



ANSI/CAN/UL 795:2024

JOINT CANADA-UNITED STATES
NATIONAL STANDARD

STANDARD FOR SAFETY

Commercial-Industrial Gas-Fired Package Boilers

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ANSI/UL 795-2024



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UL Standard for Safety for Commercial-Industrial Gas-Fired Package Boilers, ANSI/CAN/UL 795

Ninth Edition, Dated February 29, 2024

Summary of Topics

This new Ninth Edition of ANSI/CAN/UL 795 dated February 29, 2024 merge requirements from ULC/ORD-C795, Commercial-Industrial Gas-Fired Package Boilers, with UL 795, Standard for Commercial-Industrial Gas-Fired Heating Equipment, as a Joint Canada-US Standard.

The requirements are substantially in accordance with Proposal(s) on this subject dated December 16, 2022, May 26, 2023 and October 13, 2023.

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The Department of Defense (DoD) has adopted UL 795 on January 27, 1992. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

This standard has been designated as a National Standard of Canada (NSC) on date February 29, 2024.

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Preface

This is the Ninth Edition of ANSI/CAN/UL 795, Standard for Commercial-Industrial Gas-Fired Package Boilers.

ULSE is accredited by the American National Standards Institute (ANSI) and 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 795 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of ANSI and SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Annex [A](#) is identified as Normative, as such, 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 joint American National Standard and National Standard of Canada is based on, and now supersedes, the Eighth Edition of UL 795 and the First Edition of ULC/ORD-C795-2021.

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>.

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This Edition of the Standard has been formally approved by the Technical Committee (TC) on Combustion Appliances, TC 795.

This list represents the TC 795 membership when the final text in this standard was balloted. Since that time, changes in the membership may have occurred.

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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 apply to factory-built gas-fired package boilers having input ratings of more than 400,000 Btu/h (117,228 W), per individual combustion chamber, having the following:

- a) For the United States: Inlet/supply pressures up to 15 psi (103 kPa), and intended primarily for commercial and industrial installation;
- b) For Canada: Inlet/supply gas pressures >0.5 psi (3.4 kPa) up to 15 psi (103 kPa) and intended primarily for commercial and industrial installation.

1.2 These requirements also apply to all high pressure steam and high temperature water gas-fired boiler assemblies regardless of Btu/h (kW) input or inlet/supply pressure.

1.3 Package boilers covered by these requirements are designed to be automatically operated without a competent attendant being constantly on duty at the burners while the appliances are in operation.

1.4 Package boilers covered by these requirements are intended for connection to electrical supply circuits limited to 600 V ac or less.

1.5 Boiler assemblies covered by the requirements of this standard are intended for the following fuel gases, as applicable to the manufacturer's rating:

- a) Natural gas;
- b) Hydrogen-natural gas blends^a;
- c) LP-gas;
- d) LP-Gas/Air blends; and
- e) Manufactured gas.

^a Up to 25 % H₂ and 75 % natural gas blend shall be the limit for the purposes of this standard.

1.6 Additional installation and operation requirements are available for commercial-industrial gas-fired package boilers as defined by:

- a) In the United States:
 - 1) The National Fuel Gas Code, NFPA 54; and
 - 2) The Liquefied Petroleum Gas Code, NFPA 58, as applicable.
- b) In Canada: The Natural gas and propane installation code, CSA B149.1.

1.7 These requirements also apply to furnaces and air heaters (United States only) having input ratings of more than 400,000 Btu/h (117,228 W), per individual combustion chamber, having inlet/supply gas pressures up to 15 psi, and intended primarily for commercial and industrial installation. Annex A shall be used to evaluate furnaces and air heaters (United States only). All requirements of this standard apply unless modified by this Annex.

