F.C.D. of Maricopa Co.

Oak Sta Storm Drain, Ph II

FCD 99-08

PCN No. 027-03-32

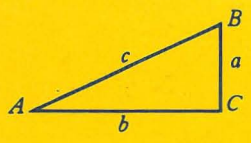
① Horizontal Control

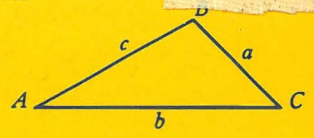
Book 1 of 2

May 1999

603.057

FORMULAE FOR SOLVING RIGHT TRIANGLES





$$\text{Sin } A = \frac{a}{c} = \text{Cos } B \qquad \text{Cot } A = \frac{b}{a} = \text{Tan } B$$

$$\text{Cos } A = \frac{b}{c} = \text{Sin } B \qquad \text{Sec } A = \frac{c}{b} = \text{Cosec } B$$

$$\text{Tan } A = \frac{a}{b} = \text{Cot } B \qquad \text{Cosec } A = \frac{c}{a} = \text{Sec } B$$

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

FORMULAE FOR SOLVING OBLIQUE TRIANGLES

Given	Required	Solution
A, a, b	B, c	$\sin B = \frac{b \sin A}{a}, c = \frac{a \sin C}{\sin A}$
A, B, a	b	$b = \frac{a \sin B}{\sin A}$
a, b, C	A, c	$A + B = 180° - C, c = \frac{a \sin C}{\sin A}$
a, b, c	Area	side $\frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $= \frac{bc \sin A}{2}$
A, B, C, a	Area	area $= \frac{a^2 \sin B \sin C}{2 \sin A}$

Book 1 of 2

Flood Control District of Maricopa Co

Oak Street Storm Drain Phase II

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Phoenix, AZ 85009

Contract FCD 99-08
PCN No. 027-03-32

C.S.W. Contractors Inc Φ

Valco Surveying Corp # 0217-000

① Horizontal Control

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
12052
Valentine M. Padilla
Date Signed 5-26-2000
ARIZONA U.S.A.

Valentine M. Padilla

May 1999

Supv - Val Padilla
P.C. - Jim Archibald
T - Kevin Reed
Φ

	TC @ 100 BS 101		
101		V∡	SD
	0-00-00	91-20-15	1456 50
102	177-23-33	89-55-10	1219 69
	354-47-06		
3X	172-10-50		
AVG	177-23-37		
	TC @ 102 BS 100		
103	180-27-35	90-28-30	1351 43
	360-55-20		
3X	181-22-55		
AVG	180-27-38		
	TC @ 103 BS 102		
104			
	182-02-50	1293 93	90-47-10
	4-06-05		
	186-09-20		
	8-12-23		
5X	190-15-20		
AVG	182-03-04		

(1)

100 NAIL & WHISKER SOUTH SIDE OF OAK 4.5' N. OF CHAIN LINK FENCE 70+95 30.19 RT

101 BC HH OAK & 56 ST (1)

102 BC 60 ST & OAK (2)

103 NAIL WHISKER N. SIDE OAK 3.4 BC IN SIDEWALK 99+66 23.94 LT

104 BC ⊥ OAK & 64 ST SEC COR 40' EAST 111

TO 104 BS 103

105	178-20-38	90-53-30	1429 25
	356-41-22		
	175-02-00		
	353-22-35		
AVG	178-20-39		

TO 105 BS 104

106	180-41-30	90-43-50	1199 87
	1-23-07		
	182-04-58		
47	2-46-45		
	180-41-41		
107	180-14-55	92-01-30	1636 0

105 CP & WIRE WEST CANAL BANK

106 PK SW REY NW COR 68 ST & OAK

107 PK BC REY N. SIDE OAK E. SIDE

66 PLACE

TO 106 BS 105

108	206-33-00	91-31-00	49 31
109	176-07-00	90-40-40	88 62
110	179-47-10	90-31-00	1321 76
	359-34-25		
	179-21-50		
	359-09-12		
5Z	178-56-45		
AVG	179-47-21		

