BS 8000-11:2011

BSI Standards Publication

Workmanship on building sites –

Part 11: Internal and external wall and floor tiling – Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics – Code of practice

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 26, an inside back cover and a back cover.

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Foreword

Publishing information

This part of BS 8000 is published by BSI and came into effect on 31 January 2011. It was prepared by Technical Committee B/539, *Ceramic tiles and other rigid tiling*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 8000 supersedes BS 8000-11.1:1989 and BS 8000-11.2:1989, which are withdrawn.

Relationship with other publications

BS 8000 is published in the following parts:

- *Part 1: Code of practice for excavation and filling;*
- *Part 2: Code of practice for concrete work;*
- *Part 3: Code of practice for masonry;*
- *Part 4: Code of practice for waterproofing;*
- *Part 5: Code of practice for carpentry, joinery and general fixings;*
- *Part 6: Code of practice for roof, slate, tile covering and cladding;*
- *Part 7: Code of practice for glazing;*
- *Part 8: Code of practice for plasterboard partitions and dry linings;*
- *Part 9: Cementitious levelling screeds and wearing screeds – Code of practice;*
- *Part 10: Code of practice for plastering and rendering;* [1)]
- *Part 11: Internal and external wall and floor tiling – Ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics – Code of practice;*
- *Part 12: Code of practice for decorative wallcoverings and painting;*
- *Part 13: Code of practice for above ground drainage and sanitary appliances;*
- *Part 14: Code of practice for below ground drainage;*
- *Part 15: Code of practice for hot and cold water services (domestic scale);*
- *Part 16: Code of practice for sealing joints in buildings using sealants.*

The content of BS 8000-11 is consistent with that of BS 5385.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- the exclusion of recommendations on using cement:sand mortar (not semi-dry mix) over a separating layer;
- updated references to take account of the new harmonized European product specifications;

[1)] BS 8000-10 has been withdrawn.

- the specifications for sands (fine aggregates) are now provided by European Standards for the specification of aggregates. Throughout this standard, the term commonly used in the UK building and tiling industry, "sand", is interchangeable with the term "fine aggregate", used in the European specifications;
- alignment with the revised versions of BS 5385 (all parts).

Use of this document

The purpose of this code of practice is to encourage good workmanship by providing:

- the most frequently required recommendations on workmanship for building work in a readily available and convenient form to those working on site;
- assistance in the preparation and administration of contracts;
- recommendations on how designers' requirements for workmanship can be satisfactorily realized;
- guidance on good practice for supervision and for training purposes;

  NOTE This guidance is not intended to supplant the normal training in craft skills.
- a reference for quality of workmanship;
- recognition that design, procurement and project information are likely to be conducive to good workmanship.

During the preparation of this Code of Practice the Construction Project Information Committee (CPIC) produced a *Common Arrangement of Work Sections (CAWS) for Building Works* [1]. This Code of Practice has generally been arranged in accordance with the *Common Arrangement* so that it can be used easily with project specifications and bills of quantities using CAWS.

As a Code of Practice, this part of BS 8000 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 8000 is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 8000 gives recommendations on basic workmanship on building sites, both commercial and domestic, and covers those tasks that are frequently carried out in relation to internal/external wall and floor tiling and slabs.

It makes recommendations and gives guidance on basic workmanship for conventional types of building work. The recommendations given are not necessarily comprehensive; particular project documents, e.g. project specifications, might need to cover particular recommendations not dealt with by this code of practice.

The recommendations given in this British Standard apply to the fixing of ceramic and agglomerated stone tiles, natural stone and terrazzo tiles and slabs, and mosaics to walls and floors using adhesive and mortar. BS EN 12440 sets out requirements for natural stone used in construction. Design aspects of wall and floor tiling are given in BS 5385. Design, installation and maintenance of natural stone cladding and lining are dealt with in BS 8298. Harmonized European product specifications are now available for natural stone tiles (BS EN 12057) and slabs (BS EN 12058), ceramic tiles (BS EN 14411), agglomerated stone (BS EN 15285) and adhesives (BS EN 12004).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5385-1:2009, *Wall and floor tiling – Part 1: Design and installation of ceramic, natural stone and mosaic wall tiling in normal internal conditions – Code of practice*

BS 5385-2, *Wall and floor tiling – Part 2: Design and installation of external ceramic and mosaic wall tiling in normal conditions – Code of practice*

BS 5385-3, *Wall and floor tiling – Part 3: Design and installation of internal and external ceramic floor tiles and mosaics in normal conditions – Code of practice*

BS 5385-4, *Wall and floor tiling – Part 4: Design and installation of ceramic and mosaic tiling in special conditions – Code of practice*

BS 5385-5, *Wall and floor tiling – Part 5: Design and installation of terrazzo, natural stone and agglomerated stone tile and slab flooring – Code of practice*

BS 6100-6:2008, *Building and civil engineering – Vocabulary – Part 6: Construction parts*

BS 8000 (all parts), *Workmanship on building sites*

BS 8298, *Code of practice for design and installation of natural stone cladding and lining*

BS EN 12004:2007, *Adhesives for tiles – Requirements, evaluation of conformity, classification and designation*

BS EN 12440, *Natural stone – Denomination criteria*

BS EN 12057, *Natural stone products – Modular tiles – Requirements*

BS EN 12058, *Natural stone products – Slabs for floors and stairs – Requirements*

BS EN 13888, *Grout for tiles – Requirements, evaluation of conformity, classification and designation*

BS EN 14411:2006, *Ceramic tiles – Definitions, classification, characteristics and marking*

BS EN 15285:2008, *Agglomerated stone – Modular tiles for flooring and stairs (internal and external)*

3 Materials – handling and preparation

3.1 Checking materials and components

3.1.1 On delivery

The delivery of materials and components should be arranged to minimize handling. Precautions should be taken to guard against the possibility of damage.

Delivery tickets and certificates should be checked against the specification; marks and labels should be examined and the condition of materials and components should be inspected. Materials should be within their storage life. If necessary, the supplier should be referred to immediately.

3.1.2 Before use

Before using materials and components the following checks should be made.

a) Materials and components should be clean, undamaged and sufficient for the task in hand.

b) Tile sizes, thicknesses and colours should be as specified.

c) For mosaics bonded to synthetic strips or other types of backing material, the glue should be confined to the immediate area of the mesh or strips and not spread over the backs of the tesserae.

NOTE 1 If the mesh and glue cover more than 25% of the back of the tesserae they could interfere with adhesion between the mosaic and the mortar or adhesive bed unless the glue and the mortar or adhesive are compatible.

d) With large tiles and slabs any reinforcing mesh should be well adhered to the underside, and the mesh and adhesive should not obscure more than 25% of the underside of the tile or slab unless they are mechanically fixed.

e) Adhesives, grouts, primers and sealants should be as specified and within their storage life, and should be suitable for the conditions to which the tiling is likely to be subjected when in service. The background should be as specified and thus compatible with the specified primers and adhesives.

f) Sand should be as specified.

g) Cement should be as specified and within its storage life.

h) Lime should be free from lumps.

