Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Fibre-enriched Acrylic Waterproofing Compound, and thereafter Tiling



Friday, 1 December 2023

IMPORTANT:

 This Installation Guideline is issued for information purposes only, and should not be used as a project specification.

Please contact the TAL Technical Advice Centre to ensure you have the latest version of this Installation Guideline, as products and application procedures can change.

- As each and every project needs to be assessed individually on its own merits and characteristics, please contact the TAL Technical Advice Centre for a project-specific detailed materials and methods specification for specific projects.
- It is important that the tile selected is suitable for the application, preferably against a written Supplier's specification. Factors such as water absorption, irreversible moisture expansion, MOR and PEI ratings, chemical resistance and overall stability of the product need to meet the requirements of the service conditions.

NB: The backs of all tiles must be clean and free from all traces of dust and contaminants which could impair adhesion.

THE TAL PRODUCTS REQUIRED FOR THIS INSTALLATION ARE AS FOLLOWS:

Waterproofing Installation

TAL FLOOR PRIMER - Priming System for Highly Porous Substrates and Dry-Wall Partitioning* TAL SUPERFLEX FIBRE 1K TAL SUPERFLEX MEMBRANE

Tile Installation

TAL GOLDSTAR 12 – Ceramic Tiles & Porcelain Tiles TAL MOSAICFIX (available in Super White and Light Grey) – Ceramic / Porcelain Mosaics TAL BOND / TAL BOND POWDER TAL WALL & FLOOR GROUT TAL SEALMASTER CORD TAL GOLDSTAR SEALMASTER 1000

NB: Prior to commencing the installation, please refer to the instructions on the packaging and product data sheets for more detailed information pertaining to substrate preparation, product mixing and application, curing times, etc. The products must be applied following a good standard of workmanship.

Norcros SA (Pty) Ltd Reg. 1952/000012/07

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



SPECIAL NOTE MUST BE TAKEN OF THE FOLLOWING:

Waterproofing System:

As showers are classified as "wet" areas, they should be waterproofed prior to tiling to ensure a watertight installation and prevent the ingress of water into the installation and water damage to adjacent walls and levels below.

TAL SUPERFLEX FIBRE 1K is a ready to use fibre-enriched acrylic-based liquid waterproofing compound specifically designed to be fully compatible with cement-based tile adhesives.

The fibre-enriched formulation provides a flexible waterproofing system that eliminates the need for reinforcing membranes in most applications, and is ideal for installations where no significant building movement will take place or where the use of a membrane-reinforced system is impractical. It is however still recommended that "critical" areas such as floor/wall and wall/wall interfaces, drain surrounds, etc on be *suspended slabs* (ie levels above ground), be reinforced with TAL SUPERFLEX MEMBRANE.

All substrates must attain a moisture continent of <u>3% or less</u> before the TAL SUPERFLEX FIBRE IK application may be commenced.

The waterproofing installations must be allowed to dry completely (72 hours, depending on site and ambient conditions) before being subjected to *light* foot traffic or application of tiles.

On completion of the installation, the waterproofing system should be flood-tested and proved watertight. This to be signed off by the waterproofing contractor/main contractor/client, and copy to be submitted to TAL for record keeping. TAL cannot be liable for any damages to the Product by following trades, abusive trafficking, etc.

Dry-Wall Partitioning (If Applicable):

The following is an extract from **SANS 10107**, Code of Practice for the Design & Installation for Ceramic Tiling:

"An important consideration with this type of background is that the sheets or boards shall be adequately braced to provide a rigid surface, free from any springiness and surface undulations. They shall also not undergo any distortion during and after completion of the tiling."

NB:

- For this application it is essential that the Panels used are of a suitable thickness and quality for the application and the structure must be such that the Panels can be positively fixed to the framework at <u>maximum</u> 300mm centres in both directions, to provide a firm and dimensionally stable substrate that is able to support the added weight of the adhesive and tiles without any bending/deforming/kicking out of the Panels.
- Although we have specified a modified adhesive and grout system for this installation to allow for the anticipated movement, it must be noted that the tile itself remains a rigid material. Excessive deflection or vibration movement in the background could result in an installation failure, ie cracking or delamination of tiles, cracking or popping of grout, etc.

