SAEInternational™

Road Load Measurement Using Onboard Anemometry and Coastdown Techniques

RATIONALE

This revision updates units and introduces minor procedural refinements and formatting.

1. SCOPE

This SAE Recommended Practice establishes a procedure for determination of vehicle road load force for speeds between 115 and 15 km/h (71.5 and 9.3 mi/h). It employs the coastdown method and applies to vehicles designed for on-road operation. The final result is a model of road load force (as a function of speed) during operation on a dry, level road under reference conditions of 20 °C (68 °F), 98.21 kPa (29.00 in-Hg), no wind, no precipitation, and the transmission in neutral.

1.1 Background

This document supplements SAE J1263 FEB96. SAE J1263 remains an alternative method for evaluating vehicle road load force during low wind conditions. This procedure incorporates recent advances in test equipment and data analysis; it defines vehicle road load force over an extended speed interval. Major changes are inclusion of real time anemometry to measure and compensate for wind conditions directly in front of the vehicle and use of a three term equation to model road force over a 115 to 15 km/h (71.5 to 9.3 mi/h) speed range. (The previous procedure relied on average wind conditions measured at distances up to several kilometers from the vehicle. Also, road load force was modeled by a two term equation and was, typically, simulated on a hydrokinetic dynamometer capable of being adjusted to reproduce this force at only one speed; performance at other speeds was a function of dynamometer characteristics.) In addition, this procedure specifically discusses and authorizes "split" coastdown runs which must be used when the test track is too short to allow a complete coastdown run due to the vehicle's performance, weight, or road load force characteristics.

2. REFERENCES

2.1 Applicable Publication

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

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

2.1.1   SAE Publication

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

SAE J1263   Road Load Measurement and Dynamometer Simulation Using Coastdown Techniques

2.2   Related Publications

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

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 724-776-4970 (outside USA), www.sae.org.

SAE Paper 720099   The Determination of Vehicle Drag Contribution from Coast-Down Test, R. A. White and H. H. Korst

SAE Paper 760106   Test Procedures for the Evaluation of Aerodynamic Drag on Full-Scale Vehicles in Windy Environments, W. H. Walston, F. T. Buckley, Jr., and C. H. Marks

SAE Paper 760153   Tire Rolling Resistance Measurements from Coast-Down Tests, B. Dayman, Jr.

SAE Paper 760850   Analysis of Coast-Down Data to Access Aerodynamic Drag Reduction on Full-Scale Tractor-Trailer Trucks in Windy Environments, F. T. Buckley, Jr., C. H. Marks, W. H. Walston, Jr.

SAE Paper 770844   Prediction of Dynamometer Power Absorption to Simulate Light Duty Truck Road Load, G. D. Thompson

SAE Paper 780255   Tire Rolling Resistance—A Speed Dependent Contribution, J. R. Smith, J. C. Tracy, and D. S. Potter

SAE Paper 780334   The Analytical Basis of Automobile Coastdown Testing, T. P. Yasin

SAE Paper 780337   Realistic Effects of Winds on the Aerodynamics Resistance of Automobiles, B. Dayman, Jr.

SAE Paper 940420   A Detailed Drag Study Using the Coastdown Method, M. A. Passmore and G. M. Le Good

SAE Paper 950626   ABCD—An Improved Coast Down Test and Analysis Method, F. T. Buckley, Jr.

SAE Paper 970269   Determination of Coastdown Mechanical Loss Ambient Correction Factors for Use with SAE J2263 Road Tests, R. W. Andrews and D. J. Pruess

2.2.2   ISO Publication

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ISO/DIS 10521:1991-07-31   Motor vehicle road load—Determination under reference atmospheric conditions and reproduction on chassis dynamometer

2.2.3   Other Publication

Japan TRIAS 23-4 1999

2.2.4   Sample Program

A working sample program is furnished as a proposed method of following this document. The full executable program, sample data, instructions and the underlaying Visual Basic code is furnished and can be obtained by contacting Carl Paulina, paulina.carl@epa.gov, at the US Environmental Protection Agency in Ann Arbor, Michigan.

3.   DEFINITIONS

3.1   Constrained Analysis

The vehicle's frontal area and aerodynamic drag coefficient have been independently determined and those values will be used in the equation of motion.

3.2   Driveline

The rotating components of a vehicle mechanically connected to the driving wheels when the transmission is in neutral gear. This includes the brake disks/drums, driveshafts, differential, propeller shaft, transmission output shaft, and some components within the transmission.

3.3   Effective Vehicle Mass

The sum of the vehicle test mass and the effective mass of rotating components.

3.4   Effective Mass of Rotating Components

The rotational inertia of driveline and non-drive axle components that rotate with the wheels is expressed as additional "linear" mass. For passenger cars without dual drive tires (or other driveline components which are likely to increase real rotational inertia to greater than 1.5% per axle) and if the actual effective mass of rotating components is unknown, the effective mass of all rotating components may be estimated as 3.0% of the vehicle test mass.

3.5   Mechanical Drag

The force opposing vehicle movement due to tire rolling resistance and friction in the driveline and non-drive axle components.

3.6   Road Load Force

The total force encountered by a vehicle by reason of motion on a level, smooth surface; it includes aerodynamic and mechanical drag components and is expressed as a function of vehicle speed.

3.7   Test Mass

The mass of the vehicle at the conclusion of the test; including driver, instrument operator (if any), and all instrumentation.