

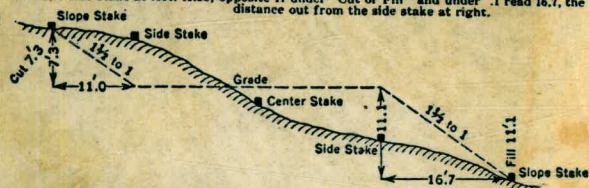
W

618

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1/2 to 1.

In the figure below: opposite 7 under "Cut or Fill" and under 3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under 1 read 16.7, the distance out from the side stake at right.



Cut or Fill	Distance out from Side or Shoulder Stake										Cut or Fill
	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

KEUFFEL & ESSER CO., N. Y.

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5-21-51
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JAN 13 1965

The paper in this book No. F370A
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with a WATER RESISTING surface sizing.

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ELEV'S OF GROUT HOLES

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Elev. of Grout Holes

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(10-23.2) (9-23.2) 13

Elev Grout HOLES

7-23 to # 11-0

(13)

In

Fr

J

Sw

Out or
Fill

0

1

2

3

4

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FEB. 21, 1942 (2)

DICKINSON
KINGELEYS OF GROUT HOLESNo. 1-25 to No. 5-25

NOTE

These holes are located on± Blocks - 7' so. of AXIS

#A-16				
B.M.	0.69	650.24		649.55
HOLE #1-25			7.7	642.5
T.P.	0.27	638.09	12.42	637.82
TP	0.71	625.95	12.85	625.24
TP	0.14	613.98	12.11	613.84
HOLE #2-25			9.1	604.9
TP	0.46	602.00	12.44	601.54
TP	0.81	589.75	13.06	588.94
TP	0.06	577.74	12.07	577.68
HOLE #3-25			6.1	571.6
TP	0.96	566.15	12.55	565.19
TP	0.57	554.03	12.69	553.46
HOLE #4-25			7.4	546.6
TP	0.48	541.93	12.58	541.45
TP			12.91	529.02

ELEV'S OF GROUT HOLES

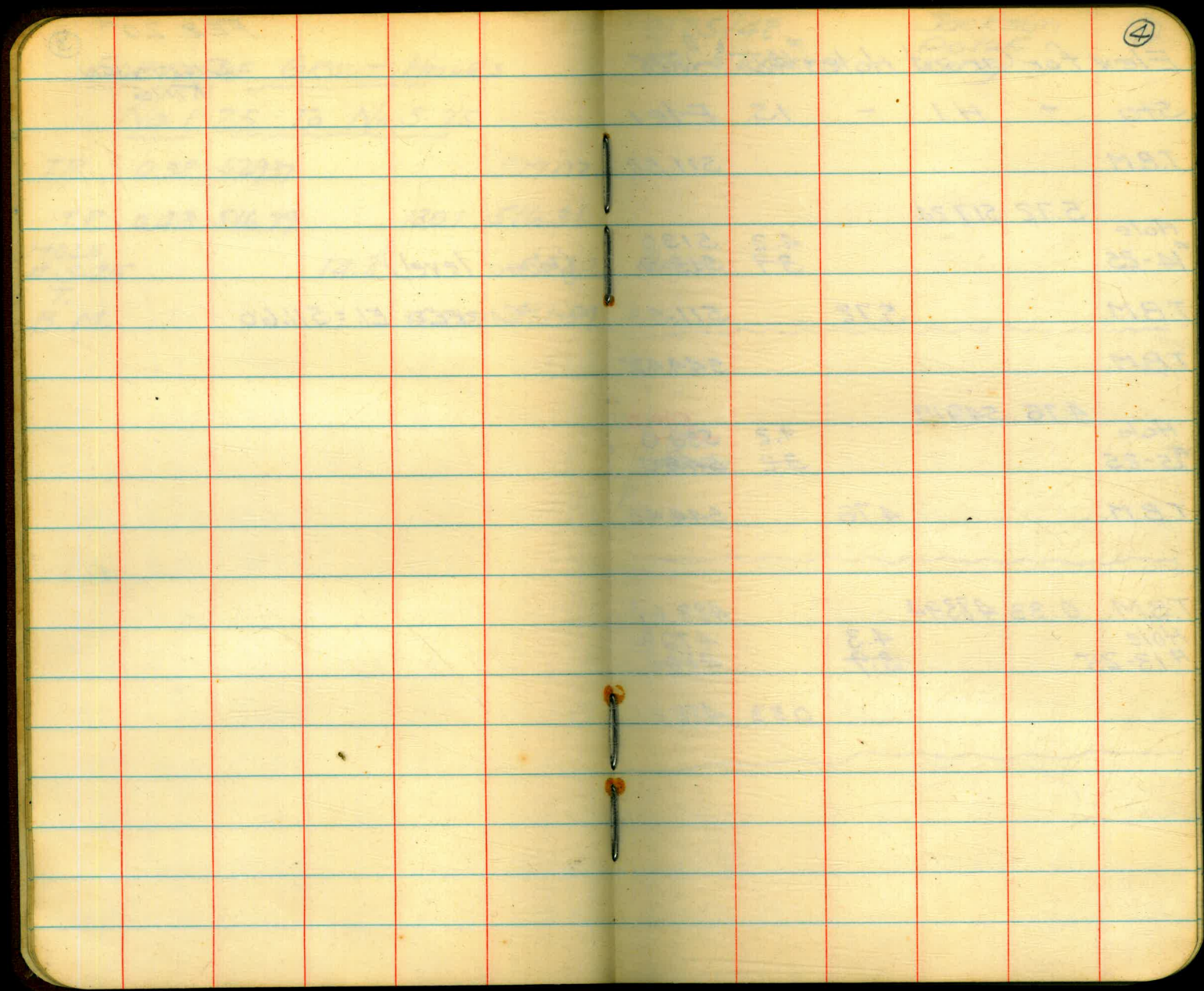
No. 1-25 To No 5-25

FEB. 20th (3)

DICKINSON

KING

T.P.	0.35	529.37		529.02	
T.P.	0.43	516.79	1301	516.36	
HOLE # 5-25		14.8		5020	(Hand level)
T. B.M.			5.20	511.59	— MARKED EL. = 511.60



Elev for Grout Holes #14-25 #15-25

2/25/42
Fair-Warm

Jackson
Dolak
King

(5)

Sta. + H.I. - IS. Elev.

T.B.M. 511.52

Hole 5.72 517.24

#14-25 4.2 513.0 ✓
3.7 513.5

AXIS

T.B.M. 5.72 511.52

T.B.M. 544.42

Hole 4.76 549.18

#15-25 9.2 540.0
3.2 546.0

AXIS

T.B.M. 4.76 544.42

T.B.M. 0.33 483.94 483.61

Hole 4.3 479.0 ✓
#13-25 3.9 480.0

0.33 483.61

Levels for Grout Holes #1-#3

3/3/42
Fair - Warm

Jackson
Polak
King
Cole (6)

Sta + H.I. - IS Elev.