Trauma that may be introduced into the installation by knocking/bumping by occupants, cleaning staff, etc should also be taken into consideration.

- Only exterior grade board should be used in "wet" applications.
- The corners and edges of the panels must align in plane, without any lippage.
- Ideally, all joints between the Panels should be respected and maintained in the tile installation in the form of tile panel movement joints.

NB: It is critical that the maximum weight of cladding/m² (tile + tile adhesive) as recommended by the walling manufacturer/supplier should not be exceeded as this could result in an installation failure.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



Mosaics:

To facilitate ease of handling, mosaics are assembled as sheets, the individual tessera being glued either face-down onto paper or plastic (paper-faced mosaics), or bed side down onto a synthetic mesh backing, fabric, or onto small tabs. Paper-faced mosaics are preferable since they allow full contact to be achieved with the adhesive bedding.

When sheets are assembled by means of a backing mesh, the mesh should be made of water-resistant synthetic fabric such as nylon, and not from cotton or paper.

In the case of a mosaic that has been assembled with a fabric backing or tabs, the following is critical for a successful installation :

- the fabric or tabs and the bonding adhesive should not occupy more than 25% of the areas of each tessera; the critical factor is the contact of the adhesive with the backs of the tessera, and
- the fabric or tabs and the bonding adhesive should be water resistant, should not weaken when exposed to moisture, and should be compatible with the adhesive bed
- the backs of the sheets must be clean and dry, and not contaminated with dust or powder

Furthermore

- The installation of mosaics requires a clean, sound, flat and level substrate. Variations in levels in the substrate must be rectified prior to the mosaic installation.
- The installation of mosaics requires effective supervision and the employment of skilled operatives. Good adhesive mixing and application procedures, as well as consistent and accurate installation techniques are essential.
- The mosaics should be FIRMLY bedded into the adhesive to ensure good contact between the adhesive and tile.
- All mosaics should be inspected, and loose or damaged tessera removed and replaced before installation.

Please refer to the manufacturer's instructions regarding cleaning and maintenance of the mosaics after installation.

Adhesive Systems:

Ceramic Tiles / Porcelain Tiles

We have specified TAL GOLDSTAR 12 **quick-setting** high-strength adhesive (mixed with TAL BOND, as a total water replacement in the mix) for this installation.

Alternatively, TAL GOLDSTAR XL **modified** quick-setting adhesive can be considered. When using TAL GOLDSTAR XL no additives are required, simply mix with cool clean water. This not only minimises the risk of mixing and application errors on site, but also reduces delivery costs and storage requirements for bulky additive containers.

Ceramic Mosaics / Porcelain Mosaics

We have specified TAL MOSAICFIX **quick-setting** adhesive (mixed with TAL BOND, as a total water replacement in the mix) for this installation.

It is important that newly installed tiles are protected from traffic (other trades, etc) while the adhesive sets. This is especially important in fast-track installations.

Too early trafficking of newly installed tiles before the adhesive has set sufficiently may result in an impaired bond (hollow-sounding and/or loose tiles).

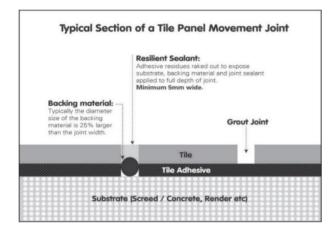
Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling

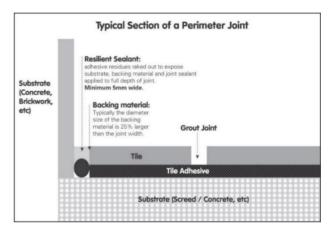


Tile Panel Movement Joints & Perimeter Joints:

It should be noted that the lack of, *or poorly constructed*, intermediate tile panel movement joints and perimeter joints in a tile installation is a major cause of tile failure.

Joints must be created at the required spacing and must be well raked out to remove all traces of adhesive residues, debris, contamination, etc, ie the joint must extend through the tile and tile adhesive layers down to the substrate. These joints must be filled with and sealed with a suitable backing cord/tape and resilient joint sealant material in accordance with the manufacturer's instructions.





