TECHNICAL UPDATE

GUIDANCE ON THE USE OF MOVEMENT JOINTS

Guidance on the use of movement joints

Introduction

This technical document provides additional guidance relating to how the Functional Requirements in the Technical Manual may be satisfied. This article covers the following:

Please note, this guidance document is in relation to low rise residential buildings only. For commercial or high rise buildings, advice should be sought from the structural engineer.

Must haves

The structural engineer must provide structural calculations and drawings clearly detailing the following:

- Spacing and location of movement joints
- Wall tie spacings around movement joints
- The materials to be used for the compressible filler and sealant
- Mortar bed joint reinforcement type, location and length if required

The above must be in line with the requirements set out in Section 6 of our Technical Manual, PD6697 and EN 1996-1-1: Eurocode 6.

What are movement joints and why are they important?

Buildings by many, may be seen as inert or static objects, however, in actual fact they are prone to a considerable amount of movement, primarily due to environmental factors such as variations in temperature and moisture. Movement joints (sometimes referred to as expansion joints) are often introduced within the design and it consists of a gap which allows for expansion and contraction. The gap is filled with a compressible filler and a weatherproof sealant is layered on top.

Having no movement joints (or movement joints at the incorrect spacing's) can therefore cause stress cracking in the external wall (and adjacent elements) as sufficient allowance has not been catered for expansion and contraction.

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Movement joint requirements in masonry

Spacing of movement joints

For masonry walls, movement joints should be spaced as per the below table (as reproduced from the Technical Manual)

Spacing of expansion joints

Material	Normal spacing	Joint thickness
Clay brickwork (2)	12m (Spacing up to 15m may be possible if sufficient restraint is provided - consult designer)	15mm
Calcium silicate	7.5-9m	10mm
Concrete brickwork (1)	6m	10mm
Concrete blockwork (used in outer leaf)	6m	10mm
Stone	12m	15mm

Note:
It is not normally necessary to provide movement joints to the internal leaf of cavity walls, but it should be considered for rooms with unbroken lengths of wall in excess of 6m.

The first joint from a return should be not more than half the dimension indicated in the table. Movement joints are not acceptable in solid party or separating walls; however, where cavity wall construction is adopted, offset movement joints with a solid rubber compressible strip may be acceptable.

(1) Where openings are over 1.5m, masonry bed joint reinforcement should be considered
(2) For unrestrained masonry such as parapets and free standing walls, vertical joint spacing should be reduced to 5m - 6m centres.

Table 1

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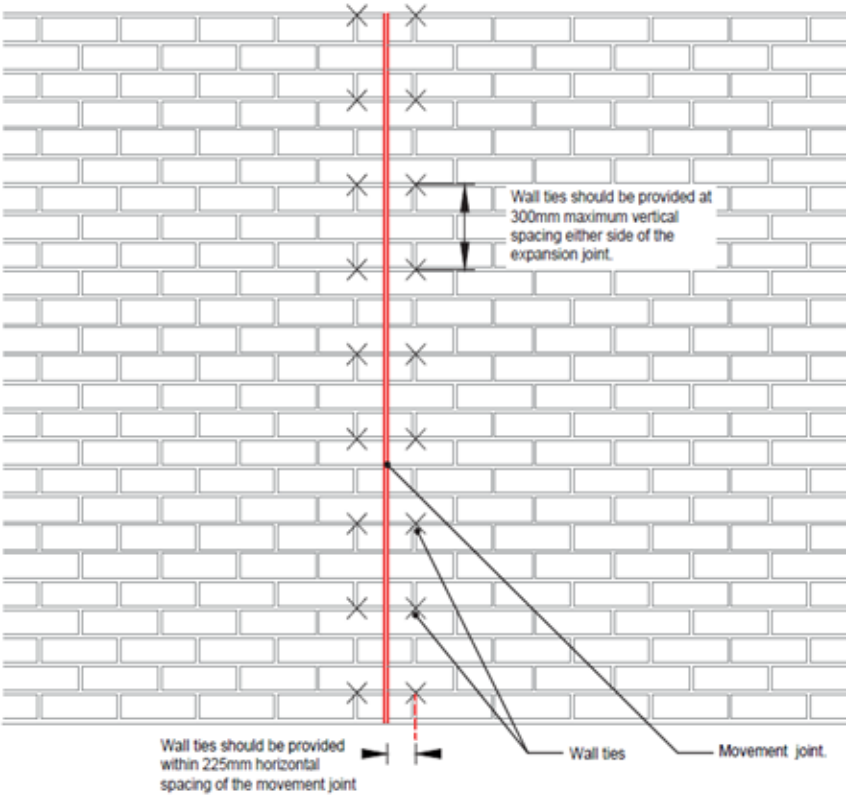
Wall tie positioning adjacent to movement joints

Wall ties should be spaced as per the diagram on the right. A structural engineer would need to provide justification and calculations for any deviation.



