SAE International

SURFACE VEHICLE INFORMATION REPORT

SAE J2638

ISSUED OCT2003

Issued 2003-10

Fifth Wheel and Gooseneck Attachment Performance Up to 13 608/kg (30 000/lb) Trailer GVW

Foreword

This information report was developed to establish minimum performance criteria for fifth wheel and gooseneck attachment systems in towing combinations at or below 13 608 kg (30 000 lb) gross trailer weight. This cooperative effort was developed through SAE by industry representatives including tow vehicle, trailer and towing component manufacturers. The loads for this standard were derived through a real time testing matrix of various vehicle and load combinations.

The committee had two goals: The first goal was to identify design load criteria at the connecting point of the tow vehicle and trailer. This load criteria may be used to evaluate the structure through the trailer or through the tow vehicle. The second goal was to create common industry terminology.

1. Scope

This document establishes minimum performance criteria and definition of terms for the towing interface between a towing vehicle and fifth wheel or gooseneck trailer at or below 13 608 kg (30 000 lb) gross trailer weight. This establishes criteria for the hitch, tow vehicle attachment structure, trailer attachment structure, and coupling.

1.1 Purpose

This document is intended as a guide for manufacturers of fifth wheel and/or gooseneck trailers at or below 13 608 kg (30 000 lb) gross trailer weight and of tow vehicles and of components necessary to tow these trailers. Regulatory authorities desiring to formulate regulations may use this standard as a guide. This document is also intended for voluntary use by others associated with manufacturing of these products.

2. References

2.1 Applicable Documents

The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest issue of the 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: custsvc@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1.1 SAE PUBLICATIONS

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

SAE J670—Vehicle Dynamics Terminology
SAE J700—Upper Coupler Kingpin- Commercial Trailers and Semi-Trailers
SAE J133—5th Wheel Kingpin Performance - Commercial Trailer & Semi-Trailer

2.1.2 UNITED STATES GOVERNMENT OFFICE OF THE FEDERAL REGISTER PUBLICATIONS

Available from US Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250-7954.

Title 49 CFR, Part 390.5 Definitions—The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.
Title 49 CFR, Part 571.3 Definitions—The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.

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, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J684—Trailer Couplings, Hitches and Safety Chains-Automotive Type

2.2.2 ISO PUBLICATIONS

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ISO 3853—Road Vehicle, Caravans & Light Trailers
ISO 8717—Commercial Road Vehicles - 5th Wheel Couplings- Strength Test

2.2.3 OTHER PUBLICATIONS

Official Journal of the European Communities; Directive 94/20/EC of the European Parliament and of the council of 30 May 1994 relating to the mechanical coupling devises of motor vehicles and their attachment to those vehicles
Australian Standard AS 1773, Articulated Vehicles—Fifth Wheel Assemblies. Standards Australia 80 Arthur Street, North Sydney, Australia 2060

3. Definitions

3.1 General

3.1.1 GVWR

Gross Vehicle Weight Rating, Reference 49 CFR 390.5, 571.3

3.1.2 GVW

Gross Vehicle Weight, Reference SAE J133

3.1.3 RATED VERTICAL COUPLER LOAD

Maximum static vertical load to be imposed at the point of connection between a tow vehicle and trailer.

3.1.4 MOUNTING SYSTEM

A structure that supports the hitch and attaches to the towing vehicle.

3.2 Gooseneck

3.2.1 GOOSENECK TRAILER

A drop frame trailer with a portion of the trailer, including the stem and coupler, extending upward and forward over the tow vehicle.

3.2.2 GOOSENECK COUPLER

The structural element at the front of a trailer, including the coupler lock/release mechanism that engages the ball or kingpin, which receives and transfers the load from the forward portion of the trailer's load carrying elements to the tow vehicle.

3.2.3 GOOSENECK BALL

A spherically shaped pin designed to mate with a gooseneck coupling assembly to form a connection between trailer and tow vehicle (See Figure 1).

a. 59 mm (2 5/16 in) and 76 mm (3 in) nominal ball diameters are typical in the industry.
b. Tolerance for nominal ball diameter to be +0.0 / -0.762 mm (+0.0 / -0.030 in).
c. Ball and coupler configuration should allow for a minimum 8 degree pitch and roll angle from vertical.

