



UL 79A

STANDARD FOR SAFETY

Power-Operated Pumps for Gasoline and
Gasoline/Ethanol Blends with Nominal Ethanol
Concentrations up to 85 Percent (E0 – E85)

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UL Standard for Safety for Power-Operated Pumps for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 79A

First Edition, Dated February 11, 2015

Summary of Topics

This first edition of the Standard for Power-Operated Pumps for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), ANSI/UL 79A, covers electrically-, hydraulically-, or pneumatically-driven power-operated pumps for use with petroleum products.

The requirements are substantially in accordance with Proposal(s) on this subject dated October 17, 2014.

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February 11, 2015

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ANSI/UL 79A-2015

UL 79A

Standard for Power-Operated Pumps 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 Power-Operated Pumps for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 - E85), UL 79A.

First Edition

February 11, 2015

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

The most recent designation of ANSI/UL 79A as an American National Standard (ANSI) occurred on February 11, 2015. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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 <http://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements cover products described in 1.2 when used with one or more of the fuels described in 1.3.

1.2 These requirements cover electrically-, hydraulically-, or pneumatically-driven power-operated pumps for use with petroleum products in the following applications:

- a) Self-contained dispensing devices and submerged pumps used in storage tanks that provide the fuel to remote control dispensing devices. They are intended for operation at discharge pressures of 50 pounds per square inch (psig) (345 kPa), or the marked maximum discharge pressure rating, when less, with the ambient and liquid temperature within the range of minus 29°C (minus 20°F) – 52°C (125°F).
- b) Dispensing systems to transfer the fuel from a tank or container to a vehicle or another container. They are intended for operation at the marked maximum discharge pressure, or less, with the ambient and liquid temperature within the range of minus 29°C (minus 20°F) – 52°C (125°F).
- c) Vapor recovery applications for dispensing devices. They are intended to operate under a vacuum at the inlet and a maximum discharge pressure of 50 psig (345 kPa), or marked discharge pressure, whichever is less.

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

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

1.4 Requirements for the installation and use of these products are included in the Flammable and Combustible Liquids Code, ANSI/NFPA 30; the Motor Fuel Dispensing Facilities and Repair Garages Code, ANSI/NFPA 30A; and the National Electrical Code, ANSI/NFPA 70.

1.5 These requirements do not cover:

- a) Oil burner pumps, which are evaluated under the Standard for Pumps for Oil-Burning Appliances, UL 343.
- b) Pumps for engine-powered automotive equipment.

- c) Pumps for marine use which are evaluated under the Standard for Mechanically and Electrically Operated Fuel Pumps for Marine Use, UL 1130.
- d) Pumps for use in chemical, petrochemical, or petroleum processing plants; utility power plants; petroleum production facilities; pipeline pump stations; pipeline or marine terminals; or bulk plant distribution and related facilities.
- e) Pumps used in mobile applications, such as on tank trucks, portable tanks, or portable containers mounted on vehicles.
- f) Pumps rated more than 600 volts.
- g) Pump assemblies also provided with a flammable liquid meter or electrically-operated shutoff valve, which are evaluated in accordance with 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.
- h) Pumps intended for use with diesel fuel, biodiesel fuel, diesel/biodiesel blends, kerosene, or fuel oil, which are evaluated in accordance with the Standard for Pumps for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel, Oil, UL 79B.

1.6 The pump assembly may be constructed such that it provides for the installation and use of a flammable liquid hose and hose nozzle valve.

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.

2.1.5 Electrical components, including motors and wiring, when incorporated by a manufacturer in an assembly with a pump, and including the means provided in the pump assembly for electrical connections, shall comply with the requirements for equipment for use in hazardous locations, Class I, Group D, National Electrical Code, ANSI/NFPA 70, Articles 500 and 501.

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

3.4 **HAZARDOUS LOCATIONS** – Locations in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixture.

3.5 **INTRINSICALLY SAFE CIRCUIT** – A circuit incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. Abnormal conditions include unintentional damage to any part of the equipment or wiring, insulation or other malfunction of electrical components, application of overvoltage, adjustment and maintenance operations, and other similar conditions.

