

NFPA®

56

Standard for
Fire and Explosion Prevention
During Cleaning and Purging of
Flammable Gas Piping Systems

2020



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NFPA® 56

Standard for

Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems

2020 Edition

This edition of NFPA 56, *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems*, was prepared by the Technical Committee on Gas Process Safety. It was issued by the Standards Council on November 4, 2019, with an effective date of November 24, 2019, and supersedes all previous editions.

This edition of NFPA 56 was approved as an American National Standard on November 24, 2019.

Origin and Development of NFPA 56

In February 2010, an explosion occurred at a power plant construction site as the result of an uncontrolled release of flammable gas that was being used to clean the interior of the fuel piping system. The incident investigation resulted in urgent recommendations being issued by the U.S. Chemical Safety Board (CSB) for NFPA to develop requirements for the “safe conduct of fuel gas piping cleaning operations.” In response, the NFPA Standards Council established the Technical Committee on Gas Process Safety and tasked that committee with developing a standard to address piping system cleaning and purging operations. As a result of the CSB’s urgent recommendation, NFPA issued provisional standard NFPA 56 (PS), *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems*, which prohibits the use of flammable gas as an agent for the interior cleaning of piping systems. NFPA 56 (PS) expanded on the CSB recommendations by including cleaning and purging of all flammable gas piping systems at any inlet pressure for electric-generating plants and for industrial, commercial, and institutional applications.

In addition to the use of flammable gas for cleaning and purging, the provisional standard addressed training requirements for personnel as well as notification of hazards for personnel not directly involved in cleaning or purging procedures. The standard required development of written procedures for cleaning and purging activities and that all such written procedures undergo a safety validation performed by a competent person. The definition of *competent person* was extracted directly from federal Occupational Safety and Health Administration (OSHA) regulations. NFPA 56 (PS) also adopted terminology commonly used by the petrochemical industry for those procedures: *purging into service* for the process of replacing air in a piping system with inert or flammable gas and *purging out of service* for the process of replacing flammable gas in the piping system with inert gas or air.

In accordance with ANSI requirements for provisional standards, NFPA 56 (PS) was immediately submitted for revision in accordance with the NFPA Regulations Governing Committee Projects. As a result, NFPA 56 is no longer a provisional standard and will no longer be designated with the suffix “PS.”

In the 2014 edition, new requirements were added to address the use of pressure relief valves and their associated piping in purging and cleaning processes. NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, was exempted from the scope of NFPA 56 in recognition of new requirements added to NFPA 55 to address cleaning and purging of flammable gas piping systems within the NFPA 55 scope.

Also, the term source valve was defined and added to the scope because it is the term used in the compressed/industrial gas industry to demarcate the point of delivery to the piping system. The 2014 edition also included additional annex text to further clarify existing and new requirements.

In the 2017 edition, the requirements for written procedures for cleaning and purging activities were modified to include additional topics. The procedures were required to address nonconductive components in temporary piping assemblies in order to account for the static charge that might be

induced by those components. Additionally, the written procedures were created to address protection and rescue of personnel; this included the selection of fire-resistant clothing based on a hazard analysis in accordance with NFPA 2113, *Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Short-Duration Thermal Exposures*. New requirements were added to the training requirements in Chapter 5 to ensure that knowledge transfer was evident in the training program and to make sure the appropriate information was maintained in the training records.

In the 2020 edition, the technical committee further specified where the standard is not applicable including: gas-consuming equipment; gathering lines from well pads to gas processing facilities, since these systems are addressed in other publications such as the *AGA Purging Manual*; and well padding systems, because of the complexity and range of issues that make NFPA 56 inadequate for this type of application. Well pad piping systems can contain significant amounts of flammable and combustible liquids that are not addressed in this standard.

Cleaning and purging activities were revised in Chapter 4. Associated guidance information was added in Annex A to address gaps within requirements that were identified in the previous edition.

Guidance information was added to Annex A to: provide guidelines for the development of an emergency response plan (ERP); assist the users of this standard develop a comprehensive training program; and verify that personnel can perform their duties prior at the start of the cleaning or purging activity.

Extracts from other NFPA documents have been updated to the latest revisions of the source documents. Information in Annex B that has been extracted from the *AGA Purging Manual* was revised to be consistent with the latest edition of the publication.

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Committee Scope: This committee shall have primary responsibility for documents on the commissioning and maintenance of flammable gas piping systems in commercial, industrial, and power plant applications, extending from the point of delivery to the equipment isolation or shutoff valve except for those already covered by the NFPA National Fuel Gas Code Technical Committee and/or the NFPA Hydrogen Technologies Technical Committee.

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Standard for

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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 D.

Chapter 1 Administration

1.1 Scope.

1.1.1 Applicability. This standard shall apply to fire and explosion prevention during cleaning and purging activities for new and existing flammable gas piping found in electric-generating plants and in industrial, institutional, and commercial applications.

1.1.1.1* Coverage of fuel gas piping systems shall extend from the point of delivery or source valve to the gas-consuming equipment isolation valve.

- ▲ **1.1.1.1.1** For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. [54:1.1.1.1(A)]

1.1.1.1.2 For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regula-

tor, 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. [54:1.1.1.1(A)]

1.1.1.1.3 For facilities that produce flammable gas for consumption on site, the point of delivery or source valve shall be the discharge isolation valve for the gas-producing equipment.

1.1.1.2* Coverage of flammable gas piping systems other than fuel gas piping systems shall extend from the source valve serving the gas supply system to the gas-consuming equipment isolation valve.

1.1.2 Nonapplication of Standard. This standard shall not apply to the following items:

- (1)* Piping systems covered by NFPA 2
- (2)* Piping systems covered by NFPA 51
- (3) Fuel-dispensing facilities covered by NFPA 52
- (4)* Piping systems covered by NFPA 54
- (5)* Piping systems covered by NFPA 55
- (6)* Piping systems covered by NFPA 58
- (7)* LP-Gas (including refrigerated storage) at utility gas plants (see NFPA 59)
- (8)* LNG facilities covered by NFPA 59A
- (9)* Vehicle fuel dispensers
- (10) Commissioning and maintenance of gas-consuming equipment
- (11) Vent lines from pressure relief valves or devices unless such vent lines are also used for purging of flammable gas piping systems
- (12)* Systems regulated by U.S. Department of Transportation (DOT) 49 CFR 100–199
- (13)* Gathering lines from well pads to gas processing facilities
- (14) Well pad piping systems

- ▲ **1.2* Purpose.** This standard provides minimum safety requirements for the cleaning and purging of flammable gas piping systems, including cleaning new or existing piping systems, and purging piping systems into or out of service.

