



AMERICAN PETROLEUM INSTITUTE

Date: July 2013

To: Purchasers of API Standard 625, *Tank Systems for Refrigerated Liquefied Gas Storage*, First Edition

Re: Addendum 1

This package contains Addendum 1 of API Standard 625, *Tank Systems for Refrigerated Liquefied Gas Storage*, First Edition. This package consists of the pages that have changed since the August 2010 printing of the First Edition.

To update your copy of API Standard 625, replace, delete, or add the following pages as indicated:

<u>Part of Book Changed</u>	<u>Old Pages to be Replaced</u>	<u>New Pages</u>
Cover	front and back covers	front and back covers
Front Matter	title page v–vi	title page to Addendum 1 v–vi
Section 1	1-1–1-2	1-1–1-2
Section 2	2-1–2-2	2-1–2-2
Section 3	3-1–3-4	3-1–3-5 + blank
Section 4	4-1–4-2	4-1–4-2
Section 6	6-5–6-8	6-5–6-8
Section 7	7-1–7-7 + blank	7-1–7-7 + blank
Section 8	8-1 + blank	8-1 + blank
Section 10	10-1–10-2	10-1–10-2
Annex D	D-1–D-2	D-1–D-2
Annex E	—	E-1–E-3 + blank

The parts of the text, tables, and figures that contain changes are indicated by a vertical bar and a small “13” in the margin.

Tank Systems for Refrigerated Liquefied Gas Storage

API STANDARD 625
FIRST EDITION, AUGUST 2010

ADDENDUM 1, JULY 2013



AMERICAN PETROLEUM INSTITUTE

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Tank Systems for Refrigerated Liquefied Gas Storage

SECTION 1—SCOPE

1.1 General

1.1.1 This standard covers low pressure, aboveground, vertical, and cylindrical tank systems storing liquefied gases requiring refrigeration. This standard provides general requirements on responsibilities, selection of storage concept, performance criteria, accessories/appurtenances, quality assurance, insulation, and commissioning of tank systems.

1.1.2 Additional information and recommendations are given in annexes. These general requirements address issues common to all of these tank systems, issues involving coordination of the components of the tank system, and issues of the tank system acting in an integrated way. The detailed requirements applicable to the metallic and concrete containers respectively are contained in the standards named in 1.4 and 1.5.

1.1.3 The annexes of this standard provide additional information that may be used in the selection and design of refrigerated tank systems. See Table 1.1 for the status of each Annex.

Table 1.1—Status of Annexes to API Standard 625

Annex	Title	Status
A	Properties of Gases	Information (informative)
B	Recommendations on Foundation Settlement	Recommendations (informative)
C	Commentary on Storage Concepts	Information (informative)
D	Recommendations on Selection of Storage Concept based on Assessment of Risk	Recommendations (informative)
E	Inquiries and Suggestions for Change	Recommendations (informative)

13

1.2 Coverage

1.2.1 This standard covers tank systems having a storage capacity of 800 cubic meters (5000 bbls) and larger.

1.2.2 Stored product shall be liquids which are in a gaseous state at ambient temperature and pressure and require refrigeration to less than 5 °C (40 °F) to maintain a liquid phase.

1.2.3 Tank systems with a minimum design temperature of –198 °C (–325 °F) (see note), a maximum design internal pressure of 50 kPa (7 psig), and a maximum design uniform external pressure of 1.75 kPa (0.25 psig) are covered.

NOTE Note for concrete containers, that ACI 376 states it “has been developed with the lowest operating temperature of –168 °C (–270 °F). However lower product temperatures could also be used, provided appropriate additional engineering analysis and justification is performed for each proposed application.”

1.3 Configuration

The tank system configurations covered are described in Section 5. These configurations consist of a primary liquid and vapor containment constructed of metal, concrete, or a metal/concrete combination and, when required, a secondary liquid containment.

1.4 Metallic Containers

Metallic container materials, design, fabrication, inspection, examination, and testing shall be in accordance with API 620 including either Appendix R or Appendix Q. The applicable appendix of API 620 depends on the design metal temperature and the applicable temperature ranges given in these appendices.

1.5 Concrete Containers

Concrete container materials, design, construction, inspection, examination, and testing shall be in accordance with ACI 376.

1.6 Boundaries

1.6.1 This standard applies to tank system components attached to and located within the liquid, vapor, and any purge gas containers (but excluding dike walls). Piping connected externally to the liquid, vapor, and any purge gas containers within the following limits shall be constructed according to this standard:

- a) the face of the first flange in bolted flanged connections;
- b) the first threaded joint on the pipe outside the tank wall in threaded pipe connections;
- c) the first circumferential joint in welding-end pipe connections that do not have a flange located near the tank.

1.6.2 The boundary of this standard may be extended as agreed between Purchaser and Tank System Contractor to complete, external, pressure containing piping connections (such as relief valves in 7.4 and instrumentation in 7.5) which serve only the tank system.

SECTION 2—NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Standard 521, *Pressure-relieving and Depressurizing Systems*

API Standard 537, *Flare Details for General Refinery and Petrochemical Service Construction Guidelines*

API Standard 620, *Design and Construction of Large, Welded, Low-Pressure Storage Tanks*

API Standard 650, *API Welded Steel Tanks for Oil Storage*

API 2000, *Venting Atmospheric and Low-pressure Storage Tanks*

API 2350, *Overfill Protection for Storage Tanks in Petroleum Facilities*, Third Edition

API Specification Q1, *Specification for Quality Programs*

ACI 376 ¹, *Code Requirements for Design and Construction of Concrete Structures for the Containment of Refrigerated Liquefied Gases and Commentary*

AGA XK 0101 ², *Purging Principles and Practice*

ANSI K61.1 ³, *American National Standard Safety Requirements for the Storage and Handling of Anhydrous Ammonia*

ASCE 7 ⁴, *Minimum Design Loads for Buildings and Other Structures*

ASME B31.3 ⁵, *Process Piping*

ASME Boiler and Pressure Vessel Code, Section VIII: Rules for Construction of Pressure Vessels Division 1

ASTM A516 ⁶, *Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service*

ASTM A553, *Standard Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered 8 and 9 Percent Nickel*

ASTM C165, *Standard Test Method for Measuring Compressive Properties of Thermal Insulations*

ASTM C177, *Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus*

ASTM C240, *Standard Test Methods of Testing Cellular Glass Insulation Block*

ASTM C552, *Standard Specification for Cellular Glass Insulation*

¹ American Concrete Institute, P.O. Box 9094, Farmington Hills, Michigan 48333, www.aci-int.org.

² American Gas Association, 400 N. Capitol St., NW, Suite 450, Washington, D.C. 20001, www.aga.org.

³ American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York 10036, www.ansi.org.

⁴ American Society of Civil Engineers, 1801 Alexander Bell Dr., Reston, Virginia 20191, www.asce.org.

