# UL 296

## STANDARD FOR SAFETY

Oil Burners

UL Standard for Safety for Oil Burners, UL 296

Eleventh Edition, Dated February 24, 2017

***Summary of Topics***

***This revision of ANSI/UL 296 dated November 16, 2022 includes the following changes in requirements:***

***– Addition of B100 biodiesel requirements for oil burners; 1.3, 5.20, Supplement SA, Supplement SB***

***– Metallic material requirements harmonization; SA6.8.1***

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated September 30, 2022.

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# UL 296

## Standard for Oil Burners

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**Eleventh Edition**

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This ANSI/UL Standard for Safety consists of the Eleventh Edition including revisions through November 16, 2022.

The most recent designation of ANSI/UL 296 as an American National Standard (ANSI) occurred on November 16, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 296 on January 27, 1992. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

No Text on This Page

## CONTENTS

### INTRODUCTION



### CONSTRUCTION – MECHANICAL



### CONSTRUCTION – ELECTRICAL

**PERFORMANCE**

No Text on This Page

## INTRODUCTION

### 1 Scope

1.1 These requirements cover oil burners intended for firing appliances and devices such as boilers; central, floor, wall, and special furnaces; storage tank water, air, and direct-fired air heater units; and ovens. These burners are required to be equipped with automatic primary safety controls to restrict abnormal discharge of oil at the burner in case of ignition failure or flame failure.

1.2 The use of oil-burning equipment covered by these requirements are intended for installation in accordance with the National Fire Protection Association Standard for the Installation of Oil-Burning Equipment, NFPA 31, the International Mechanical Code, and the Uniform Mechanical Code.

1.3 Oil Burners covered by this standard are intended for use with one or more of the following grades of fuel oil/biodiesel blends as defined in the Standard Specification for Fuel Oils, ASTM D396:

a) No. 1 S15, No. 1 S500, No. 1 S5000, No. 2 S15, No. 2 S500, No. 2 S5000, No. 2, which may contain up to 5% biodiesel.

b) B6-B20 S15, B6-B20 S500, B6-B20 S5000 which are biodiesel blends that may contain up to 20% biodiesel.

c) B21-B100 which are biodiesel blends that may contain up to 100% biodiesel.

d) No. 4, No. 4 (Light), No. 5 (Light), No. 5 (Heavy), No. 6.

Note: Unless stated otherwise it is implied that all sulfur grades are included for the fuel oil grade listed

### 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. See the individual sections of this Standard for component requirements.

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 Undated References

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.

## 5 Glossary

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

5.2 AIR SHUTTER – An adjustable device for varying the size of the air inlet or inlets regulating primary or secondary air.

5.3 ANTIFLOODING DEVICE – A primary safety control that causes the fuel flow to be shut off upon a rise in fuel level or upon receiving excess fuel, and that operates before the hazardous discharge of fuel can occur.

5.4 BURNER, AUTOMATICALLY-LIGHTED – One where fuel to the main burner is turned on and ignited automatically.

5.5 BURNER, MANUALLY-LIGHTED – One where fuel to the main burner is turned on only by hand and ignited under supervision.

5.6 BURNER, MECHANICAL-ATOMIZING TYPE – A power-operated burner that prepares and delivers the oil and all or part of the air by mechanical process in controllable quantities for combustion. Some examples are air and steam atomizing, high and low pressure atomizing, horizontal rotary, vertical rotary atomizing, and vertical rotary wall-flame burners.

5.7 BURNER, MECHANICAL-DRAFT TYPE – A burner that includes a power-driven fan, blower, or other mechanism as the principal means for supplying air for combustion.

5.8 BURNER, NATURAL-DRAFT TYPE – A burner that depends principally upon the natural draft created in the flue to induce into the burner the air required for combustion.

5.9 BURNER, VAPORIZING TYPE – A burner consisting of an oil-vaporizing bowl or other receptacle to which liquid fuel may be fed in controllable quantities; the heat of combustion being used to vaporize the fuel, with provision for admitting air and mixing it with the oil vapor in combustible proportions.

