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## TECHNICAL BULLETIN – TB230

# TILING ONTO CONCRETE BLOCKWORK

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### INTRODUCTION

Concrete block production initially involved hand-mixed and individually hand-pressed methods. Various sand blends were used, resulting in inconsistent sand-to-cement proportioning. These production methods produced blocks of inconsistent quality. There was variation in size due to moulds of different sizes used by different operators and different strengths due to inconsistent wet mixes. The degree of compaction achieved by the press operators was also a factor.

Block sizes have now become standardised due to automated production. Using consistent sand-to-cement ratios and water content has greatly improved the quality of the blocks. The wet mix can be used in multiple moulds, and all can be pressed together at a consistently controlled pressure. This forms the block shape before being loaded into an autoclave oven for at least 3 days of controlled curing. Upon removal from the autoclave, the blocks are stacked on pallets for short periods (3 - 4 weeks) before being used. Modern production rapidly produces a cement-based construction block of reliable quality and consistent size.

The improvement in the quality has led to the building industry accepting concrete block walls as suitable substrates for bonding tiles. AS3958 provides advice on such systems, which directs the concrete block walls to be rendered before bonding tiles with normal thin set adhesives. Installers and builders prefer to eliminate the render due to its considerable cost and the extra time. There are, however, significant benefits to be gained by rendering the concrete block walls.

A cement-based render (solid plaster) provides a flat surface of consistent porosity. All imperfections and voids in the surfaces of the blocks can be covered, as can the filled mortar joints. The mortar joints between blocks are slightly different in composition and porosity than the blocks. The render coat is used to even out these differences. If the render coat is eliminated, it imposes constraints on the bonding of tiles directly to the concrete block walls.

Direct tiling is feasible if the block walls are flat, with deviations of less than 3mm in 3m length, and the mortar lines are flush with the blocks. This becomes more critical with larger tiles. The surface flatness must be carefully considered when tiles are larger than 400mm on the edge.

For membranes, irregular surfaces, blowholes, and voids all create potential problems for film continuity, so any surface must be flat and free of voids and holes.

If these criteria are not met, surface rectification by rendering and patching is necessary. Tile adhesives cannot reliably be used as patching or build-up materials because of their internal shrinkage. The maximum thickness for most C-class adhesives is 6-10mm.

These issues are discussed in more detail in ARDEX Technical Bulletin TB249, which advises on rendering and smoothing walls.

### CONCRETE BLOCK WALL CONSTRUCTION

Concrete block walls are generally constructed on structural concrete substrates, with steel reinforcing starter rods connecting the wall to the substrate to prevent lateral movement. The reinforcing steel is continued through the concrete blocks, which are then “core filled” with a concrete mortar. This mortar fills the blocks to the top and strengthens the structural walls. Typical



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uses for concrete block walls include the perimeter and internal structural walls of buildings, free-standing external retaining walls, and/or dividing blade walls.

## PREPARATION PRIOR TO ADHESIVE FIXING OF TILES

Concrete blocks may have partially finished surfaces with a smooth, closed surface. This occurs as the formed pressed block is pushed out of the steel mould, leaving the surface as if it had been finished with a steel trowel. This surface must be sacrificed for the adhesive to bond properly. The recommended mechanical preparation methods include grinding, needle gun scabbling, or high-pressure water blasting.

The mechanical preparation of the blockwork aims to achieve an open-pored surface free of all contaminants. Vacuuming is recommended to remove any residual dust before proceeding.

## PRIMING

The prepared surface can be primed using one of the following primer systems:

1. Dry clean blockwork can be primed with ARDEX Multiprime or ARDEX P9 primers.
2. Damp blockwork can be primed with ARDEX WPM368 or ARDEX WPM300 (sand seeded) before applying tile adhesives.
3. Damp/new blockwork can be primed with the ARDEX WPM368 or ARDEX WPM300 before applying ARDEX Waterproofing membranes.

Ensure the selected primer is dry before proceeding.

## WATERPROOFING

The preferred ARDEX waterproofing membranes compatible with ARDEX tile adhesives are the ARDEX WPM002 two-part membrane and the ARDEX WPM155 Rapid Plus Premixed membrane. These are applied in two coats to achieve the minimum dry film thickness recommended on the product data sheets.

## TILING

ARDEX technical bulletins TB001 & TB148 provide guidelines for the adhesive fixing of large, heavy tiles to wall structures. The basic guideline is that tiles can be fixed with adhesive where the weight of the tile does not exceed 32kg/m<sup>2</sup> and/or the height of the tile finish is less than 3m. These guidelines apply to both the primed blockwork and the ARDEX Waterproofing membranes on the blockwork.

