UL 842A

STANDARD FOR SAFETY

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

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

First Edition, Dated February 18, 2015

Summary of Topics

This revision of ANSI/UL 842A includes an editorial revision to Supplement SA.

The revised requirements are substantially in accordance with Proposal(s) on this subject dated November 16, 2018.

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.

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UL 842A

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 18, 2015

This ANSI/UL Standard for Safety consists of the First Edition including revisions through April 1, 2019.

The most recent designation of ANSI/UL 842A as an American National Standard (ANSI) occurred on April 1, 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 valves that are intended to be used for the control of fluids and their vapors for the fluids indicated in 1.2. 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 minus 29°C (minus 20°F) to 52°C (125°F).

1.2 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 item (b) or formulated in accordance with the Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark-Ignition Engines, ASTM D5798.

1.3 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.

1.4 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 nozzles;

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, ANSI/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 842B;

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

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

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

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

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

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 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, E60, and E85 as the actual dispensed fuel.

3.3 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).

3.4 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.

3.5 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).

3.6 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.

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

CONSTRUCTION

4 Assembly

4.1 All valves

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

4.1.2 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.

4.1.3 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.

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

4.1.5 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 17. The means to secure the disc shall not rely upon cement or adhesive.

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

4.1.7 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.

4.2 Shutoff valves

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

4.2.2 The requirement in 4.2.1 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.

4.2.3 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.

4.2.4 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.

4.2.5 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.

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

4.2.7 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).

4.2.8 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.

5 Materials

5.1 Metallic materials

5.1.1 General

5.1.1.1 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, 5.1.2.1. For products rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 40 percent, see Metallic materials – system level, 5.1.3.

5.1.1.2 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, 5.1.2.2.

5.1.1.3 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.

5.1.2 Metallic materials – material level

5.1.2.1 Corrosion due to fluid

5.1.2.1.1 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 12.

5.1.2.1.2 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 12.

5.1.2.2 Atmospheric corrosion

5.1.2.2.1 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. thermal 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 1/4 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).

5.1.2.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 5.1.2.2.3.

5.1.2.2.3 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 5.1.2.2.1 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 the Specification for Sheet Steel, Zinc Coated (Galvanized) or Zinc-Iron-Alloy Coated (Galvannealed) by the Hot Dip Process, ASTM A653/A653M, or

b) Coatings which have been determined to be equivalent to G90 under the requirements of the Standard for Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment, UL 1332.

5.1.2.2.4 A metallic material other than as described in 5.1.2.2.1 – 5.1.2.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

5.1.3 Metallic materials – system level

5.1.3.1 Combinations of metallic materials in products rated for use with gasoline/ethanol blends with nominal ethanol concentrations greater than 40 percent shall be chosen to reduce degradation due to galvanic corrosion in accordance with 5.1.3.2 – 5.1.3.4.

5.1.3.2 Table 5.1 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 5.1, the more pronounced the effects would be. Table 5.1 serves as a guide in selecting the appropriate test conditions based on manufacturer specified material combinations.

Table 5.1
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
	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.

5.1.3.3 Plating, such as nickel plating, can be used to reduce or eliminate dissimilar metal contact areas, as long as the plating material complies with 5.1.3.2 as the contact metal. If used, the plating shall comply with the Long Term Exposure Test, Section 12.

5.1.3.4 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, 5.2, when they are in contact with the fluid.

5.2 Nonmetallic materials

5.2.1 General

5.2.1.1 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.

5.2.1.2 Gaskets or seals shall be designated as dynamic and/or static seals. See 3.6 and 3.7, respectively. If the type of seal cannot be determined, then the material shall be treated as both a static and a dynamic seal.

5.2.1.3 Gaskets and seals shall comply with the requirements as outlined in Nonmetallic materials – material level, 5.2.2, and Nonmetallic materials – system level, 5.2.3.

5.2.1.4 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.

5.2.2 Nonmetallic materials – material level

5.2.2.1 Static seals

5.2.2.1.1 Static seals shall be evaluated in accordance with the Standard for Gaskets and Seals, UL 157, modified as indicated in 5.2.2.1.2 – 5.2.2.1.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

5.2.2.1.2 A static seal shall be constructed of a material that is acceptable in accordance with the scope of the Standard for Gaskets and Seals, UL 157.

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

a) The test duration shall be 1000 hours;

b) The applicable test fluids shall be as described in Supplement SA; 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.

