# CERAMIC TILE AND ADHESIVE SELECTION

## INTRODUCTION

This TECHnote provides guidance to specifiers on the selection of ceramic tiling and adhesives used for fixing the tiles. The tables are derived from the now withdrawn BRANZ *Good Practice Guide – Tiling*, with the addition of the classifications from the Australian Standards AS 13006 and AS ISO 13007.1. While stone tiles may have some performance and selection criteria in common with ceramic tiles, this guidance relates to ceramic tiles only.

## TILE CHARACTERISTICS

The tile selection described in the table is based on water absorption properties. It is useful to start the selection process from water absorption as the degree of vitrification influences other characteristics.

## SUMMARY OF TILE QUALITY PARAMETERS

| AS 13006 Water absorption groups | | Level of moisture resistance | Typical wear resistance | Use comments |
|---|---|---|---|---|
| Group I | Group $BI_a$<br>$E_v \leq 0.5\%$<br>Impervious tiles (porcelain) | Very high – suitable in wet areas | Very high | - Superior physical properties.<br>- May be harder to bond.<br>- May be more prone to stress cracking than tiles with a 0.5 to 3% moisture absorption, particularly when installed on wood-based substrates.<br>- Withstands freeze/thaw cycles.<br>- Size is consistent. |
| | Group $BI_b$<br>$0.5\% < E_v \leq 3\%$<br>Vitreous tiles | High – suitable in wet areas | High | - High quality physical properties.<br>- Withstands freeze/thaw cycles.<br>- Bond well.<br>- Size is consistent. |
| Group II | Group $AII_a$<br>$3\% < E_v \leq 6\%$<br>Semi-vitreous tiles | Medium to high – suitable in domestic wet areas | Medium to high | - Relatively stable.<br>- Good bond. |
| | Group $AII_b$<br>$6\% < E_v \leq 10\%$<br>Non-vitreous tiles | Low – suitable for dry wall areas | Light to medium | - Porous.<br>- Chip and crack easily.<br>- Size variable.<br>- High absorption may affect adhesive bond. |
| Group III | Group III<br>$E_v > 10\%$<br>Non-vitreous tiles | Very low – dry wall areas only | Very light | - Porous.<br>- Chip and crack easily.<br>- Size variable.<br>- High absorption may affect adhesive bond. |
| $E_v$ = percentage of water impregnating a tile (measured to AS ISO 10545.3). | | | | |

Further information and illustrated examples of the more commonly used installations and tiling systems are based on conformance to Australian and New Zealand Standards and international standards as appropriate. The installation of tiles commonly follows the practices outlined in AS 3958, which gives a useful flow chart for selection.

For guidance on slip resistance refer to TECHnote *DES 001 Slip resistance performance*.

**Tile performance criteria**

- Abrasion resistance
- Chemical resistance
- Frost resistance
- Physical qualities
- Slip resistance
- Stain resistance
- Water absorption

**Relevant publications**

*Good Practice Guide -Tiling.* BRANZ (now withdrawn)
www.branz.co.nz

**Relevant standards**

AS 3958 *Ceramic tiles*

Part 1 *Guide to the installation of ceramic tiles.*

Part 2 *Guide to the selection of a ceramic tiling system.*

AS 13006 *Ceramic tiles - Definitions, classification, characteristics and marking (ISO 13006:2018 (ED.3.0) MOD)*

AS ISO 13007.1 *Ceramic tiles - Grouts and adhesives - Terms, definitions and specifications for adhesives.*

AS ISO 10545.3 *Ceramic tiles – Determination of water absorption, apparent porosity, apparent relative density and bulk density.*

**Relevant worksections**

*0181 Adhesives, sealants and fasteners*
*0631 Ceramic tiling*
*0632 Stone and terrazzo tiling*

# CERAMIC TILE AND ADHESIVE SELECTION

## ADHESIVE BEDDING

The guidance in the table below modified from the now withdrawn BRANZ *Good Practice Guide – Tiling*, gives pros and cons of using different type of adhesives and nominates substrates suitable for each type. The table will assist in the selection of the correct type of adhesive but will not guarantee quality where the choice is price driven.

## ADHESIVE BEDDING TABLE

| Classification to AS ISO 13007.1 | Substrate | Description of adhesive | Comments |
|---|---|---|---|
| **C (Cementitious)** | - Cement render<br>- Sand/cement bed<br>- Fibre-cement only when the adhesive has a shear modulus of elasticity > 0.4 < 2.5 MPa<br>- Concrete<br>- Plasterboard | Mixture of hydraulic binding agents, aggregates and organic additives. Adhesive only to be mixed with water or liquid admix just before use. | - High bonding and compressive strength.<br>- Better adhesion and cohesion than unmodified cement-based adhesives.<br>- Use waterproofing additive in wet areas.<br>- Cure >10°.<br>- Some shrinkage on curing.<br>- May require adhesion enhancing additives for fixing vitrified or glass tiles.<br>Avoid:<br>- Plywood.<br>- Metal.<br>- Glazed surfaces. |
| **D (Dispersion)** | Absorbent surfaces as a thin bed. | Mixture of organic binding agent(s) in the form of an aqueous polymer dispersion, organic additives and mineral fillers. The mixture is supplied ready-to-use. Usually single part. | - Tile wetting not required.<br>- Bond strength varies between brands.<br>- Flexible, but varies between brands.<br>- Slow curing in cold conditions.<br>Check:<br>- Compatibility with membrane.<br>- Water resistance (wet areas).<br>- Requirement for priming.<br>Avoid:<br>- High impact or wheel loads.<br>- >140°C.<br>- Non-absorbent surfaces.<br>- Dense concrete.<br>- Between membrane and vitrified tiles. |
| **D or C** | Most backgrounds for vitreous and large tiles | Two-part polymer based (acrylic, SBR) organic adhesive. Formulations available vary widely. Selection and use to follow manufacturer's recommendations. | - Tough and flexible (varies by brand).<br>- Waterproof (cannot replace a membrane).<br>- High bond strength.<br>- Good chemical resistance.<br>- 100% coverage required.<br>- Formulations with cement less flexible.<br>- SBR modified adhesives better for cool climates and have longer open life.<br>- Difficult to clean off.<br>Check:<br>- Compatibility with membrane.<br>- Suitable for heavy foot traffic. |
| **R (Reaction resin)** | All backgrounds except fibre-cement.<br>Floors, residential and light duty.<br>Walls,<br>>18°C < 29°C. | Epoxy (100% solid), two or more component forms. Mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction. | - Experience required in epoxy use.<br>- Little or no shrinkage.<br>- Non-flexible. Will not tolerate background movement.<br>- Mix instructions must be strictly followed.<br>- Water cleanability varies with brands.<br>- Very good temperature and chemical resistance.<br>- Limited suitability with waterproofing with membrane. |

## CONCLUSION

A combination of factors, including location, end use and substrate, will affect which adhesive and ceramic tile is appropriate for any given situation. By reviewing these factors against the adhesive and tile performance criteria, suitable products can be selected.