Good Practice Guide

GPG 07

Protection of openings for service penetrations in fire-resisting building elements

Version 1

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FIRE PROTECTION ASSOCIATION AUSTRALIA

Protection of openings for service penetrations in fire-resisting building elements

Leading and supporting a professional industry to minimise the impact of fire on life, property and the environment, for a safer community.

Table of Contents

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Leading and supporting a professional industry to minimise the impact of fire on life, property and the environment, for a safer community.

1.0 Purpose

The purpose of this document is to provide guidance and information on:

1. The requirements of Clause C3.15 of Volume 1 of the Building Code of Australia (BCA) for the protection of openings for service penetrations in fire-resisting building elements;
2. Why such protection is required; and
3. What options exist to comply with the requirements of the BCA.

Note:	The protection of openings for service penetrations in fire-resisting building elements (and the systems or material used) is referred to as 'the protection method' in this document. However, this is sometimes referred to as 'fire stopping' because the protection method restricts the fire, stopping it from spreading from one side of the fire-resisting building element to the other.

Note:	This document does not address smoke barriers, smoke walls or penetrations through them.

2.0 Audience

This Good Practice Guide is intended for:

(i) building owners, building managers and strata corporation managers, occupiers, tenants and the like;

(ii) builders and trade service contractors undertaking electrical, plumbing, cabling, ventilation and air-conditioning and other service works which commonly penetrate fire-resisting building elements;

(iii) fire protection companies that design, manufacture, supply, install and maintain fire stopping systems; and

(iv) other stakeholders with an interest in fire protection (fire brigades, insurers, councils, building certifiers/surveyors, architects, etc.).

3.0 Introduction

Passive fire protection is the use of fire-resisting building elements to prevent the spread of fire and prevent structural collapse. When properly installed, maintained and routinely serviced, passive fire protection improves life safety and property protection.

Openings in fire-resisting building elements (such as doors, windows, voids and service penetrations) are commonly made to allow for the movement and transport of occupants, goods and trade services within a building. Protection of these openings is extremely important and is required by the Building Code of Australia (BCA) to ensure they do not reduce the fire-resisting performance of the fire-resisting building element.

Unfortunately, there is a significant lack of awareness or misunderstanding of the BCA requirements in relation to the protection of openings for service penetrations (BCA Volume 1, Clause C3.15).

Inspections of service penetrations in multi-storey buildings almost always identify more than one service penetration through a fire-resisting building element which has no protection method installed or has a non-compliant fire protection method installed.

Typical examples of non-compliant protection of openings for service penetrations in fire-resisting building elements include:

- A compliant protection method installed which is not approved for that particular application (i.e. a compliant fire collar approved for PVC pipe penetrations used for cable penetrations);
- A compliant protection method installed incorrectly (different to that approved by a Registered Testing Authority (RTA) or stipulated by the manufacturer); or
- The service penetration has been filled by a sealant type product that has not been tested or approved by an RTA to comply with BCA Clause C3.15.

In addition, in existing buildings, owners, building managers and trades services contractors are often unaware of the location and type of fire-resisting building elements. Therefore, the installation of services through these elements often occurs without the required protection method being installed to protect the opening for the service penetration. This is difficult to monitor and rectify post installation and increases the risk to the life safety of building occupants and risk of fire spread throughout the building.

Trade services (and systems) that typically penetrate fire-resisting building elements include, but are not necessarily limited to:

- electrical services
- fire detection and alarm systems
- plumbing and gas services
- phone, data, security, communications and surveillance systems
- security and surveillance camera systems
- sprinkler and hydrant systems
- ventilation and air-conditioning systems

While some of these services/systems are installed during construction of a building, other services—phone, data, security, communications and surveillance systems—are commonly installed post construction, which is often where the required protection of service penetrations fails to occur.

Furthermore, there are multiple compliant protection method options available to protect openings for service penetrations. However, it can be difficult to identify if a protection method is suitable for a specific service penetration scenario or not.

To assist all stakeholders involved in the protection of openings for service penetrations in fire-resisting building element, this guide explains:

- What the BCA Volume 1 requirements are for fire-resisting building elements and protection of openings for service penetrations in these elements;
- What the key components of protection methods are and how they work;
- Documentation requirements including evidence of suitability and service penetration and protect method registers;
- The steps for protecting openings for service penetrations in fire-resisting building elements; and
- Some key changes to the requirements and some common misconceptions (see Appendices).

4.0 Terminology

The building industry typically uses a variety of terminology concerning fire-resistance and fire-resisting building elements. Protection method and fire stopping are used interchangeably through the industry. Refer to Section 4.0 of Good Practice Guide *GPG-06 Fire Resistance* for the full details of terminology also used in this document.

5.0 Building Code of Australia (BCA) / National Construction Code (NCC) requirements

5.1 Performance Requirements

With respect to the protection of openings for service penetrations compliance with the National Construction Code (NCC) is achieved by satisfying Performance Requirements CP2 and CP8 of the Building Code of Australia (BCA), Volume 1 as detailed below.

CP2

(a) A building must have elements which will, to the degree necessary, avoid the spread of fire—
  (i) to exits; and
  (ii) to sole-occupancy units and public corridors; and
  (iii) between buildings; and
  (iv) in a building.

(b) Avoidance of the spread of fire referred to in (a) must be appropriate to—
  (i) the function or use of the building; and
  (ii) the fire load; and
  (iii) the potential fire intensity; and

(iv) the fire hazard; and
(v) the number of storeys in the building; and
(vi) its proximity to other property; and
(vii) any active fire safety systems installed in the building; and
(viii) the size of any fire compartment; and
(ix) fire brigade intervention; and
(x) other elements they support; and
(xi) the evacuation time.

CP8

Any building element provided to resist the spread of fire must be protected, to the degree necessary, so that an adequate level of performance is maintained—

(a) where openings, construction joints and the like occur; and
(b) where penetrations occur for building services.

BCA Performance Requirements must be met by complying with:

(a) A Deemed-to-Satisfy Solution;

(b) A Performance Solution (previously known as Alternative Solution); or

(c) A combination of the two.

Because Performance Solutions are uniquely tailored to individual buildings, this guide focusses on the BCA Deemed-to-Satisfy Solution requirements.

5.2 Deemed-to-Satisfy (DTS) requirements

The most relevant BCA Deemed-to-Satisfy (DTS) Provisions for service penetrations are outlined as follows.

