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ANSI/CAN//UL/ULC 331B:2024

STANDARD FOR SAFETY

Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil

Approved American National Standard

ANSI/UL 331B-2024

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UL Standard for Safety for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, ANSI/CAN//UL/ULC 331B

Second Edition, Dated May 31, 2024

Summary of Topics

This new Second Edition of ANSI/CAN/UL/ULC 331B 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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ANSI/UL 331B-2024

MAY 31, 2024

ANSI/CAN//UL/ULC 331B:2024

Standard for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil

Prior to the first edition, the requirements for the products covered by this Standard were included in the Outline of Investigation for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil, UL 331B.

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 331B as an American National Standard (ANSI) occurred on May 31, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, Preface or SCC Foreword.

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

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Preface

This is the Second Edition of ANSI/CAN/UL/ULC 331B, Standard for Strainers for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations up to 20 Percent (B20), Kerosene, and Fuel Oil.

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 331B 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.

Annexes A and B, identified as Normative, form 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 331B.

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
M. Ebert	Fill-Right Company	Producer	USA
M. Kawate	UL Standards & Engagement	TC Project Manager – Non-voting	USA
W. Koch	Technology Resources, International Inc.	General Interest	USA
P. Legault	Integrated Review Services	General Interest	Canada
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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 the 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 diesel fuel, biodiesel fuel, diesel/biodiesel blends with nominal biodiesel concentrations up to 20 Percent (B20), kerosene, and fuel oil 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) Diesel fuel, which includes renewable diesel, and diesel/biodiesel blends with nominal biodiesel concentrations up to 5 percent (B0 – B5) formulated in accordance with the Standard Specification for Diesel Fuel Oils, ASTM D975;

b) Diesel/biodiesel blends and renewable diesel/biodiesel blends with nominal biodiesel concentrations from 5 percent up to 20 percent (B6 – B20) formulated in accordance with the Standard Specification for Diesel Fuel Oil, Biodiesel Blends (B6 – B20), ASTM D7467;

c) Biodiesel (B99.9/B100) formulated in accordance with the Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels, ASTM D6751;

d) Kerosene formulated in accordance with the Standard Specification for Kerosine, ASTM D3699;

e) Fuel oil (heating oil) formulated in accordance with the Standard Specification for Fuel Oils, ASTM D396.

1.4 These requirements do not cover the following:

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 gasoline or gasoline/ethanol blends, which are covered under the Standard for Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85), UL/ULC 331A;

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 and Combustible Liquids, Anhydrous Ammonia and Non-potable Water, 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;

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

3) Standard for the Installation of Oil-Burning Equipment, NFPA 31.

b) In Canada:

1) National Fire Code of Canada;

2) Installation Code for Oil-Burning Equipment, CSA B139;

3) Oil-Burning Equipment: General Requirements, CSA B140; or

4) 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 D396, *Standard Specification for Fuel Oils*

ASTM D471, *Standard Specification for Standard Test Method for Rubber Property – Effects of Liquids*

ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

ASTM D975, *Standard Specification for Diesel Fuel Oils*

ASTM D3699, *Standard Specification for Kerosine*

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 D6751, *Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels*

ASTM D7467, *Standard Specification for Diesel Fuel Oil, Biodiesel Blends (B6 – B20)*

ASTM E11, *Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves*

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

CSA B139, *Installation Code for Oil-Burning Equipment*

CSA B140, *Oil-Burning Equipment: General Requirements*

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, *Installation of Oil-Burning Equipment*

UL 87B, *Power-Operated Dispensing Devices for Diesel Fuel, Biodiesel Fuel, Diesel/Biodiesel Blends with Nominal Biodiesel Concentrations Up to 20 Percent (B20), Kerosene, and Fuel Oil*

UL 157, *Gaskets and Seals*

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

UL/ULC 331A, *Strainers for Gasoline and Gasoline/Ethanol Blends with Nominal Ethanol Concentrations Up to 85 Percent (E0 – E85)*

UL/ULC 842, *Valves for Flammable Fluids*

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 the Long Term Exposure Test, Section 12. For removable strainer assemblies, the Long Term Exposure Test does 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.

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 With reference to the above requirements, metallic parts including metallic materials used to form fluid confining parts as well as metallic coatings, or plating that may be applied to a base material.

