



# SURFACE VEHICLE RECOMMENDED PRACTICE

J2807™

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## Performance Requirements for Determining Tow-Vehicle Gross Combination Weight Rating and Trailer Weight Rating

### RATIONALE

Some of the tires specified in Table 1 have been discontinued and are no longer available. Specifying steering wheel angle gradient as an alternative to understeer gradient eliminates the need to measure the steering ratio and makes it easier to deal with systems that modify the front wheel angle relative to the steering wheel angle and vehicles that steer the rear wheels. There is now a minimum temperature specification for the sway damping test since lower temperatures increase sway damping. The maximum equivalent tongue length (ETL) for trailer K has been corrected.

SAE J2807 has been reaffirmed to comply with the SAE Five-Year Review policy.

### FOREWORD

Light truck, minivan, sport utility, and crossover vehicles represent a significant portion of the North American vehicle mix, and trailering usage of these vehicles has increased. Heavier duty models, approaching medium-duty trucks and often intended for trailering, have become more popular as well. Some passenger cars are also rated to tow trailers. For many vehicles, trailer weight rating may be a major marketing point.

As trailer weight ratings have increased, engine characteristics like horsepower and torque, thermal performance, and driveline durability are no longer the only significant factors in determining trailering capability. Combination vehicle dynamics and tow-vehicle hitch/attachment structure have gained in significance.

This document defines procedures and requirements to determine gross combination weight rating (GCWR) and calculate corresponding trailer weight rating (TWR) for any tow-vehicle. These procedures will establish consistent rating requirements and processes so end users (customers) can reasonably compare similar class models in terms of trailering ability.

### 1. SCOPE

This document establishes minimum performance criteria at GCWR and calculation methodology to determine tow-vehicle TWR for passenger cars, multipurpose passenger vehicles, and trucks. This includes all vehicles up to 14000 pounds GVWR.

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## 1.1 Purpose

This document establishes tow-vehicle performance requirements for combination vehicle acceleration, gradeability, understeer, trailer sway response, braking and park brake at GCWR, and tow-vehicle hitch/attachment structure at TWR. In order to minimize test variations, it provides standard test trailer specifications and requirements for use in these tests. It is acknowledged that there are a wide variety of conditions experienced while trailering which cannot be completely addressed within this document and in no way is this document intended to establish or limit manufacturers' designs or instructions to the customer. This document provides equations to determine TWR from GCWR in conjunction with other vehicle ratings and defined vehicle weight conditions and dimensions. Vehicles rated under this document are subject to normal production variation and it is intended that most vehicles of a specific model that is marketed as meeting SAE Recommended Practice J2807 shall meet the performance requirements in this standard.

As a secondary purpose, this document may be used as a benchmark to qualify the performance of a specific trailer design. The tow vehicle and trailer setup criteria should follow the trailer manufacturers' specifications when used for this purpose and may differ from the setup criteria required by the sections below.

## 2. REFERENCES

### 2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

#### 2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

|           |                                                                                           |
|-----------|-------------------------------------------------------------------------------------------|
| SAE J266  | Steady-State Directional Control Test Procedures for Passenger Cars and Light Trucks      |
| SAE J684  | Trailer Couplings, Hitches, and Safety Chains - Automotive Type                           |
| SAE J1491 | Vehicle Acceleration Measurement                                                          |
| SAE J2638 | Fifth Wheel and Gooseneck Attachment Performance Up to 13608/kg (30000/lb) Trailer Weight |
| SAE J2664 | Trailer Sway Response Test Procedure                                                      |

#### 2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

|          |                                                                                   |
|----------|-----------------------------------------------------------------------------------|
| ISO 4138 | Passenger Cars - Steady-State Circular Driving Behaviour - Open-Loop Test Methods |
| ISO 7401 | Road Vehicles - Lateral Transient Response Test Methods - Open-Loop Test Methods  |

#### 2.1.3 EEC/ECE Regulations

ECE Regulations available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: 41-0-22-917-12-34, [www.unece.org](http://www.unece.org).

