



UL 1254

STANDARD FOR SAFETY

Pre-Engineered Dry Chemical Extinguishing System Units



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

Fourth Edition, Dated February 21, 2013

Summary of Topics

The following changes in requirements have been made to the Standard for Pre-Engineered Dry Chemical Extinguishing System Units, UL 1254:

Flexible nonmetallic hose assemblies for distribution of agent

The revised requirements are substantially in accordance with Proposal(s) on this subject dated August 10, 2012 and November 16, 2012.

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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that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

The following table lists the future effective dates with the corresponding item.

Future Effective Date	References
October 8, 2013	Paragraphs 6.3, 14.1, 14.5, 19.2, 34.1, 34.2, 35.1, 38.2, 49.1.1, 49.1.3, 49.1.6, 49.2.1, 49.3.1, Sections 48, Tables 48.1

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UL 1254

Standard for Pre-Engineered Dry Chemical Extinguishing System Units

First Edition – July, 1992

Second Edition – June, 1996

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Fourth Edition

February 21, 2013

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The most recent designation of ANSI/UL 1254 as an American National Standard (ANSI) occurred on February 21, 2013. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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 <http://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover the construction and operation of fixed pre-engineered dry chemical fire extinguishing system units and fixed automatic extinguisher units intended to be used in accordance with the Standard for Dry Chemical Extinguishing Systems, NFPA 17.

1.2 Automatic extinguisher units do not have a manual means of operation and are intended to be used in accordance with the manufacturer's installation instructions. Automatic extinguisher units are not intended for use as a substitute for pre-engineered dry chemical extinguishing system units, or for protection of fire risks larger than those specified in the manufacturer's instructions for a single unit by using multiple units.

1.3 Pre-engineered dry chemical extinguishing system units covered by these requirements are intended to be used in the following fire protection systems:

- a) Industrial Total Flooding Protection System – A system arranged to discharge dry chemical throughout the intended protected volume. See Fire Test – Total Flooding Protection System, Section 26.
- b) Class B Local Application Protection System – A system arranged to discharge dry chemical directly onto a specific area of protection. This application of chemical is normally used where no fixed enclosure exists or an extinguishing system is unable to totally flood the fixed enclosure to achieve extinguishment. See Fire Test – Class B Local Application Protection System, Section 27.
- c) Commercial Cooking Equipment Protection System – A system arranged to discharge dry chemical onto cooking surfaces of cooking appliances and into hood and duct systems used for ventilation of commercial cooking appliances. See the Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment, UL 300.
- d) Automobile Service Station Fueling Area Protection System – A system arranged to discharge dry chemical directly onto small spill fires that originate and are maintained within the protected area. See Fire Test – Automobile Service Station Fueling Area Protection System, Section 28.
- e) Open-Face Paint Spray Booth Protection System – A system arranged to discharge dry chemical into paint spray working areas and into the plenum and duct systems used for ventilation of paint spraying operations. See Fire Test – Open-Face Point Spray Booth Protection System, Section 29.
- f) Vehicle Paint Spray Booth – A system arranged to discharge dry chemical into paint spray working areas and onto the plenum and duct systems used for ventilation of paint spraying operations. See Fire Test – Vehicle Paint Spray Booth Protection System, Section 30.
- g) Off-the-Road Vehicle Protection System – A system arranged to discharge dry chemical onto fire risk areas and into volumes of vehicles such as aboveground mobile mining equipment, and mobile earthmoving equipment. See Fire Test – Total Flooding Protection System, Section 26, and Fire Test– Class B Local Application Protection System, Section 27.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

2.2 A component is not required to comply with a specific requirement that:

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

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

2.4 Specific components are 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.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

3.2 Where these requirements reference extinguishing system unit or units, the requirements also apply to automatic extinguisher units unless specifically noted otherwise.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5 Glossary

5.1 For the purpose of these requirements, the following definitions apply.

5.2 AUTOMATIC EXTINGUISHER UNIT – A unit that has no manual means of actuation and discharges extinguishing agent upon thermal actuation is intended for use in a normally unoccupied space and is limited to a single protected area.

5.3 AUTOMOBILE SERVICE STATION FUELING AREA PROTECTION DEFINITIONS:

- a) ISLAND – A raised portion of the service station protection area where the fuel dispensing devices are located.
- b) PARKING AREA – The area immediately adjacent to the island where automobiles are parked for purposes of fueling.
- c) GROUNDSWEEP PROTECTION – Protection that is achieved by nozzles that are installed near the ground and discharge dry chemical parallel to the protected surface.

