



Resilient and Wood Floor Covering Flatness Requires High Performance, Cementitious Self-Leveling Underlayment

There are a growing number of different types of floor coverings being installed in commercial applications, from sheet vinyl to luxury vinyl tile to epoxy surfaces. Every floor, whether it is in a retail outlet, hospital or a restaurant, has specific needs to hold up to the unique traffic of these commercial situations. This necessitates the proper specification of materials and execution of floor surface preparation, particularly in relation to floor flatness, which is critical to any successful floor covering installation. To ensure a higher quality appearance and reduced lifecycle cost, imperfections in the subfloor must be addressed before the installation of the floor covering.

Putting more effort into surface preparation will yield massive benefits for your floor covering installation. Not only will the floor covering be easier to install, but a truly flat floor will have an aesthetic quality that building occupants will appreciate. While there are many minimum industry standards for achieving a flat floor, the question remains: **Do they go far enough? As the flooring industry continues to evolve and specifications become more demanding, construction methods must continue to improve to meet these challenges.**

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Photos Courtesy ABW Construction – Woodinville, WA



DEFINING FLOOR FLATNESS REQUIREMENTS

Most floor covering manufacturers require a high degree of flatness. The flatness of the floor is most important when the full expanse of the floor is viewed. Any waviness or variation in the floor can easily distract from the beauty of the floor covering itself. ASTM F710, *"The Preparation of Concrete Floors to Receive Resilient Flooring,"* defines the requirements for a flat floor that will receive resilient floor covering; it requires that the variation in floor flatness be no more than 3/16" in 10' and 1/32" in 12" as described in ACI 117R and as measured in ASTM E1155. More recently, the industry has begun to adopt the ACI method of measuring the flatness of the floor with F_f numbers. The F_f number represents the magnitude of surface change in 12-inch increments. There is no relationship between F_f numbers and the floor variation determined by a 10' straight edge. It is generally accepted that a straight edge variation of 3/16" is equivalent to an F_f of 32. In some instances the architect/designer will require a more stringent finish tolerance, and the subsurface specification should reflect this.

Installing a self-leveling underlayment (SLU) makes it easy to exceed the requirements for the floor covering. Using the testing procedures outlined in ASTM E1155, floor surfaces covered with a cementitious SLU have rendered F_f numbers greater than 80, which exceed the requirement of 32 (the higher the value, the flatter the floor). A floor corrected with one of CUSTOM's high performance SLUs measured an F_f of 86. Note the unbroken reflection in the photos by ABW Construction.

DEFINITION AND PERFORMANCE OF SELF-LEVELING UNDERLAYMENTS

Self-leveling underlayment for flooring consists of a blend of calcium aluminate cements, inorganic aggregates, copolymers and chemical modifiers which form a self-leveling compound that creates a uniform flatness for interior subfloors. These components are combined in a precise ratio to form a flowable, cementitious underlayment compound with high compressive strength. Virtually all the cementitious SLUs sold today are mixed with water only; no liquid acrylic-latex additive is required. The dry, re-dispersible copolymers in the manufacturers' formulas provide improved strength and flexibility. CUSTOM's SLUs are formulated with proprietary copolymers and cements which provide ultra-high compressive values exceeding 4000 psi. The high compressive value of SLU materials results in a durable floor assembly that holds up to the most demanding situations.

The versatility of cement-based self-levelers allows for SLU pours that can be applied from 1/8" thick all the way up to 1-1/2" thick, or in some cases, up to 2" in total thickness. SLU materials can also be feather edged to transition to all floor finishes. CUSTOM's proprietary formulas provide an extended set for mechanical pumping, as well as smaller bucket mixing applications.

The fast cure rates of CUSTOM's SLUs allow the installation of ceramic or natural stone tile in as little as 4 hours, and only need to cure for 12 to 14 hours for the installation of resilient flooring and other moisture-sensitive coverings. This helps to minimize project downtime and allows the work schedule to proceed more expeditiously.

FLOORING INSTALLATION SYSTEMS

To address the need for flat floors for the installation of most floor coverings, CUSTOM introduced a new line of Flooring Installation Systems products focused on leveling the floor prior to the installation of all resilient flooring and hardwood, as well as ceramic and natural stone tile. These products incorporate state-of-the-art calcium aluminate cements to achieve the performance the industry expects. They have been designed for easy application and allow rapid installation of the floor covering.



LEVELERS

CL-XP1 – A High Compressive Strength SLU

For challenging floor leveling installations, Custom Building Products developed CL-XP1, a premium, high-performance, calcium aluminate-based self-leveling underlayment. With a compressive value in excess of 5,000 psi, CL-XP1 is ideal for floors that are subject to heavy foot traffic and heavy equipment, such as hospital operating rooms. CL-XP1 contains an abrasion-resistant formula that will hold up to traffic during construction without a protective covering. CL-XP1 requires less surface preparation than conventional self-leveling underlayments and can level floors from feather edge up to 2" in thickness.

CL-150 – A Low Prep, Premium SLU

CL-150 incorporates CUSTOM's Low Prep Technology - just sweep, prime and pour. It has been formulated to meet the demanding requirements of most floor coverings in all commercial applications. It levels concrete floors in minutes and is ready for the installation of most floor coverings in as little as 14 hours. CL-150 can be used over structurally sound plywood and OSB flooring with the addition of a 2.5 metal lath, and can be used to level floors from 1/8" to 1-1/2" thick.



