BUILDING PERFORMANCE

# Weathertightness for medium-rise dwellings

Structural design and cladding design must be well co-ordinated to ensure medium-rise dwellings are weathertight.

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**Of interest to** Building consent authorities, Licensed building practitioners, Builders, Designers, Architects

There is an increasing trend away from low-rise detached dwellings to medium and high-rise apartment buildings – particularly in Auckland where there is high demand for residential property but suitable land is not readily available.

## Scope of guidance, solutions and processes being developed

Preventing leaky low-rise timber buildings was the focus when Acceptable Solution E2/AS1 (for External Moisture) was written. Its scope was limited to buildings with a maximum height of 10 metres (three storeys), matching the height limit of the timber-framed buildings standard NZS 3604 (for Structure, cited in Acceptable Solution B1/AS1). These documents are not intended as a means of demonstrating compliance for buildings taller than 10 metres, and so are only of limited use when designing medium-rise buildings.

For taller buildings, the facade testing standard AS/NZS 4284 can be used to demonstrate compliance of significant aspects of a cladding solution. Its testing requirements make it impractical to apply efficiently in many situations. For medium-rise buildings, there is a lack of available ‘benchmark’ solutions that can be used to establish compliance with the Building Code clause E2 External Moisture. This raises the following questions:

- How does a designer achieve compliance with Building Code clause E2 External Moisture for residential buildings with a height greater than 10 metres?

- What information and tools would an experienced lead design consultant (eg project architect) need to demonstrate that the appropriate matters have been addressed so that the cladding systems will achieve Building Code compliance, without involving a specialist facade consultant?

- What information is needed from cladding system manufacturers, importers and suppliers to allow designers to understand and achieve the parameters within which a specified cladding system can adequately perform?

- What information is needed in the building consent application for the building consent authority (BCA) to be able to issue the consent, and does this necessarily require confirmation from a specialist facade consultant?

- What services can various types of specialist facade consultants offer, and in what situations would any particular consultant be the most appropriate person to include in the design team?

For the purpose of developing workable solutions, representatives of BRANZ, MBIE and Auckland Council, along with weathertight designers, researchers and facade testing experts, held two preliminary meetings in Auckland, one facilitated by BRANZ and the second by MBIE. These meetings identified that additional research and expert input are required to develop robust solutions.

## Identifying the relationship between structural design and cladding design

The relationship between structural design and the design of cladding systems is an area that is often overlooked. The responsibility for design co-ordination needs to be clear, to avoid incompatible systems being specified by different design team members. A holistic approach to procuring design services is needed rather than providing separate briefs to independently engaged consultants who may be unaware of how their work relates to other parts of the design.

This relationship between structure and cladding systems can be summarised as follows:

- NZS 3604 manages lateral building movement (deflection) by incorporating bracing systems (typically sheet linings) that will limit lateral deflections during major wind and seismic events. Vertical deflections are managed primarily from an understanding of movement within the construction materials, and their performance in service.

- E2/AS1 relies on deflections being limited in this manner, for proper performance of the cladding systems and the design of movement control joints.

- Taller buildings outside the scope of NZS 3604 may be designed for different vertical and lateral deflections – these may or may not be similar to those of an NZS 3604 type building.

- There is also a risk that stiff cladding components intended to be non-structural could inadvertently attract structural loads if they are stiffer than the primary structure.

- Cladding systems for these taller buildings cannot be adequately designed without knowing the expected vertical and lateral deflections of the primary structure. Either the intended structural flexibility or the movement tolerance of the cladding systems will drive the design, with agreement and co-ordination being necessary to ensure the other will match.

Where cladding systems are promoted as suitable for medium-rise buildings, their manufacturers, importers or suppliers should specify:

- how much structural deflection the cladding system can withstand: without exceeding serviceability limits (losing weathertightness during normal events such as high wind and moderate earthquake); and also without exceeding ultimate limits (endangering people during more extreme events).

- how the cladding system should be fixed in order to allow this movement to safely occur, without interfering with the behaviour of the primary structure.

- how joints between cladding system components should be made to ensure weathertightness while allowing movement within serviceability limits.

For any cladding system that is not supported by such information, the lead design consultant would need to find another way to ascertain and demonstrate to the BCA that the cladding system and the primary structure are compatible when the design levels of deflections occur.

## Other issues for consideration

Other issues that are relevant to the cladding of medium-rise dwellings include:

- the applicability of the use of rigid underlays as an air barrier in medium-rise buildings, and the design issues affecting rigid underlays

- whether there is useful information within any available data on performance of cladding systems for medium-rise buildings, and from known cases of failure

- consideration of developing a Verification Method for on-site testing of cladding installations

- durability requirements for cladding systems and their components – where might a durability of greater than 15 years be appropriate? Do owners have realistic long-term durability expectations, and how can these be met?

- co-ordination of cladding systems with solutions to issues such as fire safety, acoustic performance, thermal performance, provisions for maintenance, and expected ownership models for multi-unit buildings, to avoid compromising the performance of the cladding or any other systems.

Read E2/AS1 (https://www.building.govt.nz/building-code-compliance/e-moisture/e2-external-moisture/acceptable-solutions-and-verification-methods/)

All guidance related to E2 External moisture(https://www.building.govt.nz/building-code-compliance/e-moisture/e2-external-moisture/)

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