UL 705

STANDARD FOR SAFETY

Power Ventilators

UL Standard for Safety for Power Ventilators, UL 705

Seventh Edition, Dated July 19, 2017

Summary of Topics

This revision of ANSI/UL 705 dated August 19, 2022 includes the following:

– Addition to Scope to add requirements to cover power ventilators for smoke control systems; 1.2.3

– Update internal wiring for hazardous voltage; 2.7, 11.1, 11.3

– Addition of solid state speed controller test requirements; Section 31A

– Correct SC10.2.1 for maximum temperature rise.

– Add new requirement for NEC Class 2 Marking; 36.22

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 new and revised requirements are substantially in accordance with Proposal(s) on this subject dated April 1, 2022, July 8, 2022 and July 15, 2022

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Standard for Safety for Power Ventilators

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The most recent designation of ANSI/UL 705 as an American National Standard (ANSI) occurred on August 19, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

The Department of Defense (DoD) has adopted UL 705 on February 5, 1993. The publication of revised pages or a new edition of this Standard will not invalidate the DoD adoption.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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APPENDIX A Examples of Controls Performing as Operating or Protective Controls (Informative)

INTRODUCTION

1 Scope

1.1 These requirements cover power ventilators of the roof-and wall-mounted types and duct fans of the straight-through type intended for commercial or industrial use, residential fans intended for heated and conditioned air and for connection to permanently installed wiring systems in accordance with the National Electrical Code, NFPA 70.

1.2 These requirements also cover dryer exhaust duct power ventilators (DEDPV) for single residential dryers.

1.2.1 These requirements cover roof or wall-mounted ventilators and duct fans of the straight-through type for restaurant exhaust appliances.

1.2.2 These requirements cover power ventilators for restaurant exhaust appliances.

1.2.3 These requirements cover power ventilators for smoke control systems.

1.3 These requirements do not cover the following:

a) Ventilating equipment such as attic, wall-insert, ceiling-insert, household hood, window fans, or canopy fans or blowers;

b) Air-moving equipment with integral air-tempering means;

c) Dryer type fans used for drying carpets or floors;

d) Household and commercial blower inflator type fans;

e) Evaporative coolers; Evaporative cooler pumps, including retrofit pumps;

f) Air filtering appliances;

g) Deodorizers and air fresheners;

h) Component fans;

i) Low voltage component fans;

j) Fans and blowers that circulate air, such as desk, ceiling-suspended, and hassock fans;

k) Ventilators rated more than 600 volts;

l) Ventilators employing universal motors rated more than 250 volts;

m) Air heaters equipped with fans;

n) Draft fans for furnaces;

o) Heating-ventilating units;

p) Blowers employed as components in equipment such as furnaces, mechanical-refrigeration equipment, or air conditioners;

q) Fusible links and similar equipment that may be provided to disconnect a fan or close shutters in the event of fire;

r) Ventilators specifically intended for use in exhausting any of the following: gases other than air, atmospheres causing corrosion to the ventilator, air with water spray, or flammable vapors; or

s) Ventilators for the removal or conveyance of dust, stock, or refuse.

t) Microwaves, ventilating and otherwise; and

u) Ducted and non-ducted heat recovery units.

2 Glossary

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

2.2 CAPACITOR, CLASS X – Capacitor or RC unit of a type suitable for use in situations where failure of the capacitor or RC unit would not lead to danger of electrical shock but could result in a risk of fire. Examples would be units connected phase to phase or phase to neutral.

Note 1 X1 capacitors are generally used in circuits of permanently connected appliances. However, if the appliance is provided with a separate surge protective device that limits the impulse voltage to ≤ 2.5KV, an X2 capacitor is permitted.

Note 2 X2 capacitors are generally used in circuits of cord-connected appliances.

2.3 CAPACITOR, CLASS Y – Capacitor or RC unit of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock. Examples would be capacitors connected across the primary and secondary circuits where electrical isolation is required to prevent an electric shock or between hazardous live parts and accessible parts.

