Wood: Sustainable Building Solutions

APA – THE ENGINEERED WOOD ASSOCIATION

Sustainability.

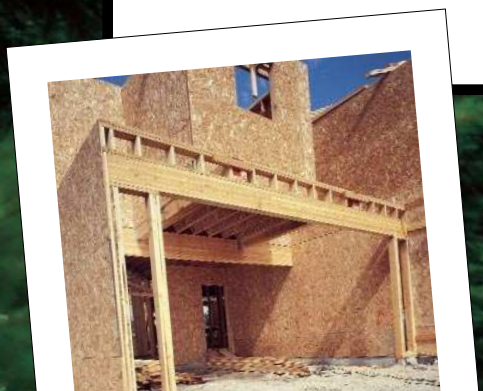
On the surface, it's a fairly basic concept: maximizing resources so as not to waste, damage, or deplete them. But when you examine how sustainability affects your daily life, you begin to see its layers unfold. Sustainability is about the items we purchase, the food we eat, and the cars we drive. It's also about one of the most lasting physical parts of our lives: the buildings in which we live, work, and play. The longevity of buildings makes it even more important to use sustainable construction to maximize the efficiency of the building and the quality of life on our planet for future generations.

Any new building is a long-term proposition – so, too, is production of the materials that go into it. Just like you would not measure the functionality of a building solely on its paint job, you would not measure its sustainability based on one step in its life cycle. Constructing sustainable – or "green" – buildings means examining the entirety of the building process: selecting appropriate sites, designing to maximize the natural attributes of the space, employing green building materials, and using energy-efficient equipment to maintain the finished product – a home, office, or public building.

Just what is a green building material? Look no further than what you're probably already using: wood, the natural green building product.

Wood's environmentally superior nature makes it the perfect material to use when building green. Wood's sustainability stems from its renewability, minimal manufacturing energy use, and few environmentally damaging greenhouse gases and other air-polluting emissions both in manufacturing and over its life cycle. A true measurement of sustainability examines the dynamic nature of wood as a building product, stretching from its beginnings as a seedling in our forests to its years of use in a building. Its natural qualities make wood a greener material than steel, aluminum, or concrete, products that may look good at a static point in the process but cannot truly compete with wood's environmental merits over the entire life cycle. And while wood is good, engineered wood is even better, maximizing the resources of a naturally renewable building material.

Examine the facts, and you'll see why wood is the natural choice for sustainable building.



Nature's Air Purifier

The naturally perfected building material,
wood sequesters carbon dioxide,
purifying the air we breathe.

Wood's beneficial role in a natural, healthy ecosystem cannot be overlooked. Not only do growing trees add oxygen into the air, they also absorb the carbon dioxide greenhouse gas we add to the atmosphere through our daily use of energy from fossil fuels. Other (man-made) building products simply add harmful pollutants to our environment in the manufacturing process, while the dynamic nature of a growing forest helps the environment for years before the wood becomes a building material. Using wood products keeps this natural cycle intact, maintains healthy forests, and promotes a better environment for earth's inhabitants.

