



Mechanical Fixings

Many system designers rely on mechanical fixings as the method of securing the external wall insulation system to the building substrate. To understand which systems are approved for this method, reference should be made to the systems approval or accreditation, either a BBA (British Board of Agrément) or ETA (European Technical Assessment). When using a mechanically fixed system, it is important that the correct fixing is chosen.

This technical note aims to clarify INCA's guidance to any stakeholder to specify the correct fixing for each project, and also aims to help simplify the process involved with this topic. This technical note is for guidance only and does not remove the 'duty of care' both the system designer and installer has, to specify the correct fixing. This technical note is only relevant for External wall insulation systems (EWI) and not for other façade cladding systems.

Choice of fixing

Definition: a fixing is defined as a proprietary plastic anchor for fixing external wall insulation systems with rendering, as defined in ETAG 014.

1. European Technical Assessment (ETA)

Fixings with ETA are preferred over those without such an approval. These fixings have been tested into various defined substrates and tabulated loading data is published. If a project has a known identified substrate which matches the ETA data the fixing can be specified without the need for further testing subject to the conditions explained in the “Procedure” section below.

2. Pull-out testing

Where the substrate does not match the ETA data or a fixing with ETA is not available pull-out tests must be carried out to establish the suitability of the proposed fixing. ETAG014 Annex D defines these tests as a set of at least 15 individual tests and the tensile load at ultimate failure is recorded. From these results the Characteristic Resistance (N_{Rk}) of the fixing is calculated as follows: $N_{Rk} = 0.6 \times N_1$ where N_1 is the mean of the 5 lowest results and N_{Rk} is $< 1.5kN$

Prior procedure

1. The system designer, client, installation contractor or appointed engineer should satisfy themselves that the building to receive the EWI system is structurally sound and able to carry the additional weight of the EWI whilst maintaining structural integrity. Some non-traditional ‘archetypes’ require input from a structural engineer who will consider the type of wall construction, existing wall thickness and quality, condition of the existing wall ties to location and environmental factors. This process should also be adopted for medium to high rise structures, being those over 2 storeys in height, unless they are out of known solid brick, solid dense block or dense concrete substrates
2. The system designer, client or installation contractor should identify the wall construction before any works commence. For two-storey houses, a solid brick wall can generally be identified, however some brick walls of newer brick can have ‘frogged brick’ which can affect the performance of the fixing.

Procedure

- **‘One Off’ Individual Houses**

For low rise properties up to 2 storey which are traditional construction i.e. solid brick, solid dense block or dense concrete and at least 100mm thickness pull out tests are not normally required provided the following criteria are met:

- The fixing has a valid ETA according to ETAG014 for use with categories A, B, C, D & E
- The fixing is a plastic anchor with a metal screw as an expansion element as defined in ETAG 014.

- **'Non Traditional' Houses**

It is generally recommended that pull out tests are undertaken on all Non-Traditional properties due to the high levels of variations between construction of the same archetypes. The stakeholder should also provide a method statement and specification for the particular 'non-traditional' archetype. The specification must include the fixing type, fixing pattern or number of fixings per m² and the length of the fixing appropriate for the required insulation thickness. Embedment depth (H_{ef}) should also be stated taking consideration of the substrate type, adhesive layer and any existing build up of old render or surface coating.

- The system certificate holder provides a declaration they have previously recorded pull-out tests with the proposed fixing type for the relevant archetype and the results of the tests indicate the fixing is appropriate for the archetype and substrate.
- A declaration on the pre-notification form & Method Statement/Specification should accompany the application but final acceptance of the fixing specification can only be confirmed after "project specific" tests have been carried out.

- **No-Fines Houses**

Pull-out tests should always be undertaken. No-fines concrete condition and substrate thickness can vary from building to building, and location.

- **Projects with Multiple Houses**

- 2 – 10 Houses:

If the properties are of the same substrate type at least 15 individual tests are required, ideally spread over 2 or 3 properties. If the properties are of different substrates at least 15 individual tests should be carried out for each substrate.

- Over 10 Houses:

It is recommended that a good spread of houses is obtained. This should either be calculated as one set of 15 tests or the system designer should determine an acceptable level of tests. The system designer or appointed engineer should employ his own duty of care to agree the amount required taking consideration of factors such as elevation changes and distance between properties in rural locations. Should there be multiple substrate types, the above regime should be carried out for each substrate.

- **New Build Applications**

No pull-out tests are required, given there would be no existing substrate.

- Use of tabulated characteristic pull-out values can be used, which can be provided by each fixing supplier/manufacturer.
- If no tabulated values are available the fixing manufacturer can undertake "off-site" tests to calculate the tensile characteristic resistance of the proposed fixing in specific substrates such as cement particle board, OSB and ply board.

- **High Rise Buildings**

High rise buildings present different challenges including higher wind loads. It is essential fixing pull-out tests are carried out on all high rise buildings to ensure the fixing capacity is sufficient to resist the higher wind loads. A minimum of 15 tests should be carried out and the tests should be spread over different elevations and floor levels. For each substrate type encountered a full set of 15 tests should be done.

Calculating the correct amount of fixings to localised wind index

Wind calculations are generally undertaken by the system designer or appointed engineer. The methodology can be found by referring to INCA technical guide 03 – Wind Assessment considerations for EWI.

Thermal performance of a mechanical fixing

The thermal performance of a fixing can be found by referring to the ETA from the fixing manufacturer. This thermal value should be inputted into the u-value calculation based on the number of fixings specified.

The thermal value can be improved by using insulation plugs within the ‘mushroom’ washer or using a recessed fixing and insulation disk.

Spotting

In certain locations an effect known as “spotting” may be a factor to consider during the fixing specification process. The system designer will be able to advise and if it is a concern different types of hidden or recessed fixings are available to prevent this rare phenomenon.

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