

**FIRST PUBLIC REVIEW DRAFT**  
**2023 Z223.1 NATIONAL FUEL GAS CODE**

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**BSR Z223.1–20xx**

**NFPA® 54–20xx**

**National Fuel Gas Code**

**2024 Edition**

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The following preprint is based on the First Revision Draft of the 2024 edition of NFPA 54/Z223.1.

How to Use the Draft: The following draft shows those parts of the Code revised based on the First Draft Report. The revisions are identified as additions (underlined) and ~~deletions~~ (strikethrough).

Each revision is identified by its First Revision Number in brackets (for example, [FR No. 1-NFPA 54/Z223.1-2021]). The FR identification is typically placed at the end of each revised section(s) or specific revision. In some cases, the revision would only apply to the NFPA edition or the Z223.1 edition. These revisions are identified using the FR number within brackets as noted above but would only show the impacted document, NFPA 54 or Z223.1, within the brackets.

The draft also identifies those sections that have not been revised shown in brackets, for example “{3.9 through 3.13.5 unchanged}”. These section numbers reflect the 2021 edition section numbering sequence.

Visit the NFPA website at [www.nfpa.org/54](http://www.nfpa.org/54) or AGA website at [www.aga.org/nfgc](http://www.aga.org/nfgc) to view the First Revisions Report which contains the committee reasons for the FRs and any Committee Inputs (CI).

**Chapter 1**  
**Administrative**

**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 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 liquefied petroleum 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) Piping systems requirements shall include design, materials, components, fabrication, assembly, installation, testing, inspection, purging, operation, and maintenance. [FR No. 33-NFPA 54/Z223.1-2021]
- (F) Requirements for appliances, equipment and related accessories shall include installation, combustion, air, ~~and~~ ventilation air and venting. [FR No. 34-NFPA 54/Z223.1-2021]

{1.1.1.2 through 1.5 unchanged}

**Chapter 2**  
**Referenced Standards**

{2.1 unchanged}

**2.2 NFPA Publications**

**2.2 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471, 617.770.3000, [www.nfpa.org](http://www.nfpa.org).

NFPA 30A, Code for *Motor Fuel Dispensing Facilities and Repair Garages*, 2024 ~~2024~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2021 ~~2018~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 2023 ~~2018~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 52, *Vehicular Natural Gas Fuel Systems Code*, 2023 ~~2019~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 58, *Liquefied Petroleum Gas Code*, 2023 ~~2020~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 70®, *National Electrical Code*®, 2023 ~~2020~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 2019 edition.

NFPA 88A, *Standard for Parking Structures*, 2023 ~~2019~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2024 ~~2024~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2024 ~~2020~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

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NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 2024 ~~2021~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2024 ~~2019~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 409, *Standard on Aircraft Hangars*, 2022 ~~2016~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2023 ~~2020~~ edition. [FR No. 1-NFPA 54/Z223.1-2021]

NFPA 853, *Standard for the Installation of Stationary Fuel Cell Power Systems*, 2020 edition.

NFPA 1192, *Standard on Recreational Vehicles*, 2021 edition.

### 2.3 Other Publications

**2.3.1 ASME International Publications.** American Society of Mechanical Engineers International, Two Park Avenue, New York, NY 10016-5990, 800.843.2763, www.asme.org.

ANSI/ASME B1.20.1, *Pipe Threads, General Purpose, Inch*, 2013 (R2018). [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/ASME B16.1, *Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250*, 2020 ~~2015~~. [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS ½ through NFPS 24 Metric/Inch Standard*, 2020 ~~2017~~. [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/ASME B16.20, *Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound and Jacketed*, 2017.

ANSI/ASME B16.21, *Nonmetallic Flat Gaskets for Pipe Flanges*, 2016.

ANSI/ASME B16.24, *Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500*, 2016.

ANSI/ASME B16.33, *Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS 1/2 through NPS 2)*, 2012 (R2017). [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/ASME B16.42, *Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300*, 2016.

ANSI/ASME B16.44, *Manually Operated Metallic Gas Valves for Use in Above Ground Piping Systems up to 5 psi*, 2012 (R2017).

ANSI/ASME B16.47, *Large Diameter Steel Flanges: NPS 26 through NPS 60 Metric/Inch Standard*, 2020 ~~2017~~. [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*, 2018.

**2.3.2 ASTM International Publications.** American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, 610.832.9500, www.astm.org.

ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless*, 2020 ~~2018~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM A106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*, 2019a ~~2019~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM A254, *Standard Specification for Copper-Brazed Steel Tubing*, 2012 reaffirmed 2019. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM A268, *Standard Specification for Seamless and Welded Ferritic and Martensitic Stainless Steel Tubing for General Service*, 2020 ~~2010~~, reaffirmed 2016. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM A269, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*, 2015a, reaffirmed 2019. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*, 2021 ~~2018a~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM B88, *Standard Specification for Seamless Copper Water Tube*, 2020 ~~2016~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM B210, *Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes*, 2019a ~~2019~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM B241, *Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube*, 2016.

ASTM B280, *Standard Specification for Seamless Copper Tube for Air-Conditioning and Refrigeration Field Service*, 2020 ~~2018~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM D2513, *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings*, 2020 ~~2018a~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2019a ~~2019~~. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*, 2018.

ASTM F1973, *Standard Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems*, 2013 reaffirmed 2018.

ASTM F2509, *Standard Specification for Field-assembled Anodeless Riser Kits for Use on Outside Diameter Controlled Polyethylene Gas Distribution Pipe and Tubing*, 2015, reaffirmed 2019. [FR No. 1-NFPA 54/Z223.1-2021]

ASTM F2945, *Standard Specification for Polyamide 11 Gas Pressure Pipe, Tubing, and Fittings*, 2018.

**2.3.3 CSA Group Publications.** CSA Group, Inc., 8501 East Pleasant Valley Road, Cleveland, OH 44131-5575, 216.524.4990, www.csa-group.org.

ANSI/CSA FC 1, *Fuel Cell Technologies - Part 3-100: Stationary Fuel Cell Power Systems - Safety*, 2014, reaffirmed 2018.

ANSI/CSA NGV 5.1, *Residential Fueling Appliances*, 2016 reaffirmed 2020. [FR No. 1-NFPA 54/Z223.1-2021]

ANSI/CSA NVG 5.2, *Vehicle Fueling Appliances (VFA)*, 2017.