5.4 CYLINDER/VALVE ASSEMBLY – A container that incorporates a valve and that provides storage of the extinguishing agent and expellant gas until the valve is actuated. For cartridge operated units, this assembly includes the dry chemical storage container and cartridge mechanism. When actuated, the valve releases the agent into the distribution network of the extinguishing system.

5.5 DISCHARGE RATE – The ratio of the quantity of agent discharged from a nozzle to the discharge time measured within ± 1 second. When a minimum discharge rate is indicated, reference is made to the minimum quantity of agent discharged and the time measured within ± 1 second.

5.6 DISCHARGE NOZZLE – A device that is used to uniformly distribute the extinguishing agent over or into a specific area, or within a specific volume, or both.

5.7 DISCHARGE TIME – The time interval between the first appearance of extinguishing agent at the nozzle and the time at which the discharge becomes predominantly gaseous.

5.8 EXPELLANT GAS – Dry nitrogen, dry air, or other gas used to facilitate the discharge of the extinguishing agent.

5.9 EXTINGUISHING SYSTEM UNIT – Identified components that are to be assembled into a system for the discharge of an extinguishing agent through fixed piping and/or hose, and nozzles for the purpose of extinguishing fires.

5.10 GAS CARTRIDGE – A container that provides storage for an expellant gas.

5.11 HEPTANE – Commercial grade heptane having the following characteristics:

- a) A minimum initial Boiling Point of 88°C (190°F);
- b) A maximum dry point of 100°C (212°F); and
- c) A specific gravity of 0.68 – 0.73 [15.6°C/15.6°C (60°F/60°F)].

5.12 INDUSTRIAL PAINT SPRAY BOOTH PROTECTION DEFINITIONS:

- a) DUCT – A continuous enclosed passageway for the exhaust of air and paint vapors.
- b) FILTERS – A component of a paint spray booth ventilation system that is intended to remove paint spray residues.
- c) SPRAY AREA – A power ventilated area that is used for open spraying of flammable or combustible materials.
- d) PLENUM – The volume of enclosed space between the paint filters and the duct entrance.
- e) PIT – A plenum located beneath the floor of the spray booth.

5.13 MANUAL MEANS OF ACTUATION – A means of system actuation in which the system operator initiates system discharge either mechanically or electrically.

5.14 MASTER VALVE – A discharge valve that upon automatic or manual actuation operates other valves or devices in an extinguishing system and achieves full system discharge.

5.15 OPEN FACE SPRAY BOOTH – A paint spray booth having one side open to the spray area and unclosable. These types of spray booths consist of a spray area, plenum, and duct.

5.16 OPERABLE PRESSURE RANGE – The pressure range corresponding to the pressures in the storage container at the specified minimum and maximum temperatures for which the extinguishing system unit is intended to be operable.

5.17 OPERATING PRESSURE – The pressure in a fully charged storage container at 70°F (21°C).

5.18 OVERHEAD PROTECTION – Protection achieved by nozzles installed above the protected area that discharge dry chemical downward, directly onto the protected surface.

5.19 PRE-ENGINEERED SYSTEM – A system that is tested in accordance with the limitations prescribed by the manufacturer for maximum and minimum pipe lengths, accessories, number of fittings, number and types of nozzles and nozzle placement, types of fire risks and their maximum areas, volumes, or both areas and volumes of protection.

5.20 PRESSURE VESSEL (CYLINDER) – A container that provides storage for dry chemical extinguishing agent and expellant gas, or when used at a location remote to the extinguishing system unit, provides storage for expellant gas.

5.21 PROOF TEST PRESSURE – The factory test pressure of each cylinder used to evaluate cylinder leakage and construction integrity. For Department of Transportation (DOT) approved cylinders, the factory test pressure is specified in the appropriate DOT specification. For ASME vessels the factory test pressure is specified in Section VIII, Pressure Vessels of the ASME Boiler and Pressure Vessel Code. For non-DOT cylinders and non-ASME cylinders, the factory test pressure is at least three times the cylinder operating pressure at 70°F (21°C).

5.22 TANK SIDE PROTECTION – Protection achieved by nozzles installed in close proximity to the fuel surface and that discharge dry chemical parallel to the protected surface.

