The Building Envelope Authority

Guidance Documents

December 2021
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CPD APPROVED

GD36 CAVITY BARRIERS FOR VENTILATED RAINSCREEN FAÇADES

1.0 INTRODUCTION

Most modern buildings contain a multitude of concealed cavities and voids within or passing through walls, floors, ceilings and roofs. Effective fire stopping and cavity barriers are essential to restrict the spread of smoke or flames, and to maintain compartmentation.

Cavity fire barriers are an essential element of fire protection. This guidance document from the Metal Cladding and Roofing Manufacturers Association (MCRMA) sets out to consider the key questions about cavity barriers and offers guidance for their correct specification.

For specific project specification and detailed guidance, specifiers and installers should follow the advice of system manufacturers and suppliers of proprietary products and in all cases comply with the standards and regulations appertaining to the application.

2.0 WHAT IS A FIRE STOP AND WHAT IS A CAVITY BARRIER? They are often confused!

2.1 Fire stopping

Approved Document B defines a fire stop as “a seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the spread of fire and smoke”.

Fire stopping needs to attain the same fire resistance performance as the structural elements and seal the junction of compartment walls and floors to maintain the integrity of the compartment. Fire stopping also seals around penetrations and services. Fire stopping is fundamental to compartmentation.

2.1.1 Why are fire stops required?

Perimeter seals or fire stops are required to maintain the fire resistance of compartment walls and floors at detail areas where imperfection of fit or design tolerance may mean fire and smoke could otherwise penetrate through the compartment if not sealed.

2.2 Cavity barriers

Approved Document B defines a cavity barrier as “a construction within a concealed cavity other than a smoke curtain, to perform either of the following functions”

- To close a cavity to stop smoke or flame entering.
- To restrict the movement of smoke or flame within a cavity”.

2.2.1 Why are cavity barriers required within a ventilated rainscreen systems?

By their function ventilated rainscreen systems create a concealed space (cavity) that can, in the event of a fire, provide a route for the passage for flames, hot gases, and smoke to move, unseen, between separate compartments of a building.

The generally accepted method of inhibiting the fire spread within such a concealed cavity is the use of cavity barriers. These will be positioned on the line of any compartment wall or floor so that they sub-divide the building both horizontally and vertically into specific compartments in line with Building Regulations, the fire strategy plan for the building, or specific requirements of warranty providers or insurers. Cavity barriers will also close off penetrations through the façade such as windows, doors, and openings.

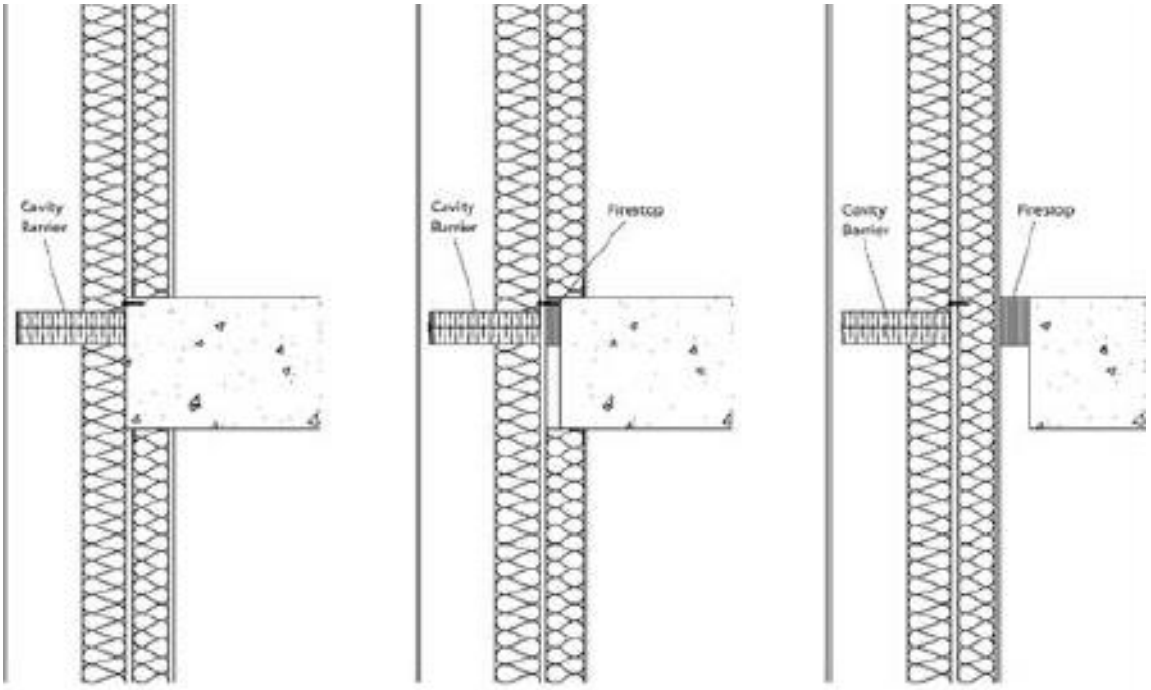


Image showing the positioning of cavity barrier and fire stops in relation to backing wall and floor slab constructions.

