 9'-11"		11.95	87.11
	10.18' = 10'-2"		12.24	86.82
	6.64' = 6'-8"		8.70	90.36

3/13/19 M.J.B.

Downstream Gravity Section

Ele. 432⁰⁰ Radius 280.63

1' = 0° - 6.12'
 5' = 0° - 30.6'
 10' = 1° - 12.5'
 20' = 2° - 25'
 30' = 3° - 37'
 40' = 4° - 50'
 50' = 5° - 62'
 60' = 6° - 75'
 70' = 7° - 87'
 80' = 8° - 100'
 90' = 9° - 112'
 100' = 10° - 125'

El. 432⁰⁰
 R. 280.63

Grades

G5	0.53	39.84	39.31
	1.28	28.96	12.16
	8.06 = 8'-11 1/2"	GR = +3.04	5.02
	8.09 = 8'-1"		5.05
	7.35 = 7'-4"		4.31
	6.96 = 6'-11 1/2"		3.92
	6.78 = 6'-9"		3.74
	5.97 = 5'-11 1/2"		2.93
	5.43 = 5'-5"		2.39

3/15/19

B-J.

Set 3/17/19

Downstream Gravity Section

Dist. $\frac{El. 437.00}{Defl.}$ Radius = 284.39

1'	= 0°	6.04'
5'	= 0°	30.2'
10'	= 1°	0.44'
20'	= 2°	0.88'
30'	= 3°	1.3'
40'	= 4°	1.8'
50'	= 5°	2.2'
60'	= 6°	2.7'
70'	= 7°	3.1'
80'	= 8°	3.5'
90'	= 9°	4.0'
100'	= 10°	4.4'

3/17/19 W-B-D.

Upstream Face Overflow Section 325 R.

D-20	13.54	434.52	420.98
D-21		740	271.2
4+54 ⁹⁶		1232	222.0
4+64 ⁹⁶		12.67	21.85
4+74 ⁹⁶		12.38	22.44

El. Top forms $22.20 + 5.6 = 27.8$

$$\begin{array}{r} 440.2 \\ \text{Set nails out} - \frac{27.8}{1.24} \end{array}$$

3/15/19

W-B-D.

Set 3/17/19

Downstream Face Overflow Section ⁶

Ele = 402.00. Radius 254.39

1'	= 0°-6.76'
5'	= 0°-33.7'
10'	1°-74'
20'	2°-147'
30'	3°-221'
40'	4°-295'
50'	5°-380'
60'	6°-454'
70'	7°-528'
80'	9°-00.5'
90'	10°-8.13'
100'	11°-15.7'

+ 84⁴ Forms = 9°-32.2'Grades - $\frac{El. 402.00}{R = 254.39}$

H 17	11.68	402.07	390.39	Fills	
20	6'-0 $\frac{1}{2}$ "	GR = -07	6.11	95.96	6.04'
30	7'-6 $\frac{1}{2}$ "		7.61	94.46	7.54'
40	6'-11 $\frac{1}{4}$ "		7.00	95.07	6.93'
50	5'-11 $\frac{1}{2}$ "		6.02	96.05	5.95'
60	6'-10 $\frac{1}{2}$ "		6.94	95.13	6.87'
70	7'-4 $\frac{3}{4}$ "		7.77	94.60	7.40'
Forms 84 ⁴	6'-7 $\frac{1}{2}$ "		6.69	95.38	6.62'
FR		11.88	411.51	2.44	399.63
H 17-935 H			12.31	399.20	399.10 th

254.39

235.85

18.54

Check on dist from

235.85 R. set 3/7/18

13.5

5.81

19.31

18.54

77 Error

3/17/18

W. S. - D

Upstream F. Overflow

+

Sta.

-

Elev.

7

D 20 13.54 34.52 420.98

D 21 7.80 27.18 426-

4+54⁹⁶ 12.32 27.20 " 29.5 73° 428 8.5 346°4+64⁹⁶ 11.67 21.85 " 29.1 76° " 7.0 16°4+74⁹⁶ 12.38 22.14 " 27.4 76°45' " 4.7 33°

Elev. top of form 22.20 + 5.6 = 27.8

Set nails 1.24 424 10.4 34°

422 Ring 12.4 65°30' " 10.6 39°45'

" 15.9 " " 11.9 43°30'

" 16.0 61°45' " 10.3 50°15'

" 19.4 59°30' " 10.9 55°

" 19.2 54° " 9.8 68°

" 18.5 50° " 14.9 71°

" 18.7 37°30' " 13.9 83°30'

" 15.4 22° " 15.6 84°30'

" 16.3 28°30' " 25.1 76°30'

" 17.0 34°15' " 28.2 73°30'

" 13.1 47° " 31.8 68°30'

" Ring 13.6 52° " 33.7 63°

424 14.6 5° " 36.7 60°

" 16.6 17°30' old Conc. 37.1 60°30'

" 15.5 20°30' Rod 8.5 old Conc. 426 36.5 61°

" 13.3 13°15' " 35.9 61°

" 11.6 22°15' " 34.0 63°

426- 31.2 - 70°45' 428 8.5 346°

" 29.5 73° " 7.0 16°

" 29.1 76° " 4.7 33°

" 27.4 76°45' " 6.6 47°

" 27.0 79°30' " 6.7 56°30'

" 25.5 85°30' " 6.3 73°30'

" 24.4 95° " 9.0 75°

" 23.1 97°30' " 9.6 85°

" 18.3 94°15' " 9.2 93°30'

" 17.2 88° " 3.3 86°

" 14.4 85°30' " 15.0 85°30'

" 11.4 85°15' " 17.4 89°30'

" 9.7 84° " 18.2 95°

" 9.9 76° " 18.5 102°30'

" 9.4 69°30' " 19.9 103°30'

" 7.6 69° " 23.3 98°

" 9.0 48° " 25.1 97°30'

" 9.7 40°30' " 25.6 94°30'

" 8.5 36°30' " 27.6 78°

" 8.5 29°30' " 30.8 75°30'

" 8.0 19° " 34.4 65°30'

" 11.5 5° " 34.9 62°30'

" 11.8 342°

Copy Book
 Top of #

3/18/19

Bub
Meyers

Downstream Face Gravity Section

Elev = 440.20 Radius 28680

Dist - Defl.

1'	= 0° - 59.9'	
5'	= 0° - 29.95'	325.00
10'	= 0° - 59.93'	<u>286.80</u>
20'	= 1° 59.86'	38.20
30'	= 2° 59.79'	
40'	= 3° 59.72'	
50'	= 4° 59.65'	
60'	= 5° 59.58'	

Grades El. 440.2 R. 2868

BM Plug in Concrete	197	441.08	439.11
Fills			
42 = 4' 2 1/2"	GR = 0.88	5.08	36.00
412 = 4' 1 1/2"		5.00	36.08
410 = 4' - 1 1/4"		4.98	36.10
429 = 4' - 3 1/2"		5.17	35.91
395 = 3' - 1 1/2"		4.83	36.25
402 = 4' - 1 1/4"		4.90	36.18
393 = 3' - 1 1/4"		4.81	36.27
Mail			
325 R.	5.4 = 5' - 4 3/4"	6.28	34.80

3/18/19

Bub-Meyers

8

Expansion Joint at 1+70.86

Sta 2+25.36 Ext. Joint

54.50

$$\begin{array}{r} 2+94.96 \\ 1+10.22 \\ \hline 1+84.96 \\ 1+70.86 \\ \hline 14.10 \end{array}$$

Sta 1+70.86 Ext. Joint

Defl. for 14.10 = 1° 14' - 34" on 325' R.

5+45.96 PT.	5+45.96	31° - 48' - 59.3"
<u>1+70.86</u>	<u>1+84.96</u>	<u>1° 14' 34.2"</u>
375.10	361.00	33° 03' 33.3"

Set Nail on forms for Derrick Pier At Abut.

Sta. 1+53.76 Defl. for 14.1 = 1° 14' 34"

1+70.86	"	30 = 15' 51.9"
<u>1+53.76</u>		<u>1° 30' 25.9"</u>
17.10		

El. on Nails 325' Radius

BM	0.64	439.75	439.11
1+70.86		4.98	434.87
1+74.96		5.02	34.73
1+84.96		5.04	34.71
1+94.96		4.96	34.79
2+04.96		4.81	34.94
2+14.96		4.98	34.77

B-J

3/19/19 Overflow Section Lt. Abut.

E.I. 407⁰⁰ Radius 258.24

$$\log 2 = 0.3010300 \quad \log 1800 = 3.2552725$$

$$" \pi = 0.4971499 \quad \frac{3.2102034}{0.0450691} =$$

$$" 258.24 = 2.4120235 \quad \text{Defl. form} = 1.10935$$

$$\frac{3.2102034}{60} = 6.5610$$

$$1' = 0^\circ 6.66'$$

$$5' = 0^\circ 33.28'$$

$$10' = 1^\circ 6.56'$$

$$20' = 2^\circ 13.12'$$

$$30' = 3^\circ 19.68'$$

$$40' = 4^\circ 26.24'$$

$$50' = 5^\circ 32.80'$$

$$60' = 6^\circ 39.36'$$

$$70' = 7^\circ 45.92'$$

$$80' = 8^\circ 52.48'$$

$$90' = 9^\circ 59.04'$$

$$100' = 11^\circ 05.60'$$

$$112.2 \text{ Forms } 12^\circ 27.48'$$

R.P. 258.52 Point on Pk

258.24

-28

3/19/19 B-J

9

Grades for E.I. 407⁰⁰ R. 258.24

$$1117 - 935.17 \text{ Fills } 1312 \quad 412.22 \quad 399.10$$

$$40 \quad 142' = 1'-5" \quad GR = 5.22 \quad 380 \quad 408.42$$

$$50 \quad 608' = 6'-1" \quad 1132 \quad 400.90$$

$$60 \quad 653' = 6'-6\frac{1}{4}" \quad 1175 \quad 400.47$$

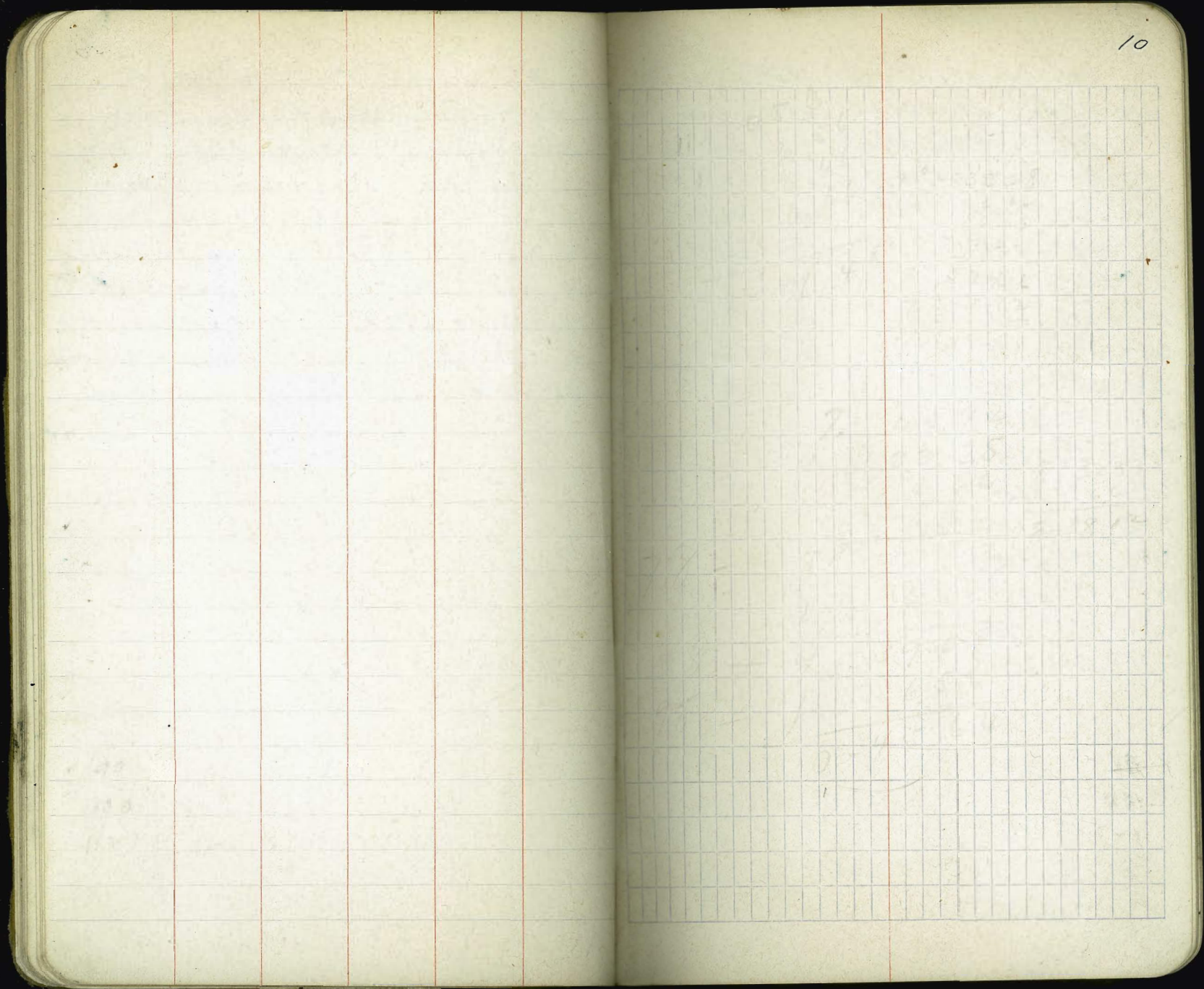
$$70 \quad 609' = 6'-1" \quad 1131 \quad 400.91$$

