

TECHNICAL BULLETIN

SUBFLOOR PREPARATION FOR LEVELLERS & TOPPING, FLOORING ADHESIVES, WATERPROOF MEMBRANES & CERAMIC TILES

INTRODUCTION & SCOPE

The key to success when installing DUNLOP products, is to achieve a good bond between the base surface (called the substrate) and the leveller or topping, the flooring adhesives, waterproof membrane and tile adhesives as well. Proper preparation of the surface is the most important factor in achieving this bond.

Whatever topping or leveller is used to level, smooth, or repair a substrate's surface, it will only be as strong as the surface to which it is bonded. The same applies to other materials applied to the surface such as flooring adhesives, membranes or tile adhesives. The surface, therefore, must be sound, clean and free of oil, grease, wax, dirt, asphalt, curing compounds, latex and gypsum compounds, dust, paint or any contaminant which might act as a bond breaker (deliberately installed bond breakers are intended to prevent adhesion to the surface).

The methods required to properly prepare the subfloor vary with the type of substrate, its surface and condition. Several methods of preparing a substrate may be available, and some methods are used because they are cheaper, easier or faster, depending upon the size of the job.

However, taking short cuts in proper substrate preparation can be an invitation to installation problems and failures.

This brochure is by no-means an all-inclusive guide, but is intended to give recommendations for many common substrate conditions and the proper preparation.

For trade users, we recommend that they refer to the current Australian Standards for the area they are working in for more details. For vinyl and linoleum floor coverings refer to AS1884-2012, for carpet AS/NZ2455-2007, waterproofing AS3740-2010/12 and tiling AS3958-2007.

CONCRETE

Concrete floors must be solid and sound. Over-watered, frozen, rain damaged or otherwise weak concrete must be removed mechanically to provide a sound base. In addition, concrete should be evaluated for moisture and be free of oil, grease, wax, dirt, asphalt, curing compounds, latex and gypsum compounds, dust, paint or any contaminant which might act as a bond breaker.

New Concrete.

There are two important reasons to avoid the installation of DUNLOP products over concrete, which is less than 28 days old:

Drying and shrinkage cracks may occur as the concrete cures. Installing flooring DUNLOP products such ARDIT LEVELLER over "green" concrete will result in the cracks telegraphing through the leveller as they develop in the concrete. To avoid this, allow the concrete to cure a minimum of 28 days and repair any cracks before proceeding with the installation of the DUNLOP material.

NOTE: Some selected tile adhesives can be applied after seven days.

DUNLOP primers must be installed over a completely dry surface to assure proper bonding. Under many conditions, concrete may not be free of excess moisture before 28 days.

Caution:

DUNLOP primers, levellers, toppings and adhesives are not vapour barriers and will allow free passage of moisture in the form of water vapour.

Power-trowelled (burnished) concrete/Hi-strength concrete greater than 35 MPa.

Burnished concrete finishes, Hi-strength concrete greater than 35 MPa (compressive strength) including post tensioned, suspended concrete, off-form concrete etc., represent a finish that is extremely dense (non-porous)

and with no surface texture or profile. Adhesion to these concrete finishes without mechanical preparation is questionable. It is recommended to remove the glazed/dense surface finish to provide a roughened open porous matrix of the concrete.

Curing Compounds.

Curing compounds are used on new concrete to help the concrete cure by stopping the loss of water to the air in the first few days. The vast majority of curing compounds are *bond breakers*, which will inhibit the ability of a leveller or topping, flooring adhesive, membrane or tile adhesive to bond to the concrete substrate. They can also affect the drying curing times.

Regardless of the type of curing compound used, including dissipating curing compounds (which break down over time or exposure to sunlight), these materials must be completely removed prior to proceeding with the installation of the flooring system.

Sealers and coatings.

Although sealers may not contain bond-breaking oils, waxes, resins or rubbers, a good bond cannot be guaranteed and complete removal is required. Acrylic sealers can oxidize and flake off from exposure to ultraviolet light and air, whilst other sealers containing urethanes or silanes and siliconates can act a bond breakers and have to be removed. Primers may not work over these materials.

Laitance, Weak Surface Areas, Frozen, Frost-Damaged or Overworked Concrete.