⁵ ASME International, 3 Park Avenue, New York, New York 10016-5990, www.asme.org.

⁶ ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.

ASTM C549, *Standard Specification for Perlite Loose Fill Insulation*

ASTM C764, *Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation*

EN14620-1⁷, *Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and –165 °C — Part 1: General*

EN 14620-4, *Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and –165 °C — Part 4: Insulation*

IBC⁸, *ICC International Building Code*

ISO 9001⁹, *Quality Management Requirements*

NFPA 58¹⁰, *Liquefied Petroleum Gas Code*

NFPA 59, *Utility LP – Gas Plant Code*

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

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*

NFPA 497, *Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*

NFPA 780, *Standard for the Installation of Lightning Protection Systems*

OSHA 29 CFR 1910¹¹, Subpart D, “Walking-Working Surfaces”

⁷ European Committee for Standardization, Avenue Marnix 17, B-1000, Brussels, Belgium, www.cen.eu.

⁸ International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, D.C. 20001, www.iccsafe.org.

⁹ International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.

¹⁰ National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02169-7471, www.nfpa.org.

¹¹ U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW, Washington, DC 20210, www.osha.gov.

SECTION 3—TERMS AND DEFINITIONS

3.1 General

For the purposes of this document, the following definitions apply.

3.2 Definitions

3.2.1 Storage Concepts

3.2.1.1

double containment tank system

See 5.3.

3.2.1.2

container

A single wall vessel for storing vapor and/or liquefied gas.

3.2.1.3

full containment tank system

See 5.4.

3.2.1.4

single containment tank system

See 5.2.

3.2.1.5

tank system

The combination of a primary liquid container, together with secondary liquid container (if any), insulation, vapor container, appurtenances, instrumentation, and all other elements within the scope of this standard.

3.2.2 Components

3.2.2.1

annular space

The space between the primary cylindrical liquid container and the primary cylindrical product vapor container or cylindrical purge gas container of a double wall tank.

3.2.2.2

base heating system

A heating system provided in the base slab or soil below the tank system to prevent freezing of the soil and frost heave.

3.2.2.3

base slab

A continuous concrete base supporting the tank system. This base may be either at grade or elevated and may be either supported by soil or piles.

3.2.2.4

dike wall

A structure remote from the tank system used to establish an impounding area for the purpose of containing any accidental spill of stored liquid. Sometimes this structure is referred to as a bund wall.

3.2.2.5**elevated foundation**

A foundation with base slab, supported by either piles or piers (stub columns), located at an elevation above grade, leaving an air gap between the grade and the bottom of the base slab.

3.2.2.6**load bearing insulation**

Insulation with special compressive strength properties used for thermal insulation and for transferring the load to the load bearing structure.

3.2.2.7**primary liquid container**

Parts of a tank system that contain the liquid during normal operation.

3.2.2.8**primary vapor container**

Parts of a tank system that contain the product vapor during normal operation.

3.2.2.9**pump column**

A pipe column to house a combined vertical pump and close coupled electric motor. The column itself protrudes through the outer tank roof.

3.2.2.10**purge gas container**

Parts of a tank system that contain only purge gas and are not expected to function after exposure to product temperature. (This includes outer container of double roof single containment tank system.)

3.2.2.11**refrigerated temperature roof**

A roof that contains product vapor and is near the liquid product temperature during normal operation. (This includes inner roofs of double roof tanks and single roofs of tanks with external roof insulation.)

3.2.2.12**secondary liquid container**

Parts of a tank system that contain the liquid in the event of leakage from the primary liquid container.

3.2.2.13**suspended deck**

Structure suspended from the fixed roof for supporting the internal insulation above the primary liquid container.

3.2.2.14**thermal corner protection**

A thermally insulating and liquid tight structure in the bottom annular section of a tank system to protect the secondary liquid container against low temperatures in the event of leakage from the primary container.

3.2.2.15**vapor barrier**

A barrier to prevent entry of water vapor (moisture) and other atmospheric gases into insulation or into the secondary container. This also prevents the product vapor escaping from the secondary container.

3.2.2.16**warm product vapor container**

Parts of a tank system that contain product vapor, but are not expected to function after exposure to refrigerated product temperature. (This includes roofs over suspended insulation deck and the outer container of a double wall, open top single containment tank system.)

3.2.3 Levels and Volumes**3.2.3.1****design liquid level**

Maximum liquid level that will be experienced during operation of the tank. This is used for the static shell thickness determination.

3.2.3.2**maximum liquid capacity**

The total volume between the design liquid level and the tank bottom. (This is also referred to as total liquid capacity in API 620.)

3.2.3.3**maximum normal operating capacity**

The volume between the maximum normal operating level and the tank bottom.

3.2.3.4**maximum normal operating level**

Maximum liquid level that will be experienced during normal operation of the tank.

3.2.3.5**minimum normal operating level**

Minimum liquid level that will be maintained during normal operation of the tank.

3.2.3.6**net working capacity**

The volume between the maximum normal operating level and minimum normal operating level.

3.2.3.7**overfill protection margin**

Capacity (tank height or volume) between the maximum normal operating level and the design liquid level (see 6.3).

3.2.3.8**seismic freeboard**

The design height above the maximum normal operating level to minimize or prevent overflow or damage to the roof due to sloshing of the liquid contents during a seismic event.

3.2.4 Process**3.2.4.1****boil-off**

The process of vaporization of refrigerated product by heat conducted through the insulation surrounding the tank.

3.2.4.2**design pressure**

The maximum gauge pressure permissible in the vapor space above the product of a tank system in its design condition.

3.2.4.3**flame spread index**

A number, obtained according to NFPA 255, which is a comparative measure, derived from visual measurements, of the spread of flame vs time.

3.2.4.4**hazard**

An event having the potential to cause harm, including ill health and injury; damage to property, product or the environment; production losses; or increased liabilities.

3.2.4.5**minimum design temperature (design metal temperature)**

See 6.4.6.

3.2.4.6**purging**

The replacement of one gas/vapor by another in an enclosed tank system by displacement, by dilution, by diffusion or by combinations of these actions.

3.2.4.7**rollover**

Uncontrolled mass movement of stored liquid, correcting an unstable state of stratified liquids of different densities and resulting in a significant evolution of product vapor.

3.2.4.8**set pressure**

The gauge pressure at which the pressure relief device first opens.

3.2.4.9**set vacuum**

The gauge pressure at which the vacuum relief device first opens.

3.2.5 Seismic**3.2.5.1****aftershock level earthquake****ALE**

See 6.5.2.

3.2.5.2**operating basis earthquake****OBE**

or

operating level earthquake**OLE**

See 6.5.2.

3.2.5.3**safe shutdown earthquake****SSE**

or

contingency level earthquake**CLE**

See 6.5.2.

3.2.5.4**seismic sloshing wave height**

Height of wave in the stored liquid due to seismic ground movement.

