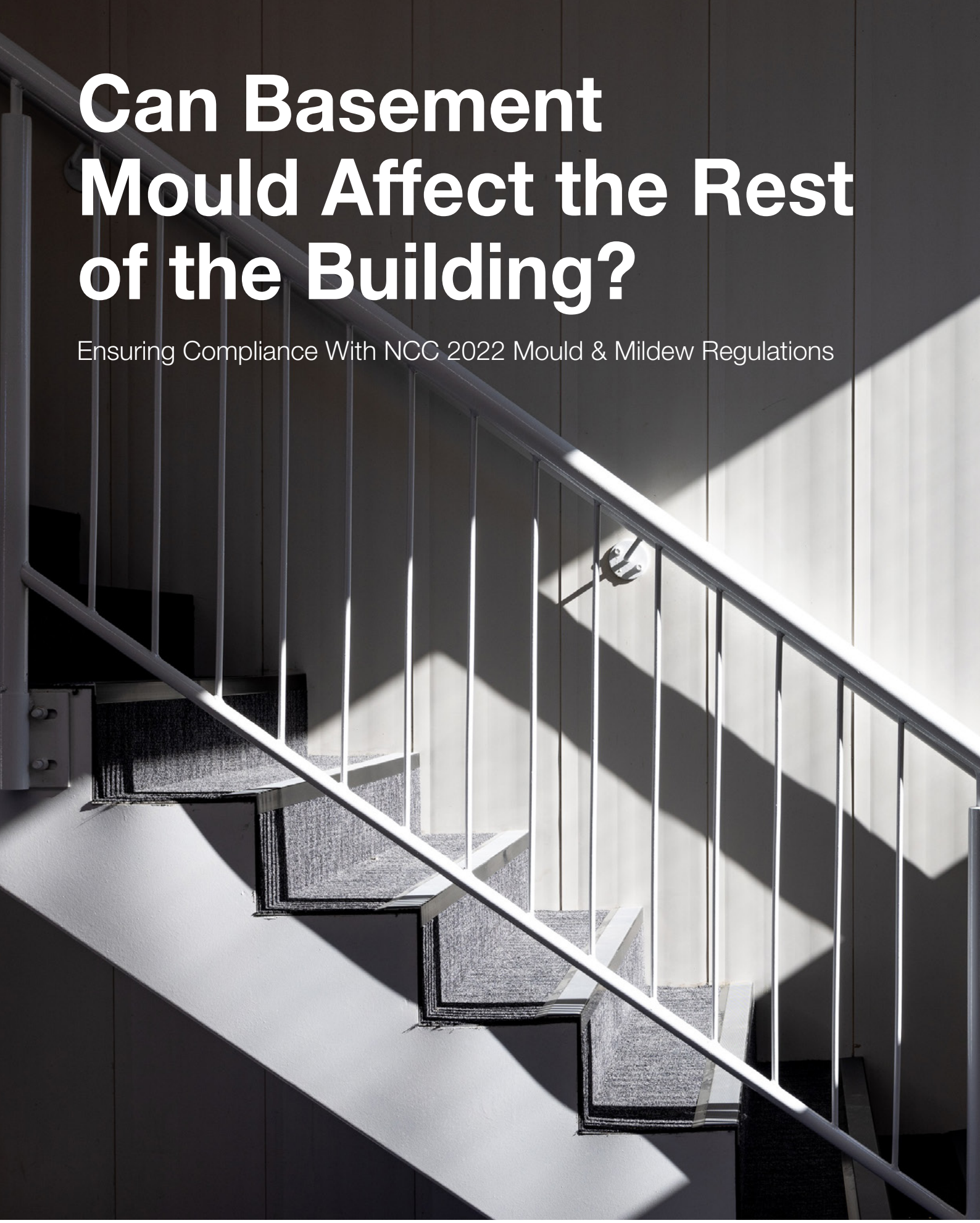
Can Basement Mould Affect the Rest of the Building?

Ensuring Compliance With NCC 2022 Mould & Mildew Regulations



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To guarantee there are no problems with building compliance or safety, habitable basement areas should be designed for zero water ingress under any circumstances.

Introduction

Intense weather combined with a trend toward more airtight buildings has made mould growth a serious concern. Over recent years, Australia has experienced record-breaking rainfall and floods, making it difficult for new homes and water-damaged properties to prevent the spread of mould.

Building mould is a complex problem that we do not fully understand. Numerous factors may contribute to it, some of which are under the builder's control, like making sure the right products are installed and used in the appropriate situations, while others, such as environmental factors and weather, are more difficult to predict.

Unfortunately, mould can spread more easily than is commonly thought. Studies have revealed that mould originating in a basement can travel to other areas within a building. The reason why these findings are so important is because there may be a general attitude among some practitioners of "who cares if there's a bit of mould in the basement, it's a non-habitable space".

If you design a basement that is susceptible to mould, you are likely contributing to a building that is non-compliant with the National Construction Code's mould and mildew regulations. This whitepaper discusses the issues surrounding basement mould and how recent studies and industry developments are impacting the design and specification of basement waterproofing solutions.