3.6 **LINE-VOLTAGE CIRCUIT** – A circuit involving a potential of not more than 600 volts and having circuit characteristics in excess of those of a low-voltage circuit.

3.7 **LOW-VOLTAGE CIRCUIT** – A circuit involving a peak open-circuit potential of not more than 42.2 volts supplied by:

a) A battery;

- b) A Class 2 transformer; or
- c) A combination of a transformer and a fixed impedance that, as a unit, complies with the performance requirements for Class 2 transformers in accordance with the Standard for Low Voltage Transformers – Part 1: General Requirements, UL 5085-1 and the Standard for Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers, UL 5085-3.

A circuit derived from a line-voltage circuit by connecting a resistance in series with the supply circuit as a means of limiting the voltage and current is not a low-voltage circuit.

3.8 RAINPROOF ENCLOSURE – An enclosure that prevents the entrance of a beating rain to the extent that there is no wetting of electrical parts and no water enters a compartment housing field installed wiring.

3.9 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.

3.10 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 The construction of a pump shall be such that parts can be assembled in the intended manner after being dismantled to the extent needed for replacement of parts or for other maintenance or servicing.

4.2 When a pump requires the use of special pipe flanges, gaskets, bolts, or other special fittings or parts for making connections, such parts shall be furnished as part of the pump assembly.

4.3 A product shall be formed and assembled so that it has the strength and rigidity required to resist the abuses to which it is subjected without resulting in the risk of fire, electric shock, or injury to persons due to total or partial collapse with:

- a) Resulting reduction of spacings;
- b) Loosening or displacement of parts; or
- c) Other defects.

4.4 A pump-motor assembly to be shipped from the manufacturer disassembled shall be provided with the marking described in 75.9.

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 25 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 coating or plating 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, shall be resistant to corrosion caused by these fuels. This requirement also applies to all tubing, piping, or other interconnection means between components. Compliance is verified by the Long Term Exposure Test, Section 41.

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 41.

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 shall be resistant to atmospheric corrosion. Ferrous materials of the 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;
- b) Standard pipe and fittings conforming to the Standard for Welded and Seamless Wrought Steel Pipe, ANSI/ASME B36.10M; and
- c) 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 or 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 25 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 manufacturers 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
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Table 5.1 Continued

	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 41.

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 and seals shall be designated as dynamic and/or static seals. See 3.9 and 3.10 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.

5.2.1.5 The reliability of a nonmetallic, pneumatic pressure confining part shall be determined for each application. Among the factors to be taken into consideration with the reliability of a nonmetallic material are:

- a) Mechanical strength;
- b) Resistance to impact;
- c) Resistance to distortion and creeping at temperature and pressures to which the material is subjected under conditions of intended use; and
- d) Dimensional stability.

Compliance with this requirement is determined by the tests of Sections 52, 68, 69, and 70.

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 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 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 durations 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 percent. 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 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 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 41. Static seals shall be provided in accordance with 41.2.5.

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 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 41. 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, is 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 41. 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 Pumps intended for use with dispensing equipment that provides for a variable blending option, at gasoline/ethanol blends with nominal ethanol concentrations above 25 percent, shall be subjected to the Blending Cycling Test, Section 71.

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

- a) If intended to be located after the blending option, such that the pump is only subjected to the final blended fuel, then the Blending Cycling Test 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 pump shall be subjected to the Blending Cycling Test, Section 71.

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

6 Bodies, Covers, and Heads

6.1 A pump body assembly shall withstand the Deformation Test, High Pressure Leakage Test, and Hydrostatic Strength Test requirements specified in Sections 46, 42, and 44, respectively. These requirements do not apply to body sections of submersible type pumps intended to be immersed in the liquid.

6.2 Plugs and other parts, other than cap screws and bolts threaded into noncorrosion-resistant ferrous parts of the pump, shall be of corrosion-resistant metal or provided with a protective coating when they are required to be removed for adjustment, repair, or other care of the pump.

