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CSA/ANSI NGV 2-2016

Compressed natural gas vehicle fuel containers

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Standards Update Service

CSA/ANSI NGV 2-2016
December 2016

Title: *Compressed natural gas vehicle fuel containers*

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Compressed natural gas vehicle fuel containers

American National Standards Institute, Inc.

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Approved on November 7, 2016 by ANSI
Published in December 2016 by CSA Group
A not-for-profit private sector organization
178 Rexdale Boulevard, Toronto, Ontario, Canada M9W 1R3

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ISBN 978-1-4883-0099-8

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Preface

This is the fifth edition of CSA/ANSI NGV 2, *Compressed natural gas vehicle fuel containers*.

This Standard was prepared by the NGV 2/HGV 2 Technical Subcommittee on Standards for Compressed Natural Gas and Compressed Hydrogen Vehicle Fuel Containers, under the jurisdiction of the Automotive Technical Committee, and has been formally approved by the Technical Committee, and the American National Standards Institute.

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
NGV 2-2007	NGV 2a-2012 NGV 2b-2012

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*

2) *This Standard contains SI (Metric) units corresponding to the yard/pound quantities, the purpose being to allow the standard to be used in SI (Metric) units. (*IEEE/ASTM SI 10, *American National Standard for Metric Practice, or* ISO 80000-1:2009*, Quantities and units – Part 1: General, is used as a guide in making metric conversion from yard/pound quantities.) If a value for a measurement and a corresponding value in other units are stated, the first stated value is to be regarded as the requirement. The given corresponding value may be approximate. If a value for a measurement and a corresponding value in other units are both specified as a quoted marking requirement, the first stated unit, or both, are to be provided.*

3) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.*

4) *This Standard was developed by consensus, which is defined by* CSA Policy governing standardization – Code of good practice for standardization *as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity." It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*

5) *This Standard is subject to review at least every five years; suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:*

a) *Standard designation (number);*
b) *relevant clause, table, and/or figure number;*
c) *wording of the proposed change; and*
d) *rationale for the change.*

6) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include "Request for interpretation" in the subject line:*

a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
b) *provide an explanation of circumstances surrounding the actual field condition; and*
c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at standardsactivities.csa.ca.

History of Development of CSA/ANSI NGV 2

Note: *This history is informative and is not part of the standard.*

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 light-weight 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 were released as a new edition of NGV 2. The third edition of the NGV fuel containers standard was approved by the American National Standards Institute, Inc. on March 3, 2000.

The fourth edition of the NGV fuel container standard was approved by the American National Standards Institute, Inc. on June 20, 2007. The ‘a’ addenda was approved by ANSI on April 23, 2012 and the ‘b’ addenda was approved by ANSI on June 5, 2012.

This, the fifth edition of the NGV fuel container standard (redesignated CSA/ANSI NGV 2) was approved by the American National Standards Institute, Inc. on November 7, 2016.

CSA/ANSI NGV 2-2016
Compressed natural gas vehicle fuel 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. This standard applies to containers up to and including 1 000 liters (35.4 ft^3) water capacity.

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 nonmetallic 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.

1.4 Units of measure

This Standard contains SI (metric) units with yard/pound quantities for reference purposes, the purpose being to allow the Standard to be used in SI (metric) units. IEEE/ASTM SI 10, or ISO 80000-1, is used as a guide in making metric conversion from inch/pound quantities. If a value for a measurement and a corresponding value in other units are stated, the first stated value is to be regarded as the requirement. The given corresponding value may be approximate. If a value for a measurement and a corresponding value in other units, are both specified as a quoted marking requirement, the first stated unit, or both are to be provided.

1.5 Terminology

In this Standard, “shall” is used to express a requirement, i.e., a provision that the user is obliged to satisfy in order to comply with the standard; “should” is used to express a recommendation or that which is advised but not required; and “may” is used to express an option or that which is permissible within the limits of the standard.

Notes accompanying clauses do not include requirements or alternative requirements; the purpose of a note accompanying a clause is to separate from the text explanatory or informative material.

Notes to tables and figures are considered part of the table or figure and may be written as requirements.

Annexes are designated normative (mandatory) or informative (non-mandatory) to define their application.

2 Reference publications

This Standard refers to the following publications, and where such reference is made, it shall be to the edition listed below, including all amendments published thereto.

CSA Group

ANSI PRD 1-2013
Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers

CSA B109-14
Natural Gas or Vehicles Installation Code

AIAG (Automotive Industry Action Group)

QS-9000:2006
Quality System Requirements

ASME (American Society of Mechanical Engineers)

BPVC 2015
Boilers and Pressure Vessels

ASQ (American Society for Quality)

ANSI/ISO/ASQC Q9000-2005
Quality management systems – Fundamentals and vocabulary

ASTM (American Society for Testing and Materials)

ASTM D638-14
Standard Test Method for Tensile Properties of Plastics

ASTM D1186-01
Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base

ASTM D1400-00
Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base

ASTM D2344/D2344M-00
Standard Test Method for Short Beam Strength of Polymer Matrix Composite Materials and Their Laminates