The nominated tile adhesives are all polymer-improved cement-based products with C2S1 ratings

- ARDEX X77+ E90
- ARDEX X18+E90
- ARDEX Abaflex
- ARDEX Optima
- ARDEX S28 + ARDEX E90 for dry internal applications

If **natural stone** tiles are to be fixed directly to the prepared blockwork, the above cement-based tile adhesives may be used if the natural stone is not 'moisture sensitive'. If the natural stone is 'moisture sensitive', ARDEX WA100 two-part epoxy adhesive would be recommended.

ARDEX Technical Bulletin TB010 discusses natural stone's moisture sensitivity. If required, ARDEX WA100 may also be used with glazed ceramic and porcelain tiles. Priming the prepared wall is not needed when using this adhesive.



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The mixed adhesive is spread on the wall surface using a notched trowel. AS3958 has guidelines regarding the minimum trowel size to use when fixing tiles of different sizes.

- 200 x 200mm tiles – 8mm notched trowel
- 250 x 250mm tiles – 10mm notched trowel
- 300 x 300mm tiles – 12mm notched trowel
- 400 x 400mm and larger size tiles – 12mm notched trowel + back buttering of tile.

The standard guidelines regarding minimum contact coverage of the tile adhesive to both the tile and the substrates are as follows:

- Internal residential walls - 65%
- Commercial and Industrial walls – 80%
- External Walls – 90%.

The recommended installation method is to apply the adhesive so the adhesive lines are parallel across the face of the wall. Each tile is placed into the adhesive and, while pressing firmly, is slid up and down across the width of one line. The objective is to create as much coverage as possible since this reduces the risk of efflorescence and other bonding problems.

This action collapses the adhesive lines and achieves full coverage between the back of the tile and the substrate. The adhesive should be at least 3mm thick behind the tiles. Allow the adhesive to dry for 24 hours before grouting.

## GROUTING

After the adhesive has dried for 24 hours, the tiles may be grouted with ARDEX grouts.

- ARDEX FG-8 sanded grout for joints 1 - 8mm.
- ARDEX FS-DD un-sanded grout for joints from 1 - 4mm.
- ARDEX WJ50 sanded grout for joints 5 - 50mm.

*These cement-based grouts may be mixed with ARDEX Grout Booster when increased adhesion to the tile and resistance to water penetration are required, thus reducing the potential for efflorescence.*

- ARDEX EG-15 epoxy grout may also be used in wall tile applications where an impervious grout is required. This is typically intended for internal commercial installations.

## MOVEMENT JOINTS

Movement joints are to be included in the tile finish based on the recommendations in AS3958. This normally means joints are to be located horizontally at every storey rise in the wall. Vertical application requires joints at not more than 3.5m intervals across the wall and around any penetration or fixture on the wall. Additional factors, such as black tiles on fully exposed walls, may require these movement joints at closer intervals to accommodate thermal movement. Movement joints must be raked free of adhesive and grout residues before filling with ARDEX ST silicone sealant. Backing rods may be required in joints between thick tiles to maintain the recommended ratio of the sealant thickness at half the joint width.

## EFFLORESCENCE



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Efflorescence is the migration of soluble salts (i.e., chemical compounds) from cement-based materials. These materials could be the concrete blocks, including the core fill concrete, cement mortars/renders, and cement-based tile adhesives/grouts. If these products are exposed to frequent periods of wetting and drying, soluble salts are leached out and brought to the surface. When the water evaporates, the salts are deposited, typically as calcium carbonate. It can occur on internal wall surfaces as well as on external walls provided there is source of moisture sufficient to dissolve these soluble salts.

The most effective way to control efflorescence (particularly on external walls) is to prevent moisture from entering the wall structure. Damp courses in the lower part of the wall control rising damp. Waterproofing membranes compatible with the tile adhesives can be applied to the wall surfaces. Additives (such as ARDEX WPM405) can be included in the render coats to reduce moisture penetration, although these are not as effective as an applied membrane.

The most frequent point of entry for moisture is at the tops of exposed walls, where there is no capping of any sort to prevent water penetration into the core filling of the blockwork. Due to incomplete filling, the core fill concrete may contain voids. Water may collect in these voids, so the efflorescence continues well after the last wetting of the wall by rainfall.

The final consideration is that the adhesive contact coverage must be continuous and not leave interconnecting voids where water can be trapped and moved behind the tiles. The adhesive **MUST** be notched horizontally along the face of the wall and not fanned or notched vertically.

**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**

Content review, change of company slogan and address

**DOCUMENT REVIEW REQUIRED**

36 months or whenever third-party suppliers change their recommendations.

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