UL 299

STANDARD FOR SAFETY

Dry Chemical Fire Extinguishers

UL Standard for Safety for Dry Chemical Fire Extinguishers, UL 299

Twelfth Edition, Dated December 18, 2024

Summary of Topics

This New Twelfth Edition of ANSI/UL 299 dated December 18, 2024 incorporates editorial changes including renumbering and reformatting to align with current style, including the revisions to salt spray corrosion test, 46.1 – 46.5 and 46.7.

The new requirements are substantially in accordance with Proposal(s) on this subject dated June 21, 2024 and November 1, 2024.

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CAN/ULC 504:2024
Fourth Edition

ULSE Inc.
ANSI/UL 299
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Dry Chemical Fire Extinguishers

December 18, 2024

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ANSI/UL 299-2024

NATIONAL STANDARD OF CANADA
STANDARDS COUNCIL OF CANADA
CONSEIL CANADIEN DES NORMES
NORME NATIONALE DU CANADA

Commitment for Amendments

This Standard is issued jointly by ULSE Inc. (ULSE) and ULC Standards. Amendments to this Standard will be made only after processing according to the Standards writing procedures by ULSE and ULC.

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

This ANSI/UL Standard for Safety consists of the Twelfth Edition.

The most recent designation of ANSI/UL 299 as an American National Standard (ANSI) occurred on December 18, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

The Department of Defense (DoD) has adopted UL 299 on August 6, 1990. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

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

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Preface

This is the common ULSE and ULC Standard for Dry Chemical Fire Extinguishers. It is the Fourth edition of CAN/ULC 504, and the Twelfth edition of ANSI/UL 299.

This common Standard was prepared by ULSE Inc., ULC Standards and the Dry Chemical Fire Extinguisher Manufacturing Industry.

This Standard was formally approved by the ULC Committee on Portable Fire Extinguishers.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

Annex A, identified as Normative, forms a mandatory part of this Standard.

NOTE: Although the intended primary application of this Standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of Harmonization

This Standard used an ISO format, but is not based on, nor shall it be considered equivalent to, an ISO standard. This Standard is published as an identical standard.

An identical standard is a standard that is the same in technical content except for conflicts in Codes and Governmental Regulations. Presentation shall be word for word except for editorial changes.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard shall be based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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INTRODUCTION

1 Scope

1.1 These requirements cover the construction and performance, exclusive of performance during fire tests, of portable dry chemical and dry powder (Class D) fire extinguishers. Dry chemical and dry powder fire extinguishers are intended to be utilized in accordance with the Standard for Portable Fire Extinguishers, NFPA 10 and with the National Fire Code of Canada.

1.2 The requirements for performance during fire testing of dry chemical fire extinguishers are specified in the Binational Standard for Rating and Fire Testing of Fire Extinguishers, UL 711/ULC-S508.

1.3 As used in these requirements, the term "extinguisher" refers to all extinguishers or any part thereof covered by these requirements, unless specifically noted otherwise.

2 Units of Measurement

2.1 The metric unit shall be designated as the official unit for purposes of this Standard. Where values of measurement are specified in both SI and English units, either unit is used. In cases of dispute, the metric unit shall be used.

3 Referenced Publications

3.1 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.

3.2 The following publications are referenced in this Standard:

ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Testing Apparatus*

ASTM B209, *Standard Specifications for Aluminum and Aluminum-Alloy Sheet and Plate*

ASTM D638, *Standard Test Method for Tensile Properties*

ASTM D677, *Standard Test Methods for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes*

ASTM D2565, *Standard Practice for Operating Xenon Arc-Type (Water-Cooled) Light Exposure Apparatus with and without Water for Exposure of Plastics*

CGA C-1, *Methods of Hydrostatic Testing of Compressed Gas Cylinders*

National Fire Code of Canada

NFPA 10, *Portable Fire Extinguishers*

UL 92, *Fire Extinguisher, Booster, and Noncollapsible Standpipe Hose and Hose Assemblies*

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 157, *Gaskets and Seals*

UL/ULC 252, *Compressed Gas Regulators*

UL/ULC 404, *Gauges, Indicating Pressure, for Compressed Gas Service*

UL 711, *Rating and Fire Testing of Fire Extinguishers*

UL 1439, *Test for Sharpness of Edges on Equipment*

ULC 522, *Fire Extinguishers and Booster Hose*

ULC-S508, *Rating and Fire Testing of Fire Extinguishers*

4 Components

4.1 Except as indicated in 4.2, a component of a product covered by this Standard shall comply with the requirements for that component. A component shall comply with both the UL and ULC standards for the component.

4.2 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.

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

4.4 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.

5 Glossary

5.1 For the purpose of this Standard, the following definitions apply.

5.2 DISPOSABLE (NONRECHARGEABLE) FIRE EXTINGUISHER – A fire extinguisher not capable of nor intended to undergo complete maintenance including internal inspection of cylinder, replacement of parts and seals and hydrostatic testing.

5.3 EFFECTIVE DISCHARGE – The time of discharge of extinguishing agent from the extinguisher until gas point.

5.4 EXPELLANT GAS – A compressed or pressurized gas used to propel the dry chemical extinguishing agent from a single cylinder.

5.5 GALVANIC COMPATIBILITY – Fire extinguisher cylinder and component parts which are not susceptible to 10-day stress corrosion cracking nor corrosion from combination of dissimilar materials.

5.6 GAS POINT – The point in time when the discharge changes from extinguishing agent to a gas and dry chemical combination.

5.7 HIGH FLOW EXTINGUISHER – A dry chemical extinguisher with a minimum 4.54 kg (10.0 lb) of extinguishing agent, an agent flow rate of at least 0.454 kg/s (1.0 lb/s), and having attained a Class B rating, suitable for Class B specific hazard applications specified in NFPA 10.

5.8 PORTABLE FIRE EXTINGUISHER – A fire extinguisher carried or on wheels and operated by hand.

5.9 PRESSURE GAUGE – A gauge that shows the pressure in the cylinder and the operating range of the extinguisher based upon the operating temperature-pressure relationship in appropriate pressure units.

5.10 PRESSURE INDICATOR – An indicator that shows that the extinguisher is pressurized with its rated expellant gas pressure.

5.11 RECHARGEABLE (REFILLABLE) FIRE EXTINGUISHER – A fire extinguisher capable of undergoing complete maintenance including internal inspection of cylinder, replacement of parts and seals and hydrostatic testing.

5.12 STORED PRESSURE TYPE FIRE EXTINGUISHER – A fire extinguisher in which both the extinguishing agent and expellant gas are in a single cylinder.

CONSTRUCTION

6 General

6.1 The construction of an extinguisher shall be such that the method of operation is obvious after observing the operating instructions.

6.2 The construction of an extinguisher shall be such that after discharge of the agent is initiated, the operator of the extinguisher is not required to take further manual actions to maintain the maximum possible flow of agent, other than holding the operating device in the fully opened position. The extinguisher shall be usable by one operator, without assistance from a second individual.

6.3 A disposable extinguisher shall not be rechargeable.

6.4 An extinguisher having a volume in excess of 2.3 L (140 in^3) shall stand in the upright position without support.

6.5 A material for an extinguisher part, the deterioration of which causes the extinguisher to become inoperable or results in the risk of injury to persons, shall not be susceptible to stress corrosion.

6.6 A polymeric or other nonmetallic part, other than an "O" ring or gasket, shall be evaluated on the basis of:

a) Mechanical strength, including resistance to impact, see Vibration Tests, Section 41; Roadability and Rough Usage Tests, Section 42; Handle and Mounting Device Test, Section 26; Hydrostatic Pressure Test, Section 40; Burst Strength Test – Gauges and Indicators, Section 52; and Nameplate Exposure Tests, Section 60;

b) Moisture absorption, see 44.3.1 and 44.3.2, Salt Spray Corrosion Test, Section 46; One-Year Time Leakage Test, Section 50; Nameplate Exposure Tests, Section 60;

c) Flammability, see 6.7;

d) Resistance to deterioration due to aging, see Aging Tests – Polymeric Materials, Section 44; One-Year Time Leakage Test, Section 50; and Nameplate Exposure Tests, Section 60;

e) Exposure to light, see 44.3.2, Nameplate Exposure Tests, Section 60; and

f) Exposure to the extinguishing agent, see 44.2.1.

6.7 With reference to flammability, see 6.6(c), polymeric materials shall be classified as HB, V-0, V-1, V-2, 5VA, or 5VB, when tested in accordance with UL 94. Other nonmetallic materials shall have equivalent characteristics.

6.8 An extinguisher shall operate as intended from the minimum storage temperature to 49 °C (120 °F), inclusive. Currently recognized minimum storage temperatures are minus 40 °C (minus 40 °F) and minus 54 °C (minus 65 °F). See Operating Temperature Limits Test, Section 32.

6.9 The edges and surfaces of a valve, cap, closure, hose, cylinder, handle, mounting device, and similar items, shall not be sufficiently sharp to constitute a risk of injury to persons in intended maintenance and use.

6.10 Whenever reference measurements are necessary to determine that a part as described in 6.9 is not sufficiently sharp to constitute a risk of injury to persons, the method described in UL 1439, is to be employed.

6.11 A hand portable extinguisher shall have a gross weight not exceeding 27 kg (60 lb).

6.12 A pressurizing adaptor for a rechargeable stored pressure type extinguisher shall have threads or other mechanical means for securement to the valve assembly.

7 Cylinders

7.1 The requirements in this clause do not apply to a rechargeable cylinder marked as complying with U.S. Department of Transportation (DOT), or Canadian Transportation of Dangerous Goods Regulations (TDGR), or ASME specifications, unless otherwise specifically indicated.

