NFPA®

55

Compressed Gases and Cryogenic Fluids Code

2020

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NFPA® 55

Compressed Gases and Cryogenic Fluids Code

2020 Edition

This edition of NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, was prepared by the Technical Committee on Industrial and Medical Gases. It was issued by the Standards Council on April 28, 2019, with an effective date of May 18, 2019, and supersedes all previous editions.

This edition of NFPA 55 was approved as an American National Standard on May 18, 2019.

Origin and Development of NFPA 55

NFPA 55 was developed by the Industrial and Medical Gases Committee in recognition of the need to provide information on the use of cylinder gases in one standard. The Compressed Gas Association assisted with the project by submitting a draft that was used as the framework for the standard.

NFPA 55 supersedes NFPA 43C, *Code for the Storage of Gaseous Oxidizing Materials*, which was developed by the Committee on Hazardous Chemicals and transferred to the Industrial and Medical Gases Committee. The committee believed that one standard covering storage of all gas cylinders was needed and, with the new NFPA 55, the need for NFPA 43C no longer existed.

Since this standard was introduced in 1993, it has been widely used and accepted by users of different types of gases as a single source covering requirements for installation and usage of gases in portable cylinders. The 1998 edition clarified many requirements and provided additional advisory information to assist the users of the standard. Editorial changes were also incorporated for clarity.

The 2003 edition of NFPA 55 was a complete revision of the document that significantly expanded the document scope and introduced requirements for areas not addressed in previous editions. For example, the 1998 edition covered only compressed and liquefied gases in portable cylinders and only at consumer (user) locations; the 2003 edition covered the use of compressed and liquefied gases in portable and stationary containers and at manufacturer sites and consumer sites. This expansion to manufacturer sites took a large portion of gas usage that was outside the scope of NFPA 55 and placed it under NFPA 55.

There were many new subjects and requirements in the 2003 edition, including the following:

(1) Requirements for cryogenic fluids
(2) Use of the concept of control areas for defining storage amounts and requirements
(3) An expanded classification scheme to cover a greater range of gaseous materials
(4) Specifications for a hazardous materials management plan
(5) Requirements for treating waste gases
(6) More detailed requirements in many of the areas than the 1998 edition of NFPA 55 covered

The 2003 edition was also restructured to comply with the *Manual of Style for NFPA Technical Committee Documents*.

The 2005 edition of NFPA 55 was a complete revision of the document. The following were some of the significant changes to the document:

(1) Incorporation of the requirements of NFPA 50, *Standard for Bulk Oxygen Systems at Consumer Sites*, into Chapter 9
(2) Incorporation of the requirements of NFPA 50A, *Standard for Gaseous Hydrogen Systems at Consumer Sites*, into Chapter 10
(3) Incorporation of NFPA 50B, *Standard for Liquefied Hydrogen Systems at Consumer Sites*, into Chapter 11
(4) Clarification of threshold storage requirements in Chapters 6 and 7
(5) Clarification of the separation distance tables formerly in NFPA 50, NFPA 50A, and NFPA 50B, and now in Chapters 9–11

(6) Schematic drawings added to annex material to illustrate system siting requirements in Chapters 9 and 11

The 2010 edition of NFPA 55 included a change in the document's title from a standard to a code. The following were some of the significant changes to the document in the 2010 edition:

(1) Incorporation of the requirements of NFPA 560, *Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigation*, into Chapter 14
(2) Updated separation distances to exposure from gaseous hydrogen systems based upon new research
(3) Incorporation of the requirements on medical bulk oxygen systems from NFPA 99, *Standard for Health Care Facilities*, based on joint task group recommendations
(4) Addition of a new chapter, Chapter 12, on gas generation systems
(5) Addition of a new chapter, Chapter 13, on insulated liquid carbon dioxide systems

The 2013 edition of NFPA 55 was a complete revision of the document. Significant changes to the document included the following:

(1) Incorporation of the requirements of NFPA 51A, *Standard for Acetylene Cylinder Charging Plants*, into a new chapter, Chapter 15, on acetylene cylinder charging
(2) Revisions to Chapters 10 and 11 on bulk compressed and liquefied hydrogen systems, including updates to separation distances to exposure from hydrogen systems
(3) Changes to the table in Chapter 6 regarding maximum allowable quantity (MAQ) of hazardous materials per control area to provide clarification and consistency with the approach used to establish the requirement of *NFPA 5000*, *Building Construction and Safety Code*, and NFPA 1, *Fire Code*

The 2016 edition incorporated the following significant changes:

(1) Clarification and organization of the requirements in Chapter 10 for gaseous hydrogen systems into three tiers based on the quantity of hydrogen stored: less than or equal to the MAQ, greater than the MAQ but less than bulk quantity, and bulk systems
(2) Changes to the requirements in Chapter 7 for emergency isolation
(3) A complete revision of Chapter 13, with a focus on carbon dioxide beverage systems
(4) A new Chapter 16 on liquid nitrous oxide systems

The 2020 edition incorporates the following changes:

