

POURED GYPSUM FLOORS IN MULTI-FAMILY STRUCTURES

USG REHABILITATION GUIDELINES FOR DAMAGED GYPSUM UNDERLAYMENTS

The use of poured gypsum floors began in the early 1970s as a substitute for light-weight concrete. The need for either gypsum or light-weight concrete is based on building codes that require all multi-family wood-frame buildings provide a one-hour fire rating. Both gypsum and light-weight concrete products act as a heat sink that in turn delivers a one- or two-hour rated assembly.

Poured gypsum concrete is beneficial for a few reasons:

1. Reduction in thickness. Poured gypsum can be poured at a minimum of $\frac{3}{4}$ in. (19 mm) instead of the 1-1/2 in. (38 mm) that light-weight concrete requires.
2. Poured gypsum sets and develops strength very quickly which can allow trade traffic to resume in as little as one day.

All multi-family structures must be designed in accordance with the requirements of Underwriters Laboratory (UL) for fire-resistance. UL has created a library of floor-ceiling assembly specifications that are used by architects and code bodies to identify the exact methodology needed to construct the floor-ceiling assembly. Therefore, it is imperative that any repair/rehabilitation performed on a multi-family dwelling conform to UL standards. This means that the minimum thickness of the poured gypsum underlayment must be maintained at no less than $\frac{3}{4}$ in. (19 mm) using a UL Classified product. There are no maximum thickness limits specified by UL.

Gypsum floors are installed by adding water and sand to a specially formulated gypsum binder powder at the jobsite. Care and control must be taken by the gypsum underlayment contractor to ensure that the gypsum manufacturers' recommended mixing instructions are followed.

Unfortunately, this does not always happen and the contractor may have added too much sand or too much water or a combination of both. When this happens, the resultant gypsum underlayment will exhibit specific defects such as a soft and chalky surface, cracks and low strength (both tensile and compressive).

Until recently, most multi-family dwellings used carpet and pad as the floor covering and as a result, gypsum floors that were not carefully installed "hid" many of the defects explained above. In recent years however, flooring choices have moved to 'hard surface' products such as ceramic tile, vinyl composition tile (VCT), luxury vinyl plank (LVP), engineered wood and laminated flooring products for common areas such as living and dining rooms, kitchens and bathrooms. It is still fairly typical that bedrooms use carpet and pad.

DAMAGED GYPSUM FLOORS

During the renovation of multi-family complexes, the removal of old carpet and pad products will expose the gypsum underlayment. In many cases, the surface will exhibit the defects described above. The problem is simple – the old gypsum underlayment is not suitable to support the 'hard surface' products being used today. In addition, damaged gypsum floors bring with it the following issues:

1. The soft and chalky surface is not a good host for the use of adhesives or mastics. A soft and chalky surface will pull water out from the adhesive or mastic which will render the adhesive or mastic useless as there will be no adhesion between the adhesive and the gypsum underlayment.
2. Any cracks or surface blemishes will transfer through to the surface of flexible products like VCT and LVP after the adhesive has completely dried.
3. Floors will lack the durability needed to sustain foot traffic (especially high heels) or point loads from furniture and appliances because the old gypsum underlayment lacks enough compressive strength to withstand the load.

GYPSUM FLOOR REPAIR

Below are remediation techniques for the most common rehabilitation projects. We highly recommend that circumstances not presented here be discussed with a USG Technical Representative for appropriate actions.

There are three key components to properly rehabilitating damaged poured gypsum floors:

- Inspect
- Clean, Core & Consolidate
- Resurface

INSPECT

Once the gypsum underlayment has been exposed by the removal of existing floor covering (see *Limitations* #5, pg. 4), a thorough inspection must take place. Typical characteristics of a floor needing rehabilitation include: surface softness, chalkiness, cracks, surface deformation or irregularities and loose gypsum that is no longer secured to the plywood or OSB subfloor. It is also very important to take note of floor areas that deflect under load. Deflection may indicate that the original structure used plywood or OSB less than ¾ in. (19 mm) (nominal), tongue-and-groove (T&G) plywood or OSB, or there is a structural issue that must be investigated further.

CLEAN & CORE

Remove all loose gypsum. Make sure there are no areas of gypsum that are no longer adhered to the wood subfloor. Using a stiff bristle broom, sweep the old gypsum surface. This will help to remove some of the old gypsum “scale” from the surface. It is highly recommended that a HEPA vacuum be used during and after the broom cleaning to remove as much dust as possible.

Note that the gypsum underlayment must be at least ¾ in. (19 mm) over the subfloor. To determine the gypsum underlayment depth, core the floor by drilling through the gypsum until the wood subfloor is detected. If after cleaning and coring the surface, areas are under ¾ in. (19 mm), a UL Classified gypsum-based product must be used. **Important** – using a non-UL Classified product will violate building code requirements. All USG Levelrock® Brand and USG Durock™ Brand gypsum-based products are UL Classified.

