CPD

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Sponsor's note

EUROFOX FACADE TECHNOLOGY

Eurofox rainscreen cladding support systems have been developed to service the ever-changing face of facade design and the demands for more flexible and economical cladding solutions.

Vertical and horizontal support systems, using either mechanical fix or structural adhesive techniques for concealed and visible construction are available for facades ranging from lightweight panels to heavy cladding elements.

Cladding zones (the distance from the back of the cladding element to the substrate) from 40mm to 380mm can be accommodated. This versatility provides the designer with an almost infinite range of facade appearances and optimum layout options, each of which must be safely engineered.

Eurofox can provide static calculations and setting out information for the components and rails required to support the chosen facade. Each calculation is 'project specific' and will reflect the engineering intent of the scheme, such as the panel weight/cladding zone/building height, and the architectural intent, eg the panel layout.

Easy access to this service is provided via completion of the 'Project Checklist' at www.eurofoxengineering.com

Rainscreen cladding support systems

This month, Eurofox explains the principles behind the design, specification, procurement and installation of facade support structures

THE SCANDINAVIANS INVENTED modern rainscreen cladding in the 1940s, with the first examples appearing in the UK in the 1980s. Today, rainscreens are available in almost every conceivable material, from aluminium to high-pressure laminate to the increasingly popular cedar.

Combinations of cladding are more and more common, which creates challenges when designing the support structure. Behind every facade is a support system which has been engineered to suit the building's conditions, from its geographical position and its height to its structural material and the weight and size of its cladding panels.

THE BASICS

The weight of cladding elements can vary enormously from a modest 5.6kg/m^2 for composite panels up to tile materials weighing in at around 110kg/m^2. The building's location is also key, due to wind loading: an exposed coastal site will be very different to a low-rise city centre project.

These factors are important in determining the support system for the facade, but this can have a knock-on effect on the main

What you'll learn:

- The principles behind rainscreen cladding
- The key information required when designing and selecting a support system
- What to look out for when assessing tenders

RAINSCREEN CLADDING

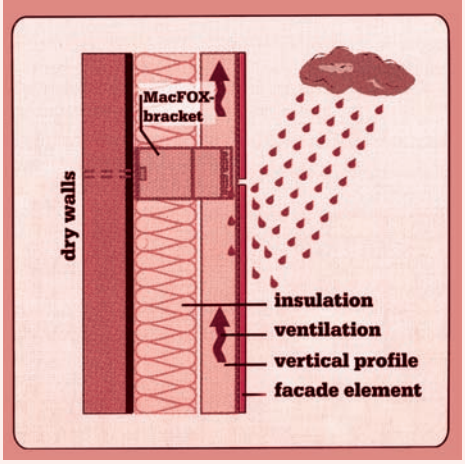
PRINCIPLES

- A rainscreen system consists of an outer panel, a ventilated cavity and an inner leaf.
- In driving rain conditions moisture forms a membrane across the baffled vertical and horizontal joints.
- The majority of water is deflected off the outside face – any penetrating water is disposed of through drainage
- Rainscreen systems differ from brick wall sealed construction as they allow the beneficial effects of air movement.
- A rainscreen system is 'pressure equalised', ie the joints are open or lightly baffled, which means that in heavy rain, pressure inside the cavity is equal to pressure outside, so the water will not be driven into the cavity.
- They must contain a continuous vertical cavity – usually a minimum of 30mm, or for NHBC schemes 38-50mm.

ADVANTAGES

- Installation is simple – allowing external cladding and internal works to proceed speedily, early and consecutively.
- Deterioration of a building can be halted with minimal additional load being applied to the existing structure (referred to as overcladding).
- Rejuvenation of external appearance.
- Uses modern methods of construction through dry trades rather than wet trades.
- Energy saving – lower running costs due to greatly improved thermal insulation.
- Easily removed panels for monitoring of structure.
- Reduction of the risk of condensation due to the elimination of cold bridges.

www.rainscreenworks.com



structure of the building, particularly with lightweight steel framing, which may be reduced – or alternatively beefed up – as a result of the cladding and the way it is attached.

A simple cladding support system typically consists of 'helping hand' brackets which are fixed to the substrate at set vertical and horizontal separations. Into these attach profiles, usually vertical, which are often an L (normally intermediate) or T (normally panel joints) profile in section, although they can be more complex to accommodate different cladding panels.

