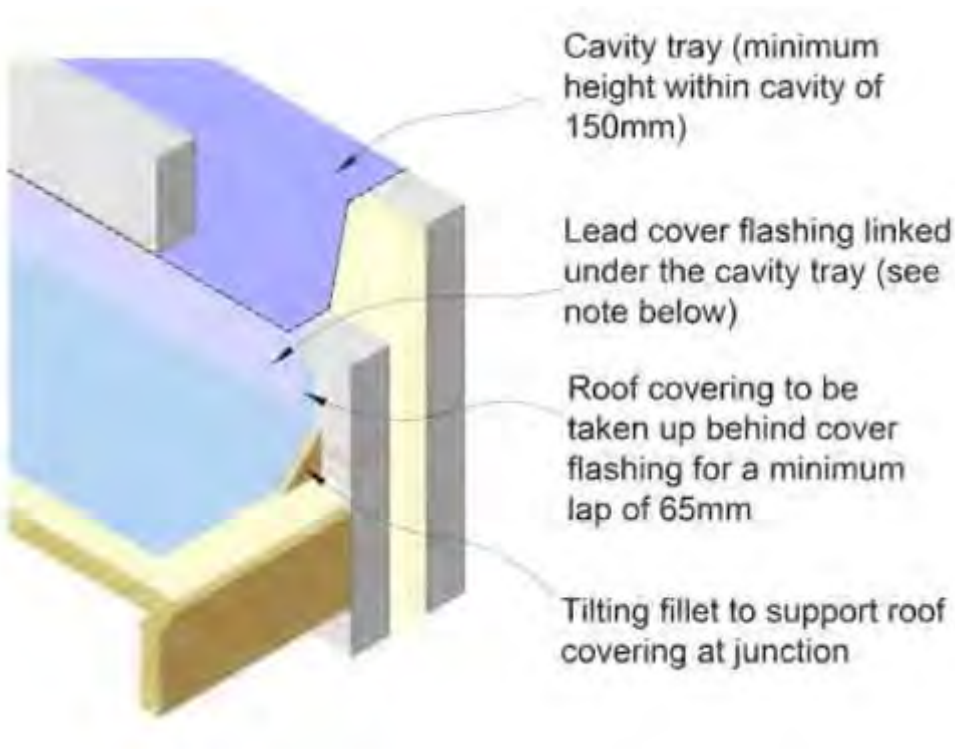
HORIZONTAL CAVITY TRAYS OVER HORIZONTAL ROOF ABUTMENTS

This article is brought about in order to refresh our knowledge on a simple, yet vitally important, element of general building, in relation to horizontal roof abutments.

Within Chapter 7 of our Technical Manual the detail below can be found showing a horizontal roof abutment.



One of the critical details here is the correct linking of the cavity tray with the cover flashing, in that the cover flashing must sit directly underneath the cavity tray.

It is the incorrect installation of the horizontal cavity trays that is all too common on building sites.

In order to achieve this correct linking the cavity tray must be bedded on a thin bed of mortar, which is then raked out prior to the mortar curing, this is all in order to allow the cover flashing to be installed correctly underneath the cavity tray.

This raking out of the thin mortar bed will allow the horizontal cavity trays to be visible over any such roof abutments whilst walking around a site. Therefore, if no cavity trays can be witnessed over a completed roof abutment, then the construction practices on a site need to be discussed with the site management.

The image below shows an opening which is to receive a GRP flat roof canopy, where you will note the horizontal cavity tray has been lost, by fully pointing up the bed joint the tray sits in. When this occurs most commonly the bed joint is then ground out, using a mechanical grinder to remove the mortar and provide an opening for the cover flashing to dress into the bed joint.

The following photo shows a similar GRP flat roof canopy where the bed joint has been ground out using a mechanical grinder and where evidence can be seen of the cavity tray being damaged. It is this physical damage to the cavity tray that we need to prevent and furthermore ensure that the cavity tray and cover flashing are correctly dressed to shed water.

COMPATIBILITY ISSUES OF CPVC PIPEWORK USED IN SPRINKLER SYSTEMS

There have been reports of some Fire sprinkler installations using CPVC plastic pipe systems, suffering damage due to the sensitivity of the pipework with certain materials used in the overall installation.

