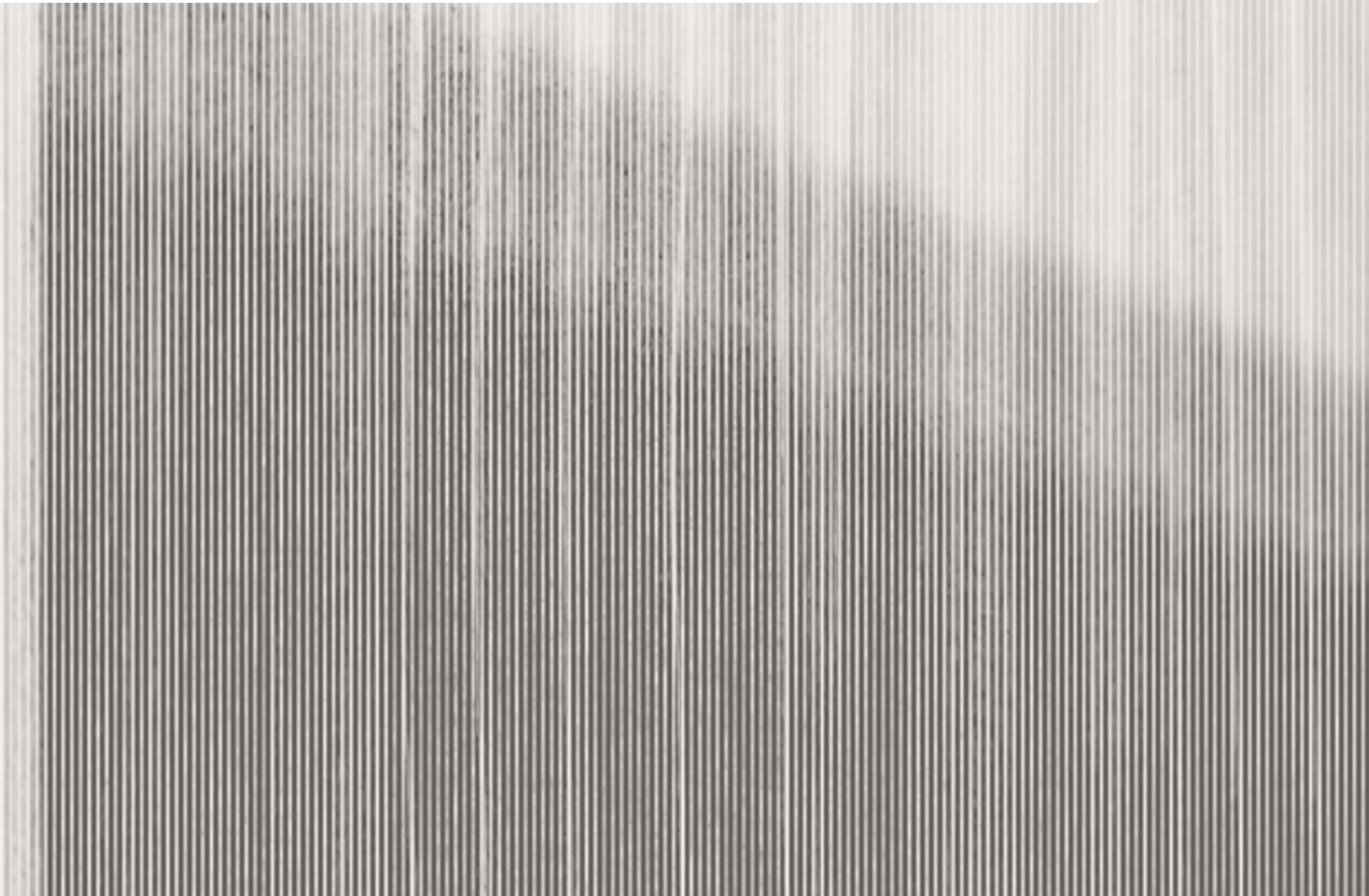
Vulcan Cladding

Design and Installation Guide



New Growth Feature Timbers

ABODO

Introduction

○ Overview

Abodo Vulcan® Cladding is a high performance natural exterior cladding product made from thermally modified New Zealand plantation timber.

The thermal modification process enhances stability, reduces resin content, creates a beautiful homogeneous brown colour, and is naturally durable so does not require any chemical preservatives (chemical treatment is required for termite zones).

Vulcan Cladding – Vertical Grain is laminated with a vertical grain orientation, enhancing the stability of the timber and allowing design possibilities previously unseen with many traditional timber species.

Design Scope

This document is suitable for use as an indicative guide for design, coatings and installation of Abodo Wood facade products in above ground exterior applications including cladding, rain screens and soffits.

This document is not an exhaustive list of requirements. It must be read in conjunction with local building codes and standards, certification body requirements, distributor installation documentation and project-specific architectural specifications, along with the latest Abodo Technical Data Sheets.

Prior to design and construction ensure compliance with specific local building regulations and consider specific site conditions.

Always consult with your local Abodo distributor for the most current and comprehensive installation information.

This Design Guide is intended for use in all markets aside from New Zealand, Australia and North America. For the North American market refer to the imperial version of this document – Abodo Vulcan Siding Design and Installation Guide – Imperial.

Vulcan timber is suitable for all climates, although local weather conditions play a significant role in shaping the aesthetics of a facade over time. Sun exposure, humidity, rainfall, wind, snow, and hail are the primary factors influencing the weathering process; and will contribute to the natural aging of exposed timber.

Vulcan thermally modified timber is not naturally resistant to termites, so must be treated for use in termite zones. Abodo offers well tested treatment options for these locations.

Product

Name	Abodo Vulcan Cladding – Vertical Grain
Grade	Select (refer to Abodo Appearance Grading Rules), equivalent to CE EN14915 Grade A
Species	New Zealand Radiata Pine
Treatment	Thermally modified 230° C
Durability	Class 1 (EN350-1)

Certification	Forest Stewardship Council® (FSC®) Certified FSC MIX, SGS-COC-004944
Moisture content	Approx. 7% MC (+/-2%) at time of dispatch. Moisture content may vary depending on environment
Interior VOC	CDPH Standard Method V1.1-2010 compliant
Environmental	ILFI Declare Certified – Red list free
Average density	420 kg/m^3

Hardness	Low (2.5kN Janka)
pH (indicative)	3.9
Thermal performance	0.095 W/(mK)
Fire	Class D-s1-d0 (EN13823 & BS EN 11925-2 (subject to specific design requirements)
Warranty	25 years against fungal decay (subject to pro-rated warranty terms)

Scope of Use

Cladding, rain screens and soffits in above ground exterior application. Interior linings, walls and ceilings.

Product Handling and Storage

- Cladding and accessories must be kept clean, dry, well-ventilated, under cover and out of the weather prior to installation.
- If moisture content is higher than 12% measures must be taken to allow the product to dry before installation.
- Timber must be stored horizontally on bearers at least 100mm off the ground in a well-ventilated area.
- Extra care must be taken during installation so as not to damage the factory finish of the boards.
- Wear a dust mask and eye protection when cutting timber.
- Wear cotton gloves when handling or installing the timber to avoid dirty/oily hand marks appearing post installation.
- Timber waste may be disposed of by reuse, landfill, mulch or incineration.
- If water has made its way into the pack, the wood must be dried before use. Open the timber pack and remove the packaging. Sticker the wood. Cover and leave to dry. Place it in an open location if during the summer. Wood that has warped should be discarded.
- Place the timber indoors with a construction fan if it is a cold time of year. Check the moisture content and the surface moisture content before the wood is to be used.

Contents

Design Considerations

Design Detailing

Prior to design and construction ensure compliance with specific local building regulations and consider specific site conditions.

The external cladding assembly is positioned in the wet zone of the external wall.

Cladding is installed over a drained and ventilated cavity, vented at both the top and bottom.

When designing cladding systems always consider the 'Four D's':

- **Deflection:** Ensure water is deflected away from the critical junctions in the cladding.
- **Drainage:** Allow any water that penetrates the exterior cladding to be drained back out of the wall assembly.
- **Drying:** Not all water will drain within a wall assembly therefore water must be allowed to drain off the face of the building.
- **Durability:** All components of the wall assembly must be of suitable durability for the local conditions and building code requirements.

Environment

Environment is without a doubt the most critical factor when designing timber exteriors. The extent of exposure to weather will dictate the life and condition of timber. Ultraviolet (UV) rays and driving rain cause weathering of exterior timber.

Different geographical zones have different challenges. Southern hemisphere countries like New Zealand and Australia have extremely high UV levels, approximately 40% higher than North America or Europe. Southeast Asian countries have higher humidity and rainfall, combined with termite risk.

○ Vodafone Christchurch – Vulcan Cladding in Protector – Teak. Designed for easy maintenance.

Eaves

In exposed applications larger eaves will protect timber cladding and joinery elements from rain and reduce the amount of UV exposure.

Orientation

Using timber components that are less exposed to the prevailing weather will reduce the maintenance required and increase the timber's lifespan.

Southern Hemisphere

Generally North and Western orientations receive the maximum weather, shelter these areas where possible.

Northern Hemisphere

Generally South and Eastern orientations receive the maximum weather, shelter these areas where possible.

○ Shown here – Western Red Cedar. North facing dark colour fading and uneven erosion due to grain orientation.

Prevailing Winds

Strong prevailing winds, particularly on coastal sites can blow sand and other abrasive substances onto timber facades causing surface damage. Design to shelter exterior timbers from these conditions.

Wood Weathering

All wood when exposed to the weather if left uncoated or clear coated will change to silver grey eventually. For thermally modified timber this lightening process will happen more rapidly than many other traditional timbers. Some surface checking (cracking) and dimensional movement can be expected as part of the weathering process. Application of a coating will enhance the aesthetic performance of the wood over time.

Where a natural brown colour is desired, a translucent brown pigmented coating should be used. By using darker wood finishes, maintenance requirements by way of re-coat period will generally increase. Highly exposed orientations should be designed for easy access for re-coat.

On exposed high elevations, choose wood coatings that are more durable, such as paint finish, reactive or silvering erosion stains. Lighter colours and shades of grey allow the timber to age gracefully in highly exposed applications so are preferable here.

See coatings section for more information.

○ Uneven weathering of uncoated Western Red Cedar.

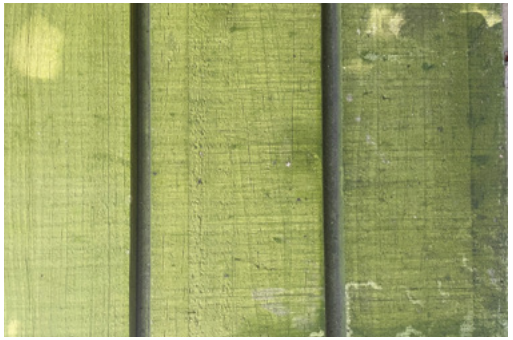
Moisture Humidity and Mould

Fungal decay and mould are the enemy of exterior wood. Though quite different things, both fungal decay and mould thrive in warmer, wet environments that are rich in plant life.

Mould

In many cases a black discolouration referred to as mould can affect exterior timbers. This discolouration can affect new or weathered wood and is generally caused by a black form of yeast fungus identified as Aureobasidium or Hormonema, although there are many other different types.

○ Surface mould (black mould) – Larch.



○ Surface mould – green algae (Radiata Pine).

Mould growth is distinct from fungal decay in that mould is a purely aesthetic issue, whereas fungal attack can cause damage to the wood leading to structural failure of the product. These organisms live on the natural sugars present in wood, as well as the breakdown products through delignification. Typically, such surface yeasts require exposure to moisture and sun to grow.

It is recommended to choose coatings that contain mouldicides to reduce mould growth particularly in wetter applications. If they are not removed early on in their growth, mould can set into the timber, become more difficult to clean off and lead to early failure of coatings. Organic based oils such as linseed oil, danish oil, soy oil and lanolin should be used with care as they can provide food for mould fungi.

Mould or algae growth should be cleaned off as soon as it occurs using a wood cleaner. Regular cleaning of the facade and use of a slow release mouldicide will help prevent mould growth on-going.

See maintenance section for more information.

○ Installation details are critical

- Detail sufficient ground clearance, ideally 150mm or more above ground level for cladding.
- Carefully detail end joints and exposed end grains, these should be detailed with adequate ventilation and protection, and/or sealed with a high solids end seal, to help reduce moisture uptake and reduce decay.
- Drip lines on all exposed vertical cladding ends should be created by cutting a 15° mitre. This is also known as a ‘weathering cut’.
- Allow minimum 8mm clearance to adjacent materials and sloped flashings.
- In humid environments more regular cleaning will be required to prevent mould growth, consider wood cleaners with long-acting biocides such as BAC (benzalkonium chloride).
- Ensure applied coatings have an active mouldicide in them.

Plants

Plants and trees located too close to cladding can lead to damage to the cladding over time as the leaves or branches move in the wind and rub against the timber surface. Trees can also drop leaves in gutters causing blockages and overflow of rainwater leading to unplanned water ingress into the cladding system or discolouration of the surface.

It is important to ensure plants and trees are planted with an appropriate gap to walls and roof lines and that they are maintained regularly by trimming back.

○ Plant damage to walls.

Marine Environments

In many instances timber is a great product for marine environments as it does not rust.

However marine environments have their own specific challenges, namely high UV, salt spray, sand and abrasive winds. Surface erosion or mechanical weathering from wind borne salt and sand, along with plant life can put additional pressure on wood, surface coatings and fixings.

Timbers should be orientated to minimise exposure and additional details should be considered:

- Concealed fixings in stainless steel should be considered, even stainless steel and silicon bronze can oxidise and this can create an unsightly stain on exposed timber.
- In marine applications use stainless steel fasteners in T316/ A4 grade from reputable manufacturers.
- More durable coating systems should be considered including acrylic paints, or low maintenance natural wood finishes such as grey erosion stains. Acrylic paints should be less than 39% solids and applied over an alkyd based primer.
- Acrylic paints must be maintained, as flaking may cause moisture entrapment, eventually leading to premature decay.

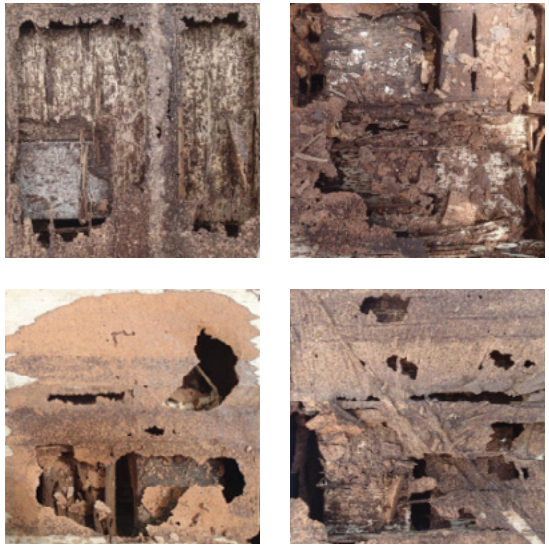
Insect Attack

Termites

Certain geographical zones have wood destroying termites. Termites are known to do severe damage to wood. Termites often burrow into the timber, eating the wood from the inside out, often serious damage is done before anyone is aware. As Vulcan is not termite resistant, a preservative treatment system must be used.

