UNDERSTANDING FIRE RATINGS IN CONSTRUCTION:

A SPECIFIER'S GUIDE

ZEGO® Building Systems

GRENFELL AND LACROSSE: PREVENTABLE TRAGEDIES

The Grenfell Tower fire tragedy in June 2017 was not the first of its kind, although it was the most lethal to date. In just 15 minutes after starting, the fire had spread from the fourth floor where it had started as a result of a faulty fridge, to the twenty-fourth.[1] 80 lives were claimed as a result. In the end, the blame for the building's rapid engulfment in flames quickly came to land on the cladding used, an aluminium composite panel with a highly flammable polyethylene core.

A similar panel was specified on the Lacrosse Building in Melbourne, which was placed under similar scrutiny after a blaze rapidly spread 13 floors up and down the façade in 2014, albeit with no casualties.

Since then, the two incidents have served as catalysts for a dramatic upheaval of the pre-existing safety system in place here in Australia. While development had begun prior to the Lacrosse Fire, a new Australian Standard was introduced in 2016 so that standardised tests could be conducted to examine the propagation rate of fire specifically on external wall systems. The new standard, AS 5113: Fire propagation testing and classification of external walls of buildings, was introduced to provide a "more accurate indication of fire combustibility of wall claddings and assemblies" than what was available at the time.[2] From audits conducted after the Lacrosse Building incident, it was clear that building designers, builders and surveyors were failing to accurately determine whether or not the combustible materials used comprised a portion of the external wall, or were simply an attachment to a complete wall system.[3]

Since the Lacrosse incident, State-based taskforces have also been ongoing, uncovering a grim reality in regards to the specification of combustible cladding. Close to 100 buildings had been found with suspected non-compliant cladding in Melbourne by the Victorian Building Authority as of June 2017, although firefighting authorities are concerned about "approximately 800 buildings with suspect cladding," given they are under 25m high and subsequently do not require sprinklers.[4] In NSW, early reports have indicated that as many as 2500 buildings have "highly flammable cladding similar to that used on Grenfell Tower".[5] Nationwide, the number of buildings with combustible cladding remains unknown.[6]

Despite that, in different circumstances combustibility itself is not immediate grounds for emergency. Timber or plastic particles are occasionally placed in concrete in order to prevent spalling in high temperatures. This concrete may have a high Fire Resistance Level (FRL), explored further in the next section, and represent a low hazard but it is still technically combustible.

Being vigilant in educating oneself on the appropriate definitions and standards for fire control is necessary in ensuring these types incidents do not occur again. Of course, fire safety is not the sole concern during construction projects, as energy efficiency, acoustics, amenities and aesthetics, among others, all require attention too. Consulting a fire expert is advisable in order to achieve the necessary balance between often competing demands.

CRITERIA FOR JUDGING FIRE CONTROL ATTRIBUTES

In accordance with AS 1530.4, several distinct construction elements receive a 'Fire Resistance Level' (FRL), including walls, floors, ceiling, columns, service penetrations, among others. The scope of an FRL does not encompass fire prevention – such as the combustibility of materials – but rather dictates in minutes the amount of time any element is rated to contain a fire across three distinct criteria: structural adequacy, integrity, and insulation. A dash (-) is used in place of a number in any of the three categories wherever it is not required. For instance, a non-structural wall could be rated -/60/60. Specific requirements for structural materials and otherwise are detailed elsewhere – for instance, Section 5 of AS 3600 on concrete structures details the necessary design for varying levels of fire resistance.

STRUCTURAL ADEQUACY: is the first number listed in any FRL. Structural adequacy is a measure of a load bearing wall's ability to meet structural demands during a fire. Failure occurs when the system has either collapsed, or when it has surpassed the deflection limits dictated by AS 1530.4.

I**NTEGRITY:** is the second number given in an FRL, dictating an element's ability to restrict the passage of flames and hot gases in prolonged conditions. However, it is important to note that integrity does not account for the passage of smoke, which is instead covered separately under AS 1530.7. Failure occurs when an element collapses, cracks, or develops fissures that allow flames or hot gases to enter, and is determined by any one of three tests – a gap gauge is used on uninsulated elements to measure the size of any gaps and their rate of deterioration; a cotton pad test may be conducted on insulated elements to measure the rate of ignition; and sustained flaming on the surface of the element's unexposed face can each indicate integrity failure. While making up only one of three measurements comprising an FRL, integrity is often cited as a product's 'fire rating'. For instance, a 2-hour fire door may be rated at -/120/30.[7]

INSULATION: is the final number listed in an FRL, referring to an element's ability to limit temperature rise on the surface of an unexposed face. Failure is determined when temperature devices attached on the unexposed face rise on average 140 degrees, or to a maximum temperature of 180 degrees.

KEY CONSIDERATIONS FOR WALL OPENINGS, AND THE DIFFERENCES BETWEEN INTERNAL AND EXTERNAL WALLS

Wall openings, such as services penetrations, doorways or windows should function similarly in a fire regardless of whether they are located on the interior or exterior of a building. In either case, any glazing, services such as ductwork or other relevant inclusion will need to be fire rated to the same level as the surrounding wall, done to prevent the incipient spread of fire from one space to the next, and prevent the compromise of an otherwise well thought out system.

However, the considerations necessary for external walls are otherwise different from those for building interiors, as the potential fire events are very different. Externally, for example, fire events can occur from embers carried from an adjacent property fire or bush fire, or fire travelling up the building via the cladding and through the windows, as seen at Grenfell. External wall systems should prevent the spread of fire up or down the building, and should be sufficiently resistant to embers or radiant heat from any neighbouring building so that it does not alight as well.