In these instances, contamination of the pipes and fittings has occurred as a result of being in contact with other ancillary products made of incompatible chemicals. These ancillary products include (but are not limited to): mastics, glues (Solvent cements), fire sealants / fire stopping materials etc. Damage in some cases has resulted in damage of the pipework and water leaks.

CPVC is a thermoplastic produced by chlorination of polyvinyl chloride (PVC) resin. CPVC pipes can be used to withstand a wider range of temperatures than standard PVC.

CPVC pipework and fittings have been used widely in fire sprinkler systems in Europe and America and whilst may have a durability of 50+ years, there have been instances of damage occurring to the pipes due to contamination when exposed to certain chemicals.

CPVC is resistant to most water soluble chemicals but is not resistant to hydrocarbon based chemicals. This can result in pipes and fittings becoming brittle and fracturing.

The industry is aware of this issue and manufacturers of CPVC Fire sprinkler pipes and fittings are now providing access to product compatibility lists, to ensure contamination of and resulting damage of the CPVC pipes is avoided. These lists of non-compatible products have been posted on manufacturer's websites.

Note: Damage to CPVC pipes can also occur due to other factors such as incorrect support, excessively tight hangers, excessive bending etc. The manufacturer's recommendations should be followed.

Summary

Developers should:

- Seek confirmation from their fire sprinkler installation contractors, that where CPVC pipework and fittings have been installed, compatible materials have been used in contact with the CPVC pipework system (i.e. Fire sealants, fire stopping materials etc.)

- Where potential non compatible materials have been used, what remediation solutions will be undertaken? Consultation with the pipe manufacturers is advisable.

- Have available documentation on request, to demonstrate that compatible materials – in contact with the CPVC pipework have been used

Developers should also ensure that other contractors involved in the Development are aware of the importance of maintaining correct ancillary materials in contact with CPVC pipes, and that materials are not disturbed or replaced with other non-compatible materials in the course of installations.

AN UPDATE ON EXTERNAL WALL INSULATION

In dealing with a recent technical referral we have become aware that certain Local Authority Building Control departments, particularly in the London areas are now advising Developers to avoid using polystyrene based EWI systems on developments ‘below 18m’.

(please note the proposed changes to Regulation 7 and amendment to Approved Document B volume 2 will ban the use of combustible materials in external wall constructions in buildings with a storey over 18m. This will come into effect 21st December 2018).

In the case of this referral, the Developer was switching from an EPS based EWI system to a mineral wool based EWI for their light steel frame structure. The mineral wool based system however, when checked, only had third party accreditation for use on timber frame.

Certain issues become evident out of this switch, particularly as in this case, the project has started and the design and procurement stages had already been completed.

Third party product approval:

There are fewer mineral wool based EWI systems with third party approval than EPS / XPS based systems.

Most of the Third party product approvals for EPS / XPS systems have only been assessed for light steel frame substrates where the system vertical rail supports match up with substrate stud supports at 600mm centres.

Those Mineral wool based EWI systems with third party approvals, identify vertical rail supports for the EWI system at 300mm centres and have generally, only been assessed in conjunction with timber frame substrates.

The change to adopting mineral wool based EWI systems particularly on a light steel frame substrate raises the issues of:

- A third party approved mineral wool EWI being used on a substrate it has not been assessed for by the product approval body

- The additional vertical rail supports potentially being fixed (at 300mm centres) to the sheathing board in between the metal studs (Note: Mineral wool based EWI systems require closer supports to avoid flexing!)

- Where the design has already been completed before the switch, the Developers structural engineer will have to reassess the supporting construction to accommodate the reduced centres of the EWI system supports. This may require proving the sheathing boards ability to take the fixings and loads from the EWI system

Summary

- Projects must be checked that the EWI system has a third party product approval for the substrate it is fixed too

- The EWI system vertical supports must be adequately supported by the substructure. If it also includes fixing to sheathing board (between studs) The structural engineer must prove the adequacy of the sheathing board to take the additional loads and pull tests will be required