Application Conditions:

Cold Ambient Conditions

Cold ambient conditions will not only impact on the temperatures of the adhesive, grout and mixing liquid (water or additive used in the adhesive and grout mix), but also the temperature of the substrate and tiles.

NB: Longer setting and curing times should thus be anticipated and catered for during extreme cold conditions.

High Ambient Conditions

As indicated on the product data sheets, warm weather conditions (generally, temperatures above 30°C) may shorten the working time of the mixture, and may even result in flash-setting of rapid- or quick-setting adhesives.

High ambient conditions will also impact on the temperatures of the adhesive and grout, mixing liquid (water or additive used in the adhesive and grout mix), substrate (concrete or screed), and tiles.

It is thus important when elevated ambient conditions are encountered that the materials (adhesives, liquids, tiles, etc) are stored in interior, cool conditions prior to use to reduce the risk of too-rapid setting.

NB: Never add more liquid to a mix which has been left standing for too long, as this will compromise the integrity of the product.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



1. BACKGROUND PREPARATION & WATERPROOFING

NB: The substrate must attain a moisture content of <u>3% or less</u> before the TAL SUPERFLEX FIBRE 1K application may be commenced.

Stir the TAL SUPERFLEX FIBRE 1K well before use to ensure uniform dispersion of product. TAL SUPERFLEX FIBRE 1K must be used as supplied; do not dilute with water, or add other chemicals.

1.1 Background Preparation:

1.1.1 <u>Walls & Floors – Rendered Masonry Walls & Screeded Floors</u>

1.1.1.1 All new renders and screeds must be allowed to cure for a minimum of 2 weeks and 4 weeks respectively before proceeding.

- **1.1.1.2** The rendering and screeding must be firmly bonded to the underlying substrate, must be integrally sound (no crumbling, cracking, etc) and must be of a quality and consistency suitable for waterproofing and tiling. All damaged, defective, deteriorated or hollow sounding areas must be removed and made good before proceeding. Renders should be left with a woodfloat finish and should not be skimcoated with gypsum plaster.
- 1.1.2 <u>Walls Dry-Wall Partitioning Panels (If Applicable)</u>
 - 1.1.2.1 Dry-Wall Partitioning must be erected and sealed strictly in accordance with the manufacturer's instructions, and must be **thoroughly braced at** <u>maximum</u> **300mm centres in both directions (screwed,** *not nailed*).

1.2 Waterproofing:

1.2.1 The substrate must be clean and dry and free of all traces of dust, loose particles and surface contaminants which could impair adhesion.

1.2.2 **Priming of the substrate may be required, as follows:**

 <u>Rendered Masonry Walls & Screeded Floors:</u> No priming is required onto render and screed surfaces that are clean and dry and free of all traces of dust, loose particles and surface contaminants which could impair adhesion.

However, *highly porous substrates* should be primed with one coat of neat TAL FLOOR PRIMER, applied using an appropriate roller or builder's block brush and ensuring complete coverage of the substrate.

• Dry-Wall Partitioning:

Prime with a coat of neat TAL FLOOR PRIMER, applied using an appropriate roller or builder's block brush and ensuring complete coverage of the substrate.

Ensure that no ponding of the priming coat occurs. Allow the primer to dry for 2 - 3 hours before proceeding.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



1.2.3 Joints between Dry-Wall Partitioning Panels (Including Joints between Dry-Wall Partitioning Panels and Render/Screed) – *All Levels*

- 1.2.3.1 The boards and sheets must be positively fixed to each other, and the corners and edges should align in plane, without any lippage.
- 1.2.3.2 Apply a coat of TAL SUPERFLEX FIBRE 1K by block brush over all joints in the dry-wall partitioning and wooden panels.
- 1.2.3.3 Immediately roll out the TAL SUPERFLEX MEMBRANE (200mm wide) into the wet TAL SUPERFLEX FIBRE 1K with the membrane extending 100mm equally on either side of the joint, ensuring that there are no wrinkles/creases in the membrane or air bubbles trapped below.
- 1.2.3.4 Apply a heavy topcoat of TAL SUPERFLEX FIBRE 1K to completely saturate the membrane *before the first coat dries.*

1.2.4 Coving Areas, Internal Corners, Taps & Rose Plumbing - Suspended Slabs Only

1.2.4.1 To allow for movement, apply a 10mm bead of flexible silicone sealant into the interface between the wall and floor, between internal vertical corners and around tap and rose plumbing fittings prior to the TAL SUPERFLEX FIBRE 1K application.