1.2.1 For the purposes of this document, a piping system shall be understood to mean a complete piping system, including valves, regulators, and other appurtenances, and any segment thereof that can be isolated from the system.

1.3* Coordination. Coordination of the flammable gas piping system design and construction, including any temporary piping, and the minimum safety requirements for cleaning and purging specified in Chapters 6, 7, and 8 shall be required.

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.

1.5 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 2, *Hydrogen Technologies Code*, 2020 edition.

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

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2020 edition.

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

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2019 edition.

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

NFPA 54, *National Fuel Gas Code*, 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2020 edition.

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

NFPA 59, *Utility LP-Gas Plant Code*, 2018 edition.

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

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

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

NFPA 2113, *Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Short-Duration Thermal Exposures from Fire*, 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 B31.1, *Power Piping*, 2016.

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

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

2.3.2 U.S. Government Publications. U.S. Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 29, Code of Federal Regulations, Part 1926.32(f), Safety and Health Regulations for Construction.

Title 49, Code of Federal Regulations, Parts 100–185, Hazardous Material Regulations.

Title 49, Code of Federal Regulations, Parts 190–199, Pipeline Safety Regulations.

2.3.3 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 54, *National Fuel Gas Code*, 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2016 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 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* 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.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1* Cleaning Media. Materials used to clean piping systems.

3.3.2 Closed Piping System. Interconnected piping that is designed to contain the flammable gas under pressure during normal operations and incorporates provisions for controlled release of contents.

3.3.3* Competent Person. One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. [29 CFR 1926.32(f)]

3.3.4* Detection Equipment. Monitoring equipment necessary for detecting and/or measuring the concentration of flammable gas or oxygen present in air.

3.3.5 End Point. Attainment of concentration (percent by volume) of inert substance in the closed system being purged such that subsequent admission of air, if purging out of service, or admission of gas or vapor, if purging into service, will not result in formation of a flammable mixture.

3.3.6 Equipment Isolation Valve. A manual shutoff valve for shutoff of the flammable gas to each piece of equipment.

3.3.7* Flammable Gas. A material that is a gas at 68°F (20°C) or less at an absolute pressure of 14.7 psi (101.3 kPa), that is ignitable at an absolute pressure of 14.7 psi (101.3 kPa) when in a mixture of 13 percent or less by volume with air, or that has a flammable range at an absolute pressure of 14.7 psi (101.3 kPa) with air of at least 12 percent, regardless of the lower limit. [55, 2016]

3.3.8* Inert Gas. A nonreactive, nonflammable, noncorrosive gas such as argon, helium, krypton, neon, nitrogen, and xenon. [55, 2016]

3.3.9 Pig. A device that is inserted into a pipeline to perform a specific task within the pipeline and that travels freely through the pipeline pulled by a cable; propelled by air, water, or another medium; or driven by the product flow.

3.3.10 Purge. To free a gas conduit of air or gas, or a mixture of gas and air. [54, 2018]

3.3.10.1 Purge into Service. To replace the air or inert gas in a closed system by a flammable gas.

3.3.10.2 Purge out of Service. To replace the normal flammable content of a closed system by inert gas, air, or water.

3.3.11 Source Valve. A shutoff valve on the piping system serving a gas supply system where the gas supply, at service pressure, first enters the supply line.

Chapter 4 General Requirements

4.1 Piping System Construction. Flammable gas piping systems shall be designed, constructed, inspected, and tested in accordance with ASME B31.1, *Power Piping*; ASME B31.3, *Process Piping*; ASME B31.12, *Hydrogen Piping and Pipelines*; NFPA 55; NFPA 54; or other approved codes or standards.

Δ 4.1.1 The requirement of Section 4.1 shall not be required to be applied retroactively.

Δ 4.1.2* **Pressure Testing and Inspection.** Prior to cleaning, pressure testing, or purging a new system that has not been in service, piping systems shall be inspected to determine that the materials, design, fabrication, and installation practices comply

with the requirements of this standard and the intended application.

4.1.2.1* Pressure testing and inspection procedures shall be documented.

4.1.2.2 Where piping is designed and installed in accordance with NFPA 54, pressure testing and inspection shall be in accordance with Chapter 8 of NFPA 54.

Δ 4.1.2.3 Where piping is designed and installed in accordance with ASME B31.1, *Power Piping*, pressure testing and inspection shall be in accordance with ASME B31.1.

4.1.2.4* Where piping is designed and constructed in accordance with ASME B31.3, *Process Piping*, leak testing and inspection shall be in accordance with Chapter VI of ASME B31.3.

Δ 4.1.2.5* Where pneumatic testing is conducted, the test medium shall be air or an inert gas. Oxygen shall never be used.

4.2* Temperature and Pressure. The delivered temperature and pressure of cleaning or purging media shall be compatible with the flammable gas piping system.

4.3 Notification of Hazards. Personnel in the affected area(s), as determined by the cleaning or purging procedure, shall be informed of the hazards associated with the activity prior to the initiation of any such activity.

4.4* Cleaning and Purging Procedures. Written cleaning and purging procedures shall be developed and implemented by a competent person.

Δ 4.4.1* **Cleaning and Purging Activities.** The written procedure for each cleaning and purging activity shall address, as a minimum, the following items:

- (1) Scope of work and site-specific purge procedure development
 - (a) Cleaning and purging method
 - (b) Piping and instrument diagrams (PIDs)
 - (c) Chemical and physical properties of flammable gas, cleaning media, purge media, and discharge gas
 - (d) Determination of purge end point introducing flammable gas, inert gas, or air
 - (e) Assessment and control of purge inlet and discharge locations
 - (f)* Mitigation or capture strategies
 - (g) Temporary piping system design
 - (h) Management review and approval
 - (i) Restoration of service
 - (j) Target design, launcher/receiver venting review for pigging operations
 - (k) Regulatory permits
 - (l) Evaluation of engineering controls that allow gases from depressurization to be consumed in a controlled manner instead of vented (e.g., flaring or controlled combustion in process equipment).
 - (m) Written stand-down instructions to stop activity in a controlled manner
 - (n)* Precautions for gases that have toxic, highly toxic, unstable reactive, corrosive, or other deleterious properties beyond flammability