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- ANSI LC 1/CSA 6.26, *Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)*, 2018.
- ANSI LC 4/CSA 6.32, *Press-Connect Metallic Fittings for Use in Fuel Gas Distribution Systems*, 2012, reaffirmed 2016.
- ANSI Z21.1/CSA 1.1, *Household Cooking Gas Appliances*, 2018.
- ANSI Z21.5.1/CSA 7.1, *Gas Clothes Dryers, Volume I, Type 1 Clothes Dryers*, 2017.
- ANSI Z21.5.2/CSA 7.2, *Gas Clothes Dryers, Volume II, Type 2 Clothes Dryers*, 2016.
- ANSI Z21.8, *Installation of Domestic Gas Conversion Burners*, 1994, reaffirmed 2017.
- ANSI Z21.10.1/CSA 4.1, *Gas Water Heaters, Volume I, Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less*, 2020 ~~2017~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.10.3/CSA 4.3, *Gas Water Heaters, Volume III, Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating or Instantaneous*, 2020 ~~2017~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.11.2, *Gas-Fired Room Heaters - Volume II, Unvented Room Heaters*, 2019 ~~2016~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.13/CSA 4.9, *Gas-fired Low Pressure Steam and Hot Water Boilers*, 2017.
- ANSI Z21.15/CSA 9.1, *Manually operated gas valves for appliances, appliance connector valves and hose end valves*, 2007, reaffirmed 2014.
- ANSI Z21.18/CSA 6.3, *Gas Appliance Pressure Regulators*, 2019 ~~2007, reaffirmed 2016~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.19/CSA 1.4, *Refrigerators Using Gas Fuel*, 2014.
- ANSI Z21.22/CSA 4.4, *Relief Valves for Hot Water Supply Systems*, 2015, reaffirmed 2020. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.24/CSA 6.10, *Connectors for Gas Appliances*, 2015, reaffirmed 2020. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.40.1/CSA 2.91, *Gas-fired Heat Activated Air Conditioning and Heat Pump Appliances*, 1996, reaffirmed 2017.
- ANSI Z21.40.2/CSA 2.92, *Air Conditioning and Heat Pump Appliances (Internal Combustion)*, 1996, reaffirmed 2017.
- ANSI Z21.41/CSA 6.9, *Quick-Disconnect Devices for use with Gas Fuel Appliances*, 2014, reaffirmed 2019. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.47/CSA 2.3, *Gas-fired Central Furnaces*, 2021 ~~2016~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.50/CSA 2.22, *Vented Decorative Gas Appliances*, 2019.
- ANSI Z21.54/CSA 8.4, *Gas Hose Connectors for Portable Outdoor Gas-Fired Appliances*, 2019.
- ANSI Z21.56/CSA 4.7, *Gas-fired Pool Heaters*, 2017.
- ANSI Z21.58/CSA 1.6, *Outdoor Cooking Gas Appliances*, 2018. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.60/CSA 2.26, *Decorative Gas Appliances for Installation in Solid-Fuel Burning Fireplaces*, 2017.
- ANSI Z21.69/CSA 6.16, *Connectors for Movable Gas Appliances*, 2015, reaffirmed 2020. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.75/CSA 6.27, *Connectors for Outdoor Gas Appliances and Manufactured Homes*, 2016, reaffirmed 2021. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.80/CSA 6.22, *Line Pressure Regulators*, 2019.
- ANSI Z21.86/CSA 2.32, *Vented Gas-fired Space Heating Appliances*, 2016.
- ANSI Z21.88/CSA 2.33, *Vented Gas Fireplace Heaters*, 2017. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.89/CSA 1.18, *Outdoor Cooking Specialty Gas Appliances*, 2017. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.90/CSA 6.24, *Gas Convenience Outlets and Optional Enclosures*, 2019 ~~2015~~. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z21.93/CSA 6.30, *Excess flow valves for natural and LP gas with pressures up to 5 psig*, 2017.
- ANSI Z21.97/CSA 2.41, *Outdoor Decorative Gas Appliances*, 2017.
- ANSI Z83.4/CSA 3.7, *Non-Recirculating Direct Gas-Fired Heating and Forced Ventilation Appliances for Commercial and Industrial Application*, 2017.
- ANSI Z83.8/CSA 2.6, *Gas Unit Heaters, as Packaged Heaters, Gas Utility Heaters, and Gas-fired Duct Furnaces*, 2016
- ANSI Z83.11/CSA 1.8, *Gas Food Service Equipment*, 2016, reaffirmed 2021. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z83.18, *Recirculating Direct Gas-Fired Heating and Forced Ventilation Appliances for Commercial and Industrial Application*, 2017, reaffirmed 2021. [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI Z83.19/CSA 2.35, *Gas-fired High-Intensity Infrared Heaters*, 2017.
- ANSI Z83.20/CSA 2.34, *Gas-fired Tubular and Low-intensity Infrared Heaters*, 2016.
- ANSI Z83.26/CSA 2.27, *Gas-fired Outdoor Infrared Patio Heaters*, 2020 ~~2014~~ [FR No. 1-NFPA 54/Z223.1-2021]
- 2.3.4 MSS Publications.** Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, VA, 22180-4602, 703.281.6613, [www.mss-hq.com](http://www.mss-hq.com). [FR No. 1-NFPA 54/Z223.1-2021]
- ANSI/MSS SP-58, *Pipe Hangers and Supports — Materials, Design, Manufacture, Selection, Application, and Installation*, 2018.
- 2.3.5 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, 877.854.3577, [www.ul.com](http://www.ul.com).
- UL 103, ~~Chimneys~~, *Factory-Built Chimneys for Residential Type and Building Heating Appliances*, 2010, revised 2017. [FR No. 1-NFPA 54/Z223.1-2021]
- UL 353, *Limit Controls*, 1994. [FR No. 1-NFPA 54/Z223.1-2021]
- UL 378, *Draft Equipment*, 2006, revised 2013.



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UL 441, *Gas Vents*, 2019 ~~2016~~. [FR No. 1-NFPA 54/Z223.1-2021]

UL 467, *Grounding and Bonding Equipment*, 2013.

UL 641, *Type L Low-Temperature Venting Systems*, 2010, revised 2018.

UL 651, *Schedule 40 and 80 Rigid PVC Conduit and Fittings*, 2011, revised 2019 ~~2018~~. [FR No. 1-NFPA 54/Z223.1-2021]

UL 959, *Medium Heat Appliance Factory-Built Chimneys*, 2010, revised 2019 ~~2014~~. [FR No. 1-NFPA 54/Z223.1-2021]

UL 1738, *Venting Systems for Gas Burning Appliances, Categories II, III, and IV*, 2010, revised 2021 ~~2014~~. [FR No. 1-NFPA 54/Z223.1-2021]

UL 1777, *Chimney Liners*, 2015, revised 2019.

UL 2158A, *Clothes Dryer Transition Ducts*, 2013, revised 2017.

UL 2561, *1400 Degree Fahrenheit Factory-Built Chimneys*, 2016, revised 2018.

UL 2989, *Outline of Investigation of Tracer Wire*, 2017. [FR No. 1-NFPA 54/Z223.1-2021]

UL 60730-2-6, *Automatics Electrical Controls for Household and Similar Use; Part 2: Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*, 1994. [FR No. 1-NFPA 54/Z223.1-2021]

{2.3.6 through 2.4 unchanged}

### Chapter 3 Definitions

{3.1 through 3.3.4.4.1 unchanged}

~~3.3.4.4.2 Gas Counter Appliance.~~ An appliance such as a gas coffee brewer and coffee urn and any appurtenant water heating appliance, food and dish warmer, hot plate, and griddle. [FR No. 35-NFPA 54/Z223.1-2021]

{3.3.4.4.3 through 3.3.4.4.6 unchanged}

~~3.3.4.5 Gas Counter Appliances.~~ See 3.3.4.4.2. [FR No. 36-NFPA 54/Z223.1-2021]

{3.3.4.6 unchanged}

~~3.3.4.6.1 Household Broiler Cooking Appliance.~~ A unit that cooks primarily by radiated heat.

~~3.3.4.6.2 Household Built-In Unit Cooking Appliance.~~ A unit designed to be recessed into, placed upon, or attached to the construction of a building, but not for installation on the floor. [FR No. 37-NFPA 54/Z223.1-2021]

{3.3.4.7 through 3.3.47.2 unchanged}

**3.3.48 Gas Convenience Outlet.** A permanently installed ~~mounted~~, hand-operated device providing a means for connecting and disconnecting an appliance or an appliance connector to the gas supply piping. [FR No. 38-NFPA 54/Z223.1-2021]

{3.3.49 through 3.3.57 unchanged}

~~3.3.58 Hot Plate.~~ A fuel gas burning An appliance consisting of one or more open-top type burners installed on supported by short legs or a base. See 3.3.4.4.2, Gas Counter Appliance.

