

TECHNICAL NOTE TN 33.15

TILING TO CALCIUM SULFATE/ANHYDRITE BASED SCREEDS

WHAT IS A CALCIUM SULFATE BASED SCREED

Instead of a cement-based binder, these types of screed contain anhydrous (dry) calcium Sulfate and aggregate(s).

When water is added, the anhydrous (dry) calcium Sulfate forms either an alpha hemi-hydrate (a stronger and harder crystalline form) or a di-hydrated calcium Sulfate – more commonly known as Gypsum. This reaction stops when the vast majority of the anhydrous calcium Sulfate is used up and is generally complete after a period between 3 and 7 days. Therefore any water remaining within the screed is surplus to requirements and needs to evaporate through the surface of the screed.

STANDARDS

BS 8204-7 : Screeds, bases and in-situ floorings

The above standard is the code of practice which covers pumpable self-smoothing screeds. The salient points to watch out for are listed below and should be used in conjunction with the other codes of practice that are relevant, specifically BS 5385 Parts 1 to 5, taking into consideration any recommendations for specific conditions, i.e. Part 4 2009.

- ◆ Any area to be screeded should be enclosed within a weatherproof structure and any opening should be covered.
- ◆ Temperature range of applying a screed 5°C to 30°C; storage of materials prior to laying 5°C to 30°C; ideally 20°C.
- ◆ Areas to be laid should be free of draughts and be protected for at least 24 hours.
- ◆ The atmospheric Relative Humidity should not fall below 50 % RH value – therefore reducing the risk of rapid early drying.
- ◆ Levels must be accurate to meet the requirements of the specification for the floor tiles being installed. See Table 4 of British Standard BS 8204-7. If a Surface Regularity of SR1 i.e. 3 mm when checked with a 2 m straightedge is not achieved, use of a suitable floor levelling compound (following priming a the screed) e.g. BAL-FIBREBASE should be considered before the tiling installation can be undertaken

MOISTURE CONTENT

Typical values at which it would be permissible to lay moisture sensitive floor finishes are < 0.5 % w/w moisture content, for impermeable floors and <1 % w/w for more permeable floors such as carpet tiles etc.

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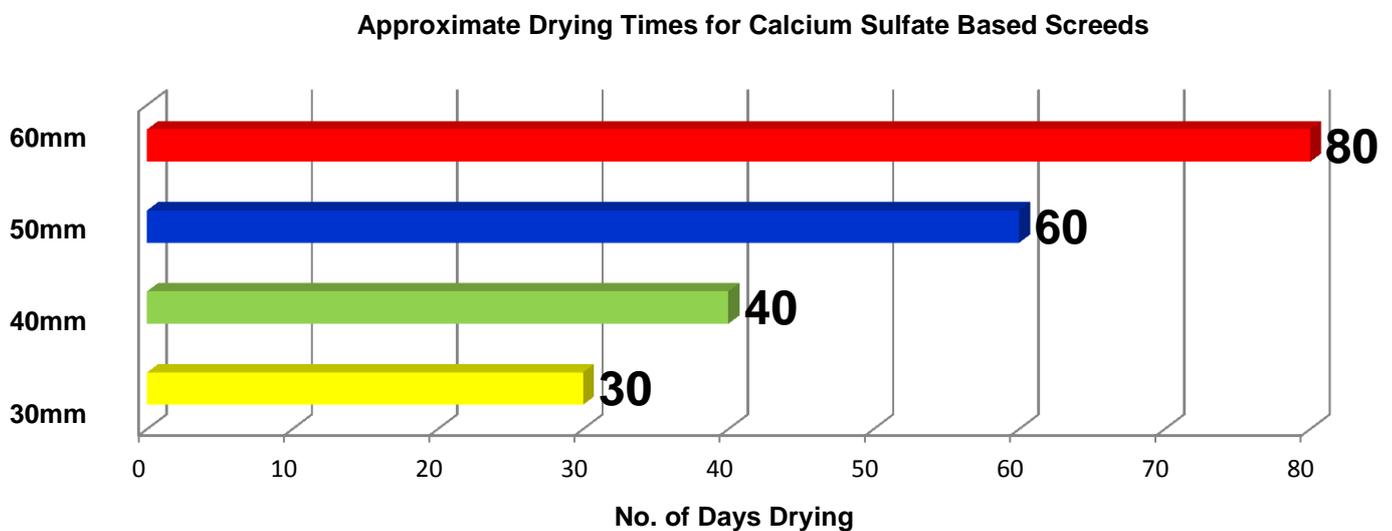
Methods of Testing Moisture

