Circular Curve Setting Out by Deflection Angles (Rankine)

Tangent length, curve length, chainages, sub-chords and Rankine deflection angles for setting out a circular curve with a theodolite and tape from the tangent point.

Method: Rankine's tangential angle method

Input parameters

Unit system: SI

Parameter	Value	Unit
Curve radius	400.00	m
Deflection (intersection) angle	36.000	°
Chainage of the intersection point	1,250.0	m
Standard chord (peg interval)	20.000	m

Calculated results

Parameter	Value	Unit
Tangent length R tan(Δ/2)	129.97	m
Curve length RΔ	251.33	m
Chainage of the first tangent point	1,120.0	m
Chainage of the second tangent point	1,371.4	m
First sub-chord	19.968	m
Last sub-chord	11.360	m
Number of full chords	11.000	
Deflection angle for the first sub-chord	1.4301	°
Deflection angle for each full chord	1.4324	°
Deflection for the last sub-chord	0.81357	°

Notes for this case

• Rankine's method: each chord subtends a tangential angle δ = c/(2R) (arc taken equal to chord); cumulative deflections from the first tangent point, ending at Δ/2. Pegs at round chainages, so the first sub-chord brings the chainage to a multiple of the peg interval.

Formula and method

$$T = R\tan\frac{\Delta}{2}, \quad L = R\Delta, \quad \delta = \frac{c}{2R}\ (\text{rad}) = 1718.9\frac{c}{R}\ (\text{minutes})$$

Variables

R	Curve radius	m
Δ	Deflection (intersection) angle	rad
Ch_I	Chainage of the intersection point	m
c	Standard chord (peg interval)	m
T	Tangent length R tan(Δ/2)	m
L	Curve length RΔ	m
Ch_{T1}	Chainage of the first tangent point	m
Ch_{T2}	Chainage of the second tangent point	m
c_1	First sub-chord	m
c_n	Last sub-chord	m

n	Number of full chords	-
δ_1	Deflection angle for the first sub-chord	rad
δ	Deflection angle for each full chord	rad
δ_n	Deflection for the last sub-chord	rad

Method and standards

Tangential angle (Rankine) method.

Assumptions and limits

- Simple circular curve, chord ≈ arc.

References

Rankine's tangential angle method

Report details

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Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/surveying/curve-setting-deflection-angles

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Reopens the calculator with the inputs of this report.