NFPA®

59A

Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)

2019

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NFPA® 59A

Standard for the

Production, Storage, and Handling of Liquefied Natural Gas (LNG)

2019 Edition

This edition of NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, was prepared by the Technical Committee on Liquefied Natural Gas. It was issued by the Standards Council on November 5, 2018, with an effective date of November 25, 2018, and supersedes all previous editions.

This edition of NFPA 59A was approved as an American National Standard on November 25, 2018.

Origin and Development of NFPA 59A

A committee of the American Gas Association began work on a standard for liquefied natural gas circa 1960. In the autumn of 1964, a draft was submitted to NFPA with the request that it be considered as the basis for an NFPA standard. The Sectional Committee on Utility Gas prepared a standard that was adopted tentatively at the 1966 NFPA Annual Meeting at the recommendation of the Committee on Gases.

With the formation of the Committee on Fuel Gases in the summer of 1966, the standard was assigned to that committee and its subcommittee on Utility Gas Plants. The first official edition was adopted at the 1967 NFPA Annual Meeting under the sponsorship of the Committee on Fuel Gases.

By early 1969, it was apparent that the use of LNG was expanding considerably beyond the utility gas plant applications covered by the 1967 edition. The American Petroleum Institute suggested that one of its standards, PUBL 2510A, *Design and Construction of Liquefied Petroleum Gas (LPG) Installations*, be used to help develop a standard having a broader scope. The Committee on Liquefied Natural Gas was established for that purpose. The 1971 edition was the first edition of NFPA 59A developed under the broadened scope. Subsequent editions were adopted in 1972, 1975, 1979, 1985, 1990, 1994, 1996, and 2001.

The 2006 edition included revisions in compliance with the *Manual of Style for NFPA Technical Committee Documents*. Chapter 5 was revised to cover double and full containment LNG storage containers. Definitions of these types of containers were also added to the standard. Seismic design criteria for LNG containers were revised to correlate with the requirements of ASCE 7, *Minimum Design Loads for Buildings and Other Structures*. Chapter 11 was revised to add requirements for a contingency plan for potential LNG marine transfer incidents.

In the 2009 edition, additional vapor dispersion models were allowed where they are evaluated and approved by an independent body using the new Model Evaluation Protocol developed by the NFPA Research Foundation. The Design Spill table was revised to separate the design spill requirements for over-the-top fill/withdrawal containers, other containers, and process areas. Scope statements were added to each chapter, and the term *radiant heat flux* replaced *thermal radiation* throughout the document.

In the 2013 edition, Annex E, Performance-Based Alternative Standard for Plant Siting, was revised and relocated to the mandatory text as new Chapter 15, Performance (Risk Assessment) Based LNG Plant Siting. Use of the performance-based option required approval of the authority having jurisdiction. The performance-based option required analyzing the risks to persons and property in the area surrounding the proposed LNG plant based on risk mitigation techniques incorporated into the facility design. All of the minimum requirements of earlier chapters of NFPA 59A also had to be met. Chapter 15 provided several tables and figures to assist a facility designer in identifying those risks and determining if the risks are tolerable, as defined in Chapter 15.

The 2013 edition also incorporated several revisions to promote consistency between NFPA 59A and the Code of Federal Regulations, as well as some new terminology for tank systems. In addition, Chapters 7 and 14 were reorganized for easier use.

In the 2016 edition, several definitions were revised to establish a hierarchy of components, facilities, and plants. A new definition for *LNG facility* was added, and the definitions for *LNG plant* and *component* were revised to maintain consistency. Subsequent chapters were revised to correspond to the new definitions.

Additional changes were made to improve the fire safe design of outer concrete containers to avoid explosive spalling during a fire event. Revisions were made to requirements for inspections after repairs, detection of leaks, and post seismic events to provide greater confidence in the system's continued safety and integrity.

The 2016 edition also incorporated several revisions to enhance the use of Annex A. NFPA documents that had been listed in Annex A as informational references in previous editions were moved into Chapter 12 as enforceable code to address the design and installation requirements for fire protection systems. New and revised annex material was added to numerous sections to provide additional information, guidance, and clarification, as well as to point users to reference materials for further guidance.

The 2019 edition of the standard presents a reorganization of the requirements for plant siting and layout to facilitate better focus and implementation of these requirements. Elements of what had been in Chapter 5, Layout and Siting, are now presented separately as plant siting (Chapter 5), plant layout (Chapter 6), plant design (Chapter 12), impounding areas (Chapter 13), and mobile and temporary LNG facilities (Chapter 14). Annex C, Security, and Annex D, Training, are removed because their content in previous editions is now incorporated into the mandatory requirements of the standard. Also in this revision, the committee standardized the use of terminology.

Another notable change for NFPA 59A, 2019 edition, is the addition of a chapter to address small-scale LNG facilities. This chapter was built on what had been presented as requirements for ASME containers in this standard. However, the growth in the small- to mid-scale segment of the global LNG market prompted a re-evaluation of available storage technologies, including a single-wall ASME container with supplementary design and fabrication requirements. The committee developed Chapter 17, Requirements for Stationary Applications for Small Scale LNG Facilities, to establish the framework under which single-wall ASME containers used for LNG storage can be safely implemented at LNG facilities.

