

Gas Vents





Northbrook, Illinois • (708) 272-8800
 Melville, New York • (516) 271-6200
 Santa Clara, California • (408) 985-2400
 Research Triangle Park,
 North Carolina • (919) 549-1400
 Camas, Washington • (360) 817-5500

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January 16, 1996

Standard for

Gas Vents

UL 441, Ninth Edition

Accompanying this transmittal notice is a copy of the Ninth edition of UL 441.

THIS EDITION OF THE STANDARD IS NOW IN EFFECT.

Attention is directed to the note on the title page of this standard identifying that the Department of Defense has adopted the text of UL 441.

Revised and/or additional pages may be issued from time to time.

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Standard for

Gas Vents

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The Department of Defense (DoD) has adopted UL 441 on September 16, 1991. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Revisions of this standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest published set of revision pages.

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product employing materials or having forms of construction differing from those detailed in the requirements of this Standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be judged to comply with the Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 These requirements cover Types B and BW gas vents and Types B and BW gas vent roof jacks intended for venting gas appliances equipped with draft hoods to burn only gas. Type B vents are also intended for use with other Category I appliances that specify they are for use with Type B gas vents.

1.2 Gas vents are intended for installation in accordance with the Standards of the National Fire Protection Association for Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances, NFPA 211 and the National Fuel Gas Code, NFPA 54. Gas vents are also intended for installation in accordance with the Department of Housing and Urban Development Mobile Home Construction and Safety Standards, Chapter II of 24 CFR, Part 280 and codes such as the BOCA Basic/National Mechanical Code, the Standard Mechanical Code, and the Uniform Mechanical Code.

1.3 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involve a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable 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 cannot be judged to comply with this Standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 General

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.

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 recognized rating established for the intended conditions of use.

2.4 Specific components are recognized as being 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 for which they have been recognized.

2.5 If a value for measurement as given in these requirements is followed by a value in other units in parentheses, the first stated value is the requirement.

3 Glossary

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

3.2 COMBUSTIBLE MATERIAL – Material made of or surfaced with wood, compressed paper, plant fibers, or other material that ignites and burns, 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 identified as combustible even though flameproofed, fire-retardant treated, or plastered.

3.3 NONCOMBUSTIBLE MATERIAL – A material that, in the form in which it is used and under the conditions anticipated, does not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.

CONSTRUCTION

4 Materials

4.1 A gas-vent and a roof-jack part shall be made of noncombustible corrosion-resistant materials. Metals shall not be used in combinations that result in galvanic action at any location within the assembly.

4.2 The minimum thickness of sheet metal, including any coatings, shall be as referenced in Table 4.1 unless otherwise specified.

4.3 Aluminum alloys containing more than 1.0 percent magnesium shall not be used when the reflectivity of the material is utilized to reduce the risk of fire.

4.4 A flue-gas conveying conduit shall be of a material having durability and resistance to corrosion and heat equivalent to that of Type 1100 aluminum, Series 300 or Types 430 and 446 stainless steel, or porcelain-coated steel complying with the requirements contained herein. Except as noted in 4.5, parts in contact with flue gases or flue gas-air mixtures, or subject to condensation, shall be of material having durability and resistance to corrosion and heat equivalent to Type 1100 aluminum or Series 300 or Types 430 and 446 stainless steel.

Table 4.1
Minimum metal thickness

	Inch	mm
Aluminum alloys (1100, 3003) – inner pipe	0.012	0.30
Aluminum alloys (1100, 3003) – other than inner pipe	0.016	0.41
Steel	0.016	0.41
Galvanized steel (G90 coating class)	0.018	0.46
Aluminum-coated steel (0.40 ounces per square foot)	0.018	0.46
Stainless steel (Type 430)	0.012	0.30

4.5 An outer casing or other structural part shall be of stainless steel, galvanized steel, or aluminum-coated steel when:

- a) Deterioration or corrosion of the part results in the venting system to collapse or otherwise increase the risk of injury to persons;
- b) The part adjoins firestopping material; or
- c) The part is subject to condensation

Exception: This requirement does not apply to the flue-gas conveying conduit or other parts in contact with flue-gases or flue-gas air mixtures. See 4.4.

4.6 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 (former coating class 1.25 commercial) in Table 1 of the Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, ASTM A525-91b, with not less than 40 percent of the zinc on any side, based on the minimum single spot test in the ASTM designation. The weight of zinc coating shall be established in accordance with the Standard Test Methods for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles, ANSI/ASTM A90-81 (R1991). Aluminum-coated steel shall be of Type T1-40 (regular) [0.40 ounce per square foot (0.12 kg/m²)].

