

NCC Passive Fire Compliance



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1 Regulatory Framework

1.1 National Construction Code (Building Code of Australia + Plumbing Code of Australia)

The National Construction Code (NCC) is a performance-based code containing all Performance Requirements for the construction of buildings. It is built around a hierarchy of guidance and code compliance levels, with the Performance Requirements being the minimum level that buildings, building elements, and plumbing and drainage systems must meet. A building, plumbing or drainage solution will comply with the NCC if it satisfies the Performance Requirements, which are the mandatory requirements of the NCC. The NCC consists of the Building Code of Australia (BCA) and Plumbing Code of Australia (PCA).

A Performance Solution is unique for each individual situation. These solutions are often flexible in achieving the outcomes and encouraging innovative design and technology use. A Performance Solution directly addresses the Performance Requirements by using one or more of the Assessment Methods available in the NCC.

A Deemed-to-Satisfy Solution (DTS) Solution follows a set recipe of what, when and how to do something. It uses the DTS Solutions from the NCC, which include materials, components, design factors, and construction methods that, if used, are deemed to meet the Performance Requirements.



The NCC is given legal effect by relevant legislation in each State and Territory. This legislation prescribes or "calls up" the NCC to fulfil any technical requirements that are required to be satisfied when undertaking building work or plumbing and drainage installations.

The NCC is administered over the Australian Building Codes Board (ABCB), and access to the NCC is provided free by individual log-in through the ABCB's website (www.abcb.gov.au).

The NCC references some Australian Standards, which by virtue of this reference become a legislative requirement.

BESIX Watpac has developed a standard inspections and testing regime, via **C-FRM-046 Standard ITRs (Checklists)** and **C-FRM-045 Standard ITPs**. These standard documents were developed as extracted requirements of the standards. The intent is that by following them, our site tradespeople will achieve the requirements of the Australian Standards, as well as any BESIX Watpac or project imposed requirements. Included within the Inspection Test Plans and checklists are the references to the appropriate Australian Standards and BCA reference. These can also be used to check the Subcontractor's proposed QA Documentation prior to commencement by way of comparison.

Our systems outline what documentation must be collected to confirm compliance with the specifications, and when applicable, the BCA/NCC and Australian Standards. All product failure pathways are controlled as much as possible via our quality control documentation processes.

Included in our completion process, all trades with works covered under the BCA/NCC must submit conformance certificates that reference the relevant section of the BCA and Australian Standard for confirmation of conformance. The Building Certifier/Surveyor collects these certificates and reviews the project to confidently conclude the project conforms to all relevant standard and codes and can safely be occupied.

1.2 Building Certification

Building certification involves independently checking, approving, inspecting and certifying building designs and work to ensure that it complies with the safety, health, amenity and sustainability standards specified in legislation and building codes.

Building certifiers, also known as building surveyors, are involved in many aspects of the building industry. A building certifier:

- Assesses building development applications and grants or refuses building approvals
- Inspects buildings at various stages to ensure that they meet minimum standards and comply with the building approval
- Informs the builder when work does not comply with the minimum standards or the building approval
- Performs building compliance and enforcement roles by ensuring that the builder attains compliance with the standards and the building approval.

2 Passive Fire Protection

Since its inception, the Building Code of Australia (as part of the NCC) has contained provisions for passive fire protection, to avoid the spread of fire within and between buildings. This includes provisions that limit the spread of fire, alert occupants to the detection of smoke, facilitate evacuation and enable fire brigade operations. Specific requirements vary with building size, however, provisions in the NCC that achieve these outcomes for a typical building include:

- Smoke detection and occupant warning systems
- Fire-isolation of exits, such as exit stairs
- More than one exit for each storey to allow alternative means of escape should one exit become unusable
- Exclusion of smoke from exit stairs
- Fire sprinklers
- Fire-resisting construction to limit the spread of fire between apartments and between storeys
- Non-combustible external walls
- Resistance to collapse as a result of fire
- Features to assist fire brigade operations, such as fire hydrants

It is also important to highlight the principal fire safety properties addressed in the different test standards in Australia:

- Combustibility
- Ignitability
- Heat release rate
- Surface spread of flame
- Fire resistance

- Smoke production
- Toxicity

2.1 Building Classes

Building Classification is a process for understanding risks of a building according to its use. It must be correctly undertaken to achieve BCA aims appropriate to each building in each circumstance.

