UL 726

STANDARD FOR SAFETY

Oil-Fired Boiler Assemblies

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UL Standard for Safety for Oil-Fired Boiler Assemblies, UL 726

Seventh Edition, Dated November 30, 1995

Summary of Topics

This revision to UL 726 is being issued to remove the reference to the withdrawal date of UL 873 and to address universal upkeep of UL Standards for Safety. These revisions are considered to be non-substantive and not subject to UL's STP process.

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1

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The Department of Defense (DoD) has adopted UL 726 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 http://csds.ul.com.

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No Text on This Page

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CONTENTS

INTRODUCTION

CONSTRUCTION

ELECTRICAL COMPONENTS

ULNORM.COM : Click to view the full PDF of UL 726 2013

SPACINGS

PROTECTION OF USERS AND SERVICE PERSONNEL

PERFORMANCE

ULNORM.COM : Click to view the full PDF of UL 726 2013

MANUFACTURING AND PRODUCTION TESTS

MARKING

INSTALLATION INSTRUCTIONS

APPENDIX A

ULNORM.COM : Click to view the full PDF of UL 726 2013

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INTRODUCTION

1 Scope

1.1 These requirements apply to oil-fired boiler assemblies.

1.2 Requirements for the installation and use of oil-burning equipment are included in the Standard of the National Fire Protection Association for the Installation of Oil-Burning Equipment, NFPA No. 31.

1.3 Deleted February 24, 2006

2 General

2.1 The term ″appliance″ refers to any equipment covered by this Standard.

2.2 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2 revised January 26, 2001

3 Glossary

3.1 For the purpose of this Standard the following definitions apply.

3.1.1 AIR-INTAKE TERMINAL – The fitting which is located on the outside of the structure through which the air for combustion is taken from the outside atmosphere. The terminal is intended to be connected to the combustion air intake of the boiler with additional piping.

3.1.1 added January 26, 2001

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

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

3.4 APPLIANCE FLUE – The flue passages within the appliance.

3.5 AUTOMATICALLY LIGHTED APPLIANCE – An appliance in which fuel to the main burner is normally turned on and ignited automatically.

3.6 BAFFLE – An object placed in an appliance to direct the flow of air or flue gases.

3.7 BOILER – A closed vessel in which water or some other liquid is heated or in which steam is generated or superheated, under pressure or vacuum, by direct application of heat.

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3.8 BOILER, HIGH PRESSURE STEAM – A boiler in which steam is generated at a pressure higher than 15 psig (103 kPa).

3.9 BOILER, HIGH TEMPERATURE WATER – A boiler intended for operation at a pressure exceeding 160 psig (1103 kPa) or at a temperature exceeding 250°F (121°C) or both.

3.10 BOILER, HOT WATER – A boiler that furnishes hot water at a pressure not exceeding 160 psig (1103 kPa) and at a temperature not exceeding 250°F (121°C).

3.11 BOILER, LOW PRESSURE STEAM – A boiler in which steam is generated at a pressure not exceeding 15 psig (103 kPa).

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

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

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

3.15 CASING – An enclosure forming the outside of the appliance, no parts of which are likely to be subjected to intense heat.

3.16 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 categorized also as a central heating appliance.

3.17 COMBUSTIBLE MATERIAL – Combustible material as pertaining to materials adjacent to or in contact with heat-producing appliances, chimney connectors and vent connectors, steam and hot water pipes, refers to material made of or surfaced with wood, compressed paper, plant fibers, or other material that will ignite and burn. Such material shall be considered as combustible even through flameproofed, fire-retardant treated, or plastered.

3.18 COMBUSTION CHAMBER – The portion of an appliance within which combustion occurs.

3.19 CONTROL, LIMIT – An automatic safety control, responsive to changes in liquid level, pressure, or temperature, for limiting the operation of the controlled equipment.

3.20 CONTROL, SAFETY – Automatic controls, including relays, switches, and other auxiliary equipment used in conjunction therewith to form a safety control system, that is intended to reduce the risk of fire, electric shock, or injury to persons during operation of the controlled equipment.

3.21 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:

a) Programming Unit – A device that programs the burner through start-up and shutdown operations in response to signals from regulating, limiting, and monitoring devices. It also provides the necessary timings, in proper sequence, for purging, pilot flame ignition, main flame ignition, and in case of ignition or flame failure, for safety shutdown (lockout); or

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b) 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.

