



Designation: F608 – 24

Standard Test Method for Evaluation of Carpet Embedded Dirt Removal Effectiveness of Household/Commercial Vacuum Cleaners¹

This standard is issued under the fixed designation F608; 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 covers only a laboratory test for determining the relative carpet dirt removal effectiveness of household/commercial vacuum cleaners when tested under specified conditions.

1.2 This test method is applicable to household/commercial types of upright, canister, and combination cleaners.

1.3 The test method applies to embedded dirt removal from carpets, not the removal of surface litter and debris.

NOTE 1—The F11.21 subcommittee is actively pursuing new market relevant carpets with the assistance of the carpet industry. Although plush and Frieze carpet panels are no longer available for purchase, some laboratories may still have samples for testing. In such cases, the table values remain valid.

NOTE 2—Due to the influence of environmental conditions, variations in time, origin of test materials, and proficiency of the operator, most of the described test methods will give more reliable results when applied for comparative testing of a number of appliances at the same time, in the same laboratory, and by the same operator until a new interlaboratory study has been completed to provide repeatability and reproducibility values.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee F11 on Vacuum Cleaners and is the direct responsibility of Subcommittee F11.21 on Cleanability.

Current edition approved Jan. 1, 2024. Published February 2024. Originally approved in 1979. Last previous edition approved in 2022 as F608 – 22. DOI: 10.1520/F0608-24.

2. Referenced Documents

2.1 ASTM Standards:²

C136/C136M Test Method for Sieve Analysis of Fine and Coarse Aggregates

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

F655 Specification for Test Carpets and Pads for Vacuum Cleaner Testing (Withdrawn 2022)³

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

F2608 Test Method for Determining the Change in Room Air Particulate Counts as a Result of the Vacuum Cleaning Process

F2756 Test Method for Determining Energy Consumption of Vacuum Cleaners

3. Terminology

3.1 Definitions:

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

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

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 The last approved version of this historical standard is referenced on www.astm.org.

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

3.1.4 *repeatability standard deviation, S_r* —the standard deviation of test results obtained under repeatability conditions.

3.1.5 *reproducibility limit, R* —the value below which the absolute difference between two test results obtained under reproducibility conditions may be expected to occur with a probability of approximately 0.95 (95 %).

3.1.6 *reproducibility standard deviation, S_R* —the standard deviation of test results obtained under reproducibility conditions.

3.1.7 *sample, n* —a group of vacuum cleaners taken from a large collection of vacuum cleaners of one particular model which serves to provide information that may be used as a basis for making a decision concerning the larger collection.

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

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

4. Significance and Use

4.1 This test method provides an indication of the capability of the vacuum cleaner to remove embedded dirt from carpeting. This test method is based upon results of home cleaning tests so that, in most cases, a reasonable correlation exists between home and laboratory results. The amount of dirt picked up in the laboratory test may not be the same as in the home; however, it will show that, in most cases, a vacuum cleaner that performs well in the laboratory will perform well in a home. Laboratory results may differ due to variations in the homes, carpets, dirt, and other factors (see Section 6).

4.2 In order to provide a uniform basis for measuring the performance described in 1.1, standardized test carpets and a standardized test dirt are employed in this procedure.

5. Apparatus

5.1 *Weighing Scale for Weighing Carpets*, accurate to 0.035 oz (1 g) and having a weighing capacity of at least 15 lb (6.82 kg).

5.2 *Weighing Scale (for Weighing Test Dirt and Dirt Container, (see 9.2.2.1(2))),* accurate to 0.0035 oz (0.1 g) and having a weighing capacity of at least 1.1 lb (500 g).⁴

5.3 *Stopwatch*, with a second hand or other type of equipment capable of establishing the specified rate of movement and total cycle time.

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

5.5 *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.

5.6 *Dirt Embedment Tool*, with the roller locked (see Fig. 3).

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 *Carpet-Conditioning Equipment*, to support the test carpet during new carpet conditioning and the removal of residual dirt from the test carpet before each test run (Fig. 4).

5.9 *Rotating Agitator Conditioning Vacuum Cleaner/Equipment*, for conditioning new test carpets and removing residual dirt from the test carpet before each test run. This cannot be the unit being tested.

NOTE 3—Automated methods for spreading the test dirt, embedding the test dirt, and cleaning and reconditioning the test carpets are acceptable if they do not change the results of this test method.

5.10 *Temperature and Humidity Indicators*, to provide temperature measurements accurate to within ± 1 °F ($\pm \frac{1}{2}$ °C) and humidity measurements accurate to within 2 % relative humidity.

5.11 *Supporting Surface*—A flat surface consisting of a piece of $\frac{3}{4}$ -in. (19-mm) thick exterior grade plywood with the “A” surface upward to support the test carpet and pad. If necessary, the four corners (only) of the test carpet and pad may be fastened to the supporting surface by any acceptable means.

5.12 *Rotating Agitator Reference Vacuum Cleaner*, one, for calibrating test carpets (see 9.3).

5.13 *Straight-Air Canister Reference Vacuum Cleaner*, one, for calibrating test carpets (see 9.3).

6. Materials

6.1 Standard carpets conforming to Specification F655,

6.2 Standard carpet padding conforming to Specification F655,

6.3 Test dirt (see Annex A1),

6.3.1 Silica sand (see Annex A1), and

6.3.2 Talc (see Annex A1).

6.4 All products being tested in a comparison test must be tested using materials from identical production lots or batches. Verify that a sufficient quantity of all materials from a single lot/batch is on hand prior to starting the test program.

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.

7.1.1 To determine the best estimate of cleaning ability effectiveness for the population of the vacuum cleaner model being tested, the arithmetic mean of the cleaning ability rating of the sample from the population shall be established by

⁴ The Mettler-Toledo Model PM 2000, available from Mettler-Toledo, Inc. Box 71, Hightstown, NJ 08520, the OHAUS Model GT-8000 available from OHAUS, Inc. Florham Park, NJ, or equivalent, have been found suitable for this purpose. (It is recommended that the scale read directly in grams.) If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.