Clause C3.9 Service penetrations in fire-isolated exits

Clause C3.9 details the requirements for service penetrations in fire-isolated exits. It limits service penetrations to services strictly related to or required for the exits, including water supply pipes for wet type fire protection services.

Note: While Clause C3.9 states what services may penetrate fire-isolated exits, it does not detail how these penetrations shall be protected. This is detailed in Clause C3.15.

Clause C3.12 Openings in floors and ceilings for services

Clause C3.12 details openings for service penetrations through floors required to have a fire-resistance level and ceilings required to have a resistance to the incipient spread of fire.

Clause C3.12 requires such service penetrations to be protected:

(i) by a shaft complying with Specification C1.1 (for Type A construction)

(ii) by a shaft that will not reduce the fire performance of the building elements it penetrates (for Type B or C construction); or

(iii) in accordance with Clause C3.15.

Where the service penetrates through a floor required to be protected by a fire-protective covering, Clause C3.12 also requires that the penetration must not reduce the fire performance of the covering.

> **Note:** Resistance to the incipient spread of fire is defined in the BCA as follows:
>
> **Resistance to the incipient spread of fire**, in relation to a ceiling membrane, means the ability of the membrane to insulate the space between the ceiling and roof, or ceiling and floor above, so as to limit the temperature rise of materials in this space to a level which will not permit the rapid and general spread of fire throughout the space.

Clause C3.15 Openings for service installations

Clause C3.15 is the most recognised clause of the BCA with regards to the protection of openings for service penetrations through fire-resisting building elements or through ceilings required to have a resistance to the incipient spread of fire.

Clause C3.15 requirements apply to:

- service penetrations in fire-isolated exits (as above, Clause C3.9 states what services can penetrate fire-isolated exits while Clause C3.15 covers how such penetrations shall be made and protected);
- service penetrations in floors and ceilings where a shaft is not used (see Clause C3.12);
- building elements required to have a resistance to the incipient spread of fire; and
- all other service penetrations in fire-resisting construction.

> **Notes:** Protection of openings in external walls is detailed in Clause C3.2.
>
> A Clause C3.15(a) tested system could be used as an option for an external wall or roof provided it achieves an FRL of -/60/-.

5.3 Clause C3.15 Compliance Methods

Clause C3.15 has four methods for the protection of openings for service penetrations in fire-resisting building elements or building elements required to have a resistance to the incipient spread of fire:

> Notes: Not all methods are applicable for every type of service penetration.
>
> It is only necessary to comply with one of these methods.

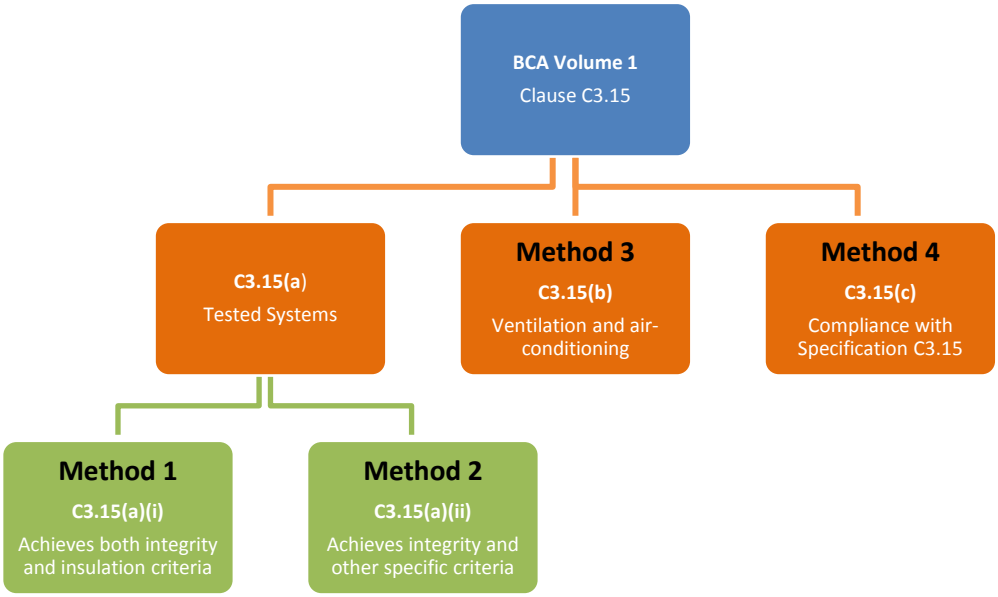


Figure 1 The four methods for fire stopping under BCA Volume 1 Clause C3.15

> Note: This guide only provides summaries of the requirements in Clauses C3.9, C3.12 and C3.15. Refer to the BCA Volume 1 for the full details, especially in regards to the criteria to be met to use the options under Clauses C3.15(a)(ii) and C3.15(c).

5.4 How does an FRL apply to protection methods

In order to comply with the Clause C3.15(a)(i) or C3.15(a)(ii) of the BCA Volume 1, these protection methods are required to achieve an FRL and be verified by the results of a fire test. However, neither is required to meet the structural adequacy criterion of the fire-resisting building element it penetrates—although the protection methods must not cause the fire-resisting building element itself to fail to meet the structural adequacy criterion of its FRL.

For the protection of ventilation and air-conditioning ducts or equipment, compliance with Clause C3.15(b) is required, which subsequently requires compliance with AS/NZS 1668.1. This may require the protection method to:

(i) Meet all criteria of the FRL of the fire-resisting building element it penetrates;

(ii) Meet some of the criteria of the FRL of the fire-resisting building element it penetrates; or

(iii) Have no FRL (if protection is provided in another way).

For the protection methods complying with Clause C3.15(c) — are Deemed-to-Satisfy solutions which achieve the Performance Requirements without needing to undergo the equivalent level of testing, as a Clause C3.15(a) tested system, to obtain the necessary 'Evidence of suitability' to demonstrate that it achieves compliance.

Note:	Evidence of Suitability is required for the fire stopping material detailed in Clause 7 of Specification C3.15; however, this is not an FRL.

5.4.1 Method 1 – Tested Systems 1

C3.15(a)(i)—A fire stopping system (service, substrate, fire seal system) at the penetration that is identical to the prototype assembly tested in accordance with AS 4072.1 and AS 1530.4 and which has achieved the required fire-resistance level (FRL) or resistance to the incipient spread of fire (RISF).

That is, the FRL or RISF achieved by the tested prototype assembly must be equivalent to or greater than the required FRL or RISF (as determined by Clause C1.1 and any modifying clauses) for the relevant fire-resisting building element the service penetrates.

