

# WOOD DESIGN & BUILDING®

S P R I N G 2 0 0 9 — N U M B E R 4 6

## **Mount Tabor Residence**

Modern house celebrates  
regional northwest woods

## **Lutheran Church of Madison**

Sanctuary shows the dramatic spans  
possible with timber frame construction

## **First Forest Marketing Center**

Beijing project promotes Canadian wood  
products in the Chinese marketplace



# What Makes Timber Framing Sustainable?

Amy Cornelius, LEED-AP, Hugh Lofting Timber Framing, Inc

**T**he sustainable movement is like a tidal wave that is bringing change to how we live and how we do business. This has spurred a surge of interest from clients and their architects and designers to incorporate 'green' elements and techniques into their timber frame projects.

The sustainable nature of timber framing and more specifically wood is not always readily apparent but it is actually one of the most sustainable building methodologies available on the marketplace. Key to that sustainability is looking at timber framing as a holistic process that begins with a good, solid, complete design and carries through the selection of wood to finishing the project.

So what is sustainable about timber framing? It all starts with the wood.

**Wood is a natural, organic, non-toxic material; it is recyclable, biodegradable and waste efficient and it is renewable.** These positive attributes of wood are important for a number of reasons. First, because wood is completely natural, renewable, recyclable, biodegradable and waste efficient; its use has very little impact on the environment. Second, because it does not off gas toxins, it promotes a healthy environment in the home. Third, the metrics that the sustainable movement has embraced for the qualifications of sustainable buildings via the newly launched National Association of Home Builders's (NAHB) National Green Building Program (NGBP) rating system, the Canada Green Building Council (CaGBC), the Green Globes system, the US Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system and others have

## What are some of the new trends in timber frame construction?

**Pete Slisz, Two Dogs Timber Frames & Architectural Timber Elements:** We are becoming more creative with the timber resources we have: Many companies are starting to make 'Mechanical-lams' – similar to glulam, except instead of gluing the layers you use a mechanical fastener. Creating larger timbers out of smaller ones is becoming more popular. I have personally been designing frames with more common sizes available. If the sizes are smaller, I may have to use more like the paired rafters in the Upper Peninsula (Michigan) cabin. By using two 3x12s together, it makes the rafter appear large and reduces the need for larger dimensioned rafter stock.

The cabin is on a private nature preserve. The client worked with a local designer to come up with the exterior elevations and a simple interior plan, and approached me to design a frame to fill the structure, and during the process also let me design the staircase that would tie into the whole frame design. In addition to stressing quality, the client expressed a love for the Craftsmen style and appreciation for old Craftsmen furniture, which he was a fond collector of. I pulled a few ideas from some Craftsmen furniture pieces I had seen to start the design. I was drawn to the long curves on so many pieces and the tapering that also detail this period. The client also wanted to use different woods to add to the dynamic of the frame. In his eyes, this was a large art installation, and was to be celebrated. Another aspect



of the design was the use of multiples. By designing parts in pairs, and using mechanical fasteners to connect pieces added to the overall tone.

The original-designed staircase had a few steps up to a winder/landing then up a longer set of steps to another winder/landing then a few more steps. We wanted to make the stairs more interesting and open them up for light. We ultimately decided to consider a simple straight set of stairs. I had just picked up some recycled red wine tank staves for some in-fill wall panels going into the frame. I thought, 'what if we recreated a wall that curved like the original tank so the staircase starts wide at the bottom, narrows half way up, and gets wider again at the top?' It makes the staircase more dynamic, and lets passive sunlight down to the lower level. We used a mix of Douglas Fir, recycled Redwood and recycled Jarrah for the treads.



specific, measurable criteria for materials selection and waste strategies that wood supports. For further information see [www.nahbgreen.org](http://www.nahbgreen.org), [www.cagbc.org](http://www.cagbc.org), [www.greenglobes.com](http://www.greenglobes.com) and [www.usgbc.org](http://www.usgbc.org).

**Wood is a carbon-neutral material.** According to [planetfriendlycanada.com](http://planetfriendlycanada.com), 50 per cent of wood is carbon. This means 8000kg of wood has 400kg of carbon, originating from 29 tonnes of carbon dioxide. When the timber frame reaches

its useful life – many decades later – the wood can be recycled into new products, refashioned into new building material or burned as a substitute for fossil fuels.

**Sourcing timbers from sustainably managed forests has many positive effects on the environment.** It is important that wood be sourced from certified sources. Certified sustainable wood can be sourced from several sources including but not limited to SFI (Sustainable Forest Initiative), American Tree

Farm Association, Canada Standards Association (CSA), and Program for the Endorsement of Forest Certification Systems (PEFC); all of which are included in the NGBP rating system.