- (o)* Preparation of a valve line-up table or chart to show the state of critical valves during each state of the purge
- (2) Environmental conditions and work locations
 - (a)* Establishment and clear identification of exclusion zones, including plume release threat zones, where flammable gas-air mixtures are likely to exist
 - (b) Limited access for personnel not directly involved with purge operations
 - (c) Assessment of potential for gas migration (e.g., building openings, adjacent structures)
 - (d) Prohibition of hot work within exclusion zones
 - (e) Lockout/tagout
 - (f) Impact of environmental conditions (e.g., wind speed and direction, temperature, barometric pressure) on purge operations
 - (g) Vehicular and air traffic, if applicable
 - (h) Topography
 - (i) Noise control/monitoring
- (3) Communication plans
 - (a) Pre-job briefings
 - (b) Work permits
 - (c) Roles and responsibilities
 - (d)* Emergency response plan
 - (e) Facility alarm, alert, and warning systems
 - (f) General facility notification prior to start of purge operations
 - (g) General facility notification at the conclusion of purge operations
 - (h) Notification of regulatory authorities as required (local emergency responders, utility operators, community officials, environmental authorities, etc.)
- (4) Control of ignition sources
 - (a)* Bonding and grounding considerations
 - (b) No smoking or spark-producing work within exclusion zones
 - (c) Elimination of hot work within exclusion zone
 - (d) Static electricity ignition sources at discharge point
 - (e)* Nonconductive piping, hose, or fittings in temporary piping assemblies
- (5) Pre-purge piping system assessment
 - (a) Assessment of piping system for trapped liquids, pyrophoric solids, and other flammable or combustible deposits within the piping system
 - (b) Ensuring that the piping system is properly isolated
 - (c) Limiting site conditions that impact the safety of the activity
 - (d) Verification that no isolation valves are seized in position
 - (e) Review of on-site tools and sealants for tri-union mounted ball valves
 - (f) Review of piping for mechanical integrity, including fastener's grade, type, and condition, and external corrosion of fasteners and piping systems
 - (g) Servicing of lubricated plug valves according to manufacturer's instructions
 - (h) Review of previous temporary repairs that could include fibreglassing, wraps, or mechanical clamps
 - (i) Review of hanger integrity and spacing
- (6)* Purge monitoring and instrumentation
 - (a) Ensuring that monitoring instruments are appropriate for gas being purged
 - (b) Training
 - (c) Calibration
 - (d) Monitoring frequency and reporting
 - (e) Appropriate selection of sample point(s)
 - (f) General atmosphere checks in vicinity of purge gas release
- (7) Protection and rescue of personnel
 - (a) Training requirements for personnel involved in the work efforts
 - (b) Personal protective equipment
 - (c) Selection of fire-resistant clothing (FRC) based on a hazard analysis in accordance with NFPA 2113
 - (d) Rescue equipment, including self-contained breathing apparatus and breathing air escape packs
 - (e) Standby rescue personnel
 - (f) Primary and secondary assembly areas
 - (g) Assignment of personnel for alerting and accounting of personnel
- (8)* Management and use of inerts
 - (a) Reviewing the form of inerts that will be used for purging (bottles, tube trailer, vaporizers) to understand the benefits, limitations, and safety aspects of each
 - (b) Establishing training requirements regarding the handling of inerts, including asphyxiation hazards and temperature issues with cryogenic or liquefied inerts
 - (c) Specifying that hoses used for inerts are compatible with inert materials, temperatures, and services pressures
 - (d) Specifying the use of hose safety restraints or other temporary constraints for all inert hose connections
 - (e) Specifying required flow rate and pressure drop limitations to ensure the proper amount of flow for the duration of the purge, either by integral or field-installed regulating equipment

4.4.2 Stand-Down. If the conditions during the purging or cleaning activity deviate from those indicated in the written procedure, resulting in a safety hazard, the purging or cleaning activity shall be discontinued according to the stand-down instructions.

4.5* Safety Validation. A written safety validation shall be performed for cleaning and purging procedures.

4.5.1* The safety validation shall be conducted independently after the procedure has been written and shall evaluate hazards, errors, and malfunctions related to each step in the procedure to validate the measures prescribed in the procedure or make recommendations for additional hazard mitigation measures if necessary.

4.5.2* Recommendations (also called "action items") resulting from the safety validation shall be resolved prior to the activity being conducted.

4.5.3* Prior to initiation of a cleaning or purging activity, the safety validation shall be approved by a designated individual who is competent and knowledgeable in the procedure and hazards and who is authorized to provide such approval.

4.6* Management of Change. Written procedures to manage change to process materials, technology, equipment, procedures, and facilities shall be established and implemented.

4.6.1 The management-of-change procedures shall ensure that the following issues are addressed prior to any change:

- (1) The technical basis for the proposed change
- (2) The safety and health implications
- (3) Whether the change is permanent or temporary
- (4) Modifications to cleaning and purging procedures
- (5) Employee training requirements
- (6) Authorization requirements for the proposed change

4.6.2* Implementation of the management-of-change procedures shall not be required for replacements-in-kind.

4.6.3 The written cleaning and purging procedure, as required by Section 4.4, shall be updated to incorporate the change.

4.7 Documentation.

4.7.1 Cleaning and purging procedures shall be documented and available at the job site.

4.7.2 The safety validation documentation shall include the following items:

- (1) Names, company names, and addresses of the primary developer and other principal team members responsible for the safety validation
- (2) Name(s), company name, and address of the principal operational personnel representing the plant owner or operator
- (3) Date of preparation and any applicable modification dates
- (4) The completed safety validation in accordance with Section 4.5
- (5) Any procedures related to the safety validation and any limiting conditions identified in the management-of-change assessment required by Section 4.6

4.7.3 The safety validation and the cleaning and purging procedures shall be retained for at least 2 years following completion of the activity.

4.8 Notification of Hazards. Personnel in the affected area(s), as determined by the cleaning or purging procedure, shall be informed of the hazards associated with the activity prior to the initiation of any such activity.

4.9 Evacuation of Affected Area. Personnel not involved in cleaning or purging activities shall be evacuated from the affected area(s) as determined by the procedure.

4.10 Segment Cleaning. Piping system segments that can be isolated for cleaning prior to completion of the entire piping system shall be permitted to be cleaned, tested, and secured in a clean condition in accordance with Section 6.7.

