SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1452

REV. DEC2002

Issued 1985-06
Revised 2002-12

Superseding J1452 SEP1995

Trailer Grade Parking Performance Test Procedure

***Foreword*—**The ability to hold a trailer stationary on a grade involves two performance factors: (a) overcoming the downhill grade force with the parking brake system by preventing rotation of the braked wheels, and (b) having sufficient weight on the braked wheels to prevent the trailer from sliding on the roadway. By the use of this procedure, the stability of a trailer parked on a grade can be observed.

1. ***Scope*—**This SAE Recommended Practice establishes methods to determine grade parking performance with respect to:

a. Ability of the parking brake system to lock the braked wheels.
b. The trailer holding or sliding on the grade, fully loaded or unloaded.
c. Applied manual effort.
d. Unburnished or burnished brake lining friction conditions.
e. Down and up grade directions.

1.1 **Purpose—**This document establishes a uniform procedure for determining the parking performance on a grade of any new trailer with manufacturer's maximum weight rating of more than 4540 kg (10 000 lb) intended for roadway use.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of SAE publications shall apply.

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

SAE J293—Vehicle Grade Parking Performance Requirements
SAE J360—Truck and Bus Grade Parking Performance Test Procedure

3. ***Instrumentation***

3.1 **Decelerometer—**0 to 1 g

3.2 **Temperature Measuring Device—**0 to 540 °C (0 to 1000 °F)

3.3 **Stopwatch**

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: custsvc@sae.org
SAE WEB ADDRESS: http://www.sae.org

3.4 Pressure Measuring Device—0 to 900 kPa (0 to 130 lbf/in^2)

4. Test Preparations

4.1 On brakes applied by the parking brake system, use new lining and drums or discs of original equipment material installed in accordance with the trailer manufacturer's specifications.

4.2 Parking brake assemblies and actuation systems are to be installed, lubricated, adjusted, and inspected in accordance with the trailer manufacturer's specifications.

4.3 All trailers are to be tested in both the fully loaded and unloaded condition.

4.3.1 The fully loaded tests shall be conducted on full trailers with the trailer loaded to the manufacturer's maximum rated weight (GVWR if applicable) with the load distributed proportionately to the individual axle GAWRs; the fully loaded weight shall include the weight of any test equipment.

4.3.2 The fully loaded tests shall be conducted on semitrailers with the front end of the semitrailer supported by a dolly and the semitrailer/dolly combination loaded to a weight (including weight of test equipment) which is equivalent to the sum of the GAWRs of the semitrailer axle(s); the load on the dolly axle(s) shall not exceed 20% of the loaded combination test weight.

4.3.3 The unloaded tests shall be conducted on full trailers with no payload but with test equipment.

4.3.4 The unloaded tests shall be conducted on semitrailers, utilizing a dolly to support the front end of the semitrailer, with no payload but with test equipment.

4.4 Tires are to be of the largest diameter specified for the trailer and inflated to pressures specified by the trailer manufacturer.

5. Test Notes

5.1 Conduct the test on a dry, smooth Portland cement concrete surface (or other surface of equivalent coefficient of surface friction) that is free from loose materials and has a grade equal to or greater than any specified grade requirement for the test vehicle, as designated in SAE J293.

5.2 Brake drums or discs are to be within a temperature range of 66 to 93 °C (150 to 200 °F).

5.3 Parking brake systems employing service brakes shall be tested after burnishing because of the difficulty of obtaining reliable and repeatable pre-burnish data. The burnish schedule is specified in SAE J360 except gross combination weight of the tow vehicle and test trailer shall equal trailer test weight per 4.3.1 or 4.3.2 and brakes of the tow vehicle are disabled. (In the event of wheel lock on the test axle, refer to Appendix A.) Parking brake systems which employ a friction brake that is not a part of the service brake system shall be tested after being burnished per the published procedure provided to the purchaser by the trailer manufacturer. If no such procedure is provided, test without burnish.