For timber framed structures, maintaining a 225mm horizontal wall tie spacing can be difficult as the timber studs may be more than 225mm away from the movement joint.

Introducing additional timber studs may be impractical and therefore an alternative solution of using slip ties at 300mm vertical centres with 50mm embedment into the masonry either side of the movement joint, could be considered subject to a structural engineers design.

Positioning of movement joints

For masonry cavity walls, horizontal expansion will occur at corners which can push the corners out and this in turn can eventually cause cracking, however this can be avoided by sub-dividing walls into shorter lengths with movement joints. Movement joints should also be provided as close to corners as possible (but not less than 665mm from a corner).

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The shaded area in figure 2 below shows the ideal position for the first movement joint – first movement joint should be **no less than 665mm from a corner** and **up to half recommended length of wall without a movement joint**.

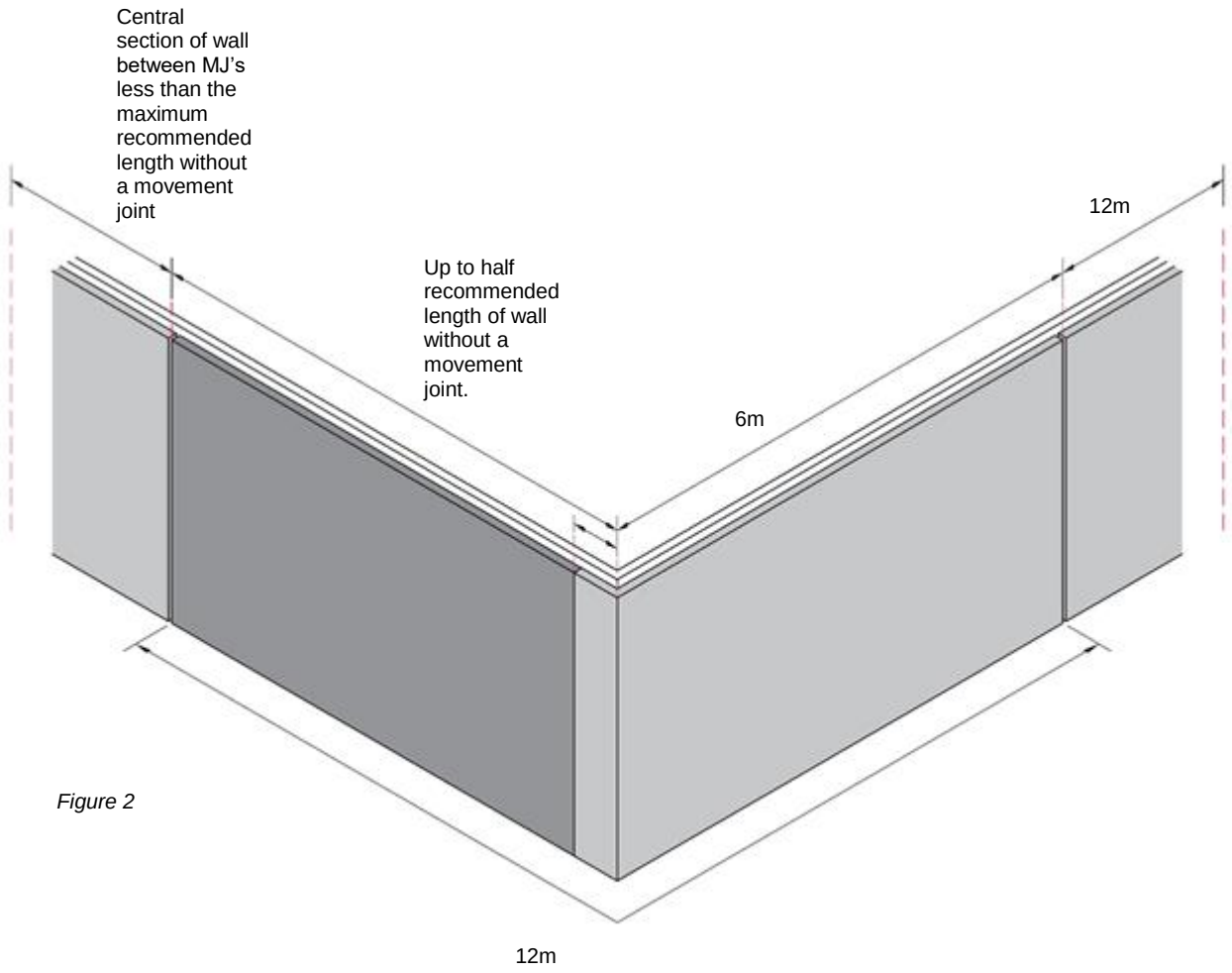

Figure 2

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Short returns in clay masonry (less than 675mm) should have movement joints as per figure 3 below. Movement joints can be specified with the use of a 'compressible joint' or a 'slide by joint'.

