AUSTRALIAN MODERN BUILDING ALLIANCE

Safe and sustainable construction with polymers

Information Sheet 10:

# Polyurethane insulation and fire safety

This information sheet introduces the compliant uses of polyurethane (PUR) – including the closely related polyisocyanurate (PIR) insulation – in commercial and residential buildings under the National Construction Code (NCC) 2019.

## Introduction

Modern buildings must be energy efficient, durable, affordable, sustainable and safe for those that build and inhabit them. To do so, they must meet standards outlined in the NCC 2019, including fire safety.

While it is impossible to make buildings 'fireproof', they need to be designed and constructed in line with the NCC 2019 and relevant Australian standards to ensure they have an acceptable level of fire risk.

This information sheet provides an introduction to the use of PUR insulation materials in commercial and residential buildings in line with the NCC 2019. It contains general information only – please refer to the NCC 2019 for full details to assess compliance.

## Residential buildings (Class 1)

### Residential external walls

Under the NCC 2019, external walls in a Class 1 residential building do not require a fire resistance rating unless the wall is less than 900mm from an allotment boundary or less than 1.8m from another building on the same allotment.

However, external walls must extend to the underside of a non-combustible roof covering or non-combustible eaves lining.

If an external wall requires a fire resistance level (FRL) it must be equal to or greater than 60/60/60 when tested from the outside under AS 1530.4:2005. However, masonry or masonry veneer construction where the external brick is equal to or greater than 90mm thick are deemed-to-satisfy (DTS) solutions under the NCC 2019.

Plasterboard and fibre-reinforced cement sheeting are also deemed non-combustible, making polyurethane insulation an ideal insulation solution in external walls of residential buildings.

Due to its low thermal conductivity, polyurethane insulation can provide equivalent thermal performance at a reduced thickness, which maximises the internal usable space of a building or reduces the building's footprint.

Foil faced PIR insulation board is ideal as insulating sheathing on timber framed homes; it simultaneously acts as insulation, a thermal bridge barrier, air barrier and weather barrier (Figure 1a and 1b). It is also used as cavity insulation in double brick construction in Perth (Figure 1c) for the same reasons.

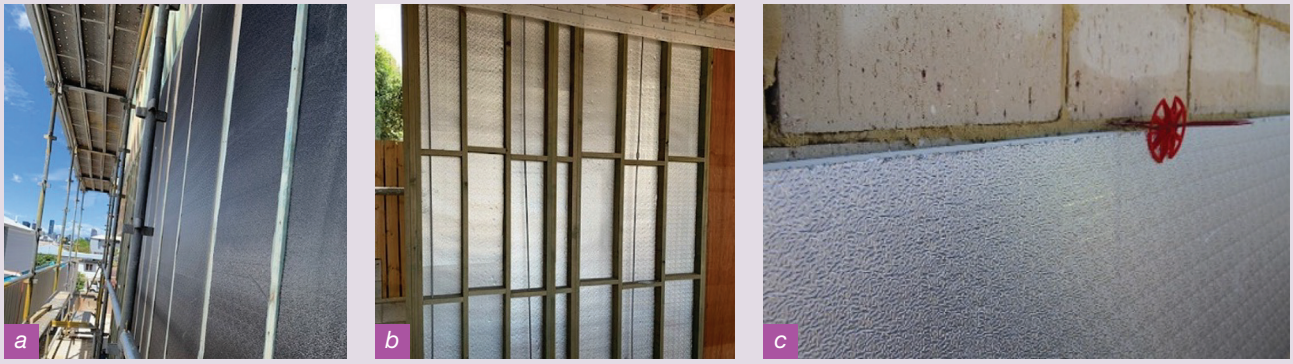


***Figure 1:*** *a) and b) Foil faced PIR insulation board installed external to the frame (continuous insulation) on a low-energy house in Brisbane prior to installing cladding (photos courtesy of Pirmax Pty Ltd), c) Foil faced PIR insulation board being installed in the cavity of a double brick construction (photo courtesy of Reflex Insulation Pty Ltd).*

***Figure 2:*** *Applications of polyurethane spray foam (SPF) a) installed under a timber floor (photo courtesy of Pacific Urethanes Pty Ltd), b) being installed to the inner masonry leaf prior to installing the external brick veneer (photo courtesy of Huntsman Polyurethanes Australia), c) being installed in Melbourne as cavity insulation prior to the plasterboard (photo courtesy of Huntsman Polyurethanes Australia).*

Polyurethane spray foam (SPF) is used between the studs of light weight residential wall constructions (Figure 2c) or as cavity insulation in double brick construction (Figure 2b). Between timber frame studs it acts as insulation, an air barrier and secondary weather barrier. Sprayed directly to the inner masonry leaf of a double brick construction it provides the same function as foil faced PIR insulation board.