2.2.2 What are the formal regulations for the various parts of the UK?

The minimum requirements for the performance of cavity barriers can vary depending on which part of the UK they are being used in.

Approved Document B (England and Wales)

As a minimum cavity barrier should provide a 30-minute integrity against flames (E) and 15-minute insulation preventing fire spread through heat transfer (I) (30:15)

Technical Handbook Section 2 (Scotland)

30 minutes integrity only and for horizontal barriers tested from underside only.

Technical Booklet E (Northern Ireland) E30 I15

As a minimum, cavity barriers should provide a 30-minute integrity against flames (E) and 15-minute insulation preventing fire spread through heat transfer (I) (30:15)

	Document	Integrity	Insulation
England	Approved Document B	30	15
Wales	Approved Document B	30	15
Northern Ireland	Technical Booklet E	30	15
Scotland	Technical Handbook Section 2	30	No requirement

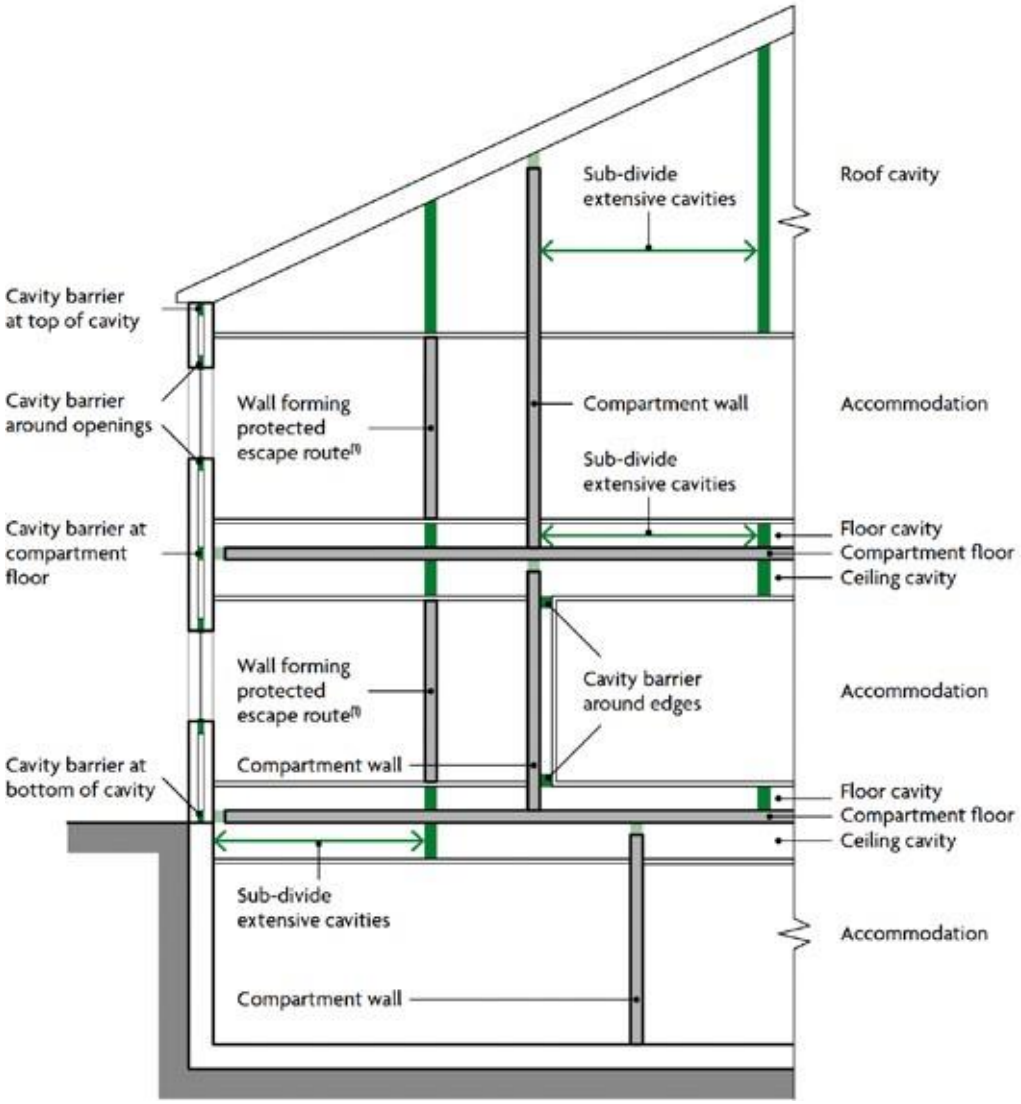
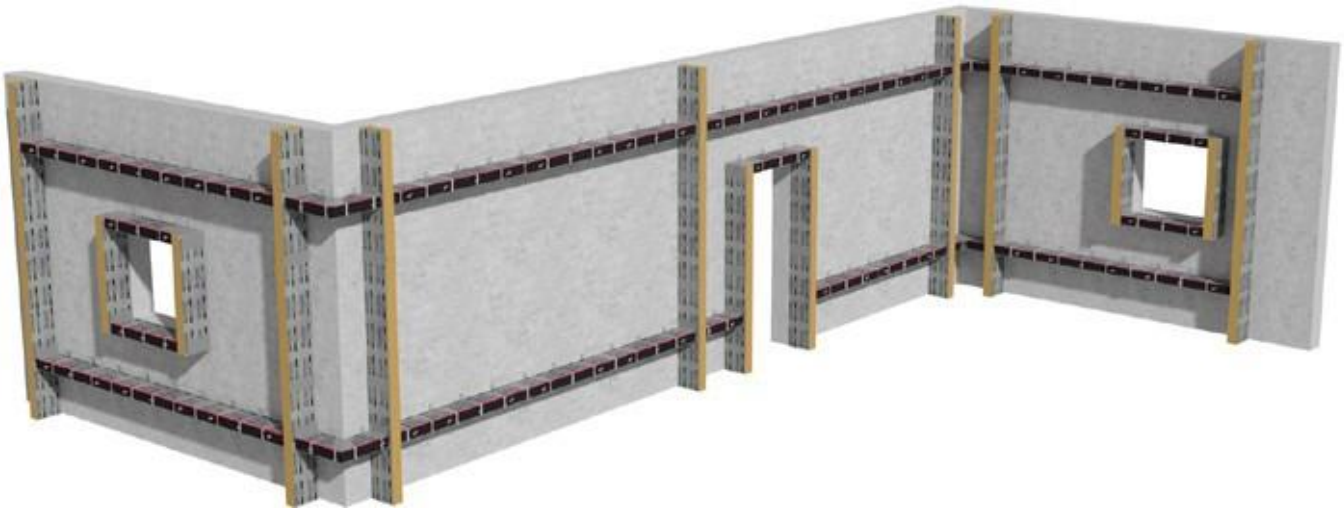