Particular care must be taken to apply an end seal containing appropriate termiticide chemical. Use of termite barriers around the base of the building and/or entry points should also be considered. Design should allow for a full visual inspection around the perimeter of the building.

Abodo offers a number of termite treatment options depending on the geographical location. Please check with an Abodo distributor for the most suitable treatment options.



○ Internal termite damage – untreated Pine.

Paper Wasps and Other Scraping Insects

Paper Wasps and other insects such as Carpenter Bees can be known to create superficial damage to timber cladding and coatings. This can appear to be a failing of the timber coating, but it is often the result of scraping from insects or small holes. In particular the Asian, Chinese or Japanese Paper Wasp, with its subspecies.

Paper Wasps build nests around houses. By scraping and chewing wood into a workable pulp, paper wasps make paper type nests in the shape of an umbrella for protection – they literally make paper – hence the namesake.

These nests are typically constructed in protected locations including in bushes, trees, ceilings, window and door frames, roof overhangs, and under decks or joists. The queen deposits eggs in the comb on the underside of the nest.

○ Paper wasp damage.

Few softwood timbers appear to be immune from Paper Wasp attack, and although they are unlikely to make any structural damage to the timber, the result is unsightly.

Paper Wasp attack is very difficult to stop – it is nature at its best. Some results have been achieved by mixing insecticides into the coating to provide some repellency.

Spraying an insecticide on top of the cladding may provide some temporary protection, but this will eventually be washed off the surface of the wood.

Film forming or high build surface coatings can also help prevent surface grazing from paper wasps.

Fire

Wood has good thermal insulation properties, high structural strength and a slow charring rate, so its general behaviour in a fire situation is fairly predictable.

Vulcan timber has been tested and conforms to Class D-s1-d0 (EN13823 & BS EN 11925-2) – note design and installation of the cladding system must be in accordance with relevant test report documentation and EN14915. Specific profiles and installation details may apply. Please enquire with Abodo prior to specification.

However, in areas where the consequence of fire is greater, for example in public buildings such as cinemas, theatres, libraries, schools, offices, hotels and hospitals and bush fire zones, building regulations are in place governing the use of performance rated, flame retardant building products.

Flame Retardants (FR) generally work by reducing the surface spread of flame, heat and smoke release, providing vital extra time for a safe escape.

Where building regulations or fire assessments stipulate a need for fire protection of timber cladding, we recommend pre-treatment with a quality assured pressure impregnated, leach resistant flame retardant applied by a processor approved by the product manufacturer.

Abodo offers Vaaro® fire retardant treated timber that conforms to Class B-s2-d0 (EN13823 & BS EN 11925-2) EXT (EN16755).

Fire systems are outside the scope of this guide. Please check with the distributor for available FR treatment and installation requirements prior to project specification.

Always seek and adhere to up-to-date national guidance on fire regulations and standards.

Dimensional Movement

Wood is hygroscopic, meaning its moisture content is affected by changes in temperature and relative humidity of the surrounding environment. This results in movement across the grain of the timber.

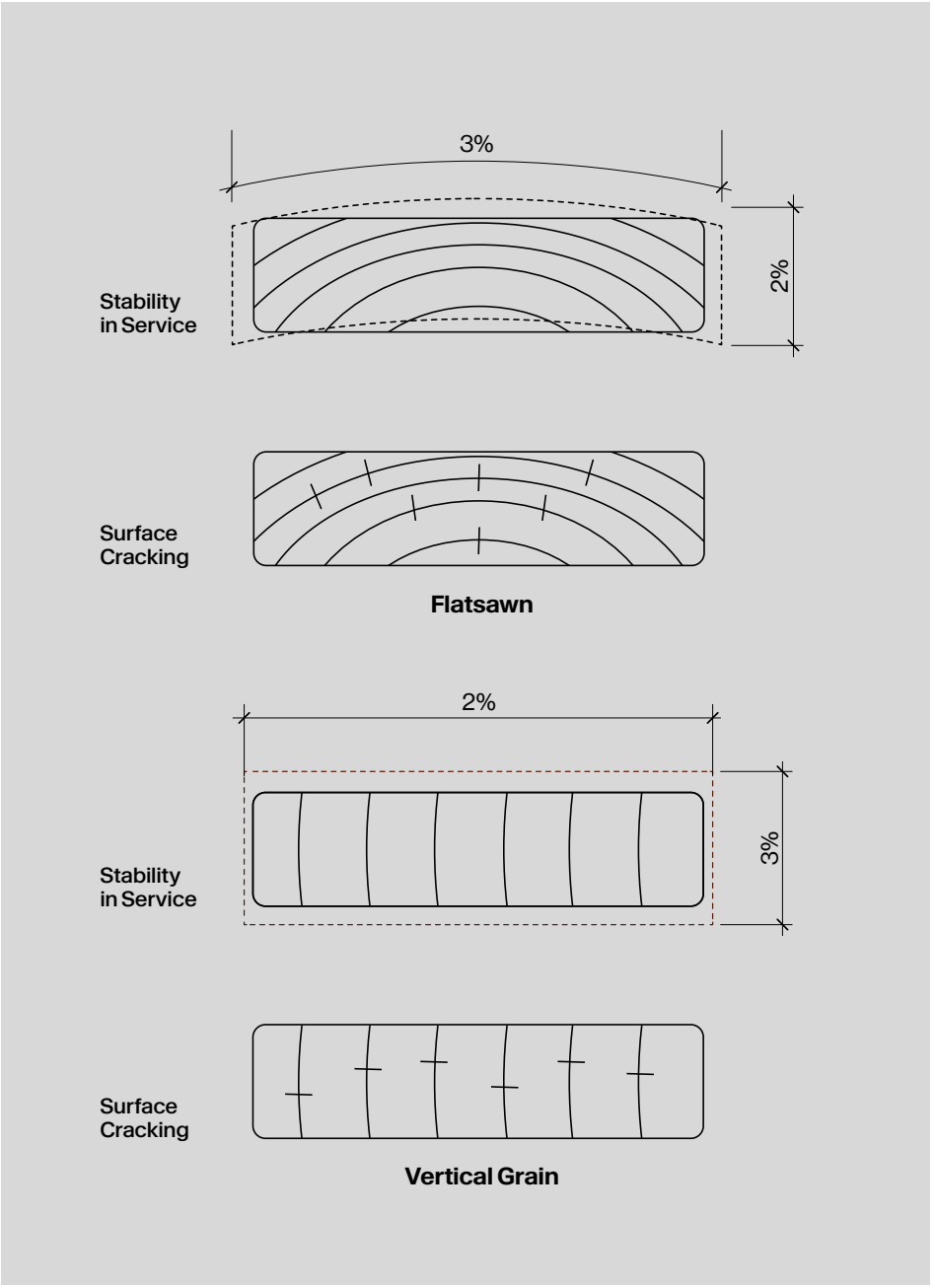
Variation in timber moisture content, density and grain orientation can influence the amount of movement in service. Shrinkage may result in cladding boards pulling apart and becoming unstable or, exposing uncoated timber on cladding that has been painted or stained after installation.

Expansion coupled with inadequate movement gaps during installation can result in boards bowing or pulling away from their fixings.

Vulcan is classified as a 'small' movement timber. The thermal modification process results in a physical change to the timber and significant lowering of the equilibrium moisture content (EMC) compared with regular kiln dried timber. This reduces the ability for the wood to expand and contract in service.

It can be expected that Vulcan timber will expand when wet by approximately 3% tangentially (parallel to growth rings) and 2% radially (perpendicular to growth rings).

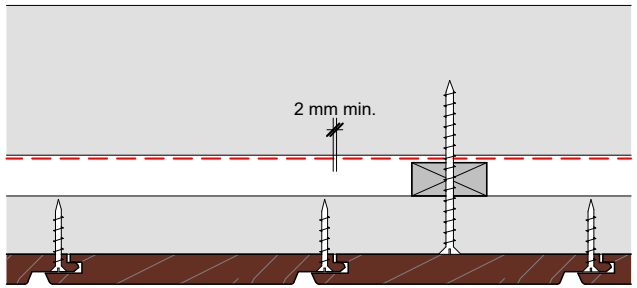
It is recommended that cladding is designed and installed to allow for an expansion gap between boards. The expansion gap will vary depending on the width of boards.



○ Natural stability of Vulcan Vertical Grain timber – grain orientation.

Generally, a minimum 2mm gap should be left between edges at the back face of T&G or shiplap boards in closed joint cladding, or 5-10mm between the board edges of open joint cladding.

Cladding should always be kept dry prior to installation and installed at the supplied moisture content to ensure dimensional correctness and uniformity.



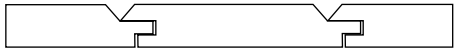
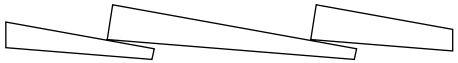
○ Install with expansion gap between edges.

○ Boards bowing or pulling away from their fixings.

Profile Design

Vulcan timber can be machined into a wide array of profiles to suit a wide array of design aesthetics. The below represents the main cladding types.

Dimensions and styles can vary between suppliers. Please check with your local distributor for their standard offer and associated specific fixing instructions.

Profile type	Cladding joint	Recommended orientation			Typical board width	Minimum thickness
		Horizontal	Vertical	Diagonal		
Shiplap 	Closed	✓	✓	✓	90-180mm	18mm
Tongue and Groove (T&G) 	Closed	✓	✓		90-180mm	18mm
Bevelled/Feather edge 	Closed	✓			140mm	Thin end minimum 9mm. Thick end 16-25mm
Batten 	Open (Closed for board-on-board design)		✓		65-180mm	18mm
Rhombus 	Open	✓	✓		65-180mm	18mm

○ Cladding profile design tips

- Horizontal profiles should be designed with a bevelled edge to shed water.
- Paint or film-forming coated profiles must have 2-3mm radius to edges to reduce stress on the coating in-service, film forming coatings are normally suited to a smooth face finish.
- A textured, bandsawn or brushed face is recommended for stain-coated cladding profiles.
- A minimum 2mm expansion gap should be allowed for in T&G and shiplap profiles to accommodate dimensional change when wet.
- Minimum 20mm overlap is recommended to all closed in cladding profiles, aside from T&G that may be 10mm.
- 8-10mm edge gap is recommended between open-joint cladding profiles.

Installation

Wall Build-up – Ventilated Cavities

The fundamental aspects of installing cladding can be broken down as follows:

- The external cladding assembly is in the wet zone of the external wall.
- Cladding is fitted over a drained and ventilated cavity, vented top and bottom.
- A breather layer separates dry and wet zones.

Framing

Timber framing must comply with relevant local standards and building regulations. In general timber should be of a structural grade and kiln dried to maximum 14% moisture content.

Steel framing or masonry may also be used according to manufacturer's specification and local building regulations.

Insulation

To achieve a required thermal performance, it might be necessary to add an insulation layer to the outer face of the backing wall but behind the timber cladding assembly.

- The insulation should be either: rigid, fixed to the backing wall and able to carry the cladding battens directly or be carried within a framework of timber battens or I-joists in a double layer arrangement to prevent thermal bridging.
- The insulation layer should be no more than 100mm thick unless the support assembly is designed to take lateral loads.
- If used, insulation should be firmly fixed and properly supported.
- Joints between adjacent pieces of insulation should be tight, with no gaps greater than 5mm wide.

Sheathing

Sheathing is a rigid sheet material fixed to a frame and will provide racking resistance against lateral loads such as wind.

If placed in a wet zone, the sheathing must be water-resistant.

The thickness of the sheathing generally ranges from 9mm to 18mm, depending on the expected lateral loads.

OSB3 (oriented strand board) may be used as sheathing, though water-resistant plywood or fibre cement can also be used.

Consult with manufacturer's specifications and instructions for correct install details.

Breather Membranes

Cladding must be fixed over a waterproof, vapour permeable breathable membrane or another suitable waterproof substrate, such as masonry or concrete.

When using concrete or masonry, a membrane is normally not necessary.

Waterproof membranes should have a minimum permeability greater than 0.25 MN·s/g and less than 0.6 MN·s/g, with overlaps of at least 5cm on horizontal joints and 10cm on vertical joints.

For open joint cladding systems (rainscreen and rhombus/ parallelogram), a UV-resistant membrane is required.

Install a self-sealing nail point tape made of butyl or closed-cell polyethylene between battens and breather layer to ensure that the membranes are completely sealed at the points where support battens screws pass through the membrane.

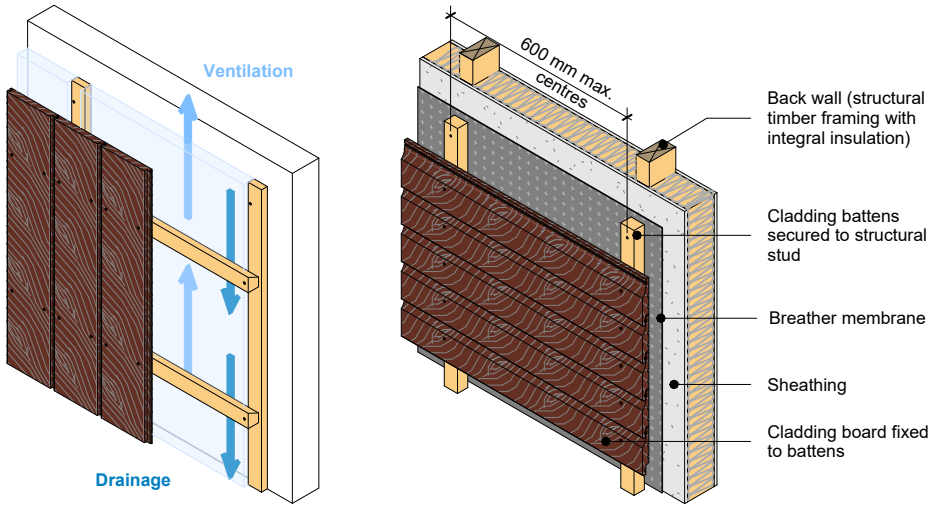
Cavities

Timber cladding provides a form of weather protection. But not all wind driven rain will be deflected, so a well-ventilated, free draining cavity should always be included in the detailed design.

Open at the top and bottom to allow through ventilation, a cavity channels any moisture that might enter, back to the building's exterior. By using a series of timber battens, a cavity between the cladding and the backing wall structure can be created.

