SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

J703 | REV. NOV2006

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Superseding J703 DEC2000

Fuel Systems—Truck and Truck Tractors

RATIONALE

This revision of SAE J703 is to update it to the current requirements of Federal Motor Carrier Safety Regulations Parts 393.65 and 393.67.

FOREWORD

This SAE Recommended Practice is a reintroduction of SAE J703 which was removed from the SAE Handbook in 1980. The reintroduction benefits from many years of industry conformance and testing to Federal Motor Carrier Safety Regulations as prescribed by the U.S. Department of Transportation Federal Motor Carrier Safety Administration Parts 393.65 and 393.67. The updating is a result of the need to introduce the international metric system, and also reflects what has been learned from component testing and reported field experiences.

This document does not exclude liquid fuel tanks less than 95 L (25 gal) capacity (as does the Federal Motor Carrier Safety Administration document). This does not appear to cause any hardship on vehicle or component manufacturers since the vast majority of fuel tanks used in the classes of vehicles covered in the "Scope" already conform to the performance and test standards required of the liquid fuel tanks over 95 L capacity.

The intent of this document is not only to clarify the procedures and reflect the best currently known practices, but also to prescribe requirements in Sections 3 and 4 that meet or exceed all the corresponding performance requirements of FMCSR 393.65 and 393.67 that were in effect at the time of issue. However, reference to the regulations should be made on such matters as applicability, markings, and subsequent regulatory changes which are beyond the purview of SAE.

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1. SCOPE

This SAE Recommended Practice applies to all commercial, self-propelled, or towed motor vehicles which transport property or passengers in interstate commerce in which the gross vehicle weight rating or gross combination weight rating *exceeds* 4550 kg (10 000 lb).

2. REFERENCES

2.1 Applicable Publications

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 Publication

Available from SAE, 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 J476a Dryseal Pipe Threads

2.1.2 FMVSS Publications

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

Federal Motor Carrier Safety Regulations, Title 49, Subparts 390.3, 390.5, 393.65 and 393.67

CFR, FMVSS 571.301 Fuel System Integrity

3. DEFINITIONS

3.1 Liquid Fuel Tank

A fuel tank containing a fuel that is liquid at normal atmospheric pressure and temperatures.

3.2 Side-Mounted Fuel Tank

A “side-mounted” fuel tank is a liquid fuel tank which:

3.2.1 If mounted on a truck tractor, extends outboard of the vehicle frame and outside of the plan view of the cab; or

3.2.2 If mounted on a truck, extends outboard of a line parallel to the longitudinal centerline of the truck and tangent to the outboard side of a front tire in a straight ahead position. In determining whether a fuel tank on a truck or truck tractor is side mounted, the fill pipe is not considered a part of the tank.

3.3 Adapters

Permanent nonremovable devices or means, affixed to the fuel tank for the attachment of fittings.

3.4 Fittings

Removable devices affixed to the adapters in the fuel tank, with the exception of the fuel cap, which is not considered a fitting.

3.5 Family Concept

Once the largest capacity of a fuel tank has been successfully tested, all smaller capacity fuel tanks having similar characteristics such as cross section, material specifications, joining and/or welding, and assembly processes are assumed to be capable of meeting the same requirements of this document.

4. REQUIREMENTS—ALL FUEL SYSTEMS

4.1 Application of this Section

This section applies to systems for containing and supplying fuel for the operation of motor vehicles or for the operation of auxiliary equipment installed on, or used in connection with, commercial motor vehicles.

4.2 Location

Each fuel system must be located on the motor vehicle so that:

4.2.1 No part of the system extends beyond the widest part of the vehicle;

4.2.2 No part of a fuel tank is forward of the front axle of a power unit;

4.2.3 Fuel spilled vertically from a fuel tank while it is being filled will not contact any part of the exhaust or electrical systems of the vehicle, except the fuel level indicator assembly;

4.2.4 Fill pipe openings are located outside the vehicle's passenger compartment and its cargo compartment;

4.2.5 A fuel line does not extend between a towed vehicle and the vehicle that is towing it while the combination of vehicles is in motion;

4.2.6 No part of the fuel system is located within or above the passenger compartment.

4.3 Fuel Tank Installation

Each fuel tank must be securely attached to the motor vehicle.

4.4 Gravity or Siphon Feed Prohibited

A fuel system must not supply fuel by gravity or siphon feed directly to the carburetor or injector.

4.5 Selection Control Valve Location

If a fuel system includes a selection control valve which is operable by the driver to regulate the flow of fuel from two or more fuel tanks, the valve must be installed so that either:

4.5.1 The driver may operate it while watching the roadway and without leaving his driving position; or

4.5.2 The driver must stop the vehicle and leave his seat in order to operate the valve.

4.6 Fuel Lines

Any portion of a fuel line which extends more than 50 mm (2 in) below the fuel tank or its sump shall be enclosed in a protective housing. Diesel fuel cross-over, return, and withdrawal lines which extend below the bottom of the tank or sump must be protected to minimize damage from impact. Every fuel line must be:

4.6.1 Long enough and flexible enough to accommodate normal movements of the parts to which it is attached without incurring damage; and

4.6.2 Secured to minimize chafing, kinking, or other causes of mechanical damage.

4.7 Excess Flow Valve

When pressure devices are used to force fuel from a fuel tank, a device which prevents the flow of fuel from the fuel tank if the fuel feed line is broken must be installed in the fuel system.

5. REQUIREMENTS—LIQUID FUEL TANKS

5.1 Application of this Section

Liquid fuel tanks must meet all the provisions contained in this section, except those liquid fuel tanks designed to carry diesel fuel only need not meet 5.2.5.