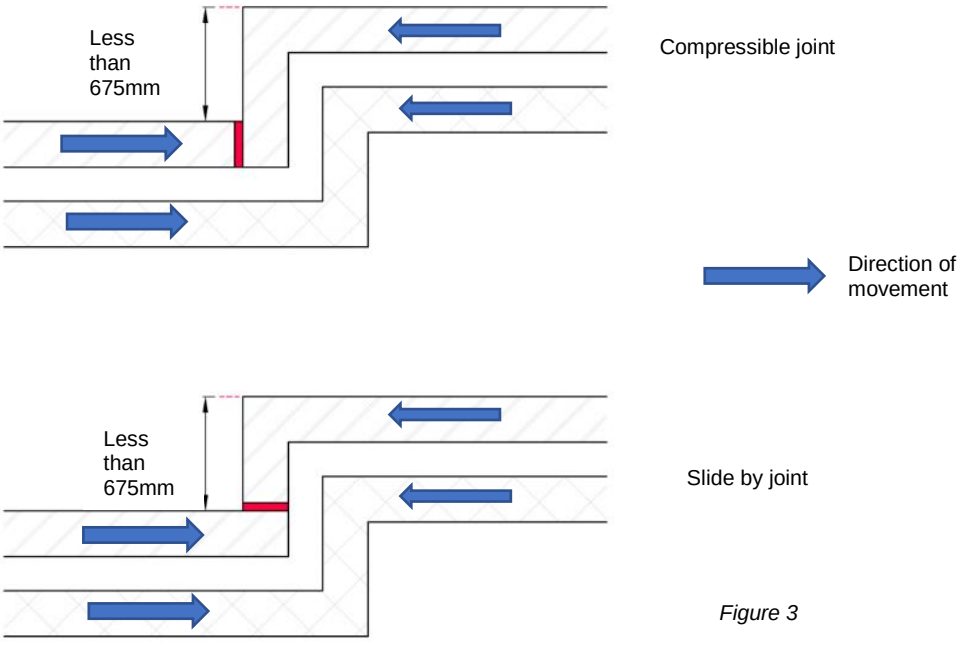

Figure 3

Parapets

Unrestrained masonry such as parapets and free standing walls require greater movement control due to their greater exposure, less restraint and stronger mortar mixes. Movement joint spacing for parapet walls should therefore be half then what is stated in table 1 and 1.5m from corners. For further guidance on movement control in parapet walls, the structural engineer should be consulted. For further guidance on parapets, please see our Guide to Creating Weatherproof Parapet Walls.

Materials

To meet our warranty requirements, compressible filler, such as polyurethane foam, should be used to form the joint and be sealed to prevent water penetration and achieve a service life of at least 15 years (without maintenance). Movement joints should be sealed with an appropriate sealant which can provide sufficient flexibility whilst resisting water penetration.

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When sealants are used in proximity with stone it is important to select a non-oil-based sealant to help prevent any staining to the stone.

Elastic sealants (Type E) are suitable as they allow for reversible movement. Where a back-up material is used to control the sealant depth, it will also provide a compressible space into which the sealant can deform.

