NATIONAL FIRE PROTECTION ASSOCIATION
The leading information and knowledge resource on fire, electrical and related hazards

Technical Committee on Liquefied Natural Gas

NFPA 59A FIRST DRAFT MEETING AGENDA

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. **Call to Order.** Call meeting to order by Chair Jeffrey Brightwell at 1:00 pm

2. **Self-Introduction of Committee Members and Guests.** For a current committee roster, ***see page 2*****.**

3. **Opening Remarks.** Chairman Jeffrey Brightwell.

4. **Approval of Fall 2018 Second Draft Meeting Minutes,** ***see page 7.***
   - The January 29-February 1, 2018 Second Draft Meeting Minutes and
   - March 15, 2018 Second Draft Continuation Meeting Minutes.

5. **Staff Liaison Report. Alex Ing.**

6. **Review of First Draft Meeting Procedures,**
   - Fall 2022 Revision Cycle
   - Committee Activity during the First Draft Meeting

7. **NFPA 59A Public Inputs,** ***see page 16.***

8. **Task Group Reports**.
   a. **Technical Comments**
   b. **Editorial Comments**
   c. **Encapsulator Fire Protection Task Group**

9. **New Business.**

10. **Future Meetings.**

11. **Adjournment.**

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

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

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

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

Kevin Gallagher E 08/03/2016
Principal LNG-AAA
Acushnet Fire & Rescue Department
24 Russell Street
Acushnet, MA 02743-2224

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

Ben Ho **SE** 4/17/2002
Principal **LNG-AAA**
Kelly Services
4415 Red Oak Grove Court
Katy, TX 77494-1507
Alternate: Roberto Ruiperez Vara

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

Joseph E. Meyer **SE** 04/03/2019
Principal **LNG-AAA**
R. A. Hoffmann Engineering, P. C.
3 Fallsview Lane
Brewster, NY 10509
Alternate: Richard A. Hoffmann

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

Gilford W. Poe **U** 4/16/1999
Principal **LNG-AAA**
ExxonMobil Pipeline Company
22777 Springwoods
Village Prkwy
EMHC/E.3 5A.613
Spring, TX 77389
American Petroleum Institute
Alternate: Bernard W. Leong

Phani K. Raj **E** 01/14/2004
Principal **LNG-AAA**
US Department of Transportation Office of Safety
Federal Railroad Administration
1200 New Jersey Avenue, SE
RRS-12, Mail Stop 25
Washington, DC 20590-0001
US Department of Transportation
Railroad

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

Thomas V. Rodante SE 1/15/2004
Principal **LNG-AAA**
Baker Engineering & Risk Consultants, Inc.
1303 Crest Drive
Colleyville, TX 76034
Alternate: Joshua Bruce-Black

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

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

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

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

Alan D. Hatfield SE 10/29/2012
Alternate **LNG-AAA**
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: Joseph E. Meyer

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

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

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

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**
CH-IV International
7467 Ridge Road, Suite 200
Hanover, MD 21076
Principal: Jeffrey P. Beale

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

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

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

Swapan Kumar Hazra U 4/28/2000
Nonvoting Member **LNG-AAA**
GF Natural Gas LNG Ltd/CNG Technology Ltd.
BG-172, Sector 2, Salt Lake
PO: Bidhan Nagar
Kolkata, West Bengal, 700091 India

James P. Lewis O 1/1/1995
Member Emeritus **LNG-AAA**
Jim Lewis LNG Expertise
206 South Masonic Street
Bellvillle, TX 77418

Alex Ing 09/26/2019
Staff Liaison **LNG-AAA**
National Fire Protection Association
One Batterymarch Park
Quincy, MA 02169

NFPA Technical Committee on Liquefied Natural Gas (LNG-AAA)

NFPA 59A Second Draft Meeting Minutes
January 29 to February 1, 2018
Conducted at Cheniere Energy, Houston, TX (with Web/Teleconference)

1. Call to Order & Chairman's Opening Remarks. The meeting was called to order at 08:35 A. M. (EDT) on Monday, January 29, 2018 by the Technical Committee Chairman, Jeffrey K. Brightwell. The purpose of the meeting was to consider and act on public comments and task group work products; and develop revisions for the Second Draft Report for NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG).*

2. Roll Call of Committee Members and Guests. A roll call was conducted to identify Committee Members and guests in attendance and those members and guests who were participating by viewing the web-meeting and/or listening to the meeting by teleconference.

TECHNICAL COMMITTEE MEMBERS PARTICIPATING:

NAME	COMPANY
Jeffrey K. Brightwell - Chairman	Lake Charles LNG
Richard Hoffman - Secretary	Hoffmann & Feige
Lawrence Russell – Staff Liaison	NFPA
Alex Ing – NFPA Staff	NFPA
Jeffery J. Baker	Chicago Bridge & Iron Company (CB&I)/Representing Steel Tank Institute/Steel Plate Fabricators Association
Denise Beach	FM Global
Jeffrey P. Beale	CH-IV Corporation
Pat Convery	Cornerstone Energy Services/Representing NFPA Industrial Fire Protection Section
Frank L. Del Nogal	BP America Inc.
Brian L. Eisentrout	Venture Global LNG
Adnan Ezzarhouni	Gaztransport et Technigaz
Mark E. Fessenden	Johnson Controls/Tyco Fire Protection Products
Filippo Gavelli	GexCon US

TECHNICAL COMMITTEE MEMBERS PARTICIPATING (CONTINUED):

NAME	COMPANY
Julie Halliday	US Department of Transportation Pipeline and Hazardous Materials Safety Administration/Representing US Department of Transportation Accident Investigation Division
Jay J. Jablonski	HSB PLC
Andrew Kohout	Federal Energy Regulatory Commission
Shahzaad Mohammed	Cheniere Energy
Michael Jared Morrison	Starr Technical Risks Agency, Inc.
Antonino Nicotra	Bechtel Oil Gas & Chemicals
Kenneth Paul	Chart Industries, Inc.
Gilford Poe	ExxonMobil Pipeline Company/Representing American Petroleum Institute
Kevin L. Ritz	Baltimore Gas & Electric Company
Anthony J. Scaraggi	Distrigas of Massachusetts LLC
Mike Turney	Air Liquide
Scott Walden	American Gas Association
Kevin J. Cox (Voting Alternate)	JENSEN HUGHES
David Anderson (Alternate to S. Mohammed)	Cheniere Energy
Alex Cooperman (Alternate to J. Baker)	Chicago Bridge & Iron Company (CB&I)/Representing Steel Tank Institute/Steel Plate Fabricators
Michael Eugene Gardner (Alternate to Scott J. Walden)	Dominion Energy Cove Point LNG/Representing American Gas Association
Alan Hatfield, (via web/telecom) (Alternate to C. Gieskes)	Braemar Engineering
Matt Martineau, (Alternate to K. Paul)	Chart Industries, Inc.
Roberto Ruiperez Vara (Alternate to B. Ho)	LNG StartUp LLC
Joseph Sieve (Alternate to J. Halliday)	USDOT-PHMSA-OPS/Representing US Department of Transportation
Susan Ann Stritter (via web/telecom) (Alternate to A. Scaraggi)	Distrigas of Massachusetts, LLC

1 Batterymarch Park, Quincy, MA 02169-7471 • p: 617-770-3000 • f: 617-770-0700 • nfpa.org

TECHNICAL COMMITTEE PRINCIPAL MEMBERS NOT PARTICIPATING (WHOSE ALTERNATE DID NOT PARTICIPATE):

NAME	COMPANY
Donald Barber	Enmat International (UK)
Christopher Bourne	Massachusetts Department of Public Utilities
Kevin Gallagher	Acushnet Fire & Rescue Department
James J. Gaughan	American Bureau of Shipping
Nicholas A. Legatos	Preload LLC/Representing American Concrete Institute
Peter A. Micciche	ConocoPhillips
Phani Raj	US Department of Transportation
Thomas V. Rodante	Baker Engineering & Risk Consultants, Inc.

GUESTS ON ADOBE CONNECT and/or TELECONFERENCE

NAME	COMPANY
Robert Bachman	RE Bachman, Consulting Structural Engineering
Greg Denton	GTT North America
Eric Thor	Chart Industries, Inc.
Robert Hoffmann	Hoffmann & Feige
Tom Drube	Chart Industries, Inc.
Allyn Risley	GTT North America
Jeff Marx	Quest Consultants, Inc.
Brandon Otto	REV LNG
Joe Moore (via web/ telecom)	Worthington Industries
Thach Nguyen	PHMSA
Fabien Pesquet	GTT North America
Phil Suter	CH-IV
Mattijs vanDer Ham	Vitol
Daniel Weidert	Chart Industries
Sentho White	DOT PHMSA
Sascha Werner	AC-Inox
Jenna Wilson (via web/telecom)	CH-IV
Matthew McDonald	Bechtel
Pat Outtrim	Tellurian

1 Batterymarch Park, Quincy, MA 02169-7471 • p: 617-770-3000 • f: 617-770-0700 • nfpa.org

3. Approval of First Draft Meeting Minutes – March 28 - 30, 2017 First Draft Meeting Minutes and May 23 - 25, 2017 First Draft Meeting Continuation Minutes.

4. Review of Second Draft Meeting Procedures – The Fall 2018 Revision Cycle and procedures for the Second Draft Meeting were reviewed and discussed.

5. **Task Group Reports.** The following task groups presented their recommendations for second revisions or provided a status update of the task group's activity.

> **a. Terminology Task Group.** Nino Nicotra provided recommendations developed by the task group for use of the terms: vessel, pressure vessel, container and tank throughout the document. Second revisions were developed based upon these recommendations.
>
> **b. Tank Maintenance Task Group & Tank Failure Rates Task Group.** Adnan Ezzarhouni reported that revision recommendations are not ready for the Second Draft meeting. The work of these task groups will be carried over to the next revision cycle for NFPA 59A.
>
> **c. Small-Scale LNG Plants.** Julie Halliday presented the work product from this task group related to its review of Chapter 13 and the requirements for small scale LNG facilities including ASME pressure vessel storage systems and non-ASME containers. Second revision recommendations were presented to the Committee.
>
> **d. Classified Areas.** Nino Nicotra presented the task group's recommendations for second revisions to Table 11.9.2 and associated figures.
>
> **e. Chapter 12 Evaluation.** Kevin Ritz presented the recommendations from the Task Group for second revisions to Section 16.2.1
>
> **f. Annex A**. There was no identified chairperson for this task group and no committee members were aware of any activity or work products generated from it.

6. Membrane Containment System Presentation. Greg Denton, *GTT America,* gave a presentation on membrane tank technology membrane tank and the safety behavior of the membrane tank systems.

1 Batterymarch Park, Quincy, MA 02169-7471 • p: 617-770-3000 • f: 617-770-0700 • nfpa.org

7. Review of NFPA 59A Public Comments & Committee Input. The Committee reviewed 122 Public Comments and 5 Committee Inputs at this meeting. From these the Committee developed 140 Second Revisions. The Committee was unable to finish a few items and agreed to allow task groups an opportunity to refine second revision work for the following:

> **a. Release Probabilities and Conditional Probabilities.** This task group will finalize the second revision for Table 19.6.1 and §A.19.6.1. Mr. Filippo Gavelli will chair this task group. This work will be presented to the Committee for final approval in a follow-up teleconference/web-meeting for the Second Draft
>
> **b. ASME VIII DIV I Pressure Vessels.** This task group will finalize the second revision for §8.5.1.1 and the addition of a new §8.5.1.5. Mr. Nino Nicotra will chair this task group. This work will be presented to the Committee for final approval in a follow-up teleconference/web-meeting for the Second Draft

8. Second Draft Balloting. NFPA staff presented the process for balloting for the Second Draft.

9. Other Business. The Committee approved the adoption of 12 revisions to items in Annex A which were designated as Committee Inputs (CI-249) during the First Draft Meeting. Because of the renumbering that occurred in the reorganization of the document during the First Draft, NFPA Staff will need to review the document for correct numbering of these Annex items and edits that may be necessary due to other related First Revisions and Second Revisions. This work will be presented to the Committee for final approval in a follow-up teleconference/web-meeting for the Second Draft.

10. Future Meetings. The Committee selected March 15, 2018 as the date for a teleconference/web-meeting to complete the unfinished items from this meeting. The final date for a Second Draft Meeting in this revision cycle is May 17, 2018

11. Adjournment. The meeting adjourned at 2:15 PM (CDT) on Thursday, February 1, 2018.

1 Batterymarch Park, Quincy, MA 02169-7471 • p: 617-770-3000 • f: 617-770-0700 • nfpa.org

NFPA Technical Committee on Liquefied Natural Gas (LNG-AAA)

NFPA 59A Second Draft Continuation Meeting Minutes
Thursday, March 15, 2018
(Web-meeting/Teleconference Only)

1. Call to Order & Chairman's Opening Remarks. The meeting was called to order at 08:35 A. M. (EDT) on Thursday, March 15, 2018 by the Technical Committee Chairman, Jeffrey K. Brightwell. The purpose of the web-meeting/teleconference was for Task Groups to report back on recommendations for the Second Draft of NFPA 59A; and for the Committee to act on some unresolved items from the previous Second Draft Meeting that was held in Houston, TX on January 29, 2018 to February 01, 2018.

2. Roll Call of Committee Members and Guests. A roll call was conducted to identify Committee Members participating and guest who were viewing the web-meeting on Adobe Connect and/or listening to the meeting by teleconference.

TECHNICAL COMMITTEE MEMBERS PARTICIPATING:

NAME	COMPANY
Jeffrey K. Brightwell - Chairman	Lake Charles LNG
Jeffery Baker	Chicago Bridge & Iron Company
Denise Beach	FM Global
Filippo Gavelli	GexCon US
Jay J. Jablonski	HSB PLC
Nicholas A. Legatos	Preload Incorporated
Antonino Nicotra	Bechtel Oil Gas & Chemicals
Andrew Kohout	Federal Energy Regulatory Commission
Peter A. Micciche	ConocoPhillips
Kenneth L. Paul	Chart Industries, Inc.
Gilford W. Poe	ExxonMobil Pipeline Company
Anthony J. Scaraggi	Distrigas of Massachusetts LLC
Phani K. Raj	US DOT, Office of Safety, Federal Railroad Administration
Mike Turney	Air Liquide
Kevin J. Cox (Voting Alternate)	Jensen Hughes
Alex Cooperman (Alternate to J. Baker)	Chicago Bridge & Iron Company

TECHNICAL COMMITTEE MEMBERS PARTICIPATING (continued):

NAME	COMPANY
Michael Eugene Gardner (Alternate to Scott J. Waldren)	American Gas Association
Matt Martineau (Alternate to K. Paul)	Chart Industries
Joseph Sieve (Alternate to Julie Halliday)	USDOT-PHMSA-OPS
Susan Ann Stritter (Alternate to A. Scaraggi)	Distrigas of Massachusetts, LLC

TECHNICAL COMMITTEE PRINCIPAL MEMBERS NOT PARTICIPATING (WHOSE ALTERNATE DID NOT PARTICIPATE):

NAME	COMPANY
Donald Barber	Enmat International (UK)
Jeffrey P. Beale	CH-IV Corporation
Christopher Bourne	Massachusetts Department of Public Utilities
Pat Convery	Cornerstone Energy Services
Frank L. Del Nogal	BP America, Inc.
Brian L. Eisentrout	Venture Global LNG
Adnan Ezzarhouni	Gaztransport et Technigaz
Mark E. Fessenden	Johnson Controls/Tyco Fire Protection Products
James J. Gaughan	American Bureau of Shipping
Constantyn Gieskes	Braemar Technical Services (Engineering), Inc.
Ben Ho	Kelly Services
Richard A. Hoffmann	Hoffmann & Feige
Shahzaad Mohammed	Cheniere Energy
Michael Jared Morrison	Starr Technical Risks Agency, Inc.
Kevin L. Ritz	Baltimore Gas & Electric Company
Thomas V. Rodante	Baker Engineering & Risk Consultants, Inc.
Scott J. Walden	Kinder Morgan Incorporated Southern LNG

GUESTS ON ADOBE CONNECT and/or TELECONFERENCE

NAME	COMPANY
John Gonzalez	Crowley Maritime
Eric Thor	Chart Industries
Tom Drube	Chart Industries
Greg Denton	GTT North America
Jeff Marx	Quest Consultants, Inc.
Dillian Beecher	Lake Charles LNG
Thach Nguyen	PHMSA
Marc Rached	(Company name not provided or available)
Martin Dollinger	(Company name not provided or available)
Mattijs Van Der Ham	Vitol
Alex Ing	NFPA Staff

3. Task Group Report – Release Probabilities and Conditional Probabilities. Mr. Filippo Gavelli summarized the work of the Task Group. A revision for Table 19.6.1 and updated Annex A material was presented to the Technical Committee and approved for NFPA 59A as a Second Revision with some minor edits. Mr. Gavelli reported that there are possibly other revisions to make to the Standard however there is not sufficient time to adequately review various reference data during this revision cycle. Accordingly the Task Group will continue to work on this project and possibly submit other change recommendations as a Technical Interim Amendment (TIA) at a later date.

