# UL 1738

## STANDARD FOR SAFETY

Venting Systems for Gas-Burning Appliances, Categories II, III, and IV

UL Standard for Safety for Venting Systems for Gas-Burning Appliances, Categories II, III, and IV, UL 1738

Fourth Edition, Dated September 21, 2023

***Summary of Topics***

***This new Fourth Edition of ANSI/UL 1738 dated September 21, 2023, includes changes in requirements to non-metallic vent elevated temperature conditioning in 40.2.1 and 40.2.2. This new edition also incorporates editorial changes including renumbering and reformatting to align with the current style.***

The revised requirements are substantially in accordance with Proposal(s) on this subject dated September 23, 2022 and June 23, 2023.

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# UL 1738

## Standard for Venting Systems for Gas-Burning Appliances, Categories II, III, and IV

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**Fourth Edition**

**September 21, 2023**

This ANSI/UL Standard for Safety consists of the Fourth Edition.

The most recent designation of ANSI/UL 1738 as an American National Standard (ANSI) occurred on September 21, 2023. 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 ULSE at any time. Proposals should be submitted via a Proposal Request in the Collaborative Standards Development System (CSDS) at https://csds.ul.com.

No Text on This Page

## CONTENTS

### INTRODUCTION



### CONSTRUCTION



### PERFORMANCE

## INTRODUCTION

### 1 Scope

1.1 These requirements cover venting systems intended for venting Category II, III, or IV gas-burning appliances as defined by the Standard for Gas-Fired Central Furnaces (except Direct-Vent Central Furnaces), ANSI Z21.47 and the National Fuel Gas Code, NFPA 54. Venting systems covered by these requirements are intended to be used with Category II, III, and IV appliances that have been installed in accordance with NFPA 54, and with codes such as the BOCA National Mechanical Code, the Standard Mechanical Code, the Uniform Mechanical Code, and local codes.

1.2 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard does not comply with this Standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

### 2 Units of Measurement

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

### 3 Glossary

3.1 For the purpose of these requirements, the following definitions apply.

3.2 APPLIANCE – A gas burning device constructed and installed in accordance with nationally recognized standards, as appropriate.

3.3 APPLIANCE ADAPTER – A special gas vent fitting which typically joins non-metallic vent systems to the outlet of a fuel gas-burning appliance.

3.4 CATEGORY II APPLIANCE – An appliance that operates with a nonpositive vent static pressure and with a flue loss less than 17 % in accordance with the Standard for Gas-Fired Central Furnaces (except Direct-Vent Central Furnaces), ANSI Z21.47.

3.5 CATEGORY III APPLIANCE – An appliance that operates with a positive vent static pressure and with a flue loss not less than 17 % in accordance with the Standard for Gas-Fired Central Furnaces (except Direct-Vent Central Furnaces), ANSI Z21.47.

3.6 CATEGORY IV APPLIANCE – An appliance that operates with a positive vent static pressure and with a flue loss less than 17 % in accordance with the Standard for Gas-Fired Central Furnaces (except Direct-Vent Central Furnaces), ANSI Z21.47.

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

3.8 CONDENSING TYPE APPLIANCE – Any Category II or IV appliance.

3.9 FLEXIBLE VENTING SYSTEM – A venting system that is intended to be bent during the installation process to avoid obstacles or to change direction, and whose bending capability is inherent in the vent gas conduit.

3.10 NONCOMBUSTIBLE MATERIAL – For the purpose of this Standard, a material which is not capable of being ignited and burned, such as materials consisting entirely of, or a combination of, steel, iron, brick, tile, concrete, slate, asbestos, glass, and plaster.

3.11 OFFSET VENT – A venting system that incorporates elbows.

3.12 PRODUCT – The term "product" as used in these requirements refers to all venting systems or any part thereof covered by these requirements unless specifically noted otherwise.

3.13 RADIATION SHIELD – A panel or panels interposed between heating surfaces and jackets to reduce heat loss through radiation.

3.14 TEMPERATURE RATING – The maximum use temperature specified by the vent manufacturer for which the venting system is intended. The marked temperature rating is equal to the minimum vent input temperature selected from Table 19.1.

3.15 THIMBLE – The part of a venting system that is intended to provide a means for routing the venting system through a combustible wall in a horizontal installation.

3.16 VENT GAS CONDUIT – The part of a venting system that is directly exposed to vent gas products.

3.17 VENT GAS INPUT TEMPERATURE – The vent gas temperature at the location where the venting system attaches to an appliance.

3.18 VENT TERMINATION OR CAP – The fitting at the end of the vent pipe that directs the flue products into the outdoor atmosphere.

3.19 VENTING SYSTEM – The gas vent, chimney or single-wall metal pipe, and vent connector when used, assembled to form a continuous open passageway from the flue collar or draft hood outlet of a gas appliance to the outside atmosphere for the purpose of removing vent gases.

