Innovative Wood Products

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OSU

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Outline

- Nanocellulose edible coatings
- Viscoelastic thermal coatings
- Environmental Product Declarations (EPD)
- Log tracking
- Cross laminated timber (CLT)

NANOCELLULOSE EDIBLE COATINGS

Nanocellulose OSU patent

"NANO-CELLULOSE EDIBLE COATINGS AND USES THEREOF"

Cherry cracking prevention

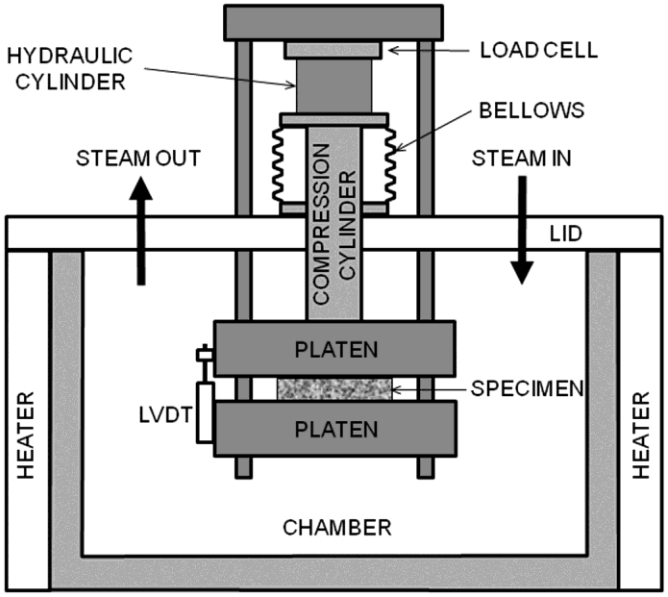
Treatments	Cracked cherries / Total number	Cracking ratio (%)
Control	36/52	69.23
Formulation 1	2/15	13.33%
Formulation 2	0/15	0.00

Food coating applications

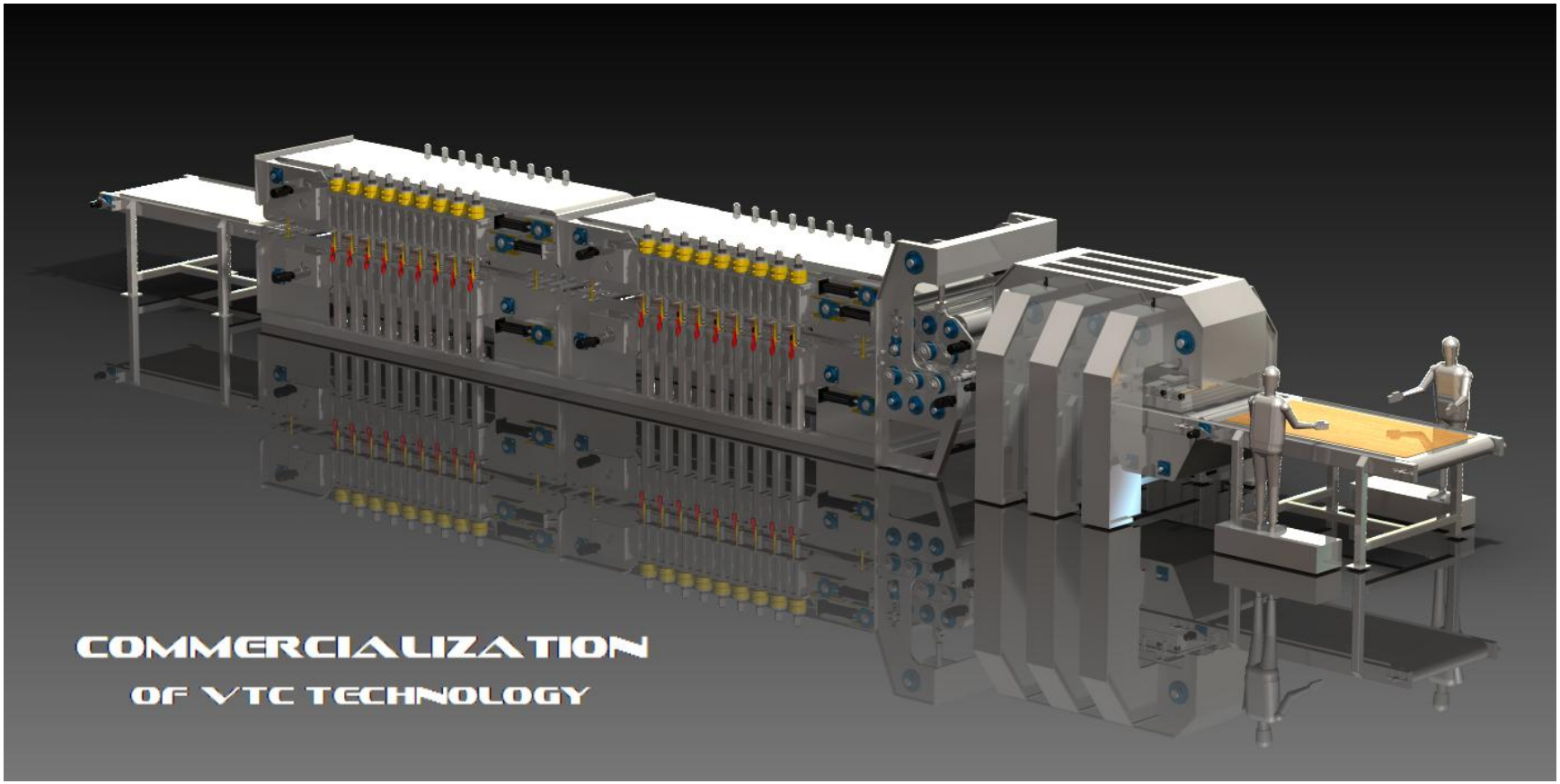
- Cherry anti-cracking product
- New food preservation method for colored fruit
- Grapes – extended harvest for wine
- Tropical fruits - extended shelf life
- Citrus - extended shelf life
- Strawberries?
- Seed coatings?
- Time release fertilizer?

