Wood and Material Quality

Summary

This text explores the structure and properties of wood, providing tips on how to select appropriate qualities for different parts of a building.

Wood has a long tradition as a building material in the Nordic countries. Knowledge of wood and material quality is part of our intangible cultural heritage. Working with older buildings requires specific skills and interest, and the choice of timber for repairs, restoration, and additions should be informed by this knowledge. High-quality materials ensure the durability of both the architecture and craftsmanship. Traditional material knowledge should also receive greater attention in modern construction.

The Nordic region has an abundance of high-quality timber. However, most forest owners are unaware of the qualities they possess. Prime timber is often treated the same as inferior logs, leading to inconsistencies in the quality of materials available at building supply stores today. Traditionally, timber was sourced and processed locally. Even today, small local sawmills can provide materials consistent with traditional practices. Using local suppliers requires some planning, as materials need to be ordered well in advance. Ideally, timber is harvested in winter when the moisture and nutrient content in the sapwood is minimal, making it easier to dry and providing fresh, dry materials for construction. For specific applications, further drying is required, typically by storing the timber in a well-ventilated and dry area until use. This is particularly important for flooring materials. If a local supplier is not an option, larger building supply stores can be used, but beware that the quality can vary significantly. In such cases, knowledge about material quality is essential — investing time in selection ensures the longevity of the work undertaken.

Economics of Timber Selection

Most homeowners order materials from large supply chains or contractors, as this is often the cheapest and least time-consuming option. However, taking a more active role in material selection as a homeowner or craftsperson requires time, knowledge, and often greater expense. Why pay more when cheaper materials are delivered directly to your door? The quality of the wood and its position within the log affect material properties. Choosing high-quality materials ensures durability and cost efficiency. Neglecting this can lead to significant additional expenses. For example, material costs typically account for about 10% of the total cost in restoring buildings. Using poor-quality materials often necessitates replacement after just a few years, incurring new material and labor costs. Investing slightly more in quality materials is well worth it.

Wood as a Building Material

The Anatomy of a Log

Examining a tree stump or log reveals growth rings, each representing one year of growth. The log consists of cells that transport water and nutrients to the tree's crown. Rapid spring growth produces wide, light-colored rings called earlywood, while the darker, denser latewood forms during the summer. Wide rings indicate weak timber, making such logs unsuitable for restoration and repair.

A tree log consists of several layers:

- **Bark:** The outermost layer.
- **Sapwood:** Beneath the bark.
- **Heartwood:** Found inside the sapwood; in pine, this is also known as malmved or resinous timber. Pine heartwood is darker than sapwood.
- **Pith:** The central part of the log.

The log's structure and the parts used significantly influence the durability of construction projects. Spruce and pine are the most commonly used species for building materials in the Nordic region. Quality varies based on growth conditions, but older pine (approximately 120-150 years) often has a high proportion of heartwood. Pine is commonly used for log houses, roofing shingles, floors, and windows. Its resin-rich heartwood provides natural resistance to decay, provided the pine is of high quality with a high heartwood content and narrow growth rings. Pine sapwood is suitable for less exposed components, such as structural and interior elements.