4**. Task Group Report – ASME VIII DIV I Pressure Vessels.** Mr. Nino Nicotra summarized the work of this Task Group and presented its recommendations for Second Revisions to §8.5.1.1 and the addition of a new §8.5.1.5. The Committee approved the adoption of both items with minor editorial changes.

5. Other Business. Mr. Brightwell and Mr. Russell presented four items from the previous meeting that needed further clarification or review by the Committee.

> **a. Update referenced ASME publication reference in Chapter 2 to latest (current) edition.** The Committee approved the revision of the ASME Boiler and Pressure Vessel Code to the 2017 edition in Chapter 2 of the Standard.
>
> **b. Two SRs for the same definition (3.3.5).** The Committee fixed a problem in the Second Revision where there were two accepted revisions for the definition for "container" in §3.3.5.

c. Second Revision No. 73-NFPA 59A-2018 [Section No. 13.14]. The Committee acted on a potential oversight in SR-73 [Section 13.14]. The Committee revised the requirement to address protecting against manual drain valves being left open accidentally.

d. New SRs from Committee Input (CI) 249. As a follow-up from the previous meeting (January 29 to February 01, 2018) the Committee approved the 12 second revisions created from CI-249 for Annex A with revised numbering and editorial changes.

6. Future Meetings. There are no future meetings scheduled or planned at this time for the NFPA 59A Fall 2018 Revision Cycle.

7. Adjournment. The Committee created 16 Second revisions during this web-meeting/teleconference. With no other business, the meeting was adjourned at 11:50 AM (EDT) on Thursday, March 15, 2018.

1 Batterymarch Park, Quincy, MA 02169-7471 • p: 617-770-3000 • f: 617-770-0700 • nfpa.org

Public Input No. 18-NFPA 59A-2019 [Global Input]

Remove “ANSI” and “Standard for” from UL standards throughout the document.

Statement of Problem and Substantiation for Public Input

Removal of repetitive wording and removal of ANSI because many years ago, UL preferred the ANSI/UL reference because there was a transition of traditional UL standards towards an ANSI standards development process.

Now, years later, a large majority of UL Standards are ANSI approved and follow the ANSI development and maintenance process. However, sometimes readers are confused because they don't understand the standards are UL standards, not developed by ANSI. There are many other references to standards promulgated by different standards development organizations where they are considered ANSI approved but do not include ANSI in the reference.

The terms “Standard for” or “Subject” are redundant and unnecessary. All references to UL are standards.

Submitter Information Verification

Submitter Full Name: Kelly Nicolello

Organization: UL LLC

Street Address:

City:

State:

Zip:

Submittal Date: Fri Dec 27 11:40:58 EST 2019

Committee:

Public Input No. 44-NFPA 59A-2020 [Global Input]

This Public Input originates from Tentative Interim Amendment No. 19-1 Log No. 1471 issued by the Standards Council on April 1, 2020 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document. (See TIA attached)

Additional Proposed Changes

File Name	Description	Approved
NFPA_59A_TIA_1471_to_be_Emulated.pdf	NFPA 59A TIA 19-1 Log No. 1471	

Statement of Problem and Substantiation for Public Input

NOTE: This public input originates from Tentative Interim Amendment No. 19-1 Log No. 1471 issued by the Standards Council on April 1, 2020 and per the NFPA Regs., needs to be reconsidered by the Technical Committee for the next edition of the Document.

Substantiation: While reviewing NFPA 59A-2019 edition, two errors were found in the Standard. These errors are in equations in Chapter 5 and Chapter 19 and pertain to the determination of hazards associated with the siting of facilities that produce, store and handle liquefied natural gas (LNG).
For Item 1: In the First Revision (FR-269) the equation is presented as it is shown above (with 105). Looking at the staff notes for the First Draft the equation in 5.3.2.12.1 was written as: [7.5 X 105 (Btu/hr/ft2)4/3s]; 10 to the fifth power rather than 105. This was balloted incorrectly by the committee. The equation should be enclosed with brackets rather than parenthesis to comply with the NFPA Manual
of Style, as well as a couple other cleanups, such as removing the “comma” in “1,600” and deleting an “extra space” after “ft2)”.
For Item 2: In the First Revision (FR-235) the revised text clearly shows the equation written as 106 (10
to the sixth power rather than 106). This was balloted incorrectly by the committee. The equation should
be enclosed with brackets rather than parenthesis to comply with the NFPA Manual of Style, as well as a
couple other cleanups, such as adding a hyphen “-” to “30-second” and adding a period at the end after
the bracket.

Emergency Nature: The standard contains an error or an omission that was overlooked during the regular revision process.

Submitter Information Verification

Submitter Full Name: TC ON LNG-AAA
Organization: NFPA TC on Liquefied Natural Gas
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 22 09:05:31 EST 2020

Committee:

Tentative Interim Amendment

NFPA® 59A

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

2019 Edition

Reference: 5.3.2.12.1, and 19.8.4.2.2
TIA 19-1
(SC 20-4-11 / TIA Log #1471)

Pursuant to Section 5 of the NFPA *Regulations Governing the Development of NFPA Standards*, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 2019 edition. The TIA was processed by the Technical Committee on Liquefied Natural Gas, and was issued by the Standards Council on April 1, 2020, with an effective date of April 21, 2020.

1. Revise 5.3.2.12.1 to read as follows (changes are highlighted):

5.3.2.12.1 For fireballs, the exposure extent shall be calculated using a dose equivalent to 1~~,~~600 Btu/hr/ft^2 (5 kW/m^2) and 40-second exposure time ~~(~~[7.5 × ~~105~~ 10^5 (Btu/hr/ft^2)~~-~~$^{4/3}$s~~)~~ or 2.4 x 10^3 (kW/m^2)$^{(4/3)}$ s].

2. Revise 19.8.4.2.2 to read as follows (changes are highlighted):

19.8.4.2.2 For fireballs, the exposure extent shall be calculated using a dose equivalent to 3000 Btu/hr/ft^2 (10 kW/m^2) and 30~~-~~second exposure time ~~(~~[1.3 × ~~106~~ 10^6 (Btu/hr/ft^2)$^{4/3}$s~~)~~ or 4.1 x 10^3 (kW/m^2)$^{(4/3)}$ s].

Issue Date: April 1, 2020

Effective Date: April 21, 2020

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/docinfo)

Public Input No. 75-NFPA 59A-2021 [Global Input]

Change the term "risk category" to "Risk Category" everywhere the term is used in NFPA 59A.

Statement of Problem and Substantiation for Public Input

In ASCE 7-16 the term "Risk Category" is capitalized while in NFPA 59A it is not. This editorial type change capitalizes the term "risk category" to make it consistent with ASCE 7 which is where it is originally defined. For this important term, NFPA 59A should be consistent with ASCE 7.

Submitter Information Verification

Submitter Full Name: Thach Nguyen
Organization: Department of Transportation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 11:38:30 EST 2021
Committee:

Public Input No. 62-NFPA 59A-2021 [Section No. 1.1.2]

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

(4) Systems which provide utilities to the LNG Facility, such as water, telecommunications, and electricity until that utility is consumed/used at the LNG Facility

(5) Pipelines which supply and receive natural gas to/from the LNG Facility

Statement of Problem and Substantiation for Public Input

The intent of this is to help define when water systems, electrical systems, etc. actually become under NFPA 59A. Power plants should not be subject to 59A until the electricity is used as part of the LNG Facility. Same with utility water systems. In addition, it is to clarify that Pipelines are not an LNG Facility.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 08:16:35 EST 2021
Committee: LNG-AAA

Public Input No. 63-NFPA 59A-2021 [Section No. 1.2]

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. As new and innovative uses for LNG are continually evolving, nothing in this standard is meant to prohibit a use if such use is not explicitly called out in this standard.

Statement of Problem and Substantiation for Public Input

I have seen some projects use LNG in various ways, such as fuel to a power plant, small fuel to a local user, or in other similar ways and folks have tried to make an argument that since that use was not explicitly called out in NFPA 59A, it didnt apply.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 08:21:05 EST 2021
Committee: LNG-AAA

Public Input No. 64-NFPA 59A-2021 [Section No. 1.4.1]

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. 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. Where specified, the provisions of this standard shall be retroactive.

Statement of Problem and Substantiation for Public Input

Over the years we have seen issues where LNG facilities which were built 50 years ago were unable to make in-kind replacements of the original installation because siting requirements changed. We should encourage owners to want to invest and maintain their LNG facilities and not be hindered but evolving siting requirements. There can be increased safety issues by preventing necessary upgrades to old, obsolete, and failing equipment.

Submitter Information Verification

Submitter Full Name:	Phil Suter
Organization:	Blue Engineering and Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 06 08:23:00 EST 2021
Committee:	LNG-AAA

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

2.2 NFPA Publications.

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

NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing,* 2018 edition.

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

NFPA 11, *Standard for Low-, Medium-, and High-Expansion Foam,* 2016 edition.

NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems,* 2018 edition.

NFPA 12A, *Standard on Halon 1301 Fire Extinguishing Systems,* 2018 edition.

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

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2019 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2017 edition.

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

NFPA 17, *Standard for Dry Chemical Extinguishing Systems,* 2017 edition.

NFPA 18A, Standard on Water Additives for Fire Control and Vapor Mitigation, 2017 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2019 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 2018 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2019 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2017 edition.

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

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines,* 2018 edition.

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

NFPA 56, *Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems,* 2017 edition.

ANSI Z223.1/NFPA 54, *National Fuel Gas Code,* 2018 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2017 edition.

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

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

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

NFPA 70®, *National Electrical Code*®, 2017 edition.

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

NFPA *101*®, *Life Safety Code*®*,* 2018 edition.

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

NFPA 274, *Standard Test Method to Evaluate Fire Performance Characteristics of Pipe Insulation,* 2018 edition.

NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids,* 2017 edition.

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

NFPA 600, *Standard on Fire Brigades,* 2015 edition.

NFPA 750, *Standard on Water Mist Fire Protection Systems,* 2019 edition.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems,* 2019 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus,* 2016 edition.

NFPA 1961, *Standard on Fire Hose,* 2013 edition.

NFPA 1962, *Standard for the Care, Use, Inspection, Service Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances,* 2018 edition.

NFPA 1963, *Standard for Fire Hose Connections,* 2019 edition.

NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems,* 2018 edition.

NFPA 5000®, Building Construction and Safety Code®, 2018 edition.

Statement of Problem and Substantiation for Public Input

NFPA 18A Standard on Water Additives for Fire Control and Vapor Mitigation is the next generation of fire suppression agents known as Encapsulator Agents. These are fluorine free agent (friendly to the environment). The basic building block of Encapsulator Agent is a Spherical Micelle. A Spherical Micelle is a molecular structure capable of encapsulating carbon and hydrocarbon molecules thus separating the fuel from the oxygen on a chemical/molecular level (i.e. smothering the fire) as opposed to foams, currently in this standard, that separate the fuel from the oxygen on a mechanical macro level (i.e., smothering the fire). One key difference is molecular encapsulation can be accomplished in a 3D environment where mechanical separation is only accomplishable in a 2D environment (i.e., flat surface).

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 28-NFPA 59A-2020 [New Section after 3.3.9]	
Public Input No. 32-NFPA 59A-2020 [Chapter 16]	
Public Input No. 33-NFPA 59A-2020 [New Section after 16.6.2]	
Public Input No. 35-NFPA 59A-2020 [Section No. 18.10.10.4]	
Public Input No. 36-NFPA 59A-2020 [Section No. 18.11.2.2]	

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski

Organization: JB HazMat Consulting

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 09:38:30 EST 2020

Committee: LNG-AAA

Public Input No. 41-NFPA 59A-2020 [Section No. 2.3.1]

2.3.1 ACI Publications.

American Concrete Institute, 38800 Country Club Dr., Farmington Hills, MI 48331.

ACI 304R, *Guide for Measuring, Mixing, Transportation and Placing of Concrete*, 2000, reapproved 2009.

ACI 318, *Building Code Requirements for Structural Concrete and Commentary,* ~~2014~~ 2019 .

ACI 350, *Code Requirements for Environmental Engineering Concrete Structures*, ~~2006~~ 2021 .

ACI 376, *Code Requirements for Design and Construction of Concrete Structures for the Containment of Refrigerated Liquefied Gases,* ~~2011~~ 2021 .

Statement of Problem and Substantiation for Public Input

Update to current ACI editions.

Submitter Information Verification

Submitter Full Name:	Kerry Sutton
Organization:	ACI
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Sep 08 14:32:38 EDT 2020
Committee:	LNG-AAA

Public Input No. 76-NFPA 59A-2021 [Section No. 2.3.4]

2.3.4 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures,* 2016 including Supplement No . 1 Errata dated 7/9/2018, 2/13/2019 and 1/16/2020.

Statement of Problem and Substantiation for Public Input

The version of ASCE 7 referenced by NFPA 59A should be the most current. Since ASCE 7-16 was published, an important Supplement has been approved and three batches of errata have been issued. The Supplement provides needed fixes in the Tsunami and Site Specific Ground motion sections, as well as needed updates of some references. This proposed change would have NFPA 59A referencing the most current and relevant version of ASCE 7-16.

Submitter Information Verification

Submitter Full Name: Thach Nguyen

Organization: Department of Transportation

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 06 11:48:38 EST 2021

Committee: LNG-AAA

Public Input No. 45-NFPA 59A-2020 [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*, ~~2016~~ 2020 .

ASTM E136, *Standard Test Method for ~~Behavior~~ Assessing Combustibility of Materials ~~in~~ Using a Vertical Tube Furnace at 750°C,* ~~2016a~~ 2019 .

ASTM E2652, *Standard Test Method for ~~Behavior of~~ Assessing Combustibility of Materials ~~in~~ Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C,* ~~2016~~ 2018 .

Statement of Problem and Substantiation for Public Input

updates

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 24 16:26:29 EST 2020
Committee: LNG-AAA

Public Input No. 47-NFPA 59A-2021 [Section No. 2.3.12]

2.3.12 UL Publications.

Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062–2096.

~~ANSI/~~ UL 723, ~~Standard~~ T *est* *for* ~~*Test for*~~ *Surface Burning Characteristics of Building Materials*, ~~2008, revised 2013~~ 2018 .

Statement of Problem and Substantiation for Public Input

UL Standard edition update.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 18-NFPA 59A-2019 [Global Input]	

Submitter Information Verification

Submitter Full Name:	Kelly Nicolello
Organization:	UL LLC
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Jan 04 12:21:53 EST 2021
Committee:	LNG-AAA

Public Input No. 3-NFPA 59A-2019 [Section No. 3.3.5 [Excluding any Sub-Sections]]

A vessel, tank, portable tank *(isotainer)* , or cargo tank used for or capable of holding, storing, or transporting liquid or gas.

Statement of Problem and Substantiation for Public Input

Clarification of the incorporation of the ASME Section VIII as it is now unclear that only LNG storage facility is being addressed and not process vessels. Additionally, the industry term typically applied to transportable containers is isotainer.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4-NFPA 59A-2019 [Section No. 3.3.5.2]	
Public Input No. 6-NFPA 59A-2019 [Section No. 12.1]	

Submitter Information Verification

Submitter Full Name: Bob Pike
Organization: McDermott
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 12 04:26:39 EDT 2019
Committee: LNG-AAA

Public Input No. 4-NFPA 59A-2019 [Section No. 3.3.5.2]

3.3.5.2 Pressure Vessel.

A container designed and fabricated in accordance with the ASME *Boiler and Pressure Vessel Code*, Section VIII, Division 1 or Division 2, or with CSA B51, *Boiler, Pressure Vessel, and Pressure Piping Code* ~~.~~ *and used in the storage or transportation of LNG but not used in the actual processing of lng (Liquefaction or Regas)*

Statement of Problem and Substantiation for Public Input

Have client reading the present wording to apply to all ASME Pressure Vessels within a facility including process vessels which are not understood to be addressed by this intent as they are not "storage" systems or components.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3-NFPA 59A-2019 [Section No. 3.3.5 [Excluding any Sub-Sections]]	interrelated with regard to definition and application
Public Input No. 5-NFPA 59A-2019 [New Section after 3.3.20]	
Public Input No. 6-NFPA 59A-2019 [Section No. 12.1]	

Submitter Information Verification

Submitter Full Name: Bob Pike
Organization: McDermott
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 12 04:29:37 EDT 2019
Committee: LNG-AAA

Public Input No. 28-NFPA 59A-2020 [New Section after 3.3.9]

Encapsulator Agent

Agent conforming to NFPA 18A, Section 7.7, whose basic building block is a spherical micelle, a molecular structure, capable of encapsulating flammable liquid or gas molecules thus separating the fuel from the oxygen on a chemical molecular level rendering the fuel nonflammable, non-ignitable, and non-explosive. Encapsulator Agents provide the ability to be proactive to prevent explosion while also providing both 2D and 3D Class B fire suppression capabilities.