5.2.2.1.4 Static seals shall be subjected to the Compression Set Test in accordance with the Standard for Gaskets and Seals, UL 157, except for the following modifications:

a) The test duration shall be 1000 hours;

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

c) The applicable test fluids shall be as described in Supplement SA.

d) The recovery period shall consist of removing the sample from the compression device and immersing it in the applicable test fluid for 30 minutes at room temperature. The sample shall not be allowed to dry out due to exposure to air. The 30-minute immersion should 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 gasket materials as defined in accordance with the Standard for Gaskets and Seals, UL 157.

5.2.2.2 Dynamic seals

5.2.2.2.1 Dynamic seals shall be evaluated in accordance with the Standard for Gaskets and Seals, UL 157, modified as indicated in 5.2.2.2.2 – 5.2.2.2.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

5.2.2.2.2 A dynamic seal shall be constructed of a material that is acceptable in accordance with the scope of the Standard for Gaskets and Seals, UL 157.

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

a) The test duration shall be 1000 hours;

b) The applicable test fluids shall be as described in Supplement SA; 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.

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

a) The test duration shall be 1000 hours;

b) The applicable test fluids shall be as described in Supplement SA; 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.

5.2.3 Nonmetallic materials – system level

5.2.3.1 For all materials, gaskets and seals that have been shown to comply with the applicable requirements for static seals in the Standard for Gaskets and Seals, UL 157, or with the requirements under material level tests shall be subjected to the system level tests for the applicable component after the Long Term Exposure Test, Section 12. Static seals shall be provided in accordance with 12.2.5.

5.3 Casting impregnation materials

5.3.1 Material level

5.3.1.1 Casting impregnation materials shall be evaluated at the material level in accordance with the requirements in the Standard for Power-Operated Dispensing Devices for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 87A.

5.3.2 System level

5.3.2.1 The casting impregnation material, applied as intended to a casting, shall comply with the Long Term Exposure Test, Section 12. The casting shall not show indications of porosity leakage at any point during or after this test.

5.4 Internal parts

5.4.1 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, 5.2. The part shall be tested in accordance with 5.4.2.

5.4.2 Internal nonmetallic parts shall be tested during the Long Term Exposure Test, Section 12. During this test, the part shall not degrade to the extent that visible particles can be observed in the fluid.

5.5 Blending options

5.5.1 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 22.

5.5.2 Valves intended for use with dispensing equipment that provides for a fixed blending option, as 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 22, 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 level, the meter shall be subjected to the Blending Cycling Test.

5.5.3 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.

6 Bodies and Covers

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

6.2 Pipe threads shall be in accordance with the Standard for Pipe Threads, General Purpose (Inch), 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 25.4.

6.3 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 13.

6.4 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 4.1.2.

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

6.6 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.

7 Seals and Stuffing Boxes

7.1 A shaft seal provided to prevent external leakage shall not require field adjustment to maintain it tight against leakage.

7.2 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.

7.3 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.

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

7.5 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.

7.6 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.

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

8 Diaphragms

8.1 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.

8.2 To comply with 8.1, 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 14.

8.3 A diaphragm or bellows shall be protected from damage.

8.4 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.

9 Springs

9.1 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.

9.2 In reference to 9.1(a), springs that are exposed to the fuels anticipated by these requirements shall comply with the applicable material requirements from Materials, Section 5. Springs not exposed to fuels, but exposed to the environment, shall comply with the atmospheric corrosion requirements in 5.1.2.2.

10 Operating Mechanisms

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

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

PERFORMANCE

11 General

11.1 Except as otherwise indicated, representative samples of each type of valve are to be subjected to the tests described in these requirements. The order of tests, as far as applicable, is to be as indicated in Sections 12 – 22 with the exception of the specific test sequence shown in 11.4. 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.

11.2 All tests shall be performed using the test fluids specified for that test. No substitution of test fluids is allowed. When the test indicates that CE25a, CE40a or CE85a are to be used, the test fluid shall be prepared as described in Supplement SA.

11.3 All tests shall be performed using the test fluids specified for that test. No substitution of test fluids is allowed. When the test indicates that CE25a or CE85a are to be used, the test fluid shall be prepared as described in Supplement SA.

