Balcony Drainage Systems in Multi-Residential Design

Common challenges, solutions and the impact of NCC 2025

Stormtech

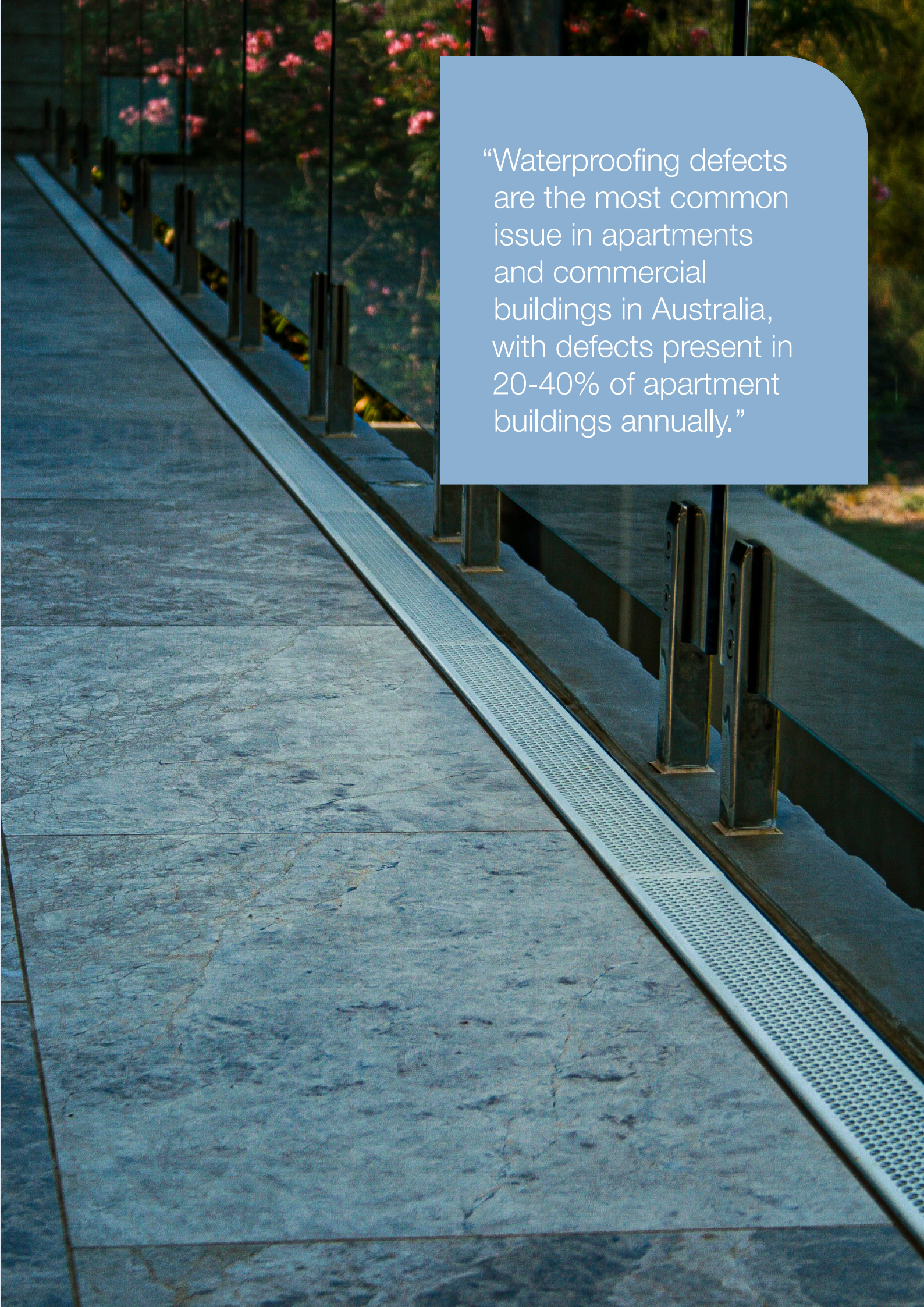
INTRODUCTION

Balconies are a popular feature in multi-residential buildings, offering occupants an appealing blend of indoor and outdoor living. However, these spaces present specific challenges in terms of drainage, making careful design of water management systems essential. Without proper drainage, balconies are susceptible to water accumulation, which can lead to structural issues, building degradation and discomfort for residents.

As multi-residential developments continue to expand across Australia, the complexity of balcony designs has grown. This has resulted in a higher number of building defects, particularly in relation to waterproofing failures, ingress and leaks. Such issues are a growing concern for architects, developers, and designers striving to create durable and reliable structures.

