Movement Joints
In Internal Tiling

Published by
The Tile Association
1. Foreword

A Technical Working Group of the Tile Association has prepared the paper “Movement Joints in internal tiling”.

The paper has been written with the aim of providing advice for all parties in the process of installing movement joints in internal tiling and should be read in conjunction with current and forthcoming British, European and International Standards.

The Tile Association acknowledges the support given by members of the Working Group, Adshead Ratcliffe and Ceram in the drafting of this document.

2. Scope

Every building is affected in some way by movement, yet in many cases insufficient consideration is given to the phenomenon when planning or undertaking a tiling project. This document sets out to provide an explanation of movement in a building and advice on how to ensure a successful tiling project by using the correct type of movement joint in the correct situation. The document provides advice on internal tiling only, external tile fixing is subject to other considerations and advice should be sought when planning this type of project. The object is to provide information on positive steps that can be taken to reduce the risk of installed tiling being damaged by the effects of movement.

The information in this document relates to the installation of ceramic, natural quarried stone and resin agglomerate tiling on internal walls and floors.

3. Movement in Buildings

3.1 General

When buildings are constructed there is always likely to be some movement occurring as a result of the following:

a) Changes in the moisture content of some of the materials used in the construction.

b) Deformation and deflections within the structure as it accommodates the weight of the materials being supported.

c) Changes in temperature.
Fig 1
Wall tile failure caused by movement

Fig 2
Wall tile failure caused by movement
It is the effects of the movement from the above causes that have to be accommodated so that the installed tiling will not be adversely affected. Movement due to a) and b) frequently continue to occur for some time after completion of the construction. The architect or specifier should select background materials, methods of construction and work schedules that minimise the effect of any movement in the building after the tiles have been fixed.

Lateral stresses can build up within tiling systems resulting from background shrinkage or thermal expansion and it is vital that the bond strength of any of the interfaces within the various ‘strata’ of the tiling (tile to adhesive, adhesive to screed, cohesive strength of screed etc) – is greater than the lateral stresses likely to develop within the system as a whole.

Incorporating movement control joints through the tiles only and not through the screed, causes excessive lateral stress development in the tiling/adhesive layer because expansion movement of the tiling, towards the compressible movement joints in the tiling, cannot be replicated by the screed to which the tiles are bonded, as there is no corresponding joint in the screed.

Pre formed movement joints will be designed for specific purposes; therefore the movement accommodation will vary with the various profile types. The materials chosen to manufacture the various profiles will provide different elasticity; therefore guidance from the manufacturer should be obtained with regard to movement capability and usage. As a general guide, pre formed movement joints can accommodate approximately 15-20% of their movement zone width. Tests for compression, loading and shear deformation for the different profile types should be obtained from the individual manufacturer.

BS 5385-4 advises that stresses may develop within the tiling system as a result of movements due to such factors as drying shrinkage and moisture movements in the background and thermal and moisture changes in the tiling. These stresses, if not properly controlled, can be sufficient to cause loss of adhesion and bulging or cracking of the tiling, sometimes with dramatic effect.
The Standard also advises that settlement, subsidence and vibration are uncommon sources of structural movement, but can still produce sufficient stresses to affect the adhesion of wall and floor tiling.

The likelihood of settlement and subsidence cannot usually be determined at the time tiles are installed so that no precautions can be taken to eliminate its effects. However effects of vibration may be reduced by appropriate choice of adhesive, and specialist advice should be sought.

### 3.2 Types of Movement to be considered before Tiling

#### 3.2.1 Drying Shrinkage

Drying shrinkage is a reduction in size of most materials when moisture is reduced. The potential for this type of movement is frequently underestimated in practice and this is usually the result of allowing insufficient drying times for in situ backgrounds such as concrete, cementitious and calcium sulfate based screeds\(^1\), concrete block work, renders, gypsum plaster, etc. The drying times given in BS5385 are based on optimum drying conditions (20°C and 65%RH with adequate ventilation); the normal site conditions on UK building sites rarely meet these requirements.

The thickness, mass and density of these in situ constructions also have to be considered since backgrounds such as power floated concrete can take a longer time to dry than expected.