7.1.2 Atmospheric corrosion

7.1.2.1 Metallic material 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 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 in (2.36 mm).

7.1.2.2 A protective coating shall provide resistance against atmospheric corrosion to a degree not less than that provided by the protective coatings specified in 7.1.2.3.

7.1.2.3 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 7.1.2.1 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.

7.1.2.4 A metallic material other than as described in 7.1.2.1 – 7.1.2.3 shall be painted or protected in a manner that has been determined to be equivalent.

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 – 7.2.2.4. If a specific material complies with these requirements, the material can be considered to be qualified for system level testing.

7.2.2.2 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 12.2.4.

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 87B.

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-in 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 shall 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 FB25a or B100a 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, Section 12 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 hours 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 diesel fuel, a diesel/biodiesel blend with a nominal biodiesel concentration of up to 20 percent (B20), kerosene, or fuel oil, then the test shall be performed using the FB25a test fluid. If the product is rated for use with a biodiesel (B99.9/B100), then the test shall be performed using the B100a test fluid. See Annex A.

12.2 Samples

12.2.1 A sample of a complete 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 suitable materials. The closures shall be provided with a 1/4 in 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 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 in 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 device 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, or impregnation are tested both during and after this exposure. See 12.4.2 and 12.4.3.

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 shall 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.

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

13 Deformation and External-Leakage Test

13.1 When tested as specified in 13.2 – 13.6, a strainer shall not leak, nor shall there be evidence of damage resulting from:

a) The application of 1-1/2 times maximum rated pressure for at least 1 minute;

b) The tightening of threaded parts used for care and servicing; and

c) The turning effort exerted on openings threaded for piping.

13.2 Representative strainer assemblies shall be rigidly supported. Any bolts, pipe plugs, or threaded parts detached for care and servicing of the strainer shall be tightened with a torque wrench to the value specified in Table 13.1 or Table 13.2. Samples with threads other than those specified in Table 13.1 or Table 13.2 shall be torqued as specified by the manufacturer.

Table 13.1
Torque Requirements for Screws

American standard screw size	Torque		I.S.O. screw size	Torque	
	lb-in	(N·m)	mm	lb-in	(N·m)
–	–	–	4	7	(0.8)
No. 8	9	(1.0)	4.5	12	(1.4)
No. 10	15	(1.7)	5	19	(2.7)
1/4 inch	50	(5.6)	6	40	(4.5)
–	–	–	7	70	(7.9)
5/16 inch	100	(11.3)	8	100	(11.3)
–	–	–	9	130	(14.7)
3/8 inch	150	(16.9)	10	165	(18.6)
7/16 inch	200	(22.6)	12	230	(26.0)
1/2 inch	250	(28.2)	14	295	(33.3)
9/16 inch	300	(33.9)	–	–	–

Table 13.2
Torque Requirements for Pipe Connections

Pipe size, nominal in	Torque	
	lb-in	(N·m)
1/8	150	(16.9)
1/4	250	(28.2)
3/8	450	(50.8)
1/2	800	(90.4)
3/4	1000	(113)
1	1200	(136)
1-1/4	1450	(164)
1-1/2	1550	(175)

Table 13.2 Continued on Next Page

Table 13.2 Continued

Pipe size, nominal in	Torque	
	lb-in	(N·m)
2	1650	(186)
2-1/2	1750	(198)
3	1800	(203)

13.3 The sample strainer used in this test shall be rigidly anchored or otherwise supported. A length of Schedule 80 pipe shall be connected to a female pipe threaded section of the body, the male threads having first been lubricated with SAE No. 10 machine oil. Each pipe is then to be tightened to the torque specified in Table 13.2.

13.4 The strainer is then to be subjected for at least one minute to a hydrostatic pressure of 1-1/2 times maximum rated pressure, but not less than 18 psig (124 kPa).

13.5 The strainer parts used for care and servicing of the strainer are then to be alternately removed and replaced 25 times, tightening each time with a torque wrench to the value specified in Table 13.1 or Table 13.2. Samples with threads other than those specified in Table 13.1 or Table 13.2 shall be torqued as specified by the manufacturer. The pressure test described in 13.4 is then to be repeated.