These surfaces are unsuitable for flooring systems and any signs of spalling, scaling, delamination, crumbling or laitance must be removed down to solid, clean concrete. A hammer or heavy instrument should be used to sound out weak, hollow and unsound material.

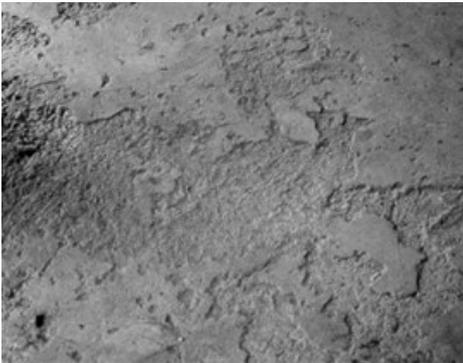
Contaminated Concrete.

All oil, grease, wax, dirt, chemicals, asphalt, latex and gypsum compounds,

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dust, paint, or any contaminant which might act as a bond breaker must be completely removed before installing a flooring system.

Failure to remove these contaminants is the most common cause of flooring materials de-bonding from the sub-surface.



The concrete surface has a layer of laitance which needs to be removed back to the sound material underneath.

Oil and Grease.

Cementitious flooring materials, tiles adhesives and membranes will not bond to a concrete substrate, which is contaminated with oil or grease. Trace amounts of oil will prevent a good bond and result in the topping de-bonding.

Chemical methods may be successful at removing oil if it has not penetrated too deeply, however the material used to



Badly contaminated concrete

remove the oil or grease may itself leave a contaminant behind. To remove any doubt, the substrate should be mechanically cleaned down to sound, solid, uncontaminated concrete.

Asphalt and Tar-Based Residues.

Although quite different in composition, both asphalt and coal tar-based residues on concrete substrates pose their own threats to the performance of the installed system. All asphalt and coal tar-based materials found on concrete substrates must be completely removed by mechanical means down to clean, sound, solid concrete prior to the installation of any flooring system.

Lightweight Concrete.

Structural lightweight, pre-cast lightweight panel and lightweight screeds, vary greatly in density and compressive strength. Lightweight insulating concrete subfloors are typically used for sound or thermal insulation, or because the floor is not strong enough to carry 'normal' concrete. These materials are not structural, have strengths, and exhibit soft weak surfaces. Lightweight substrates are often not suitable for the installation of DUNLOP levellers or toppings, as they do not provide a solid, structural surface, which can serve as a base.

As the condition and composition of lightweight concrete varies greatly, we always recommend the installation of test areas to determine the suitability of the installation for the intended use and to ensure that the lightweight concrete has cohesive integrity to remain bonded within itself.

"Magnesite" - Magnesium Oxychloride based toppings

These toppings which were typically installed as sound proofing and as a lightweight underlayment, are totally unsuitable as a subfloor for DUNLOP levellers, toppings, tile adhesives or liquid membranes. This type of material must be completely removed prior to the application of any DUNLOP product.

For more information refer to ARDEX Australia's Technical Bulletin TB078 which can be found at www.ardexaustralia.com in the Technical Bulletin section under 'Service'.

Old Adhesive residues.

This is a common source of surface contamination and it is necessary to



Magnesite residues on a floor

remove them entirely from the substrate before a flooring system is installed. This can easily be achieved by mechanical preparation.

It is not uncommon for an installer to be encouraged to apply products over old adhesives. To provide a primer or system to adequately bond to most of these compounds isn't the problem, but you are then relying on the standard of the previous preparation, the bond strength of the old adhesive and of course the cohesive strength, in itself, of the adhesive or coating. The risk of the old adhesive (coating) lifting from the substrate or indeed splitting within itself can sometimes be very high depending on the type of material being applied, the environment and usage.

Certain products can have a high surface tension, putting enormous pressure on the old adhesive such as parquetry. Some adhesives, such as the old bituminous types (Black Jack) may be reactivated by the new adhesive and in time cause leveller and subsequent floor covering to de-bond. In summary, the best course of action is to remove old adhesive residues.

Rain damaged concrete.

