A Procedure For Offsetting Curves

Quite often, it is desirable to offset a curve from its planned location, perhaps to set stakes away from construction areas, to stake berms or excavation lines, or perhaps due to the planned centerline's being in an existing channel.

The following method for offsetting a curve makes it unnecessary to compute new curve data, deflection angles, etc. By using a shorter (or longer) chord length an offset curve can be staked with very little field computation. Offset chord lengths can be determined by a simple formula or by the attached tables. Also, the basic stationing of the planned centerline is not changed and the original curve data is used in staking.

Using the following formula, the offset chord length can be determined for any offset distance.

$$\text{Offset chord} = 100 \pm 2(\sin \frac{D}{2} \times \text{offset distance})$$

(Note: This particular formula applies only to a basic chord of 100 feet. For a basic chord of 50 feet, the formula is: Offset chord = $50 \pm 2(\sin \frac{D}{4} \times \text{offset distance})$)

Example: D = 5 degrees. Find offset chord length for 75' offset to inside.

$$\begin{aligned} \text{Offset chord} &= 100 - 2(\sin 2^\circ 30' \times 75) \\ &= 100 - 2(0.04362 \times 75) \\ &= 100 - 6.54 \text{ or } 93.46 \text{ feet} \end{aligned}$$

Using this chord length, stake the curve in the normal manner, beginning at the offset P. C. The only change is to instruct the chainman to use 93.46 feet instead of 100 for the chord length. The stations will be marked on the stakes as if 100 had been used, since the planned centerline is the one to be used for computing grades, quantities, etc. Any "odd" chord length would be shortened in the same ratio.

The attached tables give the correction factor for 100-foot basic lengths for various offsets normally encountered and for "D" from 1 degree to 8 degrees in 10-minute increments. Chords for other offsets can be computed from the tables by simple addition of 2 or more values. For example, correction for offset of 65 feet would be 5.23 (from table for 50 feet) plus 1.57 (from table for 15 feet) or 6.80 feet for a 6 degree curve.

The P. T. should always be checked by some other means (tangent distance, baseline, etc.) to be sure alignment is correct. Also, the "chord" method of staking curves is not exactly correct since the chord is always shorter than the curve length. Also, it is suggested the "D" for a curve be selected at an even increment, such as those in the tables.

QUANTITIES PLUS or MINUS TO BE APPLIED TO 100' CHORDS FOR FOLLOWING OFFSETS WITH A GIVEN "D"

"D"	Offset Distance 10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	25'	50'	75'	100'
1-00	0.18	0.20	0.22	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35	0.44	0.87	1.31	1.75
1-10	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.38	0.40	0.51	1.02	1.53	2.04
1-20	0.24	0.26	0.28	0.30	0.32	0.34	0.38	0.40	0.42	0.44	0.46	0.58	1.16	1.75	2.33
1-30	0.26	0.28	0.32	0.34	0.36	0.40	0.42	0.44	0.48	0.50	0.52	0.66	1.31	1.96	2.62
1-40	0.30	0.32	0.34	0.38	0.40	0.44	0.46	0.50	0.52	0.56	0.58	0.73	1.45	2.18	2.91
1-50	0.32	0.36	0.38	0.42	0.44	0.48	0.52	0.54	0.58	0.60	0.64	0.80	1.60	2.40	3.20
2-00	0.36	0.38	0.42	0.46	0.48	0.52	0.56	0.60	0.62	0.66	0.70	0.87	1.75	2.62	3.49
2-10	0.38	0.42	0.46	0.50	0.52	0.56	0.60	0.64	0.68	0.72	0.76	0.95	1.89	2.84	3.78
2-20	0.40	0.44	0.48	0.52	0.58	0.62	0.66	0.70	0.74	0.78	0.82	1.02	2.04	3.05	4.07
2-30	0.44	0.48	0.52	0.56	0.62	0.66	0.70	0.74	0.78	0.82	0.88	1.09	2.18	3.27	4.36
2-40	0.46	0.52	0.56	0.60	0.66	0.70	0.74	0.80	0.84	0.88	0.94	1.16	2.33	3.49	4.65
2-50	0.50	0.54	0.60	0.64	0.70	0.74	0.80	0.84	0.88	0.94	0.98	1.24	2.47	3.71	4.94
3-00	0.52	0.58	0.62	0.68	0.72	0.78	0.84	0.90	0.94	1.00	1.04	1.31	2.62	3.93	5.24
3-10	0.56	0.60	0.66	0.72	0.78	0.82	0.88	0.94	1.00	1.04	1.10	1.38	2.76	4.15	5.53
3-20	0.58	0.64	0.70	0.76	0.82	0.88	0.94	0.98	1.04	1.10	1.16	1.45	2.91	4.36	5.82
3-30	0.62	0.68	0.72	0.80	0.86	0.92	0.98	1.04	1.10	1.16	1.22	1.53	3.05	4.58	6.11
3-40	0.64	0.70	0.76	0.84	0.90	0.96	1.02	1.08	1.16	1.22	1.28	1.60	3.20	4.80	6.40
3-50	0.66	0.74	0.80	0.86	0.94	1.00	1.08	1.14	1.20	1.28	1.34	1.67	3.34	5.02	6.69
4-00	0.70	0.76	0.84	0.90	0.98	1.04	1.12	1.18	1.26	1.32	1.40	1.75	3.49	5.24	6.98
4-10	0.72	0.80	0.88	0.94	1.02	1.10	1.16	1.24	1.30	1.38	1.46	1.82	3.64	5.45	7.27
4-20	0.76	0.84	0.90	0.98	1.06	1.14	1.20	1.28	1.36	1.44	1.52	1.89	3.78	5.67	7.56