EEC Regulations available from Automotive Industry, European Commission, B-1049 Brussels Belgium, Tel: 32-2-299-96-96, [www.ec.europa.eu](http://www.ec.europa.eu).

|           |                                                                                          |
|-----------|------------------------------------------------------------------------------------------|
| 92/21/EEC | Masses and Dimensions of Motor Vehicles of Category M1, as amended by Directive 95/48/EC |
| ECE R13H  | Uniform Provisions Concerning the Approval of Passenger Cars with Regard to Braking      |

## 2.1.4 United States Government Federal Safety Standards

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

Motor Vehicle Safety Standard No. 105 Hydraulic and Electric Brake Systems

Motor Vehicle Safety Standard No. 135 Passenger Car Brake Systems

## 2.1.5 ASTM Standards

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, [www.astm.org](http://www.astm.org).

ASTM F421 Standard Test Method for Measuring Groove and Void Depth in Passenger Car Tires

## 2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

### 2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J134 Brake System Road Test Code - Passenger Car and Light-Duty Truck-Trailer Combinations

SAE J135 Service Brake System Performance Requirements - Passenger Car-Trailer Combinations

SAE J670 Vehicle Dynamics Terminology

### 2.2.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO/TR 4114 Road Vehicles - Caravans and Light Trailers - Static Load on Ball Couplings

ISO 8855 Road Vehicles - Vehicle Dynamics and Road-Holding Ability - Vocabulary

ISO 9815 Road Vehicles - Passenger-Car and Trailer Combinations - Lateral Stability Test

### 2.2.3 United States Government Office of the Federal Register Publications

Available from the United States Government Printing Office, 732 North Capitol Street, NW, Washington, DC 20401, Tel: 202-512-1800, [www.gpoaccess.gov/cfr/retrieve.html](http://www.gpoaccess.gov/cfr/retrieve.html).

Title 40 CFR, Section 86.1832-01 Optional Equipment and Air Conditioning for Test Vehicles

Title 49 CFR, Section 393.52 Brake Performance

## 2.2.4 Other Publications

### 2.2.4.1 SAE Papers

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

Klein, R., Johnston, D., and Szostak, H., "Effects of Trailer Hookup Practices on Passenger Car Handling and Braking," SAE Technical Paper 780012, 1978, <https://doi.org/10.4271/780012>.

Klein, R. and Szostak, H., "Determination of Trailer Stability Through Simple Analytical Methods and Test Procedures," SAE Technical Paper 790186, 1979, <https://doi.org/10.4271/790186>.

Klein, R. and Szostak, H., "Development of Maximum Allowable Hitch Load Boundaries for Trailer Towing," SAE Technical Paper 800157, 1980, <https://doi.org/10.4271/800157>.

### 2.2.4.2 NHTSA Technical Reports

Available from NHTSA, 1200 New Jersey Avenue, SW, Washington, DC 20590, Tel: 1-888-327-4236, [www.nhtsa.gov](http://www.nhtsa.gov).

Handling Test Procedures for Passenger Cars Pulling Trailers, Vol. I: Summary Report, Vol. II: Technical Report, Vol. III: Appendices, NHTSA DOT HS-801-935, 936 and 937, June 1976, NTIS: PB-256 071, 072, 073.

Development of Car/Trailer Handling and Braking Standards, Vol. I: Executive Summary, Vol. II: Technical Report for Phase I - Rear Wheel Drive Tow Cars, Vol. III: Appendices for Phase I, Vol. IV: Technical Report for Phase II - Front Wheel Drive Tow Cars, NHTSA DOT HS-805 326, 327, 328 and 329, Nov. 1979.

Effects of Weight Distributing Hitch Torque on Car-Trailer Directional Control and Braking, NHTSA DOT HS-803 246, 1977.

### 2.2.4.3 American Association of State Highway and Transportation Officials (AASHTO) Publications

Available from AASHTO, 444 North Capitol Street, NW, Suite 249, Washington, DC 20001, Tel: 202-624-5800, [www.transportation.org](http://www.transportation.org).

A Policy on Geometric Design of Highways and Streets, 4th Edition, 2001

Chapter 3: Elements of Design, Section "Grades," pp 235-247

Chapter 8: Freeways, Section "General Design Considerations: Grades," pp 509-510

## 3. DEFINITIONS

### 3.1 CONVENTIONAL TRAILER

A semi-trailer with a coupling device designed to attach to the rear of the tow-vehicle. This does not include fifth wheel or gooseneck trailers.

