THE TILE ASSOCIATION

serving the tile industry and its customers

Technical Advice Note 7

The design and installation of ceramic wall and floor tiling in food preparation, treatment and processing areas

in accordance with United Kingdom regulations and European directives relating to food hygiene

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October 2004

Wall and floor tiling in food preparation, treatment and processing areas

1. SCOPE

This specification defines the methods by which ceramic floor and wall tiles should be installed in premises where food is prepared, treated or processed. These may include kitchens, creameries, dairies, commercial food operations and all associated areas.

The Food Safety (General Food Hygiene) Regulations 1995, implementing the requirements of the EC Food Hygiene Directive require that floors, walls ceilings and surfaces (which come into contact with food) must be adequately maintained, easy to clean and, where necessary, disinfect. This will require the use of impervious, non-absorbent, washable and non-toxic materials. Floors should be slip-resistant and walls should be smooth up to a height appropriate for the operations.

The Regulations, however, allow the risks to food safety to be taken into account in the application of these requirements. In operations of low risk, materials with some absorption, for example, may be acceptable. This should be confirmed with the food hygiene authority at the design stage.

In addition the 'Materials in Contact with Food Regulations – 1987' require that surfaces in contact with food should not transfer any constituent which could either endanger human health or taint the food.

Ceramic tiles, installed and maintained in accordance with this specification, provide a durable, attractive, hard-wearing and slip-resistant surface which fulfils all of these requirements.

The TTA technical specification recommends methods for the installation of ceramic tiles using adhesives which conform to BS EN12004:2001 and grouts which conform to EN 13888:2002 in order to satisfy the due diligence requirements of food hygiene legislation.

This specification may also be appropriate for any type of installation where hygiene is important, e.g. food storage areas, canteens and restaurants, hospitals and industrial clean areas.

2. DESIGN

Each location within a particular installation should be given separate consideration at the design stage. Tiles should be selected to suit service conditions.

Vitrified ceramic floor tiles (Class BIa, BIb or AI) afford the best long term performance for commercial food preparation, treatment and processing areas. Slip-resistant tiles should be specified for wet service conditions, particularly where the floor will be subject to pedestrian traffic. Scientific evidence (Holah and Thorpe, 1990) has shown that it is the surface finish on a microscopic scale which is important in determining a material's cleanability and not surface finish on a visual scale. A slip-resistant tile is therefore as likely to be as cleanable as a smooth tile of the same composition (Holah, 1994).

Adequate falls should be incorporated in wet duty floor areas. Gradients between 1:80 and 1:40 are recommended. The direction of falls should be planned with the traffic flow in mind so that the traffic will move across rather than up and down the slope. The position of drainage channels and gulleys should be given special attention.

Ceramic tiles cannot be relied upon to provide a tanking membrane and vulnerable areas e.g. installations on suspended floors, may need special consideration, for example tanking.

Food preparation areas which come into contact with aggressive matter are discussed in British Standard BS5385:4. Frequently wet areas are also referred to in BS5385:4.

Wall and floor tiles should always be fully supported by a solid-bed of adhesive or mortar depending upon the fixing method used. Wall tiles should be light-coloured. All tile joints should be filled completely with an epoxy resin grout where they come into contact with food. It is recommended that white grout should be used for wall tiles and grey grout for floor tiles.

Certain wall tile areas, such as corners, pillars and those near to door openings, may be subjected to impact. These locations can be protected, for example, by securing metal angles, made of grade 316 stainless steel, over the tiling. Any gaps or crevices caused by securing these metal angles should be completely filled.

General design considerations are discussed in section 3 of BS 5385-1:1995, and BS 5385-3:1989.

The installation of wall and floor tiling in accordance with this specification requires efficient supervision and the employment of skilled operatives. Recommendations on the basic workmanship required are given in BS 8000-11.1:1989.

2.1 MOVEMENT JOINTS

Movement joints should be provided in accordance with BS 5385-1:1995 Clause 3.5 for walls, and in accordance with BS 5385-3:1989 clauses 19 and 23.6 for floors. Their type and location should be decided at the design stage. Each movement joint should be at least 6mm wide and of a depth at least equal to the thickness of tile and bedding. Movement joints should be impervious and the sealant well bonded to the sides of the joints.