4.11 Hangers and Supports. Hangers, supports, or other means capable of restricting the movement of piping shall be installed prior to initiating cleaning or purging activities in accordance with the procedure.

4.12* Nonflammable Atmosphere. Fluid media for testing or cleaning shall not introduce a flammable atmosphere into or create a fire hazard in the piping system being tested or cleaned.

4.13 Utility Coordination. Where utilities such as steam, water, or compressed air are used in quantities or for a duration that can disrupt distribution or operations internal or

external to the facility, cleaning or purging activities shall be coordinated with the managing authority of the utilities.

4.14 Restricted Access. Access to all parts of the piping system during cleaning or purging activities shall be restricted in accordance with the procedure.

4.15 Hot Work Safety. Cutting, welding, and allied processes shall be in accordance with NFPA 51B.

4.15.1 Hot work shall not be permitted within the exclusion zone where flammable gas-air mixtures are likely to exist, as determined by the procedure.

Chapter 5 Training Requirements

5.1* Training. Persons whose duties fall within the scope of this standard shall be provided with training that is consistent with the scope of their job activities and assigned tasks for the cleaning or purging work to be performed. Evidence of knowledge transfer shall be included as part of the training program.

5.1.1 Topics covered by such training shall include hazards of flammable gas, hazards of compressed gases used for cleaning or purging, safe handling practices of flammable gas and compressed gas as applicable, and company emergency action plans and procedures.

5.1.2 Personnel training shall be conducted by a competent person knowledgeable in the subject matter and shall be documented.

Δ 5.1.3* Training records, including dates of training, name of instructor(s), content or curriculum covered, evidence of knowledge transfer, and demonstration of applicable skills, shall be maintained for a period not less than 5 years from the date of completion of the activity.

Chapter 6 Cleaning

6.1 Cleaning of Flammable Gas Piping.

6.1.1 General.

6.1.1.1 Flammable gas shall not be used for internal cleaning of piping.

6.1.1.2 Notification shall precede the start of cleaning in accordance with the written cleaning procedure.

6.2* Cleaning Media. Air, inert gas, steam, and water shall be acceptable cleaning media.

6.2.1* Other cleaning media, except flammable gas, shall be permitted to be used in accordance with the written cleaning procedure.

6.2.2* Use and disposal or recovery of flammable liquid solvents shall be in accordance with NFPA 30.

6.2.2.1* A copy of the safety data sheet for the flammable liquid solvent shall be provided to personnel developing the cleaning procedure, personnel performing the cleaning procedure, and personnel developing the procedures for the handling and dispensing of the flammable liquid solvent.

6.2.2.2 The compatibility of the flammable solvent with the pipe materials, with the flammable gas in the pipe, and with

other materials used during cleaning shall be established prior to the use of the solvent.

6.2.2.3 The hazards associated with the presence of residual flammable liquid solvent in the piping after cleaning shall be assessed prior to the purging of the piping into service.

6.3* Temporary Power/Fuel Supply.

6.3.1 Where electric power is used to power the equipment necessary to implement the pipe cleaning, it shall be connected in accordance with NFPA 70.

6.3.2 Where fuel gas is used to power the equipment necessary to implement the pipe cleaning, it shall be piped and connected in accordance with NFPA 54 or NFPA 58, as applicable.

6.3.3 Where fuel oil is used to power the equipment necessary to implement the pipe cleaning, it shall be piped and connected in accordance with NFPA 31.

6.4 Temporary Piping (Including Hose Assemblies). Temporary piping systems, including hose assemblies, used to connect the cleaning media supply source to the piping system shall be in accordance with ASME B31.1, *Power Piping*, paragraph 122.10, or the same code or standard used for the permanent piping system.

6.5 Pig Cleaning. Pigs shall be permitted to be used to clean piping systems.

6.5.1 Prior to placing a piping system into service, the fluid used to propel the pig through the piping system shall be water, steam, air, or inert gas.

6.5.2* A pig shall be permitted to be used to accomplish cleaning and purging into service simultaneously in accordance with 6.5.2.1 through 6.5.2.4.

6.5.2.1* Pig cleaning using flammable gas as the propellant shall utilize a closed piping system.

6.5.2.2* Where a pig is used to accomplish cleaning and purging simultaneously, the pig shall be sized to minimize unintended commingling of flammable gas and air.

6.5.2.3* A pig shall be permitted to be used to clean a piping system that is filled with flammable gas where the flammable gas in the piping system is being consumed by end-use equipment or flares and the residual flammable gas in the launcher or receiver is discharged in accordance with 8.3.2.

6.5.2.4 Where flammable gas is used as the pig propellant, the residual gas from the launcher or receiver shall be discharged in accordance with 8.3.2.

6.6* Target. Where a target is used to indicate debris during the cleaning process, it shall be designed and secured to withstand the velocity and pressure of the exiting media and debris without breaking or failing.

6.7 Isolation and Protection of Clean Piping Systems or Segments. Where piping systems are cleaned in stages during fabrication or field assembly, the clean piping shall be isolated and protected against infiltration of contaminants.

Chapter 7 Purging into Service

7.1 Charging Piping System with Flammable Gas.

7.1.1 Where gas piping containing air is placed in operation, the air in the piping first shall be displaced with an inert gas, which then shall be displaced with flammable gas in accordance with Section 7.2.

Δ 7.1.2* If an electric generating plant is operated by the serving natural gas supplier, natural gas piping between the point of delivery or source valve and the plant shall be permitted to be purged into service in accordance with the serving natural gas supplier's written procedures.

7.1.2.1 The natural gas supplier's written procedures shall include a safety validation in accordance with Section 4.5.

7.1.2.2 The natural gas supplier's written procedures and process shall be coordinated with the plant operational personnel.

7.2 Discharge of Purged Gases.

7.2.1 Vent Pipe Termination. The discharge from a piping system being purged into service shall discharge to a specified unconfined outdoor location determined by the written procedure or shall be captured or further processed before release.

7.2.2 Purging operations shall comply with the requirements in 7.2.2.1 through 7.2.2.6.

7.2.2.1 The vent line from a piping system being purged into service shall be equipped with a readily accessible or remotely actuated shutoff valve.

7.2.2.2 During purging, the discharge from the piping system shall be monitored with detection equipment that complies with Section 7.3.

7.2.2.3* Purging operations introducing inert gas shall continue in accordance with the written procedure until the oxygen concentration detected at the discharge point of the piping system is less than 60 percent of the limiting oxidant concentration as determined in accordance with 7.2.3 of NFPA 69.