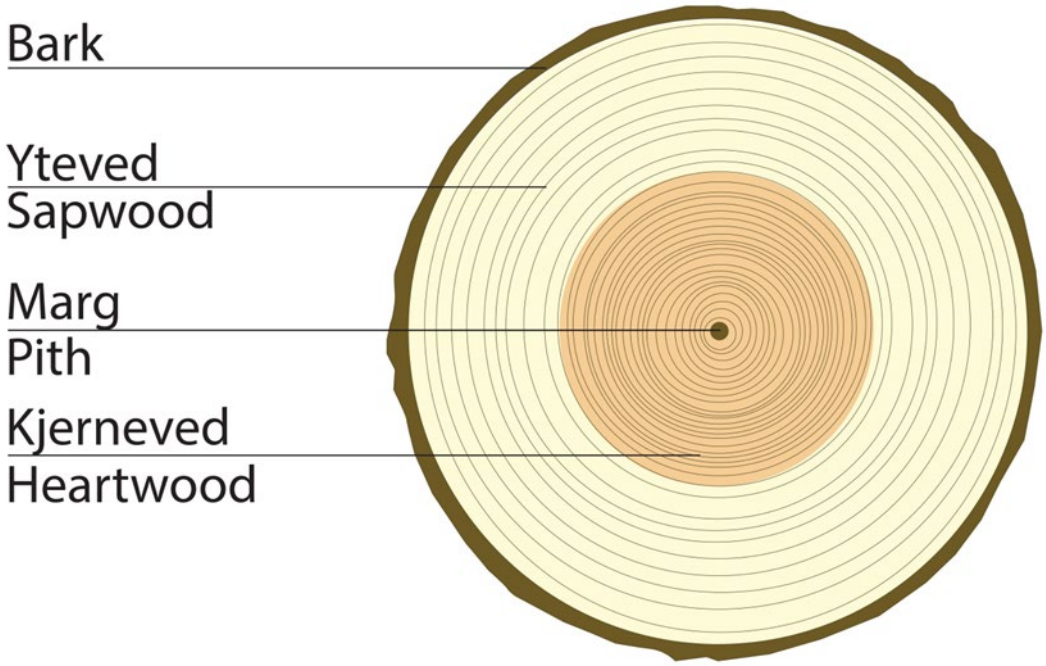

Figure 1. Anatomy of a tree log.

Spruce has different properties than pine and is commonly used for structural elements, cladding, and boatbuilding. Spruce heartwood is resistant to decay due to its low nutrient content, which inhibits mold and rot. Understanding the required wood species and qualities for specific applications is critical.

Pressure-Treated Timber

Pressure-treated timber is treated with a solution of metal salts, typically copper, for preservation. Although salt treatments date back to the early 1900s, pressure-treated wood became common in house construction around 1970. Poor to mediocre quality wood is often used for pressure treatment. These materials retain moisture and perform poorly when combined with untreated wood, potentially causing rot. Pressure-treated timber is generally not recommended for older buildings.

The Building Construction

We have two types of wooden building constructions: horizontal and vertical. Horizontal construction includes various forms of log buildings, with a wide variety of styles and local differences. Vertical constructions involve various forms of standing wood often stiffened with diagonal braces. In this category, we also find forms of timber framing and post-and-beam structures.

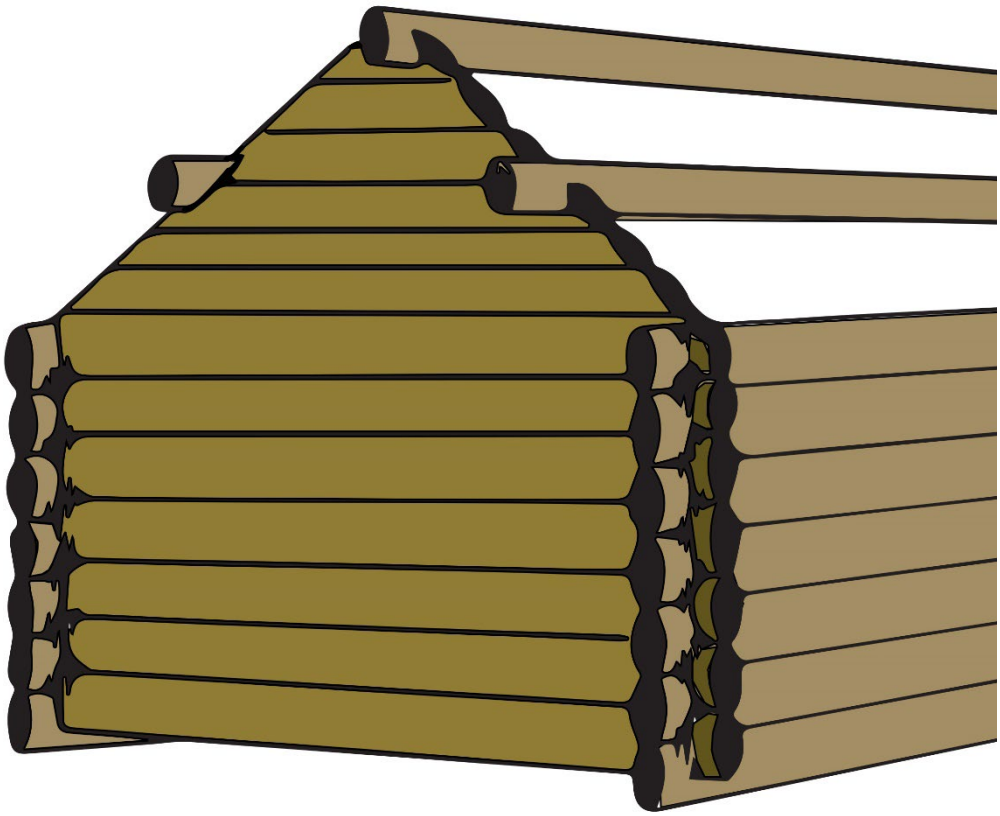

Figure 2. A traditional log construction.