Statement of Problem and Substantiation for Public Input

Encapsulator Agent conforming to NFPA 18A, Section 7.7 is the next generation of fire suppression agents that work by encapsulation of fuel molecules (in either liquid or vapor phase) thus separating the fuel from the oxygen on a chemical molecular level. This allows both proactive prevention of explosions and flammable/combustible liquid fire suppression

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 27-NFPA 59A-2020 [Section No. 2.2]	Encapsulator Agent is an agent covered within NFPA 18A

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski
Organization: JB HazMat Consulting
Street Address:
City:
State:
Zip:

Submittal Date: Tue Jan 07 10:08:20 EST 2020
Committee: LNG-AAA

Public Input No. 29-NFPA 59A-2020 [Section No. 3.3.12]

3.3.12 * Fire Protection and Explosion Prevention .

Fire prevention ~~, fire detection, and fire suppression~~ including combustible/flammable liquid vapor detection and mitigation; fire detection: and fire suppression .

Statement of Problem and Substantiation for Public Input

Encapsulator Agents conforming to NFPA 18A-Standard on Water Additives for Fire Control and Vapor Mitigation, Section 7.7 Spherical Micelle Stability Test document the ability to encapsulate hydrocarbon vapors of LNG rendering these vapors nonflammable, non-ignitable, and non-explosive. Utilizing Encapsulator Agents in Vapor Encapsulating Explosion Prevention (VEEP) Systems allows the facility owners, managers, safety personnel, and AHJs to be proactive in preventing explosions leading to fires, loss of life, property loss, etc., etc. NFPA 18A, Section 7.7. Further, Encapsulator Agents also provide Class B 2D and 3D fire suppression capabilities essentially providing two levels of protection, prevention and suppression

Submitter Information Verification

Submitter Full Name:	Jeffrey Bonkoski
Organization:	JB HazMat Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jan 07 10:27:55 EST 2020
Committee:	LNG-AAA

Public Input No. 66-NFPA 59A-2021 [Section No. 3.3.17]

~~**3.3.17** – Individual Risk.~~

~~The frequency, expressed in number of realizations per year, at which an individual, with continuous potential exposure, can be expected to sustain irreversible harm and fatal injury.~~

Statement of Problem and Substantiation for Public Input

We have a definitions section specific to Chapter 19 which this is defined in. It shouldnt be in two places. Other definitions in Chapter 19 are not included in the Definitions section in Chapter 1.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 08:28:30 EST 2021
Committee: LNG-AAA

Public Input No. 5-NFPA 59A-2019 [New Section after 3.3.20]

LNG tank systems, equipment and piping:

All equipment and piping specifically related to the Tank system and contained within the isolation valving provided to isolate the storage container from the remainder of the facility, and not transfer or loading or unloading.

Statement of Problem and Substantiation for Public Input

Provide appropriate qualification of scope of coverage intended as some clients are interpreting this to apply to all piping in LNG service.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 4-NFPA 59A-2019 [Section No. 3.3.5.2]	Interrelated definition and scope coverage applied
Public Input No. 6-NFPA 59A-2019 [Section No. 12.1]	

Submitter Information Verification

Submitter Full Name: Bob Pike

Organization: McDermott

Street Address:

City:

State:

Zip:

Submittal Date: Mon Aug 12 04:40:04 EDT 2019

Committee: LNG-AAA

Public Input No. 67-NFPA 59A-2021 [Section No. 3.3.29]

~~**3.3.29** – Societal Risk.~~

~~The cumulative risk exposure by all persons sustaining irreversible harm and fatal injury from an event in the LNG plant.~~

Statement of Problem and Substantiation for Public Input

We have a definitions section specific to Chapter 19 which this is defined in. It shouldnt be in two places. Other definitions in Chapter 19 are not included in the Definitions section in Chapter 1.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consultin
Street Address:
City:
State:
Zip:

Submittal Date: Wed Jan 06 08:29:37 EST 2021
Committee: LNG-AAA

Public Input No. 65-NFPA 59A-2021 [New Section after 3.3.37]

Uncontrolled Source of Ignition

Sources beyond the control of the LNG plant which may present a potential ignition hazard .
(Add in Annex material listing examples: vehicles, trains, or other off-site ignition sources.)

Statement of Problem and Substantiation for Public Input

We have code requirements for uncontrolled sources of ignition but we never define what they are.

Submitter Information Verification

Submitter Full Name:	Phil Suter
Organization:	Blue Engineering and Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 06 08:26:28 EST 2021
Committee:	LNG-AAA

Public Input No. 68-NFPA 59A-2021 [Section No. 3.3.38]

3.3.38* Vacuum-Jacketed.

A ~~method of construction~~ system that incorporates an outer shell designed to maintain a vacuum in the annular space between the inner container or piping and outer shell.

Statement of Problem and Substantiation for Public Input

I didnt think that vacuum jacketed was a "method of construction". Its more of a system that comes manufactured in a factory. Ask the Chart guys during the meeting if this definition is correct for piping and tanks.

Submitter Information Verification

Submitter Full Name: Phil Suter

Organization: Blue Engineering and Consulting

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 06 08:30:15 EST 2021

Committee: LNG-AAA

Public Input No. 69-NFPA 59A-2021 [New Section after 4.9.2]

Each plant should have records documenting the design and configuration of the plant, such as Piping and Instrumentation Diagrams, Process Flow Diagrams, Electrical One Line Drawings, and other engineering drawings.

Statement of Problem and Substantiation for Public Input

We require an engineering review of changes, but we dont require the basic documents which should be updated when there is a change. Its good engineering practice for plants to have the basic drawings showing the overall schematic of the installed plant, which should be updated as modifications and changes are made throughout the life of the plant.

Submitter Information Verification

Submitter Full Name:	Phil Suter
Organization:	Blue Engineering and Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 06 08:32:24 EST 2021
Committee:	LNG-AAA

Public Input No. 46-NFPA 59A-2020 [Section No. 4.10]

4.10* Noncombustible Material.

A material that complies with any of the following shall be considered a noncombustible material:

(1) * In the form in which it is used and under the conditions anticipated, it will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.

(2) It passes the noncombustible criterion of ASTM E136, *Standard Test Method for ~~Behavior of Materials in~~ Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*.

(3) It passes the noncombustible criterion of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for ~~Behavior of~~ Assessing Combustibility of Materials ~~in~~ Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*.

Statement of Problem and Substantiation for Public Input

revise title of standards

Submitter Information Verification

Submitter Full Name: Marcelo Hirschler
Organization: GBH International
Street Address:
City:
State:
Zip:
Submittal Date: Thu Dec 24 16:29:02 EST 2020
Committee: LNG-AAA

Public Input No. 56-NFPA 59A-2021 [Section No. 5.3.1.3]

5.3.1.3

Where there is a possibility for hazardous liquid releases to accumulate 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 for LNG ~~, flammable refrigerants,~~ and flammable ~~liquids~~ fluids

(5) Areas immediately surrounding flammable ~~refrigerant and flammable liquid~~ fluid storage tanks

Statement of Problem and Substantiation for Public Input

The term "flammable refrigerant" is not defined. Its often used repetitively as well throughout the document - listing flammable refrigerants and flammable fluids or flammable liquids in the same sentence. The use of flammable fluids will cover the intended materials.
Alternatively, the introductory paragraph discusses "hazardous liquids" and that can be used instead of listing "LNG and flammable fluids".
The use of these terms should be reviewed throughout the document.

Submitter Information Verification

Submitter Full Name: Jenna Wilson

Organization: Blue Engineering and Consulting Company

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 05 12:11:39 EST 2021

Committee: LNG-AAA

Public Input No. 15-NFPA 59A-2019 [Section No. 5.3.2.3 [Excluding any Sub-Sections]]

Each LNG plant shall define a set of design spills in accordance with Table 5.3.2.3 and the design spill duration period set in 5.3.2.4.

Table 5.3.2.3 Design Spill

Design Spill Source	**Design Spill Criteria**	**Design Spill Rate**
Storage Containers		
Containers with penetrations below the liquid level without internal shutoff valves in accordance with 10.4.2.5	A liquid spill through an assumed opening at, and equal in area to, that penetration below the liquid level resulting in the largest flow from an initially full container If more than one container in the impounding area, use the container with the largest flow	Use the following formula: $q = \frac{4}{3} d^2 \sqrt{h}$ For SI units, use the following formula: $q = \frac{1.06}{10,000} d^2 \sqrt{h}$ until the differential head acting on the opening is 0.
Containers with penetrations below the liquid level with internal shutoff valves in accordance with 10.4.2.5	The liquid spill through an assumed opening at, and equal in area to, that penetration below the liquid level that could result in the largest flow from an initially full container	Use the following formula: $q = \frac{4}{3} d^2 \sqrt{h}$ For SI units, use the following formula: $q = \frac{1.06}{10,000} d^2 \sqrt{h}$
Piping and Other Equipment		
Process systems or transfer areas involving hazardous fluids	For piping, arms, and hoses that are: (1) Greater than or equal to ~~6 in~~ 3 in . diameter, a hole size of 2 in. diameter is applied at any location along the piping segment (2) Less than ~~6 in~~ 3 in . diameter, a full-bore rupture is applied at any location along the piping segment	The calculated flow* based on the following: (1) The physical and thermodynamic properties of the released fluid (2) The physical characteristics of the process or containment system
Pipe-in-pipe systems designed in accordance with Section 10.13 to serve as secondary containment	No design spill — setback in accordance with Table 6.3.1 based on isolatable volume within the pipe-in-pipe system	-

Note: q = flow rate [ft^3/min (m^3/min)] of liquid; d = diameter [in. (mm)] of penetration below the liquid level; h = height [ft (m)] of liquid above penetration in the container when the container is full, plus the equivalent head for the vapor pressure above the liquid.

*See A.5.3.2.2.

Statement of Problem and Substantiation for Public Input

This change requests a design spill hole size criteria modification that would include a rupture of piping and hoses less than 2 inches in diameter, and a hole of 2 inches in diameter for all larger piping, hoses, and transfer arms. There are several reasons for this change: (1) This request normalizes all design spills to a 2-inch hole (unless the equipment is smaller). (2) The current requirements unfairly require full rupture events for 3-inch and 4-inch piping. (3) The arbitrary requirement for full ruptures of 3-inch and 4-inch piping often forces non-engineered design changes for piping diameter, forcing some 3-inch piping to 2-inch diameter and 4-inch piping to a 6-inch diameter. This unintended consequence of the design spill rules disrupts the proper engineering design of LNG plants. (4) There are no known (to the author) scientific assessments that would indicate that 3-inch and 4-inch piping is more susceptible to full rupture failure than piping that is 6 inches diameter or greater, especially within the LNG industry. (6) Probabilistic evaluation of hydrocarbon release databases indicates that hole sizes up to 2 inches in diameter represent 90% or more of the recorded failures. Piping ruptures in the 3-inch and 4-inch range are not any more evident than would occur for larger piping. (5) Normalizing the design spill hole size to 2 inches would be consistent with what is found in CSA Z276, the requirement in Canada.

Submitter Information Verification

Submitter Full Name:	Jeffrey D Marx
Organization:	Quest Consultants Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Dec 21 12:40:45 EST 2019
Committee:	LNG-AAA

Public Input No. 19-NFPA 59A-2020 [Section No. 5.3.2.3 [Excluding any Sub-Sections]]

Each LNG plant shall define a set of design spills in accordance with Table 5.3.2.3 and the design spill duration period set in 5.3.2.4.

Table 5.3.2.3 Design Spill

Design Spill Source	**Design Spill Criteria**	**Design Spill Rate**
Storage Containers		
Containers with penetrations below the liquid level without internal shutoff valves in accordance with 10.4.2.5	A liquid spill through an assumed opening at, and equal in area to, that penetration below the liquid level resulting in the largest flow from an initially full container If more than one container in the impounding area, use the container with the largest flow	Use the following formula: $$q = \frac{4}{3} d^2 \sqrt{h}$$ For SI units, use the following formula: $$q = \frac{1.06}{10{,}000} d^2 \sqrt{h}$$ until the differential head acting on the opening is 0.
Containers with penetrations below the liquid level with internal shutoff valves in accordance with 10.4.2.5	The liquid spill through an assumed opening at, and equal in area to, that penetration below the liquid level that could result in the largest flow from an initially full container	Use the following formula: $$q = \frac{4}{3} d^2 \sqrt{h}$$ For SI units, use the following formula: $$q = \frac{1.06}{10{,}000} d^2 \sqrt{h}$$
Piping and Other Equipment		
Process systems or transfer areas involving hazardous fluids	For piping, arms, and hoses that are: (1) Greater than or equal to 6 in. diameter, a hole size of 2 in. diameter is applied at any location along the piping segment (2) Less than 6 in. diameter, a full-bore rupture is applied at any location along the piping segment **(3) Alternatively, when accpetable to the AHJ, a full bore rupture is applied at any location along the piping segment but does not need to exceed 2 in.**	The calculated flow* based on the following: (1) The physical and thermodynamic properties of the released fluid (2) The physical characteristics of the process or containment system
Pipe-in-pipe systems designed in accordance with Section 10.13 to serve as secondary containment	No design spill — setback in accordance with Table 6.3.1 based on isolatable volume within the pipe-in-pipe system	
_		

Note: q = flow rate [ft^3/min (m^3/min)] of liquid; d = diameter [in. (mm)] of penetration below the liquid level; h = height [ft (m)] of liquid above penetration in the container when the container is full, plus the equivalent head for the vapor pressure above the liquid.

*See A.5.3.2.2.

Statement of Problem and Substantiation for Public Input

The language in (1) and (2) create an incentive for designers to avoid 3 and 4 inch piping and use multiple 2 inch piping which will increase total risk. While common sorting of data sets into small medium and large diameter piping tends to support the notion that the 6 inch pipe is a discreet hole size risk reduction, comprehensive data sets will show that the highest risk hole size remains at 2 inch even for pipe 3 and 4 inch pipe sizes.

AHJ's should be advised to consider arguments for the use of 3 and 4 inch pipe sizes where the design alternative is multiple 2 inch pipes.

Submitter Information Verification

Submitter Full Name: Thomas Drube
Organization: Chart Industries, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 06 12:19:01 EST 2020
Committee: LNG-AAA

Public Input No. 48-NFPA 59A-2021 [Section No. 5.3.2.5]

5.3.2.5 *

Source term models shall ~~have a creditable scientific basis~~ be approved, have available documentation that demonstrates validation against experimental data, and shall not ignore phenomena that can influence vapor evolution rate as follows:

(1) During discharge from piping or equipment and associated flashing and jetting effects

(2) During conveyance of liquid to an impoundment and subsequent vaporization

(3) Due to liquid flow into and retention within an impoundment

Statement of Problem and Substantiation for Public Input

A PHMSA-sponsored project is under way to develop a model evaluation protocol for source term models, which would allow models to be reviewed and approved for use, rather than just be required to have an unspecified "creditable basis".

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 49-NFPA 59A-2021 [New Section after A.5.3.2.3]	

Submitter Information Verification

Submitter Full Name: Filippo Gavelli
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 11:03:29 EST 2021
Committee: LNG-AAA

Public Input No. 10-NFPA 59A-2019 [Section No. 5.3.2.6]

5.3.2.6* ~~Weather and Modeling Parameters~~ Model Assessment .

Models employed in 5.3.2.9 through 5.3.2.12 shall be approved and shall have available documentation that demonstrates the following:

(1) The scientific assessment of the physical phenomena observed in experimental data applicable to the physical situation

(2) Verification processes for the details of the physics, analysis, and execution process

(3) Validation with experimental, including available field-scale, data applicable to the physical situation

Statement of Problem and Substantiation for Public Input

Paragraph title changed to properly reflect the subject matter.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Sat Dec 21 11:27:55 EST 2019
Committee: LNG-AAA

Public Input No. 11-NFPA 59A-2019 [Section No. 5.3.2.7]

5.3.2.7

Models employed in 5.3.2.~~8~~ 9 and 5.3.2.~~9~~ 10 shall incorporate the following:

(1) In calculating hazard distances, the combination of wind speed adjusted to or at a reference height of 33 ft (10 m), ambient temperature, atmospheric stability, and relative humidity that produces the maximum distances shall be used except for conditions that occur less than 10 percent of the time based on recorded data for the area.