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 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 Boiler and Pressure Vessel Code

ASTM A29/A29M, *Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought*

ASTM A90/A90M, *Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings*

ASTM A653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

ASTM B487, *Standard Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section*

ASTM B499, *Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals*

ASTM B504, *Standard Test Method for Measurement of Thickness of Metallic Coatings by the Coulometric Method*

ASTM D412, *Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension*

ASTM E70, *Standard Test Method for pH of Aqueous Solutions With the Glass Electrode*

CSA B51, *Boiler, Pressure Vessel, and Pressure Piping Code*

CSA B149.1, *Natural gas and propane Installation Code*

CSA B140.1 Series, *Atomizing- and Vapourizing-type Oil Burners*

CSA C22.1, *Canadian Electrical Code, Part I, Safety Standard for Electrical Installations*

CSA C22.2 No. 0.8, *Safety Functions Incorporating Electronic Technology*

CSA C22.2 No. 0.15, *Adhesive Labels*

CSA C22.2 No. 0.17, *Evaluation of Properties of Polymeric Materials*

CSA C22.2 No. 4, *Enclosed and Dead Front Switches*

CSA C22.2 No. 5, *Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures*

CSA C22.2 No. 13, *Transformers for oil-or gas-burner ignition equipment*

CSA C22.2 No. 14, *Industrial Control Equipment*

CSA C22.2 No. 18.1, *Metallic Outlet Boxes*

CSA C22.2 No. 18.3, *Conduit, Tubing, Cable Fittings*

CSA C22.2 No. 24, *Temperature-indicating and -regulating equipment*

CSA C22.2 No. 41, *Grounding and Bonding Equipment*

CSA C22.2 No. 42, *General Use Receptacles, Attachment Plugs, and Similar Wiring Devices*

CSA C22.2 No. 45.1, *Electrical Rigid Metal Conduit – Steel*

CSA C22.2 No. 49, *Flexible Cords and Cables*

CSA C22.2 No. 51, *Armoured Cables*

CSA C22.2 No. 56, *Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit*

CSA C22.2 No. 65, *Wire Connectors*

CSA C22.2 No. 66.1, *Low Voltage Transformers – Part 1: General Requirements*

CSA C22.2 No. 66.3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

CSA C22.2 No. 75, *Thermoplastic-Insulated Wires and Cables*

CSA C22.2 No. 77, *Motors with inherent overheating protection*

CSA C22.2 No. 83.1, *Electrical metallic tubing that complies with the Standard for Electrical Metallic Tubing – Steel*

CSA C22.2 No. 85, *Rigid PVC Boxes and Fittings*

CSA C22.2 No. 111, *General-Use Snap Switches*

CSA C22.2 No. 153, *Electrical quick-connect terminals*

CSA C22.2 No. 158, *Terminal Blocks*

CSA C22.2 No. 190, *Capacitors for Power Factor Correction*

CSA C22.2 No. 198.1, *Extruded Insulating Tubing*

CSA C22.2 No. 209, *Thermal Cut-Offs*

CSA C22.2 No. 239, *Control and Instrumentation Cables*

CSA C22.2 No. 248, *Low-Voltage Fuses Series*

CSA C22.2 No. 286, *Industrial control panels and assemblies*

CSA C22.2 No. 4248, *Fuseholders Series*

CSA C22.2 No. 60947-1, *Low-Voltage Switchgear and Controlgear – Part 1: General Rules*

CSA C22.2 No. 60947-5-2, *Low-Voltage Switchgear and Controlgear – Part 5-2: Control Circuit Devices and Switching Elements – Proximity Switches*

CSA C22.2 No. 61058-1, *Switches for Appliances – Part 1: General Requirements*

CSA E60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

CSA E60730-2-6, *Automatic Electrical Controls, Part 2, Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*

CSA E60730-2-9, *Automatic Electrical Controls; Part 2: Particular Requirements for Temperature Sensing Controls*

CSA E60730-2-15, *Automatic electrical controls – Part 2-15: Particular requirements for automatic electrical air flow, water flow and water level sensing controls*