It is important that any movement joints already incorporated in the structure should not be tiled over but be carried through to the face of the tiling.

In large areas of wall tiling movement joints should be provided at internal vertical corners and at 3-4.5m centres horizontally and vertically.

Movement joints should be provided around the perimeter of the floor and where floor tiles abut fixed machinery and structural fixtures such as columns, bases etc. Intermediate movement joints should be incorporated in large floor areas, as described in BS 5385-3: 1989, Clauses 19 and 23.6.

Stainless steel reinforced movement joints should be used for intermediate joints, especially where they are likely to be traversed by wheeled traffic.

Movement joints should be filled completely with an appropriate sealant approved for use in food preparation areas.

3 MATERIALS

3.1 Cement

Cement should comply with the requirements of BS EN 197-1:2000 or BS 4027:1996. Cement complying with the requirements of BS 5224: 1995 may be used for rendering.

3.2 Sand

Sand for rendering should comply with type A of Table 1 of BS 1199:1976.

Sands for cement:sand screeds and mortar beds should comply with BS EN13139, 0/4 category 1 and the recommendations of PD 6682-3.

3.3 Water

Water should be fresh and clean.

3.4 Tiles

Wall tiles to comply with BS 6431: Parts 2 : 6 or 9 (EN 121 or 176 or 159) or Classes BIa, BIb, BIII or AI complying with BS EN 14411.

Floor tiles to be unglazed and to comply with BS 6431 : Parts 2 or 6 (EN 121 or 176) or Classes BIa, BIb, or AI complying with BS EN14411 and should be selected to suit service conditions.

3.5 Adhesives

Adhesives are normally selected on the basis of their bonding power, colour, flexibility and setting time.

Cementitious adhesives should comply with the requirements of BS EN 12004:2001 for a C1/C2 adhesive. C1 adhesives are highly polymer-modified wall and floor tile adhesives for fixing tiles with a water absorption 0.5% or less. They also may be specified where limited background vibration or movement can be expected or where the substrate is of high density with low suction.

Where background movement or vibration is likely to occur deformable adhesives conforming to S1 or S2 of BS EN 12002 :2002 should be specified.

Water-based polymer dispersions may be added to standard, polymer modified cement-based adhesives to improve their flexural properties, reduce their water permeability and enhance their bond strength, particularly to low porosity substrates and fully vitrified tiles.

3.6 Bonding Agent

A synthetic polymer is recommended for use as a water-resistant additive to cement:sand mortars and to provide a bonding slurry when mixed with cement prior to the application of screeds and renders.

3.7 Grouts

Floors and walls that do not come into contact with food do not require the use of epoxy grout. A cement based grout classified as CG1 or CG2 conforming to BS EN 13888 may be used.

Epoxide grouts, classified as RG and conforming to the requirements of BS EN 13888:2002 provide smooth, impervious grout joints which are chemically resistant, easy to maintain in a sterile condition, and which do not taint food. Consideration should also be given to the use of a grout containing an antibacterial agent. They should meet the requirements of the Food Hygiene Regulations and have been approved for contact with food.

3.8 Sealant

Sealants for movement joints should be flexible and inert and should meet the requirements of the Food Hygiene Regulations.

4 INSTALLATION

4.1 Walls

4.1.1 Preparation

Walls should be of clay brickwork, concrete or lightweight block construction; see BS 5385-1:1995 clause 3.1. Ideally a cement:sand rendering should be applied as an intermediate substrate to provide the necessary measure of suction and accuracy. Walls should receive preparation in accordance with BS 5385-1:1995, clause 3.2 and should have been allowed to dry out for at least 6 weeks before any rendering is applied or before tiles are fixed direct.

4.1.2 Rendering

A 1:3 or 4 cement:sand mix should be used for the rendering, see BS 5385-1:1995 clause 3.3.

To improve adhesion between rendering and background**,** a slurry mixture of water resistant bonding agent and Portland cement (1:2 by weight) can be applied over the background immediately before applying the rendering.

The surface of the rendering should be left with a wood float finish. The rendering should be completed at least 14 days before tiling begins and, in addition, the prepared surface should be dry to receive the tiles.

