TIMBER DEVELOPMENT UK

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Timber Cladding for Building Refurbishment

Timber cladding is often chosen to refresh elevations in refurbishment projects. It improves appearance, weather resistance, and acts as a rainscreen. If a building has exterior insulation applied, to heighten its thermal efficiency, timber cladding can protect it.

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Timber Cladding for Building Refurbishment

Timber cladding refurbishment does not significantly increase the thickness of walls, and imposes little increased loading on existing walls, floors, and foundations. It enables a wide range of visual options according to the layout, profile, and dimensions of boards, and can be coated or left to weather naturally.

Design Principles

Timber cladding should always be viewed as a rainscreen, where some moisture is likely to penetrate it. For this reason, unless the original wall surface is impermeable such as brick, a fully weatherproof breather membrane should always be installed to prevent moisture entering the structure.

In either case a ventilated drained cavity should always be installed behind the cladding. The cavity enables water drainage and allows a free flow of air behind the timber. This will prevent a high level of humidity in the cavity and ensure that the moisture content of the timber is similar on both faces.

Additional construction on the outside of an existing wall should not reduce the overall vapour permeability, particularly if the wall is highly insulated. It is therefore not advisable to add any sheathing boards behind timber over-cladding. If sheathing is required for structural reasons, it should be vapour permeable – such as bitumen impregnated softboard – which can take the place of a breather membrane providing it has suitable horizontal joint protection.

When designing timber over-cladding, it is important to determine how any additional vertical and lateral loading can be transferred to roof, floor, existing walls, or foundations.

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Cladding to Improve Weather Resistance or Appearance

This method is to be used when insulation is not required between the cladding and the existing wall face.

- **Waterproof membrane**

If the existing wall is of cavity construction, it is usually unnecessary to install a waterproof membrane behind the cladding battens. If the wall is solid masonry without a cavity, it should be waterproofed with either a liquid waterproofing agent or a waterproof membrane, either of which should be breathable.

- **Fixing battens to flush-faced plumb masonry**

Battens can be nailed, shot-fired or screwed and plugged to the existing wall face. These battens should be at least 38mm thick to provide sufficient penetration for the cladding board nails or screws.

- **Fixing battens to irregular walls**

If the existing wall surface is very irregular or out of plumb, pack out the battens at the fixings to ensure that the external faces of the battens are level and plumb. If the wall is extremely uneven, out of plumb or does not offer secure fixings (such as drystone walling), it may be more feasible to install a separate timber frame wall from ground floor to upper floor or roof.

If the frame is adequately attached to the existing structure at these levels, it is not usually necessary to have any intermediate connections to the existing wall. Boards can then be directly nailed either to the battens or the stud framing. In the latter case, ensure that any horizontal frame members do not obstruct ventilation of the cavity between the existing wall and the back of the cladding.

- **Vertical boards**

In this case, vertical counter battens will ensure there is a ventilated and drained cavity behind the horizontal batten. If the vertical boards are to be installed ‘board-on-board,’ sufficient drainage and ventilation is available behind the outer boards, making vertical counter battens unnecessary. In such cases, the horizontal battens may need to be packed off the existing wall to ensure that the outer faces are level and true.

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Cladding to Enclose External Insulation

There are three main methods of supporting timber cladding outside exterior wall insulation. The choice will depend on the thickness and type of insulation required, the condition of the existing wall, and the number of storeys involved.

- **Method A – Cladding battens only**

In this method, cladding is fixed directly to the existing wall with cladding battens outside the insulation. Fix non-compressible insulation (usually rigid foam boards but could be wood fibre insulation boards) to the existing surface and then fix treated softwood vertical battens directly to the wall through the insulation.

Some dense mineral wool slabs may also provide sufficient compression resistance to allow the battens to be securely fixed through to the existing wall, and they have the advantage of being able to absorb small surface irregularities more easily than foam boards.

Another advantage of this method is that the thermal performance of the insulation extends across the entire existing wall, uninterrupted by any timber supporting members. The disadvantage is that with an irregular wall surface, it is difficult to ensure that the insulation boards are flat and plumb, which means the outer face of the cladding battens might not end up level or plumb. Another drawback arises because the fixings may have to support the weight of the cladding above ground level.

