

NFPA® 51A

Standard for Acetylene Cylinder Charging Plants

2012 Edition



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NFPA® 51A

Standard for

Acetylene Cylinder Charging Plants

2012 Edition

This edition of NFPA 51A, *Standard for Acetylene Cylinder Charging Plants*, was prepared by the Technical Committee on Industrial and Medical Gases, and acted on by NFPA at its June Association Technical Meeting held June 12–15, 2011, in Boston, MA. It was issued by the Standards Council on August 11, 2011, with an effective date of August 31, 2011, and supersedes all previous editions.

This edition of NFPA 51A was approved as an American National Standard on August 31, 2011.

Origin and Development of NFPA 51A

Although acetylene cylinder charging plants have been built and operated for several decades, only a limited number of concerns were involved at first, since the plants possessed a high degree of design and operating capability. Fire experience was good, and there was no need for national standard guidance.

In the 1960s, a number of other firms entered the industry, and the need for a national standard became evident. Work on this standard was initiated, and its subsequent promulgation was materially assisted by a committee of the Compressed Gas Association, Inc., which submitted a text to the NFPA Technical Committee on Industrial and Medical Gases.

NFPA 51A was adopted as a tentative standard in 1970. Amended editions were adopted in 1971, 1973, 1974, 1979, 1984, 1989, and 1996.

The 2001 edition contained editorial changes to bring the standard into compliance with the 2000 edition of the *Manual of Style for NFPA Technical Committee Documents*.

The 2006 edition of NFPA 51A was completely revised to make it conform with the 2004 edition of the *Manual of Style for NFPA Technical Committee Documents*. The order of Chapters 2 through 12 was changed. In addition, several definitions were changed to make them consistent with other NFPA documents. Other changes were made throughout the document to increase clarity of the text and ease of use.

The 2012 edition includes new requirements for mobile acetylene trailer systems (MATS) filling and discharging stations and fire protection for such systems. Fires involving MATS at user sites during unloading operations were the subject of a special investigation report (SIR 09/01, PB2009-917002) by the National Transportation Safety Board (NTSB). The Technical Committee on Industrial and Medical Gases considered the NTSB findings and developed requirements for MATS location, equipment, posted warnings, and fire protection. In addition, specific separation distances between high pressure acetylene drain lines and exposures have been added to Chapter 8.



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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.



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NFPA 51A

Standard for

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Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex B. 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 publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1 Scope. This standard shall apply to plants that are engaged in the generation and compression of acetylene and in the charging of acetylene cylinders, either as their sole operation or in conjunction with facilities for charging other compressed gas cylinders.

1.2 Purpose. This standard shall provide safety requirements for the design, construction, and installation of acetylene cylinder charging plants in order to provide safeguards for the protection of the plant, its employees, and the public.

1.3* Application. This standard shall not apply to plants that only produce and compress acetylene for chemical operations or to plants that only produce and compress acetylene below a gauge pressure of 15 psi (103 kPa).

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

1.4.1 Unless otherwise specified, the provisions of this standard 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 standard. Where specified, the provisions of this standard 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 standard deemed appropriate.

1.4.3 The retroactive requirements of this standard 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 standard 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 standard.

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.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard 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 10, *Standard for Portable Fire Extinguishers*, 2010 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2010 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2012 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2010 edition.

NFPA 70®, *National Electrical Code*®, 2011 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*, 2010 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, 2008 edition.

NFPA 400, *Hazardous Materials Code*, 2010 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, 2011 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI A13.1, *Scheme for Identification of Piping Systems*, 2007.

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

ASME B31.3, *Process Piping*, 2008.

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

ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2010.

ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, 2009.



2.3.4 IAPMO Publications. International Association of Plumbing and Mechanical Officials, 5001 E. Philadelphia Street, Ontario, CA 91761.

Uniform Mechanical Code, 2009.

2.3.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*, 2008.

2.3.6 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code*, 2012 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*, 2007 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2010 edition.

NFPA 400, *Hazardous Materials Code*, 2010 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2012 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Shall. Indicates a mandatory requirement.