Where a backing material is used, the following must be considered:

- The material is compatible with the sealant.
- It will not adhere to the sealant, preventing cracking within the sealant.
- Provides sufficient density to allow the sealant to be applied.

- Allows sufficient flexibility so not to impede lateral movement (compressible to about 50% of its original thickness).

Please note, hemp, fibreboard, cork and similar materials should not be used for expansion joints in clay brick masonry, but may be used for contraction joints in calcium silicate and concrete masonry (PD6697).

Movement joints in concrete bricks

The rate and extent of movement in concrete bricks can be considerably different to that of clay bricks, for specific guidance on movement joints in concrete bricks, please see our article 'Accounting for Movement in Concrete Bricks'.

Accounting for movement in framed structures

Anticipated differential movement for timber frame structures

Timber frame structures will move at a different rate to their masonry cladding on the exterior face and this should be taken into account by the structural engineer. Movement joints should be provided under all openings and at eaves and verges with the size of the movement joint as per guidance provided in Section 6.2 of our Technical Manual.

Any material or component attached to the timber superstructure that overhangs the brick or blockwork (e.g. cladding attached to the timber frame, window sills, roof eaves, and verges) or projects through the masonry (e.g. balcony supports, flues, extractor fan vents, or overflow pipes) should have a clear gap beneath and at the top of the masonry cladding to allow differential movement to take place, thus avoiding damage to the components or cladding.

Gap sizes should allow for anticipated differential movement while allowing for drainage and ventilation requirements. Insect infestation should be avoided by using screens to cover gaps exceeding 4mm.

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Differential movement at floor zone with cladding supported on timber frame

Horizontal cross grain timber and construction gaps are concentrated at floor zones and this is where the majority of movement occurs. Vertical timber battens or other rigid cladding support systems should not span over the floor zones of timber frame buildings.

Gaps should be provided to accommodate anticipated differential movement and the compressed size of any filler. Unlike self-supporting claddings, movement is not cumulative but should be calculated individually for each floor zone using the following formula of 1mm for every 38mm of horizontal cross grain timber.

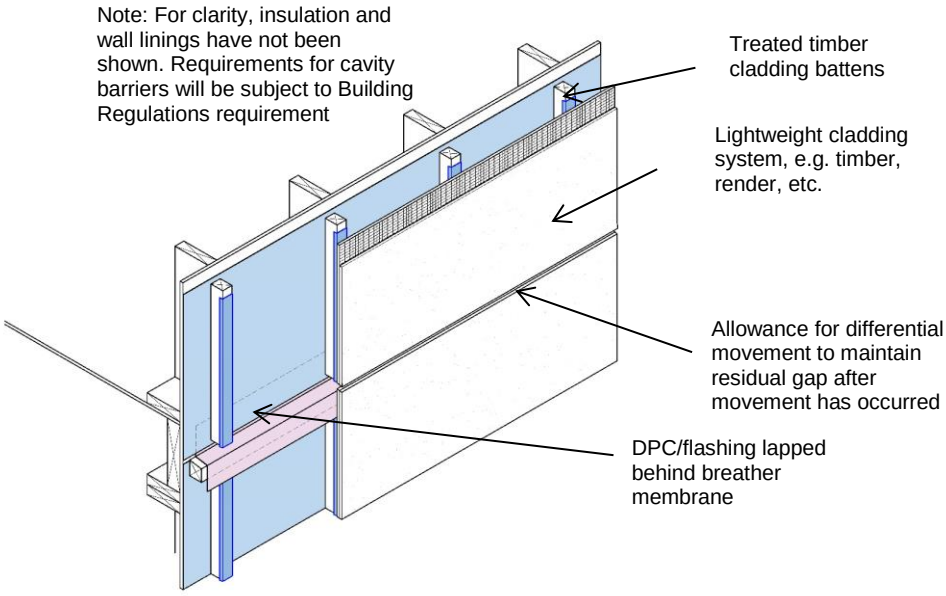

Figure 5

Accounting for movement in Light Gauge Steel Frame

Light gauge steel frame (LGSF) structures will also move at a different rate compared to the external cladding and this should be taken into account by the structural engineer. Movement joints should also be located under openings, eaves and verges.

