



USG Presents

GYP SUM CONCRETE FLOOR UNDERLAYMENTS ARE STRONGER THAN EVER

by: Brendan Deely
General Manager
USG Corporation Industrial Products

Thanks to their quick, cost-effective installation, light weight and excellent performance characteristics, poured gypsum floor underlayments have emerged as a leading choice for a wide range of commercial, institutional, residential and renovation applications.

and application requirements. These high-strength products withstand heavy construction traffic without powdering, dusting, chipping or cracking. They also offer improved flowability, which makes them almost completely self-leveling, reducing application time and finished floor preparation time.

WIDE-RANGING APPLICATIONS

In multifamily and single-family construction, gypsum concrete underlayments provide needed sound control and fire resistance in a lightweight formulation. They also provide an ideal thermal mass for radiant heat applications, ensuring uniform heat distribution throughout the entire floor surface.

In new commercial construction, gypsum concrete underlayments are typically applied over structural concrete or precast concrete planks to create a smooth, monolithic floor surface that delivers superior strength, sound control and fire resistance. The product sets quickly, allowing foot traffic within two hours and continued construction activities the next day.

Gypsum concrete underlayments are also ideal

Use the learning objectives below to focus your study as you read **GYP SUM CONCRETE FLOOR UNDERLAYMENTS ARE STRONGER THAN EVER**. To earn one AIA/CES Learning Unit including one hour of health safety credit, answer the questions on page 179, check the answers on page 242 and follow the reporting instructions on page 244 or, use the Continuing Education self report form located at www.architecturalrecord.com.

LEARNING OBJECTIVES:

- Describe the applications where gypsum concrete underlayment can be used.
- List the benefits of poured gypsum concrete underlayment.
- Specify a poured gypsum installation.

Although the products have been used for more than 50 years, only recently have they begun to realize their full potential. Leading manufacturers now offer complete specification and application packages, which include networks of trained applicators, strict quality control procedures and full product lines designed to deliver optimal performance for specific job requirements.

Gypsum concrete underlayments are currently a dominant choice in multifamily construction, and their use is escalating rapidly in commercial markets. The growth in commercial applications is driven largely by recent increases in compressive strength performance. Minimum gypsum concrete underlayment compressive strength standards, which historically were set at 1,000 to 1,500 psi, have now nearly doubled to 2,500 psi.

While not all gypsum concrete underlayment manufacturers and applicators offer minimum-strength 2,500-psi products, those that do provide architects with a practical, cost-efficient flooring solution that reliably meets a wide range of performance



The existing concrete floors in this renovated 26-story office building in downtown Philadelphia were cracked and uneven.



Approximately 525,000 sq. ft. of gypsum concrete underlayment (shown freshly poured) was applied over the existing floors throughout the building.



The new gypsum concrete underlayment provides a smooth, even surface, ready for floor finish material installation. The entire application was completed for less than half the cost of using a portland cement-based product.

leveling or resurfacing materials in commercial renovation. They apply from featheredge to 3-inch thicknesses in a single application. Thicker applications can be achieved through multiple lifts (multiple layers) or by applying the product over a high-density substrate panel.

Gypsum concrete underlayments bond strongly to existing concrete and other floor surfaces, and require minimal surface preparation. Unlike portland cement products, which often require “shot blasting” (an expensive and time-consuming process that involves shooting small metal pellets into existing concrete to roughen the surface), poured gypsum flooring simply requires cleaning and priming. This makes gypsum concrete underlayment the quickest and most cost-efficient option for transforming worn, cracked and uneven floors into smooth, high-strength surfaces ready for the application of finish materials.

GYPSUM UNDERLAYMENT ADVANTAGES

Gypsum concrete underlayments offer a wide range of performance features and application benefits. They accept virtually any type of floor covering, including vinyl composition tile, ceramic tile, wood laminate, glued-down hardwood and carpeting. Because they can be applied thinner than portland cement products, gypsum concrete underlayments are lightweight, making them ideal for wood-framed buildings where concrete-based alternatives may require structural alterations. A 3/4-inch-thick gypsum concrete underlayment floor weighs approximately 6.25 to 7.5 pounds per square foot and has a dry density of only about 115 to 125 pounds per cubic foot.