7.2 An extinguisher cylinder under the jurisdiction of the DOT or TDGR shall comply with the appropriate DOT or TDGR specifications for shipping containers.

7.3 An extinguisher cylinder shall be fabricated of a material having rigidity, durability, and resistance to corrosion at least equivalent to:

a) An aluminum alloy such as 6661-T6 or 6351-T6, see ASTM B209, having a minimum thickness of 0.71 mm (0.028 in);

b) An aluminum alloy, such as 1100, 1170, or 3003 having a minimum thickness of 0.71 mm (0.028 in);

c) A mild steel alloy, such as SAE 1010, having a minimum thickness of 0.71 mm (0.028 in); or

d) An austenitic stainless steel having a maximum of 0.03 % carbon content and having a wall thickness of at least 0.71 mm (0.028 in).

7.4 A cylinder assembled complete with permanently attached fittings shall be resistant to any corrosive influence of the extinguishing agent.

7.5 The material of the dome and bottom of a metal cylinder shall be of the same material as the cylinder.

7.6 All joints in metal cylinders shall be threaded, brazed, or welded.

Exception: Brazed joints shall not be used on stainless steel cylinders.

7.7 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.

8 Joints

8.1 The minimum width of a brazed joint on the cylinder wall shall be at least four times the design thickness of the sidewall.

9 Caps, Valves, Closures, and Pressure Relief

9.1 The inside diameter of a fill opening of a rechargeable-type extinguisher shall be:

a) A minimum 19 mm (3/4 in) for an extinguisher having a capacity of 13.6 kg (30 lb) or less;

b) A minimum 25 mm (1 in) for an extinguisher having a capacity above 13.6 to 34.0 kg (30 to 75 lb);

c) A minimum 38 mm (1-1/2 in) for an extinguisher having a capacity above 34.0 to 68.0 kg (75 to 150 lb); and

d) A minimum 64 mm (2-1/2 in) for an extinguisher having a capacity above 68.0 kg (150 lb) or greater.

Exception: The fill opening is able to be 19 mm (3/4 in) or more when the extinguisher has at least one other opening.

9.2 A collar with external threads shall be constructed so that the cap does not contact the dome or the bottom when the gasket is removed.

9.3 A threaded cap, closure, or valve shall engage the collar or the threaded opening by a minimum four full threads with the gasket in place.

9.4 A cap, plug, or other component, except a pressure gauge or indicator, 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 a minimum two threads engaged.

9.5 Closures of rechargeable extinguishers shall resist, without evidence of damage to the threads, a closing torque of 35 N·m (25 lbf-ft).

9.6 When pressure relief is required under the jurisdiction of the U.S. Department of Transportation (DOT) or Canadian Transportation of Dangerous Goods Regulations (TDGR), it shall be in accordance with the Compressed Gas Association pamphlet CGA S-1.1 Pressure Relief Standards.

10 Gaskets and "O" Rings

10.1 A gasket or an "O" ring shall be retained in a recess or the equivalent, in the cap, collar, or valve. A gasket or an "O" ring of a rubber-like material shall be of thickness to provide a compression-type seal and shall fit snugly against the cap or head. See Elastomeric Parts Test, Section 45.

11 Gas Cartridges, Cylinders, and Regulators

11.1 A gas cartridge and a cylinder under the jurisdiction of the U.S. Department of Transportation (DOT) or Canadian Transportation of Dangerous Goods Regulations (TDGR) shall be constructed, tested, marked, and charged in accordance with the applicable shipping container specifications of the DOT or TDGR. See 40.4.1.

11.2 A gas cylinder assembly shall be provided with a pressure-relief device as required by applicable DOT or TDGR regulations. A gas cylinder assembly not under the jurisdiction of the DOT or the TDGR shall be provided with a pressure relief appropriate for the cylinder used.

11.3 Gas cartridges shall be provided with an antirecoil cap for use in storage and transit.

11.4 Gas cartridges or cylinder assemblies shall be securely attached to the extinguisher.

11.5 Gas cylinders of the seated-valve type shall be provided with a pressure-relief disc held in place by a nut which vents and prevents recoil.

11.6 A seated-valve type gas cylinder assembly shall be provided with a corrosion-resistant locking device to reduce the risk of unintentional discharge. An appropriate sealing device that is breakable with a force not exceeding 65 N (15 lb-f), as installed with no external load on the locking device, shall be provided to retain the locking device and to indicate tampering with or use of the gas cylinder assembly.

11.7 A valve of the handwheel-type shall be constructed so that not more than 1-1/2 turns are required to achieve the maximum flow of agent.

11.8 The regulator used on a wheeled extinguisher shall be factory preset and pinned or otherwise locked to reduce the risk of tampering or field adjustment. The regulator shall comply with UL/ULC 252.

12 Pressure Gauges and Indicators

12.1 A rechargeable extinguisher, including a wheeled extinguisher, of the stored pressure type employing a single chamber for both the dry chemical and the expellant gas shall be equipped with a pressure gauge to show the amount of pressure in the chamber whether the valve is open or closed, except as provided in 12.2. The operating range of the gauge shall reflect the operating temperature-pressure relationship of the extinguisher, except that the minimum operating pressure line is able to be higher than the pressure that corresponds to the minimum operating temperature.

12.2 An extinguisher having a disposable, nonrefillable, sealed chamber is not required to be equipped with a pressure gauge when a pressure indicator is used to verify that the extinguisher is charged with the correct expellant gas pressure.

12.3 The pressure gauge face shall indicate the appropriate units for which the gauge is calibrated, such as psig, or kPa, or bar, or any combination of pressure units.

12.4 The maximum indicated gauge pressure shall be between 150 and 250 % of the indicated charging pressure at 21 °C (70 °F). The gauge dial shall indicate, in green, the operable pressure range of the extinguisher. The zero, charging, and maximum indicated gauge pressures shall be shown in numerals and with marks. The background of the gauge face outside of the operable pressure range shall be red. The arc of the dial from the zero pressure point to the lower end of the operable 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, operable, 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 0.25 mm (0.010 in). The

minimum length of the pointer, from the centerpoint of the dial to the tip, shall be 9.53 mm (0.375 in) measured at the zero pressure point. The minimum length of the arc from zero pressure to the indicated charging pressure shall be 12.7 mm (0.50 in) measured along the outer edge of the gauge dial face, from the centerline of the zero pressure mark to the centerline of the indicated charging pressure mark.

12.5 The mark used to indicate the charging pressure at 21 °C (70 °F) shall be a minimum 0.6 mm (0.025 in) and not more than 1.0 mm (0.040 in) wide.

12.6 The pressure gauge face shall be marked, "Use With Dry Chemical Only."

12.7 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) To indicate galvanic compatibility with aluminum valve bodies – a horizontal line above the manufacturer's identifying mark.

b) To indicate galvanic compatibility with brass valve bodies – a horizontal line below the manufacturer's identifying mark.

c) To indicate galvanic compatibility with aluminum and brass valve bodies – a line above and a line below the manufacturer's identifying mark, or the manufacturer's identifying mark by itself without additional lines.

12.8 A cartridge-operated wheeled extinguisher provided with a nitrogen cylinder shall be provided with a gauge capable of indicating cylinder pressure whether the valve is open or closed. The gauge shall comply with UL/ULC 404.

13 Puncturing Mechanisms

13.1 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.

14 Locking Devices and Seals

14.1 The operating mechanism(s) of an extinguisher shall be provided with a locking pin or other device to reduce the risk of unintentional discharge. A locking device shall be made of corrosion-resistant material. See Salt Spray Corrosion Test, Section 46.

14.2 The locking pin or other device shall be visible from the front of the extinguisher when the extinguisher is mounted on a wall in its bracket or on its mounting hook. However, the locking pin is able to be on the back side when pictographic operating instructions on the front illustrate the intended means of operation.

14.3 When the locking device is attached to the valve with a chain or similar device, the chain shall be attached so that it does not interfere with the discharge stream.

14.4 A tamper indicator such as a seal or the equivalent shall be made of a corrosion resistant material and shall be provided to retain the locking device and to indicate tampering with or use of the extinguisher. The tamper indicator shall break when subjected to a force of 65 N (15 lb-f) or less.

Exception: The 65 N (15 lb-f) does not apply when the tamper indicator is broken by the action required to start discharge of the extinguisher, or when an internal load is continuously applied to the release

mechanism, the force, applied as intended and required to accomplish discharge or release of the internal load. In this case, the force shall not exceed 133 N (30 lb-f). See 25.3.

14.5 The tamper indicator shall be constructed so that it is required to be broken to operate the extinguisher.

15 Hose

15.1 A hose to direct the discharge shall be provided on an extinguisher having:

a) A gross weight of more than 5.4 kg (12 lb); or

b) A rating of 2-A or higher, 20-B or higher, or both.

The length of the hose shall be such that the dry chemical discharge is not restricted by kinking of the hose or by other means when the extinguisher is operated in any position in which it is capable of being held in service.

15.2 An extinguisher having a gross weight of 5.4 kg (12 lb) or less is not prohibited from being provided with a hose.

15.3 A hose shall have a nominal internal diameter of a minimum 9.5 mm (3/8 in) and shall comply with UL 92 and ULC 522.

15.4 A hose shall be attached so that it is removable and replaceable as intended.

15.5 For a hand-portable extinguisher, a holding device shall maintain a hose in a position within 25 mm (1 in) of the cylinder when the hose is not in use, or the hose shall be preformed and have rigidity to provide an equivalent function. The distance is to be measured from the cylinder to the nearest edge of the hose.

16 Couplings

16.1 A hose coupling shall be made of corrosion-resistant material. See Salt Spray Corrosion Test, Section 46. The coupling shall be threaded or provided with equivalent means for its attachment to the outlet of the discharge valve. When the hose coupling incorporates a nozzle orifice, the threads or attachment means shall prevent the outlet end of the hose from being connected to the outlet of the discharge valve.