- **Class 1:** Houses, boarding houses, guest houses, or the like
- **Class 2:** Mid-Rise; A building containing 2 or more sole-occupancy units each being a separate dwelling.
- **Class 3:** Residential part of a hotel, motel, school or detention centre, boarding-houses, hostel, backpackers accommodation. A residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated persons.
- **Class 4:** A dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.
- **Class 5:** Office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.
- **Class 6:** A shop or other building for the sale of goods by retail or the supply of services direct to the public. Example: café, restaurant, kiosk, hairdressers, showroom or service station.
- **Class 7:** A car park, or building which is for storage or display of goods or produce for sale by wholesale.
- **Class 8:** A laboratory, or a building for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain.
- **Class 9:** A health care building, including those parts of the building set aside as a laboratory; an assembly building, including a trade workshop, laboratory or the like, in a primary or secondary school; or aged care.
- **Class 10:** A non-habitable building or structure. A private garage, carport, or shed; a fence, mast, antenna, retaining or free standing wall, swimming pool; a private bushfire shelter.

2.2 Types of Fire-resisting Construction

Table C1.1 “Type of Construction Required” establishes the minimum fire-resisting construction required for Class 2–9 buildings. This assigns a “Type” of Construction, depending on the Class of building and the building’s height (in storeys).

There are 3 “Types”; Type A construction is the most fire-resistant, Type C construction is the least fire-resistant, and Type B construction falls between these two.

Table C1.1 TYPE OF CONSTRUCTION REQUIRED

Rise in storeys	Class of building	
	2, 3, 9	5, 6, 7, 8
4 OR MORE	A	A
3	A	B
2	B	C
1	C	C

Spec C1.1 – 3 and Spec C1.1 – 4 also sets which elements are to be “non-combustible”, as defined by Specification C1.1 Clauses 3.1(b) and 4.1(b)). Non-combustibility is determined in accordance with AS

1530.1. This can be found summarised in table form in the NCC Guide Specification C1.1 Section 3 and 4 (below).

BUILDING ELEMENT	TYPE A CONSTRUCTION	TYPE B CONSTRUCTION
External wall	Non-combustible	Non-combustible
Common wall	Non-combustible	Non-combustible
Floor and floor framing of lift pit	Non-combustible	Non-combustible
All loadbearing internal walls (including those of shafts)	Concrete, masonry or fire-protected timber	Concrete, masonry or fire-protected timber
Loadbearing fire walls	Concrete, masonry or fire-protected timber	Concrete, masonry or fire-protected timber
Non-loadbearing walls required to be fire-resisting	Non-combustible	Non-combustible
Non-loadbearing lift, ventilation, pipe, garbage and like shafts which do not discharge hot products of combustion	Non-combustible	Non-combustible (subject to conditions outlined in Clause 4.1(h))

2.3 Non-Combustibility

Non-combustible is a defined term in the BCA, determined by AS 1530.1 standard combustibility test to a material. **BCA Clause C1.12 “Non-combustible materials” (Under Part C1)** provides a list of materials, though combustible or containing combustible fibres, “may be used wherever a non-combustible material is required”:

- Plasterboard
- Perforated gypsum lath with a normal paper finish
- Fibrous-plaster sheet
- Fibre-reinforced cement sheeting
- Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0
- Bonded laminated materials* where:
 - Each laminate is non-combustible; and
 - Each adhesive layer does not exceed 1mm in thickness; and
 - The total thickness of the adhesive layers does not exceed 2mm; and
 - The Spread-of-Flame Index and the Smoke-Developed Index of the laminated material as a whole does not exceed 0 and 3 respectively (as per AS 1530.3).

*This concession may be removed in NCC 2019.