Note 1 Y1 capacitors are used in circuits where the prevention of electric shock is afforded solely by the isolation provided by the capacitor. Two Y2 capacitors connected in series is considered to provide the same level of protection as one Y1 capacitor.

Note 2 Y2 capacitors are used where the prevention of electric shock is provided by the combination of the capacitor and earth ground for circuits operating at voltages ≥ 150V and ≤ 300V.

Note 3 Y4 capacitors are used where the prevention of electric shock is provided by the combination of the capacitor and earth ground for circuits operating at voltages ≤ 150V.

2.4 CIRCUIT, CLASS 2 – An low voltage circuit with a power of 100 VA or less; or has 30 V dc supplied by a primary battery; or is supplied by a Class 2 transformer; or is supplied by a combination of a transformer and fixed impedance that, as a unit, complies with all the performance requirements for a Class 2 transformer; or is supplied by a power supply (such as a switching power supply) whose output meets the requirements of a Class 2 circuit. A circuit that is derived from a circuit that exceeds 30 V by connecting resistance or impedance, or both, in series with the supply circuit to limit the voltage and current, is not considered to be a class 2 circuit.

2.5 CIRCUIT, LOW-VOLTAGE – A circuit that has an ac potential of not more than 30 V rms (42.4 V peak or 30 V dc).

2.6 CIRCUIT, HAZARDOUS VOLTAGE – A circuit of any voltage exceeding those of an low-voltage circuit.

2.7 DUCT FAN – A ventilator installed within a duct or provided with flanges for connection to a duct and which may be used with heated air within the duct.

2.8 FIELD WIRING TERMINAL – A terminal to which a wire may be connected in the field, unless the wire and a means of making the connection – such as a pressure terminal connector, soldering lug,

soldered loop, or crimped eyelet – that is factory assembled to the wire or provided as part of the ventilator.

2.9 MOTORS –

a) Open Motor – A motor having ventilating openings that permit passage of external cooling air over and around the windings of the motor.

b) Totally Enclosed Motor – A motor that is enclosed so as to prevent the free exchange of air between the inside and outside of the case but not sufficiently enclosed to be termed airtight.

c) Totally Enclosed Fan-Cooled Motor – A totally enclosed motor with external cooling by a fan or fans integral with the motor but external to the enclosing parts.

d) Electronically Commutated Motor (ECM) – A motor assembly consisting of the motor and a control. The control provides an AC electric signal (typically non-sinusoidal) to the motor by an inverter/switching power supply. The sensors and other electronics on the control adjust waveform and output levels of the signal. The control is often used to provide protective functions to prevent overheating or mitigate other hazardous conditions.

2.10 POWER VENTILATOR – An air-moving appliance consisting of an impeller – which may be of the centrifugal, axial, or propeller type – and an integral driver. A power ventilator is:

a) Installed in a weather-resisting base intended to fit, usually by a curb, over a wall or roof opening; or

b) Provided with flanges for connection to a duct.

2.11 SAFETY CRITICAL FUNCTION – Control, protection and monitoring functions which are being relied upon to reduce the risk of fire, electric shock or casualty hazards.

2.12 VENTILATOR – A power ventilator or a duct fan.

3 Units of Measurement

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

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.

CONSTRUCTION

5 Components

5.1 General

5.1.1 A component of a product covered by this standard shall:

a) Comply with the requirements for that component as indicated in 5.2 – 5.6 or the individual component section;

b) Be used in accordance with its rating(s) established for the intended conditions of use;

c) Be used within its established use limitations or conditions of acceptability; and

d) Additionally comply with the applicable requirements of this end product standard.

Note – 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.

