# NFPA 59A Second Draft Meeting Agenda

**Technical Committee on Liquefied Natural Gas (LNG-AAA)**
**59A Second Draft Meeting (F2022)**

April 26th and 27th, 2022
1:00 p.m. – 5:00 p.m. (Eastern)

Web/Teleconference
To join the meeting, please contact Kristi Smith (ksmith@nfpa.org)

1. **Call to order.** Jeff Brightwell.
2. **Introductions.** See committee roster attached.
3. **Chair report.** Jeff Brightwell.
4. **Staff liaison report.** Alex Ing.
5. **Previous meeting minutes.** April 2021 Web/Teleconference. See attached.
6. **NFPA 59A Second Draft.**
   a. **Public Comments.** See attached.
   b. **Task group report(s).**
      i. **Hazardous Fluid Standardization**.
      ii. **Failure Rates**. Jeff Marx.
      iii. **Electrical Area Classification Figures**. Elmer Revillia.
   c. **Committee Inputs.** See attached.
7. **Other Business.**
8. **Future meetings.**
9. **Adjournment.**

# Address List No Phone

02/25/2022
Alex Ing
**LNG-AAA**

## Liquefied Natural Gas

**Jeffrey K. Brightwell** — **U** 11/2/2006
**Chair** — **LNG-AAA**
Lake Charles LNG
8100 Big Lake Road
Lake Charles, LA 70605

**Alex Ing** — 09/26/2019
**Secretary (Staff-Nonvoting)** — **LNG-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169

**Jeffery J. Baker** — **M** 04/08/2015
**Principal** — **LNG-AAA**
McDermott
14105 South Route 59
Plainfield, IL 60544-8984
**Steel Tank Institute/Steel Plate Fabricators Association**
**Alternate: Alexander Cooperman**

**Denise Beach** — **I** 08/17/2015
**Principal** — **LNG-AAA**
FM Global
1151 Boston-Providence Tpke
PO Box 9102
Norwood, MA 02062-9102
**FM Global**

**Jeffrey P. Beale** — **SE** 7/1/1994
**Principal** — **LNG-AAA**
LCH4 Corporation
2131 Shell Ring Circle
Mount Pleasant, SC 29466
**Alternate: Arthur Ransome**

**Joshua Bruce-Black** — **SE** 12/07/2018
**Principal** — **LNG-AAA**
Bakerrisk Engineering & Risk Consultants, Inc.
4442 Center Street
Houston, TX 77007

**Pat Convery** — **U** 10/29/2012
**Principal** — **LNG-AAA**
Cornerstone Energy Services
172 Shrewsbury Street
Worcester, MA 01604
**NFPA Industrial Fire Protection Section**

**Michael J. Cooney** — **SE** 12/07/2021
**Principal** — **LNG-AAA**
R. A. Hoffmann Engineering P. C./FEIGE
3 Fallsview Lane
Brewster, NY 10509
**Alternate: Richard A. Hoffmann**

**Kevin J. Cox** — **SE** 04/04/2017
**Principal** — **LNG-AAA**
JENSEN HUGHES
100 Quannapowitt Parkway
Suite 401
Wakefield, MA 01880
**Alternate: Anil Kapahi**

**Scott G. Davis** — **SE** 12/07/2018
**Principal** — **LNG-AAA**
GexCon US
4833 Rugby Avenue, Suite 100
Bethesda, MD 20814-3035

**Frank L. Del Nogal** — **U** 10/28/2014
**Principal** — **LNG-AAA**
BP America Inc.
201 Helios Way
Houston, TX 77079-2604
**Alternate: Samuel M. Miller**

**Brian L. Eisentrout** — **U** 10/23/2003
**Principal** — **LNG-AAA**
Venture Global LNG
2200 Pennsylvania Avenue, NW
Suite 600W
Washington, DC 20037-1748

**Adnan Ezzarhouni** — **M** 08/17/2015
**Principal** — **LNG-AAA**
Gaztransport et Technigaz
1 Route De Versailles
St Remy Les Chevreuse, 78470 France
**Alternate: Fabien Pesquet**

**Mark E. Fessenden** — **M** 03/07/2013
**Principal** — **LNG-AAA**
Johnson Controls
One Stanton Street
Marinette, WI 54143-2542

# Address List No Phone

02/25/2022
Alex Ing
**LNG-AAA**

## Liquefied Natural Gas

**Filippo Gavelli** **SE** 07/26/2007
**Principal** **LNG-AAA**
Blue Engineering and Consulting
10020 Baltimore National Pike
#6364
Ellicott City, MD 21042
**Alternate: Phil J Suter**

**Constantyn Gieskes** **SE** 8/9/2011
**Principal** **LNG-AAA**
Braemar Technical Services (Engineering) Inc.
2800 North Loop West
Suite 900
Houston, TX 77092
**Alternate: Alan D. Hatfield**

**Jay J. Jablonski** **I** 7/24/1997
**Principal** **LNG-AAA**
HSB PLC
1 State Street, 9th Floor
Hartford, CT 06103-3199

**Andrew Kohout** **E** 04/05/2016
**Principal** **LNG-AAA**
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
**Alternate: Heather Ferree**

**Nicholas A. Legatos** **M** 1/1/1985
**Principal** **LNG-AAA**
Preload LLC
125 Kennedy Drive, Suite 500
Hauppauge, NY 11788-4030
**American Concrete Institute**
**Alternate: Sanjay Mehta**

**Bernard W. Leong** **U** 08/11/2014
**Principal** **LNG-AAA**
Chevron Energy Technology Company
Design & Technical Safety Unit
1400 Smith, Room 21037
Houston, TX 77002
**American Petroleum Institute**

**Michael Jared Morrison** **I** 08/11/2014
**Principal** **LNG-AAA**
Starr Technical Risks Agency, Inc.
8401 North Central Expressway
Suite 515
Dallas, TX 75225-4420
**Alternate: Hunter M. Stephens**

**Thach Nguyen** **E** 08/11/2020
**Principal** **LNG-AAA**
Department of Transportation
3401 N Centrelake Drive
Suite 550B
Ontario, CA 91761
**US Department of Transportation**
Training and Education
**Alternate: Chad T Hall**

**Antonino Nicotra** **SE** 10/29/2012
**Principal** **LNG-AAA**
Bechtel Oil Gas & Chemicals
3000 Post Oak Boulevard
Houston, TX 77056
**Alternate: Jegan Babu Arumugakan Thuraiswamy**

**Kenneth L. Paul** **M** 1/1/1983
**Principal** **LNG-AAA**
Chart Industries, Inc.
Storage Systems Division
9 Woodside Way
Atkinson, NH 03811
**Alternate: Matt Martineau**

**John R. Puskar** **L** 04/14/2021
**Principal** **LNG-AAA**
Prescient Technical Services LLC
2078 Ridge Road
Hinckley, OH 44233
**United Steelworkers**

**Phani K. Raj** **E** 01/14/2004
**Principal** **LNG-AAA**
US Department of Transportation Office of Safety
Federal Railroad Administration
52 Toby Circle
Merrimack, NH 03054
**US Department of Transportation**
Railroad

# Address List No Phone

02/25/2022
Alex Ing
**LNG-AAA**

## Liquefied Natural Gas

**April Dawn Richardson** **E** 04/02/2020
**Principal** **LNG-AAA**
Railroad Commission of Texas
1701 North Congress Avenue
PO Box 12967
Austin, TX 78711

**Kevin L. Ritz** **U** 10/27/2005
**Principal** **LNG-AAA**
Baltimore Gas & Electric Company
1699 Leadenhall Street
Baltimore, MD 21230
**American Gas Association**
Peak Shaving
**Alternate: Raymond A. Wenzel**

**Roberto Ruiperez Vara** **SE** 04/04/2017
**Principal** **LNG-AAA**
LNG StartUp LLC
3918 Emerald Lake Drive
Missouri City, TX 77459-6546

**Anthony J. Scaraggi** **SE** 10/29/2012
**Principal** **LNG-AAA**
AJS Consulting and Advisement
1120 11 Terrace
Palm Beach Gardens, FL 33418
**Alternate: Francis J. Katulak**

**Kenneth A. Smith** **E** 04/02/2020
**Principal** **LNG-AAA**
US Coast Guard
Commandant (CG-5222)
2703 MLK Jr. Avenue
SE
Washington, DC 20593-7126

**Susan Ann Stritter** **U** 08/17/2017
**Principal** **LNG-AAA**
Exelon/Distrigas Of Massachusetts LLC
18 Rover Street
Everett, MA 02149

**Mike Turney** **M** 12/06/2017
**Principal** **LNG-AAA**
Air Liquide
9807 Katy Freeway
Houston, TX 77024
**Alternate: Christophe Szamlewski**

