KOLOMORE

BEST PRACTICE

for construction with

FIRE-RETARDANT TREATED WOOD

Construction, moisture management and maintenance guidance



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1. Construction and Building Process

The core principle for a rainscreen on a timber building is that it must function as a two-stage seal. The rainscreen (timber cladding) rejects most wind-driven rain, allowing it to run down the face and onto the ground, while the remaining water and moisture from the air are drained away and dried out through a ventilated cavity in front of a wind-tight, vapour-permeable wind barrier.

1.1 The Ventilated Cavity: The Core of Good Building Practice

- **Maintain sufficient clearance:** There must always be a continuous, ventilated cavity behind the rainscreen, always at least 25 mm.
- **Ensure completely unobstructed airflow:** Air must be able to enter at the bottom of the façade and exit at the top (at the eaves or gable) to create a chimney effect that dries the timber.
- **Doors and windows must not obstruct airflow:** The bottom and top of the rainscreen above and below doors and windows must remain open so air can pass freely behind the rainscreen.
- **Keep the wind barrier taut:** Fix the wind barrier securely and tightly so that insulation cannot bulge out and close or reduce the ventilation gap.

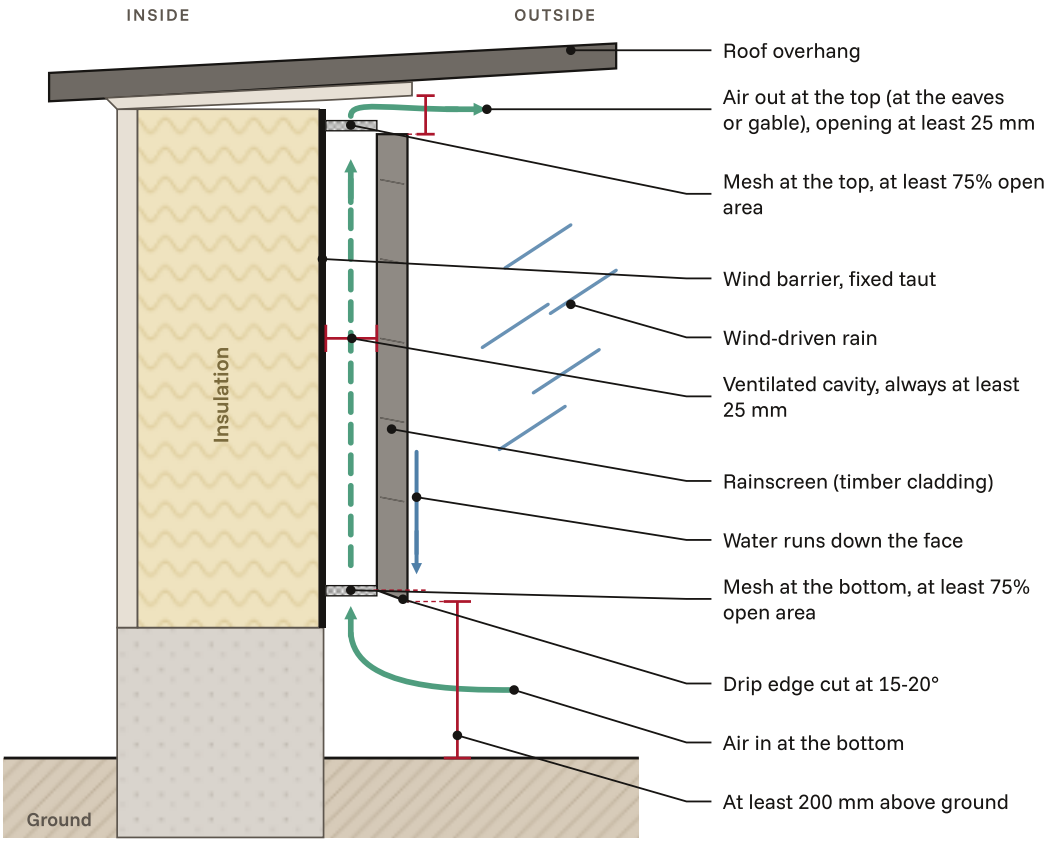


Figure 1. The ventilated cavity in section: air in at the bottom and out at the top, at least 25 mm in the cavity behind the rainscreen and in the opening at the top, and at least 200 mm above ground.