5.4.2 Method 2 – Tested Systems 2

C3.15(a)(ii)—It complies with Method 1 (Clause C3.15(a)(i)) except for the insulation requirement and:

- The service is a pipe system comprised entirely of metal (excluding pipe seals or the like) and has certain specific spatial clearances, and
- Is not located in a required exit.

5.4.3 Method 3 – Ventilation and Air-Conditioning

C3.15(b)—In the case of ventilation and air-conditioning ducts or equipment, the installation is in accordance with AS/NZS 1668.1 requirements.

5.4.4 Method 4 – Compliance with Specification C3.15

C3.15(c)—Compliance with Specification C3.15, which is applicable for:

(i) pipe systems comprised entirely of metal

(ii) sanitary plumbing (metal or uPVC)

(iii) wires or cables

(iv) electrical switches, outlets or the like

Additionally, Clause C3.15(c) itself has specific requirements in addition to those in Specification C3.15 which must also be complied with if this method is used.

It is important to note that using Specification C3.15—the option under C3.15(c)—is an alternative to using a tested system as per C3.15(a)(i) or C3.15(a)(ii).

> **Note:** Using of Clause C3.15(c)—including Specification C3.15—as a method of compliance is not a Performance Solution (Alternative Solution).
>
> Clause 2 of Specification C3.15 clearly states that it is an alternative to systems that have been demonstrated by test to fulfil the requirements of Clause C3.15(a).

Also, while Method 4 (compliance with Specification C3.15) appears to be an easier method to comply with in some aspects, it is important to note that it requires all gaps between the service and the building element (substrate) to be fire-stopped in accordance with Clause 7 of the Specification.

Clause 7 of Specification C3.15 requires a fire-stopping material that:

- does not flow at a temperature below 1120°C when tested in accordance with ISO 540, and
- has—
    - demonstrated in a system tested in accordance with C3.15(a) that it does not impair the fire-resisting

performance of the building element in which it is installed; or

- demonstrated in a test in accordance with Specification C3.15 Clause 7(e) that it does not impair the fire-resisting performance of the test slab.

As such, although using Specification C3.15 appears to be a simpler option with no testing required, it does require the use of a fire-stopping material that has been tested not only to ISO 540 but also to AS 1530.4 (either in accordance with C3.15(a) or in accordance Clause 7(e) of Specification 3.15). Therefore, Specification C3.15 can only be applied where such a tested fire seal system material—for use in the gaps between the service and the building element—is used **and** all of the other applicable requirements of Clause C3.15(c) and Specification C3.15 are complied with.

Some other key requirements of C3.15(c) and Specification C3.15 include:

- Specification C3.15 does not apply to penetrations in ceilings required to have a resistance to the incipient spread of fire or piping that contains or is intended to contain a flammable liquid or gas, see Specification C3.15, Clause 2(b).
- C3.15(c)(i) can only apply to a pipe system comprised entirely of metal (excluding pipe seals or the like) and where that pipe system:
  - has certain specific spatial clearances (if not normally filled with liquid);
  - does not connect more than 2 fire compartments; and
  - does not contain a flammable or combustible liquid or gas.

Important:	Specification C3.15 Clause 3(a) only applies to metal pipe systems not normally filled with liquid. If a metal pipe system is normally filled with liquid—which is not flammable or combustible—then Clause 3(a) is not applicable. However, such metal pipe systems must still comply with (b), (c) and (d) of Clause 3 of Specification C3.15.

- C3.15(c) and Specification C3.15 can be used for sanitary plumbing but not for Class 2, 3, 4, 9a or 9c buildings.

Note:	The above points in relation to Clause C3.15(c) and Specification C3.15 only detail some of the key requirements. Refer to the NCC for the full requirements.

Note:	There were changes to Clause C3.15 in 2008 that affected the application of Clause C3.15(a)(ii) and Specification C3.15. These changes are explored in Appendix A.

5.5 Indirect reference to BCA requirements

As mentioned in Section 3.0 of this guide, trade services are often installed or worked on (altered, extended, maintained, repaired, etc.) after construction of the building. Building legislation frequently requires that any work in relation to, or which may adversely affect, an essential fire safety measure requires a building permit/approval and/or compliance with the BCA.

Additionally, it is sometimes a requirement of other non-building related legislation, that when undertaking certain services work (that is not defined as building works) that such work it must be carried out in accordance with the applicable legislation and/or Australian Standard. This in turn may require the protection of openings for service penetrations in fire-resisting building elements in accordance with the BCA.

The following is an example of such a situation.

Example:	The Telecommunications Cabling Provider Rules 2014 (made under subsection 421 (1) of the Commonwealth Telecommunications Act 1997) requires cabling work for a range of systems connected to telecommunications network to be conducted by registered persons and installed in compliance with the Australian Standard AS/CA S009:2013, *Installation requirements for customer cabling (Wiring rules)*, which includes requirements for protection of openings (penetrations) as follows: *Clause 16.2 Fire stopping* *Any opening where customer cabling runs in or through a fire isolating wall, floor or riser shall,* ***shall****—* *(a) be suitably fire stopped; and* *(b) comply with the Building Code.* As such, anyone penetrating fire-resisting construction for cabling work under the Telecommunications Cabling Provider Rules 2014 is required to ensure that the penetration is suitably protected and in compliance with the BCA.

6.0 Protection Methods (Fire stopping systems) (Protection methods)

This section provides an overview of the general components that make up systems for the protection of openings for service penetrations in fire-resisting building elements (fire stopping systems) as well as providing an overview of particular types of products used in such systems and how they work.

6.1 Components of fire stopping systems

There is a large variety of fire stopping systems due to the wide variety of services and fire-resisting building elements that may be penetrated by these services.

However, the majority of fire stopping systems typically consist of the following components:

- Substrate—the fire-resisting building element (e.g. wall, floor or ceiling) that the service penetrates
- Opening (penetration)—the opening made through the substrate to allow a service to penetrate the substrate (and therefore the building element)
- Service—the cable, pipe, duct or the like, that passes through the opening (penetration) in the substrate
- Fire seal system—conforming fire stopping product or products used to maintain the required performance of the fire-resistance level (FRL) of the substrate. It is common that this system will comprise more than one product.

Sufficient 'Evidence of Suitability' must be provided to verify that the fire seal system, in conjunction with the substrate and service achieves the required FRL.