$$80 \quad 628' = 6'-3\frac{1}{2}" \quad 1150 \quad 400.72$$

$$90 \quad 651' = 6'-6\frac{1}{4}" \quad 1173 \quad 400.49$$

$$100 \quad 733' = 7'-4" \quad 1255 \quad 399.67$$

$$112.2 \text{ Forms } 503' = 5'-0\frac{1}{2}" \quad 1025 \quad 401.97$$



3/21/19 B. Meyers

Overflow Lt. Abut. El. 413.00 R. = 262.86

$$\text{Log } 262.86 = 2.4197245 \quad \text{log } 1800 = 3.2552725$$

$$" \quad 2 = \quad 0.3010300 \quad \frac{3.2179044}{3.2179044}$$

$$" \quad \pi = \quad 0.4971499 \quad \frac{0.0373679}{1.08985}$$

$$\frac{1.08985}{5.39100}$$

$$1' = 0^\circ - 6.54'$$

$$5' = 0^\circ - 32.7'$$

$$10' = 1^\circ - 53.9'$$

$$20' = 2^\circ - 10.78'$$

$$30' = 3^\circ - 16.17'$$

$$40' = 4^\circ - 21.56'$$

$$50' = 5^\circ - 26.95'$$

$$60' = 6^\circ - 32.34'$$

$$70' = 7^\circ - 37.73'$$

$$80' = 8^\circ - 43.12'$$

$$90' = 9^\circ - 48.51'$$

$$100' = 10^\circ - 53.90'$$

$$+83.5 \text{ forms } 9^\circ - 05.90'$$

3/21/19 B.M.

11

Grades El. 413.00 R. = 262.86

$$117 - 935.11 \quad 11.91 \quad 411.01 \quad 399.10$$

$$10 = \overset{\text{fills}}{3.22'} = 3' - 2\frac{1}{2}" \quad G.R. = 2.09' \quad 1.13 \quad 408.88$$

$$20 = 7.32' = 7' - 4" \quad 5.23 \quad 406.78$$

$$30 = 7.54' = 7' - 6\frac{3}{4}" \quad 5.47 \quad 405.54$$

$$40 = 7.85' = 7' - 10" \quad 5.76 \quad 405.25$$

$$50 = 7.70' = 7' - 9\frac{1}{2}" \quad 5.61 \quad 405.40$$

$$60 = 7.62' = 7' - 8" \quad 5.53 \quad 405.48$$

$$70 = 7.20' = 7' - 2\frac{1}{2}" \quad 5.11 \quad 405.90$$

$$83.5 = 5.47' = 5' - 6" \quad 3.38 = 407.63$$

3/21/19 Bub
Buster.

Elevations of Nails on 325' R El. 440.20

I-5	964	39.99	430.35
3+24 ⁹⁶	503 = 5'-1/2"	GR=+0.21	4.82 35.17
2+94 ⁹⁶	512 = 5'-1 1/2"		4.91 35.08
2+64 ⁹⁶	511 = 5'-1 1/4"		4.90 35.09
2+34 ⁹⁶	522 = 5'-2 5/8"		5.01 34.98
2+24 ⁹⁶	Top forms	+0.12	40.11
2+24 ⁹⁶	537 = 5'-4 1/2"		5.16 34.83
2+14 ⁹⁶	542 = 5'-5"		5.21 34.78

3/22/19 Bub
Buster.

Downstream Face Overflow Lt. Abut. 12

El. 420⁰⁰ Radius 268.25

Log R = 0.3010300

log 1800 = 3.2552725

" π = 0.4971499

3.2267196

log 268.25 = 2.4285397

0.0285529

3.2267196

1.06795

64.07700 =

1° 4.08'

1'	= 0° -	6.41'
5'	= 0° -	32.05'
10'	= 1° -	4.08'
20'	= 2° -	8.16'
30'	= 3° -	12.24'
40'	= 4° -	16.32'
50'	= 5° -	20.40'
60'	= 6° -	24.48'
70'	= 7° -	28.56'
80'	= 8° -	32.64'
90'	= 9° -	36.52'
100'	= 10° -	40.6

268.25'

258.52 R.P.

9.73 dist.

3/22/19 Overflow Section

$R = 269.79$ $EI = 422.00$

17	18-12	0.15 = 0-1"	0.15	23.02	1.17	422.87
20						21.85
30		6.36 = 6-4"	GR = 1.02	7.38		15.64
40		9.60 = 9-7"		10.62		12.40
52		8.20 = 8-2 1/2"		9.22		13.80
60		10.64 = 10-8"		11.66		11.36
70		10.61 = 10-7 1/2"		11.63		11.39
78		10.26 = 10-3"		11.28		11.74
88		9.68 = 9-8"		10.70		12.32
100		9.94 = 9-11 1/2"		10.96		12.06
110						
117.24	Forms	6.66 = 6-8"		7.68		15.34

Bub-Buster.

3/22/19 Overflow Section

$EI = 422.00$ $R = 269.79$

3.1416
2
6.2832
269.79
565488
439824
565488
376992
125664
1695.144528

1695.14 / 1800.000000 = 1.0618
169514 / 60 = 637080
1048600
1017084
315160
169514
1456460
1356112

1'	= 0° -	6.37'
5'	= 0° -	31.85'
10'	= 1° -	3.71'
20'	= 2° -	7.42'
30'	= 3° -	11.13'
40'	= 4° -	14.84'
50'	= 5° -	18.55'
52'	= 5° -	21.29'
60'	= 6° -	22.26'
70'	= 7° -	25.97'
78'	= 8° -	16.93'
80'	= 8° -	29.68'
88'	= 9° -	20.6
90'	= 9° -	33.39
100'	= 10° -	37.10
110'	= 11° -	40.8
117.24	= 12° -	27.39

269.79
258.52 R.P.
11.27 dist

3/23/19
Sub. Buster.

Lt. Abutment

Downstream Face Overflow Section

El. 427⁰⁰ R = 273.64

log 273.64 = 2.4371796 log 1800 = 3.2552725

" 2 = 0.3010300

" π = 0.4971499

3.2353595

3.2353595

0.0199130 =

104692

60
2.81520

- 1' = 0° - 6.28'
- 5' = 0° - 31.40'
- 10' = 1° - 2.82'
- 20' = 2° - 5.64'
- 30' = 3° - 8.46'
- 40' = 4° - 11.28'
- 50' = 5° - 14.10'
- 60' = 6° - 16.92'
- 70' = 7° - 19.74'
- 80' = 8° - 22.56'
- 90' = 9° - 25.38'
- 100' = 10° - 28.20'
- 110' = 11° - 31.02'

Grades El. 427⁰⁰ R. 273.64

11 18-12 11 Fills. 3.40 26.27 422.87

10' 1.48 = 1-5 3/4" GR = 0.73 0.75 25.52

20' 9.28 = 9-3 1/2" 8.55 17.72

3/24/19

Sub. Johnson - Buster.

14

Lt. Abutment Downstream Face Overflow

El. 434⁰⁰ Radius 279.03

1' = 0° 6.16'

20' = 2° 32'

30' = 3° 48'

40' = 4° 64'

50' = 5° 80'

60' = 6° 96'

70' = 7° 112'

80' = 8° 128'

90' = 9° 144'

100' = 10° 160'

Curve refigured for El. 428

see next page.

273.64
269.79 3/22/19
3.85 dist.

3/24/19 Overflow Section Lt Abot.
Downstream Face.

El. 428 ⁰⁰	R = 274.41
1' = 0° - 626'	
5' = 0° - 3132'	
10' = 1° - 260'	
20' = 2° - 530'	
30' = 3° - 790'	
40' = 4° - 105'	
50' = 5° - 132'	
60' = 6° - 158'	
70' = 7° - 185'	
80' = 8° - 211'	
90' = 9° - 238'	
100' = 10° - 264'	

274.41
Set - 273.64 3/23/19
77 dist.

Grades El. 428⁰⁰ R = 274.41

Noil 3+24 ⁹⁶ -325R	0.16	3533	3517
TP	0.65	28.58	750 2783
10	2.44' = 2' - 5 1/4"	GR = .58	302 2556
20	7.83' = 7' - 10"		841 2017
35	6.61' = 6' - 7 1/2"		719 2139
45	7.43' = 7' - 5"		801 2057
55	7.23' = 7' - 2 3/4"		781 2077
65	7.56' = 7' - 6 3/4"		814 2044
75	7.20' = 7' - 2 1/2"		778 2080
85	7.52' = 7' - 6 1/4"		810 2048
95	6.53' = 6' - 6 1/2"		711 2147
1+09.3 Forms	2.43' 2' - 5 1/4"		301 2557

15

Check on BM & A8-3' H from G5

G5	317	42.48	3931
		2.23	4025
BM = (3911)		3.33	3915
TP	-1.0	29.63	1185 3063
A8-3' H (1580)		13.86	1577

Gravity Section Rt Abot. El. 446⁰⁰ R = 290.91

1' = 0° - 591'	
5' = 0° - 295'	
10' = 0° - 59.1'	
20' = 1° - 58.2'	
30' = 2° - 57.3'	
40' = 3° - 56.3'	
50' = 4° - 55.4'	
60' = 5° - 54.5'	
70' = 6° - 53.6'	
80' = 7° - 52.7'	
90' = 8° - 51.8'	
100' = 9° - 50.9'	

325.00'
290.91
34.09' dist

3/28/19 Bob Johnson - Buster.

Grades Gravity Section El. 446⁰⁰ R 290.91

BM	Fills 697	446.08	439.11
Forms	074 = 0° - 9"	GR = .08	086 4522
	5.54 = 5' - 6 1/2"		5.62 4046
	5.44 = 5' - 5 1/4"		5.52 4056
	5.11 = 5' - 1 1/4"		5.19 4089
	5.36 = 5' - 4 1/4"		5.44 4064
	5.86 = 5' - 10 1/4"		5.94 4014
	5.76 = 5' - 9"		5.84 4024

3/29/19 Sub-Johnson-Buster

Downstream Face Gravity Section

El. 451.00 Radius 294.09

1' = 0° - 5.84'	
5' = 0° - 29.2'	325.00
10' = 0° - 58.5'	<u>294.09</u>
20' = 1° - 56.9'	30.91 dist.
30' = 2° - 55.3'	
40' = 3° - 53.8'	
50' = 4° - 52.2'	
60' = 5° - 50.7'	
70' = 6° - 49.1'	
80' = 7° - 47.6'	

3/29/19

Grades El. 451.00 R. 294.09

B.M.	Fills	9.36	48.47	39.11
	2.53' = 2'-6 1/2"	GR = +2.53	00	48.47
	5.57' = 5'-7"		3.04	45.43
	5.89' = 5'-10 1/2"		3.36	45.11
	6.47' = 6'-5 1/2"		3.94	44.53
	6.71' = 6'-8 1/2"		4.18	44.29

3/29/19 J.B.M.

