ANSI NGV1-2006
CSA NGV1-2006
(reaffirmed 2012)

American National Standard/
CSA Standard for

Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices

CSA AMERICA INC

CANADIAN STANDARDS ASSOCIATION

AMERICAN NATIONAL STANDARD
ANSI NGV1-2006

CSA STANDARD
CSA NGV1-2006

Second Edition - 2006
This Standard is based on the Standard for
Compressed Natural Gas Vehicle (NGV)
Fueling Connection Devices
ANSI/AGA NGV1-1994 • CGA NGV1-M94;
ANSI/IAS NGV1a-1997 • CGA NGV1a-M97; and
ANSI/IAS NGV1b-1998 • CGA NGV1b-M98

APPROVED

Approved American National Standard
ANSI

IGAC

Reaffirmed and Consolidated
March 2, 2006
American National Standards Institute, Inc.

February 28, 1994, December 6, 1996 and
March 25, 1998
Interprovincial Gas Advisory Council
Effective in Canada March 1, 1995

On Behalf of
the Natural Gas Vehicle Coalition

NGV
THE NATURAL GAS VEHICLE COALITION

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Published - July 2006

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Preface

This standard is being developed for agencies in North America to use for examination, testing and certification of compressed Natural Gas Vehicle (NGV) fuelling nozzles and receptacles only. As such, the scope refers to nozzles and receptacles used in the NGV fueling system, and not to the system. The American Gas Association (A.G.A.) Requirements for Natural Gas Refueling Connection Devices (No. 1-90) and Canadian Gas Association Certification Requirement for NGV Nozzles and Receptacles (Draft CR 90-005) provided a basis for this standard.

A nozzle certified to this standard will be functionally compatible from a safety and performance perspective with all listed receptacles of compatible profile and system pressure. Similarly, a receptacle certified to this standard will be functionally compatible from a safety and performance perspective with all listed nozzles of compatible profile and system pressure.

Whereas there may be a multitude of nozzles and receptacles by a host of manufacturers, all of which for safety reasons must be compatible with each other, a series of "standard" receptacle profiles have been specified. These standard profiles incorporate the mandated design specifications (mating materials, geometry and tolerances) which must be utilized in the certification of a submitted nozzle or receptacle. The design shall be unique and not currently in commercial use and shall only be used for compressed natural gas.

Currently, three vehicle system service pressures may be operated in North America; 16 500 kPa (2400 psi), 20 700 kPa (3000 psi) and 24 800 kPa (3600 psi). Consequently, the nozzle and receptacle must be designed in a manner which will prevent a vehicle from being fueled by a dispenser station with a service pressure higher than the vehicle. However, it is desirable that a vehicle can be fueled by a dispenser station with a service pressure lower than the vehicle. This issue is addressed in the geometry of the nozzle and receptacle. All nozzles and receptacles shall be designed to have a service pressure of either 16 500 kPa (2400 psi), 20 700 kPa (3000 psi) or 24 800 kPa (3600 psi), as applicable.

The construction and performance of nozzles and receptacles are based on the observation that three main parameters affect user safety and system compatibility.

1.Service Pressure. Currently, three vehicle system service pressures may be operated in North America; 16 500 ka (2400 psi), 20 700 kPa (3000 psi) and 24 800 kPa (3600 psi). Consequently, the nozzle and receptacle must be designed in a manner which will prevent a vehicle from being fueled by a dispenser station with a service pressure higher than the vehicle. However, it is desirable that a vehicle can be fueled by a dispenser station with a service pressure lower than the vehicle. This issue is addressed in the geometry of the nozzle and receptacle. All nozzles and receptacles shall be designed to have a service pressure of either 16 500 kPa (2400 psi), 20 700 kPa (3000 psi) or 24 800 kPa (3600 psi), as applicable.

2.Disconnect Venting. Nozzles transferring fuel under high pressure must be fully and safely depressurized prior to being disconnected from the receptacle. This standard addresses three types of nozzles, described as follows:

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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.