5.2 Construction of Liquid Fuel Tanks

5.2.1 Joints of a liquid fuel tank must be closed by techniques that provide heat resistance equivalent to the parent materials and mechanical securement equivalent to 80% of the parent material. Joints include all the head and body seams and nonremovable adapters affixed to the liquid fuel tank.

5.2.2 Adapters

The liquid fuel tank must have suitable means for the attachment of all fittings. (Refer to Section 3.)

5.2.3 Threads

If fittings and their corresponding adapters are of the threaded type, the threads must be as specified in SAE J476a, except that straight (nontapered) threads may be used on fittings and their corresponding adapters which have integral flanges and use gaskets for sealing. At least four full threads must be in each threaded fitting and corresponding adapter.

Metric threads are allowable provided they are equivalent in that they meet the same criteria as other threaded fittings and their corresponding adapters as described previously.

5.2.4 Bottom Fittings

If there is a bottom fitting installed, it must not extend more than 19 mm (0.75 in) below the lowest part of the liquid fuel tank or sump.

5.2.5 Fuel Withdrawal Fittings and Adapters

All liquid fuel tanks must have fuel withdrawal fittings and their corresponding adapters located such that they are above the normal level of fuel in the tank when the tank is full and resting at a normal installed attitude, except for those liquid fuel tanks designed to carry diesel fuel only. Any liquid fuel tank designed to carry any of several fuels must have a notice near all adapters below the previously defined liquid level stating “for diesel use only.” Drain adapters are exempt from this provision.

5.2.6 Fill Pipe

5.2.6.1 For diesel fuel tanks having a capacity of more than 94.8 L (25 gal) the fill pipe and vents must permit filling the liquid fuel tank with fuel at a rate of at least 76.0 L (20 gal) per minute without fuel spillage.

5.2.6.2 Each fill pipe must be fitted with a cap that can be fastened securely over the opening in the fill pipe.

5.2.7 Pressure Relief Venting System

Each liquid fuel tank must have a venting system which, in the event the tank is subjected to fire, will prevent internal pressure from rupturing the tank.

5.2.8 Pressure Resistance

Each liquid fuel tank must be capable of withstanding an internal hydrostatic pressure equal to 150% of the maximum internal pressure reached in the tank during the Pressure Relief Venting System Test specified in 5.3.1 of this section, or 276 kPa (40 lb/in^2), whichever is greater. The use of the Family concept *is* appropriate for the purpose of this test. (Refer to “Family concept” in Section 3.)

5.2.9 Overfill Restriction

A liquid fuel tank must be constructed such that the liquid fuel tank cannot be filled with a quantity of fuel that exceeds 95% of the tank's liquid fill capacity when filled at rest on a horizontal surface and while being fueled at the rate of 76.0 L (20 gal) per minute.

5.2.10 Air Vent

Each liquid fuel tank shall be equipped with an anti-spill air vent. Its installation must be such that the air vent will permit fuel to expand into the available 5% air space, without activating the shut-off function of the air vent while the tank is at rest on a horizontal surface. Momentary shut off due to fuel surge while filling is permitted as long as the vent returns to an “open” condition.

5.3 Liquid Fuel Tank Tests

The specified tests are a measure of performance only. Manufacturers and users may use any alternative procedures which assure that their equipment meets the required performance criteria.

The family concept may be utilized for these tests. (See Section 3, Definitions.)

Side-mounted liquid fuel tanks must be capable of passing all of the following tests. Non side-mounted liquid fuel tanks need not be capable of passing 5.3.4 “Drop Test” and 5.3.5 “Fill Pipe Test.”

5.3.1 Pressure Relief Venting System Test

5.3.1.1 Procedure

Fill the tank to three-fourths of its liquid fill capacity with the fuel it is designed to carry. In the event it is designed to carry any of several fuels, use the most volatile fuel. Seal all fuel feed, return and equalizing inlets and outlets, but leave the air vent, pressure relief vent and filler cap installed. Invert the tank 180 degrees from its normal installed attitude, and suspend it within 2/3 m (2 ft) above the top edge of a pan large enough to extend beyond the tank on all sides in plan view and deep enough to hold the entire fuel load in the tank. Provide means to direct fuel exiting the tank into the pan.

With the fuel initially between 10 and 27 °C (50 and 80 °F) apply a flame to the tank so that the temperature of the fuel rises at a rate of not more than 5 °C (8 °F) per minute until the pressure relief vent activates, and thereafter rises at a rate of not less than 5 °C (8 °F) per minute. Continue the test until the fuel tank is empty or until no further pressure rise is possible in the tank.

5.3.1.2 Required Performance

Neither the tank nor any of its fittings may leak visibly more than 28 g (1 oz) of fuel by weight per minute during the test (separate drops are deemed to be less than 28 g (1 oz) per minute) as evidenced by a steady stream of fuel prior to activation of the pressure relief vent. Neither the tank, body, seams, nor fittings (except the pressure relief vent) may rupture due to internal pressure. Pressure in the tank throughout the test must not exceed 310 kPa (45 lb/in^2) gauge despite the intensity or extent of the fire. Momentary pressure spikes due solely to combustion in the tank itself are excepted. The tank material must not weaken to the point of failure below the liquid level. Both the leakage and the pressure requirements must be met independent of whether or not the flame directly impinges the pressure relief vent or other portions of the tank, components, and fittings. All plugs, fittings, etc., used to seal the test tank in addition to the air vent, pressure relief vent, and filler cap must be able to withstand the same direct flame as does the fuel tank assembly.