BCA Technical Guidance Note 26	Issue 0 Apr 2017

Service Penetrations through External Wall Constructions of Residential Buildings

Purpose

BCA technical guidance notes are for the benefit of its members and the construction industry, to provide information, promote good practice and encourage consistency of interpretation for the benefit of our clients. They are advisory in nature, and in all cases the responsibility for determining compliance with the Building Regulations remains with the building control body concerned.

This guidance note is based upon information available at the time of issue and may be subject to change. The Approved Documents should be consulted for full details in any particular case.

Introduction

No specific guidance is contained in Approved Document B regarding service penetrations through external walls. These can take several forms including waste pipes, ventilation fan outlets and boiler flues. External wall constructions also vary considerably; internal leaves are usually formed from masonry, timber framed or lightweight metal framing systems, suitably lined to offer a require amount of fire resistance whilst the variety of external finishes is much larger and include many bespoke cladding systems, as well as traditional brickwork.

This guidance note looks principally at the measures needed to address unseen fire spread from a compartment of the building into the wall structure.

Key Issues

Regulation B3(4) states that '*the building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited*'.

Concealed spaces or cavities in the construction of a building provide a ready route for smoke and flame spread. This is particularly so in the case of voids in, above and below the construction of a building, e.g. walls, floors, ceilings and roof spaces. As any spread of fire or smoke is concealed, it presents a greater danger than would a more obvious weakness in the fabric of the building. Provisions can be made to restrict this by interrupting cavities which could form a pathway around a barrier to fire, subdividing extensive cavities, and closing the edges of openings.

The unseen spread of fire or smoke via voids and cavities can be a threat to occupants if it bypasses compartment boundaries or elements protecting the means of escape. It can also be a threat to fire-fighters in large spaces if it leads to the obstruction of their line of retreat.

A cavity in an external wall can behave as a chimney, accelerating fire spread up a façade. This can be a threat to occupants or fire-fighters if the cavity is open to the exterior. Sealed cavities are generally not a problem.

Current code guidance is as below:

<u>Approved Document B and BS9991</u>

Guidance is contained in Section 9 of AD B2. Summarised, it states that:

All openings in an external wall should ensure that the wall cavity is suitably closed around its edge.
An opening of maximum size of 80mm x 80mm diameter (suitably fire stopped around the cable) through the inner leaf is allowable in the case of an incoming electric service.
For pipe penetrations, the opening size is restricted to 40mm diameter (increased to 110mm diameter for a robust, non-combustible pipe)
Ventilation ducts should contain smoke operated dampers irrespective of their size.

Similar guidance is contained in BS9991:2015.

AD B2 also gives guidance for the following situations:

1. Some pipes passing through the walls of a service riser (a protected shaft) can be of up to 110mm in diameter. The least robust material allowable in this case is uPVC and the pipe should be manufactured to BS 4514:2001or BS5255:1989. A pipe wall thickness of around 3.5mm would be expected for these.
2. Guidance on the construction of the above protected shaft (paragraph 8.37 onwards and Diagram 31) states that a protected shaft need not include the part formed by the external wall. As such, an external wall doesn't come under the classification of a 'compartment wall'.

The requirements are, therefore, restricted solely to ensuring that 'unseen fire and smoke spread within concealed spaces in the building's fabric is inhibited'.

Guidance

The degree to which fire and smoke can move around an external cavity wall, and the risk it poses, are obviously dependent upon many factors.

It is important to note that a distinction is made between pipe penetrations (which would be expected to be closed on the internal side and are generally of a uPVC material or something more robust) and ventilation ducts (which would be expected to be open on both sides and are often of a light-weight thermoplastic material with little fire resistance).

Assuming that the internal wall linings provide the appropriate duration of fire resistance (generally 30 minutes for three storey houses and two storey flats, rising to 60 minutes for taller buildings – Table A2 of AD B2) and that fire stopping around the pipe is undertaken to a good standard (and to the same standard of fire resistance as the wall) it is considered appropriate to apply a performance criterion (in line with Table A1 of AD B2) for the service penetration of 30 minutes for integrity and 15 minutes insulation. Note, however, that this assumes that the wall cavity is closed elsewhere in line with Section 9 of AD B2.

It is clear from other research (see references section) that the likelihood of a fire spreading within a wall cavity is affected by:

- Size of the opening
- Air flow within the cavity (fits with the 'chimney' wording before)
- Amount of combustibles in the cavity
- Thickness / type of duct or pipe wall

Whilst it is difficult to obtain any specific test data, and so a conservative approach should be followed, it is possible to offer the following generic guidance for the most common types of penetrations using thermoplastic pipe / duct materials:

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Method of Construction

	Masonry Walls formed from of Two Leaves of 75mm		Timber Frame (including SIPS) with Masonry Outer Leaf		Lightweight Steel Frame with Masonry Outer Leaf		Lightweight Steel Frame with any other Cladding Finish	
	Non-fire rated ventilation duct	uPVC duct to BS 4514:2001or BS5255:1989	Non-fire rated ventilation duct	uPVC duct to BS 4514:2001or BS5255:1989	Non-fire rated ventilation duct	uPVC duct to BS 4514:2001or BS5255:1989	Non-fire rated ventilation duct	uPVC duct to BS 4514:2001or BS5255:1989
Two leaves masonry, **ANY** insulation in cavity	○	○	-	-	-	-	-	-
Inner lining of at least 1 x 12.5mm Plasterboard. **NO** combustible insulation in cavity	-	-	●	○*	○	○	●	●
Inner lining of at least 1 x 12.5mm Plasterboard. Combustible insulation in cavity	-	-	●	●	●	●	●	●

-	Not Applicable	●	Indicates protection needed via protective sleeves or fire seal where the penetration exceeds 40mm diameter
○*	This scenario is limited to a maximum 110mm diameter unprotected opening	○	Indicates no restriction on duct size and no requirement for cavity barrier around the duct

Boiler Flues

For steel boiler flue penetrations, due to the high melting point of the material, no further measures are required. However, it is imperative that fire stopping around the flue is of good quality. If the flue is made of any other material, the guidance above for uPVC pipes should be followed.

Further guidance on the installation of boiler flues through timber framed walls is given in *BCA Guidance Note 10 'Installation of boiler flues and ventilation perforations in external timber framed walls and other such structures'*.

References

- Approved Document B2
- BR135 - Fire performance of external thermal insulation for walls of multi-storey buildings
- Data from various Bs8414:1 and BS8414:2 Full Scale façade tests
- http://www.fireofficers.org.uk/downloads/information/resprinklers_Nov_2009.pdf)
- Timber frame walls and floors: Fire resistance of service penetrations. TRADA Technology Report 1/2001
- BCA GN 10 'Installation of boiler flues and ventilation perforations in external timber framed walls and other such structures'

References