4.7 A painted part made of steel not less than 0.053 inch (1.35 mm) thick, or of cast iron not less than 0.125 inch (3.18 mm) thick and for use only in the interior of buildings, has corrosion resistance equivalent to that required by 4.5. Paint coatings shall remain intact at the maximum temperatures obtained on the part during the tests specified in these requirements.

4.8 Except for binder materials, thermal insulation material shall be noncombustible.

4.9 Thermal insulation shall be in accordance with the following conditions when the gas vent or roof jack is tested in accordance with these requirements:

- a) The products resulting from the combustion or volatilization of any combustible binder shall be discharged to the vent terminus outside of the building.
- b) The insulating material shall remain in its intended position.
- c) The thermal conductivity of the insulating material shall not be increased.
- d) Thermal insulation shall not show evidence of softening, melting, or other evidence of malfunction or deterioration.

4.10 Thermal insulation shall not come into contact with products of combustion.

4.11 Thermal insulation that is not self-supporting shall be applied to solid surfaces so that the insulation does not sag. An adhesive or cement used to attach such material shall retain its adhesive qualities at any temperature that adhesive attains when tested in accordance with these requirements and at 0°F (minus 18°C).

4.12 A water-absorbing insulating material shall not be subjected to wetting by condensation or rain when installed as intended.

5 Assembly

5.1 Each part of a gas vent shall be constructed for ready attachment of one to the other without requiring alteration, cutting, threading, drilling, welding, or similar task by the installer.

Exception: A length of gas-vent pipe shall be shortened by cutting when means are provided to permit the shortened length to be coupled to any companion part.

5.2 Two or more parts of a gas vent 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 alteration or alignment and only in the correct relationship with each other; or
- b) Be assembled and shipped from the factory as one unit.

5.3 Each gas-vent part, such as gas-vent pipe section, an elbow, coupling, or tee, shall be completely assembled by the manufacturer at the factory.

5.4 A Type B or BW gas-vent roof jack shall be completely assembled by the manufacturer at the factory and shall include, in addition to the flue gas carrying conduit, an outer jacket or body and insulating means, a rain cap, and a roof flashing.

Exception No. 1: An adjustable pitch roof flashing for use on a roof with a maximum slope of 3/12 shall not be provided for use on a Type B or BW gas-vent roof jack unless the roof jack outer body incorporates integral mechanical stops to prevent a decrease of clearance from the roof to the lowest flue gas discharge opening as evaluated in test structures Forms IV, V, or VI. See Section 17, Test Installation.

Exception No. 2: An adjustable roof flashing is not required to be an integral part of the roof jack when:

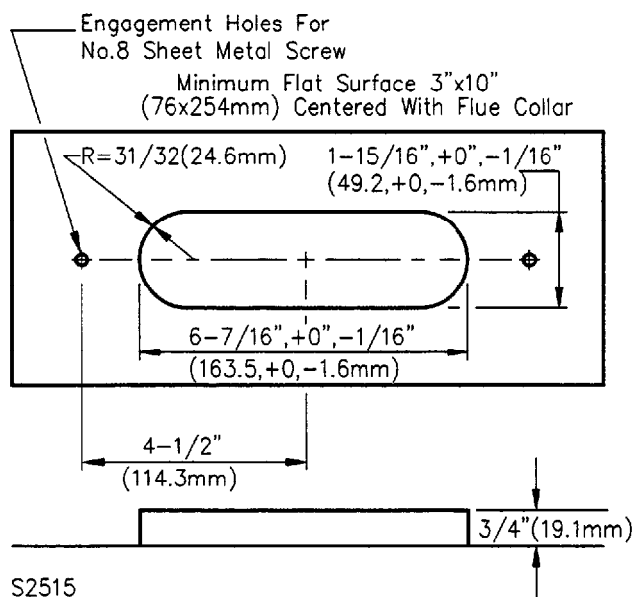
- a) *The adjustable roof flashing is marked with a specific catalog designation; and*
- b) *The roof jack body is marked to specify that the flashing identified by the catalog designation is required for installation.*

5.7 A double wall gas-vent connector for use with Type B gas-vent roof jack shall be packaged separately for field assembly to a gas vent roof jack, when it is marked as required by 31.1.

5.8 A Type B gas vent shall be capable of attachment to appliance flue outlets having diameters of integral inches (25 mm).