(1) In Chapter 3, Definitions, a new definition was added for Press-Connect Fittings. The definition incorporates fitting designs with and without elastomeric seals.
(2) In Chapter 6, a code change was made to Table 6.6 involving pyrophoric gases. The code change provides a safe system for control of pyrophoric gases in high hazard gas rooms serving Protection Level 5 fabrication facilities.
(3) In Chapter 8, under Pressure Relief Devices, a new subsection 8.2.4.1, General, was added to require that pressure relief devices involved with cryogenic fluid piping systems vent to the outdoors when the maximum allowable working pressure or maximum process operating pressure is released.
(4) New text was added to Section 11.3, Location of Bulk Liquefied Hydrogen Systems, to reflect the intentional omission of vent stacks in hydrogen storage systems as they relate to setback distances.
(5) Chapter 16, Liquid Nitrous Oxide Systems, directs the reader to Chapter 17 for medical gases applications.

Technical Committee on Industrial and Medical Gases

Rob Early, *Chair*
Compressed Gas Association, NY [M]

Tim J. Anderson, Savannah River Nuclear Solutions, LLC, SC [U]
John J. Anicello, Airgas Inc., WA [M]
Rodney L. Barnes, U.S. Department of Energy, TN [U]
Denise Beach, FM Global, MA [I]
Robert Bogart, Arc Specialty Products/Balchem Corporation, NY [IM]
Erik W. Christiansen, Exponent, Inc., CA [SE]
Michael Ciotti, Linde North America, Inc., NJ [M]
Julie V. Cordero, Sandia National Laboratories, NM [U]
Mark Fasel, Viega LLC, IN [M]
Kenneth Fegley, Air Products and Chemicals, Inc., PA [IM]
Rep. Compressed Gas Association
Jef Frick, Safe Gas Systems LLC, CO [IM]
Alejandro Gonzalez, Kryogenifex, FL [M]
Bryan R. Gordon, Ivys Energy Solutions, Inc., MA [IM]
Martin T. Gresho, FP2Fire, Inc., CO [SE]
Bridget Hamilton, Praxair, NY [M]
Gerald T. Hayes, Air Liquide America, AZ [IM]
Rep. Compressed Gas Association
Anthony J. Lachawiec, Jr., Intel Corporation, OR [M]
Frank A. Licari, U.S. Department of Transportation, VA [E]
Brian D. Musch, Sterigenics U.S., LLC, IL [IM]
Eugene Y. Ngai, Chemically Speaking LLC, NJ [SE]
Robert R. Nii, Fluor Idaho, LLC, ID [U]
Richard P. Palluzi, Richard Palluzi LLC, NJ [SE]
Josh Pringle, Co2Meter, Inc., FL [M]
April Dawn Richardson, Railroad Commission of Texas, TX [E]
Carl H. Rivkin, National Renewable Energy Laboratory, CO [U]
David A. Rohrig, Pacific Northwest National Laboratory, WA [U]
William J. Satterfield, III, Hydrogen Safety, LLC/Rode & Associates, LLC, RI [SE]
Robert M. Sutter, B&R Compliance Associates, FL [SE]
Jonathan C. Willard, Acute Medical Gas Services, NH [SE]
Edgar Wolff-Klammer, Underwriters Laboratories LLC, IL [RT]

Alternates

Joseph M. Bablo, UL LLC, IL [RT]
(Alt. to Edgar Wolff-Klammer)
Jerome Bell, Sterigenics International, Inc., IL [IM]
(Alt. to Brian D. Musch)
Richard A. Craig, Compressed Gas Association, VA [IM]
(Alt. to Gerald T. Hayes)
David J. Farese, Air Products and Chemicals, Inc., PA [IM]
(Alt. to Kenneth Fegley)
Rick Ginn, Praxair, Inc., OH [M]
(Alt. to Bridget Hamilton)
Scott M. Heyworth, FP2Fire, Inc., FL [SE]
(Alt. to Martin T. Gresho)
Stuart J. Muller, Matheson, MA [IM]
(Alt. to Rob Early)
Alice B. Muna, Sandia National Laboratories, NM [U]
(Alt. to Julie V. Cordero)
Scott E. Swanson, Intel Corporation, OR [M]
(Alt. to Anthony J. Lachawiec, Jr.)
Robert W. Whittlesey, Exponent, Inc., CA [SE]
(Alt. to Erik W. Christiansen)

Nonvoting

Charles B. Henrici, Elk Grove Village, IL [SE]
(Member Emeritus)

Debra M. Gursha, NFPA Staff Liaison

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the storage, transfer, and use of industrial gases. Included are the storage and handling of such gases in their gaseous or liquid phases; the installation of associated storage, piping, and distribution equipment; and operating practices. The Committee also has a technical responsibility for contributions in the same areas for medical gases and clean rooms. The Committee shall coordinate the material on gaseous and liquid hydrogen storage and use with the Hydrogen Technology Committee.

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NFPA 55

Compressed Gases and Cryogenic Fluids Code

2020 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 I.

Chapter 1 Administration

1.1 Scope.

1.1.1* Applicability. This code shall apply to the installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary cylinders, containers, equipment, and tanks in all occupancies.