TO 104 BS 105

111			
	1-09-00	91-56-40	40 31

108 BC 68 ST OAK (4)

109 NAIL & WHISKER BW NE COR OAK & 68 ST AT RET

110 NAIL & WHISKER NW COR 70 ST & OAK

111 BC & SEC COR 64 ST (3)

	TL @ 110	BS	106
112	180-30-25	90-41-10	1424 32
	1-01-10		
3X	181-31-40		
AVG	180-30-33		
	TL @ 112	BS	110
113	347-05-05	89-56-00	218 62
114	343-12-10	89-36-00	82 08
115	182-12-10	90-30-00	1305 46
	4-24-45		
	186-37-30		
4X	8-49-48		
AVG	182-12-27		

112 TRAV NAIL & WHISKER BC NE COR SCOTTS DALE & OAK

113 TRAV NAIL & WHISKER BC S SIDE OF OAK 140'± W OF SCOTTS DALE

114 BC HH & SCOTTS DALE & OAK

115 TRAV NAIL & WHISKER BC SE COR OAK & 74ST 25' EAST OF REY

	LO 115	BS 112	
116			
	175-34-20	90-36-30	1218 34
	351-09-00		
	166-43-25		
AVG	175-34-28		
117	18-17-05	89-53-30	69 32
	LO 116	BS 115	
118	237-29-20	89-37-40	344 30
	114-59-20		
	352-29-00		
AVG	237-29-40		
119	217-36-40	90-49-10	43 57

116 PK BC NW COR OAK & MILLER 9' E. OF WEST END OF RET

117 BC FLUSH 74 ST & OAK

118 TRAV NAIL & WHISKER B/W IN PARK

119 BC OAK & MILLER

	LC	110	BS	112
141+85	6 RT	177-02-50	726.35	
149+00	6 RT	106-39-30	36.25	MH
143+13	6 RT	176-27-45	598.53	TEE
150+17	MH 6 RT	17-49-50	112.00	TEE
147+39	6 RT	168-21-04	175.00	TEE
	LC	112	BS	110
160+80	6 RT PRC	353-12-53	256.54	
161+36	PRC 7 RT	351-21-24	207.09	
161+80	PT MH 8 RT	348-20-20	158.00	
163+29	8 RT	279-08-13	32.19	
170+00	8 RT	182-50-20	666.03	
	LC	106	BS	110
125+98	8 RT	178-34-20	991.02	PLUG
128+50	6 RT	178-08-20	739.24	4 PT
131+00	6 RT	177-02-05	489.51	
135+40	6 RT	150-30-30	56.13	

135+74	6 RT	118-06-50	31 53	TEE
135+65	6 RT	130-40-20	36 61	MH
140+00	6 RT	4-10-30	412 23	MH
136+51	6 RT	24-25-20	68 24	TEE
" "	63 RT	54-01-46	105 29	90°
137+30	6 RT	11-27-50	144 01	
	34 RT	21-52-50	151 93	
	T @ 110 BS 112			
156+21	6 RT	2-34-50	711 32	
157+34	6 RT	2-11-51	824 21	

TC 112 BS 110

160+80	6	353-12-50	256 54	
161+30	7 RT	351-21-20	207 09	
161+80	8 RT	348-20-20	158 00	
163+29 67	8 RT	279-08-13	32 19	
166+22	8	186-25-02	289 03	

TC 115 BS 116

168+46	8 ✓	183-29-15	793 53	TEL
170+00	8 ✓	183-46-07	639 57	MH
171+55	8 ✓	184-13-54	484 65	TEL
173+95	8 ✓	186-06-16	244 90	TEL
174+30	✓8 RT	186-44-05	210 00	¢PT
175+33	✓29 LT	208-52-33	118 91	MH ¢PT
175+78	✓51 RT	158-42-00	66 98	MH
✓175+87	67 LT	242-26-41	105 13	PLUG

173+79	7 LT	189-15-14	262 28	W/L 18"
176+43	6 RT	283-37-36	18 52	W/L 18"
175+47	29 LT	212-14-33	106 57	6" WL
175+87	14 LT	218-24-06	64 80	8" WL
175+68	29 LT	219-00-10	88 99	8" SEWR
174+50 94	7 LT	191-51-32	191 07	18" ⊄
174+64 54	6 RT	188-15-05	175 77	18" ⊄
175+40	14 LT	203-19-46	106 44	8" EWD
175+54	63 LT	227-55-00	122 00	TEE
175+96	50 RT	151-32-06	50 48	TEE
179+00	24 RT	2-17-06	260 63	⊄ CB
180+48	24 LT	355-35-55	411 46	

