SEAONC Sustainable Design Committee
Sustainable Materials Design Information—Wood
Expansion of initiative #2: **Utilize wood efficiently**

For the structural engineer, the efficient utilization of wood requires us to take into account two distinct perspectives: the use of wood as a raw material and the use of wood as a finished building product.

Efficient use of Wood as a Raw Material

Engineered wood products maximize the use of raw materials by enabling manufacturers to efficiently use smaller trees and underutilized species of trees with very little manufacturing waste. While the creation of engineered wood products does consume more energy during manufacture than solid sawn products, this may be offset in two ways. 1) Increased load capacities require the use of less raw material resources. For example, a typical wood I-joist only takes 65% of the fiber to support the same structural load as a solid section. 2) Bio-energy created from the bi-products of the manufacturing process supply 65% of the energy used in North American mills and manufacturing plants[1]. Some manufacturers claim to use 99% of each log to produce their wood products and the energy required for the process[2]. Common engineered wood products include:

a. Structural composite lumber (SCL), including laminated veneer lumber (LVL), laminated strand lumber (LSL), oriented strand lumber (OSL), and parallel strand lumber (PSL) products
b. Plywood
c. Oriented strand board (OSB)
d. Prefabricated wood I-joists
e. Glued laminated timbers (glulam)

Prefabricated building components are assembled before reaching the job site through a more efficient manufacturing process which maximizes the use of raw materials and reduces waste that would otherwise be seen on the jobsite. In addition to reducing on-site labor time, pre-manufactured building components often use less wood than traditional framing techniques, offer longer floor and roof spans, lighter weights, and more consistent material quality. Common prefabricated building components include:

f. Pre-manufactured trusses
g. Open web trusses
h. Panelized framing
i. Stressed-skin panels (Structural insulated panels or SIPs)
j. Cross laminated timber panels
k. Timber framing packages

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[1] Woodworks.org

[2] iLevel by Weyerhaeuser, *Manufacturing: Resource Efficiency*, http://www.ilevel.com/greenbuilding/manufac.aspx *(May 2010)*

Efficient use of Wood as a Finished Building Product

Optimum Value Engineering (OVE), also referred to as Advanced Framing, takes advantage of opportunities to use wood more efficiently at every stage of a building's design and construction. OVE is a systems approach that reduces lumber use, minimizes waste, and maximizes a structure's thermal efficiency.[3] An Advanced Framing approach includes the following[4] [5]:

1. Consider energy efficiency when designing the structural system. Examples include designing for open wall corners and intersections that allow for more insulation and less thermal bridging.
2. Optimize layout for efficient material use. Examples include designing on a modular layout of 2 foot or 4 foot intervals.
3. Use structural wood members closer to their full capacity. Examples include sizing structural elements for the actual load instead of defaulting to traditional standards.
    a. In the case of headers, 4x12 or 6x10's at all wall openings would be replaced with appropriately sized members at load bearing walls only.
    b. In the case of stud spacing at bearing walls, 2x4 or 2x6 studs at 16" oc would be replaced with 2x6 or 2x8 studs at 19.2" or 24" oc.
4. Eliminate unnecessary structural materials and reduce the structural redundancies inherent with conventional stick framing. Examples include:
    a. Eliminating headers at non-bearing walls
    b. Where loading demands allow, space stud framing on 24"oc layout rather than the typical 16"oc layout and aligning rafters and floor joists to match.
    c. Replacing trimmers with clips to support headers and eliminate extra framing at windows and doors.
    d. Using single top plates at walls not being used as chords/collectors or bearing walls.
5. Be creative. There are a variety of un-prescribed ways that framing can be altered to reduce material use, minimize waste and/or increase thermal efficiency. For example, using raised heal trusses so that ceiling insulation can extend completely to the wall line or using a rim board as a chord/collector or bearing element instead of top plate or header.

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[3] Build It Green, *Advanced Framing,* www.builditgreen.org (June 2008)

[4] Building Science Corporation, *Using Wood Efficiently: From optimizing Design to Minimizing the Dumpster*, www.buildingscience.com (August 2002)

[5] Building Science Corporation, The Future of Framing Is Here, www.buildingscience.com (October/November 2005)