13.6 Any bolts or threaded parts used for care and servicing of the strainer are then to be tightened with a torque wrench to twice the value specified in Table 13.1 or Table 13.2. Samples with threads other than those specified in Table 13.1 or Table 13.2 shall be torqued to twice the value as specified by the manufacturer. The pressure test described in 13.4 is then to be repeated.

14 Hydrostatic-Strength Test

14.1 All parts of a strainer that are subjected to pressure during intended use shall withstand for at least one minute, without rupture or permanent distortion, a hydrostatic pressure of five times the maximum rated pressure, but not less than 60 psig (414 kPa).

14.2 All samples used in the Deformation and External-Leakage Test, Section 13, shall be subjected to this test.

15 Element-Collapse Test

15.1 A strainer element shall not collapse when totally clogged and subjected for at least one minute to a differential hydrostatic pressure of 18 psig (124 kPa).

15.2 The strainer-element openings shall be closed with tape, lacquer, or other means. A hydrostatic pressure is then to be applied to exert the differential pressure between the inlet and outlet sides of the element.

16 Moist Ammonia-Air Stress Cracking Test

16.1 After being subjected to the conditions described in 16.2 – 16.3, a pressure-confining brass part containing more than 15 percent zinc shall:

a) Show no evidence of cracking, delamination, or degradation; or

b) Perform as intended when tested as described in 16.4.

16.2 One test sample of each size shall be subjected to the physical stresses normally imposed on or within a part as the result of assembly with other components. Samples with female tapered pipe threads, intended to be used for installing the product in the field shall have the threads engaged and tightened to the torque specified in Table 13.2. Samples with female threads other than tapered pipe threads shall be torqued as specified by the manufacturer. Polytetrafluoethylene (PTFE) tape or pipe compound are not to be used on any threads. Samples with male threads are evaluated as received.

16.3 The samples are then to be tested in accordance with Apparatus, Reagents and Materials, Test Media, Test Sample Preparation, (9.3 – 9.4), and Test Procedure (10.1 – 10.4) of ASTM B858, except the pH level of the test solution shall be High 10.5 ±0.1 and the exposure temperature shall be 77 ±1.8 °F (25 ±1 °C).

16.4 After the exposure period, the samples shall be examined for cracks, delamination, and degradation using a microscope having a magnification of 25X. Pressure-confining parts exhibiting degradation as indicated in 16.1 as a result of the test exposure described in 16.2 and 16.3 shall withstand, without rupture, a hydrostatic test pressure of five times the rated pressure of the valve, for at least one minute.

MANUFACTURING AND PRODUCTION

17 General

17.1 The manufacturer shall provide the necessary production control, inspection, and tests. The program shall include the test described in 17.2.

17.2 Each assembled strainer shall be tested to determine that it does not leak externally at:

a) An air pressure equal to the rated operating pressure, but not less than 18 psig (124 kPa); or

b) A hydrostatic pressure of 1-1/2 times the rated operating pressure, but not less than 27 psig (186 kPa).

MARKING

18 General

18.1 A strainer shall be marked with the following information:

a) The manufacturer's or private labeler's name or identifying symbol.

b) A distinctive catalog designation to specifically identify the strainer.

c) Strainer assemblies shall be marked to indicate the fuel rating for which they are intended. The marking shall be "Diesel Fuel" or "B5" for strainers rated for diesel fuel only; shall be "B20" for strainers rated for diesel fuel and diesel/biodiesel blends with nominal biodiesel concentration up to 20 percent (B0 – B20); shall be "B99.9/B100" for strainers rated for biodiesel fuel; shall be "Kerosene" for strainers rated for kerosene, or shall be "Fuel Oil" for strainers rated for fuel oil. The marking shall be prominently displayed. See 18.3.

d) The direction of flow.

e) The maximum working pressure or pressures for various fluids. See 18.3.

f) Strainers constructed using pipe thread in accordance with the Exception to 18.1 shall be provided with a tag, label, or similar marking on the product or smallest unit package, identifying the pipe thread type for the installer. See 18.3.

18.2 A strainer assembly consisting of a base (head) unit and a separate replaceable spin-on type filter shall have the markings specified in 18.1 marked on the fixed base (head) unit, except as noted in 18.3. In addition, the head unit shall be marked with the model and/or catalog designation of suitable replacement spin-on type filters for which it has been evaluated.

