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Construction Notes

FIELD BOOK

361S

W120

# 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
33	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	33
34	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	34
35	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	35
36	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	36

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

FOR KEITH'S RAILROAD CURVE TABLES SEE END OF BOOK.

17188.7

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9/19/19 Gravity Section  
 S-F-M. Mass Rock Recess  
 Set of center of curve set x on  
 Rock at #8 Crusher dist 158.95'  
 Set 602 Nail at dist of 169.10'  
 24.60 Set hub at dist of 193.70'  
 Set point at R. 232.26 El. = 372.00

Q 17	1.30	74.57	73.27
T.P. on Rock	about 2.03' from £	4.97	69.60
TP		6.35	68.12

1' = 0° - 7.4'	4.96 - 7.56	69.60
5' = 0° - 37.0'		
10' = 1° - 14.0'	0 - 0	8.5
20' = 2° - 28.0'		
30' = 3° - 42.0'	7'	6.74
40' = 4° - 56.0'	17'	8.65

587' Wall Height = 0° - 43.4'
7.0' P.O.R. = 0° - 51.8'
17.0' = 2° - 05.8'
27.43' = 3° - 23.1'

Radius 236.59 El. = 377.00

1' = 0° - 7.265'
5' = 0° - 36.32'
10' = 1° - 12.85'
20' = 2° - 25.3'
30' = 3° - 38.0'
40' = 4° - 50.6'
6.97' North Wall = 0° - 44.09'
17.0' = 2° - 03.5'
27.07' 3' - 16.6'

(For Check levels -)  
 continued Page # 4

5/10/19 Expansion Joints

Block Numbers

Stations on 325'	Block Number	Stations on 323'
0+736 to 0+346 <sup>61</sup>	1	0+06 <sup>64</sup> to 0+33 <sup>89</sup>
0+346 <sup>61</sup> " 0+61 <sup>86</sup> 0+87 <sup>85</sup> As Built	2	0+33 <sup>89</sup> to 0+61 <sup>14</sup>
0+61 <sup>86</sup> " (0+89 <sup>14</sup> )	3	0+61 <sup>14</sup> to 0+88 <sup>39</sup>
0+89 <sup>14</sup> " 1+16 <sup>36</sup>	4	0+88 <sup>39</sup> " 1+15 <sup>64</sup>
1+16 <sup>36</sup> " 1+43 <sup>61</sup>	5	1+15 <sup>64</sup> to 1+42 <sup>72</sup>
1+43 <sup>61</sup> " 1+70 <sup>86</sup>	6	1+42 <sup>72</sup> to 1+69 <sup>80</sup>
1+70 <sup>86</sup> " 1+98 <sup>14</sup>	7	1+69 <sup>80</sup> to 1+96 <sup>88</sup>
1+98 <sup>14</sup> " 2+25 <sup>36</sup>	8	1+96 <sup>88</sup> " 2+23 <sup>97</sup>
2+25 <sup>36</sup> " 2+52 <sup>61</sup>	9	2+23 <sup>97</sup> " 2+51 <sup>05</sup>
2+52 <sup>61</sup> " 2+79 <sup>86</sup>	10	2+51 <sup>05</sup> " 2+78 <sup>13</sup>
2+79 <sup>86</sup> " 3+07 <sup>14</sup>	11	2+78 <sup>13</sup> " 3+05 <sup>21</sup>
3+07 <sup>14</sup> " 3+34 <sup>36</sup>	12	3+05 <sup>21</sup> " 3+32 <sup>29</sup> = 3+37 <sup>19</sup>
3+34 <sup>36</sup> " 3+61 <sup>61</sup>	13	3+32 <sup>29</sup> " 3+59 <sup>38</sup> = 3+66 <sup>95</sup>
3+61 <sup>61</sup> " 3+88 <sup>86</sup>	14	3+59 <sup>38</sup> " 3+86 <sup>76</sup>
3+88 <sup>86</sup> " 4+16 <sup>11</sup>	15	3+86 <sup>76</sup> " 4+13 <sup>54</sup>
4+16 <sup>11</sup> " 4+43 <sup>36</sup>	16	4+13 <sup>54</sup> " 4+40 <sup>62</sup>
4+43 <sup>36</sup> " 4+70 <sup>61</sup>	17	4+40 <sup>62</sup> " 4+67 <sup>71</sup>
4+70 <sup>61</sup> " 4+96 <sup>94</sup>	18	4+67 <sup>71</sup> " 4+93 <sup>88</sup>
4+96 <sup>94</sup> " 5+25 <sup>11</sup> (5+52 <sup>36</sup> ) See Page 49 Book 19	19	4+93 <sup>88</sup> " 5+21 <sup>87</sup>
5+25 <sup>11</sup> " 5+47 <sup>22</sup> 5+45 <sup>28</sup> P.T.	20	5+21 <sup>87</sup> " 5+44 <sup>12</sup>
5+47 <sup>22</sup> " 5+79 <sup>61</sup>	21	5+44 <sup>12</sup> " 5+76 <sup>25</sup>
5+79 <sup>61</sup> " 6+06 <sup>86</sup>	22	5+76 <sup>25</sup> " 6+03 <sup>50</sup>
6+06 <sup>86</sup> " 6+34 <sup>11</sup>	23	6+03 <sup>50</sup> " 6+30 <sup>75</sup>
6+34 <sup>11</sup> " 6+61 <sup>36</sup>	24	6+30 <sup>75</sup> " 6+58 <sup>00</sup>

54.5 on 325 = 54.16 on 323 R  
 2725 on 325 = 2708 on 323 R

Note  
 Joint Set without  
 measurement  
 5+42 59 ft.

5/1/19

See Page 58 Book 17  
 Revised List

Stations + Elevations of Contraction Joints

325' R	Elevations	323' R
0+736		
0+344		
0+61 <sup>86</sup>	470 <sup>24</sup>	0+61 <sup>14</sup>
0+87 <sup>14</sup> As Built	466 <sup>24</sup>	0+88 <sup>39</sup>
0+89 <sup>11</sup>		
1+16 <sup>36</sup>	460 <sup>00</sup>	1+15 <sup>64</sup>
1+34 <sup>61</sup>	460 <sup>00</sup>	1+42 <sup>72</sup>
1+70 <sup>86</sup>	435 <sup>00</sup>	1+69 <sup>80</sup>
1+98 <sup>14</sup>	458 <sup>00</sup>	1+96 <sup>88</sup>
2+25 <sup>36</sup>	410 <sup>00</sup>	2+23 <sup>97</sup>
2+52 <sup>61</sup>	436 <sup>00</sup>	2+51 <sup>05</sup>
2+79 <sup>86</sup>	366 <sup>00</sup>	2+78 <sup>13</sup>
3+07 <sup>14</sup>	451 <sup>00</sup>	3+05 <sup>21</sup>
3+34 <sup>36</sup>	410 <sup>00</sup>	3+32 <sup>29</sup> = E1457°-3+37 <sup>14</sup>
3+61 <sup>61</sup>	455 <sup>06</sup>	3+59 <sup>38</sup>
3+88 <sup>86</sup>	366 <sup>00</sup>	3+86 <sup>76</sup>
4+16 <sup>11</sup>	455 <sup>89</sup>	4+13 <sup>54</sup>
4+43 <sup>36</sup>	430 <sup>00</sup>	4+40 <sup>62</sup>
4+70 <sup>61</sup>	450 <sup>12</sup>	4+67 <sup>71</sup>
4+96 <sup>94</sup>	West 438 <sup>00</sup> East 430 <sup>00</sup>	4+93 <sup>88</sup>
5+25 <sup>11</sup>	456 <sup>36</sup>	5+21 <sup>87</sup>
5+47 <sup>22</sup>	456 <sup>11</sup>	5+44 <sup>12</sup>
5+79 <sup>61</sup>	471 <sup>12</sup>	5+76 <sup>25</sup>
6+06 <sup>86</sup>	475 <sup>40</sup>	6+03 <sup>50</sup>
6+34 <sup>11</sup>	482 <sup>04</sup>	6+30 <sup>75</sup>

Continued  
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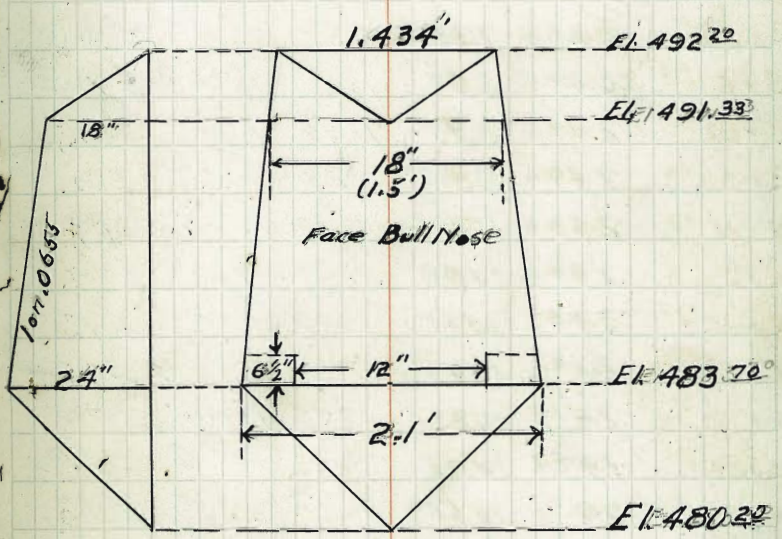
Piers for Roadway over Spillway Section

Face Divide Wall on 323 R = 2+80<sup>77</sup>

Station	Elevation	Pier No.
2+80 <sup>77</sup>	13 88	
2+94 <sup>65</sup>	14.63	1
3+09 <sup>28</sup>	14.63	2
3+23 <sup>21</sup>	14.63	3
3+38 <sup>54</sup>	14.63	4
3+53 <sup>17</sup>	14.63	5
3+67 <sup>80</sup>	14.63	6
3+82 <sup>43</sup>	14.63	7
3+97 <sup>06</sup>	14.63	8
4+11 <sup>69</sup>	14.63	9
4+26 <sup>32</sup>	14.63	10
4+40 <sup>95</sup>	14.63	11
4+55 <sup>58</sup>	14.63	12
4+70 <sup>21</sup>	14.63	13
4+84 <sup>84</sup>	14.63	14
4+99 <sup>47</sup>	14.63	15
5+14 <sup>10</sup>	14.63	16
5+28 <sup>73</sup>	14.63	17
5+42 <sup>6/74</sup>	1388	Face Divide Wall Lt. Abutment.

Top Roadway = 492<sup>20</sup> 2  
 Bottom Floor = 491<sup>33</sup>

Pier Width at El. 491<sup>33</sup> = 18 inches.  
 Pier Width at El. 476<sup>25</sup> = 2.7'  
 El. Bull Nose at Greatest <sup>Width</sup> 483<sup>70</sup> Width = 2.10'  
 El. " " at Bottom Point 480<sup>20</sup> No width  
 Stop Plank Groove at 483<sup>70</sup> Width 6 1/2 inches  
 12" between Grooves in Bull Nose



Distances from Upstream to downstream  
Face O-G-Section-

			484.70
Crest of Wier at 2' from Upstream Face			484.70
1.73 + 3.16 = 4.89	4'-10 <sup>5</sup> / <sub>8</sub> "		484.2
2.00 + 4.47 = 6.47	6'-5 <sup>5</sup> / <sub>8</sub> "		483.7
2.00 + 5.48 = 7.48	7'-5 <sup>3</sup> / <sub>4</sub> "		483.2
2.00 + 6.32 = 8.32	8'-3 <sup>7</sup> / <sub>8</sub> "		482.7
2.00 + 7.07 = 9.07	9'-0 <sup>7</sup> / <sub>8</sub> "		482.2
2.00 + 7.75 = 9.75	9'-9"		481.7
2.00 + 8.37 = 10.37	10'-4 <sup>1</sup> / <sub>2</sub> "		481.2
2.00 + 8.94 = 10.94	10'-11 <sup>1</sup> / <sub>4</sub> "		480.7
2.00 + 9.49 = 11.49	11'-5 <sup>7</sup> / <sub>8</sub> "		480.2
2.00 + 10.00 = 12.00	12'-0"		479.7
2.00 + 10.49 = 12.49	12'-5 <sup>7</sup> / <sub>8</sub> "		479.2
2.00 + 10.95 = 12.95	12'-11 <sup>3</sup> / <sub>8</sub> "		478.7
2.00 + 11.40 = 13.40	13'-4 <sup>3</sup> / <sub>4</sub> "		478.2
2.00 + 11.83 = 13.83	13'-10"		477.7
2.00 + 12.25 = 14.25	14'-3"		477.2
2.00 + 12.65 = 14.65	14'-7 <sup>3</sup> / <sub>4</sub> "		476.7
2.00 + 13.04 = 15.04	15'-0 <sup>1</sup> / <sub>2</sub> "		476.2
2.00 + 13.42 = 15.42	15'-5"		475.7
2.00 + 13.78 = 15.78	15'-9 <sup>3</sup> / <sub>8</sub> "		475.2

PT  
Parabola

Distance  
from  
32.5' Radius

Distance  
from  
32.3' Radius

Distance  
from  
32.5' Radius

Reinforcing A" from Downstream Face

	length	distance
7' pos	15'-10 <sup>1</sup> / <sub>2</sub> "	at 15'-5 <sup>1</sup> / <sub>2</sub> "
"	14'-6"	" 13'-6"
"	12'-10 <sup>1</sup> / <sub>2</sub> "	" 11'-0"
"	11'-6"	" 10'-6"
"	10'-3 <sup>1</sup> / <sub>2</sub> "	" 9'-0"
"	9'-11 <sup>1</sup> / <sub>2</sub> "	" 7'-6"
"	8'-8"	" 6'-0"
"	8'-2 <sup>1</sup> / <sub>2</sub> "	" 4'-6"
"	7'-11"	" 3'-0"
"	7'-11"	" 18" from Upstream Face
"	8'-4"	" 4" " " "

109  
6

Top Prior E1 = 491<sup>33</sup>



6/3/19 Gravity section

B-F. 17. Block # 5+44 <sup>55'</sup>/<sub>10</sub> 5+71.80

P-21 832 481.02 47270  
Top Form DS Face +32 48422

Radius = 308.36 EI = 485°

Set on 323 line 2' East

Sta 6+30 <sup>23</sup> = 6+27 <sup>57</sup> on 323 line

323 - 308.36 = 14.64 dist to DS Face

North F. North 6.59' = 6'-7" 2.61 78.41  
Center 8.65' = 8'-7 3/4" 4.67 76.35  
North F. South 6.98' = 6'-11 3/4" 3.00 78.02

Grade Gallery Lt Abut.

48102

+51 48153

Mass Rock Recess

Radius 732.26 EI 372°

Q17 1.27 74.54 7327

587 Wall N 2.54

6/3/19

4

Class 4 Estimate for May

6+27 <sup>57</sup> = Cut 00 23.5 Wide  
4743 00 1318.9  
6+50 = 6' Cut 19.6 " 117.6  
25 2895.0  
6+75 = 6' " 19.0 " 114.0  
25 2535.0  
7+00 = 6' " 14.8 Wide 888  
25 2167.5  
7+25 = 6' " 14.1 " 846  
25 808.3  
7+35 = vert. 5.5" 14.1 Wide 705

9724.7

Class 4 Right Abut.

