

# TECHNICAL BULLETIN – TB244

## SUMMARY -TOPPING & SCREED SYSTEMS

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### INTRODUCTION & SCOPE

Toppings are a necessary part of the construction process as a mechanism to remove variations in the heights of floors, to create falls to drainage systems and to provide flat /planar surfaces for the selected floor finishes. Thus toppings can include the self-levelling cements as well as traditional sand & cement mortars (screeds).

However other specialised screed systems may be composed of premixed binders that are mixed with size graded sand, or from epoxy resins mixed with size graded sands. In all cases, these topping screeds are applied over a structurally sound substrate capable of taking the weight of the topping screed either as a bonded topping or as an un-bonded topping. The following is a general summary of these systems and see TB243 for a full set of definitions for the terminology.

#### SELF-LEVELLING CEMENTS – ENGINEERED CEMENTS

These products are proprietary engineered cement items generally made to have initial flow properties that allow the surface to self- level when applied in thin (<20mm) layers to structurally sound, prepared & primed substrates. Also refer to ARDEX Technical Bulletin TB102.

These products are classed as *underlayments* as defined in AS1884-2012 and are mostly intended for the installation of resilient (e.g. vinyl) floor coverings; textiles (i.e. carpet) and resinous (e.g. epoxy) coatings although many may be used under waterproofing membranes and/or tile adhesives. These products even though not classified as 'screeds' exceed the minimum performance requirements of 20MPa compressive strength & 1.5MPa tensile strength which are the minimum requirement for 'screeds' in Section 3 of AS1884.

Self-levelling cements have rapid setting, rapid hardening properties with no residual moisture requiring prolonged drying times. Thus impervious floor coverings (e.g. vinyl) can be installed within 1-3 days of the self-levelling cement installation. These products generally do not provide fall to drainage and can be limited in their capacity to achieve significant thicknesses. In addition, they can only be used as internal bonded floor toppings and must be protected from moisture penetration.

#### BULK FILLS

To overcome the limitations of thin layer applications, the self-levelling cements can be mixed with selected washed & dried aggregate to create a bulk fill which allows greater thicknesses than normal to be achieved at reduced cost/m<sup>2</sup> (compared to full thickness of neat self-levelling cement) as fully bonded toppings. These aggregate filled toppings are generally finished with a smoothing skim coat of the levelling cement prior to the installation of the resilient floor coverings. In addition, specialised proprietary bulk-fill toppings (e.g. ARDEX K005 & ARDEX A38) can be used as thicker bonded substrates for the final self-levelling cement finish.

The ARDEX K005 is applied as an internal floor bonded topping only from 10 to 120mm thickness in one application and will harden in 4 hours to allow foot traffic access and resilient floor coverings to be installed after 24 hours.

The ARDEX A38 Rapid Set screed consists of a proprietary engineered binder mix that is added to approved filler sand where the particle size is within the nominated (0-4mm) range. This 'engineered screed' may be applied from 15 to 100mm as a bonded topping and from a minimum 45mm to 100mm as an un-bonded topping. It may be used internally and externally and is ready for the adhesive fixing of hard tile finishes after 8 hours drying.



Internally, the ARDEX A38 will be ready for applications of ARDEX levelling cements (e.g. ARDEX Pandomo) after 24 hours drying and resilient floor coverings or waterproofing membranes after 72 hours drying. In addition, this topping may be used with floor heating systems, both electrical wire types and hot water piping systems. (Consult ARDEX for these applications.)

#### MORTAR TOPPINGS - SCREEDS

Traditional toppings are sand & cement mortars normally used under hard tile finishes and classed as 'screeds' (the verb 'screeding' refers to the practice of using a long bar to even out the surface). Typically these are a blend of 3 or 4 volumes of sand to 1 volume of cement mixed with gauging water to achieve a workable mortar that can be screeded to falls as required. AS3958 recommends a minimum thickness of 15mm for a bonded topping.

A modified version of this traditional screed is the 'Granolithic screed' which used sand-gravel in the 0-4mm range as the aggregate filler, and which achieve better matrix packing with consequent better strength potential. ARDEX A38 can be considered analogous to this type of topping with the difference that it uses a high performance engineered cement binder.

The gauging water may be improved by the addition of liquid polymer additives such as the Ardex Abacrete or Ardex WPM405. These additives reduce the amount of liquid to be included in the mortar to achieve sufficient workability of the mortar for screeding while increasing the cohesive (internal) strength of the hardened screed mortar. Bonded mortar toppings are best applied as wet mortar over a wet bonding slurry composed of the liquid additive mixed with cement.

The performance of these screed mortars is generally less than that of the self-levelling cements with screeds displaying lower compressive and tensile bond strength and longer drying times. Thus they are best suited for the installation of hard floor finishes such as ceramic/porcelain and/or natural stone tiles as drying of the topping can contain by moisture evaporation through the porous grout lines. Resilient floor coverings may experience the development of "ruts" in the floor due to crushing of the screed under heavy concentrated loads and/or bubbling /blistering /discolouration of the floor covering due to excess moisture from the screed that had not fully dried prior to the installation of the floor covering.

The minimum performance requirements of AS1884-2012 therefore excludes these sand/cement screed toppings under resilient (e.g. vinyl) floor coverings as they rarely achieve the required performance requirements.

#### RESIN BASED SCREEDS

Specialised high strength topping screeds can also be made using washed and dried selected size sand mixed with epoxy resins such as the ARDEX Abapoxy (the resin only made by mixing Parts A+B, and no Part C filler).

