Designing Schools in the Bethel School District

“Building Green – Keep Green”

Jim Hansen
Director of Construction Bethel School District

Learning Objectives

At the end of this program, participants will be able to:

• Understand details used for schools in Bethel, WA.
• Evaluate the energy benefits that wood framing provides.
• Discuss cost saving techniques used in the Bethel School District for new school construction.
• Investigate the decision making process as it relates to selection of building materials and systems.

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Presentation
• Bethel School District
• Design Approach
• Wood vs Steel
• Carbon Emission (Sequestration)
• Durability: Concrete/Steel vs Wood/Masonry
• HVAC/Electrical
• Construction Details
• RCM Program
• The Numbers – 2006 Bond Issue
• Results of the RCM Program
• Questions

Bethel School District
• 215 SQ Miles Unincorporated Pierce County
• 1/3 – In Urban Growth Area
• 17,500 Students
• 17 Elementary Schools
• 6 Middle Schools
• 3 High Schools
• 1 Alternative School
• Pierce County Skills Center

Design Approach
• Function – Aesthetics – Economics
• 2006 Bond Issue
  • Educational Specifications (Administrative Team)
  • Construction Standards
  • Operational Cost
  • 30-35 Year Remodel Cycle
• Design Team
  • Collaborative Design with Team Members
  • Familiar with Local Codes & Design Standards
    • 4 Community Plans, 3 Power Companies, 5 Water Purveyors
Construction

Wood vs Steel
- Cost (Wood Studs - Metal Studs)
- Speed of Construction
- Energy Saving
  - Thermal Break
  - Insulation
- Sustainable Product
**Net Carbon Emissions**

<table>
<thead>
<tr>
<th>Material</th>
<th>Net Carbon Emissions (kg C/metric ton)</th>
<th>Net Carbon Emissions Including Carbon Storage Within Material (kg C/metric ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framing lumber</td>
<td>50</td>
<td>-457</td>
</tr>
<tr>
<td>Medium density fiberboard (virgin fiber)</td>
<td>100</td>
<td>-382</td>
</tr>
<tr>
<td>Brick</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Glass</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Recycled steel (100% from scrap)</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>Concrete</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Concrete block</td>
<td>264</td>
<td>264</td>
</tr>
<tr>
<td>Recycled aluminum (100% recycled content)</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Steel (virgin)</td>
<td>660</td>
<td>660</td>
</tr>
<tr>
<td>Plastic</td>
<td>500</td>
<td>237</td>
</tr>
<tr>
<td>Aluminum (virgin)</td>
<td>6,240</td>
<td>6,240</td>
</tr>
</tbody>
</table>

1. Values are based on life cycle assessment and include gathering and processing of raw materials, primary and secondary processing, and transportation.
3. A carbon content of 49% is assumed for wood.

**Durability: Concrete/Steel - Wood /Masonry**

McGuire Apartments
9 Years Old – Demo
Seattle, WA.

Lincoln High School
100 Years Old – Renovated 2007
AIA & CEFPI Awards
Tacoma, WA.
HVAC/Electrical

- Ridge Conduit (EMT) vs MC Cabling
- Lighting Fixtures
- Ground Couple vs Air Induction Systems
- Copper vs Pex Piping
- Cast Iron vs ABS
- No Sole Source
  - Controls
  - HVAC Equipment

Ground Couple vs Air Induction Systems

Air Induction Systems
Construction Details

- Roof Design & Materials
- Brick with Hardie Siding
- Open Soffits
- Window Type
- Restrooms – Tile
- MDF Paneling / Hallways & Gym
- Composition Flooring
- No Door Closure - Classrooms
- Rain Gardens

Brick / Hardie Siding
Open Soffits / Window Type

Restrooms – Tile
MDF Paneling / Vinyl Wall Covering

Rain Gardens

The Numbers – 2006 Bond Projects

<table>
<thead>
<tr>
<th>School</th>
<th>Date of Bid</th>
<th>Contract Amount</th>
<th>Sq Ft</th>
<th>Construction Cost per Sq</th>
<th>Total Project cost w/Soft Costs</th>
<th>Total Cost per Sq Ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nelson Elem. (New)</td>
<td>Mar. 2008</td>
<td>$15,348,400.00</td>
<td>63,495</td>
<td>$241.73</td>
<td>$19,340,916.92</td>
<td>$303.03</td>
</tr>
<tr>
<td>Liberty Jr. High (New)</td>
<td>Apr. 2008</td>
<td>$21,949,000.00</td>
<td>98,431</td>
<td>$222.99</td>
<td>$30,347,812.99</td>
<td>$308.32</td>
</tr>
<tr>
<td>Frederickson Elem.</td>
<td>May 2008</td>
<td>$14,079,500.00</td>
<td>64,569</td>
<td>$218.05</td>
<td>$19,751,454.94</td>
<td>$305.90</td>
</tr>
<tr>
<td>Spanaway Lake High</td>
<td>Apr. 2009</td>
<td>$25,286,000.00</td>
<td>182,676</td>
<td>$138.42</td>
<td>$39,889,368.52</td>
<td>$218.36</td>
</tr>
<tr>
<td>Spanaway Elem. (Remodel + 27,011SF)</td>
<td>Apr. 2009</td>
<td>$25,286,000.00</td>
<td>182,676</td>
<td>$138.42</td>
<td>$39,889,368.52</td>
<td>$218.36</td>
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<tr>
<td>Clover Creek Elem.</td>
<td>Sept 2010</td>
<td>$9,308,873.00</td>
<td>47,804</td>
<td>$194.73</td>
<td>$13,548,387.40</td>
<td>$283.42</td>
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<tr>
<td>Shining Mt. Elem.</td>
<td>April 2011</td>
<td>$12,479,245.00</td>
<td>63,121</td>
<td>$197.70</td>
<td>$15,340,079.76</td>
<td>$247.48</td>
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<tr>
<td>Shining Mt. Elem.</td>
<td>June 2011</td>
<td>$9,843,000.00</td>
<td>53,599</td>
<td>$183.64</td>
<td>$15,476,700.50</td>
<td>$287.64</td>
</tr>
</tbody>
</table>

Western WA. Average Construction Cost: Elementary $250.07 – Jr. High $257.40
RCM Program

- HVAC is the biggest user of energy, the most difference is made there (Schedule Time = Money)
- Building Audits – Unoccupied
- Billing Audits – Good and Bad
- Listen to Staff
- HVAC and Lighting Training
- Long term Solutions – Retrofits, Grants

RCM Program Results

- Over eight years, $5 million in costs avoided
- Kilowatt reduction equal to two years of usage for all district buildings (2 million SF)
- 2004/05 21 million KW $1.1 million - 26 Sites
- 2012/13 19 million KW $1.3 Million - 31 sites
- Nationwide Recognition
  - Overall portfolio average of 83 (out of 100)
  - 2013 ENERGY STAR LEADER
  - 2013 Leadership in Reducing Greenhouse Gases

Note: Numbers updated at 11/01/13
Questions?

This concludes The American Institute of Architects Continuing Education Systems Course.

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