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Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring¹

This standard is issued under the fixed designation F3191; 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 practice covers the determination of whether or not a substrate surface, in lieu of written instruction from a product manufacturer, is considered porous or non-porous prior to the installation of resilient flooring materials.

1.2 Although carpet tiles, carpet, wood flooring, coatings, films, paints, self-leveling and trowel-grade underlayments, primers, and other associated products are not specifically intended to be included in the category of resilient floor coverings, the procedures included in this practice may be useful for assessing the substrate water absorption for substrates to receive such materials.

1.3 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.

1.4 *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.* Some specific hazards statements are given in Section 6 on Hazards.

2. Referenced Documents

2.1 *ASTM Standards:*²

[C125 Terminology Relating to Concrete and Concrete Aggregates](#)

[F141 Terminology Relating to Resilient Floor Coverings](#)

[F1869 Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride](#)

¹ This practice is under the jurisdiction of ASTM Committee F06 on Resilient Floor Coverings and is the direct responsibility of Subcommittee F06.40 on Practices.

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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.

2.2 *Carpet and Rug Institute (CRI) Standard:*³

[CRI Carpet Installation Standard](#)

2.3 *Resilient Floor Covering Institute (RFCI) Standards:*⁴
[Recommended Work Practices for Removal of Resilient Floor Coverings](#)

[Recommended Installation Practice for Homogenous Sheet Flooring, Fully-Adhered](#)

3. Terminology

3.1 *Definitions:*

3.1.1 See Terminology [F141](#) for definitions of the terms: substrate, above-grade (suspended), on-grade, below grade, concrete, and resilient flooring.

3.1.2 See Test Method [F1869](#) for definition of service temperature and relative humidity.

3.1.3 See Terminology [C125](#) for definition of absorption.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *absorption, n*—the process by which a liquid is drawn into and tends to fill permeable pores in a porous solid body (Terminology [C125](#)).

3.2.2 *absorption rate, n*—critical factor in determining how to install many directly applied adhesives, determined by the amount of time necessary for one droplet of water to be absorbed with increasing length of time for absorption indicating a less absorptive, less porous, substrate surface.

4. Summary of Practice

4.1 This practice describes the procedure for assessing the substrate water absorption (often referred to as substrate porosity) of horizontal, substrate surfaces prior to the installation of resilient floor coverings. The procedure involves applying a drop of water to the surface of properly prepared substrate, and then determining whether that drop of water is absorbed within a given time period.

5. Significance and Use

5.1 The ability of a substrate surface to readily absorb water is a key indicator in determining how to correctly install many

³ Available from Carpet and Rug Institute, 100 S. Hamilton St., Dalton, GA 30720, <http://www.carpet-rug.org>.

⁴ Available from Resilient Floor Covering Institute, 115 Broad St., Suite 201, LaGrange, GA 30240, <http://www.rfci.com>.

types of flooring adhesives, primers, self-leveling underlayments, and other products. Several flooring industry publications such as CRI's Carpet Installation Standard, RFCI's Recommended Installation Practice for Homogenous Sheet Flooring, Fully-Adhered, as well as most flooring, adhesive, primer, and underlayment manufacturers reference substrate surface porosity criteria in their application instructions since this directly impacts the spread rate of directly applied material, the open time, and other critical installation factors.

5.2 Installing flooring products over low or non-absorptive (sometimes referred to as “non-porous”) substrates such as densely machine-troweled concrete, mature and well-hydrated concrete, existing resilient flooring, polymer terrazzo and others may require adjustments to the surface preparation method or product selection to ensure a successful installation.

5.3 Use this practice to obtain a qualitative assessment of substrate water absorption (porosity) and whether or not that substrate should be regarded as porous/absorptive or non-porous/non-absorptive as these terms relate to the installation of resilient floor coverings, adhesives, self-leveling underlayments, primers, and other products. This practice will produce results directly applicable to determining appropriate surface preparation requirements in accordance with manufacturer's specifications, but it is in no way meant to replace published manufacturer's literature regarding the determination of substrate water absorption (porosity) and the impact such has, if any, on substrate preparation requirements and on the installation of their respective materials.

5.4 Substrates that evidence immediate absorption, are chalky or dusty, or have varying degrees of absorption may require priming or other additional surface preparation prior to subsequent installations.

5.5 Substrates that evidence no absorption may indicate the presence of a contaminant that may negatively impact proper adhesion. In such cases, bond tests performed in accordance with the particular manufacturer's established guidelines are strongly recommended.

5.6 The size, shape, and color of the water drop may indicate the presence of contaminants or other special circumstances that may require discussion with the manufacturer of the slab covering to be installed.

5.7 Some surfaces such as concrete can become denser and less porous/less absorptive over time as the material continues to gain strength and densify. The results obtained reflect only the conditions of the substrate at the time and location of the test(s).

