2023

Fire detailing

for residential masonry structures below 11 metres in England

Figure 1:
The Chocolate Works housing development in York. Three storey houses.

Figure 2: Midland Heart Project 80. A 12 homes demonstrator built to the Future Homes Standard

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CONTENTS

1.0 Introduction

The first records of regulations for building construction date back to the 12th century when the elders of the City of London set down the measures that they hoped would bring a halt to a series of catastrophic fires in the city. Five centuries later the first legislation, in the form of the 1667 London Building Acts, appeared. Commonly regarded as the forerunner of modern Building Regulations, these were also implemented in the aftermath of the great fire in 1666. Both of these measures insisted that new buildings be constructed in masonry to resist the breakout of fire and prevent its rapid propagation.

In November 2018, once again, changes to the Building Regulations were made as a result of a catastrophic fire. The fire at Grenfell Tower brought into question the regulatory control over the construction of external walls. This led to the Building Regulations being updated to stop the use of combustible material in the external walls of residential buildings over 11m in height. The guidance given in Approved Document B: volume 2 (ADBv2) was also updated to reflect this change. A further change was made to ADBv1 and 2[1] in 2020 to reduce the height limit for the requirement of sprinklers to be installed in new homes, from 30m to 11m.[2] However, the control of material in the external wall of a new home less than 11m high and constructed of two leaves of masonry has not changed. Due to the inherent fire resistance of clay bricks and concrete blocks, it is still allowable to use combustible materials within masonry cavity walls.[3]

This simple guide to the current requirements of the Building Regulations is also a reminder of what has been recognised for centuries, namely that masonry buildings are inherently robust for energy efficiency, fire resistance and sound insulation.

Masonry buildings are by their nature and materials resistant to fire. The designer or specifier should remember that this fundamental quality leads to simpler detailing and construction and this simplicity in turn benefits the thermal and acoustic detailing as well as the construction. Masonry is an excellent material for a ‘fabric first’ approach and its longevity and local production brings embodied carbon benefits.

When compared with frame constructions, masonry buildings generally have fewer layers and fewer materials performing separate functions within the wall build-up. However, all buildings contain cavities and some concealed spaces where fire can spread undetected. To minimize the dangers of undetected fires the Building Regulations generally require that cavities are provided with barriers to reduce the extent of void spaces and to contain any spread of fire and smoke. The requirements for masonry buildings are far less onerous than for framed constructions. This guide explains the simple measures that are required to comply with the Building Regulations for detailing cavity barriers and in particular Section 5 Internal fire spread – dwellinghouses & Section 8: Cavities - flats (concealed spaces) of Approved Document B Volume 1.[4]

Figure 3:
The Chocolate Works housing development in York. Three storey houses.

1 ADBv1 and 2 Appendix B: Table B4 and ADBv1 (7.4)
2 ADBv1 list of amendments May 2020: p.59: revised paragraph 7
3 ADBV1 5.19 Diagram 5.3 notes: ‘materials used to close the cavity in this arrangement do not need to achieve a specific performance in relation to fire resistance’
4 ADBv1 Section 8, page 65

2.0 Changes to the Building Regulations

Due to the inherent fire resistance of clay bricks and concrete blocks, it is still allowable to use combustible materials within masonry cavity walls.

Dwelling: A unit where one or more people live (whether or not as a sole or main residence) in either of the following situations:

- **A single person or people living together as a family.**
- **A maximum of six people living together as a single household, including where care is provided for residents.**

Dwellings include dwellinghouses and flats.

Dwellinghouse: Does not include a flat or a building containing a flat.

Flat: A flat is a separate and self-contained premises constructed or adapted for use for residential purposes and forming part of a building from some other part of which it is divided horizontally.

Changes to Approved Document B volume 1

The latest version of Approved Document B (Fire Safety) consists of two volumes, Volume 1 covers Dwellings and Volume 2 covers all other building types. As this guide is providing advice on the delivery of new masonry homes it will focus on the content of Approved Document Volume B1 (ADBv1). The guide is also intended for use on homes with a highest floor not over 11m above ground level. The main changes to the regulations have concentrated on higher new homes (over 11m) and as such the changes to allowable constructions are small. However, it is helpful to explain some of the changes to give clarity to what is relevant to the homes covered in the guide.

Regulation 7:

Regulation 7(2) has been added to ADBv1 and it is the regulation that limits the use of combustible materials within new homes. It states that materials used in (and attached to) the external walls of new homes over 11m high should be non-combustible. As explained above, this is not relevant to the homes covered by this guide. A separate guide will be produced to cover new homes over 11m high.

Sprinklers:

The current regulations have tightened the requirements for sprinklers in new homes and the threshold for this is a new dwelling with a habitable floor more than 11m above ground level.

Responsibility

The introduction of the Fire Safety Act (2021) and the Building Safety Act (2022) has added clarity to where responsibility lies for fire safety within all buildings. The Building Safety Act also contains provisions intended to secure the safety of people in or about buildings and to improve the standard of buildings. Designers and builders are expected to be responsible for a 'golden thread' of responsibility for fire safety throughout the design and construction phases of projects. Decisions on key fire safety measures should be recorded and a robust change control procedure must be in place to make sure any amendments to the construction do not compromise fire safety.

Key

Cavity Barrier

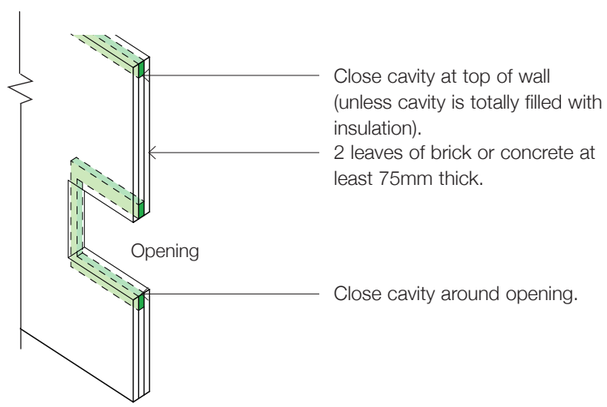


Figure 4:
Cavity walls excluded from provisions for cavity barriers.
Reproduced ADBv1 Diagram 5.3.

3.0 Building design: understanding the requirements of the regulations

Generally, in masonry buildings the materials used for external wall constructions have good fire resistance or are not combustible at all. Secondary layers of fire protection, which inevitably introduce voids and air gaps are not usually required.

Provision of cavity barriers

Cavity barriers should be provided in accordance with ADBv1 paragraph 5.18, which states the following: 'Cavity barriers should be provided at all of the following locations.

a) 'At the edges of cavities, including around openings (such as windows, doors and exit/entry points for services).
b) 'At the junction between an external cavity wall and every compartment floor and compartment wall.
c) 'At the junction between an internal cavity wall and every compartment floor, compartment wall, or other wall or door assembly which forms a fire-resisting barrier.

This does not apply where a wall meets the conditions of Diagram 5.3,'[5] (reproduced opposite on page 6 figure 4).

A cavity barrier is a construction within a cavity, other than a smoke curtain, that seals cavities around openings and at the top of a wall limiting the amount of oxygen that can circulate in the cavity preventing a chimney effect.

Walls excluded from provisions for cavity barriers

ADBv1 Diagram 5.3 clarifies that 'materials used to close the cavity in this arrangement do not need to achieve a specific performance in relation to fire resistance.' Also 'materials achieving class B-s3, d2 or worse may be placed within the cavity.'[1] This indicates that combustible materials can be included within a masonry wall cavity, providing all the provisions shown in Diagram 5.3 have been followed.

External walls formed from two leaves of brick or concrete at least 75mm wide, as illustrated in figure 4 opposite, are excluded from the requirements of paragraph 5.18. However, the top of the wall and openings around windows should still be closed, but there are no specific fire performance requirements for the materials used to close these cavities. The intention is to limit circulation of air and smoke in the cavity.

Conversely, in a framed wall there are limitations on the construction elements that can act as a cavity barrier. A window or door frame can close the cavity providing the frame is 38 mm thick for timber or 0.5 mm thick for metal. Historically openings would not have needed additional closers for timber windows. However, with the widespread use of UPVC windows, the frame of the window itself is usually not adequate to close the cavity. Many standard details for framed or partition walls show an insulated cavity closer for thermal or construction efficiency but fail to point out that this closer must also be fire resisting.

5 ADBv1 Section 5: Internal fire spread - dwellinghouses, page 54
6 ADBv1 Section 5: Internal fire spread, Diagram 5.3, page 54

4.0 Cavity barriers and fire-stopping

Differences between cavity barriers and fire stopping

Fire spread in the roof void is a particular problem in flats. The compartment walls around each dwelling should all extend to the underside of the roof covering.