- Whilst cavity ventilation only needs a minimum gap of 10mm, the depth will be dictated by the thickness and arrangement of the battens.
- Fit insect mesh to all openings to prevent access by small mammals and large insects into the cavity (you cannot effectively exclude very small insects).
- Metal vermin mesh is needed at the base of all cavities near the ground for closed joint cladding.

○ Drainage and Ventilation



Cavity Battens

Timber cladding must be fixed to timber battens, which are secured to the backing wall, creating a drained and ventilated cavity. This cavity separates the outer cladding from the structural substrate, allowing for effective moisture control and ventilation.

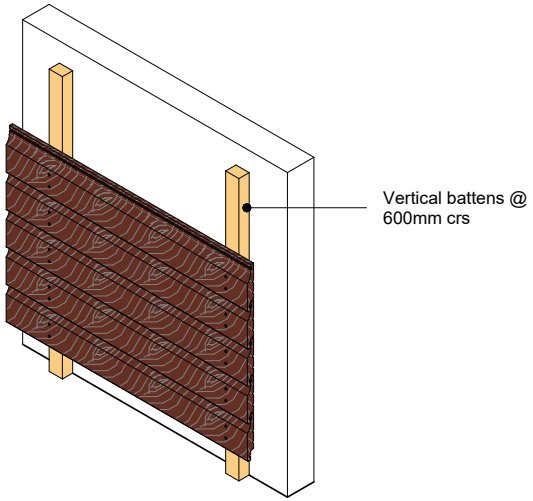
Timber cavity battens must be made from minimum Class 3 pressure-treated kiln dried softwood, or minimum natural Durability Class 2 (EN350-1) structurally graded timber to ensure durability and resistance to decay. Vulcan thermally modified timber battens may also be used for this purpose.

An alternative to a wholly timber batten support assembly is a proprietary metal framework or timber support battens carried on metal brackets. In both instances, the installation can be designed by the framework/bracket supplier. Steel must have suitable durability and performance specifications for exterior structural use.

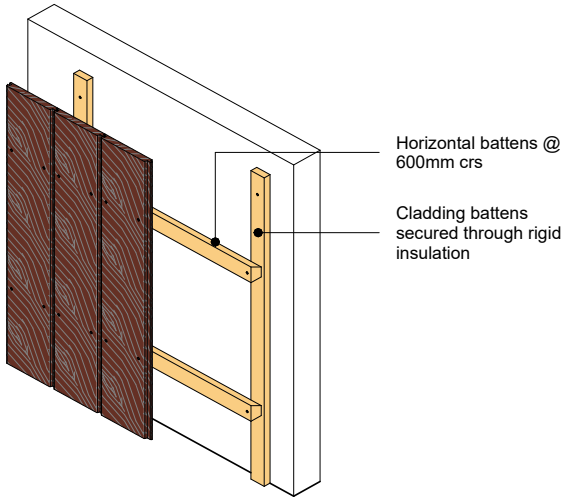
Horizontal cladding is fixed to vertical battens allowing water to run off easily and promoting airflow behind the cladding.

Vertical cladding is fixed to horizontal battens with a 10-15° angle applied to the top to shed water. Since horizontal battens can obstruct water drainage and ventilation, vertical counter-battens are installed behind them to create a gap for moisture control and airflow.

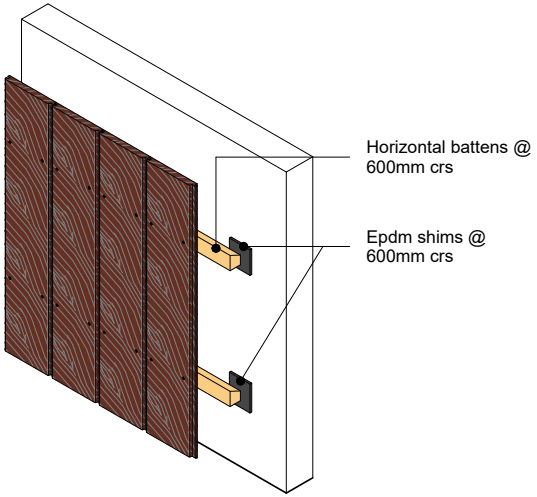
○ Horizontal Cladding – Vertical Battens



○ Vertical Cladding – Horizontal and Counter Battens



○ Vertical Cladding – Horizontal Battens and EPDM Shims

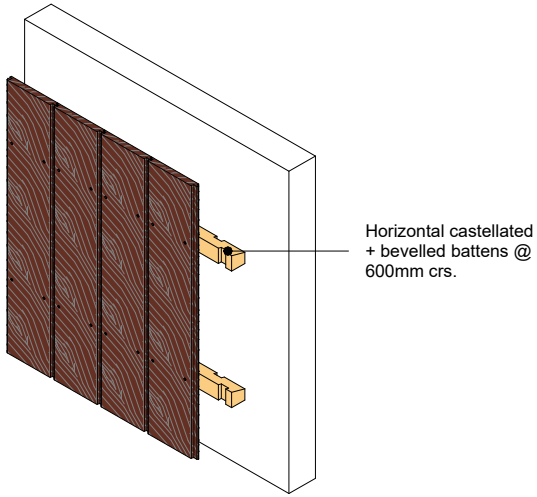


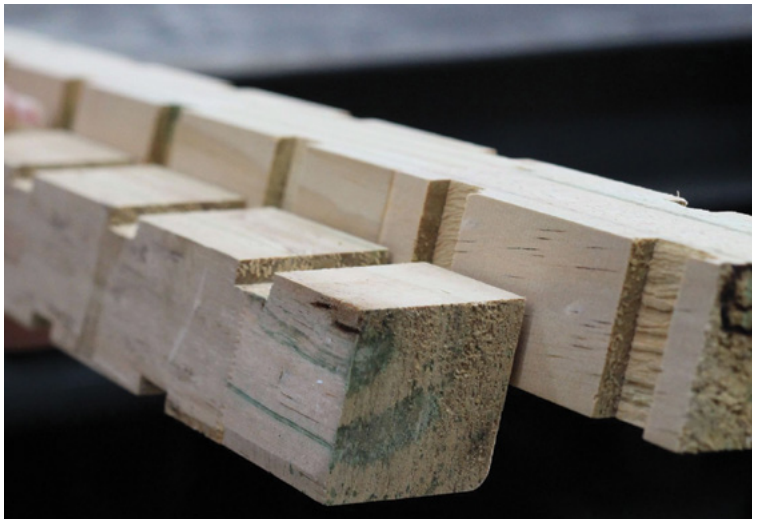
Alliteratively EPDM (Ethylene Propylene Diene Monomer) rubber Shims with minimum 10mm thickness may also be used at each batten fixing point in the place of vertical battens to achieve the same effect.

An alternative method may use a proprietary castellated and bevelled horizontal cavity batten with grooves machined into the face and back of the batten. This type of cavity batten allows movement of air and moisture through the cavity without the need for a vertical counter-batten.

Castellations (grooves) must be minimum 5mm deep and 20mm wide, set at 100mm centers and offset both sides of the batten to achieve a mimimum ventilation area of 1,000mm^2 per lineal meter. The top must be bevelled at a 10-15° angle to shed water.

○ Vertical Cladding – Horizontal Castellated Battens





○ 45x45mm horizontal castellated cavity batten.

Fixing Cavity Battens to Sheathing

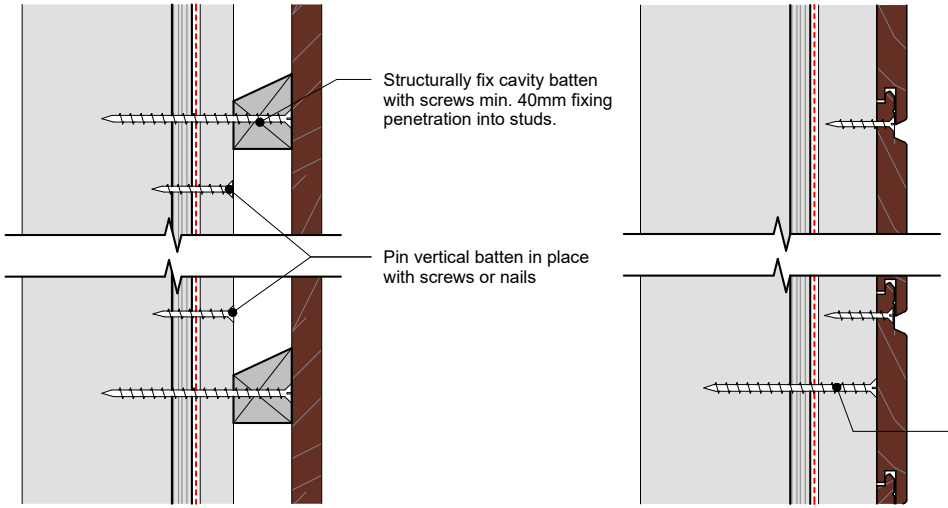
All too often more attention is given to how the cladding is attached to the battens when in fact attaching the battens to the wall is more critical, since these are exposed to the full wind load whilst wind loads on the cladding layer are generally far lower.

Minimum hot dipped galvanized corrosion resistant fixings should be used to fix cavity battens. Stainless steel 304 (A4) or 316 (A2) fixings must be used in areas near the sea.

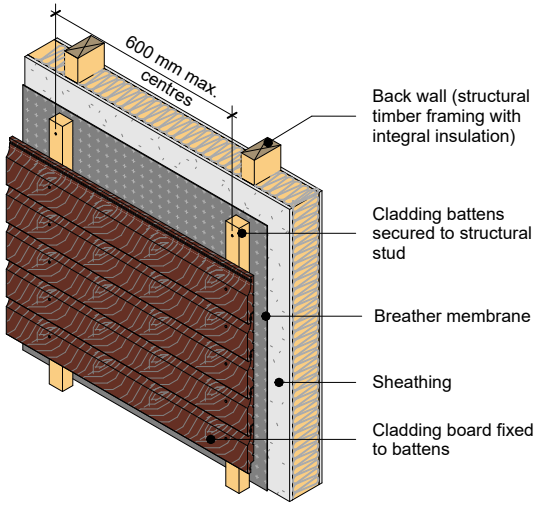
Batten spacing requirements may vary in certain areas depending on wind-loading or engineering requirements. Always check specific batten spacing as required for compliance with local building regulations or site-specific specification documentation.

If the backing wall is masonry, connections between the cladding support battens and backing wall need to be designed by a structural engineer.

○ Cavity Batten Fixing



○ Horizontal Cladding – Vertical Battens



Vertical timber battens must have minimum dimensions 35mm thick x 45mm wide and be spaced at maximum 600mm centres, or maximum 400mm centres if fixing cladding diagonally.

Fix battens off structurally to studs with 10g bugle head screws staggered along the batten at maximum 600mm centres and with minimum 40mm fixing penetration into studs.

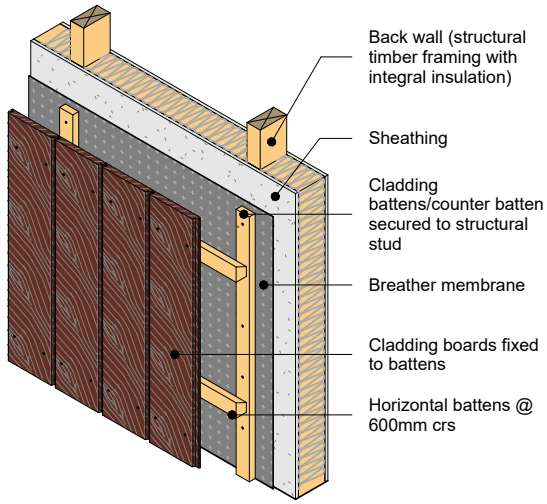
Vertical Cladding – Horizontal Battens with Counter-battens

Vertically fix minimum 18mm thick x 45mm wide timber counter-battens spaced at maximum 600mm centres to match stud spacing. Pin counter-battens in place with screws or nails staggered along the batten at maximum 600mm centres.

Shims made from EPDM rubber with minimum 10mm thickness at each horizontal batten fixing point may be used in the place of vertical counter-battens.

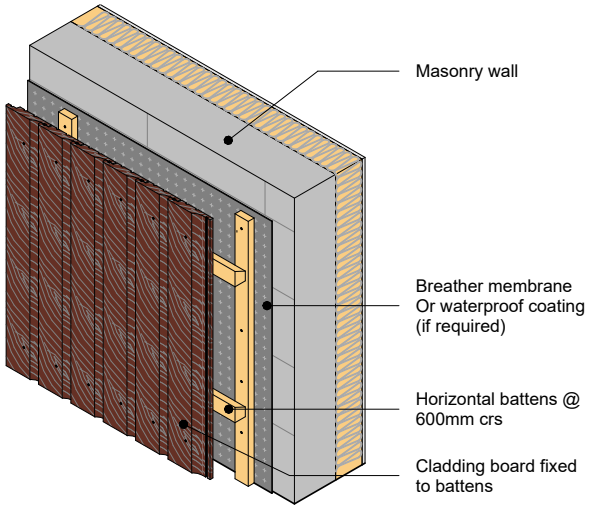
Horizontal battens must have minimum dimensions of 35mm thick x 45mm width and be spaced at maximum 600mm centres. It is recommended to apply a 10-15° angle to the top of the batten positioning the batten to shed moisture away from the back of the cladding and into the cavity. Fix horizontal battens off structurally with 10g screws staggered along the batten at max 600mm centres to match stud spacing through the counter batten/shim with minimum 40mm fixing penetration into studs.