Grades

16

Downstream Overflow R = 269.02 El. 421.00

A8-311 772 423.52 415.80

Fills

GR = -2.52

Corrected

0.19' = 0'-2 1/4"	0'-11"	2.71	20.81
3.70' = 3'-8 1/2"	4'-5"	6.22	17.30
4.79' = 4'-9 1/2"	5'-6"	7.31	16.21
4.84' = 4'-10"	5'-6 3/4"	7.36	16.16
11.7' = 1'-2"	1'-10 3/4"	3.69	19.83

Downstream Face Overflow Section

El. = 421.00 R = 269.02

1' = 0° - 6.38'	325.00
5' = 0° - 31.9'	<u>269.02</u>
10' = 1° - 38'	55.98
20' = 2° - 6.9'	Set Nail at -12.00
30' = 3° - 11.5'	<u>43.98</u> dist
40' = 4° - 15.3'	.54 Error.
50' = 5° - 19.1'	44.52 - Curve set
60' = 6° - 22.9'	at 44.52'
70' = 7° - 26.7'	

Deflection Angles for R = 323

1 FT =	0° 5.3'	166	14° 11.5'
2	0° 10.6'	176	15° 04.7'
3	0° 16.0'	186	15° 57.9'
4	0° 21.3'	196	16° 51.1'
5	0° 26.6'	200	17° 44.3'
6	0° 31.9'	210	18° 37.5'
7 ^F ₇₉₂	0° 37.2'	220	19° 30.7'
8	0° 42.5'		
9	0° 47.9'		
10 -	0° 53.21		
20 -	1° 46.4	23.65 30	
30	2° 39.6	2+19 ⁶³	22° 08.4 To Flag
40	3° 32.9		
50 ^{47.93}	4° 26.1		
60	5° 19.3	53.65	59.63 = 5° 17.34
70	6° 12.5		
80	7° 5.7		
90	7° 58.9		
100	8° 52.2		
110	9° - 45.4		
120	10° - 38.6		
130	11° - 31.8		
140	12° - 25.1		
150	13° - 18.3		

Downstream Face Overflow Section Elev. 426.00 Radius 272.87

17

1' =	0° - 63'
5' =	0° - 31.5'
10' =	1° - 3'
20' =	2° - 6'
30' =	3° - 9'
40' =	4° - 12'
50' =	5° - 15'
60' =	6° - 18'
70' =	7° - 21'
80' =	8° - 24'
90' =	9° - 27'
100' =	10° - 30'

tail set at 9.79' from 325R
" " at 2.21'
12.00
325.00'
272.87'
52.13'
12.00
40.13' to D.S.F.

140
0+59⁶³
30 2+19⁶³
160
2+49⁶³
5
2+5
17 444
+ 261
47.5
5 096

3/31/19 M.J.B.

Downstream Face Gravity Section

El. 456.00 Radius 296.95

1' = 0° - 57.9'	
10' = 0° - 57.9'	
20' = 1° - 55.8'	323.00
30' = 2° - 53.7'	296.95
40' = 3° - 51.5'	<u>26.05 dist. to Curve</u>
50' = 4° - 49.4'	

Grades for El. 456.00 R. 296.95

H4	Fills.	9.45	453.54	4409
	5.78' = 5' - 9 1/2"	GR = +2.46	332	50.22
	5.73' = 5' - 8 3/4"		327	50.27
	6.73' = 6' - 8 3/4"		427	49.27
	5.65' = 5' - 7 3/4"		319	50.35
	6.86' = 6' - 10 1/4"		440	49.14
	3.32' = 3' - 3 3/4"		086	52.68

Downstream Face Overflow Section 18

El. 440.20 R = 283.80' 3/31/18

1' = 0° - 6.06'	
10' = 1° - 0.6'	
20' = 2° - 1.1'	325.00
30' = 3° - 1.7'	283.80
40' = 4° - 2.2'	<u>41.20 dist.</u>
50' = 5° - 2.8'	Nail set at - 34.10
	<u>7.10 dist.</u>

Grades D.S.F. OF El. 440.20 R = 283.80

3+24 ²⁶	325 R-Nail	491	4008	3517
-5	4.83' = 4' - 10"	Edge concrete	471	3537
00	4.22' = 4' - 2 3/4"	GR = +1.2	410	3598
10	4.50' = 4' - 6"		438	3570
20	4.99' = 5' - 0"		487	3521
30	4.86' = 4' - 10 1/4"		474	3534
	Forms 4.86' = 4' - 10 1/4"		474	3534
	Top Divide Wall		489	3519

4/3/18 Overflow Section
Elevations on Plate
Fills for Ele 440²⁰ 325'R.

19

3+24⁹⁶ Nail 5.60 40.77 435.77

G.R. = 0.57

	Fills			
3+24 ⁹⁶	480 = 4'-9 1/2"	5.37	5.37	35.40
3+14 ⁹⁶	477 = 4'-9 1/4"	5.34	5.34	35.43
3+04 ⁹⁶	478 = 4'-9 1/4"	5.35	5.35	35.42
2+94 ⁹⁶	478 = 4'-9 1/4"	5.35	5.35	35.42
2+84 ⁹⁶	480 = 4'-9 1/2"	5.37	5.37	35.40
2+74 ⁹⁶	471 = 4'-8 1/2"	5.28	5.28	35.49
2+64 ⁹⁶	472 = 4'-8 1/2"	5.29	5.29	35.48
2+54 ⁹⁶	469 = 4'-8 1/4"	5.26	5.26	35.51
2+44 ⁹⁶	473 = 4'-8 3/4"	5.30	5.30	35.47
2+34 ⁹⁶	481 = 4'-9 3/4"	5.38	5.38	35.39

4/2/19

Downstream Face Overflow Section

Grades for Ele 433⁰⁰

4/3/19 M-J-B.

325'R				
Nail 3+24 ⁹⁶	0.15	35.32		35.17
T.P. Top Rock	3.14	35.46	3.00	32.32
	540 Fills = 5'-4 3/4"		7.86	27.60
	537 = 5'-4 1/2"		7.83	27.63
Forms	0.37 = 0'-4 1/2"		2.83	32.63

4/3/19 Grades Upstream Face Ele 440²⁰

325' Radius G.R. = 4.74

Top of Plate	Fills			
3+34 ⁹⁶	484 = 4'-10"	0.10		35.36
3+44 ⁹⁶	481 = 4'-9 3/4"	0.07		35.39
3+54 ⁹⁶	482 = 4'-9 3/4"	0.08		35.38
3+64 ⁹⁶	490 = 4'-10 3/4"	0.16		35.30
3+74 ⁹⁶	2.98 = 2'-11 3/4"	+1.76		37.22
3+84 ⁹⁶	3.09 = 3'-1"	+1.65		37.11
Check on Nail		0.29		35.17

4/4/19	Limits	Downstream Face	Overflow	Center
	and Gravity Sections	Lt. Abotment		
	Dist.			
M-21	140	467.86		466.46
5+50	33.89' out.		17.5	50.36
5+75	24.64' out.		3.60	64.26

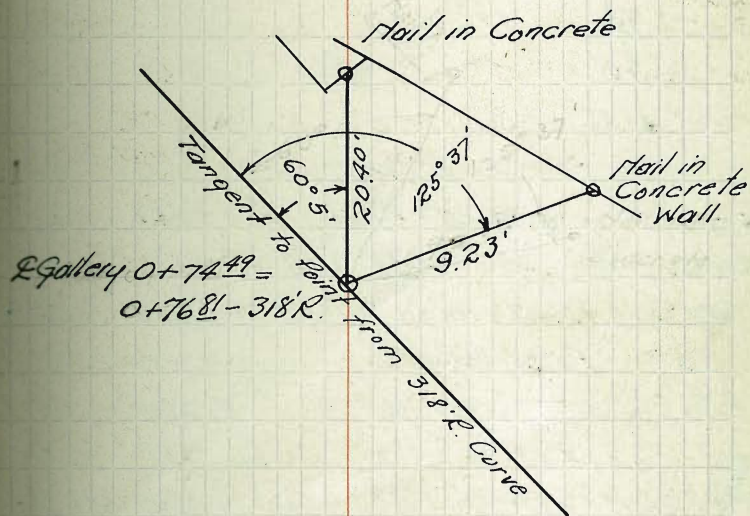
4/4/19

17-21	Downstream Face	Overflow	Center
3+24.26	150	36.67	35.17
Top forms.		0.63	36.04
Radius 280.57 El. 436.00			
325' - 280.57 = 44.43' = dist. to points.			
00-Forms.	Cut. 0.7 = 0'-1/2"	0.60	36.07
20	F. 4.30 = 4'-3 1/2"	4.97	31.70
30	F. 4.42 = 4'-5"	5.09	31.58
37	F. 0.39 = 0'-4 3/4"	1.06	35.61

New Sta for Divide Wall
 on 325' Radius 2+82.51
 Set nail 12.45 South on Curve from 2+94.96
 = Sta 2+82.51

4/11/19 B/A

Reference Points to P.C. & Gallery
 Sta 225.29 Radius



Sta of Face of Divide Wall on 323R
 = 2+80.77

4/11/19 B-M-A

Downstream Face Overflow Section

Radius = 288.01 El = 446.0

- 1' = 0° - 5.968'
- 5' = 0° - 29.84'
- 10' = 0° - 59.68'
- 20' = 1° - 59.36'
- 30' = 2° - 59.04'
- 40' = 3° - 58.72'
- 50' = 4° - 58.40'
- 60' = 5° - 58.08'
- 70' = 6° - 57.76'
- 80' = 7° - 57.44'

Forms 88.85

90' = 8° - 57.12'

325'R Grades - R = 288.01 El = 446.0

Dist	Grade	GR	El	Form
Nail 2494 ⁹⁶	8.38	43.46	35.08	
00	10.47 = 10'-6"	GR = +2.54	7.93	35.53
+10	10.24 = 10'-3"		7.70	35.76
+20	10.27 = 10'-3 1/4"		7.73	35.73
+30	10.42 = 10'-5"		7.88	35.58
+42.75 F	9.31 = 9'-3 3/4"		6.77	36.69
+50	7.86 = 7'-10 1/2"		5.32	38.14
+60	7.22 = 7'-2 1/2"		4.68	38.78
+70	7.42 = 7'-5"		4.88	38.58
+80	7.82 = 7'-10"		5.28	38.18
+88.85 F	5.84 = 5'-10 1/4"		3.32	40.14

4/12/19 B-P-M-A

21

Set point on 323' Radius at Sta of 59.63 Ran in Curve to Forms at Sta 2+23.11 Set Nail on South Forms at Sta 1+71.78

Set Points on Downstream Face Gravity Section

Distance on Radius from 323'R = 22.52

Radius 300.48 Elevation 463.00

HI. 62.68

Q 3 7.61 455.07

Ele. on Down stream forms 522 574.6

Set Points for Elev 463.00 5.00

Grade Rod + 0.32 62.46

5.37 = 5'-4 1/2"	5.05	57.63
5.02 = 5'-0 1/4"	4.69	57.99
4.21 = 4'-2 1/2"	3.89	58.79
5.67 = 5'-6 3/4"	5.25	57.43
5.29 = 5'-3 1/2"	4.97	57.71
0.79 = 0'-8 1/2"	0.47	62.21

- 1' = 0° - 5.72'
- 5' = 0° - 28.60'
- 10' = 0° - 57.20'
- 20' = 1° - 54.40'
- 30' = 2° - 51.60'

4/12/19

Check on Divide Wall

Distance from 325 Radius 470 = 278.0 Radi

Radius 279.92 Elevation 445.2

$\frac{278.00}{1.92}$ dist.

$\frac{0.64}{1.92} \times 3$

$\frac{445.20}{3.00}$

442.20 E.I.

Nail
2+94.96

3.39 440.47 35.08

Elevation of concrete. 5.26 35.21

Distance to top wall 6.92

$\frac{35.21}{7.213}$ Elevation top wall

4.920 Required Elevation

4/13/19 Bub
Phelps

22

Downstream Face Gravity Section

Radius 292.23 Elevation 448.00

B.M. HI 439.11

Elevation top forms 12.33 451.44 3.32 448.12

Set on sta. 1+49.63 323' Radius Measured
toward center 323 - 292.23 = 30.77

B.M. Fills 439.11

10.41 = 10'-5" 5.61 444.72 7.13 437.59

10.44 = 10'-5 1/4" GR + 3.28 7.16 437.56

10.63 = 10'-7 1/2" 7.35 437.37

0+00
323 Radius

10'

Nail

10'

Nail

10'

Flag

- 0+30
323 Radius.

4/14/19 Downstream Face Right Abutment.