~~3.3.58.1 Domestic Hot Plate.~~ A fuel gas burning appliance consisting of one or more open top type burners installed on short legs or a base. [FR No. 39-NFPA 54/Z223.1-2021]

{3.3.59 through 3.3.60 unchanged}

**3.3.61 Interruption of Service.** Disconnection or discontinuation of fuel gas to the point of delivery. [FR No. 20-NFPA 54/Z223.1-2021]

{3.3.61 through 3.3.64.1 unchanged}

~~3.3.64.2 Noncombustible Material.~~ A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat See Section 4.4. [FR No. 40-NFPA 54/Z223.1-2021]

{3.3.65 through 3.3.84.1.1 unchanged}

**3.3.84.2 Draft Control Damper System.** A listed electronically controlled damper device attached to a chimney, vent connector, breeching, or flue gas manifold to control the vent, vent connector or chimney pressure. [CI No. 41-NFPA 54/Z223.1-2021]

{3.3.84.2 through 3.3.96 unchanged}

~~3.3.98 97 Tubing.~~ Semirigid conduit of copper, steel, aluminum, corrugated stainless steel tubing (CSST), polyethylene, or polyamide plastic. [FR No. 42-NFPA 54-2021]

{3.3.99 through 3.3.104 unchanged}

### Chapter 4 General

{4.1 through 4.5 unchanged}

**4.6 Gas Detection.** Where fuel gas detection and warning equipment is required in residential occupancies with gas service, the installation shall be in accordance with NFPA 715, Standard for the Installation of Fuel gasses Detection and Warning Equipment. [CI No. 48-NFPA 54/Z223.1-2021]

### Chapter 5 Gas Piping System Design, Materials, and Components

#### 5.1 Piping Plan.

##### 5.1.1 Installation of Piping System.

**5.1.1.1** Where required by the authority having jurisdiction, a piping sketch or plan shall be prepared before proceeding with the installation.

**5.1.1.2** ~~The~~ This plan in 5.1.1.1 shall show the proposed location of piping, the size of different branches, the various load demands, and the location of the point of delivery, the location of isolation valves, and accommodations for meeting the safe purging requirements as required in Chapter 8. [FR No. 3-NFPA 54/Z223.1-2021]

### 5.1.2 Addition to Existing System.

**5.1.2.1** When additional appliances are being connected to a gas piping system, the existing piping shall be checked to determine whether it has adequate capacity. **[FR No. 5-NFPA 54/Z223.1-2021]**

**5.1.2.2** If the capacity of the system is determined to be inadequate for the additional appliances, ~~the existing system shall be enlarged as required, or separate gas piping of adequate capacity shall be provided~~ one or more of the following modifications shall be made to provide required minimum gas pressure to each appliance:

- (1) The existing system is enlarged as required.
- (2) Separate gas piping of adequate capacity is provided.
- (3) The gas pressure is increased within the limitations of the existing piping system and connected appliances. **[FR No. 5-NFPA 54/Z223.1-2021]**

{5.2 through 5.5.4.3 unchanged}

**5.5.5 Workmanship and Defects.** Gas pipe, tubing, and fittings ~~at the time of installation shall be clear and free from cutting burrs and defects in structure or threading and shall be thoroughly brushed and chip and scale blown. Defects in pipe, tubing, and fittings shall not be repaired. Defective pipe, tubing, and fittings shall be replaced~~ meet the following requirements:

- (1) Gas pipe, tubing, and fittings shall be clear and free from cutting burns and visible defects in structure or threading.
- (2) Gas pipe, tubing, and fittings shall be thoroughly cleaned to remove chip, scale, and debris.
- (3) Visible defects in pipe, tubing, and fittings shall not be repaired.
- (4) Pipe, tubing, and fitting with visible defect shall be replaced. **[FR No. 6-NFPA 54/Z223.1-2021]**

{5.5.6 through 5.5.6.4.3 unchanged}

### 5.5.6.2 Damaged Threads.

**5.5.6.2.1** Pipe with threads that are stripped, chipped, corroded, or otherwise damaged shall not be used.

**5.5.6.2.2** Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used. **[FR No. 7-NFPA 54/Z223.1-2021]**

{5.5.6.3 through 5.6.1 unchanged}

**5.5.7 Metallic Piping Joints and Fittings.** The type of piping joint used shall conform to the following:

- (1) Be suitable for the pressure and temperature conditions. ~~and shall~~
- (2) Be selected giving consideration to joint tightness and mechanical strength under the service conditions.
- (3) ~~The joint shall be~~ Be able to sustain the maximum end force ~~due to the internal pressure and any additional forces due to~~ forces inclusive of temperature expansion or contraction, vibration, fatigue, internal pressure, or the weight of the pipe and its contents. **[FR No. 8-NFPA 54/Z223.1-2021]**

{5.5.7.1 through 5.5.7.4 unchanged}

**5.5.7.5 Metallic Pipe Fittings.** Metallic fittings shall comply with the following:

- (1) Threaded fittings in sizes larger than 4 in. (100 mm) shall not be used.
- (2) Fittings used with steel, stainless steel, or wrought-iron pipe shall be steel, stainless steel, copper alloy, malleable iron, or cast iron.
- (3) Fittings used with copper or copper alloy pipe shall be copper or copper alloy.
- (4) Fittings used with aluminum alloy pipe shall be aluminum alloy.
- (5) *Cast-Iron Fittings.* Cast-iron fittings shall comply with the following:
  - (a) Flanges shall be permitted.
  - (b) Bushings shall not be used.
  - (c) Fittings shall not be used in systems containing flammable gas-air mixtures.
  - (d) Fittings in sizes 4 in. (100 mm) and larger shall not be used indoors unless approved ~~by the authority having jurisdiction.~~
  - (e) Fittings in sizes 6 in. (150 mm) and larger shall not be used unless approved ~~by the authority having jurisdiction.~~
- (6) *Aluminum Alloy Fittings.* Threads shall not form the joint seal.
- (7) *Zinc-Aluminum Alloy Fittings.* Fittings shall not be used in systems containing flammable gas-air mixtures.
- (8) *Special Fittings.* Fittings such as couplings, proprietary-type joints, saddle tees, gland-type compression fittings, and flared, flareless, or compression-type tubing fittings shall be as follows:
  - (a) Used within the fitting manufacturer's pressure-temperature recommendations
  - (b) Used within the service conditions anticipated with respect to vibration, fatigue, thermal expansion, or contraction
  - (c) Acceptable to the authority having jurisdiction
- (9) When pipe fittings are drilled and tapped in the field, the operation shall be in accordance with the following:
  - (a) The operation shall be performed on systems having operating pressures of 5 psi (34 kPa) or less.
  - (b) The operation shall be performed by the gas supplier or their designated representative.
  - (c) The drilling and tapping operation shall be performed in accordance with written procedures prepared by the gas supplier.
  - (d) The fittings shall be located outdoors.

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(e) The tapped fitting assembly shall be inspected and proven to be free of leaks.

