Part II: Wood Systems and Architecture

transparencies

Images:


Part III: New Materials and Systems

- Engineered woods
- Panelized and board systems
- Wood/Cement composites
Part III: New Materials and Systems

- Engineered woods
  - trusses
  - joists
  - composite sections
Part III: New Materials and Systems

- Engineered woods
  - trusses
  - joists
  - composite sections (flitch beams)
  - LVLs, Glulams
Part III: New Materials and Systems

- Engineered woods
  - trusses
  - joists
  - composite sections (flitch beams)

- LVLs, Glulams
Part III: New Materials and Systems

- Panelized systems and board systems
  - SIPs
    see sips.org
  - oriented strand boards

<table>
<thead>
<tr>
<th>EPS Core Thickness</th>
<th>3 5/8”</th>
<th>5 5/8”</th>
<th>7 3/8”</th>
<th>9 3/8”</th>
<th>12 3/8”</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-value @ 75 F</td>
<td>16</td>
<td>24</td>
<td>30</td>
<td>38</td>
<td>46</td>
</tr>
<tr>
<td>R-value @ 40 F</td>
<td>17</td>
<td>25</td>
<td>33</td>
<td>33</td>
<td>49</td>
</tr>
<tr>
<td>R-value @ 25 F</td>
<td>18</td>
<td>26</td>
<td>34</td>
<td>38</td>
<td>51</td>
</tr>
</tbody>
</table>
Part III: New Materials and Systems

- Panelized systems and board systems
  - SIPs
  - oriented strand boards
Part III: New Materials and Systems

- Wood/Cement composites
  composition: treated waste wood chips and cement 15%

Images:
- Cement lumber
- Plastic lumber
- Faswall cement/wood block
Part IV: Resource Efficiency and other sustainable issues

Issues

1. Harvesting
   - Deforestation: in the US, rate of forest growth far exceeds rate of harvest
   - Habitat destruction: primary national forest issue
   - Fragmentation of natural habitats: lately identified as major contributor to large floral and fauna population swings
   - Biodiversity: also important in the national forests

2. Indoor environmental issues
   - Off-gassing from formaldehyde composites. Architects should specify products that meet ANSI/HPVA HP-1 or comply with US HUD formaldehyde requirement. (see the American Institute of Architects: *Environmental Resource Guide*). All glulams use adhesives that contain formaldehyde, although resorcinol-formaldehyde and phenol-resorcinol formaldehyde are considered safe. Urea formaldehyde is not.
   - Preservatives, while not proven to cause health hazards, should be completely isolated from the interior spaces of buildings. Try to avoid using preservatives altogether. Good detailing can mitigate most weathering issues.
   - Trapped moisture from green wood can promote mold growth within an exterior envelope assembly. Good exterior wall analysis will prevent many moisture problems.
Part IV: Resource Efficiency and other sustainable issues

Issues

3. Energy

- Energy comparisons (in the US) between various materials shows that wood is very resource efficient (units omitted, only relative energy costs shown). For example, aluminum requires 126% more energy than wood.

<table>
<thead>
<tr>
<th>Type of Wall</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plywood siding, no sheathing, 2 x 4s</td>
<td>1.988</td>
</tr>
<tr>
<td>MDF siding, plywood sheathing, 2 x 4s</td>
<td>2.541</td>
</tr>
<tr>
<td>Aluminum siding, plywood sheathing, 2 x 4s</td>
<td>4.953</td>
</tr>
<tr>
<td>MDF siding, plywood sheathing, steel studs</td>
<td>5.106</td>
</tr>
<tr>
<td>Concrete building block (cmu), no insulation</td>
<td>17.087</td>
</tr>
<tr>
<td>Brick veneer over sheathing</td>
<td>17.887</td>
</tr>
</tbody>
</table>

- In addition, using fast growing trees (reaching maturation within 20 years; southern pine, poplar) it is possible to remove more carbon from the environment than one has released in the amount of energy used to harvest and produce lumber.

- However, there is a great deal of material waste in the production of standardized sections for construction. The production of 2 x 4s from a single log will result in about 35% waste wood, in the form of shavings, unusable sections, sawdust and chips.
Part IV: Resource Efficiency and other sustainable issues

Issues

4. Production - Rating Councils: Certification is rare and not particularly reliable outside of the United States
   - ISO 14001 (ISO)
   - Sustainable Forestry Initiative Standard (SFI)
   - Canada’s National Sustainable Forest Management System (CSA)
   - The American Tree Farm Program (ATF)
   - The Forest Stewardship Council (FSC)

However:
   - Only about 1% of the world’s wood resources are certified (US is net importer of wood)
   - Enforcement of foreign sources of wood is close to impossible
   - Tagging certification strategies are problematic on many fronts

5. Sustainable Practices
   - See article
   - Simply do not specify “exotic” woods (mahogany, teak, ebony, anigre)
   - Seek out sources of recovered, “reclaimed” wood (James Cutler, Gates house)
   - Specify glulams, lvl, osb, non-formaldehyde plywood (more resource efficient production), mdf and engineered sections and structural composite
Part IV: Resource Efficiency and other sustainable issues
More Sources of information

Precede 2-9 with www.

1. Environmental Resource Guide, American Institute of Architects (Rotch Library)

2. Engineered wood products: advanced
   buildings.org/main_t_building_engineered_wood.htm

3. Formaldehyde-free mdf: advanced
   buildings.org/main_t_finishes_formaldehyde.htm

4. Sustainable and uncommon wood species:
   sustainablebusiness.com/html/insider/jan00/wood.cfm


6. Forest Protection and wood-efficient design: rca-info.org/bldg.html

7. Building reuse: smartgrowth.org/casestudies/Presidio.html

8. Mid-Atlantic consortium of recycling and economic development:
   libertynet.org/macredo/crrprj.htm

9. Sustainable materials source; engineered sheet materials (OSB etc.):
   greenbuilder.com/sourcebook/EngSheet.html