3.22 CONTROL, SAFETY COMBUSTION – A primary safety control responsive directly to flame properties, sensing the presence of flame and causing fuel to be shut off in event of flame failure.

3.23 DAMPER – A valve or plate for regulating draft or flow of flue gases. A damper is generally considered as being located on the downstream side of the combustion chamber, usually in a flue passage of the appliance or in the chimney connector.

3.24 DAMPER, AUTOMATICALLY OPERATED – A damper operated by an automatic control.

3.25 DAMPER, MANUALLY OPERATED – An adjustable damper manually set and locked in the desired position.

3.25.1 DIRECT VENT SYSTEM, BOILER – A boiler which is constructed so that all air supplied for combustion, the combustion system of the boiler, and all products of combustion are completely isolated from the atmosphere of the space in which it is installed.

3.25.1 added January 26, 2001

3.26 DRAFT – The differential in static pressure available, between any two locations, to provide the energy potential for the moving of air for combustion or products of combustion through a fuel-burning heat-exchanging apparatus, or both.

3.27 DRAFT REGULATOR – A device which functions to maintain a desired draft in the appliance by automatically reducing the chimney draft to the desired value.

3.28 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 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.

3.29 EXCESS AIR – Air which passes through the combustion area and the appliance flues in excess of that which is theoretically required for complete combustion.

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3.30 FLUE – A general term for the conduit or passageway through which flue gases pass from the combustion chamber to the outside air.

3.31 FLUE COLLAR – That portion of an appliance designed for attachment of the chimney or vent connector.

3.32 FLUE GASES – Combustion products and excess air.

3.33 FUEL OIL – Any hydrocarbon oil as defined by Commercial Standard CS12 or Specification for Fuel Oils ANSI/ASTM D396-1986.

3.34 HEAT EXCHANGER, DIRECT – A heat exchanger in which heat generated in the combustion chamber of the appliance is transferred direct through walls of the appliance to the heating medium (such as air, steam or water) held in close contact with the combustion chamber walls. It is a self-contained combustion and heat transfer device, hence a direct heat exchanger.

3.35 HEAT EXCHANGER, INDIRECT – A heat exchanger which encloses or contains a heating medium, such as air, steam, or water, the heat from which is transferred to another heating medium separately contained in close contact with or directed through the heat exchanger.

3.36 HEATING SURFACES – All surfaces which transmit heat directly from flame or flue gases to the medium to be heated.

3.37 INDIRECT FIRED APPLIANCE – An appliance designed so that combustion products or flue gases are not mixed in the appliance with the medium to be heated and provided with a flue collar.

3.38 MANUALLY LIGHTED APPLIANCE – An appliance in which fuel to the main burner is turned on only by hand and ignited under supervision.

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

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

b) Setting ignition electrodes;

c) Cleaning strainers or replacing strainer or filter elements;

d) Resetting safety control; and

e) Replacing igniter cable.

3.40 OIL-FIRED BOILER ASSEMBLY – A boiler assembly as defined herein equipped with one or more oil burners, and all the necessary safety controls, electrical equipment as needed, and related equipment, manufactured for assembly as a unit.

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

3.42 POSTPURGE 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.

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3.43 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.

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

3.45 RADIATION SHIELD OR LINER – A separate panel(s) interposed between heating surfaces and adjacent objects to reduce heat transmission by radiation.

3.46 READILY ACCESSIBLE – Capable of being reached easily and quickly for operation, adjustment, and inspection.

3.47 SAFETY SHUTDOWN (LOCKOUT) – The shutting off of all fuel and ignition energy to the burner by means of a safety control or controls so that restart cannot be accomplished without manual reset.

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

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

3.50 THERMOSTAT – An automatic control actuated by temperature change to maintain temperatures between predetermined limits.

3.51 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.

3.52 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.

3.52.1 VENT-AIR INTAKE TERMINAL – The device used with a direct vent boiler which is located on the outside of the structure through which the air for combustion is taken from the outside atmosphere and from which flue gases are discharged.

3.52.1 added January 26, 2001

3.53 VENTED APPLIANCE – An indirect fired appliance provided with a flue collar to accommodate a chimney connector for conveying flue gases to the outside air.

3.54 VENT TERMINAL – The fitting at the end of the vent pipe that directs the flue gases to the outdoor atmosphere.

3.54 added January 26, 2001

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3A Undated References

3A.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.