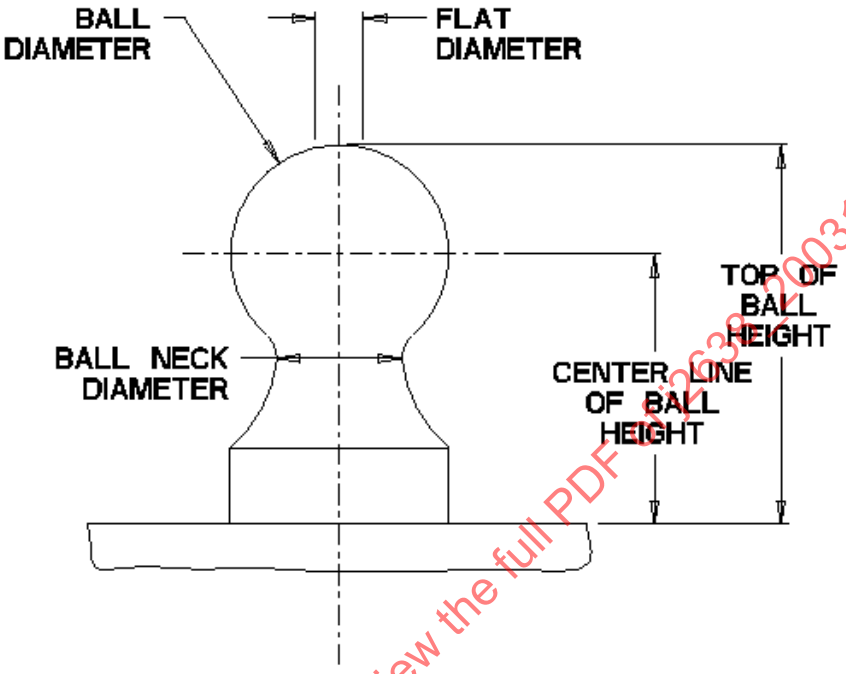

FIGURE 1—GOOSENECK BALL

3.2.4 GOOSENECK STEM

A vertical structure, on the trailer, which may consist of an upper and lower stem with adjustment hardware allowing the lower coupler stem to be adjusted to various heights.

3.2.5 GOOSENECK HITCH

A tow vehicle connecting mechanism that attaches to the towing vehicle or the mounting system and includes a ball or kingpin which engages the gooseneck coupler.

3.3 Fifth Wheel

3.3.1 FIFTH WHEEL TRAILER

A drop frame trailer with a portion of the trailer, including the kingpin, extending upward and forward over the tow vehicle.

3.3.2 KINGPIN

Reference SAE J700

3.3.3 PIN BOX

A structure, on the trailer, which may consist of an upper and lower box with adjustment hardware allowing the lower box with kingpin to be adjusted to various positions. This includes single non-adjustable structures.

3.3.4 LUBE PLATE

A polymer disk that reduces friction and wear between the vertical-load bearing surfaces of a fifth wheel coupler system.

3.3.5 FIFTH WHEEL HITCH

A tow vehicle connecting mechanism that attaches to the towing vehicle or the mounting system and includes a coupler that engages a trailer kingpin.

3.3.6 Fifth wheel configuration should allow for a minimum 12 degree pitch angle from vertical.

4. Test Methods

4.1 General Test Conditions

4.1.1 The test conditions described in 4.2 are static and dynamic tests, which shall be performed on a test bed or fixture.