Image showing the recommendations outlined by Approved Document B

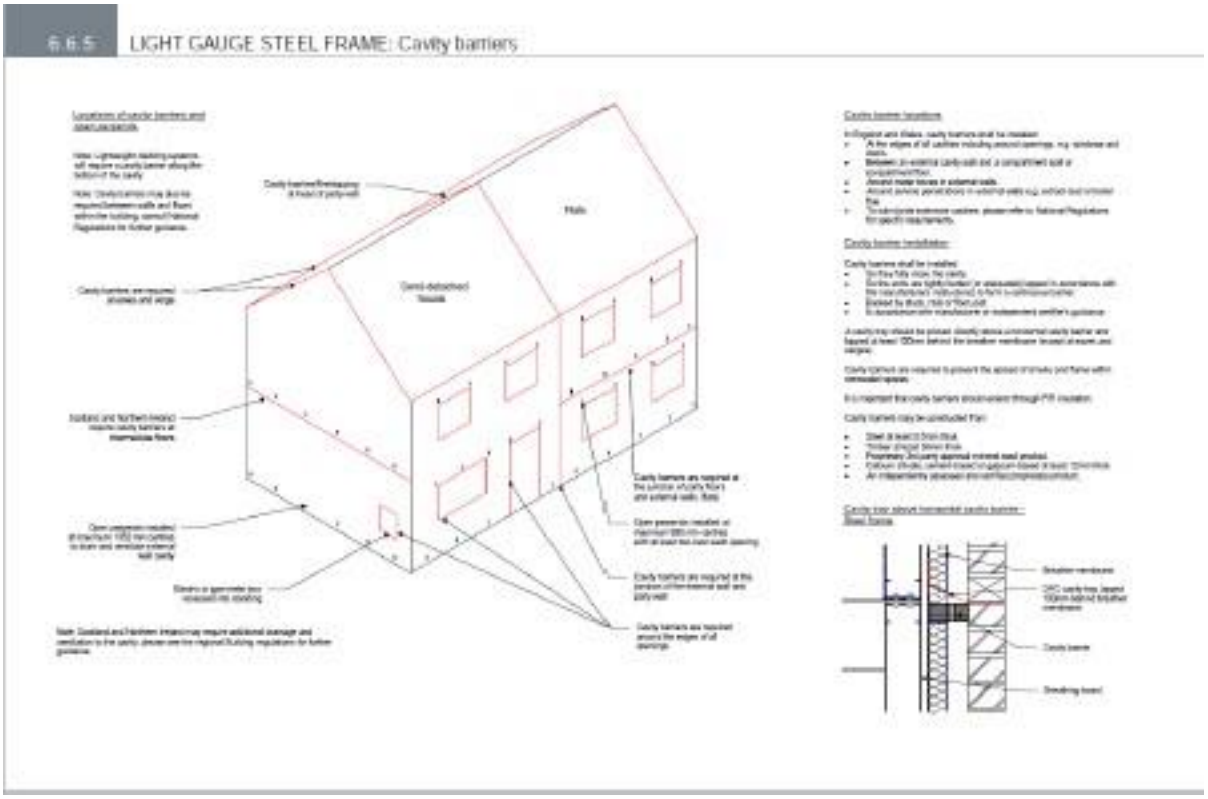
2.2.3 Informal requirements – NHBC/warranty providers