In practice tiles will frequently be fixed before all the initial background shrinkage has taken place. The amount of stress of this nature that can be restrained by the adhesive depends on the strength of the background, the adhesion achieved and the physical characteristics of the hardened adhesive. Where the tiling is fixed before most of the background drying shrinkage has taken place the residual background shrinkage will compress the tile bed laterally and this can frequently be sufficient to cause the tiling to delaminate.

The actual moisture content of the background can be checked with a range of testing equipment or suitable method of measuring moisture to ensure that sufficient drying time has taken place.

Where the tiling is fixed before most of the background drying shrinkage has taken place the residual background shrinkage will compress the tile bed laterally and this can frequently be sufficient to cause the tiling to delaminate even when movement joints are incorporated in the tile bed.

#### 3.2.2 Differential Movement

Differential movement is movement in a building that occurs between different types of background or changes in construction. At these locations cracks will gradually develop and are visible where decorative finishes do not obscure the backgrounds. Typical locations are where concrete blockwork abuts concrete columns, where a concrete lintel rests on and abuts brickwork, where wooden doorframes abut the tiled backgrounds, in internal corners between walls and at junctions between wood based sheets and boards.

\(^1\) See TTA document on Tiling to Calcium Sulfate based Screeds
Cracks occur at these junctions because of movement between the different abutting construction materials and the movement may only be minor but with some construction materials the differential movement can be large and sometimes unpredictable, especially with wood based sheets and boards, in such cases provision must be made to accommodate this.

### 3.2.3 Deflection Movement

A tile on its bed has to be considered a rigid construction and there is general design requirement for the background to provide rigid support for the installed tiling. This requirement applies to both wall and floor tiling since any rigid finish can be damaged when subjected to static or dynamic loads and impacts if the background does not adequately support it. This type of movement is frequently seen on suspended timber sub-floors and walls constructed of inadequately braced sheets and boards. Damage to the tile bed is most likely to occur where the tile bed is placed under tension, e.g. on floors where the sheets or boards pass over a supporting joist and ‘sag’ either side of the joist when under load from traffic.

### 3.2.4 Thermal Movement

All materials expand and contract at different amounts. The integrity of the individual tiles from the effects of changing temperatures is not a problem since they will easily resist a greater range of temperatures that are normally experienced in buildings. Problems are likely to arise if account is not taken of the potential movement any differences between expansion and contraction and between the tiles and the background. The most extreme situations are usually where the tiles are installed on heated sub-floors, guidance on this type of installation is contained in the TTA guidance document “Tiling to Heated Floors”.

### 3.2.5 Moisture Movement

This type of reversible movement is the result of the expansion and contraction of materials to changing moisture conditions and is frequently experienced where wood based materials are used as backgrounds for tiling.

Where water sensitive backgrounds of this type are used it is important to ensure that the moisture content of the background is appropriate for the temperature and humidity conditions that will prevail once it has been tiled. This is normally referred to as ‘conditioning’ and usually it requires the background to be acclimatised to the ‘in use’ temperature and humidity conditions for sufficient time before the tiles are adhered. In some cases tanking or waterproofing of some installations may be necessary.

Intermediate substrates or proprietary tile backer boards are available to minimise the effect of these conditions.

### 3.2.6 Structural Movement (by design)

Very large areas of insitu concrete can take many months to dry and the shrinkage that occurs can be significant therefore the anticipated shrinkage has to be accommodated by large mechanical joints which are usually located as advised by a structural engineer. It is imperative that joints in the ceramic tiling reflect structural movement joints precisely.
4. Types of Movement Joints

4.1 General

Movement joints are an integral part of any ceramic tile or stone installation. The various components of a tiled assembly (covering, adhesive, substrate, etc.) have unique physical characteristics that affect their behaviour. Specifically, these components will expand and contract at different rates, according to each component’s intrinsic physical properties, with changes in moisture, temperature and loading (both dead and live loads). The differential expansion/contraction of attached components results in internal stresses.

Furthermore, structures that restrain overall expansion of the tiled field (walls, columns, etc.) cause stress build up within the system. If the aforementioned movements are not accommodated through the use of movement joints in the tiled field and at restraining structures, the resulting stresses can cause cracking of the grout and tile and delamination of the tile from the substrate. Thus, movement joints are an essential component of any durable tiled assembly because they relieve the stress by deforming.

