Fire protecting openings close to boundaries

Understanding National Construction Code requirements and effective methods of protection
This year, the population of Australia rose to 26,473,055 people, continuing the trend of rapid growth. Australia's population is expected to reach 30 million people between 2029 and 2033 based on current trends. Architectural solutions are needed to accommodate the country's growing population. While conventional thinking has been to build “out” or “up”, there is also the option to build buildings closer together. However, as buildings get smaller and closer together, fire separation will become a major consideration for architects and designers. Fire from one building can easily spread to another through unprotected openings, potentially leading to catastrophic property damage and loss of life. The challenge for design professionals is how to reduce the spread of flame while still providing a functional and aesthetic building that is attractive to occupants. In this white paper, we discuss the principles of fire separation, the relevant building code requirements, and evaluate different methods for protecting openings close to property boundaries. Compared to other solutions, fire attenuation screens provide designers with greater flexibility in terms of cost and functionality.
Passive fire protection is based on the principle of compartmentation, which is achieved through the implementation of fire separations and fire cells. Put simply, compartmentation is a risk strategy that involves the sub-division of areas within a building in order to control and limit the spread of fire.

Fire separation refers to any fire-rated architectural element that creates a barrier between fire cells or fire cells and safe pathways. This approach involves incorporating fire-resistant elements such as walls, floors, doors, and ducts to shield buildings from the spread of fire into adjacent areas for specified periods of time (typically for 30, 60, 90 or 120 minutes).

The duration during which the element functions as a barrier to fire spread, serves to hinder the ability of the fire to escalate. This time frame provides occupants within the building ample time for evacuation, minimises property damage, and prevents the extension of the fire to adjacent properties.

Where a fire-separating element incorporates an opening, such as a door or window, it is imperative that the opening possesses an identical fire rating as the associated element. This ensures the continued effectiveness of the fire-rated structure and prevents fire from spreading.

Fire separation thus encompasses the protection of openings near property boundaries. In residential and commercial construction, fire separation is typically required in between individual properties. Unprotected or inadequately protected openings can be dangerous as they provide pathways for fire and smoke to spread to neighbouring buildings.
PROTECTION OF OPENINGS IN EXTERNAL WALLS

NCC requirements
The National Construction Code 2022 (NCC 2022) sets out requirements for the protection of openings in boundary and external walls. Below are summaries of the key provisions:

C1F2 Prevention of fire spread
Under C1F2 of the NCC 2022, a building is to be provided with safeguards to prevent fire spread:
• so that occupants have time to evacuate safely; and
• to allow for fire brigade intervention; and
• to sole-occupancy units providing sleeping accommodation (for Class 2 or 3 buildings or Class 4 parts of a building); and
• to adjoining fire compartments; and
• between buildings.

C4D3 Protection of openings in external walls
Under Deemed-to-Satisfy (DtS) provision C4D3, openings in an external wall that is required to have a Fire Resistance Level must be protected in accordance with C4D5 (see below), and if wall-wetting sprinklers are used, they must be located externally.

This requirement applies if the distance between the opening and the fire-source feature to which it is exposed is less than:
• 3 m from a side or rear boundary of the allotment; or
• 6 m from the far boundary of a road, river, lake, or the like adjoining the allotment, if not located in a storey at or near ground level; or
• 6 m from another building on the allotment that is not Class 10.

Additionally, openings required to be protected must not occupy more than 1/3 of the area of the external wall of the storey in which they are located unless they are in a Class 9b building used as an open spectator stand.

C4D5 Acceptable methods of protection
Clause C4D5 lists the acceptable methods of protection to satisfy DtS provision C4D3. These methods are as follows:
• Doorways: Internal or external wall-wetting sprinklers as appropriate used with doors that are self-closing or automatic closing; or –/60/30 fire doors that are self-closing or automatic closing.
• Windows: Internal or external wall-wetting sprinklers as appropriate used with windows that are automatic closing or permanently fixed in the closed position; or –/60/- fire windows that are automatic closing or permanently fixed in the closed position; or –/60/- automatic closing fire shutters.
• Other openings, excluding voids: Internal or external wall-wetting sprinklers, as appropriate; or construction having an FRL not less than –/60/-.

Alternative methods of protection
The NCC allows for suppliers to offer alternative solutions to meet the DtS provisions for protecting openings. For example, a fire attenuation screen can be used provided it can be demonstrated that the screen meets the requirements of Verification Methods C1V1 and C1V2.