[FR No. 15-NFPA 54/Z223.1-2021]

{5.5.8 through 5.5.10.4 unchanged}

**5.5.10.5** When flanges are separated and before gaskets are replaced, the following shall be met:

- (1) Flange surfaces shall be inspected for pitting, corrosion, and other surface defects.
- (2) Flanges that contain pitting, corrosion, and other surface defects on faces shall be repaired or replaced. [FR No. 9-NFPA 54/Z223.1-2021]

{5.6 through 5.6.2.1 unchanged}

**5.6.2.2** Gas meters shall not be placed where they will be subjected to damage, such as adjacent to a driveway, under a fire escape, in public passages, halls, or where they will be subject to excessive corrosion or vibration. [FR No. 10-NFPA 54/Z223.1-2021]

{5.6.2.3 unchanged}

### 5.6.3 Supports.

**5.6.3.1** Gas meters shall be supported or connected to rigid piping so as not to exert a strain on the meters.

**5.6.3.2** Where flexible connectors are used to connect a gas meter to downstream piping at manufactured mobile homes in manufactured mobile home parks, the meter shall be supported by a post or bracket placed in a firm footing or by other means providing equivalent support. [FR No. 11-NFPA 54/Z223.1-2021]

{5.6.4 through 5.7.6 unchanged}

**5.7.7 Regulator Removal.** A union shall be installed either upstream or downstream of a regulator with threaded pipe connections. [FR No. 16-NFPA 54/Z223.1-2021]

{5.8 through 5.13.2 unchanged}

**5.14 Pressure Regulator and Pressure Control Venting.** The venting of the atmospheric side of diaphragms in line pressure regulators, gas appliance regulators, and gas pressure limit controls shall be in accordance with all of the following:

- (1) An independent vent pipe to the outdoors, sized in accordance with the device manufacturer's instructions, shall be provided where the location of a device is such that a discharge of fuel gas will cause a hazard. ~~For devices other than appliance regulators, vents are not required to be independent where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.~~

*Exception No. 1: A regulator and vent limiting means combination listed as complying with ANSI Z21.80/CSA 6.22, Line Pressure Regulators, shall not be required to be vented to the outdoors.*

*Exception No. 2: A listed gas appliance regulator factory equipped with a vent limiting device is not required to be vented to the outdoors.*

(2) For devices other than appliance regulators, vents ~~shall~~ are not be required to be independent where the vents are connected to a common manifold designed in accordance with engineering methods to minimize backpressure in the event of diaphragm failure and such design is approved.

(3) A regulator and vent limiting means combination listed in accordance as complying with ANSI Z21.80/CSA 6.22, Line Pressure Regulators, shall not be required to be vented to the outdoors.

(4) A listed gas appliance regulator factory equipped with a vent limiting device is not required to be vented to the outdoors.

(5) A listed gas pressure limit control that is factory equipped with a vent limiting device and in accordance with UL 353, *Limit Controls*, or UL 60730-2-6, *Automatic Electrical Controls for Household and Similar Use, Part 2*, shall not be required to be vented to the outdoors.

(6) Materials for vent piping shall be in accordance with Section 5.5.

(7) The vent terminus shall be designed to prevent the entry of water, insects, and other foreign matter that could cause blockage.

(8) Vent piping shall be installed to minimize static loads and bending moments placed on the regulators and gas pressure control devices.

(9) Vents shall terminate not less than 3 ft (0.9 m) from a possible source of ignition.

(10) At locations where a vent termination could be submerged during floods or snow accumulations, an antiflood-type breather vent fitting shall be installed, or the vent terminal shall be located above the height of the expected flood waters or snow.

(11) Vent piping from pressure regulators and gas pressure controls shall not be connected to a common manifold that serves a bleed line from a diaphragm-type gas valve.

[FR No. 12-NFPA 54/Z223.1-2021]

## Chapter 6 Pipe Sizing

**6.1\* Pipe Sizing Methods.** Where the pipe size is to be determined using any of the methods in 6.1.1 through 6.1.3, the diameter of each pipe segment shall be obtained from the pipe sizing tables in 6.2, ~~or~~ 6.3, the sizing tables included in a listed piping system manufacturer's installation instructions, or from the sizing equations in 6.4.

**6.1.1 US to SI Conversions.** For SI units, the following shall apply: 1 ft<sup>3</sup> = 0.028 m<sup>3</sup>, 1 ft = 0.305 m, 1 in. w.c. = 0.249 kPa, 1 psi = 6.894 kPa, 1,000 Btu/hr = 0.293 kW.

{6.1.2 through 6.4.2 unchanged}

{Table 6.4.2 unchanged}

{Table 6.2.1(a) through 6.3.1(m) unchanged}

**Chapter 7**  
**Gas Piping Installation**

{7.1 through 7.1.7.3 unchanged}

**7.1.7.3.1** The tracer shall be one of the following:

- (1) A product specifically designed for that purpose
- (2) Insulated copper conductor not less than 14 AWG
- (3) Tracer wire listed and labeled in accordance with UL 2989, Outline of Investigation for Tracer Wire.

[FR No. 44-NFPA 54/Z223.1-2021]

{7.17.3.2 through 7.3.5.1 unchanged}

**7.3.5.2 Other Occupancies.** Gas piping in nonindustrial occupancies shall not be embedded in concrete floor slabs unless in accordance with 7.3.5.2.1 through 7.3.5.2.5. In other than industrial occupancies and where approved by the authority having jurisdiction, gas piping embedded in concrete floor slabs constructed with Portland cement shall be surrounded with a minimum of 1½ in. (38 mm) of concrete and shall not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors.

**7.3.5.2.1** The installation shall be approved.

**7.3.5.2.2** Embedded gas piping shall be surrounded with a minimum of 1 ½ in (38 mm) of concrete.

**7.3.5.2.3** Embedded gas piping shall not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors.

**7.3.5.2.4** All piping, fittings, and risers shall be protected against corrosion in accordance with 7.2.2.

**7.3.5.2.5** Piping shall not be embedded in concrete slabs containing quickset additives or cinder aggregate.

[FR No. 15-NFPA 54/Z223.1-2021]

{7.3.6 through 7.11.5.1 unchanged}

**7.11.5.2 Electrical Requirements.**

**7.11.5.2.1** Where gas-mixing machines are installed in well-ventilated areas, the type of electrical equipment shall be in accordance with NFPA 70® for general service conditions unclassified areas unless other hazards in required classification of the area prevail.

**7.11.5.2.2** Where gas-mixing machines are installed in small detached buildings or cutoff rooms, the electrical equipment and wiring small detached building or cutoff room shall be installed in accordance with NFPA 70® for hazardous locations (Articles 500 and 501, classified Class I, Division 2).

[FR No. 14-NFPA 54/Z223.1-2021]

{7.11.5.3 through 7.12 unchanged}

**7.12.1 Pipe and Tubing other than CSST.**

**7.12.1.1** Each aboveground portion of a gas piping system other than CSST, that is likely to become energized shall be electrically continuous and bonded to an effective ground-fault current path.

**7.12.1.2** Gas piping, other than CSST, shall be considered to be bonded ~~when~~ where it is connected to one or more appliances that are connected to the appliance equipment grounding conductor of the circuit supplying that appliance(s).

[FR No. 17-NFPA 54/Z223.1-2021]

{7.12.2 through 7.12.2.5 unchanged}

**7.12.3 Arc-Resistant Jacketed CSST.**

**7.12.3.1** CSST listed with an arc-resistant jacket or coating system shall be listed as arc-resistant in accordance with ANSI LC 1/CSA 6.26, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing.