NOTE 2 It is the responsibility of users, where relevant, to obtain material safety data sheets and observe the suppliers' recommendations for transportation, storage, use and disposal of materials.

3.2 Handling and site storage of materials and components

3.2.1 Tiles, slabs and mosaics

Tiles, slabs and mosaics should be handled with care to avoid breakage and chipping.

These materials should be stored in their original packaging in a clean, dry, frost-free (if necessary) lockable storage to avoid excessive handling, theft or damage. They should be stacked on a firm, level base. On solid floors these products should be stacked on a sheet of polyethylene, pallets or timber to prevent any rising damp affecting the tiles and packaging.

NOTE Damp packaging might cause staining and other damage to tiles.

Tiles and slabs should be transported from store in their original packaging to the location where they are to be fixed. A check should be made to ensure that the weight and size of the component materials is such that they can be safely handled by available manual or mechanical means.

3.2.2 Cement, lime, adhesives and jointing materials

Cement, lime, adhesives and jointing materials should be handled with care to avoid damage to packaging. Where cement, lime, adhesives or jointing materials are to be kept for later use, they should be:

a) stored in a dry, weatherproof, frost-free enclosed shed or building with a dry floor. If the floor is concrete, they should be stored on a timber platform, e.g. pallet;

b) kept in separate stacks for different materials;

c) stacked away from walls and covered with tarpaulin or polyethylene sheet;

d) stacked so that consignments can be used in the order of delivery.

Powder materials should be checked for deterioration when taking them out of storage and discarded if they contain lumps.

Adhesives and liquid admixtures should not be subjected to temperatures outside the tolerance range given in the manufacturer's instructions; any that have been subjected to such temperatures should be discarded.

Small quantities of materials for immediate use, which are not stored in a shed or building, should be stood on a timber platform well clear of the ground, e.g. on a pallet, and covered with tarpaulin or polyethylene so that all the bags and containers are wholly protected from adverse climatic conditions, e.g. wind, rain and frost.

NOTE Even if materials in powder form are protected from rain, moisture in the air can gradually cause their deterioration. Even in good conditions cement-based materials will go lumpy if left for periods in excess of the product shelf life and consequently their strength will decrease.

3.2.3 Sand

Sand should be stored in separate stock piles on hard, clean bases which permit free drainage. All stocks of sand should be protected from rain, frost and any form of contamination by covering them with tarpaulin or polyethylene.

Sand in packs or containers should be handled with care to avoid damage to packaging.

3.2.4 Flammable materials

Flammable materials should be handled in accordance with the manufacturer's instructions.

If the total quantity of flammable materials exceeds 50 L at any one time, the material should be stored in either:

a) metal lockers;

b) a detached store of fire-resistant construction;

c) the open air, away from buildings and covered over with fire-resistant material to provide protection from weather; or

d) a well ventilated room of fire-resistant construction.

"NO SMOKING" signs should be displayed.

NOTE For the storage of highly flammable liquids, attention is drawn to the Highly Flammable and Liquefied Petroleum Gases Regulations 1972 [2].

3.3 Preparation of work

*COMMENTARY ON **3.3***
Unless specifically stated otherwise, all these recommendations apply equally to internal and external work.

3.3.1 Programme

All parties should be consulted to ensure that sufficient time is allowed for fixing tiling and that, for floors, the need to prevent traffic on newly tiled areas does not disrupt the programme for other work (see **5.1.2.1**).

3.3.2 Pipes, conduits and similar items

Installation work should not commence until all conduits, pipes, electrical cables, electrical boxes, etc. that lie beneath the tile bed have been fixed securely in position and any supplementary work is complete.

3.3.3 Conditions in building

Internal tiling should not be started unless the part of the building where tiling is to be fixed is weathertight.

3.3.4 Cold weather working

Installation work should not be carried out with cement:sand or cement-based adhesives when the air temperature is at or below 5 °C and falling, or unless it is at least 3 °C and rising, or while any materials or substrate are frozen.

For internal tiling, the air temperature should be maintained at a minimum of 5 °C during construction, and for four or five days after tile fixing is complete to prevent freezing.

Unless mechanical fixing is being used, external work should be covered immediately to exclude frost.

Tiling work should not be carried out with reaction resin adhesives and primers (including aqueous dispersion-based primers) when the air and surface temperatures are below 10 °C, unless the manufacturer's instructions recommend otherwise.

The manufacturer's instructions should be followed for each product, as different proprietary products have different working temperatures. Setting and curing times can be significantly longer at lower temperatures, and this should also be taken into consideration.

3.3.5 Lighting on site

Where work is carried out in artificial light, lighting should be adequate and, where practicable, the direction and intensity of temporary lighting should be similar to that of the final permanent lighting.

NOTE Individual tiles which are very slightly out of planarity (lipped) with the general surface might show up badly when lighting falls from a different direction.

3.4 Preparation of materials and components

3.4.1 Machine mixing cement:sand mortar for bedding

When mixing cement:sand mortar by machine, the following steps should be taken.

a) Where possible use a mixer of forced-action type, especially when mixing semi-dry ingredients.

NOTE Free-fall drum mixers have been found to produce inconsistent mixing of semi-dry materials.

b) Batch materials by weight unless otherwise instructed.

c) If batching by volume, measure the materials with gauge boxes or other suitable containers of known volume. Base the measurements on a 25 kg bag of cement with a volume of 17.5 L.

d) Mix materials well, until the consistency is uniform.

e) Always obtain agreement from the project engineer before pumping a floor screed as it might be necessary to alter the mix proportions.

3.4.2 Hand mixing cement:sand mortar for bedding

When mixing cement:sand mortar by hand, the following steps should be taken.

a) Batch materials by weight unless otherwise instructed.

b) If batching by volume measure the materials with the gauge boxes or other suitable containers of known volume. Base the measurements on a 25 kg bag of cement having a volume of 17.5 L.

c) Mix materials dry to a uniform colour before adding water. Add water to achieve the required workability. After water has been added mix until the consistency is uniform.

3.4.3 Preparing admixtures

Admixtures should not be used in mortars, adhesives or grouts unless specified. Admixtures should be prepared and used in accordance with the manufacturer's instructions.

3.4.4 Preparing pigments

If pigments are required to be incorporated into jointing or grouting materials, this should be done in strict accordance with the manufacturer's instructions.

NOTE This procedure is only commonly used for terrazzo tiling to give a close match on site, as the accepted procedure for other types of tile, where coloured grouts are required, is to use proprietary pigmented grouts which obviate the need for adding pigment on site.

3.4.5 Preparing adhesives

Pre-blended powder adhesives and reaction resin adhesives should be prepared in accordance with the manufacturer's instructions.

NOTE Mixing instructions vary with different products so that no specific guidance can be given.