Addressing these defects is critical, as they impact not only the longevity of the building but also the satisfaction of both owners and occupants. Poor drainage design can result in costly maintenance and repairs, underscoring the importance of considering water management early in the design phase of multi-residential balcony projects.

In this whitepaper, we look at why balconies leak and the drainage solutions that will prevent water accumulating and entering the indoor environment. We also consider the upcoming changes related to this field in the 2025 update of the National Construction Code (NCC).



"Waterproofing defects are the most common issue in apartments and commercial buildings in Australia, with defects present in 20-40% of apartment buildings annually."

WHY BALCONIES LEAK: A WIDESPREAD PROBLEM

Balcony leaks are a significant issue in multi-residential buildings, largely due to evolving construction and waterproofing practices. One common cause is the construction of balconies with minimal substrate falls, which hinders effective water runoff. Without proper planning, this leads to water pooling, which can degrade waterproofing membranes over time.

Inadequate drainage systems exacerbate the issue, allowing water to collect and further compromising the membrane. Natural building movements, such as settling or shifting, can also create cracks in the structure, providing pathways for water ingress. Insufficient maintenance access or poor upkeep only increases the likelihood of leaks.

Balcony leaks result in substantial financial burdens due to rectification costs. Waterproofing defects are the most common issue in apartments and commercial buildings in Australia, with defects present in 20-40% of apartment buildings annually.[1] For apartment buildings alone, the projected savings from implementing improved waterproofing standards are estimated to be $946 million in avoided rectification expenses.[2]

The impact is even greater for commercial and recreational buildings, with potential savings of up to $2.2 billion.[3] These figures underscore the importance of addressing the root causes of balcony leaks through better drainage solutions, more effective waterproofing, and comprehensive maintenance strategies. Implementing these measures can significantly reduce the long-term financial impact of water damage and protect the value and integrity of buildings.

NCC 2025 DRAFT IMPACTS ON BALCONIES

The 2025 revision of the NCC includes significant changes to waterproofing provisions, aiming to address the ongoing issue of waterproofing defects in new buildings. One of the reasons provided for the changes is that the current regulatory framework has proven inadequate in preventing serious waterproofing failures, which have been prevalent in many new constructions.[4] The proposed updates are designed to rectify these systemic issues.

Key changes related to exterior above-ground waterproofing of balconies, podiums, or similar horizontal surfaces are outlined below:

- A 70mm stepdown is required between the internal finished floor level and the external structural substrate.
- A 70mm high integral hob must be installed around the balcony perimeter, except where the external substrate abuts an external wall or door.
- The waterproofing membrane must be installed directly on the structural substrate to ensure a more effective barrier against water penetration.
- Surface finishes or flooring must be self-draining, such as pavers on pedestals or open decking.
- If surface finishes are not self-draining (e.g., tiles or trafficable sheeting), they must be fixed directly to the membrane to ensure proper water management.

WATERPROOFING AND DRAINAGE ON BALCONIES: EXAMINING CHALLENGES AND SOLUTIONS

Waterproofing and drainage on balconies present unique challenges, particularly in high-rise and multi-residential buildings where exposure to weather and heavy rainfall can quickly reveal design flaws. Spitters, once a common solution for balcony drainage, are now generally prohibited, with regulations dictating that water must be directed to an outlet connected to the stormwater system, in accordance with NCC 2022 Vol. 2 and AS 4654.1-2.

The use of external waterproofing membranes is critical for ensuring balconies remain watertight. As per AS 4654.1 and AS 4654.2, balconies must be fitted with waterproofing membranes made from compliant materials and installed according to specific guidelines. However, the waterproofing layer alone is insufficient without adequate drainage design. Pedestal pavers, a common solution to creating level thresholds, provide a drainage path through gaps between the pavers, but they present challenges during peak rain events. While they allow surface water to drain, they often fail to manage higher volumes effectively, posing a risk of water ingress.

To improve drainage without compromising safety, additional solutions such as incorporating free-draining grates at thresholds should be considered. This design not only allows for better water flow but also provides access for maintaining door tracks.

Another key consideration with pedestal pavers is the effects of wind-uplift, especially in multi-storey buildings. Strong winds can dislodge even the heaviest pavers, and in some cases have caused them to become airborne – posing a significant risk of damage to surrounding structure and public safety. While adhering pavers to pedestals can reduce the risk of uplift, it complicates maintenance access, leaving designers to balance effective waterproofing, drainage, access and safety considerations.

Wind uplift can be addressed with a simple grate and frame solution that can be integrated with pedestal pavers to allow for pressure equalisation. This system ensures that raised pavers remain securely in place, even during strong wind events, without compromising drainage efficiency. Height differences between pavers and frames can easily be accommodated using standard packers, while additional gratings may be required for larger areas to provide optimal drainage.