(2) As an alternative, the maximum distances shall be permitted to be calculated using a wind speed of 4.5 mph (2 m/sec) at a 33 ft (10 m) measurement height, atmospheric stability class F, average ambient temperature for the region, and 50 percent relative humidity.

(3) All wind directions shall be considered.

(4) The surface roughness that is representative of the area upwind of the site shall be used.

(5) The effects of passive and approved active mitigation techniques shall be permitted to be incorporated into the modeling.

Statement of Problem and Substantiation for Public Input

Revised to reference correct paragraphs for vapor dispersion

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx

Organization: Quest Consultants Inc

Street Address:

City:

State:

Zip:

Submittal Date: Sat Dec 21 12:10:00 EST 2019

Committee: LNG-AAA

Public Input No. 13-NFPA 59A-2019 [Section No. 5.3.2.10]

5.3.2.10 Toxic Gas or Vapor Dispersion.

The siting of the plant shall be such that, in the event of a toxic fluid release as specified in 5.3.2.3, a predicted maximum concentration from a release does not exceed the limits listed in Table 5.3.2.10.

Table 5.3.2.10 Toxic Concentration Limits to Property Lines and Occupancies

Toxic Concentration		-
Acute Exposure Guideline Levels (AEGL)	**Description**	**Exposure**
AEGL-1	Toxic concentration at which notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure	The area that will be potentially notified for toxic clouds in the emergency response plan required in Section 18.4
AEGL-2	Toxic concentration at which irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape	The nearest point on the building or structure outside the owner's property line that is in existence at the time of plant siting and used for assembly, educational, health care, detention and correction, or residential ~~occupancies for a toxic cloud~~ occupancies
AEGL-3	Toxic concentration at which life-threatening health effects or death can occur	A property line that can be built ~~upon for dispersion of a design spill resulting in a toxic cloud~~ upon

Statement of Problem and Substantiation for Public Input

Deleted text in the table is inconsistent and unnecessary given the text of Paragraph 5.3.2.10.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx

Organization: Quest Consultants Inc

Street Address:

City:

State:

Zip:

Submittal Date: Sat Dec 21 12:33:31 EST 2019

Committee: LNG-AAA

Public Input No. 12-NFPA 59A-2019 [Section No. 5.3.2.11]

5.3.2.11 Vapor Cloud Explosions.

The siting of the plant shall be such that, in the event of the ignition of a flammable cloud in a confined or congested area based on a design spill as specified in 5.3.2.3, a maximum overpressure from an explosion does not exceed the limits listed in Table 5.3.2.11.

Table 5.3.2.11 Overpressure Limits to Property Lines and Occupancies

Overpressure		-
Overpressure	Description	Exposure
1 psi	Overpressure at which persons can be indirectly affected	The nearest point on the building or structure outside the owner's property line that is in existence at the time of plant siting and used for assembly, educational, health care, detention and correction, or residential ~~occupancies for a vapor cloud explosion~~ occupancies
3 psi	Overpressure at which persons can be directly affected	A property line that can be built ~~upon for ignition of a design spill resulting in a vapor cloud explosion~~ upon

Statement of Problem and Substantiation for Public Input

These two deletions highlight two pieces of text that should be the same but are not. For both, the condition of ignition of a vapor cloud resulting from a design spill is already stated in the text of 5.3.2.11, so does not need to be re-stated in the table.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Sat Dec 21 12:22:37 EST 2019
Committee: LNG-AAA

Public Input No. 14-NFPA 59A-2019 [Section No. 5.3.2.13]

5.3.2.13*

The hazard footprint calculated in 5.3.2.9 through 5.3.2.12 shall account for ~~the~~ uncertainty factors determined in 5.3.2. ~~7 and 5.3.2.8~~ ~~.~~ 6.

Statement of Problem and Substantiation for Public Input

Paragraph reference corrected to properly refer to the model assessment language.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Sat Dec 21 12:37:11 EST 2019
Committee: LNG-AAA

Public Input No. 57-NFPA 59A-2021 [Section No. 5.3.2.14]

5.3.2.14 Cascading Damage.

Equipment shall be located or protected so that impacts from 5.3.2.11 and 5.3.2.12 shall not cause major structural damage that can lead to failure of any LNG storage container, LNG marine carrier, ~~refrigerant~~ flammable liquid storage vessel, buildings, or equipment required for the safe shutdown and control of the hazard.

Statement of Problem and Substantiation for Public Input

The term structural damage is vague, the outcome of concern should be specified. Additionally, refrigerant storage is not defined and flammable liquid would be more encompassing.

Submitter Information Verification

Submitter Full Name: Jenna Wilson
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 12:19:57 EST 2021
Committee: LNG-AAA

Public Input No. 16-NFPA 59A-2019 [Section No. 6.3.1]

6.3.1

The minimum separation distance associated with any type of LNG container or tanks containing flammable refrigerants shall be in accordance with Table 6.3.1 or with the approval of the authority having jurisdiction at a shorter distance from buildings or walls constructed of concrete or masonry but at least 10 ft (3.0 m) from any building openings.

Table 6.3.1 Distances from Containers and Exposures

Container Water Capacity		-	**Minimum Distance from Edge of Impoundment or Container Drainage System to Property Lines That Can Be Built Upon**		-	**Minimum Distance Between Storage Containers**		
gal	**m^3**	-	**ft**	**m**	-	**ft**	**m**	
<125*	<0.5	-	0	0	-	0	0	
125–500	≥0.5–1.9	-	10	3	-	3	1	
501–2,000	≥1.9–7.6	-	15	4.6	-	5	1.5	
2,001–18,000	≥7.6–63	-	25	7.6	-	5	1.5	
18,001–30,000	≥63–114	-	50	15	-	5	1.5	
30,001–70,000	≥114–265	-	75	23	- -	-		QSD*
>70,000	>265	-	0.7 times the container diameter but not less than 100 ft (30 m)		-	~~1~~/4 ~~of the sum of the diameters of adjacent containers [5 ft (1.5 m) minimum]~~		
*								
			QSD*					

NOTE: If the aggregate water capacity of a multiple container installation is 501 gal (1.9 m^3) or greater, the minimum distance must comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per container. If more than one installation is made, each installation must be separated from any other installation by at least 25 ft (7.6 m). Do not apply minimum distances between adjacent containers to such installation.

*QSD = 1/4 of the sum of the diameters of any two adjacent containers [5 ft (1.5 m) minimum]

Statement of Problem and Substantiation for Public Input

Table revisions made for clarity.
The "QSD" modification added for clarity in the last two lines of the table, which have lacked clear formatting, and for consistency with the approach applied in Table 17.3.2.2.3.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx

Organization:	Quest Consultants Inc
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sat Dec 21 13:12:47 EST 2019
Committee:	LNG-AAA

Public Input No. 31-NFPA 59A-2020 [Section No. 8.4.14.6 [Excluding any Sub-Sections]]

The three levels of ground motion defined in 8.4.14.3 through 8.4.14.5 shall be used for the earthquake-resistant design of the following structures and systems:

(1) LNG tank systems and their impounding systems

(2) System components required to isolate the LNG tank system and maintain it in a safe shutdown condition

(3) Structures or systems, including Vapor Encapsulation Explosion Prevention (VEEP) System, fire protection systems, the failure of which could affect the integrity of 8.4.14.6(1) or 8.4.14.6(2)

Statement of Problem and Substantiation for Public Input

Encapsulator Agents conforming to NFPA 18A-Standard on Water Additives for Fire Control and Vapor Mitigation, Section 7.7 Spherical Micelle Stability Test document the ability to encapsulate hydrocarbon vapors of LNG rendering these vapors nonflammable, non-ignitable, and non-explosive. Utilizing Encapsulator Agents in Vapor Encapsulating Explosion Prevention (VEEP) Systems allows the facility owners, managers, safety personnel, and AHJs to be proactive in preventing explosions leading to fires, loss of life, property loss, etc., etc. NFPA 18A, Section 7.7. Further, Encapsulator Agents also provide Class B 2D and 3D fire suppression capabilities essentially providing two levels of protection, prevention and suppression

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski

Organization: JB HazMat Consulting

Street Address:

City:

State:

Zip:

Submittal Date: Tue Jan 07 11:02:44 EST 2020

Committee: LNG-AAA

Public Input No. 9-NFPA 59A-2019 [Section No. 8.4.16.1.1.1]

8.4.16.1.1.1

The thermal corner protection shall protect the entire bottom of the outer container and at least the lower 16.5 ft (5 m) of the wall ~~necessary thermally~~ , to thermally isolate from the cold liquid and provide liquid tightness at the monolithic or pinned wall-to-slab junction.

Statement of Problem and Substantiation for Public Input

This is a grammar error, and the sentence will read better with the proposed correction.

Submitter Information Verification

Submitter Full Name: Roberto Ruiperez Vara
Organization: LNG StartUp LLC
Street Address:
City:
State:
Zip:

Submittal Date: Thu Nov 21 11:15:07 EST 2019
Committee: LNG-AAA

Public Input No. 79-NFPA 59A-2021 [Section No. 8.4.16.2.3 [Excluding any Sub-Sections]]

The outer concrete container wall shall resist the specified impact load from wind-borne missiles and fragments from accidental explosions with the properties specified in Section 13.6(3) without perforation and scabbing.

Statement of Problem and Substantiation for Public Input

Section 8.4.16.2.3 of NFPA 59A-2019 requires that the outer concrete container walls must be designed for specified impact load without perforation and scabbing. Although NFPA 59A-2019 references ACI 376-2011, which requires consideration for both external and internal loadings on impoundments, not limited to wind-borne missiles, ACI 376-2011 does not provide design properties for wind-borne missiles. It is proposed that the impact loads are results of wind-borne missiles and accidental explosions. We further propose a new Section 13.6(3) [Public Input 81] that prescribes specific characteristics of wind-borne missiles and guidance for fragmentations from explosions (vapor cloud explosion and pressure vessel burst).

Submitter Information Verification

Submitter Full Name: Thach Nguyen
Organization: Department of Transportation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 12:07:38 EST 2021
Committee: LNG-AAA

Public Input No. 7-NFPA 59A-2019 [Section No. 8.5.1.1]

8.5.1.1

~~ASME containers used for the storage of LNG~~ Containers shall be either ~~of the following:~~

(1) ~~Double~~ double -walled, with the inner ~~container~~ tank holding the LNG surrounded by insulation contained in the outer ~~container as specified~~ tank. Requirements for the inner and outer tank are defined in 8.5.1.3 and 8.5.1.4.

(2) ~~Single~~ single -walled, if designed and fabricated according to the criteria ~~that is specified~~ described in 8.5.1.5.

Additional Proposed Changes

File Name	Description	Approved
NFPA_59A_Held_Comment_158_to_be_Emulated.pdf	59A_PC # 158	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as 'Reject but Hold" in the Public Comment No. 158 of the F18 Second Draft Report for NFPA 59A and per the Regs. at 4.4.8.3.1.

NFPA 59A currently states that all ASME containers used for LNG storage and designed for operation at more than 15 psi (103 kPa) shall be double- walled. The growth in the small-to-mid scale segment of the global LNG market has prompted a re-evaluation of the available storage technologies suitable for this segment, including a single-wall ASME container with supplementary design and fabrication requirements. This is an opportunity for NFPA 59A to append specific criteria to the ASME VIII Division 1 pressure vessel code in order to set the framework under which single-wall ASME containers used for LNG storage can be safely implemented at LNG facilities.

Self-supporting single-wall cryogenic pressure vessels that are designed and fabricated according the additional criteria proposed in Section 8.5.1.5 provides sufficient protection against internal and external forces, including all static loads, thermal loads, loading/unloading processes, vibrations, seismic loads, wind loads, environmental loads, and projectiles, such that a secondary wall is not required.

The basis for the supplementary criteria as defined in Section 8.5.1.5 is the ASME Boiler & Pressure Vessel Code Section VIII Division 1, and was developed between 1967 and 1975 in the USA by Inter-Governmental Maritime Consultative Organisation (IMCO) and US Coast Guard. Since then, this design has mainly been applied for decades in offshore applications, with no known failures occurring to date.

This supplementary design criteria gives a significant level of protection against external projectiles, based on the high wall thickness and the mechanical properties of the pressure boundary at cryogenic temperatures.

A medium-scale gas storage terminal following this design principle is operational in Belgium by the end of 2018. The terminal design has been approved against European requirements regarding all environmental, safety (including fire fighting), and building requirements. The design was made for all C2-C4 refrigerated gases.

Submitter Information Verification

Submitter Full Name:	TC ON LNG-AAA
Organization:	NFPA
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Mon Nov 04 15:08:47 EST 2019
Committee:	LNG-AAA

Public Comment No. 158-NFPA 59A-2017 [Section No. 8.5.1.1]

8.5.1.1

Containers shall be either

(A) double-walled, with the inner tank holding the LNG surrounded by insulation contained in the outer tank. Requirements for the inner and outer tank are defined in 8.5.1.3 and 8.5.1.4

(B) single-walled, if designed and fabricated according to the criteria described in 8.5.1.5.

Statement of Problem and Substantiation for Public Comment

NFPA 59A currently states that all ASME containers used for LNG storage and designed for operation at more than 15 psi (103 kPa) shall be double-walled. The growth in the small-to-mid scale segment of the global LNG market has prompted a re-evaluation of the available storage technologies suitable for this segment, including a single-wall ASME container with supplementary design and fabrication requirements. This is an opportunity for NFPA 59A to append specific criteria to the ASME VIII Division 1 pressure vessel code in order to set the framework under which single-wall ASME containers used for LNG storage can be safely implemented at LNG facilities.

Self-supporting single-wall cryogenic pressure vessels that are designed and fabricated according the additional criteria proposed in Section 8.5.1.5 provides sufficient protection against internal and external forces, including all static loads, thermal loads, loading/unloading processes, vibrations, seismic loads, wind loads, environmental loads, and projectiles, such that a secondary wall is not required.

The basis for the supplementary criteria as defined in Section 8.5.1.5 is the ASME Boiler & Pressure Vessel Code Section VIII Division 1, and was developed between 1967 and 1975 in the USA by Inter-Governmental Maritime Consultative Organisation (IMCO) and US Coast Guard. Since then, this design has mainly been applied for decades in offshore applications, with no known failures occurring to date.

This supplementary design criteria gives a significant level of protection against external projectiles, based on the high wall thickness and the mechanical properties of the pressure boundary at cryogenic temperatures.

A medium-scale gas storage terminal following this design principle is operational in Belgium by the end of 2018. The terminal design has been approved against European requirements regarding all environmental, safety (including fire fighting), and building requirements. The design was made for all C2-C4 refrigerated gases.

Related Item

• new 8.5.1.5

Submitter Information Verification

Submitter Full Name: Antonino Nicotra
Organization: Bechtel Oil Gas & Chemicals
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 12 18:52:28 EST 2017
Committee:

Committee Statement

Committee Action: Rejected but held
Resolution: The committee believes that this content be best addressed in the next revision cycle.

Public Input No. 8-NFPA 59A-2019 [New Section after 8.5.1.5]

TITLE OF NEW CONTENT

Type your content here ...

Additional Proposed Changes

File Name	Description	Approved
NFPA_59A_Held_Comment_159_to_be_Emulated.pdf	59A_PC # 159	

Statement of Problem and Substantiation for Public Input

NOTE: This Public Input appeared as "Reject but Hold" in Public Comment No. 159 of the F18 Second Draft Report for NFPA 59A and per the Regs. at 4.4.8.3.1.

NFPA 59A currently states that all ASME containers used for LNG storage and designed for operation at more than 15 psi (103 kPa) shall be doublewalled.

The growth in the small-to-mid scale segment of the global LNG market has prompted a re-evaluation of the available storage technologies suitable for this segment, including a single-wall ASME container with supplementary design and fabrication requirements. This is an opportunity for NFPA 59A to append specific criteria to the ASME VIII Division 1 pressure vessel code in order to set the framework under which single-wall ASME containers used for LNG storage can be safely implemented at LNG facilities.