In addition to the guidance set out by the various country specific technical guidance documents, various warranty providers will have additional requirements regarding the performance and placement of the cavity barriers

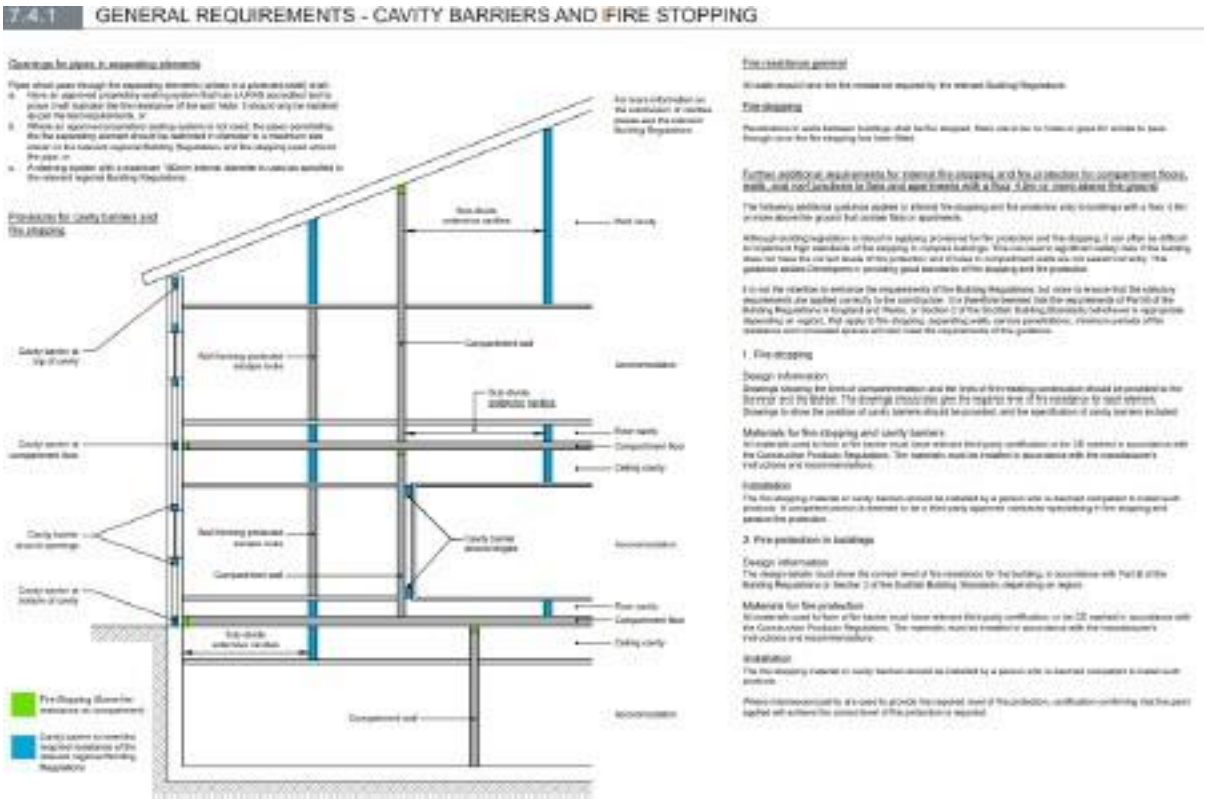


Compartmentation: NHBC Guidelines

Please note: the above illustration reflects the typical cavity barrier locations and are presented for guidance purposes only. Please refer to separate installation instructions. The specifier and user must seek formal approval regarding cavity barrier location requirements on a project basis.



