



## Movement joints

An introduction to the what, why and where of movement joints in commercial applications

## An introduction to movement joints

Ceramic and stone tiles can be subjected to a variety of strains and stresses caused by movement in the tiled surface, leading to tiles bulging, cracking or becoming detached from the substrate.

Movement joints compensate for the movement of tiles, which extends down through the tiles, the bed and screed layer below. Without them, stress builds up between the tile and the substrate, causing de-bonding, bulging and cracking. Therefore these stress-relieving joints are an essential part of any tiling installation, and should be incorporated at the design stage.

Movement joints create a tile field, which moves independently from those around it, and should be included at set distances in floor and wall tiles in accordance with recommendations from the British Standards Institution (BSI). BS 5385 states that the maximum tile field should be no more than ten metres in each direction for floors - but in practice, depending on the individual application, it tends to be between five and eight metres for floors, and every three to four and a half metres on walls.

Installing the appropriate movement joints in line with these recommendations will prevent tiles from cracking, bulging and de-bonding.

There are many different widths of pre-formed movement joints, and the correct width and material - brass, aluminium, stainless steel or PVC - must be specified to take thermal movement into account. Examples of some movement joints are shown below.

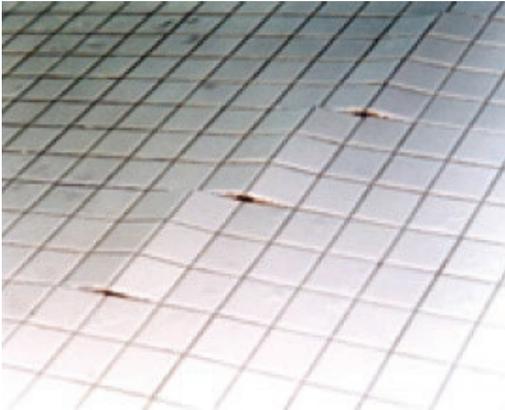


The amount of movement that can be absorbed - and therefore the degree of protection given by the joint - depends on the size of the profile and the compressible material used. Pre-formed surface joints will usually accommodate movement of up to 20% of the movement zone width. A 10mm joint will extend and compress by approximately 2mm. One of Schlüter's stress relieving movement joints, the Schlüter-DILEX-KS, has a movement zone of 11mm, and will accommodate up to 2.5mm of tile movement. Due to the fact that there are specific movement joints for specific types of application, most tiling failures are caused by using joints that aren't suitable for what is being demanded of them. There are many situations; each with their own technically engineered solution in the form of the correct joint, very often using the wrong joint - one that is not able to meet the requirements that are demanded of it, can cause severe problems.

Generally aluminium is ideal for commercial use; with brass and stainless steel used for heavy duty commercial and industrial projects such as warehouses, production facilities and airports, and where the tiled surface is cleaned by a scrubbing machine, or where there are rolling loads such as pallet trucks and metal-rimmed trolleys. Stainless steel is also ideal in places like laboratories and food processing plants where chemicals are used. PVC can be used for residential and medium duty commercial applications including offices and swimming pools, and areas subject to light mechanical loading such as showrooms and car dealerships.

Solus is always happy to advise on the requirements of individual projects.

## Why movement joints are needed



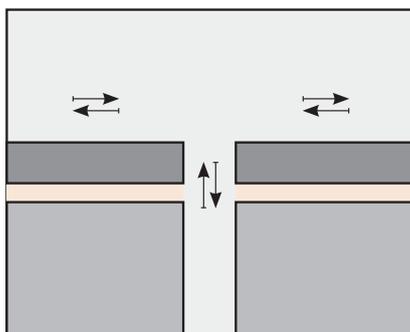
Ceramic or stone covering can be compared to a sheet of glass, in that each is rigid by nature. Movement joints must be installed in certain areas and positions to prevent tiles or grout from cracking, and in some cases prevent the tiles from tenting and becoming de-bonded from the substrate.

A movement joint is the interruption of the surface to allow for movement. Common terms are:

- Movement joint
- Expansion joint
- Stress relieving joint

Movement joints are needed because all tiles expand and contract with temperature and moisture changes. In almost every case the substrate will move differently to the covering material. The larger the tile field, the more it will expand and contract, and be vulnerable to failure.

In 95 per cent of today's tile installations tiles will be fixed using the thin-bed method. This means that the tile is adhered directly to the substrate with an appropriate adhesive. Movement joints accommodate the differential stresses within each "field" of tiling, so they don't build up to a level, which would cause shearing stresses at the bonded interface, in turn protecting the tiles from cracking, tenting and de-bonding.