1.2 Correct Batten Arrangement

- **For vertical cladding:** Install the cladding on horizontal battens. These must be mounted on vertical spacers (minimum 25 mm thick) against the wind barrier so that water can run freely downward and air can pass vertically.
- **For horizontal cladding:** Install the boards directly onto vertical spacers of at least 25 mm, which automatically ensures vertical airflow.
- **Provide free clearance at the bottom:** The lower edge of the rainscreen should terminate with a drip edge, cut at an angle of 15-20 degrees, so that water can drain away easily. Maintain a minimum clearance of 200 mm above ground level to prevent splash-back of water and soil.
- **Mouse and insect protection:** Openings at the top and bottom should be protected with a mesh having at least 75% open area, preventing mice and larger insects from entering the cavity.

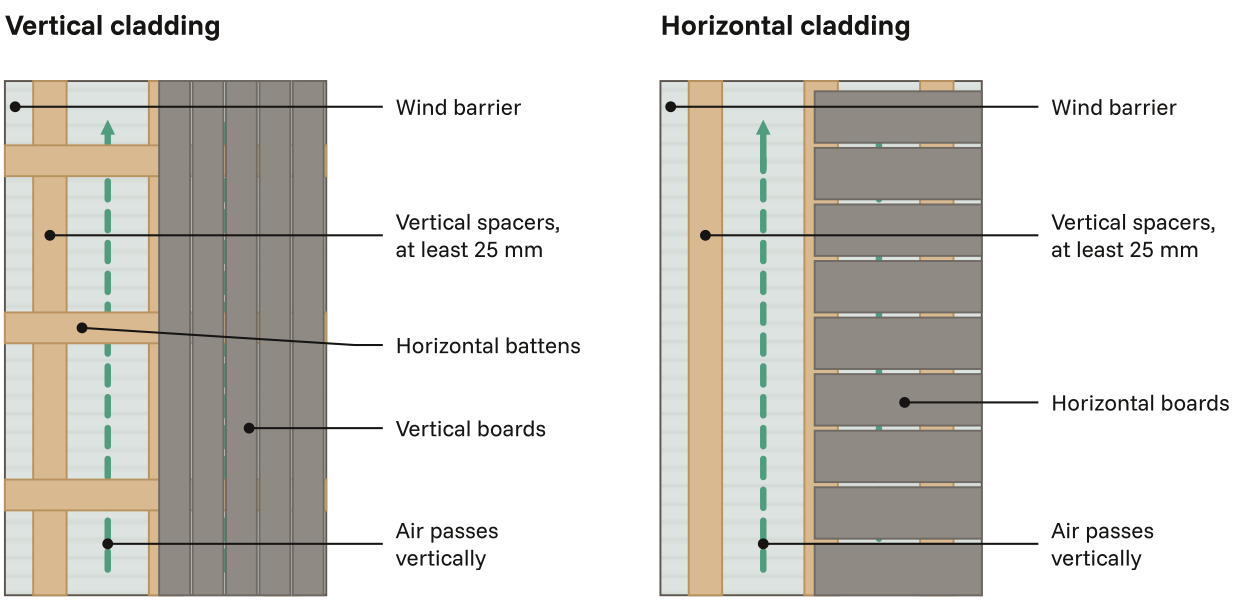


Figure 2. Battens for vertical and horizontal cladding. In both cases the air must be able to pass vertically.

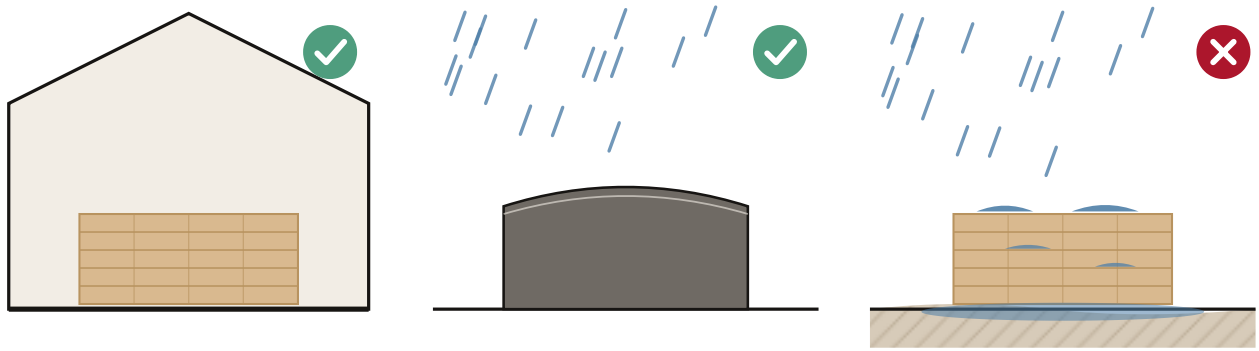
1.3 Storage and Handling

Fire-retardant treated wood must be stored dry until installation. The timber should always be stored indoors and on a solid, level surface.