If the existing gypsum substrate is clean, sound and consolidated and requires only a new smooth surface, then USG Durock™ Tuf-Skim™ Floor Patch may be applied directly onto the surface without the application of a sealer (see illustration below). See *USG Durock™ Tuf-Skim™ Floor Patch Submittal* (CB832) for further instructions. Once dry, it is recommended that the surface be primed with USG Durock™ Primer-Sealer prior to floor-covering application.

CONSOLIDATE

If the surface is soft, chalky and/or a low-strength gypsum underlayment, then a liberal coating of USG Durock™ Fusion™ Primer to the entire gypsum surface – including any exposed plywood or OSB – is required. USG Durock™ Fusion Primer is a 3-part low viscosity sealer developed to effectively seal and consolidate the surface of soft, chalky and low strength gypsum underlayment. The primer soaks into the gypsum mass and once cured, provides a sealed surface as well as strengthens the gypsum where it has penetrated. See *USG Durock™ Fusion™ Primer Submittal* (CB836) for further instructions.

After USG Durock™ Fusion Primer has cured, the gypsum underlayment is ready for correction. This is where decisions have to be made based on the flooring covering to be installed, the condition of the poured gypsum underlayment and whether a trowelable or a pourable solution is more advantageous. When determining the amount and type of resurfacing product to use, also take into account the height of the desired finish flooring and any sound attenuation product that may be used.

RESURFACE—TROWELABLE SOLUTION

If the sealed, cleaned, sound and consolidated gypsum underlayment requires only shallow repairs and a new flat surface, USG Durock™ Tuf-Skim Floor Patch can be applied directly to the sealed surface (see chart on pg. 3).

RESURFACE—POURABLE SOLUTION

If the sealed, cleaned, sound and consolidated gypsum underlayment requires deep repairs or there is a need to cover the entire surface with a self-leveling gypsum capping product, the surface needs to first be primed using USG Durock™ Primer-Sealer. There are a few choices available for deep repairs and/or resurfacing and are dependent on various conditions such as cost and time constraints.

A value-added resurfacing product such as USG Durock™ Multi-Use Self-Leveling Underlayment can be applied at a minimum thickness of ½ in. (13 mm) over the existing gypsum (minimum ¾ in. (19 mm) thickness over the subfloor). USG Durock™ Multi-Use Self-Leveling Underlayment achieves a compressive strength of 4,100 psi (28.3 MPa), making it a perfect choice for all commercial flooring products. USG Durock™ Multi-Use Self-Leveling Underlayment can be walked on in approximately two hours, but will require time to dry completely prior to application of floor coverings. Drying times will vary based on the total depth of repair and the ambient condition of the space.

To hasten the drying time of the underlayment after set, place a box fan near, but not directly on, the repair(s) to promote air circulation. It will take 3-5 days to dry ½ in. (13 mm) of USG Durock™

GYPSUM FLOOR REPAIR CONT.
RESURFACE—POURABLE SOLUTION CONT.

Multi-Use Self-Leveling Underlayment, assuming a fan is used in ambient conditions where the air temperature is above 60 °F (15 °C) and the RH is below 50%. Refer to the *USG Durock™ Brand Multi-Use Self-Leveling Underlayment Submittal* (CB519) for more information.

If a fast-track solution is needed, then USG Durock™ Quik-Top™ Self-Leveling Underlayment can be used (see chart below). USG Durock™ Quik-Top underlayments are self-leveling and 'self-drying' with high compressive strengths (min. 7,500 psi (51.7 MPa)) and can be walked on two hours after installation. Floor coverings can typically be installed after 15 hours when USG Durock™ Quik-Top Self-Leveling Underlayments are applied at a 1 in. (25 mm) thickness or less. Drying time will vary depending on underlayment thickness and ambient climate conditions.

USG Durock™ Quik-Top Self-Leveling Underlayments can be poured from a featheredge up to a 3 in. (76 mm) depth. Refer to *USG Durock™ Brand Quik-Top White and Quik-Top Gray Self-Leveling Underlayment Submittal* (CB515) at usgperformanceflooring.com for more information.