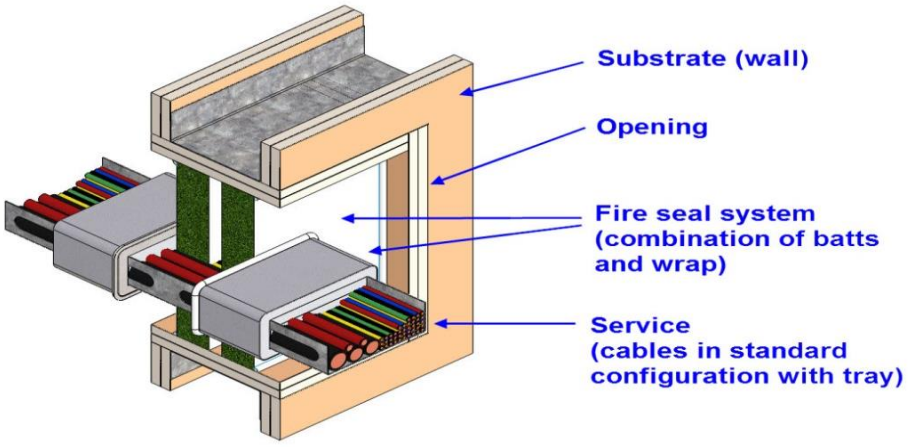


Figure 2 Example of fire stopping system components (in this case a combination of batts and wraps)

It is the combination of these components (including their orientation and installation method) that forms the complete fire stopping system required for the protection of an opening for a service penetration in a fire-resisting building element.

A fire seal system product is not on its own a suitable method of protection for any service penetration. What the substrate is, how the opening is made, what the service is, what the fire seal system product is and how it is applied all combine together to form a fire stopping system and that system must be demonstrated to provide the protection required using 'evidence of suitability'. This is to ensure that an opening created by the service penetration in a fire-resisting building element does not reduce the fire-resisting performance of those elements.

6.2 Fire seal system products

Important:	This document is not intended to advocate for any particular fire stopping product or type of fire stopping product. This section simply aims to provide information to readers on what type of fire stopping products exist and how they work. Although product types are referenced it must be remembered that it is the combination of substrate, opening, service and fire seal system (fire stopping product or products) that forms a complete fire stopping system.

Due to the large range of substrates and services, there is a large range of fire seal system products, which employ different technologies to retain the required integrity and insulation performance criteria of fire-resisting building elements.

Fire seal system products include, but are not limited to:

- Fire collars

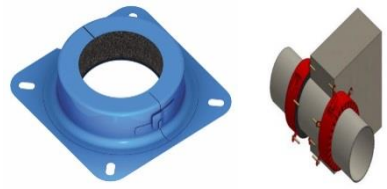


Figure 3 Fire collar and diagram of fire collars in situ

Fire collars are typically used around plastic pipework and can be installed in situ or affixed to the fire-resisting building element that they protect. They remain inert under normal conditions. However, when exposed to heat from a fire the intumescent material they contain will expand inwardly sealing off the opening otherwise caused by the plastic pipework melting away. The expanded intumescent material creates a barrier which prevents the spread of flames and hot gases as well as reducing the spread of smoke.

- Fire-resisting air transfer grilles, fire dampers and sub ducts

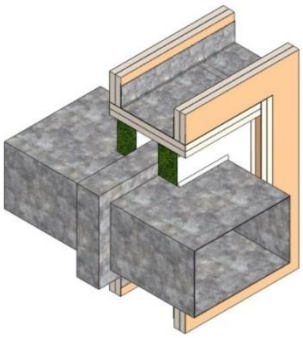


Figure 4 Ventilation duct through a fire compartment. Includes a fire damper that is independently supported within the element and with the perimeter between the damper and substrate sealed with a tested system (in this case, fire batts)

Fire-resisting air transfer grilles and fire dampers are installed in walls, ceilings, ducts, etc. They allow airflow under normal conditions but in the event of a fire the blades of the grille or damper will close on activation of a fusible link (for mechanical grilles or dampers) or fuse together (for intumescent grilles or dampers) creating a barrier to fire and hot smoke.

Note: This guide does not detail protection methods for ventilation or air conditioning ducts as required by AS/NZS 1668.1 such as:

- Wrapping of the duct in a fire proof blanket or duct wrap
- Spraying the duct with a cementitious spray
- Encasing the duct in fire rated board

- Fire pillows

Figure 5 Fire pillows

Fire pillows provide a flexible solution where openings incorporate different sized trade services, where additional services are likely to be added or where the services are regularly accessed for maintenance.

Fire pillows generally use intumescent material which expands to create a barrier to prevent the spread of flames and hot gases as well as reducing the spread of smoke.

It is important to remember that fire-resisting sealants are also required to seal all gaps around fire pillows.

- Fire batts

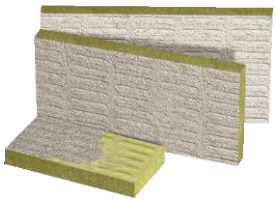
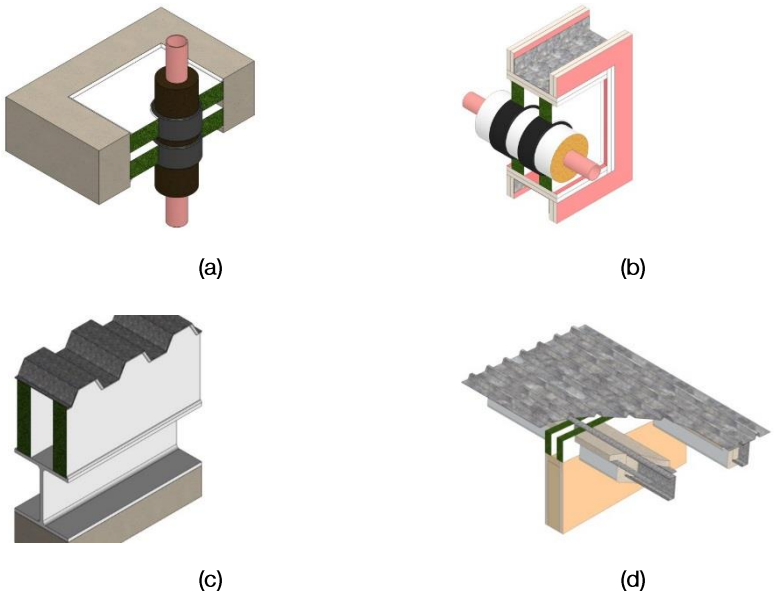


Figure 6 Fire batts

Fire batts provide another flexible solution for fire stopping allowing multiple similar trade services of different sizes to be contained within one opening. They may also offer a level of acoustic insulation.