Due care must be taken to ensure that the silicone bead is not flattened out - ie the silicone must be allowed to cure for approximately 12 - 24 hours.

1.2.4.2 Apply a coat of TAL SUPERFLEX FIBRE 1K by paint roller or block brush to these interfaces. **Immediately** roll out the TAL SUPERFLEX MEMBRANE (200mm wide) into the **wet** TAL SUPERFLEX FIBRE 1K with the membrane extending 100mm equally on either side of the interface, ensuring that there are no wrinkles or air bubbles trapped beneath the membrane. The membrane must be pushed into the corners, ensuring that the entire interface is covered with TAL SUPERFLEX MEMBRANE. Apply a heavy topcoat of TAL SUPERFLEX FIBRE 1K to completely saturate the membrane **before the first coat dries**.

1.2.5 Floor Wastes & Drains – Suspended Slabs Only

1.2.5.1 To allow for movement, apply a 10mm bead of flexible silicone sealant into the interface around Wastes/Drains prior to the TAL SUPERFLEX FIBRE 1K application.

Due care must be taken to ensure the silicone bead is not flattened out, ie allow 12 - 24 hours curing time before proceeding.

1.2.5.2 Apply a coat of TAL SUPERFLEX FIBRE 1K up the pipes and immediately position the strip of TAL SUPERFLEX MEMBRANE into the wet TAL SUPERFLEX FIBRE 1K. Apply a second coat of TAL SUPERFLEX FIBRE 1K to completely saturate the membrane.

For wastes that are flush with the floor, take the application down into and around the waste.

1.2.6 **Shower Floor & Walls**

1.2.6.1 Apply the first coat of TAL SUPERFLEX FIBRE 1K over the clean, prepared surface using a short pile (mohair) roller, at a rate of 1m²/1L.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



- 1.2.6.2 Allow the first coat to dry sufficiently (minimum 2 hours, depending on site and ambient conditions) before applying the second coat in the same manner, at a rate of 1m²/1L, and in a *cross-direction* to the first coat to ensure complete coverage, with no air entrapment or pinholes.
- 1.2.6.3 Ensure that the Main Area application overlaps the Membrane-reinforced applications **by at least 50mm**.
- 1.2.6.4 NB: Shower walls should be waterproofed to a minimum height of 1.8 metres.
- 1.2.7 Allow the SUPERFLEX FIBRE 1K system to dry completely (at least 3 days, depending on site and ambient conditions) before subjecting to *light* foot trafficking and fixing of tiles.

NB: Due care must be taken to ensure that the TAL SUPERFLEX FIBRE 1K application is not damaged by following trades.

2. <u>ADHESIVE SYSTEM</u>

2.1 Glazed Ceramic Tiles / Porcelain Tiles

2.1.1 Apply TAL GOLDSTAR 12 adhesive **mixed 20kg with 5 litres of TAL BOND (replacing the water in the mix)** to the background using a notched trowel.

Alternatively, TAL BOND POWDER may be added to the adhesive mixing water at a ratio of 1 x 1kg sachet per 20kg TAL GOLDSTAR 12.

- 2.1.2 In this tiling situation it is imperative that there is a solid bed of adhesive at least 4 - 5mm thick behind Ceramic Wall Tiles and 6mm thick behind/beneath Ceramic Floor Tiles and Porcelain Tiles. We would recommend the use of a notched FLOOR TROWEL or THICK-BED FLOOR TROWEL.
 - Ceramic Wall Tiles: The adhesive bed thickness should not exceed 5mm if using soft-bodied ceramic wall tiles.
 - Large Format Ceramic Wall Tiles, Ceramic Floor Tiles & Porcelain Tiles: Back "buttering" with adhesive is also required when using large format tiles to ensure full contact and a solid bed of adhesive behind/beneath each tile.
- 2.1.3 At no time spread more adhesive than can be tiled onto in 10 15 minutes. Depending on atmospheric conditions, this will normally be around 1 square metre. This prevents the adhesive from drying or "skinning" before the tiles are applied.
- 2.1.4 Bed dry tiles (do not soak) firmly into the wet adhesive with a twisting action to ensure full contact between the background, tiles and adhesive. Tiles should be well tapped home with a rubber mallet or the wooden handle of a trowel. It is sound practice to remove the occasional tile to ensure that good contact has been achieved.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



