

DATA

DATE

NO. OF PAGES

REVISION

11-13-96

20

REVISION

8-23-96

4

4L1254

6-28-96

64

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333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety
for
Pre-Engineered Dry Chemical Extinguishing System Units, UL 1254

Second Edition, Dated June 28, 1996

Revisions: This Standard contains revisions through and including November 13, 1996.

A change is indicated by a note following the affected item. The note is preceded and followed by an asterisk.

The revisions dated November 13, 1996 were issued to correct editorial errors introduced in the new edition, such as incorrect references.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Recognition and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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b) An aluminum alloy, such as 1100, 1170, and 3003, having a minimum thickness of 0.028 inch; or

c) A mild steel alloy, such as SAE 1010, having a minimum thickness of 0.028 inch.

10.2 The requirements in this section do not apply to a rechargeable pressure vessel marked as complying with U.S. Department of Transportation (DOT) or ASME specifications, unless otherwise specifically indicated.

10.3 An extinguishing system unit pressure vessel under the jurisdiction of the DOT shall comply with the appropriate DOT specifications for shipping containers.

10.4 An extinguishing system unit pressure vessel shall not be marked in accordance with Section VIII, Pressure Vessels, of the 1989 ANSI/ASME Boiler and Pressure Vessel Code-1995 unless it is not intended to be shipped filled, and pressurized, and it has been designed, constructed, inspected, and certified to the code.

10.4 revised November 13, 1996

10.5 A pressure vessel/valve assembly having an operating pressure greater than 300 psi (2.07 MPa) at 70°F (21°C) shall be provided with a pressure relief device that complies with the applicable requirements specified in DOT 49CFR, 173.34 and CGA Pamphlet S-1.1, Pressure Relief Device Standards Part 1 – Cylinders for Compressed Gases-1994.

10.6 For the purpose of these requirements, thickness measurements of the sidewall are to be measured on uncoated metal. The thickness of the dome and of the bottom is to be measured at several points after forming and before coating.

10.7 The minimum width of a brazed joint on the sidewall shall be at least four times the thickness of the sidewall.

10.8 Pressure vessels with an operating pressure of 240 psi (1.65 MPa) or less at 70°F (21°C), and an internal volume not exceeding 1100 cubic inches (16.4 m³), shall be constructed so that the stress in any part of the pressure vessel does not exceed 80 percent of the yield strength of the material or 50 percent of the ultimate tensile strength of the material, whichever is less, when subjected to the proof test pressure specified in 32.1.2. See 10.9 and 10.11 – 10.18.

Exception: See 10.10.

10.9 With reference to the requirements of 10.8, the maximum allowable stress at proof pressure for commonly used materials and fabricating processes is as specified in Table 10.1.

Table 10.1
Maximum allowable stress, psig (MPa)

Material	Maximum allowable stress, psig (MPa)
Copper brazed mild steel	25,000 (172)
Welded mild steel	27,000 (186)
Extruded 6061-T6, 6351-T6 aluminum	27,000 (186)
Extruded 3003 aluminum	16,000 (110)
Extruded 1100 aluminum	14,500 (100)
Extruded 1170 aluminum	11,000 (76)

10.10 When the metal and the maximum stress value of the fabricating method used is other than that specified in Table 10.1, or when the mode of use or construction is such that the values specified are not appropriate, pull tests are to be conducted to determine the yield and ultimate strength of the material. Test samples are to be taken either from stock material or from finished parts in accordance with Standard Test Methods and Definitions for Mechanical Testing of Steel Products, ASTM A370-89-1995. When samples are taken from ruptured pressure vessels, the samples are to be taken in a direction perpendicular to the ruptured opening, as determined during the rupture test specified in 32.3.2. The values to be used in the equations for the shell are to be based on a quantity needed to develop the level of confidence in the results. The maximum allowable stress value is to be based upon the mean values resulting from the test series minus two unbiased standard deviations.

10.11 To determine the stress acting on the pressure vessel at the specified proof test pressure, the formulas specified in Figure 10.1 are to be used.

10.12 When the pressure is applied to the convex side of an ellipsoidal or torispherical dome or bottom, the material thickness of the dome and bottom used for the calculations in 10.11 is to be multiplied by a factor of 1.67.

10.13 The material of the dome and bottom of a metal pressure vessel shall be of the same material as the sidewall of the pressure vessel, and shall have a thickness after forming equal to or greater than the minimum measured wall thickness of the pressure vessel.

Exception No. 1: When the dome or bottom is formed integral with the sidewall, and the measured dome or bottom thickness is at least 87 percent of the thickness of the sidewall, the intent of this requirement is met. This exception addresses the reductions in thickness resulting from the forming process.

Exception No. 2: These requirements do not apply to pressure vessels with a flat dome or bottom as defined in 10.17.

20 Anti-Recoil Devices

20.1 An anti-recoil device shall be supplied on the outlet of each pressurized dry chemical and nitrogen storage container for shipping, handling, and storage purposes. The anti-recoil device shall be attached to the storage unit by a chain or other equivalent means.

