This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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An American National Standard

Standard Specification for Spill Valves for Use in Marine Tank Liquid Overpressure Protections Applications[1]

This standard is issued under the fixed designation F1271; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification provides the minimum requirements for design, construction, performance, and testing of devices to prevent marine tank liquid overpressurization (hereafter called spill valves).

1.2 The spill valves provided in accordance with this specification will satisfy Regulation 1I-2/59.1.6 of the 1981 and 1983 Amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS), which states: "Provision shall be made to guard against liquid rising in the venting system to a height which would exceed the design head of the cargo tank. This shall be accomplished by high level alarms or overflow control systems or other equivalent means, together with gaging devices and cargo tank filling procedures.''

1.3 The spill valves are not intended for the venting of vapors or the relief of vapor overpressurization or underpressurization of marine tanks.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 The following precautionary caveat pertains only to the test methods portion, Section 8, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B117 Practice for Operating Salt Spray (Fog) Apparatus

F722 Specification for Welded Joints for Shipboard Piping Systems

2.2 *ANSI Standards:*[3]

B 2.1 Pipe Threads

B 16.1 Cast Iron Pipe Flanges and Flanged Fittings

B 16.3 Malleable Iron Threaded Fittings

B 16.4 Cast Iron Threaded Fittings

B 16.5 Steel Pipe Flanges and Flanged Fittings

B 16.11 Forged Steel Fittings, Socket-Welding and Threaded

B 16.15 Cast Bronze Threaded Fittings

B 16.24 Bronze Pipe Flanges and Flanged Fittings

B 31.1 Power Piping

2.3 *Other Documents:*

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, Pressure Vessels; Section IX, Welding and Brazing Qualifications[4]

Safety for Life at Sea Convention, Regulation II-2/59.1.6, Amendments 1981 and 1983[3]

46 CFR 153 Ships Carrying Bulk Liquid, Liquified Gas, or Compressed Gas Hazardous Materials[5]

3. Terminology

3.1 *Definitions:*

3.1.1 *spill valve*—an independent device that automatically prevents liquid overpressurization of a tank by relieving liquid at a predetermined pressure set higher than the pressure reached in the tank when the tank vapor relieving device

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

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operates at its maximum design venting rate (based on a volumetric vapor volume 1.25 times the maximum design loading rate).

4. Ordering Information

4.1 Orders for spill valves in accordance with this specification shall include the following information, as applicable:

4.1.1 Nominal pipe size and end connections,

4.1.2 Product(s) in tank being protected by the spill valve,

4.1.3 Inspection and tests other than specified by this specification,

4.1.4 Required relieving pressure at maximum tank loading flow rate,

4.1.5 Set (opening) pressure,

4.1.6 Maximum tank design loading flow rate,

4.1.7 Inlet pressure drop resulting from the maximum tank design loading flow rate,

4.1.8 Back pressure of the spill valve discharge lines resulting from maximum tank design loading flow rate,

4.1.9 Purchaser's inspection requirements (see 9.1),

4.1.10 Installation inclinations in excess of 2 ½ ° (see 6.6),

4.1.11 Purchaser's specifications for preventing the valve from leaking due to cargo sloshing, and

4.1.12 Additional requirements or testing as contracted by the manufacturer and the purchaser.

5. Materials

5.1 Materials of construction shall be suitable for the service intended and resistant to the attack by the liquid carried in the tank being protected (see 4.1.2). Table I of 46 CFR 153 specifies materials that may not be used in components that contact liquid or vapor of each hazardous liquid cargo.

5.2 Housings of spill valves, and all other parts or bolting, or both, used for pressure retention, shall be constructed of materials having a solidus melting point of greater than 1700 °F (927 °C) and be listed in ANSI B 31.1 or Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, except as noted in 5.5.

5.3 Corrosion-resistant materials shall be used for the following:

5.3.1 Housings, disks, spindles, and seats of valves.

5.3.2 Springs that actuate disks of valves. Springs plated with corrosion-resistant material are not acceptable.

5.4 Nonmetallic materials shall not be permitted except for gaskets, seals, bushings in way of moving parts, and valve diaphragms.