Gypsum concrete underlayment assemblies offer UL-certified fire ratings of up to two hours. The floor’s fire resistance is due to the fact that gypsum is naturally fire resistant. When exposed to flame, it releases moisture in the form of steam, thereby slowing heat transmission.

Sound control is another key benefit of these flooring systems. The excellent acoustical properties of a poured gypsum floor result from the product’s mass, combined with the fact that the underlayment does not shrink as it sets. Unlike portland cement products, which shrink, gypsum concrete underlayments seek and fill cracks and joints, a major source of sound leakage between floors. Gypsum concrete underlayment floor assemblies deliver STC (Sound Transmission Class) ratings in the high 60s and IIC (Impact Insulation Class) ratings of 55 and higher, even with hard-surface floor coverings.

Gypsum concrete underlayments also install quickly and cost-effectively. The product consists of a formulated gypsum cement mixed with sand and water. The resulting slurry is pumped and poured in place, then “screeded” to a smooth, monolithic surface. Depending on the floor layout, up to 30,000 sq. ft. of gypsum concrete underlayment (3/4 inch thick) can be applied in a single day.

A 3/4-inch poured gypsum floor is usually fully dry – and ready for floor finish application – within five to seven days, when properly ventilated and temperatures are

maintained above 50 degrees F. This compares favorably with concrete, which never stops curing and usually requires at least 30 days before floor finish materials can be applied.

SPECIFICATION ISSUES

When specifying gypsum concrete underlayments, architects must match product performance with project requirements. Compressive strength is a key consideration. Expected psi strength requirements should be spelled out clearly as part of the underlayment specification. However, when creating the specification, remember that gypsum concrete underlayment strength is impacted by a number of factors, including the quality of raw materials used, on-site design mix and application techniques. To ensure against any of these variables negatively impacting floor performance, it is advisable to “overspecify” a gypsum concrete underlayment floor, rather than select a product that just meets minimum strength requirements. Higher-strength products deliver a minimum 2,500 psi and provide a cost-effective means of ensuring that minimum performance requirements are met or exceeded. These higher-strength formulations require no additional labor or time to apply.

Products in the 2,000 to 2,500 psi range are recommended for multifamily and single-family construction. For light-commercial applications, specially formulated products delivering 3,000 to 3,500 psi are recommended. Generally speaking, 3,000 to 3,500 psi is suitable for hotels, motels, retail stores, offices and similar applications. The higher strengths these products deliver ensures that the underlayment will stand up to heavier trade construction activities typically associated with

(continued on p. 178)



Due to its light weight and excellent sound control properties, gypsum concrete underlayment is the leading underlayment choice for multifamily construction.

EVEN MOUNTAIN CLIMBERS APPRECIATE SMOOTH FLOORS

Erehwon Mountain Outfitters specializes in providing customers with equipment and gear to deal with rough outdoor terrain. But when the company decided to open a new retail location in an existing Orland Park, Ill., mall, it found itself facing a surface problem that couldn't be solved with harnesses, clips and climbing boots.

The 18,500-sq.-ft. retail space, which had been vacant for a number of years, had a concrete and terrazzo floor that was uneven and cracked. A complete resurfacing was required. The new floor surface would be covered with two types of carpeting and hardwood flooring, and would serve as an exposed wearing surface (protected by a sealer) on store walkway areas.

General contractor and project designer Graystar Corporation called in Barrier Corp., a Morton Grove, Ill.-based specialist in floor leveling, underlayments, toppings and coatings, to assess the situation.

Barrier Corp. president Paul Helmer offered one solution – LEVELROCK™ 3500 Brand Floor Underlayment, a poured gypsum concrete underlayment from USG Corporation Industrial Products.

“It was the only product that made sense for the job,” said Helmer. “It bonds directly to concrete and terrazzo with minimal preparation. It also offers the flowability to enable us to go from featheredge to 3 inches thick to completely level the surface. And finally, it delivers the compressive strength (a minimum of 3,500 psi) to stand up as a wearing surface in the walkway areas.”

To accomplish the job, Barrier crews cleaned and spray-primed the existing floor surface, and caulked all perimeter joints. They determined the existing floor elevations using a laser level. Based on the laser results, the floor was “pinned” with elevation pins to mark the exact thickness that the gypsum underlayment needed to be poured to achieve a level surface.