4.1.3 Direct Fixing

If it is preferred to fix tiles direct to the structural wall, ie without prior rendering, this may necessitate the use of a thick-bed adhesive. The only preparation required is to ensure that the surface to be tiled is free from dust, oil or other form of contamination.

4.1.4 Adhesive Fixing

Whichever adhesive is used, solid-bed fixing is essential. This requires that the whole of the back of the tile should be in contact with the adhesive with no voids behind. Special solid-bed trowels are available to achieve this.

After spreading the adhesive on the surface the open time will vary according to atmospheric conditions but is usually about 20 minutes. Tiles should be fixed in position before surface drying of the adhesive occurs. Therefore, it is important not to spread more adhesive than can be covered with tiles within this period.

It is sound practice to remove tiles occasionally as work proceeds to check that complete contact is being made with the adhesive. The tiles should be buttered with fresh material and refixed.

Minimum joint widths of approximately 1-2mm should be left around every wall tile. Tiles can be adjusted up to 5 minutes after fixing to align the joints.

4.2 Floors

4.2.1 Preparation

Whatever the type of base on which tiles are to be laid, it is essential that the general principles of floor tile laying, described in British Standard Code of Practice BS 5385-3:1989 be observed. A suitable damp proof layer should be incorporated in the construction, and new concrete floors should be allowed to mature for at least 6 weeks before screeding or fixing commences.

4.2.2 Screeding

4.2.2.1 Cement:Sand Mortar Screed

A bonded 1:3 or 4 Portland cement:sand mortar screed should be laid in accordance with Appendix C of BS 5385-3:1989. The minimum thickness of the screed at any point should be 25mm. The design thickness should be 40mm.

To improve adhesion between screed and concrete base, a 2 parts Portland cement and 1 part water resistant bonding agent/OPC cement slurry, by weight, can be applied over the base immediately before laying the screed.

This screed should then be left for at least 3 weeks before tile fixing is commenced and in addition should be dry to receive the tiles.

4.2.2.2 Calcium Sulfate based Screed

Calcium Sulfate based screed are not suitable for damp, frequently wet or saturated areas such as commercial kitchens.

Refer to the Tile Association document “Tiling to Calcium Sulfate based Screeds” for further information on this topic.

4.2.4 Tile Fixing

4.2.4.1 Adhesive Fixing

Ceramic floor tiles can be fixed directly to the base using C2 classified cementitious adhesives in accordance with BS 5385-3:1989, clause 24.4 and selected to suit substrate, tiles and service conditions. It is essential that solid-bed fixing is achieved i.e. no voids remain beneath the tiles.

After spreading the adhesive on the surface the open time will vary according to atmospheric conditions but is normally approximately 20 minutes.

Tiles should be fixed in position before surface drying of the adhesive occurs. Therefore, it is important not to spread more adhesive than can be covered with tiles within this period.

It is sound practice to remove tiles occasionally as work proceeds to check that complete contact is being made with the adhesive. The tiles should be buttered with fresh material and re-fixed.

Joints between ceramic tiles should be sufficiently wide to ensure that they can be filled with grout. Joints wider than 6 mm between floor tiles may not provide sufficient protection to the edges of the tiles.

4.2.4.2 Cement:Sand Mortar

Ceramic floor tiles appropriate for fixing cement:sand mortar can be fixed in accordance with BS5385-3:1989 and BS5385-4:1992.

The bedding mix should not be stronger than 1 part Portand cement and 3 parts sand, by volume, nor weaker than 1 part Portland cement and 4 parts sand, by volume.

The thickness of the bed should be 15mm minimum and 20 mm maximum.

A thin layer of a cement-based adhesive can be applied to the backs of tiles immediately before laying in cement:sand mortar, thereby increasing the bond strength about 3 or 4 times.

5 GROUTING

5.1 Walls and Floors

It is essential to allow time for the adhesive to set before grouting is carried out so as to avoid any disturbance of the tiles.

The tiles should have been fixed for at least 24 hours before the joints are grouted; on low porosity backgrounds/bases at least 3 days should be allowed. If a rapid setting adhesive has been used, however, joints can be grouted after 2-5 hours. Any surplus adhesive remaining on the face of the tiles or between the tile joints, after fixing, should be removed before it sets.

During this time the tiling should be protected.