4.1.2 The components to be tested shall be attached in accordance with manufacturers instructions.

4.1.3 The test fixture shall be representative of a typical mounting structure.

4.1.4 Adjustable components shall be positioned to create maximum stress conditions.

4.1.5 Longitudinal and transverse loads may be stabilized with a vertical load not to exceed 20% of trailer GVW.

4.1.6 Shims may be utilized to reduce connection clearances to enable the required load frequency.

4.1.7 A lube plate may be utilized in testing.

4.1.8 For load coordinate system see SAE J670.

4.1.9 For typical fifth wheel load directions see Figures 2 and 3.

4.1.10 For typical gooseneck load directions see Figures 4, 5, and 6.

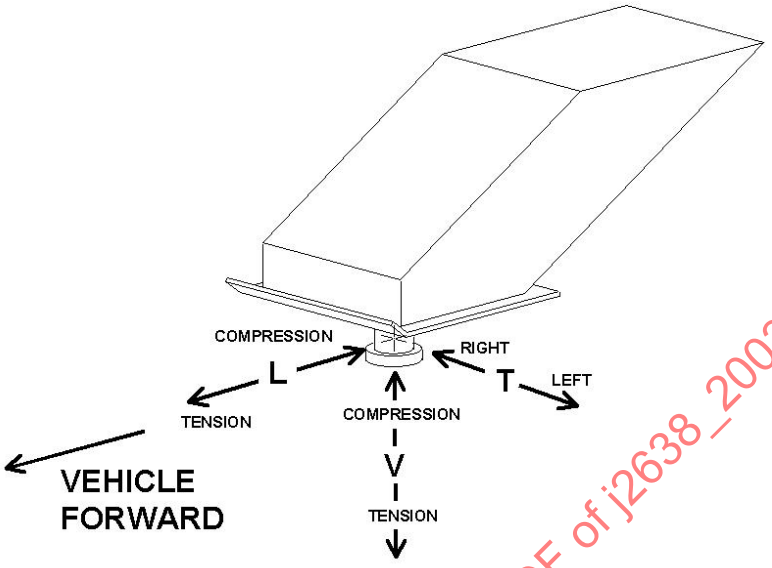

FIGURE 2—FIFTH WHEEL PIN BOX / TRAILER AND LOAD DIRECTION

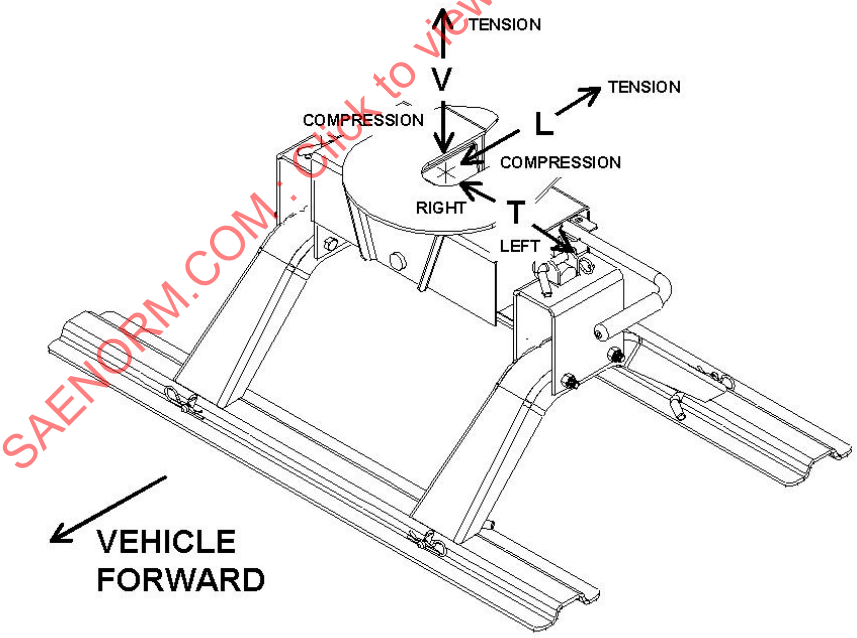

FIGURE 3—FIFTH WHEEL HITCH AND LOAD DIRECTION

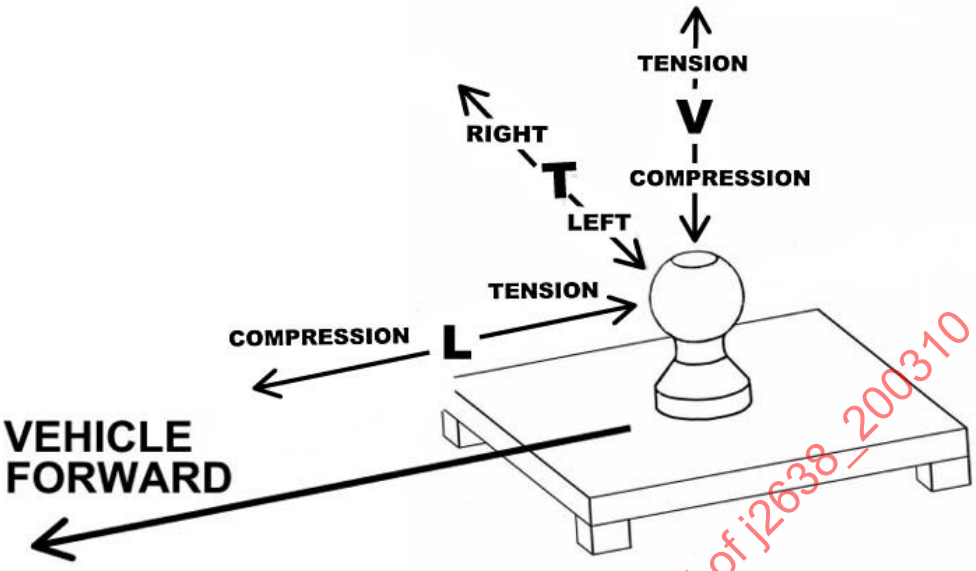

FIGURE 4—GOOSENECK HITCH AND LOAD DIRECTION

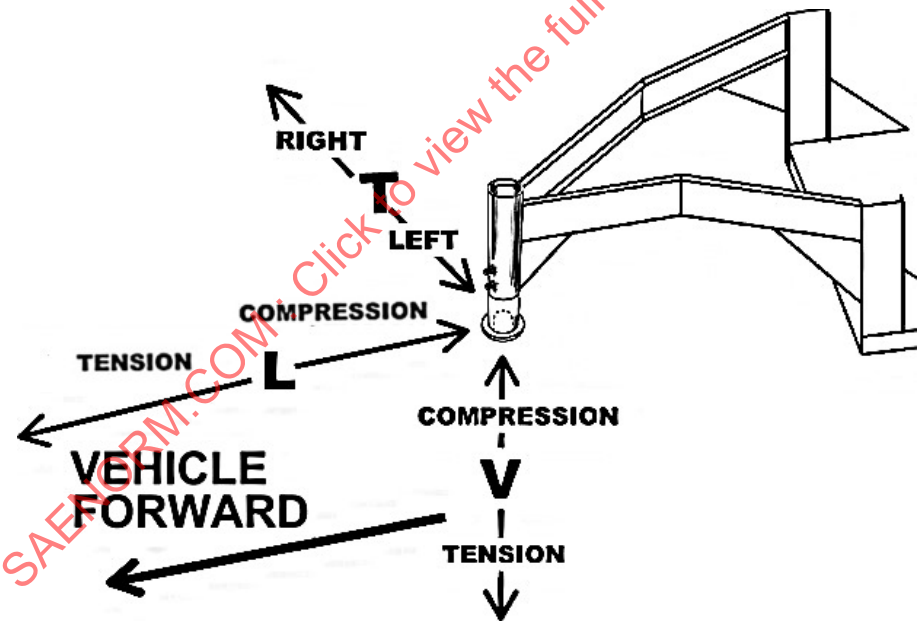

FIGURE 5—GOOSENECK STEM / TRAILER AND LOAD DIRECTION

4.2 Test Conditions

4.2.1 Static Test Conditions

a. Vertical, Longitudinal and Transverse loads as determined from Table 1, shall be applied independently.
b. Specified loads shall be maintained for a minimum of 5 s.
c. A different test specimen may be used for each specified load.