Exception No. 1: A component of a product covered by this standard is not required to comply with a specific component requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product, or

b) Is superseded by a requirement in this standard, or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

Exception No. 2: A component complying with a UL component standard other than those cited in 5.2 – 5.6 or the individual component section is acceptable if:

a) The component also complies with the applicable component standard of 5.2 – 5.6 or the individual component section; or

b) The component standard:

1) Is compatible with the ampacity and overcurrent protection requirements of the National Electrical Code, ANSI/NFPA 70, where appropriate;

2) Considers long-term thermal properties of polymeric insulating materials in accordance with the Standard for Polymeric Materials – Long Term Property Evaluations, UL 746B, and

3) Any use limitations of the other component standard is identified and appropriately accommodated in the end use application. For example, a component used in a household application, but intended for industrial use and complying with the relevant component standard may assume user expertise not common in household applications.

5.1.2 A component that is also intended to perform other functions, such as over current protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable UL standard(s) that cover devices that provide those functions.

Exception: Where these other functions are not required for the application and not identified as part of markings, instructions, or packaging for the appliance, the additional component standard(s) need not be applied.

5.1.3 A component not anticipated by the requirements of this standard, not specifically covered by the component standards of 5.2 – 5.6 or individual component sections and that involves a potential risk of electric shock, fire, or personal injury, shall be additionally investigated in accordance with the applicable UL standard, and shall comply with 5.1.1 (b) – (d).

5.1.4 With regards to a component being additionally investigated, reference to construction and performance requirements in another UL end product standard is appropriate where that standard anticipates normal and abnormal use conditions consistent with the application of this standard.

5.2 Connectors and terminals

5.2.1 Quick-connect terminals, both connectors and tabs, for use with one or two 22 – 10 AWG copper conductors, having nominal widths of 3.5, 3.2, 4.8, 5.2, and 6.3 mm (0.110, 0.125, 0.187, 0.205, and 0.250 in), intended for internal wiring connections in appliances, or for the field termination of conductors to the appliance, shall comply with the Standard for Electrical Quick-Connect Terminals, UL 310.

Exception: Other sizes of quick-connect terminals shall be investigated with respect to crimp pull out, insertion-withdrawal, temperature rise, and all tests shall be conducted in accordance with UL 310.

5.2.2 Single and multi-pole connectors for use in data, signal, control and power applications within and between electrical equipment, and that are intended for factory connection and for factory assembly to copper or copper alloy conductors, or for factory assembly to printed wiring boards, shall comply with the Standard for Component Connectors for Data, Signal, Control and Power Applications, UL 1977.

5.2.3 Wire connectors shall comply with the Standard for Wire Connectors, UL 486A-486B.

5.2.4 Splicing wire connectors shall comply with the Standard for Splicing Wire Connectors, UL 486C.

5.2.5 Multi-pole splicing wire connectors that are intended to facilitate the connection of hard-wired utilization equipment to the branch-circuit conductors of buildings or that are intended for consumer connection within and between parts of electrical equipment, shall comply with the Standard for Insulated Multi-Pole Splicing Wire Connectors, UL 2459.

5.2.6 Equipment wiring terminals for use with all alloys of copper, aluminum, or copper-clad aluminum conductors, shall comply with the Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors, UL 486E.

5.2.7 Terminal blocks shall comply with the Standard for Terminal Blocks, UL 1059, and, if applicable, be suitably rated for field wiring.

5.3 Electrical enclosures and raceways

5.3.1 Electrical enclosures and the associated bushings and fittings, and raceways, of the types specified in Chapter 3 of the National Electrical Code, ANSI/NFPA 70, and that comply with the relevant UL standard (such as UL 514A, UL 514C, UL 514D) and 5.1 are considered to fulfill the requirements of this Standard.

5.4 Overcurrent protection

5.4.1 Fuses shall comply with the Standard for Low-Voltage Fuses – Part 1: General Requirements, UL 248-1; and the applicable UL 248 Part 2 (e.g. UL 248-5). Defined use fuses that comply with UL 248-1 and another appropriate UL standard for the fuse are considered to fulfill this requirement.