CSA CGA 3.4, *Industrial and Commercial Gas-Fired Conversion Burners*

CSA/AM ANSI Z21.12, *Draft Hoods*

CAN1-6.2, *Draft Hoods*

NFPA 54, *National Fuel Gas Code*

NFPA 58, *Liquefied Petroleum Gas Code*

NFPA 70, *National Electrical Code*

NMX-J-005, *General-Use Snap Switches*

NMX-J-009/248, *Low-Voltage Fuses Series*

NMX-J-009/4248, *Fuseholders Series*

NMX-J-010, *Thermoplastic-Insulated Wires and Cables*

NMX-J-017, *Conduit, Tubing, Cable Fittings*

NMX-J-023/1, *Metallic Outlet Boxes*

NMX-J-162, *Enclosed and Dead Front Switches*

NMX-J-266, *Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures*

NMX-J-436, *Flexible Cords and Cables*

NMX-J-515, *Low-Voltage Switchgear and Controlgear – Part 1: General Rules*

NMX-J-534, *Electrical Rigid Metal Conduit – Steel*

NMX-J-536, *Electrical metallic tubing that complies with the Standard for Electrical Metallic Tubing – Steel*

NMX-J-543, *Wire Connectors*

NMX-J-590, *Grounding and Bonding Equipment*

NMX-J-726, *Metal Clad Cable*

UL 1, *Flexible Metal Conduit*

UL 6, *Electrical Rigid Metal Conduit – Steel*

UL 20, *General-Use Snap Switches*

UL 62, *Flexible Cords and Cables*

UL 83, *Thermoplastic-Insulated Wires and Cables*

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 98, *Enclosed and Dead Front Switches*

UL 224, *Extruded Insulating Tubing*

UL 248-1, *Low-Voltage Fuses – Part 1: General Requirements*

UL 295, *Commercial-Industrial Gas Burners*

UL 296, *Oil Burners*

UL 353, *Limit Controls*

UL 360, *Liquid-Tight Flexible Metal Conduit*

UL 467, *Grounding and Bonding Equipment*

UL 486A-486B, *Wire Connectors*

UL 489, *Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures*

UL 498, *Attachment Plugs and Receptacles*

UL 506, *Specialty Transformers*

UL 508, *Industrial Control Equipment*

UL 508A, *Industrial Control Panels*

UL 514A, *Metallic Outlet Boxes*

UL 514B, *Conduit, Tubing, Cable Fittings*

UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*

UL 726, *Oil-fired Boiler Assemblies*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 797, *Electrical Metallic Tubing – Steel*

UL 810, *Capacitors*

UL 873, *Temperature-Indicating and -Regulating Equipment*

UL 969, *Marking and Labeling Systems*

UL 1004-3, *Thermally Protected Motors*

UL 1059, *Terminal Blocks*

UL 1277, *Power and Control Tray Cable*

UL 1569, *Metal Clad Cable*

UL 1738, *Venting Systems for Gas Burning Appliances*

UL 1998, *Software in Programmable Components*

UL 2250, *Instrumentation Tray Cable*

UL 4248-1, *Fuseholders – Part 1: General Requirements*

UL 5085-1, *Low Voltage Transformers – Part 1: General Requirements*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

UL 60691, *Thermal-Links – Requirements and Application Guide*

UL 60730-1, *Automatic Electrical Controls – Part 1: General Requirements*

UL 60730-2-6, *Automatic Electrical Controls, Part 2, Particular Requirements for Automatic Electrical Pressure Sensing Controls Including Mechanical Requirements*

UL 60730-2-9, *Automatic Electrical Controls; Part 2: Particular Requirements for Temperature Sensing Controls*

UL 60730-2-15, *Automatic electrical controls - Part 2-15: Particular requirements for automatic electrical air flow, water flow and water level sensing controls*

UL 60947-1, *Low-Voltage Switchgear and Controlgear – Part 1: General Rules*

UL 60947-5-2, *Low-Voltage Switchgear and Controlgear – Part 5-2: Control Circuit Devices and Switching Elements – Proximity Switches*

UL 61058-1, *Switches for Appliances – Part 1: General Requirements*

ULC-S636, *Type BH Gas Venting Systems*

5 Glossary

5.1 For the purposes of this Standard the following definitions apply.

5.2 APPLIANCE FLUE – The flue passages within an appliance.

5.3 ALUMINUM COATED STEEL – An aluminum coated steel in which the bond between the steel and the aluminum is an iron-aluminum alloy.