Images showing the recommendations outlined by a warranty provider in relation to light gauge steel frame buildings



Images showing the recommendations outlined by a warranty provider in relation to cavity barriers and fire stopping in general

Generally, stakeholders will often ask for measures in excess of the requirements of each country's technical guidance. It is recommended that the EI ratings and positions of cavity barriers are agreed at design stage with all stakeholders, taking into account any potential clashes with other components of the façade. There are some insurers that prefer to see 30:30 EI performance as a minimum.

It is generally accepted across all countries within the UK as well as insurance/ warranty providers that fire stopping products should meet the same requirements of resistance as the adjacent compartment elements, wherever practicable. Attaching a 60-minute cavity barrier to a supporting inner leaf with a lower fire resistance than the cavity barrier itself is not recommended.

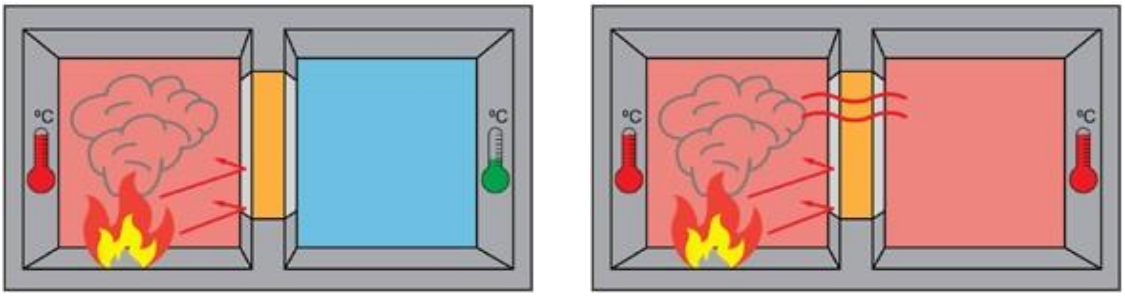
2.2.4 How is performance of cavity barriers tested?

When cavity barriers and fire stops are tested, two main performance characteristics are tested.

Integrity: Resistance to Penetration - Capacity of the product to prevent the passage of fire and hot gases into an area unaffected by the fire. This is generally referred to as "E", followed by the number in minutes of performance achieved.

Insulation: Resistance to the transfer of excessive heat - Capacity of the product to prevent temperature increase on the face that is not directly exposed to the fire. This is generally referred to as "I", followed by the number in minutes of performance achieved.

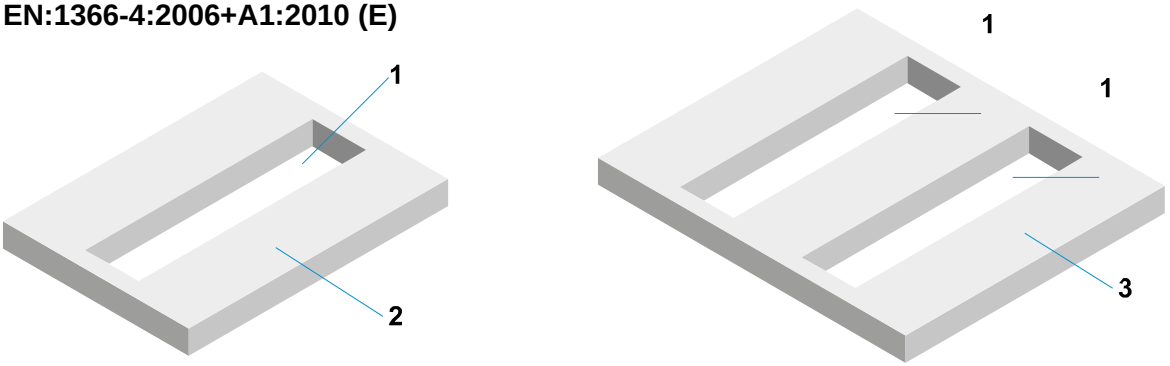
The performance of cavity barriers is also referred to as "EI", followed by the lowest number in minutes of performance achieved for both integrity and insulation.



The test methods that should be used for cavity barriers are provided with EN 13501-2:2016, where it describes (under 7.5.91) that linear joint seals (cavity barriers and fire stops) shall be tested in accordance with EN 1366-4.

The linear joint seals are tested between two leaves of concrete to gain an accurate performance level of the linear joint seal itself, without influence from the adjoining structures.