5.4.2 Circuit breakers shall comply with the Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures, UL 489.

Exception: Circuit breakers used in telecommunications circuitry that comply with the Standard for Circuit Breakers For Use in Communications Equipment, UL 489A, need not comply with UL 489.

5.4.3 Circuit breakers having integral ground fault circuit interrupter capability for protection against electrical shock shall additionally comply with the Standard for Ground-Fault Circuit-Interrupters, UL 943.

5.4.4 Supplementary protectors shall comply with the Standard for Supplementary Protectors for Use in Electrical Equipment, UL 1077.

5.5 Power supplies

5.5.1 Class 2 power supply shall comply with one of the following:

a) Standard for Class 2 Power Units, UL 1310; or

b) Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, with an output marked "Class 2", or that complies with the limited power source (LPS) requirements and is marked "LPS".

Exception: This requirement does not apply to circuits that comply with Supplement SB, UL 60335-1 Based Requirements for the Evaluation of Electronic Circuits.

5.5.2 A non-Class 2 power supply shall comply with one of the following:

a) Standard for Power Units Other Than Class 2, UL 1012; or

b) Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1.

5.6 Supplemental insulation, insulated bushings, and assembly aids

5.6.1 The requirements for supplemental insulation (e.g. tape, sleeving or tubing) are not specified unless the insulation or device is required to fulfill a requirement of this standard. In such cases:

a) Insulating tape shall comply with the Standard for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, UL 510;

b) Sleeving shall comply with the Standard for Coated Electrical Sleeving, UL 1441;

c) Tubing shall comply with the Standard for Extruded Insulating Tubing, UL 224.

5.6.2 Insulating bushings that comply with Components, General, 5.1 of this end product standard, and the Standard for Insulating Bushings, UL 635, are considered to comply with the requirements of this Standard.

6 Frame and Enclosure

6.1 General

6.1.1 A ventilator shall be formed and assembled so that it will have the strength and rigidity necessary to resist the abuses to which it may be subjected without increasing the risk of fire, electric shock, or injury to persons due to a total or partial collapse with a resulting reduction of spacings, loosening or displacement of parts, or other serious defects.

6.1.2 Among the factors taken into consideration when the acceptability of an enclosure is being judged are its:

a) Mechanical strength;

b) Resistance to impact;

c) Moisture-absorptive properties;

d) Combustibility;

e) Resistance to corrosion; and

f) Resistance to distortion at temperatures to which the enclosure may be subjected under conditions of normal or abnormal use.

6.1.3 A cast- or sheet-metal section of an enclosure shall have a thickness not less than that specified in Table 6.1.

Table 6.1
Minimum acceptable thickness of enclosure metal

Metal	Minimum thickness, inch (mm)		
	At small, flat, unreinforced surfaces and at surface of a shape or size to ensure adequate mechanical strength	At surfaces to which a wiring system is to be connected in the field	At relatively large unreinforced flat surfaces
Die-cast metal	3/64 (1.2)	– –	5/64 (2.0)
Cast malleable iron	1/16 (1.6)	– –	3/32 (2.4)
Other cast metal	3/32 (2.4)	– –	1/8 (3.2)
Uncoated sheet steel	0.026 (0.66)	0.032[a] (0.81)	0.026 (0.66)
Galvanized sheet steel	0.029 (0.74)	0.034[a] (0.86)	0.029 (0.74)
Nonferrous sheet metal	0.036 (0.91)	0.045 (1.14)	0.036 (0.91)

[a] A sheet-steel wall of thickness less than that specified is acceptable if the area surrounding the knockout has a thickness not less than 0.053 inch (1.35 mm).

6.1.4 The enclosure of an appliance shall prevent molten metal, burning insulation, flaming particles, and other ignited material from falling onto flammable materials, including the surface upon which the appliance is supported when the appliance is:

a) Installed in a remote location or unattended area.

b) Thermostatically controlled.

