

**AMERICAN NATIONAL STANDARD/
CSA STANDARD**

FOR

NGV DISPENSING SYSTEMS

First Edition - 1999

NGV DISPENSING SYSTEMS

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Prepared by

CSA INTERNATIONAL

8501 East Pleasant Valley Road
Cleveland, Ohio 44131

178 Rexdale Boulevard
Toronto, Ontario
Canada M9W 1R3

On behalf of
the Natural Gas Vehicle Coalition



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***American National Standards Institute, Inc.
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10036***

PREFACE

This publication represents a standard for safe operation, substantial and durable construction and performance testing of components for natural gas vehicle dispensing systems, within limitations given below and in the scope of this standard.

This standard is based on proven 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.

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This standard does not apply to fuel system components that will be incorporated during original manufacture of motor vehicles which comply with *Federal Motor Vehicle Safety Standards (FMVSS)* or *Canadian Motor Vehicle Safety Standards (CMVSS)* for Natural Gas Powered Vehicles.

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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. In Canada, effective dates are established by the Interprovincial Gas Advisory Council.

HISTORY OF DEVELOPMENT OF ANSI NGV 4.1 · CSA 12.5

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

During 1984, there was growing need in the U.S. natural gas vehicle industry for guidelines pertaining to the assembly of aftermarket equipment installed on motor vehicles in order to operate alternatively on either gasoline or natural gas. The American Gas Association Laboratories (AGAL), in response to this need developed an A.G.A. Requirement for Natural Gas Vehicle (CNG) Conversion Kits, No. 1-85. This requirement was intended to help promote the safe development and installation of NGV conversion systems by manufacturers and installers. The first draft of A.G.A. Requirement No. 1-85 was developed during 1984 and 1985, with the final version dated August 20, 1985.

At the time of its issuance, the A.G.A. No. 1-85 was in compliance with NGV equipment and fueling stations specifications published by the National Fire Protection Association (NFPA) under its Standard for *Compressed Natural Gas (CNG) Vehicular Fuel Systems*, NFPA 52. The first edition of NFPA 52 was issued in 1984. A second edition was issued in 1988.

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.

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 was established to achieve the goal of an organized family of coordinated codes, standards and regulations addressing natural gas vehicles and fueling stations. To help achieve this goal, the Technology Committee established the Standards and Standardization Subcommittee.

Subsequently, the third edition of NFPA 52 was published in 1992. This edition incorporated many changes developed and recommended by the NGV Coalition's task groups.

During August 1992, an NGV Conversion Equipment Task Group was established to coordinate with the AGAL for requirements for compressed NGV conversion kits. The task group agreed the phrase "NGV fuel system" should replace "NGV conversion kits." (An NGV fuel system is comprised of all major components required to supply, manage, and/or control fuel flow, enabling a vehicle to operate on natural gas.) The task group continued to meet during August, October and December 1992 to promulgate the development of a standard to cover both dedicated and bi-fuel natural gas systems for light and medium duty vehicles.

A standard for NGV fuel system components already existed in Canada namely the National Standard of Canada *CAN/CGA 12.3, Fuel System Components for Natural Gas Powered Vehicles*. The genesis for this Canadian document was the Amendment to the 1982 *CGA B149.1, Natural Gas Installation Code* which added to the Code provisions for Natural Gas for Vehicles (NGV) fuel system components on highway vehicles, as well as coverage of NGV refuelling stations. Subsequently these NGV aspects evolved into

stand-alone Canadian documents, one being the *CAN/CGA-12.3* which was first published in February 1991.

In order to further common goals for North American harmonization, the task group and the Canadian Gas Association (CGA) NGV Steering Committee on Natural Gas Powered Vehicles, initiated formation of a joint activity involving the CGA Steering Committee's Subcommittee on Fuel System Components for Natural Gas Powered Vehicles and the NGV Conversion Equipment Task Group.

On February 17, 1993, the first joint meeting of the NGV Conversion Equipment Task Group and the CGA 12.3 Standards Subcommittee on Fuel System Components for Natural Gas Powered Vehicles was held. As a result the U.S. Task Group and Canadian Subcommittee agreed to establish the Joint NGVC/CGA Subcommittee on Natural Gas Vehicle Conversion Equipment, to develop harmonized requirements for a North American Bi-National standard. The newly established subcommittee agreed to proceed with harmonization of the Canadian Standard for *Fuel System Components for Natural Gas Powered Vehicles, CAN/CGA-12.3*, which was first published in February 1991, and A.G.A. requirement 1-85. In light of different approaches in Canada and the U.S., the joint subcommittee agreed that separate harmonized standards should be developed for both complete fuel systems and individual system components.

Subsequently, as needs were identified, the following series of standards evolved under the auspices of the Joint NGV Subcommittee. Within this series these standards are complementary and achieve compatibility with regard to application and performance.