Self-supporting single-wall cryogenic pressure vessels that are designed and fabricated according the additional criteria proposed in Section 8.5.1.5 provides sufficient protection against internal and external forces, including all static loads, thermal loads, loading/unloading processes, vibrations, seismic loads, wind loads, environmental loads, and projectiles, such that a secondary wall is not required.

The basis for the supplementary criteria as defined in Section 8.5.1.5 is the ASME Boiler & Pressure Vessel Code Section VIII Division 1, and was developed between 1967 and 1975 in the USA by Inter-Governmental Maritime Consultative Organization (IMCO) and US Coast Guard. Since then, this design has mainly been applied for decades in offshore applications, with no known failures occurring to date.

This supplementary design criteria gives a significant level of protection against external projectiles, based on the high wall thickness and the mechanical properties of the pressure boundary at cryogenic temperatures.

A medium-scale gas storage terminal following this design principle is operational in Belgium by the end of 2018. The terminal design has been approved against European requirements regarding all environmental, safety (including firefighting), and building requirements. The design was made for all C2-C4 refrigerated gases.

Submitter Information Verification

Submitter Full Name: TC ON LNG-AAA

Organization: NFPA

Street Address:

City:	
State:	
Zip:	
Submittal Date:	Mon Nov 04 15:22:50 EST 2019
Committee:	LNG-AAA

Public Comment No. 159-NFPA 59A-2017 [New Section after 8.5.1.5]

TITLE OF NEW CONTENT new 8.5.1.5

Type your content here ...

See attached document

Additional Proposed Changes

File Name	Description	Approved
New_8_5_1_5_to_NFPA_59Adocx.docx	new 8.5.1.5	

Statement of Problem and Substantiation for Public Comment

NFPA 59A currently states that all ASME containers used for LNG storage and designed for operation at more than 15 psi (103 kPa) shall be double-walled. The growth in the small-to-mid scale segment of the global LNG market has prompted a re-evaluation of the available storage technologies suitable for this segment, including a single-wall ASME container with supplementary design and fabrication requirements. This is an opportunity for NFPA 59A to append specific criteria to the ASME VIII Division 1 pressure vessel code in order to set the framework under which single-wall ASME containers used for LNG storage can be safely implemented at LNG facilities.

Self-supporting single-wall cryogenic pressure vessels that are designed and fabricated according the additional criteria proposed in Section 8.5.1.5 provides sufficient protection against internal and external forces, including all static loads, thermal loads, loading/unloading processes, vibrations, seismic loads, wind loads, environmental loads, and projectiles, such that a secondary wall is not required.

The basis for the supplementary criteria as defined in Section 8.5.1.5 is the ASME Boiler & Pressure Vessel Code Section VIII Division 1, and was developed between 1967 and 1975 in the USA by Inter-Governmental Maritime Consultative Organization (IMCO) and US Coast Guard. Since then, this design has mainly been applied for decades in offshore applications, with no known failures occurring to date.

This supplementary design criteria gives a significant level of protection against external projectiles, based on the high wall thickness and the mechanical properties of the pressure boundary at cryogenic temperatures.

A medium-scale gas storage terminal following this design principle is operational in Belgium by the end of 2018. The terminal design has been approved against European requirements regarding all environmental, safety (including firefighting), and building requirements. The design was made for all C2-C4 refrigerated gases.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 160-NFPA 59A-2017 [Section No. 19.6.1]	

Related Item

- 8.5.1.1 and P.I. 158

Submitter Information Verification

Submitter Full Name: Antonino Nicotra
Organization: Bechtel Oil Gas & Chemicals
Street Address:
City:
State:
Zip:
Submittal Date: Tue Dec 12 22:43:42 EST 2017
Committee:

Committee Statement

Committee Action: Rejected but held
Resolution: The committee believes that this material is best addressed in the next revision cycle.

New 8.5.1.5 The single-walled container shall be of welded construction and in accordance with Section VIII Division 1 of the ASME *Boiler and Pressure Vessel Code* and shall be ASME-stamped and registered with the National Board of Boiler and Pressure Vessel Inspectors or other agencies that register pressure vessels.

(A) The following materials shall be used:

Any of the carbon steels in Section VIII, Part UCS of the ASME *Boiler and Pressure Vessel Code at* temperatures at or above the minimum allowable use temperature in Section II, Part D, Table 1A of the ASME *Boiler and Pressure Vessel Code*

(B) The minimum wall thickness along all points of the container shall be the greater of:

(1) a wall thickness defined by a design pressure of not less than the maximum allowable relief valve setting (MARVS)

(2) a wall thickness defined by a design liquid pressure P_{eq} in a full container, resulting from the design vapor pressure P_0 and the liquid pressure as given by:

$$P_{eq} = P_0 + P_{gd}$$

with

$$P_0 = 2 + A \cdot C \cdot \rho^{1.5} \quad \text{(barg)}$$

$$A = 0.0185 \left(\frac{\sigma_m}{\Delta\sigma_a}\right)^2$$

σ_m = Design primary membrane stress, to be taken as the smallest of $\frac{\sigma_B}{3.0}$ or $\frac{\sigma_F}{1.5}$

σ_B = the specified minimum ultimate tensile strength at room temperature (N/mm^2).

σ_F = the specified minimum upper yield stress at room temperature (N/mm^2).

$\Delta\sigma_a$ = Allowable dynamic membrane stress (double amplitude at probability level 10^{-8})

= 55 N/mm^2 for ferritic-perlitic, martensitic and austenitic steels

= 25 N/mm^2 for aluminum alloy (5083-0)

C = Characteristic tank dimension, taken as the greatest of the following: h, 0.75·b, or 0.45·l

h = Height of tank exclusive dome (m)

b = Width of tank (m)

l = Length of tank (m)

ρ = maximum cargo density (kg/m^3) at design temperature

and

$$P_{gd} = (1 \cdot 10^{-5}) \cdot z \cdot g \cdot \rho \quad \text{(barg)}$$

Where

z = Vertical distance to maximum liquid level (m)

g = gravity (m/s^2)

ρ = maximum cargo density (kg/m3) at design temperature

(3) a minimum wall thickness of 0.65 inches

(C) The container shall be equipped with a relief device or other device to release internal pressure, as follows:

(1) The discharge area shall be at least 0.00024 in.2/lb. (0.34 mm2/kg) of the water capacity of the container, but the area of any individual device shall not exceed 300 in.2 (0.2 m2).

(2) The relief device shall function at a pressure not exceeding the internal design pressure of the outer container, the external design pressure of the inner container, or 25 psi (172 kPa), whichever is least.

(D) Saddles and legs shall be designed to withstand loads anticipated during shipping and installation, and seismic, wind, and thermal loads.

(E) Foundations and supports shall be protected to have a fire resistance rating of at least 2 hours.

(F) If insulation is used to achieve the fire resistance rating of at least 2 hours, it shall be resistant to dislodgment by fire hose streams.

(G) All container penetrations shall be located above the maximum liquid level.

(H) The minimum amount of non-destructive testing to be carried out

- Radiography: butt welds 100%
- Surface crack detection: all welds 10%, reinforcement rings around holes, nozzles 100%

As an alternative, automatic ultrasonic testing (AUT) may be accepted as a partial replacement of radiographic testing, if specially allowed by the AHJ.

Public Input No. 80-NFPA 59A-2021 [Section No. 8.5.1.5.9.2]

8.5.1.5.9.2

A risk assessment shall be performed as per Chapter 19, to define the site specific external risk and identify requirements for increased minimum wall thickness or impoundment for plant siting._ The external risk assessment shall evaluate specified impact loads from wind-borne missiles and fragments from accidental explosions with the properties specified in Section 13.6 (3).

Statement of Problem and Substantiation for Public Input

Consistent with the proposed external impact loads for concrete container wall in Section 8.4.16.2.3 [Public Input 79], it is proposed that the external risk assessment for single-walled container accounts for impacts from wind-borne missiles and fragments from explosions. We further propose a new Section 13.6(3) [Public Input 81] that prescribes specific characteristics of wind-borne missiles and guidance for fragmentations from explosions (vapor cloud explosion and pressure vessel burst).

Submitter Information Verification

Submitter Full Name: Thach Nguyen
Organization: Department of Transportation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 12:27:03 EST 2021
Committee: LNG-AAA

Public Input No. 38-NFPA 59A-2020 [Section No. 10.13.3.2]

10.13.3.2

If the outer pipe also functions as the secondary containment system, the following shall apply:

(1) The outer pipe shall be designed to ~~contain~~ prevent loss of containmnet at grade of the inner pipe product upon any release from the inner pipe.

(2) The outer pipe shall be designed, fabricated, examined, and tested in accordance with the requirements of ASME B31.3, *Process Piping*.

(3) The outer pipe shall include a stress analysis of the mechanical forces and thermal shock upon a release from the inner pipe.

Statement of Problem and Substantiation for Public Input

This would help clarify that heat transfer will happen to the fluid in the outer pipe and that the outer pipe needs to have relief devices that are routed to a safe area.

Submitter Information Verification

Submitter Full Name: Jeremy Scott
Organization: Chart Industries
Street Address:
City:
State:
Zip:
Submittal Date: Thu Jan 09 08:12:42 EST 2020
Committee: LNG-AAA

Public Input No. 40-NFPA 59A-2020 [Section No. 10.13.3.2]

10.13.3.2

If the outer pipe also functions as the secondary containment system, the following shall apply:

(1) The outer pipe shall be designed to ~~contain the inner~~ prevent loss of containment at grade of the inner pipe product upon any release from the inner pipe.

(2) The outer pipe shall be designed, fabricated, examined, and tested in accordance with the requirements of ASME B31.3, *Process Piping*.

(3) The outer pipe shall include a stress analysis of the mechanical forces and thermal shock upon a release from the inner pipe.

Statement of Problem and Substantiation for Public Input

This would help clarify that heat transfer will happen to the fluid in the outer pipe and that the outer pipe needs to have relief devices that are routed to a safe area.

Submitter Information Verification

Submitter Full Name: Thomas Drube

Organization: Chart Industries, Inc.

Street Address:

City:

State:

Zip:

Submittal Date: Thu Jan 09 13:52:48 EST 2020

Committee: LNG-AAA

Public Input No. 70-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 - 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~~

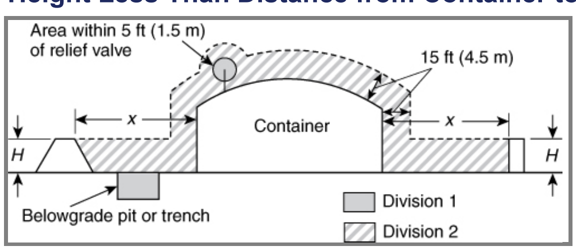
~~Within 15 ft (4.5 m) in all directions, above the deck, from the open sump~~

~~[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.~~

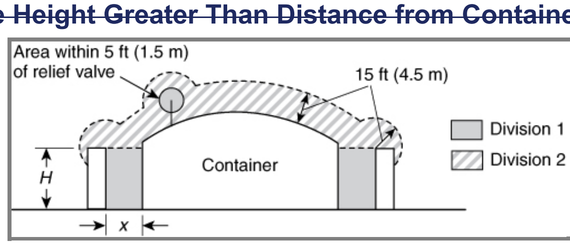
~~[b] Small containers are portable and of less than 200 gal (760 L) capacity.~~

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

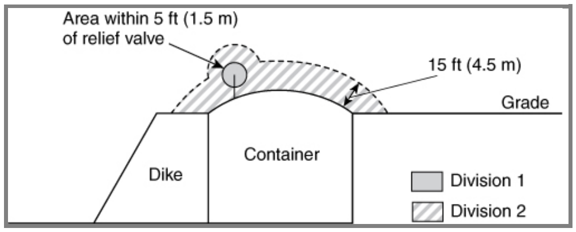
~~**Figure 11.9.2(a) Dike Height Less Than Distance from Container to Dike (*H* < *x*).**~~



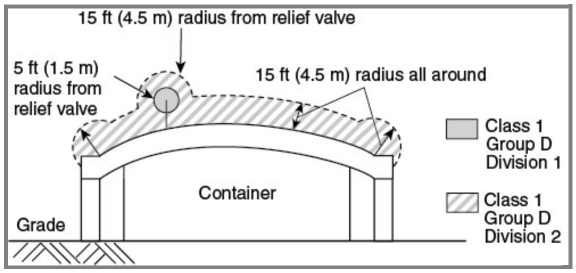
~~**Figure 11.9.2(b) Dike Height Greater Than Distance from Container to Dike (*H* > *x*).**~~



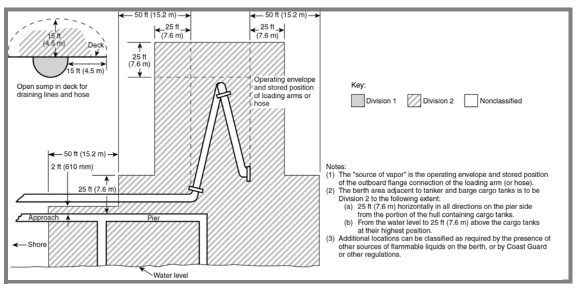
~~**Figure 11.9.2(c) Container with Liquid Level Below Grade or Below Top of Dike.**~~



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



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



~~*the electrical area classification requirements in NFPA 70 and NFPA 497* .~~

Statement of Problem and Substantiation for Public Input

I know there was some clean up on the electrical drawings in the past revision, but I think NFPA 497 provides more detail and guidance for determining electrical area classification for many other situations not defined in NFPA 59A.

Submitter Information Verification

Submitter Full Name:	Phil Suter
Organization:	Blue Engineering and Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Wed Jan 06 08:34:40 EST 2021
Committee:	LNG-AAA

Public Input No. 6-NFPA 59A-2019 [Section No. 12.1]

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) . *Note: Components clasified must be related to the LNG tank system, equipment and pipingas specficically defined in 3.Definition and does not include components specfically related to transfer of LNG tor/fom storage container nor loading/unloading.*

(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

(3) *Classification C*: All other buildings, equipment, piping, and structures

Statement of Problem and Substantiation for Public Input

Provide clear qualification of the scope of coverage intended as having issues with clients attempting to apply to process related piping.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 3-NFPA 59A-2019 [Section No. 3.3.5 [Excluding any Sub-Sections]]	Interrelated with regard to scope definition and qualification
Public Input No. 4-NFPA 59A-2019 [Section No. 3.3.5.2]	Interrelated with regard to scope definition and qualification
Public Input No. 5-NFPA 59A-2019 [New Section after 3.3.20]	Interrelated with regard to scope definition and qualification

Submitter Information Verification

Submitter Full Name: Bob Pike
Organization: McDermott
Street Address:
City:
State:
Zip:
Submittal Date: Mon Aug 12 04:47:18 EDT 2019
Committee: LNG-AAA

Public Input No. 77-NFPA 59A-2021 [Section No. 12.1]

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

Statement of Problem and Substantiation for Public Input

It is proposed to expand NFPA 59A-2019's definition for Classification B items (see section 12.1) to include all components involved in processing natural gas and LNG (i.e., components involved in natural gas pre-treatment, liquefaction, vapor handling, vaporization, transfer systems, etc.). Without this addition to the definition, these non-hazardous components would be required to meet less stringent design standards of Classification C building, structures, and components.

Title 49 CFR Part 193 defines LNG facilities as a pipeline facility used for liquefying natural gas, or transferring, storing, or vaporizing LNG. See § 193.2007. PHMSA believes that LNG facilities, as defined in § 193.2007, can include components that do not carry hazardous fluids, but are integral to the liquefaction, transfer, storage, or vaporization process. For example, the water glycol system used in the vaporization process to convert LNG to natural gas does not contain hazardous fluids but is integral to the process for shell-and-tube vaporizers. Additionally, without the flow of water glycol to the shell-and-tube vaporizers to add thermal energy for LNG vaporization, the carbon steel discharge piping at the vaporizer outlet could potentially experience cryogenic temperatures resulting in brittle fracture. Therefore, ancillary systems used to process LNG, such as the water glycol system, should be included as a component subject to Classification B design requirements. By proposing that LNG facilities, which include non-hazardous fluid containing components used in the liquefaction, transfer, storage, or vaporization process, meet the design requirements for Classification B, NFPA 59A would be ensuring that ancillary systems used to process natural gas and LNG are meeting more stringent design requirements instead of the requirements for Classification C items.

Submitter Information Verification

Submitter Full Name: Thach Nguyen

Organization: Department of Transportation

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 06 11:52:31 EST 2021

Committee: LNG-AAA

Public Input No. 78-NFPA 59A-2021 [Section No. 12.2.2]

12.2.2 Classification B.

Seismic, tsunami, wind, ice, flood including hurricane storm surge, and snow hazard levels, design loads, and associated criteria shall be determined per ASCE 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, based on a risk category of III per ASCE 7 and the additional requirements of this standard.

