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Generic forms of over-cladding systems

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GENERIC FORMS OF OVER-CLADDING SYSTEMS

‘Over-cladding’ means the addition of a new façade to an existing building to improve its thermal performance, weather tightness and appearance. Often the quality of the existing façade is poor and therefore fixings to it may not be reliable. In this case, a sub-frame may be required to span between floor slabs or columns. Also, the moisture that is contained in the existing façade materials should be allowed to evaporate. The effectiveness of the new external insulation is also influenced by its position and presence of any vapour/weather control barrier.

There are various generic forms of over-cladding system:

1. ‘Rain-screen’ cladding, in which gaps between the external cladding panels provide for ‘pressure equalisation’ to minimize ingress of wind-driven rain. The new insulation is fixed to the existing façade, as any insulation in the new cladding layer is largely ineffective due to the air movement behind. Protective strips are required to prevent rain penetration at the joints in the rain screen panels. Additional vertical and horizontal barriers are also required periodically to provide rapid pressure equalisation that is fundamental to the rain screen principle.
2. Drained and ventilated cladding permits any water that enters behind the new cladding to be drained and expelled.. The joints between the cladding panels are narrower than in rain-screen systems, but otherwise they are similar. As for rain-screen systems, insulation is attached to the existing façade. Effective ventilation allows for rapid drying out of any moisture that remains in the cavity behind the new cladding.
3. ‘Face sealed’ cladding provides a watertight barrier, which is similar to new cladding. In this case, the cladding is insulated and sealed, and the possibility of vapour movement is minimal except for vertically to roof level. This system is less likely to be used if the existing façade is vapour permeable, as moisture may be trapped.
4. Controlled ventilation can be provided in otherwise ‘face-sealed’ systems. This can be done either by special plastic ventilators, or in a controlled manner through the joints between the cladding panels. The amount of ventilation is small and is sufficient to control condensation but does not significantly affect the insulation provided by the over-cladding panels.
5. ‘Trickle’ or uncontrolled ventilation can also be provided in otherwise ‘face-sealed’ systems at the joints between the cladding panels.. The amount of ventilation is uncontrolled as it relies on buoyancy and pressure effects. However, it is sufficient to control condensation but may affect the insulation provided by the over-cladding panels
6. ‘Directly’ attached cladding, such as insulated render, has no gap between the new and existing cladding. The insulation (normally mineral wool) is attached to the façade and directly rendered. Some ventilation facility may be required to prevent build-up of moisture behind the insulated render. This system is widely used for over-cladding low-rise buildings.

A sub-frame using light steel components has the advantages of providing for:

- geometrical inaccuracies of the existing façade
- suitable fixing positions for the new façade
- reliable attachment positions to the existing structure (e.g. the floor slab or columns)

The depth of the sub-frame should be minimized so that it does not increase the thickness of the over-cladding system that is used. Also, it may influence ‘cold bridging’ in which the sub-frame or its attachments pass through the new insulating layer.

The sub-frame may be of various generic forms:

- Vertical rails (normally C sections) at approximately 600 mm centres to which the new cladding is fixed. These rails may be directly fixed to the existing cladding, as shown in Figure 1, or may span between the floor slabs, as shown in Figure 2. Direct fixing to the cladding may use L shaped sections with fixings at 0.6 to 1m spacing vertically. Free spanning systems may use C or Z sections with sufficient bending stiffness to resist wind loads over a 2.7 to 3.2m span typically.
- A combination of vertical and horizontal rails in the form of a sub-frame which spans between floors or columns, and provides for attachment of the new façade and window frames. This system is illustrated in Figure 3. The horizontal members in the sub-frame may consist of single or double C sections depending on the spacing of the attachment points. Ideally, the fixing points are made to the strong points in the existing structure and should be arranged so that failure of one fixing allows its applied force to be transferred to the adjacent fixings.
- Horizontal rails which support long spanning panels at each floor level. Figure 4 shows a horizontal rail in the form of a modified C section supporting vertically spanning composite panels. Trickle ventilation is provided at the horizontal joints in the panels.

These systems are illustrated below and the application of a light steel sub-frame is summarised in Table 1. Highly perforated steel profiles reduce cold bridging and may be used in all the sub-frames. However, local heat loss still occurs at points of attachment. Steel members are more compact than aluminium members, and are preferred for long span (2.7 – 3.2 m) applications.