3.2.6 Organizations**3.2.6.1****Purchaser**

The owner of the tank system or the owner's designated agent.

3.2.6.2**Tank System Contractor**

The party having the primary responsibility for design, supply, fabrication, construction, examination, and testing the tank system.

SECTION 4—RESPONSIBILITIES

4.1 General

4.1.1 The Owner/Purchaser shall provide the specification defining the tank design from design information specified below.

4.1.2 The Tank System Contractor shall be responsible for the design, supply, fabrication, construction, examination, and testing of the tank system. | 13

4.1.3 The interface issues, such as pre-commissioning and other transition items shall be resolved by agreement between Owner/Purchaser and contractor.

4.2 Design Information

4.2.1 Information by Purchaser

The Purchaser shall provide the following information:

- 1) scope of work for contractor (including items determined in 4.2.3);
- 2) tank type (see Section 5);
- 3) net working capacity;
- 4) tank location on plot plan;
- 5) environmental data (including, minimum/maximum ambient temperatures);
- 6) site geotechnical and seismic data (including soil properties, allowable soil bearing, predicted settlements after soil remediation, and foundation type selected);
- 7) process flow diagrams (PFDs), piping & instrumentation diagrams (P&IDs);
- 8) properties of the stored product, including density at the design temperature, toxicity, and flammability;
- 9) design pressure/vacuum, maximum/minimum operating pressure;
- 10) high/low pressure alarm set point;
- 11) design boil-off rate (as per 6.4.4);
- 12) minimum design temperature of primary containment;
- 13) natural environmental loads (such as earthquake, wind);
- 14) type of cathodic protection system (if applicable);
- 15) product filling/emptying rates;
- 16) spillage handling requirements (as per 6.4.2 and 7.7, if applicable);
- 17) rollover applicability and rollover prevention provisions (as per 7.5.4, if applicable);

- 18) piping and instrumentation requirements (as per 7.3 and 7.5);
- 19) corrosion allowances;
- 20) hazard protection system requirements (such as water spray, gas detection, if any);
- 21) accidental loads determined by assessment of risk (such as fire, pressure wave, projectile impact, if any);
- 22) overfill protection margin (refer to 6.3);
- 23) minimum normal operating level basis.

4.2.2 Information by Tank System Contractor

The contractor shall provide following information:

- 1) tank maximum liquid capacity;
- 2) internal diameter and height of inner tank (ambient temperature);
- 3) design liquid level;
- 4) normal maximum/minimum operating liquid level;
- 5) high/low level alarm.

4.2.3 Agreement by Tank Purchaser and Tank System Contractor

The following issues shall be agreed by both parties:

- 1) applicable codes and standards;
- 2) contractor's involvement in risk assessment;
- 3) materials of tank construction;
- 4) pre-commissioning and commissioning procedures, including purging, drying, and cooldown;
- 5) NDE applied to non-hydrostatically tested components;
- 6) settlement prediction and inspection method;
- 7) emergency relief valve discharge flow rate;
- 8) pressure relief and vacuum set points.

6.5 Design Loads and Load Combinations

6.5.1 Design Loads

The following types of design loads shall be considered in the design of the containers and foundations. API 620 and ACI 376, Chapter 5 list the design loads and load combinations to be used for the components within their respective scopes. The following loads, specific to tank systems covered by this standard, shall be included.

6.5.1.1 Normal Loads

- a) Seismic loads (OBE, defined in 6.5.2).
- b) Decommissioning loads.
- c) Loads induced by predicted differential settlement.

6.5.1.2 Abnormal Loads

In addition to the normal loads indicated above, the following loads from abnormal events shall be considered in the design.

- a) Loads from liquid spill condition (for double and full containment tank systems).
- b) Loads based on a assessment of risk such as: fire, pressure wave, external projectile etc. (when specified by Purchaser).
- c) Seismic loads (SSE and ALE, defined in 6.5.2).

6.5.2 Seismic Loads

Seismic hazard studies are required to determine the seismic ground motions for design of tank-fluid-foundation system. The three levels of the seismic ground motions that shall be considered are: **13**

- a) Operating basis earthquake (OBE): The OBE is defined as the seismic ground motion having 10 % probability of exceedance within 50 year period, i.e. 475 year recurrence interval. The OBE is also referred to as operating level earthquake (OLE) in API 620, Appendix L.
- b) Safe shutdown earthquake (SSE): The SSE is defined as the seismic ground motion having 2 % probability of exceedance within 50 year period, (i.e. 2,475 year recurrence interval) adjusted by the requirements of ASCE 7 Chapter 21. The SSE is also referred to as contingency level earthquake (CLE) in API 620, Appendix L.
- c) Aftershock level earthquake (ALE): The ALE is defined as half of the SSE.

6.5.3 Load Combinations

The design loads shall be combined to produce load combinations to be used in the analysis and design of the containers. Load combinations are dependent on the material type of the container. See API 620 for load combinations for metal containers and ACI 376 for concrete containers.

6.6 Seismic Analysis

6.6.1 General

The tank system shall be designed for three levels of seismic ground motions as defined in 6.4.10 and 6.5.2. The rules in API 620, Appendix L shall be applied to all steel tanks designed to this standard. The rules of ACI 376 shall be applied to all concrete tanks designed to this standard.

6.6.2 Site-Specific Response Spectra

The site-specific horizontal and vertical acceleration response spectra shall be developed for both OBE and SSE for different damping values of up to 20 %.

6.6.3 ALE Design

The ALE earthquake shall be considered only for the seismic design of secondary containment with full liquid condition, assuming that the primary container is damaged after the SSE event.

6.6.4 Tanks Supported on Rock

When the tank foundation is supported on rock-like site (defined as the site class A and B in IBC or ASCE 7), the fixed base condition is considered. In this case, the structural damping values shall be used for determining the seismic responses (SSI is not considered).

6.6.5 Soil-structure Interaction

When the tank foundation is supported on soil (defined as the site class C to F in IBC or ASCE 7), soil-structure interaction seismic analysis (SSI) shall be considered. In this case, dynamic soil and pile stiffness and damping parameters shall be included in the tank model for SSI analysis. Dynamic soil/pile properties are evaluated by considering the effects of seismically induced soil strains and forcing frequencies. System damping for SSI shall be calculated for determining seismic response, and shall be limited to 15 % for OBE and 20 % for SSE.

6.6.6 Response Modification Factors—OBE

In order for the tank system to remain in continuous operation during and after OBE, the elastic method of seismic analysis shall be performed. The response modification factor, R , applied in the response spectra design method shall be 1.0.

6.6.7 Response Modification Factors—SSE

Response modification factors for SSE greater than 1.0 not defined by API 620 or ACI 376 shall be demonstrated not to reduce the seismic performance criteria of 6.4.10. Response reduction factors are not applicable for non-linear dynamic analysis methods incorporating fluid-structure and soil-structure interaction.