Concrete which has been effected by rain prior to cure must be mechanically prepared back to the sound underlying material. The rain damage concrete is mechanically very weak and can de-bond under traffic loadings, and may be weak enough to fail when tensile strain from the drying topping is applied. Some rain damaged surfaces, even after preparation, may not be ultimately suitable for levellers especially.

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Recommended Methods of Preparing Concrete Substrates

The best way to remove any contamination in a concrete substrate is by an approved mechanical method. Equipment can normally be rented from the Hire Shop at Bunnings, or companies such as Kennards or Coates Hire.

Mechanical cleaning removes the contaminant and the concrete to which it is adhered leaving only a clean, sound and solid surface behind.

DUNLOP recommends that all concrete substrate preparation proceeds using one or more of the following mechanical methods:

Trade methods—shotblasting, scarifying, diamond grinding/shaving, sandblasting, scabbling (bush hammering) and chiselling.

DIY methods- diamond grinding or coarse grit discs on a heavy duty grinder.

Initial treatment can include methods



Using a floor grinder

such as degreasing and high pressure water blasting to remove surface oils and grease, however these contaminants can penetrate deeper into the surface and shall be followed up by mechanical methods. Please note, when water blasting is used, the floor becomes 'wet' which either requires the concrete to dry again, or that a moisture barrier will be required.

Mechanical abrasion methods such as scarifying, scabbling and chiselling are aggressive methods, which are recommended to remove unsound areas only. Diamond grinding/shaving can also be effective but are slow for large areas. Sandblasting is an excellent method of cleaning weak surface areas, if environmental restrictions permit its use.

One of the most cost-effective Trade methods of removing a wide variety of contaminants from a large area of concrete is to use shotblasting. Using different sizes of steel "shot", a shotblast machine can remove a variety of sealers, coatings, curing compounds and other contaminants quickly and effectively, leaving behind a surface which is ready to receive the specified underlayment or topping.

Removal must be deep enough to eliminate all penetrated contaminants. The objective of preparation is to produce an open porous concrete matrix suitable for the flooring system. Porosity can be checked by observing absorption of water droplets placed on the concrete surface. If the water spreads out and is absorbed the surface can be considered porous, but if it remains a bead the surface is non-porous and further preparation is required.

METHODS TO AVOID

Acid Washing (Acid Etching).

This method is not recommended because it is difficult to control and to fully remove the residue and properly neutralise the acid. Further, the acid can penetrate into the porous concrete and chemically react with the cement, thus affecting the long-term integrity of the concrete. Acid washing will



A well prepared concrete surface

not satisfactorily remove grease and oil.

Paint Solvents & Adhesive Removers and solvents.

All types of solvents should be avoided and their use will drive oil, grease and other contaminants further into the concrete. These contaminants can be released back to the surface at a later time. Physically removing oil-contaminated concrete is the only sure way to ensure a clean substrate.

Flammable and volatile solvents also carry risks associated with fires and possible chronic or acute toxic effects. In Trade situations, they are commonly restricted on job sites due to WH&S Regulations and Trade Union safety rules.

WOODEN SUBFLOORS

Although the preparation required on the surface of wooden subfloors is the same for any type of 'wood' substrate, a distinction must be made with regard to the suitability of certain types of wooden substrates for the product proposed to be installed.

For applications requiring a self-levelling underlayment such as DUNLOP TIMBER FLOOR LEVELLER, the subfloor must be a minimum of $\frac{3}{4}$ " tongue and groove APA-rated Type 1

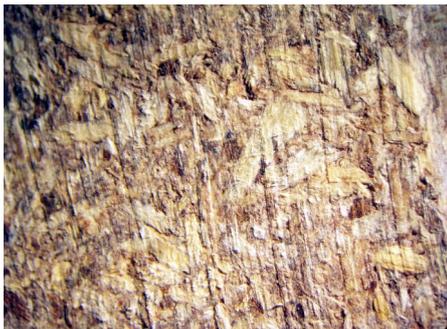
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exterior exposure plywood.

Solid hardwood flooring such as 20mm stripwood is also acceptable as a substrate and can be used with mesh reinforced DUNLOP TIMBER FLOOR LEVELLER. The wood subfloor must be structurally sound and solid, fixed securely and must conform to local building codes. To provide a solid base, re-nail all boards or plywood panels exhibiting movement. Open joints should be filled with DUNLOP FLOOR REPAIRER RAPID PATCH.