VISCOELASTIC THERMAL COMPRESSED (VTC) WOOD

VTC Device

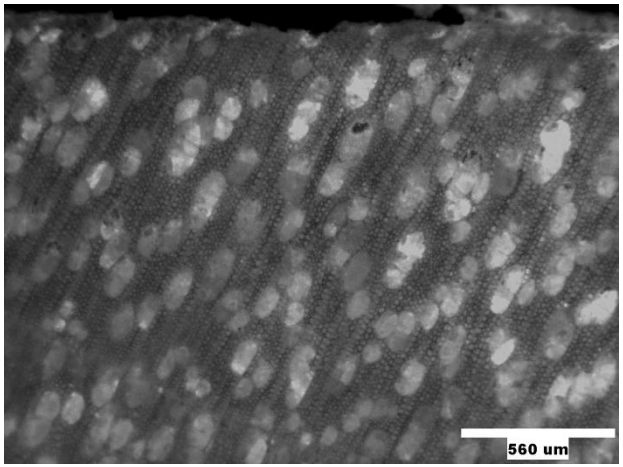


Schematic drawing of pressure vessel used to compress specimens

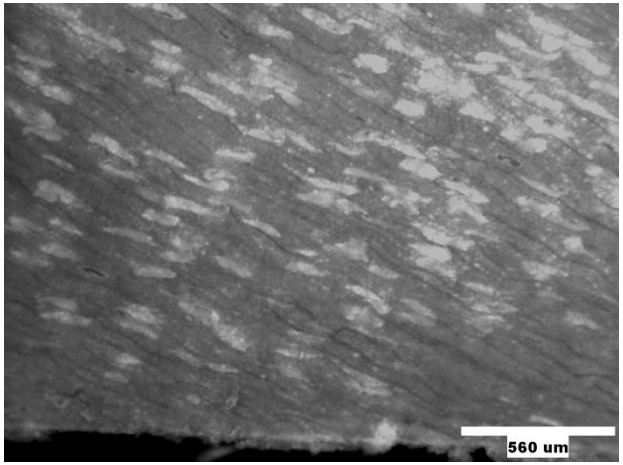

COMMERCIALIZATION
OF VTC TECHNOLOGY

Properties of the VTC Wood - Anatomy Study

control



63 %



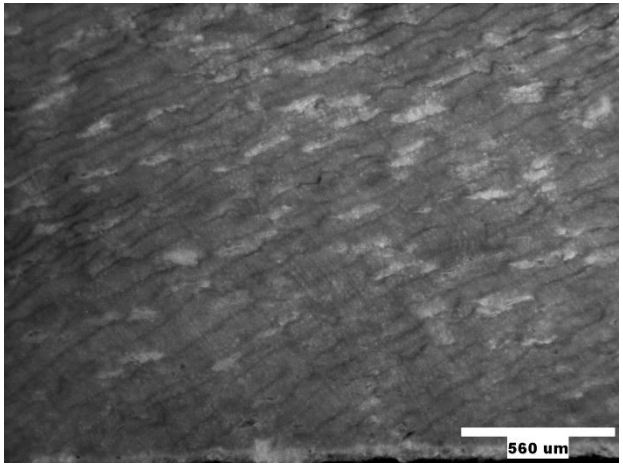
Reduce volume of void space

Deformed cell lumens

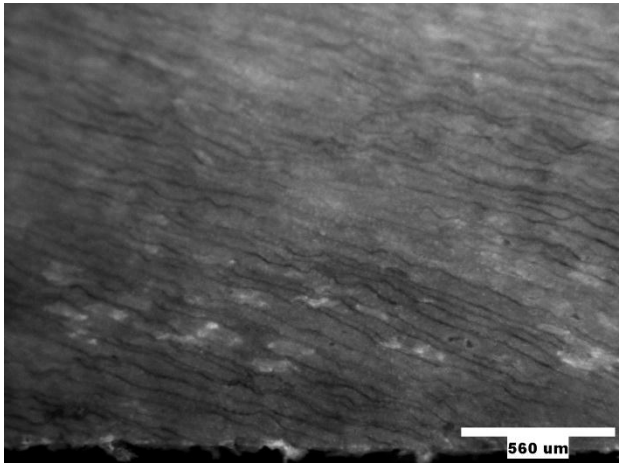
Densification to higher degree - larger reduction of void spaces

Vessels are collapsed, flatten in the direction of compression

Rays appear to buckle.