The underlayment was then mixed and pumped into the building, where it was poured over the surface and screeded to the thickness of the elevation pins.

The end result – an exceptionally smooth, high-strength floor surface – ensures that Erehwon's customers won't be encountering flooring peaks or valleys as they gear up for the next climb.



Skip Pastore, site manager for Barrier Corp., reviews construction plans following application of the gypsum concrete underlayment floor. The floor is ready for continued trade traffic within 24 hours.

ANATOMY OF A GYPSUM UNDERLAYMENT APPLICATION

A step-by-step look at the application of gypsum concrete underlayment during renovation of a new retail location for Erehwon Mountain Outfitters in Orland Park, Illinois.



The existing concrete and terrazzo floors in the 18,500-sq.-ft. retail location space were cracked and uneven.



Barrier Corp. flooring applicator crews used a laser to measure existing floor elevations.



Based on the laser results, elevation pins were attached to the floor to indicate how thick the underlayment should be applied.



Bags of gypsum concrete underlayment were mixed with sand and water to create a slurry.

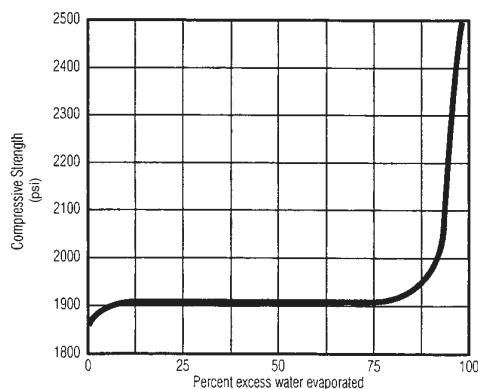


The gypsum underlayment mix was pumped via hoses and poured directly onto the floor.



The underlayment was screeded to the thickness of the elevation pins to achieve a smooth, even surface.

Gypsum Concrete Floor Underlayment The Effects of Water Evaporation on Compressive Strength



The compressive strength of gypsum concrete underlayment increases only slightly until 93 percent of the moisture has been removed from the floor.

commercial construction and, of course, heavier use after the project is completed. Strengths of 4,500 psi and higher are available, and should be specified for heavy-use commercial and institutional applications. This especially holds true when specifying the underlayment for floor leveling or repair applications over concrete substrates in heavy traffic areas.

No matter what the application, remember that performance and application are impacted by the on-site design mix. High-performance gypsum concrete underlayments utilize low-water-demand formulations. When these products are overwatered, the floor strength is significantly diminished, resulting in a loss of compressive strength.

Overwatering also frequently produces a chalky surface film that negatively impacts the adhesion of glued-down floor finishes.

Another consideration is the quantity and quality of sand that is added to the mix. Oversanding, like overwatering, diminishes the strength of the floor. Likewise, the type of sand used impacts performance. A clean, sharp, properly graded sand aggregate (per ASTM C33), commonly referred to as plaster or masonry sand, is recommended for most applications.

Yet another consideration is drying time. Gypsum underlayments do not cure like portland cement, but hydrate (set) instead. After the initial chemical set, gypsum concrete underlayments continue to gain strength as the remaining free

moisture evaporates. (See chart.) The majority of the free water in the floor must be removed before the strength of the underlayment is fully realized.

Architects can effectively neutralize all these design mix variables through two strategies: specifying higher-strength products and insisting on using only manufacturer-trained applicators. Licensed applicators understand the critical importance that sand and water have on the design mix. They will conduct on-site “slump” tests to measure design mix and product flow. Top applicators will also provide compressive strength reports. The reports, made from on-site cube samples, are the only way to determine actual performance for a specific floor application.

Other key specification criteria for gypsum concrete underlayments include:

- The building interior must be enclosed before, during and after installation, and a temperature of at least 50 degrees F must be maintained. When properly ventilated, a gypsum cement underlayment will usually attain full strength within five to seven days.
- The subfloor must be clean, dry and structurally sound.
- Apply a manufacturer-approved primer or bonding agent just prior to pouring the underlayment.
- Gypsum concrete underlayment should be applied a minimum 3/4 inch thick over wood framing and typically 3/8 to 1/2 inch thick over plank or poured-in-place concrete.
- After the floor has dried, it should be sealed using a manufacturer-approved sealer to minimize dusting when glued-down floor finishes will be applied.