3A.1 added February 24, 2006

4 Components

4.1 Except as indicated in 4.2, 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.

4.1 revised April 6, 2011

4.2 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.

4.2 revised January 26, 2001

4.3 A component shall be used in accordance with its rating established for the intended conditions of use.

4.3 revised January 26, 2001

4.4 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.

4.4 revised January 26, 2001

4.5 Deleted January 26, 2001

4.6 Deleted January 26, 2001

4.7 Deleted January 26, 2001

4.8 Deleted January 26, 2001

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CONSTRUCTION

5 Assembly

5.1 A boiler assembly shall be factory-built as a group assembly and shall include all the essential components necessary for its normal function when installed as intended. An oil-fired boiler assembly may be shipped as two or more major subassemblies. The boiler vessel of an oil-fired boiler assembly shall be constructed, equipped, inspected, tested, and marked in accordance with the ASME Boiler and Pressure Vessel Code, Section 1, Power Boilers or Section IV, Heating Boilers, whichever is appropriate. The oil burner of an oil-fired boiler assembly shall comply with the Standard for Oil Burners, UL 296.

5.1 revised April 6, 2011

5.2 A boiler assembly, if not assembled by the manufacturer as a unit, shall be arranged in major subassemblies. See 5.3. Each subassembly shall be capable of being incorporated into the final assembly without requiring alteration, cutting, drilling threading, welding, or similar tasks by the installer. Two or more subassemblies, which must bear a definite relationship to each other for the intended installation or operation of the boiler assembly, shall be arranged and constructed to permit them to be incorporated into the complete assembly only in the correct relationship with each other, without need for alteration or alignment, or such subassemblies shall be assembled, tested, and shipped from the factory as one element.

5.3 To be in accordance with 5.2, major subassemblies of a boiler assembly are deemed to be the burner and the heat exchanger sections of a cast iron sectional boiler including its base, combustion chamber, casing, and safety controls. A wiring harness may be packaged with one of the major subassemblies.

5.4 A radiation shield or baffle employed to prevent excessive temperature shall be assembled as part of the boiler assembly; or be part of a subassembly that must be attached to the boiler assembly for its normal operation; or be designed so that the boiler assembly cannot be assembled for operation without first attaching a required shield or baffle in its proper position.

5.5 A boiler assembly shall be such that, for any normal installation, the alteration or removal of a baffle, insulation, or a radiation shield needed to prevent unsafe temperatures is not required.

5.6 A boiler assembly shall afford convenient operation by the user of those parts requiring attention or manipulation in normal usage.

5.7 Adjustable or movable parts shall be provided with locking devices to prevent unintentional shifting.

5.8 Screws or bolts used to attach parts which are detached for normal care or servicing of the appliance shall be capable of holding upon the application of the torques indicated in Table 5.1 after removal and replacement.

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Table 5.1
Maximum torque requirements for screws

Screw size	(mm)	Torque, pound-inches	(N·m)
No. 8	(4.2)	20	(2.3)
No. 10	(4.8)	25	(2.8)
1/4 inch	(6.4)	100	(11.3)
5/16 inch	(7.9)	200	(22.6)
3/8 inch	(9.5)	350	(44.5)
7/16 inch	(11.1)	550	(62.1)
1/2 inch	(12.7)	800	(90.3)
9/16 inch	(14.3)	1200	(135.5)

5.9 An external door, providing access into the combustion chamber of a boiler assembly intended for installation with a clearance of less than 24 inches (610 mm) from the face of or 48 inches (1.22 m) above the door, shall be self-closing.

5.10 A burner shall be secured so it will not twist, slide, or drop out of position.

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

5.11 added April 6, 2011

5.12 Strainers supplied with the boiler assembly shall comply with the requirements of the Standard for Strainers for Flammable Fluids and Anhydrous Ammonia, UL 331.

5.12 added April 6, 2011

6 Accessibility for Servicing

6.1 A boiler assembly shall be built to allow cleaning of parts such as heating surfaces in contact with combustion products, and oil strainers, without major dismantling of the boiler assembly or removal of parts required by 5.2 to be factory-assembled.

6.2 The removal of access panels, burners, caps, plugs, etc., specifically designed to permit ready removal and replacement for servicing, and the detachment of the chimney connector are not considered major dismantling as defined by 6.1.