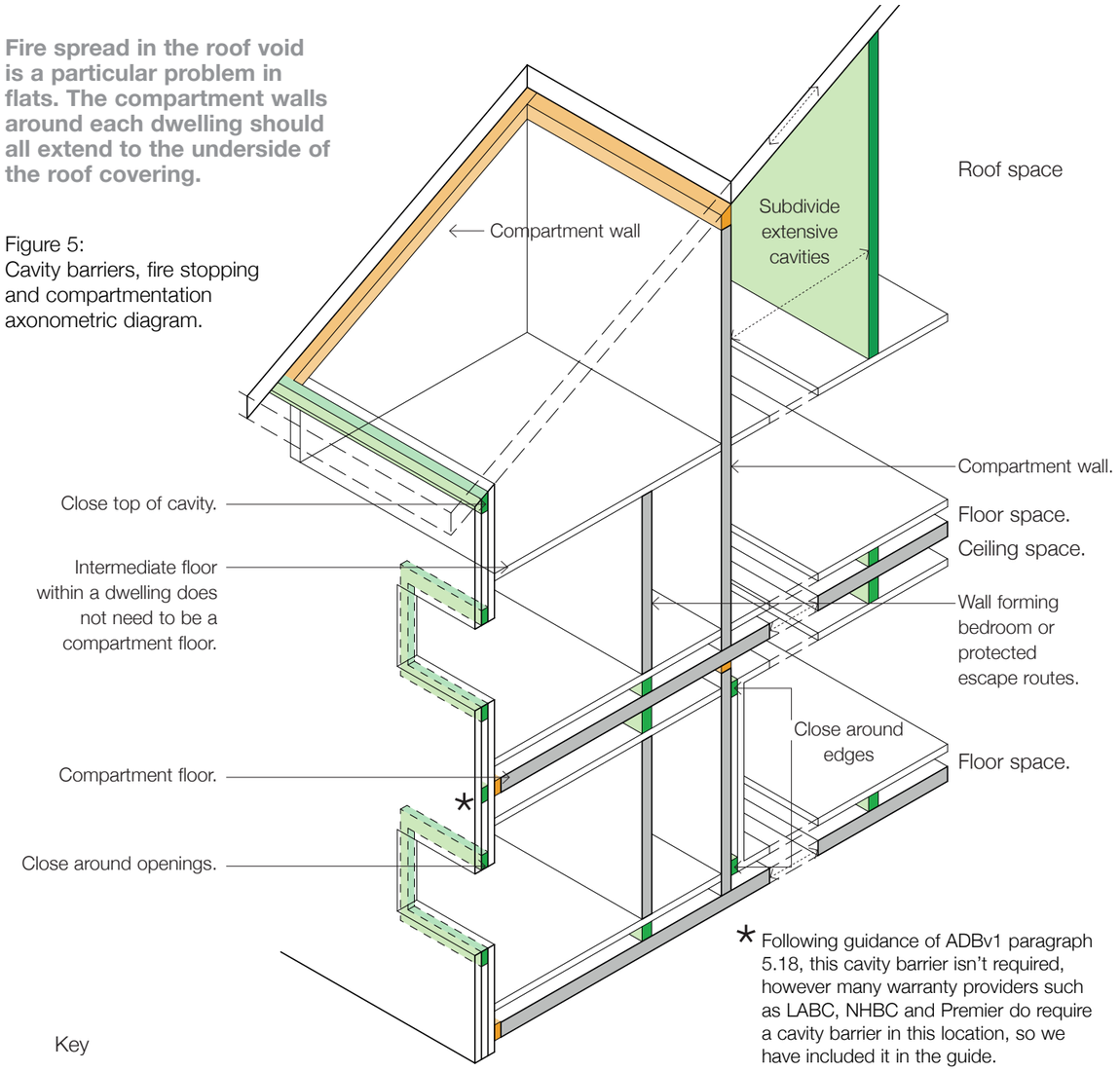


Figure 5:
Cavity barriers, fire stopping and compartmentation axonometric diagram.

Key

Cavity Barrier:
Cavity barriers sub-divide concealed voids in the construction to prevent the spread of fire and smoke. No specific fire performance (only for masonry walls).

Fire-Stopping (same fire resistance as compartment):
Fire-stopping seals the junction of compartment walls and floors to maintain the integrity of the construction. Fire-stopping also seals around penetrations and services.

Compartmentation:
In flats, every floor and every wall separating a flat from any other part of the building should be a compartment floor or a compartment wall. Sub-divide spaces into compartments to restrict the spread of fire within a building.

5.0 Construction details

This section describes where and how to install cavity barriers and fire stops in common masonry constructions only. The design of fire resisting constructions and other passive elements is not within our scope but a comprehensive guide published by the ASFP (Ensuring Best Practice for Passive Fire Protection in Buildings 2nd Edition) offers a complete introduction to all aspects of building design procurement and management.

Many of the measures illustrated in this section are simple to install and straightforward to specify with support from suppliers and manufacturers. Masonry construction does not introduce multiple layers and voids that occur in framing systems, but the cavity barriers, particularly at the top of the cavity wall, are essential to the effectiveness of the passive fire protection and must not be overlooked.

General notes for construction details:

Cavity barriers:
The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Ensure product data sheets and details are reviewed to check compatibility with construction junctions.

Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.

If fixing spikes are specified, they should be installed at the required centres in accordance with manufacturers guidelines.

For compression fit cavity barriers, specify the correct size according to the specific cavity width. This needs to allow for building tolerances and that the cavity might vary by +/-10mm.

Wall ties:
Brick wall ties: 225mm maximum distance from opening.
No greater than 450mm vertical spacing.
No greater than 900mm horizontal spacing.
450mm horizontal centres for first row of wall ties above and below opening.

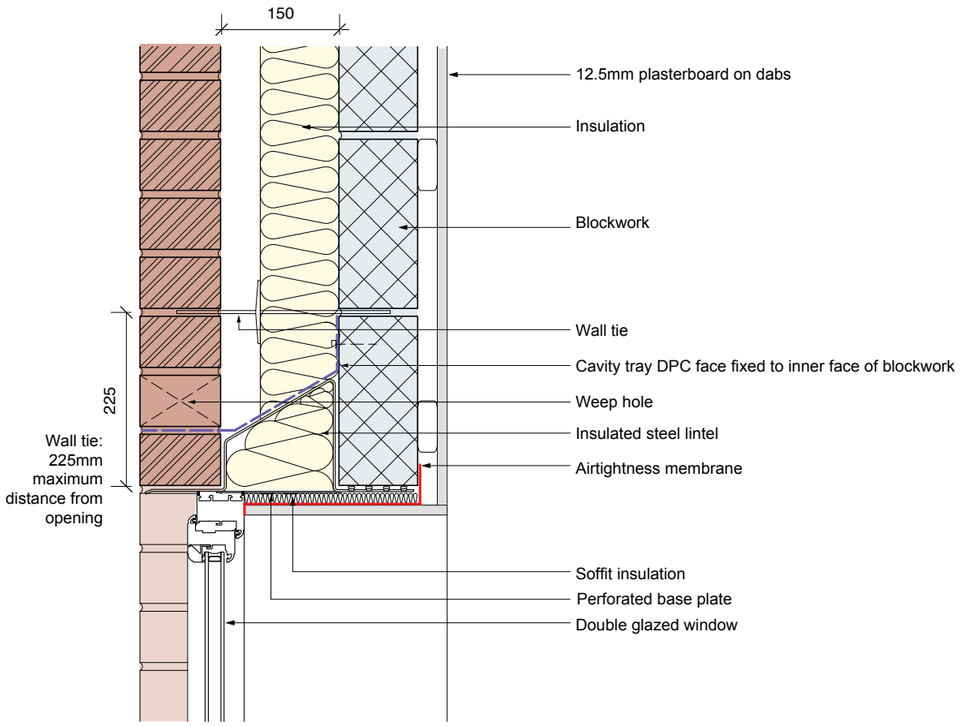
Only use insulation retaining clips that are compatible with the specific wall tie.

Specify the correct wall tie length according to the cavity width.

Window placement in opening:
Minimum 30mm window/door frame overlap.

Fixings:
Provide head restraint fixings from the inner-leaf blockwork to underside of floor slab in accordance with manufacturers guidelines.