18.3 The markings specified in 18.1 (c), (e), and (f), may be:

a) Included as part of the strainer marking or on a tag attached to the strainer;

b) Shown on the smallest carton in which the strainer is packaged; or

c) Included in installation instructions provided with each strainer.

18.4 A disposable-type element or cartridge shall be marked with the manufacturer's or private labeler's name or identifying symbol and catalog designation.

18.5 A strainer with a disposable-type element or cartridge shall be marked to enable the user to identify the element or cartridge used therein. This may be accomplished by cross referencing the strainer catalog designation to the element catalog designation in the manufacturer's or private labeler's instructions provided with the strainer.

18.6 Markings shall be legible and permanent, such as afforded by a metal nameplate, decalcomania transfer, laser etching, or waterproof marking ink.

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

ANNEX A (normative) – TEST FLUIDS

A1 Representative Aggressive Combustible Test Fuel Mixtures

There are two test fluids that are applicable for tests in this Standard. The fluids are designated as FB25a and B100a. The Test fluids represent chemical and physical characteristics of the fuels covered in this Standard. See 1.3. The aggressive biodiesel contains elements that are used to represent contaminants that can be found in actual use and are used to help represent the worst case test fluid.

The test fluid designations represent the following:

FB25a – An aggressive test fluid containing 25 percent biodiesel with aggressive elements:

1) FB25a – An aggressive test fluid containing 25 % biodiesel with aggressive elements, and

2) B100a – An aggressive test fluid containing 100 % biodiesel with aggressive elements

where:

F= Reference Fuel F (No. 2 Grade S500) in accordance with ASTM D471.

B = Biodiesel (100 % Soy feedstock) in accordance with ASTM D6751.

a = Aggressive components to be mixed with B to form an aggressive Biodiesel Stock.

The aggressive biodiesel containing <0.5 percent volume combined water and decanoic acid shall be based on the approximate formula below (*) to achieve a final 1.00 ±0.02 acid number of the mixture when measured in accordance with ASTM D664.

0.2 percent volume acid water [2.60 g decanoic acid crystals/1000 g of deionized water](†)

The resulting solution, after mixing the above elements, shall have an acid number of 1.0 ±0.02. After the measurement is determined, an acid number not within the specification of 1.0 ±0.02 shall be adjusted with additional biodiesel fuel or decanoic acid added until the acid number is 1.0 ±0.02.

These two fluids may be used to condition samples as noted in each specific test that indicates that these fluids shall be used. The test fluids shall be prepared just prior to use to minimize effects on the test fluid. The aggressive biodiesel is corrosive and changes can occur to the solution from interactions with the storage and transfer containers. Exposure to air and/or moisture may also affect the test fluid.

Products intended to be rated for use with diesel fuel or diesel/biodiesel fuel blends with nominal biodiesel concentrations up to 20 percent (B0 – B20) shall be evaluated using the FB25a test fluid as the only applicable test fluid. Products intended to be rated for use with biodiesel fuel (B99.9/B100) shall be evaluated using the B100a test fluid. For products evaluated using the FB25a test fluid or B100a test fluid, one sample is required to be conditioned in accordance with the test sequences in 11.4.

(*) Note: The formula is approximate since each source of biodiesel may have variations in specific gravity and initial acid number that require measurement and final adjustment as specified.

(†) Note: Decanoic acid crystals are insoluble in water, so are recommended to be finely ground and thoroughly mixed in the overall solutions before acid number measurements are taken.

ANNEX B (normative) – STRAINERS FOR OIL-FIRED HEATING APPLIANCES

B1 Scope

B1.1 This Annex covers complete, self-contained strainer or filter assemblies intended for use with oil-fired heating appliances.

B1.2 Except as noted, the requirements of this Annex is in addition to the requirements of Section 1 – Annex A of this Standard.

B2 Capacity

B2.1 A strainer that is intended to protect the smallest orifice in oil burning equipment shall comply with the requirements in this section.