16.2 Continued use of the hose shall not cause loosening or detachment of the coupling, and there shall be no projections to catch on objects or otherwise interfere with pulling of the hose.

17 Nozzles and Discharge Valves

17.1 A hand-portable extinguisher shall have a self-closing valve for intermittent discharge and a nozzle to direct the discharge.

17.2 A wheeled extinguisher shall have a shutoff valve and nozzle at the end of the hose for intermittent discharge.

17.3 A discharge valve, spring, pin and nozzle shall be made of a corrosion resistant material and have no blow holes, cracks, or other imperfections. See Salt Spray Corrosion Test, Section 46.

18 Siphon Tubes

18.1 A siphon tube shall be constructed of a material that is resistant to the corrosive effects of the extinguishing agent with which it is to be used.

18.2 Press-fit-type joints between the siphon tube, valve, and other mating parts of the discharge system shall not completely disengage during use. The siphon tube shall be notched, scarfed, or otherwise prevented from restricting discharge in an unintended manner when the tip of the siphon tube is resting on the bottom of the cylinder. The tip of a nonmetallic siphon tube shall not be displaced from the vertical axis during assembly. See Servicing Tests, Section 49.

19 Handles and Mounting Devices

19.1 A hand-portable extinguisher having a gross weight of 1.4 kg (3 lb) or more and having a cylinder diameter of 75 mm (3 in) or more, shall have a carrying handle and a means for mounting on a wall. A handle shall be made of nonferrous metal, austenitic stainless steel, carbon steel protected against corrosion, or a polymeric material complying with the Aging Tests – Polymeric Materials, Section 44. The mounting means shall hold the extinguisher firmly in place.

19.2 A side handle or hanger loop shall be located so that the operating instructions face outward when the extinguisher is supported by the mounting means.

19.3 A handle shall be a minimum 90 mm (3-1/2 in) long for an extinguisher of 6.8 kg (15.0 lb) or more gross weight and a minimum 75 mm (3 in) long for an extinguisher of less than 6.8 kg (15.0 lb) gross weight.

19.4 There shall be a minimum 25 mm (1 in) clearance between the dome and the carrying handle when the handle is in the carrying position.

19.5 A mounting bracket shall not permit the extinguisher to drop to the floor when the strap is opened. The clamp releasing device shall be of a color contrasting with that of the immediate background and shall be visible, and the method of release shall be obvious when viewing the front of the extinguisher.

19.6 A wall mounting hook shall require both a horizontal and a minimum 6 mm (1/4 in) vertical motion to remove the extinguisher from the wall.

Exception: A minimum vertical motion of 3 mm (1/8 in) is able to be used for an extinguisher having a gross weight of 5.4 kg (12 lb) or less.

19.7 When a bracket requires force to open, the force shall not exceed 65 N (15 lb-f) for finger actuated assemblies, and 130 N (30 lb-f) for hand actuated assemblies. See 26.3 and 26.4.

20 Hose Retainers – Wheeled Extinguishers

20.1 A hose retainer shall retain the hose and nozzle on the extinguisher so that neither the hose nor the nozzle strikes or rubs the wheels or the ground. The retainer shall permit the hose to be installed and withdrawn as intended when the extinguisher is placed in operation.

21 Running Gear – Wheeled Extinguishers

21.1 The tank or container shall be secured to the running gear, consisting of the wheels, axle, tank bands, and the handle for hauling and manipulating the extinguisher.

22 Expellant Gases

22.1 The expellant gas used in a stored-pressure extinguisher or in the cartridge or cylinder of an extinguisher so provided shall be compressed air or nitrogen, carbon dioxide, or other inert gas. The gas shall have a dew point of minus 40 °C (minus 40 °F) or lower.

22.2 The quantity of the gas charge in an accessory gas cartridge shall not exceed the filling density requirements of DOT or TDGR. Leakage by weighing shall be detectable on a scale graduated in 0.01 kg (1/8 oz) increments, unless other means are provided for detecting leakage.

PERFORMANCE

23 General

23.1 For cartridge-operated extinguishers, unless otherwise specified, an interval of 5 seconds is able to elapse after the cartridge is punctured in order that pressure builds up before discharge of the agent is initiated.

24 Fire Tests

24.1 A dry chemical fire extinguisher and an extinguisher containing Class D fire extinguishing agents shall comply with UL 711/ULC-S508.

24.2 An extinguisher charged with its rated capacity and conditioned at the minimum storage and use temperature for 16 hours shall extinguish a Class B test fire having an area numerically equal to 40 % of the area of the pan used in the rating of the fire extinguisher.

25 Locking Device and Seal Test

25.1 The force required to extract or dislodge a locking device as intended along its axis shall not exceed 130 N (30 lb-f) after the locking device is subjected to the tests specified in 25.2 and 25.3.

25.2 A locking device shall not shear when a force of 220 N (50 lb-f) is exerted upon the operating mechanism for 30 seconds, and the extinguisher then shall be capable of being operated in its intended manner. An extinguisher, with its locking device and tamper indicator attached as intended, is to be secured on the floor in a vertical position and 220 N (50 lb-f) is to be exerted 13 mm (1/2 in) from the end of the operating lever or lever-operated cartridge-puncturing mechanism, or at the center of a punch-button cartridge-puncturing mechanism.

25.3 The extinguisher then is to be secured in a test fixture in a vertical position. The locking device is to be pulled with 130 N (30 lb-f) for 30 seconds at an angle of 45° in an upward direction from the horizontal, and then pulled for 30 seconds at a horizontally rotational angle of 45°. The device shall either:

a) Be capable of extraction at the 45° angle; or

b) Not be damaged or the mechanism jammed to the extent that prevents intended extraction of the locking device directly outward along its axis, when 130 N (30 lb-f) is applied for 30 seconds.

The 130 N (30 lb-f) force exerted on the locking device both at the 45° angle and along the axis of the device is to be achieved by increasing the force from zero to 130 N (30 lb-f) at a rate of 260 N (60 lb-f) per minute.

26 Handle and Mounting Device Test

26.1 The method of attachment of the handle and hanger loop of a hand-portable extinguisher weighing 1.4 kg (3 lb) or more, and having a cylinder diameter greater than 75 mm (3 in), shall support a static load of five times the fully charged weight of the extinguisher, or a minimum 45 kg (100 lb) applied downward through the vertical axis of the extinguisher for 5 minutes. For extinguishers weighing more than 9 kg (20 lb), the load shall be 5 times the weight of the fully charged extinguisher.

26.2 A hand-portable extinguisher charged with its rated capacity is to be placed in the bracket or mounting hook provided with the extinguisher (see 63.2) after the bracket or mounting hook has been secured to a wood board. The board is to be secured in a vertical position, and the static load then is to be applied to the top of the extinguisher.

26.3 For a bracket mounting device, the force required to open the bracket shall not exceed 65 N (15 lb-f) for finger actuated assemblies and 130 N (30 lb-f) for hand actuated assemblies measured at the end of the bracket opening device.

26.4 ‘A hand-portable extinguisher, charged with its rated capacity, is to be placed in the bracket provided with the extinguisher after the bracket is secured in the vertical position to a wood board. Using a spring scale, or a similar device, a gradually increasing force is to be applied to the tip of the clasp or lever of the bracket strap or band, at a 90° angle to the extinguisher, at a rate of 0.45 kg/s (1 lb/s) until the band releases the bracket. For hand actuated assemblies, when there is an indent or gripping location, the force is to be applied to the center of that actuating area.

27 Operation Test

27.1 Hand-portable extinguishers at 21 ±3 °C (70 ±5 °F) shall discharge a minimum 80 % (by mass) of the rated capacity of dry chemical when tested in accordance with 27.2 and 27.3.

27.2 A hand-portable extinguisher that is intended to be held in the vertical position during discharge, such as an extinguisher with a valve and handle located on the top of the extinguisher, shall be charged with its rated capacity and shall be discharged with the extinguisher positioned at an angle 45° from the vertical in the forward, back, and side to side orientations.

27.3 A hand-portable extinguisher that is intended to be held at a forward angle during discharge, such as an extinguisher with the carry handle mounted on the side of the extinguisher, shall be charged with its rated capacity and shall be discharged with the extinguisher positioned at it's intended operating position and, in the vertical position.

28 Discharge Duration Test

28.1 An extinguisher at 21 ±3 °C (70 ±5 °F) shall have a duration of discharge not less than either 8 seconds, or the minimum duration specified in UL 711/ULC-S508, for the appropriate Class A or Class B rating, whichever is longer.

28.2 An extinguisher charged with its rated capacity at 21 ±3 °C (70 ±5 °F) is to be held in a vertical position, with the discharge nozzle in the horizontal position. The extinguisher then is to be discharged, and the duration to gas point and amount of dry chemical discharged recorded.

28.3 When the gas point is not readily determined in the test specified in 28.3, an extinguisher charged with its rated capacity is to be discharged into a container for the minimum required effective duration specified in UL 711/ULC-S508, for the appropriate Class A or Class B rating, and then discharged elsewhere for the remainder of the discharge. The weight of dry chemical discharged into the container shall be not greater than 95 % of the total amount discharged.

29 Rate of Flow Test

29.1 An extinguisher shall be discharged to determine the rate of flow at 21 ±3 °C (70 ±5 °F) and shall be consistent, as evidenced by the results of three consecutive tests not varying more than 10 % from their mean value.

29.2 An extinguisher charged with its rated capacity is to be discharged for a period of two-thirds of its average discharge duration at 21 ±3 °C (70 ±5 °F), rounded to the nearest second, with the nozzle held in a horizontal position. The rate of flow is to be calculated from the loss in weight during discharge. This test is to be used for:

a) Identification and countercheck purposes with the rate of flow established as ±10 % of the mean of the three tests conducted: and

b) Verification of the rate of flow required to identify high flow extinguishers as defined in 5.7.