5.23 VEHICLE PAINT SPRAY BOOTH – A paint spray booth intended for the specific purpose of painting vehicles. These types of spray booths are typically of the cross-draft or down-draft variety with plenums located at the rear, below, or at both sides of the spray booth.

CONSTRUCTION

6 General

6.1 After discharge of the extinguishing agent is initiated, an extinguishing system unit shall maintain the maximum rate of application of the extinguishing agent without requiring an additional manual action.

6.2 All exposed parts of an extinguishing system, including the finishes on coated or painted parts, the assemblies of moving parts, the nameplates as secured in place, and the mounting bracket, shall be resistant to commonly encountered atmospheric corrosive influences, and to galvanic corrosion, as determined by the Salt Spray Corrosion Test, Section 36.

6.3 When the deterioration, breakage, or other malfunction of a material for an extinguishing system unit results in the extinguishing system to become inoperable, the material shall not be susceptible to stress cracking, as determined by the 10- Day Moist Ammonia Air Stress Cracking Test, Section 48.

6.3 effective October 8, 2013

6.4 Components of an extinguishing system unit include:

- a) Actuating assemblies;
- b) An extinguishing agent storage container and valve assembly with actuating cartridge where applicable;
- c) Discharge nozzle or nozzles;
- d) Indicators that show the condition of the extinguishing system;
- e) A means for mounting the extinguishing system;
- f) Remote manual controls; and
- g) Other accessory equipment.

6.5 An extinguishing system unit shall have a minimum storage temperature of minus 65°F (minus 53.9°C), minus 40°F (minus 40°C), minus 20°F (minus 28.9°C), 0°F (minus 17.8°C), or 32°F (0°C); and a maximum storage temperature of 100°F (37.8°C), 120°F (48.9°C), 130°F (54.4°C), 150°F (65.6°C), or higher, except that the 100°F maximum storage temperature is allowed for automatic extinguisher units only.

6.6 When used as part of a multiple unit system, an extinguishing system unit shall be provided with a means for simultaneous operation of all system units.

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7 Electrically Operated Alarms

7.1 When an electrically operated alarm is used, it shall comply with the Standard for Audible Signal Appliances, UL 464.

8 Controls and Indicators

8.1 An extinguishing system unit shall be provided with the following controls and indicators:

- a) An automatic and manual means of actuation, or a manual means only.
- b) A pressure gauge for each pressure vessel containing a pressurized extinguishing agent, showing the pressure within the container. See Pressure Gauges, Section 14.

8.2 An automatic extinguisher unit shall be provided with the following controls and indicators:

- a) An automatic means of actuation only.
- b) A pressure gauge for each pressure vessel containing a pressurized extinguishing agent, showing the pressure within the container. See Pressure Gauges, Section 14.

8.3 When an electrical power source is used for a manual actuation mechanism included in an extinguishing system unit (see 8.1), the electrical power source shall be independent of the power source for the automatic actuation mechanism. Manual and automatic actuation mechanisms are permitted to be electrically powered by the same source only when a backup source, such as a battery, is provided.

8.4 A control unit, such as a control panel, and push-button station, used as part of an extinguishing system shall comply with the Standard for Control Units and Accessories for Fire Alarm Systems, UL 864.

9 Caps, Valves, and Closures

9.1 The fill opening of an extinguishing system unit shall have a minimum inside diameter of 3/4 inch (19.1 mm).

9.2 A collar with external threads shall be as high as required so the cap does not contact the dome or the bottom of the pressure vessel when the gasket is removed.

9.3 A threaded cap, closure, or valve shall engage the collar or the threaded opening by not less than four full threads with the gasket in place.

9.4 A cap, valve, or closure shall withstand the hydrostatic pressure test as specified for the pressure vessel. See 33.2.1.

9.5 A cap, plug, cylinder valve or other component except a pressure gauge, shall be provided with a means of relieving pressure when it is removed while the dry chemical chamber is still under pressure. The pressure shall be relieved with not less than two threads engaged.

10 Pressure Vessels and Cylinders

10.1 A pressure vessel shall be fabricated of a material having rigidity, durability, and resistance to corrosion at least equivalent to:

- a) An aluminum alloy, such as 6061-T6 (see the Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, ASTM B209), having a minimum thickness of 0.028 inch (0.71 mm);
- 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 ASME Boiler and Pressure Vessel Code unless it is not intended to be shipped filled, and pressurized, and it has been designed, constructed, inspected, and certified to the code.

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.

