

ANSI Z223.1

National Fuel Gas Code







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NFPA[®] 54

ANSI Z223.1-2021

National Fuel Gas Code

2021 Edition

This edition of NFPA 54/ANSI Z223.1, *National Fuel Gas Code*, was prepared by the Technical Committee on National Fuel Gas Code. It was issued by the Standards Council on March 15, 2020, with an effective date of April 4, 2020, and supersedes all previous editions.

This edition of NFPA 54/ANSI Z223.1 was approved as an American National Standard on April 4, 2020. The ANSI designation, Z223.1-2021, was approved on April 2, 2020. The NFPA designation is NFPA 54-2021.

Origin and Development of NFPA 54/ANSI Z223.1

This code offers criteria for the installation and operation of gas piping and gas equipment on consumers' premises. It is the cumulative result of years of experience of many individuals and many organizations acquainted with the installation of gas piping and equipment designed for utilization of gaseous fuels. It is intended to promote public safety by providing requirements for the safe and satisfactory utilization of gas.

Changes in this code can become necessary from time to time. When any revision is deemed advisable, recommendations should be forwarded to the Secretary, Accredited Standards Committee Z223, 400 N. Capitol St. NW, Washington, DC 20001, and the Secretary, Standards Council, National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

Prior to 1974, the following three codes covered the installation of gas piping and appliances:

- American National Standard Installation of Gas Appliances and Gas Piping, ANSI Z21.30 (NFPA 54)
- (2) Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises, ANSI Z83.1 (NFPA 54A)
- (3) Fuel Gas Piping, ASME B31.2

The first edition of the code was issued in 1974. It combined the requirements of the three predecessor documents. The American Gas Association and the National Fire Protection Association have continued co-sponsorship of the code following the first edition.

The second edition of the code, incorporating pertinent portions of B31.2, was issued in 1980 and reorganized the code to the current format. Subsequent editions were issued in 1984, 1988, 1992, 1996, 1999, and 2002, respectively. The scope of the code was expanded in 1988 to include piping systems up to and including 125 psi (862 kPa). Revision highlights from subsequent editions include the following:

The 2006 edition incorporated expanded steel, copper, and polyethylene pipe sizing tables. Requirements for appliance shutoff valves were revised to allow manifold systems with all shutoff valves in one location up to 50 ft (15 m) from the most remote appliance, and the chapters were reorganized by application.

The 2009 edition included allowing press-connect fittings for gas tubing systems, new requirements for bonding of CSST piping systems, expanded CSST sizing tables to recognize additional available sizes, new coverage of outdoor decorative appliances, and a new requirement to seal the annular space around the side wall vent penetrations.

The 2012 edition included revised fuel gas piping purging procedures that require outdoor purging of piping with larger pipe sizes or higher operating pressures and allows smaller or lower operating pressure piping to be purged indoors under specific conditions.

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The 2015 edition revised the bonding requirements for CSST so that the bonding connection can be placed on any metallic fitting in the piping system as long as the bonding jumper does not exceed 75 ft (22 m) in length. Overpressure protection requirements were rewritten and overpressure protection is required on any system containing an appliance with a maximum inlet pressure of 14 in. w.c. (3.5 kPa) that is supplied with gas at the point of delivery at a pressure greater than 2 psig (14 kPa). Annex G, Recommended Procedure for Safety Inspection of an Existing Appliance Installation, was expanded and revised to reflect modern appliances and test methods.

In the 2018 edition, revisions to piping included allowing listed arc-resistant jacket or coated CSST to use the appliance's electrical grounding connector as the bonding means and recognizing stainless steel smooth wall pipe and tubing products as acceptable piping materials. The minimum allowed wall thickness of carbon and stainless steel pipe was revised to Schedule 10, but joints on Schedule 10 pipe cannot be made with screwed fittings. Press-connect fittings were added as an acceptable joining method for pipe.

Revisions to the venting requirements included requiring listing to the appropriate UL standards for plastic venting materials, factory-built chimneys, Type B and BW vents, chimney lining systems, and special gas vents. Direct vent clearances to building openings for appliances with an input above 150,000 Btu (44 kW) are to be in accordance with the appliance manufacturer's installation instructions.

Finally, in Chapter 9 a requirement was added that an existing gas appliance installation be inspected for combustion air and venting code compliance when the building structure that it is installed in is modified with specific air infiltration-reducing changes.