Comparatively, the focus on internal wall systems, floors, ceilings and other construction elements, is to limit the rapid spread of fire and the production of toxins and smoke. These surfaces should ideally be inert, meaning that it does not react in a way that will exacerbate the situation. The main fuel load available internally will always be introduced elements such as couches or tables – linings, materials and assemblies should not contribute to that fuel load any further. For wall and ceiling specification, the characteristic to take note of is the Group Number, defined by the Building Code of Australia in Specification C1.10, and referring to the speed at which these elements will react and contribute to the fire.

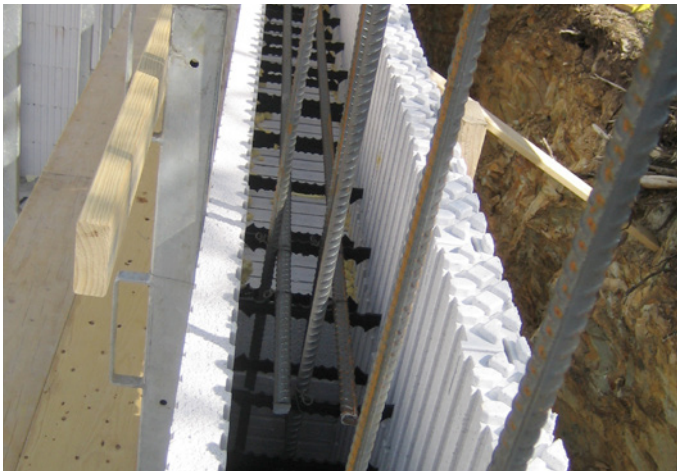
Group Numbers range from 1 to 4, 1 being the highest performing classification and 4 being the worst. While a Group 4 material will never be permitted in any habitable building, certain areas within these buildings will permit lower-rated materials. The presence of sprinklers will also permit the use of lower-rated materials in certain circumstances.

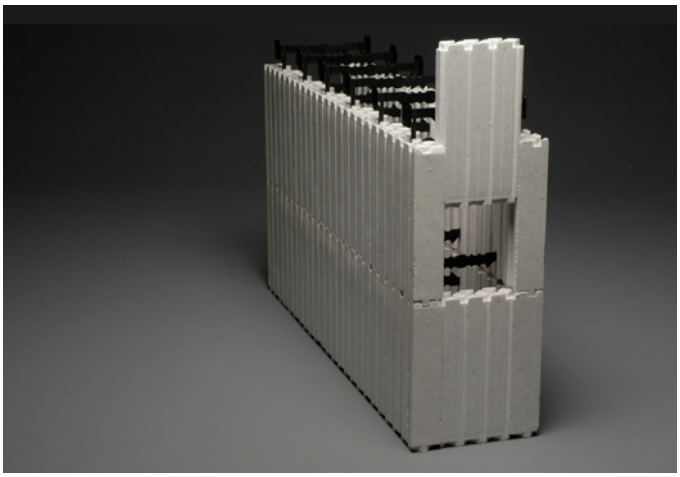
THE DIFFERENCES BETWEEN FLAME RETARDANT AND SELF-EXTINGUISHING

Certain materials, such as electrical wiring, are also labelled with characteristics such as ‘flame retardant’ or ‘self-extinguishing’. Flame retardance is useful, but not as universally applicable as self-extinguishing properties are.

Flame retardants are additives that raises the temperature at which something will burn, introduced to a manufactured material to inhibit the spread of fire. Once that temperature has been surpassed, any fire will continue to spread – even if the original source has been removed.

Conversely, a material with self-extinguishing properties may burn, but will, by definition, self-extinguish once the source of heat has been removed.





PUTTING THIS INTO PRACTICE

Proper understanding of relevant fire standards and the associated definitions is crucial to avoid incidents similar to Lacrosse and Grenfell. Consulting fire experts is one option to avoid confusion, as are suppliers themselves, who are likely to be informed on their own product’s specifications.

Regardless, fire safety is one of many characteristics that should be considered when specifying products. Amenity requirements, sustainability, acoustics, aesthetics and practicality are also necessary considerations, as a few examples.

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As an Australian, family-owned company, Zego’s products are already tailored to the Australian construction market. Their Insulated Concrete Forms (ICFs) are popular among architects and designers for their ecological qualities, being completely recyclable and offering R ratings of 3+, speed of construction, requiring less onsite labour than traditional wall systems, and structural stability, being 6-9 times stronger than a conventional brick or block construction.

With the Zego Commercial ICFs FireFORM and ReFORM, superior Fire Ratings as per AS 3600 and AS 3959 can be added to that list of benefits. FireFORM and ReFORM can achieve FRLs in excess of 240/240/240, and can be used in conjunction with domestic ICFs at T-intersections or corners in order to achieve the optimal solution. FireFORM and ReFORM ICF walls are suitable for use in areas at risk from bushfires up to the highest rated level, BAL-FZ.

Zego FireFORM and ReFORM can be used in conjunction with one another as well, paring a fully certified fire rated formwork system with an existing service duct area for plumbing, electrical and data services without causing any structural damage to the concrete core.

Zego’s vigilance in sourcing up-to-date information means that their team are readily available to assist in meeting specifications, providing construction engineering and installation details and the fire ratings necessary for any project.

For more info visit www.zego.com.au

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6 Ibid.

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