3.4.6 Retempering

Retempering of any cement-based materials by adding additional water should not be attempted. Any materials which have begun to set should be discarded.

3.4.7 Reaction resin adhesives and sealers containing organic solvents

When using these products it should be ensured that:

a) there is adequate ventilation of the working area to dilute and remove the fumes;

b) no naked flames are allowed in or near the working area;

c) containers are kept closed when not in use.

3.5 Preparation of backgrounds (walls) and bases (floors)

3.5.1 Condition

It should be checked that:

a) backgrounds and bases are free from contamination and loose material;

b) wall backgrounds are dry, sound and free from areas that sound hollow when tapped;

c) gypsum plastered backgrounds have been subjected to continuous air drying for at least 4 weeks before tiling is due to start;

d) cement:sand-rendered backgrounds have been subjected to continuous air drying for at least 2 weeks before tiling is due to start;

e) concrete backgrounds and bases have been subjected to continuous air drying for at least 6 weeks after curing before screeding, rendering or tiling;

f) cement:sand screeds have been subjected to 7 days curing followed by continuous air drying for at least 2 weeks.

If a substrate is unsatisfactory in any respect tiling should not commence until the fault has been rectified.

Information should be obtained on site about the age of the backgrounds; longer periods of drying and curing are necessary in damp conditions.

3.5.2 Accuracy of backgrounds (walls)

Accuracy of the backgrounds should be checked before wall tiling begins to see that they are within the tolerances recommended here.

When the wall is checked with a 2 m straightedge laid on the surface, any gap under the straightedge between points of contact should not be greater than either:

a) 3 mm for tiling to be fixed with adhesive; or

b) 6 mm for tiling to be fixed in cement:sand mortar.

If the accuracy of a substrate is unsatisfactory, tiling should not commence and instructions should be obtained from the contract administrator (CA).

NOTE Where adhesives are used, there is limited possibility of adjustment by increasing or decreasing their thickness during fixing.

3.5.3 Accuracy of bases (floors)

The base should be checked before installation begins to ensure that the specified accuracy of the finished surface can be achieved and the recommended thickness of specified adhesive or mortar can be applied.

When the base is checked with a 2 m straightedge laid on the surface and resting under its own weight any gap under the straightedge between points of contact should not be greater than:

a) 3 mm for tiles and slabs in an adhesive [surface regularity 1 (SR1)];

b) 5 mm for tiles and slabs bedded in a cement:sand mortar [surface regularity 2 (SR2)]; and

c) 10 mm for tiles and slabs bedded in a cement:sand semi-dry mix [surface regularity 3 (SR3)].

For floors where a fall is required the substrates should have the correct falls.

Any variations in thickness of the bed should remain within the thickness deviations of the specified bedding method. If the accuracy of a substrate is unsatisfactory installation should not commence and instructions should be obtained from the CA.

NOTE It is good practice to have a uniform bed thickness beneath the tiles. Where the allowable deviations in the bed thickness are small, inaccuracies in the substrate are likely to be repeated in the finished surface of the installation.

4 Fixing wall and floor tiles, slabs and mosaics

4.1 General

*COMMENTARY ON CLAUSE **4***
Unless specifically stated otherwise, all the recommendations in this clause apply equally to internal and external work.

4.1.1 Order of work

4.1.1.1 External wall tiling

For newly constructed buildings fixing should commence at the highest floor level and worked downwards.

NOTE 1 For extruded tiles it might be necessary at each floor level to fix upwards from a horizontal batten.

NOTE 2 Fixing tiling from the highest part and working downwards prevents contamination of completed tiling from work above, allows quicker dismantling of scaffolding and delays fixing on lower floor levels of buildings which might be subject to creep.

NOTE 3 In refurbishment work the tiling can be done from lower floor levels upwards provided cleanliness can be maintained.

4.1.1.2 Mosaics

Sheets of mosaic should be fixed from the top of the wall downwards.

4.2 Cleaning

Backgrounds and bases should be thoroughly cleaned, e.g. by brushing and/or vacuuming, and all rubbish, debris and dirt removed.

4.3 Shade consistency and colour

Before and during fixing, any colour and shade variations should be checked to see if they are acceptable. Variegated tiles, both ceramic and natural stone, should be thoroughly mixed unless otherwise specified.

NOTE This might not be possible for natural stone.

4.4 Damaged tiles and slabs

Any tiles or slabs that are chipped or cracked should be discarded or, if appropriate, the undamaged parts used.

4.5 Cutting tiles and slabs

When cutting tiles and slabs, the following steps should be taken.

a) Cut neatly and accurately in order to maintain general joint width along cut edges.

b) Cut accurately in order to fit neatly around pipes, electrical boxes, etc.

NOTE Specialist tools might be required depending upon the nature of the materials being cut.

4.6 Coved tile skirtings

When the skirting and floor tiles are the same size, coved tile skirtings should be fixed to align with the joints in floors, unless otherwise specified by the designer.

4.7 Setting out

4.7.1 Setting out tiling for walls

When setting out tiling for walls, the following steps should be taken.

a) Check whether the width of joints is specified and allow for any production tolerances.

b) Set out the tiling with joints of consistent width, ensuring they are level and plumb or, where required, parallel with architectural features that limit the extent of the tiling.

NOTE 1 Joints for ceramic tiles are normally at least 1.5 mm wide. For smooth natural stone tiles joints are normally at least 2 mm and for textured tiles between 6 mm and 10 mm.

c) Ensure that where adjoining tile surfaces are in different planes the joints are aligned from one surface to the next.

d) Avoid cut courses as far as practicable. Where it is necessary to cut a course, set out the tiling so that the cut course is as wide as possible and in the least prominent position available.

e) If it is necessary to make a raking cut at floor and/or ceiling level because either or both are not level, or because a feature that forms a boundary to an area of tiling is out of line, ensure as far as practicable that the cut will fall in one course.

f) Ensure movement joints are correctly positioned.

NOTE 2 Tiling is applied to surfaces other than walls, e.g. to sills, worktops, ceilings, etc. The need to achieve a good appearance means adopting, in suitably modified form, the recommendations for setting out tiling on walls.

NOTE 3 The appearance of very narrow tiles in a raking row is undesirable.

4.7.2 Setting out tiles and slabs for floors

The following steps should be taken when setting out the floor covering.

a) Establish that there is a datum level for the finished floor;

b) If fixing in cement:sand mortar, control the overall level of the finished floor by means of a series of spot levels.

c) Check whether the width of joints is specified and allow for any production tolerances

NOTE Joints for ceramic floor tiles are usually at least 3 mm wide, but can be increased depending upon the material being fixed. For smooth natural stone tiles and slabs joints are normally at least 2 mm and for textured tiles and slabs between 6 mm and 10 mm.

d) Set out the tiles or slabs from the centre of the room in straight lines parallel to the axes of the rooms. For irregular shaped rooms obtain instructions from the CA.

e) Where appropriate, line up flooring joints with joints in skirting tiles (see **4.6**).

f) Avoid cutting tiles or slabs as far as practicable. If cutting cannot be avoided locate cut pieces where they will be least noticeable.

g) Ensure movement joints are correctly positioned.

