UL 147B

STANDARD FOR SAFETY

Nonrefillable (Disposable) Type Metal Container Assemblies for Butane

UL Standard for Safety for Nonrefillable (Disposable) Type Metal Container Assemblies for Butane, UL 147B

Fourth Edition, Dated August 25, 2016

Summary of Topics

This revision of ANSI/UL 147B dated November 6, 2019 is issued to revised the Fire Test.

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated August 23, 2019.

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The most recent designation of ANSI/UL 147B as an American National Standard (ANSI) occurred on October 29, 2019. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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

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INTRODUCTION

1 Scope

1.1 These requirements cover nonrefillable (disposable) aerosol type metal container assemblies, charged with a commercial grade hydrocarbon fuel gas (primarily butane), constructed, charged, and marked in accordance with Code of Federal Regulations, Title 49, Specification 2P or 2Q.

1.2 Nonrefillable type metal container assemblies covered by these requirements are used with equipment for such purposes as, but not limited to, camping, cooking, heating, lighting, soldering, or brazing, and as covered in the following standards:

a) Liquefied Petroleum Gas Code, NFPA 58.

b) Standard for Hand-Held Torches for Fuel Gases, UL 147.

1.3 These requirements do not cover DOT 39 specification cylinder assemblies covered by the requirements in the Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies, UL 147A.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.1.2 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b) Is superseded by a requirement in this standard.

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

2.1.4 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.

2.2 Units of measurement

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

2.3 Undated references

2.3.1 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 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 BUTANE – A liquefied petroleum gas composed predominantly of two isomeric forms, normal or ISO-, either by themselves or as mixtures where the vapor pressure does not exceed that for commercial butane in accordance with the Standard Specification for Liquefied Petroleum (LP) Gases, ASTM D1835 REV A-2003.

3.3 CONTAINER – Inside nonrefillable metal canister that complies with the specification for Inside Containers and Linings constructed under Subpart B of Part 178 of the DOT Regulations and similar specifications of the CTC Regulations.

3.4 CTC REGULATIONS – The Canadian Transport Commission (CTC) Regulations for the Transportation of Dangerous Commodities by Rail.

3.5 DOT REGULATIONS – The U. S. Department of Transportation (DOT) Regulations for the Transportation of Hazardous Materials, under Code of Federal Regulations (CFR) Title 49, Parts 100-199.

3.6 PRESSURE-RELIEF DEVICE – A pressure or temperature, or both, activated device used to prevent the pressure from rising a predetermined maximum, and thereby prevent rupture of a normally charged cylinder when subjected to a standard fire test as required by 49CFR 173.34 (f) of the TC and CTC regulations. The term "pressure relief device" is synonymous with "safety relief device" as used by DOT, TC or CTC regulations.

3.7 TC REGULATIONS – The regulations of Transport Canada as published in Transportation of Dangerous Goods Regulations.

4 Pressure and Temperature Limitations

4.1 The maximum pressure of the container assembly shall not exceed the limits specified in Code of Federal Regulation, Title 49, 173.304a(d)(3)(ii); These limits are 45 psig (310 kPa) at 70°F (21°C) and 105 psig (724 kPa) at 130°F (54.4°C).

Exception: A container assembly may exceed these limits if U. S. DOT grants an exemption and documentation is presented at the time of investigation.

4.2 Nonrefillable type metal containers covered by these requirements are intended for use at normal room ambient temperatures and storage at a temperature not exceeding 130°F (54.4°C).

5 Size and Filling Limitations

5.1 The maximum size of the nonrefillable type metal container shall be not greater than 36.62 cubic inches (600 ml). This is equivalent to 1.32 pounds (600 g) water capacity.

Exception: A container assembly may exceed the size limitation if the U.S. DOT grants an exemption and documentation is presented at the time of the investigation.

5.2 The maximum hydrocarbon fuel gas (primarily butane) content in a nonrefillable metal container constructed in accordance with DOT 2P or 2Q specifications shall not exceed 32 cubic inches (500 mL), and the maximum filling density shall be in accordance with Code of Federal Regulation, Title 49, Part 173.304(e)(1).

Exception: A container assembly may exceed the filling limits if the U.S. DOT grants an exemption and documentation is presented at the time of the investigation.

5.3 Hydrocarbon fuel gas (primarily butane) that is contained in nonrefillable metal container assemblies shall be odorized in accordance with the Standard for Liquefied Petroleum Gas Code, NFPA 58.

CONSTRUCTION

6 General

6.1 A nonrefillable metal container assembly shall incorporate a pressure vessel constructed in accordance with this standard and the, Code of Federal Regulations, Title 49, Chapter I, Part 178.33 or 178.33(a), Specification 2P or 2Q respectively, and be so marked.

