INCA Technical Guide

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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.

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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. There are two agreed methods of specifying the correct fixing:

1. ETA: a fixing with an ETA is to be preferred over fixings that do not have such an approval. These fixings will have been tested into various known substrates and tabulated pull-out data published. If a project has a known identified substrate which complies with the ETA data, then it is agreed that this fixing can be specified by the stakeholder.

2. Pull-out test: a pull-out test is defined in ETAG 014 Annex D, which requires testing of at least 15 no. anchors to failure. From these tests, the mean average (N1) of the five lowest pull-out loads at failure is calculated, and the characteristic resistance (NRK) is determined such that NRK = 0.6 x N1 and NRK < 1.5 KN.

Prior procedure

1. The system designer, client, installation contractor or appointe 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 maintain structural integrity. Some non-traditional ‘architypes’ 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, 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 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 architypes. The stakeholder should also provide a method statement and specification for the particular 'non-traditional' archetype, which will include fixing type, fixing pattern/number per M2 or per board, embedment depth/fixing length appropriate to insulation thickness. Plus, the embedment depth for the substrate concerned.
  This process is generally accepted for 'non-traditional' archetypes of a concrete or masonry construction (except no-fines).

  - The system certificate holder provides a declaration that they have previously recorded pull-out tests with the proposed fixing type for the relevant archetype and that the results of the tests indicate that the fixing is appropriate for the archetype and substrate.
  - A declaration on the pre-notification form & Method Statement/Specification should accompany the application and will be subject to review before acceptance.

- **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:

  At least 15 tests required, with a good spread over all the houses, subject to the houses being of the same construction. We would recommend carrying out 2-3 tsets per house if the houses are spread apart i.e. rural locations. Should there be multiple archetypes, 15 tests should be carried out for each archetype.
  - 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. Should there be multiple archetypes, the regime above should be adopted for each archetype.

- **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.
  - Should the substrate not have a tabulated value, the fixing supplier/manufacturer can undertake specific lab tests to identify the pull-out capacity of the substrate (cement particle board, WPB boards, ply boards etc.).

- **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 (7-8/M2).

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

Where there is a substantial variation in thermal values, in some instances, this could lead to localised algae growth.

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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