"D"	Offset Distance 10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'	25'	50'	75'	100'
4-30	0.78	0.86	0.94	1.02	1.10	1.18	1.26	1.34	1.42	1.50	1.58	1.96	3.93	5.89	7.85
4-40	0.82	0.90	0.98	1.06	1.14	1.22	1.30	1.38	1.46	1.54	1.62	2.04	4.07	6.02	8.14
4-50	0.84	0.93	1.01	1.10	1.18	1.27	1.35	1.43	1.52	1.60	1.69	2.11	4.22	6.35	8.43
5-00	0.87	0.96	1.05	1.13	1.22	1.30	1.40	1.48	1.57	1.66	1.74	2.18	4.36	6.54	8.72
5-10	0.90	0.99	1.08	1.17	1.26	1.35	1.44	1.53	1.62	1.71	1.80	2.25	4.51	6.76	9.01
5-20	0.93	1.02	1.12	1.21	1.30	1.40	1.49	1.58	1.67	1.77	1.86	2.33	4.65	6.98	9.30
5-30	0.96	1.06	1.15	1.25	1.34	1.44	1.54	1.63	1.73	1.82	1.92	2.40	4.80	7.20	9.60
5-40	0.99	1.09	1.19	1.29	1.38	1.48	1.58	1.68	1.78	1.88	1.98	2.47	4.94	7.42	9.89
5-50	1.02	1.12	1.22	1.32	1.42	1.53	1.63	1.73	1.83	1.93	2.04	2.54	5.09	7.63	10.18
6-00	1.05	1.15	1.26	1.36	1.47	1.57	1.67	1.78	1.88	1.99	2.09	2.62	5.23	7.85	10.47
6-10	1.08	1.18	1.29	1.40	1.51	1.61	1.72	1.83	1.94	2.04	2.15	2.69	5.38	8.07	10.76
6-20	1.10	1.22	1.33	1.44	1.55	1.66	1.77	1.88	1.99	2.10	2.21	2.76	5.52	8.29	11.05
6-30	1.13	1.25	1.36	1.47	1.59	1.70	1.81	1.93	2.04	2.15	2.27	2.84	5.67	8.50	11.34
6-40	1.16	1.28	1.40	1.51	1.63	1.74	1.86	1.98	2.09	2.21	2.33	2.91	5.81	8.72	11.63
6-50	1.19	1.31	1.43	1.55	1.67	1.79	1.91	2.03	2.15	2.26	2.38	2.98	5.96	8.94	11.92
7-00	1.22	1.34	1.47	1.59	1.71	1.83	1.95	2.08	2.20	2.32	2.44	3.05	6.10	9.16	12.21
7-10	1.25	1.38	1.50	1.63	1.75	1.88	2.00	2.13	2.25	2.38	2.50	3.13	6.25	9.38	12.50
7-20	1.28	1.41	1.53	1.66	1.79	1.92	2.05	2.17	2.30	2.43	2.56	3.20	6.40	9.59	12.79
7-30	1.31	1.44	1.57	1.70	1.83	1.96	2.09	2.22	2.35	2.49	2.62	3.27	6.54	9.81	13.08
7-40	1.34	1.47	1.60	1.74	1.87	2.01	2.14	2.27	2.41	2.54	2.67	3.34	6.69	10.03	13.37
7-50	1.37	1.50	1.64	1.78	1.91	2.05	2.19	2.32	2.46	2.60	2.73	3.42	6.83	10.25	13.66
8-00	1.40	1.53	1.67	1.81	1.95	2.09	2.23	2.37	2.51	2.65	2.79	3.49	6.98	10.46	13.95