7.2.2.4* Except as permitted in 7.2.2.5, purging operations that introduce flammable gas shall continue in accordance with the written procedure until at least 90 percent flammable gas by volume or the minimum concentration established by the purging procedure is detected at the discharge of the piping system.

7.2.2.5 Where a piping system containing inert gas is purged into service, it shall be permitted to discharge the gas downstream in lieu of venting in accordance with the following parameters:

- (1) The piping system design can accommodate the activity.
- (2) The end-point concentration of inert gas does not prevent complete combustion or consumption of the flammable gas in the end-use equipment or process.
- (3) The inert gas-flammable gas mixture is released in a controlled manner to end-use equipment or process equipment.

7.2.2.6 Where permitted by the piping design code, a vent line serving a pressure relief valve or pressure relief device used to also vent purge gases shall be sized to comply with the following parameters:

- (1) The purge flow shall not compromise the operation of pressure relieving valves or devices.
- (2) Operation of the relief valve or device shall not compromise the integrity of the purge flow.
- (3)* Purge flows through such a vent line shall not compromise any connected systems.

7.3 Detection Equipment.

7.3.1* Sense of smell shall not be used to detect the presence of flammable gas.

7.3.2* Detection equipment shall be listed or approved for the gas being monitored and the environment where it is used and shall be calibrated in accordance with the manufacturer's instructions.

7.3.3* Combustible gas indicators shall numerically display the gas concentration by volume scale from 0 percent to 100 percent in measurement increments determined by the procedure.

7.3.4* Lower flammability limit (LFL) monitors shall numerically display the gas concentration as a percentage of the LFL from 0 percent to 100 percent, or the equivalent percent by volume, in measurement increments determined by the procedure.

7.3.5 Oxygen monitors shall numerically display the oxygen concentration by volume from 0 percent to 25 percent or higher in measurement increments determined by the procedure.

Chapter 8 Purging Out of Service

8.1 Isolation. Flammable gas piping shall be isolated from the flammable gas supply and downstream piping and equipment prior to purging out of service.

8.2 Charging with Inert Gas. Where existing gas piping is purged out of service, the residual flammable gas in the piping shall be displaced with an inert gas.

▲ **8.2.1*** If an electric generating plant is operated by the serving natural gas supplier, natural gas piping between the point of delivery or source valve and the plant shall be permitted to be purged out of service in accordance with the serving natural gas supplier's written procedures.

8.2.1.1 The natural gas supplier's written procedures shall include a safety validation in accordance with Section 4.5.

8.2.1.2 The natural gas supplier's written procedures and process shall be coordinated with the plant operational personnel.

8.3 Discharge of Purged Gases.

8.3.1* Pressurized flammable gas systems shall be depressurized prior to being purged out of service in accordance with the written purge procedure.

8.3.2 The discharge from a piping system being purged out of service shall discharge to a specified unconfined outdoor loca-

tion determined by the written procedure or shall be captured or further processed before release.

8.3.3 Purging operations shall comply with the requirements in 8.3.3.1 through 8.3.3.5.

8.3.3.1 The vent line from a piping system being purged out of service shall be equipped with a readily accessible or remotely actuated shutoff valve.

8.3.3.2 During purging, the discharge from the piping system shall be monitored in accordance with the written procedure with detection equipment that complies with Section 8.4.

8.3.3.3* Purging operations that introduce inert gas shall continue in accordance with the written procedure until the flammable gas concentration detected at the discharge of the piping system is such that the inert gas-flammable gas mixture is not ignitable when released in air.

8.3.3.4 Purging operations that introduce air to displace inert gas shall continue in accordance with the written procedure until at least 19.5 percent oxygen by volume is detected at the discharge of the piping system.

8.3.3.5 Where permitted by the piping design code, a vent line serving a pressure relief valve or pressure relief device used to also vent purge gases shall be sized to comply with the following parameters:

- (1) The purge flow shall not compromise the operation of pressure relieving valves or devices.
- (2) Operation of the relief valve or device shall not compromise the integrity of the purge flow.
- (3)* Purge flows through such a vent line shall not compromise any connected systems.

8.4 Detection Equipment.

8.4.1* Sense of smell shall not be used to detect the presence of flammable gas.

8.4.2* Detection equipment shall be designed and listed for the gas being monitored and the environment where it is used and operated in accordance with the manufacturer's instructions.

8.4.2.1 Where listed gas detection equipment is not available for the specific gas being detected, the gas detection equipment shall be recommended for the application by the manufacturer and approved.

8.4.3* Lower flammability limit (LFL) detectors shall be capable of measuring the gas concentration in accordance with 8.3.3.3.

8.4.4 Oxygen detectors shall be capable of measuring the oxygen concentration in accordance with 8.3.3.4.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

• **A.1.1.1.1** The piping system includes segments located between pieces of equipment, such as gas conditioning or compressing equipment. This document does not cover the commissioning or maintaining of such equipment. However,

the standard can be applied to the commissioning or maintaining of those piping segments and equipment as a system where the complete system is purged into or out of service as a unit. The equipment manufacturer's written instructions should be included as part of the written purge procedure. The equipment isolation valve is intended to be the final isolation valve prior to the manufacturer's or supplier's equipment gas train. For some common pieces of equipment in NFPA standards, the isolation valve is identified and referenced as follows:

- (1) NFPA 37 uses the term *equipment isolation valve* in 5.2.1.
- (2) NFPA 85 uses the term *manual shutoff valve* in Figure A.5.3.2.3 for single burner boilers; in Figure A.6.6.5.1.5.4(a) and Figure A.6.6.5.1.5.4(b) for multiple burner boilers; and in Figure A.8.8.5.8(a) through Figure A.8.8.5.8(c) for heat recovery steam generators.
- (3) NFPA 86 uses the term *equipment isolation valve* in 6.2.4.1.
- (4) NFPA 87 uses the term *equipment isolation valve* in 6.2.4.3.

A.1.1.1.2 Flammable gas container, cylinder, or tank filling operations are not included in the scope of NFPA 56 because there is no gas-consuming equipment.