E1: Insulated steel lintel



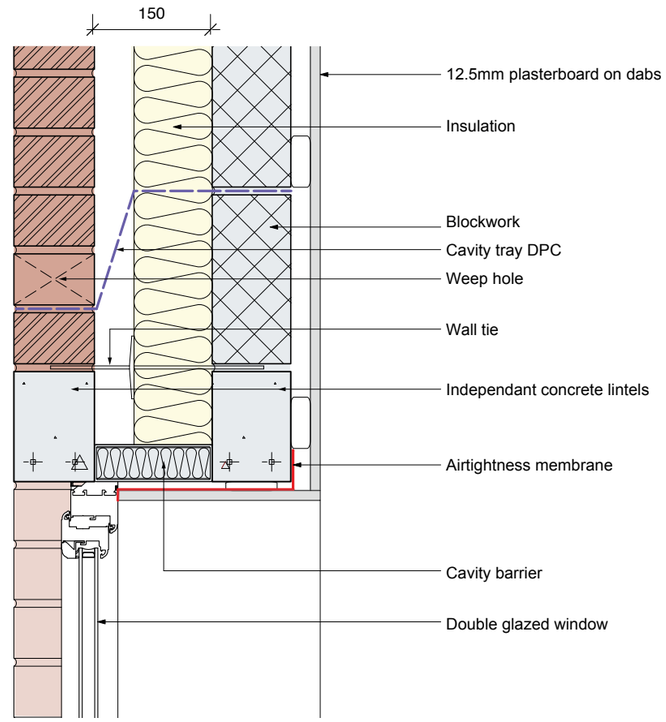
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When the window is in line with the outer leaf the cavity can also be closed by the plasterboard lining (12mm min). However, placing the window in this position is not good practice for thermal design.
- Apply a cavity tray when specifying a galvanised steel lintel.
- Ensure insulation is fitted above the insulated steel lintel.
- An insulated cavity closer may be required for thermal reasons (to reduce heat losses from thermal bridging).
- Secure the cavity tray DPC in place with a compatible double sided adhesive tape to face fix the DPC rather than fixing in the blockwork mortar joint. Avoid fixing the wall tie and cavity tray in the same mortar joint as this could form a slip plane rendering the tie ineffective.

E2 01: Independent concrete lintel



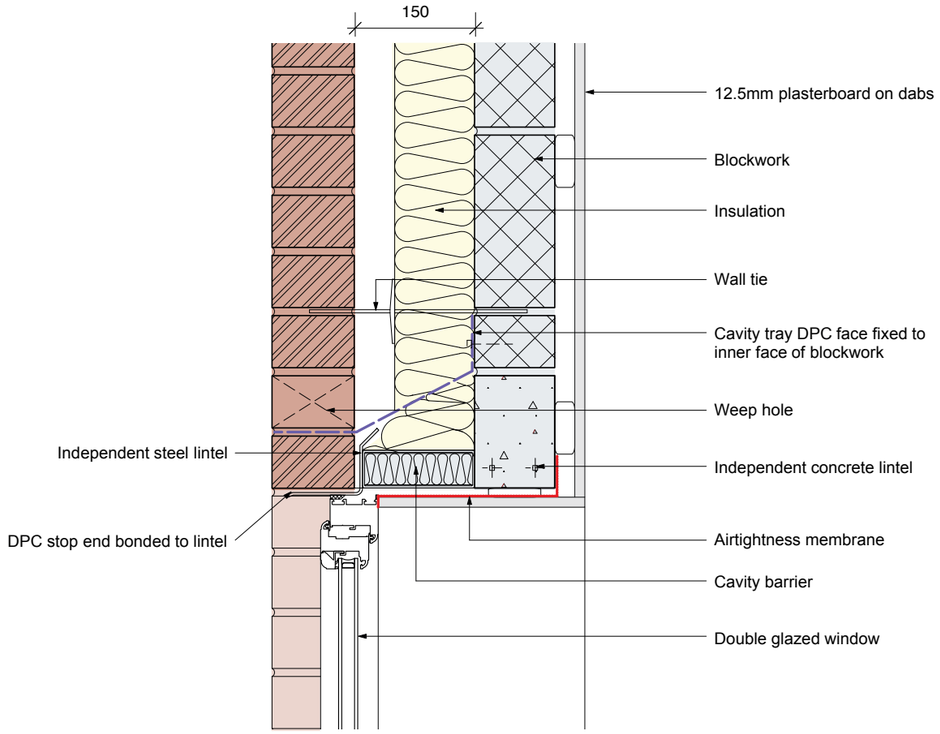
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When the window is in line with the outer leaf the cavity can also be closed by the plasterboard lining (12mm min). However, placing the window in this position is not good practice for thermal design.
- First brick tie to be constructed within 225mm of the window head.
- Depending on location: caution if using detail in a location with areas exposed to severe/very severe driving rain. Water ingress may track along tie and drip onto window head. Ensure cavity barrier is specified carefully for application.
- The cavity tray is carried straight across the insulation maintaining a continuous insulation joint. This avoids cutting the insulation at 45 degrees around the cavity tray angle. Easier to build and sequence.
- An insulated cavity closer may be required for thermal reasons (to reduce heat losses from thermal bridging)

E2 02: External steel lintel



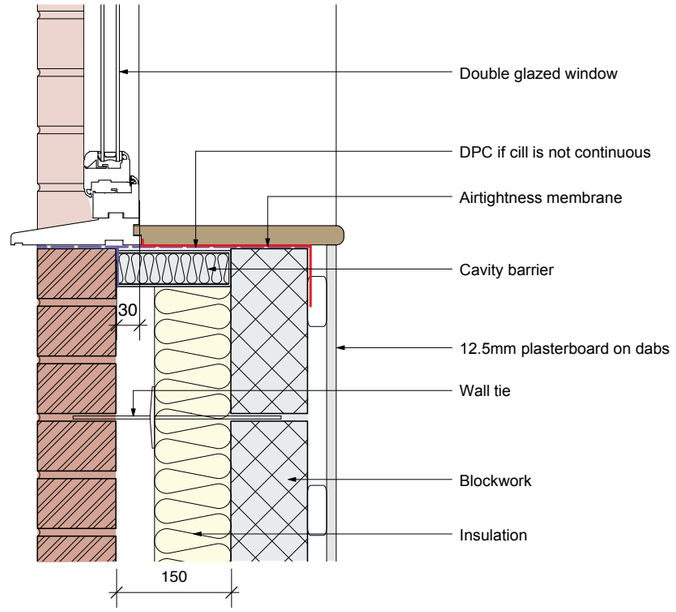
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When the window is in line with the outer leaf the cavity can also be closed by the plasterboard lining (12mm min). However, placing the window in this position is not good practice for thermal design.
- Locate the first row of wall ties at 450mm horizontal centres above and below the opening.
- Ensure insulation is fitted above and below the cavity tray.
- An insulated cavity closer may be required for thermal reasons (to reduce heat losses from thermal bridging).
- Secure the cavity tray DPC in place with a compatible double sided adhesive tape to face fix the DPC rather than fixing in the blockwork mortar joint. Avoid fixing the wall tie and cavity tray in the same mortar joint as this could form a slip plane rendering the wall tie ineffective.
- DPC stop ends bonded to the end of the single leaf lintel to prevent any rainwater penetrating the 2 courses of brickwork from running off the lintel into the cavity below.

E3: Cill



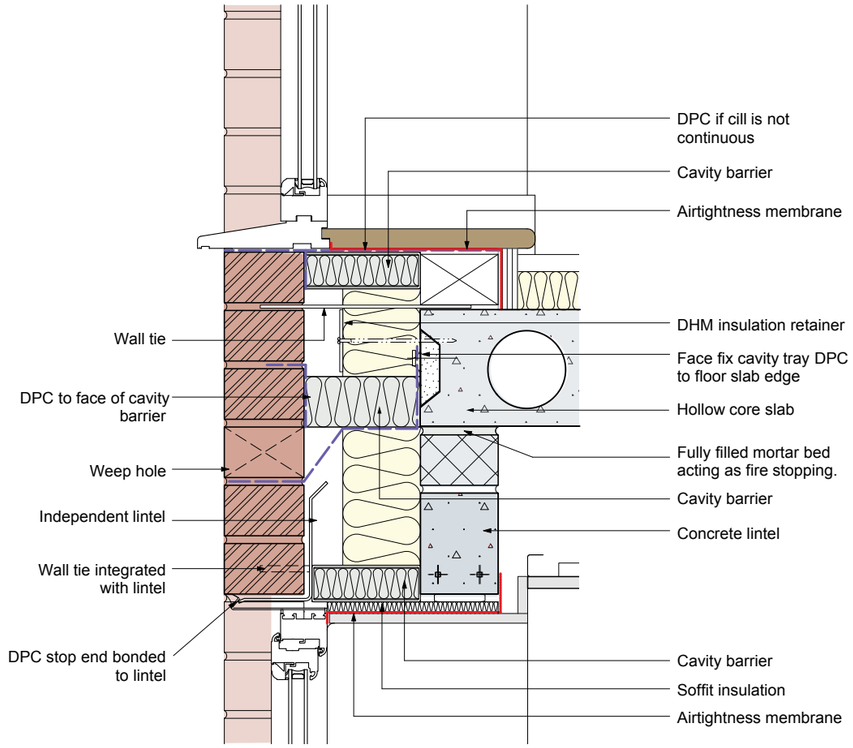
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When the window is in line with the outer leaf the cavity can also be closed by the plasterboard lining (12mm min). However, placing the window in this position is not good practice for thermal design.
- Provide a DPC if the cill is not continuous.
- Dependant upon type of cavity barrier used, a DPC should be provided to the inside face of the brickwork to prevent the cavity barrier absorbing moisture.

