Horizontal Circular Curve: Tangent, Length and Chords

Tangent length, curve length, long chord, external distance and middle ordinate of a simple circular curve from its radius and deflection angle, with chainages.

Method: Simple circular curve geometry (surveying texts)

Input parameters

Unit system: SI

Parameter	Value	Unit
Radius	300.00	m
Deflection angle	40.000	°
Chainage of the intersection point	1,000.0	m

Calculated results

Parameter	Value	Unit
Tangent length R tan(Δ/2)	109.19	m
Curve length R Δ	209.44	m
Long chord 2R sin(Δ/2)	205.21	m
External distance R(sec(Δ/2) − 1)	19.253	m
Middle ordinate R(1 − cos(Δ/2))	18.092	m
Chainage of the start of the curve	890.81	m
Chainage of the end of the curve	1,100.2	m

Formula and method

$$T = R\tan\frac{\Delta}{2},\quad L = R\Delta,\quad C = 2R\sin\frac{\Delta}{2},\quad E = R\left(\sec\frac{\Delta}{2} - 1\right),\quad M = R\left(1 - \cos\frac{\Delta}{2}\right)$$

Variables

R	Radius	m
Δ	Deflection angle	rad
C_{PI}	Chainage of the intersection point	m
T	Tangent length R tan(Δ/2)	m
L	Curve length R Δ	m
C	Long chord 2R sin(Δ/2)	m
E	External distance R(sec(Δ/2) − 1)	m
M	Middle ordinate R(1 − cos(Δ/2))	m
C_{PC}	Chainage of the start of the curve	m
C_{PT}	Chainage of the end of the curve	m

Method and standards

Circle geometry.

Assumptions and limits

- Simple circular curve.

References

- Simple circular curve geometry (surveying texts)

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/roads/horizontal-curve-geometry

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.