98 %

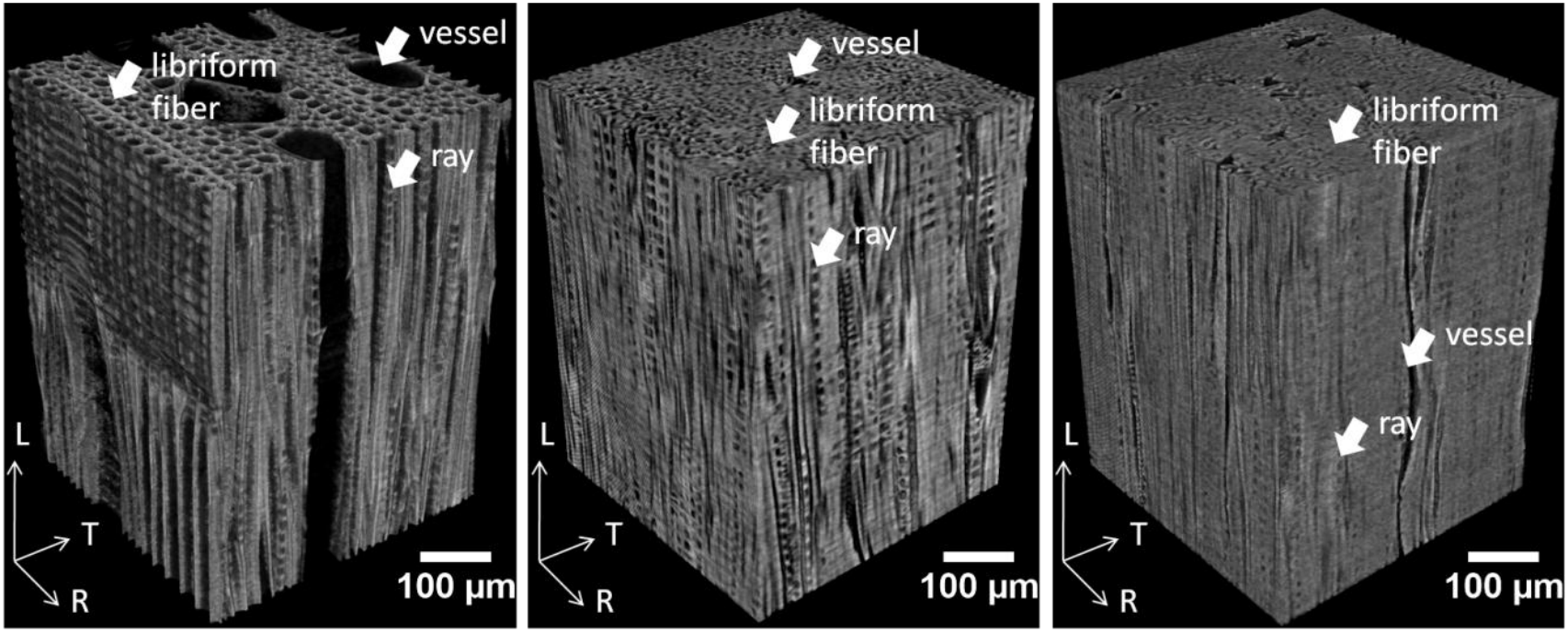


132 %

Morphology of THM wood

Microtomogrphy

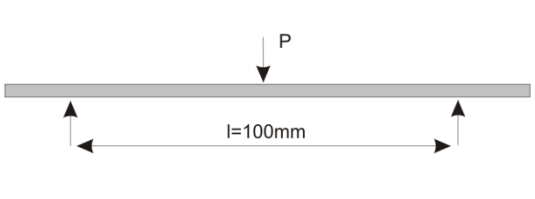
Hybrid poplar- VTC process, 170°C; 4.1 Mpa and 5.5 MPa



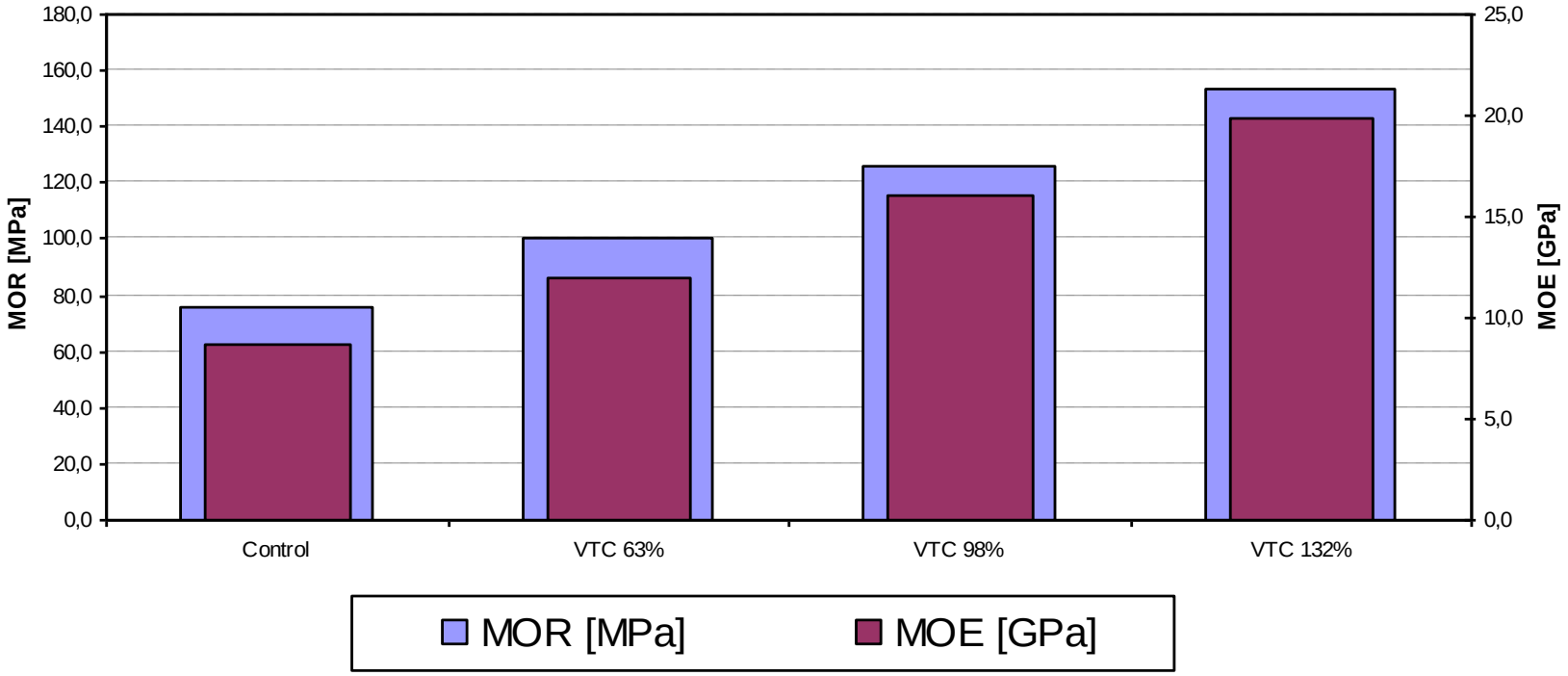
Control	VTC, 4.1 MPa	VTC, 5.2 MPa
0.371 kg/m^3	0.79 kg/m^3	1.21 kg/m^3

