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ANSI/CAN/UL/ULC 842A:2024

STANDARD FOR SAFETY

Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)

Approved American National Standard

ANSI/UL 842A-2024

SCC FOREWORD

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UL Standard for Safety for Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), ANSI/CAN/UL/ULC 842A

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 842A dated May 31, 2024 is being issued as a new joint US/Canada Standard reflecting the latest ANSI and SCC approval dates and incorporating the proposal dated February 2, 2024 and April 5, 2024.

The new requirements are substantially in accordance with Proposal(s) on this subject dated February 2, 2024 and April 5, 2024.

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ANSI/UL 842A-2024

MAY 31, 2024

ANSI/CAN/UL/ULC 842A:2024

Standard for Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85)

Prior to the first edition, the requirements for the products covered by this standard were included in the Outline of Investigation for Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 842A.

First Edition – February, 2015

Second Edition

May 31, 2024

This ANSI/CAN/UL/ULC Safety Standard consists of the Second Edition.

The most recent designation of ANSI/UL 842A as an American National Standard (ANSI) occurred on May 31, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

This Standard has been designated as a National Standard of Canada (NSC) on May 31, 2024.

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Preface

This is the Second Edition of ANSI/CAN/UL/ULC 842A, Standard for Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85).

ULSE is accredited by the American National Standards Institute (ANSI) and the Standards Council of Canada (SCC) as a Standards Development Organization (SDO). ULC Standards is accredited by the Standards Council of Canada (SCC) as a Standards Development Organization (SDO).

This Standard has been developed in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization.

This ANSI/CAN/UL/ULC 842A Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Annex A, identified as Informative, is for information purposes only.

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.

This Second Edition joint American National Standard and National Standard of Canada is based on, and now supersedes, the First Edition of UL 842A.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

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 Edition of the Standard has been formally approved by the Technical Committee (TC) on Valves for Flammable Fluids, TC 842.

This list represents the TC 842 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

TC 842 Membership

Name	Representing	Interest Category	Region
M. Bishoff	Lorax Systems Inc	Producer	Canada
D. Boyd	BP America Inc.	Commercial / Industrial User	USA
C. Deschamps	Régie du Bâtiment du Québec	Authorities Having Jurisdication / Regulator	Canada
J. Dutton	Standards Individuals	General Interest	Canada
T. Henderson	California Water Resources Control Board	Authorities Having Jurisdication / Regulator	USA
W Koch	Technology Resources International, Inc.	General Interest	USA
M. Lauber	OPW Fueling Components	Producer	USA
P. Legault	Integrated Review Services –Consulting	Government	Canada
J. Meyer	Core Engineered Solutions Inc	Commercial / Industrial User	USA
L. Panchala	NCI Canada Inc. (Process and Steam Specialties)	Producer	Canada
J. Petersen	Petersen Engineering	Commercial / Industrial User	USA
J. Prusko	UL Standards & Engagement	TC Project Manager	USA
H. Silva	Franklin Electric	Producer	USA
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L. Werner	UL Standards & Engagement	TC Chair	Canada
B. Wiegert	PMMIC	Commercial / Industrial User	USA
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J. Yager	Morrison Bros. co.	Producer	USA

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This Standard is intended to be used for conformity assessment.

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE.

INTRODUCTION

1 Scope

1.1 These requirements cover valves that are intended to be used for the control of fluids and their vapors for the fluids indicated in 1.3. They are of the type commonly used in piping systems and in the assembly of motor fuel dispensing equipment. Valves covered by this standard are for use with flammable fluids which are handled at temperatures normally within the range of –20 °F (–29 °C) to 125 °F (52 °C).

1.2 Valves for gasoline/ethanol blends with nominal ethanol concentrations up to 85 % (E0 – E85) shall be constructed to comply with the following:

a) The requirements defined in the Standard for Valves for Flammable and Combustible Liquids, UL/ULC 842; and

b) The requirements in this Standard.

1.3 Valves covered by these requirements are intended for use with one or more of the following as applicable:

a) Gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814;

b) Gasoline/ethanol blends with nominal ethanol concentrations up to 25% ethanol (E25), consisting of gasoline formulated in accordance with the Standard Specification for Automotive Spark-Ignition Fuel, ASTM D4814, when blended with denatured fuel ethanol formulated to be consistent with the Standard Specification for Denatured Fuel Ethanol for Blending With Gasolines For Use as Automotive Spark-Ignition Engine Fuel, ASTM D4806; or

c) Gasoline/ethanol blends with nominal ethanol concentrations above 25 % formulated in accordance with the Standard Specification in (b) or formulated in accordance with the Standard Specification in (b) or formulated in accordance with the Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines, ASTM D5798.

1.4 These requirements cover valves of the manually operated, pressure operated, or temperature operated types, or combinations of such to the exclusion of types operated wholly or partially by electricity. When they form a part of an assembly which provides for additional functions or service, the requirements are outside the scope of these requirements.