### 3.2 TOW-VEHICLE TRAILERING WEIGHT (TVTW)

#### 3.2.1 Tow-Vehicles Under 8500 pounds GVWR

TVTW is the weight of the tow-vehicle used for EPA emissions and fuel economy certification including all options in excess of 33% sales penetration plus one 68.0 kg (150 pound) driver and one 68.0 kg (150 pound) front seat passenger, plus the tow-vehicle manufacturer's available trailering package and/or any required trailering content (if not included in the 33% option penetration weight) plus representative aftermarket trailering equipment as specified in 5.2. In the case where a trailering package is not available from the tow-vehicle manufacturer or it does not include a trailer hitch component, the representative aftermarket trailering equipment as specified in 5.2 shall include a trailer hitch component.

### 3.2.2 Tow-Vehicles at 8500 pounds or Greater GVWR

TVTW is base vehicle curb weight plus one 68.0 kg (150 pound) driver and one 68.0 kg (150 pound) front seat passenger plus 45.4 kg (100 pounds) of optional equipment split evenly between front and rear axles plus the tow-vehicle manufacturer's available trailering package and/or any required trailering content and representative aftermarket trailering equipment as specified in 5.2. In the case where a trailering package is not available from the tow-vehicle manufacturer or it does not include a trailer hitch component, the representative aftermarket trailering equipment as specified in 5.2 shall include a trailer hitch component.

### 3.2.3 Incomplete Tow-Vehicles Requiring Final Stage Manufacturer Completion

TVTW is base incomplete vehicle curb weight plus one 68.0 kg (150 pound) driver and one 68.0 kg (150 pound) front seat passenger plus 45.4 kg (100 pounds) of optional equipment split evenly between front and rear axles plus 119.1 kg/m (80 lb/ft) for body completion from the rear surface of the cab to the rear end of the frame rail (or rearmost edge of incomplete vehicle structure), plus the tow-vehicle manufacturer's available trailering package and/or any required trailering content and representative aftermarket trailering equipment as specified in 5.2. In the case where a trailering package is not available from the tow-vehicle manufacturer or it does not include a trailer hitch component, the representative aftermarket trailering equipment as specified in 5.2 shall include a trailer hitch component.

### 3.2.4 Tow-Vehicles Completed by Final Stage Manufacturers

TVTW is that for an incomplete vehicle as defined in 3.2.3 except that the body completion weight shall equal the base weight of the body style of the manufacturer's body completion. The exception to this is that a motorhome body completion shall include 226.8 kg (500 pounds) of optional equipment split evenly between front and rear axles plus the base weight of the motorhome completion.

## 3.3 TRAILER WEIGHT RATING (TWR)

TWR is the rated value for the maximum allowable weight of a loaded trailer for a specific tow-vehicle model and hitch type, as determined by the tow-vehicle manufacturer. A specific tow-vehicle may have multiple TWRs for weight carrying hitch, weight distributing hitch, fifth wheel hitch, and/or gooseneck hitch. For vehicles that can also pull a fifth wheel or gooseneck, the conventional, fifth wheel, and gooseneck ratings shall be clearly identified. A tow-vehicle may also have a TWR for an unbraked trailer.

## 3.4 TRAILER ROTATION RADIUS RATIO (RRR)

RRR is the yaw radius of gyration divided by effective tongue length (ETL).

## 3.5 EFFECTIVE TONGUE LENGTH (ETL)

ETL is the longitudinal distance from the center of the trailer coupler ball socket to the center of the trailer wheel(s).

## 3.6 FRONT AXLE LOAD RESTORATION (FALR)

FALR is the change in front axle load due to weight distributing hitch application divided by change in front axle load due to addition of trailer tongue weight, expressed in percent.

$$FALR = 100 \times (W_{fCT-Vwd} - W_{fCT-V}) / (W_{fUT-V} - W_{fCT-V}) \quad (\text{Eq. 1})$$

where:

FALR = front axle load restoration (%)

$W_{fUT-V}$  = front axle weight of the uncoupled tow vehicle (N)

$W_{fCT-V}$  = front axle weight of the coupled tow vehicle without weight distribution (N)

$W_{fCT-Vwd}$  = front axle weight of the coupled tow vehicle with weight distribution (N)

#### 4. TECHNICAL REQUIREMENTS

This section provides specifications and/or requirements for standard trailers, trailer hitch equipment, and combination vehicle connections. It also provides performance requirements for tow-vehicle structure, propulsion system performance, and combination vehicle handling and braking. Tow-vehicle GCWR is qualified by conformance to the performance requirements following in this section. Should the tow-vehicle be capable of different GCWR values throughout the various tests in this section, the actual GCWR will be the least of the values attained. The performance requirements of this document are not intended to be used to establish minimum acceptable values for various aspects of trailering. The performance requirements and metrics specified in this document are selected considering carefully controlled specific trailers, combination load conditions, and driving maneuvers to provide for objective comparisons of tow-vehicle performance. The full range of acceptable trailer loading conditions, trailer types, and driving maneuvers to be experienced by actual customers may produce some lower performance values that remain in the range of acceptability. There is nothing in this document that precludes the use of analytical methods to confirm conformance to requirements. It is presumed that analytical methods, when used, should produce results that are equivalent to physical test results. Physical test results, when available, supersede analytical method results.