BS EN 1366-4-2006+A1:2010
EN:1366-4:2006+A1:2010 (E)

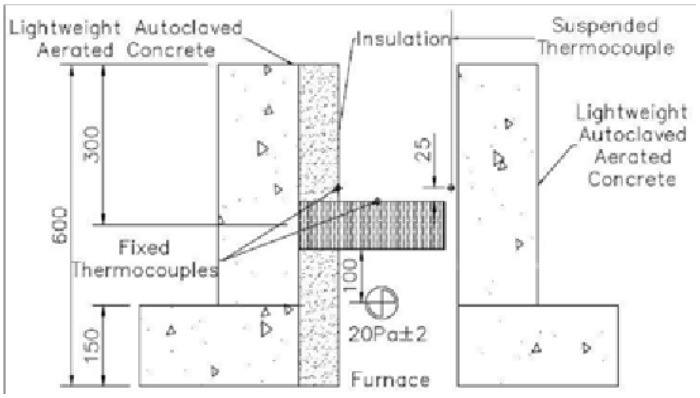


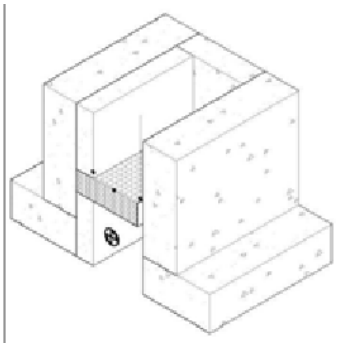
Key
1. Linear joints
2. Monolithic slab, single joint
3. Monolithic slab, multiple joints

Image showing an extract from BS EN 1366-4:2006+A1:2010 which depicts the test house provided frame in which linear joint seals are tested.

The parameters set out in EN 1366-4 would only be applicable for full fill cavity barriers and fire stops. Due to the nature of Open State cavity barriers, incorporating intumescent, a modified test regime is required.

The Association for Specialist Fire Protection (ASFP) technical guidance document TGD 19 describes a test method to evaluate the fire resistance performance of the open-state cavity barrier against fire exposure from below, measuring the time from ignition necessary to effectively seal the cavity and to maintain the seal. The ASFP TGD 19 forms the basis of a BS EN standard that is currently in process of development.





There may also be a need/desire for cavity barriers to be tested as part of a larger construction and within their specific intended usage. The tests referenced above provide information on the performance of the fire stops and the cavity barriers in ***isolation***. If evidence of how such products behave in a system, then BS 8414 could be a consideration.

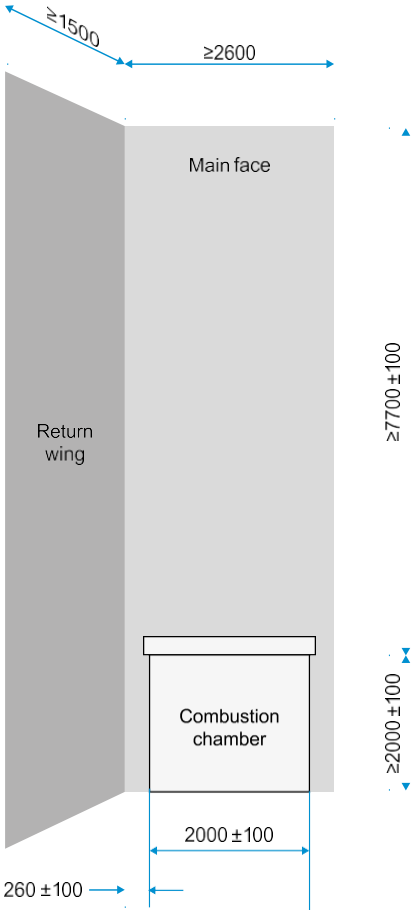
BS 8414 is a two-part standard, each part deals with differing construction types:

BS 8414-1 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.

BS 8414-2 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

BS 8414 tests are performed on full-scale constructions, to test the performance of the system. BS 8414 is solely intended to give an indication of fire spread across or within an external cladding system, such as a ventilated façade.

The purpose of the test is to provide data to enable evaluation of the fire performance of the components when combined to form a complete cladding system. The results of BS 8414 tests are then assessed against the criteria set out in BR 135 with the application of the results outlined in BS 9414:2019 which sets out procedures and rules with which to evaluate variations and changes to products and systems tested in accordance with BS 8414.



From the finished face of the specimen under test applied to the return wing

Image showing an extract from BS 8414-1 2020 depicting the scale of the test rig.

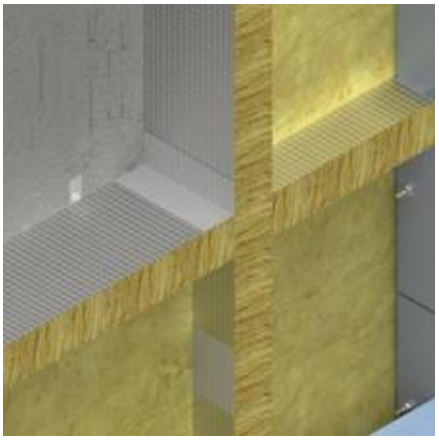
It is important to note that several factors can affect the performance of the external cladding system such as fire resistance performance of the components used, methodology of fixing and set out of the various components. Testing to BS 8414 will not provide specific performance data for individual components such as cavity barriers, but it does allow evaluation of the holistic behaviour of such components in combination with other parts of the external cladding system.