6.1.5 The requirements in 6.1.4 necessitate the use of a metal barrier or a non-metallic barrier of a material having a zero flame spread rating when tested as described in the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723:

a) Under a motor unless:

1) The structural parts of the motor or of the appliance provide the equivalent of such a barrier (such as the use of metal louvers as bottom barriers);

2) The protection provided with the motor is such that no burning insulation or molten material falls to the surface that supports the appliance or into the wiring compartment when the motor is energized under each of the following fault conditions:

i) Open main winding;

ii) Open auxiliary winding;

iii) Starting switch short-circuited; and

iv) Capacitor of a permanent-split capacitor motor short-circuited and the rotor locked - the short circuit is to be applied before the motor is energized;

3) The motor complies with the requirements for impedance-protected motors in the Standard for Overheating Protection for Motors, UL 2111, or the Standard for Rotating Electrical Machines – General Requirements, UL 1004-1, and the Standard for Thermally Protected Motors, UL 1004-3, and the temperature of the motor winding does not exceed 150°C (302°F) during the first 72 hours of operation with the rotor of the motor locked; or

4) The motor is provided with a thermal motor protector that prevents the temperature of the motor windings from exceeding 125°C (257°F) under the maximum load under which the motor runs without causing the protector to cycle and from exceeding 150°C (302°F) with the rotor of the motor locked.

Exception: A direct drive fan motor is required to only be subjected to the locked rotor test.

b) Under wire, unless the wire:

1) Is thermoplastic wire which complies with the requirements of the Vertical Wires test in the Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581 and is marked VW-1; or

2) Has at least equivalent characteristics as determined in the flame tests specified in the Standard for Thermoplastic-Insulated Wires and Cables, UL 83.

c) Under a switch, relay, solenoid, or similar component unless:

1) A short circuit or overload in the component does not result in a risk of fire; or

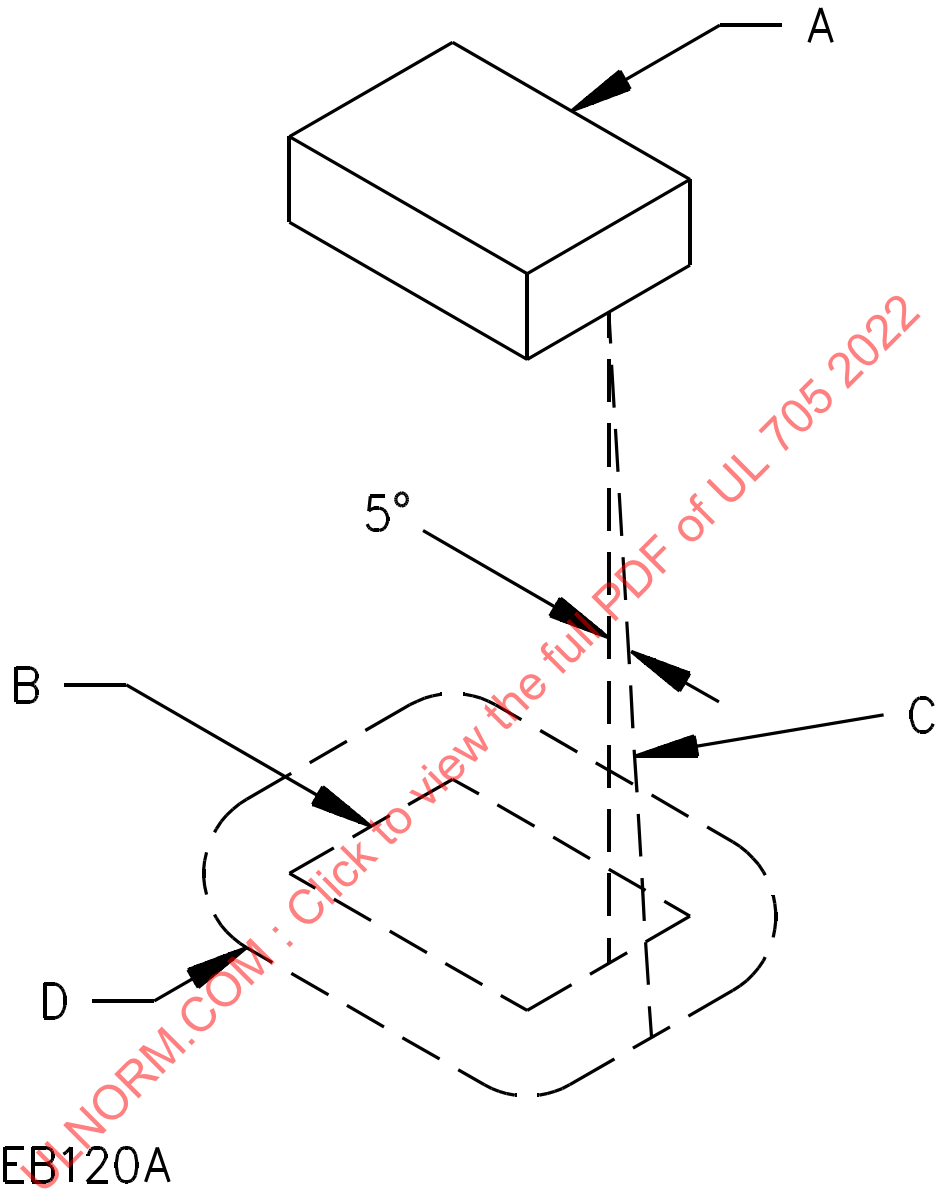
2) There are no openings in the enclosure through which molten metal, burning insulation, flaming particles, or other ignited material can fall.