### Tile and natural stone

**All tiles expand and contract with changes in temperature**

**The larger the field tile, the higher the coefficient of expansion and contraction**

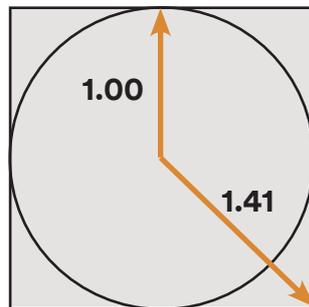
**Substrate and tiles move differently**

Stresses from drying shrinkage, deflection and moisture movement in the substrate, plus thermal and moisture changes affecting the flooring, can cause loss of adhesion, resulting in bulging or cracking of the floor. In particular, deflections in suspended floors can induce high compressive stresses in rigid floor tiling, and may be the principal cause of "hollowness" in those situations. The shear stress, resulting in the substrate and ceramic or stone surface moving differently from each other, is often too great for the adhesive to hold - shown above. Therefore, stress-relieving joints are an essential part of any tiling installation, and should be incorporated at the design stage.

There are different widths of pre-formed movement joints, and the correct width and material - brass, aluminium, stainless steel or PVC - must be specified to take thermal movement into account. The amount of movement that can be absorbed - and therefore the degree of protection given by the joint - depends on the size of the profile and the compressible material used. Pre-formed surface joints will usually accommodate movement up to 20% of the movement zone width. For example, one of the larger stress-relieving joints at 15mm wide, with a movement zone of 11mm, will accommodate up to 2.5mm of tile movement.

However, as the majority of tiled installations involve the thin-bed fixing method, cracks in the substrate will readily be transferred to the surface, causing the tiles to crack. Where irregular hairline cracks in the screed or timber board joints are present, it becomes impractical or impossible to position movement joints. In this situation the best way of preventing damage is to incorporate movement joints with an uncoupling system, such as a polyethylene membrane, to separate the covering from the substrate, in order to guarantee the long-lasting integrity of the installation.

## Where movement joints are fitted



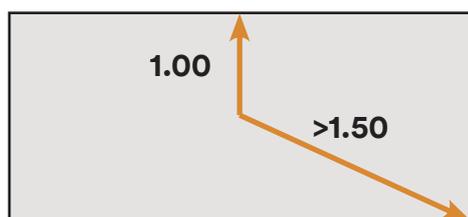
### The ideal field size

Ratio of the shortest to the longest distance from the centre of the force should be approximately 1:1.5

The theory is to create “tile fields” large enough to absorb differential movement between the substrate and the ceramic or stone covering -- movement joints must be installed in certain areas and positions to prevent tiles or grout from cracking...and in some cases prevent the tiles from tenting and becoming de-bonded from the substrate. But the exact positioning of movement joints is vital to them successfully protecting the installation. If they're installed in the wrong place they won't work.

Industry guidelines suggest that the maximum tile field should be no more than ten metres in each direction - but in practice, depending on the individual applications, it tends to be between five and eight metres. British Standards (BSI) 5385 Part 3: 2007 covers the requirements and methods for movement joint applications. Section 3 – 6.8.1.1 states that the building designer should assess the magnitude of any stresses and decide where movement joints should be located, having regard to all relevant factors, including the type of flooring, bed and substrate.

While the floor areas to be tiled come in all shapes and sizes there is a general formula for working out where movement joints should be placed. A circle provides the best configuration for movement joints, because the forces from the centre are equal in each direction. However, in practice, because few floors are circular, it is best to look at square and rectangular floors. In a square configuration the ideal field size is where the ratio of the shortest to the longest distance from the centre of the force is approximately 1:1.5 (see above) -- for example 5 × 7.5 metres. Generally, the tile “field” should be kept as square as possible, and where under floor heating is present, the tile field should not exceed 40 square-metres.



### Not an ideal field size

Cracks are probable if the ratio of the shortest to the longest distance from the centre of the force exceeds 1:1.5

However, most floors tend to be rectangular, rather than square. And rectangular shapes tend to be a more complex configuration, as the ratio of the shortest to the longest distances exceeds 1:1.5. In the example shown above the crack risk is at the centre of the area. If no movement joint has been installed, cracking of the tiled surface is highly likely.

In large floors it is advisable to incorporate movement joints forming bays at no more than 30-metre intervals. Each bay is then sub-divided into smaller bays by stress relieving joints no greater than ten metres apart.

On suspended floors, stress-relieving joints should be inserted where flexing is likely to occur, for instance, over supporting walls or beams. As in any situation, joints must be situated directly over any joints in the substrate, and at any changes in the substrate, such as timber to screed.

For areas less than two metres wide perimeter joints are not normally required, unless conditions generate stresses which are likely to become extreme, for example temperature changes.



**Solus have a broad range of services on offer.** In addition to an impressive range of services and advice, Solus also have a comprehensive library of technical information and are able to provide fixing specifications which can be added into NBS Plus specifications.

- “Don’t Slip Up” RIBA approved CPD seminar
- “An overview of tile specification” RIBA approved CPD seminar
- Product awareness seminar
- BIM
- NBS Plus specification
- Advice on standards
- Fixing specifications
- Cleaning & maintenance
- Environmental information
- Pendulum testing
- Technical data sheets
- Tile matching
- Next day sample service
- Waterjet cutting
- Design and fabrication

**supplying your imagination**