**Michael Eugene Gardner** **U** 12/06/2017
**Voting Alternate** **LNG-AAA**
Dominion Energy Cove Point LNG
2100 Cove Point Road
Lusby, MD 20657
**American Gas Association**

**Jegan Babu Arumugakan Thuraiswamy** **SE** 12/02/2020
**Alternate** **LNG-AAA**
Bechtel Oil Gas Chemicals Inc.
3000 Post Oak Boulevard
Houston, TX 77056
**Principal: Antonino Nicotra**

**Alexander Cooperman** **M** 04/04/2017
**Alternate** **LNG-AAA**
McDermott
14105 South Route 59
Plainfield, IL 60544
**Steel Tank Institute/Steel Plate Fabricators Association**
**Principal: Jeffery J. Baker**

**Heather Ferree** **E** 04/05/2016
**Alternate** **LNG-AAA**
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426
**Principal: Andrew Kohout**

**Chad T Hall** **E** 08/11/2020
**Alternate** **LNG-AAA**
USDOT- Pipeline and Hazardous Material Safety
Administration (PHMSA)
8701 S. Gessner Road
Suite 630
Hosuton, TX 77074
**US Department of Transportation**
Training and Education
**Principal: Thach Nguyen**

# Address List No Phone

02/25/2022
Alex Ing
**LNG-AAA**

## Liquefied Natural Gas

**Alan D. Hatfield** **SE** 10/29/2012
**Alternate** **LNG-AAA**
Poten & Partners/ Braemar Engineering
13000 Hunters Creek Road
College Station, TX 77845
**Principal: Constantyn Gieskes**

**Richard A. Hoffmann** **SE** 1/1/1979
**Alternate** **LNG-AAA**
Hoffmann & Feige
Croton River Executive Park
3 Fallsview Lane
Brewster, NY 10509
**Principal: Michael J. Cooney**

**Anil Kapahi** **SE** 08/11/2020
**Alternate** **LNG-AAA**
JENSEN HUGHES
3610 Commerce Drive #817
Baltimore, MD 21227
**Principal: Kevin J. Cox**

**Francis J. Katulak** **SE** 12/02/2020
**Alternate** **LNG-AAA**
Sempra LNG
502 S. Post Oak Lane
Apartment 240
Houston, TX 77056
**Principal: Anthony J. Scaraggi**

**Matt Martineau** **M** 08/11/2014
**Alternate** **LNG-AAA**
Chart Industries, Inc.
407 7th Street, NW
New Prague, MN 56071-1010
**Principal: Kenneth L. Paul**

**Sanjay Mehta** **L** 04/11/2018
**Alternate** **LNG-AAA**
Preload Inc.
Chief Engineer
8 Slope Lane
Hauppauge, NY 11788
**American Concrete Institute**
**Principal: Nicholas A. Legatos**

**Samuel M. Miller** **U** 04/14/2021
**Alternate** **LNG-AAA**
BP America Inc.
501 Westlake Park Boulevard
Houston, TX 77079
**Principal: Frank L. Del Nogal**

**Fabien Pesquet** **M** 08/11/2020
**Alternate** **LNG-AAA**
Gaztransport & Technigaz (GTT)
1 Route De Versailles
Saint Remy Les Chevreuse, ILE-DE-FRANCE 78470 France
**Principal: Adnan Ezzarhouni**

**Arthur Ransome** **SE** 07/29/2013
**Alternate** **LNG-AAA**
Clough Group/ CH-IV International
7467 Ridge Road
Suite 200
Hanover, MD 21076
**Principal: Jeffrey P. Beale**

**Hunter M. Stephens** **I** 04/11/2018
**Alternate** **LNG-AAA**
Starr Technical Risks Agency
One Lincoln Park
8401 N Central Expressway Suite 515
Dallas, TX 75225
**Principal: Michael Jared Morrison**

**Phil J Suter** **SE** 04/03/2019
**Alternate** **LNG-AAA**
Blue Engineering and Consulting
10020 Baltimore National Pike
#6364
Ellicott City, MD 21042
**Principal: Filippo Gavelli**

**Christophe Szamlewski** **M** 08/24/2021
**Alternate** **LNG-AAA**
Air Liquide
57 Carnot Avenue
Champigny Sur Marne, VAL DE MARNE 94503 France
**Principal: Mike Turney**

# Address List No Phone

02/25/2022
Alex Ing
**LNG-AAA**

## Liquefied Natural Gas

**Raymond A. Wenzel** U 08/17/2015

**Alternate** **LNG-AAA**
South Jersey Gas
215 Cates Road
Egg Harbor Township, NJ 08234-5286
**American Gas Association**
Peak Shaving
**Principal: Kevin L. Ritz**

**Alex Ing** 09/26/2019

**Staff Liaison** **LNG-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169

**Swapan Kumar Hazra** U 4/28/2000

**Nonvoting Member** **LNG-AAA**
TOREDO E Technical Services LLP.
BG-172, Sector 2, Salt Lake
PO: Bidhan Nagar
Kolkata, West Bengal, 700091 India

# Technical Committee on Liquefied Natural Gas

# NFPA 59A FIRST DRAFT MEETING MINUTES

Tuesday, April 20, 1:00pm. – 4:00 p.m.
Wednesday, April 21, 1:00pm. – 4:00 p.m.
Thursday, April 22, 1:00pm. – 4:00 p.m.
Tuesday, April 27, 1:00pm. – 4:00 p.m.
Thursday, April 29, 1:00pm. – 4:00 p.m.

All times are Eastern

Web/Teleconference

## 1. Attendance

| | Name | Representation | Class | Day: 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| **Chair** | Jeff Brightwell | Lake Charles LNG | SE | X | X | X | X | X |
| **Staff Liaison** | Alexander Ing | NFPA | Staff | X | X | X | X | X |
| | | | | | | | | |
| **Principals** | Jeffery Baker | McDermott | M | X | X | X | X | X |
| | Denise Beach | FM Global | I | X | | X | X | X |
| | Jeffery Beale | LCH4 Corporation | SE | X | X | | | X |
| | Pat Convery | Cornerstone Energy Services<br>Rep. NFPA Industrial Fire Protection Section | U | X | X | X | X | X |
| | Kevin Cox | Jensen Hughes | SE | X | X | X | | |
| | Scott Davis | GexCon US | SE | X | X | X | X | X |
| | Frank Del Nogal | BP America Inc. | U | X | X | X | X | X |
| | Brian Eisentrout | Venture Global LNG | U | X | X | X | X | X |
| | Mark Fessenden | Johnson Controls | M | X | X | X | X | |
| | Kevin Gallagher | Acushnet Fire & Rescue Department | E | X | | X | X | X |
| | Filippo Gavelli | Blue Engineering and Consulting | SE | | X | X | X | X |
| | Jay Jablonski | HSB PLC | I | X | X | X | X | X |
| | Andrew Kohout | Federal Energy Regulatory Commission | E | X | X | X | X | X |
| | Nicholas Legatos | Preload LLC<br>Rep. American Concrete Institute | M | X | X | X | X | |
| | Joseph Meyer | R.A. Hoffmann Engineering, P.C. | SE | X | | | | |
| | Michael Morrison | Starr Technical Risks Agency, Inc. | I | | | X | X | X |
| | Thach Nguyen | US Department of Transportation | E | X | X | X | X | X |
| | Antonino Nicotra | Bechtel Oil Gas & Chemicals | SE | X | X | X | X | X |
| | Kenneth Paul | Chart Industries, Inc. | M | X | X | X | X | X |
| | Gilford Poe | | | X | X | X | X | X |
| | Phani Raj | US Department of Transportation, Office of Safety | E | X | | X | | |
| | April Richardson | Railroad Commission of Texas | E | | X | X | X | X |

