

VALUABLE
 RETURN TO
 PUBLIC WORKS
 OFFICE
 CAMP LEJEUNE
 NORTH CAROLINA

 SUBJECT TRAVERSE TO LOCATE
HUTS IN TANK
PARK AREA.

FIELD PARTY

 DENNIS IN CHARGE
 DENNIS INSTRUMENT
 NOTES
 MORTON TAPE READ
 PADRICK TAPE OR ROD
 TAPE OR ROD
 INSTRUMENT No.
 TAPE No.

WEATHER

 CLEAR SNOW
 CLOUDY HOT
 WINDY MODERATE
 RAIN COLD
 FAIR FOG
 FIGURED BY
 NOTES CHECKED BY
 PLOTTED BY
FILE No. 160-5

FLDR. No. _____

SHEET 1 of 6DATE 5-21 1959

Quad. No. _____

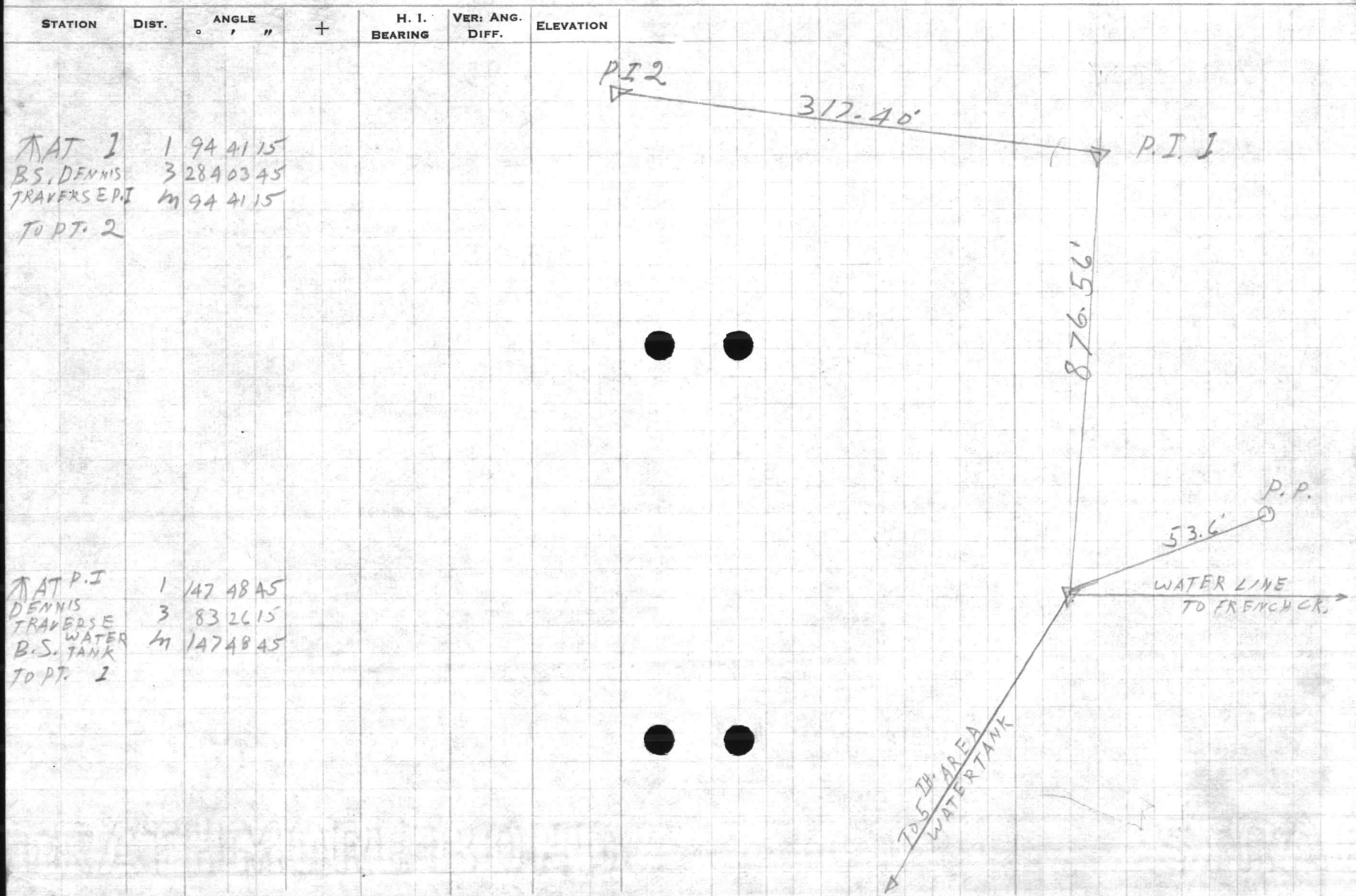




TABLE SUBJECT

WEATHER
WIND
TEMP
PRESS
HUMIDITY
SEA
STATE

DATE

TIME

PLACE

NO.

TABLE NO.

NO.

STATION
DATE
TIME
LATITUDE
LONGITUDE
ELEVATION



11-11-50

STATE OF NORTH CAROLINA
COUNTY OF ...

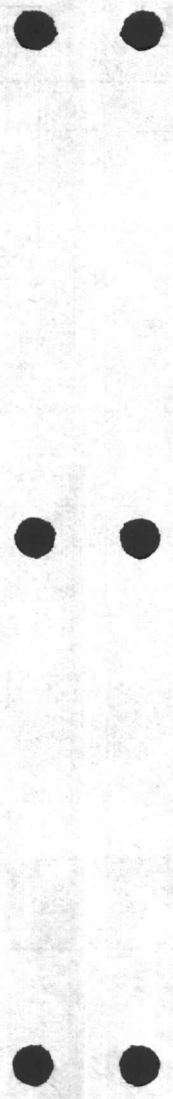
Plaintiff vs. Defendant

Case No. ...

Filed for ...

FILED EARLY
IN CHARGE
INVEST. WORK
WATER
TABLE OR FOD
TABLE OR FOD
TABLE OR FOD
TABLE NO.

FILED EARLY
IN CHARGE
INVEST. WORK
WATER
TABLE OR FOD
TABLE OR FOD
TABLE OR FOD
TABLE NO.



TABLE

SUBJECT

REG. NO.
RANGE
CLICE
LAND
NORTH CAROLINA

STATION DIST

ANGLE

BEARING

H. VERT. AND ELEVATION

TAP NO.

KN. INT. NO.

TAP OR BOP

TAP OR BOP

TAP READ

DATE

TIME

WIND

TEMP

WEATHER

TIME

FROM

TO

DAY



VALUABLE

SUBJECT _____

RETURN TO
PUBLIC WORKS
OFFICE
CAMP LEJEUNE
NORTH CAROLINA

FIELD PARTY

IN CHARGE

INSTRUMENT

NOTES

TAPE READ

TAPE OR ROD

TAPE OR ROD

INSTRUMENT No.

TAPE No. _____

WEATHER

CLEAR

CLOUDY

WINDY

RAIN

FAIR

SNOW

HOT

MODERATE

COLD

FOG

FIGURED BY _____

NOTES CHECKED BY _____

PLOTTED BY _____

FILE No. _____

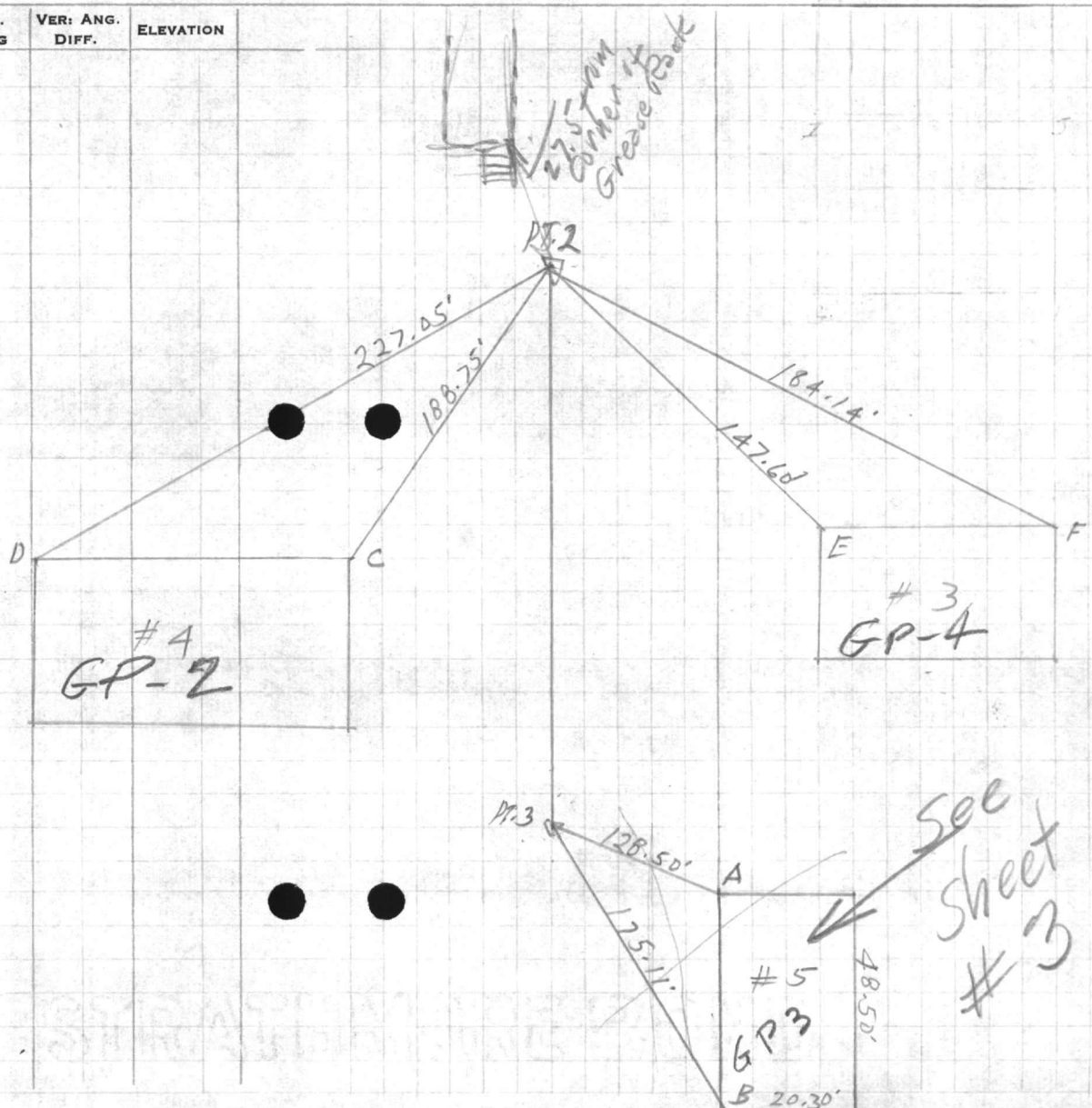
FLDR. No. _____

SHEET 4 of 4

DATE _____ 19__

Quad. No. _____

STATION	DIST.	ANGLE ° ' "	+	H. I. BEARING	VER: ANG. DIFF.	ELEVATION
A B.S. TO C	1	42 12 00				
	2	84 24 00				
	M	42 12 00				
D	1	50 26 00				
	2	100 52 00				
	M	50 26 00				
E	1	314 24 00				
	2	268 48 00				
	M	314 24 00				
F	1	303 29 00				
	2	246 58 00				
	M	303 29 00				
A B.S. TO A	1	158 37 15				
	2	317 14 30				
	M	158 37 15				
TO B	1	143 43 00				
	2	327 26 00				
	M	143 43 00				



11

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FIELD PARTY

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VALUABLE

SUBJECT _____

RETURN TO
PUBLIC WORKS
OFFICE
CAMP LEJEUNE
NORTH CAROLINA

FIELD PARTY

 _____ IN CHARGE
 _____ INSTRUMENT
 _____ NOTES
 _____ TAPE READ
 _____ TAPE OR ROD
 _____ TAPE OR ROD
 _____ INSTRUMENT No.
 _____ TAPE No.

WEATHER

 CLEAR SNOW
 CLOUDY HOT
 WINDY MODERATE
 RAIN COLD
 FAIR FOG

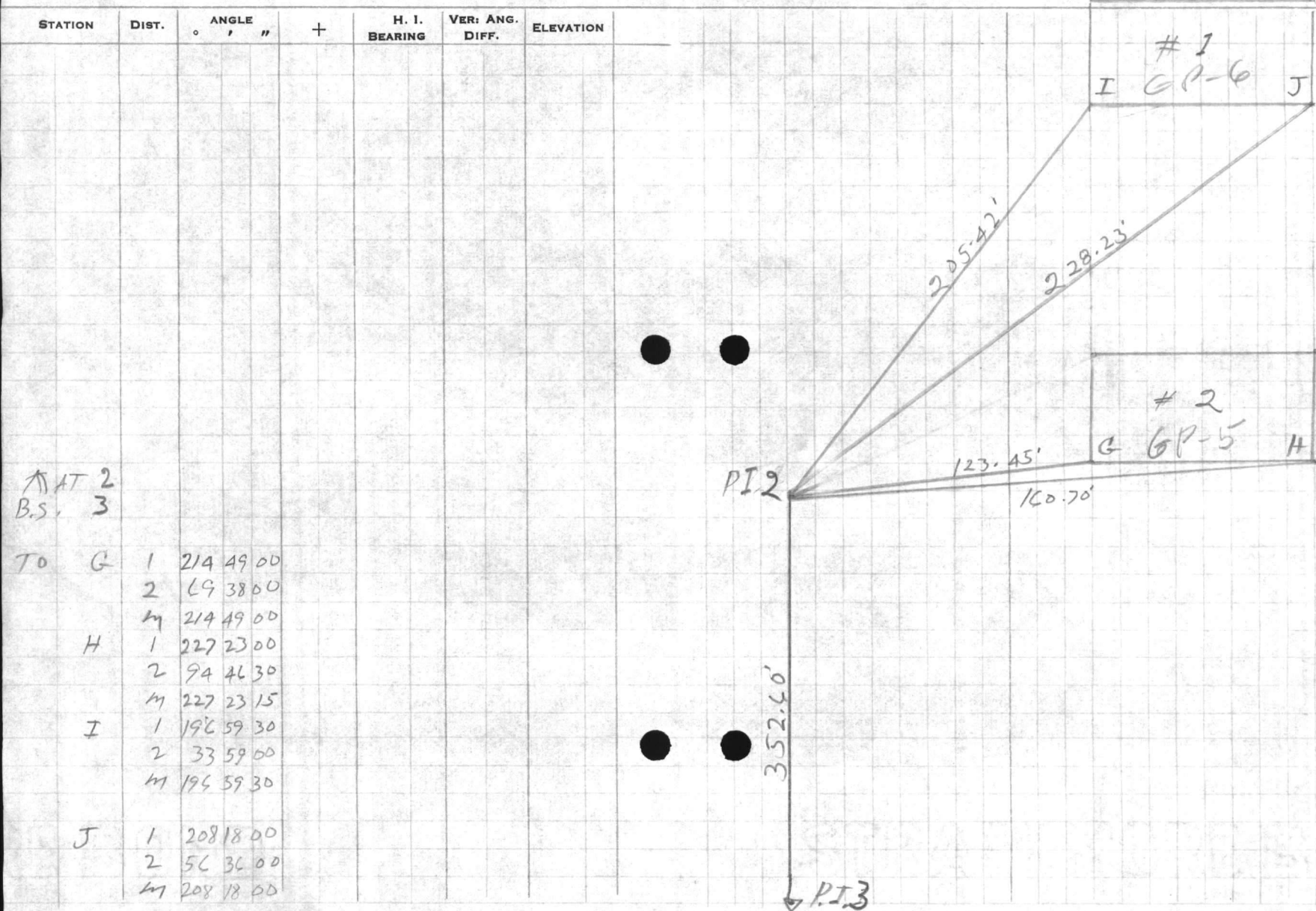
FILE No. _____

FLDR. No. _____

SHEET 5 of
 FIGURED BY _____
 NOTES CHECKED BY _____

PLOTTED BY _____ DATE _____ 19__

Quad. No. _____



VALUABLE

SUBJECT _____

RETURN TO
 PUBLIC WORKS
 OFFICE
 CAMP LEJEUNE
 NORTH CAROLINA

FIELD PARTY

 IN CHARGE

 INSTRUMENT

 NOTES

 TAPE READ

 TAPE OR ROD

 TAPE OR ROD

 INSTRUMENT No. _____
 TAPE No. _____

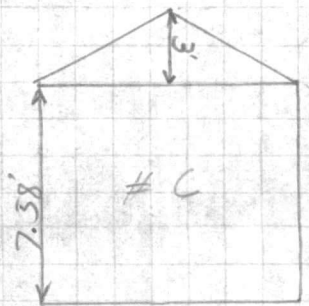
WEATHER

CLEAR
 CLOUDY
 WINDY
 RAIN
 FAIR
 SNOW
 HOT
 MODERATE
 COLD
 FOG
 FIGURED BY _____
 NOTES CHECKED BY _____
 PLOTTED BY _____

FILE No. 160-5
 FLDR. No. _____
 SHEET 6 of 6
 DATE 5-21 1959

Quad. No. _____

STATION	DIST.	ANGLE ° ' "	+	H. I. BEARING	VER: ANG. DIFF.	ELEVATION	
B.m.				5 28 30.90		25.62	FLOOR BLDG. # 739
						3 57 27.33 ✓	# 1
						4 39 26.51 26.55	# 2
T.P.						7 36 23.54	
				1 38 24.92			
						2 92 22.60 22.60	# 3
						1 67 23.25 23.16	# 4
						7 24 17.68 ✓	# 5
						7 86 17.06 ✓	# 6
T.P.						0.44 24.48	
				6 61 31.09			
B.m.						5 48 25.61 <u>25.62</u>	FL. BLDG. # 739



WOOD FL.
 METAL SIDES
 CANVAS ROOF

11-11-41

ALABAMA

ACTIVITY
FIELD NO.
CAMP
CAMP LEADER
NORTH CAROLINA

SUBJECT

STATION DIST

ANGLE

BEAR

VERT. AND ELEVATION
DATE

WEATHER

WIND DIRECTION

WIND FORCE

WIND STATE

WIND

WIND

WIND DIRECTION

WIND FORCE

WIND STATE

WIND

WIND DIRECTION

WIND FORCE

WIND STATE

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WIND DIRECTION

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WIND DIRECTION

WIND FORCE

WIND STATE

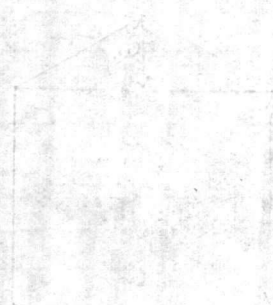
WIND

WIND DIRECTION

WIND FORCE

WIND STATE

WIND



VALUABLE

RETURN TO
PUBLIC WORKS
OFFICE
CAMP LEJEUNE
NORTH CAROLINA

SUBJECT

Test Well Site
French Creek Road
South of Main Service Road

FIELD PARTY
Dillon IN CHARGE
____ INSTRUMENT
____ NOTES
____ TAPE READ
____ TAPE OR ROD
____ TAPE OR ROD
____ INSTRUMENT NO.
____ TAPE NO.