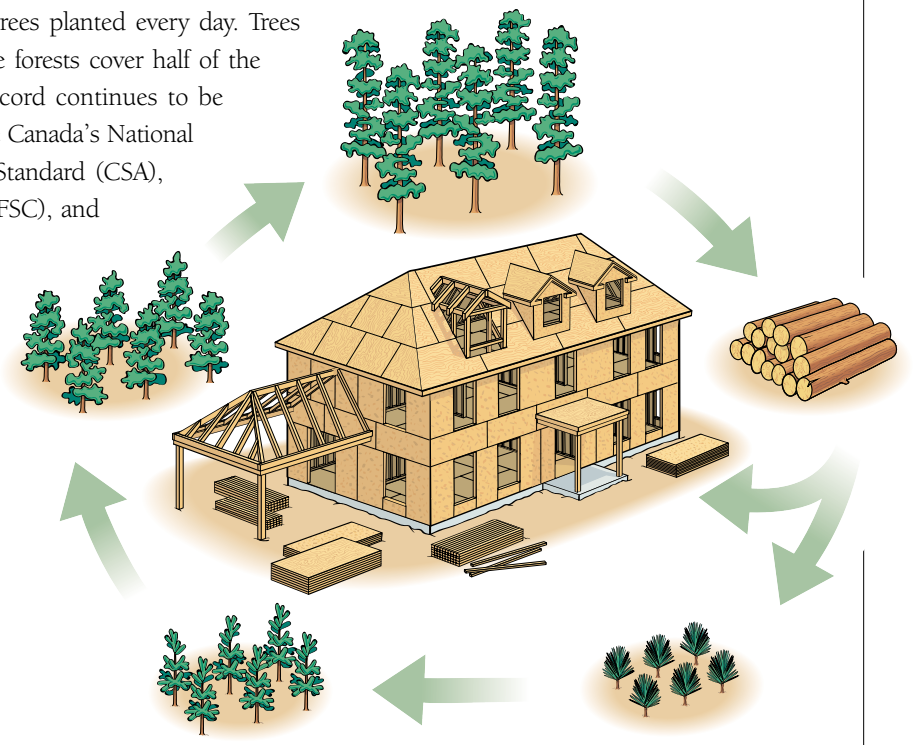
When a young forest is growing, it produces 1 ton of oxygen and absorbs 1.4 tons of carbon dioxide for every ton of wood. But as the forest matures, growth slows, and the absorption rate drops off. Harvesting a mature forest sequesters the carbon into the wood, meaning it will not be released into the atmosphere. A 2,400-square-foot wood-frame house, for example, locks carbon from 28.5 tons of carbon dioxide in the wood, roughly equivalent to seven years' worth of emissions from a small, light-duty car. Harvesting mature forests also allows new, young forests with a rapid rate of carbon absorption to take their places, continuing the naturally perfected cycle.

Demand Keeps Wood Growing

Demand for wood products gives private forest owners a good reason to plant more trees, keeping our forests growing.

Contrary to popular belief, we're not running out of trees. In fact, forest growth in the U.S. has continually exceeded harvest since the 1940s. The geographic area that encompasses the United States today has a greater exposure of forest cover – one-third of the land mass – than it did in 1920. Private forest owners ensure that quality land management, including aggressive reforestation efforts, will keep their business going in the future. But if demand for wood falls off, private landowners might replace the forests with a crop in higher demand, reducing the environmental benefits a growing forest produces in our ecosystem. Demand for wood products keeps our forests healthy and growing.

Indeed, American landowners plant more than 2 billion trees every year, and many more reseed naturally. The forest products industry, which comprises about 15% of forestland ownership, is responsible for 41% of all replanted forest acreage. That works out to more than 1 billion trees a year, or about 3 million trees planted every day. Trees flourish in Canada as well, where forests cover half of the land mass and the replanting record continues to be strong. Certification programs like Canada's National Sustainable Forest Management Standard (CSA), the Forest Stewardship Council (FSC), and the Sustainable Forestry Initiative (SFI) ensure sustainable growth and harvest, making U.S. and Canadian forests the healthiest and most productive in the world.



TECHNOLOGICAL ADVANCES, MAXIMIZED

Cutting-edge technology maximizes the resource efficiency in modern wood products mills, reducing waste and providing stronger, more durable products for the consumer.

