RM Insight®

Issue 85
Property Insurance – A broker's guide to Understanding Construction

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Insurance with insight

Understand the materials that are used to form the construction of a building and how they perform in a fire.

This is one in a four part series to understand COPE (construction, occupancy, protection, exposures). Historically, property underwriting has focused on COPE as the core principal of risk assessment.

What is a building and its purpose?

A 'building' is a physical enclosure (could have an open wall), generally bounded by walls, roof and the floor. These three integral components are typically referred to as the building envelope.

The primary aim of a building is to secure and protect the occupancy from inclement weather and provide a comfortable and safe environmental condition within for the inhabitants (i.e. habitable condition).

Of particular note, the building is supported upon footings for overall stability and is typically not considered within construction however exceptions may include timber piling and beams used in piers and wharves for example.

Note: Footings are part of the building. Foundation is the earth supporting the footings. Some buildings may incorporate piled footings in soft ground.

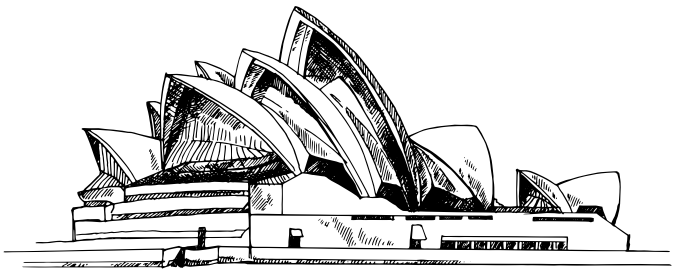
The physical form and design of a building

The building can take a variety of aesthetic and physical forms such as single to multiple levels, above and below ground for example, catering to the needs of occupancy, intricacies of the site and an architects flare.

What is construction?

The insurance industry delves deep into identifying all the individual materials that are used to form the building structure and in turn identifying the materials of construction that are most vulnerable to the effects of fire (i.e. combustibility) and subsequent fire development throughout the premises. It's like trying to find the 'weakest link' in the chain, being the most vulnerable construction material to fire. The weakest link influences the insurance proposition.

Note: the materials of construction together with the occupancy are two of the primary COPE elements considered in property underwriting with occupancy often perceived to be the most influential. However, it may well be secondary when the risk is a class of business the underwriter normally writes. For example: *an underwriter may offer coverage to a steel nut and bolt manufacturing company that resides within a non-combustible constructed building but may not be willing to offer coverage to the same occupancy located within a combustible constructed building.*



What are construction classifications?

Insurance companies define construction into classifications such as fire resistant, non-combustible, non-combustible insulated panel, mixed, combustible and combustible insulated panel. Each classification associates to how the construction will perform in a fire.

Obviously, the better the construction performs, the more attractive the insurance proposition will be. It's all about what construction elements could be left standing after a fully developed fire and ultimately what recovery options are available.

For example: *All concrete construction (i.e. walls, floors and roof) would most likely be classified as 'Fire resistive' construction and would typically be capable of withstanding a fully developed fire arising from the fire load produced by the occupancy (other elements such as wall claddings, linings, ceilings and partitions will not contribute to the development of fire). Overall structural failure is unlikely.*

In this 'all-concrete' instance, we would expect remedial action may include cleaning, repairs to spalled concrete etc. This recovery could well be less of an expense and completed in a shorter time frame compared to a building of combustible construction elements that are incapable of withstanding a fully developed fire and thus overall structural failure is possible. In this later instance, a complete rebuild may be necessary with far greater cost and an extended time frame.

Examples of typical construction

Low rise residential sector: (i.e. 'mums and dads' homes in suburbia) construction is typically a veneer being brick, fibre cement, weatherboard etc. external walls with gyprock on timber or metal frame internal walls, a timber (or metal frame) roof frame clad with concrete tiles or corrugated metal and a concrete slab or timber on timber frame floors.

High rise residential and commercial sectors: typically, concrete central core, floors and roof . Extensive glazing and Aluminium composite panels (ACP) may exist upon the façade of these buildings.

Manufacturing and warehousing sectors: typically, a concrete floor, metal clad roof and walls on steel frame, concrete tilt-up panel or concrete block walls with large open spans to accommodate manufacturing and storage. Note: Insulated sandwich panelling (ISP) may exist within these buildings for cool rooms or other insulation objectives. Refer to our RM Insight articles on 'Insulated sandwich panels' and 'EPS' for more information.

Understanding the building envelope

Whatever the building and whatever the occupancy, all are made up of footings, floors, walls and a roof. All combine to form what is typically referred to as the building envelope.

Footings: This is the lowest part of the building that is in direct contact with the ground upon which a building rests. Its core purpose is to transfer loads from the structure and anchor a building safely to the ground with stability. The main columns in a building are connected to the foundation structure to support its weight throughout its lifetime. The foundation is the most important part in construction.

The construction of footings will vary according to the stability of the ground and may include strip footings, slabs, rafting or piles. Sandy ground may require a steel reinforced concrete slab with deep steel reinforced concrete piles down to find a solid/stable stratum or rely upon friction of the pile for stability. A solid rock base may only need small reinforced concrete pads under each column.

Fire rarely damages footings so they are not normally described in the construction report. Exceptions include where the structure is exposure to earthquake or the exposed timber piling of a pier or wharf.

Floors: This is the surface of a room on which people may reside and equipment/materials are placed upon. Floors may be made from a variety of materials that can support the expected load. For example, timber on timber or steel frame or steel reinforced concrete.

