# NFPA® 52

# Vehicular Natural Gas Fuel Systems Code

# 2023 Edition



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### NFPA<sup>®</sup> 52

# Vehicular Natural Gas Fuel Systems Code

#### 2023 Edition

This edition of NFPA 52, Vehicular Natural Gas Fuel Systems Code, was prepared by the Technical Committee on Vehicular Alternative Fuel Systems. It was issued by the Standards Council on March 20, 2022, with an effective date of April 9, 2022, and supersedes all previous editions.

This edition of NFPA 52 was approved as an American National Standard on April 9, 2022.

#### Origin and Development of NFPA 52

While compressed natural gas (CNG) vehicles have been used extensively in other countries since the late 1940s, it was not until the late 1970s that their use in the United States became extensive enough to warrant preparation of a national standard.

Between 1980 and 1982, a committee of the American Gas Association (AGA) developed a draft of a fire safety standard for vehicular fuel systems. This was based on existing worldwide standards and current U.S. practice.

In late 1981, the AGA petitioned the NFPA to establish a technical committee project on the subject. The normal NFPA solicitation of comments revealed sufficient response from various interested parties, and the Committee on Compressed Natural Gas Vehicular Fuel Systems was established by the Standards Council in July 1982.

The first edition of NFPA 52, Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems, was issued in 1984, and it was revised in 1988, 1992, 1995, and 1998.

The 2002 edition of NFPA 52 contained minor revisions, most of these in the chapter on engine fuel systems. There also were some changes made to comply with the NFPA Manual of Style for Technical Committee Documents. The most significant of these were reordering of chapters and numbering of definitions.

The 2006 edition of NFPA 52 was a complete revision. NFPA 57, LNG Vehicular Fuel Systems Code, was incorporated into NFPA 52. Additionally, the scope of the technical committee was expanded to include hydrogen, and new chapters were added that addressed general gaseous hydrogen requirements and equipment qualifications; service and maintenance of gaseous hydrogen engine fuel systems; gaseous hydrogen compression, gas processing, storage, and dispensing systems; and liquefied hydrogen fueling facilities.

The 2010 edition of NFPA 52 revised the committee scope so that it better coordinated with the responsibilities of NFPA 55, Compressed Gases and Cryogenic Fluids Code, with regard to hydrogen storage systems. A large number of changes were also made to the chapters concerning hydrogen to update to current material in NFPA documents, the Manual of Style for NFPA Technical Committee *Documents*, and acceptable performance criteria.

Paragraphs extracted from NFPA 55 were shown with the extract reference in brackets [] at the end of the paragraph. In some cases, modifications were made to the extracted text to use terminology appropriate for this standard, such as the term cryogenic fluid instead of compressed gas. In those instances, brackets encased the modified terms.

The 2013 edition removed the requirements for hydrogen systems, the responsibility for which were transferred to NFPA 2, Hydrogen Technologies Code. A chapter on general fueling requirements was added, and changes were made to the onboard gas detection requirements for LNG-fueled vehicles. The installation requirements for ASME tanks for LNG were updated to coordinate with NFPA 59A, Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG).

The 2016 edition was completely reorganized for easier access to requirements. The title of the document was changed from Vehicular Gaseous Fuel Systems Code to Vehicular Natural Gas Fuel Systems

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*Code* to coordinate with the removal of hydrogen systems from the scope of the document in 2013. New and revised definitions harmonized the code with the new CSA Group NGV 5.1 standard, *Residential Fueling Appliances*. Most notably, a new definition for *residential fueling appliances* was added and the definition for *vehicle fueling appliances* was revised.

For the 2019 edition, text reorganization and additions were made to address vehicle fueling applications (VFAs). A new chapter was added for nonresidential CNG fueling applications. Several terms were added and updated to align with current definitions and VFA updates to the document. For example, the term *qualified engineer* was changed to *qualified person*, and the definition *contiguous building volume* was added to Chapter 3. Sections of the residential CNG fueling chapter were removed because they were part of the certification of appliances covered in CSA Group NGV 5.1, *Residential Fueling Appliances*.