5.9 A Type BW gas vent shall be capable of attachment to the gas-vent support and flue collar for vented wall furnaces illustrated by Figure 5.1.

Figure 5.1
Standardized details for vent support and flue collar
for vented wall furnaces for use with Type BW vents



5.10 A Type B gas-vent roof jack shall permit the attachment of a flue pipe having a diameter of integral inches (25 mm) unless it is furnished as part of a complete heating appliance, gas-vent connector, and roof jack assembly. A double wall gas-vent connector for use with a Type B gas vent roof jack shall comply with the requirements as detailed for a gas vent and shall be capable of attachment to the roof jack and to appliance flue outlets having diameters of integral inches (25 mm).

Exception: The test specified in 23.1.2 is not required to be conducted on a double wall gas-vent connector intended for use with a Type B gas vent roof jack.

5.11 A Type BW gas-vent roof jack shall be capable of attachment to a Type BW gas-vent pipe section.

5.12 The design of a gas-vent part shall not void the firestopping required between spaces of a building when the part is installed in accordance with the manufacturer's instructions.

5.13 The design of a gas-vent roof jack shall not void the firestopping required for a concealed space when the roof jack is installed in accordance with the manufacturer's instructions.

5.14 The annulus between any two walls of a multiple-wall gas-vent pipe section or gas-vent pipe fitting shall be not less than 1/4 inch (6.4 mm) in width.

6 Caps

6.1 A cap shall be provided to resist the entrance of debris and rain into the flue-gas conveying conduit and into any cooling-air passage terminating exterior to the building. See Rain Test, Section 25.

6.2 A cap shall be constructed so that leaves and debris falling or blown onto it are not retained so as to obstruct flue-gas or cooling-air passages.

7 Firestops

7.1 Joints between factory-made parts that provide for firestopping shall provide complete firestopping when the assembly is installed in a framed joist opening that is 1/2 inch (13 mm) greater on each side than the opening for which the assembly is intended. A spacer shall provide for continuous interference with construction for a height of not less than 1 inch (25 mm).

7.2 A joint between factory-made parts that provide for firestopping shall have a through opening (total eccentricity) not larger than 1/8 inch (3.2 mm) wide.

8 Spacers

8.1 A Type B and a Type BW gas vent for installation within a 2- by 4-inch (38- by 89-mm) or a 2- by 6-inch (38- by 140-mm) stud space, with other than zero clearance, shall be provided with ceiling plate spacers constructed to locate the gas-vent centrally in the stud space. Each length of pipe for such gas-vents shall include integral spacers that maintain the minimum required clearance between the pipe and the inner surfaces of walls. Such spacers are to be located so that they are directly adjacent to each joint when pipe lengths are joined.

Exception: A base plate in lieu of integral spacers meets the intent of the requirement when used with a Type BW gas vent for single-story installation only.

8.2 A ceiling-plate spacer shall constitute a complete firestop. A ceiling-plate spacer installed at the lowest ceiling level with a Type BW gas vent is not a complete firestop.

8.3 All spacers shall have the strength and bearing surface to maintain the required clearance from gas-vent parts to joists, ceiling and floor material, and the inner surface of walls.

9 Joints

9.1 Parts of gas vent and roof jacks shall be joined and secured so that they do not disengage when tested in accordance with these requirements.

9.2 When screws are employed to field-joint assemblies, the assemblies to be joined shall provide for use of screws without being field-punched or drilled. When cement is employed for this purpose, the cement shall be a quick-setting type. Cement, screws, and instructions shall be furnished. A screw shall not extend into a flue-gas passage.

9.3 A joint shall not retain condensation or permit condensation to flow from the interior to the exterior of the flue-gas conveying conduit.

10 Radiation Shields

10.1 A radiation shield for a gas vent provided to comply with the maximum temperature limits of the requirement 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 gas vents having an internal diameter of 12 inches (300 mm) or less, and not less than 12 inches for all other sizes.

10.2 The assembly referenced in 10.1 shall fit into a framed joist area not larger than the sum of:

- a) 1/2 inch (13 mm) greater than the outside diameter of the gas vent; and
- b) Twice the dimension to be specified in the installation instructions for clearance between gas-vent pipe sections and combustible enclosures.

10.3 Parts of a firestop-spacer or support assembly that provide incidental shielding from radiation to combustible construction are not radiation shields.

