UL 731

STANDARD FOR SAFETY

Oil-Fired Unit Heaters

UL Standard for Safety for Oil-Fired Unit Heaters, UL 731

Sixth Edition, Dated January 31, 2018

Summary of Topics

This revision of ANSI/UL 731 dated November 11, 2021 is being issued to update the title page to reflect the most recent designation as a Reaffirmed American National Standard (ANS). No technical changes have been made.

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 requirements are substantially in accordance with Proposal(s) on this subject dated September 17, 2021.

No Text on This Page

JANUARY 31, 2018
(Title Page Reprinted: November 11, 2021)

UL 731

Standard for Oil-Fired Unit Heaters

First Edition – August, 1955
Second Edition – April, 1974
Third Edition – May, 1975
Fourth Edition – March, 1988
Fifth Edition – September, 1995

Sixth Edition

January 31, 2018

This ANSI/UL Standard for Safety consists of the Sixth Edition including revisions through November 11, 2021.

The most recent designation of ANSI/UL 731 as a Reaffirmed American National Standard (ANS) occurred on November 4, 2021. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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

No Text on This Page

INTRODUCTION

1 Scope

1.1 These requirements apply to oil-fired unit heaters as defined herein. Unit heaters designed to supply heated air through ducts are covered in the Standard for Oil-Fired Central Furnaces, UL 727.

1.2 The 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 If a value for measurement is followed by a value in other units in parentheses, the second value may be only approximate. The first stated value is the requirement.

2 Glossary

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

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

2.3 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.

2.4 APPLIANCE FLUE – The flue passages within the appliance.

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

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

2.7 BASE – The main supporting frame or structure of the furnace, exclusive of legs.

2.8 BURNER – A device for the final conveyance of fuel or a mixture of fuel and air to the combustion zone.

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

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

2.11 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 burners.

2.12 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.

2.13 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.

2.14 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 is used to vaporize the fuel, with provision for admitting air and mixing it with the oil vapor in combustible proportions.

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

2.16 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 classified also as a central heating appliance.

2.17 CHIMNEY CONNECTOR – The pipe which connects a solid or liquid fuel burning appliance to a chimney.

2.18 COMBUSTIBLE MATERIAL – Combustible material as pertaining to materials adjacent to or in contact with heat-producing appliances, chimney connectors, vent connectors, and warm air ducts means 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 though flameproofed, fire retardant treated, or plastered.

2.19 COMBUSTION – As used herein, the rapid oxidation of fuel accompanied by the production of heat, or heat and light. Complete combustion of a fuel is possible only in the presence of an adequate supply of oxygen.

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

2.21 COMBUSTION (FLAME) SAFEGUARD – A safety combustion control.

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

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

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

2.25 CONTROL, SAFETY – Automatic controls (including relays, switches, and other auxiliary equipment used in conjunction therewith to form a safety control system) which are intended to prevent unsafe operation of the controlled equipment.

2.26 CONTROL, PRIMARY SAFETY – The automatic safety control intended to prevent abnormal discharge of oil at the burner in case of ignition failure or flame failure.

2.27 CONTROL, SAFETY COMBUSTION – A primary safety control responsive directly to flame properties. It senses the presence of flame and causes fuel to be shut off in event of flame failure.

2.28 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.

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

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

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

2.32 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 peak or direct current) and supplied by a primary battery, a standard Class 2 transformer or other suitable transforming device, or a suitable combination of transformer and fixed impedance having output characteristics in compliance with what is required for a Class 2 transformer. 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.

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

2.34 FLUE – The general term for the conduit or passageway through which flue gases pass from the combustion chamber to the outer air.

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

2.36 FLUE GASES – Combustion products and excess air.

2.37 FUEL OIL – Any hydrocarbon oil as defined by Specification for Fuel Oils, ASTM D396-1992.

2.38 HEAT EXCHANGER, DIRECT – A heat exchanger in which heat generated in the combustion chamber of the appliance is transferred directly 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 transfer device.

2.39 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. It is an indirect heat transfer device.

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

2.41 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.

2.42 LINER – See Radiation Shield.

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

2.44 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; and the like. 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 element.

d) Resetting safety control.

e) Replacing igniter cable.

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

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

2.47 RADIATION SHIELD – A separate panel or panels interposed between heating surfaces and adjacent objects to reduce heat transmission by radiation.

2.48 RADIATOR – Auxiliary heat transfer surfaces within the casing, connected between the combustion chamber and the flue collar.

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

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

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

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

2.53 UNIT HEATER – A self-contained, automatically controlled, indirect-fired air heating appliance which may be floor mounted or of the suspended type. It is equipped with an integral fan or blower for circulation of air and is to be used for the heating of a nonresidential space. It may be equipped with louvers or face extensions by the manufacturer.

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

2.55 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 an emergency device.

2.56 VENTED APPLIANCE – An indirect-fired appliance provided with a flue collar to accommodate a flue pipe for conveying flue gases to the outer air.

3 Components

3.1 Except as indicated in 3.2, a component of a product covered by this standard shall comply with the requirements for that component. See Appendix A for a list of standards covering components generally used in the products covered by this standard.

3.2 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.

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

3.4 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.

CONSTRUCTION

4 Assembly

4.1 A unit heater shall be a 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 unit heater may be shipped as two or more major subassemblies.

4.2 A unit heater, if not assembled by the manufacturer as a unit, shall be arranged in major subassemblies. Each subassembly shall be capable of being incorporated readily into the final assembly without requiring alteration, cutting, drilling, except to the extent indicated in 4.3, threading, welding, or similar tasks by the installer. Two or more subassemblies, which must bear a definite relationship to each other for the proper and safe installation or operation of the unit heater, 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. Otherwise, such subassemblies shall be assembled, tested, and shipped from the factory as one element.

4.3 To comply with 4.2, major subassemblies of a unit heater are deemed to be the burner; the heat exchanger, including its base, combustion chamber, casing, and safety controls; the fan or blower assembly, including the base, filters, and casing; and the fan or blower motor if not included as part of the assembly. A wiring harness may be packaged with one of the major subassemblies.

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

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

4.6 A unit heater intended for suspended installation shall be provided with suitable brackets or hangers to support the heater from its basic frame or structure.