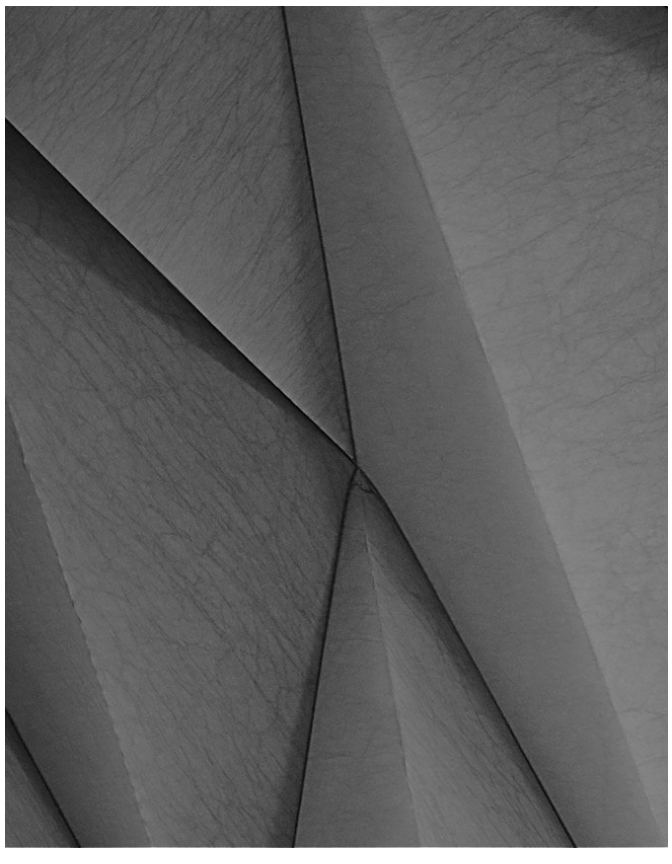
- Where a light steel frame structure is proposed a drained cavity is required. If a timber frame structure proposed, additional venting is also required

We are aware that some EWI manufacturers of Mineral wool based systems are playing catch up with their Third party approvals to include approval with light steel frame substrates, but the issue of updated certificates may take time to publish.

Where a Mineral wool based EWI system is proposed without third party approval for the substrate; this must be referred as soon as possible to Technical Standards via the Technical referral inbox procedure. We will review on a case by case situation only, with the Facades team and decisions on acceptance will not appear on the product acceptability register to avoid the “well you approved it on that site” scenario.

NEW REGULATIONS BAN COMBUSTIBLE MATERIALS IN HIGH-RISE BUILDINGS

In the light of recent announcements and formal notifications from the government this document is designed to provide a brief summary of the regulatory changes and amendments to the approved documents that affect high rise residential buildings.



A list of (and hyperlinks to) relevant recently issued government documents is available at the end of this document.

Firstly, it is important to note that **The Building Regulations 2010 Schedule 1 Requirement B4 (1)** for external walls remains unchanged, this being that:

"The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another having regard to the height, use and position of the building."

However, the government has now supplemented this requirement by introducing a series of amendments to the Building Regulations that will prohibit the use of combustible materials / products in the external walls of high-rise residential buildings that are above 18 metres in height.

View Document >

Whilst draft versions of Approved Document B: Fire Safety have been issued this year for consultation, with the new Volume 1 being for *Dwellings* and the new Volume 2 being for *Buildings other than Dwellings* (and unlike previous versions does not cover dwellings in residential high rise buildings), these are not final documents yet and so the existing Approved Document B Volume 2: *Buildings other than Dwelling Houses* (which covers high rise residential buildings) remains the current guidance. For this reason, an amendment has been issued for this document to keep it in step with the announced changes in the regulations.

The Building Regulations 2010 - Amendments to the Approved Documents >

The Building (Amendment) Regulations, SI 2018/1230 will come into force on 21 December 2018. The previous Regulations will continue to apply only to those buildings where an initial notice has been given to, or full plans deposited with, a local authority before this date and where building work has started before that day; or is started within two months of that day (i.e. 21 February 2019).

Regulation 7 of the Building Regulations deals with materials and workmanship and has been amended to define the height and type / use of building that it is applicable to, the fire classification of acceptable materials and to list materials to which the ban does not apply.

Height of Building

The Amendment will ban the use of combustible materials in the external walls of a *"…building with a storey (not including roof-top plant areas or any storey consisting exclusively of plant rooms) at least 18 metres above ground level and which…"* contains one or more dwellings.