Exception: A pressure vessel may be other than specification 2P or 2Q if the U. S. DOT grants an exemption and documentation is presented at the time of the investigation.

6.2 The pressure vessel shall be seamless or with seams. Side wall seam shall be of welded construction. Circumferential seams shall be by welding, swedging, brazing, soldering double seaming, or triple seaming. The ends shall be concave or convex.

6.3 A nonrefillable metal container assembly shall be made of corrosion-resistant material or be provided with a corrosion-resistant exterior coating equivalent to that afforded by paint.

7 Assembly

7.1 A nonrefillable metal container assembly shall include all of the components necessary for its intended function and installation, and shall be furnished as a single unit or assembly.

7.2 A nonrefillable metal container assembly is intended only for vapor withdrawal. If the container assembly is for horizontal installation and use, the design of the withdrawal tube and metal container assembly shall minimize the risk of liquid entering the tube and be so marked. See 20.1(f).

7.3 A nonrefillable metal container assembly shall be provided with an integral shutoff valve that closes automatically when the assembly is disconnected from the gas consuming equipment.

7.4 The shutoff valve connection shall provide protection against impact or the metal container assembly shall incorporate a cover or cap and be marked in accordance with 20.2. See the Drop Test, Section 15.

7.5 A nonrefillable metal container assembly shall incorporate pressure relief device(s) or system(s) that will operate to reduce the risk of rupture or propulsion of container parts from pressure buildup from a fire condition. See the Fire Test, Section 16.

8 Materials

8.1 A material for pressure vessel or gas-confining components shall have a minimum melting point (solidus temperature) of not less than 950°F (510°C) and a tensile strength of not less than 10,000 psi (68.9 MPa) at 400°F (204°C).

Exception: A valve disc or stem, soft seat, seal ring, or gasket need not comply with this requirement.

8.2 Materials shall be resistant to the action of butane fuel gas.

8.3 With reference to the requirement in 8.2, elastomeric and polymeric materials shall be subjected to the Accelerated Aging Test, Section 17, and the Butane Compatibility Test, Section 18.

Exception: Chlorotrifluoroethylene polymers, tetrafluoroethylene, fluorinated ethylene propylene polymers, and polyamids with a composition of polyhexamethylene adipamide or polycapromide polymers (nylon 6 or 6/6) are acceptable without test.

8.4 If atmospheric corrosion of a ferrous part will impair the intended operation, the part shall be provided with a corrosion-resistant protective coating.

8.5 *Deleted.*

8.6 *Deleted.*

PERFORMANCE

9 General

9.1 Three representative sample of each size and specific construction of metal container assembly and parts constructed of nonmetallic materials are to be subjected to the tests specified in Sections 10 – 18, as appropriate.

9.2 For leakage tests, a source of aerostatic pressure such as air or nitrogen is to be used.

9.3 Water or other liquid of comparable or lighter viscosity may be used for producing the required pressure in a hydrostatic-pressure strength test.

10 Pressure Test

10.1 A representative sample of the metal container assembly shall not leak externally or exceed the pressure limit specified in 4.1 when tested in accordance with 10.2.

10.2 Three metal container assemblies fully charged in accordance with the manufacturer's production procedures are to be immersed into a water bath maintained at 130°F (54.4°C) until maximum pressure is established. Means are to be provided to monitor the internal pressure of each assembly during this test.

11 Leakage Test

11.1 A representative sample of the metal container assembly shall not show evidence of external leakage at the shutoff valve inlet connection or container joints when subjected to 1-1/2 times the maximum pressure developed under the Pressure Test, Section 10.1, when tested in accordance with 11.2.

11.2 Three empty metal container assemblies arranged with an auxiliary inlet shall be used. The pressure supply piping system shall be capable of applying the test pressure and include a shutoff valve and pressure indicating device. Each sample in turn shall be connected to the pressure system through the inlet valve and subjected to the test pressure. The sample shall then be disconnected from the system and checked for external leakage by immersing in a water bath, or by using a soap and water or other equivalent leak detection solution. The test pressure shall be applied for 1 minute. The pressure indicating device shall comply with one of the following:

a) An analog gauge having a pressure range of not less than 1-1/2 times nor more than two times the test pressure;

b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or

c) Other device that is equivalent to the devices in (a) or (b).

12 Connection Valve Endurance Test

12.1 Each type of connection valve assembly shall be subjected to repeated cycles of opening and closing as specified in 12.2. After the endurance test, the valve shall comply with the leakage test requirements specified in 11.1.