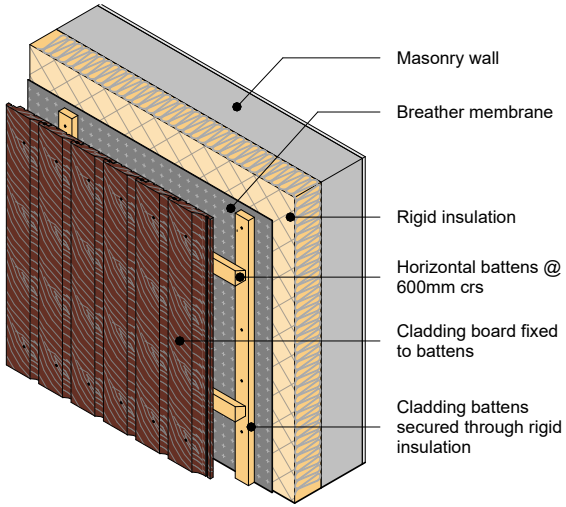
○ Vertical Cladding – Horizontal Battens

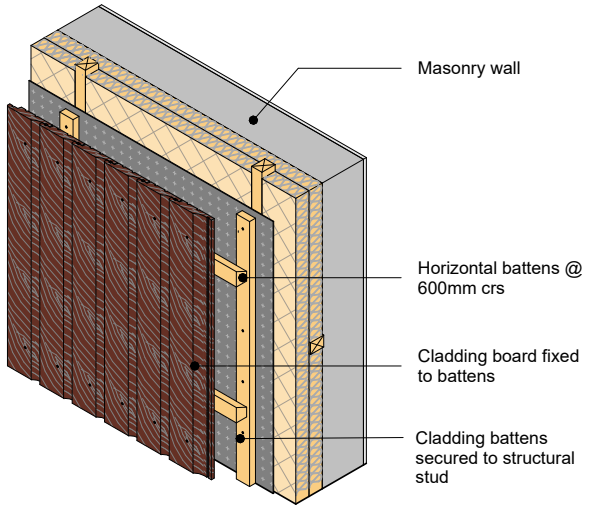


Masonry – Typical Installation

○ Vertical Cladding – Masonry







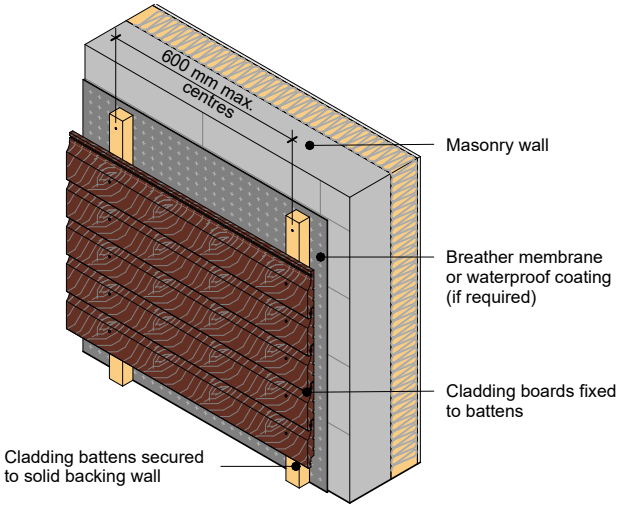
Vertical timber battens must have minimum dimensions of 18mm thick x 45mm wide and be spaced at maximum 600mm centres.

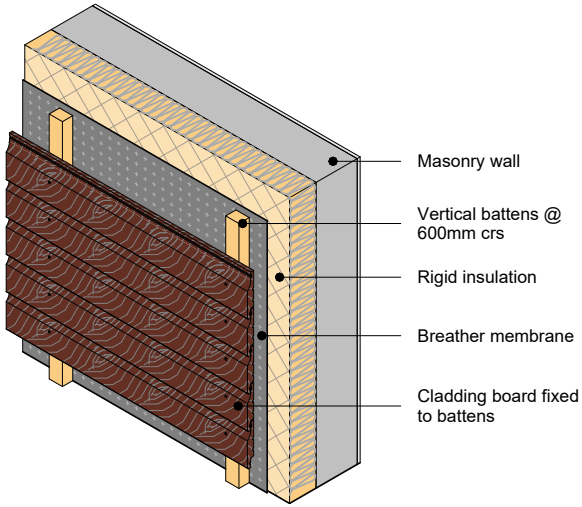
Shims made from EPDM with minimum 10mm thickness may be used in the place of vertical counter-battens if appropriate.

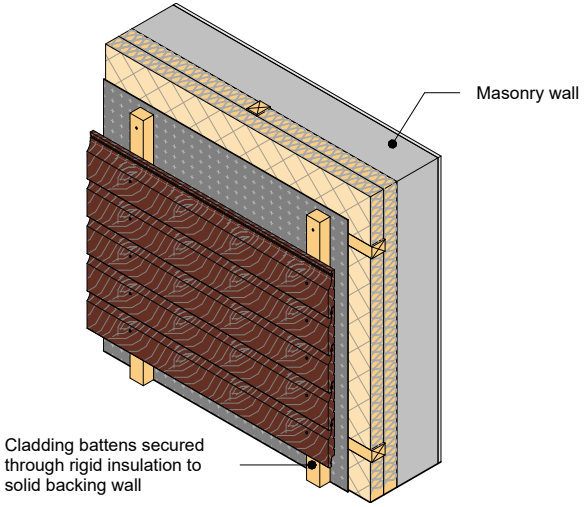
Horizontal battens must have minimum dimensions of 35mm thick x 45mm width and be spaced at maximum 600mm centres. It is recommended to apply a 15° angle to the top of the batten positioning the batten to shed moisture away from the back of the cladding and into the cavity.

Fix horizontal battens off structurally through counter batten and into masonry substrate with masonry fixings staggered along the batten to match the vertical batten spacing. Sizing, type and placement of fixings must be made by an engineer and will vary depending on the wall build-up.

Horizontal Cladding – Masonry







Vertical timber battens must have minimum dimensions of 45mm thick x 45mm width (structural battens) and be spaced at maximum 600mm centres.

Fix battens off structurally to masonry with masonry fixings staggered along the batten. Sizing, type and placement of fixings must be made by an engineer and will vary depending on the wall build-up.

Fire Cavity Barriers

Minimising the Risk of Flame Spread

Cavities in the external wall of any building can act as a chimney and provide an easy route for flame, hot gases and smoke to propagate from one compartment of a building to another. Unsealed cavities can allow air to be drawn in and smoke to vent out, enabling the fire spread to accelerate through the façade.

By utilising carefully selected vertical and horizontal cavity barrier products to sub divide and compartment concealed cavities, the rapid spread of fire from one compartment to another can be prevented. The requirement for cavity barriers is determined by local building regulations and dependant on many factors including type of building.

Tips for creating cavity barriers within a timber cladding facade:

- The vertical barriers can be formed of timber battens at least 38mm thick.
- The horizontal cavity barriers must permit vertical through-ventilation except during fires and so can be formed using intumescent strips.

When exposed to high heat, intumescent strips are triggered to expand, closing any gaps to stop the fire spreading for a period of time. They usually come with either 30 or 60 minutes of fire resistance.

- Cavity barriers must be fixed back to solid construction, they should not just be fixed to the insulation. This might require secondary timber battens within the insulation layer to carry the cavity barriers.
- Attention must also be given to cavities around window and door openings.
- Check manufacturer's specification and installation instructions.

On matters regarding compliance with fire safety, always consult an architect and/or engineer to assure safety through design and adherence to current building regulations.

Fixing Cladding

For best results we recommend that only 304 (A2) stainless-steel fixings are used. However, for secret fix profiles where fixing heads are covered or when fixing cavity battens, hot dipped galvanised fixings may be used.

Stainless steel 316 (A4) fixings must be used in areas near the sea.

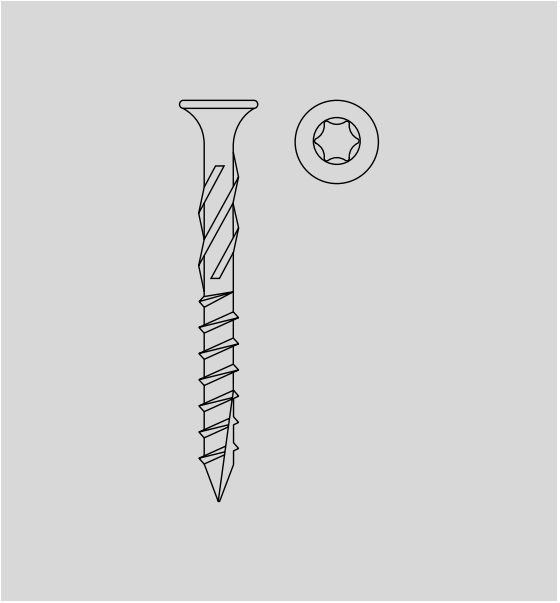
Take care to ensure compatibility of the fixing material with any other materials including flashings or battens that might lead to long term degradation such as galvanic corrosion.

Fixing Type

It is recommended to fix profiles with minimum 4mm diameter self-drilling, self-countersinking head screws designed for fixing timber to timber or to aluminium depending on material chosen for the cavity battens.

In general, fixing length must be sized to achieve minimum 30mm penetration into structural timber batten/stud or minimum of three threads deep into metal studs/battens.

Requirements for fixing type, penetration depth may vary depending on local building regulations, site, wind load and specific design requirements. Please check local requirements and project specification prior to construction.



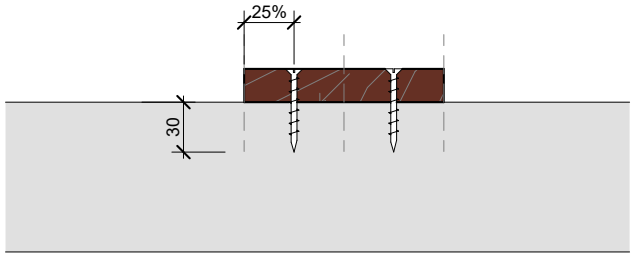
○ Abodo Cladding Screw.

Fixing Positions

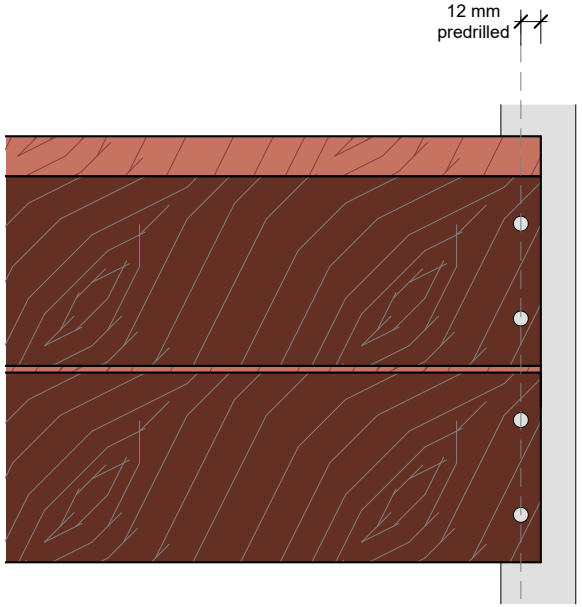
The risk of timber splitting and fixings 'pulling through' is minimised by the way you fix the boards to the battens.

- Through the face fixing is the most secure way to install timber cladding, ensuring fastener is flush with the surface.
- Use two fixings at each cladding board/batten intersection placed at quarter points of board width unless the board is less than 150mm wide (cladding) or less than 75mm wide (screening) when one fixing can be used.
- Fixings at ends of boards must be minimum 12mm from ends. Fixings less than 70mm from ends must be pre-drilled with a pilot hole 1/3rd smaller than the fastener diameter before applying the fastener.
- Due to the dimensional stability of Vulcan timber, secret fixed T&G cladding is possible. Extra care should be made to allow for expansion of timber when wet.
- For closed joint claddings fixings must be positioned clear of the overlap area. Do not fix through the lap area under any circumstances .
- Where concealed fixing of rainscreens is required, then boards may be back-fixed to counter battens or installed using a proprietary metal fastening bracket or support system. Concealed fixing systems are best used in the prefabrication of cladding panels.

○ Fixings Placed at Quarter Points



○ Minimum 12mm from Board End



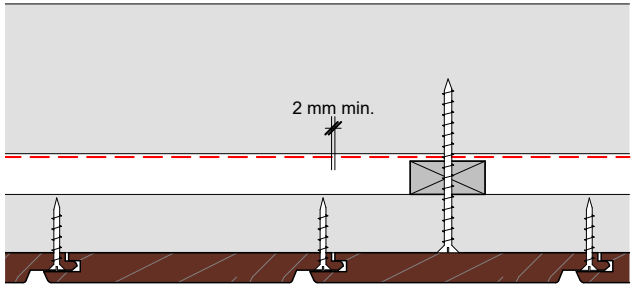
Fixing Vertical Cladding

If face-fixing, position fixing 10mm beyond the overlap (do not fix through the overlap), drive fixings so they are flush with the timber surface.

For secret fix T&G profiles, position the fixing minimum 12mm from the tongue edge drive fixings so they are flush with the timber surface.

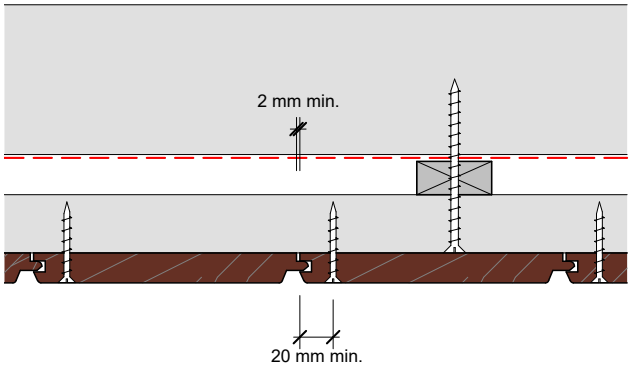
Ensure minimum 2mm expansion gap to back of boards.

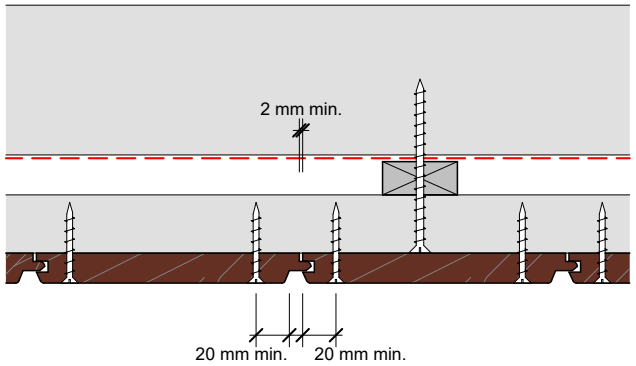
○ T&G Cladding – Secret Fixed



○ Vertical Grain Profiles <200mm width may be fixed with a single screw.

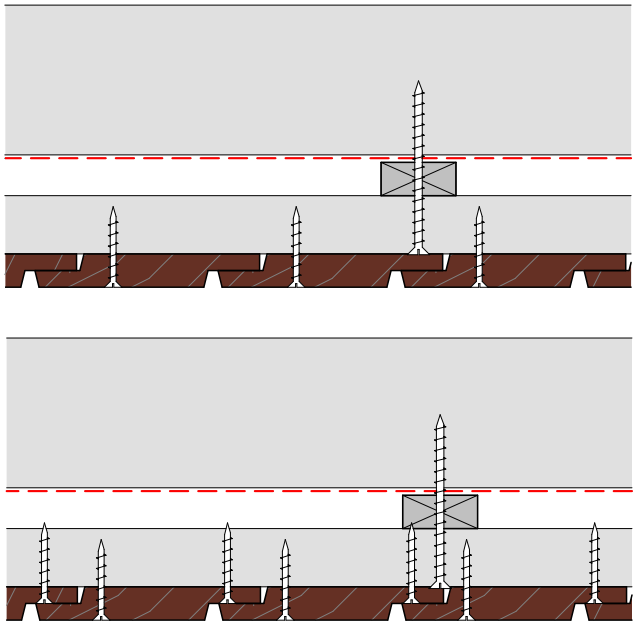
○ T&G Cladding – Face Fixed





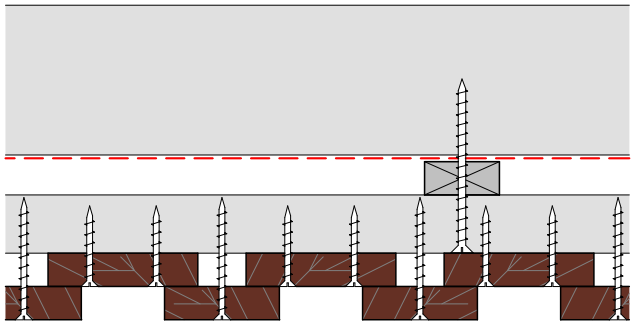
○ Profiles <150mm width may be fixed with a single screw.

