

TALLWOOD

DESIGN INSTITUTE

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
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- 47% of GHGs come from buildings
 - 33% from transportation
 - 19% from industry

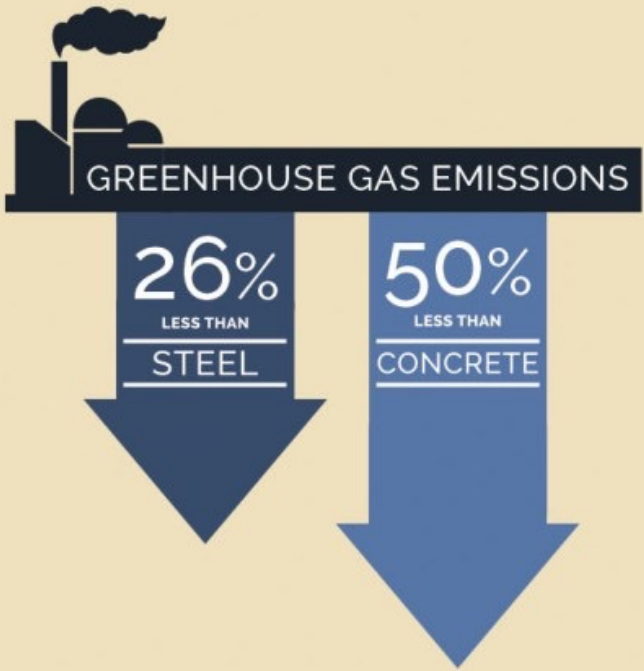
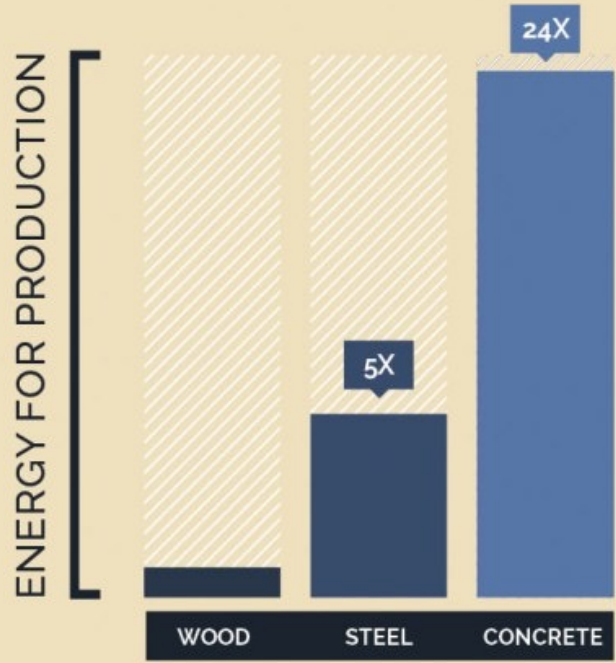
Benefits of Building with Wood

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.



Environmental Benefits During Service

- 50% of the dry weight of wood is *carbon*
- 1m³ 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.



Arбора
Montréal, Canada
8 Stories
2016



Moholt 50/50
Trondheim, Norway
9 Stories
2016



Banyan Wharf
London, UK
10 Stories
2015



Hypérion
Bordeaux, France
18 Stories
2020



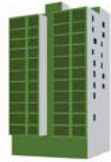
Silva
Bordeaux, France
18 Stories
Under Construction