11.4 The tests in the following sequence are to be performed on one sample of a valve for each applicable test fluid as described in the Long Term Exposure Test, Section 12. 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 12

b) External Leakage Test, Section 14;

c) Hydrostatic Strength Test, Section 19;

d) Weak Section Strength Test, Section 16 (applicable to shear valves only).

11.5 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 11.4 shall be started within 4 hours 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.

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

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

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

11.9 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.

12 Long Term Exposure Test

12.1 General

12.1.1 The test outlined in 12.2 – 12.4 is to 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 percent (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 blends with a nominal ethanol concentration of up to 40 percent (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 percent, then the test shall be performed using both the CE25a and the CE85a test fluids. See Supplement SA for the test fluids.

12.2 Samples

12.2.1 Samples of complete valves are to be tested. All inlet and outlet openings of the samples shall be sealed in accordance with 12.2.3.

12.2.2 If platings or coatings are used internal to the device, additional samples may be used. See 12.4.2.

12.2.3 Closures shall be provided to seal off inlet and outlet openings of all samples in accordance with 12.2.1. These closures shall be fabricated of materials as specified in 12.2.4. The closures shall be provided with a 1/4 inch NPT 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.

12.2.4 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 aluminum tubing. Table 5.1 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 5.1 shall be tested as necessary to represent worst case conditions.

12.2.5 Material combinations at the product and closure interface will be a specified by the manufacturer. All closures for devices rated for gasoline/ethanol blends with nominal ethanol concentrations up to 25 or 40 percent shall be fabricated of suitable materials. All closures for devices rated for gasoline/ethanol blends with nominal ethanol concentrations above 25 percent 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 5.1 shall be used to determine the worst case metal interactions. Materials that are specified by the manufacturer, but are not included in Table 5.1 shall be tested as necessary to represent worst case conditions.

12.3 Method

12.3.1 The sample is to be exposed to the applicable test fluid in accordance with 12.1.1. The test fluids shall be prepared using the instructions in Supplement SA.

12.3.2 A quick connect device is connected to the 1/4 inch NPT connection at the inlet, and is 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 are then placed in the test chamber.

12.3.3 The chamber temperature is increased to 60 ±2°C (140 ±4°F). When the chamber reaches this temperature, the exposure period begins. The samples are exposed to the applicable test fluid at 60 ±2°C for approximately 168 hours. 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 (347 kPa) pressure for one minute. The fluid is then drained from the samples and observed in accordance with 12.4.2. After this observation, the fluid is discarded. The samples are then immediately refilled with new test fluid and the chamber temperature is allowed to increase to 60 ±2°C again. The total duration of the test shall equal 2,520 hours of exposure at 60 ±2°C.

12.3.4 At the end of the total exposure duration, the test fluid is left in the samples and the samples are removed from the chamber. The samples are then subjected to the test sequence as outlined in 11.4 and in accordance with 11.5. Prior to the initiation of the test sequence, the Long Term Exposure test fluid is to be drained and discarded.

12.3.5 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 are tested both during and after this exposure. See 12.4.2 and 12.4.4.

12.4 Results

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

12.4.2 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.

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

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

13 Deformation Test

13.1 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.

13.2 The sample valve used in this test is to be rigidly anchored or otherwise supported. A length of Schedule 80 pipe, sufficient to provide for wrench engagement, is to 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 is then to be tightened across the valve body joints to the torque specified by the manufacturer or in Table 13.1, whichever is greater.

Table 13.1
Torque requirements for pipe connections

Pipe size, nominal inches	Outside diameter, inches	Outside diameter, (mm)	Torque, pound-inches	Torque, (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	137
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

13.3 After the torque force has been applied to each connected pipe, the test sample is to be subjected to the External Leakage Test, Section 14.

13.4 Upon removal of the pipe from the test sample, the assembly is to be examined for loosening of body joints.

14 External Leakage Test

14.1 All valves subjected to this test shall be subjected to a test pressure as indicated in 14.2. Test pressures shall be developed from a hydrostatic or aerostatic source and maintained for 1 minute.

14.2 All valves are to be subjected to a test pressure equal to 1-1/2 times the rated pressure of the product, but not less than 75 psi (518 kPa).

14.3 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 200 cubic centimeters per hour.