○ Shiplap Cladding – Face Fixed



○ Profiles <150mm width may be fixed with a single screw.

○ Board on Board Cladding – Face Fixed



○ Profiles <150mm width may be fixed with a single screw.

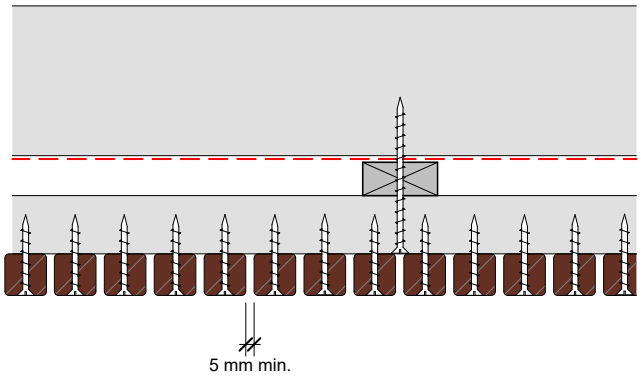
Vertical Rainscreen

Face Fixed

Position fixings 20mm from board edges, drive fixings so they are flush with the timber surface.

Ensure minimum 8mm expansion gap to edge of boards.

○ Open-joint Rainscreen – Face Fixed



○ Profiles <75mm width may have one fixing, profiles >75mm width must have two fixings.

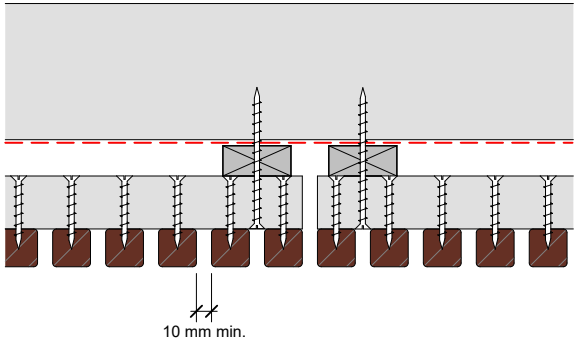
Back-fixed – Panelised

Screening may be back-fixed through horizontal cavity battens to form prefabricated panels. The panels are then screw fixed between the screening edges to minimum 35mm x 45mm structurally fixed vertical counter battens.

A minimum screening thickness of 25mm is required to allow minimum 20mm fastener depth.

Ensure minimum 10mm gap to edge of boards to allow fixing of cavity battens.

○ Open-joint Rainscreen – Back Fixed



○ Profiles <75mm width may have one fixing, profiles >75mm width must have two fixings.

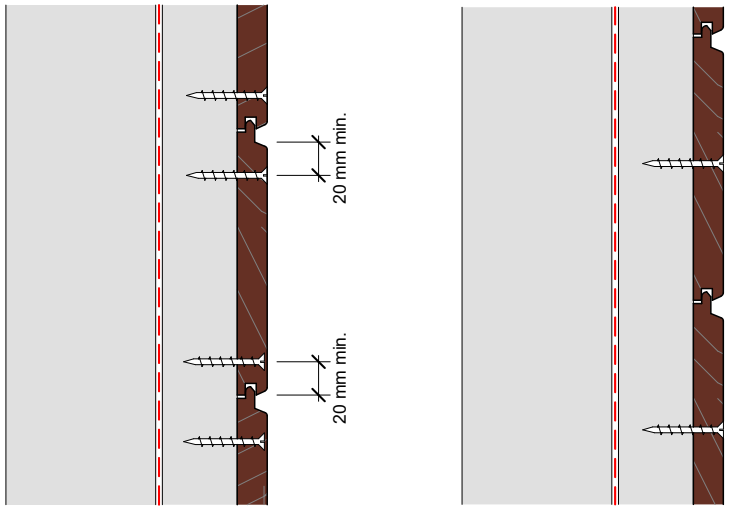
Fixing Horizontal Cladding

If face-fixing, position fixing minimum 10mm above the overlap (do not fix through the overlap), drive fixings so they are flush with the timber surface.

For secret fix T&G profiles, position the fixing minimum 12mm from the tongue edge drive fixings so they are flush with the timber surface.

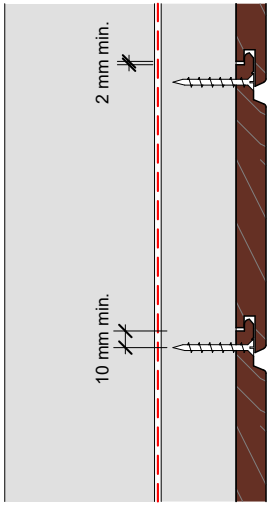
Ensure minimum 2mm expansion gap to back of T&G boards.

○ Horizontal T&G Cladding – Face Fixed

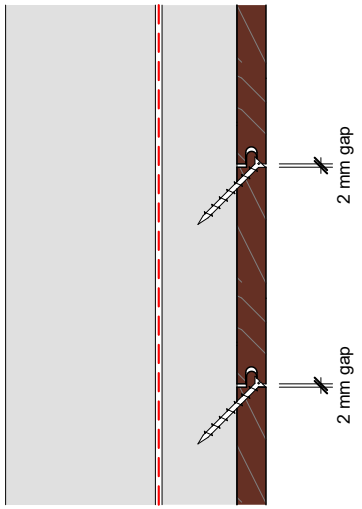


○ Profiles <150mm width may be fixed with a single screw.

○ Horizontal T&G Cladding – Secret Fixed

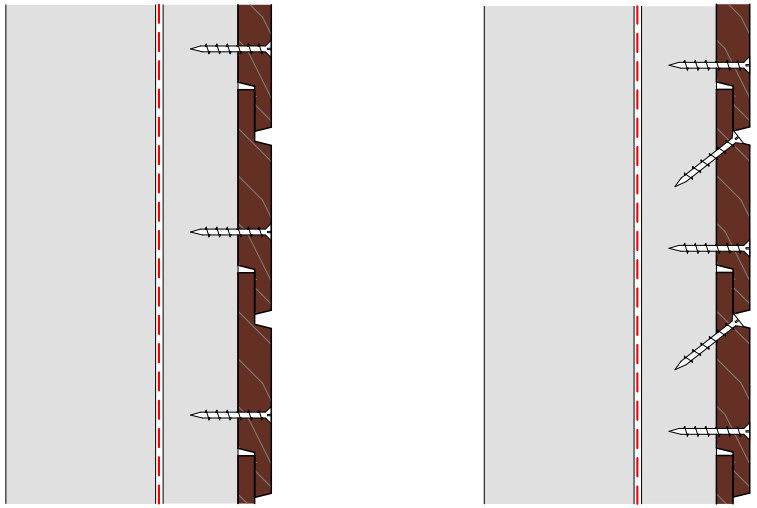


○ Horizontal T&G 'Nickel Gap' Cladding – Secret Fixed



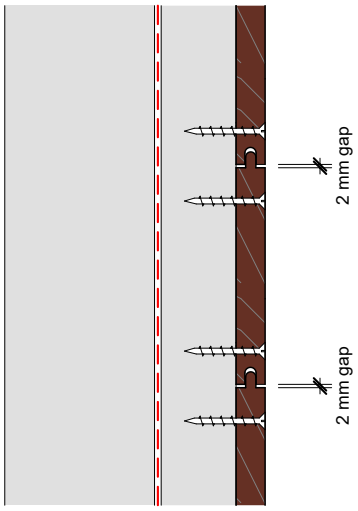
○ Profiles <150mm width only.

○ Shiplap Cladding – Face Fixed



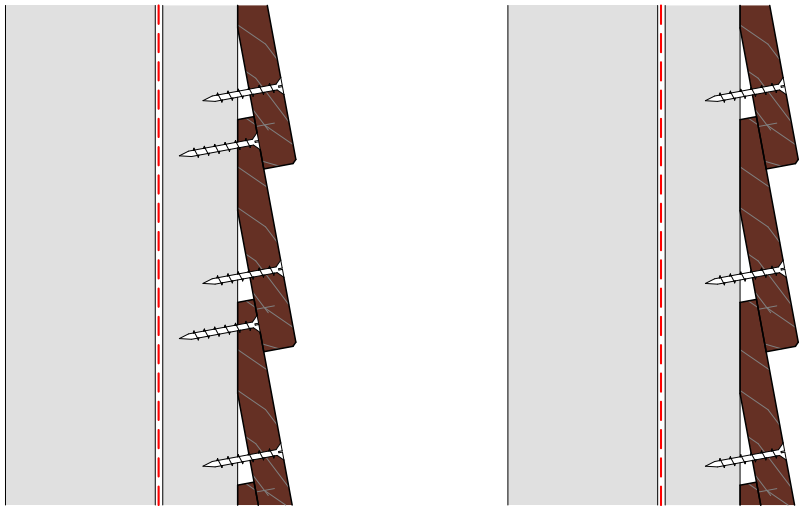
○ Profiles <150mm width may be fixed with a single screw.

○ Horizontal T&G 'Nickel Gap' Cladding – Face Fixed



○ Profiles <150mm width may be fixed with a single screw.

○ Bevelled Cladding – Face Fixed



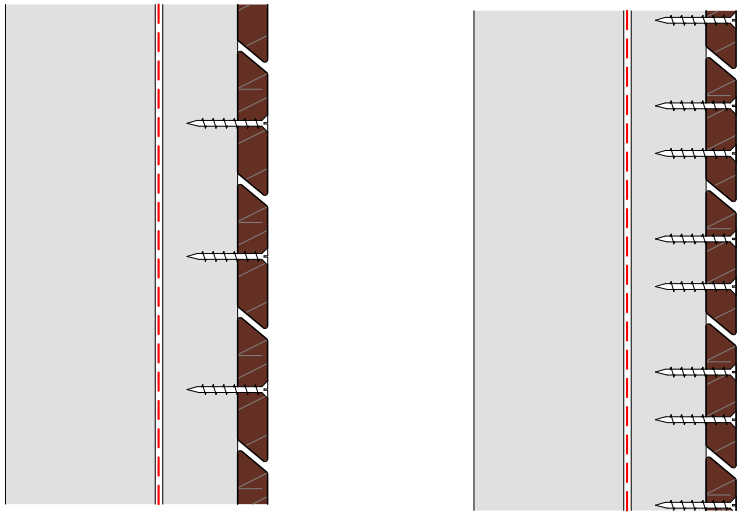
○ Profiles <150mm width may be fixed with a single screw.

Horizontal Rainscreen

Position fixings 20mm from board edges, drive fixings so they are flush with the timber surface.

Ensure minimum 8mm expansion gap to edge of boards.

○ Face Fixed Open-joint Rainscreen



○ Profiles <75mm width may have one fixing, profiles >75mm width must have two fixings.

Top of Wall

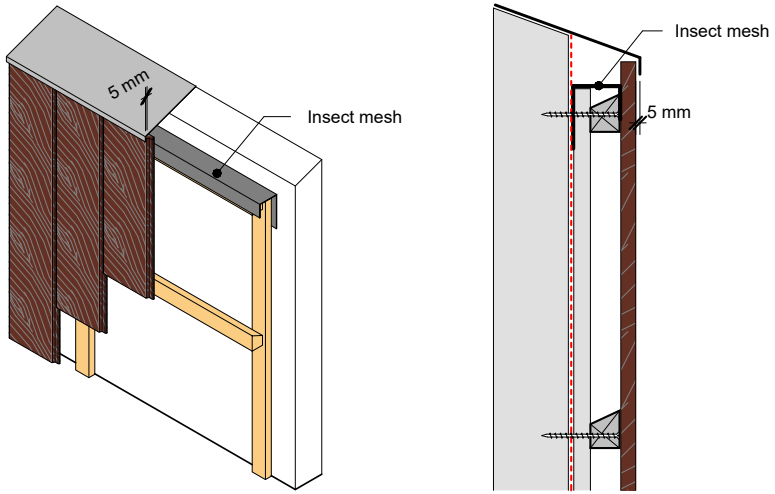
Allow minimum 5mm gap at top of the wall to soffit to allow airflow.

For vertical cladding or rain screen, apply a 15° reverse angle cut to all exposed board ends to create a drip edge.

Seal all exposed end grains with a high solids timber end grain sealer to prevent sapping of moisture. Cover end grains with a flashing where possible.

Apply mesh or fluted ventilation batten to prevent vermin travelling into the cavity.

○ Top of Wall



Base of Wall

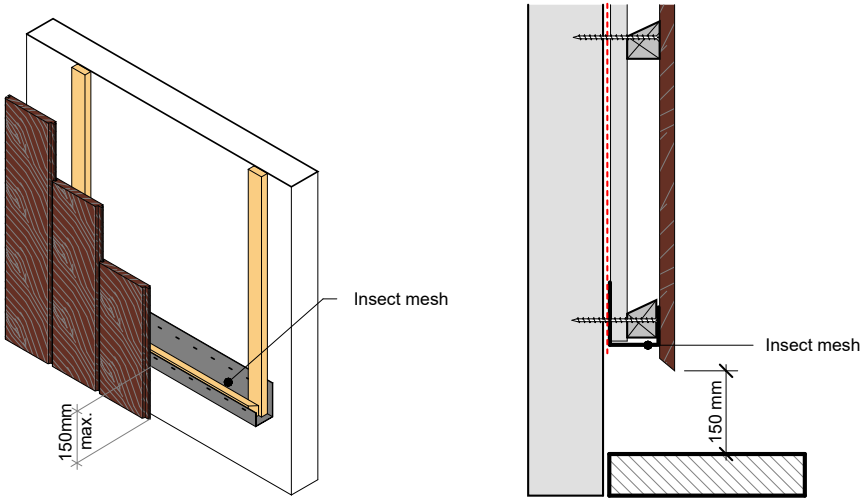
Allow minimum of 150mm gap from base of cladding to well drained ground. A larger gap may be considered in wet climates.

For closed joint cladding apply mesh, perforated flashing or fluted ventilation batten to base of cavity to allow airflow while preventing vermin travelling into the cavity.