WEATHER
CLEAR _____ SNOW _____
CLOUDY _____ HOT _____
WINDY _____ MODERATE _____
RAIN _____ COLD _____
FAIR _____ FOG _____
FIGURED BY _____ SHEET _____
NOTES CHECKED BY _____
PLOTTED BY _____ DATE 11/19/1959
Quad. No. _____

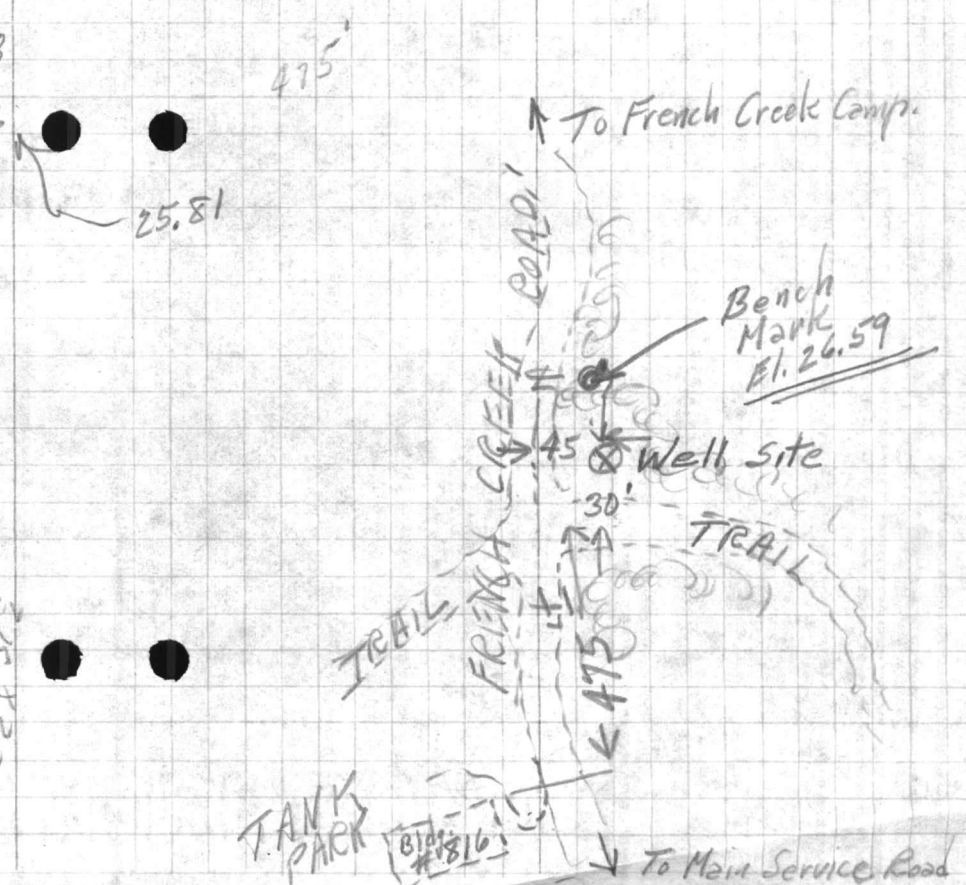
FILE No. 160-5
FLDR. No. _____

STATION	DIST.	ANGLE ° ' "	+	H. I. BEARING	VER: ANG. DIFF.	ELEVATION
B.M.						25.22
		6.05		31.27	4.25	27.02
		6.56		33.58	6.99	<u>26.59</u>
B.M.		0.84		27.43	6.24	21.19
		5.27		26.46	5.63	20.83
		8.26		29.09	3.33	25.76

On Pole RT-8, Angle Pole, Elec. Line to French Creek

Spike in 24" Oak 40' S.E. of Well Site, 30' West of French Creek Road.

Fl. Elev. Bldg #746



STATION
DATE
TIME
ELEVATION

SUBJECT

AMOUNT

WIND DIRECTION
WIND FORCE
WIND VELOCITY
WIND STATE
WIND TYPE
WIND CLASS
WIND CODE
WIND SYMBOL

WIND SPEED
WIND VELOCITY
WIND STATE
WIND TYPE
WIND CLASS
WIND CODE
WIND SYMBOL

WIND DIRECTION
WIND FORCE
WIND VELOCITY
WIND STATE
WIND TYPE
WIND CLASS
WIND CODE
WIND SYMBOL

VALUABLE

RETURN TO
PUBLIC WORKS
OFFICE
CAMP LEJEUNE
NORTH CAROLINA

SUBJECT FLOOR ELEVATIONS
OF BUILDINGS IN TANK
PARK AREA

FIELD PARTY

____ IN CHARGE
____ INSTRUMENT
____ NOTES
____ TAPE READ
____ TAPE OR ROD
____ TAPE OR ROD
____ INSTRUMENT NO.
____ TAPE NO.

WEATHER

CLEAR _____
CLOUDY _____
WINDY _____
RAIN _____
FAIR _____

SNOW _____
HOT _____
MODERATE _____
COLD _____
FOG _____

FILE No. _____

FLDR. No. _____

FIGURED BY _____ SHEET 1-07

NOTES CHECKED BY _____ DATE 8-27 1959

PLOTTED BY _____

Quad. No. _____

STATION	DIST.	ANGLE ° ' "	+	H. I. BEARING	VER: ANG. DIFF.	ELEVATION
B.M.						25.62
		5.20		30.82		
					3.48	27.34
T.P.					5.91	24.91
		3.79		28.70		
					2.15	26.55
					6.10	22.60
					5.54	23.16
T.P.					6.61	22.09
		1.28		23.37		
					5.69	17.68
					6.31	17.06
B.M.					4.87	18.50 (18.40)

FLOOR Bldg. #739

FLOOR Quonset Hut #1 GP-6

FLOOR Quonset Hut #2 GP-5

" " " #3 GP-4

" " " #4 GP-2

FLOOR Quonset Hut #5 GP-3

" Bldg. #6

FLOOR of well House #624

Line No.

WEATHER

FIELD PARTY

SNOW
HOT
FOG
CLOUD
RAIN
FST

RAIN CHASE
CLEAR
IMPROVEMENT
L.P. DATE

FOUNDED BY
NOTED ON ROAD
CROSS BY

ONE YEAR
TANK OR LOG
TANK OR LOG

LINE NO.

LINE NO.

VEG. AND
ELEVATION

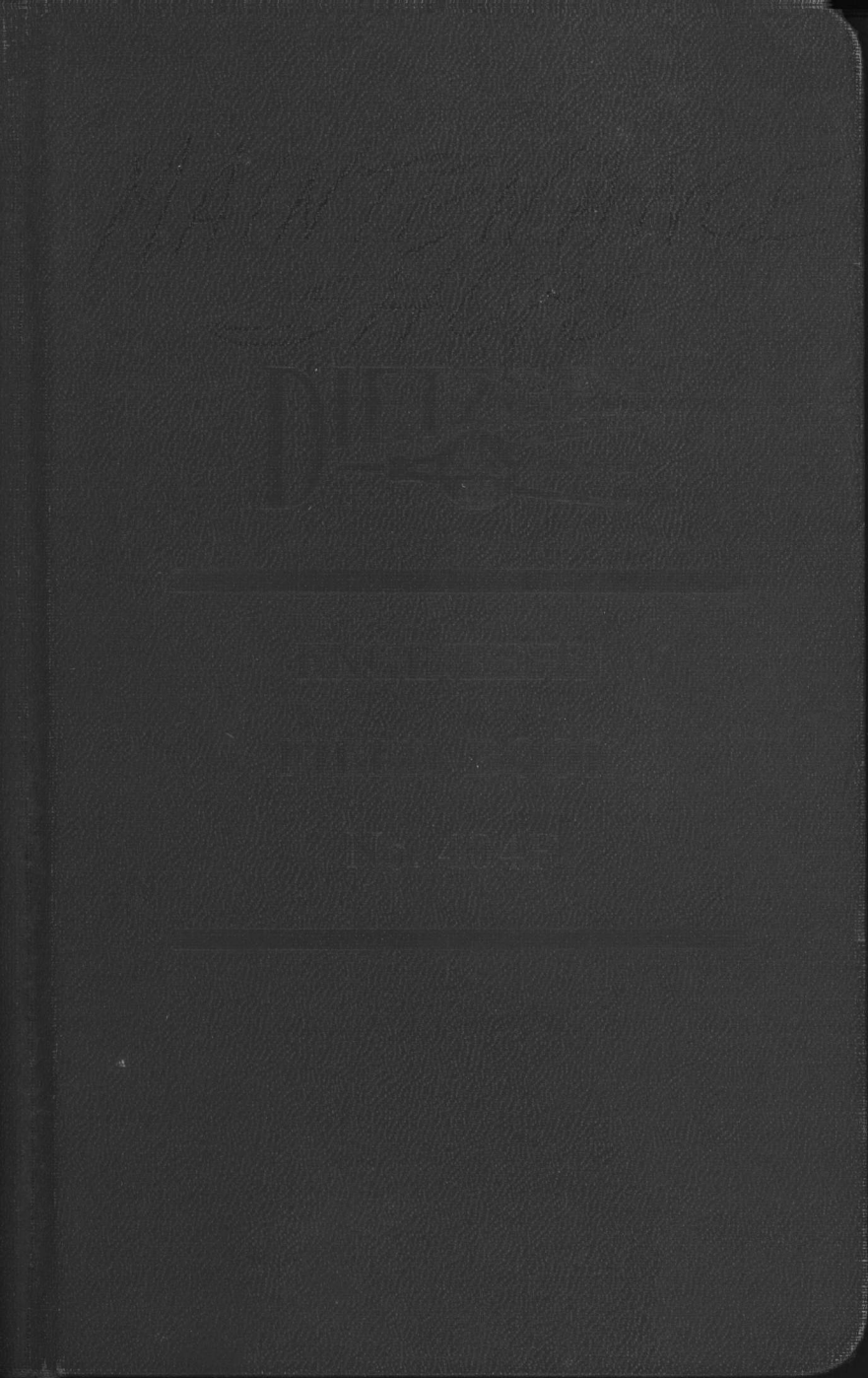
BLK. NO.

LINE NO.

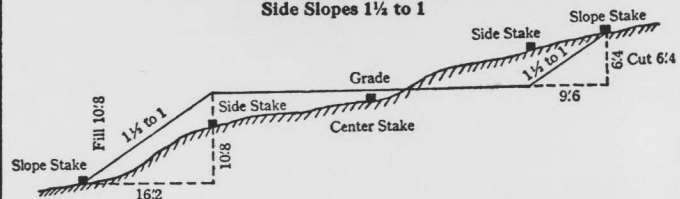
STATION DIST.

LINE NO.
BLK. NO.
STATION DIST.

1914



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING
Roadway of any Width
Side Slopes 1 1/4 to 1



In the figure above: Opposite 6 under "Cut or Fill" and under .4 read 9:6 the distance from the side stake to the slope stake at right. Opposite 10 under "Cut or Fill" and under .8 read 16:2, the distance from the side stake to the slope stake at the left.

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
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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

EUGENE DIETZGEN CO.

Comm. No 3464

File 160-S

NBY 40480

Property of J. N. PEASE

3 COMPANY

Address 2925 E. INDEPENDENCE
BLVD

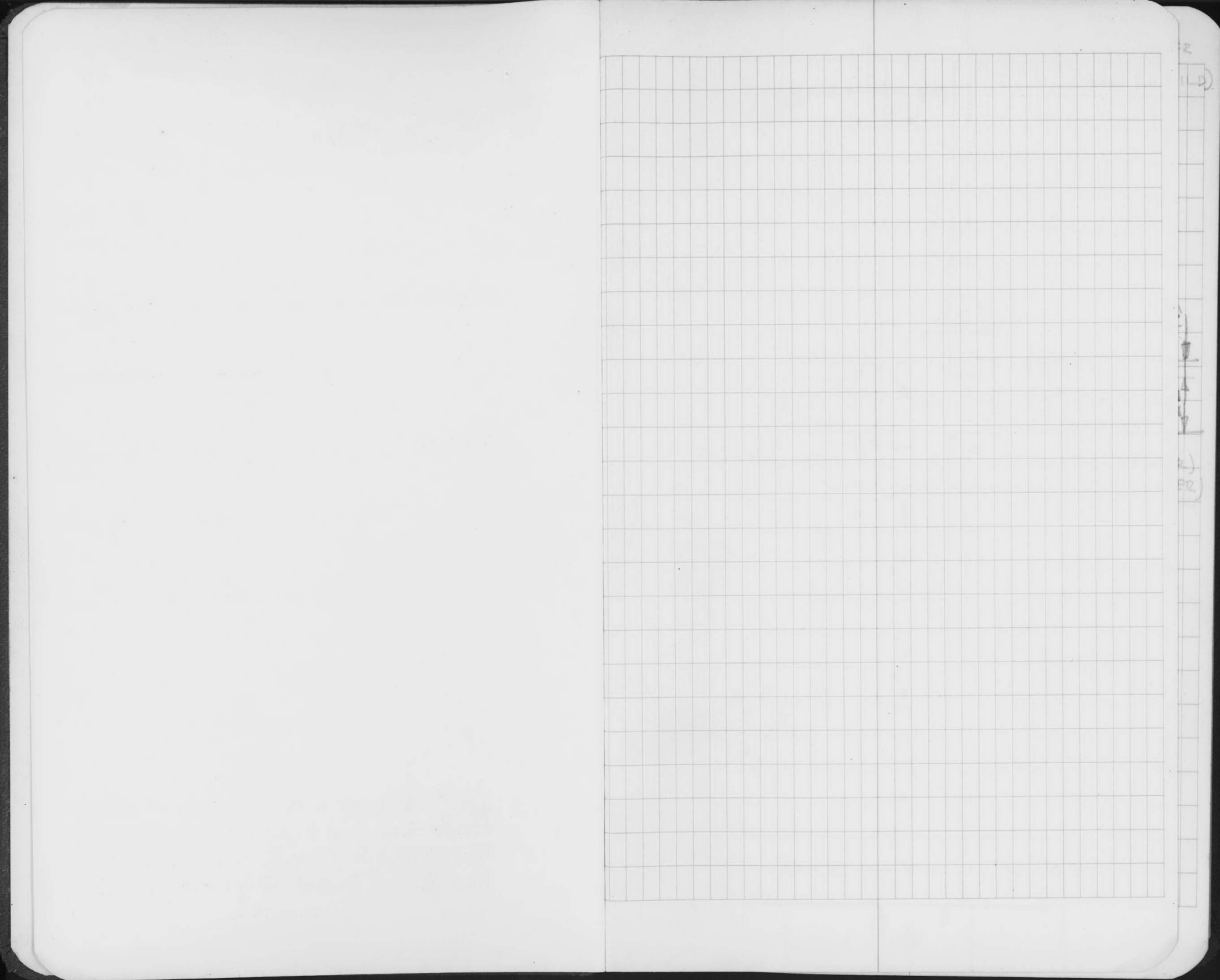
CHARLOTTE N.C.

Phone FR-66423

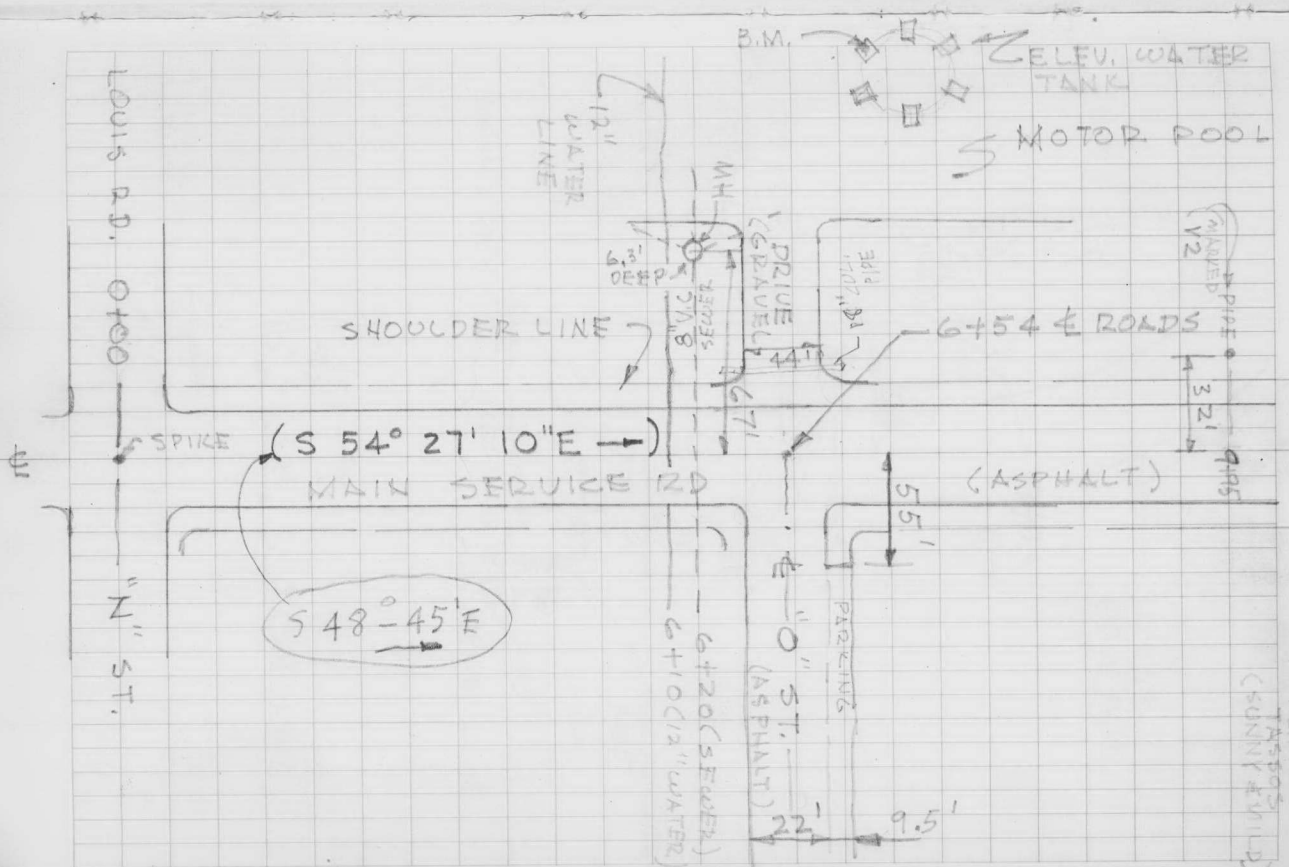
CAMP LEJUNE
JACKSONVILLE N.C.

