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An American National Standard

Standard Test Method for Determining the Change in Room Air Particulate Counts as a Result of the Vacuum Cleaning Process[1]

This standard is issued under the fixed designation F2608; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method provides a laboratory test for the measurement of particulate generated as a direct result of the vacuuming process.

1.2 This test method is applicable to all residential/commercial uprights, canisters, stickvacs, central vacuum systems, and combination cleaners.

1.3 This test method applies to test dust removal from floor coverings not the removal of surface litter and debris.

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.5 *This test method may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F555 Test Method for Motor Life Evaluation of an Upright Vacuum Cleaner

F608 Test Method for Evaluation of Carpet Embedded Dirt Removal Effectiveness of Household/Commercial Vacuum Cleaners

F655 Specification for Test Carpets and Pads for Vacuum Cleaner Testing

F884 Test Method for Motor Life Evaluation of a Built-In (Central Vacuum) Vacuum Cleaner

F922 Test Method for Motor Life Evaluation of an Electric Motorized Nozzle

F1038 Test Method for Motor Life Evaluation of a Canister, Hand-held, Stick, and Utility Type Vacuum Cleaner Without a Driven Agitator

F1334 Test Method for Determining A-Weighted Sound Power Level of Vacuum Cleaners

F1409 Test Method for Straight Line Movement of Vacuum Cleaners While Cleaning Carpets

2.2 *AHAM Standard:*

ANSI/AHAM AC-1-2006 Test Method for Performance of Portable Household Electric Room Air Cleaners[3]

2.3 *Other References:*

IEC 60312 Vacuum Cleaners for Household Use—Methods for Measuring the Performance

Standard Laboratory Practice for Quantifying Respirable Particulate Emissions Generated by Residential/Commercial Vacuums and Central Vacuum Systems, Carpet and Rug Institute, 12/4/02

3. Terminology

3.1 *Definitions:*

3.1.1 *model, n*—designation of a group of vacuum cleaners having identical mechanical and electrical construction with only cosmetic or nonfunctional differences.

3.1.2 *population, n*—total of all units of a particular model vacuum cleaner being tested.

3.1.3 *repeatability limit, n*—value below which the absolute difference between two individual test results obtained under the repeatability condition may be expected to occur with a probability of approximately 0.95 (95 %).

3.1.4 *test run, n*—definitive procedure that produces a singular measured result.

3.1.5 *unit, n*—single vacuum cleaner of the model being tested.

4. Significance and Use

4.1 In this test method, the amount of particulate generated into the air by operating a vacuum cleaner over a specific floor covering that is contaminated with dust will be determined.

[1] This test method is under the jurisdiction of ASTM Committee F11 on Vacuum Cleaners and is the direct responsibility of Subcommittee F11.23 on Filtration.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from the Association of Home Appliance Manufacturers, 19th St. NW, Suite 402, Washington, DC 20036.

Particles from the motor, floor covering, and the test dust will all be measured. The amount of dust generated in the laboratory practice will differ from that in residential/commercial installations because of variations in floor coverings, soil and other solid particulate compositions, the vacuuming process used by individual operators, the air exchange rate of heating, ventilation, and air conditioning (HVAC) systems, and other factors.

4.2 To provide a uniform basis for measuring the performance in 4.1, a standardized test chamber, equipment, floor covering material, and dust particulate are used in this test method.

5. Apparatus

5.1 An air-conditioned laboratory at 21 ± –1.5°C (70 ± 5°F) and 50 % relative humidity ±5 % is to be used for sample preparation.

5.2 *Environmentally Controlled Test Chamber (per ANSI/AHAM AC-1-2006):*

5.2.1 *Chamber Size*—Nominal dimensions of 3.2 by 3.7 by 2.4 m (10.5 by 12 by 8 ft) up to a 20 % difference in volume is permitted.

5.2.2 *Framework*—Standard 5.1 by 10.2 cm (2 by 4 in.) or equivalent construction sealed to the floor line with caulking compound.

5.2.3 *Walls*—Any hard, cleanable surface, such as wallboard (sealed with a washable latex semi-gloss paint) or stainless steel. Seal with caulking compound.

5.2.4 *Flooring*—Any hard, seamless cleanable surface such as seamless full-width vinyl, stainless steel, or sealed concrete.

5.2.5 *Filtration*—HEPA filtration (>99.97 % at 0.3 µm, 0.5 m^3/s (1000 ft^3/min) minimum).

5.2.6 *Motor and Blower for Conditioning Loop*—0.35-m^3/s (750-ft^3/min) fan.

5.2.7 *Relative Humidity*—50 ± 5 %.

5.2.8 *Temperature*—21 ± 1.5°C (70 ± 5°F).

5.2.9 *Chamber Sealing*—Chamber sealing shall be verified as follows: Particulate level in the sealed room shall not rise above 1000 particles/ft^3 at ≥0.3 µm after 20 min of HEPA off, with the room static.

5.3 Real-time aerosol particle counter in the range of 0.3 to 5 µm. A laser photometer may be used, in addition to the particle counter, with a range of 0.1 to 1000 µg/m^3.

5.4 Particulate sampling pickoff probe shall be 152.4 ± 12.7 cm (60 ± 5 in.) above the test carpet, facing up, on centerline of carpet.

5.5 *Weighing Scale (for Weighing Test Dirt),* accurate to 0.01 g (0.000353 oz) and having a weighing capacity of at least 100 g (3.53 oz) for weighing the dust for embedding.

5.6 *Dirt Embedment Tool*—Roller may be locked or unlocked (see Fig. 1).