30 Discharge Range Test

30.1 An extinguisher at 21 ±3 °C (70 ±5 °F) shall discharge a minimum of 90 % (by mass) of the rated capacity of dry chemical at a minimum distance of 3 m (10 ft) from the nozzle.

Exception: An extinguisher having a capacity under 2.3 kg (5 lb) of dry chemical shall discharge initially to a distance of a minimum 3 m (10 ft) from the nozzle and a minimum of 90 % (by mass) of the rated capacity of dry chemical shall discharge at a minimum distance of 1.5 m (5 ft) from the nozzle.

30.2 These characteristics are to be based on the operation of an extinguisher charged with its rated capacity with the discharge nozzle held in a horizontal position at a height of 1 m (3 ft) from the floor or ground.

30.3 The range characteristics of a Class D extinguisher meets the intent of the requirement when the extinguisher successfully extinguishes the appropriate combustible metal test fires as specified in UL 711/ULC-S508.

31 Intermittent Discharge Test

31.1 An extinguisher shall discharge a minimum 75 % (by mass) of the rated capacity of dry chemical when conditioned at its minimum storage and use temperature, 21 ±3 °C (70 ±5 °F) and 49 ±3 °C (120 ±5 °F), and shall operate in such a manner that not more than 1 second elapses from the time the discharge valve is opened until the dry chemical starts to discharge.

31.2 An extinguisher charged with its rated capacity and conditioned at each of the temperatures specified in 31.1 for a minimum of 16 hours is to be operated intermittently by opening and closing the discharge valve in cycles of 2 seconds "open" and 2 seconds "closed" until the end of discharge is reached. For a wheeled extinguisher, the cycles are to be 5 seconds "open" and 5 seconds "closed."

32 Operating Temperature Limits Test

32.1 An extinguisher shall discharge a minimum 85 % (by mass) of the rated capacity of dry chemical when conditioned for at least 16 hours at the minimum storage and use temperature and 49 ±3 °C (120 ±5 °F).

32.2 An extinguisher charged with its rated capacity and conditioned at the temperatures specified in 32.2 for a minimum of 16 hours is to be discharged in its intended operating position. The extinguishers are to be operated with the nozzle held in a horizontal position at a height of 1 m (3 ft).

33 Temperature Cycling Test

33.1 An extinguisher shall discharge a minimum 80 % (by mass) of the rated capacity of dry chemical when alternately conditioned at the minimum storage and use temperature and at 49 ±3 °C (120 ±5 °F).

33.2 An extinguisher charged with its rated capacity is to be conditioned at the minimum storage and use temperature for 24 hours, then conditioned at 49 ±3 °C (120 ±5 °F) for 24 hours, and then again at the minimum storage and use temperature for 24 hours. The extinguisher is then to be conditioned at 21 ±3 °C (70 ±5 °F) for 24 hours, after which it is to be discharged and the amount of dry chemical discharged is to be calculated.

34 30-Day Elevated Temperature Test

34.1 An extinguisher shall discharge a minimum 85 % (by mass) of the rated dry chemical when conditioned at 49 ±3 °C (120 ±5 °F) for 30 days.

34.2 An extinguisher charged with its rated capacity and conditioned at the temperature specified in 34.1 for 30 days is to be discharged when removed from the conditioning temperature. It is to be removed from the oven and operated with as little delay as possible. It then is to be reweighed and the amount of dry chemical discharged is to be calculated.

35 High Temperature Exposure Test

35.1 An extinguisher shall retain its parts, without rupture, during conditioning. The extinguisher is not required to operate.

35.2 An extinguisher charged with its rated capacity shall be conditioned for 7 days at 79 ±3 °C (175 ±5 °F).

36 Abnormal Operation Test

36.1 A cartridge operated extinguisher shall discharge a minimum 75 % of its rated capacity at 21 ±3 °C (70 ±5 °F) and operated without pressure build-up before discharge of the agent is initiated.

36.2 A cylinder operated wheeled unit, in addition to meeting the requirements in the Discharge Duration Test, Section 28 shall discharge not less that 75 % of its rated capacity at 21 ±3 °C (70 ±5 °F) and operate without a pressure build up and with the hose in the stored position.

37 Pressure-Retention Test

37.1 For a cartridge-operated extinguisher, the pressure in the dry-chemical chamber shall be a minimum 350 kPa (50 psig) 15 minutes after the chamber is pressurized by intended operation with the nozzle closed and the extinguisher at 21 ±3 °C (70 ±5 °F).

37.2 The chemical chamber of an extinguisher charged with its rated capacity is to be pressurized with the discharge nozzle closed and the pressure in the chamber recorded. The test sample is to be left undisturbed for 15 minutes, and the pressure again recorded.

38 Packed Chamber Test

38.1 A hand-portable extinguisher shall discharge at least 80 % (by mass) of the total dry-chemical charge after it has been overcharged and conditioned at 49 °C (120 °F). The pressure developed in a cartridge-operated extinguisher shall not exceed the factory test pressure.

38.2 The extinguisher is to be completely filled with dry chemical without jarring and placed in an impact machine designed to permit free fall of the extinguisher. The sample is to be dropped four times from a height of 25 mm (1 in). Dry chemical is then to be added, without jarring, until the cylinder is again filled. The extinguisher is to be again placed in the impact machine and dropped three times from a height of 25 mm (1 in). The extinguisher is to be removed from the machine and once again completely filled with dry chemical as in the previous step. Fifteen minutes are to elapse between each filling operation. The extinguisher is to be weighed, pressurized to the maximum expellant gas pressure, or fitted with a cartridge if cartridge-operated, and conditioned at 49 ±3 °C (120 ±5 °F) for 16 hours. Following the conditioning period, the extinguisher is to be operated. The maximum pressure and weight are to be recorded before and after discharge. The amount of dry chemical discharged is to be calculated.

39 Packed Hose Test

39.1 A hand-portable extinguisher having a discharge valve at the outlet end of the hose shall start to discharge within 5 seconds when the extinguisher is operated subsequent to packing of the hose.

39.2 A hand-portable extinguisher charged with its rated capacity at 21 ±3 °C (70 ±5 °F) is to be operated and a small quantity of the chemical is to be discharged. The gas pressure is to be relieved with as little disturbance as possible of the chemical in the chamber and in the hose. The unit then is to be repressurized as intended and the discharge valve is to be opened. The time from the opening of the discharge valve to the start of discharge of the dry chemical is to be measured.

40 Hydrostatic Pressure Test

40.1 Cylinders and tanks

40.1.1 Extinguisher cylinders that are designed, tested and marked in accordance with specifications for shipping containers of the DOT or TDGR shall comply with the applicable DOT or TDGR specification and shall meet only 40.1.8 and 41.1.3.

40.1.2 A hand-portable extinguisher cylinder shall withstand for 1 minute, without rupture, a pressure of twice the proof test pressure as specified in 40.1.3 (a), (b), (c) or (d).

40.1.3 The proof test pressure is to be determined as follows:

a) For a hand-portable extinguisher that uses a separate expellant gas cartridge, the proof test pressure shall be:

1) Three times the maximum pressure developed in the container when operated under closed nozzle conditions after being charged with its rated capacity of dry chemical and expellant gas and at 21 °C (70 °F), or

2) One and one-half times the maximum closed nozzle pressure developed when charged as above and at 49 °C (120 °F), whichever is greater.

b) For a hand-portable extinguisher that uses a single chamber for both the dry chemical and expellant gas, the proof test pressure shall be three times the intended charging pressure at 21 °C (70 °F).

c) For extinguishers of the wheeled type, the proof test pressure shall be twice the intended charging pressure at 21 °C (70 °F), or twice the maximum pressure developed in the cylinder when operated under closed-nozzle conditions, for cartridge operated extinguishers. For this determination, the extinguisher is to be charged with its rated capacity of dry chemical and expellant gas and at 21 °C (70 °F).

d) The minimum proof pressure in any case shall be equal to at least twice the charging pressure or 800 kPa (120 psig), whichever is greater.

40.1.4 A tank for a wheeled extinguisher shall withstand for 1 minute, without rupture, a pressure of four times for a metallic tank or six times for a nonmetallic tank, its intended charging pressure at 21 °C (70 °F) for stored-pressure extinguishers, or the maximum pressure developed in the container when operated under closed-nozzle conditions, whichever is greater.

40.1.5 There shall be no permanent volumetric expansion in excess of 10 % of the total expansion of the cylinder when pressurized to the proof test pressure as specified in 40.1.3 (a), (b), (c), or (d) for 30 seconds, after which the pressure is to be released. For cylinders that have been proof pressure tested, the test pressure is to be increased by 10 %.

40.1.6 When an extinguisher cylinder or tank, tested to rupture (see 40.5.3), fractures along circumferential joints between the top or bottom dome and the side sheet, or at the collar or collar joint or at the point of attachment of elbows or discharge fittings, the rupture pressure shall be a minimum eight times the operating pressure at 21 °C (70 °F). Fractures passing through welds but parallel to the longitudinal axis of the cylinder or tank are to be evaluated according to the requirements specified in 40.1.2 and 40.1.4. For the purposes of this requirement the heat affected zone is considered to be a part of the weld.

40.1.7 The flat dome or bottom of a cylinder shall withstand for 1 minute, without rupture, an internal pressure of eight times the rated pressure at 21 °C (70 °F). During this test, the cylinder sidewall is to be restrained with a close fitting steel sleeve or similar device to prevent rupture of the sidewall.