6.6.8 Seismic Design Liquid Level

The maximum normal operating level shall be applied to all seismic design including freeboard determination.

6.6.9 Seismic Sloshing Wave Height

The seismic sloshing wave height shall be calculated in accordance with API 620, Appendix L. The seismic freeboard height shall be determined based on the OBE sloshing height plus 300 mm (1 ft) allowance or the SSE sloshing height, whichever is larger.

6.6.10 Resistance to Base Shear—Sliding

The rules in API 620, Appendix L shall be applied to determine sliding resistance. In high seismic regions a more extensive analysis may be applied, provided it includes evaluation of the response of the shell, the fluid, and foundation (in the case of a slab) to the fluctuation of liquid pressures in the tank. When applying this approach, the horizontal and vertical seismic response shall be applied based on the component combination of 100 % and 40 %. The case for the 100 % vertical plus 40 % horizontal load case shall be evaluated in addition to the 100 % horizontal plus 40 % vertical load case defined by API 620, Appendix L. Alternately, a time history analysis approach may be applied incorporating both horizontal and vertical motions simultaneously.

6.6.11 Evaluation of Damage from an Earthquake

The seismic design may assume that when a tank system is subjected to an earthquake exceeding an OBE magnitude event, the tank system will be evaluated for permanent distortion, continued safe operation, and the need for repairs.

6.6.12 Interaction between Tank and Adjacent Structures

Consideration for flexibility of components connecting the tank system to adjacent structures shall be included in the tank system design.

6.7 Foundation Design

6.7.1 General

6.7.1.1 Tank systems shall be installed on foundations designed to transmit all loadings to suitable load bearing soil strata. Acceptable types of foundation support systems consist of Raft or Mat foundations, pile foundations (i.e. steel H-piles, cast in-situ concrete piles or precast prestressed concrete piles) and elevated foundations supported on drilled shafts or vertical walls. ACI 376 Chapter 10 provides foundation design requirements.

6.7.1.2 Foundation support systems are dictated by detailed geotechnical investigation of the location for siting of the tank systems. The extent and detail of the soil investigation shall be specified by qualified geotechnical engineers. See ACI 376 10.2 for detailed requirements on the geotechnical investigations to be performed.

6.7.1.3 The materials of construction and the foundation type shall be designed to adequately resist the operating and emergency temperature conditions.

6.7.1.4 The foundation shall maintain integrity under normal operating conditions. One method of maintaining the foundation integrity is to utilize foundation base heating for grade supported mat foundations where subsoil freezing would occur under normal load conditions. Elevated foundations with adequate air gap between the bottom of the foundation and grade shall be considered in cases where base heating methods are not feasible.

6.7.2 Anchorage

6.7.2.1 Anchorage of primary or secondary metallic containment tanks shall consider the following:

- a) differential movement between the anchorage and the connection to the container;
- b) local stresses at the connection to the container;
- c) differential strength along the length of the anchor due to thermal effects and weld materials;
- d) connection details where the anchor extends through a containment boundary (e.g. the secondary containment bottom of a full or double containment tank).

- 13 **6.7.2.2** For SSE and ALE load cases that have a response reduction factor $R_w > 1.0$, the anchorage shall exhibit ductile behavior prior to failure. For these load cases, connections of the anchors to the container and foundation shall be designed for 1.25 times the anchor capacity at the minimum specified yield stress increased to account for thermal increases in material properties at design temperature. Shell and weld allowable stresses may be increased for these load cases to account for thermal material strength increase.

6.8 Thermal Corner Protection System (TCP) for Concrete Tanks

6.8.1 If required by ACI 376, the design of the wall-to-slab junction of a concrete container shall include the effects of differential movement between the wall and base. Design of the junction shall also consider the application of differential thermal stresses and prestress forces to provide liquid containment in case of a spill.

- 13 **6.8.2** For tanks having a fixed wall-to-base, a standard solution applies a metallic thermal corner protection expansion joint and a secondary bottom. The TCP may be designed either to withstand the full hydrostatic pressure from a full spill, or to transfer a part of the pressure to the wall through load bearing insulation.

6.8.3 If a TCP is required, the following shall be included in the design of the TCP:

- a) the location of the top of the TCP as related to the prestress force diagram;
- b) differential thermal movements between the connection to the wall and secondary bottom including the following conditions: operating, small spill, full spill, and full spill plus ALE;
- c) differential movements due to wall prestress and creep;
- d) wall rotation due to foundation settlement;
- e) differential shrinkage between the wall and top of TCP connection;
- f) erection tolerances between the TCP and the load bearing insulation.

SECTION 7—ACCESSORIES AND APPURTENANCES

7.1 General

Accessory and appurtenance considerations for safe operation of the tank are addressed in the following paragraphs.

7.2 Access

7.2.1 General

Platforms, walkways, and stairways shall be in accordance with OSHA 29 *CFR* 1910, Subpart D, or equivalent national safety standard as supplemented by API 650, Tables 5-17, 5-18, 5-19a/b, and the requirements herein.

7.2.2 Tank Interior Access

7.2.2.1 Shell manholes shall not be used in the primary liquid container of full containment tanks unless otherwise specified by the Purchaser.

7.2.2.2 In other tank configurations, shell manholes may be provided in the primary liquid container and, when used, shall utilize welded closure details to prevent leakage during service.

7.2.3 Tank Roof Access

7.2.3.1 A primary system for accessing the tank roof shall be provided.

7.2.3.2 The type of roof access system shall be suited for reliable personnel ingress/egress.

7.2.3.3 Unless otherwise specified by the Purchaser, a second access system shall be provided if the primary tank egress pathway can be obstructed or if the primary system is mechanically operated and powered (e.g. electrical or hydraulic elevator).

7.2.4 Tank Roof Appurtenance Access

Walkways or platforms shall be provided to access all roof appurtenances requiring periodic maintenance such as vents and level gauges and for access to the roof manholes.

7.3 Process Piping

7.3.1 General Requirements

7.3.1.1 Refer to API 620, Section Q.2.5 or Table R-1 for material selection requirements for process piping components.

7.3.1.2 Refer to API 620, Sections Q.3.4 or R.3.4 for design requirements.

7.3.1.3 Refer to API 620, Sections Q.5.7 or R.5.7 for nondestructive examination requirements.

7.3.1.4 Configuration requirements are as follows.

7.3.1.4.1 Flanged joints in refrigerated liquid and vapor piping systems are not permitted in the space the between inner and outer containers.

7.3.1.4.2 For single containment tanks.

- a) Process lines may penetrate the roof, bottom, or shell unless restricted by specification or regulation.
- b) In-tank valves shall be considered when bottom or shell process lines are used. The in-tank valves shall be automatically activated due to failure of external piping and shall also be automatically activated during a loss of electrical power and shall be capable of being activated from a remote location. The design and installation of an in-tank valve shall be such that any failure of the penetrating nozzle resulting from external pipe strain is beyond the shutoff seats of the internal valve itself.