With thick insulation, the cladding weight must be supported away from the existing wall face and – because the insulation provides little resistance to load – the support of the cladding depends entirely on the bending resistance of the fixings.

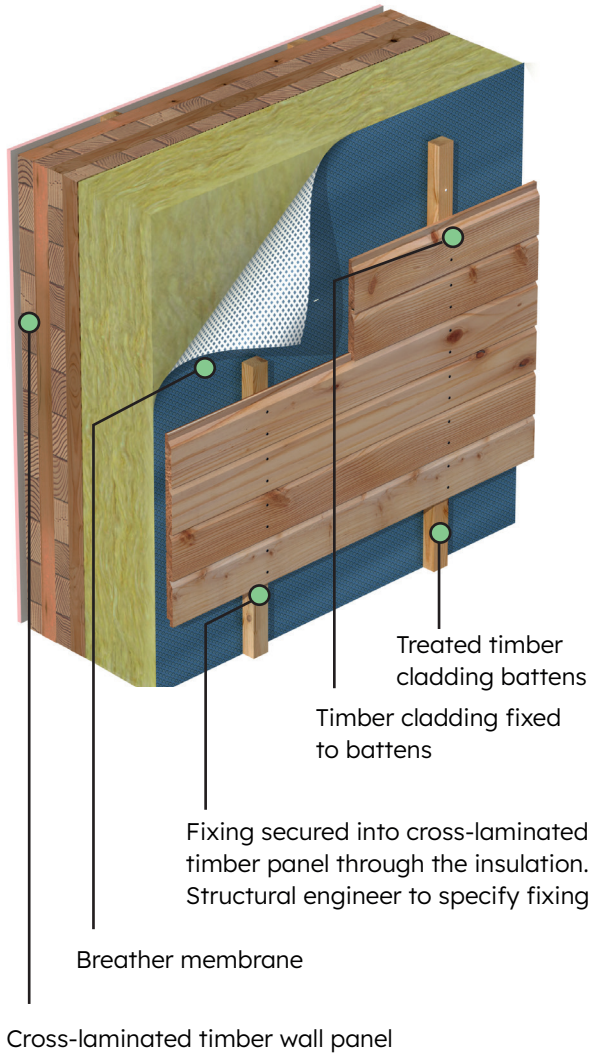

IMAGE: Method A, where cladding is fixed directly to existing walls via cladding battens

In this case, it is preferable that any vertical loads are transferred through the battens to supports at intermediate or ground floor levels.

A breather membrane between the battens and insulation is needed to protect it from wetting, to seal exposed joints between the insulation boards and to ensure airtightness.

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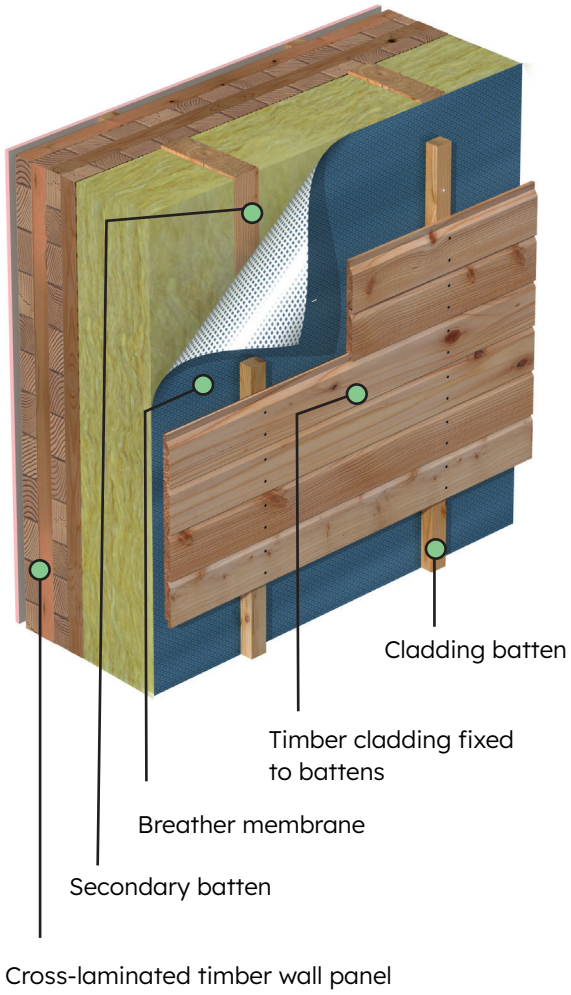