Mould in buildings explained

Mould is a persistent problem because nutrients for its growth are always present in the air. When the temperature and humidity are suitable, mould will grow. Building materials, furniture, flooring, and basically everything inside a building, all contain nutrients to some extent. However, in most cases, the presence of mould is almost always indicative of other underlying problems, such as rising damp, condensation, or leaks in the building envelope.

Defective building work can result in water leaks in the external walls. Such defects will allow water to enter the building, resulting in damp conditions inside the interior space and providing the ideal environment for mould development.

Several factors may exacerbate issues with water leaks, such as rainwater build-up at the foundation, which results in the ground around the home sloping towards it. Rising damp is the result of groundwater seeping up through minute cracks, gaps or openings in a building's masonry or brickwork.

Poor building work may also lead to a build-up of condensation and humidity in the home, both of which encourage mould growth. Two common causes of condensation and humidity build-up are thermal bridging and inadequate ventilation. It is necessary to regulate the temperature at the internal face of an external wall and the humidity level within the interior environment. If the relative humidity in a space reaches 60% or higher, this raises the risk of condensation forming.

Basement mould and its effect on the rest of the building

When it comes to basement mould, the main culprit is typically leaks at the basement wall rather than condensation. Basement walls are particularly prone to bowing, cracking, and seeping because they are surrounded by earth and soil that is constantly expanding and changing as a result of groundwater absorption. One of the primary forces pressing on basement slabs, foundations, and retaining walls is a rising water table, which increases the wall's vulnerability to water intrusion. The presence of joints in wall construction is another risk factor.

Any water entering a basement would be unacceptable as it creates the ideal environment for mould growth, but what does it mean for the rest of the building?

A recent study, "Spatial Gradients of Fungal Abundance and Ecology throughout a Damp Building", published in Environmental Science & Technology Letters, sought to answer this question.[1] The purpose of this study was to ascertain how widely fungi that are grown on damp materials are dispersed throughout a single-family house. Samples were taken from fungi that were growing straight on materials in the basement, and settled dust was taken from the top of door frames (basement, first and second floor, and outside) to serve as a proxy for indoor and outdoor air.

The study's findings showed that the fungal richness and ecology of the air throughout the building were both impacted by direct mould in the basement. The results demonstrated that 30% of the basement mould/mildew travelled to the second floor. The authors of the study also noted that mould transmission would be even greater for a property with an HVAC system.

Given these conclusions, we can now take it as true that the existence of direct mould in isolated areas of a house can lead to exposure in other areas of the structure.

What does the law say?

A non-habitable room is typically functional, like a storeroom, garage, or cellar, whereas a habitable room is one where people live and play. Whether the basement is one or the other will dictate the minimum regulatory requirements that apply to its construction.

The NCC 2022 Volumes 1 and 2 Performance Requirements F8P1 and H4P7 for Class 1, 2 and 4 buildings states:

> *"Risks associated with water vapour and condensation must be managed to minimise their impact on the health of occupants."*

The above requirement is applicable to all basements of Class 1 buildings in NCC 2022. The relevant Deemed-to-Satisfy (DtS) provisions require the minimisation of mould, mildew or fungus, while the Verification Method (VM) requires that the mould growth index, which is a rating of mould coverage from 0 to 6 (zero being no coverage and 6 being complete dense coverage of mould), be less than 3.

Both the DtS provisions and VM are very stringent, so it is advised that the best way to ensure compliance is to design such that no water or water vapour is possible within an interior space. It would be unacceptable for any water to seep into a habitable space. But, as recent studies show, even water in non-habitable areas of the basement needs to be addressed, as mould in the basement can transmit throughout a building into habitable spaces.

The requirements of local councils differ between areas, but there is a trend wherein councils are beginning to require zero water ingress for all basement areas. To guarantee there are no problems with building compliance or safety, habitable basement areas should be designed for zero water ingress under any circumstances.

What is coming up in the NCC 2025?

The exemption from the waterproofing requirement for Class 7 and 8 buildings has been proposed to be removed. This means any basement for any class of building will be required to be waterproofed.

For more information, go to: **abcb.gov.au**

What does this mean for practitioners?

In terms of insurance, the majority of building and professional indemnity insurance (PI) policies do not cover defects such as mould, mildew, or leaky walls. Non-compliance with the F8P1 and H4P7 requirements, which have been mandatory for Class 1, 2 and 4 buildings since 1 October 2023, is considered a clear building defect.

According to recent legislation introduced in various Australian states, designers (i.e., the architect, engineer, specialist waterproofing advisers, and/or consultants) may be individually responsible for all of their design input to a project.[2]

Going forward, basement waterproofing defects could potentially be a point of liability and potentially subject to legal proceedings. A building owner will now be able to make a claim against the building designer, certifier (private or local councils), and/or builder for building works displaying defects in the form of leaking walls and/or the presence of mould and mildew.

