UL 147

STANDARD FOR SAFETY

Hand-Held Torches For Fuel Gases

UL Standard for Safety for Hand-Held Torches For Fuel Gases, UL 147

Seventh Edition, Dated March 5, 2015

SUMMARY OF TOPICS

This revision of ANSI/UL 147 dated April 28, 2021 includes a change to the Temperature Test in 16.3.

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 March 5, 2021.

No Text on This Page

MARCH 5, 2015
(Title Page Reprinted: April 28, 2021)

UL 147

Standard for Hand-Held Torches for Fuel Gases

The first and second editions were titled LP-Gas Torches. The third edition was titled LP- and MPS-Gas Torches.

First Edition – November, 1970
Second Edition – August, 1973
Third Edition – July, 1984
Fourth Edition – October, 1992
Fifth Edition – September, 1996
Sixth Edition – February, 2005

Seventh Edition

March 5, 2015

This ANSI/UL Standard for Safety consists of the Seventh edition including revisions through April 28, 2021.

The most recent designation of ANSI/UL 147 as an American National Standard (ANSI) occurred on April 9, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 147 on September 26, 1988. 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 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.

No Text on This Page

CONTENTS

INTRODUCTION

1 Scope

1.1 These requirements cover hand-held torches of the air aspirating type for operations such as heating, soldering, and brazing.

1.2 Torches covered by these requirements are intended to operate on commercial grade fuel gases other than acetylene as defined in the Standard for Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes, NFPA 51.

1.3 Torches covered by these requirements are intended for direct connection to disposable containers covered in the Standard for Nonrefillable (Disposable) Type Fuel Gas Cylinder Assemblies, UL 147A, Standard for Nonrefillable (Disposable) Type Metal Container Assemblies for Butane, UL 147B, or similar type disposable containers, or as covered by 1.4.

1.4 Torches covered by these requirements may incorporate integral container assemblies which may be refillable.

1.5 LP-Gas torches are intended for use in accordance with the Liquefied Petroleum Gas Code, NFPA 58.

1.6 Torches covered by these requirements shall be permitted to incorporate a hose assembly and shall be permitted to be used with refillable containers greater than 2.71 pound (1.23 kg) water capacity.

1.7 These requirements also cover battery-operated torches covered in Supplement SA – Battery-Operated Ignited Torches in this Standard.

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 Operating Instructions

3.1 Operating instructions shall be provided with each torch assembly and shall accompany the samples that are submitted for investigation. These instructions are to be used as a guide in the examination and test of the product. For this purpose, a final printed edition is not required.

3.2 The instructions shall include such directions and information as deemed by the manufacturer to be necessary for the intended installation, maintenance, and the use of the product.

3.3 Instructions for torches incorporating refillable integral containers shall include filling procedures.

4 Service Pressure Ratings

4.1 The service pressure rating of a torch unit intended for use with propane or Methylacetylene-Propediene, Stabilized-Gas (MPS-Gas) shall not be less than 250 psig (1.7 MPa).

4.2 The service pressure rating of a torch unit intended for use with propylene shall not be less than 325 psig (2.2 MPa).

4.3 The service pressure rating of a torch unit intended for butane, butane-propane mixtures, or other fuel gases, not covered by 4.1 and 4.2, shall not be less than the vapor pressure of the fuel gas at 130°F (54.4°C).

CONSTRUCTION

5 Assembly

5.1 A torch unit consists of a valve body assembly burner tube, orifice(s), and burner head(s). A torch unit may also incorporate an integral container assembly that may be refillable.

5.2 The integral container assembly for a torch unit shall have a maximum size limitation of 4.0 fluid ounces (118.3 ml).

5.3 A torch unit that incorporates a cap intended to be placed over the burner head, shall be constructed so that the shutoff valve control is not likely to be unintentionally moved to the on position with the cap in place.

5.4 If specific fittings or parts are required for making the intended assembly, such parts shall be furnished by the manufacturer with each torch unit.