| | Name | Representation | Class | Day: 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| | Kevin Ritz | Baltimore Gas & Electric Company Rep. American Gas Association | U | X | X | X | X | X |
| | Thomas Rodante | Baker Engineering & Risk Consultants, Inc. | SE | X | X | | X | |
| | Anthony Scaraggi | AJS Consulting and Advisement | SE | X | X | X | X | X |
| | Kenneth Smith | US Coast Guard | SE | X | X | X | | X |
| | Susan Stritter | Exelon/Distrigas Of Massachusetts LLC | U | X | X | X | X | X |
| | Mike Turney | Air Liquide | M | X | X | X | X | X |
| | Michael Gardner | Dominion Energy Cove Point LNG | U | X | X | X | X | X |
| | Roberto Vara | LNG StartUp LLC | SE | X | | | X | X |
| | | | | | | | | |
| **Alternates** | Jegan Thuraiswamy | Bechtel Oil Gas Chemicals Inc. | SE | X | | X | X | |
| | Joshua Bruce-Black | Baker Risk Engineering & Risk Consultants, Inc. | SE | X | X | X | X | |
| | Alexander Cooperman | McDermott | M | X | X | X | X | X |
| | Chad Hall | US Department of Transportation | E | X | X | X | X | X |
| | Alan Hatfield | Braemar Engineering | SE | X | X | | X | |
| | Richard Hoffmann | R.A. Hoffmann Engineering, P.C. | SE | X | X | X | X | |
| | Anil Kapahi | Jensen Hughes | SE | X | X | X | X | X |
| | Francis Katulak | Sempra LNG | SE | X | X | X | X | |
| | Bernard Leong | Chevron Energy Technology Company Rep. American Petroleum Institute | U | | | X | X | |
| | Matt Martineau | Chart Industries, Inc. | M | X | | | X | X |
| | Sanjay Mehta | Preload Inc. Rep. American Concrete Institute | L | | | X | X | X |
| | Fabien Pesquet | Gaztransport & Technigaz (GTT) | M | X | X | | X | X |
| | Arthur Ransome | LCH4 Corporation | SE | | X | X | X | |
| | Hunter Stephens | Starr Technical Risks Agency | I | X | X | | | |
| | Phil Suter | Blue Engineering and Consulting | SE | X | X | X | X | X |
| | Raymond Wenzel | South Jersey Gas Rep. American Gas Association | U | X | X | X | X | X |
| | | | | | | | | |
| **Guests** | Scott Walden | Exelon Power | - | X | | | | |
| | Bob Bachman | Robert Bachman Structural Engineer | - | X | X | X | X | X |
| | Jeff Marx | Quest Consultants | - | X | X | X | X | |
| | Zach Dotson | LCH 4 Corporation | - | X | X | X | X | X |
| | Kerry Sutton | American Concrete Institute | - | X | X | x | X | X |

2. **Call to Order.** Meeting was called to order by Chair Jeffrey Brightwell at 1:00 pm

3. **Opening Remarks.** Opening remarks were made by Chairman Jeffrey Brightwell.

4. **Approval of Fall 2018 Second Draft Meeting Minutes**

- The January 29-February 1, 2018 Second Draft Meeting Minutes and March 15, 2018 Second Draft Continuation Meeting Minutes were approved as submitted

**5. Staff Liaison Report.**

**a. Alex Ing.**

**6. NFPA 59A Public Inputs**

*a.* Public inputs were reviewed and first revisions created.

**7. Task Group Reports**.

*a.* The following task groups reported and revisions were created. These task groups were then disbanded with the thanks of the committee.

*i.* Technical Comments
*ii.* Editorial Comments
*iii.* Encapsulator Fire Protection Task Group

*b.* The following task groups were created at the first draft meeting. If you are interested in becoming an active member of any of the following task group please contact Elena Carroll at ecarroll@nfpa.org

*i.* Failure Rate Task Group

*1.* Scope: To revise this table 19.6 with equipment failure rates and QRA application.
*2.* Task Group Members

*a.* Jeff Marx (Chair)
*b.* Filippo Gavelli
*c.* Antonino Nicotra
*d.* Andrew Kohout
*e.* Jegan Thuraiswamy
*f.* Jeff Baker
*g.* Tom Drube

*ii.* Hazardous Fluid Standardization

*1.* Scope: The Task Group is looking to review the terms Hazardous Fluid, Hazardous Liquid, Flammable Liquid, and Flammable Fluid for consistency in use and definition throughout the document.
*2.* Task Group Members

a. Brian Eisentrout
b. Jay Jablonski
c. Mike Turney
d. Antonino Nicotra
e. Phil Suter
f. Bob Bachman
g. Jeffery Brightwell
h. Andrew Kohout

8. **Adjournment.**
    *a.* The meeting was adjourned on Thursday April 29th at approximately 3:00 pm Eastern.

Respectfully Submitted By:
Jeff Brightwell- Technical Committee Chair
Alexander Ing- NFPA Staff Liaison.

# Public Comment No. 4-NFPA 59A-2022 [ Global Input ]

**The subcommittee Hazardous fluids has reviewed the test of NFAP59A and aligned it with other NFPA standards and clarified the use of "flammable" replacing it where appropriate with ignitable. Since LNG is a hazardous fluid by definition the wording has been simplified to eliminate "LNG and other hazardous fluids". Other changes clarify where liquids or vapors are intended to be used. The attached files shows the edits throughout the document.**

## Additional Proposed Changes

| File Name | Description | Approved |
|---|---|---|
| Hazardous_Fluid_TG.docx | Hazardous Fluid Subcommittee edit of NFPA 59A | |

## Statement of Problem and Substantiation for Public Comment

NFPA 59A has inconsistent application of flammable fluid, flammable liquid and hazardous fluid. The edit provided corrects those inconsistencies and replaces flammable with ignitable where appropriate and aligns NFPA 59A with definitions and application of these terms in other standards.

**Related Item**

• PI-56 and PI-57

## Submitter Information Verification

**Submitter Full Name:** Brian Eisentrout
**Organization:** Venture Global LNG
**Street Address:**
**City:**
**State:**
**Zip:**
**Submittal Date:** Tue Jan 04 09:21:42 EST 2022
**Committee:** LNG-AAA

**New Definition:**
**3.3.X Ignitible Fluid**
A liquid or gas that is ignitible

A.3.3.X LNG is considered to be an ignitible fluid.

A liquid or gas is ignitible if it upon its release is above its open cup flash point as measured by recognized testing standards or an approved closed cup flash point test.

Below are some recognized testing standards:
a) ASTM D92, Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester;
b) ASTM D1310, Standard Test Methods for Flash Point and Fire Point of Liquids by Tag Open Cup Tester;
c) ASTM E502, Standard Test Method for Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals for by Closed Cup Methods;
d) ASTMD56, Standard Test Method for Flash Point by Tag Closed Cup Tester;
e) ASTM D93 Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester;

**Extract Cryogenic Fluid from NFPA 55**

**3.3.XX Cryogenic Fluid**
**A fluid with a boiling point lower than -130°F (–90°C) at an absolute pressure of 14.7 psi (101.3 kPa)**

**3.3.16 Hazardous Fluid.**
A liquid or gas that is flammable, toxic, or corrosive.

A.3.3.15
LNG is considered to be a hazardous fluid. For corrosive fluids the concern is skin corrosivity rather then material corrosivity.

**3.3.30 Stationary System.**
All equipment associated with the system is fixed from movement and does not incorporate "make or break" connections between each associated piece of equipment, except for those connections used for transfer of fluids into or from the system that are manned by trained personnel during those transfers.

**3.3.35* Transfer Area.**
The portion of an LNG plant where LNG or other hazardous fluids are introduced into or removed from the plant and where necessary connections are connected or disconnected routinely.

**4.11.3**
Portable electric tools and extension lights capable of igniting ignitible fluids shall not be permitted within classified areas except where the area has been identified as free of ignitible fluids.

5.3.1.3
Where there is a possibility for hazardous fluid releases to accumulate liquid on the ground and endanger adjoining property, occupied buildings, important process equipment and structures, or reach waterways, the following areas shall be graded, drained, or provided with impoundment:

1. Process areas
2. Vaporization areas
3. Liquefaction areas
4. Transfer areas
5. Storage areas

**Table 5.3.2.3**
**Piping and Other Equipment**

**5.3.2.7* Flammable Gas or Vapor Dispersion.**

The siting of the plant shall be such that, in the event of an ignitible fluid release as specified in 5.3.2.3, a predicted concentration to the lower flammability limit (LFL) does not extend beyond the property line that can be built upon.

**5.3.2.10 Fires.**
The siting of the plant shall be such that, in the event of an ignitible fluid release as specified in 5.3.2.3, a maximum radiant heat flux from a fire shall not exceed the limits listed in Table 5.3.2.10.

**5.3.2.12 Cascading Damage**.
Equipment shall be located or protected so that impacts from 5.3.2.9 and 5.3.2.10 shall not cause major structural damage that can lead to failure of any LNG storage container, LNG marine carrier, hazardous fluid storage vessel, important buildings, or equipment required for the safe shutdown and control of the hazard that would exacerbate the initial hazard.

**6.4.1**
Vaporizers using ignitible fluids for heat transfer as their primary heat sources shall be located at least 50 ft (15 m) from any other source of ignition.

**6.4.2***
The fired components of an integral heated vaporizer shall be located as follows
1. At least 50 ft (15 m) from any impounding area for ignitible fluids (see Section 6.3) or the paths of travel of such fluids between any other source of accidental discharge and the impounding area
2. At least 50 ft (15 m) from ignitible fluids storage containers or tanks; unfired process equipment containing such fluids; or loading and unloading connections used in the transfer of such fluids
3. At least 50 ft (15 m) from control buildings, offices, shops, and other occupied or important plant structures
4. At least 100 ft (30 m) from property line that can be built upon (see 6.4.4)

**6.7.2**
Buildings not covered by Sections 12.5 through 12.7 shall be located no less than 50 ft (15 m) from tanks, vessels, and gasketed or sealed connections to equipment containing ignitible fluids.