Open packages of timber must immediately be moved indoors or completely covered if rain occurs during construction. Horizontal surfaces within the package can absorb standing water, which may initiate an osmosis process in which evaporation after installation creates an imbalance in the distribution of the fire-retardant treatment, attracting further moisture and increasing the imbalance.



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Indoors, on a solid, level surface

Open package in the rain: move it indoors or cover it completely

Never in the rain: standing water on horizontal surfaces can start osmosis

Figure 3. Store the timber dry until installation.

1.4 Fasteners and Weather Protection

- **Corrosion-resistant fasteners:** Always use stainless steel A2 or acid-resistant A4 screws or nails. Ordinary galvanised steel will corrode and may discolour the timber because of the pH value of the treated wood.
- **Roof overhangs:** A good roof overhang is the most effective rainscreen and provides the best protection for fire-retardant treated timber. The wider the overhang, the less wind-driven rain reaches the timber façade and the less UV radiation degrades the woodprotection.
- **Painted rear face of the rainscreen:** Painting the rear face reduces the uptake of water and moisture, thereby reducing the impact on the embedded fire-retardant treatment and lowering the risk of efflorescence. Furthermore a painted rear face also reduced the cupping-force of the wood-protection on the front face.
- **Protection of end grain:** End grain absorbs moisture 10-20 times faster than the longitudinal surface of timber. End grain must never be in direct contact with horizontal surfaces such as sills or decks and must always be thoroughly treated with wood protection so that it is properly sealed.
- Fire-retardant treated battens, studs and mouldings should be painted in the same way as the rainscreen to reduce moisture uptake from the surroundings as much as possible.

1.5 Special Considerations for Painted Fire-Retardant Treated Wood

When painting fire-retardant treated wood, there is a limit to how much paint may be applied per square metre of surface, because paint generally add to the heat and smoke released, when the surface is exposed to fire. A coarsely brushed, paint-cut or rough-sawn surface will therefore be more exposed to wetting from external water, than a lightly brushed or planed surface. The less permeable the paint film is, the better it protects the rainscreen against undesirable moisture uptake during wet weather.

If the stated best practices for construction with fire impregnated wood are ignored or neglected, the classifications and warranties regarding the integrity of the fireimpregnation and the painted surfaces are void.

2. Maintenance of the surfaces

All organic surface treatments are subject to wear and tear, by wind, water and UV-rays from the sun. If you do not take care of the surface treatment on the façade, it will fail over time, leaving the fire-impregnated wood to be aged and worn un-proportionally to the age of the building.

Some treatments are classified as “wear and tear” and in principle they are supposed to be worn down over a period of time, with the only maintenance needed during this period, is a yearly cleaning and inspection. This approach will cause the wood under the paint to be exposed to the wearing and tearing of time and weather-conditions.

Most wood protection systems are to be cleaned, repaired and possibly renewed on a yearly basis, and if this is not performed and documented as instructed by the paint manufacturer, all warranties are void.

Please note that many systems require a first maintenance within few months of the installation, to ensure a rain-proof surface with sealed nail-heads.

The life-time maintenance schedule will be dependent on the maintenance guide from the original producer of the paint, and in the case of fire-impregnated wood, the repainting intervals must also be aligned with documented tests, to ensure that the fire-class of the façade remains intact throughout the life-span of the façade. Renewal of the surface treatment with non classified paint, or without documentation of the applied layer thickness, will void the fire classification of the façade.

3. Mold, Mildew and Efflorescence (Salt Leaching)

> **If there is no elevated moisture content in the building-material; mold, mildew or efflorescence cannot develop.**

All organic building materials can be affected by mold, mildew and efflorescence (salt deposits) when the conditions for these problems are present, namely, excessive moisture in the material.

Conversely, if there is no elevated moisture content in the material, mold, mildew or efflorescence cannot develop.

If the façade is constructed according to the stated best-practice guidelines, the risk of elevated moisture levels in the materials is minimized but never eliminated.

Rather than viewing mould, mildew and efflorescence as the problem itself, they can be regarded as symptoms that something is wrong with the construction. If mould, mildew or efflorescence can develop, moisture conditions exist in the building, that may degrade the building's integrity over time. These conditions should be stopped immediately to avoid shortening the building's service life.

3.1 What Conditions Must Be Present?

Mould, mildew and efflorescence can occur both indoors and outdoors, and their frequency and intensity may vary depending on where the building is located and where elevated moisture has developed.