E3: Cill full height window - Option 1



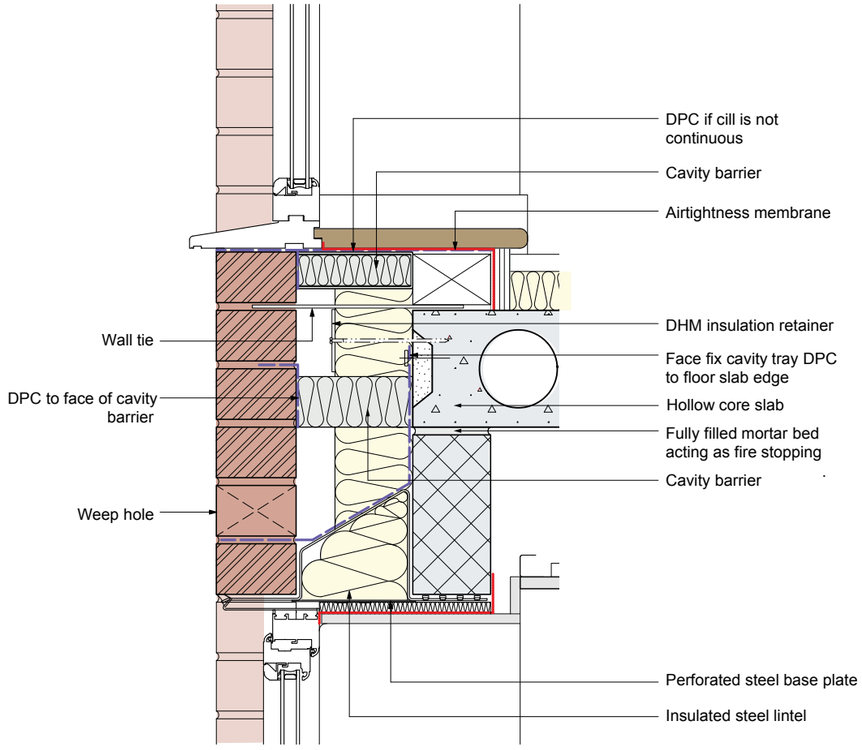
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- The brick spandrel panel between full height windows can become congested with multiple components performing different roles. Prevent rendering products from being ineffective by overlapping. Instead, secure the cavity tray DPC in place with a compatible double sided adhesive tape to face fix the DPC, rather than fixing in the same inner-leaf mortar joint as this could form a slip plane.
- Option 1 positions the cavity tray directly under the cavity barrier for ease of installation and sequencing. This ensures that the insulation doesn't have to be cut at an angle around the tray. This is easier to build, sequence and maintains a continuous insulation line.
- Clashes between wall tie insulation retainers and cavity barrier can be avoided by the use of a DHM insulation retainer (or similar) fixed directly back to the floor slab.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.
- DPC stop ends bonded to the end of the single leaf lintel to prevent any rainwater penetrating the 2 courses of brickwork from running off the lintel into the cavity below.

E3: Cill full height window - Option 2



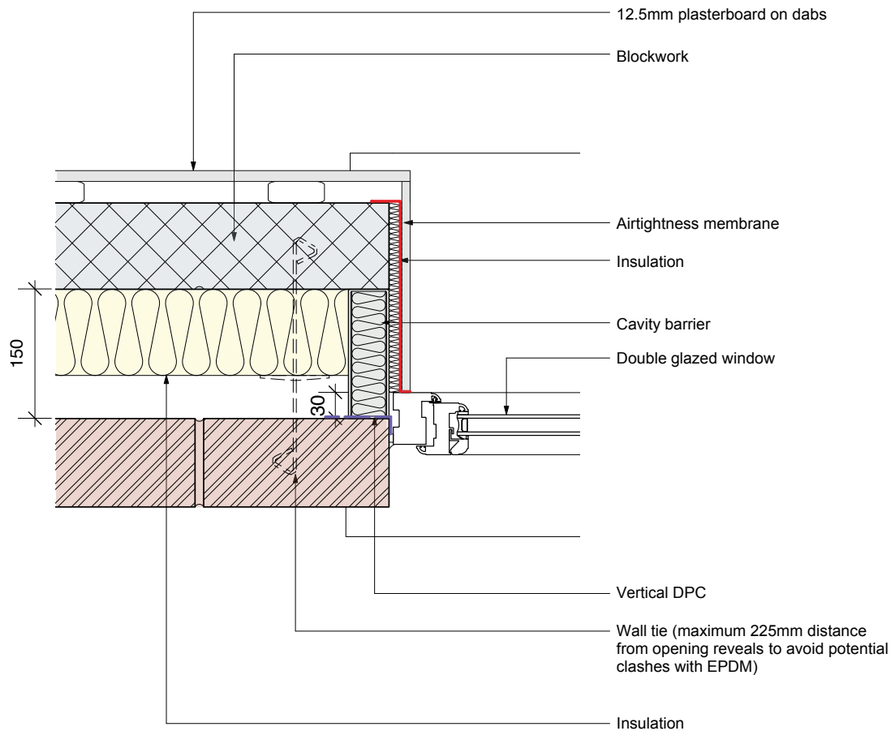
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- The brick spandrel panel between full height windows can become congested with multiple components performing different roles. Prevent rendering products from being ineffective by overlapping. Instead, secure the cavity tray DPC in place with a compatible double sided adhesive tape to face fix the DPC, rather than fixing in the same inner-leaf mortar joint as this could form a slip plane.
- Option 2 requires the insulation to be cut 45° around the steel lintel profile. This is common practice but it is less easy to build and ensure that the insulation line is continuous.
- Ensure insulation is fitted above the insulated steel lintel.
- Clashes between wall tie insulation retainers and cavity barrier can be avoided by the use of a DHM insulation retainer (or similar) fixed directly back to the floor slab.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.
- DPC stop ends bonded to the end of the single leaf lintel to prevent any rainwater penetrating the 2 courses of brickwork from running off the lintel into the cavity below.

E4: Jamb



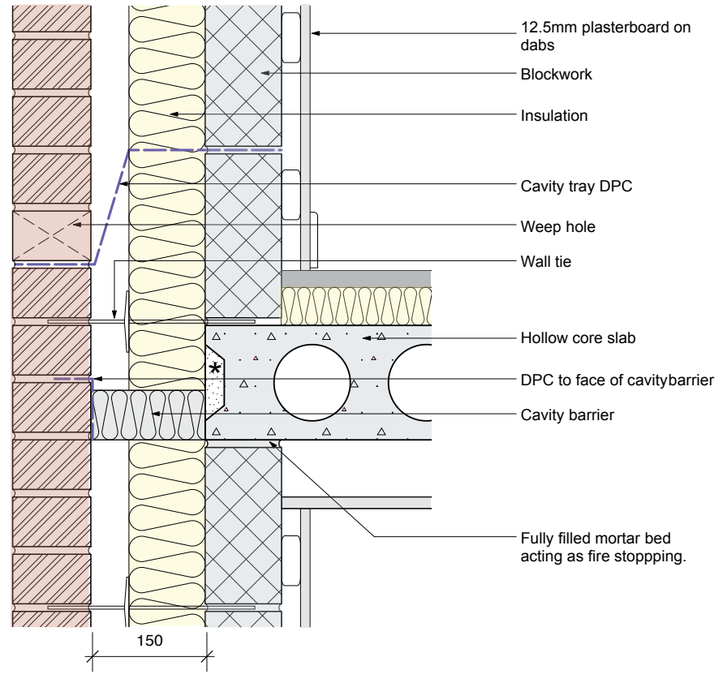
Requirements

- In a masonry wall the opening around a window or door head needs to be closed.
- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When the window is in line with the outer leaf, the cavity can also be closed by the plasterboard lining (12mm min). However, placing the window in this position is not good practice for thermal design.
- Vertical DPC between end the bricks and cavity barrier/window junction.
- Brick wall ties: No greater than 900mm horizontal spacing.

E7: Concrete intermediate floor



* For the cavity barrier to be installed, the hollowcore slab rebate needs to be filled-in post slab installation to ensure that a cavity barrier can continuously fix to the edge of the slab. Also, ensure that any holes in the hollowcore slab, exposed in the cavity, are filled-in post slab installation to maintain an enclosed cavity to stop the spread of fire and smoke.