40.1.8 Extinguishers submitted for a marine type classification shall have a minimum burst pressure of five times the rated pressure at 21 °C (70 °F).

40.2 Discharge valves

40.2.1 A discharge valve assembly, cap, or closure shall withstand, without leakage, the hydrostatic test specified in 40.1.3 (hand portable extinguisher) or 40.1.4 (wheeled extinguisher), whichever is applicable. In addition, no parts shall be thrown from the valve assembly at a pressure less than eight times the maximum operating pressure at 21 °C (70 °F).

40.3 Hose assemblies

40.3.1 A hose assembly provided with a shutoff nozzle shall withstand for 1 minute, without rupture, a hydrostatic pressure of:

a) Three times the pressure developed in the extinguisher when operated under closed-nozzle conditions after being charged with its rated capacity and at 21 °C (70 °F); or

b) 4100 kPa (600 psig), whichever is lower.

40.3.2 A hose assembly that is not provided with a shutoff nozzle shall be attached to the cylinder or valve outlet and to the nozzle and withstand for 1 minute, without leakage, a hydrostatic pressure equal to two times the operating pressure of the extinguisher at 21 °C (70 °F).

40.3.3 A hose assembly provided on a cylinder operated wheeled fire extinguisher that connects the nitrogen cylinder valve with the dry chemical container or pressure regulator, shall withstand for one minute, without rupture, a pressure of twice the maximum relief pressure of the gas pressure relief device on the nitrogen cylinder.

40.4 Gas cartridges

40.4.1 A gas cartridge exempt from DOT or TDGR requirements because of size and capacity shall not leak when subjected for 30 seconds to the applicable hydrostatic test pressure specified in either (a)(1) or (b)(1). In addition, the gas cartridge shall not rupture at less than the applicable hydrostatic test pressure specified in (a)(2) or (b)(2).

a) For a cartridge having a pressure relief device intended to rupture at pressures from 18.3 to 20.7 MPa (2650 to 3000 psig):

1) 20.7 MPa (3000 psig) leakage test pressure.

2) 41.4 MPa (6000 psig) rupture test pressure.

b) For a cartridge having a pressure relief device intended to rupture at pressures from 27.9 to 31 MPa (4050 to 4500 psig):

1) 31 MPa (4500 psig) leakage test pressure.

2) 41.1 MPa (6000 psig) rupture test pressure.

40.5 Test method

40.5.1 During the hydrostatic test, the extinguisher cylinder is to be tested with its own discharge valve or adaptor threaded in place after the cylinder has been completely filled with water. All air is to be expelled from the test sample before the pressure is applied.

40.5.2 The apparatus for these tests is to consist of a hand- or motor-operated hydraulic pump that produces the required test pressure, a test cage that contains the extinguisher and its parts in the event that parts are thrown off, required valves and fittings for attachment to the test sample, and the required valves, fittings, and similar devices, for regulating and maintaining the specified test pressure.

40.5.3 The pressure is to be increased at a rate of approximately 2000 kPa (300 psig) per minute until the test pressure is obtained. This pressure then is to be held for the time specified. The pressure then is to be increased until the cylinder ruptures.

40.5.4 To determine compliance with the requirements specified in 40.1.5, the water jacket test apparatus is to be used. The test is to be conducted in accordance with CGA C-1.

41 Vibration Test

41.1 General

41.1.1 A hand-portable extinguisher with its rated capacity and mounted in its bracket or in a standard mounting fixture shall withstand the variable frequency and endurance tests specified in 41.4.1 – 41.5.1 without:

a) Becoming inoperable;

b) Causing a risk of injury to persons;

c) Dislodgment of the siphon tube; and

d) Incurring damage to the side handle, hanger loop, or means of attachment that impairs its intended use.

41.1.2 Physical deterioration of components that requires repair or replacement of the extinguisher, components, or bracket before they are able to be returned to service does not meet the intent of the requirement. For example, broken welds in the cylinder, malfunctions of operating parts, or abrading or scoring of the cylinder in excess of 10 % of the minimum calculated wall thickness do not meet the intent of this requirement.

41.1.3 Following the vibration test, the extinguisher from the intended operating position shall discharge a minimum 80 % of its rated capacity of dry chemical [at 21 ±3 °C (70 ±5 °F)]. When there are visible signs of damage or deterioration of the valve or cylinder, the extinguisher shall be subjected to and comply with the requirements of 40.1.2, 40.1.6 and 40.2.1.The minimum burst pressure for DOT and TDGR cylinders, shall be four times the charging pressure at 21 °C (70 °F).

41.1.4 For these tests, amplitude is defined as the maximum displacement of sinusoidal motion from position of rest or one-half of the total table displacement. Resonance is defined as the maximum magnification of the applied vibration.

41.2 Mounting of test sample

41.2.1 A representative sample extinguisher charged with its rated capacity is to be mounted in its own bracket or in a standard mounting fixture, and secured to the test fixture of the vibration-test apparatus in a vertical position. When the extinguisher is intended for marine type use, the extinguisher is to be tested using the bracket supplied with the extinguisher.

41.3 Test orientation

41.3.1 The extinguisher is to be subjected to variable frequency and endurance tests in each of the three rectilinear orientation axes, horizontal, lateral, and vertical. Both variable frequency and endurance tests are to be completed in one plane of vibration before the sample is tested in another plane.

41.4 Variable frequency test

41.4.1 The extinguisher is to be vibrated from 10 to 60 hertz in discrete frequency intervals of 2 hertz at the table displacement indicated in Table 41.1. The vibration at each frequency is to be maintained for 5 minutes.

Table 41.1
Amplitude of Vibration

Frequency of vibration, Hertz	Table displacement		Amplitude	
	mm	(in)	mm	(in)
10 – 19	1.52 ±0.15	(0.060 ±0.006)	0.76 ±0.08	(0.030 ±0.003)
20 – 39	1.0 ±0.1	(0.040 ±0.004)	0.51 ±0.05	(0.020 ±0.002)
40 – 60	0.51 ±0.05	(0.020 ±0.002)	0.25 ±0.03	(0.010 ±0.001)

41.5 Endurance test

41.5.1 The extinguisher is to be vibrated for 2 hours at the frequency that produced maximum resonance as determined in the variable frequency test or, when no resonance is observed in the variable frequency test, at a frequency of 60 hertz. The table displacement is to be as specified in Table 41.1.

42 Roadability and Rough Usage Tests

42.1 Roadability

42.1.1 After being towed for 8 km (5 mi) at the rate of 8 to 13 km/h (5 to 7 mph) over concrete, macadam, or gravel roads or a combination thereof, a wheeled extinguisher shall comply with the following:

a) A minimum 85 % (by mass) of the rated capacity of the extinguisher shall be able to be discharged as intended;

b) The wheels, axles, and carriage assembly shall not be damaged to the extent of impairing mobility by one person;

c) No weld shall be broken; and

d) The siphon tube shall not become dislodged.

42.1.2 After being dropped three times onto a concrete surface from a 305-mm (12-in) high platform so as to land on the wheels; pulled at 8 km/h (5 mph) during which one wheel strikes a vertical wall of concrete, steel, or brick; and pushed over so as to land on the bumper, a wheeled extinguisher shall comply with the following:

a) The extinguisher shall not be damaged;

b) No weld shall be broken;

c) The mobility of the extinguisher shall not be impaired; and

d) The siphon tube shall not become dislodged.

42.1.3 The nozzle of a wheeled extinguisher, as attached to the hose, shall function as intended after being dropped three times onto a concrete surface from a height of 1 m (3 ft). The assembly is to be dropped in a random manner so that no effort results in any part of the nozzle, such as the tip or handle, to initially strike the concrete surface.

42.2 Rough usage

42.2.1 A hand-portable extinguisher charged with its rated capacity shall comply with the requirements specified in (a) and (b) after being dropped three times onto a concrete surface as specified in 42.2.2:

a) The extinguisher shall not rupture.

b) The extinguisher shall comply with the requirements specified in 40.1.1 and 40.1.2, except that the test pressure is to be equal to the rated charging or maximum operating pressure.

42.2.2 Sample hand-portable extinguishers are to be charged with their rated capacity. A sample is to be tested with the locking device disengaged, and another sample is to be tested with the locking device engaged. When polymeric materials are to be tested, sample extinguishers are to be conditioned to the minimum storage and use temperature and to 49 °C (120 °F) for 24 hours immediately prior to the test. The distance of the drop is to be measured from the concrete surface to the bottommost part of the extinguisher. For extinguishers having an overall height of 609 mm (2 ft) or less, the drop distance is to be 1 m (3 ft). For extinguishers having an overall height of more than 609 mm (2 ft), the drop distance is to be 609 mm (2 ft). For the first test, each extinguisher is to be held in the upright position and dropped. For the second test, each extinguisher is to be held in the horizontal position and dropped. The orientation of the extinguisher is dependent on the extinguisher design. Each extinguisher is to be positioned to impact on the weakest point. For the third test, each extinguisher is to be held upside down and dropped.

42.3 Rough usage – operation

42.3.1 A hand-portable extinguisher charged with its rated capacity shall comply with (a), (b), (c), and (d) below after being dropped once onto a concrete surface as specified in 42.3.2. After the drop test:

a) The indicated pressure loss shall not exceed 10 %;

b) The locking device shall disengage when subjected to a force not exceeding 178 N (40 lb-f);

c) The extinguisher shall actuate as intended to accomplish discharge; and

d) Parts of the extinguisher shall not be damaged to the extent that impairs intended use.