7.3.1.4.3 For double or full containment tanks, shell or bottom penetrations that breach the primary and secondary containment are not allowed, except when all of the following additional requirements are met:

- a) the penetrations are specified by the Purchaser;
- b) no prohibition exists in applicable regulations;
- c) the penetrations are accounted for in the assessment of risk as per 5.5;
- d) in-tank valves are provided [refer to 7.3.1.4.2 b)];
- e) a remote dike wall is provided in addition to the secondary containment that is part of the tank system. The volume contained by the dike shall equal 110 % of the flow from a full line break prior to closure of the in-tank valve.

7.3.2 Tank Fill Lines

Fill lines may be top and/or bottom-fill type as required by process conditions and rollover mitigation as per 7.5.4.

7.3.3 Tank Outlet System**13 | 7.3.3.1** Liquid Outlet: If shell or bottom outlets are not provided, pump columns and in-tank pumps satisfying the following are required.

- a) Pump columns, extending from above the roof level to near the tank bottom, shall be designed to transport product to the outlet line connection on the roof and to contain the removable pump.
- b) The pump columns shall be designed, constructed, and tested in accordance with ASME B31.3 or ASME Section VIII.
- c) Pump columns shall be designed for pump removal and replacement during tank operating conditions by transporting the pump through the inside of the pump column.

13 | 7.3.3.2 Vapor Outlet: A vapor outlet nozzle connected to the vapor space of the inner tank above the high liquid level is required. If the tank has a suspended deck, the outlet shall draw the vapor from below the deck.**7.3.4 Purge System**

A system shall be provided to facilitate purge and cool down per Section 10.

7.3.5 Cool-down System**7.3.5.1** The tank system shall include a separate fill line specifically for cool down of the tank.**7.3.5.2** The system shall have a means for control of the flow to meet the cool down rates defined in Section 10.

7.3.5.3 For products stored at temperatures below -51°C (-60°F), the cool down line shall incorporate spray nozzles and shall introduce liquid near the top center of the primary liquid containment tank.

7.4 Relief Valves

7.4.1 General

7.4.1.1 Design and installation of tank pressure and vacuum relief valves shall comply with API 620, Section 9 and API 2000 (and other applicable codes and standards [e.g. NFPA58, NFPA59, NFPA59A, ANSI K61.1]).

7.4.1.2 Conditions related to the plant process design, as determined by the plant process designer shall be evaluated.

7.4.1.3 Venting requirements of this standard shall be met by relief to atmosphere. If release to atmosphere is not allowed for the product stored, a second group of relief valves set at a lower set pressure shall be provided and routed to a flare or to other systems.

Comment: Design and installation of flare systems are governed by API 537 and API 521.

7.4.2 Pressure Relief Valves

7.4.2.1 The number and size of pressure relief valves required shall be calculated based on the total product vapor outflow and the applicable set point considering flow losses from the inlet and vent piping of the relief system.

7.4.2.2 In addition, one spare valve shall be installed for maintenance purposes.

7.4.2.3 The inlet piping shall penetrate the suspended deck where applicable but be located above the level of the top of a primary liquid container.

Comment: This prevents cold vapor from entering the warm space between outer roof and suspended deck under relieving conditions.

7.4.2.4 The required relief capacity shall be based on the largest single relief flow or any reasonable and probable combination of the following relief flows:

- a) fire exposure;
- b) operational upset;
- c) failures at interconnected facilities;
- d) heat input from pump recirculation, if any;
- e) barometric pressure change;
- f) tank filling;
- g) tank heat leak (boil off);
- h) rollover, if required by Owners or applicable regulations.

7.4.2.5 In addition, for a full containment tank, the required capacity shall be based on the following.

- a) Vapor generated due to a primary liquid container leakage.

Comment: EN14620-1, Section 7.2.2.1 may be referred to for sizing of the relief flow.

b) Overfill, if it is required by a hazard study.

7.4.3 Vacuum Relief Valves

7.4.3.1 The number and size of vacuum relief valves shall be calculated based on the total air inflow and set points specified.

7.4.3.2 In addition, one spare valve shall be installed for maintenance purposes.

7.4.3.3 The vacuum relief valves shall allow air to enter the vapor space. Volumetric change due to temperature change of the air shall be taken into consideration.

7.4.3.4 Required capacity shall be based on the following:

- a) withdrawal of liquid and vapor,
- b) barometric pressure change.

7.5 Instrumentation

7.5.1 Level Gauges and Overfill Protection

7.5.1.1 The tank shall be equipped with two independent liquid level gauges, which account for possible variations in liquid density.

7.5.1.2 The level gauges shall include high level alarms indicating start of process shutdown (see 6.3 regarding overflow protection margin). Alarms shall be audible to personnel controlling tank filling.

7.5.1.3 A separate, liquid level alarm and cutoff device is also required, set at the design liquid level.

7.5.1.4 All level instruments shall be designed and installed so that they can be maintained during operating condition.

7.5.2 Leak Detection

7.5.2.1 A system for detecting leaks through the primary liquid container shall be provided for all double and full containment tanks. Such a system is required for double-wall single containment tanks only if specified by the Purchaser or if required by a result of a hazard study.

7.5.2.2 The design of the leak-detection system may be based on one of the following:

- a) temperature change,
- b) gas detection,
- c) differential pressure measurement.

7.5.3 Temperature

7.5.3.1 Temperature monitoring devices for the primary liquid container shall be provided to assist in controlling cool down, foundation heating, and to monitor liquid and vapor temperature as required for operation. Temperature measurement devices may also be required for leak detection (7.5.2) and/or rollover prevention management (7.5.4).

7.5.3.2 For controlling cool down, temperature elements shall be located on the inner tank bottom and in a vertical array near or on the inner tank shell.

7.5.4 Rollover Prevention

7.5.4.1 Rollover conditions, if applicable, shall be prevented by active management of the stored liquid.

7.5.4.2 If rollover is applicable per 4.2.1, a density measurement system shall monitor the density over the full liquid height and give an alarm when predicted rollover conditions are approached.

7.5.4.3 Active management includes monitoring temperatures/densities and mixing the liquid by appropriate top and bottom filling or by recirculation.

7.5.5 Pressure

7.5.5.1 Two pressure instruments are required to monitor and control tank pressure.

7.5.5.2 The pressure instruments shall be connected to the space above the design liquid level.

7.6 Foundation Accessories

7.6.1 Foundation Heating

7.6.1.1 A system for heating the foundation shall be provided if required by the foundation design (see 6.4.9).

7.6.1.2 The foundation heating system shall be designed to meet the performance criteria stated in 6.4.9.

7.6.1.3 The foundation heating system shall:

- a) be controlled by temperature sensors, which are installed in the foundation;
- b) have 100 % redundancy and give an alarm for any system failures;
- c) be designed to allow functional and performance testing;
- d) give attention and separate treatment to zones where there is discontinuity in the foundation, such as for bottom piping;
- e) be designed, selected, and installed so that any heating element and temperature sensor used for control can be replaced after installation;
- f) incorporate provisions to prevent moisture accumulation in the conduit.