1.5 Products covered by this Standard are intended to be installed and used in accordance with the applicable Codes and Regulations as determined by the Authority Having Jurisdiction (AHJ), such as, but not limited to:

a) In the United States:

1) Flammable and Combustible Liquids Code, NFPA 30;

2) Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A.

b) In Canada:

1) The National Fire Code of Canada; or

2) Provincial or other Regulations.

1.6 These requirements do not cover the following:

a) Valves for handling liquids under cryogenic conditions;

b) Valves for general refinery service, offshore and pipe line terminals, natural gas processing plants, gas distribution systems, petrochemical processing facilities, or the like;

c) Constant-level oil valves and electrically operated valves;

d) Relief valves and pressure regulators for liquefied petroleum gas (LP-Gas) service;

e) Shutoff, emergency shutoff and check valves for liquefied petroleum gas (LP-Gas) in the liquid phase;

f) Manually operated gas valves of the plug and body or rotating disc type which are evaluated under the Standard for Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves, ANSI Z21.15;

g) Valves covered by the Standard for Gas Appliance Pressure Regulators, ANSI Z21.18; the Standard for Automatic Valves for Gas Appliances, ANSI Z21.21; or the Standard for Gas Appliance Thermostats, ANSI Z21.23;

h) Hose Nozzle Valves for Flammable and Combustible Liquids, UL/ULC 2586;

i) Valves covered by the Standard for Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 125 PSI (Sizes NPS 1/2 through NPS 2), ANSI/ASME B16.33 and Manually Operated Metallic Gas Valves for Use in Aboveground Piping Systems up to 5 PSI, ASME B16.44;

j) Manually operated valves for diesel fuel, biodiesel fuel, diesel/biodiesel blends, kerosene, or fuel oil, which are covered under the Standard for Valves for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL/ULC 842B;

k) Manually operated valves for LP-Gas, which are covered under the Standard for Valves for Flammable Fluids, UL/ULC 842;

l) Hose Nozzle Valves for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL/ULC 2586B.

1.7 Products intended to be rated for use with gasoline or gasoline/ethanol blends with nominal ethanol concentrations:

a) Up to 25 % (E0 – E25) shall be evaluated using the CE25a test fluid as the only applicable test fluid;

b) Up to 40 % (E0 – E40) shall be evaluated using both the CE25a and CE40a test fluids; or

c) Up to 85 % shall be evaluated using both the CE25a and the CE85a test fluids.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

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

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

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

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

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

4 Referenced Publications

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

4.2 The following publications are referenced in this Standard:

ASME B1.20.1, *Pipe Threads, General Purpose, Inch*

ASME B16.33, *Manually Operated Metallic Gas Valves for Use in Gas Piping Systems up to 175 psi (Sizes NPS 1/2 through NPS 2)*

ASME B16.44, *Manually Operated Metallic Gas Values for use in Above Ground Piping Systems up to 5 psi*

ANSI Z21.15, *Manually Operated Gas Valves For Appliances, Appliance Connector Valves And Hose End Valves*

ANSI Z21.18, *Gas Appliance Pressure Regulators*

ANSI Z21.21, *Automatic Valves For Gas Appliances*

ANSI Z21.23, *Gas Appliance Thermostats*

ASTM A653/A653M, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

ASTM B858, *Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*

ASTM D4806, *Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel*

ASTM D4814, *Standard Specification for Automotive Spark-Ignition Engine Fuel*

CSA C22.2 No. 0.15, *Adhesive Labels*

NFC, *National Fire Code of Canada*

NFPA 30, *Flammable and Combustible Liquids Code*

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*

UL 87A, *Power-Operated Dispensing Devices for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 - E85)*

UL 157, *Gaskets and Seals*

UL/ULC 842, *Valves for Flammable and Combustible Liquids*

UL/ULC 842B, *Valves for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil*

UL 969, *Marking and Labeling Systems*

UL 1332, *Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment*

UL/ULC 2586, *Hose Nozzle Valves for Flammable and Combustible Liquids*

UL/ULC 2586B, *Hose Nozzle Valves for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil*

5 Glossary

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

5.2 AUTHORITY HAVING JURISDICTION (AHJ) – The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

5.3 BLENDING OPTION – Dispensing devices may be provided with an option that blends two specific fuels into one fuel to be dispensed. This blending occurs at the dispenser level and can be in two forms:

a) Fixed blending – Blending at the dispenser level that blends two specific fuels into one fuel to be dispensed, and that fuel to be dispensed is fixed. For example, fixed blending includes blend options where gasoline and denatured fuel ethanol can be blended to achieve E85, which is the actual dispensed fuel.

b) Variable blending – Blending at the dispenser level that blends two specific fuels into the fuel to be dispensed, but the fuel to be dispensed can be any of a number of previously set points. For example, variable blending includes blend options where gasoline and E85 can be blended to achieve E40 or E60, as the actual dispensed fuel.

5.4 EMERGENCY SHUTOFF VALVES – Valves intended for installation at the inlet of remote control type flammable liquid dispensing devices. They are normally held open by a mechanical holding means. They incorporate a fusible element and close automatically in the event of exposure to fire or break-off resulting from severe impact. They are designed for an operating pressure of not less than 50 psi (345 kPa).