- 2.1.5 Clean off any surplus adhesive remaining on the face of tiles and between the joints with a damp sponge before the adhesive dries.
- 2.1.6 Never butt joint tiles. Joints are required to allow the individual tiles to move with respect to each other and thus avoid a compressive stress build-up. They are also required as vents for the tile adhesive to cure.

The joints between Ceramic Wall Tiles must be a minimum of 2mm wide, and a minimum of 5mm wide between ceramic floor tiles, and a minimum of 3mm wide between Porcelain Tiles.

- 2.1.7 Pot life of the adhesive will vary with climatic conditions. Under no circumstances should adhesive which has been left standing for too long be reconstituted by adding more liquid.
- 2.1.8 Do not tile over structural, expansion or cold joints in the background. These joints must be extended through the various layers to the surface.
- 2.1.9 **NOTE:** Ensure that heavy and/or large format wall tiles are well supported by means of a batten or some type of mechanical device until such time that the adhesive has set sufficiently. In this situation it will be 12 hours.

2.2 Ceramic Mosaics / Porcelain Mosaics

2.2.1 Add 20kg TAL MOSAICFIX adhesive to **6 litres of TAL BOND (replacing the water in the mix)** and mix to a smooth, creamy consistency.

Alternatively, TAL BOND POWDER may be added to the adhesive mixing water at a ratio of 1 x 1kg sachet per 20kg TAL MOSAICFIX.

2.2.2 Paper-Covered Mosaics

2.2.2.1 The adhesive is applied to the surface in a solid bed of 4 – 6mm. (The adhesive can be applied using a NOTCHED FLOOR TROWEL, and the adhesive then smoothed with the straight edge of the trowel to flatten the ridges.)

The mosaics are pre-grouted by working adhesive into the joints between the mosaics from the back.

- 2.2.2.2 Immediately, **FIRMLY** bed the mosaics into the adhesive on the background. A wooden beating block or rubber grouting float can be used to create a flat surface.
- 2.2.2.3 Allow the adhesive to dry sufficiently, and then **gently** remove the paper covering on the mosaics with a dampened sponge. **Excessive water must be avoided as this may compromise the integrity of the adhesive.** If necessary, fill any voids or depressions with the adhesive mixture.

2.2.3 Mesh-Backed Mosaics

2.2.3.1 The adhesive is applied to the surface in a solid bed of 4 – 6mm. (The adhesive can be applied using a NOTCHED FLOOR TROWEL, and the adhesive then smoothed with the straight edge of the trowel to flatten the ridges.)

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



- 2.2.3.2 Immediately, **FIRMLY** bed the mosaics into the adhesive, ensuring that the adhesive penetrates (oozes) through the mesh-backing into the joints between the tesserae. A wooden beating block or rubber grouting float can be used to create a flat surface.
- 2.2.3.3 Allow the adhesive to set for approximately 20 minutes to ensure that the mosaic sheets are not disturbed. Thereafter, fill the joints with TAL MOSAICFIX mixed with TAL BOND. In this instance a 'wet to wet' bond between the bedding and grouting is preferred.
- 2.2.3.4 For areas larger than 1m², it may be necessary to mix fresh adhesive for filling the joints to ensure that the adhesive is still workable and of a consistency suitable for filling the joints.