"One of the key benefits of threshold drainage is its ability to create a seamless transition between indoor and outdoor spaces."

THRESHOLD DRAINAGE FOR BALCONIES

Threshold drainage is an effective solution for multi-residential designs, particularly in buildings with balconies or outdoor living spaces. A threshold drain typically consists of an external linear grate located beside the door track with a concealed sub-sill that collects water and condensation around the doorway. This collected water is then channeled into the external drainage system, preventing water from entering the premises. This system is vital in maintaining a dry interior, especially during heavy rain or when condensation builds up around doorways.

One of the key benefits of threshold drainage is its ability to create a seamless transition between indoor and outdoor spaces. By eliminating the need for step-downs or high-gradient falls at doorways, it provides an unbroken path between internal and external surfaces. This flat threshold design is particularly beneficial for sliding, bi-fold, and rolling doors, as it reduces the risk of trip-and-slip hazards while maintaining effective water protection. The linear drain acts as a concealed water barrier, ensuring that water is efficiently diverted away from the building.

Moreover, threshold drains are designed to work in harmony with door systems that drain water to the outside at the sill. Positioned on the outside of the door, the linear drain captures this water without impacting the performance of the door system. This integrated solution ensures that water does not accumulate near the doorway, which could lead to water ingress or structural damage over time.

COMPLIANCE AND DESIGN

When specifying and designing threshold drainage systems, several key design considerations must be addressed to ensure compliance with Australian Standards. First and foremost, threshold drains must adhere to AS 4654.2 “Waterproofing Membranes for External Above-Ground Use”. This standard ensures that drainage systems are equipped to handle the demands of external environments. To meet these requirements, drains should be manufactured using 316 marine grade stainless steel, which is known for its corrosion resistance and ability to withstand harsh chemicals, and suspended solids often encountered in outdoor settings.

In addition to material durability, threshold drainage systems must account for the natural expansion and contraction of substrate materials, framing, and finishes due to temperature variations. These systems need to withstand extreme temperature ranges, from -5°C to +50°C, without compromising their integrity. Furthermore, the substrate beneath the threshold area must be protected by waterproof membranes that meet the strict requirements of AS 4858 “Wet Area Membranes”, which ensure the system is fully sealed against water ingress.

Another critical aspect of threshold drainage design is compliance with AS 1428.1 “Design for Access and Mobility”. This standard governs the accessibility of door thresholds, which is crucial for creating barrier-free environments. For a continuous path of travel, the threshold at doorways must have a maximum rise of 35mm, ensuring that it does not create a significant obstacle for users. The threshold's length is also restricted to a maximum of 280mm, with a maximum gradient of 1:8, providing a smooth and gradual transition across the doorway. To further enhance accessibility, the threshold ramp must be placed within 20mm of the door leaf it serves.

Finally, the edges of the threshold ramp must be tapered or splayed at a minimum of 45° where the ramp does not abut a wall. This design ensures that the threshold is safe for users, reducing the risk of tripping and allowing for smooth transitions between surfaces.

ABOUT STORMTECH

Stormtech, a proudly Australian-owned company, has been at the forefront of drainage innovation for over 35 years. As the original inventors of the permanent formwork slot drain, linear drainage for bathroom applications, and threshold drainage, Stormtech has consistently pushed the boundaries of what's possible in the industry.

Stormtech threshold drains feature the company’s signature linear stainless steel drainage system and concealed channel section for door tracks and thresholds. With integrated subsills, they collect water flows and condensation from around the doorways and quickly convey it outside. But their brilliance lies in their discreet, low-profile design. Incorporating an external linear grate that sits flush beside the doortrack (in line with the ground) and a concealed channel section for door tracks, homeowners can virtually forget they are there.

Additionally, Stormtech's ability to create custom-made threshold drainage solutions tailored to specific balcony applications showcases their versatility and commitment to meeting the unique needs of their customers.

Stormtech’s commitment to sustainability is evident in their achievement of Global GreenTag Level A Gold certification across their entire product range, making them the first drainage manufacturer to do so. This dedication to eco-friendly practices aligns perfectly with their support for Australian architecture, design, and construction.

REFERENCES

1 ACIL Allen. “Waterproofing provisions in NCC 2025: Impact analysis of proposed changes.” ABCB. https://www.abcb.gov.au/sites/default/files/resources/2024/Waterproofing-CBA-final-revised.pdf (accessed 10 October 2024).

2 Ibid.

3 Ibid.

4 Ibid.

Stormtech