5.5 A torch unit shall be provided with means for flow regulation and positive fuel shutoff. If a valve stem is employed, the stem shall be constructed so that it cannot be completely withdrawn from the body by reverse rotation. Threads of a valve stem shall not enter a stuffing box recess, or otherwise interfere with the stem seal area of the body.

5.6 If an integral container assembly is refillable, in accordance with 5.1, the container assembly shall be provided with a shutoff valve arrangement that closes automatically when the torch unit is separated from the refilling fuel container during the filling process.

5.7 A brazing material used for joining liquid-confining parts of a torch shall have a melting point (solidus temperature) not less than 1000°F (538°C).

5.8 A torch unit with integral fuel container shall be equipped with pressure relief device(s) or system(s), or be constructed so that the torch will not rupture or be violently propelled when exposed to a fire condition. See the Fire Test on Torch Units with Integral Containers, Section 17.

5.9 Torches that incorporate a hose assembly shall have the following components and they shall be evaluated to the appropriate UL standard:

a) LP-gas hose assembly – Standard for LP-Gas Hose, UL 21 or the Standard for Pigtails and Flexible Hose Connectors for LP-Gas, UL 569;

b) Compressed gas regulator or LP-Gas regulator – Standard for Compressed Gas Regulators, UL 252 or Standard for Pressure Regulating Valves for LP-Gas, UL 144;

c) Regulator accessories (if provided) – Standard for Compressed Gas Regulator Accessories, UL 252A; and

d) Excess Flow Valve – Standard for Valves for Anhydrous Ammonia and LP-Gas (Other Than Safety Relief), UL 125.

Exception: If the manufacturer does not provide any of the above components the safety instructions shall state that the torches are for use only with UL Listed regulator, compressed gas regulator (for use with LP-Gas), and/or excess flow check valve as applicable.

6 Connections

6.1 The inlet of the torch unit other than a torch unit with integral container assembly shall comply with the requirements for a CGA No. 600 connection in accordance with the Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI/CGA V-1.

Exception: A torch unit that incorporates another type of inlet connection need not comply with this requirement if the torch unit is marked in accordance with 24.2 and the operating instructions include directions for leak free connection to the specific type and model designation of fuel container.

6.2 The hose connection for LP-Gas hose shall be provided with a CGA 510, CGA 791, or CGA 810 (Type I or Type II) outlet connection complying with the Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI/CGA V-1.

7 Materials

7.1 Materials shall be resistant to the action of the liquid to which they will be exposed in service.

7.2 With reference to the requirement in 7.1, elastomeric and polymeric materials shall be subjected to the Accelerated Aging Test, Section 21 and the Fuel Gas Compatibility Test, Section 22.

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

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

7.4 A protective coating shall resist corrosion to the degree not less than that provided by the protective coatings specified in 7.5.

7.5 Cadmium plating shall have a thickness of not less than 0.0003 inch (0.008 mm), and zinc plating shall have a thickness of not less than 0.0005 inch (0.013 mm).

Exception: If threads constitute the major portion of the area of a part, the thickness of the cadmium or zinc plating may be not less than 0.00015 inch (0.0038 mm).

7.6 A fuel-confining part of a burner that is made of drawn brass or machined from brass rod made of copper alloy containing more than 15 percent zinc and incorporating internal threads shall withstand without cracking, the Moist Ammonia-Air Stress Cracking Test, Section 20.

7.7 Parts made of metals having widely varying coefficients of thermal expansion and exposed to heat shall not be used in combination if threaded together with the intent to reduce the likelihood of external leakage of fuel.

7.8 Copper or brass tubing and fittings containing more than 67-percent copper shall not be used for parts in contact with MPS-Gas.

7.9 An operating or gas-confining part of a torch unit shall have sufficient strength and durability to provide reliable service of the part and of the assembly.

7.10 To conform to the requirements of 7.9, a gas-confining material is to have a 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 No. 1: A valve disc, soft seat, seal ring, diaphragm, or gasket need not comply with this requirement.

