



The five-story 17th-century pagoda at Kyoto's Toji temple, Japan.

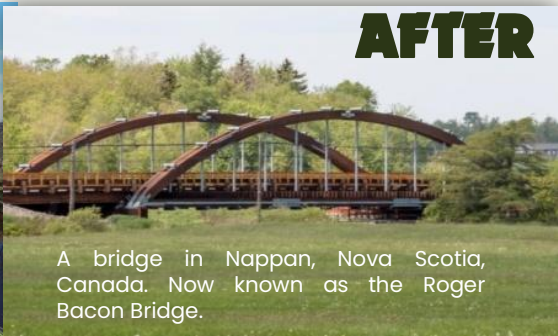


TIMBER

WHAT'S OLD IS NEW AGAIN



BEFORE



AFTER

A bridge in Nappan, Nova Scotia, Canada. Now known as the Roger Bacon Bridge.

SUSTAINABLE



Building with wood, reducing CO₂



By 2050, the level of urbanisation in Europe is expected to be **83.7%**.



Urbanisation creates a growing need for housing.



Timber is a sustainable and low-carbon construction material.

Producing 1 tonne of:



Concrete releases 159 kilos of CO₂ into the atmosphere



Steel releases 1,240 kilos of CO₂ into the atmosphere



Wood absorbs a net 1,700 kilos of CO₂ from the atmosphere.

The EU wants to reduce emissions from construction by **90%** by 2050.

CO₂



But, construction accounts for 36% of all **CO₂ emissions** in the EU



Thanks to demand for housing and emissions targets, Timber consumption is expected to rise **170%** over the next 30 years.

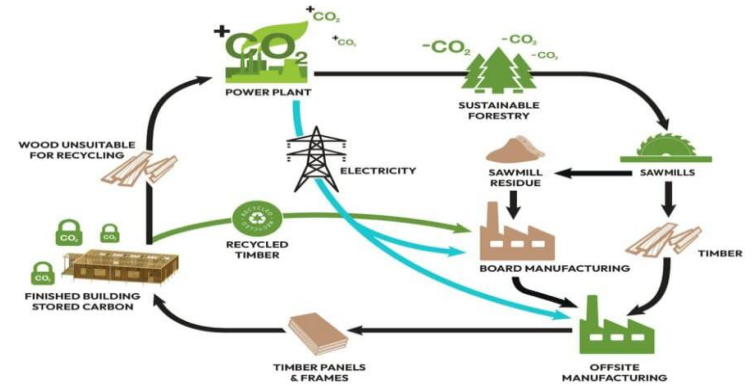
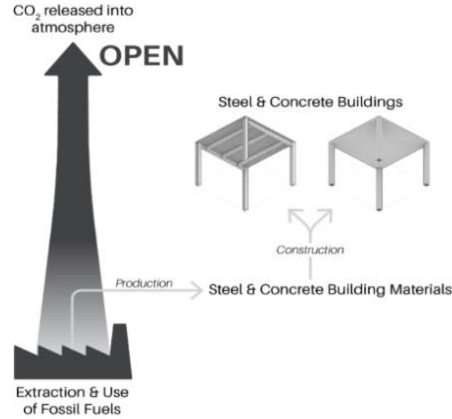
Data from the European Commission, Gresham House and the New Zealand Forestry Owners Association



Timber stands out as a naturally sustainable material, sequestering carbon during tree growth and locking it away when converted into products. In stark contrast, steel and concrete production entails extensive mining, resulting in substantial carbon emissions.



ENVIRONMENTAL BENEFITS



The use of timber in construction offers numerous environmental benefits over steel and concrete. As a renewable resource, timber absorbs carbon dioxide from the atmosphere during its growth, reducing greenhouse gas emissions, and stores carbon for its entire lifespan. Sustainable forestry practices ensure that timber is harvested responsibly, maintaining forest ecosystems and biodiversity.

Timber stands out as a highly environmentally friendly material, boasting two significant advantages: carbon sequestration and complete recyclability. Unlike steel, which is only partially recyclable and often difficult to extract from existing structures, timber can be fully repurposed. Concrete, on the other hand, is non-recyclable and can even contribute to further pollution if left to deteriorate.



