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JOINT CANADA – UNITED STATES NATIONAL STANDARD

ANSI/CAN/UL/ULC 331A:2024

STANDARD FOR SAFETY

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

Approved American National Standard
ANSI

ANSI/UL 331A-2024

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UL Standard for Safety for Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), ANSI/CAN/UL/ULC 331A

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 331A 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 September 1, 2023.

The new requirements are substantially in accordance with Proposal(s) on this subject dated September 1, 2023.

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MAY 31, 2024

ANSI/UL 331A-2024

1

ANSI/CAN/UL/ULC 331A:2024

Standard for Strainers 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 Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations up to 85 Percent (E0 – E85), UL 331A.

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 331A 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.

No Text on This Page

CONTENTS

Preface **5**

INTRODUCTION

1 Scope 7
2 Components 8
3 Units of Measurement 8
4 Referenced Publications 8
5 Glossary 9

CONSTRUCTION

6 General 10
7 Materials 10
7.1 Metallic materials 10
7.2 Nonmetallic materials 13
7.3 Casting impregnation materials 14
8 Bodies and Covers 14
9 Stuffing Boxes 15
10 Springs 15

PERFORMANCE

11 General 16
12 Long Term Exposure Test 16
12.1 General 16
12.2 Samples 16
12.3 Method 17
12.4 Results 18
13 Deformation and External-Leakage Test 18
14 Hydrostatic-Strength Test 19
15 Element-Collapse Test 19
16 Moist Ammonia-Air Stress Cracking Test 20

MANUFACTURING AND PRODUCTION

17 General 20

MARKINGS

18 General 20

ANNEX A (Normative) – TEST FLUIDS

A.1 Details 22

No Text on This Page

Preface

This is the Second Edition of ANSI/CAN/UL/ULC 331A, Standard for Strainers 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 331A 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 Normative, forms mandatory parts of this Standard.

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 331A.

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 Power-Operated Pumps for Petroleum Dispensing Products, TC 79.

This list represents the TC 79 membership when the final text in this Standard was balloted. Since that time, changes in the membership may have occurred.

TC 79 Membership

Name	Representing	Interest Category	Region
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M. Kawate	UL Standards & Engagement	TC Project Manager – Non-voting	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.

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INTRODUCTION

1 Scope

1.1 These requirements cover complete, self-contained strainer or filter assemblies intended for use with fuels designated in 1.3. Although these devices are designated strainers, they may be either strainers or filters according to the common terminology of the industry.

1.2 Strainers or filter assemblies for gasoline/ethanol blends with nominal ethanol concentrations up to 85 percent (E0 – E85) shall be constructed to comply with the following:

a) The requirements defined in UL/ULC 331, Standard for Strainers for Flammable and Combustible Liquids, Anhydrous Ammonia and Non-potable Water, and

b) The requirements in this Standard.

1.3 Strainers and filter assemblies 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 Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark Ignition Engines, ASTM D5798.

1.4 These requirements do not cover:

a) Strainers for handling liquids under cryogenic conditions;

b) Strainers for marine use;

c) Strainers for automotive fuel lines;

d) Strainers for handling refrigerants;

e) Strainers for use in such facilities as chemical, petrochemical, petroleum, and utility power plants;

f) Strainers for use in fluid-power (hydraulic and pneumatic) applications;

g) Strainers or filter assemblies for use with diesel, biodiesel, diesel/biodiesel blends, fuel oil, or kerosene which are covered under the Standard for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends With Nominal Biodiesel Concentrations Up To 20 Percent (B20), Kerosene, and Fuel Oil, UL/ULC 331B.

h) Strainers or filter assemblies for use with LP-Gas, Natural Gas, Manufactured Gas, and Anhydrous Ammonia, which are covered under the Standard for Strainers for Flammable Fluids and Anhydrous Ammonia, UL/ULC 331.

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; or

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

b) In Canada:

1) The National Fire Code of Canada;

2) Provincial or other Regulations.

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*

ASTM A653/A653M, *Specification for Sheet Steel, 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*

ASTM D5798, *Standard Specification for Ethanol Fuel Blends for Flexible-Fuel Automotive Spark Ignition Engines*

40 CFR 80, *Regulation of Fuels and Fuel Additives*

NFC, *National Fire Code of Canada*

NFPA 30, *Flammable and Combustible Liquids Code*

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

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*

SAE J1681, *Recommended Practice for Gasoline, Alcohol, and Diesel Fuel Surrogates for Material Testing*

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 331, *Strainers for Flammable and Combustible Liquids, Anhydrous Ammonia and Non-potable Water*

UL/ULC 331B, *Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations Up To 20 Percent (B20), Kerosene, and Fuel Oil*

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

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 FLAMMABLE AND COMBUSTIBLE LIQUIDS – The fuels are formulated in accordance with Regulation of Fuels and Fuel Additives, 40 CFR 80, and the following:

a) Gasoline formulated in accordance with ASTM D4814;

b) Gasoline/ethanol blends at levels designated as "gasohol" (E10) or less formulated in accordance with ASTM D4814, when blended with denatured fuel ethanol formulated in accordance with ASTM D4806;

5.4 FLAMMABLE LIQUID – A liquid having a flash point below 100 °F (37.8 °C) and a vapour pressure not exceeding 40 psig [275.79 kPa (absolute)] at 100 °F (37.8 °C) and as defined in the National Fire Code of Canada and NFPA 30.