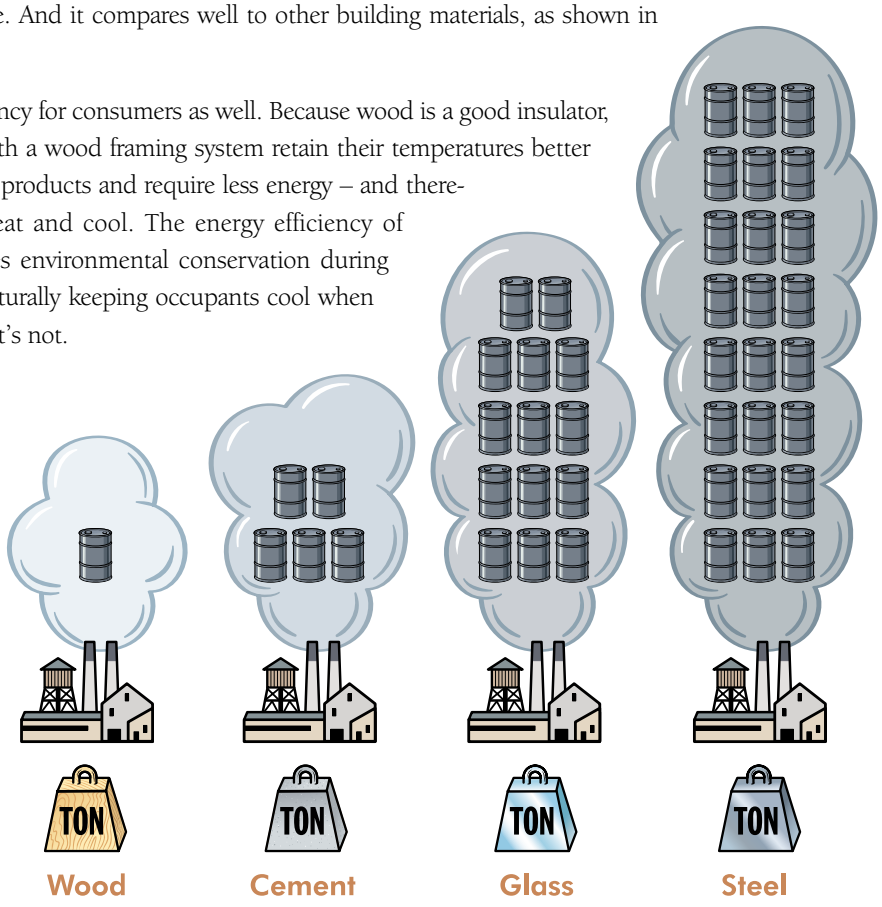
It's no tall tale. Even Paul Bunyan would cheer the technology that's improving manufacturing efficiency. Modern sawmills produce more than twice the amount of usable lumber and other products per log than they could a century ago.

More Product, Less Energy

The manufacturing process for wood is more energy efficient than the manufacturing process of any other structural building material, and a building constructed with wood will be energy efficient as well.

Other building products claim to be environmentally friendly, but their manufacturing process is anything but. Simply put, manufacturing wood products is energy efficient. Wood makes up 47% of all industrial raw materials manufactured in the United States, yet consume only 4% of the total energy used in industrial raw material manufacture. And it compares well to other building materials, as shown in the illustration.

Wood wins energy efficiency for consumers as well. Because wood is a good insulator, buildings constructed with a wood framing system retain their temperatures better than those of competing products and require less energy – and therefore less money – to heat and cool. The energy efficiency of wood products promotes environmental conservation during building operation by naturally keeping occupants cool when it's hot and warm when it's not.



Compare the amount of energy it takes to produce one ton of cement, glass, or steel to one ton of wood. It takes 5 times more energy for cement, 14 times more for glass, and 24 times more for steel.

Technological advances have increased the industrial output per unit of wood input 40% in the last 50 years. Touring a modern mill will demonstrate the effects technology has had on the efficiency of the entire production process, as computers operate to maximize resources. Innovations in recycling technology also reduce mill waste.

Modern technology assures more consistent quality of the product as it leaves the production line. This translates into better products for construction professionals who depend on strong, durable products that meet the grade every time they build. As technology continues to advance, the wood manufacturing process will only become more efficient, providing a better use of earth's resources and a dependable product for the consumer.

Green For Life

Life cycle assessment determines the full environmental impact of a product, and wood gets top ratings in these scientific studies.

The complexity of modern products makes it difficult to measure sustainability. In scientific circles, life cycle assessment (LCA) is emerging as the accepted way to determine the true environmental impact of any product. LCA provides a "cradle to grave" measurement of a product's environmental impacts due to raw material extraction and manufacture through distribution, use, maintenance, and disposal. LCA studies show wood is better for the environment than steel or concrete in terms of consumed energy, global-warming potential, air emissions, water emissions, and solid waste production.

A 2004 Consortium for Research on Renewable Industrial Materials (CORRIM) study used LCA to evaluate the differences between wood and steel in residential construction in the cold climate of Minneapolis and wood and concrete in the warm climate of Atlanta. The CORRIM study found that the wood house was better for the environment than the steel house in terms of embodied energy consumption, global-warming potential, air pollution, and water pollution. The study also showed that wood was favorable to its concrete counterpart in embodied energy consumption, global-warming potential, air pollution, and solid waste production.