Exception No. 2: A torch unit for butane incorporating an integral container assembly complying with 5.2 and subjected to the Hydrostatic Pressure Strength Test, Section 18, and the Sustained Pressure Test, Section 19 need not comply with this requirement.

7.11 Polymeric materials used for gas confining housings and caps for butane torches with integral container assemblies shall exhibit flammability characteristics in accordance with the Standard for Test for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94, flammability classification V-0, V-1, or V-2.

PERFORMANCE

8 General

8.1 Representative samples of each size and specific construction of torch are to be subjected to the tests specified in Sections 9 – 22. The number of samples required for tests are specified in Table 8.1. Additional samples of parts constructed of nonmetallic materials, such as gaskets and other seal materials, are required for physical and chemical tests.

8.2 If a torch is intended for operation on more than one fuel gas, the various performance tests described herein are to be conducted with all fuels and with any orifice/fuel combination possible, whether or not such combination is recommended by the manufacturer. The efficiency of the torch combinations is not to be considered during the tests. The torch units shall not create a risk of fire or injury to persons when tested in such combinations.

Table 8.1
Test samples required

Test	Torch unit	Torch unit with integral refillable container		Torch unit with integral disposable container (disposable torch unit)	
		Metallic container	Nonmetallic container	Metallic container	Nonmetallic container
Filling Procedure	Waived	3 samples		Waived	
Pressure	Waived	3 from Filling Test		3 samples	
Leakage	3 samples	3 samples[b]		3 samples[b]	
Drop	Waived	Waived	4 samples	Waived	4 samples
Operation	1 of 3	1 of 3 from Filling Test		1 of 3 from Pressure Test	
Flame Flare-Up	1 of 3	1 of 3 from Filling Test		1 of 3 from Pressure Test	
Valve Endurance	1 of 3	2 of 3 from Leakage (1 for shutoff valve, 1 for filler valve)		1 of 3 from Leakage Test	
Temperature	Same as Operation	1 of 3 from Filling Test		Same as Operation	
Fire	Waived	9 samples		9 samples	
Hydrostatic Strength	3 from Leakage Test	3 from Leakage Test	15 samples[a]	3 from Leakage Test	15 samples[a]
Sustained Pressure	Waived	Waived	24 samples[a]	Waived	24 samples[a]
Moist Ammonia-Air Stress Cracking Test	c	c		c	
Accelerated Air Oven Aging	c	c		c	
Fuel Gas Compatibility	c	c		c	

[a] These samples may be the fuel container portion only with a fitting attached to connect to NPT piping system.

[b] These samples shall incorporate a fitting to connect to NPT piping system, with the filling connection, if appropriate, still intact.

[c] Individual parts or components of complete assembly are needed. The exact number will be specified at time of investigation.

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

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

9 Filling Procedure Test

9.1 The risk of fire or injury to persons shall not be created during the filling sequence. It is recognized that some fuel will be released during the filling process.

9.2 Three representative samples of a torch unit incorporating a refillable integral container are to be used. Following the manufacturer's instructions, the units are to be filled using recommended and similar commercially available fuel containers. Following this test, the samples are to be subjected to the Pressure Test, Section 10.

10 Pressure Test

10.1 Representative samples of the torch unit with integral container assembly fully charged is to be subjected to a water bath maintained at 130° F (54.4° C) until maximum pressure is established. No external leakage shall be observed. The test is to be conducted until the pressure has stabilized.

10.2 This test is to be conducted on three samples of a torch unit containing an integral container assembly and on the same samples subjected to the Filling Procedure Test, Section 9. Means shall be provided on the samples for the measurement of pressure.

10.3 During this test the burner shutoff valve is to be in the closed position.

11 Leakage Test

11.1 A torch unit is to be subjected for one minute to an internal aerostatic pressure of not less than 1-1/2 times the service pressure specified in Service Pressure Ratings, Section 4. There shall be no observable leakage.

11.2 This test is to be conducted on three samples of each torch unit design. For torch units incorporating an integral container assembly, the container portion is to be provided with a fitting for connection to a source of aerostatic pressure. The samples are to be tested with the shutoff valve in a closed position so that seat leakage, as well as external leakage, can be checked.

