



UL 162

STANDARD FOR SAFETY

Foam Equipment and Liquid Concentrates

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UL Standard for Safety for Foam Equipment and Liquid Concentrates, UL 162

Eighth Edition, Dated February 23, 2018

Summary of Topics

This New Edition of ANSI/UL 162 includes the following new requirements:

1. Hydraulically Powered Oscillating Monitors

2. Update Commercial Grade Heptane Specifications

The new/revised requirements are substantially in accordance with Proposal(s) on this subject dated November 3, 2017.

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Standard for Foam Equipment and Liquid Concentrates

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The most recent designation of ANSI/UL 162 as an American National Standard (ANSI) occurred on February 23, 2018. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover foam producing equipment and liquid concentrates employed for the production and discharge of foam that has an expansion ratio of 20:1 or less and is used for fire extinguishment. These requirements are based on the premise that foam equipment and specified types of foam liquid concentrates with which they are intended to be used are to be investigated for use with each other.

1.2 If foam equipment covered by these requirements incorporate sprinklers, the sprinklers shall comply with the Standard for Automatic Sprinklers for Fire Protection Service, UL 199.

1.3 Requirements for the installation and use of foam equipment and liquid concentrates are included in the following standards of the National Fire Protection Association:

- a) Low Expansion Foam and Combined Agent Systems, NFPA 11;
- b) Deluge Foam-Water Sprinkler and Spray Systems, NFPA 16;
- c) Installation of Closed-Head Foam-Water Sprinkler Systems, NFPA 16A.

2 Units of measurement

2.1 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component.

3.2 A component need not comply with a specific requirement that:

- a) Involves a feature or characteristic not needed in the application of the component in the product covered by this standard, or
- b) Is superseded by a requirement in this standard.

3.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

3.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

4 Glossary

4.1 For the purpose of this standard, the following definitions apply.

4.2 CLASS B FIRES – Fires in flammable and combustible liquids, gases, and greases.

4.3 CONTROL – A reduction in fire intensity of approximately 90 percent.

4.4 DISCHARGE COEFFICIENT "K" – Coefficient of discharge in the formula:

$$K = \frac{Q}{\sqrt{p}}$$

where:

Q is Flow in gallons per minute (L/s x 15.85),

p is Pressure in psi (6.89 kPa)

4.5 DISCHARGE DEVICE – Fixed, semifixed, or portable devices, such as foam chambers, fixed foam makers, monitors, nozzles, spray nozzles, and sprinklers, that direct the flow to the fire or flammable liquid surface.

4.6 FIRE TEST PAN – The fire test pan is to be square, straight sided, with a minimum area of 50 square feet (4.65 m²). The pan is to be of steel not less than 1/4 inch (6.4 mm) thick with liquid tight welded joints and provided with 3/16 inch (4.8 mm) thick angle to reinforce the upper edge. The reinforcement is to be continuous around the perimeter of the pan and is to form a turned-out edge flush with the top edge of the pan. The top edge surface so formed is to be 1-3/4 inch (44 mm). The reinforcing angle is to be continuously welded to the outside of the pan at the top edge and tackwelded at the edge of the lower lip of the angle.

4.7 FILM FORMING LIQUID CONCENTRATE – A foam solution that has a spreading coefficient greater than zero when tested in accordance with the Film Forming Test, Section 7.

4.8 FIXED FOAM MAKER – A device that generates foam and that is intended to be installed between the supply piping of foam solution and piping leading to discharge outlets.

4.9 FOAM – A fire fighting agent made by mechanically mixing air with a solution consisting of fresh or salt water to which a foam liquid concentrate has been added.

4.10 FOAM CHAMBER – A device that:

- a) May include an integral foam maker,
- b) Is intended for fixed installation on flammable or combustible liquid storage tanks, and
- c) Produces foam and introduces it into the storage tanks.