Type 1 Nozzle - With a Type 1 Nozzle, the vent valve operating mechanism is integral to the nozzle. The term "integral" means that a single operation of a lever or operating mechanism first safely vents the gas trapped between the receptacle check valve and the nozzle inlet valve, and then safely disconnects the nozzle from the receptacle. This type nozzle is primarily intended but not restricted to use at public fill stations.

Type 2 Nozzle - With a Type 2 nozzle, the vent valve operating mechanism is external to the nozzle. Venting is required prior to disconnection of this type of nozzle. This type of nozzle is intended to be used by trained operators only.

Type 3 Nozzle - With a Type 3 nozzle, the fueling hose is automatically depressurized [typically below 340 kPa (50 psi)] at dispenser shutdown. The nozzle may vent low pressure gas between the receptacle check valve and the nozzle inlet valve coincident with the disconnection of the nozzle. This type of nozzle is intended to be used by trained operators only.

3.Design Life. Frequency of use is the final parameter to be considered. Since frequency of use will differ with the nozzle/receptacle application (i.e., public sector, fleet employee and residential), all receptacles will be tested at 10,000 connect/disconnect cycles for compliance with this standard. In addition, all nozzles shall be tested according to the following frequency use classifications, as applicable:

Class A Nozzle - This class specifies high frequency use, with a cycle life of 100,000. This equates to approximately 100 fills per day for 3 years.

Class B Nozzle - This class specifies medium frequency use, with a cycle life of 20,000 cycles. This equates to approximately 10 fills per day for 5 years.

History Of The Development Of Standards For ANSI/CSA NGV1

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

In 1985 a NGV Fuelling Probe Task Force was formed in Canada for the purpose of developing a certification requirement for an approved self-serve fuelling system. The key objective was to set a standard so that there would not be a proliferation of various proprietary, mutually-exclusive nozzles and receptacles. The Canadian task force drafted a set of test requirements, which were subsequently adopted by the Canadian Gas Association as laboratory requirements.

At this point, in 1988, the Canadian task force became inactive since one manufacturer's device was adopted in Ontario and Alberta and was give provisional approval in Ontario by the Fuel Safety Branch in a full-scale field evaluation.

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

It was recognized by the Coalition, and in Canada, 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) pertaining to both fuel stations and vehicle fuel systems. A major goal is to achieve an organized family of coordinated codes, standards and regulations addressing natural gas vehicles and fueling stations.

One of the major areas of concern was the compatibility of vehicle fueling connections devices. It was acknowledged that if someone were to travel across North America in a natural gas vehicle, they would soon learn that many different types of NGV fueling connections devices existed. The problem this presents to the industry is that one manufacturer's nozzle may not connect to another's receptacle. In order to overcome this situation, an individual would be required to carry adapters to fuel the vehicle. Another concern is that most connection devices currently in use were adapted from other applications (i.e., hydraulics and pneumatics) and were not specifically designed for use with compressed natural gas.

At its July 19, 1990 meeting, the Coalition's Fill Stations and Building Working Group established a Fueling Connection Device Task Group to develop a performance standard addressing NGV fueling connection devices.

At its August 15, 1990 meeting, the Fueling Connection Device Task Group initiated a proposed draft standard for NGV fueling connections devices. The draft standard was based on the American Gas Association Laboratories' (A.G.A.) Requirements for Natural Gas Refueling connections Devices (No. 1-90) and Canadian Gas Association Certification Requirement for NGV Nozzles and Receptacles (CR 90-005). The draft standard to specified certain key devices, i.e., receptacle, nozzle and three-way valve. The Task Group agreed that to effectively address the issues of safety and compatibility: (1) fueling connection devices must be unique to the NGV industry, (2) the profile and interfacing surface of the receptacle must be non-proprietary, (3) the profile, tolerances and material hardness of the receptacle must be specified, and (4) a different profile must be specified for each vehicle fuel system pressure (i.e., 2400, 3000 and 3600 psig).

The standard was prepared during several meetings over a period of 9 months and involved 5 drafts.