6. Hazards

6.1 **Silica and Asbestos Warning**—Do not sand, dry sweep, dry scrape, drill, saw, bead blast, or mechanically chip or pulverize existing resilient flooring, backing, lining felt, paint, asphaltic cutback adhesives, or other adhesives. These products may contain asbestos fibers or crystalline silica. Avoid creating dust. Use of dust collection equipment and appropriate personal protective equipment such as an approved respirator

may be required to control worker exposure to respirable crystalline silica produced from drilling concrete. Inhalation of such dust is a cancer and respiratory tract hazard. Smoking by individuals exposed to asbestos fibers greatly increases the risk of serious bodily harm. Unless positively certain that the product is a non-asbestos-containing material, presume that it contain asbestos. Regulations may require that the material be tested to determine asbestos content. The Resilient Floor Covering Institute's (RFCI) Recommended Work Practices for Removal of Resilient Floor Coverings⁴ should be consulted for a defined set of instructions addressed to the task of removing all resilient floor covering structures.

6.2 **Lead Warning**—Certain paints may contain lead. Exposure to excessive amounts of lead dust presents a health hazard. Refer to applicable federal, state, and local laws and guidelines for hazard identification and abatement of lead-based paint published by the U.S. Department of Housing and Urban Development regarding appropriate methods for identifying lead-based paint and removing such paint, and any licensing, certification, and training requirements for persons performing lead abatement work.⁵

7. Conditioning

7.1 Substrates should be at the service temperature and relative humidity expected during normal use or at the conditions required for installation of the floor covering material per the relevant manufacturer's specifications. If this is not possible, then the substrate and ambient temperature shall be 75 ± 10 °F (23.9 ± 5.5 °C) and the ambient humidity shall be 50 ± 10 % relative humidity.

8. Procedure

8.1 All substrates to receive resilient floor covering materials that require a determination regarding substrate absorption/porosity shall be tested for surface water absorption prior to the installation of resilient flooring, adhesives, primers, self-leveling underlayments, and related products regardless of age or grade level.

8.2 The substrate surface shall be prepared in the exact manner as planned or as required for each specific floor covering material installation.

8.3 To test for field substrate water absorption at the substrate's surface, place a single drop of potable water (approximately 0.05 mL, depicted in Fig. 1) on the substrate surface using a pipette (pictured in Fig. 2), water dropper, straw, etc., after the substrate surface has been prepared as described in 8.2.

8.4 Record whether the amount of time required for the substrate to completely absorb the deposited water is less than, equal to, or greater than the established threshold limit (date and time-stamped photos recommended). Fig. 3 illustrates a completely absorbed drop of water.

⁵ *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*, U.S. Dept. of Housing and Urban Development, Washington, DC, 2012, http://portal.hud.gov/hudportal/documents/huddoc?id=second_edition_2012.pdf.



FIG. 1 Non-absorptive Concrete Surface



FIG. 2 Pipette (example only; this particular device is not required)



FIG. 3 Absorptive Concrete Surface

8.5 Should the time for the water to absorb completely exceed the maximum threshold published in the manufacturer’s instructions or this standard, the practice is considered complete and the specific area tested is determined to be non-absorptive/non-porous.

8.6 Perform three tests for the first 2000 ft² (186 m²) and at least one additional test for each additional 3000 ft² (279 m²), selecting test locations to provide information about substrate water absorption. The number of tests listed herein only represents the minimum to be conducted, but the total number of tests conducted shall not be less than one per room. Jobsite

or substrate surface conditions may require more tests to sufficiently determine the correct installation procedure.

8.7 Prior to substrate covering installation, it is the responsibility of the installing party to confirm that substrate absorption testing was performed and that the results were reviewed for compliance with the manufacturers’ published guidelines for the materials to be installed. Perform this procedure in a sufficient number of places throughout the project in order to assess the appropriate installation procedures to be followed based on the substrate’s porous/absorptive properties and the manufacturers’ published guidelines relating to such.

8.8 To be considered porous/absorptive, absorption limits shall not exceed the written instructions from the floor covering manufacturer, the adhesive manufacturer, primer manufacturer, underlayment manufacturer, or combination thereof. If these instructions differ, the requirements for the product first applied directly to the substrate shall apply.

8.9 Consult the resilient flooring manufacturer, the adhesive manufacturer, the primer manufacturer, the underlayment manufacturer’s written instructions, or combination thereof, for their acceptable test methods. However, in the absence of written manufacturer’s guidelines, refer to [Table 1](#).

TABLE 1 ASTM Practice for Substrate Water Absorption Rate

Length of Time to Absorb	Substrate Determination
≤ 1 minute	Porous/Absorptive
> 1 minute	Non-porous/Absorptive

9. Report

9.1 Report the following information:

9.1.1 Name and address of the structure.

9.1.2 Date and time measurements were made.

9.1.3 Water absorption rate (stated as ≤ or > the threshold time period used).

9.1.4 Name, title, and affiliation of worker performing the measurements.

9.1.5 Locations of test sites within the structure.

9.1.6 Ambient air and substrate surface temperature, to the nearest degree Fahrenheit (Celsius).

9.1.7 Relative humidity (to the nearest percent relative humidity).

9.2 Report any observations that might affect the interpretation of individual measurements such as standing water on the slab, wet coring operations, weather, ventilating system operations, etc.

10. Acceptance Criteria

10.1 Various products from the same manufacturer can have different thresholds for what is considered absorptive and non-absorptive (porous and non-porous). It is the responsibility of the installing party to ensure that the correct determination of appropriate test method and absorption rate based upon consultation with the respective manufacturer’s published literature or technical service department was conducted.

11. Keywords

11.1 absorption; absorptive; concrete; flooring; floors; moisture; non-absorptive; non-porous; porous; substrate

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