IMAGE: Method B, cladding fixed to the existing wall via deep secondary battens

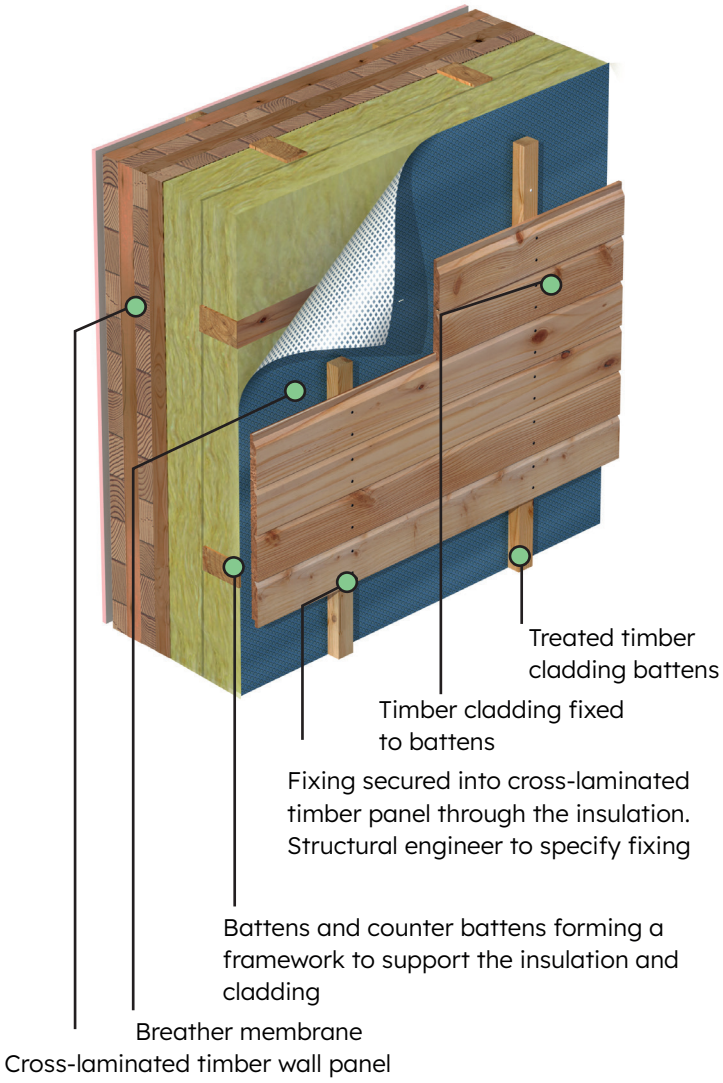

IMAGE: An alternative Method B, where cladding is fixed to an existing wall via layers of secondary battens

- **Method B – Secondary battens**

The cladding is fixed to the existing wall using cladding battens over secondary battens and requires secondary vertical battens within and of the same depth as the insulation. Fix these battens directly to the existing wall surface and pack out to ensure they are plumb and level. Then insert insulation batts or boards between the secondary battens and if necessary, add a breather membrane before fixing the cladding battens to the secondary battens.

An advantage of this method is that the secondary battens can transfer the weight of the cladding directly back to the existing walls, and the outer faces of the battens can be easily levelled and plumbed by packing between the battens and existing wall. A disadvantage is that the insulation is interrupted by the secondary battens, which will reduce the overall insulation value of the wall. If suitably compressed, flexible mineral wool batts will expand into these gaps.