This Field Book is manufactured of a High Grade 50% Rag Paper having a WATER RESISTING SURFACE, and is sewed with Bing Special Enamel Waterproof thread.

Made in U. S. A.



24.98
 6.25
 18.73

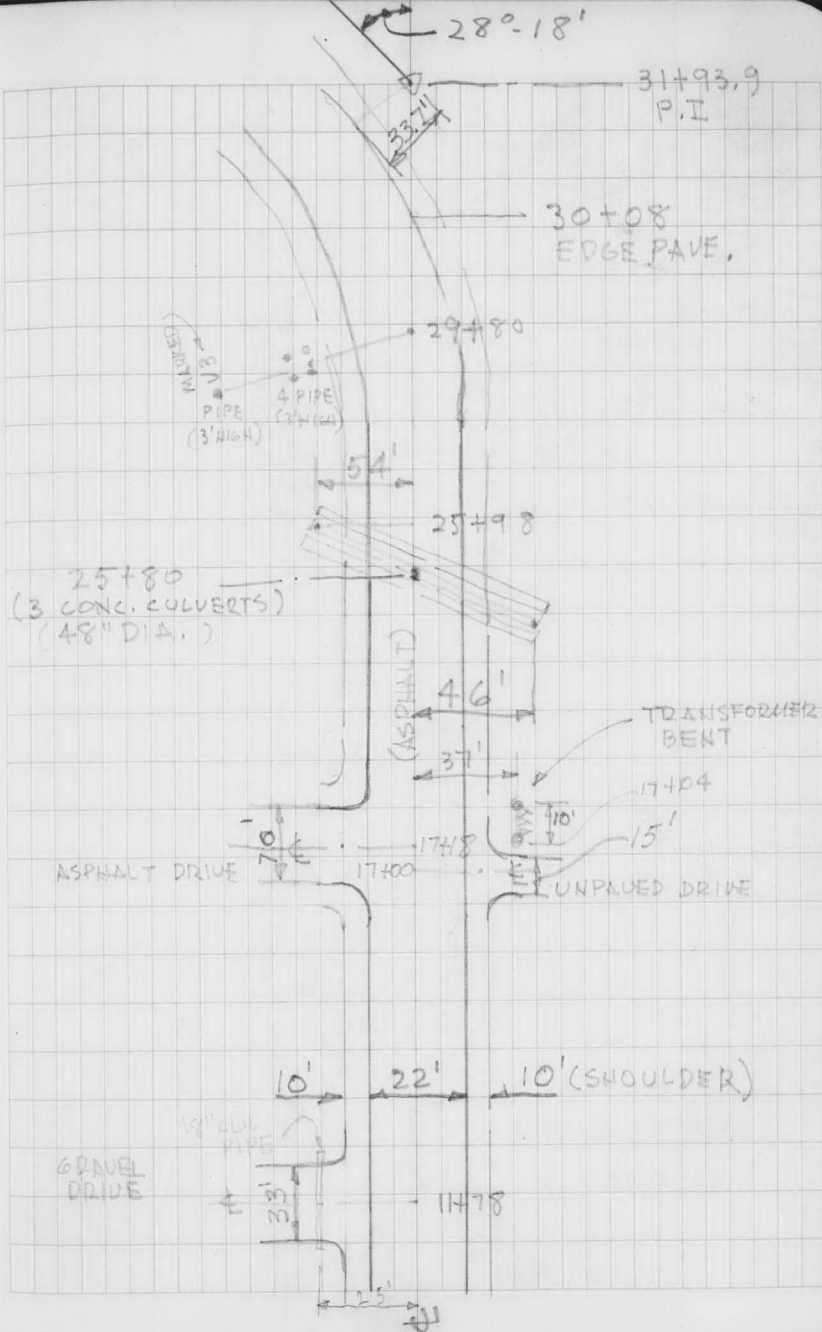


PAUCAM
 PAGE
 PENNUSER
 TASSOS
 (SUNNY & WILD)

NO COVER PAV

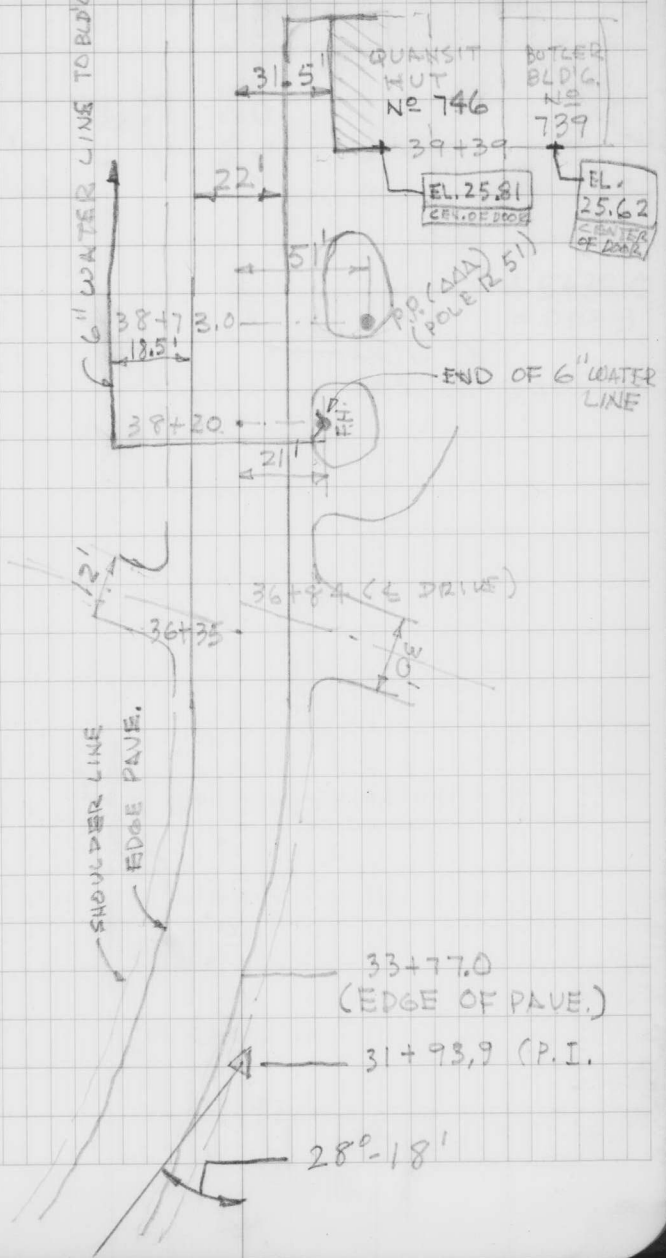
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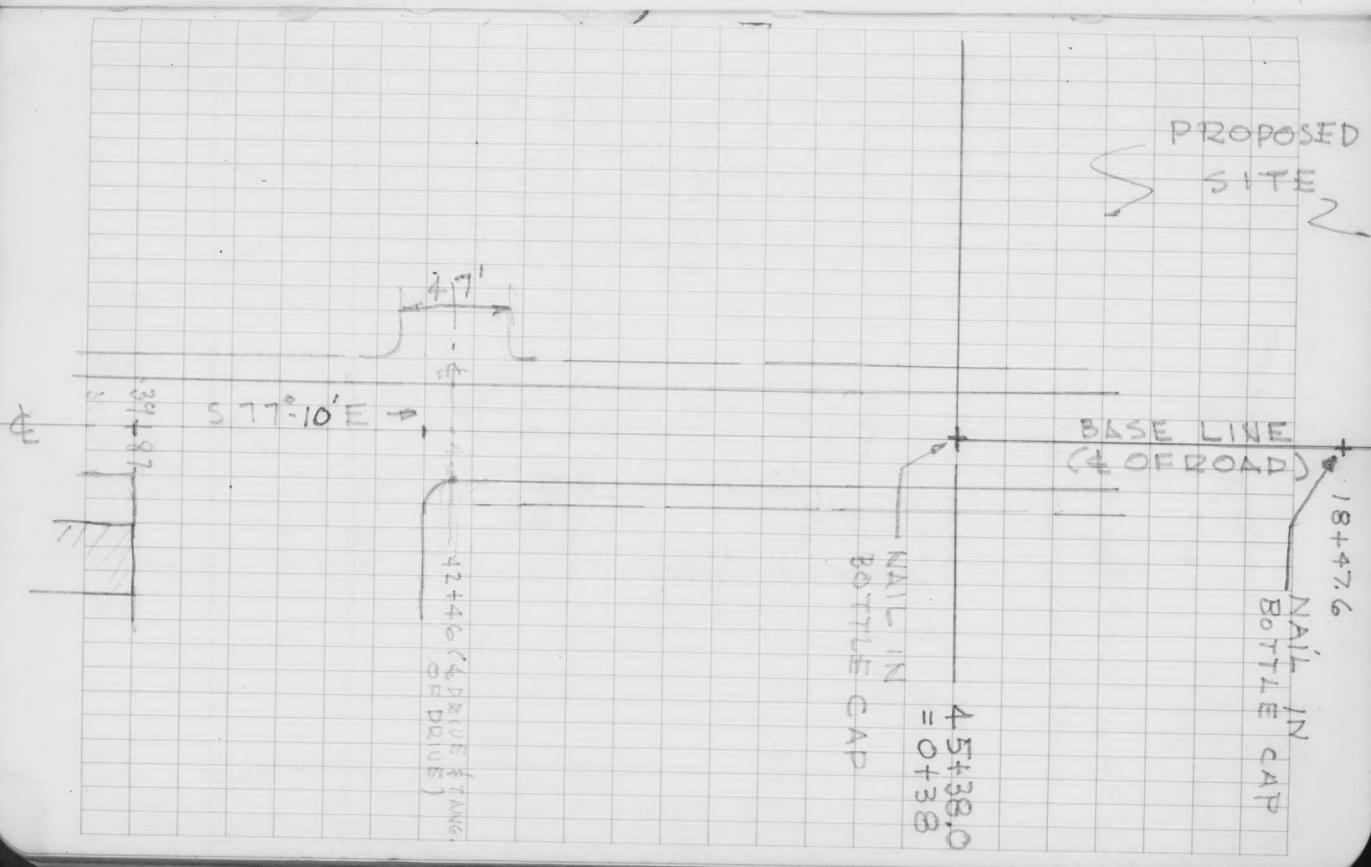
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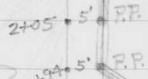
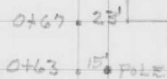
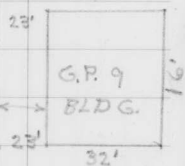
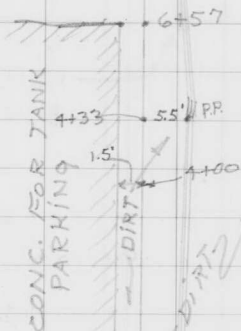
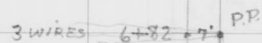
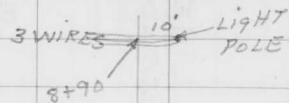


6" WATER LINE TO BLDG. N° 6P-1

U

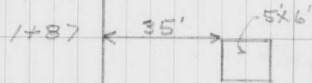
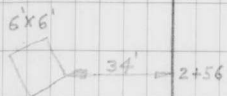






TOPO SITE GRID LINES

PAGE
BALCON
PENNYER
"HOT"



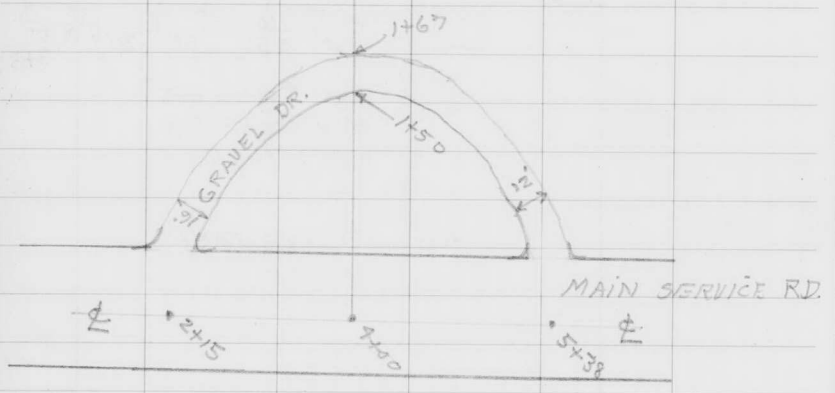
"
BLDG HAVE DIRT OR
WOODEN BOTTOMS.
"

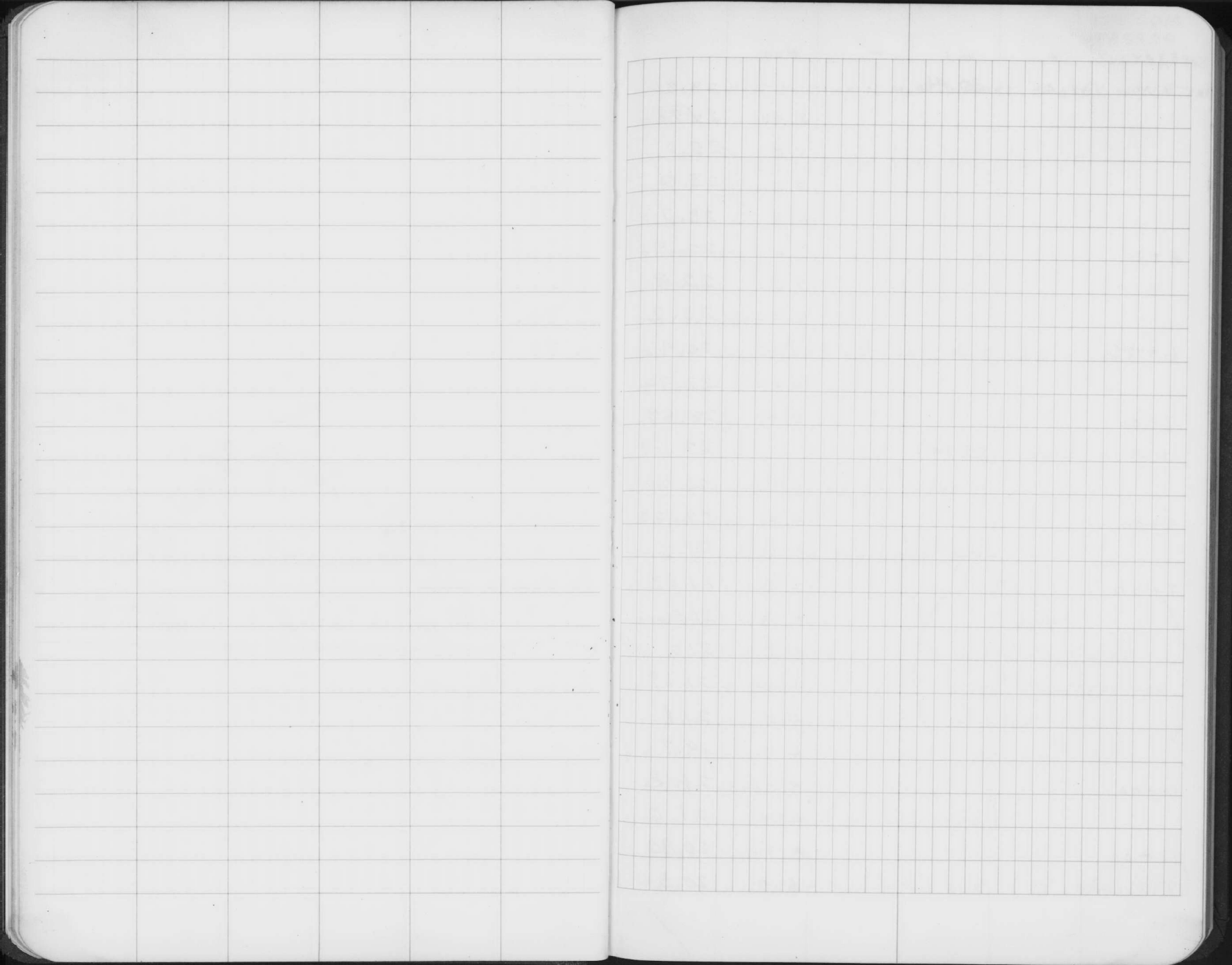


STORAGE TANK
IN SIDE

MAIN SERVICE RD.