5.5 FUSIBLE LINK VALVES – Valves intended for use in lines conveying fuel gas or fuel oil which function to close when the temperature in the vicinity of the valve exceeds the fusing temperature of the fusible element.

5.6 GASOLINE/ETHANOL BLENDS – Blended fuels composed of a gasoline component and an ethanol component. The numerical value corresponding to the ethanol component determines the blend rating (such as E85 for 85 % ethanol, 15 % gasoline).

5.7 SEALS, DYNAMIC – A seal that is subject to mechanical movement or other applied forces that result in movement or flexing of the seal under normal use conditions.

5.8 SEALS, STATIC – A seal that is not subject to mechanical movement or other applied forces other than compressing forces that are applied during installation and maintained during normal use conditions.

CONSTRUCTION

6 Assembly

6.1 All valves

6.1.1 A valve shall include all of the components required for its intended function and installation.

6.1.2 When a valve requires the use of special pipe flanges, gaskets, bolts, or other special fittings or parts for making an installation, such parts shall be furnished by the manufacturer with each valve.

6.1.3 Two or more subassemblies intended to be assembled in the field as a unit shall be capable of being joined together without requiring any of the subassemblies to be cut, drilled, welded or otherwise altered.

6.1.4 When two or more valves or actuating devices, or both, are to be used together as one unit, the entire assembly, for the purpose of these requirements, shall be tested as one valve.

6.1.5 A seat disc shall be attached to its poppet or holder or otherwise assembled so as to prevent it from becoming dislocated under service conditions as determined by the Endurance Test, Section 20. The means to secure the disc shall not rely upon cement or adhesive.

6.1.6 A brazing material used for joining liquid confining parts of a valve shall have a melting point (solidus temperature) of minimum 1000 °F (538 °C).

6.1.7 A valve with socket or butt weld ends shall be capable of being installed without damaging nonmetallic seats or seals. Required instructions for accomplishing this shall accompany each valve.

6.2 Shutoff valves

6.2.1 A shutoff valve shall not be equipped with a bypass or with a means to prevent it from closing completely.

6.2.2 The requirement in 6.2.1 does not apply to a feature provided to permit a take-off to recirculate fluid or to supply a pilot or other individually controlled outlet.

6.2.3 The appropriate operating positions or the direction of movement shall be clearly indicated for a manual operating lever or reset handle included in a nonself-closing type valve.

6.2.4 An automatic shutoff valve shall function as a shutoff regardless of the position of any damper or external operating lever or any reset device. The manipulation of a manual-reset device shall not cause the valve to function as an automatic-reset valve.

6.2.5 An automatic shutoff valve shall not be equipped with means for manually latching the valve in the open position in a manner which prevents the valve from functioning as a shutoff.

6.2.6 An automatic shutoff mechanism shall be guarded to prevent interference with the intended operation of the mechanism.

6.2.7 When a mechanically actuated indicator is provided to show whether the main valve is open or shut, it shall be visible from a distance of at least 5 feet (1.52 m).

6.2.8 An automatic shutoff valve shall close independently of the energy supplied by the medium flowing. The medium flowing is not prohibited from being used to exert supplementary forces on the valve seat.

7 Materials

7.1 Metallic materials

7.1.1 General

7.1.1.1 A metallic part, in contact with the fuels anticipated by these requirements, shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel or if it will impair the function of the device. For all fuel ratings, see Corrosion due to fluid, 7.1.2.1. For products rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 40 %, see Metallic materials – system level, 7.1.3.

7.1.1.2 The exposed surfaces of metallic parts shall be resistant to atmospheric corrosion if this corrosion will lead to leakage of the fluid or if it will impair the function of the device. The material shall comply with the requirements in Atmospheric corrosion, 7.1.2.2.

7.1.1.3 Metallic parts in contact with the fuels anticipated by these requirements shall not be constructed of lead or materials that are substantially lead. In addition no coatings or platings containing lead shall be used, such as terne-plated steel.

7.1.2 Metallic materials – material level

7.1.2.1 Corrosion due to fluid

7.1.2.1.1 All metallic materials used for fluid confining parts shall be resistant to corrosion caused by the fuels anticipated by these requirements. In addition, metallic materials, used internally in fluid confining parts, that are required to operate in some manner to address safety (e.g. plunger on a valve) shall be resistant to corrosion caused by these fuels. Compliance is verified by the Long Term Exposure Test, Section 14.

7.1.2.1.2 A coating or plating, applied to a base metal, shall be resistant to the action of the fuels anticipated by these requirements as determined by the Long Term Exposure Test, Section 14.

7.1.2.2 Atmospheric corrosion

7.1.2.2.1 Metallic materials used for fluid confining parts shall be resistant to atmospheric corrosion. In addition, metallic materials that are required to operate to address safety (e.g. fusible links on shear valves) shall be resistant to atmospheric corrosion. Ferrous materials of a thickness specified in the following items are acceptable for the preceding when uncoated:

a) A casting having a wall thickness of not less than 0.25 inch (6.4 mm) if shown by production test to be free of leakage; and

b) Fabricated sheet steel parts having a minimum wall thickness of 0.093 inch (2.36 mm).