Δ **1.1.2 Specific Applications.** This code shall not apply to the following:

(1)* Off-site transportation of materials covered by this code
(2) Storage, use, and handling of radioactive gases in accordance with NFPA 801
(3)* Use and handling of medical compressed gases at health care facilities in accordance with NFPA 99, except as specified in Chapter 17
(4) Systems consisting of cylinders of oxygen and cylinders of fuel gas used for welding and cutting in accordance with NFPA 51
(5)* Flammable gases used as a vehicle fuel when stored on a vehicle
(6)* Storage, use, and handling of liquefied and nonliquefied compressed gases in laboratory work areas in accordance with NFPA 45
(7) Storage, use, and handling of liquefied petroleum gases in accordance with NFPA 58
(8) Storage, use, and handling of compressed gases within closed-cycle refrigeration systems complying with the mechanical code
(9) Liquefied natural gas (LNG) storage at utility plants under NFPA 59A
(10) Compressed natural gas (CNG) and LNG utilized as a vehicle fuel in accordance with NFPA 52
(11)* Compressed hydrogen gas (GH_2), or liquefied hydrogen gas (LH_2) generated, installed, stored, piped, used, or handled in accordance with NFPA 2 when there are no specific or applicable requirements in NFPA 55
(12) Nonflammable mixtures of ethylene oxide with other chemicals
(13) Ethylene oxide in chambers 10 scf (0.283 Nm^3) or less in volume or for containers holding 7.05 oz (200 g) of ethylene oxide or less

1.2* Purpose. The purpose of this code shall be to provide fundamental safeguards for the installation, storage, use, and handling of compressed gases and cryogenic fluids in portable and stationary cylinders, containers, and tanks.

1.3 Application. The requirements in this code shall apply to users, producers, distributors, and others who are involved with the storage, use, or handling of compressed gases or cryogenic fluids.

1.3.1 Conflicts.

1.3.1.1 If a requirement differs between this code and a referenced document, the requirement of this code shall apply.

1.3.1.2 If a conflict between a general requirement and a specific requirement occurs, the specific requirement shall apply.

1.4 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.

1.4.1* Unless otherwise specified, the provisions of this code shall not apply to 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.

1.4.2 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.

1.4.3 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 it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency. Nothing in this code is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this code.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

1.6 Units and Formulas.

1.6.1 The units of measure in the code are presented first in U.S. customary units (inch-pound units), followed by International System (SI) units in parentheses.

1.6.2 Either system of units shall be acceptable for satisfying the requirements in this code.

1.6.3 Users of this code shall apply one system of units consistently and shall not alternate between units.

1.6.4 The values presented for measurements in this code are expressed with a degree of precision appropriate for practical application and enforcement. It is not intended that the application or enforcement of these values be more precise than the precision expressed.

1.6.5 Where extracted text contains values expressed in only one system of units, the values in the extracted text have been retained without conversion to preserve the values established by the responsible technical committee in the source document.

1.7 Enforcement. This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority. *(See Annex F for sample wording for enabling legislation.)*

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this code and shall be considered part of the requirements of this document.

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

NFPA 1, *Fire Code,* 2018 edition.

NFPA 2, *Hydrogen Technologies Code,* 2020 edition.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2018 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2019 edition.

NFPA 16, *Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems,* 2019 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2018 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* 2019 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes,* 2018 edition.

NFPA 52, *Vehicular Natural Gas Fuel Systems Code,* 2019 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2020 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG),* 2019 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* 2018 edition.

NFPA 69, *Standard on Explosion Prevention Systems,* 2019 edition.

NFPA 70®, National Electrical Code®, 2020 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2019 edition.

NFPA 79, *Electrical Standard for Industrial Machinery,* 2018 edition.

NFPA 99, *Health Care Facilities Code,* 2018 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2019 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* 2019 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2018 edition.

NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment,* 2017 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations,* 2018 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response,* 2017 edition.

NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials,* 2020 edition.

2.3 Other Publications.

2.3.1 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME A13.1, *Scheme for the Identification of Piping Systems,* 2015.

ASME B31, *Code for Pressure Piping,* 2016.

ASME B31.3, *Process Piping,* 2016.

ASME B31.12, *Hydrogen Piping and Pipelines,* 2014.

Boiler and Pressure Vessel Code, "Rules for the Construction of Unfired Pressure Vessels," Section VIII, 2017.

2.3.2 ASSE Publications. American Society of Sanitary Engineering, 901 Canterbury Road, Suite A, Westlake, OH 44145-1480.

ASSE/IAMPO/ANSI 6015, *Professional Qualification Standard for Bulk Medical Gas Systems Installers,* 2015.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM B88, *Standard Specification for Seamless Copper Water Tube,* 2016.

ASTM B819, *Standard Specification for Seamless Copper Tube for Medical Gas Systems,* 2018.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* 2018.

ASTM E136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C,* 2016.

ASTM E681, *Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases),* 2015.

ASTM E1529, *Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies,* 2016.

ASTM E2652, *Standard Test Method for Behavior of Materials in a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750 Degrees C,* 2016.