5 King
Australia
10 Stories
Under Construction



Puukuokka
Jyväskylä, Finland
8 Stories
2015



TREET
Bergen, Norway
14 Stories
2015



Strandparken
Stockholm, Sweden
8 Stories
2014



Mjøstårnet
Norway
18 Stories
Under Construction



HoHo Vienna
Vienna, Austria
24 Stories
Proposed



Haut
Amsterdam, Netherlands
21 Stories
Proposed



Contralaminada
Leida, Spain
8 Stories
2014



**Wood Innovation
& Design Centre**
British Columbia, Canada
8 Stories
2014



St. Dié-des-Vosges
St. Dié-des-Vosges
8 Stories
2014



Framework
Portland, United States
12 Stories
Design Phase



Sanctuary
Glasgow, Scotland
7 Stories
2018



Sida Vid Sida
Skelleftea, Sweden
19 Stories
Announced



Cenni di Cambiamento
Milan, Italy
9 Stories
2013



Wagramerstrasse
Vienna, Austria
7 Stories
2013



Panorama Giustinelli
Triste, Italy
7 Stories
2013



**Brock Commons
Tallwood House**
Vancouver, Canada
18 Stories
2017



Origine Condos
Quebec City, Canada
13 Stories
2017



T3
Minnesota, United States
7 Stories
2016

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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



TESTING & DEVELOPMENT



INNOVATIVE SOLUTIONS



EDUCATION & OUTREACH



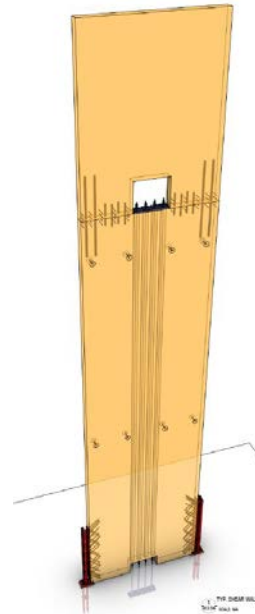
Applied Research



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

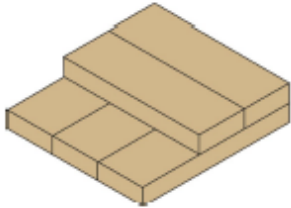
Kevin Van Den Wymelenberg, Professor
Research Assistants: Denise Blankenberger



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?



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



INNOVATIVE SOLUTIONS

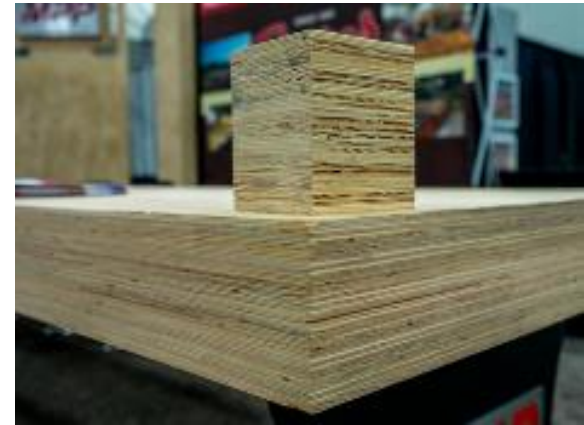


Evaluation and Testing of Mass Plywood Panels

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 & OUTREACH



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

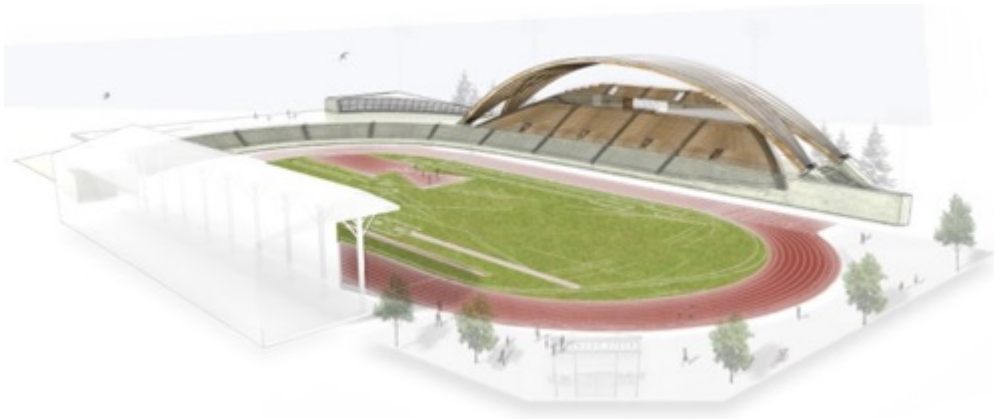
Krysten Gormly | David Lieberman| Scotty McClelland
Judith Sheine, Mark Donofrio, Faculty Advisors