Movement joints can be formed in the floor and wall by using suitable sealants or pre-formed movement joint profiles, typically comprising PVC or metal anchoring legs connected to a flexible synthetic movement zone. Normally sealants can be used in low traffic floors, e.g. where neither the edge of the ceramic tile or stone flooring unit, nor the sealant will be exposed to high levels of impact or abrasion.

In high traffic environments the sealant will not protect the edges of the ceramic tile or stone flooring units and these may become damaged.

4.2 Sealant Movement Joints

4.2.1 Types of joint

There are two basic types of movement joints in floors, structural or non-structural joints and non-structural or non structural joints. A structural joint passes through the tile, screed and floor slab. A non structural joint passes through the tile and screed only and does not penetrate the floor slab.

Movement at a structural joint is brought about by structural movement of the building and may be caused by thermal changes, producing both expansion and contraction, or by permanent shrinkage of the building causing opening and closing of the joint but is not cyclic. Non structural joints are used to allow shrinkage of the floor slab relative to the tiles. Non structural joints are made in the covering to allow the differential movement to occur without damage to the tiles; the principal movement being the closing of the joint with only minimal thermal movement. Structural and non structural joints are subject to different movement patterns that influence the choice of sealant types.

4.2.1.1 Structural joints

Generally sealants with greater movement capabilities and hence more flexibility are required for Structural joints than for non structural joints. In floors metal reinforced mechanical joints are normally used for structural joints.
Structural joints in the screed and tiles should always align with the joints in the floor slab. The joints need to be of sufficient width to allow the sealant to accommodate the expected movement. The need for non structural joints around the extreme edges of the floor will depend upon the dimensions of the floor, the screed or bedding system and tile type.

The sealant needs to have properties that will accommodate all the conditions of service. In order to keep the joint widths relatively narrow, sealant with a high movement accommodation factor is required, however in many cases it will mean that the sealant is relatively soft and may be more vulnerable to damage. Planning of the joint locations at the design stage may reduce such problems. The joint should not be less than 6mm in width and not less than 12mm in depth. For width depth ratio see table.

4.2.1.2 Non structural joints

The need for non structural joints around the extreme edges of the floor and others dividing the floors into bays will depend upon the floor dimensions, the screed or bedding system and the tile type. Where perimeter joints are required (not more than 2 metres between retaining structures) they should also be provided around features such as columns, steps etc. Where possible intermediate joints should be located at points of high stress in the concrete base, such as over supporting beams.

Intermediate movement control joints in underfloor heated screeds are crucial and should penetrate through the full depth of the tiles and the base screed – down to the insulation or the slip membrane.

The joint should not be less than 6mm in width and not less than 12mm in depth. For width depth ratio see table.

4.2.1.3 Joint backing material

The filler or backing material immediately below the sealant should be compatible with the sealant being used. It should be compressible and should support the sealant. It needs to be of a material type that the sealant will not adhere to. Such materials include closed cell foam polyethylene and appropriate closed cell rubber where additional support is required. Where there is insufficient joint depth to accommodate a joint backing material and the required sealant depth polyethylene bond breaker tape may be used.

<table>
<thead>
<tr>
<th>Recommended Joint Sealant Sections for Joints in Floors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Joint Width</strong></td>
</tr>
<tr>
<td>6mm</td>
</tr>
<tr>
<td>8mm</td>
</tr>
<tr>
<td>12mm</td>
</tr>
<tr>
<td>15mm</td>
</tr>
<tr>
<td>20mm</td>
</tr>
<tr>
<td>25mm</td>
</tr>
<tr>
<td>30mm</td>
</tr>
</tbody>
</table>

The choice of sealant and joint design is dictated by the amount of movement to be accommodated and conditions of service. There is a range of available sealant type in both one and two-part varieties and it is important to ensure that the sealant...
properties will accommodate both the expected movement and the conditions of service.

4.3 Pre formed Movement Joints

The types of pre-formed joints available can be basically described as:

- Intermediate – For dividing tiled areas.
- Perimeter – For perimeter connections e.g. floor to wall.
- Connecting – Where tiling abuts other building structures, e.g. steps, door and window frames.

Profiles are available in a wide variety of materials and finishes, which are designed for certain applications, therefore it is important to select the correct movement joint profile for the tiled application.

