A Unique Partnership Between the Colleges of Forestry and Engineering at Oregon State University and the College of Design at University of Oregon
Why Build Bigger with Wood?

- 50% of the world’s population live in cities today
- 75% will be urban dwellers by 2040
- 3 billion people will need a new home in next 20 years

- 47% of GHGs come from buildings
- 33% from transportation
- 19% from industry
Benefits of Building with Wood

We should all now be familiar with the sustainability reasons for using wood in terms of its lower embodied energy and carbon sequestration properties. Wood has gone through a rebrand – based on solid science – and the general public is realising that sustainable harvesting of the working forest can help rather than harm the environment.

Did you know it takes 5 times more energy to produce a ton of concrete and 24 times more energy to produce a ton of steel, as compared to a ton of wood? Concrete produces almost two times more solid waste by-product than wood, and wood produces 50% less greenhouse gas emissions than concrete and 23% less than manufactured steel. It takes approximately 8 times less fossil fuels to produce a finished wood product compared to other building materials. Concrete, steel, and aluminum come from materials extracted from the land that can never be replaced, and vinyl and most plastics are from non-renewable petroleum products. Wood comes out as a clean, ecologically responsible building material.
BENEFITS OF BUILDING WITH WOOD

Wood and wood products need the least amount of energy to manufacture and has the lowest impact on air and water quality.

ENERGY FOR PRODUCTION

WOOD  STEEL  CONCRETE

24X

GREENHOUSE GAS EMISSIONS

26% LESS THAN STEEL

50% LESS THAN CONCRETE
Environmental Benefits During Service

- 50% of the dry weight of wood is carbon
- 1 m³ of wood stores 1 ton of carbon dioxide
- Carbon is sequestered throughout the lifetime of the building
- Can be reclaimed at end of building life
Economic Benefits

- Offsite prefabrication saves jobsite labor
- Up to 75% lighter than a concrete building = reduced foundation sizes and easier material handling
- Less deliveries, simplified jobsite logistics
- Less jobsite waste
Taller Buildings

Mass timber materials have opened up new possibilities for building larger and taller with wood in contexts that have not been open to wood since the advent of the skyscraper. Starting with Murray Grove we have seen a race to build taller and larger wood buildings. Producing the mass timber products needed for this new wave of buildings offers a way to reinvigorate rural employment that has often been lost due to sawmill rationalization.
What We Do

The work of TDI is based around three pillars – research, product development and testing, and training and education. In the last two years the institute has directly sponsored $1.9 in research projects to address technical and market challenges to growth of the sector. We have worked with manufacturers and developers to test and prototype products and building components, including Oregon’s two mass timber producers. And we are rolling out a range of educational programming to respond to skills and knowledge gaps all down the value chain.
Applied Research
Splice Connection Testing
Lead: Associate Professor of Engineering Andre Barbosa

- Framework Building Project
- 12 story CLT timber building planned for Portland’s Pearl District
- Large project team (e.g. LEVER Architecture, KPFF)
Fire Testing CLT

Oregon State University
College of Forestry
Department of Civil and Construction Engineering

Erica Fisher, Assistant Professor
Acoustics Testing

Lead: Associate Professor of Architecture Kevin Van Den Wymelenberg
Moisture and Structural Performance Monitoring/Smart CLT

Oregon State University
College of Forestry
Department of Wood Science and Engineering

University of Oregon
College of Design
Department of Architecture
Energy Studies in Building Laboratory

Peavy Hall, College of Forestry, Oregon State University, Michael Green Architects

Mariapaola Riggio, Assistant Professor
Research Assistant: Evan Schmidt
Toward Net-Zero Energy Design
Thermal Comfort and Energy Performance with Mass Timber

University of Oregon
College of Design
Department of Architecture
Energy Studies in Building Laboratory

Kevin Van Den Wymelenberg, Professor
Research Assistants: Denise Blankenberger
Life Cycle Analysis and Case Studies
Lead: Professor of Architecture Alison Kwok

Carbon and Cross-Laminated Timber

What are common misunderstandings regarding CLT and carbon analysis?

+CO₂ - CO₂ =

What is the net carbon impact of CLT, considering both embodied and sequestered carbon?