BAUCOM
TASSOS
JULY 11, 1962

STA.	+	H.I.	-	ROD
B.M.	1.61	30.46		28.85
				5.48 24.98
				5.5 25.0
				7.5 23.0
				6.8 23.7
6+00				7.6 22.9
				7.6 22.9
				7.3 23.2
6+05				10.00 20.46
				7.52 22.94
7+00				7.77 22.69
T.P.	3.05	25.74	7.77	22.69
				5.74 20.00
8+00				3.71 22.03
				4.2 21.5
7+00				3.91 21.83
				4.18 21.56
				4.5 21.2
				4.05 21.69
				4.6 21.1
				6.0 19.7
10+00				4.56 21.18
				4.7 21.0
11+00				4.94 20.80
				5.2 20.5

Top of N. Most Bolt of N. Most Support of Elev. Water Tank
RIM M.H.
Top BNK. } OPPOSITE MH AT DRIVE
Bot. }
E DRIVE }
E RD. ✓
EDGE PAY.
Top shoulder
INV. 18" CULV. (25 ft from E ROAD - left)
E INTERS.
TP & E
INV. 18" CULV. (25 FT. LT. 7+04)
EDGE PAY.
Top shoulder or Top ditch BNK.
E
RT. EDGE PAY.
RT. Top shoulder
LT. EDGE PAY.
Top shoulder
E DITCH
EDGE PAY.
Top shoulder (12' shoulder)
EDGE PAY.
Top shoulder - Top ditch BNK (12' shoulder)

(Note
UNLESS OTHERWISE
NOTED SHOULDERS ARE
10' WIDE)

STA.	+	H.I.	-	ROD
12+00		25.74		5.25 20.49
				5.50 20.24
				5.8 19.9
				5.47 20.27
				5.8 19.9
T.P.	2.10	22.58	5.26	20.48
12+00				5.6 17.0
13+00				2.82 19.76
				3.2 19.4
14+00				3.54 19.04
				3.9 18.7
15+00				4.24 18.34
				4.62 17.96
				5.2 17.4
				4.28 18.30
				4.8 17.8
				7.4 15.2
16+00				5.08 17.50
				5.4 17.2
17+03				5.82 16.76
16+80				8.97 13.61
17+00				5.82 16.76
				5.82 16.76
				5.63 16.95
18+00				7.10 15.48

& RD.
 RT. EDGE PAV.
 TOP SHOULDER (12' SHOULDER)
 LT. EDGE PAV.
 TOP SHOULDER (12' SHOULDER)
 STA. 12+00
 & DITCH
 EDGE PAV.
 TOP SHOULDER
 EDGE PAV.
 TOP SHOULDER (9' SHOULDER)
 & RD.
 RT. EDGE PAV.
 RT. TOP SHOULDER
 EDGE PAV.
 TOP SHOULDER
 & DITCH (25' FROM & RD.)
 EDGE PAV.
 TOP SHOULDER
 OVER 30" CORR. METAL CULV. (& RD.)
 25' LT. INV. 30" CORR. METAL CULV.
 & RD.
 EDGE PAV. (BEGINNING OF DRIVE)
 LT. 12' (ON PAV.)
 & RD.

?
 ?
))

STA.	+	H.I.	-	ROD
18+00		22.58		7.16 15.42
				7.6 15.0
				7.33 15.25
				7.5 15.1
				8.1 14.5
T.P.	1.17	16.68	7.07	15.51
19+00				2.55 14.13
				3.0 13.7
20+00				3.93 12.75
				4.3 12.4
21+00				5.05 11.63
				5.20 11.48
				5.5 11.2
				5.16 11.52
				5.3 11.4
				6.2 10.5
22+00				6.49 10.19
				6.8 9.9
23+00				7.66 9.02
				8.2 8.5
T.P.	3.86	12.96	7.58	9.10
24+00				4.35 8.61
				4.50 8.46
				4.9 8.1
				4.46 8.50

RT. EDGE PAV.
 Top SHOULDER RT.
 EDGE PAV.
 Top SHOULDER
 & DITCH
 STA. 18+00
 EDGE PAV.
 Top SHOULDER (13' SHOULDER)
 EDGE PAV.
 Top SHOULDER (12' SHOULDER)
 & RD.
 LT. EDGE PAV.
 LT. Top SHOULDER
 EDGE PAV.
 Top SHOULDER (16' SHOULDER)
 & DITCH (LT. 30' FROM & RD.)
 EDGE PAV.
 Top SHOULDER (15' SHOULDER)
 EDGE PAV.
 Top SHOULDER (15' SHOULDER)
 & RD.
 RT. EDGE PAV.
 RT. Top SHOULDER
 EDGE PAV.

STA.	+	H. I.	-	ROD
24+00		12.96		4.9 8.1 7.4 5.6
25+00				4.48 8.48 4.9 8.1
26+00				4.43 8.53 4.6 8.4
25+80				14.02 -1.06 9.56 3.40 13.48 -0.52 9.11 3.85
27+00				3.31 9.65 3.20 9.76 3.1 9.9 3.64 9.32 3.8 9.2 5.6 7.4
T. P.	7.59	17.23	3.32	9.64
28+00				7.01 10.22 7.8 9.4 8.3 8.9
29+00				5.30 11.93 6.07 11.16
30+00				4.23 13.00 3.89 13.34 3.5 13.7

Top shoulder

LT. 42'

EDGE PAY.

Top shoulder

EDGE PAY.

Top shoulder

LT. INV. 48" CONC. CULV. (CENTER PIPE)

Top pipe (LT. END)

RT. INV. 48" CONC. CULV.

Top pipe (RT. END)

± RD.

RT. EDGE PAY.

RT. Top shoulder

EDGE PAY.

Top shoulder

LT. 33' ± ditch

EDGE PAY.

Top shoulder (7' shoulder)

± ditch (22' LT. FROM ± RD)

± RD. (2' LT. OF LINE)

EDGE PAY. (13' LT. OF LINE)

± RD. (10' LT. OF LINE)

EDGE PAY. (1' RT.)

Top shoulder RT.)

14.02

12.96

1.06

13.48

12.96

-0.52

STA.	+	H.I.	-	ROD.
30+00		17.23		4.85 12.38
				5.4 11.8
				6.2 11.0
31+00				2.54 14.69
				2.2 15.0
				2.98 14.25
				3.57 13.66
				4.5 12.7
				4.8 12.4
T.P.	6.98	22.11	2.10	15.13
				6.3 15.8
				6.42 15.69
				6.96 15.15
				7.57 14.54
				8.4 13.7
				8.7 13.4
33+00				6.43 15.68
				7.3 14.8
34+00				5.19 16.92
				5.6 16.5
35+00				3.94 18.17
				4.3 17.8
T.P.	7.96	26.84	3.23	18.88
36+00				6.95 19.89
				6.66 20.18

23' LT. EDGE PAV.
 33' LT. Top SHOULDER
 43' LT. & DITCH
 15.5' LT. EDGE PAV.
 4' LT. Top SHOULDER
 26.5' LT. & RD.
 39.5' LT. EDGE PAV.
 48' LT. Top SHOULDER
 53' LT. & DITCH

shot on-line bisecting P.I. ANGLE (Top SHOULDER)
 EDGE PAV.
 & RD.
 EDGE PAV.
 Top SHOULDER
 & DITCH
 35' LT. EDGE PAV.
 45' LT. Top SHOULDER
 20' LT. EDGE PAV.
 34' LT. Top SHOULDER
 13' LT. EDGE PAV.
 28' LT. Top SHOULDER
 STA. 35+00
 & RD.
 RT. EDGE PAV.

STA.	+	H.I.	-	ROD
36+00		26.84		7.0 19.8
				7.26 19.58
				7.9 18.9
				8.5 18.3
37+00				5.88 20.96
				6.6 20.2
38+00				4.66 22.18
				5.0 21.8
39+00				3.36 23.48
				3.55 23.29
				3.2 23.6
				3.55 23.29
				4.0 22.8
				5.1 21.7
				1.03 25.81
				1.24 25.60
T.P.	5.02	28.51	3.35	23.49
40+00				4.67 23.84
				5.1 23.4
41+00				4.60 23.91
				5.3 23.2
42+00				4.23 24.28
				4.36 24.15
				5.24 23.27
				4.30 24.21

RT. Top shoulder (12' shoulder)
EDGE PAV.
Top shoulder (15' shoulder)
& DITCH
EDGE PAV.
Top shoulder
EDGE PAV.
Top shoulder
& RD.
RT. EDGE PAV.
RT. shoulder (15' shoulder)
EDGE PAV.
Top shoulder
& DITCH (LT. 31' FROM & RD.)
F.L. 746 BLDG. (TIE)
F.L. 739 BLDG. (TIE)
EDGE PAV.
Top shoulder
EDGE PAV.
Top shoulder
& RD.
RT. ED
31' RT. FROM & RD. (ON PAV.)
EDGE PAV.

STA.	+	H.I.	-	ROD	
42+00		28.51		5.1	23.4
				6.2	22.3
43+00				4.41	24.10
				5.0	23.5
44+00				4.11	24.40
				4.3	24.2
T.P.	5.11	29.69	3.93		24.58
45+00				4.75	24.94
				4.81	24.98
				4.8	24.9
				4.85	24.84
				5.2	24.5
				5.4	24.3
				4.5	25.2
				3.7	26.0
45+38			4.57	✓	25.12

Top SHOULDER
 & DITCH
 EDGE PAV.
 Top SHOULDER
 EDGE PAV.
 Top SHOULDER
 & RD.
 RT. EDGE PAV.
 RT. Top SHOULDER
 EDGE PAV.
 Top SHOULDER
 & DITCH LT. 28' FROM & RD.
 LT. 44' FROM & RD.
 LT. 64' FROM & RD.
 NAIL IN BOTTLE CAP ROAD STA 45+38 =
 BASE LINE STA. 0+38

CHECK LEVEL

T.B.M.	3.05		25.12		25.81	25.12
B.M.		2.36	25.81	FLOOR LEVEL BLDG 746		3.05
						28.17

± MAIN SERVICE RD.					
STA	+	HI.	-	ROD	ELEV.
0+38 T.B.M.	5.17	30.29			25.12
T.P.	5.64	32.30	3.63		26.66
BL 9+00	5.03	33.29	4.05		28.25
BL 10+00				4.81	28.47
BL 11+00				4.60	28.68
BL 12+00				4.38	28.90
BL 13+00				4.49	28.79
BL 14+00	4.18	32.91	4.55		28.73
BL 15+00				4.38	28.53
BL 16+00				4.55	28.36
BL 17+00				4.73	28.18
BL 18+00				5.03	27.88
BL				5.06	27.85
BL 19+00				5.16	27.75
BL 20+00				5.32	27.59
BL 20+38				5.43	27.48
T.B.M.			1.18		31.73

NOTE
THIS LINE OF LEVELS
WAS DOUBLE CHECKS.

± MAIN SERVICE RD. "NAIL BOTTLE CAP"

± MAIN SERVICE RD

PAGE
BAUCOM
PENNINGER
"HOT"

25.12	33.28
5.17	28.69
30.29	
3.63	
26.66	
5.64	33.29
32.30	4.55
4.05	28.79
28.25	
5.03	
33.28	
4.55	
28.73	
4.18	
32.91	
1.18	
31.73	

LOCATION OF B.M.

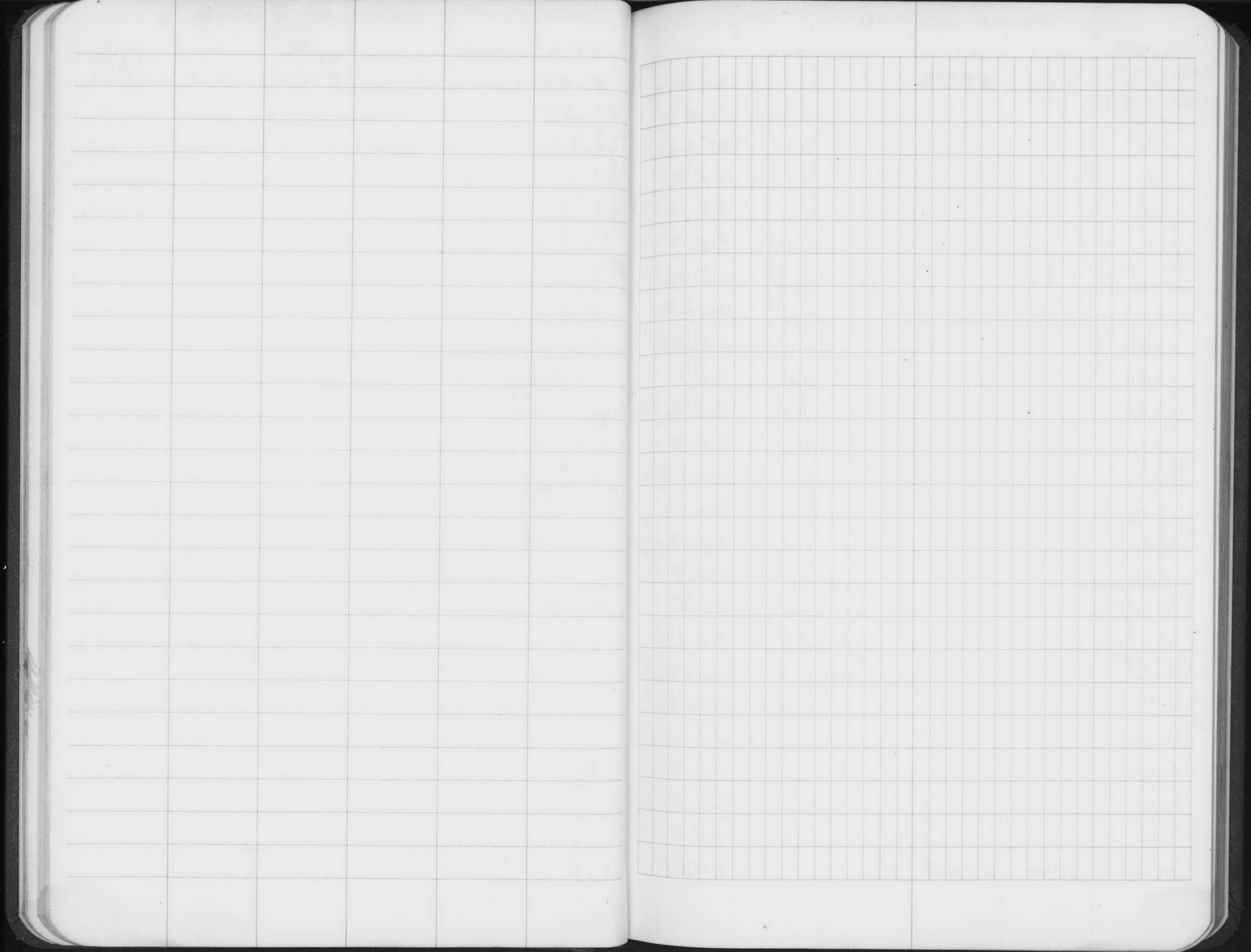
B.M. NAIL IN 20" pine

B.M.

50'

± MAIN SERVICE RD.

← 18+53



CROSS SECTION

STA.	+	H.I.	-	ROD	ELEV.
T. B. M.	4.80	29.92			25.12
BL. 1+00					
0+00				4.55	25.37
+11				4.71	25.21
+21				5.2	24.7
+50				4.5	25.4
1+00				4.2	25.7
BL. 2+00					
0+00				4.06	25.86
+11				4.31	25.61
+37				4.1	25.8
+42				3.8	26.1
+50				3.7	26.2
1+00				4.6	25.3
BL. 3+00					
0+00				3.64	26.28
+11				3.80	26.12
+30				4.2	25.7
+43				3.2	26.7
+50				3.4	26.5
1+00				4.8	25.1
BL. 4+00					
0+00				3.22	26.70
+11				3.33	26.59
+27				3.8	26.1
+43				3.0	26.9
+50				3.4	26.5
1+00				4.4	25.5
T. P.	0.35	27.44	2.83		27.09

STA.	+	H.I.	-	ROD	ELEV.
STA. 45+38					
♀ RD.					
EDGE RD.					
OPEN FIELD					
" "					
" "					
♀ RD.					
E. RD.					
OPEN FIELD					
" "					
" "					
" "					
♀ RD.					
E. RD.					
OPEN FIELD					
" "					
" "					
" "					
♀ RD.					
E. RD.					
OPEN FIELD					
" "					
" "					
" "					

PAGE
 BAUCOM
 PENNIGER
 "HOT"

STA	#1.	ROD	ELEV.
BL. 1+00	27.44	2.6	24.8
1+50		3.7	23.7
2+00		3.7	23.7
2+50		4.4	23.0
3+00		5.6	21.8
3+50		6.6	20.8
4+00		7.4	20.0
4+50		8.3	19.1
5+00		2.3	25.1
BL. 2+00		3.3	24.1
1+50		3.8	23.6
2+00		4.7	22.7
2+50		5.4	22.0
3+00		6.2	21.2
3+50		6.9	20.5
4+00		8.1	19.3
4+50		2.0	25.4
5+00		1.9	25.5
BL. 3+00		2.1	25.3
1+11		2.7	24.7
+25		3.7	23.7
+39		4.8	22.6
+50		5.7	21.7
2+00		5.6	21.8
2+50		6.3	21.1
3+00		7.3	20.1
3+50		8.6	18.8
4+00			
4+50			
5+00			

OPEN

FIELD

GRAVEL DR.

OPEN FIELD

STA	+	H.I.	-	ROD	ELEV.
BL. 4+00					
1+95		27.44		2.9	24.5
1+50				2.4	25.0
1+59				2.3	25.1
1+67				2.3	25.1
2+00				2.9	24.5
2+50				4.0	23.4
3+00				4.7	22.7
3+50				5.7	21.7
4+00				6.4	21.0
4+50				7.1	20.3
5+00				8.5	18.9
T.P.	1.41	21.00	7.85		19.59
BL. 1+00					
5+50				2.4	18.6
6+00				3.2	17.8
6+50				4.2	16.8
7+00				4.3	16.7
7+50				5.4	15.6
8+00				6.0	15.0
8+50				7.3	13.7
9+00				8.6	12.4
BL. 2+00					
5+50				2.5	18.5
6+00				3.6	17.4
6+50				4.3	16.7
7+00				4.6	16.4
7+50				5.4	15.6

E. GRAVEL DR

E. "

E. "

FIELD

STA	+	HI	-	ROD	ELEV	
BL. 2+00		21.00		5.6	15.4	FIELD
8+00				5.9	15.1	
8+50				6.5	14.5	
9+00				2.4	18.6	
BL. 3+00				3.7	17.3	
5+50				4.1	16.9	
6+00				5.0	16.0	
6+50				5.8	15.2	
7+00				6.1	14.9	
7+50				6.5	14.5	
8+00				6.7	14.3	
8+50				2.7	18.3	
9+00				3.5	17.5	
BL. 4+00				4.6	16.4	
5+50				5.1	15.9	
6+00				5.4	15.6	
6+50				5.8	15.2	
7+00				7.1	13.9	
7+50				7.0	14.0	
8+00					15.73	
T. B. M.		5.27			15.72	TOP STAKE 8+00 - B.L. 4+00

NEXT PAGE

STA.	+	H.I.	-	ROD
T.B.M.	3.79	30.49		26.70
B.L. 5+00				
0+00				3.32 27.17
+ 11				3.50 26.99
+ 29				4.0 26.5
+ 35				3.5 27.0
+ 50				3.6 26.9
1+00				4.8 25.7
+ 05				4.8 25.7
+ 30				4.5 26.0
+ 50				5.1 25.4
2+00				6.0 24.5 //
B.L. 6+00				
0+00				3.03 27.46
0+11				3.10 27.39
+ 30				3.9 26.6
+ 50				4.1 26.4
1+00				4.8 25.7
+ 50				5.0 25.5
2+00				5.4 25.1 //
B.L. 7+00				
0+00				2.73 27.76
+ 11				2.92 27.57
+ 25				3.9 26.6
+ 50				3.9 26.6
1+00				4.9 25.6
+ 50				5.8 24.7
2+00				6.3 24.2

STA. 4+00 ϕ RD. ✓

ϕ RD.