PATCHING SOLUTIONS

Feather Patch – High-Strength Skim Coat Patching and Finishing Compound

Feather Patch is a fast-setting, calcium aluminate-based compound that provides a smooth finish on interior subfloors prior to flooring installation. It offers exceptional handling with no additives required, and is easily applied from feather edge to 1" thick.

General Patch – Durable General Purpose Patching Compound

Use General Patch for general purpose, trowel-applied patching of interior concrete substrates. General Patch mixes with only water, can accept floor finish and adhesive bond coat in 30-90 minutes, and can be feather edged or applied up to 2" thick.



PRIMERS

Most cement-based self-leveling underlayments require that the floor surface is primed with an appropriate primer. The primer not only improves the bond of the underlayment to the concrete, but also seals the surface of the concrete to improve the flow and workability of the SLU. It is important that the primer selected has been formulated to work with the self-leveling underlayment being applied over the surface. CUSTOM has developed a line of Flooring Installation Systems primers to fill this need for all installations, from porous concrete to impervious moisture control epoxy coatings.

CP-A – Advanced Acrylic Primer

CP-A is an advanced, multi-purpose acrylic primer/sealer that prepares a variety of surfaces for the application of CUSTOM Flooring Installation Systems self-leveling underlayments. It is easy to mix and apply, seals porous and non-porous surfaces and improves the bond of the underlayment to the subsurface.



CP-WE – Water-Based Epoxy Primer

CP-WE is a polymer-modified, water-based epoxy primer/sealer that prepares non-porous surfaces such as CMVC moisture vapor barriers, ceramic tiles, metals and well-bonded cutback adhesives, plus surfaces such as wood, plywood and OSB for the application of CUSTOM SLUs. CP-WE is solvent-free and provides outstanding bond strength over difficult substrates.



CP-E – 100% Solids Epoxy Primer

CP-E is a low viscosity, two-component, 100%-solids epoxy primer for preparing surfaces before installing CUSTOM self-leveling underlayments. It is used to prepare concrete and non-porous substrates for underlayment installation. CP-E penetrates the surface and is ideal for crack repair. It creates the strongest possible bond between the substrate and the SLU.

MOISTURE CONTROL

In addition to floor flatness, ASTM F710 requires checking the moisture level and pH of the concrete floor. It is typically recommended that SLUs are applied in conditions where the ambient temperature is between 50° F and 90° F. To ensure the integrity of the floor covering adhesive and primer, the moisture vapor transmission rate from the substrate should not be in excess of manufacturer's recommendation. This is typically less than 5 pounds of water per day per 1000 square feet, based on a standard ASTM F1869 (calcium chloride) test, or 80% R.H., based on ASTM F2170. Excessive moisture vapor emission should be corrected with CUSTOM CMVC prior to the installation of a CUSTOM SLU. CUSTOM's Flooring Installation Systems products have been formulated to consume most of the mix water and will not contribute towards any vapor emission from the floor; their low surface pH meets the requirements of most floor covering materials.



CMVC – Moisture Vapor Control and Alkalinity Barrier

CMVC is a single-coat, high-density, 100% solids epoxy barrier specifically formulated to control concrete moisture vapor emission and alkalinity beneath finished flooring. CMVC can be used on concrete substrates with moisture vapor emission (MVE) up to 100% R.H. (ASTM F2170), 25 lbs MVE (ASTM F1869) and pH 14. Single-coat application effectively controls concrete moisture emission and creates an alkaline barrier between the substrate and adhered flooring materials. CMVC is compatible with most epoxy coatings (including epoxy terrazzo) and reactive urethane and epoxy adhesives for direct bond applications.

SUMMARY

Assure a flat subfloor for the installation of wood, resilient and other floor coverings by installing a self-leveling underlayment. The use of a self-leveling system can provide:

- A cost effective, low prep method compared to traditional floor prep methods
- Finished floors that provide flatness and levelness characteristics far greater than the requirements of ASTM and ACI
- A subsurface finish that provides for a faster, more efficient and higher quality floor covering installation
- Prevention of moisture transmission that can damage flooring
- Protection against cracks, crumbling and substrate bond failure
- The availability of self-leveling products formulated with post consumer recycled content, which provide a floor with a lighter per square foot weight and contribute to LEED certification for the project

The flooring preparation products chosen should be easy to use, high performance formulas that are eligible for a system warranty. CUSTOM Flooring Installation Systems includes advanced primers, moisture control and patching solutions designed to work as a system with low prep self-leveling underlayments. These products comprise a state-of-the-art flooring preparation system to effectively prepare and flatten the substrate for any flooring installation.

ABOUT THE AUTHOR

Steve Taylor is Director of Architecture and Technical Marketing for Custom Building Products and has more than 30 years of experience developing products for the construction industry. Steve is a member of the Tile Council of North America (TCNA) and Materials & Methods Standards Association (MMSA). In these roles, he helps to determine proper tile installation methods and standards. This includes simplifying the tile installation process to save tile professionals time and money.



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