Remember, the overall intent is to identify the materials of construction that are most vulnerable (i.e. combustible) to the effects of fire and subsequent development throughout the premises. Thus, a timber floor is more vulnerable to fire than a concrete floor and in turn will add to the overall fire load.

Walls: A wall is a structure and a surface that defines an area, carries a load, provides security, shelter, or soundproofing or is decorative. There are many kinds of walls including: walls in buildings that form a fundamental part of the superstructure or separate interior rooms, sometimes for fire safety.

Walls can be made from a variety of materials such as timber, metals, concrete, fibre cement, asbestos cement, masonry and can be in any combination. The cladding of a wall could be plaster board, timber, metal, composite panelling etc. Insulated sandwich panelling (ISP) and aluminium composite panelling (ACP) may also be used.

An important note about asbestos: Wall sheeting containing asbestos may be in a flat sheet or corrugated form and typically referred to as fibro, asbestos cement or AC sheeting. Fibre cement sheeting does not contain asbestos. Careful as some people mix up fibro and fibre. The existence of this asbestos product influences the 'removal of debris' (ROD) sum insured, as following a fire there are a multitude of precautions that must be deployed to contain, remove and dispose of this waste which is expensive and time consuming.

Per the 'Australian Government-Department of Health' website, as a general rule a building constructed between the 1940s to 1990 is likely to include asbestos containing products. The total ban on any activity involving asbestos products became effective from December 2003. Refer to our RM Insight article on 'Asbestos'.

Note: Conversations and literature may refer to 'girts' (also known as a 'sheeting rail') in a wall structure. A girt is a horizontal structural member in a framed wall that the wall cladding (e.g. metal sheeting) is fixed to and provides lateral support to resist wind loads. Purlins are similar but support the roof structure.

Roof: A roof is the top cover of a building providing protection from the elements and in conjunction with the walls and floor, contributes to the overall structural integrity, safety, security, privacy and insulation.

A roof can be made from a variety of materials such as metal, concrete or clay tiles, slate, insulated sandwich panelling (ISP), fibre cement. Insulated sandwich panelling and Aluminium composite panelling may also be used.

An important note about asbestos: Refer to walls above.

Typical building materials and their behaviour in fire

Brick (walls): Bricks are fired in a kiln and thus are already highly resistant to fire. However, it's true that individual bricks are much more fire-resistant than a brick wall. A brick wall is held together with mortar, which is less fire-resistant. Structural collapse is highly likely.

Concrete block: Unlike clay based brick, a concrete block is not fired in a kiln and high temperature is detrimental to the material. Basically, like most any other material, concrete expands when heated. When extreme heat is applied, the outer layers will expand much more quickly than the inner sections. Just like in brick walls, the weakest link is the mortar that beds the blocks together. Structural collapse is highly likely.

Concrete: As above, concrete experiences detriment from thermal shock. It is typically not a catastrophic failure but will experience spalling which is when the outer layers of concrete will come away from the surface. Repairs are likely.

Reinforced concrete panels (tilt-up walls): As per concrete block and concrete above. Typically, the supporting structure fails (i.e. steel) and the concrete walls collapse.

Concrete/clay roofing tiles: Prone to failure and recovery is highly unlikely.

Metal sheeting (applied to roof and walls): Fails early on in a fire subjected to high temperatures. Typically peels away from its structure.

Steel sections (structure within roof, floor and walls): Bends and twists, thus structural failure is imminent.

Timber sections (structure within roof, floor and walls): Obviously burns.

Fibre cement sheeting (applied to roof and walls): Explodes when subjected to heat, cracks and basically falls apart.

Asbestos cement: As per fibre cement and don't forget the extensive clean-up costs (i.e. ROD).

Insulated sandwich panels: An insulated sandwich panel (ISP), sometimes called a composite panel, is a wall and ceiling cladding material (typically found in cool and freezer rooms due to its insulation properties) mostly consisting of a core of insulation bonded to and between two outer metal skins. Much has been said about this material over the past three decades or so and thus the fire risk is well known. Those panels with a combustible core, regardless of any inhibitor within, will burn with intensity and fault is imminent. Refer to our RM Insight article on Insulated sandwich panels' and 'EPS'.

Aluminium composite panelling (ACP): Many types of aluminium composite panels are combustible contrary to various fire tests and may be fixed to the building façade for aesthetics or internal environmental control (e.g. sun/light control).

The use of this external cladding may influence the insurance company related construction classification however it is typically viewed in conjunction with all other construction elements.

It's just like the above ISP but in a thinner form. When subjected to fire, the core (and the adhesive) will burn with fire spread across the surface of the building with relative ease. Panels will fall and in many instances the supporting structure will also fail. Fire can also enter the building through windows or balcony doors.

Heritage listing

'Heritage' in property terms is basically things we want to keep. Heritage significance is assessed on historic and aesthetic values that are deemed worthy of preservation for future generations.

The issue for insurers lies in the cost of repairs following partial damage to the building. To acquire materials for a 100 year old building, listed or not, presents considerable problems in most instances. *For example:* 100 year old bricks are not easy to come by, floorboards are of different dimensions now, skirting board sectional profiles of 'days gone by' are very hard to come by and in many instances need to be made up. As a result, restoration of buildings using original materials (or the modern equivalent) can be a more complex, time consuming and an expensive exercise.

It's important to note that an entire building may be heritage listed, or parts thereof such as the façade, a staircase, ceiling, doors etc. may be listed for preservation. It's important to clarify the extent of heritage listed items.

Resources

Australian Government-Department of Health web site.

LMI RiskCoach: internet based risk management and insurance resource.

Factory Mutual Global Property Loss Prevention Data Sheets.

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