3602 Cys

15 x 15 x 4.0 =

333

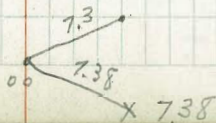
3935.0

Radius 236.59 EI - 377.0

27.07 Walls 00 7454 + 2.46 377.0

17 9.19' = 9'-2" 673 67.81

00 10.3' = 10'-3 1/2" 784 66.70



6/3/19

Overflow Block 12

3+05<sup>21</sup>3+32<sup>29</sup>Set on 3+04<sup>63</sup> Sight 0+00  
deflect 27°-01.12 for tang

3+14 <sup>63</sup>	10' =	0°-53.21'
3+24 <sup>63</sup>	20' =	1°-46.4'
3+34 <sup>63</sup>	30' =	2°-39.6"
3+37 <sup>19</sup>	32 <sup>56</sup>	2°-53.18"

Grade Block 12

Nail in forms P

481.14

15.71

Bottom T.P.

595 471.38

465.43

6.6

Radios = 306.89 EI = 472.00

3+3<sup>00</sup> - 306.89 = 16.11 dist to D.S. Face

9.6-S. 6.25' = 6'-3" 563. 465.75

00 5.41' = 5'-5" 479 466.59

Nail F. Nails 2.08' = 2'-1" 1.46 469.92

Set on 3+24<sup>63</sup> Sight 3+04<sup>63</sup>

tang defl = 1°46.4'

3+14<sup>63</sup> 10 = 0°-53.21Block 5 - 1+15<sup>64</sup> to 1+42<sup>22</sup> 5

Gravity Section

543 484.75

479.32

Top Studs

488<sup>00</sup>Radios = 309.10 EI = 488<sup>00</sup>3+3<sup>00</sup> - 309.10 = 13.90 dist to D.S. Face1+19<sup>63</sup> 7.98' = 7'-11.34" 5 473 80.021+29<sup>63</sup> 8.00' = 8'-0" 1 475 480.001+39<sup>63</sup> 7.83' = 7'-10" 3 458 80.17

Ex Joints Continued from Page 1

325 line Ele 323 line

6+34<sup>11</sup> 482<sup>00</sup> 6+30<sup>75</sup> N side B236+61<sup>36</sup> 482<sup>00</sup> 6+58<sup>00</sup> " " " 246+88<sup>61</sup> 480<sup>00</sup> 6+85<sup>25</sup> " " " 257+15<sup>86</sup> 487<sup>3</sup> 7+12<sup>50</sup> " " " 267+39<sup>10</sup> 7+35<sup>74</sup> End Dam " " " 27

6/4/19 Overflow Section

F-M-B. Block 12 - 3+05<sup>21</sup> to 3+32<sup>29</sup>

Set on Sta 3+04<sup>63</sup> Sight  
0+00 deflect 27°-1.12' for  
tang.

3+14 <sup>63</sup>	10'	0°-53'21"
3+24 <sup>63</sup>	20'	10-46.4"
3+34 <sup>63</sup>	30'	20-39.6"
3+37 <sup>25</sup>	32.62'	2°-53.5'

Grades Block 12

T.P. Rock Block 9 - 2+23 <sup>91</sup> - 2+51 <sup>05</sup>	82.90
672 489.62	82.90
Spike in Forms: 880 80.82	
dist. down from Nail - 8.71	
T.P. in Bottom Block 12	472.11

Radius 309<sup>22</sup> EI = 475.2

323<sup>02</sup> - 309<sup>22</sup> = 1378

2.91 75.02 472.11

Pt on Rock 3.97 = 3'-11<sup>3</sup>/<sub>4</sub>" 3.79 71.23

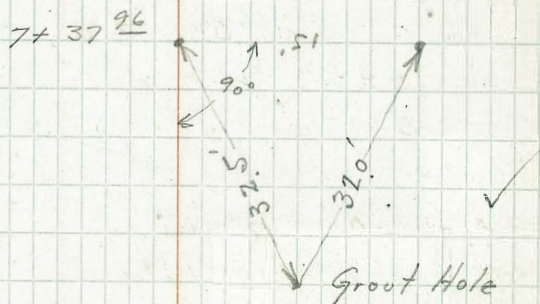
Nail in Core 4.26 = 4'-3" 4.08 70.94

Nail F. North 5.30 = 5'-3<sup>1</sup>/<sub>2</sub>" 5.12 69.90

S.P. 1012

Groot Hole Lt End Dam

6



Grades Block 21 - 5+47<sup>92</sup> to 5+79<sup>61</sup>

P.21	117.5	84.45	472.70
Nail in North Form		0.0	84.45
Top Cor. at E Joint	5+79 <sup>61</sup>	13.33	71.12
Top Cor. Block 21		3.1	81.35
			7

Radius = 309.10 Elevation 488<sup>00</sup>

323<sup>02</sup> - 309.10 = 1390 dist to d.s. Face.

Nail in N Form 3.55 = 3'-6<sup>1</sup>/<sub>2</sub>" S.P. 0.00 84.45

Nail in Gallery North 4.02 = 4'-0<sup>1</sup>/<sub>4</sub>" S.P. 3.047 83.98

1.63 86.08 84.45

Nail Form South 3.50 = 3'-6" S.P. 1.58 84.50

" S. side Gallery 0.47 = 0'-5<sup>3</sup>/<sub>4</sub>" S.P. + 1.45 - 87.53

Center Block 6.64 = 6'-7<sup>3</sup>/<sub>4</sub>" S.P. 4.72 81.36

8/20/19

Mass Rock Recess.

F-M-B.

Radius 240.06 EI = 381.0

1' = 0° 7.16'

5' = 0° 35.80'

10' = 1° 11.6'

20' = 2° 23.2'

30' = 3° 34.8'

40' = 4° 46.4'

6.3 = N. Wall 0° 45.1'

26.75 S Wall 3° 11.53'

10' 1° 11.6'

15' 18.40 78.00 69.60

+ 26.75 S Wall 00 = 0-0" + 3.0 381.00

Grade Rod - 3.0 EI - 81.00

+ 10 12.91 = 12'-10<sup>3</sup>/<sub>4</sub>" 9.91 68.090 + 0 13.15 = 13'-1<sup>3</sup>/<sub>4</sub>" 10.15 67.85

+ 6.3 N Wall 7' = 7'-0" - 4.0 74.00

8/23/19

(about  
T.P. 2+03)

11.10 380.70 369.80

TP on Form 0.19 380.51

4.82 385.33

TP on Rock 0.97 384.36

5.94 390.30

ON W Wall

on Wall

5.70 396.00 00 390.30

See page 13

8/23/19 Mass Rock Recess

Set nail in bottom whale

44.99 Hub at Station 1+93.70 238.69

Nail in upper whale 238.69

10.43 Cross on rock 2+49.12

42.96 Cross on Face Concrete 2+92.08

Radius 250.46 EI 393.0

1' = 0° - 6.863'

5' = 0° - 34.315'

10' = 1° - 8.63'

20' = 2° - 17.26'

30' = 3° - 25.89'

7.03 North Wall = 0° - 46.25'

27.29 South Wall = 3° - 07.28'

Measure East 347 on Walls

Set points on Radius 246.99 EI - 389.00

by offset on both Walls

Set Point 433 West from 250.46

433

Radius 254.79 EI 398.00

1' = 0° - 6.745'

7.20 = North Wall = 0° - 48.56'

27.70 = South Wall = 3° - 6.83'

6/5/19 Beginning O.G. Section  
 F-M-B. Block 12 - 3+05<sup>21</sup> to (3+32<sup>29</sup>)

Ext. Joint at 3+32<sup>29</sup> 323 R Set  
 over to 3+37<sup>19</sup> on E1. 457<sup>2</sup>

Set on 2+74<sup>63</sup> Sight oo-323 R  
 deflect for tang 24°-2144  
 2+84<sup>63</sup> = 10' 0°-53<sup>21</sup> set final  
 2+94<sup>63</sup> = 20' 1°-46.4<sup>6</sup> points in concrete  
 3704<sup>63</sup> = 30' 2°-39.60'  
 2+94<sup>65</sup> 20<sup>02</sup> 1°-46.51' & Pier # 1

Block 9- 2+23<sup>91</sup> 2+51<sup>05</sup> 691. 489.81 482.90  
 Nail in Face Concrete 974 480.07

Set on 3+04<sup>63</sup> Sight oo for tang  
 defl = 27°-01.11'  
 3+14<sup>63</sup> 10'- 0°-53<sup>21</sup>  
 3+09<sup>28</sup> & Pier # 2

3+23<sup>91</sup> & P. #3 = 1928 = 1°-42.57'  
 3+34<sup>63</sup> 30.0 = 2°-39.60'  
 3+37<sup>22</sup> 32.59 = 2°-53.34' Nail in Face E  
 → should be 3+37<sup>19</sup>

6/5/19 Block 12 8

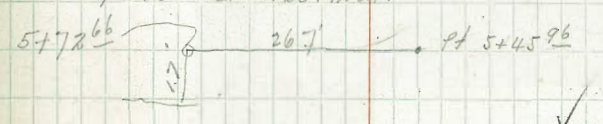
Set on 3+23<sup>91</sup> - 323 R. Sight  
 3+04<sup>63</sup> dist. 1928 defl for tang = 1°-42.57'  
 Turn to Center Set Nail in downstream  
 Forms for & Pier # 3

3+09<sup>28</sup> & Pier #2 dist 14<sup>63</sup> = 1°-17.86'  
 Radius = 314<sup>63</sup> EI = 481.20

3+30<sup>02</sup> - 314<sup>63</sup> = 8<sup>37</sup> dist to d.s. Face  
 Set on 3+09<sup>28</sup> & Pier #2 Sight 3+23<sup>91</sup> tang  
 defl = 1°-17.86' turn to Center Set Nail  
 on & Pier # 2

T.P. Nail in Con.	0.95	481.02		480.07
& Pier #2 on 314 <sup>63</sup>	592 = 5'-11"	574	75.28	
" " #3 " "	609 = 6'-1"	591	75.11	
Nail in Forms on 314 <sup>63</sup>	537 = 5'-4 1/2"	519	75.83	
" " " on 323 R.	445 = 4'-5 1/2"	527	75.75	
Grade on Con. Wall 323 R.	Bottom B.Nose 0.82		480.20	

Fillet at Abutment.



6/5/19

## Lt Abutment

F-M-B. Up Stream Face Gravity Section

7+47.81 ~~7+46.64~~

Set on 333 line 7+50

Sight R.P. - Set Points on

Sta 6+27.51 = 6+30.23 on 325' line

" 6+10

" 6+03.50 E+Joint. El. = 475.40

" 6+00

" 5+90

" 5+80

" 5+76.15 Conc Face Ex. Joint. El. outside

" 5+70.86 = North Side of Gallery Outlet Landing = 323R

" 5+66.86 = South Side of Gallery Outlet 481.53 = 323R

6+30.75 E+Joint.

6+40

6+50

7/12/19 Spillway GG Section

A33-A31 North 343 84.41 80.98

20. 70.8 0.3 13.28 71.13

17.5 71.86 17.95 71.46

15.32 72.9 11.2 72.2

10 80.82 3.59 80.32

2.75 481.0 3.52 80.89

5.35 485.00 5.65 84.70

2.75 481.00 6.02 84.33

5.35 485.00 6.02 84.33

## Downstream Face Gravity Section 9

Lt Abutment Block 22

P-21 8.93 481.63 472.70  
 Top Landing E Gallery 318R + 0.30 481.93  
 Top DS Forms + 3.44 485.07  
 Radius = 308.36 El. = 485.00  
 323.00 - 308.36 = 14.64 dist to DS Face

P-21 9.09 481.79 472.70  
 6+10 981' = 9' - 9 3/4" S 6.60 75.19  
 6+03.50 E+J. 9.60 = 9' - 7 1/4" P 6.39 75.40  
 6+00 940' = 9' - 4 3/4" S 6.19 75.60  
 5+90 917' = 9' - 2" S 5.96 75.83  
 5+80 930' = 9' - 3 3/4" 6.09 75.70

8/2/19 Spillway Grades  
15.32 line North.

0.58 82.04 81.46

Grade 474.60 Rod - 7.44 El.

1 2.03 = 2' - 0 1/2" 9.97 72.57

2 2.31 = 2' - 3 3/4" 9.75 72.29

3 1.94 = 1' - 11 1/4" 9.38 72.66

4 2.14 = 2' - 1 1/4" 9.58 72.46

5 2.66 = 2' - 8" 10.10 71.99

6 0.95 = 0' - 11 1/2" 8.39 73.65

7 1.10 = 1' - 1 1/4" 8.54 73.50

C = 0.56 C = 0' - 6 3/4" 6.88 75.16

6/5/19 Block 12 - 3+05<sup>21</sup> to (3+32<sup>29</sup>)  
 Grade = 476.25 3+37<sup>19</sup>

5.24 80.52  
 2+94<sup>65</sup> on Nail in Concrete 475.28  
 310 R. 1.11' = 1'-1<sup>3</sup>/<sub>8</sub>" 5.38 75.14

Pier # 3

Nail Pier #2 479 80.07 475.28  
 +0.13 480.20

4.91 480.19 475.28  
 3.94 476.25

Distance between Piers on 325' R = 14.72  
 " " Piers on 310' R = 14.04  
 1.35 or 323 = 1.30 on 310 R. P

3.92 79.20 475.28  
 2.95 476.25  
 3.52 75.68  
 6<sup>7</sup>/<sub>8</sub>" → .57

6/6/19 Gravity Section 4. Abut. 10

Block 22 5+76<sup>25</sup> to 6+03<sup>50</sup>  
 P-21 12.94 85.64 472.70

Radius = 309.80 EI = 491.20

323 - 309.80 = 13.20 dist to DS Face

Nail Forms N. 8'6" = 8'-7<sup>1</sup>/<sub>4</sub>" 3.05 82.59  
 Center. 9'9" = 9'-11<sup>3</sup>/<sub>4</sub>" 4.41 81.23  
 9'7" = 9'-9<sup>1</sup>/<sub>2</sub>" 4.22 81.42  
 9'8<sup>5</sup>/<sub>8</sub>" = 9'-10<sup>1</sup>/<sub>4</sub>" 4.29 81.35

B.F.M.

8/2/19

Retaining Wall. Spillway.

5.28 492.48 487.20  
 0.31

1 0.30  
 2  
 3 6.04 493.24 487.20  
 4

8.04 495.20

1.04 492.20

7.94 485.30

4 7.26 485.98

92.83 - 140

6/6/19		Ele 485 <sup>20</sup>		96 <sup>2</sup> 485 <sup>2</sup>	
B-F-M	Spillway Cuts				
USGS Brass Cap	Cuts	10.60	497.17	486.57	
00 Cut on Pier of Tower				11.97	485.20
1+00	2.3			9.68	87.49
0+75	5.7			6.22	90.95
0+50	7.5			4.41	92.76
0+25	9.7			2.21	94.96
0+00	11.5			0.49	96.68
				11.97	485.20
	9.1			2.81	94.36
	5.9			6.01	91.16
	1.8			10.14	87.03
				0	
8	11.5			0.39	96.78
0+25	11.7			0.25	96.92
G-	2.1			9.78	87.37
0+50	11.1			0.83	96.34
0+75	7.8			4.09	93.08
1+0	3.7			8.25	88.92
1+25	0.6			11.34	85.83
Edge Road	0.00			11.94	85.23
" Spillway	2.8			9.14	88.03
" "	7.8			4.11	93.06

6/7/19		11	
B-F-M	Block 5- 1+15 <sup>64</sup> to 1+42 <sup>72</sup>		
	Set on 1+09 <sup>63</sup> Sight 1+59 <sup>63</sup>		
	defl for tang = 4° - 26.1		
1+16 <sup>26</sup>	6.63		Joint Concrete Face
1+19 <sup>63</sup>	10		= 0° - 53.21'
1+29 <sup>63</sup>	20		= 1° - 46.4'
1+39 <sup>63</sup>	30		= 2° - 39.6'
1+42 <sup>91</sup>	33 <sup>28</sup>		Face Concrete Joint
	Grades R = 310° E1 = 492 <sup>20</sup>		
	Nail in DS. from 3035 495.235 492 <sup>20</sup>		
	Set Grades Block 2 on every 2 <sup>nd</sup> Stod		
1+19 <sup>63</sup>	DSF 4.91' = 4' - 11"	Sp	7.95 87.29
1+29 <sup>63</sup>	" 5.29' = 5' - 3 1/2"	W	8.33 86.91
1+39 <sup>63</sup>	" 5.39' = 5' - 4 3/4"	X	8.43 86.81
	Set on Sta 1+10 - 323 line		Set Nails
1+00			
0+90			
0+80			
0+70			
0+60			
0+50			
0+40			
0+34 <sup>49</sup>	Face Contr Joint.		
0+29 <sup>40</sup>	checked		



6/7/19

Block 12 - 3+05<sup>21</sup> to  
3+37<sup>19</sup> - ok

B-F-M.