4.7.3 Setting out mosaics

When setting out mosaic tiling, the following steps should be taken.

a) Set out mosaics with straight joints in both directions between sheets, with the joints between sheets the same width as joints between the tesserae. Ensure that on walls the joints are horizontal and vertical, as appropriate, and on other surfaces are parallel with architectural features that limit the extent of the mosaic finish. Line up joints in adjoining surfaces.

b) Where it is necessary to cut sheets to exact sizes ensure that, as far as practicable, cut edges are positioned in internal angles, behind fittings or in some inconspicuous location.

c) Do not attempt to adjust joint widths between sheets after the bed has partially set.

d) Start fixing to walls at the top of the area to be covered.

e) Fix sheets with uncut mosaics at salient corners and against any prominent features, as far as practicable.

f) Ensure movement joints are correctly positioned.

4.8 Accuracy of finished tiled and slabbed surfaces

Tiles and slabs should be fixed so that finished surfaces are within the following tolerances.

a) For both wall and floor finished surfaces, the surface should be true such that, when checked with a 2 m straightedge with 3 mm thick feet at each end, the straightedge should not be obstructed by the tiles and no gap should be greater than 6 mm;

b) There should be no appreciable difference in level across joints (commonly called "lipping") and the maximum deviation between tile surfaces either side of a joint including movement joints should be as follows:

- for joints less than 6 mm wide: 1 mm;
- for joints 6 mm or more wide: 2 mm.

NOTE For natural stone in domestic applications, lips between stones might not be acceptable and tighter tolerances might be required.

4.9 Fixing tiles

4.9.1 Bedding tiles and slabs in adhesives for walls and floors

4.9.1.1 Thickness of adhesive

The adhesive should be applied in accordance with the manufacturer's instructions to obtain the required thickness.

4.9.1.2 Surface dryness

Background surfaces and tiles should not be wetted when fixing with adhesives of any sort.

4.9.1.3 Priming background

The background surface should be primed if and as required by the adhesive manufacturer's instructions.

4.9.1.4 Timing of bedding tiles

When bedding tiles, the following steps should be taken.

a) Do not spread more adhesive than can be covered with tiles before the surface of the adhesive begins to dry or form a skin.

b) Follow the manufacturer's instructions regarding the open time of adhesive films.

NOTE In practice, the open time is likely to be 20 min to 30 min at most. Although the adhesive might remain plastic after this time its adhesive property is likely to be inadequate. If moisture penetrates through the joints and collects in voids, the tiling might fail and/or other problems caused by free moisture entering the structure might occur.

4.9.1.5 Cleaning surface of tiling and slabbing

Adhesive should be cleaned from the surface of tiles and slabs as soon as practicable before it sets. Care should be taken not to disturb the tiles.

4.9.1.6 Internal wall tiling: notched trowelling method

When fixing tiles to internal walls using the notched towelling method, the following steps should be taken.

a) Spread the adhesive on the background to the thickness given in the manufacturer's instructions.

b) Rib the surface of the adhesive in one direction only using a notched trowel to the adhesive manufacturer's instructions.

c) Press tiles on to the adhesive surface with a twisting, sliding action.

d) Place all tiles with regular and straight joints not less than 1 mm wide and tap them firmly into position.

NOTE 1 For larger or thicker tiles wider joints might be required.

*NOTE 2 Where it is essential to have no voids behind tiles the notched trowelling method is not suitable unless it is used in conjunction with the buttering method (see **4.9.1.7**).*

4.9.1.7 Wall tiling: combined notched trowelling and buttering method

When fixing wall tiling using the combined notched trowelling and buttering method, the following steps should be taken.

a) Use a notched trowel in accordance with the adhesive manufacturer's instructions.

b) Spread the adhesive on the background according to the manufacturer's instructions.

c) Comb the bed with a notched trowel to provide a ribbed adhesive bed.

d) Spread the adhesive uniformly over the back of each tile, ensuring that the whole surface is covered.

e) Place all tiles with regular and straight joints not less than 1 mm wide and tap them firmly into position.

NOTE 1 For larger or thicker tiles wider joints might be required.

f) Ensure that the finished thickness of the adhesive bed does not exceed the maximum thickness given in the manufacturer's instructions.

NOTE 2 This method is used where it is essential to prevent moisture collecting in voids behind the tiles, e.g. externally. The time during which adhesive remains workable varies with the conditions and with the type of adhesive. It is not possible therefore to define this period.

4.9.1.8 Wall tiling: buttering method

When fixing wall tiling using the buttering method, the following steps should be taken.

a) Spread the adhesive uniformly over the back of each tile, ensuring that the whole tile surface is covered.

b) Place all tiles with regular and straight joints not less than 1 mm wide and tap them firmly into position.

NOTE 1 For larger or thicker tiles wider joints might be required.

c) Ensure that the finished thickness of the adhesive bed does not exceed the maximum thickness given in the manufacturer's instructions.

NOTE 2 The use of this method is limited to positions where it is difficult or impractical to apply adhesive by means of a notched trowel, e.g. on window reveals.

4.9.1.9 Bedding floor tiles and slabs in adhesive

When bedding floor tiles and slabs in adhesive, the following steps should be taken.

a) Spread adhesive with a trowel in accordance with the adhesive manufacturer's instructions.

b) Where the tiles or slabs have a raised or recessed pattern on the backs, butter the back of each immediately before laying.

c) Press the tiles or slabs firmly into the adhesive layer and tap to give the tiling an overall even surface.

d) Ensure that tiles and slabs are solidly bedded as far as practically possible.

e) Lay tiles or slabs with straight and regular joints not less than 3 mm wide (ceramic) or 2 mm wide (natural stone) and generally not wider than 10 mm.

f) Clean any adhesive off the face of the tiles or slabs and off the faces of the joints as the work proceeds.

g) Ensure that the adhesive thickness does not exceed any recommendation made by the manufacturer.

4.9.1.10 Checking bedding of wall and floor tiling

When checking the bedding of wall and floor tiling, the following steps should be taken.

a) Carefully remove one random tile wherever instructed by the CA, as work proceeds and before the adhesive has set. Check that the adhesive is uniformly distributed over the whole area of the tile with no substantial areas bare of adhesive in order to provide consistent support for the tiles.

b) Where tiling is to be solidly bedded (see **4.9.1.6**, **4.9.1.7** and **4.9.1.8**), ensure that as far as practicable the adhesive has no voids.

c) If the bedding appears to be solid carefully remove all adhesive from the tile and its background, butter the tile with fresh adhesive and replace.

d) If the bedding does not appear to be solid remove further tiles, as instructed, in the vicinity of the original tile to check whether or not the fault is general. In either case obtain instructions before proceeding.

Where tiling is exposed to frequent wetting the quality of workmanship should be checked very soon after commencing tiling to ensure there are no significant voids left behind tiles.