## 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 Components

5.1 Except as indicated in 5.2, a component of a product covered by this Standard shall comply with the requirements for that component. See Annex A for a list of standards covering components used in the products covered by this Standard.

5.2 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.

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

5.4 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

### 6 Materials

6.1 A venting system shall be made of corrosion resistant materials, or have a corrosion resistant finish in areas subject to corrosion from the effects of condensate, and shall be made of materials acceptable for exposure to the temperatures anticipated during all operations of the appliance. Metals shall not be used in combinations such as to cause galvanic action at any location within the assembly.

6.2 The thickness of sheet metal, including any coatings, shall not be less than as specified in Table 6.1 unless otherwise specified in these requirements. The requirements in Table 6.1 do not preclude the use of other materials that provide for equivalent rigidity, corrosion resistance, thermal properties, and gas tightness.

**Table 6.1**
**Minimum Metal Thickness**

| Metal | Inch | (mm) |
|---|---|---|
| Aluminum alloys (1100, 3003) inner pipe | 0.012 | (0.30) |
| Aluminum alloys (1100, 3003) other than for inner pipe | 0.012 | (0.30) |
| Steel coated | 0.016 | (0.41) |
| Galvanized steel (G90 coating class) | 0.018 | (0.46) |
| Aluminum-coated steel [40 ounces per square foot (0.12 kg/m$^2$)] | 0.018 | (0.46) |
| Stainless steel | 0.012 | (0.30) |



6.3 A vent gas conduit of a venting system shall be of a material having the rigidity, durability, and resistance to heat necessary for the intended application. Stainless steel, porcelain coated steel, aluminum, cast or fired refractory, non-metallic materials, and other vent gas conduit shall comply with the requirements for the applicable tests described in these requirements. See Performance, Sections 16 – 43.

6.4 Parts of a venting system subject to contact by vent gases at or beyond the terminus of the vent gas conduit shall be of a material equivalent to the vent gas conduit. See 6.3.

6.5 Galvanized steel used for outer casings, structural parts, firestopping, or other components or subassemblies shall have a zinc-coating complying with the coating designation G90 in the Weight (Mass) of Coating Requirments table in the Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM A653, with not less than 40 % of the zinc on any side, based on the minimum single spot test in ASTM A653. The weight of zinc coating shall be permitted to be determined by any acceptable method; however, in case of question, the weight of coating shall be established in accordance with the Standard Test Method for Weight (Mass) of Coating on

Iron or Steel Articles with Zinc or Zinc-Alloy Coatings, ASTM A90. Aluminum coated steel shall be of Type T1-40 (regular) [0.40 ounce per square foot (0.12 kg/$m^2$)].

6.6 Metallic materials which are coated shall be free of sharp edges, burrs, or protrusions which could scratch mating parts in a manner so as to reduce the thickness of the coating.

6.7 Non-metallic vent gas conduit materials shall be made of:

a) Class 12454-B or 12454-C PVC as specified in the Standard Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds, ASTM D1784,

b) Class 23447-A or 23447-B CPVC as specified in ASTM D1784, or

c) Material having equivalent properties.

6.8 A non-metallic venting system part shall be of material having sufficient strength and rigidity for the intended application, shall not soften or melt when exposed to the temperatures anticipated during appliance operation, or crack when exposed to outdoor or indoor temperatures, as applicable.

6.9 Polymeric venting system materials shall be resistant to the effects of acids contained in the vent gas products, and shall show no signs of aging after extended use that would increase the risk of injury when using the product. See Polymeric Materials – Conditioning for Physical Properties Tests, Section 40, High Acid Conditioning Test, Section 41, and Polymeric Materials – Physical Properties Tests, Section 42.

## 7 Assembly

7.1 A venting system shall consist of all the essential parts necessary for the intended installation. Each venting system part shall be constructed for assembly as intended without requiring alteration, cutting, threading, drilling, welding, or similar tasks.

*Exception No. 1: An assembly or part intended to be cut to length or fitted by the installer may be provided if means are furnished for joining any altered part to a companion part or assembly. All fasteners required to complete the assembly shall be provided with the venting system or specified in the manufacturer's installation instructions and be readily available.*

*Exception No. 2: Drilling is acceptable if:*

*a) The drilling operation does not weaken the assembly,*

*b) The size of the drill bit is specified and the instructions clearly describe the location or locations to be drilled,*

*c) The required fasteners are provided with the venting system, and*

*d) The drilling operation does not expose protected metal parts to corrosion.*

7.2 Two or more parts of a venting system that bear a definite relationship to each other in the intended application shall:

a) Be arranged and constructed to permit them to be incorporated into the complete assembly without need for alteration or alignment and only in the correct relationship with each other, or

b) Be assembled and shipped from the factory as one unit.

