



## Designing Schools in the Bethel School District "Building Green – Keep Green"

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# WoodWorks

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## 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.



## 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

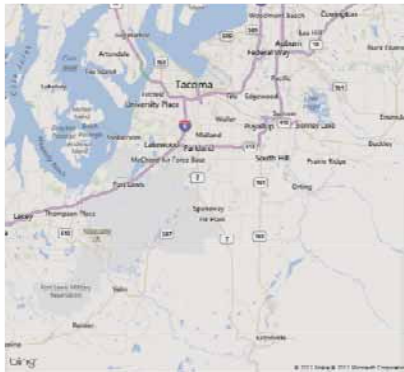


## Bethel School District

- 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



## Bethel School District



## 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



## Speed of Construction / Framing



## Speed of Construction / Framing

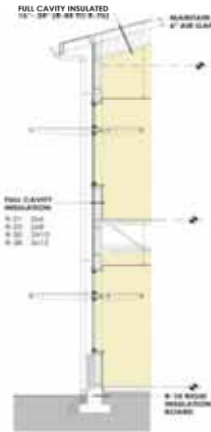


## Speed of Construction / Framing





## Thermal Break / Insulation



## Sustainable Product



## Net Carbon Emissions

Material	Net Carbon Emissions (kg C/metric ton)	Net Carbon Emissions Including Carbon Storage Within Material (kg C/metric ton) <sup>1/2</sup>
Framing lumber	50	-457
Medium density fiberboard (virgin fiber)	100	-382
Brick	80	80
Glass	150	150
Recycled steel (100% from scrap)	210	210
Concrete	240	240
Concrete block	264	264
Recycled aluminum (100% recycled content)	300	300
Steel (virgin)	660	660
Plastic	580	237
Aluminum (virgin)	4,260	4,260

<sup>1/2</sup> Values are based on life cycle assessment and include gathering and processing of raw materials, primary and secondary processing, and transportation.

<sup>2/</sup> Source: USEPA (2006).

<sup>3/</sup> 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

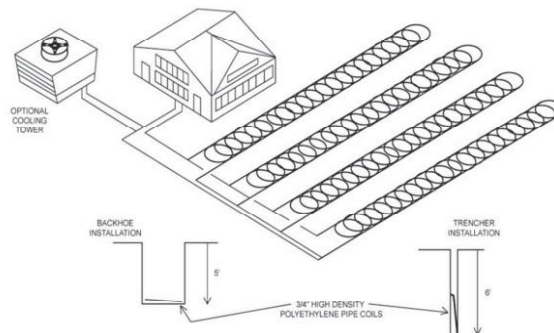
- Ridge Conduit (EMT) vs MC Cabling
- Lighting Fixtures
- Ground Couple vs Air Induction Systems
- Copper vs Pex Piping
- Cast Iron vs ABS
- No Sole Source
  - Controls
  - HVAC Equipment



## Lighting Fixtures



## 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



## Roof Design & Materials



## Brick / Hardie Siding Open Soffits / Window Type



## Restrooms – Tile





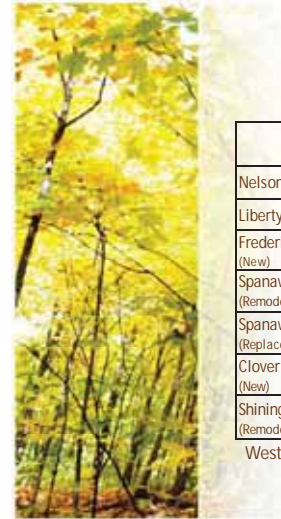
### MDF Paneling / Vinyl Wall Covering



### MDF Paneling / Composition Flooring



### Rain Gardens



### The Numbers – 2006 Bond Projects

School	Date of Bid	Contract Amount	Sq Ft	Construction Cost per Sq	Total Project cost w/Soft Costs	Total Cost per Sq Ft
Nelson Elem. (New)	Mar. 2008	\$15,348,400.00	63,495	\$241.73	\$19,240,916.92	\$303.03
Liberty Jr. High (New)	Apr. 2008	\$21,949,000.00	98,431	\$222.99	\$30,347,812.99	\$308.32
Frederickson Elem. (New)	May 2008	\$14,079,500.00	64,569	\$218.05	\$19,751,454.94	\$305.90
Spanaway Lake High (Remodel + 27,511SF)	April 2009	\$25,286,000.00	182,676	\$138.42	\$39,889,368.52	\$218.36
Spanaway Elem. (Replacement)	Sept 2010	\$9,308,873.00	47,804	\$194.73	\$13,548,387.40	\$283.42
Clover Creek Elem. (New)	April 2011	\$12,479,245.00	63,121	\$197.70	\$17,332,079.76	\$274.58
Shining Mt. Elem. (Remodel + 10,00 SF)	June 2011	\$9,843,000.00	53,599	\$183.64	\$15,417,670.50	\$287.64

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 \$1.1million - 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.

**Jim Hansen**

Bethel Public Schools

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Special Recognition: Erickson McGovern Architects, BCE Engineers, Sitts & Hill  
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