10.4 A radiation shield provided to obtain compliance with the maximum temperature limits of these requirements for roof structures shall not be employed in a roof or other terminating assembly intended to be altered in the field when such alteration requires the shifting or relocation of the shield.

11 Roof Assemblies

11.1 The height of a roof assembly shall be such that the flue-gas exit is not less than 2 feet (0.61 m) above the roof.

11.2 A roof assembly installed in accordance with the installation instructions shall resist the entrance of excess water and debris into the building at the point where the gas vent passes through the roof. See Rain Test, Section 25.

11.3 A gas-vent roof assembly shall resist the accumulation of soot and debris when such accumulation obstructs flue-gas or cooling-air passages.

12 Roof Jacks

12.1 A roof jack constructed for placement in contact with combustible roof, rafter, insulation, or ceiling material shall provide a continuous surface or barrier for a vertical distance, measured from the roof line, of at least 6 inches (150 mm).

12.2 When installed in accordance with the manufacturer's instructions, a roof jack shall protect against the entrance of excess water and debris into the building where the gas vent passes through the roof. See Rain Test, Section 25.

12.3 A roof jack shall be constructed so that soot or debris shall not accumulate therein when such accumulation obstructs flue-gas or cooling-air passages.

13 Fittings

13.1 The nominal cross-sectional area of the flue-gas passage of a gas-vent pipe fitting shall be equivalent to that of the vent piping with which it is intended to be used.

14 Sizes

14.1 A gas-vent pipe or fitting or a roof jack shall have an internal cross-sectional area of not less than 7-1/16 square inches (45.6 cm²).

14.2 The internal cross-sectional area of a gas vent pipe or fitting shall be equivalent to a round pipe having an internal diameter of integral inches or in units of 25 mm.

14.3 The internal dimension of the cross section of an oval or rectangular gas-vent pipe or fitting, or of a roof jack, measured across the minor axis, shall be not less than 1-1/2 inches (38 mm).

15 Support Assembly

15.1 A support assembly (such as a ceiling or floor support) shall establish and maintain the minimum required clearance between a gas-vent pipe and combustible construction. A support for installation in a joist area shall constitute a complete firestop when tested in accordance with these requirements.

15.2 A support assembly shall sustain a load equivalent to four times the weight imposed upon it by all the gas-vent parts it is intended to support. See Vertical Support Test, Section 22.

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

PERFORMANCE

16 General

16.1 When a gas vent or roof jack is tested in accordance with these requirements, specified temperatures on combustible construction shall be maintained.

16.2 After being subjected to the tests specified in Sections 19, Temperature Test – Structures and 20, Temperature Test – Gas Vent Pipe Surfaces, as applicable, a gas vent or roof jack shall be capable of being further used.

16.3 Test results indicating compliance with the requirement of 16.2 include the following:

- a) No part of the gas vent or roof jack has become damaged or permanently distorted to an extent that it shall not continue to function as intended.
- b) The effectiveness of any required protective coating or finish on metal parts has not been reduced.
- c) A ceramic material shows no evidence of cracking, disintegration, or spalling to the extent that serviceability of any part of an assembly has been impaired.
- d) Cracks are not observable in porcelain enamel used as a required protective coating when the surface is examined under a microscope of 60 magnification.

- e) The reflectivity of a surface has not been impaired when the reflectivity is utilized to reduce the risk of fire.
- f) Burning or scaling of metal parts is not evident upon visual observation.
- g) The effectiveness of insulating material has not been reduced.

17 Test Installation

17.1 General

17.1.1 The test installation for Type B gas vent is to be based on the following factors:

- a) Size and type (round, oval, or other) of gas vent.
- b) Height in feet (m) of gas vent.
- c) Minimum clearance of gas vent to combustible construction (Test Structure, Form I) and, when manufacturer so elects, with enclosure in stud space (Test Structure, Form II).

17.1.2 The test installation for Type BW gas vent is to consider the following factors:

- a) Maximum appliance input.
- b) Enclosure in stud space (Test Structure, Form III).
- c) Single or multistory buildings.

17.1.3 The test installation for Type B or BW gas-vent roof jack is to be based on the following factors:

- a) Size and type of roof jack.
- b) Maximum appliance input (Type BW).
- c) Zero clearance of roof jack to combustible construction (Test Structure, Forms IV, V, and VI).
- d) Length of roof jack body.

17.1.4 The test structure for a Type B gas vent is to be similar to one of those illustrated by Figures 17.1 and 17.2. The structure is to provide for various sizes and designs following the details as shown by Figures 17.3, 17.4, and 17.5.