4.11 FOAM EXPANSION VALUE – The ratio of final foam volume to original foam solution volume before adding air.

4.12 FOAM QUALITY – A measure of a foam's physical characteristics, expressed as the foam's:

- a) 25 percent drain time, and
- b) Expansion value.

4.13 FOAM SOLUTION – A mixture of a proportioned or premixed foam liquid concentrate dissolved in either fresh or salt water.

4.14 FULL-SCALE EQUIPMENT – Field installed components, such as proportioners and foam makers, that are intended to extinguish fires.

4.15 INDUCTION – A method that uses the venturi principle to introduce a proportionate quantity of foam concentrate into a water stream.

a) Pressure Induction – This method employs the water supply to pressurize the foam concentrate storage tank. At the same time, water flowing through an adjacent venturi or orifice creates a pressure differential. The difference between the water supply pressure and this lower pressure area forces the foam concentrate to flow through a fixed or metering orifice into the water stream.

b) Vacuum Induction – This method utilizes the negative pressure created by water passing through a venturi to draw the liquid concentrate from the storage tank or container through a pick-up tube and mix it with the water stream.

c) Pump-and-Motor Induction – By means of an auxiliary pump, foam compound is injected into the water stream passing through an inductor. The resulting foam solution is then delivered to a foam maker. The proportioner may be inserted in the line at any point between the water source and foam maker.

4.16 LIQUID CONCENTRATE – A protein or synthetic based liquid that is intended to be diluted with fresh water, salt water, or a mixture of both fresh and salt water to a concentration (volume of concentrate/volume of water) of 1 percent or higher. Different types of low expansion liquid concentrates are designated as follows:

a) Aqueous Film Forming (AFFF) – A liquid concentrate that has a fluorinated surfactant base plus stabilizing additives.

b) Protein – A liquid concentrate that has a hydrolyzed protein base plus stabilizing additives.

c) Fluoroprotein – A liquid concentrate that is similar to protein, but with one or more fluorinated surfactant additives.

d) Film Forming Fluoroprotein (FFFP) – A liquid concentrate that has both a hydrolyzed protein and fluorinated surfactant base plus stabilizing additives.

e) Synthetic – A liquid concentrate that has a base other than fluorinated surfactant or hydrolyzed protein.

f) Alcohol Resistant – A liquid concentrate intended to extinguish both hydrocarbon and polar solvent (water miscible) fuel fires. To be identified as alcohol resistant, a liquid concentrate shall comply with the fire tests indicated in Class B Fire Tests – Sprinklers and Spray Nozzles, Section 11, or Class B Fire Tests – Topside Discharge Devices, Section 12, using both heptane and isopropyl alcohol test fuels.

4.17 MONITOR – A device that includes a nozzle and is intended to deliver a large foam stream and is mounted on:

- a) A stationary support at grade level or on an elevated platform, or
- b) A vehicle.

4.18 MONITOR, MANUALLY OPERATED – A monitor that includes manual controls for adjusting elevation and sweep and may include manual controls for adjusting rotation.

4.19 MONITOR, HYDRAULICALLY POWERED OSCILLATING – A monitor that includes an integral hydraulic circuit that automatically controls the sweeping motion of the monitor over a specified angle; includes manual override controls for adjusting the sweeping motion; manual controls for adjusting elevation; and may include manual controls for adjusting rotation, sweep angle, and sweep speed.

4.20 NOZZLE – A portable device intended to discharge foam solution. A nozzle may be either aspirating or nonaspirating and may pick up foam liquid concentrate directly from a container (self-inducting) or utilize a foam solution produced at some point before introduction into the nozzle.

4.21 PROPORTIONER – A device intended to provide continuous introduction of foam liquid concentrate at the recommended ratio into a water stream to form a foam solution.

4.22 SALT WATER – Synthetic seawater complying with the Standard Specification for Substitute Ocean Water, ASTM D1141-90 or the equivalent.