STRENGTH TO WEIGHT RATIO

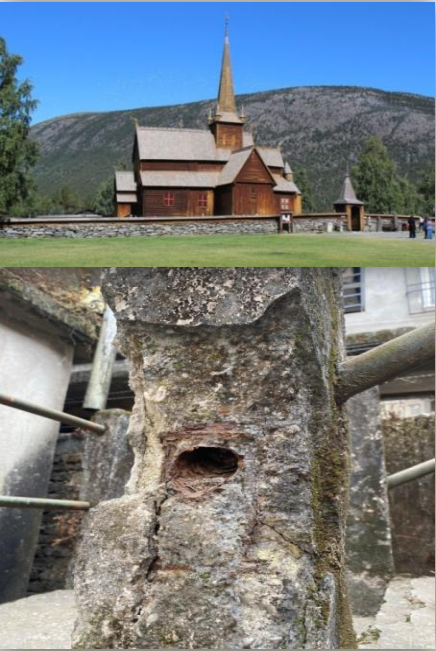


Steel excels in strength but is outmatched by timber's exceptional strength-to-weight ratio, while concrete trails behind due to its substantial weight and relatively lower strength.

Criteria	Timber	Steel	Concrete
Tensile Strength /Weight Ratio	High (45.71)	Moderate (43.75)	Low (1.79)
Compressive Strength / Weight Ratio	High (57.14)	Moderate (31.25)	Low (10.11)
Weight (Kg)	500	8000	1680



BUILT TO LAST

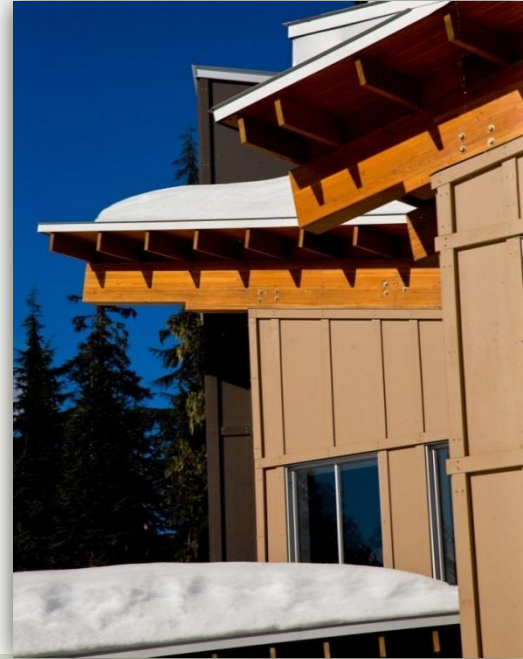


Natural Strength & Stability:

Wood is a naturally strong, lightweight material due to its unique cellular structure. Composed of cellulose, lignin, and hemicellulose, wood cells provide exceptional strength and durability. Wood products can withstand significant force, particularly when compressed or tensioned parallel to the grain. A 10x10 cm Douglas-fir square can support up to 5,000 kg in compression. Wood's stiffness and ability to handle constant stress make it an ideal choice for structures bearing heavy loads over time.

Deflection, Drainage & Drying :

Issues such as decay and mould can be avoided with proper detailing of wood buildings to prevent exposure to water and moisture entrapment. Moisture can be managed, and decay averted in wood buildings using four common strategies: deflection, drainage, drying and durable materials



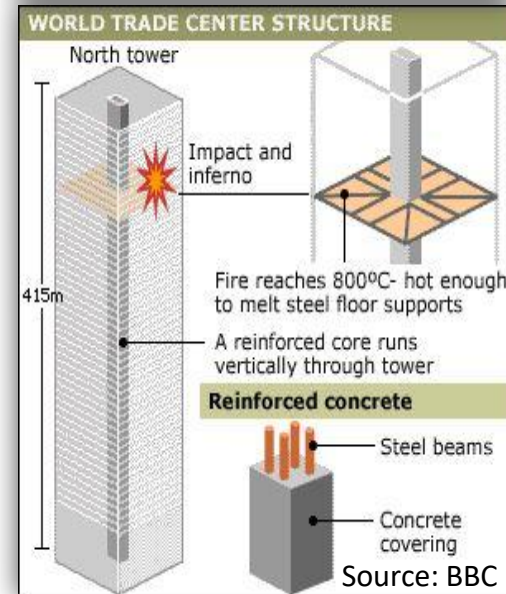
Durable and strong: Wood is a resilient material that provides decades, even centuries, of service. Yet misperceptions still exist that buildings made of materials such as concrete or steel last longer than buildings made of wood. As with any structural material, effective design is what counts.