**7.3.1**
Process system equipment containing ignitible fluids shall be installed in accordance with one of the following:
1. Outdoors, for ease of operation, to facilitate manual fire-fighting, and to facilitate dispersal of accidentally released liquids and gases
2. Indoors, in enclosing structures that comply with Sections 12.5 through 12.7

**7.5** Hazardous Fluid Storage.

**7.5.1**
Storage containers and equipment for hazardous liquids other than LNG shall comply with NFPA 30; NFPA 58; NFPA 59; API Std 2510, Design and Construction of Liquefied Petroleum Gas (LPG) Installations, as applicable; or Section 5.3 of this standard

**7.5.2***
Design and specification of storage tanks for hazardous liquids shall be in accordance with recognized standards.

**7.5.3***
Venting of atmospheric and low-pressure hazardous liquid tanks shall be in accordance with recognized standards.

**9.4.4**

Where a ignitible fluid used as an intermediate fluidis used with a vaporizer, shutoff valves shall be provided on both the hot and the cold lines of the intermediate fluid system with the controls at least a 50 ft (15 m) radius from the vaporizer.

**10.2.1.2**
The additional provisions of this chapter supplement those in ASME B31.3, Process Piping, and shall apply to piping systems and components for hazardous fluid service.

**10.3.2.5**
A liquid line on a container, cold box, or other insulated equipment external to the outer shell or jacket, whose failure can release a significant quantity of hazardous fluid , shall not be made of aluminum, copper or copper alloy, or material with a melting point of less than 2000°F (1093°C).

**10.3.2.8**
Cast iron, malleable iron, and ductile iron pipe shall not be used for hazardous fluids.

**10.3.3.2**
Cast iron, malleable iron, and ductile iron fittings shall not be used for hazardous fluids.

**10.4.2.11**
A piping system used for periodic transfer of cryogenic fluid shall be provided with a means for precooling before transfer.

**10.5 Isolation of Hazardous Fluid Equipment and Systems.**

**10.5.1**
The design for isolating equipment, systems, or piping in hazardous fluid service for maintenance, routine idle operation, or seasonal shutdowns shall consider the properties and operating pressure of the hazardous fluid.

**10.5.2**
Where any leakage of hazardous fluid through a primary isolation device, such as a valve, can generate a safety or operational hazard, a second isolation device shall be used.

**10.8.4.1**
Nondestructive examination methods, limitations on defects, and the qualifications of the personnel performing and interpreting the examinations shall meet the requirements of Chapter VI, Sections 341 through 344, of ASME B31.3, Process Piping, and the following:

1. The requirements of Normal Fluid Service shall apply as a minimum for examination acceptance criteria, unless specified otherwise in the engineering design.
2. Personnel performing nondestructive examinations (NDE) shall, as a minimum, be qualified Level I per ASNT SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing, or an equivalent qualification standard.
3. Personnel interpreting nondestructive examinations shall, as a minimum, be qualified Level II per ASNT SNT-TC-1A or an equivalent qualification standard.
4. NDEs shall be performed in accordance with written procedures meeting all the requirements of Section V of the ASME Boiler and Pressure Vessel Code, as applicable to the specific NDE method.

**10.13.2.2**
As a minimum, Normal Fluid Service requirements shall be met, unless specified otherwise in the engineering design.

**10.13.3.1**
As a minimum, Normal Fluid Service requirements shall be met, unless specified otherwise in the engineering design.

**11.3.2*** Tanks for Ignitible Fluids
**11.3.2.1**
Each storage tank shall be equipped with two independent liquid level gauging devices.

**11.3.2.2**
If it is possible to overfill the tank, a high-liquid-level alarm shall be provided in accordance with 11.3.1.3.

**11.3.2.3**
The requirements of 11.3.1.4 shall apply to installations of ignitible fluids

**11.4.2**
Each non-LNG hazardous fluid container shall be equipped with a pressure gauge connected to the container at a point above the maximum intended liquid level for continuous monitoring and high- and low-pressure alarms.

**11.9.3***
Electrically classified areas shall be as specified in Table 11.9.2 and as specified by recognized methods that account for the properties of the fluids potentially released such as highly volatile liquids (HVLs) and the conditions such as operating pressure, density, temperature, and volume.

**11.9.6***
Each interface between a ignitible fluid system and an electrical conduit or wiring system, including process instrumentation connections, integral valve operators, foundation heating coils, canned pumps, and blowers, shall be sealed or isolated to prevent the passage of ignitible fluids to another portion of the electrical installation in accordance with the requirements in this standard, Article 501.17 of NFPA 70, and ISA 12.27.01, Requirements for Process Sealing Between Electrical Systems and Flammable or Combustible Process Fluids.

**11.9.6.2**
A primary seal shall be provided between the ignitible fluid flammable fluid system and the electrical conduit wiring system.

**11.9.6.2.1**
If the failure of the primary seal allows the passage of ignitible fluids to another portion of the conduit or wiring system, an additional approved seal, barrier, or other means shall be provided to prevent the passage of the ignitible fluids beyond the additional device or means if the primary seal fails.

**11.9.7**
Where primary seals are installed, drains, vents, or other devices shall be provided to detect ignitible fluids and leakage

**12.1 Design Classification.**

Buildings, structures, and systems, including equipment and piping, shall be classified in accordance with the following:

1. *Classification A: LNG tank systems, buildings, structures, and systems, including equipment and piping, as defined in 8.4.14.6(3)
2. Classification B: Buildings, enclosures, and structures, including the main control room, supporting containers other than LNG tank systems, equipment, and piping, that contain hazardous fluids, as well as containers other than LNG tank systems, equipment, and piping that contain hazardous fluids that are not in a building. In addition, Classification B includes all other components used in the natural gas and LNG process, including natural gas pre-treatment, liquefaction, vapor handling, vaporization, and transfer systems
3. Classification C: All other buildings, equipment, piping, and structures

12.6 * Fire and Explosion Control.
Rooms containing ignitible fluids, if located within or attached to buildings in which such fluids are not handled shall be designed for fire and explosion control in accordance with the following:

1. Deflagration venting shall be provided in accordance with NFPA 68.

2. Common walls shall have no doors or other communicating openings.
3. Common walls shall have a fire-resistance rating of at least 1 hour.

A.12.6
Buildings in which ignitible fluids are not handled are buildings such as control centers and shops.

13.12.2
Water removal systems shall be as follows:
1. Operated as necessary to keep the impounding area as dry as practical
2. If designed for automatic operation, have redundant automatic shutdown controls to prevent operation when hazardous fluids are present
3. If water removal systems are designed for manual operation, have a means or procedure to prevent hazardous fluids from escaping through piping or valves

Chapter 15 Transfer Systems for Hazardous Fluids

16.1.1

This chapter covers equipment and procedures designed to minimize the consequences from released hazardous fluids in facilities constructed and arranged in accordance with this standard.

16.2.1.2*
The fire protection evaluation shall be conducted and fire protection equipment installed before the introduction of hazardous fluids at new plants or significantly altered facilities.

16.2.2*
The evaluation shall determine the following:

1. The type, quantity, and location of equipment necessary for the detection and control of fires, leaks, and spills of hazardous fluids
2. The type, quantity, and location of equipment necessary for the detection and control of potential nonprocess and electrical fires
3. The methods necessary for protection of the equipment and structures from the effects of fire exposure
4. Requirements for fire protection water systems
5. *Requirements for fire-extinguishing and other fire control equipment
6. The equipment and processes to be incorporated within the emergency shutdown (ESD) system, including analysis of subsystems, if any, and the need for depressurizing specific vessels or equipment during a fire emergency or hazardous release
7. The type and location of sensors necessary to initiate automatic operation of the ESD system or its subsystems
8. The availability and duties of individual plant personnel and the availability of external response personnel during an emergency
9. *The personal protective equipment, special training, and qualification needed by individual plant personnel for their respective emergency duties as specified by NFPA 600
10. Requirements for other hazard protection equipment and systems

16.3.1*
Each LNG facility shall have an ESD system(s) to isolate or shut off a source of hazardous fluids, and to shut down equipment whose continued operation could add to or sustain an emergency.

16.3.4
If equipment shutdown will introduce a hazard or result in mechanical damage to equipment, the shutdown of any equipment or its auxiliaries shall be omitted from the ESD system if the effects of the continued release of ignitible fluids controlled.

16.4.1

Areas, including enclosed buildings and enclosed drainage channels, that can have the presence of hazardous fluids during normal operation or following an accidental release shall be monitored as required by the evaluation in 16.2.1.