2.3 What types of cavity barriers are typically used in ventilated rainscreen facades?

1 Vertical closed state cavity barriers (aka “Full fill”)
2 Horizontal open state cavity barriers (aka “OSCB”)

2.3.1 Vertical closed state cavity barriers

As the name “closed state” would suggest, these are cavity barriers that fully fill the void from the outer surface of the inner leaf to the inner surface of the outer leaf. Typically used to provide vertical compartmentation of the external facade cavity in a ventilated rainscreen.



a) Typically Installed prior to the installation of a horizontal open state cavity barrier.
b) At the junction where an external wall cavity is in alignment with a compartment wall.
c) If no compartment wall is present, (or the compartmental walls exceed 20m) then at a maximum spacing of 20m*****.
Please note: *Some guidelines will state a maximum spacing of cavity barriers of differing to this with additional cavity barriers within a specified distance of an internal and external corner. Please check with the local authority and warranty/insurance providers prior to commencing any works.*
d) At the jamb of any openings through the façade.
e) Should span the entirety of the cavity from the backing wall to the inside face of the rainscreen panel.
f) Cut to size on site or pre sized ensuring that manufacturers guidelines are followed.
g) Installed permanently under compression to ensure the correct level of performance is achieved (typically, 10mm compression).
h) Be installed to accommodate any panel movement either by atmospheric conditions, thermal expansion, or movement of the structure.
i) Installed tightly fitting with the manufacturers approved brackets, non-combustible (Euroclass A1) fixings at the centres specified (fixings normally supplied by others).

2.3.2 Horizontal open state cavity barriers

a) Are delivered to site pre-cut to size to suit the width of the cavity less the air gap size.
b) Have an intumescent front face which allows an air gap to be maintained (when in the open state). To facilitate airflow for ventilation.
c) Installed at the horizontal compartment line and at the head and cill (where appropriate) of any opening through the facade.
d) Should be installed tightly fitting between the vertical cavity barriers and securely fixed to the backing wall.
e) Should be installed in the correct orientation with the intumescent strip facing outwards.
f) Have continuity of the intumescent strip in all internal and external angles.
g) Installed tightly fitting with the manufacturers approved brackets, non-combustible (Euroclass A1) fixings at the centres specified. (Fixings supplied by others)
h) Be mechanically retained (split ended brackets, spiral screws or similar)

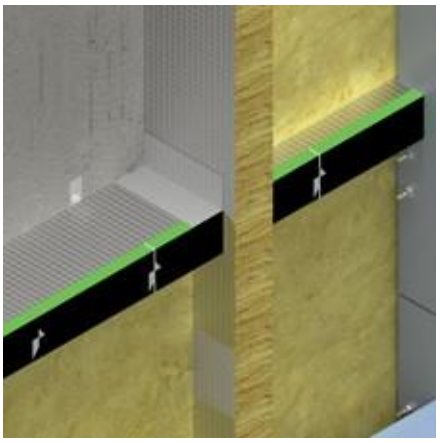


Image showing the vertical closed state cavity barrier extending to the full width of the cavity with the horizontal open state set back to allow for ventilation of the cavity.

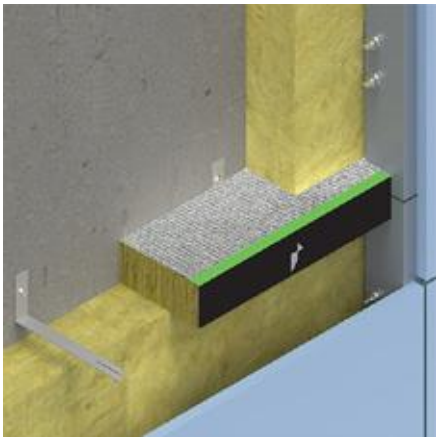


Image showing the horizontal open state cavity barrier installed tight to the backing wall prior to the thermal insulation with the horizontal open state set back to allow for ventilation of the cavity.

Image showing closed state vertical cavity barriers on the jamb of an opening and horizontal open state on the head and cill.

2.3.3 The principles of a horizontal open state cavity barrier

Open state cavity barriers are supplied with a continuously factory bonded reactive intumescent strip on the leading edge and will normally come with a weather resistant coating. An intumescent strip is a material that is designed to activate at a critical temperature and expand to close off the purposely designed air gap to slow the fire propagating for a specified length of time, normally 30, 60, 90, or 120 minutes, depending on the specified product's integrity and insulation performance.