Uneven wooden subfloors both T&G and particleboard may be pre-levelled with DUNLOP TIMBER FLOOR LEVELLER prior to installation of the underlay boards. This is a good system prior to the installation of carpet floor coverings.

The surface of any type of suitable wooden subfloor must be clean and free of all oil, grease, wax, dirt, varnish, shellac, or any contaminant which might act as a bond breaker. Sand the wooden subfloor, using a coarse abrasive, to remove all foreign matter and "protective coatings" to provide a clean mechanically sound surface. A commercial drum sander can be used to sand larger areas. Vacuum all dust and debris thoroughly to remove it.



A well sanded particleboard subfloor.

Do not use solvents, strippers or cleaners to remove contamination from the surface of the wood. Only clean, bare wood is a suitable surface. If contamination exists which cannot be effectively removed, an overlay of ½" plywood or fibre-cement sheeting may be used as an alternative to complete removal and replacement of the wood.

There are a variety of other types of manufactured wooden subfloors which are recommended by flooring manufacturers for certain grades or types of floor covering. Masonite, M.D.F. Board and certain plywoods, and other types of wood composites may be recommended as being suitable to receive a certain manufacturer's flooring. (not ceramic tiles or stone). If the manufacturer of the finished goods approves that substrate as being suitable, and the surface requires smoothing or flash patching, DUNLOP FLOOR REPAIRER RAPID PATCH can be used over any type of wood. The installation of the underlay board must be performed in strict accordance with the manufacturer's written instructions. Do not use DUNLOP FLOOR REPAIRER RAPID PATCH as a short cut to bypass specific installation instructions such as sanding the surface of the underlay board unless the manufacturer permits the use of a skimcoat product.

NON POROUS SUBSTRATES

Smooth, dense and solid substrates such as; ceramic and quarry tile, natural stone, cementitious and epoxy terrazzo, and solidly bonded epoxy coatings can be smoothed with certain DUNLOP levellers and patches, and tiled with specific adhesives. The ARDEX range of products has a wider scope of choices for these difficult surfaces and can be an alternative choice in these cases.

The surface of these substrates must be clean and free of all contaminants including oil, grease, wax, etc. Due to the non-porous character of these substrates, sealers, dressing and surface treatments can often be completely removed effectively using professional stripping agents. As an alternative and where stripping is not a sufficient technique, mechanically cleaning of all of the above non-porous substrates can be used to remove all foreign matter.

Please note that all hard surface tile substrates must be thoroughly evaluated for the bond of the individual tiles. All tiles which are not solidly bonded must be completely removed

including the setting mortar, down to clean, sound, solid concrete.

One way of ensuring a good bond is to attempt mechanical removal. If removal is difficult or impossible, install a test area of the products to be used. If removal can be done readily using a mechanical method, continue removal to clean, sound, solid concrete or timber.

SUMMARY

The performance of an application starts with correct preparation. Time and time we have seen problems occur because of poor surface preparation or failure to conduct any preparation at all. This advice provides guidance on surface preparation and the types of substrate that can be encountered.

Further advice can be obtained by calling the Technical Advice hot lines in your country.

NOTES

The use of non-DUNLOP primers or bonding agents is not recommended. Limited testing with certain proprietary bonding agents has shown that the performance of some flooring systems can be altered by their use, and no product warranty is applicable.

Always refer to the product data sheets for specific usage details.

The information contained herein is to the best of our knowledge true and accurate.

No warranty is implied or given as to its completeness or accuracy in describing the performance or suitability of the product application. Users are asked to check that the literature in their possession is the latest issue.

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GLOSSARY OF TERMS

Australian / New Zealand Standards

AS1884-2012 Floor coverings - Resilient sheet and tiles - Installation practices.

AS/NZS2455-2007 Textile floor coverings—Installation practice Part 1: General.

AS 3740-2010/12 Waterproofing of domestic wet areas.

AS3958.1-2007 Ceramic tiles

Part 1: Guide to the installation of ceramic tiles.