5.10 CENTRAL HEATING APPLIANCE – A stationary indirect-fired vented appliance comprising the following classes: boilers, central furnaces, floor furnaces, and recessed heaters. A floor-mounted unit heater to be connected to a duct system is classified also as a central heating appliance.

5.11 CONSTANT-LEVEL VALVE – A device for maintaining within a reservoir a constant level of fuel for delivery to the burner.

5.12 CONTROL – A device that functions to regulate the fuel, air, water, or electrical supply to the controlled equipment. It may be automatic, semiautomatic, or manual.

5.13 CONTROL, LIMIT – A safety control responsive to changes in liquid level, pressure, or temperature, normally set beyond the intended operating range of the controlled equipment to limit its operation.

5.14 CONTROL, OPERATING – A control, other than a safety control or interlock, to start or regulate input according to demand, and to stop or regulate input on satisfaction of demand. Operating controls may also actuate auxiliary equipment.

5.15 CONTROL, SAFETY – An automatic control, such as a relay or switch used in conjunction with other auxiliary equipment to form a safety control system that is relied upon to reduce the risk of fire, electric shock, or injury to persons.

5.16 CONTROL, PRIMARY SAFETY – An automatic control that monitors the operation of a gas-fired or an oil-fired burner. It normally consists of the following sections that may be integrated into a common unit or may be separate units, interconnected by wiring:

Programming Unit – A device that programs the burner through start-up and shut-down operations in response to signals from regulating, limiting, and monitoring devices. It also provides the timings, as required, in proper sequence, for purging, flame establishing periods, and in case of flame failure, for safety shutdown (lockout).

Combustion Detector – A device that is responsive to flame properties. It monitors the flame at the point of flame supervision and transmits a signal to the programming unit, indicating absence or presence of flame.

5.17 CONTROL, SAFETY COMBUSTION – See Control, Primary Safety – 5.16.

5.18 DRAFT REGULATOR, BAROMETRIC (Automatic Damper) – A device that functions to maintain a desired draft in the appliance by automatically reducing excess chimney draft to the desired value.

5.19 ELECTRICAL CIRCUITS –

a) High-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.

b) Low-Voltage Circuit – A circuit involving a potential of not more than 30 volts rms alternating current (42.4 volts peak) or direct current and supplied by:

1) A Class 2 transformer, or by a battery, by a battery and fixed impedance, or by a transformer and fixed impedance, each of which, as a unit is in compliance with what is required for a Class 2 transformer; or

2) Is limited to a maximum of 100 volt-amperes. A circuit derived from a source of supply classified as a high-voltage circuit, by connecting resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be a low-voltage circuit.

c) Safety-Control Circuit – A circuit involving one or more safety controls.

5.20 FUEL OIL – Any hydrocarbon oil or biodiesel blend as defined by Standard Specification for Fuel Oils, ANSI/ASTM D396-2021.

5.21 IGNITION, CONTINUOUS – Ignition by an energy source that is continuously maintained throughout the time the burner is in service, whether the main burner is firing or not.

5.22 IGNITION, INTERMITTENT – Ignition by an energy source that is continuously maintained throughout the time the burner is firing.

5.23 IGNITION, INTERRUPTED – An ignition system that is energized each time the main burner is to be fired and de-energized at the end of a timed trial for ignition period or after the main flame is proven to be established.

5.24 IGNITION, MANUAL – Ignition by an energy source that is manually energized and where the fuel to the pilot is lighted automatically when the ignition system is energized.

5.25 PILOT – A flame that is utilized to ignite the fuel at the main burner or burners.

5.26 PILOT FLAME-ESTABLISHING PERIOD – The length of time fuel is permitted to be delivered to a proved pilot before the flame-sensing device is required to detect pilot flame.

5.27 PILOT, EXPANDING – A pilot that burns at a low turndown throughout the entire time the burner is in service whether the main burner is firing or not. Upon a call for heat, the pilot is automatically expanded so as to ignite the main burner as intended. This pilot may be turned down at the end of the trial-for-ignition period for the main burner.

5.28 PILOT, PROVED – A pilot flame supervised by a primary safety control which senses the presence of the pilot flame prior to permitting the main burner fuel to be delivered for combustion.

5.29 POST-PURGE PERIOD – The period of time after the fuel delivered to the burner is stopped and during which the burner motor or fan continues to run to supply air to the combustion chamber.