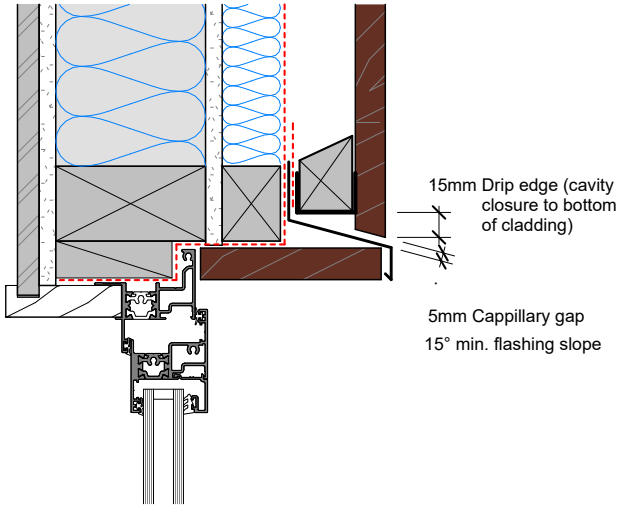
For vertical cladding, apply a 15° reverse angle cut to board ends to create a drip edge.

Seal exposed end grains with a timber high solids end grain sealer to prevent sapping of moisture.

Base of Wall



Allow a Gap to Flashings



Allow minimum 5mm gap to flashings or adjacent materials, ensuring minimum 15° fall of flashings, so that water deflects away from the building.

Vertical cladding may have maximum 150mm overhang from last batten fixing point.

Joins

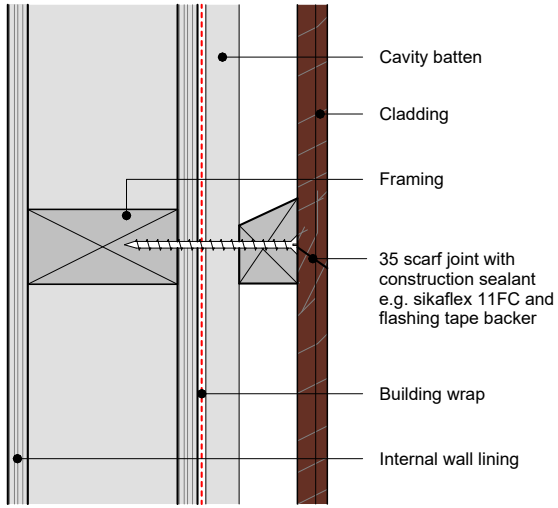
Joins between cladding board ends must be made over cavity battens only.

Apply a fixing on each side of the join pre-drilled minimum 12mm from the board end.

A closed join may be created using a 35° mitre at board ends, and application of sealant at the join e.g. Sikaflex 11FC. This type of join is best suited to T&G profiles as the profile locks the join together. Alternatively an open join may be created with a minimum 5mm gap to board ends. Vertical orientation apply a 15° angle to board ends to shed water away from the join.

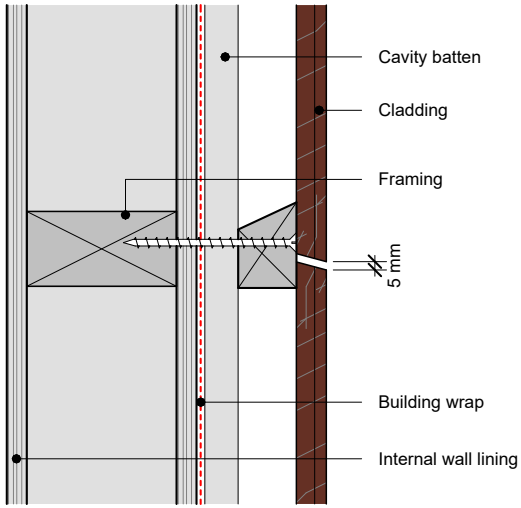
Seal exposed ends with an appropriate end grain sealer. Seal exposed ends with an appropriate end grain sealer.

○ Mitre Join

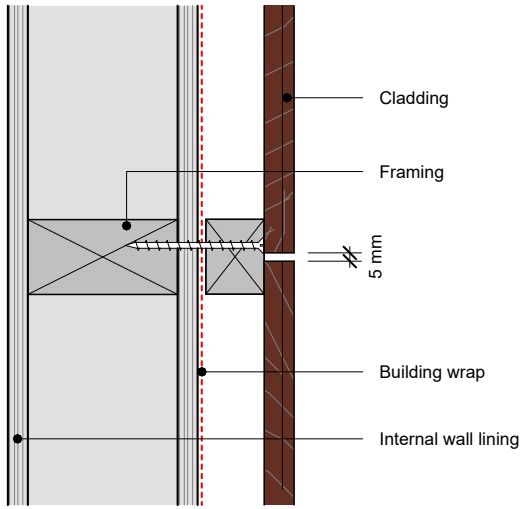


○ Closed Cladding – Mitre Join.

○ Vertical Butt Join with 5mm Gap



○ Horizontal Butt Join with 5mm Gap



○ Open-joint Cladding – Butt Join.

Corners

Correct detailing of corners is important to maintain the integrity of the cladding system. There are numerous options for corners. The following are some examples.

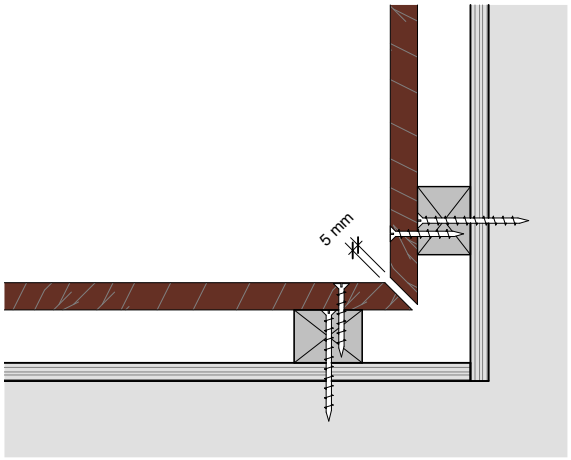
Please check with Abodo distributor for other options.

Fix mouldings with stainless steel ring shank nails or screws at maximum 450mm centres, ensuring minimum 20mm fixing penetration into batten or cladding.

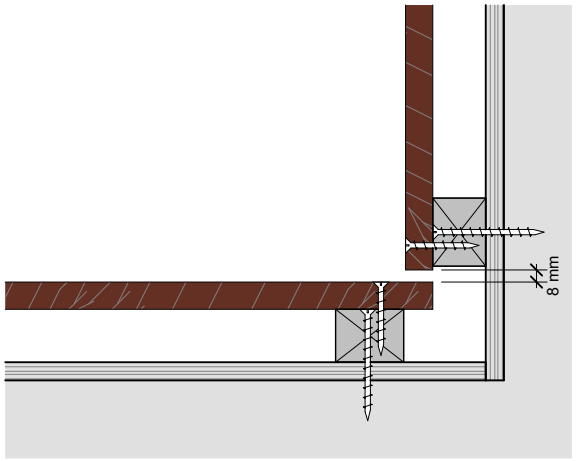
Some local building codes may require back-flashings to corners, please check prior to construction.

Closed in mitre joins are not recommended as they can open and become a weak point in the cladding. If a mitred look is desired, an open join or additional aluminium Y flashing may be used at the corner.

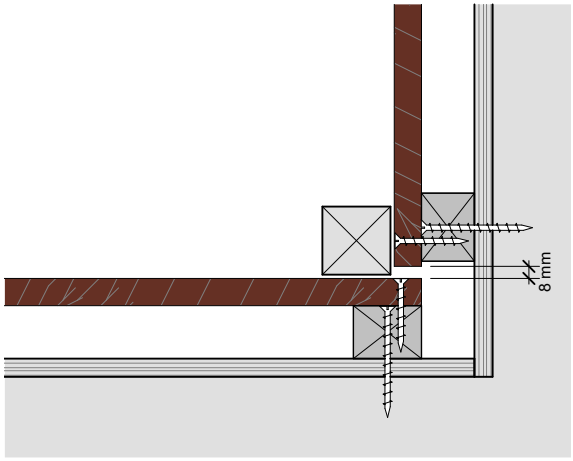
Internal Corners – Horizontal Cladding



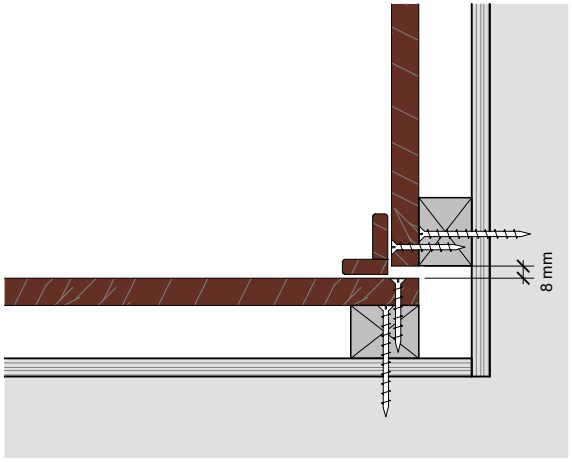
Open Mitre.



Open Square Edge.

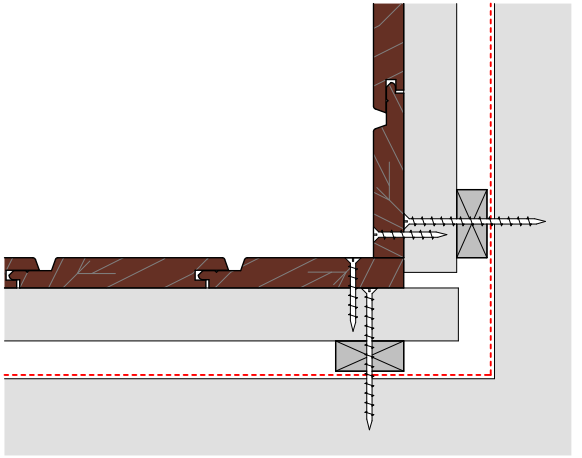


Internal Block Corner.

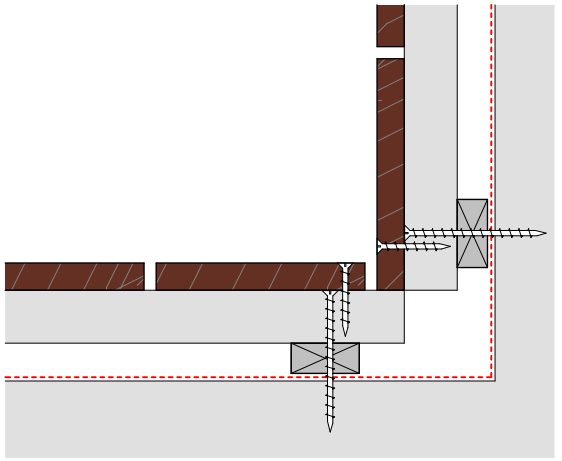


Internal Board Corner.

Internal Corners – Vertical Cladding

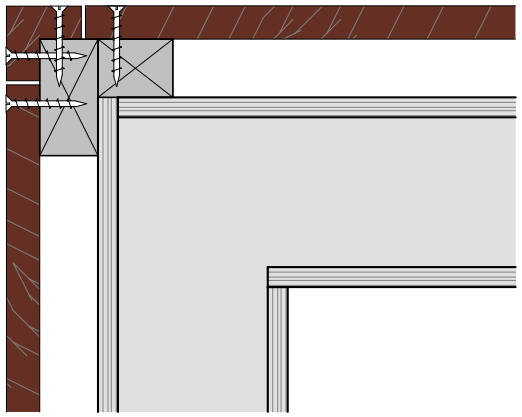


Closed Joint Cladding Square Edge.

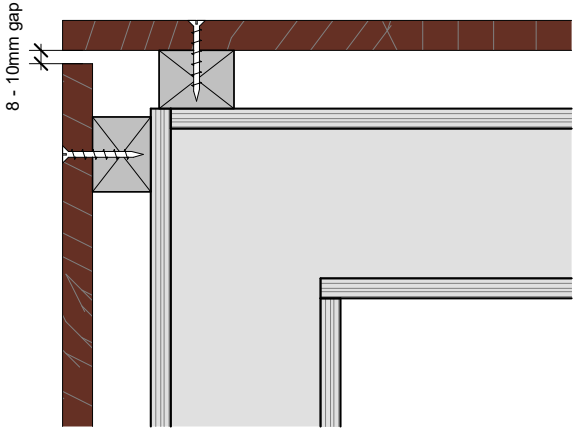


Open Joint Cladding.

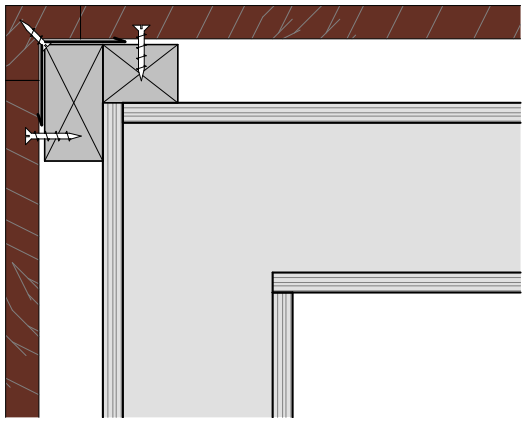
External Corners



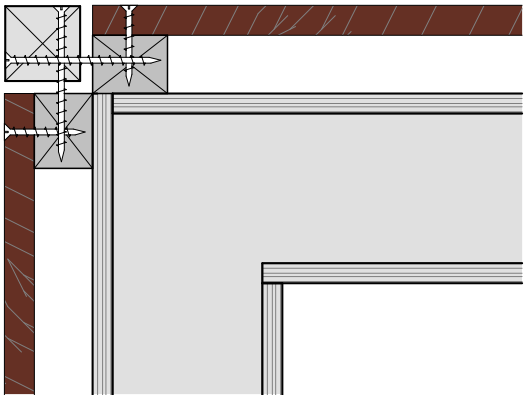
Corner Moulding.



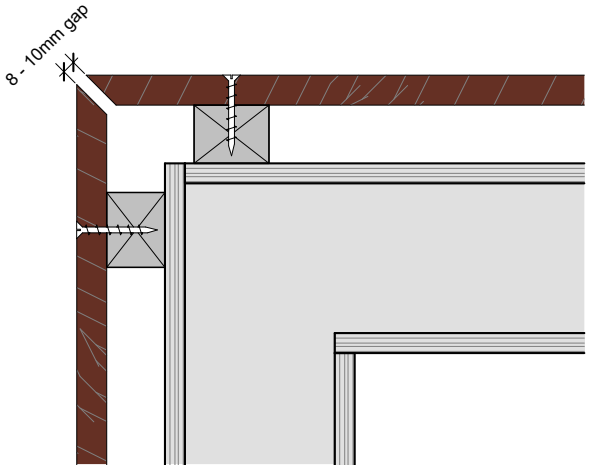
Open Butt Join.



