Testing mid-rise cladding

BRANZ has developed a new façade test, EM7, that provides a generic verification of cladding systems on a range of mid-rise buildings. This ensures they meet the requirements of the Building Code external moisture clause.

BY JOHN BURGESS, BRANZ SENIOR SCIENTIST

AS OWNERS OR OCCUPIERS of low-rise housing, New Zealanders expect their housing to keep the rain out, even after a moderate earthquake. When we travel to a medium-rise workplace, apartment or gym, we expect the offices, warehouses and other buildings to be weathertight. When we live or work in high-rise apartments or office spaces in our cities, we expect them to also keep us dry when it rains and safe in moderate earthquakes.

Figure 1: Example of a mid-rise cladding system undergoing the E2/VM2 test.

Weathertightness testing for mid-rise

All low, medium and high-rise buildings must comply with the requirements of clause E2 *External moisture* of the Building Code.

To ensure weathertightness for low-rise housing, typical details have been published since 1992 as an Acceptable Solution to E2 (E2/AS1) and a test method - Verification Method E2/VM1 based on the weathertightness tests of AS/NZS 4284 *Testing of building façades*.

For high-rise construction, testing performed to AS/NZS 4284 has been undertaken by cladding suppliers or specifiers for specific projects since 1990.

However, there has been a gap. E2/VM1 and E2/AS1 are for low-rise construction from 0-10 m in height. High-rise construction is referenced as 'over 25 m'. There has been no specific weathertightness test regime for buildings between 10 m and 25 m above ground level.

BRANZ developed a solution

BRANZ research filled this gap with the development of the BRANZ EM7 test method, which has been cited in the Building Code since May 2019 as E2/VM2. BRANZ EM7 *Performance of mid-rise cladding systems* is a specific implementation of a series of tests from AS/NZS 4284 with a particular set of values used in the lab-based assessment.

EM7 provides a generic verification of a cladding system for use on a variety of buildings rather than having to test the cladding specifically for every building that uses it. It expects a cladding to be based upon a domestic-type cladding and to have a drained cavity to help manage any penetrating water. It requires tests on a cladding with a minimum of 15 specific joint details to provide confidence that the cladding will work as a system. Water may be within the cavity but is not allowed to penetrate through to the outer face of the rigid underlay.

This is a different requirement than tests in many countries that allow water to get through to the rigid underlay and where the underlay is treated with waterproofing to prevent damage. Under the E2/VM2 test, the cladding fails the EM7 test if water gets to the underlay, so it can be seen as a more rigorous test but one that expects the drainage cavity to do some work.

Basics of the EM7 test

In brief, this is the EM7 test procedure:

- Apply static air pressures of ±2.25 kPa to a sample of a cladding system to check the system can remain serviceable in use.
- Measure the air infiltration through the cladding system at a 75 Pa pressure differential to understand the base level of air leakage. (This can be useful for the design of the air conditioning systems.)
- Apply an in-plane seismic displacement of ±15 mm to the cladding system to confirm the cladding can cope with moderate seismic movement.
- Repeat the air infiltration test to assess any damage from the seismic test.
- Apply a series of three water penetration tests to:
  - assess the weathertightness of the cladding system
  - separately assess the ability of the cavity to drain water
  - assess the outer cladding layer (wetwall) to prevent significant water ingress.

Provides evidence for BCAs

Since this is a Verification Method, a cladding system that passes this test must be accepted by building consent authorities (BCAs). It provides evidence the system meets the requirements of clause E2 for use on buildings up to 25 m. It also provides evidence for CodeMark suppliers and for BRANZ Appraisals that a cladding has passed a weathertightness assessment.

However, if a supplier uses a cladding from an EM7 test report (even a failed test) with different materials or construction - for example, a different rigid sheathing - the BCA may require further evidence. A façade engineer may need to provide this evidence. Even a failed test can be useful for design.

EM7 assesses an example of common connections of claddings to other typical building elements but does not specifically assess the performance of windows in the cladding. However, as of July 2020, NZS 4211:2008 *Specification for performance of windows* is under revision to align with the requirements of EM7. This will ensure that there are window and door systems that can be readily used within cladding systems in our mid-rise construction market.

Teething issues sorted

EM7 will be recognised by the commercial cladding industry since it implements values from the AS/NZS 4284:2008 testing typically used to verify the performance of high-rise cladding construction. However, EM7 may appear onerous to the low-rise cladding industry, which will not be familiar with it.

While it is not an easy test to perform, several laboratories have now undertaken it in New Zealand. There have been some teething problems, requiring the release of versions 2 and 3, and there are now no significant barriers to its use.

Critical for mid-rise claddings

We expect that the EM7 test will become a critical part of confirming which claddings are suitable for mid-rise buildings through its specification as a Verification Method for clause E2. Use of EM7 will allow us to be more confident in the specification, design, construction and use of claddings designed for mid-rise buildings.

The research underpinning this test has been supported by the Building Research Levy, with additional thanks to the mid-rise cladding and testing industry who helped develop the test.

For more EM7 can be downloaded from the BRANZ website at www.branz.co.nz/em7.