For the 2023 edition, bulk plant requirements extracted from NFPA 59A have been revised and in most cases are no longer extracted, since these requirements commonly do not apply to NFPA 52 installations. To provide additional clarity throughout the document, *defueling* and *manifold* have been added as defined terms in Chapter 3. Container protection requirements in Chapter 8 also have been revised where the requirements referred to ASME containers that utilize pressure relief valves instead of pressure relief devices.

2023 Edition

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**Committee Scope:** This Committee shall have primary responsibility for documents on fire and explosion hazards associated with compressed natural gas (CNG), liquefied natural gas (LNG) engine fuel systems, on vehicles of all types and for refueling stations and associated storage. The Committee shall coordinate its documents with the Committee on the National Fuel Gas Code with respect to natural gas piping within the scope of that Committee; with the Committees on Industrial Trucks, Fire Safety for Recreational Vehicles, and Marine Fire Protection with respect to engine fuel systems and refueling stations within their scopes; and the Liquefied Natural Gas Committee with respect to storage of LNG within its scope.

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#### NFPA 52

# Vehicular Natural Gas Fuel Systems Code

#### 2023 Edition

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NOTICE: An asterisk (\*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document. Information on referenced and extracted publications can be found in Chapter 2 and Annex D. **1.1.5** Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

**1.1.6** Where, in any specific case, different sections of this code specify different materials, methods, or other requirements, the most restrictive shall govern.

**1.1.7** Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

**1.1.8** Manufacturer specifications shall equal or surpass the applicable requirements of this code.

**1.2 Purpose.** The purpose of this code shall be to provide fundamental safeguards against fire and explosion hazards associated with compressed natural gas (CNG) and liquefied natural gas (LNG) engine fuel systems on vehicles of all types and for refueling stations and associated storage.

**1.3 Retroactivity.** The provisions of this code reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this code at the time the code was issued.

**1.3.1** Unless otherwise specified, the provisions of this code are not intended to require upgrading facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the code. Where specified, the provisions of this code shall be retroactive.

**1.3.2** In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this code deemed appropriate.

#### Chapter 1 Administration

#### 1.1\* Scope.

**1.1.1** This code shall apply to the design, installation, operation, and maintenance of compressed natural gas (CNG) and liquefied natural gas (LNG) engine fuel systems on vehicles of all types and for fueling vehicle (dispensing) systems and facilities, and associated storage, including the following:

- (1) Original equipment manufacturers (OEMs)
- (2) Final-stage vehicle integrator/manufacturer (FSVIM)
- (3) Vehicle fueling (dispensing) systems

**1.1.2** This code shall apply to the design, installation, operation, and maintenance of LNG engine fuel systems on vehicles of all types, to their associated fueling (dispensing) facilities, and to LNG-to-CNG facilities with LNG storage in ASME containers of 100,000 gal (379 m<sup>3</sup>) or less.

**1.1.3** This code shall not apply to those aspects of vehicles and fuel supply containers that are covered by federal motor vehicle safety standards (FMVSSs).

**1.1.4** This code shall include marine, highway, rail, off-road, and industrial vehicles.

**1.3.3** The retroactive requirements of this code shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction, and only where a reasonable degree of safety is provided and is clearly evident.

**1.4 Alternate Provisions.** Site conditions, advancements in technology, and improvements in system design and equipment shall be permitted to allow for equipment fabrication methods, component design requirements, and installation and operating practices that differ from those specified in this code.

**1.4.1** Such deviations or improvements shall be permitted to provide equivalent safety and compatible operation that meet the intent of this code.

**1.4.2** Such deviations shall be permitted where the authority having jurisdiction has seen evidence that a special investigation of all factors has been made and, based on sound experience and engineering judgment, has concluded that the proposed deviations meet the intent of this code.

**1.5 Training.** Persons engaged in the handling and storage of LNG, CNG, and LCNG shall be trained in the hazards and properties of these materials.

### 1.6 Units.

**1.6.1** Metric units in this code are based on IEEE/ASTM SI 10, *American National Standard for Metric Practice*.

Shaded text = Revisions.  $\Delta$  = Text deletions and figure/table revisions. • = Section deletions. N = New material.

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