Absolute Maximum Moment Under Two Moving Wheel Loads

Absolute maximum bending moment and maximum support reaction in a simply supported girder under two moving wheel loads at a fixed spacing (crane or vehicle axle).

Method: Absolute maximum moment under moving concentrated loads (Timoshenko and Young, Theory of Structures, 2nd ed. (McGraw-Hill))

Input parameters

Unit system: SI

Parameter	Value	Unit
Span	12.000	m
Heavier wheel load	100.00	kN
Lighter wheel load	60.000	kN
Wheel spacing	3.0000	m

Calculated results

Parameter	Value	Unit
Position of the heavier wheel from the left support	5.4375	m
Absolute maximum moment	394.22	kN·m
Maximum support reaction	145.00	kN

Notes for this case

• Rule: the absolute maximum moment occurs under the heavier wheel when mid-span bisects the distance between that wheel and the resultant. If the wheels are far apart, one wheel alone at mid-span governs. Add impact allowance as your code requires.

Formula and method

$$M_{max} = \frac{(W_1 + W_2)\left(\frac{L}{2} - \frac{e}{2}\right)^2}{L}, \quad e = \frac{W_2 d}{W_1 + W_2}, \quad M_1 = \frac{W_1 L}{4} \text{ (heavier wheel alone; the larger governs)}, \quad R_{max} = W_1 + W_2 \frac{L - d}{L}$$

Variables

L	Span	m
W_1	Heavier wheel load	N
W_2	Lighter wheel load	N
d	Wheel spacing	m
x	Position of the heavier wheel from the left support	m
M_{max}	Absolute maximum moment	N·m
R_{max}	Maximum support reaction	N

Method and standards

Moving-load rule.

Assumptions and limits

- Simply supported; two loads.

References

• Absolute maximum moment under moving concentrated loads (Timoshenko and Young, Theory of Structures, 2nd ed. (McGraw-Hill))

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/steel/moving-loads-two-wheels

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.