2.4 Variations (Augmentations and Concessions)

The application of the NCC is strictly dependent on the variables of the project: Class, Height (in storeys), Type, Sprinklered or Non-sprinklered, Location/Region. Many variations (augmentations and concessions) exist for each element and product depending on these factors. Additionally, State variations will come through in both the NCC and in separate State Development Codes. These variations must be factored into specifying the materials and affirmed by the Subcontractors prior to ordering and installation.

To understand the specification application of the NCC and State Development Codes for the project, teams should read and understand the NCC/BCA/DDA Compliance Report prepared for project by the Certifier. This report will also outline any deviations from the Deemed-to-Satisfy requirements and the alternate solutions to address them.

Examples of these variations include various FRL and fire test performance requirements (including those under AS 1530.2 and AS 1530.3) for the construction of:

- Attachments to buildings or elements

- Air handling ductwork
- Balconies and verandas
- Carparks
- Doors
- Escalators, moving walkways or pedestrian ramps
- Fire compartment and corridor enclosures
- Fixed seating in the audience area or auditorium, curtains
- Insulation and sarking
- Lifts and lift shafts
- Openings
- Paint coatings
- Roofs
- Services and fire penetrations
- Sprinklered or non-sprinklered
- Stairways
- Walls, ceilings and floors
- Windows and facades

2.5 Assessing Products

Although products will be subject to the wide variety of variations under the NCC, broadly speaking there are 4 main applications that should be reviewed against the following testing regimes. Any of the products in these categories should be discussed for fire performance with the Architect, Certifier, and Subcontractor.

2.5.1 External cladding

- Needs a NATA approved Laboratory test report showing compliance with [AS 1530.1](#)—a test for non-combustibility. This includes substitute materials that “may be used wherever a non-combustible material is required” as per [BCA Clause C1.12](#) (see 12.11.3 of this PQP for this list).
- A Codemark Certificate is acceptable, but it needs to nominate deemed to satisfy compliance to NCC Clause C1.12 (“Non-combustible materials”).
- [AS 5113](#) is a new compliance verification method applicable to all products for façades, outer skins, core materials, cavities and attachments (but does not include any additional supporting structure). It tests the product as a system, rather than by each material/element. [AS 5113](#) is not yet mandatory,
- Ideally, [AS 1530.1](#) compliant materials should be used; if not, a performance solution will be required, at the Fire Engineer’s discretion. This will also require consultation and approval from the Certifier/Surveyor and the Fire Brigade.
- Additionally, Fire Resistance Level (FRL) properties (determined in accordance with [AS 1530.3](#)), provided by:
 - “Table 3 Type **A** Construction: FRL of Building Elements” (Spec C1.1 – 3); or
 - “Table 4 Type **B** Construction: FRL of Building Elements” (Spec C1.1 – 4); or
 - “Table 5 Type **C** Construction: FRL of Building Elements”. (Spec C1.1 – 5).