Diamond Grinders—The most commonly known type of floor preparation equipment is the diamond grinder. These range from small angle grinders fitted with abrasive discs right up to large self propelled machines with multiple heads. Grinding can really be done on any surface and floors, walls and ceilings are all candidates.

The basic mode of operation is a disc coated with abrasive (carborundum or diamonds) is spun at speed and under pressure onto the surface. This mechanically abrades the surface removing the top several millimeters. The final surface profile is between CSP1 and 3, with an open matrix.

Floor Sanding—This procedure was used formerly for preparation on masonry floors, but this is no longer the case. Floor sanding is recommended only on timber floors where flexible smoothing cements are to be applied. Typically these units are belt type sanders using 24-40 grit sand paper. The primary limitation with these units is that they are easily clogged up by old adhesives. After sanding vacuum dusting is essential to clean the floor as sanding creates large amounts of saw dust residue.

Green-concrete—This is concrete less than 28 days old, but this term can be applied to new concrete is several months old and which has not properly dried after being poured.

Grit/Sand Blasting—This process involves the use of a powdered grit such as sand or other abrasives blown onto the surface by high pressure air. For the purposes of floor smoothing, the only time this process is applied is when

smoothing cements are to be applied to metal surfaces.

Laitance—A weak crust or skin which forms on new concrete from overworking, overwatering or efflorescence.

Leveller—also called smoothing cement, floor levelling cement, topping or the standard term underlayment. These are typically poured liquids but can also be mortar pastes.

Mechanical method—As defined in AS1884-2012 is,

“1.3.15 Mechanical means

‘Mechanical means’ is the process of surface preparation performed by application of applied physical forces to the substrate surfaces to remove contamination. For the purposes of installations on concrete this refers to the use of diamond grinders, scarifiers and captive shot blasters. For smaller areas this can include chippers and nail gun type scabblers. When installations are to be performed on timber floors ‘mechanical means’ refers to floor sanders. Regardless of the means used the final process in a mechanical preparation is vacuum cleaning.”

Nailguns’ or Needle Scalers

These handheld tools which usually are powered by compressed air. A piston moves rapidly inside the tool propelling a set of set steel needles back and forth. These needles impact on the surface and can break loose weak surfaces, laitance.

Over-watered—When a cement based material is mixed, water is added which has exceeded the recommended amount. For levellers, when this exceeds 5%, it degrades the product.

Scabbling—The most severe method of surface preparation used is scabbling. This process involves impacting the concrete surface with piston driven cutting heads to break up the surface for removal. Scabbling is a quite severe process and should really be considered the method of last resort as it is possible to remove too much material, and also damage the concrete itself.

Scarifiers—Are a type of flail device that has rotating steel drums or rods fitted horizontally across the tool body. These have tempered steel teeth of several

different configurations fitted onto the rod or drum which basically eat away the surface (more correctly they fracture or pulverize the concrete).

Scarification is more severe than grinding and can be used for removing high spots where slabs may have lifted, or tilted at joints etc. Typically a scarifier can remove between 3 and 19mm in one pass. The surface is normally fairly highly profiled as a result of the cutter action, and comprises parallel striations. The CSP rating varies from 4 to 9.

Shotblasting—Involves the propulsion of steel shot at high speed by centrifugal force onto the subfloor surface. The housing of the blaster machine constrains the treated area to the machines footprint. The steel shot pulverizes or spalls the surface off.

A magnetic separator reclaims the shot for re-use, and a vacuum-dust extractor removes the debris and rubbish.

This process is probably one of the most versatile preparation process as it can deal with many types of floor contaminants, and the throw velocity, size of the shot (0.4-1.5mm) and travel speed are highly adjustable. Typically blasting is used to remove contaminants such as hard coatings or sealers and some adhesives, but will remove things such as laitance and weak surfaces. It is designed for profiling and is the preferred method prior to the use of epoxy based damp proof membranes. It is not as effective for soft resins, resilient coatings, soft adhesives and bituminous materials.

A pass is typically up to 6mm and CSP profiles between 2 and 8 are possible.

Self levelling—This means that the leveller self heals trowel marks, it does not mean finds its own water line level or flows to the low spots.

Substrate—the surface on which the product will be applied. Can be concrete, sand-cement screed, fibre-cement sheet or particleboard.