**7.12.3.2** Arc-resistant jacketed CSST shall be electrically continuous and bonded to an effective ground fault current path.

**7.12.3.3** Arc-resistant jacketed CSST shall be considered to be bonded where it is connected to one or more appliances that are connected to the equipment grounding conductor of the circuit supplying the appliance(s).

**7.12.3.4** Where any CSST component of fused in a piping system does not have an arc-resistant jacket or coating system, the bonding requirements of 7.12.2 shall apply. Arc-resistant jacketed CSST shall be considered to be bonded when it is connected to appliances that are connected to the appliance grounding conductor of the circuit supplying that appliance.

[FR No. 18-NFPA 54/Z223.1-2021]

{7.12.4 through 7.14.1 unchanged}

**7.14.2** Any essential safety control depending upon electric current as the operating medium shall be of a type that shuts off (fail safe) the flow of gas in the event of current. Electrically operated safety devices shall fail safe and shut off the flow of gas in the event of electrical power failure.

[FR No. 19-NFPA 54/Z223.1-2021]

**Chapter 8**  
**Inspection, Testing, and Purging**

{8.1 through 8.1.1.2 unchanged}

**8.1.1.3** Where repairs or additions are made following the pressure test, the affected piping shall be tested.

**8.1.1.4** Minor repairs and additions shall not be ~~are not~~ required to be pressure tested, provided that the work is inspected and connections are tested with a noncorrosive leak-detecting fluid or other approved leak-detecting methods ~~approved by the authority having jurisdiction.~~

**8.1.1.5** ~~4~~ Where new branches are installed to new appliance(s), only the newly installed branch(es) shall be required to be pressure tested.



**8.1.1.6** Connections between the new piping and the existing piping shall be tested with a noncorrosive leak-detecting fluid or approved leak-detecting methods.

**8.1.1.7** ~~5~~ A piping system shall be tested as a complete unit or in sections.

**8.1.1.8** Under no circumstances shall a valve in a line be used as a bulkhead between gas in one section of the piping system and test medium in an adjacent section, unless a double block and bleed valve system is installed.

**8.1.1.9** A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve closing mechanism, is designed to safely withstand the test pressure.

[FR No. 15-NFPA 54/Z223.1-2021]

{8.1.1.6 through 8.1.4.1 unchanged}

**8.1.4.2** The test pressure to be used shall be no less than 1½ times the proposed maximum working pressure, but not less than 3 psi (20 kPa), ~~irrespective of design pressure~~. Where the test pressure exceeds 125 psi (862 kPa), the test pressure shall not exceed a value that produces a hoop stress in the piping greater than 50 percent of the specified minimum yield strength of the pipe.

[FR No. 21-NFPA 54/Z223.1-2021]

{8.1.4.3 through 8.1.5.1 unchanged}

**8.1.5.2** The leakage shall be located by means of a listed combustible gas ~~an approved gas~~ detector, a noncorrosive leak detection fluid, or other approved leak detection methods.

[FR No. 22-NFPA 54/Z223.1-2021]

{8.1.5.3 through 8.3.3 unchanged}

**8.3.4 Abandoned Fuel Gas Piping.** Where fuel gas piping is removed from service for an indefinite time period, it shall be purged.

[FR No. 43-NFPA 54/Z223.1-2021]

## Chapter 9

### Appliance, Equipment and Accessory Installation

{9.1 through 9.1.6.1 unchanged}

~~9.1.6.2 Non direct vent appliances installed in beauty shops, barber shops, or other facilities where chemicals that generate corrosive or flammable products such as aerosol sprays are routinely used shall be located in a mechanical room separate or partitioned off from other areas with provisions for combustion and dilution air from outdoors. Direct vent appliances in such facilities shall be installed in accordance with the appliance manufacturer's installation instructions. Where chemicals that generate corrosive or flammable products such as aerosol sprays are routinely used, one of the following shall apply to fired appliances where these chemicals can enter combustion air:~~

(1) Fired appliances shall be located in a mechanical room separate or partitioned off from other areas with provisions for combustion and dilution air from outdoors.

(2) The appliances shall be direct vent and installed in accordance with the appliance manufacturer's installation instructions.

[FR No. 23-NFPA 54/Z223.1-2021]

{9.1.7 through 9.1.14 unchanged}

**9.1.15 Extra Device or Attachment.** No device or attachment shall be installed on any appliance that ~~could in any way impair~~ impairs the combustion of gas. [FR No. 24-NFPA 54/Z223.1-2021]

{9.1.16 through 9.2 unchanged}

### 9.2.1 Accessibility for Service.

**9.2.1.1** All appliances shall be located with respect to building construction and other equipment so as to permit access to the appliance. ~~Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connections; the lubrication of moving parts where necessary; the adjustment and cleaning of burners and pilots; and the proper functioning of explosion vents, if provided. For attic installation, the passageway and servicing area adjacent to the appliance shall be floored.~~

**9.2.1.2** Clearances shall be maintained to permit servicing the appliance.

**9.2.1.3** The passageway to and the servicing area adjacent to attic appliances shall be provided with flooring.

[FR No. 25-NFPA 54/Z223.1-2021]

{9.2.2 through 9.7.2 unchanged}

**9.7.3 Electrical Circuit.** The electrical circuit employed for operating the automatic main gas control valve, automatic pilot, room temperature thermostat, limit control, or other electrical devices used with the appliances shall be in accordance with the wiring diagrams ~~provided certified or approved~~ provided by the original appliance manufacturer. [FR No. 26-NFPA 54/Z223.1-2021]

{9.8 through 9.8.2 unchanged}

{Figure 9.6.8 unchanged}

## Chapter 10

### Installation of Specific Appliances

{10.1 through 10.12.2 unchanged}

### 10.12.3 Clearance for Appliances.

**10.12.3.1** Food service counter appliances where installed on combustible surfaces shall be installed with a minimum horizontal clearance of 6 in. (150 mm) from combustible material, except that at least a 2 in. (50 mm) clearance shall be maintained between a draft hood and combustible material.

**10.12.3.2** The clearance between a food service counter appliance draft hood and combustible material shall be at least 2 in. (50 mm).

**10.12.3.3** Food service counter appliances listed for installation at lesser clearances shall be installed in accordance with manufacturer's installation instructions.



[FR No. 27-NFPA 54/Z223.1-2021]

{10.12.3.3 through 10.26.4 unchanged}

**10.26.5 Temperature Limiting Devices.** ~~A water heater installation or a~~ The installation of water heaters and hot water storage vessels installation shall be provided overtemperature protection by means of ~~a~~ an approved, listed device installed in accordance with the manufacturer's installation instructions. [FR

No. 28-NFPA 54/Z223.1-2021]

{10.26.6 through 10.31 unchanged}

## Chapter 11

### Procedures to Be Followed to Place Appliance in Operation

{11.1 through 11.5 unchanged}

**11.6\* Checking the Draft.** Draft hood-equipped appliances shall be checked to verify that there is no draft hood spillage after 5 minutes of main burner operation under the following conditions:

(1) The building or structure envelope is complete and intact, and all openings to the outdoors are closed.

(2) All combustion air systems and openings are in place.

(3) All air-exhausting appliances, power-vented appliances, and exhaust fans are operating.