Glenwood Parking Garage, Springfield, OR SRG Partnership, 2018-19

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



Hayward Field
SHELL

Jenny Lam | Alexandra Lau | Joshua Tully
Judith Sheine, Mikhail Gershfeld, Faculty Advisors



Hayward Field

University of Oregon

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

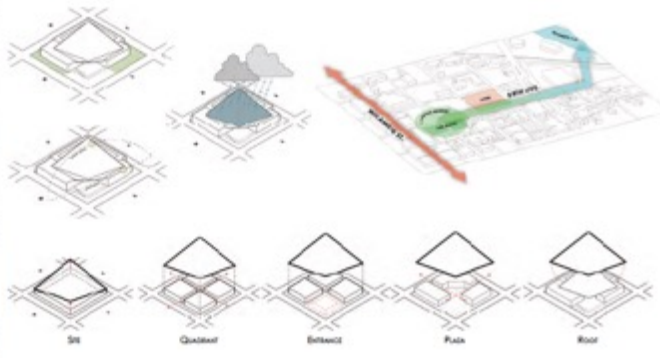


1: INTEGRATION

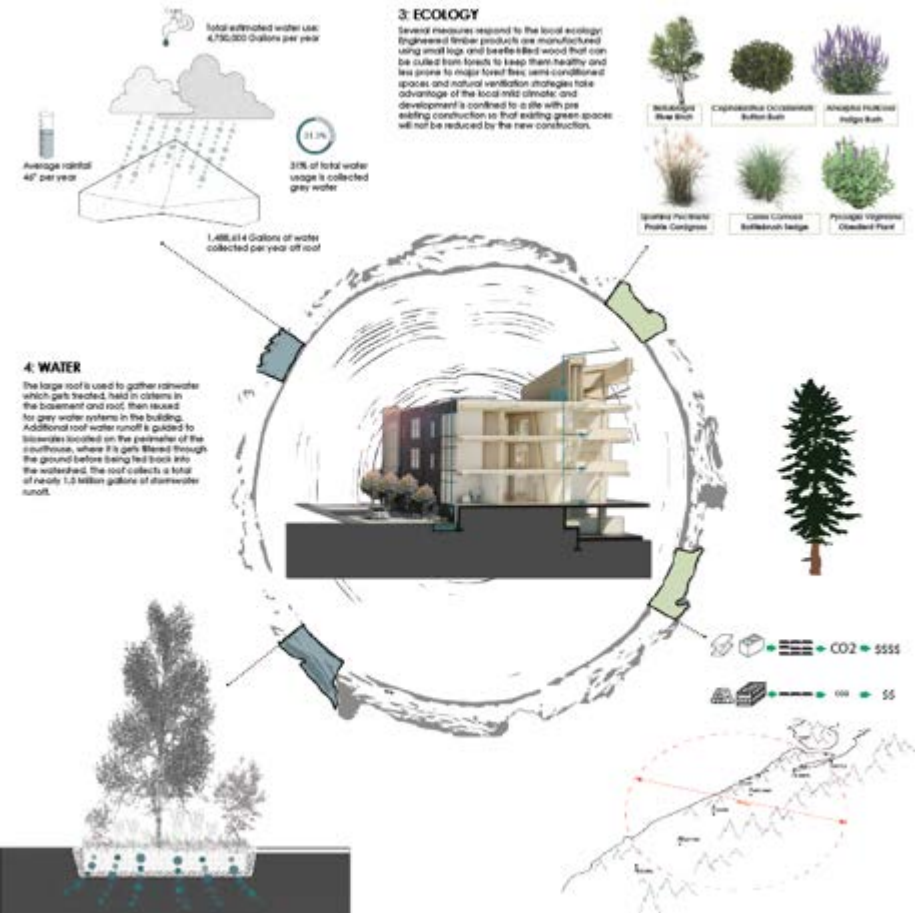
Given the temperate, but wet, climate in Oregon, the design began with a large semi-conditioned, uninterupted public space at its center, featuring a dramatic, engineered timber roof. The roof was designed to enhance the indoor/outdoor experience with the use of skylights and selected daylight penetration.