12 Drop Test

12.1 Representative samples of the torch unit incorporating a nonmetallic container assembly shall not show evidence of cracking, splitting, or rupture, or leak externally when tested in accordance with 12.2.

12.2 Four samples are to be used, two of which are to be subjected to a circulating air oven for 30 days at 212°F (100°C) and two are to be in the as-received condition prior to test. The samples are to be fully charged in accordance with the manufacturer's recommendations and then dropped from rest through a vertical distance of 4 feet (1.2 m) onto a concrete surface so as to impact the side and edge of the container.

13 Operation Test

13.1 Each torch assembly is to be tested in accordance with the manufacturer's instructions and shall perform its intended function.

13.2 This test is to be conducted on the same samples subjected to the Leakage Test, Section 11, using:

a) Fuel containers charged as intended and

b) All equipment comprising the assembly.

14 Flame Flare-Up Test

14.1 Each torch assembly shall be tested to determine that the flame does not flare-up to a length exceeding 150 percent of the length and configuration recommended by the manufacturer's instructions. The flame is to be observed during the first 3 minutes of operation with the burner outlet held in any position level with or above the horizontal plane.

14.2 The test conditions specified in 14.1 are to be repeated with the assembly below the horizontal plane (assembly inverted), and if such excessive flare-up is noted, the manufacturer's operation manual shall warn against using the torch in the inverted position.

15 Valve-Endurance Test

15.1 Each burner shutoff valve and container filling valve, if provided, is to be subjected to repeated cycles of opening and closing as specified in 15.2. After the endurance test, the valve shall comply with the leakage test requirements specified in 11.1.

15.2 Samples of each different style of valve are to be subjected to a 1500-cycle test, conducted manually and with a closing force sufficient to stop leakage. The valve inlet is to be pressurized aerostatically during the test at 100 psig (690 kPa) if for use with propane, MPS-Gas or all fuel gases other than butane or butane-propane mixtures and at 50 psig (345 kPa) if for use with butane or butane-propane mixtures.

16 Temperature Test

16.1 A torch is to be subjected to the temperature test described in 16.2 – 16.4. The temperature rise:

a) On a supporting surface of a torch when placed in its intended stationary position shall not exceed 90°F (50°C).

b) On any handle or surface of a torch that is intended to be held during normal use shall not exceed:

1) 45°F (25°C) for a metallic surface and

2) 63°F (35°C) for a nonmetallic surface.

c) On any control knob, lever or other part that is intended for hand manipulation and is used by the operator to regulate or shut off the torch shall not exceed:

1) 54°F (30°C) for a metallic part and

2) 90°F (50°C) for a nonmetallic part.

16.2 The values specified in 16.1 are based on an assumed ambient temperature of 77° F (25° C). However, tests may be conducted at any ambient temperature within the range of 50 – 104°F (10 – 40°C).

16.3 The temperatures are to be monitored as the burner valve is manipulated to determine the position at which the highest temperatures are achieved. The torch is then to be connected to a new container of fuel and operated at that flow setting until all fuel is exhausted or for 8 hours, whichever comes first, or when the operating pressure drops below that recommended by the manufacturer as stated in their instruction manual.

16.4 Temperatures are to be determined by means of a potentiometer and thermocouples not larger than No. 24 AWG (0.21 mm^2). The thermocouple wire is to comply with the requirements listed in the Tolerances on Initial Values of EMF versus Temperature tables in the Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples, ANSI/ASTM E230/E230M. Thermocouples are to be attached to metal surfaces by soldering or brazing of junctions and to other surfaces by cement or tape to maintain thermal contact of junctions with the surface. Room temperature is to be taken by a shielded thermocouple located 18 inches (457 mm) from the torch assembly. Temperatures are to be observed and recorded while the torch is firing.

17 Fire Tests on Torch Units with Integral Containers

17.1 A torch unit incorporating an integral container shall be subjected to the heat of a charcoal fire as specified in 17.2, 17.3, and 17.4. The relief device system provided on the container or the inherent design

of the torch unit shall operate to prevent any part of the torch and container from being propelled or thrown from the assembly.