Fire batts absorb heat from the fire over a period of time which delays heat and combustion products from transferring through the product.



(a) (b)

(c) (d)

Figure 7 Example of fire batts in use—to seal apertures around services, (a) and (b), and as linear gap seals, (c) and d)

- Fire compounds/Fire mortars

Figure 8 Fire mortars in use

Fire compounds/fire mortars are usually used within floor seal systems and some have tested load-bearing capabilities. Like normal compounds/mortars, fire compounds/fire mortars can be used to fill gaps. However, unlike normal mortars

they consist of various fillers and binders which limit the rate of transfer of heat through the compound/mortar.

- Fire rated sealants

Figure 9 Fire rated sealant

Fire rated sealants are usually acrylic, one part polyurethane or silicon based and are most commonly used to seal/protect expansion joints in fire-resisting building elements. The sealant usually has some intumescent properties. It is commonly used to seal linear gaps between the service pipe, cable or wire and the building element. It is also used in conjunction with other fire-resisting products—by sealing gaps around fire pillows, fire batts and the like—to form a compliant protection method.

Fire rated sealants will char when exposed to heat from a fire. The char acts as an insulant which limits the rate of heat transfer.

Pressure exerting mastics or high-content graphite sealants are another type of fire-rated sealant. Such high pressure mastics also contain intumescent materials which, when exposed to heat from a fire, expand and seal multiple cables. Some of these mastics/sealants can crush or close plastic pipes; however, this use must be detailed in the 'evidence of suitability' documentation.

Figure 10 Example of pressure exerting mastics

6.3 Typical Applications for Fire Stopping Systems

The table below provides some guidance on which particular type of fire stopping systems could be suitable for a type of service penetration.

Important:	You must always read the specific fire stopping product certification to verify that it meets the criteria for the proposed application and is within the limitation and conditions specified by the manufacturer.

Service Penetration Type	Likely Fire Stopping System
Metal Pipe	• Fire batts • Fire compounds/Fire mortars • Fire-rated sealant
Lagged Metal Pipe	• Fire collar • Intumescent seals/wraps • Fire-rated intumescent sealant • Fire rated lagging
Non-Metal Pipe	• Fire collar • Fire batts • Fire compounds/Fire mortars
Wire/Cable or Cluster	• Fire collar • Fire pillows (inc. Fire-rated sealant) • Fire compounds/Fire mortars • Fire-rated sealant
Electrical Outlet	• Fire-rated sealant
Duct	• Fire-resisting air transfer grilles • Fire dampers • Fire-resisting wrap/blanket/duct wrap • Fire-resisting plasterboard • Cementitious spray • Intumescent paint/spray
Construction Joint	• Fire-rated sealant
Gaps between non-service type openings	• Fire batts • Fire-resisting plasterboard

7.0 Documentation Requirements

This section covers required and recommended documentation for protection of openings for service penetrations in fire-resisting building elements. In particular, it focuses on evidence of suitability and registers of service penetrations and protection methods.

7.1 Evidence of suitability

As with almost all building works throughout Australia, it is the responsibility of the relevant Authority Having Jurisdiction (Building Surveyors, Building Certifier, Principal Certifying Authority and the like) to determine from Part A2 of the BCA—with some exceptions—the required and appropriate type of 'Evidence of Suitability' for materials, forms of construction, designs or products.

However, in some instances; such as Clause A2.3 of the BCA, the required type of 'Evidence of Suitability' is stipulated and therefore, not optional.

Evidence of suitability is required to demonstrate that the protection method used to protect openings for service penetrations in fire-resisting building elements meet the Performance Requirements. The most common way of meeting the Performance Requirement in relation to service penetrations is to comply with the Deemed-to-Satisfy Provisions of the BCA (Clause C3.15).

For more information, see Good Practice Guide *GPG-06 Fire Resistance* and Position Statement *PS-05 Product Compliance and Evidence of Suitability*.

Report from a Registered Testing Authority

Clause C3.15(a) 'Tested system' protection methods are required to comply with Australian Standards AS 4072.1 and AS 1530.4.

For compliance, evidence of suitability to verify that such tested systems are fit for purpose and meet the performance requirements must be provided in the form of a report from a Registered Testing Authority (RTA) detailing the results from a Standard Fire Test (i.e. to AS 1530.4). AS 1530.4 details two methods for the reporting of test results as follows:

- **Test report**—This is the full report of the test and includes some information that is relevant only to the manufacturer and RTA.
- **Regulatory information report (RIR)**—This is an abbreviated version of the test report and includes only that information required for regulatory compliance.

Test certificates can also be provided by the RTA. These are highly abbreviated versions of the test report and include only the most basic information (that the test was conducted and the FRL achieved). These are typically only used for marketing purposes.

A test certificate is not suitable evidence for regulatory compliance and is not suitable evidence of suitability under the BCA. However, both the test report and RIR are suitable (this is supported in the Guide to the Volume 1 of the BCA).

The test reports and regulatory information reports both include sufficient information to be used as evidence of suitability under the BCA. However, it is important to recognise that the test report is extremely comprehensive and could include intellectual property from which a competitor could replicate the manufacturer's product. FPA Australia considers that the provision of a RIR is sufficient evidence of suitability.

7.2 Penetration and Protection Method Register

In addition to the evidence of suitability, FPA Australia recommends that the designed and installed location and type of penetrations and protection methods be provided/recorded and kept as baseline data to ensure that any persons carrying out future works in the building can easily identify this information in the future.

AS 4072.1-2005, *Components for the protection of openings in fire-resisting separating elements* provides guidance in Appendix B for the registering of "as installed" penetrations and the protection methods installed. Because it is an informative appendix and isn't strictly required for compliance. However, it is included in the standard as 'good practice'.

Without registering each penetration, identifying the fire stopping system used and noting the FRL achieved, it is difficult to verify the evidence of suitability of the installation and extremely difficult to identify installed systems in future routine service inspections or refurbishment work.

FPA Australia recommends registration of each penetration and protection method used in the form of a register similar to that detailed in Appendix B of AS 4072.1 with the headings detailed below. This register must be provided to the owner for future reference.