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

5.5 BAROMETRIC DRAFT REGULATOR – A device which functions to maintain a desired draft by automatically reducing the chimney draft to the desired value.

5.6 BASE – The main supporting frame or structure of the assembly, exclusive of legs.

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

5.8 BURNER –

a) AUTOMATICALLY LIGHTED BURNER – One where fuel to the main burner is normally turned on and ignited automatically;

- b) **GAS BURNER** – A device for the final conveyance of the gas, or a mixture of gas and air, to the combustion zone;
- c) **MANUALLY LIGHTED BURNER** – One where fuel to the main burner is turned on only by hand and ignited under supervision
- d) **NATURAL-DRAFT BURNER** – 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 **CASING** – An enclosure forming the outside of the appliance, no parts of which are likely to be subjected to intense heat.
- 5.10 **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.
- 5.11 **COMBUSTIBLE MATERIAL, NONCOMBUSTIBLE MATERIAL** – As used in this standard, these terms are defined in the Standard Glossary of Terms Relating to Chimneys, Vents, and Heat-Producing Appliances, NFPA 97M and/or National Building Code of Canada.
- 5.12 **COMBUSTION CHAMBER** – The portion of an appliance within which combustion occurs.
- 5.13 **COMBUSTION DETECTOR** – That part of a primary safety control which is responsive directly to flame properties.
- 5.14 **COMBUSTION PRODUCTS** – Constituents resulting from the combustion of a fuel with the oxygen of the air, including the inert gasses, but excluding excess air.
- 5.15 **CONDENSATE** – The liquid which separates from a gas, including flue gases, due to a reduction in temperature.
- 5.16 **CONTROL** – A device designed to regulate the fuel, air, water, or electrical supply to the controlled equipment. It may be automatic, semi-automatic, or manual.
- 5.17 **DAMPER** – A valve or plate for regulating draft or flow of the 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 or vent connector.
- 5.18 **ELECTRICAL CIRCUITS** –
- a) **HAZARDOUS-VOLTAGE CIRCUIT** – A circuit of any voltage exceeding those of an extra-low-voltage circuit;
- b) **EXTRA-LOW-VOLTAGE CIRCUIT** – A circuit involving a potential of not more than 30 Vac (42.4 V peak) or direct current and supplied by a primary battery or by a standard Class 2 transformer or other suitable transforming device, or by 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 circuit of voltage above Extra-Low-Voltage, by connecting resistance in series with the supply circuit as a means of limiting the voltage and current, is not considered to be an Extra-Low-Voltage circuit.
- c) **ISOLATED LIMITED SECONDARY CIRCUIT** – A circuit of limited energy derived from an isolated secondary winding of a transformer having a maximum capacity of 100 VA and open-circuit secondary voltage rating not exceeding 1000 V.

- d) SAFETY CONTROL CIRCUIT – A circuit involving one or more safety controls.
- 5.19 EXCESS AIR – Air which passes through the combustion chamber and the appliance flues in excess of that which is theoretically required for complete combustion.
- 5.20 FLAME FAILURE – REACTION TIME – The interval between the occurrence of flame extinguishment and de-energizing the safety shutoff means.
- 5.21 FLAME SAFEGUARD – See Primary Safety Control, [5.33](#).
- 5.22 FLUE COLLAR – That portion of an appliance designed for attachment of the chimney or vent connector.
- 5.23 FLUE GASES – Combustion products and excess air.
- 5.24 GAS-ELECTRIC HIGH TENSION IGNITION SYSTEM – A system incorporating an electric arc to initiate ignition of a burner.
- 5.25 GAS-ELECTRIC HOT-WIRE IGNITION SYSTEM – A system incorporating an electric hot surface to initiate ignition of a burner.
- 5.26 GAS-PRESSURE REGULATOR – A device for controlling and maintaining a uniform outlet gas pressure.
- 5.27 GAS VENT – The piping and fittings for conveying flue gases to the outside atmosphere.
- 5.28 HIGH LIMIT CONTROL – A protective (safety) control that is responsive to changes in pressure, temperature, liquid level, or flow. It is to be set beyond the intended operating range of the controlled equipment to limit its operation. This control may be electrical or mechanical in nature.
- 5.29 HIGH PRESSURE STEAM BOILER – A boiler in which steam is generated at a pressure higher than 15 psig (103 kPa);
- 5.30 HIGH TEMPERATURE WATER BOILER – A boiler intended for operation at a pressure exceeding 160 psig (1103 kPa) and at a temperature exceeding or at a temperature exceeding 250 °F (121 °C);
- 5.31 HOT WATER BOILER – 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);
- 5.32 LOW PRESSURE STEAM BOILER – A boiler in which steam is generated at a pressure not exceeding 15 psig (103 kPa).
- 5.33 PRIMARY SAFETY CONTROL – An automatic control that monitors the operation of a gas-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 timings, as required, in proper sequence, for purging, flame establishing periods and in case of ignition or flame failure, for safety shutdown (lockout).
 - 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.