##### 4.1 Standard Trailer

This section defines representative “standard” trailers, connections and ballast conditions for test purposes. This is not intended to define “worst-case” trailer loading or specifications, or to establish limits in trailer types that can be towed. The frontal area consideration is required only for propulsion system testing; effective tongue length consideration is required only for dynamics testing. Trailers to be used for dynamics purposes should be equipped with limited optional equipment in order to minimize trailer weight and maximize ballast flexibility. Additional trailer, hitch connection, and ballast requirements for testing various performance attributes (propulsion, handling, and braking) may be found in those specific sections. The frontal area requirements account for entire trailer frontal silhouette to the ground plane.

## 4.1.1 Trailer Size/Shape

**Table 1 - Standard trailer requirements**

|   | Trailer Type             | TWR Requirement          | Axle(s)       | Maximum Effective Tongue Length | Tire Brand/Size/Pressure                                                                                                                                                | Minimum Frontal Area                      |
|---|--------------------------|--------------------------|---------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| A | Conventional             | ≤454 kg (1000 pounds)    | Single        | 2.1 m (83 inches)               | Goodyear Marathon Radial ST175/80R13C 345 kPa (50 psi)<br>or<br>Duro Bias ST175/80D13C 345 kPa (50 psi)<br>or<br>Carlisle Radial Trail HD ST175/80R13C 345 kPa (50 psi) | 1.11 m <sup>2</sup> (12 ft <sup>2</sup> ) |
| B | Conventional             | ≤907 kg (2000 pounds)    | Single        | 2.7 m (106 inches)              | Goodyear Marathon Radial ST205/75R15C 345 kPa (50 psi)<br>or<br>Goodyear Endurance Radial ST205/75R15D 448 kPa (65 psi)                                                 | 1.86 m <sup>2</sup> (20 ft <sup>2</sup> ) |
| C | Conventional             | ≤1588 kg (3500 pounds)   | Single        | 2.7 m (106 inches)              | Goodyear Marathon Radial ST205/75R15C 345 kPa (50 psi)<br>or<br>Goodyear Endurance Radial ST205/75R15D 448 kPa (65 psi)                                                 | 2.79 m <sup>2</sup> (30 ft <sup>2</sup> ) |
| D | Conventional             | ≤2268 kg (5000 pounds)   | Tandem        | 4.2 m (165 inches)              | Goodyear Marathon Radial ST205/75R15C 345 kPa (50 psi)<br>or<br>Goodyear Endurance Radial ST205/75R15D 448 kPa (65 psi)                                                 | 3.72 m <sup>2</sup> (40 ft <sup>2</sup> ) |
| E | Conventional             | ≤3493 kg (7700 pounds)   | Tandem        | 4.2 m (165 inches)              | Goodyear Marathon Radial ST205/75R15C 345 kPa (50 psi)<br>or Goodyear Endurance Radial ST205/75R15D 448 kPa (65 psi)                                                    | 5.11 m <sup>2</sup> (55 ft <sup>2</sup> ) |
| F | Conventional             | ≤4536 kg (10000 pounds)  | Tandem        | 5.0 m (196 inches)              | Goodyear Marathon Radial ST225/75R15D 540 kPa (65 psi)<br>or<br>Goodyear Endurance Radial ST225/75R15E 552 kPa (80 psi)                                                 | 5.57 m <sup>2</sup> (60 ft <sup>2</sup> ) |
| G | Conventional             | ≤5897 kg (13000 pounds)  | Tandem        | 5.7 m (224 inches)              | Goodyear Marathon Radial ST235/80R16D 540 kPa (65 psi)<br>or<br>Goodyear Endurance Radial ST235/80R16E 552 kPa (80 psi)                                                 | 5.57 m <sup>2</sup> (60 ft <sup>2</sup> ) |
| H | Conventional             | ≤7983 kg (17600 pounds)  | Tandem/Triple | 6.55 m (258 inches)             | Goodyear G114 Unisteel 215/75R17.5H 862 kPa (125 psi)                                                                                                                   | 5.57 m <sup>2</sup> (60 ft <sup>2</sup> ) |
| J | Fifth Wheel or Gooseneck | ≤10886 kg (24000 pounds) | Tandem/Triple | 10.7 m (420 inches)             | Commensurate with trailer Gross Axle Weight Rating (GAWR)                                                                                                               | 6.97 m <sup>2</sup> (75 ft <sup>2</sup> ) |
| K | Conventional             | ≤10886 kg (24000 pounds) | Triple        | 6.55 m (258 inches)             | Goodyear G114 Unisteel 215/75R17.5H 862 kPa (125 psi)                                                                                                                   | 5.57 m <sup>2</sup> (60 ft <sup>2</sup> ) |
| L | Fifth Wheel or Gooseneck | >10886 kg (24000 pounds) | Tandem/Triple | 10.7 m (420 inches)             | Commensurate with trailer Gross Axle Weight Rating (GAWR)                                                                                                               | Not specified                             |