A.1.1.2(1) The application of NFPA 2 is included here for the convenience of the user:

1.3 Application. [2:1.3]

1.3.1 This code shall apply to the production, storage, transfer, and use of hydrogen in all occupancies and on all premises. [2:1.3.1]

1.3.2 The use of hydrogen shall include stationary, portable, and vehicular infrastructure applications. [2:1.3.2]

1.3.3 The fundamental requirements of Chapters 1 through 8 [of NFPA 2] shall apply in addition to the use-specific requirements provided in Chapters 9 through 18, as applicable. [2:1.3.3]

1.3.4 Exemptions. This code shall not apply to the following:

- (1) Onboard vehicle or mobile equipment components or systems, including the onboard GH_2 or LH_2 fuel supply
- (2) Mixtures of GH_2 and other gases with a hydrogen concentration of less than 95 percent by volume when in accordance with NFPA 55
- (3) The storage, handling, use, or processing of metal hydride materials outside of metal hydride storage systems defined in Chapter 3 [of NFPA 2]

[2:1.3.4]

Δ A.1.1.2(2) The scope and application of NFPA 51 is included here for the convenience of the user:

1.1 Scope. [51:1.1]

1.1.1 This standard applies to the following:

- (1) Design and installation of oxygen–fuel gas welding and cutting systems and allied processes (*see* 3.3.2), except for systems meeting the criteria in 1.1.5
- (2) Utilization of gaseous fuels generated from flammable liquids under pressure where such fuels are used with oxygen

(3) Storage on the site of a welding and cutting system installation of the following:

- (a) Gases to be used with such systems where more than one cylinder each of oxygen and fuel gas are stored in any single storage area [includes storage of more than one cylinder each in any single storage area even though all such stored cylinders may be intended for use in systems of the kind described in 1.1.1(1)].
- (b) Calcium carbide

[51:1.1.1]

1.1.2 Unless specifically indicated otherwise, the term *welding and cutting systems* shall be considered to include *allied processes* in this standard. [51:1.1.2]

1.1.3 Where only a portion of a fuel gas system is to be used for welding, cutting, or allied processes, only that portion of the system need comply with this standard. [51:1.1.3]

1.1.4 Where only a portion of an oxygen system is to be used with fuel gas for welding, cutting, or allied processes, only that portion of the system need comply with this standard. [51:1.1.4]

1.1.5 This standard shall not apply to the following:

- (1) Systems consisting of a single cylinder not exceeding 120 ft³ (3.4 m³) of oxygen and a single cylinder not exceeding 120 ft³ (3.4 m³) of fuel gas used for welding and cutting
- (2) Systems in which fuel gases are not to be used with oxygen, as described in NFPA 54 and NFPA 58
- (3) The manufacture of gases and the filling of cylinders
- (4) Storage of empty cylinders
- (5) Compressed air–fuel gas systems

[51:1.1.5]]

Δ A.1.1.2(4) The scope of NFPA 54 is included here for the convenience of the user:

1.1 Scope. [54:1.1]

1.1.1 Applicability. [54:1.1.1]

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). [54:1.1.1.1]

(A)* Coverage of piping systems shall extend from the point of delivery to the appliance connections. For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. For undiluted LP-Gas systems, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed. Where a meter is installed, the point of delivery shall be the outlet of the meter. [54:1.1.1.1(A)]

A.1.1.1.1(A) The final pressure regulator in an undiluted liquefied petroleum gas (LP-Gas) system can include any one of the following:

- (1) The second stage regulator or integral two-stage regulator
- (2) A 2 psi (14 kPa) service regulator or integral 2 psi (14 kPa) service regulator

(3) A single-stage regulator, where single-stage systems are permitted by NFPA 58

(B) This code shall apply to natural gas systems operating at a pressure of 125 psi (862 kPa) or less. [54:1.1.1.1(B)]

(C) This code shall apply to LP-Gas systems operating at a pressure of 50 psi (345 kPa) or less. [54:1.1.1.1(C)]

(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. [54:1.1.1.1(D)]

(E) Requirements for piping systems shall include design, materials, components, fabrication, assembly, installation, testing, inspection, operation, and maintenance. [54:1.1.1.1(E)]

(F) Requirements for appliances, equipment, and related accessories shall include installation, combustion, and ventilation air and venting. [54:1.1.1.1(F)]

A.1.1.2(5) The scope of NFPA 55 is included here for the convenience of the user:

1.1 Scope. [55:1.1]

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 containers, cylinders, equipment, and tanks in all occupancies. [55:1.1.1]

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
- (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 liquefied natural gas (LNG), utilized as a vehicle fuel in accordance with NFPA 52
- (11) *Compressed hydrogen gas (GH₂), or liquefied hydrogen gas (LH₂) 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 Nm³) or less in volume or for containers holding 7.05 oz (200 g) of ethylene oxide or less

[55:1.1.2]

A.1.1.2(1) For regulations on the transportation of gases, see 49 CFR 100–185, “Transportation,” and *Transportation of Dangerous Goods Regulations*. [55:A.1.1.2(1)]

A.1.1.2(3) Bulk compressed gas and cryogenic fluid system installations are intended to be covered by the requirements of this code. Instrumentation and alarms that are attendant to the system and designed to interface with the application in a health care facility are to be retained within the purview of NFPA 99. [55:A.1.1.2(3)]

A.1.1.2(5) For information, see NFPA 52 or NFPA 58. [55:A.1.1.2(5)]

A.1.1.2(6) The storage and use of compressed gases and cryogenic fluids outside the boundaries of laboratory work areas are covered by this code. [55:A.1.1.2(6)]

A.1.1.2(11) NFPA 55 is used as the source document for the fundamental requirements for compressed hydrogen gas (GH₂), or liquefied hydrogen gas (LH₂) system installations. Correlation between NFPA 55 and NFPA 2 is the responsibility of the two technical committees involved. The installation requirements for bulk GH₂ or LH₂ are viewed as fundamental provisions. On the other hand, use-specific requirements for designated applications such as vehicular fueling are not resident in NFPA 55 and are under the purview of the NFPA 2 Technical Committee. Where there are specific provisions or controls included in NFPA 55, the specific controls of NFPA 55 will govern except that modifications made to provisions that have been extracted can be followed when the modifications have been made within NFPA’s extract procedure as indicated in the *Manual of Style for NFPA Technical Committee Documents*. [55:A.1.1.2(11)]

A.1.1.2(6) The scope of NFPA 58 is included here for the convenience of the user:

1.1 Scope. This code shall apply to the storage, handling, transportation, and use of liquefied petroleum gas (LP-Gas). [58:1.1]

1.2 Purpose. (Reserved) [58:1.2]

1.3 Application. [58:1.3]

1.3.1 Application of Code. This code shall apply to the operation of all LP-Gas systems, including the following:

- (1) Containers, piping, and associated equipment, when delivering LP-Gas to a building for use as a fuel gas.
- (2) Highway transportation of LP-Gas.
- (3) The design, construction, installation, and operation of marine terminals whose primary purpose is the receipt of LP-Gas for delivery to transporters, distributors, or users, except for marine terminals associated with refineries, petrochemicals, gas plants, and marine terminals whose purpose is the delivery of LP-Gas to marine vessels.
- (4) The design, construction, installation, and operation of pipeline terminals that receive LP-Gas from pipelines under the jurisdiction of the U.S. Department of Transportation (DOT) whose primary purpose is the receipt of LP-Gas for delivery to transporters, distributors, or users. Coverage shall begin downstream of the last pipeline valve or tank manifold inlet.