7.1.2.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 7.1.2.2.3.

7.1.2.2.3 Cadmium plating shall not be less than 0.0003 inch (0.008 mm) thick, and zinc plating shall not be less than 0.0005 inch (0.013 mm) thick, except on parts where threads constitute the major portion of the area in which case the cadmium or zinc plating shall not be less than 0.00015 inch (0.0038 mm) thick. Metallic parts are considered to comply with 7.1.2.2.1 when they are protected against atmospheric corrosion by:

a) Hot dipped, mill galvanized sheet steel complying with the coating designation G90 in Table I of ASTM A653/A653M; or

b) Coatings which have been determined to be equivalent to G90 under the requirements of UL 1332.

7.1.2.2.4 A metallic material other than as described in 7.1.2.2.1 – 7.1.2.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

7.1.3 Metallic materials – system level

7.1.3.1 Combinations of metallic materials in products rated for use with gasoline/ethanol blends with nominal ethanol concentrations greater than 40 % shall be chosen to reduce degradation due to galvanic corrosion in accordance with 7.1.3.2 – 7.1.3.4.

7.1.3.2 Table 7.1 shows the galvanic series for metallic materials exposed to a conductive solution of sea water. The most active material in a given combination will experience increased levels of corrosion, while the most passive material in the combination will experience reduced levels of corrosion. The greater the separation of the materials in the galvanic series of Table 7.1, the more pronounced the effects would be. Table 7.1 serves as a guide in selecting the appropriate test conditions based on manufacturer specified material combinations.

Table 7.1
Galvanic Series of Metal Materials

Most passive	Platinum
	Gold
	Graphite
	Silver
	Stainless Steel Type 316 (Passive)
	Stainless Steel Type 304 (Passive)
	Titanium
	13 % Chromium Stainless Steel (Passive)
	76 Ni – 16 Cr –7 Fe Alloy (Passive)
	Nickel (Passive)
	Silver Solder

Table 7.1 Continued on Next Page

Table 7.1 Continued

	M-Bronze
	G-Bronze
	70:30 Cupro Nickel
	Silicon Bronze
	Copper
	Red Brass
	Aluminum Brass
	Admiralty Brass
	Yellow Brass
	60 Ni – 30 Mo – 6 Fe – 1 Mn
	76 Ni – 16 Cr – 7 Fe Alloy (Active)
	Nickel (Active)
	Manganese Bronze
	Tin
	Stainless Steel Type 316 (Active)
	Stainless Steel Type 304 (Active)
	13 % Chromium Stainless Steel (Active)
	Cast Iron
	Wrought Iron
	Mild Steel
	Aluminum 2024
	Cadmium
	Alclad
	Aluminum 6053
	Aluminum 1100
	Galvanized Steel
	Zinc
	Magnesium Alloys
Most active	Magnesium
NOTE: Reprinted with permission from NACE. Based on table titled "Galvanic Series of Metals Exposed to Seawater" from NACE Corrosion Engineer's Reference Book, Third Edition ©NACE International 2002.	

7.1.3.3 Plating, such as nickel plating, can be used to reduce or eliminate dissimilar metal contact areas, as long as the plating material complies with 7.1.3.2 as the contact metal. If used, the plating shall comply with the Long Term Exposure Test, Section 14.

7.1.3.4 Gaskets or nonmetallic spacers used to reduce or eliminate dissimilar metal contact areas, where permitted, shall be subjected to the applicable requirements for static seals in Nonmetallic materials, 7.2, when they are in contact with the fluid.

7.2 Nonmetallic materials

7.2.1 General

7.2.1.1 A nonmetallic part in contact with the fuels anticipated by these requirements shall be resistant to the action of the fuel if degradation of the material will result in leakage of the fuel, or if it will impair the function of the device.

7.2.1.2 Gaskets or seals shall be designated as dynamic and/or static seals. See 5.7 and 5.8, respectively. If the type of seal cannot be determined, then the material shall be treated as both a static and a dynamic seal.

7.2.1.3 Gaskets and seals shall comply with the requirements as outlined in Nonmetallic materials – material level, 7.2.2, and Nonmetallic materials – system level, 7.2.3.

7.2.1.4 Nonmetallic materials in contact with the fuels anticipated by these requirements shall not be constructed of the following:

a) Polysulfide rubber;

b) Ethylene propylene diene monomer (EPDM) rubber;

c) Methyl-Methacrylate;

d) Polyvinyl Chloride (PVC);

e) Nylon 6/6; or

f) Polyurethane.

