FINDING THE BEST OF BOTH WORLDS:

FIRE SAFETY AND MOISTURE MANAGEMENT IN BUILDING FACADES

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A VOLATILE AUSTRALIAN CLIMATE INTRODUCTION

Fire safety is and always will be a top concern for architects, capable of causing immediate, catastrophic damage and, in the worst cases, loss of life. Most recently, cladding fires caused by combustible cladding such as in the Grenfell Tower tragedy in June 2017 and the equally dangerous, but thankfully less catastrophic Lacrosse building fire in Melbourne in 2014, have led to a critical focus on fire safety in nations around the world, Australia included.

From the reviews that have occurred across the country since then, there is now widespread recognition of a significant presence of non-compliant and combustible cladding utilised in multi-residential projects, which has led to two critical upshots as a result.[1] Firstly, at the time of writing, political leaders have agreed to an in-principle ban on flammable cladding nationwide, although specifics of the plan have yet to be established.[2] Secondly, and having had more time to establish itself, a new clause within Section C of the National Construction Code (NCC), C 1.9, on Non-Combustible Building Elements, was introduced in March 2018 as part of the NCC Volume 1 Amendment 1. The same clause has carried over into the NCC 2019 Volume 1, which is to be adopted by Australian States and Territories on May 1.

This clause requires all apartment buildings over two stories tall to have non-combustible external walls, including all of their independent components (being the façade coverings, framing and insulation). However, in the time since its introduction and prior to the introduction of the NCC 2019 Volume 1, the narrow scope of such an amendment has led to a series of instances across Australia where non-combustible, non-permeable sheathing has been specified in place of a traditional sarking material.[3] While providing protection against foreseeable fire events, this has led to subsequent consequences in another crucial area of design and construction: moisture control. The NCC 2019 Volume 1 has taken steps to amend this problem, giving certain sarking materials exemption from this requirement as per C1.9(e), but as the NCC represents the bare minimum in acceptable practice, a balance must still be found between fire safety, the long-term management of moisture and other relevant considerations, such as air leakage.

Mould and moisture control has long been an issue in Australian climates, with one WHO report, published in 2009, estimating that between 10-50 per cent of indoor environments in Australia feature undesirable conditions of indoor dampness.[4] Furthermore, respondents to an Australian Building Codes Board survey in 2015 estimated that one third of new Australian buildings were affected by condensation problems.[5] The specification of non-permeable membranes in an effort to meet the highest standards of non-combustibility is a decision set only to exacerbate these figures further.

> “10%-50% of indoor environments feature undesirable conditions of indoor dampness.[4]”

THE CONSEQUENCES OF INSUFFICIENT MOISTURE CONTROL

While less of an immediate threat, the major risks of insufficient moisture control lie in its nature as a significantly more insidious form of damage and potential health hazard than fire. It is often too late to implement any preventative measures once the damage becomes perceptible, either through direct observation or through the diagnosis of consequential health issues.

Physical damage can occur anywhere throughout a building. The structure itself, such as with steel or timber frame construction, along with the insulation, electrical wiring, and interior finishes – among other elements – that comprise a building’s assembly are all at risk of water damage. Given that the worst of the damage is often not immediately visible for occupants on the inside of the building, or for those observing from the outside, the discovery of water damage often demands costly refitting of both the impacted elements and any elements that might prove to be an source of problems further down the line in similar circumstances. If the source of the issue is a non-permeable external membrane, which wraps the entire building, this can be especially problematic.

In Australia, the problems associated with moisture control can go beyond its sustained presence. The most common, “and possibly the most destructive” wood decay fungus, the dry rot fungus *Serpula lacrymans*, is found in temperate regions across the country.[6] It grows quickly and only in areas of sufficient relative humidity, potentially causing “devastating effects in the whole building”.[7] Furthermore, damp timber is also known to attract termites, well known in Australia for their ability to compromise building structure without detection.[8]

Beyond physical damage, insufficient moisture control can also lead to ongoing health hazards of varying severity, associable to toxic mould growth, allergens associated with other fungal growths, bacteria, and the expansion of dust mite populations.[9] Poor natural ventilation and condensation build-up, as well as some high energy-efficient or fireproof homes have all been found to contribute to mould growth, although high-efficiency, airtight buildings (such as those that have been PassivHaus certified) should not necessarily correspond to higher humidity levels if there is a sufficient level of natural ventilation.[10] Ensuring that this is the case is the responsibility of both the designer, who must provide adequate opportunity for natural ventilation, and the occupants, who must actively engage with the space and any operable elements in order to ensure comfort and building longevity.[11]

UNDERSTANDING THE RELATIONSHIP BETWEEN NON-COMBUSTIBILITY AND CONDENSATION

In order to meet weatherproofing requirements and requirements for non-combustibility, the tendency under the new laws has been to specify metal sheathing such as steel or aluminium sheets on the outside of the structure. This solution eliminates the potential for cladding fires stemming from that element of the façade and completely protects the interior from wind and water penetration from the exterior.

However, as a rigid, non-permeable form of sheathing, water vapour is also unable to pass through from the interior out. This in turn can lead to condensation build up, as the warm air of the interior passes through the internal wall structure, only to be trapped as it meets the colder external surface. When the air cools down its ability to hold moisture is reduced and condensation forms.

Whereas up until now there has been no specific requirement for condensation management in the NCC, changes published within the NCC 2019 Volume 1 includes a section on Condensation Management within Section F: Health and Amenity.[12] Most crucially, F6.2 dictates that any external membrane applied to a project in Climate Zones 6, 7 and 8 must be vapour permeable in order to mitigate condensation.

While non-permeable metal sheathing meets non-combustibility requirements and provides better wind and weather resistance than flexible membranes as a type of rigid barrier, it is nonetheless unable to comply with the new standard for condensation management.

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SINIAT WEATHER DEFENCE 2ND GENERATION

Tried and tested in Europe over the past 7 years, Weather Defence is an external weather resistant, highly breathable Rigid Air Barrier (RAB) that meets the deemed-to-satisfy provisions for non-combustibility and vapour permeability, whilst doubling as a fire-resistant board in order to provide a physical fire barrier between the façade and the interior. As a RAB, it also provides better water and weather resistance than flexible alternatives, equalising air pressure within the outer wall cavity to prevent water ingress, and requiring no additional sarking or weather membranes given its patented hydrophobic core and integrated liner. Unwanted air leakage is also minimised, tested to 0.002m^3 of air per square metre of barrier per hour. Weather Defence can be exposed to the weather for up to 12 months prior to being over-clad, offering plenty of time for other service contractors to complete the work required without concerns of water ingress, and comes with a 12-year warranty on board and componentry. It is also compatible with most architectural cladding systems currently available; with the parallel threats of fire and moisture build-up, architects and specifiers should not have to choose between one form of protection or another, whether that be because of compatibility or compliance.

For more information, get in touch with Promat Australia on 1800 PROMAT, or by visiting the link below.
https://www.promat.com.au/en/products/weather-defence/weather-defence

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