### Residential roofs and floors

While roof cladding must be non-combustible under the NCC 2019, there are no FRL requirements for floors, except for dwellings on top of garages. As a result, the use of polyurethane spray foam (SPF) to prevent air leakage, strengthen and insulate timber floors is a common application in Canberra (Figure 2a).

Although not yet common practice in Australia, SPF is used in North America both at ceiling level for vented attics, and under the roof for unvented attics. When used this way in unvented attics, it provides superior home energy efficiency when heating, ventilation, and air conditioning (HVAC) ducting is installed in the roof space.

### Bushfire Attack Level (BAL)

BAL ratings under AS 3959 do not require the use of non-combustible insulation in residential buildings. They do, however, require that exposed external wall components are non-combustible (e.g. brick veneer), that roof coverings are non-combustible (e.g. steel sheeting, concrete roof tiles) and fully sarked, and that any gaps greater than 3mm are filled with non-combustible material.

### Commercial buildings (Class 2–9)

Commercial buildings are categorised as requiring either Type A, B or C construction depending on the class of building and the rise in storeys (see Table 1).

Each type of construction has FRL requirements for all building elements. For example, non-load bearing plain concrete walls are deemed to have a FRL of 60/60/60 at 90mm thickness or 240/240/240 at 125mm thickness.

| Rise in storeys | Class 2, 3 & 9 | Class 5, 6, 7 & 8 |
|---|---|---|
| 4 or more | A | A |
| 3 | A | B |
| 2 | B | C |
| 1 | C | C |

***Table 1:*** *Minimum type of fire-resistant construction.*

Under the NCC 2019, there is no FRL requirement for walls or roofs required in Type C construction. So, large single storey warehouses (Class 7b commercial buildings) are often constructed from metal faced PIR composite panels (Figure 3).

***Figure 3:*** *Large single storey warehouse being constructed from metal faced PIR composite panels (photo courtesy of Polyurethane Consulting Services Pty Ltd).*

## Polyurethane insulation on exterior walls of commercial buildings

Under the DTS solutions of the NCC 2019, external walls and common walls – including all components incorporated in them – framing and insulation must be non-combustible in Type A or B construction. Similar combustibility requirements apply to some non-loadbearing internal walls in Type A or B construction. Combustibility is tested according to AS 1530.1.

However, the NCC 2019 also recognises that the use of combustible materials is needed in external walls for energy efficiency purposes. An energy efficient building requires insulation on the outside and thermal mass on the inside; however, the best insulation, waterproofing membranes and vapour barriers are often combustible.

So, a performance solution is required to ensure the building's facade system – including the PIR insulation – complies with the NCC 2019 for Type A or B construction, one option of which is CV3 and AS 5113:2016. Under AS 5113:2016, the facade system must achieve an EW classification.

Foil faced PIR insulation board can be used under the DTS solutions for Type C construction and can achieve an EW classification under AS 5113:2016 with non-combustible cladding (Figure 4) for use in a performance solution for Type A and B construction.

Similarly, metal faced PIR composite panels are acceptable under the DTS solutions for Type C construction and can also achieve an EW classification under AS 5113:2016 for use in a performance solution for Type A and B construction.