(Standfest et al. 2012)

Bending Properties



The increase in the **MOE** and **MOR** of the VTC wood specimens was approximately proportional to the increase in density.



Bulletproof wood?

VTC Applications

- Upgrade low quality veneer
- Allow wood to compete with light gauge steel
- Many product uses
  - Longer spanning beams
  - Smaller profiles
  - Truck/rail beds
  - Flooring
  - Architectural
  - …

ENVIRONMENTAL PRODUCT DECLARATIONS (EPD)

What is an EPD?

- Goal is to provide relevant, verified and comparable information about environmental impacts
- Required for many products in Europe
- LEED system provides incentive to have EPD

Joint effort of American Wood Council and Canadian Wood Council

ENVIRONMENTAL PRODUCT DECLARATION

NORTH AMERICAN SOFTW

AMERICAN WOOD COUNCIL
CANADIAN WOOD COUNCIL

ENVIRONMENTAL PRODUCT DECLARATION

NORTH AMERICAN SOFTWOOD PLYWOOD

AMERICAN WOOD COUNCIL
CANADIAN WOOD COUNCIL

The American Wood Council (AWC) and the Canadian Wood Council (CWC) are pleased to present this Environmental Product Declaration (EPD) for North American softwood plywood. This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified under UL Environment's EPD program.

The EPD includes Life Cycle Assessment (LCA) results for all processes up to the point that plywood is packaged and ready for shipment at the manufacturing gate; the cradle-to-gate product system includes forest management, logging, transportation of logs to plywood plants, lathing, veneer drying and application, and curing.

The AWC and CWC represent wood product manufacturers across North America. Our organizations have undertaken numerous sustainability initiatives on behalf of our membership and we are pleased to present this document to show how we are doing. The publication of this EPD, which is based on rigorous LCA research, is our effort to back up with science what we know to be true – that wood products stand alone as a green building material.

Please follow our sustainability initiatives at:
www.awc.org and **www.cwc.ca**

CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

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CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

ENVIRONMENTAL PRODUCT DECLARATION

NORTH AMERICAN GLUED LAMINATED TIMBERS

AMERICAN WOOD COUNCIL
CANADIAN WOOD COUNCIL

APA - The Engineered Wood Association

The American Wood Council (AWC) and Canadian Wood Council (CWC) are pleased to present this Environmental Product Declaration (EPD) for North American glued laminated timbers (glulam). This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified under UL Environment's EPD program.

The EPD includes Life Cycle

ENVIRONMENTAL PRODUCT DECLARATION

NORTH AMERICAN WOOD I-JOISTS

AMERICAN WOOD COUNCIL
CANADIAN WOOD COUNCIL

The American Wood Council (AWC) and Canadian Wood Council (CWC) are pleased to present this Environmental Product Declaration (EPD) for North American wood I-joists. This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified under UL Environment's EPD program.

The EPD includes Life Cycle Assessment (LCA) results for all processes up to the point that wood I-joists are packaged and ready for shipment at the manufacturing gate. The cradle-to-gate product system includes the cradle-to-gate product systems for LVL, lumber, OSB, the transportation of these inputs to I-joist plants, and I-joist production.

The AWC and CWC represent wood product manufacturers across North America. Our organizations have undertaken numerous sustainability initiatives on behalf of our membership and we are pleased to present this document to show how we are doing. The publication of this EPD, which is based on rigorous LCA research, is our effort to back up with science what we know to be true – that wood products stand alone as a green building material.

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CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

Table 2: Cradle-to-Gate Impact Assessment Results - 10m North American I-joist					
Impact category indicator	**Unit**	**Total**	**Forestry operations**	**Chord & web production**	**I-joist production**
Global warming potential	kg CO_2 eq.	16.74	0.84	12.28	3.62
Acidification potential	H+ moles eq.	8.64	0.56	6.42	1.66
Eutrophication potential	kg N eq.	0.0071	0.0019	0.0038	0.0013
Ozone depletion potential	kg CFC-11 eq.	0.0000	0.0000	0.0000	0.0000
Smog potential	kg O_3 eq.	2.20	0.28	1.52	0.40
Total primary energy consumption	**Unit**	**Total**	**Forestry operations**	**Chord & web production**	**I-joist production**
Non-renewable fossil	MJ	281.03	15.02	205.96	60.05
Non-renewable nuclear	MJ	37.63	0.14	28.73	8.76
Renewable, biomass	MJ	200.31	0.00	195.91	4.40
Renewable, other	MJ	10.23	0.02	6.13	4.08
Material resources consumption	**Unit**	**Total**	**Forestry operations**	**Chord & web production**	**I-joist production**
Non-renewable materials	kg	0.16	0.00	0.08	0.08
Renewable materials	kg	44.95	0.00	44.95	0.00
Fresh water	L	36.13	0.38	25.90	9.85
Non-hazardous waste generated	**Unit**	**Total**	**Forestry operations**	**Chord & web production**	**I-joist production**
Solid waste	kg	2.31	0.01	2.03	0.26