If problems are revealed in the earliest stages action should be taken to ensure the problem does not recur; thereafter random checks should be sufficient.

4.9.2 Bedding wall and floor tiles in cement:sand wet mortar

4.9.2.1 Dampening backgrounds

Backgrounds should be dampened sufficiently to prevent excessive absorption of water from the mortar bed immediately before its placing.

4.9.2.2 Wetting tiles

Unless otherwise specified [see **4.9.2.5**a)], porous body ceramic tiles which are to be bedded in cement:sand mortar should be wetted as follows:

a) remove the tiles from the packaging;

b) soak porous tiles in clean water for at least 30 min. Remove them from the water and stack them tightly together with the end tiles facing outwards to drain on a clean surface. Remove excess water before fixing using a chamois cloth;

c) fix tiles while wet.

NOTE Tiles classified as AIIb, AIII, BIIb and BIII according to BS EN 14411:2006 require this saturation treatment to prevent rapid suction and subsequent failure to develop adequate bond strength with mortar. AIa, AIb, AIIa, BIa, BIb, and BIIa tiles do not require soaking; only Class AIa and BIa tiles are suitable for external use.

4.9.2.3 Internal and external wall tiling: floating and back filling method

*COMMENTARY ON **4.9.2.3***
This method might not be suitable for fixing tiles with a surface area greater than 0.1 m^2.

When fixing internal and external wall tiling using the floating and back filling method, the following steps should be taken.

a) Float mortar (cement:sand 1:3 to 1:4 by volume or 1:3.5 to 1:5 by weight) on to the background, trowel to a finished thickness not exceeding 10 mm and finish surface with a wooden float.

b) Allow the bed to stiffen to a degree where it will support its own weight and that of the tiles but is still green enough to permit the bedding mortar to form an intimate bond with it.

NOTE It is not possible to define the time necessary for the floated bed to arrive at a suitable stiffness as this depends on a number of factors such as suction of the substrate, the temperature and humidity of the air, ventilation rates, etc.

c) Spread bedding mortar (cement:sand 1:1 to 1:2 by volume or 1:1.2 to 1:2.5 by weight) uniformly over the back of each tile to a thickness of approximately 2 mm taking care to fill deep keys, frogs and all remaining depressions.

d) Place each tile and tap it firmly into position to ensure that each tile makes contact with the bedding mortar over its whole area.

e) If necessary, adjust the position of the tiles within 5 min of fixing.

4.9.2.4 Internal and external ceramic wall tiling: buttering method

When fixing internal and external ceramic wall tiling using the buttering method, the following steps should be taken.

a) Spread bedding mortar (cement:sand 1:3 to 1:4 by volume or 1:3.5 to 1:5 by weight) evenly over the back of each tile taking care to fill all depressions. The thickness of the mortar bed should not be less than 6 mm and not more than 12 mm, excluding the depth of mortar in keys or frogs.

b) Place each tile and tap it firmly into position to ensure that each tile makes full contact over its whole area with the background.

c) If necessary, adjust the position of the tiles within 10 min of fixing.

NOTE This method might not be suitable for fixing tiles with a surface area greater than 0.1 m^2 and is only used for small areas of tiling or for situations where it would be impractical to float the walls.

4.9.2.5 Floor tiling: direct mortar bedding method

When fixing floor tiles or slabs using the direct mortar bedding method, the following steps should be taken.

a) Wet porous tiles (see **4.9.2.2**), except where they are to be buttered with a minimum Class C1 cement-based adhesive conforming to BS EN 12004:2007.

b) Mix mortar (see **3.4.1** and **3.4.2**), to a stiff, plastic consistency so that when it is fully compacted, free water does not come to the surface.

c) Spread mortar bed evenly and compact thoroughly to the thickness required, leaving the surface true and flat (SR1, see **3.5.3**).

d) Spread at any time only the amount of mortar that can be compacted and tiled in one continuous operation.

e) Either:

- immediately after the mortar bed has been compacted, dust the surface with a layer of cement and trowel in lightly until the cement becomes damp; or
- apply a mortar slurry of one part cement and one part sand or a cement-based adhesive to the backs of the tiles.

f) Place the tiles in position with the least possible delay after the mortar bed has been laid. Take care to avoid depressing the bed with one of the tile corners as each tile is placed.

g) Place all the tiles with regular and straight joints not less than 3 mm wide (ceramic) and 2 mm wide (stone) and generally not wider than 10 mm.

h) Tap the tiles as work proceeds to provide a true and even surface to the tiling.

4.9.3 Bedding floor tiles and slabs in cement:sand semi-dry mix

4.9.3.1 Ceramic floor tiling: semi-dry mix method

When fixing floor tiling using the semi-dry mix method, the following steps should be taken.

a) Mix mortar (see **3.4.1 and 3.4.2**), adding sufficient water to ensure the following:

- when the mortar is thoroughly mixed a handful of mortar will, when squeezed, retain its shape and not crumble, leaving the hand slightly moist;
- when a sample is compacted on the base, no film of water forms on the surface.

NOTE 1 The water:cement ratio is approximately 0.55 (about 13.5 L of water, including water in the sand, to 25 kg of cement) to attain the desired "moist earth" consistency.

b) Spread mortar evenly approximately 10% to 15% thicker than the final bed thickness and compact it thoroughly to the bed thickness required, leaving surface true and flat.

NOTE 2 The maximum practical thickness is 70 mm. Where falls have to be formed in the bed, its greatest thickness could be 100 mm. The minimum thickness of the bed is 25 mm for an unreinforced bed and 40 mm for a reinforced bed.

c) Spread at any time only the amount of mortar that can be compacted, slurried and tiled in one continuous operation.

d) Cover the surface of the newly compacted bed with a slurry of a thick, creamy consistency (cement:fine sand 1:1 by volume, or 1:1.2 by weight), spread to form an even layer approximately 2 mm thick.

e) Do not wet the tiles unless they are porous, in which case, follow the procedure in **4.9.2.2**.

f) Where tiles have uneven or deep back patterns, fill the backs of tiles with cement:sand 1:2 or cement-based adhesive (minimum Class C1, conforming to BS EN 12004:2007), according to the manufacturer's instructions, before laying.

g) Place the tiles in position with the least possible delay after the bed has been slurried. Avoid depressing the bedding with one of the tile corners as each tile is placed.

h) Place all tiles with regular and straight joints not less than 3 mm wide and generally not wider than 10 mm.

i) Tap tiles with a wooden beater as work proceeds to ensure a true and even surface to the flooring and a firm and full contact between tiles and slurried bed. If a beating or vibrating machine is used commence tapping within 30 min of laying tiles.

NOTE 3 It is not possible to define times between laying the bed and placing and tapping in the tiles, as the period is entirely dependent on prevailing conditions. If conditions are such that the bed will dry rapidly the time available could be as little as 20 min. In the most favourable circumstances the limit will be 2 h.