7.6.2 Foundation Settlement Monitoring

7.6.2.1 For monitoring the foundation settlement, an independent datum reference point located beyond the influence of local foundations shall be established.

7.6.2.2 Permanent markers shall be provided to facilitate settlement monitoring around the perimeter of the foundation at a minimum of 8 equal-spaced locations not more than 10 m (32 ft) apart.

7.6.2.3 For settlement conditions that are expected to approach the design limits set for the tank, provisions shall be made to measure dishing settlement. An inclinometer system may be provided to accomplish this requirement.

7.6.3 Seismic Ground Motion Measurement

As noted in 6.6.11, seismic design may assume a damage evaluation is performed for seismic events greater than an OBE event. The Purchaser shall specify if a seismometer or accelerometer for determining if an OBE event has been exceeded is a required part of the tank system.

7.7 Fire, Gas, and Spill Protection

Protections for fire, gas, and low temperature spill are required as per 7.7.1 through 7.7.5, if they are specified by the Purchaser or per regulations, or as a result of a hazard study.

7.7.1 Gas Detection

For tanks designed to store flammable products, flammable gas detector(s) shall be installed in the area where potential leakage could occur (e.g. flange joints in the area of the process lines on the tank).

7.7.2 Fire Protection

All essential appurtenances and equipment on the tank and the platforms shall be protected against radiant heat flux by means of fixed cooling water spray systems, fire proofing, or other relevant method enabling protection against radiant heat flux resulting from external fire.

7.7.3 Fire Detection

7.7.3.1 If water spray systems are provided, fire detection devices shall be provided to give an alarm so that the water spray system can be activated.

7.7.3.2 Fire detection devices shall be installed in the tail pipes of pressure relief valves (PRVs).

7.7.4 Low Temperature Detection

Low temperature detector(s) shall be installed in the area where potential leakage could occur (e.g. flange joints in the area of the process lines on the tank and tail pipe of PRV).

7.7.5 Spill Protection

7.7.5.1 Any portion of the outer surface area of a warm product vapor container or external members which if failed could result in loss of containment from accidental exposure to low temperatures resulting from the leakage of refrigerated liquid or vapor from flanges, valves, seals, or other non-welded connections shall be designed for such temperatures or otherwise protected from the effects of low temperature exposure.

7.7.5.2 The protection described in 7.7.5.1 may consist of a separate collection system or utilize roof components, constructed of suitable low temperature material.

Comment: As an example, a concrete roof may be a part of the spill protection system if it is designed for low temperature.

7.7.5.3 Design spill parameters shall be per the applicable regulation and any Purchaser requirements.

7.8 Electrical

7.8.1 Lightning Protection

Lightning protection shall be provided in accordance with NFPA 780, and NFPA 59A if applicable.

7.8.2 Grounding/Earth

Tank grounding shall meet the requirements of NFPA 780.

7.8.3 Aviation Lighting

Aircraft warning lights shall be supplied when required by Federal Aviation Administration or applicable local/international rules and regulations or when specified by the Purchaser.

7.9 Miscellaneous

7.9.1 A means for handling roof top equipment requiring periodic maintenance, such as in-tank pumps, shall be provided.

7.9.2 Perlite fill nozzles in the roof shall be provided when applicable.

SECTION 8—QUALITY ASSURANCE AND QUALITY CONTROL

8.1 Introduction

Tank system construction in accordance with this standard consists of various sub activities such as design, procurement, fabrication, construction, and testing for all subsystems such as the foundation, tanks, piping, insulation, electrical, instrumentation systems, etc. A quality management system shall be utilized to ensure that the work performed meets quality requirements.

Comments:

- 1) Quality management systems consist of quality control (QC) and quality assurance (QA) activities.
- 2) QC is a system of routine activities developed to measure and control the quality of the work as it is being performed. The QC system is designed to provide routine and consistent checks to ensure correctness and completeness and identify corrective responses.
- 3) QA consists of a series of systematic planned activities implemented in a quality system so that quality requirements are met. QA includes procedures for the implementation of QC.
- 4) Documents such as ISO 9001 and API Specification Q1 provide guidance for establishing QA and QC plans.

8.2 NDE, Testing, and Tolerances

8.2.1 Nondestructive examination (NDE) activities during tank system construction shall be performed to ensure that the quality requirements of the work are met.

8.2.2 Testing, such as hydrostatic and pneumatic tests, and loop checks of the electrical work must be performed in accordance with construction standards to insure the integrity of the tank system construction.

8.2.3 Construction tolerances for the tank and foundation imposed by API 620 and ACI 376, as applicable, must be satisfied to ensure that the as-built tank system construction is consistent with the design.

SECTION 10—POST CONSTRUCTION ACTIVITIES

10.1 Scope

This section provides requirements and guidance for post construction activities necessary for the safe startup of storage tank systems covered in this standard. Activities include pressure testing, purging, and cool down.

- Additional requirements for concrete structures are provided within ACI 376.
- Additional requirements for metal structures are provided in API 620.

10.2 General

All construction activities, inspections, testing, and cleaning (all sand, sludge, and standing water shall be removed) of the tank shall be completed. All instrumentation shall be calibrated and verified prior to final closure of the tank. All electrical systems including the foundation heating system shall be verified as operational. A drying/purging and cool down procedure shall be prepared by the Tank System Contractor for incorporation into the detailed plant purge and cool down procedure.

10.3 Hydrostatic and Pneumatic Testing

10.3.1 Testing of Primary Liquid and Vapor Containers

Primary liquid and vapor containers shall be hydrostatically tested and leak tested in accordance with the API 620 or ACI-376, as applicable, and the following, and all leaks shall be repaired.

- a) Primary liquid containers shall be hydrostatically tested to a minimum liquid height equal to the design liquid height times the product design specific gravity times 1.25 or higher if so stated in the governing construction code or standard but not greater than the design liquid level.
- b) Primary vapor containers shall be tested to an overload pressure of 1.25 times the pressure for which the vapor space is designed.
- c) Settlement monitoring during hydrostatic test in accordance with API 620, C.11 shall be a mandatory requirement.

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10.3.2 Testing of Secondary Liquid Containers

Hydrostatic testing of secondary liquid containers of double and full containment tank systems is not required unless explicitly specified by the Purchaser. If specified for specific projects, hydrostatic testing of secondary liquid containers shall include the following:

- a) hydrostatic testing of the primary container shall be completed prior to the secondary container test and shall not be drained prior to filling and emptying the secondary container;
- b) verification of primary bottom leak tightness shall be made during testing of the primary liquid container;
- c) the bottom insulation system shall be protected from exposure to water during secondary container testing;
- d) water test height for the secondary container shall, as a minimum, be set at a height that produces a liquid pressure in the base of the container equivalent to 1.25 times the pressure produced to contain the full primary container filled with product at design liquid level.