21 Hose Assemblies Used for Distribution of Agent

21.1 A hose used for distributing the dry chemical extinguishing agent shall incorporate a metallic reinforcement and comply with the applicable requirements of the Standard for LP-Gas Hose, UL 21 or equivalent requirements. Hose connectors shall comply with the applicable requirements of the Standard for Pigtails and Flexible Hose Connectors for LP-Gas, UL 569.

Exception: Transition hoses 5 feet (1.52 m) or less in length and used for connecting the cylinder valve to the piping are required to comply with UL 21 or UL 569, and with the requirements in this standard.

21.1 revised November 13, 1996

22 Electrically Operated Devices

22.1 Only electrically operated devices, such as valves and solenoids, that are intended to operate an extinguishing system unit shall be used in such application.

23 Pressure Switches

23.1 Only pressure switches intended for use with an extinguishing system unit shall be used in such applications.

23.2 Pressure switches that provide the mandatory functions for the extinguishing system unit to achieve extinguishment shall incorporate a manual reset, or require recharging of the storage container before the pressure switch is able to be reset.

23.3 Pressure switches intended for supervision of pressurized containers shall be preset to operate at the pressure that corresponds to the minimum operating temperature of the extinguishing system unit or higher.

PERFORMANCE

24 General

24.1 Representative samples of an extinguishing system unit are to be subjected to the tests specified in Sections 25 – 56.

25 Fire Test – Total Flooding Protection System

25.1 General

25.1.1 An extinguishing system unit intended for industrial total flooding applications shall distribute its extinguishing agent and shall totally flood an enclosure when tested in accordance with the requirements of 25.1.6 – 25.3.4 under the maximum intended operating conditions and most severe installation limitations. See also 25.1.2 – 25.1.5. In addition to complying with the requirements specified in 25.1.3 – 25.3.4, an automatic extinguisher unit, when tested under the most severe installation limitations, shall also comply with the requirements specified in 25.4.1 – 25.4.3.

25.1.2 An extinguishing system unit tested for total flooding applications is intended for protection of Class A combustibles or Class B combustibles or both.

25.1.3 The test enclosure is to have one opening on each of two of the longest walls which are opposite of each other. Each opening is to have a minimum area of 0.5 percent of the total area of the sides, top and bottom of the test enclosure. The openings are to be located at the bottom of the side of the enclosure and shall have a height to width ratio of approximately 3 to 1.

25.1.4 When a manufacturer designates total flooding protection for enclosures having uncloseable openings not exceeding 5 percent, the tests described in 25.1.6, 25.3.1 and 25.3.4 shall be conducted using the percentage of uncloseable openings specified by the manufacturer and this percentage shall be referenced in the installation manual.

25.1.4 effective December 29, 1997

25.1.5 When a manufacturer designates total flooding protection for enclosures having uncloseable openings in excess of 5 percent, the tests described in 25.1.6 shall be conducted using:

- a) A single opening having the maximum height and width specified by the manufacturer and representing the largest uncloseable openings specified by the manufacturer; and
- b) Additional test fires as specified in 25.3.3.

25.1.5 effective December 29, 1997

25.1.6 When tested as described in 25.1.7 – 25.3.4, an extinguishing system unit shall extinguish all fires.

25.1.7 The tests described in 25.1.8 – 25.4.3 shall consider the intended use and limitations of the extinguishing system unit, with specific reference to:

- a) The area coverage of each nozzle;
- b) The volume of protection, when applicable;
- c) The operating temperature range of the extinguishing system unit;
- d) Location of nozzles in the protected area;
- e) The maximum height of the protected area;
- f) The length and size of piping and number of fittings to each nozzle;
- g) The minimum discharge rate condition for the test nozzles; and
- h) The percent of uncloseable openings.

25.1.7 effective December 29, 1997

25.1.8 The enclosure for the tests is to be constructed of either indoor or outdoor grade minimum 3/8 inch (9.5 mm) thick plywood or equivalent material. Providing protection for the plywood areas exposed to the fire is not prohibited. Unprotected plywood is to be used for the tests specified in 25.4.1.

25.1.9 An enclosure is to be constructed having the maximum area and volume (when applicable) limitation, and the maximum height and volume limitation for the extinguishing system nozzles, as specified in the installation manual.

25.1.10 An extinguishing system unit is to be assembled using its maximum piping limitations with respect to number of fittings and size and length of pipe. The cylinder is to be filled to its rated capacity and the cylinder or gas cartridge pressurized with the expellant gas to the normal operating pressure at 70°F (21°C). The cylinder or gas cartridge used for these tests is to be conditioned, after charging, for at least 16 hours at the minimum operating temperature prior to the test. Alternatively, an extinguishing system unit that utilizes dry nitrogen or dry air as an expellant gas and is tested by underpressurizing the cylinder or gas cartridge at ambient temperature to simulate the minimum operating temperature also complies with this requirement.

