Nearly all "self" leveling underlayments need a little help from a screed to get level. Over a large area, they tend to follow the contour of the floor.

SELF-LEVELING UNDERLAYMENTS

Make old floors new, and new floors better with cementitious toppings.

by Bill Olsen

Smooth, level floors are desirable in any building project. Conversely, rough underlayments with bumps and depressions damage the appearance and function of floor coverings.

Traditional underlayments, such as cellular-lightweight concrete, are expensive because they require labor-intensive screeding and troweling by hand or machine. The development of highly fluid leveling compounds has changed all this and now provides considerable savings in time and labor.

Self-leveling underlayments are easy to use. Most are simply mixed with water, and poured or pumped onto the subfloor. The fluid material spreads evenly and covers the surface with a smooth finish. Although the materials tend to self-level, friction between the leveling compound and the floor will make the material follow the slope of the floor, which will rarely be perfectly horizontal. Over large areas this can be advantageous because less material is required to resurface. A floor that must be perfectly horizontal should be pumped to level chalk lines snapped around the perimeter.

Gypsum-based underlayments, such as Gyp-Crete, shown here on a rehab project, are flexible enough that they can go directly over wood without metal lath. In new multifamily construction, gypsum toppings are used to improve fire and sound resistance of wood floors. Gypsum toppings can range from 3/4- to 3-inches thick.

Though these underlayments are referred to as "self-leveling," not all products perform equally. Some underlayments need to be placed with a spreader or squeegee, while others need no mechanical assistance whatsoever. In general, however, self-leveling compounds do not need troweling.

New or Retrofit

Self-leveling underlayments are specified for many construction projects.

Renovation of existing residential floors is a common use. Usually, the original flooring is removed, revealing uneven subflooring. The underlayment is used to level the floors and provide a substrate for the new finish flooring. Rehabbing old warehouses and manufacturing facilities to new offices is another typical use.

Self-leveling underlayments are also used in corrective work sometimes needed in new concrete construction. The topping covers over and cures problems such as "bird bath" depressions, weathered concrete, or textured defects.

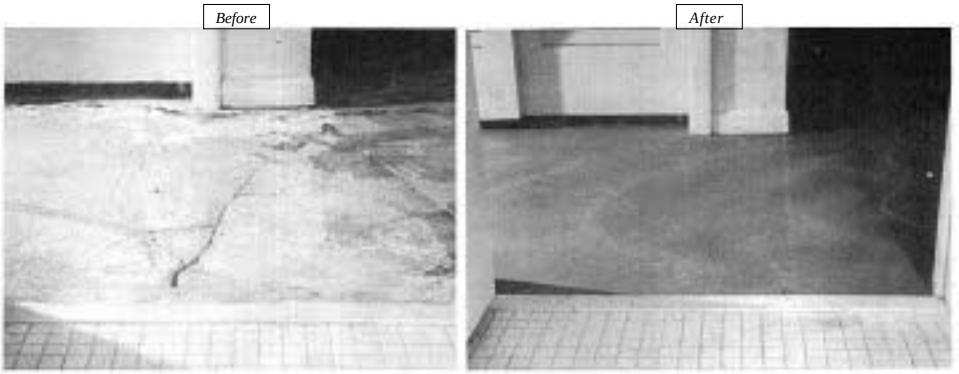
Similarly, the self-leveling underlayments can be used over newly poured concrete floors. In this system, used mostly in Europe, the concrete floor is only screeded and bull floated. Once the building is enclosed, a thin layer of self-leveling underlayment is installed. In the U.S., a similar system is used with some precast plank construction to eliminate seams and overcome problems caused by camber in the planks.

In new multi-family woodframe construction, gypsum underlayments are used to provide increased fire and sound resistance. Cement-based underlayments can also be used over wood floors, but this requires the use of metal lath. The lath is needed because the cement products are harder and more rigid—making them less able to flex with the wood underlayment.

Gypsum-Based

There are two common types of underlayments—gypsum-based and portland-cement based.

The first self-leveling underlayments on the market were gypsum products used mostly over wood floors for leveling, and for fire and sound resistance.



Cement-based toppings are strong and stiff, and can go on as thin as 1/8 inch—making them ideal for slab repair. Over wood substrates, they require metal lath.

Gypsum-based underlayments are generally a minimum of 3/4-inch thick over wood and 1/2-inch thick over concrete. Gypsum-based products do not require metal lath over wood.

Gypsum-based products have lower compressive strengths than cement underlayments, and therefore are more prone to damage from impact or wear. Because of this, gypsum underlayments are usually applied during the last phase of building construction. Unlike portland-cement underlayments, gypsum products are not water-resistant and cannot be used in wet environments.

Gypsum-based products require large mixing and pumping machinery and are only installed by applicators licensed by the manufacturer. These underlayments can be walked on within two hours of application, and flooring can be installed within one week. Gypsum-based underlayments usually cost less than the cement type—averaging 50¢ per square foot for a 3/4-inch topping.