E. PAY.

EDGE GRAVEL DRIVE

" "

ϕ RD.

E. PAY.

ϕ RD.

E. PAY.

STA.	+	H.I.	-	ROD	
B.L. 8+00		30.49		2.45	28.04
0+00					
+11				2.63	27.86
+19				3.0	27.5
+27				4.3	26.2
+50				3.9	26.6
1+00				4.6	25.9
+50				5.7	24.8
2+00				6.4	24.1
T.P.	0.42	23.34	7.57		22.92
B.L. 5+00			→	+.8	24.1
2+50				0.4	22.9
3+00				2.0	21.3
+50				2.4	20.9
4+00				3.9	19.4
+50				4.6	18.7
5+00				5.3	18.0
+50				6.2	17.1
6+00				7.0	16.3
+50				7.3	16.0
7+00				8.0	15.3
+50				9.0	14.3
8+00				9.5	13.8
+50				9.9	13.4
9+00				7.60	15.74
T. B.M.				0.0	
B.L. 6+00					
2+50					

Top STAKE 8+00 - B.L. 4+00

STA.	+	H.I.	-	ROD
B.L. 7+00		23.34		9.5
8+50				13.8
9+00				10.3
B.L. 8+00				13.0 //
2+50				0.0
				23.3
3+00				0.7
				22.6
+50				1.2
				22.1
4+00				2.4
				20.9
+50				2.6
				20.7
5+00				3.1
				20.2
+50				4.0
				19.3
6+00				5.4
				17.9
+50				6.3
				17.0
7+00				7.2
				16.1
+50				8.2
				15.1
8+00				8.4
				14.9
+50				9.4
				13.9
9+00				10.4
				12.9

//

STA	+	HI.	-	ROD	ELEV.
BL. 0+38	4.52	29.64			25.12
0+11				4.63	25.01
0+30				5.1	24.5
0+50				4.0	25.6
1+00				4.4	25.2
1+50				4.6	25.0
2+00				4.7	24.9
2+50				5.9	23.7
LT. ON PAU.				5.27	24.37
3+00				6.8	22.8
LT. ON PAU.				6.08	23.56
3+50				7.1	22.5
4+00				7.8	21.8
LT. ON PAU.				7.52	22.12
T.P.	1.11	23.11	7.64		22.00
4+50				2.1	21.0
5+00				3.0	20.1
LT. ON PAU.				2.57	20.54
5+50				3.8	19.3
6+00				4.5	18.6
LT. ON PAU.				4.27	18.84
6+50				5.1	18.0
LT. ON PAU.				4.91	18.20
7+00				6.7	16.4
7+50				7.2	15.9

RD.
E. RD.
OPEN FIELD

PAGE
BALCOM
PENNSYLVANIA
"RED" "HOT"
7-14-62

25.12
4.52
29.64
-7.64
22.00
1.11
23.11

STA	+	HI	-	ROD	ELEV
BL. 0+38		23.11		7.6	15.5
8+00					
T.P.	1.86	18.22	6.75		16.36
9+50				3.7	14.5
9+00				2.7	15.5
9+50				6.7	11.5
10+00				7.5	10.7
10+50				7.9	10.3
11+00				8.4	9.8
T.P.	2.91	16.66	4.47		13.75
BL. 1+00				4.4	12.3
9+50					
10+00				6.4	10.3
10+50				6.8	9.9
11+00				7.3	9.4
T.P.	4.45	18.20	2.91		13.75
BL. 2+00				4.5	13.7
9+50					
10+00				9.7	8.5
10+50				10.0	8.2
11+00				9.2	9.0
T.P.	3.63	18.56	3.27		14.93
BL. 3+00				2.5	16.1
9+50					
10+00				5.7	12.9
10+50				7.2	11.4
11+00				9.3	9.3
T.P.	7.99	22.49	4.06		14.50

NEXT PAGE

OPEN FIELD

↓ TOP STAKE BL. 0+38
8+00

23.11

6.75

16.36

+1.86

18.22

-4.47

13.75

+2.91

16.66

-2.91

13.75

+4.45

18.20

-3.27

14.93

+3.63

18.56

-4.06

14.50

7.99

22.49

EDGE WOODS

IN "

AX

↓

AX

EDGE WOODS

IN "

AX

↓

AX

EDGE WOODS 9+40

IN "

↓

EDGE WOODS 9+40

IN "

↓

STA	+	HI.	-	ROD	ELEV.
B.L. 4+00		22.49		7.7	14.8
9+45					
9+60				2.9	19.6
10+00				7.9	12.6
T.P.	10.38	24.88	7.99		14.50
B.L. 5+00				10.0	14.9
9+35					
9+55				3.0	21.9
10+00				6.2	18.7
10+50				12.0	12.9
11+00				14.9	10.0
T.P.	2.33	16.84	10.37		14.51
B.L. 6+00				4.6	12.2
9+50					
10+00				5.2	11.6
10+50				5.7	11.1
11+00				7.0	9.8
T.P.	4.35	17.67	3.52		13.32
B.L. 7+00				5.9	11.8
9+50					
10+00				6.5	11.2
10+50				6.9	10.8
11+00				7.2	10.5
T.P.	3.34	15.51	5.50		12.17
B.L. 8+00				4.2	11.3
9+50					
10+00				4.8	10.7
10+50				5.0	10.5
11+00				5.3	10.2
T.P.	9.04	21.99	2.56		12.95 ✓ 12.95

Bot. Slope EDGE WOODS
 Top " IN "
 EDGE SWAMP "
 Bot. Slope EDGE WOODS
 Top Slope IN WOODS
 SWAMP WATER
 50'
 10+00
 EDGE WOODS
 IN WOODS
 OPEN FIELD
 EDGE WOODS
 IN WOODS
 " "
 OPEN FIELD
 EDGE WOODS
 IN "
 " "
 Top STAKE BL. 9+00
 9+00

22.49
 -7.99
 AXE 14.50
 +10.38
 24.88
 -10.37
 AXE 14.51
 +2.33
 16.84
 -3.52
 13.32
 +4.35
 17.67
 -5.50
 12.17
 +3.34
 15.51
 -2.56
 12.95
 +9.04
 21.99

STA	+	HI.	-	ROD	ELEV.
B.L. 11+00					
5+50		22.08		4.4	17.7
5+00				5.0	17.1
4+50				5.2	16.9
4+00				2.4	19.7
T.P.	4.16	24.24	2.00		20.08
3+50				4.4	19.8
3+00				5.0	19.2
2+50				5.0	19.2
2+00				3.9	20.3
1+50				1.4	22.8
T.P.	10.16	33.09	1.31		22.93
1+00				6.2	26.9
0+50				3.7	29.4
0+30				6.0	27.1
0+11				4.65	28.44
11+00					
0+00			4.41		28.68
T.B.M.	4.28	33.18			28.90
B.L. 12+00					
0+00				4.28	28.90
+11				4.53	28.65
+21				4.5	28.7
+31				6.2	27.0
+50				4.2	29.0
1+00				2.8	30.4
+50				4.2	29.0

IN WOODS

E. WOODS

E. PAYS

E. RD.

STA. 12+00

E. RD.

E. PAYS

E. WOODS

STA	+	H.I.	-	ROD	ELEV
B.L. 12+00					
1+60		33.18		10.1	23.1
2+00				11.9	21.3
T.P.	2.97	24.90	11.25		21.93
2+50				5.2	19.7
3+00				5.4	19.5
+50				4.7	20.2
4+00				4.0	20.9
+50				6.0	18.9
5+00				6.1	18.8
+50				5.7	19.2
6+00				7.7	17.2
T.P.	3.73	21.49	7.14		17.76
6+50				5.9	15.6
7+00				5.8	15.7
+50				4.9	16.6
8+00				7.2	14.3
+50				8.3	13.2
9+00				9.4	12.1
+50				9.3	12.2
+75				4.3	17.2
10+00				5.5	16.0
+50				6.3	15.2
11+00				8.4	13.1
T.P.	4.75	17.11	9.13		12.36
B.L. 13+00					
11+00				7.4	9.7

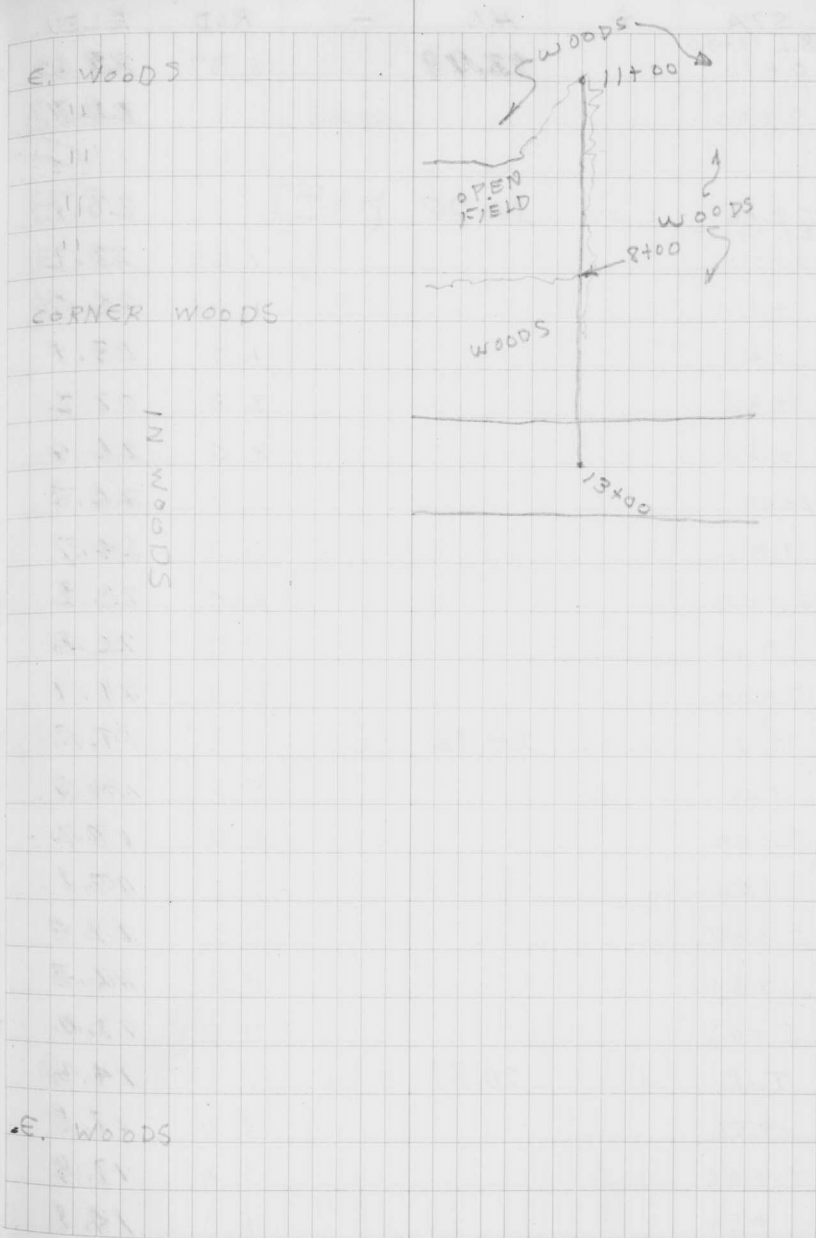
IN WOODS

WOODS

WOODS

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STA	+	H.I.	-	ROD	ELEV.
B.L. 13+00					
10+50		17.11		7.1	10.0
10+00				6.4	10.7
9+50				5.3	11.8
9+00				5.1	12.0
8+50				4.6	12.5
8+00				4.9	12.2
7+50				4.0	13.1
7+00				3.8	13.3
6+50				2.5	14.6
6+00				2.2	14.9
5+50				1.0	16.1
5+00				0.8	16.3
T.P.	7.48	24.34	0.25		16.86
4+50				6.3	18.0
4+00				4.8	19.5
3+50				3.7	20.6
3+00				4.7	19.6
2+50				4.5	19.8
2+00				3.8	20.5
1+50				1.5	22.8
T.P.	5.90	28.99	1.25		23.09
1+00				4.5	24.5
0+50				3.1	25.9
0+30				2.1	26.9
0+21				0.7	28.3



STA	+	#1.	-	ROD	ELEV.
B.L. 14+00		20.87		5.4	15.5
8+00				5.3	15.6
+50				5.4	15.5
9+00				5.4	15.5
+50				7.7	13.2
10+00				8.0	12.9
+50				8.5	12.4
11+00					12.59
T.P.	7.64	20.23	8.28		
B.L. 15+00				4.5	15.7
11+00				5.7	14.5
+50				2.9	17.3
10+00				3.5	16.7
+50				4.7	15.5
9+00				6.7	13.5
+50				6.2	14.0
8+00				5.7	14.5
+50				3.1	17.1
7+00					17.66
T.P.	6.58	24.24	2.57		
+50				3.9	20.3
6+00				3.3	20.9
+50				3.0	21.2
5+00				5.8	18.4
+50				8.9	15.3
4+00				8.2	16.0
+50				4.7	19.5

IN WOODS

STA.	+	H. I.	-	ROD	ELEV.
B.L. 18+00					
0+50		32.41		2.0	30.4
1+00				2.3	30.1
1+50				2.2	30.2
2+00				3.9	28.5
2+50				4.5	27.9
3+00				4.3	28.1
3+50				2.7	29.7
4+00				3.9	28.5
4+50				8.0	24.4
5+00				12.2	20.2
5+50				12.3	20.1
6+00				11.6	20.8
6+50				9.2	23.2
7+00				7.8	24.6
7+50				10.4	22.0
8+00				11.9	20.5
8+50				12.3	20.1
9+00				11.3	21.1
9+50				11.8	20.6
10+00				11.8	20.6
10+50				13.3	19.1
11+00				14.3	18.1

//

E. WOODS

IN

E

STA	+	H/L	-	R/D	ELEV.
BL. 19+00					27.75
0+00	4.15	31.90			
0+11				4.31	27.59
0+22				4.6	27.3
0+32				5.8	26.1
0+50				2.0	29.9
1+00				4.5	27.4
1+50				4.3	27.6
2+00				4.2	27.7
2+50				5.0	26.9
3+00				5.8	26.1
3+50				4.5	27.4
4+00				4.7	27.2
4+50				7.1	24.8
5+00				9.9	22.0
T.P.	0.73	22.87	9.76		22.44
5+50				4.3	18.6
6+00				5.9	17.0
6+50				6.7	16.2
7+00				5.2	17.7
T.P.	8.39	26.64	4.62		18.25
7+50				6.8	19.8
8+00				5.7	20.9
8+50				4.0	22.6
9+00				4.2	22.4
9+50				5.4	21.2

RD. T.B.M.

E. PAV.

E. S.

E. S.

E. WOODS

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E. S.

E. S.

STA	+	#1.	-	ROD	ELEV.
BL. 19+00					
10+00		26.64		5.0	21.6
10+50				4.3	22.3
11+00				4.8	21.8
T.P.	5.56	24.54	7.66		18.98
BL. 20+00					
11+00				1.5	23.0
10+50				3.2	21.3
10+00				4.3	20.2
9+50				4.8	19.7
9+00				4.7	19.8
8+50				5.8	18.7
8+00				6.9	17.6
7+50				7.3	17.2
7+00				7.2	17.3
6+50				6.5	18.0
T.P.	13.64 ±	32.27	5.91		18.63
6+00				10.0	22.3
5+50				9.9	22.4
5+00				8.5	23.8
4+50				7.5	24.8
4+00				7.9	24.5
3+50				4.7	27.6
3+00				4.0	28.3
2+50				4.9	27.4
2+00				5.3	27.0
1+50				5.9	26.4

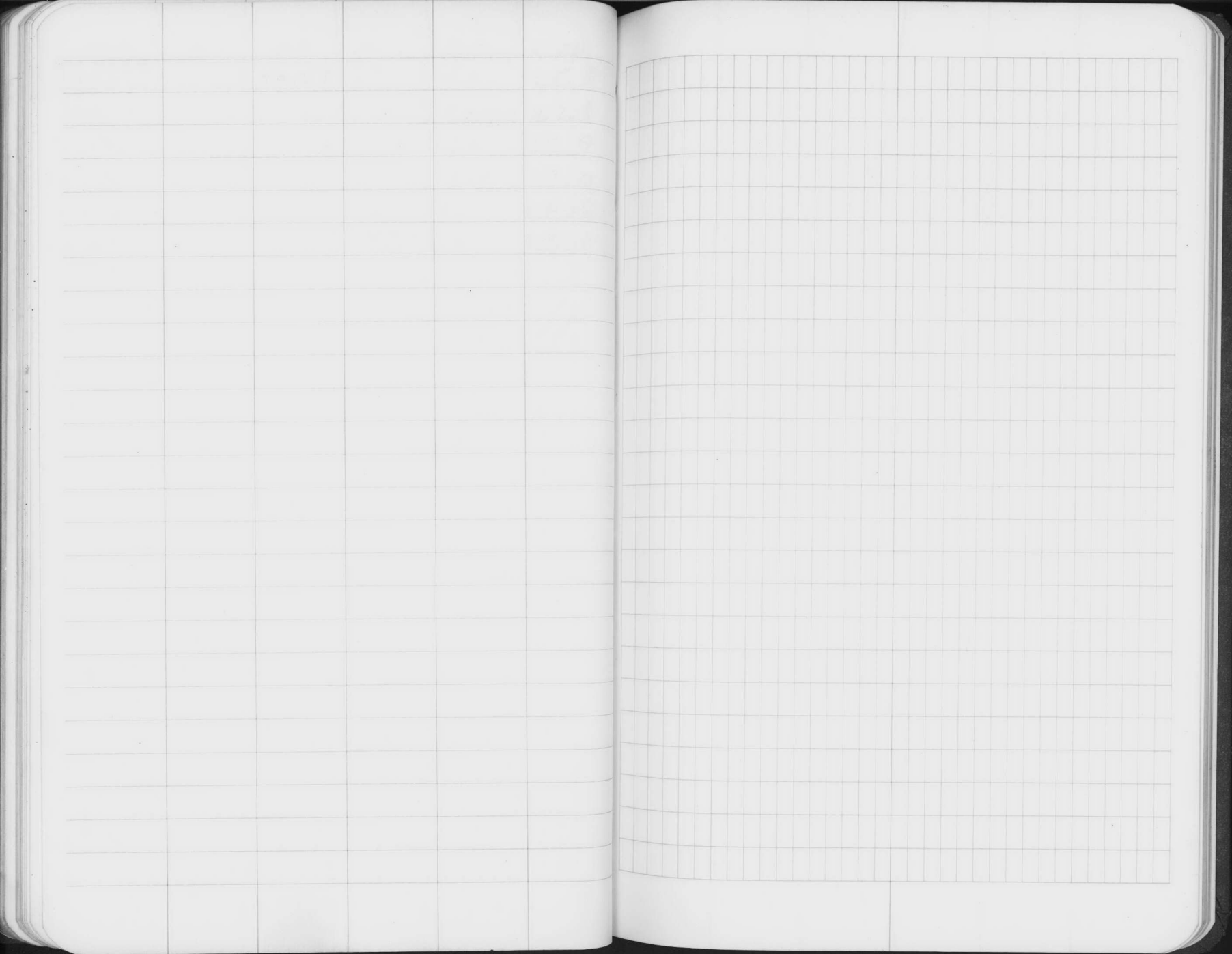
STA	+	HI	-	ROD	ELEV.
BL. 20+00					
1+00		32.27		7.0	25.3
0+50				5.2	27.1
0+32				6.4	25.9
0+21				5.3	27.0
0+11				4.81	27.46
T.B.M.					
0+00		4.66			27.61