Horizontal open state cavity barrier installed so that the correct air gap is maintained to allow ventilation of the cavity

Fire starts to propagate

Intumescent strip on the face of the horizontal open state cavity barrier starts to react and expand due to the heat created by the fire

Cavity is closed and sealed

3.0 INSTALLATION RECOMMENDATIONS

The manufacturer of the passive fire protection products should be able to provide general detailing advice as well as making recommendations for product specification if informed of the project specifics in advance.

Manufacturers should be able to provide guidance or training to the installers of their products, to ensure the installers understand the basic principles of cavity barrier/ fire stop installation as well as the product specific recommendations given by the manufacturer.

Manufacturers should also be able to provide site visits/ audits to ensure the seen products are installed to the manufacturer's recommendations.

General principles to follow are:

- Barriers to be tightly butted with no gaps between.
- Any trimming or cutting of cavity barriers is done in accordance with manufacturer's instructions (avoid clashes with other facade components where practical)
- Ensure that foil tape is applied to applicable joints.
- The correct amount of compression is achieved on vertical cavity barriers where required.
- Check that the open state cavity barrier is acceptable for use with gap width on site.
- The corners are to be formed as required by the specific manufacturer's guidance.
- The method of fixing must be suitable for barrier/ fire stop.
- The fixing brackets must be at the correct centres of fixing as per the manufacturer's recommendations.
- Non-combustible fixings are to be used to fix the brackets and must be suitable for the substrate (a pull-out test may be required)

NOTE: It is important that all of the above is completed in accordance with the specification manufacturer's recommendations.

4.0 WHERE TO SEEK DETAILED ADVICE

It is important to seek detailing and technical advice from the manufacturer/ supplier of the products that are being used to ensure all information is accurate and up to date for those given products.

The type of information that should be available from product manufacturers:

- Product brochure
- Technical data sheets
- Safety data sheets
- Detail drawings
- Installation instructions

It is recommended that cavity barrier users seek individual verification of test evidence from their chosen supplier and engage with their supplier at an early stage to ensure correct specification and installation.

The appointed fire engineer to the project may also be able to identify fire- related risks, feed into the ‘fire strategy’ and liaise with building control, manufacturers, and other stake holders accordingly.

The Approved Documents and other associated country specific guidance documents will give recommendations for the uses of a given product type.

The ASFP (Association for Specialist Fire Protection) provides guidance documents which include recommendations on all passive fire protection products.

British standards such as BS 9991 and BS 9999 give guidance on fire safety in the design, management and use of buildings.

MCRMA member companies provide a wide range of building envelope solutions for metal-based roofing and cladding products and services, and they can advise on the suitability and performance of materials, systems, and assemblies.

Manufacturers are best placed to offer advice about their products and any variation from their published data during the design or construction process could result in the component or system failing prematurely or not complying with the guarantee or warranty conditions. In addition, design information can be obtained from any of the independent roofing and cladding inspectors featured on the MCRMA web site.

MCRMA ONLINE CPD PROGRAMME

This guidance document is available as an online CPD and is accredited by the CPD Certification Service. MCRMA's online CPD programme is open to anyone seeking to develop their knowledge and skills within the metal building envelope sector. Each module also offers members of professional institutions an opportunity to earn credit toward their annual CPD requirement.

MCRMA provides informative self-study training, delivering good learning value with an online assessment to check knowledge. The course material is studied offline with an online assessment component to verify knowledge. It is a training with learning and CPD value accredited by the CPD Certification Service. This module has an anticipated CPD value of 60 minutes or equivalent.

You can take the module at https://mcrma.co.uk/online-cpds/

5.0 REFERENCES

Building standards technical handbook 2019:non-domestic (Scotland)

BS 8414-1:2015 *Fire performance of external cladding systems.* Test method for non-loadbearing external cladding systems applied to the masonry face of a building

BS 8414-2 *Fire performance of external cladding systems*. Test method for non-loadbearing external cladding systems fixed to, and supported by, a structural steel frame.

BS 9414:2019 *Fire performance of external cladding systems*. The application of results from BS 8414-1 and BS 8414-2 tests

BS 9991:2015 *Fire safety in the design, management and use of residential buildings. Code of practice*

BS 9999:2017 *Fire safety in the design, management and use of buildings. Code of practice*

Fire performance of external thermal insulation for walls of multi storey buildings: (BR 135) Third edition

Fire safety: Approved Document B

Technical Booklet E (Northern Ireland) E30 I15

Technical guidance document TGD 19 *Fire resistance test for open state cavity* Association for Specialist Fire Protection (ASFP)

USEFUL LINKS

Association for Specialist Fire Protection (ASFP) – www.asfp.org.uk

National House Building Council (NHBC) – nhbc.co.uk

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