7.2.2 Nonmetallic materials – material level

7.2.2.1 Static seals

7.2.2.1.1 Static seals shall be evaluated in accordance with UL 157, modified as indicated in 7.2.2.1.3 – 7.2.2.1.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

7.2.2.1.2 A static seal shall be constructed of a material that is acceptable in accordance with the scope of UL 157.

7.2.2.1.3 Static seals shall be subjected to the Volume Change and Extraction Test in accordance with UL 157, except for the following modifications:

a) The test duration shall be 1000 ±0.5 h;

b) The applicable test fluids shall be as described in Annex A; and

c) For all materials, the average volume change for a gasket or seal material shall not exceed 40 % swell (increase in volume) or 1 % shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10 %. For coated fabrics, alternate limits can be used with the average volume change not exceeding 60 % swell or 5 % shrinkage, and the weight loss shall not exceed 20 %. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material including coated fabrics.

7.2.2.1.4 Static seals shall be subjected to the Compression Set Test in accordance with UL 157, except for the following modifications:

a) The test duration shall be 1000 ±0.5 h;

b) The samples shall be immersed, at room temperature, in the test fluids while compressed for the entire test duration. No oven conditioning is required.

c) The applicable test fluids shall be as described in Annex A.

d) The recovery period shall consist of removing the sample from the compression device and immersing it in the applicable test fluid for 30 ±2 minutes at room temperature. The sample shall not be allowed to dry out due to exposure to air. The 30-minute immersion shall use the same fluid as the test fluid for each sample.

e) For all materials, the average compression set is calculated and shall not exceed 35 %. For coated fabrics, alternate limits can be used with the average compression set not exceeding 70 %.

Exception: This requirement does not apply to composite or thermoplastic gasket materials as defined in accordance with UL 157.

7.2.2.2 Dynamic seals

7.2.2.2.1 Dynamic seals shall be evaluated in accordance with UL 157, modified as indicated in 7.2.2.2.3 – 7.2.2.2.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

7.2.2.2.2 A dynamic seal shall be constructed of a material that is acceptable in accordance with the scope of UL 157.

7.2.2.2.3 Dynamic seals shall be subjected to the Volume Change and Extraction Test in accordance with UL 157, except for the following modifications:

a) The test duration shall be 1000 ±0.5 h;

b) The applicable test fluids shall be as described in Annex A; and

c) For all materials, the average volume change for a gasket or seal material shall not exceed 40 % swell (increase in volume) or 1 % shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10%. For coated fabrics, alternate limits can be used with the average volume change not exceeding 60 % swell or 5 % shrinkage, and the weight loss shall not exceed 20 %. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material including coated fabrics.

7.2.2.2.4 Dynamic seals shall be subjected to the Tensile Strength and Elongation Test in accordance with UL 157, except for the following modifications:

a) The test duration shall be 1000 ±0.5 h;

b) The applicable test fluids shall be as described in Annex A; and

c) For all materials, the average tensile strength and the average elongation of materials shall not be less than 60 % of the as-received values. For coated fabrics, alternate limits can be used with the average tensile strength and the average elongation not less than 30 % of the as-received values.

7.2.3 Nonmetallic materials – system level

7.2.3.1 For all materials, gaskets and seals that have been shown to comply with the applicable requirements for static seals in UL 157, along with the exceptions as noted in 7.2.2.1, the requirements of the Long Term Exposure Test, Section 14, shall be waived

7.3 Casting impregnation materials

7.3.1 Material level

7.3.1.1 Casting impregnation materials shall be evaluated at the material level in accordance with the requirements in UL 87A.

7.3.2 System level

7.3.2.1 The casting impregnation material, applied as intended to a casting, shall comply with the Long Term Exposure Test, Section 14. The casting shall not show indications of porosity leakage at any point during or after this test.

7.4 Internal parts

7.4.1 Nonmetallic parts located internally to a fluid confining part, degradation of which would not directly result in leakage, are not required to comply with Nonmetallic materials, 7.2. The part shall be tested in accordance with 7.4.2.

7.4.2 Internal nonmetallic parts shall be tested during the Long Term Exposure Test, Section 14. During this test, the part shall not degrade to the extent that visible particles can be observed in the fluid.

7.5 Blending options

7.5.1 Valves intended for use with dispensing equipment that provides for a variable blending option, at gasoline/ethanol blends with nominal ethanol concentrations above 25 %, shall be subjected to the Blending Cycling Test, Section 25.

7.5.2 Valves intended for use with dispensing equipment that provides for a fixed blending option, at gasoline/ethanol blends with nominal ethanol concentrations above 25 %, shall be evaluated in accordance with (a) or (b):

a) If intended to be located after the blending option such that it is only subjected to the final blended fuel, then the Blending Cycling Test, Section 25, is not required.

b) If intended to be located at or before the blending option such that it is subjected to different gasoline/ethanol blend levels, the meter shall be subjected to the Blending Cycling Test.

7.5.3 Valves intended for use with dispensing equipment that provides for a variable or fixed blending of gasoline/ethanol blends with nominal ethanol concentrations below 25 % are considered acceptable without further evaluation for the blending option.

8 Bodies and Covers

8.1 A threaded section of a body intended for the connection of pipe shall have a section to serve as a wrench grip.

8.2 Pipe threads shall be in accordance with ANSI/ASME B1.20.1.

Exception: Valves intended for use in installations where pipe fittings incorporate other than NPT type threads shall be permitted to be provided with pipe threads complying with a national pipe thread standard compatible with those fittings. The pipe thread type shall be identified in accordance with 28.4.