25.2 Class A fire tests

25.2.1 The Class A fire test shall consist of two wood cribs, each measuring 12 by 12 by 12 inches (0.3 x 0.3 x 0.3 m). Each crib is to consist of eight alternate layers of four trade size 2 by 2 inch (nominal 1-1/2 by 1-1/2 inches) kiln-dried spruce or fir lumber 12 inches (0.3 m) long. The alternate layers of lumber shall be placed at right angles to the adjacent layers. The individual wood members in each layer are to be evenly spaced along the length of the previous layer of wood members and fastened by staples or nails.

25.2.2 The wood cribs shall be preconditioned to have a moisture content not to exceed 5 percent by weight. The two cribs are to be placed on the floor supported by four 2 inch (50.8 mm) high bricks, one at each corner of the crib. The cribs are to be placed in locations that are most difficult to achieve extinguishment. To determine the crib locations, the extinguishing system unit is to be discharged prior to conducting the fire test to observe the extinguishing agent distribution and determine areas receiving the least amount of chemical. Each crib shall have a 1/4 pound (113.5 g) mass of shredded newspaper placed under the crib in the center of the four bricks. Eight ounces (236 ml) of denatured alcohol is to be poured over the crib and paper, and then ignited. After ignition, the crib is to be allowed to burn for 2 minutes after which time the extinguishing system unit is to be manually actuated.

25.3 Class B fire tests

25.3.1 Three-to-four inch (76-to-102 mm) diameter cans at least 4 inches (102 mm) high, and containing either heptane or heptane and water, are to be placed within 2 inches (50.8 mm) of the corners of the test enclosure, and located vertically so that the top of the can is within 12 inches (305 mm) of the top or bottom of the enclosure, or both top and bottom when the enclosure permits such placement, and at other locations on the floor that are the most difficult to achieve extinguishment. When the cans contain heptane and water, the heptane is to be at least 2 inches deep. The surface of the heptane layer is to be located not less than 2 inches below the top edge of the can.

25.3.1 effective December 29, 1997

25.3.2 For protection of enclosures having uncloseable openings not exceeding 5 percent a separate, additional test is to be conducted with a 2 1/2 square foot (0.23 m²) square pan located within the enclosure of the spray area in a location that is the most difficult to achieve extinguishment. The pan shall contain not less than a 2 inch (50.8 mm) layer of heptane. The surface of the heptane layer is to be located 6 ± 1/4 inch (152 ± 6 mm) below the top edge of the pan.

Exception: An automatic extinguisher unit is to be tested using a 2 1/2 square foot pan in accordance with 25.4.

25.3.2 effective December 29, 1997

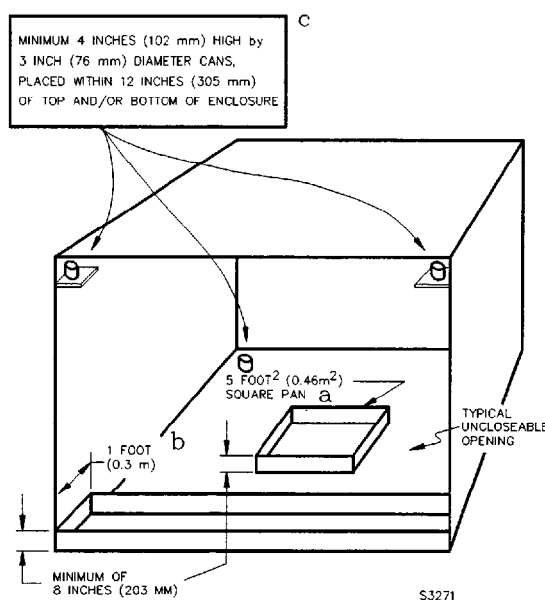
25.3.3 For protection of enclosures having uncloseable openings in excess of 5 percent of the total area of the sides, top and bottom, a separate, additional test is to be conducted using a 5 square foot (0.46 m^2) square pan located on the floor of the enclosure in a location identified as being the most difficult to achieve extinguishment. Also, a 1 foot (0.3 m) wide pan extending the length of the uncloseable opening is to be installed at the entrance of the uncloseable opening. The pans shall contain not less than a 2 inch (51 mm) layer of heptane. The surface of the heptane layer is to be located $6 \pm 1/4$ inch ($152 \pm 6 \text{ mm}$) below the top edge of the pan. See Figure 25.1.

Exception No 1: When requested by the manufacturer, the fire test using the one foot wide pan is to be conducted separately from the 5 square foot square pan test.

Exception No. 2: An automatic extinguisher unit is not required to be subjected to the 5 square foot pan fire test.

25.3.3 effective December 29, 1997

Figure 25.1
Typical test apparatus for total flooding protection
of enclosures having unclosable openings in excess of 5 percent



NOTES —

- ^a Placement of the 5 square foot square pan is determined for each test condition.
- ^b The 1 foot wide test pan must be placed at the bottom edge of the unclosable opening, that is, flush with the unclosable opening.
- ^c Test cans must be placed so that the top of the can is within 12 inches of top and/or bottom of the enclosure and 2 inches of the corners. The number of test cans is determined for each test condition.