4.9.3.2 Floor tiling: terrazzo tiling: semi-dry mix method

When laying terrazzo tiles using the semi-dry mix method the following steps should be taken.

a) Mix mortar as described in **4.9.3.1**a).

b) Bond the mortar to the base by spreading over the base a slurry of neat cement mixed to a thick creamy consistency, to form an even layer approximately 2 mm thick.

c) Spread mortar evenly, somewhat thicker than the final bed thickness and partially compact it, leaving the surface reasonably true and flat; the final bed thickness should be at least 25 mm after the beating in of the tiles.

NOTE 1 Partial compaction of the bed allows tiles of varying thicknesses to be beaten level.

NOTE 2 70 mm is the maximum practical thickness. Where falls have to be formed in the bed, its greatest thickness can be 100 mm.

d) Cover the surface of the newly compacted bed with a neat cement slurry of a thick, creamy consistency, spread to form an even layer approximately 2 mm thick. Alternatively, the back of the tile can be fully covered with a layer of slurry;

e) Spread at any time only the amount of mortar that can be compacted, slurried and tiled in one continuous operation.

f) Place the tiles in position with the least possible delay after the bed has been slurried. Avoid depressing the bedding with one of the tile corners as each tile is placed.

g) Place all tiles with regular and straight joints approx 2 mm wide.

h) Thoroughly beat tiles with a heavy rubber hammer as work proceeds to ensure a true and even surface to the flooring and a firm and full contact between tiles and slurried bed.

i) Wash tiled surface thoroughly with clean water after laying to remove traces of bedding slurry from the tile face and the joints.

NOTE 3 Joints less than 2 mm wide are undesirable as too narrow a joint can impede grout penetration. Dirt and bedding grout left on tile surface or in top of joints can cause staining of the final grout colour. Open joints need to be protected and other trades excluded to prevent contamination.

4.9.3.3 Floor tiling: natural stone: semi-dry mix method

When fixing floor tiling for limestone, sandstone and slate using the semi-dry mix method, the following steps should be taken.

a) Mix mortar as described in **4.9.3.1**a);

b) Where the semi-dry bed is to be laid bonded as in BS 5385-1:2009, **7.2.3.4**, apply a bonding grout /slurry to the prepared base. Spread mortar evenly approximately 10% to 15% thicker than the final bed thickness and compact it thoroughly to the bed thickness required, leaving the surface true and flat.

NOTE 1 The maximum practical thickness is 70 mm. Where falls have to be formed in the bed, its greatest thickness can be 100 mm. The minimum practical thickness of the base is 40 mm.

c) Spread at any time only the amount of mortar that can be compacted, slurried and tiled in one continuous operation.

d) Cover the rear face of the stone with a slurry of cement and fine sand (1:1 by volume or 1:1.2 by weight) of a thick creamy consistency, spread to form an even layer approximately 2 mm thick.

e) Place the tiles in position with the least possible delay after the bed has been slurried. Avoid depressing the bedding with one of the tile corners as each tile is placed.

f) Place all tiles with regular and straight joints not less than 3 mm wide and generally not wider than 10 mm.

g) Tap tiles with a wooden beater as work proceeds to ensure a true and even surface to the flooring and a firm and full contact between tiles and slurried bed. If a beating or vibrating machine is used commence tapping within 30 min of laying tiles.

h) If limestone and sandstone tiles are not dry when they are laid, cover the completed floor with dampened hessian or similar material for at least a week to prevent rapid drying from the surface.

NOTE 2 It is not possible to define times between laying the bed and placing and tapping in the tiles, as the period is entirely dependent on prevailing conditions. If conditions are such that the bed will dry rapidly, the time available could be as little as 20 min. In the most favourable circumstances the limit will be 2 h.

4.9.4 Bedding natural stone floor tiles and slabs in cement, lime and sand mortar

4.9.4.1 Laying

When laying, the following steps should be taken.

a) Mix mortar (cement:lime:sand 1:1:5 to 1:1:6 by volume, or 1:0.5:6 to 1:0.5:7 by weight) as given in **3.4.1**, except that cement and lime are added at the same time. Mix to a stiff plastic consistency so that when the mortar is fully compacted, free water does not come to the surface.

b) Immediately before spreading the mortar, dampen the background with clean water sufficiently to prevent excessive absorption of water from the mortar.

c) Dampen the back of each tile immediately before laying.

d) Spread the mortar bed evenly and compact thoroughly to the thickness required, leaving the surface true and flat.

e) Spread at any time only the amount of mortar that can be compacted and tiled in one continuous operation.

f) Either:

- immediately after the mortar bed has been compacted dust the surface with a layer of cement and trowel lightly until the cement becomes damp; or
- apply a slurry of neat cement on the backs of the tiles.

g) Place the tiles in position with the least possible delay after the mortar has been laid. Avoid depressing the bed with one of the tile corners as each tile is placed.

h) Place all the tiles with regular and straight joints not less than 3 mm wide and not generally wider than 10 mm, except in the case of riven sandstone tiles, roughly squared and laid in a random pattern.

i) Tap the tiles as work proceeds to provide a true and even surface to the tiling.

j) If limestone and sandstone tiles are not dry when they are laid, cover the completed floor with dampened hessian or similar material for at least a week to prevent rapid drying from the surface.

4.10 Fixing mosaics

*NOTE Subclauses **4.1.1.2, 4.7.3, 4.8, 4.9.1.1** to **4.9.1.4, 4.9.2.1, 4.9.2.5** and **4.11.2** also apply to mosaics.*

4.10.1 General

Mosaics should be checked in accordance with **3.1.1**c). Any damaged tesserae should be removed and replaced.

Before commencement of fixing, the work should be set out in accordance with **4.7.3**.

Designs and murals should be laid out for inspection prior to fixing.

4.10.2 Bedding mosaics in adhesive: thin-bed

4.10.2.1 General

The adhesive should be applied to the background and evenly spread using a notched trowel suitable for mosaics.

The thin adhesive bed should never be thicker than 3 mm and the trowel for forming ribs should be finer than that used for tiling, i.e. that it will form 3 mm × 3 mm ribs at 6 mm centres.

4.10.2.2 Synthetic strip or mesh-backed mosaics

When fixing synthetic strip or mesh-backed mosaics, the following steps should be taken.

a) For both walls and floors, fix sheets of mosaic in position as accurately as possible and tap them with a laying-on trowel, or wooden beater, so that full contact with the adhesive is achieved.

b) Check horizontal and vertical alignment as work proceeds and use a straightedge to ensure that the surface of the mosaic is true.

c) Maintain the joint width between the tesserae established when the mosaics were assembled. Carry out any necessary adjustment of tesserae or joints before the adhesive sets.

4.10.2.3 Paper-faced mosaics

When fixing paper-faced mosaics, the following steps should be taken.

a) Ideally pre-grout paper-faced mosaics. It is not always practical to pre-grout mosaics bedded in adhesives.

b) Pre-grout each sheet by spreading a proprietary grout over the backs of the sheets then remove all surplus grout from the backs of the tesserae using a squeegee.