[FR No. 29-NFPA 54/Z223.1-2021]

{11.7 unchanged}

## Chapter 12

### Venting of Appliances

#### 12.1\* Minimum Safe Performance.

**12.1.1** Venting systems shall be designed and constructed to convey all flue and vent gases to the outdoors.

**12.1.2** The chimney or vent system shall be sized for the total btu input.

[CI No. 30-NFPA 54/Z223.1-2021]

{12.2 through 12.14.3 unchanged}

**12.15** ~~Automatically Operated~~ Automatic Vent Dampers. An ~~automatically operated~~ automatic vent damper shall be listed. [FR

No. 31-NFPA 54/Z223.1-2021]

{12.16 unchanged}

## Chapter 13

### Sizing of Category I Venting Systems

{13.1 through 13.2.30 unchanged}

{Table 13.1(a) through Table 13.2.2 unchanged}

## Annex A

### Explanatory Material

{A.1.1.1.1(A) through A.5.6 unchanged}

**A.5.6.2.2** Locations that might subject gas meters to damage include those adjacent to a driveway, under a fire escape, in areas subject to ice or water damage, in public passages, in halls, or where they will be subject to excessive corrosion or vibration. [FR

No. 10-NFPA 54/Z223.1-2021]

{A.5.7 through A.9.1.22 unchanged}

**A.9.2.1** ~~Sufficient clearance shall be maintained to permit Service of appliances includes~~ cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connection; the lubrication of moving parts where necessary the adjustment and cleaning of burners and pilots; and the proper functioning of explosion vents, if provided; and other required service procedures. [FR No. 25-NFPA 54/Z223.1-2021]

{A.9.3 through A.13.2.20 unchanged}

## Annex B

### Sizing and Capacities of Gas Piping

{B.1 through B.7.6 Example 6, (6) unchanged}

## Annex C

### Suggested Method for Checking for Leakage

{C.1 through C.4 unchanged}

## Annex D

### Suggested Emergency Procedure for Gas Leaks

{D.1 unchanged}

**D.2** Where accumulation of gas inside a building is detected by odor or by activation of a combustible gas detector or system designed and installed in accordance with NFPA 715, the procedures in Section D.1 should be followed. [FR No. 32-NFPA 54/Z223.1-2021]

## Annex E

### Flow of Gas through Fixed Orifices

{E.1 through E.1.2 unchanged}

{Table E.1.1(a) through Table E.1.1(d) unchanged}

## Annex F

### Sizing of Venting Systems Serving Appliances Equipped with Draft Hoods, Category I Appliances, and Appliances Listed for Use with Type B Vents

{F.1 through F.2.4 Example 5(c) unchanged}

{Figure F.1(a) through Figure F.2.4 unchanged}

**Annex G**  
**Recommended Procedure for Safety**  
**Inspection of an Existing Appliance**  
**Installation**

{G.1 through G.6.8 unchanged}  
{Table G.6 unchanged}

**Annex H**  
**Indoor Combustion Air Calculation**  
**Examples**

{H.1 through H.3 unchanged}

**Annex I**  
**Example of Combination of Indoor and Outdoor Combustion**  
**and Ventilation Opening Design.**

{I.1 unchanged}

**Annex J**  
**Enforcement**

**J.1** The following sample ordinance is provided to assist a jurisdiction in the adoption of this code and is not part of this code.

ORDINANCE NO. \_\_\_\_\_

An ordinance of the [jurisdiction] adopting the 2024 ~~2021~~ edition of NFPA 54/ANSI Z223.1, *National Fuel Gas Code*, documents listed in Chapter 2 of that code;

...

SECTION 3 Additions, insertions, and changes – that the 2024 ~~2021~~ edition of NFPA 54/ANSI Z223.1, *National Fuel Gas Code*, is amended and changed in the following respects: [FR No. 49-NFPA 54/Z223.1-2021]

{Remainder of J.1 unchanged}

**Annex K**  
**Informational Publications**

{K.1 unchanged}

**K.1.1 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471, 617.770.3000, www.nfpa.org.

NFPA 56, *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Pipeline Systems*, 2020 ~~2023~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 58, *Liquefied Petroleum Gas Code*, 2020 ~~2023~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, 2018 ~~2023~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 70®, *National Electrical Code*®, 2020 ~~2023~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2021 ~~2024~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2021 ~~2024~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*, 2021 ~~2024~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 715, *Standard for the Installation of Fuel Gases Detection and Warning Equipment*, 2023 edition. [FR No. 2-NFPA 54/Z223.1-2021]

NFPA 780, *Standard for the Installation of Lightning Protection Systems*, 2020 ~~2023~~ edition. [FR No. 2-NFPA 54/Z223.1-2021]

**K.1.2 Other Publications**

**K.1.2.1 API Publication.** American Petroleum Institute, ~~4220 L Street, NW, Washington, DC 20005-4070, 200 Massachusetts Avenue NW, Suite 1100, Washington, DC 20001-5571, 202.682.8000, www.api.org.~~ [FR No. 2-NFPA 54/Z223.1-2021]

API 1104, *Welding Pipelines and Related Facilities*, 2013 ~~2021~~. [FR No. 2-NFPA 54/Z223.1-2021]

**K.1.2.2 ASHRAE Publications.** American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., ~~1791 Tullie Circle, N.E., Atlanta, GA 30329-2305, 404.636.8400~~ 180 Technology Parkway, Peachtree Corners, GA 30092, www.ashrae.org. [FR No. 2-NFPA 54/Z223.1-2021]

*ASHRAE Handbook — Fundamentals*, 2017 ~~2021~~. [FR No. 2-NFPA 54/Z223.1-2021]

*ASHRAE Handbook — HVAC Systems and Equipment*, 2016 ~~2020~~. [FR No. 2-NFPA 54/Z223.1-2021]

**K.1.2.3 ASME International Publications.** American Society of Mechanical Engineers International, Two Park Avenue, New York, NY 10016-5990, 800.843.2763, www.asme.org.

*Boiler and Pressure Vessel Code*, Section IX and Section IV, 2015 ~~2021~~. [FR No. 2-NFPA 54/Z223.1-2021]

{K.1.2.4 through K.1.2.7 unchanged}

**K.1.2.8 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, 847.272.8800, www.ul.com.

UL 651, *Schedule 40 and 80 Type EB and A Rigid PVC Conduit and Fittings*, 2011, revised 2018 ~~2019~~. [FR No. 2-NFPA 54/Z223.1-2021]

UL 795, *Standard for Commercial-Industrial Gas Heating Equipment*, 2016, revised 2020. [FR No. 2-NFPA 54/Z223.1-2021]

{K.1.2.9 through K.2 unchanged}

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**K.2.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.**

NFPA 30, *Flammable and Combustible Liquids Code*, 2021 edition.

NFPA 59, *Utility LP-Gas Plant Code*, 2021 edition.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*, 2020 edition.

NFPA 86, *Standard for Ovens and Furnaces*, 2019 2024 edition. [FR No. 2-NFPA 54/Z223.1-2021]

~~NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2019 edition. [FR No. 2-NFPA 54/Z223.1-2021]~~

NFPA 501A, *Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and Communities*, 2017 2021 edition. [FR No. 2-NFPA 54/Z223.1-2021]

**K.2.2 CSA Group Publications.** CSA Group, 178 Rexdale Boulevard, Toronto, ON M9W 1R3, Canada, (216) 524-4990, www.csagroup.org.

ANSI/AGA NGV3.1/CSA 12.3, Fuel System Components for Compressed Natural Gas-Powered Vehicles, 2014 reaffirmed 2019 2020. [FR No. 2-NFPA 54/Z223.1-2021]

ANSI NGV1/CSA NGV1, Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices, 2017.

