ANSI/ASHRAE Standard 149-2000 (RA 2009)
(Reaffirmation of ANSI/ASHRAE Standard 149-2000 [RA 2005])

ASHRAE STANDARD

Laboratory Methods of Testing Fans Used to Exhaust Smoke in Smoke Management Systems

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NOTE

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FOREWORD

This is a reaffirmation of ANSI/ASHRAE Standard 149-2000 (RA 2005). This standard was prepared under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.

The only changes made for this version were that the word Informative *has been included in the title of Annex A and in the contents page so it reads "Informative Annex A" and other minor editorial changes.*

1. PURPOSE

This standard establishes uniform methods of laboratory testing and test documentation for fans used to exhaust smoke in smoke management systems.

2. SCOPE

2.1 This standard covers fans that are to be permanently installed in smoke management systems to exhaust smoke, including fan components and accessories when supplied, mounted, or intended to be mounted to the fan.

2.2 This standard establishes test procedures for the following areas:

a. Fan tests:
   1. Aerodynamic performance
   2. Operation at specified elevated temperature
   3. Reversal
b. Appurtenance tests: Dampers

2.3 This standard does not cover the following types of fans:

a. Portable fans
b. Mechanical draft fans
c. Circulating fans
d. Attic fans
e. Non-electrically driven fans

3. DEFINITIONS

ambient temperature: 10°C–40°C (50°F–104°F).

design temperature: the temperature at which the critical clearance(s) of the fan are identical to the critical clearance(s) of the fan at specified elevated temperature.

***fan*:** a device that uses a power-driven rotating impeller to move air. A fan has at least one inlet opening. The opening(s) may or may not have an element or elements for connection to ductwork. For the purpose of this standard, *fan* shall be deemed to refer to the complete fan assembly as it is intended to be provided for smoke management.

smoke management system: An engineered system that includes all methods that can be used singly or in combination to modify smoke movement.[1]

specified elevated temperature: the temperature at which the operation test shall be conducted.

***stabilized*:** A temperature is considered to be stabilized when three successive readings, taken at intervals of 10% of the previously elapsed duration of the test but not less than five-minute intervals, vary no more than 3°C (5°F).

standard conditions: 20°C, 1.2 kg/m^3 (68°F, 0.075 lb$_m$/ft^3).

4. REQUIREMENTS

4.1 General. The fan and its accessories (when supplied, mounted, or intended to be mounted to the fan) shall be tested as an assembly. Test setups, apparatus, instruments, data to be recorded, and data to be reported shall be in accordance with referenced standards except as indicated in this standard.

4.2 Test Parameters Required (Relevant Test). Prior to the test, the following items shall be specified by a party or document other than this standard. For parameters (g) and (h), see Section 5.4.3.2.

a. Elevated temperature (aerodynamic performance and operation at specified elevated temperature tests)
b. Number of restarts and running time between restarts if more than one restart is required (operation at specified elevated temperature test)
c. Duration (operation at specified elevated temperature test)
d. Number of reversals (reversal test)
e. Time delay (reversal test)
f. Run time (reversal test)
g. Wind load (damper test)
h. Snow load (damper test)

5. TESTS

5.1 Test of Aerodynamic Performance

5.1.1 General

5.1.1.1 The performance of a fan is affected by temperature in two ways: First, since a fan is basically a constant-volume device, the decrease in density accompanying an increase in the temperature of the gas passing through the fan will cause a decrease in the mass flow. This first effect is adequately accounted for by making a density correction as defined in *ANSI/ASHRAE 51: ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating*,[2] ignoring the density correction limitations (see Informative Annex A). Second, the fan components will change size as the temperature of these components increases and, if this