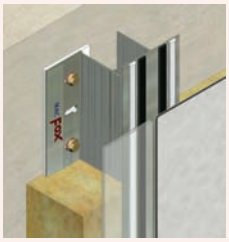
Cladding can be visibly face fixed, normally riveted onto aluminium support profiles. Architects currently tend to favour concealed fixing, either structurally bonding cladding elements onto the vertical support profile or, if the specifier requires a mechanical concealed fix, adopting an additional horizontal grid and cleat system.

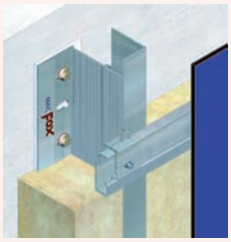
The vertical profiles attach to the brackets by a combination of fixed and flexible points to allow for dead loads and for dynamic load. Flexible points are vital due to the differing thermal performances of the materials being combined. Take aluminium and high pressure laminate (HPL). HPL panels are made from wood pulp and resin. In the winter the aluminium will be at its minimum length, whilst the HPL will have taken on water and will have expanded. In the summer, the reverse is true. Aluminium expands by 1mm per linear metre per 100 deg C and in the UK temperature could vary from -10 to 40 deg C or possibly more.

SPECIFICATION

There are certain key elements that a facade support system specialist needs to design a system (see project checklist, right). First, the type, weight per m^2 and intended layout (portrait or landscape) of the facade material. Second, the preferred fixing method: whether concealed or visible fix. Third, details about the building, its height, window heights and its geographical location (in order that wind loads can be determined). In addition, it is essential to understand the type and condition of the substrate to which the system is to be fixed (steel or block/masonry), depth of insulation and the overall cladding zone (including the correct ventilated cavity).

From this basic information, a specialist facade engineer can calculate the type, 'mix', and the optimum horizontal and vertical spacing of brackets required for the bulk of the building and also for more extreme conditions





Architects currently favour a concealed fixing using bonding (above left), or a mechanical concealed fix (above, right). A combination of fixed and flexible points will be needed to cope with both dead and dynamic loads (right)

or areas such as corners and under windows. Fixed point brackets must be able to withstand the weight of the cladding panels and the wind suction, whereas flexible point brackets have only wind suction to withstand. The spacing of brackets required will vary depending on the area of the building. Generally, more fixings are required at the edges and corners of buildings and around window openings.

Often the architect's specification will consist only of the support system type and some basic information about bracket spacing, or in some cases there will be no mention of a support system. Some clients or contractors choose to employ a specialist envelope designer to fine tune the design and layout.

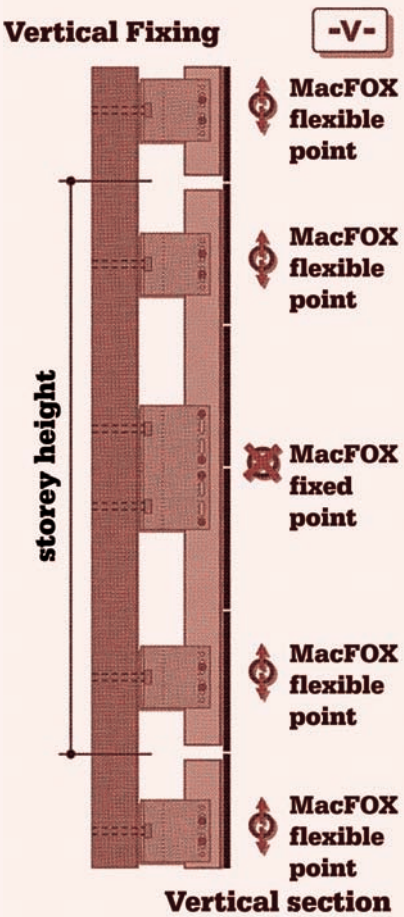
PROCUREMENT

When assessing a tender from a specialist contractor, package managers need to be aware of a number of things.

Check that the support system has been engineered to BS 6399-2 which covers wind loading of buildings. Make sure that the architect's aesthetic intent can be achieved, for example by concealing the fixings.

The main practical consideration for contractors and installers is 'buildability' – will the size of the panel allow it to pass through the scaffolding? An architect may envisage monolithic panels measuring 3.6m by 1.2m, each weighing 130kg. If you're installing that on a windy day with a tower crane, you will struggle, so panels may need to be split down to assist with installation.

Control of heat loss is key, particularly since the introduction of the new Part L last year and



the drive towards carbon neutral buildings. Procurers should check that the detailed design allows the thermal requirements to be met. For example, check that the system limits thermal bridging by the inclusion of insulation pads. (These pads also prevent a chemical reaction occurring between an aluminium bracket and lime in a cement frame).