These third party rating organizations provide an impartial look at the management and sustainable practices in forests. Obtaining certification means that rigorous standards are being followed in the forest; that forests are harvested and replanted ecologically appropriately and



PHOTO CREDIT: TIMBERPEG

## What are clients currently looking for, and how are you delivering on that?

**Jonathan Vincent, Director of Design, Timberpeg:** Many clients are now interested in smaller, more compact houses – not only to keep costs down, but also to better utilize spaces – but they still want the warmth of a timber frame and high-quality materials and finishes. Keeping the house small, with limited cathedral space, not only saves on initial costs but also on yearly operating costs. A good example of this trend is the Hawk Mountain design, intended as a mountain side ski getaway with a Swiss chalet look. It is small but charming with exterior decks for added living space. The combination of a complete Douglas Fir frame and exterior trim details with living spaces focused on the gable end and views allows this compact home to feel much bigger.

## How do you stay innovative?

**Jesse Kendall, P.E., Timberpeg:** Innovations are often discovered merging traditional methods with new technology. Combining this with the new challenges in the building code on energy performance and structural requirements, along with an uncertain economy and competitive pricing, there's no room for stagnation. We stay innovative by accepting challenging projects from architects and engineers who are pushing the envelope with timber frame and hybrid designs. Each day we see more complicated roof and building shapes creating challenges for us with timber truss roof configurations, compound joinery, and composite floor systems. We approach these challenges armed with everything from chisels and mallets to Building Information Modeling (BIM) software and Computer Numerical Control (CNC) machinery.

An excellent example is a Timberpeg home currently under construction in Holderness, NH. The plan required a diagonal truss over a great room/dining room to create both the hip and valley for the roof while matching other trusses. As if that wasn't challenging enough, the shape of the truss included an arched bottom chord. The truss design was innovative in utilizing traditional timber framed joinery with modern materials and analysis. The images don't justify its magnitude.



PHOTO CREDIT: SAMYN-D'ELIA ARCHITECTS, TWIN OAKS CONSTRUCTION AND TIMBERPEG



that the forests exhibit healthy environments for wildlife and plant life. Young trees rapidly absorb CO<sub>2</sub>. Selectively harvesting older trees and replanting with young trees makes for a healthy, vigorous forest.

Reclaimed and forest salvaged/standing dead material are also environmentally friendly sources of wood. These sources can be used in the LEED and NGBP systems for material and recycling credit. If the material is found within 500 miles for

LEED and 300 miles for NGBP, it can also earn credits for local sourcing. Reclaimed wood is derived from a variety of sources including: the dismantling of old, unused barns and other farm structures, the dismantling of unused factories and large commercial buildings mostly mills and war time factories and from submerged logs and structures. Reclaimed wood has a patina depending on its age, species and previous building application which can be quite desirable in adding character to new structures.

Sourcing from standing dead forests creates demand for wood that has been water, disease or bug killed; wood that would otherwise rot in the forest releasing its carbon store back to the environment. Harvesting maintains the tree's carbon store and creates open space for reforestation.

Good forest management contributes to the eco-system in many other ways including: maintaining stream and groundwater health by protecting the soil and reducing runoff, contributing to maintaining ecosystems and habitats for wildlife, and it supports healthy forests for the long term. This provides viable income to foresters thus reducing reliance on clear cutting for farming or overharvesting the forest.

**Timber framing contains low embodied energy.** Converting timbers into a frame takes far less energy and produces less greenhouse gases than concrete, masonry or steel framing construction. This is another hot topic in the sustainable movement. The energy used to transport, manufacture and deliver a product, including the energy used for all of its

## What are some new design angles in timber frame construction?



### Jennifer Young, New Energy Works:

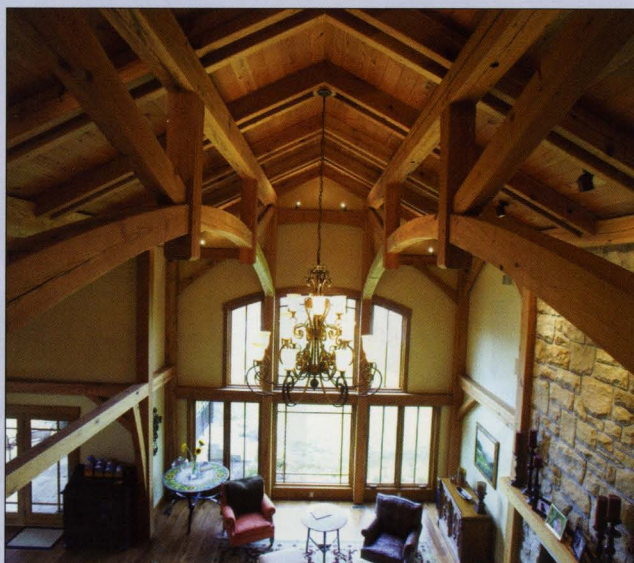
In terms of new trends or design angles in timber frame construction, overall we're creating more non-traditional and contemporary designs. We believe timber framing doesn't have to be the stereotypical rustic, Adirondack mountain style home. In fact, timber framing lends itself well to almost any architectural



style, allowing for wide expanses and immense flexibility in interior wall positioning because the timber is structural, not the wall. Customers continue to request our signature curves from bottom chords to braces to struts; these lyrical sweeping curves balance the hard surface of the timber, floors, and walls.