Two conditions must be present for mold and mildew to develop:

1. There is moisture present, that the fungus can use.
2. There is organic material present, from which the fungus can live.

If the fungus has neither moisture nor organic material to live on, it will die. Paint and timber are organic materials on which (and from which) fungi can live. Even if the paint contains a fungicidal substance, this alone is not sufficient to keep fungi away when the other conditions are present.

3.2 Conditions for Efflorescence

Two conditions must be present for efflorescence to occur:

1. There are water-soluble salts in or on the material. Timber naturally contains salts, while fire-retardant or pressure treatment increases the content of salts and minerals.

2. Moisture is present, allowing the salts to dissolve into a water-based solution.

The common denominator is therefore EXCESSIVE MOISTURE. Without elevated moisture, neither mildew, mold nor efflorescence can occur.

Mildew, mold and efflorescence cannot be treated effectively as isolated problems; the underlying cause, moisture, must be removed. These phenomena should instead be used as indicators that something is wrong with the construction of the building. If the indicators are ignored, moisture can lead to extensive degradation of the material's structural strength, deterioration of the indoor climate, and visual damage.

Moisture always moves towards the material surface, where it evaporates. This causes dissolved salts to crystallise, producing efflorescence that can be seen with the naked eye.

3.3 Common Causes of Excess Moisture

- Missing or inadequate ventilation due to missing or undersized cross-battens.
- Missing or inadequate ventilation of the material due to missing or reduced openings to the ventilated cavity at the top and/or bottom.
- Incorrect construction of the concealed materials behind the cladding, causing moisture to be drawn into the construction and discharged through the timber cladding.
- Timber cladding installed too close to the ground or paving.
- Installation onto wet underlying studs or battens.
- Failure to seal end grain and nail holes.
- Materials stored incorrectly or left on the ground or exposed to rain during construction.

3.4 Osmosis

The reason the extent of problems caused by installing wet building materials is often overlooked is that a process referred to as osmosis, can start undiscovered in the cladding timber. Osmosis in this case is a self-reinforcing and escalating process, that can make the problem worse over time.

When water reaches the surface of a porous material, evaporation occurs. Once the water has evaporated, salts remain on the surface. This creates a high salt concentration in and on the surface, which leads to osmosis. During osmosis, water moves towards the salt in an attempt to reduce its concentration. This can result in further deposits on the surface and generate hydrostatic pressure within the material. The hydrostatic pressure can damage the material, including surface coatings such as paint and oil.

The osmosis process can generate internal hydrostatic pressure of up to 200 bar, exceeding the structural strength (cohesion) of paint, and even of the wood itself. Osmosis can therefore cause paint to crumble, crack, peel or break apart. It can also

result in complete delamination and separation of the building material due to the hydrostatic pressure.

Exterior paint is designed to allow a small amount of moisture to pass through. Vapour-permeable paint therefore does not block evaporation, and consequently paint cannot prevent the crystallisation of salts on the surface. Painting the surface can never solve this issue, only correct installation of dry materials can solve it.

