

SUBSTRATE POROSITY AND ITS ROLE IN RESILIENT FLOORING INSTALLATION

Why Porosity Matters in Flooring Applications

A common question from flooring professionals is: *Why must a concrete substrate be porous before installing resilient flooring along with primers, sealers, underlayments, or adhesives?* The answer lies in how porosity directly influences product performance—especially adhesive bonding, performance and curing times.

Substrate porosity impacts how quickly materials like adhesives, primers, and sealers absorb and cure. On a porous surface, these materials typically dry and bond faster, allowing installers to work more efficiently. Conversely, non-porous concrete can significantly delay curing, impacting schedules and profitability.

Concrete Porosity Explained

Although concrete is often perceived as solid, it contains an internal network of microscopic pores—typically accounting for 12–18% or more of its volume. These pores form as water escapes during curing, leaving behind capillary channels.

The strength and porosity of a concrete slab are influenced by several factors, especially the water-to-cement ratio. Lower porosity increases the slab's compressive strength, while higher porosity makes it more absorbent but potentially weaker. However, for flooring installations, it is the surface porosity that matters most.

Industry Standards for Porosity Testing

Surface porosity should be tested per **ASTM F3191-16**, *Standard Practice for Field Determination of Substrate Water Absorption (Porosity)*. This test involves placing a **0.05 mL droplet of water** on the concrete:



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- **If the droplet is absorbed within 60 seconds**, the surface is considered **porous**.
- **If it remains after one minute**, the substrate is classified as **non-porous**.

Non-porous surfaces typically require **mechanical abrasion**—such as grinding or shot-blasting—to improve absorbency and ensure compatibility with primers, adhesives, and underlayments. Another alternative is using a self-leveler cementitious underlayment or blotter coat to provide porosity, minimum depth $\frac{1}{4}$ ".

How Porosity Affects Flooring System Components

1. **Concrete Sealers**

These products are designed to block moisture transmission by sealing pores. On a porous slab, they bond more effectively. A properly sealed surface improves adhesive performance and protects the flooring from moisture intrusion.

2. **Primers**

Used especially on lightweight or gypsum-based concrete, primers help neutralize pH, improve bond strength, and enhance spread rate. Applying primer on a porous surface ensures better coverage and adhesion for subsequent layers.

3. **Cement-Based Underlayments**

These are used to level the substrate and meet industry flatness requirements. Proper porosity ensures a stronger bond between the underlayment and concrete substrate, creating a reliable base for adhesives and resilient flooring.

4. **Adhesives**

Porosity influences both open time and cure time. On porous surfaces, adhesives dry more quickly and allow for *wet-set* or *semi-wet* installation methods. Non-porous surfaces often require pressure-



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sensitive adhesives and may necessitate *dry-set* applications, which take longer to cure.

Rendering the Surface Porous

To meet porosity requirements, mechanical surface preparation is essential, especially on dense or hardened slabs. Tools like grinders or shot-blasters help achieve the recommended **Concrete Surface Profile (CSP)**:

- Most flooring manufacturers recommend a **CSP level of 1–3**, where:
 - **1 = light texture**
 - **3 = moderate texture**

Higher CSP values may be used for heavier coatings but are not typical for resilient flooring applications.

⚠ Note: Adhesives and flooring products should not be applied to any substrate that has been treated with solvent-based cleaners, oil base or adhesive removers, as residues may interfere with bonding.

Key Benefits of Installing Over Porous Substrates

- **Enhanced Adhesion:** Products form stronger bonds on absorbent surfaces.
- **Faster Installation:** Reduced drying times increase installation speed and lower labor costs.
- **Versatile Application:** Installers have the flexibility to apply adhesives in wet, semi-wet, or dry methods depending on substrate absorption.

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Moisture and pH Testing Requirements

Before any installation, substrates must also be tested for **moisture content and pH** using these methods:

- **ASTM F2170:** Measures internal relative humidity of the concrete slab.
- **ASTM F2659:** Uses an electronic impedance meter for surface moisture evaluation.

Product manufacturers will define acceptable moisture and pH levels for their specific adhesives and flooring materials.

⚠ Note:

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