SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) TOWED VEHICLE/TOW EQUIPMENT ATTACHMENT TEST PROCEDURE—PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS

1. ***Scope***—The purpose of this SAE Recommended Practice is to subject a vehicle to sling and wheel lift towing equipment under a variety of road conditions, and to observe and evaluate its behavior. The power train should be evaluated by conducting SAE J1144.

   NOTE: The glossary as included in 2.2 of SAE J1142 will be used in conjunction with this document.

2. ***References***

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1142—Towability Design Criteria and Equipment Use—Passenger Cars, Vans, and Light Duty Trucks

3. ***Test Equipment***

3.1 Tow Truck

3.1.1 TOW SLING EQUIPMENT—PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS BEING TOWED WITH TOW SLING EQUIPMENT—The tow vehicle used will conform to criteria set in SAE J1142, 3.2.1 through 3.2.3.1.

3.1.2 WHEEL-LIFT EQUIPMENT—PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS BEING TOWED WITH WHEEL-LIFT EQUIPMENT—The tow vehicle used should conform to criteria set in SAE J1142, 3.3.1 and 3.3.3.

3.1.3 Additional towing equipment, as necessary, to safely tow the vehicle. See SAE J1142, 3.1 through 3.1.6.

3.1.4 Other equipment and information as required. See SAE J1142, 5.2.6.

3.2 Vehicle Ballast

3.3 Wheel Alignment Checking Device

4. ***Test Procedure***

4.1 Towed Vehicle Preparation

NOTE: For recording purposes, use the test data sheet. (See Figures 1 to 3.)

4.1.1 The vehicle shall be at curb weight.

4.1.2 The tires shall be those with the smallest static loaded radius available for the vehicle at the heaviest curb weight in 4.1.1.

4.1.3 The tire pressures shall be to vehicle manufacturer's lowest recommended pressure.

4.1.4 Optional equipment including, but not limited to, bumper guards, aero skirting, automatic level control systems, which may affect tow equipment attachment and/or reduce towed vehicle ground clearance during towing, shall be installed.

4.1.5 The trim height shall be within the vehicle manufacturer's specifications prior to testing.

4.1.6 Check the front and rear wheel alignments, if applicable, and record on the test data sheet. Reset to vehicle manufacturer's specifications, if required.

4.1.7 Sheet metal, doors, deck lid, or tailgate clearance shall be within the vehicle manufacturer's tolerances. For light trucks, cab-to-body clearance shall be set to minimum dimensions, if applicable.

4.1.8 Check the bumper system, for clearances to sheet metal, grilles, etc., to the vehicle manufacturer's tolerances. Realign, if required.

4.1.9 Check the bumper system fastener torques to the vehicle manufacturer's tolerances. Retorque to specifications, if required.

4.1.10 Test Vehicle Loads

4.1.10.1 The passenger cars shall be loaded to the vehicle manufacturer's recommended cargo capacity.

4.1.10.2 The vans and light duty trucks shall be loaded as specified by the vehicle manufacturer.

4.1.11 Record the final vehicle weights.

4.1.12 Drive the vehicle to determine if the vehicle is operating normally.

4.2 Front Towing Test Procedure

4.2.1 With the tow truck and vehicle on level ground, attach the tow sling, or wheel-lift equipment to the front end of the vehicle using the vehicle manufacturer's recommended procedure if available. Raise the front wheels to a minimum of 102 mm (4 in) above ground. Record the height on the test data sheet.

4.2.2 Determine the minimum ground clearance at the rear of the vehicle. Record the component closest to the ground and the amount of clearance on the test data sheet.

4.2.3 Set the ignition switch and transmission selector in the applicable position for towing, and release the parking brake.

NOTE: The following sequence is recommended, but not mandatory. Events may be resequenced as long as all the tests are performed.

4.2.4 Curb Test—This test is to determine ground clearance. At creep speed, drive off a 102 mm (4 in) curb, with the towed vehicle centerline at 45 degrees to the curb on the right side. Repeat with the towed vehicle centerline at 45 degrees to the curb on the left side.

4.2.5 Conduct a visual inspection of the vehicle and towing equipment. Record any irregularities on the test data sheet.

4.2.6 High Frequency Vertical Shock Test—This test is to induce vertical shock loads to determine stability of vehicle attachments. (This test is not to determine ground clearance, which is evaluated in other portions of this procedure.) Drive 1.6 km (1 mile) at 24 km/h (15 mph) on Belgian-block type road as specified by the vehicle manufacturer.

4.2.7 Repeat 4.2.5.

4.2.8 Roll Test—This test is to induce opposing roll between the towing and the towed vehicles. Drive 0.8 km (0.5 miles) at 56 km/h (35 mph) on twisted-plane type road as specified by the manufacturer.

4.2.9 Repeat 4.2.5.

4.2.10 PITCH TEST—This test is to induce pitch between the towing and the towed vehicles. Drive at 24 km/h (15 mph) in the normal traffic lane through a 90 degree intersection of two highly crowned roads as specified by the vehicle manufacturer.

4.2.11 Repeat 4.2.5.

4.2.12 HIGHWAY TEST—This test is to evaluate both the handling characteristics of the combination during highway towing, and the distance capabilities of the combination. Drive 8 km (5 miles) at 88 km/h (55 mph). If required by the vehicle manufacturer's recommended towing procedure, driveshaft, or axle shafts as applicable, may be disconnected or removed, for towing on the drive wheels at these speeds and distance. The use of a dolly may be specified when towing on the drive wheels. Refer to SAE J1142, 3.5 and 4.6.5.