Many of the innovations we're

seeing are in 'green' building. We're seeing an increase in green products and companies, which just makes it that much easier for us to be responsible. Timber frame construction is innately sustainable for several reasons, including because of the efficiencies gained by completely enclosing a structure without breaks or gaps in the thermal barrier.



inputs, is the total embodied energy in a product. Depending on the methodology a particular framer employs to manufacture a frame, the total embodied energy runs the gamut of low to almost zero.

**Timber frames are durable and have very long life spans.** Choosing timber framing is a choice made for generations. In the NGBP a Life Cycle Assessment is completed that systematically compares

the environmental burden of building materials prior to selection. In the LEED for Homes program, a durability plan is developed for the home that includes the probable life span of materials.

**Many timber framers install a tight envelope of Structural Insulated Panels (SIPS) or other enclosure system around the entire frame that provides a high R-value and reduces air infiltration/**



**heat loss. This is extremely important to sustainability metrics.** Under NGBP and LEED for Homes the house is measured to Energy Star requirements via blower door and duct blast testing methodologies. Failing these tests means not achieving a rating at all. That is important for a number of reasons. First, the homeowner or commercial owner may really want to achieve a certain certification level for personal or market-placement reasons. Second, independent testing has shown that structures built to LEED standards have substantial reductions in energy use when compared to traditional construction methodologies; and third, there is mounting data that shows that certified structures garner higher rents, are more fully occupied and have higher sales values than noncertified structures. One example of the financial impact of certification is Countrywide Home Mortgage

offering a .125 per cent deduction in its mortgage rate for certified homes.

**Timber frames are usually crafted and pre-fitted off site, minimizing construction site waste and reducing construction time.** This together with careful shop management reduces the overall waste effect of the frame. Manufacturing and precutting the SIPs at the factory further reduces site waste and construction time. Here is where having a good, solid, complete plan is key. Shop drawings that include window and door penetrations, mechanical, electrical and plumbing chases, locations and wall layouts enable the entire project to proceed efficiently and reduces waste.

**Many timber framers use low- to no-Volatile Organic Compound (VOC) adhesives, finishes and materials.** These are a requirement for all the rating systems as they have a direct effect on the indoor air quality (IAQ) of the structure.

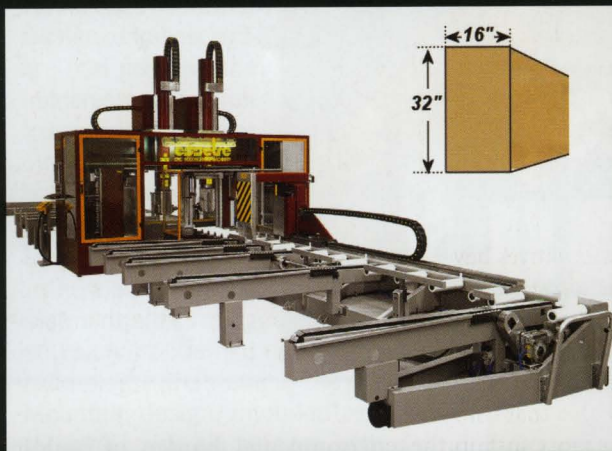
**Many timber framers source their materials locally.** Making a concerted effort to use local vendors for all materials supports local economies and the overall health of communities. This makes for a thriving community for employees and clients. It also meets the goal of local sourcing of materials in the rating systems.

**So what is sustainable about timber framing?** Just about everything from the nature of the wood to how the structure is enclosed. Timber framers go beyond by educating themselves and their clients about the sustainable building movement and the benefits of building with wood. 🌲

Amy Cornelius, LEED AP, works with Hugh Lofting Timber Framing, based in West Grove, PA, [www.hltf.net](http://www.hltf.net). She can be reached at [acornelius@hltf.net](mailto:acornelius@hltf.net). This article was reprinted with permission from the author and the Timber Frame Business Council.

## Techno PF CNC Joinery for Timberwork

**essetre**



No job too large or complex!

[Timbertools.com](http://Timbertools.com) • 1-800-350-8176

# REEX

Wood Processing Machines for 24/7 Continuous use

**BigMaster – The extra wide 4-sided planer  
for glulam applications – curved and straight**



**Rex Maschinenfabrik  
Germany**

[www.rexmaschinenfabrik.de](http://www.rexmaschinenfabrik.de)

Represented by: Timber Tools

[www.timbertools.com](http://www.timbertools.com) • Tel: 1-800-350-8176