

SAE J2807 Tow-Vehicle Rating Cheat Sheet

How GCWR and trailer weight ratings are set: performance, stability and braking tests

ENGINEERING
CHEAT SHEET

Key equations

Quantity	Equation	Notes
Trailer weight rating	$TWR = GCWR - TVTW$	TVTW = tow vehicle total weight, loaded for the trip
Power-to-weight	$HP / GCWR$	Engine horsepower against combined weight (tow vehicle + trailer)
Grade launch	12% incline, forward and reverse	Launch from a stop at maximum rated load. Test weight is adjusted for the grade
Front axle load restoration	$FALR = (W_{wd} - W_c) / (W_u - W_c)$	W_u = front axle load uncoupled, W_c = coupled without weight distribution, W_{wd} = coupled with it
Understeer	δ / A_y must show understeer	δ = steering angle, A_y = lateral acceleration, checked from 0.1 g to 0.3 g
Braking force	$F = \mu W$	μ = tire-road friction, W = tow vehicle plus trailer weight
Stopping distance	$d = V^2 / (2 \mu g)$	V = initial speed
Hitch deformation	$\theta_{max} = 5^\circ$	Maximum permanent deformation angle at the hitch attachment
Sway response	0.10 at 100 km/h	Standardized trailer sway target

Key takeaways

- SAE J2807 standardizes how GCWR and trailer weight ratings are determined, so tow ratings can be compared across brands. It covers vehicles up to 13,000 lb GVWR.
- A truck must pass **acceleration**, **12% grade launch** (forward and reverse), **Davis Dam** highway grade, **handling**, **braking** and **structural** tests while towing at its maximum rated load.
- Davis Dam: hold 40 mph (single rear wheel) or 35 mph (dual rear wheel) at 100°F with the air conditioning on.
- Trailer brakes are required for any trailer over 3,000 lb GVWR.
- Hitch receivers, frames and attachments must meet SAE J684 and J2638, and cover weight-carrying, weight-distributing, fifth-wheel and gooseneck towing.
- Standard test trailers fix axle configuration (single or tandem), tongue length (83 to 420 in) and frontal area (12 to 75 ft²) so results are repeatable.
- Heavier tow vehicles and trailers raise every demand at once: power, brakes, rear-axle load and structure. See the tow science and brake mass guides.

Acceleration limits at maximum rated load

Test	Single rear wheel	Dual rear wheel
0-60 mph	≤ 30 s	≤ 35 s
0-30 mph	≤ 12 s	≤ 14 s
40-60 mph	≤ 18 s	≤ 21 s
Davis Dam min. speed	40 mph	35 mph