CONSTRUCTION

6 General

6.1 A strainer shall include all of the components necessary for its intended function and installation, and shall be furnished as a complete assembly. Strainers may be one of two types:

a) Removable assemblies, or

b) Non-removable assemblies with removable strainer elements.

In this Standard, the term strainer applies to both types, and requirements that apply to a specific type will designate that type in the text of the requirement.

6.2 The construction of a strainer shall be such that parts can be reassembled in the intended manner after being dismantled to the extent needed for servicing.

6.3 A strainer shall be constructed so that, when in its intended operating position, any air trapped within will not reduce the rate of liquid flow or the effective strainer element capacity.

6.4 A non-removable strainer employing a strainer element intended to be cleaned or replaced shall permit the removal of the element without disconnecting piping.

6.5 A strainer element shall be constructed so that joints or seals required to prevent fluid bypass of the element will be maintained.

6.6 A non-removable strainer shall be constructed so that, when the screen or filter element is removed for cleaning, all foreign matter (sediment and dirt) will be removed or can be removed without the probability of any foreign matter being deposited in the outlet side of the strainer.

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 non-removable strainer assemblies for all fuel ratings covered by this Standard, see Corrosion due to fluid, 7.1.2.1. For non-removable strainer assemblies rated for gasoline/ethanol blends with nominal ethanol concentrations greater than 40 percent, see Metallic materials – system level, 7.1.3. For removable strainer assemblies, the requirements in 7.1.2.1 and 7.1.3 do not apply.

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.

7.1.1.4 A wire-cloth element, if finer than 60 mesh, shall be resistant to corrosion. A 60-mesh or coarser element shall be resistant to the fluid it is intended to contact.

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 of non-removable strainer assemblies shall be resistant to corrosion caused by the fuels anticipated by these requirements. Compliance is verified by the Long Term Exposure Test, Section 12.

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 12.

7.1.2.2 Atmospheric corrosion

7.1.2.2.1 Metallic materials used for fluid confining parts 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 in (6.4 mm) if shown by production test to be free of leakage,

b) Fabricated sheet steel parts having a minimum wall thickness of 0.093 in (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 in (0.008 mm) thick, and zinc plating shall not be less than 0.0005 in (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 in (0.0038 mm) thick. Metallic parts are also 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 non-removable strainer assemblies 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 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
	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 12.

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

7.2.1.3 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 Seals shall be evaluated in accordance with UL 157, modified as indicated in 7.2.2.2 – 7.2.2.3. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

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

7.2.2.3 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 hours;

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

c) For all materials, the average volume change shall not exceed 40 percent swell (increase in volume) or 1 percent shrinkage (decrease in volume). In addition, the weight loss shall not exceed 10 percent. There shall be no visual evidence of cracking or other degradation as a result of the exposure for any material.

7.2.2.4 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 hours;

b) The samples shall be immersed, at room temperature, in the test fluids [see (c)] 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 at least 30 minutes at room temperature. The sample shall not be allowed to dry out due to exposure to air. The at least 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.

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

7.2.3 Nonmetallic materials – system level

7.2.3.1 For all materials used in non-removable strainer assemblies, gaskets and seals that have been shown to comply with the applicable requirements for static seals in UL 157, or with the requirements under material level tests shall be subjected to the system level tests after the Long Term Exposure Test, Section 12. Static seals shall be provided in accordance with 12.2.5.

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 For non-removable strainer assemblies utilizing casting impregnation materials, the casting with the material applied as intended 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.

8 Bodies and Covers

8.1 An opening threaded for connection of pipe shall be threaded in accordance with ASME B1.20.1.

Exception: Strainers 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 18.1.

8.2 A strainer for attachment to pipe larger than 3-inch nominal size shall be provided with flanged pipe connections. Flanges shall conform to the appropriate American National Standard for pipe flanges and flanged fittings covering the material from which the flange is made, or shall be of a construction found by investigation to be equivalent for the specific application.

8.3 Cleanout and drain openings shall be closed by a standard pipe plug, a threaded, shouldered plug, or a wing-nut plug. The specified plugs shall be supplied with a seal to prevent leakage that is compatible with the intended fuel(s) as demonstrated by compliance with the performance requirements of this Standard. A strainer shall have plugs that are constructed of materials in accordance with Materials, Section 7.

8.4 A strainer provided with a screwed cover shall employ either ground joints, gaskets, or O-rings acceptable for the purpose. If a gasket or O-ring is used, it shall be retained by the body, cover, or cap when the part is removed and shall not be damaged when the cover or cap is screwed in place.

8.5 A flat gasket employed with a bolted cover shall be cemented to the cover or body unless the construction is such that the gasket will be retained by either the body or cover when the cover is removed.

Exception: Cementing or retaining of the gasket is not necessary provided a complete set of new gaskets is furnished with each replacement cartridge for a strainer that employs a cartridge-type filtering element.