10.3.3 Pressure Testing of Pump Columns

10.3.3.1 Pump columns shall be pressure tested, hydrostatically or pneumatically, in accordance with the standard used for their design (see 7.3.3).

10.3.3.2 Pump columns shall be installed prior to hydrostatic testing of the primary liquid container.

10.3.3.3 Pump column internal pressure testing shall be performed with the primary liquid container empty, and the pump column shall be empty when the primary liquid container is hydrostatically tested.

10.3.4 Pressure Testing of Piping

Piping shall be pressure tested as required by API 620, Appendix Q or Appendix R.

10.4 Drying and Purging

10.4.1 Immediately following the hydrostatic test of the tank, residual standing water shall be removed.

10.4.2 Erection procedures shall incorporate provisions that eliminate collection of excessive moisture within the insulation system.

Comment: Excessive free water within the insulation system can cause the insulation system to perform below its design basis and, in the case of cellular glass load bearing insulation, could cause damage to the insulation system.

10.4.3 The dew point values in Table 10.1 may be used as an indication for when detrimental moisture has been adequately removed. It is not necessary to lower the dew point below 32 °F (0 °C). If the recommended dew point is reached at the end of the nitrogen purge and if the nitrogen purge is followed by a warm product purge, it is not necessary to take subsequent readings

Comment: Excessive moisture in the tank atmosphere will be naturally removed from the gas when the gas temperature drops below the dew point of the gas. Therefore, removal of most moisture from the gas within the tank will be achieved through the process of nitrogen and warm gas purges discussed below.

10.4.4 A nitrogen purge shall be conducted to reduce the oxygen level in the tank to a level that will allow the product to be introduced without creating a combustible gas mixture.

Comment: The O₂ end point value in Table 10.1 is a value that is considered safe for ethylene per AGA *Purging Principles and Practice*. Percent oxygen in nitrogen gas end points for all other gasses covered by this standard could be safely set at a higher level but the dew point values listed will normally be harder to achieve than the 8 % O₂ level.

10.4.5 An exception to the O₂ values in Table 10.1 is ammonia storage. The O₂ level achieved prior to cool down (liquid accumulation) is recommended to be lower than the value in Table 10.1 and should be as low as practical.

Comment: Anhydrous ammonia storage is susceptible to stress corrosion cracking (SCC). Water additions have been shown to reduce the SCC process and any free moisture exposed to ammonia vapor will combine with the ammonia. The percent O₂ at time of liquid accumulation is also important to reduce the SCC process.

10.4.6 A warm product purge to between 80 % and 90 % product gas normally follows the nitrogen purge and is completed prior to tank cool down. If liquefied gas is introduced directly into a nitrogen environment, the initial introduction can cause the temperature of the liquid to drop below the product design temperature and the design metal temperature. Material selection and tank design shall consider this lower temperature if a warm product purge is not performed.

Annex D **(informative)**

Recommendations on Selection of Storage Concept Based on Assessment of Risk

D.1 Scope

This annex provides the Purchaser guidance on making the storage concept selection from among the three main concepts and their variations that are presented in Section 5. Per 5.5, the selection is to be based on a risk assessment. The risk is a function of not only the storage concept itself but also the way the tank system relates to many other aspects of the overall facility. Therefore, while the guidance provided is mostly focused on the storage concept, it also touches as necessary on other aspects of the facility and its surroundings.

D.2 Introduction and Background

D.2.1 By definition, refrigerated liquefied gas facilities can in the event of an upset or emergency event release gases that present a significant threat to human life, the environment and surrounding communities. This is especially true for refrigerated liquids where the volume of their gases can be up to 928 times the volume of the liquid. Depending on the liquefied gas stored and the rate of leakage, the potential result following a loss of primary containment is generation of vapor clouds that can drift beyond the facility. **13**

D.2.2 Plans for the proposed facility should specifically address the impact of gas clouds and radiant heat flux on plant facilities and adjacent properties. Intrinsic within this approach is the selection of storage concept; separation distances and proximity to property lines; site topography; soil conditions; and ground water conditions. A review of the site may identify constraints or provide opportunities to utilize specific features of site to the benefit of the facility i.e. natural topography may allow the selection of single containment.

D.2.3 Key drivers known to influence storage concept selection are as follows:

- product to be stored;
- availability of land;
- proximity to residential developments and habitable areas;
- influence/impact of adjacent process plant and equipment;
- hazards as discussed in D.3.2.4 and D.3.2.5.

D.2.4 The possible effect of a liquid spill from any portion of the facility should be considered. This is particularly relevant where there is a conduit through which the liquid product can flow beyond the secondary liquid containers. Annex C provides information on effects of liquid spills from the various tank concepts.

D.2.5 The determination of vapor generation and dissipation is complex and dependent on many parameters including relative gas to air densities, meteorological conditions, terrain, rate of release, and the amount of entrained liquid droplets dispersed into the vapor cloud.

D.2.6 When liquid product spills, evaporation takes place. The amount of evaporation in the very first moments depends primarily on the exposed surface in contact with the refrigerated liquid. **13**

D.2.7 Initially most refrigerated vapors are heavier than air and sink due to their low temperature. However as heat is drawn from the environment some hydrocarbons become less dense and when warmed eventually become lighter

than air. Propane, ethylene, and heavier vapors remain denser than air, even when warmed to ambient temperatures. Refer to Annex A for data relevant to these considerations.

D.2.8 Depending on atmospheric and environmental conditions the resulting gas cloud may drift across or away from the facility prior to being dispersed below its lower flammable limit where ignition is no longer possible. The area wetted in the case of a spill may be limited in order to reduce the size and travel distance of a gas cloud. The exposed wetted area is directly linked to the selection of containment concept.

D.2.9 The rate of heat generation from a large pool of burning liquefied gas is significantly higher than that of a similar pool of another oil product. Again in order to limit the radiant heat flux on the surroundings to acceptable levels it may be necessary to reduce as much as possible the area of the pool of spilled liquefied gas though the selection of containment concept.

D.3 Assessment of Risk

D.3.1 General

D.3.1.1 Per 5.5, the Purchaser shall select the storage concept based on a risk assessment.

D.3.1.2 One method to achieve this is by means of a staged risk assessment that clearly identifies the hazards, failure conditions, probabilities of occurrence and consequences thereof.

D.3.2 Hazard Identification

D.3.2.1 The assessment of risk process commences with identification of the hazards that may be grouped into external and internal threats.