Figure 4: Cradle-to-Gate Energy Use

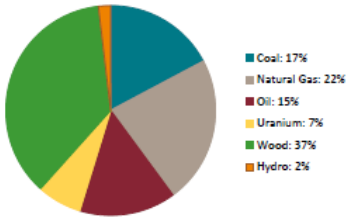


Figure 5: Forestry Operations Energy Use

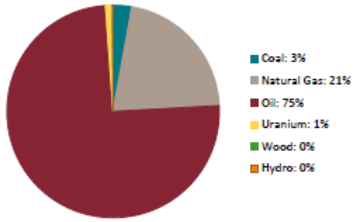


Figure 6: I-Joist Production Energy Use

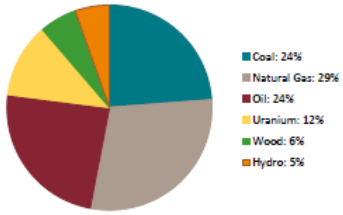
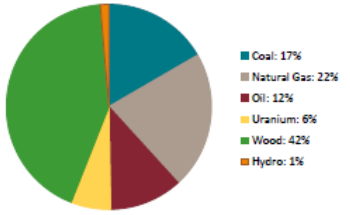


Figure 7: Chord & Web Production



Primary Energy Consumption by Resource

LOG TRACKING

Log tracking

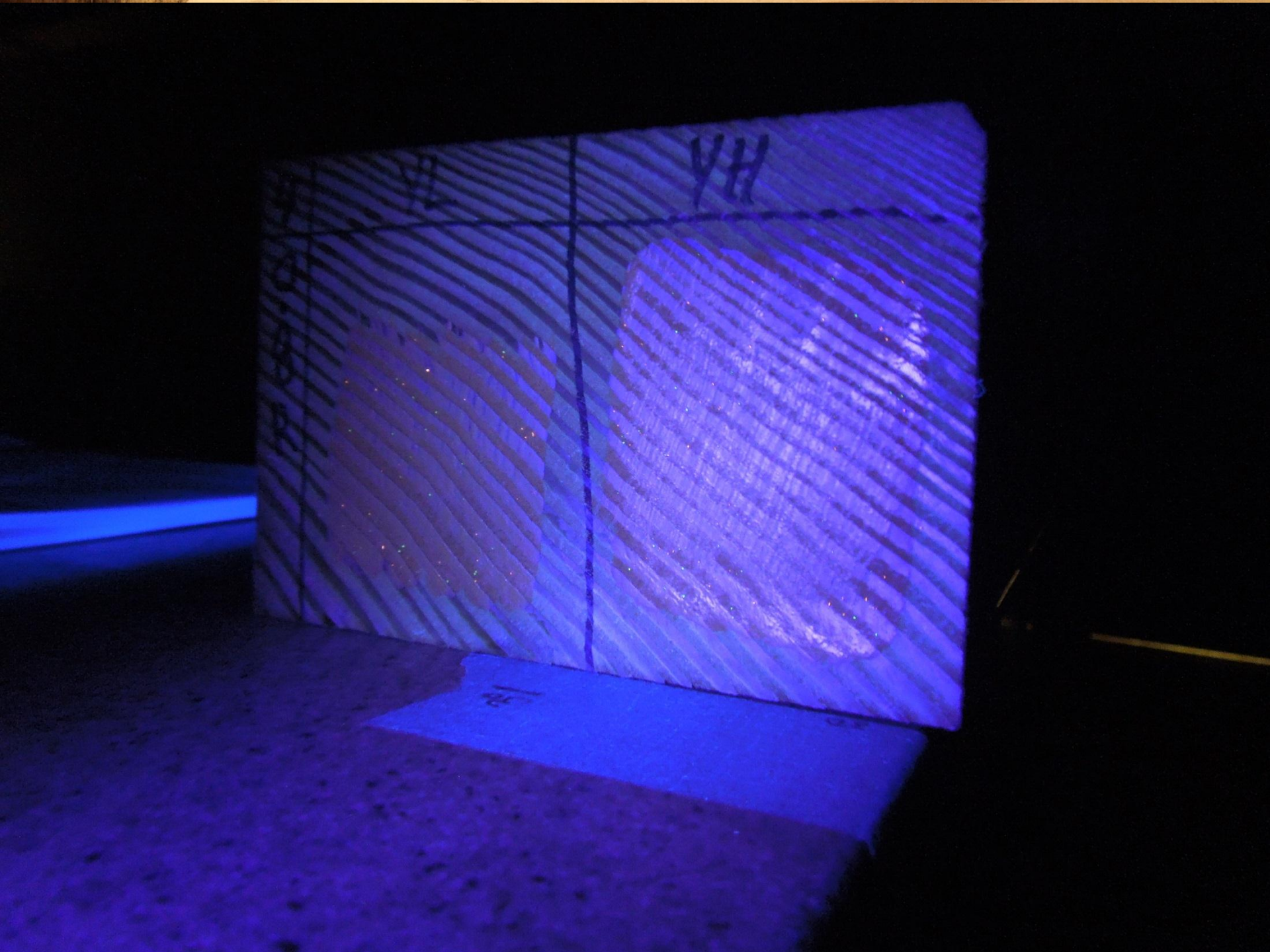
- Increasing need to track back to source
  - Forest certification
  - Lacey Act
  - European Union Timber Regulation
  - Australia Illegal Logging Prohibition Act
- Provide companies with ability to track recovery by stand
  - Are cruising methods accurate?
  - Are the correct taper models being used?
  - Etc…

Criteria for log tracking technology

- Easy to deploy
- Low cost to deploy
- Difficult to fraudulently reproduce
- Will not interfere with downstream processing
  - No metal staples
  - No plastic
  - No plastic coated papers
- Easy to read
- Can attach additional information to the log

What have we been working on?