5.30 PREPURGE PERIOD – The period of time during the burner start-up in which air is introduced into the combustion chamber and the associated flue passages in such volume and manner as to completely replace the air or fuel-air mixture contained therein prior to initiating ignition.

5.31 PRIMARY AIR – The air introduced into a burner and which mixes with the fuel before it reaches the ignition zone.

5.32 PUMP, AUTOMATIC OIL – A pump, not an integral part of a burner, that automatically pumps oil from the supply tank and delivers the oil by gravity under a constant head to an oil-burning appliance. The pump is intended to stop pumping automatically in case of total breakage of the oil supply line between the pump and the appliance.

5.33 PUMP, OIL-TRANSFER – An oil pump, automatically or manually operated, that transfers oil through continuous piping from a supply tank to an oil-burning appliance or to an auxiliary tank, and which is not intended to stop pumping automatically in case of total breakage of the oil supply line between the pump and the appliance.

5.34 RECYCLE – A characteristic in some programming primary safety controls for automatically lighted burners that, upon accidental flame failure during a normal firing cycle and the subsequent shutoff of main burner fuel, will provide, after a preestablished shutdown period and under a normal starting program, one attempt to automatically light the main burner.

5.35 SAFETY SHUTDOWN – The action of shutting off all fuel and ignition energy to the device by means of a safety control or controls such that restart cannot be accomplished without a recycle or manual reset (lockout).

5.36 SECONDARY AIR – The air externally supplied to the flame at or beyond the point of ignition.

5.37 SERVICING – The periodic tasks usually performed to operate and maintain an appliance, such as air, fuel, pressure, and temperature regulation, cleaning, lubrication, and resetting of controls. Repair and replacement of parts other than those expected to be renewed periodically is not considered to be servicing. Some examples of servicing are:

a) Cleaning or replacing nozzles, atomizers, and pilots.

b) Setting ignition electrodes.

c) Cleaning strainers or replacing strainer or filter element.

d) Resetting safety control.

e) Replacing igniter cable.

5.38 SPECIAL PARTS AND TOOLS – Those parts and tools that are not available on the open retail market.

5.39 STRAINER, PRIMARY – The strainer through which all oil first passes on way to burner, being upstream from any other strainer.

5.40 STRAINER, SECONDARY – A strainer downstream from the primary strainer, interposed in the fuel line between the primary strainer and the point at which fuel is delivered for combustion.

5.41 UNATTENDED – Lacking the presence of a person, not necessarily an electrician, capable of exercising responsible control of the motor under consideration. Such a person need not be in sight of the motor at all times but must be available for opening the motor circuit in the event of motor overheating. See 41.6.

5.42 TRIAL-FOR-IGNITION PERIOD – That period of time the main burner fuel is permitted to be delivered into the ignition zone before the main flame-sensing device is required to detect main flame.

5.43 VALVE, MANUAL OIL SHUT-OFF – A manually operated valve in the oil line for the purpose of completely turning on or shutting off the oil supply to the burner.

5.44 VALVE, OIL CONTROL – An automatically or manually operated device consisting essentially of an oil valve for controlling the fuel supply to a burner.

a) Metering (Regulating) Valve – An oil control valve for regulating burner input.

b) Safety Valve – A normally closed valve of the "on" and "off" type, without any bypass to the burner, that is actuated by a safety control or by an emergency device.

## CONSTRUCTION – MECHANICAL

### 6 General

6.1 Fuel-confining parts or operating parts shall not sag, distort, melt, oxidize, show leakage of fuel, or reduce the likelihood of a safety device from functioning during any of the tests specified herein.

6.2 To conform to 6.1, a material shall have a melting point, solidus temperature, of not less than 950°F (510°C) and a tensile strength not less than 10,000 pounds per square inch (psi) (69 MPa) at 400°F (204°C).

6.3 Fuel-confining parts not conforming to 6.1 and 6.2 may be employed if a fusible-link valve or the equivalent is included in the assembly of the burner so as to shut off the fuel supply in the event of excessive temperature or fire in the vicinity of such parts.

