



# Bridge Design Details 2F October 2019

## Tangent Offset for Circular Curves

Radius	50'	100'	150'	200'	250'	300'	400'	500'	600'	700'	800'	900'	1,000'
20,000'	0.06	0.25	0.56	1.00	1.56	2.25	4.00	6.25	9.00	12.25	16.01	20.26	25.02
15,000'	0.08	0.33	0.75	1.33	2.08	3.00	5.33	8.34	12.01	16.34	21.35	27.02	33.37
10,000'	0.13	0.50	1.13	2.00	3.13	4.50	8.00	12.51	18.02	24.53	32.05	40.58	50.13
9,000'	0.14	0.56	1.25	2.22	3.47	5.00	8.89	13.90	20.02	27.26	35.62	45.11	55.73
8,000'	0.16	0.63	1.41	2.50	3.91	5.63	10.01	15.64	22.53	30.68	40.10	50.79	62.75
7,000'	0.18	0.71	1.61	2.86	4.47	6.43	11.44	17.88	25.76	35.09	45.87	58.10	71.80
6,000'	0.21	0.83	1.88	3.33	5.21	7.51	13.35	20.87	30.08	40.97	53.57	67.88	83.92
5,000'	0.25	1.00	2.25	4.00	6.25	9.01	16.03	25.06	36.13	49.24	64.24	81.67	101.02
4,500'	0.28	1.11	2.50	4.45	6.95	10.01	17.81	27.86	40.18	54.78	71.68	90.92	112.52
4,000'	0.31	1.25	2.81	5.00	7.82	11.27	20.05	31.37	45.26	61.73	80.82	102.57	127.02
3,500'	0.36	1.43	3.22	5.72	8.94	12.88	22.93	35.90	51.18	70.71	92.66	117.69	145.90
3,000'	0.42	1.67	3.75	6.67	10.44	15.04	26.79	41.96	60.61	82.81	108.53	138.18	171.57
2,500'	0.50	2.00	4.50	8.01	12.53	18.07	32.20	50.51	73.07	100.00	131.46	167.62	208.71
2,000'	0.63	2.50	5.63	10.03	15.69	22.63	40.41	63.51	92.12	126.50	166.97	213.94	267.95
1,800'	0.70	2.78	6.26	11.15	17.45	25.18	45.01	70.84	102.94	141.69	187.55	241.15	303.34
1,700'	0.74	2.94	6.63	11.81	18.48	26.68	47.73	75.19	109.40	150.81	200.00	257.78	325.23
1,600'	0.78	3.12	7.05	12.55	19.65	28.38	50.81	80.13	116.76	161.25	214.36	277.12	351.00
1,500'	0.83	3.34	7.52	13.39	20.98	30.31	54.32	85.79	125.23	173.35	231.14	300.00	
1,400'	0.89	3.58	8.06	14.36	22.50	32.52	58.36	92.33	135.09	187.56	251.09	327.61	
1,300'	0.96	3.85	8.58	15.48	24.27	35.09	63.07	100.00	146.74	204.56	275.31		
1,250'	1.00	4.01	9.03	16.10	25.26	36.53	65.73	104.36	153.41	214.38	289.53		
1,200'	1.04	4.17	9.41	16.78	26.33	38.11	68.63	109.13	160.77	225.32	305.57		
1,100'	1.14	4.56	10.28	18.34	28.79	41.70	75.31	120.20	178.05	251.47			
1,000'	1.25	5.01	11.31	20.20	31.75	46.06	83.49	133.96	200.00	285.86			

**Table 2A.F.1 Distance from Beginning or End of Curve Along Tangents**



Radius	50'	100'	150'	200'	250'	300'	400'
900'	1.39	5.57	12.59	22.50	35.42	51.47	93.77
800'	1.56	6.28	14.19	25.40	40.07	58.38	107.18
750'	1.67	6.70	15.15	27.16	42.89	62.61	
700'	1.79	7.18	16.26	29.18	46.17	67.54	
650'	1.93	7.74	17.54	31.53	50.00	73.37	
600'	2.09	8.39	19.05	34.32	54.56	80.39	
550'	2.28	9.17	20.85	37.65	60.10		
500'	2.51	10.10	23.03	41.74	66.99		
450'	2.79	11.25	25.74	46.89			
400'	3.14	12.70	29.19	53.59			
300'	4.20	17.16	40.19				
200'	6.35	26.80	67.71				
100'	13.40						

**Derivation of Table**

Given: Radius and X Find: Offset Y

$$(1) R \sin \Delta = X \implies \sin \Delta = \frac{X}{R}$$

$$(2) R - R \cos \Delta = R(1 - \cos \Delta)$$

Given: Y and X Find: Radius

$$(1) \tan \frac{\Delta}{2} = \frac{Y}{X}$$

$$(2) R = \frac{X}{\sin \Delta}$$

**Note:**

For approximate results, the following simpler formula can be used.

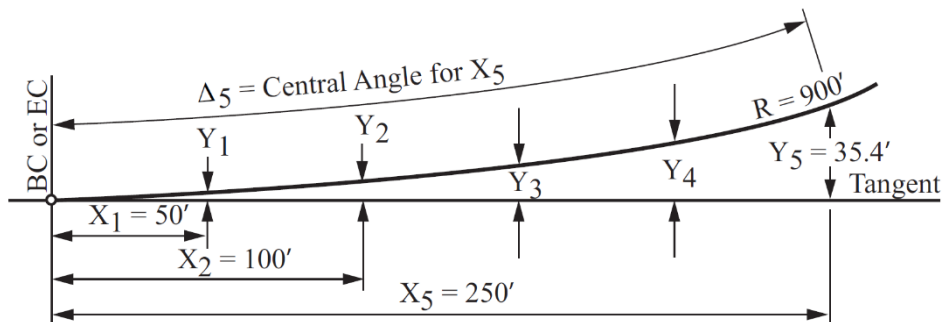
(The error is 1% when  $X = 0.2R$ )

$$(Y = \frac{X^2}{2R})$$

**Table 2A.F.1 Distance from Beginning or End of Curve Along Tangents (continued)**

**Example:**

Given Radius = 900'.



**Figure 2A.F.1 Example of Distances along Tangent from Curve**