At its December 5-6, 1990 and March 6, 1991 meetings, the task group agreed that the draft NGV fueling connection device standard should be processed as an American National Standard in accordance with accredited canvass procedures of the American National Standards Institute (ANSI).

The American Gas Association Laboratories (AGAL), now International Approval Services (IAS), as an ANSI accredited canvass sponsor, agreed to seek expansion of its scope to facilitate processing the standard. On May 30, 1991, ANSI approved the expansion of AGAL's canvass scope.

During the period of September 1991 through December 1991, AGAL initiated two ANSI Public Review submittals and concurrent canvass ballots to approve proposed AGA NGV1 as an American National Standard. Both ballots prompted comments which delayed the process.

From January 1992 to present, the task group and Canada sought to harmonize efforts, and established the Joint NGVC Task Group/CGA Subcommittee on Standards for Compressed Natural Gas Fueling Connections Devices to prepare harmonized requirements for a North American bi-National standard. Under a Gas Research Institute (GRI) contract, a Validation Test Program substantiated the test requirements and verified receptacle profiles detailed in the proposed AGA/CGA NGV1 standard. Validation testing was performed by IAS-U.S. testing laboratories and was completed in July 1993. A report was prepared and submitted to the joint task group/subcommittee for consideration.

At its August 17-18, 1993 meeting, the joint task group/subcommittee reviewed the validation report and additional proposed revisions. Following consideration of all the issues, the task group/subcommittee voted affirmatively to initiate a third ANSI Public Review submittal and concurrent canvass ballot.

On December 1-2, 1993, a meeting was convened of the NGV Coalition/Canadian Gas Association Joint Task Group/Subcommittee on Standards for Compressed NGV Fueling Connection Devices to respond to comments received on the canvass ballot.

Following resolution of comments received on the third canvass ballot, the proposed standard was submitted to ANSI for consideration of approval. The first edition of the compressed natural gas vehicle fuelling connection device standard, was approved by the American National Standards Institute, Inc., on February 18, 1994 and the Interprovincial Gas Advisory Council on February 28, 1994.

This, the second edition, consists of a consolidation of ANSI/AGA NGV 1-1994 • CGA NGV 1-M94, Addenda "a" ANSI/IAS NGV 1a-1997 • CGA NGV 1a-M97 and Addenda "b" ANSI/IAS NGV 1b-1998 • CGA NGV 1b- M98. No charges were made to this document.

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(February, 1994)

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American National Standard/ CSA Standard for Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices

Part I: Construction

1.1 Scope

1.1.1
This standard applies to newly produced compressed Natural Gas Vehicle (NGV) fueling connection devices, hereinafter referred to as devices, constructed entirely of new, unused parts and materials. NGV fueling connection devices shall consist of the following components, as applicable:

1. Receptacle and protective cap (mounted on vehicle) (see 1.5, Receptacles);

2. Nozzle (see 1.3, Nozzles); and/or

3. Three-way valve (external to nozzle and mounted in the fuel dispenser system) (see 1.6, Three-Way Valve).

1.1.2
This standard applies to devices which have a service pressure of either 16 500 kPa (2400 psi), 20 700 kPa (3000 psi), or 24 800 kPa (3600 psi), hereinafter referred to in this standard as the following (see 1.9.1-c):

"P24" - 16 500 kPa (2400 psi)

"P30" - 20 700 kPa (3000 psi)

"P36" - 24 800 kPa (3600 psi)

1.1.3
This standard applies to devices with standardized mating components (see 1.3.9, 1.5.6 and 1.7, Interchangeability.)

1.1.4
This standard applies to devices which (1) prevent natural gas vehicles from being fueled by dispenser stations with service pressures higher than the vehicle, and (2) allow natural gas vehicles to be fueled by dispenser stations with service pressures equal to or lower than the vehicle fuel system service pressure.

1.1.5
All dimensions used in this standard are in metric units [International System of Units (SI)], unless otherwise specified. If a value for measurement, as given in this standard, is followed by an equivalent value in other units, the first stated value is to be regarded as the specification.