Register headings should include:

- Reference/identification number;
- Building element type (floor, wall, ceiling or other, e.g. fire door, shaft, etc.);
- Location;
- FRL;
- Service Description;
- Accessible from floor level;
- Protection Method type;

- Manufacturer;
- Product type/code;
- Varied from Design;
- Registered Testing Authority; and
- Certification No#

8.0 Who is responsible for fire resistance

This section sets out the process for the protection of openings for service penetrations in fire-resisting building elements. This process is written for the service contractor. For further information on who is responsible for fire resistance as a whole, please see Section 8.0 of Good Practice Guide *GPG-06 Fire Resistance*.

8.1 What must a service contractor do

For ongoing occupation, fire safety measures (including fire-resisting building elements) must be routinely serviced. As such, the building owner (or occupier, in some jurisdictions) must ensure that any opening for service penetrations in fire-resisting building elements in their building are appropriately protected. This means that there must be no reduction to the fire-resisting performance of the fire-resisting building element.

Although the building owner is ultimately responsible for ensuring openings for service penetrations in fire-resisting building elements are protected, it is often left up to the trade service contractor making the penetration in the fire-resisting building elements to choose an appropriate fire stopping system, install it correctly and provide the required evidence of suitability.

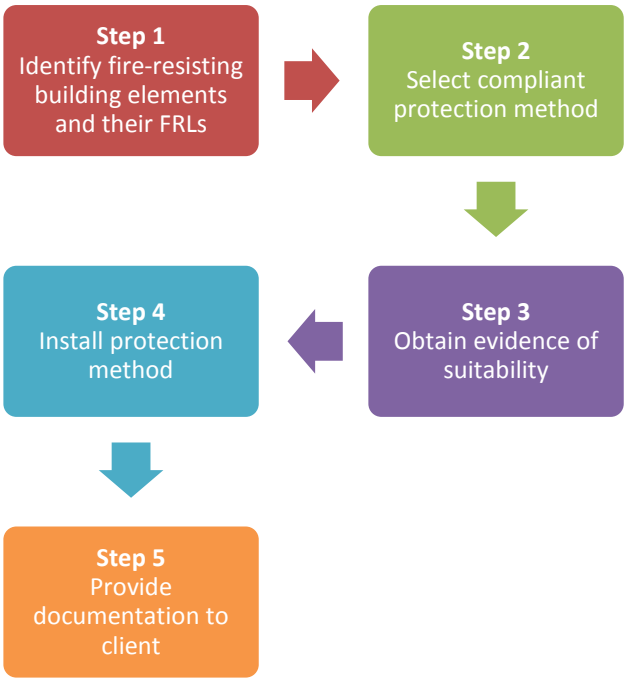


Figure 11 Process of fire stopping openings created by service penetrations between fire compartments

The following outlines the different steps, shown in Figure 11 above, a trade service contractor should take to ensure that openings for service penetrations in fire-resisting building elements are appropriately protected:

1. Identify fire-resisting building elements in the building and their FRL

   For new construction of buildings (or works within existing buildings), either a Deemed-to-Satisfy Solution or a Performance Solution could be used. Therefore, the best identification option is to obtain details of the fire-resisting building elements and their FRLs from the Authority Having Jurisdiction (Building Surveyor, Building Certifier, Principal Certifying Authority, etc.) for the project.

   For existing buildings, the location of fire-resisting building elements (and their FRLs) can be much more difficult to determine. While the requirements of the BCA have remained relatively consistent since the BCA was implemented in 1990, there may be some variances depending on the edition of the BCA that applied at the time of a building's construction. Also, the building may have been built using a Performance Solution to meet some of the Performance Requirements. Furthermore, before the BCA was legislated for adoption by the states and territories, they had their own individual building requirements detailed in regulations, ordinances and the like.

   In some instances, particularly in states where AS 1851-2012 applies, the building owner (or their agent) may have baseline data for the passive fire protection

system (information of fire-resisting building elements, fire compartmentation and FRLs). Additionally, the plans detailing this information may be available from the local council.

However, this information is often not readily available. Where this is the case, a competent person may be able to identify that a building element is fire-resisting by looking at existing fire stopping systems used in that element. If fire stopping systems are used there may be labels or identification markings on them denoting the FRL. Fire doors are another, often more easily identifiable, indication that the building element they are installed within is fire-resisting (although this is limited to identifying fire-resisting walls).

If in doubt, it is recommended to consider the requirements of the current BCA as a basis to determine what the required protection would be if it was a new building and protect any openings created by service penetrations accordingly.

2. Select compliant protection method

The specification/contract for the trades service work may require a particular type of fire stopping system or even a specific fire stopping system to be used.

Most likely, though, the specification/contract will simply require compliance with Section C of the BCA. That is, it is left to the contractor to select and install a compliant fire stopping system.

Where unsure of the Section C requirements for a particular installation, the trade services contractor should engage a specialist passive fire protection contactor to select and, in some instances, install the appropriate compliant fire stopping system.

3. Obtain evidence of suitability for the protection method

As covered in Section 7.1, depending on whether a Clause C3.15(a) tested system is used or not, there may be several forms of evidence of suitability. In most cases, however, this information can be sourced from the manufacturer/supplier of the fire stopping product.

Important	It is essential that the intended use of the fire stopping product matches the evidence of suitability. A fire stopping product may be tested in accordance with AS 4072.1 and AS 1530.4 for the substrate and service but may not be suitable for the intended orientation, opening size or for use with multiple services (or differently sized services) within the one opening.

4. Install protection method in accordance with manufacturer's instructions and evidence of suitability

   Fire stopping systems are required to be installed in accordance with manufacturer's instructions and must meet the installation details contained in the 'Evidence of Suitability' documents (i.e. report from registered testing authority). If the fire stopping system is not installed in accordance with its evidence of suitability it is not compliant.

5. Provide documentation to the client

   When the trade service work—including fire stopping systems—is completed, all relevant 'evidence of suitability' documentation for the installed fire stopping systems must be supplied to the building owner (or their agent, as appropriate). Also, as per Section 7.2, FPA Australia recommends registration of each penetration and fire stopping system.

   This documentation should ensure that the building owner has sufficient evidence that the fire stopping system is compliant for that installation.

9.0 Summary

Passive fire protection in the form of fire-resisting building elements is a necessary and required fire safety measure required for most Class 2 to 9 buildings. Fire-resisting building elements are required to maintain structural adequacy and stability and to avoid the spread of fire and therefore provide time for the evacuation of the building in the event of a fire. As such, any openings for service penetrations in fire-resisting building elements must be appropriately protected to ensure they do not reduce the fire-resisting performance of the building element.