A-16
B.M. 649.55

9.31 658.86

Hole #1-0 6.5 652.4 ✓

T.P. 11.57 647.29 ✓

0.72 648.01

T.P. 12.42 635.59 ✓

0.79 636.38

Hole #2-0 10.6 625.8 ✓

T.P. 12.57 623.81 ✓

0.05 623.86

T.P. 12.53 611.33 ✓

0.12 611.45

T.P. 13.07 598.38 ✓

1.08 599.46

HOLE #3-0 7.2 592.3 ✓

Levels for Grout Holes #4 & #5

3/3/42.
Fair - Warm

Jackson
Polak
King
Cole

(7)

Sta	+	H.I.	-	I.S.	Flev.
		599.46			
T.P.			12.35		587.11
	0.22	587.33			
T.P.			12.52		574.81
	0.26	575.07			
T.P.			11.72		563.35
	0.18	563.53			563.42
Hole #4-0				4.5	559.0
T.P.			12.97		550.56
	1.29	551.85			
T.P.			12.95		538.90
	0.92	539.82			
HOLE #5-0				12.6	527.2
T.P.			12.92		526.90
	1.82	528.72			
T.P.			12.96		515.76

Levels for Grout Holes

3/3/42
Fair-Warm

Jackson
Cole

(8)

Sta	+ H.I.	- I.S.	Elev.
T.P.	205	517.81	515.76
T.B.M.		6.27	511.54

511.60

March 11-42 (9)

Location of Grout Holes as Drilled

Hole No. Sta. Dist. from Axis

1	1-0	7.0 south
2	1-25	7.7
3	2-0	7.0
4	2-25	7.3
5	3-0	7.5
6	3-25	7.1
7	4-0	4.2
8	4-25	6.9
9	5-0.4	7.3
10	5-23	5.3

Sta. 1-0 is W. edge of block #1
" 1-25 " Block #1 etc.

Levels for Grout Holes

3-11-42 (10)

T.B.M.	0.28	663.44		663.16	Marked Rock
Hole #20-25			13.4	650.0	
7 T.P.	0.56	651.08	12.92	650.52	
T.P.	0.37	639.59	11.86	639.22	
T.P.	0.13	627.23	12.49	627.10	
T.P.	1.01	615.81	12.43	614.80	
Hole # 19-25			2.6	613.2	
T.B.M.			4.12	611.69	Marked 611.70
T.P.	0.93	603.69	13.05	602.76	
T.P.	0.60	591.29	13.00	590.69	12.88
T.P.			12.49	578.80	
T.B.M.	0.74	581.97	10.06	581.23	Marked 581.14
T.P.	0.20	569.29	12.88	569.09	
T.P.	0.14	556.52	12.91	556.38	
Hole # 17-25			3.6	552.9	
Hole # 16-25			9.7	546.8	STA 107.72
T.B.M.		12.03		544.49	Marked 544.42

3-12-42 (11)

Levels for Grout Hole

TBM 0.11 511.71 ✓ 511.60 Marked Rock

0.96 501.49 11.18 500.53 ✓

Hole #

5-47

8.7 492.8 ✓

11.39 511.68 1.20 500.29 ✓

TBM

0.08

511.60 = 511.60 as above ✓

TBM 4.31 667.45 663.14 Marked Rock

3-20-42

Hole #

0-25

0.1 667.4 sta 2+96.0

TBM

4.31

663.14 above

TBM 9.35 572.77 563.42 Marked Rock

Hole

3-35

8.1 56.42 sta 4+58⁹

TBM

9.35

563.42 above

Elev. GROUT HOLES

Mar 24,

(12)

T.B.M. 9.43 ✓ 602.68

593.25

Hole # 2-39 ✓

6.2

596.5 ✓

STA 4+10 - 6.5' south of axis

T.B.M.

943

593.25

T.B.M. 0.92 ✓ 462.76

461.84

Hole # 11-23 ✓

4.8

458.0 ✓

STA 8+30²⁵ - On Axis

T.B.M. 6.71 ✓ 570.13

563.12

Hole # 3-37^E ✓

5.0

565.1 ✓

Sta 9+58.5

3-27-42

?

T.B.M. 6.44 ✓ 637.40

630.96

Hole # 1-37^E ✓

4.4

633.0 ✓

Sta 3+58.5

?

T.B.M. 7.54 ✓ 658.96

651.42

Hole # 1-12.5 ✓

11.33

647.6 ✓

Sta 3+33.5

" # 0-43 ✓

2.8

657.6 ✓

" 3+14

Elevation of GROUT HOLES

3-27-42

Rogers
Cole
King

(13)

T.B.M.	031	449.66		449.35	
Hole #	10-23.2		7.3	442.4	Sta 7+83.75 On Axis
" #	9-23.2		7.9	442.0	" 7+37.25 On Axis
T.B.M.		507		444.59	= 444.59 Marked Rock.

T.B.M. 672 451.31 444.59

MAR 31

Hole #	11-0		2.7	448.6	STA. 8+06.7
Hole #	10-23		9.0	442.3	STA 7+83.4
HOLE #	10-0		8.9	442.4	STA 7+59.8
HOLE #	9-23		9.3	442.0	STA 7+36.3
HOLE #	9-00		10.5	440.8	STA 7+13.8
HOLE #	8-23		9.0	442.3	STA 6+89.7
HOLE #	8-0		8.4	442.9	STA 6+67.5
HOLE #	7-23		9.9	441.4	STA 6+45.0
T.B.M.			1.97	449.34	Marked E.I. 449.35

DICKINSON
POLAK

ELEVATION & LOCATION of GROUT HOLES

April 1-1942

Rogers
Cole
King

(14)

Hole #	309	447.68	444.59	
7-23.8			6.3	441.4
Hole #			1.7	446.0
7-0			+36	451.3
Hole #				444.59
6-25				

Sta 6+44.81

" 6+21

" 5+96

TBM 1.79 607.39

APR 2 1942

Hole # 2-31 609.18

DICKINSON

TBM 7.4 601.8

STA 4+02 - 7 so. of axis

TBM 4.18 605.00

Marked E1. 605.00

APR 2

TBM 563.42

DICKINSON

Hole # 3-31.5 7.73 571.15

TBM 3.6 567.6

STA 4+52.5

T.B.M 1.14 570.01

Marked E1 570.00

Elev. $\frac{1}{2}$ Location of Grout Holes

APR 2

(15)

DICKINSON

T.BM 0.79 543.65 ✓ 542.86

Hole # 4-37.5 4.3 539.4 ✓ STA 5+08.5 - 7' so. of axis

T.BM 8.68 534.97 Marked Elev. 535⁰⁰

TBM 7.24 501.74 ✓ 499.50

APR 2

DICKINSON

Hole 5-37.5 4.6 497.1 ✓ STA 5+58.5 - 6.5 so. of axis

T.BM 0.39 501.35 ✓ Marked E1 = 501.34

Elev of GROUT HOLE

T.BM	4.50	624.08	619.58
Hole #	2-12.5	5.8	618.3
BM		4.50	619.58

Sta 3+83.5 - 7' so. of axis

T.BM			444.59
	10.26	454.85	
Hole #	8-11.6	11.9	443.0
Hole #	8-34.9	13.9	441.0
		13.0	441.6
Hole #	9-11.6	13.7	441.2
Hole #	9-34.9	12.0	443.2
		35.5	442.9
TBM		10.25	444.60

STA 6+79.1 on axis
 STA 7+02.4 " "
 STA 7+25.6 " "
 STA 7+48.9 " "

APR 7

(16)

DICKINSON

Apr 7

DICKINSON

Elev of GROUT HOLES

APR 7

(17)

T.B.M. 0.57 449.92 ✓ 449.35
 Hole # 10-35 5.5 444.4 On Axis - Sta 7+95.5
 Hole # 10-11² 7.8 442.1 " " Sta 7+72.0
 0.57 449.35 T.B.M.

