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Cladding panels and sandwich panels

1 Types of product

The range of materials available to clad an external envelope of a structure is vast. Listed below are some of the more commonly used products:

- **clay** – used in panel systems as small standard-sized components, such as tiles
- **concrete** – pre-cast concrete panels as slabs applied to a solid background or as cladding to a structural frame,

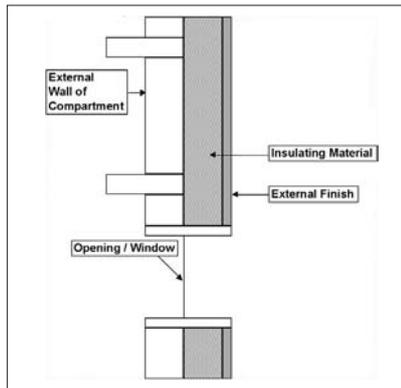


Figure 1: Render systems

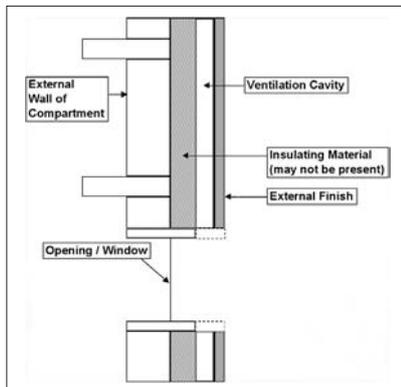


Figure 2: Ventilated cladding systems

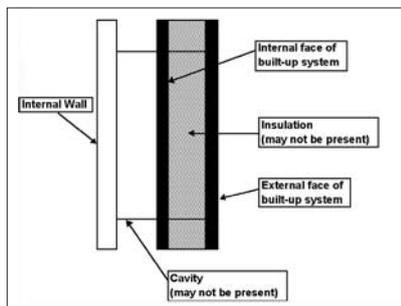


Figure 3: Built-up systems

independent of any in-fill walling. Also used as small standard sized components, such as tiles

- **thin stone** – used with or without insulation as a natural veneer, often epoxy-bonded to honeycomb backing panels
- **metal** – steel, stainless steel, copper, bronze and aluminium are generally used in sheet form for cladding to walls as profiled metal or panels
- **brickwork** – used for its weathering properties, appearance and range of colours, which make it a very suitable cladding for other materials, such as concrete
- **glazing** – found in the majority of façades in a variety of forms, ranging from in-fill panels, windows and suspended glazing. Single, double or fire-resistant glazing may also be used

The choice of systems and materials is based on a number of factors including:

- appearance
- durability
- strength
- weathertightness
- thermal performance
- costs
- buildability

In some cases, a fire rating requirement is included in the guidance in Approved Document B (ADB) to the Building Regulations in England and Wales, where they form part of a loadbearing wall and where there is a danger of fire spread to adjacent buildings. These requirements may also restrict combustibility in high-rise buildings.

Construction types

The different construction types of cladding system include:

a) render systems

These types of system use a continuous background structure to provide support and fixing for the materials forming the external face of the building. It typically contains two elements (see Figure 1):

- the insulating material that is fixed to the external wall in order to provide the necessary level of thermal performance
- the external surface membrane that provides the weather protection to the insulating layer

b) ventilated cavities

These types of system typically consist of an external wall with an inner structural leaf, insulated on its outer face. There are a number of different products that can be categorised within this description, including rainscreen cladding systems and drained and/or ventilated cavity systems (see Figure 2).

The principle behind this type of system relies upon an airspace that can be drained, back ventilated and, if required, pressure-equalised. The systems have an external surface membrane, or cladding assembly, and an insulation layer fixed either to the external wall or the cladding panel. In practice, the insulation layer may not always be present, since it may be incorporated within the panel or existing wall design.

c) built-up systems

Built-up systems are not typically used in the residential market but are widely used in the construction of lightweight industrial units. Generally, built-up systems consist of profiled metal external sheets, profiled metal liner sheets and one or more layers of insulation material. They can be factory assembled prior to installation or can be built-up on site from their component parts, in which case they usually include some form of rigid spacer to protect the insulation against becoming compressed, and sometimes include membranes to reduce or control the movement of water vapour (see Figure 3).