Fire breaks are also necessary, with the requirements for these varying from authority to authority. A common solution is to use intumescent breaks within the ventilation area. These swell up with heat to prevent the spread of fire up the back of the facade.

By the time a cladding package is procured, the type of cladding may have changed from what the architect originally specified. In these situations it is important to check that the calculations that determined the type and design of support system still hold true. It may be the case that a cheaper cladding material has been specified, but which is heavier than the original. In this case different brackets or closer spacing may be required.

Alternatively, if the material is lighter, a lesser system may be sufficient. This will lead to some savings in material and possible savings in time if there are less fixings or a simpler support system.

ON SITE

When it comes to installation, one of the biggest challenges faced by suppliers such as Eurofox is short lead times. Specialist contractors are unwilling to invest in materials until they are certain that their section of works is about to begin. Preplanning, which allows contractors to have a certain start date and therefore gives suppliers a reasonable lead time, helps here.

Tolerances are also an issue at this stage, since the cladding system must accommodate a steel or concrete structure which is not bang on. Here, a support system which can cope with potentially large differences is very helpful. Eurofox can accommodate cladding zones from 40mm to 380mm in 1mm increments. Systems are designed with a factor of safety, but if tolerances are far outside specification, it may be necessary to check the calculations to ensure that additional brackets are not required.

Package managers should also check that the correct materials and components are being used. For example, stainless steel screws are required for aluminium because a galvanised steel screws used with aluminium would corrode. It is also important to check that inferior products have not been substituted, as these may not have the traceability of the originally specified component.

IN CONCLUSION

There are no set standards for procuring cladding support systems. Every application is different and will require more or less engineering input.

Systems that are simple and logical to use will lead to less errors and swifter installation. Cladding is a serious business and support systems need to be 'fit for purpose'. **cm**

Eurofox project checklist for the specification of a cladding support system

1. FACADE TYPE
Ceramic/thin stone .....
Metal/ ACM .....
Fibrecement/Concrete .....
Timber .....
HPL .....
Terracotta .....
Render .....

Make .....
Size .....

2. FIXING METHOD
Secret fix
Mechanical .....
Adhesive .....
Visible fix
Rivets .....
Screws .....

3. PROJECT DATA
Building height .....m
Storey height .....m
Window height .....m
Windloads
General .....kN/m²
Special .....kN/m²

4. WALL CONDITION
Steel .....
Concrete .....
Brick .....
Other .....
Pullout of primary fixing .....kN
Insulation .....mm
Cladding zone .....mm

CPD test paper

Rainscreen cladding support systems

You've read the module; now complete the questionnaire (below), fill in the form (right), then photocopy and fax the page to the course administrators on 020 7560 4014. Or complete the test online at www.construction-manager.co.uk/cpdjuly07. The deadline is 31 July 2007.

1. Essential details when engineering a rainscreen cladding support system include:

- ☐ **Facade material and layout**
- ☐ **The building's height and location**
- ☐ **State of the substrate**
- ☐ **All of the above**

2. A combination of flexible and fixed points is required to:

- ☐ **Allow for wind loading**
- ☐ **Allow for dead and dynamic loads**
- ☐ **Allow for adjustment of panels**
- ☐ **Allow for fixings to be concealed**

3. Aluminium expands by:

- ☐ **1mm per linear metre**
- ☐ **1mm per 100 deg C**
- ☐ **1mm per linear metre per deg C**
- ☐ **1mm per linear metre per 100 deg C**

4. The cladding zone is:

- ☐ **The gap between the insulation and the cladding panel**
- ☐ **The area requiring cladding**
- ☐ **The distance between the substrate and the cladding**
- ☐ **Typically 38mm**

5. Galvanised steel screws should not be used with aluminium brackets because:

- ☐ **The aluminium would corrode**
- ☐ **They are cheaper than stainless steel screws**
- ☐ **The screws would corrode**
- ☐ **They may not have traceability**

PLEASE USE BLOCK CAPITALS (clarity is vital)

Name.....

Firm or practice name.....

Address .....

.....

..... Postcode .....

Telephone .....

Fax .....

Email .....

Unique reference code .....
(this number will be allocated upon your submission and should be quoted thereafter)

Under which of the following job descriptions would you describe yourself (tick one box only):

- ☐ Project manager
- ☐ Architectural technologist
- ☐ Foreman
- ☐ Site manager
- ☐ Quantity surveyor
- ☐ Building surveyor

Other (please state):.....

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