DICKINSON

T.B.M. 8.91 457.36 ✓ 448.45
 Hole # 6-23 5.4 452.0 STA 5+94.0 - on Axis
 Hole Sloped to west 0.3 to 1'
 8.91 448.45 B.M.

APR 8th

T.B.M. 3.94 448.53 ✓ 444.59
 Hole # A-10-18² 7.2 441.3 STA 7+78.8 ~ 151° south of Axis
 Hole # A-10-12³ 8.3 440.2 (STA 7+72.3 ~ 104.7 " " "
 Hole sloped to ~~west~~ ^{East} 0.3 to 1'
 Hole # A-10-18² 8.9 439.6 STA 7+78.7 ~ 76.3 sp. of Axis
 3.94 444.59 B.M.

DICKINSON

ELEV. OF GROUT HOLES

APR. 15th (18)
DICKINSON

T.B.M 0.01 455.41 455.40

Hole # 6-37.5 9.0 446.4 STA 6+08.5 On Axis
0.01 455.46

T.B.M 0.20 511.72 511.52

#21/42
Super
King
Davis

Hole # 14-0 14.7 497.0 Sta 9+50 - On Axis (Used 2' beam on stake)
0.20 511.52

T.B.M 1.79 530.82 529.03

Hole # 15-0 1.6 529.2 Sta 10+00 - On Axis

T.B.M 1.79 529.03

Elev. of Gout Holes

Apr. 21

(19)

DICKINSON

T.B.M. ¹²⁵¹
~~1269~~ 556.93 544.42

Hole # 16-0 13.2 543.7 Sta 10+50 - on Axis

Hole # 17-0 6.3 6.3 550.6 Sta 11+00 - on Axis

TP 11.99 568.11 0.81 556.12

Hole # 18-0 10.6 557.5 Sta 11+50 - on Axis

TP 11.78 579.81 0.08 568.03

TP 11.76 591.31 0.26 579.55

Hole # 19-0 3.3 589.0 Sta 12+00 - on Axis

T.B.M. 10.16 581.15 Marked - 581.14

T.B.M. 916 635.22 626.06

Hole # 20-0 7.5 627.7 Sta 12+50 - on Axis

T.B.M. 916 626.06

ELEV. OF GROUT HOLES

Apr 18th (20)
Dickinson

BM 8.93 524.03 515.10

Hole # 5-12.5 12.0 512.0

Sta 5+33.5 - 7° south of Axis

T.P.M. 1.94 522.09

Marked 522.09

T.B.M. 5.24 556.43 551.19

Hole # 4-12.5 3.7 552.7

STA 4+83.5 - 7° south of Axis

TP 12.69 564.08 504 551.39

BM. 0.66 563.42

Marked E.L. = 563.42

T.B.M. 6.82 451.41 444.59

Apr. 22nd

Hole # 9-42° 9.2 442.2

Sta 7+56° - 39.5 So. of axis

Hole Pitched 5" to 1'

6.82 444.59

ELEV and LOCATION OF GROUT

APR. 22nd

(21)

HOLES

T.BM 2.96 450.51 447.55

Hole # 7-11⁶ 7.1 443.4 STA 6+32.6 on AXIS

Hole # 7-35⁰ 9.7 440.8 STA 6+56⁰ on AXIS

2.96 447.55

BM 580⁰⁰

5.66 585.66

MAY 1st

DICKINSON

Hole # 3-12-5 0.86 584.80

5.66 580⁰⁰ BM

ELEV. 2nd Location of Grout

MAY 5

(22)

ROGERS

HOLE 5

TBM 2.59 470.47 467.88

Hole # 6-12⁵ ✓ 4.0 466.5 Sta. 5+83.5 ~ On AXIS

2.59 467.88

T.P. 8.31 460.32 452.01

Hole # 11-11⁵ 6.6 453.7 Sta. 8+18⁶ 7' so. of axis

MAY 5, 1942

T.P. 0.77 459.55

BM 3.21 462.76 0.93 461.83 Marked EI = 461.84

ELEV. & LOCATION GROUT HOLES

Rogers
May - 42

23

BM ₁	1244	496.05	483.61	
Hole #				
13-37 ⁵		5.7	490.3	Sta 9+37.5 ~ on Axis

BM ₁	1244		483.61	= 483.61
-----------------	------	--	--------	----------

BM ₁	1094	522.46	511.52	
Hole #				
14-12 ⁵		14.4	508.1	Sta 9+62.5 ~ On Axis
Hole #				
14-37 ⁵		2.6	519.9	Sta 9+87.5 ~

BM ₁	1094		511.52	= 511.52
-----------------	------	--	--------	----------

BM ₁	442	548.84	544.42	
Hole #				
15-12 ⁵		15.8	533.0	STA 10+12.5
Hole #				
15-37 ⁵		4.9	543.9	" 10+37.5
Hole #				
16-12 ⁵		4.2	544.6	" 10+62.5
Hole #				
16-39 ²		0.0	548.8	" 10+89.5 (An additional deep hole)

BM ₁	442		544.42	= 544.42
-----------------	-----	--	--------	----------

ELEV & LOCATION OF GROUT HOLES

Apr 24th (24)

ROGERS

BM 0.38 581.52 581.14

Hole # 18-25 11.7 569.8 STA 11+75⁷ - On Axis

BM 0.38 581.14

BM 10.91 555.33 544.42

Hole # 16-46 5.2 550.1 STA 10+96 - On Axis

Hole # 17-12¹/₂ 5.1 550.2 " 11+12⁵ " "

T.P. 11.56 566.43 0.46 554.87

Hole # 17-37⁵ 10.7 555.7 " 11+37⁵ " "

Hole # 18-12¹/₂ 3.2 563.2 Sta. 11+62⁵ " "

T.P. 10.69 576.58 0.54 565.89

T.P. 11.04 586.87 0.75 575.83

Hole # 18-37.5 8.7 578.2 Sta " "

BM, 5.75 581.12 = 581.14

ELEV & LOCATION of Grout Hole

Rogers

(25)

May 13-47

BM	1.62	612.22	613.22	611.60		
Hole #	19-12 $\frac{1}{2}$		11.1	601.1	602.1	sta 12+12.5 1.5' S. Axis
BM,		1.62		611.60	-611.60	
BM,				626.02		
	10.24	636.30				
Hole #	19-37 $\frac{1}{2}$		14.9	621.4	621.4	sta 12+37.5 27' S. Axis
Hole #	20-12 $\frac{1}{2}$		3.0	633.3	633.3	" 12+62.5 3.3 S "
BM,		10.24		626.06		
BM,	3.12	666.28		663.16		
Hole #	20-31 $\frac{1}{2}$		11.2	655.1	655.1	sta 12+81.5 5' S. Axis
BM,		3.12		663.16		