2.2.4 General

- 2.2.4.1 **Gently** clean any excess adhesive off the face of the mosaics before it hardens.
- 2.2.4.2 At no time spread more adhesive than can be tiled onto in 10 15 minutes. Depending on atmospheric conditions, this will normally be around 1 square metre. This prevents the adhesive from drying or "skinning" before the tiles are applied.
- 2.2.4.3 Pot life of the adhesive will vary with climatic conditions. Under no circumstances should adhesive which has been left standing for too long be reconstituted by adding more liquid.
- 2.2.4.4 Leave a 'grout joint' between the mosaic sheets, the same width as the joints between the mosaics on the sheets.
- 2.2.4.5 Do not tile over structural, expansion or cold joints in the background. These joints must be extended through the various layers to the surface.
- 2.2.4.6 A sample of the tiles to be used should be tested beforehand to ensure that no grout is absorbed into the tile body, causing permanent staining of the tiles.

3. <u>GROUTING</u> – Ceramic Tiles / Porcelain Tiles

- 3.1 Grouting must not be carried out until sufficient bond has developed between the bedding mix and the tiles to preclude disturbance of the tiles during the grouting operation. Allow a minimum of 8 10 hours before grouting.
- 3.2 Use Super White or coloured TAL WALL & FLOOR GROUT mixed 20kg with 8 litres (Super White Grout) or 6 litres (all other colours) of TAL BOND replacing the water in the mix for filling wall tile joints up to 8mm wide.

* NOTE: TAL Super White Grout is only suitable for wall tile joints up to 3mm wide.

3.3 WARNING:

- 3.3.1 The joints must be raked out and cleaned before grouting.
- 3.3.2 Ensure that the joints are completely filled, and the grout is thoroughly compacted into the joints.

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



3.3.3 Particular care must be taken to clean the grout off the tile face before it hardens completely. This is especially important when a modified grout system has been used.

NOTE: Due care must be taken to ensure the face of soft-glazed ceramic wall tiles are not scratched during application and cleaning. The use of soft applicators and equipment is essential.

- 3.3.4 A sample of the tiles to be used should be tested beforehand to ensure that no grout is absorbed through the glaze, or into the tile body, causing permanent staining of the tiles.
- 3.3.5 It is important to use the stipulated amount of liquid in the TAL Grout mixture. When cleaning, a **damp**, *not wet*, sponge must be used. Over hydration (too much liquid) of the mix, or in cleaning, causes colour variations in the grout joints, and also affects the integrity of the grout, resulting in a friable product.

4. MOVEMENT JOINTS

- 4.1 It should be noted that the lack of movement joints in a tile panel is a major cause of tile failure. They should be specified at the design stage to avoid spoiling the visual effect of the tiles.
- 4.2 Movement joints should be located around the perimeter of the shower floors, in all vertical and internal corners/interfaces, and at maximum 3 metre centres for large areas.
- 4.3 Movement joints should also be located against obstructions fixed to the structural background and over all discontinuities in building materials, e.g. at interfaces of concrete and brickwork, Partition Walling and concrete/brickwork. In addition, movement joints should be located around any fixtures protruding through the tiled surface, such as shower door frames and plumbing fittings.
- 4.4 **The joints should be at least 5mm wide and extend through the adhesive and tile layers.** All construction / cold joints and structural joints in the background must be extended through the adhesive and tile layers to the surface in the form of tile panel movement joints. With regards to structural joints, the full width of the structural joints must be respected and extended through the adhesive and tile layers to the surface.

NB: Special care must be taken to ensure that the waterproofing installation is not damaged during cleaning out of the tile panel movement joints and perimeter joints. Failure to do so will result in an impaired waterproofing installation. Ideally the adhesive should be carefully removed from the joints whilst still wet; dried adhesive is significantly more difficult to remove.

- 4.5 Where practical, the bulk of the depth of the movement joint can be filled with TAL SEALMASTER CORD.
- 4.6 Seal the joint using TAL GOLDSTAR SEALMASTER 1000 polyurethane joint sealant in accordance with the manufacturer's instructions. It is important that the joint sealant bonds only to the sides of the movement joint (edges of tiles).

Type: Waterproofing a Residential Shower using TAL SUPERFLEX FIBRE 1K Waterproofing Compound, and thereafter Tiling



4.7 For the key requirements common to all tiling situations please refer to SANS 10107, Code of Practise for the Design and Installation of Ceramic Tiling.

Note: Shower installations must be allowed to set sufficiently (minimum 5 days after completion of grouting) before being subjected to service conditions.

©TAL 1972 & 1984