Compound Curve: Tangent Lengths and Chainages

Tangent lengths, curve lengths and chainages of a two-arc compound curve from the radii and deflection angles of its arcs and the chainage of the intersection point.

Method: Compound curve geometry

Input parameters

Unit system: SI

Parameter	Value	Unit
Radius of first arc	300.00	m
Radius of second arc	450.00	m
Deflection of first arc	30.000	°
Deflection of second arc	25.000	°
Chainage of the intersection point	2,500.0	m

Calculated results

Parameter	Value	Unit
Tangent length on the first-arc side	173.33	m
Tangent length on the second-arc side	209.72	m
First arc length	157.08	m
Second arc length	196.35	m
Chainage of the first tangent point	2,326.7	m
Chainage of the point of compound curvature	2,483.8	m
Chainage of the last tangent point	2,680.1	m

Notes for this case

• Each arc has its own tangent t = R·tan(Δ/2); the two meet on a common tangent of length t_a + t_b. In the triangle formed with the main intersection point, the sine rule gives T_1 = t_a + (t_a + t_b)sinΔ_2/sinΔ and T_2 = t_b + (t_a + t_b)sinΔ_1/sinΔ, Δ = Δ_1 + Δ_2. Chainages run along the curve from the first tangent point; each arc is then set out by deflection angles from its own tangent.

Formula and method

$$t_i = R_i \tan\frac{\Delta_i}{2}, \quad T_1 = t_a + (t_a + t_b)\frac{\sin\Delta_2}{\sin\Delta}, \quad T_2 = t_b + (t_a + t_b)\frac{\sin\Delta_1}{\sin\Delta}$$

Variables

R_1	Radius of first arc	m
R_2	Radius of second arc	m
Δ_1	Deflection of first arc	rad
Δ_2	Deflection of second arc	rad
Ch_{PI}	Chainage of the intersection point	m
T_1	Tangent length on the first-arc side	m
T_2	Tangent length on the second-arc side	m
l_1	First arc length	m
l_2	Second arc length	m
Ch_{T_1}	Chainage of the first tangent point	m
Ch_{PCC}	Chainage of the point of compound curvature	m

Ch_{T_2}	Chainage of the last tangent point	m

Method and standards

Compound curve.

Assumptions and limits

- Circular arcs; arcs turn in the same direction.

References

Compound curve geometry

Report details

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

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