25.3.4 The heptane is to be ignited and allowed to burn for 30 seconds, after which the extinguishing system unit is to be manually actuated.

28.1.3 The tests described in 28.2.1 – 28.5.5 shall consider the intended use and limitations of the extinguishing system unit, with specific reference to:

- a) The area coverage of each nozzle;
- b) The volume of protection, when applicable;
- c) The operating temperature range of the extinguishing system unit;
- d) Location of nozzles in the protected area;
- e) The maximum height of the protected area;
- f) The length and size of piping and number of fittings to each nozzle;
- g) The minimum discharge rate condition for the test nozzles;
- h) The elevation of the duct connection location within the plenum; and
- i) The percent of unclosable openings.

28.1.3 effective December 29, 1997

28.1.4 When a manufacturer designates open-face paint spray booth protection for enclosures having unclosable openings not exceeding 5 percent the tests described in 28.5.1, 28.5.2, 28.5.4 and 28.5.5 are to be conducted using the percentage of unclosable openings specified by the manufacturer and this percentage shall be referenced in the installation manual. All fire tests are to be conducted with air flow as specified in (b). When a manufacturer designates open-face paint spray booth protection for enclosures having unclosable openings in excess of 5 percent the applicable tests described in this section are to be conducted and additional fire tests specified in 28.5.3 are to be conducted. The fire tests are to be conducted using:

- a) A single opening having the maximum height and width specified by the manufacturer and representing the largest unclosable openings specified by the manufacturer; and
- b) Airflow with an average air velocity of not less than 100 feet per minute (28.5 m/min) over the total unclosable area and without airflow.

28.1.4 effective December 29, 1997

28.2 Test apparatus

28.2.1 The enclosure for the tests is to be constructed of either indoor or outdoor grade minimum 3/8 inch (9.5 mm) thick plywood or equivalent material. Protection for the plywood area exposed to the fire is not prohibited.

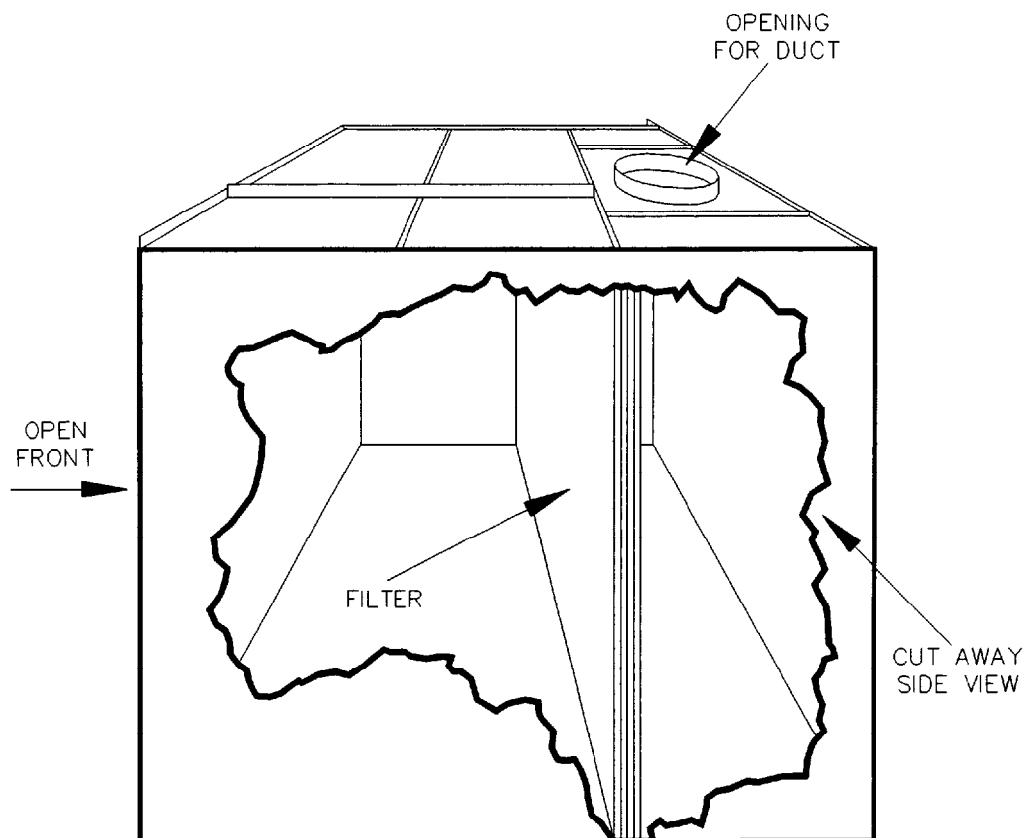
28.2.2 An enclosure or enclosures is to be constructed to have at least one percent unclosable opening area is specified in 25.1.3 and the following:

- a) The maximum area and volume (when applicable) limitation for the extinguishing system unit nozzle(s); and
- b) The maximum height and volume limitation for the extinguishing system unit nozzles.