PRODUCT	GYPSUM FLOOR REPAIR
CONSOLIDATE	
USG Durock™ Fusion™ Primer	If the surface is soft, chalky and/or a low-strength gypsum underlayment, then a liberal coating of USG Durock™ Fusion Primer over the entire gypsum surface – including any exposed plywood or OSB – is required. The primer soaks into the gypsum mass and once cured, provides a sealed surface as well as strengthens the gypsum where it has penetrated.
RESURFACE - TROWELABLE SOLUTION	
USG Durock™ Tuf-Skim™ Floor Patch	<ol style="list-style-type: none">1. Prepare existing compromised gypsum underlayment by removing adhesive and loose debris.2. Apply USG Durock™ Fusion Primer¹.3. Trowel in USG Durock™ Tuf-Skim Floor Patch.4. See <i>Surface Sealing</i> below.5. Apply floor-covering adhesive.6. Apply new floor covering.
RESURFACE - POURABLE SOLUTION	
USG Durock™ Multi-Use Self-Leveling Underlayment	<ol style="list-style-type: none">1. Prepare existing compromised gypsum underlayment by removing adhesive and loose debris.2. Apply USG Durock™ Fusion Primer¹.3. Apply USG Durock™ Primer-Sealer.4. Pour a recommended USG Durock™ Self-Leveling Underlayment.5. See <i>Surface Sealing</i> below.6. Apply floor-covering adhesive.7. Apply new floor covering.
USG Durock™ Quik-Top™ White & Gray Self-Leveling Underlayment	
SURFACE SEALING	
USG Durock™ Primer-Sealer	<p>USG Durock™ Multi-Use Self-Leveling Underlayment must be sealed with USG Durock™ Primer-Sealer prior to floor covering adhesive application. USG Durock™ Tuf-Skim Floor Patch and USG Durock™ Quik-Top Underlayments may not require priming. Follow floor-covering manufacturers' recommendations for surface-sealing requirements. If the floor-covering or adhesive manufacturer requirements are more stringent, their requirements take precedence.</p> <p>For tile applications using Portland cement-based mortars over USG Durock™ Tuf-Skim Floor Patch, USG Durock™ Multi-Use Self-Leveling Underlayment or USG Durock™ Quik-Top Self-Leveling Underlayment, an application of USG Durock™ Primer-Sealer is required.</p>

Note

1. Allow USG Durock™ Fusion Primer to cure for a minimum of 8 hours.

FLOOR-COVERING INSTALLATION

USG recommends priming the surface of USG Durock™ Multi-Use Self-Leveling Underlayment prior to floor-covering adhesive application. Follow floor-covering manufacturers' recommendations for surface-sealing requirements. If the floor-covering or adhesive manufacturer requirements are more stringent, their requirements take precedence.

For tile applications using cement-based mortars over USG Durock™ Tuf-Skim Floor Patch, Multi-Use Self-Leveling Underlayment or Quik-Top Self-Leveling Underlayment, the use of USG Durock™ Primer-Sealer is required.

NOTES/LIMITATIONS

1. Do not use in exterior applications.
2. Do not install where continuous exposure to moisture is a possibility.
3. Do not install over dimensionally unstable, improperly prepared subfloors.
4. Do not use oil-based sweeping compounds to clean and prepare the old gypsum underlayment. Use of such sweeping compounds leaves an oil film on the surface of the underlayment. Use a HEPA vacuum or a dry broom to remove the dust and debris.
5. If the old gypsum underlayment was previously covered with a flooring product that was glued or otherwise adhered to the surface of the gypsum underlayment, do not use adhesive-removing chemicals or solvents to eliminate contaminants from the old gypsum underlayment. Use of such chemicals can transport oil, grease, and other contaminants further into the gypsum underlayment. These chemicals can migrate back to the surface at a later time to interfere with the floor-covering adhesives, thus compromising the bond performance. Mechanically removing the organic adhesives, asphalt, coal-tar based adhesives and other oil-based contaminants is the sole recommended method of preparing the gypsum underlayment. Use mechanical removal methods such as scraping, scarifying or sanding to clean and prepare the old gypsum underlayment contaminated with adhesives, asphalt or oil. Do not apply over subfloors containing asbestos. Do not mechanically remove organic adhesives, asphalt, coal-tar based adhesives or other materials containing asbestos.
6. Do not overwater or over mix the trowelable or pourable USG Durock™ products.
7. Do not add any non-approved chemical additives or polymers to the USG Durock™ products.
8. Do not mix with other products or self-leveling materials.
9. Structure shall be designed so that deflection does not exceed L/240 from combined dead and live loads and L/360 from live loads. Certain floor coverings such as marble, limestone, travertine and wood may have more restrictive deflection limits. Consult the appropriate floor-covering manufacturer.
10. All subfloors must be structurally sound, stable and solid. Please be advised that old gypsum underlayments may have compressive strengths below 1,000 psi (6.9 MPa). Most manufacturers' resilient vinyl tile or vinyl plank compressive strength requirements specify a minimum of least 3,000 psi (20.7 MPa) – some manufacturers may require compressive strengths exceeding 3,500 psi (24.1 MPa). It is very difficult to measure the existing compressive strength of a gypsum subfloor without the use of an instrument such as a Windsor Pin Test System, manufactured by James Instruments (ndtjames.com). Special consideration must be used when evaluating a low compressive strength underlayment. A thin coating of a troweled or poured repair product may not be able to withstand heavy loads, especially point and rolling loads when the repair product thickness is less than ½ in. (13 mm). For a pourable solution that requires a thickness of ½ in. (13 mm) or less, USG fiber-reinforced underlayments are recommended. A judgment call must be made by the repair contractor as to whether the existing gypsum underlayment is strong enough to support the repair. Note - USG is not liable for failures resulting from pre-existing materials.

PRODUCT INFORMATION

See usgperformanceflooring.com for the most up-to-date product information.

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SAFETY FIRST!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read applicable SDSs and literature before specification and installation.

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