6.4 A burner part intended for the handling of fluids under pressure shall withstand, without rupture, a hydrostatic pressure equivalent to five times the maximum working pressure.

6.5 Soft solder shall not be used on any fuel-handling parts if melting of the solder may allow leakage of fuel. Soft-soldered joints, where permitted, shall be made mechanically secure before soldering.

6.6 The burner shall function so as to reduce to a minimum the generation of unburned vapors, and shall not include chambers or pockets in which unburned vapors may accumulate. An oil-conveying pipe or passage shall not be exposed to such temperatures as may result in carbonization or clogging when the burner is tested in accordance with these requirements.

## 7 Servicing

7.1 The requirements of 37.1 are not applicable to mechanical service functions which are not normally performed with the equipment energized.

7.2 Moving parts such as fan blades, blower wheels, pulleys, or belts which may cause injury shall be enclosed or guarded.

7.3 If the removal of doors or panels or shields will expose such moving parts:

a) The opening or removal of the door, panel or shield shall require the use of tools;

b) An interlocking device shall shut off the mechanism; or

c) A marking, preceded by the word "DANGER," shall be displayed which reads essentially as follows:

To Avoid Injury From Moving Parts, Shut Off The (Equipment) Before (Removing- Opening) This (Cover-Door).

7.4 The distance from an opening in a required guard or enclosure to the moving part mentioned in 7.1 shall be in accordance with Table 7.1, but the minor dimension of the opening shall not in any case exceed 3 inches (76.2 mm). For an opening having a minor dimension intermediate between two of the values included in the table, the distance from the opening to the moving part shall be not less than that found by appropriate interpolation between the corresponding values in the right-hand column of the table. The minor dimension of the opening is determined by the largest hemispherically tipped cylindrical probe that can be inserted through the opening with a force of 5 pounds (22 N).

7.5 A moving part is not to be considered when judging compliance with 7.2 and 7.4 if the part is unlikely to be contacted through the opening because of fixed components, including baffles.



**Table 7.1**
**Dimensions of openings**

| Minor dimensions of openings[a] | | Minimum distance from opening to moving part | |
|---|---|---|---|
| Inches | (mm) | Inches | (mm) |
| 1/4 | 6.4 | 1/2 | 12.7 |
| 3/8 | 9.5 | 1-1/2 | 38.1 |
| 1/2 | 12.7 | 2-1/2 | 63.5 |
| 3/4 | 19.1 | 4-1/2 | 114 |
| 1 | 25.4 | 6-1/2 | 165 |
| 1-1/2 | 38.1 | 10-1/2 | 267 |
| 2 | 50.8 | 14-1/2 | 368 |
| Over 2 inches | (over 50.8) | 30 | 762 |

[a] Openings less than 1/4 inch (6.4 mm) are not to be considered.

## 8 Assembly

8.1 Except as indicated in 8.2 – 8.6, a burner shall be factory-built and shipped as an unit assembly and shall include all the essential parts necessary for its intended function when installed as intended. The equipment may be shipped as two or more subassemblies.

*Exception: The equipment necessary to supply atomizing burner need not be provided with the assembly if the burner is marked in accordance with 74.19.*

8.2 The burner may incorporate individual assemblies which are installed remotely from the burner. Such individual assemblies shall be marked in accordance with 74.4.

8.3 A strainer needed to protect small orifices need not be provided with the burner. See 15.1.

8.4 In accordance with 8.1 the complete primary safety control shall be furnished with each burner by the burner manufacturer except that an oil burner having an input not in excess of 3 gallons per hour (gph) (11.4 liters per hour) and intended for use with separate interchangeable primary safety controls may be furnished less the control if the burner is marked to indicate the appropriate type to be used.

8.5 Parts of a safety control that are required to be burner-mounted shall be factory-attached. If the combustion detector is burner-mounted but the safety switch is not, the burner shall be marked to declare the safety switch with which it is to be used.

8.6 The burner equipment, if not assembled by the manufacturer as unit assemblies, shall be arranged in as few subassemblies as practicable. Each subassembly shall be capable of being incorporated into the final assembly without requiring alteration, cutting, threading, welding, or similar tasks by the installer. Two or more subassemblies, which must bear a definite relationship to each other for the intended operation of the equipment, shall be arranged and constructed to permit them to be incorporated into the complete assembly, without need for alteration or alignment, only in the correct relationship with each other; or such assemblies shall be assembled, tested, and shipped from the factory as part of the burner assembly.