Exception: A terminal is not required to have a barrier.

6.1.6 The barrier mentioned in 6.1.5 shall be horizontal, shall be located as illustrated in Figure 6.1, and shall have an area in accordance with the illustration. Openings for drainage, ventilation, and the like, shall not be employed in the barrier unless such openings do not permit molten metal, burning insulation, or similar material, to fall onto flammable material.

Figure 6.1

Barrier



A – Region to be shielded by barrier. This will consist of the entire component if it is not otherwise shielded and will consist of the unshielded portions of a component that is partially shielded by the component enclosure or equivalent.

B – Projection of outline of component on horizontal plane.

C – Inclined line that traces out minimum area of barrier. The line is always:

1) Tangent to the component,

2) 5 degrees from the vertical, and

3) So oriented that the area traced out on a horizontal plane is maximum.

D – Location (horizontal) and minimum area for barrier. The area is that included inside the line of intersection traced out by the inclined line C and the horizontal plane of the barrier.

6.1.7 A ventilating opening provided in the enclosure of an appliance or an externally mounted component of an appliance where the appliance is intended to be recessed into a wall or false ceiling shall not vent into a concealed space where the spread of a fire occurs undetected.

6.2 Non-metallic enclosures

6.2.1 A non-metallic enclosure shall comply with the applicable mechanical and electrical property considerations, flammability, and thermal requirements as specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. A 6.8 J (5 ft·lbf) impact value shall apply to all appliances when determining the impact resistance of polymeric enclosures. This impact value shall also be used for cold impact testing of appliances intended to be used or stored in cold environments, such as fans mounted in the crawl space or attic and outdoor use products.

Exception: A polymeric grille used in a fan intended to be mounted at least 2.4 m (8 feet) above the floor is not required to comply with the Resistance to Impact Test of UL 746C.

6.3 Non-metallic parts other than enclosures

6.3.1 Polymeric material used to enclose a metal housing that encloses insulated or uninsulated live parts, or used as a decorative part, shall be classed either 5VA, 5VB, V-0, V-1, V-2, or HB by the burning tests described in the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

Exception No. 1: Decorative parts are not required to be made of a material classed 5VA, 5VB, V-0, V-1, V-2, or HB when the part does not occupy a volume greater than 2 cubic centimeters (0.122 cubic inch), does not have any dimension greater than 3 cm (1.18 inch), and is located so it does not propagate flame from one area to another or bridge between a possible source of ignition and other ignitable parts.