10.6 For the purpose of these requirements, thickness measurements of the sidewall shall be measured on uncoated metal. The thickness of the dome and of the bottom shall 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 33.1.2. 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 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 shall be conducted to determine the yield and ultimate strength of the material. Test samples shall 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. 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 33.3.2. The values to be used in the equations for the shell shall 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.

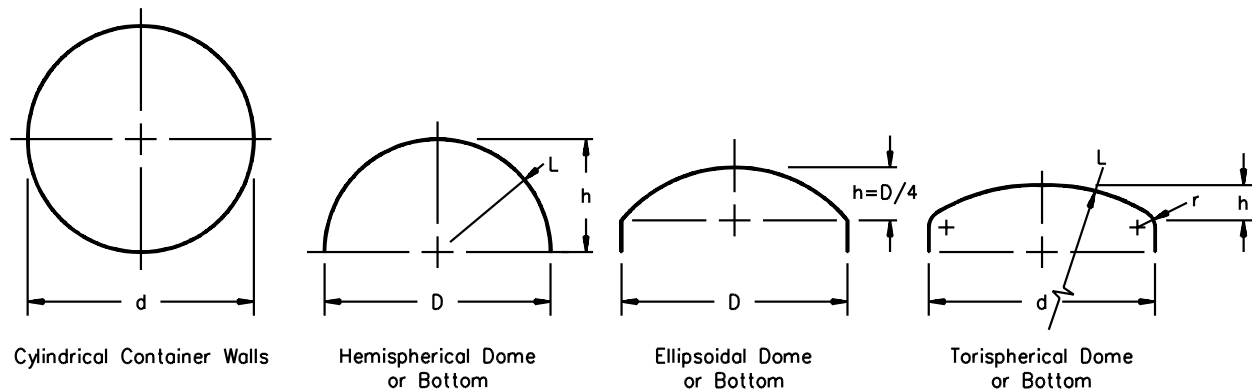
10.11 To determine the stress acting on the pressure vessel at the specified proof test pressure, the formulas specified in Figure 10.1 shall be used.

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Figure 10.1
Stress determination formulas



$$S = \frac{Pd}{2t}$$

$$S = \frac{PL}{2t}$$

$$S = \frac{PD}{2t}$$

$$S = \frac{0.885PL}{t}$$

$$S = \frac{Pd}{4t} \text{ (sphere)}$$

S2509B

in which:

S is the stress at proof test pressure, psi (kPa)

P is the proof test pressure, psi (kPa)

d is the inside diameter (cylindrical portion of shell), inches (mm)

D is the inside diameter of dome or bottom, inches (mm)

L is the inside spherical radius or dish radius, inches (mm)

t is the material thickness, inches (mm)

r is the "Knuckle" radius, inches (mm)

h is the distance from outside crest of head to tangent point with sidewall

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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.

10.14 A dome or bottom is integral with the sidewall when the distance from the point at which the dome or bottom is turned (the tangent point between the dome or bottom and the sidewall) to the nearest circumferential joint of the pressure vessel (excluding the collar) is greater than the radius of the sidewall to the center of the pressure vessel.

10.15 When a torispherical form dome or bottom is used, the knuckle radius (r) shall be not less than 6 percent of the inside dish radius (L), and the cylinder diameter (d) shall be equal to or larger than the inside dish radius (L). See Figure 10.1.

10.16 When either a flat dome or flat bottom is integral with the sidewall, the minimum thickness of the thinnest section of the dome or bottom shall be twice the minimum measured sidewall thickness. The minimum inside knuckle radius shall be 2.5 percent of the inside diameter of the sidewall.

10.17 For the purpose of these requirements, the shape of a dome or bottom is to be determined by calculating the ratio of the inside diameter of the dome or bottom to twice the distance from the outside crest of the head to the inside tangent point with the sidewall. The ratio ($D/2h$) then is to be applied as specified in Table 10.2.

Table 10.2
Shape determination of domes and bottoms

Ratio range	Shape
1.00 – 1.50	Hemispherical
1.51 – 3.00	Ellipsoidal
3.01 – 3.50	Torispherical
Greater than 3.50	Flat

10.18 A flat dome or bottom shall be used only on seamless pressure vessels or on pressure vessels having a linear sidewall length greater than 1-1/2 times the sidewall inside diameter.