Grouting of wall and floor tiles which come into contact with food should be carried out using a suitable epoxy grout as defined by the requirements of BS EN 13888:2002. The joints should be completely filled. Contact between food and tiling should be avoided for at least 7 days.

6. CLEANING AND MAINTENANCE

Ceramic tiles are easy to clean and maintain in a hygienic condition in accordance with BS 5385-3:1989. As with all types of floor and wall surfaces it is important to follow the correct cleaning regime to maintain hygiene.

Wall and floor surfaces in food preparation areas should be maintained in good condition. Surfaces should be capable of refurbishment in locations where heavy traffic or wear could cause damage. Ceramic tiles are readily replaced locally to restore the tiling finish to its original specification.

The appropriate cleaning and maintenance regime should form part of the tiling specification.

Refer to the TTA document 'The Cleaning of Ceramic Tiles' for guidance on correct methodology.

7. REFERENCE DOCUMENTS

BRITISH STANDARDS INSTITUTION:

BS EN 197-1: 2000: Specification for Portland Cement.
BS EN 13139:2002 Specification for aggregates from natural sources for concrete.
BS 1199 and 1200: 1976: Specifications for building sands from natural sources + AMD 4510, AMD 4834, AMD 5126.
BS 4027: 1996: Specification for sulphate-resisting Portland cement.
BS 5224: 1995: Specification for masonry cement + AMD 2614.
BS 5385: Wall and floor tiling
- Part 1: Code of Practice for the design and installation of internal ceramic wall tiling and mosaics in normal conditions.
- Part 3: Code of Practice for the design and installation of ceramic floor tiles and mosaics + AMD 7059.
- Part 4: Code of Practice for ceramic tiling and mosaics in specific conditions.

BS 6431: Ceramic floor and wall tiles
- Part 2: 1984 (EN121): Specification for extruded ceramic tiles with a low water absorption (E<3%). Group A1.
- Part 6: 1984 (EN176): Specification for dust-pressed ceramic tiles with a low water absorption (E<3%). Group B1.
- Part 9: 1984 (EN159): Specification for dust-pressed ceramic tiles with a water absorption of E>10%. Group B111.

BS 8000: Workmanship on Building Sites
- Part 11: 1989 Code of Practice for wall and floor tiling : Section 11.1 Ceramic tiles, terrazzo tiles and mosaics.

BS EN 12004: 2001: Adhesives for tiles – Definitions and specifications
BS EN 13888: 2002: Grouts for tiles – Definitions and specifications
BS EN 14411: 2003: Ceramic tiles
- Annex A: Extruded ceramic tiles Group A1
- Annex G: Dry-pressed ceramic tiles with low water absorption Group BIa
- Annex H: Dry-pressed ceramic tiles with low water absorption Group Bib
- Annex L: Dry-pressed ceramic tiles Group BIII

BS EN ISO 10545:1997 Ceramic tiles

THE FOOD SAFETY (GENERAL FOOD HYGIENE) REGULATIONS 1995
Statutory Instrument 1995 No. 1763

THE MATERIALS AND ARTICLES IN CONTACT WITH FOOD REGULATIONS 1987
Statutory Instrument 1995 No.1523

EUROPEAN COMMUNITIES COUNCIL DIRECTIVE 93/43/EEC
On 14 June 1993 on the hygiene of foodstuffs. Official Journal of the European Communities No. L175/1, 19.7.93

CAMPDEN & CHORLEYWOOD FOOD RESEARCH ASSOCIATION
Holah. J. T. and Thorpe, R. H. (1990).
Cleanability in relation to bacterial retention on unused and abraded domestic sink materials.
Journal of Applied Bacteriology 69, 599-608
Holah, J. T. (1994). Hygiene and safety in the food industry: compromise or complimentary? Seminar at RAPRA Technology Ltd, Shropshire, 29 September 1994
Taylor, J. H. (1995). The Cleanability of Tiled Surfaces Compared with Generic Materials in New Condition.
Taylor, J. H. and Holah, J. T. (In preparation). A comparative evaluation with respect to the bacterial cleanability of a range of wall and floor surface materials used in the food industry. Journal of Applied Bacteriology.

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Tiling to Calcium Sulfate based Screeds, published February 2002