12.2.2.1 Wind loads shall be determined using a 3-second gust basic design wind speed with a 10,000-year mean recurrence interval.

12.2.2.2 Flood including hurricane storm surge hazard levels shall be based on a 500-year mean recurrence interval including relative sea level rise and wind driven wave effects.

Statement of Problem and Substantiation for Public Input

Wind Forces Criteria changes. It is proposed to require that Classification B buildings, structures, and systems must be designed for a 10,000-year MRI wind velocity in addition to Classification A items. NFPA 59A-2019, section 12.2.2 requires the wind loads for Classification B buildings, structures, and systems be designed for Risk Category III wind speeds in accordance with ASCE 7-16, which specifies an MRI of 1,700 years. The 1,700-year MRI wind velocity requirement in ASCE 7-16 for Classification B buildings, structures, and systems is much lower than the current requirement for LNG facilities in 49 CFR Part 193.

Section 193.2067(b) requires that LNG facilities must be designed to either a sustained wind velocity of not less than 150 miles per hour or a wind velocity having a probability of exceedance in a 50-year period of 0.5 percent or less (equivalent to a 10,000-year MRI). PHMSA's regulations define an LNG facility as "a pipeline facility that is used for liquefying natural gas or synthetic gas or transferring, storing, or vaporing liquefied natural gas." See § 193.2007. Since Classification B buildings, structures, and systems are used for the transportation and liquefaction of natural gas, the transfer, storage or vaporization of LNG, PHMSA believes that Classification B buildings, structures, and systems would meet the definition of LNG facilities and this would be required to be designed for the loads associated with 10,000 year MRI wind velocities in order to align with the requirements of § 193.2067(b)(2) requires a wind velocity for LNG facilities equivalent to a 10,000-year MRI.

Flood/Hurricane Storm Surge Criteria. It is proposed to require Classification B buildings, structures, and systems must be designed for a 500-year MRI for flood and hurricane storm surge design hazards to be consistent with Classification A items. NFPA 59A-2019, section 8.3.2.1.1, requires that LNG storage containers (i.e., Classification A) be designed to resist or be otherwise protected from a flood and hurricane storm surge with a 500-year MRI, including both relative sea-level rise and wind-driven wave effects. On the other hand, section 12.2.2 of NFPA 59A-2019 only requires that the flood and hurricane storm surge design hazards for Classification B buildings, structures, and systems be based on Risk Category III in ASCE 7-16.

ASCE 7-16 references the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), which specifies a 1 percent probability of exceedance in 1 year (equivalent to a 100-year MRI) as the flood and storm surge hazard level. Not only is this hazard level significantly less than the hazard level of a 500-year MRI that is required for Classification A items, but the FEMA FIRMs are understood to have been primarily developed for residential housing – not an LNG facility where the failure consequence may result in a greater impact on the public and the environment. Furthermore, in contrast to the FEMA FIRMs, FEMA's "Emergency Power Systems for Critical Facilities: A Best Practices Approach to Improving Reliability," and other industry standards, including ASCE 24- Flood Resistant Design and Construction (Flood Design Class IV facilities) require critical facilities to be elevated above or otherwise projected from a 500-year flood event. Classification B buildings, structures, and systems contain hazardous fluids similar to Classification A LNG storage containers, and they are essential facilities that are critical to remaining operational following the event of a flood or hurricane storm surge.

Submitter Information Verification

Submitter Full Name: Thach Nguyen
Organization: Department of Transportation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 11:56:35 EST 2021
Committee: LNG-AAA

Public Input No. 43-NFPA 59A-2020 [Section No. 12.9]

12.9* Occupant Protection.

Buildings or structural enclosures not covered by Sections 12.5 through 12.7 shall be designed, constructed, and installed to protect occupants against ~~explosion~~ hazards including explosion , fire, and toxic material releases as appropriate based on a hazard assesment .

Statement of Problem and Substantiation for Public Input

The existing text requires protection from hazards that may not be present at the location of the building in question. This can lead to enforcement of requirements for buidling features such as fire ratings, blast resistance, toxic gas protection, etc. where none are warranted. The Annex material is very clear about using a hazard assesment protocol, but the mandatory language is overly restrictive.

Submitter Information Verification

Submitter Full Name:	Pat Convery
Organization:	Cornerstone Energy Services
Affiliation:	Member of Technical Committee, representing NFPA Industrial Fire Protection Section
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Dec 01 17:18:22 EST 2020
Committee:	LNG-AAA

Public Input No. 81-NFPA 59A-2021 [Section No. 13.6]

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.

(2) Where the outer container of a tank system complies with the requirements of 5.3.1.1 and 5.3.1.2, the dike shall be either the outer container or as specified in 5.3.1.1 and 5.3.1.2.

(3) Dikes and impounding walls shall resist the specified impact load requirements of 8.4.16.2.3 without perforation. The specified impact load shall include loadings from wind-borne missiles with the properties specified in the following table where V_h is the ASCE 7 3-second gust basic design wind speed. Additionally, the evaluation of projectile impacts from fragmentations shall be based on the results of vapor cloud explosions and pressure vessel burst analyses.

(4)

		Missile Horizo[n] **Velocity Coefficie[n]**	
Missile [3]	**Horizontal wind velocity range greater than V or V_h**	**Tornado (V) coefficient, k_1**	**Hu[r]** **coe[f]**
	Weight 4000 lb (1810 kg) [2)]		
Impact type: automobile, 20.0-ft^2 (2.0-mi^2) contact area	250 mph (400 kmph)	0.4	
	200 mph (325 kmph)	0.4	
	150 mph (245 kmph)	0.3	
	100 mph (160 kmph)	0.3	
	Weight 287 lb (130 kg) [1)]		
Penetrating-type, Schedule 40 pipe, 6.0-in. (150-mm) diameter, 15-ft (4.58-m) length	250 mph (400 kmph)	0.4	
	200 mph (325 kmph)	0.4	
	150 mph (245 kmph)	0.4	
	100 mph (160 kmph)	0.4	
	Weight 0.147 lb (0.0669 kg) [1)]		
Solid steel sphere, structural opening 1.0-in. (25-mm)-diameter	250 mph (400 kmph)	0.1	
	200 mph (325 kmph)	0.1	
	150 mph (245 kmph)	0.1	
	100 mph (160 kmph)	0.0	

ft^2 = square feet; mi^2 = square miles; mph = miles per hour; kmph = kilometers per hour;

k_1 = missile velocity coefficient.

1) Vertical velocity taken as 0.67 of horizontal velocity.

2) Missile velocity = k_1 (V or V_h).

3) Automobile missile impact limited to elevation ≤ 30 ft. (9.14 m) above plant grade.

Statement of Problem and Substantiation for Public Input

It is proposed to provide, as clarification, specific characteristics of wind-borne missiles based on Table 4 of American Nuclear Society's ANSI/ANS 2.3-2011 "Estimating Tornado, Hurricane, and Extreme Straight Line Wind Characteristics at Nuclear Facility Sites." These wind-borne missile characteristics can be utilized in conjunction with the evaluation criteria in NFPA 59A-2019 to evaluate the adequacy of LNG impoundment systems for impact force and potential penetrations. In addition, missile fragments from accidental explosions shall be considered for design based on results of vapor cloud explosion and pressure vessel burst analyses.

Submitter Information Verification

Submitter Full Name: Thach Nguyen
Organization: Department of Transportation
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 12:35:38 EST 2021
Committee: LNG-AAA

Public Input No. 58-NFPA 59A-2021 [Section No. 13.9.2]

13.9.2

Dikes, impounding walls, and drainage channels for non-LNG liquefied gas containment shall conform to NFPA 58, NFPA 59, and API Std 2510, *Design and Construction of Liquefied Petroleum Gas (LPG) Installations*, as applicable.

Statement of Problem and Substantiation for Public Input

Text added to provide clarity that this section is not meant to apply to LNG (which is also a liquefied gas).

Submitter Information Verification

Submitter Full Name: Jenna Wilson
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 12:25:23 EST 2021
Committee: LNG-AAA

Public Input No. 61-NFPA 59A-2021 [Section No. 13.12]

13.12– _ Water Removal for LNG Impounding Areas .

13.12.1

Impounding areas shall be provided with water removal systems capable of removing water at a minimum of 25 percent of the rate from a storm of a 10-year frequency and 1-hour duration, except if the design of the impounding area does not allow the entrance of rainfall.

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 LNG or other 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

Statement of Problem and Substantiation for Public Input

Clarification added that this section is meant for impounding areas around LNG equipment.

Submitter Information Verification

Submitter Full Name: Jenna Wilson
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 12:56:46 EST 2021
Committee: LNG-AAA

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

Chapter 16 – Vapor Encapsulation Explosion Prevention, Fire Protection, Safety, and Security

16.1 Scope.

16.1.1

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

16.1.2

The provisions in Chapter 16 augment the leak and spill control provisions in other chapters.

16.1.3

This chapter includes basic plant security provisions.

16.2 * General.

Vapor Encapsulation Explosion Prevention, Fire protection shall be provided for all LNG facilities.

16.2.1 *

The extent of such protection shall be determined by an evaluation based on fire protection engineering principles, analysis of local conditions, hazards within the facility, and exposure to or from other property.

16.2.1.1

Each LNG plant shall ~~conduct the fire~~ conduct an explosive vapor release and fire protection evaluation.

16.2.1.2 *

~~The fire~~ Based on the explosive vapor release and fire protection evaluation ~~shall be conducted~~ conducted, vapor encapsulation explosion prevention (VEEP) systems and fire protection equipment shall be installed before the introduction of hazardous fluids at new plants or significantly altered facilities.

16.2.1.3

The explosive vapor release and fire protection evaluation for existing plants shall be reviewed and updated at intervals not exceeding two calendar years~~, but at least once every 27 months~~ .

16.2.1.4 *

Where results of the re-evaluation required by 16.2.1.3 for existing LNG plants identifies vapor encapsulation explosion prevention (VEEP) systems and/or fire protection system modifications to existing systems, or installation of new vapor encapsulation explosion prevention (VEEP) systems and/or fire protection systems, they must be implemented after completion of the evaluation as follows:

(1) Modification, expansion, or replacement of vapor encapsulation explosion prevention (VEEP) systems and/or fire protection systems or components shall be installed within one calendar year not to exceed 15 months.

(2) New ~~fire~~ vapor encapsulation explosion prevention (VEEP) systems and/or fire protection systems shall be installed within two calendar years not to exceed 27 months or as approved by the AHJ.

16.2.1.5 *

Protection installed as a result of the evaluation in 16.2.2 shall be designed, engineered, installed and tested based upon fire protection equipment standards incorporated by reference adhering to the following standards:

(1) NFPA 10

(2) NFPA 11

(3) NFPA 12

(4) NFPA 12A

(5) NFPA 13

(6) NFPA 14

(7) NFPA 15

(8) NFPA 16

(9) NFPA 17

(10) NFPA 18A

(11) NFPA 20

(12) NFPA 22

(13) NFPA 24

(14) NFPA 25

(15) NFPA 68

(16) NFPA 69

(17) *NFPA 72*

(18) NFPA *101*

(19) NFPA 750

(20) NFPA 1221

(21) NFPA 1901

(22) NFPA 1961

(23) NFPA 1962

(24) NFPA 1963

(25) NFPA 2001

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 LNG and other 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~~ vapor encapsulation explosion prevention (VEEP) systems and/or 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 Emergency Shutdown (ESD) Systems.

16.3.1 *

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

16.3.2

Valves, control systems, and equipment required by the ESD system shall not be required to duplicate valves, control systems, and equipment installed to meet other requirements of the standard where multiple functions are incorporated in the valves, control systems, and equipment. The valves, control systems, and equipment shall meet the requirements for ESD systems.

16.3.3

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 flammable or combustible fluids are controlled.

16.3.4

The ESD system(s) shall be of a fail-safe design and shall be installed, located, or protected to minimize the possibility that it will become inoperative in the event of an emergency or a failure at the normal control system.

16.3.5 *

Where motor-operated valves that are part of ESD systems are not fail-safe, they shall have all components that are located within 50 ft (15 m) of the equipment protected in either of the following ways:

(1) Installed or located where they cannot be exposed to a fire

(2) Protected against failure due to a fire exposure of at least 10 minutes

16.3.6

Operating instructions identifying the location and operation of emergency controls shall be posted in the facility area.

16.3.7

Manual actuators shall be located in an area accessible in an emergency, shall be at least 50 ft (15 m) from the equipment they serve, and shall be marked with their designated function.

16.3.8 *

When determined to be appropriate as part of the evaluation of fire and safety protection systems by 16.2.2(6), emergency depressurizing means shall be provided where necessary for safety. The depressurization system shall be either manual or automated and shall be designed and sized based on requirements of recognized standards.

16.3.9 *

ESD systems shall be tested based on recognized standards.

16.4 Hazard Detection.

16.4.1

Areas, including enclosed buildings and enclosed drainage channels, that can have the presence of LNG or other hazardous fluids shall be monitored as required by the evaluation in 16.2.1.

16.4.2 * Gas Detection.

16.4.2.1

Continuously monitored flammable gas, toxic gas, and oxygen depletion detection systems shall sound an alarm at the plant site and at a constantly attended location if the plant site is not attended continuously.

16.4.2.2

Flammable gas detection systems shall activate an audible and a visual alarm at not more than 25 percent of the LFL of the gas or vapor being monitored or point gas detectors and 1 LFL-m for open-path gas detectors.

16.4.2.3

Flammable gas detection systems shall activate a second audible ~~and~~ , visual alarm ~~at~~ , and automatically activate the vapor encapsulation explosion prevention (VEEP) systems at not more than 50 percent of the LFL of the gas or vapor being monitored for point gas detectors and not more than 3 LFL-m for open-path gas detectors.

16.4.2.3.1

If so determined by an evaluation in accordance with 16.2.1, gas detectors shall be permitted to activate portions of the ESD system.

16.4.2.4

Flammable gas detection systems setpoints shall account for the potential of different flammable gases and vapors being released in the calibration or setpoint of the detectors.

16.4.2.5

Toxic gas detectors shall be present in areas where toxic fluids can be released and shall activate an audible ~~and~~ , a visual alarm, and automatically activate the vapor encapsulation explosion prevention (VEEP) systems at no more than 25 percent of the AEGL-3 or ERPG-3 level or other approved toxic concentration.

16.4.2.6

Oxygen depletion gas detectors shall be present in areas where asphyxiates can be released and migrate into occupied buildings and shall activate an audible and a visual alarm at no less than 19.5 percent oxygen levels or other approved oxygen concentration.

16.4.3 Fire Detectors.

16.4.3.1

Fire detectors shall activate an audible and a visual alarm at the plant site and at a constantly attended location if the plant site is not attended continuously.

16.4.3.2

If so determined by an evaluation in accordance with 16.2.1, fire detectors shall be permitted to activate portions of the ESD system.

16.4.4

Leak detection shall activate an audible ~~and~~ , visual alarm, and automatically activate the vapor encapsulation explosion prevention (VEEP) systems at the plant site and at a constantly attended location if the plant is not continuously attended.

16.4.5 *

The detection systems shall be designed, installed, and maintained in accordance with*NFPA 72*.

16.4.6

Where fire protection systems are installed in accordance with*NFPA 72* and are planned to be integrated with other systems, the integrated systems shall be tested in accordance with NFPA 4.

16.5 Fire Protection Water Systems.

16.5.1

A water supply and a system for distributing and applying water shall be provided for protection of exposures; for cooling containers, equipment, and piping; and for controlling unignited leaks and spills, unless an evaluation in accordance with 16.2.1 determines that the use of water is unnecessary or impractical.

16.5.2

The fire water supply and distribution systems, if provided, shall simultaneously supply water to fixed fire protection systems, including monitor nozzles, at their design flow and pressure, involved in the maximum single incident expected in the plant plus an allowance of 1000 gpm (63 L/sec) or as determined from the fire evaluation required in 16.2.1 for hand hose streams for at least 2 hours.

16.5.3

Where provided, fire protection water systems shall be designed in accordance with NFPA 13, NFPA 14, NFPA 15, NFPA 20, NFPA 22, NFPA 24, NFPA 750, or NFPA 1961 as applicable.

16.6 Fire Extinguishing and Other Fire Control Equipment.

16.6.1 *

Portable or wheeled fire extinguishers shall be recommended for gas fires by their manufacturer.

16.6.1.1

Portable or wheeled fire extinguishers shall be available at strategic locations, as determined in accordance with 16.2.1, within an LNG facility and on tank vehicles.

