The Use of Exterior Timber Cladding in Buildings
The intention of this booklet is to inform and advise designers on the use of exterior timber cladding in buildings and to ensure that cladding material is used and maintained correctly.

The advice is aimed at improving the long term surface appearance, quality and specification of timber cladding in buildings and to help avoid timber cladding becoming badly weathered and stained in subsequent service.

**PLANNING REQUIREMENTS**

Careful attention must be taken to comply with any planning requirements.

Many planning authorities require applicants to submit a timber cladding quality statement containing a maintenance regime to ensure the visual impact is retained.

**SELECTION OF TIMBER SPECIES AND THEIR DURABILITY**

There is a wide range of timber species available in the marketplace suitable for use as exterior timber cladding, including hardwoods and softwoods. The Wood Marketing Federation (WMF) places a strong emphasis on sustainability along all parts of the forest chain. This policy is reflected in the WMF mission statement:

- to promote wood as a renewable sustainable and versatile natural material.

This policy in relation to sourcing of timber species is presented in the WMF Talking Timber document No 4 (www.wood.ie).

This needs to address issues such as:

- cleaning
- maintenance
- repair
- maintenance programme in accordance with the coating manufacturer’s instructions
- access for the cleaning, maintenance, repair and re-coating of the proposed cladding.

**This policy in relation to sourcing of timber species is presented in the WMF Talking Timber document No 4 (www.wood.ie).**

If specifiers wish to use a species with a heartwood durability rating of between 4 and 5 (slightly durable – non-durable), they must ensure that the timber is preservative pre-treated prior to installation to Use Class 3 in accordance with BS 8417 recommendations.

It is important to note that the sapwood content of timbers is non-durable, irrespective of species, and if present it requires preservative pre-treatment. Therefore, care must be taken in the selection of timber species for cladding - see Table 1 opposite.

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**Table 1. A summary of commonly used species for external cladding.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Natural Heartwood Durability</th>
<th>Average Service Life Unrefracted BRE BRE2</th>
<th>Sapwood Treatability</th>
<th>Heartwood Colour</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Red Cedar</td>
<td>2</td>
<td>15-25</td>
<td>3</td>
<td>Dark red</td>
<td>Normally free of sapwood</td>
</tr>
<tr>
<td>Iroko</td>
<td>1-2</td>
<td>15-35</td>
<td>1</td>
<td>Yellow brown</td>
<td>Normally free of sapwood</td>
</tr>
<tr>
<td>Larch</td>
<td>3-4</td>
<td>5-15</td>
<td>2</td>
<td>Yellowish brown</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>Meranti</td>
<td>2-3</td>
<td>10-25</td>
<td>2</td>
<td>Light red yellow</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>Scots pine</td>
<td>3-4</td>
<td>5-15</td>
<td>1</td>
<td>Yellow brown</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>Spruce</td>
<td>4</td>
<td>5-10</td>
<td>3</td>
<td>White</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>European oak</td>
<td>2</td>
<td>15-25</td>
<td>1</td>
<td>Pale brown</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>Douglas fir</td>
<td>3-4</td>
<td>5-15</td>
<td>1-3</td>
<td>Reddish brown</td>
<td>May incorporate sapwood</td>
</tr>
<tr>
<td>White oak</td>
<td>2-3</td>
<td>10-25</td>
<td>2</td>
<td>Pale brown</td>
<td>May incorporate sapwood</td>
</tr>
</tbody>
</table>

1. According to EN 350-2 ‘Durability of wood and wood-based products – Natural durability of solid wood’ for heartwood, on a scale from 1 (most durable) to 5 (least durable). The sapwood of all species is not durable and must be preservative pre-treated in accordance with BS 8417.


