



# **ASHRAE STANDARD**

## **Method of Test for Determining the Airtightness of HVAC Equipment**

Approved by the ASHRAE Standards Committee on June 26, 2010; by the ASHRAE Board of Directors on June 30, 2010; and by the American National Standards Institute on July 1, 2010.

ASHRAE Standards are scheduled to be updated on a five-year cycle; the date following the standard number is the year of ASHRAE Board of Directors approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE Web site ([www.ashrae.org](http://www.ashrae.org)) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: [orders@ashrae.org](mailto:orders@ashrae.org). Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to [www.ashrae.org/permissions](http://www.ashrae.org/permissions).

© Copyright 2010 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

ISSN 1041-2336



**American Society of Heating, Refrigerating  
and Air-Conditioning Engineers, Inc.**  
1791 Tullie Circle NE, Atlanta, GA 30329  
[www.ashrae.org](http://www.ashrae.org)

**ASHRAE Standard Project Committee 193**  
**Cognizant TCs: TC 4.3, Ventilation Requirements and Infiltration, and**  
**TC 6.3, Central Forced Air Heating and Cooling Systems**  
**SPLS Liaison: K. William Dean**

Michael R. Lubliner, *Chair\**  
Iain S. Walker, *Vice-Chair\**  
James Lee Austermilller\*  
Roy R. Crawford\*  
James B. Cummings\*  
Glenn Friedman\*

Paul M. Haydock\*  
Kevin E. Keller\*  
Lalit Kumar\*  
Collin L. Olson\*  
Hans Paller

Elbert G. Phillips\*  
Brian L. Reynolds  
Armin Rudd\*  
Steven Schneider\*  
Steven Andrew Tice  
George A. Yaeger\*

*\*Denotes members of voting status when the document was approved for publication*

---

**ASHRAE STANDARDS COMMITTEE 2009–2010**

Steven T. Bushby, *Chair*  
H. Michael Newman, *Vice-Chair*  
Robert G. Baker  
Michael F. Beda  
Hoy R. Bohanon, Jr.  
Kenneth W. Cooper  
K. William Dean  
Martin Dieryckx  
Allan B. Fraser  
Katherine G. Hammack  
Nadar R. Jayaraman  
Byron W. Jones  
Jay A. Kohler  
Carol E. Marriott

Merle F. McBride  
Frank Myers  
Janice C. Peterson  
Douglas T. Reindl  
Lawrence J. Schoen  
Boggarm S. Setty  
Bodh R. Subherwal  
James R. Tauby  
James K. Vallort  
William F. Walter  
Michael W. Woodford  
Craig P. Wray  
Wayne R. Reedy, *BOD ExO*  
Thomas E. Watson, *CO*

Stephanie Reiniche, *Manager of Standards*

---

**SPECIAL NOTE**

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Manager of Standards of ASHRAE should be contacted for:

- a. interpretation of the contents of this Standard,
- b. participation in the next review of the Standard,
- c. offering constructive criticism for improving the Standard, or
- d. permission to reprint portions of the Standard.

**DISCLAIMER**

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

**ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS**

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

## CONTENTS

### ANSI/ASHRAE Standard 193-2010 Method of Test for Determining the Airtightness of HVAC Equipment

SECTION	PAGE
Foreword.....	2
1 Purpose .....	2
2 Scope .....	2
3 Definitions.....	2
4 Nomenclature .....	2
5 Test Apparatus and Specifications .....	2
6 Test Procedure .....	4
7 Data to be Recorded .....	5
Informative Annex A: Bibliography.....	5

#### NOTE

When addenda, errata, or interpretations to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at [www.ashrae.org/technology](http://www.ashrae.org/technology).

© Copyright 2010 American Society of Heating,  
Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle NE  
Atlanta, GA 30329  
[www.ashrae.org](http://www.ashrae.org)  
All rights reserved.