5.34 PROTECTIVE (SAFETY) CONTROL – Automatic controls and interlocks (including relays, switches, and other auxiliary equipment used in conjunction with a safety control circuit) which are intended to prevent operation of the controlled equipment under conditions not anticipated by the design. A control intended to prevent the risk of electric shock, fire, or injury to persons during abnormal operation of the appliance. An example would be a water temperature limit control. A protective control always provides Type 2 action. (See [5.60](#)).

5.35 OPERATING LIMIT CONTROL – A protective (safety) control to start fuel input according to demand and to stop fuel input on satisfaction of demand. An operating limit control may be electrical or mechanical in nature.

5.36 HEAT EXCHANGER – An assembly designed to transfer heat between different elements of the boiler assembly, typically the combustion chamber and the heating medium. In a direct heat exchanger, heat generated in the combustion chamber is transferred directly through walls of the heat exchanger to the heating medium, such as steam or water, held in close contact with the combustion-chamber walls. In an indirect heat exchanger an intermediate medium transfers heat from the combustion chamber to the heating medium.

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

5.38 HYDROGEN-NATURAL GAS BLEND – A fuel comprised of H₂ and natural gas in a mixture no greater than twenty-five percent H₂ and no less than seventy-five percent natural gas.

5.39 INTERLOCK – A control to prove the physical state of a required condition, and to furnish that proof to the primary safety control circuit.

5.40 LINER – See Radiation Shield, [5.56](#).

5.41 LINING – Those interior surfaces of a combustion chamber which are exposed to combustion during use of the boiler assembly.

5.42 LP-GAS (LIQUEFIED-PETROLEUM GAS) – Fuel gases, including commercial propane, predominantly propane or propylene or commercial butane, predominantly butane, isobutane, and/or butylene.

5.43 LP-GAS/AIR BLENDS – Liquefied-petroleum gases distributed at relatively low pressures and normal atmospheric temperatures which have been diluted with air to produce desired heating value and utilization characteristic.

5.44 MAIN BURNER FLAME-ESTABLISHING PERIOD – The interval of time the main burner fuel safety shutoff valves are permitted to be open before the primary safety control is required to supervise the main burner flame.

5.45 MANIFOLD – The conduit of a device which supplies gas to the individual burner.

5.46 MANUFACTURED GAS – A gas obtained by destructive distillation of coal, or by the thermal decomposition of oil, or by the reaction of steam passing through a bed of heated coal or coke. Examples are coal gases, coke oven gases, producer gas, blast furnace gas, blue (water) gas, carbureted water gas.

5.47 NORMAL CARE – 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.

5.48 ORIFICE – The opening in a cap, spud, or other device whereby the flow of gas is limited and through which the gas is discharged to a burner.

5.49 PLENUM – Refer to Annex [A](#), Furnaces and Air Heaters (United States only).

5.50 PILOT –

a) CONTINUOUS PILOT – A pilot that burns throughout the entire time the burner assembly is in service, whether the main burner is firing or not.

b) INTERMITTENT PILOT – A pilot which is automatically lighted each time there is a call for heat, if burns during the entire period that the main burner is firing.

c) INTERRUPTED PILOT – A pilot which is automatically lighted each time there is a call for heat. The pilot fuel is cut off automatically at the end of the main burner flame-establishing period.

d) PROVED PILOT – A pilot flame supervised by a primary safety control.