11 Gaskets and O-Rings

11.1 A gasket of an elastomeric material shall be of such thickness as to provide a compression type seal. A seal, gasket, or an O-ring that is continuously exposed to the extinguishing agent under pressure during intended service shall be made of a material compatible with the dry chemical extinguishing agent and the expellant (pressurizing) gas. See Elastomeric Parts Test, Section 45, and One-Year Time Leakage Test, Section 38.

12 Gas Cartridges

12.1 A gas cartridge under the jurisdiction of the DOT shall be constructed, tested, marked, and charged in accordance with the applicable shipping container specifications of the DOT. See 33.1.2.

13 Pressure Regulators

13.1 A pressure regulator used with gas cartridges or pressure vessels shall be factory preset and pinned or otherwise locked to reduce the risk of tampering or field adjustment. The regulator shall comply with the Standard for Compressed Gas Regulators, UL 252.

14 Pressure Gauges

14.1 An extinguishing system unit of the stored pressure type employing a single chamber for both the dry chemical and the expellant gas and a low pressure nitrogen cylinder and valve assembly used for remote actuation shall be equipped with a pressure gauge to show the amount of pressure in the chamber whether the valve is opened or closed. The operating range of the gauge shall reflect the operating temperature-pressure relationship of an extinguishing system unit, except that the marked minimum operating pressure is permitted to be higher than the pressure that corresponds to the minimum operating temperature.

14.1 effective October 8, 2013

14.2 The pressure gauge face shall indicate the appropriate units for which the gauge is calibrated, such as psig, kPa, kg/cm², or any combination of pressure units.

14.3 The maximum indicated gauge pressure shall be between 150 and 250 percent of the indicated operating pressure at 70°F (21°C). The gauge dial shall indicate in green the operating pressure range of the extinguishing system unit. The zero pressure, indicated operating pressure at 70°F (21°C), and maximum indicated pressure shall be shown with numerals and with identification marks. The background of the gauge face above a horizontal line through the lowest required markings shall be red. The arc of the dial from the zero pressure point to the lower end of the operating range shall read "Recharge." The arc of the dial from the higher end of the operable range to the maximum indicated pressure shall read "Overcharged." All numerals, letters, and characters in the recharge, operating, and overcharge portions of the dial shall be white. Pointers shall be yellow, and the tip of the pointer shall end in the arc of the pressure indicating dots, and shall have a maximum tip radius of 0.010 inch (0.25 mm). The minimum length of the pointer, from the center point of the dial to the tip, shall be 0.375 inch (9.53 mm) measured at the zero pressure point. The minimum length of the arc from zero pressure to the indicated operating pressure at 70°F (21°C) shall be 0.50 inch (12.7 mm) measured from the center line of the zero pressure identification mark to the center line of the indicated operating pressure mark at 70°F (21°C).

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14.4 The identification mark used for the indicated operating pressure at 70°F (21°C) shall be not less than 0.025 inch (0.6 mm) and not more than 0.040 inch (1.0 mm) wide.

14.5 The pressure gauge face shall be marked, "Use With Dry Chemical Only" or "Use With Nitrogen Only," as applicable for a stored pressure extinguishing system unit or a low pressure nitrogen cylinder and valve assembly, respectively.

14.5 effective October 8, 2013

14.6 The pressure gauge shall be marked with the gauge manufacturer's identifying mark. The pressure gauge shall also be marked according to the following, as applicable, using a line extending as wide as, and of the same stroke thickness as the manufacturer's identifying mark:

- a) A horizontal line above the gauge manufacturer's identifying mark shall be used to indicate galvanic compatibility with aluminum valve bodies .
- b) A horizontal line below the gauge manufacturer's identifying mark shall be used to indicate galvanic compatibility with brass valve bodies .
- c) A horizontal line above and below the gauge manufacturer's identifying mark, or only the manufacturer's identifying mark without any additional lines shall be used to indicate galvanic compatibility with aluminum and brass valve bodies.

14.7 A pressure gauge shall have a pressure relief that provides for venting in the event of a Bourdon tube leak.

14.8 A high pressure nitrogen cylinder and valve assembly used for remote actuation shall be provided with a gauge capable of indicating cylinder pressure whether the valve is open or closed. The gauge shall comply with the requirements of the Standard for Gauges, Indicating Pressure for Compressed Gas Service, UL 404.

15 Puncturing Mechanisms

15.1 The parts of a puncturing mechanism, with the exception of unexposed springs and pins, shall be made of nonferrous metal or corrosion resistant stainless steel.