8.3 Joints in a body formed of two or more parts shall be prevented from loosening as the result of the turning effort exerted by connecting or disconnecting piping. See the Deformation Test, Section 15.

8.4 A valve assembly intended for attachment to pipe larger than 4 inch (102 mm) nominal size shall be provided with flanged pipe connections. A flange shall conform to the appropriate American National Standard for Pipe Flanges and Flanged Fittings covering the material from which the flange is made, or it shall be found by investigation to be acceptable for the application. See 6.1.2.

8.5 Openings for bolts or screws used for assembly shall not extend through the outer walls of a body into a liquid-handling section.

8.6 Each cleanout and drain opening shall be closed by a standard pipe plug or a threaded shouldered plug. A gasket shall be retained by the valve body or the plug when the plug is removed.

9 Seals and Stuffing Boxes

9.1 A valve shall include a stuffing box or other means for sealing to prevent leakage at the valve stem.

9.2 When packing is used to prevent leakage around a valve stem, and when it is required for the user to adjust or renew the packing during intended usage or as wear occurs, a stuffing box conforming to the following shall be used.

a) The stuffing box shall be provided with a removable, shouldered, unthreaded follower gland, with a nut or other means for adjusting the gland to maintain pressure on the packing.

b) The stuffing box gland shall be made of corrosion resistant material.

c) The stuffing box shall be fully packed prior to shipment of the valve.

9.3 An adjustable stuffing box used to seal an automatically actuated stem of a valve shall be such that any adjustment of the packing take-up will not bind the stem sufficiently to prevent the valve from functioning automatically.

9.4 A spring-loaded follower gland shall employ a spring made of corrosion resistant material or of material provided with a corrosion resistant coating.

9.5 When corrosion of a valve stem results in damage to a packing or seal material and results in leakage, or binding of the assembly, the stem shall be of corrosion resistant material or be provided with a corrosion resistant coating or treatment.

9.6 A valve stem shall not be capable of being completely withdrawn from the valve by reverse rotation. Threads of a valve stem shall not enter a stuffing box recess.

9.7 A stem shall be of sufficient length to permit repacking the stuffing box without requiring the part to be dismantled.

10 Diaphragms

10.1 A valve in which a flexible diaphragm, bellows, or similar construction constitutes the only fluid seal shall have the atmospheric side of the diaphragm or bellows enclosed in a casing intended to limit external leakage in the event of diaphragm or bellows rupture, or shall have provision for connection of a vent pipe or tubing intended to be routed to the outdoors or other location.

10.2 To comply with 10.1, a valve shall not leak under conditions of ruptured diaphragm or bellows from an unthreaded vent opening or around any pins, stems, or linkage passing through the housing when tested in accordance with the External Leakage Test, Section 16.

10.3 A diaphragm or bellows shall be protected from damage.

10.4 Metal parts coming in contact with a diaphragm shall have no sharp edges, burrs, projections, or the like which cause chafing or abrasion of the diaphragm.

11 Springs

11.1 A spring employed in a dispensing device assembly to reduce the risk of leakage or in a safety mechanism, such as is employed in an operating handle, shall:

a) Be protected against abrasion and corrosion; and

b) Demonstrate no loss in strength following subjection to a compression force of three times that exerted by the spring in any position of its intended function.

11.2 In reference to 11.1(a), springs that are exposed to the fuels anticipated by these requirements shall comply with the applicable material requirements from Materials, Section 7. Springs not exposed to fuels, but exposed to the environment, shall comply with the atmospheric corrosion requirements in 7.1.2.2.

12 Operating Mechanisms

12.1 Screws and nuts used to attach operating parts to movable members shall be upset or otherwise locked to prevent loosening.

12.2 A manually-operated mechanism of a valve shall provide free movement of all parts.

PERFORMANCE

13 General

13.1 Except as otherwise indicated, representative samples of each type of valve shall be subjected to the tests described in these requirements. The order of tests, as far as applicable, shall be as indicated in Sections 14 – 25 with the exception of the specific test sequence shown in 13.3. Additional samples of parts constructed of nonmetallic materials, such as seal materials and valve seat discs, shall be provided as required for physical and chemical tests.

13.2 All tests shall be performed using the test fluids specified for that test. No substitution of test fluids shall be allowed. When the test indicates that CE25a, CE40a or CE85a shall be used, the test fluid shall be prepared as described in Annex A.

13.3 The tests in the following sequence shall be performed on one sample of a valve for each applicable test fluid as described in the Long Term Exposure Test, Section 14. The remaining tests in this standard may be performed in any order on the same samples or on additional samples as needed.

a) Long Term Exposure Test, Section 14;

b) External Leakage Test, Section 16;

c) Hydrostatic Strength Test, Section 22;

d) Weak Section Strength Test, Section 19 (applicable to shear valves only).