6.3 A plug, cap, or other part threaded into or on the pump body shall engage with at least four full threads.

6.4 A bolt or a screw hole shall not extend through the outer walls of a pump body into a liquid-handling section.

7 Drive-Shaft Seals

7.1 A stuffing box or a seal shall comply with the requirements specified in the Endurance Test – Pumps, Section 43.

7.2 An adjustable stuffing box, when guarded or not accessible, or when clearly visible to the operator, shall be provided with a spring-loaded follower gland or the equivalent.

7.3 An automatic spring take-up for a gland shall employ a spring made of corrosion resistant material or coated to retard corrosion.

7.4 The physical characteristics of a take-up spring shall be such that it advances the gland through not less than one-half its possible travel from its initial setting with the spring compressed.

7.5 The stuffing-box recess shall be such that packing material does not come into contact with screw threads.

8 Diaphragms

8.1 A metal part coming in contact with a diaphragm shall have no sharp edges, burrs, projections, and surfaces that are capable of chafing or abrading the diaphragm.

8.2 A pump, in which a flexible diaphragm, bellows, or similar construction constitutes the only fluid seal, shall be constructed such that the atmospheric side of the diaphragm or bellows is enclosed in a casing construction to reduce external leakage in the event of a diaphragm or bellows rupture, or shall have provisions for connection of a vent pipe or tubing intended to be routed to the outdoors or other location determined to be equivalent. See 75.8.

9 Springs

9.1 An operating spring shall be guided and arranged to reduce binding, buckling, or other interference with its free movement. When required, ends of a spring shall be closed and squared.

9.2 A spring employed in a pump to reduce the risk of leakage, shall:

- a) Be protected against abrasion and corrosion and
- b) Demonstrate no loss in strength after being subjected to a compression force of three times that exerted by the spring in any position of its intended function.

9.3 In reference to 9.2(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 Floats

10.1 A float constructed to actuate a mechanism shall have a buoyancy not less than 50 percent greater than that required to operate the mechanism. See the Float Buoyancy Test, Section 51.

10.2 A hollow float shall withstand an external crushing pressure of not less than 35 psig (240 kPa). See the Float Crushing Test, Section 54.

10.3 A cork float shall be provided with a coating that is resistant to the action of the liquid with which it is in contact. Compliance of the coating is verified by the Long Term Exposure Test, Section 41.

10.4 A float shall be secured to its corresponding lever, rod, or other part of the mechanism by a method that prevents the float from becoming detached under its intended conditions of operation.

10.5 A float constructed of nonmetallic materials shall comply with the requirements of the

- a) Float Buoyancy Test, Section 51;
- b) Dimensional Stability of Floats Test, Section 52; and
- c) Weight Change of Floats Test, Section 53.

11 Air Separators

11.1 Air separators that are provided as an integral part of a pump assembly shall be provided with floats that comply with the requirements of Floats, Section 10.

11.2 The valve mechanism operated by the float shall be subjected to the Endurance Test for Air Separators, Section 48. When the valve mechanism closes a vent to atmosphere, it shall also be subjected to the High Pressure Leakage Test, Section 42.

12 Strainers

12.1 A strainer integral with or provided as part of a pump assembly shall comply with the applicable requirements in the Standard for Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 331A. The additional requirements of 12.2 – 12.6 apply.

12.2 A strainer shall enable the removal of foreign matter (sediment or dirt) without depositing the foreign matter in the outlet side of the strainer when the screen or filter element is removed for cleaning.

12.3 A strainer shall be installed and located so that removal and replacement of the strainer element is accomplished without breaking liquid lines or disturbing any part of the pump assembly. The location shall provide for the collection and removal of any spillage.

12.4 When provided, a drain opening shall be closed by a pipe plug not smaller than 1/4 inch pipe size (ANSI B36.10M). A pet cock or valve shall not be provided for drainage purposes. The materials shall comply with Materials, Section 5.