Exception No. 2: A material is determined to be equivalent when it complies with the 12-mm (0.47 inch) flame test, the 19-mm (0.75-inch) flame test, or 127-mm (5-inch) flame test of the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, when flame tested as used in the equipment. The use of a flame-retardant coating applied to the inside of a polymeric enclosure is not considered to comply with this requirement unless the coating/material interface is found to be compliant by separate investigation.

6.3.2 An impeller of polymeric material outside a motor shall not be located within 25.4 mm (1 inch) of an opening in the motor housing.

Exception:

a) The material is classed as V-2, V-1, V-0, or 5V in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94. The coil wrap that complies with the 127 mm (5 inches) end product flame test as described in the Standard for Polymeric Materials – Use in Electric Equipment Evaluations, UL 746C does not need to possess a 5VA flame rating;

b) The material complies with the requirements for enclosure flammability using a 19-mm (3/4-inch) flame, in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C;

c) No motor opening within 25.4 mm of the blade has a dimension more than 6.75 mm (17/64 inch) or an area more than 35.48 mm^2 (0.055 square inch), and no more than six such openings are provided; or

d) The material has a hot wire ignition rating of at least 7 seconds as described in the Standard Test Method for Ignition of Materials by Hot Wire Sources, ASTM D3874-1990a.

6.3.3 Foamed thermoplastic shall be classed HF-2 or HF-1.

6.3.4 A thermoplastic damper shall be classed HB, V-2, V-1, V-0, or 5V.

6.3.5 A thermoplastic part that is not decorative and that does not serve as an enclosure shall be classed HB, V-2, V-1, V-0, or 5V.

6.4 Flame spread and smoke developed requirements for non-metallic enclosures and other parts of permanently connected equipment

6.4.1 Materials in a compartment handling conditioned air for circulation through a duct system shall have a flame spread rating of not more than 25, and a smoke developed rating of not more than 50, when tested as specified in the requirements for the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723. This requirement does not apply to the following:

a) Air filters, drive belts, wire insulation, paint applied for corrosion protection, or tubing of material equivalent to one of the types of wire insulation permitted by this Standard;

b) Gaskets forming air or water seals between metal parts;

c) Miscellaneous small parts such as refrigerant line bushings or insulating bushings, resilient or vibration mounts, wire ties, clamps, labels, or drain line fittings having a total exposed surface area not exceeding 161.29 cm^2 (25 in^2);

d) An adhesive that, when tested in combination with the specific insulating material, complies with the requirement;

e) Moulded or formed components (not liners) of polymeric materials in such quantities that their total exposed surface area within the compartment does not exceed 0.93 m^2 (10 ft^2); or

f) Materials in a compartment handling air for circulation through a duct supplying only one room.

6.4.2 Polymeric materials exempted by 6.4.1(e) shall have a flame spread rating of not more than 25, or shall comply with the requirements of the vertical burning test for classifying materials 5VA in accordance with the Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances, UL 94.

6.5 Accessibility of moving parts

6.5.1 Electrical parts of a ventilator shall be located or enclosed so that protection against unintentional contact with uninsulated live parts will be provided.

6.5.2 To reduce the likelihood of unintentional contact that may involve a risk of electric shock from an uninsulated live part or film-coated wire, or injury to persons from a moving part, the enclosure shall comply with the following:

a) A probe as illustrated in Figure 6.2 shall not touch film-coated wire when inserted through an opening;

b) A probe as illustrated in Figure 6.3 shall not touch any uninsulated live part when inserted through an opening; and

c) A probe as illustrated in Figure 6.4 shall not contact a moving part when inserted through an opening.

Figure 6.2

Probe for film-coated wire