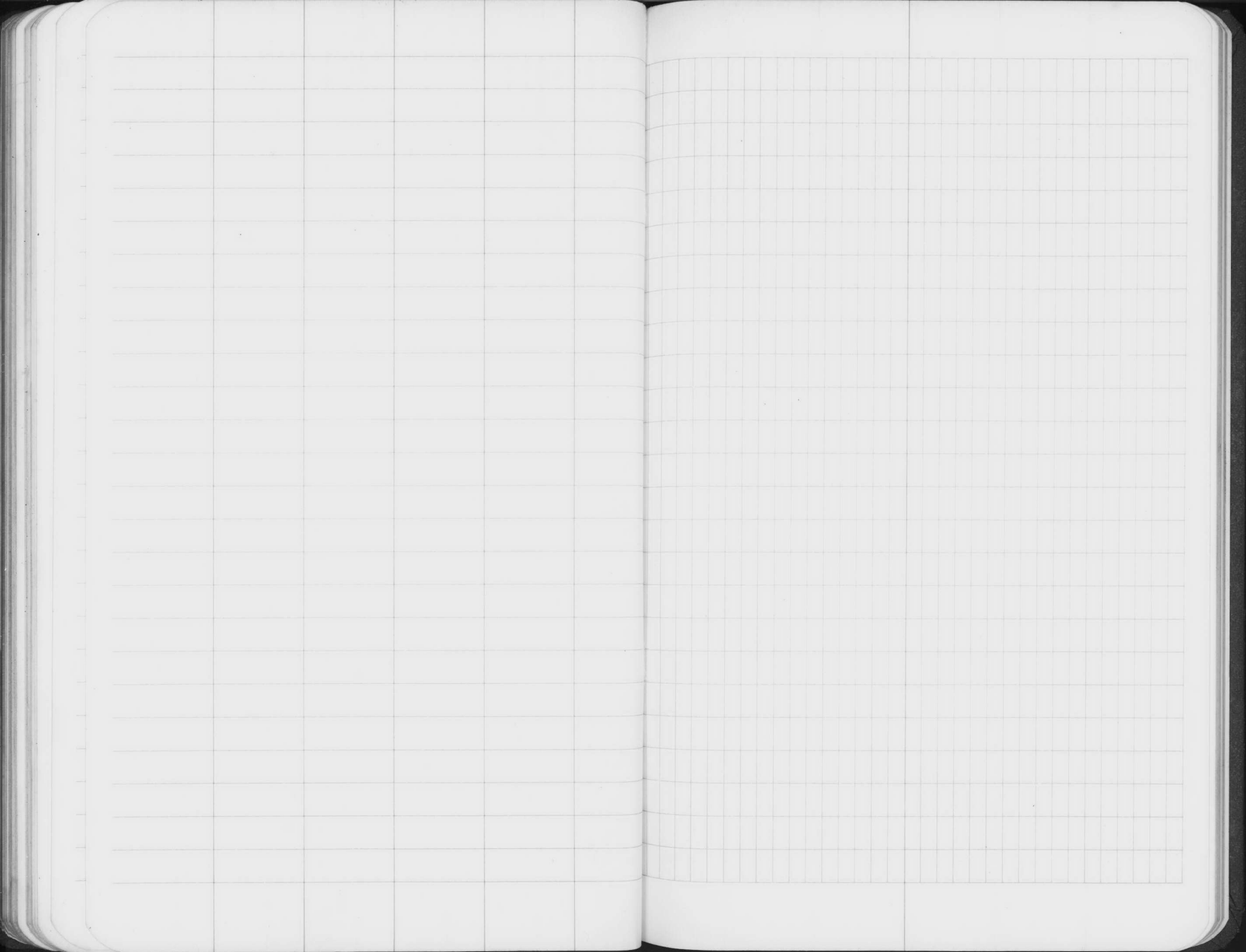
E. Woods

E. RD.

E. RD. 20+00

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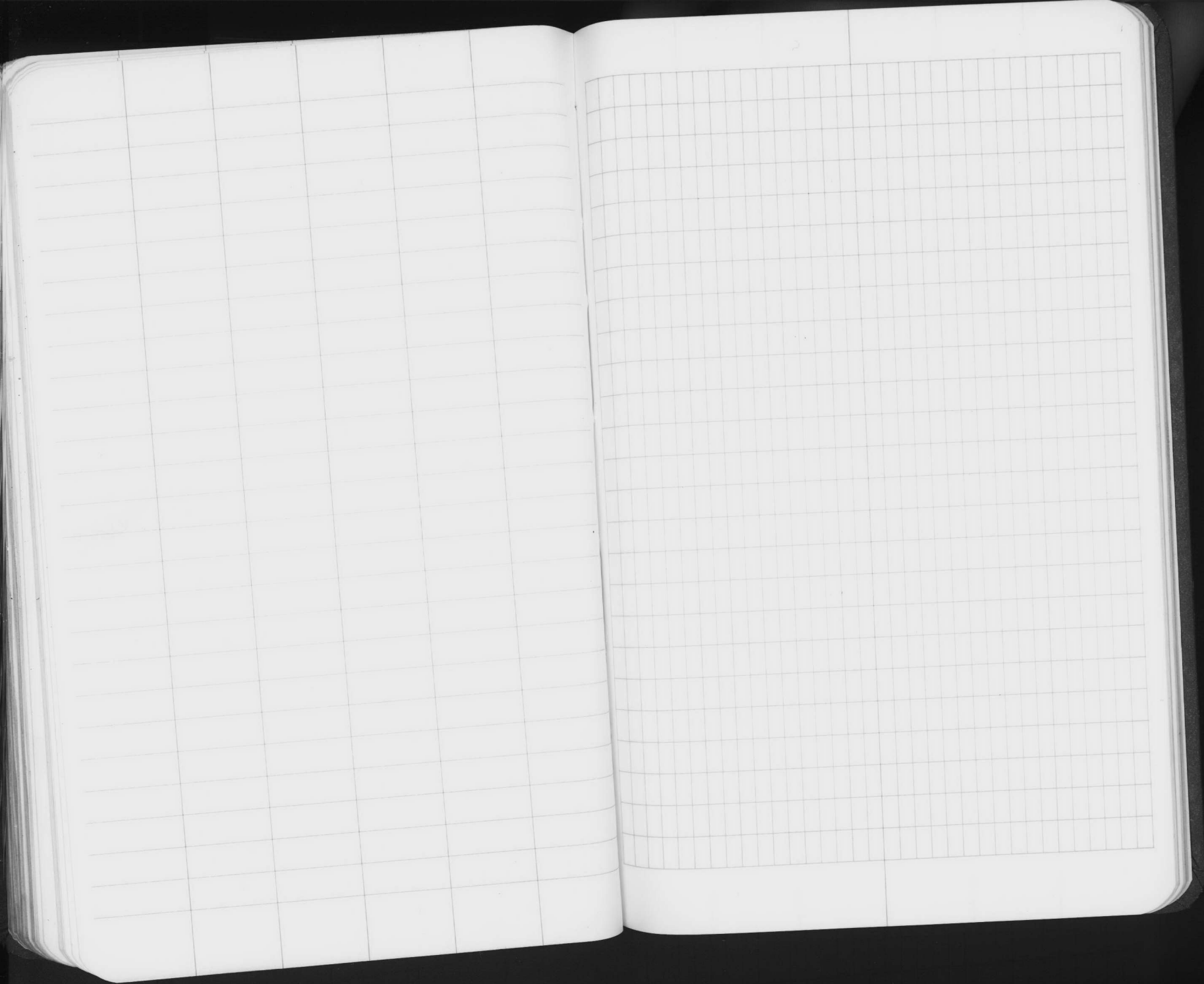


