THE 4 DS - DEFLECTION, DRAINAGE, DRYING AND DURABILITY

The external walls of all buildings should be designed and built following the basic philosophy for managing water known as the 4 Ds - deflection, drainage, drying and durability.

DEFLECTION

The more a wall is exposed to water, the higher the risk of water penetration. Deflection devices (such as cladding and window head flashings) intercept water at the building exterior and deflect it away from critical junctions. The style of the building can also aid deflection, with features such as roof eaves deflecting rain away from walls.

Macro deflection devices are big features, like cladding, roof eaves and verandas, that shelter areas of wall and restrict the amount of water that impacts on these walls. Buildings with macro deflection devices have a lower risk of weathertightness failure than buildings where the entire wall area is fully exposed.

Micro deflection devices are smaller items such as window head flashings, window facings and saddle flashings that deflect water away from a specific junction in the cladding.

The effectiveness of deflection on the building exterior depends on the type of cladding and the cladding details:

- Absorbent claddings and surface finishes will slow the drainage of water down the exterior, and some water will be absorbed. These claddings/finishes need to be durable enough to manage the level of water absorbed until it can be dried by the wind or the sun.
- Rough surface claddings will slow the path of water down the face of the building, so water is held on it for a longer period of time.

The face of the cladding must also include drip edges and the like to ensure that water drains off the surface at the transition between the vertical wall and any horizontal surface, such as at a building overhang. This will ensure that water is not held by surface tension on a horizontal surface where it can be blown by the wind into a vulnerable junction that may seem to be protected such as a window head hard up to a soffit.

Components of the cladding must be adequately sloped to aid drainage and deflection. Critical penetrations in the cladding (such as the gaps between windows and the cladding) need to be sealed or incorporate deflection devices (such as head flashings).

Other penetrations in the cladding (such as gaps between service pipes and the cladding) need to be sealed so that water drains over these and not in through them.

DRAINAGE

Wall assesmblies also need to be designed and built to incorporate drainage to allow water that may have penetrated the exterior cladding to drain down the back of the wall cladding and out of the wall assembly.

Drainage provided at the base of a wall cavity.

Both direct-fixed and drained and vented cavity claddings must be designed and built to allow water to drain out to the exterior of the cladding at the earliest opportunity.

This may be through specifically designed drainage gaps at a window head or sill, at an inter-storey horizontal junction or at the bottom of the cladding.

Where gaps for drainage are provided in the face of the cladding (such as across a window head), a deflection device must be used to ensure that water draining down the building surface does not enter through the gap. In these situations, a building component may be required to do more than one job – a head flashing to a window in a drained and vented cavity cladding protects the junction between the window and the cladding from water penetration by acting as a deflection device but also allows water to drain out over it from within the cavity as a drainage device.

Historically, it has been common for every gap in the exterior of a building to be covered or sealed, but modern design and construction incorporates protected gaps in the cladding to facilitate drainage and air circulation, and these are an important component in the weathertight performance of the building.

DRYING

Wall assemblies dry as a result of air movement through and behind the cladding systems. The amount of drying that does occur depends on:

- the cladding type, for example, more drying can occur where a cladding is considered air permeable, like weatherboards
- how the cladding is installed – is it over a cavity (which significantly increases the amount of ventilation behind the cladding and therefore drying) or is it direct-fixed?

How much ventilation and therefore drying that occurs is also influenced by:

- air temperature and pressure differences
- orientation
- season
- the absorbency of the back of the cladding – a non-absorbent cladding will dry more quickly than an absorbent one because water that gets behind the cladding will drain more effectively down the back of it if it is non-absorbent.

The amount of drying that will occur behind a cladding can be calculated using the BRANZ WALLDRY-NZ tool (www.branz.co.nz/walldry), which is based on recent BRANZ research that has shown that commonly used cavity construction as outlined in E2/AS1 provides sufficient ventilation to provide more than adequate drying.

DURABILITY

All components of a cladding and wall assembly must meet the durability requirements of the Building Code.

Claddings like brick veneer are very durable in their basic form, while other cladding types may need an exterior finish to make them durable and weathertight. For example, EIFS cladding is made up of a non-durable extruded polystyrene substrate that will deteriorate if it remains wet. It would also transfer moisture to the timber frame, which would decay if kept wet. These systems rely on the face seal exterior paint or texture coating to keep water out and to be durable and weathertight.

Other components in the assembly have varying levels of durability. Treated timber framing will be durable if it remains dry, but it may rot if it is kept wet for long periods of time. Kraft-based wall underlays are durable but will deteriorate if they are kept wet, while synthetic-based wall underlays will have greater durability.

BALANCING THE 4 DS

In approaching weathertightness design, the ideal is to achieve all 4 Ds. BRANZ WALLDRY-NZ is the only tool that copes with the task of drying numerically.

An example of a D being strengthened is to add eaves to a building, which increases deflection and reduces the demands on drying and drainage.

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