Radius 292.86 Elevation 449

G 4 5.6 52.31 46.71

Measure 30.14 toward center 37.5 48.56

11.45 40.86

019 0.58 35.35 6.15 35.93

Top of steel form 29.20

Down stream face over flow section

Radius 279.80 Elevation 435

R.P. 258.52 Radius R.P. from which

Measure 21.28 towards P.T. for

Point on 279.80 Curve

Arc Dist. Defl

1' = 0° - 6.14' 120' = 12° - 17.0'

5' = 0° - 30.71' 122' = 12° - 29.28'

10' = 1° - 1.43'

20' = 2° - 2.86'

30' = 3° - 4.29'

40' = 4° - 5.72'

50' = 5° - 7.15'

60' = 6° - 8.58'

70' = 7° - 10.01'

80' = 8° - 11.44'

90' = 9° - 12.87'

100' = 10° - 14.30'

110' = 11° - 15.73'

4/14/19 B-P-M-A.

23

Grades - Radius 279.80 $EI = 435^{\circ}$

019 0.20 436.13 435.93

0+00 = P.T. Radial Line G.R. = -1.13'

+30 5.56' = 5' - 6 3/4" 6.69 29.44

+40 5.36' = 5' - 4 1/4" 6.49 29.64

+50 5.74' = 5' - 9" 6.87 29.26

+60 4.54' = 4' - 6 1/2" 5.67 30.46

+70 4.74' = 4' - 9" 5.87 30.26

+80 6.15' = 6' - 1 3/4" 7.28 28.85

+90 4.23' = 4' - 2 3/4" 5.36 30.77

+100 5.45' = 5' - 5 1/2" 6.58 29.55

+110 5.72' = 5' - 8 3/4" 6.85 29.28

+120

+122 forms 4.61' = 4' - 7 1/4" 5.74 30.39

4/14/19 P-B-M-A

Ele for Top of Old Core Wall

Lt. Abutment

M 23	4.25	84.08		79.83
Top Concrete Wall			4.62	79.46
" " "			4.78	79.30
" " "			4.97	79.11
Approt Top Dam			2.00	82.08
Top old Road			4.09	80.00
Core Wall Right Abutment				
C-3	11.86	83.49	4.12	71.63
Top Core Wall			4.12	79.37
" " "			4.15	79.34
" " "			4.22	79.27
" " "			4.21	79.28
Top Embankment			0.47	83.02

4/14/19 Ran in 325' Radius 29.0
beyond PT set stake at Sta 5+74⁹⁶

4/15/19 323' Radius

Upstream Face Overflow Section 24

Set on Sta 2+19⁶³ - 323'R

Sight flag with defl. for 249⁶³ =

defl of 22° 08.4' Set Nail in forms 2+77⁶³

with defl. = 5° 08.6' - First Nail in Conc. = 2+79⁶³

Set Nail in forms 3+30⁶³ on 323'R.

4/15/19

CONTRACTION JOINT

Set on Sta 4+84⁹⁶ Meas 41.6 with
defl 3° 39' 59.0" for Sta 4+43³⁶ - 325'R.

Set on 4+43³⁶ ^{Ele 73.50°} Cont. Joint Turn 86° 20' 01"
toward Center set Nail in Downstream
Forms.

323' Radius Lt. Abutment.

Set on Sta 4+14⁹⁶ 325'R Sight Center

Set Nail on 323'R = Sta 4+12⁴¹

Set points on 323'R South to Sta
3+39⁶³

4/15/19

Rt Abutment

Downstream Face Gravity Section

G-4 1122 57.93 46.71

Top Forms. 3.76 54.17

Radius 295.85 Elc = 454.00

323.00

295.85

G Rod = -2.11

Dist to Face 27.15

G-4 Fill 5.18 51.89 46.71

6.52' = 6'-6 1/4" 4.41 47.48

4/16/19

Grades for 292.37 Radius El 452.00

G-4 Fills 3.76 50.47 46.71

+10 8.69' = 8'-8 1/4" G-Rod = 1.53' 7.16 43.31

+20 6.71' = 6'-8 1/2" 5.18 45.29

+30 8.26' = 8'-3" 6.73 43.74

+40 8.16' = 8'-2" 6.63 43.84

+50 8.49' = 8'-6" 6.96 43.51

+54 8.55' = 8'-6 1/2" 7.02 43.45

4/16/19

B-P-17.

25

Downstream Face Overflow Section

Radius 292.37 El 452.00

Set on 3+42.4 Measure toward Center
of Curve for dist of 30.63 Point on
downstream Face

G4 4.08 50.79 46.71

Top Forms. +1.40 52.19

Dist. deflections,

1' = 0° - 5.879'

5' = 0° - 29.395'

10' = 0° - 58.79'

20' = 1° - 57.58'

30' = 2° - 56.37'

40' = 3° - 55.16'

50' = 4° - 53.95'

60' = 5° - 52.74'

4/17/19 B-P-M

Upstream Face Overflow Section

Set on 2+19⁶³ - 323' R. Sight
Flag at Sta - 30⁰⁰ defl. 22° 08.4'
for tangent deflect for 58' nail
in forms defl. = 5° 08.4'

Defl for 60' = 5° 19.3'

70 = 6° 12.5'

80 = 7° 5.7'

90 = 7° 58.9'

100 = 8° 52.2'

Nail in forms 3+30⁶⁸ = 11105 = 9-50.96'

4/18/19 B-P-M

Upstream Face Gravity 26

Set up on Sta 0+59⁶³ on 323 Radius
Set nails in Concrete at
Sta 0+99⁶³ Defl = 3° - 32.9' - 40'

" 1+09⁶³ " 4° - 26.1' 50'

" 1+19⁶³ " 5° - 19.3' 60'

" 1+29⁶³ " 6° - 12.5' 70'

" 1+39⁶³ " 7° - 5.7' 80'

" 1+49⁶³ " 7° - 58.9' 90'

Grades Upstream Face Gravity Section

G-4 12.93 59.64 46.71

Concrete 2.63 57.01

Top Steel Forms +0.51 60.15

Grades for Elev 460.15 - 323' Radius

1+49⁶³ 582' = 5'-10" 531 54.84

1+39⁶³ 568' = 5'-8 1/4" 5.17 54.98

1+29⁶³ 554' = 5'-4 3/4" 5.03 55.12

1+19⁶³ 530' = 5'-3 1/2" 4.79 55.36

1+09⁶³ 521' = 5'-2 1/2" 4.70 55.45

0+99⁶³ 00 = 00 0.0 60.15

G. Rod = +0.51

4/18/19

Downstream Face Gravity Section

	1293	5964	46.71
Top Concrete		4.96	54.68
			5.00
			59.68

Radius 299.04 El 460⁰⁰

323⁰⁰
299.04

23.96 = Dist toward Center

Arc Deflections

1'	=	0° - 57.5	
5'	=	0° - 28.75	
10'	=	0° - 57.48	
20'	=	1° - 54.96	
30'	=	2° - 52.44	
40'	=	3° - 49.92	
50'	=	4° - 47.40	Forms = 56.15' defl = 5° 22.76'
60'	=	5° - 44.88	
70'	=	6° - 42.36	
80'	=	7° - 39.84	

Grades for Radius 299.04 El = 460⁰⁰

G-3	00	5.17 = 5'-2"	9.59	64.66	9.83	55.07
	-10	+1.65 = +1'-7 3/4" Cut			3.01	54.83
Mail	-15	+3.04 = 3'-0 1/2" Cut			1.62	63.04
	+10	2.98 = 2'-11 3/4"			7.64	57.02
	+20	1.84 = 1'-10"			6.50	58.16
	+30	5.15 = 5'-1 3/4"			9.81	54.85
	+40	5.56 = 5'-6 3/4"			10.22	54.44
	+50	5.58 = 5'-7"			10.24	54.42
Old Con.	+56.15	2.67 = 2'-8 1/4"			7.33	57.33

FP on old Core Wall 5.59 59.07

4/18/19

27

To Start Forms Downstream Face Gravity

FP Rock in old Con 52.8 64.35 59.07
Dist from 299.04 Radius

+10	2.65	9.38	54.97
+20	2.03	8.24	56.11
+30	2.75	9.57	54.78
+40	2.93	9.89	54.46
0+00	2.86	9.76	54.59
-10	1.34	H.I. 6.96	57.39

TP Rock 7.12 66.17 59.07

Check on Nail in Concrete 8.85 57.32

4/18/19 DOWNSTREAM FACE GRAVITY SECTION

Radius 300.48 El. 463⁰⁰

TP Rock 377 62.84 59.07

10 5.48' = 5'-5 3/4" 5.32 57.52

20 5.27' = 5'-3 1/4" 5.11 57.73

27.14 Forms 5.73' = 5'-8 3/4" 5.57 57.27

70 4.20' = 4'-2 1/4" 4.04 58.80

57.32 = +.16

4/18/19 Expansion Joints

Sta 1+70⁸⁶ Exp. Joint on 325 R.
54⁵⁰

Sta 1+16³⁶ new Joint = 1+15⁶⁵ on 323 R.
27²⁵ El. 460⁰⁰

Sta 1+43⁶¹ on 325 = 1+42⁷³ on 323 R
El. = 460⁰⁰

Set up 1+42⁷³ Sight Sta 0+89⁶³
distance 53¹⁰ defl. = 4° 42.63'

Set up 1+18⁷² Sight Sta 0+89⁶³
dist. 29.09 defl. 2°-34.8'

4/21/19

Set on 323 R Sta 2+19⁶³
defl. 22° 08.4' for Tang from Flag at 0-30'
Set Expansion Joint at Sta 2+51⁰⁶
= (2+52⁶¹ on 325 R) El. 436⁰⁰

Sta 2+51⁰⁶
2+19⁶³
31.43 = dist. defl. = 2°-47.2'

Set Nail at 5.51 from Instr. = Sta 2+25¹⁴
Measure 25⁹² to Exp. Joint

Up stream Face

4/19/19 Points on 323 Radius

Set up on Sta 2+19⁶³ on 323 R.

Sight flag defl 22° 08.4'

Set Nails on 323 R at Sta.

2+80.77 defl 5°-25.3' Divide Wall

2+89⁶³ " 6°-12.5'

3+99⁶³ " 7°-5.7'

3+09⁶³ " 7°-58.9'

3+19⁶³ " 8°-52.2'

3+30⁵⁵ Forms 9°-42.57'

4/19/19 Downstream Face Overflow Section

Radius 296⁰⁰ El. 457⁰⁰ dist from 323 R = 27.0

G-3 166 56.73 455.07

Top Concrete 4.79 51.94

Dist on Arc of 296⁰⁰ = 9.16 for 10 in 323

Divide W. ~~5.55 = 5' 6 1/2"~~ 5.78 51.45

8.12 = 5.47 = 5' 5 1/2" 5.70 51.53

17.28 = 5.31 = 5' 3 3/4" 5.04 51.69

26.44 = 5.40 = 5' 4 1/4" 5.13 51.60

35.60 = 5.37 = 5' 4 1/2" 5.10 51.63

35.76 = 5.51 = 5' 6" 5.24 51.49

Check Top of Divide Wall

Top of Wall 4.47 52.26

Dist. from 323 R = 38.56

G. Rod = 4.27
See page 38
Book 19

4/19/19 B-P.M.

Upstream Face Overflow Section

D-21	325' Radius	Lt. Abut.	4.1' EI TOP	Forms
	6.12	dist out	3324	27.12
		to rails		
4+34 ⁹⁶	0.72		0.24	33.00
4+44 ⁹⁶	0.72		0.28	32.96
4+54 ⁹⁶	0.73		0.57	32.87
4+64 ⁹⁶	0.76		0.68	32.56
4+74 ⁹⁶	0.78		0.82	32.42
4+84 ⁹⁶	0.78		0.85	32.39

4/21/19 B-P.M.

Inspection Gallery Lt. Abut.
318 Radius

Arc dist.	deflections
1' =	0° - 5' - 2.43"
5' =	0° - 27' - 1.56"
10' =	0° - 54' - 3.13"
20' =	1° - 48' - 6.26"
30' =	2° - 42' - 9.39"
40' =	3° - 36' - 12.52"
50' =	4° - 30' - 15.65"
60' =	5° - 24' - 18.78"
70' =	6° - 18' - 21.91"
80' =	7° - 12' - 25.04"
90' =	8° - 06' - 28.17"
100' =	9° - 00' - 31.30"

Dist from Point on P.T. Radial line
318' Radius to P.T. of Compound Curve
= 38.02' defl = 3° - 22' 28"

4/21/19 B-P-17.