ELEV OF GROUT HOLE # 11-34⁸

Rogers (26)
May 15-42

BM	3.64	465.48	461.84
Hole # 11-34 ⁸		8.3	457.2
	3.64		

Sta 8+41.8
= 461.84

BM	1.39	485.00	483.61
Hole # 12-45 ⁵		8.1	476.9
		13.9	483.6

MAY 19th
STA 8+99⁰ ~ on AXII
(top of pipe)

BM	0.03	483.64	483.61
Hole # 12-0		14.4	469.2
Hole # 12-25		13.4	470.2
BM		0.03	483.61

MAY 24th
ELEV TOP OF 12' PIPE
" Rock = 457.2 = 156.4
" Top of 5' Pipe
" Rock = 465.2

FINAL STATIONS OF
HALF ROUND DRAINS

APR 22nd (27)
DICKINSON

E of DRAIN 9⁰⁸ south of AXIS
E of FIRST RISER = STA 4+21⁰

Blocks completed:
0-3 incl.

STA. 3+16⁴ to STA 4+22⁰

7-10 incl.

" 4+22.8 to " 4+42.6

" 4+43.4 to " 4+62.5

" 4+63.5 to " 4+80.0⁹

✓ " 4+84.0 to " 5+02.0

" 5+05⁰ to " 5+22⁵

" 5+23³ to " 5+32⁰

" 5+32⁵ to " 5+52²

" 5+52⁷ to " 5+73⁰

5+77⁰ to " 5+88⁰

" 5+89¹ to " 6+08⁸

" 6+09.5 to " 6+28⁰

(cont'd next page)

FINAL STATIONS FOR (Contd)

HALF ROUND DRAINS

April
DICKINSON

(28)

STA. 6+29⁴ to STA. 6+43.6

" 6+44³ to " 6+62.5

" 6+63⁴ to " 6+81.8

" 6+82.5 to " 7+01.3

" 7+02.3 to " 7+20.7

" 7+21.2 to " 7+34.0

" 7+34.5 to " 7+52.9

" 7+54.8 to " 7+75.3

" 7+76.8 to " 7+95.3

" 7+96.3 to " 8+07.5

8+08² to " ~~8+13¹~~ to

~~8+13¹~~ to " 8+31⁰

8+31.8 to " 8+50.5

8+52⁰ to 8+66⁰

8+67⁰ to 8+84⁰

(Contd on Page 36)

JUNE 11/75

(29)

ELEV FOR GROUT HOLES
(Top of 2 1/2" Pipe - After Final Grouting)

T.P.	5.05	635.01		629.96	
Hole #	2-31		2.09	632.92 633.94	Top of 2 1/2" Pipe Sta: 3+72 ✓
Hole #	2-12 ^E		1.29	633.78 ²	" " " " ✓
T.P.		4.80		630.23	= 630.23
B.M.	11.39	662.81		651.42	
Hole #	1-37 ^E		2.87	659.94	Top of 2 1/2" Pipe ✓
" #	1-12 ^E		2.17	660.64	" " ✓
B.M.		11.39		651.42	= 651.42
B.M.	5.64	545.46		539.82	
Hole #	5-12 ^E		2.74	542.72	Top of 2 1/2" Grout Pipe ✓
Hole #	5-37 ^E		3.14	542.32	" " ✓
B.M.		5.64		539.82	= 539.82
T.P.	4.96	500.64		495.68	
Hole #	6-12 ^E		3.56	497.08	Top of 2 1/2" Grout Pipe ✓

~~Copy~~

ELEVS TOP OF GROUT PIPES
 (After final grouting thru concrete)

JUNE 15th (30)

BM	100	664.14		663.14		
Hole #	0-43		507	659.07	Top 2 1/2" pipe	✓

BM	10.43	606.91		596.48		
Hole #	3-12 ^s		5.10	601.8	" " "	✓
"	3-31 ^s		6.40	600.5	" " "	✓

BM	4.90	590.44		565.54		
Hole #	4-12 ^s		2.9	567.5	" " "	✓
"	4-37 ^s		2.9	567.5	" " "	✓

ELEVS. TAKEN AT BOTTOM
OF COPPER WATER STOP

APRIL 1942
DICKINSON

31

STATION	ELEVATION	REFERENCES
0-1 3+21	650.2	Copper Sheet dimension = 5'17"
1-2 3+71	622.8	F.B.# 589 - Page 72
2-3 4+21	590.8	F.B.# 617 - Page 66
3-4 4+71	558.8	" " - " 69
4-5 5+21	527.6	" " - " 70
5-6 5+71	488.7	" " - " 72
6-7 6+21	443.7	F.B.# 624 - Page 2
7-8 6+67.50	439.9	F.B.# 589 - " 8
7+14.0	440.4	F.B.# 624 - " 21
7+60.5	441.2	" " - " 21
8+07.0	449.5	" " - " 18
8+53.5	464.7	" " - " 18
9+00.0	475.2	" 652" - " 55
		(ON AXIS) " 653 - " 56

COPPER DIMENSIONS
5'17"

4-5 Betw EL 575 and EL 540 - Copper 5'17"

contd on page 35

ELEV. & LOCATION of Grout Holes

T.B.M.	0.44	581.58	581.14	5-27-42
A-17-23		11.42	570.16	30' So. Axis sta 11+23 Gravenkamp
A-16-40		7.38	574.20	50' So. Axis sta 10+90 Foster
T.P.	3.83	575.69	571.86	
A-16-20		8.41	567.28	30' So. Axis sta 10+70
A-15-40		11.83	563.86	40' So. Axis sta 10+40
T.P.	9.69	581.55	571.86	
T.B.M.		0.41	581.14	

Elevation Grout Hole 13-12-5

T.B.M.	0.93	484.54	483.61	6-8-42
Top Pipe				Gravenkamp Foster
13-12-5	5.17	584.49	5.22	489.32
T.B.M.		0.88	483.61	

Axis Elev Top of Pipe Rock to be determined later

Elevation Grout Hole 20-31

B.M.	1.34	664.50	663.16
20-31		9.45	655.0
B.M.	9.10	487.07	477.97
Hole # 13-12-5		9.8	477.3

Axis

Aug. 28th 1942

On Axis - Rock Top of grout hole

(CONT'D FROM PAGE 1)

INDEX CONTD

PAGE

Elev. top of 2 1/2" pipes after

final grouting - Hole #2-31,

#2-12⁵, #1-37⁵, #1-12⁵, #5-12⁵,

#5-37⁵, #6-12⁵, #0-43,

#3-12⁵, #3-31⁵, #4-12⁵, #4-37⁵ 29-30

Hole #12-23, #12-24⁹, #13-0, #13-12⁵ 34

Elev. top of 2 1/2" pipes after

final grouting #11-11⁵ and 37

#11-35-

Elev. top of rock - Hole #11-11⁵,

#11-35, #12-11⁶, #18-27⁷, #18-33' 37

Elev. & Location of Grout Hole

#18-27⁷ and #18-33.1 37

Elev. & Location of Grout

Holes #A-12-24⁹ and #A13-5 38

Hole #12-11⁶, #12-34⁹, #A12-24⁹ (top of pipe) 38

(INDEX CONT'D ON PAGE 46)