2.5.2 Internal Linings (Walls and Ceilings)

- Linings are assigned “Group Numbers” or “Material Group Numbers”, determined by testing the material in accordance with [AS 5637.1](#) (which provides a Group Number via [AS/ISO 9705](#) or [AS/NZS 3837/ISO 5660](#)). A Group 1 material indicates the best performing material and a Group 4 material is the worst performing material.
- **Clause 4 of Spec C1.10 – 3** specifies that a material used as a wall or ceiling lining must be a Group 1, Group 2 or Group 3 material, applied to different elements and used in accordance with **Table 3 “Wall and Ceiling Lining Materials (Material Groups Permitted)” (Spec C1.10 – 4)**.
- The allowable material group number differences are based on the building classification and the location of the material in the building. It is also dependent on whether the building contains a sprinkler system, and whether the material is used as a wall lining or a ceiling lining.
- Generally, Group No. 1-3 is acceptable to Class 6 Retail, Class 5 Office, Class 7 Carpark, Class 9b sprinklered buildings unless in a Fire Control Room or Fire Corridor (where Group 1 is required).
- Additionally, Fire Resistance Level (FRL) properties (determined in accordance with [AS 1530.3](#)), provided by:
 - “Table 3 Type A Construction: FRL of Building Elements” (Spec C1.1 – 3); or
 - “Table 4 Type B Construction: FRL of Building Elements” (Spec C1.1 – 4); or
 - “Table 5 Type C Construction: FRL of Building Elements”. (Spec C1.1 – 5).
- The NCC stipulates instances when a ceiling system must be resistant to the incipient spread of fire (RISF). This requirement determines the ability of the ceiling to provide adequate thermal insulation to combustible materials within the ceiling plenum, thus avoiding the danger of the materials being ignited. In most situations, ceilings (and walls, where they meet) require a resistance to the incipient spread of fire to the space above itself of not less than 60 minutes, as tested to [AS 1530.4](#).
- For buildings not fitted with a sprinkler system, wall or ceiling linings must have a smoke growth rate index (SMOGRARC) not more than 100; or an average specific extinction area less than 250 m²/kg, determined in accordance with [AS ISO 9705](#).
- In some cases, the BCA requires “Resistance to the Incipient Spread of Fire” (RISF) ceilings to stop or limit the spread of a fire to the roof space. This is tested in **Section 4 of AS 1530.4**. The RISF states the ability of a ceiling to limit the temperature rise in the ceiling cavity. RISF requirements are commonly required where the ceiling is the primary fire barrier that limits fire spread by way of the ceiling void, like separating Classes of a Building, and fire passageways not built out of concrete.
- Note that linings are exempt from being non-combustible as per Spec C1.1 – 2, Clause 2.4, as they are an attachment, but some ceilings may need to be non-combustible—refer to your NCC/BCA Compliance Report.

2.5.3 Internal Linings (Floor)

- Critical Rating of Flux (CRF) test result required. A floor lining or covering must have a critical radiant flux not less than that in **Table 2 “Critical Radiant Flux (CRF in kW/m² of Floor Materials and Floor Coverings)” (Spec C1.10 – 3)**. A material’s critical radiant flux is determined by testing the material in accordance with [AS ISO 9239.1](#). This test is the floor radiant panel test. The higher a material’s critical radiant flux is, the better the material performs.
- Additionally, Fire Resistance Level (FRL) properties (determined in accordance with [AS 1530.3](#)), provided by:
 - “Table 3 Type A Construction: FRL of Building Elements” (Spec C1.1 – 3); or

- “Table 4 Type **B** Construction: FRL of Building Elements” (Spec C1.1 – 4); or
- “Table 5 Type **C** Construction: FRL of Building Elements”. (Spec C1.1 – 5).
- Note that linings are exempt from being non-combustible as per Spec C1.1 – 2, Clause 2.4, as they are an attachment.

2.5.4 Roof Systems

- Strictly speaking, roofing systems only need to comply with the FRL tables (determined in accordance with [AS 1530.4](#)), provided by:
 - “Table 3 Type **A** Construction: FRL of Building Elements” (Spec C1.1 – 3); or
 - “Table 4 Type **B** Construction: FRL of Building Elements” (Spec C1.1 – 4); or
 - “Table 5 Type **C** Construction: FRL of Building Elements” (Spec C1.1 – 5).However, this means that the roofing systems, comprised of all elements (including insulation, sarking etc) must also meet the FRL properties. Some Certifiers take the stance that it's easier to specify non-combustible roof sheeting.
- Where a part of a building required to have an FRL depends upon direct vertical or lateral support, that supporting part must have the same FRL, **and** be non-combustible. However, roofs providing lateral support don't need to be non-combustible or have the same FRL, in Type A Construction (so long as it has sprinklers installed throughout, is less than 3 storeys or less, or has a height of 25m or less and an incipient flame protected ceiling), or Type B and Type C Construction.