1. Two-level tracking system
    1. Large format bar codes painted or stenciled directly on the logs.
    2. Paint contains a microtaggant creating a unique identification for the source of the logs.
2. Standard Nelson marking paint (blue)
3. Microtaggant – Microtrace Solutions

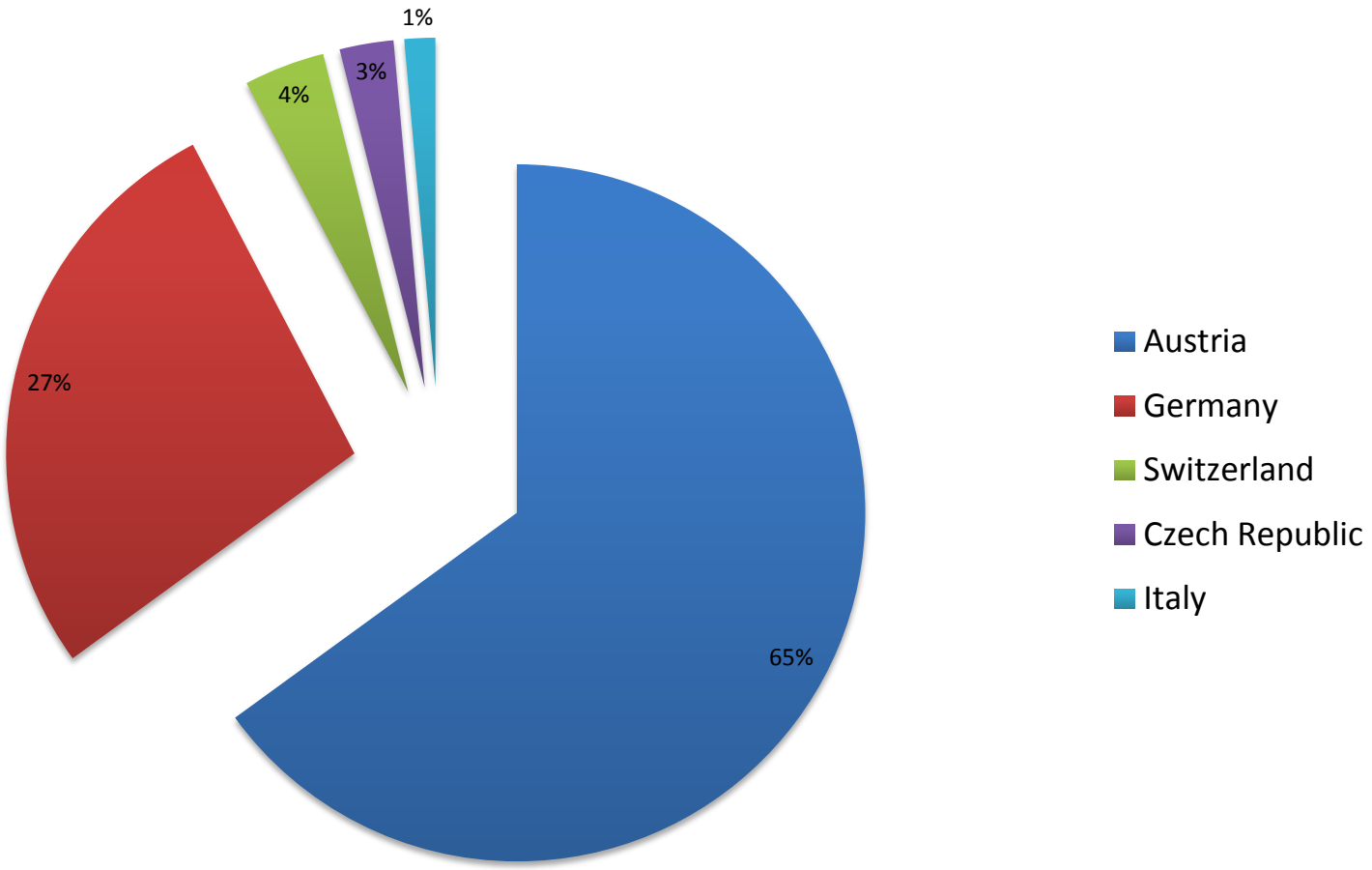

VH

CROSS LAMINATED TIMBER

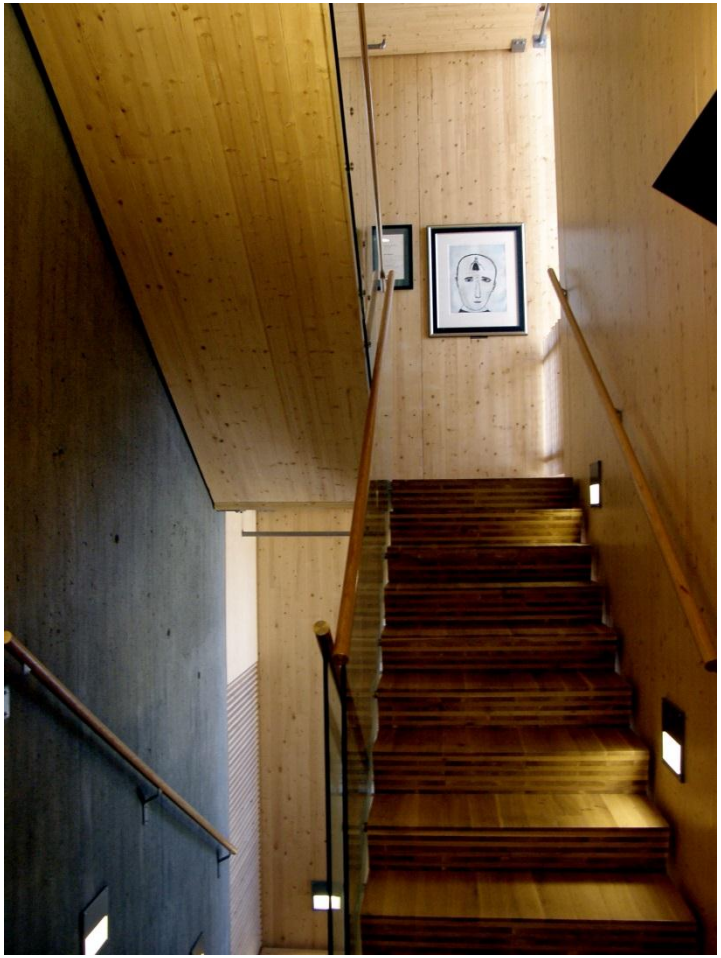

Hundegger
Panel Cutting Machine
PBA

European wood-based panel production - CLT

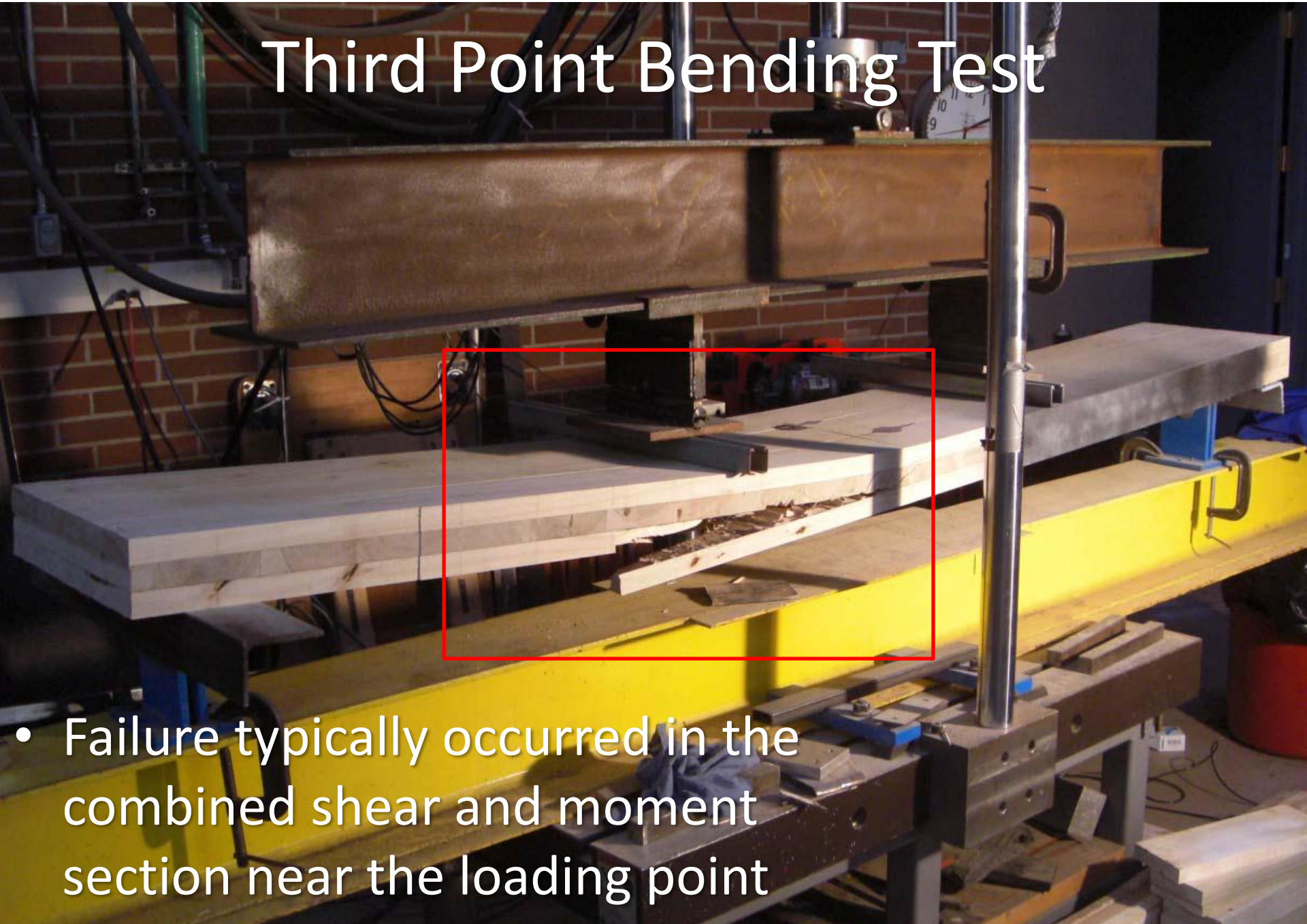
European cross-laminated timber production, 560000m^3 in 2011/12



