American National Standard for **Natural Gas Vehicle Containers**

Fourth Edition - 2007

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American National Standards Institute, Inc.
25 West 43rd Street, Fourth Floor
New York, NY
10036

Memorandum from

CSA America
8501 East Pleasant Valley Rd.
Cleveland, OH 44131

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March 19, 2008

Erratum to

**American National Standard for
Compressed Natural Gas Vehicle Fuel Containers
ANSI NGV 2-2007**

The fourth edition of American National Standard for Compressed Natural Gas Vehicle Fuel Containers, NGV 2-2007, was recently published. There are errors in Table II, Test Requirements For Designs And Design Changes, the references were incorrect. Attached is a corrected page.

Erratum to American National Standard for Compressed Natural Gas Vehicle Fuel Containers, ANSI NGV 2-2007, March 19, 2008

Table II

Test Requirements For Designs And Design Changes

Test	Fiber Material or Manufacturer	Resin System Material	Liner or Metal Container Material	Dia. <20% Change (7)	Dia. >20% Change (7)	Service Pressure <20% Change (7)	Length <50% Change	Length >50% Change	Integral Mounting Brackets & Valve Protection Shrouds	Pressure Relief Devices or Valves	External Coating	Boss
Ambient Cycling Test (Section 16.3)	X(1)		X	X(5)	X	X(5)			X(5)			X(5)
Environmental Test (Section 16.4) (4)	X	X(10)	X(2)								X	
Extreme Temperature Cycling (Section 16.5) (4)	X	X(10)	X		X							
Hydrostatic Burst Test (Section 16.6)	X	X	X	X(5)	X	X(5)	X(5)	X	X(5)			X(5)
Composite Flaw Tolerance Test (Section 16.7) (4)	X(1)	X(10)	X(2)		X							
Drop Test (Section 16.8) (4)	X	X(10)	X(11)		X			X				
Bonfire Test (Section 16.9)	X(1)		X(2)		X		X(3)	X		X(8)		
Accelerated Stress Rupture Test (Section 16.10) (4)	X(1)	X	X(11)									
Penetration Test (Section 16.11)	X(1)	X(10)	X(2)	X(9)	X							
Permeation Test (Section 16.12) (6)			X									
Natural Gas Cycling Test (Section 16.13) (6)			X(11)									X(12)
Leak Before Break (Section 16.14)	X(1)		X		X							

Notes For Table 2:

(1) Test required only when fiber type is changed.
(2) Tests required only when liner material type is changed, e.g., steel to aluminum or metal to polymer.
(3) Fire test not required provided safety relief devices or device configuration passed the required fire test on a container with equal or greater internal water volume.
(4) Test required only on composite reinforced containers.
(5) Only one unit required for qualification.
(6) Test required only for Type 4 containers.
(7) When changes in diameter or pressure are made the structural wall elements must be operating at the same or lower nominal stress levels as the original design (e.g., if pressure or diameter increase, the wall thickness must increase proportionally.)
(8) Required if the new valve design has reduced relief channel flow area compared with previously qualified valves or if the mass of the valve and PRD increase by more than 30%, or when pressure relief device is changed.
(9) Test required only if diameter decreases.
(10) Test not required when chemically equivalent materials are substituted.
(11) Test required only when change is made to polymer.
(12) Test required for Type 4 containers when the boss to liner interface is affected by design changes.

Preface

This publication represents a standard for safe operation, substantial and durable construction and performance testing of containers for the on-board storage of compressed natural gas for vehicle operation, within limitations given below and in the scope of this standard.

This standard is based on engineering principles, research and the combined expertise of gas utilities, manufacturers, users, and others having specialized experience.

Nothing in this standard is to be considered in any way as indicating a measure of quality beyond compliance with the provisions it contains. It is designed to allow compliance of products which may exceed that specified in the provisions herein. In its preparation, full recognition has been given to possibilities of improvement through ingenuity of design. This standard is subject to revision as further experience and investigation may show it is necessary and desirable.

CSA International, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. CSA International shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this standard.

Users of this American National Standard are advised that the devices/products/activities within its scope may be subject to regulation at the federal, state, or local levels. Users are strongly urged to investigate this possibility through appropriate channels. In the event of a conflict with this standard, the federal, state, or local regulations should be followed.

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EFFECTIVE DATE: An organization using this standard for product evaluation as a part of its certification program will normally establish the date by which all products certified by that organization should comply with this standard.

History Of Development Of ANSI NGV 2

(This history is informative and is not part of the standard.)