The method of measurement of height is effectively the same as was shown by diagram C6 of the current version of Approved Document B Volume 2: *Buildings other than Dwelling Houses,* but with a minor, but important, change in the regulation to the definition of ground level i.e. the ground level that the measurement is to be taken from *"…the lowest ground level adjoining the outside of a building", rather than to the "….ground level on lowest side of building"* the former being clearer and more specific.

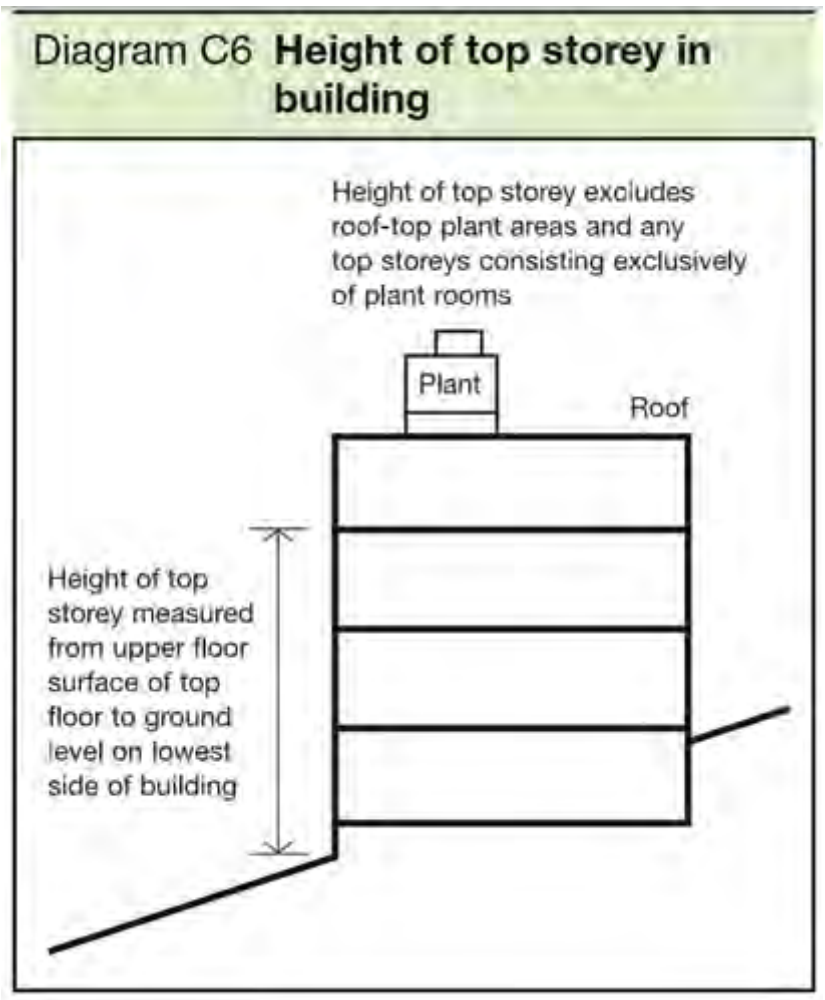


Diagram C6 of current (2013) version of Approved Document B, Version 2

Type / use of building

Buildings that are relevant this regulation are above 18.0m in height (see above for definition of height) and which contains:

- one or more dwellings;
- an institution; or
- a room for residential purposes (excluding any room in a hostel, hotel or boarding house)

The amendments to the Approved Documents provide the further guidance (12.10 Note 2) that the above *"…. includes student accommodation, care homes, sheltered housing, hospitals and dormitories in boarding schools."*

Fire classification of acceptable construction products and building elements

For buildings to which the regulation is applicable must utilise in the external wall construction only materials / products that achieve European Classification A2-s1, d0 or A1, when classified in accordance with BS EN 135011:2007+A1:2009.
The amendments to the Approved Documents provide the further guidance (12.10 Note 2) that *"materials achieving limited combustibility cannot be deemed to meet the requirement using an alternative classification method."*

Full list of materials to which the ban does not apply:

(a) cavity trays when used between two leaves of masonry;

(b) any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) if that part is connected to an external wall;
(c) door frames and doors
(d) electrical installations
(e) insulation and waterproofing materials used below ground level
(f) intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1
*(g) *membranes*
(h) seals, gaskets, fixings, sealants and backer rods
*(i) **thermal break materials where necessary to prevent thermal bridging in order to meet the requirements of Part L of Schedule 1 or*
*(j) ***window frames and glass*

