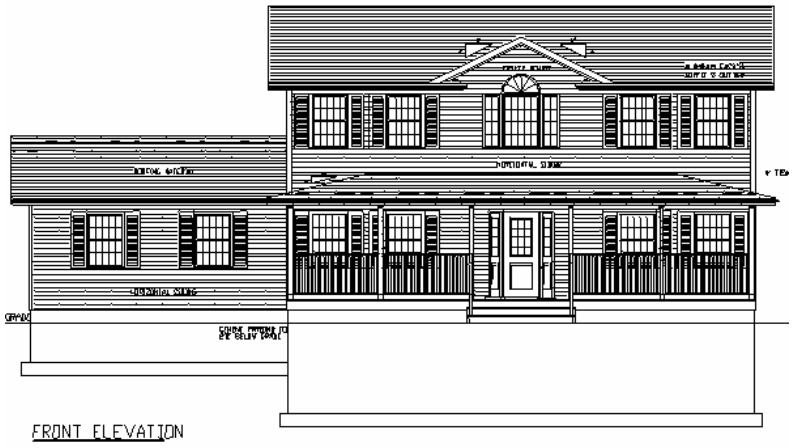
For Immediate Release
Aug. 24, 2004

Environmental costs of home construction lower with wise choice, reuse of building materials

Most of the energy that goes into building U.S. homes is consumed – not by the power tools, welding and trucking during construction – but during the manufacture of the building materials, according to a comprehensive life-cycle assessment comparing typical wood-, steel- and concrete-frame homes.

Using the least energy-intensive building materials – and taking steps toward such things as recycling and reusing more building materials – makes sense considering the nation's energy concerns and attendant issues of pollution and global warming, according to University of Washington's Bruce Lippke, professor of forest resources. He and 22 other authors recently published a report tallying the environmental impact of home construction.



Researchers comparing two versions of this typical Minneapolis house – 2,062 square feet in size and built to code – determined that building the structure using steel framing would use 17 percent more energy than building it with wood framing. Graphic credit: CORRIM

Considering the energy required to produce building materials, construct, maintain and demolish a house on a time period of 75 years is one part of a cradle-to-grave analysis known as a life-cycle assessment. In this case researchers determined that the construction of a hypothetical Minneapolis steel-frame home used 17 percent more energy than the matching wood-frame home. Constructing the study's hypothetical Atlanta concrete-frame home used 16 percent more energy than a matching wood-frame house. The designs in both cases were typical of homes in those regions.

Choosing construction materials wisely is significant, Lippke says, because building 1.7 million houses using wood-, steel- and concrete-frame construction each year consumes as much energy as heating and cooling 10 million or more homes a year. Better material selection and house design could reduce energy use during home construction substantially, he says.

The energy tallied for the study included not just electricity but also such things as diesel

and fuel oil to extract and haul materials, natural gas to generate steam in lumber mills and electricity for steel mills.

"Everything kind of flows from energy consumption," Lippke says. "If you're using energy, you're polluting water, polluting air and kicking out carbon dioxide emissions."

Indeed, the carbon emissions associated with energy use represented one of the more important environmental impacts, the report says. The researchers considered, for example, carbon dioxide, methane and nitrous oxide emissions generated during the life cycles of the homes, as well as the length of time these greenhouse gases linger in the atmosphere, to determine the global warming potential of different construction materials. They estimate the global-warming potential of the steel-frame home to be 26 percent higher than the wood-frame, and the concrete-frame home was 31 percent higher than the comparable wood-frame.

The use of wood products instead of steel or concrete can farther reduce the greenhouse emissions from fossil fuels wherever lumber mills generate power and heat using bark, sawdust and other byproducts of milling. More than half the energy required by mills currently comes from these residuals, a renewable source of energy compared to fossil fuels.

Two designs of typical houses were analyzed in the study by the Consortium for Research on Renewable Industrial Materials, a research group started by 15 universities and research institutes, see http://www.corrim.org/. The $1 million effort was supported by those institutions, the United States Department of Agriculture Forest Service, U.S. Department of Energy and major wood-product manufacturers.

A 12-page summary recently published in the Forest Products Journal and the full report are available at http://www.corrim.org/reports/. Life-cycle inventory international protocol experts reviewed the report and information from this study is slated to become part of the life-cycle inventory database for the designers and engineers at http://www.nrel.gov/lci/.

A 2,100-square-foot house designed for the cold Minneapolis climate was used to compare wood-frame with steel-frame construction while a 2,200-square-foot house was designed for the hot and humid Atlanta climate was used to compare wood-frame with concrete-frame construction.

There are a number of products other than wood that are common to all the designs, such as glass for windows, gypsum for wall board and sheathing, asphalt roofing and concrete for such things as foundations. Concrete products, for example, make up between 72 and 78 percent of the mass of the hypothetical homes that are *not* concrete-frame. These materials are energy-intensive

on their own and make up the largest percentage of the energy required for home construction.

The report offers many suggestions of other opportunities to reduce the energy demands of home construction that include:

- Redesigning houses to use less fossil-fuel intensive products
- Changing building codes that result in excessive use of wood, steel and concrete
- Recycling demolition wastes
- Increasing durability of homes through improved products, construction designs and maintenance practices.

The Consortium for Research on Renewable Industrial Materials has started a new $1 million research project that expands the current effort to include all U.S. wood-product supply regions, other non-structural wood products and additional research on design and process changes to reduce environmental burdens.

###

For more information:
Lippke, 206-543-8684, blippke@u.washington.edu
Jim Wilson, Oregon State University, 541-737-4227, jim.wilson@oregonstate.edu
Jim Bowyer, University of Minnesota, 651-490-7688, jbowyer@umn.edu
Leonard Johnson, University of Idaho, 208-885-7604, ljohnson@uidaho.edu
Paul Winistorfer, Virginia Tech, 540-231-8853, pstorfer@vt.edu
Bo Kasal, North Carolina State University, 919-515-5726, bo_kasal@ncsu.edu

Images and table of environmental impacts available:

Minneapolis house http://www.uwnews.org/photos.asp?articleID=5360&spid=5361

Atlanta house http://www.uwnews.org/photos.asp?articleID=5360&spid=5363
Researchers comparing two versions of this typical Atlanta house – 2,153 square feet in size and built to code – determined that building the structure using concrete framing would use 16 percent more energy than building it with wood framing. Graphic credit: CORRIM

Table of environmental impacts http://www.uwnews.org/article.asp?articleID=5359
With two exceptions, all of the construction index measures had considerably lower environmental risk for the wood-frame designs in Atlanta and Minneapolis compared to the non-wood frame designs. (Note: GJ stands for gigajoules.)