6.3 Sufficient and reasonable accessibility shall be afforded for cleaning, inspection, repair, and replacement of all burners, controls, and safety devices when the boiler assembly is installed as recommended by the manufacturer. The disposition of parts in the assembly removed for normal care shall be such that their restoration, following removal, will not necessitate their realignment to secure their proper relationship with other parts of the assembly. Special facilities required for normal care to be done by the operator shall accompany the boiler assembly to the user.

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6A Air-Intake Terminal

6A.1 The requirements in this section are applicable to boilers equipped to provide for separation (isolation) of the combustion air system from the indoor atmosphere by an installation method.

6A.1 added January 26, 2001

6A.2 A boiler shall be provided with a combustion air-intake assembly. The intake shall be provided with means for secure attachment to the boiler or building structure. An intake shall communicate with the outside atmosphere. The boiler shall be marked in compliance with 47.19.

6A.2 added January 26, 2001

6A.3 An air-intake assembly through the roof shall be such that, when the assembly is installed as intended, the air entrance will be at least 6 inches (152.4 mm) above the top surface of the roof and the exit will be at least 6 inches below the top surface of the roof.

6A.3 added January 26, 2001

6A.4 An air-intake assembly for installation through an outside wall shall extend at least 2 inches (50.8 mm) to 4-3/4 inches (121 mm) beyond the inside face of the wall and shall not project beyond the outside wall more than 3 inches (76.2 mm).

6A.4 added January 26, 2001

6A.5 The air entrance of an air-intake assembly shall be guarded, shielded, or located to exclude rain, snow, debris, and birds. A screen, if used, shall have a mesh of not less than 1/4 inch (6.4 mm).

6A.5 added January 26, 2001

6A.6 Openings in perforated or expanded metal panels provided over openings for combustion air shall be a minimum 1/4 inch (6.4 mm) diameter. If the openings are other than circular in shape, they shall be of such size that will permit entrance of a No. 3 DMS (5.4102 mm) drill.

6A.6 added January 26, 2001

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6A.7 The design and path of an air-intake shall provide the intended amount of combustion air to the boiler and of dilution air to any draft regulator.

6A.7 added January 26, 2001

6A.8 An outer casing or other structural part of an air-intake assembly or connector exposed to the weather shall be made of material having durability and resistance to corrosion, fire, and heat equivalent to that of galvanized steel, 0.018 inch (0.46 mm) thick, and have a coating of zinc conforming with the coating Designation G90 in Table I of the Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM A653/A653M, with not less than 40 percent of the zinc on any side, based on the minimum single spot test requirement in this ASTM Designation. The weight of zinc coating may, in case of question, be established in accordance with the Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings, ANSI/ASTM A90. Such parts that are always inside the structure shall comply with 8.1.

6A.8 revised April 6, 2011

6B Vent-Air Intake Assemblies

6B.1 The requirements in this section are applicable to direct vented boiler systems that provide for separation (isolation) of the combustion system from the indoor atmosphere by an installation method.

6B.1 added January 26, 2001

6B.2 A boiler shall be provided with a vent-air intake. The intake for a boiler equipped with a draft regulator shall also provide air for draft regulator dilution. The intake shall be provided with means for secure attachment to the boiler or building structure. An intake shall communicate with the outside atmosphere. The boiler shall be marked in compliance with 47.20.

6B.2 added January 26, 2001

6B.3 Parts of flueways shall be joined in a manner to prevent disengagement and shall be tight when tested in accordance with this standard.

6B.3 added January 26, 2001

6B.4 The assembly shall be provided with a cap to prevent the entrance of debris or rain into the flue-gas conveying pipe and into any air passages terminating outside the structure.

6B.4 added January 26, 2001

6B.5 A cap shall be designed so that flue-gas or air passages will not be obstructed by soot accumulation, by leaves or debris falling or blown onto it, or by birds.

6B.5 added January 26, 2001

6B.6 A vent-air-intake assembly intended for installation through the roof or outside wall shall be designed for varying thicknesses of roof and wall construction in accordance with 6A.3 or 6A.4.

