

Cavity Wall Ties

Survey & Repair Summary

Brief History

Cavity wall construction has existed since the early nineteenth century and became the norm from the late 1800s to the present day.

Principal advantages

- Thermal insulation
- Sound insulation
- To prevent the ingress of moisture from outside.
- To give structural stability

Whilst the materials and composition of cavity walls may vary, they all rely on some tying mechanism to connect the individual leaves and give the wall strength and stability.

"Wall ties are a crucial structural element".

Historically, many different types of material have been used for ties including slate and wood. The predominant material since the late Victorian era has been iron or mild steel and it is properties with these types of tie that form the core area of concern.

It is often quoted that any property built before 1981 may be at risk from wall tie corrosion and associated problems. After this time, the use of stainless steel and higher spec. galvanised ties have reduced (though not removed) the level of concern.

The Problems

Corrosion

Older types of metal tie may have no protective coating or they may have a bitumen or light zinc coating. Either way these ties are susceptible to corrosion in the presence of moisture and oxygen. The extent and rate of corrosion will depend upon a number of factors including:

- Exposure to prevailing weather

- Type of mortar e.g. corrosive black ash mortar, weak and porous lime sand mortars.
- Condition of pointing.
- Poor design & construction e.g. blocked cavities, lack of dpc's.
- Environmental factors e.g. coastal locations.

Wall tie corrosion leads to a situation varying in severity from potential future maintenance to a catastrophic collapse of the structure.

As ties corrode they expand and this *expansive corrosion can produce distinctive horizontal cracking* within the bed joints (usually, though not exclusively, outer leaf).

Such problems are normally restricted to the thicker metal and "fishtail" ties.



Corroded thick metal ties where outer leaf has been dismantled

Wire ties (and other thin metals) are unlikely to expand sufficiently to cause cracking unless the bed joints are very tight and/or mortars very hard.

Patterns of horizontal cracks can seriously destabilise the structure and accelerate tie corrosion by increasing their exposure to moisture.

Tie Density

The pattern of existing wall ties in many older properties is often found to be irregular and overall density is frequently inadequate.

Particular areas of concern are:

- Sides of door and window openings.

- Verge & eaves levels.

Historically there was no additional tie allowance to these areas - can lead to potential weak points within the structure.

Wall Tie Survey

Key elements of the survey are as follows:

- Location & approximate age of the property.
- Establish the methods of construction. Cavity or solid. Inner and outer leaf materials. (NB form of construction may vary even within the same wall e.g. cavity brickwork reverting to solid at eaves level on a gable pike).
- Mortar type and condition. Overall condition of pointing
- Cavity width.
- Cavity insulation?
- Note all cracks and obvious signs of movement – bowed or bulging walls.
- Particular attention to horizontal cracks and/or wide joints which have been cosmetically repointed (NB these may only be noticeable at higher level where lighter loads are involved).
- Establish the pattern and overall density of ties.
- Establish the type of existing tie – wire butterfly, fishtail etc (NB rare though not unknown for different types of tie to be used even within the same wall).
- Establish the condition of the existing ties – extent and severity of corrosion.
- Does the location of corroded ties correspond to any of the cracking already noted?
- Distinguish between cracks caused by corroded ties and that caused by other corroded metal e.g. steel lintels, down pipe fixings etc.
- Tie embedment – are they long enough to suit cavity width; are they correctly positioned?

Equipment

Several specialist items are required to carry out a thorough survey.

- Metal detector to locate ties
- Cordless hammer drill for inspection holes
- Endoscope to examine ties in the cavity
- Chisels to remove mortar and/or individual bricks

- Mortar & dyes etc. for making good

NB *Cavity insulation is an additional complication. Often it is sufficient to expose the ends of sample ties by chasing out mortar joints to the outer leaf. In some cases it may prove necessary to remove individual bricks.*

Repair Strategies

The results of the survey will dictate the next stage which can range from no action through to complete rebuild of entire walls. Generally the most cost effective solution lies between these extremes.

Detailed recommendations are given within BRE Digests 329 & 401 and BSI DD140.

The majority of solutions will be found amongst the following.

- Complete tie replacement is recommended where the ties exhibit evidence of extensive corrosion and definitely where rusting is visible.
- For most walls the recommended fixing density is 2.5 ties/m² with additional ties at 300mm vertical centres at sides of openings and up verges.
- Where the existing ties are thin metal or wire butterfly type which have not caused any cracking, it is generally acceptable for them to remain in place.
- Where expansive corrosion of ties is causing cracking in the outer leaf these ties should be removed or structurally isolated from the outer leaf. *This can only be completed after the installation of remedial ties and is usually the more disruptive and expensive element.*
- If the ties are in good condition but low in density then it may be necessary to install supplementary ties e.g. at sides of openings.

Remedial Tie Installation

A wide selection of remedial ties are available and a competent contractor will be able to decide upon the most appropriate product. Selection should be based upon the results of the initial survey and particularly the inner and outer leaf substrates & cavity width.

- *A single standard product will not cover all eventualities and, even with the benefit of an accurate survey, installation teams should be aware of and equipped for variations in construction.*
- Ties may be installed from inside the property if extensive refurbishment is taking place. Usually the ideal option since there is no visual impact.
- It is acceptable for ties to be installed through mortar joints where the joints are tight (approx. <8mm). Reduces the visual impact particularly on smooth faced & decorative brickwork.
- Where holes are drilled through the centre of bricks it is important to achieve as close a match as possible by dyeing mortars on site.
- Operative experience and supervision is crucial to ensure that ties are installed correctly.

Treatment to Existing Ties

When the repair strategy dictates treatment to the existing wall ties these must first be detected (using a metal detector and/or borescope).

- Complete removal of the ties is necessary where there is evidence of damage to both inner and outer leaves. This involves removal and replacement of individual bricks.
- Where damage is limited to the outer leaf then it is acceptable to structurally isolate the ties from the bed joints. Several methods can be used including the use of plastic isolation sleeves.

Structural isolation proves sufficient for the majority of cases. However the procedure is necessarily time consuming, requires more in the way of access and substantially increases the costs when compared to a basic tie replacement.

NB If a property is in need of general repointing then it is a good idea, both financially & aesthetically, to undertake this at the same time as treatment to existing wall ties.

Guarantee

“Remedial tie installation is a technical solution to a common structural/durability problem of cavity wall structure. However, like other common remedial treatments such as damp treatment and woodworm eradication, one of the most important things that the customer (owner, lender, occupier etc) is buying is peace of mind and confidence that the property is safe to live in, and that it will retain its market value.

This means that some form of extended guarantee will normally be required, backed by a reputable and financially stable institution”

Quote from BRE Digest 401

The final guarantee is critically important.

It should cover both materials and workmanship – most manufacturer warranties will only cover the material element.

The guarantee offered by The Wall Tie Installers’ Federation (wtif.org.uk) is a comprehensive 25 year insurance backed warranty which is transferable to subsequent owners of the property. It offers the following specific benefits which are excluded from most other warranties.

- It includes cover for treatment to the existing ties
- Any consequential loss that can be shown to have been caused by failure of the installation is underwritten by the guarantee