5.51 PILOT FLAME-ESTABLISHING PERIOD – The interval of time fuel is permitted to be delivered to a proved pilot before the primary safety control is required to detect pilot flame.

5.52 PORT – Any opening in a burner head through which fuel or an air-fuel mixture is discharged for ignition.

5.53 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.

5.54 PRESSURE CUT-OUT – A pressure sensing control intended to keep a pressure below or above one particular value during abnormal operating conditions and which has no provisions for setting by the user.

5.55 PRIMARY AIR (COMBUSTION AIR) – The air introduced into a burner which mixes with the fuel before it reaches the ignition zone.

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

5.57 SAFETY CONTROL – See Protective (Safety) Control, [5.34](#).

5.58 SAFETY SHUTDOWN – The action of shutting off all fuel and ignition energy to the boiler assembly by means of a safety control or controls such that restart cannot be accomplished without manual reset.

5.59 SPECIAL TOOLS – Those tools that are not available on the open retail market.

5.60 TYPE 2 ACTION – Automatic action for which the manufacturing deviation and the drift of its operating value, operating time, or operating sequence have been declared and tested to:

a) In the United States, the Standard for Automatic Electrical Controls – Part 1: General Requirements, UL 60730-1; or

b) In Canada, the Standard for Automatic Electrical Controls – Part 1: General Requirements, CSA E60730-1.

5.61 VALVE –

MANUAL GAS SHUTOFF VALVE – A manually operated valve in a gas line for the purpose of completely turning on or shutting off the gas supply.

SAFETY SHUTOFF VALVE – A valve that is automatically closed by the safety control system or by an emergency device. Such valve may be of the automatic or manually opened type.

5.62 VENT CONNECTOR – The pipe which connects a gas-fired boiler assembly to a gas vent or chimney.

CONSTRUCTION – MECHANICAL

6 General

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

6.2 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 warning marking shall be displayed which reads essentially as follows:

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

and

« DANGER – Pour éviter les blessures causées par des pièces mobiles, éteignez (l'équipement) avant de (retirer-ouvrir) ce (capot-porte) »

6.3 The distance from an opening in a required guard or enclosure to the moving part mentioned in [6.2](#) shall be in accordance with [Table 6.1](#), but the minor dimension of the opening shall not in any case exceed 3 in (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 lbf (22.2 N).

Table 6.1
Maximum Distances Between Moving Parts and Openings in Enclosures

Minor dimensions of opening in (mm) ^a	Minimum distance from opening to moving part in (mm)
1/4 (6.4)	1/2 (12.7)
3/8 (9.6)	1-1/2 (38.1)
1/2 (12.7)	2-1/2 (63.5)
3/4 (19)	4-1/2 (114.3)
1 (25.4)	6-1/2 (165.1)
1-1/2 (38.1)	10-1/2 (266.7)

Table 6.1 Continued on Next Page

Table 6.1 Continued

Minor dimensions of opening in (mm) ^a	Minimum distance from opening to moving part in (mm)
2 (50.8)	14-1/2 (368.3)
Over 2 (Over 50.8)	30 (762)

^a Openings less than 1/4 in (6.4 mm) are not to be considered for clearances to moving parts.

6.4 A moving part is not to be considered when judging compliance with [6.2](#) and [6.3](#) if the part is unlikely to be contacted through the opening because of fixed components, including baffles.

6.5 Parts that may come in contact with the operator's hand during normal adjustment or servicing shall be free from sharp projections or edges and projecting screw ends.

7 Corrosion Protection

7.1 Iron and steel parts shall be protected against corrosion by painting, galvanizing, plating or other equivalent means when malfunctioning of such unprotected part results in a hazardous condition.

Exception: Cast-iron parts, cast-aluminum parts, ASME Boiler and Pressure Vessel Code and/or CSA B51, Boiler, pressure vessel, and pressure piping code, -stamped coded pressure vessels are not required to be protected against corrosion.