16.6.1.2

Portable and wheeled fire extinguishers shall conform to the requirements of NFPA 10.

16.6.1.3

Handheld portable dry chemical extinguishers shall contain minimum nominal agent capacities of 20 lb (9 kg) or greater and shall have a minimum 1 lb/sec (0.45 kg/sec) agent discharge rate.

16.6.1.4

For LNG plant hazard areas where minimal Class A fire hazards are present, the selection of potassium bicarbonate–based dry chemical extinguishers is recommended.

16.6.1.5

Wheeled portable dry chemical extinguishers shall contain minimum nominal agent capacities of 125 lb (56.7 kg) or greater and shall have a minimum 2 lb/sec (0.90 kg/sec) agent discharge rate.

16.6.2

If provided, automotive and trailer-mounted fire apparatus shall not be used for any other purpose.

16.6.3

Fire trucks shall conform to NFPA 1901.

16.6.4

Automotive vehicles assigned to the plant shall be provided with a minimum of one portable dry chemical extinguisher having a capacity of not less than 18 lb (8.2 kg).

16.7 Personnel Safety.

16.7.1 *

Protective clothing that will provide protection against the effects of exposure to LNG shall be available and readily accessible at the LNG plant.

16.7.2 *

Employees who are involved in emergency response activities beyond the incipient stage shall be equipped with protective clothing and equipment and trained in accordance with NFPA 600.

16.7.3 *

Written practices and procedures shall be developed to protect employees from the hazards of entry into confined or hazardous spaces.

16.7.4 *

At least three portable flammable gas indicators shall be readily available.

16.8 Security.

16.8.1 Security Assessment.

16.8.1.1 *

A security assessment covering hazards, threats, vulnerabilities, and consequences shall be prepared for the LNG plant.

16.8.1.2

The security assessment shall be available to the authority having jurisdiction on a nonpublic basis.

16.8.2

The LNG plant operator shall provide a security system with controlled access that is designed to prevent entry by unauthorized persons.

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) Flammable refrigerant storage tanks

(4) Hazardous materials storage tanks, including those storing toxic materials

(5) Flammable liquid storage tanks

(6) Other hazardous materials storage areas

(7) Outdoor process equipment areas

(8) Buildings housing process or control equipment

(9) Onshore loading and unloading facilities

(10) Control rooms and stations

(11) Control systems

(12) Fire control equipment

(13) Security communications systems

(14) Alternative power sources

16.8.3.1

The LNG plant shall be secured either by a single continuous enclosure or by multiple independent enclosures or approved barrier(s) that meet the following requirements:

(1) Each protective enclosure shall have sufficient strength and configuration to obstruct unauthorized access to the facilities enclosed.

(2) Openings in or under protective enclosures shall be secured by grates, doors, or covers of construction and fastening of sufficient strength such that the integrity of the protective enclosure is not reduced by any opening.

(3) Ground elevations outside a protective enclosure shall be graded in a manner that does not impair the effectiveness of the enclosure.

(4) Protective enclosures shall not be located near features outside of the facility, such as trees, poles, or buildings, which could be used to breach the enclosure.

(5) At least two accesses shall be provided in each protective enclosure and be located to minimize the escape distance in the event of an emergency.

(6) Each access shall be locked unless it is continuously guarded, and with the following provisions:

  (a) During normal operations, an access shall be permitted to be unlocked only by persons designated in writing by the operator.

  (b) During an emergency, a means shall be readily available to all facility personnel within the protective enclosure to open each access.

16.8.4 Security Communications.

A means shall be provided for the following:

(1) Prompt communication between personnel having supervisory security duties and law enforcement officials

(2) Direct communication between all on-duty personnel having security duties and all control rooms and control stations

16.8.5 Security Monitoring.

Each protective enclosure and the area around each facility shall be monitored for the presence of unauthorized persons.

16.8.5.1

Monitoring shall be by visual observation in accordance with the schedule in the security procedures or by security warning systems that continuously transmit data to an attended location.

16.8.5.2

At an LNG plant with less than 250,000 bbl(40,000 m^3) of storage capacity, only the protective enclosure shall be required to be monitored.

16.8.6 Warning Signs.

16.8.6.1

Warning signs shall be conspicuously placed along each protective enclosure at intervals so that at least one sign is recognizable at night from a distance of 100 ft (30 m) from any direction that could reasonably be used to approach the enclosure.

16.8.6.2

Signs shall be marked with the words “NO TRESPASSING,” or words of comparable meaning, on a background of sharply contrasting colors.

16.8.7

LNG plants shall be illuminated to a minimum of 2.2 lux in the vicinity of protective enclosures and in other areas as necessary to promote security of the LNG plant.

Statement of Problem and Substantiation for Public Input

Encapsulator Agents conforming to NFPA 18A-Standard on Water Additives for Fire Control and Vapor Mitigation, Section 7.7 Spherical Micelle Stability Test document the ability to encapsulate hydrocarbon vapors of LNG rendering these vapors nonflammable, non-ignitable, and non-explosive. Utilizing Encapsulator Agents in Vapor Encapsulating Explosion Prevention (VEEP) Systems allows the facility owners, managers, safety personnel, and AHJs to be proactive in preventing explosions leading to fires, loss of life, property loss, etc., etc. NFPA 18A, Section 7.7. Further, Encapsulator Agents also provide Class B 2D and 3D fire suppression capabilities essentially providing two levels of protection, prevention and suppression

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 27-NFPA 59A-2020 [Section No. 2.2]	
Public Input No. 34-NFPA 59A-2020 [Section No. 17.13]	

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski
Organization: JB HazMat Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 07 11:21:38 EST 2020
Committee: LNG-AAA

Public Input No. 39-NFPA 59A-2020 [Section No. 16.2.1.5]

16.2.1.5*

Protection installed as a result of the evaluation in 16.2.2 shall be designed, engineered, installed and tested based upon fire protection equipment standards incorporated by reference adhering to the following standards:

(1) NFPA 10

(2) NFPA 11

(3) NFPA 12

(4) NFPA 12A

(5) NFPA 13

(6) NFPA 14

(7) NFPA 15

(8) NFPA 16

(9) NFPA 17

(10) NFPA 20

(11) NFPA 22

(12) NFPA 24

(13) NFPA 25

(14) NFPA 68

(15) NFPA 69

(16) *NFPA 72*

(17) NFPA *101*

(18) NFPA 750

(19) NFPA 770

(20) NFPA 1221

(21) NFPA 1901

(22) NFPA 1961

(23) NFPA 1962

(24) NFPA 1963

(25) NFPA 2001

Statement of Problem and Substantiation for Public Input

NFPA 770 is a new NFPA standard on Hybrid (Water and Inert Gas) Fire Extinguishing Systems. This new standard should be added to the list of Fire Protection Systems that could potentially be used for the protection of these facilities. NFPA 770 should also be added to the referenced documents in section 2.2.

Submitter Information Verification

Submitter Full Name:	Kevin Kelly
Organization:	Victaulic
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Thu Jan 09 11:08:31 EST 2020
Committee:	LNG-AAA

Public Input No. 51-NFPA 59A-2021 [Section No. 16.4.1]

16.4.1

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

Statement of Problem and Substantiation for Public Input

Vapor clouds can migrate from the area where the leak occurs to other areas in the facility. Therefore, depending on the facility layout and potential release scenarios, detection may be necessary in non-process areas.

Submitter Information Verification

Submitter Full Name:	Bryant Hendrickson
Organization:	Blue Engineering and Consulting
Affiliation:	None
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jan 05 11:24:53 EST 2021
Committee:	LNG-AAA

Public Input No. 52-NFPA 59A-2021 [Section No. 16.4.2.2]

16.4.2.2

Flammable gas detection systems shall activate an audible and a visual alarm at not more than 25 percent of the LFL of the gas or vapor being monitored ~~or~~ for point gas detectors and 1 LFL-m for open-path gas detectors.

Statement of Problem and Substantiation for Public Input

Editorial correction

Submitter Information Verification

Submitter Full Name:	Bryant Hendrickson
Organization:	Blue Engineering and Consulting
Affiliation:	None
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jan 05 11:27:21 EST 2021
Committee:	LNG-AAA

Public Input No. 53-NFPA 59A-2021 [New Section after 16.4.5]

16.4.5.1

The location of fire and gas detectors shall be determined using a documented performance-based analysis.

Statement of Problem and Substantiation for Public Input

There is no industry standard for developing a fire and gas detection system layout, therefore, the LNG industry lacks a consistent approach to developing layouts and there is no systematic method for AHJs to evaluate these designs. Further, fire and gas detection layouts are often submitted to AHJs without justification for device locations. Since there are no prescriptive requirements for these layouts, it is proposed to explicitly require a performance-based design to be performed consistent with the documentation requirements contained in NFPA 72 (section 17.3 of the 2019 edition).

This is linked to a recommended addition for Appendix A.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 54-NFPA 59A-2021 [New Section after A.16.4.5]	Explanatory Material
Public Input No. 54-NFPA 59A-2021 [New Section after A.16.4.5]	

Submitter Information Verification

Submitter Full Name: Bryant Hendrickson
Organization: Blue Engineering and Consulting
Affiliation: None
Street Address:
City:
State:
Zip:

Submittal Date: Tue Jan 05 11:29:08 EST 2021
Committee: LNG-AAA

Public Input No. 33-NFPA 59A-2020 [New Section after 16.6.2]

Flammable Liquid Vapor Mitigation/Spill Control Canisters

A portable or wheeled encapsulator agent canister capable of encapsulating and removing the flammabiltiy of 500 square feet of spilled fuel shall be provided.

Statement of Problem and Substantiation for Public Input

Encapsulator Agents conforming to NFPA 18A-Standard on Water Additives for Fire Control and Vapor Mitigation, Section 7.7 Spherical Micelle Stability Test document the ability to encapsulate hydrocarbon liquid and vapor molecules including LNG rendering these vapors and/or liquids nonflammable, non-ignitable, and non-explosive.

Related Public Inputs for This Document

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

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski
Organization: JB HazMat Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 07 12:08:31 EST 2020
Committee: LNG-AAA

Public Input No. 34-NFPA 59A-2020 [Section No. 17.13]

17.13 – Vapor Encapsulation Explosion Prevention, Fire Protection, Safety, and Security.

Vapor Encapsulation Explosion Prevention, Fire protection, safety, and security shall comply with Chapter 16,Vapor Encapsulation Explosion Prevention, Fire Protection, Safety, and Security.

Statement of Problem and Substantiation for Public Input

Same as Section 16 Substantiation

Related Public Inputs for This Document

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

Submitter Information Verification

Submitter Full Name:	Jeffrey Bonkoski
Organization:	JB HazMat Consulting
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Jan 07 12:28:43 EST 2020
Committee:	LNG-AAA

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

18.10.10.4

Control systems that are used as part of the fire protection and hazard detection systems at the LNG facility shall be inspected and tested in accordance with the applicable fire code and conform to the following:

(1) Monitoring equipment shall be maintained in accordance with *NFPA 72* and NFPA 1221.

(2) Fire protection water systems shall be maintained in accordance with NFPA 13, NFPA 14, NFPA 15, NFPA 20, NFPA 22, NFPA 24, NFPA 25, NFPA 750, and NFPA 1962.

(3)* Portable or wheeled fire extinguishers suitable for gas fires shall be available at strategic locations, as determined in accordance with Chapter 16, within an LNG facility and on tank vehicles, and shall be maintained in accordance with NFPA 10.

(4) Fixed fire extinguishing systems and other fire control equipment shall be maintained in accordance with NFPA 11, NFPA 12, NFPA 12A, NFPA 16, NFPA 17, NFPA 18A, and NFPA 2001.

(5) Detection devices not covered by *NFPA 72* shall be tested and calibrated in accordance with manufacturer's instructions once each calendar year at intervals not greater than 15 months.

Statement of Problem and Substantiation for Public Input

Encapsulator Agents are covered under the NFPA 18A standard

Related Public Inputs for This Document

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

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski
Organization: JB HazMat Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 07 12:38:36 EST 2020
Committee: LNG-AAA

Public Input No. 36-NFPA 59A-2020 [Section No. 18.11.2.2]

18.11.2.2

All personnel involved in operation and maintenance of LNG plants, including immediate supervisors, shall be trained in the following aspects of flammable liquid spill control, vapor mitigation, fire protection and fire drills:

(1) Potential causes and areas of ~~fire~~ spills,vapor releases and fire

(2) Types, sizes, and predictable consequences of fire

(3) Assigned fire control duties in accordance with the emergency procedures in Section 18.4, which includes proper use of ~~fire protection and~~ emergency response equipment including flammable liquid spill control, vapor mitigation,and fire protection equipment.

(4) Hands-on experience in carrying out duties as listed in the emergency procedures in Section 18.4

Statement of Problem and Substantiation for Public Input

Encapsulator Agents conforming to NFPA 18A-Standard on Water Additives for Fire Control and Vapor Mitigation, Section 7.7 Spherical Micelle Stability Test document the ability to encapsulate hydrocarbon liquid and vapor molecules including LNG rendering these vapors and/or liquids nonflammable, non-ignitable, and non-explosive. These agents and related equipment allow facility owners to be proactive to prevent fires and explosions, thus this new technology need to be taught to all facility personal.

Related Public Inputs for This Document

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

Submitter Information Verification

Submitter Full Name: Jeffrey Bonkoski
Organization: JB HazMat Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 07 12:44:17 EST 2020
Committee: LNG-AAA

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

19.6.1*

The annual probability of LNG and other hazardous material releases from various equipment for scenarios identified in Section 19.5 shall be based on Table 19.6.1 or as approved by the AHJ.

Table 19.6.1 Failure Rate Database

Type of Failure	Failure Rate Per Year of Operation
Single-Containment Atmospheric Storage Tank System	
Catastrophic failure	1E-6 per tank system*
Catastrophic failure of tank system roof (steel roof only)	1E-4 per tank system
Double-Containment Atmospheric Storage Tank System	
Catastrophic failure	1.25 E-8 per tank system*
Catastrophic failure of tank system roof (steel roof only)	1E-4 per tank system
Full-Containment and Membrane Atmospheric Storage Tanks System (Concrete Outer Container)	
Catastrophic failure	1E-8 per tank system*
Catastrophic failure of tank system roof (steel roof only)	4E-5 per tank system
Membrane-Containment Atmospheric Storage Tanks System (Concrete Outer Container)	
Catastrophic failure	1E-8 per tank system*
Catastrophic failure of tank system roof (steel roof only)	4E-5 per tank system
Other Atmospheric Storage Tanks	
Catastrophic failure	3E-6 per tank
Product release from a hole with effective diameter of 12 in. (300 mm)	2.5E-3 per tank
Product release from a hole with effective diameter of 36 in. (1000 mm)	1E-4 per tank
Catastrophic failure of tank roof	2E-3 per tank
Pressurized Storage Vessels	
Catastrophic failure (i.e., rupture)	5E-7 per vessel
Catastrophic failure of vessel fabricated according to 8.5.1.5	1E-8* a per vessel
Release from a hole with effective diameter of 0.4 in. (10 mm)	1E-5 per vessel
Process Vessels, Distillation Columns, Heat Exchangers, and Condensers	
Catastrophic failure (i.e., rupture)	5E-6 per vessel
Release from a hole with effective diameter of 0.4 in. (10 mm)	1E-4 per vessel
Truck Transfer	
Rupture of transfer arm	3E-4 per transfer arm
Release from a hole in transfer arm with effective diameter of 10% of the transfer arm diameter with maximum of 2 in. (50 mm)	3E-3 per transfer arm
Rupture of transfer hose	4E-2 per transfer hose

Type of Failure	Failure Rate Per Year of Operation
Release from a hole in transfer hose with effective diameter of 10% of the transfer hose diameter with maximum of 2 in. (50 mm)	4E-1 per transfer hose
Ship Transfer	
Rupture of transfer arm	2E-5 per transfer arm
Release from a hole in transfer arm with effective diameter of 10% of the transfer arm diameter with maximum of 2 in. (50 mm)	2E-4 per transfer arm
Piping (General)†	
Rupture at valve	9E-6 per valve
Rupture at expansion joint	4E-3 per expansion joint
Failure of gasket	3E-2 per gasket
Piping: d < 2 in. (50 mm)	
Catastrophic rupture	1E-6 per meter of piping
Release from a hole with effective diameter of 1 in. (25 mm)	5E-6 per meter of piping
Piping: 2 in. (50 mm) ≤ d < 6 in. (149 mm)	
Catastrophic rupture	5E-7 per meter of piping
Release from a hole with effective diameter of 1 in. (25 mm)	2E-6 per meter of piping
Piping: 6 in. (150 mm) ≤ d < 12 in. (299 mm)	
Catastrophic rupture	2E-7 per meter of piping
Release from a hole equivalent to ⅓ of the pipe diameter	4E-7 per meter of piping
Release from a hole with effective diameter of 1 in. (25 mm)	7E-7 per meter of piping
Piping: 12 in. (300 mm) ≤ d < 20 in. (499 mm)	
Catastrophic rupture	7E-8 per meter of piping
Release from a hole equivalent to ⅓ of the pipe diameter	2E-7 per meter of piping
Release from a hole equivalent to 10% of the pipe diameter, up to 2 in. (50 mm)	4E-7 per meter of piping
Release from a hole with effective diameter of 1 in. (25 mm)	5E-7 per meter of piping
Piping: 20 in. (500 mm) ≤ d < (40 in. (1000 mm)	
Catastrophic rupture	2E-8 per meter of piping
Release from a hole equivalent to ⅓ of the pipe diameter	1E-7 per meter of piping
Release from a hole equivalent to 10% of the pipe diameter, up to 2 in. (50 mm)	2E-7 per meter of piping
Release from a hole with effective diameter of 1 in. (25 mm)	4E-7 per meter of piping

*Consider effects due to external hazards when determining failure frequency.