17.2 Nine samples of the torch assembly, fully charged, 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.

17.3 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 17.2). 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.

17.4 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.

18 Hydrostatic Pressure Strength Test

18.1 Three samples of a torch unit are to be subjected for 1 minute to a hydrostatic pressure of four times the rated service pressure as specified in Service Pressure Ratings, Section 4. The samples shall not rupture. If a nonmetallic material is used as a pressure confining component in accordance with 18.2, the test pressure is to be increased until failure occurs after the 1 minute hold period. The rupture pressure, after conditioning, shall be greater than or equal to 50 percent of the "as received" values and be greater than four times the rated service pressure as specified in Service Pressure Ratings, Section 4.

18.2 Fifteen additional samples of a torch unit incorporating a nonmetallic pressure confining component or integral container assembly are to be subjected to the conditions noted below prior to being subjected to the test conditions specified in 18.1:

a) Five samples are to be tested in the "as received" condition.

b) Five samples subjected to air oven aging for 30 days at 212°F (100°C).

c) Five samples filled with n-hexane or butane, pressurized to 40 psig (276 kPa) for 60 days at 73.4°F (23°C).

18.3 The samples are 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 indicating device is to be installed in the pressure-supply piping between the shutoff valve and the torch. The test sample is 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 not less than 1-1/2 times nor more than twice 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).

19 Sustained Pressure Test

19.1 Representative samples of butane torch units with nonmetallic bodies or integral container assembly, when tested in accordance with 19.2, shall have a calculated pressure rating greater than 105 psig (700 kPa) based upon methods in the Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products, ASTM D2837 (assuming a 0.50 service factor).

19.2 Twenty-four samples of the torch assembly will be required. Based upon test methods similar to those described in the Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure, ASTM D1598, samples of the torch assembly with appropriate fittings are to be connected to a hydrostatic test apparatus. One set of samples is to be subjected to slowly increasing internal pressure until rupture occurs. Other sets of samples are to be tested by holding the internal pressure at that estimated to obtain rupture at periods of approximately 10, 100, 1000, and 2400 hours.

20 Moist Ammonia-Air Stress Cracking Test

20.1 After being subjected to the conditions described in 20.2 – 20.4, a fuel-confining brass part containing more than 15 percent zinc shall show no evidence of cracking, delamination, or degradation.

20.2 One test sample of each size is to be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Samples with female tapered pipe 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 20.1. Samples with female threads other than tapered pipe threads shall be torqued as specified by the manufacturer. Polytetrafluoroethylene (PTFE) tape or pipe compound are not to be used on any threads. Samples with male threads are evaluated as received.

Table 20.1
Torque requirements for pipe connections

American standard pipe size, inches[a]	Outside diameter, inch	Outside diameter, (mm)	Torque, pound-inches	Torque, (N·m)
1/8	0.4	10.3	150	17
1/4	0.5	13.7	250	28
3/8	0.7	17.2	450	51
1/2	0.8	21.3	800	90
3/4	1.1	26.7	1000	113
1	1.3	33.4	1200	136

[a] Welded and Seamless Wrought Steel Pipe, ANSI/ASME B36.10M

20.3 The samples are then to be tested in accordance with Apparatus, Section 6, Reagents and Materials, Section 7, Test Media, Section 8, Test Sample Preparation (9.3 – 9.4), Test Procedure (10.1 – 10.4) of the Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys, ASTM B858-06, except the pH level of the test solution shall be High 10.5 ±0.1 and the exposure temperature shall be 25 ±1°C.

20.4 After the exposure period, the samples are to be examined for cracks or other signs of stress corrosion using a microscope having a magnification of 25X.

21 Accelerated Aging Test

21.1 A nonmetallic part is to be conditioned for 70 hours in an air oven at a temperature of 212° F (100°C). After conditioning, there shall be no cracking or visible evidence of deterioration.