~~ANSI/CSA FC 1, Fuel Cell Technologies — Part 3 100: Stationary Fuel Cell Power Systems — Safety, 2014, reaffirmed 2018. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI/CSA NGV 2, Natural Gas Vehicle Fuel Containers, 2016 2019. [FR No. 2-NFPA 54/Z223.1-2021]

ANSI LC 2A, Direct Gas-Fired Circulating Heaters for Agricultural Animal Confinement Buildings, 1998, reaffirmed ~~2015~~ 2020. [FR No. 2-NFPA 54/Z223.1-2021]

ANSI LC 2, Direct Gas-Fired Circulating Heaters for Agricultural Animal Confinement Buildings, 1996, reaffirmed ~~2015~~ 2020. [FR No. 2-NFPA 54/Z223.1-2021]

~~ANSI Z21.1, Household Cooking Gas Appliances, 2018. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.5.1/CSA 7.1, Gas Clothes Dryers — Volume I — Type 1 Clothes Dryers, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.5.2/CSA 7.2, Gas Clothes Dryers — Volume II — Type 2 Clothes Dryers, 2016 [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.10.1/CSA 4.1, Gas Water Heaters — Volume I — Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.10.3/CSA 4.3, Gas Water Heaters — Volume III — Storage Water Heaters with Input Ratings above 75,000 Btu per Hour, Circulating and Instantaneous, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.11.2, Gas Fired Room Heaters — Volume II — Unvented Room Heaters, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.12, Draft Hoods, 1990, reaffirmed ~~2015~~ 2020. [FR No. 2-NFPA 54/Z223.1-2021]

~~ANSI Z21.13/CSA 4.9, Gas Fired Low-Pressure Steam and Hot Water Boilers, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.15/CSA 9.1, Manually Operated Gas Valves for Appliances, Appliance Connector Valves, and Hose End Valves, 2009, reaffirmed 2014. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.17/CSA 2.7, Domestic Gas Conversion Burners, 1998, reaffirmed 2014.

~~ANSI Z21.18/CSA 6.3, Gas Appliance Pressure Regulators, 2007, reaffirmed 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.19/CSA 1.4, Refrigerators Using Gas Fuel, 2014. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.20/CSA 22.2 – No. 60730-2-5, Automatic Electrical Controls for Household and Similar Use – Part 2: Particular Requirements for Automatic Burner Ignition Systems and Components, 2014, reaffirmed 2019.

ANSI Z21.21/CSA 6.5, Automatic Valves for Gas Appliances, 2019.

~~ANSI Z21.22/CSA 4.4, Relief Valves for Hot Water Supply Systems, 2015. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.23, Gas Appliance Thermostats, 2010, reaffirmed ~~2015~~ 2020. [FR No. 2-NFPA 54/Z223.1-2021]

~~ANSI Z21.24/CSA 6.10, Connectors for Gas Appliances, 2015. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.35/CSA 6.8, Pilot Gas Filters, 2005, reaffirmed ~~2015~~ 2020. [FR No. 2-NFPA 54/Z223.1-2021]

~~ANSI Z21.40.1/CSA 2.91, Gas Fired, Heat Activated Air-Conditioning and Heat Pump Appliances, 1996, reaffirmed 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.40.2/CSA 2.92, Gas Fired, Work Activated Air-Conditioning and Heat Pump Appliances (Internal Combustion), 1996, reaffirmed 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

ANSI Z21.40.4/CSA 2.94, Performance Testing and Rating of Gas-Fired, Air-Conditioning and Heat Pump Appliances, 1996, reaffirmed 2017.

ANSI Z21.42, Gas-Fired Illuminating Appliances, 2013, reaffirmed 2018.

~~ANSI Z21.47/CSA 2.3, Gas Fired Central Furnaces, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.54/CSA 8.4, Gas Hose Connectors for Portable Outdoor Gas Fired Appliances, 2019. [FR No. 2-NFPA 54/Z223.1-2021]~~



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~~ANSI Z21.56/CSA 4.7, Gas Fired Pool Heaters, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.57, Recreational Vehicle Cooking Gas Appliances, 2010, reaffirmed 2021. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.58/CSA 1.6, Outdoor Cooking Gas Appliances, 2015 2018.~~

~~ANSI Z21.60/CSA 2.26, Decorative Gas Appliances for Installation in Solid Fuel Burning Fireplaces, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.61, Gas-Fired Toilets, 1993, reaffirmed 2013.~~

~~ANSI Z21.66/CSA 6.14, Automatic Vent Damper Devices for Use with Gas-Fired Appliances, 2015, reaffirmed 2020. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.69/CSA 6.16, Connectors for Movable Gas Appliances, 2015 [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.71, Automatic Intermittent Pilot Ignition Systems for Field Installation, 1993, reaffirmed 2016.~~

~~ANSI Z21.77/CSA 6.23, Manually-Operated Piezo-Electric Spark Gas Ignition Systems and Components 2005, reaffirmed 2015 2020. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.78/CSA 6.20, Combination Gas Controls for Gas Appliances, 2010, reaffirmed 2015 2020. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.84, Manually Lighted, Natural Gas Decorative Gas Appliances for Installation in Solid-Fuel Burning Fireplaces, 2017.~~

~~ANSI Z21.86/CSA 2.32, Vented Gas Fired Space Heating Appliances, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.87/CSA 4.6, Automatic Gas Shutoff Devices for Hot Water Supply Systems, 2007, reaffirmed 2016.~~

~~ANSI Z21.88/CSA 2.33, Vented Gas Fireplace Heaters, 2017 2019. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z21.91, Ventless Firebox Enclosures for Gas-Fired Unvented Decorative Room Heaters, 2017 2020. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.4/CSA 3.7, Non-Recirculating Direct Gas Fired Industrial Air Heaters, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.8/CSA 2.6, Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters and Gas Fired Duct Furnaces, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.11/CSA 1.8, Gas Food Service Equipment, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.19/CSA 2.35, Gas Fired High Intensity Infrared Heaters, 2017. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.20/CSA 2.34, Gas Fired tubular and Low Intensity Infrared Heaters, 2016. [FR No. 2-NFPA 54/Z223.1-2021]~~

~~ANSI Z83.21/CSA C 22.2 No.168, Commercial Dishwashers, 2016 2020. [FR No. 2-NFPA 54/Z223.1-2021]~~

**K.2.3 MSS Publications.** Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, VA, 22180-4602, 703.281.6613, www.msshq.org.

~~MSS SP-6, Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings, 2017.~~

~~ANSI/MSS SP-58, Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation, 2018. [FR No. 2-NFPA 54/Z223.1-2021]~~

{K.2.4 through K.2.5 unchanged}

~~**K.2.6 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062 2096, 847.272.8800, www.ul.com:~~

~~UL 103, Factory Built Chimneys for Residential Type and Building Heating Appliances, 2010, revised 2017.~~

~~UL 441, Gas Vents, 2016.~~

~~UL 641, Standard for Type L Low Temperature Venting Systems, 2010, revised 2018.~~

~~UL 1738, Venting Systems for Gas Burning Appliances, Categories II, III, and IV, 2010, revised 2014.~~

~~UL 1777, Chimney Liners, 2015, revised 2019.~~

~~[FR No. 2-NFPA 54/Z223.1-2021]~~

{K.2.7 through K.3 unchanged}

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**[FR No. 1-NFPA 54/Z223.1-2021]**: Reference standards are being updated to the latest edition year.