Points to consider:

- Area of use, e.g. light or heavy duty traffic.
- Exposure to moisture.
- Exposure to chemicals.
- Anticipated movement.
- Fixing method of tile covering.

Typically pre-formed movement joints are available, that can be fitted with a mortar bed or adhesive fixed tile coverings. The most common is usually the profiles with anchoring legs, which are used where tiles are fixed with adhesive.

These types of profiles are manufactured with either PVC or metal anchoring legs, which should have large closely spaced punched sections to allow the tile adhesive to mechanically lock the profile and adequately support the tile edges. Metal anchoring edges will give greater protection to tile edges and should be used in heavy trafficked areas.

Anchoring legs without punched cut-out sections are not ideal and should be avoided where possible. The movement joint zone of these profiles is usually created with a synthetic compressible material, which can be bonded or clamped to the anchoring legs. Where clamped systems are used it is possible to replace the sealant material.

Areas of use:

PVC – Residential and light commercial
Aluminium – Residential and commercial.
Brass – Residential, commercial and industrial.
Stainless steel – Residential, commercial and industrial.

Prior to a movement joint profile being used, it is recommended that the manufacturer is consulted regarding the type of profile to use in individual applications.
5. **Design Consideration**

5.1 **General**

Both BS 5385-1 and BS 5385-3 state that consideration should be given at the design stage to the provision of movement joints. The building designer should assess the magnitude of any stresses and decide where movement joints should be located. The type and location of movement joints involve considerations of construction materials, bedding systems, anticipated temperature and humidity conditions, areas concerned and the setting out of the tiling.

For many other backgrounds and tile installations additional information can be found in BS5385-4. Other cladding materials are referred to in BS5385-5.

Where underfloor heating is to be used, the pipes or cables should be located to ensure the system is contained within the pattern of expansion joints.

When wall tiling is planned and the background is mature and stable, e.g. existing rendering or plaster, the non-structural movement joints in the tiling might need to extend only through the tiling and its bed, and should be a minimum of 6 mm wide.

Before the type of movement joint can be determined, it is essential that the background or base can support a tiling system.

The choice of large format tiles may result in the cutting of tiles to allow for the installation of movement joints.

When planning an installation using tiles such as natural stone or terrazzo, using the semi-dry mixed method advice should be sought from the Stone Federation and National Federation of Terrazzo Marble and Mosaic.

5.2 **Location**

5.2.1 **Location: Wall tiling**

BS 5385-1 states that movement joints should be located in the wall tiling installation to coincide and be continuous with all existing structural movement joints, although they are actually formed as separate joints isolated by suitable thicknesses of back-up material.

In detailing the location of movement joints in tiling the designer normally specifies that they are positioned in the following locations:

a) over existing and/or structural movement joints;
b) where tiling abuts other materials;
c) where tiling is continuous across junctions of different background materials;
d) in large tiled areas, at internal vertical corners and at 3 m to 4.5 m centres horizontally and vertically;
e) where stresses are likely to be concentrated, for example at changes of alignment.

Where large degrees of thermal movement or vibration are expected, the frequency of movement joints should be increased to accommodate the movement.

Movement joints in the tiling should be of a suitable width to permit the sealant to accommodate the expected structural movement.
Conversely, in small tiled areas in normal conditions, intermediate joints should not be necessary on walls up to 6 m long provided the background is strong and dimensionally stable, there is adequate compressible joint width around each tile and movement joints are included at internal angles.

5.2.2 Location: Floor Tiling

Structural movement joints in the bed and tiling should be sited immediately over and be continuous with structural movement joints in the base. This procedure might not be acceptable if the base joints are not straight and parallel, or if their layout does not coincide with that of the floor tiles; in these circumstances, guidance should be sought from the buildings designer or engineer.

Flexible joints should be inserted:

a) over supporting walls and beams at intermediate positions to accommodate deflection of the base and movements in the flooring.

b) at floor perimeters and to divide the floor into bays of size not greater than 10m by 10m. Wherever possible they should coincide with structural features, e.g. columns and door openings, or they can be planned to provide a decorative panelled effect.

c) where tiling is continuous across junctions of different background materials, e.g. from screed to timber flooring

Where high temperatures are expected, for instance around boilers, over heating installations or from strong sunlight, an assessment of the likely temperature range and corresponding linear changes in the flooring should be made to determine whether and where any additional allowance for movement is necessary.