42.3.2 Sample hand-portable extinguishers are to be charged with their rated capacity. The test procedure is to be similar to that described in 42.2.2, except that the inverted drop test is to be omitted and the locking device is to be engaged. When polymeric materials are to be tested, sample extinguishers including any polymeric parts are to be conditioned to the minimum storage and use temperature and to 49 °C (120 °F) for 24 hours immediately prior to the test. Conditioning is to be conducted after air oven aging and after light and water exposure. See the Aging Tests – Polymeric Materials, Section 44. Each sample is to be subjected to only one drop, and a different sample is to be used for each test. After each drop, the locking device of the extinguisher is to be removed. Each extinguisher shall be subjected to and shall comply with the results obtained in the Discharge Range Test, Section 30, and Discharge Duration Test, Section 28.

43 Siphon Tube Pull Test

43.1 Twenty-four charged hand-portable extinguishers are to be divided into six groups. Three groups are to be conditioned in a vertical position at temperatures of 21, 49, and 60 °C (70, 120, and 140 °F) respectively, for 30 days. The remaining three groups are to be conditioned in a horizontal position at 21, 49, and 60 °C (70, 120, and 140 °F), respectively, for 90 days. After conditioning, all extinguishers are to be cooled.

43.2 For extinguishers having a press-fit type siphon tube assembly, two samples from each of the six groups then are to be inverted, depressurized, and cut open to allow removal of the siphon tube assemblies. Pull strength tests then are to be conducted on each dip tube in accordance with ASTM D638, with the test machine crosshead speed set at 0.021 mm/s (0.5 in/min).

43.3 The siphon tube strength data derived from the tests specified in 43.2 is to be used to determine the "most severe condition" combination of time and temperature, as evidenced by the lowest pull strength. Two extinguishers from those remaining that have not been cut open, and that have the most severe condition combination of time and temperature determined as specified in 43.1 or 43.2 then are to be subjected to the Vibration Test, Section 41.

43.4 For extinguishers having threaded siphon tube assemblies, the assemblies are to be visually examined for signs of cracking or other deterioration. Following the Vibration Test, Section 41, the extinguishers shall comply with the requirements of 28.1. The samples then are to be examined. There shall be no evidence of cracking or other deterioration that will prevent intended operation of the extinguishers.

44 Aging Tests – Polymeric Materials

44.1 General

44.1.1 There shall be no cracking of a polymeric valve, valve part, or bracket after air-oven aging for 180 days at 100 ±3 °C (212 ±5 °F). Aged samples of the valve, valve part, bracket, or container shall perform

as intended, when tested in accordance with 42.3.1 and 40.2.1 (valves); Burst Strength Test – Gauges and Indicators, Section 52 (gauge components intended to be pressurized); 41.1.1 and Section 26 (brackets); or the Hydrostatic Pressure Test, Section 40 (containers). See 44.1.4 – 44.2.3.

44.1.2 There shall be no cracking of a polymeric siphon tube after air-oven aging for 90 days at 100 ±3 °C (212 ±5 °F). Aged samples of the siphon tube shall perform as intended, when installed in test extinguishers and tested in accordance with 42.3.1. Ring samples cut from the aged tube shall not exhibit a degradation in excess of 40 % of the original tensile or ring crushing strength values. See 44.1.5.

44.1.3 As an alternate to the air-oven aging tests specified in 44.1.1 and 44.1.2, an air-oven aging test at a lower temperature for a longer period of time is able to be used. The equivalent time-temperature for 180 days at 100 ±3 °C (212 ±5 °F) is to be 430 days at 87 ±3 °C (189 ±5 °F). The equivalent time-temperature for 90 days at 100 ±3 °C (212 ±5 °F) is to be 210 days at 87 ±3 °C (189 ±5 °F).

44.1.4 When polymeric parts are attached to other polymeric or nonpolymeric parts or assemblies, the securement of the parts shall remain as intended after air-oven aging.

44.1.5 To determine the degradation of a polymeric material used in a siphon tube, ring samples 13 mm (1/2 in) wide are to be cut from the tube and subjected to air-oven aging. See 44.1.6. The ring samples then are to be subjected to a crush test between parallel flat plates using a machine capable of applying a compression load at a uniform rate of 5 mm (0.2 in) per minute and recording the load applied as a function of the deflection. The test is also to be conducted on as-received parts of identical size for comparative purposes. When the nature of the material is such that meaningful test results cannot be obtained, other tests, such as tension tests of the rings, are to be conducted.

44.1.6 The polymeric valve, valve parts, bracket, and 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 100 ±1 °C (212 ±2 °F). Samples are not to touch one another or the sides of the oven. The samples of the polymeric valve, valve parts, and the bracket are to be aged for 180 days and the siphon tube is aged for 90 days at full draft and then allowed to cool in air at 21 ±2 °C (70 ±4 °F) for at least 24 hours before conducting any test or dimensional check. As used in this test, the term "full draft" refers to the oven being used with inlet and outlet vents open and the air vent damper control at a maximum setting so as to provide 250 to 350 air changes per hour.

44.2 Exposure to extinguishing agent test

44.2.1 Polymeric siphon tubes that have been partially buried in the dry chemical with which they are to be used for 210 days at 87 °C (189 °F) shall perform as intended, when installed in test extinguishers that are then subjected to the test described in 42.3.1. Ring samples cut from the tube, and completely buried in the dry chemical with which they are to be used for 210 days at 87 °C (189 °F), shall not exhibit degradation in excess of 40 % of the original tensile or ring crushing strength values. See 44.2.2 and 44.2.3.

44.2.2 When the dry chemical does not withstand the temperature specified in 44.2.1, an exposure test at a lower temperature for a longer period of time is able to be used. See 44.1.3.

44.2.3 Complete siphon tubes are to be partially buried in the dry chemical with which they are to be used, and ring samples, 13 mm (1/2 in) wide, cut from as-received 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 87 ±3 °C (189 ±5 °F) for 210 days. After the test exposure, the samples are to cool in air at 21 ±2 °C (70 ±4 °F) 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 5 mm (0.2 in) per minute and

recording the load versus the deflection. When the nature of the material is such that meaningful test results are not able to be obtained, other tests, such as tensile tests, are to be conducted.

44.3 Light and water test

44.3.1 There shall be no cracking of a polymeric valve, valve part, or bracket following exposure to ultraviolet light and water for 720 hours. Aged samples of the valve or valve part or bracket shall perform as intended when tested as specified in 42.3.1, 40.2.1 and 40.1.6 (valves); Burst Strength Test – Gauges and Indicators, Section 52 (gauges); Vibration Test, Section 41, and Handle and Mounting Device Test, Section 26 (brackets); or the Hydrostatic Pressure Test, Section 40 (containers). See 44.1.4 and 44.3.2. If a gauge or indicator is involved in this test, the gauge shall remain watertight throughout the test.

44.3.2 The ultraviolet light is to be obtained from two stationary enclosed carbon-arc lamps. The arc of each lamp is to be formed between two vertical carbon electrodes, 12.7 mm (1/2 in) in diameter, located at the center of a revolvable vertical metal cylinder, 787 mm (31 in) in diameter and 450 mm (17-3/4 in) in height. Each arc is to be enclosed with a No. 9200-PX clear Pyrex glass globe. The samples are to be mounted vertically on the inside of the revolvable cylinder, facing the lamps, and the cylinder continuously revolved around the stationary lamps at one revolution per minute. A system of nozzles is to be provided so that each sample, in turn, is sprayed with water as the cylinder revolves. During each operating cycle (total of 20 minutes) each sample is to be exposed to the light and water spray for 3 minutes and to the light only for 17 minutes. The air temperature within the revolving cylinder of the apparatus during operation is to be 63 ±5 °C (145 ±9 °F).

44.3.3 An alternate ultraviolet light exposure is obtainable in accordance with ASTM D2565. The source of radiation is to be a 6500 Watt, water-cooled xenon-arc lamp with borosilicate inner and outer optical filters. The wattage to the lamp is automatically controlled to provide spectral irradiance of 0.35 W/m^2 at 340 nm. The samples are mounted vertically on the inside of a 97 cm (38 in) diameter cylinder, facing the arc, and the cylinder is rotated about the arc at one revolution per minute. During each operating cycle of 120 minutes, each sample is exposed to light for 102 minutes and to light and water spray for 18 minutes. The black-panel temperature during the dry portion of the light-on cycle is regulated to 63 ±5 °C (145 ±9 °F).

45 Elastomeric Parts Test

45.1 An elastomeric part used to provide a seal shall have the following properties when tested as specified in UL 157:

a) For silicone rubber (having poly-organo-siloxane as its constituent characteristic), a minimum tensile strength of 3400 kPa (500 psi) and a minimum ultimate elongation of 100 %;

b) For fluoroelastomers, a minimum tensile strength of 6900 kPa (1000 psi) and a minimum ultimate elongation of 150 %;

c) For natural rubber and synthetic rubber other than silicone rubber or fluoroelastomers, a minimum tensile strength of 8300 kPa (1200 psi) and minimum ultimate elongation of 150 %; and

d) Those properties relating to maximum tensile set; minimum tensile strength and elongation after oven aging; and hardness after oven aging, as specified in UL 157. The maximum service temperature used to determine the oven time and temperature for oven aging is considered to be 60 °C (140 °F).

45.2 UL 157 provides for the testing of either finished elastomeric parts or sheet or slab material. Sheet or slab material is to be tested when the elastomeric parts are O-rings having diameter of less than 25.4 mm (1 in). The material tested is to be the same as that used in the product, regardless of whether finished elastomeric parts or sheet or slab material is used.