182+69.96 29LT 357-30-06 632.83 PC

183+50 27.55 LT 358-09-30 712.51 PT

TC 116 BS 115

185+60	8 68 LT	359-08-22	297 21	MH
185+90	2° LT	357-21-21	267 75	MH
187+29	2° LT	352-02-22	129 83	MH
187+21	6 RT	349-23-16	139 28	18" w/L
188+33	6 RT	309-37-20	39 19	18" w/L
		187+50	106 15	
184+90 10	22 45 LT	1-53-42	366 66	
185+69 93	21 LT	1-29-14	286 85	
	186+97 37			
15	0-49-16	159 43		PC
	187+96 62			
17	331-40-15	81 59		PT
187+65	349-16-02	97 52		MH

189+52 25	18 96 RT	263-39-20	167 79	
191+35 45	0	241-46-40	328 95	
192+34 52		233-42-45	410 44	

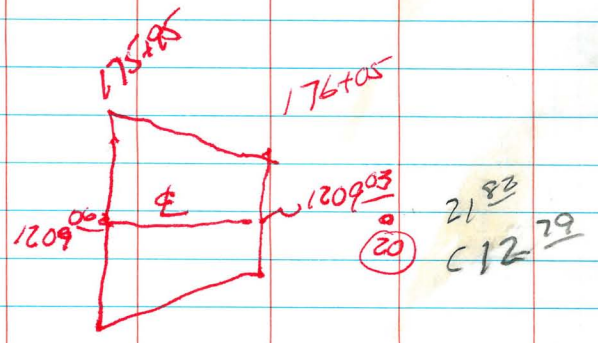
TL 115 BS 116

175+95	39^{23} LT	237-19-54	77^{37}
175+95	18^{77} LT	226-22-38	61^{74}
176+05	35^{56} LT	242-24-03	68^{91}
176+05	22^{44} LT	235-54-42	57^{90}

175+95	3^{77} LT (15)	214-30-44	52^{43}
175+95	1^{23} RT (20)	209-39-09	49^{94}

175+75	29^{47} (20)	221-52-25	83^{48}
176+25	29^{47} (20)	257-11-44	55^{07}

177+00 ℄ (29) 340-35-35 65^{27}



22^{18}

(20)

$C\text{-}13^{12}$

21^{82}

(20)

$C12^{79}$

177+00 1208 93

1221 47

$C12^{54}$

116 BS 115

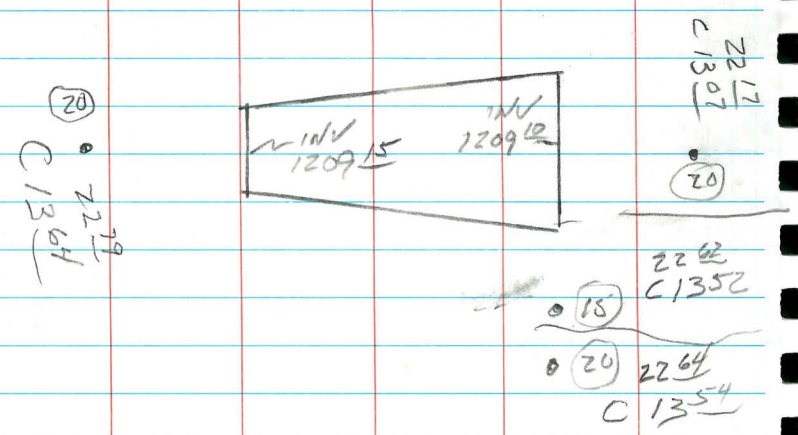
182+69 96	29 RT	PC	359-51-51	587 33
183+09 98			359-39-00	547 89
183+50	✓	PT	359-19-16	508 52
184+00	✓		358-46-04	458 73
184+90 10	✓	PC	357-23-41	369 17
185+30	✓ ✓		356-35-58	329 03
185+69 93	✓	PT	355-43-36	288 85
186+00	✓		354-57-46	259 01
186+50	✓		353-12-40	209 51
186+97 37	✓	PC	350-34-20	162 98

T/C 115 BS 112

175+36	35^{25}	27-47-00	119^{23}
175+36	22^{75}	22-18-18	113^{52}
175+60	39^{19}	36-29-30	101^{55}
175+60	18^{81}	26-19-37	90^{26}
175+80	29^{47}	39-44-16	79^{69}
175+16	29^{47}	21-12-25	134^{33}