Where the background is less stable it may be prudent to increase the number of movement joints. Additional information on this can be found in the Tile Association document “Tiling to heated floors”.

In floors that have to withstand hard-rimmed wheel traffic or the dragging of heavy loads, the position of movement joints should, where possible, be planned so that they do not occur in the traffic area. Where this is not practicable the joints should be of types having their edges reinforced with metal or rigid plastics sections.

Joints other than those protected by metal or rigid plastics edging, subject to traffic heavier than light pedestrian, should not be wider than 10 mm. Information on the permissible maximum and minimum joint widths should be obtained from the manufacturer of the particular joint filling selected.

5.3 Modular installations

BS 5385-3 points out that some tiles are made in sizes that allow their installation in modular grid systems. Factors concerning setting out and joint widths should be appreciated and resolved at the design stage. For example, the introduction of movement joints, if they are to be wider than the general joints between tiles in the installation, calls for a decision as to the way in which the interruption to the modular grid pattern is to be corrected.
6. Installation of Movement Joints

6.1 Sealant Movement Joints

Before inserting the sealant material, the joint surfaces should be clean and free from contamination. The surface should be degreased using an appropriate surface cleaner.

Where two-part sealant is being used, it should be mixed following the manufacturers’ instructions. Once mixed, the sealant should be placed into an empty cartridge dispenser. The dispenser should be placed into a sealant gun following the manufacturers’ instructions.

The sealant should be extruded into the joint using a firm even pressure.

The sealant should be allowed to cure, however the cure rate will be dependent on localised temperatures, and in some cases surrounding humidity and depth of sealant.

The British Adhesive and Sealant Association has published a guide to BS6213 Selection of Construction Sealants and reference should be made to this document.

Where a flexible sealant is the preferred option it should be installed by a competent sealant applicator.

6.1.1 Wall tiling

6.1.1.1 General

Provision should be made to incorporate movement joints in appropriate positions when setting out the tiling.

All joints should be rectangular in section, with firm, straight, smooth edges free from cavities and irregularities. The width:depth ratios and dimensions of the sealant profile in a joint should accord with the recommendations of the sealant manufacturer.

When forming the joints it is useful to insert a temporary filler strip that can be removed when the tiling is sufficiently firm. The filler strip can be wrapped in polyethylene film to ensure smooth, clean joint faces and to assist in its removal. Care should be taken to avoid grout and other materials becoming trapped in the joint cavity that prevent proper application of the back-up and sealant and might prevent movement of the joint, resulting in damage or displacement.

6.1.1.2 Tolerances across joints

There should be no appreciable difference in level across joints and the maximum deviation between tile surfaces either side of a joint, including movement joints, should be as follows:

a) joints less than 6 mm wide, 1 mm;
b) joints 6 mm or more wide, 2 mm.
6.1.2 Floor Tiles

6.1.2.1 General

Care should be taken to ensure that levelling screeds or tile beds adjacent to movement joints are fully compacted.

Movement joint cavities should extend through the tiling, tile bed and levelling screed and should be completely filled and sealed after the grouting of the normal joints. Where separating layers are incorporated, however, the movement joint should extend to this layer but should not penetrate it. Prior to the filling and sealing operation, the joints should be thoroughly cleaned of all extraneous matter, excess grout, dust, etc.

6.1.2.2 Structural movement joints

Movement joints as illustrated in Annex a Figures 1a (sealant with back-up material) or 1b (prefabricated) should be inserted in the bed and tiles over movement joints and/or contraction joints in the base. They should be continuous with the base joints and should be of sufficient width to permit the joint filling to accommodate the expected movement. In the event of the base joints not being true, e.g. not straight and parallel, or their layout not coinciding with that of the tiles, the siting of the movement joints in the finish as stated might not be acceptable and a decision as to any alternative procedure should be obtained from the building designer or engineer or their agent.