NOTE: This edition of NGV 2 incorporates changes to the 2000 edition and addenda thereto. Changes, other than editorial, are denoted by a vertical line in the margin.

In 1988 a group of U.S. gas utility companies formed the Natural Gas Vehicle (NGV) Coalition (the Coalition) to promote widespread use of natural gas as a vehicle fuel. The Coalition organized committees to address technical, marketing and legislative issues which would affect future expansion.

The Coalition recognized that an important consideration in the successful commercialization of natural gas as a vehicle fuel was the issue of codes and standards (or the lack of codes and standards, or harmonized codes and standards) pertaining to both fuel stations and vehicle fuel systems. The Coalition's Technology Committee undertook the goal of establishing a program for the development of an organized family of coordinated codes, standards and regulations addressing natural gas vehicles and fueling stations.

One of the major technical obstacles to the above goal concerned the on-board fuel container. It was acknowledged that lack of a design standard and certification program for lightweight composite vehicle fuel supply containers was a major obstacle to wider use of compressed natural gas as a vehicle fuel. U.S. Department of Transportation (DOT) regulations and exemptions do not address the use of cylinders as vehicle fuel containers. Such government regulations only cover cylinders which are approved for use in interstate transport.

The Standards and Standardization Subcommittee's On-Board Fuel Containers Working Group established a task group to prepare a draft standard addressing NGV on-board fuel containers.

The Fuel Cylinder Task Group initiated a proposed draft standard for NGV on-board fuel containers, which was (1) based on existing standards, (2) had no limitation on materials or method of construction, (3) considered the internal and external container environment, and (4) incorporated a certification process for design, manufacturing and quality control. The draft standard was initially based on the format of U.S. DOT cylinder regulations and exemptions (e.g., *DOT FRP-1 for Fiber Reinforced, Full Composite Cylinders Using a Seamless Aluminum Liner*).

The draft NGV fuel container standard was processed as an American National Standard under the canvass method in accordance with procedures of the American National Standards Institute (ANSI).

On June 30 1997, the Canadian Standards Association (CSA) acquired International Approval Services (IAS) which was until then a joint venture of the American Gas Association (A.G.A.) and the Canadian Gas Association (CGA). Under this agreement CSA acquired the complete range of IAS standards administration, certification and registration products and services for appliances and accessories fueled by natural and liquefied petroleum gases.

The revisions contained in the third edition of NGV 2-2000 were originally proposed to be published as an "a" addenda to the 1998 edition. In response to industry requests these revisions were incorporated in the base document and are being released as a new edition of NGV 2. This, the third edition of the NGV fuel containers standard was approved by the American National Standards Institute, Inc. on March 3, 2000.

Previous editions of this standard, and addenda thereto, approved by the American National Standards Institute are as follows:

NGV 2-1992	NGV 2-1998	NGV 2-2000 NGV 2a-2001

The following identifies the designation and year of the fourth edition of the standard:
ANSI NGV 2-2007

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American National Standard For Natural Gas Vehicle Containers

1. Scope

1.1 General

This standard contains requirements for the material, design, manufacture and testing of serially produced, refillable Type NGV 2 containers intended only for the storage of compressed natural gas for vehicle operation. These containers are to be permanently attached to the vehicle. Type NGV 2 containers shall not be over 1000 liters (35.4 ft^3) water capacity.

Where the word "shall" is used in this standard, it indicates a requirement .

1.2 Container Type

Type NGV 2 containers are designated as follows:

Type 1. Metal.

Type 2. Resin impregnated continuous filament with metal liner with a minimum burst pressure of 125 percent of service pressure. This container is hoop-wrapped.

Type 3. Resin impregnated continuous filament with metal liner. This container is full-wrapped.

Type 4. Resin impregnated continuous filament with a non-metallic liner.

1.3 Alternative Construction or Materials

All specifications as to construction or materials set forth herein may be satisfied by the construction or materials actually prescribed or such other construction or materials as will provide at least equivalent level of performance. Additional tests may be required to evaluate potential failure modes that pertain to the new construction or materials that are not specifically addressed in this standard.

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. Containers are intended to be installed on vehicles in accordance with *The Vehicular Fuel Systems Code, ANSI/NFPA 52, Fuel System Integrity of Compressed Natural Gas Vehicles, FMVSS No. 303, (49CFR571.303), Compressed Natural Gas Fuel Container Integrity, FMVSS No. 304, (49CFR571.304),* or other equivalent standards.