†Consider distribution of hole sizes using total failure frequency in table.

Statement of Problem and Substantiation for Public Input

No specific edits suggested for the failure rate table, however:

1) I suggest re-convening a failure rates task force to revise this table, comprised of persons familiar with equipment failure rates and QRA application.
2) I suggest that the table include more types of equipment. For example, pumps, compressors, and heat exchangers are not listed.
3) I 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

Submitter Full Name: Jeffrey D Marx

Organization: Quest Consultants Inc

Street Address:

City:

State:

Zip:

Submittal Date: Mon Jan 06 17:22:33 EST 2020

Committee: LNG-AAA

Public Input No. 25-NFPA 59A-2020 [Section No. 19.7.1.1]

19.7.1.1*

The weather data shall include a probabilistic valuation for a range of the following parameters :

(1) Wind direction

(2) Wind speed

(3) Ambient temperature

(4) ~~Relative humidity~~ Pasquill-Gifford atmospheric stability class

Statement of Problem and Substantiation for Public Input

The requirements for weather data should be explicitly for probabilistic data when applied to a QRA. Relative humidity is removed, as this is the least important variable and can be held constant (see also Public Input No. 24-NFPA-59A-2020 regarding Paragraph 19.8.3).
Atmospheric stability is added to the list, as this is an important parameter for vapor dispersion, and should be accounted for in a probabilistic way, along with the corresponding wind speed and direction values. Stability class should be reported in the Pasquill-Gifford system that ranks stability by a letter from A to F, where F is the most stable. This is the commonly-used representation of stability in dispersion modeling software.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 06 16:36:06 EST 2020
Committee: LNG-AAA

Public Input No. 24-NFPA 59A-2020 [Section No. 19.8.3]

19.8.3*

The following types of hazard footprints shall be evaluated to quantify potentially fatal effects or, if required by the AHJ, irreversible harm:

(1) Concentration endpoints arising from flammable gas or vapor dispersion

(2) Concentration endpoints arising from toxic or oxygen-depriving gas or vapor dispersion

(3) Overpressure endpoints arising from vapor cloud explosions, pressure vessel bursts, and BLEVEs

(4) Heat flux or heat dosage endpoints arising from pool fires, jet fires, and fireballs

19.8.3.1

Potential cascading damages from primary release scenarios identified in Section 19.5 within the plant boundaries shall be assessed. If the assessment identifies an exacerbation of the initial hazards, the risk calculation shall include the cascading effects.

19.8.3.2

Hazard footprints shall be determined by incorporation of the following parameters, as applicable to each hazard type:

(1) Wind speeds adjusted to or at a reference height of 33 ft (10 m)

(2) The average ambient air temperature for the region, and 50 percent relative humidity

(3) At least 8 wind directions shall be considered

(4) The surface roughness that is representative of the area upwind of the release location shall be used

(5) The effects of passive and approved active mitigation techniques shall be permitted to be incoprorated into the modeling

Statement of Problem and Substantiation for Public Input

Paragraph 19.8.3.2 is added, and to be applied to all hazard modeling, as may be applicable. These specifications are not made otherwise in Chapter 19, and should be listed so that various QRA studies will be more consistent. These parameters are effectively the same as those listed in Chapter 5 (see paragraphs 5.3.2.7 and 5.2.3.8), but are somewhat less specific due to the nature of a QRA as compared to the consequence analysis requirements of Chapter 5.

Note that specification of 50% relative humidity in all modeling may negate the need to include relative humidity in paragraph 19.7.1.1.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:

Submittal Date:	Mon Jan 06 16:22:02 EST 2020
Committee:	LNG-AAA

Public Input No. 71-NFPA 59A-2021 [Section No. 19.8.3 [Excluding any Sub-Sections]]

The following types of hazard footprints shall be evaluated to quantify potentially fatal effects or, if required by the AHJ, irreversible harm:

(1) Concentration endpoints arising from flammable gas or vapor dispersion

(2) Concentration endpoints arising from toxic ~~or oxygen-depriving gas or~~ vapor dispersion

(3) Overpressure endpoints arising from vapor cloud explosions, pressure vessel bursts, and BLEVEs

(4) Heat flux or heat dosage endpoints arising from pool fires, jet fires, and fireballs

Statement of Problem and Substantiation for Public Input

Asphyxiation hazards are so extremely minor that it takes a significant amount of work to include these when they will only account for an extremely small fraction of the overall risk. In addition, many overseas entities which have been doing risk assessments for years do not include asphyxiation and many of the commercial softwares available to perform QRAs also do not include asphyxiation. Therefore, this adds a lot of complexity and cost to include in QRAs and provides little to no impact to risk.

Submitter Information Verification

Submitter Full Name: Phil Suter

Organization: Blue Engineering and Consulting

Street Address:

City:

State:

Zip:

Submittal Date: Wed Jan 06 08:37:15 EST 2021

Committee: LNG-AAA

Public Input No. 21-NFPA 59A-2020 [Section No. 19.8.4.1]

19.8.4.1*

Hazard footprints for vapor cloud dispersion shall be calculated using models that meet the criteria specified in 5.3.2.~~7~~ ~~or~~ 6 or any other models that are acceptable to the AHJ.

19.8.4.1.1*

Threshold hazard values for vapor cloud dispersion shall be as specified in Table 19.8.4.1.1.

Table 19.8.4.1.1 Vapor Dispersion Consequence Endpoints

Concentration of released material in air	Duration	Consequence
LFL	N/A	Irreversible harm to and fatality of persons within an ignited flammable gas or vapor cloud
AEGL-3	Based on duration of exposure, but no more than 1 hour	Fatality of persons within a toxic gas cloud
AEGL-2	Based on duration of exposure, but no more than 1 hour	Irreversible harm to persons within a toxic gas cloud
40%	N/A	Fatality of persons within a gas cloud that displaces air to less than 12.5% oxygen
23%	N/A	Irreversible harm to persons within a gas cloud that displaces air to less than 16% oxygen

N/A: Not applicable.

Statement of Problem and Substantiation for Public Input

The correct reference for model criteria is 5.3.2.6.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 06 16:11:35 EST 2020
Committee: LNG-AAA

Public Input No. 72-NFPA 59A-2021 [Section No. 19.8.4.1.1]

19.8.4.1.1*

Threshold hazard values for vapor cloud dispersion shall be as specified in Table 19.8.4.1.1 or by using probit functions as approved by the AHJ .

Table 19.8.4.1.1 Vapor Dispersion Consequence Endpoints

Concentration of released material in air	Duration	Consequence
LFL	N/A	Irreversible harm to and fatality of persons within an ignited flammable gas or vapor cloud
AEGL-3	Based on duration of exposure, but no more than 1 hour	Fatality of persons within a toxic gas cloud
AEGL-2	Based on duration of exposure, but no more than 1 hour	Irreversible harm to persons within a toxic gas cloud
40%	N/A	Fatality of persons within a gas cloud that displaces air to less than 12.5% oxygen
23%	N/A	Irreversible harm to persons within a gas cloud that displaces air to less than 16% oxygen

N/A: Not applicable.

Statement of Problem and Substantiation for Public Input

This is an international standard and many international countries which perform QRAs use probit functions. We need to align with international practices for performing QRAs.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 08:40:17 EST 2021
Committee: LNG-AAA

Public Input No. 73-NFPA 59A-2021 [Section No. 19.8.4.1.1]

19.8.4.1.1*

Threshold hazard values for vapor cloud dispersion shall be as specified in Table 19.8.4.1.1.

Table 19.8.4.1.1 Vapor Dispersion Consequence Endpoints

Concentration of released material in air	Duration	Consequence
LFL	N/A	Irreversible harm to and fatality of persons within an ignited flammable gas or vapor cloud
AEGL-3	Based on duration of exposure, but no more than 1 hour	Fatality of persons within a toxic gas cloud
~~AEGL-2~~	~~Based on duration of exposure, but no more than 1 hour~~	~~Irreversible harm to persons within a toxic gas cloud~~
~~40%~~		

N/A

~~Fatality of persons within a gas cloud that displaces air to less than 12.5% oxygen 23% N/A Irreversible harm to persons within a gas cloud that displaces air to less than 16% oxygen~~

~~N/A : Not applicable.~~

Statement of Problem and Substantiation for Public Input

Related to asphyxiation, this edit would match up with the previous edit to remove those requirements from the QRA.

Related to AEGL-2 for irreversible harm, many software programs which are used to perform a QRA do not include the ability to model for irreversible harm. In addition, this criteria is not used internationally where QRAs have been performed. The US is relatively new to the QRA market for LNG facilities and this requirement does not align with what is done globally. NFPA 59A is an international standard and some of the irreversible harm requirements in Chapter 19 do not align with their developed QRA processes. I believe to do irreversible harm will require a QRA to be done manually.

Submitter Information Verification

Submitter Full Name: Phil Suter
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Wed Jan 06 08:46:04 EST 2021

Committee:	LNG-AAA

Public Input No. 22-NFPA 59A-2020 [Section No. 19.8.4.2]

19.8.4.2

Hazard footprints for radiant heat flux and modified thermal dosage shall be calculated with models that meet the criteria specified in 5.3.2.~~8~~ 6 or any other models that are acceptable to the AHJ.

19.8.4.2.1

Threshold hazard values for radiant heat flux shall be as specified in Table 19.8.4.2.1.

Table 19.8.4.2.1 Radiant Heat Flux Consequence Endpoints

Maximum Heat Flux Level		Consequences
Btu/hr/ft^2	(kW/m^2)	
3000	9	Fatality of persons outdoors without personal protective equipment (PPE)
1600	5	Irreversible harm to persons outdoors without PPE
8000	25	Irreversible harm to and fatality of persons inside a building with a combustible exterior*.
10,000	30	Irreversible harm to and fatality of persons inside a building with a noncombustible exterior.

*Examples of combustible exteriors include wood-framed structures, asphalt shingles, vegetation, and so on.

19.8.4.2.2

For fireballs, the exposure extent shall be calculated using a dose equivalent to 3000 Btu/hr/ft^2 and 30 second exposure time (1.3 × 106 (Btu/hr/ft^2)$^{4/3}$s)

Statement of Problem and Substantiation for Public Input

The correct reference for model criteria is 5.3.2.6.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 06 16:18:09 EST 2020
Committee: LNG-AAA

Public Input No. 23-NFPA 59A-2020 [Section No. 19.8.4.3]

19.8.4.3

Hazard footprints for overpressures shall be calculated with models that meet the criteria specified in 5.3.2.~~8~~ 6 or any other models that are acceptable to the AHJ.

19.8.4.3.1*

Threshold hazard values for overpressures shall be as specified in Table 19.8.4.3.1.

Table 19.8.4.3.1 Overpressure Consequence Endpoints

Side On Overpressure (psi)	Consequence
3.0	Fatality of persons outdoors
1.0	Irreversible harm of persons outdoors
1.0	Irreversible harm to and fatality of persons inside a building that is not blast resistant

19.8.4.3.2

For BLEVEs or pressure vessel bursts, the exposure to projectile impact shall be considered using a kinetic energy threshold of 11 ft-lbf for persons outdoors, and 11 ft-lbf or a higher approved value for persons indoors.

Statement of Problem and Substantiation for Public Input

The correct reference for model criteria is 5.3.2.6.

Submitter Information Verification

Submitter Full Name: Jeffrey D Marx
Organization: Quest Consultants Inc
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jan 06 16:19:05 EST 2020
Committee: LNG-AAA

Public Input No. 49-NFPA 59A-2021 [New Section after A.5.3.2.3]

A.5.3.2.5 For models used to calculate the vapor evolution rate for the scenarios described in this paragraph, evaluation using the Model Evaluation Protocol report published by DOT-PHMSA and titled "Model Evaluation Protocol for Source Term" should be applied.

Statement of Problem and Substantiation for Public Input

Annex material referencing the model evaluation protocol for source term models

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 48-NFPA 59A-2021 [Section No. 5.3.2.5]	

Submitter Information Verification

Submitter Full Name: Filippo Gavelli
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 11:11:10 EST 2021
Committee: LNG-AAA

Public Input No. 50-NFPA 59A-2021 [Section No. A.5.3.2.6]

A.5.3.2.6

For models used for flammable vapor dispersion from liquid spills or pressurized releases, evaluation using the Model Evaluation Protocol report published by DOT-PHMSA and titled "Model Evaluation Protocol for Flammable Dispersion" should be applied.

For models used for toxic vapor dispersion from

~~ground-based sources~~

liquid spills or pressurized releases , evaluation using the Model Evaluation Protocol

~~facilities~~

report published by

~~the Fire Protection Research Foundation report "Evaluating Vapor Dispersion Models for Safety Analysis of LNG Facilities"~~

DOT-PHMSA and titled "Model Evaluation Protocol for Toxic Dispersion" should be applied.

For models used for flammable vapor cloud explosions, evaluation using the Model Evaluation Protocol report published by DOT-PHMSA and titled "Model Evaluation Protocol for Vapor Cloud Explosions" should be applied.

Statement of Problem and Substantiation for Public Input

Replacing reference to the FPRF MEP with reference to the PHMSA MEP for flammable dispersion, and adding references to the MEPs for toxic dispersion and explosions.

Submitter Information Verification

Submitter Full Name: Filippo Gavelli
Organization: Blue Engineering and Consulting
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jan 05 11:13:23 EST 2021
Committee: LNG-AAA

Public Input No. 54-NFPA 59A-2021 [New Section after A.16.4.5]

A.16.4.5.1

The performance-based analysis should include documentation of each performance objective and applicable scenario, together with any calculations, modeling, or other technical substantiation used in demonstrating acceptable performance of the fire and gas detection system.

Statement of Problem and Substantiation for Public Input

There is no industry standard for developing a fire and gas detection system layout, therefore, the LNG industry lacks a consistent approach to developing layouts and there is no systematic method for AHJs to evaluate these designs. Further, fire and gas detection layouts are often submitted to AHJs without justification for device locations. Since there are no prescriptive requirements for these layouts, it is proposed to explicitly require a performance-based design to be performed consistent with the documentation requirements contained in NFPA 72 (section 17.3 of the 2019 edition).

This recommended addition to Appendix A is linked to a proposed addition to the body of the code.

Related Public Inputs for This Document

Related Input	Relationship
Public Input No. 53-NFPA 59A-2021 [New Section after 16.4.5]	Explanatory Material
Public Input No. 53-NFPA 59A-2021 [New Section after 16.4.5]	

Submitter Information Verification

Submitter Full Name: Bryant Hendrickson
Organization: Blue Engineering and Consulting
Affiliation: None
Street Address:
City:
State:
Zip:

Submittal Date: Tue Jan 05 11:33:17 EST 2021
Committee: LNG-AAA

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

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.*

Statement of Problem and Substantiation for Public Input

To provide guidance for the analysis that is required by 17.3.2.1.2.

Submitter Information Verification

Submitter Full Name: Thomas Deary
Organization: Compressed Gas Association
Street Address:
City:
State:
Zip:

Submittal Date: Mon Jan 06 15:43:01 EST 2020
Committee: LNG-AAA

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

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 .

Statement of Problem and Substantiation for Public Input

Update current edition.

Submitter Information Verification

Submitter Full Name:	Kerry Sutton
Organization:	Aci
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Tue Sep 08 14:37:47 EDT 2020
Committee:	LNG-AAA