Requirements

- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.
- Detail at Party floor/separating floor junctions.

Notes :

- Fire Stop: joints between fire-separating elements should be fire-stopped.
- Carefully specify fire-stopping and sealing system that is appropriate to the particular material. Refer to ADBv1 Section 9.
- Ensure the inner-leaf top mortar joint under the floor slab is a fully filled mortar joint to act as a fire stop. Ensure a closed cavity.
- Maintain clear separation of components to prevent congestion within the cavity and mortar joints.
- The cavity tray is carried straight across the insulation maintaining a continuous insulation joint. This avoids cutting the insulation at an angle around the cavity tray and makes it easier to build and sequence.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.

E7: Concrete intermediate floor (section 2)

* For the cavity barrier to be installed, the hollowcore slab rebate needs to be filled-in post slab installation to ensure that a cavity barrier can continuously fix to the edge of the slab. Also, ensure that any holes in the hollowcore slab, exposed in the cavity, are filled-in post slab installation to maintain an enclosed cavity to stop the spread of fire and smoke.

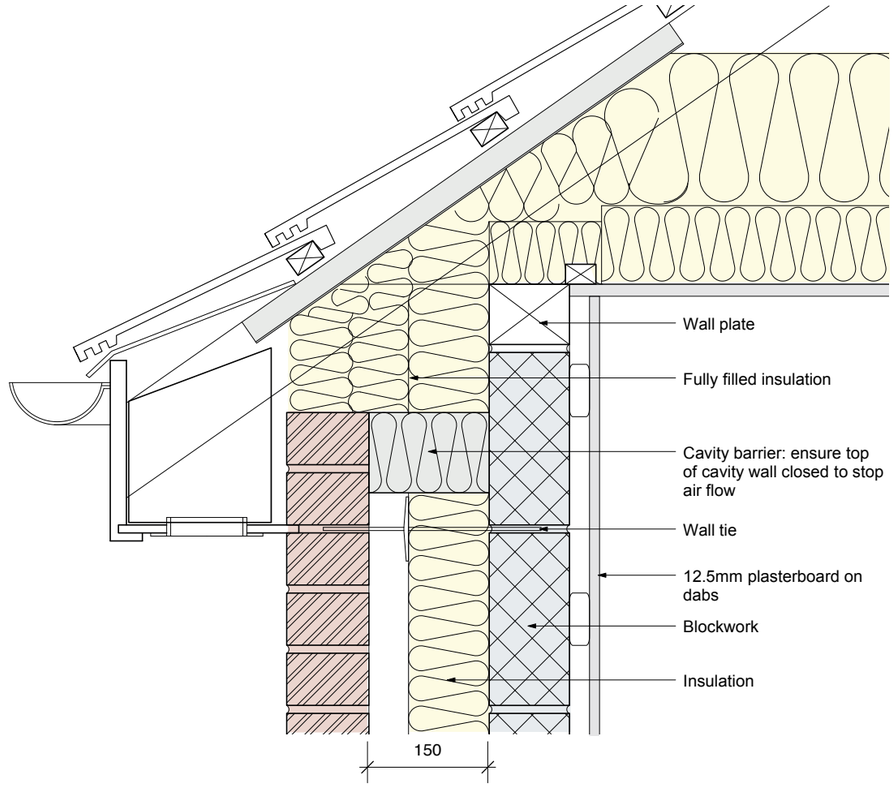
Requirements

- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.
- Detail at Party floor/separating floor junctions.

Notes :

- Fire Stop: joints between fire-separating elements should be fire-stopped.
- Carefully specify fire-stopping and sealing system that is appropriate to the particular material. Refer to ADBv1 Section 9.
- Ensure the inner-leaf top mortar joint under the floor slab is a fully filled mortar joint to act as a fire stop. Ensure a closed cavity.
- Maintain clear separation of components to prevent congestion within the cavity and mortar joints.
- The cavity tray is carried straight across the insulation maintaining a continuous insulation joint. This avoids cutting the insulation at an angle around the cavity tray and makes it easier to build and sequence.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.

E10: Pitched roof eaves insulation at ceiling level



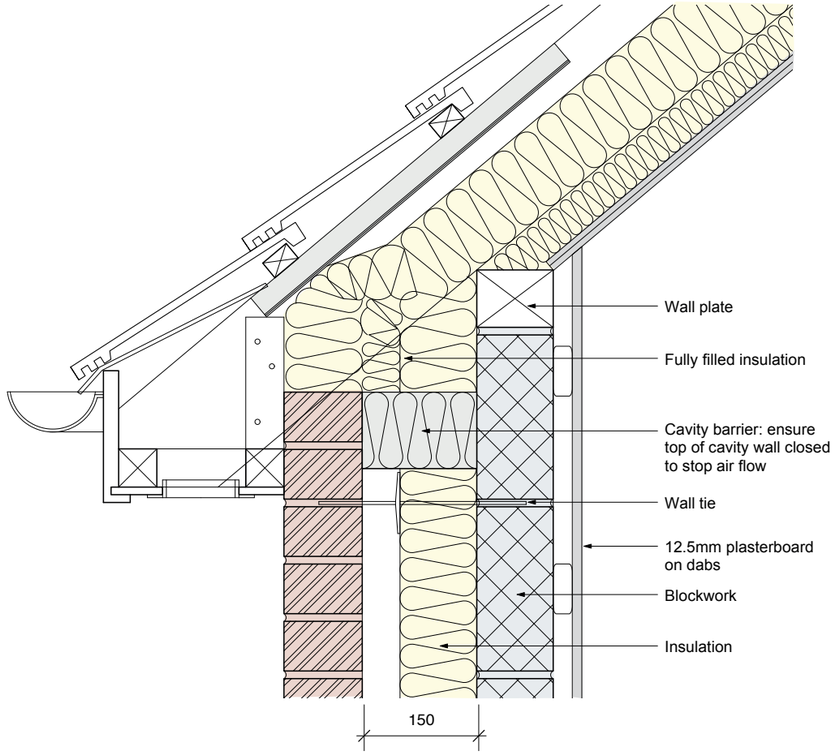
Requirements

- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- Close cavity at top of the wall to the underside of roof covering.
- Cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a cavity barrier joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped. Refer to ADBV1 Section 5.
- Ensure product data sheets and details are reviewed to check compatibility with construction junctions.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.

E11: Pitched roof eaves insulation between rafters



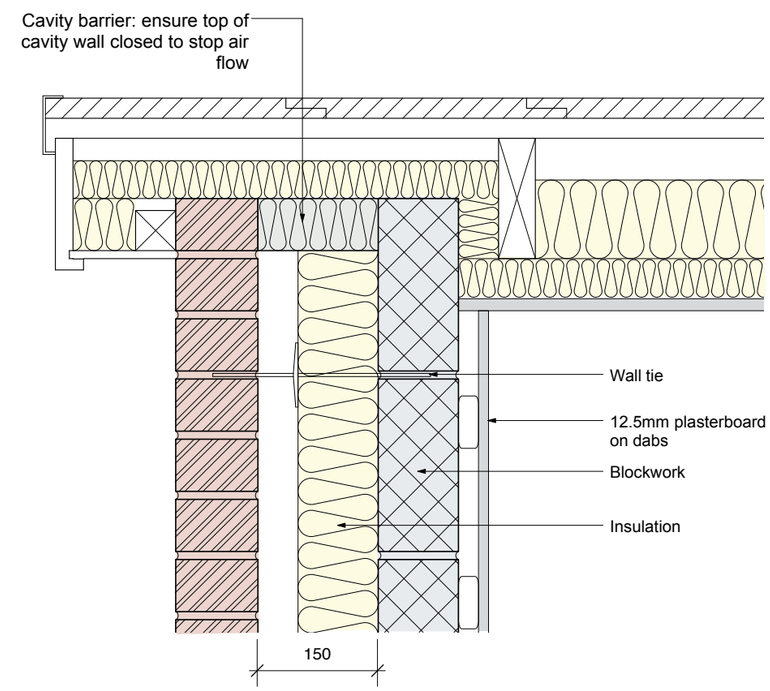
Requirements

- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- Close cavity at top of the wall to the underside of roof covering.
- Cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a cavity barrier joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped. Refer to ADBV1 Section 5.
- Ensure product data sheets and details are reviewed to check compatibility with construction junctions.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.