This Good Practice Guide has provided readers with information on:

- The Building Code of Australia requirements (mainly Clause C3.15) for the protection of openings for service penetrations in fire-resisting building elements;
- The requirements for documentation in the form of evidence of suitability and service penetration and protection method registers; and
- A process for how trade service contractors can ensure that such openings are adequately protected and compliant.

The information provided by this Good Practice Guide should assist the industry to ensure that any openings for service penetrations in fire-resisting building elements are appropriately protected and compliant.

10.0 References

- National Construction Code Series 2016 – Volume One, Building Code of Australia: Class 2 to Class 9 Buildings – Published by the Australian Building Codes Board, Canberra, Australia.
- National Construction Code Series 2016 – Guide to Volume One, Building Code of Australia: Class 2 to Class 9 Buildings – Published by the Australian Building Codes Board, Canberra, Australia.
- Building Code of Australia 2008 – Volume One, Building Code of Australia: Class 2 to Class 9 Buildings – Published by the Australian Building Codes Board, Canberra, Australia.
- Building Code of Australia 2007 – Volume One, Building Code of Australia: Class 2 to Class 9 Buildings – Published by the Australian Building Codes Board, Canberra, Australia.
- Telecommunications Cabling Provider Rules 2014, Commonwealth, <https://www.comlaw.gov.au/Details/F2014L01684>
- AS/CA S009:2013, Installation requirements for customer cabling (Wiring Rules) – published by Communications Alliance Ltd, North Sydney, Australia.
- AS 1530.4-2014, *Methods for fire tests on building materials, components and structures - Fire-resistance test of elements of construction* – Published by Standards Australia International Ltd, Sydney.

11.0 Disclaimer

The opinions expressed in this correspondence reflect those of FPA Australia however are subject to change based on receipt of further information regarding the subject matter. You should interpret the technical opinion or information provided carefully and consider the context of how this opinion / information will be used in conjunction with the requirements of regulation (state and/or federal); relevant standards, codes or specifications; certification; accreditation; manufacturer's documentation and advice; and any other relevant requirements, instructions or guidelines. FPA Australia does not accept any responsibility or liability for the accuracy of the opinion / information provided, nor do they accept either directly or indirectly any liabilities, losses and damages arising from the use and application of this opinion / information.

For more information, please see www.fpaa.com.au or contact FPA Australia on: 1300 731 922.

Appendix A – BCA 2008 changes to Clause C3.15 and Specification C3.15

This appendix explains the changes to Clause C3.15 and Specification C3.15 made in the 2008 edition of the BCA. Although these changes were made almost a decade ago now, evidence from FPA Australia members indicates that there is little awareness of these changes. Therefore, FPA Australia highlights these changes to increase industry awareness.

In the 2008 edition of the BCA, the previous requirements of Clause C3.15(b) and Clause 3(a) of Specification C3.15 of the 2007 edition of the BCA were changed to align with the changes to Clause C3.15(a)(ii) in the 2008 edition of the BCA.

The relevant clauses in BCA 2007 and BCA 2008 are shown in the Table below.

Comparison between BCA 2007 and BCA 2008 Clause C3.15 and Specification C3.15

BCA 2007 Clause C3.15(b)	BCA 2008 Clause C3.15(a)(ii)
(b) It complies with (a) [similar to C3.15(a)(i) in BCA 2016] except for the insulation criteria relating to the service if— (i) the service is protected so that combustible material cannot be located within 100 mm of it; and (ii) it is not located in a required exit.	(a) Tested systems … (ii) It complies with (i) except for the insulation criteria relating to the service if— (A) the service is a pipe system comprised entirely of metal (excluding pipe seals or the like); and (B) any combustible building element is not located within 100 mm of the service for a distance of 2 m from the penetration; and (C) combustible material is not able to be located within 100 mm of the service for a distance of 2 m from the penetration; and (D) it is not located in a required exit.
BCA 2007 Specification C3.15, Clause 3(a)	**BCA 2008 Specification C3.15, Clause 3(a)**
A pipe system comprised entirely of metal (excluding pipe seals or the like) that is not normally filled with liquid must not penetrate a wall, floor or ceiling within 100 mm of any combustible material, and must be constructed of—…	A pipe system comprised entirely of metal (excluding pipe seals or the like) that is not normally filled with liquid must not be located within 100 mm, for a distance of 2 m from the penetration, of any combustible building element or a position where combustible material may be located, and must be constructed of—…
Note: Clause C3.15 and Specification C3.15 have remained unchanged since 2008 with the exception of the reference to AS 1038.15 in Clause 7 of Specification C3.15, which changed to a reference to ISO 540 in BCA 2012.	

Protection of openings for service penetrations in fire-resisting building elements

Leading and supporting a professional industry to minimise the impact of fire on life, property and the environment, for a safer community.

The List of Amendments in each edition of the BCA highlights the changes from the previous edition and provides an explanation of, and commentary on, each change. The List of Amendments in BCA 2008 explained the reasons for the changes to Clause C3.15 and Specification C3.15 as follows:

- For Clause C3.15:
    - *The existing provisions have been grouped with headings to clarify which apply to tested systems, which apply to ventilation and air-conditioning systems and which may comply with Specification C3.15. As a result, all subclauses have been re-numbered.*
    - *Existing (a) amended and re-numbered (a)(i) to be more consistent with the wording of similar provisions in the BCA and to clarify that only the service where it penetrates the building element needs to be identical and protected in accordance with the tested prototype.*
    - *Existing (b) amended and re-numbered so that the concession for the insulation criteria to a service penetrating a building element only applies to metal pipe systems. Clarification has also been added that the service must not penetrate within 100 mm for a distance of 2 m from the penetration of the building element of any combustible building element or where combustible material could be located.*
- For Specification C3.15, Clause 3:

  Amended to be consistent with the changes to C3.15(a)(i) so the service penetration must not penetrate within 100 mm, for a distance of 2 m from the penetration, of any combustible building element. Accordingly, the provision does not apply to other combustible materials including stored materials.

These changes had several effects:

1. Most significantly, Clause C3.15(a)(ii) in BCA 2008—C3.15(b) in BCA 2007—now only applies to a pipe system comprised entirely of metal (excluding pipe seals or the like). This clause no longer applies to any other service.