Useful to Know When Selecting Wood for the Main Construction

- Both pine and spruce are used in building construction. However, there are several local variations. In some areas in the Nordic countries, oak and birch have also been used.
- Lower quality wood can be used for standing construction elements that only need to bear compressive forces, such as posts. These are building components that are clad and protected from the weather. The exception is posts that are in direct contact with the foundation.
- Roof beams and rafters are exposed to significant loads and bending forces. For this, strength is required, which means using higher-quality wood (spruce is stiff and strong and has a lighter weight than pine, making it more suitable).
- Log construction should use especially high-quality wood with slow growth for the lower logs in the structure, such as the base log. Higher up on the wall, the weather exposure is less, and lower quality can be used. Walls exposed to harsh weather conditions should also use high-quality logs. Logs with many knots can be used in log structures, both for spruce and pine.

The Roof

The roof structure is divided into two main types: log roof construction and rafter roofs. Roof decking or boarding is placed on the beams or rafters. This forms the substrate for various roofing materials, such as slate or tiles. Another variant is a plank roof, built from overlapping boards, traditionally used as both the underlayer and the outer roof covering. The choice of roofing material determines the roof structure and the dimensions of the timber used in construction.

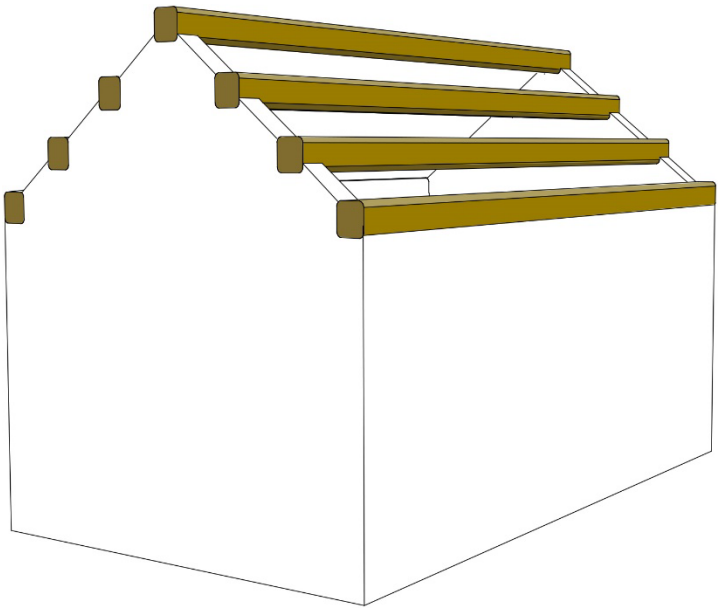

Figure 3. Log roof construction.

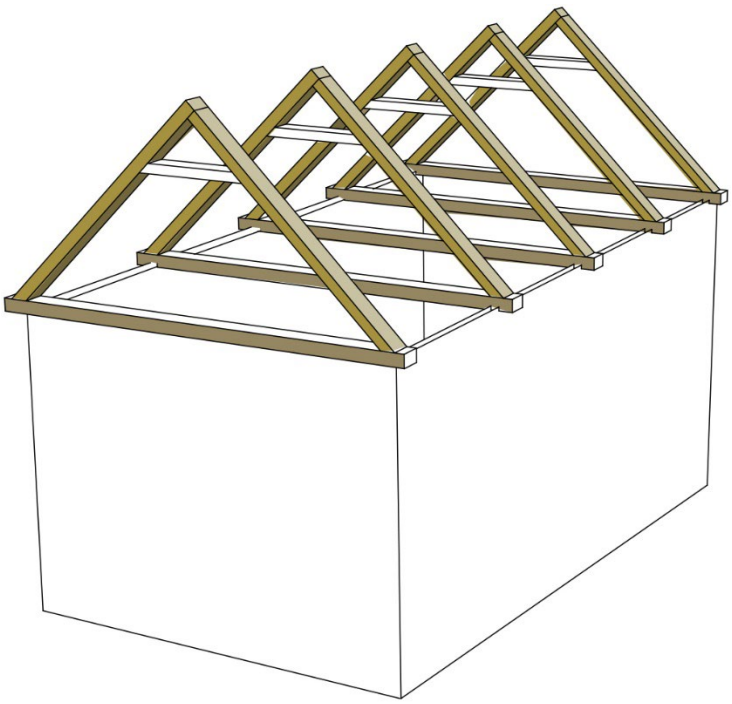

Figure 4. Rafter roof construction.

