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An American National Standard

Standard Specification for Tank Vent Flame Arresters[1]

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ε[1] NOTE—Keywords were added editorially in November 1996.

1. Scope

1.1 This specification provides the minimum requirements for design, construction, performance, and testing of tank vent flame arresters.

1.2 This specification is intended for flame arresters protecting systems containing vapors of flammable or combustible liquids where vapor temperatures do not exceed 60°C. The test media defined in 9.1.1 can be used except where arresters protect systems handling vapors with a maximum experimental safe gap (MESG) below 0.9 mm. Flame arresters protecting such systems must be tested with appropriate media (the same vapor or a media having a MESG no greater than the vapor). Various gases and their respective MESG are listed in Table 1.

NOTE 1—Flame arresters meeting this specification also comply with the minimum requirements of the International Maritime Organization, Maritime Safety Committee Circular No. 373 (MSC/Circ. 373/Rev. 1).

1.3 The values stated in either inch-pound or SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following precautionary caveat pertains only to the test methods portions, Sections 8 and 9, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use*

TABLE 1 Gases and Their MESGs

Inflammable Gas or Vapor	Maximum Experimental Safe Gap	
	mm	in.
Methane	1.170	0.046
Blast furnace gas	1.193	0.047
Propane	0.965	0.038
Butane	1.066	0.042
Pentane	1.016	0.040
Hexane	0.965	0.038
Heptane	0.965	0.038
Iso-octane	1.040	0.041
Decane	1.016	0.040
Benzene	0.99	0.039
Xylene	1.066	0.042
Cyclohexane	0.94	0.037
Acetone	1.016	0.040
Ethylene	0.71	0.028
Methyl-ethyl-ketone	1.016	0.040
Carbon monoxide	0.915	0.036
Methyl-acetate	0.990	0.039
Ethyl-acetate	1.04	0.041
Propyl-acetate	1.04	0.041
Butyl-acetate	1.016	0.040
Amyl-acetate	0.99	0.039
Methyl alcohol	0.915	0.036
Ethyl alcohol	1.016	0.040
Iso-butyl-alcohol	0.965	0.038
Butyl-alcohol (normal)	0.94	0.037
Amyl-alcohol	0.99	0.039
Ethyl-ether	0.864	0.034
Coal gas (H_2 57 %)	0.482	0.019
Acetylene	<0.025	<0.001
Carbon disulphide	0.203	0.008
Hydrogen	0.102	0.004
Blue water gas (H_2 53 % CO 47 %)	0.203	0.008
Ethyl nitrate	<0.025	<0.001
Ammonia	3.33	0.133
Ethylene oxide	~0.65	~0.026
Ethyl nitrite	0.922	0.038

2. Referenced Documents

2.1 *ASTM Standards:*

F 722 Specification for Welded Joints for Shipboard Piping Systems[2]

F 1155 Practice for Selection and Application of Piping System Materials[2]

2.2 *ANSI Standard:*

[1] This specification is under the jurisdiction of ASTM Committee F-25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.13 on Piping Systems.

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[2] *Annual Book of ASTM Standards*, Vol 01.07.

B16.5 Pipe Flanges and Flanged Fittings[3]

2.3 *Other Documents:*

ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, Pressure Vessels;

ASME Boiler and Pressure Vessel Code: Section IX, Welding and Brazing Qualifications[4]

International Maritime Organization, Maritime Safety Committee: MSC/Circ. 373/Rev. 1 Revised Standards for the Design, Testing and Locating of Devices to Prevent the Passage of Flame into Cargo Tanks in Tankers[5]

International Electrotechnical Commission: Publication 79-1 Electrical Apparatus for Explosive Gas Atmospheres[6]

3. Terminology

3.1 *Definitions:*

3.1.1 *flame arrester*—a device to prevent the passage of flame in accordance with a specified performance standard. Its flame arresting element is based on the principle of quenching.

3.1.2 *flame passage*—the transmission of a flame through a flame arrester.

3.1.3 *flame speed*—the speed at which a flame propagates along a pipe or other system.

3.1.4 *gasoline vapors*—a nonleaded petroleum distillate consisting essentially of aliphatic hydrocarbon compounds with a boiling range of approximately 65 to 75°C.

4. Classification

4.1 The two types of flame arresters covered in this specification are classified as follows:

4.1.1 *Type I*—Flame arresters acceptable for end-of-line applications.

4.1.2 *Type II*—Flame arresters acceptable for in-line applications.

5. Ordering Information

5.1 Orders for flame arresters under this specification shall include the following information, as applicable:

5.1.1 Type (I or II),

5.1.2 Nominal pipe size,

5.1.3 Each gas or vapor in the tank being protected by the flame arrester and the corresponding MESG,

5.1.4 Inspection and tests other than those specified by this specification,

5.1.5 Anticipated ambient air temperature range,

5.1.6 Purchaser's inspection requirements (see 10.1),

5.1.7 Description of installation (distance and configuration of pipe between the arrester and the atmosphere or potential ignition source) (see 8.2.4.2),

5.1.8 Materials of construction (see Section 6), and

5.1.9 Maximum flow rate and the design pressure drop for that maximum flow rate.

6. Materials

6.1 The flame arrester housing, and other parts or bolting used for pressure retention, shall be constructed of materials listed in Practice F 1155, or Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

6.1.1 Arrester, elements, gaskets, and seals shall be of materials resistant to attack by seawater and the liquids and vapors contained in the tank being protected (see 5.1.3).

6.2 Nonmetallic materials, other than gaskets and seals, shall not be used in the construction of pressure-retaining components of the flame arrester.

6.2.1 Nonmetallic gaskets and seals shall be noncombustible and suitable for the service intended.

6.3 Bolting materials, other than those in 6.1, shall be at least equal to those listed in Table 1 of ANSI B16.5.

6.4 The possibility of galvanic corrosion shall be considered in the selection of materials.

6.5 All other parts shall be constructed of materials suitable for the service intended.

7. Other Requirements

7.1 Flame arrester housings shall be gastight to prevent the escape of vapors.

7.2 Flame arrester elements shall fit in the housing in a manner that will ensure tightness of metal-to-metal contacts in such a way that flame cannot pass between the element and the housing.

7.2.1 The net free area through flame arrester elements shall be at least 1.5 times the cross-sectional area of the arrester inlet.

7.3 Housings and elements shall be of substantial construction and designed for the mechanical and other loads intended during service. In addition, they shall be capable of withstanding the maximum and minimum pressures and temperatures to which the device may be exposed under both normal and the specified fire test conditions in Section 9.

7.4 Threaded or flanged pipe connections shall comply with the applicable B–16 standards in Practice F 1155. Welded joints shall comply with Specification F 722.

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

7.6 Where welded construction is used for pressure-retaining components, welded joint design details, welding, and nondestructive testing shall be in accordance with Section VIII, Division 1 of the ASME Code and Specification F 722. Welders and weld procedures shall be qualified in accordance with Section IX of the ASME Code.

7.7 The design of flame arresters shall allow for ease of inspection and removal of internal elements for replacement, cleaning, or repair without removal of the entire device from the system.

7.8 Flame arresters shall allow for efficient drainage of condensate without impairing their efficiency to prevent the passage of flame.

7.8.1 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

[3] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[4] Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.

[5] Available from International Maritime Organization, 4 Albert Embankment, London SE1 7SR, England.

[6] Available from International Electrotechnical Commission, 1 rue de Varembe, Geneva, Switzerland.