MARKET & PRODUCT DEVELOPMENT OF CROSS-LAMINATED TIMBER IN THE USA

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LITERATURE REVIEW
**Introduction to CLT**

**Characteristics of CLT**
- Prefabricated solid engineered wood panel
- Out of solid-sawn lumber or structural composite lumber
- At least three orthogonally bonded layers
- Bonded with structural adhesives (ANSI/APA, 2012)

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**Applications of CLT**

**Wall Application**
- Prefabricated wall and floor panels
- Dry and clean construction technique
- Short erection time
- High dimension stability
- Positive environmental impact (Karacabeyli & Douglas, 2013; Brandner, 2013)
OBJECT PRESENTATION “Forte”

- **Location**: Victoria Harbor, Melbourne, AUS
- **Scale**: 10 floors, 23 apartments, 32.17 meters high, 485 tonnes of timber, 759 CLT panels
- **Building Period**: Building start in February 2012, completion in December 2012, erected in 16 weeks (Lend Lease, 2013)

**Forte’s Achievements & Challenges**

- **Achievements**: Safe, sustainable, lightweight, time savings & efficiencies, high quality (Lend Lease, 2013)
- **Challenges**: Approvals, fire performance, acoustic performance, durability (Lend Lease, 2013)

CURRENT STATE OF INDUSTRY

- About 35 production sites worldwide with an estimated total capacity of 560,000 m³
- 95% of the volume is located in Middle Europe
- 1 million m³ capacity expected in 2015
- Slow growth in North America so far
  - 2 mills in Canada - 10,000 m³ (Schickhofer, 2013)
  - 1 joint venture in USA (Timber Online, 2014)

(Schedule, 2013)
RESEARCH OBJECTIVES

1. Foster entrepreneurial activity for CLT in the US

2. Feasibility study for a CLT mill in Stuart, Virginia based on yellow poplar feedstock

METHODS
INDUSTRIAL ENGINEERING STUDY

• Assessment of the Most Relevant CLT Mills in Austria

  KHL  MUM  [Image]

• Special Focus on
  – Production process
  – Wood species
  – Moisture variability
  – Feedstock quality
  – Process design and capability

• Cooperation with plant engineering companies and universities

PRODUCTION PROCESS OF CLT

INDUSTRIAL ENGINEERING STUDY

• Plant Layout for a Mill in Virginia Suitable for Yellow Poplar (Liriodendron tulipifera) and Other Low Grade Hardwoods

  – Small capacity venture
  – Large capacity venture

Lend Lease 2013
CAPABILITY STUDY

• Applying statistical process control (Forrest & Breyfogle, 1999)

  – Research hypotheses: A CLT mill producing CLT made from yellow poplar will have more variability than a CLT mill using conifers
  – Is yellow poplar (Liriodendron tulipifera) capable for the production of CLT?
  – Comparison of natural tolerances vs. engineering tolerances
  – Raw material for grade & quality
  – Moisture content in %
  – Dimensional strength & performance (MOE, MOR)

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• Lend Lease, 2013. Creating the world’s tallest CLT apartment building, Australia: Lend Lease
THANK YOU VERY MUCH FOR YOUR ATTENTION!

I WOULD BE HAPPY TO ANSWER YOUR QUESTIONS!