12.5 The force necessary to open a strainer shall not permanently distort the assembly or piping to which the strainer is attached.

12.6 Filter elements do not need to be evaluated for fluid compatibility.

13 Outlet Pressure Regulation

13.1 A pump assembly for use with or in dispensing devices intended to dispense the fuels anticipated by this standard shall incorporate means for the prevention of or the relief of pressures developed by the pump in excess of the maximum discharge pressure of 50 psig (345 kPa) or the marked maximum discharge pressure rating, whichever is less. See Blocked Outlet Test, Section 49.

13.2 To comply with the requirements in 13.1, a pump assembly may be equipped with:

- a) A bypass valve connected between the discharge and suction ports;
- b) A relief valve arranged to be connected between the discharge side and the supply tank through a separate return line. When the relief valve is not provided as part of the pump, it shall be marked as indicated in 75.6;
- c) A means to effect an automatic reduction in volumetric capacity upon an increase in pressure at the outlet; or
- d) An energy input incapable, because of power or speed, of developing a discharge pressure in excess of the maximum discharge pressure.

13.3 After the valve or other means for pressure regulation has been adjusted in accordance with the requirements in 13.1, it shall:

- a) Be capable of being sealed to discourage tampering;
- b) Be located within the pump body and require tools for access; or
- c) Be constructed so that the maximum adjustment obtainable does not result in a pressure in excess of the maximum discharge pressure under maximum output conditions.

14 Pressure Relief

14.1 A pump for use with or in dispensing devices intended to dispense the fuels anticipated by this standard shall incorporate means for the relief of pressures developed by thermal expansion of the fluid in excess of the maximum discharge pressure of 50 psig (345 kPa), or in excess of the marked maximum discharge pressure, whichever is less. Thermal expansion pressure shall anticipate a temperature rise of 28°C (50°F) in an ambient temperature of 24°C (75°F). See the Pressure Relief Test, Section 50.

14.2 To comply with the requirements in 14.1, a pump assembly may be equipped with:

- a) A bypass valve connected between the discharge and suction ports and
- b) A relief valve arranged to be connected between the discharge side and the supply tank through a separate return line. When the relief valve is not provided as part of the pump, it shall be marked as indicated in 75.6.

14.3 After the valve or other means for pressure relief has been adjusted in accordance with the requirements in 14.1, it shall be:

- a) Capable of being sealed to discourage tampering;
- b) Located within the pump body and require the use of tools for access;, or
- c) Constructed so that the maximum adjustment obtainable does not result in a pressure in excess of the maximum discharge pressure.

15 Mounting and Base

15.1 A pump shall be provided with supporting and mounting means independent of liquid-handling pipe connections. A mounting arrangement shall permit anchoring of the pump by bolts or cap screws.

15.2 When a base is furnished as part of a pump assembly, it shall be arranged to permit attachment and alignment of mounted parts and for anchoring to a mounting surface by cap screws or bolts.

16 Guards

16.1 A gear, belt, pulley, or other rotating part shall be enclosed in a metal guard or the pump assembly shall be furnished with an enclosure.

17 Piping and Fittings

17.1 Pipe threads shall be in accordance with the Standard for Pipe Threads, General Purpose (Inch) ANSI/ASME B1.20.1.

17.2 Flanges of flange-type pumps shall comply with the appropriate American National Standard for pipe flanges and flanged fittings covering the material from which they are made, or such flanges and flanged fittings shall comply with all of the following tests as complete assemblies forming part of the pump:

- a) High Pressure Leakage Test, Section 42;
- b) Hydrostatic Strength Test, Section 44;
- c) Retention Test for Screws and Bolts, Section 45;
- d) Deformation Test, Section 46; and
- e) 10-Day Moist Ammonia-Air Stress Cracking Test, Section 55.

17.3 An opening threaded for attachment to pipe shall be constructed so that a pipe threaded two threads beyond standard construction (for the size in question) is capable of being threaded into the opening without distorting any part of the fitting.

