

A Wood Primer

by Susan Turner

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ood, an early building material, is natural and dynamic, changing in appearance and size due to time, weather, and organic factors. As a building material, wood is strong in compression, is flexible and has good tensile qualities. Unfortunately, it is combustible and subject to organic attack. Wood is anisotropic, which means that it changes dimensions unequally in different directions. With moisture changes, the length changes very minimally, but the width or depth can vary significantly. The degree of expansion or contraction of the wood is also dependent on the milling of the wood (see Figure 1). When the wood grain is perpendicular to the wood surface, the dimensions of the lumber are more stable.

In nature, wood grain is vertical, drawing up moisture, but it is protected by bark. Once milled, wood grain should ideally stay vertical and protected; but in our buildings, the wood found in beams, lintels, and sills needs to run horizontally. There is an inherent problem that can lead to deterioration.

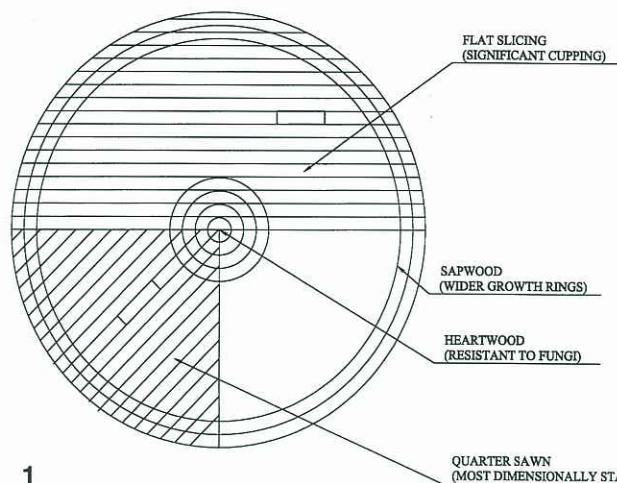
Wood deteriorates over time due to a number of factors:

- Inherent problems in the growth of the wood, its seasoning or milling, which can cause cupping or warping.
- Structural overloading, which causes checking, bending, or failure of the wood.
- Photodegradation caused by exposure to the sun, which results in silvering of the wood, as seen in driftwood on the beach.
- Moisture cycling (i.e., repeated cycles of wetting and drying), which can cause damage by salts crystallization, as seen in wood located in close contact with the ground.
- Detailing problems in the use of the wood, which can cause standing water, or wear and tear damage.
- Organic attack, by fungus, mould, rot, insects and animals.

CASE STUDY

Figures 2 and 3 provide specific examples of typical wood deterioration. What has occurred?

First, the paint is old and is peeling. This exposes the wood, allowing it to photodegrade, or silver. The exposed



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Wood Milling Diagram. Locations of Heartwood, Sapwood, Quarter Sawn and Flat Sliced Lumber.

wood also absorbs more water, causing it to expand, which further deteriorates the paint film. Once the moisture content in the wood increases, it affects the fasteners, perhaps causing nails to rust. As the nails rust, they expand, causing the joint to spread. As the joint opens, it allows moisture into the soffit behind, causing its deterioration. All this, just because the paint was not maintained!

THE APPROACH

1. Determine the cause of the deterioration.

In Figure 2, is it the age of the paint that causes it to fail? In actual fact, the problem here began with a rain gutter that did not drain properly, and this excess moisture caused the initial paint failure. Around the corner, the flat roof actually drains back against the building, causing ponding, with an insufficient downspout to carry the water away (see Figure 3). This excessive moisture is the actual cause of the deterioration.

2. Remove the source of the deterioration.

For a successful repair, the root cause of the symptoms must be "cured" before the symptoms can be repaired. If the soffit and fascia were painted without removing the source of water, the repair would fail prematurely. In these examples, the small roof must be repaired to drain positively into the gutter, and the gutters must shed through adequately sized downspouts. Once this drainage is in place, the wood repair can proceed.

3. When repairing historic wood, always maintain as much of the original material as possible.

In these examples, the wood is not particularly historic, but generally, removing the least amount of existing material is recommended.

Figure 3 shows rot of the fascia board adjacent to the wall. The ingress of water over time has caused cracking of the stucco. To repair this, cut away the rotted fascia back to the point at which there is sound wood, using neat, square cuts. Fit in a new piece of wood, ensuring matching of the new material for grain direction, cross-section, wood species and moisture content. Prime all faces and edges of the new piece, as well as the newly prepared edges of the existing wood, before fastening it into place. Use hot-dipped galvanized or stainless steel screws, nails, crimps, to avoid future rusting. Once the new material is in place, finish the new surface to match the existing surface. This might involve planing the surface level, or tooling the new surface to match the old, or replicating the profiles.

As an alternative to splicing wood, there are wood consolidants that can be used in small areas. These products, such as 2-part epoxy resins, pre-mixed wood fillers and fibreglass products, need to be thoroughly assessed prior to use to ensure that they are of compatible strength, composition, appearance and porosity. These products are not reversible, and should not be used indiscriminately. They are very useful in small areas of damage, where wood splicing would require dismantling too many elements. Once set, these products can be finished and/or tooled to match the adjacent wood.

4. Ensure the work is fully finished to prevent future deterioration.

When the wood repair is completed, apply the appropriate finish. Generally, this is a prime coat and two top coats of paint or varnish, as dictated by the existing finish.

There is a lot of debate over latex versus oil paints. Historically, paints contained lead, which is inherently an anti-fungal agent that tended to preserve the wood. When refinishing existing lead-based paints, follow health codes to prevent lead poisoning. Subsequently, oil paints were produced without lead. These provide good adhesion with the wood, but are less flexible than the later latex paints. This means that the oil paint will tend to crack and visibly fail before latex. Because of the ease of cleanup, and the environmental friendliness of latex paints, many people prefer latex paint. The downside of latex is that, due to its flexibility and breathability, it will allow moisture through to the wood for several years prior to the paint film visibly failing, which causes saturated wood in the meantime.

As a final step, assess the appropriateness of using caulking and sealants in small beads where dissimilar materials meet and could allow ingress of moisture. Prior to application, ensure the substrates are very dry, or it could inadvertently seal in moisture.

Susan Turner, a restoration architect in Winnipeg, can be reached at sturner@smithcarter.com

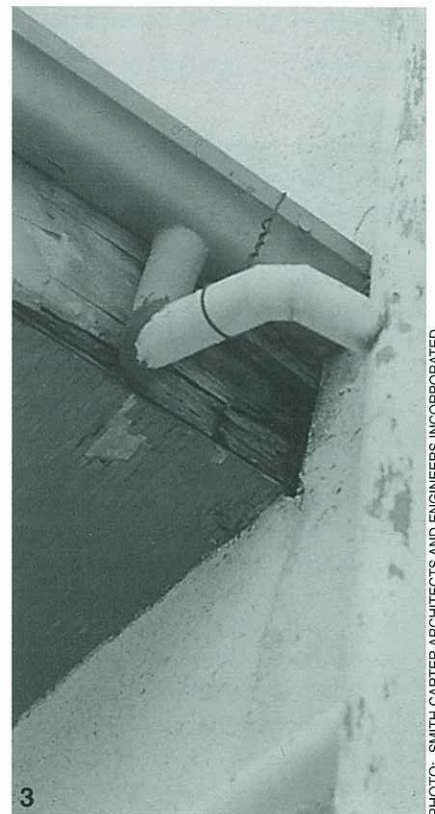
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Soffit with wood deterioration.



Soffit and fascia deterioration due to water drainage difficulties.

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