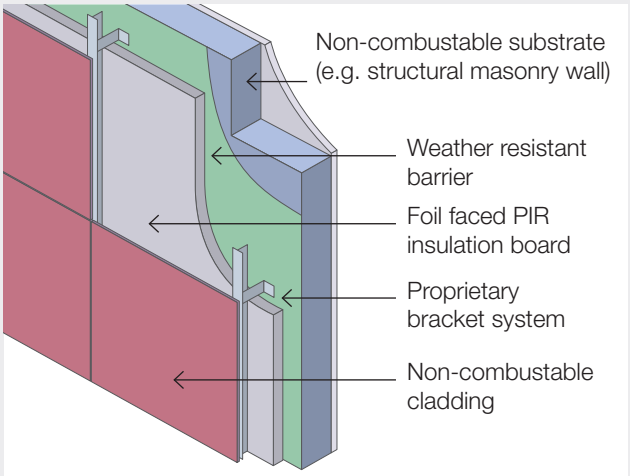



***Figure 4:*** *Facade system using foil faced PIR insulation board.*

## Polyurethane insulation on internal walls and ceilings of commercial buildings

Whether materials can be used internally on walls or ceilings as a lining depends on the building class and the presence of sprinklers (see NCC 2019 Specification C1.10, Table 3).

Under the DTS solutions of the NCC 2019, internal wall or ceiling linings in commercial buildings must achieve a Group Number equal to or greater than 3 under AS 5637.1. There are extra requirements for NSW; insulation needs to have a spread-of-flame index below 9 and a smoke-developed index of 8 if the spread-of-flame index is greater than 5.

A foil faced PIR insulation board can achieve a Group 2 rating, which means it can be used in most building applications excluding fire isolated exits, fire control rooms and public corridors without sprinklers (Figure 5a).

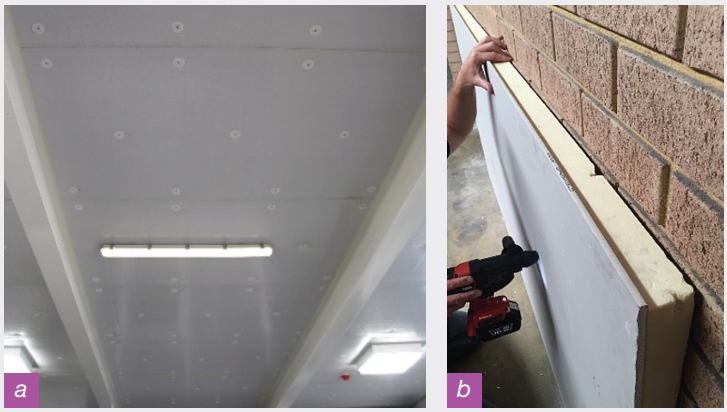
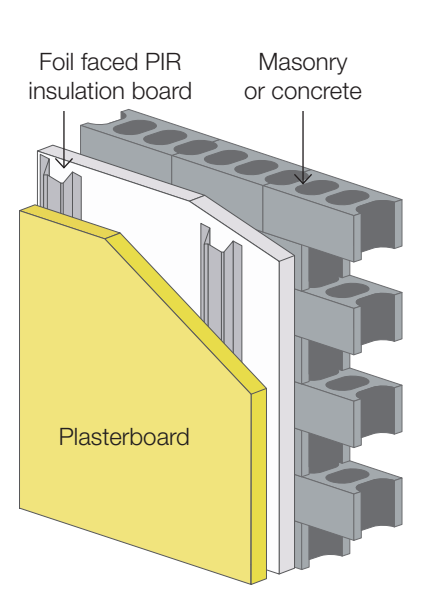



***Figure 5:*** *a) Foil faced PIR insulation board used as a ceiling lining, b) PIR insulated plasterboard being used as an internal lining (photos courtesy of Reflex Insulation Pty Ltd).*

PIR insulated plasterboard (Figure 5b) and foil faced PIR insulation board installed with plasterboard over furring (Figure 6) has a Group 1 rating which is adequate for most applications.

***Figure 6:*** *Foil faced PIR insulation board covered with furring prior to installation of plasterboard (photo courtesy of Reflex Insulation Pty Ltd).*




## Safety is our priority

AMBA's priority is to foster a safe built environment for Australians – ensuring our buildings are designed and constructed to protect the people that construct, live and work in them.

We are committed to working with industry, government, authorities and fire safety professionals to share knowledge and best practice in further advancing the safety of Australian buildings.





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AMBA is an interest group of companies within Chemistry Australia representing the use of polymers in the Australian building and construction industries.