Testing windows for weathertightness

High-performance testing of windows for weathertightness developed by BRANZ should give the industry confidence in the weathertightness of window to wall joints.

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MEANS OF ASSESSING the weathertightness of claddings and windows in New Zealand have been developed over many years driven by responses to weathertightness concerns or advances in construction, cladding or window technologies. This has led to methods for testing the performance of claddings before, during and after construction.

Testing overlooked thermal performance

Tests such as AS/NZS 4284:2008 *Testing of building facades* focused on commercial cladding systems, and NZS 4211:2008 *Specification for performance of windows* focused on the performance of domestic-oriented windows.

With the introduction in 1992 of a performance-based Building Code, new methods to assess the weathertightness of windows and claddings were developed including E2/VM1 for low-rise construction and E2/VM2 for mid-rise construction.

These addressed weathertightness but only some aspects of the integration of cladding with windows and were not concerned with thermal performance.

New Zealand has its own unique environment

In Europe, windows and their installation are expected to provide high levels of thermal performance and have different weathertightness challenges. Windows are often fully recessed into claddings and sometimes also the structure, which may be masonry or stone. The junction around the window outer frame is often filled with insulating materials.

Construction methods, industry practice and the regulatory environment in New Zealand are different, however, so we cannot use installation methods from overseas without considering their impacts.

A research partnership between BRANZ and the Window & Glass Association New Zealand has looked at ways that weathertightness and improved thermal performance can be assessed for a window installation.

Two evaluation methods developed

Existing test methods to assess weathertightness of windows and cladding systems are not necessarily well suited to consider the junction of windows to cladding systems.

NZS 4211:2008 is normally applied to prototypes of mass-produced windows before construction. It is concerned only with performance aspects of window systems and not the junction of windows to the cladding.

E2/VM1 and E2/VM2 tests were developed from AS/NZS 4284:2008 and assess the management of drainage water. They require defects to be introduced through the cladding and expect any water from this to be managed. However, these defects do not always stress the window to wall junction and may also encourage designs with poor thermal performance.

Our research partnership produced two evaluation methods:

- EM8 to assess the thermal performance of a window to wall joint (to be discussed in a future *Build* article).
- EM9 to provide a more robust assessment of the weathertightness of window to wall joints.

EM9 assessment

EM9 assesses the weathertightness of the window to cladding interface and is intended to follow an E2/VM1 or E2/VM2 test. It is concerned with getting water out once it has got in. Preventing water ingress through cladding systems is not always possible so performance is determined by what happens to any water that does penetrate the cladding.

New Zealand does not have a test method for the weathertightness of direct-fixed claddings - these are reliant upon workmanship so testing may not be conclusive.

EM9 test introduces water

In E2/VM1 testing, drainage water must be directed out to the line of the cladding and is not allowed to drip in the cavity.

Within EM9, water is purposely introduced into the window installation system and is only allowed to contact durable non-absorbent materials of low permeability, resulting in a low risk of ongoing problems if the materials get wet.

Figure 1 shows an isometric view of a test sample, where the furthest inside point at which water may be found within a window system is identified. Water is then introduced via a hole drilled in the window profile, and how the window system deals with this is assessed.

Figure 2 identifies locations where water may be found within the test and what methods are provided to manage this water.

Aims of EM9

EM9 allows users to determine if a window installation method adequately drains water from around the windows away from the structure. The window may or may not include corner soakers or other elements expected in E2/AS1 and allows the removal of water that has inadvertently leaked into the window system.

The wider aim of this method is to:

- provide more certainty for the low-rise and medium-rise building industry on window installation weathertightness performance
- allow the direct comparison of window installation practices for the purposes of installation method development
- provide an alternative to the prescriptive window installation requirements of E2/AS1
- be added to the end of E2/VM1 and E2/VM2 so that specific performance is demanded of the window installation method rather than the more generic assessment provided in E2/VM1 and E2/VM2.

Where EM9 can be used

EM9 is applicable to:

- windows installed in cavity-based cladding systems
- windows with any type of profiled frame but including moisture management systems
- windows in many types of cladding and structure provided there is a designed interface with the structure
- windows that are:
  - projected out from the face of the cladding or structure
  - aligned with the face of the cladding or structure
  - recessed into the structure.

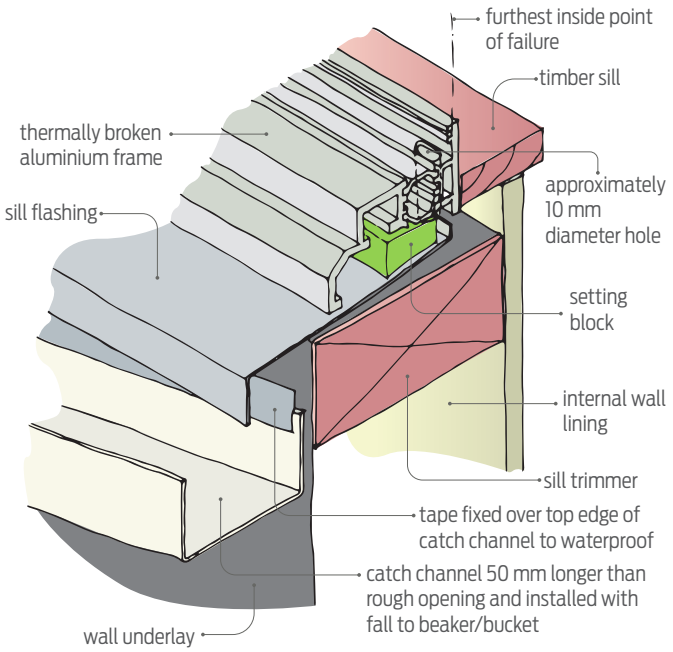

Figure 1: Typical window installation under test.

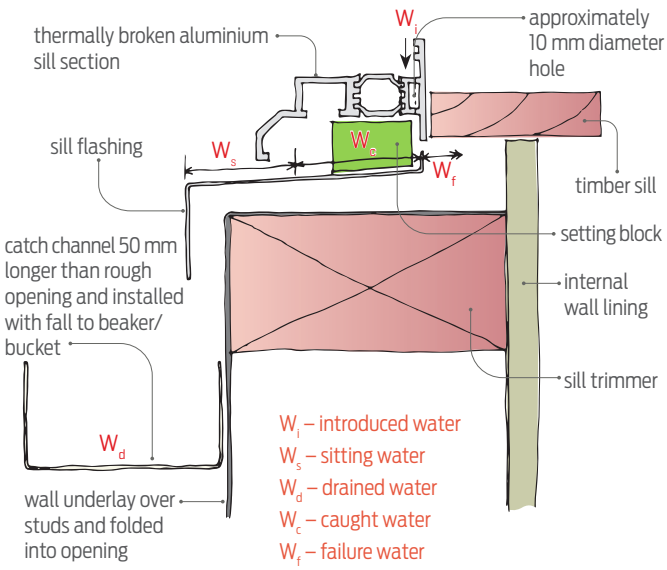

Figure 2: Identification of locations where water may be found during testing.

Test available at BRANZ

Until IANZ accreditation to undertake this test at other labs can be obtained, this test will be available at BRANZ.

Note This research was funded by the Building Research Levy, with contributions from Window & Glass Association New Zealand. It should give the New Zealand building industry greater confidence in the weathertightness of window to wall joints.