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Standard Methods for Gas Flow Resistance Testing of Filtration Media¹

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1. Scope

1.1 The flow resistance of any fabricated filter device will depend on the flow resistance of the media used.

1.2 This standard offers procedures sufficient to determine the gas flow characteristics of flat specimens of media used in the filtration process. The methods are extended to include pleated specimens and bulk media as well.

1.3 In all cases, flow rates through the specimen are determined in accordance with procedures outlined in ASME “Fluid Meters.” The test fluid is air.

1.4 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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:

- D 461 Method of Testing Felt²
- D 585 Methods for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product³
- D 645 Test for Thickness of Paper and Paperboard⁴
- D 685 Method for Conditioning Paper and Paper Products for Testing³
- D 737 Test Method for Air Permeability of Textile Fabrics²
- D 1776 Practice for Conditioning Textiles For Testing²
- D 1777 Method for Measuring Thickness of Textile Materials²
- D 2905 Practice for Statements on Number of Specimens for Textiles²
- D 3574 Methods of Testing Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foam⁵
- E 105 Practice for Probability Sampling of Materials⁶
- E 122 Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process⁶

¹ These methods are under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and are the direct responsibility of Subcommittee D22.09 on ISO TAG for ISO/TC 146.

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² *Annual Book of ASTM Standards*, Vol 07.01.

³ *Annual Book of ASTM Standards*, Vol 15.09.

⁴ Discontinued, see 1981 *Annual Book of ASTM Standards*, Part 20.

⁵ *Annual Book of ASTM Standards*, Vol 09.02.

⁶ *Annual Book of ASTM Standards*, Vol 14.02.

2.2 ASME Document:

“Fluid Meters,” Sixth Edition, 1971⁷

3. Terminology

3.1 *Definitions*—Those definitions appropriate for this standard will be adopted from the F-21 committee approved submission from Subcommittee F21.92 on Definitions.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *air density*, ρ —mass per unit volume.

3.2.2 *air flow resistance*, ΔP —pressure drop or pressure differential across a test specimen of filter medium at a specified air face velocity or mass flow rate.

3.2.3 *constituted bulk media*—those types of filter media formed from bonded aggregates or discrete solid materials.

3.2.4 *edge leakage*—air flow that passes into or bypasses the test specimen in geometric planes other than those intended for resistance measurement.

3.2.5 *face area*, A —cross-sectional area perpendicular to air flow at the specimen test boundary.

NOTE 1—If specimen inlet and exit face areas are different, “Inlet” or “Exit” shall be used to describe the face area in question.

3.2.6 *face velocity*, V —volumetric flow rate per unit face area.

NOTE 2—If specimen inlet and exit face areas are different, “Inlet” or “Exit” shall be used to describe the face velocity in question.

3.2.7 *mass rate of flow*, $\dot{m}$ —mass transport of air per unit time through the test specimen.

3.2.8 *medium area*, A_m —total area of filtration media exposed to air flow.

NOTE 3—Medium area may be greater than face area due to pleating, folding, etc.

3.2.9 *medium velocity*, V_m —volumetric flow rate per unit medium area.

3.2.10 *normalized resistance*, $\sigma \Delta P$ —product of sigma and measured air flow resistance.

3.2.11 *sigma*, σ —ratio of air density existing at test conditions to standard air density. Density at standard conditions is taken to be 0.075 lb/ft³ (1.201 kg/m³).

3.2.12 *unconstituted bulk media*—those types of filter media formed from unbonded aggregates or discrete solid materials.

⁷ Available from American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017.