D.3.2.2 Per 6.4.2, all containment systems are to be designed with the assumption that the primary tank may leak or fail and gradual filling of the secondary container may take place. For primary containers built in compliance with the standards required by 1.4 and 1.5, the possibility of sudden failure (unzipping or zip failure) of the inner tank is not a normal design consideration. If extra protection from brittle fracture is desired, the general practice is to increase the toughness requirements of the primary container rather than design for zip failure. Design for zip failure, implies a requirement that the outer tank or wall should be designed to withstand the consequent impact loading.

D.3.2.3 Additional hazards that should be considered by the Purchaser when selecting a containment concept are in D.3.2.4 and D.3.2.5. These lists are not exhaustive and a risk assessment should be performed by responsible parties to identify the critical hazards that influence the concept selection and plant layout.

D.3.2.4 External hazards include the following:

- environmental hazards including earthquake, lightning, wind loading including hurricane/typhoons, flooding, snow and ice loading, tsunamis, and seiches;
- ground conditions, weak strata, liquefiable layers, lateral spreading, and presence of caverns, voids and defects;
- flying objects, and equipment following a process incident;
- pressure waves due to vapor cloud ignitions from the process plant, adjacent plant, process equipment, and carriers including facilities located outside the boundary limits;
- operational and upset conditions including spillage and leakage of product;
- maintenance hazards;

Annex E (informative)

Inquiries and Suggestions for Change

E.1 Introduction

This annex describes the process established by API for submitting inquiries to API and for submitting suggestions for changes to this standard. Inquiries and suggestions for change are welcome and encouraged; however, submittals not complying with this annex and additional API policies will be returned unanswered. These submittals provide useful reader feedback to the responsible API Committee regarding technical accuracy, current technology use, clarity, consistency, and completeness of the standard. API will attempt to answer all valid inquiries.

E.2 Inquiries

E.2.1 Inquiry References

E.2.2 API maintains several websites that provide information that should be considered when considering submitting an inquiry.

E.2.3 Your inquiry may have been previously formally addressed by the Subcommittee and the resulting interpretation posted on the API website at the following.

- For all standards: <http://mycommittees.api.org/standards/techinterp/default.aspx>.
- Refining only: <http://mycommittees.api.org/standards/techinterp/refequip/default.aspx>.

For both links, click on the standard in question to download the file.

E.2.4 In addition, an addendum or errata, which may have addressed your issue, can be found on the API website at the following.

- For all standards: <http://www.api.org/standards/addenda/>.
- Refining only: <http://www.api.org/standards/addenda/add-ref.cfm>.

E.3 Definitions of Terms

E.3.1 Inquiry: A question that asks what is the meaning of a specific paragraph, figure, or table in the standard; i.e. what do the words say. It is not a question that asks about the intention of the standard.

E.3.2 Interpretation: The Subcommittee's answer to the inquiry. Typically, the answer is simply a "Yes" or "No" response, with a brief clarification if needed. This term is also used to refer to the combined question and answer.

E.3.3 Suggestion for change: As opposed to an inquiry, a suggestion for change is a proposal to API for modifying the standard to make additions or to resolve apparent conflicts or omissions. API encourages both; however, the submittal and handling procedures are different.

E.4 API Policy Regarding Inquiries

E.4.1 API has established the following limits on its activity in the handling of inquiries.

- a) API does not approve, certify, rate, or endorse any item, construction, proprietary device, or activity.

- b) API does not act as a consultant on specific engineering problems.
- c) API does not provide information on the general understanding, rationale, or application of the standard.

E.4.2 All inquiries that result in interpretations will therefore be made available to the general public on the API website.

E.5 Submission of Inquiries

E.5.1 All background and policies for submitting inquiries are stated in the following API webpages.

- 1) Click on: <http://www.api.org/publications-standards-and-statistics/faqs-and-inquiries.aspx>.
- 2) Then click on: "Technical Questions and Requests for Interpretation."
- 3) Then click on: "Click here for detailed information on Technical Questions and Requests for Interpretation."
- 4) Then click on: "RFI website here" to access the required electronic form for submitting an inquiry.

E.5.2 All inquiries must comply with the following.

- a) Be limited to a single subject or closely related subjects.
- b) Be stated as briefly and precisely as possible, including the applicable paragraph, figure, or table numbers.
- c) Providing a background explanation is optional but is encouraged to assist the Subcommittee in understanding the query.
- d) Be in the form of a "Yes" or "No" question.
- e) Be technically and editorially correct and written in understandable English.
- f) Be related to the current edition/addendum of the document in question.

NOTE API will not issue interpretations of superseded or withdrawn documents.

- g) The general format of the inquiry should be as follows: "Does Paragraph XXX of API-6XX require that?" The inquirer shall also state the potential answer to the inquiry. In addition, if the inquirer believes a revision to the standard is also needed, he or she shall provide recommended wording.

E.6 Typical Inquiry Process

E.6.1 The typical process of an inquiry is as follows.

- a) The Inquirer must prepare the inquiry, including any necessary background information, in full compliance with this annex and submit via the API webpage link.
- b) API Standards Coordinator checks the inquiry to verify compliance with the requirements of submitting an inquiry.
- c) If the inquiry cannot be answered for any reason, the Coordinator will issue the form letter to the inquirer advising the reason(s) for not answering the inquiry.
- d) If the inquiry is valid, it will be forwarded to the Subcommittee for study, and the inquirer will be advised using the form letter.

- e) The Subcommittee will evaluate the inquiry and either develop a response or determine that the inquiry cannot be answered and advise the Coordinator accordingly. The Subcommittee will consider the need for modifying the standard to resolve technical issues, add new requirements, make editorial corrections, improve clarity, remove conflicts, etc.
- f) The interpretation will be published on the API website when approved by the Subcommittee.

E.6.2 The time required to process a valid inquiry as described in E.6.1 may take as long as a year.

E.7 Responses to Inquiries

E.7.1 If the inquiry is properly phrased, the interpretation can be a one-word response. With many inquiries, there may be a need to provide clarifying statements, such as limits on the applicability.

E.7.2 The industry benefits as a whole when inquiries are utilized as a means to understand the technical requirements of the standard.

E.7.3 It is not possible to develop interpretations quickly to resolve immediate needs.

E.7.4 A form letter or email will be used to reply to inquirers indicating the action taken by API, and if applicable, the reason(s) for not being able to accept the inquiry.

E.8 Suggestions for Changes

E.8.1 A Suggestion for change is a communication (email preferred) from a reader to API proposing that a specific change be made to the standard.

E.8.2 Any format is acceptable, as long as the content is clear.

E.8.3 Submit suggestions to: pubweb@api.org.

E.8.4 The content of a suggestion should include the standard number, edition, and addendum, and the relevant paragraph, table, or figure numbers, etc. Provide as much explanation as necessary to be sure the reader understands the technical issues. Provide specific language that you think is needed to implement the change.

E.8.5 API will forward all suggestions that are suitably written to the Subcommittee for consideration. The Subcommittee will evaluate each suggestion and determine if a change is needed. The change may be included in a future edition or addendum.