17.1.2

This chapter provides an alternative set of requirements for LNG plants that meet all of the following limitations:

1. LNG storage capacity complies with one of the following:
    a. Individual LNG container water capacity not exceeding 264,000 gal (1000 m3) water capacity with an aggregate 1,056,000 gal (3997 m3) water capacity of LNG storage constructed in accordance with the ASME Boiler and Pressure Vessel Code
    b. LNG tank systems with an aggregate capacity not exceeding 1,056,000 gal (3997 m3) water capacity of LNG storage
2. Aggregate mass of ignitible fluids, excluding methane and LNG, not exceeding 25,000 lb (11,340 kg) and individual tanks with a storage capacity not exceeding 10,000 lb (4536 kg)
3. Toxic fluids with a 60-minute AEGL-2 of 10,000 ppm or less and an aggregate mass of toxic fluids not exceeding 25,000 lb (11,340 kg) and individual tanks with a storage capacity not exceeding 10,000 lb (4536 kg)
4. LNG container liquid line penetrations not exceeding 6 in. (15.24 cm) nominal pipe size
5. LNG container design pressure not exceeding 300 psi (2068 kPa)

17.8.2
All other process piping in hazardous fluid service shall be in accordance with Chapter 10 and ASME B31.3, Process Piping.

17.12 Transfer Systems for Hazardous Fluids.
Transfer systems for hazardous fluids shall comply with Chapter 15, Transfer Systems for Hazardous Fluids.

17.13 Fire Protection, Safety, and Security.
Fire protection, safety, and security shall comply with Chapter 16, Fire Protection, Safety, and Security.

17.14 Operating, Maintenance, and Personnel Training.
Operating, maintenance, and personnel training shall comply with Chapter 18, Operating, Maintenance, and Personnel Training, with the follow differences:

1. Positive identification of all persons entering the plant and in the plant shall be required in lieu of requirements in 18.5.1(6).
2. Vehicle traffic shall be prohibited on the pier or dock within 100 ft (30 m) of the loading and unloading or shorter distances as approved while transfer operations are in progress in lieu of requirements in 18.8.7.4.1.
3. General cargo, other than ships' stores for the LNG tank vessel, shall not be handled over a pier or dock within 100 ft (30 m) or shorter distances as approved, of the point where connections are made for ignitible fluids transfer while ignitible fluids are being transferred through piping systems in lieu of requirements in 18.8.7.4.6.

18.3.9
The operating manual shall include procedures for the following:

1. Maintaining the vaporization rate, temperature, and pressure so that the resultant gas is within the design tolerance of the vaporizer and the downstream piping
2. Determining the existence of any abnormal conditions and the response to those conditions in the LNG facility
3. The safe transfer of hazardous fluids, including prevention of overfilling of containers
4. Security

18.8.6.9.1
Before ignitible fluids are loaded into a tank car, tank vehicle, or ISO container that is not in exclusive service for that fluid, a test shall be made to determine the oxygen content in the container.

18.8.7.4.6
General cargo, other than ships' stores for the LNG marine vessel, shall not be handled over a pier or dock within 100 ft (30 m) of the point where connections are made for ignitible fluids transfer while ignitible fluids are being transferred through piping systems.

18.10.10.7
All other relief valves protecting hazardous fluid components shall be randomly inspected and set-point tested at the intervals specified in 18.10.10.7.1 and 18.10.10.7.2.

18.10.13.1.1 *
All metallic components containing hazardous fluids that could have their integrity or reliability adversely affected by external, internal, or atmospheric corrosion during their intended service life shall be protected from corrosion.

18.10.13.8.2
All expanded, significantly modified plants, or plants replacing components containing hazardous fluids shall meet the requirements for corrosion control in 18.10.13 for expanded, modified, or replaced portions of the plant.

18.11.2
The training plan shall include training of permanent maintenance, operating, and supervisory personnel with respect to the following:

1. The basic operations carried out at the LNG facility
2. * The characteristics and potential hazards of hazardous fluids involved in operating and maintaining the LNG plant,
3. Methods of carrying out the duties of maintaining and operating the LNG plant as set out in the manual of operating and maintenance procedures referred to in Sections 18.3 and 18.9
4. Methods of carrying out emergency procedures required by Section 18.4 as they relate to their assigned functions
5. Personnel safety and general construction industry safety-related training as it relates to the assigned functions

A.18.11.2
Potential hazards in operating and maintaining the LNG plant include including the serious danger from frostbite that can result from contact with LNG or cold refrigerants, asphyxiants, flammability of mixtures with air, odorless vapors, boiloff characteristics, reactions with water, and exposure to toxic fluids.

19.5.2.1
The following shall be specified for each hazardous fluid release scenario, as applicable:

1. Stream composition
2. Nominal stream pressure and temperature
3. Physical state of the fluid
4. Sectionable inventory
5. Hole size(s)
6. Release location(s) and direction(s)
7. Release duration for successful and unsuccessful isolated inventories

19.5.2.1.1
The release flow rate for each scenario shall take into account pump runout, the phase of the fluid, and other applicable phenomena.

19.5.2.3
The spectrum of hazardous behavior of the released fluid due to its interaction with the substrate, the environment, and natural tendencies shall be considered and documented. The behavior modes that shall be considered include, flashing, aerosol formation, liquid jetting, pool formation and flow, dispersion of vapors, jet fires, flash fires, vapor cloud explosions, fireballs, pool fires, pressure vessel bursts, and BLEVES.

A.6.2.2
The layout and minimum separation distance between components and facilities should consider, where practical, separating the various facilities into units with different areas for facilities primarily containing hazardous fluids, facilities primarily containing non-hazardous fluids, and ignition sources.

A.8.4.3
Another mechanism is when the upper layer experiences preferential boil-off of lighter end fluids (i.e., nitrogen) and the liquid in the upper layer becomes warmer and more dense compared to the bottom layer until the density difference becomes large enough that the gravitational force causes the upper warmer layer to sink and heat and vaporize the lower colder fluid.

A.11.9.6
Examples of other means for preventing the passage of ignitible fluids flammable fluids to another portion of the conduit or wiring system can include a physical interruption of the conduit run and of the stranded conductors through the use of an adequately vented junction box containing terminal strip or busbar connections; an exposed section of mineral-insulated (MI) cable using suitable fittings; or an exposed section of single conductors that are incapable of transmitting gases or vapors. See NFPA 70, 501.15(e)(2).

A.18.2.2(7)
Safety-related malfunctions can include any of the following:

1. Fire
2. Explosion
3. Estimated property damage of $50,000 or more
4. Death or personal injury necessitating in-patient hospitalization
5. A leak or release of hazardous fluid
6. Unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids
7. Any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids
8. Any malfunction or operating error that causes the pressure of a pipeline or facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices
9. Inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank
10. Any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20-percent reduction in operating pressure or shutdown of operation of a pipeline or a facility that contains or processes hazardous fluids
11. Safety-related incidents to hazardous material transportations occurring at or enroute to and from the LNG facility
12. An event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan

# Liquid

## Note this does not include the word liquid in regards to the physical state (e.g liquid level, liquid line)

.

3.3.6* Container.
A vessel, tank, portable tank (isotainer), or cargo tank used for or capable of holding, storing, or transporting fluid..

3.3.6.1 Frozen Ground Container.
A container in which the maximum liquid level is below the normal surrounding grade, that is constructed essentially of natural materials, such as earth and rock, that is dependent on the freezing of water-saturated earth materials, and that has appropriate methods for maintaining its tightness or that is impervious by nature.

3.3.6.4 Tank System.
Low-pressure (less than 15 psi) equipment designed for storing liquefied natural gas or other hazardous liquids, consisting of one or more containers, together with various accessories, appurtenances, and insulation.

3.3.6.4.3* Membrane-Containment Tank System.
A tank system consisting of a thin metal liquid barrier and load-bearing thermal insulation supported by a self-standing outer container jointly forming an integrated composite tank system designed to contain liquid and vapor during tank operation as well as LNG in the event of leakage from the liquid barrier, and where the vapor-containing roof of the outer container is either steel or concrete configured such that the excess vapor caused by a spill of LNG from the liquid barrier will discharge through the relief valves.

3.3.34 Tank Car.
A type of railroad car, tank wagon, or rolling stock designed to transport fluid commodities.

4.9.1
Each plant shall have a record of materials of construction for components, buildings, foundations, and support systems used for containment of hazardous fluids.

5.3.1.1

Provisions shall be made to minimize the potential of discharge of hazardous liquids at containers, piping, and other equipment such that a discharge from any of these does not endanger adjoining property, occupied buildings, or important process equipment, buildings, and structures or reach waterways.