28.2.2 effective December 29, 1997

28.2.3 A bank of filters is to be installed so that it extends throughout the full height and width of the enclosure. The filters shall be constructed of fiberglass or other materials that are representative of those used for paint spray booths. See Figure 28.1.

Figure 28.1
Typical test apparatus for an open-face paint spray booth



SM214

NOTE: Opening for duct is at the elevation specified in the manufacturer's installation instructions.

28.5.4 Three-to-four inch (76-to-102 mm) diameter cans containing heptane as described in 28.5.1 are also to be installed in the duct. One shall be located 3 feet (0.97 m) past the duct entrance and one located within 1 foot (0.3 m) of the duct termination. Using other test fire arrangements such as cloth wicks soaked in heptane, also comply with the intent of this requirements when determined to provide equivalent results.

28.5.5 The heptane is to be ignited and allowed to burn for 30 seconds, after which the extinguishing system is to be manually actuated.

29 Fire Test – Vehicle Paint Spray Booth Protection System

29.1 General

29.1.1 An extinguishing system unit intended for the protection of vehicle paint spray booths, when tested in accordance with the requirements of 29.1.3 – 29.5.4, shall extinguish all fires using the maximum intended operating conditions and most severe installation limitations. See 29.1.2.

29.1.1 effective December 29, 1997

29.1.2 An extinguishing system unit for vehicle paint spray applications is intended for protection of Class B combustibles or both Class A and Class B combustibles.

29.1.2 effective December 29, 1997

29.1.3 The tests described in 29.2.1 – 29.5.3 shall consider the intended use and limitations of the extinguishing system unit, with specific reference to:

- a) The area coverage of each nozzle;
- b) The volume of protection, when applicable;
- c) The operating temperature range of the extinguishing system unit;
- d) Location of nozzles in the protected area;
- e) The maximum height of the protected area;
- f) The length and size of piping and number of fittings to each nozzle;
- g) The minimum discharge rate condition for the test nozzles; and
- h) Provisions for exhaust fan shutdown with a time delay to system actuation.

29.1.3 effective December 29, 1997

29.1.4 Extinguishment tests are to be conducted on vehicle paint spray booth or booths representative of each type and configuration of the spray booth area, plenum, filter bank arrangement, and pit referenced in the manufacturers installation instructions.

29.1.4 effective December 29, 1997

29.1.5 The test described in 29.2.1 – 29.5.3 are to be conducted under the following conditions:

- a) With not less than three spray booth work space volume air changes per minute;

Exception: An extinguishing system unit which incorporates a time delay of 10 to 20 seconds prior to system actuation, after energy to the exhaust fan is shut down is provided, are not required to be subjected to (a).

- b) For Class B fire tests, a barrier centrally located within the spray booth work area and without a barrier.

29.1.5 effective December 29, 1997

29.2 Test apparatus

29.2.1 The enclosure for the tests is to be constructed of either indoor or outdoor grade minimum 3/8 inch (9.5 mm) thick plywood or equivalent material. Providing protection for the plywood areas exposed to the fire is not prohibited.

29.2.1 effective December 29, 1997

29.2.2 An enclosure or enclosures is to be constructed having:

- a) The maximum area and volume (when applicable) limitation for a nozzle or nozzles of an extinguishing system unit; and

- b) The maximum height and volume limitation for a nozzle or nozzles of an extinguishing system unit.

29.2.2 effective December 29, 1997

29.2.3 When ventilation shutdown is not provided, banks of filters to be installed are to represent filter arrangements specified in the manufacturer installation instructions. The filters shall be constructed of fiberglass or other materials that are representative of those used for paint spray booths.

29.2.3 effective December 29, 1997

29.2.4 When ventilation shutdown is provided, a single filtered opening representing at least 1 percent of the total surface area of the sides, top, and bottom of the spray booth work area is to be provided. The test enclosure is to be located at the floor level and at the front of the spray booth. The filtered openings is to have a height to width ratio of approximately 3 to 1. The construction of the filters shall be as specified in 29.2.3.

29.2.4 effective December 29, 1997

29.2.5 The spray booth work area test enclosure is to have a length to width ratio of 1.8 (± 1) to 1.0.

29.2.5 effective December 29, 1997

29.2.6 The barrier used in the Class B fire test is to be constructed of $1/2 \pm 1/8$ inch (12.70 ± 3.17 mm) thick plywood or equivalent and centrally located within the spray booth work area. The height of the barrier is to be sized so that it is located $12 \pm 1/2$ inch (305 ± 12.7 mm) above the floor and extend to 60 percent of the test enclosure height. The solid barrier to have length and width dimensions that are 50 percent and 75 percent of the work area test enclosure's width and length, respectively.