Ancient wood buildings continue to stand including 8th century Japanese temples, 11th century Norwegian stave churches, and the many medieval post-and-beam structures of England and Europe. Beyond their cultural significance, these old wood buildings endure because they were well-designed, built and maintained.

FIRE RESISTANCE

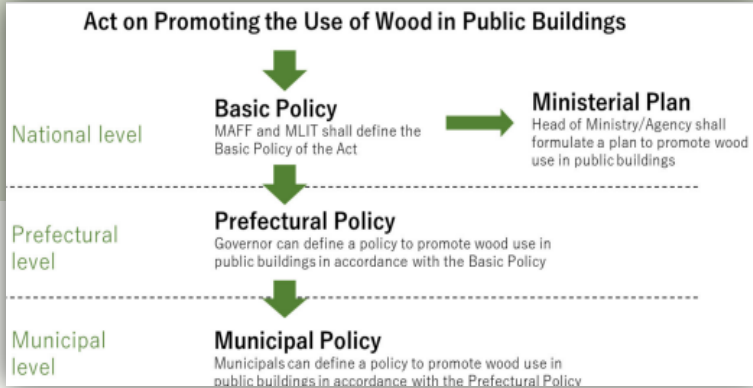


Unique properties of timber make it a safer choice in fires. When exposed to flames, timber chars, creating a thermal barrier that slows heat transfer and protects the inner material. This maintains structural integrity, allowing for safe evacuation. Steel, however, melts at relatively low temperatures (around 550°C), compromising its load-bearing capacity and potentially leading to catastrophic failures, as witnessed in the World Trade Center collapse in the USA.





EARTHQUAKE RESILIENCE



Source: Ministry of Agriculture, Forestry and Fisheries (MAFF), Japan

Higher strength to weight ratio of timber makes it a suitable material for high seismic active regions. Countries like Japan, a high-seismic region, revolutionizes building design with timber construction, showcasing unparalleled earthquake resilience and suitability for ecologically sensitive areas. Concrete and steel, with their high weight, are ill-suited for earthquake-prone regions, exacerbating damage and collateral destruction.



Osaka Kansai, Japan



QUICK FACT

Japan has introduced a policy to incorporate timber into its future construction projects. As a country prone to seismic activity, the use of lightweight timber enables the creation of resilient structures that can better withstand earthquakes. Additionally, this initiative supports Japan's environmental goals, including its commitment to becoming carbon neutral by 2050.

TRANSPORTABILITY



Less density (weight) of timber helps in transporting it to remote locations with ease. The rigidity and heavy weight of steel makes it tough to transport to remote locations.. Concrete requires on-site preparation or production within a nearby accessible radius, due to its limited transportation distance and time constraints before setting.



QUICK FACT

Timber's inherent flexibility and relatively lightweight composition make it an ideal material for transportation to remote locations, where accessibility is often limited. In contrast, steel and concrete are much heavier and more cumbersome to transport, posing significant logistical challenges in reaching isolated areas.



CORROSION



Wood's natural properties make it an outlier in chemical resistance. While metals like steel and aluminium succumb to corrosion in harsh conditions, wood's cellular structure and organic compounds protect it from degradation.



QUICK FACT

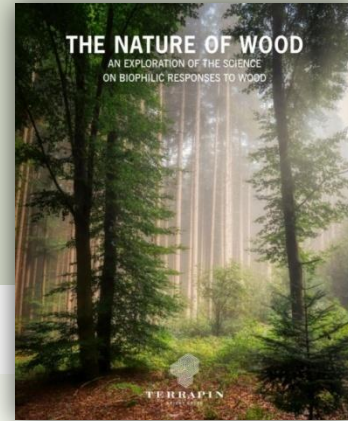
For centuries, wooden barrels have safely stored chemicals, showcasing wood's enduring resistance to chemical corrosion