CORRIM FINDINGS: ENVIRONMENTAL PERFORMANCE INDICES FOR RESIDENTIAL CONSTRUCTION

Minneapolis house	Wood frame	Steel frame	Difference	Steel vs. wood (% change)
Embodied energy (GJ)	651	764	113	17%
Global-warming potential (CO_2 kg)	37,047	46,826	9,779	26%
Air emission index (index scale)	8,566	9,729	1,163	14%
Water emission index (index scale)	17	70	53	312%
Solid waste (total kg)	13,766	13,641	-125	-0.9%
Atlanta house	**Wood frame**	**Concrete frame**	**Difference**	**Concrete vs. wood (% change)**
Embodied energy (GJ)	398	461	63	16%
Global-warming potential (CO_2 kg)	21,367	28,004	6,637	31%
Air emission index (index scale)	4,893	6,007	1,114	23%
Water emission index (index scale)	7	7	0	0%
Solid waste (total kg)	7,442	11,269	3,827	51%

The CORRIM study clearly indicates that the use of wood in both locations presents significantly less environmental impact than the steel or concrete counterparts, making wood the most sustainable building material over the life cycle of the product. Studies by the ATHENA Sustainable Materials Institute produced similar results, scientifically proving that wood is the greenest building product.

Wood's Good; Engineered Wood's Better

Engineered wood products maximize forest resources even more by enabling more efficient use of wood.

APA engineered wood products – including plywood, oriented strand board (OSB), glued-laminated timber (glulam), I-joists, laminated veneer lumber (LVL), oriented strand lumber (OSL), and Rim Board,® make far more efficient use of the available resource today than ever before. Engineered wood can be manufactured from fast growing, underutilized, and less expensive wood species grown in privately managed forests. That helps safeguard older forests that we, as a society, have chosen to preserve. Byproducts from production processes – small chips or unusable bits of wood – can be recycled and reused in other products and paper. Engineered wood also eliminates many of the defects found naturally in wood, thereby improving upon many of the material's inherent structural advantages.

Designers can order engineered wood products such as beams and headers to be manufactured to the exact specification for the particular project, reducing jobsite waste and promoting the maximization of resource efficiency. And the technological assurances of strength and stiffness mean engineers can design using fewer structural components, and therefore less of the resource.

WHAT ABOUT THE FORMALDEHYDE IN GLUES?

The glues used in structural engineered wood product manufacturing do not emit significant levels of formaldehyde.

When specifying APA trademarked engineered wood products, you can be sure the glues used in their manufacture are safe for both builders and occupants. Structural wood products use phenol formaldehyde or diphenylmethane diisocyanate (MDI). Their unique chemistry makes these waterproof adhesives highly durable and stable, resulting in low formaldehyde emissions.

In fact, large-scale chamber tests have shown that formaldehyde emissions levels in wood structural panels are no higher than the levels found naturally in the environment. Indeed, because formaldehyde levels associated with phenolic resin-bonded products are so low, the U.S. Department of Housing and Urban Development (HUD) exempts these products from the testing and certification requirements of the federal standard. For more information on phenol formaldehyde adhesives, refer to APA Technical Report *Structural Wood Panels and Formaldehyde,* Form SPE-1040, available at www.apawood.org/publications.

Wood: Sustainable Building Solutions

Please visit the following sites for more information on wood's environmental benefits:

- Athena Sustainable Materials Institute: www.athenasmi.ca
- Wood Promotion Network: www.beconstructive.com
- Consortium for Research on Renewable Industrial Materials: www.corrim.org
- Evergreen Magazine: www.evergreenmagazine.com
- Temperate Forest Foundation: www.forestinfo.org
- Forest Information: www.forestinformation.com
- Forintek Canada Corp.: www.forintek.ca

About *APA – The Engineered Wood Association*

APA – The Engineered Wood Association is a nonprofit trade association of and for structural wood panel, glulam timber, wood I-joist, laminated veneer lumber, and other engineered wood product manufacturers. Based in Tacoma, Washington, APA represents approximately 150 mills throughout North America, ranging from small, independently owned and operated companies to large integrated corporations.

APA offers a comprehensive set of services and tools for design and construction professionals specifying and using engineered wood products and building systems. If you're looking for detailed product information, training material, or technical assistance, APA can help.

www.apawood.org, APA's web site, is your link to in-depth design and building support, including a library of more than 400 publications available for instant PDF download or hard-copy purchase.

help@apawood.org or (253) 620-7400 is your connection to the APA Product Support Help Desk. Staffed by specialists who have the knowledge to address a diverse range of inquiries related to engineered wood, the Help Desk can answer your questions about specification and application of APA products.

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