29.2.6 effective December 29, 1997

45 Aging Tests – Plastic Materials

45.1 Air-oven aging test

45.1.1 There shall be no cracking of a plastic valve, valve part, part subjected to the flow of dry chemical, or bracket, after air-oven aging for 180 days at 212°F (100°C). Aged samples of the valve, valve part, bracket, or container shall perform as intended when tested as specified in 32.2.1 (valves and parts); Hydrostatic Pressure Test, Section 32 (containers); 38.1 (brackets); or the Burst Strength – Gauges and Indicators, Section 48 (pressurized gauge components). See 45.1.4 – 45.2.3.

45.1.2 Following air-oven aging for 90 days at 212°F (100°C), there shall be no cracking of a plastic siphon tube, and aged samples of the siphon tube shall perform as intended. Ring samples cut from the aged tube shall not exhibit a degradation in excess of 40 percent of the original tensile or ring crushing strength values. See 45.1.5.

45.1.3 When a plastic material is unable to withstand the temperature specified in 45.1.1 and 45.1.2 without excessive softening, distortion, or deterioration, an alternative method to comply with this requirement, is to use an air-oven aging test at a lower temperature for a longer period of time used. The equivalent time and temperature for 180 days at 212°F (100°C) is to be 430 days at 188.6°F (87.0°C). The equivalent time and temperature for 90 days at 212°F is to be 210 days at 188.6°F.

45.1.4 When plastic parts are attached to other parts or assemblies, the securement of the parts shall not be impaired after air-oven aging.

45.1.5 To determine the degradation of a plastic material used in a siphon tube, ring samples 1/2 inch (12.7 mm) wide are to be cut from the tube and subjected to air-oven aging. See 45.1.6. The ring samples then are to be subjected to a crush test between parallel flat plates using a machine that applies a compression load at a uniform rate of 0.2 inch (5 mm) per minute and records the load applied as a function of the deflection. The test also is to be conducted on unaged parts of identical size for comparative purposes. When the nature of the material is such that meaningful test results are unobtainable, other tests, such as a tensile strength test, are to be conducted. The tensile strength test shall be conducted according to the ASTM test method applicable to the plastic material being tested.

45.1.6 The plastic valve parts and plastic siphon tube samples to be aged are to be supported in a full-draft, circulating-air oven that has been preheated at full draft to $212 \pm 1.8^\circ\text{F}$ ($100 \pm 1.0^\circ\text{C}$). Samples are not to touch one another or the sides of the oven. The samples of the plastic valve parts and siphon tube are to be aged for 180 and 90 days, respectively, at full draft and then allowed to cool in air at $73.4 \pm 3.6^\circ\text{F}$ ($23.0 \pm 2.0^\circ\text{C}$) for at least 24 hours before conducting any test or dimensional measurement. As used in this test, the term "full draft" refers to the oven used with inlet and outlet vents open and the air vent damper control at a setting that provides 250 to 350 air changes per hour.

45.2 Exposure to extinguishing agent test

45.2.1 Plastic siphon tubes that have been partially buried in the dry chemical with which they are to be used for 210 days at 189°F (87.2°C) shall perform as intended, when installed in test extinguishing system units that are then subjected to the test described in 31.5 except that the length of pipe attached to the cylinder is able to be as short as required. Ring samples cut from the tube, and completely buried in the dry chemical with which they are to be used for 210 days at 189°F, shall not exhibit degradation in excess of 40 percent of the original tensile or ring crushing strength values. See 45.2.2 and 45.2.3.

45.2.2 When the dry chemical is unable to withstand the temperature specified in 45.2.1, conducting an exposure test at a lower temperature for a longer period of time is an alternative test method.

45.2.2 revised November 13, 1996

45.2.3 Complete siphon tubes are to be partially buried in the dry chemical with which they are to be used, and ring samples, 1/2 inch (12.7 mm) wide, cut from unaged siphon tubes are to be totally buried in the dry chemical. The samples are not to touch each other or the container holding the dry chemical and samples. The container of dry chemical, with the samples in place, is to be loosely capped and placed in a preheated oven at 189°F (87.2°C) for 210 days. After the test exposure, the samples are to cool in air at 73.4 ± 3.6°F (23.0 ± 2.0°C) for at least 24 hours before any tests or dimensional measurements are conducted. The ring samples then are to be subjected to a crush test between two parallel flat plates using a testing machine capable of applying a compressive load at a uniform rate of 0.2 inch (5 mm) per minute and recording the load versus the deflection. When the nature of the material is such that meaningful test results are unobtainable, conducting other tests, such as tensile tests, is an alternative test method.

45.3 Light and water test

45.3.1 There shall be no cracking of materials used for a plastic valve, exposed valve part, or bracket after exposure to light and water for 720 hours. Samples of the valve or valve part or bracket so exposed shall perform as intended when tested as specified in Hydrostatic Pressure Test, Section 32 (containers); 32.2.1 (valves and parts); Mounting Device Test, Section 38 (brackets); or the Burst Strength Tests – Gauges and Indicators, Section 48 (gauges). See 45.1.4. When a gauge or indicator is involved in this test, it shall remain watertight throughout the test.

