



## MOVEMENTS OF THE SUBSTRATE AND COVERING

### MECHANICAL MOVEMENTS

#### Movements due to substrate and covering flexibility.

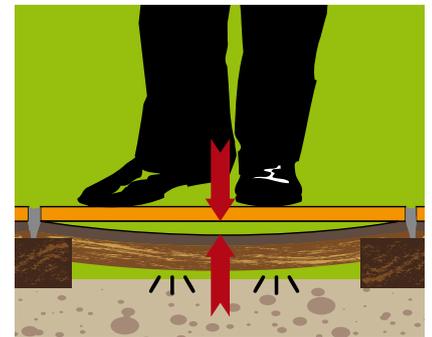
When tiling onto flexible substrates, covering and substrate should deflect in conformity according to the load applied. The adhesive should be flexible to absorb the amount of movement or in mismatch the tiles will either delaminate or crack.

- Flexible floors and walls (timber floors and gypsum panels) will deflect, spring, vibrate or move according to the load applied.

- Deflection and the tension forming between the substrate and covering will be exacerbated across each tile's width for large tiles.

- Tiles are rigid and brittle whereas timber floors or gypsum panels are flexible. Therefore, tiles are incapable of bending in accordance with the substrate defined.

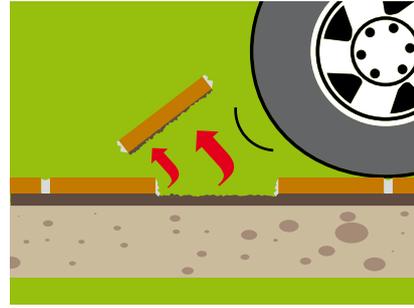
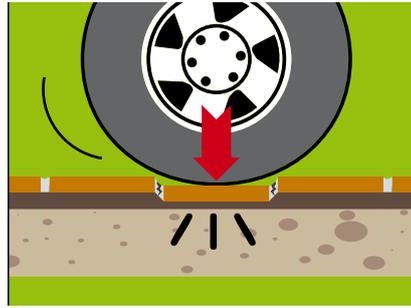
- Large tiles have less joint area to absorb any movements on the covering. This may cause cracking of the joints.



## Movements due to loads.

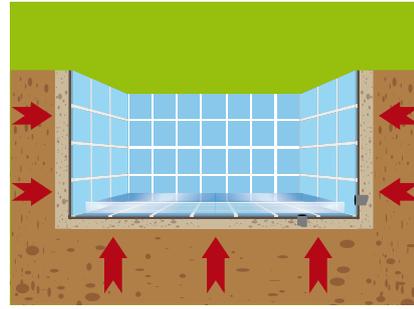
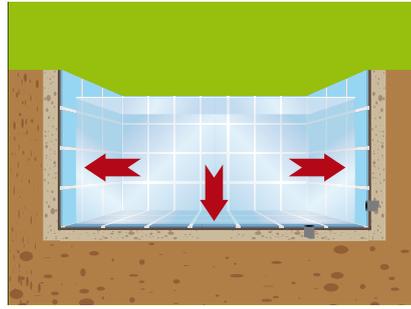
The floors of public places (hospitals, malls, public buildings) and industrial areas (factories, warehouses) are exposed to heavy loads such as pedestrian or vehicle traffic. Loads will create pressure and vibration on the covering. The structure must be strong enough to support the expected load including tiles, adhesive, grout and the screed if needed without undue movement.

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Movements in pools due to water pressure varying with weight water.