Typically the epoxy resin will be a 100% solids epoxy that eliminates the need for hydraulic cement in the mortar mix. The washed & dried sand size range is in the order of 0 - 2.0mm overall that allows closest packing of the particles for maximum strength.

The epoxy resin is a two part liquid system that is initially mixed to achieve a uniform colour prior to the addition of the sand fillers. The mixed epoxy comprises approximately 10% of the screed volume and is thoroughly mixed to ensure all sand particles are coated with the liquid epoxy. The substrate is coated with a bond coat of the mixed epoxy and the epoxy mortar mix is placed over the wet bond coat and screeded to falls levels as required.

The epoxy screed is used where high strength is required as soon as possible to minimise downtime. Epoxy screeds such as this have been used to install paving cobbles by the wet bed method in driveways leading to loading docks. Epoxy screeds will harden



overnight and can be made accessible for foot traffic after 24 hours while vehicular traffic can travel across the screed after a minimum of 7 days.

While these are high strength screeds, the epoxy is not UV stable and may discolour in sunlight. They are of limited use as they are *not* compatible with levelling cements and/or tile adhesive generally because of bonding problems, and are not recommended as a substrate for most types of floor finishes due to their finish and issues with the flooring adhesives.

#### BONDED VERSUS UN-BONDED SCREEDS

**Bonded** topping installations based around screeds are the most common as this allows the minimum thickness (15mm) to be applied thus limiting the weight load on the structure. The substrate is generally concrete although it may be an applied membrane system over a concrete that is compatible with cement based toppings.

Note: Self-levelling cements are not suitable for application over waterproofing membranes although they may be applied to prepared substrates as bonded toppings and subsequently protected by an applied membrane. Thus the sand-cement or granolithic (bonded or un-bonded) screeds and the ARDEX A38 (**un-bonded only**) toppings are the only approved systems applicable over a liquid applied *waterproofing* membrane. Bonded screeds, but not A38, can only be used over fleece faced sheet membranes such as ARDEX WPM750 or WPM1000.

**Un-bonded** topping screeds are not bonded to the substrate thus act to isolate the topping screed from substrates that may be contaminated, cracked or constructed with movement joints that would be unacceptable in the new floor coverings. Because they are un-bonded, they also have to be self-supporting.

This generally means sand/cement toppings will include welded wire mesh reinforcement and have a minimum thickness of 40mm. However specialist toppings such as the ARDEX A38 can be applied at a minimum 45mm thickness and does not require additional reinforcement although it is limited to approx., 40sqm panel/bay size so large areas will require several panels/bays to be placed.

Un-bonded toppings are placed over a slip sheet (e.g. double layer plastic sheet, ~300micron thick each layer) with the top layer of plastic placed at right angles across the base layer.

Regardless of whether or not the screed is bonded or un-bonded, the screed must be compacted to ensure close packing and maximum strength development. Self-levelling toppings are applied as a liquid mortar thus can be left to settle without further compaction. However sand/cement topping mortar and the ARDEX A38 Rapid set screed must be compacted during installation, especially when the topping thickness exceeds 40mm.

#### SELF-DRAINING TOPPING SCREEDS

External paving installations frequently show excessive efflorescence as moisture falling onto the paving seeps through into the bedding until the weather conditions improve and evaporation can occur. The moisture dissolves the soluble compounds in cement based toppings which then migrates up to the surface as the moisture is drawn up to evaporate. The development of self-draining bedding screeds is a solution where the moisture is able to continue to drain out of the bedding system into drainage systems in the underlying structural substrate.

The ARDEX A38 Rapid Setting screed system can be used as a Self-Draining bonded topping screed when mixed with the ARDEX 2-5mm washed aggregate. The aggregate size does not provide the close packing normally associated with the A38 screed thus moisture can percolate down through the screed provided the screed is a minimum of 60mm thick. The perimeters of this topping screed must be formed up to prevent the edges of the screed breaking under load and it has a rough surface texture unsuitable for



any sort of textile covering such as 'grass carpet'. Typically this self-draining topping screed is used with external paving finishes.

## SUMMARY

The above is a brief outline of topping systems provided by Ardex Australia Pty Ltd. It includes the self-levelling systems for internal floors where the addition of approved aggregate filler can be done to achieve topping thickness at a more economical rate than that of using the levelling cement without the aggregate.

Other types of topping screed are noted beginning with the traditional sands/cement mortar used mostly under hard tile finishes, to the rapid setting high strength systems recommended for internal applications under resilient floor coverings and ARDEX Pandomo decorative floor finishes. In addition, special toppings are noted for specific applications such as epoxy toppings for the installation of paving cobbles in high traffic areas, or the use of the ARDEX A38 system as a self-draining topping under external paving.

The distinction is also made regarding un-bonded versus bonded topping system and notes the self-levelling cement toppings are only used for internal applications as fully bonded toppings.

### **IMPORTANT**

This Technical Bulletin provides guideline information only and is not intended to be interpreted as a general specification for the application/installation of the products described. Since each project potentially differs in exposure/condition specific recommendations may vary from the information contained herein. For recommendations for specific applications/installations contact your nearest Ardex Australia Office.

### **DISCLAIMER**

The information presented in this Technical Bulletin 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 a product for a particular application. Users are asked to check that the literature in their possession is the latest issue.

### **REASON FOR REVISION - ISSUER**

Rewrite with clarifications

### **DOCUMENT REVIEW REQUIRED**

24 months from issue

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