4.23 SPECIAL FIRE EQUIPMENT (SMALL SCALE EQUIPMENT) – Foam nozzles or foam makers, used for the Class B Fire Tests, that produce foam:

- a) At the flow rate required for the Class B Fire Tests and
- b) Having a foam quality approximating that produced using full-scale equipment.

Special fire equipment may be provided by the manufacturer to produce a range of foam quality.

4.24 SPRAY NOZZLE – A device attached to piping intended to discharge foam in a fixed spray pattern.

4.25 SPRINKLER, FOAM-WATER TYPE – An air aspirating, open type sprinkler, constructed to discharge water or foam-water solutions.

4.26 STANDARD SPRINKLER – A nonair aspirating type sprinkler that complies with the Standard for Automatic Sprinklers for Fire Protection Service, UL 199, and discharges water or foam solutions.

4.27 **STOVE PIPE** – A device intended to provide an open area for the 1 minute free burn during the burnback test. The stove pipe shall be constructed of 28 – 18 gauge (.015 – .048 inch thickness) sheet steel. The stove pipe is to be cylindrical in shape with an inside diameter not less than 12 inch (305 mm) and length not greater than 14 inch (356 mm).

4.28 **SUBSURFACE FOAM INJECTION** – Discharge of foam into a storage tank below the liquid surface near the tank bottom.

4.29 TEST FUELS –

a) **HEPTANE** – Commercial grade hydrocarbon having the following characteristics:

Distillation –	
Minimum initial boiling point	190°F (88°C)
Maximum dry point	212°F (100°C)
Specific Gravity (60°F/60°F) (15.6°C/15.6°C)	0.67 --- 0.73

b) **POLAR SOLVENT FUELS** – Standard Polar Test fuels are as follows:

Polar Solvent Group	Standard Test Fuel
Alcohol	Isopropyl Alcohol
Ketones	Dimethyl Ketone
Esters	N-Butyl Acetate
Carboxylic Acids	Glacial Acetic Acid
Amines	Ethylene Diamine
Aldehydes	Propionaldehyde
Ethers, except Diethyl and Methyl Tertiary Butyl Ether	Isopropyl ether
Impurities for any polar test fuel is not to exceed 1.0 percent.	

4.30 **TOPSIDE APPLICATION** – A method of foam discharge wherein the foam is applied onto the top of a burning fuel surface.

4.31 **TORCH** – A device intended to determine the sealability of a foam blanket when used as described under Class B Fire Tests. The torch shall be constructed so that the flame is not less than 4 inch (102 mm) in length and 6 inch (152 mm) in height.

4.32 **TWENTY-FIVE PERCENT DRAIN TIME** – The time required for a 25 percent volume of liquid foam solution to drain from the foam sample.

4.33 **TYPE II DISCHARGE OUTLET** – A fixed device that delivers foam onto the burning liquid and partially submerges the foam and produces restricted agitation of the surface. Examples of a Type II discharge outlet include foam chambers and foam makers.

4.34 **TYPE III DISCHARGE OUTLET** – A fixed or portable device that delivers foam in a manner that causes the foam to fall directly onto the surface of the burning liquid and does so in a manner that causes general agitation. Examples of a Type III discharge outlet include hose stream nozzles and monitors.

CONSTRUCTION

5 Foam Equipment

5.1 Assembly

5.1.1 Pipe joint dimensions shall comply with the Standard for Pipe Threads, General Purpose, ANSI B1.20.1-83 or other national or international pipe thread standard.

5.1.2 A Flange dimensions and bolt layouts used for pipe connections shall comply with the requirements in the Standard for Pipe Flanges and Flanged Fittings, ASME B16.5 or other national or international pipe flange standards.

5.1.3 Bolts, nuts, and studs employed for the bolting of pressure-holding castings shall comply with the applicable requirements in the Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength, ASTM A307, or other equivalent national or international bolt and stud standards; and in the Standard Specification for Carbon and Alloy Steel Nuts, ASTM A563, or other equivalent national or international nut standards.