While a fire-resisting internal wall may not always be present, the flexibility of the design allows for lightweight partitioning and/or requires no internal lining of these systems to be undertaken.

Where insulating core panels are used in internal structures there have been problems with fire spread. Appendix F of ADB gives comprehensive guidance on their use and includes design recommendations.

2 Design and installation issues

The Building Regulations in the UK generally set minimum standards for design and building work in the construction of domestic, commercial and industrial buildings. The regulatory systems in Scotland and Northern Ireland differ from those in England and Wales. However, the underlying principles are similar in that these Regulations set out acceptance criteria for a wide range of inter-related technical provisions. However, care should be taken at the design stage, since the needs of one provision may conflict with the needs of another and designers must be able to satisfy each provision without contravening another.

The 2000 edition of ADB came into force on 1 July 2000. It does not place any fire-resistance requirements upon the façade, since it is not considered as a loadbearing element of the structure, except where there is a danger of fire spread to adjacent buildings or across a site boundary.

External surface

In order to reduce the risk of fire spread to adjacent buildings, provisions are made in ADB to restrict the combustibility of external walls of buildings that are less than 1,000mm from the relevant boundary. Diagram 40 (Provisions for external surfaces of walls) in ADB, also restricts the combustibility of external walls of high buildings (where the top floor is at least 18m above ground level) to reduce the danger from fire spread up the external face of the building.

Internal surfaces

In the case of the outer cladding of a wall of 'rainscreen' cladding, that is, where a drained and ventilated cavity is provided, the surface of the outer cladding that faces the cavity should also meet the provisions of Diagram 40 of ADB.

Insulation

Insulation material used in ventilated cavities in the external wall constructions in a building with a storey 18m or more above ground level, should be of limited combustibility, as defined in Appendix A of ADB, unless the construction complies with Diagram 32 in Section 10 of ADB.

Subdivision of cavities

Provisions for cavity barriers are set out in Table 13 of ADB against specified locations and purpose groups. For external wall constructions that include cavities (such as rainscreen cladding), cavity barriers are recommended at the junctions between the wall and every compartment floor or wall or other wall or door assembly that forms a fire-resisting barrier (Table 13 items 1,3,4 and 9 of ADB). This reflects the importance placed on compartmentation with regard to the design of multi-unit residential buildings.

Fire resistance

Where external walls require fire resistance in order to prevent fire spread, they should be tested in accordance with BS 476-22: 1987 or BS EN 13501-2: 2003.



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3 Testing and maintenance

Where the provisions of Diagram 40, in the 2000 revision of ADB, cannot be met, reference is made to BRE Fire Note 9: *Assessing the fire performance of external cladding systems: a test method* (1999). This test has been superseded by BS 8414-1: 2002 as an alternative method for demonstrating compliance with regard to the spread of fire over the external walls. Where the guidance in ADB on materials and/or cavity barriers has not been followed, this test can also be used to establish whether the guidance for

restricting the spread of fire over external walls has been satisfied. The test does not replace the provisions for fire spread between buildings or fire resistance. Guidance on the use of external insulation material is also referenced in the 2000 revision of ADB through the BRE publication BR135: *Fire performance of external thermal insulation for walls of multi-storey buildings* (2003).

4 Relevant standards and other documents

Approved Document B: *Fire Safety* (2000)

BS 476-22: 1987: *Fire tests on building materials and structures. Methods for determination of the fire resistance of non-loadbearing elements of construction*

BS 8414-1: 2002: *Fire performance of external cladding systems. Test methods for non-loadbearing external cladding systems applied to the face of a building*

BS EN 13501-2: 2003: *Fire classification of construction products and building elements*

BRE Fire Note 9: *Assessing the fire performance of external cladding systems: a test method* (1999)

BR135: *Fire performance of external thermal insulation for walls of multi-storey buildings* (2003)



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