CGA G-19.4—2020

GUIDELINE FOR DETERMINING THE LIMITS OF LIQUEFIED NATURAL GAS SPILLS

FIRST EDITION

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NOTE—Appendix A (Informative) are for information only.

FIRST EDITION: 2020

Contents **Page**

Figure

Appendix

1 Introduction

Impoundment areas are required for liquefied natural gas (LNG) installations in accordance with CGA G-19.1, *Standard for Natural Gas Supply Systems*, NFPA 59A, *Standard for the Production, Storage, and Handling of Liquified Natural Gas (LNG)*, and per CSA Z276, *Liquified natural gas (LNG) – Production, storage, and handling* [1, 2, 3].[1] Furthermore, impoundment areas are required for LNG storage at pipeline facilities in accordance with Title 49 of the U.S. *Code of Federal Regulations* (49 CFR) Part 193.2181 [5]. The intent of requiring containment or impounding systems is to ensure any LNG spillage remains on the owner's property.

Historically these requirements have been for the impoundment to have the capacity for full volumetric containment, 110%, of the maximum liquid capacity of the largest single container. These requirements were applied to large atmospheric pressure tanks (API 625, *Tank Systems for Refrigerated Liquefied Gas Storage*) with large (greater than 6 in [152 mm] Nominal Pipe Size [NPS]) piping penetrations [6]. In the event of a piping breach, such loss of containment could result in appreciable rainout and accumulation of LNG. Before LNG can accumulate, the surface must be sufficiently cooled.

There are also American Society of Mechanical Engineers (ASME) containers with relatively small liquid penetrations (up to and including 6 in [150 mm] NPS). The scope of ASME containers includes pressures greater than 15 psi (103 kPa).[2] For ASME containers, higher pressure discharge from smaller pipe ruptures will mostly result in no accumulation of LNG by the time the container empties. The LNG is vaporized via aerosol, splashing, or boiling of the LNG at the impoundment surface.

The standards mentioned in this section permit calculation to size impoundments to contain the amount of the spill that can accumulate. This publication provides a method to size these LNG impoundments.

2 Scope

This publication provides technical guidance and the equation set to determine the maximum impoundment volume required for North American LNG facilities governed by CGA G-19.1, NFPA 59A, or CSA Z276 [1, 2, 3]. This publication applies to bulk cryogenic storage systems with LNG. The credible releases and potential spills come from piping. Accordingly, this publication is based on piping releases, up to and including 6 in (150 mm) NPS. The simplified approach presented in Section 6 is specific to pressure vessels. For pipeline facilities, see 49 CFR Part 193 [5]. This publication is intended for ASME vessels of 15 psi (103 kPa) maximum allowable working pressure (MAWP) or greater.

3 Definitions

For the purpose of this publication, the following definitions apply.

3.1 Publication terminology

3.1.1 Shall
Indicates that the procedure is mandatory. It is used wherever the criterion for conformance to specific recommendations allows no deviation.

3.1.2 Should
Indicates that a procedure is recommended.

3.1.3 May
Indicates that the procedure is optional.

3.1.4 Will
Is used only to indicate the future, not a degree of requirement.

[1] References are shown by bracketed numbers and are listed in order of appearance in the reference section.

[2] kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Guideline for Metric Practice in the Compressed Gas Industry* [4].