ELEVATION & LOCATION of
GROUT HOLES

B.M	0.36	483.93		483.57	
P	6.71	479.62	11.02	472.91	
Hole #					
12-23			13.0	466.6	On Rock - Top of grout hole
12-342			6.6	473.0	" " " "
13-0			4.4	475.2	" " " "
13-125			2.1	477.5	" " " "
P	7.07	484.01	2.65	476.97	
B.M		0.48		483.56	Marked EI = 483.57

cont'd from Page 21

ELEV. BOTTOM OF COPPER

WATER STOP

35

REFERENCES

STATION	ELEVATION	FIELD BOOK	PAGE
9+50	494.6	# 655	30
10+00	523.9	"	36
10+50	543.1	"	67
11+00	548.3	# 655	49
11+50	557.1	" " 653	22
12+00	588.1	" " 653	28
12+50	628.1	" " 653	31

(cont'd from Page 28)

FINAL STATIONS FOR

HALE ROUND DRAINS

36

STATION TO STATION

" 8+84.5 to 9+01.3

9+02.0 to 9+21.6

9+23.0 to 9+44.0

9+44.8 to 9+67.3

9+68.5 to 9+83.2

9+84 to 10+06.0

10+07.4 to 10+25.7

10+26.2 to 10+45.0

10+45.8 to 10+62.5

10+63.7 to 10+82.4

10+83.1 to 11+01.7

11+03.4 to 11+26.8

11+28.0 to 11+43.4

11+45.2 to 11+61.7

11+62.5 to 11+83.1

(cont'd on Page 39)

ELEVS - TOP OF 2 1/2" PIPES -

After final grouting

July 11th 1942 (37)

BM			498.19	
	3.24	501.43		
Hole # 11-11 ^{1/2}	4.4		497.0	Top of 2 1/2" grout pipe
" # 11-35	4.4		497.0	" " " "
		3.24	498.19	

ELEV. OF GROUT HOLE

July 11th

BM			471.50	
	2.11	473.61		
Hole # 12-11 ^{1/2}	11.4		462.2	Top of rock
		2.11	473.50	

BM	3.60	584.74	581.14	
Hole # 18-27.7		13.0	571.7	3' south of axis - Dip 75° east
" 18-33.1		9.4	575.3	on axis " 60°?
BM	3.60		581.14 = 581.14	

FLY. & LOCATION OF GROUT HOLE

July 27th
DICKINSON

BM 0.38 483.99 483.61
 HOLE # A12-24¹ 11.13 472.86 STA 8+78.4 - 32.4' so. of AXIS
 0.55 483.61

BM 9.10 487.07 477.97 Aug. 29th
Dickinson

Hole # A13-5 13.5 473.6 STA 9+05 - 53' so. of AXIS
 9.10 477.97

2.15 490.72 483.57 Rogers
 Hole # 12-11⁶ 3.6 487.1 Top of 2 1/2" grout Pipe (Grated) Aug 28
 " # 12-34⁹ 4.1 486.6 " " " " " "
 Hole # A-12-24⁹ 3.4 487.3 " 2" " " " " "

BM 3.78 515.30 511.52
 Hole # A 13-5 4.4 510.9 STA 9+05 - 53' S. Axis Top 2 1/2" Pipe
 " 13-12⁵ 4.0 511.3 Top of 2" Pipe
 Hole # 13-37⁵ 4.0 511.3 " " " "

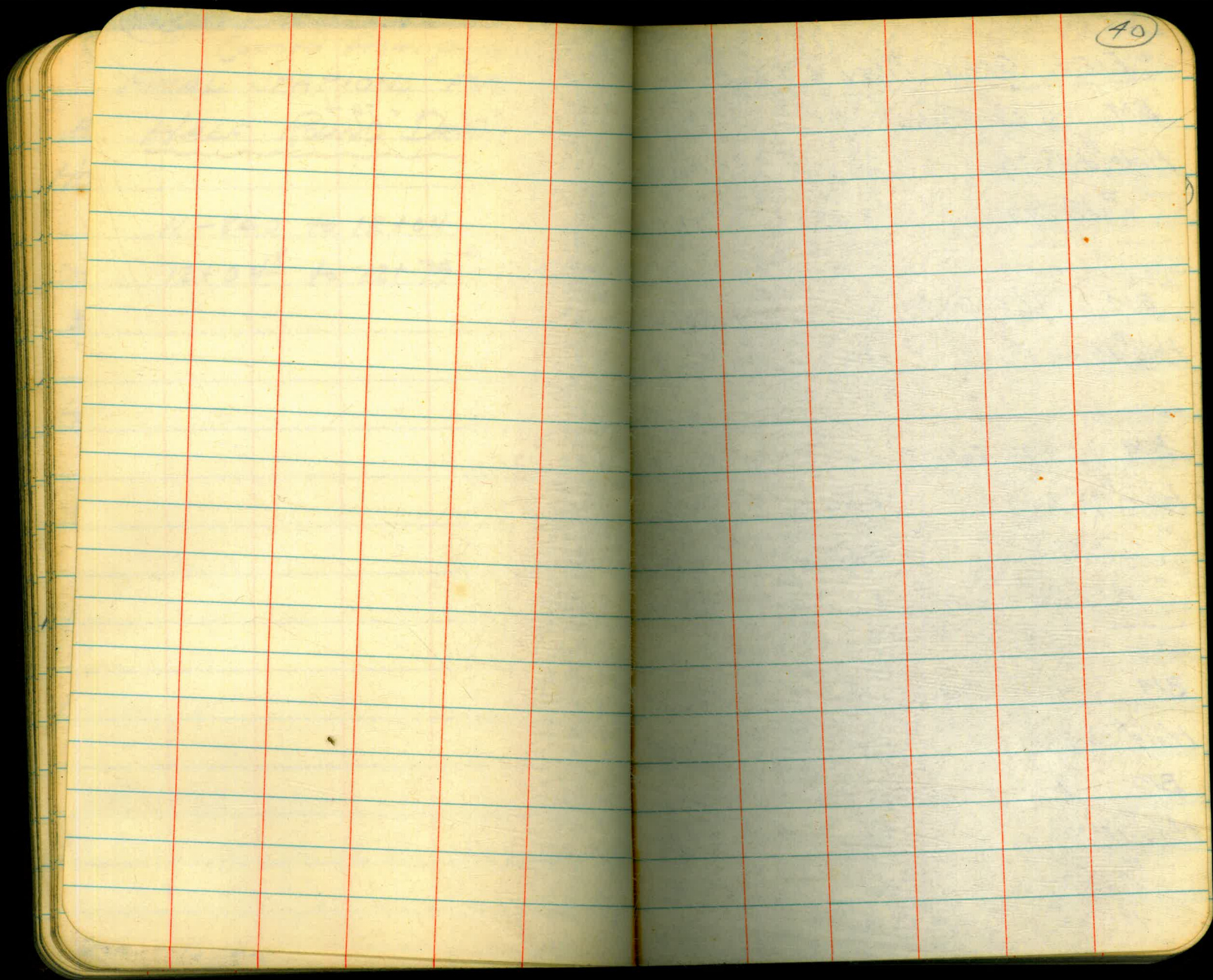
(Cont'd from page 36)
FINAL STATIONS FOR
HALF ROUND DRAIN