In addition, any material or component attached to the LGSF structure that overhangs the brick or blockwork (e.g. cladding attached to the LGSF, window sills, roof eaves, and verges) or projects through the masonry (e.g. balcony supports, flues, extractor fan vents, or overflow

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pipes) should have a clear gap beneath and at the top of the masonry cladding to allow differential movement to take place, thus avoiding damage to the components or cladding.

Movement joints in render

Rendered walls should be constructed with control measures in place to reduce the risk of damage to the render from movement in the substrate.

Rendering onto masonry walls

Any movement joints within the substrate should be carried through to the face of the render (figure 6)

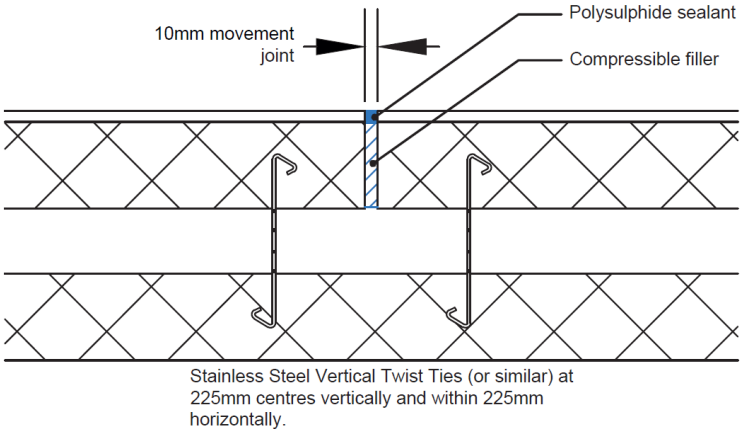

Figure 6

Where recommended by the blockwork manufacturer, cracking of the substrate could be significantly reduced by introducing a specialist proprietary bed joint reinforcement within the mortar joints. This should be provided in accordance with the structural engineer's specification.

Ensure that the reinforcement is continuous and joints lapped in accordance with the manufacturer's requirements (generally 450 - 500mm laps and continued around corners). Specialist corner units are likely to be required, check with the block manufacturer.

Introducing bed joint reinforcement at weak points such as above and below window and doors openings will greatly assist in minimising cracking to these areas. Where possible, the reinforcement should project 600mm beyond the opening.

Render **should not bridge across dissimilar materials**, however if this cannot be avoided, the render should be stopped at an appropriately formed movement joint or austenitic

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stainless steel lath reinforcement should be used across the joint with a separation strip behind.

Rendering onto render board and timber/steel framed structures

Note: Render boards must be proven to meet a relevant BS EN standard and proven suitable as a direct render board e.g. BS EN 12467 to a category A weather resistance and have third party product approval by a UKAS or international equivalent.

Gaps between boards should be provided in accordance with the manufacturer's recommendations and carried through to the face of the render. Care should be taken to ensure there are no excessive gaps between the boards and appropriate weather seals are incorporated against walls and frames.

Where renders spans across an intermediate floor zone in timber frame construction, allow for differential movement due to timber shrinkage by incorporating a movement joint as per figure 5 above.

Vertical movement joints should be provided at the required intervals. The actual spacing and position of the joints will be determined by the shape of the area to be rendered and generally vertical movement joints should be provided at maximum 5m centres.

For further guidance on render boards, please see Section 6.4 of our Technical Manual

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Mesh reinforcement around openings

For rendering onto both masonry and render board, mesh reinforcement is required around openings as per figure 7 below.

