Circular Curve Points by Coordinates

Coordinates of a point on a circular curve from the PC coordinates, back tangent azimuth, radius, arc distance and turn direction, with the chord and deflection.

Method: Circular curve layout by coordinates

Input parameters

Unit system: SI

Parameter	Value	Unit
Northing of the PC	5,000.0	m
Easting of the PC	5,000.0	m
Back tangent azimuth (direction of travel)	75.000	°
Radius	400.00	m
Arc length from the PC	85.000	m
Turn: right (+1) or left (−1)	1.0000	

Calculated results

Parameter	Value	Unit
Chord from the PC	84.840	m
Deflection angle from the tangent	6.0877	°
Chord azimuth	81.088	°
Northing of the point	5,013.1	m
Easting of the point	5,083.8	m
Tangent azimuth at the point	87.175	°

Notes for this case

• The deflection angle from the tangent to a point on the curve is half the central angle: δ = s/2R. The long chord is C = 2R sin δ and its azimuth is the back tangent azimuth ± δ (right turn adds). Coordinates of the point = PC + C(cos, sin) of the chord azimuth. Points can then be staked by total station or GNSS from any control point.

Formula and method

$$\delta = \frac{s}{2R}, \quad C = 2R\sin\delta, \quad N = N_0 + C\cos(\alpha_{BT} \pm \delta), \quad E = E_0 + C\sin(\alpha_{BT} \pm \delta)$$

Variables

$N0$	Northing of the PC	m
$E0$	Easting of the PC	m
α_{BT}	Back tangent azimuth (direction of travel)	rad
R	Radius	m
s	Arc length from the PC	m
$\pm$	Turn: right (+1) or left (−1)	-
C	Chord from the PC	m
δ	Deflection angle from the tangent	rad
α_C	Chord azimuth	rad
N	Northing of the point	m
E	Easting of the point	m
α_t	Tangent azimuth at the point	rad

Method and standards

Curve coordinates.

Assumptions and limits

- Simple circular curve; plane coordinates; arc definition of length.

References

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Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

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/circular-curve-coordinates

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Reopens the calculator with the inputs of this report.