5.3.1.2
Hazardous liquid storage tanks shall be provided with one of the following methods to contain any release:

1. An impounding area surrounding the container(s) that is formed by a natural barrier, dike, impounding wall, or combination thereof complying with Chapter 13 and Chapter 6
2. An impounding area formed by a natural barrier, dike, excavation, impounding wall, or combination thereof complying with Chapter 13 and Chapter 6, plus a natural or man-made drainage system surrounding the container(s) that complies with Chapter 13 and Chapter 6
3. Where the container is constructed below or partially below the surrounding grade, an impounding area formed by excavation complying with Chapter 13 and Chapter 6
4. Secondary containment as required for double-, full-, or membrane-containment tank systems complying with Chapter 13 and Chapter 6.

6.3.5
Ignitible fluid containers shall not be located within an LNG tank impounding area.

6.4.2*
The fired components of an integral heated vaporizer shall be located as follows:

1. At least 50 ft (15 m) from any impounded ignitible fluid (see Section 6.3) or the paths of travel of such fluids between any other source of accidental discharge and the impounding area
2. At least 50 ft (15 m) from ignitible fluid storage containers or tanks; unfired process equipment containing such fluids; or loading and unloading connections used in the transfer of such fluids
3. At least 50 ft (15 m) from control buildings, offices, shops, and other occupied or important plant structures
4. At least 100 ft (30 m) from property line that can be built upon (see 6.4.4)

6.5.1
Process equipment containing ignitible fluid shall be located at least 50 ft (15 m) from sources of ignition, a property line that can be built upon, control centers, offices, shops, and other occupied structures.

9.4.1.1
Where LNG plants are either unattended or vaporizers are installed within a 50 ft (15 m) radius of their heat source or any igntible fluid container, an automatic shutoff valve shall be installed within 10 ft (3 m) of the vaporizer or vaporizer system in accordance with 16.3.5.

9.4.1.2
Where an LNG plant is attended and vaporizers are installed at least a 50 ft (15 m) radius from their heat source and any ignitible fluids container, either an automatic or manual shutoff valve shall be installed at least a 50 ft (15 m) radius form the vaporizer, vaporizer system, or vaporizer building.

10.8 Inspection, Examination, and Testing of Piping.
Inspection, examination, and testing shall be performed in accordance with Chapter VI of ASME B31.3, Process Piping, to demonstrate sound construction, installation and leak tightness. Unless specified otherwise in the engineering design, piping systems for ignitible fluids shall be examined and tested per the requirements of ASME B31.3.

11.9.3*
Electrically classified areas shall be as specified in Table 11.9.2 and as specified by recognized methods that account for the properties of the fluids potentially released such as highly volatile liquids (HVLs) and the conditions of the fluids such as operating pressure, density, temperature, and volume.

13.4 Enclosed Drainage Channels.
Enclosed drainage channels for ignitible fluids shall be prohibited except where they meet one of the following requirements:
1. Where enclosed drainage channels are approved to be used to rapidly conduct spilled LNG or other flammable and combustible liquids away from critical areas and they are sized for the anticipated liquid flow and vapor formation rates
2. Where the enclosed drainage channels are inerted or purged with an inert gas and continuously monitored for a ignitible fluids, and instrumentation and controls are provided to maintain pressures at a safe level within the drainage channel
3. Where the enclosed drainage channels are provided with deflagration venting in accordance with NFPA 68
4. Where pipe-in-pipe is installed in accordance with 10.13.3.2, and instrumentation and controls are provided to maintain pressures at a safe level within the drainage channel

13.6* Dikes and Impounding Walls.

Dikes and impounding walls shall meet the following requirements:

1. Dikes, impounding walls, drainage systems, and any penetrations thereof shall be designed to withstand the full hydrostatic head of impounded LNG and other hazardous liquids, the effect of rapid cooling to the temperature of the liquid to be confined, any anticipated fire exposure, and natural forces, such as earthquakes, wind, and rain.

13.9.1
Dikes, impounding walls, and drainage channels for ignitible (flammable or combustible) liquid containment shall conform to NFPA 30.

13.12 Water Removal for Hazardous Liquid Impounding Areas.

15.6.2
Tank vehicles not under the jurisdiction of the DOT shall comply with the following standards:

1. LNG tank vehicles shall comply with CGA 341, Standard for Insulated Cargo Tank Specification for Cryogenic Liquids.
2. LP-Gas tank vehicles shall comply with NFPA 58.
3. Ignitible (flammable or combustible) liquid d tank vehicles shall comply with NFPA 385.

16.8.3
At LNG plants, there shall be a protective enclosure, including a peripheral fence, wall, building wall, or approved natural barrier enclosing major facility components, including, but not limited to, the following, except where the entire onshore facility is enclosed:

1. LNG storage containers
2. Impoundment systems
3. *Hazardous fluid containers
4. Other hazardous materials storage areas
5. Outdoor process equipment areas
6. Buildings housing process or control equipment
7. Onshore loading and unloading facilities
8. Control rooms and stations
9. Control systems
10. Fire control equipment
11. Security communications systems
12. Alternative power sources

A.16.8.3
Hazardous fluid containers can be located in multiple areas of the plant and can be segregated by fluid type and 16.8.3 could be applied to each of these areas individually.

17.3.2.1.1
Provisions shall be made to minimize the potential of discharge of hazardous liquids at containers, piping, and other equipment such that a discharge from any of these does not endanger adjoining property, occupied buildings, or important process equipment and structures or reach waterways.

17.3.2.1.3
Where there is a possibility for hazardous liquid releases to accumulate and endanger adjoining property, occupied buildings, or important process equipment and structures, or reach waterways, the following areas shall be graded, drained, or provided with impoundment:

1. Process areas
2. Vaporization areas
3. Liquefaction areas
4. Transfer areas
5. Storage areas

17.3.2.1.6
Site preparation shall include provisions for retention of spilled hazardous liquids where liquids might accumulate on the ground within the limits of plant property and for surface water drainage.

## Public Comment No. 2-NFPA 59A-2021 [ Section No. 1.4.4 ]

~~1.4.4~~ –

~~This standard shall not apply to situations where equipment, piping, or components are replaced with in-kind equipment, piping, or components for the purpose of continued maintenance to ensure safety and operability of the facility.~~

## Statement of Problem and Substantiation for Public Comment

The accepted language destroys everything that codes and standards exist for with regards to protecting the public and providing for safe means to accomplish things. The very nature of all NFPA documents is to continue to provide state of the art and state of the industry information to document users as things are learned from unsafe situations. There are many ways that replacing "in-kind" components still can benefit from following things that are in the document when these things are being selected and installed. The proposed language provides a major loophole into a place that NO OTHER NFPA document has ever ventured. I did a search on NFPA link and found other places where non-applicability for in-kind replacement exists, but it was only for "Management of Change" issues. I have no problem modifying this statement in that way. However, I am opposed to providing this loophole. I do not believe it serves the cause of safety.
The following is an example of how and why the previous clause added is dangerous and should be removed. The document has an important provision in 4.6.2 which reads as follows:
4.6.2 The repair, replacement, or significant alteration of components shall be reviewed only if the action to be taken involves or is due to one of the following:
(1)A change in the original components specified
(2)A failure caused by corrosion
(3)A failure resulting in a loss of containment
(4)An inspection that reveals a significant deterioration of the component

If the previous language is kept and the document does not apply to things being changed "in-kind" then 4.6.2 would also no longer apply. This means then that you could have chronic failures of things that continuously corroded and were failing due to this corrosion. However, you would never be required to formally review this, you would just simply continue to replace it in kind. Again, this does not support the cause of safety.

**Related Item**

• FR 46

## Submitter Information Verification

**Submitter Full Name:** John Puskar
**Organization:** Prescient Technical Services L
**Street Address:**
**City:**
**State:**
**Zip:**
**Submittal Date:** Thu Dec 30 16:28:46 EST 2021
**Committee:** LNG-AAA

## Public Comment No. 3-NFPA 59A-2021 [ Section No. 2.3.6 ]

**2.3.6** ASTM Publications.

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

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, ~~2021~~ 2021a .

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials in a Vertical Tube Furnace at 750°C,* 2019.

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

## Statement of Problem and Substantiation for Public Comment

update

**Related Item**

• pi45

## Submitter Information Verification

**Submitter Full Name:** Marcelo Hirschler
**Organization:** GBH International
**Street Address:**
**City:**
**State:**
**Zip:**
**Submittal Date:** Thu Dec 30 17:38:54 EST 2021
**Committee:** LNG-AAA

## Public Comment No. 1-NFPA 59A-2021 [ Section No. 14.1 ]

**14.1** Temporary Service Use.

Where mobile and temporary LNG equipment is used for temporary use, for service maintenance during gas systems repair or alteration, or for other short-term applications, the following requirements shall be met:

(1) Mobile and temporary LNG equipment shall not remain in service more than 180 days at the mobile and temporary equipment installation.

(2) Mobile and temporary installations in service more than 180 days shall meet one of the following:

  (a) Approval by the AHJ to remain for a period exceeding 180 days

  (b) Compliance with all the applicable requirements of Chapter 17 for stationary applications using ASME containers and with the security requirements in Section 16.8

(3) LNG transport vehicles complying with US Department of Transportation (DOT) requirements shall be used as the supply container.