BIOPHILIC BENEFITS

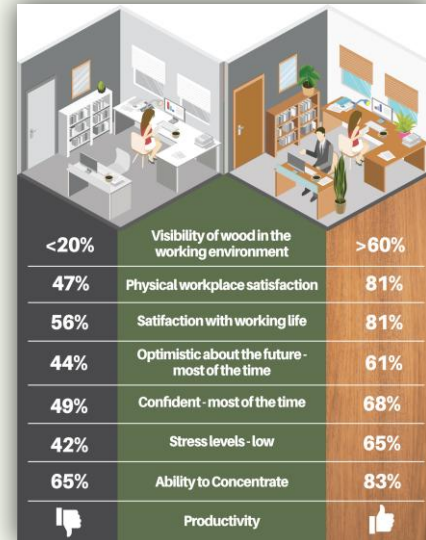


Timber offers unique biophilic advantages over steel and concrete, promoting well-being and connectivity to nature. Its natural aesthetic, warmth, and texture create inviting spaces, improving air quality and acoustics. Timber's organic origin reduces stress, boosts mood, and increases productivity. As a renewable and sustainable resource, timber also minimizes environmental impact. Incorporating timber into design fosters a sense of connection to nature, enhancing occupant experience.

Early biophilia research focused on the responses to viewing and experiencing natural environments. One of the best-known studies found that having a view to nature led to better healing outcomes among hospital patients. Research also suggests that humans prefer views to savannah habitats with trees and, specifically, shade trees. Through guided walks in forests in Japan and Korea, researchers have been exploring Shinrin-yoku, or "forest bathing," in conjunction with impacts on stress reduction and immune system function.



Source: A report by Terrapin Bright Green



Source: Think wood





DESIGN FLEXIBILITY



Timber's inherent flexibility is a designer's dream, allowing for sweeping curves, intricate details, and bold creativity – all impossible with rigid steel and concrete.

- * Curved, tapered, and complex shapes possible.
- * Customizable dimensions and profiles.
- * Easy integration with other materials.
- * Endless aesthetic options.



THERMAL INSULATION



Typical Construction Materials	Thermal conductivity (W/mK)
Reinforced concrete (2% Steel)	2.5
Concrete Block Outer Leaf	1.21
Concrete Block Inner Leaf	1.33
Clay Tiles	1.00
Felt Bitumen Layers	0.23
Timber	0.13

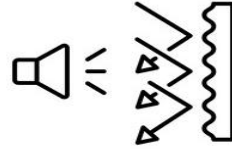
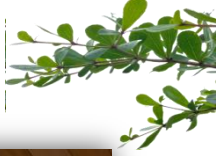
Source: KORE Insulation



Timber possesses excellent thermal insulation properties, making it an energy-efficient building material. The cellular structure of wood contains air pockets that act as natural insulation, reducing heat transfer and minimizing thermal conductivity. This results in a lower U-value, which measures the rate of heat transfer through a material. With a U-value ranging from 0.15 to 0.30 W/m²K, timber provides better thermal insulation than many other building materials, including steel and concrete. This natural insulation property of timber helps reduce heating and cooling costs, creating a more energy-efficient and sustainable building envelope.



ACOUSTICS



For centuries, wood has been a material of choice for acoustic performance. Wood produces sound by direct striking and it amplifies or absorbs sound waves. For these reasons, wood is an ideal material for musical instruments and other acoustic applications, including architectural ones. When it comes to auditorium and performance spaces, such as concert halls, classrooms and lecture theatres, wood is often chosen over steel, concrete and glass to produce some of the most rewarding acoustic spaces for performers and audiences.



GLULAM PROPERTIES



Glulam species	MoE (GPa)	MoR (MPa)	Glulam Grade (EN 14080)
SYP	12.32	30.40	GL 26 h
Hemlock	12.55	30.68	GL 28 h
Douglas fir	9.97	44	GL 20h

Properties	GL 20 h	GL 26 h	GL 28 h
Tensile strength to grain (Mpa)	16	20.80	22.30
Compressive strength to grain (Mpa)	20	26	28
Shear Strength (Mpa)	3.5		
Rolling shear Strength (Mpa)	1.2		
Shear Modulus (Mpa)	650		
Rolling Shear Modulus (Mpa)	65		



UNIQUE COMBINATION



Unlike steel and concrete, which excel in either tensile or compressive strength respectively, timber uniquely offers a combination of both. While steel dominates in tensile strength and concrete in compressive strength, timber provides a balanced blend of aesthetics, strength, durability, making it an attractive, versatile, and sustainable building material.





THANK YOU

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