E13: Pitched roof gable



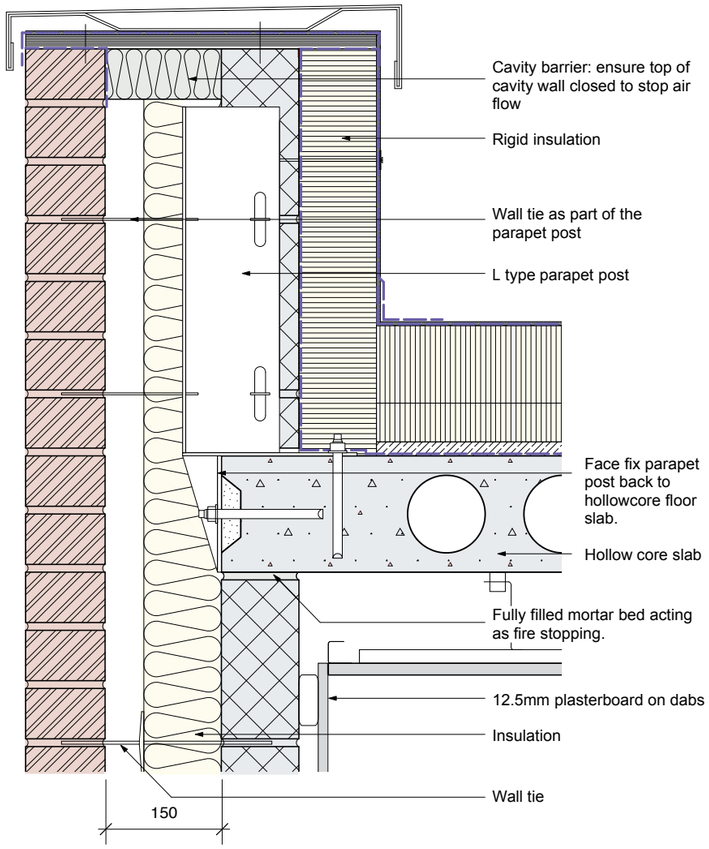
Requirements

- The cavity must be closed at the top of the wall for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- Close cavity at top of the wall to the underside of roof covering.
- Cavity barriers should be tightly fitted to a rigid construction and mechanically fixed in position. If this is not possible (e.g. where a cavity barrier joins to slates, tiles, corrugated sheeting or similar materials) the junction should be fire-stopped. Refer to ADBV1 Section 5.
- Ensure product data sheets and details are reviewed to check compatibility with construction junctions.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.

E10: Parapet roof junction - ‘L’ parapet post



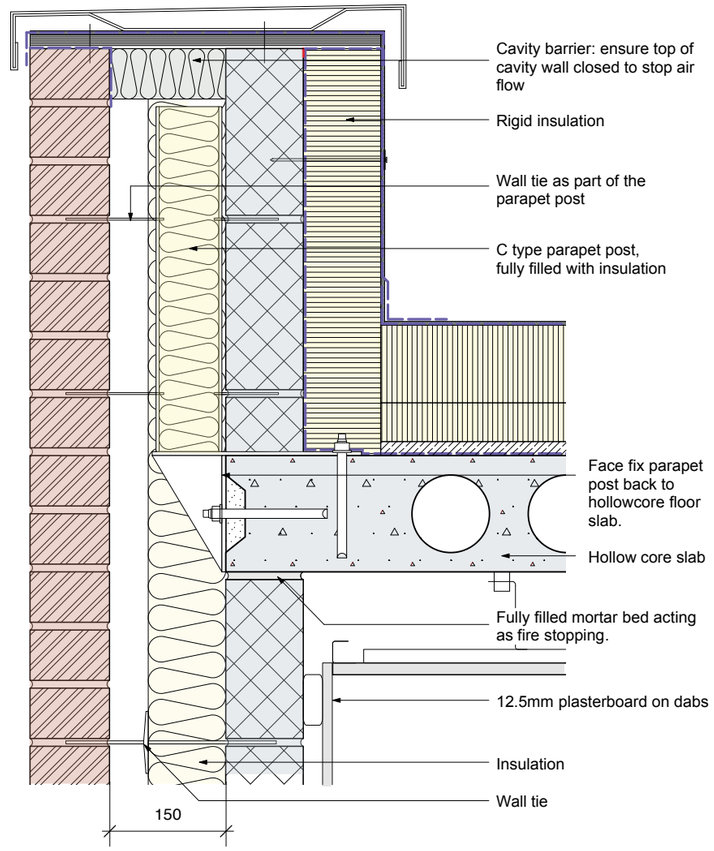
Requirements

- The cavity must be closed at the top of the wall and underside of parapet for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When fixing back to a hollowcore floor slab, it is good practice to use a resin type fixing as this will not stress the concrete when installing the parapet posts.
- Ensure the parapet post fixes into a solid concrete floor slab area, rather than a hollow section.
- Joints between fire-separating elements should be fire-stopped.
- Carefully specify fire-stopping and sealing system that is appropriate to the particular material. Refer to ADBv1 Section 9.
- Ensure the inner-leaf top mortar joint under the floor slab is a fully filled mortar joint to act as a fire stop. Ensure a closed cavity.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.

E10: Parapet roof junction - ‘C’ parapet post



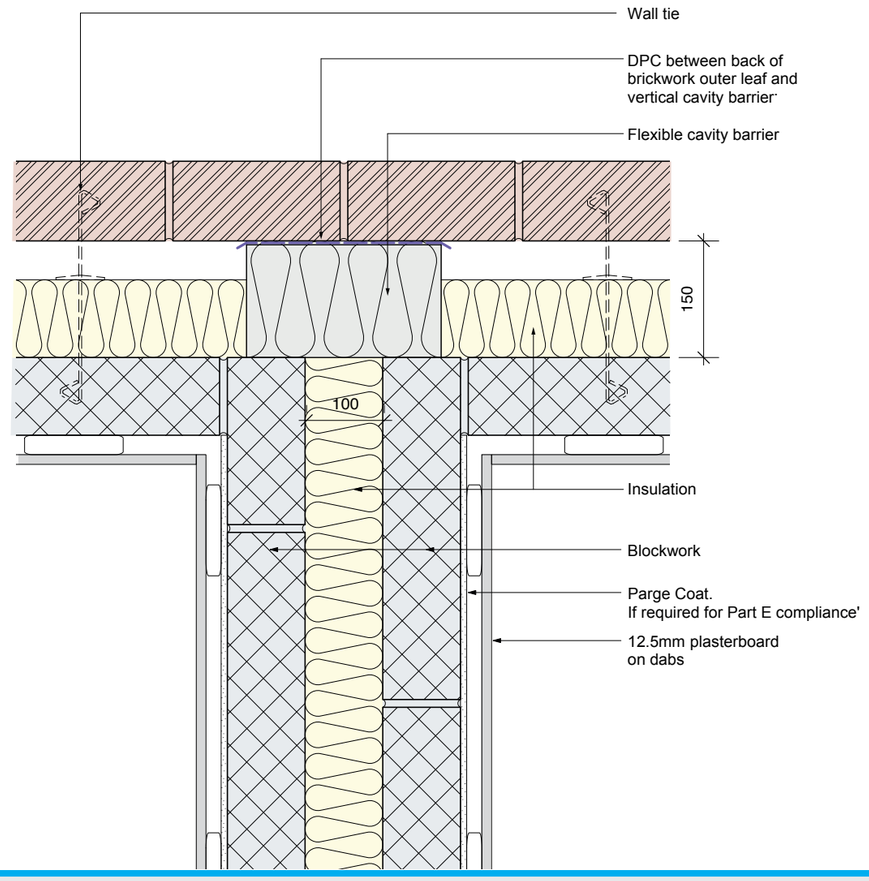
Requirements

- The cavity must be closed at the top of the wall and underside of parapet for the provisions of Diagram 5.3 ADBv1 to apply.

Notes :

- When fixing back to a hollowcore floor slab, it is good practice to use a resin type fixing as this will not stress the concrete when installing the wind posts.
- Ensure the parapet post fixes into a solid concrete floor slab area, rather than a hollow section.
- Full fill the C type Parapet post void with insulation.
- Joints between fire-separating elements should be fire-stopped.
- Carefully specify fire-stopping and sealing system that is appropriate to the particular material. Refer to ADBv1 Section 9.
- Ensure the inner-leaf top mortar joint under the floor slab is a fully filled mortar joint to act as a fire stop. Ensure a closed cavity.
- Head restraint may be required to the inner-leaf blockwork to underside of floor slab.