Set on 3+04<sup>63</sup> Sight 00

323 R Tang defl = 27°-01'11"

3+11<sup>23</sup> 6.6 0°-35°09'3+14<sup>63</sup> 10 0°-53'21"3+25<sup>80</sup> 21.7 10°-52'60"3+36<sup>25</sup> 31.63 20°-48'20"Nail  
Studs  
in  
top

8/3/19

Spillway

Grade = 483.40

F-D. Nail in Forms 7.30 89.50 487.20

#1 2.65 = 2'-8" 87.5 80.75

2 2.07 = 2'-1" 81.7 81.33

3 2.35 = 2'-4" 84.5 81.05

4 3.82 = 3'-10" 99.2 79.58

5 2.98 = 2'-11<sup>3</sup>/<sub>4</sub>" 90.8 80.426 3.72 = 3'-8<sup>3</sup>/<sub>4</sub>" 98.2 79.68

7 2.75 = 2'-9" 88.5 80.65

8 2.08 = 2'-1" 81.8 81.32

9 Cut 1.53 = 1'-6<sup>1</sup>/<sub>2</sub>" 45.7

Top old Nail

1070 78.80

8/4/19

F-M

Spillway

Nail in forms 3.33 490.53 487.20

Grade = 7.13 483.40

1 1.56 1'-6<sup>3</sup>/<sub>4</sub>" 8.69 481.742 1.87 1'-10<sup>1</sup>/<sub>2</sub>" 9.00 81.333 1.94 1'-11<sup>1</sup>/<sub>4</sub>" 9.07 81.484 2.04 2'-0<sup>1</sup>/<sub>2</sub>" 9.17 81.365 2.14 2'-1<sup>3</sup>/<sub>4</sub>" 9.27 81.266 0.64 0 7<sup>3</sup>/<sub>4</sub>" 7.77 82.767 0.28 0 3<sup>1</sup>/<sub>4</sub>" 7.41 83.128 0.30 0 0'-3<sup>1</sup>/<sub>2</sub>" 6.83 83.70

9

10

GRADE 9' Line 483.40

8/11/19

B-F-M.

Grades 9' line West Wier

0.32 487.52 487.20

Nail North 9.16 = 9'-2" 132.8 74.24

✓ 8.91 = 8'-11" 130.3 74.49

2 8.79 = 8'-9<sup>1</sup>/<sub>4</sub>" 128.1 74.714 8.63 = 8'-7<sup>1</sup>/<sub>2</sub>" 127.5 74.775 8.62 = 8'-7<sup>1</sup>/<sub>4</sub>" 127.4 74.786 8.51 = 8'-6<sup>1</sup>/<sub>4</sub>" 126.3 74.89Nail South 8.14 = 8'-1<sup>3</sup>/<sub>4</sub>" 122.8 75.24

Bottom Bull Nose E.L. = 483.45 407 83.45

8/23/19 cont. from Page 7

390.30

Radius 246.99 EI = 389.00

North Wall

South Wall Rod 1.3

Radius 250.46 EI = 393.00

North Wall

South Wall Rod + 27

Radius 254.79 EI = 398.00

North Wall

South Wall

Bolt T.P. = 0.54 389.76

11.98 401.74

B.M. on old Con. Core Wall 3.89 397.85

Nail in Stud Sand Bin 9.67 407.52

B.M. Chain dist = 6.13 413.65

7.13 420.78 (Correct EI = 415.80)

A8-3'N 5.19 415.59

chain dist 21.03 441.81

See Topog Book # 21 page 21

373 R.

2.16  
 .98  
 1.18

5+32.41  
 11

5+43.41  
 00 98

5+44.39 - Center Joint Bottom

5+32.41  
 11

5+43.41  
 2 16

5+45.57 Center Joint top 11.00  
 2.16

30.49  
 5+76.06 top Center Joint 30.49  
 14.72  
 40.00

27 10  
 6+03.16 top Center Joint 33.00  
 14 72 22.50

6+17.88 Nail in Core 34.43

40 00 215.40

6+57.88 Pencil X on Rock

33 00  
 6+90.88 P. X on Rock

22 50  
 7+13.38 P. X on Rock

34 43  
 7+47.81 R.P. Nail

5+32.41  
 2 16  
 7+47.81

6/9/19

Left Abut. Blocks 22-23

P.M.O. Set of Sta 7+47<sup>81</sup> 323 line

Set Nails at

7+13 <sup>38</sup>	34 <sup>43</sup>	Pencil x on Rot
6+67 <sup>88</sup>	45 <sup>51</sup>	" " "
6+57 <sup>88</sup>	55 <sup>51</sup>	" " "
6+47 <sup>88</sup>	10	Nail
6+37 <sup>88</sup>	10	Pencil x on Rot
6+30 <sup>58</sup>	7.3	Expansion Joint <small>should be 6+30<sup>75</sup></small>
6+07 <sup>88</sup>	12.7	"
6+03 <sup>17</sup>	14 <sup>72</sup>	Nail in Form <small>Top</small> Block 22
5+76 <sup>06</sup>	27 <sup>10</sup>	" " " <small>Top</small> Block 21
5+45 <sup>57</sup>	30 <sup>49</sup>	" " " <small>Top</small> Block 21
5+44 <sup>39</sup>	1.8	Bottom Joint 5 Block 21

Set R.P.s Lt End Dam.

Old Sta 7+37<sup>26</sup> on 325 line should be 7+39<sup>10</sup>Set Nail N. East at 120° = 7+51<sup>17</sup>Set " at 90° - 2' dist = Sta 7+47<sup>81</sup>

on 323 line

Expansion = 325 - 7+51<sup>17</sup> = 323 - 7+47<sup>81</sup>

6/9/19

14

Set Expansion Joint at 6+30<sup>75</sup>Measure 12<sup>87</sup> from Nail at 6+17<sup>88</sup> =6+30<sup>75</sup> = Contr JointSet of 6+30<sup>75</sup> turn 90° Set Nail  
for downstream Face at 13.90'

13.90 = dist. to D.S. Face.

Radius 309.10 EI = 488<sup>00</sup>

Grades downstream Gravity.

P. 21	13.10	485.80	472.70
Nail opp. 6+67 <sup>88</sup>	517' - 5" - 2"	297	82.83
" " 6+57 <sup>88</sup>	634' - 6" - 4"	S 414	81.66
" " 6+47 <sup>88</sup>	518' - 5" - 2 1/4"	298	82.82
" " 6+37 <sup>88</sup>	615' - 6" - 1 3/4"	x 395	81.85
" " 6+30 <sup>75</sup> C.J.	721' - 7" - 2 1/2"	501	80.79
6+17 <sup>88</sup>	727' - 7" - 3 1/4"	507	80.73

6/19/19

Downstream Face Gravity

F-M-B

Block 22 - 5+76<sup>25</sup> to 6+03<sup>50</sup>Radius 310 - EI 492<sup>20</sup>

L-23

730 93.35 486.05

253 94.73 1.15 492.20

Nail in Con.

3.44' = 3' 5 1/4"

S 5.97 88.76

3.13' = 3' 1 1/2"

P 5.66 89.07

Nail from N

0.0' = 0'-0"

253 492.20

" Forms S

0.5' = 0'-6"

303 491.70

6/19/19 Up + down stream face Gravity 15

Block # 7 = 1+69<sup>80</sup> to 1+96<sup>88</sup>Set on 1+59<sup>63</sup> Sight 2+74<sup>63</sup>  
dist = 115.0 tang defl = 10° 12.0'1+79<sup>43</sup> - 20' = 1° - 46.4'1+89<sup>63</sup> - 30' = 2° - 39.6'1+96<sup>58</sup> 36.89 = 3° - 16.23'

Forms North

2+09<sup>63</sup> 50 = 4° - 26.1' Fr. Check

Nail Grade

Top Dam

434 96.54

492<sup>20</sup>

Top Studs d.s.F

747

89.07

Radius = 309.33 EI = 489.00

323.00 - 309.33 = 13.67 - dist to D.S.F.

Nail opp 1+79<sup>63</sup> 6.47' = 6' - 5 3/4" S 14.01 82.53" " 1+89<sup>63</sup> 6.40' = 6' - 4 3/4" " 13.94 82.60" " 1+96<sup>58</sup> 6.38' = 6' - 4 1/2" " 13.92 82.62

6/9/19 Block 5 = 1+15<sup>54</sup>/<sub>16</sub> 1+42<sup>72</sup>

F.M.B. Gravity Section

Nail on Grade 434 492<sup>20</sup>

Set Noils on every 2<sup>nd</sup> Stud  
at Grade 434 492<sup>20</sup>

Set on 1+59<sup>63</sup> Sight 2+74<sup>63</sup>

dist 115.0 tang defl = 10° - 12.0'

3 2 3 Radius

1+39<sup>63</sup> 20' = 1° - 46.4'

1+79<sup>63</sup> 30' = 2° - 39.6'

1+19<sup>63</sup> 40' = 3° - 32.9'

1+15<sup>64</sup> 43<sup>99</sup> = 3° - 54.17' = P.C. of New Curve

Set on 1+15<sup>64</sup> Sight 1+59<sup>63</sup>

tang defl = 3° - 54.17'

0+99<sup>93</sup> 15.71 Should check 1+00

6/10/19 Block 7 1+69<sup>80</sup> to 1+96<sup>88</sup> 16

F.M.B. Gravity Section

Set on 1+59<sup>63</sup> Sight 2+74<sup>63</sup>  
dist 115' tang defl = 10° - 12.0'

1+79<sup>63</sup> 20' - 1° - 46.4'

1+59<sup>63</sup> 30' - 2° - 39.6'

1+96<sup>82</sup> 36<sup>89</sup> - 3° - 16.23' Forms North

Radius 310<sup>00</sup> E1- 492<sup>20</sup>

Nail on Grade 4.36 96.56 492.20

1+79<sup>63</sup> 5.28' = 5' - 3<sup>1</sup>/<sub>4</sub>" S.P. 964 86.72

1+59<sup>63</sup> 5.44' = 5' - 5<sup>1</sup>/<sub>4</sub>" 980 86.76

1+96<sup>82</sup> 2.64' = 2' - 7<sup>3</sup>/<sub>4</sub>" 700 89.56

6/10/19 Block 13 3+32<sup>29</sup> to (3+59<sup>38</sup>)

M-M-B Overflow Section

Set on 2+74<sup>63</sup> Sight on 3+32<sup>29</sup>  
Tang defl = 24° - 21.44"

2+84 <sup>63</sup>	10'	= 0° - 53.21"
2+94 <sup>63</sup>	20'	= 1° - 46.4"
3+04 <sup>63</sup>	30'	= 2° - 39.6"
3+14 <sup>63</sup>	40'	= 3° - 32.9"
3+24 <sup>63</sup>	50'	= 4° - 26.1"
3+34 <sup>63</sup>	60'	= 5° - 19.3"
3+38 <sup>78</sup>	64.5'	5° - 41.4" Nail in Whale

FP Block 9 712 - 90.02 482.90  
Spike in Whale 3+38<sup>78</sup> 706 482.96  
dist to Nail in Bottom 27.42

Nail in Bottom Bl. 13 455.54  
Set on 3+34<sup>63</sup> Sight 2+74<sup>63</sup>  
Tang defl = 5° - 19.3" dist 60'

3+38 <sup>78</sup>	415	
3+44 <sup>63</sup>	10	= 0° - 53.21"
3+54 <sup>63</sup>	20	= 1° - 46.4"
3+66 <sup>45</sup>	31.82	2° - 49.26" S. Side Pier of EI 476.25
3+67 <sup>80</sup>	33.17	E Pier #6

6/10/19 Block 13 17

Set on 3+66<sup>45</sup> Sight 3+34<sup>63</sup>  
dist. 31.82 Tang defl = 2° - 49.26  
Turn to Center Set Nail in downstream Form.  
Set Nail in Center

3+38<sup>78</sup> Radius 299<sup>63</sup> EI = 462.00  
Nail in Bottom 470 460.24 455.54  
Check on Nail d.S. Face 499 - 5'0" 323 57.02

6/11/19 Block 13 - 3+32<sup>29</sup> - 3+66<sup>45</sup> EI = 455.00  
Set on 3+34<sup>63</sup> Sight 2+74<sup>63</sup> New Sta  
Tang defl = 60' = 5° - 19.3"

3+38 <sup>78</sup>	415	= 0° - 72.10"
3+44 <sup>63</sup>	10	= 0° - 53.21"
3+54 <sup>63</sup>	20	= 1° - 46.4"
3+66 <sup>45</sup>	31.82	= 2° - 49.26" Nail in Conc.
3+67 <sup>80</sup>	32.48	= 2° - 52.76" Nail in form N

Spike in Whale at 3+38<sup>78</sup> 482.96  
22.81

Nail in Bottom 515 465.30 460.75  
Top Forms +30 468.30  
Radius = 303.99 EI = 468.00

323.00 303.99 = 19.01 dist to D.S.F.  
3+44<sup>63</sup> 7.59' = 7' - 7"  
3+54<sup>63</sup> 7.63' = 7' - 7 1/2"  
3+67<sup>80</sup> F.H. 2.10 = 2' - 11 1/2"  
GR = +2.7  
+ 0.60 65.90

6/11/19 Block 23 = 6+03<sup>50</sup> - 6+30<sup>75</sup>  
 R-M-O. Gravity Section

Set in 7447<sup>81</sup> 323 line

6+30<sup>58</sup> Nail in N. Forms  
 6+20<sup>58</sup> " " Con.  
 6+10<sup>58</sup> " " Con.  
 6+03<sup>10</sup> Face Con. Joint  
 6+00<sup>58</sup> Nail in Con.  
 5+90<sup>58</sup> " " "  
 5+80<sup>58</sup> " " "  
 5+78<sup>25</sup> = sta as should be  
 5+76.01 Nail in face Joint

Block 23  
 R = 310<sup>00</sup> Grades EI = 492.20  
 R-28 308 99.49 96.91  
           7.39 92.10  
 Brass Cap 1037 96.94 86.57  
                   480 92.14  
 6+30<sup>58</sup> Nail in FN 0.58 = 0'-7" GR = 474  
 6+20<sup>58</sup> 4.23 = 4'-2 3/4" 897 87.97  
 6+10<sup>58</sup> 4.37 = 4'-4 1/2" 911 87.83

Distance between Piers 18  
 B.M.F. Overflow Section - Dam

sta	Pier Number	correct Distance	measured Dist
2+84 <sup>63</sup>		10 02	10.05
2+94 <sup>65</sup> * 1		14 63	14 62
3+09 <sup>28</sup> 2		14 63	14 61
3+23 <sup>91</sup> 3		14.63	14 66
3+38 <sup>54</sup> 4		14 63	14 62
3+53 <sup>47</sup> 5		14 63	14 58
3+67 <sup>52</sup> 6		14 63	14 76
3+82 <sup>43</sup> 7		14 63	14 48
3+97 <sup>06</sup> 8		14.63	14 61
A+11 <sup>69</sup> 9		12 94	12 93
4+24 <sup>63</sup> 10		1.69	1 38
4+26 <sup>37</sup> 11		141.69	141.30

8/12/19

Block #13 Overflow

F-M-B

Set on 3+34<sup>63</sup> Sight2+74<sup>63</sup> dist. 60' = tang defl. 5°-19.3'3+38<sup>28</sup> 415 = 0°-22.10'3+54<sup>63</sup> 20 = 1°-46.4'3+66<sup>48</sup> 3182 = 20°-49.26'3+67<sup>12</sup> 3249 = 20°-52.8' Forms North

Grades

Nail in Whole

1877

482.96

18.77

Nail in Bottom

532 69.51

464.19

T.P. Rock Block 13

336 66.15

Radius = 30689 R1 = 472<sup>00</sup>

34300 - 30689 = 16.11 dist to D.S.F

3+46<sup>63</sup> 6.66 = 6'-8" S.P. 4.17 65.343+54<sup>63</sup> 7.57 = 7'-6<sup>3/4</sup>" " 5.08 64.43F.N. 3+67<sup>12</sup> 5.42 = 5'-5" " 2.93 66.58

373R.