5.1.4 The load on any bolt shall not exceed the minimum tensile strength specified in the Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength, ASTM A307 or other equivalent national or international bolt and stud standards, when the equipment is pressurized to the hydrostatic test pressure as determined by the Equipment Pressurization Test, Section 17. The area of the application of pressure shall be calculated as follows:

- a) If a full-face gasket is used, the area of force application is that extending out over the area circumscribed by the center line of the bolts.
- b) If an "O" ring seal or ring gasket is used, the area of force application is that extending out of the center line of the "O" ring or gasket.

5.1.5 An internal operating part whose removal may become necessary during anticipated maintenance or repair shall be accessible, removable, and replaceable without damage to the equipment.

5.1.6 The construction of an operating part shall not permit it to be reassembled other than as intended if the part may be disassembled during anticipated field servicing.

5.1.7 A foam chamber shall be constructed so that it can be permanently attached to a storage tank, such as by bolting or welding.

5.1.8 A foam chamber assembly for use on a tank containing a liquid subject to evaporation shall include a breakable seal located and arranged to prevent entrance of vapors into outlets and pipe lines.

5.1.9 A foam chamber shall be provided with inspection openings to permit maintenance, and replacement of the vapor seal.

5.1.10 A foam-water sprinkler shall be of the open type and shall comply with the applicable requirements of the Standard for Automatic Sprinklers for Fire Protection Service, UL 199.

5.1.11 A standard sprinkler used to discharge a foam solution shall comply with the applicable requirements of the Standard for Automatic Sprinklers for Fire Protection Service, UL 199.

5.1.12 A foam-water sprinkler and a spray nozzle shall be constructed to reduce the risk of clogging caused by foreign matter in the foam solution or water passing through the sprinkler and nozzle. A passageway for foam solution or water shall have a cross-sectional dimension not less than 0.21 inch (5.3 mm).

5.1.13 A hydraulically powered oscillating monitor's integral hydraulic circuit, which includes parts that bear against, rotate within, or slide on stationary parts, and that must be free to move during intended operation, shall have corrosion resistance equivalent to brass, bronze, or austenitic stainless steel.

5.2 Materials

5.2.1 A casting shall be smooth and free of scale, lumps, cracks, blisters, sand holes, and defects of any nature that may make it unfit for the use for which it is intended. A casting shall not be plugged or filled, but may be impregnated to remove porosity.

5.2.2 Materials used in the construction of foam equipment shall resist galvanic corrosion and corrosion caused by atmospheric conditions as determined by the 10-Day Moist Ammonia Air Stress Cracking Test, Section 18; or the Salt Spray Corrosion Test, Section 19, as applicable.

5.2.3 A plastic or other nonmetallic part, other than an "O" ring, gasket, hose, or bladder material, shall comply with the requirements for:

- a) Operation as specified in the air oven aging test, 22.1.1 and 22.1.2.
- b) Moisture absorption and exposure to light, as specified in the light and water test, 21.2.1 and 21.2.2.
- c) Flammability, as specified in 5.2.4.
- d) Exposure to foam liquid concentrate, as specified in the liquid concentrate test, 22.2.1.

5.2.4 With reference to flammability, external plastic materials shall be classified as Type HB, V-2, V-1, V-0, or 5V, when tested in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

5.2.5 An elastomeric part shall comply with requirements of the Elastomeric Parts Tests Other Than Hose, Section 20, or the Rubber Materials Test – Hose, Section 21.

5.2.6 A part that bears against, rotates within, or slides on stationary parts, and that must be free to move during intended operation, shall:

- a) Be made of corrosion resistant material, such as bronze, chrome-plated bronze, monel metal, and the like, or
- b) If made of materials lacking corrosion resistant properties, be fitted with bushings, inserts, or other parts made of corrosion resistant materials at those points where freedom of motion is required.