STRUCTURE #3

BM 1221^{74}



TC 107 BS 106

125-198 14 8R7

45-28-30 65 29

	TO 102	BS	102	
102	0-00-00	135 50		
95+20	8 RT	348-40-42	149 48	MH
98+80	8 RT	189-30-14	216 34	MH
102+40	8 RT	184-12-00	574 86	MH
106+00	8 RT	182-58-23	934 51	MH
107+30 67	8 RT	182-44-00	1065 12	PC
107+89 21	5 40	182-30-40	1123 56	PT
108+20 78	2 59 RT	182-19-50	1155 05	PC
108+79 33	0 RT	182-08-42	1213 53	PT
91+40	8 RT	357-32-25	526 99	
87+60	8 RT	358-59-45	906 59	

	TO 102	BS	103	
85+02 72	8 RT	3-27-08	188 15	PT
84+17 64	2 49 RT	2-24-07	102 93	PC
83+60	5° LT	354-42-45	45 53	MH
82+50	5° LT	185-22-22	64 23	GB
80+10	5° LT	181-53-50	304 78	MH
75+90	5 LT	181-21-10	724 76	MH
73+80	5 LT	181-15-50	934 75	MH

115 BS 116

X173+65	75 LT		188-54-12 276 19		STOP
X174+21	75 LT		190-34-14	220 65	VALVE
X174+50	94 75 LT		191-51-32	191 07	45
X174+64	54 6 RT		188-15-05	175 76	45
176+02	6 RT		208-14-27	41 54	AR VALVE
X173+79	75 LT		189-15-14	262 28	
176+43	6 RT		283-37-36	18 52	

	TC @ 116	BS 115
186+97 37	0-49-20	159 56
187+50	354-25-24	109 44
188+00	329-28-34	80 88
188+50	294-48-17	86 09
189+00	271-16-18	115 24
189+50	258-29-33	155 40
190+00	251-10-20	200 04

	TC @ 188+00 ℄	BS 115
187+00	12 LT	30-29-55 102 64
187+25	15 LT	40-24-28 79 62
187+50	25 LT	59-54-50 59 87
187+69	37 LT	86-05-00 51 04
RAD	317-15-21	125 04

	T @ 190+00 BS 116		
190+00	22	66-40-12	22 00
190+50		156-40-13	50 00
	22	132-55-14	54 62
191+00		156-40-13	100 00
	22	144-15-46	102 39
191+35 45		156-40-13	135 45 PC
	22	147-26-41	137 22
192+00		151-57-50	197 85
	22	145-55-13	189 67
192+34 52		147-16-24	227 56
	22	142-31-50	215 38
193+00		139-27-32	283 16
193+50		135-19-46	328 07
193+98		132-19-00	372 42
19		113-59-43	184 41 RAD