Such legal claims will cause serious issues for the industry because insurance providers typically do not cover leaky walls, mould, or mildew. Lawyers acting on behalf of a building owner may pursue legal action against all parties associated with the defective works.

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Basement waterproofing methods

One method of waterproofing used to prevent damp issues in underground spaces is basement tanking. The process involves applying a waterproofing barrier to the basement's walls, base slab, and, in certain situations, ceiling. A fully tanked basement is one in which the entire envelope of the below ground structure is encased to protect it from water ingress.

The guidelines for the implementation of Section 1.4 of the Water Management Act 2000 (NSW) note a preference for a fully tanked basement where groundwater (permanent or temporary) is impacted.[3] A fully tanked basement also serves the purpose of meeting F8P1 and H4P7 of the NCC 2022 by preventing water and moisture ingress.

For these reasons, other Australian states building authorities and councils are following suit with similar requirements.[4] It should be expected that the number of councils mandating tanked basements in the presence of groundwater will increase. As a side benefit, specifying fully tanked basements from the start should significantly reduce Development Application (DA) approval time. The council needs to forward any development that impacts groundwater to the authority controlling inground water activity (i.e., NSW Water or equivalent authorities in other jurisdictions) but the approval time will be significantly reduced as fully tanked is the preferred design option. Also, it will be highly unlikely for any other conditions to be applied to the DA, aside from during construction.

The alternative to basement tanking is the use of a cavity drainage system that channels water away from the basement into a sump and pump system that pumps the water to an external drain. However, this option is not the preferred method because it has long-term impacts, such as the energy demand from the continual operation of the pump-out system, maintenance of the pumps and drainage lines, the impact on the surrounding groundwater system, and the need to keep records to maintain valid approvals. Councils and water authorities may also place limitations on the discharge of pumped groundwater into their assets.

Spotlight on the Dincel Waterproof Basement Solution

Flooding water, unmaintained and/or non-air tight pump-out systems, high groundwater tables, seasonal water table fluctuations, undrained surface rainfall or groundwater seepage, and unmaintained agricultural lines are some of the many causes of mould and mildew problems in basements. The only effective solution to prevent water from entering the building interior is for the basement to be fully tanked or, better yet, to utilise the **Dincel Waterproof Basement Solution** and **Dincel Waterproof Warranty**.

The new Dincel Waterproof Warranty, which includes the Dincel Wall, the Dincel Water Stop (DWS) accessory, self-compacting concrete, and an injection system, promises up to 50 years of leak-free performance. Dincel's own construction experts supervise and manage the installation process, from footing construction to resin injection. The Dincel Waterproof Warranty is also applicable to habitable spaces under fully submerged basement conditions.

Dincel's latest innovation offers waterproofing with DWS at the wall-footing slab junction in addition to Dincel panel joints. Dincel applies injection resin to seal the wall to the footing/slab junction after the completion of all structural works, including floor slabs. Any leakage is visible and can be locally attended to with re-injection with no responsibility to the building owner. If property is sold, the warranty is transferrable.

For more information, go to **dincel.com.au/products/waterproof_warranty**.

Why Dincel is the best solution for basement walls

- **Tests at CSIRO:** Demonstrated that the Dincel Walling System complies with the relevant tests to be considered waterproof. View the full test report **here**.
- **Dincel Wall water test to AS 3735:** Even with three metres height of water, test results show zero leakage of the Dincel Wall. View the water tank test video **here**.
- **Expert opinion by ACOR Consultants**: Authored by Mr. Sam Parker of ACOR Consultants, this report verifies the Dincel Wall in relation to watertightness. Click **here** to view the report.
- **Dincel Waterproof Warranty:** An all-encompassing warranty in that Dincel warrants the fully installed system, not just a specific product or installation.
- **"Australian Waterproof Basement Construction" document:** Providing pertinent information for specifiers and for consideration by the relevant Australian authorities in the development of the proposed basement construction code. This document is available **here**.

REFERENCES

1 Hegarty, Bridget, Ulla Haverinen-Shaughnessy, Richard J. Shaughnessy and Jordan Peccia. “Spatial Gradients of Fungal Abundance and Ecology throughout a Damp Building.” Environmental Science & Technology Letters, Vol. 6, No. 6 (2019): 329–333.

2 For example, see the Design and Building Practitioners Act 2020 (NSW).

3 Department of Planning and Environment. “Minimum requirements for building site groundwater investigations and reporting.” NSW Government. https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0003/541605/minimum-requirements-for-building-site-groundwater-investigations-and-reporting.pdf (accessed 17 June 2024).

4 For example, see the City of Kingston. “Basements and Deep Building Construction Guidelines 2014.” City of Kingston. https://www.kingston.vic.gov.au/files/sharedassets/public/v/1/hptrim/communications-website-and-online-development-corporate-website-documents/basements-and-deep-building-construction-guidelines.pdf (accessed 17 June 2024). Clause 6.3.2 of this document notes that a tanked basement is the preferred method of construction by Council.

All information provided correct as of July 2024

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