8.6 A plant fiber gasket shall not be less than 1/32 in (0.8 mm) thick.

8.7 A cork gasket shall be graphited on one side, and when high pressures are involved, the other side shall be cemented in place so the gasket will not be blown out.

9 Stuffing Boxes

9.1 If packing is used to prevent leakage around a stem, and the construction is such that it is necessary for the user to adjust or renew the packing during usage or as wear occurs, a stuffing box complying with the requirements in 9.2 – 9.8 shall be provided.

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

9.3 A stuffing box gland shall be made of corrosion-resistant material in accordance with Materials, Section 7.

9.4 A stuffing box shall be fully packed prior to shipment of the strainer.

9.5 A spring-loaded follower gland shall employ a spring made of corrosion-resistant material, or of material provided with a corrosion-resistant protective coating. See Materials, Section 7.

9.6 If corrosion of a stem will cause damage to a packing or seal material and result in leakage, the stem shall be of a corrosion-resistant material. See Materials, Section 7.

9.7 A stem shall be constructed so that it cannot be completely withdrawn from the strainer by reverse rotation. Threads of a stem shall not enter a stuffing box recess.

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

10 Springs

10.1 The construction and application of a spring employed in a strainer shall be such that it is not likely to fail because of corrosion, fatigue, overstress, or wear, if failure of the spring will allow the strainer elements to become displaced.

PERFORMANCE

11 General

11.1 Except as otherwise indicated, representative samples of a strainer shall be subjected to the tests described in Sections 12 – 16.

11.2 If a series of strainers shall be investigated in which the bodies differ in size only, three representative samples are to be chosen to include the largest, smallest, and one intermediate size for each test fluid that is used. If a strainer having a single body size is being investigated, one sample is sufficient for each test fluid that is used. See 11.3.

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, CE40a or CE85a shall be used, the test fluid shall be prepared as described in Annex A.

11.4 For non-removable strainer assemblies, the following test sequence outlines the order in which tests shall be performed. Tests included in this Standard, but not included in the test sequence, can be performed in any order. The tests in the given sequence shall be performed on samples that were subjected to the Long Term Exposure Test, Section 12. Samples of the strainer are required for each applicable test fluid in accordance with 11.2, and the samples shall then be subjected to the sequence.

a) Long Term Exposure Test, Section 12;

b) Deformation and External Leakage Test, Section 13; and

c) Hydrostatic Strength Test, Section 14.

11.5 For removable strainer assemblies, the Long Term Exposure Test is not applicable. All other tests shown in this Standard may be performed in any order on samples as indicated in 11.2.

11.6 To reduce the effects of seal dry out due to removal of the test fluid during the test sequence in 11.4, the tests in the sequence shall be started within 4 hour of removal of the previous 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.

12 Long Term Exposure Test

12.1 General

12.1.1 The test outlined in 12.2 – 12.4 shall be performed on samples in accordance with 11.2 and 12.2. If the product is rated for use with gasoline or gasoline/ethanol blends 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 above 25 percent, then the test shall be performed using both the CE25a and CE85a test fluids. See Annex A.

12.2 Samples

12.2.1 A samples of a complete non-removable strainer assembly shall 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 assembly, additional samples may be used. See 12.4.2.

12.2.3 Closures shall be provided to seal off inlet and outlet openings 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 of the product and closure interface will be as specified by the manufacturer. All closures for non-removable strainer assemblies rated for gasoline/ethanol blends with nominal ethanol concentrations up to 40 percent shall be fabricated of suitable materials. All closures for non-removable strainer assemblies rated for gasoline/ethanol blends with nominal ethanol concentrations above 40 percent shall be fabricated of the materials representing permitted material to which the device may be connected; such as aluminum closures representing an aluminum manifold. Table 7.1 shall be used to determine the worst case material interactions. Materials that are specified by the manufacturer, but not included in Table 7.1 shall be tested as necessary to represent worst case conditions.

12.2.5 Any O-rings, gaskets, or other sealing materials, shall be provided and installed by the manufacturer. These dynamic sealing devices shall be the same as those that will be used in the final product installation. Static seals shall be representative of the seals being used in the final product installation. If the sealing device or material is not considered part of the component under test, but will be provided in the end product at the time of installation, a representative seal shall be provided for the test.

12.3 Method

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

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 meter 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 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 hours. At the end of this duration, the exposure period is halted and the chamber is allowed to cool. The samples are subjected to the rated pressure for at least one minute. The fluid is then drained from the samples, observed, and discarded. The samples are then immediately refilled with new test fluid and the chamber temperature is allowed to increase to 140 ±3.6 °F (60 ±2 °C) again. The total duration of the test shall equal 2,520 hours of exposure at 140 ±3.6 °F (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 appropriate test sequence as outlined in 11.4 and in accordance with 11.6. Prior to the initiation of the test sequence, the test fluid shall be drained and discarded.

12.3.5 If the device contains any parts or surfaces that are plated or coated, or if the device uses casting impregnation materials to eliminate porosity leakage, the plating, coating, impregnation, are tested both during and after this exposure. See 12.4.2 and 12.4.3.