The amendments to the Approved Documents provide the following further guidance:

*That for membranes (12.14 (a)) *"membranes used as part of the external wall construction should achieve a minimum classification of European Class B-s3, d0."*

**For thermal breaks (12.14 (e)) that *"There is no minimum performance for these materials. However, they should not span two compartments and should be limited in size to the minimum required to restrict the thermal bridging (the principal insulation layer is not to be regarded as a thermal break)."*

***For window frames and glass (12.14 (d)) that whilst "*window frames and glass (including laminated glass) are exempted from Regulation 7(2). Window spandrel panels and infill panels must comply with Regulation 7(2)."*

Regulations 4, 5 & 6 of the building regulations have been amended such that they cover any material change of use of the building, in so much that if the change of use moves the building into a category that is relevant, in both height and type/use of building, to the new requirements then the external wall construction must suitable for, or amended to, the new requirements.

This material change-of-use requirement is important, because the design of its external wall may limit its ability to be converted to alternative use. For example, a hotel may be built using external wall materials / products that would not be permitted in a student residence, the hotel therefore cannot latterly be converted to a student residence without first substituting any non-compliant materials.

Developers who plan to convert properties at a later date or wish to are designing their buildings to be multipurpose will need to ensure that this is factored in at the outset.

Regulation 2 of the building regulations has been amended to define the components of an external wall and introduces the term 'specified attachment'.

It defines an external wall as being:

- *anything located within any space forming part of the wall*
- *any decoration or other finish applied to any external (but not internal) surface forming part of the wall*
- *any windows and doors in the wall and*
- *any part of a roof pitched at an angle of more than 70 degrees to the horizontal if that part of the roof adjoins a space within the building to which persons have access, but not access only for the purpose of carrying out repairs or maintenance and*
- [a 'specified attachment"]

A specified attachment is defined as being

- *a balcony attached to an external wall*
- *a device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall*

- *a solar panel attached to an external wall*

The amendments to the Approved Documents provide the further guidance (12.14 (g)) that in addition to external walls and specified attachments *"….consideration should be given to other attachments to the wall which could impact on the risk of fire spread over the wall."*

As the government issues additional reports and guidance we will provide further updates.

The government has released the following documents relating to these regulatory changes:

1 Written Ministerial Statement.
https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-11-29/HCWS1126/

2 The Building (Amendment) Regulations.
http://www.legislation.gov.uk/id/uksi/2018/1230

3 Amendments to Approved Document B2.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760526/AD_Bv2_vB_amend.pdf

4 Amendments to Regulation 7.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760341/AD_7_v2_amend_2.pdf

5 MHCLG Circular letter and Circular 02/2018, which describes the amendments more fully.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760396/29112018_Circular_Letter.pdf

6 MHCLG Final Impact Assessment: Ban on combustible materials in external wall systems.
https://www.gov.uk/government/publications/ban-on-combustible-materials-in-external-wall-systems-impact-assessment

CASE STUDY - ELEMENTS EUROPE

Elements Europe are a large modular manufacturer located in the West Midlands, with a factory production space, which totals 200,000 sq ft.

They provide a full solution including design, factory manufacture and site construction, acting either as main contractor or as a sub-contractor on site. The Elements Europe modular system can incorporate the installation of windows, doors, mechanical and electrical, decoration, carpets, fixed furniture and sanitary ware, all completed in the factory.

Ground floors and Foundations

Foundations must be designed in accordance to suit ground conditions. They must be level and free from defects beneath the structural framing.

Substructure Connection Details

The concrete for the substructure is constructed to a tolerance of ±5mm over 5 m, horizontally and vertically. Galvanized steel shims are added under load bearing points within the modules or on the underside of the studs within the wall panels to ensure that the gap between the bottom of the track and the foundation does not exceed the stated tolerances.

Post-drill-and-fix expanding anchors, (Hilti anchors), are used to fix holding down brackets to the foundation concrete - of a size and at centers specified by a qualified structural engineer.

The corner of each module are secured to the foundation/sub-structure using a post-drill-and-fix expanding anchor, e.g. Hilti anchor, into a suitable concrete base/slab using a minimum M16 diameter anchor bolt fixing.

