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Cladding for residential mid-rises

A recent project at BRANZ has been testing the weathertightness of residential-style claddings for use on mid-rise buildings.

THE PRINCIPLES of AS/NZS 4284:2008 *Testing of building facades* have been applied to produce a test method than can be reliably used to prove the weathertight performance of mid-rise cladding systems.

Test for evaluating mid-rise claddings

The resulting test, BRANZ Evaluation Method EM7, has been available since May 2019 and has recently been referenced by MBIE in the Acceptable Solution to clause E2 *External moisture* as a verification method for mid-rise buildings, E2/VM2.

In an article in *Build* 155, *Shaking up façade testing*, pages 72-73, we briefly reviewed the difference between two façade testing methods - E2/VM1 and AS/NZS 4284:2008.

The clause and the standard

E2/VM1 is the Verification Method of clause E2 of the New Zealand Building Code for low-rise cavity-based cladding systems, but it was derived from the joint Australian and New Zealand standard AS/NZS 4284:2008.

In summary, AS/NZS 4284:2008 is used to test multiple aspects of a façade's performance, including its structural strength. E2/VM1 is intended to look only at the water management of a façade.

Mid-rise housing.

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E2/VM1 doesn't apply to mid-rise buildings - taken to be between 10 m and 25 m in height - because it is limited to buildings that are within the scope of NZS 3604:2011 *Timber-framed buildings* - that is, low-rise timber-framed buildings.

AS/NZS 4284, on the other hand, is normally associated with taller buildings that are clad with curtain wall systems, but there ➤

is scope within the standard to set whatever criteria the test specifier wants.

Exploring the limits of residential cladding

E2/VM1 can therefore be thought of as a specific instance of an AS/NZ 4284:2008 test where the test parameters and failure criteria have been selected to reflect the realities of a residential-style wall system. This is a wall comprising materials that are more susceptible to water damage than the materials in a typical curtain wall system. Likewise, EM7 can be thought of as a specific instance of NZS 4284:2008 for using domestic-orientated claddings on mid-rise buildings.

EM7 is the result of several full-scale tests where we explored the limits of residential cladding. A key difference between this new test and E2/VM1 is that EM7 considers the treatment of everything outboard of the framing as a single system - the air barrier, the cladding carrier system and the cladding itself.

Test methods

In the research project, we subjected residential claddings to more severe loadings than in a normal E2/VM1 procedure. Here is a comparison of EM7 and the other test methods.

- E2/VM1 is based on a ULS pressure of 2.13 KPa (associated with the extra high wind speed in NZS 3604:2011). EM7 is associated with a ULS pressure of 3.2 kPa. The pressures for the water penetration test are correspondingly higher as well.
- Seismic racking or inter-storey drift is an optional test in NZS 4284:2008 as a means of assessing resilience to seismicity and potentially introducing damage to the specimen. E2/VM1 puts deliberate holes in the cladding at specific locations as a means of simulating cladding damage instead of the quasi-random damage you'd get from seismic movement. EM7 has a mandatory seismic component of ± 15mm induced lateral movement.
- The airtightness of the specimen is another optional part of AS/NZS 4284:2008. EM7 contains a mandatory air infiltration component with requirements both pre- and post-seismic racking.

A typical E2/VM1 test specimen.

Now an Alternative Solution

The adoption of EM7 as Verification Method E2/VM2 by MBIE gives it the status of a deemed-to-comply Alternative Solution. The overall intention is, of course, that it will lead to higher-quality buildings in the field, especially through the coordination of manufacturers of the various parts of the overall system.

The research mentioned here and any Verification Methods or tests that may arise from it simply provide a means of reducing the risk on a construction project.

Further development to support innovation

The testing will show, that if constructed as per the test specimen, the façade can withstand the necessary loading. The main challenge then becomes ensuring that the critical details are executed properly on site, and this is where contractor experience and coordination of the façade installation is critical.

The failure criteria for water penetration in EM7 is that water should not strike the rigid underlay during the testing. The approach, which is the same as in E2/VM1, is relatively conservative.

Other building codes around the world - for example, the National Building Code of Canada - recognise that the underlay may at times have to perform as a second layer of defence. That is, water can be present on the underlay if there is appropriately balanced provision for drainage, drying and durability as a whole.

Future work may result in amendments to EM7 that facilitate these kinds of systems while still maintaining the intent of the test, which is that we end up with claddings that last for the long term.

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