With the exception of trailers defined by rows A and L above, trailers should all be cargo ("box") type with flat, vertical front wall and corner radii no more than 152.4 mm (6 inches). See Appendix A for trailer exemplars that meet these requirements. Trailers A and L are flatbed trailers.

## 4.1.2 Trailer Chassis

Torsion or leaf spring suspensions are acceptable. Tire size and type shall be as specified by the trailer manufacturer with maximum load capacity consistent with trailer GAWR. Tire load capacities are defined in the Tire and Rim Association Yearbook. Tires shall be inflated to maximum sidewall pressure, have a minimum tread depth of 3.97 mm (5/32 inch) and be in good condition. ASTM F421 should be used to measure tread depth. See Appendix G for a form that can be used for measuring tread depth.

#### 4.1.3 Trailer Ballast

Unless otherwise specified, all performance tests in this document shall be run with the tow-vehicle/trailer combination ballasted to a minimum of the appropriate GCWR. The trailer ballast should be placed on the floor of the trailer in “ballast boxes” or secured in such a manner that it cannot shift during testing. It should also be equally distributed left and right of the longitudinal centerline of the trailer. Additional information on distribution of ballast between and/or within tow-vehicle and trailer may be found in specific performance requirement sections.

#### 4.2 Tow-Vehicle Structural Performance

This section defines tow-vehicle structural performance requirements at maximum TWR as determined (or targeted) as in Section 5. This section should be used to determine any or all of the following TWR limits: weight carrying TWR, weight distributing TWR, fifth wheel TWR, and gooseneck TWR.

##### 4.2.1 Tow-Vehicle Structural Performance Requirement Summary

The tow-vehicle frame, body sheet metal, trailer hitch or hitch receiver, rear bumper, and/or any other structure intended to react trailering loads, shall be capable of meeting the requirements of SAE J684 or SAE J2638 for the specified TWR and hitch type. Table 2 summarizes metrics, requirements, and test methods for specific performance attributes.

**Table 2 - Tow-vehicle structural requirements**

| Performance Attribute                                  | Performance Metric                      | Requirement                                        | Test Procedure |
|--------------------------------------------------------|-----------------------------------------|----------------------------------------------------|----------------|
| Tow-vehicle structural strength (conventional trailer) | Angular deformation                     | 5 degree permanent deformation in any direction    | SAE J684       |
| Tow-vehicle structural strength (fifth wheel hitch)    | Ability to withstand load               | React load for minimum of 5 seconds                | SAE J2638      |
| Tow-vehicle structural strength (gooseneck hitch)      | Ability to withstand load               | React load for minimum of 5 seconds                | SAE J2638      |
| Tow-vehicle structural durability (fifth wheel hitch)  | Ability to attain loads throughout test | No loss of attachment; react loads throughout test | SAE J2638      |
| Tow-vehicle structural durability (gooseneck hitch)    | Ability to attain loads throughout test | No loss of attachment; react loads throughout test | SAE J2638      |

##### 4.2.2 Test Tow-Vehicle Structure Selection

The tow-vehicle structure shall be the least capable required to produce the maximum TWR under test. In the case where multiple models (body style, wheelbase, GVWR, etc.) or multiple chassis packages within a model share similar structures, it is the responsibility of the tow-vehicle tester to choose the appropriate structure to test to the maximum TWR of the model group.