6/12/19

Block 17 Overflow

4+40<sup>62</sup> to 4+67<sup>21</sup> 19Set on 4+32<sup>41</sup> Sight 4+62<sup>41</sup>

tang Defl 20°-39.6'

Center Joint = 4+67<sup>21</sup> Outside EdgeTop Form = dist 3523 = 4+67<sup>64</sup> Nail in form4+67<sup>41</sup> 30' = 20°-39.6'4+67<sup>64</sup> 3523 = 30°-17.42'Radius 296<sup>00</sup> E1 = 457<sup>00</sup>373<sup>00</sup> - 296<sup>00</sup> = 27.00' dist to D.S.F

C.21 545 60.55 55.10

Nail D.S.F opp 4+34<sup>61</sup>

Nail opp

4+52<sup>41</sup> 683 = 6'-10"4+62<sup>41</sup> 5'0 = 5'-0"4+67<sup>21</sup> Center Joint 00° = 0'-0"

S.P. 4.40 56.15

" 11.38 50.17

" 8.55 52.00

" 3.55 457.0

E1 of Center Joint at Sta 4+67<sup>21</sup>  
= 451.6 at downstream face ✓



6/12/19 Block 24 6+30<sup>25</sup> to 6+58<sup>00</sup>

F-M-B.

323 line

Checked Points at 6+58<sup>00</sup> C.J.

6+47<sup>58</sup>

6+37<sup>88</sup>

Set Points

6+30<sup>00</sup> Nail in Con. Block 23

6+20<sup>58</sup>

6+10<sup>58</sup>

6+00<sup>58</sup> - checked.

Set on 6+58<sup>00</sup> C.J. Turn 90°

Set Nail for Center Joint in D.S Form

El. Bottom Joint = Average = 482<sup>00</sup>

6/13/19

20

F-M-B.

Block 13. Set on 2+74<sup>63</sup> Sight

0+00 - 323 R for tang defl of  
24° 21' 44" ✓

2+84<sup>63</sup> 10 = 0° 53' 21"

2+94<sup>63</sup> 20 = 10° 46' 4"

3+04<sup>63</sup> 30 = 20° 37' 6"

3+14<sup>63</sup> 40 = 30° 32' 9"

3+24<sup>63</sup> 50 = 40° 26' 1"

3+34<sup>63</sup> 60 = 50° 19' 3"

Set on 3+30<sup>63</sup> Sight zero for  
tang defl of 29° 40' 75"

3+37<sup>63</sup> 3 = 0° 16' 0" Nail in Face

3+44<sup>63</sup> 7 = 0° 53' 21"

3+54<sup>63</sup> 20 = 10° 46' 4"

3+66<sup>45</sup> 30<sup>82</sup> = 2° 49' 26" = S Side Pier #6 at El 476<sup>25</sup>

3+66<sup>78</sup> 32<sup>45</sup> = 2° 51' 0" Nail in Form Wall

Radius = 3092<sup>2</sup> El. = 475<sup>20</sup>

1378 = dist to downstream Face.

R. Rock Block 9 681 89.71 82.90

Nail in Face 3+37<sup>63</sup> 533 84.38

Nail in Top down 2+84<sup>63</sup> 503

84.68

1602

629 74.65

68.36

6/13/19 Block 13 3+32<sup>29</sup> - 3+66<sup>45</sup>  
 El = 475<sup>20</sup>  
 474.65

3+44 <sup>63</sup> Dst.	5.53' = 5'-6 1/2"	9.498	69.67
3+54 <sup>63</sup>	5.25' = 5'-3"	9.470	69.95
3+66 <sup>78</sup> F. North	2.27' = 2'-3 1/4"	9.172	72.93

6/13/19 Block 24

R 28 2.92 99.33 96.41

Radius 310 El. 992.20  
 6+58<sup>2</sup> F. North 5'-1 1/4" 5.1 12.23 87.10

6/14/19 21  
 Block 13 3+32<sup>29</sup> + 366<sup>45</sup>

Set on 3+34<sup>63</sup> Sight 0+00  
 for 29° 40' 75" tang defl.

3+37<sup>63</sup> 3 - 0°-16.0' Nail in face

3+38<sup>54</sup> # 4 Pier

3+53<sup>17</sup> # 5 Pier 18<sup>54</sup> 1°-38.05'

(3+67<sup>80</sup> #) 6 Pier

3+66<sup>45</sup> 31<sup>82</sup> 2°-49.26'

3+60<sup>45</sup> 25<sup>82</sup> 2°-17.36'

3+46<sup>17</sup> 11<sup>54</sup> 1°-00.85'

Set on Pier # 5 = 3+53<sup>17</sup> turn to Center  
 from 3+34<sup>63</sup> tang defl = 1°-38<sup>05</sup>

Set Nail at 8.37 <sup>and 132</sup> toward Center

Radius = 314.63 El = 481.20

3+38<sup>54</sup> 14.63 1°-17.84' # Pier # 4

Set on 3+38<sup>54</sup> # Pier # 4 Sight 3+53<sup>17</sup> # Pier # 5  
 tang defl = 1°-17.84' turn to center Set  
 Nail in D.S.F. and at 132 and 8.37

6/14/19

Block 13 -3+37<sup>29</sup> to 3+66<sup>45</sup>F-M-B Radios = 314<sup>63</sup> EI = 481<sup>20</sup>Set on 3+66<sup>45</sup> Sight3+34<sup>63</sup> tang defl for 31<sup>82</sup>  
= 20-49<sup>26</sup>"Nail in face 3+37<sup>63</sup> 484<sup>38</sup>

dist down from Nail 948

Nail in Bottom 517 480<sup>07</sup> 474<sup>90</sup>3+38<sup>54</sup> - 8.37E 6.40 = 6'-4<sup>3</sup>/<sub>4</sub>" 527 74.803+44<sup>62</sup> " 1.25 = 6'-3" 512 74.953+53<sup>7</sup> " EP#5 5.61 = 5'-7<sup>1</sup>/<sub>4</sub>" x 448 75.593+60<sup>45</sup> " " 6.39 = 6'-4<sup>3</sup>/<sub>4</sub>" 526 74.813+66<sup>45</sup> " Sline P#6 5.34 = 5'-4<sup>1</sup>/<sub>4</sub>" 421 75.86

Bottom Bull Nose 00.05 480.2

Nail in Bottom 526 480.16 474.90

+0.04 482.0

3.89 476.25

Nail in Bottom 537 80.27 474.90

4.68 75.59

6/14/19 Up + downstream Face 34

Lt Abutment

Blocks 21-22-23

Set Nail on 323 line

Sta 5+45<sup>58</sup> Nail in from SF Block 215+50<sup>58</sup>5+60<sup>58</sup>5+70<sup>58</sup>5+80<sup>58</sup>5+90<sup>58</sup>6+00<sup>58</sup>6+10<sup>58</sup>6+20<sup>58</sup>6+30<sup>00</sup>(6+30<sup>25</sup>) = correct sta in C.S.  
Nail 0.57 South of Face Center Joint

B.M. 486.57

D.S.G.S. 1015 496.72

R 26 324 93.48

4.52 492.20

Set Grades from Sta 5+45<sup>58</sup> to  
6+30<sup>00</sup> Every 2<sup>0</sup> Stud Front + Rear  
Face at EI 492<sup>20</sup>Set Pickets for Rear Face 12.5' from  
323' Line Nails in Concrete

6/16/19 Block 17 4+40<sup>62</sup>/<sub>16</sub> 4+67<sup>71</sup>/<sub>21</sub>

F-M-B.

1 Set on 4+32<sup>41</sup> Sight 5+02<sup>41</sup>  
 dist. = 70' Tang Defl = 6°-12.5'

4+42<sup>41</sup> 0° 53' 21" ✓

4+52<sup>41</sup> 1° 46' 4" ✓

4+62<sup>41</sup> 2° 39' 6" ✓

4+67.71 3° 07' 8" ✓

40 3° 32' 9" ✓

50 4° 26' 1" ✓

B-21 5.66 60.76 55.10

Top of concrete 3.22 57.54

Dist 22.64 R. 300.36 El. 463.9

4+32<sup>41</sup> 5.55 5'-6 1/2" 3.31 57.45

4+42<sup>41</sup> 5.41 5'-5" 3.17 57.59

4+52<sup>41</sup> 5.43 5'-5 1/4" 3.19 57.57

4+62<sup>41</sup> 5.50 5'-6" 3.26 57.50

Nail in F. North

4+67.71 5.47 5'-5 3/4" 3.23 57.53

Grade Ref + 2.24

6/16/19

E Pier # 6

E Pier # 9

Block 14 = 3+67<sup>80</sup>/<sub>16</sub> 4+11<sup>69</sup>/<sub>21</sub> 43

F-M-B

Set on 3+82<sup>41</sup> Sight 4+12<sup>41</sup>  
 dist 30' tang defl = 2° 39.6'

Set Nail in Concrete at Sta.

4+10<sup>34</sup> = South Side Pier # 9 at

El. 476.25 width of Pier = 2.7'

4+10<sup>34</sup> 27.93 = 2° - 28.55'

Set on 4+10<sup>34</sup> Sight 3+82<sup>41</sup> tang  
 defl. = 2° - 28.55' - turn to Center.

Set Nail at in center + on D. S. Form  
 for South side of Pier # 9.

Block 25

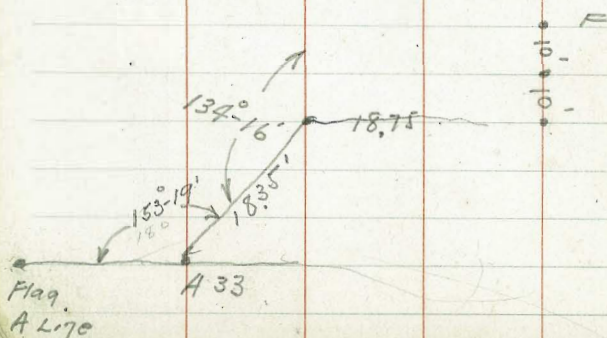
6/16/19 UpStream face left Abut  
Set Points on 323 line

- 6+30<sup>58</sup>
- 6+40<sup>58</sup>
- 6+50<sup>58</sup>
- 6+57<sup>58</sup> = last Nail in Block 24
- 6+58<sup>58</sup> Pencil tin Bottom " 25
- 6+70<sup>58</sup> " " " "
- 6+80<sup>58</sup> " " " "
- 6+85<sup>25</sup> x in Rock Contr Joint.

7/30/19

RR 18.75 18.75 RR 54's 2+00

TIE Coord Point  
to Wier. Spillway



6/17/19

F-M-B.

24

Top Dam Rt Abutment.

D.S. Face  
Nail Top Dam 3.93 496.13 492<sup>20</sup>

Set points out 18" from  
upstream face 16 feet apart.  
Set Nails in US Logging at  
EI 492<sup>20</sup>

Tie to Coord Point  
from Crest Line Spillway



4.20 75.99 71.79  
4.19 471.8

3.75 75.54 71.79  
2.94 74.69  
1.81  
2.74

6/17/19.

F-M-B.

Block 14 - 3+67<sup>80</sup> to ~~4+169~~CP#8 - ~~CP#9~~3+95<sup>71</sup>Seton 3+34<sup>63</sup>Sight 0+00 - 323 line tang  
defl = 29° - 40.75'3+44<sup>63</sup> 10 0° - 53.21'3+54<sup>63</sup> 20 10 - 46.4'3+64<sup>63</sup> 30 20 - 39.6'3+67<sup>58</sup> 32.95<sup>(2812)</sup> 20 - 55.26'3+95<sup>71</sup> 61.08

→ = South Side Pier # 8

Block 14

Seton 3+64<sup>63</sup> Sight 2+74<sup>63</sup>dist = ~~100~~ tang defl = ~~8° - 52.2'~~  
28<sup>13</sup> 7° - 58.9'3+95<sup>71</sup> 31.08 20 - 45.32'

6/18/19

25

F-M-B Block 24 - 6+58<sup>00</sup> to 6+85<sup>25</sup>

R: 285	99.26	96.41
Top Concrete	92.20	87.66
	7.06	497.20

Radius = 310 - EI = 492.20

Set on 323 line Sta 7+47.81

Set Nail in North frame Block 24

Sta - 6+84<sup>84</sup> Should be 6+85<sup>25</sup>6+84<sup>84</sup> d.s.f. 3.47' = 3' - 5 3/4" Sp 10.53 88.736+74<sup>84</sup> " " 4.99' = 5' - 0" " 12.05 87.216+64<sup>84</sup> " " 5.39' = 5' - 3 1/2" " 12.35 86.91

R = 309.10 EI = 488.00

373.00 - 309.10 = 13.90

1126 488.00

8/31/19

B.F.M. Grades Spillway

Crest grade	2.17	489.37	487.2
T.P. Rock		11.43	477.94
2.10			
4' 2"			
5.35			
9			

L.F.S. 7.87 485.81 477.94

Concrete Pkg		
17.5	472.76	13.35
15.32	474.60	11.21
14-0'	476.91	8.90
13'	78.95	7.36
12'	79.97	5.94
11	81.17	4.64

12.91 478.90

T.P.

26

17.33 99.53 487.20

3.33 96.20

T.P. Rock: 6.64 7843.13 71.79

GRADE - EI = 474.60

1	Cut 0.24 = 0'-3"	359	359	74.84
2	0.74 = 0'-9"		457	73.86
3	2.70 = 2'-8 1/2"		653	71.90
4	2.16 = 2'-2"	SP	599	72.44
5	2.70 = 2'-8 1/2"		653	71.90
6	1.42 = 1'-5"	3.33	525	73.18
7	2.63 = 2'-7 1/2"		646	71.77
8	2.08 = 2'-1"		591	72.52
9	2.089 = 0'-10 3/4"		472	73.71
10	Cut 2.06 = 2'-3/4"		177	76.66
	Check of 20 line EI 471.80		664	71.79

6/18/19

## Overflow Section

F-N-B.