5.5 Bolting materials shall be at least equal to those listed in Table 1 of ANSI B 16.5. Bolts, screws, and fasteners in contact with interior liquid shall be compatible with the liquid (see 4.1.2).

6. Other Requirements

6.1 Pressure-retaining housings shall be designed to withstand a hydrostatic pressure of at least 125 lb/in.^{2} (8.78 kg/cm^2) without rupturing or showing permanent distortion.

6.2 Housing shall have suitable pipe connections for the removal, maintenance, and testing of the spill valve.

6.2.1 Threaded or flanged pipe end connections shall comply with the applicable B16 ANSI standards listed in 2.2 or as agreed upon by the manufacturer and the purchaser (see 4.1.12). Welded joints shall comply with Specification F722.

6.3 The design of spill valves shall allow for ease of inspection and removal of internal elements for replacement, cleaning, or repair without removal of the spill valve.

6.4 All flat joints of the housing shall be machined true and shall provide for a joint having adequate metal-to-metal contact.

6.5 Where welded construction is used, welded joint design details, welding, and nondestructive testing shall be in accordance with Section VIII, Division 1 of the ASME Code and Specification F722. Welders and weld procedures shall be qualified in accordance with Section IX of the ASME Code.

6.6 The spill valve shall be fully operable at static inclinations up to 2½ ° unless otherwise specified by the ordering information in Section 4.

6.7 Spill valves shall allow for efficient drainage of moisture without impairing their proper operation.

6.7.1 Where the design does not permit complete drainage of condensate through its connection to the tank, the housing shall be fitted with a plugged drain opening on the side of the atmospheric outlet of not less than nominal pipe size ½ in. (12 mm).

6.8 Housing, elements, and seal gasket materials shall be capable of withstanding the highest pressure and temperature to which the spill valve may be exposed under normal conditions.

6.9 Spill valves shall be vapor tight at pressures below the rated liquid relieving pressure.

6.10 Fastenings essential to the operation of the spill valve shall be protected against loosening.

6.11 Spill valves shall be designed and constructed to minimize the effect of fouling under normal conditions.

6.12 The spill valve shall not be provided with a means of positive closure. In installations where cargo sloshing is expected, the spill valve installation must be designed to preclude premature opening of the valve due to cargo sloshing. Also, the installation shall be designed so that it complies with applicable loadline and subdivision requirements.

6.13 Spill valves shall be capable of operating in freezing conditions.

6.14 Each of the free areas through the valve seat and through the valve discharge at maximum lift shall not be less than the cross-sectional area of the valve inlet connection.

6.15 Means shall be provided to check that any valve opens freely and does not remain lodged in the open position.

6.16 *Valve Disks:*

6.16.1 Valve disks shall be guided by a ribbed cage or other suitable means to prevent binding and ensure proper seating. Where valve stems are guided by bushings suitably designed to

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prevent binding and to ensure proper seating, the valves need not be fitted with ribbed cages.

6.16.2 Valve disks shall close tight against the valve seat by metal to metal contact; however, resilient seating seals may be provided if the design is such that the disk closes tight against the seat in case the seals are destroyed or in case they carry away.

6.16.3 Valve disks may be solid or hollow. The pressure at which the valve disks open fully at maximum flow rating shall not exceed 120 % of the set (opening) pressure.

6.17 Valves may be actuated by nonmetallic diaphragms.

6.17.1 Nonmetallic diaphragms are not allowed where failure results in unrestricted flow of flammable or toxic tank vapors to the atmosphere or in an increase in the pressure at which the valve normally releases.

6.18 Relief pressure adjusting mechanisms shall be permanently secured by lockwire, locknuts, or other suitable means.

6.18.1 Hollow portions of the valve used to vary the relieving pressure by adding or removing weight shall be watertight.

6.18.2 Spill valves shall not permit entrance of water when exposed to boarding seas.

7. Workmanship, Finish, and Appearance

7.1 Spill valves shall be of first class workmanship and free from imperfections that may affect their intended purpose.

7.2 Each finished spill valve shall be visually and dimensionally checked to ensure that the spill valve corresponds to this specification, is certified in accordance with Section 10, and is marked in accordance with Section 11.