8.7 If the abnormal discharge of oil is restricted by the establishment and maintenance of a definite maximum level of oil in the burner, the parts required to maintain that oil level shall be assembled and fixed upon a common base in the correct relationship with one another by the burner manufacturer. The minimum distance between the designed maximum normal oil level in the burner and the level of the lowest point at which overflow may occur shall be not less than 3/4 inch (19.1 mm).

8.8 The burner shall provide a uniform and definite supply of fuel and air for combustion when installed and adjusted in accordance with the manufacturer's installation instructions. The means for regulating the supply of air and oil shall be arranged so that the adjustments may be fixed or restricted in a manner to prevent accidental changes in settings.

8.9 All parts requiring adjustment or manipulation by the user in the course of operation of the burner shall be accessible and easily moved. Any part that may normally come in contact with the operator's hand during usage shall be free from sharp edges or projections and projecting sharp screw ends.

8.10 Accessibility shall be afforded to all burner parts, controls, and safety devices requiring servicing. The disposition of parts in the assembly removed for servicing shall be such that their restoration, following removal, will not necessitate their realignment to secure their intended relationship with other parts of the assembly. Special facilities that may be required for servicing to be performed by the operator shall accompany the burner to the user.

8.11 A firing assembly, atomizer and nozzle assemblies, and the like, intended to be removed and replaced for servicing shall be constructed so that, upon replacement, the assembly will self-restore the atomizer or nozzle to its correct position.

8.12 The burner and/or subassemblies shall incorporate provisions for support, adjustment, and attaching to the heating plant or to the foundation on which it rests in order that installation can be so made as to prevent its twisting, sliding, or dropping out of the intended position.

8.13 A burner intended to be installed with a special combustion chamber or hearth shall be constructed and arranged to facilitate its installation. Where necessary, such a burner shall be provided with means to support the combustion chamber or hearth in its intended position.

**Table 8.1**
**Torque requirements for screws or bolts**

| American standard screw size | | Torque | | I.S.O. screw size | Torque | |
|---|---|---|---|---|---|---|
| No. | mm | Lb-In | N·m | mm | N·m | Lb-In |
| – | – | – | – | 4 | 1.6 | 14 |
| 8 | 4.2 | 18 | 2.0 | 4.5 | 2.6 | 23 |
| 10 | 4.8 | 30 | 3.4 | 5 | 4.2 | 37 |
| Inch | mm | | | | | |
| 1/4 | 6.4 | 100 | 11.3 | 6 | 8.7 | 77 |
| – | – | – | – | 7 | 15.0 | 133 |
| 5/16 | 7.9 | 200 | 22.6 | 8 | 23.5 | 208 |
| – | – | – | – | 9 | 33.6 | 297 |
| 3/8 | 9.5 | 350 | 39.6 | 10 | 45.2 | 400 |
| 7/16 | 11.1 | 575 | 65.0 | 12 | 81.0 | 715 |
| 1/2 | 12.7 | 850 | 96.0 | 14 | 128.0 | 1130 |
| 9/16 | 14.3 | 1200 | 136.0 | – | – | – |
| 5/8 | 15.9 | 1600 | 181.0 | 16 | 185.0 | 1640 |



8.14 A burner of the "swing-type" shall be provided with means for locking the burner in the firing position and, for an automatically-lighted burner, to restrain it from discharging fuel when in other than the firing position.

8.15 An adjusted or movable part shall be provided with a locking device to restrict accidental shifting.

8.16 Screws or bolts used to attach parts which are detached for servicing of the burner shall be capable of holding upon the application of the torques indicated in Table 8.1 after removal and replacement.

8.17 Burners equipped, or intended to be equipped in the field; with preheaters to heat the fuel oil before burner combustion shall be provided with an interlock to prevent fuel oil from being delivered to the burner for combustion until it has been heated to the intended temperature. An oil temperature in excess of the limit established by the burner manufacturer shall result in safety shutdown. If the oil temperature falls below the predetermined low limit, the interlock shall operate to stop fuel delivery to the burner and allow circulation of the oil until the temperature increases to permit firing. Preheaters shall comply with the Standard for Electric Oil Heaters, UL 574 and interlocks shall comply with the Standard for Limit Controls, UL 353.