3.2.5 Should. Indicates a recommendation or that which is advised but not required.

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions

3.3.1* Acetylene.

3.3.1.1 High Pressure Acetylene. Acetylene at pressures exceeding a gauge pressure of 15 psi (103 kPa) but not exceeding a gauge pressure of 400 psi (2760 kPa).

3.3.1.2 Low Pressure Acetylene. Acetylene at a pressure not exceeding a gauge pressure of 1 psi (6.9 kPa).

3.3.1.3 Medium Pressure Acetylene. Acetylene at gauge pressures exceeding 1 psi (6.9 kPa) but not exceeding 15 psi (103 kPa). [51, 2007]

3.3.2 Acetylene Operations. Operations that include acetylene generation, storage, purification, compression, cylinder filling, cylinder storage, and calcium carbide storage.

3.3.3 Acetylene Plant. A facility engaged in the generation and compression of acetylene and in the filling of acetylene cylinders either as its sole operation or in conjunction with facilities for filling other compressed gas cylinders.

3.3.4 Building Code. The building or construction code adopted by the jurisdiction. [55, 2010]

3.3.5* Control Area. A building or portion of a building within which hazardous materials are allowed to be stored, dispensed, used, or handled in quantities not exceeding the maximum allowable quantities (MAQ). [5000, 2012]

3.3.6 Fixed Natural Ventilation. The movement of air into and out of a space through permanent openings that are arranged in such a way that the required ventilation cannot be reduced by operating windows, doors, louvers, or similar devices.

3.3.7 High Hazard Contents. High hazard contents include materials defined as hazardous materials in NFPA 400, *Hazardous Materials Code*, whether stored, used, or handled.

3.3.7.1* High Hazard Level 2 Contents. High hazard Level 2 contents include materials that present a deflagration hazard or a hazard from accelerated burning, including but not limited to: Class I, Class II or Class III-A flammable or combustible liquids that are used or stored in normally open containers or systems, or in closed containers or systems at gauge pressures of more than 15 psi (103 kPa); combustible dusts stored, used, or generated in a manner creating a severe fire or explosion hazard; flammable gases and flammable cryogenic liquids; Class I organic peroxides; Class 3 solid or liquid oxidizers that are used or stored in normally open containers or systems, or in closed containers or systems at gauge pressures of more than 15 psi (103 kPa); nondetonable pyrophoric materials; Class 3 nondetonable unstable (reactive) materials; and Class 3 water-reactive materials [1, 2012]

3.3.7.2 High Hazard Level 3 Contents. High hazard Level 3 contents include materials that readily support combustion or present a physical hazard including, but not limited to, Level 2 and Level 3 aerosols; Class I, Class II, or Class III-A flammable or combustible liquids that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa); consumer fireworks 1.4G; flammable solids, other than dusts classified as high hazard Level 2, stored, used, or generated in a manner creating a high fire hazard; Class II and Class III organic peroxides; Class 2 solid or liquid oxidizers; Class 3 solid or liquid oxidizers that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103 kPa);

oxidizing gases and oxidizing cryogenic liquids; Class 2 unstable (reactive) materials; and Class 2 water-reactive materials [1, 2012]

3.3.7.3 High Hazard Level 4 Contents. High hazard Level 4 contents include materials that are acute health hazards including, but not limited to, corrosives; highly toxic materials; and toxic materials [1, 2012]

3.3.8 Material.

3.3.8.1* Limited-Combustible (Material). Refers to a building construction material not complying with the definition of noncombustible material that, in the form in which it is used, has a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg), where tested in accordance with NFPA 259, *Standard Test Method for Potential Heat of Building Materials*, and includes either of the following: (1) materials having a structural base of noncombustible material, with a surfacing not exceeding a thickness of $\frac{1}{8}$ in. (3.2 mm) that has a flame spread index not greater than 50; and (2) materials, in the form and thickness used, having neither a flame spread index greater than 25 nor evidence of continued progressive combustion, and of such composition that surfaces that would be exposed by cutting through the material on any plane would have neither a flame spread index greater than 25 nor evidence of continued progressive combustion, when tested in accordance with ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

3.3.8.2 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. Materials that are reported as passing ASTM E 136, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*, are considered noncombustible materials.