- Using a hair hygrometer or digital¹ hygrometer. Moisture content must be <75 % RH (Relative Humidity).
- CM tester (carbide bomb²) may be used. Moisture content must be <0.5 % water by weight.
- Laboratory testing of weight loss via oven drying a sample of the screed at 40°C.

¹ NB these results can sometimes be misleading

²TIP 1: This is the best method for testing moisture. However please seek expert advice with regards to the use of a carbide bomb tester

The graph below represents the approximate time taken to reach 0.5 % Water by Weight in ideal drying conditions i.e. air temperature of 20°C with a relative humidity not greater than 65 %



WATCHPOINTS

- 1) All laitance³, dust, dirt or any other loose surface material incompatible with the tile adhesive must be removed. This is normally carried out using a sanding machine i.e. a rotary floor scarifier and a 60 grit paper. Remove excess dust completely by the use of suitable vacuum equipment. Seek further advice on the correct method to achieve this from the screed manufacturer.

³ Laitance is a weak intermediary layer of fine particles deposited on the surface of the screed, generated by water migrating through to the screed surface as drying occurs.

TIP 2: Good preparation for calcium Sulfate screeds includes abrading the surface of the screed (as with cement based screeds). This helps to remove surface contamination and things like laitance³ and the like which will be present on most screeds. By exposing the screed's surface this will also provide a key to the primer and adhesive and this aids adhesion.

TIP 3: Abrading the surface is best carried out 4-6 days after application of the screed and can assist in the drying out process.

TIP 4: It may still be advisable to lightly sand the surface even for low laitance calcium Sulfate/anhydrite screeds (screeds modified with a laitance suppressing additive) as this will provide an additional mechanical key to aid further adhesion.

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- 2) The installation should be protected against ingress of water or rain. Accelerated drying of calcium Sulfate based pumpable self-smoothing screeds may be used once the screed is at least 7 days old. As a general rule of thumb, the screed drying time is approximately 1 mm per day up to 40 mm (See graph above) **and will significantly increase for thicker screeds or those in poor drying conditions**

TIP 5: The speed of drying out of the screed can be improved by

- a) **Increasing the ventilation in the room**
 - b) **Application of external heat e.g. space heaters combined with the use of industrial dehumidifiers in order to remove water vapour as the higher temperature encourages natural evaporation of excess moisture**
 - c) **Where applicable, commission the underfloor heating after 7 days (see below)**
- 3) All traffic should be kept off the screed until the screed has hardened sufficiently in accordance with manufacturers' recommendations and should be protected from contamination and damage from following trades. The screed should also be protected until the flooring is applied.

TIP 6: If not protected as the project progresses, trafficking by other trades may result in wearing or grinding down of the screed's surface. It may then be necessary to carry out further surface treatment using a suitable sanding machine/vacuum equipment as recommended by the screed manufacturer.

PRIMING

In reality, the risk of an adverse chemical reaction (ettringite attack) with Calcium Sulfate is reduced when the tiling is carried out using a BAL rapid setting adhesive due to the specialist cement chemistry. However, we would always recommend that after following the correct preparation of a Calcium Sulfate screed surface, a primer is applied to the prepared screed surface before application of the tile adhesive.

TIP 7: Priming creates both an effective barrier and assists in consolidating the prepared surface making it more stable. This helps to ensure the tile adhesive is fully bonded to the screed. Use an acrylic primer such as BAL-PRIME APD or a suitable epoxy based primer.