22 Fuel Gas Compatibility

22.1 General

22.1.1 A nonmetallic part in contact with the gases described in Table 22.1 is to be subjected to the tests described in 22.2.1– 22.3.1. Polymeric parts other than those described in the exception to 7.2 shall show no evidence of appreciable shrinkage, warpage, cracking, or other signs of deterioration following the immersion test (s). The elastomeric part shall not show a change in volume of more than 25 percent swelling or 1 percent shrinkage, and a weight loss (extraction) of more than 10 percent.

Table 22.1
Test liquids for nonmetallic materials

Gas in contact with part	Test liquid
Propane, propane-butane mixtures[a]	n-Hexane
Methylacetylene-Propadiene Stabilized (MPS)	Liquid MPS
Other fuel gases other than propane, MPS-Gas, or hydrogen	Specified fuel Gas in liquid phase
Hydrogen	Test waived
[a] If the torch unit is for butane only, butane in the liquid phase may be used as the test fluid.	

22.1.2 With reference to the requirement in 22.1.1, if the limits for volume change or weight loss are exceeded, a complete torch unit is to be filled with the test fluid for 70 hours, following which the assembly shall comply with the requirements of the Leakage Test, Section 11, the Filling Procedure Test, Section 9, and the Pressure Test, Section 10, as appropriate.

22.2 Volume change

22.2.1 The volume change test is to be conducted as described in the Immersion Test of the Standard for Gaskets and Seals, UL 157.

22.3 Weight loss

22.3.1 The weight-loss test is to be conducted as described in the Immersion Test of the Standard for Gaskets and Seals, UL 157.

MANUFACTURING AND PRODUCTION TESTS

23 General

23.1 The manufacturer shall provide regular production control, inspection, and tests. The tests shall at least include those specified in 23.2.

23.2 Each torch assembly shall be attached to a fuel container that is charged as intended or attached to a test fixture and checked for operation, throttling, leakage, and complete shutoff of all valves. The test fixture is to be:

a) Connected to the appropriate fuel supply and

b) Provided with a connection for the torch that conforms to the requirements for a Compressed Gas Association (CGA) No. CGA 510, CGA 600, CGA 791, or CGA 810 connection in accordance with the Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI/CGA V-1.

MARKING

24 General

24.1 A product shall be legibly and permanently marked with:

a) The manufacturer's name, trade name, or trademark or other descriptive marking by which the organization responsible for the product may be identified;

b) A distinctive catalog number or the equivalent; and

c) The date or other dating period of manufacture not exceeding any three consecutive months.

Exception No. 1: The manufacturer's identification may be in a traceable code if the product is identified by the brand or trademark owned by a private labeler.

Exception No. 2: The date of manufacture may be abbreviated; or may be in a nationally accepted conventional code or in a code affirmed by the manufacturer, provided that the code:

a) Does not repeat in less than 10 years.

b) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.

24.2 A torch unit having a connection as described in the exception to 6.1 shall be marked to indicate the intended mating component.

24.3 All markings shall be legible and permanent as afforded by metal stamping, by a metal nameplate, by a decalcomania transfer, by molding in a casting by printing on a pressure-sensitive label secured by adhesive, or the equivalent.

24.4 To determine if a pressure-sensitive label, or a label secured by cement or adhesive is of a permanent nature, representative samples are to be subjected to exposure conditions for indoor use (standard atmosphere, water immersion, and oven-aging) and to exposure conditions for outdoor use (the above plus low temperature and ultraviolet light and water exposure), as specified in the requirements for permanence and legibility in the Standard for Marking and Labeling Systems, UL 969.

24.5 If a manufacturer produces torches at more than one factory, each torch shall have a distinctive marking to identify it as the product of a particular factory.

INSTRUCTIONS

25 General

25.1 An instruction manual shall be provided with each torch. The manual shall specifically warn the user against each potential risk of fire or injury to persons; and state the precautions that should be taken to reduce each risk. The safety instructions shall be a permanent part of the manual, but separated in format from the other instructions. They shall appear before the operating instructions in the manual.