#### 4.3 Tow-Vehicle Propulsion System Performance

This section defines tow-vehicle propulsion system performance requirements at GCWR. This section should be used to determine any or all of the following GCWR limits: conventional trailer GCWR, fifth wheel GCWR, and/or gooseneck trailer GCWR.

##### 4.3.1 Propulsion System Performance Requirement Summary

The tow-vehicle propulsion and thermal management systems, in conjunction with appropriate test trailer(s) per 4.1, shall be capable of meeting certain acceleration, launch, and gradeability requirements for the specified GCWR. The following table summarizes metrics, requirements, and test methods for specific performance attributes.

**Table 3 - Tow-vehicle propulsion requirements**

| Performance Attribute   | Performance Metric                        | Requirement                                                                                                                               | Test Procedure                                                  |
|-------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Level road acceleration | 0 to 96.6 km/h (0 to 60 mph)              | 30.0 seconds (single rear wheel tow-vehicles);<br>35.0 seconds (dual rear wheel tow-vehicles)                                             | SAE J1491, modified in 4.3.2 and 4.3.3                          |
| Level road acceleration | 0 to 48.3 km/h (0 to 30 mph) Interval     | 12.0 seconds (single rear wheel tow-vehicles);<br>14.0 seconds (dual rear wheel tow-vehicles)                                             | SAE J1491, modified in 4.3.2 and 4.3.3                          |
| Level road acceleration | 64.4 to 96.6 km/h (40 to 60 mph) Interval | 18.0 seconds (single rear wheel tow-vehicles);<br>21.0 seconds (dual rear wheel tow-vehicles)                                             | SAE J1491, modified in 4.3.2 and 4.3.3                          |
| Launch on grade         | 12% grade, forward direction              | 5 launches to 5.0 m (16 feet) in 5 minutes                                                                                                | 92/21/EEC, Annex II, Section 3.3.3, modified in 4.3.2 and 4.3.4 |
| Launch on grade         | 12% grade, reverse direction              | 5 launches to 5.0 m (16 feet) in 5 minutes                                                                                                | 92/21/EEC, Annex II, Section 3.3.3, modified in 4.3.2 and 4.3.4 |
| Highway gradeability    | Minimum speed on grade (Davis Dam)        | 64.4 km/h (40 mph) (single rear wheel tow-vehicles); 56.3 km/h (35 mph) (dual rear wheel tow-vehicles)                                    | 4.3.2 and 4.3.5                                                 |
| Highway gradeability    | Drivetrain system performance             | No component failures; no diagnostic codes that alert the operator; no customer warnings                                                  | 4.3.2 and 4.3.5                                                 |
| Highway gradeability    | Cooling system performance                | No component failures; no diagnostic codes that alert the operator to take service or driving action; no customer warnings; no fluid loss | 4.3.2 and 4.3.5                                                 |

#### 4.3.2 Propulsion System Performance Test Vehicle and Ballast Requirements

The following conditions apply to all propulsion system performance tests and supersede any related section(s) in referenced publications.

##### 4.3.2.1 Test Tow-Vehicle Selection

The tow-vehicle to be tested shall be selected by the manufacturer as representative of the vehicle being rated. It shall be equipped with the propulsion system or powertrain and driveline (engine, transmission, axle ratio, tire size, etc.), and cooling package to produce the GCWR under test. In the case where there is more than one axle ratio and/or tire size available with no change in GCWR, the combination producing the lowest numerical final drive ratio shall be tested. In the case where there is optional cooling content that is not required to attain GCWR, the vehicle should not be equipped with that content. Tow-vehicle chassis content (suspension, steering, brakes, etc.) is immaterial to this section as long as it does not affect propulsion/powertrain selection or final drive ratio. Any vehicle equipped with specific selectable propulsion/powertrain calibration for trailering should be operated per tow-vehicle manufacturer's instructions.

##### 4.3.2.2 Test Trailer Selection

Test trailer should be chosen based upon specifications in 4.1. If rating a vehicle using standard trailer L, then the requirements for standard trailer J at 10886 kg (24000 pounds) must also be met.

##### 4.3.2.3 Combination Ballast and Hitch Connection

The tow-vehicle/trailer combination shall be ballasted to a minimum of GCWR for the model/powertrain/driveline/tire package of the product under test and connected in any manner permissible by the tow-vehicle manufacturer and within the ratings of the associated trailers and trailering equipment used in the test.