6.1.2.3 Intermediate (non-structural) movement joints

The need for intermediate joints between perimeter joints depends on the dimensions of the floor; for example, with the exception of those on suspended construction, in floors with less than 10 m between perimeter joints no intermediate joints are necessary but in larger floors as illustrated in Figures 1c or 1d should be employed to divide the area into bays of size not greater than 10 m × 10 m.

On suspended floors, stress-relieving joints (see Figures 1c or 2d) should be inserted where flexing is likely to occur, e.g. over supporting walls or beams.

For floors, which might be subjected to significant thermal changes, i.e. direct sunlight in atria, or underfloor heating etc., the floor area should be divided up by movement joints into bays of size not greater than 40 m² with an edge length not greater than 8 m.

6.1.2.4 Perimeter joints

Perimeter movement joints should be inserted where the tiling abuts restraining surfaces such as perimeter walls, columns, curbs, steps and plant fixed to the base. In floors with dimensions of 2 m or less between restraining surfaces, perimeter joints are not necessary unless the conditions that can generate stresses are likely to be extreme, for example, violent temperature changes or prolonged immersion in liquid.

6.1.2.5 Consideration of movement joints when setting out

Setting out might have to be related to the siting of movement joints. Movement joints should be detailed on working drawings but it is sometimes necessary for the exact
6.8.1.3 Natural stone

6.8.1.3.1 General

Like all building materials, natural stone and terrazzo tiles exhibit dimensional changes in response to fluctuations in environmental conditions.

It is becoming more common to use stone units bedded on to other materials with different movement characteristics. As a result there is a need to provide stress relieving movement joints to prevent damage resulting from restrained dimensional change which can manifest itself as minor spalling at grouted joints, or fracture and major dislocation of stone units.

Where stone flooring is subjected to high temperatures (i.e. over heating installations or from strong sunshine) an assessment of the likely temperature range and corresponding linear changes should be made.

It is difficult to calculate the anticipated movement with precision but, fortunately, in the majority of cases this is unnecessary. Movement joints are provided in the floor at widths and spacings which are known from experience to be satisfactory and also where movement joints occur in the substrate. The positions of movement joints must be established before work commences.

Any movement joints must be properly formed, according to the degree of exposure, with a suitable flexible material. The extension capability and recovery performance of the chosen joint former or sealant will frequently determine the actual joint width. This section suggests spacings and sizes for movement joints in normal environments.

It is important that the designed minimum gap is not obstructed. A careful check should be carried out before joints are sealed. Perimeter joints can usually be hidden beneath the skirting (see figure 1e).

Unusual circumstances, novel construction details or contaminated environments will all need special consideration and the extent of any movement should always be carefully calculated.

Where day work joints in the screed do not coincide with those in the floor crack inducing joints must be post-cut.

Reinforcement should cross all day work joints to ensure that no unpredicted movement can affect the performance of the stone, particularly where the stone is set on adhesive.

Where underfloor heating is used the pipes or cables should be located to ensure that the system is contained within the pattern of expansion joints.

Movement joints for the flooring described in this code are as follows:

a) flexible joints aligned to structural movement joints (see Figure 1, types a and b);
b) flexible movement joints to accommodate smaller movements than structural joints (see Figure 1, types c or d);
c) contraction joints which are non-compressible to relieve tension

6.1.3.2 Structural movement joints

Structural movement joints in the flooring and bed should be sited immediately over and be continuous with structural movement joints in the base. This procedure may not be acceptable if the base joints are not true, for example, not straight and parallel, or if the layout does not coincide with that of the flooring units. In these circumstances, guidance should be sought from the building designer or engineer.

6.1.3.3 Intermediate (non-structural) movement joints

Flexible joints (see Figure 1, types c or d) should be inserted over supporting walls and beams and at intermediate positions, to accommodate deflection of the base and movements in the flooring. Contraction joints should be used to accommodate shrinkage in terrazzo tile and slab flooring and may be used instead of flexible joints over supporting walls and beams.

6.1.3.4 Perimeter joints

Flexible joints (see Figure 1, types c or d) or contraction joints should be used at floor perimeters and to divide the floor into bays at the intervals given in the relevant flooring sections. Where possible they should coincide with structural features such as columns and door openings, or should be positioned to provide a decorative effect.

Where high temperatures are expected, for instance, around boilers, over heating installations, or from strong sunshine, an assessment of the likely temperature range and corresponding linear changes in the flooring should be made to determine whether and where any additional allowance for movement is necessary.