45.3.2 The test apparatus is to be as specified Type D or Type DH in the Standard Practice for Operating Light Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials, ASTM G23-1995. The temperature within the apparatus is to be 60 ± 2°C (140 ± 3.6°F).

45.3.3 During each operating cycle of 120 minutes, the specimens for exposure are to be exposed to light alone for 102 minutes and to light and water for 18 minutes. This conditioning is to last for 720 hours.

45.3.4 The specimens are then to be conditioned for 24 hours in air having a temperature of 60°C (140°F) and a relative humidity of 50 percent.

45.3.5 Conditioning procedures not described in 45.3.2 – 45.3.4 are to be as specified in the Standard Practice for Operating Light-and-Water Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics, ASTM D1499-1992.

46 Extinguishing Agent Tests

46.1 General

46.1.1 When subjected to the tests specified in 46.1.4 – 46.3.3, the dry chemical shall be free flowing at all temperatures in the range from the minimum storage and usage temperature to 140°F (60.0°C), except that when there is a tendency to lump, harden, or cake, such portions shall be friable when dropped from a height of 4 inches (102 mm) onto a smooth, hard surface.

- d) Factory test pressure of the cylinder.
- e) Reference to the Standard for Dry Chemical Extinguishing Systems, NFPA 17-1994 (except for automatic extinguisher units) and the manufacturer's installation, operation, and maintenance instruction manual (identified by part number or date) for detailed instructions for correct system usage and maintenance.
- f) The charge weight for dry chemical extinguishing agent.
- g) Basic inspection instructions, which shall include the following or equivalent text:
 - 1) "The extinguishing system unit shall be inspected monthly, or at more frequent intervals when circumstances require,"
 - 2) "The piping and nozzle should be examined to ascertain that they are unobstructed,"
 - 3) For stored pressure type units, "The unit shall be pressurized as intended."
 - 4) For gas cartridges, "The cartridge shall be weighed semiannually and replaced if the loss in weight exceeds the permissible weight loss marked on this cartridge."
- h) When intended for Class B local application protection, a statement indicating whether the unit is intended for indoor use or outdoor use, or both.
- i) For extinguishing system units intended to be connected to a piping system in the field, the following statement or equivalent text shall appear in letters at least 1/8 inch (3.2 mm) high: "WARNING: The anti-recoil device shall be installed on the cylinder valve except when the cylinder assembly is connected to the system piping or while the cylinder is being filled."

59.3 Each extinguishing system unit shall be marked with an identifying part or model number and the manufacturer's or private labeler's name or other equivalent designation.

59.4 The fully charged weight of the gas cartridge shall be permanently stamped on the cartridge, cartridge nut, or the cartridge valve body. In addition, the gas cartridge shall be stencilled or marked to indicate the following:

- a) Permissible weight loss before recharging.
- b) Name of extinguishing system unit manufacturer.

The above information shall be stencilled or stamped on the cartridge or placed on the cartridge in the form of a decalcomania transfer when the cartridge is mounted on the outside of the dry-chemical chamber. When the cartridge is mounted inside the dry-chemical chamber, this information shall be stencilled or stamped on the cartridge.

59.5 A cylinder/valve assembly, in addition to being marked with operating, recharging, inspection and maintenance instructions (see 59.2), shall be marked with the year of manufacture, or the last two digits of the year of manufacture. A cylinder/valve assembly manufactured in the last 3 months of a calendar year is able to be marked with the following year as the date of manufacture, and a cylinder/valve assembly manufactured in the first 3 months of a calendar year is able to be marked with the previous year as the date of manufacture.

Exception: A marked manufacturing date on the cylinder used as the year of manufacturer marking for the cylinder/valve assembly, also complies with this requirement. The nameplate shall reference that the date of manufacture is on the cylinder.

59.6 When a manufacturer produces extinguishing system units at more than one factory, each system unit shall have a distinctive marking to identify it as the product of a particular factory.

INSTALLATION INSTRUCTIONS

60 Installation, Operation, and Maintenance Instruction Manual

60.1 A copy of the installation, operating, recharging, inspection, and maintenance instruction manual is to be furnished for use as a reference in the examination and testing of an automatic extinguisher unit or pre-engineered extinguishing system unit.

60.2 The instructions shall reference the limitations of each extinguishing system unit and shall include at least the following items:

- a) Description and operating details of each extinguishing system unit and all accessory equipment, including identification of extinguishing system units or accessory equipment by part or model number.
- b) Type of protection afforded by the system.
- c) Type of pipe, hose, tubing, and fittings to be used.
- d) Typical system layout and specific limitations for correct system installation and effective protection.
- e) Specific information on piping limitations and nozzle placement.
- f) Description of all variations of each extinguishing system, including the limitations for each variation.
- g) Discharge nozzle limitations, including maximum dimensional and area coverage, minimum and maximum height limitations, and nozzle location. When a system unit is limited to a maximum volume, this information shall also be included.
- h) Details on installation of each extinguishing system unit, including accessory equipment.
- i) Reference to the specific types of detection and control panels (when applicable) to be connected to the equipment.

