

Addenda to the Fourth Edition of
NGV 2-2007

Standard for
**Compressed natural gas
vehicle fuel containers**

The standards set forth herein apply to the fourth edition of the Standard for Compressed Natural Gas Vehicle Fuel Containers, NGV 2-2007 and supersede corresponding standards therein. Following their preparation by the supervising Technical Advisory Group, they were accepted by the American National Standards Institute (ANSI).

NOTE: Changes, other than editorial, are denoted by a vertical line in the margin.



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CSA America Inc., operating as "CSA Group"
8501 East Pleasant Valley Road
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Addenda to the Standard for Compressed natural gas vehicle fuel containers

2. Service Conditions

2.1 General

2.1.1 Standard Service Conditions

The standard service conditions specified in this section are provided as a basis for the design, manufacture, inspection, testing, and approval of containers that are to be mounted permanently on vehicles and used to store natural gas for use as a fuel on the vehicles.

2.1.2 Installation Requirements

Containers are intended to be installed on vehicles in accordance with the current edition of *NFPA 52, Vehicular Fuel Systems Code*, or *CSA B109 Natural Gas for Vehicles Installation Code*, or installed in vehicles certified in compliance with *FMVSS No. 303, (49CFR571.303)*, *Fuel System Integrity of Compressed Natural Gas Vehicles*, or *CMVSS 301.2 CNG Fuel System Integrity-Passenger Cars, Multipurpose passenger vehicles, Trucks, Buses and Chassis-Cabs* or other equivalent standards.

This standard contains no requirements for container integrity in a vehicle collision. It is intended that containers be protected from accidental cargo spillage and from mechanical damage. Container locations and mountings should be designed to provide adequate impact protection to prevent container failure in a collision.

2.1.4 Periodic In-Service Inspections

Any requirements for periodic re-qualification by inspection or testing during the service life shall be specified by the container manufacturer on the basis of use under service conditions specified herein. Each container shall be visually inspected at least every 36 months, or at the time of any re-installation, for external damage and deterioration.

Prior to visual inspection, the container surface shall be exposed by the removal of protective shields and covers, unless the vehicle or container manufacturer recommends against such removal.

The inspection shall be performed by a qualified container inspector in accordance with (1) the manufacturer's recommendations and (2) the inspection procedures provided in the *Method for External Visual Inspection of Natural Gas Vehicle Fuel Containers and Their Installations, CGA C-6.4*. Inspections shall be documented by the inspector and the documentation shall be made available to the authority having jurisdiction upon request. Alternatively, containers may be inspected as installed using a non-destructive test method approved by the container manufacturer.

Containers without labels containing mandatory information, or with labels containing mandatory information which is illegible in any way, shall be removed from service. If the container can be positively identified by manufacturer and serial number, a replacement label supplied by the manufacturer may be applied to the container, and it may remain in service.

2.1.6 Overpressurization

Any container which is believed to have been subjected to a pressure greater than 1.25 times service pressure shall be depressurized and removed from service.

After inspection by an agency authorized by the manufacturer and, if required, by the authority having jurisdiction, the container may be returned to service if it is determined that the container has not suffered any damage that might reduce its service life. A record of any such incident shall be sent to and retained by the manufacturer according to the provisions of Section 13, Records of Manufacture.

2.2 Pressures

2.2.2 Maximum Pressures

Containers are designed to be filled to a pressure not exceeding any of the following conditions:

- a. A pressure that would settle to 1.0 times the service pressure at a settled temperature of 21°C (70°F);
- b. A settled pressure of 1.25 times the service pressure at 57°C (135°F); or
- c. 1.25 times the service pressure immediately after filling, regardless of temperature.

Note: The fill pressure shall be temperature compensated to prevent pressures from exceeding the maximum pressures that are defined. Fuel containers and pressure relief device (PRD) systems complying with this standard do not incorporate any means to prevent container damage or rupture as a result of overfilling. The required pressure relief devices are not intended to limit maximum pressures except in the event of a fire. The safety of natural gas vehicles and natural gas vehicle fuel containers are dependent on accurate control of filling by the compressed natural gas dispenser that is used to fill the vehicle.

2.4.2 Container Temperatures

The temperature of the container materials may vary from -40°C to 85°C (-40°F to 185°F).

2.4.3 Transient Temperatures

Transient temperatures during filling and discharge may vary beyond the limits described in Section 2.4.1, Settled Gas Temperatures, and Section 2.4.2, Container Temperatures.

Note: During filling and discharge localized transient gas temperatures of limited duration between -110 °C (-166°F) and +90°C (194°F) have been recorded.

2.5 Gas Composition

Containers made to this standard are designed to be used with gas complying with the *Recommended Practice for Compressed Natural Gas Vehicle Fuel, SAE J1616*, or the *Canadian General Standards Board Standard for Natural Gas for Vehicles, CGSB 3.513*; or an equivalent national standard. Methanol and/or glycol shall not be deliberately added to the natural gas at the fueling station. Recognizing that the gas supplied to the vehicle may not always be in compliance with these documents, containers should be designed to tolerate being filled with natural gas meeting both of the following conditions:

- a. Dry Gas - Water vapor would normally be limited to less than 32 mg/m³, a pressure dewpoint of -9°C (16°F) at 20 700 kPa (3,000 psi). There would be no maximum constituent limits for dry gas, except for:
 1. Hydrogen Sulfide 23 mg/m³
 2. Oxygen 1.0 percent by volume
 3. Hydrogen 2.0 percent by volume
- b. Wet Gas - Gas that contains 32 mg/m³ of water or more normally meets the following maximum constituent limits:
 1. Hydrogen Sulfide and other soluble sulfides 23 mg/m³
 2. Total Sulfur 115 mg/m³
 3. Oxygen 1 percent by volume
 4. Carbon Dioxide 3 percent by volume
 5. Hydrogen 0.1 percent by volume

Under wet gas conditions, a minimum of 1 mg of compressor oil per kilogram of gas is necessary to protect metallic containers, liners, and bosses.

2.8 Installation Issues

The installer shall be responsible for the protection of container valves, pressure relief devices, and connections. If this protection is mounted to the container, the installer shall obtain approval from the container manufacturer for the design and method of attachment. Factors to be considered include the ability of the container to support the transferred impact loads and the effect of local stiffening on container stresses and fatigue life.

4. Material Qualification Tests And Requirements

4.2 Metal Containers and Metal Liners

4.2.1 Material Properties

Steels shall be aluminum killed and produced to predominantly fine grain practice. The chemical composition of all steels shall be declared and defined at least by:

- a. Carbon, manganese, aluminum, and silicon contents in all cases; and
- b. Nickel, chromium, molybdenum, boron, vanadium, or any other elements that are deliberately added.