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ANSI/AHAM AC-1: Method for Measuring the Performance of Portable Household Electric Room Air Cleaners

Understanding its Scope and the Related AHAM Industry Certification Program

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The Association of Home Appliance Manufacturers (AHAM) is the trade association representing manufacturers of major, portable, and floor care appliances and suppliers to the industry. Included in AHAM membership are manufacturers of portable room air cleaners. AHAM is a standards development organization for numerous technical, performance based standards for home appliances. AHAM also administers third party appliance rating verification programs which are available to members and non-members alike.

Portable Room Air Cleaner Performance Standard

In the early 1980s, AHAM developed an objective and repeatable performance test method for measuring the ability of **portable household electric room air cleaners** to reduce particulate matter from a specific size room. The standard, ANSI/AHAM AC-1-2006, *Method for Measuring the Performance of Portable Household Electric Room Air Cleaners*, is designed to evaluate portable household electric room air cleaners **regardless of the particle removal technology utilized.**

CADR

The resulting performance metric in the standard is called the **Clean Air Delivery Rate (CADR)**. CADR is a measure of the appliance's ability to reduce smoke, dust, and pollen particles in the 0.10 to 11 micron (μm) size range from the air. In ANSI/AHAM AC-1-2006, CADR is defined as "the rate of contaminant reduction in the test chamber when the unit is turned on, minus the rate of natural decay when the unit is not running, multiplied by the volume of the test chamber as measured in cubic feet." The 1008 ft³ test **chamber size is an integral part of the definition** and is standardized in ANSI/AHAM AC-1-2006 to ensure that comparisons between units that have been evaluated using the standard are fairly made. This standardized room size chamber limits the maximum CADR measurement (or value) to 450 (pollen and smoke) and 400 (dust). These maximum CADR values were determined through analysis of the acceptable minimum number of available particles, an average background natural decay rate (from statistical study), the size of the chamber, and the available minimum experiment time. **CADR values outside the ranges listed will not have the necessary statistical data required by this method.**

Comparing CADR Performance

The terms "CADR" and "Clean Air Delivery Rate" are general terms used to make performance claims for many types of products other than portable room air cleaners. CADR values for other products may not have been calculated in accordance with the AC-1 definition of CADR. As such, to accurately compare air cleaner CADR performance claims, the measured values being compared must fall within the defined scope of ANSI/AHAM AC-1-2006 and the CADR values for each unit must have been determined in accordance with ANSI/AHAM AC-1-2006. Otherwise, the comparison is not accurate.

Industry Acceptance and Use

Since its original development in the early 1980s, the ANSI/AHAM AC-1 test method has increasingly become the credible industry standard for evaluating portable room air cleaner particle removal performance. In 1989, the FTC confirmed that ANSI/AHAM AC-1 was a reasonable basis for measuring the degrees of reduction of airborne solid

particulate matter from household rooms.¹ The test method is utilized by the U.S. Environmental Protection Agency (USEPA) in its Air Cleaner Energy Star Program. Additionally, Consumers Union² uses CADR to determine the air cleaner ratings and product comparison information that are published in *Consumer Reports*®. Air Quality experts often refer to CADR in technical papers as well. In a recent research paper on the use of air cleaners to reduce fine particulate matter during prescribed burns and wildfires in Colorado, the authors utilized the CADR metric to select appropriate portable room air cleaners for the study, noting that CADR is a “useful parameter for characterizing effectiveness of an air cleaner.”³

Recent ANSI Re-Affirmation

On November 29, 2005, ANSI/AHAM AC-1-2006 was reaffirmed as an **American National Standard** by the American National Standards Institute (ANSI). The changes reflected in the new updated 2006 version are a result of an AHAM-initiated independent technical expert review of the standard and a subsequent ANSI consensus panel review during 2004 and 2005.

What is Not Covered by ANSI/AHAM AC-1?

Research efforts and experimental tests that have been conducted to develop the method have included only portable devices that are normally placed in a room during operation. One of the key principles of the test is that particles are not to be forced through the product – rather, the product is being tested as it is used – it is placed on a table or on the floor in the chamber in order to allow the unit’s own design and air flow patterns to dictate how many particles go into the unit. Other types of products that do not fit into the definition of a “portable household electric room air cleaner” are outside the scope of ANSI/AHAM AC-1-2006. **For example, whole house air cleaners which are typically mounted in the duct system (not placed in a room) and which have different particle dynamics and airflow patterns than portable room air cleaners are not covered by ANSI/AHAM AC-1-2006. CADR claims for whole house air cleaners are therefore not comparable to ANSI/AHAM AC-1-2006 CADR claims for portable room air cleaners.**

In addition, other portable room air cleaner performance characteristics such as the ability of the air cleaner to reduce gases, odors or microbiological components, or the sound and ozone emissions levels of the product are outside the scope of ANSI/AHAM AC-1-2006. AHAM has developed a separate standard for measuring the sound rating of portable room air cleaners (ANSI/AHAM AC-2-2006) and is working on a standard for evaluating performance of air cleaners following accelerated loading (draft AHAM AC-3).

Industry Certification Program (www.cadr.org)

Since 1985, AHAM has administered a portable room air cleaner certification program based on the ANSI/AHAM AC-1 standard whereby AHAM, acting as third party using an independent testing laboratory, will verify product ratings certified by program participants. Both AHAM and non-AHAM members are eligible to participate in the program. To reduce market confusion, participants must include all the units they manufacture in the program. Participants are required to include the following seal on the packaging of all certified room air cleaners.

¹ Sanger, William S, Associate Director for Enforcement, Bureau of Consumer Protection, FTC, Letter to AHAM dated June 1989.

² Consumers Union (CU) is a nonprofit organization whose main mission is to ensure that there is a fair and safe marketplace for consumers. CU tests products and publishes the product ratings in its magazine.

³ Henderson, Milford and Miller. Prescribed Burns and Wildfires in Colorado: Impacts of Mitigation Measures on Indoor Air Particulate Matter; *Air & Waste Management Association*. 2005, 55, 1516-1526.



FIGURE 1. CADR Ratings Seal

The seal provides the consumer with a simple tool to compare the performance of room air cleaners, making the purchasing decision easier. It includes the participant's certified CADR rates for tobacco smoke, dust and pollen, and a suggested room size that is based on the tobacco smoke CADR results. Using the CADR rating seal, consumers can comparison shop, selecting the unit the meets their room size and performance needs. By knowing the size of their room, consumers can choose an effective air cleaner.

Portable air cleaner models included in the program are independently tested on a periodic on-going basis to ensure that the units meet the claimed ratings. The models to be tested are randomly selected and are obtained from either the participant's warehouse or the open market. Units that do not successfully pass the on-going verification process must be re-rated or withdrawn from the market.

To order a copy of ANSI/AHAM AC-1-2006, please visit the AHAM web site store at www.aham.org. To learn more about the AHAM certification programs, please visit www.cadr.org or contact the AHAM Certification Director at (202) 872 5955 x314.