46 Salt Spray Corrosion Test

46.1 All parts of an extinguisher, including the finishes on coated or painted parts, the assemblies of moving parts, the nameplates as secured in place, and brackets or mounting hooks, when provided, shall be subjected to a 240 hour salt spray exposure as described in 46.5 and 46.6, and after exposure shall comply with the following:

a) The extinguisher shall operate as intended;

b) Any corrosion-resistant coating (such as paint) shall remain intact and shall adhere to the surface so as not to be removable (when such removal exposes a material subject to corrosion) by such action as washing or rubbing with a thumb or fingernail. Loss of adhesion of a coating is not to be considered when applied to the base material of a part that has complied with these requirements, and so long as it does not compromise integrity of top-level components (such as nameplates);

c) Dissimilar metals in contact or close proximity with one another shall be provided with a corrosion protection system, so that there is no evidence of galvanic corrosion;

d) Each extinguisher and its bracket or mounting hook having no protective coating and/or paint shall show no pitting, flaking, chipping, spalling or similar evidence of destruction of metal surfaces when examined without magnification;

e) Areas within 0.062 inch from identification markings (i.e., stamping of metallic parts), edges of stamp processed parts, and processing contact marks from manufacturing shall be excluded from evaluation; and

f) The gauge or indicator on a stored-pressure extinguisher shall remain watertight throughout the test.

46.2 Prior to shipment, each sample shall be examined by the manufacturer for surface finish imperfections due to normal processing conditions associated with casting, extrusion and forging, such as, surface porosity, galling or flash. The surface finish imperfections shall be identified in photographic images provided to the testing laboratory.

46.3 Prior to testing, each sample shall be reviewed by the laboratory in comparison to the photographic images specified in 46.2. In addition, paint chip damage from shipping and handling shall be identified in photographic images provided to the manufacturer.

46.4 The surface finish imperfections of 46.2 and the paint chip damage of 46.3 shall be reviewed between the manufacturer and the laboratory, any discrepancies resolved, and when mutually agreeable, surface finish imperfections and paint chip damage shall be excluded from evaluation. Photographic images shall be included as part of the data.

46.5 Each samples is to be supported vertically and exposed to salt spray (fog) as specified by ASTM B117. The apparatus used for salt spray exposure is to consist of a fog chamber, having a salt solution reservoir, a supply of conditioned compressed air, a dispersing tower for producing a salt fog, specimen supports, provision for heating the chamber, and means of control. Each dispersion tower is to be located in the chamber per ASTM B117 and is to be supplied with salt solution and with warmed, humidified air at a pressure of 120 to 130 kPa (17 to 19 psi) gauge, to disperse the salt solution in the form of a fine mist or fog throughout the interior of the chamber. The temperature within the chamber is to be maintained between 33 and 36 °C (92 and 97 °F). Condensate accumulation on the cover of the chamber shall not drop on the test specimens, and drops of the solution that fall from the specimens are not to be recirculated and are to be removed through a drain located in the floor of the chamber.

46.6 The salt solution is to consist of 20 % (by mass) of common salt (sodium chloride) and distilled water. The pH value of this solution as collected after spraying in the test apparatus is to be between 6.5 and 7.2, and the specific gravity between 1.126 and 1.157 at 35 °C (95 °F).

46.7 Following exposure, each sample shall be examined for compliance with 46.1(f), thoroughly rinsed using a clean water source to remove salt solution, allowed to dry for no greater than 72 hours, and then examined for compliance with 46.1 (a) through (e). Any non-compliance shall be identified in photographic images as part of the data collected.

47 10-Day Moist Ammonia Air Stress Cracking

47.1 After being subjected to the conditions described in 47.2 – 47.4, a brass part containing more than 15 % 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.

47.2 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 47.1. Teflon tape or pipe compound are not to be used on the threads.

Table 47.1
Torque Requirements for Threaded Connections

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

47.3 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 300 by 300 by 300 mm (12 by 12 by 12 in) having a glass cover.

47.4 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 38 mm (1-1/2 in) 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 34 ±2 °C (93 ±4 °F).

48 Extinguishing Agent Tests

48.1 General

48.1.1 When subjected to the tests specified in 48.1.4 – 48.3.3, the dry chemical shall be free flowing at all temperatures in the range from the minimum storage and use temperature to 66 °C (140 °F), except

that should there be any tendency to lump, harden, or cake, such portions shall be friable when dropped from a height of 100 mm (4 in) onto a smooth, hard surface.

48.1.2 A dry-chemical extinguishing agent intended for use in extinguishers classified for use on electrical fires shall have a dielectric voltage withstand strength of at least 5000 volts when tested as specified in 48.4.1 and 48.4.2.

48.1.3 Prior to the tests, all dry chemical samples are to be conditioned in a desiccator containing anhydrous calcium chloride for 48 hours at room temperature.

48.1.4 The samples required are to be taken from a container of powder of approximately 23 kg (50 lb) size. The samples are to be taken only after the container has been rolled or tumbled vigorously through at least 20 revolutions in each of two different directions. The individual samples are to be taken using a tubular "thief" intended to prevent the taking of a stratified sample.

48.2 Elevated temperature test

48.2.1 The apparatus to be used in checking for caking in the elevated temperature test at 60 °C (140 °F) is to consist of seamless tinned steel cups approximately 75 mm (3 in) in diameter and 50 mm (2 in) deep [0.24 L (8 oz) capacity] with closely fitting flanged covers, and a thermostatically controlled oven.

48.2.2 In the closed-cup test at 60 °C (140 °F), 150 g of the dry chemical are to be placed in the cup which is then to be fitted with its cap. It is to be transferred to an oven maintained at 60 °C (140 °F). After 1 week, the sample is to be removed from the oven, allowed to cool for 3 days, and then examined for evidence of caking. Any lumps present are to be dropped from a height of 100 mm (4 in) onto a smooth, hard surface to determine whether they are friable.

48.3 Hygroscopicity test

48.3.1 The apparatus for conducting the hygroscopicity test is to consist of 249 mL beakers, 65 mm watch glasses, a humidity jar, a desiccator jar, and an analytical balance.

48.3.2 Hygroscopicity tests are to be conducted on a 100 g sample in a standard 250 mL beaker. The sample is to be placed in a humidity jar maintained at a temperature of 21 ±3 °C (70 ±5 °F) and at approximately 80 % relative humidity. This relative humidity can be obtained by maintaining a saturated solution of ammonium chloride, containing an excess of undissolved crystals, at the bottom of the jar.

48.3.3 After 2 days at 80 % relative humidity, the 100 g sample is to be placed in a desiccator jar containing anhydrous calcium chloride for 2 days and then returned to the humidity jar. This alternating cycle is to be continued for three weeks, with observations made for caking of the dry chemical. Any lumps found are to be dropped from a height of 100 mm (4 in) onto a smooth, hard surface to determine whether they are friable.

48.4 Dielectric strength test

48.4.1 The apparatus for determining the dielectric breakdown voltage of dry chemicals is to consist of a test cup constructed in accordance with ASTM D877, with electrodes rigidly mounted, and a step-up transformer energized from an acceptable voltage source. The axes of the electrodes are to be positioned horizontally with a 2.54 mm (0.100 in) spacing between the electrodes. The electrodes and the test cup are to be thoroughly cleaned.

48.4.2 Dielectric breakdown voltage tests are to be conducted by filling the test cup with dry chemical to a point over the top of the electrodes. The cup then is to be shaken on a shaker for 15 minutes. Voltage is

to be applied and increased at a uniform rate until breakdown occurs as indicated by continuous discharge across the gap.

49 Servicing Tests

49.1 After 30 recharging cycles as described in 49.2, a rechargeable extinguisher charged with its rated capacity shall retain its charge during a 24-hour conditioning cycle at minimum storage and use temperature and then shall comply with the requirements of the Discharge Duration Test, Section 28, and the Hydrostatic Pressure Test, Section 40.

49.2 During each cycle, the extinguisher is to be cleaned, filled with agent, pressurized or fitted with an expellant gas cartridge, and discharged according to the manufacturer's written instructions. The complete valve assembly, including discharge nozzle, stem, pressure gauge, and siphon tube assembly is to be disassembled during the first, tenth, twentieth, and thirtieth cycles, according to the manufacturer's written instructions. After the tenth cycle, an extinguisher having polymeric parts is to be subjected to the Aging Tests – Polymeric Materials, Section 44, except that the test duration is to be reduced to 90 days at 100 °C (212 °F) for a valve and valve part, and 45 days at 100 °C (212 °F) for a siphon tube assembly.

50 One-Year Time Leakage Test

50.1 A stored-pressure type extinguisher shall retain its expellant-gas charge for 1 year at a temperature of 21 ±4 °C (70 ±7 °F).

50.2 Twelve sample extinguishers charged with their rated capacity are to be tested and the pressure checked after 1, 3, 6, and 12 months. Any loss in pressure is an indication of leakage. When indicated, the leakage shall not exceed the rate when the pressure drops to the lower limit of the operable pressure range in 2 years. For rechargeable extinguishers at least half of the samples are to be discharged and recharged at the 3 month and 6 month points during the one-year test period.

50.3 A cartridge for an expellant-gas type extinguisher shall retain its charge, without leakage, for 1 year at a temperature of 21 ±4 °C (70 ±7 °F) and at a temperature of 49 ±2 °C (120 ±3 °F).

50.4 Thirty samples of the gas cartridge are to be weighed and stored at a temperature of 21 ±4 °C (70 ±7 °F) and six samples are to be weighed and stored at a temperature of 49 ±2 °C (120 ±3 °F). They are to be reweighed after 1, 3, 6, and 12 months.

51 Calibration Test – Gauges and Indicators

51.1 An indicator shall be accurate to within 4 % of the charging pressure at the lower limit of the operable range.

51.2 The error of a pressure gauge at the indicated charging pressure and at the upper and lower limits of the operable range shall not exceed ±4 % of the charging pressure. At the zero pressure mark the error shall not exceed plus 12, minus 0 % of the charging pressure. At the maximum indicated pressure, the error shall not exceed ±15 % of the charging pressure.