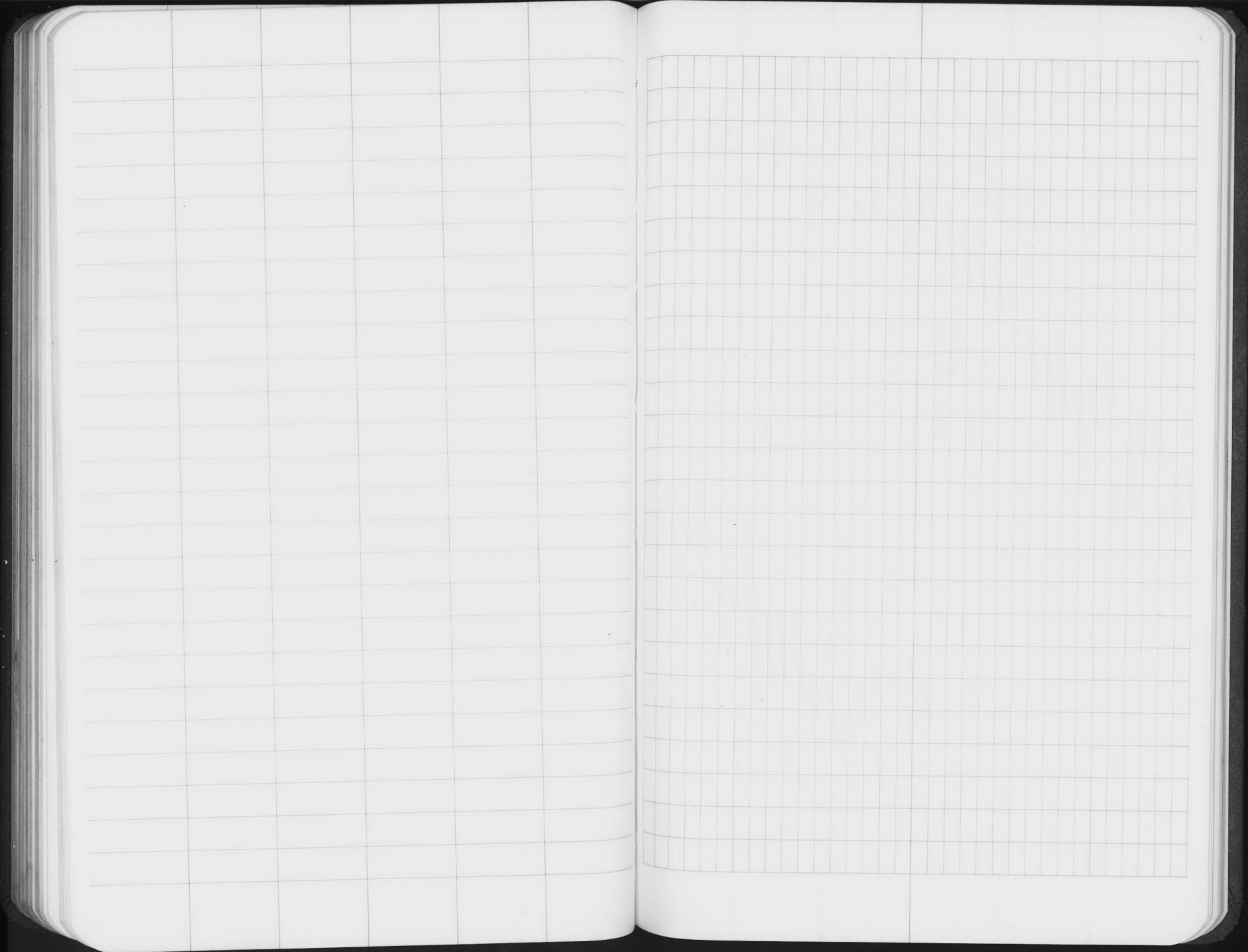


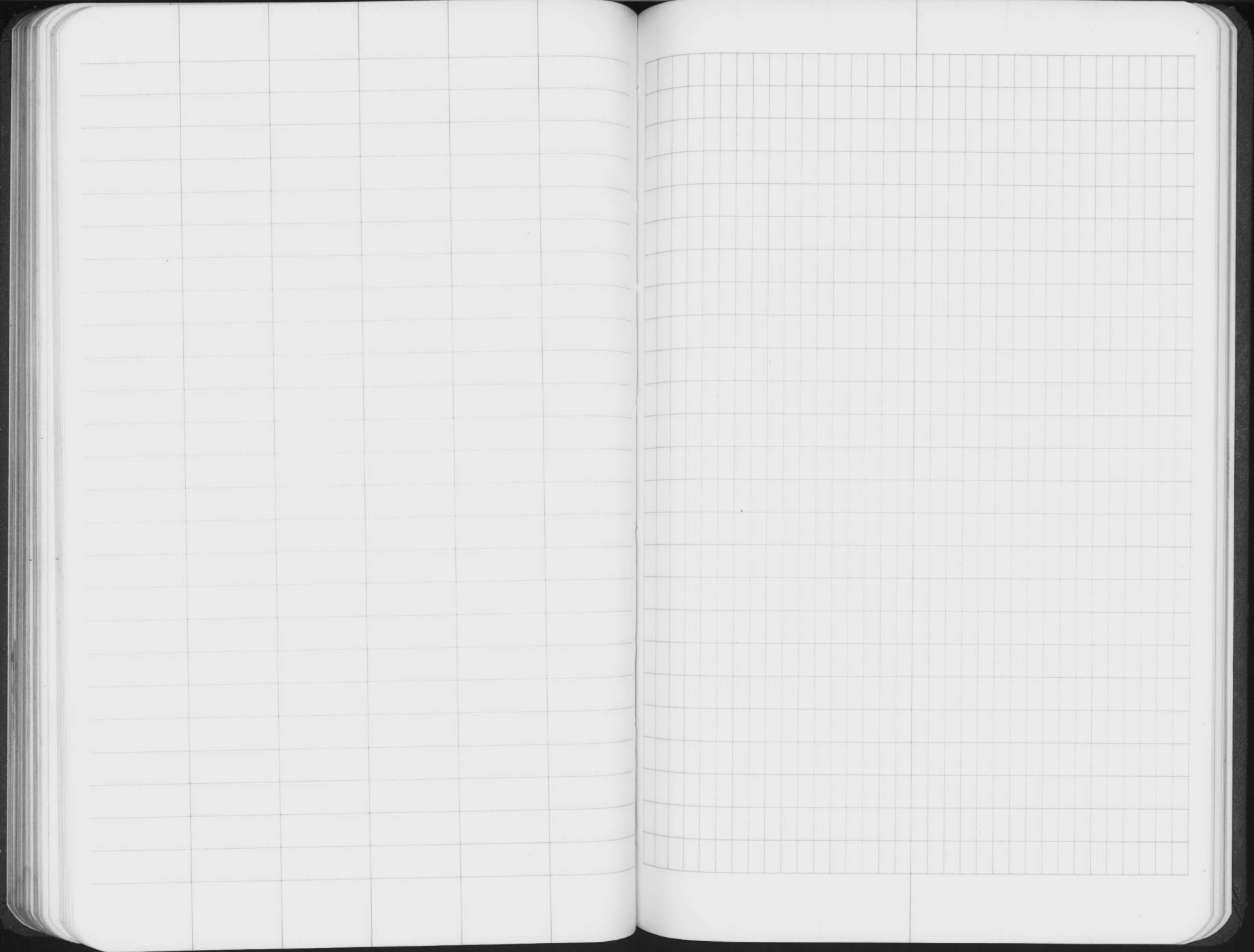


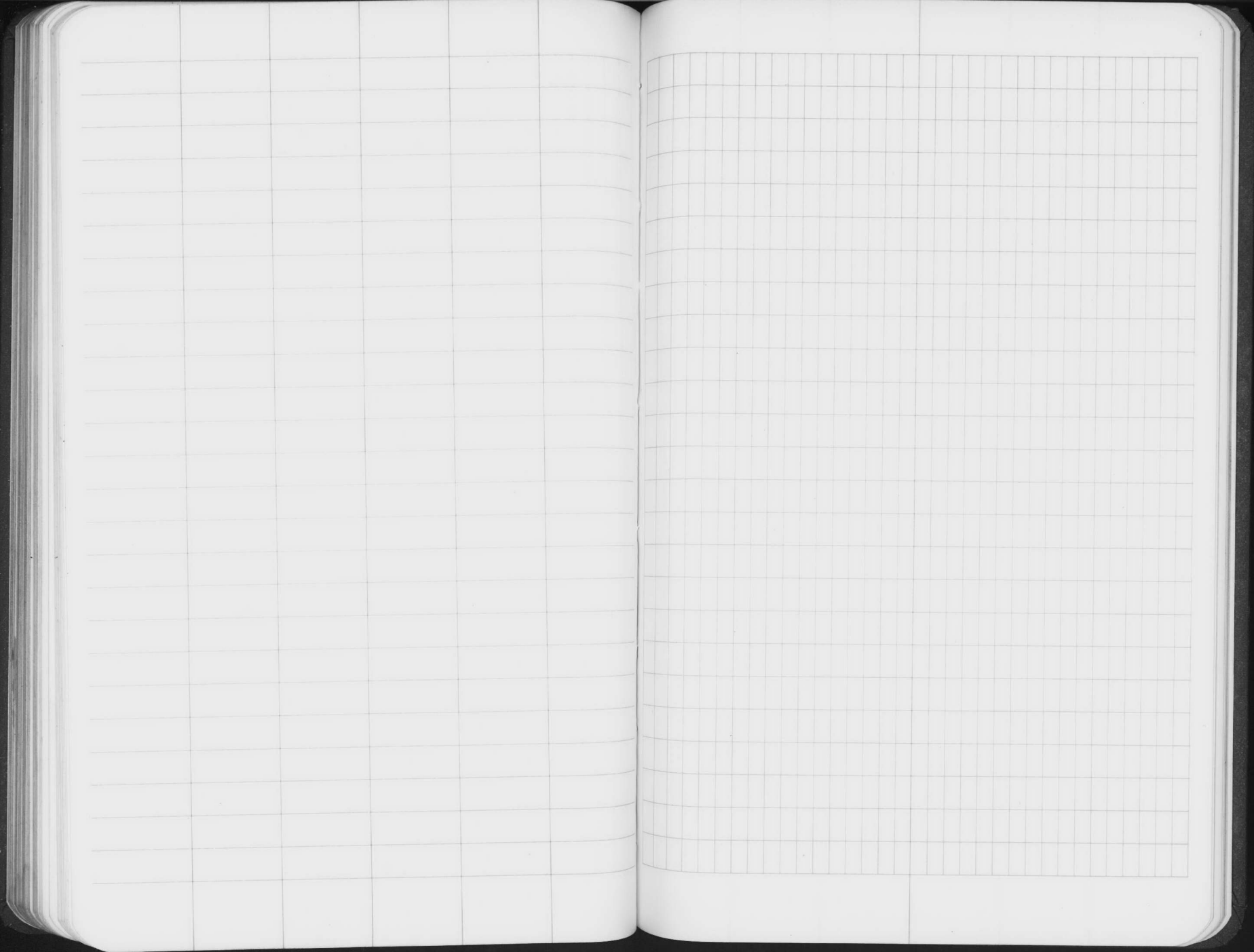


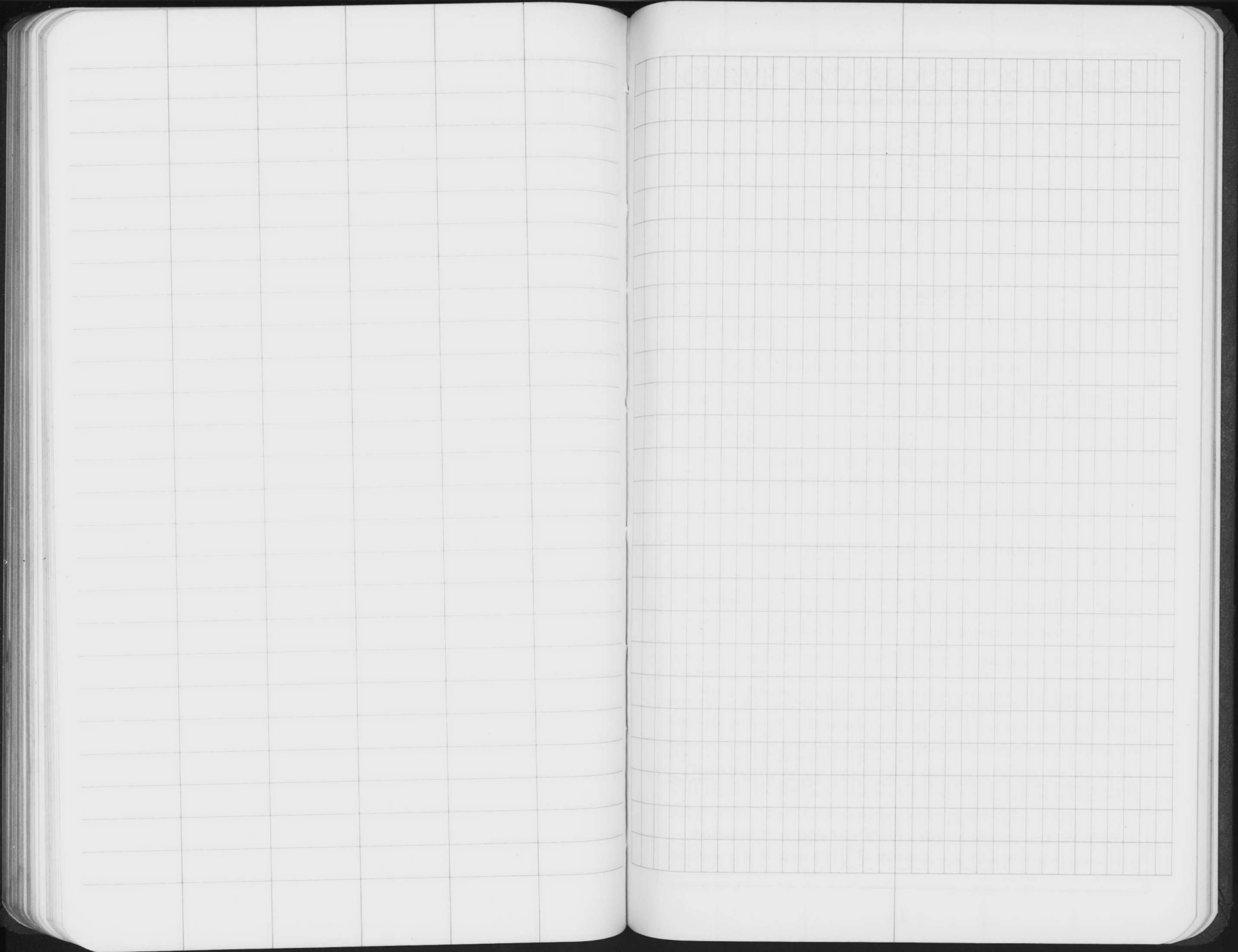






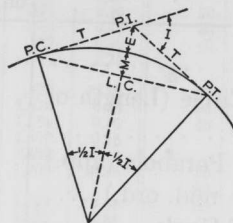






CURVE AND REDUCTION TABLES

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CURVE FORMULAS

1. Radius : $R = \frac{50}{\sin D/2}$
2. Degree of Curve: $D = 100 \frac{I}{L}$. Also, $\sin D/2 = \frac{50}{R}$
3. Tangent : $T = R \tan \frac{1}{2} I$. Also, $T = \frac{T \text{ for } 1^\circ \text{ curve}}{D} + C$.
4. Length of Curve: $L = 100 \frac{I}{D}$
5. Long Chord : $L. C. = 2R \sin \frac{1}{2} I$.
6. Middle Ordinate: $M = R (1 - \cos \frac{1}{2} I)$
7. External : $E = \frac{R}{\cos \frac{1}{2} I} - R$. Also, $E = T \tan \frac{1}{4} I$.

EXPLANATION AND USE OF TABLES

Given P.I. Sta. 83+40.7, $I = 45^\circ 20'$ and $D = 6^\circ 30'$ find:

Stations—P. C. = P. I. - T. $T = \frac{T \text{ for } 1^\circ \text{ Curve}}{D} + C$. From Tables V and VI

$$T = \frac{2392.8}{6.5} + .197 = 368.32 = 3 + 68.32. \text{ Sta. P. C.} = 83 + 40.7 - (3 + 68.32) = 79 + 72.38.$$

$$P. T. = P. C. + L, \text{ and } L = 100 \frac{I}{D} = 100 \frac{45.33}{6.5} = 697.38 \text{ Therefore, } P. T. = (79 + 72.38) + (6 + 97.38) = 86 + 69.76.$$

Offsets—Tangent offsets vary (approximately) directly with D and with the square of the distance. From Table III Tangent Offset for 100 feet = 5.669 feet. Distance = 80 - Sta. P. C. = 27.62. Hence offset = $5.66 \times \left(\frac{27.62}{100}\right)^2 = .432$ ft. Also, square of any distance, divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(27.62)^2 \div (2 \times 881.95) = .432$ ft.

Deflections—Deflection angle = $\frac{1}{2} D$ for 100 ft., $\frac{1}{4} D$ for 50 ft., etc. For "X" ft., Deflection Angle (in minutes) = $.3 \times X \times D$. For Sta. 80 of above curve Deflection Angle = $.3 \times 27.62 \times 6.5 = 53.86'$. Also Deflection Angle = dfl. for 1 ft. from Table III $\times X = 1.95$

$$\times 27.62 = 53.86'. \text{ For Sta. 181 Deflection Angle} = 53.86' + \frac{6^\circ 30'}{2} = 4^\circ 8.86'.$$

Externals—From Table V for 1° curve, with central angle of $45^\circ 20'$, $E = 479.6$.

$$\text{Therefore, for } 6^\circ 30' \text{ curve, } E = \frac{479.6}{6.5} + \text{Correction from Table VI} = 7.378 + .039 = 7.417.$$

Table V.—Tangents and Externals to a 1° Curve.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10'	58.34	.30	10'	560.11	27.31	10'	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

Table V.—Tangents and Externals to a 1° Curve.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32	1643.0	230.9	42	2199.4	407.6	52	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	43	2257.0	428.5	53	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	44	2314.9	450.0	54	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	45	2373.3	472.1	55	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.3	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	46	2432.1	494.8	56	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	47	2491.3	518.2	57	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	48	2551.0	542.2	58	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	49	2611.2	566.9	59	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	50	2671.8	592.3	60	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

Table V.—Tangents and Externals to a 1° Curve.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
61°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1315.6	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62°	3442.7	954.8	72°	4162.8	1352.6	82°	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63°	3511.1	990.2	73°	4239.7	1398.0	83°	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64°	3580.3	1026.6	74°	4317.6	1444.6	84°	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65°	3650.2	1063.9	75°	4396.5	1492.4	85°	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66°	3720.9	1102.2	76°	4476.5	1541.4	86°	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67°	3792.4	1141.4	77°	4557.6	1591.6	87°	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68°	3864.7	1181.6	78°	4639.8	1643.0	88°	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69°	3937.9	1222.7	79°	4723.2	1695.8	89°	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70°	4011.9	1265.0	80°	4807.7	1749.9	90°	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

Table V.—Tangents and Externals to a 1° Curve.

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10'	5847.5	2457.1	10'	6971.3	3294.1	10'	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92°	5933.2	2518.5	102°	7075.5	3374.9	112°	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93°	6037.8	2594.0	103°	7203.2	3474.4	113°	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94°	6144.3	2671.6	104°	7333.6	3576.8	114°	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95°	6252.8	2751.3	105°	7467.0	3682.3	115°	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96°	6363.4	2833.2	106°	7603.5	3791.0	116°	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97°	6476.2	2917.3	107°	7743.2	3902.9	117°	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98°	6591.2	3003.8	108°	7886.2	4018.2	118°	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99°	6708.6	3092.7	109°	8032.7	4137.1	119°	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100°	6828.3	3184.1	110°	8182.8	4259.7	120°	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	

Table VI.—Corrections for Tangents and Externals.

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

FOR TANGENTS ADD														
Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°	.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.79	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.40	4.98	5.38	5.83
100°	.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6.34
110°	.51	1.03	1.56	2.08	2.61	3.14	3.67	4.21	4.76	5.31	5.86	6.43	7.01	7.60
120°	.62	1.25	1.93	2.52	3.16	3.81	4.45	5.11	5.77	6.44	7.12	7.80	8.50	9.22
FOR EXTERNALS ADD														
Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°	.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°	.046	.093	.142	.188	.236	.283	.332	.381	.420	.479	.530	.582	.641	.700
60°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.771	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.07	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.53
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
110°	.268	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96
120°	.360	.721	1.08	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32

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

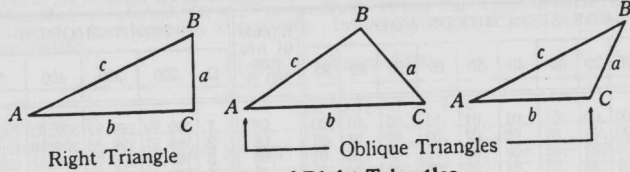
D	FOR SUB-CHORDS ADD									Excess of arc per 100 ft.	LONG CHORDS				
	10	20	30	40	50	60	70	80	90		D	200	300	400	500
4°	.00	.00	.01	.01	.01	.01	.01	.01	.00	.02	1	199.99	299.97	399.92	499.85
6	.00	.01	.01	.02	.02	.02	.02	.01	.01	.05	2	199.97	299.88	399.70	499.39
8	.01	.02	.02	.03	.03	.03	.03	.02	.01	.08	3	199.93	299.73	399.32	498.63
10	.01	.02	.03	.04	.05	.05	.05	.04	.02	.13	4	199.88	299.51	398.78	497.57
12	.02	.04	.05	.06	.07	.07	.07	.05	.03	.18	5	199.81	299.24	398.10	496.20
14	.02	.05	.07	.08	.09	.10	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
16	.03	.06	.09	.11	.12	.12	.12	.09	.05	.33	7	199.63	298.51	396.28	492.57
18	.04	.08	.11	.14	.15	.15	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.18	.15	.09	.51	9	199.38	297.54	393.86	487.75
22	.06	.12	.17	.21	.23	.24	.22	.18	.10	.62	10	199.24	296.96	392.42	484.90
24	.07	.14	.20	.25	.28	.28	.26	.21	.12	.74	12	198.90	295.63	389.12	478.34
26	.09	.17	.24	.29	.32	.33	.31	.25	.15	.86	14	198.51	294.06	385.22	470.65
28	.10	.19	.27	.34	.37	.38	.36	.29	.17	1.00	16	198.05	292.25	380.76	461.86
30	.11	.22	.31	.39	.43	.44	.41	.33	.19	1.15	18	197.54	290.21	375.74	452.02
32	.13	.25	.36	.44	.49	.50	.47	.38	.22	1.31	20	196.90	287.94	370.17	441.15
34	.15	.28	.40	.50	.55	.57	.53	.43	.25	1.48	22	196.32	285.44	364.08	429.30
36	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.63	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.86	26	194.87	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.06	276.59	342.69	388.42
42	.23	.44	.62	.76	.85	.87	.81	.65	.38	2.28	30	193.18	273.20	334.61	373.20
44	.25	.48	.68	.84	.94	.96	.89	.72	.42	2.50	32	192.25	269.61	326.08	357.28
46	.27	.52	.75	.92	1.02	1.05	.98	.78	.46	2.74	34	191.26	265.81	317.12	340.73
48	.30	.57	.81	1.00	1.12	1.14	1.06	.86	.50	2.99	36	190.21	261.80	307.77	323.61
50	.32	.62	.89	1.09	1.21	1.24	1.15	.93	.55	3.24	38	189.10	257.60	298.03	305.99
52	.35	.67	.96	1.18	1.31	1.35	1.25	1.01	.59	3.52	40	187.94	253.21	287.94	287.94
54	.38	.73	1.04	1.28	1.42	1.46	1.35	1.09	.64	3.80	42	186.72	248.63	277.51	269.54
56	.41	.78	1.12	1.38	1.53	1.57	1.46	1.17	.69	4.09	44	185.44	243.87	266.78	250.85
58	.44	.84	1.20	1.48	1.65	1.69	1.57	1.20	.74	4.40	46	184.10	238.93	255.78	231.95
60	.47	.91	1.29	1.59	1.76	1.81	1.68	1.35	.80	4.72	48	182.71	233.83	244.51	212.92

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

Table VIII.—Middle Ordinates for Rails in Feet.

Deg. of Curve	LENGTH OF RAILS						Deg. of Curve	LENGTH OF RAILS							
	32	30	28	26	24	22		20	32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.067	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.486	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424</			

TRIGONOMETRIC FORMULÆ



Right Triangle

Oblique Triangles

Solution of Right Triangles

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

Given a, b Required A, B, c

$\tan A = \frac{a}{b} = \cot B$, $c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$

Given a, c Required A, B, b

$\sin A = \frac{a}{c} = \cos B$, $b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$

Given A, a Required B, b, c

$B = 90^\circ - A$, $b = a \cot A$, $c = \frac{a}{\sin A}$

Given A, b Required B, a, c

$B = 90^\circ - A$, $a = b \tan A$, $c = \frac{b}{\cos A}$

Given A, c Required B, a, b

$B = 90^\circ - A$, $a = c \sin A$, $b = c \cos A$

Solution of Oblique Triangles

Given A, B, a Required b, c, C

$b = \frac{a \sin B}{\sin A}$, $C = 180^\circ - (A+B)$, $c = \frac{a \sin C}{\sin A}$

Given A, a, b Required B, c, C

$\sin B = \frac{b \sin A}{a}$, $C = 180^\circ - (A+B)$, $c = \frac{a \sin C}{\sin A}$

Given a, b, c Required A, B, C

$A+B = 180^\circ - C$, $\tan \frac{1}{2}(A-B) = \frac{(a-b) \tan \frac{1}{2}(A+B)}{a+b}$

Given a, b, c Required A, B, C

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

$s = \frac{a+b+c}{2}$, $\sin \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{bc}}$

$\sin \frac{1}{2} B = \sqrt{\frac{(s-a)(s-c)}{ac}}$, $C = 180^\circ - (A+B)$

Given a, b, c Required Area

$s = \frac{a+b+c}{2}$, $\text{area} = \sqrt{s(s-a)(s-b)(s-c)}$

Given A, b, c Required Area

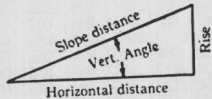
$\text{area} = \frac{bc \sin A}{2}$

Given A, B, C, a Required 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, for a slope distance of 403.6 ft. and a vertical angle of $4^\circ 40'$ —the cosine of $4^\circ 40'$, taken from a table of natural trigonometrical functions, = .9967, and horizontal distance = $403.6 \times .9967 = 402.27$ ft.



Horizontal distance also = Slope distance minus slope distance times (1 - cosine of vertical angle). Using the same figures as in the preceding example— $\text{distance times } (1 - \cos) = 403.6 \times .0033 = 1.33$ ft. Horizontal dist. = $403.6 - 1.33 = 402.27$ ft.

When the rise is known, the horizontal distance may be found by the following approximate rule:—the slope distance less the square of the rise divided by twice the slope distance. Thus, for a slope distance of 372.5 ft., and a rise of 15 ft. the horizontal distance = $372.5 - \frac{15 \times 15}{2 \times 372.5} = 372.5 - .30 = 372.2$ ft.

Table IX.—Natural Trigonometrical Functions.