12.2 One sample of each different style of valve is to be subjected to a 1500 cycle test conducted in the following manner. The valve is to be connected to a source of aerostatic pressure maintained at 50 psig (345 kPa) for the duration of the test. A mating probe is to be used to depress the valve pin sufficiently to fully unseat the valve poppet and then backed off to close the valve poppet. The rating of cycling shall not exceed 30 cycles per minute.

13 Hydrostatic Pressure Strength Test

13.1 A representative sample of the metal container assembly shall not rupture when tested in accordance with 13.2 and 13.3. A metal container assembly may show evidence of visible deformation or leakage externally during the test sequence.

13.2 Three samples of the metal container assembly without the relief device(s) shall be used. Each sample is to be connected to a source of hydrostatic pressure. A shutoff valve and a calibrated pressure indicating device are to be installed in the pressure-supply piping. The pressure gauge is to be installed in the pressure-supply piping between the shutoff valve and the torch. The samples are to be completely filled with liquid and all air is to be expelled. The pressure indicating device shall comply with one of the following:

a) An analog gauge having a pressure range of not less than 1-1/2 times nor more than two times the test pressure;

b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or

c) Other device that is equivalent to the devices in (a) or (b).

13.3 The test pressure shall be increased slowly to four times the pressure developed in the Pressure Test, Section 10, and maintained for 1 minute.

14 Relief System Operation Test

14.1 A representative sample of the relief system incorporated in the metal container assembly shall operate within the range of 200 to 250 psig (1380 to 1724 kPa) when tested in accordance with 14.2. The relief system is not required to reseal.

14.2 Three samples of the system incorporated into three empty metal container assemblies shall be used. Each sample shall be connected to an adequate source of aerostatic pressure. A shutoff valve and calibrated pressure indicating device are to be installed in the pressure supply piping. Each sample shall be subjected to increasing aerostatic pressure at a rating not exceeding 250 psig per minute (1724 kPa per minute) until the device opens to relieve pressure. The pressure indicating device shall comply with one of the following:

a) An analog gauge having a pressure range of not less than 1-1/2 times nor more than two times the upper limit of the range specified in 14.1;

b) A digital pressure transducer, or other digital gauge, that is calibrated over a range of pressure that includes the test pressure; or

c) Other device that is equivalent to the devices in (a) or (b).

15 Drop Test

15.1 Representative samples, fully charged, of the container assembly are to be subjected to the test conditions described in 15.2 and 15.3. If leakage is observed after any of the impacts, the container assembly shall incorporate a cover or cap and be marked in accordance with 20.2. This test is then to be repeated with the cap or cover in place and there shall be no evidence of leakage.

15.2 Three samples, fully charged in accordance with the manufacturer's recommendations, are to be individually dropped from rest through a vertical distance of 4 feet (1.2 m) onto a concrete surface. One sample each is to be dropped as follows:

a) With the height of the container in a perpendicular orientation to the concrete surface such that impact is made on the valve stem or collar.

b) With the height of the container at 45 degrees from perpendicular orientation such that impact is made on the edge of the collar.

c) With the height of the container at 45 degrees from perpendicular orientation such that impact is made on the edge of the collar opposite (b).

15.3 After impact, each container is to be checked for leakage in a water bath maintained at 130°F (55°C) for 1 minute.

16 Fire Test

16.1 A metal container assembly is to be subjected to the heat of a charcoal fire as specified in 16.2 – 16.4. The relief device(s) or system(s) provided on the container assembly shall operate to prevent any part of the cylinder from being propelled or thrown from the assembly.

16.2 Nine sample metal container assemblies, fully charged by the manufacturer, are to be used. A charcoal fire, 24 by 18 by 6 inches (610 by 457 by 152 mm) high, is to be prepared within a 3-sided concrete-block, cinder block or brick enclosure. The top and one long side of the enclosure are to be open for observation.

16.3 A metal grate with minimum 1/2 inch spacings or wire screen with minimum 1/4 inch openings on which the samples are placed, is to be placed on top of the charcoals. The grate or metal wire screen shall be even with the top of the enclosure (described in 16.2). The temperature shall be measured in the air space between the screen and the charcoals, below the sample. The temperature during the test shall be between 1000 and 1200°F (537 and 649°C). Thermocouples may be used to measure the temperature. Thermocouples and related instruments are to be accurate and calibrated in accordance with good laboratory practice.

16.4 The samples shall be individually tested in the charcoal fire. Three samples in each position of vertical up, vertical down, and horizontal shall be tested. The test shall be conducted until the entire contents of the container have been exhausted.