11+84.0 to 12+04'

12+04⁸ to 12+79⁴ (End)

(39)

End 12+79.4



Sept 22, 1942

(41)

ELEV. GROUT PIPE'S & HOLES

BM.	5.29	580.62	575.33	(slope 75%)
Hole # A18-29		3.22	577.4	19' so. of Axis - Rock - Top of hole
" # 18-277		3.45	577.17	3' " " " Top of 2 1/2" grout Pipe (Final)

Sept. 25, 1942

BM.	9.68	590.82	581.14	
Hole # 18-331		14.0	576.8	On Axis - Bottom of 2 1/2" grout Pipe

Sept 22, 1942

BM	9.73	600.57	590.84	
Hole # 17-12.5		3.66	596.91	On Axis - Top of 2" grout pipe
" 17-37.5		4.25	596.32	" " " " " "
" A17-23°		3.40	597.17	" " " " " "

(602.5)

Oct 5, 1942

BM	49 ⁴	590.05	585.11	
Hole # 18-33 ¹		3.8	586.3	Top of 2 1/2" grout Pipe (Final)

BM	8.15	621.47	613.32	
Hole # 18-37 ⁵		3.8	617.7	Top of 2" grout pipe
" # A18-29		4.1	617.4	" " 2 1/2" " "
" 18-12 ⁵		3.3	618.2	" " 2" " "

ELEVS - ON ROCK - TOP OF
3" DRAIN HOLES - BOTTOM
OF 8" RISERS

REFERENCES

HOLE #	ELEV.	F. B #	PAGE
13-0			
13-08	476.7 ^{5.7}	Sta 9+08 655	30
13-19	479.8 ^{8.3}	" " " "	"
13-30	484.6 ⁶	" " " "	"
13-40			
14-0	503.9	Sta 9+50 655	"
14-10	510.0	" 9+60 " "	34
14-20	511.8	" 9+70 " "	"
14-30	514.2	" 9+80 " "	"
14-40			
15-0			
15-10			
15-20			

Rough
measurements
See
Page 25
Sta 9+30

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(cont'd from page 42)

(43)

ELEV'S - ON ROCK - TOP OF
3" DRAIN HOLES - BOTTOM
8" RISERS

REFERENCES

F.B.

PAGE

15-30

15-40

16-0

16-10

16-20

16-30

16-40

17-0

17-10

17-20

17-30

17-40

18-0

18-10

18-20

553.9

552.6

550.5

552.0

554.9

556.3

559.7

564.6

571.8

Sta. 10+90) #592

Sta. 11+00)

" 11+10)

" 11+20)

" 11+30)

" 11+40)

" 11+50)

" 11+60)

Sta. 11+70)

24

"

"

"

"

"

"

"

"

? 19

(cont'd on Next page)

(cont'd from page 43)

ELEVS. ON ROCK - TOP OF

3" DRAIN HOLES - BOTTOM

OF 8" RISERS

18-30

574°

(Sta 11780)

F. B. #

PAGE

?

?

18-40

19-0

19-10

ELEVS. OF GROUT HOLES

(45)
Nov 11, 1942

TOP OF 2" PIPES

BM. 495	540.14		535.19	
Hole #14-12 ⁵		4.1	536.0	Top of 2" pipe - after final grouting
" 14-37 ⁵		3.9	536.2	" " " " " "

BM 4.81	565.48		560.67	Nov 28 th
Hole #15-12 ⁵		4.4	561.1	Top of 2" pipe - after final grouting
Hole #15-37 ⁵		4.4	561.1	" " " " " "

	9.61	661.17	651.56	
Hole #20-12 ⁵		4.8	656.4	
" * 20-31		5.5	655.7	

	4.89	640.15	635.26	
Hole #19-37 ⁵		3.5	636.7	" " " " " "
" 19-12 ⁵		3.8	636.4	" " " " " "

INDEX CONTD.

(From page 33)

Hole # A18-29, #18-27, #18-33 Page
" #17-12^s, #17-37^s, #A17-23 41

Elevs - Rock, Top of 3" Drain

Holes - Bottom 8" risers 42-44

Final Profile of Half-Round
Drain, - Sta 10+00 to Sta 11+00.

