Wall Ties and Bed Joint Reinforcement

A single unreinforced brick wall 102mm wide is unstable; in order to maintain stability, it must be tied to an inner skin. The inner skin is often blockwork but may be a metal framing system or even wind posts. The minimum requirement for sheltered conditions for general brickwork is to have wall ties at 450mm height and 900mm width arranged in a diamond formation. Detailed information can be found in the BS EN 1996 series of Eurocodes. General information can be found in PD 6697: 2010. Essential background information is listed below. For specification advice, information should be taken from the standard not from this guide.

Embedment in the mortar joint should be an absolute minimum of 50mm in both skins. The wall ties should be selected with an allowance made for tolerances. Wall ties are often available in stainless steel but as cavities grow larger with more insulation Balsalt ties are sometimes used to avoid cold bridging. Helical ties which can be let into the inner leaf are sometimes used retrospectively where wall tie provision has been inadequate.

The density for wall ties should conform to the National Annex to BS EN 1996-1 2005, NA.2.16. Wall ties should be evenly distributed. In the event that blockwork is not the internal leaf and framing is available, the ties may be vertically distributed. The density should be higher than if arranged in a diamond formation.

De-bonded ties with a pull out plastic sleeve can be used across a movement joint (MJ) where restraint is required in shear, but will still allow movement.

Commonly in construction the following omissions occur. Either side of MJs, windows doors or other un-bonded edges including gable walls, wall ties should be placed at 300mm max height (often 225mm to suit blockwork coursing) within 225mm of the edge of the opening.

Wall ties come in the following classifications:

- Type 1 Heavy duty, often used for high rise and the high winds in the North and West, particularly Scotland and Northern Ireland where high winds are frequent.
- Type 2 Up to 15M above ground level, domestic and small commercial buildings. Wind velocity up to 31m/s.
- Type 3 Wind velocity limited to 27 m/s.
- Type 4 Light weight lower rise masonry cavity walls in domestic construction with bracing walls. Not suitable with the high winds noted above, or any construction more than 150M above sea level.

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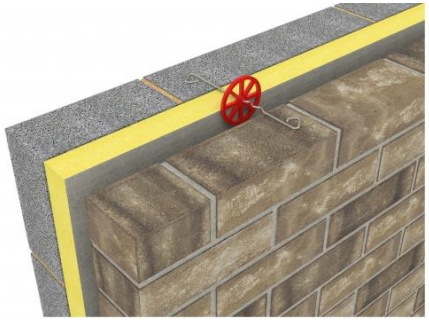
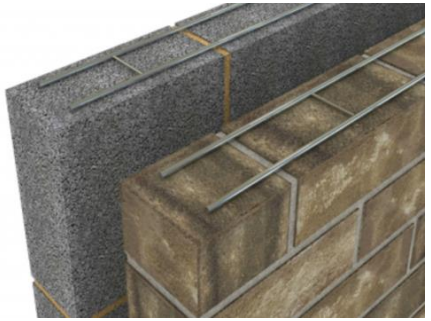
Bed Joint Reinforcement:

Bed joint reinforcement (BJR) is a panacea for much brickwork. It adds tensile characteristics to an otherwise merely compressive element. There is little downside to BJR and when employed, a host of brickwork issues are negated.





With BJR installed every 3rd course or 225mm high, movement joints can be increased to 17M. This has been common industry advice for the last 20 years, although it is not included in standards. BJR is an aid in the following circumstances:

- At the junction of columns and horizontal bands of brickwork to avoid cracking at the corners. Normally 3 rows, at least 1M past the corner in each direction.
- In the bed joint where the wall consists of different colour brickwork, or different materials such as stone or block are laid in the wall. BJR minimises the possibility of the mortar bed cracking.
- In severely exposed brickwork such as gables or free standing walls where additional durability is required.
- To resist lateral forces, likely to impose point loads such as crowd impact or glancing connections from vehicles.

Where BJR is used many brickwork problems can be alleviated. All construction must conform to the appropriate standards and codes and be reviewed by a competent professional.

Brick Education notes provided by Simon Hay, Chartered Architect, Building Expertise Ltd.