NOTE 1 Pre-grouting prevents the adhesive squeezing up between the joints.

c) Fix sheets of mosaic in accordance with **4.10.2.2**a).

d) Fill the joints between sheets of mosaic that have been pre-grouted with more grout as work proceeds.

e) Ensure that alignment of sheets is checked and that all tesserae are in the same general plane (see **4.10.2.2**b).

f) After the sheets have been firmly tapped in place, remove any facing papers by soaking and sponging. Carry out any necessary adjustment of tesserae before the adhesive sets.

g) When mosaic sheets have not been pre-grouted, as soon as the adhesive has set, fill the joints between tesserae fully with grout (see **4.10.2.1**).

The paper facing should be removed and any adjustments should be made before the bed starts to set.

NOTE 2 The side joints cannot be seen clearly until the paper is removed and side joints of a different width from the joints between the tesserae might look conspicuous when the work is completed.

4.10.3 Bedding mosaics in cement:sand mortar

4.10.3.1 General

On walls, cement:sand mortar beds should only be used with paper-faced mosaics as these beds require the mosaics to be pre-grouted.

A bed of cement:sand mortar (1:3 or 1:4 by volume or 1:3.5 to 1:5 by weight) should be floated onto the prepared background and finished with a wooden float (see **4.9.2.3**a). The finished thickness of the mortar on walls should not exceed 10 mm.

The mortar bed should be allowed to stiffen slightly, but it should not be left for more than 2 h before fixing the mosaic sheets.

On floors, the bedding method detailed in **4.9.3.1** should be used.

4.10.3.2 Synthetic strip or mesh-backed mosaics

For floors, 2 mm thick slurry mortar (cement:sand 1:1 by volume or 1 to 1.2 by weight) should be spread over the bed before the sheets are positioned and pressed firmly into place. Follow **4.10.2.2**b) and **4.10.2.2**c).

NOTE It is impracticable to use synthetic strip or mesh-backed mosaics when fixing to walls with a cement and sand mortar bed.

4.10.3.3 Paper-faced mosaics

Paper-faced mosaics bedded in cement:sand mortar should always be pre-grouted with a proprietary grout or neat cement (or where joints are wider than 2 mm, or the mosaic thickness is greater than 4 mm, fine sand should be mixed with the cement in the proportions1:1 by volume or 1 to 1.2 by weight). Immediately after pre-grouting, the sheets should be positioned and pressed firmly into place [see **4.10.2.3**c) to g)].

4.11 Joints

4.11.1 Joints in ceramic, natural stone and agglomerated stone tiling

*NOTE See also **4.11.4**. for further details on pointing and grouting natural stone.*

4.11.1.1 Grouting joints

When grouting joints between tiles or slabs, the following steps should be taken.

a) Grout a small trial area of tiles before full grouting commences to check staining or scratching; if the trial area shows staining or scratching, obtain further instructions from the CA.

   NOTE 1 Some tiles are susceptible to staining by coloured grouts and/or scratching by hard fillers in the grouts.

b) Remove any dust or debris that has collected in the joints.

c) Before grouting floor tiles which are 6 mm or more thick, check that the depth of the joint is at least 6 mm.

d) Where slabs are used ensure that grout penetrates the full depth of the slab.

e) Where grout requires site mixing with water, mix it to a smooth paste with the minimum amount of clean water required to achieve workability: too much water in the grout might result in it cracking or colour variation.

f) Do not pre-wet joints to receive grout when tiles are bedded in adhesive or when using proprietary grouts.

g) Work the grout well, fully compacting the joints and finish smoothly and neatly ensuring that joints are completely filled.

h) Ensure tiles are not disturbed. On flooring use walking boards as necessary.

i) Fill joints wider than 6 mm as described in **4.11.1.2** using appropriate materials.

j) Finish joints between cushion edge tiles with a suitable tool such as a piece of wooden dowel with a rounded end.

k) Clean off surplus grout from the tile faces as work proceeds. Do not use excessive water to clean off the grout.

l) Polish wall tiles with a dry cloth when joints are hard.

NOTE 2 It is advisable to avoid conditions in which grouted joints can dry out very rapidly as faults can develop.

4.11.1.2 Wide joint filling

Where tiling with wide joints is specified, the joints should be filled as follows.

a) Prepare the specified joint filling material and, in the case of wall tiling, ensure the mixture is stiff enough to be self-supporting.

b) Fill all joints fully and ensure the grout is well compacted into them so there is no trapped air.

c) Ensure the tiles are not disturbed. On flooring use walking boards as necessary.

d) Clean off surplus jointing material from tile faces as work proceeds. Avoid the use of excessive water during the cleaning-off process.

e) Finish wall joints neatly with a suitable tool. Wash the face of tiling when joints are hard and polish with a dry cloth when the face is dry.

f) Finish floor joints flush with the edge of the tiles.

4.11.1.3 Timing of grouting joints

Joints should be grouted within the following times after fixing:

a) on walls, not later than 24 h after tile fixing is complete, and in any case not before the tile bed is firm enough to prevent displacement of tiles during grouting;

b) on floors, not sooner than 12 h nor later than 48 h after completion of tile laying unless the tiles have been bedded with a beating machine on a semi-dry bed, when grouting should be completed within 4 h.

NOTE On non-absorbent backgrounds it might be necessary to wait up to 3 days before some tile adhesives are firm enough to permit grouting. A longer drying period might be required in colder conditions.

When fixing tiles in rapid setting adhesive, the above timings might not be accurate and the adhesive manufacturer's instructions should be followed.

4.11.2 Grouting joints in mosaics

When grouting mosaic joints the following steps should be taken.

a) Grout a small trial area of mosaic before full grouting commences to check staining or scratching; if the trial area shows staining or scratching is likely to occur, obtain instructions from the CA.

NOTE Some mosaic tesserae are susceptible to staining by coloured grouts and/or scratching by hard fillers in grouts.

b) Where grout requires site mixing with water, mix it to a paste with the minimum amount of clean water to achieve workability.

c) Allow sufficient time for the bed to become firm.

d) Where the mosaic sheets have been pre-grouted before fixing, work the grout well into any remaining gaps and finish smoothly and neatly.

e) Where the mosaic sheets have not been pre-grouted, grout the joints ensuring the grout is worked well into the joints to form a solid mass and finish smoothly and neatly.

f) When the grout has hardened sufficiently to remain in position wash the mosaic surface with clean water to remove grout smears. If any grout marks cannot be removed this way clean them off using a proprietary cement remover in accordance with the manufacturer's sitework instructions and wash down finally with clean water.

4.11.3 Terrazzo tiling joints and finishing

4.11.3.1 Grouting joints

Joints should be grouted within two to three days after fixing.

The neat white or grey cement, tinted as required, should be mixed with clean cold water to a consistency thin enough to ensure penetration of the full depth of tile joints.