L @ 116 BS 192+34 52

189+00 (22) 28-28-41 101 38

188+50 (22) 53-37-44 66 40

187+96 68 (22) 103-04-20 60 50

C 115 B5 116

240-23-20 85^{38}

175+94^{21} 48^{3} ~~242-57-45~~ ~~83^{83}~~

176+14^{09} 23^{5} 244-22-47 53^{95}

359-52-22 1126.^{20}

176+14^{09}

176+60 45^{91}

178+00 185^{91}

180+90 475^{91}

185+00 885^{91}

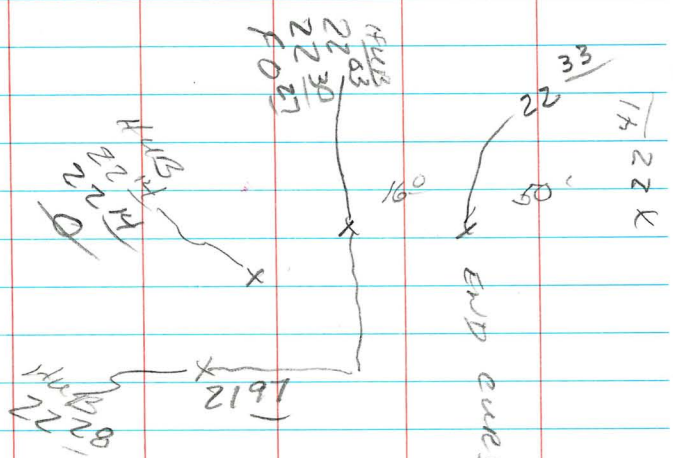
1166.^{78}

STA	7	H 1	—		LIP
BC	5 39	1219 99		1214 60	
MATCH TC					
187+81			3 85	1216 14	
187+00	HUB		4 23	1215 76	
	EP 11°		3 20	1216 29	1216 09
	PAV 17°		3 59	1216 40	
186+00	HUB		3 72	1216 27	
	EP 10°		3 38	1216 61	16 46
	PAV 17°		3 17	1216 82	
185+00	HUB		3 18	1216 81	
	EP 20°		2 85	1217 14	1216 90
	PAV 10°		2 68	1213 31	
				1216 81	
	5 82	1222 63			
184+00	HUB		5 61	1217 02	
	EP 8°		5 18	1217 45	17 32
	PAV 18°		5 02	1217 61	

Sta	+	H1	−	E2	LIP
		1222.63			
183+00	HUB		5.53	1217.10	
	EP 6.0		4.82	1217.81	1768
	PAV 16.0		4.61	1218.02	
182+00	HUB		4.84	1217.79	
	EP 7.0		4.40	1218.23	1218.03
	PAV 17.0		4.12	1218.51	
181+00	HUB	1222.63	4.41	1218.22	
	6.10	1224.32			
	EP 4.0		5.69	1218.63	1218.51
	PAV 14.0		5.40	1218.92	
180+00	HUB		5.57	1218.75	
	EP 5.0		5.21	1219.11	1218.95
	PAV 15.0		4.88	1219.44	

Sta	+	HI	−	EL	LIP
		1224.32			
179+00	HUB		4.96	1219.36	
	EP 4°		4.77	1219.55	1219.41
	PAV 14°		4.42	1219.90	
178+60	HUB		4.45	1219.87	
	EP 4°		4.04	1220.28	1220.14
	PAV 14°		3.70	1220.62	
177+00	HUB		4.08	1220.24	
	EP 6°		3.21	1221.11	1220.92
	PAV 16°		2.89	1221.43	
115			2.60	1221.72	
REY			2.35	1221.97	

STA	+	HI	−	EL
				21 74
	4 41	26 15		



	TL @ 115 BS 116	
117	202-42-37	69.33
S.D.M.H	239-15-20	69.07
S.D.M.H.	206-11-06	123.50
℄ B/C C.B.	243-13-56	92.29
℄ B/C C.B.	229-35-59	125.04
	TL @ 112 BS 110	
	343-12-10	82.08
	TL @ 110 BS 112	
7	39-57-14	44.59
	TL @ ~~106~~ 8 BS 110	
105		
	180-12-39	1199.87
		1199.56
108	26-35-47	49.58

	TC	103	BS	102	
102	0-00-00			1351 50	
95+60		30 48	333-50-50 119 18		END PAR
95+63 48		27 48	334-23-11 114 72		
95+56 52		27 48	335-51-50 120 98		
95+63 48		35 52	330-54-37 118 54		
95+56 52		25 52	332-31-00 124 61		
93+14	30	352-28-00		355 99	
83+60	30	358-39-00		1307 14	

Tc @ 102 BS 103

83+60	30	34-33-16	54 30
82+72	23	152-40-12	48 53
82+70	48	133-56-40	65 62
80+10	20	177-12-10	305 40
95		175-24-46	307.42
74+80	20	179-35-10	834 98

Tc @ 95 BS 102

80+10	51 RT	92-12+40	21 33
80+10	26 RT	294-03-54	3 91
96		185-26-19	447.76

Tc @ 96 BS 102

75+74	47 RT	54-01-32	20 98
		351-51-30	19.48

73+60 50 RT

176-47-20 201 94

	T @ 201	BS 1		
201	0-00-00	1850.57		
202 M.H.	15-59-03	113.09		73+81.67 / 5.48 LT
END 203 Pipe	355-48-47	127.17	+ 11.00 RT.	73+62.97 45.67 RT
END 204 Pipe	184-18-30	84.78	+ 12.5 RT.	75+74.40 / 47.38 RT
205 M.H.	161-36-16	108.14	75+93.05	/ 5.35 LT
END 206 Pipe	180-00-21	520.15	+ 16.00 RT.	80+10.07 / 51° RT
207 M.H.	175-36-24	523.50	80+12.47	5.14 LT
208 TRAV. PT.	178-41-40	820.48		
	T @ 208	B.S. 201		
209 TRAV. PT.	178-34-56	1314.90		
210 END Pipe	341-39-50	43.20	+ 12.4 RT	82+69.56 / 47° RT
211 M.H.	153-21-51	56.27	83+60.55	/ 5.02 LT
212 END Pipe	191-49-23	50.83	83+60.32	30.63 RT