6B.6 added January 26, 2001

6B.7 An outer casing or other structural part of a vent-air intake assembly or connector exposed to the weather (exclusive of flue-gas conveying conduit) shall be made of material having durability and resistance to corrosion, fire, and heat equivalent to that of galvanized steel, 0.018 inch (0.46 mm) thick, and have a coating of zinc conforming with the coating Designation G90 in Table I of the Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM A653/A653M, with not less than 40 percent of the zinc on any side, based on the minimum single spot test requirement in this ASTM Designation. The weight of zinc coating may, in case

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of question, be established in accordance with the Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings, ANSI/ASTM A90. Such parts that are always inside the structure shall comply with 8.1.

6B.7 revised April 6, 2011

7 Casing

7.1 The outer casing or jacket shall be made of steel or equivalent material, braced, reinforced or formed so that it is not likely to be damaged through handling in shipment, installation, and use. Sheet metal casings shall be made of steel at least 0.020 inch (0.51 mm) (No. 24 MSG) thick if uncoated, or 0.023 inch (0.58 mm) (No. 24 GSG) if galvanized, or of nonferrous sheet metal having an average thickness of not less than 0.029 inch (0.74 mm).

7.2 Access panels that need to be removed for normal service and accessibility shall be constructed to permit removal and replacement repeatedly without causing damage or impairing any required insulating value.

7.3 A removable panel through which air is drawn for combustion shall be so constructed as to prevent it from being attached in a manner that may cause unsafe performance of the boiler assembly.

7.4 A removable panel shall be so constructed that it will not be interchangeable with other panels on the same boiler when interchange may allow unsafe operation of the boiler assembly.

7.5 The casing of a boiler assembly for installation on combustible flooring shall completely close the bottom or be constructed to provide an effective radiation barrier between the heat exchanger and the floor.

8 Radiation Shields or Liners

8.1 A radiation shield or liner shall be so constructed, formed, and supported as to ensure proper positioning and to prevent distortion or sagging in service. A shield or liner shall be protected against corrosion if its deterioration may cause excessive temperature when the boiler assembly is tested in accordance with these requirements. Any finish to obtain the required resistance to corrosion shall not be damaged by heat when the boiler assembly is tested under these requirements.

8.2 Thermal insulation which is not adequately self-supporting shall be applied to solid surfaces in a manner so as to prevent sagging. The insulating value of the material shall be unimpaired when the boiler assembly is tested under these requirements.

8.3 An adhesive for attaching insulating material shall retain its adhesive qualities at any temperature the adhesive may attain when the unit is tested under these requirements and at 0°F (minus 17.8°C).

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9 Combustion Chamber

9.1 A combustion chamber and flueway shall be constructed of cast iron, sheet steel, or of a material equivalent in mechanical properties and corrosion resistance. Plain carbon sheet steel, if used, shall be at least 0.042 inch (1.07 mm) (No. 18 MSG) thick.

9.2 Combustion chamber or fire box lining material, if used, shall be durable, adequately held in place, and accessible for replacement with equivalent lining material.

10 Baffles

10.1 A baffle in a flue-gas passage or otherwise exposed to combustion products shall be constructed and disposed in a manner to provide for reasonable life and shall be fixed in position. A flue baffle shall be made of material having resistance to corrosion equivalent to ANSI C1010 hot-rolled sheet steel having a minimum thickness of 0.042 inch (1.07 mm) (No. 18 MSG) unless its deterioration will not cause excessive temperatures or deleterious performance characteristics when the boiler assembly is tested in accordance with these requirements.

10.2 A flue baffle shall be accessible for cleaning. A flue baffle which is removable for cleaning shall be such as to facilitate its removal and permit replacement only in a safe position.

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11 Flue collar

11.1 A flue collar shall be constructed and arranged to permit the secure attachment of the chimney connector to the boiler assembly.

12 Damper and Draft Regulator

12.1 An adjustable damper shall be equipped with minimum and maximum operating stops. The minimum operating stop for such damper shall be located to obtain sufficient air for complete combustion at minimum burner input.

12.2 An automatically operated damper shall be designed to maintain a safe damper opening at all times and be arranged to prevent starting of the burner unless the damper is in a safe position for starting.

12.3 A boiler assembly to be equipped with a barometric draft regulator shall be designed so as not to require the regulator to be installed in a false ceiling, in a different room, or in any manner that will permit a difference in pressure between the air in the vicinity external to the regulator and the combustion air supply.

13 Controls

13.1 Application

13.1.1 A safety control circuit shall be two-wire, one side grounded, having a nominal voltage of 120. A safety control or protective device shall interrupt the ungrounded conductor.

