Energy Efficiency and Wood Structural Systems: A Montage Approach

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Course Description

Achieving energy efficiency is not a simple task and becomes more challenging when factoring in the desire for good design and affordability. In this presentation, a leader in the development of high performance structures will share strategies for meeting energy goals with wood frame construction. Topics will include components and assembly of wall, roof and floor systems that have high thermal resistance, are extremely airtight and minimize thermal bridging while also ensuring building longevity. Commercial and public and residential building project examples will be reviewed and techniques for layering components, off-site fabrication and manufacturing technology will also be discussed.
Learning Objectives

1. The audience will be given an overview about how the application of Montage practices optimizes use of resources and increases design-build process efficiencies without limiting functionality and aesthetics in an energy efficient building
2. The listener will gain an understanding about how Open-Built principles support Montage building and construction
3. They will learn about one example of the history of product development for wood based components in Montage construction
4. Project examples for application of Open-Built design and Montage construction will be given to support learning objectives above

Montage building

Montage as described in dictionary.com:
“any combination of disparate elements that forms or is felt to form a unified whole”

A building approach with a plan
Optimize, Maximize, No Compromise

Open building

is not specific to wood construction but is an important rational basis

3D grid
Open-Built layers
Building organization
Disentanglement
Predetermined interfaces

Construction surges again...YAY!

Lots of wood products used
Sustainable?
Sustainable?
Sustainable?
Sustainable?
Sustainable?
Sustainable?
Economical?
Economical?
Economical?
pen-Built Grid

- Structure:
  - ft.
  - ft. x 4 ft.
  - in.
  - in. x 1 ft.

- ical:
  - .5 in.

Open-Built Layers

- Foundation, Structure and Skin makes up the Enclosure

- Services, Space plan and “Stuff”

Reorganizing the building layers
Better access to utilities
More efficient installation
Example: Finish systems

Energy performance safety rating: HIGH

From bits and pieces to **Montage building**

**Kit of raw parts**
Prepared kit of parts

Structural panels

Structural and Insulated Panels

Structural insulated and finished Panels
Finished Modular components

Example: Panelization

'arts consolidation!
Example:

>> 32’ by 9’ OBPlus wall (no openings!):

17 studs, 2 plates, 18 sheets of OSB,
21 pieces of strapping, 27 bags of cellulose,
9 sheets of drywall, 6 electrical boxes

= 100 pieces >>> 1 Panel
Virtual before actual: Build it twice

Owner of BIM

Design = Simulated building

Automated PM information—costs, supply chain, shipping, etc.

Automated cutting and shaping machine code.

Information transfer

Shipping
Information transfer

Digital information fed directly to CNC machines...tireless workers

Cutting and organizing parts

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Framing with Engineered I-joists

Denspack Cellulose Insulation
Ready for window installation

Window installation

Ready for shipment

Installation on site
Installation on site

Fast progress on site

Weather tight in a day

Finish stages done within weeks
Systems for Montage building

A Montage Wall development history

Piece on piece foam wall assemblies (early 70’s)
SIP’s or Foamcore panels ('77 through today)
Open-Built I-stud foam walls (1998-2007)
Open-Built 2x6 Cellulose walls (2005 to today)
R40 wall (2008)
R35 OBPlus wall (introduced 2010)

Energy calculations

New requirements, new tools
New tools of the trade

1977 Advent of SIPS

1978-1997 Timberframe and SIP Shell Package

1998 Open-Built Elements

Two Industries Launched
- Green
- Energy efficient
- TFGuild
- SIPA
- National reach
- Specialized equipment
- Building code recognition
First OB walls

Loblolly House

2005 Cellulose as alternative to foam

2008 More then just building walls
Production R40 wall

Unity House

2010 Today’s wall

- 5/8” mold resistant gypsum board
- 2x strapping
- 1/2” OSB (sealed seams)
- 9.5” Engineered lumber I-joists framing 24” o.c.
- Denspack Cellulose
- 5/8 exterior sheathing system

12-3/4” thick wall assembly
Connection detailing

Structural support detailing

Baseboard detailing

Montage buildings examples
Small house (netzero)

Large house

School house (netzero)

Passivhaus
Summary

Montage building
- allows architectural flexibility
- makes beautiful and functional buildings
- supports energy efficient building
- sets a scalable base principle for construction
- reduces design and construction time through parallel processing
- helps with error detection before they become costly
- enables manufacturing and assembly of consistently high quality buildings
- results in long term sustainability through adaptability
- has lots of opportunity for more WOOD based systems

THANK YOU!
This concludes The American Institute of Architects Continuing Education Systems Course

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