4.2.13 Repeat 4.2.5 (if applicable, reinstall driveshaft, or axle shafts removed in 4.2.12).

4.2.14 GRADE TEST—This test is to evaluate, approach, departure and breakover, and stability of the towing equipment on grades. Drive 15% grade (8.5 degrees) uphill. Repeat drive in downhill direction. The entrance to the grade, the run of the grade, and the departure from the grade must each exceed the length of the towing/towed vehicles combination.

4.2.15 Repeat 4.2.5.

4.2.16 NORMAL BRAKE STOP—This test is to evaluate the stability of the towing equipment under normal braking conditions. Recognizing that movement damage could occur, the recommended method should minimize such damage. Make normal brake stops from 8.0 km/h (5 mph) to 56 km/h (35 mph), in 8.0 km/h (5 mph) increments.

4.2.17 Repeat 4.2.5.

4.2.18 PANIC BRAKE STOP—This test is to evaluate the stability of the towing equipment under severe braking conditions. Recognizing that major movement damage can occur, the recommended method should minimize such damage. Make panic brake stops (both feet on brake pedal) from 8.0 km/h (5 mph) to 32 km/h (20 mph) in 8.0 km/h (5 mph) increments.

4.2.19 Repeat 4.2.5.

4.2.20 FINAL INSPECTION—Depending on towing equipment used, detach vehicle and inspect for bumper system, air dam, and paint damage; buckles in body or sheet metal; proper opening and closing of doors, hood, and deck lid (or tailgate) and deformation of fuel tank, filler pipe, and exhaust system. Perform a general undercarriage inspection including T-hook, J-hook, or grab hook attachment points for deformation. Check front and rear wheel alignments after the test vehicle has been driven at least 1.6 km (1 mile) to normalize suspension components. Check the brake systems. Note observations and the results of all inspections on the test data sheet.

4.2.21 Drive the vehicle to determine if the vehicle is operating normally.

4.3 Rear Towing Test Procedure

4.3.1 Set the front wheels in a straight ahead position and secure with an acceptable steering wheel locking device. (Refer to SAE J1142, 3.1.5.)

CAUTION: Do not use the vehicle's steering column lock.

4.3.2 With the tow truck and vehicle on level ground, attach the towing equipment to the rear of vehicle. Connect the steering wheel locking device. Raise the rear wheels to a minimum of 102 mm (4 in) above the ground. Determine the minimum ground clearance at the front of the vehicle. Record the component closest to the ground and the amount of clearance on the test data sheet.

4.3.3 Put the ignition switch and transmission selector in an applicable position for towing and release the parking brake. (See NOTE in 4.2.3.)

4.3.4 to 4.3.19 Repeat 4.2.4 through 4.2.19.

4.3.20 FINAL INSPECTION—Conduct the complete inspection listed in 4.2.20 including the check of the front and rear wheel alignments.

4.3.21 Drive the vehicle to determine if the vehicle is operating normally.

5. Notes

5.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED BY THE SAE MAINTENANCE DIVISION

TOWED VEHICLE/TOW EQUIPMENT ATTACHMENT TEST DATA SHEET -
PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS - REAR TOW

Rear Tow Test (4.3) Report No. _____

Height of Rear Wheels Above Ground (4.3.2) _____ (mm) in

Ground Clearance at Front of Vehicle (4.3.2) _____ (mm) in

Component Closet to Ground (4.3.2) _____ (mm) in

Results of Visual Inspection after Curb Test (4.3.4-4.3.5) _____

Results of Visual Inspection After High Frequency Vertical Shock Test (4.3.6-4.3.7) _____

Results of Visual Inspection After Roll Test (4.3.8-4.3.9) _____

Results of Visual Inspection After Pitch Test (4.3.10-4.3.11) _____

Results of Visual Inspection After Highway Test (4.3.12-4.3.13) _____

Results of Visual Inspection After Grade Test (4.3.14-4.3.15) _____

Results of Visual Inspection After Normal Brake Stop (4.2.16-4.2.17) _____

Results of Visual Inspection After Panic Brake Stop (4.2.18-4.2.19) _____

Results of Final Inspection (4.3.20) _____

Results of Vehicle Road Test (4.3.21) _____

FIGURE 1—TOWED VEHICLE/TOW EQUIPMENT ATTACHMENT TEST DATA SHEET—
PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS—FRONT TOW

TOWED VEHICLE/TOW EQUIPMENT ATTACHMENT TEST DATA SHEET -
PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS - FRONT TOW

Front Tow Test (4.2) Report No. _____

Height of Front Wheels Above Ground (4.2.1) _____ (mm) in

Component Closest to Ground (4.2.2) _____ (mm) in

Record Ground Clearance to Component (4.2.2) _____ (mm) in

Results of Visual Inspection after Curb Test (4.2.4-4.2.5) _____

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Results of Visual Inspection After High Frequency Vertical Shock Test
(4.2.6-4.2.7) _____

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Note: If lifted wheels were removed or if dolly was used _____

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_____

Results of Visual Inspection After Roll Test (4.2.8-4.2.9) _____

_____

_____

Results of Visual Inspection After Pitch Test (4.2.10-4.2.11) _____

_____

_____

Results of Visual Inspection After Highway Test (4.2.12-4.2.13) _____

_____

_____

Results of Visual Inspection After Grade Test (4.2.14-4.2.15) _____

_____

_____

Results of Visual Inspection After Normal Brake Stop (4.2.16-4.2.17) _____

_____

_____

Results of Visual Inspection After Panic Brake Stop (4.2.18-4.2.19) _____

_____

_____

Results of Final Inspection (4.2.20) _____

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_____

Results of Vehicle Road Test (4.2.21) _____

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FIGURE 2—TOWED VEHICLE/TOW EQUIPMENT ATTACHMENT TEST DATA SHEET—
PASSENGER CARS, VANS, AND LIGHT DUTY TRUCKS—REAR TOW