Technical Committee on Liquefied Natural Gas

Jeffrey K. Brightwell, *Chair*
Lake Charles LNG, LA [U]

Richard A. Hoffmann, *Secretary*
Hoffmann & Feige, NY [SE]

Jeffery J. Baker, McDermott, IL [M]
Rep. Steel Tank Institute/Steel Plate Fabricators Association

Donald Barber, Enmat International (UK), United Kingdom [SE]

Denise Beach, FM Global, MA [I]

Jeffrey P. Beale, CH-IV Corporation, MD [SE]

Christopher Bourne, Massachusetts Department of Public Utilities, MA [E]

Pat Convery, Cornerstone Energy Services, MA [U]
Rep. NFPA Industrial Fire Protection Section

Kevin J. Cox, JENSEN HUGHES, MA [SE]

Frank L. Del Nogal, BP America Inc., TX [U]

Brian L. Eisentrout, Venture Global LNG, DC [U]

Adnan Ezzarhouni, Gaztransport et Technigaz, France [M]

Mark E. Fessenden, Johnson Controls, WI [M]

Kevin Gallagher, Acushnet Fire & Rescue Department, MA [E]

James J. Gaughan, American Bureau of Shipping, NY [E]

Filippo Gavelli, GexCon U.S., MD [SE]

Constantyn Gieskes, Braemar Technical Services (Engineering) Inc., TX [SE]

Julie B. Halliday, U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, VA [E]
Rep. U.S. Department of Transportation

Ben Ho, Kelly Services, TX [SE]

Jay J. Jablonski, HSB PLC, CT [I]

Andrew Kohout, Federal Energy Regulatory Commission, DC [E]

Nicholas A. Legatos, Preload LLC, NY [M]
Rep. American Concrete Institute

Peter A. Micciche, ConocoPhillips, AK [U]

Shahzaad Mohammed, Cheniere Energy, TX [U]

Michael Jared Morrison, Starr Technical Risks Agency, Inc., TX [I]

Antonino Nicotra, Bechtel Oil Gas & Chemicals, TX [SE]

Kenneth L. Paul, Chart Industries, Inc., NH [M]

Gilford W. Poe, ExxonMobil Pipeline Company, TX [U]
Rep. American Petroleum Institute

Phani K. Raj, U.S. Department of Transportation Office of Safety, DC [E]
Rep. U.S. Department of Transportation

Kevin L. Ritz, Baltimore Gas & Electric Company, MD [U]
Rep. American Gas Association

Thomas V. Rodante, Baker Engineering & Risk Consultants, Inc., TX [SE]

Anthony J. Scaraggi, Distrigas of Massachusetts LLC, MA [U]

Mike Turney, Air Liquide, TX [M]

Scott J. Walden, Kinder Morgan Incorporated Southern LNG, GA [U]
Rep. American Gas Association

Alternates

David Michael Anderson, Cheniere Energy, TX [U]
(Alt. to Shahzaad Mohammed)

Alexander Cooperman, McDermott, IL [M]
(Alt. to Jeffery J. Baker)

Heather Ferree, Federal Energy Regulatory Commission, DC [E]
(Alt. to Andrew Kohout)

Michael Eugene Gardner, Dominion Energy Cove Point LNG, MD [U]
(Alt. to Scott J. Walden)

Alan D. Hatfield, Braemar Engineering, TX [SE]
(Alt. to Constantyn Gieskes)

Bernard W. Leong, Chevron Energy Technology Company, TX [U]
(Alt. to Gilford W. Poe)

Matt Martineau, Chart Industries, Inc., MN [M]
(Alt. to Kenneth L. Paul)

Sanjay Mehta, Preload Inc., NY [L]
(Alt. to Nicholas A. Legatos)

Davis R. Parsons, BWD Consulting, CA [U]
(Alt. to Peter A. Micciche)

Arthur Ransome, CH-IV International, MD [SE]
(Alt. to Jeffrey P. Beale)

Roberto Ruiperez Vara, LNG StartUp LLC, TX [SE]
(Alt. to Ben Ho)

Joseph Sieve, USDOT-PHMSA-OPS, DC [E]
(Alt. to Julie B. Halliday)

Hunter M. Stephens, Starr Technical Risks Agency, TX [I]
(Alt. to Michael Jared Morrison)

Susan Ann Stritter, Distrigas Of Massachusetts LLC, MA [U]
(Alt. to Anthony J. Scaraggi)

Raymond A. Wenzel, South Jersey Gas, NJ [U]
(Alt. to Kevin L. Ritz)

Nonvoting

Swapan Kumar Hazra, GF Natural Gas LNG Ltd/CNG Technology Ltd., India [U]

James P. Lewis, Jim Lewis LNG Expertise, TX [SE]
(Member Emeritus)

Lawrence Russell, 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 safety and related aspects in the liquefaction of natural gas and the transport, storage, vaporization, transfer, and use of liquefied natural gas.

Contents

NFPA 59A

Standard for the

Production, Storage, and Handling of Liquefied Natural Gas (LNG)

2019 Edition

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. 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 C. 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 C.

Chapter 1 Administration

1.1* Scope.

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 personnel involved with LNG

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

1.2 Purpose. The purpose of this standard is to provide minimum fire protection, safety, and related requirements for the siting, design, construction, security, operation, and maintenance of LNG plants.

1.3* 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.

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

N **1.3.2** The operator shall include any additional requirements to achieve equivalency in their procedures, as applicable.

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

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* SI Units. SI units in this standard shall be based on IEEE/ASTM SI 10, *American National Standard for Use of the International System of Units (SI): The Modern Metric System.*

1.5.1 Alternate usage of U.S. customary units and SI units on a single project shall not be used to lessen clearance distances.

1.6 Pressure Measurement. All pressures expressed in this document are gauge pressures unless specifically noted otherwise.

1.7 Referenced Standards. Reference is made to both U.S. and Canadian standards, because this standard is prepared for use in both the United States and Canada, as well as in other countries.

1.7.1 Where this standard is adopted, the adoption shall include a statement of which U.S. or Canadian reference standards shall be used.

1.7.2 If no such statement is made, the user shall use either all available U.S. or all available Canadian reference standards.

1.7.3 If other reference standards are to be used, it shall be so stated.