Angle	Sin	Tan	Cot	Cos	Angle	Sin	Tan	Cot	Cos
0	0	0	∞	1	90	1	∞	0	0
10	.0029	.0058	343.8	.99998	80	.1736	.1763	5.226	.98218
20	.0058	.0087	171.9	.99996	70	.1495	.1523	6.457	.98481
30	.0087	.0116	85.94	.99993	60	.1196	.1223	8.254	.98769
40	.0116	.0145	68.75	.99989	50	.0898	.0925	11.034	.99067
50	.0145	.0175	57.29	.99985	40	.0601	.0628	15.848	.99371
60	.0175	.0204	49.10	.99979	30	.0304	.0331	30.070	.99681
70	.0204	.0233	42.96	.99973	20	.0157	.0184	54.638	.99987
80	.0233	.0262	38.19	.99966	10	.0079	.0096	104.713	.99999
89	.0262	.0291	34.37	.99958	0	0	0	∞	1
90	.0291	.0320	31.24	.99949	0	0	0	∞	1
10	.0320	.0349	28.64	.99939	10	.1736	.1763	5.226	.98218
20	.0349	.0378	26.43	.99929	20	.1495	.1523	6.457	.98481
30	.0378	.0407	24.54	.99917	30	.1255	.1283	7.688	.98769
40	.0407	.0436	22.90	.99905	40	.1014	.1042	8.920	.99067
50	.0436	.0466	21.47	.99892	50	.0773	.0801	12.560	.99371
60	.0466	.0494	20.21	.99878	60	.0532	.0560	17.364	.99681
70	.0494	.0523	19.08	.99863	70	.0291	.0319	31.071	.99987
80	.0523	.0552	18.07	.99847	80	.0157	.0184	54.638	.99999
89	.0552	.0581	17.17	.99831	90	0	0	∞	1
90	.0581	.0610	16.35	.99813	0	0	0	∞	1
10	.0610	.0640	15.60	.99795	10	.1736	.1763	5.226	.98218
20	.0640	.0669	14.92	.99776	20	.1495	.1523	6.457	.98481
30	.0669	.0698	14.30	.99756	30	.1255	.1283	7.688	.98769
40	.0698	.0727	13.73	.99736	40	.1014	.1042	8.920	.99067
50	.0727	.0756	13.20	.99714	50	.0773	.0801	12.560	.99371
60	.0756	.0785	12.71	.99692	60	.0532	.0560	17.364	.99681
70	.0785	.0814	12.25	.99668	70	.0291	.0319	31.071	.99987
80	.0814	.0843	11.83	.99644	80	.0157	.0184	54.638	.99999
89	.0843	.0872	11.43	.99619	90	0	0	∞	1
90	.0872	.0901	11.06	.99594	0	0	0	∞	1
10	.0901	.0929	10.71	.99567	10	.1736	.1763	5.226	.98218
20	.0929	.0958	10.39	.99540	20	.1495	.1523	6.457	.98481
30	.0958	.0987	10.08	.99511	30	.1255	.1283	7.688	.98769
40	.0987	.1016	9.788	.99482	40	.1014	.1042	8.920	.99067
50	.1016	.1045	9.514	.99452	50	.0773	.0801	12.560	.99371
60	.1045	.1074	9.255	.99421	60	.0532	.0560	17.364	.99681
70	.1074	.1103	9.010	.99390	70	.0291	.0319	31.071	.99987
80	.1103	.1132	8.777	.99357	80	.0157	.0184	54.638	.99999
89	.1132	.1161	8.556	.99324	90	0	0	∞	1
90	.1161	.1190	8.345	.99290	0	0	0	∞	1
10	.1190	.1219	8.144	.99255	10	.1736	.1763	5.226	.98218
20	.1219	.1248	7.953	.99219	20	.1495	.1523	6.457	.98481
30	.1248	.1276	7.770	.99182	30	.1255	.1283	7.688	.98769
40	.1276	.1305	7.596	.99144	40	.1014	.1042	8.920	.99067
50	.1305	.1334	7.429	.99106	50	.0773	.0801	12.560	.99371
60	.1334	.1363	7.269	.99067	60	.0532	.0560	17.364	.99681
70	.1363	.1392	7.116	.99027	70	.0291	.0319	31.071	.99987
80	.1392	.1421	6.969	.98986	80	.0157	.0184	54.638	.99999
89	.1421	.1450	6.827	.98944	90	0	0	∞	1
90	.1450	.1478	6.691	.98902	0	0	0	∞	1
10	.1478	.1507	6.561	.98858	10	.1736	.1763	5.226	.98218
20	.1507	.1536	6.435	.98814	20	.1495	.1523	6.457	.98481
30	.1536	.1564	6.314	.98769	30	.1255	.1283	7.688	.98769
40	.1564	.1593	6.197	.98723	40	.1014	.1042	8.920	.99067
50	.1593	.1622	6.084	.98676	50	.0773	.0801	12.560	.99371
60	.1622	.1650	5.976	.98629	60	.0532	.0560	17.364	.99681
70	.1650	.1679	5.871	.98580	70	.0291	.0319	31.071	.99987
80	.1679	.1708	5.769	.98531	80	.0157	.0184	54.638	.99999
89	.1708	.1736	5.671	.98481	90	0	0	∞	1
90	.1736	.1765	5.576	.98430	0	0	0	∞	1
10	.1765	.1794	5.485	.98378	10	.1736	.1763	5.226	.98218
20	.1794	.1823	5.396	.98325	20	.1495	.1523	6.457	.98481
30	.1823	.1851	5.309	.98272	30	.1255	.1283	7.688	.98769
40	.1851	.1880	5.226	.98218	40	.1014	.1042	8.920	.99067
50	.1880	.1908	5.145	.98163	50	.0773	.0801	12.560	.99371
60	.1908	.1937	5.066	.98107	60	.0532	.0560	17.364	.99681
70	.1937	.1965	4.989	.98050	70	.0291	.0319	31.071	.99987
80	.1965	.1994	4.915	.97992	80	.0157	.0184	54.638	.99999
89	.1994	.2022	4.843	.97934	90	0	0	∞	1
90	.2022	.2051	4.773	.97875	0	0	0	∞	1
10	.2051	.2079	4.705	.97815	10	.1736	.1763	5.226	.98218
20	.2079	.2108	4.638	.97754	20	.1495	.1523	6.457	.98481
30	.2108	.2136	4.574	.97692	30	.1255	.1283	7.688	.98769
40	.2136	.2164	4.511	.97630	40	.1014	.1042	8.920	.99067
50	.2164	.2193	4.449	.97566	50	.0773	.0801	12.560	.99371
60	.2193	.2221	4.390	.97502	60	.0532	.0560	17.364	.99681
70	.2221	.2249	4.331	.97437	70	.0291	.0319	31.071	.99987
80	.2249	.2278	4.275	.97371	80	.0157	.0184	54.638	.99999
89	.2278	.2306	4.219	.97304	90	0	0	∞	1
90	.2306	.2334	4.165	.97237	0	0	0	∞	1
10	.2334	.2363	4.113	.97169	10	.1736	.1763	5.226	.98218
20	.2363	.2391	4.061	.97100	20	.1495	.1523	6.457	.98481
30	.2391	.2419	4.011	.97030	30	.1255	.1283	7.688	.98769
40	.2419	.2447	3.962	.96959	40	.1014	.1042	8.920	.99067
50	.2447	.2476	3.914	.96887	50	.0773	.0801	12.560	.99371
60	.2476	.2504	3.867	.96815	60	.0532	.0560	17.364	.99681
70	.2504	.2532	3.821	.96742	70	.0291	.0319	31.071	.99987
80	.2532	.2560	3.776	.96667	80	.0157	.0184	54.638	.99999
89	.2560	.2588	3.732	.96593	90	0	0	∞	1
90	.2588	.2616	3.68						

Table IX.—Natural Trigonometrical Functions.

Angle	Sin	Tan	Cot	Cos		Angle	Sin	Tan.	Cot	Cos	
or						or					
16	.2756	.2867	3.487	.96126	74	24	.4067	.4452	2.246	.91355	66
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229	.91236	50
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211	.91116	40
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194	.90996	30
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177	.90875	20
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161	.90753	10
17	.2924	.3057	3.271	.95630	73	25	.4226	.4663	2.145	.90631	65
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128	.90507	50
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112	.90383	40
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097	.90259	30
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081	.90133	20
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066	.90007	10
18	.3090	.3249	3.078	.95106	72	26	.4384	.4877	2.050	.89879	64
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035	.89752	50
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020	.89623	40
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006	.89493	30
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991	.89363	20
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977	.89232	10
19	.3256	.3443	2.904	.94552	71	27	.4540	.5095	1.963	.89101	63
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949	.88968	50
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935	.88835	40
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921	.88701	30
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907	.88566	20
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894	.88431	10
20	.3420	.3640	2.747	.93969	70	28	.4695	.5317	1.881	.88295	62
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868	.88158	50
20	.3475	.3706	2.699	.93769	40	20	.4746	.5392	1.855	.88020	40
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842	.87882	30
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829	.87743	20
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816	.87603	10
21	.3584	.3839	2.605	.93358	69	29	.4848	.5543	1.804	.87462	61
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792	.87321	50
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780	.87178	40
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767	.87033	30
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756	.86892	20
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744	.86748	10
22	.3746	.4040	2.475	.92718	68	30	.5000	.5774	1.732	.86603	60
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720	.86457	50
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709	.86310	40
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698	.86163	30
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686	.86015	20
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675	.85866	10
23	.3907	.4245	2.356	.92050	67	31	.5150	.6009	1.664	.85717	59
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653	.85567	50
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643	.85416	40
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632	.85264	30
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621	.85112	20
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611	.84959	10
					66						58
	Cos	Cot	Tan.	Sin	Angle		Cos	Cot	Tan.	Sin	Angle

Table IX.—Natural Trigonometrical Functions.

Angle	Sin	Tan	Cot	Cos		Angle	Sin	Tan	Cot	Cos	
or						or					
32	.5299	.6249	1.600	.84805	58	30	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30	39	.6293	.8098	1.235	.77715	51
40	.5398	.6412	1.560	.84182	20	10	.6316	.8146	1.228	.77531	50
50	.5422	.6453	1.550	.84025	10	20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30	40	.6428	.8391	1.192	.76604	50
40	.5544	.6661	1.501	.83228	20	10	.6450	.8441	1.185	.76417	50
50	.5568	.6703	1.492	.83066	10	20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30	41	.6561	.8693	1.150	.75471	49
40	.5688	.6916	1.446	.82248	20	10	.6583	.8744	1.144	.75280	50
50	.5712	.6959	1.437	.82082	10	20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30	42	.6691	.9004	1.111	.74314	48
40	.5831	.7177	1.393	.81242	20	10	.6713	.9057	1.104	.74120	50
50	.5854	.7221	1.385	.81072	10	20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30	43	.6820	.9325	1.072	.73135	47
40	.5972	.7445	1.343	.80212	20	10	.6841	.9380	1.066	.72937	50
50	.5995	.7490	1.335	.80038	10	20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30	44	.6947	.9657	1.036	.71934	46
40	.6111	.7720	1.295	.79158	20	10	.6967	.9713	1.030	.71732	50
50	.6134	.7766	1.288	.78980	10	20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
						or					
	Cos	Cot	Tan	Sin	Angle		Cos	Cot	Tan	Sin	Angle

STADIA REDUCTION DIAGRAM

Enter on the horizontal scale with the value of the stadia reading (the interval times the stadia constant) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted lines marked "ONE" etc. gives the correction to be subtracted from the entering value, and to which " $f + c$ " (usually about 1 foot) must be added to obtain the true horizontal distance. The reading on the vertical scale plus about 0.1 ft. for each 5° of vertical angle $|(f + c) \sin \alpha|$ is the true vertical distance.

If the vertical angle is beyond the range of diagram, use $H = R \cos^2 \alpha + 1$ to find true horizontal distance and $V = R \times \frac{1}{2} \sin 2\alpha$ for true vertical distance, where R equals observed stadia distance and α equals vertical angle.

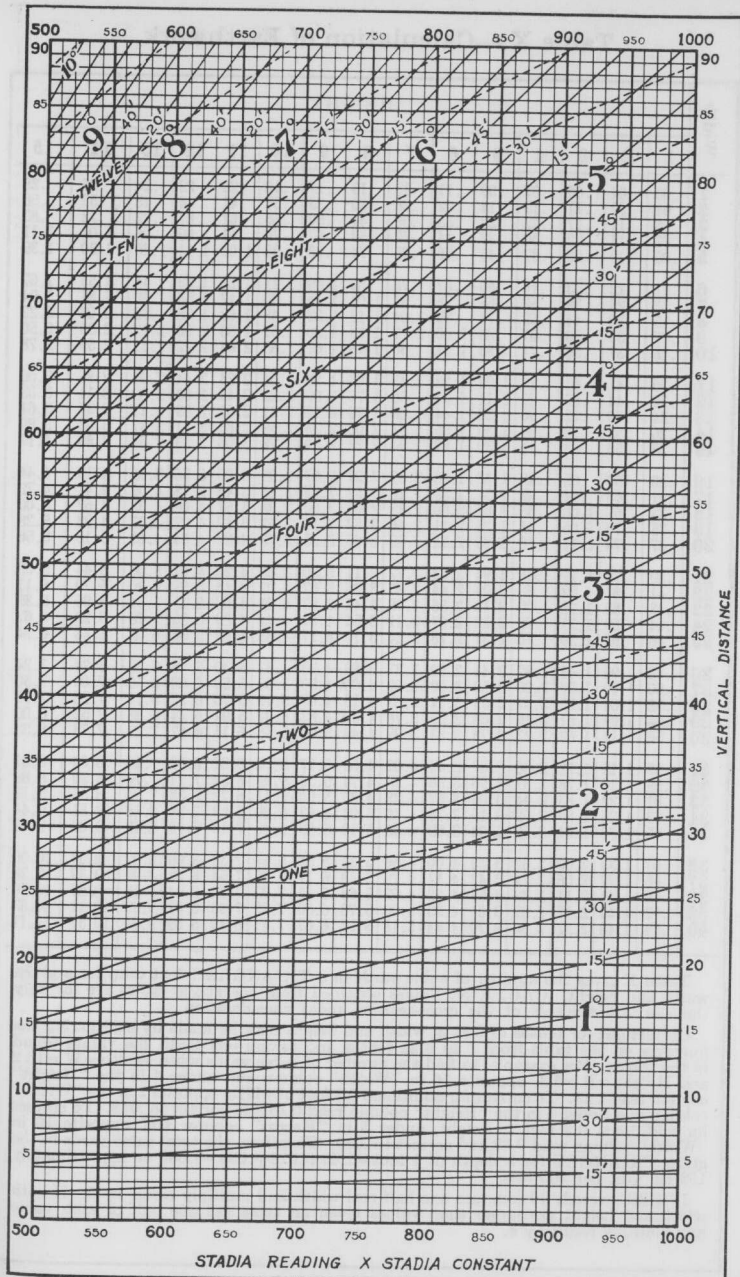
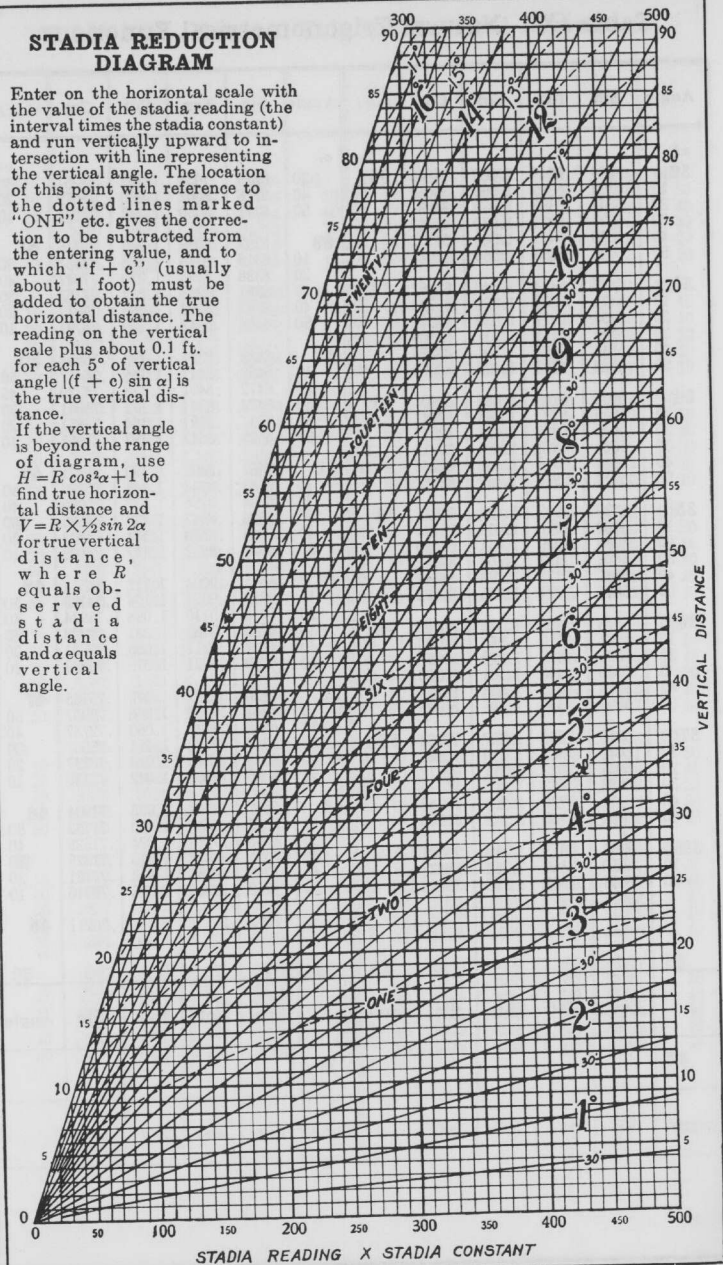


Table X.—Calculation of Earthwork.

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

Table X gives the number of cubic yards in a TRIANGLE 1 foot deep for a given width and height. CAUTION: Values obtained from the above tables are for only the one TRIANGLE of the cross-section under consideration.

Corrections for tenths of feet in width and height may be made by considering the numbers on the table from 1 to 9 as tenths and taking one tenth the values found in the tables. For example, to find the number of cubic yards when Width = W = 16.2 and Height = H = 5.3, opposite 16 in "Width" column and under 5 in the "Height" column read 1.18. To correct for additional 0.2 foot of width, opposite 2 in the "Width" column and under 5 in the "Height" column read 0.18 and correct to .018. To correct for additional 0.3 foot in height, under 3 in "Height" column and opposite 16 in "Width" column read 0.89 and correct to .089. Therefore, the total cubic yards in the given TRIANGLE for a depth of 1 foot = 1.48 + .018 + .089 = 1.587 or approximately 159 cu. yds. per 100 feet.

If width exceeds 40 feet, use one half real width and multiply result by 2. If both width and height are larger than values given on table use one half of each value and multiply result by 4.

77 15
54 27 10.
22 48

77 10
48 45

28 25

28 18