In floors that have to withstand hard-rimmed wheel traffic or the dragging of heavy loads, the position of movement joints should, where possible, be planned so that they do not occur in the traffic area. Where this is not practicable the joints should be of types having their edges reinforced with metal or rigid plastics sections (see Figure 1, types a, b or d).

Joints other than those protected by metal or rigid plastics edging, subject to traffic heavier than light pedestrian, should not be wider than 10 mm. Information on the permissible maximum and minimum joint widths should be obtained from the manufacturer of the particular joint filling selected.

6.2 Pre formed Movement Joints

Generic installation guidelines for movement joint profiles – please consult individual manufacturers’ recommendations.

Installation: Surface joints with anchoring legs

- Generally the height of the profile is selected to correspond to the thickness of the tile and adhesive bed.
- Using a notched trowel, apply tile adhesive over the area where the profile is to be placed.
Press the perforated anchoring leg(s) of the profile into the adhesive and align. The profile must align with existing movement joints within the substrate.

Trowel adhesive over the anchoring legs to ensure full coverage.

Firmly press the adjoining tiles into place and adjust them so that the tiled surface is flush with the top of the profile, or up to 1 mm lower. The tiles should be solidly bedded over the anchoring leg. (Note – where heavy traffic is expected the profile height can be slightly higher than the tile thickness, so that a solid bed of adhesive can be ensured over the anchoring leg).

Leave a joint of approximately 2 mm between the tile and profile.

Fill the joint cavity between the tile and the profile completely with grout.

Installation: Movement joint profiles mortar bed fixed

Select the profile for the correct depth and application.

Set the profile flush against the edge of the area already completed, inserting any anchoring ties, if required.

Ensure that the profile is solidly bedded laterally.

Install adjacent surface against the movement joint profile.

Fill the remaining joint between the tile and profile with grout.

Site cutting of pre formed movement joints can be achieved using the appropriate method.

PVC profiles can be cut using a proprietary pair of snips or hacksaw with an appropriate blade. Metal profiles can be cut using a hacksaw or angle grinder with the appropriate blade or disc. Specialist band saws and chop saws are available for cutting large quantities of profile; these can be obtained from various tool suppliers and manufacturers. Stainless steel products can be tarnished if the wrong cutting blade or disc is chosen, therefore correct selection is important.

Tile fixers should ensure their personal safety when cutting profiles by wearing the appropriate PPE for the task.

7. Tile Fixing

Tile fixing should be undertaken in accordance with the requirements of British Standard BS5385.

8. Frequently Asked Questions

8.1 What is likely to happen if the joint in the tiles does not correspond to the joint in the base?

The tiles will crack in line with the joint in the base. The tiles will have to be cut directly above the joint in the base to avoid this happening.

8.2 If, for aesthetic reasons, joints in tiles and the base will not line through, can anything be done to reduce the risk of failure?

It is possible to reduce the risk of failure by using a separating membrane (intermediate substrate)

8.3 Can preformed or sealant joints be successfully repaired if damaged?
Some preformed joints have removable infill strips. If the anchoring legs are damaged the tiles will have to be removed and joints replaced. In most cases it is possible to cut out and reseal sealant material without detriment to the integrity of the tiling system.

8.4 Can joints be incorporated in the floor at a later stage?

Yes, but this is not a preferred option. It can be a way of rectifying a design fault. Such joints are not as effective as those incorporated at the design stage.

This process will require much mechanical cutting and is an expensive process highlighting the need to consider this at the design stage.

8.5 Do joints need to be placed over day joints in a screed?

In this situation consideration should be given to a movement joint or separating membrane.

8.6 Can perimeter joints which are hidden by sit on skirting or timber skirting be left open, i.e. not filled with appropriate mastic?

It is preferable to fill such joints in order to comply with Building Regulations on sound transmission in multi-storey dwellings and to prevent debris falling into the void.

8.7 Do PVC sided joints have the same movement capability as preformed metal sided joints?

Yes, in certain circumstances. However it is important that in a heavily trafficked area or an area where hard wheels are used, a metal sided joint is used. A PVC joint edge will not protect the tile edge in the same way as a metal side edge joint.