Upstream Face Gravity Section

Set up on Sta 2+09⁶³

Sight flag at 0-30 deflect 21° 15.2' for forms

Set Nails on 323' Radius

Sta 1+70 ¹³	3° - 30.1'
1+59 ⁶³	4° - 26.1'
1+49 ⁶³	5° - 19.3'
1+39 ⁶³	6° - 12.5'
1+29 ⁶³	7° - 5.7'
1+19 ⁶³	7° - 58.9'
1+09 ⁶³	8° - 52.2'
0+99 ⁶³	9° - 45.4'
0+89 ⁶³	10° - 38.6'
1	

1+15⁶⁵ Expansion Joint 8° - 20.1'
 1+42⁷³ " " 5° - 56.7'

4/21/19 Rt Abutment

30

Downstream Face Gravity Section

G-3	10.57	65.64	455.07
	5.27		60.34
			5.00
			<u>65.34</u>

Top Forms

Radius	301.39	Ele.	465.00
TP	6.32	65.39	459.07
-9	0.79' = 0'-9 1/2"	+ 0.4	65.79
00	4.73' = 4'-8 3/4"	5.12	60.27
10	4.67' = 4'-8"	5.06	60.33
20	4.57' = 4'-7"	4.96	60.43
30	4.84' = 4'-10"	5.23	60.16
40	3.52' = 3'-6 1/4"	3.91	61.48
50	4.72' = 4'-8 3/4"	5.11	60.28
60	4.83' = 4'-10"	5.22	60.17
661 Forms	4.67' = 4'-8"	5.06	60.33

G. Rad 301.39

Downstream face Gravity Section

Radius 301.39 El 465.00

1'	= 0° - 5.70'
5'	= 0° - 28.52'
-9'	= 0° - 51.3' Cross in old concrete
10'	= 0° - 57.03'
20'	= 1° - 54.06'
30'	= 2° - 51.09'
40'	= 3° - 48.12'
50'	= 4° - 45.15'
60'	= 5° - 42.18'
661	= 6° - 16.97' forms.

4/21/19 B-P-M

Inspection Gallery Lt. Abutment

Set points on 225.29 Radius

Set up on Sta. 4+89⁴⁹ Gallery = 4+96¹⁸-318R

1' = 0°-7'-37.7"

5' = 0°-38'-8.5"

10' = 1°-16'-17.0"

15' = 1°-54'-25.5"

20' = 2°-32'-34.0"

30' = 3°-48'-51.0"

Expansion Joints

3+88⁸⁶ Main Joint on 325' Radius
54⁵⁰

4+43³⁶
27²⁵

4+70⁶¹ set point at E1.432.14

Upstream Face Overflow Section

Set on 325' Radius Sta 5+24⁹⁶

5+14⁹⁶ = 0°-52'-52.8"

5+04⁹⁶ = 1°-45'-45.7"

4+94⁹⁶ = 2°-38'-38.5"

4+84⁹⁶ = 3°-31'-31.3"

4+74⁹⁶ = 4°-24'-24.1"

4+64⁹⁶ = 5°-17'-17.0"

Sta 4+54⁹⁶ = 6°-10'-09.8"

4/22/19 B-P-M

31

Upstream Face Overflow Lt Abutment

325' Elev. 432+

Set up at Sta 5+14⁹⁶ deflect from P.T.

4+94⁹⁶

4+84⁹⁶

4+74⁹⁶

4+64⁹⁶

4+54⁹⁶

4+44⁹⁶

4+43⁹⁶ Forms defl. = 6°-15'-26.3"

4+34⁹⁶

See Blueprint Book 7
for deflections

Grades for E1 440²⁰

Upstream Face Overflow 325' Radius

D-21 11.85 438.97 427.12

GR for 440²⁰ = +1.23'

4+34⁹⁶ 7.17' = 7'-2" 5.94 33.03

4+43⁹⁶ Top Forms 1.99' = 2'-0" 0.76 38.21

4+44⁹⁶ 7.36' = 7'-4 1/4" 6.13 32.84

4+54⁹⁶ 7.54' = 7'-6 1/2" 6.31 32.66

4+64⁹⁶ 8.04' = 8'-0 1/2" 6.81 32.16

4+74⁹⁶ 8.06' = 8'-0 3/4" 6.83 32.14

4+84⁹⁶ 7.89' = 7'-10 3/4" 6.66 32.31

4+94⁹⁶ 7.67' = 7'-8" 6.44 32.53

4/22/19 B-P-M

Downstream Face Overflow Section
Radius 283.80 El. 440²⁰

D-21 10.17 37.29 427.12
T.P. Rock 1.99 35.30

Set on 4+64⁹⁶ - 325' R measure toward
Center 41²⁰ for 283.80 Radius

Arc dist. deflection

1' = 0° - 60.6'

5' = 0° - 30.30'

10' = 1° - 0.57'

20' = 2° - 1.14'

11 28.48 Forms = 2° - 52.52'

30' = 3° - 1.71'

519.25 Forms 1° - 56.6'

4/22/19 Grades Downstream Face Overflow Section

Radius 283.80 El. 440²⁰

T.P. Rock 4.67 39.97 435.30

+19.25 Forms 0.96' = 0' - 11 1/2" 0.73 39.24

-10 5.88' = 5' - 10 1/2" 5.65 34.32

00 5.68' = 5' - 8 1/4" 5.45 34.52

+10 5.81' = 5' - 9 3/4" 5.58 34.39

+20 5.87' = 5' - 10 1/2" 5.64 34.33

+28.48 Forms Cut .27' = 0' - 3 1/4" +0.50 40.47

9.18d = +0.23

4/22/19 B-P-M

323' Radius

32

Elevations Upstream Face Overflow

G-21 5.27 50.99 445.72

0-19-15' H 1. 1.63 449.36 ✓

T.P. Rock 4.48 46.51 ✓

T.P. Rock 4.41 50.92 446.51

3+82⁴¹ 5.99 449.3

3+72⁴¹ 5.89 450.3

3+62⁴¹ 6.03 44.89

3+52⁴¹ 6.01 44.91

3+42⁴¹ 5.86 45.06

4/22/19

Downstream Face Overflow Section

Radius 290.92 El 450⁰⁰

323.00 - 290.92 = 32.08' dist

1' = 0° - 5.91

5' = 0° - 29.54 ✓

10' = 0° - 59.08 Edge Concrete

20' = 1° - 58.16

30' = 2° - 57.24

40' = 3° - 56.32

4/22/19 Overflow Section
Grades Downstream Face

Fr. Rock	Fills	4.31	50.82	46.51
-10	4.28' = 4'-3 1/2"	S. Rad = -0.82	5.10	45.72
00	4.60' = 4'-7 1/4"		5.42	45.40
+10	4.87' = 4'-10 1/2"		5.69	45.13
+20	4.68' = 4'-8 1/4"		5.50	45.32
+26 ³	4.53' = 4'-6 1/2"		5.35	45.47

4/22/19

Expansion Joint 323' Radius
 1+70⁸⁶ on 325' Radius
 27.25
 1+98⁸⁹ on 325'R = 1+96⁸⁹ on 323'R

Set 1+96⁸⁹ on 323'R at E1 458⁰⁰

54.5' on 325'R = 54¹⁶' on 323' Radius
 27.25' on 325'R = 27.08' on 323' Radius

4/22/19 B-P-17. 33
 Upstream Face Gravity Section
 Right Abutment.

Set up on 323'R Sta 0+59⁶³

Set up	Forms	4°-57.6'
1+15 ⁵⁵	4°-57.6'	
1+19 ⁶³	5°-19.3'	
1+29 ⁶³	6°-12.5'	
1+39 ⁶³	7°-5.7'	
1+42 ⁶⁸	7°-22.0'	

Grades Upstream Face Gravity Section

TP	11.34	70.41	459.07
1+19 ⁶³			538 65.03
1+29 ⁶³			542 64.99
1+39 ⁶³			540 65.01

Downstream Face Gravity Section

Radius 304.26 E1 472⁰⁰
 Set on 1+39⁶³ deflect from 0+89⁶³ 4°-26.1' for Tang.
 323⁰⁰ - 304.26 = 18.74 dist toward Center

Top Forms	70.41	3.18	67.23
1' = 0°-56.5'			5.00
5' = 0°-28.25'			72.23
10' = 0°-56.49'			
20' = 1°-52.98'	22.51-Forms =	2°-07.10'	
30' = 2°-49.47'			

4/22/19

Grades Downstream Face Gravity

Radius 304.26 El. 472⁰⁰

Station	Fills	Gr. Rad = 1/30	El.
Nail 1419 ⁶³	5.67	70.70	465.03
00	6.83' = 6'-10"		553 65.17
+10	6.48' = 6'-5 ³ / ₄ "		518 65.52
+20	6.40' = 6'-4 ³ / ₄ "		510 65.60
+22.51 Forms	5.35' = 5'-4 ¹ / ₂ "		405 66.65

4/22/19

323 "Radios

34

Upstream Face Gravity Section

Set on 2+19 ⁶³	Sight flag deflected
22° - 0.84	for tangent
2+51.04 forms	3° - 47.2'
2+59 ⁶³	3° - 32.8'
2+69 ⁶³	4° - 26.1'
2+77 ⁵⁷	5° - 06.3 Concrete Wall

~~Downstream Face Gravity Section~~~~Intersection of Slope of Face with Vertical Wall~~

H4	1.77	45.86	44.09
P. Rock		0.36	45.50
	11.45	56.95	

~~Nail in Edge of Con. 296⁰⁰R - 535 51.60~~~~Measure toward Center dist 1.55 and set~~~~Nail in Edge of Concrete on 294.45 R at El. 451.60~~~~Set point on Divide Wall for intersection of Wall + Edge Gravity Section on 292.37 R at El. 448.22~~

4/24/19

323 R

35

Up-stream Face Gravity Section

Set on 2+19⁶³ Sight flag for
22°-08.4' deflection for Tangent2+51⁰⁴ Forms 2°-49.2'2+59⁶³ 3°-32.9'2+69⁶³ 4°-26.1'2+77⁵⁷ Concrete
Joint 5°-06.3'Intersection of Gravity downstream Face
with Rear Wall Mass Rock Recess

H-4	597	450.06	444.09
FRock			380 46.26

FR	380	450.06	446.26
----	-----	--------	--------

Sta on 323 R.	Dist toward Center from 323R	
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2+51 ⁰⁴	30.03'	0.88 449.18
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2+59 ⁶³	30.52	1.66 448.40
--------------------	-------	-------------

2+69 ⁶³	30.81	2.12 447.94
--------------------	-------	-------------

4/24/19

Downstream Face Gravity Section

R = 294.69 E.L. 452⁰⁰

323 - 294.69 = 28.31 toward Center

1' = 0° - 58.33'

10' = 0° - 58.33'

Nail in Edge
of Conc.

11.75' = 1° - 08.53'

18.33' = 1° - 46.91'

20' = 1° - 56.66'

27.30 = 2° - 39.24'

30' = 2° - 54.99'

Forms 35.17 = 3° - 25.13'

4/24/19

Grades for R-294.69 E.L. 452⁰⁰

FF Rock	10.48	56.74	446.26
2+51 ⁰⁴			7.55 49.19
2+59 ⁶³			8.32 48.42
2+69 ⁶³			8.80 47.94
-11.75	28.31 dist from 323'R		5.18 51.56
-11.75	30.66 " " "		8.56 48.18

Grade Rod for 452⁰⁰ = -4.86'

11.75	5.30	56.86	51.56
18.33	3.15 = 3'-1 ³ / ₄ "		8.01 48.85
27.30	2.77 = 2'-9 ¹ / ₄ "		7.63 49.23
35.17	Forms 0.64 Cut = 0'-7 ³ / ₄ "		4.22 52.64

36

Intersection of Gravity Face
downstream And Rear face Divide Wall

Set up on Radial line from
Sta 2+89⁶³ 323' Radius measure
toward center 28.31' set nail on
294.69 Radius - deflect for dist 11.75
= 1°-08.5 from Tangent & Set nail
in Edge of Concrete joint E.L. of Nail =
451.56 = fill of 0.44'
Set point on Rear face Divide Wall
E.L. 448.18 at 30.66' distant from
323' Radius.