8.18 Fuel oil pumps provided as part of the burner shall comply with the Standard for Pumps for Oil-Burning Appliances, UL 343.

## 9 Bases

9.1 The base or frame on which burner parts are mounted shall consist of noncombustible material.

9.2 Each base or frame shall incorporate provisions for installing the assembly, and shall include securing and adjusting means for leveling and alignment where such are necessary.

## 10 Fan Housings and Air Tubes

10.1 A fan housing and an air duct shall be made of noncombustible material having the strength and durability to not be damaged during test under these requirements.

10.2 A housing in which oil leaking from any oil-handling part of the assembly may accumulate shall be provided with an open drain, that is, an inverted fan housing on a gun-type burner.

10.3 An air tube of a gun-type oil burner shall prevent the accumulation of oil within it. Any drippage from the nozzle shall drain to the fire box. A drain shall be located to avoid blockage by refractory or cement.

10.4 The exterior portion of a firing head within 6 inches (152 mm) measured parallel to its axis, from the firing end and all parts which may be in contact with masonry when the burner is installed as intended, shall be made of iron or steel. Interior parts shall be made of materials conforming with 6.1 – 6.5.

10.5 An outer shell of a blast tube or firing head, if made of sheet metal, shall be such as to assure strength, rigidity, durability, resistance to corrosion, and other physical properties equivalent to sheet steel having a thickness of not less than 0.053 inch (1.35 mm) or Type 309 stainless steel having a thickness of not less than 0.026 inch (0.66 mm).

## 11 Fire Pots and Vaporizers

11.1 A fire pot or vaporizer shall be constructed of ferrous materials and shall reduce the likelihood of splashing or seepage of fuel from it during tests under these requirements.

11.2 If sheet metal is used in the construction of a fire pot or vaporizer, the metal shall be such as to provide strength, rigidity, durability, resistance to corrosion, and other physical properties equivalent to sheet steel having a thickness of not less than 0.042 inch (1.07 mm) for oil-retaining parts and having a thickness of not less than 0.032 inch (0.81 mm) for other parts. Drawn parts shall be made of steel possessing drawing qualities.

11.3 A vaporizing burner shall be constructed so that, when installed, the oil-inlet piping to the fire pot or vaporizers may be cleaned.

11.4 An air duct shall be so arranged with respect to a fire pot or vaporizer as to reduce the risk of the discharge of liquid fuel through it when the oil in the fire pot is at the maximum level permitted by the oil control.

## 12 Combustion Air Controls

12.1 An air shutter shall be capable of being adjusted to any intended setting and be provided with means for reducing the risk of unintentional change in setting.

12.2 The air inlet arrangement shall be capable of supplying sufficient air for complete combustion under the specified draft condition and at the maximum rate of firing when the burner is installed as intended. All

the air required for complete combustion shall be introduced in a manner so as to maintain thorough mixing of the fuel and air in order to complete the combustion within the combustion zone.

12.3 An air shutter shall provide a smooth surface between the shutter and the matching face.

12.4 Sheet metal air shutters shall be of a thickness not less than 0.0254 inch (0.65 mm). If sheet metal air shutters are of a thickness less than 0.0508 inch (1.29 mm), they shall have the outer edge turned at right angles or be reinforced in an equivalent manner.

12.5 An air shutter shall by its construction or assembly and selection of materials be guarded against sticking or corroding in position. Screws or bolts used for attaching or adjustment shall be of corrosion-resistant material.

12.6 An adjustable part shall be guided to restrain its movement from its intended path during adjustment, and the means for adjusting the part shall be accessible for servicing.

12.7 A burner arranged to change the firing rate automatically shall automatically proportion the air supply with the fuel, if necessary to produce stable combustion at all firing rates allowed by the automatic control.

12.8 Linkage for operating air and fuel controls shall maintain the intended fuel-air ratio and shall resist unintentional damage and disengagement.