51.3 The pressure gauge or indicator is to be installed on a deadweight gauge tester or a piping apparatus with a master gauge having an accuracy of a minimum 1/4 of 1 %. The pressurizing medium shall be oil, water, nitrogen, or air, and all tests on a given type of gauge are to be conducted using the same medium. The pressure is to be applied to the gauge under test in uniform increments until the upper limit of the gauge is reached. The pressure then is to be reduced in the same increments until the zero point is reached. The pressure applied, the gauge or indicator reading, and net error are to be recorded for each increment in both the increasing and decreasing pressure conditions.

52 Burst Strength Test – Gauges and Indicators

52.1 A pressure gauge or indicator shall withstand, for 1 minute, a pressure of six times the indicated charging pressure without rupture. In addition, if the Bourdon Tube or pressure-retaining assembly bursts at a pressure less than eight times the indicated charging pressure, no parts of the device shall be thrown.

52.2 The sample gauge or indicator is to be attached to a hydraulic pressure pump after all air has been excluded from the test system. The sample is to be placed in a test cage and the pressure applied at a rate of approximately 2000 kPa/min (300 psig/min) until the required test pressure is reached. The pressure is to be held for 1 minute, then increased until rupture occurs or eight times the indicated charging pressure is reached, whichever occurs first.

53 Water Resistance Test – Gauges and Indicators

53.1 A gauge or indicator for use on an extinguisher shall remain watertight after being immersed in 0.30 m (1 ft) of water for 2 hours, and after being subjected to the Salt Spray Corrosion Test, Section 46, and when polymeric parts are used, after exposure to the Aging Tests – Polymeric Materials, Section 44.

54 Leakage Test – Gauges and Indicators

54.1 A pressure gauge or indicator shall not leak at a rate in excess of 1×10^{-6} cc/s (6.1×10^{-8} in^3/s) when the gauge or indicator (including a press-to-test type indicator) is exposed to a pressure equivalent to the intended operating pressure of the extinguisher at 21 °C (70 °F).

54.2 A leak detection apparatus and leak standard are to be used to verify compliance with the requirements specified in 54.1. The leak detection apparatus is to be capable of signaling, and the leak standard capable of generating, a leakage rate of 1×10^{-6} cc/s (6.1×10^{-8} in^3/s).

54.3 Twelve sample gauges or indicators, as applicable and without pressure relief devices for the type using such devices, are to be individually pressurized to a pressure equivalent to the intended operating pressure of the extinguisher at 21 °C (70 °F). Each sample gauge or indicator, other than a pin-type indicator, is then to be subjected to a leak test by checking all pressurized components for leakage in order to verify compliance with the requirements in 54.1. Each pin-type indicator is to be tested for leakage by checking the opening sealed by the indicator for leakage. None of the samples shall exhibit leakage at a rate in excess of 1×10^{-6} cc/s (6.1×10^{-8} in^3/s).

55 Cycling Test – Pressure Indicators

55.1 An extinguisher with a press-to-test type pressure indicator shall not have a loss of pressure, as evidenced by a reduction of indicator pin length, after 300 cycles of pressure indicator operation.

55.2 An extinguisher with a press-to-test type pressure indicator is to be charged with its rated capacity with nitrogen and extinguishing agent. The press-to-test indicator pin length is to be measured from the valve assembly to the top of the pin. The indicator is then to be pressed and released 75 times each week for four weeks, for a total of 300 cycles. Measurements of the indicator pin length are to be taken after each 75 cycles, to determine compliance with 55.1.

56 Vibration Test – Pressure Gauges And Indicators

56.1 A pressure gauge and indicator shall be capable of withstanding the Vibration Test, Section 41, and shall comply with the Calibration Test – Gauges and Indicators, Section 51, following the Vibration test.

57 Overpressure Test – Gauges

57.1 The difference in readings of indicated charge pressure before and after a pressure gauge is subjected for 3 hours to a pressure of 110 % of the indicated gauge capacity shall not exceed 4 % of the indicated charge pressure.

57.2 Sample pressure gauges are to be subjected to the required test pressure for 3 hours. The pressure then is to be released and the gauges allowed to stand at zero pressure for 1 hour. The gauges then are to be subjected to the Calibration Test – Gauges and Indicators, Section 51.

58 Impulse Test – Gauges

58.1 The difference in readings of indicated charge pressure before and after a pressure gauge used on a rechargeable extinguisher is subjected to 1000 cycles of pressure impulse shall not exceed 4 % of the indicated charging pressure.

58.2 Sample pressure gauges are to be attached to a regulated source of pressure, either air, nitrogen, or water. The pressure then is to be varied from 0 to 125 % of the indicated charging pressure, or from 0 to 66 % of the gauge capacity, whichever is higher, and then back to 0 at a rate of six complete cycles each minute. The samples then are to be subjected to the Calibration Test – Gauges and Indicators, Section 51.

59 Pressure Gauge Relief Test

59.1 A pressure gauge shall have a pressure relief that vents in the event of a Bourdon Tube leak. This pressure relief shall function at a pressure of 350 kPa (50 psig) or less within 24 hours. The minimum flow capacity of the pressure relief at 350 kPa (50 psig) shall be 1 liter per hour measured at 0 kPa (0 psig) and 25 ±4 °C (77 ±7 °F).

59.2 This test is to be conducted on pressure gauges with the Bourdon Tube cut completely through. The gauge is to be immersed under water with the gauge inlet connected to a regulated source of air or nitrogen. The supply pressure is to be maintained at 350 kPa (50 psig) until the pressure relief functions, or for 24 hours, whichever is shorter. The flow rate is to be measured with an inverted water column or other equivalent means.

60 Nameplate Exposure Tests

60.1 There shall be no significant deterioration of the legibility, such as darkening, fogging or blistering, of a nameplate upon completion of the exposures specified in 60.2 (b) – (f) as compared to 60.2(a) nor shall there be any cracking or curling at the edges.

60.2 Prior to the exposures specified in (a) – (f), sample pressure-sensitive type nameplates are to be applied to test surfaces representative of the surface employed in the intended application. Curvature of this surface is to have the minimum radius anticipated in application. Each of the exposures specified in (b) – (f) is to be preceded by that specified in (a).

a) 72 hours at 23 ±2 °C (73 ±4 °F) and 50 ±5 % relative humidity.

b) 24 hours at minus 54 ±2 °C (minus 65 ±4 °F) or minus 40 ±2 °C (minus 40 ±4 °F), depending on intended use.

c) 6 weeks at 60 ±2 °C (140 ±4 °F) and 97 ±3 % relative humidity.

d) 90 days air-oven aging (mechanical convection) at 87 ±1 °C (189 ±2 °F).

e) 720 hours in ultraviolet light and water. See 44.3.1.

f) 48 hours immersion in distilled water 23 ±2 °C (73 ±4 °F).

61 Nameplate Adhesion Test

61.1 A pressure-sensitive nameplate containing the model number and extinguisher classification shall have an average adhesion after a 72-hour exposure to air at 23 ±2 °C (73 ±4 °F) and 50 ±5 % relative humidity of a minimum 0.18 N/mm (1 lb-f/in) of nameplate width. Following the exposures specified in 60.2 (b) – (f), the average adhesion shall be a minimum 0.09 N/mm (1/2 lb-f/in) of nameplate width. The nameplate shall not be removable intact, showing signs of tearing, deformation or destruction of printed information when removal is attempted by hand following exposure specified in 60.2(a).

61.2 Sample nameplates are to be affixed to test surfaces representative of the surface employed in the intended application. The surface is to have a curvature with the minimum radius anticipated in application. The samples then are to be subjected to each of the exposures specified in 60.2 (b) – (f). After the exposure, the samples are to be conditioned for not less than 24 hours at 23 ±2 °C (73 ±4 °F) and 50 ±5 % relative humidity and the nameplate is to be pulled from the surface at an angle of 90° to the surface and at a constant speed of 50 mm/min (2 in/min) by means of an Instron testing machine. The force to remove the nameplate is to be recorded. The results obtained from a minimum three samples subjected to each exposure are to be averaged.

62 Nameplate Abrasion Test

62.1 After being subjected to the exposure specified in 60.2(a), a nameplate shall remain intact, readable, and legible after being subjected to 500 strokes of emery cloth and to 500 strokes of a cloth covered with household detergents or cleansers.

Exception: Overlaminated or subsurface printed nameplates are not required to be subjected to the 500 strokes of a cloth covered with household detergents or cleansers requirement.

62.2 The apparatus for this test is to consist of common household detergents and cleaners and medium grade, 100 grit emery cloth.

62.3 The extinguisher is to be laid on its side and a strip of medium emery cloth, 25 mm (1 in) wide and long enough to cover half of the circumference of the extinguisher plus 150 mm (6 in), is to be draped over the nameplate. Weights of 0.45 kg (1 lb) each are to be attached vertically to the ends of the emery cloth. The weights are to be alternately unbalanced by quickly lifting one 125 mm (5 in), then the other. One stroke shall be performed as a single unidirectional movement that occurs after the balance force on one weight is removed until balance is restored and movement stops. The tests using detergent and cleanser, with a cloth, are to be conducted similarly but with the following exceptions. The weights, 0.45 kg (1 lb) each, are to be attached to a belt, 50 mm (2 in) wide, and the belt is to be placed over a cloth folded to form a pad, 50 mm (2 in) wide by 200 mm (8 in) long. The pad is to be wetted, squeezed by one hand to a damp condition, the powdered cleanser is to be applied liberally, and any excess powder shaken off. The powdering procedure is to be repeated for each series of 25 strokes for the duration of the test.

PACKAGING

Advisory Note: In Canada, there are two official languages, English and French. Annex A lists acceptable French translations of the markings specified in this Standard. All markings required by this Standard may have to be in other languages to conform with the language requirements where the product is to be used.