STANDARDS FOR:

- *ANSI NGV 4.1-1999 CSA 12.5-M99, NGV DISPENSING SYSTEMS;*
- *ANSI NGV 4.2-1999 CSA 12.52-M99, HOSES FOR NATURAL GAS VEHICLES AND DISPENSING SYSTEMS;*
- *ANSI NGV 4.4-1999 CSA 12.54-M99, BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS;*
- *ANSI NGV 4.6-1999 CSA 12.56-M99, MANUALLY OPERATED VALVES FOR NATURAL GAS DISPENSING SYSTEMS; AND*
- *ANSI NGV 4.7-1999 CSA 12.57-M99, AUTOMATIC PRESSURE OPERATED VALVES FOR NATURAL GAS DISPENSING SYSTEMS.*

The first edition of the harmonized ANSI/CSA Standard for NGV Dispensing Systems, was approved in the U.S. by the American National Standards Institute, Inc. on February 18, 1999, and in Canada by the (Interim CSA) NGV Standards Steering Committee on Natural Gas Vehicles and Fuelling on May 21, 1998, and the Canadian Interprovincial Gas Advisory Council (IGAC) on December 1, 1998.

The following identifies the designation and the year of the harmonized standard:

ANSI NGV 4.1/CSA 12.5-1999

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DANGER

Testing described in these requirements may result in the sudden release of test gas at high pressure with dangerous explosive force. Adequate protection from explosion, concussion, and flying debris must be utilized to protect test personnel and facilities.

STANDARD FOR NGV DISPENSING SYSTEMS (ANSI/IAS NGV 4.1 · CSA 12.5)

PART I CONSTRUCTION

1.1 SCOPE

1.1.1 This standard applies to:

- a. The mechanical and electrical features of newly manufactured systems that dispense natural gas for vehicles (NGV) where such a system is intended primarily to dispense the fuel directly into the fuel storage container of the vehicle,
- b. NGV dispensers contained in a single housing, and
- c. NGV dispensers contained in multiple housings for metering and registering devices, remote electronics, remote overfill protection, hoses and nozzles.

1.1.2 Each dispenser may have the capability of independently fueling more than one vehicle simultaneously.

1.1.3 NGV dispensers covered by this standard are intended for use with gas composition specified by *SAE J1616, Recommended Practice for Compressed Natural Gas Vehicle Fuel*.

1.1.4 A dispenser hose may be pressurized or non-pressurized while inactive.

1.1.5 This standard does not apply to:

- a. Compression and ancillary equipment;
- b. Compressed natural gas storage containers;
- c. Priority valving equipment;
- d. Vehicle Fueling Appliances for NGV;

- e. Remote station or Kiosk consoles; and
 - f. Remote sequencing equipment and other remote equipment not supplied as part of the dispenser.
- 1.1.6 Installation of a dispensing system is intended to be in accordance with the Standards *ANSI/NFPA 52, Compressed Natural Gas (CNG) Vehicular Fuel Systems*, or the *CSA-B108-99 Natural Gas Fuelling Stations Installation Code*, as applicable, and the requirements of the authority having jurisdiction.
- 1.1.7 All dimensions used in this standard are in metric units [International System of Units (SI)], unless otherwise specified. If a value for a measurement, as given in this standard, is followed by an equivalent value in other units, the first stated is to be regarded as the specification.
- 1.1.8 All references to pressure throughout this document are to be considered gauge pressures unless otherwise specified.
- 1.1.9 Exhibit B contains a list of standards specifically referenced in this standard, and sources from which these reference standards may be obtained. It includes both U.S., and Canadian reference standards where applicable.

1.2 GENERAL CONSTRUCTION AND ASSEMBLY

- 1.2.1 A component used in compressed natural gas dispensing equipment shall either be listed by a nationally recognized certification agency as complying with an applicable standard, or shall be evaluated by the certification agency for the intended application as part of the dispensing equipment.
- 1.2.2 The construction of all parts of a compressed natural gas dispenser, whether specifically covered in this standard or not, shall be in accordance with reasonable concepts of safety, durability, and maintainability.
- 1.2.3 All components used in a dispenser shall be assembled in such a manner so as to be secure against distortion, warping, or other damage, and shall be supported to maintain a fixed relationship with each other.
- 1.2.4 All parts which may be contacted during normal servicing shall be free from sharp projections or edges and projecting screw ends.
- 1.2.5 All components shall be accessible for normal servicing and functional adjustment in position, and shall be replaceable during normal servicing.
- 1.2.6 A dispenser shall have provisions for operation in conjunction with an Emergency Shut-Off Device (ESD). Activation of the ESD shall cause the dispenser to disable the flow of gas to the vehicle, and shall shut off the electrical supply to the dispenser. (See 2.6 DISPENSER SHUT-DOWN).