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

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

14.6 In accordance with 14.5, 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

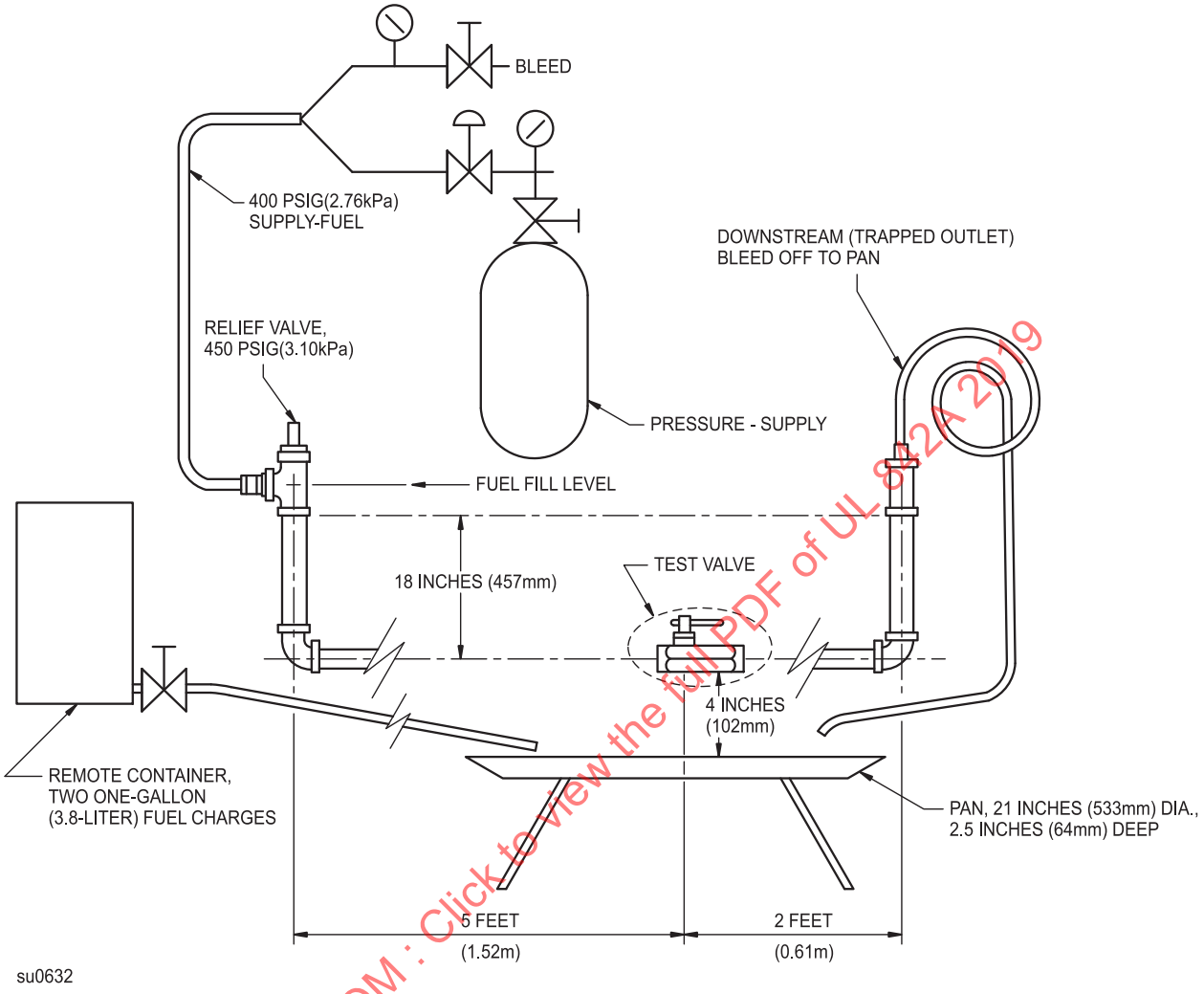
c) Other devices that are equivalent to the devices in (a) and (b).

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

15 Fire Test

15.1 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 15.2 – 15.8. An example of the test configuration is shown on Figure 15.1.

Figure 15.1
Test configuration



15.2 Prior to the fire test the valve is to be manually operated 100 times from fully opened to fully closed with normal closing pressures exerted on the valve seat.

15.3 The valve is then to be mounted and connected into a piping system, that utilizes the same size pipe couplings as the sample valve, and will place the valve inlet approximately 4 inches (102 mm) above the surface of the kerosene that will be burned during the test. The kerosene is to be contained by a pan approximately 21 inches (533 mm) in diameter and 2-1/2 inches (63.5 mm) deep.

