Movement in Masonry Walls

To allow for movements in masonry (expansion and contraction and footing movement) control joints are required. These can usually be constructed so that the expansion joint and the articulation joint are one and the same.

Expansion Joints

Expansion and contraction must be allowed for in masonry design by inserting control joints at spacings designed to suit the magnitude of the movement.

Clay products expand permanently over time. This is the opposite of cement-based products, which permanently shrink. For this reason it is unwise to use clay and concrete units in the same band in a wall. If clay bricks are used in concrete framed buildings, control joint spacing and workmanship are critical, as the bricks will expand as the concrete frame shrinks.

The magnitude of thermal changes varies from brick to brick depending on the many factors, however, allowing 0.008 mm/m/°C is usually recommended. Expansion and contraction from wetting and drying of clay bricks is less than for concrete and calcium silicate products and usually can be ignored in brick masonry design.

AS3700, Clause 4.8 requires expansion joints to be spaced to limit panel movement so that movement from both sides closes joints by less than 15 mm and joints are at least 5 mm wide when closed. This means the gap, when constructed, should be 20-25 mm. However, in most buildings articulation joints are used and these are closer than required for expansion making separate expansion joints unnecessary.

Articulation Joints

Articulation joints are vertical gaps that allow for minor footing movements, to prevent distress or significant wall cracking. Articulation joints provide the flexibility needed when building on reactive clay soils and usually are not required for masonry on stable sites (classified according to AS2870). Spacing of articulation joints depends on the site classification and the slab or footing design, but where used must be placed no closer than 0.5 metres and no further than 3 metres from all corners. The width of articulation joints depends on the height of the masonry: 10 mm for masonry up to 3 metres and 15 mm for masonry up to 6 metres high. ▶

Movement in Masonry Walls (continued)

Control Joints (General)

Control joints should be used beside large openings, where wall thickness changes (except where this is for support eg. engaged piers), where wall height changes by more than 20%, at changes of level in footings and at other points of potential cracking. Control joints must not continue through bond beams.

Ideally, control joints are located near a corner and concealed behind a down pipe. The bricklayer and renderer must keep the control joint clean, otherwise, bridging mortar or render will induce cracks as the masonry moves. External control joints should be finished with a soft flexible sealant to prevent moisture penetration.

The design and construction of control gaps in the external leaf of a full brick wall is identical to that in brick veneer. In internal masonry, control gaps are not usually required, except at re-entrant angles in long walls. However, where an internal control joint is required the design is as for external leaves but the thermal component may be ignored in calculations. Internal control joints can usually be located at a full-height opening such as a door or window.

Ties are required on both sides of a control joint, but where it is not possible to use them masonry flexible anchors (MFAs) must be used across the joint. Where MFAs are used in walls over 3 metres or in walls exposed to high winds, MFAs must be built in at half height and every seventh course (600 mm) above. MFAs are ties that are of a type that only allows movement in one plane. Unless ties are used, control joints create a 'free end' in terms of Robustness and Fire Resistance Level calculations for structural adequacy, so their positioning is critical to the overall design of the structure. In portal frame construction, the control joint is positioned at a column so that both ends can be tied to the column's flanges.

The principles of control joint construction are illustrated in the adjacent figure.