



UL 181

STANDARD FOR SAFETY

Factory-Made Air Ducts and Air Connectors

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UL Standard for Safety for Factory-Made Air Ducts and Connectors, UL 181

Eleventh Edition, Dated July 25, 2013

Summary of Topics

This new edition of ANSI/UL 181 includes the following changes in requirements:

Clarity to the corrosion resistance test method

Flame Penetration Test - Deletion of requirement for continuous monitoring of natural gas and added clarity on the furnace thermocouples

Clarity to the puncture test impact locations

Clarity to the static load test

Clarity to the pressure test regarding testing of joints

Clarity to the collapse test regarding testing of joints

Clarity to the tension test regarding testing of joints

Clarity to the torsion test regarding testing of joints

Clarity to the leakage test

Delete Manufacturing and Production Tests section

Exemption of full instructions

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated June 1, 2012 and March 22, 2013.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

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ANSI/UL 181-2013

UL 181

Standard for Factory-Made Air Ducts and Air Connectors

The first through the fourth editions were titled "Air Ducts."

The fifth edition was titled "Factory-Made Air Duct Materials and Air Duct Connectors."

The sixth edition was titled "Factory-Made Air Ducts and Connectors."

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Eleventh Edition

July 25, 2013

The most recent designation of ANSI/UL 181 as an American National Standard (ANSI) occurred on July 25, 2013. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

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

The Department of Defense (DoD) has adopted UL 181 on July 20, 1994. 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 <http://csds.ul.com>.

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INTRODUCTION

1 Scope

1.1 These requirements apply to materials for the fabrication of air duct and air connector systems for use in accordance with the International Mechanical Code (IMC), International Residential Code (IRC), and Uniform Mechanical Code (UMC), Standards of the National Fire Protection Association for the Installation of Air-Conditioning and Ventilating Systems, NFPA No. 90A, and the Installation of Warm Air Heating and Air-Conditioning Systems, NFPA No. 90B.

1.2 The air ducts and air connectors covered by these requirements include preformed lengths of flexible or rigid ducts, materials in the form of boards for field fabrication of lengths of rigid ducts, and preformed flexible air connectors.

1.3 For the purpose of these requirements, air ducts and air connectors are classified as follows:

Class 0 – Air ducts and air connectors having surface burning characteristics of zero.

Class 1 – Air ducts and air connectors having a flame-spread index of not over 25 without evidence of continued progressive combustion and a smoke-developed index of not over 50.

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.

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 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 Materials

5.1 Metals used in the assembly of air ducts and air connectors shall be resistant to atmospheric corrosion and shall not be used in combinations that results in galvanic action which deteriorates any part of the system formed from such material.

5.2 To comply with 5.1 with respect to resistance to atmospheric corrosion, metals which are not inherently corrosion resistant, such as sheet steel, or steel wire, are to have a corrosion-resistant coating.

5.3 The corrosion-resistant coating shall provide protection against atmospheric corrosion as determined by Section 12, Corrosion Resistance, at least equivalent to steel having a uniform coating of zinc of not less than 0.3 ounce per square foot (91.6 g/m²) of surface area.

5.4 Materials which have their protective coating damaged or the effectiveness reduced by the manufacturing process are to be tested after being subjected to such process.

PERFORMANCE

6 General

6.1 Table 6.1 indicates the tests applicable to the specific forms of air ducts, air connectors, and joining materials. Additionally, joining materials intended for factory installation are to be evaluated in conjunction with the air duct and air connector tests when specified in the individual sections of this Standard.

Exception: Joining materials which comply with the requirements in the Standard for Closure Systems for Use With Rigid Air Ducts and Air Connectors, UL 181A or the Standard for Closure Systems for Use With Flexible Air Ducts and Air Connectors, UL 181B are not required to be evaluated.

Table 6.1
Test program

Tests	Air ducts		Air connectors	Joining materials
	Rigid	Flexible		
Surface Burning Characteristics	X	X	X	—
Flame Resistance	—	—	—	X
Flame Penetration	X	X	—	—
Burning	X	X	X	—
Corrosion ^a	X	X	X	X
Mold Growth and Humidity	X	X	X	X
Temperature	X	X	X	—
Puncture	X	X	—	—
Static Load	X	X ^b	X ^b	—
Impact	X	X	—	—
Erosion	X	X	X	—
Pressure	X	X	X	—
Collapse	X	X	X	—
Tension	—	X	X	—
Torsion	—	X	X	—
Bending	—	X	X	—
Leakage	X	X	X	—
NOTES X Test applicable. — Test not applicable. ^a Applicable to parts of metals not inherently corrosion resistant. ^b Test applicable for flexible air ducts and air connectors that incorporate vapor barriers supported by grommets or other means of field support.				

7 Tests for Surface Burning Characteristics

7.1 Representative samples of air ducts and air connectors shall be evaluated for surface burning characteristics and classified according to the requirements in 7.2 and 7.3.