Where heavy duty cleaning machines are to be used, metal sided joints should be installed.

8.8 Are floor and wall joints affected by chemicals or cleaning materials used in every day cleaning?

Yes, it is important to choose the sealant material dependent on the environment of the tiling system when in use. When aggressive materials are to be used, advice should be sought from the sealant and preformed joint manufacturer.

8.9 If a base is suitably reinforced and a full curing period is adhered to, is there any need to incorporate expansion/movement joints?

There is always likely to be some movement. This is dealt with in section 3 of this document.

8.10 Do movement joints/expansion joints need to be used when carrying out new tiling works in old buildings?

Yes, there is always likely to be some movement.
8.11 Should movement joints be incorporated when an extension is build onto the side of an existing building?

Yes.

9. Glossary of Terms

Deformation: change in shape or size as a result of applied force.

Creep occurs in a construction material, such as cement mortars, concrete, stone, wood, etc., when they are maintained under constant load and is a deformation movement (strain) that continues over a period of time.

10. Sources of Reference/Bibliography

British Standards:
BS5385-1: 1995 Wall and floor tiling. Code of practice for the design and installation of internal ceramic and natural stone wall tiling and mosaics in normal conditions.
BS5385-3: 2007 Wall and floor tiling. Code of practice for the design and installation of ceramic floor tiles and mosaics
BS5384-4: 1992 Wall and floor tiling. Code of practice for tiling and mosaics in specific conditions
BS5385-5: 1994 Wall and floor tiling. Code of practice for the design and installation of terrazzo tile and slab, natural stone and composition block floorings
BS8204-1: 2003 Screeds, bases and in-situ floorings. Concrete bases and cement sand levelling screeds to receive floorings. Code of practice
BS EN ISO 10545 Ceramic Tiles
BS EN 14411: 2003 Ceramic Tiles – Definitions, classifications, characteristics and marking
BE EN 12004: 2001 Adhesives for tiles. Definitions and specifications
BS EN 13888 Grouts for tiles
BS6093: 1993 Code of practice for design of joints and jointing in building construction

Publications issued by the Tile Association:
Design & Construction Process for Swimming Pools
Tiling to Calcium Sulfate based Screeds
Tiling to timber Sheets and Board, Timber Substrates and Alternative Products
Ceramic and Natural Stone Tiling to Acoustic Systems to meet the requirements of the Building Regulations 2000 Approved Document E Resistance to the Passage of Sound
Tiling to Heated Floors

Publication issued by the Stone Federation Great Britain:
Natural Stone Flooring. Code of Practice for the design and installation of internal flooring. Ref: FC02

Publication issued by the British Adhesives and Sealants Association:
The BASA guide to the British Standard BS6213 – selection of construction sealants. The BASA guide to the ISO 11600 – Classification of sealants for building construction.
Members of the Working Group

Phil Brierton
Steve Brown
Peter Fereday
Richard Friebe
Ian Knifton
Brian Newell
Cyril Potter
Lesley Reid
Colin Stanyard
Bill Walters
David Wilson
Annex 1
Typical Movement Joints

Fig 1a
Joint aligned to structural movement joint

1 Sealant
4 Grout
7 Cement:sand mortar bed
10 Levelling bed
13 Structural movement joint

Fig 1b
Prefabricated joint with reinforced edges and capping over structural movement joint

1 Flexible insert
4 Tile
7 Cement:sand mortar bed
10 Concrete base

11 Structural movement joint

Copyright to the Tile Association
Published March 2008
Page 20 of 22
Fig 1c
Flexible joint in bed, with or without separating layer

1  Sealant
4  Cement:sand mortar bed
7  Concrete base

2  Tile
5  Screed
8  Back-up material

3  Adhesive bed
6  Separating layer (optional)

Fig 1d
Slightly flexible joint: preformed strip with reinforced edges

1  Neoprene bonded to non-ferrous metal or rigid plastic strips
4  Adhesive bed
7  Tile wire

2  Grout
5  Screed
8  Locating lug attached to preformed strip

3  Tile
6  Cement:sand mortar bed
9  Concrete base
Fig 1e
Alternative perimeter joints (with skirtings)

1 Sealant (optional)
2 Sealant
3 Tile
4 Back-up material