4.2.2 Dynamic Test Conditions

a. Vertical, Longitudinal and Transverse loads as determined from Table 2, shall be applied independently in any sequence.
b. A static vertical load may be used during Longitudinal and Transverse test for stability. Load must not exceed Rated Vertical Coupler Load (VR)
c. Each specified load shall be applied for 300 000 cycles (900 000 cumulative cycles).
d. Loads shall be applied with a sinusoidal pattern at a frequency between 2 and 5 Hz.
e. One test specimen shall be used for all 900 000 cycles.

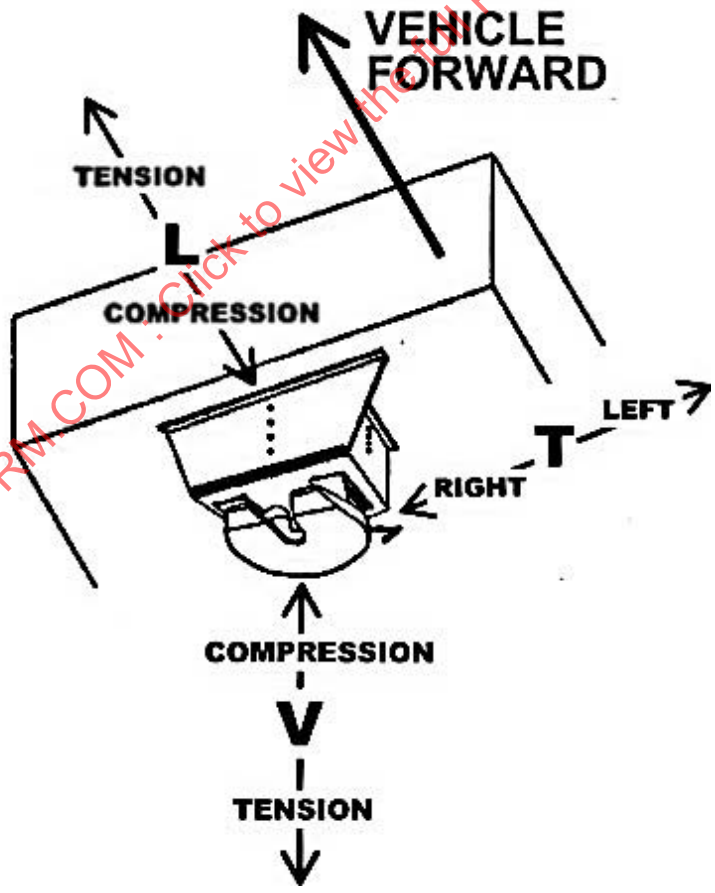

FIGURE 6—INVERTED FIFTH WHEEL TRAILER AND LOAD DIRECTION

4.3 Test Loads, Force in Newtons (See Addendum for Equivalent English Units)

TABLE 1—STATIC LOADS (N)

GOOSENECK		
Vertical	0.85 R Compression	0.5 R Tension
Longitudinal	0.75 R Compression	0.75 R Tension
Transverse	0.30 R Right	0.30 R Left
FIFTH WHEEL		
Vertical	35,584 + 0.45 R Compression	0.50 R Tension
Longitudinal	1.10 R Compression	0.75 R Tension
Transverse	0.30 R Right	0.30 R Left

TABLE 2—DYNAMIC LOADS (N)

Load Direction	Fifth Wheel	Gooseneck
Vertical	VR Compression +/- (5560 + 0.11 R)	VR Compression +/- (4448 + 0.15 R)
Longitudinal	+/- (4448 + 0.08 R)	+/- (14456 + 0.02 R)
Transverse	+/- (2446 + 0.06 R)	+/- (4448 + 0.04 R)

R = Trailer GVW (N)
VR = Rated Vertical Coupler Load (N)

4.4 Performance Criteria

4.4.1 Static Performance Criteria

a. There shall be no loss of attachment.
b. Each specified load shall be maintained for a minimum of 5 s.

4.4.2 Dynamic Performance Criteria

a. There shall be no loss of attachment.
b. Specified loads shall be attained throughout the test.
c. The fifth wheel hitch or gooseneck coupler specimen shall be capable of being uncoupled and coupled at the end of the test.