ADHESIVE

TIP 8: When selecting the tile adhesive, consideration should be given to factors such as the type and method of cleaning and maintenance for the floor whilst in service i.e. how wet the finished floor may become and what are the risks associated with limited water penetration beneath the tiling layer? Ceramic tile adhesive must meet the requirements for BS EN 12004 "Adhesives for tiles – Requirements, evaluation of conformity, classification and designation"

UNDERFLOOR HEATED CALCIUM SULFATE SCREEDS

If underfloor heating is incorporated into the calcium sulfate based screed, allow the screed to dry for a minimum of 7 days before commissioning of the underfloor heating.

Gradually increase the temperature by approximately 5°C per day until the maximum required working temperature is reached. Maintain this temperature for a minimum of one week. Reduce the temperature gradually to around 15-20°C. If force drying of the screed is required, do not exceed a temperature of 55°C.

The moisture content of the screed must be checked by the floor layer prior to tiling.

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INSTALLATION

As discussed, when the screed is ready for tiling we would recommend the following procedure:

1. Mechanically prepare the screed to expose a clean base as described above
2. Apply BAL-PRIME APD in two coats, the first coat should be diluted 1:1 by volume with water and allowed to touch dry before applying a second undiluted coat at 90° to the first. This is in order to ensure the entire surface of the screed is covered.
3. When the above primer coats have dried and if necessary the floor may require levelling using BAL-FIBREBASE e.g. over electric heating cables.
4. Apply a thin bed of a suitable BAL flexible tile adhesive to bond the BAL-RAPID-MAT. Use a BAL Mosaic Trowel (or 4 x 4 mm notched trowel).
5. The tiles can be fixed in a 3-6 mm solid bed (i.e. ensuring as far as possible, no voids are left beneath the tiles) with BAL-PTB FLEXIBLE GREY / WHITE or BAL-STONE & TILE PTB adhesive GREY / WHITE. BAL-RAPIDSET FLEXIBLE FIBRE GREY or WHITE may also be considered. Alternatively if a slow setting adhesive is required for ceramic or porcelain tiles, use BAL-SINGLE PART FLEXIBLE or BAL-MAX FLEX FIBRE.
6. When the adhesive has fully cured, the joints between the tiles should be filled with a suitable grout, e.g. BAL-MICROMAX2, BAL-MICROFLEX WIDE JOINT GROUT or BAL-SUPERFLEX WIDE JOINT GROUT. (NB. A minimum joint width of 3 mm for floor tiling is recommended).

MOVEMENT JOINTS

Movement joints will be required in these installations. Any movement joints, or joints likely to be subject to movement, in the calcium sulfate screed should coincide with movement joints in the tile bed. Perimeter joints should be a minimum of 6 mm in width and extend through the full depth of tile and adhesive bed. For ceramic/porcelain tiling these may be filled using BAL-MICROMAX SEALANT (colour to match the BAL- MICROMAX2 GROUT).

Movement joints should be incorporated as outlined in British Standard BS 5385-3, 2007 Clauses 6.8 and 7.1.6. Briefly, this document requires that joints be located:

- a) Over existing and/or structural movement joints or at day joints (with unbonded/ floating screeds) where movement is likely.
- b) Around the perimeter of the floor and where tiling abuts columns, curbs, steps and plant fixed to the base and at doorway thresholds
- c) In large floor areas tiles should be divided into bays of size not greater than 10 m x 10 m intervals.
- d) For floors subjected to significant thermal changes i.e. underfloor heated screeds, tiles should be divided into bays of size not greater than 40 m² with an edge length not greater than 8 m. The areas bound by movement joints should be square to rectangular with a width to length ratio not greater than 5 to 8 m.
- e) On suspended floors the bay size should be reduced and additional joints provided over supporting walls or beams

Further advice should be obtained from The Tile Association Technical Document "Tiling to Calcium Sulfate Based Screeds" and BS 5385-3 - 2014.

THE BAL 25 YEAR GUARANTEE

BAL products are supplied with a 25-year product guarantee. For further details and/or copies please contact the Company's marketing department.

TECHNICAL ADVISORY SERVICE

For free expert guidance on the use of BAL products, or any aspect of ceramic tiling contact the BAL Technical Helpline on: Tel: 01782 591120 or 0845 600.

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