Pg. 48-49

Elevs of top of grout pipes

Hole # 18-37^s, 18-12^s, A18-29 41

Elevs - Top of grout pipes

Hole # 14-12^s & #14-37^s 45

Elev - Top of grout pipes

Hole # 15-12^s - 15-37^s

Elev - Top 2" Grout Pipes

Hole # 20-12^s, #20-31, #19-37^s

" #19-12^s 45

Elev Top 2" Grout Pipes

Hole # 16-46 and #16-12^s 50

Elev. Top of 2 1/2" Grout Pipes

Hole # A16-20, #A16-40 and #A15-40 50

46

Final Profile of Hall Road
Drain - Station to Station

Station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50																																																																																																																																																																																																																																																																																																																																																															
Elevation	100.0	99.5	99.0	98.5	98.0	97.5	97.0	96.5	96.0	95.5	95.0	94.5	94.0	93.5	93.0	92.5	92.0	91.5	91.0	90.5	90.0	89.5	89.0	88.5	88.0	87.5	87.0	86.5	86.0	85.5	85.0	84.5	84.0	83.5	83.0	82.5	82.0	81.5	81.0	80.5	80.0	79.5	79.0	78.5	78.0	77.5	77.0	76.5	76.0	75.5	75.0	74.5	74.0	73.5	73.0	72.5	72.0	71.5	71.0	70.5	70.0	69.5	69.0	68.5	68.0	67.5	67.0	66.5	66.0	65.5	65.0	64.5	64.0	63.5	63.0	62.5	62.0	61.5	61.0	60.5	60.0	59.5	59.0	58.5	58.0	57.5	57.0	56.5	56.0	55.5	55.0	54.5	54.0	53.5	53.0	52.5	52.0	51.5	51.0	50.5	50.0	49.5	49.0	48.5	48.0	47.5	47.0	46.5	46.0	45.5	45.0	44.5	44.0	43.5	43.0	42.5	42.0	41.5	41.0	40.5	40.0	39.5	39.0	38.5	38.0	37.5	37.0	36.5	36.0	35.5	35.0	34.5	34.0	33.5	33.0	32.5	32.0	31.5	31.0	30.5	30.0	29.5	29.0	28.5	28.0	27.5	27.0	26.5	26.0	25.5	25.0	24.5	24.0	23.5	23.0	22.5	22.0	21.5	21.0	20.5	20.0	19.5	19.0	18.5	18.0	17.5	17.0	16.5	16.0	15.5	15.0	14.5	14.0	13.5	13.0	12.5	12.0	11.5	11.0	10.5	10.0	9.5	9.0	8.5	8.0	7.5	7.0	6.5	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0	0.5	0.0	-0.5	-1.0	-1.5	-2.0	-2.5	-3.0	-3.5	-4.0	-4.5	-5.0	-5.5	-6.0	-6.5	-7.0	-7.5	-8.0	-8.5	-9.0	-9.5	-10.0	-10.5	-11.0	-11.5	-12.0	-12.5	-13.0	-13.5	-14.0	-14.5	-15.0	-15.5	-16.0	-16.5	-17.0	-17.5	-18.0	-18.5	-19.0	-19.5	-20.0	-20.5	-21.0	-21.5	-22.0	-22.5	-23.0	-23.5	-24.0	-24.5	-25.0	-25.5	-26.0	-26.5	-27.0	-27.5	-28.0	-28.5	-29.0	-29.5	-30.0	-30.5	-31.0	-31.5	-32.0	-32.5	-33.0	-33.5	-34.0	-34.5	-35.0	-35.5	-36.0	-36.5	-37.0	-37.5	-38.0	-38.5	-39.0	-39.5	-40.0	-40.5	-41.0	-41.5	-42.0	-42.5	-43.0	-43.5	-44.0	-44.5	-45.0	-45.5	-46.0	-46.5	-47.0	-47.5	-48.0	-48.5	-49.0	-49.5	-50.0	-50.5	-51.0	-51.5	-52.0	-52.5	-53.0	-53.5	-54.0	-54.5	-55.0	-55.5	-56.0	-56.5	-57.0	-57.5	-58.0	-58.5	-59.0	-59.5	-60.0	-60.5	-61.0	-61.5	-62.0	-62.5	-63.0	-63.5	-64.0	-64.5	-65.0	-65.5	-66.0	-66.5	-67.0	-67.5	-68.0	-68.5	-69.0	-69.5	-70.0	-70.5	-71.0	-71.5	-72.0	-72.5	-73.0	-73.5	-74.0	-74.5	-75.0	-75.5	-76.0	-76.5	-77.0	-77.5	-78.0	-78.5	-79.0	-79.5	-80.0	-80.5	-81.0	-81.5	-82.0	-82.5	-83.0	-83.5	-84.0	-84.5	-85.0	-85.5	-86.0	-86.5	-87.0	-87.5	-88.0	-88.5	-89.0	-89.5	-90.0	-90.5	-91.0	-91.5	-92.0	-92.5	-93.0	-93.5	-94.0	-94.5	-95.0	-95.5	-96.0	-96.5	-97.0	-97.5	-98.0	-98.5	-99.0	-99.5	-100.0

PROFILE OF HALF ROUND DRAIN

Supercedes FB. 592 Page 18

11.01 553.43

544.82

10-20-82
Sta. 10+00 to 11+00

Rogers

48

10+00

+07

19.3 536.1

+10

15.9 539.5

RISER 9.7

+14

13.5 541.9

7.3

+20

11.8 543.6

5.6

+21

11.5 543.9

+23

9.3 546.1

+30

6.8 548.6

553.4

6.7

+34

7.3 548.1

5.6

+40

5.4 550.0

6.2

+50

3.3 552.1

+56

1.9 553.5

+59

1.4 554.0

13.1

+60

2.3 553.1

+66

0.8 554.6

+68

2.1 553.3

55543

10+70	3.3	552.1
+76	3.6	551.8
+80	2.5	552.9
+85	1.8	553.6
+90	1.5	553.9
+95	0.6	554.8
+97	2.9	552.5
11+00	2.7	552.7

Revised Profile, — Sta $\left\{ \begin{array}{l} 11+00 \\ 11+60 \end{array} \right.$
 See BK #592, Pg. 24

Profile Continued from Sta. 11+63
 to East End of Dam
 See BK #592 Pg. 19 to 22

ELEV OF GROUT HOLES

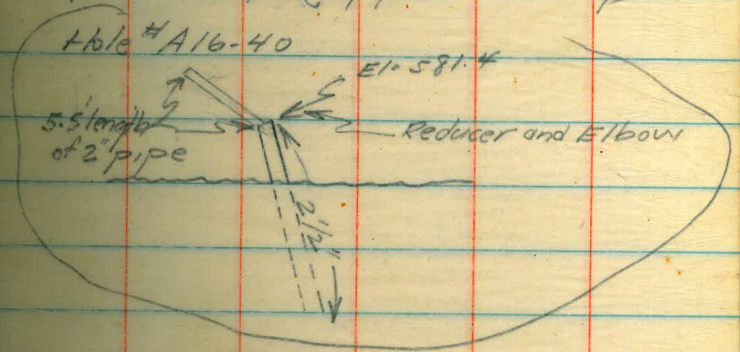
Dec 1st (50)

TOP 2" PIPES

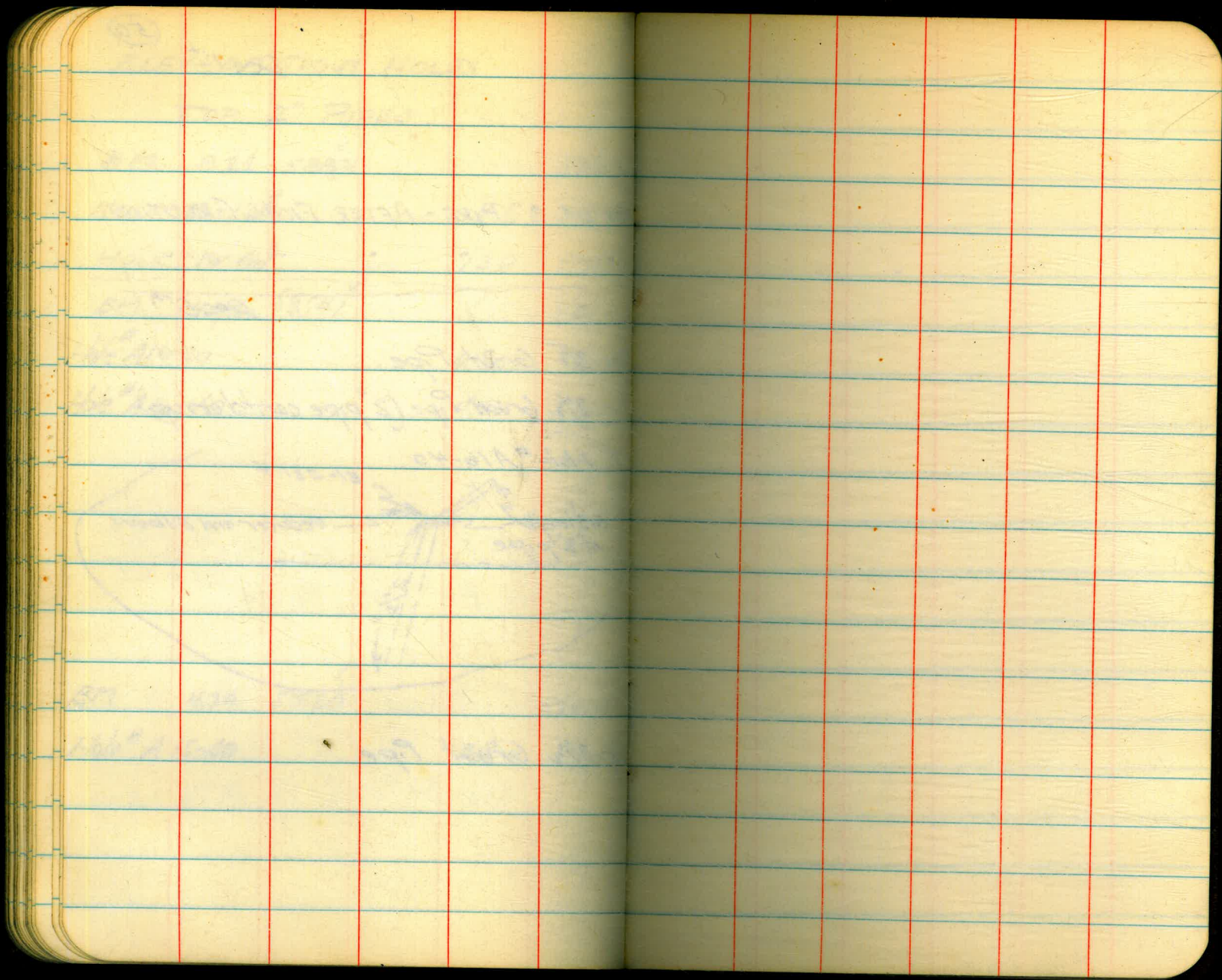
BM 820	58831	580.07	
HOLE # 16-12 ^F	12.6	575.9	TOP OF 2" PIPE - AFTER FINAL GROUTING
HOLE # 16-46 ^o	13.0	575.3	" " " "