7.2 Surfaces of the burner assembly and flue gas conveying parts that contact flue gas condensation shall be evaluated with respect to resistance to corrosion. Among the factors to be considered are material thickness and type, length of time subjected to the condensate condition and type of corrosion protection provided. See [43.3](#).

8 General Components and Devices

8.1 Wire connectors shall comply with UL 486A-486B/CSA C22.2 No. 65/NMX-J-543.

8.2 Thermoplastic wiring material shall comply with UL 83/CSA C22.2 No. 75/NMX-J-010.

8.3 Flexible cords and cables shall comply with UL 62/CSA C22.2 No. 49/NMX-J-436.

8.4 Fittings for conduit and/or metal clad cable shall comply with UL 514B/CSA C22.2 No. 18.3/NMX-J-017.

8.5 Fuseholders shall comply with UL 4248-1/CSA C22.2 No. 4248.1/NMX-J-009/4248/1, and the applicable Part 2 through 17 (e.g. UL 4248-9/CSA C22.2 No. 4248.9/NMX-J-009/4248/9 for Class K).

8.6 Fuses shall comply with UL 248-1/CSA C22.2 No. 248.1/NMX-J-009/248/1; and the applicable Part 2 through 10 (e.g. UL 248-5/CSA C22.2 No. 248.5/NMX-J-009/248/5 for Class G).

8.7 Circuit breakers shall comply with UL 489/CSA C22.2 No. 5/NMX-J-266.

8.8 Terminal blocks shall comply with:

- a) In the United States, UL 1059; or
- b) In Canada, CSA C22.2 No. 158, or CSA C22.2 No. 153.

8.9 Electrical (junction) boxes shall comply with UL 514A/CSA C22.2 No. 18.1/NMX-J-023/1 or CSA C22.2 No. 85, as applicable.

8.10 Attachment-plug receptacles intended for general use as a convenience receptacle on the equipment shall be of the grounding type, and shall comply with:

- a) In the United States, UL 498; or
- b) In Canada, CSA C22.2 No. 42.

CONSTRUCTION – ELECTRICAL

9 General

9.1 Fuel confining parts, or operating parts if failure of the part will allow excess leakage of fuel, unintended operation, or restrict a safety device from functioning, shall be of sufficient strength, durability, and resistance to fire. Such parts shall be made of material having a melting point (solidus temperature) of not less than 950 °F (510 °C) and a tensile strength of not less than 10,000 psi (69 MPa) at 400 °F (204 °C). Such parts shall not sag, distort, melt, oxidize, or show leakage of fuel during any of the tests specified herein.

9.2 Electrical equipment and wiring shall be arranged so that oil or water will not drip or run on them during normal usage, or from a connection required to be uncoupled for servicing the boiler assembly, and so as to reduce the risk of contact with water from humidifiers.

9.3 Attachment plugs or separable connectors shall not be used in circuits when the breaking or making of the circuit by such devices may result in operation of the equipment in a manner that involves a risk of fire, electric shock, or injury to persons.

10 Servicing and Adjustment

10.1 Service functions which may be performed with the equipment energized include:

- a) Adjusting the setting of temperature controls with or without marked dial settings;
- b) Resetting control trip mechanism; operating manual switches;
- c) Adjusting air-flow dampers.

NOTE: A factory set and sealed control is not considered to be adjustable.

10.2 Adjustable or resettable electrical control or manual switching devices may be located or oriented with respect to uninsulated live parts so that manipulation of the mechanism for adjustment, resetting, or operation can be accomplished in the normal direction of access if uninsulated live parts or moving parts are:

- a) Not located in front, in the direction of access of the mechanism; and
- b) Are not located within 6 in (152 mm) on any side or behind the mechanism, unless guarded.

10.3 An electrical control component which may require examination, adjustment, servicing, or maintenance while energized, not including voltage measurements, shall be located and mounted with respect to other components and with respect to grounded metal parts so that it is accessible for electrical service functions without subjecting the serviceman to the likelihood of risk of electric shock from adjacent uninsulated live parts or to the risk of injury from adjacent moving parts.