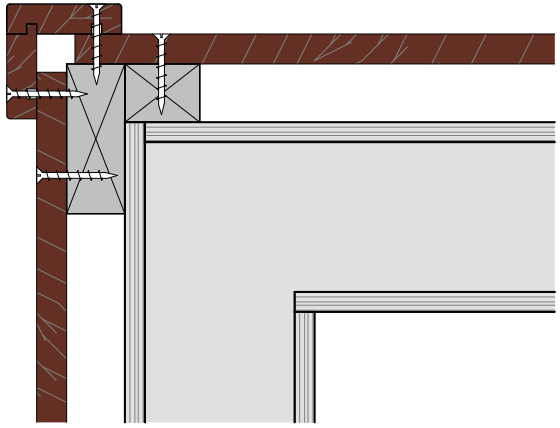
Corner Moulding Flashing Back-fixed.



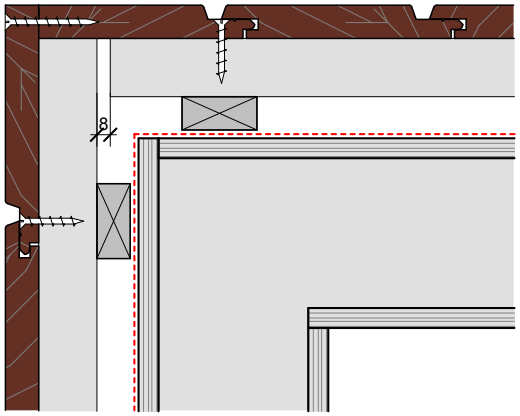
Block Corner.



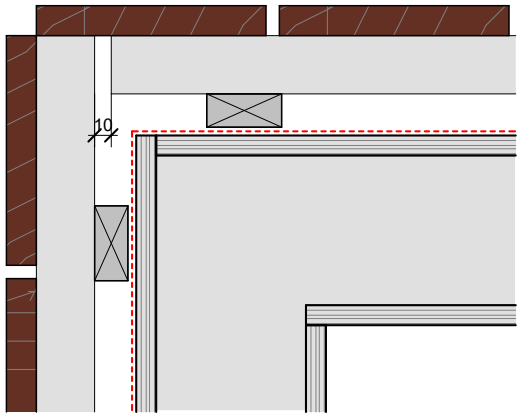
Open Mitre.



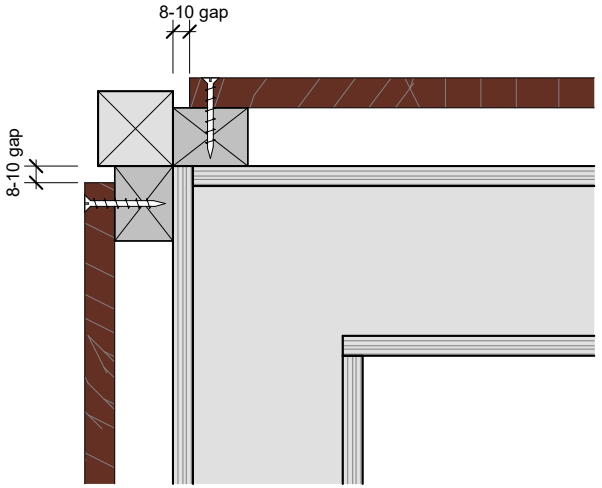
Box Corner.



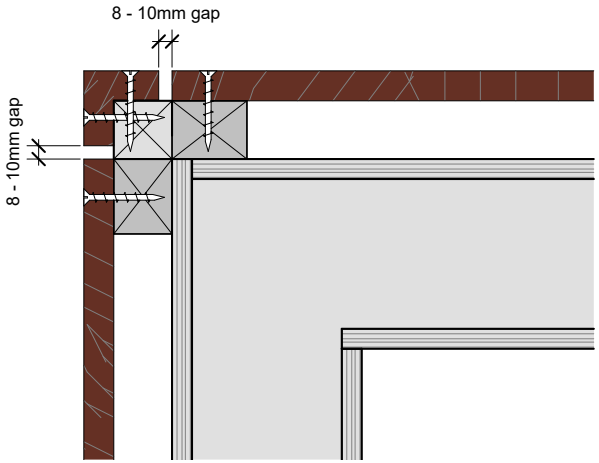
○ Vertical Butt Join.



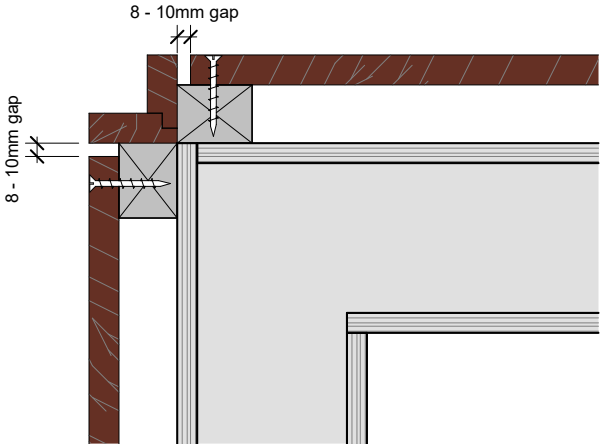
○ Vertical Open Butt Join.



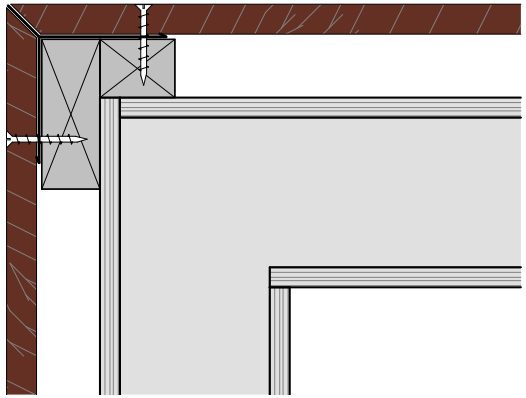
○ Exterior Block Corner.



○ Exterior Corner Mould Gaps.



○ Exterior 2-piece Corner.



○ Exterior Corner with Y Flashing.

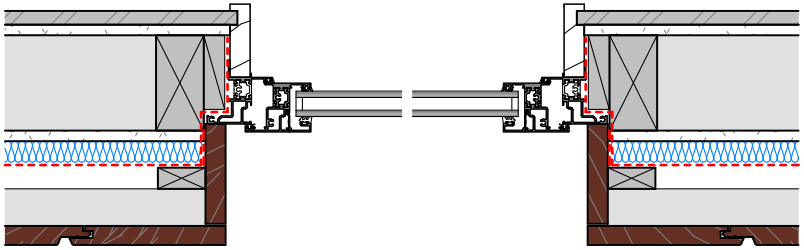
Windows and Doors

There a numerous way of creating window and door openings within a timber clad façade, these are typically influenced by the design of the project.

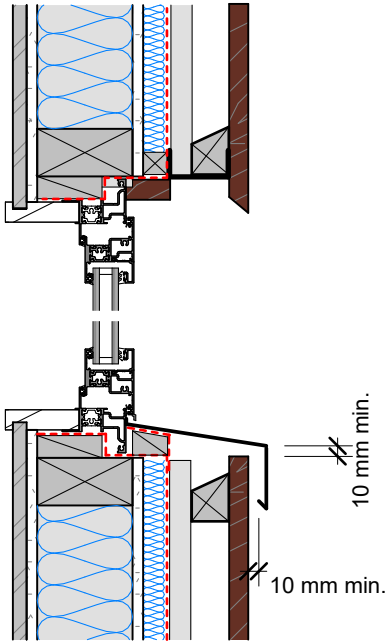
Certain principles remain the same:

- The joint between the window casement and surrounding wall is important and needs to be weather tight (and fire resistant if required).
- Wherever possible there should be rain and wind-proofing layers separated by a well-ventilated cavity.
- Install cavity barriers if required by the project specification to ensure fire resistance.
- Windows shall be flashed appropriately to ensure that external moisture is directed away from the cavity to the outside of the wall. Properly designed and installed flashing is essential, especially at the windowsill including:
- Consider vertical ‘waterbars’ at sides and rear.
- Window head flashing shall be installed with a 15mm slope and drip edge and stop ends to channel water away from the cavity to the outside of the wall.
- Leave adequate gaps where board edges/ends meet flashing/sills (min 5-10mm). Window head shall have a 5mm minimum capillary gap between head/sill flashings and cladding board.

○ Close Joint Cladding Window Opening

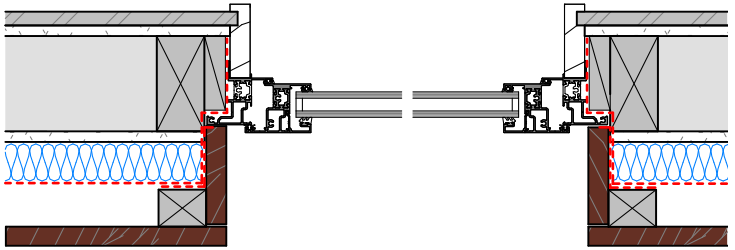


○ Plan View.

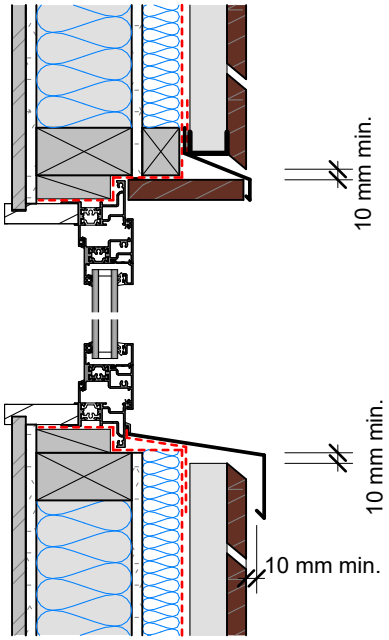


○ Section.

○ Open Joint Cladding Window Opening



○ Plan View.



○ Section.

○ All drawings are for illustrative purpose only and are not to scale.

○ These cladding arrangement drawings are generic scenarios. If more complex arrangements are required say for multi storey buildings, it is advised to consult an architect or structural engineer to assure safety through design.

Finishes and Coatings

Due to it's high durability, low resin content and inherent dimensional stability, Vulcan is an excellent substrate for most coatings.

Uncoated or Clear Coated Timber

All wood if left uncoated or clear coated will change to silver grey eventually. Vulcan Cladding can be left uncoated to weather naturally – changing in appearance with exposure to the elements. Some surface checking (cracking), mould growth and additional dimensional movement can be expected as part of the weathering process.

Application of a pigmented coating will enhance the aesthetic performance of the wood over time and help maintain colour.

When deciding whether to use a surface coating or finish there are factors you should consider.

- The aspect of the cladding: south or west facing (northern hemisphere) are more exposed to both sunlight and driving rain so will weather more quickly. Northerly or eastern facing walls will be shaded and appear darker and may and may require more frequent cleaning.
- Shade from a canopy, overhanging trees or nearby buildings may also have a localised impact and cause variations in colour on the same elevation.

To counteract these factors or simply to add another dimension to your cladding, various types of coatings and finishes are available. Selection of the correct coating is very important as incorrect coating selection can lead to future problems associated with coating failure and excessive maintenance.

Colour Selection

Where a natural brown colour is desired, a translucent brown pigmented coating should be used. By using darker wood finishes, maintenance requirements by way of re-coat period will generally increase. Highly exposed orientations should be designed for easy access for re-coat. Lighter colours and shades of grey allow the timber to age gracefully in highly exposed applications so are preferable here.

On exposed high elevations, choose wood coatings that are more durable, such as paint finish, reactive or silvering erosion stains.

In high sun exposure situations darker colours such as black can cause the timber to heat up quickly causing 'shock', this can lead to increased movement, surface cracking, and possible early failure of coatings.

There are translucent stains offering partial colour effects and solid pigmented coatings which give a completely opaque look. Clear oils generally offer limited UV protection so the timber will 'silver off' over time.

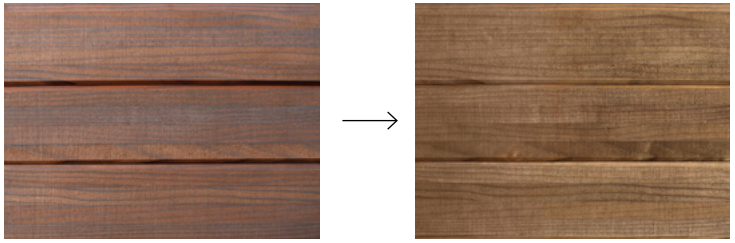
Many coatings have water repellent, mouldicide and/ or UV protection built-in and this is recommended for any semi-transparent coating.

Factory vs Site Finishing

Where possible factory finishing is recommended as this ensures cladding is coated all sides with the correct amount of coating consistently applied with associated quality assurance.

In all cases coating should not be commenced unless timber is in a dry state with moisture content less than 14%.

Always ensure coatings are tested on Vulcan timber prior to use and refer to product supplier and coating manufacturer for guidance.



Vulcan Teak
As delivered

Vulcan Teak
Weathered exterior install

Vulcan Sioo:x
As delivered

Vulcan Sioo:x
Weathered exterior install

○ These images show how the timber colour lightens over time.

Film Forming Semi-transparent Coatings

Transparent film forming coatings including polyurethanes and some semi-transparent acrylics create a film on the surface of the wood. As they are semi-transparent UV can penetrate onto the timber surface leading to possible failure of the coating. Significant discolouration can occur when moisture enters flaking parts of the coating, this can cause mould growth and decay under the coating itself.

Once flaking or cracks start it may be necessary to strip the coating back to bare timber before re-coating, creating substantial work.

These coatings are not suitable for highly exposed applications unless very regularly maintained. They may be suitable for protected and semi protected applications such as joinery.

For these reasons semi-transparent or translucent film forming coatings should be avoided in exposed cladding applications.

Penetrating Oils and Erosion Stains

Penetrating oils and stains are designed to penetrate the timber surface while enhancing the visual natural aesthetic of the timber. They are designed to erode with exposure to the weather hence avoiding cracking or flaking associated with film forming coatings. They are also microporous allowing moisture to easily escape from the timber substrate if it gets wet.

These coatings will tend to erode over time with exposure to UV and rain and need to be re-coated when they start becoming patchy; typically between 2-4 years depending on exposure to the weather.

The re-coating process is relatively easy compared with film forming coatings and paints, as it only requires a wash down prior to maintenance coat.

Abodo recommends this coating type for semi-transparent cladding finish – Abodo Protector is an example of this coating.

Paints

Paints have the longest re-coat cycle, this is almost exclusively based on pigment and film build. As they are opaque in colour, paints do not allow any show-through of natural timber grain. Like film forming transparent coatings it is critical that paints have a re-coat towards the end of their service life, typically around 8-10 years depending on exposure.

While the re-coat period is longer than penetrating oils and stains, the re-coating process is more labour intensive due to the need for preparation including striping and sanding.

