Tractor–Semitrailer Low-Speed Off-Tracking

Steady-state low-speed off-tracking of a tractor-semitrailer on a curve, the path radii of the drive and trailer axles and the approximate swept-path width.

Method: Steady-state low-speed off-tracking (SAE method)

Input parameters

Unit system: SI

Parameter	Value	Unit
Path radius of the steer axle centre	15.000	m
Tractor wheelbase	3.8000	m
Kingpin ahead of the drive axle	0.40000	m
Kingpin to trailer axle (group centre)	10.500	m
Vehicle width	2.5500	m

Calculated results

Parameter	Value	Unit
Drive axle path radius	14.511	m
Trailer axle path radius	10.023	m
Off-tracking R − R_2	4.9765	m
Approximate swept-path width	7.5265	m

Notes for this case

• At low speed every axle rolls without slip, so each axle's path radius and the length to the hitch ahead form a right triangle: $R_1^2 = R^2 - L_1^2$, the kingpin radius $R_k^2 = R_1^2 + a^2$, and $R_2^2 = R_k^2 - L_2^2$. Off-tracking is the steady-state difference between the steer axle and trailer axle path radii (the SAE formula, $R - \sqrt{(R^2 - \Sigma L^2)}$ with signed hitch offsets). Transient turns off-track less than this; the swept width estimate adds the vehicle width and ignores front overhang.

Formula and method

$$R_2 = \sqrt{R^2 - L_1^2 + a^2 - L_2^2}, \quad OT = R - R_2$$

Variables

R	Path radius of the steer axle centre	m
L_1	Tractor wheelbase	m
a	Kingpin ahead of the drive axle	m
L_2	Kingpin to trailer axle (group centre)	m
w	Vehicle width	m
R_1	Drive axle path radius	m
R_2	Trailer axle path radius	m
OT	Off-tracking R − R_2	m
W_s	Approximate swept-path width	m

Method and standards

Off-tracking.

Assumptions and limits

- Low speed; no tyre slip; steady-state circular path.

References

Steady-state low-speed off-tracking (SAE 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/automotive/vehicle-dynamics/trailer-off-tracking

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.