- j) Specifications and instructions for interconnection of multiple extinguishing systems units; or a caution statement to not use multiples of units, when a means for interconnecting is unavailable.
- k) Operating pressure of the system at 70°F (21°C).
- l) Operating temperature range limitations.
- m) Information on inspection of system after installation.
- n) Detailed instructions for recharging system after operation that shall:
 - 1) Contain:
 - i) Required instructions, warnings, and cautions;
 - ii) A description of servicing equipment; and
 - iii) A description of procedures for intended servicing.
 - 2) Provide a list of part numbers of all replacement parts.
 - 3) Indicate that:
 - i) The pressure gauge attached to the extinguishing system should not be used to determine when the intended charging pressure has been reached; and
 - ii) A pressure regulator should be used when the pressure source is a tank of high pressure gas, that is, gas at higher than the charging pressure of the unit.
- o) Description of requirements for maintenance of all equipment.
- p) Reference to the Standard for Dry Chemical Extinguishing Systems, NFPA 17-1994 for installation maintenance and inspection requirements. For automatic extinguisher units, refer to NFPA 17-1994 for maintenance and inspection only.
- q) The name of the manufacturer or private labeler, or equivalent designation.
- r) Date and manual designation number on each page.

60.2 revised November 13, 1996

61 Manuals

61.1 An installation, operation and maintenance manual shall either be provided with each extinguishing system unit or made available upon request. When these manuals are not included with each system, an owner's manual shall be shipped with each system.

62 Owner's Manual

62.1 An owner's manual provided with an extinguishing system unit, in accordance with 61.1, shall include at least the following:

- a) Clear indication that it is not to be recognized as a detailed installation, operation, and maintenance manual.
- b) Clear reference to the availability of the installation, operation, and maintenance manual by contacting the manufacturer.
- c) A statement that the system shall be inspected at least semiannually by qualified and trained personnel.
- d) Information regarding procedures required to maintain the system in operation both before and after a fire.
- e) A statement that no modifications are to be made to the system without consulting a qualified and trained system designer who refers to the detailed installation or maintenance manual. The statement shall include the following or equivalent wording: "This system is made up of units tested within limitations contained in the detailed installation manual. The system designer must be consulted whenever changes are planned for the system or area of protection. An authorized installer or system designer must be consulted after the system has discharged."

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062-2096

UL Standard for Safety
for
Pre-Engineered Dry Chemical Extinguishing System Units, UL 1254

Second Edition, Dated June 28, 1996

Revisions: This Standard contains revisions through and including August 23, 1996.

A change is indicated by a note following the affected item. The note is preceded and followed by an asterisk.

The new requirements are substantially in accordance with UL's Bulletin on this subject dated December 8, 1995. The bulletin is now obsolete and may be discarded.

The master for this Standard at UL's Northbrook Office is the official document insofar as it relates to a UL service and the compliance of a product with respect to the requirements for that product and service, or if there are questions regarding the accuracy of this Standard.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Recognition and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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This Standard consists of pages dated as shown in the following checklist:

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3	August 23, 1996
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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

44A 10-Day Moist Ammonia Air Stress Cracking Test

44A.1 After being subjected to the conditions described in 44A.2 – 44A.4, a brass part containing more than 15 percent zinc shall show no evidence of cracking when examined using 25X magnification.

Exception: Cracking is not prohibited when the cracking does not impact the ability of the product to comply with the requirements of this standard.

Added 44A.1 effective February 23, 1998

44A.2 Each test sample is to be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Such stresses are to be applied to the sample prior to and maintained during the test. Samples with threads, intended to be used for installing the product in the field, are to have the threads engaged and tightened to the torque specified in Table 22A.1. Teflon tape or pipe compound are not to be used on the threads.

Added 44A.2 effective February 23, 1998

Table 44A.1
Torque requirements for threaded connections

Nominal thread size, inches	Torque pound-inches (N·m)	
1	1200	(135.6)
1-1/4	1450	(163.8)
1-1/2	1550	(175.1)
2	1650	(186.4)
2-1/2	1750	(197.7)
3	1800	(203.4)

Added Table 44A.1 effective February 23, 1998

44A.3 Three samples are to be degreased and then continuously exposed in a set position for ten days to a moist ammonia-air mixture maintained in a glass chamber approximately 12 by 12 by 12 inches (305 by 305 by 305 mm) having a glass cover.

Added 44A.3 effective February 23, 1998

44A.4 Approximately 600 ml of aqueous ammonia having a specific gravity of 0.94 is to be maintained at the bottom of the glass chamber below the samples. The samples are to be positioned 1-1/2 in. (38.1 mm) above the aqueous ammonia solution and supported by an inert tray. The moist ammonia-air mixture in the chamber is to be maintained at atmospheric pressure and at a temperature of 93°F (34°C).

Added 44A.4 effective February 23, 1998

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UL 1254

ISBN 1-55989-066-5

Pre-Engineered Dry Chemical Extinguishing System Units