3. According to EN 350-2, 1 is most permeable and easier to preservative treat; 5 is least permeable and harder to preservative treat.
Particular attention must be made to the CLADDING PROFILES

There are many types of timber cladding profiles available to the designer, which can have a significant visual impact on the building. Generally these fall into the following categories:

- Shiplap
- Square Edge
- Feathered Edge / Bevelled / Rebated Feather Edge
- Open Joint
- Tongued & Grooved (T&G)

Table 2. Cladding Profiles (extract from TRADA External Cladding 2nd edition, Hislop 2007)

<table>
<thead>
<tr>
<th>Board Profile</th>
<th>Minimum Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shiplap</td>
<td>19mm</td>
</tr>
<tr>
<td>Square Edge</td>
<td>8mm thin end</td>
</tr>
<tr>
<td>Feathered Edge</td>
<td>8mm thin end</td>
</tr>
<tr>
<td>Rebated Feather Edge</td>
<td>8mm thin end</td>
</tr>
<tr>
<td>Open Joint</td>
<td>19mm</td>
</tr>
<tr>
<td>Tongued and Grooved</td>
<td>22mm</td>
</tr>
</tbody>
</table>

Please note: In Irish conditions the preferred cladding profiles would be shiplap and square edged.

Table tonnes of CO₂ can be saved by using timber frame from the 20 tonne CO₂ footprint of a typical 3 bedroom detached house. Increasing the timber content, including softwood cladding, can reduce the footprint to 2.4 tonnes – a total reduction of 17.6 tonnes CO₂

TIMBER CARBON FOOTPRINT

Widespread concern about global warming and carbon dioxide (CO₂) emissions has led to growing interest in understanding and measuring the level of emissions associated with a wide range of human activities. One approach has been the development of a carbon footprint which attempts to assess emissions associated with each stage of a product during its life cycle. Assessing the carbon footprint of any material is complex and factors to consider with timber include:

- Harvesting of logs and transport to sawmill
- Primary processing at the sawmill
- Transportation to point of manufacture
- Secondary processing in the factory

Three tonnes of CO₂ can be saved by using timber frame from the 20 tonne CO₂ footprint of a typical 3 bedroom detached house. Increasing the timber content, including softwood cladding, can reduce the footprint to 2.4 tonnes – a total reduction of 17.6 tonnes CO₂.

When specifying timber treatments, the following text is recommended:

"Preservative treat timber to Use Class 3 in accordance with BS 8417:2003, using a suitable preservative for that Use Class. That any cut ends with an appropriate end grain treatment or preservative treatment process to determ ine the suitability and effective retention of products for use in the relevant Use Class."

Preservative pre-treatment recommendations for timber cladding are detailed in the publication ‘Talking Timber No. 6’ (www.wood.ie).

W O O D  M O D I F I C AT I O N

Wood modification is defined as the application of a substance or process to wood which results in a permanent change in the properties of the substrate. Permanent is defined as the design lifetime of a component made from modified wood. The concept of wood modification has moved from an interesting research programme to commercial reality. This advancement has been linked to the need to find ways of increasing some of the properties of wood such as durability and dimensional stability. For further information and guidance on wood modification the BRI Digest DG 004 should be consulted.

DESIGNED SERVICE LIFE

Only a 30 year desired service life needs to be considered when specifying timber cladding as this is the common length of service.

DESIGNED SERVICE LIFE

The detailing of the timber cladding, including flashings, trimming pieces, corner details, etc., must be carefully designed to avoid unsightly staining, uneven bleaching and trapping of moisture.

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CLADDING DETAILS

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affected by moisture penetration and retention. Detailing of the substrate and the ventilation of cavities behind timber cladding should be designed to allow the back and face of the timber cladding to dry out at similar rates. All timber cladding should be installed with a ventilated cavity to allow the cladding to dry out evenly. Equilibrium moisture content will vary depending on the time of year and atmospheric conditions. All timber used for exterior cladding should have a moisture content at equilibrium which can lead to adverse effect on timber cladding. Unfinished timber will vary rapidly in moisture content which can lead to the development of one of the many moulds that deface external timbers in a moist climate. Therefore, where unseen bleaching of timber may be an issue, surface finishing must be provided to best practice standards. Ideally this should be in the form of a pre-finished timber board. However, if on-site application of coatings is the chosen option, this must take place before the cladding is erected as the coating must be applied to the front, back and sides. Normally at least three coats should be applied on all sides with a third coat being applied after installation. A more uniform finish will be achieved if coatings are applied by spray. Specialist end grain sealants must be used on all end grain surfaces. Coatings should not be applied if (1) the moisture content of the wood is above 25% (2) the air temperature is below 10°C or (3) relative humidity is above 85%. These weather conditions do not favour site application at all times and therefore a factory or pre-finished board is favoured. The coating supplier should prove compliance of the proposed coating system according to the requirements outlined in EN 927-2. When a surface coating is selected, technical advice must be obtained from that coating supplier in terms of:
- the specific coating most suitable for some exterior cladding on a building in a particular location to achieve the desired life
- how the coating should be applied (spray, brush, roller, factory-finish, site application, etc.)
- the number of coats
- a maintenance schedule
- guidelines on application conditions

This approach will ensure that the timber cladding retains its colour and prolongs the life expectancy of the cladding system in the building.