Dec 5th

BM 492	58541	580.49	
Hole # A16-20	4.8	580.6	Top 2 1/2" Grout Pipe.
Hole # A16-40	4.0	581.4	2 1/2" Grout Pipe (2" pipe cont'd on up)



BM 479	57520	570.41	
Hole # A15-40	3.8	571.4	Top 2 1/2" Grout Pipe



11456

257

BK1 = 635

BK2 = 605

BK3

8-2

6-5

770

477

293
29
47

18.14

0 7+65.1
754

7+65.1

0 897

7+65.1
41.6
8+0.6.7

7+65.1
288
363

7+65.1

183

834

7+65.1

513

38

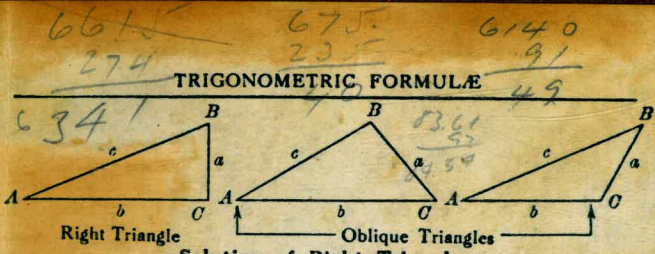
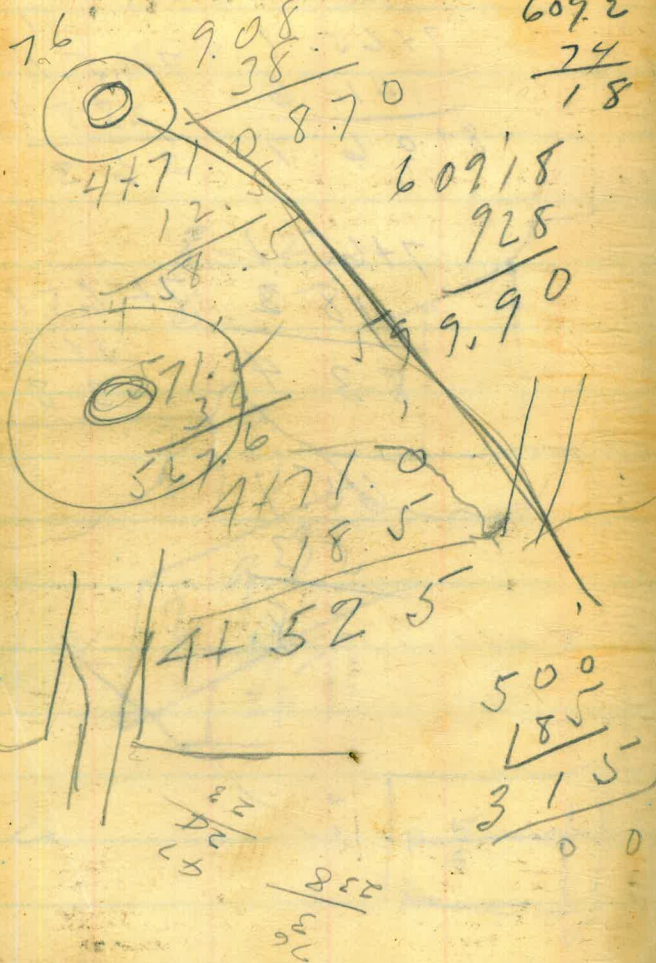
65.1

53

8



5771° 5771
 $\frac{12}{585}$ $\frac{8}{7114}$
 5779 $\frac{116}{1.6}$
 609.2
 $\frac{74}{18}$



Solution of Right Triangles

For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{a}$, $\text{cosec} = \frac{c}{b}$

Given	Required	Formula
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B$, $c = \sqrt{a^2 + b^2} = a \sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B$, $b = \sqrt{(c+a)(c-a)} = c \sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90^\circ - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$
A, b	B, a, c	$B = 90^\circ - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$
A, c	B, a, b	$B = 90^\circ - A$, $a = c \sin A$, $b = c \cos A$

Solution of Oblique Triangles

Given	Required	Formula
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a}$, $C = 180^\circ - (A + B)$, $c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180^\circ - C$, $\tan \frac{1}{2}(A - B) = \frac{(a - b) \tan \frac{1}{2}(A + B)}{a + b}$ $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a + b + c}{2}$, $\sin \frac{1}{2}A = \sqrt{\frac{(s - b)(s - c)}{bc}}$ $\sin \frac{1}{2}B = \sqrt{\frac{(s - a)(s - c)}{ac}}$, $C = 180^\circ - (A + B)$
a, b, c	Area	$s = \frac{a + b + c}{2}$, $\text{area} = \sqrt{s(s - a)(s - b)(s - c)}$
A, b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
A, B, C, a	Area	$\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL

Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = $5^\circ 10'$. From Table, Page IX, $\cos 5^\circ 10' = .9959$. Horizontal distance = $319.4 \times .9959 = 318.09$ ft.
 Horizontal distance also = Slope distance minus slope distance times (1 - cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. $\cos 5^\circ 10' = .9959$. $1 - .9959 = .0041$. $319.4 \times .0041 = 1.31$. $319.4 - 1.31 = 318.09$ ft.
 When the rise is known, the horizontal distance is approximately: - the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft. slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.