E18: Masonry separating wall



Requirements

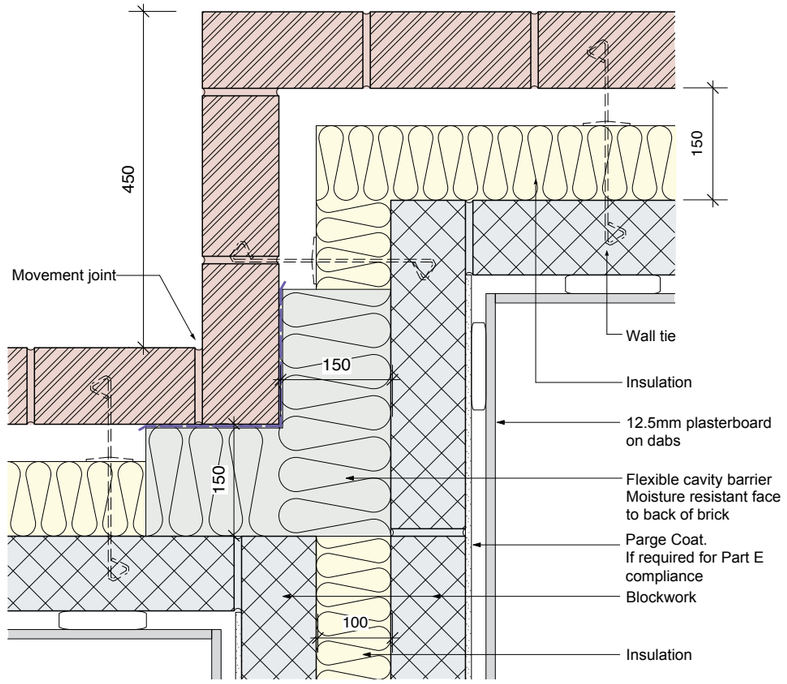
- Close the external wall cavity with a flexible cavity barrier.

Notes :

- AD Part E: Type A wall ties at no more than 2.5 ties/m² (900 x 450mm spacing).
- Brick wall ties: No greater than 900mm horizontal spacing.
- Specify the correct wall tie length according to the cavity width.
- Ensure product data sheets and details are reviewed to check compatibility with construction junctions.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.
- This detail conforms with the Mineral Wool Insulation Manufacturers Association (MIMA) good practice guide for thermal and acoustic reasons. When full-fill insulation is used, the cavity barrier is NOT required here to conform with ADBv1 Diagram 5.3 page 54.

See MIMA design guide, *Preventing Thermal Bypasses in Party Separating Walls*.

E25: Masonry staggered separating wall



Requirements

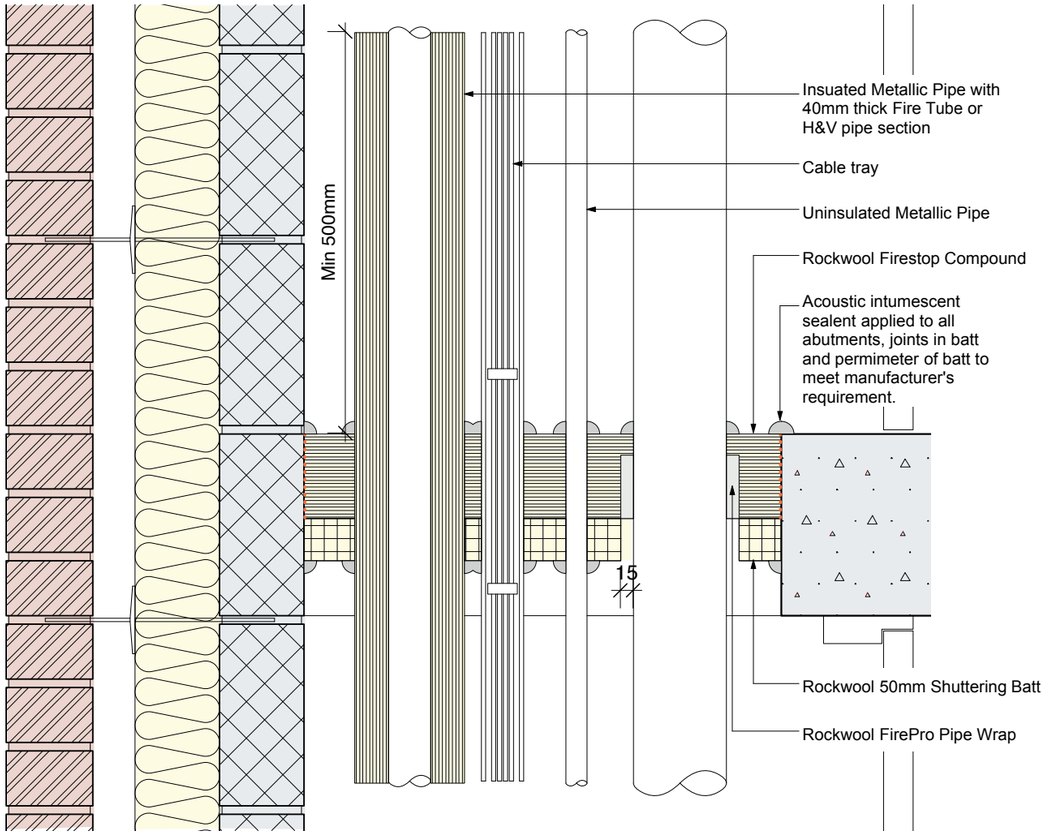
- Close the external wall cavity with a flexible cavity barrier.

Notes :

- AD Part E: Type A wall ties at no more than 2.5 ties/m² (900 x 450mm spacing).
- Brick wall ties: No greater than 900mm horizontal spacing. Ties should be positioned within 225mm of the movement joint.
- Specify the correct wall tie length according to the cavity width.
- Ensure product data sheets and details are reviewed to check compatibility with construction junctions.
- Horizontal/vertical cavity barriers need to be fixed in accordance with manufacturers guidelines.
- If fixing spikes are specified, they should be installed at the required centres.
- For compression fit cavity barriers, specify the correct size according to the cavity width.
- Ensure that the cavity barrier is fitted accurately, preferably as a whole ‘L’ shape form, as there could be the potential for a gap to form behind the external brick leaf 90° angle if the cavity barrier is formed in two pieces.
- This detail conforms with the Mineral Wool Insulation Manufacturers Association (MIMA) good practice guide for thermal and acoustic reasons. When full-fill insulation is used, the cavity barrier is NOT required here to conform with ADBv1 Diagram 5.3 page 54.

See MIMA design guide, *Preventing Thermal Bypasses in Party Separating Walls*.

S1a: Vertical services penetration



Requirements

- The service riser shuttering batt insulation must have all service penetrations, joints and abutments sealed to meet manufacturer’s requirements.

Notes :

- Acoustic intumescent sealant applied to all abutments, joints and perimeter of batt insulation to meet manufacturer’s requirements.

6.0 Installation practice

As a general rule, products that use a mechanical fixing should be favoured above friction fitted or self supporting barriers that rely on the accuracy of other trades for their effectiveness – for instance a consistent cavity width in the case of push-fit horizontal barriers.

Types of cavity barrier

Cavity barriers for wall constructions may have different functional requirements according to where they are located in the wall and where they are in relation to other elements, such as damp proof courses, trays and cloaks. Cavity barriers may also have the dual function of preventing heat loss (by sealing the cavity perimeter) and preventing the ingress of water (when combined with a dpc in a single product). Similarly, window and door surround closers may have a fire, water-proofing and thermal role.

These different applications have given rise to a wide variety of products, each with different installation requirements. Designers should establish the specific requirements for each condition and not assume that a single product will be equally effective in all locations. Even where products are suitable for two positions (vertical and horizontal applications) they will invariably have different support and fixing requirements. Designers should seek specialist manufacturers’ advice for each condition and not allow the selection of the barrier to be left to chance.

Supported closers and barriers are generally preferable, both for long-term stability and for quality control of the installation process. Supported closers are less reliant on other construction elements being in place (both leaves of a cavity wall) and can often be inspected effectively before the construction is covered up. Supported closers are also less likely to be displaced by falling mortar and debris from the construction ‘lifts’ above.
Most of the cavity barrier and closer products come in defined lengths for handling and for ease of transportation but the junction between adjacent lengths is rarely illustrated on the design drawings. Designers should make sure that the method for jointing barriers is achievable within the construction and that the requirements are communicated effectively through drawings or specification.

Product innovation

Note that in most instances a horizontal closer will require a cavity tray above it to deflect water from the back face of the cavity forwards and to prevent pooling around the tray.

A number of manufacturers have produced non-combustible independently accredited cavity trays. Shaped semi-rigid closers are also available

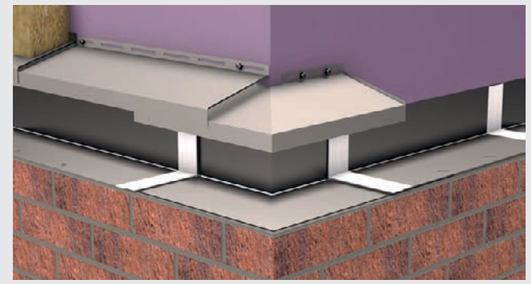


Figure 6: Example of a non-combustible cavity tray.

7.0 Fires in concealed spaces

Designer's responsibilities

Although our current regulations provide for effective safety of the occupier they are not expressly written with the purpose of protecting property in the case of fire, nor do they safeguard a building from fire during construction – an increasing occurrence in some forms of construction but extremely rare in masonry. There have been a number of large scale building fires in timber frame construction in recent years.