2: COMMUNITY

The site is located in the civic center of downtown Eugene, which the city prides to sidewalk to connect downtown to the river and encourage active public use gatherings, walking and biking. The site is accessible by the public bus system and adjacent to the Eugene City Hall site and the Park Blocks, which hosts the Saturday Farmer's Market.



Lane County Courthouse



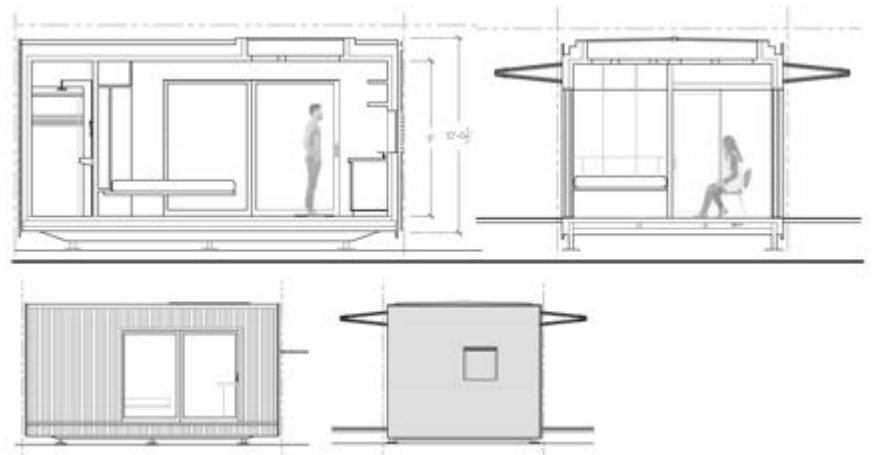
Westin Hill, Russell Regulinski, Tim Walsh
Judith Sheine, Mark Donofrio, Faculty Advisors