Block 14 3+67<sup>80</sup> to 3+95<sup>21</sup>Set on 3+64<sup>63</sup> Sight 2+74<sup>63</sup>

90' tang defl = 7°-58.9'

Nail in Whale

at Sta 3+67<sup>58</sup>

295 0°-160'

3+74<sup>63</sup>

100 0°-53.21'

3+84<sup>63</sup>

200 1°-46.4'

"17

31.17

3+95<sup>80</sup>

31.17 2°-45.80'

Nail in Top Dam 2+84<sup>63</sup> 515 89.83 8468

Nail in Forms 10.24 79.59

dist down from top Nail = 18.26

Nail in Bottom 393 65.26 61.33

TP Rock 272 62.54

7

Top Forms 69.54

Radius = 304.71 Fl = 469.0

343 - 304.71 = 18.29

352 66.06 62.54

3+84<sup>63</sup>

878 = 8'-9 1/2"

584

60.22

3+95<sup>80</sup>

Nail 10 F. North 114 = 1'-1 1/3"

50

+1.80

67.86

50

+2.04

6/18/19

47

- Levels for Check

TP Rock Block 9 667 89.57 8290

Nail Top dam 2+84<sup>63</sup> 489 84.68

Nail in Forms 998 79.59

Nail T.

Nail Stud 4.11 496.31 492.2

Set 4 Bolt 4.21 492.1

6/19/19

F-N-B Block 14 - 3+67<sup>80</sup> to 3+95<sup>21</sup>Set on 3+64<sup>63</sup> Sight 2+74<sup>63</sup> dist 90

Tang defl = 7°-58.9'

Nail in Whale Sta 3+67<sup>58</sup> 295 = 0°-160'3+74<sup>63</sup> 100 = 0°-53.21'3+84<sup>63</sup> 200 = 1°-46.4'3+95<sup>80</sup> 31.17 = 2°-45.80'

Nail in forms 79.59

Dist down from Nail 1386

TP Bottom 65.73

478 70.51 65.73

Top Forms = +2.5 73.00

Cont. next page.



Block 14 3+0780

TO 3+9521

6/19/19

F-14-B

H.I.  
47051

Radius 30762 EI = 47300

3+300 - 30762 = 15.38 dist to D.S.F.

3+8463 760 = 7' - 7 1/2" S.P. 511 65.40

3+9580 F.N. 321 = 3' - 2 1/2" 0.72 69.79

8/2/19

Etc Fillet Lt Abut = 487.6 D.S.F.

" " " " 487.6 U.S.F.

8.25 495.45 487.20

2' 487.15 2.23 2'-2 3/4" 10.53 484.92

3' 487.0 2.40 2'-4 3/4" 10.85 484.60

4' 486.72 2.47 2'-5 3/4" 11.20 484.25

5' 486.30 1.76 1'-9" 10.91 484.54

6.72 485.30 2.22 2'-2 3/4" 12.37 483.08

6/19/19

38

Left Abutment.

Set on 7+4781 Set Points at

6+3058 Nail in Runway

6+4058 " "

6+5058 " "

6+6058 Nail in Concrete

6+7058 " "

6+8058 " "

7+3592 God driven to Line & Grade

R28 294 99.35 96.41

Top dam 7.15 92.20

Set Point on 310 line 13' East at 90° from Sta 7+4781

Set on 310 line turn 90° from 4+4781

Set Iron Pin to line & Grade

at 1102 South

R28. 245 98.86 496.41

Nail in Stringer U.S.F. 084 = 0'-10" S.P. 750 91.36

" " D.S.F. 101 = 1'-0" 767 91.19

6/20/19

F-M-B Block #9 2+23<sup>97</sup> - 2+51<sup>05</sup>

Nail in Top Crest

2+84<sup>63</sup> 521 89.89 8468

Set Nails in North Forms

Block #9 00 89.89

497<sup>20</sup>

89 89

2.31 = 2'-3<sup>3</sup>/<sub>4</sub>"

Block 13 &amp;

Block 14 3+67<sup>80</sup> 3+95<sup>71</sup> <sup>7</sup>/<sub>16</sub>Set on 3+34<sup>63</sup> Sight 2+74<sup>63</sup>  
dist = 60' tang defl = 5°-19.33+44<sup>63</sup> 10 = 0°-53.21'3+54<sup>63</sup> 40 = 1°-46.4'3+64<sup>63</sup> 30 = 2°-39.6'3+66<sup>63</sup> 32 = 2°-50.2' Nail in Cor. Face

Nail in Crest

2+84<sup>63</sup> 527 89.95 8468Nail in Face 3+66<sup>63</sup> T.P. 559 84.36

dist down from Nail 8.88

Nail in Bottom 75.48

6/20/19

29

Block #14

Set up on 3+64<sup>63</sup> Sight  
2+74<sup>63</sup> dist 90' tang  
defl = 7°-58.93+74<sup>63</sup> - 10 = 0°-53.21'3+84<sup>63</sup> - 20 = 1°-46.4'3+94<sup>63</sup> - 30 = 2°-39.6'3+95<sup>78</sup> 31<sup>15</sup> 20-45.7'Radius 309.22 El. 475.20  
13.78 dist to DS Face.

Nail in Bottom 014 75.62 75.48

3+74<sup>63</sup> 50.2 = 5'-0<sup>1</sup>/<sub>4</sub>" 9 544 70.183+84<sup>63</sup> 4.75 = 4'-9" P 517 70.453+95<sup>78</sup> - Nail in F. 00-00 10 042 75.20

F.M.B. Left Abutment 6/20/19

7.83 494.40 486.57

6+40<sup>53</sup> 6+70<sup>53</sup> 2.2 492.2

Set nail every 3rd stud 492.2 Top Dam.

6/20/19

F-10-B Independent Spillway

07 Grade Hub 9.68 494.88 485.2

c 1.7

7.0

F-M-B

R = 310°

EI = 492.2°

6/21/19

Bspud end of Dam 6.71 98.91 492.20

Dist to Sta A Slope

1.08 11.66 87.25

1.10 11.75 87.16

1.08 11.65 87.26

1.1 11.75 87.16

Top of Stringer DSF 7.24 91.67

DSF 7.26 91.65

7+12.72 USF end of Killeth 7.15 91.76

7+12.72

Average El. 87.25

F-M-B

Independent Spillway 6/21/19

12.77 97.97 485.2

6/21/19

F-M-B Block 14

3+67.80

3+95.71

30

Set on 3+64<sup>63</sup> Sight 2+74<sup>63</sup>

dist 90' tang Defl = 7° 58.9

3+66<sup>63</sup> x on Road 2' = 0° - 10.6'3+67<sup>80</sup> 317' = 0° - 16.9' & Pier # 63+74<sup>63</sup> 10.0 = 0° - 53.21'3+82<sup>43</sup> 17.80 = 1° - 34.66' & Pier # 73+95<sup>71</sup> 31.08 = 2° - 45.33' = S Side P# 8Set on 3+67<sup>80</sup> & P# 6 Sight 3+95<sup>71</sup>

dist 27.91' tang defl = 2° - 28.92

Turn to Center Set Nail at 8.37 @ 15°

Set on 3+82<sup>43</sup> & P# 7 Sight 3+95<sup>71</sup>dist = ~~12.72~~<sup>13.28</sup> tang Defl = 1° - 00.76

Turn to Center Set Nail at 8.37 @ 13°

Set on 3+95<sup>71</sup> S Line P# 8 Sight 3+82<sup>43</sup>dist ~~12.72~~<sup>13.28</sup> tang defl = 1° - 10.7' Turn

to Center Set Nail at 8.37 @ 13°

6/21/19

## Block 14 Cont.

F.M.B.

Nail in Face <sup>3+66<sup>63</sup></sup> 84.36  
 dist down from nail 8.88  
 Nail in Bottom 445 79.93 75.48  
 Grade = 481.20

Nails at 8<sup>37</sup> from 373 line

3+67 <sup>80</sup>	6.45' = 6'-5 1/2"	518	74.75
3+74 <sup>63</sup>	5.91' = 5'-11"	464	75.29
3+82 <sup>43</sup>	4.03' = 4'-0 1/2"	276	77.17
3+95 <sup>71</sup>	6.03' = 6'-0 1/2"	476	75.17

Grade = 476.25

Nail at 13' from 373 line

3+67 <sup>80</sup>	1.73' = 1'-8 3/4"	541	74.52
3+82 <sup>43</sup>	0.99' = 1'-0"	467	75.26
3+95 <sup>71</sup>	1.16' = 1'-2"	484	75.09

6/23/19

31

## F.M.B. Block 14

Nail in Bottom 477 80.25 75.48  
 005 480.20

1463

~~537~~ on 373 = 1425 on 31463 R

1463 on 373 = 1472 on 325 R

135 on 373 = 135 on 325 R

Set on 3+82<sup>43</sup> E Pier #7 Sight3+64<sup>63</sup> dist = 17.80 tang defl

= 1° - 34.66

3+95<sup>71</sup> -13.28 = 1° - 10.70'

Set on 3+95<sup>71</sup> Sight 3+64<sup>63</sup>  
 dist. 31.08 tang defl =  
 2° - 45.33' turn to center set  
 Nails at 8<sup>37</sup> & 15°

6/23/19

4+67 <sup>71</sup> to  
K-17-B Block 18 4+93 <sup>88</sup>Set on 4+62 <sup>71</sup> Sight  
5+12 <sup>41</sup> dist 50' - lang defl.  
= 4<sup>0</sup> 261

4+72 <sup>41</sup>	10	-	0°	5321
4+82 <sup>41</sup>	20		1°	464
4+92 <sup>41</sup>	30		2°	396
5+02 <sup>41</sup>	40		3°	329

R. = 300 <sup>36</sup> KI = 463 <sup>00</sup>  
3x3 <sup>00</sup> - 300. <sup>36</sup> 2x64 dist to DSFSet downstream Face by offsets  
from 3x3 line

3x3	506	60.16		55.10
4+42 <sup>41</sup>	539' = 5' - 4 <sup>3</sup> / <sub>4</sub> "		2.55	57.61
4+52 <sup>41</sup>	541' = 5' - 5"	2.57		57.59
4+62 <sup>41</sup>	548' = 5' - 5 <sup>3</sup> / <sub>4</sub> "	2.64		57.52
4+72 <sup>41</sup>	538' = 5' - 4 <sup>1</sup> / <sub>2</sub> "	2.54		57.62
4+82 <sup>41</sup>	584' = 5' - 10"	3.00		57.16
4+92 <sup>41</sup>	628' = 6' - 3 <sup>1</sup> / <sub>2</sub> "	3.44		56.72

6/23/19

32

North End of Dam

Set on 13' East of 7+47 <sup>81</sup>  
Set Nails on Down Stream Face

657	498.77	492 <sup>20</sup>
1 <sup>st</sup> Nail 2 <sup>33</sup> = 2'-4"	Sp 890	89.87
2 <sup>nd</sup> Nail 2 <sup>15</sup> = 2'-2"	Sp 872	90.05

Dist out for Slope

48 out	89.87
44 out	90.05

Grades for Hand Rail

USGS 5.3.17	11.23	497.80	486.57
		3.60	494 <sup>20</sup>

6/23/19 Block 10  $\frac{2+51.0}{2+78.3}$   $\frac{1}{8}$

Set on 2+74<sup>63</sup> Sight 2+59<sup>63</sup>  
 dist 15' tang defl = 1°-19.81

2+69<sup>63</sup> 5'  
 2+59<sup>63</sup> 15' = 1°-19.81  
 2+54<sup>63</sup> 20' - 1' - 46.4  
 2+44<sup>63</sup> 30' - 2° - 39.6  
 2+71.93 2.3 0° 11.12  
 40' = 3° 32.9

Grades R. 310<sup>00</sup> E.I. = 49220  
 422 496.42

2+74<sup>63</sup> 6.62' = 6' - 7 1/2" 1084 85.58  
 2+69<sup>63</sup> 6.51' = 6' - 6" 1073 85.69  
 2+59<sup>63</sup> 6.53' = 6' - 6 1/4" 1075 85.67  
 2+54<sup>63</sup> 6.33' = 6' - 4" 1055 85.87

6/23/19

33

Blocks 9-8-7 Upstream Face

Set on 2+44<sup>63</sup> Sight 00 fr.  
 tang, defl 21° 41.75'

2+34 <sup>63</sup>	10	- 0° - 53.21	✓
2+24 <sup>63</sup>	20	- 1° - 46.4	✓
2+14 <sup>63</sup>	30	- 2° - 39.6	✓
2+04 <sup>63</sup>	40	- 3° - 32.9	✓
1+94 <sup>63</sup>	50	4° - 26.1	✓
1+84 <sup>63</sup>	60	5° - 19.3	✓
1+74 <sup>63</sup>	70	6° - 12.5	✓
1+64 <sup>63</sup>	80	7° - 5.7	
1+54 <sup>63</sup>	90	7° - 58.9	
1+49 <sup>63</sup>	95	8° - 25.15	
		8° - 52.2	
		9° - 45.4	

6/24/19

## Grades Lt Abut.

6+80 to 7+0

Nail in Stud 4.84 499.04 494.20

Grade = 492.2

Top of Dam Every 2<sup>nd</sup> Stud 6.84 492.2082 = 0'-10" 0.16 <sup>dist out</sup> <sub>Sp. 6.84</sub> 7.66 491.38

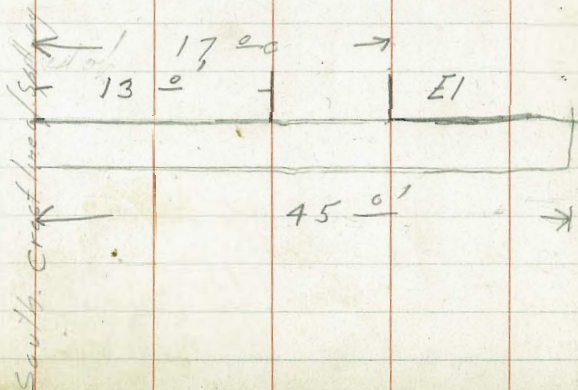
7+12.81 323 line = End Fillet.)

→ EI South 11.31 87.73

Upstream Face EI North 7.91 91.13

8/14/19 Downstream Fillet = 491.38

Spillway Fillet - South Retaining Wall



6/25/19

F-M-B

34

323' line

Set of 2+44<sup>63</sup> Sight 00 for  
tang defl. 21° - 41.752+54<sup>63</sup> 10 - 00 - 53.212+64<sup>63</sup> 20 - 10 - 46.42+74<sup>63</sup> 30 - 20 - 39.6'6/25/19 Levels for Check  
F.M.B. Rt Abut.

Concrete Res. 1.45 96.34 494.79

2.14 494.20

2.14 94.20

6/25/19  
F.M.B. Grade Rt. Abut.