8. Test Methods

8.1 *Prototype Tests:*

8.1.1 A prototype of the largest and smallest spill valve of each design, based on valve inlet connection size, shall be tested as specified in 8.1.5, 8.1.6, and 8.1.8 through 8.1.10. Additionally, all models shall be tested as specified in 8.1.7.

8.1.2 The spill valve shall have the dimensions of and most unfavorable clearances expected in production units.

8.1.3 Tests shall be conducted by a laboratory capable of performing the tests.

8.1.4 A test report shall be prepared by the laboratory that shall include:

8.1.4.1 Detailed drawings of the spill valve,

8.1.4.2 Types of tests conducted and results obtained,

8.1.4.3 Specific advice on approved attachments,

8.1.4.4 Types of liquid for which the spill valve is approved,

8.1.4.5 Drawings of the test rig,

8.1.4.6 The pressures at which the spill valve opens and closes and the efflux flow rate at various inlet pressures,

8.1.4.7 Records of all markings found on the prototype spill valve, and

8.1.4.8 A traceable report number.

8.1.5 *Corrosion Test*—A corrosion test shall be conducted in accordance with Practice B117. The valve shall be subjected to the test for a period of 240 h and allowed to dry for 48 h. There shall be no corrosion deposits that cannot be washed off.

8.1.6 *Hydrostatic Test*—A hydrostatic pressure test shall be conducted to show compliance with 6.1. The test shall be made with water or other liquid having a maximum viscosity of 40 SSU at 125 °F (52 °C) with a maximum pressure test temperature of 125 °F (52 °C). The minimum duration of the test shall be 1 min.

8.1.7 *Performance Tests*—Performance characteristics, including flow rates under various positive pressures, operating sensitivity, flow resistance, and velocity, shall be demonstrated by appropriate tests with a representative fluid.

8.1.8 *Freeze Test*—Simulate water sloshing on deck by spraying a prototype spill valve completely with water from all sides and below using a fully pressurized fire hose. Allow 3 min to drain off. Immediately immerse it in a freeze chamber prechilled to 20 °F (−7 °C). Hold it in a chamber for 2 h at this temperature. Immediately test the valve as in 8.1.7 to determine opening pressure while frozen. The unit passes the test if it opens within 10 % of its previously measured set (opening) pressure.

8.1.9 *Vapor Tightness Test*—Compliance with 6.9 shall be demonstrated by testing the spill valve with compressed air at 90 % of the spill valve set (opening) pressure. The test apparatus shall have a total volume of air (in cubic feet) equal to $5 \times D$, where D is the seat diameter of the spill valve, in inches (test volume may vary by ±10 %). The valve design shall be deemed satisfactory if the air leakage rate is such that the pressure drop is not more than 2 % in 2 h.

8.1.10 *Seaworthiness Test*—In a simulated installation, immerse the spill valve such that the seal is under 2 ft of water, minimum. Spray it for 10 min with a 2 ½ in. fire hose with a fully open ⅞ in. diameter nozzle at a pitot pressure of 80 psig measured at the open nozzle. Spray all parts of the valve, both immersed and non-immersed, from all angles. The hose nozzle shall not be located further than 10 ft from the spill valve during the course of this test. The valve design is sufficient if leakage through the housing or past the disk, or both, is no more than 1 oz.

8.1.11 After completion of all tests the device shall be disassembled and examined and no part of the device shall be damaged or show permanent deformation.

8.2 *Production Tests:*

8.2.1 Each finished spill valve is to be tested by a hydrostatic test conducted at 1½ times the rated relieving pressure of the spill valve, with the device secured closed. The test shall be made with water or other liquid having a maximum viscosity of 40 SSU at 125 °F (52 °C) with a maximum pressure test temperature of 125 °F (52 °C). The minimum duration of the test shall be 1 min. The purpose of this test is to detect leaks and structural imperfections. No visible leakage is permitted.

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