



Architects and developers concerned about climate change are becoming more interested in alternatives to steel and concrete, both of which have significant carbon footprints compared to wood. As a renewable natural resource, wood offers a building material with plenty of structural capability and superior environmental performance.

One alternative to steel and concrete that has much lower embodied energy and greater carbon storage capacity is a group of products called mass timber. These innovative engineered wood products are made from sustainably grown timber and can be used to build large wood structures that are safe in both fires and earthquakes. Larger, commercial wood buildings also meet marketplace demands for more open floorplans with exposed structural elements and warm natural finishes.

WOOD STANDS TALL



Michael Green Architecture
Photo: Ema Peter

CARBON STORAGE

Trees and wood sequester carbon, helping to offset greenhouse gas emissions – a major contributor to global warming. Through photosynthesis, trees remove carbon dioxide from the air. This is stored as carbon in the trunk, branches, roots and leaves or needles. About half of the dry weight of wood is carbon. This means that when trees are harvested and converted to wood products, these products continue storing carbon for the life of the structure.

Each year, forests and wood products store enough carbon to offset about 10 percent of the nation's CO₂ emissions. Increasing the use of wood products from sustainably managed forests can expand that capacity.

*Oregon State University - Hallie E. Ford Center for Healthy Children & Families, Corvallis, Ore.
THA Architecture
Winner of a U.S. WoodWorks Wood Design Award
Lara Swimmer Photography*



Oregon Forest Resources Institute

ENVIRONMENTALLY RESPONSIBLE

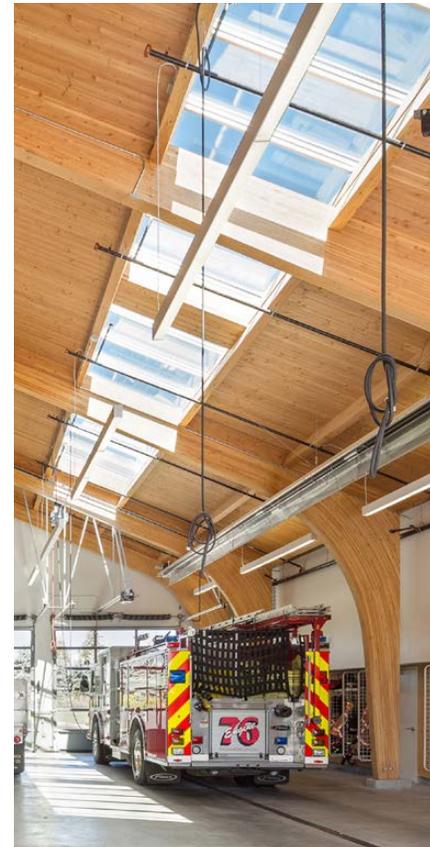
Life cycle assessment studies consistently show wood to be better for the environment than steel or concrete in terms of embodied energy, air and water pollution, and greenhouse gas emissions. North American wood producers use 99 percent of each log they process, reducing waste to near zero.

Wood is the only major building material derived from a resource that is both renewable and sustainably managed. In U.S. forests, annual growth has exceeded combined harvest and mortality for decades. According to the U.S. Department of Agriculture, the standing inventory of trees on U.S. public and private forestland has increased by more than 50 percent since 1953. In the Pacific Northwest and elsewhere, laws mandate prompt reforestation after harvest and require landowners to protect wildlife habitat and water quality, ensuring sustainable forests in perpetuity.

SEISMIC AND FIRE SAFETY

Building designers are devising mass timber building systems that meet and even exceed seismic and fire safety building code requirements. Prescriptive codes are being developed for inclusion in future updates to the International Building Code (IBC). When it comes to seismic loads, wood products perform quite well. Some newer mass timber products, such as cross-laminated timber (CLT), are undergoing testing in the U.S. to determine their full structural capabilities and fire safety ratings. Test results from other parts of the world indicate a strong probability that these products and building systems will prove to be safe. In the meantime, building designers are utilizing hybrid systems that combine mass timber products with concrete and steel to ensure safety in the event of an earthquake or fire.

The 2015 IBC recognizes CLT and other mass timber products and grades them with a two-hour fire rating, because they burn much differently than 2x4s and other light wood framing materials. In a fire, mass timber's exposed surface becomes a char layer that safeguards its strength much longer than light-frame materials. Sprinklers and other modern fire suppression and egress systems further abate concerns about conflagration fires that many cities experienced more than a 100 years ago.



*Fire Station 76, Gresham, Ore.
Hennebery Eddy Architects
Winner of a U.S. WoodWorks Wood Design Award
Josh Partee Photography*

NEW ECONOMY

People often prefer wood's warmth, beauty and natural feel, placing a high value on exposed wood structure buildings. This is especially important to new economy industries that are characterized by cutting-edge technologies and high growth. They rely heavily on providing a pleasing work environment to attract and keep highly skilled employees.

Just as these wooden office buildings are attractive to companies that are filling them, they also support rural economic development, helping to drive demand for the mills in communities such as Riddle, Ore., and Colville, Wash. Portland architect Thomas Robinson calls the phenomenon "Forest to Frame" and likens it to the Farm to Table movement.



University of Washington, Mercer Court, Seattle, Wash.
Ankrom Moisan Architects
Photo: WG Clark Construction



Photo courtesy of DR Johnson Lumber Company

WOOD SUPPLY

Increased demand for wood in commercial construction can be addressed by using wood already in the supply stream. For instance, in the Pacific Northwest, some nine million acres of forestland are in need of restoration and fire resiliency work, which is often deferred because there is no market for the wood it produces. That material can be used to make mass timber which, in turn, would help finance restoration activities, while providing greater protection against catastrophic wildfires caused by excessively dense forests.

Another added benefit is that high-value engineered wood products create new markets for existing timber. This increased demand for raw timber may divert to domestic use some logs that would otherwise be exported.

ADHESIVES

North American manufacturers use polyurethane adhesives that meet the American National Standards Institute standard for bonding strength, moisture durability, elevated-temperature performance and heat durability. The adhesives cause no harmful off-gassing and retain their holding ability under extreme heat and moisture conditions. They do not act as a fire accelerant.

Adhesives used by Oregon's D.R. Johnson Lumber Company, currently the only U.S. producer of structurally certified cross-laminated timber (CLT), are GREENGUARD Gold Certified for low chemical emissions. They also meet the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) credit EQc4.4 and contain no urea or urea formaldehyde (UF).



CONSTRUCTION COSTS

Research cited by the London-based architectural firm Waugh Thistleton indicates CLT construction is about 15 percent less expensive than using conventional steel and concrete. Of course, construction costs vary from building to building, but the fact remains that mass timber buildings hold great promise for reducing overall design and construction costs.

Mass timber components are often cut to size and prefabricated offsite with openings for connectors, windows, doors, etc. The manufacturer then delivers these components to the construction site “ready to assemble.” This significantly reduces construction time, resulting in both labor savings and reduced interest for construction loans. As the mass timber industry grows, competition will result in lower product prices. Similarly, as building design teams learn how best to use these new products, architecture and engineering costs will decrease.



Photo: Tom Waddell,
Forest Business Network

Oregon Forest
Resources Institute



www.WhyBuildWithWood.org
email: BuildWithWood@OFRI.org



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