Nail in Stud 2.44 94.20

Top of Dam 4.44 92.20

Q 28 - 6.85 102.45 95.60

Top of Wall begins to batter 13° 6.23 96.22

13' - Fillet Bot 10.45 92.00

17' Fillet H when form 14.40 88.50

begins

end of Wall 75° 12.07 490.38

6/26/19

S line P 8 S line P 10

F-M-B

Block 15

3+95<sup>71</sup> - 4+24<sup>97</sup>Set on 3+64<sup>63</sup> Sight 2+74<sup>63</sup>

dist 90' tang defl = 7° 58.9

3+74<sup>63</sup> 10 = 0° - 53.213+84<sup>63</sup> 20 = 1° - 46.43+94<sup>63</sup> 30 = 2° - 39.63+97<sup>37</sup> Nail 32<sup>74</sup> = 2° - 54.13 spike in WhaleSet on 3+94<sup>63</sup> Sight 0+00

tang defl = 35° - 00

Nail in Whale

3+97<sup>36</sup> 273 = 0° - 14.484+04<sup>63</sup> 10 = 1° - 46.44+14<sup>63</sup> 20 = 2° - 39.64+24<sup>97</sup> 30<sup>34</sup> = 2° - 41.41 S line Pier #10Nail Crest 2+84<sup>63</sup> 480 89.48 84.68

Nail in Whale on face 12.51 76.97

dist down from Nail 2068

Nail in Bottom 56.29

Set on 4+24<sup>97</sup> Sight 3+94<sup>63</sup>dist = 30<sup>34</sup> tang defl = 2° 41.41

Cont. Page 36

6/26/19

35

F-M-B

Block 20

Radius = 304.71 EI = 469.00

373.00 - 304.71 = 18.29

Set on 5+02<sup>41</sup> Sight 4+72<sup>41</sup>

dist 30' tang defl = 2° - 39.6

turn to center set Nail at 18.29 dist

1 = 0° - 56.4

10' = 0° - 56.41

Nail  
3 Fours 17.91 1° - 41.03

27.91 = 2° - 37.44

37.91 = 3° - 33.85

36.21 3° - 24.22

3-21 12.65 67.75 55.10

Nail in  
S Four 53.6 = 5' 4 1/2"

27.91 5.34 = 5' 4"

36.21 5.18 = 5' 2"

S 411 63.64

+ 409 63.66

+ 393 63.82

125



6/26/19

F-M-B

Block 15

3+95.21 to

4+74.92

R = 300.36 EI = 463.00

373.00 - 300.36 = 72.64

T.P. in Bottom

56.3

61.92

56.29

4+02<sup>28</sup>

6.88' = 6' - 10 3/4"

580

56.12

4+12<sup>28</sup>

5.31' = 5' - 3 3/4"

Sp 423

57.69

4+22<sup>28</sup>

5.43' = 5' - 5 1/4"

x 435

57.57

4+34<sup>97</sup>

5.42' = 5' - 5"

Sp 434

57.58

6/27/19

Block 20

EI = 475.2

T.P. in Bottom

15.14

71.43

56.29

6.06 = 6' - 3/4"

Sp 239

69.04

7.27 = 7' - 3/4"

Sp 360

67.83

7.01 = 7' - 0"

Sp 334

68.09

6/27/19

36

F-M-B Block 20

~~Set on 5+02.41 Sight 4+72.41~~~~dist 30' tang defl = 2° - 39.6'~~~~turn to center set nail at~~

Radius = 309.22

EI = 475.2

373.00 - 309.22 = 13.78 dist to d.s.f.

Set on 4+52<sup>28</sup>Sight 3+94<sup>63</sup>dist 57<sup>65</sup> Tang. defl = 5° - 06.76

Set point toward center 13.78 distant

Set on 13.78 feet nail turn 90° from  
Center of Curve.

1' = 0° - 5.56'

10' = 0° - 55.587'

20' = 1° - 51.174' ✓

40' = 3° - 42.348'

60' = 5° - 33.522'

66<sup>08</sup> 6° - 07.32'76<sup>08</sup> 7° - 02.91'84<sup>08</sup> 7° - 47.38'

- 2° - 22.12'

32' = 4° - 16.705'

11' = 2° - 11.33'

6/27/19

Block 20

Divide Wall Grade for 49220

5+42<sup>60</sup> P.T. - 323R5+42<sup>57</sup>5+50<sup>58</sup>5+42<sup>60</sup>

7.98 dist to P.T. Radius

Set Nail on Grade

6/28/19

Block 20

5+15<sup>45</sup> to  
5+42<sup>60</sup>B-F. Set Sta 5+42<sup>60</sup> by intersection

from P.P.s Sight R.P. on South

Hill on line of Divide Wall turn

90° for tangent

5+28<sup>23</sup> E Pier #17 1388 = 1° - 1389'5+21<sup>59</sup> Nail in Firms 2102 1° - 51.81'5+15<sup>45</sup> North loc P#16 2716 = 2° - 24.45'

Grades Block 20

37

USGS B.M. 1.88 488.45 486.57

T.P. 9.41 479.04

5.19 484.23

T.P. Rock Block 20 7.51 476.72

2.91 479.63

837 line. Gr. E1 = 481.2

5+42<sup>61</sup> 6.74 = 6'-9" 9.517 = 74.465+28<sup>23</sup> 5.61 = 5'-7 1/2" 4.04 75.595+21<sup>59</sup> Nail in Firms 6.83 = 6'-2 3/4" 4.66 74.97

Gr. E1 = 476.25

13' line

5+42<sup>61</sup> 9.84 = 1'-10" 5.22 74.415+28<sup>23</sup> 1.86 = 1'-10 1/2" 5.24 74.395+21<sup>59</sup> Nail in SF 1.73 = 1'-2 3/4" 4.61 75.02

6/28/19

B-F Independent Spillway  
Sub  
Grades

T-31		0.83	71.25		70.42
			Cuts		
2+87 <sup>45</sup>	Nail 6935	00			69.35
3+00	6916	1.5	7	0.82	70.43
+10	6900	14	16.5%	1.18	70.43
+20	66.94	34		0.97	70.28
+30	64.84				
+40	62.76	74		1.06	70.19
+50	60.68				
+60	58.60	116		1.04	70.21
Nail in N Wall					
+69	56.75	8.5		5.91	65.24
Nail in South Wall					
+69	56.75	10.9		3.60	67.65

6/30/19

38

Block 15 - 3+95<sup>71</sup> to 4+24<sup>92</sup>Set on 3+94<sup>63</sup> Sight Center

Flag Turn 90° for Tang.

4+04 <sup>63</sup>	10'	0°-53'21"
4+14 <sup>63</sup>	20'	1°-46'4"
(4+24 <sup>92</sup> ) <sup>sol.</sup>		
4+25 <sup>32</sup>	30.69	2°-43'27"

Nail in Whale in face

76.97

dist down from Nail

16.32

T.P. in Bottom

60.65

to Top Slabs

7

Radius = 303.99' R1 = 468<sup>00</sup>

373.00 - 303.99 = 19.01 dist to ds. face

5.48 66.13 60.65

4+04<sup>63</sup> 5.04 = 5'-0 1/2" 31.7 62.96

4+14<sup>63</sup> 6.44 = 6'-5 1/4" x 4.57 61.56

4+25<sup>32</sup> Nail 4.26 = 4'-3" 18.339 63.74

6/30/19

F-M-B

Block 20

Sta 15<sup>45</sup> to  
5+42<sup>62</sup>Set of Sta 28<sup>73</sup> & Pier # 175+19<sup>95</sup>

878 = 0° - 46.65' Nail in Whole

5+12<sup>51</sup>= 1632 old Sta 5+12<sup>41</sup>5+14<sup>10</sup>  
10834+94<sup>15</sup>

34.58 = 3° - 03.99' = Contr Joint

486<sup>19</sup>

= North line Pier # 14

Set of 4+94<sup>15</sup> Contr JointSight 5+19<sup>95</sup> dist. 258 tang

defl = 2° - 17.25'

EI = 463<sup>00</sup>

See Page 32

Nail in S Face  
4+82<sup>41</sup>

412 61.28 5716

4+92<sup>41</sup>

627 = 6'-3 1/4" 455 56.73

5+02<sup>41</sup>

629 = 6'-3 1/4" 457 56.71

5+12<sup>41</sup>

602 = 6'-1/4" 430 56.98

6/30/19

39

F-M-B

Spillway

Grade

Pin

1026

495.46

485.20

H

973

85.73

0+25

1005

485.41

0+50

930

486.16

0+75

770

485.76

1+00

570

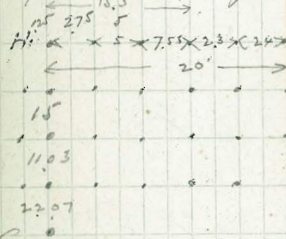
89.76

1+25

520

90.26

7/8/19 Cuts for Wier



0+75

224

488.00

+22.07

Bottom Trench  
481.22  
485.22

481.00

+33.50

+48.00

H

Face of 0.9

484.8

481.00

485.22

481.00

484.9

481.00

481.00

481.00

481.00

481.00

481.00

481.00

481.00

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481.00

481.00

84.8

481.00

485.22

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481.00

72.9

481.00

485.22

481.00

484.9

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485.22

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481.00

481.00

62.9

481.00

485.22

481.00

484.9

481.00

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6/20/19 3 PM

40

June Estimate ETC

Spillway

Class - 4

			Enol Area	Cv. Yds
2+90	20'	1.4 cut	490	36.3
3+10	10'	1.4	490	28.5
3+20	10'	3.0 cut	1050	103.7
3+40	20'	5.0 cut	1750	94.0
3+69	29'	Grade oocut	00	462.5 cy.

Width of cut 35'

North Side Spillway Class 4

+90	00'	00'	Cut 00	288
+75	40'	180'	18'	1035
+50	60'	130'	18'	1590
+25	60'	370'	32.0'	3690
H.	70'	370'	37.0'	4100
-15	00'	00'	00'	00

South Side P

SRT. Abutment 35 cys Class 4

Total Spillway Est = 1136.0 + Previous Est

" Dam 35 cy + Topog

Elev - Spillway Floor -

T-32	5.81	76.23	70.92
0+66.90		5.02	71.21
0+88.97		5.05	71.18
1+00		5.13	71.10
1+50		5.35	70.78
1+80		5.47	70.76

10.84 497.41 486.57

TP. Rock 1145 48.5.96

Grades Spillway

R28	4.38	500.79	96.41
Nail on West Face 0.9 on Tower		10.47	90.32
0.52		90.8K	
B.M. Nail in Tower		3.43	87.41
1.84		89.04	3.64
			487.20

7/25/19

B-F-17

Piers -

Set on 4+62<sup>60</sup>4+55<sup>58</sup> E Pier #12 702 = 0°-37.314+40<sup>95</sup> 2165 = 1°-55.164+76<sup>32</sup> 3628 = 3°-17.974+56<sup>67</sup> S Side #12 593 = 0°-31.55

N Side 8.14 = 0°-43.24

Set on E Pier #14 - 4+84<sup>84</sup> Sight4+62<sup>60</sup> dist. 22<sup>4</sup> 1979 defl. = 1°-58.27

Set points on E Pier on 3254 310 R

4+52<sup>60</sup> 10 = 0°-53.214+42<sup>60</sup> 20 = 1°-46.44+42<sup>13</sup> N Side 2047 = 1°-48.9'4+39<sup>76</sup> 5" 2284 = 2°-01.46Set on 4+52<sup>60</sup> Sight flag for 90°

tang defl.

4+32<sup>60</sup> 20' = 1°-46.4'4+26<sup>32</sup> 26<sup>28</sup> = 2°-19.794+27<sup>91</sup> N Side 25<sup>19</sup> = 2°-14.014+25<sup>18</sup> #10 S Side 27<sup>42</sup> = 2°-58.84Pier #9 40<sup>59</sup> 3°-36.04Distance between 4+26<sup>32</sup> & 4+11<sup>69</sup>

Piers # 9 to 10 as measured = 14.31

Set on E Pier #10 Sight E Pier #12

dist - 29.26 = 2°35.68 tang defl. set points

on 3254 310 R

7/1/19 Block 15

Set on 3+94<sup>63</sup> Sight Center flag for tang. 490°

1078

4+04<sup>63</sup> 10' = 0°-53.21'4+14<sup>63</sup> 20' = 1°-46.4'4+24<sup>63</sup> 30' = 2°-43.27'

Nail in Whale 76.97

dist. down from Nail = 10.78

Thin Bottom 66.19

Radius = 306.17 EI = 471.00

327200 - 306.17 = 1683 dist to DSF

57' 71.90 66.19

4+04<sup>63</sup> 450' = 4°-6" 540 65.504+14<sup>63</sup> 428' = 4°-53.4" 538 66.524+25<sup>18</sup> Nail 386' = 3°-10.6" 476 67.14

7/2/19  
FMB

Grades Lt Abut.  
Railing + Top Dam

10.19 496.71 486.57

Railing 2.51 494.2

Top Dam 4.51 492.2

(5.49)

7/3/19

Block 15

Set on 3+94<sup>63</sup>, Sight Flag at  
center for 90° tang defl.

3+96<sup>02</sup> 137 0°-735'

3+97<sup>06</sup> 243 0°-1305'

4+11<sup>69</sup> 1706 1°-3073'

4+24<sup>97</sup> 3034 = 2°-4141'

2+84<sup>63</sup> 837 line Gr. El = 481.20

Nail in Crest 517 8980 484.68

R Nail in form. 138 80.62 1056 79.24

3+97<sup>06</sup> 462' = 4'-7 1/2" 404 76.58

4+11<sup>69</sup> 335' = 3'-4 1/4" 2.77 77.85

Nail in form. 4+24<sup>97</sup> 506 = 5'-0 3/4" 4.48 76.14

15' Nails Gr = El 476.25

3+97<sup>06</sup> 0.71' = 0'-9 1/2" 513 75.49

4+11<sup>69</sup> 0.91' = 0'-11" 528 75.34

Nail in form. 4+24<sup>97</sup> 0.21' = 0'-2 1/2" 4.58 76.04

7/2/19

Block 15 3+952' to  
4+2492'

Rv

Set on 3+84<sup>63</sup> Sight Flag at  
center for 90° Tang.

3+96<sup>03</sup> 1140 1°-00 64'

Set on 3+94<sup>63</sup> Sight Flag at  
Center for 90° Tang.

3+04<sup>63</sup> 10 0°-5321'

4+14<sup>63</sup> 20 1°-464'

4+25<sup>10</sup> 3047 2°-4210 Nail in N Form

Radius = 309.72 El = 475.20  
1378 dist to DS Face.

Nail in Crest 3+84<sup>53</sup> 495 8963 484.68

Nail in Face of Concrete 3+96<sup>03</sup> 516 84.47

dist down from Nail 1357

R Nail in Bottom 506 45.96 7090

4+04<sup>63</sup> 422' = 4'-2 3/4" 4.98 70.98

4+14<sup>63</sup> 398' = 3'-11 3/4" 4.74 71.22

4+25<sup>10</sup> Nail in Form 1.96 = 1'-11 1/2" 2.72 73.24

7/3/19

F-117-13 Block 20.

Set of 5+28<sup>23</sup> @ Pier 17.

Sight Flag in Center for tang

defl. 90°

Page 37  
 Top Lock Block 20 297.7969 476.72

13.78 dist out El = 475.2

5+21<sup>59</sup> 0.73 = 0'-2 3/4" Sp 472 74.975+28<sup>23</sup> 0.80 = 0'-9 1/2" 529 74.405+42<sup>61</sup> 0.73 = 0'-8 3/4" Sp 512 74.47

## Block 19.

Set of 5+28<sup>23</sup> @ Pier 17

Sight Flag in Center for tang

defl 90°

5+19<sup>95</sup> 878 0° 46.65'5+09<sup>95</sup> 1878 1° - 39.86'4+99<sup>95</sup> 2878 2° - 33.07'Forms South  
4+95<sup>17</sup> 3356 2° - 58.58'~~2+277<sup>58</sup> 4 12.46~~

7/3/19

43

F-B-M. Block 19 Grades

334 80.06 476.72

Top Forms D.S.Face 11.75 68.31

Radius = 30599 El = 468.0

32300 - 30399 = 1901 dist to D.S.F

Top Nail in S.Form 082 68.13 1275 67.31

Forms South  
 4+75<sup>27</sup> 0.84 = 0'-10" Sp 0.97 67.16  
 4+99<sup>95</sup> 342 = 3'-5" " 3.55 64.58  
 5+09<sup>95</sup> 330 = 3'-3 1/2" " 3.43 64.70

## Block 19 Grades

Top R-8420 328 480.00 476.72

T.D.S.F. " 11.82 468.18

Radius = 13.78 Gr El. 475.2

5+09<sup>95</sup> 6.74 = 6'-9" Sp 11.54 68.484+99<sup>95</sup> 7.47 = 7'-8" " 12.47 67.534+95<sup>17</sup> 7.88 = 7'-10 1/2" " 12.68 67.32





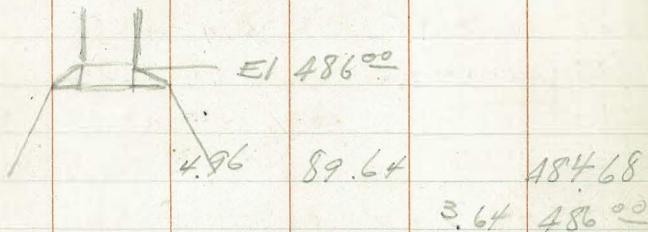
7/7/19

Block 20 See pg. 37

5+28<sup>23</sup>  
Nail 837 ext

39<sup>v</sup> 7951 7559  
Grade 480.20  
+0.69

7/7/19 Change in Piers over  
F.M.B. overflow Section for Roadway.