   As such, the insulation criteria can now only be waived for a tested system if the service is a metal pipe system and only where the pipe system is installed in accordance with conditions of Clause C3.15(a)(ii). For all other services, the fire stopping system must meet both the integrity ***and*** the insulation criteria of Clause C3.15(a) of the fire-resisting building element it penetrates.
2. The clearance and separation requirement is extended to require separation from both combustible materials ***and*** combustible building elements. Previously only separation from combustible materials was required.
3. The measurement of this clearance and separation from combustible materials (and now combustible building elements as well) is more clearly defined. From simply "within 100 mm of the service"—which could be interpreted either as within 100 mm of the service at the penetration or within 100 mm of the service for the *entire* length of the service—to "within 100 mm of the service for a distance of 2 m from the penetration" measured linearly along the pipe, not radially from the penetration.

Appendix B – Common misconceptions regarding Clause C3.15 and Specification C3.15

The requirements of the National Construction Code (NCC) are often interpreted differently. These interpretations lead to misconceptions, which could negatively result in non-compliance and a reduction in life safety. Additionally, such misconceptions can impose a significant cost burden on the consumer who may end up paying for construction over and above the minimum level set by the Code.

FPA Australia has, over time, become aware of many of these misconceptions. Therefore, with the aims of assisting in the understanding and application of the NCC, the following collection of misconceptions are provided along with FPA Australia's interpretation of the requirements.

MISCONCEPTION A:

Specification C3.15 Clause 2 (a)

Reference Text:

Specification C3.15 Penetrations of walls, floors and ceiling by services

Clause 2. Application

*(a) This Specification applies to installations permitted under the Deemed-to-Satisfy Provisions of the BCA as **alternatives** to systems that have been demonstrated by test to fulfil the requirements of C3.15(a).*

Common Misconception:

The use of the word **alternatives** in the text means that application of this section can only be complied with using an Alternative Solution (Prescriptive Solution) as defined Clause A.08.

FPA Australia considers this to be incorrect.

FPA Australia Interpretation:

The use of the word **alternatives** is in relation to the Deemed-to-Satisfy Option C3.15 (c) being an alternative option to Deemed-to-Satisfy Option C3.15 (a) Tested Systems.

The first part of this clause clearly defines that the specification is applicable to installations permitted by the Deemed-to-Satisfy Provisions (Prescriptive Solution). Therefore, it is a Deemed-to-Satisfy Provision.

The use of the word **alternatives** in this clause is not reference to a Performance Solution (Alternative Solution) as defined in Clause A0.8.

MISCONCEPTION B:

Specification C3.15 Clause 3 (a)

Reference Text:

Specification C3.15 Penetrations of walls, floors and ceiling by services

Clause 3. Metal Pipe Systems

(a) A pipe system comprised entirely of metal (excluding pipe seals or the like) that is not normally filled with liquid must not be located within 100 mm, for a distance of 2 m from the penetration, of any combustible building element or a position where combustible material may be located, and must be constructed of—

(i) copper alloy or stainless steel with a wall thickness of at least 1 mm; or

(ii) cast iron or steel (other than stainless steel) with a wall thickness of at least 2 mm.

Common Misconception:

Specification C3.15 is not applicable and cannot be used where a metal pipe is filled with liquid because Clause 3(a) only relates to metal pipes not normally filled with liquid, and then by association the remainder of specification C3.15 cannot be used.

FPA Australia considers this to be incorrect.

FPA Australia Interpretation:

Specification C3.15 Clause 3 relates to metal pipe system penetrations that are not tested systems. Clause 3(a) only applies to metal pipe systems that are not normally filled with liquid.

However, Clauses 3(b), 3(c) and 3(d) remain applicable irrespective of whether the metal pipe is filled with liquid or not (excluding flammable and combustible liquids or gases).

MISCONCEPTION C:

Specification C3.15 Clause 3 (b)

Reference Text:

Specification C3.15 Penetrations of walls, floors and ceiling by services

Clause 3. Metal Pipe Systems

(b) An opening for a pipe system comprised entirely of metal (excluding pipe seals or the like) must—

(i) be neatly formed, cut or drilled; and

(ii) be no closer than 200 mm to any other service penetration; and

Common Misconception:

The term 'any other service penetration' only applies to other metal pipe systems.

FPA Australia considers this to be incorrect.

FPA Australia Interpretation:

The term '<u>any other service penetration</u>' is literally just that, <u>any other service penetration</u>.

In lieu of any other NCC associated Clause or text which may further clarify or limit this term, the literal meaning should be applied. FPA Australia is not aware of any such associated Clause or text.

MISCONCEPTION D:

Clause C3.15 (a)(ii)(B) and (C)

Reference Text:

Clause C3.15 Openings for service installations

(a) Tested Systems

(ii) It complies with (i) except for the insulation criteria relating to the service if—

(B) any combustible building element is not located within 100mm of the service for a <u>distance of 2m from the penetration</u>; and

(C) combustible material is not able to be located within 100mm of the service for a <u>distance of 2m from the penetration</u>; and

Common Misconception:

The term '<u>distance of 2m from the penetration</u>' is measured radially from the penetration.

<u>FPA Australia considers this to be incorrect.</u>

FPA Australia Interpretation:

The term '<u>distance of 2m from the penetration</u>' means the distance measured along the penetrating pipe, using the measurement of the inside radius of any bends in the pipe.

Note: FPA Australia also considers this interpretation to apply to Specification C3.15 Clause 3(a).

MISCONCEPTION E:

Clause C3.15 (a)(ii)(B) and (C)

Reference Text:

Clause C3.15 Openings for service installations

(a) Tested Systems

(ii) It complies with (i) except for the insulation criteria relating to the service if—

(B) any combustible building element is not located within 100mm of the service for a <u>distance of 2m from the penetration</u>; and

(C) combustible material is not able to be located within 100mm of the service for a <u>distance of 2m from the penetration</u>; and

Common Misconception:

For vertical pipes penetrating a floor, or similar element, the term '**distance of 2m from the penetration**' only applies to the service above the penetration, not to the service below the penetration. It is argued that because heat rises the required clearance from combustibles only applies above the penetration.

FPA Australia considers this to be incorrect.

FPA Australia Interpretation:

The term '**distance of 2m from the penetration**' applies to both sides of the penetration, irrespective of the orientation of the service or orientation of the element being penetrated by the service.

Heat conducts along a vertical metal pipe in both directions (up and down). While the rate of conduction occurs faster upwards, heat still does conduct downwards. Therefore, the '**distance of 2m from the penetration**' applies to a vertical service both above and below the penetration.

Note: FPA Australia also considers this interpretation to apply to Specification C3.15 Clause 3(a).