4/24/19

up stream Face gravity section
 Set up on 219⁶³ 323 Radius. sight
 flag Deflect 22°08.4'

1 + 89⁶³ Deflect. 2° 39.6'
 1 + 79⁶³ " 3° 32.9'
 terms. 1 + 69⁶³ 4° 26.1'

4/24/19

37

Downstream Face Gravity section
 G.3. 8.06 63.13 455.07
 t.P. on Rock 4.04 59.09
 8.60 67.69

Concrete. 4.03 63.66
 $\frac{7}{70.66}$

Measure towards center 19.12'

1' = 0° - 5.66'

5' = 0° - 28.30'

7' = 0° - 39.62'

10' = 0° - 56.86'

18.5' = 1° - 44.7'

20' = 2° - 49.68'

Grades for 470⁰⁰ Ele.

Radius 503.88 Elevation 470.00

tP	10.74	69.83	59.09
-7	5.04 = 5' $\frac{1}{2}$ "	G.R. +.17	4.87 64.26
00	6.29 = 6' $\frac{3}{4}$ "		6.12 63.71
+10	6.00 = 6' 00"		5.83 64.00
+185	6.08 = 6' $\frac{3}{4}$ "		5.90 63.93

4/24/19

UP stream face overflow section

Set up on 5+42⁶⁰ 325 R. Sight R.F.P.
on hill. turn 90° for tangent.

5+32 ⁶⁰	0° - 53.21'
5+22 ⁶⁰	1° - 46.4'
5+12 ⁶⁰	2° - 39.6'
5+02 ⁶⁰	3° - 32.9
4+93 ⁸⁵	4° - 18.0 forms
4+82 ⁶⁰	5° - 19.3
4+72 ⁶⁰	6° - 12.5
4+62 ⁶⁰	7° - 5.7
4+52 ⁶⁰	7° - 5.89
4+41 ²²	8° - 59.5 forms.

4/25/19

38

Downstream face overflow section

C-21	1.73	47.45	45.72
TP top of Rock		4.19	43.26
Top of D.S. forms		1.74	45.71

Radius 288.01 Ele. 446⁰⁰323 - 288.01 = 34.99 Distance
to down stream face from 323 R.

1' = 0° - 5.969'

5' = 0° - 29.845'

10' = 0° - 59.68'

11.1' = 1° 1.65'

20' = 1° 59.88'

30' = 2° 59.04'

36.95 3' = 40.88'

Grades for radius 288.01 Ele. 446.

T.P. Rock	258	45.84		443.26
- 11.1 forms	4.08 = 4' 1"		3.92	41.92
00	5.90 = 5' 10 ³ / ₄ "	GR	5.74	40.10
+10	4.54 = 4' 6 ¹ / ₂ "	+	4.38	41.46
+20	5.83 = 5' 10"	=	5.67	40.17
+30	5.74 = 5' 9"		5.58	40.26
+36.95 forms	1.39 = 1' 4 ³ / ₄ "		1.23	44.61

PT. on 325 R. - 5+42⁶⁰ = 5+45⁹⁶ on 325 R.4+97²¹ Ex Joint on 325 = 4+93⁸⁸ on 323 R.4+96⁹⁴ @4+93⁸⁸ ok

4/25/19

39.

up stream face gravity section
 set up on 59⁶³ 323 Radius
 sight flag 7° 56.94'

sta 1+14.33	4° 51.1'
.. 1+15.57	4° 57.67' forms.
.. 1+19 ⁶³	5° 19.3'
.. 1+29 ⁶³	6° 12.5'
.. 1+39 ⁶³	7° 5.7'
.. 1+42.72	7° 22.44' forms
.. 1+70 ²⁴	9° 47.36 forms.
.. 1+79 ⁶³	10° 38.6
.. 1+89 ⁶³	11° 31.8
.. 1+96.99	12° 10.77 forms.

4/25/19

Up stream face gravity section
set up on 2+19⁶² 323 Radius.
Sight 5°-06.3'

Sta.	2+51 ⁰⁴	2° 49.2' forms.
"	2+59 ⁶³	3° 32.9'
"	2+69 ⁶³	4° 26.1'
"	2+77 ⁵²	5° 06.3'

4/26/19

40

Up stream face over flow section
set up on 5+42⁶⁰ P.T. on 323
Sight R.F.P. on Hill turned 90°

Expansion
Joint

4+93 ⁸⁶	4° - 18.0'
4+82 ⁶⁰	5° - 19.3'
4+72 ⁶⁰	6° - 12.5'

4/26/19

Down Stream face Over flow section

Radius 290.92 Ele. 450.00

$$323.00 - 290.92 = 32.08$$

C 21 3.03 4875 45.72

Top Down stream forms. + 1.1 49.85

$$10' = 0^\circ - 59.08'$$

$$19.28 = 1^\circ - 53.91' \text{ forms.}$$

$$20' = 1^\circ - 58.16'$$

$$29.05 = 2^\circ - 51.13' \text{ forms.}$$

$$30' = 2^\circ - 57.24'$$

$$40' = 3^\circ - 56.32'$$

C 21 4.18 49.90 4572

Grade Rod = +0.10

1885 Forms 0.0 = 00 +.10 450.00

10 6.23 = 6' - 2 3/4" 6.13 43.77

00 6.30 = 6' - 3 1/2" 6.20 43.22

10 5.05 = 5' - 0 1/2" 4.95 44.22

20 5.48 = 5' - 5 3/4" 5.38 44.22

29.52 Forms 2.07 = 2' - 0 3/4" 1.97 47.23

4/26/19 Check.

41

Down Stream face over flow section

Radius 290.92 Ele. 450.00

Top of forms. 29.52 2' - 0 3/4" 1.85 49.78 47.93

Grade Rod +0.22

+20 5.55 = 5' - 6 1/2" 5.33 44.45

+10 4.81 = 4' - 9 3/4" 4.59 45.19

+00 6.28 = 6' - 3 1/4" 6.06 43.72

-10 6.17 = 6' - 2" 5.95 43.83

-19.28 forms. Grade 00 +.22 450.00

4/26/19

Downstream face gravity section

Radius 305.69 Elev 476⁰⁰

323 - 305.69 = 17.31

C.3	4.84	76.47	71.63
T.P. Rock in first Block	2.53	73.94	
top of conc. Downstream face	5.74	70.73	
		<u>75.73</u>	
T.P. Rock in second Block.	1.32	76.15	

1' = 0°	56.23'
5' = 0°	28.115
10' = 0°	56.23
18.4 = 1°	52.46
20' = 1°	43.46 forms

Grades. Radius 305.69 Elev 476⁰⁰

T.P. Rock	1.32	76.47	475.15
far side of forms. 6.15	3.33 = 5' 4"	5.80	70.67
00	4.36 = 4' 4 1/4"	4.83	71.64
10	4.99 = 5' 00"	5.46	71.01
forms Near side 18.4	4.33 = 4' 4"	4.80	71.67

G.R. - 0.47

4/27/19

42

Downstream face gravity section

Radius 304.99 Elev. 474⁰⁰

323 - 304.99 = 18.01 towards center.

T.P.	1.40	75.34	73.94
Top Downstream forms.	0.97	74.37	
T.P.	1.52	75.46	73.94
forms 00			146 74.00
3.55 = 3' 6 1/2"			5.01 70.45
3.24 = 3' 3"			4.70 70.76
3.59 = 3' 7"			5.05 70.41
1.39 = 1' 4 3/4"			2.85 72.61

G.R. - 146

4/28/19

up stream face gravity section
 set up on 59⁶³ 323 Radius
 sight flag 7° 56.94'

1 + 15 ⁴⁹

4° 57.26' forms

1 + 19 ⁶³

5° 19.3'

1 + 29 ⁶³

6° 12.5'

1 + 39 ⁶³

7° 5.7'

1 + 42 ⁶⁸

7° 21.86' forms.

4/28/19

43

Downstream face gravity section
 Radius 306.97 Ele 480.00
 323 - 306.97 = 16.03

C.3

8.38 80.01

71.63

TP Rock 2 Block

2.53 77.48

concrete

5.66 74.35

79.35

set up on 1 + 39 ⁶³ 323 Radius
 sight flag 15° 02.64.

Grades

Radius 306.97 - Ele. 480.00

480.01

Forms North	5.46 = 5' - 5½"	5.47	74.54
0.0	5.62 = 5' - 7½"	5.63	74.38
9.05	5.34 = 5' - 4"	5.35	74.66
18.10	5.21 = 5' - 2½"	5.22	74.79
Forms S.	4.56 = 4' - 6¾"	4.57	75.44

G.R. = -0.01

4/28/19

Downstream face gravity section

Radius 306.20 Elev 77.56

T.P. 80.01 77.48

Top forms Downstream 2.45 77.56

$R \ 306.02 = 477.00$

$R \ \underline{306.35} = 478.00$
 $\ .33 = 1 \text{ ft.}$

$.1 = .033 \quad 56 = 56 \times .033 = .18$

$\frac{306.02}{306.20}$

$323 - 306.20 = 16.80 \text{ towards center.}$

$10' \text{ on } 323R = 9.48 \text{ on } 306.20' R.$

T.P. Rock 80.01 77.48

Forms S. $5.90' = 5' - 10\frac{3}{4}''$ G.R. 8.35 71.66

$6.50' = 6' - 6''$ 8.95 71.06

$5.79' = 5' - 9\frac{1}{2}''$ 8.24 71.77

Forms N. $6.93' = 6' - 11\frac{1}{4}''$ G.R. - 2.45 9.38 70.63

4/28/19

44

Up stream face over flow section

Set up on P.T. 5+42.60

slight RFP on Hill with 90°

40	5+2.60	3° 32.9'
47	4+93.60	4° 20.8' forms.
46	4+82.60	5° 19.3'
47	4+72.60	6° 12.5'
48	4+62.60	7° 5.7'
49	4+52.60	7° 58.9'
42	4+49.68	8° 13.4' forms.

4/28/19

Downstream face overflow section

Radius 294.55 Elev. 455.00

Set up on 4+72.60 323 Radius sight

5+42.60 7° 5.7' 323 - 294.55 = 28.45

0.19-15N 4.22 53.61 49.39

concrete. 4.00 49.61

54.61

1' = 5.83'

5' = 29.17'

10' = 58.35'

20' = 1° 56.7'

30' = 2° 55.05'

19.58' = 1° 54.20' forms Lt.

29.48 2° 51.97 forms Rt

Grades.

T.P. Rock. 3.32 50.29

4.00 54.29

F.N. 4.54' = 4' - 6 1/2" 3.83 50.46

+10 4.43' = 4' - 5" 3.72 50.57

0 5.36' = 5' - 4 1/4" 4.65 49.64

+10 5.66' = 5' - 8" 4.95 49.34

+20 5.98' = 5' - 11 3/4" 5.27 49.02

F.S. 6.23' = 6' - 2 3/4" 5.52 48.71

GR+0.71

4/28/19

45

up stream face gravity section

Set up on 2+19.63 323 Radius

sight R.F.P. turn 90°

2+51.33

2+59.63

2+69.63

2+77.68

2° 48.6' forms

3° 32.9'

4° 26.1'

5° 08.6' forms

4/28/19

Downstream face gravity section

Radius 299.04 Elev 460.00

323 - 299.04 ^{23.96} towards center.

G.S.	4.98	60.05	455.07
T.P.		3.10	56.95
concrete.	4.68	55.40	
		<u>5</u>	<u>60.40</u>

10' on 323 = 9.26 on 299.04.

Set up on 2+59.63 323 Radius
Sight flag 25° 41.24' with 90°

Grades.

460.05

forms N.	4.99 = 5'-00"	G.R. - 0.05	5.04	55.01
9.25	4.76 = 4'-9"		4.81	55.24
00	4.62 = 4'-7 1/2"		4.67	55.38
forms S.	4.54 = 4'-6 1/2"		4.59	55.46

31	1.60	0+88.39 E.L.
1st Nail at 0+	29.40	70.90
	4.5	17.49
2nd N = 0+	33.90	
	37.00	0+93.96
3rd N 0+	70.90	Copper 22.58
	16.06	1+16.54 Sta
4 Ex Joint Set at 0+	86.96	of Copper
	7.00	
5 - Nail 0+	93.96	

4/29/19

Change in End of Dam Right Abutment ⁴⁶

log 325 = 2.5118834

log Sin 20° 30' 38" = 9.5445392

2.0564226

log Sin 79° 44' 41" = 9.9930058

2.0634168

115.72

cos 10° 15' 19" = 115.72

152 on 323.5 R.