	T @ 208	B.S. 201		
213 M.H.	178-54-52	450.60	5360 718	89-21-17
			87+60 94 / 8 95 RT	
	T @ 209	B.S. 208		
214 ℄ C.B.	322-17-56	86.77	95+57 91 / 31 59 RT	
215 M.H.	344-50-39	109.05	95+20 50 / 8 29 RT	
216 ℄ C.B.	352-09-32	315.43	93+13 86 / 29 81 RT	
217 M.H.	358-07-27	485.03	91+40 74 / 8 48 RT	
218 M.H.	359-48-54	864.28	87+60 98	SAME AS 213
219 M.H.	189-07-01	253.40	98+76 47 / 7 91 RT	
220 M.H.	184-54-02	615.59	102+39 56 / 8 07 RT	
221 M.H.	183-49-59	971.57	105+98 86 / 8 40 RT	
222 B.C.	182-55-10	1375.47	B.C. IN H.H. @ 64ST & Oak	

101 - 111

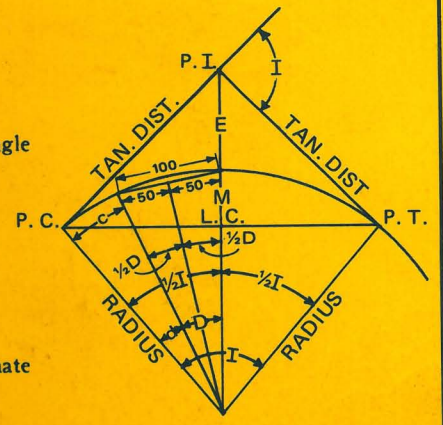
	T @ 110	B.S. 113			
		1212.24			
223 M.H.	358-59-32	1267.83		(223)	161+77 91 / 4 88 R
224 & C.B.	1-03-29	824.90	-5.72	224	157+33 81 22 86 RT
225 M.H.	0-12-29	719.64		(225)	156+29 34 5 62 R
226 & C.B.	23-06-58	118.36	-5.64	(226)	150+17 23 22 53 RT
227 M.H.	96-17-50	35.08		(227)	149+05 14 / 5 97 RT
228 & C.B.	160-48-14	178.88	-5.55	(228)	147+39 16 / 22 63 RT
229 & C.B.	172-34-57	599.73	-4.08	(229)	143+13 40 / 22 46 R
230 & C.B.	177-06-23	726.37	-6.31	(230)	141+84 17 / 24 82 LT
	T @ 106	B.S. 110			
231 M.H.	4-15-35	412.67		231	140+00 40 / 6 64 RT
232 & C.B.	21-40-31	151.19	-6.15	232	137+29 50 / 33 22 RT
233 & C.B.	50-16-35	111.28		233	136+60 27 / 63 33

	TC 106	BS. 110			
234 ℄ C.B.	109-27-46	46.43	-4.34	234	135+73.47 / 22.00 RT
235 M.H.	131-07-01	37.22	-4.32	235	135+64.39 / 6.28 RT
236 ℄ C.B.	180-28-21	49.66		236	135+39.05 / 22.04 LT
237 M.H.	177-01-03	488.20		237	131+01.32 / 6.07 RT
238 M.H.	178-33-49	979.07		238	126+10.09 / 7.80
	TC 112	BS 115	1305.32		
239 M.H.	357-48-05	1191.54		239	175+26.26 / 25.74 LT
240 ℄ C.B.	357-53-17	1060.86	-8.12	240	173+95.58 23.91
241 ℄ C.B.	357-53-18	817.10	-8.60	241	171+51.82 / 23.89 LT
242 M.H.	0-35-48	665.53		242	169+99.51 / 7.58 RT
243 ℄ C.B.	3-15-08	513.30	-5.60	243	168+45.78 / 24.13 RT
244 ℄ C.B.	357-52-50	439.74	N/A	244	167+74.46 / 23.90 LT
245 ℄ C.B.	357-52-14	272.91	-4.68	245	166+07.63 / 23.91 LT