7.2 Class 0 material shall have surface burning characteristics of zero (flame spread and smoke developed).

7.3 Class 1 material shall have a flame-spread index of not over 25 without evidence of continued progressive combustion and a smoke-developed index of not over 50.

7.4 Tests for surface burning characteristics are to be conducted as specified in the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723. For the purpose of establishing the flame spread and smoke developed indices, typically a minimum of three tests are to be conducted.

7.5 Samples are to be positioned in the 25 foot (7.62 m) long fire test chamber specified in the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723. When the composite duct is rigid, no supplemental supports are to be used. When required, due to unusual characteristics of a composite duct that affects the conduct of the test, 1/4 inch (6.4 mm) diameter steel rods shall be used to support the duct constructions. When supporting rods are used, they are to be spaced between 2 feet and 4 feet (0.6 m and 1.2 m) apart as required for support of the samples.

7.6 When the inside and outside surfaces of an air duct or air connector are of different composition, tests for surface burning characteristics are to be conducted by exposing first one side and then the other to the test conditions, using different samples for each exposure. A third test is then to be conducted on the worse case condition using a different sample for the exposure.

7.7 Fabrics, tapes, or other joining materials field-applied to or forming part of a factory-made air duct, air connector, or other parts identified as a component of the product are to be in place during the tests for surface burning characteristics. When, however, the application of the fabric, tape, or other joining material to the sample is likely to affect the various surface burning characteristic indices, samples are to be tested with and without longitudinal seams or joints, and the higher indices taken.

8 Flame Resistance Test

8.1 Fabrics, tapes, or other joining materials shall be those classified for flammability when, as applied to an air duct or air connector, the material is exposed to the internal air stream.

8.2 Tests of fabrics, tapes, or other joining materials to determine compliance with 8.1 are to be made in accordance with the method described in the Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, NFPA 701.

9 Bending Test

9.1 Sections of flexible air ducts and air connectors shall not be damaged when bent through a 180-degree arc over a mandrel having a diameter equal to the inside diameter of the air duct or air connector when tested in accordance with 9.3 – 9.5.

9.2 Sections of flexible air ducts shall maintain minimum insulation and scrim (when applicable) overlaps when tested in accordance with 9.6 – 9.10.

Exception: A flexible air duct whose inner core complies with the Flame Penetration Test without insulation is not required to be tested in accordance with 9.6 – 9.10.

9.3 Previously untested samples are to be tested. Samples, at least 8 feet (2.43 m) long, (are to be specified) in accordance with 17.2. Sections of air ducts and air connectors are to be prepared in accordance with 17.3. Steel collars, when not part of the assembly, are to be attached to each end of the test sample in accordance with the manufacturer's instructions. One end of the test sample is to be retained in place and the sample positioned adjacent to the test mandrel so that the center joint of the sample is not located in the area to be subjected to bending. The sample is to be bent through a 180-degree arc around the test mandrel.

9.4 The test is to be repeated five times, and each time the sample is to be returned to its original position.

9.5 Observations are to be made during and following the test. The sample shall not rupture, break, tear, rip, or separate; any reduction in internal cross-sectional area shall not exceed 20 percent at any time during the test; any joining material shall remain intact; and there shall be no evidence of other damage to the sample which results in it not being suitable for further use.

9.6 To comply with the requirement of 9.2, additional samples of previously untested flexible air ducts are to be tested. Packaged samples of standard length duct, at least 8 feet (2.43 m) long, are to be specified in accordance with 17.2. One end of the test sample is to be retained in place and the sample positioned adjacent to the test mandrel such that the midpoint of the air duct is centered on the test mandrel. The sample is to be positioned such that any insulation/scrim seam is at the outside of the bending radius. The sample is to be bent through a 180-degree arc around the test mandrel.

9.7 The bend is to be repeated five times. Between bends, the sample is to be returned to its original position. Upon completion of the final bend, the sample is to be maintained in the 180-degree bent position.

9.8 The vapor barrier is to be cut around the circumference of the duct at the center point of the duct. The vapor barrier is to be separated at the cut to a distance of 1 inch (25.4 mm). The end point of the insulation and scrim overlap is to be marked on the insulation and scrim. The vapor barrier is to be separated further and the distance from the marks to the end of the insulation and scrim measured.

9.9 The sample is to be removed from the mandrel and overlap measurements are to be made at the quarter points as specified in 9.8.

9.10 Sections of flexible air ducts that incorporate seamed insulation shall maintain a minimum 1 inch (25.4 mm) insulation overlap at each of the points measured in 9.8 and 9.9. When scrim is used as an individual component, it shall also maintain a 1 inch (25.4 mm) overlap.

Exception: Lesser overlaps are capable of being used for constructions that comply with the Flame Penetration Test when such overlaps are directly evaluated. In no case are gaps in the insulation or scrim allowed.