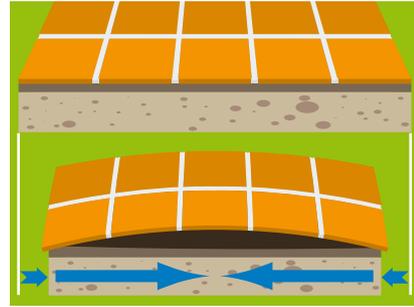
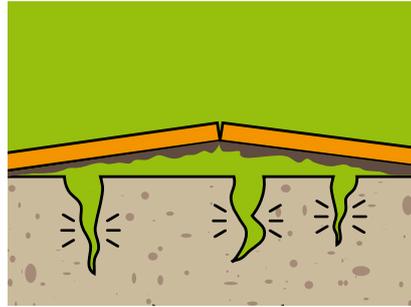
- After tiling the pool, once the pool is filled there will be some movement due to the effect of water pressure on the walls and the overall weight of water in the pool. These movements will cause tension in the covering system.
- When the pool is emptied inertial forces will be formed on the pool walls and base. Thus, the bond strength of the adhesive must not be affected by the movements caused by opposite forces.



## Movements due to shrinkage of new screeds, plasters and concrete.

Newly laid cementitious screeds, plasters and concrete will shrink during curing period. When they are fresh they contain relatively large amounts of water. Excessive water retained in the binder is evaporates during curing. Shrinkage occurs to compensate the volume of water lost.

- For at least 6 weeks should be allowed for the binder to stabilize and minimize shrinkage. Tiling very soon may cause tiles cracking or blowing away from their base.



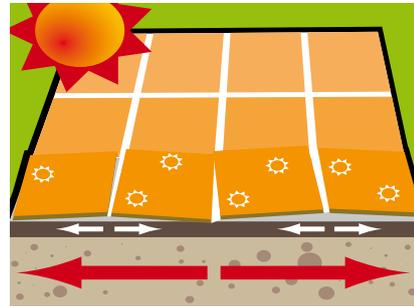
## THERMAL MOVEMENTS

### Movements due to thermal changes.

All substrates and covering systems (tile, adhesive and grout) will shrink and expand naturally due to temperature fluctuations and humidity. Particularly when seasonal temperature changes are severe, shrinkage and expansion will occur.

- Because of different coefficients of thermal expansion and elasticity characteristics of the materials forming the substrate and the covering system, shrinkage and expansion rates will naturally be different for each material.

- Any movement caused by shrinkage or expansion will cause stresses to form between the substrate and the tiling layer as both move at different rates. These stresses can cause cracks and fracture or delaminating of tiles.

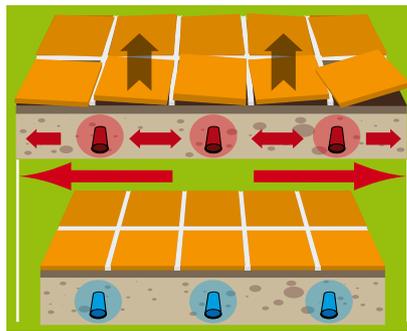
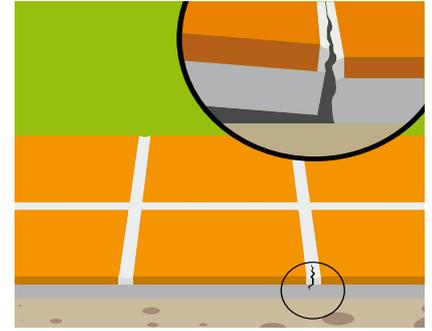
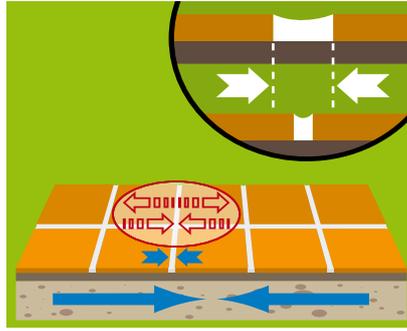


The grouting materials filled into joints should be flexible sufficient to absorb the movements occurring in horizontal with the surface. Too stiff grouting materials will fracture or depart from the tiles' edges.

■ In case of outdoor pool and terraces; the water seeped under the covering may freeze in cold weathers. This will cause volume expansion and therefore tension under the covering. Tension may cause delaminating, cracking or deformations of the covering.