Verification Method C1V1 sets out the level of performance required to avoid the spread of fire between buildings on adjoining allotments whereas C1V2 relates to avoiding fire spread between buildings on the same allotment. Compliance is achieved if a building will not cause or is capable of withstanding heat flux (without ignition) in excess of those specified in these provisions.

Unprotected or improperly protected openings can be dangerous as they provide pathways for fire and smoke to spread to neighbouring buildings.
Sprinklers and drenchers

Sprinkler and drencher solutions are common methods for fire protecting openings. Unlike sprinklers, which are typically installed within a structure, drenchers are commonly situated on the exterior of a building. This placement is designed to protect the building against fires originating from adjacent buildings.

Drenchers are typically positioned over windows and external openings, and sometimes on the roof. This requires the installation of water tanks, pumps and pipework connected to the sprinkler and drencher systems on the boundary walls. Installing such systems can be complicated and expensive depending on the nature of the building and application.

Fire-rated glazing

When windows are incorporated into fire-resistant structures, the openings must be treated in a way that preserves the fire resistance of the enclosure. Fire-rated glazing refers to glass that is designed and tested to meet specific fire resistance standards.

There are different types of fire-rated glazing, including wired, ceramic, resin laminated and more. Depending on the product specifications, the glazing could also resist the transfer of radiant and conductive heat. Note, however, that fire-rated glazing materials are one of the more expensive glass types on the market.

Fire attenuation screens

Fire attenuation screens are specifically designed with the purpose of reducing the transmission of radiant heat between different areas, thereby mitigating the potential for fire to spread between buildings. These screens impede the spread of fire by obstructing the passage of flaming embers and debris into or out of a structure. They also diminish radiant heat by dispersing it evenly across the screen’s surface, which prevents the spontaneous ignition of combustible materials within the building.

The fire attenuation rating assigned to a screen is established through testing in compliance with AS 1530.4:2014 “Methods for Fire Tests on Building Materials.” This rating reflects the percentage of heat effectively blocked by the screen.

In addition to fire protecting openings, fire attenuation screens perform a range of secondary functions. For example, fire attenuation screens can avert falls from apartment windows, which is particularly reassuring for families with young children. Additionally, these screens also double as a security measure, a particularly crucial function for occupants residing in ground-floor or lower-level units.

Depending on how they are designed, fire attenuation screens can serve as insect screens, preventing pests and other unwanted elements from entering a living or work space, while also increasing natural airflow into the building. This ventilation can help regulate indoor temperatures and improve the efficiency of heating and cooling systems.
A “bushfire screen” is a screening product specifically designed for use in areas prone to bushfires. AS 3959:2018 “Construction of buildings in bushfire-prone areas” sets out the requirements for Bushfire Attack Level (BAL), which is the rating used to assess a building’s susceptibility to risks posed by bushfires. The BAL rating of a building site dictates the materials and building design elements that are required for that project.

Fire attenuation involves diminishing radiant heat and restraining the spread of flame. In comparison, bushfire screens are specialised products designed to address the specific risks associated with bushfires, including factors like ember attack and direct flame contact.

Bushfire screens may be specified to meet the requirements of bushfire construction, whereas fire attenuation screens are designed to address the risk of fire spread between buildings. Both respective product types are tested under different Australian standards, so specifying either product for the wrong purpose will result in a non-compliant solution.

Crimsafe Fire Attenuation screening solutions are a performance-based solution, designed to meet the NCC to help reduce the level of radiant heat and spread of fire. Fire attenuation screens can offer protection to window openings to buildings with property boundaries closer than 3 m, or within 6 m of adjacent buildings on the same allotment.

AS 1530.4:2014 “Methods for Fire Tests on Building Materials, Components and Structures” sets out the level of process and conditions for testing Fire Attenuation products—this involves exposing the screen to a heat of 40 kW/m² for 90 minutes. Crimsafe screens were tested to exceed this, blocking 59% attenuation for a 150-minute duration.

Crimsafe screens offer significant advantages over common DtS solutions, requiring far less maintenance and a lower capital investment. Screens are also a lightweight solution, preventing the need for over-engineering and are an economical solution that offer not only fire attenuation but a multifaceted solution including security and insect protection, solar heat gain reduction, and fall prevention.

Crimsafe supplies security solutions to protect homes and businesses in Australia and overseas. The company is the industry leader in stainless steel security screen products, consistently outperforming the competition in strength and performance tests over more than 25 years of operation.
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Reference