There are a number of types of exterior surface coatings/finishes for cladding.

The correct application of surface coatings will dramatically reduce the moisture movement in external wood cladding, creating a stabilising effect. In addition the correct choice of coating will give protection from the damaging ultra violet (UV) rays from the sun. This protection is provided by pigments in the coating system. Clear finishes will give minimal protection and will need more frequent maintenance. The durability of pigmented coatings will depend on the shade used - dark shades will have better durability than light shades. Maintenance of coatings of this type will be in the region of 3-7 years when applied in accordance with manufacturers’ instructions. Thinner opaque paint colours will give the best protection, often giving 8-10 years to first maintenance.

SITE APPLIED COATINGS

Both water-based and oil-based coatings can be used to finish cladding on-site. It is recommended that all six sides receive at least two coats. When using a pigmented finish, three coats of a low build surface coating is required. Consideration should be given to the time of year when finishing is to be done and the oil content of the timber. For example, oily timber will delay the drying of oil based coatings. Also, when coated with water based finish, the air temperature will be a factor. Guidance should be sought from the coating manufacturer to identify the specific product to be used to achieve the desired finish and durability.

FACTORY FINISHED CLADDING

Factory finished timber cladding is now widely available in Ireland. This cladding will be finished and dried in controlled conditions using the correct materials. The range of finished cladding includes:
- hot oil treatment with a pigmented coating
- solvent based / water based coatings with machine applied base coat
- full finish via machine applied coatings

Details can be found from your cladding supplier, timber merchant or specialist joinery manufacturer (with coating application facilities).

METHODS OF FIXING

Methods for fixing of timber cladding will depend largely on the board profile and species of timber selected. This will also depend upon the substrate onto which the timber is being fixed. Typical fixing methods include nailed fixing, clips, screw and plug fixings and direct nailing of ring shank nails. However, in all situations, relevant codes of practice, standards and good practice guidelines should be followed in regard to fixings. It has been clearly demonstrated that a plain steel or galvanised nail or screw fixing will lead to rust staining on the face of the timber cladding, and MUST NOT be used in any circumstances for fixing external timber cladding.

Authentic stainless steel has been proven over time to be the superior fixing material for timber cladding. Please refer to www.woodspec.ie for further information.

SURFACE COATINGS

Unprotected timber cladding will bleach over time through exposure to sunlight, due to photo-degradation of its surface, and as a result of ultra-violet exposure. Urban pollution is considered to have an adverse effect on timber cladding. Unfinished timber will vary rapidly in moisture content which can lead to the development of one of the many moulds that deface external timbers in a moist climate. Therefore, where unseen bleaching of timber may be an issue, surface finishing must be provided to best practice standards.

Ideally this should be in the form of a pre-finished timber board. However, if on-site application of coatings is the chosen option, this must take place before the cladding is erected as the coating must be applied to the front, back and sides. Normally at least three coats should be applied on all sides with a third coat being applied after installation. A more uniform finish will be achieved if coatings are applied by spray. Specialist end grain sealants must be used on all end grain surfaces. Coatings should not be applied if (1) the moisture content of the wood is above 25% (2) the air temperature is below 10°C or (3) relative humidity is above 85%. These weather conditions do not favour site application at all times and therefore a factory or pre-finished board is favoured. The coating supplier should prove compliance of the proposed coating system according to the requirements outlined in EN 927-2. When a surface coating is selected, technical advice must be obtained from that coating supplier in terms of:
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This approach will ensure that the timber cladding retains its colour and prolongs the life expectancy of the cladding system in the building.

If coating application instructions are followed, external timber cladding will retain its durability and appearance in conjunction with a necessary maintenance schedule.