The introduction of the secondary battens removes the need to use non-compressible insulation. Another disadvantage is that with the increased thickness of the insulation and consequent increased depth of the secondary batten, it becomes difficult to fix these deep sections back to the existing wall. This can be avoided by installing secondary battens and insulation in two separate layers.

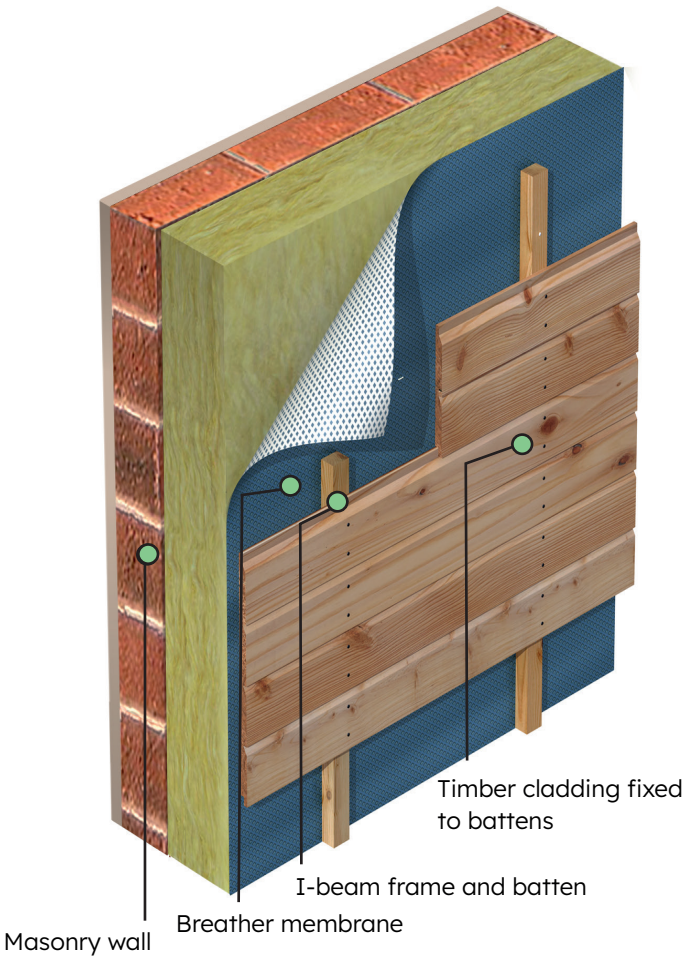

IMAGE: Method C, cladding battens over secondary I-beam frames, independent of the existing masonry wall

If the thickness of each layer of insulation is reduced to 50-75mm, battens of this depth can still be nailed or screwed and plugged into the existing wall. Install the first layer of insulation between these battens and fix the second layer of battens by nailing perpendicular to the first layer. Then install a second layer of insulation between these battens flush with their outer face. Besides simpler fixing, the main advantage is that the only positions where the timber totally penetrates the insulation are at the crossovers of the batten, which reduces thermal bridging. Any gaps between the insulation and framing will also be covered by at least one layer of insulation.

Both variations of Method B allow the cladding battens to be fixed to the secondary battens, either in line or spanning between them. A breather membrane is installed across the outer face of the secondary battens before the cladding battens are fixed.

- **Method C – Self-supporting**

Using this method, cladding is fixed with cladding battens over secondary frames of I-beams that are independent of the existing wall. These frames are deep enough to span between floors, or between floor and roof. If the required insulation is at least 100mm thick, vertical timber sections of this depth can span typical storey heights and resist wind loading. Wind and cladding loads are then taken back to the roof or floor structure using steel brackets, without needing to transfer these loads to the existing walls.

This variant of Method C entails installing a separate timber frame outside and independent of the existing wall. However, it still has the disadvantage that the thermal insulation of the wall will be reduced because the framing interrupts

the insulation. If there is sufficient space available, insert the insulation between the supporting frame and the existing wall to reduce thermal bridging effects.