The construction of the underlayer is relatively constant and falls into two categories:

1. **Roof decking:** This includes both standing and lying boards or plates that are placed edge-to-edge.
2. **Subroof:** This involves boards laid parallel to the long walls.
3. **Counter-battens:** These are thin wooden strips nailed onto the underlayer, forming a base for the battens, which in turn support the roofing material. Counter-battens allow water to pass through if it gets past the roofing material.

Useful Information for Choosing Timber for Roofs:

- When roofing with slate or tile, the underlayer provides extra protection against weather and moisture infiltration. It should be made of high-quality material to ensure it is watertight.
- Counter-battens and battens should also be of high-quality wood, as they are exposed to moisture and susceptible to rot.
- Dimensions for counter-battens and battens should be at least 30 mm each. The underlayer, battens, and counter-battens should be made from slow-grown spruce or high-quality heartwood.

Exterior Cladding

Exterior cladding refers to the outer panels or siding of the building. This can be made from either spruce or pine. In cases where replacements are necessary, the existing wood type should be continued, meaning the same species already present on the wall. Exterior cladding serves as the house's outer shield against weather and wind, facing significant exposure. However, the sun is the greatest enemy, as heat causes drying and cracking of the panels. For coastal houses, the prevailing wind direction determines the most exposed side.

Useful Information for Choosing Timber for Exterior Cladding:

- Timber for cladding should be of high quality, with a high proportion of heartwood. The denser the growth rings, the better.
- Panel boards should have vertical growth rings.
- Exterior cladding usually ends with a waterboard beneath, at the base of the wall near the foundation. These boards are highly exposed to moisture and should also be of high-quality material.

Bargeboards, Top and Bottom Boards, and Drip Boards

Bargeboards, top and bottom boards, and drip boards are exposed building elements that must withstand weather, wind, moisture, and sunlight. The bargeboard is the edge board that finishes the roof cladding at the gable end of the building, protecting the roof structure from lateral moisture. Poor-quality bargeboards risk warping outward, reducing their protective function.

The top board lies at a 90-degree angle to the bargeboard and parallel to the roof. It is subjected to significant moisture as it lies horizontally and faces upward. A rule of thumb is that thinner top boards (15–19 mm) last longer because they can dry out between rainfalls. If the top board absorbs and retains too much moisture, it can negatively affect the bargeboards. Top boards are also considered "sacrificial boards," meaning they may need replacement periodically.

The drip board is located below the exterior cladding or beneath windows. It is a slanted board designed to divert rainwater away from the cladding, foundation, and windows.

Useful Information for Choosing Timber for Bargeboards, Top and Bottom Boards, and Drip Boards:

- These are components subject to heavy loads, and high-quality materials, preferably heartwood or resinous wood, should be used.
- Dimensions, width, and thickness of the boards should match the originals.
- Traditionally, almost exclusively slow-grown spruce was used for these components.

Windows

Old windows generally have a long lifespan because they are part of older craftsmanship traditions, both in terms of execution and material choice. With proper maintenance, windows over a hundred years old can last at least another hundred years. In comparison, modern wooden windows have a lifespan of 25–30 years. It is therefore a good investment—both economically and environmentally—to preserve and restore old windows. Rotted material in old window frames, casings, and moldings can be replaced with new, high-quality timber. For insulation purposes, sealing around windows with materials like moss, wood fiber, wool, or flax is recommended. Additionally, an insulating interior storm window can be installed to limit heat loss.

Useful Information for Choosing Timber for Windows:

- Traditionally, high-quality timber with dense growth rings was used to ensure durability and stability.
- Knotty wood was commonly used for window frames.

Gates and Doors

The restoration of gates and doors shares similarities with the restoration of windows. High-quality craftsmanship and materials were typically used in their original construction. Damaged timber can be replaced with new, high-quality material. To avoid shrinkage and cracking, it is important that the materials are dry.

Useful Information for Choosing Timber for Gates and Doors:

- Timber with high-quality heartwood and dense growth rings should be used.
- During restoration, ensure that materials are dry before use.

The text is based on the booklet "Wood and Material Quality" published by Fortidsminneforeningen.