13.4 To reduce the effects of seal dry out due to removal of the test fluid after specific tests, the tests given in the test sequence of 13.3 shall be started within 4 h of removal of the test fluid. If necessary to coordinate testing, the sample may be left filled with the most recent test fluid at room temperature until the next test is initiated. If the previous test used an aerostatic or hydrostatic source, the sample shall be filled with kerosene.

13.5 A valve which is intended to be mounted in a definite position in order to function as intended shall be so tested.

13.6 Leakage tests may be conducted with air. When leakage is observed, the tests shall be repeated with a hydrostatic source of pressure.

13.7 Water shall be used for developing the required pressure in a hydrostatic pressure strength test.

13.8 A valve provided with a fusible element or other device that will close the valve automatically when subjected to heat or fire shall be subjected to the Fire Test, Section 18

14 Long Term Exposure Test

14.1 General

14.1.1 The test outlined in 14.2 – 14.4 shall be performed on one or two samples of the device. If the product is rated for use with gasoline or a gasoline/ethanol blend with a nominal ethanol concentration of up to 25 % (E0 – E25), then the test shall be performed using the CE25a test fluid. If the product is rated for use with gasoline or a gasoline/ethanol blend with a nominal ethanol concentration of up to 40 % (E0 – E40), then the test shall be performed using both the CE25a and CE40a test fluids. If the product is rated for use with a gasoline/ethanol blend with a nominal ethanol concentration of up to 85 %, then the test shall be performed using both the CE25a and the CE85a test fluids. See Annex A for the test fluids.

14.2 Samples

14.2.1 Samples of complete valves shall be tested. All inlet and outlet openings of the samples shall be sealed in accordance with 14.2.3.

14.2.2 If platings or coatings are used internal to the device, additional samples may be used. See 14.4.2.

14.2.3 Closures shall be provided to seal off inlet and outlet openings of all samples in accordance with 14.2.1. These closures shall be fabricated of materials as specified in 14.2.4. The closures shall be provided with a 1/4 inch NPT (6.35 mm) opening for connection to the test apparatus. All closures shall be installed by the manufacturer and provided with a torque rating. There will be no other adjustment to connections for the duration of the test.

14.2.4 Material combinations at the product and closure interface will be as specified by the manufacturer. All closures for valves rated for gasoline/ethanol blends with nominal ethanol concentrations up to 25 % shall be fabricated of suitable materials. All closures for valves rated for gasoline/ethanol

blends above 25 % shall be fabricated of the materials representing permitted material to which the device may be connected such as aluminum closures representing an aluminum fitting or tube. Table 7.1 shall be used to determine the worst case material interactions based on the materials specified by the manufacturer. Materials specified by the manufacturer but not included in Table 7.1 shall be tested as necessary to represent worst case conditions.

14.2.5 Material combinations at the product and closure interface will be as specified by the manufacturer. All closures for devices rated for gasoline/ethanol blends with nominal ethanol concentrations up to 25 % shall be fabricated of suitable materials. All closures for devices rated for gasoline/ethanol blends with nominal ethanol concentrations above 25 % shall be fabricated of the materials representing permitted material to which the device may be connected such as aluminum closures representing an aluminum fitting or tube. Table 7.1 shall be used to determine the worst case metal interactions. Materials that are specified by the manufacturer, but are not included in Table 7.1 shall be tested as necessary to represent worst case conditions.

14.3 Method

14.3.1 The sample shall be exposed to the applicable test fluid in accordance with 14.1.1. The test fluids shall be prepared using the instructions in Annex A.

14.3.2 A quick connect device shall be connected to the 1/4 inch NPT (6.35 mm) connection at the inlet, and shall be used to fill the samples with the applicable test fluids. A source of pressure may be used to assist in filling or draining the samples; however, the pressure shall not exceed the rated pressure of the valve under test. Once the samples are filled to exclude all air, they are closed off and sealed. The samples shall then be placed in the test chamber.

14.3.3 The chamber temperature is increased to 140 ±3.6 °F (60 ±2 °C). When the chamber reaches this temperature, the exposure period begins. The samples are exposed to the applicable test fluid at 140 ±3.6 °F (60 ±2 °C) for approximately 168 ±0.5 h. At the end of this duration, the exposure period is halted and the chamber is allowed to cool. The samples are subjected to a 50 psi (345 kPa) pressure for at least one min. The fluid shall then be drained from the samples and observed in accordance with 14.4.2. After this observation, the fluid shall be discarded. The samples shall then be immediately refilled with new test fluid and the chamber temperature allowed to increase to 140 ±3.6 °F (60 ±2 °C) again. The total duration of the test shall equal 2520 ±0.5 h of exposure at 140 ±3.6 °F (60 ±2 °C).

14.3.4 At the end of the total exposure duration, the test fluid shall be left in the samples and the samples shall be removed from the chamber. The samples are then subjected to the test sequence as outlined in 13.3 and in accordance with 13.4. Prior to the initiation of the test sequence, the Long Term Exposure test fluid shall be drained and discarded.

14.3.5 If the device contains any parts or surfaces that are plated or coated, if the device uses casting impregnation materials to eliminate porosity leakage, or if the device contains internal nonmetallic parts, the plating, coating, impregnation, or internal parts shall be tested both during and after this exposure. See 14.4.2 to 14.4.4.