	Λ @ 112	BS 115	
246			
℄ C.B.	8-14-15	266.73	-5.71
	246 165+97 12	/ 24 10 RT	
247			
M.H.	91-26-49	28.30	
	247 163+32 97	/ 4 46 RT	
1218 34			
	℞ @ 116	BS 115	
248			
℄ C.B.	2-13-58	805.20	
	180+51 55	/ 23 94 LT	
249			
M.H.	2-22-04	544.05	
	183+12 70	/ 25 62 LT	
250			
M.H.	351-08-45	101.05	
	187+57 61	/ 5 59 LT	
	℞ @ 115	BS 116	
251			
℄ C.B.	182-21-26	18.91	
	176+20 46	24 15 RT	
252			
℄ C.B.	254-01-15	50.65	
	252 176+23 47	/ 23 93 LT	
253			
M.H.	239-14-02	69.01	
	253 76+01 70	/ 33 66 LT	
254			
℄ C.B.	242-11-03	89.36	175+94 50 53 12 LT
255			
℄ C.B.	228-42-18	122.93	(175+54 57) 49 84 LT
256			
℄ C.B.	165-55-14	88.66	175+54 32 / 49 2 RT
257			
℄ C.B.	158-35-27	49.25	+ 13 20
	175+94 28	/ 57 2 RT	

CURVE FORMULAE

D = Degree of Curve
1° = 1-Degree of Curve
2° = 2-Degree of Curve
P.C. = Point of Curve
P.T. = Point of Tangent
P.I. = Point of Intersection
I = Intersection of Angle, Angle Between Two Tangents
L = Length of Curve, from P.C. to P.T.
T = Tangent Distance
E = External Distance
R = Radius
L.C. = Length of Chord
M = Length of Middle Ordinate
c = Length of Sub-Chord
d = Angle of Sub-Chord



$$R = \frac{L.C.}{2\sin{}^1\!/_2 I},\ T = R\tan{}^1\!/_2 I = \frac{L.C.}{2\cos{}^1\!/_2 I}$$

$$\frac{L.C.}{2} = R\sin\frac{I}{2},\ D\,1^\circ = R = 5730,\ D\,2^\circ = \frac{5730}{2},\ D = \frac{5730}{R}$$

$$M = R\,(1 - \cos{}^1\!/_2 I),\ = R - R\cos\frac{I}{2}$$

$$\frac{E+R}{R} = \sec\frac{I}{2},\ \frac{R-M}{R} = \cos\frac{I}{2}$$

$$c = 2R\sin{}^1\!/_2 d,\ d = \frac{c}{2R}$$

$$L.C. = 2R\sin{}^1\!/_2 I,\ E = R\,(\sec{}^1\!/_2 I - 1),\ = R\sec\frac{I}{2} - R$$

Minutes in Decimals of a Degree

1′	.0167	11′	.1833	21′	.3500	31′	.5167	41′	.6833	51′	.8500
2	.0333	12	.2000	22	.3667	32	.5333	42	.7000	52	.8667
3	.0500	13	.2167	23	.3833	33	.5500	43	.7167	53	.8833
4	.0667	14	.2333	24	.4000	34	.5667	44	.7333	54	.9000
5	.0833	15	.2500	25	.4167	35	.5833	45	.7500	55	.9167
6	.1000	16	.2667	26	.4333	36	.6000	46	.7667	56	.9333
7	.1167	17	.2833	27	.4500	37	.6167	47	.7833	57	.9500
8	.1333	18	.3000	28	.4667	38	.6333	48	.8000	58	.9667
9	.1500	19	.3167	29	.4833	39	.6500	49	.8167	59	.9833
10	.1667	20	.3333	30	.5000	40	.6667	50	.8333	60	1.0000

Inches in Decimals of a Foot

1/16 .0052	3/32 .0078	1/8 .0104	3/16 .0156	1/4 .0208	5/16 .0260	3/8 .0313	1/2 .0417	5/8 .0521	3/4 .0625	7/8 .0729
1 .0833	2 .1667	3 .2500	4 .3333	5 .4167	6 .5000	7 .5833	8 .6667	9 .7500	10 .8333	11 .9167