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

## FOREWORD

One of the most important predictors of a building's energy efficiency is its HVAC system. There are a number of ways to measure the performance of HVAC systems—energy efficiency ratings being one of the most common—but the airtightness of the equipment is obviously an important factor as well. Air that is not delivered to areas as specified in the building design is air that is not being used efficiently. With this in mind, ASHRAE Standard 193 was created to test the airtightness of HVAC equipment.

Targeted at systems that move less than 3000 cfm (1400 L/s), Standard 193 will provide results that may be used by cognizant authorities who wish to regulate the air leakage of HVAC equipment and by contractors and installers that wish to specify and install equipment with known leakage characteristics.

The approach taken in this method of test is to determine the air leakage rate of HVAC equipment at a fixed reference pressure difference. In this way Standard 193 is similar to other rating standards that perform evaluations at a single condition for comparison purposes rather than attempting to estimate performance for an individual installation. Because this test method can be applied to a wide range of equipment, it is beyond the scope of this standard to fully specify detailed test arrangements.

Currently the need for minimizing air leakage in HVAC systems is reflected in various ASHRAE standards. ASHRAE Standard 62.2 limits allowable air leakage between garages and houses due to leaks in forced-air HVAC systems. ASHRAE Standard 152 includes HVAC system air leakage in estimates of distribution system efficiency for residential buildings. But while these standards aim to reduce the overall air leakage found in HVAC systems, neither provides a way to determine the effectiveness of specific components in an HVAC system in preventing air leakage. Although ASHRAE Standard 130 includes a test method for measuring air leakage of air terminal units, it does not specify a fixed test pressure suitable for airtightness ratings.

## 1. PURPOSE

This standard prescribes a method of test to determine the airtightness of forced-air HVAC equipment prior to field installation.

## 2. SCOPE

2.1 This standard applies to the following:

- a. Equipment intended for installation in ducted systems, including furnaces, heat pumps, air conditioners, coil boxes, filter boxes, and associated components.
  - b. Equipment that moves less than 3000 cfm (1400 L/s) of air.
- 2.2 This standard does not apply to ducts, plenums, or other field-constructed components.

## 3. DEFINITIONS

Where the following terms occur in this standard, the definitions provided in this section apply.

**air-handling unit (AHU):** any device that includes a fan or blower for moving air through ductwork. Examples include furnaces, fan-coil units, energy or heat recovery units, and exhaust fans.

**cased coil:** a heating or cooling coil that is mounted in a cabinet and contains no fan or blower.

**duct-mounted air cleaner:** a media air filter or other air-cleaning device that is mounted in a cabinet and has no fan or blower.

**standard conditions:** for the purposes of this standard, standard conditions are defined as follows: 68°F (20°C) for temperature, 0.07517 lb/ft<sup>3</sup> (1.2041 kg/m<sup>3</sup>) for air density, and 29.92 in. Hg (101.325 kPa) for barometric pressure.

**variable-air-volume (VAV) box:** a terminal air control device that regulates the amount of air entering a space; usually contains a damper but no fan or blower.

## 4. NOMENCLATURE

$P_{baro}$	=	barometric pressure, in. Hg (kPa)
$Q_{leak}$	=	air leakage of equipment under test adjusted to standard conditions and corrected for background leakage, cfm (L/s)
$Q_{bg}$	=	background air leakage rate of the test apparatus, cfm (L/s)
$Q_{bg,std}$	=	background air leakage rate of the test apparatus adjusted to standard conditions, cfm (L/s)
$Q_{meas}$	=	measured air leakage rate, cfm (L/s)
$Q_{meas,std}$	=	measured air leakage of equipment under test adjusted to standard conditions, cfm (L/s)
$T_{meas}$	=	temperature of air flowing through the air flowmeter, °F (°C)

## 5. TEST APPARATUS AND SPECIFICATIONS

This method of test requires the depressurization and/or pressurization of HVAC equipment to a specified test pressure. The airflow rate required to maintain the applied pressures is the air leakage rate of the equipment under test,  $Q_{leak}$ . Schematics of typical test apparatuses are shown in Figures 1 and 2.