The design of the passive protection elements will follow the statutory guidance in Approved Document B or the codes of practice (BS 9991:2015 - Fire safety in the design, management and use of residential buildings or BS 7974 – Application of Fire Safety Engineering principles to the design of buildings) that allow a more flexible approach to fire safety design through the use of a risk-based fire engineering strategy. By whatever means the design of passive elements is achieved, it is important to recognise that the integrity of the fire construction can easily be compromised by voids and cavities that breach the fire-resisting construction or by gaps and discontinuities in the construction itself, occurring either through movement and settlement or because of the imperfections of construction and the tolerances required around junctions of different materials. Any fire within a concealed space may present a greater danger than would a more obvious weakness in the fabric of the building.

Alarming instances of fire reigniting

A multi-storey timber frame building was tested in a simulated fire at the BRE research facility at Cardington. The published results demonstrated that the multi-storey timber frame construction resisted the spread of fire for the necessary time period to allow occupants to escape. However, less-widely reported was the fact that the fire reignited after the controlled experiment was complete and the fire service had left. Smouldering embers within the cavities between construction elements re-ignited and the fire spread to the whole building, taking more than five hours before it was brought under control (Thomas Lane, Building Magazine issue 28, 2002). The fire spread because cavity barriers at floor level had become dislodged, others were missing from the outset. The potential issues with fires reigniting are investigated in NHBC NF 51 Fires in cavities in residential buildings. This example also highlights an important issue for building owners – that the design of a building to satisfy fire safety will usually only consider life safety, not necessarily the protection of the building fabric itself or the contents.

Figure 7: BRE research facility at Cardington

8.0 Fire stopping products for services, penetrations and ductwork

Stopping fire spread

A comprehensive reference guide is produced by the Association for Specialist Fire Protection. Refer to the ASFP Red Book – Fire-stopping: linear joint seals and small cavity barriers 4th edition, www.asfp.org.uk

Since the 3rd edition in 2009, widespread fire testing to BSEN standards and the introduction of the Construction Products Regulation is changing the way in which products are tested and assessed.

Fire stopping generally refers to the sealants or jointing materials between construction elements (for instance at the head of a wall where it meets the underside of the floor above or around penetrations where services and pipe-work pass through a fire resisting construction). Fire stopping will often have to resist deflection or thermal movement at and around the junction. Although this guide is primarily concerned with cavity barriers we have referred to common instances where the design and specification of fire stopping should be considered. The principal risk is the same as with cavity barriers - a fire passing through constructions in a concealed space is extremely dangerous because both the source and extent of the fire are not immediate.

In multi-occupancy buildings (such as blocks of flats) there will be common services that require additional consideration and the instances where services pass through a fire-resisting construction could be greater than in a scheme of self-contained apartments. Multi-occupancy buildings often have common ventilation extract systems with ducting passing through the separating walls and into the ceiling voids of common areas. Heating systems are also likely to be shared and pipework distributing hot water from a common plant room will also cross between corridor ceilings and into the ceiling void of each dwelling.

Designers should set out the requirements for cavity barriers, fire stopping, fire protected ductwork and services at the same time as the other elements of passive fire protection are being considered and wherever possible third party certified products and installers should be specified along with inclusion of CE marked products.

Figure 8: ASFP Red Book Fire Stopping, 4th Edition.

Fire spread

The fatal fire at Lakanal House in Peckham in 2009 spread rapidly between floors. Fire broke out on floors above and below the source. Replacement cladding panels were thought to have contributed but further enquiry also established that fire stopping measures had been removed during refurbishment works in the 1980s. Lakanal House had a single escape stair serving 98 properties. Six people perished, overcome by smoke and fumes after being instructed to stay in their home by the fire service. The escape strategy was later revised but the importance of maintaining the integrity of fire compartments within risers and concealed spaces was dramatically illustrated in this tragedy.

Figure 9: Lakanal House.

9.0 After handover: understanding the Fire Safety Orders

“The move within regulatory guidance from prescriptive rules to performance-based designs and risk assessment during occupation puts greater responsibility for safety on construction companies and building owners and occupiers. The establishment of the ‘Responsible Person’ under the RR(FS)O means that those who are responsible for the operation of a business within a building need to be aware of their responsibilities which include the installation and maintenance of passive fire protection systems.”

ASFP

Maintaining fire safety measures

In this guide we have identified where cavity barriers are used to maintain the overall integrity of the passive protection measures within a building. The passive protection measures include the fire protection to structure, the compartmentation of walls and floors and the various fire-resisting constructions that protect escape routes such as fire-resisting partitions and doors. The passive protection measures are generally installed at the time of construction and are distinguished from the active measures, which include detection and alarm systems, sprinklers and fire suppression systems and which require a command signal or a power supply to activate them.

Both active and passive measures require periodic inspection and maintenance, a responsibility of the building manager or someone designated by them under the requirements of the Regulatory Reform (Fire Safety) Order. Designers, contractors and building operators all have serious legal responsibilities in the delivery and operation of safe buildings. It is essential that designers and contractors ensure that the passive protection measures are adequate in the parts of the building which may not readily be inspected once the building is complete.

The correct installation of passive measures is particularly important in buildings that include multiple households, for instance, apartment buildings because the escape strategy for the building is usually based on the principle that the fire safety measures are implemented only in the part of the building where the fire occurs and other residents ‘stay put’ protected by the fire resisting compartmentation of the building.

Further reading:
“Fire safety in purpose - built blocks of flats” Local Government Group

“NF51 - Fires in cavities in residential buildings” NHBC Foundation

“Ensuring Best Practice for Passive Fire Protection in Buildings” ASFP

Fire risk assessments: making sure protection is in place

The responsible person undertaking an annual risk assessment will need to be aware of any alterations to the building’s occupancy and use and to any processes or equipment that may impact fire safety. The risk assessment should also check that routine maintenance or services installations have not displaced existing fire stopping.
“The ‘responsible person’ must either undertake these reviews or appoint a suitable qualified Fire Risk Assessor to do so. Where work is carried on the structure of the building it is recommended that this be done by certified installers wherever possible.”
ASFP

References

References

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The Building Regulations 2010 Amendments to the Approved Documents, May 2020, For use in England.

The Building Regulations 2010 Fire Safety Approved Document B Volume 1: Dwellings (2019 edition incorporating 2020 amendments for use in England)

The Building Regulations 2010 Fire Safety Approved Document B Volume 2: Buildings other than dwellings (2019 edition incorporating 2020 amendments for use in England)

Image References

Figures 1 and 3: ©Tim Crocker, The Chocolate Works housing development, York, David Wilson Homes.

Figure 2: Midland Heart Project 80.

Figure 4: Studio Partington illustration, Cavity walls excluded from provisions for cavity barriers. Reproduced ADBv1 Diagram 5.3.

Figure 5: Studio Partington illustration, Cavity barriers, fire stopping and compartmentation axonometric diagram.

Figure 6: ACS non-combustible cavity tray.

Figure 7: Chiltern Fire, BRE research facility at Cardington

Figure 8: ASFP Red Book Fire Stopping, 4th Edition.

Figure 9: Lakanal House, Peckham, CIOB Construction Manager News *Copyright Paul Wood, Flickr.*

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Fire Protection Association

Fire Testing

The Fire Protection Association works in partnership with the Building Alliance, to offer one of the most versatile and comprehensive fire testing facilities in the UK based at our Gloucestershire fire research laboratory. Our facilities are available to government and commercial organisations, testing to some British Standards and creating real case fire scenarios.

We are accredited by UKAS to carry out BS 8414 testing which tests the fire performance of external cladding on buildings. We are one of only four organisations currently offering cladding testing facilities in the UK and Northern Ireland.

We also pride ourselves on our ability to design, build and carry out bespoke fire testing. This allows our customers to assess whether materials and systems are safe under specific scenarios, giving customers a clear picture of how their product or system will perform in a fire situation.

For further information visit: **thefpa.co.uk**

Fire Engineering Degree Apprenticeship

The need to increase the number Fire Engineers to ensure fire safety in the built environment is well recognised.

Birmingham City University is the first in the UK to offer the Higher-Level Fire Degree Apprenticeship aimed at new entrants and those already in the industry. The course is delivered through block release part time and can be funded by the Apprenticeship Levy.

BIRMINGHAM CITY University

For further information visit: **https://www.bcu.ac.uk/courses/fire-safety-engineer-apprenticeship-beng-hons-2022-23**

Thank you to the Association of Brickwork Contractors and the Brick Development Association for their support of this industry guide.

This publication has been produced by The Building Alliance Community Interest Company and authored by Studio Partington

The contents are supported by