- 1.2.7 In the event of a loss of electrical power, the flow of gas to the fueling connection shall be shut off automatically, and the natural gas dispenser shall shut down in a safe manner. A manual operation shall be required for the dispenser to resume operation.
- 1.2.8 Dispensers for outdoor installation shall be equipped with a means to protect all operating controls and electrical wiring from climatic conditions. (See 2.13).
- 1.2.9 Each dispenser shall be provided with a mounting means to provide sufficient support.
- 1.2.10 Dispensers shall be equipped with a means to secure and protect the fueling nozzle when not in use.
- 1.2.11 The manufacturer shall furnish the following equipment and data for use by the certification agency:
- a. Representative dispensers, as specified by the certification agency;
 - b. Drawings, blueprints, or photographs which describe each model dispenser, as specified by the certification agency;
 - c. Maximum operating pressure in kilopascals (pounds per square inch); and
 - d. Delivery capacity in liters per minute at standard conditions (cubic feet per minute at standard conditions), or mass per unit time, at the pressure drop specified by the manufacturer.
 - e. Electrical rating.
 - f. Installation instructions.
- 1.2.12 Any component covered under this standard shall be capable of operating in the temperature range of -40°C (-40°F) to 65°C (150°F).
- 1.2.13 A compressed natural gas line inlet or outlet for field connection shall be plugged, capped or otherwise sealed by the manufacturer prior to shipment to prevent entrance of foreign materials.
- 1.2.14 Compressed natural gas confining parts shall have a maximum allowable working pressure (MAWP) of not less than the pressure at which the safety relief device protecting that system, or subsystem, is activated.
- 1.2.15 A dispensing system shall be designed to provide effective grounding when attached to the vehicle. (See 2.10).

- 1.2.16 A manual purge or release valve shall be inaccessible to the public, and shall be protected by a locking mechanism or permanent enclosure.
- 1.2.17 The dispensing system shall incorporate immediate shutdown protection in the event of a rupture or rapid depressurization of the fuel delivery hose during active fueling. (See 2.7).
- 1.2.18 A dispenser shall require a minimum of two operations to initiate gas flow to the vehicle. One operation shall be to secure the nozzle to the vehicle receptacle, another operation shall consist of a manual operation at the dispenser to enable fuel flow. The controls for manual start up of the dispenser shall be located or orientated so there is no possibility of accidental actuation. Switches, valves, etc., that can be activated with the power off and that can cause the system to function as soon as the power is restored shall not be used.
- 1.2.19 A dispenser shall be protected against lightning strikes in accordance with American Petroleum Institute Recommended Practice *RP 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*.

1.3 HOUSING

- 1.3.1 The construction of the housing, where provided, shall be such that it will not become warped, bent, loosened, or otherwise damaged in normal operation so as to prevent the device from complying with these requirements. A recess or depression in the housing that may collect water shall contain means to drain the water to an area which will not cause an unsafe condition.
- 1.3.2 The construction of housings not specifically covered by this requirement shall be in accordance with reasonable concepts of safety, substantiality, and durability. All specifications as to construction set forth herein may be satisfied by the construction actually prescribed or such construction as will provide at least equivalent performance.
- 1.3.3 The housing shall afford space for making field connections of gas-carrying piping and electrical equipment. Openings with acceptable closures shall be provided for making connections and for inspection and adjustment of the operating mechanism after installation. Closures shall require a key or tool to open.
- 1.3.4 Housings which enclose gas carrying components shall incorporate vent opening(s) near the top, totalling an area of not less than 8 cm² (1¹/₄ in.²) to prevent the accumulation of gas. These openings shall be of such size and arrangement as to avoid clogging.

- 1.3.5 A plastic panel used as part of the housing shall remain intact when subjected to room temperature and cold impact tests as described in section 2.4 IMPACT. Except as otherwise stated, testing at room temperature will be conducted between 15°C (59°F) minimum and 30°C (86°F) maximum.
- 1.3.6 Plastic parts shall be resistant to deterioration from conditions imposed on them in service.

1.4 PRESSURE RELIEF VALVES

- 1.4.1 Pressure relief valves (see appended Part IV Definitions) shall comply with and be sized in accordance with Recommended Practice for API RP 520, *Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries*, and installed in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, (UG 125-136), CSA B51, *Boiler, Pressure Vessel, and Pressure Piping Code*, or CGA S-1, *Cylinders for Compressed Gases*.
- 1.4.2 A pressure relief valve shall be located downstream of the overfill protection system to prevent over-pressurization of the vehicle storage vessels (See 1.11 OVERFILL PROTECTION). PRV settings are to be consistent with NGV 1 or CSA B51, Part 2.
- 1.4.3 The discharge opening of all pressure relief valves shall be vented to a safe location, as allowed in ANSI/NFPA 52, *Compressed Natural Gas (CNG) Vehicular Fuel Systems* and CSA-B108-99, *Natural Gas Fuelling Stations Installation Code* (Clause 6.6).

1.5 FILTERS

- 1.5.1 If a gas line filter is included as part of the dispenser, it shall be installed at a point upstream of all gas controls. The filter shall be of adequate size and construction for the application, and shall be accessible for inspection, cleaning and replacement, without taking apart gas handling lines or disturbing any part of the dispensing device assembly (for **WARNING** see 1.14.2)
- 1.5.2 The filter shall be installed in such a manner so that the force required to install or open the filter will not permanently distort the piping or other components of the dispenser.

1.6 VALVES

Valves certified by a nationally recognized certification agency as complying with an approved standard shall be considered as complying with this Section.