5.4 Trailer shall be positioned on a test grade either by a powered unit in a manner consistent with normal usage, or by other mechanical means (example: block and tackle).

5.5 Data sheets should provide for recording the following data: gross vehicle test weight (including test equipment) and axle weights for the fully loaded and unloaded condition, percent grade or grade angle, identification of parking brake system, direction of trailer on the grade, applied input effort, and observation of wheel roll or lock and trailer hold or slide.

6. Test Procedure

6.1 Connect towing equipment to full trailer or dolly that supports semitrailer in a normally connected attitude.

6.2 Ascend 20% grade until trailer is fully on grade.

6.3 Apply and hold service brakes by using maximum treadle (pedal) travel with system at compressor cut-out pressure. Apply parking brakes. Release service brakes after parking brake control is at the fully-applied position.

6.4 Render trailer brake system independent of towing equipment brake system.

6.5 Disengage towing equipment so that no retarding force is supplied to the trailer. Deactivate any brakes on a dolly supporting a semitrailer so that they do not retard the trailer. Observe parking performance for at least 5min.

NOTE—Suitable precautions must be taken to stop trailer in case of breakaway on test grade.

6.6 In case of trailer motion, note whether wheels roll or slide.

6.7 Reconnect towing equipment. Release parking brakes and repeat steps 6.2 through 6.6 facing the opposite direction on the grade.

7. Reporting of Performance— Trailer parking performance shall be expressed as described in 5.5.

8. Notes

8.1 Marginal Indicia— The change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE TRUCK AND BUS BRAKE SYSTEMS SUBCOMMITTEE
OF THE SAE TRUCK AND BUS BRAKE COMMITTEE

APPENDIX A

A.1 If wheel lock is experienced while burnishing brakes on the test axle, modification of burnish conditions has been accepted if vehicle test weight is kept below 150% of test axle GAWR.

a. Add ballast loading the test axle as required to prevent wheel lock.
b. Adjust deceleration rate and final snub speed according to Equations A1 to A8.

A.2 Equations for Adjusting Burnish Deceleration and Final Snub Speed When Vehicle Test Weight is Different Than GAWR

A.2.1 Deceleration—For brake forces to be equal at different loads,

$$\frac{\text{Test Wt.}}{g}(\text{decel}_{\text{adj.}}) = \frac{\text{GAWR}}{g}(\text{decel}_{\text{spec.}}) \quad \text{(Eq. A1)}$$

then,

$$\text{decel}_{\text{adj.}} = \left(\frac{\text{GAWR}}{\text{Test Wt.}}\right)\text{decel}_{\text{spec.}} \quad \text{(Eq. A2)}$$

$$= \frac{\text{GAWR}}{\text{Test Wt.}} \times 3.05 \ \ \text{m/s}^2 (\text{Metric}) \quad \text{(Eq. A3)}$$

or

$$= \frac{\text{GAWR}}{\text{Test Wt.}} \times 10 \ \text{ft/s}^2 (\text{English}) \quad \text{(Eq. A4)}$$

A.2.2 Final Snub Speed—For energy to be equal at different loads,

$$\frac{\text{Test Wt.}}{2g}(V_i^2 - V_{\text{f adj.}^2}) = \frac{\text{GAWR}}{2g}(V_i^2 - V_{\text{f spec.}^2}) \quad \text{(Eq. A5)}$$

then,

$$V_{\text{f adj.}} = \sqrt{V_i^2 - \frac{\text{GAWR}}{\text{Test Wt,}}(V_i^2 - V_{\text{f spec.}^2})} \quad \text{(Eq. A6)}$$

$$= \sqrt{4143 - \frac{\text{GAWR}}{\text{Test Wt.}}(3106)}\,\text{kph (Metric)} \quad \text{(Eq. A7)}$$

or

$$= \sqrt{1600 - \frac{\text{GAWR}}{\text{Test Wt.}}(1200)}\,\text{mph (English)} \quad \text{(Eq. A8)}$$