12.9 A burner having an input in excess of 20 gph (76 L/h) shall be provided with an interlock which shuts off the burner and causes safety shutdown upon loss of combustion air, so that a manual reset is required to restore the burner operation when the combustion air is reestablished. See 12.12.

12.10 For a burner having an input not in excess of 20 gph (76 L/h) for which combustion air is supplied by a forced or induced draft fan which is not integral with the burner motor shaft, the loss of combustion air shall result in shutting off the fuel. The burner operation may be resumed automatically when the combustion air is reestablished.

12.11 For requirements for mechanical draft burners not equipped with a combustion air interlock in regard to operation during the interruption and restoration of the combustion air supply see Section 52, Combustion Air Failure Test.

12.12 With respect to 12.9, loss of air during prepurge or any time at start-up prior to delivery of fuel, need not result in safety shutdown. However, no delivery of fuel shall be initiated before the combustion air flow has been reestablished and the required prepurge has been completed. See 13.1.

12.13 A burner having an input rating in excess of 20 gph (76 L/h) shall employ a low oil pressure interlock switch that shall cause safety shutdown when the oil pressure falls below the predetermined limit.

*Exception No. 1: A low pressure interlock is not required for rotary cup type burners.*

*Exception No. 2: A low pressure interlock switch is not required if the oil pump is secured directly on the burner motor shaft.*

12.14 A burner having an input rating in excess of 3 gph (11.4 L/h) shall be provided with a low pressure interlock switch for the atomizing media that shall cause safety shutdown when the pressure falls below the predetermined limit.

*Exception: A low pressure interlock switch is not required provided the air pump is secured directly on the burner motor shaft and the input does not exceed 20 gph (76 L/h).*

12.15 A control device provided as an interlock, as described in 12.13 – 12.14, shall be constructed and tested in accordance with the Standard for Limit Controls, UL 353.

## 13 Prepurge and Post-Purge

13.1 The following types of mechanical draft burners shall include a prepurge period in accordance with 13.2 and 13.3 before the ignition and fuel deliver are initiated:

a) A burner having an input in excess of 20 gph (76 L/h).

b) A burner having an input in excess of 7 gph (26.5 L/h) when the oil pump operates independently of the burner.

13.2 The prepurge shall be performed in accordance with one of the following. During the prepurge the air flow and the damper position shall be proven. See also 13.3.

a) A period of 30 seconds during which time the air flow is at a rate equivalent to that provided for combustion at the maximum rated high-fire input.

b) A period of 60 seconds during which time the air flow is at a rate at least equivalent to that provided for combustion at 60 percent of the maximum rated high-fire input.

13.3 A prepurge of a shorter time than specified in 13.2 is acceptable for a burner that is designated by a marking on the burner for use only on a specific appliance and it is determined that the shorter time provides at least four complete air changes for the combustion chamber, heat exchanger and the flue passages of the appliance. However, the purging shall be accomplished with the air flow at a rate not less than equivalent to that provided for combustion at 60 percent of the maximum rated high-fire input. During the purge the air flow and the damper position shall be proven.

13.4 A mechanical draft burner having an input in excess of 20 gph (76 L/h) shall provide a post-pruge period of not less than 15 seconds.

## 14 Draft Regulators

14.1 Regulation of draft within an oil-fired appliance over the ranges specified in Combustion Tests, Section 51, shall be anticipated in the construction of an oil burner.

## 15 Strainers

15.1 A small orifice or other opening in an oil-supply system shall be protected by a strainer in accordance with the requirements of 15.2 – 15.12. The strainer need not be provided with the burner if the marking on the burner or the installation instructions furnished with burner specify that a strainer suitable for the maximum fuel input and grade of oil marked on the burner shall be provided by the installer.

15.2 The largest opening of the strainer element shall be of such size that its larger dimension will not be greater than 90 percent of the smaller dimension of the smallest fixed opening protected by the screen.

15.3 For the purpose of these requirements, a metering valve, a float valve, and an automatic safety valve shall be considered as a fixed opening, having a diameter of 0.03125 (1/32) inch (0.79 mm) when Nos. 1 and 2 oils are used, and 0.0625 (1/16) inch (1.59 mm) when Nos. 4, 5, and 6 oils are used.