Intermediate Floors

Used in conjunction with ceiling element to create a separating floor. The overall depth of the cassette is 192 mm, made up as follows:

- floor joists at 300mm, 400mm or 600mm centres as specified by the engineer.

- floor joists are manufactured at 150mm deep which will typically be adequate for the span, however other joists may also be used. If required by the structural engineer, noggins may be introduced.
- joists are underlined with 9mm OSB.
- a layer of 150mm deep man made mineral fibre of minimum density 45 kg/m3 laid between each joist, overlaid with;
- 15mm LaDura plasterboard fixed with self-drilling and tapping screws at 300mm centres with staggered joints, overlaid with;
- a particle board deck of 18mm thick, Grade P5 tongue and groove chipboard fixed with self-drilling and tapping screws at 300mm centres with “brick bond” joints all well glued;

Ceiling Section

Used in conjunction with floor element to create a separating floor. Overall depth of cassette 142 mm (excl. membrane) made up as follows:

- ceiling joists at 300mm, 400mm or 600mm centres as specified by the engineer.
- ceiling joists are manufactured at 100mm deep which will typically be adequate for the span, however other joists may also be used. If required by the structural engineer noggins may be introduced.
- joists are overlaid with 12mm OSB.
- a layer of 100mm deep man made mineral fibre of minimum density 45 kg/m3 laid between each joist, underlined with;
- 2no 15mm Megadeco plasterboard fixed with self-drilling and tapping screws at 300mm centres with staggered joints.
- joists are overlaid with 12mm OSB.

External walls

External walls forming the outer skin of the module/inner leaf of the external wall:

- a rigid frame of perimeter tracks with studs at 600mm centres – (Reduced centres at 400mm or 300mm can be used if required by the engineered design);
- intermediate noggins generally at mid-span and at no greater than 1.5m intervals vertically;
- integral C section and diagonal cross bracing;
- studs may use any of the standard sections.
- A Vapour Control Layer will be required on the internal face of the structure
- internal lining –two layers of 15mm thick La Dura plasterboard, however board build up is selected to suit fire and acoustic performance required;
- in wet areas the internal board may be replaced with 15mm moisture resistant Type 5 fire grade plasterboard
- plasterboard fixed with self-drilling and tapping screws at 300mm centres with staggered joints all in line with board manufacturers recommendations;
- warm frame external lining system – depends on the cladding to be applied

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Party Walls

Party or separating walls are panels comprising- (back to back module walls):

- two rigid frames of C Section studs at 600mm centres (Reduced centres at 400mm or 300mm can be used if required by the engineered design); within C

Section head and base track. 20mm cavity is created between the modules.

- intermediate noggins at no greater than 1.5 m intervals vertically;
- integral C section and diagonal cross bracing;
- studs may use any of the standard sections, however 70mm deep studs are typically adequate in most applications;
- 20mm cavity closed as required with fire stops formed from manufactured mineral fibre or similar.
- each side is lined with two layers of 15mm thick, Type 5, fire resistant board, however board build up is selected to suit fire and acoustic performance required;
- in wet areas the outer board may be replaced with 15mm moisture resistant Type 5 fire grade plasterboard;
- plasterboard fixed with self-drilling and tapping screws at 300mm centres with staggered joints

External Finishes

The design, supply and installation of cladding does not form a part of the Elements Europe modules system. This will be the responsibility of the cladding designer. The standard detail drawings indicate likely fixing methods, opening details and cavity fire barriers. Project specific details need to be developed by the cladding designer to address these and the junction details between the different cladding types to meet the requirements of the building as designed for the specific project.

The most common cladding is a skin of masonry, either brickwork or blockwork, on site. This is tied back to the modules wall panels / structure with Stainless Steel dovetail and channel wall ties across a designed 50mm cavity. The channels are fixed through the insulation onto the steel studs to sandwich the insulation in place and provide a firm fixing back to the structural members with stainless steel fixings. A waterproof breather face is formed at the external face of the insulation to prevent the ingress of moisture from the cavity and air leakage from the building by taping the joints of the foil faced insulation in accordance with the supplier’s recommendations.

Roof

The system includes wall and floor elements and can accommodate various roof types, to be approved on a site-by-site basis.