Tiling onto under floor heated systems; the tiles usually have a lower coefficient of thermal expansion. For a given temperature rise tiles will expand less than the substrate and stresses will be formed at the interface between the tile and the adhesive. At weak bonded parts, the tiles may delaminate or blow away from their base.

■ Same rule applies for the substrates on heat transmitting systems and insulation applications.

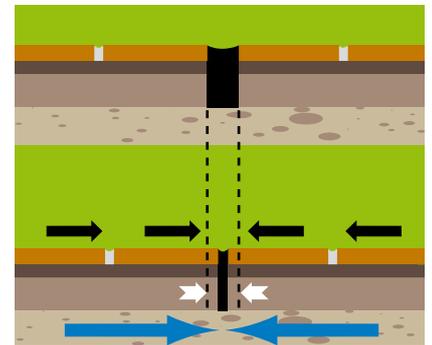
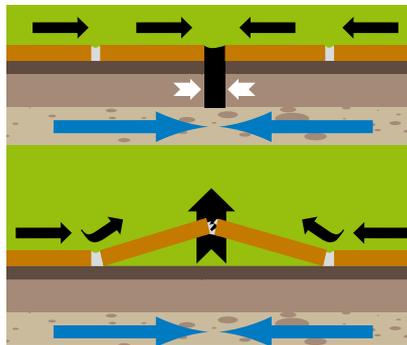


USE OF EXPANSION JOINTS

Expansion joints on floors.

■ Expansion joints should be incorporated to allow for slight movements due to changes in temperature, humidity and thermal and mechanical loads formed on the covering and substrate. Expansion joints should be provided considering heat transmitting systems and insulation applications, floors exposed to heavy traffic and pedestrian loads, wide-ness of the area.

■ Expansion joints absorb the stresses formed between different movement capacities of overlapping materials. Thus, it prevents the deformations that may arise in the flooring and covering.



Any movement joints in the building structure must be carried through the tiling layer.

- If there exist any expansion joints on the floor, artificial expansion joints should be created. Before laying the covering, cold joints should be formed on the screed within rectangular areas of minimum 4 m x 4 m (for large sized tiles up to 8 m x 8 m) with minimum depth of 1 cm. Spiral or concrete cutting machines can be used for forming the joints.

- When the area is smaller than 4m x 4m, expansion joints should be incorporated in the shape (+) on the area. If this is not possible, expansion joints should be laid within columns. These artificial joints will eliminate the stress formed by the structural movements of the building.

- Expansion joints should have minimum width of 6-10 mm.

- Expansion joints should be laid where tiling meets other materials, along all internal corners (wall and floor intersections). Skirting should be fixed upon to the completion of tiling.

- No coatings or coverings should be applied on the existing dilatation zones and structural expansion joints in buildings. These zones should be insulated by using proper profiles or mastics.

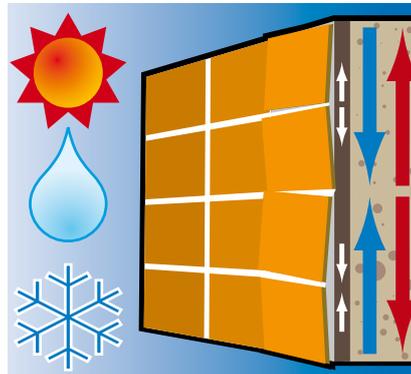
- Expansion joints should be insulated by using proper profiles or mastics. Cementitious grouting materials are not appropriate for expansion joints.



### Expansion joints on facades.

- On facades; along storey transitions, in internal corners, overlapping wall coverings, wall-floor intersections and on areas > 3 m x 3 m expansion joints should be applied. Expansion joints should have minimum width of 10 mm. Skirting should be fixed upon to the completion of tiling. Expansion joints should be insulated by using proper profiles or mastics.

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### Compatibility of the substrate and covering system.

- In tiling application which are exposed to mechanical and thermal loads, compatible products (substrate-selaing-adhesive-tile-grouts) with elastic character should be selected for corresponding to the movements (expansions and shrinks) caused by thermal and mechanical effects.