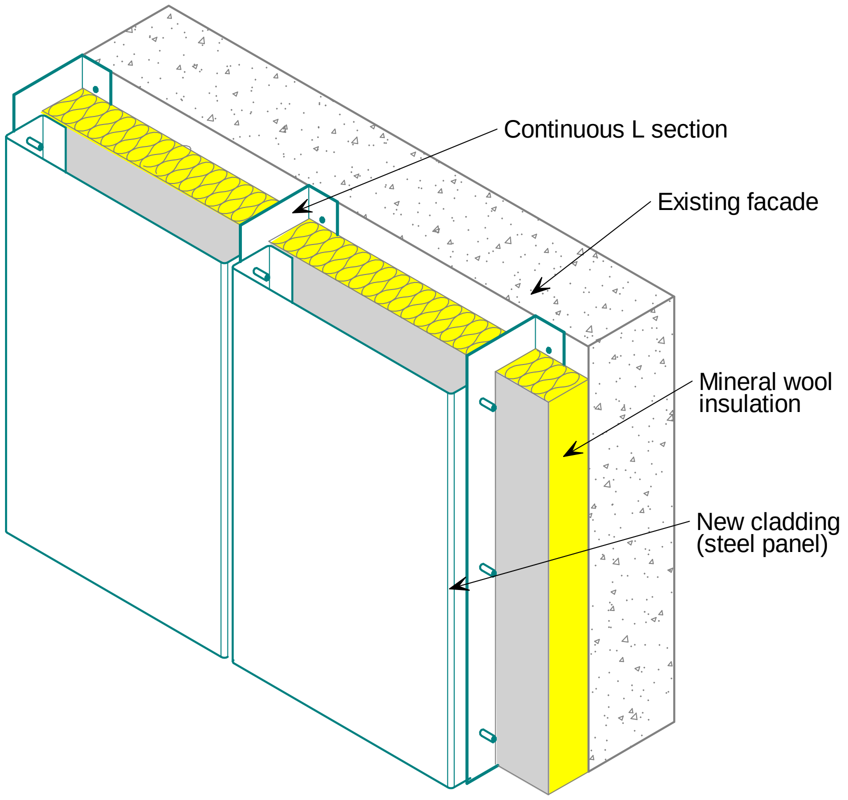

Figure 1 *Continuous attachment of L sections to the existing façade*

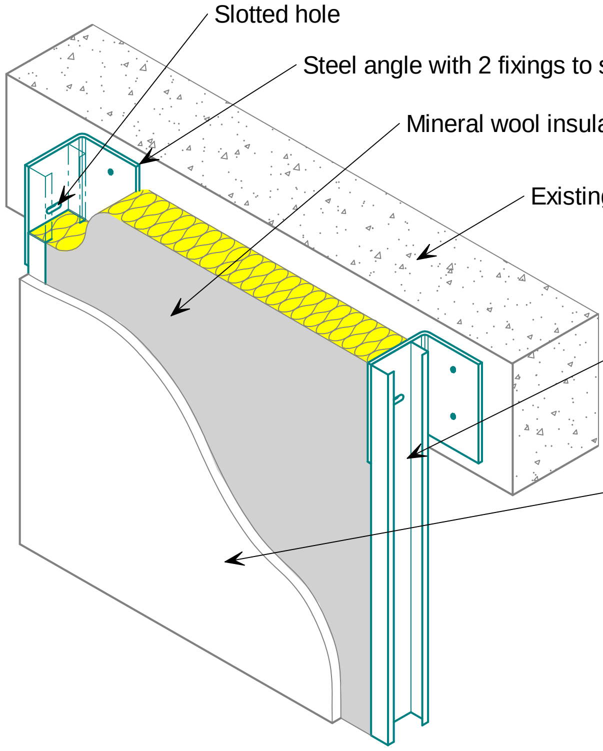

Figure 2 *Individual vertically spanning C sections attached at floor levels*

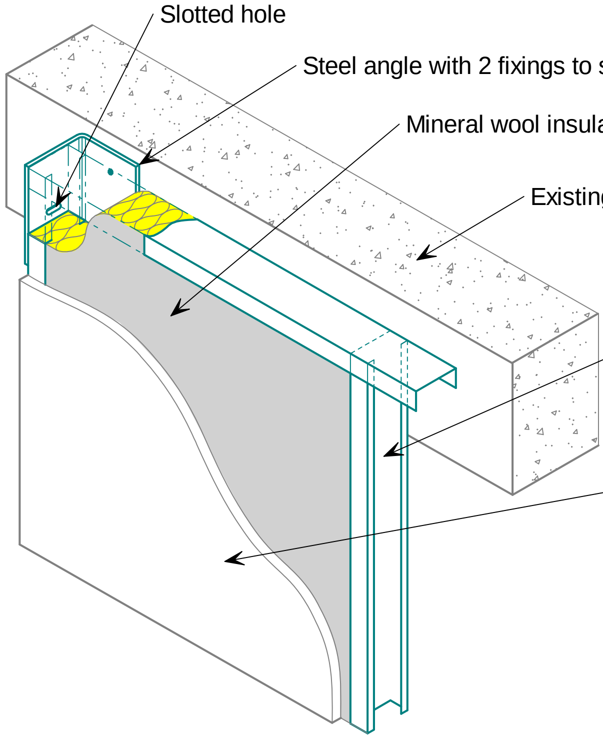

Figure 3 *Light steel sub-frame spanning between floors and attached at strong points, such as columns*

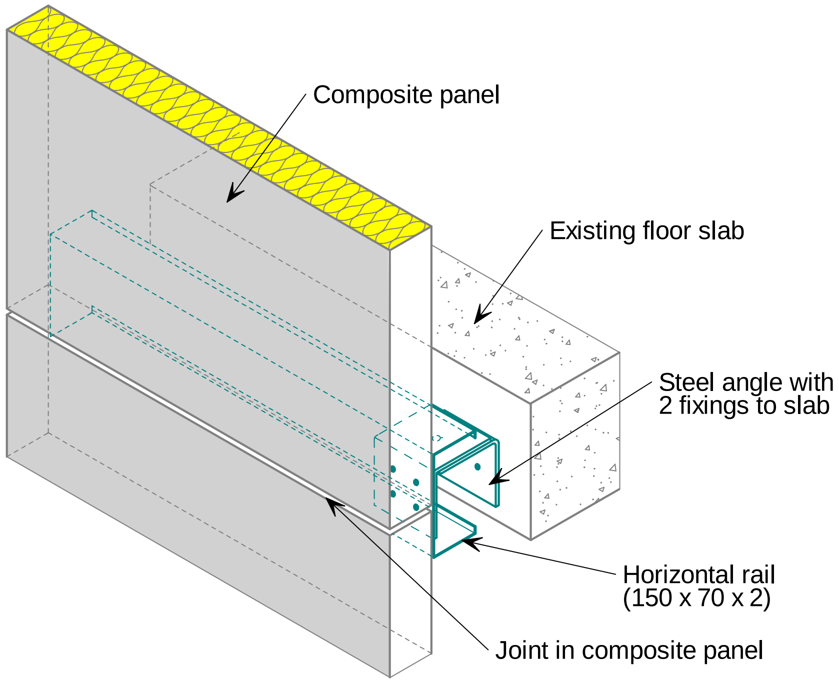

Figure 4 *Horizontal rails and vertically spanning cladding, such as composite panels*

An air-tightness membrane may be required, but this should be positioned carefully in order that it does not add to the condensation risk. Ideally it should be internal to the building, but if this is not practical, it should be on the inside of the new insulation. It should also be vapour permeable if moisture emanating from the building fabric is to evaporate.

A new over-cladding system would generally be designed to satisfy the thermal performance requirements of new buildings to National Codes and a target U-value of 0.24–0.30 W/m^2°C would normally be specified for the combined new and existing façade. This U-value should also take into account any ‘cold bridging’ through the attachments which can be responsible for 15–30% local heat loss.

Table 1 *Application of sub-frames for the various generic over-cladding systems*

Over-cladding system	Application of sub-frame	Span requirements
Rain-screen cladding	Sub-frame is required. Pressure equalisation requires rapid air movement. Gaps around the sub-frame or perforations in the members are required	The sub-frame can be attached to the existing façade or can span between floors
Face sealed cladding	Attachment to a sub-frame requires accurate installation as all joints have to be effectively sealed	Vertical rails or a sub-frame is required with facility for adjustment.
Trickle or partial ventilation	Local ventilation is provided generally at floor levels in a face-sealed system	The sub-frame or cladding panels span between floors.
Direct attachment	Direct fixing to the existing facade, although ventilation gaps may be introduced	No sub-frame required