Set on 3+34<sup>63</sup> Sight 3+24<sup>63</sup>

10' - tang defl = 0° 53.21'  
3+23<sup>91</sup> = 10<sup>72</sup> - 0° 57.04  
3+09<sup>78</sup> 45<sup>35</sup> 2° 14.9'  
3+94<sup>65</sup> 39.98 3° 32.76  
2+80<sup>77</sup> 53.86 4° 46.65

Long Sight

3+38<sup>54</sup> 391 = 0° - 20.84  
3+53<sup>17</sup> 18.54 1 3870  
3+67<sup>80</sup> 33.17 2° 56.56

45

Set up on 3+39<sup>63</sup>

3+82<sup>63</sup> 4780 5° 14.42'

7/8/19

Set on 3+94<sup>65</sup> & Pier # 1. Sight 3+23<sup>91</sup>  
& Pier # 3 dist 29.76 Tang defl = 2° 35.68  
Set Nail & Pier # 1 at 13' downstream  
and Nail at 2' up stream

Set on & Pier # 2 Sight Point on  
3+34<sup>63</sup> & Pier # 4 Tang defl = 2° 35.68  
Set Nail & Pier # 2 at 13' down - 2' up

Set on 3+23 R & P # 3 Sight 3+23 Point  
& Pier # 5 Tang defl = 2° 35.68 Set  
Nail at 13' downstream on & P # 3 and  
2' upstream on 2

Set on 3+25 R & P # 4 Sight 3+23 Point  
& Pier # 6 Tang defl = 2° 35.68 Set  
Nail at 13' on 3+25 R & P # 4 and  
Nail on - 3+25 R - on & P # 4

7/8/19.

E Piers over Spillway

Set on 323 line & Pier #5  
Sight 323 Point & Pier #7  
tang defl =  $2^{\circ} - 35'68''$   
Set Nails on 310 + 325 R  
& Pier #5

Set on 343 line & Pier #6  
Sight 343 Point on & P. #4  
tang defl =  $2^{\circ} - 35'68''$   
Set Nails on 310 + 325 R  
on & Pier #6

Set on 323 line & P. #7  
Sight 323 Point on & P. #5  
tang defl =  $2^{\circ} - 35'68''$   
Set Nails on - 310 & 325 R  
on & Pier #7

Set on Face of Divide  
Wall 2+80<sup>22</sup> 323 line  
Sight 3+09<sup>28</sup> & Pier #2  
dist. 28.51 tang defl =  $2^{\circ} - 31'61''$

46

E Piers over Spillway

Set on 2+80<sup>23</sup> Sight Flag  
Center of Curve tang defl  
for dist 100 =  $2^{\circ} - 53'32''$

Set & Pier #2  
Set face Divide Wall dist 386  
tang defl =  $0^{\circ} - 20'57''$

Set on 2+94<sup>65</sup> Sight 3+14<sup>63</sup>  
dist = 19.98 tang defl =  
 $1^{\circ} - 46'4''$  Set Nails on 325 + 310  
R on & P. #1. tang defl for  
1463 =

Set on 3+09<sup>28</sup> Sight

6/8/19.

Grades.

Trench for Parapet

L-38. 416 500.57 9641  
 Top Parapet 4.37 49670

7/9/19.

Blocks 19 &amp; 20

F-17-D.

Set on 4+42<sup>41</sup> Sight  
 4+77<sup>41</sup> dist. 30' tang defl  
 = 2°-396'

4+95<sup>28</sup> 52<sup>87</sup> 4°-4132'  
 5+05<sup>28</sup> 62<sup>87</sup> 5°-3453'

Set on 5+05<sup>28</sup> Sight  
 4+42<sup>41</sup> dist. 62<sup>87</sup> tang defl  
 = 5°-3453'  
 55 21

Set on 5+15<sup>28</sup> Sight 4+42<sup>41</sup>  
 dist. 72<sup>87</sup> tang defl = 6°-2774

Start in Fours

5+21<sup>51</sup> 623 0°-3314

5+38.73 1345 10-1161

47

Blocks 19-20.5

Set on 5+05<sup>28</sup> Sight 4+42<sup>41</sup>  
 dist = 62<sup>87</sup> tang defl = 5°-34<sup>53</sup>

5+42<sup>61</sup> 37.37 3°-18.50'  
<sup>13 88</sup>  
 5+28.73 <sup>13 88</sup> 23.44 - 2°-04.74  
 5+14<sup>10</sup> <sup>75</sup> 8.82 North - 0°-46.86  
 4+99<sup>47</sup> <sup>07</sup> 5.88 South 0°-31.27'

Set on 4+99<sup>47</sup> & Pier # 15 Sight  
 4+42<sup>48</sup> dist 56.99 tang defl  
 = 5°-03.3' Turn to center set points  
 at 8.37 - 15<sup>00</sup> 15<sup>28</sup>

Set on 5+14<sup>10</sup> & Pier # 16 Sight  
 4+99<sup>47</sup> - dist 14<sup>63</sup> tang defl = 1°-17.86  
 turn to center set points - at 8.37 - 15<sup>00</sup>  
 15.78 -

7/9/19

F-N-B Block 19. 5+05<sup>28</sup> to 5+21<sup>51</sup>

Point on Upstream Face -1.18 79.02 480.20

837 line Gr = 481.20

5+05 <sup>28</sup>	7.11 = 7'-1 1/2"	Sp 4.93	74.09
4+99 <sup>47</sup> E.P. #15	6.78 = 6'-3 1/2"	4.10	74.92
5+14 <sup>10</sup> E.P. #16	7.13 = 7'-1 1/2"	4.95	74.07

13' line Gr = 476.2

5+05 <sup>28</sup>	2.19 = 2'-2 1/4"	Sp 5.01	74.01
4+99 <sup>47</sup>	1.95 = 1'-11 1/4"	4.77	74.25
5+14 <sup>10</sup>	2.06 = 2'-3/4"	4.88	74.14

13.78 line Gr = 475.2

5+05 <sup>28</sup>	1.19 = 1'-2 1/4"	Sp 5.01	74.01
4+99 <sup>47</sup>	1.18 = 1'-2 1/4"	5.00	74.02
5+14 <sup>10</sup>	1.07 = 1'-3/4"	4.89	74.13

R Iron Pin in damp 001 7901  
From Gov. Bm - 790'

Grades Top Parapet Left Abut.

R-38	3.66	500.07	96.41
		Sp 3.87	96.20
7+44 <sup>81</sup>	1.08 = 1'-1"	4.95	95.12
7+49 <sup>81</sup>	1.33 = 1'-4"	5.20	94.97

7/9/19 Block 15

Set on 3+94<sup>63</sup> Sight Flag at center for 90° tang defl.

3+97 <sup>06</sup>	2.43	0° - 17.89
4+04 <sup>63</sup>	10.0	0° - 53.21'
4+11 <sup>69</sup>	17.06	-1° - 30.73
4+14 <sup>63</sup>	20.0	-1° - 46.4'
4+24 <sup>63</sup>	30.0	-2° - 39.6
4+25 <sup>51</sup>	30.88	2° - 42.58' Nail in face of Wall

Set on 3+97<sup>06</sup> E Pier # 8 Sight  
4+24<sup>63</sup> dist = 27.57 tang defl  
= 2° 26.63 turn to center set  
E Pier at 13' - set Nail on 325' R  
on E Pier #9.

7/9/19

F.M.B Block 15 Pier Centers  
 Set on A+11<sup>63</sup> & Pier #9  
 Sight. 3+8+<sup>43</sup> dist 29.26  
 tang defl = 2°-35.68'

3+67<sup>80</sup> 1389 - 3°-53.63Grade on bed. 548 8948 486<sup>00</sup>

7/10/19

Block 16

Set on A+24<sup>63</sup> Sight Flag  
 at Center for 90° tang defl.

4+54<sup>23</sup> 29.60 2° 37.54+55<sup>58</sup> 30.95 2°-44.7'

4+56.93 32.30 2- 51.9

Set on A+56.93 Sight A+24<sup>63</sup>  
 tang defl = 2°-51.9 turn to  
 center set Nail for Contr Joint

7/10/19

F.M.B Grades Bottom Floor for Roadway.

1+84<sup>63</sup>

Crest. 1228 96.96 484.68

563 491.33

70.8

7/11/19 Blocks 17-18.

Set on A+24<sup>63</sup> Sight Flag at  
 Center for 90° tang defl.

A+99<sup>47</sup> - 7484 - 6°-38.26 EP 15Nail in Form A+93<sup>86</sup> 69.23 6°-08.42A+83<sup>86</sup> 59.23 5°-15.21A+73<sup>86</sup> 49.23 4°-27.00A+63<sup>86</sup> 39.23 3°-28.79A+59<sup>30</sup> 32.67 2°-53.51 Nail in Form

Q. 20 170 66.89 65.19

TPR Block 16. 884 580.5

Nail opp A+24<sup>63</sup> 927 57.52R. 30x54 E1 = 466<sup>0</sup>

20.46 dist to d.s. Face.

4.36 - 4-4 1/2" 525 61.54

Form 5 2.28 = 2-3 1/2" 317 63.72

Ext. Joint. 4+57<sup>30</sup> up from E1457<sup>00</sup>

7/10/19

F.B. 19

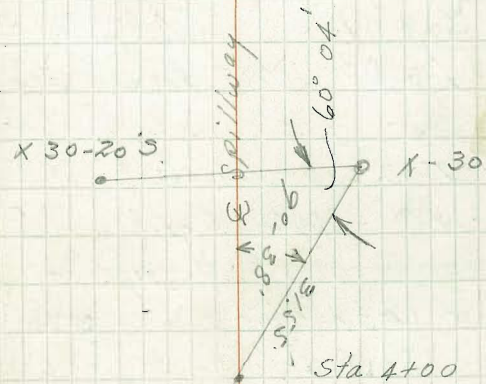
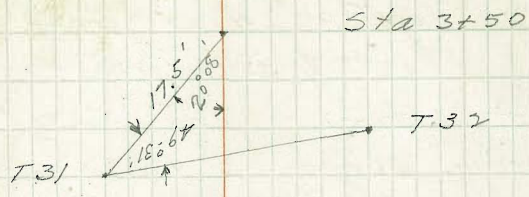
Grades Spillway

	Grade Top Conc.	Sub Grade	Grades old Channel		
T 31		248	72.90		70.42
2+87 <sup>45</sup>	70.35	69.35			
3+00	70.16	69.16	70.30	411	68.79
3+10	69.60	68.60	70.26	493	67.97
3+20	67.92	66.92	70.22	628	66.22
+30	65.84	64.84	70.18		
3+40	63.76	62.76	70.14	1048	62.42
3+50	61.68	60.68	70.10		
3+59	59.81				
3+60	59.60	58.60	70.06	1424	58.66
3+69	457.75	456.75	70.02	1514	57.76
3+79	457.25				
3+80	457.2	456.2	69.98	1553	57.37
A+00	456.2	455.2	69.90	1644	56.46
A+04 <sup>60</sup>	55.97	54.97			End Concrete
4+25	454.95	453.95	69.80		
TP Rock below L line		7.94	61.47		453.53

0.4%  
 0.5%  
 0.6%  
 0.7%  
 0.8%  
 0.9%  
 1.0%  
 1.1%  
 1.2%  
 1.3%  
 1.4%  
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 4.3%  
 4.4%  
 4.5%  
 4.6%  
 4.7%  
 4.8%  
 4.9%  
 5.0%

Grades old channel

Old spillway channel = 0.4% Grade



Reinforcing Spillway

3+26.5 = 1<sup>st</sup> vertical bar to 3+41.5 = 15 bars - 2 ft c/c  
 3+41.5 to 3+61.5 3 bars - 20" c/c  
 3+61.5 to 3+69.5 6 bars 16" c/c  
 3+69.5 to 3+80 9 bars 14" c/c  
 3+80 to 3+93 13 bars 12" c/c  
 3+93 to 4+00 9 bars 10" c/c  
 Floor = 1/4" 15" C to C both ways  
 Tie bars in Walls 1/4" 15" C to C  
 Bars 4" below floor line + about 4" from rear face in Walls

9" Vertical bars  
 1" 1/2

7/12/19 Blocks 17 & 18

F-17-B

Set on 4+24<sup>63</sup> Sight  
Flag at center

4+56 <sup>31</sup>	32 <sup>68</sup>	- 2° 53 <sup>82</sup>	Nail in forms
4+66 <sup>31</sup>	42 <sup>68</sup>	3° 47 <sup>03</sup>	
4+76 <sup>31</sup>	52 <sup>68</sup>	4° 40 <sup>24</sup>	
4+86 <sup>31</sup>	62 <sup>68</sup>	5° 33 <sup>45</sup>	

R.  $\frac{373.00}{306.17}$  El. 471<sup>00</sup>  
16.83 dist to D.S.F.

5+44<sup>60</sup> PT 117<sup>97</sup> = 10° - 27.76'  
I.P. Block 16 473 62.78 58.05  
Nail in forms 1053 73.31 00 462.78  
Nail in forms  
4+56<sup>31</sup> D.S.F. 60.0' = 0'-0" 9 2.31 71.11  
4+66<sup>31</sup> " 50.5' = 5'-0<sup>1</sup>/<sub>2</sub>" 9 2.36 65.95  
4+76<sup>31</sup> " 50.2' = 5'-4<sup>1</sup>/<sub>4</sub>" 9 2.33 65.98  
4+86<sup>31</sup> " 48.4' = 4'-10" 9 2.15 66.16

7/12/19

51

F-17-B 373 line for Piers

Set on 5+42<sup>60</sup> Sight R.P.s  
Turn 90° for tang defl

5+28<sup>23</sup> - 1388 10-1389  
Set on 5+28<sup>23</sup> Sight 5+42<sup>60</sup>  
Tang defl = 10-1389' Set Nails  
on 325 & 310' R in R Pier

Iron Pin in dump 1014 89.15 7901  
3.15 486.00

7/14/19

F-17-B Blocks 17-18

Set on 4+24<sup>63</sup> Sight 5+42<sup>60</sup> P.T.  
dist 117.97 defl for tang = 10° - 32.11  
4+56<sup>31</sup> 32<sup>68</sup> 2° - 53<sup>82</sup>' Nail in form  
4+66<sup>31</sup> 42<sup>68</sup> 3° - 47<sup>03</sup>'  
4+76<sup>31</sup> 52<sup>68</sup> 4° - 40<sup>24</sup>'  
4+86<sup>31</sup> 62<sup>68</sup> 5° - 33<sup>45</sup>'  
I.P. Block 16 457 62.62 58.05  
Nail in forms 1263 75.25 00 62.62  
4+56<sup>31</sup> 32.9' = 3'-3<sup>1</sup>/<sub>2</sub>" 9 2.34 71.91  
4+66<sup>31</sup> 45.7' = 4'-8<sup>3</sup>/<sub>4</sub>" 9 2.46 70.63  
4+76<sup>31</sup> 47.2' = 4'-8<sup>3</sup>/<sub>4</sub>" 9 2.47 70.48  
4+86<sup>31</sup> 47.2' = 4'-8<sup>3</sup>/<sub>4</sub>" 9 2.47 70.45



7/15/19

F-M-B

Blocks 17-18-19

Set on 373 R. Sta 5+12<sup>60</sup>

Sight RP on Hill for 90°

4+24<sup>63</sup> 11797 10°-27765+28<sup>23</sup> 13885+22<sup>60</sup> 200 1°-464'5+14<sup>10</sup> 2851 2°-3161'4+99<sup>47</sup> 4314 3°-4964'Set on 4+99<sup>47</sup> EP# 15Sight 5+42<sup>60</sup> P.T. dist 4313

lang defl. 3°-4964

4+94<sup>47</sup> 5 = 0°-2664+84<sup>84</sup> 1463 = 1°-17864+92<sup>00</sup> 2179 1°-55914+70<sup>21</sup> 2926 2°-35224+58<sup>18</sup> 4129 3°-3924 Nail in F. South

Note dist between Piers 12 &amp; 13

= 1437

7/15/19

52

F-M-B. Block 17-18

Set on 4+84<sup>84</sup> EP# 14Sight 4+70<sup>21</sup> EP# 17 lang defl = 1°-1786

Set points at 837-13-1378

toward center

Set on 4+70<sup>21</sup> EP# 13Sight 4+84<sup>84</sup> dist 1463 lang

defl = 1°-1786 Set points at

837-13-1378 toward center.