2.5.5 Insulation and Sarking

- Table 4 “Other Materials” (Spec C1.1 – 4) imposes a flammability index, spread-of-flame index, and smoke-developed index tested as per [AS 1530.2](#) and [AS 1530.3](#).
- Externally, much like façade systems, needs a NATA approved Laboratory test report showing compliance with [AS 1530.1](#) (non-combustibility), or Codemark Certificate nominating compliance to NCC Clauses C1.12. Also requires [AS 5113](#) “Fire Performance of External Walls and Cladding” tested as component in whole façade system.
- Additionally, Fire Resistance Level (FRL) properties (determined in accordance with [AS 1530.3](#)), provided by:
 - “Table 3 Type **A** Construction: FRL of Building Elements” (Spec C1.1 – 3); or
 - “Table 4 Type **B** Construction: FRL of Building Elements” (Spec C1.1 – 4); or
 - “Table 5 Type **C** Construction: FRL of Building Elements”. (Spec C1.1 – 5).

2.5.6 Air Handling Ductwork

- Requires tests to [AS 4254.1](#) (requires [AS 1530.3](#) and UL 181 Burn test)

2.5.7 Attachments: Joinery, Whiteboards, Blinds, and Feature Elements to Walls

Spec C1.1 – 2, Clause 2.4 states that a combustible material may be used as a finish, lining or other attachment to a wall, roof, or other building element that is required to have an FRL, if the material:

- Is one of the exemptions from fire hazard properties listed in C1.10(c), **OR** complies with the fire hazard properties prescribed in Specification C1.10. Exempted materials include:
 - Plaster, cement render, concrete, terrazzo, ceramic tile or the like
 - Fire-protective covering
 - Timber-framed window
 - Solid timber handrail or skirting
 - Timber-faced solid-core door or timber-faced fire door
 - Electrical switch, socket-outlet, cover plate or the like
 - Roof insulating material applied in continuous contact with a substrate
 - Adhesive
 - Damp-proof course, flashing, caulking, sealing, ground moisture barrier, or the like
 - Paint, varnish, lacquer or similar finish, other than nitro-cellulose lacquer
 - Face plate or neck adaptor of supply and return air outlets of an air handling system
 - Face plate or diffuser plate of light fitting and emergency exit signs and associated electrical wiring and electrical components
 - Joinery units, cupboards, shelving, or the like
 - Curtain, blind, or similar decor, other than a proscenium curtain
 - Whiteboard, window treatment or the like
 - Timber treads, risers, landings and associated supporting framework installed in accordance with D2.25 where the Spread-of-Flame Index and the Smoke-Developed Index of the timber does not exceed 9 and 8 respectively
 - Any other material that does not significantly increase the hazards of fire.
- Is not located near or directly above a required exit so as to make the exit unusable in a fire; and
- Does not otherwise constitute an undue risk of fire spread via the facade of the building.

The above only applies to the use of finishes or linings, and other attachments. **The attachment of a facing or finish, or the installation of ducting or any other service, to a part of a building required to have an FRL must not impair the required FRL of that part (Spec C1.1 – 2, Clause 2.4(b)).** For example, a feature wall attachment is required to share the same Material Group Number as the wall lining its being attached to.

2.6 Evidence of Suitability

The assessments above will be based on a collection of evidence of suitability, which should be in accordance with the NCC's "Evidence of Suitability Handbook". This may take the form of:

- A Codemark Certificate
- Australian Standard Test Result (from NATA Accredited Laboratory)
- Product Technical Statement confirming conformance and compliance to intended application
- Product technical data or brochure that explicitly covers the compliance with NCC or Australian Standards, as well as the intended use.

Note that the Building Surveyor/ Private Certifier has no authority to accept a product that has not been tested in accordance with Australian Standards. In this sense, International Standard testing results cannot be relied on. Only test results to Australian Standards from JAS-ANZ or NATA Accredited laboratories can be accepted. International suppliers should also have their test results checked for validity to ensure they're not fabricated.