[58:1.3.1]

A.1.1.2(7) The scope of NFPA 59 is included here for the convenience of the user:

1.1 Scope. [59:1.1]

1.1.1* This code shall apply to the design, construction, location, installation, operation, and maintenance of refrigerated and nonrefrigerated utility gas plants including LP-gas containers, piping, and associated process equipment, and controls and fire protection. Coverage begins at:

- (1) The point of transfer when delivery is by cargo tank vehicle or railcar
- (2) The liquid inlet isolation valve located downstream of 49 CFR Part 195, "Transportation of Hazardous Liquids by Pipeline."
- (3) Coverage shall extend to the point where LP-Gas vapor or mixture of LP-Gas vapor and air is introduced into the utility distribution system under the jurisdiction of 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards."

[59:1.1.1]

1.1.2 Installations that have an aggregate water capacity of 4000 gal (15.14 m³) or less shall conform to NFPA 58. [59:1.1.2]

A.1.1.1 See Figure A.1.1.2(7) for a graphical representation of the scope of coverage of NFPA 59. [59:A.1.1.1]

Δ A.1.1.2(8) The scope of NFPA 59A is included here for the convenience of the user:

1.1 Scope. [59A:1.1]

1.1.1 This standard shall apply to the following:

- (1) The siting, design, construction, maintenance, and operation of facilities that produce, store, and handle liquefied natural gas (LNG)
- (2) The training of all personnel involved with LNG [59A:1.1.1]

1.1.2 This standard shall not apply to the following:

- (1) Frozen ground containers
- (2) Portable storage containers stored or used in buildings
- (3) All LNG vehicular applications, including fueling of LNG vehicles

[59A:1.1.2]

A.1.1.2(9) Vehicle fuel dispensers are covered by NFPA 2, NFPA 30A, NFPA 52, and NFPA 58.

A.1.1.2(12) DOT regulations in 49 CFR 100–199 govern the transport of gases in commerce by pipelines, motor vehicles, and rail systems. The transportation of compressed gases or cryogenic fluids, including offsite pipeline transmission systems and loading and unloading functions as regulated by 49 CFR, is not within the scope of NFPA 56.

N A.1.1.2(13) AGA *Purging Manual* provides guidance for purging gathering lines and other pipelines into and out of service.

A.1.2 Any activities related to the introduction of flammable gas into a piping system are included in the scope of this standard, regardless of the project phase or operational status.

N A.1.3 The design process should address the need for important purging system-related components like purge points, line blind spacers, and purged gas venting lines so that gas is not released indoors.

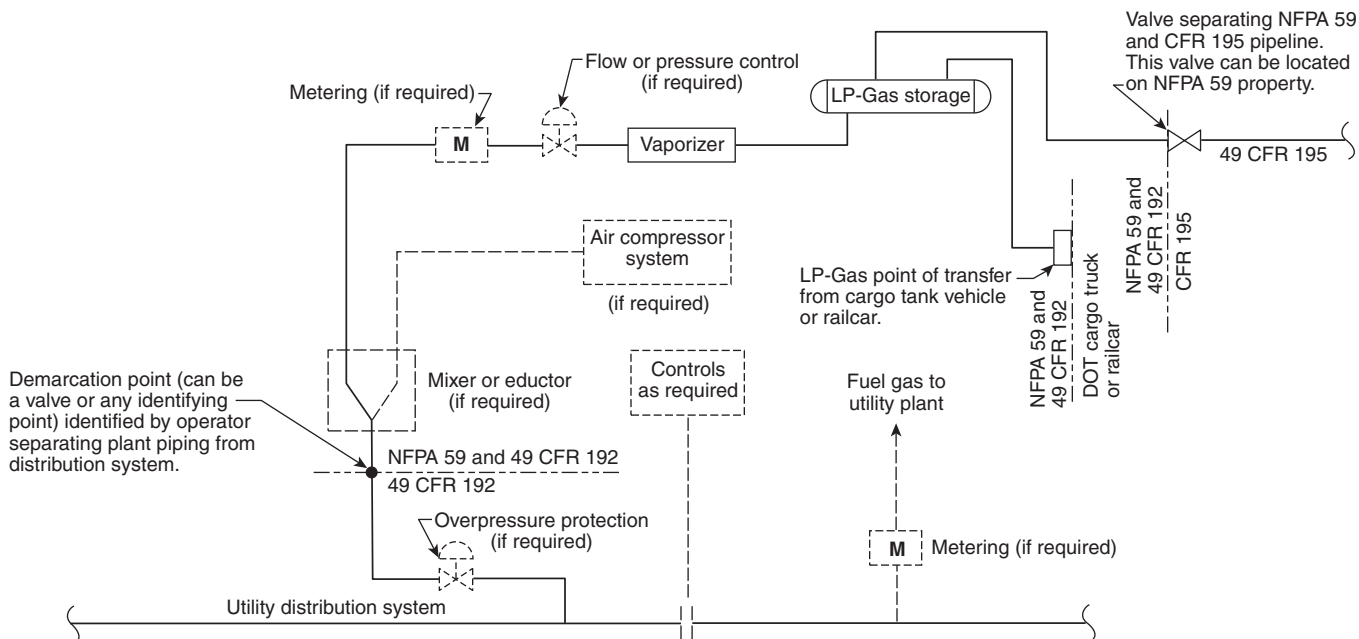


FIGURE A.1.1.2(7) Typical Installation of an LP-Gas or an LP-Gas Air Facility. [59:Figure A.1.1.1]

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase “authority having jurisdiction,” or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.1 Cleaning Media. Cleaning media include liquids, gases, and solids. Chemical washing uses chemical substances (usually liquid) capable of dissolving or dispersing foreign substances or contaminants and can involve steaming or vacuuming to remove the chemical residue. When a pig is used to clean a piping system, the pig itself is considered to be the cleaning medium. Several solvents frequently used as cleaning media present flammability or other hazards related to personnel exposure. Use of these solvents requires special precautions beyond those developed for noncombustible cleaning media.