Nail in forms 1782 80.44

462.62

837 line

EI- 481.20

4+58<sup>18</sup> 517 = 5'-2" 441 76.034+70<sup>21</sup> 571 = 5'-8<sup>1</sup>/<sub>2</sub>" S 495 75.494+92<sup>00</sup> 568 = 5'-8<sup>1</sup>/<sub>4</sub>" P 492 75.524+84<sup>84</sup> 565 = 5'-7<sup>3</sup>/<sub>4</sub>" + 489 75.554+94<sup>47</sup> 569 = 5'-8<sup>1</sup>/<sub>4</sub>" S 493 75.51

13 line

EI = 476.25

4+70<sup>21</sup> 168 = 1'-8<sup>1</sup>/<sub>2</sub>" S 487 75.574+84<sup>84</sup> 168 = 1'-8<sup>1</sup>/<sub>4</sub>" S 487 75.57

7/15/19

B-F-M. E Piers

Set on E Pier 16:  $5+14^{\circ}10'$   
 323' Radius. Sight  $5+42^{\circ}60'$  =  $28.50'$   
 tang defl. =  $2^{\circ}31.56'$  set points  
 on 325 and 310 Radius E Pier

Set on E Pier #15  $4+99^{\circ}47'$   
 Sight  $5+42^{\circ}60'$  - dist 1313  
 tang defl. =  $3^{\circ}49.59'$   
 Set points on 310 + 325 Radius  
 on E Pier.

7/18/19

B-F-M

Set on  $4+14^{\circ}63'$  Sight flag  
 at center. turn  $90^{\circ}$  for tang defl  
 Set point on 323 R

$4+23^{\circ}00'$   $837$  =  $0^{\circ}-44.47'$

53

7/18-19

B-F-M

Set on  $5+42^{\circ}60'$  PT, 323 Line  
 Sight flag  
 at center. turn  $90^{\circ}$  for tangent

$5+32^{\circ}60'$	10	Nail in Conc.
$5+22^{\circ}60'$	20	" " "
$5+12^{\circ}60'$	30	" " "
$5+02^{\circ}60'$	40	" " "
$4+92^{\circ}60'$	50	Nail in form.
$4+82^{\circ}60'$	60	Nail in Conc.
$4+72^{\circ}60'$	70	" " "
$4+62^{\circ}60'$	80	" " "

Set on  $4+62^{\circ}60'$  Sight flag at center.  
 turn  $90^{\circ}$  for tang.

$4+23^{\circ}00'$  dist.  $39^{\circ}60'$  Measured dist =  
 $39^{\circ}28'$  defl for  $39^{\circ}28'$  =  $3^{\circ}28.99'$   
 Angle check  $3^{\circ}-29.0'$

7/18/19

B-F-101

## Holes for Gate Shafts

Nail 2+84 <sup>63</sup>	1738	97.06	484.68
El. Center of Hole	10.49		486.57

$$\text{Radius} = 321.87$$

$$\begin{array}{r} 323.20 \\ 321.87 \\ \hline 1.13 \end{array}$$

## 32187 Radius Curve

1' = 0° - 5.34'	} 14.63 on 323' Radius
5' = 0° - 26.70'	
10' = 0° - 53.40'	
20' = 1° - 46.80'	
30' = 2° - 40.20'	} 14.58 on 32187 Radius
40' = 3° - 33.60'	
50' = 4° - 27.00'	} 13.88 on 323' Radius
60' = 5° - 20.40'	
70' = 6° - 13.80'	} 13.83 on 32187 Radius
80' = 7° - 07.20'	
90' = 8° - 00.60'	
100' = 8° - 54.00'	

$$\begin{aligned} \text{Sta } 284^{\underline{63}} \text{ on } 323R \\ = 283^{\underline{63}} \text{ on } 32187 \end{aligned}$$

54

Set on 3+83 <sup>63</sup>	- 32187 Radius
Sight Flag at Center for 90°	
lang. 9.11	
2+93 <sup>67</sup> - 9.98	0° - 53.40
10.91	0° - 58.26
2+80 <sup>77</sup> on 323R =	2+79 <sup>78</sup> on 32187
	13.83
	2+93.61 Pier #1
	14.58
	3+08.19 #2
	14.58
	3+22.77 = P#3
	14.58
	3+37.35 = P#4
	14.58
	3+51.93 = P#5
	14.58
	3+66.51 = P#6
	14.58
	3+81.09 = P#7
	14.58
	3+95.67 = P#8
	14.58
	4+10.25 = P#9

7/19/19

B-F-N. TP

2+84<sup>63</sup> Nail in Crest 12.10 496.78 484.68

4+23<sup>00</sup> Nail in Crest 12.12 484.66

Spillway

3+20 = End of Vertical Curve

7/21/19

B-F-N. Grades for Bottom floor Roadway

10.57 97.14 486.57

Grade Bottom Roadway 5.81 491.033

Top Dam D.S.F. - 5.12 92.02

11.14 86.00

7/21/19

Piers Roadway over Overflow

Set on 5+22<sup>60</sup> Sight Flag at

Center Turn 90° for tangent

5+15<sup>30</sup> 7.3 0°-38.8 Forms <sup>set Point 113 East</sup> ~~NS~~ Pier 16.

5+13<sup>00</sup> 9.6 0°-51.08

5+27.65 5.05 0°-26.9 Forms NS Pier #17

5+14.11 8.50 0°-45.16 E Pier 16

4+99.7 22.9 2°-01.79 ~~E Pier~~ 15

4+99.47 23.13 2°-03.03 E Pier #15

5+42.60

55

4+98.4-29.2 2°-8.76 N.S.F. Pier 18

4+84.89 37.76 3°-20.83 E Pier 14

36.64 3°-14.88 S.S.F. Pier #14

4+85.98-38.9 3°-26.99 N.S.F. Pier #14

4+70.21 52.39 4°-38.78 E Pier #13

4+71.46 51.14 4°-32.14 S.S. Form #13

4+69.32 53.38 4°-44.12 N.S. Form #13

Set on 5+32.60

Sight flag at Center Turn 90° for Tangent

5+42.53 9.93 0°-52.85 N Form. Pier <sup>with grade</sup> #18

5+39.6 7.00 0 37.2

Set on 5+39.60 -

5+29.92 9.68 0°-51

Grade for Gate Shafts

D.S.F. Concrete 5+45° 5.12 97.14 92.02

10.57 486.57

9/24/19

B-F-17 Block 16

Set on 4+62<sup>60</sup> sight Flag  
at Center for 90° Tang defl.

4+57<sup>60</sup> 50 = 0° - 26.6' Nail in Bottom

4+55<sup>58</sup> 702 = 0° - 37.31'

4+40<sup>95</sup> 2165 = 1° - 55.16'

4+26<sup>32</sup> 3628 = 3° - 17.99'

Set on 4+26<sup>32</sup> Sight  
4+55<sup>58</sup> dist. 29.36. Tang  
defl = 2° - 35.72'

P. Nail in Crest

4+23<sup>00</sup> 483 489.49 484.66

9.29 480.2

P in Bottom 285 79.70 12.64 76.85

837 hinc El. 481.2

4+26<sup>32</sup> 6.80 = 6' 9 1/2" 9 5.30 74.40

4+40<sup>95</sup> 6.65 = 6' - 7 3/4" 4 5.15 74.55

4+55<sup>58</sup> 6.59 = 6' - 7 1/4" 5 5.09 74.61

Block 16

sl

13' 1110 79.70

El = 476.25

4+26<sup>32</sup> 1.87 = 1' - 10 1/2" G 532 74.38  
4+40<sup>95</sup> 1.78 = 1' - 9 1/2" P 523 74.47  
4+55<sup>58</sup> 1.56 = 1' - 6 3/4" 501 74.69

7/24/19

B-F-17

P.O.D.

Stated 8/1/19 Parapet Curve.



Right Abutment.

8/1/19

X on Rock

N1

1.37 96.52

95.15

1.94 out for slope

12.66

83.86

1.64 " "

11.52

85.00

4.32

92.20

5/6/19 Deflections for 323 Radius Curve.

57

1 = 0° - 5.3'	30 = 2° - 39.6'
2 = 0° - 10.6'	40 = 3° - 32.9'
3 = 0° - 16.0'	50 = 4° - 26.1'
4 = 0° - 21.3'	60 = 5° - 19.3'
5 = 0° - 26.6'	70 = 6° - 12.5'
6 = 0° - 31.9'	80 = 7° - 5.7'
7 = 0° - 37.2'	90 = 7° - 58.9'
8 = 0° - 42.5'	100 = 8° - 52.2'
9 = 0° - 47.9'	110 = 9° - 45.4'
10 = 0° - 53.2'	120 = 10° - 38.6'
11 = 0° - 58.5'	130 = 11° - 31.8'
12 = 1° - 03.8'	140 = 12° - 25.1'
13 = 1° - 09.2'	150 = 13° - 18.3'
14 = 1° - 14.5'	160 = 14° - 11.5'
15 = 1° - 19.8'	170 = 15° - 4.7'
16 = 1° - 25.1'	180 = 15° - 57.9'
17 = 1° - 30.4'	190 = 16° - 51.1'
18 = 1° - 35.7'	200 = 17° - 44.3'
19 = 1° - 41.1'	210 = 18° - 37.5'
20 = 1° - 46.4'	220 = 19° - 30.7'
21 = 1° - 51.7'	230 = 20° - 23.9'
22 = 1° - 57.0'	240 = 21° - 17.1'
23 = 2° - 02.4'	250 = 22° - 10.4'
24 = 2° - 07.7'	260 = 23° - 03.6'
25 = 2° - 13.0'	270 = 23° - 56.8'

280 = 24° - 50.0'
290 = 25° - 43.2'
300 = 26° - 36.47'
310 = 27° - 29.7'
320 = 28° - 22.9'
330 = 29° - 16.1'
340 = 30° - 09.3'
350 = 31° - 02.55'
360 = 31° - 55.76'
370 = 32° - 48.97'
380 = 33° - 42.18'
390 = 34° - 35.39'
400 = 35° - 28.63'

0.1 = 0° - 0.53'
0.2 = 0° - 1.06'
0.3 = 0° - 1.60'
0.4 = 0° - 2.13'
0.5 = 0° - 2.66'
0.6 = 0° - 3.18'
0.7 = 0° - 3.72'
0.8 = 0° - 4.25'
0.9 = 0° - 4.79'
1.0 = 0° - 5.32'

# KEITH'S RAILROAD CURVE TABLES.

Published by KEUFFEL & ESSER CO., New York.

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## HOW TO USE KEITH'S TABLES.

### EXAMPLE.

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

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

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

Tab. V correction for A.  $23^{\circ} 20'$  for a  $10^{\circ}$  Cur. = 0.16  
 $118.31 + 0.16 = 118.47 = \text{corrected Tangent}$ .

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

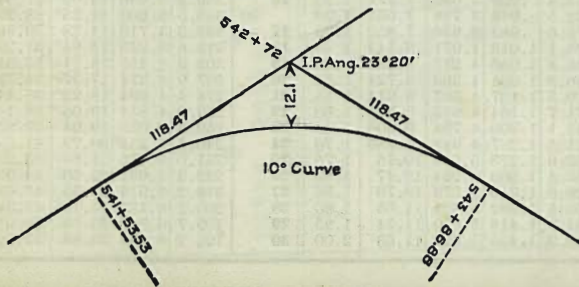
$2^{\circ} 19\frac{1}{2}' = \text{def. for sta.}$	542	I. P. = sta.	542+72
$4^{\circ} 49\frac{1}{2}' = \text{" " "}$	+50	Tan. =	118.47
$7^{\circ} 19\frac{1}{2}' = \text{" " "}$	543	B. C. = sta.	541+53.53
$9^{\circ} 49\frac{1}{2}' = \text{" " "}$	+50	L. C. =	2.33.33
$11^{\circ} 40' = \text{" " "}$	543+	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  $10^{\circ}$  Curve.

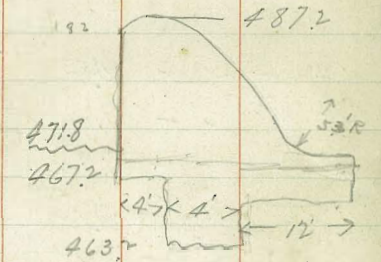
Def. for 36.86 ft. =  $1^{\circ} 50\frac{1}{2}'$  for a  $10^{\circ}$  Curve.

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



## Grades O.G. Section

	Top Conc	Sub Gr	Station	End of
upstream face	486.45	481.0		New Concrete Floor
1.25 Crest	487.2	481.0		1+85.5
2	487.15	481.0		
3	487.0	481.0		
4	486.72	481.0		
5	486.30	485.0		
5.35	486.15	485.0		
6	485.75	484.6		
7	485.1	483.85		
8	484.32	483.00		
9	483.4	481.95		
10	482.32	480.82		
11	481.17	479.55		
12	479.87	478.15		
13	478.45	476.63		
14	476.91	474.95		
15	475.2	473.3		
15.32 P.C.V.C.	474.6	472.9		
16	473.62	472.25		
17	472.73	471.58		
18	472.2	471.15		
19	471.9	470.9		
20	471.8	470.8		
Grade on tower base	240	87.60		485.20
			021	487.39



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3776  
 1463  
 5239  
 1463  
 67.02

1463 125  
 4 + 84 87 92 4

80.52  
 267  
 7765

Page 34 2313  
 1463  
 3776 + 74.63  
 3776 + 67.80  
 56.53  
 57.22 40  
 52.39  
 11.55 4 + 70.21  
 1.60  
 1136/8  
 1.1

**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 Jullen A. Hall, M. Am. Soc. C. E.