Portland Cement

Another type of self-leveling underlayment is portland-cement based. These products vary regarding set times, strength, and other characteristics. You should consider these variables when choosing a product for a particular job. Cement-based underlayments can be applied as thin as 1/8-inch and are usually restricted to a maximum thickness of 1 inch—unless the compound is extended with aggregate.

Anyone can install cement-based underlayments, as long as the installer follows the manufacturer's instructions. The product is mixed in containers (using 1/2-inch drill with a paddle) or in mixing machines for larger jobs. It is then poured or pumped into place with or without spreading, depending on the product and application. Approximately 3,000 to 5,000 psi is achieved with portland-cement compounds—about three times greater than gypsum-based toppings.

Portland cement-based underlayments are most commonly specified for commercial areas because of their higher impact and abrasion resistance. Some can even serve as the final wear surface. They can be installed during virtually any phase of building construction and range in cost from 40 cents to $1 per square foot for a 1/4-inch thickness.

Portland-cement underlayments can set slowly or quickly depending on the recipe. The fast-set products are useful for areas that must be resurfaced and walked on within hours and need the floor covering applied the next day. The fast-setting underlayments can be walked on in an average of two to four hours. Floor covering can be installed after 24 hours. The delayed-set products can be walked on in one to two days and have flooring applied in one to two weeks. The fast-set products have the highest in-place cost.

The ability of the leveling compound to level and blend in from one batch to another is critical to the smoothness of the finished floor.

Prep Work

The substrate must be well cleaned or the underlayment material will not bond well. All dust, dirt, wax, oil, and various curing and cleaning compounds should be removed. Wood substrates should be tightly nailed down. Any delaminated plywood should be removed. Concrete may need to be scarified to remove laitance, and will usually need to be vacuumed. Fill any holes, lest the material leak through and end up on the floor below.

After cleaning, a primer is usually applied. The primer helps the bond, and on a concrete substrate, it helps prevent air from rising up into the new underlayment—leaving pin holes in the new surface. Within a few hours—depending on the primer—the underlayment is ready to go on.

Installation

Gypsum leveling compounds are usually applied at 3/4-inch thickness and are typically used for large projects. Because of these factors, the most expensive mixing and pumping equipment is necessary. Cement underlayments, however, are easy to apply and do not require licensed applicators or expensive equipment. Therefore, they are ideal for small residential projects. Most manufacturers will recommend the equipment needed to dispense self-leveling compounds.

Once the material is placed onto the subfloor, the underlayments flow to a smooth level surface. Some gypsum and cement materials require the use of a spreader to smooth and level the product while others require nothing but pouring. The ability of the leveling compound to level and blend in from one batch to another is critical to the smoothness of the finished floor. Materials with poor flow qualities can exhibit uneven elevations and ridges. Faulty installation practices can yield similar bad results. When possible, continuous pouring or pumping applications are recommended to assure level and smooth surfaces.

The Finish Flooring

Once the underlayment has set, care must be taken when applying the finish flooring. The material must be thoroughly dried to assure proper bonding to the floor covering. A simple test to determine whether the underlayment has sufficiently cured is to tape a rubber or plastic sheet to the floor, and check for moisture condensation after several hours. When the test indicates no moisture is present, the floor coverings can then be applied.

Precautions

Although self-leveling underlayments are easy to install, temperature and humidity effects can influence their performance. Hot, dry weather can shorten setting and working times. Cold weather application can delay final setting. You can minimize these weather effects, however, with simple precautionary measures. In hot weather, store the dry material in shaded areas and use cold water. Conversely, in cold temperatures, use warm water.

Sunlight and wind can also affect the hardening rate of the materials and increase drying shrinkage and cracking. To minimize these effects, close windows prior to application, and cover with plastic any openings that cause extreme drafts. Shield large windows and other openings that allow in direct sunlight.

Finally, it's critical to use the right amount of water to mix the underlayments. Too much mixing water can cause extreme settling of sand particles and excessive bleeding. This can lead to surface dusting (which would impair the bond to the flooring), cracking, and possible delamination of the material from the substrate. If you follow the manufacturer's mixing and application instructions, however, and take the necessary precautions, self-leveling materials will provide a smooth, durable underlayment. ■

Bill Olsen is technical manager of Quikrete, Atlanta, Ga., which manufactures packaged cement products for new construction and building repair.

Product Information:

Cement-based products

Ardex, Inc.
630 Stoops Ferry Road
Pittsburgh, PA 15108
412/264-4240

Quikrete
1790 Century Circle, N.E.
Atlanta, GA 30345
404/634-9100

Thoro System Products
7800 N.W. 38th St.
Miami, FL 33166
305/592-2081

Gypsum-based products

Gyp-Crete Corp.
P.O. Box 253
Hamel, MN 55340
612/478-6072

Hacker Industries
15111 East Whittier Blvd. Suite 475
Whittier, CA 90603
213/698-0541

For small jobs, cement-based toppings such as Quikrete or Ardex can be mixed on site with a 1/2-inch drill and paddle (left) and poured into place (right). Maximum thickness is 1 inch, unless aggregate is added.