7.3 Each individual part, such as a pipe section, elbow, vent cap, firestop-spacer, coupling, tee, or the like shall be completely assembled by the manufacturer at the factory.

7.4 A venting system shall not void the firestopping required between spaces of a building when the assembly is installed in accordance with the manufacturer's installation instructions.

7.5 A venting system intended for use with a condensate neutralizer shall be provided with a means to direct overflow to a sanitary waste system should the neutralizer become blocked.

7.6 Thermal insulation that is not self-supporting shall be applied to solid surfaces so that the insulation does not sag.

7.7 A water absorbing insulating material shall not be subject to wetting by condensation or rain when installed as intended.

7.8 A venting system shall not take air from an occupied space and exhaust such air to the outside of a building for cooling purposes.

## 8 Joints

8.1 Joints and seams in a venting system intended for use with Category III or IV appliances shall be gas-tight as determined by the Leakage Test, Section 33.

8.2 Parts of a venting system shall be joined and secured so that they do not disengage when tested in accordance with these requirements.

8.3 When cement, joining compounds, tape, screws, or similar means are required for sealing vent joints, they shall be provided or specified in the manufacturer's installation instructions and be readily available. Joint compounds and tape shall be resistant to deterioration due to aging and temperatures anticipated during use of the venting system. See Joint Sealing Compound Test, Section 34.

*Exception: Solvent welding materials used as a secondary means of securing vent joints together are not required to be subjected to the Joint Sealing Compound Test, Section 34.*

8.4 A joint shall not retain condensate or permit condensate to flow from the interior to the exterior of the vent gas conduit.

8.5 A joint shall not reduce the cross-sectional area of the vent gas conduit.

## 9 Firestop Spacers

9.1 A venting system intended for vertical installation within a trade size 2 by 4 inch [nominal 1-1/2 by 3-1/2 inch (38 by 89 mm)] or a trade size 2 by 6 inch [nominal 1-1/2 by 5-1/2 inch (38 by 140 mm)] stud space, with other than zero clearance, shall be provided with ceiling plate spacers constructed to locate the venting system centrally in the stud space.

9.2 A ceiling-plate spacer shall constitute a complete firestop.

9.3 A spacer shall have sufficient strength and bearing surface to maintain the required clearance from venting system parts to joists, ceiling and floor material, and the inner surface of walls.

9.4 A firestop shall provide complete firestopping when the assembly is installed in a framed joist opening, or through a stud space, that is 1/2 inch (13 mm) greater on each side than the opening for which

the space is intended. A spacer shall provide for continuous interference around the perimeter of the construction for a height of not less than 1 inch (25 mm). The inside diameter of the firestop opening shall not be more than 1/8 inch (3.2 mm) greater than the outside diameter of the venting system, either at the firestop or at the outside diameter of the venting system, excluding vent joints and raised projections.

9.5 Firestops for non-metallic venting systems shall be provided and designed to permit unrestricted longitudal or radial thermal expansion and contraction movement that occurs during pipe heating.

## 10 Thimbles

10.1 A venting system intended for horizontal installation shall be provided with a thimble constructed to enable the venting system to penetrate a vertical wall unless the venting system is tested at zero clearance to combustible construction.

10.2 A thimble shall have sufficient strength and bearing surface to maintain the required clearance from the venting system parts to the wall studs and inner surfaces of walls.

10.3 Thimbles for non-metallic venting systems shall be provided and designed to permit unrestricted longitudal or radial thermal expansion and contraction movement that occurs during pipe heating.

## 11 Support Assembly

11.1 A support assembly, if required, shall establish and maintain the minimum required clearance between a venting system and combustible construction. A support for installation in a joist area shall constitute a complete firestop when tested in accordance with these requirements.

11.2 A support assembly shall sustain a load equivalent to four times the weight imposed upon it by all the venting system parts it is intended to support. See Vertical Support Test, Section 21.

11.3 A support assembly intended to be secured by nails or screws shall be arranged so that the load on such holding means will be a shear or compressive load.

11.4 A venting system intended for exterior installation shall be provided with support assemblies.

11.5 An offset vent shall be supported at or immediately above the vertical return elbow at the first floor or roof above the offset section.

11.6 An exterior support assembly shall be constructed to maintain specified clearances to adjacent combustible construction.

11.7 Supports and hangers shall be specified and shall accommodate both longitudinal and lateral vent movement. Instructions for the maximum length of pipe between supports and hangers shall be specified in the manufacturer's installation instructions.

## 12 Radiation Shields

12.1 A radiation shield for a venting system provided to comply with the maximum temperature limits of these requirements for floor or ceiling structures shall:

a) Be an integral part of a firestop-spacer or support assembly, and

b) Provide a continuous barrier for a vertical distance, referenced to the ceiling or floor level, of not less than 10 inches (250 mm) for venting systems having an internal diameter of 12 inches