

Wall Ties and Cavity Wall Failure

Wall ties are an essential element for the stability of a cavity wall structure, tying its weather protecting masonry facade to the main body of the building at regular spacings.

An effective wall tie system transfers static and live loads across the cavity, enabling load-sharing by both inner and outer walls. Typically cavity wall ties are bedded in a mortar bed joint as a building is constructed.

Cavity wall tie failure can be a consequence of a construction defect; for example where the original 'built-in' cavity wall ties have been omitted, incorrectly fixed or fitted with masonry ties that are too short. Alternatively failure may be a result of a buildings ageing process, whereby wall tie corrosion may have compromised the load-sharing capacity of the wall structure.

Over time mortar joints, which host the wall ties, undergo a chemical change through carbonation. The mortar becomes aggressive to the base steel and its protective coatings, reducing the life expectancy of cavity tie systems to as little as 26 years. The design life of the building is typically much longer than this period and it therefore follows that at some point the installation of a wall tie replacement system may be necessary if the stability and load sharing capacity of the wall is to be maintained.

As wall tie corrosion sets in the steel wall ties generate a build up of iron oxide layers which occupy a greater volume than that of non-corroded steel. In most cases, particularly when wire wall ties have been used, the increase in volume is accommodated within the mortar bed as the cavity ties erode. In such cases there may be little sign that the outer facade is free-standing and the walls not supported, save that the wall may appear to bulge.

In other cases, particularly where sheet steel or vertical twist wall ties have been used in less forgiving mortars, replacement of sound steel with iron oxide build up may have the effect of lifting the masonry above a line of in situ masonry ties. If expansion is widespread along several rows of the corroding wall ties, a tell-tale pattern of horizontal cracks may be produced along each wall tie course.

Where any type of cavity tie failure has been established the walls should be immediately stabilised with new stainless steel remedial wall ties. Where each leaf is at least 90mm thick, installation of the replacement wall ties is, generally, undertaken at a density of 2.5 per sq. metre, tie centres measuring 900mm horizontally and 450mm vertically, in a staggered 'domino 5' pattern. Additional retrofit ties are installed adjacent to open reveals. Installation of wall tie replacement systems is a simple process that can be carried out by competent builders.

Where wall tie corrosion and expansion has resulted in horizontal cracks to a brick facade, a qualified engineer should be asked to assess the potential for continued expansive damage and to weigh this against the damage that could result from efforts to remove or isolate all the corroding wall ties. Remedial work to remove or isolate existing cavity ties is a separate and delicate task requiring extreme care if the masonry is not to be unduly damaged.



Replacement

There are a number of corrosion resistant stainless steel remedial wall ties that are designed specifically for cavity wall tie replacement in domestic housing and for ease of use. The most common retrofit brick tie types are:

Driven Helical Wall Ties - A profiled and twisted remedial wall tie that is driven into a pilot hole. Work hardened blades cut a spiral interlock into brick, block & concrete walls as the cavity ties are driven by a series of impacts. Tiny 6mm pilot holes enable extremely quick wall tie installation with minimal disruption to the facade or to cavity insulation. Use helical ties in all masonry types. A setting tool in a hammer drill facilitates the easiest and fastest retrofit wall tie replacement system available.

Resin Grouted Wall Ties - Remedial cavity wall ties that are pushed into resin or grout filled holes in one brick leaf before more bonding agent is pumped around the other end.

The resin or grout sets around, and keys to, major deformations located at each tie end. Grouted wall ties are well suited to domestic buildings having inconsistent or suspect quality masonry.