5.7 *Dirt Dispenser*—Dispensing system that provides the operator with a method to distribute the test dirt uniformly on the carpet test area.

5.8 *Voltmeter,* to measure input volts to the vacuum cleaner, to provide measurements accurate within ±1 %.

5.9 *Voltage-Regulator System,* to control the input voltage to the vacuum cleaner. The regulator shall be capable of maintaining the vacuum cleaner's rated voltage ±1 % and rated frequency having a wave form that is essentially sinusoidal with 3 % maximum harmonic distortion for the duration of the test.

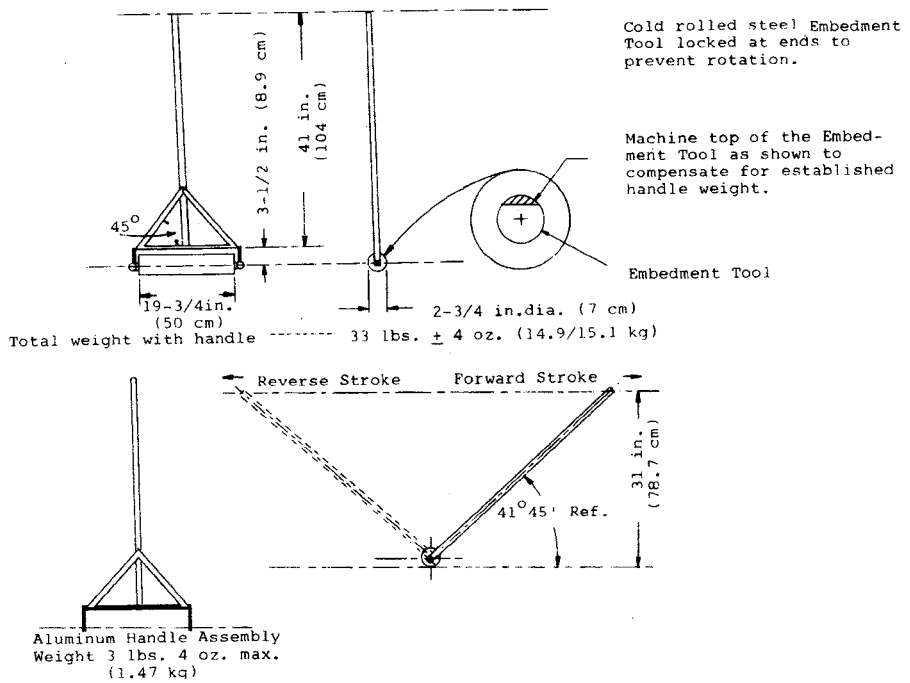

FIG. 1 Dirt Embedment Tool

5.10 Carpet bed length of 182.9 cm (72 in.) and minimum width of 68.6 cm (27 in.). See an example of a suitable cleaning bed apparatus in Fig. 2.

5.11 Drive for carpet or vacuum cleaner capable of maintaining specified test speed of 55 cm/s (1.8 ft/s) both forward and reverse in a straight pattern. Bed must be equipped with brackets to hold the test vacuum handle at 80 cm (31.5 in.) above the test material.

5.12 If moving the vacuum cleaner, a suitable system is described in Test Method F608. Travel length and width are as specified in the procedure.

5.13 Tachometer or equivalent device for calibrating conveyor or vacuum drive speed.

5.14 *Rotating Agitator Conditioning Vacuum Cleaner/ Equipment or a Central Vacuum Cleaning System equipped with a powered, rotating agitator-equipped nozzle,* for conditioning new test carpets and removing residual dirt from the test carpet before each test run. This cannot be the unit tested.

6. Materials

6.1 *Level Loop Carpet and Padding,* as described in Specification F655.

6.2 *ISO 12103-A2 Arizona Test Dust (IEC 60312)*—Weigh and record 10 g of test dust in a room meeting the requirements of 5.1. See Table 1 for a description of the dust.

NOTE 1—Relative humidity can have a significant effect upon the weight and amount of test dust.

7. Sampling

7.1 A minimum of three units of the same model vacuum cleaner selected at random, in accordance with good statistical practice, shall constitute the population sample.

7.2 To determine the best estimate of the total particulate counts during the activity of cleaning for the population of the vacuum cleaner model being tested, the arithmetic mean of the particulate level in the air rating of the samples from the population shall be established by testing to a 90 % confidence level within ±5 % of the mean value.

7.3 Annex A1 provides a procedural example for determining the 90 % confidence level and when the sample size shall be increased.

TABLE 1 ISO 12103-1, A2 Fine Test Dust Particle Distribution

Cumulative Volume Numeric Data	
Size, µm	Less Than, %
1	2.6
2	11.3
3	20.4
4	28.9
5	35.8
7	44.6
10	52.9
20	70.7
40	88.2
80	99.8

8. Standard Test Carpet Preparation

8.1 Cut panels as needed of the test carpet, specified in 6.1, to a size of 68.6 cm (27 in.) warp by 182.9 cm (72 in.) fill.

8.2 Mark the carpet panel(s) with test identification numbers for later reference.

8.3 *Preconditioning New Test Carpet Panels:*

8.3.1 Vacuum new test carpet panels using a rotating agitator-equipped vacuum cleaner to remove any loose materials before soiling and testing.

8.3.2 Vacuum the carpet with the first stroke in the direction of the pile lay and continue vacuuming the entire area of the carpet until less than 2 g of carpet fiber or soil is picked up after 5 min of cleaning.

8.4 *Reconditioning Used Carpet Panels:*

FIG. 2 Cleaning Bed Apparatus