2.7 Noteworthy Fire Performance Tests

- AS 1530.1 - Combustibility
A test done in accordance with AS 1530.1 will determine if a material is combustible. If materials used in an assembly contain combustible components, then the assembly is combustible.
- AS 1530.2 - Flammability Index
A test performed in accordance with AS 1530.2 will determine the flammability index of a material.
- AS 1530.3 - Smoke Index and Spread-of-Flame
A test in accordance with AS/NZS 1530.3 determines the Smoke-Developed Index and Spread-of-Flame Index of a material. The indices are based on a logarithmic scale of 0 to 10. A lower index number indicates better performance.
- AS 1530.4 - Fire Resistance Level
AS 1530.4 contains details of the Standard Fire Test. The test is used to determine the FRL of a building element. The results are recorded in order as: structural adequacy, integrity and insulation.
- AS ISO 9239.1 - Smoke development rate
A test in accordance with AS ISO 9239.1 determines the smoke development rate of a material. A lower value indicates better performance.
- AS ISO 9705 - Smoke growth rate index
A test in accordance with AS ISO 9705 determines the smoke growth rate index (SMOGRARC) of a material. A lower value indicates better performance.
- AS 3837 - Heat and smoke release rates for materials
Tests for average specific extinction area. Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter. Sets out a test method for the determination of ignitability, heat release rates, mass loss rates, effective heat of combustion and smoke release of materials and products when exposed to controlled levels of radiant heating.
- AS 5637.1 - Determination of fire hazard properties Wall and ceiling linings
Determines a group number of a wall or ceiling lining, and the smoke growth rate index or average specific extinction area.

3 Fire Penetration Management

The core principle is that penetrations through fire compartments shall not compromise the fire resistance or the structural integrity of the penetrated member.

Subcontractors must be instructed not to drill, core, cut or put any holes through or into the wall without making undetraining to label and register the penetration. The subcontractor must provide the specific manufacturer installation details and tested application of each and every item used.

As examples of what can go wrong:

- Many test results will not be applicable once the other externalities are taken into account; e.g. the other trade's conduits, the size of the actual penetration etc
- Many fire collars are only tested for either vertical or horizontal uses and although you will often see the same collar used both on slabs and in walls.

3.1 General Principles

To achieve the required fire rating the following protocols for service penetrations need to be adhered to:

- All penetrations are to be neatly formed, cut or drilled and no larger than is necessary to accommodate and seal around the pipe or cable.
- All services are to run perpendicular (at a right angle) to the Party Wall at the point of penetration, unless tested otherwise.
- All sealants around penetrations should have a concaved fillet, unless tested otherwise.
- Where the services penetrate into an apartment are through a core header beam, these will be via a Fyrebox which is to be post-fixed within the penetration by the plasterboard contractor. Services running through this Fyrebox unit should follow spacings provided on the agreed diagram to ensure compliant spacings are achieved.
- No service should run within 100mm of the mechanical fire damper.
- All metal pipework must have a 200mm minimum clear separation (from the edge of the penetration, not the pipe/cable) between them to ensure a fully fire rated caulk joint can be achieved, except through a Fyrebox
- All hydraulic pipes must have a separate penetration. NO pipes can share a penetration through a party wall except through a Fyrebox.
- No services can share a penetration unless that penetration is bunched Electrical cables no more than 32mm in diameter (MATV, Comms & Security cables will share a penetration), except through a Fyrebox.
- All wiring for temporary lighting is to be run through a separate penetration and treated as if it were permanent so it does not interfere with the caulking process of other services. If the temporary wiring is removed, the penetration will be caulked as appropriate.
- The lagging of any hydraulic pipework must not run flush against, or through, the fire wall at any instance except through a Fyrebox. This ensures a fully fire rated caulk joint can be achieved.
- In any instance where a proprietary collar is used, the collar must protrude through the wall on both sides to ensure a fully fire rated caulk joint is achieved around the collar
- Fire dampers to be installed as per manufacturers guidelines
- All sealing/caulking of penetrations must be done in accordance with the tested solution and/or with Clause 7 of Specification 3.15 of the NCC 2016

Note: tested systems must be mirrored onsite, where installation detail is missing, refer to the technical installation instructions for further information.