How can LCA tools better support an understanding of CLT carbon impacts?
Indoor Air Quality & Microbiome Science

Lead: Professor of Architecture Kevin Van Den Wymelenberg
Evaluation and Testing of Mass Plywood Panels

Lead: Associate Professor of Wood Science and Engineering Arijit Sinha

- PRG 320 Evaluation
- Mechanical Properties
- Basic Connections
- Component assembly
- Seismic Performance
- Life Cycle Assessment
- Acoustics
Low-Value Wood Species in CLT
Leads: Associate Professor of Wood Science and Engineering Lech Muszynski
Assistant Professor of Wood Science and Engineering Mariapaola Riggio

PONDEROSA PINE CROSS-LAMINATED TIMBER
Reclaimed Wood in CLT

Lead: Professor of Wood Science and Engineering Laurence Schimleck
Education & Training

Programs that cross disciplines and prepare tomorrow’s workforce

• Collate and synthesize research findings for code officials and designers
• Joint courses and programs for UO and OSU students
• New MS in Mass Timber Design Fall 2020
• Certificate program in mass timber manufacturing and construction
• Workshops for industry professionals
SPRINGFIELD MASS TIMBER PARKING GARAGE
A PUBLIC PARTNERSHIP

Judith Sheine, Mark Donofrio
Department of Architecture
College of Design
University of Oregon

Christine Lundberg
Mayor
City of Springfield, Oregon
The NEW MILL

Krysten Gormly | David Lieberman | Scotty McClelland
Judith Sheine, Mark Donofrio, Faculty Advisors
HISTORIC HAYWARD FIELD
MASS TIMBER WEST GRANDSTANDS

Judith Sheine
Department of Architecture
University of Oregon

Mikhail Gershfeld
Department of Civil Engineering
California State Polytechnic University, Pomona
LANE COUNTY MASS TIMBER COURTHOUSE

Judith Sheine, Mark Donofrio
Department of Architecture
University of Oregon

Mikhail Gershfeld
Department of Civil Engineering
California State Polytechnic University, Pomona
Lane County Courthouse

Spencer Boragine | David Moreno | Josh Rosenthal | Zachary Sherrod
Judith Sheine, Mark Donofrio, Faculty Advisors
CIVIC RESILIENCE: Mass Timber Courthouse

1: INTEGRATION
2: COMMUNITY
3: ECOLOGY
4: WATER

Lane County Courthouse

Westin Hill, Russell Regulinski, Tim Walsh
Judith Sheine, Mark Donofrio, Faculty Advisors
SMALL MASS PLYWOOD PANEL HOUSES

Judith Sheine
Department of Architecture
University of Oregon

Mikhail Gershfeld
Department of Civil Engineering
California State Polytechnic University, Pomona
Mass Plywood House – Unfolded House

Konrad Stuebgen
Faculty Advisor, Judith Sheine
MODULAR SCHOOLS

Judith Sheine
Department of Architecture
University of Oregon

Mikhail Gershfeld
Department of Civil Engineering
California State Polytechnic University, Pomona
Modular Mass Timber School
Payton Narancic and Simone O’Halloran

University of Oregon, Department of Architecture
Faculty Advisor: Judith Sheine
Modular Mass Plywood Classroom

Judith Sheine, Mark Donofrio
with David Moreno
This degree path allows students to focus on mass timber design in an interdisciplinary one-year program, taking advantage of Oregon’s position as the epicenter of mass timber manufacture and application in the United States and the TallWood Design Institute (TDI), a partnership of the University of Oregon’s College of Design with Oregon State University’s Colleges of Forestry and Engineering.

This is a non-professional degree designed for students with a professional degree in architecture, structural engineering, architectural engineering, construction management or an allied field.
Program

- **MS Path in Mass Timber Design**
- One year, 46 - 50 credit program

**Fall term**
- OSU WSE 520 The Global Context of the Forest Sector 3 credits
- OSU WSE 506 Wood Science (Special Topics)* 4 credits
- OSU WSE 559 Design of Wood Structures 3 credits
- UO ARCH 584 Timber Tectonics in the Digital Age 6 credits
- Subtotal 16 credits

**Winter Break**
- UO ARCH 510 Field trip to Europe - Holzbau, Innsbruck, tour of mass timber buildings and manufacturing sites (10-14 days) 2 credits (optional)
- Subtotal 2 credits

**Winter term**
- UO ARCH 619 Terminal Project: Integrated Timber Design Studio 8 credits
- UO ARCH 510 Advanced Mass Timber Design (Mass-ter Builder) 4 credits
- UO ARCH 606 TallWood Design Institute Seminar (Special Topics)* 3 credits
- UO ARCH 601 Independent study/research project (A/E teams of two) 1 credits
- Subtotal 16 credits

**Spring Term**
- UO ARCH 619 Terminal Project: Integrated Timber Design Studio 8 credits
- UO ARCH 606 TallWood Design Institute Seminar (Special Topics)* 4 credits
- UO ARCH 601 Independent study/research project (teams of two) 2 - 4 credits
- Subtotal 16 credits
- Total credits 46 - 50 credits
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