Modern School Construction: Achieving Performance and Cost Objectives with Wood

Implementing Budget Solutions for Schools: Construction Cost, Schedule and Energy Efficiency

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Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.
Presentation

- Bethel School District
- Design Approach
- Carbon Emission (Sequestration)
- Durability: Concrete/Steel vs Wood/Masonry
- Wood vs Steel - Cost
- HVAC/Electrical
- Construction Details
- RCM Program
- Results of the RCM Program
- Questions
Bethel School District

- 215 SQ Miles Unincorporated Pierce Co.
- 1/3 – In Urban Growth Area
- 18,000 Students
- $480 Million Building Program
- 190 Portable Classrooms
- 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
# 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>580</td>
<td>237</td>
</tr>
<tr>
<td>Aluminum (virgin)</td>
<td>4,260</td>
<td>4,260</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.
McGuire Apartments

9 Years Old – Demo 2010 – 25 Stories
Seattle, WA.
Lincoln High School

100 Years Old – Renovated 2007
Tacoma, WA.
Eatonville High School

100 Years Old – Renovated 2009
Eatonville, WA.
Eatonville High School

Auditorium
Eatonville High School

Old/New Framing
Maplewood Elementary

82 Years Old – Remodel 1998
Conway School

78 Years Old – Remodel 2014
Conway School

78 Years Old – Remodel 2014
Construction Cost

- Wood Studs  
  2x6 = 0.56¢/ft
- Steel Studs  
  2x6 = 0.97¢/ft
- Framing Package – Frederickson Elementary  
  - $1.2 ± million – Wood
  - $2.8 ± million – Steel (Estimate)
- Carpenter  $68.00/hour
- Ironworker  $80.00/hour
- Additional Cost for Thermal Break  
  - R-7.5 Energy Code
  - R-10 New Energy Code
  - Cost $2.50 to $4.00
- Project Management Cost  
  - $125,000 / $150,000 ± Month
Bethel Learning Center

LSL, LVL, Glue Lam, Plywood, OSB, Dimensional Lumber
Frederickson Elementary

LSL, LVL, TJI, Glue Lam, Open Web Truss, Plywood, OSB, Dimensional Lumber
Spanaway Middle School

LSL, LVL, TJI, Glue Lam, Open Web Truss
Plywood, OSB, Dimensional Lumber
Spanaway Middle School
Thompson Elementary
Pierce County Skills Center

2006
Pierce County Skills Center

LSL, LVL, TJI, Glue Lam, Plywood, OSB, Dimensional Lumber
Pierce County Skills Center

LSL, LVL, Glue Lam, TJI, Plywood, OSB, Dimensional Lumber
Pierce County Skills Center

LSL, LVL, Glue Lam, TJI, Plywood, OSB, Dimensional Lumber
Pierce County Skills Center

Phase 1, 2b, 2b & 3
Pierce County Skills Center

Phase 1
Pierce County Skills Center

Phase 2a & 2b
“Wainwright parents search for answers on delayed opening of Fircrest school.”
Construction Details

- Wall Section
- 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
Thermal Break / Insulation

- TJI
- Open Web Truss
Roof Design & Materials

Frederickson Elementary
Brick / Hardie Siding
Open Soffits

Spanaway Middle School
Restrooms – Tile

Spanaway Elementary
MDF Paneling / Vinyl Wall Covering

Shining Mt. Elementary
MDF Paneling / Composition Flooring

Shining Mt. Elementary
Spanaway Elementary

Rain Garden
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
Light Fixtures

Nelson Elementary
Ground Couple vs Air Induction Systems
Heat Pumps

Spanaway Middle School
Pump Package

Spanaway Middle School
Air Induction Systems

Spanaway Elementary
HVAC – Heat Recover

Cover Creek Elementary
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

• Since 2005, $7.5 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 92 (out of 100)
  • 2013 ENERGY STAR LEADER
  • 2013 Leadership in Reducing Greenhouse Gases
  • 2016 Dept. of Education Green Ribbon District
Bethel Wins Green Award on Earth Day!

Today, the U.S. Secretary of Education named the Bethel School District a U.S. Department of Education Green Ribbon School District Sustainability Awardee!

Bethel was one of only 15 school districts in the country to receive the award. All were honored for their innovative efforts to reduce environmental impact and utility costs, improve health and wellness, and ensure effective sustainability education. 47 schools and 11 postsecondary institutions were also recognized.

We are excited to share this wonderful news with our staff on Earth Day!
Frederickson Elementary

Open 2009
Nelson Elementary

Open 2009
Liberty Middle School

Open 2010
Shining Mt. Elementary

38 Years Old – Remodel 2012
Spanaway Elementary

Open 2011
Clover Creek Elementary

Open 2012
Questions?

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

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