3.2 BESIX Watpac System Forms

For passive fire protection and fire-resistant service penetrations, evidence of compliance with Australian Standard AS 4072.1 will be the expectation. Refer to **QA-PRO-010 Fire Penetration Management Procedure**.

Services trades will seal behind any penetrations in internal walls, slabs or ceilings to achieve the Fire Resistance Level (FRL) of that compartment, as specified by drawings or the Fire Engineering Report/Brief (FER/FEB). These penetrations will be sealed with a “fire separating element” with the same FRL as required for the wall, floor or ceiling. This is usually a fire collar but may be other materials such as fire rated sealant or fire pillows.

Fire collars may be cast-in before pouring a slab, or retrofitted. Even when they are cast-in, Services trades will only certify and document them during the finishes and fit-off stage, prior to any sheeting.

All subcontractors must also provide a simple marked-up plan showing penetration location and ID, which can just be a mark-up of any plan. All penetrations should be labelled, using the **Fire Penetration Label Template (QA-FRM-026)**. The label should be positioned close to the service penetration, seal, or control joint. Multiple labels may be used where appropriate, e.g. control joints. All subcontractors must also provide a simple marked-up plan showing penetration location and ID, which can just be a mark-up of any plan. Some Contracts, Specifications or Certifiers may also require that we take photos of the completed fire rated penetrations. This must be discussed and established early.

Subcontractors must keep their own Fire Penetration Registers, and provide to BESIX Watpac once complete.

A **Fire Rated Penetration Register Template (QA-FRM-025)** is provided as an example. The template provides a standard protocol for numbering/naming the penetrations.

3.3 Penetrations in Concrete Block Walls

Where the penetration width exceeds 400mm, or are large circular penetrations and/or if there are many penetrations in close proximity to each other the wall above the penetration shall be supported by a reinforced bond beam designed by a Structural Engineer.

Blocks each side of any opening shall be a solid face, uncut and as manufactured. If cutting is required to meet opening sizes, the cut end of the block shall be turned away from the opening.

Cut blocks shall have the cut core filled with mortar as the work progresses.

When a penetration results in a space above the damper less than 200 mm to the slab above, concrete blocks shall not be used above the penetration. Instead a tested and approved proprietary lintel or filler board shall be used. Confirmation from the Designer & the damper manufacturer will be required confirming the filler material will be -

1. compatible with the selected damper, and
2. the damper casing will be adequately retained in the opening.

3.4 Cable Trays in Plasterboard Wall Systems

3.4.1 Cable Trays >300mm

Cable trays over 300 mm in width require the opening to be framed and lined.

Studs each side of the opening shall be sufficient to transfer loads to the main structure, not steel door frames or other non-load bearing elements. This will generally require boxed studs each side but may require supplemental structural steel within the wall cavity. The wall system manufacturer shall provide the details of the wall construction.

The lining of the annular space shall the same number of layers as the face of the wall, screwed to the studs and trimmers, and all gaps sealed.

3.4.2 Hangers

Irrespective to the width of the cable tray, in order to minimise the effects of sag of the cable tray during a fire event, one set of hangers must be located within 100 to 150mm from one side of the wall.

3.4.3 Clearance for Fire Stopping

The opening in the wall shall ensure that the annular space shall be large enough to enable correct fire stopping. Clearances between any cable tray and the sides of the annular space shall be large enough to enable fire stopping of the full thickness of the penetrated member. Refer to the manufacturer's specified installation requirements for size limitations.

All gaps are to be sealed with tested and approved fire stopping, mastics, sealants or putties.

3.4.4 Incorrectly Sized Openings

Undersized openings shall be reconstructed to the correct dimensions. Reconstruction does not mean simply cutting a larger opening. Partial disassembly of the adjoining areas will be required. Oversize openings shall be repaired only with tested and approved fire stopping/repair systems.

3.4.5 Metal Penetrating Items

All metal items penetrating fire resistant floors or walls will reduce the FRL for insulation of the wall. Therefore, unless tested and approved otherwise or exempt by the NCC, all metal penetrating items shall be wrapped with tested and approved insulating wraps.