3.3.9* Mobile Acetylene Trailer System. A manifolded group of cylinders held together as a unit on a transport vehicle for the purpose of containing and transporting large quantities of acetylene. [51, 2007]

3.3.10 Normal Temperature and Pressure (NTP). A temperature of 70°F (21°C) at an absolute pressure of 14.7 psi (101.3 kPa). [55, 2010]

3.3.11* Protection Level. A tier of building safety that exceeds the construction requirements for control areas to accommodate quantities of hazardous materials in excess of those permitted using the control area concept. [5000, 2012]

3.3.12* Secondary Containment. That level of containment that is external to and separate from primary containment. [400, 2010]

3.3.13 Unpierced Wall. A wall that is allowed to have pipes or conduits passing through it, or unopenable windows, glazed with safety glass or wired glass, set in it, but such openings are sealed to prevent the flow of air between adjacent rooms.

Chapter 4 Plant Location, Arrangement, Construction, and Utilities

4.1 Location. Portions of plants housing acetylene generation and charging and acetylene cylinder storage operations where protection level controls are provided shall be located in accordance with the requirements of the building code.

4.2 Arrangement.

4.2.1 Multiple-Occupancy Buildings.

4.2.1.1* Portions of plants housing multiple occupancies that include acetylene operations shall be permitted to be used for charging of other gases provided that oxidizing gas operations are located at least 20 ft (6 m) from flammable gas operations.

4.2.1.2 The 20 ft (6 m) separation distance shall not be required to be met if charging of oxidizing gas cylinders or storage of such filled cylinders is separated from charging or storage of flammable gas cylinders by a masonry wall at least 5 ft (1.5 m) high having a fire resistance rating of at least 1 hour.

4.2.2 Separated Occupancy. Where mixed-occupancy buildings are to be separated by the use of occupancy separations, fire-resistive separations shall be provided in accordance with the building code.

4.2.3* Single-Story Buildings. Acetylene cylinder charging plants shall be limited to single-story buildings without basements or crawl spaces.

4.2.4 Security. Storage, use, and handling areas shall be secured against unauthorized entry in accordance with NFPA 55, *Compressed Gases and Cryogenic Fluids Code*.

4.3 Construction.

4.3.1 Buildings where acetylene operations are conducted shall be constructed of noncombustible or limited-combustible materials.

4.3.2* Buildings or rooms housing acetylene operations, excluding calcium carbide storage rooms, shall be provided with explosion control in accordance with NFPA 55, *Compressed Gases and Cryogenic Fluids Code*.

4.3.3 Exits shall be provided for areas with protection level controls in accordance with the building code.

4.4 Ventilation. Rooms housing acetylene operations shall be provided with mechanical exhaust or fixed natural ventilation that ventilates the space at a rate of not less than 1 ft³/min/ft² (0.03 m³/min/0.09 m²) of floor area over the area of storage or use.

4.4.1 Rooms or areas where gases other than acetylene are stored or used shall be ventilated in accordance with NFPA 55, *Compressed Gases and Cryogenic Fluids Code*.

4.4.2 Calcium carbide storage rooms shall be in accordance with 5.2.7.

4.4.3 Continuous Operation. Where mechanical exhaust systems are provided, the systems shall operate continuously unless an alternative design is approved by the authority having jurisdiction.

4.4.3.1 Reduction in Ventilation. Mechanical exhaust ventilation shall be permitted to be reduced below 1 ft³/min/ft² (0.03 m³/min/0.09 m²), provided that full ventilation is automatically restored when the acetylene concentration exceeds 25 percent of the lower flammable limit (LFL) when measured by a gas detection system in accordance with Section 4.5.

4.4.4 Shutoff Controls. Where powered exhaust ventilation is provided, a manual shutoff switch shall be provided outside the room in a position adjacent to the principal access door to the room or in an approved location.