Source: http://www.en.brettsperrholz.org/manufacturer/mn_45163

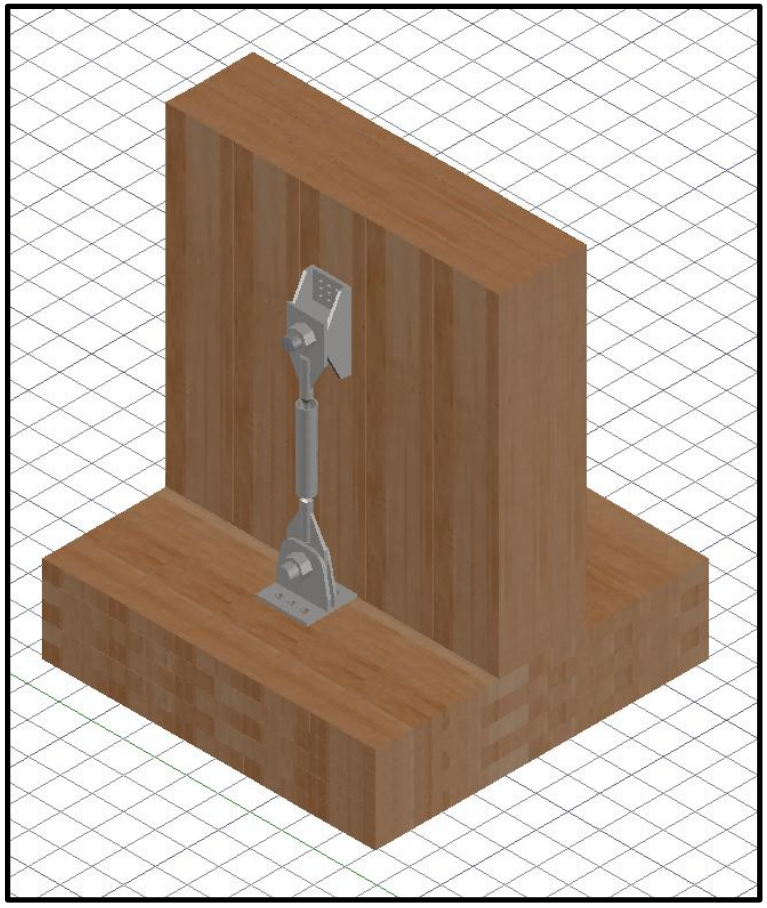


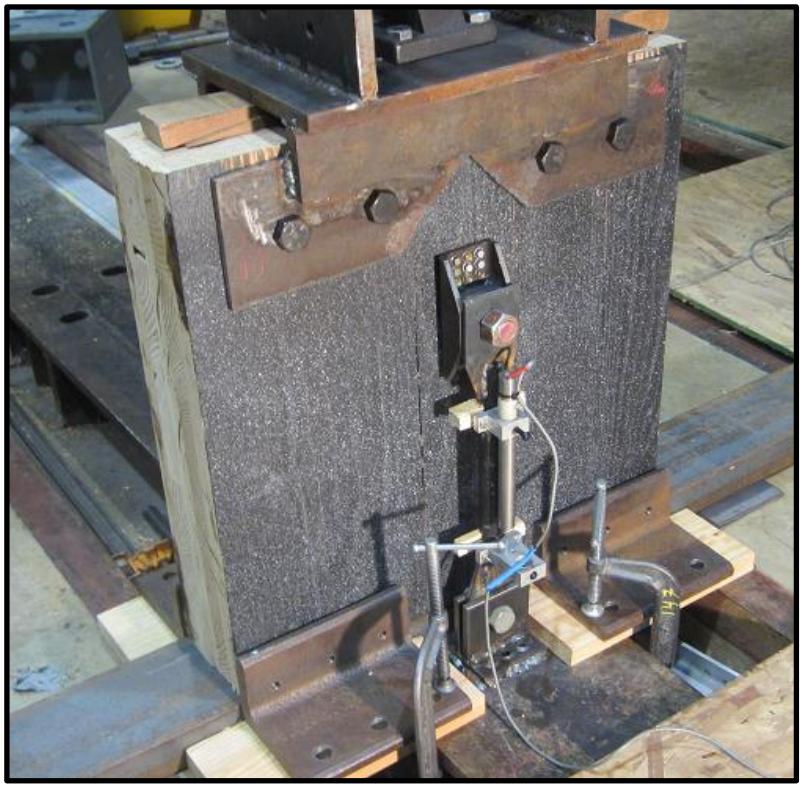
Third Point Bending Test



- Failure typically occurred in the combined shear and moment section near the loading point

Component Tests

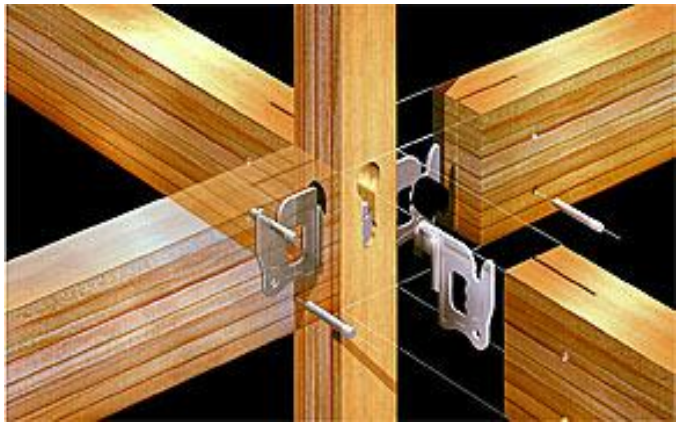




The World’s Tallest Wooden Building

How high can we go?

New Japanese Construction System



Suteki Home

"Powerbuild System"

http://www.nice.co.jp/en/index.html

QUESTIONS?

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