13.1.2 It is the intent of the requirement in 13.1.1 that a short circuit or combination of short circuits to ground will not render a safety control or protective device inoperative. Safety control circuit arrangements other than described in 13.1.1 may be considered if they accomplish the intent of this requirement.

13.1.3 The requirement of 13.1.1 does not apply to a circuit within a safety control or to the extension of a circuit to a separate element of the control, such as a flame-sensing device.

13.1.4 A control circuit shall be arranged so that it may be connected to a power-supply branch circuit that can be fused at not more than the value appropriate for the rating of any control included in the circuit.

13.1.5 All safety controls shall be accessible.

13.1.6 A safety control and its sensing element shall be supported in such a manner to remain in proper position. It shall be possible to determine by observation or test whether or not each control is in its proper location.

13.1.7 Nothing shall be provided for the purpose of permitting any safety control to be rendered ineffective or to allow firing of the boiler assembly without the protection of each of the required safety controls.

13.1.8 A burner not equipped to provide safe automatic restarting shall be arranged to require manual restart after any control functions to cause the fuel supply to be shut off and after restoration of an interrupted power supply.

13.1.9 A boiler assembly shall be provided with operating controls that regulate the fuel supply so as not to exceed the rated operating temperature or pressure as specified in 13.1.10 – 13.1.12.

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13.1.10 A steam boiler shall be provided with at least one steam pressure actuated control that will shut off fuel supply to the burner when the steam pressure in the boiler reaches a preset maximum operating pressure. This requirement does not preclude the use of additional operating controls, if required.

13.1.11 A water boiler shall be provided with at least one temperature actuated control to shut off the fuel supply to the burner when the temperature of the water in the boiler reaches a preset operating temperature. This requirement does not preclude the use of additional operating controls, if required.

13.1.12 If a boiler assembly is equipped with an operating control that only regulates the fuel input between high and low values of steam pressure or water temperature, an additional operating control set to shut off the equipment at a value below the set point of the limit control is required.

13.1.13 An operating control need not be factory-installed provided the wiring diagram and instructions furnished with the boiler indicate that an operating control of an appropriate type and setting is to be furnished by the installer. See 48.3.

13.2 Limit controls

13.2.1 A boiler shall be provided with limit controls that operate to shut off fuel and cause safety shutdown in case of a low water condition and excessive temperature or excessive pressure, as specified in 13.2.2 – 13.2.4 and 13.4.1 – 13.6.1. The limit controls shall be in addition to any operating controls specified in 13.1.9– 13.1.13.

13.2.2 With respect to 13.2.1, safety shutdown may be provided either by employing manual reset type limit controls or it may be effected remotely by utilizing the manual reset feature of another control, such as the primary safety control. For systems where the reset feature is remote from the limit control, means shall be provided to indicate the limit control has operated when it causes safety shutdown.

Exception: An automatic reset temperature limit control may be employed in lieu of a manual reset type limit control for a water boiler that has a main flame hourly input of not more than 400,000 Btus per hour (117 kW) or 2.85 gallons of oil per hour (10.8 L/h).

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13.2.3 A limit control that functions to interrupt or reduce the delivery of fuel for combustion by opening an electrical circuit shall be so arranged as to effect the direct opening of that circuit, whether the switching mechanism is integral with or remote from the sensing element.

13.2.4 The purpose of the requirement in 13.2.3 is to avoid interposing in the limit-control circuit other controls, the failure of which may result in a condition that the limit control is intended to prevent. However, a limit control may interrupt the pilot circuit of a magnetic-type motor controller which, in turn, directly opens the safety circuit when it is necessary to interrupt a single-phase circuit carrying a load greater than the capacity of available limit controls or to interrupt a multiphase circuit.

13.2.5 The limit control for a boiler for alcove or closet installation shall be factory-located on the assembly or its location shall be factory-predetermined.

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13.3 Primary safety control

13.3.1 An oil-fired boiler assembly shall be provided with a primary safety control to program and monitor the burner operation in accordance with 13.3.2 – 13.3.7 and Table 13.1. The primary safety control may be integral with the oil burner or it may be integrated into the boiler assembly.

13.3.2 The operation of the primary safety control shall be such that after the end of the main burner flame establishing period the combustion detector is responsive only to the properties of main burner flame.

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