17.4 A male thread for attachment to pipe fittings shall have no shoulder within the distance specified in Table 17.1, from the beginning of the thread, including any chamfer, nor shall any shoulder prevent an additional turn being made within this distance as determined by assembling the part into a fitting within a tolerance of plus or minus one thread.

Table 17.1
Minimum shoulder distance from beginning of thread

Pipe size, ANSI B36.10M, nominal inches	Shoulder distance,	
	inches	(mm)
1/8	3/8	9.5
1/4, 3/8	9/16	14.3
1/2, 3/4	3/4	19.1
1	15/16	23.8
1-1/4	31/32	24.6
1-1/2	1	25.4
2	1-1/32	26.2
1-1/2	1-33/64	38.5
3	1-37/64	40.1

17.5 A threaded pipe connection shall be made with litharge and glycerine cement, shellac, shellac and inert powder filler, or a suitable pipe-joint sealing compound that is not alcohol based.

17.6 ASTM Schedule 40 metallic pipe shall be used, and the metallic materials shall comply with Materials, Section 5. A union, when used, shall be of the ground-joint type or a part that has been determined to be equivalent.

17.7 Tubing may be used where it is protected by its location in the pump assembly or by its intended installation location. Tubing and tube fittings shall be metallic, and all metallic materials shall comply with Materials, Section 5.

17.8 Tubing shall have a minimum wall thickness in accordance with Table 17.2 in any configuration that is used.

Table 17.2
Wall thickness for tubing

Outside diameter,		Minimum wall thickness,	
inch	(mm)	inch ^a	(mm) ^a
1/8	3.17	0.028	0.71
1/4	6.35	0.028	0.71
5/16	7.94	0.028	0.71
3/8	9.53	0.028	0.71
1/2	12.7	0.0315	0.80

^a Nominal wall thickness of tubing is required to be greater than the thickness indicated to maintain the minimum wall thickness.

18 Hose Nozzle Valve, Hose, and Coupling

18.1 A pump assembly for use with service-station type hose-nozzle valves may be furnished without a hose-nozzle valve when the assembly is marked as specified in 75.4. If the hose nozzle valve is provided, the hose nozzle valve shall be in accordance with the Standard for Hose Nozzle Valves for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 2586A.

18.2 When a hose assembly, consisting of hose and couplings, is supplied with the pump assembly, it shall comply with the Standard for Hose and Hose Assemblies for Dispensing Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 330A.

19 Conduit Seals

19.1 A factory-installed conduit seal incorporated as part of the product shall comply with the requirements of the High Pressure Leakage Test, Section 42; the Leakage of Wire Seal Test, Section 47; and the Hydrostatic Strength Test, Section 44.

19.2 When a conduit seal is incorporated with the product, the wires or conductors shall be securely held and tightly sealed where they pass into the enclosure. When a sealing compound or cement is used it shall:

- a) Provide a tight fit;
- b) Neither soften nor crack under service conditions;
- c) Be resistant to the solvent action of the liquids and vapors to which it is capable of being exposed – see the Tests on Sealing Compounds, Section 56;
- d) Be resistant to moisture and aging; and
- e) Have a depth equal to the inside diameter of the conduit or 5/8 inch (15.9 mm), whichever is greater.

19.3 The sealing compound used in a conduit seal shall not flow or creep at the operating temperature of the device. Sealing compounds that soften with the application of heat shall have a softening point of not less than 93°C (200°F) when used adjacent to motors having Class A (Class 105) insulation and not less than 113°C (236°F) when used adjacent to motors having Class B (Class 130) insulation. The softening point is to be determined in accordance with the Standard Test Method for Softening Point by Ring-and-Ball Apparatus, ASTM E28.

19.4 When a nipple is used to retain the sealing compound for lead wires, the depth of the seal shall not be less than the internal diameter of the nipple or 5/8 inch (15.9 mm), whichever is greater. Depending on the compound, the size of the lead wires, and the construction of the sealing well, a greater depth of sealing compound shall be used as required to form a tight seal. Means shall be provided in the nipple to anchor the sealing compound.