B2.2 A strainer element of the wire cloth, perforated, or plate type shall have a maximum orifice (diameter) size or plate separation of:

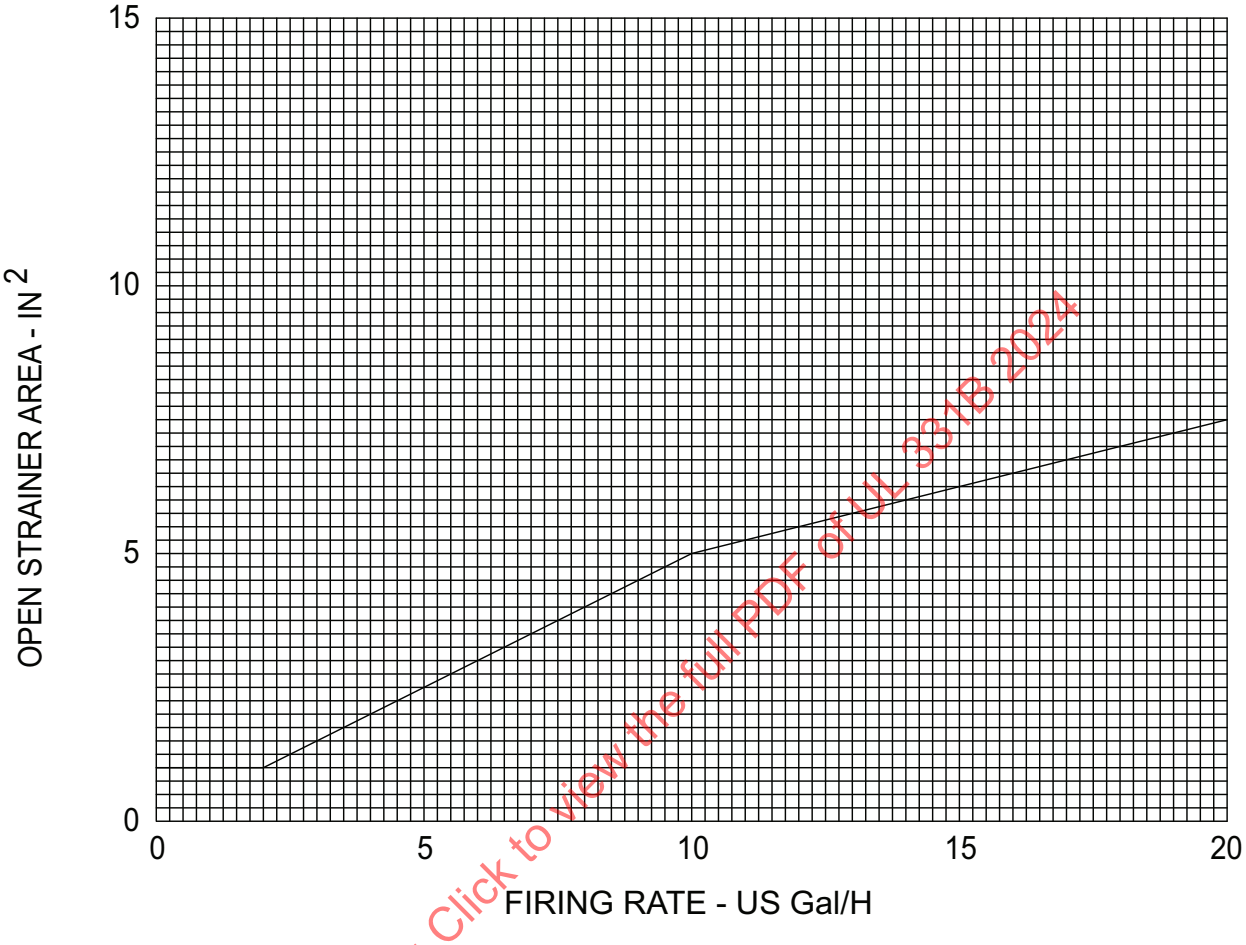
a) 0.027 in (0.69 mm) if the strainer is intended for use with No. 1 or 2 grade fuel oil; and

b) 0.056 in (1.42 mm) if the strainer is intended for use with No. 4, 5, or 6 grade fuel oil service.

B2.3 Each strainer assembly shall be rated for capacity in terms of the maximum firing rate of the burner equipment as expressed in US gallons of fuel oil /hour (3.79 L/hr). For strainers employing wire cloth or perforated screens, Figure B2.1 – Figure B2.3 specify minimum areas of screen opening based upon the grade of fuel oil used and the firing rate of the equipment to be served.