The grout should be worked and re-worked over the tile surface with a squeegee until all joints are completely full and remain so when all settlement has ceased.

When grout starts to stiffen, it should be cleaned with a squeegee or trowel, ensuring that joints are fully filled.

Grouted floors should be left for least three days or until grouted joints are thoroughly hardened before grinding commences and should be covered to prevent them from drying too rapidly.

NOTE Some colours, particularly if black colour is used, require a longer curing period before grinding

4.11.3.2 Grinding

Grinding should be carried out mechanically using carborundum or diamond grit stones. The minimum standard of finish should be that produced by an 80 grit stone, unless otherwise specified.

Grinding should remove all surface grout and correct unevenness (lipping) between tiles.

The sequence of grit sizes of the grinding stones should be such that progressively finer stones are used to remove scratches left by the previous coarser stone.

The final grinding stone used should be that which is intended to produce the finished floor finish.

The floor should be washed off after grinding to remove all traces of grinding residue and dust.

The floor should be re-grouted using the same mix as that for the first grout.

The re-grouted floor should be left for a minimum of 24 h before re-grinding with the finest stone used in the first grinding sequence.

NOTE Some coloured cements might require extending the curing period before regrinding can take place.

Any subsequent surface treatments should be carried out in accordance with manufacturer's instructions.

Terrazzo slabs having wider joints than for tiles and grout should be laid using 1:1 sand and cement by volume, or 1:1.2 by weight. If the floor is to be ground or polished the aggregate should be suitable for grinding.

4.11.4 Pointing and grouting natural stone floors

4.11.4.1 Grouting joints

When grouting joints the following steps should be taken.

a) Grout a small trial area before full grouting commences to check staining or scratching; if the trial area shows staining or scratching is likely to occur, obtain instructions from the CA.

b) Remove any dust or debris that might have collected in the joints.

c) Mix grout of one-part cement and two-parts lime to six-parts stone dust or suitable sand.

d) Work the grout well into the joints to consolidate and finish smoothly and neatly, ensuring that all the joints are thoroughly filled.

e) Ensure the tiles are not disturbed; use walking boards as necessary.

f) Fill joints wider than 3 mm as described in **4.11.1.2**.

g) Clean off surplus grout as the work proceeds. Do not use sawdust to clean off grout.

NOTE It is advisable to avoid conditions in which joints dry out very rapidly as faults might develop.

4.11.4.2 Wide joint filling

Limestone, sandstone and slate floors with joints wider than 3 mm should be pointed as laying proceeds.

4.11.4.3 Timing of grouting of joints

The grouting of joints should be delayed for at least 12 h after all the tiles have been bedded. However, it should not be delayed unduly as open joints might collect general building dust and deleterious substances.

4.11.5 Movement joints

4.11.5.1 Movement joints with sealant

When filling movement joints with sealant, the following steps should be taken.

a) Form movement joints through the full depth of tiling and bed and (where specified) through the rendering or screed. Leave the joint open for sealant until completion of all joints. All structural movement joints should be brought through to the face of the tiling.

b) Unless otherwise instructed, ensure that joints are fully dry before applying sealant.

c) Position back-up material and ensure that the depth left to receive sealant is in accordance with manufacturer's sitework instructions. Ensure that the joint is cleared of any debris or obstructions and is of the full width throughout its length and depth. Back-up materials should be of a tight fit in the joint in order to ensure that they maintain their position during sealant installation.

d) Mix two-part sealants in accordance with the manufacturer's sitework instructions.

e) Install the sealant in accordance with the manufacturer's sitework instructions ensuring there are no air gaps; finish the surface neatly and flush with the surface of tiles.

4.11.5.2 Movement joints with preformed strips

When preformed strips are used to fill movement joints, the following steps should be taken.

a) Form movement joints through the full depth of tiling and bed.

b) Position preformed strip, as tiling work proceeds, to finish flush with the surface of the tiling.

c) Ensure that the joint side or anchor plates are fully bedded without voids.

5 Protection and cleaning

5.1 Protection

5.1.1 Wall tiling and mosaics

5.1.1.1 External tiling and mosaics

External tiling and mosaics should be protected from rain, sun, pollution and frost (e.g. by cocooning and the addition of heat if necessary) until the bed and joints have set. Protection should be continued for at least another 2 weeks.

5.1.1.2 Shower and bath areas

Tiling and mosaics should not be wetted for at least 2 weeks, until the bedding and joints have set and hardened.

5.1.2 Floor tiling

5.1.2.1 Traffic

For newly laid floors, the following traffic restrictions should be observed.

a) Do not permit any traffic at all on tile flooring for 4 days after completion.

b) After 4 days and for a further 10 days, permit only light foot traffic (i.e. low-density pedestrian traffic).

NOTE If a rapid setting adhesive is used, the floor may take traffic earlier than 4 days after completion. However, unless a rapid hardening grout is used, it would be inadvisable to reduce the 4-day period.

5.1.2.2 Protection

For newly laid floors, the following steps should be taken.

a) C*eramic tiles*: for general protection, loosely spread sheets or boards that are not likely to cause staining.

b) *Natural stone, terrazzo or agglomerated stone*: for general protection, spread sheets or boards that are not likely to cause staining. Ensure that any sheeting allows the flooring to breathe where necessary while providing suitable protection. The sheeting should not retain any moisture and sawdust should not be used for this purpose.

c) *All types*: Provide protection (see BS 5385-3 and BS 5385-5) if heavy loads are to be moved across the floor, or if impact loading is anticipated. Protect stair treads and risers using temporary casings.

5.2 Cleaning

5.2.1 Efflorescence

Loose materials should be brushed off and the tiles washed with clean water. Surplus water should be removed with a cloth. This procedure should be repeated if efflorescence reappears.

Persistent deposits on ceramic tiles should be treated with an appropriate proprietary cleaner in accordance with the manufacturer's instructions. Before applying the cleaning agent, the tiles should be wetted and any surplus water removed. Treatment should be followed immediately by thorough rinsing with clean water and drying.

5.2.2 Residual cement film

Residual cement film should be treated with an appropriate proprietary cleaner in accordance with the manufacturer's instructions. Before applying the cleaning agent, the tiles should be wetted and any surplus water removed. After cleaning, tiles should be rinsed thoroughly with clean water. Acid cleaners (e.g. limescale-removing agents) should not be used on marble or limestone.

5.2.3 Cleaning off mortar

Mortar splashes on the face of tiles should not be cleaned off until approximately 2 h after bedding is complete, then all marks can be cleaned off, taking care not to disturb the tiles.

5.2.4 Removal of residual epoxide resin film on ceramic tiles

Residual film should be removed from the surface of the tiles as part of the grouting process before the resin cures. Once cured, removal becomes more difficult and should then be achieved with proprietary epoxide removers.

NOTE Several applications might be required to achieve removal. Proprietary cleaners ought to always be used in accordance with the manufacturer's instructions.

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