A.3.3.3 Competent Person. The OSHA website states that “by way of training and/or experience, a competent person is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, and has the authority to correct them. Some standards add additional specific requirements which must be met by the competent person.” (See U.S. Department of Labor, *Occupational Safety and Health Administration (OSHA), Safety and Health Topics, “Competent Persons,”* <http://www.osha.gov/SLTC/competentperson/index.html>.)

A.3.3.4 Detection Equipment. Detection equipment can include combustible gas indicators, lower flammability limit (LFL) monitors, and oxygen monitors. The LFL is sometimes called the lower explosive limit, or LEL. There can also be devices capable of monitoring and displaying gas concentration, oxygen concentration, percentage of LFL, or any combination thereof.

A.3.3.7 Flammable Gas. Pyrophoric gases such as silane or silicon tetrahydride are classified as such under the definition for pyrophoric materials found in NFPA 1, NFPA 400, or NFPA 55. The control strategy used for the regulation of pyrophoric materials is somewhat different from that for materials that do not autoignite on release to the atmosphere. Pyrophoric gases are not considered to be flammable gases per se.

A.3.3.8 Inert Gas. Inert gases do not react readily with other materials under normal temperatures and pressures. For example, nitrogen combines with some of the more active metals such as lithium and magnesium to form nitrides, and at high temperatures it will also combine with hydrogen, oxygen, and other elements. The gases neon, krypton, and xenon are considered rare due to their scarcity. Although these gases are commonly referred to as inert gases, the formation of compounds is possible. For example, xenon combines with fluorine to form various fluorides and with oxygen to form oxides; the compounds formed are crystalline solids. Radon is inert under the definition provided, but because it is radioactive, it is not considered inert for the purposes of NFPA 55. [55, 2016]

A.4.1.2 Where pressure testing is completed before the piping system is cleaned of dirt and debris, operators should release the media and debris in such a way that does not pose a risk to personnel. Operators can consider the following methods to discharge the pressure test media:

- (1) Releasing test media at a rate that prevents the ejection of debris or liquids at high velocity
- (2) Providing means to capture debris or liquids exiting the system
- (3) Locating the discharge point a safe distance from any person, vehicle, or structure

N A.4.1.2.1 Inspections of piping systems prior to testing should include reviewing threaded bolted connections for integrity, hanger loadings and spacings, and valve functionality.

A.4.1.2.4 ASME B31.3, *Process Piping*, requires a “leak test” wherein piping systems are subjected to pressures at least 1.5 times the design operating pressure and such pressure is held for at least 10 minutes. NFPA 54, and ASME B31.1, *Power Piping*, require a similar test procedure and parameters but refer to the test as a “pressure test.”

A.4.1.2.5 ASME B31.1, *Power Piping*, and ASME B31.3, *Process Piping*, require the use of a “nonflammable and nontoxic” gas as the test medium for pneumatic testing. NFPA 56 specifically limits the acceptable media to air or inert gas. Oxygen is specifically prohibited because of the possible subsequent introduction of flammable gas and the risk of developing a flammable atmosphere. In addition, pneumatic testing is prohibited in ASME B31.1 and B31.3 at certain pressures without the owner’s approval.

A.4.2 The person or agency performing cleaning or purging operations should coordinate with the system designer or facility operator to ensure that the medium is being supplied at a temperature and pressure that is compatible with the flammable gas piping system materials and construction.

A.4.4 A sample written procedure, for informational purposes only, is included in Annex C.

A.4.4.1 It is recognized that purging as part of routine maintenance of small piping segments can be accomplished safely,

provided that the written procedure (standard practice) is incorporated into a plant or facility operations and maintenance (O&M) manual that addresses the potential hazards occurring at the time of the purging operations. Purging should be conducted by competent personnel trained in purging operations, including recognition of potential hazards associated with purging. It is not intended that a new written procedure and/or safety validation be required each time the activity occurs within a facility.

Some items will not be applicable to all procedures or installations. Items that are not applicable can be noted as such in the procedure. The basis for non-applicability should be noted in the written procedure for safety validation.

A.4.4.1(1)(f) Gases that have hazards other than flammability could be subject to mitigation strategies such as scrubbing, flaring, afterburning, thermal oxidizing, or capture.

A.4.4.1(1)(n) Gases with properties in addition to flammability might require capture, scrubbing, or other engineered disposal methods. These gases might not be suitable for release to the atmosphere outdoors.

N A.4.4.1(1)(o) An example of a valve line-up table that shows the state of critical valves during each state of the purge is illustrated in Figure A.4.4.1(1)(o).

Example Project Valve Line-Up Mode: Gas Intro-Unit #2 #21

Valve Name	Description	Beginning Position	Ending Position
1	Manual shutoff valve owned by NFG (located at bottom of hill)	Closed	Closed
2	New main header purge point manual shutoff valve (to be added at NFG outlet)	Closed	Closed
3	Manual shutoff valve at top of hill (to be replaced)	Closed	Closed
4	New main header purge point manual shutoff valve (to be added at top of hill)	Closed	Closed
5	Manual shutoff valve at top of hill on bypass (to be replaced)	Closed	Closed
6	Manual shutoff valve, isolation of knockout pot	Open	Open
7	Manual shutoff valve at top of hill on regulator bypass line	Open	Open
8	Manual shutoff valve at top of hill, generator set feed isolation valve	Open	Open
9	Manual shutoff valve on Unit #5 scrubber (upstream)	Closed	Open
10	Manual shutoff valve on Unit #5 scrubber (downstream)	Closed	Open
11	Manual shutoff valve on Unit #5 (scrubber bypass)	Open	Closed
12	Manual shutoff valve on Unit #5 (stainless steel vent)	Closed	Closed
13	Manual shutoff valve on Unit #5 (yellow gas vent)	Closed	Closed
14	Manual shutoff valve on Unit #4 scrubber (upstream)	Closed	Open
15	Manual shutoff valve on Unit #4 scrubber (downstream)	Closed	Open

N FIGURE A.4.4.1(1)(o) Example Project Valve Line-Up.