Another variant consists of a separate framework independent of the existing wall, which may be capable of spanning one or more storeys without connections to the original structure. This uses timber I-beams at least 150mm deep and at a maximum of 600mm horizontal centre-to-centre (c/c), securely held at top and bottom to cover multiple storeys, connecting at roof and ground. Through these connections, the wind loads are taken back to the roof structure and to ground floor level, while the I-beams carry cladding loads down to ground level.

Frames can be prefabricated and erected as panels containing the insulation and faced with a breather membrane. They will not normally be required to provide any racking resistance, so there should be no need to add sheathing. If sheathing is necessary to improve the handling strength of these panels, this should be with a breathable material rather than plywood or oriented strand board.

If framed panels are to be prefabricated, different types of insulation can be used to their best advantage. Foamed plastic panels – with interlocking joints – can be pinned to the walls and temporarily exposed to weather. In the framed part of the wall, mineral wool batts can be included in the framed panels where they can be protected by a breather membrane. Compressed mineral wool can be used to close any gaps that may develop as the secondary frame members shrink, and cladding battens can then be fixed to the outside of the secondary frames. Biomaterials, such as wood fibre insulation and sheep wool can also be utilised.

Fire Regulations and Approved Document B

In the wake of the Grenfell fire tragedy, the UK government has conducted a series of consultations into the use of different cladding materials on high rise buildings. Timber, where necessary enhanced with flame retardant, continues to be approved as a suitable material for external cladding and balconies on residential buildings, under Building Regulations, for buildings below 11 metres in England, Wales and in Scotland.

Regardless of height, an independent, professional fire risk assessment is essential to consider building design, use, materials and location at the design stage for multi-occupancy and assembly buildings, such as community centres and schools.

Furthermore, in multi-occupancy and assembly buildings, timber cladding components should be treated using a quality assured factory-applied flame retardant to Euroclass B performance levels – the highest ‘reaction to fire’ standard achievable for an organic substrate – unless demonstrated as unnecessary by an appropriate risk assessment process. This principle of risk assessment is embodied in the **Construction Design and Management Regulations** and is reinforced by the Ministry of Housing, Communities & Local Government

Timber Cladding Details

The choice and installation of timber cladding which is applied to any of the above refurbishment systems will follow the same specification and detailing for the cladding applied to new buildings. The following is a brief summary of critical factors:

- **Boards**

The face width of horizontal or vertical boards should not exceed 150mm, to limit moisture movement across the board. Boards with tongue-and groove profiles should be no more than 125mm wide, because of the risk of disengagement of the tongues if the boards shrink due to variation in moisture content. For boards with a face width over 100mm, use two fixings to keep the boards flat to the supports.

- **Battens**

Cladding battens should be at least 50mm x 38mm and spaced at a maximum 600mm c/c. For horizontal cladding, the cladding battens could be reduced to 50mm x 25mm if they are coincident with secondary members behind and the fixings can be driven partially into them. For vertical cladding, the battens should be at a maximum of 600mm c/c and at least 50mm x 38mm if they are spanning between supports. If counter-battens are coincident with secondary vertical framing, they can be reduced to 50mm x 25mm.

- **Fixings**

As a rule of thumb for softwood boards, use ring-shank nails that are long enough to penetrate twice the thickness of the board into the supporting battens. Fix hardwood boards to the battens with screws through pre-drilled oversize holes.

- **Durability**

Moderately durable timber types are adequate for external cladding, providing sapwood is excluded. For non-durable timber or where sapwood is not excluded, boards should be pressure-treated with preservative. Alternatively, modified or heat-treated timber can be used, provided it is rated at least moderately durable. Cladding battens and cladding counter battens should be pressure treated with preservative, but it is unnecessary to treat secondary battens and framing within the insulation layer, unless there is no breather membrane.

- **Finish**

Some timber types can be left unfinished to weather to a natural grey – without affecting durability. If a colour finish is required, this should be a translucent or opaque penetrating vapour-permeable stain or paint. Coatings should be applied as soon as possible before ultraviolet exposure affects the surface of the board, and all faces of the boards finished with at least one coat before installation.

To limit moisture movement in use, install boards at a mean moisture content of 16% +/- 2%.