15.4 A means for adding kerosene to the pan during the test is to be provided, consisting of a small remotely located container, a manual shutoff valve, and a supply line to provide for gravity feed of the liquid to be added to the pan.

15.5 A manual shutoff valve and a means for relief are to be provided in the fluid line serving the test valve. The system of piping is to be such that the maximum pressure of fluid for which the valve is rated can be impressed on the inlet to the valve immediately after the test valve has closed during the fire test. The test valve outlet is to be arranged to discharge any leakage to the pan.

15.6 At the start of the test, the test valve is to be open. When the valve is for liquid shutoff service, the supply line and the valve are to be filled with the test liquid. This shall be accomplished by providing a trapped outlet on the discharge side of the valve. The manual shutoff valve is to remain closed until the fusible link has operated.

15.7 A valve is to be subjected to the burning of kerosene. The test fluid in the test valve and its supply line is to be kerosene. An initial charge of 1 gallon (3.8 L) of kerosene to which 30 cubic centimeters of ″white″ gasoline has been added is to be placed in the pan. After ignition and immediately following the rupture of the fusible element, the manual valve and the means for relief are to be manipulated to maintain the rated or minimum test pressure, whichever is the greater, of the test valve in the supply line. The minimum test pressure is to be:

a) 10 feet (3.05 m) of liquid head for a valve intended for kerosene or fuel oil or

b) 9 inches (229 mm) water column for a valve intended for fuel gas.

15.8 At 10 minutes and again 20 minutes after ignition, an additional gallon (3.8 L) of kerosene is to be added to the fire in the pan. Forty-five minutes after ignition, the kerosene originally in the pan, added charges of kerosene, and any liquid added thereto as the result of seat or external leakage are to be completely burned out. It is anticipated that any leakage of liquid will be accumulated in the pan. With the pan dry of liquid, small flames issuing from the valve or its outlet after the 45-minute burnout period are not to be considered as contributing to an external fire.

16 Weak Section Strength Test

16.1 An emergency shutoff valve intended for installation at the supply connection of a dispensing device shall close when a bending moment of not more than 650 pound-feet (884 N·m) is applied to its assembly.

16.2 The valve is to be anchored immediately adjacent to the valve inlet connection using a full-size pipe, flange, or support as intended for this opening. A full-size pipe extension, sufficiently long to provide the bending moment required to operate the valve is to be secured to the outlet connection of the valve.

16.3 Following operation as the result of the required applied bending moment, the valve shall comply with the requirements of the tests for external leakage. See External Leakage Test, Section 14.

17 Endurance Test

17.1 A manually operated valve shall perform in its intended manner when tested as described in 17.3 – 17.11. There shall be no external leakage, no sticking of the valve, nor shall the valve become inoperative. Required corrosion protection shall not be impaired.

Exception: Flow limiters and emergency shutoff valves are not subjected to an endurance test.

17.2 A manual-operated valve shall perform in its intended manner when tested as described in 17.3 – 17.11. All other valves having automatic features shall perform as intended for at least 100,000 cycles of operation when tested with kerosene or Soltrol 170. There shall be no external leakage, no sticking of the valve, nor shall the valve become inoperative. Required corrosion protection shall not be impaired.

17.3 The valve is to be operated for 6,000 cycles when tested with kerosene or Soltrol 170 with rated pressure on the valve seat.

17.4 Prior to the beginning of this test, a test valve of the shutoff type is to be found in conformance with the requirements for deformation and seat leakage.

17.5 An endurance test is to be conducted with the valve outlet plugged. For anti-siphon valves and pressure actuators, the endurance test is to be conducted in a manner which subjects the discharge side of a valve to the pressures and flow of fluid anticipated in service.

17.6 An endurance test is to be conducted at a rate not faster than 10 times per minute.

17.7 A test valve is to be closed with a torque consistent with the size of the handwheel, wrench, or other means employed for the service.

17.8 When a valve is rated for use in an ambient temperature other than 25°C (77°F), the test assembly is to be placed in an enclosure in which the stipulated ambient temperature is maintained during the test. However, the test temperature is not to exceed the flash point of the test fluid.

17.9 An adjusting nut of a stuffing box or seal not equipped with spring takeup is to be initially adjusted as intended. When leakage is observed during the test, only one adjustment of the adjusting nut is to be made.