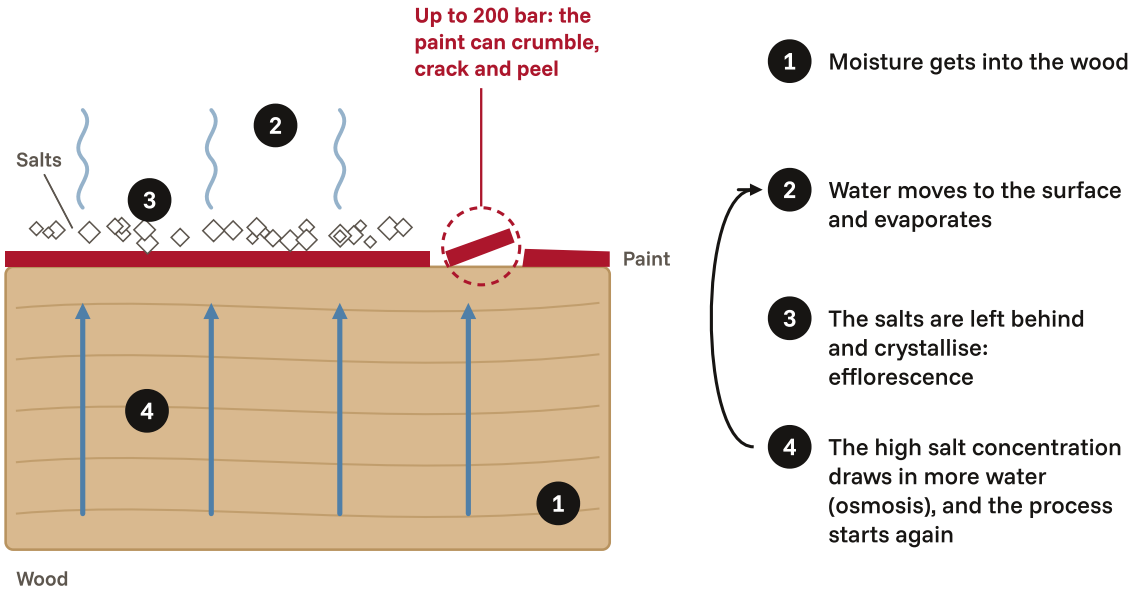


Figure 4. Efflorescence and osmosis: a self-reinforcing process.

4. Prevention of Problems

Dry storage of building materials before and during construction helps prevent mould, mildew, efflorescence and the onset of osmosis. However, effective ventilation of the construction is the most effective measure for preventing problems later in the building's service life.

Although there are several preventive measures that can be taken, problems may still occur as a result of the combined effect of several minor shortcomings. It is therefore also important to understand how to investigate the causes when a problem occurs.

4.1 Investigation Checklist

- **Assess the affected construction:** How old was the building when the problem first appeared? If the building is new, the source is likely to be the building material itself and/or water that entered the construction during the building process. If the building is older, inspect it carefully for possible new leaks and sources of water.
- **Assess the location of the problem:** The location of the symptom can help identify the water source causing the problem. Consider the use of the building as well. For example, if a building has stood empty/unheated for several months, different conditions may have developed that contributed negatively.
- **Check the condition of the building material:** Cracks or other defects may have allowed water ingress. Examine the condition of the material and the quality of workmanship to identify potential moisture entry points.
- **Review the building construction:** Evaluate wall sections and construction details to identify possible moisture paths and sources of contamination with soluble salts. Check roof and wall junctions, as well as ventilation, flashing and covering details.
- **Collect laboratory reports:** Where possible, review laboratory test reports to determine the presence of soluble salts in the building materials and the surrounding area. Such reports can provide valuable information for identifying potential building problems.
- **Consider all sources of moisture:** Common sources include condensation within a wall, installation too close to ground or paving, lack of free airflow behind the construction, leaking pipes and defective drains. A comprehensive condensation analysis may be considered to identify all potential moisture sources.

5. Removing Mould, Mildew and Efflorescence

Once the cause of the problem, moisture, has been removed, the surface should be cleaned of mould, mildew and salts.

There are several techniques and simple remedies that can be tried. Efflorescence salts are water-soluble, meaning that efflorescence may disappear naturally through normal weathering and rainfall, but if the residues are heavy, it will not be efficient to just let rain do the work. Mold and mildew will not wash off ever, mechanical force must be used to remove this.

5.1 Methods for Removing Efflorescence

- **Pressurised water:** Applying pressurised water can dissolve efflorescence quickly, but care must be taken because high pressure can easily damage the paint and the timber beneath. If water is used, remove the water after application. If water is left behind, crystals may remain and efflorescence may reappear through osmosis.
- **Soap solution:** Efflorescence can often be removed easily using a soft brush and soapy water.
- **Diluted vinegar:** Household-diluted white vinegar can be used on efflorescence, mould and mildew. It is less harmful than industrial chemicals and is likely to be readily available.
- **Rodalon and similar products:** A number of products are available on the market that are specifically suitable for removing mould and mildew and may be more effective than vinegar solution.

Mold spots and salts may permanently alter the colour of the paint if they are allowed to remain for too long without being removed. This means that visible colour differences may remain even after the surface has been cleaned. This is particularly problematic with black, dark and translucent paints.

If osmosis has damaged the structural integrity of the paint, the damaged paint must be removed and the surface repaired with new paint. The same applies if the cleaning process itself has damaged the paint.

6. Key Takeaways

- Keep the rainscreen cavity continuously ventilated and unobstructed.
- Keep fire-retardant treated timber dry before and during installation.
- Protect end grain, joints and vulnerable details against moisture.
- Maintain and clean the cladding through the lifespan of the building.
- Treat mould, mildew and efflorescence as indicators of an underlying moisture problem, not as a problem by itself.
- Remove the source (fix the problem) of moisture before carrying out surface cleaning or repainting.

Fire-retardant paint from KOLOMORE

Read more about fire-retardant paint and fire classes on our website. Scan the code or go to **kolomore.com/en/brand/**

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Best practice for construction with fire-retardant treated wood

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