Learning Objectives

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

1. Identify how innovative wood products are changing the way buildings are being designed.
2. Evaluate, from example, how taller wood frame buildings are being designed and built around the world.
3. Determine through the manufacturing process of CLT, how and where CLT applications are best suited.
4. Distinguish, from example, CLT connections from traditional platform framing connections.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.
Solid Wall Construction - Europe

Cross Laminated Timber (CLT)

Typical Panels

90 degrees

- two way spanning
- high shear resistance
Cross-Laminated Timber Buildings (Europe)
**CLT – technology (Europe only)**

**Production process of Cross Laminated Timber (CLT) elements**

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<th>Step</th>
<th>Intermediate product</th>
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<td>STEP I: log</td>
<td>cross cut</td>
<td>20-23&quot; diameter</td>
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**Bonding pressure horizontal**
- approx. 29 lbs/sq inch
- up to 54 feet (or longer)

**Bonding pressure vertical**
- ~ 87 lbs/sq inch with hydraulic equipment
- < 15 lbs/sq inch with vacuum
- ~15 lbs/sq inch with clip connection

**Intermediate product**
- STEP II: board
- STEP III: finger-jointed lamella
- STEP IV: Cross Laminated Timber (CLT)

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Cross-Laminated Timber Manufacturing Process

- Lumber
- Kiln Drying
- Finger-Jointing
- Lay up and Gluing
- Transport
- Material Handling
- Pressing
- CNC Edge Finishing

Shake Table Test: Project SOFIE

- Panels mfg in Italy sent to Japan
- Oct 2007
- Panel damage, panels then shipped back to Italy and reused in a demonstration project

Panels
- 85mm
- 125mm
- 142mm

Wall Thickness
- ~3.5"
- ~4.75"
- ~6"

FIRE TEST IN TSUKUBA MARCH 2007

Cross-Laminated Timber Mid-rise Buildings

Limnologen Project: 2006 start

Construction of four-8 Storey buildings

First storey concrete and 7 storeys wood

Växjö, Sweden

Source: Växjö University
CLT – connection techniques

“wall to wall”
connection techniques:
- self drilling, partly or full threaded screws
- system connector | steel core and glued in rods
- system connector | hook connector

CLT-wall element (indoor)
- corner joint
- T-joint
- longitudinal joint

CLT – connection techniques

“wall to ceiling to wall”
connection techniques:
- self drilling screws
- steel angle | nailing

e.g. 5-layered CLT-wall element (outdoor)
- sealing gasket
- Secured by screws (screws in grain must be avoided!)

“ceiling to ceiling”
connection techniques:
- self drilling screws
- bonded joint
- overlapping / interlocking joint

overlapping / interlocking joint
- transverse force joint
- transverse force joint
- Filler gussets with screws
- bending stiff joint
Murray Grove, London, England
Waugh Thistleton Architects

- 9 Storey Wood Building
- 29 apartments
- Cross Laminated Wall and Floor Panels
- Prefabricated with cutouts for doors and windows

Murray Grove, London, England
Waugh Thistleton Architects

- Honeycomb Structure
- Rotated Plan
- Solid Wood Panel Core
Design - Fire

- 30mins (---)
  - internal corridors/living space
- 60mins (____)
  - apartment/apartment
  - public corridors/app.
- 120mins (-----)
  - apartment/lift & stair cores

All bearing walls/floor systems- 90mins!

Murray Grove, London, England
Shrinkage

Max. 24mm

~3 mm
Norwich- Open Academy, UK

CLT BEYOND MID-RISE
25 story CLT bldg proposed

Acknowledgements:

- Gerhard Schickhofer, Graz University of Technology (Austria)
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- Sheppard Robson Architects (UK)- Sophie Cambell, Norwich Open academy.
Thank you

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Canadian Wood Council/ WoodWORKS! BC
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QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course