Typical mesh reinforcement around openings

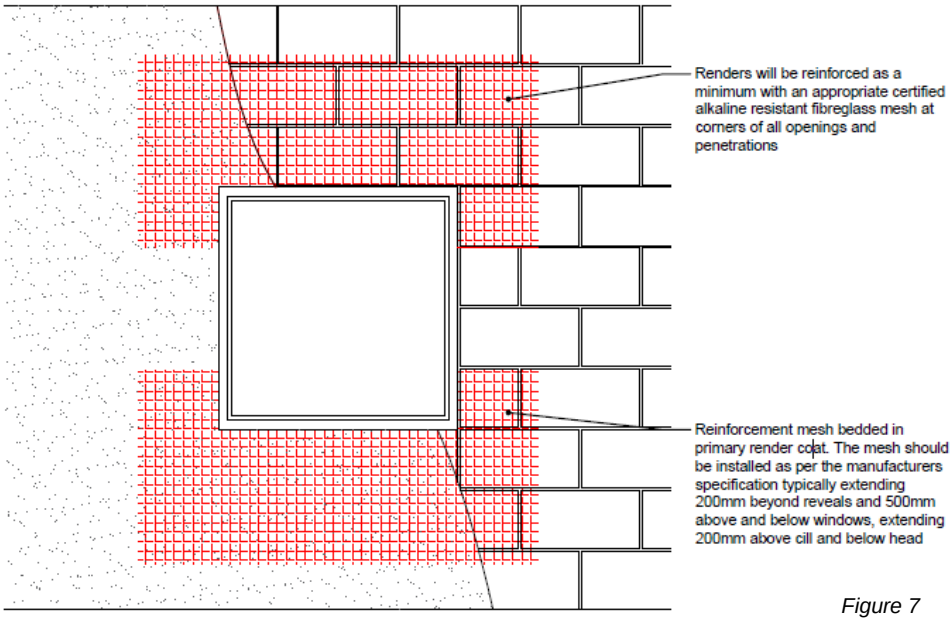

Figure 7

In summary, prior to works starting on site, rendered walls and their anticipated movement should be considered as part of the design by the structural engineer.

Other considerations

Differing materials

Brickwork and other building materials move at different rates and therefore where differing materials abut each other there should be consideration for how the movement is to be accommodated by your structural engineer (movement joints, bed joint reinforcement etc.).

On any given wall elevation where there is a mix of masonry e.g. Brickwork external leaf lower level with a rendered block upper level, the requirement of a full height movement joint should be based on the shorter spacing requirement e.g. for the blockwork at 6m - not brickwork at 12m.

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Changes in height

A movement joint should be considered where there is a significant change in height in the building elevation. This can be achieved with the use of a compressible or slide-by joint and should run the full height of the building.

Bed joint reinforcement

Bed Joint reinforcement may also be required to critical areas to accommodate stresses such as above and below window openings. The Structural engineer or render manufacturer may require this to be provided as part of the overall design specification. Where provided, they will be in addition to movement joints, not instead of. Bed joint reinforcement potentially can increase spacings of movement joints subject to the structural engineer's specification.

Movement joints below DPC

Where the finished ground level is 600mm or greater below the horizontal DPC, the movement joint should be continued within the external leaf of the sub structure

Building orientation

The orientation of your building can have a substantial impact on the movement of different materials due to temperature changes. Allowance should therefore be made for south, south west, south east and the rear face of north facing parapets to move in a controlled manner with the use of movement joints and/or bed joint reinforcement. The structural engineer and render manufacturer should provide a project specific specification.

Retrofitting movement joints

Movement joints must be considered and detailed at design stage and discussed on site before any works begin. Their positions must be fully communicated to the site team and relevant trades before bricklaying begins.

In instances where they've been missed on site, a structural engineer should be consulted to provide a designed solution and the following should be considered:

- The structural engineer must provide a specification of:
    - Spacing and location of movement joints
    - Wall tie spacings around movement joints
    - Provision of slip ties
    - Type of sealant and backing material
    - A detailed method statement for how this is to be achieved.

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Induced movement joints **are not recommended** (e.g. retrospective cuts in completed panels with a petrol Stihl saw) as these rarely achieve full depth of the cut and required width of joint) and the necessary wall tie provision may not be in place either

Warranty stance

The provision of movement joints should be considered at an early stage by your designer and they should meet the requirements of Section 6 of our Technical Manual, PD6697 and EN 1996-1-1: Eurocode 6.

References

- PD 6697:2019 Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2
- Designing for Movement in Brickwork, Brick Development Association
- Design and specification considerations designing for movement, IB Stock
- Accommodating Movement in Building Envelope Materials, The Building Envelope

Every care was taken to ensure information in this article was correct at the time of writing (February 2022). Guidance provided does not replace the reader's professional judgement and any construction project should comply with the relevant building regulations or applicable technical standards. For the most up to date LABC Warranty technical guidance please refer to your risk management surveyor and the latest version of the LABC Warranty Technical Manual.

Reference: TS 3174

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