(4) All mobile and temporary LNG equipment shall be operated by at least one person qualified by experience and training in the safe operation of these systems in accordance with the requirements in 18.11.3 and 18.11.4, based on the written training plan requirements in 18.11.1 and 18.11.2.

(5) All other operating personnel, at a minimum, shall be qualified by training in accordance with the requirements in 18.11.3 and 18.11.4, based on the written training plan requirements in 18.11.1 and 18.11.2.

(6) All personnel requiring training in Section 14.1(3) and 14.1(4) shall receive refresher training in accordance with requirements in 18.11.6.1.

(7) All personnel training shall be documented in accordance with records requirements in 18.12.4.

(8) Each operator shall provide and implement a written plan of initial training in accordance with the requirements in 18.11.1 and 18.11.2 to instruct all designated operating and supervisory personnel.

(9) Provisions shall be made to minimize the possibility of accidental discharge of LNG at containers endangering adjoining property or important process equipment and structures or reaching surface water drainage.

(10) Mobile and temporary containment means shall be permitted to be used.

(11) Vaporizers and controls shall comply with Section 9.3, 9.4.1(1), 9.4.1(2), and Section 9.5.

(12) Each heated vaporizer shall be provided with a means to shut off the fuel source remotely and at the installed location.

(13) Equipment and process design, including piping, piping components, instrumentation and electrical systems, and transfer systems, shall comply with Sections 4.2 and 4.9; 7.4.3, 7.4.5, 7.4.6, 7.4.7, 7.6.1, 7.6.2, 7.6.6.1, 7.6.6.2, 10.2.1, 10.2.1.2, 10.2.1.3, 10.3.1.1, 10.3.1.2(3), 10.3.2.1 through 10.3.2.4, 10.3.3, and 10.3.4; Sections 10.4 through 10.10; and if utilized, cryogenic pipe-in-pipe systems shall comply with Section 10.13, 11.9.1, 11.9.2, 11.9.6, Section 11.10, 15.4.1, 15.6.1, 15.6.2, 15.8.1, 15.8.2, 15.8.3, 15.8.6, 15.9.1, 15.9.2, and 16.2.1.

(14) The LNG facility spacing specified in Table 6.3.1 shall be maintained except where necessary to provide temporary service on a public right-of-way or on property where clearances specified in Table 6.3.1 are not feasible and where the following additional requirements are met:

  (15) Traffic barriers shall be erected on all sides of the facility subject to passing vehicular traffic.

  (16) The operation shall be continuously attended to monitor the operation whenever LNG is present at the facility.

  (17) If the facility or the operation causes any restriction to the normal flow of vehicular traffic, in addition to the monitoring of personnel required in Section 14.1(11) , flag

persons shall be continuously on duty to direct such traffic.

(18) Provisions shall be made to minimize the possibility of accidental ignition in the event of a leak.

(19) Fire protection systems shall comply with 16.2.1, Section 16.3, 16.4.1, 16.4.2.2, 16.6.1, 16.7.1, 16.8.1, and 16.8.2.

(20) Portable or wheeled fire extinguishers recommended by their manufacturer for gas fires shall be available at strategic locations and shall be provided and maintained in accordance with NFPA 10.

(21) Operating and maintenance activities shall comply with ~~16.4.2 and~~ Sections 18.1 through 18.4; 18.8.1, 18.8.2, 18.8.4, 18.8.5, 18.8.6.5 through 18.8.6.8, 18.8.6.8.3, 18.8.6.8.4, 18.8.6.8.5; Section 18.9; and 18.10.1, 18.10.2, 18.10.6, 18.10.8, 18.10.9, 18.10.10.1, 18.10.10.2, 18.10.10.3, 18.10.10.7, 18.10.13.1, 18.10.13.6, and 18.10.13.7.

(22) The site shall be continuously attended, and provisions shall be made to restrict public access to the site whenever LNG is present.

## Statement of Problem and Substantiation for Public Comment

The reference to section 16.4.2 in 14.1 (18) seems to be a mistake.

14.1 (18) begins with "Operating and maintenance activities shall comply with..." but section 16.4.2 is from the fire protection portion of the standard.

14.1 (16) includes the requirements for fire protection, which only references paragraph 16.4.2.2. Thus, these requirements are in conflict.

Suggestion: delete reference to Section 16.4.2 in 14.1 (18).

**Related Item**

• PI52; First draft report;

## Submitter Information Verification

**Submitter Full Name:** Jeffrey D Marx
**Organization:** Quest Consultants Inc
**Street Address:**
**City:**
**State:**
**Zip:**
**Submittal Date:** Tue Dec 14 18:43:45 EST 2021
**Committee:** LNG-AAA

# Committee Input No. 11-NFPA 59A-2021 [ Global Input ]

**The committee is reviewing the document in regards to consistency for units, both metric units and imperial units.**

## Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Tue Apr 20 16:02:49 EDT 2021

## Committee Statement

**Committee Statement:** The committee is reviewing the document in regards to consistency for units, both metric units and imperial units. The committee welcomes input on the use of units.

**Response Message:** CI-11-NFPA 59A-2021

## Ballot Results

**This item has not been balloted**

## Committee Input No. 15-NFPA 59A-2021 [ Global Input ]

**The committee is considering to add reference to NFPA 18A to allow the use of Encapsulator Agents.**

### Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Wed Apr 21 14:12:21 EDT 2021

### Committee Statement

**Committee Statement:** The committee is considering to add reference to NFPA 18A to allow the use of Encapsulator Agents. The committee is not considering requiring Encapsulator Agents, just permitting their use as an acceptable fire protection system.

**Response Message:** CI-15-NFPA 59A-2021

Public Input No. 27-NFPA 59A-2020 [Section No. 2.2]

Public Input No. 32-NFPA 59A-2020 [Chapter 16]

Public Input No. 35-NFPA 59A-2020 [Section No. 18.10.10.4]

### Ballot Results

**This item has not been balloted**

# Committee Input No. 30-NFPA 59A-2021 [ Global Input ]

The committee is looking at modifying table 19.6 to consider the following.

1) Re-convening a failure rates task force to revise this table, comprised of persons familiar with equipment failure rates and QRA application.

2) Table include more types of equipment. For example, pumps, compressors, and heat exchangers are not listed.

3) Suggest that for most equipment types (storage tanks are the exception, and there may be others), a total failure rate be listed along with some methodology for assigning a set of hole sizes from leak to rupture, which is flexible enough to be used in many QRA applications, but allows for consistent hole size allocations across all equipment types.

## Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Thu Apr 22 14:43:58 EDT 2021

## Committee Statement

**Committee Statement:** The committee is looking at modifying table 19.6 to consider the following.

1) Re-convening a failure rates task force to revise this table, comprised of persons familiar with equipment failure rates and QRA application.

2) Table include more types of equipment. For example, pumps, compressors, and heat exchangers are not listed.

3) Suggest that for most equipment types (storage tanks are the exception, and there may be others), a total failure rate be listed along with some methodology for assigning a set of hole sizes from leak to rupture, which is flexible enough to be used in many QRA applications, but allows for consistent hole size allocations across all equipment types.

**Response Message:** CI-30-NFPA 59A-2021

Public Input No. 26-NFPA 59A-2020 [Section No. 19.6.1]

## Ballot Results

**This item has not been balloted**

## Committee Input No. 60-NFPA 59A-2021 [ Global Input ]

**The committee is looking to review the terms Hazardous Fluid, Hazardous Liquid, Flammable Liquid, and Flammable Fluid for consistency in use and definition throughout the document.**

## Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Thu Apr 29 13:56:44 EDT 2021

## Committee Statement

**Committee Statement:** The committee is looking to review the terms Hazardous Fluid, Hazardous Liquid, Flammable Liquid, and Flammable Fluid for consistency in use and definition throughout the document

**Response Message:** CI-60-NFPA 59A-2021

## Ballot Results

**This item has not been balloted**

## Committee Input No. 62-NFPA 59A-2021 [ Global Input ]

**C.1.2.1** ACI Publications.

American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48331.ACI 376, *Code Requirements for Design and Construction of Concrete Structures for the Containment of Refrigerated Liquefied Gases,* ~~2011~~ 2021 .

### Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Thu Apr 29 15:21:11 EDT 2021

### Committee Statement

**Committee Statement:** The committee is considering updating the standard to the latest edition. The committee is unsure of the publication status of the ACI Document.

**Response Message:** CI-62-NFPA 59A-2021

Public Input No. 42-NFPA 59A-2020 [Section No. C.1.2.1]

### Ballot Results

**This item has not been balloted**

## Committee Input No. 114-NFPA 59A-2021 [ Section No. 10.1 ]

**10.1*** Scope.

This chapter presents the design, construction, installation, examination, and inspection requirements for process piping systems and components.