14.4 Results

14.4.1 There shall be no leakage during this test. If leakage is observed at any point during the test, the test shall be stopped.

14.4.2 For platings or coatings, there shall be no softening of the plating or coating material. Compliance is checked by observance of the drained test fluid. There shall be no evidence of visible flaking or material. In addition, there shall be no substantial discoloration of the test fluid when observing the drained fluid. Discoloration is an indication of chemical attack on the plating or coating internal to the device. In order to

determine that the base metal is not exposed, visual inspections shall be made. If the visual inspection requires examination of internal surfaces, the samples shall be cut open to determine compliance. If this is necessary, additional samples can be used to determine compliance with this requirement, such that the remaining test sequence will not be disturbed by cutting open samples. However, both the samples to be cut open and the samples to be used for the test sequence are required to complete the Long Term Exposure Test.

14.4.3 For casting impregnation materials, the sample shall not show evidence of porosity leakage during or after the fluid exposure duration.

14.4.4 For internal nonmetallic parts, there shall be no visible evidence of this material in the drained test fluid.

15 Deformation Test

15.1 Joints in a valve shall not leak, nor shall there be evidence of loosening of joints, distortion, or other damage resulting from the stress imposed on pipe-threaded sections when tested in accordance with these requirements.

15.2 The sample valve used in this test shall be rigidly anchored or otherwise supported. A length of Schedule 80 pipe, sufficient to provide for wrench engagement, shall be connected to a female pipe threaded section of the body. The male threads shall have pipe joint sealing compound or polytetrafluoroethylene (PTFE) tape applied to them first or be coated as specified by the manufacturer. Each pipe shall then be tightened across the valve body joints to the torque specified by the manufacturer or in Table 15.1, whichever is greater.

Table 15.1
Torque Requirements for Pipe Connections

Pipe size	Outside diameter		Torque	
nominal in	in	(mm)	lb-in	(N·m)
1/8	0.405	(10.29)	150	(17)
1/4	0.540	(13.72)	250	(28)
3/8	0.675	(17.15)	450	(51)
1/2	0.840	(21.34)	800	(90)
3/4	1.050	(26.67)	1000	(113)
1	1.315	(33.40)	1200	(136)
1-1/4	1.660	(42.16)	1450	(164)
1-1/2	1.900	(48.26)	1550	(175)
2	2.375	(60.33)	1650	(186)
2-1/2	2.875	(73.03)	1750	(198)
3	3.500	(88.90)	1800	(203)
4	4.500	(114.30)	1900	(215)

15.3 After the torque force has been applied to each connected pipe, the test sample shall be subjected to the External Leakage Test, Section 16.

15.4 Upon removal of the pipe from the test sample, the assembly shall be examined for loosening of body joints.

16 External Leakage Test

16.1 All valves subjected to this test shall be subjected to a test pressure as indicated in 16.2. Test pressures shall be developed from a hydrostatic or aerostatic source and maintained for at least 1 minute.

16.2 All valves shall be subjected to a test pressure equal to 1-1/2 times the rated pressure of the product.

16.3 For all valves other than shear valves or emergency shut off valves, there shall be no leakage outside of fluid confining areas and there shall be no evidence of casting porosity leakage during this test. For shear valves or emergency shut off valves, the valve shall not leak externally at a rate in excess of 12.2 in^3/h (200 cm^3/h).

16.4 For all tests, the inlet of the device shall be connected to the source of pressure and the outlet shall be blocked. The test is repeated with the valve closed and the outlet open.

16.5 A positive shutoff valve and a calibrated pressure indicating device shall be installed in the pressure supply piping. The pressure indicating device shall be installed in the piping between the shutoff valve and the device under test.

16.6 In accordance with 16.5, the pressure indicating device shall comply with one of the following:

a) An analog gauge having a pressure range such that the test pressure is between 30 and 70 % of the maximum scale reading of the gauge;

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 devices that are equivalent to the devices in (a) or (b).

16.7 In the case of diaphragm elements, the test pressure is shall be applied to both sides of the diaphragm slowly and without shock.

17 Seat Leakage Test

17.1 The seat leakage test shall be conducted on as received samples and after the Endurance Test, Section 20.

17.2 A shutoff valve for liquids shall not leak past the seat when subjected to any pressure between 0 and 1-1/2 times maximum rated pressure.

17.3 To verify compliance with 17.2, the inlet of the test valve shall be connected to a system utilizing the appropriate test medium. This test shall be conducted with the valve in its intended position of installation. The valve shall be in the closed position assumed as the result of intended operation. The pressure shall be increased gradually from zero and then maintained at 1-1/2 times rated pressure and maintained for at least 5 min.

18 Fire Test

18.1 A fusible link shutoff valve and an emergency shutoff valve shall operate to limit contribution of flammable fluid to a fire, when tested in accordance with 18.2 – 18.8. An example of the test configuration is shown on Figure 18.1.

Figure 18.1

Test Configuration