A RELIABLE SOLUTION

Gypsum concrete underlayments have come a long way in recent years. They now give architects reliable and practical solutions for a variety of flooring needs. The products are used and recommended by many of the largest and best flooring and underlayment contractors in the business. And most importantly, gypsum concrete underlayments themselves are stronger than ever.

Today’s top-of-the-line gypsum concrete underlayments offer almost double the compressive strength that products typically delivered 10 to 15 years ago. As a result, architects are now able to specify poured gypsum underlayments with complete confidence ... and take advantage of the fire resistance, acoustical performance and application versatility that these products provide.

CHOICES FOR RESIDENTIAL FLOOR UNDERLAYMENTS

While gypsum concrete underlayments offer attractive performance upgrades for residential construction, wood-based panel underlayments, such as plywood, OSB (oriented strand board) and lauan remain the dominant choice for single-family construction.

However, there is one residential application where gypsum underlayments are experiencing rapid growth. Specially formulated products, such as USG’s LEVELROCK Brand floor underlayment-RH (Radiant Heat), provide excellent thermal mass for radiant heat floors, ensuring even distribution of heat over the entire floor.

For more conventional single-family floor applications, underlayment selection is generally based on the type of floor finish to be used. For carpeting, OSB is suitable from a

performance standpoint. However, OSB is not a viable option under vinyl, as the rough surface of the panel may eventually show through the floor finish. To remedy this situation, a 1/4-inch-thick board of sanded lauan is often installed over the OSB substrate before laying down the vinyl.

A recently introduced gypsum/fiber underlayment panel offers a practical, labor-saving alternative. FIBEROCK® Brand Underlayment-AQUA-TOUGH™ from USG delivers up to 60 percent more indentation resistance than traditional products, while ensuring a smooth, flat surface with no bumps or ridges to telegraph through. Additionally, the panel contains no resins, adhesives, solvents or dyes that can stain floor-covering materials.



For residential construction, FIBEROCK Brand Underlayment-AQUA-TOUGH™ offers a high-performance alternative to wood-based underlayments. The gypsum/fiber product is up to 60 percent more indentation resistant than traditional panels.

LEARNING OBJECTIVES

- Describe the applications where gypsum concrete underlayment can be used.
- List the benefits of poured gypsum concrete underlayment.
- Specify a poured gypsum installation.

INSTRUCTIONS:

Refer to the learning objectives above. Complete the questions below. Then turn to page 242 and check your answers. Fill out the self report form on page 244 and submit it or use the Continuing Education self report form on *Record's* web site - www.architecturalrecord.com - to receive one AIA/CES Learning Unit including one hour of health safety welfare credit.

QUESTIONS:

1. What are the benefits of using gypsum concrete underlayments?

2. What are the key factors to bear in mind when specifying gypsum concrete underlayments?

3. Why is the gypsum concrete underlayment design mix an important consideration?

4. Why is gypsum concrete underlayment a good choice for multifamily housing?

5. How do gypsum concrete underlayments compare to portland cement-based alternatives?

ABOUT USG

USG is a Fortune 500 company with subsidiaries that are market leaders in their key product groups: gypsum wallboard, joint compound and related gypsum products; cement board; gypsum fiber panels; ceiling tile and grid; and building products distribution.

LEVELROCK™ Brand Floor Underlayment, recently introduced by USG Corporation Industrial Products, is establishing new performance standards for gypsum concrete underlayments. LEVELROCK Brand products offer a minimum compressive strength of 2,500 psi, which is nearly double the compressive strength of competing entry level gypsum concrete products. Compressive strengths as high as 5,500 psi are available.

LEVELROCK Brand products offer ideal solutions for commercial, multifamily and single-family new construction and renovation. The underlayments are installed by a network of trained contractors who work closely with on-site USG quality control teams.

For more information on LEVELROCK Brand Floor Underlayment, write USG Corporation Industrial Products, P.O. Box 806278, Chicago, IL 60680-4124, call USG at 800-487-4431 or visit the USG Corporation Industrial Products Web site at www.gypsumsolutions.com.

For information about other products from USG, visit the USG Web site at www.usg.com.



1-800-USG-4YOU
www.usg.com
Email: usg4you@usg.com

Circle 66 on inquiry card