The 2021 edition includes revisions in Chapter 10 that now require appliances to be listed to and in compliance with the appropriate ANSI/CSA appliance listing standard, thereby providing an increased level of safety. Installation requirements for unlisted appliances have been removed, and they will now have to be evaluated through the application of equivalency.

A table for through the wall vent terminal clearances has been added to Chapter 12, along with an associated annex figure that coordinates this code with the clearances in ANSI product standards. Engineering methods are now defined in Chapter 4 to provide guidance to authorities having jurisdiction on acceptable engineering methods that will eliminate the need to approve individually all engineering methods used.

Finally, electric isolation requirements for gas piping installation have been revised and reorganized to better reflect where the dielectric union is to be installed in the system and what it is protecting.

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Committee Scope: This Committee shall have primary responsibility for documents on safety code for gas piping systems on consumers' premises and the installation of gas utilization equipment and accessories for use with fuel gases such as natural gas, manufactured gas, liquefied petroleum gas in the vapor phase, liquefied petroleum gas-air mixtures, or mixtures of these gases, including: a. The design, fabrication, installation, testing, operation, and maintenance of gas piping systems from the point of delivery to the connections with each gas utilization device. Piping systems covered by this Code are limited to a maximum operating pressure of 125 psig. For purposes of this Code, the point of delivery is defined as the outlet of the meter set assembly, or the outlet of the service regulator or service shutoff valve where no meter is provided. b. The installation of gas utilization equipment, related accessories, and their ventilation and venting systems.

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National Fuel Gas Code

2021 Edition

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Information on referenced publications can be found in Chapter 2 and Annex K.

All pressures used in this code are gauge pressure unless otherwise indicated.

Chapter 1 Administration

1.1 Scope.

1.1.1 Applicability.

1.1.1.1 This code is a safety code that shall apply to the installation of fuel gas piping systems, appliances, equipment, and related accessories as shown in 1.1.1.1(A) through 1.1.1.1(F).

(A)* Coverage of piping systems shall extend from the point of delivery to the appliance connections. For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed. Where a meter is installed, the point of delivery shall be the outlet of the meter. **(B)** This code shall apply to natural gas systems operating at a pressure of 125 psi (862 kPa) or less.

(C) This code shall apply to LP-Gas systems operating at a pressure of 50 psi (345 kPa) or less.

(D) This code shall apply to gas–air mixture systems operating within the flammable range at a pressure of 10 psi (69 kPa) or less.

(E) Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation, and maintenance.

(F) Requirements for appliances, equipment, and related accessories shall include installation, combustion, and ventilation air and venting.

1.1.1.2 This code shall not apply to the following items:

- (1) Portable LP-Gas appliances and equipment of all types that are not connected to a fixed fuel piping system
- (2) Installation of appliances such as brooders, dehydrators, dryers, and irrigation equipment used for agricultural purposes
- (3) Raw material (feedstock) applications except for piping to special atmosphere generators
- (4) Oxygen-fuel gas cutting and welding systems
- (5) Industrial gas applications using such gases as acetylene and acetylenic compounds, hydrogen, ammonia, carbon monoxide, oxygen, and nitrogen
- (6) Petroleum refineries, pipeline compressor or pumping stations, loading terminals, compounding plants, refinery tank farms, and natural gas processing plants
- (7) Large integrated chemical plants or portions of such plants where flammable or combustible liquids or gases are produced by chemical reactions or used in chemical reactions
- (8) LP-Gas installations at utility gas plants
- (9) Liquefied natural gas (LNG) installations
- (10) Fuel gas piping in electric utility power plants
- (11) Proprietary items of equipment, apparatus, or instruments such as gas generating sets, compressors, and calorimeters
- (12) LP-Gas equipment for vaporization, gas mixing, and gas manufacturing
- (13) LP-Gas piping for buildings under construction or renovations that is not to become part of the permanent building piping system that is, temporary fixed piping for building heat
- (14) Installation of LP-Gas systems for railroad switch heating
- (15) Installation of LP-Gas and compressed natural gas (CNG) systems on vehicles
- (16) Gas piping, meters, gas pressure regulators, and other appurtenances used by the serving gas supplier in distribution of gas, other than undiluted LP-Gas
- (17) Building design and construction, except as specified herein
- (18) Fuel gas systems on recreational vehicles manufactured in accordance with NFPA 1192
- (19) Fuel gas systems using hydrogen as a fuel
- (20) Construction of appliances

1.1.2 Other Standards. In applying this code, reference shall also be made to the manufacturers' instructions and the serving gas supplier regulations.

1.2 Purpose. (Reserved)

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