Figure B2.1

Strainer Area for No. 1 Grade Fuel Oil



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NOTES:

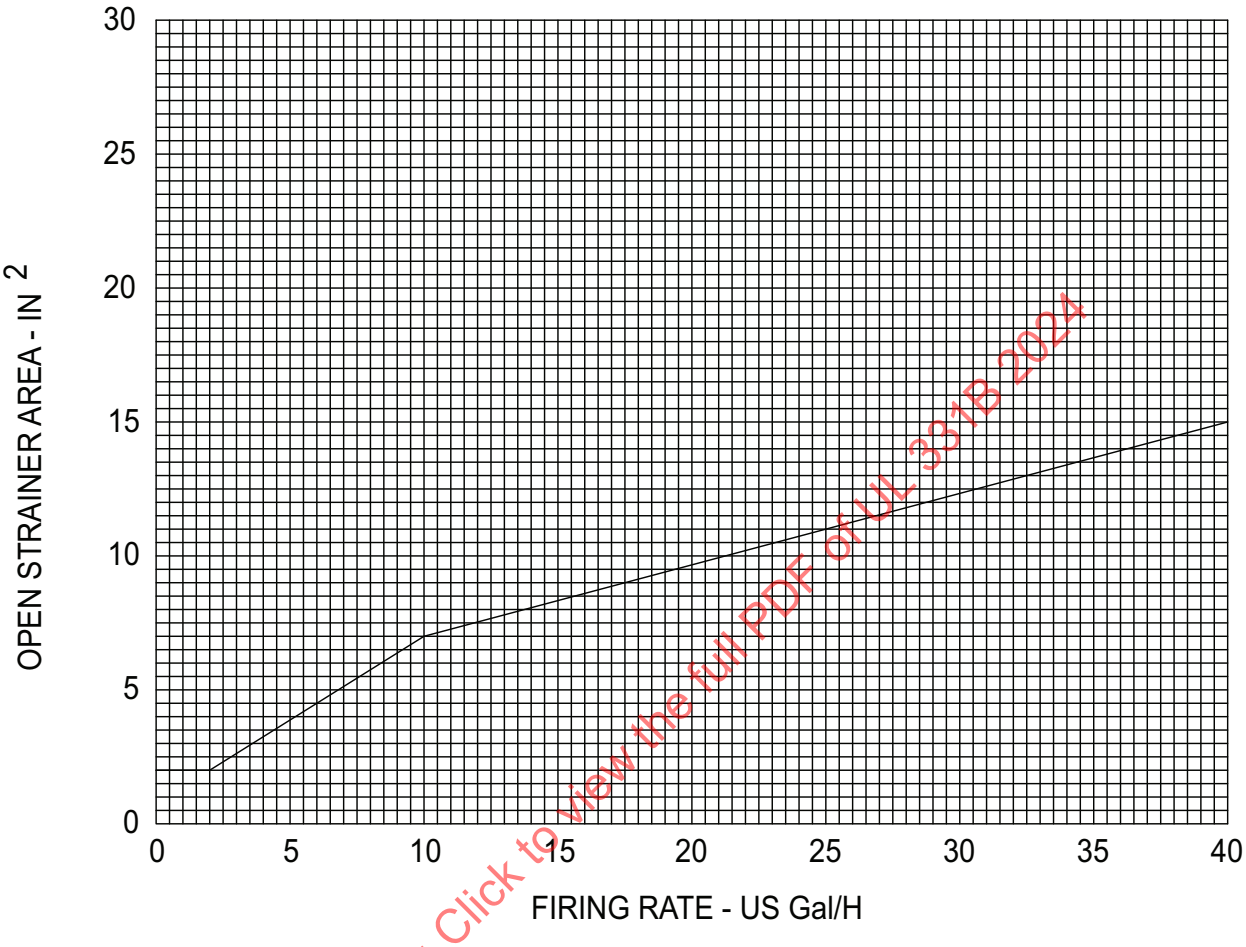
1) Fuel oil as designated by ASTM D396

2) 1 in^2 = 6.45 cm^2

3) 1 US Gallon = 3.79 L

Figure B2.2

Strainer Area for No. 2 Grade Fuel Oil



NOTES:

1) Fuel oil as designated by ASTM D396

2) 1 in^2 = 6.45 cm^2

3) 1 US Gallon = 3.79 L