Heat attracted from darker colours can cause excessive movement, cracking and flaking. When painting cladding with dark colours it is recommended to apply at least one topcoat to the exposed face and lap line prior to installation, this will reduce the chance of visible primer lines should the timber shrink in service.

Exterior grade acrylic paints are recommended with flexibility in the coating surface that allows for expansion and contraction of the timber substrate. Application of a primer with tannin blocking properties is recommended prior to application of paint topcoats. Please refer to paint manufacturer's specific recommendations.

It is recommended to factory pre-finish painted cladding where possible. If primer coat only cladding is shipped to site, then an oil borne primer should be used to seal the wood from moisture ingress prior to top coating.

Paints must be well maintained with sufficient film build. Should the film be allowed to crack or flake, moisture can be trapped inside the wood and cause premature failure and decay.

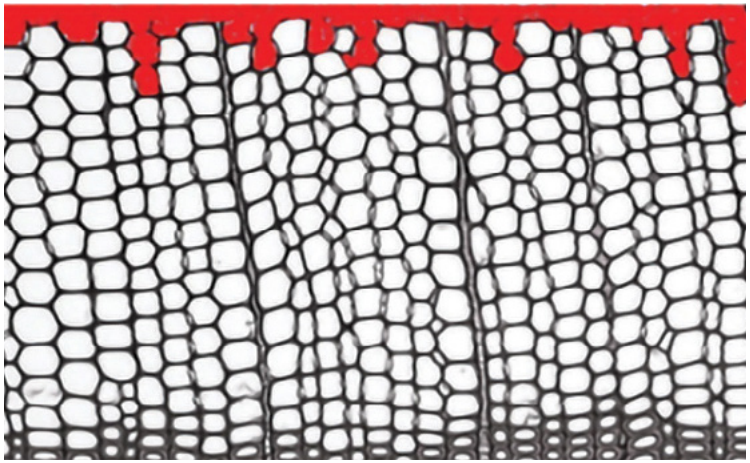
Surface Finish – Impacts on Coatings and Weathering

While many stains and oils are designed to penetrate, it is dependent on how the cell structure of the timber is formed and its condition e.g. broken open or closed off. This makes a big difference to how much the stain can penetrate.

In addition, stains can only penetrate while they are in a 'liquid' form, thus for standard fast drying modern waterborne stains this does not allow much time for penetration before the stain dries and changes from a liquid to a solid. In some instances, waterborne penetrating oils (e.g. Abodo Protector) can penetrate into the cells better than a regular waterborne stain.

Earlywood (spring growth) is more open and easier to penetrate, however Latewood bands (autumn/winter) are smaller and denser so don't allow coatings to penetrate as well. Even during processing to achieve a bandsawn finish, the Latewood areas do not 'lift up' like the earlywood areas, leaving bands of dense and difficult to penetrate cells.

Surface finish can have a significant effect in the penetration of coatings, along with the amount of coating used and corresponding weathering durability performance.



○ Penetration of coating into wood cells.

Smooth Dressed Face

Smooth dressed timber produced in modern high-speed planers can have a glass-like finish and resists coating penetration. This can reduce weathering durability coatings. Smooth dressed surfaces must be thoroughly sanded with 120-150 grit sandpaper prior to application of coating to ensure absorption of the coating.

When applying semi-transparent penetrating coatings, a bandsawn, distressed or brushed face is recommended (see adjacent).

Paint finish may be applied to smooth dressed or textured timber.

○ Abodo Vulcan smooth finish – uncoated.

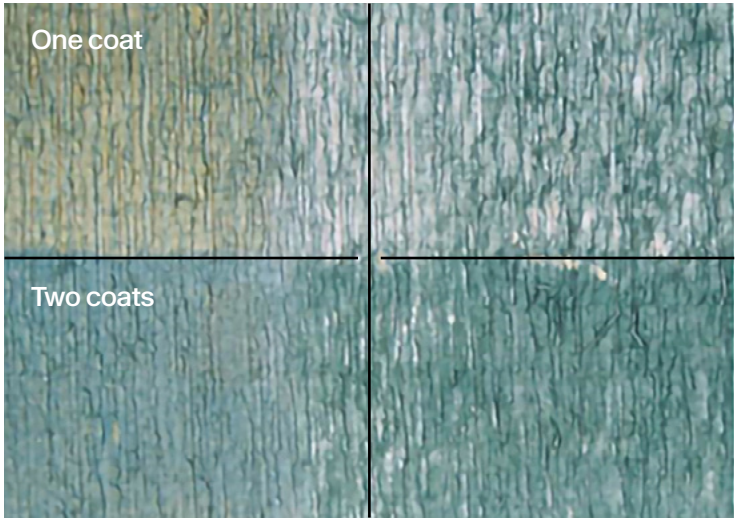
○ Smooth dressed timber stain finish – one coat (top)/two coats (bottom) covered (left)/exposed to the weather (right).

Bandsawn Face

Bandsawn faces perform significantly better than smooth faces in terms of coating performance.

A bandsawn surface allows the coating to penetrate deeper into the cells of the wood due to increased surface area.

Abodo Vulcan bandsawn finish – coated in Iron Vitriol.



Bandsawn timber stain finish – one coat (top)/two coats (bottom) covered (left)/exposed to the weather (right).

Brushed Face

When exposed to weather, timber will eventually erode back over time, the softer earlywood rings will erode first, while the harder latewood will remain. In most softwood species this means a ribbed surface will develop on the surface of the wood over time.

Brushing the surface of the wood with a spinning nylon brush can pre-empt nature by scouring the softer early wood away in advance, allowing the wood to be sound substrate for coatings though not as effective as band sawn.

○ Abodo Vulcan brushed finish – coated in Protector – Teak.

○ Distressed timber finish.

Distressed Face

Modern machining techniques mean some equipment can apply a rough or distressed finish direct from the planer. A distressed finish incorporates a combination of micro reeded and rough machining to create a rough surface that accepts and holds coatings similarly to a band sawn finish.

Grain Orientation

Grain orientation has a significant effect on long term weathering. Flat grained timbers are more likely to show more surface cracking over time, while vertical grain pieces are less likely to crack. Coatings will last longer on timbers with vertical grain orientation.

Abodo offers Vulcan Vertical Grain Cladding that will provide better weathering performance than flatsawn timber.

○ Effects of heavy weathering. Bottom piece was cut with a vertical grain/ quartersawn, top piece is plain sawn and exhibits severe surface checking – chemically treated Radiata Pine.

○ Summary/Vulcan Cladding Coating Recommendations

- Factory applied coatings with an extended maintenance system are best for consistent quality and long-term performance. Many timber cladding suppliers offer this service.
- Exterior coatings must have biocide included to protect against mould growth.
- Surface texture is important. Coatings generally perform better applied to sawn or distressed rather than smooth planed timber.
- Smooth dressed timber must be thoroughly sanded prior to coating.
- When using translucent coatings, moisture-permeable erosion coatings such as Abodo Protector or equivalent are recommended. Specially developed for external timber, they are resistant to cracking, flaking and peeling associated with more brittle varnishes or paints which can trap water under their surface.
- Paints may be applied ideally with a tannin blocking primer.
- Highly pigmented coatings resist weathering best. Paler colours, especially white, also reflect the heat. Darker colours may be used but will put additional stress on the timber due to heat.
- Before using a coating ensure that it has been adequately tested on the timber including adhesion and exposure testing (please refer to coating manufacturer for further information).
- Timber must be less than 14% moisture content before commencement of coating.
- If possible, seal all sides of timber cladding with at least one coat prior to installation.
- Thoroughly seal timber end grain with a high solids end grain sealer to prevent water migrating into ends.

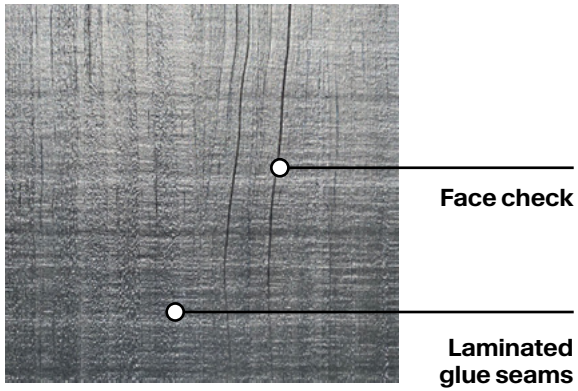
Maintenance

The natural weathering process of exterior timber from exposure to moisture and UV causes rapid lightening or silvering of timber if left uncoated, the same will occur with lighter coloured semi-transparent coatings such as whites and greys.

Accumulation of environmental contamination such as dirt and pollen can influence the weathering process.

Mould growth can occur as natural sugars migrate to the surface, which results in a change in colour over time. Darker moulds tend to set into and stain timber for longer than green moulds or algae and thus should be acted on promptly. Green coloured surface algae are typically easier to remove. Mould is distinct from wood destroying fungus in that it does not cause wood decay but can result in poor aesthetics and affect coating performance.

Checking (cracks) may be observed on the face and ends of Vulcan timber. Checks are acceptable to install. Checking may become more apparent as the material weathers naturally in place. Fibre pull at laminated glue lines is also possible. These are not defects and are considered a natural part of this wood product. Maintenance with a coating and thorough sealing of end grains with wax sealer will improve long term weathering characteristics.



Cleaning

Annual washing is recommended as minimum maintenance for any exterior timbers.

The use of a low-pressure wash, with a neutral pH detergent based cleaner and soft brush is recommended. A soft-bristled brush loosens up grime and mould growth that may build up on the surface of timber. Rinse thoroughly with low pressure water.

Do not water blast timber, as high pressure can damage the fibres of the wood, and cause permanent damage to the surface, and the coating.

Where heavy discolouration occurs, a stiff bristle brush may be used, although this may strip some or all of the existing coating from the wood.

For areas with heavy mould or discolouration and prior to coating, a specialist timber cleaner should be used. Timber cleaners may include oxalic-acid and percarbonate oxygenating products. Bleach based cleaning products (Sodium hypochlorite) must be used with caution as higher concentrations can damage the timber surface.

Spray-on slow-acting mouldicides may also be used after cleaning and/or coating to help prevent future mould growth. These products will typically contain a biocide such as benzalkonium chloride (BAC) and will require re-application after 6-12 months.

Annual Maintenance Check

During an annual wash, cladding and junctions should be inspected for weathertightness, coating erosion and general weathering. Clear all gutters and trim back foliage from trees or plant touching the cladding as this can result in abrasion of the timber surface and coating.

Repairs must be made to ensure the weather tightness and integrity of the cladding system.

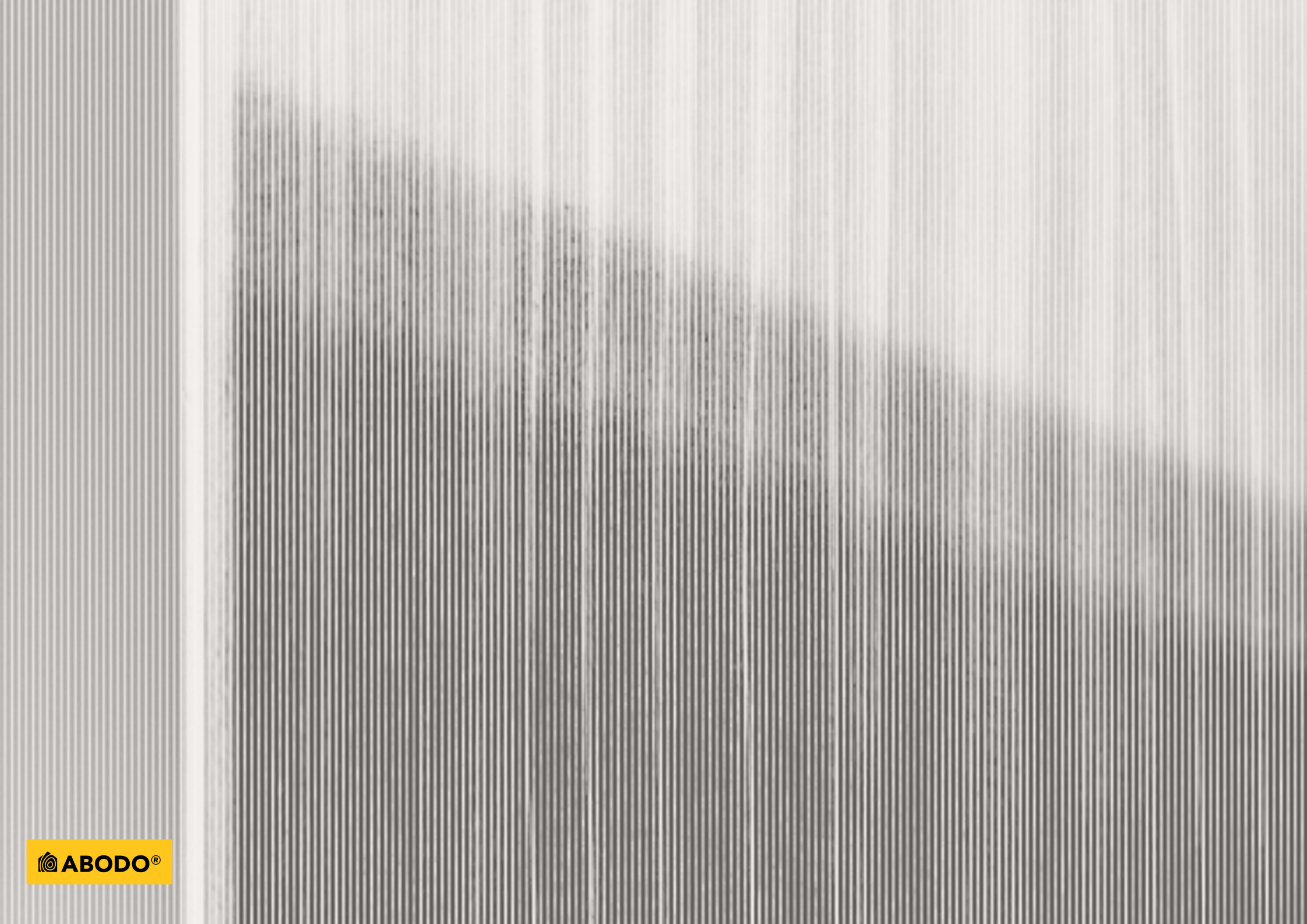
Re-coating

Should the timber appear to require re-coating, this must be done after thoroughly washing down with a specialist timber cleaner and then allowing to dry. Paint finish may require further preparation by sanding or stripping back of coating. Always refer to coating manufacturer's instructions first.

As a general rule an erosion stain is expected to have a re-coat every 2-4 years and paint finish 8-10 years though this is dependent on coating, surface finish used and local environmental conditions including level of exposure to the weather.

○ Acknowledgments:

Abodo wish to thank the UK Timber Development Association and Resene Paints for providing information and access to content for parts of this guide.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