Ex Joint 1+16.36
1+17.64
1+15.64
- 1.60
88.39 E.L.
27.25
61.14
27.25
33.89

1+15.64
27.25
88.39 E.L.
27.25
61.14
27.25
33.89

540-156
tan 10° 15' 19" = x
117.60
22
117.38 back from 1+15.82

tan 10° 15' 19" = x / 115.72

log 115.72 = 2.0634168

log Tan 10° 15' 19" = 9.2574976

1.3209144

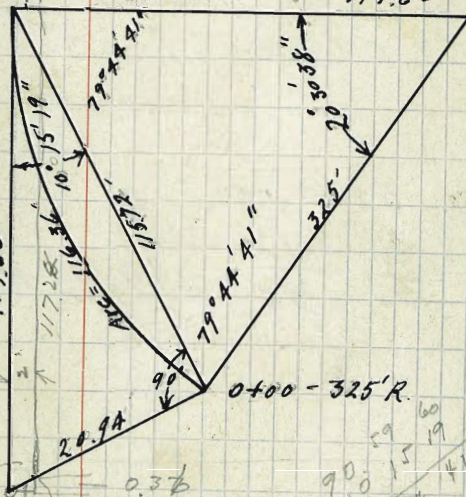
20.987

log Cos 10° 15' 19" = 9.9930058

log 115.72 = 2.0634168

2.0704110 =

117.60



Sta = -0+1.60

117.60

22

117.38

1.56

90° 15' 19"

147.60

147.36

1.24

4/29/19

Downstream face Gravity section

C.3. top of forms.	8.54	80.17	71.63
		12.50	67.67

Radius 302.12 Elev. 466.67

Ele 467 = R = 302.26

" 466 = R = 301.83

1' diff = .043

0.67 = 67 x .043 = .29

301.83

302.12

323.00

302.12

20.88 Dist to Downstream
face.

4/29/19

Check Downstream face gravity
section.

G.3.	11.32	66.40	55.07
T.P.			3.25 63.15

Check on c-3.

G.3. 10.60 65.67 55.07

+P Rock 10.24 75.04 64.80

10.24 75.04

C-3. 341 71.63

A/29/19

Down stream face gravity section

Radius 302.57 E/c. 467.61

G-3 11.32 66.39 55.07

T.P. Rock. 465 67.80 3.24 63.15

Top of forms. 0.19 67.61

EI 468 = R = 302.68

EI 467 = R = 302.26

1' = 0.42

~~323.00~~

302.56

dist = 20.49

0.61
2562
302.26
302.51

Grades.

GR = + 2.42

T.P. Rock. 2.04 65.19 63.15

Nail 7.47' = 7'-5 3/4" 5.05 60.14

Cross 7.48' = 7'-6" 5.06 60.13

4/29/19

48

up stream face over flow section.

Set up on 4+12 ⁴¹ 323 Radius.

Sight center with 90°

37.26 to Temporary joint North.

4+22 ⁴¹ 0° 53.21'

4+32 ⁴¹ 1° 46.4'

4+42 ⁴¹ 2° 39.6'

4+49 ⁶⁷ 3° 18.2 forms. [check]

4+02 ⁴¹ 0° 53.21'

3+92 ⁴¹ 1° 46.4'

3+87 ⁴¹ 2° 13.0'

3+86 ⁷⁰ 2° 16.75' out side
Edge of forms.

4/30/19

Downstream face over flow section.

Radius 279⁸⁰ Elev. 435⁰⁰

D-21	11.60	38.72	27.12
T.P. Rock			4.57 34.15
on forms.			8.46 30.26

323 - 279.80 = 43.20' to D.S.F.

+10	1°	1.43'
+20	2°	2.86'
-614	0°	47.47'

T.P. Rock	2.05	36.20	34.15
0 - 614	0.42	0'-5"	1.62 34.58
00	5.52' = 5'-6 1/4"		6.72 29.48
+10	5.77' = 5'-9 1/4"		6.97 29.23
+20	4.56 = 4'-6 3/4"		5.76 30.44

G.R. = -120

top of Forms upstream face 2.48 33.72

upstream Face Elevations on 323R

4+22 ⁴¹	dist to	436.20	281	433.39
4+12 ⁴¹	U.S.F. from		2.74	33.46
	323R. El. 33.73			
4+02 ⁴¹	2.65		7.28	28.92
3+92 ⁴¹	2.65		7.22	28.98
3+87 ⁴¹	2.65		7.16	29.04
FP Rock	145	35.52	213	34.07
4+32 ⁴¹			249	33.03

4/30/19.

49

up stream face over flow section.

Set up on 4+12⁴¹ sight center with 90°

[4+12⁴¹] set point on Rock on center line at out side edge of forms

3+86 ⁷⁰	2°	16.76"
3+82 ⁴¹	2°	39.6
3+72 ⁴¹	3°	32.9

set up on 3+72⁴¹ sight 4+22⁴¹ 4° 26.1'

3+62 ⁴¹	0°	53.21'
3+52 ⁴¹	1°	46.4'
3+40 ⁸⁹	2°	47.65' forms

Grades for U.S. Face El. 440[±] - 323R

435.52

412 ⁴¹	6.74' = 6'-9"	G.R. +1.68	206	33.46
4+22 ⁴¹	6.81' = 6'-9 3/4"		213	33.39
4+32 ⁴¹	7.17' = 7'-2"		249	33.03

4/30/19

Down stream face overflow section
 set up on 3+72⁴¹ turned deflection
 for center.

Radius 296²³ EI 458⁰⁰
 019-15'N 613 53.32 49.39
 t.P. Rock #1 1.63 53.89
 forms top down stream face. 57.52
 323⁰⁰
 296²³
 26.27 dist to D.S.F.

1' = 0° 58'
 5' = 0° 28.98'
 10' = 0° 57.96' forms N.
 20' = 1° 55.92'
 30' = 2° 53.88'
 40' = 3° 51.84'
 35.97 = 3° 28.66' forms S.

4/30/19

50

T.P. at Derrick

019-15'N 735 56.74 49.39
 t.P. Rock #2 552 51.22
 T.P. Rock #1 286 53.88

R = 296.73 EI = 458⁰⁰

Grades G.R. = +1.26

forms -36⁸⁹ = 0' - 9³/₄" 56.74 +.45 57.19
 -30 6.64 = 6' - 7³/₄" 5.38 51.36
 -20 6.54 = 6' - 6¹/₂" 5.28 51.46
 -10 6.80 = 6' - 9¹/₂" 5.54 51.20
 00 7.27 = 7' - 3¹/₄" 6.01 50.73
 +10 Forms. 2.37 = 2' - 4¹/₂" 1.11 55.63

T.P. #3 73 56⁰¹

Grades on 440²⁰

T.P. on Rock 540 39.47 34.07
 3SR 4+02⁴¹ 11.32 = 11' 4" G.R. +.73 10.59 28.88
 3SR 3+92⁴¹ 11.22 = 11' 2¹/₂" 10.49 28.98

4/30/19

Elev. for estimate.

T.P.	5.40	39.47	34.07
Block 3			
Bench 3.			5.16 34.31
Block 3			
Bench 2.			6.03 33.44
Block 3			
Bench 1.			0.96 38.51
Block 3			+ 2.75 42.22
Block 3			
T.P. #3	4.29	60.30	8.67 30.80 56.01
Block 4	5.40		6.42 53.88
Block 5	11.37		9.08 51.22
Block 6	11.73		4.97 55.53
Block 7			4.58
			24.48 35.82
Block 8.			2.65 57.65
C-3	12.67	84.30	71.63
Block 11			9.35 74.75
Block 9			6.78 77.52
T.P. Block 9			4.15 80.15
old t.p.	6.31	65.38	59.07
Block 12.			61.26

Blocks taken from North End

4/30/19

51

check on chaining.

Measured from sta 2+77⁶⁸
2+77.68 forms.

12.00
2+89.68
30.00
21.17
3+40.85

Measuring from 00 North
to center sta. of Nail 2+89⁶⁸
on 323 Radius. Measuring
south from sta. 4+12^{4L} sta.
of nail = 2+89⁷² Error in
Chaining .04.

323 Radius

0+00

0+6 64

0+33 89

0+61 14

0+86 96

El 474 40

El 460 00

Fillet begins at
Junt 3' long

4/30/19

52

up stream face gravity section

T.P. 1.79 81.94 80.18

forms 4.57 77.35

forms 8.23 73.71

Set up on sta 1+79⁶³ set nail
on 323 R. 30' South, on sta 1+49⁶³

5/1/19.

up stream face overflow section

set up on 4+42^{4L} sight 4+12^{4L}

2° 39.6'

f-21

1.67 47.39

45.72

Top of forms

9.00 38.36

Top of forms AA022

7.14 40.25

40' 402^{4L}

3° 32.9'

55^{4L} 3486²⁰

4° 56.46' forms.

60' 3482^{4L}

5° 19.3'

70' 3+72^{4L}

6 12.5

80' 3+62⁴¹

7° 5.7

90' 3+52⁴¹

7° 58.9

101⁴⁵ 3+40²⁶

8° 59.84 forms.

5/1/19.

53

Down stream face overflow section.

Radius 299⁶³ Elev. 462[—]set up on 3+72⁴¹ 323 R.sight 4+42^{4L} 5° 19.3'TP[#] 2

9.15 60.37

51.22

3.43 56.94

T.P. on Rock.

3.15 57.21

3.31 57.06

check { 457 = 296.00

323 - 296 = 27 to D.S.F.

5
62.06462 = 299⁶³323 - 299⁶³ = 23³⁷ to D.S.F.

10' S 0° 57.37'

20' S 1° 54.74'

30' S 2° 52.11'

36⁴² S 3° 28.96' forms.10⁶⁴ N 1° 01.04' forms.

continued

5/1/19

Radius 299 ⁶³		Elev 462 ⁰⁰	
T.P.	3.53	60.74	57.21
forms N	11 ⁶⁴		3.75 56.99
	00	GRA.22	3.80 56.94
	+10		3.77 56.97
	+20		3.77 56.97
	+30		3.78 56.96
forms S	86 ⁴²		3.67 57.17

5/2/19

Grades on R. 299 ⁶³		Elev. 462 ⁰⁰	
P.T.	3.98	61.22	57.24
-10 ⁶²	4.98 = 5' 0"	4.20	57.02
00	5.05 = 5' 1/2"	4.27	56.95
+10	5.01 = 5' 0"	4.23	56.99
+20	5.00 = 5' 0"	4.22	57.00
+30	5.02 = 5' 1/4"	4.24	56.98
+36.4	4.80 = 4' 9 1/2"	4.02	57.20

5/2/19

54

Down stream face orer flow section

Radius 299 ⁶³		Elev. 462 ⁰⁰	
Set up on 3 + 72 ⁴¹		323 R.	
Sight 5 + 32 ⁶⁰		13° 19.3'	

019-15N 1082	60 21	49.39
T.P. Rock	297	57.24
		5
		<u>462</u>

323-

299⁶³23.37

1 = 0° - 5.74'

5' = 0° 28.70

10 = 0° 57.37

20 = 1° 54.74

30 = 2° 52.11

36.4 = Forms south 3° 28.85'

-10.67 = forms N. 1° - 01

5/27/19

up stream face. gravity section

set up on 59⁶³ 323 R.

sight flag 7° 56.94'

52 1+09⁶² 4° 26.1'55.47 1+15¹⁰ 4° 55.2' Nail on wal-1+15²⁸ 4° 58.8' forms.60 1+19⁶³ 5° 19.3'70 1+29⁶³ 6° 12.5'80 1+39⁶² 7° 5.7'82.9 1+42⁵² 7° 21.07 forms.110.7 1+70³³120.0 1+79⁶³ 10° 38.6'

130

1+96⁶⁸ 12° 08' forms.C-3 12.22 83.85 71⁶³

+P Block 4. 2.09 82.26 3.68 80.17

Top forms. 1.97 80.29

9.83 72.43

setup on 1+79⁶³ sight flag

18° 35.54

1+54⁶³ 2° 13'1+49⁶³ 2° 39.6'

5/2/19

55

Down stream face gravity section

Radius 306⁹⁷ Elev. 480⁶²setup on 1+49⁶³ 323 Rsight 1+79⁶³ 2° 39.6'323⁶²306⁹⁷

16.03 to D.S.F.

+P 2.93 75.36 72.43

9.58 = 9'-7" GR+4.64 4.94 70.42

9.70 = 9-8½" 5.06 70.30

5/2/19.

Down stream face gravity section.