**[FR No. 2-NFPA 54/Z223.1-2021]**: Reference standards are being updated to the latest edition years. Informational references that have been incorporated into the code have been removed as they are already referenced in the code in mandatory text.

**[FR No. 3-NFPA 54/Z223.1-2021]**: Where plans are required in a piping system, the provisions to identify isolation valves and purge the system need to be included on the design.

**[FR No. 5-NFPA 54/Z223.1-2021]**: The existing language did not address the option of increasing pressure or pressure drop which is commonly used in commercial applications.

**[FR No. 6-NFPA 54/Z223.1-2021]**: The requirement is being broken out into separate items per the NFPA Manual of Style. The pipe, tubing, and fittings need to be cleaned of chip, scale, and debris prior to being put into use. Visible defects are all that can be expected of installers at the time of installation.

**[FR No. 7-NFPA 54/Z223.1-2021]**: Requirements are being broken out to comply with the NFPA Manual of Style.

**[FR No. 8-NFPA 54/Z223.1-2021]**: The requirements have been broken out to comply with the NFPA manual of style.

**[FR No. 9-NFPA 54/Z223.1-2021]**: Flange surfaces need to be inspected and repaired or replaced if any damage is found.

**[FR No. 10-NFPA 54/Z223.1-2021]**: The list of examples is relocated to Annex A as it is not a conclusive list of locations gas meters can be subject to damage.

**[FR No. 11-NFPA 54/Z223.1-2021]**: Manufactured housing is the correct term.

**[FR No. 12-NFPA 54/Z223.1-2021]**: UL 353 and UL 60730-2-6 are two standards under which gas pressure switches are listed, and both of these standards have provisions for vent limiting device termination locations.

**[FR No. 14-NFPA 54/Z223.1-2021]**: The requirement is revised to use terminology consistent with the National Electrical Code as this is an electrical requirement. The term “general service” is not used in the National Electrical Code and is replaced with the more appropriate term “unclassified area”.

**[FR No. 15-NFPA 54/Z223.1-2021]**: The phrase "by the authority having jurisdiction" is redundant when used with the term "approved" and is being revised in several sections

**[FR No. 16-NFPA 54/Z223.1-2021]**: A requirement for a union upstream or downstream of a threaded regulator is added to facilitate regulator removal. Flanged regulators do not require a union for replacement.

**[FR No. 17-NFPA 54/Z223.1-2021]**: 7.12.1 is updated to indicate that a single appliance within the gas piping system connected to the grounding conductor is sufficient to serve to bond the gas piping system. The paragraph is also updated to change ‘appliance grounding conductor’ to ‘equipment grounding conductor’ to make the language consistent with NFPA 70, National Electrical Code®.

**[FR No. 18-NFPA 54/Z223.1-2021]**: The requirement is updated to indicate that a single appliance withing the gas piping system connected to the grounding conductor is sufficient to serve to bond the gas piping system. The same paragraphs are also updated to change ‘appliance grounding conductor’ to ‘equipment grounding conductor’ to make the language consistent with NFPA 70, National Electrical Code.

**[FR No. 19-NFPA 54/Z223.1-2021]**: The section was revised to delete the definition of fail safe which is generally understood.

**[FR No. 20-NFPA 54/Z223.1-2021]**: A definition is needed to ensure that code users understand the committee's intent of the term.

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**[FR No. 21-NFPA 54/Z223.1-2021]**: The phrase “irrespective of design pressure” is deleted as it is not needed. The 3 psi limit is clear.

**[FR No. 22-NFPA 54/Z223.1-2021]**: The term “gas detector” is not consistent with the use of “combustible gas indicator” and “combustible gas detector” in 8.3, Purging. Approved is deleted and listed is substituted to be consistent with 8.3.3.2 which requires listing of combustible gas detectors.

**[FR No. 23-NFPA 54/Z223.1-2021]**: This revision was made to emphasize that this requirement applies to many more areas than barber shops and or beauty shops and provide two equivalent remedies for installation of appliances in these areas.

**[FR No. 24-NFPA 54/Z223.1-2021]**: An unnecessary modifier is deleted.

**[FR No. 25-NFPA 54/Z223.1-2021]**: Editorial revisions and relocation of specific examples to Annex A. The paragraph is separated as multiple requirements are included.

**[FR No. 26-NFPA 54/Z223.1-2021]**: There is no indication of who can certify the wiring diagram, or what the AHJ should use to determine if the wiring diagram is acceptable. The wiring diagrams need to be provided as part of the manufacturer's packaging.

**[FR No. 27-NFPA 54/Z223.1-2021]**: The requirements have been broken out to comply with the NFPA Manual of Style.

**[FR No. 28-NFPA 54/Z223.1-2021]**: The device does not need to be approved by an AHJ as the intent is only to have a listed device be installed.

**[FR No. 29-NFPA 54/Z223.1-2021]**: The draft needs to be checked under the anticipated adverse conditions of the final configuration.

**[FR No. 31-NFPA 54/Z223.1-2021]**: Title and text revised to match the definition in chapter 3.

**[FR No. 32-NFPA 54/Z223.1-2021]**: Annex D needs to include recommended actions in response to odor recognition and combustible gas detector and systems, the latter designed and installed in accordance with NFPA Standard 715. The Technical Committee believes that the requirement for installation of residential fuel gas detectors belongs in the respective building code or fire code and is placing it in the non-mandatory annex section to appropriately reference the NFPA installation standard.

**[FR No. 33-NFPA 54/Z223.1-2021]**: This document applies to purging of piping systems and is being added to the scope for clarity.

**[FR No. 34-NFPA 54/Z223.1-2021]**: The intent of the committee is to reference combustion air and not the process of combustion.

**[FR No. 35-NFPA 54/Z223.1-2021]**: The term is not used in the code and is being deleted.

**[FR No. 36-NFPA 54/Z223.1-2021]**: The term is not used in the code and is being deleted.

**[FR No. 37-NFPA 54/Z223.1-2021]**: The terms are deleted as they are not used in the Code.

**[FR No. 38-NFPA 54/Z223.1-2021]**: Installed is the preferred term used widely elsewhere in the Code.

**[FR No. 39-NFPA 54/Z223.1-2021]**: The definition of gas counter appliance is deleted as it is not used in the code. The term "domestic hot plate" is not used in the Code however "hot plate" is used.

**[FR No. 40-NFPA 54/Z223.1-2021]**: The material in section 4.4 is a more complete description of what noncombustible materials are and therefore avoid conflict the definition here now references section 4.4.

**[FR No. 42-NFPA 54/Z223.1-2021]**: Only certain types of plastic are allowed by the code to be tubing materials.



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**[FR No. 43-NFPA 54/Z223.1-2021]**: The committee is aware of several incidents in which fuel gas piping had been abandoned in place without purging the pipe of fuel gas which can lead to a hazardous condition.

**[FR No. 44-NFPA 54/Z223.1-2021]**: Tracer wire in accordance with UL 2989 is an acceptable material to be used as a tracer for fuel gas piping systems.

**[FR No. 49-NFPA 54/Z223.1-2021]**: Edition year updated to the latest edition.

**[FR No. 50-NFPA 54/Z223.1-2021]**: To make 6.1 consistent with the 5.3.3 as CSST manufacturer's design and installation guides can be used to size piping system in accordance with the methods in chapter 6.

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