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



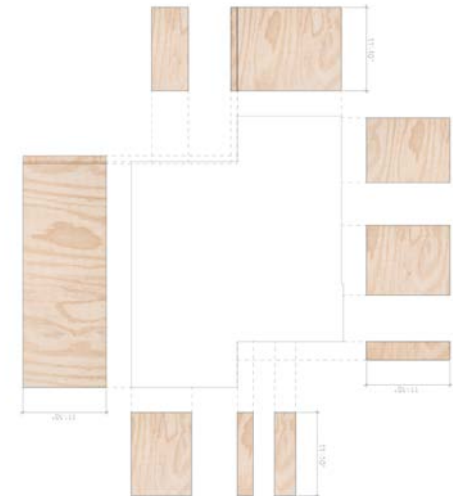
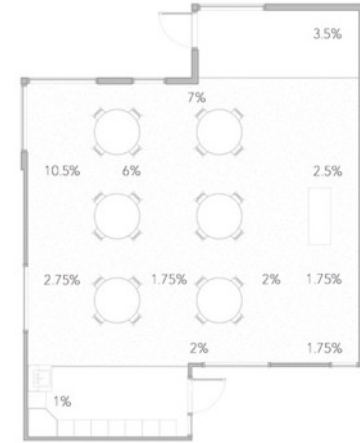
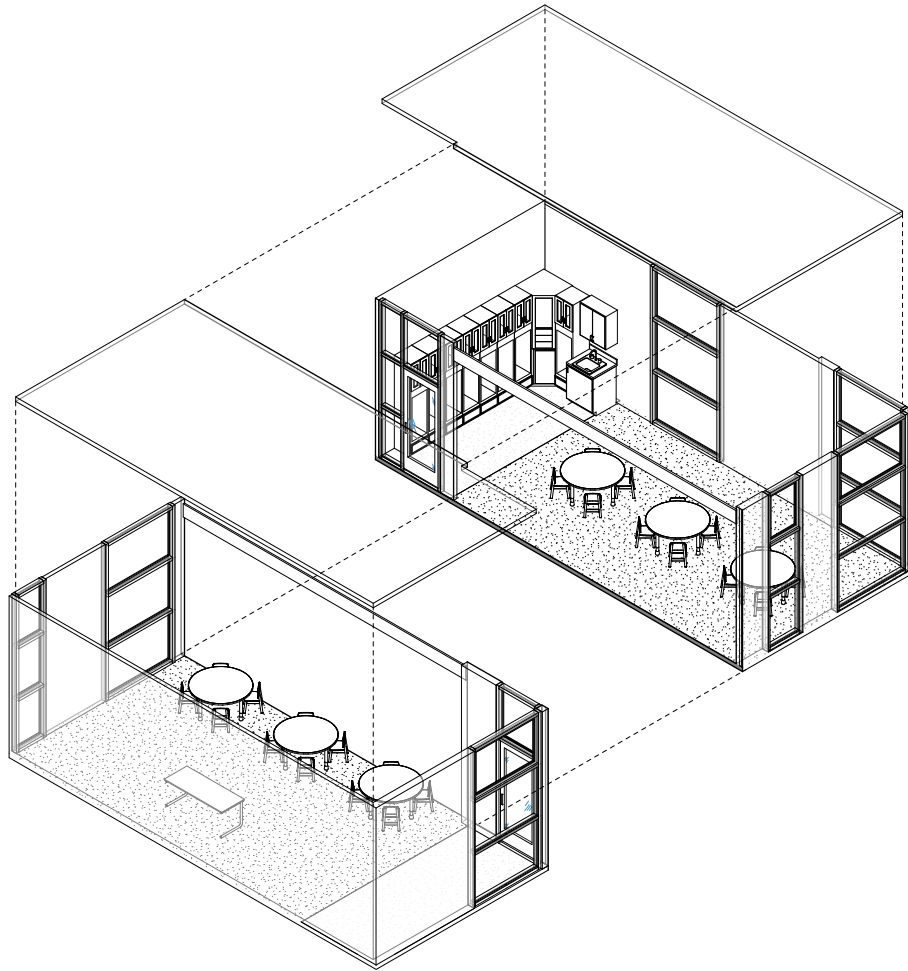
Judith Sheine
Department of Architecture
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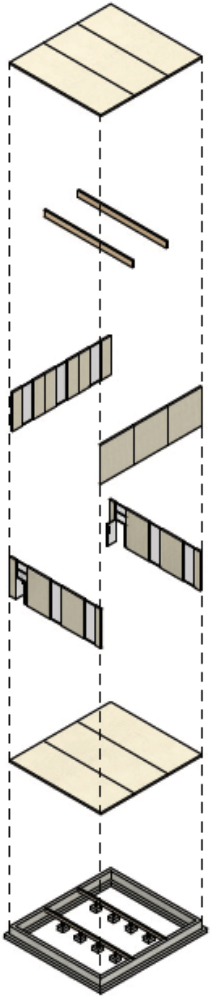
Mikhail Gershfeld
Department of Civil
Engineering
California State Polytechnic
University, Pomona



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

MS in Architecture Mass Timber Design Path

- 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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