Radius 308.36 El. 485⁰⁰

323.00

308.36

14.64 dist to DSF

1' = 0° 5.57'

5' = 0° 27.87'

10' = 0° 55.74'

20' = 1° 51.48'

30' = 2° 47.22'

40' = 3° 42.96'

50' = 4° 38.70'

60' = 5° 34.44'

16.1N = 1° 29.73' forms N

9'S = 0° 50.17 " S

35.5S = 3° 17.87 " S

61.2°S = 5° 41.12 " S

5/2/19.

56

Grades.

TP	225	82.42	80.17
61.2S	3.43 =		0.85 81.57
50.S	4.97 = 4'-11½"		2.39 80.03
40.S	4.81 = 4'-9¾"	GR = +1258	2.23 80.19
35.5S	4.76 = 4'-9"		2.18 80.24
9.S	7.46 = 7'-5½"		4.88 77.54
00	7.43 = 7'-5½"		4.87 77.55
10.N	7.66 = 7'-8"		5.08 77.34

5/2/19.

Set up on 0.0 on tangent

Set Nail 20'
" Hub 70'

5/2/19.

Set up on Pt. 279.80 Radius. 57'

Sight flag 90°

Radius 279.80 E. 435⁰⁰

+10' = 1° 1.43'

+20' = 2° 2.86'

+30' = 3° 4.29'

+40' = 4° 5.72'

Grades.

019. 235 38.28 35.93

00	3.33 =		+05	38.33
20	5.77 = 5'	9 1/4"	9.05	29.23
30	5.57 = 5'	6 3/4"	8.85	29.43
40	5.36 = 5'	4 1/4"	8.64	29.64

GR-318

Station on 325R Block Number	Station on 323R
0+7 ³⁶ to 0+34 ⁶¹	0+06 ⁶⁴ to 0+33 ⁸⁹
0+34 ⁶¹ to 0+61 ⁸⁶	0+17⁸⁹ to 0+34 ¹¹⁴
0+61 ⁸⁶ to 0+89 ¹¹	0+33 ⁸⁹ to 0+61 ¹¹⁴
0+89 ¹¹ to 1+16 ³⁶	0+61 ¹¹⁴ to 0+88 ¹³⁹
1+16 ³⁶ to 1+43 ⁶¹	0+88 ¹³⁹ to 1+15 ⁶⁴
1+43 ⁶¹ to 1+70 ⁸⁶	1+15 ⁶⁴ to 1+42 ²²
1+70 ⁸⁶ to 1+98 ¹¹	1+42 ²² to 1+69 ⁸⁰
1+98 ¹¹ to 2+25 ³⁶	1+69 ⁸⁰ to 1+96 ⁸⁸
2+25 ³⁶ to 2+52 ⁶¹	1+96 ⁸⁸ to 2+23 ⁹⁷
2+52 ⁶¹ to 2+79 ⁸⁶	2+23 ⁹⁷ to 2+51 ⁰⁵
2+79 ⁸⁶ to 3+07 ¹¹	2+51 ⁰⁵ to 2+78 ¹³
3+07 ¹¹ to 3+34 ³⁶	2+78 ¹³ to 3+05 ²¹
3+34 ³⁶ to 3+61 ⁶¹	3+05 ²¹ to 3+32 ²⁹
3+61 ⁶¹ to 3+88 ⁸⁶	3+32 ²⁹ to 3+59 ³⁸
3+88 ⁸⁶ to 4+16 ¹¹	3+59 ³⁸ to 3+86 ⁴⁶
4+16 ¹¹ to 4+43 ³⁶	3+86 ⁴⁶ to 4+13 ⁵⁴
4+43 ³⁶ to 4+70 ⁶¹	4+13 ⁵⁴ to 4+40 ⁶²
4+70 ⁶¹ to 4+96 ⁸⁶	4+40 ⁶² to 4+67 ⁷¹
4+96 ⁸⁶ to 5+25 ¹¹	4+67 ⁷¹ to 4+93 ⁸⁸
5+25 ¹¹ to 5+52 ³⁶	4+93 ⁸⁸ to 5+21 ⁸⁷
5+52 ³⁶ to 5+79 ⁶¹	5+21 ⁸⁷ to 5+42 ⁶⁰ = P.T.
5+79 ⁶¹ to 6+06 ⁸⁶	5+42 ⁶⁰ to 5+44 ⁴⁴
	5+44 ⁴⁴ to 5+76 ²⁵
	5+76 ²⁵ to 6+03 ⁵⁰
	6+03 ⁵⁰ to 6+30 ⁷⁵

325R on 325R = 54.5 on 323R
 27.25 on 325R = 27.02 on 323R
 This joint set without measurement

Stations of Contraction Joints
on 325' Radius

325' Radius

323' Radius

1+16 ³⁶ = E.I.	460 ⁰⁰	1+1564
1+43 ⁶¹ = E.I.	460 ⁰⁰	1+42 ²²
1+70 ⁸⁶ = E.I.	435 ⁰⁰	1+69 ^{82.0}
1+98 ¹¹ = E.I.	458 ⁰⁰	1+96 ^{82.8}
2+25 ³⁶ = E.I.	410 ⁰⁰	2+23 ^{98.7}
2+52 ⁶¹ = E.I.	436 ⁰⁰	2+51 ⁰⁵
2+79 ⁸⁶ = E.I.	366 ⁰⁰	2+78 ^{14.3}
3+07 ¹¹	E.W. 451 ⁰⁰	3+05 ^{22.1}
3+34 ³⁶ = E.I.	410 ⁰⁰	3+32 ^{20.29}
3+61 ⁶¹	E.I. 455 ⁰⁶	3+59 ³⁸
3+88 ⁸⁶ = E.I.	366 ⁰⁰	3+86 ^{47.1}
4+16 ¹¹	E.I. = 455 ⁸⁹	4+13 ^{55.4}
4+43 ³⁶ = E.I.	430 ⁰⁰	4+40 ^{63.1}
4+70 ⁶¹ = N.W. E.I.	450 ^{12.14}	4+67 ^{72.1}
4+96 ⁸⁶ = E.I.	West = 438 ⁰⁰ East = 430 ⁰⁰	4+93 ⁸⁸
5+25 ¹¹ = E.I.	456 ³⁶	5+21 ⁸⁷
5+52 ³⁶ = E.I.	456 ¹¹	5+44 ⁴²
5+79 ⁶¹ =	471 ⁴⁰	5+76 ²⁵
6+06 ⁸⁶ =		6+03 ⁵⁰

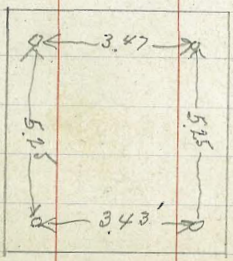
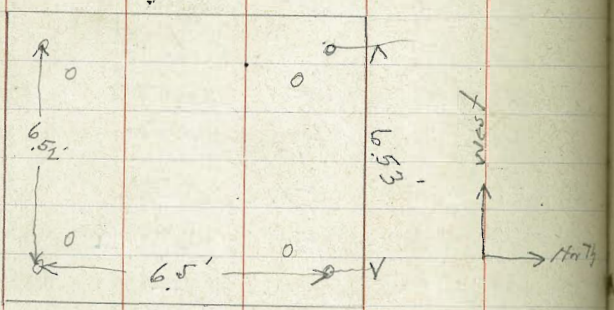
See Page 1 - Book 20 for Balance

Willcomb Sections across Creek at
 Sub Point of Rocks - Reservoir
 Start 0+00 on Point Marked 0+00 East Side
 Chain West to Rock - 317 ft. P.O.R. marked

4/8/19

0+23
 0+42' to Stake marked 0+43
 0+50 to " " 0+51
 0+99.2 " " " 1+00
 -1+62 " " " 1+63
 1+67 " " " 1+68
 1+70.5 " " " to Stake - Kiel Mark
 1+73 " " " 1+74
 1+99 " " " 2+00

8



4

KEITH'S RAILROAD CURVE TABLES.

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HOW TO USE KEITH'S TABLES.

EXAMPLE.

Wanted a Curve with an Ext. of about 12 ft. Angle
 of Intersection or I. P. = $23^{\circ} 20'$ to the R. at Station
 542+72.

Ext. in Tab. IV opposite $23^{\circ} 20' = 120.87$
 $120.87 + 12 = 132.87$. Say a 10° Curve.

Tan. in Tab. IV opp. $23^{\circ} 20' = 1183.1$
 $1183.1 + 10 = 1193.1$.

Tab. V. correction for A. $23^{\circ} 20'$ for a 10° Cur. = 0.16
 $1193.1 + 0.16 = 1193.26 = \text{corrected Tangent}$.

(If corrected Ext. is required find in same way)
 Ang. $23^{\circ} 20' = 23.33^{\circ} + 10 = 2.3333 = \text{L. C.}$

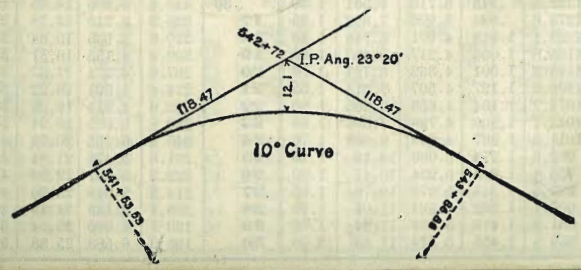
$2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542$	I. P. = sta.	542+72
$4^{\circ} 49\frac{1}{2}' = \text{ " " " } +50$	Tan. =	1.18.47
$7^{\circ} 19\frac{1}{2}' = \text{ " " " } 543$	B. C. = sta.	541+53.53
$9^{\circ} 49\frac{1}{2}' = \text{ " " " } +50$	L. C. =	2.33.33
$11^{\circ} 40' = \text{ " " " } 543+$	E. C. = sta.	543+86.86
		86.86

$100 - 53.53 = 46.47 \times 3' (\text{def. for 1 ft. of } 10^{\circ} \text{ Cur.}) = 139.41' =$
 $2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542.$

Def. for 50 ft. = $2^{\circ} 30'$ for a 10° Curve.

Def. for 36.86 ft. = $1^{\circ} 50\frac{1}{2}'$ for a 10° Curve

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



Natural Tangents

deg.	0'	10'	20'	30'	40'	50'	deg.	0'	10'	20'	30'	40'	50'	deg.	
0	0000	0029	0058	0087	0116	0145	89	40	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	88	41	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	87	42	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	86	43	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	85	44	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	84	45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	83	46	1.0355	1.0416	1.0477	1.0538	1.0599	1.0661	43
7	1228	1257	1287	1317	1346	1376	82	47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	81	48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	80	49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	79	50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	78	51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	77	52	1.2709	1.2786	1.2864	1.2942	1.3021	1.3100	37
13	2309	2339	2370	2401	2432	2462	76	53	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	75	54	1.3704	1.3788	1.3873	1.3958	1.4044	1.4130	35
15	2679	2711	2742	2773	2805	2836	74	55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	73	56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	72	57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	71	58	1.6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	70	59	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	69	60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	68	61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	67	62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	66	63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4452	4487	4522	4557	4592	4628	65	64	2.0503	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	64	65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	63	66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	62	67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	61	68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	60	69	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	59	70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	58	71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	57	72	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	56	73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	55	74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	54	75	3.7321	3.7760	3.8208	3.8657	3.9136	3.9617	14
36	7265	7310	7355	7400	7445	7490	53	76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
37	7536	7581	7627	7673	7720	7766	52	77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	51	78	4.7040	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	50	79	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10

deg.	60'	50'	40'	30'	20'	10'	deg.	60'	50'	40'	30'	20'	10'	deg.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9							
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8							
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7							
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6							
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5							
85	11.430	11.826	12.250	12.706	13.197	13.727	4							
86	14.300	14.924	15.605	16.350	17.169	18.075	3							
87	19.081	20.206	21.470	22.903	24.542	26.432	2							
88	28.636	31.242	34.368	38.189	42.964	49.104	1							
89	57.290	68.750	85.940	114.588	171.885	343.770	0							

Natural Cotangents

Radius 323

$60 / 19.000 = 3.16$
 $1823 - 20$
 $1793 - 10$
 $10' = 3.0$
 $5.316 = 5 - 19''$
 45.948
 1793
 1809
 3678

1718871
 2+19⁶³
 55

 2+74⁶³

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1½ TO 1.

FOR SINGLE TRACK EMBANKMENT.

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

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

MADE IN GERMANY.