**A.10.1**

Refer to 8.4.2 and Section 17.~~13~~ 8 for piping that is part of an LNG tank

## Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Thu Jul 22 08:48:11 EDT 2021

## Committee Statement

**Committee Statement:** The cross reference to current 17.13 is incorrect and should be 17.8. The committee to review this at second draft.

**Response Message:** CI-114-NFPA 59A-2021

## Ballot Results

**This item has not been balloted**

## Committee Input No. 21-NFPA 59A-2021 [ Section No. 11.9.2 ]

**11.9.2***

Fixed electrical equipment and wiring installed within the classified areas specified in Table 11.9.2 shall comply with Table 11.9.2 and Figure 11.9.2(a) through Figure 11.9.2(e) and shall be installed in accordance with *NFPA 70*.

Table 11.9.2 Electrical Area Classification

| Part | Location | Group D, Division[a] | Extent of Classified Area |
|---|---|---|---|
| A | **LNG storage containers with vacuum breakers** | | |
| | Inside containers | 2 | Entire container interior, except where 11.9.5 applies |
| B | **LNG storage container area** | | |
| | Indoors | 1 | Entire room |
| | Outdoor aboveground containers (other than small containers)[b] | 1 | Open area between a high-type dike and the container wall where dike wall height exceeds distance between dike and container walls *[see Figure 11.9.2(b)]* |
| | | 2 | Within 15 ft (4.5 m) in all directions from container walls and roof plus area inside a low-type diked or impounding area up to the height of the dike impoundment wall *[see Figure 11.9.2(a)]* |
| | Outdoor belowground containers | 1 | Within any open space between container walls and surrounding grade or dike *[see Figure 11.9.2(c).]* |
| | | 2 | Within 15 ft (4.5 m) in all directions from roof and sides *[see Figure 11.9.2(c).]* |
| C | **Tank car, tank vehicle, and container loading and unloading** | | |
| | Indoors with adequate ventilation[c] | 1 | Within 5 ft (1.5 m) in all directions from connections regularly made or disconnected for product transfer |
| | | 2 | Beyond 5 ft (1.5 m) and entire room and 15 ft (4.5 m) beyond any wall or roof ventilation discharge vent or louver |

| Part | Location | Group D, Division[a] | Extent of Classified Area |
|---|---|---|---|
| | Outdoors in open air at or above grade | 1 | Within 5 ft (1.5 m) in all directions from connections regularly made or disconnected for product transfer |
| | | 2 | Beyond 5 ft (1.5 m) but within 15 ft (4.5 m) in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade |
| D | **Electrical seals and vents specified in 10.7.5 through 10.7.7** | 2 | Within 15 ft (4.5 m) in all directions from the equipment and within the cylindrical volume between the horizontal equator of the sphere and grade |
| E | **Marine terminal loading and unloading areas***[see Figure 11.9.2(e).]* | 2 | Within 15 ft (4.5 m) in all directions, above the deck, from the open sump |

[a]See Article 500 in *NFPA 70* for definitions of classes, groups, and divisions. Article 505 can be used as an alternate to Article 500 for classification of hazardous areas using an equivalent zone classification to the division classifications specified in Table 11.9.2. Most of the flammable vapors and gases found within the facilities covered by NFPA 59A are classified as Group D. Ethylene is classified as Group C. Much of the available electrical equipment for hazardous locations is suitable for both groups.

[b]Small containers are portable and of less than 200 gal (760 L) capacity.

[c]Ventilation is considered adequate where provided in accordance with the provisions of this standard.

**Figure 11.9.2(a) Dike Height Less Than Distance from Container to Dike (*H* < *x*).**

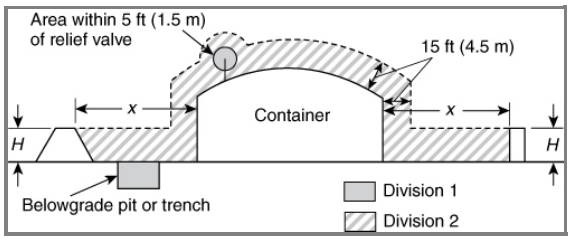



**Figure 11.9.2(b) Dike Height Greater Than Distance from Container to Dike (*H* > *x*).**

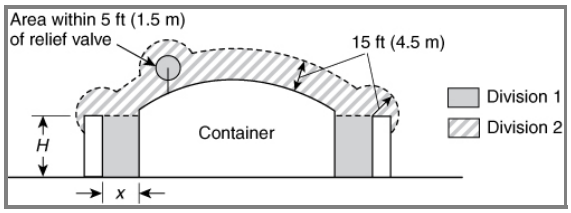



**Figure 11.9.2(c) Container with Liquid Level Below Grade or Below Top of Dike.**

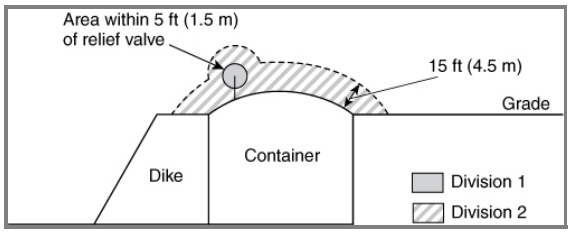


**Figure 11.9.2(d) Full and Membrane Containment Tank Systems.**

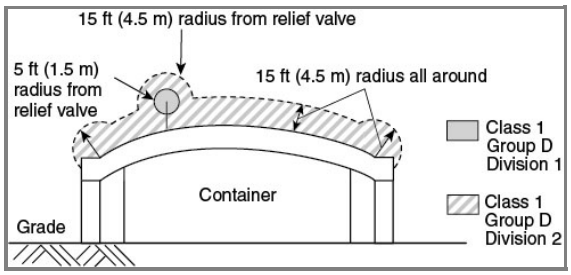
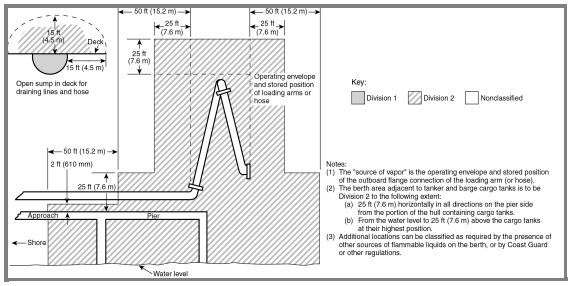



**Figure 11.9.2(e) Classification of a Marine Terminal Handling LNG.**




## Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Wed Apr 21 15:54:52 EDT 2021

## Committee Statement

**Committee Statement:** The committee is reviewing the electrical area classification drawings as to which ones are necessary and which figures are necessary. The committee is considering adding additional figures from NFPA 497.

**Response Message:** CI-21-NFPA 59A-2021

Public Input No. 70-NFPA 59A-2021 [Section No. 11.9.2]

## Ballot Results

**This item has not been balloted**

## Committee Input No. 37-NFPA 59A-2021 [ Section No. 17.3.2.1.2 ]

**17.3.2.1.2**– * -

An analysis shall be performed that determines the practical limits of unimpounded liquid spills.

**A. 17.3.2.1.2 ***

Spill limit analysis should include the rate of the spill, the net amount of liquid anticipated available for the spill, flashing, atomizing and vaporization of rainout that is required to cool the substrate under the spill and transient nature of the above parameters . One such version of this analysis can be found in CGA G-19.4, Determining the Limits of LNG Spills.

**17.3.2. 1.2.1**

If the analysis determines that the liquid does not remain on the property or could enter underground conduits, LNG and hazardous liquid containers shall be provided with one of the following methods to contain any release:

(1) An impounding area surrounding the container(s) that is formed by a natural barrier, dike, impounding wall, or combination thereof complying with Chapter 13 and Chapter 6

(2) An impounding area formed by a natural barrier, dike, excavation, impounding wall, or combination thereof complying with Chapter 13 and Chapter 6, plus a natural or man-made drainage system surrounding the container(s) that complies with Chapter 13 and Chapter 6

(3) Where the container is constructed below or partially below the surrounding grade, an impounding area formed by excavation complying with Chapter 13 and Chapter 6

(4) Secondary containment as required for double-, full-, or membrane-containment tank systems complying with Chapter 13 and Chapter 6

### Submitter Information Verification

**Committee:** LNG-AAA

**Submittal Date:** Thu Apr 22 15:58:58 EDT 2021

### Committee Statement

**Committee Statement:** The committee is considering referencing CGA G-19.4 for determining the limits of LNG spills as required in 17.3.2.1.2.

**Response Message:** CI-37-NFPA 59A-2021

Public Input No. 20-NFPA 59A-2020 [New Section after A.17.3.1]

### Ballot Results

**This item has not been balloted**